İSTANBUL TECHNICAL UNIVERSITY ★ ENERGY INSTITUTE

PLANNING AND LEVELIZED COST OF ENERGY ANALYSIS OF A FLOATING OFFSHORE WIND FARM AND A FIXED BOTTOM OFFSHORE WIND FARM PROJECT

M.Sc. THESIS

Hatice Özge ÖZÜER

Energy Science and Technology Division

Energy Science and Technology Program

MAY 2016

İSTANBUL TECHNICAL UNIVERSITY ★ ENERGY INSTITUTE

PLANNING AND LEVELIZED COST OF ENERGY ANALYSIS OF A FLOATING OFFSHORE WIND FARM AND A FIXED BOTTOM OFFSHORE WIND FARM PROJECT

M.Sc. THESIS

Hatice Özge ÖZÜER

Energy Science and Technology Division

Energy Science and Technology Program

Thesis Advisor: Prof. Dr. Bihrat ÖNÖZ

MAY 2016

İSTANBUL TEKNİK ÜNİVERSİTESİ ★ ENERJİ ENSTİTÜSÜ

DENİZE KURULAN YÜZEN TEMEL VE SABİT TEMELLİ RÜZGAR TÜRBİN PROJELERİNİN PLANLANMASI VE SEVİYELENDİRİLMİŞ ENERJİ MALİYET ANALİZLERİ

YÜKSEK LİSANS TEZİ

Hatice Özge ÖZÜER

Enerji Bilim ve Teknoloji Anabilim Dalı

Enerji Bilim ve Teknoloji Programı

Tez Danışmanı: Prof. Dr. Bihrat ÖNÖZ

MAYIS 2016

Hatice Özge ÖZÜER, a M.Sc. student of İTU Energy Institute 301111013, successfully defended the thesis entitled "PLANNING AND LEVELIZED COST OF ENERGY ANALYSIS OF A FLOATING OFFSHORE WIND FARM AND A FIXED BOTTOM OFFSHORE WIND FARM PROJECT", which she prepared after fulfilling the requirements specified in the associated legislations, before the jury whose signatures are below.

Thesis Advisor :	**Prof. Dr. Bihrat ÖNÖZ** İstanbul Technical University	.....
Jury Members :	**Prof. Dr. Ş. Sibel MENTEŞ** İstanbul Technical University	.....
	Yard. Doç. Dr. M. Adil AKGÜL Yeditepe University	.....

Date of Submission : 02 Mayıs 2016
Date of Defense : 31 August 2016

FOREWORD

I owe a debt of gratitude to a number of individuals for their support and encouragement over the last year. They will always inspire me to be a supportive and encouraging individual myself for the people I work with and for my friends and for any people I will interact.

I would like to thank to Marc Seidel, my company supervisor in Hamburg, Siemens Offshore Wind Power department, for his great support, time and inspiration that helped to determine the purpose of this thesis.

I would like to thank to Bihrat Önöz, for her great support and understanding. Without Bihrat Önöz, this thesis would not be possible.

I would like to thank to Burak Barutcu for his support and contribution to my work.

I would like to thank to my friends that gave me the strength to manage hard work at challenging times due to full time job and research work responsibilities.

Last but not least, I would like to thank to my family and my brothers Burak and Berk for their support.

April 2016

H. Özge ÖZÜER

(Civil Engineer)

TABLE OF CONTENTS

Page

ABBREVIATIONS

AEP : Annual Energy Production per MW
CAPEX : Capital Expenditure
CRF : Capital Recovery Factor
DEP : Depreciation
EHS : Environmental Health and Safety
ICC : Initial Capital Cost per MW
INT : Interest
LCOE : Levelized Cost of Energy
LP : Loan Payment
O&M : Annual Operation and Maintenance Costs per MW
OPEX : Operational Expenditure
QA : Quality
PC : Project Cost
TR : Tax rate
WDT : Weather Down Time
WACC : Weighted Average Cost of Capital
WTG : Wind Turbine Generator

SYMBOLS

C^1	**:** Cost flow at period 1
d	**:** Discount rate
D	**:** Market value of the firm's debt
D/V	**:** Percentage of financing that is debt
e	**:** Escalation factor
E	**:** Market value of the firm's equity
E/V	**:** Percentage of financing that is equity
EP	**:** Energy produced at time t
Hs	**:** Significant wave height
n	**:** Number of periods
R	**:** Rate of return
Rd	**:** Cost of debt
Re	**:** Cost of equity
t:	**:** Year calculated
V	**:** (E+D) – Total market value of the firm's financing; equity and debt

LIST OF TABLES

Page

LIST OF FIGURES

Page

PLANNING AND LEVELIZED COST OF ENERGY ANALYSIS OF A FLOATING OFFSHORE WIND FARM AND A FIXED BOTTOM OFFSHORE WIND FARM PROJECT

SUMMARY

Today wind energy is one of the significant resources of the world's energy. Although offshore wind industry has the added attactions due to increased rated power and large turbines, there are several additional cost and risk factors that offshore industry faces including additional technical requirements of turbines, complex foundation structures, complex electrical infrastructure and additional challanges during transportation, installation and maintenance works. Bottom – fixed offshore wind farm solutions that have been established the most in the industry are not economically competitive especially due to the low achievement rates of utilization of installation vessels in the chartered period, which result in financial damages and remarkable amount of costs and due to the harsh weather conditions at offshore that limit the available workable durations. As the industry tends to move into deeper waters, far away from the shore, bottom – fixed concepts become less feasible solution. Floating offshore wind turbines have more potential to overcome the challanges of offshore wind industry. The advantages of Glosten PelaStar tension leg platform concept that is analyzed in this thesis to evaluate its competitivesness vs. bottom – fixed solution, have been demonstrated in terms of enabling better weather conditions and working environment, early project completion, reduced site manning costs and elimination of the risk of financial losses due to time target failures of installation vessel charters.These advantages indicate lower levelized cost of energy results, which are very significant on the pathway to commercialization of floating offshore wind turbines. As currently there isn't a floating wind farm installed in the scale that have been modelled in this thesis, the detailed planning results of a conceptual floating offshore wind farm consisting of 83 PelaStar tension leg platform turbines provide comparable basis in order to evaluate the competitiveness of this concept vs. dominant bottom – fixed solutions in the offshore industry. In addition to advantages, the additional costs that is estimated due to unique hull structure production and support barge design have also been considered when calculating life cycle costs and levelized cost of energy of both solutions. Levelized cost of energy

depends on life cycle cost of a wind farm including capital, operational and maintenance costs and as well as on annual energy production of the wind fam. The phases of life cycle costs of a wind farm consist of conception & definition, design & development, manufacturing, installation, exploitation and dismantling costs. Annual energy production depends on turbine rated power, capacity factor and annual mean wind speed of the wind farm.An annnual energy production calculation for a 7 MW turbine has also been demonstrated in this thesis based on the annual wind speed data at hub height of an operating offshore wind farm at North Sea.

In this study LCOE calculations have been conducted by evaluating three different methods that are commonly used in the offshore industry. By keeping all the cost parameters and annual energy production amount same, LCOE is calculated as 124.9 Euro/MWh, 141.8 Euro/MWh and 148.36 Euro/MWh respectively using simple LCOE method, cash flow LCOE method and leveraged cash flow LCOE method. Leveraged cash flow LCOE method is chosen to further evaluate PelaStar tension leg platform and bottom-fixed projects.

Assuming the wind farm is located at 75 meter water depth, 156.46 Euro/MWh LCOE is calculated for PelaStar concept. Conducting the same calculation for a location at 57 meter water depth, 156.71 Euro/MWh value is obtained while for bottom fixed project at 40 meter water depth, LCOE is calculated as 164 Euro/MWh.

In order to evaluate the impact of delay in projects' timeline on LCOE values, further calculations have been conducted assuming both projects will be delayed 90 days. The increase in LCOE for PelaStar concept at 57 meter is calculated as 0.55 Euro/MWh while for bottom fixed concept the increase in LCOE has seen to be much higher as 1.28 Euro/MWh.

Finally in order to evaluate the impact of wind speed on LCOE results, calculations have been repeated for PelaStar project assuming that annual mean wind speed is 10.5 m/s and 11.4 m/s. The increase in wind speed, resulting in increase of annual energy production, reduced the LCOE results to 143.02 MWh and 135.23 MWh respectively.

DENİZE KURULAN YÜZEN TEMEL VE SABİT TEMELLİ RÜZGAR TÜRBİN PROJELERİNİN PLANLANMASI VE SEVİYELENDİRİLMİŞ ENERJİ MALİYET ANALİZLERİ

ÖZET

Denize kurulan rüzgar türbin endüstrisinde su derinliğinin daha yüksek olduğu ve karadan daha uzak yerlere yönelme eğilimi, rüzgar türbin projelerinin kurulum ve operasyon süreçlerinin planlanmasını zorlaştıran kompleks altyapı gereksinimlerini de beraberinde getirmektedir. Yüzen temelli rüzgar türbin sistemleri, endüstrinin karşı karşıya kaldığı bu zorluklara çözüm getirme açısından büyük potansiyel içermektedir. Birçok simülasyon ve protatip proje ile yüzen temelli sistemlerin teknik fizibilitesi gösterilmiş olsa da, ekonomik fizibilite bu sistemlerin ticarileşmesinin önündeki zorluklardan biridir. Bu çalışmada ele alınan Glosten PelaStar çekme kazıklı tip platform konseptinin özgün yüzen gövde yapısı ve yüzen mavna tasarımı, bu projenin yaşam çevrim maliyetini oluşturan bazı yatırım giderlerini arttırmaktadır. Fakat sabit temelli sistemlerden farklı olarak bu konseptin sağladığı karada kurulum ve devreye alma fazlarının yapılabilmesi, projenin erken bir tarihte tamamlanması ve kaynak maliyetlerinin düşürülmesi gibi avantajları da beraberinde getirmektedir. Projelerin yaşam çevrim maliyetinin azalması, rüzgar türbin sahalarındaki yıllık rüzgar hızı ve türbinlerin nominal gücü gibi parametrelere de bağlı olarak değişen seviyelendirilmiş maliyetleri de azaltmaktadır.

Bu çalışmada yüzen temel ve sabit temel konseplerini karşılaştırmak için, rüzgar türbin sahasının Kuzey Denizinde, Almanya sınırları içerisinde bir bölgede karadan 54 km uzaklıkta bir alana kurulacağı ve rüzgar türbin parkının 83 türbinden oluşacağı varsayılmıştır. Projenin maliyet analizlerini yapmak için kurulum süresi 28 ay, operasyon periyodu ise 20 yıl olarak alınmıştır.

Yüzen temelli rüzgar türbin tasarımının kurulum aşamasında sağladığı avantajlardan dolayı, çalışmanın 5. Bölümünde montaj ve inşaat süreci, primavera programı kullanılarak iş kalemlerine ayrıldı ve her iki farklı konsept için zaman planı yapıldı. Sabit temelli rüzgar türbin projesinin kurulumunun, denizde, dolayısıyla karada kurulan yüzen temelli türbin projesine göre daha kötü hava şartlarında gerçekleşmesi nedeniyle, kurulum sırasındaki hava koşullarına dair istatistiksel verilere dayalı hava

tahmin raporları, primavera programına entegre edildi. Yüzen temelli proje için 260 gün, sabit temelli proje için 288 gün kurulum süreci hesaplandı. Bu zaman planı baz alınarak kurulum sürecinde çalışacak inşaat isçilerinin maliyetleri hesaplandı. Ön montaj, montaj, kurulum, mekanik, elektrik işlerinin devreye alınması, test ve denetleme süreçlerinde görev alacak beyaz ve mavi yaka işçilerin toplam maliyeti, PelaStar yüzen temel projesi için 27,805,774 Euro olarak hesaplanırken, sabit temelli proje için 31,750,568 Euro olarak hesaplandı.

Çalışmanın 6. Bölümünde rüzgâr enerjisi üretmekte olan rüzgâr türbin sahasına ait bir yıllık rüzgar hızı verileri kullanılarak yıllık enerji üretimi hesabı yapıldı. Örnek yıllık enerji üretim hesabi için, rüzgar türbininin 7 MW'lık güçte olduğu kabul edildi ve güç eğrisi ve rüzgar verileri baz alınarak seçilen türbine ait bir yıllık enerji üretiminin 39550 MWh ve kapasite faktörünün maksimum 64.5 % olduğu hesaplandı.

Çalışmanın 7. Bölümünde öncelikle enerji maliyet analizi (LCOE) hesabına ilişkin kullanılan yöntemler ele alındı ve kullanılan yönteme göre farklı sonuçlar elde edilebileceğini göstermek için aynı maliyet ve enerji üretim verileri kullanılarak üç farklı yöntem ile seviyelendirilmiş enerji maliyet hesabi yapıldı. Basit LCOE yöntemiyle 124.9 Euro/MW saat sonucu elde edilirken, maliyet akış LCOE yöntemi ve geliştirilmiş maliyet akış LCOE yöntemiyle sırasıyla 141.8 Euro/MW saat ve 148.36 Euro/MW saat sonuçları elde edildi. Yüzen temel ve sabit temel konseptlerinin LCOE hesaplarını yapmak için, amortisman ve ödenen faizlere uygulanan vergi indirimlerini de hesaba eklemek amacıyla geliştirilmiş maliyet akış LCOE yöntemi seçildi.

7. bölümde metotların karşılaştırılmasının yanı sıra, PelaStar ve sabit temel projelerinin maliyet kalemleri detaylı olarak ele alındı. PelaStar projesi 75 metre su derinliği ve 57 metre su derinliği olmak üzere iki farklı durum için incelendi ve LCOE değerleri sırasıyla 156.46 Euro/MW saat ve 156.71 Euro/MW saat olarak hesaplandı. Sabit temelli proje 40 metre su derinliğinde olduğu varsayılarak ele alındı ve LCOE değeri 164 Euro/MWsaat olarak bulundu. Kurulum sırasındaki gecikmelerin LCOE üzerindeki etkisini ölçmek için projenin 90 gün geciktiği varsayılarak PelaStar yüzen temel ve sabit temel konseptlerinin maliyet hesapları tekrar yapıldı ve elde edilen maliyet hesaplarıyla LCOE değerleri sırasıyla 157.26 Euro/MW saat ve 165.28 Euro/MW saat olarak hesaplandı. Bu değerlere göre projelerin kurulum sırasında olası bir gecikmenin sabit temelli projeye ait LCOE değerini daha fazla artmasına neden olduğu sonucuna varıldı.

Son olarak rüzgâr hızının LCOE üzerindeki etkisini ölçmek için PelaStar yüzen temel projesine ait LCOE hesabi maliyet verileri ayni kabul edilerek farklı rüzgâr hızı dolayısıyla farklı enerji üretim verileriyle tekrar yapıldı. 9.7 m/s rüzgar hızına karşılık gelen yıllık üretim miktarı ile elde edilen 156.71 Euro/MW saat değerinin 10.5 m/s ve 11.4 m/s ortalama rüzgar hızı koşullarında 143.02 Euro/MW saat ve 135 Euro/MW saat değerlerine düştüğü hesaplandı.

1. INTRODUCTION

The re-emergence of the wind as a significant source of the world's energy is one of the important developments of the late 20th century as in contrast to "windmill" which is a machine converting the wind's power in to mechanical power, the modern wind turbines are machines which convert the power in the wind into electricity (Manwell et all, 2002). In modern wind turbines, the actual conversion process uses the basic aerodynamic force of lift to produce a net positive torque on a rotating shaft, resulting first in the production of mechanical power and then in its transformation to electricity in generator (Manwell et all, 2002). The first country to use the wind for generation of electricity was Denmark, using a 23 m diameter wind turbine in 1890 (Johnson, 2001) and today wind power technologies come in a variety of sizes and styles and can be categorised by whether they are located in onshore and offshore.

In the countries bordering on the North Sea and Baltic Sea, wind energy utilization is playing an important role; this is therefore, where offshore technology for siting wind turbines is primarily developed (Hau, 2005). In addition to having significant positive aspects such as increased rated power and large turbines, offshore wind turbines have a lot of challanges compared to onhore turbines in terms of turbines technical requirements, foundation on the sea floor, electrical infrastructure, transportation, installation and maintenance. The loads that are taken into consideration in the strength and stiffness design of the structures in offshore are different from those on land due to higher mean wind speed, higher induced turbulence in the array depending on the turbine spacing selected, additional high loads of wave motion of water and motion of the ice at sea, currents, the scouring of the sea bottom behind the sea bottom and the increased corrosion that plays a considereable role in the fatigue strength of the components of the structure (Hau, 2005). In addition to increased loads, offshore siting of wind turbines requires increased demands on their technical equipment such as additional corrosion protections, monitoring and control systems that can be reprogrammed from land,

docking platforms for maintenance boats and mountings for accessibility in rough sea, illuminination in accordance with the rules at sea, adaptation with the tower design and its foundation on the sea floor, more complex electrical infrastructure that consist of internal electricity system of the wind farm, offshore transformer station, sea-cable connection to the land and link-up with the interconnected grid on land, increased demands on the concept of transportation, assembly and the later operation of the turbine (Hau, 2005). Despite these challanges, offshore wind farms have significant advantages compared to onshore wind farms regarding space and productivity, where ocean surface friction is less, no structures disturb the wind filled, wind is consistent and strong compared to onshore to allow lower towers that provide the same capacity like much higher onshore turbines (Ludewig, 2014). The wind turbines suitable for offshore wind energy utilization are becoming larger and larger andprojects are planned with wind farms of the magnitude of 1000 megawatts and more, enabling offshore wind farm utilization to reach an order of magnitude similar to power stations even in indivudual projects (Hau, 2005).

1.1 Purpose of Thesis

The current tendency in the offshore industry to move into greater water depths further away from shore leads to more complex infrastructures which makes the planning installation and operation process even more challenging. The global market for floating offshore wind turbines shows great potential to handle these challenges. Technical feasibility of floating offshore wind turbines has been demonstrated in various simulations and prototypes; however, economic feasibility seems to be the key challenge in front of commercialization. In this thesis, it is aimed to develop foundation concept strategy, to plan the construction phases of different offshore wind farm concepts and to calculate “Levelized Cost of Energy” for chosen projects to judge the cost effectiveness of floating wind turbine concepts and also to identify the parameters offering cost reduction potential.

The main objective of the timeline calculation and Levelized Cost of Energy calculation is to analyze and compare different floating offshore wind turbine concepts in deep waters from a techno-economic perspective. As a case study, the competitiveness of GLOSTEN PELASTAR TLP (Tension Leg Platform) and a Bottom-Fixed Offshore Platform project will be anaylzed.

Methodologically,activity network diagram for timeline calculation and life cycle cost analysis for levelized cost of energy analysis will be conducted for each of the substructure types. All costs occurring through different life cycle phases of a wind farm such as wind farm development, manufacturing, acquisition and installation of components to operation and maintenance of the wind farm and finally decommissioning will be considered. To find cost per produced unit of energy, levelized cost of energy, total costs will be discounted to values at equal points on time and will be assigned to expected wind farm energy production. The Levelized Cost of Energy analysis will include all capital operational and decommissioning expenditures incurred over the life time of a projects.

2. TECHNOLOGY OVERVIEW

Offshore wind turbine foundations are complex structures that must be designed to survive the harsh marine environment and impact of large waves. The choice of which foundation type to use in offshore wind farm systems depends on local sea – bed conditions, water depth and estimated costs (International Renewable Energy Agency, 2012). Figure 2.1 below shows the most established support structure concepts (Minambres, 2012).

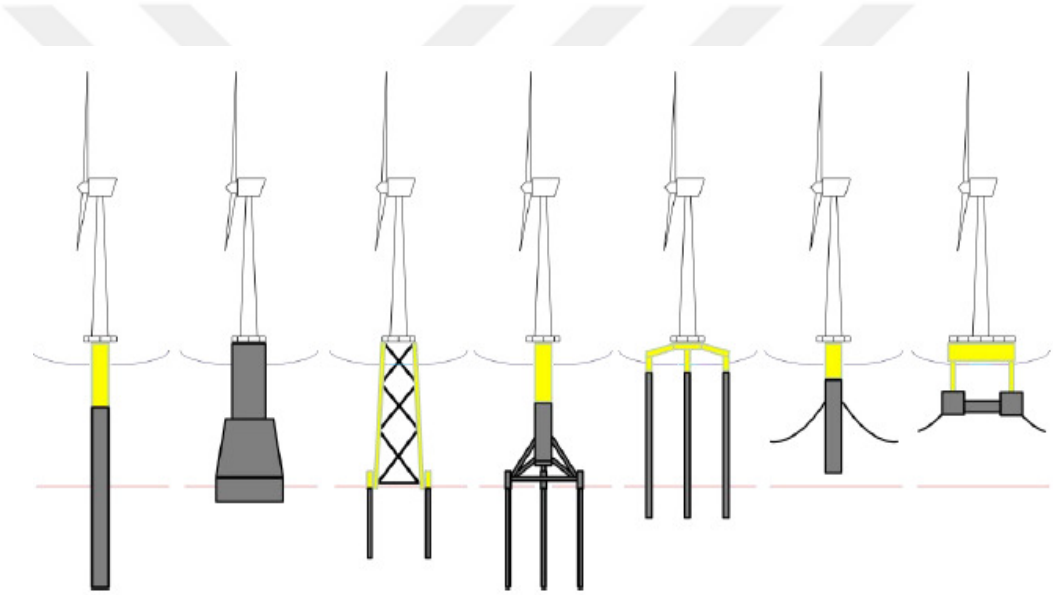


Figure 2.1 : Different Support Structure Concepts. From left to right:Monopile - gravity base - jacket d)tripod – tripile – spar - semisubmersible platform.

2.1 Fixed Platform and Foundation Designs

Monopiles are the most common offshore wind support structures. The design of the monopile consists of a cylindrical foundation pile and a transition piece between tower and monopile, which could be identified like a continuation of the tower. Relatively simple fabrication and installation process have made monopiles the most widely used support structure; nevertheless they present limitations in terms of water depth (Minambres, 2012).

Gravity base support structures relay on their weight and ballast to retain the tower and turbine in place. The base structures are made of steel reinforced concrete on which tower is placed. The advantages of gravity based structures are that no transition piece installation is required, structure can be floated and there is low environmental impact due to the absence of piling during the installation. However, transportation and installation is limited due to high weight, production cost is high, sea bed preparation is required and it is not suitable for soft seabed surfaces (Minambres, 2012).

A jacket is a structure made up of three or four legs connected by slender braces. All elements are tubular and they are joined by welding. Like monopiles, jackets need a transition piece to support the wind turbine tower. Advantages of jacket structures are their lightweight and stiff structure, their low soil dependency and good response to wave loads while disadvantages are their complexity of fabrication and complex connection to transition piece (Minambres, 2012).

2.2 Floating Platforms and Foundation Designs

The tendency within the offshore wind market to move into deeper waters had the impact on the development of floating support structures. The main types of floating foundations are spar buoyance monopile, semisubmersible platform and tension leg platform as shown in Figure 2.2 below.

Figure 2.2 : Floating Support Structures Hywind (spar) – Sway (spar) – WindFloat (semisubmersible) – Blue H (TLP).

All these solutions have their origin in the oil & gas industry but modifications are beginning to emerge in their use of wind turbines. Advantages of floating support structures are being less sensitive to water depth and wave loads, enabling access to superior wind resources further offshore, ability to reduce visual effect, ability to locate further offshore and simplified offshore installation procedures. However, floating support structures also bring high mooring and platform costs, increase in design complexity and lack of mass production (Minambres, 2012).

The simplest design regarding floating support structures is the Spar, which is basically a large tube that floats due to air in the top of the structure and stays in vertical position due to the big amount of ballast at the bottom. The turbine is placed on top of the spar which is attached to the sea bed by means of anchors (Minambres, 2012).

The world's first operational deep-water floating large capacity wind turbine is the Hywind, in the North Sea of Norway. The support structure has a diameter of 8.3 m in the submerged body and a diameter of 6 m in the body at water level. The first stage of installing the spar floater is to tow the support structure horizontally to the desired location and then to straighten up by pumping water to an end of structure. After foundation is made vertical more water is added to sink the foundation in and with the help of a big barge, the tower, the turbine and the blades are lifted by a crane (Minambres, 2012). Figure 2.3 below shows the transport of an offshore turbine with a support barge to the offshore wind farm.

Figure 2.3 : Transport of Beatrice 5 MW Offshore Turbine, 2009 (Statoil, 2016).

Tension leg platform is a floating platform which allows a wind turbine to be motionless in spite of wind, waves and current loads. The principle of the tension leg platform is to create an underwater platform with buoyancy instead of the large amount of ballast to keep the structure stable. The buoyancy exceeds the weight of the platform and hence causes a pretension in the vertical cables which keep the platform on location. The legs can either be secured to a template at the seabed by individual piles or by suction anchors (Minambres, 2012).

3. CONCEPT DESIGNS

3.1 PelaStar Floating Foundation Concept Design

In this study the floating offshore wind turbine concept that is analyzed is PelaStar tension leg platform concept which is developed as deep water, floating foundation structure system. The aim is to focus on the capital and operational expenditures of a conceptual windfarm and the impact of the tension leg platform solution on LCOE of offshore wind projects. Therefore, the technical design criteria's and calculations have not been conducted in this study, rather the technical properties that given in the PelaStar report by Hurley and Nordstrom (2014) have been taken as a basis for Capex. Figure 3.1 below shows an illustration of the hull structure designed for PelaStar concept.

Figure 3.1 : PelaStar Hull Structure (Hurley and Nordstrom, 2014).

Principal characteristic include 18 meter as lower hull diameter and 8.5 meter for lower hull depth. For calculations carried out in Section 5 and Section 7, it is assumed that PelaStar wind farm consist of 83 Tension leg platform offshore wind turbines with a capacity of 6MW.

3.2 Fixed Bottom Foundation Concept Design

For fixed bottom concept, monopile offshore wind turbine solution is analyzed. In order to focus on the cost differences that are generated due to floating and fixed bottom foundations, it is assumed that turbine platforms consist of the same technical characteristics. Due to the fact that fixed bottom solutions are ideal for shallower waters compared to floating concepts, it is assumed that monopile structure is designed for a 40 meter water depth and for the calculation in Section 7, material quantity; equivalent to the aforementionedmonopile is taken from a reference project's bill of material.

4. SITE CONDITION PARAMETERS

4.1 Wind Speed

Wind speed is a parameter that has significant impact on LCOE as it has a huge impact on the annual energy production of a wind farm. In this study for the LCOE calculations, 9.7 m/s mean wind speed and the equivalent annual energy production given in the PelaStar report (Hurley and Nordstrom, 2014) has been used to calculate the LCOE of floating and fixed bottom concepts. To compare the impact wind speed, LCOE calculations have been repeated for 10.5 m/s and 11.4 m/s wind speeds.

The impact of wind during construction has been evaluated separately in Section 5 in order to estimate the adverse weather down time percent's that can occur during installation and construction. The weather forecast details have been provided in detail in Section 5.

4.2 Water Depth

For LCOE calculations in Section 7, three water depth cases have been evaluated. For the analysis of bottom –fixed project concept, it is assumed that water depth is 40 meter. PelaStar tension leg platform concept has been evaluated at water depth of 75 meter and 57 meter.

4.3 Distance to Port

For the calculations carried out in Section 5, it is assumed that distance to port is 54 km, which has an impact on the travel time to reach offshore wind farm location. The location of the wind farm is assumed to be at North Sea as shown in Figure 4.1 below.

Figure 4.1 : Location of Wind Farm that has Centre Latitude 53,967° and Centre Longitude 6,554°

5. PLANNING

5.1 Methodology

Most of the operations that belong to offshore wind farm construction subject to weather conditions. In order to be able perform the works such as lifting components with cranes, transferring crew to offshore site, erecting the turbine or commissioning, weather conditions shouldn't exceed the limits stated for the particular work. Hence predicting the adverse weather periods and amount that will occur as the construction works take place play a very significant part for being able to make realistic operational planning. For this purpose it is necessary to prepare weather assessment reports that belong to offshore site and all construction site locations prior to planning. Once a detailed work breakdown structure is created and the net durations required to complete each single work is estimated, weather limits for each work should also be evaluated. Based on these weather limits defined, weather assessment reports of a specific site location provide the adverse weather percentages per each month, which are then incorporated into planning of offshore wind farm construction. For the planning in this study, "Primavera" planning software is used and adverse weather statistics are incorporatedinto the calendars that are assigned to the activities. As next step activity network diagram is created and sequence of activities are prepared in primavera planning tool based on the network diagram. Lastly team and resource numbers that will perform the work are estimated and are introduced into the planning.

5.1.1 Work day planning for commissioning teams

Maximum working hour for commissioning teams are 12 hour per day. However, net working duration is less due to the break, lunch and time lost for traveling. In order to estimate the net working duration of commissioning teams per day, a detailed planning as shown in Table 5.1has been prepared. For commissioning teams, the net working duration used in calculations is 8.15 hour for both concepts.

Table 5.1 : Detailed day planning for commissioning teams.

Activity	Start	End	Duration
Toolbox/Preparation	06:30	07:00	00:30
Sailing / Preparation Time	07:00	08:45	01:45
Access to turbine/craning	08:45	09:15	00:30
Working time	09:15	09:45	00:30
Break	09:45	10:00	00:15
Working time	10:00	11:45	01:45
Lunch	11:45	12:15	00:30
Working time	12:15	14:30	02:15
Break	14:30	14:45	00:15
Working time	14:45	16:00	01:15
Descending from turbine/craning	16:00	16:30	00:30
Sailing / Preparation Time	16:30	18:15	01:45
De Briefing	18:15	18:30	00:15
Sum			12:00

5.2 Bottom - Fixed Concept Planning

All site parts and components of wind turbine are transported to a pre assembly site at port from production facilities. For the planning of bottom-fixed concept, it is assumed that an installation vessel with a maximum capacity of carrying components of 8 turbines, will load these components at port after the completion of preassembly works. For loading, the crane that is located in installation vessel will be utilized. Once all components are loaded and fastened to the vessel to prevent damages during transportation, installation vessel transits to offshore site. It is assumed that construction of fixed bottom turbine foundations of entire wind farm is complete and grid is also available before installation vessel arrives. Technicians that will perform installation work accommodate in the installation vessel and after they complete installation works of a turbine, vessel moves to the next turbine location. After installation of 8 turbines, vessel moves to the port and load the next 8 components of 8 turbine and returns to offshore site until all 83 turbine are completed. For commissioning works, it is assumed that a Hotel Vessel is utilized where all resources needed to perform commissioning works will accommodate. Hotel vessel will be anchored at offshore site, once the installation works of a turbine is completed, the commissioning teams will go to the turbine from Hotel vessel via crew transfer boats to perform the remaining works. Please see the Appendix A for the detailed operational planning of bottom-fixed project.

5.2.1 Work breakdown structure and adverse weather statistics

5.2.1.1 Installation works

In Offshore Wind Turbines Projects where foundation are fixed – bottom, installation and commissioning works have to be carried out offshore. For the planning of bottom-fixed concept, it is assumed that there will be one installation vessel, where all technicians will accommodate. Tools and equipment will also be stored on the installation vessel. The detailed sequence of works that will be performed from installation vessel and their durations are listed in Table 5.2.

Table 5.2 : Installation works and durations.

Activity Name	Duration (Hour)
Start WTG. Wind Farm Installation	0
Loading WTG no.01	48
Sea fastening and prepare to departure no.01	2
Pilot out of port no.01	1
WTG transit to site no.01	13
WTG Positioning and jack up no.01	4,5
WTG Prep for installation no.01	1
Installing tower, nacelle & hub no.01	8
Installing 3 blades no.01	10,5
Position checked by client rep. no.01	0
Jack Down no.01	2
WTG return to port no.01	16

During Loading phase, the first activity listed in Table 5.2, components that are pre-assembled in the assembly port are loaded to installation vessel at quay site. For this study it is assumed that when wind at hub height is higher than 10 m/s loading can not be done. For the planning, adverse weather percentages that belong to the weather window assessment, Borkum Riffgrund 1report of Holst and Thiesen (2013) are used. Weather assessment report provides the availability weather percentages based on assumed wind speed limits and weather windows. For loading, weather window used is 3 hour and average availability percentage for entire year is 79%, which means that 79% there will be consequent 3 hour time periods that weather will be available for loading operation in one year. Set up is based on working for 24 hours with day and night shifts. On Table 5.3 below, estimated working hours are

calculated by using the adverse weather percentages. These calculated percentages are then used to create calendar in primavera and assigned to the loading activities.

Table 5.3 : WDT percentages for loading and working hour.

	Availability (%)	WDT (%)	Estimated Working Hour in Primavera Including WDT
Jan	51,20	48,80	12,29
Feb	60,50	39,50	14,52
Mar	62,10	37,90	14,90
Apr	75,10	24,90	18,02
May	76,30	23,70	18,31
June	76,20	23,80	18,29
July	82,40	17,60	19,78
Aug	78,90	21,10	18,94
Sep	66,70	33,30	16,01
Oct	60,40	39,60	14,50
Nov	56,00	44,00	13,44
Dec	58,70	41,30	14,09

Once loading is completed, components should be fixed on installation vessel in order to prevent any component damage during transfer to offshore site. These “Sea fastening and prepare to departure” activities and “WTG preparation for Installation” works are also affected from adverse weather. For both of these works “Availability on Deck Preparatory Works” percentages from weather assessment report, Holst and Thiesen (2013), areused in calculation. These percentages are based on 14 m/s wind speed and 3 hours weather window. The Estimated working hours used in the calendar created in primavera is listed in Table 5.4.

Table 5.4 : WDT percentages for on deck preparatory works and working hour.

	Availability (%)	WDT (%)	Estimated Working Hour
Jan	62,40	37,60	14,98
Feb	69,70	30,30	16,73
Mar	74,80	25,20	17,95
Apr	85,80	14,20	20,59
May	88,10	11,90	21,14
June	91,00	9,00	21,84
July	92,60	7,40	22,22
Aug	92,60	7,40	22,22
Sep	83,50	16,50	20,04
Oct	74,10	25,90	17,78
Nov	69,30	30,70	16,63
Dec	67,10	32,90	16,10

After sea fastening is completed installation vessel leaves the preassembly port to transfer the turbine components to offshore wind farm site. The duration of the transfer depends on the wind farm location and for this study it is taken as 13 net hour when weather conditions are available for transfer. However, for transfer, Significant Wave Height (Hs), which is defined as the average of the highest 1/3 of the waves in a wave series, Kamphuis (2010), should be lower than a certain value that is specified for the type of vessel. Weather assessment report that is referred for the weather downtime percentages in this study is based on 2.5 m significant wave height limit for installation vessel. Based on this weather down time percentages, maximum travel hour for installation vessel transfer per month has been calculated and used to create calendar in primavera, as shown in Table 5.5.

Table 5.5 : WDT percentages for installation vessel transfer.

	Availability (%)	WDT (Weather Down Time) (%)	Primavera Calendar for Transfer Including WDT
Jan	71,70	28,30	17,21
Feb	75,20	24,80	18,05
Mar	83,00	17,00	19,92
Apr	95,70	4,30	22,97
May	96,70	3,30	23,21
June	93,10	6,90	22,34

Table 5.5 (continued) : WDT percentages for installation vessel ′

	Availability (%)	WDT (Weather Down Time) (%)	Primavera Calendar for Transfer Including WDT
July	94,70	5,30	22,73
Aug	94,90	5,10	22,78
Sep	86,20	13,80	20,69
Oct	81,20	18,80	19,49
Nov	76,80	23,20	18,43
Dec	73,20	26,80	17,57

“Installing tower, nacelle and hub” activities consist of installing tower on top of transition piece,a connection piece between the monopile foundation and the tower, and installation of nacelle, which has been preassembled with hub in the preassembly site. Weather assessment report, Holst and Thiesen (2013),is based on 3 hours weather window and 12 m/s wind speed at hub height for tower lift operations whereas for nacelle lift operations weather criteria consist of 7 hours weather window and 10 m/s wind speed limit in hub height. As the weather criteria are different for these two operations, average monthly availabilities are also different. For tower lift, average monthly availability is 66.8 % whereas for nacelle it is 44.9 %. In this study both operations are combined in one single activity and for calculation a calendar that is prepared based on nacelle lift percentages are assigned to these activities. Estimated working hours and monthly weather availabilities used are given in Table 5.6 below.

Table 5.6 : WDT percentages for installing tower, nacelle and hub percentages and working hours.

	Availability (%)	WDT (Weather Down Time) (%)	Estimated Working Hour in Primavera Including WDT
Jan	32,50	67,50	7,80
Feb	39,70	60,30	9,53
Mar	43,30	56,70	10,39
Apr	55,00	45,00	13,20
May	57,00	43,00	13,68
June	62,60	37,40	15,02
July	64,70	35,30	15,53

Table 5.6 (continued) : WDT percentages for installing tower, nacelle and hub percentages and working hours.

	Availability (%)	WDT (Weather Down Time) (%)	Estimated Working Hour in Primavera Including WDT
Aug	62,70	37,30	15,05
Sep	51,70	48,30	12,41
Oct	41,80	58,20	10,03
Nov	37,10	62,90	8,90
Dec	39,00	61,00	9,36

Turbine erection is completed after the installation of blades. It is followed by jacking down of installation vessel and travel to the next turbine location. In order to provide stable working environment for installation operations, installation vessels are equipped with special designed legs that are jacked down onto the sea floor upon arrival at the work location. In this study it is assumed that the average travel time from one turbine location and jack up time of vessel once work location is arrived is 4,5 hour and jacking down of vessel after installation completion takes 2 hours. For installation of 3 blades activities 10,5 net duration is used for calculation. Similar to the other installation activities, a calendar based on average monthly availabilities for blade lift operation has been prepared and assigned to these activities. As shown in Table 5.7., availability percent for blade lift is the lowest among all due to the fact that wind speed limit at hub height is 8 m/s and weather window is 8 hours for this operation. The average monthly availabilities that are taken from weather assessment report and working hours calculated based on these percent's are shown in Table 5.7 below.

Table 5.7 :WDT percentages for installation of 3 blades and working hours.

	Availability (%)	WDT (Weather Down Time) (%)	Estimated Working Hour in Primavera Including WDT
Jan	20,70	79,30	4,97
Feb	23,50	76,50	5,64
Mar	27,30	72,70	6,55
Apr	37,20	62,80	8,93
May	38,00	62,00	9,12
June	43,50	56,50	10,44
July	45,00	55,00	10,80

Table 5.7 (continued) :WDT percentages for installation of 3 blades and working hours.

	Availability (%)	WDT (Weather Down Time) (%)	Estimated Working Hour in Primavera Including WDT
Aug	42,60	57,40	10,22
Sep	33,30	66,70	7,99
Oct	26,20	73,80	6,29
Nov	23,10	76,90	5,54
Dec	26,30	73,70	6,31

5.2.1.2 Commissioning works

In this study commissioning works are grouped into four phases, mechanical, electrical, pre-commissioning and hot-commissioning. Unlike installation works, it is assumed that commissioning works are carried out only with day shifts. Set up for the basis of this calculation consist of utilization of hotel vessel, where all technicians and site manning accommodate and crew transfer to turbine locations is done with crew transfer vessels from Hotel Vessel, that is anchored at a location at offshore wind farm. The assumptions and details behind the maximum commissioning teams working hours used in this study are explained in Section 5.1.1. Similar to the method of planning installation works, this maximum 8.15 working hour for commissioning teams is then multiplied with adverse monthly weather availability percent and the results are incorporated into the primavera commissioning calendar that is assigned to commissioning activities in the plan. Weather criteria that form the basis for these availability percent's presented in the weather assessment report are 5 hours of weather window for commissioning works and 20 m/s wind speed limit. Weather availability percent's and working hours for commissioning teams are presented in Table 5.8 below. Once hot commissioning of a turbine is completed, then turbine should be tested for 240 hours. In this study this test period is included as "Reliability Test" with duration of 240 hours and a 24 hour calendar that does not include monthly weather availability percent's.

Table 5.8 : WDT percentages for commissioning works and working hours.

	Availability (%)	WDT (Weather Down Time) (%)	Estimated Working Hour in Primavera Including WDT
Jan	75,50	24,50	6,15
Feb	77,60	22,40	6,32
Mar	78,40	21,60	6,39
Apr	73,70	26,30	6,01
May	74,90	25,10	6,10
June	69,10	30,90	5,63
July	69,70	30,30	5,68
Aug	70,80	29,20	5,77
Sep	76,50	23,50	6,23
Oct	80,30	19,70	6,54
Nov	80,40	19,60	6,55
Dec	74,70	25,30	6,09

Successful completion of reliability test is followed by quality walkdown and snagging activities, with durations of 8 and 120 hours respectively. An 8 hour per day calendar is assigned to QA walkdown activity while a 12 hour per day calendar activity is assigned to Snagging for calculation. An overview of the work breakdown structure for the offshore works executed at bottom-fixed wind farm location is provided in Table 5.9 below.

Table 5.9 : Works that are done at fixed bottom offshore wind farm.

Activity Name	Duration (Team Hour)
Mechanical Completion	31
Electrical Completion	33
Pre-Commissioning	23
Hot Commissioning	15
Reliability Testing	240
QA Walkdown	8
Snagging	120

5.2.2 Resource set up and cost

As explained in Section 5.2.1, adverse weather percent's for each work phase have been incorporated into primavera planning tool to calculate the project construction works timeline. The dates that have been calculated are also used to calculate the site manning resource costs. The start and end dates ofthe required resources are taken from the time schedule, prepared by primavera. Based on the assumed payment details such as hourly rate of resources and how many hours the resources will be paid per day, total costs for each resource have been calculated.

Table 5.10 below shows the total costs for general site management resources. The reference for the hourly rates of resources is a bottom fixed offshore wind farm project that will be executed by Siemens. It is assumed that the general site management resources will be responsible for installation and the rest of the works until project closure but not preassembly works. For cost calculation it is assumed that they will be assigned to project as of 4th of April, 2016, earlier than installation start, which is assumed to be 1st of June, 2016 in this calculation due to preparation time needed before erection works. It is also assumed that these site management resources consisting of one site manager, one commercial site manager, one site administrator and 2 stock keepers will only work 5 daysa week and will be paid 8 hours per day. Another assumption is that they will be paid on adverse weather days as well, even though there is no progress at site due to weather downtime.

Table 5.10 : General site management resource costs.

	Start Date	Finish Date	Total Man hour	Hourly Rate (EUR)	Total Cost (EUR)
Site Administrator	04. Apr 16	27. Apr 17	2231	74	165.168
Commercial Site Manager	04. Apr 16	27. Apr 17	2232	90	200.880
Site Manager	04. Apr 16	27. Apr 17	2232	90	200.880
Stock Keeper	04. Apr 16	27. Apr 17	2232	74	165.168
Stock Keeper	04. Apr 16	27. Apr 17	2232	74	165.168
Sum					897.264

Unlike general site management resources, it is assumed that commissioning management reources, consisting of 2 installation leads, 2 quality inspectors, 2 stock keepers, 2 ehs officers and 1 assistant site manager will stay at hotel vessel, which

will be located in wind farm location. They will work 7 days a week and for 12 hours during their shift. After working 2 weeks at offshore, they will be replaced by the next shift and each resource will be paid for entire 12 hour during their shift, including the adverse weather days, when there won't be any work due to harsh weather conditions. As Table 5.11 below shows, commissioning management resources are assigned to the project starting from 2nd of June, 2016. The total days these resources will be working are less compared to general site management resources; however, total manhours of one resource is higher, 3795 hours whereas for site management it is 2231 hours. This is due to the fact that man hour of commissioning resources based on 12 hour per day.

Table 5.11 : Commissioning management resource costs.

	Start Date	Finish Date	Total Man hours	Hourly Rate (EUR)	Total Cost (EUR)
Ass.Site Manager	02. Jun 16	14. Apr 17	3795	90	341.550
EHS Officer	02. Jun 16	14. Apr 17	3795	90	341.550
EHS Officer	02. Jun 16	14. Apr 17	3795	90	341.550
Installation Lead	02. Jun 16	14. Apr 17	3795	90	341.550
Installation Lead	02. Jun 16	14. Apr 17	3795	90	341.550
Quality Inspector	02. Jun 16	14. Apr 17	3795	90	341.550
Quality Inspector	02. Jun 16	14. Apr 17	3795	90	341.550
Stock Keeper (Warehouse)	02. Jun 16	14. Apr 17	3795	74	280.830
Stock Keeper (Warehouse)	02. Jun 16	14. Apr 17	3795	74	280.830
Sum					2.952.510

Preassembly works require the assembly of 3 tower sections, assembly of hub and other nacelle components and assembly of blade. For the resource cost estimation it is assumed that in order to complete preassembly works a site manager, quality inspector, EHS officer, installation lead, blade techniician, 4 foreman, paint

technician, 9 ground technicians and 31 tower technicians should be assigned to the project as shown in Table 5.12. Based on the assumption that these resources will work 5 days a week and 8 hour per day, 2072 has been calculated as total man hour per resource. With the hourly rates used as per Table 12, the total preassembly resource cost has been calculated as 8.279.712 EUR.

Table 5.12 : Pre-assembly resource costs.

	Start Date	Finish Date	Total Man hours	Hourly Rate (EUR)	Total Cost (EUR)
Site Manager	01. Mar 16	24. Feb 17	2072	90	186.480
Quality Inspector	01. Mar 16	24. Feb 17	2072	90	186.480
EHS Officer	01. Mar 16	24. Feb 17	2072	90	186.480
Installation lead	01. Mar 16	24. Feb 17	2072	90	186.480
Blade Technician	01. Mar 16	24. Feb 17	2072	78	161.616
Foreman Preassembly x 4	01. Mar 16	24. Feb 17	2072	90	745.920
Tower Technician x 31	01. Mar 16	24. Feb 17	2072	78	5.010.096
Ground Technician x 9	01. Mar 16	24. Feb 17	2072	78	1.454.544
Paint Technician	01. Mar 16	24. Feb 17	2072	78	161.616
Sum					8.279.712

Installation vessel resources accommodate at installation vessel and similar to commissioning team that accommodate at hotel vessel, after working 2 weeks, they are replaced by the next shift. During one of these 2 weeks, half of the resources that stay at the installation vessel work day shift whereas the other half works at night shift. Each resource is paid for 12 hour per day per 7 days a week. As Table 5.13 below shows, the resources that are required for installation operation are 2 installation leads, 3 competent technician in installation, 2 installation foremen, 2 lifting supervisor, 2 EHS officer, quality inspector and 16 tower technicians. These resources work until erection works of all turbines are completed, which is calculated to be 5th February, 2017 as per primavera plan. Based on the man hours calculated and hourly rates given in Table 5.13, 7.103.412 EUR is the total cost of installation resources.

Table 5.13 : Installation vessel resource costs.

	Start Date	Finish Date	Total Man hours	Hourly Rate (EUR)	Total Cost (EUR)
Installation lead x 2	17. May. 16	5. Feb. 17	3174	90	571.320
Competent Technician In Installation x 2	17. May. 16	5. Feb. 17	3174	90	571.320
Foreman Installation x 2	17. May. 16	5. Feb. 17	3174	90	571.320
Lifting Supervisor x 2	17. May. 16	5. Feb. 17	3174	90	571.320
EHS Officer x 2	17. May. 16	5. Feb. 17	3174	90	571.320
Quality Inspector	17. May. 16	5. Feb. 17	3174	90	285.660
Tower Technician x 16	17. May. 16	5. Feb. 17	3174	78	3.961.152
Sum					7.103.412

Once erection works of a turbine is completed and installation vessel leaves the turbine, mechanical completion teams start working on mechanical commissioning works. Same like commissioning management resources, mechanical completion resources stay at hotel vessel as well. For time calculation it is assumed that the resources consisting of 2 competent technician in installaiton, 6 tower technicians and 2 high voltage specialized tower technicians as per Table 5.14 work only day shift and are paid 12 hour per day and for 7 days a week. These resources work in 2 teams, meaning they can work in parallel in 2 different turbine and one team can finish mechanical commissioning works of a turbine in 31 net hours, as given in Table 5.9 in Section 5.2.1.2. They work until the mechanical commissioning works of all turbines are completed, which is calculated as 13th February, 2017 by primavera. Based on the manhours calculated and hourly rates given in Table 5.14, the total cost of commissioning resources are 2.508.806 EUR.

Table 5.14 : Mechanical completion resource costs.

	Start Date	Finish Date	Total Man hour	Hourly Rate (EUR)	Total Cost (EUR)
Competent Tech. In Installation x 2	2. Jun. 16	13. Feb. 17	3067	90	552.060
Tower Tech. x 6	2. Jun. 16	13. Feb. 17	3067	78	1.435.356
Tower Tech. High Voltage x 2	2. Jun. 16	13. Feb. 17	3067	85	521.390
Sum					2.508.806

Electrical commissioning resources consist of 3 competent technicians in installation and 9 tower technicians as shown in Table 5.15. These resources split into 3 teams that can work parallel at 3 different turbines at the same time and for time calculation it is assumed that one team can complete the electrical commissioning works of a turbine in 33 hours. The calculated electrical completion date of last turbine is 16th of February, 2017. Based on the estimated man hours and hourly rates given in Table 5.15. total electrical completion resource cost is 2.973.348 EUR.

Table 5.15 : Electrical completion resource costs.

	Start Date	Finish Date	Total Man hour	Hourly Rate (EUR)	Total Cost (EUR)
Competent Tech. In Installation x 3	6. Jun. 16	16. Feb. 17	3059	90	825.930
Tower Tech. x 9	6. Jun. 16	16. Feb. 17	3059	78	2.147.418
Sum					2.973.348

Similar to mechanical and electrical commisioning teams, precommissioning resources accommodate at Hotel vessel as well. As per Appendix A “Bottom Fixed Offshore Wind Farm Project Construction Planning”, calculated completion date of precommissioning works by primavera is 19th February, 2017; however, for the resource cost calculation it is assumed that precommissioning resources will stay at the hotel vessel until reliability tests of all turbines are completed, which is

calculated to be 4th of March, 2017. As shown in Table 5.16 below, precommissioning resources consisting of 3 competent technicians in commissioning and 6 tower technicians form 3 teams that can work in paralel at 3 different turbine at the same time. As provided in Table 5.9, it is assumed that one precommissioning team needs 23 net hour to complete the precommissioing works of a turbine. As per the hourly rates presented in Table 5.16 and manhours calculated, the total precommissioning resource cost is 2.267.136 EUR.

Table 5.16 : Pre-commissioning resource costs.

	Start Date	Finish Date	Total Man hour	Hourly Rate (EUR)	Total Cost (EUR)
Competent Tech. in Commissioning x 3	21. Jun. 16	4. Mrz. 17	3072	90	829.440
Tower Tech. x 6	21. Jun. 16	4. Mrz. 17	3072	78	1.437.696
Sum					2.267.136

As per Appendix A “Bottom Fixed Offshore Wind Farm Project Construction Planning“, the calculated completion date of hot commissioning works for all turbines is 22nd of February, 2017. However, as shown in Table 5.17 below, for resource cost calculation it is assumed that hot commissioning teams will also stay at Hotel vessel and will be paid until 4th of March, 2017. Table 5.17 shows both reliability teams and hot commissioning teams that consist of 5 competent technicians in commissioning and 10 tower technicians. As per the calculated manhours and given hourly rates the total cost of hot commissioning and reliability test resources is 3.778.560 EUR.

Table 5.17 : Hot commissioning and test resource cost.

	Start Date	Finish Date	Total Man hour	Hourly Rate (EUR)	Total Cost (EUR)
Competent Tech. in Commissioning x 5	21. Jun. 16	4. Mar. 17	3072	90	1.382.400
Tower Tech. x 10	21. Jun. 16	4. Mar. 17	3072	78	2.396.160
Sum					3.778.560

After hot commissioning works are completed, snagging teams go to the turbines to do snagging works that have been listed during quality walkdown of the turbines. The list is generated by inspectors after all works are completed; therefore, for each project the content of the list and the time that will be needed to fix the snags that are recorded by inspectors are different. For this study, based on the duration of snagging activities that belong to the completed Siemens offshore projects have been used as reference and for each turbine it is assumed that for each turbine it will take 240 net hours to complete the snagging works. Table 5.18. shows the planned resources that will do snagging works, which consist of competent technician in installation, tower technician, paint technician and blade technician. As per the calculated manhours and given hourly rates of resources, total snagging work resources is 989.820 EUR.

Table 5.18 : Snagging works resource costs.

	Start Date	Finish Date	Total Man hour	Hourly Rate (EUR)	Total Cost (EUR)
Competent Tech. In Installation	05. Jul 16	16. Mar 17	3055	90	274.950
Tower Tech.	05. Jul 16	16. Mar 17	3055	78	238.290
Paint Tech.	05. Jul 16	16. Mar 17	3055	78	238.290
Blade Tech.	05. Jul 16	16. Mar 17	3055	78	238.290
Sum					989.820

Table 5.19 below shows the total cost of manning resource for construction phase of bottom fixed offshore wind farm project, which is 31.750.568 EUR. The resource costs belonging to white and blue color workers that work in engineering, production, procurement, planning and development phases of the project are included in the projects cost breakdown as a separate cost which is shown in Section 7.

Table 5.19 : Sum of construction resource costs.

Work Phase	Manning Resource Cost (EUR)
General Site Management Resource Costs	897.264
Commissioning Management Resource Costs	2.952.510
Pre Assembly Resource Costs	8.279.712
Installation Vessel Resource Costs	7.103.412
Mechanical Completion Resource Costs	2.508.806
Electrical Completion Resource Costs	2.973.348
Pre-commissioning Resource Plan	2.267.136
Hot Commissioning and Test Resource Plan	3.778.560
Snagging Works Resource Cost	989.820
Sum	31.750.568

5.3 PelaStar Concept Planning

Similar to bottom – fixed offshore wind farm project, in PelaStar tension leg platform concept, wind turbine components and all site parts are transported to preassembly site from manufacturing facilities. In this study it is assumed that preassembly will occur at the same area and with the same team set up as bottom-fixed concept. Whereas in a bottom fixed turbine concept, preassembled components are loaded to installation vessel to be transferred to offshore wind farm location to do turbine installation works, in a floating wind farm project, components stay at preassembly site until pre-commissioning works are completed. Installing turbines onshore instead of offshore is more advantageous as average weather availability of onshore sites is higher compared to offshore for construction works. As per the report of Hurley and Nordstrom (2014, p. 23), after fully assembled and installed turbine is merged with floating hull in the staging port, it is transported from staging port to the offshore site using the PelaStar Support Barge. The activities that are performed at onshore staging port are listed in Table 5.20 below.

Table 5.20 : Works that are done at pre-assembly port and quay site.

Activity Name	Duration Per Team (Team - Hour)
Lifting and Installation of Nacelle	6
Lifting and Installation of Rotor	10
Preparation for Installation	2
Mechanical Completion	31
Electrical Completion	33
Pre-Commissioning	23
Turbine Merging With Floating Hull in the Staging Port	31
Turbine Completion Before Transfer	50

5.3.1 Work breakdown structure and adverse weather statisctics

5.3.1.3 Onshore works

In a bottom – fixed offshore wind farm construction, the first phase after completion of preassembly is loading of components into the installation vessel while in a floating foundation concept; assembled components are installed at preassembly site. As in this study it is assumed that preassembly works such as mobilization of equipment, lifting and installation of tower sections are common and take same of amount of time, planning of PelaStar construction phase starts with “Lifting and Installation of Nacelle” activity, which is followed by “lifting and installation of Rotor”. To structure the installation concept of PelaStar floating foundation project, Siemens onshore project installation concepts and an Offshore Floating project, which is currently being executed in Norway, has been evaluated. Unlike bottom-fixed concepts installation, where nacelle and hub are preassembled at staging port and installed after tower installation, in PelaStar planning, it is assumed that hub and blades, defined as Rotor, will be assembled on ground and lifted to complete the rotor installation following the installation of nacelle. In onshore projects and offshore floating project that has been evaluated, it has been observed that prior to “lifting and installation of Nacelle”, “lifting and assembly of tower section” activities take place. Due to the fact that tower assembly has been assumed to be a part of bottom fixed preassembly works; thereof, it has not been modelled in bottom-fixed project planning, in PelaStar planning tower assembly has also not been modeled to compare the same construction phases that include same work scope.The durations of Nacelle, Rotor lifting and installation activities and preparation of installation that have been used to model PelaStar planning, have been taken from evaluated floating

offshore project planning. As in bottom-fixed project, set up was based on day and night shift work, for PelaStar it is also assumed that during 24 hours, construction will continue with day and night shift works. Some operations in onshore such as lifting components with crane, may also be prevented due to adverse weather; however, the milder and softer weather conditions of onshore sites compared to offshore provides longer available working hours for installation works. For bottom-fixed concept planning, the monthly weather availability percent's provided in the weather assessment report, Holst and Thiesen (2013), has been the basis to calculate the net working hours per month for installation. However, as aforementioned weather assessment report belongs to the offshore site, an onshore report, which belongs to one of the Siemens onshore projects have been used as a basis for adverse weather percentage calculation. Theprobabilities of level of exceedance for threshold wind speed 10 m/s provided in the weather report and estimated working hours based on these weather down time percent's are presented in Table 5.21 below. The calendars that are created in primavera based on these estimated working hours are assigned to "Lifting and Installation of Nacelle and Rotor" activities.

Table 5.21 : WDT percentages for onshore installation works and working hours.

	Availability (%)	WDT (Weather Down Time) (%)	Estimated Working Hour in Primavera Including WDT
Jan	80	20	15,91
Feb	88	12	17,61
Mar	86	14	17,21
Apr	81	19	16,22
May	79	21	15,79
June	64	36	12,89
July	80	20	15,95
Aug	62	38	12,39
Sep	71	29	14,15
Oct	71	29	14,12
Nov	70	30	13,99
Dec	78	22	15,62

For the set up of mechanical, electrical and commissioning works of PelaStar floating foundation concept, work breakdown structure of evaluated offshore floating turbine project is taken as referance. The sequence of activities are similar to bottom-fixed project construction phase; mechanical works follow the completion of installation and then electrical and pre-commissioning works are done respectively.

Similar to installation, it is assumed that these works are done in the same onshore site where components are assembled and installed. In order to focus on the impact of weather availability difference between onshore and offshore construction sites, same durations are used for both bottom-fixed and PelaStar concepts. For weather statistics, the weather assessment report that is used for bottom fixed project has been taken as reference; however, instead of refering to the availability percents provided for commissioning works executed at offshore site, the availability percents provided for "Port Pre-assembly Work" in the report have been used for calculation as it is assumed that these works will be executed in the same preassembly port. Due to the fact that no lifting operation is involved for the execution of these commissioning activities, wind speed limit is assumed to be 15 m/s. Monthly availability weather percents are shown in Table 5.22. As per section 5.1.1. maximum net working hour is taken as 8.15 hour to calculate the estimated working hours of primavera calendar.

Table 5.22 : WDT percentages for onshore mechanical, electrical and pre-commmissioning works.

	Availability (%)	WDT (Weather Down Time) (%)	Estimated Working Hour in Primavera Including WDT
Jan	88	12	7,16
Feb	92	8	7,52
Mar	96	4	7,81
Apr	99	1	8,08
May	99	1	8,09
June	99	1	8,04
July	100	0	8,12
Aug	99	1	8,08
Sep	97	3	7,93
Oct	95	6	7,70
Nov	92	8	7,52
Dec	92	8	7,50

As per the report of Hurley and Nordstrom (2014), turbine assembly atop the floating hull is completed using a land-based crane while the floating hull is alongside the quay wall. For the duration of turbine merging activities in primavera, Siemens floating project's time estimation for turbine merging on floating platform has been taken as reference. For the basis of net working hour calculation, it is assumed that

weather criteria required to perform loading operations in bottom-fixed project and turbine merging operations in PelaStar concept are same. Therefore,the monthly availability percents that have been used to create loading calendar for bottom-fixed project have also been used for estimation of working hours for PelaStar concept "Turbine merging with Floating Hull" activities as presented in Table 5.23 below.

Table 5.1 :WDT percentages for turbine merging on floating hull in staging port.

	Availability (%)	WDT (Weather Down Time) (%)	Estimated Working Hour in Primavera Including WDT
Jan	51,20	48,80	12,29
Feb	60,50	39,50	14,52
Mar	62,10	37,90	14,90
Apr	75,10	24,90	18,02
May	76,30	23,70	18,31
June	76,20	23,80	18,29
July	82,40	17,60	19,78
Aug	78,90	21,10	18,94
Sep	66,70	33,30	16,01
Oct	60,40	39,60	14,50
Nov	56,00	44,00	13,44
Dec	58,70	41,30	14,09

After "Turbine Merging with Floating Hull" activity, "Turbine completion before transfer" activities are included in the plan as per the planning of Hywind floating turbine project. For the calculation it is assumed that there will be 4 PelaStar barges available for transferring floating hulls to the offshore wind farm. It is also assumed that to start the "Turbine Completion before Transfer" activities, PelaStar barge should be available at quay site. As in the set-up there are 4 barges, the first "turbine completion before transfer" activity starts just after "turbine merging with floating hull in staging port" activity finishes. However, the 5^{th} activity can start after the first PelaStar barge completes its offshore round trip and returns back to port. Similarly, the 6^{th} turbine completion activity can start after the 2^{nd} PelaStar barge returns back to port after completing all the required offshore tasks. This activity network has been set up for all remaining turbines. In order to estimate the working hours per month, it is assumed that there will be both day and night shifts available and turbine completion works will depend on the same weather conditions as the commissioning

works of bottom-fixed project. Therefore the monthly availability percent's that have been presented in commissioning works section of weather assessment report have been used, which is based on 20 m/s wind speed limit at hub height and 5 hours of weather window. Availability percent's and estimated working hours are shown in Table 5.24 below.

Table 5.2 : WDT percentages for turbine completion before transfer.

	Availability (%)	WDT (Weather Down Time) (%)	Estimated Working Hour in Primavera Including WDT
Jan	75,50	24,50	16,61
Feb	77,60	22,40	17,07
Mar	78,40	21,60	17,25
Apr	73,70	26,30	16,21
May	74,90	25,10	16,48
June	69,10	30,90	15,20
July	69,70	30,30	15,33
Aug	70,80	29,20	15,58
Sep	76,50	23,50	16,83
Oct	80,30	19,70	17,67
Nov	80,40	19,60	17,69
Dec	74,70	25,30	16,43

5.3.1.4 Offshore works

Once Turbine is ready for transfer, PelaStar Support Barge transports floating wind turbine (i.e., hull and turbine) to wind plant location and stabilizes floating turbine during final installation (Hurley and Nordstrom, 2014, p. 16). According to the same report of Hurley and Nordstrom (2014, p. 23), once PelaStar supports Barge arrives wind farm plant, tendons are deployed from the PelaStar Support Barge, lower end of tendons are connected to the anchors, the upper ends of the tendons are connected to the PelaStar hull and finally floating turbine is secured to the tendons. Table 5.25 below shows the work break down structure used in this study for planning PelaStar concept offshore works. Referring to the assumption of Hurley and Nordstrom (2014, p. 23) for tendon installation duration that accounts for approximately 0.75 days out of the overall installation process, for tendon installation activity 24 net hour is used while for "securing floating turbine to the tendon" activity 8 hour is used in order to be conservative with calculation results.

Table 5.3 : Works that are done at offshore wind park.

Activity Name	Duration (Team Hour)
WTG Transit to Site	13
Tendon Installation	24
Securing Floating Turbine to the Tendon	8
Final Power Cable Connection	6
Hot Commissioning	15
Reliability Testing	240
QA Walkdown	8
Snagging	120

In order to estimate the net working hour for tendon installation and securing floating turbine to the tendon activities, it is assumed that weather conditions required are similar to the requirements to perform "positioning and jack up installation vessel" activity of the bottom-fixed project. Therefore, monthly availability percent's for this operation provided in weather assessment report based on 14 m/s wind speed limit in 10 m and 6 hours weather window have been used for calculation. The maximum working hour is assumed to be 10 hours. Table 5.26 below shows the weather down time percent's and estimated working hours.

Table 5.4 : WDT percentages for tendon installation and securing floating turbine to the tendon.

	Availability (%)	WDT (Weather Down Time) (%)	Estimated Working Hour in Primavera Including WDT
Jan	52,40	47,60	5,24
Feb	57,20	42,80	5,72
Mar	67,30	32,70	6,73
Apr	83,40	16,60	8,34
May	84,20	15,80	8,42
June	81,20	18,80	8,12
July	84,30	15,70	8,43
Aug	81,70	18,30	8,17
Sep	68,00	32,00	6,80
Oct	62,50	37,50	6,25
Nov	56,20	43,80	5,62
Dec	54,30	45,70	5,43

Completion of securing floating turbine to the tendon is followed by final power cable connection activity, which is assumed to take 6 hours long in this study. After connecting final power cables, turbines will be hot-commissioned. For hot commissioning, reliability testing, QA walk down and snagging works, same activity durations have used as bottom-fixed project in order to plan the PelaStar concept. It is also assumed that connecting final power cables depend on the same weather conditions as hot commissioning works; therefore, same monthly weather availability percent's have been used to create calendar in primavera to assign final power cable connection and hot commissioning activities. Estimated working hours calculated based on these weather availability percent's are shown in Table 5.27. For timeline calculation it is assumed that PelaStar support barge will start traveling back to port after connecting final power cables. Once PelaStar support barge arrives back to preassembly port, which is the finish date of "wtg return to port" activity that is created in primavera, "Turbine Completion before transfer" works for the related turbine will start. The crew that will perform the offshore final power cable connection, hot commissioning, reliability testing, QA walkdown and snagging activities will accommodate in a separate hotel vessel, similar to the set-up of fixed – bottom project.

Table 5.5: WDT percentages for final power cable connection and hot commissioning works.

	Availability (%)	WDT (Weather Down Time) (%)	Estimated Working Hour in Primavera Including WDT
Jan	75,50	24,50	6,15
Feb	77,60	22,40	6,32
Mar	78,40	21,60	6,39
Apr	73,70	26,30	6,01
May	74,90	25,10	6,10
June	69,10	30,90	5,63
July	69,70	30,30	5,68
Aug	70,80	29,20	5,77
Sep	76,50	23,50	6,23
Oct	80,30	19,70	6,54
Nov	80,40	19,60	6,55
Dec	74,70	25,30	6,09

5.3.2 Resource set up and cost

For PelaStar project construction resources cost estimation, it is assumed that general site management resources are same as the set up used in bottom- fixed project resource planning. As shown in Table 5.28, site management consists of site manager, commercial site manager, site administrator and 2 stock keepers. Since installation start date is taken as 1st of June, 2016 in both PelaStar and bottom fixed concept planning and the same amount of preparation period before installation is estimated, general site management resources start date is also same, 4th of April, 2016. However, it is assumed that they will work for a shorter period, until 30th of March, 2017 instead of 27th of April, 2017 due to the fact PelaStar construction phase will be completed earlier compared to bottom-fixed project construction phase as described in more detailed in section 5.3.3. Based on the given hourly rates and total man hours calculated, the total site management cost is 832.944 EUR.

Table 5.6 : General site management resource costs.

	Start Date	Finish Date	Total Man hours	Hourly Rate (EUR)	Total Cost (EUR)
Site Administrator	04. Apr 16	30. Mar 17	2072	74	153.328
Commercial Site Manager	04. Apr 16	30. Mar 17	2072	90	186.480
Site Manager	04. Apr 16	30. Mar 17	2072	90	186.480
Stock Keeper	04. Apr 16	30. Mar 17	2072	74	153.328
Stock Keeper	04. Apr 16	30. Mar 17	2072	74	153.328
Sum					832.944

For PelaStar concept planning it is assumed that commissioning management team has the same set up as bottom- fixed project team, consisting of assistant site manager, 2 EHS officers, 2 installation leads, 2 quality inspectors and 2 stock keepers. Due to the fact that floating offshore project construction activities are completed earlier as shown in the time planning in Appendix B, commissioning team resources also work shorter period; hence the calculated man hour per resource is 3438 hour instead of 3795 hour. As shown in Table 5.29 below, total resource cost calculated based the given hourly rates and total man hour is 2.674.764 EUR.

Table 5.7 : Commissioning management resource costs.

	Start Date	Finish Date	Total Man hours	Hourly Rate (EUR)	Total Cost (EUR)
Ass.Site Manager	02. Jun 16	15. Mrz 17	3438	90	309.420
EHS Officer	02. Jun 16	15. Mrz 17	3438	90	309.420
EHS Officer	02. Jun 16	15. Mrz 17	3438	90	309.420
Installation Lead	02. Jun 16	15. Mrz 17	3438	90	309.420
Installation Lead	02. Jun 16	15. Mrz 17	3438	90	309.420
Quality Inspector	02. Jun 16	15. Mrz 17	3438	90	309.420
Quality Inspector	02. Jun 16	15. Mrz 17	3438	90	309.420
Stock Keeper (Warehouse)	02. Jun 16	15. Mrz 17	3438	74	254.412
Stock Keeper (Warehouse)	02. Jun 16	15. Mrz 17	3438	74	254.412
Sum					2.674.764

In this study it is assumed that preassembly works are completed in the same amount of time with the same number of resources for both floating and fixed – bottom concepts. Therefore, as shown in Table 5.30 below, total manhour and total cost of preassembly resources are same as fixed – bottom project, 2072 hour and 8.279.712 EUR respectively. Resource set up is also same consisting of site manager, quality inspector, EHS officer, installation lead, blade technician, 4 foreman, paint technician, 31 tower techniciand and 9 ground technicians. Due to the fact that all preassembly works need to be completed before the installation completion activity of last turbine, that is completed at an earlier date in floating concept, preassembly works also start at an earlier date in floating concept, on 6th of October, 2015 as shown in Table 5.30.

Table 5.30 : Pre-assembly resource costs.

	Start Date	Finish Date	Total Man hours	Hourly Rate (EUR)	Total Cost (EUR)
Site Manager	06. Oct 15	30. Sep 16	2072	90	186.480
Quality Inspector	06. Oct 15	30. Sep 16	2072	90	186.480
EHS Officer	06. Oct 15	30. Sep 16	2072	90	186.480
Installation lead	06. Oct 15	30. Sep 16	2072	90	186.480
Blade Technician	06. Oct 15	30. Sep 16	2072	78	161.616
Foreman Preassembly x 4	06. Oct 15	30. Sep 16	2072	90	745.920
Tower Technician x 31	06. Oct 15	30. Sep 16	2072	78	5.010.096
Ground Technician x 9	06. Oct 15	30. Sep 16	2072	78	1.454.544
Paint Technician	06. Oct 15	30. Sep 16	2072	78	161.616
Sum					8.279.712

In order to evaluate the impact of weather conditions on turbine installation as explained in more detailed in Section 5.3.1, all other parameters such as net working hours per day and resource set up, except the available weather percent's per month per installation, are assumed to be same for both concepts in this study. Therefore, it is assumed that installation resources will work both day shift and night shift as it was assumed for bottom fixed project and consist of same resources, which are 2 installation leads, 2 competent technician in installation, 2 foreman, 2 lifting supervisor, 2 EHS officer, 1 quality inspector and 16 tower technicians. Available weather percent's used for calculation for floating percent is much higher for onshore installation works; therefore, installation works are completed at an earlier date, on 11th of September, 2016 as shown in Table 5.31. The decrease in installation work completion time also enables cost saving for installation resources; based on the calculated man hour and given hourly rates, total cost of installation resources are 3.137.676 EUR instead of 7.103.412 EUR total cost of bottom–fixed concept installation works.

Table 5.31 : Installation resource costs.

	Start Date	Finish Date	Total Man hours	Hourly Rate (EUR)	Total Cost (EUR)
Installation lead x 2	17. May. 16	11. Sep. 16	1402	90	252.360
Competent Tech. in Installation x 2	17. May. 16	11. Sep. 16	1402	90	252.360
Foreman Inst. x 2	17. May. 16	11. Sep. 16	1402	90	252.360
Lifting Supervisor x 2	17. May. 16	11. Sep. 16	1402	90	252.360
EHS Officer x 2	17. May. 16	11. Sep. 16	1402	90	252.360
Quality Inspector	17. May. 16	11. Sep. 16	1402	90	126.180
Tower Tech. x 16	17. May. 16	11. Sep. 16	1402	78	1.749.696
Sum					3.137.676

Similar to installation works, mechanical, electrical and pre-commissioning works are done in preassembly offshore site instead of offshore wind farm location which enables these works to be completed in a shorter amount of time due to higher weather availability percent's. As stated in Table 5.32 below, estimated finish date for mechanical completion resources is 19th of November, 2016 which is the reason of decrease in man hour of 2048 instead of 3067 hour that was calculated for bottom – fixed concept. The decrease in man hour results in decrease in total mechanical resource cost, which is calculated as 1.675.264 EUR. As shown in Table 5.32, the same set up of mechanical teams that have been used for bottom-fixed concept is also used for floating concept.

Table 5.32 : Mechanical completion resource costs.

	Start Date	Finish Date	Total Man hour	Hourly Rate (EUR)	Total Cost (EUR)
Competent Tech. In Installation x 2	2. Jun. 16	19. Nov. 16	2048	90	368.640
Tower Tech. x 6	2. Jun. 16	19. Nov. 16	2048	78	958.464
Tower Tech. High Voltage x 2	2. Jun. 16	19. Nov. 16	2048	85	348.160
Sum					1.675.264

As shown in Table 5.33, electrical completion resources consist of 3 competent technician in installation and 9 tower rechnicans and work until 21th of November, 2016. Based on the given hourly rates and man hour calculated total electrical completion resource cost is 1.987.740 EUR.

Table 5.33 : Electrical completion resource costs.

	Start Date	Finish Date	Total Man hour	Hourly Rate (EUR)	Total Cost (EUR)
Competent Tech. In Installation x 3	3. Jun. 16	21. Nov. 16	2045	90	552.150
Tower Tech. x 9	3. Jun. 16	21. Nov. 16	2045	78	1.435.590
Sum					1.987.740

For calculation it is assumed that pre commissioning teams will consist of 3 competent technician and 6 tower technicians that will work only day shift similar to the set up that was used for bottom-fixed project planning as shown in Table 5.34. As explained in Section 5.3.1 the only difference is the calendar that is assigned to the precommissioning activities, which reflect the working conditions at onshore site. This resulted in an early completion date that is 23rd of November, 2016 for precommissioning activities as shown in Table 5.34 hence less total man hour compared to bottom – fixed precommissioning team hours. Total Cost calculated based on given hourly rates and man hours is 1.467.882 EUR.

Table 5.34 : Pre-commissioning resource costs.

	Start Date	Finish Date	Total Man hour	Hourly Rate (EUR)	Total Cost (EUR)
Competent Tech. In Comm. x 3	11. Jun. 16	23. Nov. 16	1989	90	537.030
Tower Tech. x 6	11. Jun. 16	23. Nov. 16	1989	78	930.852
Sum					1.467.882

"Turbine merging with hull" works are peculiar to the floating offshore project concept; therefore, an additional team has been planned for these activities, which is different than the set-up of bottom fixed project concept. In this study it is assumed that turbine merging with hull resource team will consist of 2 competent technicians in installation, one installation lead, 2 foreman installation and 4 tower technicians as shown in Table 5.35 and they will also complete the "turbine completion before transfer" works. As per the calculation explained in section 5.3.1, these works will be done between the time period 11th of June and 13th of January, which result in 2541 man hour per each technician. Based on the given hourly rates in Table 5.35 the total resource cost of this team is 1.936.242 EUR.

Table 5.35 : Turbine merging with hull resource costs.

	Start Date	Finish Date	Total Man hour	Hourly Rate (EUR)	Total Cost (EUR)
Competent Tech. In Installationx2	15. Jun 16	13. Jan 17	2541	90	457.380
Installation lead	15. Jun 16	13. Jan 17	2541	90	228.690
Foreman Installationx2	15. Jun 16	13. Jan 17	2541	90	457.380
Tower Tech.x4	15. Jun 16	13. Jan 17	2541	78	792.792
Sum					1.936.242

Similar to turbine merging with hull activities, tendon installation works are also only a part of tension leg platform construction phase; therefore, the resources performing these tasks constitute additional costs compared to bottom-fixed concepts. As shown Table 5.36, in this study it is assumed that tendon installation

teams will consist of 2 competent technician in installation and 6 tower technicians that will be paid between the time period 21th of June, 2016 and 21thof January, 2017, as it is planned to use these resources also for securing floating turbine to tendon and final power connection works.Based on the hourly rates given and total man hour calculated, total resource costs for tendon installation works is 1.656.288 EUR.

Table 5.36 : Tendon installation resource costs.

	Start Date	Finish Date	Total Man hour	Hourly Rate (EUR)	Total Cost (EUR)
Competent Tech. in Installation x 2	21. Jun. 16	21 Jan. 17	2556	90	460.080
Tower Tech. x 6	21. Jun. 16	21. Jan. 17	2556	78	1.196.208
Sum					1.656.288

Hot commissioning resource set up is same in floating and bottom-fixed project concepts; as shown in Table 5.37, hot commissioning and test resource teams consist of 5 competent technicians in commissioning and 10 tower technicians in total. It is assumed that similar to bottom – fixed concept, these teams will stay in hotel vessel and will be working at the same offshore weather conditions. Despite the same assumptions, as shown in Table 5.37, the total man hour per resource is 2685 man hour, which is much less compared to bottom fixed project – hot commissioning resource man hour that has been calculated as 3072. The reason of this reduction is that hot commissioning work in floating project is completed earlier due to the early completed precommissioning works. In order to start hot commissioning works, precommissioning works should be completed. In bottom-fixed concept, since precommsisoning works are completed offshore, it takes longer time to finish the works thus hot commissioning works start and finish late as well. However, in floating concept, pre-commissioning works are done in onshore, which enable the completion of these works in a shorter time. Without having pre commissioning works as a driving prerequisite work, hot commissioning works start and finish earlier. Based on the hourly rates provided and man hours calculated, total resource cost is 3.302.550 EUR.

Table 5.37 : Hot commissioning and test resource cost.

	Start Date	Finish Date	Total Man hour	Hourly Rate (EUR)	Total Cost (EUR)
Competent Tech. in Commissioning x 5	25. Jun. 16	4. Feb. 17	2685	90	1.208.250
Tower Tech. x 10	25. Jun. 16	4. Feb. 17	2685	78	2.094.300
Sum					3.302.550

Resource set up for snagging works are same in both floating and bottom fixed concept, consisting of competent technician in installation, tower technician, paint technician and blade technician as shown in Table 5.38. Similar to hot commissioning and team man hours, snagging teams man hour per resource is also less compared to bottom fixed project teams as these snagging works can start and finish earlier in floating concept. Based on given hourly rate and man hour calculated, total snagging team resource is 854.712 EUR.

Table 5.38 : Snagging works resource costs.

	Start Date	Finish Date	Total Man hour	Hourly Rate (EUR)	Total Cost (EUR)
Competent Tech. In Installation	11. Jul 16	16. Feb 17	2638	90	237.420
Tower Tech.	11. Jul 16	16. Feb 17	2638	78	205.764
Paint Tech.	11. Jul 16	16. Feb 17	2638	78	205.764
Blade Tech.	11. Jul 16	16. Feb 17	2638	78	205.764
Sum					854.712

Table 5.39 below shows the overview of the entire construction phase resources, which sum up to 27.787.486 EUR in total. The resource costs belonging to white and blue color workers that work in engineering, production, procurement, planning and

development phases of the project are included in the projects' cost breakdown asa separate parameter which is explained in Section 7.

Table 5.39 : Sum of construction resource costs.

Work Phase	Manning Resource Cost (EUR)
General Site Management Resource Costs	832.944
Commissioning Management Resource Costs	2.674.764
Pre Assembly Resource Costs	8.279.712
Installation Resource Costs	3.137.676
Mechanical Completion Resource Costs	1.675.264
Electrical Completion Resource Costs	1.987.740
Pre-commissioning Resource Costs	1.467.882
Turbine Merging with Hull Resource Costs	1.917.954
Tendon Installation Resource Costs	1.656.288
Hot Commissioning and Test Resource Costs	3.302.550
Snagging Works Resource Cost	854.712
Sum	27.805.774

5.4 Planning Results Comparison and Output

Assuming that erection start date is 1st of June, 2016, the calculated completion date of work phases of both bottom –fixed and tension leg platform concept projects are presented in Table 5.40 and Table 5.41 respectively. The opportunity of performing erection, mechanical completion, electrical completion and pre commissioning works in onshore site in floating turbine concept brings a lot of advantageouscompared to bottom-fixed concepts, due to having more weather availability to be able to continue construction activities. As shown in Table 5.40, for turbine erection, mechanical, electrical and pre commissioning works 249, 250, 250 and 247 days are required to complete these work phases respectively in bottom fixed concept, while in floating concept, only 100, 165, 166 and 165 days are required as shown in Table 5.41, which enables to finish complete all the works including pre commissioning until 23rd of November, 2016 instead of 19th of February, 2017.

Table 5.40 : Bottom-fixed project planning overview.

Activity Name	Start	Finish	Days
Turbine Erection	1. Jun. 16	5. Feb. 17	249
Mechanical Completion	6. Jun. 16	11. Feb. 17	250
Electrical Completion	11. Jun. 16	16. Feb. 17	250
Pre-Commissioning	17. Jun. 16	19. Feb. 17	247
Hot Commissioning	21. Jun. 16	22. Feb. 17	246
Reliability Testing	24. Jun. 16	4. Mrz. 17	253
QA Walkdown	4. Jul. 16	6. Mrz. 17	245
Snagging	5. Jul. 16	16. Mrz. 17	254
Period Between Installation - Project Completion	1. Jun. 16	16. Mrz. 17	288

Although construction works including the end of pre-commissioning are completed 82 days earlier in floating concept as shown in Table 5.41, there are additional activities that are needed to be done in floating concept after pre commissioning, such as turbine merging with floating hull, turbine completion before transfer, tendon installation, securing floating turbine to tendon and final power cable connection, which delays the start of hot commissioning works. The advantage of completing the pre commissioning works in floating concept enables hot commissioning works to be completed earlier as well since pre commissioning activities don't enter the critical path and don't drive the start of hot commissioning works as they do in bottom – fixed concept. Thus for completion of hot commissioning works only 212 days are needed instead of 246 days that is required in bottom – fixed project. Due to the same reason the remaining work phases; reliability testing, quality walkdown and snagging works are completed in relatively shorter time period compared to bottom fixed concept. Overall the construction phase consisting of activities between turbine erection and project completion takes 288 days in bottom- fixed concept, while it is 260 days in tension leg platform project concept.

Table 5.41 : Tension leg floating project planning overview and variance.

Activity Name	Start	Finish	Days	Variance With Bottom Fixed Conp. (Days)
Turbine Erection	1. Jun. 16	9. Sep. 16	100	-149
Mechanical Completion	3. Jun. 16	15. Nov. 16	165	-85
Electrical Completion	6. Jun. 16	19. Nov. 16	166	-84
Pre-Commissioning	11. Jun. 16	23. Nov. 16	165	-82

Table 5.41 (continued) : Tension leg floating project planning overview and variance.

Activity Name	Start	Finish	Days	Variance With Bottom Fixed Conp. (Days)
Turbine Merging with Floating Hull	15. Jun. 16	25. Nov. 16	163	na
Turbine Completion Before Transfer	17. Jun. 16	13. Jan. 17	210	na
Tendon Installation	21. Jun. 16	18. Jan. 17	211	na
Securing Floating Turbine to Tendon	24. Jun. 16	20. Jan. 17	210	na
Final Power Cable Connection	25. Jun. 16	21. Jan. 17	210	na
Hot Commissioning	26. Jun. 16	24. Jan. 17	212	-34
Reliability Testing	28. Jun. 16	3. Feb. 17	220	-33
QA Walkdown	8. Jul. 16	6. Feb. 17	213	-32
Snagging	11. Jul. 16	16. Feb. 17	220	-34
Period Between Installation - Project Completion	1. Jun. 16	16. Feb. 17	260	-28

The difference in completion time of work phases of bottom-fixed and floating concept also result in difference of site manning resource costs. Table 5.42 below shows the resource cost for both bottom fixed and floating concepts and also the variance. The total site manning resource cost for floating concept is 27.805.774 EUR while it is 31.750.568 EUR for bottom fixed project. Based on these figures, 3.944.794 EUR resource cost saving is calculated for tension leg platform floating concepts.

Table 5.42 : Resource cost comparison of bottom-fixed and floating concept.

Resource Cost / Work Phase	Resource Cost Bottom Fixed (EUR)	Resource Cost Floating (EUR)	Variance (EUR)
General Site Management	897.264	832.944	-64.320
Commissioning Management	2.952.510	2.674.764	-277.746
Pre Assembly	8.279.712	8.279.712	0
Installation	7.103.412	3.137.676	-3.965.736
Mechanical Completion	2.508.806	1.675.264	-833.542

Table 5.42 (continued) : Resource cost comparison of bottom-fixed and floating concept.

Resource Cost / Work Phase	Resource Cost Bottom Fixed (EUR)	Resource Cost Floating (EUR)	Variance (EUR)
Electrical Completion	2.973.348	1.987.740	-985.608
Pre-commissioning	2.267.136	1.467.882	-799.254
Turbine Merging with Hull		1.936.242	1.936.242
Tendon Installation		1.656.288	1.656.288
Hot Commissioning and Test	3.778.560	3.302.550	-476.010
Snagging Works	989.820	854.712	-135.108
Sum	31.750.568	27.805.774	**-3.944.794**

6. ANNUAL ENERGY PRODUCTION

Annual Energy Production of a wind farm is one of the parameters that affect the levelized cost of energy results. In this study the purpose is to analyze the impact of tension leg platform floating foundations on costs per produced unit of energy; therefore, characteristics other than foundation, is assumed to be same for both floating and bottom – fixed concepts that are analyzed. Energy values that are used to calculate levelized cost of energy in this study for both concepts are described in detail in sections 7.3.1 and 7.3.2.

In this section an example annual energy production calculation is conducted to evaluate the impact of wind speed and turbine characteristics on energy output by using power curve method and annual wind speed datagiven in Appendix C.Annual energy production of a wind farm depends on turbine capacity factor, which is one element in measuring the productivity of a wind turbine to compare the plant's actual production with the amount of power the plant would have produced if it had run at full capacity (Wagner and Mathur, 2013).The turbine that is used for annual energy production calculation in this section is a 7 MW turbine that produces 7000 kW power at full capacity as shown in Figure 6.1 below. The power curve shown in Figure 6.1 is specified by manufacturer, showing the power increasing with wind speed until a peak is reached. To use power curve method, a table of power produced at different wind speeds is prepared and using the annual wind speed distribution of a specified location, power curve is matched with the wind speed distribution and then energy produced by turbine across the annual wind speeds is summed (Gipe, 2009).

Wind [m/s]	Power [kW]
0	0
1	0
2	0
3	107
4	288
5	593
6	1068
7	1699
8	2567
9	3635
10	4821
11	5810
12	6582
13	6897
14	6987
15	7000
16	7000
17	7000
18	7000
19	7000
20	7000
21	7000
22	7000
23	6930
24	6860
25	5488
26	4116
27	2744
28	1372

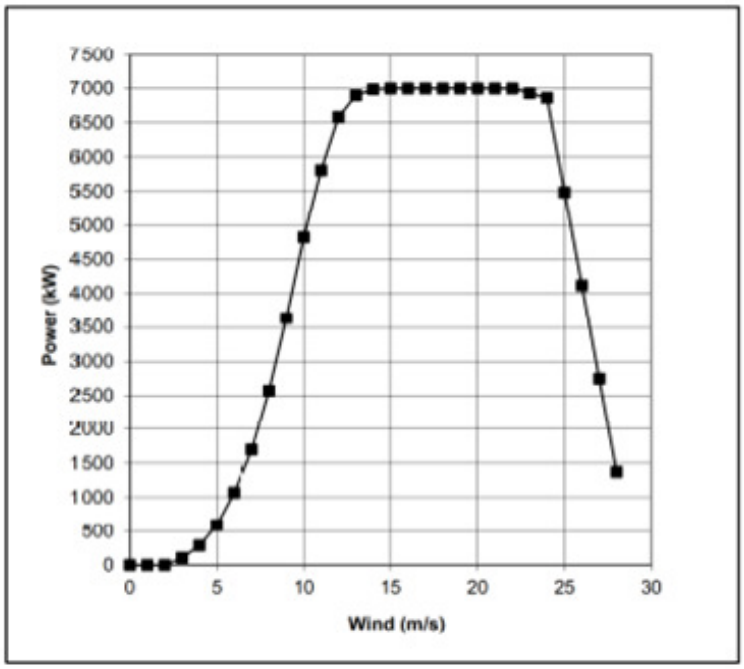


Figure 6.1 : Power Output of a 7 MW Wind Turbine with Wind Speed (Siemens)

Based on this method and the wind speed data given in Appendix C, annual energy of a wind farm consisting of turbines with the power curve as per Figure 6.1, annual energy is calculated as 39,550MWh. The rated annual output of a 7MW turbine 61,320 MWh; therefore, capacity factor is calculated as 64.5 %. Although the wind speed data that is used to conduct this calculation belongs to an actual wind farm in operation, calculated annual energy of a wind farm is not accurate as this calculation assumes that wind direction is always perpendicular to the turbine. In reality, when wind direction is not perpendicular, turbine generates lower energy than is claimed in the power curve of the turbine. In addition, during operation, yawing and breaking operation of wind turbines in order to capture the optimum amount of wind also consumes energy. Due to these reasons, it is expected to have a lower capacity factor for wind turbine for the same wind speed conditions.

For the LCOE calculations conducted in Section 7, the same annual energy production value has been used as per the PelaStar report of Hurley and Nordstrom (2014).

7. LEVELIZED COST OF ENERGY

Levelized Cost of Energy (LCOE) expresses the levelized unit of 1 MWh over the lifetime costs relative to the sum of discounted energy production at the time of the financial investment decision (Megavind, 2015). LCOE can be expressed as

$$\text{LCOE} = \frac{\text{Present Value (Costs)}}{\text{Present Value (Production)}} \tag{7.1}$$

Levelized cost of energy production plays a very important role in determining whether an energy technology can reach commercialization. LCOE is the metric used to evaluate a project's financial feasibility. The cost of energy is calculated using present value calculations. All costs are forecasted and present valued using the present value method given in the below equation (MacDougall, 2016). In cost of energy calculations revenues are not discounted. Present value formula is shown below, where cost flow at period 1 is depicted as C^1, rate of return as r and number of periods as n.

$$\text{Present Value} = C1 \,/\, (1+r)\text{^}n \tag{7.2}$$

Although in offshore wind industry LCOE is one of the most important parameters that is being used to compare the feasibility of projects, different methodologies that are used to calculate LCOE stand as a challenge in front of using a standardized LCOE approach in the offshore wind industry. Depending on financial model of the investment, discount rate that is used, weighted average cost of capital percent or the impact of tax incentives and depreciation,different LCOE values can be calculated for the same concept that has same initialcapital and operating costs. Therefore, in this study it is first aimed to analyze the different LCOE calculation methodologies by calculating the LCOE with these different methods, keeping the costs and energy production values constant. Based on the result of this analysis, the LCOE calculation method will be chosen and the levelized cost of energy of the floating & fixed bottom offshore wind farm concepts will be calculated with the chosen method.

7.1 Simple LCOE Method

Hurley and Nordstrom (2014, pg. 38) uses the following formula to calculate the LCOE for PelaStar Floating Offshore project concept, where initial capital cost per MW, annual operation & maintenance costs per MW, annual energy production per MW and capital recovery factor are shown as ICC, O&M, AEP and CRF respectively.

$$\text{LCOE} = \frac{\text{ICC x CRF} + \text{O \& M}}{\text{AEP net}} \tag{7.3}$$

Capital Recovery Factor is used to turn initial capital costs into annual values (Foster et al, 2014). When a project has a lifetime of n years and capital is financed at discount rate, d, the capital recovery factor is calculated as

$$\text{CRF} = \frac{\text{d x } (1+\text{d})_{\text{n}}}{(1+\text{d})_{\text{n-1}}} \tag{7.4}$$

The values provided by Hurley and Nordstrom per turbine per MW for PelaStar floating offshore wind farm concept's ICC, AEP, CRF and O&M are 2,983,833/MW EUR, 3,994 MWh (per MW installed), 10.0 % and 200,317 EUR respectively. Using these values in the formula given in (7.3), 124.9 EUR/MW hour is calculated for LCOE.

7.2 LCOE - Cash Flow Method

In simple LCOE model, parameters such as how the project is financed, the costs incurred as a result of loan payments and interests are not evaluated. As a second method, these costs that result from debt shares and interests will be incorporated into the formula and instead of using annual values, cost flow approach will be utilized by calculating each cost parameter per month until the end of project life. These monthly costs will be discounted to their present values by using the present value formula given in Section 7.1. The formula for this method of LCOE calculation will be as following, where project cost, loan payment, interest, operation and maintenance, energy produced at time t and discount rate are shown as PC, LP, INT, O&M, EP and d respectively.

$$\text{LCOE} = \frac{\sum_{t=1}^{n} \frac{\text{PCt}}{(1+\text{d})^{t}} + \sum_{t=1}^{n} \frac{\text{LPt}}{(1+\text{d})^{t}} + \sum_{t=1}^{n} \frac{\text{INTt}}{(1+\text{d})^{t}} + \sum_{t=1}^{n} \frac{\text{O\&Mt}}{(1+\text{d})^{t}}}{\sum_{t=1}^{n} \frac{\text{EPt}}{(1+\text{d})^{t}}} \tag{7.5}$$

Input values will be taken from Hurley and Nordstrom's report to compare the results of simple LCOE method and cash flow method. In the first method, in order to calculate the LCOE of PelaStar concept, 10 % capital recovery factor has been used. In the second method, the discount rate that will be used in the LCOE formula is driven from the relationship between capital recovery factor and discount rate as per the CRF formula given in (7.4).

Project life time is 20 years. Using 20 years as n value and 10 % capital recovery factor, we get 8 % discount rate, which will be used to calculate the present value of costs and energy production.

7.2.1 Construction period costs

In this method financial model of the developer that invest in the project will also be a part of LCOE calculation and it will be assumed that 35 % of project costs will be financed by equity share while remaining 65 % will be financed by debt share. Debt financing involves borrowing money from investors by issuing corporate bonds and rewarding the investor through interest. In equity share financing, ownership rights of the company is sold to investors by issuing stocks and investors may be paid dividends depending on the discretion of the company. When a company borrows money to finance its business through the sale of corporate bonds, the company agrees to repay investors' loans within a given time and makes interest payments to its investors as an incentive. One advantage of debt financing is that loan interest payments are tax deductible (Johnson, 2016).

Other input parameter is the construction period of the project, which is taken as 28 months. The project cost that is used in Section 7.1 for PelaStar concept is 2,983,833/MW EUR. Conceptual PelaStar project consist of 83 turbines that have 6 MW production capacities. Therefore, multiplying per turbine per MW value with the number of turbines in the wind farm and turbine MW 1,485,949 EUR is calculated as initial construction cost for the whole wind farm.

In this study it is assumed that initial capital costs will occur during construction period in equal amounts. It is also assumed that the payment of debt amount, which is 65 % of capital costs, will start after 28 months, once the construction of project is completed. Therefore, the costs that occur during construction period consist of equity share, which is distributed evenly to 28 months. Based on this assumption the monthly equity share / cost flow is calculated as 18,574.36k EUR.

Even if the nominal amount of monthly costs is same, present values of these costs will be different due to time value of money, which is calculated by using the net present value formula. Taking the discount rate as 8 %, the discount factor will be calculated with the following formula, where t is the actual year that costs occur:

$$\text{discount factor} = \frac{1}{(1+\text{d})^{\text{t}}} \tag{7.6}$$

Calculations have been carried out in an excel spreadsheet. By using the input values given above, the total discounted net present value of the costs that occur during 28 month of construction period is calculated as 474,520,980 EUR as shown in the table below. In excel spreadsheet costs are divided by 1000 in order to simplify the calculation. The costs shown in Table 7.1 should be multiplied by 1000 to convert the amount into Euro.

Table 7.1 : Discounted costs during construction period.

Month	Discount Factor	Cost Flow/ Equity Share (kEUR)	Discounted Costs (kEUR)
0	1,000		
28	0,993	18.574,36	18.453,35
27	0,987	18.574,36	18.340,86
26	0,981	18.574,36	18.221,36
25	0,975	18.574,36	18.106,47
24	0,968	18.574,36	17.988,50
23	0,962	18.574,36	17.875,07
22	0,956	18.574,36	17.758,62
21	0,950	18.574,36	17.642,92
20	0,944	18.574,36	17.531,67
19	0,938	18.574,36	17.417,45
18	0,932	18.574,36	17.307,62
17	0,926	18.574,36	17.194,86
16	0,920	18.574,36	17.082,83
15	0,914	18.574,36	16.982,27
14	0,908	18.574,36	16.871,63
13	0,903	18.574,36	16.765,25
12	0,897	18.574,36	16.656,02
11	0,891	18.574,36	16.550,99
10	0,885	18.574,36	16.443,16
9	0,879	18.574,36	16.336,03
8	0,874	18.574,36	16.233,02
7	0,868	18.574,36	16.127,26
6	0,863	18.574,36	16.025,57

Table 7.1 (continued): Discounted costs during construction period.

Month	Discount Factor	Cost Flow/ Equity Share (kEUR)	Discounted Costs (kEUR)
5	0,857	18.574,36	15.921,16
4	0,852	18.574,36	15.817,44
3	0,847	18.574,36	15.724,33
2	0,841	18.574,36	15.621,88
1	0,836	18.574,36	15.523,38
Total		520.082,15	474.520,98

7.2.2 Operation period costs

The first two parameters of the LCOE formula given in this section are Project Costs and Loan Payments as shown below:

$$\sum_{t=1}^{n} \frac{PCt}{(1+d)^t} + \sum_{t=1}^{n} \frac{LPt}{(1+d)^t} \tag{7.7}$$

35% of project costs that are assumed to occur during construction phase due to equity financing have been discounted in Section 7.2.1. Loan Payment parameter of the equation consists of principal payments due to debt share and the interest accumulated during construction phase. To calculate the total amount of interest at the end of the construction period, debt shares are evenly distributed to 28 months. Taking the 65 % of the total capex, 34,495.24 kEUR is calculated for monthly debt shares.

Interests are calculated for each month seperately. Marjinal interest increment is higher in each month as the cumulative debt amount increases. Assuming that interest rate during construction is 0.612 %, the formula that is used to calculate interest amount for month, n, is shown below.

$$\text{Interest}_n = \text{Interest rate x Cumulative debt amount}_{(n-1)} \tag{7.8}$$

As seen in the formula, to calculate the interest at month n, the cumulative sum, shown as Balance C/f, of previous month is multiplied by interest rate. By adding these interest amounts to the debt share, the total cost amount that should be funded is calculated as 1,050,107,811 EUR as shown in the Table 7.2 below:

Table 7.2 : Cost to be funded.

Month	Debt Share (kEUR)	Balance C/f (kEUR)	Interest (kEUR)	Cost to be funded (kEUR)
0				
28	34.495,24	34.495,24	0	34.495,24
27	34.495,24	69.201,70	211,21	34.706,45
26	34.495,24	104.120,66	423,71	34.918,96
25	34.495,24	139.253,42	637,52	35.132,76
24	34.495,24	174.601,30	852,63	35.347,88
23	34.495,24	210.165,60	1.069,06	35.564,31
22	34.495,24	245.947,66	1.286,82	35.782,06
21	34.495,24	281.948,81	1.505,91	36.001,15
20	34.495,24	318.170,40	1.726,34	36.221,58
19	34.495,24	354.613,76	1.948,12	36.443,36
18	34.495,24	391.280,26	2.171,26	36.666,50
17	34.495,24	428.171,26	2.395,76	36.891,00
16	34.495,24	465.288,15	2.621,64	37.116,88
15	34.495,24	502.632,29	2.848,90	37.344,15
14	34.495,24	540.205,09	3.077,55	37.572,80
13	34.495,24	578.007,94	3.307,61	37.802,85
12	34.495,24	616.042,26	3.539,07	38.034,31
11	34.495,24	654.309,45	3.771,95	38.267,19
10	34.495,24	692.810,95	4.006,25	38.501,50
9	34.495,24	731.548,19	4.241,99	38.737,24
8	34.495,24	770.522,61	4.479,18	38.974,42
7	34.495,24	809.735,67	4.717,81	39.213,06
6	34.495,24	849.188,82	4.957,91	39.453,15
5	34.495,24	888.883,54	5.199,48	39.694,72
4	34.495,24	928.821,31	5.442,52	39.937,77
3	34.495,24	969.003,61	5.687,06	40.182,30
2	34.495,24	1.009.431,94	5.933,09	40.428,33
1	34.495,24	1.050.107,81	6.180,62	40.675,87
Total	965.866,85		84.240,96	1.050.107,81

In this study it is assumed that debt payment period is 17 years. Therefore, in order to calculate monthly principal payment amount, total "Cost to be funded" is divided by 17 years and 12 months and 5147.59 kEUR is received.

The total debt amount which is 1,050,107.81 kEUR in the beginning of operation period will reduce each month by 5147.59 kEUR, the principal payment amount.

Interest, which is the third parameter in the LCOE formula given as $\sum_{t=1}^{n} \frac{INTt}{(1+d)^t}$, will also decrease as the sum of remaining debt amount decreases. The interest rate

for operation period is taken as 0.573 %. By using the following formula, a total amount of 617,016,550 EUR nominal and 347,047,520 EUR discounted present value for interest-operion period have been calculated:

$$Interest_n = Interest\ rate\ x\ [Total\ Cost\ to\ be\ funded - Principal\ Payment*(n-1)] \quad (7.9)$$

Discount factor is calculated as the same way using the $\frac{1}{(1+d)^t}$ formula and taking 8 % for discount rate. To calculate t, the start date is taken as the start of construction period. Table 7.3 below shows the calculation results for discount factors, debt, interest and discounted interest amounts per month for a period of 30 months after the start of operation period. Since debt payment period is taken as 17 years, in excel spreadsheet, the calculations have been carried out for 204 months, which are entirely included in Appendix D.

Table 7.3 : Operation period iscount factor, debt and interest amounts.

Month	Discount Factor	Debt (kEUR)	Interest (kEUR)	Discounted Interest (kEUR)
1	0,83	1.050.107,81	6.019,67	4.998,12
2	0,83	1.044.960,22	5.990,17	4.942,26
3	0,82	1.039.812,63	5.960,66	4.885,87
4	0,81	1.034.665,05	5.931,15	4.830,01
5	0,81	1.029.517,46	5.901,64	4.775,67
6	0,80	1.024.369,87	5.872,13	4.720,84
7	0,80	1.019.222,28	5.842,62	4.667,50
8	0,79	1.014.074,70	5.813,12	4.613,67
9	0,79	1.008.927,11	5.783,61	4.560,34
10	0,78	1.003.779,52	5.754,10	4.510,37
11	0,78	998.631,94	5.724,59	4.458,00
12	0,77	993.484,35	5.695,08	4.407,06
13	0,77	988.336,76	5.665,58	4.355,66
14	0,76	983.189,17	5.636,07	4.305,65
15	0,76	978.041,59	5.606,56	4.255,20
16	0,75	972.894,00	5.577,05	4.205,23
17	0,75	967.746,41	5.547,54	4.156,60
18	0,74	962.598,82	5.518,03	4.107,56
19	0,74	957.451,24	5.488,53	4.059,83
20	0,73	952.303,65	5.459,02	4.011,70
21	0,73	947.156,06	5.429,51	3.964,01
22	0,73	942.008,47	5.400,00	3.918,44
23	0,72	936.860,89	5.370,49	3.871,64
24	0,72	931.713,30	5.340,99	3.826,08
25	0,71	926.565,71	5.311,48	3.780,16

Table 7.3 (continued) : Operation period discount factor, debt and interest amounts.

Month	Discount Factor	Debt (kEUR)	Interest (kEUR)	Discounted Interest (kEUR)
26	0,71	921.418,13	5.281,97	3.735,45
27	0,70	916.270,54	5.252,46	3.690,38
28	0,70	911.122,95	5.222,95	3.645,74
29	0,69	905.975,36	5.193,44	3.602,29
30	0,69	900.827,78	5.163,94	3.558,48

For operation & maintenance cost, which is the last parameter in the LCOE formula shown as $\sum_{t=1}^{n} \frac{O\&Mt}{(1+d)^t}$ same cost value that has been used in Simple LCOE method section is used here and 8313.16 kEUR is calculated for opex monthly amount by multiplying the annual O&M - per turbine per MW value by total number of turbine in the wind farm and turbine rated power and dividing the result my 12 month.

However, this calculated 8313.16 kEUR opex monthly amount should be re-adjusted with escalation factors to estimate its future monthly equivalent. In general terms, escalation is defined as changes in price levels driven by underlying economic conditions and it reflects changes in price drivers such as productivity & technology as well as changes in market conditions such as high demand, labor shortages and profit margins. It is important to emphasize that escalation is not driven by the practices used by company or project management, it is driven by macro-economic; however, it is predictable (Hollman, 2007).

In this study % 2 opex escalation factor is used.The formula used to calculate the future escalated, monthly opex amounts is given below, where escalation factor and year is depicted as e and t respectively.

$$\text{Future Value}_t = 8313.16 \text{ kEUR x } (1+e)^{\wedge t} \quad (7.10)$$

After calculating the escalated monthly opex costs, these costs are discounted to their present values for LCOE calculation.

The annual energy production value that has been used for the simple LCOE method is 3,994 MWh (per MW installed). In PelaStar Cost of Energy report, Hurley and Nordstrom (2014) provide the selected average wind speed at hub height, net annual energy production and capacity factor values that result in 3,994 MWh (per MW installed) number. The basis for annual energy production is given below in table 7.4.

Table 7.4 : Annual energy production input.

Description	Value
Average wind speed at hub height:	9.7 m/s
Gross Annual Energy Production:	29,321 MWh
Net Annual Energy Production:	23,460 MWh
Capacity Factor:	45.59 %

In order to discount the monthly energy production of entire wind farm to present values, net annual production value given above is multiplied by number of turbines in the wind farm and divided by 12 to get the monthly value of 162,265 MWh.

Table 7.5 shows the discounted annual energy production and opex values for 30 months. Project life is 240 months in total and the present value of total energy production during 20 years 16,545,367.18 MWh. Total present value of OPEX belonging to entire lifetime of project is calculated as 1,036,670,687 EUR. All monthly results of calculations are shown in Appendix D.

Table 7.5 : Opex and discounted annual energy production.

Month	Opex Escalated (kEUR)	Opex Discounted (kEUR)	AEP	AEP Discounted
1	8.707,48	7.229,79	162265	134728
2	8.722,19	7.196,34	162265	133879
3	8.736,45	7.161,15	162265	133006
4	8.751,21	7.126,51	162265	132140
5	8.765,99	7.093,54	162265	131307
6	8.780,33	7.058,85	162265	130451
7	8.795,16	7.026,19	162265	129629
8	8.809,54	6.991,82	162265	128784
9	8.824,43	6.958,01	162265	127945
10	8.839,33	6.928,74	162265	127192
11	8.852,82	6.894,10	162265	126363
12	8.867,78	6.862,20	162265	125566
13	8.882,28	6.828,64	162265	124748
14	8.897,29	6.797,05	162265	123962
15	8.911,83	6.763,80	162265	123154
16	8.926,89	6.731,09	162265	122352
17	8.941,97	6.699,95	162265	121580
18	8.956,59	6.667,18	162265	120788
19	8.971,72	6.636,33	162265	120026

Table 7.5 (continued) : Opex and discounted annual energy production.

Month	Opex Escalated (kEUR)	Opex Discounted (kEUR)	AEP	AEP Discounted
20	8.986,39	6.603,87	162265	119244
21	9.001,58	6.571,93	162265	118468
22	9.016,78	6.542,91	162265	117745
23	9.031,04	6.510,55	162265	116978
24	9.046,29	6.480,43	162265	116241
25	9.061,08	6.448,74	162265	115483
26	9.076,39	6.418,90	162265	114755
27	9.091,23	6.387,51	162265	114008
28	9.106,59	6.356,61	162265	113265
29	9.121,98	6.327,20	162265	112551
30	9.136,89	6.296,26	162265	111817

7.2.3 LCOE result

The summary of calculations as per Sections 7.2.1 and 7.2.2 is given in Table 7.6 below. Using these results and using them in LCOE formula presented as (7.6), LCOE is calculated as 141.8 EUR / MWh.

Table 7.6 : Summary of cost and energy calculations.

Discounted Sum - Description	Value
Costs of construction period	474,520,980 EUR
Opex + interest + principal payment	1,871,379,291 EUR
Annual energy production	16,545,367.18 MWh

7.3 LCOE – Leveraged Cash Flow Method

Although second method that has been used to calculate LCOE reflected the impact of interest and the financing model of the project, the impact of tax deductions through tax benefits both on interest and depreciation have not been evaluated. In this section as a third method the following formula will be used to calculate post-tax LCOE, which includes the tax benefit on depreciation and on interest and also factoring of annual costs after accounting for the tax benefit they provide, where project cost, loan payment, interest, tax rate, depreciation and weighted average cost of capital are shown as PC, LP, INT, TR, DEP and WACC respectively. One of the

major differences that is introduced with the third LCOE formula is using WACC, weighted average cost of capital instead of discount rate.

$$\text{LCOE} = \frac{\sum_{t=1}^{n} \frac{PCt}{(1+WACC)^t} + \sum_{t=1}^{n} \frac{LPt+INTt}{(1+WACC)^t}}{\sum_{t=1}^{n} \frac{Et}{(1+WACC)^t}} \tag{7.11}$$

$$\text{LCOE (continues)} = \frac{+\sum_{t=1}^{n} \frac{O\&Mt\ x\ (1-TR)}{(1+WACC)^t} - \sum_{t=1}^{n} \frac{INTt+DEPt}{(1+WACC)^t}}{\sum_{t=1}^{n} \frac{Et}{(1+WACC)^t}}$$

WACC is calculation of a firm's cost of capital, in which each category of capital is proportionally weighted and it is expressed by the following formula (Investopedia, 2016), where cost of equity, cost of debt, market value of the firm's equity, market value of the firm's debt, total market value of the firm's financing and corporate tax rate are shown as Re, Rd, E, D, V and Tc respectively.

$$\text{WACC} = \frac{E}{V} * \text{Re} + \frac{D}{V} * \text{Rd} * (1 - \text{Tc}) \tag{7.12}$$

Debt and equity are the two components that constitute a company's capital funding. Since cost of capital is the return that equity holders (shareholders) and debt holders will expect, WACC indicates the return that both of stakeholders can expect to receive. Thus a firm's WACC is the overall required return for a firm as it is the average of the costs financing where each type is weighted by its proportionate. Cost of equity, Re, can be expressed as the amount that a company must spend in order to maintain a share price that will satisfy its investors. As the shareholders will expect to receive a certain return on their investment in a company, the equity holders' required rate of return is acost from company's perspective. For calculation of cost of debt, Rd, market rate that a company is paying on its debt is used. There are tax deductions available on interest paid, which is often for companies benefit; therefore, the net cost of companies' debt is the amount of interest they are paying minus the amount they have saved in taxes as aresult of their tax deductible interest payments (Investopedia, 2016).

For calculation of WACC, 14.5 % and 7.1 % are used for cost of equity, Re and cost of debt, Rd respectively. Equity and debt shares are same as 35 % and 65 %. Corporate tax rate is taken as 30 % and WACC is calculated as 8.3 %.

7.3.1 Construction period costs

For construction period calculation same cost inputs and equity share is used as per Section 7.1; however, costs per month is discounted to their present values with WACC. Construction period is also assumed to be 28 months. As shown in Table 7.7, the total sum of net present value of construction costs are 472,951,050 EUR.

Table 7.7 : Construction period costs.

Month	Discount Factor (Wacc)	Cost Flow/ Equity Share (kEUR)	Discounted Costs (kEUR)
0	1,000		
28	0,993	18.574,36	18.448,92
27	0,987	18.574,36	18.332,34
26	0,980	18.574,36	18.208,54
25	0,974	18.574,36	18.089,52
24	0,967	18.574,36	17.967,35
23	0,961	18.574,36	17.849,91
22	0,955	18.574,36	17.729,37
21	0,948	18.574,36	17.609,63
20	0,942	18.574,36	17.494,53
19	0,936	18.574,36	17.376,38
18	0,929	18.574,36	17.262,81
17	0,923	18.574,36	17.146,22
16	0,917	18.574,36	17.030,43
15	0,911	18.574,36	16.926,51
14	0,905	18.574,36	16.812,20
13	0,899	18.574,36	16.702,31
12	0,893	18.574,36	16.589,51
11	0,887	18.574,36	16.481,08
10	0,881	18.574,36	16.369,77
9	0,875	18.574,36	16.259,22
8	0,870	18.574,36	16.152,95
7	0,864	18.574,36	16.043,86
6	0,858	18.574,36	15.938,99
5	0,852	18.574,36	15.831,35
4	0,847	18.574,36	15.724,43
3	0,841	18.574,36	15.628,49
2	0,836	18.574,36	15.522,94
1	0,830	18.574,36	15.421,48
Total		520.082,15	472.951,05

7.3.2 Operation period costs

For the post-tax LCOE calculation, same methodology and inputs are used as per Section 7.1 to calculate the loan payment, interest and opex parameters in the nominator of the equation shown as $\sum_{t=1}^{n} \frac{LPt+INTt}{(1+WACC)^t} + \sum_{t=1}^{n} \frac{O\&Mt\ x\ (1-TR)}{(1+WACC)^t}$. Annual energy production is also calculated the same way; however, similar to other parameters it is discounted with WACC to calculate the net present value. For post-tax LCOE calculation, opex is factored by deducting the tax amount. Table 7.8 below shows the discounted principal payment, interest, tax deducted & discounted opex and annual energy production for the first 30 months of operation period of the project. Complete calculation, including the values for 20 years of project lifetime is presented in Appendix D, showing 815,693,160 EUR for total net present value of principal payment + interest, 704,515,850 EUR for discounted & tax deducted Opex and 16,090,549 MWh for net present value of annual energy production.

Table 7.8 : Discounted principal payment, interest, opex and AEP.

Month	Discount Factor	Discounted Principal Payment+ Interest (kEUR)	Discounted Opex (Tax Deducted) (kEUR)	Discounted AEP
1	0,825	9.209,07	5.026,43	133812
2	0,819	9.124,70	5.002,01	132937
3	0,814	9.039,07	4.976,35	132039
4	0,808	8.954,17	4.951,10	131148
5	0,803	8.871,95	4.927,05	130290
6	0,798	8.788,50	4.901,77	129410
7	0,792	8.707,68	4.877,96	128565
8	0,787	8.625,65	4.852,94	127696
9	0,782	8.544,34	4.828,31	126834
10	0,777	8.469,27	4.806,96	126060
11	0,772	8.389,31	4.781,78	125209
12	0,767	8.311,85	4.758,55	124390
13	0,761	8.233,25	4.734,14	123550
14	0,756	8.157,12	4.711,14	122743
15	0,751	8.079,86	4.686,98	121914
16	0,746	8.003,27	4.663,19	121090
17	0,741	7.929,08	4.640,54	120299
18	0,736	7.853,80	4.616,73	119486
19	0,732	7.780,88	4.594,31	118705
20	0,727	7.706,89	4.570,74	117904
21	0,722	7.633,55	4.547,54	117108
22	0,717	7.564,15	4.526,44	116368

Table 7.8 (continued) : Discounted principal payment, interest, opex and AEP.

Month	Discount Factor	Discounted Principal Payment+ Interest (kEUR)	Discounted Opex (Tax Deducted) (kEUR)	Discounted AEP
23	0,712	7.492,05	4.502,98	115582
24	0,708	7.422,20	4.481,10	114826
25	0,703	7.351,33	4.458,12	114051
26	0,698	7.282,68	4.436,46	113305
27	0,694	7.213,03	4.413,70	112540
28	0,689	7.143,99	4.391,30	111780
29	0,684	7.077,10	4.369,97	111049
30	0,680	7.009,25	4.347,55	110299

The major difference between second and third LCOE methods described in this study is the deduction of tax savings on depreciation and on interest expressed as the formula: $-\sum_{t=1}^{n}\frac{INTt+DEPt}{(1+WACC)^t}$. In a broad term, depreciation is an accounting method of allocating the cost of a tangible asset over its useful life and businesses depreciate long term assetsfor both accounting and tax purposes as the cost of the purchased tangible assets can be deducted as business expenses (Investopedia, 2016).

In this study it is assumed that depreciation period is 16 years. To calculate the tax saving on depreciation, Total Capex is divided by 16 years and 12 in order to get the monthly depreciation amount. This amount is then multiplied by tax rate, 30 % and discounted to net presented value. To calculate the tax saving on interest during operation, monthly interest amounts are calculated the same way as per Section 7.2. These monthly interest amounts are also factored by tax rate and discounted. In order to calculate the tax saving on interest during construction, the Interest values presented in Section 7.2, on Table 7.2 :Cost to Funded are used. The total sum of interest during construction is distributed to 16 years of depreciation period. The monthly interest during construction amounts are multiplied by tax rate and discounted to their present values. Table 7.9 below shows the discounted depreciation on tax saving, tax saving on interest during operation and interest during construction for the first 30 months of the operation period. The values for the entire life cycle of the project are presented in Appendix D. The sum of net present values of depreciation on tax saving is 208,232,750 EUR. Total sum of discounted tax

saving on interest-operational period is 102,100,210 EUR. The total net present value of tax saving depreciation on interest during construction is 11,805,070 EUR.

Table 7.9 : Discounted tax saving on depreciation and on interest

Month	Discounted Depreciation Tax Saving (kEUR)	Discounted Tax Saving Interest (kEUR)	Discounted Tax Saving Depreciation on Interest During Construction (kEUR)
1	1.914,67	1.489,24	108,55
2	1.902,15	1.472,25	107,84
3	1.889,31	1.455,10	107,11
4	1.876,55	1.438,12	106,38
5	1.864,28	1.421,61	105,69
6	1.851,69	1.404,95	104,98
7	1.839,59	1.388,76	104,29
8	1.827,16	1.372,41	103,58
9	1.814,82	1.356,22	102,89
10	1.803,75	1.341,07	102,26
11	1.791,57	1.325,18	101,57
12	1.779,86	1.309,73	100,90
13	1.767,84	1.294,15	100,22
14	1.756,28	1.278,99	99,57
15	1.744,42	1.263,70	98,89
16	1.732,64	1.248,56	98,23
17	1.721,32	1.233,84	97,58
18	1.709,69	1.218,99	96,93
19	1.698,52	1.204,54	96,29
20	1.687,05	1.189,98	95,64
21	1.675,65	1.175,55	95,00
22	1.665,06	1.161,78	94,40
23	1.653,82	1.147,62	93,76
24	1.643,01	1.133,86	93,14
25	1.631,91	1.119,98	92,52
26	1.621,25	1.106,48	91,91
27	1.610,30	1.092,86	91,29
28	1.599,42	1.079,39	90,67
29	1.588,97	1.066,27	90,08
30	1.578,24	1.053,05	89,47

7.3.3 LCOE result

The summary of the calculations given in section 7.3.1 and 7.3.2 for post-tax LCOE calculation are given in Table 7.10 below.

Table 7.10 : Summary of cost and energy calculations with leveraged LCOE method.

Discounted Sum - Description	Value
Costs of construction period	472,951,050 EUR
Interest + principal payment	815,693,160 EUR
After tax Opex	704,515,850 EUR
Depreciation on tax saving	208,232,750 EUR
Tax saving on interest operation	102,100,210 EUR
Tax saving depp. on interest construction	11,805,070 EUR
Annual energy production	16,090,549 MWh

Using the discounted sum results in the leveraged LCOE formula, post-tax LCOE is calculated as 103.85 EUR / MWh and by taking tax rate as 30 % pre-tax LCOE is calculated as 148.36 EUR / MWh.

7.4 Selected LCOE Method and Conclusion

The quality of LCOE estimations depends on the quality and the level of detail of the input data. LCOE is highly sensitive to the assumed discount rate, typically reflected as WACC, weighted average cost of capital, which depends on the risk associated toa potential investment. Thus obtaining good data quality for LCOE calculations is challenging (Visser and Held, 2014).

In Section 7, three LCOE methods have been analyzed. In the first method a 10 % capital recovery factor has been used to convert the project costs into annual costs. 124.9 EUR / MWh has been calculated for LCOE of PelaStar floating foundation concept.

In the second LCOE cash flow method, discount rate is driven from the 10 % capital recovery factor using the mathematical relationship between them. Financing model of the project has also been evaluated by assuming equity share and debt share of the financing are 35 % and 65 % respectively. All monthly costs, including costs arising from interest of loan payments and monthly energy production amounts have been calculated and discounted to their net present values using the discount factor. Using the same inputs for cost and energy production capacity, 141.8 EUR/MWh has been calculated for LCOE of PelaStar floating foundation concept.

In the third, leveraged LCOE cash flow method, tax benefits on interests and depreciation have also been included in the LCOE formula. In order to discount the monthly costs and energy production into net present values, 8.3 % of Weighted

Average Cost of Capital rate that has been calculated using 14.5 % cost of equity and 7.1 % cost of debt has been used. For post-tax LCOE, opex is factored by tax rate and 108.85 EUR/MWh post tax LCOE has been calculated. Using the same tax rate, the post-tax has been converted into pre-tax LCOE value, which is 148.36 EUR /MWh.

In order to include the impact of tax benefits on interest and depreciation leveraged LCOE pre-tax method will be used to calculate the LCOE of Pelastar floating offshore wind farm and fixed-bottom offshore wind farm concepts, incorporating resource costs calculated in Section 5.

7.5 Capex Work Breakdown

In Section 7.1, 7.2 and 7.3 the capex that has been provided in PelaStar report has been used for LCOE calculations to compare the impact of using different LCOE calculation methods. The total Capex that Hurley and Nordstrom (2014) calculates for baseline case of PelaStar concept is 1,485,949,000 EUR for entire offshore wind farm that consist of 83 turbines. In this section Capex will be analyzed in more detail focusing on mainly the costs arising from foundation differences between PelaStar floating and fixed bottom concepts.

Water depth is an important parameter that has impact on the floating turbine system Capex especially due to the amount of material needed for the mooring lines and hub structure. According to PelaStar report, the primary steel weight decreases with increasing water depth but this decrease in steel cost is offset by an increase in tendon cost. The optimisation cost function, which is sum of hull cost, tendon material cost and anchor material cost, is relatively constant, with the minimum occuring in water depths near 75 m, baseline condition (Hurley and Nordstrom, 2014). On the other hand, ata water depth of 75 m, bottom fixed wind turbine with a monopile is not a feasible solution. For that reason in this study the water depth of 40 metre and a corrresponding primary steel weight has been used to calculate the Capex of the bottom fixed offshore wind farm. For PelaStar offshore wind farm capex calculation, two different water depth conditions have been analyzed, which are 75 metre and 57 metre.

The primary steel weight for PelaStar concept at 75 meter water depth, PelaStar concept at 57 meter water depth and fixed bottom concept at 40 meter water depth is 1174 MT, 1246 MT and 1094 MT respectively. In order to calculate the primary steel costs, these quantities are multiplied with 930 EUR/MT, assumed unit steel cost. Manufacturing cost per turbine has been taken as 796296 EUR for fixed bottom

foundation refering to the standards of offshore wind farm construction companies. Due to the complexity of PelaStar hull design & structure and due to the fact that it is a new concept and there is no manufacturing experience in the production of this special design, it is assumed that manufacturing cost per piece for PelaStar concept will be higher compared to bottom fixed foundation manufacturing. In this study it is assumed that the difference between manufacturing costs will be 15 %. Table 7.11 below shows the detail work breakdown for primary steel and secondary steel fabrication costs for both concepts at given water depths. The figures for bottom-fixed concept costs are based the template of Siemens for these concepts while the figures for PelaStar are taken from the report of Hurley and Nordstrom (2014).

Table 7.11 : Capex: primary and secondary steel fabrication.

Description	PelaStar Cost (75 m water depth) (EUR)	PelaStar Cost (57 m water depth) (EUR)	Fixed Bottom Cost (40 m water depth) (EUR)
Primary Steel Fabrication	**2.007.560**	**2.074.520**	**1.866.716**
Primary Steel	1.091.820	1.158.780	1.017.420
Manufacturing Cost per Piece	915.740	915.740	796.296
Shear Keys with welded beads			5.000
System to insert grouting mortar			19.000
Stops for the foundation structure			29.000
Secondary Steel Fabrication	**220.000**	**220.000**	**475.000**
Secondary Steel: External Ladders			
Platforms			
Fenders/boat bumpers	220.000	220.000	
Support Barge Spud Pockets			
Tendon Foundation			
Internal Piping			
Service Platform + Railings			120.000
Interior Gangway inc. Grids			165.000
Secondary Steel Components			100.000
Airtight deck + intermediate deck			50.000
Interior + Outdoor ladders			20.000
Grout Seals			20.000

Water depth not only has an impact on primary steel weight but also on tendon cost. Table 7.9 below shows the primary steel weight and optimization cost function, consisting of hull cost, tendon material cost and anchor material cost for water depths of 57 meter and 75 meter. In this study the ratio of optimization cost function for these water depths has been used to estimate the synthetic fiber costs and anchors

costs of PelaStar concept at 57 meter. For 75 meter, the cost figures are provided in PelaStar report as 242,000 EUR and 944,000 EUR respectively. Using the ratio between optimization cost function results and based on the primary steel costs calculated, synthetic fiber tendons and anchor costs for PelaStar concept at water depth 57 meter have been estimated as 238,697 EUR and 931,114 EUR as shown in Table 7.12.

Table 7.12 : Impact on primary steel weight and optimization cost function from water depth (Hurley and Nordstrom, 2014).

Water Depth (m)	Primary Steel Weight (MT)	Optimisation Cost Function (GBP)
57	1246	908,956
75	1174	896,548

The detailed cost breakdown for Mechanical Outfitting, platform paint, cathodic protection, transport, anchor and tendon systems, building site facilities, mobilization & demobilization of offshore installation of foundations are given in Table 7.13. Foundation cost structure varies between floating and fixed bottom concepts. One of these variations is related to Mechanical outfitting costs, consisting of all electrical and mechanical equipment necessary to monitor and operate the foundation, which are relatively higher in PelaStar floating concept compared to fixed bottom. Other major difference is the cost arising from Anchor and Tendon System which exists for PelaStar concept, consisting of all hardware required to secure the floating turbine to the sea bed, including anchors, tendons and connectors. On the other hand, mobilization and demobilization of offshore installation foundation costs, including the jack up vessel costs for these operations, comprise a major percent of fixed bottom foundation costs.

In the capex breakdown, it is assumed that subcontractor & service providers' profits are included in the bottom fixed costs; however, PelaStar profit has been included separately in Table 7.13 as per PelaStar report.

Rest of Capex consists of Installation, Turbine and Tower and Balance of System Costs as shown in Table 7.14.

Table 7.13 : Capex work breakdown for hull fabrication, foundation, anchor and tendon system.

Description	PelaStarCost (75 m) (EUR)	PelaStarCost (57 m) (EUR)	Fxd.BottomCost (40 m) (EUR)
Mechanical Outfitting & Foundation Commissioning	**1.051.000**	**1.051.000**	**310.000**
Mechanical Outfitting: Motor operated sea valves Bilge Alarm sensors Internal lighting Internal ventilation Tendon monitoring system Power Panel Back-up batteries Remaining items on electrical diagram	1.051.000	1.051.000	
Sonar Transponders Sea lighting for foundation Electrical equipment in TP & service platform Service Cranes on service platform			260.000
Acceptance & Commissioning of foundation			50.000
Platform Paint & Cathodic Protection	**398.000**	**398.000**	**450.000**
Platform paint interior and exterior	378.000	378.000	
Cathodic protection Supply and installation of aluminum anodes	20.000	20.000	225.000
Corrosion protection of foundation structure			100.000
Cathodic corrosion protection primary steel outdoor area - secondary steel outdoor area + indoor area			125.000
Transport from fabrication to staging port	**413.000**	**413.000**	**413.000**
Engineering & Management	**288.000**	**288.000**	**288.000**
PelaStar Profit Margin through the supply of PelaStar hull, tendons, tendon connectors	**454.000**	**454.000**	
Building Site Facilities Inc. Port areas, storage ares, administration areas			**800.000**

Table 7.13 (continued) : Capex work breakdown for hull fabrication, foundation, anchor and tendon system.

Description	PelaStarCost (75 m) (EUR)	PelaStarCost (57 m) (EUR)	Fxd.BottomCost (40 m) (EUR)
Mobilization & Demobilization of Offshore			
Installation of Foundation			**2.000.000**
- Noise mitigation system			
- Jack Up Vessel for foundation ins.			
- Barges to transport the found structure			
Anchor and Tendon Systems	**2.827.000**	**2.810.810**	
Synthetic Fiber Tendons	242.000	238.697	
Connectors	378.000	378.000	
Anchors	944.000	931.114	
Anchor Installation Mobilization& demobilization of installation vessel	1.263.000	1.263.000	

In this study, installation cost, which was calculated as 685,000 EUR by Hurley and Nordstrom (2014) has been divided into two sections as Procurement of PelaStar and Required fixture and Equipment costs. It is assumed that the PelaStar support barges will be purchased. In Section 5 it is estimated that four PelaStar support barge will be used for the project. Therefore, the unit barge price, which was taken as 6,284,959 EUR (Sun Machinery Corporation, 2016), multiplied by 4 and divided by 83 to get 302,890 EUR cost per Turbine. The costs for "Required fixture & equipment & transit" have been received by subtracting 302,890 EUR from 685,000 EUR and the estimated cost has been assigned to bottom fixed project's costs in order to focus on the cost deviations arising from foundation structure, installation vessel and resource costs. For the currency exchange rates of the prices retrieved from internet into euro, the figures in the report of Hurley and Nordstrom (2014) have been used.

Unlike PelaStar concept, for bottom fixed project, a jack up installation vessel should be rented for installation operations. Based on the report of Dalgic, et al (2015), and the currency exchange rates provided in PelaStar report, 136,332 EUR is taken as daily charter rate for an offshore wind jack up vessel that is assumed to be built in 2012. In Chapter 5, it is calculated that bottom-fixed construction period is 288 days; therefore, the daily charter rate of 136,332 EUR is multiplied by 288 days and divided by 83 to receive 473,056 EUR per turbine as shown in Table 7.14 below.

As per the PelaStar report, Turbine and Tower cost, including the man power and platform costs is 8,000,000 EUR in total. In this study this item is divided into two consisting of Resource / Manpower costs and Turbine and Tower costs.

For Resource costs, the values calculated in Section 5 have been used for PelaStar and bottom fixed cost breakdown. For entire wind farm consisting of 83 turbines, the costs of resources working on construction & installation phase have been calculated as 31,750,568 EUR and 27,805,774 EUR for bottom fixed and PelaStar concepts respectively. These values are divided into 83 to get 382,537 EUR and 335,009 EUR per turbine costs for bottom fixed and floating concepts.

335,009 EUR is then subtracted from 8,000,000 EUR cost and the result of 7,664,991 EUR has been assigned to cost breakdown as Turbine and Tower Cost for both concepts.

Table 7.14 : Capex for installation, turbine and tower and balance of system.

Description	PelaStar Cost (75 m) (EUR)	PelaStar Cost (57 m) (EUR)	Fxd.Bottom Cost (40 m) (EUR)
Installation	**1.020.009**	**1.020.009**	**1.237.703**
Required fixure and equipment + transit	382.110	382.110	382.110
Procurement of PelaStar Support Barge	302.890	302.890	
Installation Vessel Rent			473.056
Resource / Man Power Cost during Construction	335.009	335.009	382.537
Turbine and Tower	**7.664.991**	**7.664.991**	**7.664.991**
Balance of System	**1.637.000**	**1.637.000**	**1.637.000**
Port of Staging Equipment	79.000	79.000	79.000
Electrical Array Cables Installed	1.025.000	1.025.000	1.025.000
Permits, Engineering, Site Assessment, Proj. Mag Consulting, Bank fees	533.000	533.000	533.000
Decommissioning	1.613.640	1.566.641	2.611.068

In order to focus on the differences arising from foundation differences, Balance of System Costs, consisting of port & staging equipment, electrical array cables, permits, engineering site assessment, project management, consulting fees, have assumed to be same for both concepts and a total of 1,637,000 EUR cost has been used in capex calculation based on PelaStar report.

One of the major differences in this study compared to the report of Hurley and Nordstrom (2014) is the assumptions regarding decommissioning costs while in Pelastar capex calculation, decommissioning is assumed to be cost neutral due to the claim that the equipment required to remove the floating turbines is owned by the wind plant; therefore the cost of removing the floating turbines is limited to the marginal costs of performing the operation. However, in this study it is assumed that there will be decommissioning costs for both concepts but due to the extra costs of installation vessel charter for bottom-fixed project decommissioning, decommissioning costs of PelaStar concept will be less. The percentage of installation vessel among the total installation costs equals to approximately 40 % of the costs. It is assumed that the benefit of having PelaStar barge by wind farm will be approximately 40 %. Therefore, 60 % of bottom – fixed decommissioning costs has been assigned to PelaStar capex structure.

Decommissioning cost of bottom-fixed concept is based on the figures provided for wind farm removal operation costs in the report of Shafiee, et al (2016).

7.5.1 Capex – Delay Case

Offshore wind industry is a continuously developing field that faces the challenge of completing manufacturing with the required quality within the planned timeframe. The underlying cause of the quality problems that result in delay in the project timeline is the newly proposed design and engineering solutions in order to increase the rated power of turbines. Not having a standardized production delivers new quality risks for each new offshore wind farm solution. Despite the learning curves that enabled to reduce the construction time and streamline many processes of the life cycle of offshore wind projects, delays in time schedule and the costs born due to delays generate the major non conformity costs that jeopardize commercialization of many offshore wind solutions. Therefore, in this study the impact of delay in project timeline on Capex has also been analyzed.

It has been assumed that both projects will be delayed 90 days; hence the construction period of the projects will be 90 days longer. For bottom fixed concept, the delay in construction period results in both increase in manning costs and also increase in installation vessel costs. For PelaStar concept; however, it is assumed that a delay in construction phase only results in increase in manpower costs as the purchasing price of PelaStar barges are fixed and doesn't incur additional costs due to delay of projects.

In Section 5, construction duration is calculated as 260 days and 288 days for PelaStar and bottom-fixed concepts respectively. 90 days of delay is 34 % of

PelaStar project and 31 % of the bottom fixed construction time. Using these ratios, man power costs for delay scenario have been estimated as 450,923 EUR and 502,080 EUR per turbine as shown in Table 7.15. Cost of PelaStar support barge is unchanged. However, for fixed bottom project, there is an increase in installation vessel costs due to the rent payment for additional 90 days, which results in 620,885 EUR per turbine.

Table 7.15 : Capex – installation for delay case.

Description	PelaStar Cost (75 m) (EUR)	PelaStar Cost (57 m) (EUR)	Fxd.Bottom Cost (40 m) (EUR)
	1.135.922	**1.135.922**	**1.505.075**
Installation			
Required fixure and equipment + transit	382.110	382.110	382.110
Procurement of PelaStar Support Barge	302.890	302.890	
Installation Vessel Rent			620.885
Resource / Man Power Cost during Construction	450.923	450.923	502.080

7.6 Opex Work Breakdown

Operation and Maintenance costs include the recurring costs upon construction and commissioning of the wind farm. One category of operation & maintenance is Equipment and Foundation Maintenance which is a fixed annual cost, including regularly occurring structural inspection expenses. In PelaStar report it is claimed that PelaStar hull is expected to have a similar level of inspection effort required asa bottom-fixed foundation, namely a regularly scheduled, remotely-operated vehicle based visual inspection in-situ. As per the same report, it is not anticipated that the PelaStar hull will be removed from service for repairs or maintenance during its 20-year service life. Based on this assumption the same Equipment and Foundation Maintenance cost, 84,500 EUR calculated by Hurley and Nordstrom (2014) has been assigned to the cost structure of both PelaStar and bottom fixed concepts as shown in Table 7.16.

Another category of Opex is “scheduled and un-scheduled turbine maintenance”, which is a fixed annual cost, including the jack up vessel costs for major

maintenance activities of a conventional offshore wind farm. The figure for this category given in PelaStar report is based on the assumption that wind farm will use PelaStar support barge for major maintenance activities. Based on this assumption, the costs for bottom fixed projects will be higher due to the jack up installation vessel costs used for these operations. To estimate the increase in cost, the ratio of jack up vessel cost within the total installation cost has been used and 473,064 EUR has been assigned to bottom-fixed project cost structure. For PelaStar, 342,800 EUR has been assigned to this category as per the report of Hurley and Nordstrom (2014).

Bottom lease, plant operations and transmission costs are taken from the PelaStar report and assigned to the opex of both projects. These categories include the costs of offshore substation, export cable to shore and costs incurring from taxes, insurance that are assumed to be same for both concepts in this study.

Table 7.16 : OPEX for pelaStar and bottom – fixed projects.

Description	PelaStar Cost (75 m) (EUR)	PelaStar Cost (57 m) (EUR)	Fxd.Bottom Cost (40 m) (EUR)
OPEX	**1.201.900**	**1.201.900**	**1.332.164**
Bottom Lease	60.800	60.800	60.800
Plant Operations	63.800	63.800	63.800
Turbine Maintenance	342.800	342.800	473.064
Equipment and Foundation Maintenance	84.500	84.500	84.500
Transmission Fee	650.000	650.000	650.000

7.7 LCOE Calculation Results

In Section 7.5 and 7.6, Capex and Opex values for PelaStar and Fixed – Bottom concepts have been calculated per turbine. It is assumed that Opex will be same for PelaStar projects at different water depth level, which is calculated as 99,757,700 EUR for an entire wind farm as shown in Table 7.17. The total Opex for entire bottom-fixed offshore wind farm is calculated as 110,569,612 EUR. The highest CAPEX value belongs to the Fixed Bottom Projects. The capex of PelaStar at water depth 75 meter is lower compared to water depth 57 meter due to the decrease of primary steel weight of PelaStar hull structure at its optimum water depth level, 75 meter.

For LCOE calculation annual energy production is assumed to be same for both concepts and taken as 23,460 MWh per year as stated in Section 7.1 and 7.2. Based on these figures LCOE for bottom fixed project is calculated as 164 Eur / MW hour

while the LCOE of PelaStar, at 57 meter water depth, is calculated as 156,71 EUR /MWhour. LCOE of PelaStar project at 75 meter is lower due to the lower Capex value.

LCOE for delay scenario for PelaStar floating project at 57 meter water depth is calculated as 157,26 EUR /MW hour, which is 0.55 EUR /MW hour higher than the non-delay case.

LCOE for delay scenario for Fixed-Bottom project at 40 meter water depth is calculated as 165.28 EUR /MW hour, which is 1.28 EUR /MW hour higher than the non-delay case.

Table 7.17 : LCOE calculation results.

Concept - Description	**Capex+ Decommissioning (EUR)**	**Opex (EUR)**	**LCOE (EUR/MW hour)**
PelaStar - 75 m Water Depth	1.626.318.601	99.757.700	156,46
PelaStar - 57 m Water Depth	1.630.532.521	99.757.700	156,71
Fixed Bottom - 40 m Water Depth	1.639.538.639	110.569.612	164,00
Delay_Fixed Bottom - 40 m Water Depth	1.661.730.572	110.569.612	165,28
Delay_PelaStar - 57 m Water Depth	1.640.153.319	99.757.700	157,26

8. CONCLUSION AND RECOMMENDATIONS

Calculations carried out showed that fixed bottom project at 40 meter depth have the highest Capex cost due to higher decommissioning costs. However, the highest foundation costs belong to the PelaStar tension leg platform project at 57 meter water depth due to the additional costs arising from mechanical outfitting to monitor hull and tendon systems and also from the higher primary steel weight at this water depth. As shown in Table 8.1, the total foundation costs per turbine for PelaStar at 75 meter, PelaStar at 57 meter and Fixed-Bottom at 40 meter are 7,658,560 EUR, 7,709,331 EUR and 6,602,716 EUR respectively.

Although higher capex for foundations looks like a disadvantage for PelaStar tension leg platform concept, this concept provides a lot of advantages in terms of savings in site manning and installation costs and most importantly it reduces the risks that generate high non-conformity costs due to delays in timeline. Fixed bottom offshore wind farm projects depend on installation vessel and in current industry regulations, offshore wind farm companies are obliged to pay the agreed the installation vessel charter cost based on the initial timeline. When there is a delay in the project, contractors pay both the agreed, initial cost together with the additional costs of installation vessel, even if they don't use the installation vessel due to delays. However, tension leg platform floating concept is not dependent on vessels in case of delay, which reduce the increment of costs due to delay significantly. As stated in Section 7.5.1, keeping the other parameters constant and only evaluating the impact of delay on installation capex and therefore on LCOE, we see that LCOE of PelaStartension leg platform concept increases in an amount of 0.55 EUR /MW hour while the LCOE of fixed bottom concept increases 1.28 EUR /MW hour.

Table 8.1 : Overview of foundation capex.

Description	PelaStar Cost (75 m) (EUR)	PelaStar Cost (57 m) (EUR)	Fxd.Bottom Cost (40 m) (EUR)
Total Capex	**19.594.200**	**19.597.971**	**19.753.478**
Foundation Total per WTG	**7.658.560**	**7.709.331**	**6.602.716**
Primary Steel Fabrication	2.007.560	2.074.520	1.866.716
Secondary Steel Fabrication	220.000	220.000	475.000

Table 8.1 (continued) : Overview of foundation capex.

Description	PelaStar Cost (75 m) (EUR)	PelaStar Cost (57 m) (EUR)	Fxd.Bottom Cost (40 m) (EUR
Mechanical Outfitting & Foundation Commissioning	1.051.000	1.051.000	310.000
Platform Paint & Cathodic Protection	398.000	398.000	450.000
Transport from fabrication to staging port	413.000	413.000	413.000
Engineering & Management	288.000	288.000	288.000
PelaStar Profit	454.000	454.000	
Anchor and Tendon Systems	2.827.000	2.810.810	
Building Site Facilities			800.000
Mobilization & Demobilization of Offshore Installation of Foundation			2.000.000

Another advantage of PelaStar tension leg platform is the opportunity to use the concept in deeper waters compared to water depth range that fixed-bottom concepts can be utilized. At a water depth of 75 meter, fixed-bottom monopile foundations can not be a solution. The technical alternatives, which are jacket systems are expensive and have higher Capex compared to tension leg platform at the water depth of 75 meter, resulting in higher LCOE. This limitation of fixed-bottom solutions also limits the site opportunities that have higher wind speed. Apart from Capex and Opex parameters, Annual Energy Production, which significantly depends on the wind speed at the offshore wind farm location, has an important impact on LCOE. Table 8.2 below shows how LCOE changes at different wind speeds, keeping all the other parameters same. At 9.7 m/s wind speed, which is the assumed wind speed used for the LCOE calculations in Section 7, LCOE of PelaStar is calculated as 156.71 EUR /MW hours. In case of 10.5 m/s mean wind speed, annual energy production per turbine increases to 25705 Mwh and this reduces the LCOE down to 143.02 EUR /MW hours. When we repeat the calculation for 11.4 m/s mean wind speed, we get 27186 MWh annual energy production per turbine and 135.23 EUR /MW hour LCOE as shown in Table 8.2.

Table 8.2: LCOE results for pelaStar at different wind speeds.

Concept - Description	Wind Speed (m/s)	Net Annual Energy Production per WTG (MWh)	Net Annual Energy Production Wind Farm (MWh)	LCOE (EUR/MW hour)
PelaStar - 57 m Water Depth	9.7 m/s	23460	1947180	156,71
PelaStar - 57 m Water Depth	10.5 m/s	25705	2133515	143,02
PelaStar - 57 m Water Depth	11.4 m/s	27186	2256438	135,23

For further research, learning curve of the PelaStar tension leg platform concept and the technology upgrades regarding the rated power of turbines should be studied. Learning curves will generate the potential to reduce the CAPEX of the projects by enabling the construction phase to be completed in shorter periods with less resources. The improvement potential in offshore wind farm supply chain should also be researched to forecast the reductions of LCOE values due to the improvements of supply chain quality.

REFERENCES

Dalgic, Y., Lazakis, I. and Turan, O. (2013). *Vessel Charter Rate Estimation for Offshore Wind O&M Activities*. Presented at International Maritime Association of Mediterranean IMAM, UK, 10-17 October 2013. Glaskow: University of Strathclyde.

Foster, J., Wagner L. & Bratanova A. (2014*). LCOE models: a comparison of the theoretical frameworks and key assumptions*. Presented at University of Queensland, Australia, July 2014. Australia: CSIRO Future Grid Flagship Cluster.

Gipe, P. (2009). *Wind Energy Basics A Guide to home and Community Scale Wind Energy Systems.* USA: Chelsea Green Publishing company.

Hau, E. (2005). *Wind Turbines Fundamentals, Technologies, Application, Economics* (H. Renouard, Trans.) Germany: Springer.

Hollman, J.K.; Dysert, L. R.: Escalation Estimation: Working with Economics Consultants. In: AACE International Transactions, (2007), pp. 01.01-01.06

Holst, P. and Thiesen, J.(2013). Weather Window Assessment, Borkum Riffgrund 1 (File no. SIE/2013/09/BR1). ConWX and Siemens Wind Power A/S Metocean Hindcast and Analysis Report.

Hurley, W. L. and Nordstrom, C. J. (2014*). PelaStar Cost of Energy: A Cost Study of the PelaStar Floating Foundation Sytem in UK waters*. Glosten and Energy Technologies Institute (File No. 12004.01).

International Renewable Energy Agency. (2012). Wind Power. *Renewable Energy Technologies: Cost Analysis Series.* Volume 1: Power Sector, Issue 5/5.

Investopidia. (2016). Weigted Average Cost of Capital – WACC. Retrived on April 17, 2016 from http://www.investopedia.com/terms/w/wacc.asp.

Johnson, G.L. (2001). *Wind Energy Systems*. Manhattan.

Johnson, R. (2016). Debt Financing vs. Share Financing. Zacks Investment Research. Retrived on April 02, 2016 from http://finance.zacks.com

Kamphuis, J. W. (2010). *Introduction to Coastal Engineering and Management.* Canada: Queen's University.

Ludewig, E. (2014). *On the Effect of Offshore Wind Farms on the Atmosphere and Ocean Dynamics.* Germany: Institute of Ocenography.

MacDougall, S. and Colton, S. (2013). Financial Evaluation and Cost of Energy. *Acadia Tidal Energy Institute Publication, 2013-01.*

Manwell, J.F., McGowan, J.G. & Rogers, A.L. (2002). *Wind Energy Explained Theory, Design and Application*. USA: University of Massachusetts, Amherst.

Megavind. (2015). Megavind LCOE Model Guidelines and documentation. Retrieved from http://megavind.windpower.org

Minambres, O. Y. (2012). *Assessment of Current Offshore Wind Support Structure Concepts – Challenges and Technological Requirements by 2020.* (Thesis) Karlshochschule International University, Industrial Engineering, Germany.

Myhr, A., Bjerkseter, C., Agotnes, A. and Nygaard, TA. (2014). Levelised cost of Energy for offshore floating wind turbines in a life cycle perspective. Renew Energy 66:714-728.

Shafiee, M., Brennan, F. and Espinosa, A. (2016). A parametric whole life cost model for offshore wind farms. *The international Journal of Life Cycle assessment*, 21(7), pp 961-975.

Statoil. (2016). Assembly Site Meeting, Siemens-Vejle, 2 March 2016. [Power Point Slides].

Sun Machinery Corporation. (2016). Retrieved on May, 2016 from http://www.sunmachinery.com/barges_for_sale.html

Visser, E. and Held, A. (2014). *Methodologies for Estimating Levelized Cost of Electiricty.* European Commission, DG Energy.

Wagner, H. J. and Mathur, J. (2013). *Introduction to Wind Energy Systems Basics, Technology and Operation.* Germany: EDP Sciences.

APPENDICES

APPENDIX A : Bottom Fixed Offshore Wind Farm Construction Planning

APPENDIX B: Floating Offshore Wind Farm Project Construction Planning

APPENDIX C: Annual Energy Production Calculation Based on Annual Wind Speed Data

APPENDIX D: Calculations for LCOE

APPENDIX A

Activity Name	Duration (Hour)	Start	Finish
Bottom Fixed Offshore Wind Farm Project	1553	01-Jun-16	16-Mar-17
Installation - WTG	1398	01-Jun-16	16-Feb-17
Turbines Erection_Detailed	1335	01-Jun-16	05-Feb-17
Installation 1st Batch	90	01-Jun-16	17-Jun-16
Load WTG Batch 001	0	01-Jun-16*	
Return WTG Batch - Batch 001	0		17-Jun-16
Installation 1st Batch	90	01-Jun-16	17-Jun-16
Loading	48	01-Jun-16	03-Jun-16
Loading WTG - WTG 001	48	01-Jun-16	03-Jun-16
Loading WTG - WTG 002	48	01-Jun-16	03-Jun-16
Loading WTG - WTG 003	48	01-Jun-16	03-Jun-16
Loading WTG - WTG 004	48	01-Jun-16	03-Jun-16
Loading WTG - WTG 005	48	01-Jun-16	03-Jun-16
Loading WTG - WTG 006	48	01-Jun-16	03-Jun-16
Loading WTG - WTG 007	48	01-Jun-16	03-Jun-16
Loading WTG - WTG 008	48	01-Jun-16	03-Jun-16
Sea Fastening and Prepare to Departure	2	03-Jun-16	03-Jun-16
Sea Fastening and Prepare to Departure - WTG 001	2	03-Jun-16	03-Jun-16
Sea Fastening and Prepare to Departure - WTG 002	2	03-Jun-16	03-Jun-16
Sea Fastening and Prepare to Departure - WTG 003	2	03-Jun-16	03-Jun-16
Sea Fastening and Prepare to Departure - WTG 004	2	03-Jun-16	03-Jun-16
Sea Fastening and Prepare to Departure - WTG 005	2	03-Jun-16	03-Jun-16
Sea Fastening and Prepare to Departure - WTG 006	2	03-Jun-16	03-Jun-16
Sea Fastening and Prepare to Departure - WTG 007	2	03-Jun-16	03-Jun-16
Sea Fastening and Prepare to Departure - WTG 008	2	03-Jun-16	03-Jun-16
Pilot Out of Port	1	03-Jun-16	03-Jun-16
Pilot Out of Port - WTG 001	1	03-Jun-16	03-Jun-16
Pilot Out of Port - WTG 002	1	03-Jun-16	03-Jun-16
Pilot Out of Port - WTG 003	1	03-Jun-16	03-Jun-16
Pilot Out of Port - WTG 004	1	03-Jun-16	03-Jun-16
Pilot Out of Port - WTG 005	1	03-Jun-16	03-Jun-16
Pilot Out of Port - WTG 006	1	03-Jun-16	03-Jun-16
Pilot Out of Port - WTG 007	1	03-Jun-16	03-Jun-16
Pilot Out of Port - WTG 008	1	03-Jun-16	03-Jun-16
Transit to Site	13	03-Jun-16	04-Jun-16
WTG Transit to Site - WTG 001	13	03-Jun-16	04-Jun-16
WTG Transit to Site - WTG 002	13	03-Jun-16	04-Jun-16
WTG Transit to Site - WTG 003	13	03-Jun-16	04-Jun-16
WTG Transit to Site - WTG 004	13	03-Jun-16	04-Jun-16
WTG Transit to Site - WTG 005	13	03-Jun-16	04-Jun-16
WTG Transit to Site - WTG 006	13	03-Jun-16	04-Jun-16
WTG Transit to Site - WTG 007	13	03-Jun-16	04-Jun-16
WTG Transit to Site - WTG 008	13	03-Jun-16	04-Jun-16
Positioning and Jack Up	201	04-Jun-16	14-Jun-16
WTG Positioning and Jack Up - WTG 001	5	04-Jun-16	04-Jun-16
WTG Positioning and Jack Up - WTG 002	5	06-Jun-16	06-Jun-16
WTG Positioning and Jack Up - WTG 003	5	04-Jun-16	04-Jun-16
WTG Positioning and Jack Up - WTG 004	5	06-Jun-16	06-Jun-16
WTG Positioning and Jack Up - WTG 005	5	08-Jun-16	08-Jun-16

Figure A.1 : Bottom fixed offshore wind farm construction planning (continues)

Activity Name	Duration (Hour)	Start	Finish
WTG Positioning and Jack Up - WTG 006	5	10-Jun-16	10-Jun-16
WTG Positioning and Jack Up - WTG 007	5	12-Jun-16	12-Jun-16
WTG Positioning and Jack Up - WTG 008	5	14-Jun-16	14-Jun-16
Prep for Installation	222	04-Jun-16	14-Jun-16
WTG Prep for Installation - WTG 001	1	04-Jun-16	04-Jun-16
WTG Prep for Installation - WTG 002	1	06-Jun-16	06-Jun-16
WTG Prep for Installation - WTG 003	1	04-Jun-16	04-Jun-16
WTG Prep for Installation - WTG 004	1	06-Jun-16	06-Jun-16
WTG Prep for Installation - WTG 005	1	08-Jun-16	08-Jun-16
WTG Prep for Installation - WTG 006	1	10-Jun-16	10-Jun-16
WTG Prep for Installation - WTG 007	1	12-Jun-16	12-Jun-16
WTG Prep for Installation - WTG 008	1	14-Jun-16	14-Jun-16
Installing Tower, Nacelle and Hub	159	04-Jun-16	15-Jun-16
Instaling Tower, Nacelle and Hub - WTG 001	8	04-Jun-16	05-Jun-16
Instaling Tower, Nacelle and Hub - WTG 002	8	07-Jun-16	07-Jun-16
Instaling Tower, Nacelle and Hub - WTG 003	8	04-Jun-16	05-Jun-16
Instaling Tower, Nacelle and Hub - WTG 004	8	07-Jun-16	07-Jun-16
Instaling Tower, Nacelle and Hub - WTG 005	8	09-Jun-16	09-Jun-16
Instaling Tower, Nacelle and Hub - WTG 006	8	11-Jun-16	11-Jun-16
Instaling Tower, Nacelle and Hub - WTG 007	8	13-Jun-16	13-Jun-16
Instaling Tower, Nacelle and Hub - WTG 008	8	15-Jun-16	15-Jun-16
Installing 3 Blades	116	05-Jun-16	16-Jun-16
Instaling 3 Blades - WTG 001	11	05-Jun-16	06-Jun-16
Instaling 3 Blades - WTG 002	11	07-Jun-16	08-Jun-16
Instaling 3 Blades - WTG 003	11	05-Jun-16	06-Jun-16
Instaling 3 Blades - WTG 004	11	07-Jun-16	08-Jun-16
Instaling 3 Blades - WTG 005	11	09-Jun-16	10-Jun-16
Instaling 3 Blades - WTG 006	11	11-Jun-16	12-Jun-16
Instaling 3 Blades - WTG 007	11	13-Jun-16	14-Jun-16
Instaling 3 Blades - WTG 008	11	15-Jun-16	16-Jun-16
Position Checked by Client Rep.	241	06-Jun-16	16-Jun-16
Position Checked by Client Rep. - WTG 001	0	06-Jun-16	06-Jun-16
Position Checked by Client Rep. - WTG 002	0	08-Jun-16	08-Jun-16
Position Checked by Client Rep. - WTG 003	0	06-Jun-16	06-Jun-16
Position Checked by Client Rep. - WTG 004	0	08-Jun-16	08-Jun-16
Position Checked by Client Rep. - WTG 005	0	10-Jun-16	10-Jun-16
Position Checked by Client Rep. - WTG 006	0	12-Jun-16	12-Jun-16
Position Checked by Client Rep. - WTG 007	0	14-Jun-16	14-Jun-16
Position Checked by Client Rep. - WTG 008	0	16-Jun-16	16-Jun-16
Jack Down	198	06-Jun-16	16-Jun-16
Jack Down - WTG 001	2	06-Jun-16	06-Jun-16
Jack Down - WTG 002	2	08-Jun-16	08-Jun-16
Jack Down - WTG 003	2	06-Jun-16	06-Jun-16
Jack Down - WTG 004	2	08-Jun-16	08-Jun-16
Jack Down - WTG 005	2	10-Jun-16	10-Jun-16
Jack Down - WTG 006	2	12-Jun-16	12-Jun-16
Jack Down - WTG 007	2	14-Jun-16	14-Jun-16
Jack Down - WTG 008	2	16-Jun-16	16-Jun-16
Vessel Departure	241	06-Jun-16	16-Jun-16
Vessel Departure - WTG 001	0		06-Jun-16
Vessel Departure - WTG 002	0		08-Jun-16
Vessel Departure - WTG 003	0		06-Jun-16
Vessel Departure - WTG 004	0		08-Jun-16
Vessel Departure - WTG 005	0		10-Jun-16

Figure A.1 : Bottom fixed offshore wind farm construction planning (continues)

Activity Name	Duration (Hour)	Start	Finish
Vessel Departure - WTG 006	0		12-Jun-16
Vessel Departure - WTG 007	0		14-Jun-16
Vessel Departure - WTG 008	0		16-Jun-16
Return to Port	242	06-Jun-16	17-Jun-16
WTG Return to Port - WTG 001	16	06-Jun-16	07-Jun-16
WTG Return to Port - WTG 002	16	08-Jun-16	09-Jun-16
WTG Return to Port - WTG 003	16	06-Jun-16	07-Jun-16
WTG Return to Port - WTG 004	16	08-Jun-16	09-Jun-16
WTG Return to Port - WTG 005	16	10-Jun-16	11-Jun-16
WTG Return to Port - WTG 006	16	12-Jun-16	13-Jun-16
WTG Return to Port - WTG 007	16	14-Jun-16	15-Jun-16
WTG Return to Port - WTG 008	16	16-Jun-16	17-Jun-16
Installation 2nd Batch	105	17-Jun-16	07-Jul-16
Load WTG Batch 002	0	17-Jun-16*	
Return WTG Batch - Batch 002	0		07-Jul-16
Loading	48	17-Jun-16	19-Jun-16
Loading WTG - WTG 009	48	17-Jun-16	19-Jun-16
Loading WTG - WTG 010	48	17-Jun-16	19-Jun-16
Loading WTG - WTG 011	48	17-Jun-16	19-Jun-16
Loading WTG - WTG 012	48	17-Jun-16	19-Jun-16
Loading WTG - WTG 013	48	17-Jun-16	19-Jun-16
Loading WTG - WTG 014	48	17-Jun-16	19-Jun-16
Loading WTG - WTG 015	48	17-Jun-16	19-Jun-16
Loading WTG - WTG 016	48	17-Jun-16	19-Jun-16
Sea Fastening and Prepare to Departure	2	19-Jun-16	19-Jun-16
Sea Fastening and Prepare to Departure - WTG 009	2	19-Jun-16	19-Jun-16
Sea Fastening and Prepare to Departure - WTG 010	2	19-Jun-16	19-Jun-16
Sea Fastening and Prepare to Departure - WTG 011	2	19-Jun-16	19-Jun-16
Sea Fastening and Prepare to Departure - WTG 012	2	19-Jun-16	19-Jun-16
Sea Fastening and Prepare to Departure - WTG 013	2	19-Jun-16	19-Jun-16
Sea Fastening and Prepare to Departure - WTG 014	2	19-Jun-16	19-Jun-16
Sea Fastening and Prepare to Departure - WTG 015	2	19-Jun-16	19-Jun-16
Sea Fastening and Prepare to Departure - WTG 016	2	19-Jun-16	19-Jun-16
Pilot Out of Port	1	19-Jun-16	19-Jun-16
Pilot Out of Port - WTG 009	1	19-Jun-16	19-Jun-16
Pilot Out of Port - WTG 010	1	19-Jun-16	19-Jun-16
Pilot Out of Port - WTG 011	1	19-Jun-16	19-Jun-16
Pilot Out of Port - WTG 012	1	19-Jun-16	19-Jun-16
Pilot Out of Port - WTG 013	1	19-Jun-16	19-Jun-16
Pilot Out of Port - WTG 014	1	19-Jun-16	19-Jun-16
Pilot Out of Port - WTG 015	1	19-Jun-16	19-Jun-16
Pilot Out of Port - WTG 016	1	19-Jun-16	19-Jun-16
Transit to Site	13	19-Jun-16	20-Jun-16
WTG Transit to Site - WTG 009	13	19-Jun-16	20-Jun-16
WTG Transit to Site - WTG 010	13	19-Jun-16	20-Jun-16
WTG Transit to Site - WTG 011	13	19-Jun-16	20-Jun-16
WTG Transit to Site - WTG 012	13	19-Jun-16	20-Jun-16
WTG Transit to Site - WTG 013	13	19-Jun-16	20-Jun-16
WTG Transit to Site - WTG 014	13	19-Jun-16	20-Jun-16
WTG Transit to Site - WTG 015	13	19-Jun-16	20-Jun-16
WTG Transit to Site - WTG 016	13	19-Jun-16	20-Jun-16
Positioning and Jack Up	280	20-Jun-16	04-Jul-16
WTG Positioning and Jack Up - WTG 009	5	20-Jun-16	20-Jun-16
WTG Positioning and Jack Up - WTG 010	5	22-Jun-16	22-Jun-16

Figure A.1 : Bottom fixed offshore wind farm construction planning (continues)

Activity Name	Duration (Hour)	Start	Finish
WTG Positioning and Jack Up - WTG 011	5	24-Jun-16	24-Jun-16
WTG Positioning and Jack Up - WTG 012	5	26-Jun-16	26-Jun-16
WTG Positioning and Jack Up - WTG 013	5	28-Jun-16	28-Jun-16
WTG Positioning and Jack Up - WTG 014	5	30-Jun-16	30-Jun-16
WTG Positioning and Jack Up - WTG 015	5	02-Jul-16	02-Jul-16
WTG Positioning and Jack Up - WTG 016	5	04-Jul-16	04-Jul-16
Prep for Installation	310	20-Jun-16	04-Jul-16
WTG Prep for Installation - WTG 009	1	20-Jun-16	20-Jun-16
WTG Prep for Installation - WTG 010	1	22-Jun-16	22-Jun-16
WTG Prep for Installation - WTG 011	1	24-Jun-16	24-Jun-16
WTG Prep for Installation - WTG 012	1	26-Jun-16	26-Jun-16
WTG Prep for Installation - WTG 013	1	28-Jun-16	28-Jun-16
WTG Prep for Installation - WTG 014	1	30-Jun-16	30-Jun-16
WTG Prep for Installation - WTG 015	1	02-Jul-16	02-Jul-16
WTG Prep for Installation - WTG 016	1	04-Jul-16	04-Jul-16
Installing Tower, Nacelle and Hub	221	20-Jun-16	05-Jul-16
Installing Tower, Nacelle and Hub - WTG 009	8	20-Jun-16	21-Jun-16
Installing Tower, Nacelle and Hub - WTG 010	8	22-Jun-16	23-Jun-16
Installing Tower, Nacelle and Hub - WTG 011	8	24-Jun-16	25-Jun-16
Installing Tower, Nacelle and Hub - WTG 012	8	27-Jun-16	27-Jun-16
Installing Tower, Nacelle and Hub - WTG 013	8	29-Jun-16	29-Jun-16
Installing Tower, Nacelle and Hub - WTG 014	8	01-Jul-16	01-Jul-16
Installing Tower, Nacelle and Hub - WTG 015	8	02-Jul-16	03-Jul-16
Installing Tower, Nacelle and Hub - WTG 016	8	04-Jul-16	05-Jul-16
Installing 3 Blades	161	21-Jun-16	06-Jul-16
Installing 3 Blades - WTG 009	11	21-Jun-16	22-Jun-16
Installing 3 Blades - WTG 010	11	23-Jun-16	24-Jun-16
Installing 3 Blades - WTG 011	11	25-Jun-16	26-Jun-16
Installing 3 Blades - WTG 012	11	27-Jun-16	28-Jun-16
Installing 3 Blades - WTG 013	11	29-Jun-16	30-Jun-16
Installing 3 Blades - WTG 014	11	01-Jul-16	02-Jul-16
Installing 3 Blades - WTG 015	11	03-Jul-16	04-Jul-16
Installing 3 Blades - WTG 016	11	05-Jul-16	06-Jul-16
Position Checked by Client Rep.	336	22-Jun-16	06-Jul-16
Position Checked by Client Rep. - WTG 009	0	22-Jun-16	22-Jun-16
Position Checked by Client Rep. - WTG 010	0	24-Jun-16	24-Jun-16
Position Checked by Client Rep. - WTG 011	0	26-Jun-16	26-Jun-16
Position Checked by Client Rep. - WTG 012	0	28-Jun-16	28-Jun-16
Position Checked by Client Rep. - WTG 013	0	30-Jun-16	30-Jun-16
Position Checked by Client Rep. - WTG 014	0	02-Jul-16	02-Jul-16
Position Checked by Client Rep. - WTG 015	0	04-Jul-16	04-Jul-16
Position Checked by Client Rep. - WTG 016	0	06-Jul-16	06-Jul-16
Jack Down	278	22-Jun-16	06-Jul-16
Jack Down - WTG 009	2	22-Jun-16	22-Jun-16
Jack Down - WTG 010	2	24-Jun-16	24-Jun-16
Jack Down - WTG 011	2	26-Jun-16	26-Jun-16
Jack Down - WTG 012	2	28-Jun-16	28-Jun-16
Jack Down - WTG 013	2	30-Jun-16	30-Jun-16
Jack Down - WTG 014	2	02-Jul-16	02-Jul-16
Jack Down - WTG 015	2	04-Jul-16	04-Jul-16
Jack Down - WTG 016	2	06-Jul-16	06-Jul-16
Vessel Departure	336	22-Jun-16	06-Jul-16
Vessel Departure - WTG 009	0		22-Jun-16
Vessel Departure - WTG 010	0		24-Jun-16

Figure A.1 : Bottom fixed offshore wind farm construction planning (continues)

Activity Name	Duration (Hour)	Start	Finish
Vessel Departure - WTG 011	0		26-Jun-16
Vessel Departure - WTG 012	0		28-Jun-16
Vessel Departure - WTG 013	0		30-Jun-16
Vessel Departure - WTG 014	0		02-Jul-16
Vessel Departure - WTG 015	0		04-Jul-16
Vessel Departure - WTG 016	0		06-Jul-16
Return to Port	331	22-Jun-16	07-Jul-16
WTG Return to Port - WTG 009	16	22-Jun-16	23-Jun-16
WTG Return to Port - WTG 010	16	24-Jun-16	25-Jun-16
WTG Return to Port - WTG 011	16	26-Jun-16	27-Jun-16
WTG Return to Port - WTG 012	16	28-Jun-16	29-Jun-16
WTG Return to Port - WTG 013	16	30-Jun-16	01-Jul-16
WTG Return to Port - WTG 014	16	02-Jul-16	03-Jul-16
WTG Return to Port - WTG 015	16	04-Jul-16	05-Jul-16
WTG Return to Port - WTG 016	16	06-Jul-16	07-Jul-16
Installation 3rd Batch	128	07-Jul-16	31-Jul-16
Load WTG Batch 003	0	07-Jul-16*	
Return WTG Batch - Batch 003	0		26-Jul-16
Loading	48	07-Jul-16	09-Jul-16
Loading WTG - WTG 017	48	07-Jul-16	09-Jul-16
Loading WTG - WTG 018	48	07-Jul-16*	09-Jul-16
Loading WTG - WTG 019	48	07-Jul-16	09-Jul-16
Loading WTG - WTG 020	48	07-Jul-16	09-Jul-16
Loading WTG - WTG 021	48	07-Jul-16	09-Jul-16
Loading WTG - WTG 022	48	07-Jul-16	09-Jul-16
Loading WTG - WTG 023	48	07-Jul-16	09-Jul-16
Loading WTG - WTG 024	48	07-Jul-16	09-Jul-16
Sea Fastening and Prepare to Departure	2	09-Jul-16	09-Jul-16
Sea Fastening and Prepare to Departure - WTG 017	2	09-Jul-16	09-Jul-16
Sea Fastening and Prepare to Departure - WTG 018	2	09-Jul-16	09-Jul-16
Sea Fastening and Prepare to Departure - WTG 019	2	09-Jul-16	09-Jul-16
Sea Fastening and Prepare to Departure - WTG 020	2	09-Jul-16	09-Jul-16
Sea Fastening and Prepare to Departure - WTG 021	2	09-Jul-16	09-Jul-16
Sea Fastening and Prepare to Departure - WTG 022	2	09-Jul-16	09-Jul-16
Sea Fastening and Prepare to Departure - WTG 023	2	09-Jul-16	09-Jul-16
Sea Fastening and Prepare to Departure - WTG 024	2	09-Jul-16	09-Jul-16
Pilot Out of Port	1	09-Jul-16	09-Jul-16
Pilot Out of Port - WTG 017	1	09-Jul-16	09-Jul-16
Pilot Out of Port - WTG 018	1	09-Jul-16	09-Jul-16
Pilot Out of Port - WTG 019	1	09-Jul-16	09-Jul-16
Pilot Out of Port - WTG 020	1	09-Jul-16	09-Jul-16
Pilot Out of Port - WTG 021	1	09-Jul-16	09-Jul-16
Pilot Out of Port - WTG 022	1	09-Jul-16	09-Jul-16
Pilot Out of Port - WTG 023	1	09-Jul-16	09-Jul-16
Pilot Out of Port - WTG 024	1	09-Jul-16	09-Jul-16
Transit to Site	13	09-Jul-16	10-Jul-16
WTG Transit to Site - WTG 017	13	09-Jul-16	10-Jul-16
WTG Transit to Site - WTG 018	13	09-Jul-16	10-Jul-16
WTG Transit to Site - WTG 019	13	09-Jul-16	10-Jul-16
WTG Transit to Site - WTG 020	13	09-Jul-16	10-Jul-16
WTG Transit to Site - WTG 021	13	09-Jul-16	10-Jul-16
WTG Transit to Site - WTG 022	13	09-Jul-16	10-Jul-16
WTG Transit to Site - WTG 023	13	09-Jul-16	10-Jul-16
WTG Transit to Site - WTG 024	13	09-Jul-16	10-Jul-16

Figure A.1 : Bottom fixed offshore wind farm construction planning (continues)

Activity Name	Duration (Hour)	Start	Finish
Positioning and Jack Up	268	10-Jul-16	23-Jul-16
WTG Positioning and Jack Up - WTG 017	5	10-Jul-16	10-Jul-16
WTG Positioning and Jack Up - WTG 018	5	11-Jul-16	12-Jul-16
WTG Positioning and Jack Up - WTG 019	5	13-Jul-16	13-Jul-16
WTG Positioning and Jack Up - WTG 020	5	15-Jul-16	15-Jul-16
WTG Positioning and Jack Up - WTG 021	5	17-Jul-16	17-Jul-16
WTG Positioning and Jack Up - WTG 022	5	19-Jul-16	19-Jul-16
WTG Positioning and Jack Up - WTG 023	5	21-Jul-16	21-Jul-16
WTG Positioning and Jack Up - WTG 024	5	23-Jul-16	23-Jul-16
Prep for Installation	291	10-Jul-16	23-Jul-16
WTG Prep for Installation - WTG 017	1	10-Jul-16	10-Jul-16
WTG Prep for Installation - WTG 018	1	12-Jul-16	12-Jul-16
WTG Prep for Installation - WTG 019	1	13-Jul-16	13-Jul-16
WTG Prep for Installation - WTG 020	1	15-Jul-16	15-Jul-16
WTG Prep for Installation - WTG 021	1	17-Jul-16	17-Jul-16
WTG Prep for Installation - WTG 022	1	19-Jul-16	19-Jul-16
WTG Prep for Installation - WTG 023	1	21-Jul-16	21-Jul-16
WTG Prep for Installation - WTG 024	1	23-Jul-16	23-Jul-16
Installing Tower, Nacelle and Hub	325	10-Jul-16	31-Jul-16
Installing Tower, Nacelle and Hub - WTG 017	8	10-Jul-16	11-Jul-16
Installing Tower, Nacelle and Hub - WTG 018	8	12-Jul-16	12-Jul-16
Installing Tower, Nacelle and Hub - WTG 019	8	13-Jul-16	14-Jul-16
Installing Tower, Nacelle and Hub - WTG 020	8	15-Jul-16	16-Jul-16
Installing Tower, Nacelle and Hub - WTG 021	8	17-Jul-16	18-Jul-16
Installing Tower, Nacelle and Hub - WTG 022	8	19-Jul-16	20-Jul-16
Installing Tower, Nacelle and Hub - WTG 023	8	21-Jul-16	22-Jul-16
Installing Tower, Nacelle and Hub - WTG 024	8	23-Jul-16	24-Jul-16
Installing Tower, Nacelle and Hub - WTG 025	8	29-Jul-16	29-Jul-16
Installing Tower, Nacelle and Hub - WTG 026	8	31-Jul-16	31-Jul-16
Installing 3 Blades	157	11-Jul-16	25-Jul-16
Installing 3 Blades - WTG 017	11	11-Jul-16	11-Jul-16
Installing 3 Blades - WTG 018	11	12-Jul-16	13-Jul-16
Installing 3 Blades - WTG 019	11	14-Jul-16	15-Jul-16
Installing 3 Blades - WTG 020	11	16-Jul-16	17-Jul-16
Installing 3 Blades - WTG 021	11	18-Jul-16	19-Jul-16
Installing 3 Blades - WTG 022	11	20-Jul-16	21-Jul-16
Installing 3 Blades - WTG 023	11	22-Jul-16	23-Jul-16
Installing 3 Blades - WTG 024	11	24-Jul-16	25-Jul-16
Position Checked by Client Rep.	328	11-Jul-16	25-Jul-16
Position Checked by Client Rep. - WTG 017	0		11-Jul-16
Position Checked by Client Rep. - WTG 018	0		13-Jul-16
Position Checked by Client Rep. - WTG 019	0		15-Jul-16
Position Checked by Client Rep. - WTG 020	0		17-Jul-16
Position Checked by Client Rep. - WTG 021	0		19-Jul-16
Position Checked by Client Rep. - WTG 022	0		21-Jul-16
Position Checked by Client Rep. - WTG 023	0		23-Jul-16
Position Checked by Client Rep. - WTG 024	0		25-Jul-16
Jack Down	274	11-Jul-16	25-Jul-16
Jack Down - WTG 017	2	11-Jul-16	11-Jul-16
Jack Down - WTG 018	2	13-Jul-16	13-Jul-16
Jack Down - WTG 019	2	15-Jul-16	15-Jul-16
Jack Down - WTG 020	2	17-Jul-16	17-Jul-16
Jack Down - WTG 021	2	19-Jul-16	19-Jul-16
Jack Down - WTG 022	2	21-Jul-16	21-Jul-16

Figure A.1 : Bottom fixed offshore wind farm construction planning (continues)

Activity Name	Duration (Hour)	Start	Finish
Jack Down - WTG 023	2	23-Jul-16	23-Jul-16
Jack Down - WTG 024	2	25-Jul-16*	25-Jul-16
Vessel Departure	328	11-Jul-16	25-Jul-16
Vessel Departure - WTG 017	0		11-Jul-16
Vessel Departure - WTG 018	0		13-Jul-16
Vessel Departure - WTG 019	0		15-Jul-16
Vessel Departure - WTG 020	0		17-Jul-16
Vessel Departure - WTG 021	0		19-Jul-16
Vessel Departure - WTG 022	0		21-Jul-16
Vessel Departure - WTG 023	0		23-Jul-16
Vessel Departure - WTG 024	0		25-Jul-16
Return to Port	323	11-Jul-16	26-Jul-16
WTG Return to Port - WTG 017	16	11-Jul-16	12-Jul-16
WTG Return to Port - WTG 018	16	13-Jul-16	14-Jul-16
WTG Return to Port - WTG 019	16	15-Jul-16	16-Jul-16
WTG Return to Port - WTG 020	16	17-Jul-16	18-Jul-16
WTG Return to Port - WTG 021	16	19-Jul-16	20-Jul-16
WTG Return to Port - WTG 022	16	21-Jul-16	22-Jul-16
WTG Return to Port - WTG 023	16	23-Jul-16	24-Jul-16
WTG Return to Port - WTG 024	16	25-Jul-16	26-Jul-16
Installation 4th Batch	105	26-Jul-16	14-Aug-16
Load WTG Batch 004	0	26-Jul-16*	
Return WTG Batch - Batch 004	0		14-Aug-16
Loading	48	26-Jul-16	28-Jul-16
Loading WTG - WTG 025	48	26-Jul-16	28-Jul-16
Loading WTG - WTG 026	48	26-Jul-16	28-Jul-16
Loading WTG - WTG 027	48	26-Jul-16	28-Jul-16
Loading WTG - WTG 028	48	26-Jul-16	28-Jul-16
Loading WTG - WTG 029	48	26-Jul-16	28-Jul-16
Loading WTG - WTG 030	48	26-Jul-16	28-Jul-16
Loading WTG - WTG 031	48	26-Jul-16	28-Jul-16
Loading WTG - WTG 032	48	26-Jul-16	28-Jul-16
Sea Fastening and Prepare to Departure	2	28-Jul-16	28-Jul-16
Sea Fastening and Prepare to Departure - WTG 025	2	28-Jul-16	28-Jul-16
Sea Fastening and Prepare to Departure - WTG 026	2	28-Jul-16	28-Jul-16
Sea Fastening and Prepare to Departure - WTG 027	2	28-Jul-16	28-Jul-16
Sea Fastening and Prepare to Departure - WTG 028	2	28-Jul-16	28-Jul-16
Sea Fastening and Prepare to Departure - WTG 029	2	28-Jul-16	28-Jul-16
Sea Fastening and Prepare to Departure - WTG 030	2	28-Jul-16	28-Jul-16
Sea Fastening and Prepare to Departure - WTG 031	2	28-Jul-16	28-Jul-16
Sea Fastening and Prepare to Departure - WTG 032	2	28-Jul-16	28-Jul-16
Pilot Out of Port	1	28-Jul-16	28-Jul-16
Pilot Out of Port - WTG 025	1	28-Jul-16	28-Jul-16
Pilot Out of Port - WTG 026	1	28-Jul-16	28-Jul-16
Pilot Out of Port - WTG 027	1	28-Jul-16	28-Jul-16
Pilot Out of Port - WTG 028	1	28-Jul-16	28-Jul-16
Pilot Out of Port - WTG 029	1	28-Jul-16	28-Jul-16
Pilot Out of Port - WTG 030	1	28-Jul-16	28-Jul-16
Pilot Out of Port - WTG 031	1	28-Jul-16	28-Jul-16
Pilot Out of Port - WTG 032	1	28-Jul-16	28-Jul-16
Transit to Site	13	28-Jul-16	29-Jul-16
WTG Transit to Site - WTG 025	13	28-Jul-16	29-Jul-16
WTG Transit to Site - WTG 026	13	28-Jul-16	29-Jul-16
WTG Transit to Site - WTG 027	13	28-Jul-16	29-Jul-16

Figure A.1 : Bottom fixed offshore wind farm construction planning (continues)

Activity Name	Duration (Hour)	Start	Finish
WTG Transit to Site - WTG 028	13	28-Jul-16	29-Jul-16
WTG Transit to Site - WTG 029	13	28-Jul-16	29-Jul-16
WTG Transit to Site - WTG 030	13	28-Jul-16	29-Jul-16
WTG Transit to Site - WTG 031	13	28-Jul-16	29-Jul-16
WTG Transit to Site - WTG 032	13	28-Jul-16	29-Jul-16
Positioning and Jack Up	269	29-Jul-16	11-Aug-16
WTG Positioning and Jack Up - WTG 025	5	29-Jul-16	29-Jul-16
WTG Positioning and Jack Up - WTG 026	5	30-Jul-16	31-Jul-16
WTG Positioning and Jack Up - WTG 027	5	01-Aug-16	01-Aug-16
WTG Positioning and Jack Up - WTG 028	5	03-Aug-16	03-Aug-16
WTG Positioning and Jack Up - WTG 029	5	05-Aug-16	05-Aug-16
WTG Positioning and Jack Up - WTG 030	5	07-Aug-16	07-Aug-16
WTG Positioning and Jack Up - WTG 031	5	09-Aug-16	09-Aug-16
WTG Positioning and Jack Up - WTG 032	5	11-Aug-16	11-Aug-16
Prep for Installation	296	29-Jul-16	11-Aug-16
WTG Prep for Installation - WTG 025	1	29-Jul-16	29-Jul-16
WTG Prep for Installation - WTG 026	1	31-Jul-16	31-Jul-16
WTG Prep for Installation - WTG 027	1	01-Aug-16	01-Aug-16
WTG Prep for Installation - WTG 028	1	03-Aug-16	03-Aug-16
WTG Prep for Installation - WTG 029	1	05-Aug-16	05-Aug-16
WTG Prep for Installation - WTG 030	1	07-Aug-16	07-Aug-16
WTG Prep for Installation - WTG 031	1	09-Aug-16	09-Aug-16
WTG Prep for Installation - WTG 032	1	11-Aug-16	11-Aug-16
Installing Tower, Nacelle and Hub	158	02-Aug-16	12-Aug-16
Installing Tower, Nacelle and Hub - WTG 027	8	02-Aug-16	02-Aug-16
Installing Tower, Nacelle and Hub - WTG 028	8	04-Aug-16	04-Aug-16
Installing Tower, Nacelle and Hub - WTG 029	8	06-Aug-16	06-Aug-16
Installing Tower, Nacelle and Hub - WTG 030	8	08-Aug-16	08-Aug-16
Installing Tower, Nacelle and Hub - WTG 031	8	10-Aug-16	10-Aug-16
Installing Tower, Nacelle and Hub - WTG 032	8	12-Aug-16	12-Aug-16
Installing 3 Blades	148	30-Jul-16	13-Aug-16
Installing 3 Blades - WTG 025	11	30-Jul-16	30-Jul-16
Installing 3 Blades - WTG 026	11	31-Jul-16	01-Aug-16
Installing 3 Blades - WTG 027	11	02-Aug-16	03-Aug-16
Installing 3 Blades - WTG 028	11	04-Aug-16	05-Aug-16
Installing 3 Blades - WTG 029	11	06-Aug-16	07-Aug-16
Installing 3 Blades - WTG 030	11	08-Aug-16	09-Aug-16
Installing 3 Blades - WTG 031	11	10-Aug-16	11-Aug-16
Installing 3 Blades - WTG 032	11	12-Aug-16	13-Aug-16
Position Checked by Client Rep.	332	30-Jul-16	13-Aug-16
Position Checked by Client Rep. - WTG 025	0		30-Jul-16
Position Checked by Client Rep. - WTG 026	0		01-Aug-16
Position Checked by Client Rep. - WTG 027	0		03-Aug-16
Position Checked by Client Rep. - WTG 028	0		05-Aug-16
Position Checked by Client Rep. - WTG 029	0		07-Aug-16
Position Checked by Client Rep. - WTG 030	0		09-Aug-16
Position Checked by Client Rep. - WTG 031	0		11-Aug-16
Position Checked by Client Rep. - WTG 032	0		13-Aug-16
Jack Down	272	30-Jul-16	13-Aug-16
Jack Down - WTG 025	2	30-Jul-16	30-Jul-16
Jack Down - WTG 026	2	01-Aug-16	01-Aug-16
Jack Down - WTG 027	2	03-Aug-16	03-Aug-16
Jack Down - WTG 028	2	05-Aug-16	05-Aug-16
Jack Down - WTG 029	2	07-Aug-16	07-Aug-16

Figure A.1 : Bottom fixed offshore wind farm construction planning (continues)

Activity Name	Duration (Hour)	Start	Finish
Jack Down - WTG 030	2	09-Aug-16	09-Aug-16
Jack Down - WTG 031	2	11-Aug-16	11-Aug-16
Jack Down - WTG 032	2	13-Aug-16	13-Aug-16
Vessel Departure	332	30-Jul-16	13-Aug-16
Vessel Departure - WTG 025	0		30-Jul-16
Vessel Departure - WTG 026	0		01-Aug-16
Vessel Departure - WTG 027	0		03-Aug-16
Vessel Departure - WTG 028	0		05-Aug-16
Vessel Departure - WTG 029	0		07-Aug-16
Vessel Departure - WTG 030	0		09-Aug-16
Vessel Departure - WTG 031	0		11-Aug-16
Vessel Departure - WTG 032	0		13-Aug-16
Return to Port	334	30-Jul-16	14-Aug-16
WTG Return to Port - WTG 025	16	30-Jul-16	31-Jul-16
WTG Return to Port - WTG 026	16	01-Aug-16	02-Aug-16
WTG Return to Port - WTG 027	16	03-Aug-16	04-Aug-16
WTG Return to Port - WTG 028	16	05-Aug-16	06-Aug-16
WTG Return to Port - WTG 029	16	07-Aug-16	08-Aug-16
WTG Return to Port - WTG 030	16	09-Aug-16	10-Aug-16
WTG Return to Port - WTG 031	16	11-Aug-16	12-Aug-16
WTG Return to Port - WTG 032	16	13-Aug-16	14-Aug-16
Installation 5th Batch	113	14-Aug-16	03-Sep-16
Load WTG Batch 005	0	14-Aug-16*	
Return WTG Batch - Batch 005	0		03-Sep-16
Loading	48	14-Aug-16	16-Aug-16
Loading WTG - WTG 033	48	14-Aug-16	16-Aug-16
Loading WTG - WTG 034	48	14-Aug-16	16-Aug-16
Loading WTG - WTG 035	48	14-Aug-16	16-Aug-16
Loading WTG - WTG 036	48	14-Aug-16	16-Aug-16
Loading WTG - WTG 037	48	14-Aug-16	16-Aug-16
Loading WTG - WTG 038	48	14-Aug-16	16-Aug-16
Loading WTG - WTG 039	48	14-Aug-16	16-Aug-16
Loading WTG - WTG 040	48	14-Aug-16	16-Aug-16
Sea Fastening and Prepare to Departure	2	16-Aug-16	16-Aug-16
Sea Fastening and Prepare to Departure - WTG 033	2	16-Aug-16	16-Aug-16
Sea Fastening and Prepare to Departure - WTG 034	2	16-Aug-16	16-Aug-16
Sea Fastening and Prepare to Departure - WTG 035	2	16-Aug-16	16-Aug-16
Sea Fastening and Prepare to Departure - WTG 036	2	16-Aug-16	16-Aug-16
Sea Fastening and Prepare to Departure - WTG 037	2	16-Aug-16	16-Aug-16
Sea Fastening and Prepare to Departure - WTG 038	2	16-Aug-16	16-Aug-16
Sea Fastening and Prepare to Departure - WTG 039	2	16-Aug-16	16-Aug-16
Sea Fastening and Prepare to Departure - WTG 040	2	16-Aug-16	16-Aug-16
Pilot Out of Port	1	16-Aug-16	16-Aug-16
Pilot Out of Port - WTG 033	1	16-Aug-16	16-Aug-16
Pilot Out of Port - WTG 034	1	16-Aug-16	16-Aug-16
Pilot Out of Port - WTG 035	1	16-Aug-16	16-Aug-16
Pilot Out of Port - WTG 036	1	16-Aug-16	16-Aug-16
Pilot Out of Port - WTG 037	1	16-Aug-16	16-Aug-16
Pilot Out of Port - WTG 038	1	16-Aug-16	16-Aug-16
Pilot Out of Port - WTG 039	1	16-Aug-16	16-Aug-16
Pilot Out of Port - WTG 040	1	16-Aug-16	16-Aug-16
Transit to Site	13	16-Aug-16	17-Aug-16
WTG Transit to Site - WTG 033	13	16-Aug-16	17-Aug-16
WTG Transit to Site - WTG 034	13	16-Aug-16	17-Aug-16

Figure A.1 : Bottom fixed offshore wind farm construction planning (continues)

Activity Name	Duration (Hour)	Start	Finish
Jack Down - WTG 035	2	23-Aug-16	23-Aug-16
Jack Down - WTG 036	2	25-Aug-16	25-Aug-16
Jack Down - WTG 037	2	27-Aug-16	27-Aug-16
Jack Down - WTG 038	2	29-Aug-16	29-Aug-16
Jack Down - WTG 039	2	31-Aug-16	31-Aug-16
Jack Down - WTG 040	2	02-Sep-16	02-Sep-16
Vessel Departure	339	19-Aug-16	02-Sep-16
Vessel Departure - WTG 033	0		19-Aug-16
Vessel Departure - WTG 034	0		21-Aug-16
Vessel Departure - WTG 035	0		23-Aug-16
Vessel Departure - WTG 036	0		25-Aug-16
Vessel Departure - WTG 037	0		27-Aug-16
Vessel Departure - WTG 038	0		29-Aug-16
Vessel Departure - WTG 039	0		31-Aug-16
Vessel Departure - WTG 040	0		02-Sep-16
Return to Port	337	19-Aug-16	03-Sep-16
WTG Return to Port - WTG 033	16	19-Aug-16	20-Aug-16
WTG Return to Port - WTG 034	16	21-Aug-16	22-Aug-16
WTG Return to Port - WTG 035	16	23-Aug-16	24-Aug-16
WTG Return to Port - WTG 036	16	25-Aug-16	26-Aug-16
WTG Return to Port - WTG 037	16	27-Aug-16	28-Aug-16
WTG Return to Port - WTG 038	16	29-Aug-16	30-Aug-16
WTG Return to Port - WTG 039	16	31-Aug-16	01-Sep-16
WTG Return to Port - WTG 040	16	02-Sep-16	03-Sep-16
Installation 6th Batch	120	03-Sep-16	27-Sep-16
Load WTG Batch 006	0	03-Sep-16	
Return WTG Batch - Batch 006	0		27-Sep-16
Loading	48	03-Sep-16	06-Sep-16
Loading WTG - WTG 041	48	03-Sep-16	06-Sep-16
Loading WTG - WTG 042	48	03-Sep-16	06-Sep-16
Loading WTG - WTG 043	48	03-Sep-16	06-Sep-16
Loading WTG - WTG 044	48	03-Sep-16	06-Sep-16
Loading WTG - WTG 045	48	03-Sep-16	06-Sep-16
Loading WTG - WTG 046	48	03-Sep-16	06-Sep-16
Loading WTG - WTG 047	48	03-Sep-16	06-Sep-16
Loading WTG - WTG 048	48	03-Sep-16	06-Sep-16
Sea Fastening and Prepare to Departure	2	06-Sep-16	06-Sep-16
Sea Fastening and Prepare to Departure - WTG 041	2	06-Sep-16	06-Sep-16
Sea Fastening and Prepare to Departure - WTG 042	2	06-Sep-16	06-Sep-16
Sea Fastening and Prepare to Departure - WTG 043	2	06-Sep-16	06-Sep-16
Sea Fastening and Prepare to Departure - WTG 044	2	06-Sep-16	06-Sep-16
Sea Fastening and Prepare to Departure - WTG 045	2	06-Sep-16	06-Sep-16
Sea Fastening and Prepare to Departure - WTG 046	2	06-Sep-16	06-Sep-16
Sea Fastening and Prepare to Departure - WTG 047	2	06-Sep-16	06-Sep-16
Sea Fastening and Prepare to Departure - WTG 048	2	06-Sep-16	06-Sep-16
Pilot Out of Port	1	06-Sep-16	06-Sep-16
Pilot Out of Port - WTG 041	1	06-Sep-16	06-Sep-16
Pilot Out of Port - WTG 042	1	06-Sep-16	06-Sep-16
Pilot Out of Port - WTG 043	1	06-Sep-16	06-Sep-16
Pilot Out of Port - WTG 044	1	06-Sep-16	06-Sep-16
Pilot Out of Port - WTG 045	1	06-Sep-16	06-Sep-16
Pilot Out of Port - WTG 046	1	06-Sep-16	06-Sep-16
Pilot Out of Port - WTG 047	1	06-Sep-16	06-Sep-16
Pilot Out of Port - WTG 048	1	06-Sep-16	06-Sep-16

Figure A.1 : Bottom fixed offshore wind farm construction planning (continues)

Activity Name	Duration (Hour)	Start	Finish
Transit to Site	13	06-Sep-16	07-Sep-16
WTG Transit to Site - WTG 041	13	06-Sep-16	07-Sep-16
WTG Transit to Site - WTG 042	13	06-Sep-16	07-Sep-16
WTG Transit to Site - WTG 043	13	06-Sep-16	07-Sep-16
WTG Transit to Site - WTG 044	13	06-Sep-16	07-Sep-16
WTG Transit to Site - WTG 045	13	06-Sep-16	07-Sep-16
WTG Transit to Site - WTG 046	13	06-Sep-16	07-Sep-16
WTG Transit to Site - WTG 047	13	06-Sep-16	07-Sep-16
WTG Transit to Site - WTG 048	13	06-Sep-16	07-Sep-16
Positioning and Jack Up	283	07-Sep-16	24-Sep-16
WTG Positioning and Jack Up - WTG 041	5	07-Sep-16	07-Sep-16
WTG Positioning and Jack Up - WTG 042	5	09-Sep-16	09-Sep-16
WTG Positioning and Jack Up - WTG 043	5	11-Sep-16	12-Sep-16
WTG Positioning and Jack Up - WTG 044	5	14-Sep-16	14-Sep-16
WTG Positioning and Jack Up - WTG 045	5	16-Sep-16	17-Sep-16
WTG Positioning and Jack Up - WTG 046	5	19-Sep-16	19-Sep-16
WTG Positioning and Jack Up - WTG 047	5	21-Sep-16	22-Sep-16
WTG Positioning and Jack Up - WTG 048	5	23-Sep-16	24-Sep-16
Prep for Installation	339	07-Sep-16	24-Sep-16
WTG Prep for Installation - WTG 041	1	07-Sep-16	07-Sep-16
WTG Prep for Installation - WTG 042	1	09-Sep-16	09-Sep-16
WTG Prep for Installation - WTG 043	1	12-Sep-16	12-Sep-16
WTG Prep for Installation - WTG 044	1	14-Sep-16	14-Sep-16
WTG Prep for Installation - WTG 045	1	17-Sep-16	17-Sep-16
WTG Prep for Installation - WTG 046	1	19-Sep-16	19-Sep-16
WTG Prep for Installation - WTG 047	1	22-Sep-16	22-Sep-16
WTG Prep for Installation - WTG 048	1	24-Sep-16	24-Sep-16
Installing Tower, Nacelle and Hub	219	07-Sep-16	24-Sep-16
Instaling Tower, Nacelle and Hub - WTG 041	8	07-Sep-16	07-Sep-16
Instaling Tower, Nacelle and Hub - WTG 042	8	10-Sep-16	10-Sep-16
Instaling Tower, Nacelle and Hub - WTG 043	8	12-Sep-16	12-Sep-16
Instaling Tower, Nacelle and Hub - WTG 044	8	14-Sep-16	15-Sep-16
Instaling Tower, Nacelle and Hub - WTG 045	8	17-Sep-16	17-Sep-16
Instaling Tower, Nacelle and Hub - WTG 046	8	19-Sep-16	20-Sep-16
Instaling Tower, Nacelle and Hub - WTG 047	8	22-Sep-16	22-Sep-16
Instaling Tower, Nacelle and Hub - WTG 048	8	24-Sep-16	24-Sep-16
Installing 3 Blades	146	08-Sep-16	26-Sep-16
Instaling 3 Blades - WTG 041	11	08-Sep-16	09-Sep-16
Instaling 3 Blades - WTG 042	11	10-Sep-16	11-Sep-16
Instaling 3 Blades - WTG 043	11	12-Sep-16	14-Sep-16
Instaling 3 Blades - WTG 044	11	15-Sep-16	16-Sep-16
Instaling 3 Blades - WTG 045	11	17-Sep-16	19-Sep-16
Instaling 3 Blades - WTG 046	11	20-Sep-16	21-Sep-16
Instaling 3 Blades - WTG 047	11	22-Sep-16	23-Sep-16
Instaling 3 Blades - WTG 048	11	24-Sep-16	26-Sep-16
Position Checked by Client Rep.	407	09-Sep-16	26-Sep-16
Position Checked by Client Rep. - WTG 041	0		09-Sep-16
Position Checked by Client Rep. - WTG 042	0		11-Sep-16
Position Checked by Client Rep. - WTG 043	0		14-Sep-16
Position Checked by Client Rep. - WTG 044	0		16-Sep-16
Position Checked by Client Rep. - WTG 045	0		19-Sep-16
Position Checked by Client Rep. - WTG 046	0		21-Sep-16
Position Checked by Client Rep. - WTG 047	0		23-Sep-16
Position Checked by Client Rep. - WTG 048	0		26-Sep-16

Figure A.1 : Bottom fixed offshore wind farm construction planning (continues)

Activity Name	Duration (Hour)	Start	Finish
Jack Down	282	09-Sep-16	26-Sep-16
Jack Down - WTG 041	2	09-Sep-16	09-Sep-16
Jack Down - WTG 042	2	11-Sep-16	11-Sep-16
Jack Down - WTG 043	2	14-Sep-16	14-Sep-16
Jack Down - WTG 044	2	16-Sep-16	16-Sep-16
Jack Down - WTG 045	2	19-Sep-16	19-Sep-16
Jack Down - WTG 046	2	21-Sep-16	21-Sep-16
Jack Down - WTG 047	2	23-Sep-16	23-Sep-16
Jack Down - WTG 048	2	26-Sep-16	26-Sep-16
Vessel Departure	407	09-Sep-16	26-Sep-16
Vessel Departure - WTG 041	0		09-Sep-16
Vessel Departure - WTG 042	0		11-Sep-16
Vessel Departure - WTG 043	0		14-Sep-16
Vessel Departure - WTG 044	0		16-Sep-16
Vessel Departure - WTG 045	0		19-Sep-16
Vessel Departure - WTG 046	0		21-Sep-16
Vessel Departure - WTG 047	0		23-Sep-16
Vessel Departure - WTG 048	0		26-Sep-16
Return to Port	364	09-Sep-16	27-Sep-16
WTG Return to Port - WTG 041	16	09-Sep-16	10-Sep-16
WTG Return to Port - WTG 042	16	11-Sep-16	12-Sep-16
WTG Return to Port - WTG 043	16	14-Sep-16	15-Sep-16
WTG Return to Port - WTG 044	16	16-Sep-16	17-Sep-16
WTG Return to Port - WTG 045	16	19-Sep-16	20-Sep-16
WTG Return to Port - WTG 046	16	21-Sep-16	22-Sep-16
WTG Return to Port - WTG 047	16	23-Sep-16	24-Sep-16
WTG Return to Port - WTG 048	16	26-Sep-16	27-Sep-16
Installation 7th Batch	153	27-Sep-16	25-Oct-16
Load WTG Batch 007	0	27-Sep-16	
Return WTG Batch - Batch 007	0		25-Oct-16
Loading	48	27-Sep-16	30-Sep-16
Loading WTG - WTG 049	48	27-Sep-16	30-Sep-16
Loading WTG - WTG 050	48	27-Sep-16	30-Sep-16
Loading WTG - WTG 051	48	27-Sep-16	30-Sep-16
Loading WTG - WTG 052	48	27-Sep-16	30-Sep-16
Loading WTG - WTG 053	48	27-Sep-16	30-Sep-16
Loading WTG - WTG 054	48	27-Sep-16	30-Sep-16
Loading WTG - WTG 055	48	27-Sep-16	30-Sep-16
Loading WTG - WTG 056	48	27-Sep-16	30-Sep-16
Sea Fastening and Prepare to Departure	2	30-Sep-16	30-Sep-16
Sea Fastening and Prepare to Departure - WTG 049	2	30-Sep-16	30-Sep-16
Sea Fastening and Prepare to Departure - WTG 050	2	30-Sep-16	30-Sep-16
Sea Fastening and Prepare to Departure - WTG 051	2	30-Sep-16	30-Sep-16
Sea Fastening and Prepare to Departure - WTG 052	2	30-Sep-16	30-Sep-16
Sea Fastening and Prepare to Departure - WTG 053	2	30-Sep-16	30-Sep-16
Sea Fastening and Prepare to Departure - WTG 054	2	30-Sep-16	30-Sep-16
Sea Fastening and Prepare to Departure - WTG 055	2	30-Sep-16	30-Sep-16
Sea Fastening and Prepare to Departure - WTG 056	2	30-Sep-16	30-Sep-16
Pilot Out of Port	1	30-Sep-16	30-Sep-16
Pilot Out of Port - WTG 049	1	30-Sep-16	30-Sep-16
Pilot Out of Port - WTG 050	1	30-Sep-16	30-Sep-16
Pilot Out of Port - WTG 051	1	30-Sep-16	30-Sep-16
Pilot Out of Port - WTG 052	1	30-Sep-16	30-Sep-16
Pilot Out of Port - WTG 053	1	30-Sep-16	30-Sep-16

Figure A.1 : Bottom fixed offshore wind farm construction planning (continues)

Activity Name	Duration (Hour)	Start	Finish
Pilot Out of Port - WTG 054	1	30-Sep-16	30-Sep-16
Pilot Out of Port - WTG 055	1	30-Sep-16	30-Sep-16
Pilot Out of Port - WTG 056	1	30-Sep-16	30-Sep-16
Transit to Site	13	30-Sep-16	01-Oct-16
WTG Transit to Site - WTG 049	13	30-Sep-16	01-Oct-16
WTG Transit to Site - WTG 050	13	30-Sep-16	01-Oct-16
WTG Transit to Site - WTG 051	13	30-Sep-16	01-Oct-16
WTG Transit to Site - WTG 052	13	30-Sep-16	01-Oct-16
WTG Transit to Site - WTG 053	13	30-Sep-16	01-Oct-16
WTG Transit to Site - WTG 054	13	30-Sep-16	01-Oct-16
WTG Transit to Site - WTG 055	13	30-Sep-16	01-Oct-16
WTG Transit to Site - WTG 056	13	30-Sep-16	01-Oct-16
Positioning and Jack Up	315	01-Oct-16	21-Oct-16
WTG Positioning and Jack Up - WTG 049	5	01-Oct-16	01-Oct-16
WTG Positioning and Jack Up - WTG 050	5	03-Oct-16	03-Oct-16
WTG Positioning and Jack Up - WTG 051	5	06-Oct-16	06-Oct-16
WTG Positioning and Jack Up - WTG 052	5	09-Oct-16	09-Oct-16
WTG Positioning and Jack Up - WTG 053	5	12-Oct-16	12-Oct-16
WTG Positioning and Jack Up - WTG 054	5	15-Oct-16	15-Oct-16
WTG Positioning and Jack Up - WTG 055	5	18-Oct-16	18-Oct-16
WTG Positioning and Jack Up - WTG 056	5	21-Oct-16	21-Oct-16
Prep for Installation	372	01-Oct-16	21-Oct-16
WTG Prep for Installation - WTG 049	1	01-Oct-16	01-Oct-16
WTG Prep for Installation - WTG 050	1	03-Oct-16	03-Oct-16
WTG Prep for Installation - WTG 051	1	06-Oct-16	06-Oct-16
WTG Prep for Installation - WTG 052	1	09-Oct-16	09-Oct-16
WTG Prep for Installation - WTG 053	1	12-Oct-16	12-Oct-16
WTG Prep for Installation - WTG 054	1	15-Oct-16	15-Oct-16
WTG Prep for Installation - WTG 055	1	18-Oct-16	18-Oct-16
WTG Prep for Installation - WTG 056	1	21-Oct-16	21-Oct-16
Installing Tower, Nacelle and Hub	216	01-Oct-16	22-Oct-16
Instaling Tower, Nacelle and Hub - WTG 049	8	01-Oct-16	02-Oct-16
Instaling Tower, Nacelle and Hub - WTG 050	8	04-Oct-16	04-Oct-16
Instaling Tower, Nacelle and Hub - WTG 051	8	07-Oct-16	07-Oct-16
Instaling Tower, Nacelle and Hub - WTG 052	8	10-Oct-16	10-Oct-16
Instaling Tower, Nacelle and Hub - WTG 053	8	13-Oct-16	13-Oct-16
Instaling Tower, Nacelle and Hub - WTG 054	8	16-Oct-16	16-Oct-16
Instaling Tower, Nacelle and Hub - WTG 055	8	19-Oct-16	19-Oct-16
Instaling Tower, Nacelle and Hub - WTG 056	8	22-Oct-16	22-Oct-16
Installing 3 Blades	147	02-Oct-16	24-Oct-16
Instaling 3 Blades - WTG 049	11	02-Oct-16	03-Oct-16
Instaling 3 Blades - WTG 050	11	05-Oct-16	06-Oct-16
Instaling 3 Blades - WTG 051	11	08-Oct-16	09-Oct-16
Instaling 3 Blades - WTG 052	11	11-Oct-16	12-Oct-16
Instaling 3 Blades - WTG 053	11	14-Oct-16	15-Oct-16
Instaling 3 Blades - WTG 054	11	17-Oct-16	18-Oct-16
Instaling 3 Blades - WTG 055	11	20-Oct-16	21-Oct-16
Instaling 3 Blades - WTG 056	11	23-Oct-16	24-Oct-16
Position Checked by Client Rep.	504	03-Oct-16	24-Oct-16
Position Checked by Client Rep. - WTG 049	0		03-Oct-16
Position Checked by Client Rep. - WTG 050	0		06-Oct-16
Position Checked by Client Rep. - WTG 051	0		09-Oct-16
Position Checked by Client Rep. - WTG 052	0		12-Oct-16
Position Checked by Client Rep. - WTG 053	0		15-Oct-16

Figure A.1 : Bottom fixed offshore wind farm construction planning (continues)

Activity Name	Duration (Hour)	Start	Finish
Position Checked by Client Rep. - WTG 054	0		18-Oct-16
Position Checked by Client Rep. - WTG 055	0		21-Oct-16
Position Checked by Client Rep. - WTG 056	0		24-Oct-16
Jack Down	317	03-Oct-16	24-Oct-16
Jack Down - WTG 049	2	03-Oct-16	03-Oct-16
Jack Down - WTG 050	2	06-Oct-16	06-Oct-16
Jack Down - WTG 051	2	09-Oct-16	09-Oct-16
Jack Down - WTG 052	2	12-Oct-16	12-Oct-16
Jack Down - WTG 053	2	15-Oct-16	15-Oct-16
Jack Down - WTG 054	2	18-Oct-16	18-Oct-16
Jack Down - WTG 055	2	21-Oct-16	21-Oct-16
Jack Down - WTG 056	2	24-Oct-16	24-Oct-16
Vessel Departure	504	03-Oct-16	24-Oct-16
Vessel Departure - WTG 049	0		03-Oct-16
Vessel Departure - WTG 050	0		06-Oct-16
Vessel Departure - WTG 051	0		09-Oct-16
Vessel Departure - WTG 052	0		12-Oct-16
Vessel Departure - WTG 053	0		15-Oct-16
Vessel Departure - WTG 054	0		18-Oct-16
Vessel Departure - WTG 055	0		21-Oct-16
Vessel Departure - WTG 056	0		24-Oct-16
Return to Port	426	03-Oct-16	25-Oct-16
WTG Return to Port - WTG 049	16	03-Oct-16	04-Oct-16
WTG Return to Port - WTG 050	16	06-Oct-16	07-Oct-16
WTG Return to Port - WTG 051	16	09-Oct-16	10-Oct-16
WTG Return to Port - WTG 052	16	12-Oct-16	13-Oct-16
WTG Return to Port - WTG 053	16	15-Oct-16	16-Oct-16
WTG Return to Port - WTG 054	2	18-Oct-16	18-Oct-16
WTG Return to Port - WTG 055	16	21-Oct-16	22-Oct-16
WTG Return to Port - WTG 056	16	24-Oct-16	25-Oct-16
Installation 8th Batch	160	25-Oct-16	23-Nov-16
Load WTG Batch 008	0	25-Oct-16	
Return WTG Batch - Batch 008	0		23-Nov-16
Loading	48	25-Oct-16	28-Oct-16
Loading WTG - WTG 057	48	25-Oct-16	28-Oct-16
Loading WTG - WTG 058	48	25-Oct-16	28-Oct-16
Loading WTG - WTG 059	48	25-Oct-16	28-Oct-16
Loading WTG - WTG 060	48	25-Oct-16	28-Oct-16
Loading WTG - WTG 061	48	25-Oct-16	28-Oct-16
Loading WTG - WTG 062	48	25-Oct-16	28-Oct-16
Loading WTG - WTG 063	48	25-Oct-16	28-Oct-16
Loading WTG - WTG 064	48	25-Oct-16	28-Oct-16
Sea Fastening and Prepare to Departure	2	28-Oct-16	28-Oct-16
Sea Fastening and Prepare to Departure - WTG 057	2	28-Oct-16	28-Oct-16
Sea Fastening and Prepare to Departure - WTG 058	2	28-Oct-16	28-Oct-16
Sea Fastening and Prepare to Departure - WTG 059	2	28-Oct-16	28-Oct-16
Sea Fastening and Prepare to Departure - WTG 060	2	28-Oct-16	28-Oct-16
Sea Fastening and Prepare to Departure - WTG 061	2	28-Oct-16	28-Oct-16
Sea Fastening and Prepare to Departure - WTG 062	2	28-Oct-16	28-Oct-16
Sea Fastening and Prepare to Departure - WTG 063	2	28-Oct-16	28-Oct-16
Sea Fastening and Prepare to Departure - WTG 064	2	28-Oct-16	28-Oct-16
Pilot Out of Port	1	28-Oct-16	28-Oct-16
Pilot Out of Port - WTG 057	1	28-Oct-16	28-Oct-16
Pilot Out of Port - WTG 058	1	28-Oct-16	28-Oct-16

Figure A.1 : Bottom fixed offshore wind farm construction planning (continues)

Activity Name	Duration (Hour)	Start	Finish
Pilot Out of Port - WTG 059	1	28-Oct-16	28-Oct-16
Pilot Out of Port - WTG 060	1	28-Oct-16	28-Oct-16
Pilot Out of Port - WTG 061	1	28-Oct-16	28-Oct-16
Pilot Out of Port - WTG 062	1	28-Oct-16	28-Oct-16
Pilot Out of Port - WTG 063	1	28-Oct-16	28-Oct-16
Pilot Out of Port - WTG 064	1	28-Oct-16	28-Oct-16
Transit to Site	13	28-Oct-16	29-Oct-16
WTG Transit to Site - WTG 057	13	28-Oct-16	29-Oct-16
WTG Transit to Site - WTG 058	13	28-Oct-16	29-Oct-16
WTG Transit to Site - WTG 059	13	28-Oct-16	29-Oct-16
WTG Transit to Site - WTG 060	13	28-Oct-16	29-Oct-16
WTG Transit to Site - WTG 061	13	28-Oct-16	29-Oct-16
WTG Transit to Site - WTG 062	13	28-Oct-16	29-Oct-16
WTG Transit to Site - WTG 063	13	28-Oct-16	29-Oct-16
WTG Transit to Site - WTG 064	13	28-Oct-16	29-Oct-16
Positioning and Jack Up	296	29-Oct-16	20-Nov-16
WTG Positioning and Jack Up - WTG 057	5	29-Oct-16	29-Oct-16
WTG Positioning and Jack Up - WTG 058	5	01-Nov-16	02-Nov-16
WTG Positioning and Jack Up - WTG 059	5	04-Nov-16	05-Nov-16
WTG Positioning and Jack Up - WTG 060	5	07-Nov-16	08-Nov-16
WTG Positioning and Jack Up - WTG 061	5	10-Nov-16	11-Nov-16
WTG Positioning and Jack Up - WTG 062	5	13-Nov-16	14-Nov-16
WTG Positioning and Jack Up - WTG 063	5	16-Nov-16	17-Nov-16
WTG Positioning and Jack Up - WTG 064	5	19-Nov-16	20-Nov-16
Prep for Installation	359	29-Oct-16	20-Nov-16
WTG Prep for Installation - WTG 057	1	29-Oct-16	29-Oct-16
WTG Prep for Installation - WTG 058	1	02-Nov-16	02-Nov-16
WTG Prep for Installation - WTG 059	1	05-Nov-16	05-Nov-16
WTG Prep for Installation - WTG 060	1	08-Nov-16	08-Nov-16
WTG Prep for Installation - WTG 061	1	11-Nov-16	11-Nov-16
WTG Prep for Installation - WTG 062	1	14-Nov-16	14-Nov-16
WTG Prep for Installation - WTG 063	1	17-Nov-16	17-Nov-16
WTG Prep for Installation - WTG 064	1	20-Nov-16	20-Nov-16
Installing Tower, Nacelle and Hub	200	30-Oct-16	20-Nov-16
Installing Tower, Nacelle and Hub - WTG 057	8	30-Oct-16	30-Oct-16
Installing Tower, Nacelle and Hub - WTG 058	8	02-Nov-16	02-Nov-16
Installing Tower, Nacelle and Hub - WTG 059	8	05-Nov-16	05-Nov-16
Installing Tower, Nacelle and Hub - WTG 060	8	08-Nov-16	08-Nov-16
Installing Tower, Nacelle and Hub - WTG 061	8	11-Nov-16	11-Nov-16
Installing Tower, Nacelle and Hub - WTG 062	8	14-Nov-16	14-Nov-16
Installing Tower, Nacelle and Hub - WTG 063	8	17-Nov-16	17-Nov-16
Installing Tower, Nacelle and Hub - WTG 064	8	20-Nov-16	20-Nov-16
Installing 3 Blades	127	31-Oct-16	22-Nov-16
Installing 3 Blades - WTG 057	11	31-Oct-16	01-Nov-16
Installing 3 Blades - WTG 058	11	03-Nov-16	04-Nov-16
Installing 3 Blades - WTG 059	11	06-Nov-16	07-Nov-16
Installing 3 Blades - WTG 060	11	09-Nov-16	10-Nov-16
Installing 3 Blades - WTG 061	11	12-Nov-16	13-Nov-16
Installing 3 Blades - WTG 062	11	15-Nov-16	16-Nov-16
Installing 3 Blades - WTG 063	11	18-Nov-16	19-Nov-16
Installing 3 Blades - WTG 064	11	21-Nov-16	22-Nov-16
Position Checked by Client Rep.	505	01-Nov-16	22-Nov-16
Position Checked by Client Rep. - WTG 057	0		01-Nov-16
Position Checked by Client Rep. - WTG 058	0		04-Nov-16

Figure A.1 : Bottom fixed offshore wind farm construction planning (continues)

Activity Name	Duration (Hour)	Start	Finish
Position Checked by Client Rep. - WTG 059	0		07-Nov-16
Position Checked by Client Rep. - WTG 060	0		10-Nov-16
Position Checked by Client Rep. - WTG 061	0		13-Nov-16
Position Checked by Client Rep. - WTG 062	0		16-Nov-16
Position Checked by Client Rep. - WTG 063	0		19-Nov-16
Position Checked by Client Rep. - WTG 064	0		22-Nov-16
Jack Down	287	01-Nov-16	22-Nov-16
Jack Down - WTG 057	2	01-Nov-16	01-Nov-16
Jack Down - WTG 058	2	04-Nov-16	04-Nov-16
Jack Down - WTG 059	2	07-Nov-16	07-Nov-16
Jack Down - WTG 060	2	10-Nov-16	10-Nov-16
Jack Down - WTG 061	2	13-Nov-16	13-Nov-16
Jack Down - WTG 062	2	16-Nov-16	16-Nov-16
Jack Down - WTG 063	2	19-Nov-16	19-Nov-16
Jack Down - WTG 064	2	22-Nov-16	22-Nov-16
Vessel Departure	505	01-Nov-16	22-Nov-16
Vessel Departure - WTG 057	0		01-Nov-16
Vessel Departure - WTG 058	0		04-Nov-16
Vessel Departure - WTG 059	0		07-Nov-16
Vessel Departure - WTG 060	0		10-Nov-16
Vessel Departure - WTG 061	0		13-Nov-16
Vessel Departure - WTG 062	0		16-Nov-16
Vessel Departure - WTG 063	0		19-Nov-16
Vessel Departure - WTG 064	0		22-Nov-16
Return to Port	406	01-Nov-16	23-Nov-16
WTG Return to Port - WTG 057	16	01-Nov-16	02-Nov-16
WTG Return to Port - WTG 058	16	04-Nov-16	05-Nov-16
WTG Return to Port - WTG 059	16	07-Nov-16	08-Nov-16
WTG Return to Port - WTG 060	16	10-Nov-16	11-Nov-16
WTG Return to Port - WTG 061	16	13-Nov-16	14-Nov-16
WTG Return to Port - WTG 062	16	16-Nov-16	17-Nov-16
WTG Return to Port - WTG 063	16	19-Nov-16	20-Nov-16
WTG Return to Port - WTG 064	16	22-Nov-16	23-Nov-16
Installation 9th Batch	157	23-Nov-16	22-Dec-16
Load WTG Batch 009	0	23-Nov-16	
Return WTG Batch - Batch 009	0		22-Dec-16
Loading	48	23-Nov-16	27-Nov-16
Loading WTG - WTG 065	48	23-Nov-16	27-Nov-16
Loading WTG - WTG 066	48	23-Nov-16	27-Nov-16
Loading WTG - WTG 067	48	23-Nov-16	27-Nov-16
Loading WTG - WTG 068	48	23-Nov-16	27-Nov-16
Loading WTG - WTG 069	48	23-Nov-16	27-Nov-16
Loading WTG - WTG 070	48	23-Nov-16	27-Nov-16
Loading WTG - WTG 071	48	23-Nov-16	27-Nov-16
Loading WTG - WTG 072	48	23-Nov-16	27-Nov-16
Sea Fastening and Prepare to Departure	2	27-Nov-16	27-Nov-16
Sea Fastening and Prepare to Departure - WTG 065	2	27-Nov-16	27-Nov-16
Sea Fastening and Prepare to Departure - WTG 066	2	27-Nov-16	27-Nov-16
Sea Fastening and Prepare to Departure - WTG 067	2	27-Nov-16	27-Nov-16
Sea Fastening and Prepare to Departure - WTG 068	2	27-Nov-16	27-Nov-16
Sea Fastening and Prepare to Departure - WTG 069	2	27-Nov-16	27-Nov-16
Sea Fastening and Prepare to Departure - WTG 070	2	27-Nov-16	27-Nov-16
Sea Fastening and Prepare to Departure - WTG 071	2	27-Nov-16	27-Nov-16
Sea Fastening and Prepare to Departure - WTG 072	2	27-Nov-16	27-Nov-16

Figure A.1 : Bottom fixed offshore wind farm construction planning (continues)

Activity Name	Duration (Hour)	Start	Finish
Pilot Out of Port	1	27-Nov-16	27-Nov-16
Pilot Out of Port - WTG 065	1	27-Nov-16	27-Nov-16
Pilot Out of Port - WTG 066	1	27-Nov-16	27-Nov-16
Pilot Out of Port - WTG 067	1	27-Nov-16	27-Nov-16
Pilot Out of Port - WTG 068	1	27-Nov-16	27-Nov-16
Pilot Out of Port - WTG 069	1	27-Nov-16	27-Nov-16
Pilot Out of Port - WTG 070	1	27-Nov-16	27-Nov-16
Pilot Out of Port - WTG 071	1	27-Nov-16	27-Nov-16
Pilot Out of Port - WTG 072	1	27-Nov-16	27-Nov-16
Transit to Site	13	27-Nov-16	28-Nov-16
WTG Transit to Site - WTG 065	13	27-Nov-16	28-Nov-16
WTG Transit to Site - WTG 066	13	27-Nov-16	28-Nov-16
WTG Transit to Site - WTG 067	13	27-Nov-16	28-Nov-16
WTG Transit to Site - WTG 068	13	27-Nov-16	28-Nov-16
WTG Transit to Site - WTG 069	13	27-Nov-16	28-Nov-16
WTG Transit to Site - WTG 070	13	27-Nov-16	28-Nov-16
WTG Transit to Site - WTG 071	13	27-Nov-16	28-Nov-16
WTG Transit to Site - WTG 072	13	27-Nov-16	28-Nov-16
Positioning and Jack Up	276	28-Nov-16	19-Dec-16
WTG Positioning and Jack Up - WTG 065	5	28-Nov-16	28-Nov-16
WTG Positioning and Jack Up - WTG 066	5	30-Nov-16	01-Dec-16
WTG Positioning and Jack Up - WTG 067	5	03-Dec-16	04-Dec-16
WTG Positioning and Jack Up - WTG 068	5	06-Dec-16	07-Dec-16
WTG Positioning and Jack Up - WTG 069	5	09-Dec-16	10-Dec-16
WTG Positioning and Jack Up - WTG 070	5	12-Dec-16	13-Dec-16
WTG Positioning and Jack Up - WTG 071	5	15-Dec-16	16-Dec-16
WTG Positioning and Jack Up - WTG 072	5	18-Dec-16	19-Dec-16
Prep for Installation	335	28-Nov-16	19-Dec-16
WTG Prep for Installation - WTG 065	1	28-Nov-16	28-Nov-16
WTG Prep for Installation - WTG 066	1	01-Dec-16	01-Dec-16
WTG Prep for Installation - WTG 067	1	04-Dec-16	04-Dec-16
WTG Prep for Installation - WTG 068	1	07-Dec-16	07-Dec-16
WTG Prep for Installation - WTG 069	1	10-Dec-16	10-Dec-16
WTG Prep for Installation - WTG 070	1	13-Dec-16	13-Dec-16
WTG Prep for Installation - WTG 071	1	16-Dec-16	16-Dec-16
WTG Prep for Installation - WTG 072	1	19-Dec-16	19-Dec-16
Installing Tower, Nacelle and Hub	203	28-Nov-16	19-Dec-16
Installing Tower, Nacelle and Hub - WTG 065	8	28-Nov-16	29-Nov-16
Installing Tower, Nacelle and Hub - WTG 066	8	01-Dec-16	01-Dec-16
Installing Tower, Nacelle and Hub - WTG 067	8	04-Dec-16	04-Dec-16
Installing Tower, Nacelle and Hub - WTG 068	8	07-Dec-16	07-Dec-16
Installing Tower, Nacelle and Hub - WTG 069	8	10-Dec-16	10-Dec-16
Installing Tower, Nacelle and Hub - WTG 070	8	13-Dec-16	13-Dec-16
Installing Tower, Nacelle and Hub - WTG 071	8	16-Dec-16	16-Dec-16
Installing Tower, Nacelle and Hub - WTG 072	8	19-Dec-16	19-Dec-16
Installing 3 Blades	145	29-Nov-16	21-Dec-16
Installing 3 Blades - WTG 065	11	29-Nov-16	30-Nov-16
Installing 3 Blades - WTG 066	11	02-Dec-16	03-Dec-16
Installing 3 Blades - WTG 067	11	05-Dec-16	06-Dec-16
Installing 3 Blades - WTG 068	11	08-Dec-16	09-Dec-16
Installing 3 Blades - WTG 069	11	11-Dec-16	12-Dec-16
Installing 3 Blades - WTG 070	11	14-Dec-16	15-Dec-16
Installing 3 Blades - WTG 071	11	17-Dec-16	18-Dec-16
Installing 3 Blades - WTG 072	11	20-Dec-16	21-Dec-16

Figure A.1 : Bottom fixed offshore wind farm construction planning (continues)

Activity Name	Duration (Hour)	Start	Finish
Position Checked by Client Rep.	502	30-Nov-16	21-Dec-16
Position Checked by Client Rep. - WTG 065	0		30-Nov-16
Position Checked by Client Rep. - WTG 066	0		03-Dec-16
Position Checked by Client Rep. - WTG 067	0		06-Dec-16
Position Checked by Client Rep. - WTG 068	0		09-Dec-16
Position Checked by Client Rep. - WTG 069	0		12-Dec-16
Position Checked by Client Rep. - WTG 070	0		15-Dec-16
Position Checked by Client Rep. - WTG 071	0		18-Dec-16
Position Checked by Client Rep. - WTG 072	0		21-Dec-16
Jack Down	274	30-Nov-16	21-Dec-16
Jack Down - WTG 065	2	30-Nov-16	30-Nov-16
Jack Down - WTG 066	2	03-Dec-16	03-Dec-16
Jack Down - WTG 067	2	06-Dec-16	06-Dec-16
Jack Down - WTG 068	2	09-Dec-16	09-Dec-16
Jack Down - WTG 069	2	12-Dec-16	12-Dec-16
Jack Down - WTG 070	2	15-Dec-16	15-Dec-16
Jack Down - WTG 071	2	18-Dec-16	18-Dec-16
Jack Down - WTG 072	2	21-Dec-16	21-Dec-16
Vessel Departure	502	30-Nov-16	21-Dec-16
Vessel Departure - WTG 065	0		30-Nov-16
Vessel Departure - WTG 066	0		03-Dec-16
Vessel Departure - WTG 067	0		06-Dec-16
Vessel Departure - WTG 068	0		09-Dec-16
Vessel Departure - WTG 069	0		12-Dec-16
Vessel Departure - WTG 070	0		15-Dec-16
Vessel Departure - WTG 071	0		18-Dec-16
Vessel Departure - WTG 072	0		21-Dec-16
Return to Port	382	30-Nov-16	22-Dec-16
WTG Return to Port - WTG 065	16	30-Nov-16	01-Dec-16
WTG Return to Port - WTG 066	16	03-Dec-16	04-Dec-16
WTG Return to Port - WTG 067	16	06-Dec-16	07-Dec-16
WTG Return to Port - WTG 068	16	09-Dec-16	10-Dec-16
WTG Return to Port - WTG 069	16	12-Dec-16	13-Dec-16
WTG Return to Port - WTG 070	16	15-Dec-16	16-Dec-16
WTG Return to Port - WTG 071	16	18-Dec-16	19-Dec-16
WTG Return to Port - WTG 072	16	21-Dec-16	22-Dec-16
Installation 10th Batch	185	22-Dec-16	26-Jan-17
Load WTG Batch 010	0	22-Dec-16*	
Return WTG Batch - Batch 010	0		26-Jan-17
Loading	48	22-Dec-16	25-Dec-16
Loading WTG - WTG 073	48	22-Dec-16	25-Dec-16
Loading WTG - WTG 074	48	22-Dec-16	25-Dec-16
Loading WTG - WTG 075	48	22-Dec-16	25-Dec-16
Loading WTG - WTG 076	48	22-Dec-16	25-Dec-16
Loading WTG - WTG 077	48	22-Dec-16	25-Dec-16
Loading WTG - WTG 078	48	22-Dec-16	25-Dec-16
Loading WTG - WTG 079	48	22-Dec-16	25-Dec-16
Loading WTG - WTG 080	48	22-Dec-16	25-Dec-16
Sea Fastening and Prepare to Departure	2	25-Dec-16	26-Dec-16
Sea Fastening and Prepare to Departure - WTG 073	2	25-Dec-16	26-Dec-16
Sea Fastening and Prepare to Departure - WTG 074	2	25-Dec-16	26-Dec-16
Sea Fastening and Prepare to Departure - WTG 075	2	25-Dec-16	26-Dec-16
Sea Fastening and Prepare to Departure - WTG 076	2	25-Dec-16	26-Dec-16
Sea Fastening and Prepare to Departure - WTG 077	2	25-Dec-16	26-Dec-16

Figure A.1 : Bottom fixed offshore wind farm construction planning (continues)

Activity Name	Duration (Hour)	Start	Finish
Sea Fastening and Prepare to Departure - WTG 078	2	25-Dec-16	26-Dec-16
Sea Fastening and Prepare to Departure - WTG 079	2	25-Dec-16	26-Dec-16
Sea Fastening and Prepare to Departure - WTG 080	2	25-Dec-16	26-Dec-16
Pilot Out of Port	1	26-Dec-16	26-Dec-16
Pilot Out of Port - WTG 073	1	26-Dec-16	26-Dec-16
Pilot Out of Port - WTG 074	1	26-Dec-16	26-Dec-16
Pilot Out of Port - WTG 075	1	26-Dec-16	26-Dec-16
Pilot Out of Port - WTG 076	1	26-Dec-16	26-Dec-16
Pilot Out of Port - WTG 077	1	26-Dec-16	26-Dec-16
Pilot Out of Port - WTG 078	1	26-Dec-16	26-Dec-16
Pilot Out of Port - WTG 079	1	26-Dec-16	26-Dec-16
Pilot Out of Port - WTG 080	1	26-Dec-16	26-Dec-16
Transit to Site	13	26-Dec-16	26-Dec-16
WTG Transit to Site - WTG 073	13	26-Dec-16	26-Dec-16
WTG Transit to Site - WTG 074	13	26-Dec-16	26-Dec-16
WTG Transit to Site - WTG 075	13	26-Dec-16	26-Dec-16
WTG Transit to Site - WTG 076	13	26-Dec-16	26-Dec-16
WTG Transit to Site - WTG 077	13	26-Dec-16	26-Dec-16
WTG Transit to Site - WTG 078	13	26-Dec-16	26-Dec-16
WTG Transit to Site - WTG 079	13	26-Dec-16	26-Dec-16
WTG Transit to Site - WTG 080	13	26-Dec-16	26-Dec-16
Positioning and Jack Up	326	27-Dec-16	21-Jan-17
WTG Positioning and Jack Up - WTG 073	5	27-Dec-16	27-Dec-16
WTG Positioning and Jack Up - WTG 074	5	29-Dec-16	30-Dec-16
WTG Positioning and Jack Up - WTG 075	5	01-Jan-17	02-Jan-17
WTG Positioning and Jack Up - WTG 076	5	05-Jan-17	05-Jan-17
WTG Positioning and Jack Up - WTG 077	5	09-Jan-17	09-Jan-17
WTG Positioning and Jack Up - WTG 078	5	13-Jan-17	13-Jan-17
WTG Positioning and Jack Up - WTG 079	5	17-Jan-17	17-Jan-17
WTG Positioning and Jack Up - WTG 080	5	21-Jan-17	21-Jan-17
Prep for Installation	388	27-Dec-16	21-Jan-17
WTG Prep for Installation - WTG 073	1	27-Dec-16	27-Dec-16
WTG Prep for Installation - WTG 074	1	30-Dec-16	30-Dec-16
WTG Prep for Installation - WTG 075	1	02-Jan-17	02-Jan-17
WTG Prep for Installation - WTG 076	1	05-Jan-17	05-Jan-17
WTG Prep for Installation - WTG 077	1	09-Jan-17	09-Jan-17
WTG Prep for Installation - WTG 078	1	13-Jan-17	13-Jan-17
WTG Prep for Installation - WTG 079	1	17-Jan-17	17-Jan-17
WTG Prep for Installation - WTG 080	1	21-Jan-17	21-Jan-17
Installing Tower, Nacelle and Hub	220	27-Dec-16	22-Jan-17
Installing Tower, Nacelle and Hub - WTG 073	8	27-Dec-16	28-Dec-16
Installing Tower, Nacelle and Hub - WTG 074	8	30-Dec-16	30-Dec-16
Installing Tower, Nacelle and Hub - WTG 075	8	02-Jan-17	02-Jan-17
Installing Tower, Nacelle and Hub - WTG 076	8	06-Jan-17	06-Jan-17
Installing Tower, Nacelle and Hub - WTG 077	8	10-Jan-17	10-Jan-17
Installing Tower, Nacelle and Hub - WTG 078	8	14-Jan-17	14-Jan-17
Installing Tower, Nacelle and Hub - WTG 079	8	18-Jan-17	18-Jan-17
Installing Tower, Nacelle and Hub - WTG 080	8	22-Jan-17	22-Jan-17
Installing 3 Blades	146	28-Dec-16	25-Jan-17
Installing 3 Blades - WTG 073	11	28-Dec-16	29-Dec-16
Installing 3 Blades - WTG 074	11	31-Dec-16	01-Jan-17
Installing 3 Blades - WTG 075	11	03-Jan-17	05-Jan-17
Installing 3 Blades - WTG 076	11	07-Jan-17	09-Jan-17
Installing 3 Blades - WTG 077	11	11-Jan-17	13-Jan-17

Figure A.1 : Bottom fixed offshore wind farm construction planning (continues)

Activity Name	Duration (Hour)	Start	Finish
Installing 3 Blades - WTG 078	11	15-Jan-17	17-Jan-17
Installing 3 Blades - WTG 079	11	19-Jan-17	21-Jan-17
Installing 3 Blades - WTG 080	11	23-Jan-17	25-Jan-17
Position Checked by Client Rep.	645	29-Dec-16	25-Jan-17
Position Checked by Client Rep. - WTG 073	0		29-Dec-16
Position Checked by Client Rep. - WTG 074	0		01-Jan-17
Position Checked by Client Rep. - WTG 075	0		05-Jan-17
Position Checked by Client Rep. - WTG 076	0		09-Jan-17
Position Checked by Client Rep. - WTG 077	0		13-Jan-17
Position Checked by Client Rep. - WTG 078	0		17-Jan-17
Position Checked by Client Rep. - WTG 079	0		21-Jan-17
Position Checked by Client Rep. - WTG 080	0		25-Jan-17
Jack Down	337	29-Dec-16	25-Jan-17
Jack Down - WTG 073	2	29-Dec-16	29-Dec-16
Jack Down - WTG 074	2	01-Jan-17	01-Jan-17
Jack Down - WTG 075	2	05-Jan-17	05-Jan-17
Jack Down - WTG 076	2	09-Jan-17	09-Jan-17
Jack Down - WTG 077	2	13-Jan-17	13-Jan-17
Jack Down - WTG 078	2	17-Jan-17	17-Jan-17
Jack Down - WTG 079	2	21-Jan-17	21-Jan-17
Jack Down - WTG 080	2	25-Jan-17	25-Jan-17
Vessel Departure	645	29-Dec-16	25-Jan-17
Vessel Departure - WTG 073	0		29-Dec-16
Vessel Departure - WTG 074	0		01-Jan-17
Vessel Departure - WTG 075	0		05-Jan-17
Vessel Departure - WTG 076	0		09-Jan-17
Vessel Departure - WTG 077	0		13-Jan-17
Vessel Departure - WTG 078	0		17-Jan-17
Vessel Departure - WTG 079	0		21-Jan-17
Vessel Departure - WTG 080	0		25-Jan-17
Return to Port	473	29-Dec-16	26-Jan-17
WTG Return to Port - WTG 073	16	29-Dec-16	30-Dec-16
WTG Return to Port - WTG 074	16	01-Jan-17	02-Jan-17
WTG Return to Port - WTG 075	16	05-Jan-17	06-Jan-17
WTG Return to Port - WTG 076	16	09-Jan-17	10-Jan-17
WTG Return to Port - WTG 077	16	13-Jan-17	14-Jan-17
WTG Return to Port - WTG 078	16	17-Jan-17	18-Jan-17
WTG Return to Port - WTG 079	16	21-Jan-17	22-Jan-17
WTG Return to Port - WTG 080	16	25-Jan-17	26-Jan-17
Installation 11th Batch	57	25-Jan-17	05-Feb-17
Load WTG Batch 011	0	26-Jan-17	
Return WTG Batch - Batch 011	0		05-Feb-17
Loading	48	26-Jan-17	30-Jan-17
Loading WTG - WTG 081	48	26-Jan-17	30-Jan-17
Loading WTG - WTG 082	48	26-Jan-17	30-Jan-17
Loading WTG - WTG 083	48	26-Jan-17	30-Jan-17
Sea Fastening and Prepare to Departure	2	30-Jan-17	30-Jan-17
Sea Fastening and Prepare to Departure - WTG 081	2	30-Jan-17	30-Jan-17
Sea Fastening and Prepare to Departure - WTG 082	2	30-Jan-17	30-Jan-17
Sea Fastening and Prepare to Departure - WTG 083	2	30-Jan-17	30-Jan-17
Pilot Out of Port	1	30-Jan-17	30-Jan-17
Pilot Out of Port - WTG 081	1	30-Jan-17	30-Jan-17
Pilot Out of Port - WTG 082	1	30-Jan-17	30-Jan-17
Pilot Out of Port - WTG 083	1	30-Jan-17	30-Jan-17
Transit to Site	13	30-Jan-17	31-Jan-17

Figure A.1 : Bottom fixed offshore wind farm construction planning (continues)

Activity Name	Duration (Hour)	Start	Finish
WTG Transit to Site - WTG 081	13	30-Jan-17	31-Jan-17
WTG Transit to Site - WTG 082	13	30-Jan-17	31-Jan-17
WTG Transit to Site - WTG 083	13	30-Jan-17	31-Jan-17
Positioning and Jack Up	98	25-Jan-17	02-Feb-17
WTG Positioning and Jack Up - WTG 081	5	25-Jan-17	25-Jan-17
WTG Positioning and Jack Up - WTG 082	5	29-Jan-17	29-Jan-17
WTG Positioning and Jack Up - WTG 083	5	01-Feb-17	02-Feb-17
Prep for Installation	115	25-Jan-17	02-Feb-17
WTG Prep for Installation - WTG 081	1	25-Jan-17	25-Jan-17
WTG Prep for Installation - WTG 082	1	29-Jan-17	29-Jan-17
WTG Prep for Installation - WTG 083	1	02-Feb-17	02-Feb-17
Installing Tower, Nacelle and Hub	67	26-Jan-17	02-Feb-17
Installing Tower, Nacelle and Hub - WTG 081	8	26-Jan-17	26-Jan-17
Installing Tower, Nacelle and Hub - WTG 082	8	30-Jan-17	30-Jan-17
Installing Tower, Nacelle and Hub - WTG 083	8	02-Feb-17	02-Feb-17
Installing 3 Blades	47	27-Jan-17	04-Feb-17
Installing 3 Blades - WTG 081	11	27-Jan-17	29-Jan-17
Installing 3 Blades - WTG 082	11	31-Jan-17	01-Feb-17
Installing 3 Blades - WTG 083	11	03-Feb-17	04-Feb-17
Position Checked by Client Rep.	149	29-Jan-17	04-Feb-17
Position Checked by Client Rep. - WTG 081	0		29-Jan-17
Position Checked by Client Rep. - WTG 082	0		01-Feb-17
Position Checked by Client Rep. - WTG 083	0		04-Feb-17
Jack Down	85	29-Jan-17	04-Feb-17
Jack Down - WTG 081	2	29-Jan-17	29-Jan-17
Jack Down - WTG 082	2	01-Feb-17	01-Feb-17
Jack Down - WTG 083	2	04-Feb-17	04-Feb-17
Vessel Departure	149	29-Jan-17	04-Feb-17
Vessel Departure - WTG 081	0		29-Jan-17
Vessel Departure - WTG 082	0		01-Feb-17
Vessel Departure - WTG 083	0		04-Feb-17
Return to Port	126	29-Jan-17	05-Feb-17
WTG Return to Port - WTG 081	16	29-Jan-17	30-Jan-17
WTG Return to Port - WTG 082	16	01-Feb-17	02-Feb-17
WTG Return to Port - WTG 083	16	04-Feb-17	05-Feb-17
Mechanical Completion - WTG	1348	06-Jun-16	11-Feb-17
Mechanical Completion - WTG #001	31	06-Jun-16	11-Jun-16
Mechanical Completion - WTG #002	31	08-Jun-16	13-Jun-16
Mechanical Completion - WTG #003	31	11-Jun-16	15-Jun-16
Mechanical Completion - WTG #004	31	13-Jun-16	18-Jun-16
Mechanical Completion - WTG #005	31	16-Jun-16	20-Jun-16
Mechanical Completion - WTG #006	31	18-Jun-16	22-Jun-16
Mechanical Completion - WTG #007	31	20-Jun-16	25-Jun-16
Mechanical Completion - WTG #008	31	22-Jun-16	27-Jun-16
Mechanical Completion - WTG #009	31	25-Jun-16	30-Jun-16
Mechanical Completion - WTG #010	31	27-Jun-16	02-Jul-16
Mechanical Completion - WTG #011	31	30-Jun-16	05-Jul-16
Mechanical Completion - WTG #012	31	02-Jul-16	07-Jul-16
Mechanical Completion - WTG #013	31	05-Jul-16	09-Jul-16
Mechanical Completion - WTG #014	31	07-Jul-16	11-Jul-16
Mechanical Completion - WTG #015	31	09-Jul-16	14-Jul-16
Mechanical Completion - WTG #016	31	11-Jul-16	16-Jul-16
Mechanical Completion - WTG #017	31	14-Jul-16	19-Jul-16
Mechanical Completion - WTG #018	31	16-Jul-16	21-Jul-16
Mechanical Completion - WTG #019	31	19-Jul-16	24-Jul-16

Figure A.1 : Bottom fixed offshore wind farm construction planning (continues)

Activity Name	Duration (Hour)	Start	Finish
Mechanical Completion - WTG #020	31	21-Jul-16	26-Jul-16
Mechanical Completion - WTG #021	31	24-Jul-16	28-Jul-16
Mechanical Completion - WTG #022	31	26-Jul-16	30-Jul-16
Mechanical Completion - WTG #023	31	28-Jul-16	02-Aug-16
Mechanical Completion - WTG #024	31	31-Jul-16	04-Aug-16
Mechanical Completion - WTG #025	31	02-Aug-16	07-Aug-16
Mechanical Completion - WTG #026	31	04-Aug-16	09-Aug-16
Mechanical Completion - WTG #027	31	07-Aug-16	12-Aug-16
Mechanical Completion - WTG #028	31	09-Aug-16	14-Aug-16
Mechanical Completion - WTG #029	31	12-Aug-16	16-Aug-16
Mechanical Completion - WTG #030	31	14-Aug-16	19-Aug-16
Mechanical Completion - WTG #031	31	17-Aug-16	21-Aug-16
Mechanical Completion - WTG #032	31	19-Aug-16	23-Aug-16
Mechanical Completion - WTG #033	31	21-Aug-16	26-Aug-16
Mechanical Completion - WTG #034	31	23-Aug-16	28-Aug-16
Mechanical Completion - WTG #035	31	26-Aug-16	31-Aug-16
Mechanical Completion - WTG #036	31	28-Aug-16	02-Sep-16
Mechanical Completion - WTG #037	31	31-Aug-16	05-Sep-16
Mechanical Completion - WTG #038	31	02-Sep-16	07-Sep-16
Mechanical Completion - WTG #039	31	05-Sep-16	10-Sep-16
Mechanical Completion - WTG #040	31	07-Sep-16	12-Sep-16
Mechanical Completion - WTG #041	31	10-Sep-16	15-Sep-16
Mechanical Completion - WTG #042	31	12-Sep-16	17-Sep-16
Mechanical Completion - WTG #043	31	15-Sep-16	20-Sep-16
Mechanical Completion - WTG #044	31	18-Sep-16	23-Sep-16
Mechanical Completion - WTG #045	31	20-Sep-16	26-Sep-16
Mechanical Completion - WTG #046	31	23-Sep-16	28-Sep-16
Mechanical Completion - WTG #047	31	26-Sep-16	01-Oct-16
Mechanical Completion - WTG #048	31	28-Sep-16	03-Oct-16
Mechanical Completion - WTG #049	31	03-Oct-16	09-Oct-16
Mechanical Completion - WTG #050	31	06-Oct-16	12-Oct-16
Mechanical Completion - WTG #051	31	09-Oct-16	16-Oct-16
Mechanical Completion - WTG #052	31	12-Oct-16	19-Oct-16
Mechanical Completion - WTG #053	31	16-Oct-16	22-Oct-16
Mechanical Completion - WTG #054	31	19-Oct-16	25-Oct-16
Mechanical Completion - WTG #055	31	22-Oct-16	28-Oct-16
Mechanical Completion - WTG #056	31	25-Oct-16	31-Oct-16
Mechanical Completion - WTG #057	31	01-Nov-16	08-Nov-16
Mechanical Completion - WTG #058	31	05-Nov-16	11-Nov-16
Mechanical Completion - WTG #059	31	08-Nov-16	15-Nov-16
Mechanical Completion - WTG #060	31	11-Nov-16	18-Nov-16
Mechanical Completion - WTG #061	31	15-Nov-16	22-Nov-16
Mechanical Completion - WTG #062	31	18-Nov-16	25-Nov-16
Mechanical Completion - WTG #063	31	22-Nov-16	29-Nov-16
Mechanical Completion - WTG #064	31	25-Nov-16	02-Dec-16
Mechanical Completion - WTG #065	31	01-Dec-16	07-Dec-16
Mechanical Completion - WTG #066	31	03-Dec-16	10-Dec-16
Mechanical Completion - WTG #067	31	07-Dec-16	14-Dec-16
Mechanical Completion - WTG #068	31	10-Dec-16	17-Dec-16
Mechanical Completion - WTG #069	31	14-Dec-16	21-Dec-16
Mechanical Completion - WTG #070	31	17-Dec-16	24-Dec-16
Mechanical Completion - WTG #071	31	21-Dec-16	28-Dec-16
Mechanical Completion - WTG #072	31	24-Dec-16	31-Dec-16
Mechanical Completion - WTG #073	31	29-Dec-16	06-Jan-17

Figure A.1 : Bottom fixed offshore wind farm construction planning (continues)

Activity Name	Duration (Hour)	Start	Finish
Mechanical Completion - WTG #074	31	01-Jan-17	09-Jan-17
Mechanical Completion - WTG #075	31	06-Jan-17	13-Jan-17
Mechanical Completion - WTG #076	31	09-Jan-17	17-Jan-17
Mechanical Completion - WTG #077	31	14-Jan-17	21-Jan-17
Mechanical Completion - WTG #078	31	17-Jan-17	24-Jan-17
Mechanical Completion - WTG #079	31	21-Jan-17	29-Jan-17
Mechanical Completion - WTG #080	31	25-Jan-17	01-Feb-17
Mechanical Completion - WTG #081	31	29-Jan-17	05-Feb-17
Mechanical Completion - WTG #082	31	02-Feb-17	08-Feb-17
Mechanical Completion - WTG #083	31	05-Feb-17	11-Feb-17
Electrical Completion - WTG	1338	11-Jun-16	16-Feb-17
Electrical Completion - WTG	6002	11-Jun-16	16-Feb-17
Electrical Completion - WTG #001	33	11-Jun-16	17-Jun-16
Electrical Completion - WTG #002	33	13-Jun-16	19-Jun-16
Electrical Completion - WTG #003	33	16-Jun-16	21-Jun-16
Electrical Completion - WTG #004	33	18-Jun-16	23-Jun-16
Electrical Completion - WTG #005	33	20-Jun-16	26-Jun-16
Electrical Completion - WTG #006	33	22-Jun-16	28-Jun-16
Electrical Completion - WTG #007	33	25-Jun-16	01-Jul-16
Electrical Completion - WTG #008	33	27-Jun-16	03-Jul-16
Electrical Completion - WTG #009	33	30-Jun-16	06-Jul-16
Electrical Completion - WTG #010	33	02-Jul-16	08-Jul-16
Electrical Completion - WTG #011	33	05-Jul-16	10-Jul-16
Electrical Completion - WTG #012	33	07-Jul-16	13-Jul-16
Electrical Completion - WTG #013	33	09-Jul-16	15-Jul-16
Electrical Completion - WTG #014	33	12-Jul-16	17-Jul-16
Electrical Completion - WTG #015	33	14-Jul-16	20-Jul-16
Electrical Completion - WTG #016	33	16-Jul-16	22-Jul-16
Electrical Completion - WTG #017	33	19-Jul-16	25-Jul-16
Electrical Completion - WTG #018	33	21-Jul-16	27-Jul-16
Electrical Completion - WTG #019	33	24-Jul-16	30-Jul-16
Electrical Completion - WTG #020	33	26-Jul-16	01-Aug-16
Electrical Completion - WTG #021	33	29-Jul-16	03-Aug-16
Electrical Completion - WTG #022	33	31-Jul-16	05-Aug-16
Electrical Completion - WTG #023	33	02-Aug-16	08-Aug-16
Electrical Completion - WTG #024	33	04-Aug-16	10-Aug-16
Electrical Completion - WTG #025	33	07-Aug-16	12-Aug-16
Electrical Completion - WTG #026	33	09-Aug-16	14-Aug-16
Electrical Completion - WTG #027	33	12-Aug-16	17-Aug-16
Electrical Completion - WTG #028	33	14-Aug-16	19-Aug-16
Electrical Completion - WTG #029	33	17-Aug-16	22-Aug-16
Electrical Completion - WTG #030	33	19-Aug-16	24-Aug-16
Electrical Completion - WTG #031	33	21-Aug-16	27-Aug-16
Electrical Completion - WTG #032	33	23-Aug-16	29-Aug-16
Electrical Completion - WTG #033	33	26-Aug-16	31-Aug-16
Electrical Completion - WTG #034	33	28-Aug-16	03-Sep-16
Electrical Completion - WTG #035	33	31-Aug-16	05-Sep-16
Electrical Completion - WTG #036	33	02-Sep-16	07-Sep-16
Electrical Completion - WTG #037	33	05-Sep-16	10-Sep-16
Electrical Completion - WTG #038	33	07-Sep-16	13-Sep-16
Electrical Completion - WTG #039	33	10-Sep-16	16-Sep-16
Electrical Completion - WTG #040	33	12-Sep-16	18-Sep-16
Electrical Completion - WTG #041	33	15-Sep-16	21-Sep-16
Electrical Completion - WTG #042	33	18-Sep-16	23-Sep-16

Figure A.1 : Bottom fixed offshore wind farm construction planning (continues)

Activity Name	Duration (Hour)	Start	Finish
Electrical Completion - WTG #043	33	20-Sep-16	26-Sep-16
Electrical Completion - WTG #044	33	23-Sep-16	28-Sep-16
Electrical Completion - WTG #045	33	26-Sep-16	01-Oct-16
Electrical Completion - WTG #046	33	28-Sep-16	03-Oct-16
Electrical Completion - WTG #047	33	01-Oct-16	06-Oct-16
Electrical Completion - WTG #048	33	03-Oct-16	08-Oct-16
Electrical Completion - WTG #049	33	09-Oct-16	14-Oct-16
Electrical Completion - WTG #050	33	12-Oct-16	17-Oct-16
Electrical Completion - WTG #051	33	16-Oct-16	21-Oct-16
Electrical Completion - WTG #052	33	19-Oct-16	24-Oct-16
Electrical Completion - WTG #053	33	22-Oct-16	27-Oct-16
Electrical Completion - WTG #054	33	25-Oct-16	30-Oct-16
Electrical Completion - WTG #055	33	28-Oct-16	02-Nov-16
Electrical Completion - WTG #056	33	31-Oct-16	05-Nov-16
Electrical Completion - WTG #057	33	08-Nov-16	13-Nov-16
Electrical Completion - WTG #058	33	11-Nov-16	16-Nov-16
Electrical Completion - WTG #059	33	15-Nov-16	20-Nov-16
Electrical Completion - WTG #060	33	18-Nov-16	23-Nov-16
Electrical Completion - WTG #061	33	22-Nov-16	27-Nov-16
Electrical Completion - WTG #062	33	25-Nov-16	30-Nov-16
Electrical Completion - WTG #063	33	29-Nov-16	04-Dec-16
Electrical Completion - WTG #064	33	02-Dec-16	07-Dec-16
Electrical Completion - WTG #065	33	07-Dec-16	13-Dec-16
Electrical Completion - WTG #066	33	10-Dec-16	15-Dec-16
Electrical Completion - WTG #067	33	14-Dec-16	20-Dec-16
Electrical Completion - WTG #068	33	17-Dec-16	22-Dec-16
Electrical Completion - WTG #069	33	21-Dec-16	27-Dec-16
Electrical Completion - WTG #070	33	24-Dec-16	29-Dec-16
Electrical Completion - WTG #071	33	28-Dec-16	02-Jan-17
Electrical Completion - WTG #072	33	31-Dec-16	05-Jan-17
Electrical Completion - WTG #073	33	06-Jan-17	11-Jan-17
Electrical Completion - WTG #074	33	09-Jan-17	14-Jan-17
Electrical Completion - WTG #075	33	13-Jan-17	19-Jan-17
Electrical Completion - WTG #076	33	17-Jan-17	22-Jan-17
Electrical Completion - WTG #077	33	21-Jan-17	27-Jan-17
Electrical Completion - WTG #078	33	24-Jan-17	30-Jan-17
Electrical Completion - WTG #079	33	29-Jan-17	03-Feb-17
Electrical Completion - WTG #080	33	01-Feb-17	06-Feb-17
Electrical Completion - WTG #081	33	05-Feb-17	10-Feb-17
Electrical Completion - WTG #082	33	08-Feb-17	13-Feb-17
Electrical Completion - WTG #083	33	11-Feb-17	16-Feb-17
WTG Installed	5858	17-Jun-16	16-Feb-17
Last WTG Installed	0		02-Jan-17
WTG Installed - WTG #001	0		17-Jun-16
WTG Installed - WTG #002	0		19-Jun-16
WTG Installed - WTG #003	0		21-Jun-16
WTG Installed - WTG #004	0		23-Jun-16
WTG Installed - WTG #005	0		26-Jun-16
WTG Installed - WTG #006	0		28-Jun-16
WTG Installed - WTG #007	0		01-Jul-16
WTG Installed - WTG #008	0		03-Jul-16
WTG Installed - WTG #009	0		06-Jul-16
WTG Installed - WTG #010	0		08-Jul-16
WTG Installed - WTG #011	0		10-Jul-16

Figure A.1 : Bottom fixed offshore wind farm construction planning (continues)

Activity Name	Duration (Hour)	Start	Finish
WTG Installed - WTG #012	0		13-Jul-16
WTG Installed - WTG #013	0		15-Jul-16
WTG Installed - WTG #014	0		17-Jul-16
WTG Installed - WTG #015	0		20-Jul-16
WTG Installed - WTG #016	0		22-Jul-16
WTG Installed - WTG #017	0		25-Jul-16
WTG Installed - WTG #018	0		27-Jul-16
WTG Installed - WTG #019	0		30-Jul-16
WTG Installed - WTG #020	0		01-Aug-16
WTG Installed - WTG #021	0		03-Aug-16
WTG Installed - WTG #022	0		05-Aug-16
WTG Installed - WTG #023	0		08-Aug-16
WTG Installed - WTG #024	0		10-Aug-16
WTG Installed - WTG #025	0		12-Aug-16
WTG Installed - WTG #026	0		14-Aug-16
WTG Installed - WTG #027	0		17-Aug-16
WTG Installed - WTG #028	0		19-Aug-16
WTG Installed - WTG #029	0		22-Aug-16
WTG Installed - WTG #030	0		24-Aug-16
WTG Installed - WTG #031	0		27-Aug-16
WTG Installed - WTG #032	0		29-Aug-16
WTG Installed - WTG #033	0		31-Aug-16
WTG Installed - WTG #034	0		03-Sep-16
WTG Installed - WTG #035	0		05-Sep-16
WTG Installed - WTG #036	0		07-Sep-16
WTG Installed - WTG #037	0		10-Sep-16
WTG Installed - WTG #038	0		13-Sep-16
WTG Installed - WTG #039	0		16-Sep-16
WTG Installed - WTG #040	0		18-Sep-16
WTG Installed - WTG #041	0		21-Sep-16
WTG Installed - WTG #042	0		23-Sep-16
WTG Installed - WTG #043	0		26-Sep-16
WTG Installed - WTG #044	0		28-Sep-16
WTG Installed - WTG #045	0		01-Oct-16
WTG Installed - WTG #046	0		03-Oct-16
WTG Installed - WTG #047	0		06-Oct-16
WTG Installed - WTG #048	0		08-Oct-16
WTG Installed - WTG #049	0		14-Oct-16
WTG Installed - WTG #050	0		17-Oct-16
WTG Installed - WTG #051	0		21-Oct-16
WTG Installed - WTG #052	0		24-Oct-16
WTG Installed - WTG #053	0		27-Oct-16
WTG Installed - WTG #054	0		30-Oct-16
WTG Installed - WTG #055	0		02-Nov-16
WTG Installed - WTG #056	0		05-Nov-16
WTG Installed - WTG #057	0		13-Nov-16
WTG Installed - WTG #058	0		16-Nov-16
WTG Installed - WTG #059	0		20-Nov-16
WTG Installed - WTG #060	0		23-Nov-16
WTG Installed - WTG #061	0		27-Nov-16
WTG Installed - WTG #062	0		30-Nov-16
WTG Installed - WTG #063	0		04-Dec-16
WTG Installed - WTG #064	0		07-Dec-16
WTG Installed - WTG #065	0		13-Dec-16

Figure A.1 : Bottom fixed offshore wind farm construction planning (continues)

Activity Name	Duration (Hour)	Start	Finish
WTG Installed - WTG #066	0		15-Dec-16
WTG Installed - WTG #067	0		20-Dec-16
WTG Installed - WTG #068	0		22-Dec-16
WTG Installed - WTG #069	0		27-Dec-16
WTG Installed - WTG #070	0		29-Dec-16
WTG Installed - WTG #071	0		02-Jan-17
WTG Installed - WTG #072	0		05-Jan-17
WTG Installed - WTG #073	0		11-Jan-17
WTG Installed - WTG #074	0		14-Jan-17
WTG Installed - WTG #075	0		19-Jan-17
WTG Installed - WTG #076	0		22-Jan-17
WTG Installed - WTG #077	0		27-Jan-17
WTG Installed - WTG #078	0		30-Jan-17
WTG Installed - WTG #079	0		03-Feb-17
WTG Installed - WTG #080	0		10-Feb-17
WTG Installed - WTG #081	0		10-Feb-17
WTG Installed - WTG #082	0		13-Feb-17
WTG Installed - WTG #083	0		16-Feb-17
Commissioning (PM600)	1394	17-Jun-16	04-Mar-17
Turbine Supply Agreement (TSA)	1394	17-Jun-16	04-Mar-17
Pre-Commissioning	1505	17-Jun-16	19-Feb-17
Pre-Commissioning - WTG	1505	17-Jun-16	19-Feb-17
Pre-Commissioning - WTG #001	23	17-Jun-16	21-Jun-16
Pre-Commissioning - WTG #002	23	19-Jun-16	23-Jun-16
Pre-Commissioning - WTG #003	23	22-Jun-16	26-Jun-16
Pre-Commissioning - WTG #004	23	24-Jun-16	28-Jun-16
Pre-Commissioning - WTG #005	23	26-Jun-16	30-Jun-16
Pre-Commissioning - WTG #006	23	28-Jun-16	03-Jul-16
Pre-Commissioning - WTG #007	23	01-Jul-16	05-Jul-16
Pre-Commissioning - WTG #008	23	03-Jul-16	07-Jul-16
Pre-Commissioning - WTG #009	23	06-Jul-16	10-Jul-16
Pre-Commissioning - WTG #010	23	08-Jul-16	12-Jul-16
Pre-Commissioning - WTG #011	23	11-Jul-16	15-Jul-16
Pre-Commissioning - WTG #012	23	13-Jul-16	17-Jul-16
Pre-Commissioning - WTG #013	23	15-Jul-16	20-Jul-16
Pre-Commissioning - WTG #014	23	18-Jul-16	22-Jul-16
Pre-Commissioning - WTG #015	23	20-Jul-16	24-Jul-16
Pre-Commissioning - WTG #016	23	22-Jul-16	26-Jul-16
Pre-Commissioning - WTG #017	23	25-Jul-16	29-Jul-16
Pre-Commissioning - WTG #018	23	27-Jul-16	31-Jul-16
Pre-Commissioning - WTG #019	23	30-Jul-16	03-Aug-16
Pre-Commissioning - WTG #020	23	01-Aug-16	04-Aug-16
Pre-Commissioning - WTG #021	23	03-Aug-16	07-Aug-16
Pre-Commissioning - WTG #022	23	05-Aug-16	09-Aug-16
Pre-Commissioning - WTG #023	23	08-Aug-16	11-Aug-16
Pre-Commissioning - WTG #024	23	10-Aug-16	14-Aug-16
Pre-Commissioning - WTG #025	23	12-Aug-16	16-Aug-16
Pre-Commissioning - WTG #026	23	15-Aug-16	18-Aug-16
Pre-Commissioning - WTG #027	23	17-Aug-16	21-Aug-16
Pre-Commissioning - WTG #028	23	19-Aug-16	23-Aug-16
Pre-Commissioning - WTG #029	23	22-Aug-16	26-Aug-16
Pre-Commissioning - WTG #030	23	24-Aug-16	28-Aug-16
Pre-Commissioning - WTG #031	23	27-Aug-16	31-Aug-16
Pre-Commissioning - WTG #032	23	29-Aug-16	02-Sep-16

Figure A.1 : Bottom fixed offshore wind farm construction planning (continues)

Activity Name	Duration (Hour)	Start	Finish
Pre-Commissioning - WTG #033	23	01-Sep-16	04-Sep-16
Pre-Commissioning - WTG #034	23	03-Sep-16	06-Sep-16
Pre-Commissioning - WTG #035	23	05-Sep-16	09-Sep-16
Pre-Commissioning - WTG #036	23	08-Sep-16	11-Sep-16
Pre-Commissioning - WTG #037	23	10-Sep-16	14-Sep-16
Pre-Commissioning - WTG #038	23	13-Sep-16	16-Sep-16
Pre-Commissioning - WTG #039	23	16-Sep-16	19-Sep-16
Pre-Commissioning - WTG #040	23	18-Sep-16	22-Sep-16
Pre-Commissioning - WTG #041	23	21-Sep-16	25-Sep-16
Pre-Commissioning - WTG #042	23	23-Sep-16	27-Sep-16
Pre-Commissioning - WTG #043	23	26-Sep-16	30-Sep-16
Pre-Commissioning - WTG #044	23	28-Sep-16	02-Oct-16
Pre-Commissioning - WTG #045	23	01-Oct-16	05-Oct-16
Pre-Commissioning - WTG #046	23	03-Oct-16	07-Oct-16
Pre-Commissioning - WTG #047	23	06-Oct-16	09-Oct-16
Pre-Commissioning - WTG #048	23	08-Oct-16	12-Oct-16
Pre-Commissioning - WTG #049	23	14-Oct-16	18-Oct-16
Pre-Commissioning - WTG #050	23	17-Oct-16	21-Oct-16
Pre-Commissioning - WTG #051	23	21-Oct-16	24-Oct-16
Pre-Commissioning - WTG #052	23	24-Oct-16	27-Oct-16
Pre-Commissioning - WTG #053	23	27-Oct-16	30-Oct-16
Pre-Commissioning - WTG #054	23	30-Oct-16	02-Nov-16
Pre-Commissioning - WTG #055	23	02-Nov-16	06-Nov-16
Pre-Commissioning - WTG #056	23	05-Nov-16	09-Nov-16
Pre-Commissioning - WTG #057	23	13-Nov-16	17-Nov-16
Pre-Commissioning - WTG #058	23	16-Nov-16	20-Nov-16
Pre-Commissioning - WTG #059	23	20-Nov-16	24-Nov-16
Pre-Commissioning - WTG #060	23	23-Nov-16	27-Nov-16
Pre-Commissioning - WTG #061	23	27-Nov-16	01-Dec-16
Pre-Commissioning - WTG #062	23	30-Nov-16	04-Dec-16
Pre-Commissioning - WTG #063	23	04-Dec-16	08-Dec-16
Pre-Commissioning - WTG #064	23	08-Dec-16	11-Dec-16
Pre-Commissioning - WTG #065	23	13-Dec-16	17-Dec-16
Pre-Commissioning - WTG #066	23	16-Dec-16	19-Dec-16
Pre-Commissioning - WTG #067	23	20-Dec-16	23-Dec-16
Pre-Commissioning - WTG #068	23	22-Dec-16	26-Dec-16
Pre-Commissioning - WTG #069	23	27-Dec-16	30-Dec-16
Pre-Commissioning - WTG #070	23	29-Dec-16	02-Jan-17
Pre-Commissioning - WTG #071	23	03-Jan-17	06-Jan-17
Pre-Commissioning - WTG #072	23	05-Jan-17	09-Jan-17
Pre-Commissioning - WTG #073	23	11-Jan-17	15-Jan-17
Pre-Commissioning - WTG #074	23	15-Jan-17	18-Jan-17
Pre-Commissioning - WTG #075	23	19-Jan-17	23-Jan-17
Pre-Commissioning - WTG #076	23	22-Jan-17	26-Jan-17
Pre-Commissioning - WTG #077	23	27-Jan-17	30-Jan-17
Pre-Commissioning - WTG #078	23	30-Jan-17	02-Feb-17
Pre-Commissioning - WTG #079	23	03-Feb-17	07-Feb-17
Pre-Commissioning - WTG #080	23	10-Feb-17	13-Feb-17
Pre-Commissioning - WTG #081	23	10-Feb-17	13-Feb-17
Pre-Commissioning - WTG #082	23	13-Feb-17	16-Feb-17
Pre-Commissioning - WTG #083	23	16-Feb-17	19-Feb-17
Final Site Test / Visibility	2920	21-Jun-16	19-Feb-17
Final Site Test / Visibility - WTG	2920	21-Jun-16	19-Feb-17
Final Site Test / Visibility - WTG #001	0	21-Jun-16	21-Jun-16

Figure A.1 : Bottom fixed offshore wind farm construction planning (continues)

Activity Name	Duration (Hour)	Start	Finish
Final Site Test / Visibility - WTG#002	0	23-Jun-16	23-Jun-16
Final Site Test / Visibility - WTG#003	0	26-Jun-16	26-Jun-16
Final Site Test / Visibility - WTG#004	0	28-Jun-16	28-Jun-16
Final Site Test / Visibility - WTG#005	0	30-Jun-16	30-Jun-16
Final Site Test / Visibility - WTG#006	0	03-Jul-16	03-Jul-16
Final Site Test / Visibility - WTG#007	0	05-Jul-16	05-Jul-16
Final Site Test / Visibility - WTG#008	0	07-Jul-16	07-Jul-16
Final Site Test / Visibility - WTG#009	0	10-Jul-16	10-Jul-16
Final Site Test / Visibility - WTG#010	0	12-Jul-16	12-Jul-16
Final Site Test / Visibility - WTG#011	0	15-Jul-16	15-Jul-16
Final Site Test / Visibility - WTG#012	0	17-Jul-16	17-Jul-16
Final Site Test / Visibility - WTG#013	0	20-Jul-16	20-Jul-16
Final Site Test / Visibility - WTG#014	0	22-Jul-16	22-Jul-16
Final Site Test / Visibility - WTG#015	0	24-Jul-16	24-Jul-16
Final Site Test / Visibility - WTG#016	0	26-Jul-16	26-Jul-16
Final Site Test / Visibility - WTG#017	0	29-Jul-16	29-Jul-16
Final Site Test / Visibility - WTG#018	0	31-Jul-16	31-Jul-16
Final Site Test / Visibility - WTG#019	0	03-Aug-16	03-Aug-16
Final Site Test / Visibility - WTG#020	0	04-Aug-16	04-Aug-16
Final Site Test / Visibility - WTG#021	0	07-Aug-16	07-Aug-16
Final Site Test / Visibility - WTG#022	0	09-Aug-16	09-Aug-16
Final Site Test / Visibility - WTG#023	0	11-Aug-16	11-Aug-16
Final Site Test / Visibility - WTG#024	0	14-Aug-16	14-Aug-16
Final Site Test / Visibility - WTG#025	0	16-Aug-16	16-Aug-16
Final Site Test / Visibility - WTG#026	0	18-Aug-16	18-Aug-16
Final Site Test / Visibility - WTG#027	0	21-Aug-16	21-Aug-16
Final Site Test / Visibility - WTG#028	0	23-Aug-16	23-Aug-16
Final Site Test / Visibility - WTG#029	0	26-Aug-16	26-Aug-16
Final Site Test / Visibility - WTG#030	0	28-Aug-16	28-Aug-16
Final Site Test / Visibility - WTG#031	0	31-Aug-16	31-Aug-16
Final Site Test / Visibility - WTG#032	0	02-Sep-16	02-Sep-16
Final Site Test / Visibility - WTG#033	0	04-Sep-16	04-Sep-16
Final Site Test / Visibility - WTG#034	0	06-Sep-16	06-Sep-16
Final Site Test / Visibility - WTG#035	0	09-Sep-16	09-Sep-16
Final Site Test / Visibility - WTG#036	0	11-Sep-16	11-Sep-16
Final Site Test / Visibility - WTG#037	0	14-Sep-16	14-Sep-16
Final Site Test / Visibility - WTG#038	0	16-Sep-16	16-Sep-16
Final Site Test / Visibility - WTG#039	0	19-Sep-16	19-Sep-16
Final Site Test / Visibility - WTG#040	0	22-Sep-16	22-Sep-16
Final Site Test / Visibility - WTG#041	0	25-Sep-16	25-Sep-16
Final Site Test / Visibility - WTG#042	0	27-Sep-16	27-Sep-16
Final Site Test / Visibility - WTG#043	0	30-Sep-16	30-Sep-16
Final Site Test / Visibility - WTG#044	0	02-Oct-16	02-Oct-16
Final Site Test / Visibility - WTG#045	0	05-Oct-16	05-Oct-16
Final Site Test / Visibility - WTG#046	0	07-Oct-16	07-Oct-16
Final Site Test / Visibility - WTG#047	0	09-Oct-16	09-Oct-16
Final Site Test / Visibility - WTG#048	0	12-Oct-16	12-Oct-16
Final Site Test / Visibility - WTG#049	0	18-Oct-16	18-Oct-16
Final Site Test / Visibility - WTG#050	0	21-Oct-16	21-Oct-16
Final Site Test / Visibility - WTG#051	0	24-Oct-16	24-Oct-16
Final Site Test / Visibility - WTG#052	0	27-Oct-16	27-Oct-16
Final Site Test / Visibility - WTG#053	0	30-Oct-16	30-Oct-16
Final Site Test / Visibility - WTG#054	0	02-Nov-16	02-Nov-16
Final Site Test / Visibility - WTG#055	0	06-Nov-16	06-Nov-16

Figure A.1 : Bottom fixed offshore wind farm construction planning (continues)

Activity Name	Duration (Hour)	Start	Finish
Final Site Test / Visibility - WTG #056	0	09-Nov-16	09-Nov-16
Final Site Test / Visibility - WTG #057	0	17-Nov-16	17-Nov-16
Final Site Test / Visibility - WTG #058	0	20-Nov-16	20-Nov-16
Final Site Test / Visibility - WTG #059	0	24-Nov-16	24-Nov-16
Final Site Test / Visibility - WTG #060	0	27-Nov-16	27-Nov-16
Final Site Test / Visibility - WTG #061	0	01-Dec-16	01-Dec-16
Final Site Test / Visibility - WTG #062	0	04-Dec-16	04-Dec-16
Final Site Test / Visibility - WTG #063	0	08-Dec-16	08-Dec-16
Final Site Test / Visibility - WTG #064	0	11-Dec-16	11-Dec-16
Final Site Test / Visibility - WTG #065	0	17-Dec-16	17-Dec-16
Final Site Test / Visibility - WTG #066	0	19-Dec-16	19-Dec-16
Final Site Test / Visibility - WTG #067	0	23-Dec-16	23-Dec-16
Final Site Test / Visibility - WTG #068	0	26-Dec-16	26-Dec-16
Final Site Test / Visibility - WTG #069	0	30-Dec-16	30-Dec-16
Final Site Test / Visibility - WTG #070	0	02-Jan-17	02-Jan-17
Final Site Test / Visibility - WTG #071	0	06-Jan-17	06-Jan-17
Final Site Test / Visibility - WTG #072	0	09-Jan-17	09-Jan-17
Final Site Test / Visibility - WTG #073	0	15-Jan-17	15-Jan-17
Final Site Test / Visibility - WTG #074	0	18-Jan-17	18-Jan-17
Final Site Test / Visibility - WTG #075	0	23-Jan-17	23-Jan-17
Final Site Test / Visibility - WTG #076	0	26-Jan-17	26-Jan-17
Final Site Test / Visibility - WTG #077	0	30-Jan-17	30-Jan-17
Final Site Test / Visibility - WTG #078	0	02-Feb-17	02-Feb-17
Final Site Test / Visibility - WTG #079	0	07-Feb-17	07-Feb-17
Final Site Test / Visibility - WTG #080	0	13-Feb-17	13-Feb-17
Final Site Test / Visibility - WTG #081	0	13-Feb-17	13-Feb-17
Final Site Test / Visibility - WTG #082	0	16-Feb-17	16-Feb-17
Final Site Test / Visibility - WTG #083	0	19-Feb-17	19-Feb-17
Commissioning	1497	21-Jun-16	22-Feb-17
Hot Commissioning - WTG #001	15	21-Jun-16	24-Jun-16
Hot Commissioning - WTG #001 - #071	1497	21-Jun-16	22-Feb-17
Hot Commissioning - WTG #002	15	23-Jun-16	26-Jun-16
Hot Commissioning - WTG #003	15	26-Jun-16	28-Jun-16
Hot Commissioning - WTG #004	15	28-Jun-16	30-Jun-16
Hot Commissioning - WTG #005	15	01-Jul-16	03-Jul-16
Hot Commissioning - WTG #006	15	03-Jul-16	05-Jul-16
Hot Commissioning - WTG #007	15	05-Jul-16	08-Jul-16
Hot Commissioning - WTG #008	15	07-Jul-16	10-Jul-16
Hot Commissioning - WTG #009	15	10-Jul-16	13-Jul-16
Hot Commissioning - WTG #010	15	12-Jul-16	15-Jul-16
Hot Commissioning - WTG #011	15	15-Jul-16	17-Jul-16
Hot Commissioning - WTG #012	15	17-Jul-16	19-Jul-16
Hot Commissioning - WTG #013	15	20-Jul-16	22-Jul-16
Hot Commissioning - WTG #014	15	22-Jul-16	24-Jul-16
Hot Commissioning - WTG #015	15	24-Jul-16	27-Jul-16
Hot Commissioning - WTG #016	15	26-Jul-16	29-Jul-16
Hot Commissioning - WTG #017	15	29-Jul-16	01-Aug-16
Hot Commissioning - WTG #018	15	31-Jul-16	03-Aug-16
Hot Commissioning - WTG #019	15	03-Aug-16	05-Aug-16
Hot Commissioning - WTG #020	15	05-Aug-16	07-Aug-16
Hot Commissioning - WTG #021	15	07-Aug-16	10-Aug-16
Hot Commissioning - WTG #022	15	09-Aug-16	11-Aug-16
Hot Commissioning - WTG #023	15	12-Aug-16	14-Aug-16
Hot Commissioning - WTG #024	15	14-Aug-16	16-Aug-16

Figure A.1 : Bottom fixed offshore wind farm construction planning (continues)

Activity Name	Duration (Hour)	Start	Finish
Hot Commissioning - WTG #025	15	16-Aug-16	19-Aug-16
Hot Commissioning - WTG #026	15	18-Aug-16	21-Aug-16
Hot Commissioning - WTG #027	15	21-Aug-16	23-Aug-16
Hot Commissioning - WTG #028	15	23-Aug-16	26-Aug-16
Hot Commissioning - WTG #029	15	26-Aug-16	28-Aug-16
Hot Commissioning - WTG #030	15	28-Aug-16	30-Aug-16
Hot Commissioning - WTG #031	15	31-Aug-16	02-Sep-16
Hot Commissioning - WTG #032	15	02-Sep-16	04-Sep-16
Hot Commissioning - WTG #033	15	04-Sep-16	07-Sep-16
Hot Commissioning - WTG #034	15	06-Sep-16	09-Sep-16
Hot Commissioning - WTG #035	15	09-Sep-16	12-Sep-16
Hot Commissioning - WTG #036	15	11-Sep-16	14-Sep-16
Hot Commissioning - WTG #037	15	14-Sep-16	17-Sep-16
Hot Commissioning - WTG #038	15	17-Sep-16	19-Sep-16
Hot Commissioning - WTG #039	15	19-Sep-16	22-Sep-16
Hot Commissioning - WTG #040	15	22-Sep-16	24-Sep-16
Hot Commissioning - WTG #041	15	25-Sep-16	27-Sep-16
Hot Commissioning - WTG #042	15	27-Sep-16	29-Sep-16
Hot Commissioning - WTG #043	15	30-Sep-16	02-Oct-16
Hot Commissioning - WTG #044	15	02-Oct-16	04-Oct-16
Hot Commissioning - WTG #045	15	05-Oct-16	07-Oct-16
Hot Commissioning - WTG #046	15	07-Oct-16	09-Oct-16
Hot Commissioning - WTG #047	15	09-Oct-16	12-Oct-16
Hot Commissioning - WTG #048	15	12-Oct-16	14-Oct-16
Hot Commissioning - WTG #049	15	18-Oct-16	20-Oct-16
Hot Commissioning - WTG #050	15	21-Oct-16	23-Oct-16
Hot Commissioning - WTG #051	15	24-Oct-16	27-Oct-16
Hot Commissioning - WTG #052	15	27-Oct-16	30-Oct-16
Hot Commissioning - WTG #053	15	30-Oct-16	02-Nov-16
Hot Commissioning - WTG #054	15	02-Nov-16	05-Nov-16
Hot Commissioning - WTG #055	15	06-Nov-16	08-Nov-16
Hot Commissioning - WTG #056	15	09-Nov-16	11-Nov-16
Hot Commissioning - WTG #057	15	17-Nov-16	19-Nov-16
Hot Commissioning - WTG #058	15	20-Nov-16	22-Nov-16
Hot Commissioning - WTG #059	15	24-Nov-16	26-Nov-16
Hot Commissioning - WTG #060	15	27-Nov-16	29-Nov-16
Hot Commissioning - WTG #061	15	01-Dec-16	03-Dec-16
Hot Commissioning - WTG #062	15	04-Dec-16	06-Dec-16
Hot Commissioning - WTG #063	15	08-Dec-16	11-Dec-16
Hot Commissioning - WTG #064	15	11-Dec-16	14-Dec-16
Hot Commissioning - WTG #065	15	17-Dec-16	19-Dec-16
Hot Commissioning - WTG #066	15	19-Dec-16	22-Dec-16
Hot Commissioning - WTG #067	15	24-Dec-16	26-Dec-16
Hot Commissioning - WTG #068	15	26-Dec-16	29-Dec-16
Hot Commissioning - WTG #069	15	30-Dec-16	02-Jan-17
Hot Commissioning - WTG #070	15	02-Jan-17	05-Jan-17
Hot Commissioning - WTG #071	15	06-Jan-17	09-Jan-17
Hot Commissioning - WTG #072	15	09-Jan-17	12-Jan-17
Hot Commissioning - WTG #073	15	15-Jan-17	18-Jan-17
Hot Commissioning - WTG #074	15	18-Jan-17	21-Jan-17
Hot Commissioning - WTG #075	15	23-Jan-17	25-Jan-17
Hot Commissioning - WTG #076	15	26-Jan-17	29-Jan-17
Hot Commissioning - WTG #077	15	31-Jan-17	02-Feb-17
Hot Commissioning - WTG #078	15	03-Feb-17	05-Feb-17

Figure A.1 : Bottom fixed offshore wind farm construction planning (continues)

Activity Name	Duration (Hour)	Start	Finish
Hot Commissioning - WTG#079	15	07-Feb-17	09-Feb-17
Hot Commissioning - WTG#080	15	13-Feb-17	16-Feb-17
Hot Commissioning - WTG#081	15	13-Feb-17	16-Feb-17
Hot Commissioning - WTG#082	15	16-Feb-17	19-Feb-17
Hot Commissioning - WTG#083	15	20-Feb-17	22-Feb-17
Functional Test / SCADA Test	2917	24-Jun-16	22-Feb-17
Functional Test / SCADA Test - WTG	2917	24-Jun-16	22-Feb-17
Functional Test / SCADA Test - WTG#001	0	24-Jun-16	24-Jun-16
Functional Test / SCADA Test - WTG#002	0	26-Jun-16	26-Jun-16
Functional Test / SCADA Test - WTG#003	0	28-Jun-16	28-Jun-16
Functional Test / SCADA Test - WTG#004	0	30-Jun-16	30-Jun-16
Functional Test / SCADA Test - WTG#005	0	03-Jul-16	03-Jul-16
Functional Test / SCADA Test - WTG#006	0	05-Jul-16	05-Jul-16
Functional Test / SCADA Test - WTG#007	0	08-Jul-16	08-Jul-16
Functional Test / SCADA Test - WTG#008	0	10-Jul-16	10-Jul-16
Functional Test / SCADA Test - WTG#009	0	13-Jul-16	13-Jul-16
Functional Test / SCADA Test - WTG#010	0	15-Jul-16	15-Jul-16
Functional Test / SCADA Test - WTG#011	0	17-Jul-16	17-Jul-16
Functional Test / SCADA Test - WTG#012	0	19-Jul-16	19-Jul-16
Functional Test / SCADA Test - WTG#013	0	22-Jul-16	22-Jul-16
Functional Test / SCADA Test - WTG#014	0	24-Jul-16	24-Jul-16
Functional Test / SCADA Test - WTG#015	0	27-Jul-16	27-Jul-16
Functional Test / SCADA Test - WTG#016	0	29-Jul-16	29-Jul-16
Functional Test / SCADA Test - WTG#017	0	01-Aug-16	01-Aug-16
Functional Test / SCADA Test - WTG#018	0	03-Aug-16	03-Aug-16
Functional Test / SCADA Test - WTG#019	0	05-Aug-16	05-Aug-16
Functional Test / SCADA Test - WTG#020	0	07-Aug-16	07-Aug-16
Functional Test / SCADA Test - WTG#021	0	10-Aug-16	10-Aug-16
Functional Test / SCADA Test - WTG#022	0	11-Aug-16	11-Aug-16
Functional Test / SCADA Test - WTG#023	0	14-Aug-16	14-Aug-16
Functional Test / SCADA Test - WTG#024	0	16-Aug-16	16-Aug-16
Functional Test / SCADA Test - WTG#025	0	19-Aug-16	19-Aug-16
Functional Test / SCADA Test - WTG#026	0	21-Aug-16	21-Aug-16
Functional Test / SCADA Test - WTG#027	0	23-Aug-16	23-Aug-16
Functional Test / SCADA Test - WTG#028	0	26-Aug-16	26-Aug-16
Functional Test / SCADA Test - WTG#029	0	28-Aug-16	28-Aug-16
Functional Test / SCADA Test - WTG#030	0	30-Aug-16	30-Aug-16
Functional Test / SCADA Test - WTG#031	0	02-Sep-16	02-Sep-16
Functional Test / SCADA Test - WTG#032	0	04-Sep-16	04-Sep-16
Functional Test / SCADA Test - WTG#033	0	07-Sep-16	07-Sep-16
Functional Test / SCADA Test - WTG#034	0	09-Sep-16	09-Sep-16
Functional Test / SCADA Test - WTG#035	0	12-Sep-16	12-Sep-16
Functional Test / SCADA Test - WTG#036	0	14-Sep-16	14-Sep-16
Functional Test / SCADA Test - WTG#037	0	17-Sep-16	17-Sep-16
Functional Test / SCADA Test - WTG#038	0	19-Sep-16	19-Sep-16
Functional Test / SCADA Test - WTG#039	0	22-Sep-16	22-Sep-16
Functional Test / SCADA Test - WTG#040	0	24-Sep-16	24-Sep-16
Functional Test / SCADA Test - WTG#041	0	27-Sep-16	27-Sep-16
Functional Test / SCADA Test - WTG#042	0	29-Sep-16	29-Sep-16
Functional Test / SCADA Test - WTG#043	0	02-Oct-16	02-Oct-16
Functional Test / SCADA Test - WTG#044	0	04-Oct-16	04-Oct-16
Functional Test / SCADA Test - WTG#045	0	07-Oct-16	07-Oct-16
Functional Test / SCADA Test - WTG#046	0	09-Oct-16	09-Oct-16
Functional Test / SCADA Test - WTG#047	0	12-Oct-16	12-Oct-16

Figure A.1 : Bottom fixed offshore wind farm construction planning (continues)

Activity Name	Duration (Hour)	Start	Finish
Functional Test / SCADA Test - WTG #048	0	14-Oct-16	14-Oct-16
Functional Test / SCADA Test - WTG #049	0	20-Oct-16	20-Oct-16
Functional Test / SCADA Test - WTG #050	0	23-Oct-16	23-Oct-16
Functional Test / SCADA Test - WTG #051	0	27-Oct-16	27-Oct-16
Functional Test / SCADA Test - WTG #052	0	30-Oct-16	30-Oct-16
Functional Test / SCADA Test - WTG #053	0	02-Nov-16	02-Nov-16
Functional Test / SCADA Test - WTG #054	0	05-Nov-16	05-Nov-16
Functional Test / SCADA Test - WTG #055	0	08-Nov-16	08-Nov-16
Functional Test / SCADA Test - WTG #056	0	11-Nov-16	11-Nov-16
Functional Test / SCADA Test - WTG #057	0	19-Nov-16	19-Nov-16
Functional Test / SCADA Test - WTG #058	0	22-Nov-16	22-Nov-16
Functional Test / SCADA Test - WTG #059	0	26-Nov-16	26-Nov-16
Functional Test / SCADA Test - WTG #060	0	29-Nov-16	29-Nov-16
Functional Test / SCADA Test - WTG #061	0	03-Dec-16	03-Dec-16
Functional Test / SCADA Test - WTG #062	0	06-Dec-16	06-Dec-16
Functional Test / SCADA Test - WTG #063	0	11-Dec-16	11-Dec-16
Functional Test / SCADA Test - WTG #064	0	14-Dec-16	14-Dec-16
Functional Test / SCADA Test - WTG #065	0	19-Dec-16	19-Dec-16
Functional Test / SCADA Test - WTG #066	0	22-Dec-16	22-Dec-16
Functional Test / SCADA Test - WTG #067	0	26-Dec-16	26-Dec-16
Functional Test / SCADA Test - WTG #068	0	29-Dec-16	29-Dec-16
Functional Test / SCADA Test - WTG #069	0	02-Jan-17	02-Jan-17
Functional Test / SCADA Test - WTG #070	0	05-Jan-17	05-Jan-17
Functional Test / SCADA Test - WTG #071	0	09-Jan-17	09-Jan-17
Functional Test / SCADA Test - WTG #072	0	12-Jan-17	12-Jan-17
Functional Test / SCADA Test - WTG #073	0	18-Jan-17	18-Jan-17
Functional Test / SCADA Test - WTG #074	0	21-Jan-17	21-Jan-17
Functional Test / SCADA Test - WTG #075	0	25-Jan-17	25-Jan-17
Functional Test / SCADA Test - WTG #076	0	29-Jan-17	29-Jan-17
Functional Test / SCADA Test - WTG #077	0	02-Feb-17	02-Feb-17
Functional Test / SCADA Test - WTG #078	0	05-Feb-17	05-Feb-17
Functional Test / SCADA Test - WTG #079	0	09-Feb-17	09-Feb-17
Functional Test / SCADA Test - WTG #080	0	16-Feb-17	16-Feb-17
Functional Test / SCADA Test - WTG #081	0	16-Feb-17	16-Feb-17
Functional Test / SCADA Test - WTG #082	0	19-Feb-17	19-Feb-17
Functional Test / SCADA Test - WTG #083	0	22-Feb-17	22-Feb-17
Run-In Period / Slow Start	2917	24-Jun-16	22-Feb-17
Run-In Period / Slow Start - WTG	2917	24-Jun-16	22-Feb-17
Run-In Period / Slow Start - WTG #001	0	24-Jun-16	24-Jun-16
Run-In Period / Slow Start - WTG #002	0	26-Jun-16	26-Jun-16
Run-In Period / Slow Start - WTG #003	0	28-Jun-16	28-Jun-16
Run-In Period / Slow Start - WTG #004	0	30-Jun-16	30-Jun-16
Run-In Period / Slow Start - WTG #005	0	03-Jul-16	03-Jul-16
Run-In Period / Slow Start - WTG #006	0	05-Jul-16	05-Jul-16
Run-In Period / Slow Start - WTG #007	0	08-Jul-16	08-Jul-16
Run-In Period / Slow Start - WTG #008	0	10-Jul-16	10-Jul-16
Run-In Period / Slow Start - WTG #009	0	13-Jul-16	13-Jul-16
Run-In Period / Slow Start - WTG #010	0	15-Jul-16	15-Jul-16
Run-In Period / Slow Start - WTG #011	0	17-Jul-16	17-Jul-16
Run-In Period / Slow Start - WTG #012	0	19-Jul-16	19-Jul-16
Run-In Period / Slow Start - WTG #013	0	22-Jul-16	22-Jul-16
Run-In Period / Slow Start - WTG #014	0	24-Jul-16	24-Jul-16
Run-In Period / Slow Start - WTG #015	0	27-Jul-16	27-Jul-16
Run-In Period / Slow Start - WTG #016	0	29-Jul-16	29-Jul-16

Figure A.1 : Bottom fixed offshore wind farm construction planning (continues)

Activity Name	Duration (Hour)	Start	Finish
Run-In Period / Slow Start - WTG #017	0	01-Aug-16	01-Aug-16
Run-In Period / Slow Start - WTG #018	0	03-Aug-16	03-Aug-16
Run-In Period / Slow Start - WTG #019	0	05-Aug-16	05-Aug-16
Run-In Period / Slow Start - WTG #020	0	07-Aug-16	07-Aug-16
Run-In Period / Slow Start - WTG #021	0	10-Aug-16	10-Aug-16
Run-In Period / Slow Start - WTG #022	0	11-Aug-16	11-Aug-16
Run-In Period / Slow Start - WTG #023	0	14-Aug-16	14-Aug-16
Run-In Period / Slow Start - WTG #024	0	16-Aug-16	16-Aug-16
Run-In Period / Slow Start - WTG #025	0	19-Aug-16	19-Aug-16
Run-In Period / Slow Start - WTG #026	0	21-Aug-16	21-Aug-16
Run-In Period / Slow Start - WTG #027	0	23-Aug-16	23-Aug-16
Run-In Period / Slow Start - WTG #028	0	26-Aug-16	26-Aug-16
Run-In Period / Slow Start - WTG #029	0	28-Aug-16	28-Aug-16
Run-In Period / Slow Start - WTG #030	0	30-Aug-16	30-Aug-16
Run-In Period / Slow Start - WTG #031	0	02-Sep-16	02-Sep-16
Run-In Period / Slow Start - WTG #032	0	04-Sep-16	04-Sep-16
Run-In Period / Slow Start - WTG #033	0	07-Sep-16	07-Sep-16
Run-In Period / Slow Start - WTG #034	0	09-Sep-16	09-Sep-16
Run-In Period / Slow Start - WTG #035	0	12-Sep-16	12-Sep-16
Run-In Period / Slow Start - WTG #036	0	14-Sep-16	14-Sep-16
Run-In Period / Slow Start - WTG #037	0	17-Sep-16	17-Sep-16
Run-In Period / Slow Start - WTG #038	0	19-Sep-16	19-Sep-16
Run-In Period / Slow Start - WTG #039	0	22-Sep-16	22-Sep-16
Run-In Period / Slow Start - WTG #040	0	24-Sep-16	24-Sep-16
Run-In Period / Slow Start - WTG #041	0	27-Sep-16	27-Sep-16
Run-In Period / Slow Start - WTG #042	0	29-Sep-16	29-Sep-16
Run-In Period / Slow Start - WTG #043	0	02-Oct-16	02-Oct-16
Run-In Period / Slow Start - WTG #044	0	04-Oct-16	04-Oct-16
Run-In Period / Slow Start - WTG #045	0	07-Oct-16	07-Oct-16
Run-In Period / Slow Start - WTG #046	0	09-Oct-16	09-Oct-16
Run-In Period / Slow Start - WTG #047	0	12-Oct-16	12-Oct-16
Run-In Period / Slow Start - WTG #048	0	14-Oct-16	14-Oct-16
Run-In Period / Slow Start - WTG #049	0	20-Oct-16	20-Oct-16
Run-In Period / Slow Start - WTG #050	0	23-Oct-16	23-Oct-16
Run-In Period / Slow Start - WTG #051	0	27-Oct-16	27-Oct-16
Run-In Period / Slow Start - WTG #052	0	30-Oct-16	30-Oct-16
Run-In Period / Slow Start - WTG #053	0	02-Nov-16	02-Nov-16
Run-In Period / Slow Start - WTG #054	0	05-Nov-16	05-Nov-16
Run-In Period / Slow Start - WTG #055	0	08-Nov-16	08-Nov-16
Run-In Period / Slow Start - WTG #056	0	11-Nov-16	11-Nov-16
Run-In Period / Slow Start - WTG #057	0	19-Nov-16	19-Nov-16
Run-In Period / Slow Start - WTG #058	0	22-Nov-16	22-Nov-16
Run-In Period / Slow Start - WTG #059	0	26-Nov-16	26-Nov-16
Run-In Period / Slow Start - WTG #060	0	29-Nov-16	29-Nov-16
Run-In Period / Slow Start - WTG #061	0	03-Dec-16	03-Dec-16
Run-In Period / Slow Start - WTG #062	0	06-Dec-16	06-Dec-16
Run-In Period / Slow Start - WTG #063	0	11-Dec-16	11-Dec-16
Run-In Period / Slow Start - WTG #064	0	14-Dec-16	14-Dec-16
Run-In Period / Slow Start - WTG #065	0	19-Dec-16	19-Dec-16
Run-In Period / Slow Start - WTG #066	0	22-Dec-16	22-Dec-16
Run-In Period / Slow Start - WTG #067	0	26-Dec-16	26-Dec-16
Run-In Period / Slow Start - WTG #068	0	29-Dec-16	29-Dec-16
Run-In Period / Slow Start - WTG #069	0	02-Jan-17	02-Jan-17
Run-In Period / Slow Start - WTG #070	0	05-Jan-17	05-Jan-17

Figure A.1 : Bottom fixed offshore wind farm construction planning (continues)

Activity Name	Duration (Hour)	Start	Finish
Run-In Period / Slow Start - WTG #071	0	09-Jan-17	09-Jan-17
Run-In Period / Slow Start - WTG #072	0	12-Jan-17	12-Jan-17
Run-In Period / Slow Start - WTG #073	0	18-Jan-17	18-Jan-17
Run-In Period / Slow Start - WTG #074	0	21-Jan-17	21-Jan-17
Run-In Period / Slow Start - WTG #075	0	25-Jan-17	25-Jan-17
Run-In Period / Slow Start - WTG #076	0	29-Jan-17	29-Jan-17
Run-In Period / Slow Start - WTG #077	0	02-Feb-17	02-Feb-17
Run-In Period / Slow Start - WTG #078	0	05-Feb-17	05-Feb-17
Run-In Period / Slow Start - WTG #079	0	09-Feb-17	09-Feb-17
Run-In Period / Slow Start - WTG #080	0	16-Feb-17	16-Feb-17
Run-In Period / Slow Start - WTG #081	0	16-Feb-17	16-Feb-17
Run-In Period / Slow Start - WTG #082	0	19-Feb-17	19-Feb-17
Run-In Period / Slow Start - WTG #083	0	22-Feb-17	22-Feb-17
Reliability Testing (240h)	6073	24-Jun-16	04-Mar-17
Reliability Testing (240h) - WTG #001	240	24-Jun-16	04-Jul-16
Reliability Testing (240h) - WTG #002	240	26-Jun-16	06-Jul-16
Reliability Testing (240h) - WTG #003	240	28-Jun-16	08-Jul-16
Reliability Testing (240h) - WTG #004	240	30-Jun-16	10-Jul-16
Reliability Testing (240h) - WTG #005	240	03-Jul-16	13-Jul-16
Reliability Testing (240h) - WTG #006	240	05-Jul-16	15-Jul-16
Reliability Testing (240h) - WTG #007	240	08-Jul-16	18-Jul-16
Reliability Testing (240h) - WTG #008	240	10-Jul-16	20-Jul-16
Reliability Testing (240h) - WTG #009	240	13-Jul-16	23-Jul-16
Reliability Testing (240h) - WTG #010	240	15-Jul-16	25-Jul-16
Reliability Testing (240h) - WTG #011	240	17-Jul-16	27-Jul-16
Reliability Testing (240h) - WTG #012	240	19-Jul-16	29-Jul-16
Reliability Testing (240h) - WTG #013	240	22-Jul-16	01-Aug-16
Reliability Testing (240h) - WTG #014	240	24-Jul-16	03-Aug-16
Reliability Testing (240h) - WTG #015	240	27-Jul-16	06-Aug-16
Reliability Testing (240h) - WTG #016	240	29-Jul-16	08-Aug-16
Reliability Testing (240h) - WTG #017	240	01-Aug-16	11-Aug-16
Reliability Testing (240h) - WTG #018	240	03-Aug-16	13-Aug-16
Reliability Testing (240h) - WTG #019	240	05-Aug-16	15-Aug-16
Reliability Testing (240h) - WTG #020	240	07-Aug-16	17-Aug-16
Reliability Testing (240h) - WTG #021	240	10-Aug-16	20-Aug-16
Reliability Testing (240h) - WTG #022	240	11-Aug-16	21-Aug-16
Reliability Testing (240h) - WTG #023	240	14-Aug-16	24-Aug-16
Reliability Testing (240h) - WTG #024	240	16-Aug-16	26-Aug-16
Reliability Testing (240h) - WTG #025	240	19-Aug-16	29-Aug-16
Reliability Testing (240h) - WTG #026	240	21-Aug-16	31-Aug-16
Reliability Testing (240h) - WTG #027	240	23-Aug-16	02-Sep-16
Reliability Testing (240h) - WTG #028	240	26-Aug-16	05-Sep-16
Reliability Testing (240h) - WTG #029	240	28-Aug-16	07-Sep-16
Reliability Testing (240h) - WTG #030	240	30-Aug-16	09-Sep-16
Reliability Testing (240h) - WTG #031	240	02-Sep-16	12-Sep-16
Reliability Testing (240h) - WTG #032	240	04-Sep-16	14-Sep-16
Reliability Testing (240h) - WTG #033	240	07-Sep-16	17-Sep-16
Reliability Testing (240h) - WTG #034	240	09-Sep-16	19-Sep-16
Reliability Testing (240h) - WTG #035	240	12-Sep-16	22-Sep-16
Reliability Testing (240h) - WTG #036	240	14-Sep-16	24-Sep-16
Reliability Testing (240h) - WTG #037	240	17-Sep-16	27-Sep-16
Reliability Testing (240h) - WTG #038	240	19-Sep-16	29-Sep-16
Reliability Testing (240h) - WTG #039	240	22-Sep-16	02-Oct-16
Reliability Testing (240h) - WTG #040	240	24-Sep-16	04-Oct-16

Figure A.1 : Bottom fixed offshore wind farm construction planning (continues)

Activity Name	Duration (Hour)	Start	Finish
Reliability Testing (240h) - WTG #041	240	27-Sep-16	07-Oct-16
Reliability Testing (240h) - WTG #042	240	29-Sep-16	09-Oct-16
Reliability Testing (240h) - WTG #043	240	02-Oct-16	12-Oct-16
Reliability Testing (240h) - WTG #044	240	04-Oct-16	14-Oct-16
Reliability Testing (240h) - WTG #045	240	07-Oct-16	17-Oct-16
Reliability Testing (240h) - WTG #046	240	09-Oct-16	19-Oct-16
Reliability Testing (240h) - WTG #047	240	12-Oct-16	22-Oct-16
Reliability Testing (240h) - WTG #048	240	14-Oct-16	24-Oct-16
Reliability Testing (240h) - WTG #049	240	20-Oct-16	30-Oct-16
Reliability Testing (240h) - WTG #050	240	23-Oct-16	02-Nov-16
Reliability Testing (240h) - WTG #051	240	27-Oct-16	06-Nov-16
Reliability Testing (240h) - WTG #052	240	30-Oct-16	09-Nov-16
Reliability Testing (240h) - WTG #053	240	02-Nov-16	12-Nov-16
Reliability Testing (240h) - WTG #054	240	05-Nov-16	15-Nov-16
Reliability Testing (240h) - WTG #055	240	08-Nov-16	18-Nov-16
Reliability Testing (240h) - WTG #056	240	11-Nov-16	21-Nov-16
Reliability Testing (240h) - WTG #057	240	19-Nov-16	29-Nov-16
Reliability Testing (240h) - WTG #058	240	22-Nov-16	02-Dec-16
Reliability Testing (240h) - WTG #059	240	26-Nov-16	06-Dec-16
Reliability Testing (240h) - WTG #060	240	29-Nov-16	09-Dec-16
Reliability Testing (240h) - WTG #061	240	03-Dec-16	13-Dec-16
Reliability Testing (240h) - WTG #062	240	06-Dec-16	16-Dec-16
Reliability Testing (240h) - WTG #063	240	11-Dec-16	21-Dec-16
Reliability Testing (240h) - WTG #064	240	14-Dec-16	24-Dec-16
Reliability Testing (240h) - WTG #065	240	19-Dec-16	29-Dec-16
Reliability Testing (240h) - WTG #066	240	22-Dec-16	01-Jan-17
Reliability Testing (240h) - WTG #067	240	26-Dec-16	05-Jan-17
Reliability Testing (240h) - WTG #068	240	29-Dec-16	08-Jan-17
Reliability Testing (240h) - WTG #069	240	02-Jan-17	12-Jan-17
Reliability Testing (240h) - WTG #070	240	05-Jan-17	15-Jan-17
Reliability Testing (240h) - WTG #071	240	09-Jan-17	19-Jan-17
Reliability Testing (240h) - WTG #072	240	12-Jan-17	22-Jan-17
Reliability Testing (240h) - WTG #073	240	18-Jan-17	28-Jan-17
Reliability Testing (240h) - WTG #074	240	21-Jan-17	31-Jan-17
Reliability Testing (240h) - WTG #075	240	25-Jan-17	04-Feb-17
Reliability Testing (240h) - WTG #076	240	29-Jan-17	08-Feb-17
Reliability Testing (240h) - WTG #077	240	02-Feb-17	12-Feb-17
Reliability Testing (240h) - WTG #078	240	05-Feb-17	15-Feb-17
Reliability Testing (240h) - WTG #079	240	09-Feb-17	19-Feb-17
Reliability Testing (240h) - WTG #080	240	16-Feb-17	26-Feb-17
Reliability Testing (240h) - WTG #081	240	16-Feb-17	26-Feb-17
Reliability Testing (240h) - WTG #082	240	19-Feb-17	01-Mar-17
Reliability Testing (240h) - WTG #083	240	22-Feb-17	04-Mar-17
Acceptance (PM650)	1379	04-Jul-16	16-Mar-17
Turbine Supply Agreement (TSA)	1379	04-Jul-16	16-Mar-17
QA Walk Down	1407	04-Jul-16	06-Mar-17
QA Walk Down - WTG #001	8	04-Jul-16	05-Jul-16
QA Walk Down - WTG #002	8	06-Jul-16	07-Jul-16
QA Walk Down - WTG #003	8	08-Jul-16	11-Jul-16
QA Walk Down - WTG #004	8	11-Jul-16	11-Jul-16
QA Walk Down - WTG #005	8	13-Jul-16	14-Jul-16
QA Walk Down - WTG #006	8	15-Jul-16	18-Jul-16
QA Walk Down - WTG #007	8	18-Jul-16	19-Jul-16
QA Walk Down - WTG #008	8	20-Jul-16	21-Jul-16

Figure A.1 : Bottom fixed offshore wind farm construction planning (continues)

Activity Name	Duration (Hour)	Start	Finish
QA Walk Down - WTG #009	8	25-Jul-16	25-Jul-16
QA Walk Down - WTG #010	8	25-Jul-16	26-Jul-16
QA Walk Down - WTG #011	8	27-Jul-16	28-Jul-16
QA Walk Down - WTG #012	8	29-Jul-16	01-Aug-16
QA Walk Down - WTG #013	8	01-Aug-16	02-Aug-16
QA Walk Down - WTG #014	8	03-Aug-16	04-Aug-16
QA Walk Down - WTG #015	8	08-Aug-16	08-Aug-16
QA Walk Down - WTG #016	8	08-Aug-16	09-Aug-16
QA Walk Down - WTG #017	8	11-Aug-16	12-Aug-16
QA Walk Down - WTG #018	8	15-Aug-16	15-Aug-16
QA Walk Down - WTG #019	8	15-Aug-16	16-Aug-16
QA Walk Down - WTG #020	8	17-Aug-16	18-Aug-16
QA Walk Down - WTG #021	8	22-Aug-16	22-Aug-16
QA Walk Down - WTG #022	8	22-Aug-16	22-Aug-16
QA Walk Down - WTG #023	8	24-Aug-16	25-Aug-16
QA Walk Down - WTG #024	8	26-Aug-16	29-Aug-16
QA Walk Down - WTG #025	8	29-Aug-16	30-Aug-16
QA Walk Down - WTG #026	8	31-Aug-16	01-Sep-16
QA Walk Down - WTG #027	8	02-Sep-16	05-Sep-16
QA Walk Down - WTG #028	8	05-Sep-16	06-Sep-16
QA Walk Down - WTG #029	8	07-Sep-16	08-Sep-16
QA Walk Down - WTG #030	8	09-Sep-16	12-Sep-16
QA Walk Down - WTG #031	8	12-Sep-16	13-Sep-16
QA Walk Down - WTG #032	8	14-Sep-16	15-Sep-16
QA Walk Down - WTG #033	8	19-Sep-16	19-Sep-16
QA Walk Down - WTG #034	8	19-Sep-16	20-Sep-16
QA Walk Down - WTG #035	8	22-Sep-16	23-Sep-16
QA Walk Down - WTG #036	8	26-Sep-16	26-Sep-16
QA Walk Down - WTG #037	8	27-Sep-16	28-Sep-16
QA Walk Down - WTG #038	8	29-Sep-16	30-Sep-16
QA Walk Down - WTG #039	8	03-Oct-16	03-Oct-16
QA Walk Down - WTG #040	8	04-Oct-16	05-Oct-16
QA Walk Down - WTG #041	8	07-Oct-16	10-Oct-16
QA Walk Down - WTG #042	8	10-Oct-16	10-Oct-16
QA Walk Down - WTG #043	8	12-Oct-16	13-Oct-16
QA Walk Down - WTG #044	8	14-Oct-16	17-Oct-16
QA Walk Down - WTG #045	8	17-Oct-16	18-Oct-16
QA Walk Down - WTG #046	8	19-Oct-16	20-Oct-16
QA Walk Down - WTG #047	8	24-Oct-16	24-Oct-16
QA Walk Down - WTG #048	8	24-Oct-16	25-Oct-16
QA Walk Down - WTG #049	8	31-Oct-16	31-Oct-16
QA Walk Down - WTG #050	8	02-Nov-16	03-Nov-16
QA Walk Down - WTG #051	8	07-Nov-16	07-Nov-16
QA Walk Down - WTG #052	8	09-Nov-16	10-Nov-16
QA Walk Down - WTG #053	8	14-Nov-16	14-Nov-16
QA Walk Down - WTG #054	8	15-Nov-16	16-Nov-16
QA Walk Down - WTG #055	8	18-Nov-16	21-Nov-16
QA Walk Down - WTG #056	8	21-Nov-16	22-Nov-16
QA Walk Down - WTG #057	8	29-Nov-16	30-Nov-16
QA Walk Down - WTG #058	8	02-Dec-16	05-Dec-16
QA Walk Down - WTG #059	8	06-Dec-16	07-Dec-16
QA Walk Down - WTG #060	8	09-Dec-16	12-Dec-16
QA Walk Down - WTG #061	8	13-Dec-16	14-Dec-16
QA Walk Down - WTG #062	8	16-Dec-16	19-Dec-16

Figure A.1 : Bottom fixed offshore wind farm construction planning (continues)

Activity Name	Duration (Hour)	Start	Finish
QA Walk Down - WTG #063	8	21-Dec-16	22-Dec-16
QA Walk Down - WTG #064	8	26-Dec-16	26-Dec-16
QA Walk Down - WTG #065	8	29-Dec-16	30-Dec-16
QA Walk Down - WTG #066	8	02-Jan-17	02-Jan-17
QA Walk Down - WTG #067	8	05-Jan-17	06-Jan-17
QA Walk Down - WTG #068	8	09-Jan-17	09-Jan-17
QA Walk Down - WTG #069	8	12-Jan-17	13-Jan-17
QA Walk Down - WTG #070	8	16-Jan-17	16-Jan-17
QA Walk Down - WTG #071	8	19-Jan-17	20-Jan-17
QA Walk Down - WTG #072	8	23-Jan-17	23-Jan-17
QA Walk Down - WTG #073	8	30-Jan-17	30-Jan-17
QA Walk Down - WTG #074	8	31-Jan-17	01-Feb-17
QA Walk Down - WTG #075	8	06-Feb-17	06-Feb-17
QA Walk Down - WTG #076	8	08-Feb-17	09-Feb-17
QA Walk Down - WTG #077	8	13-Feb-17	13-Feb-17
QA Walk Down - WTG #078	8	15-Feb-17	16-Feb-17
QA Walk Down - WTG #079	8	20-Feb-17	20-Feb-17
QA Walk Down - WTG #080	8	27-Feb-17	27-Feb-17
QA Walk Down - WTG #081	8	27-Feb-17	27-Feb-17
QA Walk Down - WTG #082	8	01-Mar-17	02-Mar-17
QA Walk Down - WTG #083	8	06-Mar-17	06-Mar-17
Snagging	3056	05-Jul-16	16-Mar-17
Snagging - WTG #001	120	05-Jul-16	15-Jul-16
Snagging - WTG #002	120	07-Jul-16	17-Jul-16
Snagging - WTG #003	120	11-Jul-16	21-Jul-16
Snagging - WTG #004	120	11-Jul-16	21-Jul-16
Snagging - WTG #005	120	14-Jul-16	24-Jul-16
Snagging - WTG #006	120	18-Jul-16	28-Jul-16
Snagging - WTG #007	120	19-Jul-16	29-Jul-16
Snagging - WTG #008	120	21-Jul-16	31-Jul-16
Snagging - WTG #009	120	25-Jul-16	04-Aug-16
Snagging - WTG #010	120	26-Jul-16	05-Aug-16
Snagging - WTG #011	120	28-Jul-16	07-Aug-16
Snagging - WTG #012	120	01-Aug-16	11-Aug-16
Snagging - WTG #013	120	02-Aug-16	12-Aug-16
Snagging - WTG #014	120	04-Aug-16	14-Aug-16
Snagging - WTG #015	120	08-Aug-16	18-Aug-16
Snagging - WTG #016	120	09-Aug-16	19-Aug-16
Snagging - WTG #017	120	12-Aug-16	22-Aug-16
Snagging - WTG #018	120	15-Aug-16	25-Aug-16
Snagging - WTG #019	120	16-Aug-16	26-Aug-16
Snagging - WTG #020	120	18-Aug-16	28-Aug-16
Snagging - WTG #021	120	22-Aug-16	01-Sep-16
Snagging - WTG #022	120	22-Aug-16	01-Sep-16
Snagging - WTG #023	120	25-Aug-16	04-Sep-16
Snagging - WTG #024	120	29-Aug-16	08-Sep-16
Snagging - WTG #025	120	30-Aug-16	09-Sep-16
Snagging - WTG #026	120	01-Sep-16	11-Sep-16
Snagging - WTG #027	120	05-Sep-16	15-Sep-16
Snagging - WTG #028	120	06-Sep-16	16-Sep-16
Snagging - WTG #029	120	08-Sep-16	18-Sep-16
Snagging - WTG #030	120	12-Sep-16	22-Sep-16
Snagging - WTG #031	120	13-Sep-16	23-Sep-16
Snagging - WTG #032	120	15-Sep-16	25-Sep-16

Figure A.1 : Bottom fixed offshore wind farm construction planning (continues)

Activity Name	Duration (Hour)	Start	Finish
Snagging - WTG #033	120	19-Sep-16	29-Sep-16
Snagging - WTG #034	120	20-Sep-16	30-Sep-16
Snagging - WTG #035	120	23-Sep-16	03-Oct-16
Snagging - WTG #036	120	26-Sep-16	06-Oct-16
Snagging - WTG #037	120	28-Sep-16	08-Oct-16
Snagging - WTG #038	120	30-Sep-16	10-Oct-16
Snagging - WTG #039	120	03-Oct-16	13-Oct-16
Snagging - WTG #040	120	05-Oct-16	15-Oct-16
Snagging - WTG #041	120	10-Oct-16	20-Oct-16
Snagging - WTG #042	120	10-Oct-16	20-Oct-16
Snagging - WTG #043	120	13-Oct-16	23-Oct-16
Snagging - WTG #044	120	17-Oct-16	27-Oct-16
Snagging - WTG #045	120	18-Oct-16	28-Oct-16
Snagging - WTG #046	120	20-Oct-16	30-Oct-16
Snagging - WTG #047	120	24-Oct-16	03-Nov-16
Snagging - WTG #048	120	25-Oct-16	04-Nov-16
Snagging - WTG #049	120	31-Oct-16	10-Nov-16
Snagging - WTG #050	120	03-Nov-16	13-Nov-16
Snagging - WTG #051	120	07-Nov-16	17-Nov-16
Snagging - WTG #052	120	10-Nov-16	20-Nov-16
Snagging - WTG #053	120	14-Nov-16	24-Nov-16
Snagging - WTG #054	120	16-Nov-16	26-Nov-16
Snagging - WTG #055	120	21-Nov-16	01-Dec-16
Snagging - WTG #056	120	22-Nov-16	02-Dec-16
Snagging - WTG #057	120	30-Nov-16	10-Dec-16
Snagging - WTG #058	120	05-Dec-16	15-Dec-16
Snagging - WTG #059	120	07-Dec-16	17-Dec-16
Snagging - WTG #060	120	12-Dec-16	22-Dec-16
Snagging - WTG #061	120	14-Dec-16	24-Dec-16
Snagging - WTG #062	120	19-Dec-16	29-Dec-16
Snagging - WTG #063	120	22-Dec-16	01-Jan-17
Snagging - WTG #064	120	26-Dec-16	05-Jan-17
Snagging - WTG #065	120	30-Dec-16	09-Jan-17
Snagging - WTG #066	120	02-Jan-17	12-Jan-17
Snagging - WTG #067	120	06-Jan-17	16-Jan-17
Snagging - WTG #068	120	09-Jan-17	19-Jan-17
Snagging - WTG #069	120	13-Jan-17	23-Jan-17
Snagging - WTG #070	120	16-Jan-17	26-Jan-17
Snagging - WTG #071	120	20-Jan-17	30-Jan-17
Snagging - WTG #072	120	23-Jan-17	02-Feb-17
Snagging - WTG #073	120	30-Jan-17	09-Feb-17
Snagging - WTG #074	120	01-Feb-17	11-Feb-17
Snagging - WTG #075	120	06-Feb-17	16-Feb-17
Snagging - WTG #076	120	09-Feb-17	19-Feb-17
Snagging - WTG #077	120	13-Feb-17	23-Feb-17
Snagging - WTG #078	120	16-Feb-17	26-Feb-17
Snagging - WTG #079	120	20-Feb-17	02-Mar-17
Snagging - WTG #080	120	27-Feb-17	09-Mar-17
Snagging - WTG #081	120	27-Feb-17	09-Mar-17
Snagging - WTG #082	120	02-Mar-17	12-Mar-17
Snagging - WTG #083	120	06-Mar-17	16-Mar-17

Figure A.1 : Bottom fixed offshore wind farm construction planning (continues)

APPENDIX B

Activity Name	Duration (Hour)	Start	Finish
Floating Offshore Wind Farm Project	1395	01-Jun-16	16-Feb-17
Construction / Installation	920	01-Jun-16	19-Nov-16
Lifting and Installation of Nacelle	1391	01-Jun-16	08-Sep-16
Lifting and Installation of Nacelle - WTG 001	6	01-Jun-16*	01-Jun-16
Lifting and Installation of Nacelle - WTG 002	6	02-Jun-16	03-Jun-16
Lifting and Installation of Nacelle - WTG 003	6	03-Jun-16	03-Jun-16
Lifting and Installation of Nacelle - WTG 004	6	04-Jun-16	05-Jun-16
Lifting and Installation of Nacelle - WTG 005	6	06-Jun-16	06-Jun-16
Lifting and Installation of Nacelle - WTG 006	6	07-Jun-16	08-Jun-16
Lifting and Installation of Nacelle - WTG 007	6	09-Jun-16	09-Jun-16
Lifting and Installation of Nacelle - WTG 008	6	10-Jun-16	10-Jun-16
Lifting and Installation of Nacelle - WTG 009	6	11-Jun-16	12-Jun-16
Lifting and Installation of Nacelle - WTG 010	6	13-Jun-16	13-Jun-16
Lifting and Installation of Nacelle - WTG 011	6	14-Jun-16	14-Jun-16
Lifting and Installation of Nacelle - WTG 012	6	15-Jun-16	16-Jun-16
Lifting and Installation of Nacelle - WTG 013	6	17-Jun-16	17-Jun-16
Lifting and Installation of Nacelle - WTG 014	6	18-Jun-16	18-Jun-16
Lifting and Installation of Nacelle - WTG 015	6	19-Jun-16	20-Jun-16
Lifting and Installation of Nacelle - WTG 016	6	21-Jun-16	21-Jun-16
Lifting and Installation of Nacelle - WTG 017	6	22-Jun-16	22-Jun-16
Lifting and Installation of Nacelle - WTG 018	6	23-Jun-16	24-Jun-16
Lifting and Installation of Nacelle - WTG 019	6	25-Jun-16	25-Jun-16
Lifting and Installation of Nacelle - WTG 020	6	26-Jun-16	26-Jun-16
Lifting and Installation of Nacelle - WTG 021	6	27-Jun-16	28-Jun-16
Lifting and Installation of Nacelle - WTG 022	6	29-Jun-16	29-Jun-16
Lifting and Installation of Nacelle - WTG 023	6	30-Jun-16	30-Jun-16
Lifting and Installation of Nacelle - WTG 024	6	01-Jul-16	01-Jul-16
Lifting and Installation of Nacelle - WTG 025	6	02-Jul-16	03-Jul-16
Lifting and Installation of Nacelle - WTG 026	6	03-Jul-16	04-Jul-16
Lifting and Installation of Nacelle - WTG 027	6	05-Jul-16	05-Jul-16
Lifting and Installation of Nacelle - WTG 028	6	06-Jul-16	06-Jul-16
Lifting and Installation of Nacelle - WTG 029	6	07-Jul-16	07-Jul-16
Lifting and Installation of Nacelle - WTG 030	6	08-Jul-16	08-Jul-16
Lifting and Installation of Nacelle - WTG 031	6	09-Jul-16	09-Jul-16
Lifting and Installation of Nacelle - WTG 032	6	10-Jul-16	10-Jul-16
Lifting and Installation of Nacelle - WTG 033	6	11-Jul-16	11-Jul-16
Lifting and Installation of Nacelle - WTG 034	6	12-Jul-16	12-Jul-16
Lifting and Installation of Nacelle - WTG 035	6	13-Jul-16	13-Jul-16
Lifting and Installation of Nacelle - WTG 036	6	14-Jul-16	14-Jul-16
Lifting and Installation of Nacelle - WTG 037	6	15-Jul-16	15-Jul-16
Lifting and Installation of Nacelle - WTG 038	6	16-Jul-16	16-Jul-16
Lifting and Installation of Nacelle - WTG 039	6	17-Jul-16	17-Jul-16
Lifting and Installation of Nacelle - WTG 040	6	18-Jul-16	18-Jul-16
Lifting and Installation of Nacelle - WTG 041	6	19-Jul-16	19-Jul-16
Lifting and Installation of Nacelle - WTG 042	6	20-Jul-16	20-Jul-16
Lifting and Installation of Nacelle - WTG 043	6	21-Jul-16	21-Jul-16
Lifting and Installation of Nacelle - WTG 044	6	22-Jul-16	22-Jul-16

Figure B.1 : Floating offshore wind farm project construction planning (continues)

Activity Name	Duration (Hour)	Start	Finish
Lifting and Installation of Nacelle - WTG 045	6	23-Jul-16	23-Jul-16
Lifting and Installation of Nacelle - WTG 046	6	24-Jul-16	24-Jul-16
Lifting and Installation of Nacelle - WTG 047	6	25-Jul-16	25-Jul-16
Lifting and Installation of Nacelle - WTG 048	6	26-Jul-16	26-Jul-16
Lifting and Installation of Nacelle - WTG 049	6	27-Jul-16	27-Jul-16
Lifting and Installation of Nacelle - WTG 050	6	28-Jul-16	28-Jul-16
Lifting and Installation of Nacelle - WTG 051	6	29-Jul-16	29-Jul-16
Lifting and Installation of Nacelle - WTG 052	6	30-Jul-16	30-Jul-16
Lifting and Installation of Nacelle - WTG 053	6	31-Jul-16	31-Jul-16
Lifting and Installation of Nacelle - WTG 054	6	01-Aug-16	01-Aug-16
Lifting and Installation of Nacelle - WTG 055	6	02-Aug-16	02-Aug-16
Lifting and Installation of Nacelle - WTG 056	6	03-Aug-16	04-Aug-16
Lifting and Installation of Nacelle - WTG 057	6	05-Aug-16	05-Aug-16
Lifting and Installation of Nacelle - WTG 058	6	06-Aug-16	06-Aug-16
Lifting and Installation of Nacelle - WTG 059	6	07-Aug-16	08-Aug-16
Lifting and Installation of Nacelle - WTG 060	6	09-Aug-16	09-Aug-16
Lifting and Installation of Nacelle - WTG 061	6	10-Aug-16	10-Aug-16
Lifting and Installation of Nacelle - WTG 062	6	11-Aug-16	12-Aug-16
Lifting and Installation of Nacelle - WTG 063	6	13-Aug-16	13-Aug-16
Lifting and Installation of Nacelle - WTG 064	6	14-Aug-16	14-Aug-16
Lifting and Installation of Nacelle - WTG 065	6	15-Aug-16	16-Aug-16
Lifting and Installation of Nacelle - WTG 066	6	17-Aug-16	17-Aug-16
Lifting and Installation of Nacelle - WTG 067	6	18-Aug-16	18-Aug-16
Lifting and Installation of Nacelle - WTG 068	6	19-Aug-16	20-Aug-16
Lifting and Installation of Nacelle - WTG 069	6	21-Aug-16	21-Aug-16
Lifting and Installation of Nacelle - WTG 070	6	22-Aug-16	22-Aug-16
Lifting and Installation of Nacelle - WTG 071	6	23-Aug-16	24-Aug-16
Lifting and Installation of Nacelle - WTG 072	6	25-Aug-16	25-Aug-16
Lifting and Installation of Nacelle - WTG 073	6	26-Aug-16	26-Aug-16
Lifting and Installation of Nacelle - WTG 074	6	27-Aug-16	28-Aug-16
Lifting and Installation of Nacelle - WTG 075	6	29-Aug-16	29-Aug-16
Lifting and Installation of Nacelle - WTG 076	6	30-Aug-16	30-Aug-16
Lifting and Installation of Nacelle - WTG 077	6	31-Aug-16	01-Sep-16
Lifting and Installation of Nacelle - WTG 078	6	02-Sep-16	02-Sep-16
Lifting and Installation of Nacelle - WTG 079	6	03-Sep-16	03-Sep-16
Lifting and Installation of Nacelle - WTG 080	6	04-Sep-16	04-Sep-16
Lifting and Installation of Nacelle - WTG 081	6	05-Sep-16	06-Sep-16
Lifting and Installation of Nacelle - WTG 082	6	07-Sep-16	07-Sep-16
Lifting and Installation of Nacelle - WTG 083	6	08-Sep-16	08-Sep-16
Lifting and Installation of Rotor	1395	01-Jun-16	09-Sep-16
Lifting and Installation of Rotor - WTG 001	10	01-Jun-16	02-Jun-16
Lifting and Installation of Rotor - WTG 002	10	03-Jun-16	04-Jun-16
Lifting and Installation of Rotor - WTG 003	10	03-Jun-16	04-Jun-16
Lifting and Installation of Rotor - WTG 004	10	05-Jun-16	06-Jun-16
Lifting and Installation of Rotor - WTG 005	10	06-Jun-16	07-Jun-16
Lifting and Installation of Rotor - WTG 006	10	08-Jun-16	08-Jun-16
Lifting and Installation of Rotor - WTG 007	10	09-Jun-16	10-Jun-16
Lifting and Installation of Rotor - WTG 008	10	10-Jun-16	11-Jun-16
Lifting and Installation of Rotor - WTG 009	10	12-Jun-16	12-Jun-16
Lifting and Installation of Rotor - WTG 010	10	13-Jun-16	14-Jun-16
Lifting and Installation of Rotor - WTG 011	10	14-Jun-16	15-Jun-16
Lifting and Installation of Rotor - WTG 012	10	16-Jun-16	16-Jun-16
Lifting and Installation of Rotor - WTG 013	10	17-Jun-16	18-Jun-16
Lifting and Installation of Rotor - WTG 014	10	18-Jun-16	19-Jun-16

Figure B.1 : Floating offshore wind farm project construction planning (continues)

Activity Name	Duration (Hour)	Start	Finish
Lifting and Installation of Rotor - WTG 015	10	20-Jun-16	20-Jun-16
Lifting and Installation of Rotor - WTG 016	10	21-Jun-16	22-Jun-16
Lifting and Installation of Rotor - WTG 017	10	22-Jun-16	23-Jun-16
Lifting and Installation of Rotor - WTG 018	10	24-Jun-16	24-Jun-16
Lifting and Installation of Rotor - WTG 019	10	25-Jun-16	26-Jun-16
Lifting and Installation of Rotor - WTG 020	10	26-Jun-16	27-Jun-16
Lifting and Installation of Rotor - WTG 021	10	28-Jun-16	28-Jun-16
Lifting and Installation of Rotor - WTG 022	10	29-Jun-16	30-Jun-16
Lifting and Installation of Rotor - WTG 023	10	30-Jun-16	01-Jul-16
Lifting and Installation of Rotor - WTG 024	10	02-Jul-16	02-Jul-16
Lifting and Installation of Rotor - WTG 025	10	03-Jul-16	03-Jul-16
Lifting and Installation of Rotor - WTG 026	10	04-Jul-16	04-Jul-16
Lifting and Installation of Rotor - WTG 027	10	05-Jul-16	05-Jul-16
Lifting and Installation of Rotor - WTG 028	10	06-Jul-16	06-Jul-16
Lifting and Installation of Rotor - WTG 029	10	07-Jul-16	07-Jul-16
Lifting and Installation of Rotor - WTG 030	10	08-Jul-16	08-Jul-16
Lifting and Installation of Rotor - WTG 031	10	09-Jul-16	09-Jul-16
Lifting and Installation of Rotor - WTG 032	10	10-Jul-16	10-Jul-16
Lifting and Installation of Rotor - WTG 033	10	11-Jul-16	11-Jul-16
Lifting and Installation of Rotor - WTG 034	10	12-Jul-16	12-Jul-16
Lifting and Installation of Rotor - WTG 035	10	13-Jul-16	13-Jul-16
Lifting and Installation of Rotor - WTG 036	10	14-Jul-16	14-Jul-16
Lifting and Installation of Rotor - WTG 037	10	15-Jul-16	15-Jul-16
Lifting and Installation of Rotor - WTG 038	10	16-Jul-16	16-Jul-16
Lifting and Installation of Rotor - WTG 039	10	17-Jul-16	17-Jul-16
Lifting and Installation of Rotor - WTG 040	10	18-Jul-16	18-Jul-16
Lifting and Installation of Rotor - WTG 041	10	19-Jul-16	19-Jul-16
Lifting and Installation of Rotor - WTG 042	10	20-Jul-16	20-Jul-16
Lifting and Installation of Rotor - WTG 043	10	21-Jul-16	21-Jul-16
Lifting and Installation of Rotor - WTG 044	10	22-Jul-16	22-Jul-16
Lifting and Installation of Rotor - WTG 045	10	23-Jul-16	23-Jul-16
Lifting and Installation of Rotor - WTG 046	10	24-Jul-16	24-Jul-16
Lifting and Installation of Rotor - WTG 047	10	25-Jul-16	25-Jul-16
Lifting and Installation of Rotor - WTG 048	10	26-Jul-16	26-Jul-16
Lifting and Installation of Rotor - WTG 049	10	27-Jul-16	27-Jul-16
Lifting and Installation of Rotor - WTG 050	10	28-Jul-16	28-Jul-16
Lifting and Installation of Rotor - WTG 051	10	29-Jul-16	29-Jul-16
Lifting and Installation of Rotor - WTG 052	10	30-Jul-16	30-Jul-16
Lifting and Installation of Rotor - WTG 053	10	31-Jul-16	31-Jul-16
Lifting and Installation of Rotor - WTG 054	10	01-Aug-16	02-Aug-16
Lifting and Installation of Rotor - WTG 055	10	02-Aug-16	03-Aug-16
Lifting and Installation of Rotor - WTG 056	10	04-Aug-16	04-Aug-16
Lifting and Installation of Rotor - WTG 057	10	05-Aug-16	06-Aug-16
Lifting and Installation of Rotor - WTG 058	10	06-Aug-16	07-Aug-16
Lifting and Installation of Rotor - WTG 059	10	08-Aug-16	08-Aug-16
Lifting and Installation of Rotor - WTG 060	10	09-Aug-16	10-Aug-16
Lifting and Installation of Rotor - WTG 061	10	10-Aug-16	11-Aug-16
Lifting and Installation of Rotor - WTG 062	10	12-Aug-16	12-Aug-16
Lifting and Installation of Rotor - WTG 063	10	13-Aug-16	14-Aug-16
Lifting and Installation of Rotor - WTG 064	10	14-Aug-16	15-Aug-16
Lifting and Installation of Rotor - WTG 065	10	16-Aug-16	16-Aug-16
Lifting and Installation of Rotor - WTG 066	10	17-Aug-16	18-Aug-16
Lifting and Installation of Rotor - WTG 067	10	18-Aug-16	19-Aug-16
Lifting and Installation of Rotor - WTG 068	10	20-Aug-16	20-Aug-16

Figure B.1 : Floating offshore wind farm project construction planning (continues)

Activity Name	Duration (Hour)	Start	Finish
Lifting and Installation of Rotor - WTG 069	10	21-Aug-16	22-Aug-16
Lifting and Installation of Rotor - WTG 070	10	22-Aug-16	23-Aug-16
Lifting and Installation of Rotor - WTG 071	10	24-Aug-16	24-Aug-16
Lifting and Installation of Rotor - WTG 072	10	25-Aug-16	26-Aug-16
Lifting and Installation of Rotor - WTG 073	10	26-Aug-16	27-Aug-16
Lifting and Installation of Rotor - WTG 074	10	28-Aug-16	28-Aug-16
Lifting and Installation of Rotor - WTG 075	10	29-Aug-16	30-Aug-16
Lifting and Installation of Rotor - WTG 076	10	30-Aug-16	31-Aug-16
Lifting and Installation of Rotor - WTG 077	10	01-Sep-16	01-Sep-16
Lifting and Installation of Rotor - WTG 078	10	02-Sep-16	03-Sep-16
Lifting and Installation of Rotor - WTG 079	10	03-Sep-16	04-Sep-16
Lifting and Installation of Rotor - WTG 080	10	05-Sep-16	05-Sep-16
Lifting and Installation of Rotor - WTG 081	10	06-Sep-16	06-Sep-16
Lifting and Installation of Rotor - WTG 082	10	07-Sep-16	08-Sep-16
Lifting and Installation of Rotor - WTG 083	10	08-Sep-16	09-Sep-16
Preparation for Installation	2356	02-Jun-16	09-Sep-16
Preparation for Installation - WTG 001	2	02-Jun-16	02-Jun-16
Preparation for Installation - WTG 002	2	03-Jun-16	03-Jun-16
Preparation for Installation - WTG 003	2	04-Jun-16	04-Jun-16
Preparation for Installation - WTG 004	2	06-Jun-16	06-Jun-16
Preparation for Installation - WTG 005	2	07-Jun-16	07-Jun-16
Preparation for Installation - WTG 006	2	08-Jun-16	08-Jun-16
Preparation for Installation - WTG 007	2	10-Jun-16	10-Jun-16
Preparation for Installation - WTG 008	2	11-Jun-16	11-Jun-16
Preparation for Installation - WTG 009	2	12-Jun-16	12-Jun-16
Preparation for Installation - WTG 010	2	14-Jun-16	14-Jun-16
Preparation for Installation - WTG 011	2	15-Jun-16	15-Jun-16
Preparation for Installation - WTG 012	2	16-Jun-16	16-Jun-16
Preparation for Installation - WTG 013	2	18-Jun-16	18-Jun-16
Preparation for Installation - WTG 014	2	19-Jun-16	19-Jun-16
Preparation for Installation - WTG 015	2	20-Jun-16	20-Jun-16
Preparation for Installation - WTG 016	2	22-Jun-16	22-Jun-16
Preparation for Installation - WTG 017	2	23-Jun-16	23-Jun-16
Preparation for Installation - WTG 018	2	24-Jun-16	24-Jun-16
Preparation for Installation - WTG 019	2	26-Jun-16	26-Jun-16
Preparation for Installation - WTG 020	2	27-Jun-16	27-Jun-16
Preparation for Installation - WTG 021	2	28-Jun-16	28-Jun-16
Preparation for Installation - WTG 022	2	30-Jun-16	30-Jun-16
Preparation for Installation - WTG 023	2	01-Jul-16	01-Jul-16
Preparation for Installation - WTG 024	2	02-Jul-16	02-Jul-16
Preparation for Installation - WTG 025	2	03-Jul-16	03-Jul-16
Preparation for Installation - WTG 026	2	04-Jul-16	04-Jul-16
Preparation for Installation - WTG 027	2	05-Jul-16	05-Jul-16
Preparation for Installation - WTG 028	2	06-Jul-16	06-Jul-16
Preparation for Installation - WTG 029	2	07-Jul-16	07-Jul-16
Preparation for Installation - WTG 030	2	08-Jul-16	08-Jul-16
Preparation for Installation - WTG 031	2	09-Jul-16	09-Jul-16
Preparation for Installation - WTG 032	2	10-Jul-16	10-Jul-16
Preparation for Installation - WTG 033	2	11-Jul-16	11-Jul-16
Preparation for Installation - WTG 034	2	12-Jul-16	12-Jul-16
Preparation for Installation - WTG 035	2	13-Jul-16	13-Jul-16
Preparation for Installation - WTG 036	2	14-Jul-16	14-Jul-16
Preparation for Installation - WTG 037	2	15-Jul-16	15-Jul-16
Preparation for Installation - WTG 038	2	16-Jul-16	16-Jul-16

Figure B.1 : Floating offshore wind farm project construction planning (continues)

Activity Name	Duration (Hour)	Start	Finish
Preparation for Installation - WTG 039	2	17-Jul-16	17-Jul-16
Preparation for Installation - WTG 040	2	18-Jul-16	18-Jul-16
Preparation for Installation - WTG 041	2	19-Jul-16	19-Jul-16
Preparation for Installation - WTG 042	2	20-Jul-16	20-Jul-16
Preparation for Installation - WTG 043	2	21-Jul-16	21-Jul-16
Preparation for Installation - WTG 044	2	22-Jul-16	22-Jul-16
Preparation for Installation - WTG 045	2	23-Jul-16	23-Jul-16
Preparation for Installation - WTG 046	2	24-Jul-16	24-Jul-16
Preparation for Installation - WTG 047	2	25-Jul-16	25-Jul-16
Preparation for Installation - WTG 048	2	26-Jul-16	26-Jul-16
Preparation for Installation - WTG 049	2	27-Jul-16	27-Jul-16
Preparation for Installation - WTG 050	2	28-Jul-16	28-Jul-16
Preparation for Installation - WTG 051	2	29-Jul-16	29-Jul-16
Preparation for Installation - WTG 052	2	30-Jul-16	30-Jul-16
Preparation for Installation - WTG 053	2	31-Jul-16	31-Jul-16
Preparation for Installation - WTG 054	2	02-Aug-16	02-Aug-16
Preparation for Installation - WTG 055	2	03-Aug-16	03-Aug-16
Preparation for Installation - WTG 056	2	04-Aug-16	04-Aug-16
Preparation for Installation - WTG 057	2	06-Aug-16	06-Aug-16
Preparation for Installation - WTG 058	2	07-Aug-16	07-Aug-16
Preparation for Installation - WTG 059	2	08-Aug-16	08-Aug-16
Preparation for Installation - WTG 060	2	10-Aug-16	10-Aug-16
Preparation for Installation - WTG 061	2	11-Aug-16	11-Aug-16
Preparation for Installation - WTG 062	2	12-Aug-16	12-Aug-16
Preparation for Installation - WTG 063	2	14-Aug-16	14-Aug-16
Preparation for Installation - WTG 064	2	15-Aug-16	15-Aug-16
Preparation for Installation - WTG 065	2	16-Aug-16	16-Aug-16
Preparation for Installation - WTG 066	2	18-Aug-16	18-Aug-16
Preparation for Installation - WTG 067	2	19-Aug-16	19-Aug-16
Preparation for Installation - WTG 068	2	20-Aug-16	20-Aug-16
Preparation for Installation - WTG 069	2	22-Aug-16	22-Aug-16
Preparation for Installation - WTG 070	2	23-Aug-16	23-Aug-16
Preparation for Installation - WTG 071	2	24-Aug-16	24-Aug-16
Preparation for Installation - WTG 072	2	26-Aug-16	26-Aug-16
Preparation for Installation - WTG 073	2	27-Aug-16	27-Aug-16
Preparation for Installation - WTG 074	2	28-Aug-16	28-Aug-16
Preparation for Installation - WTG 075	2	30-Aug-16	30-Aug-16
Preparation for Installation - WTG 076	2	31-Aug-16	31-Aug-16
Preparation for Installation - WTG 077	2	01-Sep-16	01-Sep-16
Preparation for Installation - WTG 078	2	03-Sep-16	03-Sep-16
Preparation for Installation - WTG 079	2	04-Sep-16	04-Sep-16
Preparation for Installation - WTG 080	2	05-Sep-16	05-Sep-16
Preparation for Installation - WTG 081	2	06-Sep-16	06-Sep-16
Preparation for Installation - WTG 082	2	08-Sep-16	08-Sep-16
Preparation for Installation - WTG 083	2	09-Sep-16	09-Sep-16
Mechanical Completion - WTG	1302	03-Jun-16	15-Nov-16
Mechanical Completion - WTG #001	31	03-Jun-16	06-Jun-16
Mechanical Completion - WTG #002	31	04-Jun-16	07-Jun-16
Mechanical Completion - WTG #003	31	06-Jun-16	10-Jun-16
Mechanical Completion - WTG #004	31	07-Jun-16	11-Jun-16
Mechanical Completion - WTG #005	31	10-Jun-16	14-Jun-16
Mechanical Completion - WTG #006	31	11-Jun-16	15-Jun-16
Mechanical Completion - WTG #007	31	14-Jun-16	18-Jun-16
Mechanical Completion - WTG #008	31	15-Jun-16	19-Jun-16

Figure B.1 : Floating offshore wind farm project construction planning (continues)

Activity Name	Duration (Hour)	Start	Finish
Mechanical Completion - WTG #009	31	18-Jun-16	22-Jun-16
Mechanical Completion - WTG #010	31	19-Jun-16	23-Jun-16
Mechanical Completion - WTG #011	31	22-Jun-16	26-Jun-16
Mechanical Completion - WTG #012	31	23-Jun-16	27-Jun-16
Mechanical Completion - WTG #013	31	26-Jun-16	30-Jun-16
Mechanical Completion - WTG #014	31	27-Jun-16	01-Jul-16
Mechanical Completion - WTG #015	31	30-Jun-16	03-Jul-16
Mechanical Completion - WTG #016	31	01-Jul-16	04-Jul-16
Mechanical Completion - WTG #017	31	04-Jul-16	07-Jul-16
Mechanical Completion - WTG #018	31	05-Jul-16	08-Jul-16
Mechanical Completion - WTG #019	31	07-Jul-16	11-Jul-16
Mechanical Completion - WTG #020	31	08-Jul-16	12-Jul-16
Mechanical Completion - WTG #021	31	11-Jul-16	15-Jul-16
Mechanical Completion - WTG #022	31	12-Jul-16	16-Jul-16
Mechanical Completion - WTG #023	31	15-Jul-16	19-Jul-16
Mechanical Completion - WTG #024	31	16-Jul-16	20-Jul-16
Mechanical Completion - WTG #025	31	19-Jul-16	23-Jul-16
Mechanical Completion - WTG #026	31	20-Jul-16	24-Jul-16
Mechanical Completion - WTG #027	31	23-Jul-16	27-Jul-16
Mechanical Completion - WTG #028	31	24-Jul-16	28-Jul-16
Mechanical Completion - WTG #029	31	27-Jul-16	31-Jul-16
Mechanical Completion - WTG #030	31	28-Jul-16	01-Aug-16
Mechanical Completion - WTG #031	31	31-Jul-16	03-Aug-16
Mechanical Completion - WTG #032	31	01-Aug-16	04-Aug-16
Mechanical Completion - WTG #033	31	04-Aug-16	07-Aug-16
Mechanical Completion - WTG #034	31	05-Aug-16	08-Aug-16
Mechanical Completion - WTG #035	31	07-Aug-16	11-Aug-16
Mechanical Completion - WTG #036	31	08-Aug-16	12-Aug-16
Mechanical Completion - WTG #037	31	11-Aug-16	15-Aug-16
Mechanical Completion - WTG #038	31	12-Aug-16	16-Aug-16
Mechanical Completion - WTG #039	31	15-Aug-16	19-Aug-16
Mechanical Completion - WTG #040	31	16-Aug-16	20-Aug-16
Mechanical Completion - WTG #041	31	19-Aug-16	23-Aug-16
Mechanical Completion - WTG #042	31	20-Aug-16	24-Aug-16
Mechanical Completion - WTG #043	31	23-Aug-16	27-Aug-16
Mechanical Completion - WTG #044	31	24-Aug-16	28-Aug-16
Mechanical Completion - WTG #045	31	27-Aug-16	31-Aug-16
Mechanical Completion - WTG #046	31	28-Aug-16	01-Sep-16
Mechanical Completion - WTG #047	31	31-Aug-16	03-Sep-16
Mechanical Completion - WTG #048	31	01-Sep-16	04-Sep-16
Mechanical Completion - WTG #049	31	04-Sep-16	07-Sep-16
Mechanical Completion - WTG #050	31	05-Sep-16	08-Sep-16
Mechanical Completion - WTG #051	31	07-Sep-16	11-Sep-16
Mechanical Completion - WTG #052	31	08-Sep-16	12-Sep-16
Mechanical Completion - WTG #053	31	11-Sep-16	15-Sep-16
Mechanical Completion - WTG #054	31	12-Sep-16	16-Sep-16
Mechanical Completion - WTG #055	31	15-Sep-16	19-Sep-16
Mechanical Completion - WTG #056	31	16-Sep-16	20-Sep-16
Mechanical Completion - WTG #057	31	19-Sep-16	23-Sep-16
Mechanical Completion - WTG #058	31	20-Sep-16	24-Sep-16
Mechanical Completion - WTG #059	31	23-Sep-16	27-Sep-16
Mechanical Completion - WTG #060	31	24-Sep-16	28-Sep-16
Mechanical Completion - WTG #061	31	27-Sep-16	01-Oct-16
Mechanical Completion - WTG #062	31	28-Sep-16	02-Oct-16

Figure B.1 : Floating offshore wind farm project construction planning (continues)

Activity Name	Duration (Hour)	Start	Finish
Mechanical Completion - WTG #063	31	01-Oct-16	05-Oct-16
Mechanical Completion - WTG #064	31	02-Oct-16	06-Oct-16
Mechanical Completion - WTG #065	31	05-Oct-16	09-Oct-16
Mechanical Completion - WTG #066	31	06-Oct-16	10-Oct-16
Mechanical Completion - WTG #067	31	09-Oct-16	13-Oct-16
Mechanical Completion - WTG #068	31	10-Oct-16	14-Oct-16
Mechanical Completion - WTG #069	31	13-Oct-16	17-Oct-16
Mechanical Completion - WTG #070	31	14-Oct-16	18-Oct-16
Mechanical Completion - WTG #071	31	17-Oct-16	21-Oct-16
Mechanical Completion - WTG #072	31	18-Oct-16	22-Oct-16
Mechanical Completion - WTG #073	31	21-Oct-16	25-Oct-16
Mechanical Completion - WTG #074	31	22-Oct-16	26-Oct-16
Mechanical Completion - WTG #075	31	25-Oct-16	30-Oct-16
Mechanical Completion - WTG #076	31	27-Oct-16	31-Oct-16
Mechanical Completion - WTG #077	31	30-Oct-16	03-Nov-16
Mechanical Completion - WTG #078	31	31-Oct-16	04-Nov-16
Mechanical Completion - WTG #079	31	03-Nov-16	07-Nov-16
Mechanical Completion - WTG #080	31	04-Nov-16	08-Nov-16
Mechanical Completion - WTG #081	31	07-Nov-16	11-Nov-16
Mechanical Completion - WTG #082	31	08-Nov-16	12-Nov-16
Mechanical Completion - WTG #083	31	11-Nov-16	15-Nov-16
Electrical Completion - WTG	894	06-Jun-16	19-Nov-16
Electrical Completion - WTG	3985	06-Jun-16	19-Nov-16
Electrical Completion - WTG #001	33	06-Jun-16	10-Jun-16
Electrical Completion - WTG #002	33	07-Jun-16	11-Jun-16
Electrical Completion - WTG #003	33	10-Jun-16	14-Jun-16
Electrical Completion - WTG #004	33	11-Jun-16	15-Jun-16
Electrical Completion - WTG #005	33	14-Jun-16	18-Jun-16
Electrical Completion - WTG #006	33	15-Jun-16	19-Jun-16
Electrical Completion - WTG #007	33	18-Jun-16	22-Jun-16
Electrical Completion - WTG #008	33	19-Jun-16	23-Jun-16
Electrical Completion - WTG #009	33	22-Jun-16	26-Jun-16
Electrical Completion - WTG #010	33	23-Jun-16	27-Jun-16
Electrical Completion - WTG #011	33	26-Jun-16	30-Jun-16
Electrical Completion - WTG #012	33	27-Jun-16	01-Jul-16
Electrical Completion - WTG #013	33	30-Jun-16	04-Jul-16
Electrical Completion - WTG #014	33	01-Jul-16	05-Jul-16
Electrical Completion - WTG #015	33	04-Jul-16	08-Jul-16
Electrical Completion - WTG #016	33	05-Jul-16	09-Jul-16
Electrical Completion - WTG #017	33	07-Jul-16	11-Jul-16
Electrical Completion - WTG #018	33	08-Jul-16	12-Jul-16
Electrical Completion - WTG #019	33	11-Jul-16	15-Jul-16
Electrical Completion - WTG #020	33	12-Jul-16	16-Jul-16
Electrical Completion - WTG #021	33	15-Jul-16	19-Jul-16
Electrical Completion - WTG #022	33	16-Jul-16	20-Jul-16
Electrical Completion - WTG #023	33	19-Jul-16	23-Jul-16
Electrical Completion - WTG #024	33	20-Jul-16	24-Jul-16
Electrical Completion - WTG #025	33	23-Jul-16	27-Jul-16
Electrical Completion - WTG #026	33	24-Jul-16	28-Jul-16
Electrical Completion - WTG #027	33	27-Jul-16	31-Jul-16
Electrical Completion - WTG #028	33	28-Jul-16	01-Aug-16
Electrical Completion - WTG #029	33	31-Jul-16	04-Aug-16
Electrical Completion - WTG #030	33	01-Aug-16	05-Aug-16
Electrical Completion - WTG #031	33	04-Aug-16	08-Aug-16

Figure B.1 : Floating offshore wind farm project construction planning (continues)

Activity Name	Duration (Hour)	Start	Finish
Electrical Completion - WTG #032	33	05-Aug-16	09-Aug-16
Electrical Completion - WTG #033	33	07-Aug-16	11-Aug-16
Electrical Completion - WTG #034	33	08-Aug-16	12-Aug-16
Electrical Completion - WTG #035	33	11-Aug-16	15-Aug-16
Electrical Completion - WTG #036	33	12-Aug-16	16-Aug-16
Electrical Completion - WTG #037	33	15-Aug-16	19-Aug-16
Electrical Completion - WTG #038	33	16-Aug-16	20-Aug-16
Electrical Completion - WTG #039	33	19-Aug-16	23-Aug-16
Electrical Completion - WTG #040	33	20-Aug-16	24-Aug-16
Electrical Completion - WTG #041	33	23-Aug-16	27-Aug-16
Electrical Completion - WTG #042	33	24-Aug-16	28-Aug-16
Electrical Completion - WTG #043	33	27-Aug-16	31-Aug-16
Electrical Completion - WTG #044	33	28-Aug-16	01-Sep-16
Electrical Completion - WTG #045	33	31-Aug-16	04-Sep-16
Electrical Completion - WTG #046	33	01-Sep-16	05-Sep-16
Electrical Completion - WTG #047	33	04-Sep-16	08-Sep-16
Electrical Completion - WTG #048	33	05-Sep-16	09-Sep-16
Electrical Completion - WTG #049	33	07-Sep-16	11-Sep-16
Electrical Completion - WTG #050	33	08-Sep-16	12-Sep-16
Electrical Completion - WTG #051	33	11-Sep-16	15-Sep-16
Electrical Completion - WTG #052	33	12-Sep-16	16-Sep-16
Electrical Completion - WTG #053	33	15-Sep-16	19-Sep-16
Electrical Completion - WTG #054	33	16-Sep-16	20-Sep-16
Electrical Completion - WTG #055	33	19-Sep-16	23-Sep-16
Electrical Completion - WTG #056	33	20-Sep-16	24-Sep-16
Electrical Completion - WTG #057	33	23-Sep-16	27-Sep-16
Electrical Completion - WTG #058	33	24-Sep-16	28-Sep-16
Electrical Completion - WTG #059	33	27-Sep-16	01-Oct-16
Electrical Completion - WTG #060	33	28-Sep-16	02-Oct-16
Electrical Completion - WTG #061	33	01-Oct-16	05-Oct-16
Electrical Completion - WTG #062	33	02-Oct-16	06-Oct-16
Electrical Completion - WTG #063	33	05-Oct-16	09-Oct-16
Electrical Completion - WTG #064	33	06-Oct-16	10-Oct-16
Electrical Completion - WTG #065	33	09-Oct-16	13-Oct-16
Electrical Completion - WTG #066	33	10-Oct-16	14-Oct-16
Electrical Completion - WTG #067	33	13-Oct-16	17-Oct-16
Electrical Completion - WTG #068	33	14-Oct-16	18-Oct-16
Electrical Completion - WTG #069	33	17-Oct-16	22-Oct-16
Electrical Completion - WTG #070	33	18-Oct-16	23-Oct-16
Electrical Completion - WTG #071	33	21-Oct-16	26-Oct-16
Electrical Completion - WTG #072	33	22-Oct-16	27-Oct-16
Electrical Completion - WTG #073	33	25-Oct-16	30-Oct-16
Electrical Completion - WTG #074	33	27-Oct-16	31-Oct-16
Electrical Completion - WTG #075	33	30-Oct-16	03-Nov-16
Electrical Completion - WTG #076	33	31-Oct-16	04-Nov-16
Electrical Completion - WTG #077	33	03-Nov-16	07-Nov-16
Electrical Completion - WTG #078	33	04-Nov-16	08-Nov-16
Electrical Completion - WTG #079	33	07-Nov-16	11-Nov-16
Electrical Completion - WTG #080	33	08-Nov-16	12-Nov-16
Electrical Completion - WTG #081	33	11-Nov-16	15-Nov-16
Electrical Completion - WTG #082	33	12-Nov-16	16-Nov-16
Electrical Completion - WTG #083	33	15-Nov-16	19-Nov-16
Commissioning (PM600)	1270	11-Jun-16	03-Feb-17

Figure B.1 : Floating offshore wind farm project construction planning (continues)

Activity Name	Duration (Hour)	Start	Finish
Pre-Commissioning	1294	11-Jun-16	23-Nov-16
Pre-Commissioning - WTG	1294	11-Jun-16	23-Nov-16
Pre-Commissioning - WTG #001	33	11-Jun-16	15-Jun-16
Pre-Commissioning - WTG #002	33	12-Jun-16	16-Jun-16
Pre-Commissioning - WTG #003	33	14-Jun-16	18-Jun-16
Pre-Commissioning - WTG #004	33	15-Jun-16	19-Jun-16
Pre-Commissioning - WTG #005	33	18-Jun-16	22-Jun-16
Pre-Commissioning - WTG #006	36	19-Jun-16	24-Jun-16
Pre-Commissioning - WTG #007	33	22-Jun-16	26-Jun-16
Pre-Commissioning - WTG #008	33	23-Jun-16	27-Jun-16
Pre-Commissioning - WTG #009	33	26-Jun-16	30-Jun-16
Pre-Commissioning - WTG #010	33	27-Jun-16	01-Jul-16
Pre-Commissioning - WTG #011	23	30-Jun-16	03-Jul-16
Pre-Commissioning - WTG #012	23	01-Jul-16	04-Jul-16
Pre-Commissioning - WTG #013	23	04-Jul-16	07-Jul-16
Pre-Commissioning - WTG #014	23	05-Jul-16	08-Jul-16
Pre-Commissioning - WTG #015	23	08-Jul-16	10-Jul-16
Pre-Commissioning - WTG #016	23	09-Jul-16	11-Jul-16
Pre-Commissioning - WTG #017	23	12-Jul-16	14-Jul-16
Pre-Commissioning - WTG #018	23	13-Jul-16	15-Jul-16
Pre-Commissioning - WTG #019	23	15-Jul-16	18-Jul-16
Pre-Commissioning - WTG #020	23	16-Jul-16	19-Jul-16
Pre-Commissioning - WTG #021	23	19-Jul-16	22-Jul-16
Pre-Commissioning - WTG #022	23	20-Jul-16	23-Jul-16
Pre-Commissioning - WTG #023	23	23-Jul-16	26-Jul-16
Pre-Commissioning - WTG #024	23	24-Jul-16	27-Jul-16
Pre-Commissioning - WTG #025	23	27-Jul-16	30-Jul-16
Pre-Commissioning - WTG #026	23	28-Jul-16	31-Jul-16
Pre-Commissioning - WTG #027	23	31-Jul-16	03-Aug-16
Pre-Commissioning - WTG #028	23	01-Aug-16	04-Aug-16
Pre-Commissioning - WTG #029	23	04-Aug-16	07-Aug-16
Pre-Commissioning - WTG #030	23	05-Aug-16	08-Aug-16
Pre-Commissioning - WTG #031	23	08-Aug-16	10-Aug-16
Pre-Commissioning - WTG #032	23	09-Aug-16	11-Aug-16
Pre-Commissioning - WTG #033	23	12-Aug-16	14-Aug-16
Pre-Commissioning - WTG #034	23	13-Aug-16	15-Aug-16
Pre-Commissioning - WTG #035	23	15-Aug-16	18-Aug-16
Pre-Commissioning - WTG #036	23	16-Aug-16	19-Aug-16
Pre-Commissioning - WTG #037	23	19-Aug-16	22-Aug-16
Pre-Commissioning - WTG #038	23	20-Aug-16	23-Aug-16
Pre-Commissioning - WTG #039	23	23-Aug-16	26-Aug-16
Pre-Commissioning - WTG #040	23	24-Aug-16	27-Aug-16
Pre-Commissioning - WTG #041	23	27-Aug-16	30-Aug-16
Pre-Commissioning - WTG #042	23	28-Aug-16	31-Aug-16
Pre-Commissioning - WTG #043	23	31-Aug-16	03-Sep-16
Pre-Commissioning - WTG #044	23	01-Sep-16	04-Sep-16
Pre-Commissioning - WTG #045	23	04-Sep-16	07-Sep-16
Pre-Commissioning - WTG #046	23	05-Sep-16	08-Sep-16
Pre-Commissioning - WTG #047	23	08-Sep-16	10-Sep-16
Pre-Commissioning - WTG #048	23	09-Sep-16	11-Sep-16
Pre-Commissioning - WTG #049	23	12-Sep-16	14-Sep-16
Pre-Commissioning - WTG #050	23	13-Sep-16	15-Sep-16
Pre-Commissioning - WTG #051	23	15-Sep-16	18-Sep-16
Pre-Commissioning - WTG #052	23	16-Sep-16	19-Sep-16

Figure B.1 : Floating offshore wind farm project construction planning (continues)

Activity Name	Duration (Hour)	Start	Finish
Pre-Commissioning - WTG #053	23	19-Sep-16	22-Sep-16
Pre-Commissioning - WTG #054	23	20-Sep-16	23-Sep-16
Pre-Commissioning - WTG #055	23	23-Sep-16	26-Sep-16
Pre-Commissioning - WTG #056	23	24-Sep-16	27-Sep-16
Pre-Commissioning - WTG #057	23	27-Sep-16	30-Sep-16
Pre-Commissioning - WTG #058	23	28-Sep-16	01-Oct-16
Pre-Commissioning - WTG #059	23	01-Oct-16	04-Oct-16
Pre-Commissioning - WTG #060	23	02-Oct-16	05-Oct-16
Pre-Commissioning - WTG #061	23	05-Oct-16	08-Oct-16
Pre-Commissioning - WTG #062	23	06-Oct-16	09-Oct-16
Pre-Commissioning - WTG #063	23	09-Oct-16	12-Oct-16
Pre-Commissioning - WTG #064	23	10-Oct-16	13-Oct-16
Pre-Commissioning - WTG #065	23	13-Oct-16	16-Oct-16
Pre-Commissioning - WTG #066	23	14-Oct-16	17-Oct-16
Pre-Commissioning - WTG #067	23	17-Oct-16	20-Oct-16
Pre-Commissioning - WTG #068	23	19-Oct-16	22-Oct-16
Pre-Commissioning - WTG #069	23	22-Oct-16	25-Oct-16
Pre-Commissioning - WTG #070	23	23-Oct-16	26-Oct-16
Pre-Commissioning - WTG #071	23	26-Oct-16	29-Oct-16
Pre-Commissioning - WTG #072	23	27-Oct-16	30-Oct-16
Pre-Commissioning - WTG #073	23	30-Oct-16	02-Nov-16
Pre-Commissioning - WTG #074	23	31-Oct-16	03-Nov-16
Pre-Commissioning - WTG #075	23	03-Nov-16	06-Nov-16
Pre-Commissioning - WTG #076	23	04-Nov-16	07-Nov-16
Pre-Commissioning - WTG #077	23	07-Nov-16	10-Nov-16
Pre-Commissioning - WTG #078	23	08-Nov-16	11-Nov-16
Pre-Commissioning - WTG #079	23	11-Nov-16	14-Nov-16
Pre-Commissioning - WTG #080	23	15-Nov-16	18-Nov-16
Pre-Commissioning - WTG #081	23	15-Nov-16	18-Nov-16
Pre-Commissioning - WTG #082	23	16-Nov-16	19-Nov-16
Pre-Commissioning - WTG #083	23	20-Nov-16	23-Nov-16
Turbine Merging with Floating Foundation	2760	15-Jun-16	25-Nov-16
Turbine Merging With Floating Hull in the Staging Port - WTG #001	31	15-Jun-16	17-Jun-16
Turbine Merging With Floating Hull in the Staging Port - WTG #002	31	16-Jun-16	18-Jun-16
Turbine Merging With Floating Hull in the Staging Port - WTG #003	31	18-Jun-16	20-Jun-16
Turbine Merging With Floating Hull in the Staging Port - WTG #004	31	19-Jun-16	21-Jun-16
Turbine Merging With Floating Hull in the Staging Port - WTG #005	31	22-Jun-16	24-Jun-16
Turbine Merging With Floating Hull in the Staging Port - WTG #006	31	24-Jun-16	26-Jun-16
Turbine Merging With Floating Hull in the Staging Port - WTG #007	31	26-Jun-16	28-Jun-16
Turbine Merging With Floating Hull in the Staging Port - WTG #008	31	27-Jun-16	29-Jun-16
Turbine Merging With Floating Hull in the Staging Port - WTG #009	31	30-Jun-16	02-Jul-16
Turbine Merging With Floating Hull in the Staging Port - WTG #010	31	01-Jul-16	03-Jul-16
Turbine Merging With Floating Hull in the Staging Port - WTG #011	31	03-Jul-16	04-Jul-16
Turbine Merging With Floating Hull in the Staging Port - WTG #012	31	04-Jul-16	05-Jul-16
Turbine Merging With Floating Hull in the Staging Port - WTG #013	31	07-Jul-16	08-Jul-16
Turbine Merging With Floating Hull in the Staging Port - WTG #014	31	08-Jul-16	09-Jul-16
Turbine Merging With Floating Hull in the Staging Port - WTG #015	31	10-Jul-16	12-Jul-16
Turbine Merging With Floating Hull in the Staging Port - WTG #016	31	11-Jul-16	13-Jul-16
Turbine Merging With Floating Hull in the Staging Port - WTG #017	31	14-Jul-16	16-Jul-16
Turbine Merging With Floating Hull in the Staging Port - WTG #018	31	15-Jul-16	17-Jul-16
Turbine Merging With Floating Hull in the Staging Port - WTG #019	31	18-Jul-16	20-Jul-16
Turbine Merging With Floating Hull in the Staging Port - WTG #020	31	19-Jul-16	21-Jul-16
Turbine Merging With Floating Hull in the Staging Port - WTG #021	31	22-Jul-16	24-Jul-16
Turbine Merging With Floating Hull in the Staging Port - WTG #022	31	23-Jul-16	25-Jul-16

Figure B.1 : Floating offshore wind farm project construction planning (continues)

Activity Name	Duration (Hour)	Start	Finish
Turbine Merging With Floating Hull in the Staging Port - WTG #023	31	26-Jul-16	28-Jul-16
Turbine Merging With Floating Hull in the Staging Port - WTG #024	31	27-Jul-16	29-Jul-16
Turbine Merging With Floating Hull in the Staging Port - WTG #025	31	30-Jul-16	31-Jul-16
Turbine Merging With Floating Hull in the Staging Port - WTG #026	31	31-Jul-16	02-Aug-16
Turbine Merging With Floating Hull in the Staging Port - WTG #027	31	03-Aug-16	05-Aug-16
Turbine Merging With Floating Hull in the Staging Port - WTG #028	31	04-Aug-16	06-Aug-16
Turbine Merging With Floating Hull in the Staging Port - WTG #029	31	07-Aug-16	08-Aug-16
Turbine Merging With Floating Hull in the Staging Port - WTG #030	31	08-Aug-16	09-Aug-16
Turbine Merging With Floating Hull in the Staging Port - WTG #031	31	10-Aug-16	12-Aug-16
Turbine Merging With Floating Hull in the Staging Port - WTG #032	31	11-Aug-16	13-Aug-16
Turbine Merging With Floating Hull in the Staging Port - WTG #033	31	14-Aug-16	16-Aug-16
Turbine Merging With Floating Hull in the Staging Port - WTG #034	31	15-Aug-16	17-Aug-16
Turbine Merging With Floating Hull in the Staging Port - WTG #035	31	18-Aug-16	20-Aug-16
Turbine Merging With Floating Hull in the Staging Port - WTG #036	31	19-Aug-16	21-Aug-16
Turbine Merging With Floating Hull in the Staging Port - WTG #037	31	22-Aug-16	24-Aug-16
Turbine Merging With Floating Hull in the Staging Port - WTG #038	31	23-Aug-16	25-Aug-16
Turbine Merging With Floating Hull in the Staging Port - WTG #039	31	26-Aug-16	28-Aug-16
Turbine Merging With Floating Hull in the Staging Port - WTG #040	31	27-Aug-16	29-Aug-16
Turbine Merging With Floating Hull in the Staging Port - WTG #041	31	30-Aug-16	01-Sep-16
Turbine Merging With Floating Hull in the Staging Port - WTG #042	31	31-Aug-16	02-Sep-16
Turbine Merging With Floating Hull in the Staging Port - WTG #043	31	03-Sep-16	05-Sep-16
Turbine Merging With Floating Hull in the Staging Port - WTG #044	31	04-Sep-16	06-Sep-16
Turbine Merging With Floating Hull in the Staging Port - WTG #045	31	07-Sep-16	09-Sep-16
Turbine Merging With Floating Hull in the Staging Port - WTG #046	31	08-Sep-16	10-Sep-16
Turbine Merging With Floating Hull in the Staging Port - WTG #047	31	10-Sep-16	12-Sep-16
Turbine Merging With Floating Hull in the Staging Port - WTG #048	31	11-Sep-16	13-Sep-16
Turbine Merging With Floating Hull in the Staging Port - WTG #049	31	14-Sep-16	16-Sep-16
Turbine Merging With Floating Hull in the Staging Port - WTG #050	31	15-Sep-16	17-Sep-16
Turbine Merging With Floating Hull in the Staging Port - WTG #051	31	18-Sep-16	20-Sep-16
Turbine Merging With Floating Hull in the Staging Port - WTG #052	31	19-Sep-16	21-Sep-16
Turbine Merging With Floating Hull in the Staging Port - WTG #053	31	22-Sep-16	24-Sep-16
Turbine Merging With Floating Hull in the Staging Port - WTG #054	31	23-Sep-16	25-Sep-16
Turbine Merging With Floating Hull in the Staging Port - WTG #055	31	26-Sep-16	28-Sep-16
Turbine Merging With Floating Hull in the Staging Port - WTG #056	31	27-Sep-16	29-Sep-16
Turbine Merging With Floating Hull in the Staging Port - WTG #057	31	30-Sep-16	02-Oct-16
Turbine Merging With Floating Hull in the Staging Port - WTG #058	31	01-Oct-16	03-Oct-16
Turbine Merging With Floating Hull in the Staging Port - WTG #059	31	04-Oct-16	06-Oct-16
Turbine Merging With Floating Hull in the Staging Port - WTG #060	31	05-Oct-16	07-Oct-16
Turbine Merging With Floating Hull in the Staging Port - WTG #061	31	08-Oct-16	10-Oct-16
Turbine Merging With Floating Hull in the Staging Port - WTG #062	31	09-Oct-16	11-Oct-16
Turbine Merging With Floating Hull in the Staging Port - WTG #063	31	12-Oct-16	14-Oct-16
Turbine Merging With Floating Hull in the Staging Port - WTG #064	31	13-Oct-16	15-Oct-16
Turbine Merging With Floating Hull in the Staging Port - WTG #065	31	16-Oct-16	18-Oct-16
Turbine Merging With Floating Hull in the Staging Port - WTG #066	31	17-Oct-16	19-Oct-16
Turbine Merging With Floating Hull in the Staging Port - WTG #067	31	20-Oct-16	22-Oct-16
Turbine Merging With Floating Hull in the Staging Port - WTG #068	31	22-Oct-16	24-Oct-16
Turbine Merging With Floating Hull in the Staging Port - WTG #069	31	25-Oct-16	27-Oct-16
Turbine Merging With Floating Hull in the Staging Port - WTG #070	31	26-Oct-16	28-Oct-16
Turbine Merging With Floating Hull in the Staging Port - WTG #071	31	29-Oct-16	31-Oct-16
Turbine Merging With Floating Hull in the Staging Port - WTG #072	31	30-Oct-16	01-Nov-16
Turbine Merging With Floating Hull in the Staging Port - WTG #073	31	02-Nov-16	04-Nov-16
Turbine Merging With Floating Hull in the Staging Port - WTG #074	31	03-Nov-16	05-Nov-16
Turbine Merging With Floating Hull in the Staging Port - WTG #075	31	06-Nov-16	08-Nov-16
Turbine Merging With Floating Hull in the Staging Port - WTG #076	31	07-Nov-16	09-Nov-16

Figure B.1 : Floating offshore wind farm project construction planning (continues)

Activity Name	Duration (Hour)	Start	Finish
Turbine Merging With Floating Hull in the Staging Port - WTG #077	31	10-Nov-16	12-Nov-16
Turbine Merging With Floating Hull in the Staging Port - WTG #078	31	11-Nov-16	13-Nov-16
Turbine Merging With Floating Hull in the Staging Port - WTG #079	31	14-Nov-16	16-Nov-16
Turbine Merging With Floating Hull in the Staging Port - WTG #080	31	18-Nov-16	21-Nov-16
Turbine Merging With Floating Hull in the Staging Port - WTG #081	31	18-Nov-16	21-Nov-16
Turbine Merging With Floating Hull in the Staging Port - WTG #082	31	19-Nov-16	22-Nov-16
Turbine Merging With Floating Hull in the Staging Port - WTG #083	31	23-Nov-16	25-Nov-16
Turbine Completion Before Transfer	3465	17-Jun-16	13-Jan-17
Turbine Completion Before Transfer - WTG #001	50	17-Jun-16	20-Jun-16
Turbine Completion Before Transfer - WTG #002	50	18-Jun-16	21-Jun-16
Turbine Completion Before Transfer - WTG #003	50	20-Jun-16	23-Jun-16
Turbine Completion Before Transfer - WTG #004	50	28-Jun-16	01-Jul-16
Turbine Completion Before Transfer - WTG #005	50	27-Jun-16	30-Jun-16
Turbine Completion Before Transfer - WTG #006	50	28-Jun-16	01-Jul-16
Turbine Completion Before Transfer - WTG #007	50	01-Jul-16	04-Jul-16
Turbine Completion Before Transfer - WTG #008	50	08-Jul-16	11-Jul-16
Turbine Completion Before Transfer - WTG #009	50	06-Jul-16	09-Jul-16
Turbine Completion Before Transfer - WTG #010	50	07-Jul-16	10-Jul-16
Turbine Completion Before Transfer - WTG #011	50	10-Jul-16	13-Jul-16
Turbine Completion Before Transfer - WTG #012	50	17-Jul-16	20-Jul-16
Turbine Completion Before Transfer - WTG #013	50	15-Jul-16	18-Jul-16
Turbine Completion Before Transfer - WTG #014	50	16-Jul-16	19-Jul-16
Turbine Completion Before Transfer - WTG #015	50	19-Jul-16	22-Jul-16
Turbine Completion Before Transfer - WTG #016	50	26-Jul-16	29-Jul-16
Turbine Completion Before Transfer - WTG #017	50	24-Jul-16	27-Jul-16
Turbine Completion Before Transfer - WTG #018	50	25-Jul-16	28-Jul-16
Turbine Completion Before Transfer - WTG #019	50	28-Jul-16	31-Jul-16
Turbine Completion Before Transfer - WTG #020	50	04-Aug-16	07-Aug-16
Turbine Completion Before Transfer - WTG #021	50	02-Aug-16	05-Aug-16
Turbine Completion Before Transfer - WTG #022	50	03-Aug-16	06-Aug-16
Turbine Completion Before Transfer - WTG #023	50	06-Aug-16	09-Aug-16
Turbine Completion Before Transfer - WTG #024	50	13-Aug-16	16-Aug-16
Turbine Completion Before Transfer - WTG #025	50	11-Aug-16	14-Aug-16
Turbine Completion Before Transfer - WTG #026	50	12-Aug-16	15-Aug-16
Turbine Completion Before Transfer - WTG #027	50	15-Aug-16	18-Aug-16
Turbine Completion Before Transfer - WTG #028	50	22-Aug-16	25-Aug-16
Turbine Completion Before Transfer - WTG #029	50	20-Aug-16	23-Aug-16
Turbine Completion Before Transfer - WTG #030	50	21-Aug-16	24-Aug-16
Turbine Completion Before Transfer - WTG #031	50	24-Aug-16	27-Aug-16
Turbine Completion Before Transfer - WTG #032	50	31-Aug-16	03-Sep-16
Turbine Completion Before Transfer - WTG #033	50	29-Aug-16	01-Sep-16
Turbine Completion Before Transfer - WTG #034	50	30-Aug-16	02-Sep-16
Turbine Completion Before Transfer - WTG #035	50	02-Sep-16	05-Sep-16
Turbine Completion Before Transfer - WTG #036	50	10-Sep-16	13-Sep-16
Turbine Completion Before Transfer - WTG #037	50	08-Sep-16	11-Sep-16
Turbine Completion Before Transfer - WTG #038	50	09-Sep-16	12-Sep-16
Turbine Completion Before Transfer - WTG #039	50	12-Sep-16	15-Sep-16
Turbine Completion Before Transfer - WTG #040	50	20-Sep-16	23-Sep-16
Turbine Completion Before Transfer - WTG #041	50	18-Sep-16	21-Sep-16
Turbine Completion Before Transfer - WTG #042	50	19-Sep-16	22-Sep-16
Turbine Completion Before Transfer - WTG #043	50	22-Sep-16	25-Sep-16
Turbine Completion Before Transfer - WTG #044	50	30-Sep-16	03-Oct-16
Turbine Completion Before Transfer - WTG #045	50	28-Sep-16	01-Oct-16
Turbine Completion Before Transfer - WTG #046	50	29-Sep-16	02-Oct-16

Figure B.1 : Floating offshore wind farm project construction planning (continues)

Activity Name	Duration (Hour)	Start	Finish
Turbine Completion Before Transfer - WTG #047	50	02-Oct-16	05-Oct-16
Turbine Completion Before Transfer - WTG #048	50	11-Oct-16	14-Oct-16
Turbine Completion Before Transfer - WTG #049	50	09-Oct-16	12-Oct-16
Turbine Completion Before Transfer - WTG #050	50	10-Oct-16	13-Oct-16
Turbine Completion Before Transfer - WTG #051	50	13-Oct-16	16-Oct-16
Turbine Completion Before Transfer - WTG #052	50	22-Oct-16	25-Oct-16
Turbine Completion Before Transfer - WTG #053	50	20-Oct-16	23-Oct-16
Turbine Completion Before Transfer - WTG #054	50	21-Oct-16	24-Oct-16
Turbine Completion Before Transfer - WTG #055	50	24-Oct-16	27-Oct-16
Turbine Completion Before Transfer - WTG #056	50	02-Nov-16	05-Nov-16
Turbine Completion Before Transfer - WTG #057	50	31-Oct-16	03-Nov-16
Turbine Completion Before Transfer - WTG #058	50	31-Oct-16	03-Nov-16
Turbine Completion Before Transfer - WTG #059	50	04-Nov-16	07-Nov-16
Turbine Completion Before Transfer - WTG #060	50	13-Nov-16	16-Nov-16
Turbine Completion Before Transfer - WTG #061	50	11-Nov-16	14-Nov-16
Turbine Completion Before Transfer - WTG #062	50	11-Nov-16	14-Nov-16
Turbine Completion Before Transfer - WTG #063	50	15-Nov-16	18-Nov-16
Turbine Completion Before Transfer - WTG #064	50	24-Nov-16	27-Nov-16
Turbine Completion Before Transfer - WTG #065	50	22-Nov-16	25-Nov-16
Turbine Completion Before Transfer - WTG #066	50	22-Nov-16	25-Nov-16
Turbine Completion Before Transfer - WTG #067	50	26-Nov-16	29-Nov-16
Turbine Completion Before Transfer - WTG #068	50	05-Dec-16	08-Dec-16
Turbine Completion Before Transfer - WTG #069	50	03-Dec-16	06-Dec-16
Turbine Completion Before Transfer - WTG #070	50	03-Dec-16	06-Dec-16
Turbine Completion Before Transfer - WTG #071	50	07-Dec-16	10-Dec-16
Turbine Completion Before Transfer - WTG #072	50	16-Dec-16	19-Dec-16
Turbine Completion Before Transfer - WTG #073	50	14-Dec-16	17-Dec-16
Turbine Completion Before Transfer - WTG #074	50	14-Dec-16	17-Dec-16
Turbine Completion Before Transfer - WTG #075	50	18-Dec-16	21-Dec-16
Turbine Completion Before Transfer - WTG #076	50	27-Dec-16	30-Dec-16
Turbine Completion Before Transfer - WTG #077	50	25-Dec-16	28-Dec-16
Turbine Completion Before Transfer - WTG #078	50	25-Dec-16	28-Dec-16
Turbine Completion Before Transfer - WTG #079	50	29-Dec-16	01-Jan-17
Turbine Completion Before Transfer - WTG #080	50	08-Jan-17	11-Jan-17
Turbine Completion Before Transfer - WTG #081	50	06-Jan-17	09-Jan-17
Turbine Completion Before Transfer - WTG #082	50	06-Jan-17	09-Jan-17
Turbine Completion Before Transfer - WTG #083	50	10-Jan-17	13-Jan-17
Transfer to Site	4191	20-Jun-16	14-Jan-17
WTG Transit to Site - WTG 001	13	20-Jun-16	20-Jun-16
WTG Transit to Site - WTG 002	13	21-Jun-16	21-Jun-16
WTG Transit to Site - WTG 003	13	24-Jun-16	24-Jun-16
WTG Transit to Site - WTG 004	13	02-Jul-16	02-Jul-16
WTG Transit to Site - WTG 005	13	30-Jun-16	30-Jun-16
WTG Transit to Site - WTG 006	13	01-Jul-16	01-Jul-16
WTG Transit to Site - WTG 007	13	04-Jul-16	04-Jul-16
WTG Transit to Site - WTG 008	13	11-Jul-16	12-Jul-16
WTG Transit to Site - WTG 009	13	09-Jul-16	10-Jul-16
WTG Transit to Site - WTG 010	13	10-Jul-16	11-Jul-16
WTG Transit to Site - WTG 011	13	13-Jul-16	14-Jul-16
WTG Transit to Site - WTG 012	13	20-Jul-16	21-Jul-16
WTG Transit to Site - WTG 013	13	18-Jul-16	19-Jul-16
WTG Transit to Site - WTG 014	13	19-Jul-16	20-Jul-16
WTG Transit to Site - WTG 015	13	22-Jul-16	23-Jul-16
WTG Transit to Site - WTG 016	13	29-Jul-16	30-Jul-16

Figure B.1 : Floating offshore wind farm project construction planning (continues)

Activity Name	Duration (Hour)	Start	Finish
WTG Transit to Site - WTG 017	13	27-Jul-16	28-Jul-16
WTG Transit to Site - WTG 018	13	28-Jul-16	29-Jul-16
WTG Transit to Site - WTG 019	13	31-Jul-16	01-Aug-16
WTG Transit to Site - WTG 020	13	07-Aug-16	08-Aug-16
WTG Transit to Site - WTG 021	13	05-Aug-16	06-Aug-16
WTG Transit to Site - WTG 022	13	06-Aug-16	07-Aug-16
WTG Transit to Site - WTG 023	13	09-Aug-16	10-Aug-16
WTG Transit to Site - WTG 024	13	16-Aug-16	17-Aug-16
WTG Transit to Site - WTG 025	13	14-Aug-16	15-Aug-16
WTG Transit to Site - WTG 026	13	15-Aug-16	16-Aug-16
WTG Transit to Site - WTG 027	13	18-Aug-16	19-Aug-16
WTG Transit to Site - WTG 028	13	25-Aug-16	26-Aug-16
WTG Transit to Site - WTG 029	13	23-Aug-16	24-Aug-16
WTG Transit to Site - WTG 030	13	24-Aug-16	25-Aug-16
WTG Transit to Site - WTG 031	13	27-Aug-16	28-Aug-16
WTG Transit to Site - WTG 032	13	03-Sep-16	03-Sep-16
WTG Transit to Site - WTG 033	13	01-Sep-16	02-Sep-16
WTG Transit to Site - WTG 034	13	02-Sep-16	02-Sep-16
WTG Transit to Site - WTG 035	13	05-Sep-16	06-Sep-16
WTG Transit to Site - WTG 036	13	13-Sep-16	13-Sep-16
WTG Transit to Site - WTG 037	13	11-Sep-16	11-Sep-16
WTG Transit to Site - WTG 038	13	12-Sep-16	12-Sep-16
WTG Transit to Site - WTG 039	13	15-Sep-16	15-Sep-16
WTG Transit to Site - WTG 040	13	23-Sep-16	23-Sep-16
WTG Transit to Site - WTG 041	13	21-Sep-16	21-Sep-16
WTG Transit to Site - WTG 042	13	22-Sep-16	22-Sep-16
WTG Transit to Site - WTG 043	13	25-Sep-16	25-Sep-16
WTG Transit to Site - WTG 044	13	03-Oct-16	03-Oct-16
WTG Transit to Site - WTG 045	13	01-Oct-16	01-Oct-16
WTG Transit to Site - WTG 046	13	02-Oct-16	02-Oct-16
WTG Transit to Site - WTG 047	13	05-Oct-16	05-Oct-16
WTG Transit to Site - WTG 048	13	14-Oct-16	14-Oct-16
WTG Transit to Site - WTG 049	13	12-Oct-16	12-Oct-16
WTG Transit to Site - WTG 050	13	13-Oct-16	13-Oct-16
WTG Transit to Site - WTG 051	13	16-Oct-16	16-Oct-16
WTG Transit to Site - WTG 052	13	25-Oct-16	25-Oct-16
WTG Transit to Site - WTG 053	13	23-Oct-16	23-Oct-16
WTG Transit to Site - WTG 054	13	24-Oct-16	24-Oct-16
WTG Transit to Site - WTG 055	13	27-Oct-16	27-Oct-16
WTG Transit to Site - WTG 056	13	05-Nov-16	06-Nov-16
WTG Transit to Site - WTG 057	13	03-Nov-16	04-Nov-16
WTG Transit to Site - WTG 058	13	03-Nov-16	04-Nov-16
WTG Transit to Site - WTG 059	13	07-Nov-16	08-Nov-16
WTG Transit to Site - WTG 060	13	16-Nov-16	17-Nov-16
WTG Transit to Site - WTG 061	13	14-Nov-16	15-Nov-16
WTG Transit to Site - WTG 062	13	14-Nov-16	15-Nov-16
WTG Transit to Site - WTG 063	13	18-Nov-16	19-Nov-16
WTG Transit to Site - WTG 064	13	27-Nov-16	28-Nov-16
WTG Transit to Site - WTG 065	13	25-Nov-16	26-Nov-16
WTG Transit to Site - WTG 066	13	25-Nov-16	26-Nov-16
WTG Transit to Site - WTG 067	13	29-Nov-16	30-Nov-16
WTG Transit to Site - WTG 068	13	08-Dec-16	09-Dec-16
WTG Transit to Site - WTG 069	13	06-Dec-16	07-Dec-16
WTG Transit to Site - WTG 070	13	06-Dec-16	07-Dec-16

Figure B.1 : Floating offshore wind farm project construction planning (continues)

Activity Name	Duration (Hour)	Start	Finish
WTG Transit to Site - WTG 071	13	10-Dec-16	11-Dec-16
WTG Transit to Site - WTG 072	13	19-Dec-16	20-Dec-16
WTG Transit to Site - WTG 073	13	17-Dec-16	18-Dec-16
WTG Transit to Site - WTG 074	13	17-Dec-16	18-Dec-16
WTG Transit to Site - WTG 075	13	21-Dec-16	22-Dec-16
WTG Transit to Site - WTG 076	13	30-Dec-16	31-Dec-16
WTG Transit to Site - WTG 077	13	28-Dec-16	29-Dec-16
WTG Transit to Site - WTG 078	13	28-Dec-16	29-Dec-16
WTG Transit to Site - WTG 079	13	01-Jan-17	02-Jan-17
WTG Transit to Site - WTG 080	13	11-Jan-17	12-Jan-17
WTG Transit to Site - WTG 081	13	09-Jan-17	10-Jan-17
WTG Transit to Site - WTG 082	13	09-Jan-17	10-Jan-17
WTG Transit to Site - WTG 083	13	13-Jan-17	14-Jan-17
Tendon Installation	**1412**	**21-Jun-16**	**18-Jan-17**
Tendon Installation- WTG 001	24	21-Jun-16	23-Jun-16
Tendon Installation- WTG 002	24	22-Jun-16	24-Jun-16
Tendon Installation- WTG 003	24	25-Jun-16	27-Jun-16
Tendon Installation- WTG 004	24	03-Jul-16	05-Jul-16
Tendon Installation- WTG 005	24	01-Jul-16	03-Jul-16
Tendon Installation- WTG 006	24	02-Jul-16	04-Jul-16
Tendon Installation- WTG 007	24	05-Jul-16	07-Jul-16
Tendon Installation- WTG 008	24	12-Jul-16	14-Jul-16
Tendon Installation- WTG 009	24	10-Jul-16	12-Jul-16
Tendon Installation- WTG 010	24	11-Jul-16	13-Jul-16
Tendon Installation- WTG 011	24	14-Jul-16	16-Jul-16
Tendon Installation- WTG 012	24	21-Jul-16	23-Jul-16
Tendon Installation- WTG 013	24	19-Jul-16	21-Jul-16
Tendon Installation- WTG 014	24	20-Jul-16	22-Jul-16
Tendon Installation- WTG 015	24	23-Jul-16	25-Jul-16
Tendon Installation- WTG 016	24	30-Jul-16	01-Aug-16
Tendon Installation- WTG 017	24	28-Jul-16	30-Jul-16
Tendon Installation- WTG 018	24	29-Jul-16	31-Jul-16
Tendon Installation- WTG 019	24	01-Aug-16	03-Aug-16
Tendon Installation- WTG 020	24	08-Aug-16	10-Aug-16
Tendon Installation- WTG 021	24	06-Aug-16	08-Aug-16
Tendon Installation- WTG 022	24	07-Aug-16	09-Aug-16
Tendon Installation- WTG 023	24	10-Aug-16	12-Aug-16
Tendon Installation- WTG 024	24	17-Aug-16	19-Aug-16
Tendon Installation- WTG 025	24	15-Aug-16	17-Aug-16
Tendon Installation- WTG 026	24	16-Aug-16	18-Aug-16
Tendon Installation- WTG 027	24	19-Aug-16	21-Aug-16
Tendon Installation- WTG 028	24	26-Aug-16	28-Aug-16
Tendon Installation- WTG 029	24	24-Aug-16	26-Aug-16
Tendon Installation- WTG 030	24	25-Aug-16	27-Aug-16
Tendon Installation- WTG 031	24	28-Aug-16	30-Aug-16
Tendon Installation- WTG 032	24	04-Sep-16	07-Sep-16
Tendon Installation- WTG 033	24	02-Sep-16	05-Sep-16
Tendon Installation- WTG 034	24	03-Sep-16	06-Sep-16
Tendon Installation- WTG 035	24	06-Sep-16	09-Sep-16
Tendon Installation- WTG 036	24	14-Sep-16	17-Sep-16
Tendon Installation- WTG 037	24	12-Sep-16	15-Sep-16
Tendon Installation- WTG 038	24	13-Sep-16	16-Sep-16
Tendon Installation- WTG 039	24	16-Sep-16	19-Sep-16
Tendon Installation- WTG 040	24	24-Sep-16	27-Sep-16

Figure B.1 : Floating offshore wind farm project construction planning (continues)

Activity Name	Duration (Hour)	Start	Finish
Tendon Installation- WTG 041	24	22-Sep-16	25-Sep-16
Tendon Installation- WTG 042	24	23-Sep-16	26-Sep-16
Tendon Installation- WTG 043	24	26-Sep-16	29-Sep-16
Tendon Installation- WTG 044	24	04-Oct-16	07-Oct-16
Tendon Installation- WTG 045	24	02-Oct-16	05-Oct-16
Tendon Installation- WTG 046	24	03-Oct-16	06-Oct-16
Tendon Installation- WTG 047	24	06-Oct-16	09-Oct-16
Tendon Installation- WTG 048	24	15-Oct-16	18-Oct-16
Tendon Installation- WTG 049	24	13-Oct-16	16-Oct-16
Tendon Installation- WTG 050	24	14-Oct-16	17-Oct-16
Tendon Installation- WTG 051	24	17-Oct-16	20-Oct-16
Tendon Installation- WTG 052	24	26-Oct-16	29-Oct-16
Tendon Installation- WTG 053	24	24-Oct-16	27-Oct-16
Tendon Installation- WTG 054	24	25-Oct-16	28-Oct-16
Tendon Installation- WTG 055	24	28-Oct-16	31-Oct-16
Tendon Installation- WTG 056	24	06-Nov-16	10-Nov-16
Tendon Installation- WTG 057	24	04-Nov-16	08-Nov-16
Tendon Installation- WTG 058	24	04-Nov-16	08-Nov-16
Tendon Installation- WTG 059	24	08-Nov-16	12-Nov-16
Tendon Installation- WTG 060	24	17-Nov-16	21-Nov-16
Tendon Installation- WTG 061	24	15-Nov-16	19-Nov-16
Tendon Installation- WTG 062	24	15-Nov-16	19-Nov-16
Tendon Installation- WTG 063	24	19-Nov-16	23-Nov-16
Tendon Installation- WTG 064	24	28-Nov-16	02-Dec-16
Tendon Installation- WTG 065	24	26-Nov-16	30-Nov-16
Tendon Installation- WTG 066	24	26-Nov-16	30-Nov-16
Tendon Installation- WTG 067	24	30-Nov-16	04-Dec-16
Tendon Installation- WTG 068	24	09-Dec-16	13-Dec-16
Tendon Installation- WTG 069	24	07-Dec-16	11-Dec-16
Tendon Installation- WTG 070	24	07-Dec-16	11-Dec-16
Tendon Installation- WTG 071	24	11-Dec-16	15-Dec-16
Tendon Installation- WTG 072	24	20-Dec-16	24-Dec-16
Tendon Installation- WTG 073	24	18-Dec-16	22-Dec-16
Tendon Installation- WTG 074	24	18-Dec-16	22-Dec-16
Tendon Installation- WTG 075	24	22-Dec-16	26-Dec-16
Tendon Installation- WTG 076	24	31-Dec-16	04-Jan-17
Tendon Installation- WTG 077	24	29-Dec-16	02-Jan-17
Tendon Installation- WTG 078	24	29-Dec-16	02-Jan-17
Tendon Installation- WTG 079	24	02-Jan-17	06-Jan-17
Tendon Installation- WTG 080	24	12-Jan-17	16-Jan-17
Tendon Installation- WTG 081	24	10-Jan-17	14-Jan-17
Tendon Installation- WTG 082	24	10-Jan-17	14-Jan-17
Tendon Installation- WTG 083	24	14-Jan-17	18-Jan-17
Securing Floating Turbine to the Tendons	1396	24-Jun-16	20-Jan-17
Securing the Floating Turbine to the Tendon - WTG 001	8	24-Jun-16	24-Jun-16
Securing the Floating Turbine to the Tendon - WTG 002	8	25-Jun-16	25-Jun-16
Securing the Floating Turbine to the Tendon - WTG 003	8	28-Jun-16	28-Jun-16
Securing the Floating Turbine to the Tendon - WTG 004	8	05-Jul-16	06-Jul-16
Securing the Floating Turbine to the Tendon - WTG 005	8	03-Jul-16	04-Jul-16
Securing the Floating Turbine to the Tendon - WTG 006	8	04-Jul-16	05-Jul-16
Securing the Floating Turbine to the Tendon - WTG 007	8	07-Jul-16	08-Jul-16
Securing the Floating Turbine to the Tendon - WTG 008	8	14-Jul-16	15-Jul-16
Securing the Floating Turbine to the Tendon - WTG 009	8	12-Jul-16	13-Jul-16
Securing the Floating Turbine to the Tendon - WTG 010	8	13-Jul-16	14-Jul-16

Figure B.1 : Floating offshore wind farm project construction planning (continues)

Activity Name	Duration (Hour)	Start	Finish
Securing the Floating Turbine to the Tendon - WTG 011	8	16-Jul-16	17-Jul-16
Securing the Floating Turbine to the Tendon - WTG 012	8	23-Jul-16	24-Jul-16
Securing the Floating Turbine to the Tendon - WTG 013	8	21-Jul-16	22-Jul-16
Securing the Floating Turbine to the Tendon - WTG 014	8	22-Jul-16	23-Jul-16
Securing the Floating Turbine to the Tendon - WTG 015	8	25-Jul-16	26-Jul-16
Securing the Floating Turbine to the Tendon - WTG 016	8	01-Aug-16	02-Aug-16
Securing the Floating Turbine to the Tendon - WTG 017	8	30-Jul-16	31-Jul-16
Securing the Floating Turbine to the Tendon - WTG 018	8	31-Jul-16	01-Aug-16
Securing the Floating Turbine to the Tendon - WTG 019	8	04-Aug-16	04-Aug-16
Securing the Floating Turbine to the Tendon - WTG 020	8	11-Aug-16	11-Aug-16
Securing the Floating Turbine to the Tendon - WTG 021	8	09-Aug-16	09-Aug-16
Securing the Floating Turbine to the Tendon - WTG 022	8	10-Aug-16	10-Aug-16
Securing the Floating Turbine to the Tendon - WTG 023	8	13-Aug-16	13-Aug-16
Securing the Floating Turbine to the Tendon - WTG 024	8	20-Aug-16	20-Aug-16
Securing the Floating Turbine to the Tendon - WTG 025	8	18-Aug-16	18-Aug-16
Securing the Floating Turbine to the Tendon - WTG 026	8	19-Aug-16	19-Aug-16
Securing the Floating Turbine to the Tendon - WTG 027	8	22-Aug-16	22-Aug-16
Securing the Floating Turbine to the Tendon - WTG 028	8	29-Aug-16	29-Aug-16
Securing the Floating Turbine to the Tendon - WTG 029	8	27-Aug-16	27-Aug-16
Securing the Floating Turbine to the Tendon - WTG 030	8	28-Aug-16	28-Aug-16
Securing the Floating Turbine to the Tendon - WTG 031	8	31-Aug-16	31-Aug-16
Securing the Floating Turbine to the Tendon - WTG 032	8	07-Sep-16	08-Sep-16
Securing the Floating Turbine to the Tendon - WTG 033	8	05-Sep-16	06-Sep-16
Securing the Floating Turbine to the Tendon - WTG 034	8	06-Sep-16	07-Sep-16
Securing the Floating Turbine to the Tendon - WTG 035	8	09-Sep-16	10-Sep-16
Securing the Floating Turbine to the Tendon - WTG 036	8	17-Sep-16	18-Sep-16
Securing the Floating Turbine to the Tendon - WTG 037	8	15-Sep-16	16-Sep-16
Securing the Floating Turbine to the Tendon - WTG 038	8	16-Sep-16	17-Sep-16
Securing the Floating Turbine to the Tendon - WTG 039	8	19-Sep-16	20-Sep-16
Securing the Floating Turbine to the Tendon - WTG 040	8	27-Sep-16	28-Sep-16
Securing the Floating Turbine to the Tendon - WTG 041	8	25-Sep-16	26-Sep-16
Securing the Floating Turbine to the Tendon - WTG 042	8	26-Sep-16	27-Sep-16
Securing the Floating Turbine to the Tendon - WTG 043	8	29-Sep-16	30-Sep-16
Securing the Floating Turbine to the Tendon - WTG 044	8	08-Oct-16	09-Oct-16
Securing the Floating Turbine to the Tendon - WTG 045	8	06-Oct-16	07-Oct-16
Securing the Floating Turbine to the Tendon - WTG 046	8	07-Oct-16	08-Oct-16
Securing the Floating Turbine to the Tendon - WTG 047	8	10-Oct-16	11-Oct-16
Securing the Floating Turbine to the Tendon - WTG 048	8	19-Oct-16	20-Oct-16
Securing the Floating Turbine to the Tendon - WTG 049	8	17-Oct-16	18-Oct-16
Securing the Floating Turbine to the Tendon - WTG 050	8	18-Oct-16	19-Oct-16
Securing the Floating Turbine to the Tendon - WTG 051	8	21-Oct-16	22-Oct-16
Securing the Floating Turbine to the Tendon - WTG 052	8	30-Oct-16	31-Oct-16
Securing the Floating Turbine to the Tendon - WTG 053	8	28-Oct-16	29-Oct-16
Securing the Floating Turbine to the Tendon - WTG 054	8	29-Oct-16	30-Oct-16
Securing the Floating Turbine to the Tendon - WTG 055	8	01-Nov-16	02-Nov-16
Securing the Floating Turbine to the Tendon - WTG 056	8	10-Nov-16	11-Nov-16
Securing the Floating Turbine to the Tendon - WTG 057	8	08-Nov-16	09-Nov-16
Securing the Floating Turbine to the Tendon - WTG 058	8	08-Nov-16	09-Nov-16
Securing the Floating Turbine to the Tendon - WTG 059	8	12-Nov-16	13-Nov-16
Securing the Floating Turbine to the Tendon - WTG 060	8	21-Nov-16	22-Nov-16
Securing the Floating Turbine to the Tendon - WTG 061	8	19-Nov-16	20-Nov-16
Securing the Floating Turbine to the Tendon - WTG 062	8	19-Nov-16	20-Nov-16
Securing the Floating Turbine to the Tendon - WTG 063	8	23-Nov-16	24-Nov-16
Securing the Floating Turbine to the Tendon - WTG 064	8	02-Dec-16	03-Dec-16

Figure B.1 : Floating offshore wind farm project construction planning (continues)

Activity Name	Duration (Hour)	Start	Finish
Securing the Floating Turbine to the Tendon - WTG 065	8	30-Nov-16	01-Dec-16
Securing the Floating Turbine to the Tendon - WTG 066	8	30-Nov-16	01-Dec-16
Securing the Floating Turbine to the Tendon - WTG 067	8	04-Dec-16	05-Dec-16
Securing the Floating Turbine to the Tendon - WTG 068	8	13-Dec-16	14-Dec-16
Securing the Floating Turbine to the Tendon - WTG 069	8	11-Dec-16	12-Dec-16
Securing the Floating Turbine to the Tendon - WTG 070	8	11-Dec-16	12-Dec-16
Securing the Floating Turbine to the Tendon - WTG 071	8	15-Dec-16	16-Dec-16
Securing the Floating Turbine to the Tendon - WTG 072	8	24-Dec-16	25-Dec-16
Securing the Floating Turbine to the Tendon - WTG 073	8	22-Dec-16	23-Dec-16
Securing the Floating Turbine to the Tendon - WTG 074	8	22-Dec-16	23-Dec-16
Securing the Floating Turbine to the Tendon - WTG 075	8	26-Dec-16	27-Dec-16
Securing the Floating Turbine to the Tendon - WTG 076	8	04-Jan-17	06-Jan-17
Securing the Floating Turbine to the Tendon - WTG 077	8	02-Jan-17	04-Jan-17
Securing the Floating Turbine to the Tendon - WTG 078	8	02-Jan-17	04-Jan-17
Securing the Floating Turbine to the Tendon - WTG 079	8	06-Jan-17	08-Jan-17
Securing the Floating Turbine to the Tendon - WTG 080	8	16-Jan-17	18-Jan-17
Securing the Floating Turbine to the Tendon - WTG 081	8	14-Jan-17	16-Jan-17
Securing the Floating Turbine to the Tendon - WTG 082	8	14-Jan-17	16-Jan-17
Securing the Floating Turbine to the Tendon - WTG 083	8	18-Jan-17	20-Jan-17
Final Power Cable Connection	1274	25-Jun-16	21-Jan-17
Final Power Cable Connection - WTG 001	6	25-Jun-16	26-Jun-16
Final Power Cable Connection - WTG 002	6	26-Jun-16	27-Jun-16
Final Power Cable Connection - WTG 003	6	29-Jun-16	30-Jun-16
Final Power Cable Connection - WTG 004	6	06-Jul-16	07-Jul-16
Final Power Cable Connection - WTG 005	6	04-Jul-16	05-Jul-16
Final Power Cable Connection - WTG 006	6	05-Jul-16	06-Jul-16
Final Power Cable Connection - WTG 007	6	08-Jul-16	09-Jul-16
Final Power Cable Connection - WTG 008	6	15-Jul-16	16-Jul-16
Final Power Cable Connection - WTG 009	6	13-Jul-16	14-Jul-16
Final Power Cable Connection - WTG 010	6	14-Jul-16	15-Jul-16
Final Power Cable Connection - WTG 011	6	17-Jul-16	18-Jul-16
Final Power Cable Connection - WTG 012	6	24-Jul-16	25-Jul-16
Final Power Cable Connection - WTG 013	6	22-Jul-16	23-Jul-16
Final Power Cable Connection - WTG 014	6	23-Jul-16	24-Jul-16
Final Power Cable Connection - WTG 015	6	26-Jul-16	27-Jul-16
Final Power Cable Connection - WTG 016	6	03-Aug-16	03-Aug-16
Final Power Cable Connection - WTG 017	6	31-Jul-16	01-Aug-16
Final Power Cable Connection - WTG 018	6	01-Aug-16	02-Aug-16
Final Power Cable Connection - WTG 019	6	05-Aug-16	05-Aug-16
Final Power Cable Connection - WTG 020	6	12-Aug-16	12-Aug-16
Final Power Cable Connection - WTG 021	6	10-Aug-16	10-Aug-16
Final Power Cable Connection - WTG 022	6	11-Aug-16	11-Aug-16
Final Power Cable Connection - WTG 023	6	14-Aug-16	14-Aug-16
Final Power Cable Connection - WTG 024	6	21-Aug-16	21-Aug-16
Final Power Cable Connection - WTG 025	6	19-Aug-16	19-Aug-16
Final Power Cable Connection - WTG 026	6	20-Aug-16	20-Aug-16
Final Power Cable Connection - WTG 027	6	23-Aug-16	23-Aug-16
Final Power Cable Connection - WTG 028	6	30-Aug-16	30-Aug-16
Final Power Cable Connection - WTG 029	6	28-Aug-16	28-Aug-16
Final Power Cable Connection - WTG 030	6	29-Aug-16	29-Aug-16
Final Power Cable Connection - WTG 031	6	01-Sep-16	01-Sep-16
Final Power Cable Connection - WTG 032	6	08-Sep-16	09-Sep-16
Final Power Cable Connection - WTG 033	6	06-Sep-16	07-Sep-16
Final Power Cable Connection - WTG 034	6	07-Sep-16	08-Sep-16

Figure B.1 : Floating offshore wind farm project construction planning (continues)

Activity Name	Duration (Hour)	Start	Finish
Final Power Cable Connection - WTG 035	6	10-Sep-16	11-Sep-16
Final Power Cable Connection - WTG 036	6	18-Sep-16	19-Sep-16
Final Power Cable Connection - WTG 037	6	16-Sep-16	17-Sep-16
Final Power Cable Connection - WTG 038	6	17-Sep-16	18-Sep-16
Final Power Cable Connection - WTG 039	6	20-Sep-16	21-Sep-16
Final Power Cable Connection - WTG 040	6	28-Sep-16	29-Sep-16
Final Power Cable Connection - WTG 041	6	26-Sep-16	27-Sep-16
Final Power Cable Connection - WTG 042	6	27-Sep-16	28-Sep-16
Final Power Cable Connection - WTG 043	6	30-Sep-16	01-Oct-16
Final Power Cable Connection - WTG 044	6	09-Oct-16	10-Oct-16
Final Power Cable Connection - WTG 045	6	07-Oct-16	08-Oct-16
Final Power Cable Connection - WTG 046	6	08-Oct-16	09-Oct-16
Final Power Cable Connection - WTG 047	6	11-Oct-16	12-Oct-16
Final Power Cable Connection - WTG 048	6	20-Oct-16	21-Oct-16
Final Power Cable Connection - WTG 049	6	18-Oct-16	19-Oct-16
Final Power Cable Connection - WTG 050	6	19-Oct-16	20-Oct-16
Final Power Cable Connection - WTG 051	6	22-Oct-16	23-Oct-16
Final Power Cable Connection - WTG 052	6	31-Oct-16	01-Nov-16
Final Power Cable Connection - WTG 053	6	29-Oct-16	30-Oct-16
Final Power Cable Connection - WTG 054	6	30-Oct-16	31-Oct-16
Final Power Cable Connection - WTG 055	6	02-Nov-16	03-Nov-16
Final Power Cable Connection - WTG 056	6	11-Nov-16	12-Nov-16
Final Power Cable Connection - WTG 057	6	09-Nov-16	10-Nov-16
Final Power Cable Connection - WTG 058	6	09-Nov-16	10-Nov-16
Final Power Cable Connection - WTG 059	6	13-Nov-16	14-Nov-16
Final Power Cable Connection - WTG 060	6	22-Nov-16	23-Nov-16
Final Power Cable Connection - WTG 061	6	20-Nov-16	21-Nov-16
Final Power Cable Connection - WTG 062	6	20-Nov-16	21-Nov-16
Final Power Cable Connection - WTG 063	6	24-Nov-16	25-Nov-16
Final Power Cable Connection - WTG 064	6	03-Dec-16	04-Dec-16
Final Power Cable Connection - WTG 065	6	01-Dec-16	02-Dec-16
Final Power Cable Connection - WTG 066	6	01-Dec-16	02-Dec-16
Final Power Cable Connection - WTG 067	6	05-Dec-16	06-Dec-16
Final Power Cable Connection - WTG 068	6	14-Dec-16	15-Dec-16
Final Power Cable Connection - WTG 069	6	12-Dec-16	13-Dec-16
Final Power Cable Connection - WTG 070	6	12-Dec-16	13-Dec-16
Final Power Cable Connection - WTG 071	6	16-Dec-16	17-Dec-16
Final Power Cable Connection - WTG 072	6	25-Dec-16	26-Dec-16
Final Power Cable Connection - WTG 073	6	23-Dec-16	24-Dec-16
Final Power Cable Connection - WTG 074	6	23-Dec-16	24-Dec-16
Final Power Cable Connection - WTG 075	6	27-Dec-16	28-Dec-16
Final Power Cable Connection - WTG 076	6	06-Jan-17	07-Jan-17
Final Power Cable Connection - WTG 077	6	04-Jan-17	05-Jan-17
Final Power Cable Connection - WTG 078	6	04-Jan-17	05-Jan-17
Final Power Cable Connection - WTG 079	6	08-Jan-17	09-Jan-17
Final Power Cable Connection - WTG 080	6	18-Jan-17	19-Jan-17
Final Power Cable Connection - WTG 081	6	16-Jan-17	17-Jan-17
Final Power Cable Connection - WTG 082	6	16-Jan-17	17-Jan-17
Final Power Cable Connection - WTG 083	6	20-Jan-17	21-Jan-17
Return to Port	4195	26-Jun-16	22-Jan-17
WTG Return to Port - WTG 001	16	26-Jun-16	27-Jun-16
WTG Return to Port - WTG 002	16	27-Jun-16	28-Jun-16
WTG Return to Port - WTG 003	16	30-Jun-16	01-Jul-16
WTG Return to Port - WTG 004	16	07-Jul-16	08-Jul-16

Figure B.1 : Floating offshore wind farm project construction planning (continues)

Activity Name	Duration (Hour)	Start	Finish
WTG Return to Port - WTG 005	16	05-Jul-16	06-Jul-16
WTG Return to Port - WTG 006	16	06-Jul-16	07-Jul-16
WTG Return to Port - WTG 007	16	09-Jul-16	10-Jul-16
WTG Return to Port - WTG 008	16	16-Jul-16	17-Jul-16
WTG Return to Port - WTG 009	16	14-Jul-16	15-Jul-16
WTG Return to Port - WTG 010	16	15-Jul-16	16-Jul-16
WTG Return to Port - WTG 011	16	18-Jul-16	19-Jul-16
WTG Return to Port - WTG 012	16	25-Jul-16	26-Jul-16
WTG Return to Port - WTG 013	16	23-Jul-16	24-Jul-16
WTG Return to Port - WTG 014	16	24-Jul-16	25-Jul-16
WTG Return to Port - WTG 015	16	27-Jul-16	28-Jul-16
WTG Return to Port - WTG 016	16	03-Aug-16	04-Aug-16
WTG Return to Port - WTG 017	16	01-Aug-16	02-Aug-16
WTG Return to Port - WTG 018	16	02-Aug-16	03-Aug-16
WTG Return to Port - WTG 019	16	05-Aug-16	06-Aug-16
WTG Return to Port - WTG 020	16	12-Aug-16	13-Aug-16
WTG Return to Port - WTG 021	16	10-Aug-16	11-Aug-16
WTG Return to Port - WTG 022	16	11-Aug-16	12-Aug-16
WTG Return to Port - WTG 023	16	14-Aug-16	15-Aug-16
WTG Return to Port - WTG 024	16	21-Aug-16	22-Aug-16
WTG Return to Port - WTG 025	16	19-Aug-16	20-Aug-16
WTG Return to Port - WTG 026	16	20-Aug-16	21-Aug-16
WTG Return to Port - WTG 027	16	23-Aug-16	24-Aug-16
WTG Return to Port - WTG 028	16	30-Aug-16	31-Aug-16
WTG Return to Port - WTG 029	16	28-Aug-16	29-Aug-16
WTG Return to Port - WTG 030	16	29-Aug-16	30-Aug-16
WTG Return to Port - WTG 031	16	01-Sep-16	02-Sep-16
WTG Return to Port - WTG 032	16	09-Sep-16	10-Sep-16
WTG Return to Port - WTG 033	16	07-Sep-16	08-Sep-16
WTG Return to Port - WTG 034	16	08-Sep-16	09-Sep-16
WTG Return to Port - WTG 035	16	11-Sep-16	12-Sep-16
WTG Return to Port - WTG 036	16	19-Sep-16	20-Sep-16
WTG Return to Port - WTG 037	16	17-Sep-16	18-Sep-16
WTG Return to Port - WTG 038	16	18-Sep-16	19-Sep-16
WTG Return to Port - WTG 039	16	21-Sep-16	22-Sep-16
WTG Return to Port - WTG 040	16	29-Sep-16	30-Sep-16
WTG Return to Port - WTG 041	16	27-Sep-16	28-Sep-16
WTG Return to Port - WTG 042	16	28-Sep-16	29-Sep-16
WTG Return to Port - WTG 043	16	01-Oct-16	02-Oct-16
WTG Return to Port - WTG 044	16	10-Oct-16	11-Oct-16
WTG Return to Port - WTG 045	16	08-Oct-16	09-Oct-16
WTG Return to Port - WTG 046	16	09-Oct-16	10-Oct-16
WTG Return to Port - WTG 047	16	12-Oct-16	13-Oct-16
WTG Return to Port - WTG 048	16	21-Oct-16	22-Oct-16
WTG Return to Port - WTG 049	16	19-Oct-16	20-Oct-16
WTG Return to Port - WTG 050	16	20-Oct-16	21-Oct-16
WTG Return to Port - WTG 051	16	23-Oct-16	24-Oct-16
WTG Return to Port - WTG 052	16	01-Nov-16	02-Nov-16
WTG Return to Port - WTG 053	16	30-Oct-16	31-Oct-16
WTG Return to Port - WTG 054	2	31-Oct-16	31-Oct-16
WTG Return to Port - WTG 055	16	03-Nov-16	04-Nov-16
WTG Return to Port - WTG 056	16	12-Nov-16	13-Nov-16
WTG Return to Port - WTG 057	16	10-Nov-16	11-Nov-16
WTG Return to Port - WTG 058	16	10-Nov-16	11-Nov-16

Figure B.1 : Floating offshore wind farm project construction planning (continues)

Activity Name	Duration (Hour)	Start	Finish
WTG Return to Port - WTG 059	16	14-Nov-16	15-Nov-16
WTG Return to Port - WTG 060	16	23-Nov-16	24-Nov-16
WTG Return to Port - WTG 061	16	21-Nov-16	22-Nov-16
WTG Return to Port - WTG 062	16	21-Nov-16	22-Nov-16
WTG Return to Port - WTG 063	16	25-Nov-16	26-Nov-16
WTG Return to Port - WTG 064	16	04-Dec-16	05-Dec-16
WTG Return to Port - WTG 065	16	02-Dec-16	03-Dec-16
WTG Return to Port - WTG 066	16	02-Dec-16	03-Dec-16
WTG Return to Port - WTG 067	16	06-Dec-16	07-Dec-16
WTG Return to Port - WTG 068	16	15-Dec-16	16-Dec-16
WTG Return to Port - WTG 069	16	13-Dec-16	14-Dec-16
WTG Return to Port - WTG 070	16	13-Dec-16	14-Dec-16
WTG Return to Port - WTG 071	16	17-Dec-16	18-Dec-16
WTG Return to Port - WTG 072	16	26-Dec-16	27-Dec-16
WTG Return to Port - WTG 073	16	24-Dec-16	25-Dec-16
WTG Return to Port - WTG 074	16	24-Dec-16	25-Dec-16
WTG Return to Port - WTG 075	16	28-Dec-16	29-Dec-16
WTG Return to Port - WTG 076	16	07-Jan-17	08-Jan-17
WTG Return to Port - WTG 077	16	05-Jan-17	06-Jan-17
WTG Return to Port - WTG 078	16	05-Jan-17	06-Jan-17
WTG Return to Port - WTG 079	16	09-Jan-17	10-Jan-17
WTG Return to Port - WTG 080	16	19-Jan-17	20-Jan-17
WTG Return to Port - WTG 081	16	17-Jan-17	18-Jan-17
WTG Return to Port - WTG 082	16	17-Jan-17	18-Jan-17
WTG Return to Port - WTG 083	16	21-Jan-17	22-Jan-17
Commissioning	1286	26-Jun-16	24-Jan-17
Hot Commissioning - WTG #001	15	26-Jun-16	28-Jun-16
Hot Commissioning - WTG #002	15	27-Jun-16	29-Jun-16
Hot Commissioning - WTG #003	15	30-Jun-16	02-Jul-16
Hot Commissioning - WTG #004	15	08-Jul-16	10-Jul-16
Hot Commissioning - WTG #005	15	06-Jul-16	08-Jul-16
Hot Commissioning - WTG #006	15	07-Jul-16	09-Jul-16
Hot Commissioning - WTG #007	15	10-Jul-16	13-Jul-16
Hot Commissioning - WTG #008	15	17-Jul-16	19-Jul-16
Hot Commissioning - WTG #009	15	15-Jul-16	17-Jul-16
Hot Commissioning - WTG #010	15	16-Jul-16	18-Jul-16
Hot Commissioning - WTG #011	15	19-Jul-16	22-Jul-16
Hot Commissioning - WTG #012	15	26-Jul-16	28-Jul-16
Hot Commissioning - WTG #013	15	24-Jul-16	26-Jul-16
Hot Commissioning - WTG #014	15	25-Jul-16	27-Jul-16
Hot Commissioning - WTG #015	15	28-Jul-16	31-Jul-16
Hot Commissioning - WTG #016	15	04-Aug-16	06-Aug-16
Hot Commissioning - WTG #017	15	01-Aug-16	04-Aug-16
Hot Commissioning - WTG #018	15	02-Aug-16	05-Aug-16
Hot Commissioning - WTG #019	15	06-Aug-16	08-Aug-16
Hot Commissioning - WTG #020	15	13-Aug-16	15-Aug-16
Hot Commissioning - WTG #021	15	11-Aug-16	13-Aug-16
Hot Commissioning - WTG #022	15	12-Aug-16	14-Aug-16
Hot Commissioning - WTG #023	15	15-Aug-16	17-Aug-16
Hot Commissioning - WTG #024	15	22-Aug-16	24-Aug-16
Hot Commissioning - WTG #025	15	20-Aug-16	22-Aug-16
Hot Commissioning - WTG #026	15	21-Aug-16	23-Aug-16
Hot Commissioning - WTG #027	15	24-Aug-16	26-Aug-16
Hot Commissioning - WTG #028	15	31-Aug-16	02-Sep-16

Figure B.1 : Floating offshore wind farm project construction planning (continues)

Activity Name	Duration (Hour)	Start	Finish
Hot Commissioning - WTG #029	15	29-Aug-16	31-Aug-16
Hot Commissioning - WTG #030	15	30-Aug-16	01-Sep-16
Hot Commissioning - WTG #031	15	02-Sep-16	04-Sep-16
Hot Commissioning - WTG #032	15	09-Sep-16	11-Sep-16
Hot Commissioning - WTG #033	15	07-Sep-16	09-Sep-16
Hot Commissioning - WTG #034	15	08-Sep-16	10-Sep-16
Hot Commissioning - WTG #035	15	12-Sep-16	14-Sep-16
Hot Commissioning - WTG #036	15	19-Sep-16	21-Sep-16
Hot Commissioning - WTG #037	15	17-Sep-16	19-Sep-16
Hot Commissioning - WTG #038	15	18-Sep-16	20-Sep-16
Hot Commissioning - WTG #039	15	22-Sep-16	24-Sep-16
Hot Commissioning - WTG #040	15	29-Sep-16	01-Oct-16
Hot Commissioning - WTG #041	15	27-Sep-16	29-Sep-16
Hot Commissioning - WTG #042	15	28-Sep-16	30-Sep-16
Hot Commissioning - WTG #043	15	01-Oct-16	04-Oct-16
Hot Commissioning - WTG #044	15	10-Oct-16	12-Oct-16
Hot Commissioning - WTG #045	15	08-Oct-16	10-Oct-16
Hot Commissioning - WTG #046	15	09-Oct-16	11-Oct-16
Hot Commissioning - WTG #047	15	12-Oct-16	14-Oct-16
Hot Commissioning - WTG #048	15	21-Oct-16	23-Oct-16
Hot Commissioning - WTG #049	15	19-Oct-16	21-Oct-16
Hot Commissioning - WTG #050	15	20-Oct-16	22-Oct-16
Hot Commissioning - WTG #051	15	23-Oct-16	25-Oct-16
Hot Commissioning - WTG #052	15	01-Nov-16	03-Nov-16
Hot Commissioning - WTG #053	15	30-Oct-16	01-Nov-16
Hot Commissioning - WTG #054	15	31-Oct-16	02-Nov-16
Hot Commissioning - WTG #055	15	03-Nov-16	05-Nov-16
Hot Commissioning - WTG #056	15	12-Nov-16	14-Nov-16
Hot Commissioning - WTG #057	15	10-Nov-16	12-Nov-16
Hot Commissioning - WTG #058	15	10-Nov-16	12-Nov-16
Hot Commissioning - WTG #059	15	15-Nov-16	17-Nov-16
Hot Commissioning - WTG #060	15	23-Nov-16	25-Nov-16
Hot Commissioning - WTG #061	15	21-Nov-16	23-Nov-16
Hot Commissioning - WTG #062	15	21-Nov-16	23-Nov-16
Hot Commissioning - WTG #063	15	26-Nov-16	28-Nov-16
Hot Commissioning - WTG #064	15	04-Dec-16	07-Dec-16
Hot Commissioning - WTG #065	15	02-Dec-16	05-Dec-16
Hot Commissioning - WTG #066	15	02-Dec-16	05-Dec-16
Hot Commissioning - WTG #067	15	07-Dec-16	09-Dec-16
Hot Commissioning - WTG #068	15	15-Dec-16	18-Dec-16
Hot Commissioning - WTG #069	15	13-Dec-16	16-Dec-16
Hot Commissioning - WTG #070	15	13-Dec-16	16-Dec-16
Hot Commissioning - WTG #071	15	18-Dec-16	20-Dec-16
Hot Commissioning - WTG #072	15	26-Dec-16	29-Dec-16
Hot Commissioning - WTG #073	15	24-Dec-16	27-Dec-16
Hot Commissioning - WTG #074	15	24-Dec-16	27-Dec-16
Hot Commissioning - WTG #075	15	29-Dec-16	31-Dec-16
Hot Commissioning - WTG #076	15	07-Jan-17	09-Jan-17
Hot Commissioning - WTG #077	15	05-Jan-17	07-Jan-17
Hot Commissioning - WTG #078	15	05-Jan-17	07-Jan-17
Hot Commissioning - WTG #079	15	09-Jan-17	12-Jan-17
Hot Commissioning - WTG #080	15	19-Jan-17	21-Jan-17
Hot Commissioning - WTG #081	15	17-Jan-17	19-Jan-17
Hot Commissioning - WTG #082	15	17-Jan-17	19-Jan-17

Figure B.1 : Floating offshore wind farm project construction planning (continues)

Activity Name	Duration (Hour)	Start	Finish
Hot Commissioning - WTG #083	15	21-Jan-17	24-Jan-17
Reliability Testing (240h)	5278	28-Jun-16	03-Feb-17
Reliability Testing (240h) - WTG #001	240	28-Jun-16	08-Jul-16
Reliability Testing (240h) - WTG #002	240	29-Jun-16	09-Jul-16
Reliability Testing (240h) - WTG #003	240	02-Jul-16	12-Jul-16
Reliability Testing (240h) - WTG #004	240	10-Jul-16	20-Jul-16
Reliability Testing (240h) - WTG #005	240	08-Jul-16	18-Jul-16
Reliability Testing (240h) - WTG #006	240	09-Jul-16	19-Jul-16
Reliability Testing (240h) - WTG #007	240	13-Jul-16	23-Jul-16
Reliability Testing (240h) - WTG #008	240	19-Jul-16	29-Jul-16
Reliability Testing (240h) - WTG #009	240	17-Jul-16	27-Jul-16
Reliability Testing (240h) - WTG #010	240	18-Jul-16	28-Jul-16
Reliability Testing (240h) - WTG #011	240	22-Jul-16	01-Aug-16
Reliability Testing (240h) - WTG #012	240	28-Jul-16	07-Aug-16
Reliability Testing (240h) - WTG #013	240	26-Jul-16	05-Aug-16
Reliability Testing (240h) - WTG #014	240	27-Jul-16	06-Aug-16
Reliability Testing (240h) - WTG #015	240	31-Jul-16	10-Aug-16
Reliability Testing (240h) - WTG #016	240	06-Aug-16	16-Aug-16
Reliability Testing (240h) - WTG #017	240	04-Aug-16	14-Aug-16
Reliability Testing (240h) - WTG #018	240	05-Aug-16	15-Aug-16
Reliability Testing (240h) - WTG #019	240	08-Aug-16	18-Aug-16
Reliability Testing (240h) - WTG #020	240	15-Aug-16	25-Aug-16
Reliability Testing (240h) - WTG #021	240	13-Aug-16	23-Aug-16
Reliability Testing (240h) - WTG #022	240	14-Aug-16	24-Aug-16
Reliability Testing (240h) - WTG #023	240	17-Aug-16	27-Aug-16
Reliability Testing (240h) - WTG #024	240	24-Aug-16	03-Sep-16
Reliability Testing (240h) - WTG #025	240	22-Aug-16	01-Sep-16
Reliability Testing (240h) - WTG #026	240	23-Aug-16	02-Sep-16
Reliability Testing (240h) - WTG #027	240	26-Aug-16	05-Sep-16
Reliability Testing (240h) - WTG #028	240	02-Sep-16	12-Sep-16
Reliability Testing (240h) - WTG #029	240	31-Aug-16	10-Sep-16
Reliability Testing (240h) - WTG #030	240	01-Sep-16	11-Sep-16
Reliability Testing (240h) - WTG #031	240	04-Sep-16	14-Sep-16
Reliability Testing (240h) - WTG #032	240	11-Sep-16	21-Sep-16
Reliability Testing (240h) - WTG #033	240	09-Sep-16	19-Sep-16
Reliability Testing (240h) - WTG #034	240	10-Sep-16	20-Sep-16
Reliability Testing (240h) - WTG #035	240	14-Sep-16	24-Sep-16
Reliability Testing (240h) - WTG #036	240	21-Sep-16	01-Oct-16
Reliability Testing (240h) - WTG #037	240	19-Sep-16	29-Sep-16
Reliability Testing (240h) - WTG #038	240	20-Sep-16	30-Sep-16
Reliability Testing (240h) - WTG #039	240	24-Sep-16	04-Oct-16
Reliability Testing (240h) - WTG #040	240	01-Oct-16	11-Oct-16
Reliability Testing (240h) - WTG #041	240	29-Sep-16	09-Oct-16
Reliability Testing (240h) - WTG #042	240	30-Sep-16	10-Oct-16
Reliability Testing (240h) - WTG #043	240	04-Oct-16	14-Oct-16
Reliability Testing (240h) - WTG #044	240	12-Oct-16	22-Oct-16
Reliability Testing (240h) - WTG #045	240	10-Oct-16	20-Oct-16
Reliability Testing (240h) - WTG #046	240	11-Oct-16	21-Oct-16
Reliability Testing (240h) - WTG #047	240	14-Oct-16	24-Oct-16
Reliability Testing (240h) - WTG #048	240	23-Oct-16	02-Nov-16
Reliability Testing (240h) - WTG #049	240	21-Oct-16	31-Oct-16
Reliability Testing (240h) - WTG #050	240	22-Oct-16	01-Nov-16
Reliability Testing (240h) - WTG #051	240	25-Oct-16	04-Nov-16
Reliability Testing (240h) - WTG #052	240	03-Nov-16	13-Nov-16

Figure B.1 : Floating offshore wind farm project construction planning (continues)

Activity Name	Duration (Hour)	Start	Finish
Reliability Testing (240h) - WTG #053	240	01-Nov-16	11-Nov-16
Reliability Testing (240h) - WTG #054	240	02-Nov-16	12-Nov-16
Reliability Testing (240h) - WTG #055	240	05-Nov-16	15-Nov-16
Reliability Testing (240h) - WTG #056	240	14-Nov-16	24-Nov-16
Reliability Testing (240h) - WTG #057	240	12-Nov-16	22-Nov-16
Reliability Testing (240h) - WTG #058	240	12-Nov-16	22-Nov-16
Reliability Testing (240h) - WTG #059	240	17-Nov-16	27-Nov-16
Reliability Testing (240h) - WTG #060	240	25-Nov-16	05-Dec-16
Reliability Testing (240h) - WTG #061	240	23-Nov-16	03-Dec-16
Reliability Testing (240h) - WTG #062	240	23-Nov-16	03-Dec-16
Reliability Testing (240h) - WTG #063	240	28-Nov-16	08-Dec-16
Reliability Testing (240h) - WTG #064	240	07-Dec-16	17-Dec-16
Reliability Testing (240h) - WTG #065	240	05-Dec-16	15-Dec-16
Reliability Testing (240h) - WTG #066	240	05-Dec-16	15-Dec-16
Reliability Testing (240h) - WTG #067	240	09-Dec-16	19-Dec-16
Reliability Testing (240h) - WTG #068	240	18-Dec-16	28-Dec-16
Reliability Testing (240h) - WTG #069	240	16-Dec-16	26-Dec-16
Reliability Testing (240h) - WTG #070	240	16-Dec-16	26-Dec-16
Reliability Testing (240h) - WTG #071	240	20-Dec-16	30-Dec-16
Reliability Testing (240h) - WTG #072	240	29-Dec-16	08-Jan-17
Reliability Testing (240h) - WTG #073	240	27-Dec-16	06-Jan-17
Reliability Testing (240h) - WTG #074	240	27-Dec-16	06-Jan-17
Reliability Testing (240h) - WTG #075	240	31-Dec-16	10-Jan-17
Reliability Testing (240h) - WTG #076	240	09-Jan-17	19-Jan-17
Reliability Testing (240h) - WTG #077	240	07-Jan-17	17-Jan-17
Reliability Testing (240h) - WTG #078	240	07-Jan-17	17-Jan-17
Reliability Testing (240h) - WTG #079	240	12-Jan-17	22-Jan-17
Reliability Testing (240h) - WTG #080	240	21-Jan-17	31-Jan-17
Reliability Testing (240h) - WTG #081	240	19-Jan-17	29-Jan-17
Reliability Testing (240h) - WTG #082	240	19-Jan-17	29-Jan-17
Reliability Testing (240h) - WTG #083	240	24-Jan-17	03-Feb-17
Acceptance (PM650)	1190	08-Jul-16	16-Feb-17
QA Walk Down	1206	08-Jul-16	06-Feb-17
QA Walk Down - WTG #001	8	08-Jul-16	11-Jul-16
QA Walk Down - WTG #002	8	11-Jul-16	11-Jul-16
QA Walk Down - WTG #003	8	12-Jul-16	13-Jul-16
QA Walk Down - WTG #004	8	20-Jul-16	21-Jul-16
QA Walk Down - WTG #005	8	18-Jul-16	19-Jul-16
QA Walk Down - WTG #006	8	19-Jul-16	20-Jul-16
QA Walk Down - WTG #007	8	25-Jul-16	25-Jul-16
QA Walk Down - WTG #008	8	29-Jul-16	01-Aug-16
QA Walk Down - WTG #009	8	27-Jul-16	28-Jul-16
QA Walk Down - WTG #010	8	28-Jul-16	29-Jul-16
QA Walk Down - WTG #011	8	01-Aug-16	02-Aug-16
QA Walk Down - WTG #012	8	08-Aug-16	08-Aug-16
QA Walk Down - WTG #013	8	05-Aug-16	08-Aug-16
QA Walk Down - WTG #014	8	08-Aug-16	08-Aug-16
QA Walk Down - WTG #015	8	10-Aug-16	11-Aug-16
QA Walk Down - WTG #016	8	16-Aug-16	17-Aug-16
QA Walk Down - WTG #017	8	15-Aug-16	15-Aug-16
QA Walk Down - WTG #018	8	15-Aug-16	16-Aug-16
QA Walk Down - WTG #019	8	18-Aug-16	19-Aug-16
QA Walk Down - WTG #020	8	25-Aug-16	26-Aug-16

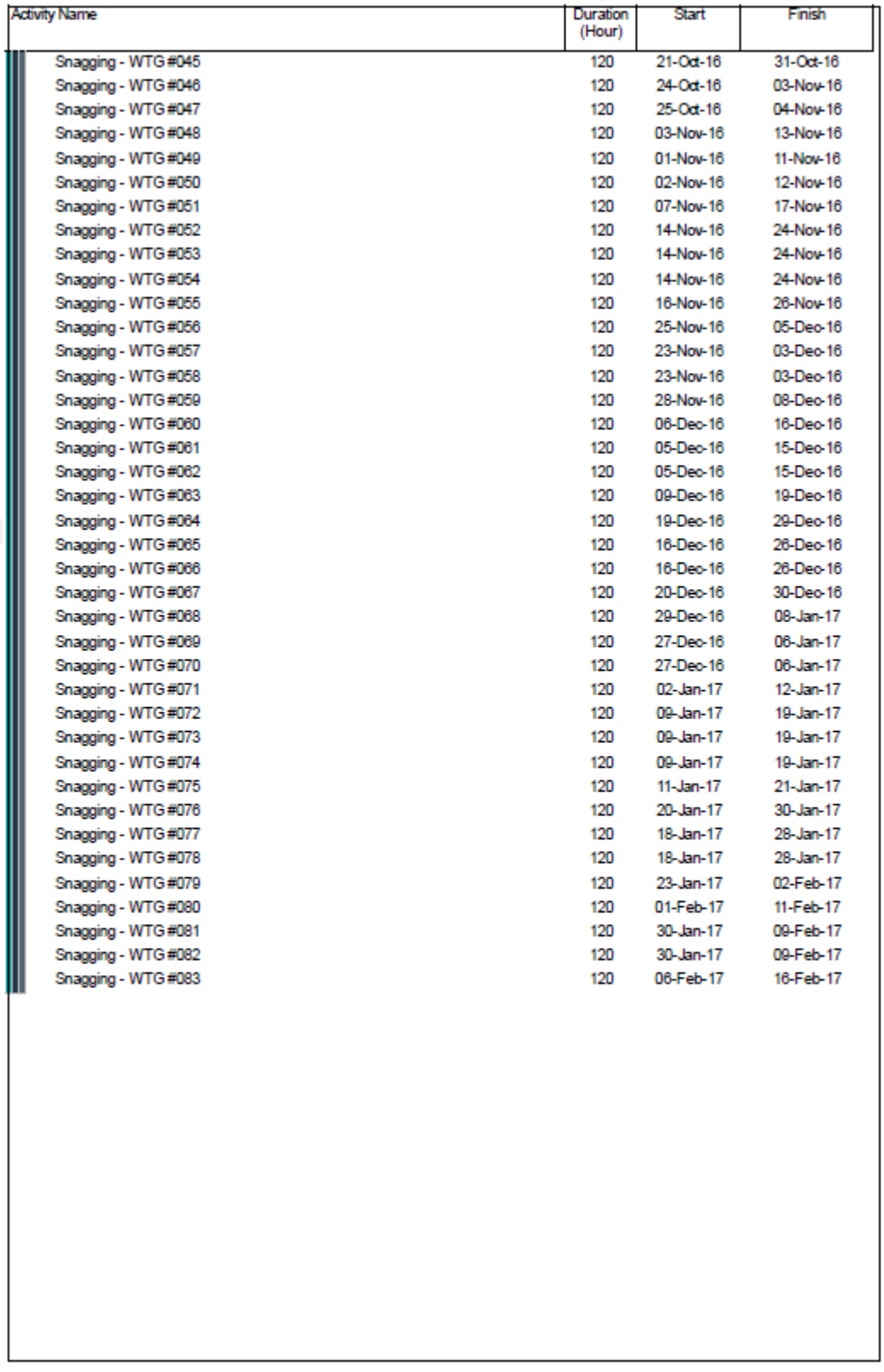
Figure B.1 : Floating offshore wind farm project construction planning (continues)

Activity Name	Duration (Hour)	Start	Finish
QA Walk Down - WTG #021	8	23-Aug-16	24-Aug-16
QA Walk Down - WTG #022	8	24-Aug-16	25-Aug-16
QA Walk Down - WTG #023	8	29-Aug-16	29-Aug-16
QA Walk Down - WTG #024	8	05-Sep-16	05-Sep-16
QA Walk Down - WTG #025	8	01-Sep-16	02-Sep-16
QA Walk Down - WTG #026	8	02-Sep-16	05-Sep-16
QA Walk Down - WTG #027	8	05-Sep-16	06-Sep-16
QA Walk Down - WTG #028	8	12-Sep-16	13-Sep-16
QA Walk Down - WTG #029	8	12-Sep-16	12-Sep-16
QA Walk Down - WTG #030	8	12-Sep-16	12-Sep-16
QA Walk Down - WTG #031	8	14-Sep-16	15-Sep-16
QA Walk Down - WTG #032	8	21-Sep-16	22-Sep-16
QA Walk Down - WTG #033	8	19-Sep-16	20-Sep-16
QA Walk Down - WTG #034	8	20-Sep-16	21-Sep-16
QA Walk Down - WTG #035	8	26-Sep-16	26-Sep-16
QA Walk Down - WTG #036	8	03-Oct-16	03-Oct-16
QA Walk Down - WTG #037	8	29-Sep-16	30-Sep-16
QA Walk Down - WTG #038	8	30-Sep-16	03-Oct-16
QA Walk Down - WTG #039	8	04-Oct-16	05-Oct-16
QA Walk Down - WTG #040	8	11-Oct-16	12-Oct-16
QA Walk Down - WTG #041	8	10-Oct-16	10-Oct-16
QA Walk Down - WTG #042	8	10-Oct-16	11-Oct-16
QA Walk Down - WTG #043	8	14-Oct-16	17-Oct-16
QA Walk Down - WTG #044	8	24-Oct-16	24-Oct-16
QA Walk Down - WTG #045	8	20-Oct-16	21-Oct-16
QA Walk Down - WTG #046	8	21-Oct-16	24-Oct-16
QA Walk Down - WTG #047	8	24-Oct-16	25-Oct-16
QA Walk Down - WTG #048	8	02-Nov-16	03-Nov-16
QA Walk Down - WTG #049	8	31-Oct-16	01-Nov-16
QA Walk Down - WTG #050	8	01-Nov-16	02-Nov-16
QA Walk Down - WTG #051	8	04-Nov-16	07-Nov-16
QA Walk Down - WTG #052	8	14-Nov-16	14-Nov-16
QA Walk Down - WTG #053	8	11-Nov-16	14-Nov-16
QA Walk Down - WTG #054	8	14-Nov-16	14-Nov-16
QA Walk Down - WTG #055	8	15-Nov-16	16-Nov-16
QA Walk Down - WTG #056	8	24-Nov-16	25-Nov-16
QA Walk Down - WTG #057	8	22-Nov-16	23-Nov-16
QA Walk Down - WTG #058	8	22-Nov-16	23-Nov-16
QA Walk Down - WTG #059	8	28-Nov-16	28-Nov-16
QA Walk Down - WTG #060	8	05-Dec-16	06-Dec-16
QA Walk Down - WTG #061	8	05-Dec-16	05-Dec-16
QA Walk Down - WTG #062	8	05-Dec-16	05-Dec-16
QA Walk Down - WTG #063	8	08-Dec-16	09-Dec-16
QA Walk Down - WTG #064	8	19-Dec-16	19-Dec-16
QA Walk Down - WTG #065	8	15-Dec-16	16-Dec-16
QA Walk Down - WTG #066	8	15-Dec-16	16-Dec-16
QA Walk Down - WTG #067	8	19-Dec-16	20-Dec-16
QA Walk Down - WTG #068	8	28-Dec-16	29-Dec-16
QA Walk Down - WTG #069	8	26-Dec-16	27-Dec-16
QA Walk Down - WTG #070	8	26-Dec-16	27-Dec-16
QA Walk Down - WTG #071	8	30-Dec-16	02-Jan-17
QA Walk Down - WTG #072	8	09-Jan-17	09-Jan-17
QA Walk Down - WTG #073	8	06-Jan-17	09-Jan-17
QA Walk Down - WTG #074	8	06-Jan-17	09-Jan-17

Figure B.1 : Floating offshore wind farm project construction planning (continues)

Activity Name	Duration (Hour)	Start	Finish
QA Walk Down - WTG #075	8	10-Jan-17	11-Jan-17
QA Walk Down - WTG #076	8	19-Jan-17	20-Jan-17
QA Walk Down - WTG #077	8	17-Jan-17	18-Jan-17
QA Walk Down - WTG #078	8	17-Jan-17	18-Jan-17
QA Walk Down - WTG #079	8	23-Jan-17	23-Jan-17
QA Walk Down - WTG #080	8	31-Jan-17	01-Feb-17
QA Walk Down - WTG #081	8	30-Jan-17	30-Jan-17
QA Walk Down - WTG #082	8	30-Jan-17	30-Jan-17
QA Walk Down - WTG #083	8	03-Feb-17	06-Feb-17
Snagging	2638	11-Jul-16	16-Feb-17
Snagging - WTG #001	120	11-Jul-16	21-Jul-16
Snagging - WTG #002	120	11-Jul-16	21-Jul-16
Snagging - WTG #003	120	13-Jul-16	23-Jul-16
Snagging - WTG #004	120	21-Jul-16	31-Jul-16
Snagging - WTG #005	120	19-Jul-16	29-Jul-16
Snagging - WTG #006	120	20-Jul-16	30-Jul-16
Snagging - WTG #007	120	25-Jul-16	04-Aug-16
Snagging - WTG #008	120	01-Aug-16	11-Aug-16
Snagging - WTG #009	120	28-Jul-16	07-Aug-16
Snagging - WTG #010	120	29-Jul-16	08-Aug-16
Snagging - WTG #011	120	02-Aug-16	12-Aug-16
Snagging - WTG #012	120	08-Aug-16	18-Aug-16
Snagging - WTG #013	120	08-Aug-16	18-Aug-16
Snagging - WTG #014	120	08-Aug-16	18-Aug-16
Snagging - WTG #015	120	11-Aug-16	21-Aug-16
Snagging - WTG #016	120	17-Aug-16	27-Aug-16
Snagging - WTG #017	120	15-Aug-16	25-Aug-16
Snagging - WTG #018	120	16-Aug-16	26-Aug-16
Snagging - WTG #019	120	19-Aug-16	29-Aug-16
Snagging - WTG #020	120	26-Aug-16	05-Sep-16
Snagging - WTG #021	120	24-Aug-16	03-Sep-16
Snagging - WTG #022	120	25-Aug-16	04-Sep-16
Snagging - WTG #023	120	29-Aug-16	08-Sep-16
Snagging - WTG #024	120	05-Sep-16	15-Sep-16
Snagging - WTG #025	120	02-Sep-16	12-Sep-16
Snagging - WTG #026	120	05-Sep-16	15-Sep-16
Snagging - WTG #027	120	06-Sep-16	16-Sep-16
Snagging - WTG #028	120	13-Sep-16	23-Sep-16
Snagging - WTG #029	120	12-Sep-16	22-Sep-16
Snagging - WTG #030	120	12-Sep-16	22-Sep-16
Snagging - WTG #031	120	15-Sep-16	25-Sep-16
Snagging - WTG #032	120	22-Sep-16	02-Oct-16
Snagging - WTG #033	120	20-Sep-16	30-Sep-16
Snagging - WTG #034	120	21-Sep-16	01-Oct-16
Snagging - WTG #035	120	26-Sep-16	06-Oct-16
Snagging - WTG #036	120	03-Oct-16	13-Oct-16
Snagging - WTG #037	120	30-Sep-16	10-Oct-16
Snagging - WTG #038	120	03-Oct-16	13-Oct-16
Snagging - WTG #039	120	05-Oct-16	15-Oct-16
Snagging - WTG #040	120	12-Oct-16	22-Oct-16
Snagging - WTG #041	120	10-Oct-16	20-Oct-16
Snagging - WTG #042	120	11-Oct-16	21-Oct-16
Snagging - WTG #043	120	17-Oct-16	27-Oct-16
Snagging - WTG #044	120	24-Oct-16	03-Nov-16

Figure B.1 : Floating offshore wind farm project construction planning (continues)



Activity Name	Duration (Hour)	Start	Finish
Snagging - WTG#045	120	21-Oct-16	31-Oct-16
Snagging - WTG#046	120	24-Oct-16	03-Nov-16
Snagging - WTG#047	120	25-Oct-16	04-Nov-16
Snagging - WTG#048	120	03-Nov-16	13-Nov-16
Snagging - WTG#049	120	01-Nov-16	11-Nov-16
Snagging - WTG#050	120	02-Nov-16	12-Nov-16
Snagging - WTG#051	120	07-Nov-16	17-Nov-16
Snagging - WTG#052	120	14-Nov-16	24-Nov-16
Snagging - WTG#053	120	14-Nov-16	24-Nov-16
Snagging - WTG#054	120	14-Nov-16	24-Nov-16
Snagging - WTG#055	120	16-Nov-16	26-Nov-16
Snagging - WTG#056	120	25-Nov-16	05-Dec-16
Snagging - WTG#057	120	23-Nov-16	03-Dec-16
Snagging - WTG#058	120	23-Nov-16	03-Dec-16
Snagging - WTG#059	120	28-Nov-16	08-Dec-16
Snagging - WTG#060	120	06-Dec-16	16-Dec-16
Snagging - WTG#061	120	05-Dec-16	15-Dec-16
Snagging - WTG#062	120	05-Dec-16	15-Dec-16
Snagging - WTG#063	120	09-Dec-16	19-Dec-16
Snagging - WTG#064	120	19-Dec-16	29-Dec-16
Snagging - WTG#065	120	16-Dec-16	26-Dec-16
Snagging - WTG#066	120	16-Dec-16	26-Dec-16
Snagging - WTG#067	120	20-Dec-16	30-Dec-16
Snagging - WTG#068	120	29-Dec-16	08-Jan-17
Snagging - WTG#069	120	27-Dec-16	06-Jan-17
Snagging - WTG#070	120	27-Dec-16	06-Jan-17
Snagging - WTG#071	120	02-Jan-17	12-Jan-17
Snagging - WTG#072	120	09-Jan-17	19-Jan-17
Snagging - WTG#073	120	09-Jan-17	19-Jan-17
Snagging - WTG#074	120	09-Jan-17	19-Jan-17
Snagging - WTG#075	120	11-Jan-17	21-Jan-17
Snagging - WTG#076	120	20-Jan-17	30-Jan-17
Snagging - WTG#077	120	18-Jan-17	28-Jan-17
Snagging - WTG#078	120	18-Jan-17	28-Jan-17
Snagging - WTG#079	120	23-Jan-17	02-Feb-17
Snagging - WTG#080	120	01-Feb-17	11-Feb-17
Snagging - WTG#081	120	30-Jan-17	09-Feb-17
Snagging - WTG#082	120	30-Jan-17	09-Feb-17
Snagging - WTG#083	120	06-Feb-17	16-Feb-17

Figure B.1 : Floating offshore wind farm project construction planning (continues)

APPENDIX C

Table C.1 : Annual energy production calculation based on annual wind.

Description	Value
Rated Annual Output (MWh)	61320
Capacity Factor	64,5
Annual Energy Production (KWh)	39570340,1
Annual Energy Production (MWh)	39570,3

Table C.2 : Hourly wind speed data for 3 months period and power production calculation.

Year	Month	Day	Hour	Wind speed 100m	Power (kW) (Formula)	Power (kW)
14	1	1	0	14,47	7089,771560	7000
14	1	1	1	13,34	6990,244934	6990,244934
14	1	1	2	12,89	6881,759758	6881,759758
14	1	1	3	13,11	6940,844148	6940,844148
14	1	1	4	13,25	6972,345694	6972,345694
14	1	1	5	13,17	6954,903696	6954,903696
14	1	1	6	12,74	6834,313893	6834,313893
14	1	1	7	12,28	6649,301946	6649,301946
14	1	1	8	12,08	6549,015601	6549,015601
14	1	1	9	12,59	6780,714930	6780,71493
14	1	1	10	12,92	6890,536421	6890,536421
14	1	1	11	12,84	6866,610186	6866,610186
14	1	1	12	13,07	6930,993558	6930,993558
14	1	1	13	13,45	7009,747646	7009,747646
14	1	1	14	13,72	7047,361824	7047,361824
14	1	1	15	14,11	7079,298500	7000
14	1	1	16	15,26	7069,373890	7000
14	1	1	17	16,61	6979,536637	7000
14	1	1	18	17,39	6934,682465	7000
14	1	1	19	18,22	6911,220941	7000
14	1	1	20	18,65	6911,554746	7000
14	1	1	21	19,16	6923,728698	7000
14	1	1	22	19,62	6945,283887	7000

14	1	1	23	19,81	6956,841970	7000
14	1	2	0	20,15	6980,792774	7000
14	1	2	1	19,78	6954,922673	7000
14	1	2	2	20,1	6977,039079	7000
14	1	2	3	19,86	6960,115821	7000
14	1	2	4	19,23	6926,383736	7000
14	1	2	5	18,06	6913,369212	7000
14	1	2	6	17,16	6946,055467	7000
14	1	2	7	16,87	6962,769233	7000
14	1	2	8	16,79	6967,773576	7000
14	1	2	9	16,27	7003,093777	7000
14	1	2	10	15,56	7052,029460	7000
14	1	2	11	14,89	7084,715310	7000
14	1	2	12	14,51	7090,004510	7000
14	1	2	13	14,27	7085,929622	7000
14	1	2	14	13,77	7052,844473	7052,844473
14	1	2	15	13,37	6995,817996	6995,817996
14	1	2	16	12,92	6890,536421	6890,536421
14	1	2	17	12,89	6881,759758	6881,759758
14	1	2	18	13,3	6982,510599	6982,510599
14	1	2	19	13,44	7008,079380	7008,07938
14	1	2	20	13,1	6938,417660	6938,41766
14	1	2	21	12,73	6830,935230	6830,93523
14	1	2	22	12,72	6827,529127	6827,529127
14	1	2	23	12,92	6890,536421	6890,536421
14	1	3	0	13,1	6938,417660	6938,41766
14	1	3	1	13,1	6938,417660	6938,41766
14	1	3	2	13,7	7045,044911	7045,044911
14	1	3	3	14,84	7086,104426	7000
14	1	3	4	16,19	7008,772623	7000
14	1	3	5	17,19	6944,470290	7000
14	1	3	6	18,23	6911,126862	7000
14	1	3	7	18,83	6914,393743	7000
14	1	3	8	19,18	6924,463582	7000
14	1	3	9	19,3	6929,269212	7000
14	1	3	10	18,94	6916,915294	7000
14	1	3	11	17,97	6915,101124	7000
14	1	3	12	17,19	6944,470290	7000
14	1	3	13	16,68	6974,886601	7000
14	1	3	14	17,13	6947,669473	7000
14	1	3	15	18,75	6912,934323	7000
14	1	3	16	20,76	7030,643716	7000
14	1	3	17	21,29	7073,607693	7000
14	1	3	18	21,2	7066,808601	7000

14	1	3	19	21,44	7084,126474	7000
14	1	3	20	20,69	7024,714135	7000
14	1	3	21	20,49	7007,916212	7000
14	1	3	22	21,41	7082,116664	7000
14	1	3	23	21,67	7097,559238	7000
14	1	4	0	21,57	7092,188418	7000
14	1	4	1	21,83	7104,313797	7000
14	1	4	2	22	7108,460332	7000
14	1	4	3	21,81	7103,608087	7000
14	1	4	4	21,51	7088,606054	7000
14	1	4	5	20,91	7043,299086	7000
14	1	4	6	19,5	6938,749837	7000
14	1	4	7	17,94	6915,760573	7000
14	1	4	8	16,35	6997,445963	7000
14	1	4	9	14,83	7086,359556	7000
14	1	4	10	14,53	7090,058591	7000
14	1	4	11	14,64	7089,646884	7000
14	1	4	12	14,78	7087,517525	7000
14	1	4	13	15,11	7076,562516	7000
14	1	4	14	14,23	7084,585874	7000
14	1	4	15	15,98	7023,673838	7000
14	1	4	16	17,89	6916,949704	7000
14	1	4	17	18,11	6912,568749	7000
14	1	4	18	17,61	6925,620434	7000
14	1	4	19	16,79	6967,773576	7000
14	1	4	20	15,76	7038,920188	7000
14	1	4	21	14,65	7089,552289	7000
14	1	4	22	13,47	7013,022675	7013,022675
14	1	4	23	12,23	6625,395709	6625,395709
14	1	5	0	11,18	5940,076953	5940,076953
14	1	5	1	10,76	5570,630585	5570,630585
14	1	5	2	10,32	5134,739934	5134,739934
14	1	5	3	9,73	4494,306133	4494,306133
14	1	5	4	9,49	4223,321227	4223,321227
14	1	5	5	10,26	5072,074354	5072,074354
14	1	5	6	11,08	5856,717623	5856,717623
14	1	5	7	11,76	6362,209274	6362,209274
14	1	5	8	11,37	6090,066745	6090,066745
14	1	5	9	11,25	5996,631734	5996,631734
14	1	5	10	11,91	6453,859436	6453,859436
14	1	5	11	12,37	6690,407027	6690,407027
14	1	5	12	12,17	6595,687433	6595,687433
14	1	5	13	12,1	6559,607194	6559,607194
14	1	5	14	12,29	6653,991021	6653,991021

14	1	5	15	12,61	6788,227100	6788,2271
14	1	5	16	13,11	6940,844148	6940,844148
14	1	5	17	12,92	6890,536421	6890,536421
14	1	5	18	12,83	6863,501185	6863,501185
14	1	5	19	13,47	7013,022675	7013,022675
14	1	5	20	14,35	7088,024460	7000
14	1	5	21	14,66	7089,448523	7000
14	1	5	22	14,64	7089,646884	7000
14	1	5	23	15,11	7076,562516	7000
14	1	6	0	16,06	7018,013627	7000
14	1	6	1	17,09	6949,865252	7000
14	1	6	2	19,13	6922,662131	7000
14	1	6	3	20,39	6999,695856	7000
14	1	6	4	20,78	7032,337602	7000
14	1	6	5	19,97	6967,634449	7000
14	1	6	6	19,17	6924,093762	7000
14	1	6	7	19,52	6939,795908	7000
14	1	6	8	19,25	6927,184787	7000
14	1	6	9	19,73	6951,800879	7000
14	1	6	10	19,91	6963,480789	7000
14	1	6	11	19,25	6927,184787	7000
14	1	6	12	18,51	6910,452969	7000
14	1	6	13	18,25	6910,953033	7000
14	1	6	14	18,68	6911,916716	7000
14	1	6	15	19,23	6926,383736	7000
14	1	6	16	19,67	6948,185203	7000
14	1	6	17	19,33	6930,575538	7000
14	1	6	18	18,98	6917,979367	7000
14	1	6	19	18,83	6914,393743	7000
14	1	6	20	18,68	6911,916716	7000
14	1	6	21	18,69	6912,047259	7000
14	1	6	22	18,61	6911,141292	7000
14	1	6	23	18,4	6910,263193	7000
14	1	7	0	18,19	6911,531749	7000
14	1	7	1	19,3	6929,269212	7000
14	1	7	2	20,13	6979,282716	7000
14	1	7	3	21,34	7077,238425	7000
14	1	7	4	21,9	7106,438080	7000
14	1	7	5	21,53	7089,827937	7000
14	1	7	6	21,46	7085,437266	7000
14	1	7	7	21,01	7051,607765	7000
14	1	7	8	20,45	7004,609016	7000
14	1	7	9	19,94	6965,542166	7000
14	1	7	10	19,59	6943,592940	7000

14	1	7	11	19,34	6931,020192	7000
14	1	7	12	19,26	6927,592344	7000
14	1	7	13	19,25	6927,184787	7000
14	1	7	14	19,23	6926,383736	7000
14	1	7	15	19,53	6940,325458	7000
14	1	7	16	19,61	6944,716048	7000
14	1	7	17	19,59	6943,592940	7000
14	1	7	18	19,53	6940,325458	7000
14	1	7	19	19,4	6933,784015	7000
14	1	7	20	19,54	6940,859330	7000
14	1	7	21	19,26	6927,592344	7000
14	1	7	22	18,8	6913,809436	7000
14	1	7	23	18,64	6911,443973	7000
14	1	8	0	18,44	6910,263688	7000
14	1	8	1	18,6	6911,050274	7000
14	1	8	2	18,35	6910,372178	7000
14	1	8	3	17,9	6916,702925	7000
14	1	8	4	17,15	6946,590296	7000
14	1	8	5	16,31	7000,264742	7000
14	1	8	6	15,95	7025,785352	7000
14	1	8	7	16,97	6956,738261	7000
14	1	8	8	17,61	6925,620434	7000
14	1	8	9	17,68	6923,141253	7000
14	1	8	10	18,17	6911,762690	7000
14	1	8	11	18,78	6913,444574	7000
14	1	8	12	19,17	6924,093762	7000
14	1	8	13	19,41	6934,260519	7000
14	1	8	14	19,51	6939,270696	7000
14	1	8	15	18,94	6916,915294	7000
14	1	8	16	17,99	6914,684188	7000
14	1	8	17	17,23	6942,402606	7000
14	1	8	18	16,62	6978,866990	7000
14	1	8	19	16,05	7018,722974	7000
14	1	8	20	15,55	7052,658253	7000
14	1	8	21	14,7	7088,943390	7000
14	1	8	22	13,79	7054,915792	7054,915792
14	1	8	23	13,06	6928,470321	6928,470321
14	1	9	0	12,56	6769,232164	6769,232164
14	1	9	1	11,02	5805,281416	5805,281416
14	1	9	2	11,69	6316,958227	6316,958227
14	1	9	3	12,59	6780,714930	6780,71493
14	1	9	4	14,59	7089,979436	7000
14	1	9	5	17,49	6930,330813	7000
14	1	9	6	19,11	6921,975015	7000

14	1	9	7	19,27	6928,004575	7000
14	1	9	8	19,67	6948,185203	7000
14	1	9	9	19,92	6964,164435	7000
14	1	9	10	20,57	7014,592929	7000
14	1	9	11	21,22	7068,346162	7000
14	1	9	12	21,13	7061,322494	7000
14	1	9	13	21,99	7108,315358	7000
14	1	9	14	22,22	7107,995016	7107,995016
14	1	9	15	21,48	7086,723773	7000
14	1	9	16	20,18	6983,078622	7000
14	1	9	17	19,82	6957,489302	7000
14	1	9	18	19,67	6948,185203	7000
14	1	9	19	19,16	6923,728698	7000
14	1	9	20	18,75	6912,934323	7000
14	1	9	21	18,7	6912,182744	7000
14	1	9	22	19,09	6921,307110	7000
14	1	9	23	19,26	6927,592344	7000
14	1	10	0	19,09	6921,307110	7000
14	1	10	1	20,46	7005,433598	7000
14	1	10	2	20,2	6984,615949	7000
14	1	10	3	20,05	6973,359108	7000
14	1	10	4	20,19	6983,845967	7000
14	1	10	5	20,5	7008,746545	7000
14	1	10	6	20,35	6996,456441	7000
14	1	10	7	19,73	6951,800879	7000
14	1	10	8	19,01	6918,828672	7000
14	1	10	9	18,44	6910,263688	7000
14	1	10	10	17,92	6916,222774	7000
14	1	10	11	17,48	6930,748879	7000
14	1	10	12	16,89	6961,542357	7000
14	1	10	13	16,46	6989,766849	7000
14	1	10	14	15,84	7033,449748	7000
14	1	10	15	15,35	7064,538378	7000
14	1	10	16	14,79	7087,301880	7000
14	1	10	17	14,46	7089,686824	7000
14	1	10	18	14,22	7084,218077	7000
14	1	10	19	14,1	7078,769388	7000
14	1	10	20	14,09	7078,226220	7000
14	1	10	21	14,07	7077,097333	7000
14	1	10	22	14,33	7087,573014	7000
14	1	10	23	14,65	7089,552289	7000
14	1	11	0	15,08	7077,853548	7000
14	1	11	1	14,03	7074,666681	7000
14	1	11	2	15,11	7076,562516	7000

14	1	11	3	16,21	7007,351110	7000
14	1	11	4	16,59	6980,880999	7000
14	1	11	5	16,98	6956,149819	7000
14	1	11	6	17,2	6943,948408	7000
14	1	11	7	16,78	6968,409549	7000
14	1	11	8	16,91	6960,325608	7000
14	1	11	9	17,15	6946,590296	7000
14	1	11	10	16,54	6984,269939	7000
14	1	11	11	14,38	7088,613775	7000
14	1	11	12	12,71	6824,095498	6824,095498
14	1	11	13	14,52	7090,036678	7000
14	1	11	14	13,74	7049,607560	7049,60756
14	1	11	15	15,68	7044,274509	7000
14	1	11	16	17,94	6915,760573	7000
14	1	11	17	17,45	6932,026094	7000
14	1	11	18	16,71	6972,921922	7000
14	1	11	19	17,57	6927,126897	7000
14	1	11	20	19	6918,540699	7000
14	1	11	21	19,62	6945,283887	7000
14	1	11	22	20,05	6973,359108	7000
14	1	11	23	19,28	6928,421471	7000
14	1	12	0	18,14	6912,144549	7000
14	1	12	1	17,08	6950,421858	7000
14	1	12	2	17,08	6950,421858	7000
14	1	12	3	16,83	6965,252484	7000
14	1	12	4	16,55	6983,589079	7000
14	1	12	5	16,54	6984,269939	7000
14	1	12	6	16,24	7005,220791	7000
14	1	12	7	15,45	7058,774715	7000
14	1	12	8	14,09	7078,226220	7000
14	1	12	9	13,28	6978,511505	6978,511505
14	1	12	10	12,86	6872,748831	6872,748831
14	1	12	11	12,5	6745,486888	6745,486888
14	1	12	12	11,77	6368,544728	6368,544728
14	1	12	13	10,48	5298,325429	5298,325429
14	1	12	14	9,14	3825,383882	3825,383882
14	1	12	15	7,65	2259,705053	2259,705053
14	1	12	16	5,93	1010,230309	1010,230309
14	1	12	17	4,41	400,151729	400,1517287
14	1	12	18	3,19	136,684852	136,6848521
14	1	12	19	3,58	204,543232	204,5432318
14	1	12	20	4,86	541,977176	541,9771758
14	1	12	21	6,45	1317,874402	1317,874402
14	1	12	22	7,51	2132,904364	2132,904364

14	1	12	23	8,54	3157,042994	3157,042994
14	1	13	0	10,39	5206,962092	5206,962092
14	1	13	1	11,8	6387,357665	6387,357665
14	1	13	2	13,07	6930,993558	6930,993558
14	1	13	3	14,38	7088,613775	7000
14	1	13	4	15,68	7044,274509	7000
14	1	13	5	15,86	7032,067030	7000
14	1	13	6	14,9	7084,415324	7000
14	1	13	7	14,07	7077,097333	7000
14	1	13	8	13,53	7022,363060	7022,36306
14	1	13	9	13,26	6974,423388	6974,423388
14	1	13	10	13,35	6992,124138	6992,124138
14	1	13	11	14,12	7079,813651	7000
14	1	13	12	14,82	7086,606944	7000
14	1	13	13	14,12	7079,813651	7000
14	1	13	14	12,66	6806,511554	6806,511554
14	1	13	15	11,79	6381,118918	6381,118918
14	1	13	16	11,64	6283,669036	6283,669036
14	1	13	17	11,33	6059,419889	6059,419889
14	1	13	18	10,7	5513,900392	5513,900392
14	1	13	19	10,39	5206,962092	5206,962092
14	1	13	20	10,36	5176,130222	5176,130222
14	1	13	21	10,27	5082,565660	5082,56566
14	1	13	22	10,11	4912,596842	4912,596842
14	1	13	23	10,07	4869,448391	4869,448391
14	1	14	0	9,78	4550,258080	4550,25808
14	1	14	1	8,12	2715,530823	2715,530823
14	1	14	2	7,41	2045,003077	2045,003077
14	1	14	3	6,83	1580,356360	1580,35636
14	1	14	4	7,8	2400,277690	2400,27769
14	1	14	5	8,83	3476,139906	3476,139906
14	1	14	6	8,97	3633,108194	3633,108194
14	1	14	7	8,73	3365,062950	3365,06295
14	1	14	8	8,24	2838,733084	2838,733084
14	1	14	9	8,26	2859,510654	2859,510654
14	1	14	10	8,55	3167,879908	3167,879908
14	1	14	11	8,75	3387,199149	3387,199149
14	1	14	12	8,92	3576,876398	3576,876398
14	1	14	13	9,28	3984,513627	3984,513627
14	1	14	14	9,64	4393,091784	4393,091784
14	1	14	15	9,59	4336,628053	4336,628053
14	1	14	16	9,89	4672,505483	4672,505483
14	1	14	17	10,53	5348,316928	5348,316928
14	1	14	18	10,77	5579,995054	5579,995054

14	1	14	19	10,78	5589,333308	5589,333308
14	1	14	20	10,55	5368,154491	5368,154491
14	1	14	21	10,3	5113,927375	5113,927375
14	1	14	22	10,15	4955,494635	4955,494635
14	1	14	23	10,03	4826,061359	4826,061359
14	1	15	0	9,83	4605,979436	4605,979436
14	1	15	1	9,42	4143,793264	4143,793264
14	1	15	2	9,83	4605,979436	4605,979436
14	1	15	3	9,95	4738,620564	4738,620564
14	1	15	4	10,04	4836,929818	4836,929818
14	1	15	5	9,78	4550,258080	4550,25808
14	1	15	6	9,33	4041,409724	4041,409724
14	1	15	7	8,59	3211,358221	3211,358221
14	1	15	8	8,65	3276,951932	3276,951932
14	1	15	9	9,2	3893,530001	3893,530001
14	1	15	10	9,78	4550,258080	4550,25808
14	1	15	11	10,3	5113,927375	5113,927375
14	1	15	12	10,54	5358,247222	5358,247222
14	1	15	13	11,45	6149,850227	6149,850227
14	1	15	14	12,74	6834,313893	6834,313893
14	1	15	15	13,74	7049,607560	7049,60756
14	1	15	16	14,64	7089,646884	7000
14	1	15	17	15,65	7046,247016	7000
14	1	15	18	16,32	6999,558990	7000
14	1	15	19	16,55	6983,589079	7000
14	1	15	20	16,38	6995,340073	7000
14	1	15	21	16,15	7011,617299	7000
14	1	15	22	15,96	7025,082337	7000
14	1	15	23	15,83	7034,139014	7000
14	1	16	0	15,67	7044,934314	7000
14	1	16	1	14,34	7087,804653	7000
14	1	16	2	14,52	7090,036678	7000
14	1	16	3	14,47	7089,771560	7000
14	1	16	4	13,88	7063,402278	7063,402278
14	1	16	5	13,13	6945,625392	6945,625392
14	1	16	6	12,54	6761,433087	6761,433087
14	1	16	7	12,33	6672,441932	6672,441932
14	1	16	8	12,33	6672,441932	6672,441932
14	1	16	9	12,7	6820,634260	6820,63426
14	1	16	10	13,1	6938,417660	6938,41766
14	1	16	11	12,91	6887,636744	6887,636744
14	1	16	12	12,52	6753,518192	6753,518192
14	1	16	13	12,45	6724,895574	6724,895574
14	1	16	14	12,37	6690,407027	6690,407027

14	1	16	15	12,28	6649,301946	6649,301946
14	1	16	16	12,36	6685,961089	6685,961089
14	1	16	17	12,13	6575,258377	6575,258377
14	1	16	18	11,55	6221,721891	6221,721891
14	1	16	19	10,81	5617,189539	5617,189539
14	1	16	20	10,08	4880,258345	4880,258345
14	1	16	21	9,26	3961,759227	3961,759227
14	1	16	22	8,75	3387,199149	3387,199149
14	1	16	23	9,06	3734,722022	3734,722022
14	1	17	0	9,62	4370,524088	4370,524088
14	1	17	1	9,59	4336,628053	4336,628053
14	1	17	2	10,36	5176,130222	5176,130222
14	1	17	3	11,04	5822,543607	5822,543607
14	1	17	4	11,6	6256,458224	6256,458224
14	1	17	5	11,83	6405,880595	6405,880595
14	1	17	6	11,88	6436,108399	6436,108399
14	1	17	7	11,71	6330,048319	6330,048319
14	1	17	8	11,48	6171,746451	6171,746451
14	1	17	9	11,62	6270,127958	6270,127958
14	1	17	10	11,93	6465,533063	6465,533063
14	1	17	11	11,82	6399,738495	6399,738495
14	1	17	12	11,76	6362,209274	6362,209274
14	1	17	13	11,64	6283,669036	6283,669036
14	1	17	14	11,48	6171,746451	6171,746451
14	1	17	15	11,56	6228,733310	6228,73331
14	1	17	16	11,71	6330,048319	6330,048319
14	1	17	17	12	6505,383023	6505,383023
14	1	17	18	12,46	6729,072754	6729,072754
14	1	17	19	12,62	6791,940515	6791,940515
14	1	17	20	12,58	6776,916020	6776,91602
14	1	17	21	12,42	6712,186182	6712,186182
14	1	17	22	12,41	6707,890209	6707,890209
14	1	17	23	12,43	6716,452355	6716,452355
14	1	18	0	12,25	6635,050592	6635,050592
14	1	18	1	9,57	4314,003390	4314,00339
14	1	18	2	10,18	4987,496305	4987,496305
14	1	18	3	10,07	4869,448391	4869,448391
14	1	18	4	9,76	4527,903567	4527,903567
14	1	18	5	9,14	3825,383882	3825,383882
14	1	18	6	8,67	3298,912157	3298,912157
14	1	18	7	8,44	3049,430442	3049,430442
14	1	18	8	8,69	3320,918215	3320,918215
14	1	18	9	9,75	4516,712977	4516,712977
14	1	18	10	10,61	5427,106187	5427,106187

14	1	18	11	11,22	5972,577165	5972,577165
14	1	18	12	11,31	6043,909008	6043,909008
14	1	18	13	11,81	6393,564188	6393,564188
14	1	18	14	12,78	6847,555841	6847,555841
14	1	18	15	14,24	7084,940835	7000
14	1	18	16	15,66	7045,591834	7000
14	1	18	17	16,48	6988,384764	7000
14	1	18	18	16,94	6958,519942	7000
14	1	18	19	17,28	6939,893707	7000
14	1	18	20	17,64	6924,533222	7000
14	1	18	21	17,83	6918,523458	7000
14	1	18	22	17,91	6916,460612	7000
14	1	18	23	17,81	6919,083208	7000
14	1	19	0	18,2	6911,423392	7000
14	1	19	1	17,83	6918,523458	7000
14	1	19	2	19,25	6927,184787	7000
14	1	19	3	20,28	6990,866298	7000
14	1	19	4	20,73	7028,102040	7000
14	1	19	5	20,84	7037,410953	7000
14	1	19	6	21,06	7055,696343	7000
14	1	19	7	21,04	7054,067176	7000
14	1	19	8	20,93	7044,972237	7000
14	1	19	9	21,02	7052,429552	7000
14	1	19	10	20,99	7049,958634	7000
14	1	19	11	20,79	7033,184186	7000
14	1	19	12	20,53	7011,245246	7000
14	1	19	13	20,34	6995,651495	7000
14	1	19	14	20,61	7017,955950	7000
14	1	19	15	21	7050,784100	7000
14	1	19	16	21,22	7068,346162	7000
14	1	19	17	21,15	7062,905530	7000
14	1	19	18	20,69	7024,714135	7000
14	1	19	19	19,9	6962,800659	7000
14	1	19	20	19,09	6921,307110	7000
14	1	19	21	18,38	6910,292201	7000
14	1	19	22	17,52	6929,099878	7000
14	1	19	23	16,54	6984,269939	7000
14	1	20	0	15,66	7045,591834	7000
14	1	20	1	12,77	6844,286088	6844,286088
14	1	20	2	12,81	6857,203381	6857,203381
14	1	20	3	13,53	7022,363060	7022,36306
14	1	20	4	13,89	7064,262925	7064,262925
14	1	20	5	13,39	6999,426464	6999,426464
14	1	20	6	12,73	6830,935230	6830,93523

14	1	20	7	11,97	6488,496126	6488,496126
14	1	20	8	11,71	6330,048319	6330,048319
14	1	20	9	11,44	6142,487965	6142,487965
14	1	20	10	10,96	5752,803016	5752,803016
14	1	20	11	10,34	5155,474674	5155,474674
14	1	20	12	9,96	4749,596799	4749,596799
14	1	20	13	9,48	4211,968632	4211,968632
14	1	20	14	9,34	4052,789114	4052,789114
14	1	20	15	9,29	3995,892082	3995,892082
14	1	20	16	9,47	4200,612855	4200,612855
14	1	20	17	9,65	4404,366128	4404,366128
14	1	20	18	9,77	4539,085335	4539,085335
14	1	20	19	9,45	4177,892561	4177,892561
14	1	20	20	9,04	3712,102090	3712,10209
14	1	20	21	8,79	3431,592904	3431,592904
14	1	20	22	8,4	3006,789258	3006,789258
14	1	20	23	8,13	2725,699413	2725,699413
14	1	21	0	8,14	2735,886204	2735,886204
14	1	21	1	8,06	2654,906837	2654,906837
14	1	21	2	7,95	2545,539291	2545,539291
14	1	21	3	8,03	2624,848161	2624,848161
14	1	21	4	8,47	3081,565987	3081,565987
14	1	21	5	8,43	3038,747795	3038,747795
14	1	21	6	8,2	2797,383602	2797,383602
14	1	21	7	7,55	2168,691650	2168,69165
14	1	21	8	7,13	1810,994904	1810,994904
14	1	21	9	6,92	1647,361402	1647,361402
14	1	21	10	6,6	1417,573909	1417,573909
14	1	21	11	6,31	1229,334803	1229,334803
14	1	21	12	6,36	1260,461321	1260,461321
14	1	21	13	6,72	1500,994649	1500,994649
14	1	21	14	7,18	1851,459786	1851,459786
14	1	21	15	7,55	2168,691650	2168,69165
14	1	21	16	8,07	2664,964228	2664,964228
14	1	21	17	8,29	2890,803083	2890,803083
14	1	21	18	8,36	2964,391184	2964,391184
14	1	21	19	8,51	3124,612885	3124,612885
14	1	21	20	8,53	3146,219427	3146,219427
14	1	21	21	8,56	3178,730028	3178,730028
14	1	21	22	8,56	3178,730028	3178,730028
14	1	21	23	8,74	3376,125861	3376,125861
14	1	22	0	8,86	3509,644435	3509,644435
14	1	22	1	9,08	3757,361635	3757,361635
14	1	22	2	9,06	3734,722022	3734,722022

14	1	22	3	9,64	4393,091784	4393,091784
14	1	22	4	10,51	5328,387872	5328,387872
14	1	22	5	11,13	5898,771017	5898,771017
14	1	22	6	11,51	6193,356127	6193,356127
14	1	22	7	11,82	6399,738495	6399,738495
14	1	22	8	11,93	6465,533063	6465,533063
14	1	22	9	12,08	6549,015601	6549,015601
14	1	22	10	12,11	6564,855710	6564,85571
14	1	22	11	12,32	6667,874898	6667,874898
14	1	22	12	12,43	6716,452355	6716,452355
14	1	22	13	12,58	6776,916020	6776,91602
14	1	22	14	12,92	6890,536421	6890,536421
14	1	22	15	13,54	7023,850174	7023,850174
14	1	22	16	14,13	7080,314935	7000
14	1	22	17	14,57	7090,045378	7000
14	1	22	18	15,06	7078,684793	7000
14	1	22	19	15,32	7066,189673	7000
14	1	22	20	15,27	7068,854571	7000
14	1	22	21	15,18	7073,353652	7000
14	1	22	22	15,14	7075,220147	7000
14	1	22	23	15,21	7071,898638	7000
14	1	23	0	15,48	7056,974129	7000
14	1	23	1	14,47	7089,771560	7000
14	1	23	2	14,72	7088,637913	7000
14	1	23	3	14,98	7081,762035	7000
14	1	23	4	15,39	7062,279075	7000
14	1	23	5	15,54	7053,284101	7000
14	1	23	6	15,69	7043,612474	7000
14	1	23	7	15,54	7053,284101	7000
14	1	23	8	15,45	7058,774715	7000
14	1	23	9	15,48	7056,974129	7000
14	1	23	10	15,63	7047,550150	7000
14	1	23	11	15,38	7062,849884	7000
14	1	23	12	15,59	7050,125972	7000
14	1	23	13	15,73	7040,943080	7000
14	1	23	14	15,79	7036,880977	7000
14	1	23	15	15,96	7025,082337	7000
14	1	23	16	16,18	7009,483647	7000
14	1	23	17	16,47	6989,075192	7000
14	1	23	18	16,53	6984,952268	7000
14	1	23	19	16,54	6984,269939	7000
14	1	23	20	16,38	6995,340073	7000
14	1	23	21	16,2	7008,061764	7000
14	1	23	22	15,83	7034,139014	7000

14	1	23	23	15,43	7059,957576	7000
14	1	24	0	14,91	7084,108125	7000
14	1	24	1	14,94	7083,144004	7000
14	1	24	2	15,06	7078,684793	7000
14	1	24	3	14,74	7088,298020	7000
14	1	24	4	15,05	7079,091373	7000
14	1	24	5	14,82	7086,606944	7000
14	1	24	6	14,26	7085,612617	7000
14	1	24	7	13,87	7062,525436	7062,525436
14	1	24	8	13,72	7047,361824	7047,361824
14	1	24	9	13,62	7035,049340	7035,04934
14	1	24	10	13,87	7062,525436	7062,525436
14	1	24	11	14,05	7075,911076	7000
14	1	24	12	14,3	7086,806195	7000
14	1	24	13	14,08	7077,668900	7000
14	1	24	14	13,75	7050,703989	7050,703989
14	1	24	15	13,78	7053,888728	7053,888728
14	1	24	16	14,3	7086,806195	7000
14	1	24	17	15,32	7066,189673	7000
14	1	24	18	15,67	7044,934314	7000
14	1	24	19	15,7	7042,948260	7000
14	1	24	20	15,85	7032,759070	7000
14	1	24	21	15,91	7028,588098	7000
14	1	24	22	15,65	7046,247016	7000
14	1	24	23	15,08	7077,853548	7000
14	1	25	0	14,45	7089,591314	7000
14	1	25	1	13,48	7014,629641	7014,629641
14	1	25	2	14,44	7089,484945	7000
14	1	25	3	15,42	7060,543569	7000
14	1	25	4	15,63	7047,550150	7000
14	1	25	5	15,28	7068,330613	7000
14	1	25	6	15,49	7056,367157	7000
14	1	25	7	15,6	7049,485960	7000
14	1	25	8	15,96	7025,082337	7000
14	1	25	9	16,21	7007,351110	7000
14	1	25	10	16,41	6993,242326	7000
14	1	25	11	16,38	6995,340073	7000
14	1	25	12	16,46	6989,766849	7000
14	1	25	13	16,49	6987,695599	7000
14	1	25	14	16,74	6970,975365	7000
14	1	25	15	17,49	6930,330813	7000
14	1	25	16	18,54	6910,607744	7000
14	1	25	17	19,63	6945,855893	7000
14	1	25	18	20,52	7010,411112	7000

14	1	25	19	21,06	7055,696343	7000
14	1	25	20	21,18	7065,257157	7000
14	1	25	21	20,85	7038,254615	7000
14	1	25	22	20,31	6993,249116	7000
14	1	25	23	19,6	6944,152393	7000
14	1	26	0	19,01	6918,828672	7000
14	1	26	1	16,37	6996,041181	7000
14	1	26	2	16,29	7001,678131	7000
14	1	26	3	15,62	7048,197994	7000
14	1	26	4	13,75	7050,703989	7050,703989
14	1	26	5	13,67	7041,434322	7041,434322
14	1	26	6	13,57	7028,194208	7028,194208
14	1	26	7	13,25	6972,345694	6972,345694
14	1	26	8	13,52	7020,856226	7020,856226
14	1	26	9	14,27	7085,929622	7000
14	1	26	10	14,33	7087,573014	7000
14	1	26	11	14,63	7089,732228	7000
14	1	26	12	14,91	7084,108125	7000
14	1	26	13	14,96	7082,466556	7000
14	1	26	14	15,42	7060,543569	7000
14	1	26	15	16,36	6996,743157	7000
14	1	26	16	17,24	6941,894025	7000
14	1	26	17	18,7	6912,182744	7000
14	1	26	18	20,05	6973,359108	7000
14	1	26	19	20,87	7039,939714	7000
14	1	26	20	21,49	7087,357643	7000
14	1	26	21	21,68	7098,051264	7000
14	1	26	22	21,51	7088,606054	7000
14	1	26	23	21,05	7054,882856	7000
14	1	27	0	20,35	6996,456441	7000
14	1	27	1	19,43	6935,227010	7000
14	1	27	2	18,82	6914,194041	7000
14	1	27	3	17,11	6948,761187	7000
14	1	27	4	14,83	7086,359556	7000
14	1	27	5	11,63	6276,914585	6276,914585
14	1	27	6	8,79	3431,592904	3431,592904
14	1	27	7	9,23	3927,636800	3927,6368
14	1	27	8	12,41	6707,890209	6707,890209
14	1	27	9	13,72	7047,361824	7047,361824
14	1	27	10	13,13	6945,625392	6945,625392
14	1	27	11	12,36	6685,961089	6685,961089
14	1	27	12	11,79	6381,118918	6381,118918
14	1	27	13	11,37	6090,066745	6090,066745
14	1	27	14	11,09	5865,187618	5865,187618

14	1	27	15	11,24	5988,644210	5988,64421
14	1	27	16	12,03	6521,983260	6521,98326
14	1	27	17	12,99	6910,118263	6910,118263
14	1	27	18	13,83	7058,854143	7058,854143
14	1	27	19	14,46	7089,686824	7000
14	1	27	20	15,12	7076,120672	7000
14	1	27	21	15,17	7073,828287	7000
14	1	27	22	14,79	7087,301880	7000
14	1	27	23	14,3	7086,806195	7000
14	1	28	0	14,23	7084,585874	7000
14	1	28	1	15,65	7046,247016	7000
14	1	28	2	15,9	7029,286221	7000
14	1	28	3	15,74	7040,270682	7000
14	1	28	4	15,36	7063,979598	7000
14	1	28	5	15,2	7072,388760	7000
14	1	28	6	15,17	7073,828287	7000
14	1	28	7	15,25	7069,888506	7000
14	1	28	8	15,34	7065,093026	7000
14	1	28	9	15,62	7048,197994	7000
14	1	28	10	15,74	7040,270682	7000
14	1	28	11	15,63	7047,550150	7000
14	1	28	12	15,85	7032,759070	7000
14	1	28	13	16,32	6999,558990	7000
14	1	28	14	16,84	6964,628053	7000
14	1	28	15	17,36	6936,060616	7000
14	1	28	16	17,98	6914,890379	7000
14	1	28	17	18,22	6911,220941	7000
14	1	28	18	18,48	6910,342425	7000
14	1	28	19	18,62	6911,237247	7000
14	1	28	20	18,42	6910,253676	7000
14	1	28	21	18,17	6911,762690	7000
14	1	28	22	17,73	6921,495290	7000
14	1	28	23	17,35	6936,527274	7000
14	1	29	0	17,16	6946,055467	7000
14	1	29	1	14,7	7088,943390	7000
14	1	29	2	15,01	7080,655763	7000
14	1	29	3	14,68	7089,213808	7000
14	1	29	4	14,57	7090,045378	7000
14	1	29	5	14,74	7088,298020	7000
14	1	29	6	14,88	7085,008009	7000
14	1	29	7	14,58	7090,017281	7000
14	1	29	8	14,52	7090,036678	7000
14	1	29	9	14,62	7089,808238	7000
14	1	29	10	14,43	7089,367630	7000

14	1	29	11	14,62	7089,808238	7000
14	1	29	12	14,69	7089,083022	7000
14	1	29	13	14,61	7089,874831	7000
14	1	29	14	14,93	7083,472391	7000
14	1	29	15	15,24	7070,398354	7000
14	1	29	16	15,27	7068,854571	7000
14	1	29	17	15,28	7068,330613	7000
14	1	29	18	15,05	7079,091373	7000
14	1	29	19	14,72	7088,637913	7000
14	1	29	20	14,86	7085,571245	7000
14	1	29	21	14,85	7085,841630	7000
14	1	29	22	14,42	7089,239279	7000
14	1	29	23	13,57	7028,194208	7028,194208
14	1	30	0	13,22	6965,976868	6965,976868
14	1	30	1	12,32	6667,874898	6667,874898
14	1	30	2	12,68	6813,628623	6813,628623
14	1	30	3	13,17	6954,903696	6954,903696
14	1	30	4	13,18	6957,164641	6957,164641
14	1	30	5	13,22	6965,976868	6965,976868
14	1	30	6	13,08	6933,492462	6933,492462
14	1	30	7	12,88	6878,782267	6878,782267
14	1	30	8	12,87	6875,778655	6875,778655
14	1	30	9	13,2	6961,616867	6961,616867
14	1	30	10	13,38	6997,632853	6997,632853
14	1	30	11	13	6912,814521	6912,814521
14	1	30	12	12,54	6761,433087	6761,433087
14	1	30	13	12,67	6810,084059	6810,084059
14	1	30	14	12,73	6830,935230	6830,93523
14	1	30	15	12,63	6795,625589	6795,625589
14	1	30	16	12,87	6875,778655	6875,778655
14	1	30	17	13,37	6995,817996	6995,817996
14	1	30	18	13,53	7022,363060	7022,36306
14	1	30	19	13,38	6997,632853	6997,632853
14	1	30	20	12,86	6872,748831	6872,748831
14	1	30	21	12,6	6784,485265	6784,485265
14	1	30	22	12,57	6773,088457	6773,088457
14	1	30	23	12,64	6799,282400	6799,2824
14	1	31	0	12,72	6827,529127	6827,529127
14	1	31	1	11,93	6465,533063	6465,533063
14	1	31	2	11,98	6494,156991	6494,156991
14	1	31	3	11,77	6368,544728	6368,544728
14	1	31	4	12,27	6644,582219	6644,582219
14	1	31	5	13,07	6930,993558	6930,993558
14	1	31	6	13,19	6959,402332	6959,402332

14	1	31	7	12,5	6745,486888	6745,486888
14	1	31	8	10,64	5456,259207	5456,259207
14	1	31	9	9,88	4661,445194	4661,445194
14	1	31	10	9,88	4661,445194	4661,445194
14	1	31	11	10,1	4901,832759	4901,832759
14	1	31	12	10,17	4976,845801	4976,845801
14	1	31	13	9,85	4628,197807	4628,197807
14	1	31	14	9,61	4359,231140	4359,23114
14	1	31	15	9,64	4393,091784	4393,091784
14	1	31	16	9,93	4716,630499	4716,630499
14	1	31	17	10,47	5288,260209	5288,260209
14	1	31	18	11,12	5890,419819	5890,419819
14	1	31	19	11,9	6447,974523	6447,974523
14	1	31	20	12,75	6837,665200	6837,6652
14	1	31	21	13,49	7016,216378	7016,216378
14	1	31	22	14,41	7089,099807	7000
14	1	31	23	15,47	7057,577751	7000
14	2	1	0	16,33	6998,853917	7000
14	2	1	1	16,48	6988,384764	7000
14	2	1	2	17,56	6927,513557	7000
14	2	1	3	18,24	6911,037557	7000
14	2	1	4	18,97	6917,706018	7000
14	2	1	5	20,05	6973,359108	7000
14	2	1	6	19,85	6959,453661	7000
14	2	1	7	19,62	6945,283887	7000
14	2	1	8	19,68	6948,777757	7000
14	2	1	9	19,18	6924,463582	7000
14	2	1	10	18,35	6910,372178	7000
14	2	1	11	17,38	6935,138191	7000
14	2	1	12	16,74	6970,975365	7000
14	2	1	13	15,88	7030,679058	7000
14	2	1	14	14,95	7082,808701	7000
14	2	1	15	14,27	7085,929622	7000
14	2	1	16	14	7072,689391	7000
14	2	1	17	13,98	7071,296270	7071,29627
14	2	1	18	14,15	7081,276285	7000
14	2	1	19	14,62	7089,808238	7000
14	2	1	20	14,86	7085,571245	7000
14	2	1	21	15,16	7074,297626	7000
14	2	1	22	15,69	7043,612474	7000
14	2	1	23	16,24	7005,220791	7000
14	2	2	0	16,48	6988,384764	7000
14	2	2	1	18,22	6911,220941	7000
14	2	2	2	18,27	6910,798355	7000

14	2	2	3	18,23	6911,126862	7000
14	2	2	4	18,29	6910,662881	7000
14	2	2	5	18,45	6910,276027	7000
14	2	2	6	18,35	6910,372178	7000
14	2	2	7	17,55	6927,904201	7000
14	2	2	8	16,65	6976,868571	7000
14	2	2	9	15,84	7033,449748	7000
14	2	2	10	15,48	7056,974129	7000
14	2	2	11	15,23	7070,903369	7000
14	2	2	12	14,83	7086,359556	7000
14	2	2	13	14,48	7089,845610	7000
14	2	2	14	14,13	7080,314935	7000
14	2	2	15	13,82	7057,894841	7057,894841
14	2	2	16	13,63	7036,363542	7036,363542
14	2	2	17	13,57	7028,194208	7028,194208
14	2	2	18	13,52	7020,856226	7020,856226
14	2	2	19	13,41	7002,950353	7002,950353
14	2	2	20	13,22	6965,976868	6965,976868
14	2	2	21	13,03	6920,753651	6920,753651
14	2	2	22	12,65	6802,911028	6802,911028
14	2	2	23	12	6505,383023	6505,383023
14	2	3	0	11,19	5948,247600	5948,2476
14	2	3	1	10,82	5626,421698	5626,421698
14	2	3	2	10,14	4944,794341	4944,794341
14	2	3	3	9,74	4505,513765	4505,513765
14	2	3	4	9,24	3939,009462	3939,009462
14	2	3	5	8,98	3644,374854	3644,374854
14	2	3	6	9,2	3893,530001	3893,530001
14	2	3	7	9	3666,927069	3666,927069
14	2	3	8	8,98	3644,374854	3644,374854
14	2	3	9	8,74	3376,125861	3376,125861
14	2	3	10	8,49	3103,061378	3103,061378
14	2	3	11	8,44	3049,430442	3049,430442
14	2	3	12	9,06	3734,722022	3734,722022
14	2	3	13	9,6	4347,932395	4347,932395
14	2	3	14	10,26	5072,074354	5072,074354
14	2	3	15	11,3	6036,106887	6036,106887
14	2	3	16	12,36	6685,961089	6685,961089
14	2	3	17	13,32	6986,421473	6986,421473
14	2	3	18	14,18	7082,616674	7000
14	2	3	19	14,96	7082,466556	7000
14	2	3	20	15,29	7067,802081	7000
14	2	3	21	15,13	7075,673193	7000
14	2	3	22	14,55	7090,071987	7000

14	2	3	23	14,09	7078,226220	7000
14	2	4	0	13,55	7025,317669	7025,317669
14	2	4	1	13,12	6943,246693	6943,246693
14	2	4	2	13,51	7019,329568	7019,329568
14	2	4	3	13,4	7001,198930	7001,19893
14	2	4	4	13,43	7006,390476	7006,390476
14	2	4	5	13,42	7004,680835	7004,680835
14	2	4	6	13	6912,814521	6912,814521
14	2	4	7	12,56	6769,232164	6769,232164
14	2	4	8	12,37	6690,407027	6690,407027
14	2	4	9	12,46	6729,072754	6729,072754
14	2	4	10	12,57	6773,088457	6773,088457
14	2	4	11	12,48	6737,338598	6737,338598
14	2	4	12	12,54	6761,433087	6761,433087
14	2	4	13	11,27	6012,514472	6012,514472
14	2	4	14	10,55	5368,154491	5368,154491
14	2	4	15	10,65	5465,928096	5465,928096
14	2	4	16	10,56	5378,038583	5378,038583
14	2	4	17	10,53	5348,316928	5348,316928
14	2	4	18	10,72	5532,913096	5532,913096
14	2	4	19	11,03	5813,927035	5813,927035
14	2	4	20	11,33	6059,419889	6059,419889
14	2	4	21	11,42	6127,668377	6127,668377
14	2	4	22	11,75	6355,841576	6355,841576
14	2	4	23	12,16	6590,627095	6590,627095
14	2	5	0	12,59	6780,714930	6780,71493
14	2	5	1	11,34	6067,128543	6067,128543
14	2	5	2	12,44	6720,688797	6720,688797
14	2	5	3	13,66	7040,194329	7040,194329
14	2	5	4	14,76	7087,924347	7000
14	2	5	5	16,04	7019,431890	7000
14	2	5	6	17,42	6933,337454	7000
14	2	5	7	18,09	6912,874959	7000
14	2	5	8	18,63	6911,338140	7000
14	2	5	9	19,32	6930,135482	7000
14	2	5	10	19,18	6924,463582	7000
14	2	5	11	18,02	6914,093039	7000
14	2	5	12	16,41	6993,242326	7000
14	2	5	13	15,21	7071,898638	7000
14	2	5	14	14,59	7089,979436	7000
14	2	5	15	14,27	7085,929622	7000
14	2	5	16	14,43	7089,367630	7000
14	2	5	17	14,68	7089,213808	7000
14	2	5	18	14,99	7081,399804	7000

14	2	5	19	15,79	7036,880977	7000
14	2	5	20	16,32	6999,558990	7000
14	2	5	21	16,64	6977,532925	7000
14	2	5	22	16,92	6959,721098	7000
14	2	5	23	17,11	6948,761187	7000
14	2	6	0	17,14	6947,128306	7000
14	2	6	1	19,39	6933,312023	7000
14	2	6	2	19,4	6933,784015	7000
14	2	6	3	19,41	6934,260519	7000
14	2	6	4	19,48	6937,721243	7000
14	2	6	5	19,41	6934,260519	7000
14	2	6	6	19,16	6923,728698	7000
14	2	6	7	18,79	6913,624537	7000
14	2	6	8	18,5	6910,411210	7000
14	2	6	9	18,31	6910,546662	7000
14	2	6	10	18,09	6912,874959	7000
14	2	6	11	17,84	6918,250145	7000
14	2	6	12	17,1	6949,311687	7000
14	2	6	13	16,4	6993,940609	7000
14	2	6	14	15,74	7040,270682	7000
14	2	6	15	15,13	7075,673193	7000
14	2	6	16	14,17	7082,183304	7000
14	2	6	17	13,29	6980,522130	6980,52213
14	2	6	18	13,03	6920,753651	6920,753651
14	2	6	19	13,85	7060,722774	7060,722774
14	2	6	20	14,66	7089,448523	7000
14	2	6	21	15,25	7069,888506	7000
14	2	6	22	15,91	7028,588098	7000
14	2	6	23	16,17	7010,194796	7000
14	2	7	0	17,1	6949,311687	7000
14	2	7	1	20,42	7002,144803	7000
14	2	7	2	20,14	6980,036337	7000
14	2	7	3	19,04	6919,721756	7000
14	2	7	4	17,96	6915,316412	7000
14	2	7	5	17,89	6916,949704	7000
14	2	7	6	16,68	6974,886601	7000
14	2	7	7	16,58	6981,555648	7000
14	2	7	8	17,63	6924,891534	7000
14	2	7	9	18,85	6914,807935	7000
14	2	7	10	18,5	6910,411210	7000
14	2	7	11	18,52	6910,499642	7000
14	2	7	12	18,06	6913,369212	7000
14	2	7	13	16,87	6962,769233	7000
14	2	7	14	15,4	7061,704379	7000

14	2	7	15	14,91	7084,108125	7000
14	2	7	16	17,45	6932,026094	7000
14	2	7	17	19,95	6966,236196	7000
14	2	7	18	19,89	6962,124071	7000
14	2	7	19	20,61	7017,955950	7000
14	2	7	20	19,62	6945,283887	7000
14	2	7	21	18,49	6910,374363	7000
14	2	7	22	17,71	6922,141039	7000
14	2	7	23	17,46	6931,596538	7000
14	2	8	0	17,1	6949,311687	7000
14	2	8	1	15,17	7073,828287	7000
14	2	8	2	15,49	7056,367157	7000
14	2	8	3	15,59	7050,125972	7000
14	2	8	4	15,1	7076,998656	7000
14	2	8	5	16	7022,262355	7000
14	2	8	6	17,44	6932,459444	7000
14	2	8	7	19,03	6919,419206	7000
14	2	8	8	19,89	6962,124071	7000
14	2	8	9	20,14	6980,036337	7000
14	2	8	10	20,34	6995,651495	7000
14	2	8	11	20,1	6977,039079	7000
14	2	8	12	19,3	6929,269212	7000
14	2	8	13	18,19	6911,531749	7000
14	2	8	14	17,53	6928,697379	7000
14	2	8	15	17,11	6948,761187	7000
14	2	8	16	17,22	6942,914544	7000
14	2	8	17	17,22	6942,914544	7000
14	2	8	18	17,37	6935,597582	7000
14	2	8	19	17,31	6938,429760	7000
14	2	8	20	17,26	6940,887023	7000
14	2	8	21	17,41	6933,782077	7000
14	2	8	22	17,62	6925,253943	7000
14	2	8	23	17,87	6917,456606	7000
14	2	9	0	18,59	6910,964191	7000
14	2	9	1	18,32	6910,495788	7000
14	2	9	2	19,66	6947,596721	7000
14	2	9	3	20,35	6996,456441	7000
14	2	9	4	20,81	7034,876319	7000
14	2	9	5	21,12	7060,526651	7000
14	2	9	6	21,46	7085,437266	7000
14	2	9	7	21,36	7078,657771	7000
14	2	9	8	21,35	7077,950551	7000
14	2	9	9	21,4	7081,435525	7000
14	2	9	10	21,35	7077,950551	7000

14	2	9	11	21,39	7080,748962	7000
14	2	9	12	21,86	7105,291498	7000
14	2	9	13	22,07	7109,093875	7109,093875
14	2	9	14	21,93	7107,175096	7000
14	2	9	15	21,64	7096,032252	7000
14	2	9	16	21,19	7066,034569	7000
14	2	9	17	20,84	7037,410953	7000
14	2	9	18	21,31	7075,073608	7000
14	2	9	19	21,85	7104,976571	7000
14	2	9	20	22,3	7105,879838	7105,879838
14	2	9	21	21,64	7096,032252	7000
14	2	9	22	20,6	7017,113943	7000
14	2	9	23	19,65	6947,012329	7000
14	2	10	0	19,05	6920,029155	7000
14	2	10	1	16,48	6988,384764	7000
14	2	10	2	16,28	7002,385691	7000
14	2	10	3	15,45	7058,774715	7000
14	2	10	4	14,59	7089,979436	7000
14	2	10	5	13,4	7001,198930	7001,19893
14	2	10	6	12,78	6847,555841	6847,555841
14	2	10	7	12,64	6799,282400	6799,2824
14	2	10	8	12,71	6824,095498	6824,095498
14	2	10	9	11,73	6343,009441	6343,009441
14	2	10	10	10,79	5598,645222	5598,645222
14	2	10	11	10,1	4901,832759	4901,832759
14	2	10	12	9,51	4246,016073	4246,016073
14	2	10	13	8,54	3157,042994	3157,042994
14	2	10	14	7,65	2259,705053	2259,705053
14	2	10	15	7,34	1984,817430	1984,81743
14	2	10	16	7,78	2381,259073	2381,259073
14	2	10	17	8,11	2705,380529	2705,380529
14	2	10	18	8,83	3476,139906	3476,139906
14	2	10	19	10,1	4901,832759	4901,832759
14	2	10	20	10,9	5699,303447	5699,303447
14	2	10	21	11,1	5873,628037	5873,628037
14	2	10	22	10,93	5726,179497	5726,179497
14	2	10	23	9,99	4782,447967	4782,447967
14	2	11	0	8,97	3633,108194	3633,108194
14	2	11	1	6,22	1174,676118	1174,676118
14	2	11	2	4,82	528,197782	528,1977823
14	2	11	3	3,64	216,215320	216,2153203
14	2	11	4	2,59	55,937158	55,93715767
14	2	11	5	1,98	-2,471303	0
14	2	11	6	1,95	-4,826895	0

14	2	11	7	1,99	-1,676227	0
14	2	11	8	3,49	187,675401	187,6754006
14	2	11	9	5,36	735,607673	735,6076731
14	2	11	10	7,73	2334,080811	2334,080811
14	2	11	11	10,1	4901,832759	4901,832759
14	2	11	12	11,31	6043,909008	6043,909008
14	2	11	13	11,37	6090,066745	6090,066745
14	2	11	14	11,28	6020,409562	6020,409562
14	2	11	15	11,9	6447,974523	6447,974523
14	2	11	16	12,64	6799,282400	6799,2824
14	2	11	17	14,17	7082,183304	7000
14	2	11	18	15,77	7038,242196	7000
14	2	11	19	17,32	6937,948801	7000
14	2	11	20	18,12	6912,422658	7000
14	2	11	21	17,91	6916,460612	7000
14	2	11	22	16,91	6960,325608	7000
14	2	11	23	14,94	7083,144004	7000
14	2	12	0	13,14	6947,980344	6947,980344
14	2	12	1	12,25	6635,050592	6635,050592
14	2	12	2	11,95	6477,078565	6477,078565
14	2	12	3	12,93	6893,410345	6893,410345
14	2	12	4	14,73	7088,472229	7000
14	2	12	5	15,26	7069,373890	7000
14	2	12	6	14,59	7089,979436	7000
14	2	12	7	14,28	7086,234160	7000
14	2	12	8	14,34	7087,804653	7000
14	2	12	9	13,76	7051,782927	7051,782927
14	2	12	10	13,77	7052,844473	7052,844473
14	2	12	11	14,35	7088,024460	7000
14	2	12	12	15,01	7080,655763	7000
14	2	12	13	15,42	7060,543569	7000
14	2	12	14	16,08	7016,593815	7000
14	2	12	15	17,3	6938,914244	7000
14	2	12	16	17,75	6920,866522	7000
14	2	12	17	19,24	6926,781914	7000
14	2	12	18	20,6	7017,113943	7000
14	2	12	19	22,06	7109,045353	7109,045353
14	2	12	20	23,29	6947,836151	6947,836151
14	2	12	21	24,43	6256,915338	6256,915338
14	2	12	22	24,43	6256,915338	6256,915338
14	2	12	23	22,94	7037,567098	7037,567098
14	2	13	0	21,29	7073,607693	7000
14	2	13	1	21,94	7107,396554	7000
14	2	13	2	20,71	7026,407743	7000

14	2	13	3	20,16	6981,551990	7000
14	2	13	4	20,5	7008,746545	7000
14	2	13	5	20,73	7028,102040	7000
14	2	13	6	20,63	7019,642144	7000
14	2	13	7	19,98	6968,338614	7000
14	2	13	8	18,73	6912,618863	7000
14	2	13	9	18,33	6910,449745	7000
14	2	13	10	17,58	6926,744238	7000
14	2	13	11	16,32	6999,558990	7000
14	2	13	12	15,28	7068,330613	7000
14	2	13	13	14,15	7081,276285	7000
14	2	13	14	12,58	6776,916020	6776,91602
14	2	13	15	11,43	6135,094002	6135,094002
14	2	13	16	10,13	4934,077820	4934,07782
14	2	13	17	9,47	4200,612855	4200,612855
14	2	13	18	9,47	4200,612855	4200,612855
14	2	13	19	9,7	4460,634729	4460,634729
14	2	13	20	10,11	4912,596842	4912,596842
14	2	13	21	10,8	5607,930673	5607,930673
14	2	13	22	11,8	6387,357665	6387,357665
14	2	13	23	12,45	6724,895574	6724,895574
14	2	14	0	13,33	6988,344080	6988,34408
14	2	14	1	13,34	6990,244934	6990,244934
14	2	14	2	14,25	7085,283052	7000
14	2	14	3	14,76	7087,924347	7000
14	2	14	4	14,94	7083,144004	7000
14	2	14	5	14,55	7090,071987	7000
14	2	14	6	14,22	7084,218077	7000
14	2	14	7	14,83	7086,359556	7000
14	2	14	8	15,03	7079,886095	7000
14	2	14	9	15,02	7080,274097	7000
14	2	14	10	14,63	7089,732228	7000
14	2	14	11	13,9	7065,107476	7065,107476
14	2	14	12	13,37	6995,817996	6995,817996
14	2	14	13	12,61	6788,227100	6788,2271
14	2	14	14	12,53	6757,490154	6757,490154
14	2	14	15	12,77	6844,286088	6844,286088
14	2	14	16	13,47	7013,022675	7013,022675
14	2	14	17	14,68	7089,213808	7000
14	2	14	18	17,18	6944,995442	7000
14	2	14	19	19,52	6939,795908	7000
14	2	14	20	20,77	7031,490757	7000
14	2	14	21	22,21	7108,180870	7108,18087
14	2	14	22	23,48	6878,750674	6878,750674

14	2	14	23	23,79	6729,877252	6729,877252
14	2	15	0	23,59	6831,316819	6831,316819
14	2	15	1	22,54	7092,029382	7092,029382
14	2	15	2	22,13	7109,076085	7109,076085
14	2	15	3	22,49	7095,927365	7095,927365
14	2	15	4	24,03	6580,184575	6580,184575
14	2	15	5	24,6	6090,378273	6090,378273
14	2	15	6	25,51	4924,760854	4924,760854
14	2	15	7	26,3	3684,431290	3684,43129
14	2	15	8	26,62	3182,896258	3182,896258
14	2	15	9	26,83	2866,768540	2866,76854
14	2	15	10	27,57	1888,074080	1888,07408
14	2	15	11	28,34	1143,880911	0
14	2	15	12	28,89	776,847595	0
14	2	15	13	28,48	1038,447495	0
14	2	15	14	27,97	1465,759981	1465,759981
14	2	15	15	27,9	1534,003050	1534,00305
14	2	15	16	28,05	1390,675994	0
14	2	15	17	28,31	1167,609308	0
14	2	15	18	28,85	799,461034	0
14	2	15	19	28,96	738,691231	0
14	2	15	20	28,67	908,811223	0
14	2	15	21	27,83	1604,639541	1604,639541
14	2	15	22	25,95	4243,132975	4243,132975
14	2	15	23	23,43	6898,463110	6898,46311
14	2	16	0	20,98	7049,131442	7000
14	2	16	1	21,49	7087,357643	7000
14	2	16	2	21,08	7057,316414	7000
14	2	16	3	21,17	7064,476455	7000
14	2	16	4	21,29	7073,607693	7000
14	2	16	5	21,32	7075,799853	7000
14	2	16	6	20,64	7020,486219	7000
14	2	16	7	20,02	6971,188193	7000
14	2	16	8	19,79	6955,558632	7000
14	2	16	9	19,72	6951,188276	7000
14	2	16	10	19,45	6936,211387	7000
14	2	16	11	19,13	6922,662131	7000
14	2	16	12	18,73	6912,618863	7000
14	2	16	13	18,29	6910,662881	7000
14	2	16	14	17,96	6915,316412	7000
14	2	16	15	17,49	6930,330813	7000
14	2	16	16	16,9	6960,932703	7000
14	2	16	17	16,35	6997,445963	7000
14	2	16	18	15,96	7025,082337	7000

14	2	16	19	15,76	7038,920188	7000
14	2	16	20	15,4	7061,704379	7000
14	2	16	21	15,04	7079,491830	7000
14	2	16	22	14,58	7090,017281	7000
14	2	16	23	14,2	7083,443605	7000
14	2	17	0	13,83	7058,854143	7058,854143
14	2	17	1	11,95	6477,078565	6477,078565
14	2	17	2	11,52	6200,495530	6200,49553
14	2	17	3	11,25	5996,631734	5996,631734
14	2	17	4	10,73	5542,381154	5542,381154
14	2	17	5	10,33	5145,117117	5145,117117
14	2	17	6	10,49	5308,368551	5308,368551
14	2	17	7	10,46	5278,173049	5278,173049
14	2	17	8	10,27	5082,565660	5082,56566
14	2	17	9	9,66	4415,633866	4415,633866
14	2	17	10	8,77	3409,376225	3409,376225
14	2	17	11	7,77	2371,781209	2371,781209
14	2	17	12	6,95	1670,112418	1670,112418
14	2	17	13	6,41	1292,136508	1292,136508
14	2	17	14	6,1	1104,496140	1104,49614
14	2	17	15	6,14	1127,550278	1127,550278
14	2	17	16	6,16	1139,204074	1139,204074
14	2	17	17	6,08	1093,095158	1093,095158
14	2	17	18	6,34	1247,945105	1247,945105
14	2	17	19	6,8	1558,436500	1558,4365
14	2	17	20	7,35	1993,347106	1993,347106
14	2	17	21	8,19	2787,089701	2787,089701
14	2	17	22	9,12	3802,694043	3802,694043
14	2	17	23	9,94	4727,631732	4727,631732
14	2	18	0	10,75	5561,240027	5561,240027
14	2	18	1	10,5	5318,389417	5318,389417
14	2	18	2	11,15	5915,383633	5915,383633
14	2	18	3	11,62	6270,127958	6270,127958
14	2	18	4	12,03	6521,983260	6521,98326
14	2	18	5	12,01	6510,948247	6510,948247
14	2	18	6	11,92	6459,712276	6459,712276
14	2	18	7	12,05	6532,891237	6532,891237
14	2	18	8	12,8	6854,014400	6854,0144
14	2	18	9	13,12	6943,246693	6943,246693
14	2	18	10	12,81	6857,203381	6857,203381
14	2	18	11	12,08	6549,015601	6549,015601
14	2	18	12	11,01	5796,606844	5796,606844
14	2	18	13	10,24	5051,036703	5051,036703
14	2	18	14	9,94	4727,631732	4727,631732

14	2	18	15	9,6	4347,932395	4347,932395
14	2	18	16	9,31	4018,650528	4018,650528
14	2	18	17	9,2	3893,530001	3893,530001
14	2	18	18	9,22	3916,265875	3916,265875
14	2	18	19	9,26	3961,759227	3961,759227
14	2	18	20	9,24	3939,009462	3939,009462
14	2	18	21	9,14	3825,383882	3825,383882
14	2	18	22	8,99	3655,647872	3655,647872
14	2	18	23	8,68	3309,909532	3309,909532
14	2	19	0	8,03	2624,848161	2624,848161
14	2	19	1	11,33	6059,419889	6059,419889
14	2	19	2	11,65	6290,391295	6290,391295
14	2	19	3	11,83	6405,880595	6405,880595
14	2	19	4	11,85	6418,068219	6418,068219
14	2	19	5	11,78	6374,847941	6374,847941
14	2	19	6	11,81	6393,564188	6393,564188
14	2	19	7	11,45	6149,850227	6149,850227
14	2	19	8	11,22	5972,577165	5972,577165
14	2	19	9	11,04	5822,543607	5822,543607
14	2	19	10	10,58	5397,736639	5397,736639
14	2	19	11	10,25	5061,564643	5061,564643
14	2	19	12	10,32	5134,739934	5134,739934
14	2	19	13	10,75	5561,240027	5561,240027
14	2	19	14	11,21	5964,497775	5964,497775
14	2	19	15	11,43	6135,094002	6135,094002
14	2	19	16	11,52	6200,495530	6200,49553
14	2	19	17	11,4	6112,722300	6112,7223
14	2	19	18	11,42	6127,668377	6127,668377
14	2	19	19	11,46	6157,180752	6157,180752
14	2	19	20	10,86	5663,080899	5663,080899
14	2	19	21	10,18	4987,496305	4987,496305
14	2	19	22	9,61	4359,231140	4359,23114
14	2	19	23	9,6	4347,932395	4347,932395
14	2	20	0	9,83	4605,979436	4605,979436
14	2	20	1	10,08	4880,258345	4880,258345
14	2	20	2	9,98	4771,510695	4771,510695
14	2	20	3	10,16	4966,178516	4966,178516
14	2	20	4	10,92	5717,248732	5717,248732
14	2	20	5	11,69	6316,958227	6316,958227
14	2	20	6	11,79	6381,118918	6381,118918
14	2	20	7	12,02	6516,481649	6516,481649
14	2	20	8	12,65	6802,911028	6802,911028
14	2	20	9	13,79	7054,915792	7054,915792
14	2	20	10	14,81	7086,846512	7000

14	2	20	11	15,65	7046,247016	7000
14	2	20	12	16,45	6990,459699	7000
14	2	20	13	16,96	6957,329446	7000
14	2	20	14	17,52	6929,099878	7000
14	2	20	15	17,89	6916,949704	7000
14	2	20	16	17,96	6915,316412	7000
14	2	20	17	17,77	6920,254846	7000
14	2	20	18	17,48	6930,748879	7000
14	2	20	19	17,28	6939,893707	7000
14	2	20	20	16,9	6960,932703	7000
14	2	20	21	16,44	6991,153708	7000
14	2	20	22	15,83	7034,139014	7000
14	2	20	23	15,03	7079,886095	7000
14	2	21	0	14,24	7084,940835	7000
14	2	21	1	14,87	7085,293346	7000
14	2	21	2	14,89	7084,715310	7000
14	2	21	3	14,64	7089,646884	7000
14	2	21	4	13,63	7036,363542	7036,363542
14	2	21	5	12,61	6788,227100	6788,2271
14	2	21	6	11,48	6171,746451	6171,746451
14	2	21	7	10,5	5318,389417	5318,389417
14	2	21	8	10,19	4998,129844	4998,129844
14	2	21	9	9,83	4605,979436	4605,979436
14	2	21	10	9,63	4381,811037	4381,811037
14	2	21	11	9,38	4098,300703	4098,300703
14	2	21	12	9,39	4109,676122	4109,676122
14	2	21	13	10,12	4923,345258	4923,345258
14	2	21	14	10,47	5288,260209	5288,260209
14	2	21	15	10,86	5663,080899	5663,080899
14	2	21	16	11,6	6256,458224	6256,458224
14	2	21	17	12,7	6820,634260	6820,63426
14	2	21	18	13,57	7028,194208	7028,194208
14	2	21	19	14,57	7090,045378	7000
14	2	21	20	15,35	7064,538378	7000
14	2	21	21	16,15	7011,617299	7000
14	2	21	22	17,26	6940,887023	7000
14	2	21	23	17,75	6920,866522	7000
14	2	22	0	17,91	6916,460612	7000
14	2	22	1	17,16	6946,055467	7000
14	2	22	2	17,5	6929,916613	7000
14	2	22	3	17,5	6929,916613	7000
14	2	22	4	17,82	6918,801150	7000
14	2	22	5	17,98	6914,890379	7000
14	2	22	6	17,98	6914,890379	7000

14	2	22	7	18,11	6912,568749	7000
14	2	22	8	17,73	6921,495290	7000
14	2	22	9	17,12	6948,213774	7000
14	2	22	10	16,53	6984,952268	7000
14	2	22	11	15,99	7022,968447	7000
14	2	22	12	15,48	7056,974129	7000
14	2	22	13	15,15	7074,761602	7000
14	2	22	14	14,63	7089,732228	7000
14	2	22	15	14,03	7074,666681	7000
14	2	22	16	13,71	7046,212315	7046,212315
14	2	22	17	13,53	7022,363060	7022,36306
14	2	22	18	13,4	7001,198930	7001,19893
14	2	22	19	13,46	7011,395377	7011,395377
14	2	22	20	13,61	7033,716332	7033,716332
14	2	22	21	13,76	7051,782927	7051,782927
14	2	22	22	13,77	7052,844473	7052,844473
14	2	22	23	13,75	7050,703989	7050,703989
14	2	23	0	13,93	7067,545545	7067,545545
14	2	23	1	15,36	7063,979598	7000
14	2	23	2	15,96	7025,082337	7000
14	2	23	3	16,55	6983,589079	7000
14	2	23	4	16,9	6960,932703	7000
14	2	23	5	16,83	6965,252484	7000
14	2	23	6	16,91	6960,325608	7000
14	2	23	7	17,08	6950,421858	7000
14	2	23	8	17,13	6947,669473	7000
14	2	23	9	17,43	6932,896571	7000
14	2	23	10	17,75	6920,866522	7000
14	2	23	11	17,75	6920,866522	7000
14	2	23	12	17,67	6923,483023	7000
14	2	23	13	17,52	6929,099878	7000
14	2	23	14	17,41	6933,782077	7000
14	2	23	15	17,32	6937,948801	7000
14	2	23	16	17,26	6940,887023	7000
14	2	23	17	17,12	6948,213774	7000
14	2	23	18	16,85	6964,006015	7000
14	2	23	19	16,72	6972,271016	7000
14	2	23	20	16,65	6976,868571	7000
14	2	23	21	16,78	6968,409549	7000
14	2	23	22	16,74	6970,975365	7000
14	2	23	23	16,69	6974,229745	7000
14	2	24	0	16,58	6981,555648	7000
14	2	24	1	15,48	7056,974129	7000
14	2	24	2	15,08	7077,853548	7000

14	2	24	3	14,69	7089,083022	7000
14	2	24	4	14,74	7088,298020	7000
14	2	24	5	14,72	7088,637913	7000
14	2	24	6	14,61	7089,874831	7000
14	2	24	7	14,61	7089,874831	7000
14	2	24	8	14,76	7087,924347	7000
14	2	24	9	15,03	7079,886095	7000
14	2	24	10	15,15	7074,761602	7000
14	2	24	11	15,45	7058,774715	7000
14	2	24	12	15,66	7045,591834	7000
14	2	24	13	15,96	7025,082337	7000
14	2	24	14	16,11	7014,461959	7000
14	2	24	15	16,04	7019,431890	7000
14	2	24	16	15,81	7035,513116	7000
14	2	24	17	15,51	7055,143400	7000
14	2	24	18	15,07	7078,272161	7000
14	2	24	19	14,71	7088,794994	7000
14	2	24	20	14,05	7075,911076	7000
14	2	24	21	13,29	6980,522130	6980,52213
14	2	24	22	12,72	6827,529127	6827,529127
14	2	24	23	12,11	6564,855710	6564,85571
14	2	25	0	11,57	6235,712673	6235,712673
14	2	25	1	10,04	4836,929818	4836,929818
14	2	25	2	10,46	5278,173049	5278,173049
14	2	25	3	11,35	6074,805936	6074,805936
14	2	25	4	12,17	6595,687433	6595,687433
14	2	25	5	12,93	6893,410345	6893,410345
14	2	25	6	13,16	6952,619397	6952,619397
14	2	25	7	13,54	7023,850174	7023,850174
14	2	25	8	14,19	7083,036743	7000
14	2	25	9	14,77	7087,725040	7000
14	2	25	10	14,53	7090,058591	7000
14	2	25	11	14,25	7085,283052	7000
14	2	25	12	13,8	7055,925765	7055,925765
14	2	25	13	13,28	6978,511505	6978,511505
14	2	25	14	12,91	6887,636744	6887,636744
14	2	25	15	12,38	6694,822845	6694,822845
14	2	25	16	12,26	6639,831786	6639,831786
14	2	25	17	12,67	6810,084059	6810,084059
14	2	25	18	13,05	6925,922656	6925,922656
14	2	25	19	12,92	6890,536421	6890,536421
14	2	25	20	12,71	6824,095498	6824,095498
14	2	25	21	12,5	6745,486888	6745,486888
14	2	25	22	11,73	6343,009441	6343,009441

14	2	25	23	10,76	5570,630585	5570,630585
14	2	26	0	9,8	4572,575697	4572,575697
14	2	26	1	10,3	5113,927375	5113,927375
14	2	26	2	10,78	5589,333308	5589,333308
14	2	26	3	11,23	5980,625998	5980,625998
14	2	26	4	11,25	5996,631734	5996,631734
14	2	26	5	10,44	5257,933546	5257,933546
14	2	26	6	9,65	4404,366128	4404,366128
14	2	26	7	9,15	3836,734058	3836,734058
14	2	26	8	8,85	3498,467610	3498,46761
14	2	26	9	8,77	3409,376225	3409,376225
14	2	26	10	8,7	3331,938052	3331,938052
14	2	26	11	8,66	3287,926240	3287,92624
14	2	26	12	8,63	3255,038746	3255,038746
14	2	26	13	8,24	2838,733084	2838,733084
14	2	26	14	7,74	2343,474133	2343,474133
14	2	26	15	7,31	1959,365426	1959,365426
14	2	26	16	6,97	1685,395479	1685,395479
14	2	26	17	6,93	1654,921938	1654,921938
14	2	26	18	6,98	1693,071738	1693,071738
14	2	26	19	7,21	1876,015827	1876,015827
14	2	26	20	7,39	2027,693557	2027,693557
14	2	26	21	7,73	2334,080811	2334,080811
14	2	26	22	8,31	2911,747440	2911,74744
14	2	26	23	8,93	3588,108641	3588,108641
14	2	27	0	9,49	4223,321227	4223,321227
14	2	27	1	9,01	3678,212269	3678,212269
14	2	27	2	9,23	3927,636800	3927,6368
14	2	27	3	9,85	4628,197807	4628,197807
14	2	27	4	10,85	5653,956749	5653,956749
14	2	27	5	11,84	6411,990500	6411,9905
14	2	27	6	12,48	6737,338598	6737,338598
14	2	27	7	12,88	6878,782267	6878,782267
14	2	27	8	12,75	6837,665200	6837,6652
14	2	27	9	12,98	6907,396907	6907,396907
14	2	27	10	13,36	6993,981791	6993,981791
14	2	27	11	13,64	7037,659040	7037,65904
14	2	27	12	13,98	7071,296270	7071,29627
14	2	27	13	14,2	7083,443605	7000
14	2	27	14	14,51	7090,004510	7000
14	2	27	15	14,63	7089,732228	7000
14	2	27	16	14,54	7090,070332	7000
14	2	27	17	14,57	7090,045378	7000
14	2	27	18	14,21	7083,837352	7000

14	2	27	19	13,8	7055,925765	7055,925765
14	2	27	20	13,21	6963,808346	6963,808346
14	2	27	21	12,59	6780,714930	6780,71493
14	2	27	22	11,77	6368,544728	6368,544728
14	2	27	23	10,77	5579,995054	5579,995054
14	2	28	0	9,81	4583,720168	4583,720168
14	2	28	1	9,69	4449,395431	4449,395431
14	2	28	2	9,52	4257,357923	4257,357923
14	2	28	3	8,92	3576,876398	3576,876398
14	2	28	4	8,11	2705,380529	2705,380529
14	2	28	5	7,06	1755,315636	1755,315636
14	2	28	6	6,28	1210,920506	1210,920506
14	2	28	7	5,7	891,974650	891,9746502
14	2	28	8	5,27	697,694082	697,6940825
14	2	28	9	5,01	595,825442	595,8254422
14	2	28	10	4,33	377,806913	377,8069126
14	2	28	11	3,74	236,452526	236,4525263
14	2	28	12	3,23	143,039213	143,0392131
14	2	28	13	2,58	54,803246	54,80324606
14	2	28	14	2,2	16,202650	16,20265002
14	2	28	15	1,8	-15,955674	0
14	2	28	16	1,73	-20,791738	0
14	2	28	17	1,89	-9,406588	0
14	2	28	18	2,21	17,112179	17,1121785
14	2	28	19	2,68	66,433442	66,43344184
14	2	28	20	2,84	86,434458	86,43445827
14	2	28	21	2,84	86,434458	86,43445827
14	2	28	22	2,68	66,433442	66,43344184
14	2	28	23	2,79	79,994665	79,99466452
14	3	1	0	3,01	109,677534	109,6775337
14	3	1	1	3,37	166,339082	166,3390821
14	3	1	2	3,68	224,191132	224,191132
14	3	1	3	4	293,907496	293,9074962
14	3	1	4	4,33	377,806913	377,8069126
14	3	1	5	4,88	548,957201	548,9572012
14	3	1	6	5,33	722,813530	722,81353
14	3	1	7	5,89	988,909256	988,909256
14	3	1	8	6,27	1204,825801	1204,825801
14	3	1	9	6,97	1685,395479	1685,395479
14	3	1	10	7,63	2241,327179	2241,327179
14	3	1	11	7,97	2565,249410	2565,24941
14	3	1	12	8,25	2849,113390	2849,11339
14	3	1	13	8,69	3320,918215	3320,918215
14	3	1	14	8,81	3453,847899	3453,847899

14	3	1	15	8,77	3409,376225	3409,376225
14	3	1	16	8,56	3178,730028	3178,730028
14	3	1	17	8,63	3255,038746	3255,038746
14	3	1	18	8,71	3342,968890	3342,96889
14	3	1	19	8,78	3420,479694	3420,479694
14	3	1	20	8,97	3633,108194	3633,108194
14	3	1	21	8,79	3431,592904	3431,592904
14	3	1	22	8,03	2624,848161	2624,848161
14	3	1	23	6,71	1493,917548	1493,917548
14	3	2	0	5,51	801,976055	801,9760554
14	3	2	1	4,98	584,776272	584,7762723
14	3	2	2	5,9	994,209271	994,2092705
14	3	2	3	7,04	1739,615677	1739,615677
14	3	2	4	8,27	2869,924765	2869,924765
14	3	2	5	9,15	3836,734058	3836,734058
14	3	2	6	9,35	4064,168104	4064,168104
14	3	2	7	9,17	3859,443989	3859,443989
14	3	2	8	9,62	4370,524088	4370,524088
14	3	2	9	10,06	4858,623525	4858,623525
14	3	2	10	10,8	5607,930673	5607,930673
14	3	2	11	11,42	6127,668377	6127,668377
14	3	2	12	11,93	6465,533063	6465,533063
14	3	2	13	12,04	6527,453112	6527,453112
14	3	2	14	11,89	6442,057516	6442,057516
14	3	2	15	12,51	6749,517127	6749,517127
14	3	2	16	13,04	6923,350464	6923,350464
14	3	2	17	13,24	6970,245442	6970,245442
14	3	2	18	12,82	6860,365613	6860,365613
14	3	2	19	13,07	6930,993558	6930,993558
14	3	2	20	14,01	7073,363376	7000
14	3	2	21	14,83	7086,359556	7000
14	3	2	22	15,18	7073,353652	7000
14	3	2	23	15,33	7065,643479	7000
14	3	3	0	15,46	7058,177967	7000
14	3	3	1	14,47	7089,771560	7000
14	3	3	2	15,07	7078,272161	7000
14	3	3	3	15,7	7042,948260	7000
14	3	3	4	16,1	7015,172805	7000
14	3	3	5	16,74	6970,975365	7000
14	3	3	6	16,98	6956,149819	7000
14	3	3	7	16,98	6956,149819	7000
14	3	3	8	16,8	6967,139855	7000
14	3	3	9	16,34	6998,149562	7000
14	3	3	10	15,72	7041,613511	7000

14	3	3	11	15	7081,031023	7000
14	3	3	12	14,38	7088,613775	7000
14	3	3	13	13,76	7051,782927	7051,782927
14	3	3	14	12,92	6890,536421	6890,536421
14	3	3	15	12,21	6615,617154	6615,617154
14	3	3	16	11,53	6207,602976	6207,602976
14	3	3	17	11,02	5805,281416	5805,281416
14	3	3	18	10,76	5570,630585	5570,630585
14	3	3	19	10,59	5407,550306	5407,550306
14	3	3	20	10,03	4826,061359	4826,061359
14	3	3	21	9,31	4018,650528	4018,650528
14	3	3	22	8,58	3200,469327	3200,469327
14	3	3	23	7,63	2241,327179	2241,327179
14	3	4	0	6,75	1522,363294	1522,363294
14	3	4	1	3,65	218,194560	218,1945604
14	3	4	2	3,45	180,419216	180,4192159
14	3	4	3	3,27	149,526344	149,5263436
14	3	4	4	2,65	62,875902	62,87590165
14	3	4	5	1,97	-3,261426	0
14	3	4	6	2,09	6,551645	6,551645249
14	3	4	7	2,42	37,509429	37,50942875
14	3	4	8	2,72	71,269909	71,26990929
14	3	4	9	2,97	104,016567	104,0165674
14	3	4	10	2,91	95,748758	95,74875789
14	3	4	11	2,6	57,077467	57,07746657
14	3	4	12	2,26	21,742170	21,74216974
14	3	4	13	1,82	-14,532943	0
14	3	4	14	1,45	-38,017857	0
14	3	4	15	1,31	-45,446152	0
14	3	4	16	1,11	-54,805518	0
14	3	4	17	1,28	-46,941682	0
14	3	4	18	1,58	-30,428316	0
14	3	4	19	1,83	-13,814647	0
14	3	4	20	2,07	4,865248	4,865248402
14	3	4	21	2,36	31,423252	31,42325198
14	3	4	22	2,51	47,042782	47,04278201
14	3	4	23	2,36	31,423252	31,42325198
14	3	5	0	2,13	9,986892	9,986891879
14	3	5	1	1,02	-58,565651	0
14	3	5	2	0,65	-71,348343	0
14	3	5	3	0,74	-68,614123	0
14	3	5	4	1,23	-49,361118	0
14	3	5	5	1,6	-29,199052	0
14	3	5	6	2,32	27,482402	27,4824023

14	3	5	7	2,72	71,269909	71,26990929
14	3	5	8	3,37	166,339082	166,3390821
14	3	5	9	3,64	216,215320	216,2153203
14	3	5	10	3,6	208,395443	208,3954432
14	3	5	11	3,05	115,460048	115,4600478
14	3	5	12	2,81	82,549543	82,54954349
14	3	5	13	3,59	206,464558	206,4645579
14	3	5	14	4,2	343,205808	343,205808
14	3	5	15	4,35	383,316643	383,3166432
14	3	5	16	4,42	403,002661	403,0026612
14	3	5	17	4,09	315,518686	315,5186857
14	3	5	18	3,73	234,383868	234,3838676
14	3	5	19	3,93	277,725883	277,7258831
14	3	5	20	4,31	372,347564	372,3475639
14	3	5	21	4,7	488,276882	488,2768819
14	3	5	22	5,37	739,907447	739,9074471
14	3	5	23	6,17	1145,062792	1145,062792
14	3	6	0	6,79	1551,175907	1551,175907
14	3	6	1	7,49	2115,144464	2115,144464
14	3	6	2	8,34	2943,285785	2943,285785
14	3	6	3	9,03	3700,799958	3700,799958
14	3	6	4	10,26	5072,074354	5072,074354
14	3	6	5	11,08	5856,717623	5856,717623
14	3	6	6	11,46	6157,180752	6157,180752
14	3	6	7	11,66	6297,081354	6297,081354
14	3	6	8	11,93	6465,533063	6465,533063
14	3	6	9	11,87	6430,127155	6430,127155
14	3	6	10	12,15	6585,535503	6585,535503
14	3	6	11	12,42	6712,186182	6712,186182
14	3	6	12	12,69	6817,145329	6817,145329
14	3	6	13	12,92	6890,536421	6890,536421
14	3	6	14	12,91	6887,636744	6887,636744
14	3	6	15	12,8	6854,014400	6854,0144
14	3	6	16	12,67	6810,084059	6810,084059
14	3	6	17	12,91	6887,636744	6887,636744
14	3	6	18	13,32	6986,421473	6986,421473
14	3	6	19	13,65	7038,935935	7038,935935
14	3	6	20	14,13	7080,314935	7000
14	3	6	21	14,62	7089,808238	7000
14	3	6	22	15,14	7075,220147	7000
14	3	6	23	15,62	7048,197994	7000
14	3	7	0	16	7022,262355	7000
14	3	7	1	15,08	7077,853548	7000
14	3	7	2	15,65	7046,247016	7000

14	3	7	3	15,67	7044,934314	7000
14	3	7	4	15,73	7040,943080	7000
14	3	7	5	15,62	7048,197994	7000
14	3	7	6	15,43	7059,957576	7000
14	3	7	7	15,58	7050,763264	7000
14	3	7	8	15,6	7049,485960	7000
14	3	7	9	15,88	7030,679058	7000
14	3	7	10	16,33	6998,853917	7000
14	3	7	11	16,73	6971,622154	7000
14	3	7	12	17,2	6943,948408	7000
14	3	7	13	17,6	6925,990991	7000
14	3	7	14	17,93	6915,989424	7000
14	3	7	15	18,36	6910,340664	7000
14	3	7	16	18,63	6911,338140	7000
14	3	7	17	17,87	6917,456606	7000
14	3	7	18	17,3	6938,914244	7000
14	3	7	19	16,02	7020,848252	7000
14	3	7	20	14,73	7088,472229	7000
14	3	7	21	13,35	6992,124138	6992,124138
14	3	7	22	12,47	6733,220405	6733,220405
14	3	7	23	11,55	6221,721891	6221,721891
14	3	8	0	10,76	5570,630585	5570,630585
14	3	8	1	10,17	4976,845801	4976,845801
14	3	8	2	8,16	2756,313995	2756,313995
14	3	8	3	6,11	1110,228092	1110,228092
14	3	8	4	3,84	257,702532	257,7025317
14	3	8	5	1,99	-1,676227	0
14	3	8	6	1,95	-4,826895	0
14	3	8	7	4,08	313,071815	313,0718149
14	3	8	8	6,16	1139,204074	1139,204074
14	3	8	9	7,19	1859,622061	1859,622061
14	3	8	10	7,82	2419,379739	2419,379739
14	3	8	11	8,25	2849,113390	2849,11339
14	3	8	12	9,23	3927,636800	3927,6368
14	3	8	13	10,08	4880,258345	4880,258345
14	3	8	14	11,01	5796,606844	5796,606844
14	3	8	15	12,25	6635,050592	6635,050592
14	3	8	16	13,38	6997,632853	6997,632853
14	3	8	17	14,38	7088,613775	7000
14	3	8	18	15,46	7058,177967	7000
14	3	8	19	16,24	7005,220791	7000
14	3	8	20	16,81	6966,508413	7000
14	3	8	21	16,92	6959,721098	7000
14	3	8	22	16,86	6963,386400	7000

14	3	8	23	16,74	6970,975365	7000
14	3	9	0	16,77	6969,047743	7000
14	3	9	1	16,91	6960,325608	7000
14	3	9	2	16	7022,262355	7000
14	3	9	3	15,39	7062,279075	7000
14	3	9	4	15,18	7073,353652	7000
14	3	9	5	14,61	7089,874831	7000
14	3	9	6	14,18	7082,616674	7000
14	3	9	7	13,95	7069,092253	7069,092253
14	3	9	8	14,04	7075,296194	7000
14	3	9	9	13,92	7066,748688	7066,748688
14	3	9	10	14,04	7075,296194	7000
14	3	9	11	13,87	7062,525436	7062,525436
14	3	9	12	13,5	7017,782986	7017,782986
14	3	9	13	13,4	7001,198930	7001,19893
14	3	9	14	13,34	6990,244934	6990,244934
14	3	9	15	13	6912,814521	6912,814521
14	3	9	16	12,61	6788,227100	6788,2271
14	3	9	17	12,73	6830,935230	6830,93523
14	3	9	18	13,06	6928,470321	6928,470321
14	3	9	19	13,59	7030,993491	7030,993491
14	3	9	20	13,72	7047,361824	7047,361824
14	3	9	21	13,77	7052,844473	7052,844473
14	3	9	22	13,97	7070,576940	7070,57694
14	3	9	23	14,11	7079,298500	7000
14	3	10	0	14,19	7083,036743	7000
14	3	10	1	9,27	3973,135944	3973,135944
14	3	10	2	10,07	4869,448391	4869,448391
14	3	10	3	10,9	5699,303447	5699,303447
14	3	10	4	11,67	6303,739201	6303,739201
14	3	10	5	11,98	6494,156991	6494,156991
14	3	10	6	11,71	6330,048319	6330,048319
14	3	10	7	10,96	5752,803016	5752,803016
14	3	10	8	9,88	4661,445194	4661,445194
14	3	10	9	8,54	3157,042994	3157,042994
14	3	10	10	7,36	2001,899581	2001,899581
14	3	10	11	6,29	1217,036885	1217,036885
14	3	10	12	5,82	952,369205	952,3692048
14	3	10	13	6,09	1098,785175	1098,785175
14	3	10	14	6,68	1472,823333	1472,823333
14	3	10	15	7,73	2334,080811	2334,080811
14	3	10	16	9,91	4694,591614	4694,591614
14	3	10	17	12,23	6625,395709	6625,395709
14	3	10	18	13,84	7059,796754	7059,796754

14	3	10	19	14,62	7089,808238	7000
14	3	10	20	15,1	7076,998656	7000
14	3	10	21	15,18	7073,353652	7000
14	3	10	22	14,89	7084,715310	7000
14	3	10	23	14,2	7083,443605	7000
14	3	11	0	13,37	6995,817996	6995,817996
14	3	11	1	12,65	6802,911028	6802,911028
14	3	11	2	12,19	6605,714525	6605,714525
14	3	11	3	11,34	6067,128543	6067,128543
14	3	11	4	10,53	5348,316928	5348,316928
14	3	11	5	9,7	4460,634729	4460,634729
14	3	11	6	9,14	3825,383882	3825,383882
14	3	11	7	8,75	3387,199149	3387,199149
14	3	11	8	8,15	2746,091098	2746,091098
14	3	11	9	7,3	1950,927171	1950,927171
14	3	11	10	6,3	1223,174972	1223,174972
14	3	11	11	5,38	744,224833	744,2248334
14	3	11	12	5,1	629,832822	629,8328216
14	3	11	13	5,5	797,425217	797,4252172
14	3	11	14	6,2	1162,766687	1162,766687
14	3	11	15	7,1	1786,993468	1786,993468
14	3	11	16	7,87	2467,496424	2467,496424
14	3	11	17	8,34	2943,285785	2943,285785
14	3	11	18	8,29	2890,803083	2890,803083
14	3	11	19	8,11	2705,380529	2705,380529
14	3	11	20	7,89	2486,886285	2486,886285
14	3	11	21	7,4	2036,336981	2036,336981
14	3	11	22	6,71	1493,917548	1493,917548
14	3	11	23	5,99	1042,820825	1042,820825
14	3	12	0	5,45	774,943838	774,943838
14	3	12	1	4,94	570,263285	570,2632846
14	3	12	2	4,28	364,252225	364,2522248
14	3	12	3	3,81	251,218873	251,218873
14	3	12	4	3,8	249,078507	249,0785073
14	3	12	5	3,6	208,395443	208,3954432
14	3	12	6	3,57	202,631428	202,631428
14	3	12	7	3,76	240,620264	240,6202638
14	3	12	8	3,95	282,294178	282,2941775
14	3	12	9	3,96	284,594750	284,5947497
14	3	12	10	3,83	255,530846	255,5308456
14	3	12	11	3,83	255,530846	255,5308456
14	3	12	12	3,62	212,286040	212,28604
14	3	12	13	3,11	124,366058	124,3660576
14	3	12	14	2,79	79,994665	79,99466452

14	3	12	15	2,65	62,875902	62,87590165
14	3	12	16	2,82	83,837474	83,83747355
14	3	12	17	3,23	143,039213	143,0392131
14	3	12	18	3,4	171,552388	171,5523881
14	3	12	19	3,32	157,825211	157,8252111
14	3	12	20	3,25	146,266050	146,2660497
14	3	12	21	3,28	151,169120	151,1691204
14	3	12	22	3,26	147,891998	147,8919978
14	3	12	23	3,38	168,068033	168,068033
14	3	13	0	3,68	224,191132	224,191132
14	3	13	1	4,15	330,443901	330,4439015
14	3	13	2	3,84	257,702532	257,7025317
14	3	13	3	3,68	224,191132	224,191132
14	3	13	4	3,16	132,004946	132,0049457
14	3	13	5	2,63	60,537043	60,53704257
14	3	13	6	2,26	21,742170	21,74216974
14	3	13	7	2,17	13,506591	13,50659064
14	3	13	8	2,08	5,705863	5,705862922
14	3	13	9	2,17	13,506591	13,50659064
14	3	13	10	2,6	57,077467	57,07746657
14	3	13	11	3,15	130,461158	130,4611584
14	3	13	12	4,03	301,009195	301,0091946
14	3	13	13	4,87	545,459620	545,4596205
14	3	13	14	5,45	774,943838	774,943838
14	3	13	15	5,79	937,006719	937,0067185
14	3	13	16	6,11	1110,228092	1110,228092
14	3	13	17	6,86	1602,483604	1602,483604
14	3	13	18	7,55	2168,691650	2168,69165
14	3	13	19	7,87	2467,496424	2467,496424
14	3	13	20	7,9	2496,611615	2496,611615
14	3	13	21	7,6	2213,924039	2213,924039
14	3	13	22	7,12	1802,971287	1802,971287
14	3	13	23	7,27	1925,749923	1925,749923
14	3	14	0	7,33	1976,310577	1976,310577
14	3	14	1	6,86	1602,483604	1602,483604
14	3	14	2	6,35	1254,192255	1254,192255
14	3	14	3	5,59	839,045717	839,0457173
14	3	14	4	4,19	340,629559	340,6295589
14	3	14	5	2,95	101,231054	101,2310537
14	3	14	6	2,95	101,231054	101,2310537
14	3	14	7	3,49	187,675401	187,6754006
14	3	14	8	4,08	313,071815	313,0718149
14	3	14	9	4,67	478,621954	478,6219544
14	3	14	10	5,57	829,667128	829,6671277

14	3	14	11	6,98	1693,071738	1693,071738
14	3	14	12	8,63	3255,038746	3255,038746
14	3	14	13	10,12	4923,345258	4923,345258
14	3	14	14	11,77	6368,544728	6368,544728
14	3	14	15	13,35	6992,124138	6992,124138
14	3	14	16	14,89	7084,715310	7000
14	3	14	17	16,43	6991,848839	7000
14	3	14	18	18,08	6913,035061	7000
14	3	14	19	19,72	6951,188276	7000
14	3	14	20	20,5	7008,746545	7000
14	3	14	21	21,09	7058,122835	7000
14	3	14	22	21,54	7090,428643	7000
14	3	14	23	22,13	7109,076085	7109,076085
14	3	15	0	21,8	7103,239485	7000
14	3	15	1	22,52	7093,657008	7093,657008
14	3	15	2	22,75	7068,982225	7068,982225
14	3	15	3	22,58	7088,492827	7088,492827
14	3	15	4	22,37	7103,060681	7103,060681
14	3	15	5	22,11	7109,141977	7109,141977
14	3	15	6	21,9	7106,438080	7000
14	3	15	7	21,49	7087,357643	7000
14	3	15	8	20,46	7005,433598	7000
14	3	15	9	19,53	6940,325458	7000
14	3	15	10	18,5	6910,411210	7000
14	3	15	11	17,59	6926,365598	7000
14	3	15	12	16,6	6980,207984	7000
14	3	15	13	15,62	7048,197994	7000
14	3	15	14	15,3	7067,269038	7000
14	3	15	15	15,63	7047,550150	7000
14	3	15	16	16,23	7005,930584	7000
14	3	15	17	16,13	7013,039799	7000
14	3	15	18	15,99	7022,968447	7000
14	3	15	19	16,95	6957,923348	7000
14	3	15	20	17,79	6919,660373	7000
14	3	15	21	17,65	6924,179023	7000
14	3	15	22	17,77	6920,254846	7000
14	3	15	23	18,74	6912,774122	7000
14	3	16	0	19,19	6924,838150	7000
14	3	16	1	21,64	7096,032252	7000
14	3	16	2	21,51	7088,606054	7000
14	3	16	3	22,29	7106,207040	7106,20704
14	3	16	4	22,74	7070,342483	7070,342483
14	3	16	5	22,44	7099,268895	7099,268895
14	3	16	6	21,38	7080,057079	7000

14	3	16	7	20,75	7029,796541	7000
14	3	16	8	21,04	7054,067176	7000
14	3	16	9	20,76	7030,643716	7000
14	3	16	10	20,65	7021,330873	7000
14	3	16	11	19,98	6968,338614	7000
14	3	16	12	19,29	6928,843020	7000
14	3	16	13	19,15	6923,368400	7000
14	3	16	14	18,95	6917,173978	7000
14	3	16	15	18,72	6912,468547	7000
14	3	16	16	18,53	6910,551233	7000
14	3	16	17	18,15	6912,012547	7000
14	3	16	18	17,96	6915,316412	7000
14	3	16	19	18,17	6911,762690	7000
14	3	16	20	18,38	6910,292201	7000
14	3	16	21	18,44	6910,263688	7000
14	3	16	22	18,95	6917,173978	7000
14	3	16	23	18,98	6917,979367	7000
14	3	17	0	19,1	6921,638657	7000
14	3	17	1	15,35	7064,538378	7000
14	3	17	2	15,88	7030,679058	7000
14	3	17	3	16,79	6967,773576	7000
14	3	17	4	17,91	6916,460612	7000
14	3	17	5	17,48	6930,748879	7000
14	3	17	6	16,77	6969,047743	7000
14	3	17	7	16,24	7005,220791	7000
14	3	17	8	15,58	7050,763264	7000
14	3	17	9	15,34	7065,093026	7000
14	3	17	10	14,97	7082,117644	7000
14	3	17	11	14,8	7087,078183	7000
14	3	17	12	14,45	7089,591314	7000
14	3	17	13	13,97	7070,576940	7070,57694
14	3	17	14	13,44	7008,079380	7008,07938
14	3	17	15	13,55	7025,317669	7025,317669
14	3	17	16	14,18	7082,616674	7000
14	3	17	17	15,06	7078,684793	7000
14	3	17	18	15,32	7066,189673	7000
14	3	17	19	15,03	7079,886095	7000
14	3	17	20	14,81	7086,846512	7000
14	3	17	21	14,25	7085,283052	7000
14	3	17	22	13,75	7050,703989	7050,703989
14	3	17	23	13,35	6992,124138	6992,124138
14	3	18	0	13,01	6915,485774	6915,485774
14	3	18	1	13,87	7062,525436	7062,525436
14	3	18	2	13,96	7069,842300	7069,8423

14	3	18	3	13,76	7051,782927	7051,782927
14	3	18	4	13,84	7059,796754	7059,796754
14	3	18	5	14,28	7086,234160	7000
14	3	18	6	14,16	7081,736539	7000
14	3	18	7	13,71	7046,212315	7046,212315
14	3	18	8	13,44	7008,079380	7008,07938
14	3	18	9	13,23	6968,122534	6968,122534
14	3	18	10	13,49	7016,216378	7016,216378
14	3	18	11	13,62	7035,049340	7035,04934
14	3	18	12	13,48	7014,629641	7014,629641
14	3	18	13	12,94	6896,258607	6896,258607
14	3	18	14	12,43	6716,452355	6716,452355
14	3	18	15	12,39	6699,208606	6699,208606
14	3	18	16	12,44	6720,688797	6720,688797
14	3	18	17	12,57	6773,088457	6773,088457
14	3	18	18	12,71	6824,095498	6824,095498
14	3	18	19	11,99	6499,785947	6499,785947
14	3	18	20	10,63	5446,565831	5446,565831
14	3	18	21	9,74	4505,513765	4505,513765
14	3	18	22	9,37	4086,924096	4086,924096
14	3	18	23	10,14	4944,794341	4944,794341
14	3	19	0	11,28	6020,409562	6020,409562
14	3	19	1	12,52	6753,518192	6753,518192
14	3	19	2	12,95	6899,081301	6899,081301
14	3	19	3	13,7	7045,044911	7045,044911
14	3	19	4	15,3	7067,269038	7000
14	3	19	5	16,44	6991,153708	7000
14	3	19	6	17,25	6941,388824	7000
14	3	19	7	17,85	6917,981223	7000
14	3	19	8	18,29	6910,662881	7000
14	3	19	9	18,86	6915,022421	7000
14	3	19	10	19,79	6955,558632	7000
14	3	19	11	21,36	7078,657771	7000
14	3	19	12	21,71	7099,474636	7000
14	3	19	13	21,23	7069,109510	7000
14	3	19	14	20,95	7046,640271	7000
14	3	19	15	20,63	7019,642144	7000
14	3	19	16	20,48	7007,087243	7000
14	3	19	17	20,71	7026,407743	7000
14	3	19	18	20,73	7028,102040	7000
14	3	19	19	20,61	7017,955950	7000
14	3	19	20	20,47	7006,259689	7000
14	3	19	21	20,56	7013,754439	7000
14	3	19	22	20,78	7032,337602	7000

14	3	19	23	20,81	7034,876319	7000
14	3	20	0	20,53	7011,245246	7000
14	3	20	1	18,1	6912,719519	7000
14	3	20	2	18,07	6913,199815	7000
14	3	20	3	17,71	6922,141039	7000
14	3	20	4	16,91	6960,325608	7000
14	3	20	5	16,56	6982,909722	7000
14	3	20	6	16,9	6960,932703	7000
14	3	20	7	17,31	6938,429760	7000
14	3	20	8	17,47	6931,170793	7000
14	3	20	9	17,07	6950,981480	7000
14	3	20	10	16,7	6973,574842	7000
14	3	20	11	16	7022,262355	7000
14	3	20	12	16,09	7015,883438	7000
14	3	20	13	16,49	6987,695599	7000
14	3	20	14	17	6954,981269	7000
14	3	20	15	17,49	6930,330813	7000
14	3	20	16	17,7	6922,470246	7000
14	3	20	17	18,31	6910,546662	7000
14	3	20	18	19,21	6925,601499	7000
14	3	20	19	20,05	6973,359108	7000
14	3	20	20	20,13	6979,282716	7000
14	3	20	21	21,09	7058,122835	7000
14	3	20	22	22,31	7105,534132	7105,534132
14	3	20	23	22,46	7097,997411	7097,997411
14	3	21	0	21,76	7101,663363	7000
14	3	21	1	19,07	6920,658473	7000
14	3	21	2	18,05	6913,543242	7000
14	3	21	3	17,64	6924,533222	7000
14	3	21	4	16,44	6991,153708	7000
14	3	21	5	14,74	7088,298020	7000
14	3	21	6	13,3	6982,510599	6982,510599
14	3	21	7	12,02	6516,481649	6516,481649
14	3	21	8	11,85	6418,068219	6418,068219
14	3	21	9	10,9	5699,303447	5699,303447
14	3	21	10	10,76	5570,630585	5570,630585
14	3	21	11	10,93	5726,179497	5726,179497
14	3	21	12	10,63	5446,565831	5446,565831
14	3	21	13	10,2	5008,746236	5008,746236
14	3	21	14	9,95	4738,620564	4738,620564
14	3	21	15	9,52	4257,357923	4257,357923
14	3	21	16	9,18	3870,803366	3870,803366
14	3	21	17	9,29	3995,892082	3995,892082
14	3	21	18	9,67	4426,894797	4426,894797

14	3	21	19	9,94	4727,631732	4727,631732
14	3	21	20	10,16	4966,178516	4966,178516
14	3	21	21	10,75	5561,240027	5561,240027
14	3	21	22	11,75	6355,841576	6355,841576
14	3	21	23	12,45	6724,895574	6724,895574
14	3	22	0	12,78	6847,555841	6847,555841
14	3	22	1	14,07	7077,097333	7000
14	3	22	2	14,2	7083,443605	7000
14	3	22	3	14,68	7089,213808	7000
14	3	22	4	14,99	7081,399804	7000
14	3	22	5	14,56	7090,063641	7000
14	3	22	6	14,7	7088,943390	7000
14	3	22	7	14,88	7085,008009	7000
14	3	22	8	15,25	7069,888506	7000
14	3	22	9	15,53	7053,906946	7000
14	3	22	10	15,66	7045,591834	7000
14	3	22	11	15,96	7025,082337	7000
14	3	22	12	16,41	6993,242326	7000
14	3	22	13	15,92	7027,888903	7000
14	3	22	14	14,59	7089,979436	7000
14	3	22	15	13,64	7037,659040	7037,65904
14	3	22	16	12,52	6753,518192	6753,518192
14	3	22	17	11,4	6112,722300	6112,7223
14	3	22	18	10,7	5513,900392	5513,900392
14	3	22	19	10,29	5103,492346	5103,492346
14	3	22	20	10,26	5072,074354	5072,074354
14	3	22	21	11,19	5948,247600	5948,2476
14	3	22	22	12,51	6749,517127	6749,517127
14	3	22	23	12,73	6830,935230	6830,93523
14	3	23	0	13,26	6974,423388	6974,423388
14	3	23	1	12,9	6884,711220	6884,71122
14	3	23	2	13,94	7068,326700	7068,3267
14	3	23	3	14,53	7090,058591	7000
14	3	23	4	13,99	7072,000388	7072,000388
14	3	23	5	12,59	6780,714930	6780,71493
14	3	23	6	11,08	5856,717623	5856,717623
14	3	23	7	10,43	5247,781524	5247,781524
14	3	23	8	10,96	5752,803016	5752,803016
14	3	23	9	11,51	6193,356127	6193,356127
14	3	23	10	11,55	6221,721891	6221,721891
14	3	23	11	11,39	6105,201930	6105,20193
14	3	23	12	11	5787,903412	5787,903412
14	3	23	13	10,49	5308,368551	5308,368551
14	3	23	14	9,59	4336,628053	4336,628053

14	3	23	15	8,49	3103,061378	3103,061378
14	3	23	16	7,68	2287,434561	2287,434561
14	3	23	17	7,14	1819,041651	1819,041651
14	3	23	18	6,95	1670,112418	1670,112418
14	3	23	19	6,9	1632,309708	1632,309708
14	3	23	20	6,89	1624,818534	1624,818534
14	3	23	21	6,98	1693,071738	1693,071738
14	3	23	22	6,88	1617,350464	1617,350464
14	3	23	23	6,74	1515,217505	1515,217505
14	3	24	0	6,53	1370,419041	1370,419041
14	3	24	1	4,61	459,693411	459,6934108
14	3	24	2	4,21	345,794078	345,7940778
14	3	24	3	3,99	291,562658	291,5626584
14	3	24	4	4,44	408,743580	408,7435799
14	3	24	5	5,28	701,837577	701,8375772
14	3	24	6	5,84	962,709661	962,7096615
14	3	24	7	6,11	1110,228092	1110,228092
14	3	24	8	6,2	1162,766687	1162,766687
14	3	24	9	5,95	1021,012273	1021,012273
14	3	24	10	5,86	973,129583	973,1295835
14	3	24	11	5,48	788,378250	788,3782503
14	3	24	12	4,79	518,019778	518,0197782
14	3	24	13	4,44	408,743580	408,7435799
14	3	24	14	4,25	356,268239	356,2682387
14	3	24	15	4,3	369,636671	369,636671
14	3	24	16	4,3	369,636671	369,636671
14	3	24	17	4,03	301,009195	301,0091946
14	3	24	18	3,51	191,358517	191,3585172
14	3	24	19	2,58	54,803246	54,80324606
14	3	24	20	1,63	-27,323531	0
14	3	24	21	0,95	-61,306371	0
14	3	24	22	0,77	-67,651097	0
14	3	24	23	1,53	-33,428734	0
14	3	25	0	2,34	29,441297	29,44129663
14	3	25	1	1,38	-41,825820	0
14	3	25	2	1,94	-5,602283	0
14	3	25	3	2,39	34,439849	34,43984861
14	3	25	4	2,77	77,467570	77,4675703
14	3	25	5	2,86	89,059802	89,0598016
14	3	25	6	2,77	77,467570	77,4675703
14	3	25	7	2,43	38,544511	38,54451139
14	3	25	8	2,19	15,298558	15,29855776
14	3	25	9	2,09	6,551645	6,551645249
14	3	25	10	2,09	6,551645	6,551645249

14	3	25	11	2,09	6,551645	6,551645249
14	3	25	12	2,53	49,228726	49,22872613
14	3	25	13	3,27	149,526344	149,5263436
14	3	25	14	4,25	356,268239	356,2682387
14	3	25	15	5,61	848,499069	848,4990693
14	3	25	16	7,24	1900,779330	1900,77933
14	3	25	17	8,68	3309,909532	3309,909532
14	3	25	18	9,85	4628,197807	4628,197807
14	3	25	19	10,41	5227,413750	5227,41375
14	3	25	20	10	4793,371863	4793,371863
14	3	25	21	9,26	3961,759227	3961,759227
14	3	25	22	8,91	3565,651560	3565,65156
14	3	25	23	9,35	4064,168104	4064,168104
14	3	26	0	10,42	5237,608205	5237,608205
14	3	26	1	9,55	4291,358764	4291,358764
14	3	26	2	9,12	3802,694043	3802,694043
14	3	26	3	9,3	4007,271114	4007,271114
14	3	26	4	10,27	5082,565660	5082,56566
14	3	26	5	10,64	5456,259207	5456,259207
14	3	26	6	9,71	4471,866414	4471,866414
14	3	26	7	7,42	2053,691816	2053,691816
14	3	26	8	4,21	345,794078	345,7940778
14	3	26	9	2,08	5,705863	5,705862922
14	3	26	10	3,93	277,725883	277,7258831
14	3	26	11	6,34	1247,945105	1247,945105
14	3	26	12	8,07	2664,964228	2664,964228
14	3	26	13	8,8	3442,715693	3442,715693
14	3	26	14	8,85	3498,467610	3498,46761
14	3	26	15	8,63	3255,038746	3255,038746
14	3	26	16	8,3	2901,267063	2901,267063
14	3	26	17	8,01	2604,904509	2604,904509
14	3	26	18	8,3	2901,267063	2901,267063
14	3	26	19	9,06	3734,722022	3734,722022
14	3	26	20	10,59	5407,550306	5407,550306
14	3	26	21	12,27	6644,582219	6644,582219
14	3	26	22	13,11	6940,844148	6940,844148
14	3	26	23	13,8	7055,925765	7055,925765
14	3	27	0	14,42	7089,239279	7000
14	3	27	1	13,5	7017,782986	7017,782986
14	3	27	2	13,37	6995,817996	6995,817996
14	3	27	3	13,7	7045,044911	7045,044911
14	3	27	4	14,33	7087,573014	7000
14	3	27	5	15	7081,031023	7000
14	3	27	6	14,99	7081,399804	7000

14	3	27	7	14,48	7089,845610	7000
14	3	27	8	13,63	7036,363542	7036,363542
14	3	27	9	12,74	6834,313893	6834,313893
14	3	27	10	11,92	6459,712276	6459,712276
14	3	27	11	11,2	5956,387898	5956,387898
14	3	27	12	10,62	5436,848111	5436,848111
14	3	27	13	10,3	5113,927375	5113,927375
14	3	27	14	10,43	5247,781524	5247,781524
14	3	27	15	10,72	5532,913096	5532,913096
14	3	27	16	11,44	6142,487965	6142,487965
14	3	27	17	12,16	6590,627095	6590,627095
14	3	27	18	12,67	6810,084059	6810,084059
14	3	27	19	12,85	6869,692704	6869,692704
14	3	27	20	12,76	6840,989236	6840,989236
14	3	27	21	12,6	6784,485265	6784,485265
14	3	27	22	12,67	6810,084059	6810,084059
14	3	27	23	12,69	6817,145329	6817,145329
14	3	28	0	12,53	6757,490154	6757,490154
14	3	28	1	12,21	6615,617154	6615,617154
14	3	28	2	12,13	6575,258377	6575,258377
14	3	28	3	12,2	6610,681374	6610,681374
14	3	28	4	12,19	6605,714525	6605,714525
14	3	28	5	12,19	6605,714525	6605,714525
14	3	28	6	12,25	6635,050592	6635,050592
14	3	28	7	12,28	6649,301946	6649,301946
14	3	28	8	12,07	6543,672447	6543,672447
14	3	28	9	11,55	6221,721891	6221,721891
14	3	28	10	10,9	5699,303447	5699,303447
14	3	28	11	10,42	5237,608205	5237,608205
14	3	28	12	10,27	5082,565660	5082,56566
14	3	28	13	10,59	5407,550306	5407,550306
14	3	28	14	11,01	5796,606844	5796,606844
14	3	28	15	11,37	6090,066745	6090,066745
14	3	28	16	12,31	6663,277440	6663,27744
14	3	28	17	13,54	7023,850174	7023,850174
14	3	28	18	14,19	7083,036743	7000
14	3	28	19	14,05	7075,911076	7000
14	3	28	20	13,81	7056,918749	7056,918749
14	3	28	21	13,61	7033,716332	7033,716332
14	3	28	22	13,02	6918,132119	6918,132119
14	3	28	23	12,34	6676,978602	6676,978602
14	3	29	0	12,04	6527,453112	6527,453112
14	3	29	1	9,69	4449,395431	4449,395431
14	3	29	2	10,32	5134,739934	5134,739934

14	3	29	3	10,48	5298,325429	5298,325429
14	3	29	4	10,68	5494,786453	5494,786453
14	3	29	5	10,97	5761,620919	5761,620919
14	3	29	6	10,65	5465,928096	5465,928096
14	3	29	7	10,26	5072,074354	5072,074354
14	3	29	8	9,76	4527,903567	4527,903567
14	3	29	9	9,24	3939,009462	3939,009462
14	3	29	10	8,6	3222,259755	3222,259755
14	3	29	11	8,17	2766,554795	2766,554795
14	3	29	12	7,9	2496,611615	2496,611615
14	3	29	13	7,47	2097,474117	2097,474117
14	3	29	14	7,09	1779,039278	1779,039278
14	3	29	15	6,72	1500,994649	1500,994649
14	3	29	16	6,74	1515,217505	1515,217505
14	3	29	17	6,87	1609,905491	1609,905491
14	3	29	18	7,12	1802,971287	1802,971287
14	3	29	19	7,82	2419,379739	2419,379739
14	3	29	20	8,74	3376,125861	3376,125861
14	3	29	21	9,59	4336,628053	4336,628053
14	3	29	22	9,99	4782,447967	4782,447967
14	3	29	23	9,72	4483,090282	4483,090282
14	3	30	0	8,68	3309,909532	3309,909532
14	3	30	1	7,24	1900,779330	1900,77933
14	3	30	2	6,94	1662,505608	1662,505608
14	3	30	3	6,74	1515,217505	1515,217505
14	3	30	4	7,16	1835,204507	1835,204507
14	3	30	5	7,22	1884,247294	1884,247294
14	3	30	6	7,1	1786,993468	1786,993468
14	3	30	7	6,95	1670,112418	1670,112418
14	3	30	8	6,43	1304,961116	1304,961116
14	3	30	9	5,51	801,976055	801,9760554
14	3	30	10	4,54	438,241195	438,2411953
14	3	30	11	3,79	246,948503	246,9485028
14	3	30	12	3,48	185,847652	185,8476521
14	3	30	13	3,67	222,182428	222,1824284
14	3	30	14	3,79	246,948503	246,9485028
14	3	30	15	4,16	332,972502	332,9725017
14	3	30	16	4,81	524,790287	524,7902866
14	3	30	17	5,56	825,005748	825,0057478
14	3	30	18	6,32	1235,516412	1235,516412
14	3	30	19	6,91	1639,823995	1639,823995
14	3	30	20	7,16	1835,204507	1835,204507
14	3	30	21	7,06	1755,315636	1755,315636
14	3	30	22	6,78	1543,938304	1543,938304

14	3	30	23	6,26	1198,752734	1198,752734
14	3	31	0	5,75	916,798108	916,7981081
14	3	31	1	6,65	1451,934346	1451,934346
14	3	31	2	6,29	1217,036885	1217,036885
14	3	31	3	5,97	1031,875662	1031,875662
14	3	31	4	5,6	843,763024	843,7630239
14	3	31	5	5,01	595,825442	595,8254422
14	3	31	6	4,7	488,276882	488,2768819
14	3	31	7	4,6	456,587529	456,5875288
14	3	31	8	4,34	380,555458	380,5554577
14	3	31	9	3,68	224,191132	224,191132
14	3	31	10	3,02	111,111690	111,1116902
14	3	31	11	2,63	60,537043	60,53704257
14	3	31	12	2,09	6,551645	6,551645249
14	3	31	13	1,69	-23,456827	0
14	3	31	14	1,97	-3,261426	0
14	3	31	15	2,66	64,055154	64,0551544
14	3	31	16	3,5	189,512344	189,5123437
14	3	31	17	4,19	340,629559	340,6295589
14	3	31	18	4,6	456,587529	456,5875288
14	3	31	19	4,89	552,469967	552,4699669
14	3	31	20	4,93	566,673859	566,673859
14	3	31	21	4,72	494,784988	494,7849878
14	3	31	22	4,42	403,002661	403,0026612
14	3	31	23	4,03	301,009195	301,0091946

APPENDIX D

Table D.1 : Calculations for LCOE - part 1

Year	Month	Discount Factor (Cost of Equity)	Discounted AEP (MWh)	Discounted Opex (kEUR)	Debt (kEUR)	Disc.Interest (kEUR)	WaccDisc. Depreciation on IDC (kEUR)
1	1	0,721	116983,61	6277,58	1050107,81	4339,83	108,55
1	2	0,713	115688,90	6218,60	1044960,22	4270,76	107,84
1	3	0,705	114366,08	6157,54	1039812,63	4201,13	107,11
1	4	0,697	113058,39	6097,42	1034665,05	4132,54	106,38
1	5	0,689	111807,13	6040,12	1029517,46	4066,47	105,69
1	6	0,681	110528,70	5980,82	1024369,87	3999,87	104,98
1	7	0,674	109305,43	5924,62	1019222,28	3935,73	104,29
1	8	0,666	108055,60	5866,45	1014074,70	3871,07	103,58
1	9	0,658	106820,07	5809,17	1008927,11	3807,39	102,89
1	10	0,652	105716,25	5758,86	1003779,52	3748,82	102,26
1	11	0,644	104507,46	5701,70	998631,94	3686,95	101,57
1	12	0,637	103350,83	5648,12	993484,35	3627,35	100,90
2	13	0,630	102169,09	5592,67	988336,76	3567,29	100,22
2	14	0,623	101038,34	5540,12	983189,17	3509,44	99,57
2	15	0,616	99883,04	5485,72	978041,59	3451,15	98,89
2	16	0,609	98740,96	5432,16	972894,00	3393,73	98,23
2	17	0,602	97648,15	5381,12	967746,41	3338,41	97,58
2	18	0,595	96531,61	5328,29	962598,82	3282,68	96,93
2	19	0,588	95463,25	5278,22	957451,24	3228,99	96,29
2	20	0,582	94371,70	5226,40	952303,65	3174,91	95,64
2	21	0,575	93292,63	5175,37	947156,06	3121,64	95,00
2	22	0,569	92294,36	5128,64	942008,47	3071,46	94,40
2	23	0,562	91239,04	5078,01	936860,89	3019,74	93,76
2	24	0,556	90229,26	5030,29	931713,30	2969,91	93,14
3	25	0,550	89197,55	4980,90	926565,71	2919,73	92,52
3	26	0,544	88210,36	4934,10	921418,13	2871,38	91,91
3	27	0,537	87201,74	4885,66	916270,54	2822,69	91,29
3	28	0,531	86204,66	4837,95	911122,95	2774,74	90,67
3	29	0,525	85250,59	4792,49	905975,36	2728,53	90,08
3	30	0,519	84275,82	4745,44	900827,78	2682,00	89,47
3	31	0,514	83343,10	4700,85	895680,19	2637,16	88,89

3	32	0,508	82390,13	4654,70	890532,60	2592,03	88,29
3	33	0,502	81448,06	4609,25	885385,01	2547,58	87,69
3	34	0,497	80606,42	4569,33	880237,43	2506,59	87,16
3	35	0,491	79684,75	4523,97	875089,84	2463,44	86,57
3	36	0,486	78802,84	4481,46	869942,25	2421,85	86,00
4	37	0,480	77901,79	4437,46	864794,67	2379,99	85,42
4	38	0,475	77039,62	4395,77	859647,08	2339,64	84,86
4	39	0,469	76158,73	4352,61	854499,49	2299,04	84,29
4	40	0,464	75287,91	4310,11	849351,90	2259,06	83,72
4	41	0,459	74454,67	4269,61	844204,32	2220,51	83,17
4	42	0,454	73603,33	4227,69	839056,73	2181,74	82,61
4	43	0,449	72788,73	4187,97	833909,14	2144,36	82,07
4	44	0,443	71956,45	4146,85	828761,55	2106,75	81,52
4	45	0,438	71133,68	4106,36	823613,97	2069,73	80,97
4	46	0,434	70398,62	4070,79	818466,38	2035,54	80,47
4	47	0,429	69593,67	4030,39	813318,79	1999,61	79,93
4	48	0,424	68823,44	3992,51	808171,21	1964,96	79,41
5	49	0,419	68036,50	3953,32	803023,62	1930,12	78,87
5	50	0,415	67283,51	3916,17	797876,03	1896,52	78,36
5	51	0,410	66514,17	3877,72	792728,44	1862,74	77,83
5	52	0,405	65753,63	3839,86	787580,86	1829,49	77,30
5	53	0,401	65025,91	3803,78	782433,27	1797,41	76,80
5	54	0,396	64282,39	3766,43	777285,68	1765,17	76,28
5	55	0,392	63570,94	3731,04	772138,09	1734,07	75,78
5	56	0,387	62844,06	3694,41	766990,51	1702,82	75,27
5	57	0,383	62125,48	3658,33	761842,92	1672,05	74,76
5	58	0,379	61483,51	3626,65	756695,33	1643,59	74,30
5	59	0,375	60780,50	3590,65	751547,74	1613,75	73,80
5	60	0,370	60107,81	3556,91	746400,16	1584,95	73,32
6	61	0,366	59420,52	3521,99	741252,57	1556,03	72,82
6	62	0,362	58762,89	3488,89	736104,98	1528,12	72,35
6	63	0,358	58090,98	3454,64	730957,40	1500,08	71,86
6	64	0,354	57426,75	3420,91	725809,81	1472,49	71,37
6	65	0,350	56791,19	3388,77	720662,22	1445,86	70,91
6	66	0,346	56141,82	3355,49	715514,63	1419,12	70,43
6	67	0,342	55520,48	3323,96	710367,05	1393,32	69,97
6	68	0,338	54885,64	3291,33	705219,46	1367,41	69,49
6	69	0,334	54258,06	3259,19	700071,87	1341,90	69,03
6	70	0,331	53677,48	3229,77	694924,28	1317,78	68,59
6	71	0,327	53063,71	3197,88	689776,70	1293,07	68,13
6	72	0,323	52476,43	3167,83	684629,11	1269,21	67,68
7	73	0,320	51876,41	3136,73	679481,52	1245,26	67,22
7	74	0,316	51302,27	3107,26	674333,94	1222,15	66,78
7	75	0,313	50715,66	3076,75	669186,35	1198,96	66,33

7	76	0,309	50135,77	3046,71	664038,76	1176,13	65,88
7	77	0,306	49580,89	3018,08	658891,17	1154,10	65,45
7	78	0,302	49013,97	2988,45	653743,59	1131,99	65,01
7	79	0,299	48471,51	2960,37	648596,00	1110,64	64,59
7	80	0,295	47917,28	2931,30	643448,41	1089,23	64,15
7	81	0,292	47369,38	2902,68	638300,82	1068,16	63,72
7	82	0,289	46879,89	2877,54	633153,24	1048,60	63,33
7	83	0,286	46343,86	2848,98	628005,65	1028,18	62,90
7	84	0,282	45830,95	2822,21	622858,06	1008,47	62,49
8	85	0,279	45306,90	2794,50	617710,48	988,70	62,07
8	86	0,276	44805,47	2768,24	612562,89	969,61	61,66
8	87	0,273	44293,16	2741,06	607415,30	950,47	61,25
8	88	0,270	43786,70	2714,30	602267,71	931,64	60,83
8	89	0,267	43302,09	2688,79	597120,13	913,45	60,43
8	90	0,264	42806,96	2662,39	591972,54	895,22	60,03
8	91	0,261	42333,20	2637,38	586824,95	877,61	59,63
8	92	0,258	41849,15	2611,48	581677,36	859,97	59,23
8	93	0,255	41370,64	2585,98	576529,78	842,61	58,83
8	94	0,252	40943,14	2563,59	571382,19	826,46	58,47
8	95	0,249	40474,98	2538,14	566234,60	809,65	58,08
8	96	0,247	40027,03	2514,29	561087,02	793,41	57,70
9	97	0,244	39569,35	2489,61	555939,43	777,14	57,31
9	98	0,241	39131,42	2466,21	550791,84	761,43	56,93
9	99	0,238	38683,98	2442,00	545644,25	745,68	56,55
9	100	0,236	38241,66	2418,15	540496,67	730,20	56,17
9	101	0,233	37818,42	2395,43	535349,08	715,24	55,80
9	102	0,230	37385,99	2371,91	530201,49	700,27	55,42
9	103	0,228	36972,23	2349,63	525053,90	685,79	55,06
9	104	0,225	36549,48	2326,56	519906,32	671,31	54,69
9	105	0,223	36131,56	2303,84	514758,73	657,06	54,32
9	106	0,220	35758,20	2283,89	509611,14	643,77	53,99
9	107	0,218	35349,33	2261,22	504463,55	629,98	53,62
9	108	0,215	34958,10	2239,97	499315,97	616,65	53,27
10	109	0,213	34558,38	2217,98	494168,38	603,31	52,91
10	110	0,211	34175,91	2197,14	489020,79	590,42	52,57
10	111	0,208	33785,13	2175,56	483873,21	577,53	52,21
10	112	0,206	33398,83	2154,32	478725,62	564,85	51,86
10	113	0,204	33029,19	2134,08	473578,03	552,59	51,52
10	114	0,201	32651,52	2113,13	468430,44	540,33	51,17
10	115	0,199	32290,15	2093,27	463282,86	528,48	50,84
10	116	0,197	31920,94	2072,72	458135,27	516,63	50,50
10	117	0,194	31555,95	2052,48	452987,68	504,99	50,15
10	118	0,192	31218,28	2033,95	447840,09	493,91	49,84
10	119	0,190	30861,33	2013,87	442692,51	482,65	49,50

10	120	0,188	30519,77	1994,95	437544,92	471,76	49,18
11	121	0,186	30170,80	1975,36	432397,33	460,88	48,85
11	122	0,184	29836,89	1956,80	427249,75	450,35	48,53
11	123	0,182	29495,72	1937,59	422102,16	439,84	48,20
11	124	0,180	29158,46	1918,67	416954,57	429,50	47,87
11	125	0,178	28835,75	1900,64	411806,98	419,51	47,56
11	126	0,176	28506,04	1881,98	406659,40	409,53	47,24
11	127	0,174	28190,55	1864,29	401511,81	399,87	46,93
11	128	0,172	27868,21	1845,99	396364,22	390,23	46,61
11	129	0,170	27549,56	1827,97	391216,63	380,76	46,30
11	130	0,168	27264,88	1812,13	386069,05	371,86	46,02
11	131	0,166	26953,12	1794,15	380921,46	362,71	45,70
11	132	0,164	26654,82	1777,29	375773,87	353,85	45,41
12	133	0,162	26350,04	1759,84	370626,29	345,01	45,10
12	134	0,161	26058,42	1743,30	365478,70	336,45	44,80
12	135	0,159	25760,46	1726,19	360331,11	327,92	44,50
12	136	0,157	25465,91	1709,33	355183,52	319,54	44,20
12	137	0,155	25184,06	1693,27	350035,94	311,42	43,91
12	138	0,153	24896,10	1676,65	344888,35	303,34	43,62
12	139	0,152	24620,57	1660,89	339740,76	295,50	43,33
12	140	0,150	24339,05	1644,58	334593,17	287,70	43,04
12	141	0,148	24060,75	1628,53	329445,59	280,03	42,75
12	142	0,147	23812,12	1614,42	324298,00	272,81	42,49
12	143	0,145	23539,85	1598,40	319150,41	265,41	42,20
12	144	0,143	23279,32	1583,38	314002,82	258,24	41,92
13	145	0,142	23013,14	1567,83	308855,24	251,10	41,64
13	146	0,140	22758,44	1553,10	303707,65	244,18	41,37
13	147	0,139	22498,22	1537,85	298560,06	237,30	41,09
13	148	0,137	22240,97	1522,84	293412,48	230,54	40,81
13	149	0,136	21994,82	1508,53	288264,89	223,99	40,55
13	150	0,134	21743,32	1493,72	283117,30	217,47	40,27
13	151	0,133	21502,68	1479,68	277969,71	211,16	40,01
13	152	0,131	21256,81	1465,15	272822,13	204,88	39,74
13	153	0,130	21013,76	1450,85	267674,54	198,71	39,47
13	154	0,128	20796,61	1438,28	262526,95	192,88	39,23
13	155	0,127	20558,82	1424,00	257379,36	186,93	38,96
13	156	0,125	20331,28	1410,62	252231,78	181,17	38,71
14	157	0,124	20098,81	1396,77	247084,19	175,44	38,45
14	158	0,122	19876,37	1383,65	241936,60	169,88	38,20
14	159	0,121	19649,10	1370,06	236789,02	164,37	37,94
14	160	0,120	19424,42	1356,69	231641,43	158,96	37,68
14	161	0,118	19209,45	1343,94	226493,84	153,70	37,44
14	162	0,117	18989,80	1330,74	221346,25	148,49	37,18
14	163	0,116	18779,63	1318,24	216198,67	143,43	36,94

14	164	0,114	18564,90	1305,30	211051,08	138,42	36,69
14	165	0,113	18352,62	1292,55	205903,49	133,50	36,44
14	166	0,112	18156,24	1280,88	200755,90	128,77	36,21
14	167	0,111	17948,64	1268,24	195608,32	124,03	35,97
14	168	0,109	17749,99	1256,32	190460,73	119,43	35,73
15	169	0,108	17547,04	1243,99	185313,14	114,87	35,49
15	170	0,107	17352,83	1232,30	180165,56	110,45	35,26
15	171	0,106	17154,42	1220,20	175017,97	106,07	35,02
15	172	0,105	16958,27	1208,28	169870,38	101,77	34,78
15	173	0,103	16770,59	1196,93	164722,79	97,59	34,56
15	174	0,102	16578,83	1185,18	159575,21	93,46	34,32
15	175	0,101	16395,34	1174,04	154427,62	89,45	34,10
15	176	0,100	16207,87	1162,51	149280,03	85,48	33,87
15	177	0,099	16022,55	1151,16	144132,44	81,58	33,64
15	178	0,098	15856,98	1141,19	138984,86	77,86	33,44
15	179	0,097	15675,67	1129,87	133837,27	74,12	33,21
15	180	0,096	15502,18	1119,25	128689,68	70,48	32,99
16	181	0,094	15324,92	1108,26	123542,10	66,88	32,77
16	182	0,093	15155,31	1097,85	118394,51	63,39	32,56
16	183	0,092	14982,02	1087,07	113246,92	59,94	32,34
16	184	0,091	14810,72	1076,45	108099,33	56,56	32,12
16	185	0,090	14646,80	1066,34	102951,75	53,27	31,91
16	186	0,089	14479,32	1055,87	97804,16	50,03	31,69
16	187	0,088	14319,08	1045,95	92656,57	46,87	31,48
16	188	0,087	14155,35	1035,68	87508,98	43,76	31,27
16	189	0,086	13993,49	1025,57	82361,40	40,72	31,06
16	190	0,085	13848,89	1016,68	77213,81	37,78	30,87
16	191	0,084	13690,54	1006,59	72066,22	34,86	30,66
16	192	0,083	13539,02	997,13	66918,63	32,01	30,46
17	193	0,082	13384,21	987,34	61771,05	29,21	
17	194	0,082	13236,08	978,07	56623,46	26,48	
17	195	0,081	13084,74	968,46	51475,87	23,79	
17	196	0,080	12935,12	959,01	46328,29	21,17	
17	197	0,079	12791,96	950,00	41180,70	18,61	
17	198	0,078	12645,70	940,67	36033,11	16,10	
17	199	0,077	12505,74	931,83	30885,52	13,65	
17	200	0,076	12362,75	922,68	25737,94	11,24	
17	201	0,075	12221,39	913,67	20590,35	8,89	
17	202	0,075	12095,10	905,76	15442,76	6,60	
17	203	0,074	11956,80	896,77	10295,17	4,35	
17	204	0,073	11824,47	888,34	5147,59	2,15	
18	205	0,072	11689,27	879,62	0,00	0,00	
18	206	0,071	11559,90	871,35		0,00	
18	207	0,070	11427,72	862,80		0,00	

18	208	0,070	11297,05	854,38		0,00	
18	209	0,069	11172,02	846,35		0,00	
18	210	0,068	11044,28	838,04			
18	211	0,067	10922,05	830,16			
18	212	0,067	10797,16	822,01			
18	213	0,066	10673,70	813,99			
18	214	0,065	10559,49	806,64			
18	215	0,064	10438,75	798,67			
18	216	0,064	10323,22	791,17			
19	217	0,063	10205,18	783,40			
19	218	0,062	10092,24	776,04			
19	219	0,061	9976,84	768,42			
19	220	0,061	9862,76	760,92			
19	221	0,060	9753,61	753,77			
19	222	0,059	9642,08	746,37			
19	223	0,059	9535,37	739,35			
19	224	0,058	9426,34	732,10			
19	225	0,057	9318,55	724,95			
19	226	0,057	9222,26	718,67			
19	227	0,056	9116,81	711,53			
19	228	0,056	9015,91	704,85			
20	229	0,055	8912,82	697,93			
20	230	0,054	8814,18	691,37			
20	231	0,054	8713,40	684,58			
20	232	0,053	8613,76	677,90			
20	233	0,052	8518,43	671,53			
20	234	0,052	8421,03	664,94			
20	235	0,051	8327,83	658,69			
20	236	0,051	8232,61	652,22			
20	237	0,050	8138,48	645,85			
20	238	0,050	8054,38	640,26			
20	239	0,049	7962,28	633,90			
20	240	0,049	7874,16	627,95			
Sum			9724451,58	589854,23	107636050,31	236308,04	11805,07

Table D.2 : Calculations for LCOE - part 2.

Year	Month	Discount Factor (WACC)	WaccDisc. AEP (MWh)	WaccDisc. Tax Deducted Opex (kEUR)	WaccDisc. Princ. Payment +Intrerest (kEUR)	WaccDisc. Depreciation on Tax Saving (kEUR)	WaccDisc. Tax Saving Interest (kEUR)
1	1	0,825	133811,68	5026,43	9209,07	1914,67	1489,24
1	2	0,819	132937,05	5002,01	9124,70	1902,15	1472,25
1	3	0,814	132039,27	4976,35	9039,07	1889,31	1455,10
1	4	0,808	131147,56	4951,10	8954,17	1876,55	1438,12
1	5	0,803	130290,34	4927,05	8871,95	1864,28	1421,61
1	6	0,798	129410,43	4901,77	8788,50	1851,69	1404,95
1	7	0,792	128564,57	4877,96	8707,68	1839,59	1388,76
1	8	0,787	127696,32	4852,94	8625,65	1827,16	1372,41
1	9	0,782	126833,93	4828,31	8544,34	1814,82	1356,22
1	10	0,777	126060,01	4806,96	8469,27	1803,75	1341,07
1	11	0,772	125208,68	4781,78	8389,31	1791,57	1325,18
1	12	0,767	124390,28	4758,55	8311,85	1779,86	1309,73
2	13	0,761	123550,22	4734,14	8233,25	1767,84	1294,15
2	14	0,756	122742,66	4711,14	8157,12	1756,28	1278,99
2	15	0,751	121913,73	4686,98	8079,86	1744,42	1263,70
2	16	0,746	121090,39	4663,19	8003,27	1732,64	1248,56
2	17	0,741	120298,91	4640,54	7929,08	1721,32	1233,84
2	18	0,736	119486,48	4616,73	7853,80	1709,69	1218,99
2	19	0,732	118705,49	4594,31	7780,88	1698,52	1204,54
2	20	0,727	117903,82	4570,74	7706,89	1687,05	1189,98
2	21	0,722	117107,57	4547,54	7633,55	1675,65	1175,55
2	22	0,717	116367,55	4526,44	7564,15	1665,06	1161,78
2	23	0,712	115581,67	4502,98	7492,05	1653,82	1147,62
2	24	0,708	114826,20	4481,10	7422,20	1643,01	1133,86
3	25	0,703	114050,73	4458,12	7351,33	1631,91	1119,98
3	26	0,698	113305,26	4436,46	7282,68	1621,25	1106,48
3	27	0,694	112540,07	4413,70	7213,03	1610,30	1092,86
3	28	0,689	111780,04	4391,30	7143,99	1599,42	1079,39
3	29	0,684	111049,41	4369,97	7077,10	1588,97	1066,27
3	30	0,680	110299,45	4347,55	7009,25	1578,24	1053,05
3	31	0,675	109578,50	4326,44	6943,50	1567,92	1040,19
3	32	0,671	108838,47	4304,24	6876,82	1557,33	1027,23
3	33	0,666	108103,44	4282,40	6810,72	1546,82	1014,40

3	34	0,662	107443,81	4263,46	6749,62	1537,38	1002,34
3	35	0,658	106718,19	4241,13	6684,63	1526,99	989,75
3	36	0,653	106020,65	4220,52	6621,66	1517,01	977,50
4	37	0,649	105304,65	4198,88	6557,79	1506,77	965,15
4	38	0,645	104616,35	4178,48	6495,90	1496,92	953,14
4	39	0,640	103909,83	4157,04	6433,14	1486,81	941,03
4	40	0,636	103208,09	4135,95	6370,92	1476,77	929,05
4	41	0,632	102533,49	4115,86	6310,63	1467,12	917,38
4	42	0,628	101841,04	4094,74	6249,50	1457,21	905,63
4	43	0,624	101175,38	4074,85	6190,25	1447,68	894,19
4	44	0,619	100492,10	4053,95	6130,17	1437,91	882,67
4	45	0,615	99813,43	4033,37	6070,62	1428,20	871,26
4	46	0,611	99204,39	4015,54	6015,54	1419,48	860,53
4	47	0,607	98534,42	3994,50	5956,99	1409,90	849,35
4	48	0,603	97890,37	3975,10	5900,25	1400,68	838,45
5	49	0,599	97229,28	3954,71	5842,72	1391,22	827,49
5	50	0,595	96593,76	3935,50	5786,97	1382,13	816,81
5	51	0,591	95941,42	3915,31	5730,44	1372,79	806,06
5	52	0,587	95293,49	3895,44	5674,41	1363,52	795,42
5	53	0,583	94670,62	3876,52	5620,11	1354,61	785,05
5	54	0,579	94031,27	3856,63	5565,05	1345,46	774,62
5	55	0,576	93416,66	3837,90	5511,69	1336,67	764,46
5	56	0,572	92785,78	3818,21	5457,59	1327,64	754,24
5	57	0,568	92159,16	3798,83	5403,98	1318,67	744,11
5	58	0,564	91596,81	3782,03	5354,34	1310,63	734,58
5	59	0,561	90978,22	3762,22	5301,64	1301,78	724,65
5	60	0,557	90383,56	3743,95	5250,55	1293,27	714,98
6	61	0,553	89773,17	3724,74	5198,77	1284,53	705,26
6	62	0,550	89186,38	3706,65	5148,57	1276,14	695,78
6	63	0,546	88584,07	3687,63	5097,69	1267,52	686,25
6	64	0,542	87985,82	3668,92	5047,26	1258,96	676,82
6	65	0,539	87410,73	3651,10	4998,37	1250,73	667,62
6	66	0,535	86820,40	3632,37	4948,83	1242,28	658,38
6	67	0,532	86252,92	3614,72	4900,80	1234,16	649,37
6	68	0,528	85670,42	3596,18	4852,12	1225,83	640,31
6	69	0,524	85091,85	3577,93	4803,88	1217,55	631,34
6	70	0,521	84554,15	3561,33	4758,15	1209,86	622,74
6	71	0,518	83983,12	3542,87	4710,74	1201,69	613,95
6	72	0,514	83434,18	3525,66	4664,78	1193,83	605,39
7	73	0,511	82870,72	3507,57	4618,20	1185,77	596,78
7	74	0,507	82329,05	3490,53	4573,04	1178,02	588,39
7	75	0,504	81773,05	3472,63	4527,29	1170,06	579,95
7	76	0,501	81220,80	3455,00	4481,95	1162,16	571,61
7	77	0,497	80689,92	3438,22	4437,98	1154,56	563,47

7	78	0,494	80144,99	3420,58	4393,43	1146,77	555,29
7	79	0,491	79621,14	3403,97	4350,23	1139,27	547,32
7	80	0,487	79083,42	3386,51	4306,47	1131,58	539,31
7	81	0,484	78549,34	3369,32	4263,11	1123,94	531,38
7	82	0,481	78070,04	3354,42	4222,90	1117,08	523,88
7	83	0,478	77542,80	3336,85	4180,28	1109,53	516,11
7	84	0,475	77035,96	3320,64	4138,94	1102,28	508,53
8	85	0,472	76515,70	3303,60	4097,08	1094,84	500,92
8	86	0,468	76015,58	3287,56	4056,47	1087,68	493,50
8	87	0,465	75502,21	3270,69	4015,35	1080,34	486,05
8	88	0,462	74992,31	3254,09	3974,59	1073,04	478,68
8	89	0,459	74502,14	3238,29	3935,07	1066,03	471,48
8	90	0,456	73999,00	3221,68	3895,03	1058,83	464,26
8	91	0,453	73515,32	3206,02	3856,21	1051,91	457,22
8	92	0,450	73018,84	3189,58	3816,89	1044,80	450,15
8	93	0,447	72525,71	3173,39	3777,92	1037,75	443,15
8	94	0,444	72083,17	3159,36	3741,76	1031,41	436,51
8	95	0,441	71596,37	3142,81	3703,47	1024,45	429,66
8	96	0,438	71128,39	3127,54	3666,33	1017,75	422,97
9	97	0,435	70648,03	3111,50	3628,72	1010,88	416,26
9	98	0,433	70186,26	3096,38	3592,24	1004,27	409,71
9	99	0,430	69712,26	3080,50	3555,30	997,49	403,14
9	100	0,427	69241,46	3064,87	3518,70	990,75	396,64
9	101	0,424	68788,88	3049,98	3483,19	984,28	390,29
9	102	0,421	68324,32	3034,33	3447,24	977,63	383,93
9	103	0,418	67877,74	3019,59	3412,37	971,24	377,72
9	104	0,415	67419,33	3004,10	3377,06	964,68	371,49
9	105	0,413	66964,02	2988,86	3342,08	958,17	365,33
9	106	0,410	66555,41	2975,64	3309,58	952,32	359,47
9	107	0,407	66105,94	2960,05	3275,21	945,89	353,43
9	108	0,405	65673,85	2945,67	3241,86	939,71	347,54
10	109	0,402	65230,33	2930,56	3208,10	933,36	341,63
10	110	0,399	64803,96	2916,33	3175,35	927,26	335,86
10	111	0,397	64366,32	2901,37	3142,20	921,00	330,08
10	112	0,394	63931,62	2886,64	3109,35	914,78	324,37
10	113	0,391	63513,75	2872,62	3077,48	908,80	318,78
10	114	0,389	63084,81	2857,89	3045,22	902,66	313,19
10	115	0,386	62672,47	2844,00	3013,92	896,76	307,72
10	116	0,384	62249,22	2829,41	2982,25	890,70	302,25
10	117	0,381	61828,83	2815,05	2950,86	884,69	296,83
10	118	0,379	61438,12	2801,99	2921,04	879,10	291,61
10	119	0,376	61023,21	2787,47	2890,22	873,16	286,31
10	120	0,374	60624,34	2773,93	2860,30	867,45	281,13
11	121	0,371	60214,92	2759,70	2830,03	861,60	275,95

11	122	0,369	59821,34	2746,29	2800,66	855,96	270,88
11	123	0,366	59417,34	2732,21	2770,94	850,18	265,81
11	124	0,364	59016,07	2718,34	2741,49	844,44	260,79
11	125	0,361	58630,32	2705,13	2712,91	838,92	255,89
11	126	0,359	58234,37	2691,26	2684,00	833,26	250,98
11	127	0,357	57853,73	2678,18	2655,94	827,81	246,19
11	128	0,354	57463,02	2664,45	2627,55	822,22	241,39
11	129	0,352	57074,95	2650,92	2599,43	816,67	236,65
11	130	0,350	56726,69	2639,20	2573,25	811,68	232,11
11	131	0,347	56343,59	2625,38	2545,62	806,20	227,47
11	132	0,345	55975,31	2612,62	2518,81	800,93	222,92
12	133	0,343	55597,29	2599,22	2491,69	795,52	218,39
12	134	0,340	55233,89	2586,59	2465,35	790,32	213,95
12	135	0,338	54860,87	2573,33	2438,73	784,99	209,51
12	136	0,336	54490,37	2560,27	2412,35	779,68	205,12
12	137	0,334	54134,21	2547,83	2386,74	774,59	200,83
12	138	0,331	53768,62	2534,76	2360,84	769,36	196,54
12	139	0,329	53417,17	2522,45	2335,70	764,33	192,34
12	140	0,327	53056,42	2509,51	2310,27	759,17	188,14
12	141	0,325	52698,11	2496,77	2285,09	754,04	184,00
12	142	0,323	52376,55	2485,73	2261,62	749,44	180,02
12	143	0,321	52022,83	2472,71	2236,89	744,38	175,96
12	144	0,319	51682,80	2460,70	2212,87	739,51	171,99
13	145	0,316	51333,76	2448,08	2188,59	734,52	168,03
13	146	0,314	50998,23	2436,18	2165,01	729,72	164,15
13	147	0,312	50653,82	2423,69	2141,17	724,79	160,28
13	148	0,310	50311,73	2411,39	2117,57	719,89	156,45
13	149	0,308	49982,88	2399,67	2094,63	715,19	152,70
13	150	0,306	49645,32	2387,36	2071,46	710,36	148,96
13	151	0,304	49320,83	2375,77	2048,95	705,72	145,30
13	152	0,302	48987,74	2363,58	2026,21	700,95	141,65
13	153	0,300	48656,91	2351,58	2003,67	696,22	138,03
13	154	0,298	48360,01	2341,18	1982,65	691,97	134,55
13	155	0,296	48033,42	2328,92	1960,53	687,29	131,02
13	156	0,294	47719,46	2317,61	1939,04	682,80	127,56
14	157	0,292	47397,19	2305,72	1917,32	678,19	124,12
14	158	0,290	47087,39	2294,52	1896,23	673,76	120,74
14	159	0,288	46769,39	2282,75	1874,92	669,21	117,37
14	160	0,286	46453,53	2271,16	1853,81	664,69	114,04
14	161	0,284	46149,90	2260,13	1833,30	660,34	110,78
14	162	0,282	45838,23	2248,54	1812,58	655,88	107,53
14	163	0,281	45538,62	2237,61	1792,45	651,60	104,34
14	164	0,279	45231,08	2226,14	1772,12	647,20	101,17
14	165	0,277	44925,61	2214,84	1751,98	642,83	98,04

14	166	0,275	44641,72	2204,56	1732,79	638,76	94,98
14	167	0,273	44340,24	2193,13	1713,03	634,45	91,92
14	168	0,271	44050,42	2182,48	1693,82	630,30	88,92
15	169	0,270	43752,93	2171,28	1674,42	626,05	85,93
15	170	0,268	43466,95	2160,74	1655,58	621,95	83,00
15	171	0,266	43173,40	2149,65	1636,54	617,75	80,08
15	172	0,264	42881,83	2138,74	1617,69	613,58	77,20
15	173	0,263	42601,54	2128,35	1599,37	609,57	74,37
15	174	0,261	42313,84	2117,44	1580,88	605,45	71,56
15	175	0,259	42037,26	2107,15	1562,90	601,50	68,80
15	176	0,257	41753,37	2096,34	1544,75	597,43	66,06
15	177	0,256	41471,39	2085,70	1526,78	593,40	63,35
15	178	0,254	41218,34	2076,48	1509,97	589,78	60,71
15	179	0,252	40939,97	2065,60	1492,32	585,80	58,07
15	180	0,251	40672,38	2055,57	1475,17	581,97	55,47
16	181	0,249	40397,70	2045,02	1457,86	578,04	52,89
16	182	0,247	40133,65	2035,09	1441,04	574,26	50,36
16	183	0,246	39862,61	2024,65	1424,06	570,38	47,84
16	184	0,244	39593,40	2014,37	1407,24	566,53	45,36
16	185	0,242	39334,61	2004,59	1390,89	562,83	42,92
16	186	0,241	39068,96	1994,31	1374,39	559,02	40,50
16	187	0,239	38813,60	1984,62	1358,35	555,37	38,11
16	188	0,238	38551,47	1974,44	1342,16	551,62	35,75
16	189	0,236	38291,12	1964,42	1326,14	547,89	33,42
16	190	0,235	38057,47	1955,73	1311,12	544,55	31,14
16	191	0,233	37800,45	1945,49	1295,39	540,87	28,87
16	192	0,231	37553,38	1936,04	1280,10	537,34	26,63
17	193	0,230	37299,77	1926,10	1264,67	0,00	24,42
17	194	0,228	37055,96	1916,75	1249,66	0,00	22,24
17	195	0,227	36805,71	1906,92	1234,53	0,00	20,08
17	196	0,225	36557,15	1897,24	1219,55	0,00	17,95
17	197	0,224	36318,20	1888,02	1204,97	0,00	15,85
17	198	0,222	36072,93	1878,34	1190,27	0,00	13,78
17	199	0,221	35837,14	1869,21	1175,98	0,00	11,73
17	200	0,219	35595,12	1859,62	1161,56	0,00	9,71
17	201	0,218	35354,73	1850,19	1147,29	0,00	7,72
17	202	0,217	35139,00	1842,00	1133,90	0,00	5,75
17	203	0,215	34901,69	1832,36	1119,89	0,00	3,81
17	204	0,214	34673,57	1823,45	1106,27	0,00	1,89
18	205	0,212	34439,40	1814,10	0,00	0,00	0,00
18	206	0,211	34214,30	1805,29	0,00	0,00	0,00
18	207	0,209	33983,23	1796,03	0,00	0,00	0,00
18	208	0,208	33753,73	1786,91	0,00	0,00	0,00
18	209	0,207	33533,11	1778,23	0,00	0,00	0,00

18	210	0,205	33306,64	1769,11	0,00	0,00	0,00
18	211	0,204	33088,94	1760,52	0,00	0,00	0,00
18	212	0,203	32865,48	1751,49	0,00	0,00	0,00
18	213	0,201	32643,52	1742,60	0,00	0,00	0,00
18	214	0,200	32437,25	1734,51	0,00	0,00	0,00
18	215	0,199	32218,18	1725,52	0,00	0,00	0,00
18	216	0,197	32007,60	1717,14	0,00	0,00	0,00
19	217	0,196	31791,44	1708,33	0,00	0,00	0,00
19	218	0,195	31583,64	1700,03	0,00	0,00	0,00
19	219	0,193	31370,34	1691,31	0,00	0,00	0,00
19	220	0,192	31158,48	1682,73	0,00	0,00	0,00
19	221	0,191	30954,82	1674,55	0,00	0,00	0,00
19	222	0,189	30745,77	1665,96	0,00	0,00	0,00
19	223	0,188	30544,81	1657,87	0,00	0,00	0,00
19	224	0,187	30338,53	1649,37	0,00	0,00	0,00
19	225	0,186	30133,64	1641,00	0,00	0,00	0,00
19	226	0,185	29949,77	1633,74	0,00	0,00	0,00
19	227	0,183	29747,51	1625,18	0,00	0,00	0,00
19	228	0,182	29553,07	1617,29	0,00	0,00	0,00
20	229	0,181	29353,48	1608,99	0,00	0,00	0,00
20	230	0,180	29161,62	1601,17	0,00	0,00	0,00
20	231	0,179	28964,68	1592,96	0,00	0,00	0,00
20	232	0,177	28769,07	1584,88	0,00	0,00	0,00
20	233	0,176	28581,03	1577,18	0,00	0,00	0,00
20	234	0,175	28388,01	1569,09	0,00	0,00	0,00
20	235	0,174	28202,46	1561,46	0,00	0,00	0,00
20	236	0,173	28011,99	1553,46	0,00	0,00	0,00
20	237	0,171	27822,82	1545,57	0,00	0,00	0,00
20	238	0,170	27653,04	1538,74	0,00	0,00	0,00
20	239	0,169	27466,29	1530,68	0,00	0,00	0,00
20	240	0,168	27286,77	1523,24	0,00	0,00	0,00
Sum			16090549,34	704515,85	815693,16	208232,75	102100,21

CURRICULUM VITAE

Name Surname **:** H. Özge Özüer

Place and Date of Birth **:** Ankara, 08.11.1986

E-Mail **:** ozgeozuer@gmail.com

EDUCATION **:**

- **High School** **:** 2006, Robert College
- **B.Sc.** **:** 2010, Bogazici University, Civil Engineering

PROFESSIONAL EXPERIENCE AND REWARDS:

- 2013 - Offshore Project Planner / Siemens Offshore Wind Power
- 2012 - 2013 Planning Engineer / Siemens Energy Transmission
- 2010 - 2012 Project Engineer / Verwater