UNIVERSITY OF GAZİANTEP
GRADUATE SCHOOL OF
NATURAL & APPLIED SCIENCES

EVALUATING FUEL ALTERNATIVES FOR ELECTRICITY GENERATION IN TURKEY THROUGH MULTIPLE CRITERIA DECISION SUPPORT METHODOLOGIES

M.Sc. THESIS
IN
INDUSTRIAL ENGINEERING

BY
MURAT HALİS
JULY 2009

Evaluating Fuel Alternatives For Electricity Generation In Turkey Through Multiple Criteria Decision Support Methodologies

M.Sc. Thesis
in
Industrial Engineering
University Of Gaziantep

Supervisor
Prof.Dr. Adil BAYKASOĞLU

by
Murat HALİS
July 2009

ABSTRACT

EVALUATING FUEL ALTERNATIVES FOR ELECTRICITY GENERATION IN TURKEY THROUGH MULTIPLE CRITERIA DECISION SUPPORT METHODOLOGIES

HALİS Murat
M.Sc.in Industrial Eng.
Supervisor: Prof.Dr. Adil BAYKASOĞLU
July 2009, 105 Pages

In today's world, with development to the growing electrical energy demand is considered as a important problem. This problem became significant, to capture the new perspective about to installing environmental and environment-friendly clean fuel technology of energy generation systems not only thinking economical criteria. Turkey electric energy demand trend in is an increase 7.5% on average at a rate of speed. According to estimates to meet the increasing electricity demand, the current 42,394 MW installed capacity by 2020 of at least the period should be doubled. However Kyoto agreement was signed in 2009, within the framework need to be limit of carbon emission rates. In this case, the generation of electrical energy that are not only depend economic factors, also environment, sustainability, such as direct and indirect interactions with each other bearing in mind the many factors which need to be evaluated. For this kind of multi-criteria decision problems Analytical Hierarchy (AHP) and Analytical Network Processes (ANP) are good approaches to analysis comes to the fore. In this thesis to evaluate of electricity generation ways models built with the help of AHP and ANP methods. Models and criteria, mined from resources as follows, "Energy and Natural Resources Ministry", "International Energy Agency", "Turkey Electricity Transmission Company" issues and surveys with experts and were obtained by interviews. According to the thesis, models built and results put in place for priorisation of alternatives.

Key Words: Electrical Energy, Energy Management, Analytic Hierarchy Process, Analytic Network Process, Multi-Criteria Decision Making.

ÖZET

TÜRKİYE'DE ELEKTRİK ÜRETİMİ İÇİN YAKIT ALTERNATİFLERİNİN ÇOK ÖLÇÜTLÜ KARAR DESTEK YÖNTEMLERİ İLE DEĞERLENDİRİLMESİ

HALİS Murat
Yüksek Lisans Tezi, Endüstri Müh. Bölümü
Tez Yöneticisi: Prof.Dr. Adil BAYKASOĞLU
Temmuz 2009, 105 Sayfa

Günümüz dünyasında gelişmeyle birlikte elektrik enerjisine olan artan talep bir sorun olarak varlığını sürdürmektedir. Bu problemi daha da önemli kılan sadece kaynakların kıt olması değil önemi günümüzde artan ve gelecekte artacak olan çevre faktörü ve çevre dostu teknoloji-yakıtlardan oluşan enerji üretim perspektifini yakalama zorunluluğudur. Ülkemizin elektrik enerjisi talebinde yıllık %7,5 oranında artış eğilimi vardır. Bu tahminlere göre artan elektrik talebini karşılamak üzere, 42.394 MW mevcut kurulu gücümüzün 2020 yılına kadar iki katına çıkartılması gerekmektedir. Bununla birlikte 2009 yılında imzalanan Kyoto anlaşması çerçevesinde öngörülen büyümeyle beraber karbon emisyonlarını sınırlamak gerekmektedir. Bu durumda elektrik enerjisi üretimi için kullanılacak olan kaynakların sadece ekonomik faktörler değil, çevre, sürdürülebilirlik gibi birbiri ile doğrudan ve dolaylı etkileşim halinde bulunan birçok faktörü göz önünde bulundurarak değerlendirilmesi gerekmektedir. Bu tür çok kıstaslı ve kıstaslar arasında etkileşimlerin bulunduğu bir karar problemi için Analitik Hiyerarşi (AHS) ve Analitik Ağ Süreçleri (AAS) uygun bir modelleme ve analiz yaklaşımı olarak öne çıkmaktadır. Tez çalışmamızda yakıt alternatiflerinin değerlendirilmesine yönelik modeler AHS ve AAS süreçleri yardımı ile çalışılmıştır. Model için gerekli olan veriler "Enerji ve Tabii Kaynaklar Bakanlığı", "Uluslararası Enerji Ajansı ", "Türkiye Elektrik İletim A.Ş." yayınlarından ve uzmanlarla yapılan anket ve görüşmeler ile elde edilmiştir. Tez çalışması ile oluşturulan modeller çerçevesinde alternatifler önceliklendirilmiştir.

Anahtar Kelimeler: Elektrik Enerjisi, Enerji Yönetimi, Analitik Hiyerarşi Süreci, Analitik Ağ Süreci, Çok Kıstaslı Karar Verme.

ACKNOWLEDGEMENTS

I would like to express my deep appreciation to my supervisor Prof. Dr. Adil Baykasoğlu for their valuable directions and contributions during this study. Also I am very thankful to Prof. Dr. Adil Baykasoğlu and Prof Dr. Türkay Dereli for their willingness to take me into opportunity and passionate guidance he gave me during all academic life. Their enthusiasm and interest for science are contagious. I have learned not only scientific techniques from them, but also more importantly, the method of scientific thinking, how to identify a research problem, how to form and carry out a research plan and how to get results. What I have learned all at University of Gaziantep from them, believe that will greatly benefit my future careers.

I would be grateful to my wife Besime Halis and my parent Şükrü, Aysel Halis and my family for their valuable contributions during my study. Without their support I can not walk on my way.

CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF SYMBOLS AND ABREVIATIONS

AHP :Analytical Hierarchy Process

ANP :Analytical Network Process

AVL :Availability

BG :Biogas

CC :Climate Change

CCGT :Combined Cycle Gas Turbines

CCGT :Combined Cycle Gas Turbines

CHP :Combined Heat and Power

CO :Cost

CST :Capital Cost

CW :Civil Works

CWC :Critical Waste Confinement

DEC :Decentrilazation

EC :Economic

EFF :Efficiency

ELT :Effective Life Time

EME :Electro Mechanical Equipment

EN :Environmental

EP :Engineering & Project

ES :Environmental – Sustainability

ET :Employment

FO :Fuel Oil

FPIS :Fuel price increase sensitivity

FR :Financial Requirements

GDP :Gross Domestic Product

GEPP :Geothermal Electric Power Pant

GT :Geothermal

GW :Global Warming

GW :Gigawatt

GWh :Gigawatt hour

HC :Hard Coal

HEPP :Hydro Electric Power Plant

HHI :Human Health Impacts

HYD :Hydro

IAEA :International Atomic Energy Agency

IC :Imported Caol

IEA :International Energy Agency

IGCC :Integrated Gasification Combined Cycle

IP :International Policy

kWh : Kilowatt Hour

LD :Local Disturbance

LGT : Lignite

LTSE :Long-term sustainability Energetic

LTSN :Long-term sustainability Non-energetic

MENR :Ministry of Energy and Natural Resources

MI :Market-Investor

MW :Megawatt

NC : Nuclear

NETA :New Electricity Trading Arrangements

NG :Natural Gas

NPEL :Non-Pollutant Effects Land use

PLR : Peak load response

POC :Production & Operation cost

PW :Pairwise Comparison

RA :Risk Aversion

RE :Resources

REI :Regional Environmental Impact

RES :Renewable Energy System

RES :Renevable Energy Sources

RTFD :Reference Technology&Fuel Data

SA :Safe Assurance

SCSP : Solar Csp
SE :Security
SO :Social
SPV :Solar Pv
TA :Technological Availability
TD :Tidal
TE :Technology
TEPP :Thermic Electric Power Plant
TETC :Turkish Electricity Transmission Company
TW :Total Waste
WCED:World Commission on Environment and Development
WEPP :Wind Electric Power Plant
WOF :Wind Offshore
WON :Wind Onshore

1 INTRODUCTION

1.1 Introduction

This chapter includes defining of objective of thesis. Revising Turkish energy politics. Method and Materials used in this thesis.

1.2 Objective of Thesis

The primary objective of energy management is to maximize profits or minimize costs while take in to account of environmental and social effect of system. In the thesis we will introduce a Model that gives the way of best method for electric energy production methodology and fuel and technology mix. Using this model better long and short term plans can be built up. In order to build up this decision support model, firstly we will analyze the literature on production ways of energy (particularly electricity) (conventional & unconventional) then according to the this research we build our criteria's like; fuel sustainability, environment effect, technology availability, resource accessibility-security, fuel transportation cost, human resources availability, investment & operation cost resource etc.So in this thesis this multi objective problem trying to be solving.

First purpose of this thesis building of AHP&ANP models to decide for best fuel and technology mix for Electricity generation ways of Turkey. Secondly Criteria, used in this model, will be determined. Criteria are play an important role in this study. To reach such a good criteria and their values literature survey made and findings are modified to Turkish conditions.

After building model and criteria alternative fuel-technology ways are determined. This case is also important for useful ranking. We try to take in to account many of alternatives.

Then finally using Super Decision Software AHP and ANP Models implemented to build ranking of alternatives.

1.3 Role of Management Activity in Electricity Sector

Investment activity plays an extremely important role in every economic organization.Various elements must be taken into account before an investment project is applied. Technical factors, environmental effects, social issues and financial profitability are of significant importance. Thus this type selection is a typical example of a multiple criteria decision making problem.

Some desirable subobjectives of energy management should include:

- Improving energy efficiency and reducing energy use, thereby reducing costs
- Developing and maintaining effective monitoring, reporting, and management strategies for wise energy usage
- Finding new and better ways to increase returns from energy investments through research and development
- Developing interest in and dedication to the energy management program from all employees
- Reducing the impacts of curtailments, brownouts, or any interruption in energy supplies

Energy is an all-encompassing commodity that touches the life of everyone. Managing energy efectively is of vital importance in every organization and every nation. Reducing the impact of climate change requires an integrated and global response. Energy systems must play a central role in this response, which has to address environmental stewardship, economic growth and energy supply and security.

The development and deployment of new clean energy technologies are fundamental. Secure, reliable and affordable energy supplies are fundamental to economic stability and development. The erosion of energy security, the threat of disruptive climate change and the growing energy needs of the developing world all major challenges to energy decision-makers and planners. Since the 1970s, rising concern for global environmental degradation have led to wide acceptance of sustainable development concept. Following its initial popularization, the concept of the sustainability has appeared in a wide range of forms in recent literature. Although different authors have given it a variety of meanings, sustainable development is best defined as meeting the needs of the present generation without compromising the ability of future generations to meet their own needs (WCED). In this context, sustainability is used to characterize the desired balance between economic growth and environmental preservation [11].

Energy and Climate Change is a twin topics and they can not be separated. So To decrease environmental effect of conventional electricity generation ways some scenarios are widely used to predict the future evolution of energy systems and assess their environmental implications. Alternative scenarios for the same system are intended to illustrate the impact of different energy and technology mixes on the type and intensity of these implications. Specfic emphasis is recently put to the role of Renewable Energy Sources (RES) which are recognized to significantly contribute to the reduction of environmental repercussions, although inducing a more or less higher nancial burden [13].

EU climate regulations is important indicator for Turkey. While planning it must be taken in to account. Recent Policy of EU climate change as follows [16] ; On 28 January 2009 the EC has published a Communication “Towards a Comprehensive Climate Change Agreement in Copenhagen”, which reiterates the emission reduction targets which have been adopted by the European Council in 2007 and the main topics of the EU “Energy and Climate Package” adopted in December 2008, amongst which:

- The objective is to limit the average global temperature increase to less than 2°C compared to pre-industrial levels;
- An autonomous 20% reduction of the EU emissions by 2020 below 1990;
- A 30% reduction target in the context of a sufficiently ambitious and comprehensive international agreement that provides for comparable reductions by other developed countries, and appropriate actions by developing countries;
- 80 to 95% reduction of emissions by 2050 in developed countries; leading to global 50% emission reduction by 2050.

1.4 Revising Energy Politics of Turkey

The power industry was liberalised in 2000 with a generous capacity margin. Investment decisions since privatisation have been more complex. The core of investment are driven by the Regional Electricity Companies who were anxious to gain some independence from the state generators. There was no competition for many customers and so much of the initial risk was passed on to end users. The chosen technology was combined cycle gas turbines (CCGTs) because of the low capital costs. As gas became cheaper during the 1995s and the existing coal-fired generators tended, in the relatively uncompetitive conditions that then applied, to price above new entry cost, a second wave of CCGT investment took place. It was possible for new entrants to invest on the basis that they could produce power more cheaply than existing plant was prepared to sell it. Also, at the time the short run marginal cost of a new CCGT was significantly lower than the short run cost of coal generation, ensuring a high load factor since coal rather than the new gas plant would likely be displaced in the event of over-supply. This situation stopped with the gas moratorium in 2000 and by the time the stricter consents policy was lifted in 2004, the market no longer looked so welcoming to new CCGT investments. This was the result of a combination of events: the introduction of the New Electricity Trading Arrangements (NETA) in 2001 which forced all market players to participate in the competitive process, forced divestment of price-setting plant by the large generators, and rising Turkish gas prices.

Since then, investment in new gas stations has been sporadic, normally driven by particular situations affecting specific locations or players. The main transactions have involved existing assets changing hands. In the absence of a clear cost advantage of new technologies over existing technologies, new investment must be driven largely by investors' expectations of future scarcity. The dynamics of the market have not been tested under these conditions until now. Some recent announcements of intentions to invest in new generation assets have been made. However, notwithstanding other specific strategic reasons for investing, the question is how high the long-term expectations of the electricity to gas spread or the electricity to coal, nuclear, solar, wind, spread need to be before generators commit to building the levels of capacity that will be required over the next ten years. Also how much Turkey need new investment on electrical energy sector can be seen from Figure 1.1 [8].

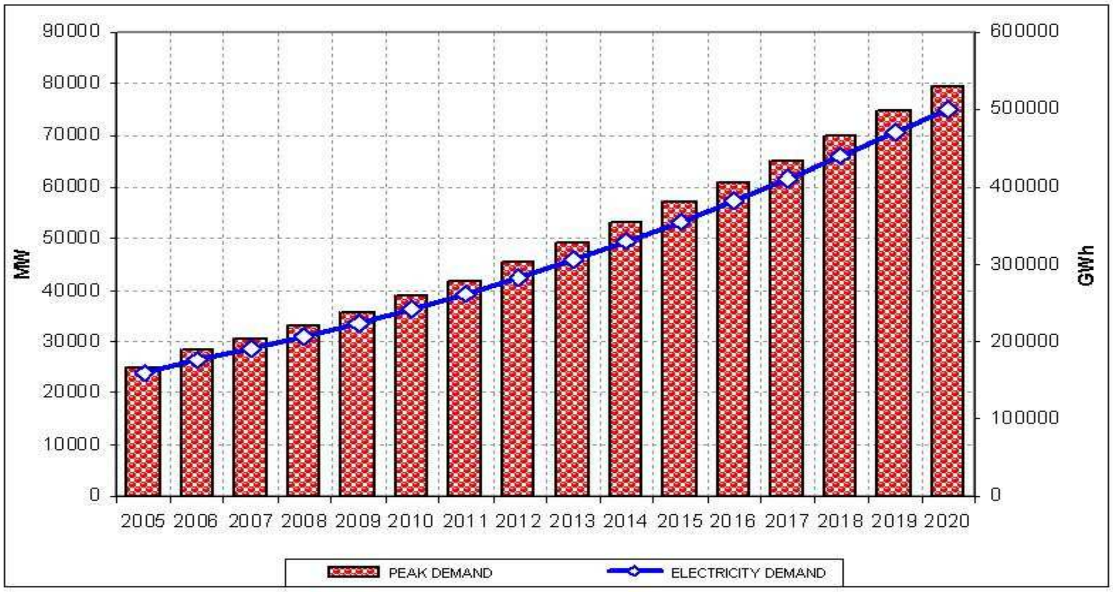


Figure 1.1 Electricity High Demand Scenerio 2005-2020 [8]

1.5 Methodology And Materials

Though nature; this problem must be solved multi objective decision making techniques. One of the best techniques are AHP and ANP. So AHP and ANP (ANP-Analytic Network Proces, AHP-Analytic Hierarchy Process) Decision Support Techniques are used in this study. These techniques are implemented via Super Decision computer programme. Datas used in this study sollected from several sources like Ministry og Energy and Natural Resources of Turkey (MENR), International Energy Agency (IEA) Issues, International Atomic Energy Agency (IAEA) Issues, Turkish Electricity Transmission Company (TETC) Issues and Questionnaire from Energy Experts. While evaluating these datas Turkish conditions are taken into account.

1.6 Literature Summary

Evaluating fuel alternatives for electricity generation through multiple criteria decision support methodologies applied in several study.

Köne Ç. Et al [10] study Cost Benefit Analysis via ANP method to evaluate to determine the best fuel mix for electricity generation in Turkey from a sustainable development perspective. Two scenarios implemented in this study. Sustainability is the main criteria for this study. As shown in figure 1.2 ANP model contains five criteria as; Environment, Technology, Energy Security, Health Hazards and Total Costs.

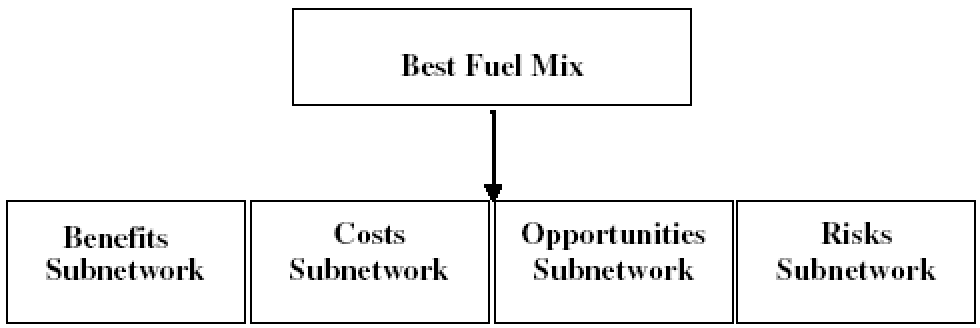


Figure 1.2 ANP Model [10]

Implementing these model nine alternatives evaluating for Turkey conditions. These alternatives are as follows; Natural Gas, Hydropower, Coal, Oil, Nuclear, Biomass, Geothermal, Wind, Solar.

Fuel shares in installed capacity of Turkey (%)

Fuel type	2005	Scenario 1 strong sustainability	Scenario 2 weak sustainability
Natural gas	36.57	14.50	13.76
Hydropower	33.25	21.14	22.39
Coal	23.49	13.88	21.74
Oil	6.51	4.61	4.10
Nuclear	–	10.21	9.16
Biomass	0.07	11.27	8.65
Geothermal	0.06	11.27	8.28
Wind	0.05	7.68	7.25
Solar	–	5.44	4.67

Figure 1.3 Result of ANP Model [10]

After implementing these model results calculated for the two sceneraios.

S Hirschberg et al [26] evaluates sustainability of electricity supply technologies under German conditions. Used method in this study is multi criteria decision analysis. Method used for evaluation is based on simple weighted multiple attribute function. Individual weights reflect the relative importance of the various evaluation criteria and are combined with the normalized indicator values. Normalizing is carried out using a local scale, defined according to the set of alternatives under consideration. Criteria selected as quantitative especially. Economy, Environment and Social criteria are used to determine results. These criteria have thirteen sub criteria. Eight alternatives as; Lignite, Hard Coal, Natural Gas, Hydro, Nuclear, Solar, Wind and Fuel Oil are evaluated in this study. After implementing model for each main criteria three ranking acquired.

D. Diakoulaki and F. Karangelis [13] examines multi-criteria decision analysis and cost–benefit analysis of alternative scenarios for the power generation sector in Greece. The aim is to encompass all positive and negative side-effects characterizing the electricity generation technologies assumed to participate in each scenario and emphasis is given to the particular role of renewable energy sources which represent a major differentiating factor between them. The calculation of economic, technical and environmental performances of the examined scenarios for the year 2010 shows that electricity planning is a complicated task since improvements in one policy target are accompanied by losses in others. Lignite, Oil, Natural Gas, Hydro, Wind and other RES alternatives are evaluated.

Also Turkish Electricity Transmission Company et al [2] study on 2005-2020 capacity increaing sceneraios. The main criteria of this selection is cost. Many scenerios implemented especially on demand. This demand is directly relwevan with the economic growth. And and other scenerios implemented as no nuclear or with co generation. However data on electricity generated from combustible renewables and waste are available from 1991. In 1995, the Turkish Administration reclassified autoproducer plants by type and source to be consistent with IEA definitions. This causes breaks between 1994 and 1995 for electricity production in these plants. Electricity production from wind is available starting in 1998. A new gas fired main activity producer CHP plant was put into operation in 1999 and a new autoproducers electricity plant fuelled with coking coal started in 2000. Last year, the Turkish Statistical Office provided electricity and heat output on the basis of a new survey that allowed revising time series starting from 2000. This causes breaks in the time series between 1999 and 2000. Comprehensive data on electricity consumption are available from 1973. This causes a break in series between 1972 and 1973. Consumption in the machinery sector includes transport equipment. Prior to 1998, electricity consumption in wood and wood products sub-sector includes that of pulp, paper, and printing industry. Data on direct use of solar thermal is available from 1986. Net electricity generating capacity by type of generation for both main activity producers and autoproducers is not available prior to 1999 [14]. So, the energy datas for Turkish electricity sector is weak. This reduces the reliability of the statistics of the calculation.

After surveying literature, we need to expand the criteria and increase alternatives for Turkish conditons eg; Tide-Wave and Wind Offshore, IGCC are also new alternatives for generating electricity. So, in this thesis new criteria and new alternatives have been studied. And, then more reliable result has been acquired.

2 ELECTRICAL ENERGY GENERATING TECHNOLOGIES

2.1 Introduction

This chapter contains Turkish energy mix and Carbon emission case and revising of energy chains used for generating electricity. These fuels and technologies are used as alternatives in thesis.

2.2 Turkey's Energy Mix Case

Electricity demand in Turkey has been growing rapidly. In Figure 2.1 shows the trend energy production share for the period 1971-2006. Energy demand doubling from 1971.

The average annual growth rate has been 7.5% in the period 1990–2007. Total installed capacity at the end of 2007 is 40.836 MW and consumption rate is 191,6 billion kWh. This total capacity is composed of approximately 47,3% natural gas, 20,7% coal fired power plant, 18,2% hydroelectric. Figure 2.2 also shows the generation by fuel type. Natural gas, hydro, and lignite, in that order, were the largest resources for electricity. In recent years there has been a considerable increase in the utilization of natural gas for electric power generation about 47% share to total. This is the result of the implementation of the government policy to expand natural gas use in all sectors, including electric power generation. Because Natural Gas Power Plant building period is generally shorter than the other power plants.

Thermic coal fired electricity ranks a distant second with roughly 21%, followed by coal, hydro, and oil power, which together account for the remaining 35%. Although non-hydro renewables have great potential in Turkey, their current contributions are practically negligible.

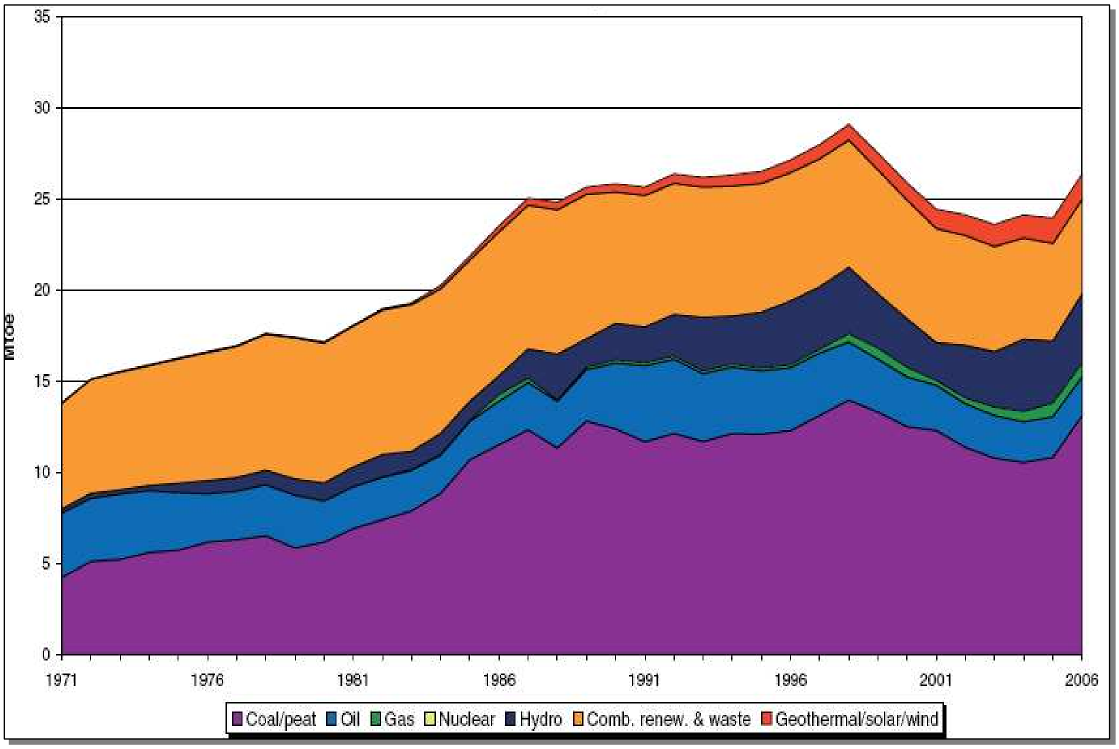


Figure 2.1 Energy Production Trend 1971-2006 [6]

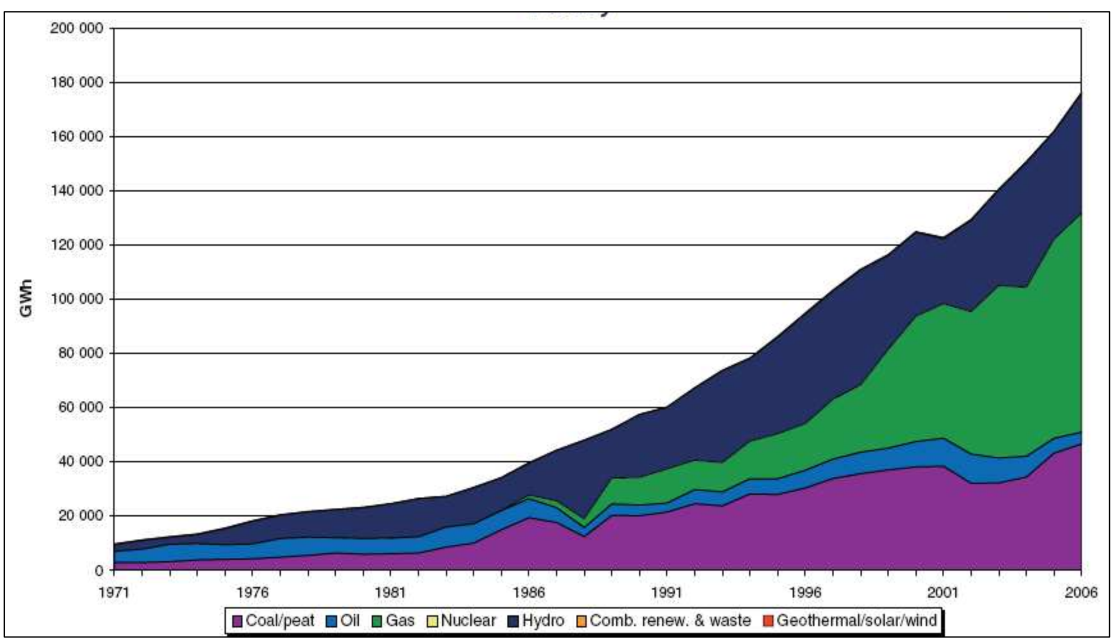


Figure 2.2 Electricity Generation By Fuel [6]

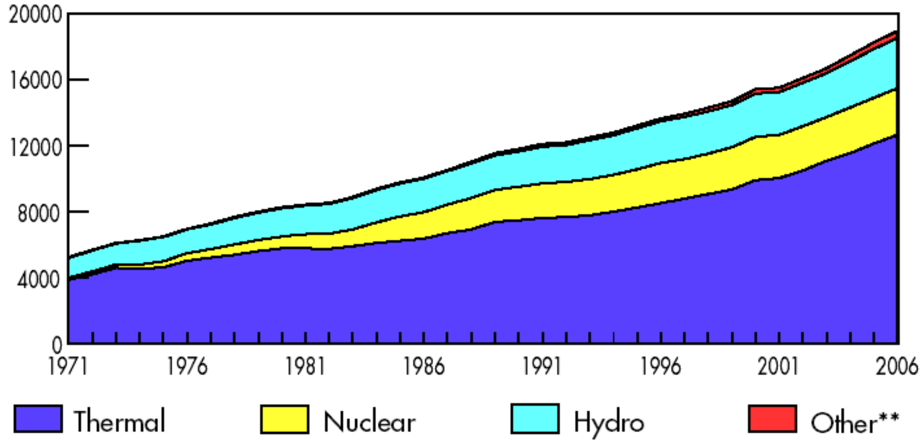


Figure 2.3. World Electricity Generation Trend 1971-2006 (TWh) [17]

Figure 2.3 shows that World Electricity Generation trend for 1971-2006. Thermal, Nuclear and Hydro powers share is about 99% of all.

Fuel Type	Potential (MW)	Utilization (MW)	Unused %
Lignite	17.470,00	8.111,00	53,57
Hard Coal	1.535,00	335,00	78,18
Hydro	35.440,00	13.602,00	61,62
Wind	10.000,00	335,35	96,65
Geothermal	500,00	30,00	94,00
Toplam	**63.008,00**	**22.413,50**	**64,43**

Table 2.1 Turkey Local Resource Utilization Condition [26]

In Table 2.1 shows that Turkey's local resource utilization capacity. This means that still we can install power plants to ngenerate 40594,50 MW from local resources. This must be take into account while planning expansion periods.

2.3 Turkey's Carbon Emission Case

Electricity generation and Climate is meshing each other. These process cannot be separated and directly effect each other. In Figure 2.4 shows the trend of Carbon emission of Turkey for the period 1990-2006. The total GHG emissions of Turkey increased steadily in the period 1990-2006 due to the country's steady population growth and intensive industrialisation.The total GHG emissions of Turkey rose by 89% between the years 1990 and 2006, from 170.1 to 332.0 million tonnes.

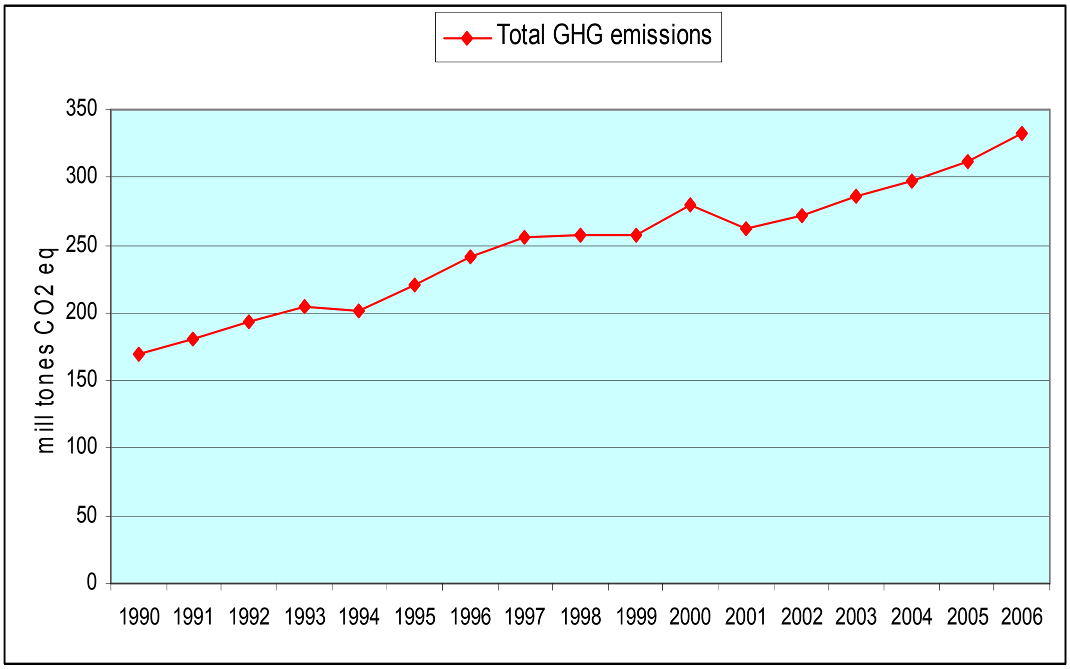


Figure 2.4 Turkey Total Carbon Emission Trend 1990-2006 [15]

As mentioned Chapter 1 Kyoto Protocols and European Union regulates Carbon Emission values. Energy sector especially Electricity Generating Sector increases carbon emission rates. So while planning&directing energy sector carbon emission and also climate change will play important role.

2.4 Energy Conversion & Electricity Generation

To generate electricity such a fuels must be used and they must be good understood for healty results and ranking. Figure 2.5 Shows that simplified reference energy system. It shows all stages of the generating process. Fuel processing and Conversion technology parts are so important and these stages will be explained later. If we can add this chart domestic gas production and Import Coal we can get all picture of energy system of Turkey.

Figure 2.6 also shows that Structure of the Transmission and Distrubution Networks. This case is very important while calculating overall cost of the system and system connection condition of the decided plants. Grid is an important part of the Electric system.

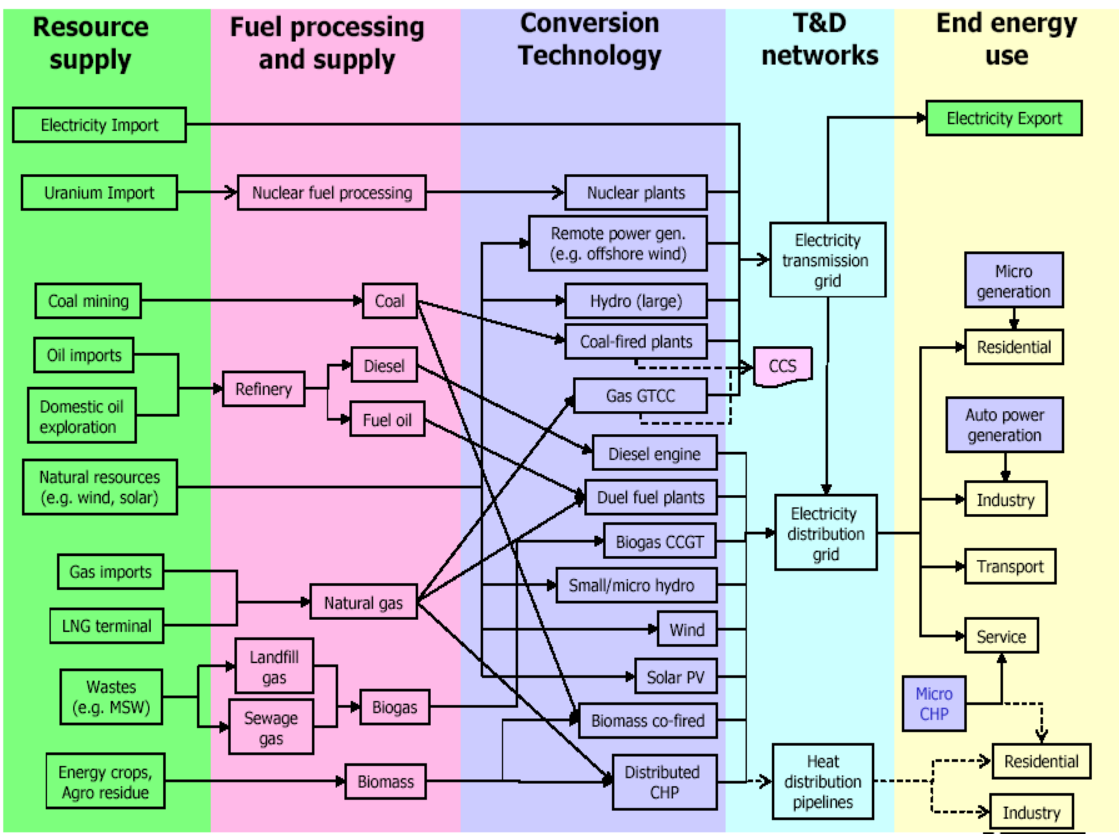


Figure 2.5 Structure of the Simplified Reference Energy System[7]

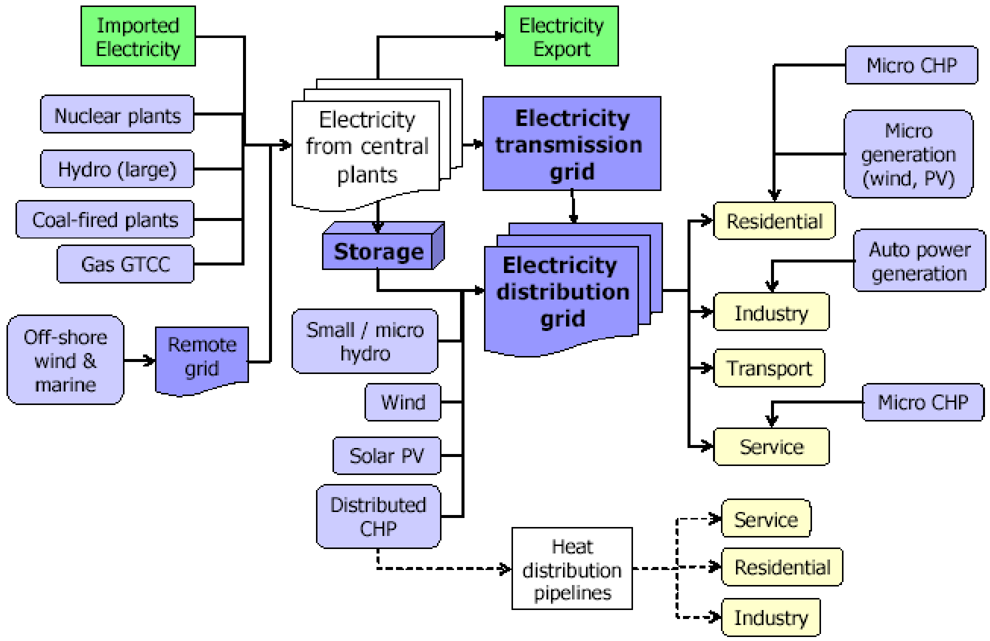


Figure 2.6 Structure of the Transmission and Distrubution Networks [7]

2.4.1 Fossil Fuels

a. Coal

Figure 2.7 gives an overview of the various coal categories. Generally, coal can be divided into two main classes; hard and low rank coals. Low rank coals, such as lignite and subbituminous coals, are typically softer, friable materials with a dull, earthly appearance; they are characterized by high moisture levels and a low carbon content, and hence a low energy content. Higher rank coals are typically harder and stronger and often have a black vitreous luster. Increasing rank is accompanied by a rise in the carbon and energy content and a decrease in the moisture content of the coal.

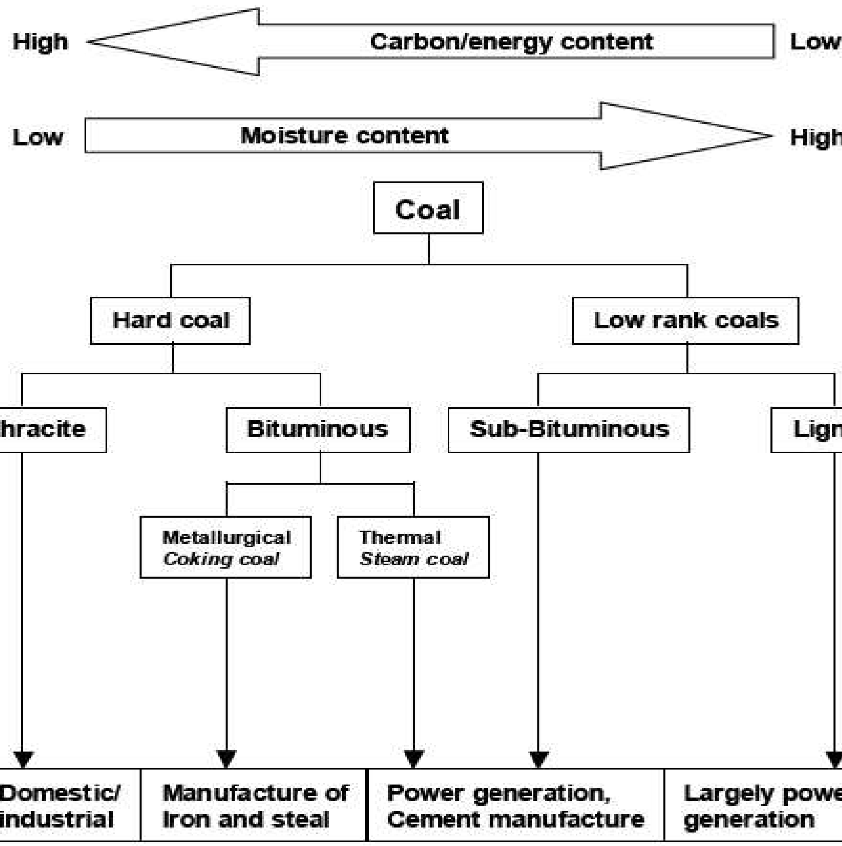


Figure 2.7 Classification of Uses Coal [3]

Lignite is one of the most important domestic energy resources of the country and is found in almost all regions. Total proven reserves are 7.3 billion tons of which 3.4 billion tons are in the Afsin-Elbistan region, which is in the southeastern part of the country. The Elbistan lignite is, however, of poor quality with an average calorific value of only 1,100 kcal/kg, a sulphur content of 1.23%, and an ash content of about 19%. The remaining lignite reserves are of higher quality with an average calorific value of 2,000–2,300 kcal/kg. The main lignite-consuming sectors are the residential, power, and industrial sectors. Lignite with the lowest calorific value is consumed in power plants. Higher quality lignite is used in the residential and industrial sectors [3].

There is a total of 1.3 billion tons of hard coal reserves in the Black Sea Region and 0.6 billion tons of total reserves are proven. Much of the domestic hard coal is first converted to coke and then used in the iron and steel sector. Hard coal is also used in the residential sector for heating purposes and in power plants. Hard coal production reached 1.9 million tons in 2004. In the same year, 16.4 million tons of hard coal was imported. In addition, 2.3 million tons of coke and petroleum coke were imported. More than 90% of the final hard coal consumption was consumed in the industrial sector. The iron and steel industry consumed about 26% of total hard coal imports, followed by the cement industry, which consumed 11%. The remaining hard coal was imported for household consumption in large towns to alleviate air pollution. Asphaltite (sub-bituminous coal) reserves of 79 million tons are found in the southwest Anatolia Region. Asphaltite, which is consumed mainly in the residential sectors in east and southeast Anatolia, is a valuable energy resource with a high calorific value (4,300 kcal/kg) and its ash rarely has mineral contamination. Asphaltite production reached 722,000 tons in 2004.[2] Already available clean coal technologies can make a significant contribution to containing the growth of CO2 emissions from power generation. Use of advanced steam cycle or integrated gasification combined-cycle (IGCC) technologies could raise the average efficiency of coal-fired power plants from 35% today to 50% in 2050 [6].

Advantages of Coal: The advantages of using fossil fuels to generate energy are that it is convenient and low-cost relative to other sources. Fossil fuels can be burned to generate energy since the middle of the nineteenth century, and have established efficient methods of extracting, transporting, and harnessing the energy contained in fossil fuels [6].

Disadvantages of Coal: The problems associated with fossil fuel use are that the extraction of fossil fuels causes local environmental problems including noise, dust, and groundwater pollution; while the burning of fossil fuels releases greenhouse gases and other harmful particulates into the atmosphere causing wider environmental problems such the enhanced greenhouse effect and acid rain. Fossil fuels are a finite energy source that will eventually run out. As fossil fuel reserves run low, the cost of retrieving them will increase significantly, making this form of energy production more expensive than others [6].

b. Oil

Crude oil is defined as a naturally occurring mixture consisting predominantly of hydrocarbons; it exists in liquid phase in natural underground reservoirs and is recoverable as liquid at typical atmospheric conditions of pressure and temperature. [3]. Electricity generation from fuel oil is so easy way than other methods. Using simple internal combustion engines electricity can be generated with little areas.

Advantages of Oil: Low capital cost. High availability load factor. High mobilization ability. Low land use. High employment ratio.

Disadvantages of Oil: High operation and production cost. High carbon emission and fuel oil is outsourcing it is not local resource.

c. Natural Gas

Natural gas is kind of hydrocarbon fuels. It exist in natural underground reservoirs. It can be transported via liquid or gaseous phase.

Advantages of Natural Gas: Clean efficient combustion. Among lowest life-cycle greenhouse gas emissions of all commercially available fuels. Insignificant levels of sulfur dioxide. Extremely low particulates produced during combustion.Less damage to soil and water in case of spills, due to rapid evaporation.So low land use area. Low employment. Hihg calorific value.

Disadvantages of Natural Gas: Security problem. Gas Turbine technology is high technology. So can not be produced via local resources. Like fuel also technology is outsourcing.

d. Nuclear

Nuclear power is generated from the fission of uranium, plutonium or thorium, or by the fusion of hydrogen into helium. The most common method is via the fission of uranium.

The nuclear fission generates heat, which is used to heat water to produce steam. The steam drives turbines which turn generators to produce electricity. Figure 54 shows the development of the nuclear electricity production in OECD and non- OECD countries, in the period 1980 to 1999. After a major expansion phase in the eighties, a phase of stagnation followed in the nineties. This is also corresponding to the decreasing number of nuclear power plants taken into commercial operation after the peak in 1985 with 38 new plants [27]. While Turkey has no nuclear power plant In contrast, more than 15 countries cover at least 25% of their electricity demand using nuclear based electricity [4].

Advantages of Nuclear: There are very low greenhouse gas emissions associated nuclear power, the energy generated is very low-cost compared to other sources, and the process is generally clean in relation to fossil fuel use [7].

Disadvantages of Nuclear: An accident at a nuclear power station could result in the release of vast amounts of highly radioactive material into the atmosphere. Whilst the chances of an accident are low the impacts can be very high. The accident at Chernobyl in 1986 is a stark reminder of what can happen when things go wrong (please see links at the bottom of this sheet for further information). In addition, nuclear waste can stay dangerously radioactive for thousands of years, and there is still no solution for dealing with it safely. There is also a risk of proliferation of nuclear material. Nuclear waste can be used to make nuclear weapons, and nuclear power stations would be prime targets for terrorists[7].

e. Biomas and Coal Gasification (IGCC)

The term "energy from waste" refers to the range of combustion processes that exploit the calorific value in waste material in order to generate heat, electricity, or both. There are various techniques that are used to produce energy from waste, these are combustion, gasification, pyrolysis, and biological processes, including anaerobic digestion and extraction of landfill gas. Incineration technology is the most common form of extracting energy from waste. Prior to incineration, the materials that can be either composted or recycled are removed, leaving only residual waste. The residual waste is then burned in a furnace to heat water and produce steam. The steam then turns turbines which then generate electricity. Incineration plants can also burn industrial and clinical waste, but may have to operate at higher temperatures or use additional filters in the chimneys. In other energy from waste process, the residual waste is made into pellets, which are fed into furnaces at a refuse derived fuelplant [7].

In fuel gasification, biomass feedstock is partially oxidised at high temperatures using restricted oxygen to form a mixture of CO, H2, CH4 and higher hydrocarbon gases that can then be combusted. Fuels can be gasified in many different designs of gasifier, the content of the synthesis gas mixture depending on the gasification method used. The gas mixture may contain different amounts of condensing liquids, tars formed during pyrolysis, carbonised residues, ash, impurities, and CO2. Gasification technologies have been developed which can produce fuel gas from biomass feedstocks for use in engines, gas turbines and co-firing in boilers. Most gasifiers are based on combustion technologies using air, oxygen or water[6].

Advantages of Biomass: Reduction in the CO2 emissions of the coal plant. higher energy-conversion efficiency than would be obtainable in dedicated, smaller-scale, biomass facilities; reduced sulphur and nitrogen-oxide emissions especially for Co fired with coal. Also Energy from waste saves resources by generating energy from waste materials that would otherwise be sent to landfill. This saves landfill space and reduces the need for electricity generation via fossil fuels or nuclear. There are many natural waste by-products produced by our lifestyles, and it makes sense to use them whenever possible. Biomass fuel is carbon neutral, and has a tendency to be very low-cost compared to other fuels. Using biomass lessens the demand for the Earths' resources [6].

Disadvantages of Biomass: Potential Capacity can be problem. There is widespread concern over emissions from energy from waste plants. Despite the vast improvements in flue cleaning technology and the implementation of stricter regulations over recent years, the public at large is still unconvinced that emissions from energy from waste plants are safe. Greenhouse gases and particulates are released through burning, and some materials are not available all year round. In addition, collecting biomass materials in sufficient quantities may prove difficult[6]. Capital and Operation Cost is high because of new technology, also a few experts exist to install all system.

2.4.2 Renewable Energy

Renewable Energy means environmental friend natural and directly converting energy without burning any carbons. We need this type energies to reduce carbon emission rates.

a. Hydro

Hydroelectric powerstations exploit the huge gravitational (potential) energy that is contained in rivers in mountainous regions. A dam is constructed to trap water in a river valley and allow a huge increase in water level. At the bottom of the dam there are holes containing turbines for the water to flow through. Dams are built very high, which generates high water pressure and therefore more potential for energy production. When the water flows through the pipes at high pressure, it turns the turbines, which generate electricity. The water is then free to flow downstream and eventually return to the sea[7].

Advantages of Hydro: The energy source is constant, making it more reliable than other renewables. Water can be stored up when energy demand is low and used when demands increase. Hydroelectric plants can also reach peak output faster than other power stations.Hydropower is an extremely flexible power technology. Hydro reservoirs provide built-in energy storage, and the fast response time of hydropower enables it to be used to optimise electricity production across power grids, meeting sudden fluctuations in demand or helping to compensate for the loss of power from other [6].

Disadvantages of Hydro: Suitable sites for dams are few and far between and hydroelectric plants are very expensive to build. The construction of hydroelectric plants leads to the displacement of many riparian communities, and causes devastating effects on ecosystems either side of the dam[7].

b. Geothermal

Geothermal energy is the energy available as heat emitted from within the earth's crust, usually in the form of hot water or steam. The centre of the Earth is extremely hot, around 6000 degrees Celsius. This heat drives the movement of the Earths tectonic plates which causes earthquakes and volcanic eruptions. The temperature can reach over 250 degrees Celsius even a few kilometres below then surface. It is generally believed that the temperature increases by one degree Celsius for every 36 metres descended. [7].

Advantages of Geothermal: A distinct advantage offered by geothermal energy production is that there is very little visual impact on the environment. Low land use. High thermal efficiency.

Disadvantages of Geothermal: High internal consumption electricity. So the electrical efficiency is low. Suitable sites for geothermal schemes are hard to come by, for example the rocks need to be drilled through easily, and the hot rocks also need to be close enough to the surface to be easily reached. Also, some hazardous gases may come up from the rocks, and their handling and disposal may be a problem, and some geothermal site have been known to "run out of steam" for long periods so re injection must be operated.

c. Solar

In this thesis two types of solar power has been studied. They are as follows;

Photovoltaic cells (PV):

Photovoltaics (pv's) are the most common type of solar energy generation. These are the solar panels we see on wristwatches, calculators, and on the roofs of buildings. The pv's convert sunlight directly into electricity. When energy from the sun hits a photovoltaic cell, electrons become dislodged and create an electrical current. The DC current produced depends on the type of material used and the amount of sunlight reaching the photovoltaic cell. A number of photovoltaic cells side by side in a rectangle shape are called a "module", and a number of modules together are known as an "array". The single crystal silicon cell is the most common cell used today as it is more efficient than the cheaper.

Advantages of PV: Directly convert solar to electricity without turning any part.

Disadvantages of PV: High Capital cost, High land use, Low conversion efficiency. Dependent to the Sun so availability factor is low.

Concentrated Solar Power (CSP);

This uses the heat from the Sun to heat water. The heated water can be used for cooking, bathing, heating, or even for generating electricity. Solar Thermal uses mechanical devices such as pumps or fans to distribute the energy where it is required, and it is this that distinguishes it from passive solar systems. There are three main types of Solar Thermal systems, and they operate at differing temperatures. Concentrated solar power (CSP) uses direct sunlight, concentrating it several times to reach higher energy densities and thus higher temperatures. The heat is used to operate a conventional power cycle, e.g. through a steam turbine or a Stirling engine, which drives a generator. [6]. Figure 2.8 shows that most promising areas for CSP plants of world. Southeast of Turkey is suitable for the installation of the CSP plants.

Advantages of CSP: It is simple and can be very cheap to introduce, especially passive systems.

Disadvantages of CSP: Solar power has limited use in regions at higher latitudes such as the Turkey, and can also be affected by factors such as cloud cover or seasonal variation in solar radiation.

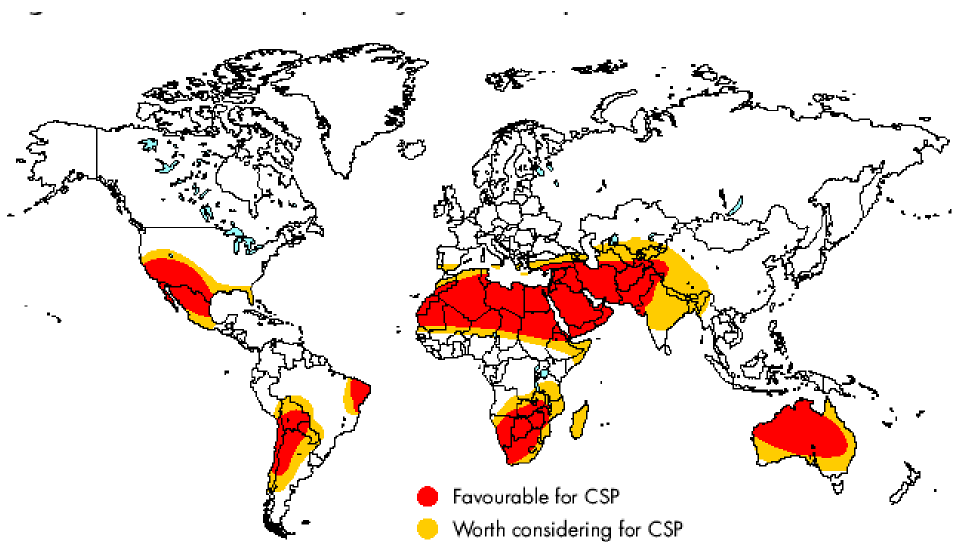


Figure 2.8 The most promising areas for CSP plants [6]

d. Tide, Wave and Ocean

Tide, wave and ocean represents the mechanical energy derived from tidal movement, wave motion or ocean current and exploited for electricity generation. Tidal energy works using the power from changing tides, and the changing tides are driven by the gravitational pull of the Earth, Moon, and Sun combined with the revolution of the Earth. Civil works cost dominate total cost. [6].

Advantages of Tide: There is an enormous amount of energy contained in the tides, dams would protect large areas of the coast from high storm tides, and that tides are totally predictable.

Disadvantages of Tide: Tidal energy dams would have enormous impacts on ecosystems as currents and water levels change. Tidal energy systems are also very expensive to build.

e. Wind;

Wind energy represents the kinetic energy of wind exploited for electricity generation in wind turbines. Winds are driven by the heat of the Sun. The potential for exploiting the energy stored in the winds was recognised hundreds of years ago. Windmills have been used for centuries for grinding grain or for pumping water. Nowadays, energy from the wind is harnessed via wind turbines. [6]. In figure 2.9 trend of wind turbine size shown. Although it is improving still it is not sufficient. We must research bigger and compact turbines for efficient and environmental technology.

Advantages of Wind: It is claimed that a wind turbine used for electricity generation will repay the energy used in its manufacture within 6-9 months of its operation. The Turkey has the larges wind resource in the whole of World.

Disadvantages Wind: Opponents of wind farms claim the turbines are unsightly, and a danger to wildlife. It is unfortunate that the best sites for wind farms are also areas that are highly valued for their tranquillity and natural beauty. A solution to the wind farm problem would be to locate them offshore. Low availability factor so operate in grid is so hard.

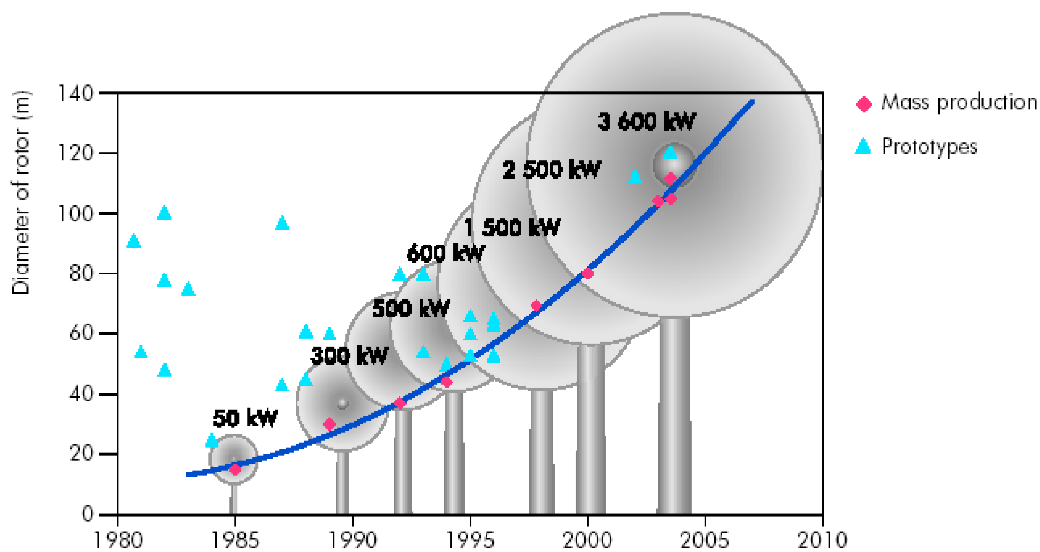


Figure 2.9 Development of Wind Turbine Size from 1980-2010 [6]

3 EMPLOYED METHOD

3.1 Introduction

This chapter contains employed method in this thesis. Short introduction about AHP and ANP methods given in this chapter.

3.2 Mcda Methodology And Application Basis

Multi-criteria analysis provides a framework that allows the often conflicting evaluation criteria to be addressed simultaneously. Full-scale implementation of such analysis requires the establishment of a systematic and transparent process, with interactions between analysts and decision makers.

3.2.1 Analytic Hierarchy Process (AHP)

Currently, Analytic Hierarchy Process (AHP) is one of the most commonly used MCDA tools being applied in contaminated sites management. AHP is a methodology to rank the alternative courses of action based on the decision-maker's judgement concerning the importance of the criteria and the extent to which they are met by each alternative [18]. AHP contains both qualitative and quantitative components. Qualitatively, it helps to decompose a decision problem from the top overall goal to a set of manageable clusters, sub-clusters, and so on down to final level that usually contains scenarios or alternatives. The cluster or sub-clusters can be forces, attributes, criteria, activities, objectives, etc. Quantitatively, it uses pair-wise comparison to assign weights to the elements at the cluster and sub-cluster levels and finally calculates global weights for assessment taking place at the final level. Each pair-wise comparison measures the relative importance or strength of the elements within cluster by using ratio scale. One of the main functions of AHP is to calculate the consistency ratio to matrices are appropriate for analysis [19].

General procedure of standard AHP

- Break down the complex problem into a number of small constituent elements and then structure the elements in a hierarchical form.

- Make a series of pair wise comparisons among the elements according to a ratio scale.
- Use the eigenvalue method to estimate the relative weights of the elements.
- Aggregate these relative weights and synthesize them for the final measurement of given decision alternatives.

3.2.2 Analytic Network Process (ANP)

Other most commonly used MCDA tool is Analytic Network Process (ANP). However, this method requires a strictly hierarchic structure where elements such as criteria are mutually independent. In reality, evaluation criteria for remedial alternatives could be interdependent to each other. Moreover, feedback dependence from alternatives could be significant, which means that the relative importance of the criteria could be influenced by the characteristics of remedial alternatives under evaluation. Thus, ANP, a general form of AHP, was shown to be effective in addressing such complexity of interactions in the problem structure.

General procedure of standard ANP

In general, the step-by-step procedure of ANP can be described as follows [20]:

- Develop a decision model. Such model can be represented by a digraph that includes all contributive factors (clusters and nodes) and their possible direct interactions (directed arc) in the decision structure.
- Elicit value judgment in a pairwise comparison process. The intensity assigned to the comparison process between factors may be made using Saaty's 9-point scale.
- Compute the local priorities (w) from the pairwise comparison matrix using the following eigenvalue formulation:

  $Aw = \lambda_{max} w, e^T e w = 1$

  where $A= [a_{ij}]$ is the positive reciprocal pairwise comparison matrix, λ_{max} is the principal eigenvalue of the matrix A and e^T [1,1,...,1] is a unit row (orsummation) vector.

  The inconsistency of judgments can be checked using the consistency ratio (CR) For acceptable inconsistency, CR must be less than 0.20

- Form the initial supermatrix, i.e., a partitioned matrix where each block matrix contains null or local priorities depending on the type of dependence in the decision structure. If the supermatrix is not column stochastic, transform the supermatrix to a stochastic matrix by cluster weighting and column normalization to make the column sum of the matrix equal to one.
- Raise the supermatrix to large powers until it converges to a limit or to the Cesaro sum of the resulting limit matrices. The limit supermatrix provides a meaningful weight of influence of each factor on every other factor in the decision model wherein all possible interactions are captured in the process of convergence. Then, these column vectors from the said limit matrix are normalized according to clusters to provide the overall priorities.

3.2.3 Comparison of AHP and ANP Methods

Figure 3.1 shows that MCDA methological frame work. ANP contains more complexity than AHP interactions. This gives more reliable result than AHP. Fuzzy ANP and Multi-participant MCDA methods are not scope in this thesis. Table 3.1 shows that comparing of two method with each other.

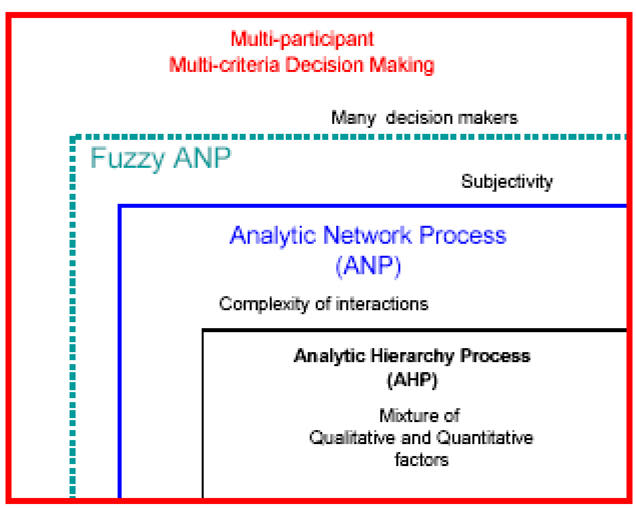


Figure 3.1 MCDA methological framework.[28]

Method	Advantage	Disadvantage
AHP	• It has ability to hierarchically structure a multi-attribute problem into a comprehensive structure • It has the ability to determine which factor outweighs the others • Complex decision problems can be solved • Multi criteria problems can be hadled • Consistency check can be applied	• Hierarchyic structure is not flexible • It assumes that there are unidirectional relationships between elements of different decision levels along the hierarchy and uncorrelated elements within each cluster as well as between clusters • The rankings of alternatives obtained by the AHP may change if a new alternative is added
ANP	• Flexible Network structure • Allows for the consideration of interdependencies among and between levels of attributes • The elements of the ANP system may interact themselves	• It is too complex to understand easily. • Needs relatively more information to implement.

Table 3.1 AHP-ANP Comparison [5]

4 MODEL DEVELOPMENT

4.1 Introduction

This chapter contains model development phases of thesis. Building policies, criteria selecting alternatives and interacting them with each other.

4.2 Model

Model development is one of the main activities in thesis. There can be many models to choose Best Fuel & Technology Mix. Also these models are generally in secret. Because this process is so important for all country or player in market. These policies can change government of countries. However even you can find any model for your study. It can not be suitable for your state conditions. That means you have to built your own model. It must be tailor made to give its best and useful result for your cases. From this point AHP and ANP decision support models are built. Model building can be separated in to four phases.

Firstly to reach the goal we have to determine policies, after determining policies we must relate them with criteria and finally we must select the alternatives. After determining these three phases AHP-ANP interactions have to be determined. All these phases built via team work. The team constructed from experts of Ministry of Energy and Natural Resources and Market Players.

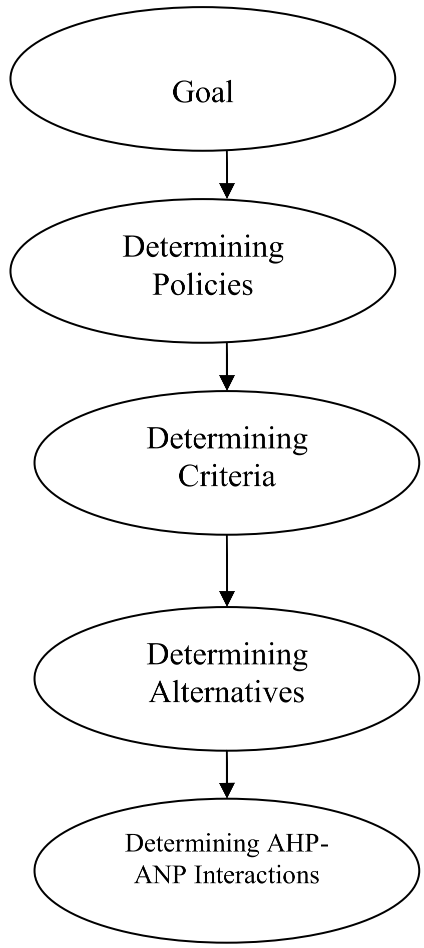


Figure 4.1 Model Development Algorithm

4.2.1 Building Policies

Team, after brain storming, decided on four policies as;

- Cost Policy
- Climate Change Policy
- Market&Investor Policy
- International Policy

These policies will determine the goal. As Best Fuel & Technology Mix it means**:** Ranking the Technology and fuel mixtures to generate electiricity while optimising all parameters of policies.

These policies are so important to determine the goal.To determine the weight of the policies pairwise comparisons made from four questionnaires. They served at the appendix of thesis.

Policies can be explained as follows;

A) Cost Policy

Policy focus on optimisation of investment, fuel and operation cost of technology. Cost can not be thougt as static costs like investment cost. In energy plants operation is also important case. Sometimes you can need capacity of plant as fast as possible in peak times. If your plant can not start at that time this can be result in more costly.

B) Climate Change Policy

Policy focus on minimization of negative environmental effect of electiricity generation technologies.So environmental friend fuel and technologies are more prefered according to this policy.

C) Market&Investor Policy

Policy focus on cost and technology optimisation in terms of market and investor. Also to make more competetive in global at energy sector. Policy should pursue the benefits of competitive markets to allow for more effcient and more transparent management of investment risks. Competition in well-designed and effectively liberalised markets creates incentives for efficient use of resources and investments in power generation.

D) International Policy

Policy focus on improve and adaptation of electiricity generation sector in terms of all international regulations that have been accepted by Country for now or future.

4.2.2 Building Criteria and Indicators

After determinng policies criteria they interact with policies have to be determined. To built up criteria many study had been searched. After searching Hirscberg et al.[27] criteria found as the best for this study. After working on these criteria they modified to

Turkish conditions. Some addition and subtraction had been made. Finally Table 4.1 has been built up for model. Five main criteria and sub criteria defined as follows;

- Economical
- Environmental
- Social
- Security
- Technological

Criteria	**Subcriteria**	**Indicator**	**Unit**
Economy	Financial Requirements	Capital Cost	$/Kw
		Production & Operation Cost	C/Kwh
		Fuel Price İncrease Sensitivity	Factor
	Resources	Availability (Load Factor)	%
		Long-Term Sustainability Energetic	Years
		Long-Term Sustainability Non-Energetic	Kg/Gwh
		Peak Load Response	Pairwise Comparison
Environmental	Global Warming		Tons/Gwh
	Regional Environmental Impact		Km2/Gwh
	Non-Pollutant Effects Land Use		M2/Gwh
	Total Waste		Tons/Gwh
Social	Employment		Person-Years/Gwh
	Human Health Impacts		Years Of Life Lost/Gwh
	Local Disturbance		Pairwise Comparison
	Critical Waste Confinement		Thousand Years
	Risk Aversion		Max Fatalities/ Accident
Security	Safe Assurance		Pairwise Comparison
	Decentrilazation		Pairwise Comparison
Technology	Effective Life Time		Years
	Efficiency		%
	Environmental - Sustainability		Pairwise Comparison
	Technological Availability	Engineering & Project	Pairwise Comparison
		Civil Works	Pairwise Comparison
		Electro Mechanical Equipment	Pairwise Comparison

Table 4.1 Criteria and Indicators

A) **Economical Criteria**

a. **Financial Requirements**

Capital Cost ($/kW): Investment Cost of Power Plants. Land reserving costs not including.

Production & Operation cost (c/kWh): "Production costs" are based on Turkey conditions. These are typical costs and may not represent the exact average. It should be noted that the exceptionally low costs of nuclear energy are due to the fact that the capital cost component has been amortized. Back-up costs for wind and solar Photovoltaic (PV) are not accounted for. In the PV case its contribution to the overall supply is so small that there is no need for a dedicated back-up. For wind these costs are significant, i.e. depending on the local wind conditions range from 5 to 20% of the production cost.

Fuel price increase sensitivity (Factor) : "Fuel price increase sensitivity" is represented by a factor corresponding to increase of production cost given doubling of fuel costs.

b. **Resources**

Availability -load factor (%): Availability is based on typical load factors.

Long-term sustainability Energetic (Years): "Long-term sustainability: Energetic" is a measure of how long the resources of energy carriers will be available given that the current consumption would stabilize and only resources that can be exploited without substantial increase of electricity production prices are credited.

Long-term sustainability Non-energetic (kg/GWh): "Long-term sustainability: Non-Energetic" uses copper as a reference material. Other materials could have been used instead or in addition. Consumption of materials can also be viewed as an indirect measure of the efficiency of a system.

B) **Environmental Criteria**

Global Warming CO2-Equivalents (tons/GWh): Global Warming caused by Greenhouse Gas (GHG) emissions represents the global environmental effects and is expressed in terms of "CO2-equivalents" (for 100 years time horizon).

Regional Environmental Impact (km2/GWh): Acidification and eutrophication change in Unprotected Ecosystem Area

Non-Pollutant Effects Land use (m2/GWh): This indicator expresses the total "Land use" for each energy generation type. This corresponds to the sum of different land types, as they have been categorized in below according to their transformation from one more or less natural status into one of the following:

- transformation to dump
- transformation to industrial area
- transformation to traffic area
- transformation to reservoir (for hydropower)

Areas at bottom of seas, relevant for the case of gas/oil offshore platforms or offshore wind parks, are here excluded. They were, however, accounted for in ecoinvent.

Total Waste (tons/GWh): The indicator "Weight" refers to the total waste mass for each energy systems. This is the sum of several single species, disposed of as or in:

- hazardous waste
- incineration
- inert material landfill
- land farming
- municipal incineration
- lignite ash
- residual material landfill
- sanitary landfill
- underground deposits
- final repository for low level radioactive waste (assumed approximate density 2500 kg/m3)
- final repository for spent fuel, high and intermediate level radioactive waste
- uranium mill tailings
- low active radioactive waste in superficial or shallow depositories

C) Social Criteria

Employment (Person-years/GWh): Serving new Employment Technology-Specific job opportunities for each generation way of electricity.

Human Health Impacts (Years of Life Lost/GWh): Mortality (reduced lifeexpectancy) risk in terms of "Years of Life Lost" resulting from the emission of one kilo-ton of pollutant.

Local Disturbance (Pairwise Comparison): Criteria concerns Which way has more Noise and visual amenity.

Critical Waste Confinement (Thousand years): The necessary confinement time of the most hazardous waste of power plant.

Risk Aversion (max fatalities/Accident): Maximum credible number of fatalities per accident is used here as a surrogate for risk aversion.

D) Security Criteria

Safe Assurance (Pairwise Comparison): Geo-political factors refer to the security of energy carrier supply in view of the stability of countries of origin.

Decentrilazation (Pairwise Comparison): Criteria focus on which fuel&technology is more suitable to generate electiricities where it consumes.

E) Technological Criteria

Effective Life Time (Years): Power Plant effective life time.

Efficiency (%): Energy Conversion Efficiency of technology.

Environmental – Sustainability (Pairwise Comparison): Focus on sustainable environmental friend generation technologies.

Technological Availability

Engineering & Project (Pairwise Comparison): Manufacturing ability via local resources in terms of Engineering & Project Stages.

Civil Works (Pairwise Comparison): Manufacturing ability via local resources in terms of Civil Works Stages.

Electro Mechanical Equipment (Pairwise Comparison): Manufacturing ability via local resources in terms of Electro Mechanical Equipment Stages

4.2.3 Determining Alternatives

After building policies and criteria, alternatives determined to be ranked. Alternatives are also so important to get the best result of study. After literature survey there can be many alternatives to generate electiricity in Turkey but because of hard to get real datas maybe these alternatives narrowed to as;

"Biogas, Fuel Oil, Geothermal, Hard Coal, Hydro, IGCC, Imp Coal, Lignite, Natural Gas, Nuclear, Solar Csp, Solar Pv, Tidal, Wind Offshore and Wind Onshore"

These Electricity Generating Technologies consist of renevables and non renevables energies. They can all be applied to Turkey grid.

4.2.4 Building Interactions

After completing all phases the last step is building interactions between policies and criteria to rank the alternatives. For these we have two ways they are AHP and ANP cases. As mentioned Chapter 3 AHP method is hierarchyic however ANP is more flexible. According to their mature after brainstorming of team AHP and ANP interactions built up as shown below. Of course for especially ANP interactions that can be many alternatives. Every team or body can built many models. However simple way is the best way. While we built these model this was the our rule.

A) Analytic Hierarchy Process (AHP) Model

Model is built after team work as shown in Figure 4.2 below also these interactions defined in Table 4.2

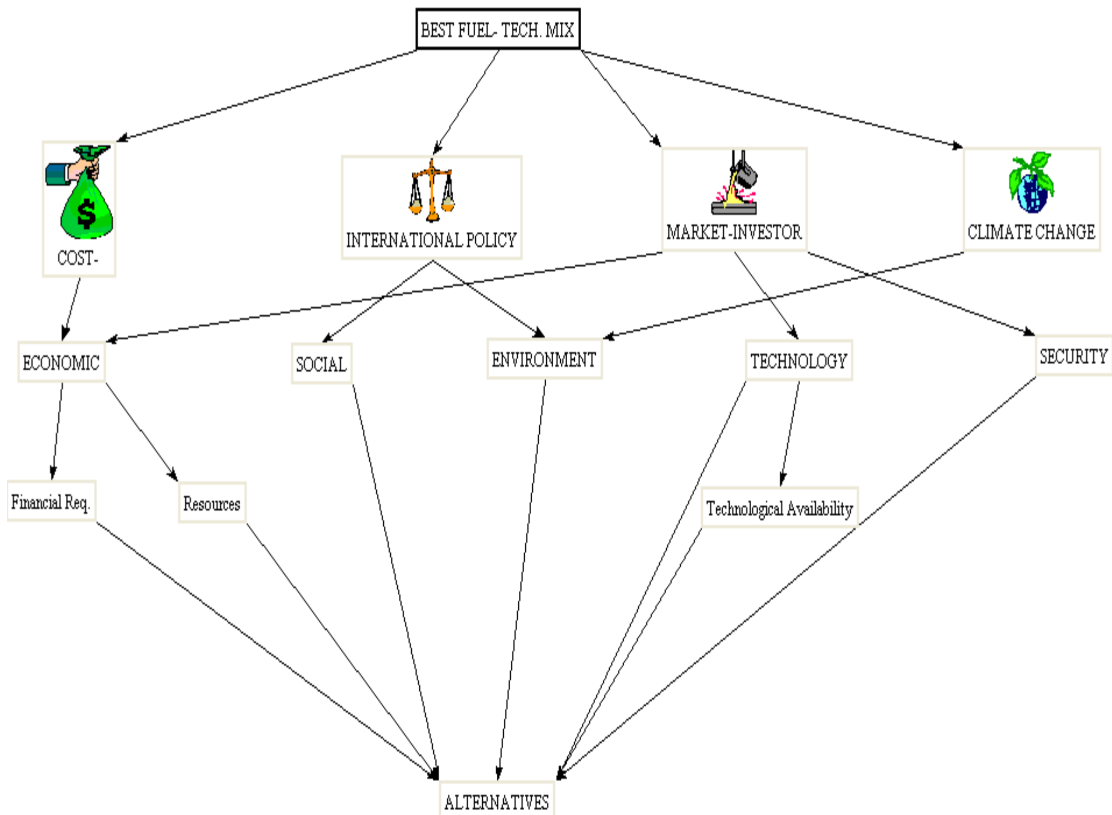


Figure 4.2 AHP Model Interactions

AHP Interactions;

As a result of team work. Realations of the criteria are determined as follows;

Factors used in our models:

Factors Effected	Effect
BFTM	CO,IP,MI,CC
CO	EC
IP	SO,EN
MI	EC,TE,SE
CC	EN
EC	FR,RE
TE	TA

Table 4.2 AHP Model Relations

CO-BFTM : Cost is main factors while deciding goal

IP- BFTM : Intenational Policy is main factors while deciding goal

MI-BFTM : Market&Investor is main factors while deciding goal

CC-BFTM : Climate Change is main factors while deciding goal

EC-CO : Economic Criteria are directly afect on Cost

SO-IP :Social criteria is mainly affect on International Policy

EN-IP :Environmental criteria are mainly affect on International Policies especially for Kyoto Protocols

EC-MI :Economic Criteria is generally most important for Market Investor

TE-MI :Technological Criteria can also directly affect on Market Investor responsible

SE-MI :Security Criteria is affect on Market&Investor factor because of the sustainable price of fuel.

EN-CC :Envrionmental Criteria is directly affect on Climate Change factor

FR-EC :Financial Requirements (Capital-Production&Operation Costs) is directly affect on Economic factor

RE-EC :Resource criteria is dirfectly affect on Economical factor

TA-TE :Technological Availability for local resources is directly affect Technological Factor.

B) Analytic Network Process (ANP) Model

Model is built after team work as shown in Figure 4.3 below also these interactions defined in Table 4.3

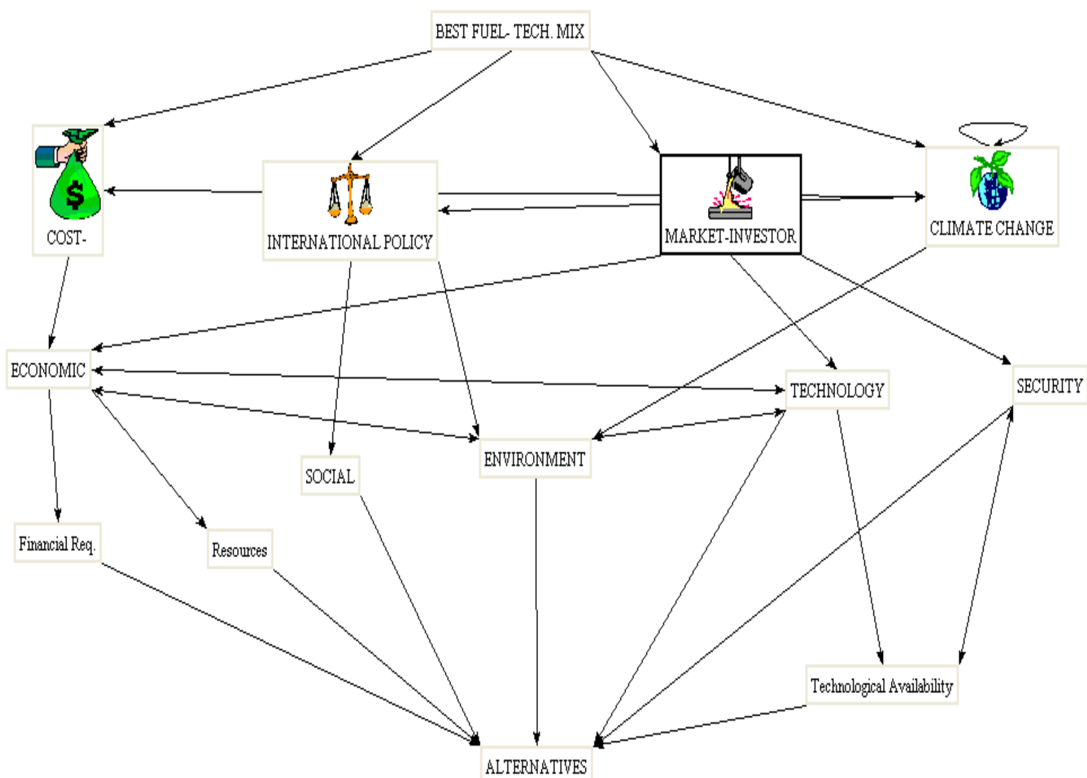


Figure 4.3 ANP Model Interactions

ANP Interactions;
As a result of team work. Realations of the criteria are determined as follows;

Factors used in our models:

Factors Effected	Effect
BFTM	CO,IP,MI,CC
CO	EC,CC
IP	SO,EN,CC
MI	EC,TE,SE
CC	EN,CC,IP,CO
EC	FR,RE,TE,EN
TE	TA,EC,EN
SE	TA
TA	SE

Table 4.3 AHP Model Relations

CO-BFTM : Cost is main factors while deciding goal
IP- BFTM : Intenational Policy is main factors while deciding goal
MI-BFTM : Market&Investor is main factors while deciding goal
CC-BFTM : Climate Change is main factors while deciding goal
EC-CO : Economic Criteria is directly afect on Cost
CC-CO :Climate change is directly affect Cost because of the CCS or Carbon Trade Costs.
SO-IP :Social criteria is directly affect on International Policy
EN-IP :Environmental criteria is directly affect on International Policies especially for Kyoto Protocols signed on 2009
CC-IP :Climate Change can directly affect International Policy
EC-MI :Economic Criteria is directly affect on Market&Investor factor
TE-MI :Technological Criteria is directly affect on Market&Investor factor.

SE-MI :Security Criteria are directly affect on Market&Investor factor especially for safe assurance of fuel.

EN-CC :Envrionmental Criteria is directly affect on Climate Change factor

CC-CC :Climate change can directly affect itself

IP-CC :International policies is directily can affect Climate Change

CO-CC :Cost is directly affect the Climate Change because of CCS and Carbon Emission trade cost.

FR-EC :Financial Requirements (Capital-Operation&Production Costs) is directly affect on Economic factor

RE-EC :Resource criteria is dirfectly affect on Economic factor

TE-EC :Technological criteria can directly affect Economic factor especially for efficiency, localization and effective life time of the plant.

EN:EC :Environmental criteria can directly affect Economic factor because of environmental investments.

TA-TE :Technological Availability (Localization) is directly affect Technological Factor.

EC-TE : Economical is directly affect Technological Factor

EN-TE : Environmental is directly affect Technological Factor

SE-TA :Security is affect the Technological Availability because of technological localization is also kind of Security.

TA-SE :Technological Availability is affect the Security because of technological localization is also kind of Security.

5 DATA COLLECTION & MODEL IMPLEMENTATION

5.1 Introduction

This chapter includes implementation of model developed in Chapter 4. To implement model first of all Policy and Criteria weights and values will be evaluated. After this model and values introduced to Super decision program and results acquired.

5.2 Data Collection:

To evaluate the AHP and ANP Models, need weighting of policies and criteria for all alternatives. Quantitative and Qualitative datas need to be mined to evaluate weights of criteria. Quantitative datas collected from several kind of sources, like MENR, IEA, IEAE and CETP study and issues. These quantitative datas need to be modified to Turkish conditions.

Pairwise comparisons for policy and criteria questionnaire shown at the appendix of this thesis. Participants of the questionnaire ;Bolat F(MENR), Demir Ş(EGC), Çelebi C (MENR), Guler M (MENR) Questionnaire (2009) from *Energy Experts from Ministry of Energy and Nat. Res. and Market,*

After all evaluation Reference Technology and Fuel Data Tables are built. First column shows criteria second and third column shows subcriteria. Fourth column shows Indicator for all criteria. Fifth column shows how these values acquired and which resources used. Sixth column shows that evaluation method of the values and resources. Finally Seventh column shows that values of the criteria for alternatives.

Reference Technology and Fuel Data Tables for all alternatives have been built and shown from Table 5.1 to 5.15.

5.2.1 Biogas RTFD

Criteria-Subcriteria			Indicator	Ref.	Evaluation Method	Value
Economic	Financial Requirements	Capital Cost	$/kW	6,8,3	Stat&Prob.	1200
		Production cost	c/kWh	6,8,3	Stat&Prob.	6,70
		Fuel price increase sensitivity	Factor	3	Stat&Prob.	0,75
	Resources	Availability (load factor)	%	3	Stat&Prob.	40
		Long-term sustainability Energetic	Years	3	Stat&Prob.	1000
		Long-term sustainability Non-energetic	kg/GWh	3	Stat&Prob.	5,5
		Peak load response	Pairwise Comparison	9	Expertise	-
Environmenta l	Global Warming		tons/GWh	3	Stat&Prob.	540
	Regional Env. Imp		km2/GWh	3	Stat&Prob.	0,0195
	Non-Pollutant Effects Land use		m2/GWh	3	Stat&Prob.	53
	Total Waste		tons/GWh	3	Stat&Prob.	90
Social	Employment-Technology		Person-years/GWh	3	Stat&Prob.	0,43
	Human Health Impacts		Years of Life Lost/GWh	3	Stat&Prob.	0,034
	Local Disturbance		Pairwise Comparison	9	Expertise	-
	Critical Waste Confinement		Thousand years	3	Stat&Prob.	25
	Risk Aversion		Max fatalities/ accident	3	Stat&Prob.	250
Security	Safe Assurance		Pairwise Comparison	9	Expertise	-
	Decentrilazation		Pairwise Comparison	9	Expertise	-
Technology	Effective Life Time		Years	6,7	Stat&Prob.	35
	Efficiency		%	6,7	Stat&Prob.	58
	Environmental Sustainability		Pairwise Comparison	9	Expertise	-
	Technological Availability	Engineering & Project	Pairwise Comparison	9	Expertise	-
		Civil Works	Pairwise Comparison	9	Expertise	-
		Electro Mechanical Equipment	Pairwise Comparison	9	Expertise	-

Table 5.1 RTFD for Biogas

5.2.2 Fuel Oil RTFD

Criteria-Subcriteria			Indicator	Ref.	Evaluation Method	Value
Economic	Financial Requirements	Capital Cost	$/kW	6,8,3	Stat&Prob.	1000
		Production cost	c/kWh	6,8,3	Stat&Prob.	6,31
		Fuel price increase sensitivity	Factor	3	Stat&Prob.	1,8
	Resources	Availability (load factor)	%	3	Stat&Prob.	80
		Long-term sustainability Energetic	Years	3	Stat&Prob.	100
		Long-term sustainability Non-energetic	kg/GWh	3	Stat&Prob.	12
		Peak load response	Pairwise Comparison	App.	Expertise	-
Environmental	Global Warming		tons/GWh	3	Stat&Prob.	884
	Regional Env. Imp		km2/GWh	3	Stat&Prob.	0,061
	Non-Pollutant Effects Land use		m2/GWh	3	Stat&Prob.	335
	Total Waste		tons/GWh	3	Stat&Prob.	11
Social	Employment-Technology		Person-years/GWh	3	Stat&Prob.	0,47
	Human Health Impacts		Years of Life Lost/GWh	3	Stat&Prob.	0,12
	Local Disturbance		Pairwise Comparison	App.	Expertise	-
	Critical Waste Confinement		Thousand years	3	Stat&Prob.	0,1
	Risk Aversion		Max fatalities/ accident	3	Stat&Prob.	4500
Security	Safe Assurance		Pairwise Comparison	App.	Expertise	-
	Decentrilazation		Pairwise Comparison	App.	Expertise	-
Technology	Effective Life Time		Years	6,7	Stat&Prob.	30
	Efficiency		%	6,7	Stat&Prob.	46
	Environmental Sustainability		Pairwise Comparison	App.	Expertise	-
	Technological Availability	Engineering & Project	Pairwise Comparison	App.	Expertise	-
		Civil Works	Pairwise Comparison	App.	Expertise	-
		Electro Mechanical Equipment	Pairwise Comparison	App.	Expertise	-

Table 5.2 RTFD for Fuel Oil

5.2.3 Geothermal RTFD

Criteria-Subcriteria			Indicator	Ref.	Evaluation Method	Value
Economic	Financial Requirements	Capital Cost	$/kW	6,8,3	Stat&Prob.	3700
		Production cost	c/kWh	6,8,3	Stat&Prob.	6,50
		Fuel price increase sensitivity	Factor	3	Stat&Prob.	0,75
	Resources	Availability (load factor)	%	3	Stat&Prob.	40
		Long-term sustainability Energetic	Years	3	Stat&Prob.	10000
		Long-term sustainability Non-energetic	kg/GWh	3	Stat&Prob.	6,5
		Peak load response	Pairwise Comparison	App.	Expertise	-
Environmental	Global Warming		tons/GWh	3	Stat&Prob.	540
	Regional Env. Imp		km2/GWh	3	Stat&Prob.	0,0195
	Non-Pollutant Effects Land use		m2/GWh	3	Stat&Prob.	53
	Total Waste		tons/GWh	3	Stat&Prob.	90
Social	Employment-Technology		Person-years/GWh	3	Stat&Prob.	0,43
	Human Health Impacts		Years of Life Lost/GWh	3	Stat&Prob.	0,034
	Local Disturbance		Pairwise Comparison	App.	Expertise	-
	Critical Waste Confinement		Thousand years	3	Stat&Prob.	25
	Risk Aversion		Max fatalities/ accident	3	Stat&Prob.	250
Security	Safe Assurance		Pairwise Comparison	App.	Expertise	-
	Decentrilazation		Pairwise Comparison	App.	Expertise	-
Technology	Effective Life Time		Years	6,7	Stat&Prob.	35
	Efficiency		%	6,7	Stat&Prob.	35
	Environmental Sustainability		Pairwise Comparison	App.	Expertise	-
	Technological Availability	Engineering & Project	Pairwise Comparison	App.	Expertise	-
		Civil Works	Pairwise Comparison	App.	Expertise	-
		Electro Mechanical Equipment	Pairwise Comparison	App.	Expertise	-

Table 5.3 RTFD for Geothermal

5.2.4 Hard Coal RTFD

Criteria-Subcriteria			Indicator	Ref.	Evaluation Method	Value
Economic	Financial Requirements	Capital Cost	$/kW	6,8,3	Stat&Prob.	1657
		Production cost	c/kWh	6,8,3	Stat&Prob.	3,58
		Fuel price increase sensitivity	Factor	3	Stat&Prob.	1,5
	Resources	Availability (load factor)	%	3	Stat&Prob.	80
		Long-term sustainability Energetic	Years	3	Stat&Prob.	2000
		Long-term sustainability Non-energetic	kg/GWh	3	Stat&Prob.	11
		Peak load response	Pairwise Comparison	App.	Expertise	-
Environmental	Global Warming		tons/GWh	3	Stat&Prob.	1080
	Regional Env. Imp		km2/GWh	3	Stat&Prob.	0,039
	Non-Pollutant Effects Land use		m2/GWh	3	Stat&Prob.	106
	Total Waste		tons/GWh	3	Stat&Prob.	180
Social	Employment-Technology		Person-years/GWh	3	Stat&Prob.	0,86
	Human Health Impacts		Years of Life Lost/GWh	3	Stat&Prob.	0,068
	Local Disturbance		Pairwise Comparison	App.	Expertise	-
	Critical Waste Confinement		Thousand years	3	Stat&Prob.	50
	Risk Aversion		Max fatalities/ accident	3	Stat&Prob.	500
Security	Safe Assurance		Pairwise Comparison	App.	Expertise	-
	Decentrilazation		Pairwise Comparison	App.	Expertise	-
Technology	Effective Life Time		Years	6,7	Stat&Prob.	50
	Efficiency		%	6,7	Stat&Prob.	33
	Environmental Sustainability		Pairwise Comparison	App.	Expertise	-
	Technological Availability	Engineering & Project	Pairwise Comparison	App.	Expertise	-
		Civil Works	Pairwise Comparison	App.	Expertise	-
		Electro Mechanical Equipment	Pairwise Comparison	App.	Expertise	-

Table 5.4 RTFD for Hard Coal

5.2.5 Hydro Power RTFD

Criteria-Subcriteria			Indicator	Ref.	Evaluation Method	Value
Economic	Financial Requirements	Capital Cost	$/kW	6,8,3	Stat&Prob.	2400
		Production cost	c/kWh	6,8,3	Stat&Prob.	7,00
		Fuel price increase sensitivity	Factor	3	Stat&Prob.	1,00
	Resources	Availability (load factor)	%	3	Stat&Prob.	40
		Long-term sustainability Energetic	Years	3	Stat&Prob.	10000
		Long-term sustainability Non-energetic	kg/GWh	3	Stat&Prob.	1
		Peak load response	Pairwise Comparison	App.	Expertise	-
Environmental	Global Warming		tons/GWh	3	Stat&Prob.	4
	Regional Env. Imp		km2/GWh	3	Stat&Prob.	0,0009
	Non-Pollutant Effects Land use		m2/GWh	3	Stat&Prob.	92
	Total Waste		tons/GWh	3	Stat&Prob.	24
Social	Employment-Technology		Person-years/GWh	3	Stat&Prob.	1,2
	Human Health Impacts		Years of Life Lost/GWh	3	Stat&Prob.	0,011
	Local Disturbance		Pairwise Comparison	App.	Expertise	-
	Critical Waste Confinement		Thousand years	3	Stat&Prob.	0,01
	Risk Aversion		Max fatalities/ accident	3	Stat&Prob.	2000
Security	Safe Assurance		Pairwise Comparison	App.	Expertise	-
	Decentrilazation		Pairwise Comparison	App.	Expertise	-
Technology	Effective Life Time		Years	6,7	Stat&Prob.	40
	Efficiency		%	6,7	Stat&Prob.	90
	Environmental Sustainability		Pairwise Comparison	App.	Expertise	-
	Technological Availability	Engineering & Project	Pairwise Comparison	App.	Expertise	-
		Civil Works	Pairwise Comparison	App.	Expertise	-
		Electro Mechanical Equipment	Pairwise Comparison	App.	Expertise	-

Table 5.5 RTFD for Hydropower

5.2.6 Int.Gas Combined Cycle (IGCC) RTFD

Criteria-Subcriteria			Indicator	Ref.	Evaluation Method	Value
Economic	Financial Requirements	Capital Cost	$/kW	6,8,3	Stat&Prob.	1400
		Production cost	c/kWh	6,8,3	Stat&Prob.	35,00
		Fuel price increase sensitivity	Factor	3	Stat&Prob.	0,75
	Resources	Availability (load factor)	%	3	Stat&Prob.	40
		Long-term sustainability Energetic	Years	3	Stat&Prob.	1000
		Long-term sustainability Non-energetic	kg/GWh	3	Stat&Prob.	5,5
		Peak load response	Pairwise Comparison	App.	Expertise	-
Environmental	Global Warming		tons/GWh	3	Stat&Prob.	540
	Regional Env. Imp		km2/GWh	3	Stat&Prob.	0,0195
	Non-Pollutant Effects Land use		m2/GWh	3	Stat&Prob.	53
	Total Waste		tons/GWh	3	Stat&Prob.	90
Social	Employment-Technology		Person-years/GWh	3	Stat&Prob.	0,43
	Human Health Impacts		Years of Life Lost/GWh	3	Stat&Prob.	0,034
	Local Disturbance		Pairwise Comparison	App.	Expertise	-
	Critical Waste Confinement		Thousand years	3	Stat&Prob.	25
	Risk Aversion		Max fatalities/ accident	3	Stat&Prob.	250
Security	Safe Assurance		Pairwise Comparison	App.	Expertise	-
	Decentrilazation		Pairwise Comparison	App.	Expertise	-
Technology	Effective Life Time		Years	6,7	Stat&Prob.	35
	Efficiency		%	6,7	Stat&Prob.	44
	Environmental Sustainability		Pairwise Comparison	App.	Expertise	-
	Technological Availability	Engineering & Project	Pairwise Comparison	App.	Expertise	-
		Civil Works	Pairwise Comparison	App.	Expertise	-
		Electro Mechanical Equipment	Pairwise Comparison	App.	Expertise	-

Table 5.6 RTFD for IGCC

5.2.7 Imported Coal RTFD

Criteria-Subcriteria			Indicator	Ref.	Evaluation Method	Value
Economic	Financial Requirements	Capital Cost	$/kW	6,8,3	Stat&Prob.	1325
		Production cost	c/kWh	6,8,3	Stat&Prob.	2,89
		Fuel price increase sensitivity	Factor	3	Stat&Prob.	1,80
	Resources	Availability (load factor)	%	3	Stat&Prob.	80
		Long-term sustainability Energetic	Years	3	Stat&Prob.	100
		Long-term sustainability Non-energetic	kg/GWh	3	Stat&Prob.	12
		Peak load response	Pairwise Comparison	App.	Expertise	-
Environmental	Global Warming		tons/GWh	3	Stat&Prob.	2000
	Regional Env. Imp		km2/GWh	3	Stat&Prob.	0,061
	Non-Pollutant Effects Land use		m2/GWh	3	Stat&Prob.	335
	Total Waste		tons/GWh	3	Stat&Prob.	12
Social	Employment-Technology		Person-years/GWh	3	Stat&Prob.	0,47
	Human Health Impacts		Years of Life Lost/GWh	3	Stat&Prob.	0,12
	Local Disturbance		Pairwise Comparison	App.	Expertise	-
	Critical Waste Confinement		Thousand years	3	Stat&Prob.	0,1
	Risk Aversion		Max fatalities/ accident	3	Stat&Prob.	500
Security	Safe Assurance		Pairwise Comparison	App.	Expertise	-
	Decentrilazation		Pairwise Comparison	App.	Expertise	-
Technology	Effective Life Time		Years	6,7	Stat&Prob.	50
	Efficiency		%	6,7	Stat&Prob.	44
	Environmental Sustainability		Pairwise Comparison	App.	Expertise	-
	Technological Availability	Engineering & Project	Pairwise Comparison	App.	Expertise	-
		Civil Works	Pairwise Comparison	App.	Expertise	-
		Electro Mechanical Equipment	Pairwise Comparison	App.	Expertise	-

Table 5.7 RTFD for Import Coal

5.2.8 Lignite RTFD

Criteria-Subcriteria			Indicator	Ref.	Evaluation Method	Value
Economic	Financial Requirements	Capital Cost	$/kW	6,8,3	Stat&Prob.	1678
		Production cost	c/kWh	6,8,3	Stat&Prob.	3,04
		Fuel price increase sensitivity	Factor	3	Stat&Prob.	1,60
	Resources	Availability (load factor)	%	3	Stat&Prob.	80
		Long-term sustainability Energetic	Years	3	Stat&Prob.	400
		Long-term sustainability Non-energetic	kg/GWh	3	Stat&Prob.	13
		Peak load response	Pairwise Comparison	App.	Expertise	-
Environmental	Global Warming		tons/GWh	3	Stat&Prob.	1220
	Regional Env. Imp		km2/GWh	3	Stat&Prob.	0,032
	Non-Pollutant Effects Land use		m2/GWh	3	Stat&Prob.	52
	Total Waste		tons/GWh	3	Stat&Prob.	84
Social	Employment-Technology		Person-years/GWh	3	Stat&Prob.	0,21
	Human Health Impacts		Years of Life Lost/GWh	3	Stat&Prob.	0,061
	Local Disturbance		Pairwise Comparison	App.	Expertise	-
	Critical Waste Confinement		Thousand years	3	Stat&Prob.	50
	Risk Aversion		Max fatalities/ accident	3	Stat&Prob.	10
Security	Safe Assurance		Pairwise Comparison	App.	Expertise	-
	Decentrilazation		Pairwise Comparison	App.	Expertise	-
Technology	Effective Life Time		Years	6,7	Stat&Prob.	50
	Efficiency		%	6,7	Stat&Prob.	33
	Environmental Sustainability		Pairwise Comparison	App.	Expertise	-
	Technological Availability	Engineering & Project	Pairwise Comparison	App.	Expertise	-
		Civil Works	Pairwise Comparison	App.	Expertise	-
		Electro Mechanical Equipment	Pairwise Comparison	App.	Expertise	-

Table 5.8 RTFD for Lignite

5.2.9 Natural Gas RTFD

Criteria-Subcriteria			Indicator	Ref.	Evaluation Method	Value
Economic	Financial Requirements	Capital Cost	$/kW	6,8,3	Stat&Prob.	525
		Production cost	c/kWh	6,8,3	Stat&Prob.	15,00
		Fuel price increase sensitivity	Factor	3	Stat&Prob.	1,80
	Resources	Availability (load factor)	%	3	Stat&Prob.	90
		Long-term sustainability Energetic	Years	3	Stat&Prob.	100
		Long-term sustainability Non-energetic	kg/GWh	3	Stat&Prob.	4
		Peak load response	Pairwise Comparison	App.	Expertise	-
Environmental	Global Warming		tons/GWh	3	Stat&Prob.	675
	Regional Env. Imp		km2/GWh	3	Stat&Prob.	0,016
	Non-Pollutant Effects Land use		m2/GWh	3	Stat&Prob.	47
	Total Waste		tons/GWh	3	Stat&Prob.	2
Social	Employment-Technology		Person-years/GWh	3	Stat&Prob.	0,65
	Human Health Impacts		Years of Life Lost/GWh	3	Stat&Prob.	0,023
	Local Disturbance		Pairwise Comparison	App.	Expertise	-
	Critical Waste Confinement		Thousand years	3	Stat&Prob.	0,01
	Risk Aversion		Max fatalities/ accident	3	Stat&Prob.	100
Security	Safe Assurance		Pairwise Comparison	App.	Expertise	-
	Decentrilazation		Pairwise Comparison	App.	Expertise	-
Technology	Effective Life Time		Years	6,7	Stat&Prob.	30
	Efficiency		%	6,7	Stat&Prob.	60
	Environmental Sustainability		Pairwise Comparison	App.	Expertise	-
	Technological Availability	Engineering & Project	Pairwise Comparison	App.	Expertise	-
		Civil Works	Pairwise Comparison	App.	Expertise	-
		Electro Mechanical Equipment	Pairwise Comparison	App.	Expertise	-

Table 5.9 RTFD for Natural Gas

5.2.10 Nuclear Power RTFD						
Criteria-Subcriteria			**Indicator**	**Ref.**	**Evaluation Method**	**Value**
Economic	Financial Requirements	Capital Cost	$/kW	6,8,3	Stat&Prob.	1500
		Production cost	c/kWh	6,8,3	Stat&Prob.	4,00
		Fuel price increase sensitivity	Factor	3	Stat&Prob.	1,30
	Resources	Availability (load factor)	%	3	Stat&Prob.	82
		Long-term sustainability Energetic	Years	3	Stat&Prob.	500
		Long-term sustainability Non-energetic	kg/GWh	3	Stat&Prob.	5
		Peak load response	Pairwise Comparison	App.	Expertise	-
Environmental	Global Warming		tons/GWh	3	Stat&Prob.	10
	Regional Env. Imp		km2/GWh	3	Stat&Prob.	0,0017
	Non-Pollutant Effects Land use		m2/GWh	3	Stat&Prob.	7
	Total Waste		tons/GWh	3	Stat&Prob.	15
Social	Employment-Technology		Person-years/GWh	3	Stat&Prob.	0,16
	Human Health Impacts		Years of Life Lost/GWh	3	Stat&Prob.	0,005
	Local Disturbance		Pairwise Comparison	App.	Expertise	-
	Critical Waste Confinement		Thousand years	3	Stat&Prob.	1000
	Risk Aversion		Max fatalities/ accident	3	Stat&Prob.	50000
Security	Safe Assurance		Pairwise Comparison	App.	Expertise	-
	Decentrilazation		Pairwise Comparison	App.	Expertise	-
Technology	Effective Life Time		Years	6,7	Stat&Prob.	50
	Efficiency		%	6,7	Stat&Prob.	32
	Environmental Sustainability		Pairwise Comparison	App.	Expertise	-
	Technological Availability	Engineering & Project	Pairwise Comparison	App.	Expertise	-
		Civil Works	Pairwise Comparison	App.	Expertise	-
		Electro Mechanical Equipment	Pairwise Comparison	App.	Expertise	-

Table 5.10 RTFD for Nuclear Power

5.2.11 Solar CSP RTFD

Criteria-Subcriteria			Indicator	Ref.	Evaluation Method	Value
Economic	Financial Requirements	Capital Cost	$/kW	6,8,3	Stat&Prob.	6500
		Production cost	c/kWh	6,8,3	Stat&Prob.	16,75
		Fuel price increase sensitivity	Factor	3	Stat&Prob.	1,10
	Resources	Availability (load factor)	%	3	Stat&Prob.	9
		Long-term sustainability Energetic	Years	3	Stat&Prob.	10000
		Long-term sustainability Non-energetic	kg/GWh	3	Stat&Prob.	230
		Peak load response	Pairwise Comparison	App.	Expertise	-
Environmental	Global Warming		tons/GWh	3	Stat&Prob.	86
	Regional Env. Imp		km2/GWh	3	Stat&Prob.	0,011
	Non-Pollutant Effects Land use		m2/GWh	3	Stat&Prob.	65
	Total Waste		tons/GWh	3	Stat&Prob.	66
Social	Employment-Technology		Person-years/GWh	3	Stat&Prob.	6,6
	Human Health Impacts		Years of Life Lost/GWh	3	Stat&Prob.	0,02
	Local Disturbance		Pairwise Comparison	App.	Expertise	-
	Critical Waste Confinement		Thousand years	3	Stat&Prob.	50
	Risk Aversion		Max fatalities/ accident	3	Stat&Prob.	100
Security	Safe Assurance		Pairwise Comparison	App.	Expertise	-
	Decentrilazation		Pairwise Comparison	App.	Expertise	-
Technology	Effective Life Time		Years	6,7	Stat&Prob.	20
	Efficiency		%	6,7	Stat&Prob.	17
	Environmental Sustainability		Pairwise Comparison	App.	Expertise	-
	Technological Availability	Engineering & Project	Pairwise Comparison	App.	Expertise	-
		Civil Works	Pairwise Comparison	App.	Expertise	-
		Electro Mechanical Equipment	Pairwise Comparison	App.	Expertise	-

Table 5.11 RTFD for Solar CSP

5.2.12 Solar Photo Voltaic (PV) RTFD

Criteria-Subcriteria			Indicator	Ref.	Evaluation Method	Value
Economic	Financial Requirements	Capital Cost	$/kW	6,8,3	Stat&Prob.	4500
		Production cost	c/kWh	6,8,3	Stat&Prob.	25,00
		Fuel price increase sensitivity	Factor	3	Stat&Prob.	1,10
	Resources	Availability (load factor)	%	3	Stat&Prob.	9
		Long-term sustainability Energetic	Years	3	Stat&Prob.	10000
		Long-term sustainability Non-energetic	kg/GWh	3	Stat&Prob.	230
		Peak load response	Pairwise Comparison	App.	Expertise	-
Environmental	Global Warming		tons/GWh	3	Stat&Prob.	86
	Regional Env. Imp		km2/GWh	3	Stat&Prob.	0,011
	Non-Pollutant Effects Land use		m2/GWh	3	Stat&Prob.	65
	Total Waste		tons/GWh	3	Stat&Prob.	66
Social	Employment-Technology		Person-years/GWh	3	Stat&Prob.	6,6
	Human Health Impacts		Years of Life Lost/GWh	3	Stat&Prob.	0,02
	Local Disturbance		Pairwise Comparison	App.	Expertise	-
	Critical Waste Confinement		Thousand years	3	Stat&Prob.	50
	Risk Aversion		Max fatalities/ accident	3	Stat&Prob.	100
Security	Safe Assurance		Pairwise Comparison	App.	Expertise	-
	Decentrilazation		Pairwise Comparison	App.	Expertise	-
Technology	Effective Life Time		Years	6,7	Stat&Prob.	20
	Efficiency		%	6,7	Stat&Prob.	17
	Environmental Sustainability		Pairwise Comparison	App.	Expertise	-
	Technological Availability	Engineering & Project	Pairwise Comparison	App.	Expertise	-
		Civil Works	Pairwise Comparison	App.	Expertise	-
		Electro Mechanical Equipment	Pairwise Comparison	App.	Expertise	-

Table 5.12 RTFD for Solar PV

5.2.13 Tidal RTFD

Criteria-Subcriteria			Indicator	Ref.	Evaluation Method	Value
Economic	Financial Requirements	Capital Cost	$/kW	6,8,3	Stat&Prob.	2500
		Production cost	c/kWh	6,8,3	Stat&Prob.	12,20
		Fuel price increase sensitivity	Factor	3	Stat&Prob.	1,03
	Resources	Availability (load factor)	%	3	Stat&Prob.	20
		Long-term sustainability Energetic	Years	3	Stat&Prob.	10000
		Long-term sustainability Non-energetic	kg/GWh	3	Stat&Prob.	38
		Peak load response	Pairwise Comparison	App.	Expertise	-
Environmental	Global Warming		tons/GWh	3	Stat&Prob.	10
	Regional Env. Imp		km2/GWh	3	Stat&Prob.	0,0009
	Non-Pollutant Effects Land use		m2/GWh	3	Stat&Prob.	28
	Total Waste		tons/GWh	3	Stat&Prob.	23
Social	Employment-Technology		Person-years/GWh	3	Stat&Prob.	0,36
	Human Health Impacts		Years of Life Lost/GWh	3	Stat&Prob.	0,07
	Local Disturbance		Pairwise Comparison	App.	Expertise	-
	Critical Waste Confinement		Thousand years	3	Stat&Prob.	1
	Risk Aversion		Max fatalities/ accident	3	Stat&Prob.	5
Security	Safe Assurance		Pairwise Comparison	App.	Expertise	-
	Decentrilazation		Pairwise Comparison	App.	Expertise	-
Technology	Effective Life Time		Years	6,7	Stat&Prob.	30
	Efficiency		%	6,7	Stat&Prob.	39
	Environmental Sustainability		Pairwise Comparison	App.	Expertise	-
	Technological Availability	Engineering & Project	Pairwise Comparison	App.	Expertise	-
		Civil Works	Pairwise Comparison	App.	Expertise	-
		Electro Mechanical Equipment	Pairwise Comparison	App.	Expertise	-

Table 5.13 RTFD for Tidal

5.2.14 Wind Offshore RTFD						
Criteria-Subcriteria			**Indicator**	**Ref.**	**Evaluation Method**	**Value**
Economic	Financial Requirements	Capital Cost	$/kW	6,8,3	Stat&Prob.	2597,5
		Production cost	c/kWh	6,8,3	Stat&Prob.	10,00
		Fuel price increase sensitivity	Factor	3	Stat&Prob.	1,03
	Resources	Availability (load factor)	%	3	Stat&Prob.	25
		Long-term sustainability Energetic	Years	3	Stat&Prob.	10000
		Long-term sustainability Non-energetic	kg/GWh	3	Stat&Prob.	38
		Peak load response	Pairwise Comparison	App.	Expertise	-
Environmental	Global Warming		tons/GWh	3	Stat&Prob.	10
	Regional Env. Imp		km2/GWh	3	Stat&Prob.	0,0009
	Non-Pollutant Effects Land use		m2/GWh	3	Stat&Prob.	28
	Total Waste		tons/GWh	3	Stat&Prob.	23
Social	Employment-Technology		Person-years/GWh	3	Stat&Prob.	0,36
	Human Health Impacts		Years of Life Lost/GWh	3	Stat&Prob.	0,07
	Local Disturbance		Pairwise Comparison	App.	Expertise	-
	Critical Waste Confinement		Thousand years	3	Stat&Prob.	1
	Risk Aversion		Max fatalities/ accident	3	Stat&Prob.	5
Security	Safe Assurance		Pairwise Comparison	App.	Expertise	-
	Decentrilazation		Pairwise Comparison	App.	Expertise	-
Technology	Effective Life Time		Years	6,7	Stat&Prob.	25
	Efficiency		%	6,7	Stat&Prob.	90
	Environmental Sustainability		Pairwise Comparison	App.	Expertise	-
	Technological Availability	Engineering & Project	Pairwise Comparison	App.	Expertise	-
		Civil Works	Pairwise Comparison	App.	Expertise	-
		Electro Mechanical Equipment	Pairwise Comparison	App.	Expertise	-

Table 5.14 RTFD for Wind Offshore

5.2.15 Wind Onshore RTFD

Criteria-Subcriteria			Indicator	Ref.	Evaluation Method	Value
Economic	Financial Requirements	Capital Cost	$/kW	6,8,3	Stat&Prob.	1400
		Production cost	c/kWh	6,8,3	Stat&Prob.	8,00
		Fuel price increase sensitivity	Factor	3	Stat&Prob.	1,03
	Resources	Availability (load factor)	%	3	Stat&Prob.	20
		Long-term sustainability Energetic	Years	3	Stat&Prob.	10000
		Long-term sustainability Non-energetic	kg/GWh	3	Stat&Prob.	38
		Peak load response	Pairwise Comparison	App.	Expertise	-
Environmental	Global Warming		tons/GWh	3	Stat&Prob.	10
	Regional Env. Imp		km2/GWh	3	Stat&Prob.	0,0029
	Non-Pollutant Effects Land use		m2/GWh	3	Stat&Prob.	28
	Total Waste		tons/GWh	3	Stat&Prob.	23
Social	Employment-Technology		Person-years/GWh	3	Stat&Prob.	0,36
	Human Health Impacts		Years of Life Lost/GWh	3	Stat&Prob.	0,07
	Local Disturbance		Pairwise Comparison	App.	Expertise	-
	Critical Waste Confinement		Thousand years	3	Stat&Prob.	1
	Risk Aversion		Max fatalities/ accident	3	Stat&Prob.	5
Security	Safe Assurance		Pairwise Comparison	App.	Expertise	-
	Decentrilazation		Pairwise Comparison	App.	Expertise	-
Technology	Effective Life Time		Years	6,7	Stat&Prob.	25
	Efficiency		%	6,7	Stat&Prob.	90
	Environmental Sustainability		Pairwise Comparison	App.	Expertise	-
	Technological Availability	Engineering & Project	Pairwise Comparison	App.	Expertise	-
		Civil Works	Pairwise Comparison	App.	Expertise	-
		Electro Mechanical Equipment	Pairwise Comparison	App.	Expertise	-

Table 5.15 RTFD for Wind Onshore

5.2.16 Implementation Models

After collecting all datas and getting pairwise comparisons next step is put them all to the Super decision computer programme to implement and get the rankings. Firstly model, built before, created in the software then interactions made finally all datas and pairwise comparisons saved in the software. After implementing model Policies weight calculated as follows: Cost: 0,466314 Climate Change: 0,089361 International Policy: 0,190746 Market Investor: 0,253579 the other results are as follows for AHP and ANP models.

5.2.17 AHP Model Implementation

a) AHP Priorities

After implementing criteria and alternative priority graph and tables are as follows;

Name	Graphic	Ideals	Normals
BIOGAS		0.313658	0.042561
FUEL OIL		0.303517	0.041185
GEOTHERMAL		0.516469	0.070080
HARD COAL		0.357354	0.048490
HYDRO		1.000000	0.135692
IGCC		0.285463	0.038735
IMP COAL		0.331504	0.044982
LIGNITE		0.371711	0.050438
NATURAL GAS		0.534698	0.072554
NUCLEAR		0.581717	0.078934
SOLAR CSP		0.484335	0.065720
SOLAR PV		0.487140	0.066101
TIDAL		0.603665	0.081912
WIND OFFSHORE		0.623120	0.084552
WIND ONSHORE		0.575299	0.078063

Figure 5.1 AHP Model Implementing Result Priority Graph

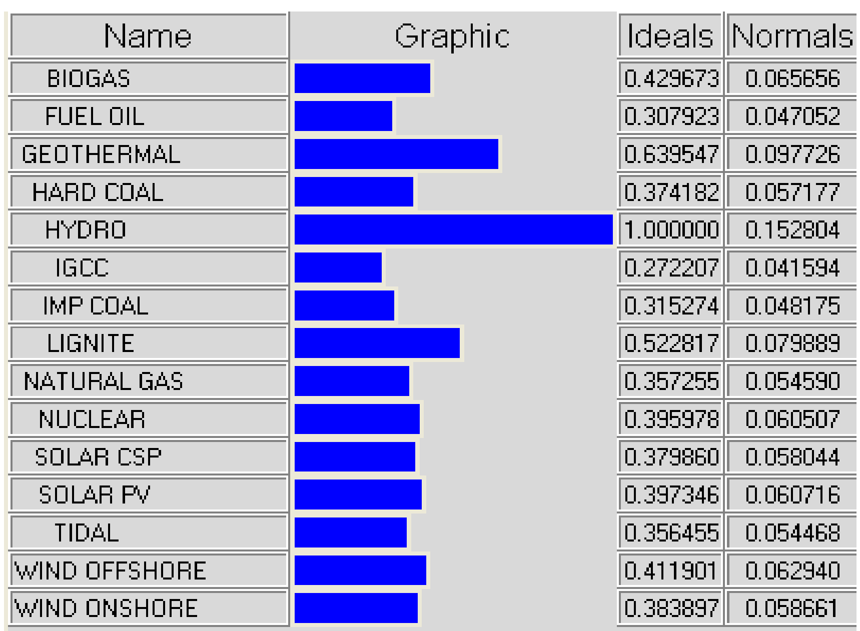
b) AHP Ranking

Alternatives	Total	Normal	Ranking
HYDRO	0.0377	0.1357	1
WIND OFFSHORE	0.0235	0.0846	2
TIDAL	0.0228	0.0819	3
NUCLEAR	0.0219	0.0789	4
WIND ONSHORE	0.0217	0.0781	5
NATURAL GAS	0.0202	0.0726	6
GEOTHERMAL	0.0195	0.0701	7
SOLAR PV	0.0184	0.0661	8
SOLAR CSP	0.0183	0.0657	9
LIGNITE	0.0140	0.0504	10
HARD COAL	0.0135	0.0485	11
IMP COAL	0.0125	0.0450	12
BIOGAS	0.0118	0.0426	13
FUEL OIL	0.0114	0.0412	14
IGCC	0.0108	0.0387	15

Table 5.16 AHP Model Implementing Result Ranking

5.2.18 ANP Model Implementation

a) ANP Priorities



Name	Graphic	Ideals	Normals
BIOGAS		0.429673	0.065656
FUEL OIL		0.307923	0.047052
GEOTHERMAL		0.639547	0.097726
HARD COAL		0.374182	0.057177
HYDRO		1.000000	0.152804
IGCC		0.272207	0.041594
IMP COAL		0.315274	0.048175
LIGNITE		0.522817	0.079889
NATURAL GAS		0.357255	0.054590
NUCLEAR		0.395978	0.060507
SOLAR CSP		0.379860	0.058044
SOLAR PV		0.397346	0.060716
TIDAL		0.356455	0.054468
WIND OFFSHORE		0.411901	0.062940
WIND ONSHORE		0.383897	0.058661

Figure 5.2 ANP Model Implementing Result Priority Graph

b) **ANP Ranking**

Alternatives	Total	Normal	Ranking
HYDRO	0.0562	0.1528	1
GEOTHERMAL	0.0359	0.0977	2
LIGNITE	0.0294	0.0799	3
BIOGAS	0.0241	0.0657	4
WIND OFFSHORE	0.0232	0.0629	5
SOLAR PV	0.0223	0.0607	6
NUCLEAR	0.0223	0.0605	7
WIND ONSHORE	0.0216	0.0587	8
SOLAR CSP	0.0213	0.0580	9
HARD COAL	0.0210	0.0572	10
NATURAL GAS	0.0201	0.0546	11
TIDAL	0.0200	0.0545	12
IMP COAL	0.0177	0.0482	13
FUEL OIL	0.0173	0.0471	14
IGCC	0.0153	0.0416	15

Table 5.17 ANP Model Implementing Result Prioritisation

5.2.19 Limit Matrix:

limit_matrix_anp.txt - Not Defteri

Dosya Düzen Biçim Görünüm Yardım

	BIOGAS	FUEL OIL	GEOTHER~	HARD CO~	HYDRO	IGCC	IMP COAL	LIGNITE	NATURAL~	NUCLEAR	SOLAR C~	SOLAR PV	TIDAL	WIND OF~	WIND ON
BIOGAS	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
FUEL OIL	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
GEOTHER~	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
HARD CO~	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
HYDRO	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
IGCC	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
IMP COAL	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
LIGNITE	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
NATURAL~	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
NUCLEAR	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
SOLAR C~	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
SOLAR PV	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
TIDAL	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
WIND OF~	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
WIND ON~	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Goal	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Climate~	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Cost	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Financi~	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Resourc~	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Global ~	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Non-Pol~	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Regiona~	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Total W~	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Capital~	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Fuel Pr~	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Product~	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Interna~	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Market-~	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Availab~	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Long Te~	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Long Te~	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Peak Lo~	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Decentr~	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Safe As~	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Critica~	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Employm~	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Human H~	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Local D~	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Risk Av~	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Civil W~	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Electro~	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Enginee~	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Effecti~	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Efficie~	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Environ~	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Technol~	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

Figure 5.3-a ANP Limit Matrix

limit_matrix_anp.txt - Not Defteri

Dosya Düzen Biçim Görünüm Yardım

Goal	Climate~	Cost	Financi~	Resourc~	Global ~	Non-Pol~	Regiona~	Total W~	Capital~	Fuel Pr~	Product~	Interna~	Market-~	Availab~	Long Te~
0.02415	0.02415	0.02414	0.02412	0.00000	0.02412	0.02412	0.02412	0.02412	0.00000	0.00000	0.00000	0.02415	0.02415	0.00000	0.00000
0.01731	0.01731	0.01731	0.01731	0.00000	0.01731	0.01731	0.01731	0.01731	0.00000	0.00000	0.00000	0.01731	0.01731	0.00000	0.00000
0.03594	0.03595	0.03597	0.03601	0.00000	0.03601	0.03601	0.03601	0.03601	0.00000	0.00000	0.00000	0.03594	0.03595	0.00000	0.00000
0.02103	0.02102	0.02098	0.02088	0.00000	0.02088	0.02088	0.02088	0.02088	0.00000	0.00000	0.00000	0.02104	0.02102	0.00000	0.00000
0.05620	0.05621	0.05625	0.05635	0.00000	0.05635	0.05635	0.05635	0.05635	0.00000	0.00000	0.00000	0.05620	0.05621	0.00000	0.00000
0.01530	0.01529	0.01525	0.01515	0.00000	0.01515	0.01515	0.01515	0.01515	0.00000	0.00000	0.00000	0.01530	0.01529	0.00000	0.00000
0.01772	0.01771	0.01767	0.01756	0.00000	0.01756	0.01756	0.01756	0.01756	0.00000	0.00000	0.00000	0.01772	0.01771	0.00000	0.00000
0.02938	0.02937	0.02928	0.02909	0.00000	0.02909	0.02909	0.02909	0.02909	0.00000	0.00000	0.00000	0.02939	0.02937	0.00000	0.00000
0.02008	0.02008	0.02009	0.02012	0.00000	0.02012	0.02012	0.02012	0.02012	0.00000	0.00000	0.00000	0.02008	0.02008	0.00000	0.00000
0.02226	0.02224	0.02213	0.02189	0.00000	0.02189	0.02189	0.02189	0.02189	0.00000	0.00000	0.00000	0.02227	0.02224	0.00000	0.00000
0.02135	0.02135	0.02132	0.02127	0.00000	0.02127	0.02127	0.02127	0.02127	0.00000	0.00000	0.00000	0.02135	0.02135	0.00000	0.00000
0.02233	0.02233	0.02228	0.02219	0.00000	0.02219	0.02219	0.02219	0.02219	0.00000	0.00000	0.00000	0.02234	0.02233	0.00000	0.00000
0.02003	0.02003	0.01998	0.01987	0.00000	0.01987	0.01987	0.01987	0.01987	0.00000	0.00000	0.00000	0.02004	0.02003	0.00000	0.00000
0.02315	0.02314	0.02311	0.02303	0.00000	0.02303	0.02303	0.02303	0.02303	0.00000	0.00000	0.00000	0.02315	0.02314	0.00000	0.00000
0.02158	0.02157	0.02152	0.02141	0.00000	0.02141	0.02141	0.02141	0.02141	0.00000	0.00000	0.00000	0.02158	0.02157	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.11351	0.11334	0.11222	0.10971	0.00000	0.10971	0.10971	0.10971	0.10971	0.00000	0.00000	0.00000	0.11362	0.11335	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.02262	0.02266	0.02290	0.02343	0.00000	0.02343	0.02343	0.02343	0.02343	0.00000	0.00000	0.00000	0.02260	0.02266	0.00000	0.00000
0.00430	0.00431	0.00435	0.00445	0.00000	0.00445	0.00445	0.00445	0.00445	0.00000	0.00000	0.00000	0.00430	0.00431	0.00000	0.00000
0.00300	0.00300	0.00303	0.00310	0.00000	0.00310	0.00310	0.00310	0.00310	0.00000	0.00000	0.00000	0.00299	0.00300	0.00000	0.00000
0.00363	0.00364	0.00368	0.00376	0.00000	0.00376	0.00376	0.00376	0.00376	0.00000	0.00000	0.00000	0.00363	0.00364	0.00000	0.00000
0.00775	0.00776	0.00784	0.00803	0.00000	0.00803	0.00803	0.00803	0.00803	0.00000	0.00000	0.00000	0.00774	0.00776	0.00000	0.00000
0.02324	0.02328	0.02353	0.02408	0.00000	0.02408	0.02408	0.02408	0.02408	0.00000	0.00000	0.00000	0.02322	0.02328	0.00000	0.00000
0.02324	0.02328	0.02353	0.02408	0.00000	0.02408	0.02408	0.02408	0.02408	0.00000	0.00000	0.00000	0.02322	0.02328	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.13511	0.13532	0.13675	0.13995	0.00000	0.13995	0.13995	0.13995	0.13995	0.00000	0.00000	0.00000	0.13497	0.13531	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.02566	0.02563	0.02537	0.02481	0.00000	0.02481	0.02481	0.02481	0.02481	0.00000	0.00000	0.00000	0.02569	0.02563	0.00000	0.00000
0.09538	0.09524	0.09430	0.09219	0.00000	0.09219	0.09219	0.09219	0.09219	0.00000	0.00000	0.00000	0.09548	0.09525	0.00000	0.00000
0.04942	0.04935	0.04886	0.04777	0.00000	0.04777	0.04777	0.04777	0.04777	0.00000	0.00000	0.00000	0.04947	0.04936	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.02053	0.02050	0.02030	0.01985	0.00000	0.01985	0.01985	0.01985	0.01985	0.00000	0.00000	0.00000	0.02055	0.02050	0.00000	0.00000
0.10479	0.10495	0.10606	0.10854	0.00000	0.10854	0.10854	0.10854	0.10854	0.00000	0.00000	0.00000	0.10467	0.10494	0.00000	0.00000

Figure 5.3-b ANP Limit Matrix Continued

limit_matrix_anp.txt - Not Defteri

Dosya Düzen Biçim Görünüm Yardım

Long Te~	Peak Lo~	Decentr~	Safe As~	Critica~	Employm~	Human H~	Local D~	Risk Av~	Civil W~	Electro~	Enginee~	Effecti~	Efficie~	Environ~	Technol~
0.00000	0.00000	0.00000	0.03075	0.00000	0.00000	0.00000	0.00000	0.00000	0.03075	0.03075	0.03075	0.00000	0.00000	0.02412	0.02412
0.00000	0.00000	0.00000	0.02306	0.00000	0.00000	0.00000	0.00000	0.00000	0.02306	0.02306	0.02306	0.00000	0.00000	0.01731	0.01731
0.00000	0.00000	0.00000	0.05487	0.00000	0.00000	0.00000	0.00000	0.00000	0.05487	0.05487	0.05487	0.00000	0.00000	0.03601	0.03601
0.00000	0.00000	0.00000	0.02726	0.00000	0.00000	0.00000	0.00000	0.00000	0.02726	0.02726	0.02726	0.00000	0.00000	0.02088	0.02088
0.00000	0.00000	0.00000	0.08655	0.00000	0.00000	0.00000	0.00000	0.00000	0.08655	0.08655	0.08655	0.00000	0.00000	0.05635	0.05635
0.00000	0.00000	0.00000	0.02001	0.00000	0.00000	0.00000	0.00000	0.00000	0.02001	0.02001	0.02001	0.00000	0.00000	0.01515	0.01515
0.00000	0.00000	0.00000	0.02034	0.00000	0.00000	0.00000	0.00000	0.00000	0.02034	0.02034	0.02034	0.00000	0.00000	0.01756	0.01756
0.00000	0.00000	0.00000	0.04618	0.00000	0.00000	0.00000	0.00000	0.00000	0.04618	0.04618	0.04618	0.00000	0.00000	0.02909	0.02909
0.00000	0.00000	0.00000	0.02558	0.00000	0.00000	0.00000	0.00000	0.00000	0.02558	0.02558	0.02558	0.00000	0.00000	0.02012	0.02012
0.00000	0.00000	0.00000	0.02475	0.00000	0.00000	0.00000	0.00000	0.00000	0.02475	0.02475	0.02475	0.00000	0.00000	0.02189	0.02189
0.00000	0.00000	0.00000	0.03222	0.00000	0.00000	0.00000	0.00000	0.00000	0.03222	0.03222	0.03222	0.00000	0.00000	0.02127	0.02127
0.00000	0.00000	0.00000	0.03438	0.00000	0.00000	0.00000	0.00000	0.00000	0.03438	0.03438	0.03438	0.00000	0.00000	0.02219	0.02219
0.00000	0.00000	0.00000	0.02255	0.00000	0.00000	0.00000	0.00000	0.00000	0.02255	0.02255	0.02255	0.00000	0.00000	0.01987	0.01987
0.00000	0.00000	0.00000	0.02750	0.00000	0.00000	0.00000	0.00000	0.00000	0.02750	0.02750	0.02750	0.00000	0.00000	0.02303	0.02303
0.00000	0.00000	0.00000	0.02401	0.00000	0.00000	0.00000	0.00000	0.00000	0.02401	0.02401	0.02401	0.00000	0.00000	0.02141	0.02141
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.10971	0.10971
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.02343	0.02343
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00445	0.00445
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00310	0.00310
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00376	0.00376
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00803	0.00803
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.02408	0.02408
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.02408	0.02408
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.25000	0.00000	0.00000	0.00000	0.00000	0.00000	0.25000	0.25000	0.25000	0.00000	0.00000	0.13995	0.13995
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.03571	0.00000	0.00000	0.00000	0.00000	0.00000	0.03571	0.03571	0.03571	0.00000	0.00000	0.02481	0.02481
0.00000	0.00000	0.00000	0.14286	0.00000	0.00000	0.00000	0.00000	0.00000	0.14286	0.14286	0.14286	0.00000	0.00000	0.09219	0.09219
0.00000	0.00000	0.00000	0.07143	0.00000	0.00000	0.00000	0.00000	0.00000	0.07143	0.07143	0.07143	0.00000	0.00000	0.04777	0.04777
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.01985	0.01985
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.10854	0.10854

Figure 5.3-c ANP Limit Matrix Continued

5.2.20 Weighted Super Matrix:

super_weighted_anp.txt - Not Defteri

Dosya Düzen Biçim Görünüm Yardım

	BIOGAS	FUEL OIL	GEOTHER~	HARD CO~	HYDRO	IGCC	IMP COAL	LIGNITE	NATURAL~	NUCLEAR	SOLAR C~	SOLAR PV	TIDAL	WIND OF~	WIND ON
BIOGAS	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
FUEL OIL	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
GEOTHER~	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
HARD CO~	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
HYDRO	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
IGCC	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
IMP COAL	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
LIGNITE	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
NATURAL~	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
NUCLEAR	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
SOLAR C~	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
SOLAR PV	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
TIDAL	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
WIND OF~	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
WIND ON~	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Goal	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Climate~	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Cost	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Financi~	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Resourc~	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Global ~	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Non-Pol~	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Regiona~	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Total W~	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Capital~	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Fuel Pr~	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Product~	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Interna~	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Market-~	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Availab~	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Long Te~	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Long Te~	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Peak Lo~	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Decentr~	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Safe As~	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Critica~	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Employm~	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Human H~	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Local D~	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Risk Av~	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Civil W~	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Electro~	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Enginee~	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Effecti~	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Efficie~	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Environ~	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Technol~	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

Figure 5.4-a ANP Weighted Super Matrix

super_weighted_anp.txt - Not Defteri

Dosya Düzen Biçim Görünüm Yardım

Goal	Climate~	Cost	Financi~	Resourc~	Global ~	Non-Pol~	Regiona~	Total W~	Capital~	Fuel Pr~	Product~	Interna~	Market-~	Availab~	Long Te~
0.00000	0.00000	0.00000	0.00000	0.00000	0.00090	0.02327	0.00537	0.00610	0.08694	0.10153	0.06435	0.00000	0.00000	0.05102	0.01301
0.00000	0.00000	0.00000	0.00000	0.00000	0.00055	0.00364	0.00172	0.04923	0.10144	0.04061	0.06435	0.00000	0.00000	0.11225	0.00100
0.00000	0.00000	0.00000	0.00000	0.00000	0.00090	0.02327	0.00537	0.00610	0.02792	0.10153	0.06435	0.00000	0.00000	0.05102	0.13313
0.00000	0.00000	0.00000	0.00000	0.00000	0.00045	0.01149	0.00270	0.00306	0.06210	0.05077	0.12870	0.00000	0.00000	0.11225	0.02703
0.00000	0.00000	0.00000	0.00000	0.00000	0.06335	0.01334	0.11810	0.02297	0.04286	0.08123	0.12870	0.00000	0.00000	0.05102	0.13313
0.00000	0.00000	0.00000	0.00000	0.00000	0.00090	0.02327	0.00537	0.00610	0.07422	0.10153	0.01170	0.00000	0.00000	0.05102	0.01301
0.00000	0.00000	0.00000	0.00000	0.00000	0.00024	0.00364	0.00172	0.04595	0.07803	0.04061	0.12870	0.00000	0.00000	0.11225	0.00100
0.00000	0.00000	0.00000	0.00000	0.00000	0.00040	0.02327	0.00328	0.00656	0.06086	0.04512	0.12870	0.00000	0.00000	0.11225	0.00500
0.00000	0.00000	0.00000	0.00000	0.00000	0.00072	0.02592	0.00656	0.22974	0.20287	0.04061	0.02860	0.00000	0.00000	0.12245	0.00100
0.00000	0.00000	0.00000	0.00000	0.00000	0.06335	0.18147	0.05905	0.03628	0.06916	0.05802	0.08580	0.00000	0.00000	0.11225	0.00701
0.00000	0.00000	0.00000	0.00000	0.00000	0.00576	0.01890	0.00958	0.00830	0.01585	0.06769	0.02340	0.00000	0.00000	0.01020	0.13313
0.00000	0.00000	0.00000	0.00000	0.00000	0.00576	0.01890	0.00958	0.00830	0.02288	0.06769	0.01609	0.00000	0.00000	0.01020	0.13313
0.00000	0.00000	0.00000	0.00000	0.00000	0.06335	0.04321	0.11810	0.02377	0.04112	0.06769	0.03218	0.00000	0.00000	0.03061	0.13313
0.00000	0.00000	0.00000	0.00000	0.00000	0.06335	0.04321	0.11810	0.02377	0.03952	0.06769	0.04290	0.00000	0.00000	0.03061	0.13313
0.00000	0.00000	0.00000	0.00000	0.00000	0.06335	0.04321	0.03543	0.02377	0.07422	0.06769	0.05148	0.00000	0.00000	0.03061	0.13313
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.08936	0.17121	0.20000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.32748	0.00000	0.00000	0.00000
0.46631	0.48501	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.16000	0.00000	0.00000	0.33333	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.10916	0.00000	0.00000
0.00000	0.00000	0.64000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.21832	0.00000	0.00000
0.00000	0.07404	0.00000	0.11620	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.13637	0.00000	0.00000	0.00000
0.00000	0.00982	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.02620	0.00000	0.00000	0.00000
0.00000	0.03605	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.06330	0.00000	0.00000	0.00000
0.00000	0.02131	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.03405	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.04306	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.12918	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.12918	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.19075	0.20257	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.25358	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.23219	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.39521	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.14042	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.23219	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.19495	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.06498	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.02646	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.16144	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.11859	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.02428	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.08183	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.08210	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.09043	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.33333	0.50000	0.50000	0.50000	0.00000	0.00000	0.00000	0.00000	0.04207	0.00000	0.00000
0.00000	0.00000	0.00000	0.58238	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.19799	0.00000	0.00000

Figure 5.4-b ANP Weighted Super Matrix Continued

super_weighted_anp.txt - Not Defteri

Dosya Düzen Biçim Görünüm Yardım

Long Te~	Peak Lo~	Decentr~	Safe As~	Critica~	Employm~	Human H~	Local D~	Risk Av~	Civil W~	Electro~	Enginee~	Effecti~	Efficie~	Environ~	Technol~
0.08815	0.03010	0.06617	0.02560	0.00003	0.02202	0.02908	0.06663	0.00558	0.04251	0.03496	0.03448	0.06700	0.08008	0.04827	0.00000
0.03918	0.06941	0.04072	0.01635	0.00491	0.02402	0.00831	0.05526	0.00031	0.04471	0.03043	0.02102	0.05700	0.06306	0.01002	0.00000
0.07052	0.07822	0.09757	0.05160	0.00005	0.02202	0.02908	0.07437	0.00558	0.05369	0.05633	0.06400	0.06700	0.04805	0.07819	0.00000
0.04148	0.07321	0.02956	0.02623	0.00001	0.04404	0.01466	0.04189	0.00279	0.03383	0.02925	0.02358	0.09500	0.04505	0.00982	0.00000
0.35258	0.17871	0.12825	0.07375	0.49041	0.06106	0.09183	0.06730	0.00070	0.07067	0.09734	0.11774	0.07600	0.12412	0.07329	0.00000
0.08815	0.05611	0.05867	0.02252	0.00003	0.02202	0.02908	0.05676	0.00558	0.01969	0.01675	0.01788	0.06700	0.06006	0.01377	0.00000
0.03918	0.08172	0.03749	0.01855	0.00491	0.02402	0.00831	0.05058	0.00279	0.02408	0.02137	0.02266	0.09500	0.06006	0.00936	0.00000
0.03526	0.08358	0.04451	0.05677	0.00001	0.01101	0.01631	0.04990	0.14019	0.03510	0.03593	0.03515	0.09500	0.04505	0.00962	0.00000
0.11753	0.12204	0.08003	0.01541	0.49779	0.03303	0.04362	0.05756	0.01394	0.03510	0.03932	0.02894	0.05700	0.08208	0.01784	0.00000
0.08815	0.08364	0.03484	0.03117	0.00000	0.00801	0.19386	0.08400	0.00003	0.01831	0.02137	0.01226	0.09500	0.04404	0.01742	0.00000
0.00199	0.03281	0.09225	0.03865	0.00001	0.33734	0.04985	0.08167	0.01394	0.02736	0.02582	0.02493	0.03800	0.02302	0.06676	0.00000
0.00199	0.03572	0.09509	0.04579	0.00001	0.33734	0.04985	0.08752	0.01394	0.02316	0.02442	0.01999	0.03800	0.02302	0.07940	0.00000
0.01195	0.02846	0.06578	0.02486	0.00061	0.01802	0.14539	0.07065	0.26488	0.01858	0.02046	0.02062	0.05700	0.05405	0.05681	0.00000
0.01195	0.02485	0.06641	0.02759	0.00061	0.01802	0.14539	0.08139	0.26488	0.02880	0.02455	0.03242	0.04800	0.12412	0.06299	0.00000
0.01195	0.02143	0.06266	0.02517	0.00061	0.01802	0.14539	0.07453	0.26488	0.02442	0.02172	0.02433	0.04800	0.12412	0.05791	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.61420
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.05271	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.13209	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.09208	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.11164	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.50000	0.50000	0.50000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.07143	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.06305
0.00000	0.00000	0.00000	0.28571	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.20819
0.00000	0.00000	0.00000	0.14286	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.11457
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

Figure 5.4-c ANP Weighted Super Matrix Continued

5.3 Sensitivity Analysis for AHP & ANP Models

Sensitivity case was run in order to investigate qualitative datas harmony in the ranking based. As mentioned before the inconsistency of judgments can be checked using the consistency ratio. For acceptable inconsistency, Consistency Ratio (CR) must be less than 0.20 while the weights given to levels of criteria may in most cases be regarded as experts choices, the ranking of systems remains, however, quite stable given a moderate variation of these weights. It needs to be said that CR for all alternatives are in acceptable level because of all values little than 0,20. The super decision software sensitivity result is given in Figure 4.9 below for AHP and ANP interactions;

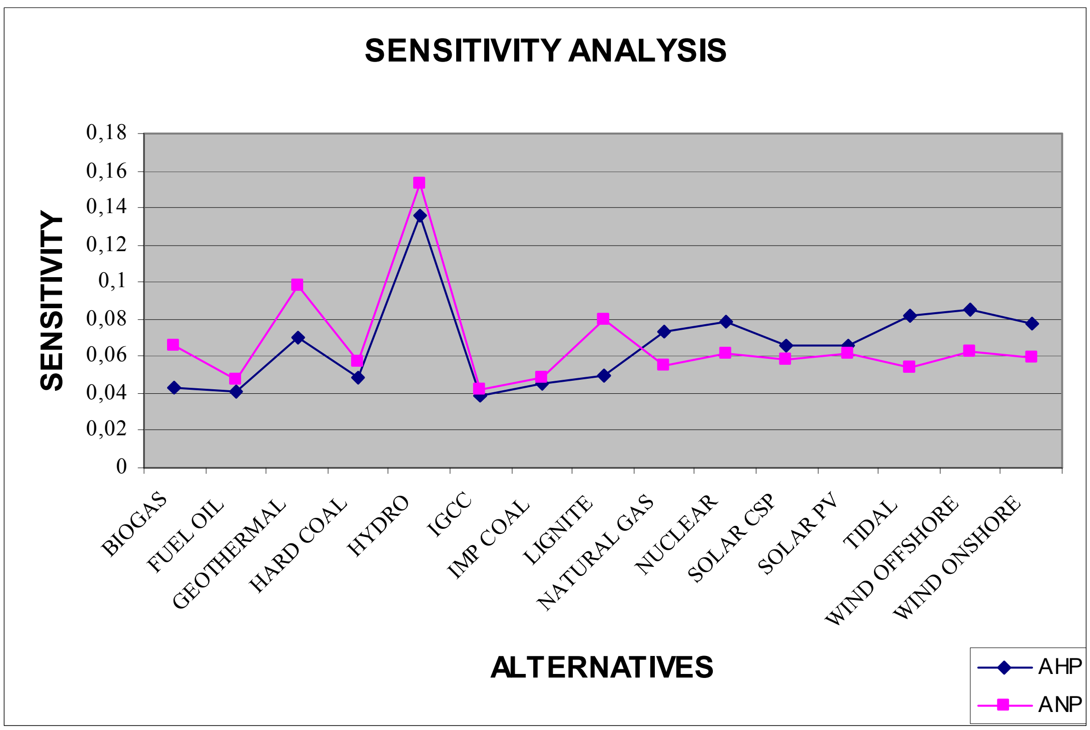


Figure 5.5 Sensitivity Analysis for AHP and ANP Models

6 RESULT& CONCLUSION

6.1 Introduction

This chapter contains Result and Conclusion of the thesis.

6.2 Result

The model developed in this thesis gives decision makers a tool to use in making strategic decisions on matters related to energy policy. The proposed model provides quantitative results that can help improve the decision-making process. As a result of implementing AHP & ANP Models via Super Decision soft computing tool we acquired two types of prioritization as showv below Table 5.1. Hydro electric Power Plants was arosen as a first alternative of all. If we analyze two outputs we can see renevable energy resources for electricity must be preferred firstly over the other non renevable resources.

ALTERNATIVES	PRIORITISATION	
	AHP	ANP
BIOGAS	13	4
FUEL OIL	14	14
GEOTHERMAL	7	2
HARD COAL	11	10
HYDRO	1	1
IGCC	15	15
IMP COAL	12	13
LIGNITE	10	3
NATURAL GAS	6	11
NUCLEAR	4	7
SOLAR CSP	9	9
SOLAR PV	8	6
TIDAL	3	12
WIND OFFSHORE	2	5
WIND ONSHORE	5	8

Table 6.1 AHP and ANP Prioritisation

6.3 Conclusion:

First case of AHP model priorities are as follows; Hydro, Wind Offshore, Tidal, Nuclear, Wind Onshore, Natural Gas, Geothermal, Solar PV, Solar CSP, Lignite, Hard Coal, Imp Coal, Biogas, Fuel Oil and IGCC.

Second case ANP model priorities are as follows; Hydro Geothermal, Lignite, Biogas, Wind Offshore, Solar PV, Nuclear, Wind Onshore, Solar CSP, Hard Coal, Natural Gas, Tidal, Imp Coal, Fuel Oil, and IGCC.

According to the rankings, the priorizaiton of the generation alternatives can be diversified through non-fossil fuels, renewables (hydro, solar and offshorewind) are mostly superior to fossil sources, However biogas is an important and new alternative also.It must not be forgotten that 8,7% of the emission rates arisen from wastes. This means we have a high potential of biogas. Today, because of the rapidly increasing urban activity, especially regular garbage storage area construction must be encouraged in a short time. The overall performance of wind energy is favourable while economic competitiveness of solar photovoltaic systems is under the Turkish conditions still low because of high capital cost and low efficiency.

In this thesis suggested that, construction plans of firstly Hydraulic Power Plants should be realized as soon as possible and all potential must be used. The Turkish power industry is required to systematically increase the share of energy taken from renewable sources like hydro, geothermal, wind especially offshore and solar in the total electricity generation.

The fossil systems are subject to limited energetic resources and show relatively unfavourable ecological and accident risk features. However because local resources is suited for fosil fuels can be used. So lignite potential has to be used. Even it seems having negative effect on environment. New Technologies like fluidized bed and supercíritical boilers is so environmental friend Technologies. In Turkey these Technologies must be encouraged.

Also in AHP case Nuclear Energy shows good performance even it exhibits negative environmental and health performance. Within the western world it also has an excellent safety record, reflected in very low estimates of technical risks. The sensitive issues for nuclear energy include risk aversion and the perceived problems associated with the necessity to assure safe storage of relatively small volumes of radioactive wastes over extremely long period of time. So far it must be realized also at least these plants can be used as base power plants and regulates grid.

If we can increase the converting efficency of generation from former energy resources we can reduce carbon emission rates also if we can increase energy efficiency at the consumption side also we can reduce the emission rates. But the most important factor for both generation and consumption side we have to increase R&D effort.

These results are just ranking of alternatives. These results must be taken in to account with capacity and budgetary scenerios to optimize electricity generating planning.

REFERENCES

1- Barney L.C & Wayne C.T & William J.K. (2003) *Guide to Energy management* (4th ed.) The Fairmont Press, Inc.

2- Altas M (Menr), Sakaryalı Z Sevgor S (Euas), Guler M Bayrak Y (Teıas), Conzelmann G (Anl) (2004) *PIMS 3367 Turkey First National Communication Project Reference Case: Energy Sector Modelling Final Report*

3- Hirschberg S, Burgherr P, Spiekerman G, Cazzoli E, Vitazek J, Cheng L (2003) *China Energy Technology Program Comparative Assessment of Severe Accidents in the Chinese Energy Sector*, Paul Scherrer Institut

4- Hirschberg, S., Spiekerman, G. & Dones, R. (1998): *Severe accidents in the energy sector. PSI Report No. 98-16, November 1998,* Paul Scherrer Institute, Wuerenlingen and Villigen, Switzerland.

5- Baykasoğlu A, Özbay E, Göğüş M. T, Öztaş A (2009 Vol. 4, No. 2) *Contractor selection with Multi Criteria Decision Support Tools* Int. J. Industrial and Systems Engineering,

6- International Energy Agency (2008) *Energy Technology Perspectives. Scenarios & Strategies to 2050*

7- Energy Systems Modelling Theme (2007) The Uk Markal ocumentation Electricity and Heat Generation Technology

8- Turkish Electricity Transmission Corporation (2005-2020) *Production Planning* S*tudy*

9- Maurstad, O. (2005), *An Overview of Coal based Integrated Gasification Combined Cycle:(IGCC) Technology,* Sept 2005, MIT, Cambridge

10- Kone A.Ç, Büke T, (2007 Vol. , No:35) *An Analytical Network Process (ANP) evaluation of alternative fuels for electricity generation in Turkey.* Energy Policy

11- Todaro, M.P., Smith, S.C., 2006. *Economic Development, ninth ed*. Addison-Wesley, Boston.

12- Turkis Electricity Generation Company (2007) Annual Report

13- Diakoulaki D, Karangelis F, (2007) *Multi-criteria decision analysis and cost–benefit analysis of alternative scenarios for the power generation sector in Greece*. Renewable and Sustainable Energy Reviews

14- International Energy Agency (2008) *Electricity Information*

15- Stoycheva D, (2008*) Capacity Building for Climate Change Management Project in Turkey*

16- IEA CCC (IEA Clean Coal Centre) (2007), *"Research and Development Needs for Clean Coal Deployment", OECD/IEA, Paris.*

17- Key World Energy Statistics (2008) International Energy Agency.

18- Saaty, T.L. (1990) *'How to make decision: the analytic hierarchy process'*, European Journal of Operational Research, Vol. 48, No. 1, pp.9–26.

19- Saaty, T.L. (1980) *The Analytic Hierarchy Process*, McGraw-Hill, New York.

20- Saaty, T.L, (2001) *Decision making with Dependence and Feedback: The Analytic Network Process*, 2nd ed., 376 p.RWS Publications.

21- OECD/NEA (2000), *Nuclear Energy in a Sustainable Development Perspective*. OECD, Paris, 2000.

22- Energie-Spiegel (2000), *Energie-Spiegel*: *Facts für die Energiepolitik von Morgen.* Nr. 3, PSI/ETHZ, Würenlingen and Villigen, 2000.

23- Hirschberg S. and Dones R. (2000), *Analytical Decision Support for Sustainable Electricity Supply. Proceedings of VDI Conference on Energy and Sustainable Development: Contributions to Future Energy Supply*, VDI, Düsseldorf, Germany, pp. 168-187,

24- Haldi P.A. and Pictet J. (2003), *Multi-criteria output integration analysis. In: Eliasson B. and Lee Y.Y. (Eds.), Integrated Assessment of Sustainable Energy Systems in China – The China Energy Technology Program (CETP) – A Framework for Decision Support in the Electric Sector of Shandong Province*. Kluwer Academic Publishers, Dordrecht/Boston/London, 2003.

25- Hirschberg S. and Dones R. (2003), *Interactive Presentations and Tools. CD included in: Eliasson, B and Lee, Y.Y. (Editors), Integrated Assessment of Sustainable Energy Systems in China, The China Energy Technology Program*. Kluwer Academic Publishers, Dordrecht/Boston/London, 2003.

26- MENR Energy Documents and Statistics.

27- Hirschberg S. and Dones R. Heck T, Burgherr P, Schenler W, Bauer C (2006), *Strengtens and Weaknesses of Current Energy Chains in a Sustaineble Development Perspective*. PSI Energieversorgung und Nachhaltigkeit 2006.

28- Michael Angelo B. Promentilla Development of a Multiple Criteria Decision Making Method for Remedial Countermeasures of Contaminated Sites

APPENDIX

Participants; Bolat F(MENR), Demir Ş(EGC),Çelebi C (MENR), Guler M (MENR) Questionnaire (2009) from *Energy Experts from Ministry of Energy and Nat. Res. and Market,*

Sample;

1: Equal, 3:More Important, 5: Very Important, 7: Much More Imp 9:Absolute Important

GOAL: BEST FUEL&TECH MIX

CLIMATE CHANGE	9	8	7	6	5	4	3	[redacted]	1	2	3	4	5	6	7	8	9	**COST**
CLIMATE CHANGE	9	8	7	6	5	4	3	2	1	2	[redacted]	4	5	6	7	8	9	**INT POLICY**
CLIMATE CHANGE	9	8	7	6	5	4	3	2	[redacted]	2	3	4	5	6	7	8	9	**MARKET-INVEST**
COST	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	**INT POLICY**
COST	9	8	7	6	5	4	3	2	1	2	[redacted]	4	5	6	7	8	9	**MARKET-INVEST**
INT POLICY	9	8	7	6	5	4	3	2	1	2	3	4	5	[redacted]	7	8	9	**MARKET-INVEST**

QUESTIONNAIRE ;

PART -A COMPARISONS AHP MODEL

For BEST FUEL&TECH MIX							
No	Criter I	Criter II	I	II	III	IV	Geometric Mean
1	CC	CO	0,14	0,25	1,00	0,14	0,27
2	CC	IP	1,00	2,00	0,20	0,14	0,49
3	CC	MI	0,17	0,50	0,33	0,14	0,25
4	CO	IP	7,00	5,00	0,17	5,00	2,32
5	CO	MI	1,00	4,00	5,00	0,33	1,61
6	IP	MI	0,17	1,00	4,00	3,00	1,19

For INTERNATIONAL POLICY							
No	Criter I	Criter II	I	II	III	IV	Geometric Mean
1	SO	EN	5,00	2,00	2,00	0,33	1,61

For MARKET & INVESTOR							
No	Criter I	Criter II	I	II	III	IV	Geometric Mean
1	EC	SE	5,00	3,00	0,20	4,00	1,86
2	EC	TE	0,13	2,00	0,20	5,00	0,71
3	SE	TE	0,14	5,00	3,00	0,33	0,92

For MARKET&INVESTOR							
No	Criter I	Criter II	I	II	III	IV	Geometric Mean
1	FR	RE	0,17	3,00	0,25	3,00	0,78

For COST							
No	Criter I	Criter II	I	II	III	IV	Geometric Mean
1	FE	RE	0,33	0,17	0,33	0,33	0,28

For ECONOMIC / FIN REQ							
No	Criter I	Criter II	I	II	III	IV	Geometric Mean
1	CC	FPIS	0,14	0,33	0,14	3,00	0,38
2	CC	OPC	0,25	0,50	0,20	1,00	0,40
3	FPIS	OPC	1,00	4,00	1,00	0,33	1,07

For ECONOMIC / RESOURCES							
No	Criter I	Criter II	I	II	III	IV	Geometric Mean
1	AVL	LTSE	0,20	4,00	1,00	0,33	0,72
2	AVL	LTSN	0,33	1,00	1,00	7,00	1,24
3	AVL	PLR	7,00	0,25	0,33	1,00	0,87
4	LTSE	LTSN	5,00	0,50	0,33	9,00	1,65
5	LTSE	PLR	5,00	0,33	0,25	7,00	1,31
6	LTSN	PLR	5,00	0,50	0,33	0,20	0,64

For INTERNATONAL POLICY / ENVIRONMENTAL							
No	Criter I	Criter II	I	II	III	IV	Geometric Mean
1	GW	NPEL	5,00	3,00	2,00	9,00	4,05
2	GW	REI	5,00	2,00	2,00	5,00	3,16
3	GW	TW	5,00	3,00	3,00	7,00	4,21
4	NPEL	REI	0,20	2,00	2,00	0,14	0,58
5	NPEL	TW	0,20	0,33	3,00	0,33	0,51
6	REI	TW	5,00	2,00	2,00	3,00	2,78

FOR CLIMATE CHANGE / ENVIRONMENTAL							
No	Criter I	Criter II	I	II	III	IV	Geometric Mean
1	GW	NPEL	7,00	4,00	3,00	9,00	5,24
2	GW	REI	7,00	0,50	4,00	3,00	2,55
3	GW	TW	7,00	3,00	3,00	5,00	4,21
4	NPEL	REI	0,20	0,33	2,00	0,20	0,40
5	NPEL	TW	0,20	0,25	1,00	0,14	0,29
6	REI	TW	6,00	3,00	2,00	1,00	2,45

For INTERNATINONAL POLICY / SOCIAL							
No	Criter I	Criter II	I	II	III	IV	Geometric Mean
1	CWC	ET	0,14	0,33	0,13	0,20	0,19
2	CWC	HHI	0,14	0,20	0,14	0,25	0,18
3	CWC	LD	5,00	0,50	0,20	5,00	1,26
4	CWC	RA	0,14	0,33	0,33	0,20	0,24
5	ET	HHI	5,00	0,33	0,50	3,00	1,26
6	ET	LD	8,00	2,00	4,00	9,00	4,90
7	ET	RA	6,00	1,00	0,50	5,00	1,97
8	HHI	LD	4,00	5,00	1,00	7,00	3,44
9	HHI	RA	1,00	3,00	3,00	2,00	2,06
10	LD	RA	0,14	1,00	1,00	0,14	0,38

For MARKET&INVESTOR / ENERGY SECURITY							
No	Criter I	Criter II	I	II	III	IV	Geometric Mean
1	SA	DEC	9,00	4,00	0,20	5,00	2,45

For MARKET&INVESTOR / TECHNOLOGY

No	Criter I	Criter II	I	II	III	IV	Geometric Mean
1	ELT	EFF	1,00	0,50	0,20	3,00	0,74
2	ELT	ES	5,00	4,00	0,25	7,00	2,43
3	ELT	TA	3,00	0,33	0,33	0,20	0,51
4	EFF	ES	5,00	2,00	0,33	5,00	2,02
5	EFF	TA	0,33	0,50	0,25	0,20	0,30
6	ES	TA	1,00	0,33	0,25	0,20	0,36

For TECHNOLOGICAL AVAILABILITY							
No	Criter I	Criter II	I	II	III	IV	Geometric Mean
1	CW	EME	0,20	0,20	2,00	0,20	0,36
2	CW	EP	1,00	0,14	3,00	0,20	0,54
3	EME	EP	6,00	0,33	1,00	2,00	1,41

PART - B COMPARISONS FOR ANP MODEL

For INTERNATIONAL POLICY							
No	Criter I	Criter II	I	II	III	IV	Geometric Mean
1	CC	ENV	1,00	2,00	1,00	0,33	0,90
2	CC	SOC	2,00	1,00	1,00	0,33	0,90
3	ENV	SOC	0,33	1,00	2,00	0,25	0,64

For CLIMATE CHANGE							
No	Criter I	Criter II	I	II	III	IV	Geometric Mean
1	CC	CO	0,20	0,33	2,00	0,20	0,40
2	CC	EN	1,00	1,00	2,00	6,00	1,86
3	CC	IP	1,00	0,50	2,00	0,25	0,71
4	CO	EN	3,00	3,00	2,00	5,00	3,08
5	CO	IP	3,00	3,00	1,00	4,00	2,45
6	EN	IP	3,00	2,00	1,00	0,17	1,00

For COST							
No	Criter I	Criter II	I	II	III	IV	Geometric Mean
1	CC	EC	0,20	0,33	1,00	0,14	0,31

For ECONOMIC							
No	Criter I	Criter II	I	II	III	IV	Geometric Mean
1	EN	FR	0,33	0,25	0,25	0,20	0,25
2	EN	RE	1,00	0,25	0,20	0,25	0,33
3	EN	TE	1,00	0,20	0,25	0,20	0,32
4	FR	RE	1,00	0,33	0,33	5,00	0,86
5	FR	TE	1,00	0,33	0,50	0,20	0,43
6	RE	TE	1,00	0,50	0,50	0,20	0,47

For ECONOMIC							
No	Criter I	Criter II	I	II	III	IV	Geometric Mean
1	EC	TE	1,00	3,00	0,20	2,00	1,05

For TECHNOLOGY							
No	Criter I	Criter II	I	II	III	IV	Geometric Mean
1	EC	EN	3,00	3,00	1,00	5,00	2,59
2	EC	TA	3,00	2,00	2,00	2,00	2,21
3	EN	TA	0,33	0,33	2,00	0,20	0,46

For SAFE ASSURANCE / TECH. AVAILABILITY							
No	Criter I	Criter II	I	II	III	IV	Geometric Mean
1	CW	EME	0,20	0,33	0,33	0,14	0,24
2	CW	EP	5,00	0,25	0,33	0,14	0,49
3	EME	EP	7,00	0,50	0,50	2,00	1,37

For ENV SUST./ ENVIRONMENTAL							
No	Criter I	Criter II	I	II	III	IV	Geometric Mean
1	GW	NPEL	0,33	0,50	0,33	5,00	0,73
2	GW	REI	0,33	0,33	0,50	5,00	0,73
3	GW	TW	0,33	0,33	0,25	5,00	0,61
4	NPEL	REI	1,00	0,50	0,33	4,00	0,90
5	NPEL	TW	1,00	2,00	0,33	6,00	1,41
6	REI	TW	1,00	2,00	0,50	0,25	0,71

PART - C COMPARISONS FOR ALTERNATIVES

For PEAK LOAD RESPONSE / ALTERNATIVES							
No	Criter I	Criter II	I	II	III	IV	Geometric Mean
1	BG	FO	0,13	0,33	3,00	0,14	0,37
2	BG	GT	0,25	2,00	0,20	0,33	0,43
3	BG	HC	0,11	0,50	0,20	0,11	0,19
4	BG	HYD	0,11	0,13	0,14	0,20	0,14
5	BG	IGCC	0,33	0,33	1,00	0,11	0,33
6	BG	IC	0,11	0,33	2,00	0,11	0,30
7	BG	LGT	0,13	0,50	2,00	0,11	0,34
8	BG	NG	0,11	0,20	5,00	0,11	0,33
9	BG	NC	0,11	0,33	0,20	0,20	0,20
10	BG	SCSP	3,00	0,33	0,20	5,00	1,00
11	BG	SPV	3,00	2,00	0,20	5,00	1,57
12	BG	TD	3,00	5,00	0,20	9,00	2,28
13	BG	WOF	1,00	4,00	0,20	5,00	1,41
14	BG	WON	1,00	6,00	0,20	5,00	1,57
15	FO	GT	5,00	6,00	0,17	5,00	2,24
16	FO	HC	3,00	4,00	0,25	0,33	1,00
17	FO	HYD	0,14	0,14	0,20	3,00	0,33
18	FO	IGCC	5,00	3,00	0,20	0,20	0,88
19	FO	IC	0,20	3,00	0,25	0,33	0,47
20	FO	LGT	0,20	4,00	0,14	0,33	0,44
21	FO	NG	0,17	1,00	0,25	0,20	0,30
22	FO	NC	0,20	4,00	0,13	5,00	0,84
23	FO	SCSP	9,00	5,00	0,14	9,00	2,76
24	FO	SPV	9,00	6,00	0,14	9,00	2,89
25	FO	TD	9,00	7,00	0,14	9,00	3,00
26	FO	WOF	9,00	7,00	0,14	9,00	3,00
27	FO	WON	9,00	8,00	0,14	9,00	3,10
28	GT	HC	0,13	3,00	4,00	0,14	0,68
29	GT	HYD	9,00	0,13	1,00	1,00	1,03
30	GT	IGCC	1,00	4,00	3,00	0,33	1,41
31	GT	IC	0,13	3,00	4,00	0,14	0,68
32	GT	LGT	0,13	3,00	4,00	0,14	0,68
33	GT	NG	0,13	2,00	5,00	0,14	0,65
34	GT	NC	0,13	4,00	2,00	3,00	1,32
35	GT	SCSP	5,00	2,00	3,00	7,00	3,81
36	GT	SPV	5,00	2,00	3,00	7,00	3,81
37	GT	TD	5,00	2,00	0,33	7,00	2,20
38	GT	WOF	6,00	2,00	0,33	7,00	2,30
39	GT	WON	6,00	3,00	0,33	7,00	2,55
40	HC	HYD	0,14	0,13	0,20	7,00	0,40

41	HC	IGCC	7,00	0,50	0,20	1,00	0,91
42	HC	IC	1,00	2,00	0,25	1,00	0,84
43	HC	LGT	1,00	2,00	0,14	1,00	0,73
44	HC	NG	0,25	0,33	0,33	1,00	0,41
45	HC	NC	1,00	2,00	0,14	7,00	1,19
46	HC	SCSP	9,00	2,00	0,14	9,00	2,19
47	HC	SPV	9,00	0,50	0,17	9,00	1,61
48	HC	TD	9,00	3,00	0,17	9,00	2,52
49	HC	WOF	9,00	3,00	0,17	9,00	2,52
50	HC	WON	9,00	4,00	0,17	9,00	2,71
51	HYD	IGCC	8,00	6,00	6,00	0,14	2,53
52	HYD	IC	8,00	6,00	7,00	0,14	2,63
53	HYD	LGT	7,00	7,00	7,00	0,14	2,65
54	HYD	NG	5,00	3,00	8,00	0,14	2,03
55	HYD	NC	7,00	8,00	5,00	5,00	6,12
56	HYD	SCSP	9,00	4,00	7,00	3,00	5,24
57	HYD	SPV	9,00	3,00	2,00	3,00	3,57
58	HYD	TD	9,00	8,00	2,00	3,00	4,56
59	HYD	WOF	9,00	6,00	2,00	3,00	4,24
60	HYD	WON	9,00	7,00	2,00	3,00	4,41
61	IGCC	IC	0,14	0,50	2,00	1,00	0,61
62	IGCC	LGT	0,14	2,00	1,00	1,00	0,73
63	IGCC	NG	0,14	0,33	1,00	1,00	0,47
64	IGCC	NC	0,14	2,00	0,25	5,00	0,77
65	IGCC	SCSP	6,00	0,50	0,25	9,00	1,61
66	IGCC	SPV	6,00	0,50	0,20	9,00	1,52
67	IGCC	TD	6,00	3,00	0,20	9,00	2,39
68	IGCC	WOF	6,00	3,00	0,20	9,00	2,39
69	IGCC	WON	6,00	4,00	0,20	9,00	2,56
70	IC	LGT	3,00	2,00	0,25	1,00	1,11
71	IC	NG	0,33	0,20	0,20	1,00	0,34
72	IC	NC	1,00	2,00	0,25	5,00	1,26
73	IC	SCSP	9,00	2,00	0,25	9,00	2,52
74	IC	SPV	9,00	2,00	0,20	9,00	2,39
75	IC	TD	9,00	3,00	0,20	9,00	2,64
76	IC	WOF	9,00	3,00	0,20	9,00	2,64
77	IC	WON	9,00	4,00	0,20	9,00	2,84
78	LGT	NG	0,20	0,25	1,00	1,00	0,47
79	LGT	NC	1,00	2,00	0,20	5,00	1,19
80	LGT	SCSP	9,00	2,00	0,17	9,00	2,28
81	LGT	SPV	9,00	2,00	0,17	9,00	2,28
82	LGT	TD	9,00	4,00	0,17	9,00	2,71
83	LGT	WOF	9,00	4,00	0,17	9,00	2,71
84	LGT	WON	9,00	4,00	0,17	9,00	2,71

85	NG	NC	7,00	3,00	0,14	5,00	1,97
86	NG	SCSP	9,00	4,00	0,17	9,00	2,71
87	NG	SPV	9,00	4,00	0,14	9,00	2,61
88	NG	TD	9,00	4,00	0,25	9,00	3,00
89	NG	WOF	9,00	4,00	0,14	9,00	2,61
90	NG	WON	9,00	4,00	0,14	9,00	2,61
91	NC	SCSP	9,00	3,00	3,00	5,00	4,49
92	NC	SPV	9,00	3,00	4,00	5,00	4,82
93	NC	TD	9,00	3,00	4,00	7,00	5,24
94	NC	WOF	9,00	3,00	4,00	7,00	5,24
95	NC	WON	9,00	3,00	4,00	7,00	5,24
96	SCSP	SPV	1,00	2,00	6,00	1,00	1,86
97	SCSP	TD	1,00	2,00	5,00	5,00	2,66
98	SCSP	WOF	1,00	2,00	6,00	0,20	1,24
99	SCSP	WON	1,00	2,00	6,00	0,20	1,24
100	SPV	TD	1,00	2,00	6,00	5,00	2,78
101	SPV	WOF	1,00	2,00	6,00	4,00	2,63
102	SPV	WON	1,00	2,00	6,00	4,00	2,63
103	TD	WOF	1,00	2,00	4,00	7,00	2,74
104	TD	WON	1,00	2,00	4,00	7,00	2,74
105	WOF	WON	1,00	2,00	3,00	5,00	2,34

For LOCAL DISTURBANCE / ALTERNATIVES							
No	Criter I	Criter II	I	II	III	IV	Geometric Mean
1	BG	FO	7,00	1,00	2,00	0,20	1,29
2	BG	GT	1,00	0,50	2,00	9,00	1,73
3	BG	HC	7,00	0,33	1,00	0,20	0,83
4	BG	HYD	7,00	3,00	0,25	9,00	2,62
5	BG	IGCC	7,00	0,25	0,33	0,20	0,58
6	BG	IC	7,00	0,33	0,50	0,20	0,70
7	BG	LGT	7,00	0,33	2,00	0,20	0,98
8	BG	NG	7,00	2,00	1,00	0,20	1,29
9	BG	NC	9,00	0,33	2,00	0,20	1,05
10	BG	SCSP	0,20	2,00	1,00	5,00	1,19
11	BG	SPV	0,20	3,00	0,33	5,00	1,00
12	BG	TD	0,20	0,50	0,33	5,00	0,64
13	BG	WOF	0,20	2,00	0,33	3,00	0,80
14	BG	WON	0,20	2,00	0,33	3,00	0,80
15	FO	GT	1,00	3,00	0,33	9,00	1,73
16	FO	HC	1,00	0,33	0,25	1,00	0,54
17	FO	HYD	1,00	4,00	0,33	7,00	1,75
18	FO	IGCC	1,00	0,50	0,14	1,00	0,52
19	FO	IC	1,00	0,33	0,33	1,00	0,58

20	FO	LGT	1,00	0,33	0,25	1,00	0,54
21	FO	NG	1,00	2,00	0,33	1,00	0,90
22	FO	NC	9,00	1,00	0,14	1,00	1,06
23	FO	SCSP	0,20	2,00	0,14	9,00	0,85
24	FO	SPV	0,20	2,00	0,14	9,00	0,85
25	FO	TD	0,20	3,00	0,14	3,00	0,71
26	FO	WOF	0,20	2,00	0,14	3,00	0,64
27	FO	WON	0,20	2,00	0,14	3,00	0,64
28	GT	HC	7,00	3,00	7,00	0,11	2,01
29	GT	HYD	7,00	4,00	7,00	3,00	4,92
30	GT	IGCC	7,00	0,33	6,00	0,11	1,12
31	GT	IC	7,00	0,33	7,00	0,11	1,16
32	GT	LGT	7,00	0,33	7,00	0,11	1,16
33	GT	NG	7,00	0,50	7,00	0,11	1,28
34	GT	NC	9,00	0,50	5,00	0,11	1,26
35	GT	SCSP	1,00	1,00	3,00	0,33	1,00
36	GT	SPV	1,00	2,00	3,00	0,33	1,19
37	GT	TD	1,00	0,50	3,00	1,00	1,11
38	GT	WOF	1,00	1,00	3,00	0,20	0,88
39	GT	WON	1,00	1,00	3,00	0,20	0,88
40	HC	HYD	1,00	0,14	0,20	7,00	0,67
41	HC	IGCC	1,00	0,50	0,20	1,00	0,56
42	HC	IC	1,00	1,00	0,25	1,00	0,71
43	HC	LGT	1,00	2,00	0,33	1,00	0,90
44	HC	NG	1,00	0,33	0,33	1,00	0,58
45	HC	NC	9,00	0,33	0,14	1,00	0,81
46	HC	SCSP	0,20	0,17	0,17	9,00	0,47
47	HC	SPV	0,20	0,14	0,17	9,00	0,45
48	HC	TD	0,20	0,33	0,17	9,00	0,56
49	HC	WOF	0,20	0,33	0,17	7,00	0,53
50	HC	WON	0,20	0,33	0,17	7,00	0,53
51	HYD	IGCC	1,00	8,00	6,00	0,14	1,62
52	HYD	IC	1,00	6,00	7,00	0,14	1,57
53	HYD	LGT	1,00	7,00	6,00	0,14	1,57
54	HYD	NG	1,00	5,00	6,00	0,14	1,44
55	HYD	NC	9,00	5,00	5,00	0,14	2,38
56	HYD	SCSP	0,20	4,00	7,00	0,33	1,17
57	HYD	SPV	0,20	3,00	2,00	0,33	0,80
58	HYD	TD	0,20	4,00	2,00	0,33	0,85
59	HYD	WOF	0,20	4,00	2,00	0,20	0,75
60	HYD	WON	0,20	4,00	2,00	0,20	0,75
61	IGCC	IC	1,00	2,00	2,00	1,00	1,41
62	IGCC	LGT	1,00	2,00	1,00	1,00	1,19
63	IGCC	NG	1,00	0,33	1,00	1,00	0,76

64	IGCC	NC	9,00	0,25	0,25	1,00	0,87
65	IGCC	SCSP	0,20	0,20	0,25	7,00	0,51
66	IGCC	SPV	0,20	0,17	0,20	7,00	0,46
67	IGCC	TD	0,20	0,50	0,20	7,00	0,61
68	IGCC	WOF	0,20	0,50	0,20	5,00	0,56
69	IGCC	WON	0,20	0,50	0,20	5,00	0,56
70	IC	LGT	1,00	1,00	0,25	1,00	0,71
71	IC	NG	1,00	0,33	0,20	1,00	0,51
72	IC	NC	9,00	0,25	0,25	1,00	0,87
73	IC	SCSP	0,20	0,20	0,25	7,00	0,51
74	IC	SPV	0,20	0,17	0,20	7,00	0,46
75	IC	TD	0,20	0,33	0,20	7,00	0,55
76	IC	WOF	0,20	0,33	0,20	5,00	0,51
77	IC	WON	0,20	0,33	0,20	5,00	0,51
78	LGT	NG	0,17	0,25	1,00	1,00	0,45
79	LGT	NC	1,00	0,20	0,20	1,00	0,45
80	LGT	SCSP	1,00	0,20	0,17	7,00	0,70
81	LGT	SPV	1,00	0,17	0,17	7,00	0,66
82	LGT	TD	4,00	0,33	0,17	7,00	1,12
83	LGT	WOF	0,20	0,20	0,17	5,00	0,43
84	LGT	WON	0,20	0,20	0,17	5,00	0,43
85	NG	NC	9,00	0,50	0,14	1,00	0,90
86	NG	SCSP	0,20	0,50	0,17	7,00	0,58
87	NG	SPV	0,20	0,33	0,14	7,00	0,51
88	NG	TD	0,20	0,50	0,14	7,00	0,56
89	NG	WOF	0,20	0,50	0,14	5,00	0,52
90	NG	WON	0,20	0,50	0,14	5,00	0,52
91	NC	SCSP	0,11	3,00	3,00	7,00	1,63
92	NC	SPV	0,11	2,00	4,00	7,00	1,58
93	NC	TD	0,11	2,00	4,00	7,00	1,58
94	NC	WOF	0,11	2,00	4,00	5,00	1,45
95	NC	WON	0,11	2,00	4,00	5,00	1,45
96	SCSP	SPV	1,00	0,50	6,00	1,00	1,32
97	SCSP	TD	1,00	0,50	5,00	4,00	1,78
98	SCSP	WOF	1,00	0,50	6,00	0,33	1,00
99	SCSP	WON	1,00	0,50	6,00	0,33	1,00
100	SPV	TD	1,00	2,00	6,00	4,00	2,63
101	SPV	WOF	1,00	2,00	6,00	0,33	1,41
102	SPV	WON	1,00	2,00	6,00	0,33	1,41
103	TD	WOF	1,00	0,50	4,00	0,33	0,90
104	TD	WON	1,00	0,50	4,00	0,33	0,90
105	WOF	WON	1,00	2,00	3,00	1,00	1,57

For SAFE ASSURANCE / ALTERNATIVES							
No	Criter I	Criter II	I	II	III	IV	Geometric Mean
1	BG	FO	8,00	6,00	3,00	0,14	2,13
2	BG	GT	1,00	1,00	0,20	0,14	0,41
3	BG	HC	6,00	5,00	0,20	0,14	0,96
4	BG	HYD	1,00	1,00	0,14	0,33	0,47
5	BG	IGCC	9,00	3,00	2,00	0,14	1,67
6	BG	IC	9,00	6,00	2,00	0,14	1,98
7	BG	LGT	8,00	0,50	2,00	0,20	1,12
8	BG	NG	8,00	6,00	5,00	0,14	2,42
9	BG	NC	7,00	0,20	0,20	0,25	0,51
10	BG	SCSP	1,00	0,50	0,20	0,20	0,38
11	BG	SPV	1,00	0,33	0,20	0,20	0,34
12	BG	TD	5,00	2,00	0,20	0,20	0,80
13	BG	WOF	1,00	2,00	0,20	0,20	0,53
14	BG	WON	1,00	2,00	0,20	0,20	0,53
15	FO	GT	0,11	0,33	0,17	0,20	0,19
16	FO	HC	0,17	0,50	0,25	0,20	0,25
17	FO	HYD	0,11	0,14	0,20	3,00	0,31
18	FO	IGCC	1,00	0,50	0,20	5,00	0,84
19	FO	IC	1,00	0,50	0,25	3,00	0,78
20	FO	LGT	0,11	0,14	0,14	0,20	0,15
21	FO	NG	1,00	0,50	0,25	5,00	0,89
22	FO	NC	7,00	0,17	0,13	1,00	0,62
23	FO	SCSP	0,20	0,20	0,14	5,00	0,41
24	FO	SPV	0,20	0,17	0,14	5,00	0,39
25	FO	TD	0,20	2,00	0,14	5,00	0,73
26	FO	WOF	0,20	2,00	0,14	5,00	0,73
27	FO	WON	0,20	2,00	0,14	5,00	0,73
28	GT	HC	5,00	3,00	4,00	0,33	2,11
29	GT	HYD	0,14	0,17	1,00	3,00	0,52
30	GT	IGCC	0,17	0,50	3,00	5,00	1,06
31	GT	IC	0,17	2,00	4,00	1,00	1,07
32	GT	LGT	0,33	0,25	4,00	0,33	0,58
33	GT	NG	7,00	2,00	5,00	5,00	4,33
34	GT	NC	7,00	0,33	2,00	5,00	2,20
35	GT	SCSP	1,00	3,00	3,00	5,00	2,59
36	GT	SPV	1,00	0,50	3,00	5,00	1,65
37	GT	TD	1,00	3,00	0,33	5,00	1,50
38	GT	WOF	1,00	4,00	0,33	5,00	1,61
39	GT	WON	1,00	4,00	0,33	5,00	1,61
40	HC	HYD	0,14	0,14	0,20	5,00	0,38

41	HC	IGCC	1,00	0,50	0,20	5,00	0,84
42	HC	IC	7,00	2,00	0,25	5,00	2,05
43	HC	LGT	1,00	0,33	0,14	1,00	0,47
44	HC	NG	7,00	0,33	0,33	5,00	1,40
45	HC	NC	7,00	0,17	0,14	5,00	0,96
46	HC	SCSP	1,00	0,33	0,14	5,00	0,70
47	HC	SPV	1,00	0,25	0,17	5,00	0,68
48	HC	TD	1,00	0,50	0,17	5,00	0,80
49	HC	WOF	1,00	0,50	0,17	5,00	0,80
50	HC	WON	1,00	0,50	0,17	5,00	0,80
51	HYD	IGCC	7,00	7,00	6,00	2,00	4,92
52	HYD	IC	7,00	7,00	7,00	0,33	3,27
53	HYD	LGT	1,00	5,00	7,00	0,20	1,63
54	HYD	NG	9,00	7,00	8,00	3,00	6,24
55	HYD	NC	9,00	3,00	5,00	1,00	3,41
56	HYD	SCSP	1,00	5,00	7,00	3,00	3,20
57	HYD	SPV	1,00	5,00	2,00	3,00	2,34
58	HYD	TD	1,00	4,00	2,00	3,00	2,21
59	HYD	WOF	1,00	6,00	2,00	3,00	2,45
60	HYD	WON	1,00	6,00	2,00	3,00	2,45
61	IGCC	IC	5,00	1,00	2,00	0,33	1,35
62	IGCC	LGT	0,17	0,33	1,00	0,20	0,32
63	IGCC	NG	5,00	0,33	1,00	1,00	1,14
64	IGCC	NC	5,00	0,20	0,25	1,00	0,71
65	IGCC	SCSP	1,00	0,33	0,25	4,00	0,76
66	IGCC	SPV	1,00	0,33	0,20	4,00	0,72
67	IGCC	TD	1,00	0,25	0,20	4,00	0,67
68	IGCC	WOF	1,00	0,50	0,20	4,00	0,80
69	IGCC	WON	1,00	0,50	0,20	4,00	0,80
70	IC	LGT	0,13	0,33	0,25	0,20	0,21
71	IC	NG	5,00	0,50	0,20	3,00	1,11
72	IC	NC	7,00	0,25	0,25	5,00	1,22
73	IC	SCSP	0,13	0,50	0,25	6,00	0,55
74	IC	SPV	0,13	0,50	0,20	6,00	0,52
75	IC	TD	0,13	0,50	0,20	6,00	0,52
76	IC	WOF	0,13	0,50	0,20	6,00	0,52
77	IC	WON	0,13	0,50	0,20	6,00	0,52
78	LGT	NG	9,00	3,00	1,00	7,00	3,71
79	LGT	NC	9,00	0,33	0,20	7,00	1,43
80	LGT	SCSP	1,00	0,50	0,17	7,00	0,87
81	LGT	SPV	1,00	0,50	0,17	7,00	0,87
82	LGT	TD	1,00	3,00	0,17	7,00	1,37
83	LGT	WOF	1,00	3,00	0,17	7,00	1,37
84	LGT	WON	1,00	3,00	0,17	7,00	1,37

85	NG	NC	1,00	0,25	0,14	3,00	0,57
86	NG	SCSP	0,13	0,50	0,17	5,00	0,48
87	NG	SPV	0,13	0,50	0,14	5,00	0,46
88	NG	TD	0,13	1,00	0,14	5,00	0,55
89	NG	WOF	0,13	2,00	0,14	5,00	0,65
90	NG	WON	0,13	2,00	0,14	5,00	0,65
91	NC	SCSP	0,11	3,00	3,00	1,00	1,00
92	NC	SPV	0,11	3,00	4,00	1,00	1,07
93	NC	TD	0,11	3,00	4,00	3,00	1,41
94	NC	WOF	0,11	3,00	4,00	0,33	0,82
95	NC	WON	0,11	3,00	4,00	0,33	0,82
96	SCSP	SPV	1,00	0,50	6,00	1,00	1,32
97	SCSP	TD	1,00	2,00	5,00	3,00	2,34
98	SCSP	WOF	1,00	2,00	6,00	3,00	2,45
99	SCSP	WON	1,00	2,00	6,00	3,00	2,45
100	SPV	TD	1,00	3,00	6,00	3,00	2,71
101	SPV	WOF	1,00	3,00	6,00	3,00	2,71
102	SPV	WON	1,00	3,00	6,00	3,00	2,71
103	TD	WOF	1,00	2,00	4,00	0,33	1,28
104	TD	WON	1,00	2,00	4,00	0,33	1,28
105	WOF	WON	1,00	2,00	3,00	3,00	2,06

For LOCAL DECENTRILAZATION / ALTERNATIVES							
No	Criter I	Criter II	I	II	III	IV	Geometric Mean
1	BG	FO	3,00	2,00	4,00	0,33	1,68
2	BG	GT	2,00	3,00	3,00	0,11	1,19
3	BG	HC	0,25	2,00	3,00	0,33	0,84
4	BG	HYD	1,00	2,00	4,00	0,11	0,97
5	BG	IGCC	1,00	1,00	4,00	0,11	0,82
6	BG	IC	0,14	2,00	4,00	0,33	0,79
7	BG	LGT	1,00	0,50	4,00	0,33	0,90
8	BG	NG	0,13	0,50	3,00	0,33	0,50
9	BG	NC	5,00	2,00	4,00	0,33	1,91
10	BG	SCSP	3,00	0,50	3,00	0,11	0,84
11	BG	SPV	3,00	0,33	4,00	0,11	0,82
12	BG	TD	3,00	2,00	3,00	0,11	1,19
13	BG	WOF	3,00	2,00	4,00	0,11	1,28
14	BG	WON	3,00	2,00	3,00	0,11	1,19
15	FO	GT	5,00	3,00	0,33	0,11	0,86
16	FO	HC	4,00	2,00	0,50	1,00	1,41
17	FO	HYD	3,00	0,25	0,17	0,11	0,34
18	FO	IGCC	2,00	2,00	0,17	0,11	0,52

19	FO	IC	1,00	2,00	0,20	3,00	1,05
20	FO	LGT	3,00	0,50	0,25	1,00	0,78
21	FO	NG	0,13	0,50	0,25	1,00	0,35
22	FO	NC	2,00	3,00	0,20	1,00	1,05
23	FO	SCSP	3,00	2,00	0,25	0,11	0,64
24	FO	SPV	3,00	0,50	0,25	0,11	0,45
25	FO	TD	3,00	2,00	0,20	0,11	0,60
26	FO	WOF	3,00	2,00	0,20	0,11	0,60
27	FO	WON	3,00	2,00	0,20	0,11	0,60
28	GT	HC	1,00	2,00	4,00	9,00	2,91
29	GT	HYD	1,00	0,25	3,00	9,00	1,61
30	GT	IGCC	1,00	0,50	4,00	5,00	1,78
31	GT	IC	0,33	1,00	4,00	9,00	1,86
32	GT	LGT	1,00	0,33	3,00	9,00	1,73
33	GT	NG	0,13	0,50	4,00	9,00	1,22
34	GT	NC	1,00	3,00	4,00	9,00	3,22
35	GT	SCSP	0,33	0,50	3,00	1,00	0,84
36	GT	SPV	0,33	0,33	3,00	1,00	0,76
37	GT	TD	1,00	1,00	3,00	1,00	1,32
38	GT	WOF	1,00	1,00	4,00	1,00	1,41
39	GT	WON	1,00	2,00	4,00	1,00	1,68
40	HC	HYD	1,00	0,33	0,17	0,11	0,28
41	HC	IGCC	1,00	1,00	0,20	0,11	0,39
42	HC	IC	1,00	1,00	0,20	1,00	0,67
43	HC	LGT	1,00	0,33	0,25	1,00	0,54
44	HC	NG	0,13	0,33	0,33	1,00	0,34
45	HC	NC	1,00	2,00	0,33	1,00	0,90
46	HC	SCSP	1,00	0,50	0,33	0,11	0,37
47	HC	SPV	1,00	0,33	0,25	0,11	0,31
48	HC	TD	1,00	2,00	0,33	0,11	0,52
49	HC	WOF	1,00	2,00	0,33	0,11	0,52
50	HC	WON	1,00	2,00	0,25	0,11	0,49
51	HYD	IGCC	1,00	3,00	7,00	5,00	3,20
52	HYD	IC	1,00	3,00	7,00	9,00	3,71
53	HYD	LGT	1,00	2,00	7,00	9,00	3,35
54	HYD	NG	0,13	3,00	6,00	9,00	2,12
55	HYD	NC	1,00	4,00	7,00	9,00	3,98
56	HYD	SCSP	1,00	2,00	7,00	1,00	1,93
57	HYD	SPV	1,00	1,00	6,00	1,00	1,57
58	HYD	TD	1,00	2,00	6,00	1,00	1,86
59	HYD	WOF	1,00	2,00	6,00	1,00	1,86
60	HYD	WON	1,00	2,00	6,00	1,00	1,86
61	IGCC	IC	1,00	1,00	0,50	5,00	1,26
62	IGCC	LGT	1,00	1,00	1,00	5,00	1,50

63	IGCC	NG	0,13	0,50	2,00	5,00	0,89
64	IGCC	NC	1,00	2,00	1,00	5,00	1,78
65	IGCC	SCSP	1,00	0,50	2,00	0,11	0,58
66	IGCC	SPV	1,00	0,50	3,00	0,11	0,64
67	IGCC	TD	1,00	1,00	3,00	0,11	0,76
68	IGCC	WOF	1,00	1,00	2,00	0,11	0,69
69	IGCC	WON	1,00	1,00	3,00	0,11	0,76
70	IC	LGT	3,00	0,33	0,25	1,00	0,71
71	IC	NG	0,13	0,50	0,25	1,00	0,35
72	IC	NC	5,00	2,00	0,33	1,00	1,35
73	IC	SCSP	1,00	0,50	0,33	0,11	0,37
74	IC	SPV	1,00	0,50	0,25	0,11	0,34
75	IC	TD	1,00	2,00	0,33	0,11	0,52
76	IC	WOF	1,00	2,00	0,33	0,11	0,52
77	IC	WON	1,00	2,00	0,25	0,11	0,49
78	LGT	NG	0,13	2,00	5,00	1,00	1,06
79	LGT	NC	1,00	3,00	0,20	1,00	0,88
80	LGT	SCSP	1,00	2,00	0,20	0,11	0,46
81	LGT	SPV	1,00	0,50	0,25	0,11	0,34
82	LGT	TD	1,00	2,00	0,25	0,11	0,49
83	LGT	WOF	1,00	2,00	0,20	0,11	0,46
84	LGT	WON	1,00	2,00	0,25	0,11	0,49
85	NG	NC	8,00	3,00	0,25	1,00	1,57
86	NG	SCSP	8,00	2,00	0,33	0,11	0,88
87	NG	SPV	8,00	2,00	0,25	0,11	0,82
88	NG	TD	8,00	3,00	0,33	0,11	0,97
89	NG	WOF	8,00	3,00	0,33	0,11	0,97
90	NG	WON	8,00	3,00	0,33	0,11	0,97
91	NC	SCSP	1,00	0,33	2,00	0,11	0,52
92	NC	SPV	1,00	0,33	3,00	0,11	0,58
93	NC	TD	1,00	0,50	4,00	0,11	0,69
94	NC	WOF	1,00	0,50	4,00	0,11	0,69
95	NC	WON	1,00	0,50	4,00	0,11	0,69
96	SCSP	SPV	1,00	0,50	3,00	1,00	1,11
97	SCSP	TD	1,00	2,00	3,00	1,00	1,57
98	SCSP	WOF	1,00	2,00	4,00	1,00	1,68
99	SCSP	WON	1,00	2,00	4,00	1,00	1,68
100	SPV	TD	1,00	3,00	4,00	1,00	1,86
101	SPV	WOF	1,00	2,00	2,00	1,00	1,41
102	SPV	WON	1,00	2,00	3,00	1,00	1,57
103	TD	WOF	1,00	0,50	3,00	1,00	1,11
104	TD	WON	1,00	0,50	4,00	1,00	1,19
105	WOF	WON	1,00	1,00	3,00	1,00	1,32

For LOCAL ENVIRONMENTAL SUST. / ALTERNATIVES							
No	Criter I	Criter II	I	II	III	IV	Geometric Mean
1	BG	FO	7,00	4,00	4,00	5,00	4,86
2	BG	GT	0,20	2,00	3,00	0,11	0,60
3	BG	HC	7,00	3,00	3,00	5,00	4,21
4	BG	HYD	0,14	0,33	4,00	0,20	0,44
5	BG	IGCC	5,00	2,00	4,00	1,00	2,51
6	BG	IC	3,00	4,00	4,00	5,00	3,94
7	BG	LGT	5,00	2,00	4,00	5,00	3,76
8	BG	NG	5,00	2,00	3,00	5,00	3,50
9	BG	NC	9,00	2,00	4,00	5,00	4,36
10	BG	SCSP	1,00	1,00	3,00	0,11	0,76
11	BG	SPV	1,00	0,50	4,00	0,11	0,69
12	BG	TD	1,00	2,00	3,00	0,11	0,90
13	BG	WOF	1,00	1,00	4,00	0,11	0,82
14	BG	WON	1,00	1,00	3,00	0,11	0,76
15	FO	GT	0,11	0,50	0,33	0,11	0,21
16	FO	HC	5,00	0,50	0,50	1,00	1,06
17	FO	HYD	0,11	0,20	0,17	0,14	0,15
18	FO	IGCC	5,00	0,50	0,17	0,20	0,54
19	FO	IC	5,00	0,50	0,20	1,00	0,84
20	FO	LGT	5,00	0,33	0,25	1,00	0,80
21	FO	NG	0,20	0,50	0,25	0,33	0,30
22	FO	NC	9,00	0,25	0,20	0,33	0,62
23	FO	SCSP	0,11	0,33	0,25	0,11	0,18
24	FO	SPV	0,11	0,25	0,25	0,11	0,17
25	FO	TD	0,11	0,33	0,20	0,11	0,17
26	FO	WOF	0,11	0,33	0,20	0,11	0,17
27	FO	WON	0,11	0,33	0,20	0,11	0,17
28	GT	HC	9,00	3,00	4,00	9,00	5,58
29	GT	HYD	5,00	1,00	3,00	1,00	1,97
30	GT	IGCC	9,00	3,00	4,00	7,00	5,24
31	GT	IC	9,00	3,00	4,00	9,00	5,58
32	GT	LGT	9,00	2,00	3,00	9,00	4,70
33	GT	NG	9,00	2,00	4,00	9,00	5,05
34	GT	NC	9,00	2,00	4,00	9,00	5,05
35	GT	SCSP	1,00	1,00	3,00	1,00	1,32
36	GT	SPV	1,00	0,50	3,00	1,00	1,11
37	GT	TD	1,00	1,00	3,00	1,00	1,32
38	GT	WOF	1,00	1,00	4,00	1,00	1,41
39	GT	WON	1,00	1,00	4,00	1,00	1,41
40	HC	HYD	0,11	0,25	0,17	0,11	0,15

41	HC	IGCC	0,20	1,00	0,20	0,20	0,30
42	HC	IC	1,00	1,00	0,20	1,00	0,67
43	HC	LGT	3,00	0,33	0,25	1,00	0,71
44	HC	NG	0,20	0,33	0,33	0,33	0,29
45	HC	NC	3,00	0,25	0,33	0,33	0,54
46	HC	SCSP	0,11	0,33	0,33	0,11	0,19
47	HC	SPV	0,11	0,25	0,25	0,11	0,17
48	HC	TD	0,11	0,50	0,33	0,11	0,21
49	HC	WOF	0,11	0,33	0,33	0,11	0,19
50	HC	WON	0,11	0,33	0,25	0,11	0,18
51	HYD	IGCC	9,00	5,00	6,00	7,00	6,59
52	HYD	IC	9,00	5,00	7,00	9,00	7,30
53	HYD	LGT	9,00	5,00	7,00	9,00	7,30
54	HYD	NG	7,00	5,00	8,00	9,00	7,09
55	HYD	NC	9,00	7,00	5,00	9,00	7,30
56	HYD	SCSP	0,14	2,00	7,00	1,00	1,19
57	HYD	SPV	0,14	2,00	2,00	1,00	0,87
58	HYD	TD	0,14	2,00	2,00	1,00	0,87
59	HYD	WOF	0,14	2,00	2,00	1,00	0,87
60	HYD	WON	0,14	2,00	2,00	1,00	0,87
61	IGCC	IC	3,00	1,00	2,00	5,00	2,34
62	IGCC	LGT	3,00	1,00	1,00	5,00	1,97
63	IGCC	NG	0,33	0,33	1,00	1,00	0,58
64	IGCC	NC	8,00	0,25	0,25	1,00	0,84
65	IGCC	SCSP	0,11	0,33	0,25	0,11	0,18
66	IGCC	SPV	0,11	0,25	0,20	0,11	0,16
67	IGCC	TD	0,11	0,50	0,20	0,11	0,19
68	IGCC	WOF	0,11	0,33	0,20	0,11	0,17
69	IGCC	WON	0,11	0,33	0,20	0,11	0,17
70	IC	LGT	3,00	2,00	0,25	1,00	1,11
71	IC	NG	0,20	0,33	0,20	0,33	0,26
72	IC	NC	9,00	0,20	0,25	0,33	0,62
73	IC	SCSP	0,11	0,25	0,25	0,11	0,17
74	IC	SPV	0,11	0,20	0,20	0,11	0,15
75	IC	TD	0,11	0,33	0,20	0,11	0,17
76	IC	WOF	0,11	0,33	0,20	0,11	0,17
77	IC	WON	0,11	0,33	0,20	0,11	0,17
78	LGT	NG	0,20	0,33	1,00	0,33	0,39
79	LGT	NC	9,00	0,20	0,20	0,33	0,59
80	LGT	SCSP	0,11	0,33	0,17	0,11	0,16
81	LGT	SPV	0,11	0,25	0,17	0,11	0,15
82	LGT	TD	0,11	0,50	0,17	0,11	0,18
83	LGT	WOF	0,11	0,50	0,17	0,11	0,18
84	LGT	WON	0,11	0,50	0,17	0,11	0,18

85	NG	NC	9,00	0,25	0,14	1,00	0,75
86	NG	SCSP	0,11	0,33	0,17	0,11	0,16
87	NG	SPV	0,11	0,33	0,14	0,11	0,16
88	NG	TD	0,11	0,25	0,14	0,11	0,14
89	NG	WOF	0,11	0,33	0,14	0,11	0,16
90	NG	WON	0,11	0,33	0,14	0,11	0,16
91	NC	SCSP	0,11	0,33	3,00	0,11	0,33
92	NC	SPV	0,11	0,25	4,00	0,11	0,33
93	NC	TD	0,11	0,33	4,00	0,11	0,36
94	NC	WOF	0,11	0,33	4,00	0,11	0,36
95	NC	WON	0,11	0,33	4,00	0,11	0,36
96	SCSP	SPV	1,00	0,50	6,00	1,00	1,32
97	SCSP	TD	1,00	2,00	5,00	1,00	1,78
98	SCSP	WOF	1,00	0,50	6,00	1,00	1,32
99	SCSP	WON	1,00	0,50	6,00	1,00	1,32
100	SPV	TD	1,00	2,00	6,00	1,00	1,86
101	SPV	WOF	1,00	2,00	6,00	1,00	1,86
102	SPV	WON	1,00	2,00	6,00	1,00	1,86
103	TD	WOF	1,00	0,50	4,00	1,00	1,19
104	TD	WON	1,00	0,50	4,00	1,00	1,19
105	WOF	WON	1,00	2,00	3,00	1,00	1,57

For ENGINEERING&PROJECT / ALTERNATIVES							
No	Criter I	Criter II	I	II	III	IV	Geometric Mean
1	BG	FO	5,00	3,00	3,00	0,14	1,59
2	BG	GT	0,20	2,00	0,20	0,14	0,33
3	BG	HC	5,00	3,00	0,20	0,14	0,81
4	BG	HYD	0,14	2,00	0,14	0,14	0,28
5	BG	IGCC	5,00	4,00	1,00	7,00	3,44
6	BG	IC	5,00	3,00	2,00	0,20	1,57
7	BG	LGT	5,00	3,00	2,00	0,14	1,44
8	BG	NG	4,00	2,00	5,00	0,14	1,55
9	BG	NC	9,00	5,00	0,20	9,00	3,00
10	BG	SCSP	1,00	2,00	0,20	5,00	1,19
11	BG	SPV	1,00	2,00	0,20	5,00	1,19
12	BG	TD	1,00	3,00	0,20	7,00	1,43
13	BG	WOF	1,00	3,00	0,20	0,14	0,54
14	BG	WON	1,00	3,00	0,20	3,00	1,16
15	FO	GT	0,20	0,50	0,17	1,00	0,36
16	FO	HC	1,00	0,50	0,25	1,00	0,59
17	FO	HYD	0,14	0,25	0,20	1,00	0,29
18	FO	IGCC	1,00	0,50	0,20	7,00	0,91
19	FO	IC	1,00	1,00	0,25	3,00	0,93

20	FO	LGT	1,00	0,50	0,14	1,00	0,52
21	FO	NG	1,00	1,00	0,25	1,00	0,71
22	FO	NC	8,00	3,00	0,13	9,00	2,28
23	FO	SCSP	1,00	1,00	0,14	9,00	1,06
24	FO	SPV	1,00	0,50	0,14	9,00	0,90
25	FO	TD	1,00	2,00	0,14	9,00	1,27
26	FO	WOF	1,00	0,50	0,14	9,00	0,90
27	FO	WON	1,00	0,50	0,14	9,00	0,90
28	GT	HC	5,00	2,00	4,00	1,00	2,51
29	GT	HYD	0,14	4,00	1,00	1,00	0,87
30	GT	IGCC	5,00	2,00	3,00	9,00	4,05
31	GT	IC	5,00	2,00	4,00	3,00	3,31
32	GT	LGT	5,00	2,00	4,00	0,20	1,68
33	GT	NG	5,00	2,00	5,00	0,14	1,63
34	GT	NC	7,00	5,00	2,00	9,00	5,01
35	GT	SCSP	1,00	2,00	3,00	9,00	2,71
36	GT	SPV	1,00	2,00	3,00	9,00	2,71
37	GT	TD	1,00	2,00	0,33	9,00	1,57
38	GT	WOF	1,00	2,00	0,33	3,00	1,19
39	GT	WON	1,00	2,00	0,33	9,00	1,57
40	HC	HYD	0,14	0,20	0,20	1,00	0,27
41	HC	IGCC	1,00	2,00	0,20	5,00	1,19
42	HC	IC	1,00	1,00	0,25	5,00	1,06
43	HC	LGT	1,00	0,50	0,14	1,00	0,52
44	HC	NG	1,00	0,50	0,33	1,00	0,64
45	HC	NC	7,00	4,00	0,14	9,00	2,45
46	HC	SCSP	1,00	0,50	0,14	9,00	0,90
47	HC	SPV	1,00	0,50	0,17	9,00	0,93
48	HC	TD	1,00	0,50	0,17	9,00	0,93
49	HC	WOF	1,00	0,50	0,17	9,00	0,93
50	HC	WON	1,00	0,50	0,17	9,00	0,93
51	HYD	IGCC	7,00	5,00	7,00	9,00	6,85
52	HYD	IC	7,00	6,00	7,00	7,00	6,74
53	HYD	LGT	7,00	4,00	7,00	1,00	3,74
54	HYD	NG	7,00	4,00	6,00	1,00	3,60
55	HYD	NC	7,00	8,00	7,00	9,00	7,71
56	HYD	SCSP	7,00	3,00	7,00	9,00	6,03
57	HYD	SPV	7,00	3,00	6,00	9,00	5,80
58	HYD	TD	7,00	4,00	6,00	9,00	6,24
59	HYD	WOF	7,00	3,00	6,00	7,00	5,45
60	HYD	WON	7,00	3,00	6,00	9,00	5,80
61	IGCC	IC	1,00	1,00	0,50	0,33	0,64
62	IGCC	LGT	1,00	0,50	1,00	0,11	0,49
63	IGCC	NG	1,00	0,50	2,00	0,11	0,58

64	**IGCC**	**NC**	**5,00**	**3,00**	**1,00**	**1,00**	**1,97**
65	**IGCC**	**SCSP**	**0,33**	**0,50**	**2,00**	**1,00**	**0,76**
66	**IGCC**	**SPV**	**0,33**	**0,33**	**3,00**	**1,00**	**0,76**
67	**IGCC**	**TD**	**0,33**	**2,00**	**3,00**	**1,00**	**1,19**
68	**IGCC**	**WOF**	**0,33**	**0,33**	**2,00**	**0,20**	**0,46**
69	**IGCC**	**WON**	**0,33**	**0,33**	**3,00**	**1,00**	**0,76**
70	**IC**	**LGT**	**1,00**	**0,50**	**0,25**	**0,20**	**0,40**
71	**IC**	**NG**	**1,00**	**1,00**	**0,25**	**0,20**	**0,47**
72	**IC**	**NC**	**5,00**	**3,00**	**0,33**	**7,00**	**2,43**
73	**IC**	**SCSP**	**1,00**	**0,50**	**0,33**	**9,00**	**1,11**
74	**IC**	**SPV**	**1,00**	**2,00**	**0,25**	**9,00**	**1,46**
75	**IC**	**TD**	**1,00**	**2,00**	**0,33**	**9,00**	**1,57**
76	**IC**	**WOF**	**1,00**	**0,50**	**0,33**	**1,00**	**0,64**
77	**IC**	**WON**	**1,00**	**0,50**	**0,25**	**9,00**	**1,03**
78	**LGT**	**NG**	**1,00**	**2,00**	**5,00**	**1,00**	**1,78**
79	**LGT**	**NC**	**5,00**	**4,00**	**0,20**	**9,00**	**2,45**
80	**LGT**	**SCSP**	**1,00**	**1,00**	**0,20**	**9,00**	**1,16**
81	**LGT**	**SPV**	**1,00**	**2,00**	**1,00**	**9,00**	**2,06**
82	**LGT**	**TD**	**1,00**	**2,00**	**0,25**	**9,00**	**1,46**
83	**LGT**	**WOF**	**1,00**	**0,50**	**0,20**	**9,00**	**0,97**
84	**LGT**	**WON**	**1,00**	**0,50**	**0,25**	**9,00**	**1,03**
85	**NG**	**NC**	**5,00**	**4,00**	**0,25**	**9,00**	**2,59**
86	**NG**	**SCSP**	**1,00**	**0,50**	**0,33**	**9,00**	**1,11**
87	**NG**	**SPV**	**1,00**	**0,50**	**0,25**	**9,00**	**1,03**
88	**NG**	**TD**	**1,00**	**0,50**	**0,33**	**9,00**	**1,11**
89	**NG**	**WOF**	**1,00**	**0,50**	**0,33**	**9,00**	**1,11**
90	**NG**	**WON**	**1,00**	**0,50**	**0,33**	**9,00**	**1,11**
91	**NC**	**SCSP**	**0,20**	**0,25**	**2,00**	**1,00**	**0,56**
92	**NC**	**SPV**	**0,20**	**0,33**	**3,00**	**1,00**	**0,67**
93	**NC**	**TD**	**0,20**	**0,33**	**4,00**	**1,00**	**0,72**
94	**NC**	**WOF**	**0,20**	**0,25**	**4,00**	**1,00**	**0,67**
95	**NC**	**WON**	**0,20**	**0,25**	**4,00**	**1,00**	**0,67**
96	**SCSP**	**SPV**	**1,00**	**3,00**	**3,00**	**1,00**	**1,73**
97	**SCSP**	**TD**	**1,00**	**1,00**	**3,00**	**1,00**	**1,32**
98	**SCSP**	**WOF**	**1,00**	**0,50**	**4,00**	**0,20**	**0,80**
99	**SCSP**	**WON**	**1,00**	**0,50**	**4,00**	**1,00**	**1,19**
100	**SPV**	**TD**	**1,00**	**0,50**	**4,00**	**1,00**	**1,19**
101	**SPV**	**WOF**	**1,00**	**0,50**	**2,00**	**0,20**	**0,67**
102	**SPV**	**WON**	**1,00**	**0,50**	**3,00**	**1,00**	**1,11**
103	**TD**	**WOF**	**1,00**	**0,50**	**3,00**	**1,00**	**1,11**
104	**TD**	**WON**	**1,00**	**0,50**	**4,00**	**1,00**	**1,19**
105	**WOF**	**WON**	**1,00**	**1,00**	**3,00**	**0,20**	**0,88**

For CIVIL WORKS / ALTERNATIVES							
No	Criter I	Criter II	I	II	III	IV	Geometric Mean
1	BG	FO	1,00	3,00	3,00	0,14	1,06
2	BG	GT	1,00	2,00	2,00	0,14	0,87
3	BG	HC	1,00	3,00	3,00	0,14	1,06
4	BG	HYD	1,00	0,50	2,00	0,14	0,61
5	BG	IGCC	1,00	2,00	2,00	7,00	2,30
6	BG	IC	1,00	2,00	3,00	0,20	1,05
7	BG	LGT	1,00	2,00	5,00	0,14	1,09
8	BG	NG	1,00	2,00	5,00	0,14	1,09
9	BG	NC	1,00	5,00	3,00	9,00	3,41
10	BG	SCSP	1,00	4,00	3,00	5,00	2,78
11	BG	SPV	1,00	2,00	3,00	5,00	2,34
12	BG	TD	1,00	2,00	3,00	7,00	2,55
13	BG	WOF	1,00	0,50	4,00	0,14	0,73
14	BG	WON	1,00	0,50	4,00	3,00	1,57
15	FO	GT	1,00	0,50	4,00	1,00	1,19
16	FO	HC	1,00	1,00	4,00	1,00	1,41
17	FO	HYD	1,00	0,20	1,00	1,00	0,67
18	FO	IGCC	1,00	2,00	2,00	7,00	2,30
19	FO	IC	1,00	1,00	2,00	3,00	1,57
20	FO	LGT	1,00	0,50	1,00	1,00	0,84
21	FO	NG	1,00	1,00	1,00	1,00	1,00
22	FO	NC	1,00	4,00	2,00	9,00	2,91
23	FO	SCSP	1,00	2,00	2,00	9,00	2,45
24	FO	SPV	1,00	2,00	0,33	9,00	1,57
25	FO	TD	1,00	2,00	0,50	9,00	1,73
26	FO	WOF	1,00	2,00	0,50	9,00	1,73
27	FO	WON	1,00	2,00	0,50	9,00	1,73
28	GT	HC	1,00	2,00	2,00	1,00	1,41
29	GT	HYD	1,00	0,33	3,00	1,00	1,00
30	GT	IGCC	1,00	2,00	3,00	9,00	2,71
31	GT	IC	1,00	2,00	4,00	3,00	2,21
32	GT	LGT	1,00	2,00	4,00	0,33	1,28
33	GT	NG	1,00	2,00	5,00	0,17	1,14
34	GT	NC	1,00	5,00	5,00	9,00	3,87
35	GT	SCSP	1,00	2,00	5,00	9,00	3,08
36	GT	SPV	1,00	2,00	5,00	9,00	3,08
37	GT	TD	1,00	2,00	4,00	9,00	2,91
38	GT	WOF	1,00	1,00	5,00	3,00	1,97
39	GT	WON	1,00	1,00	5,00	9,00	2,59
40	HC	HYD	1,00	0,33	0,50	1,00	0,64
41	HC	IGCC	1,00	1,00	0,50	5,00	1,26

42	HC	IC	1,00	1,00	1,00	5,00	1,50
43	HC	LGT	1,00	0,50	1,00	1,00	0,84
44	HC	NG	1,00	2,00	0,50	1,00	1,00
45	HC	NC	1,00	5,00	0,33	9,00	1,97
46	HC	SCSP	1,00	0,50	0,33	9,00	1,11
47	HC	SPV	1,00	0,50	0,33	9,00	1,11
48	HC	TD	1,00	2,00	0,50	9,00	1,73
49	HC	WOF	1,00	0,50	0,50	9,00	1,22
50	HC	WON	1,00	0,50	0,50	9,00	1,22
51	HYD	IGCC	1,00	4,00	5,00	9,00	3,66
52	HYD	IC	1,00	4,00	4,00	7,00	3,25
53	HYD	LGT	1,00	4,00	4,00	1,00	2,00
54	HYD	NG	1,00	4,00	5,00	1,00	2,11
55	HYD	NC	1,00	6,00	5,00	9,00	4,05
56	HYD	SCSP	1,00	3,00	4,00	9,00	3,22
57	HYD	SPV	1,00	3,00	4,00	9,00	3,22
58	HYD	TD	1,00	5,00	5,00	9,00	3,87
59	HYD	WOF	1,00	3,00	4,00	7,00	3,03
60	HYD	WON	1,00	3,00	5,00	9,00	3,41
61	IGCC	IC	1,00	1,00	2,00	0,33	0,90
62	IGCC	LGT	1,00	0,50	2,00	0,11	0,58
63	IGCC	NG	1,00	0,50	2,00	0,11	0,58
64	IGCC	NC	1,00	3,00	0,50	1,00	1,11
65	IGCC	SCSP	1,00	0,50	0,50	1,00	0,71
66	IGCC	SPV	1,00	0,50	0,50	1,00	0,71
67	IGCC	TD	1,00	0,50	0,50	1,00	0,71
68	IGCC	WOF	1,00	0,50	0,33	0,20	0,43
69	IGCC	WON	1,00	0,50	0,33	1,00	0,64
70	IC	LGT	1,00	0,50	0,50	0,20	0,47
71	IC	NG	1,00	2,00	0,50	0,20	0,67
72	IC	NC	1,00	5,00	0,25	7,00	1,72
73	IC	SCSP	1,00	1,00	0,33	9,00	1,32
74	IC	SPV	1,00	1,00	0,33	9,00	1,32
75	IC	TD	1,00	2,00	0,33	9,00	1,57
76	IC	WOF	1,00	0,50	0,20	1,00	0,56
77	IC	WON	1,00	0,50	0,20	9,00	0,97
78	LGT	NG	1,00	2,00	4,00	1,00	1,68
79	LGT	NC	1,00	5,00	0,50	9,00	2,18
80	LGT	SCSP	1,00	2,00	0,20	9,00	1,38
81	LGT	SPV	1,00	2,00	0,20	9,00	1,38
82	LGT	TD	1,00	3,00	0,25	9,00	1,61
83	LGT	WOF	1,00	2,00	0,17	9,00	1,32
84	LGT	WON	1,00	2,00	0,17	9,00	1,32
85	NG	NC	1,00	4,00	0,17	9,00	1,57

86	NG	SCSP	1,00	2,00	0,17	9,00	1,32
87	NG	SPV	1,00	2,00	0,17	9,00	1,32
88	NG	TD	1,00	3,00	0,17	9,00	1,46
89	NG	WOF	1,00	1,00	0,14	9,00	1,06
90	NG	WON	1,00	1,00	0,14	9,00	1,06
91	NC	SCSP	1,00	0,33	4,00	1,00	1,07
92	NC	SPV	1,00	0,33	4,00	1,00	1,07
93	NC	TD	1,00	0,33	3,00	1,00	1,00
94	NC	WOF	1,00	0,33	6,00	1,00	1,19
95	NC	WON	1,00	0,33	6,00	1,00	1,19
96	SCSP	SPV	1,00	1,00	6,00	1,00	1,57
97	SCSP	TD	1,00	1,00	6,00	1,00	1,57
98	SCSP	WOF	1,00	1,00	6,00	0,20	1,05
99	SCSP	WON	1,00	1,00	6,00	1,00	1,57
100	SPV	TD	1,00	1,00	4,00	1,00	1,41
101	SPV	WOF	1,00	1,00	4,00	0,20	0,95
102	SPV	WON	1,00	1,00	4,00	1,00	1,41
103	TD	WOF	1,00	1,00	4,00	1,00	1,41
104	TD	WON	1,00	1,00	4,00	1,00	1,41
105	WOF	WON	1,00	1,00	4,00	0,20	0,95

For CIVIL WORKS / ALTERNATIVES							
No	Criter I	Criter II	I	II	III	IV	Geometric Mean
1	BG	FO	1,00	1,00	2,00	0,14	0,73
2	BG	GT	6,00	1,00	3,00	0,14	1,27
3	BG	HC	1,00	3,00	2,00	0,14	0,96
4	BG	HYD	0,20	5,00	0,50	0,14	0,52
5	BG	IGCC	3,00	6,00	1,00	7,00	3,35
6	BG	IC	1,00	3,00	2,00	0,14	0,96
7	BG	LGT	1,00	3,00	2,00	0,14	0,96
8	BG	NG	1,00	2,00	1,00	0,14	0,73
9	BG	NC	9,00	6,00	1,00	9,00	4,70
10	BG	SCSP	1,00	2,00	0,33	3,00	1,19
11	BG	SPV	1,00	2,00	0,33	3,00	1,19
12	BG	TD	1,00	3,00	0,50	3,00	1,46
13	BG	WOF	1,00	2,00	0,50	0,20	0,67
14	BG	WON	1,00	2,00	0,50	0,20	0,67
15	FO	GT	3,00	1,00	0,25	1,00	0,93
16	FO	HC	1,00	1,00	0,33	1,00	0,76
17	FO	HYD	0,20	3,00	0,20	1,00	0,59
18	FO	IGCC	1,00	2,00	0,20	5,00	1,19
19	FO	IC	1,00	2,00	0,33	5,00	1,35
20	FO	LGT	1,00	2,00	0,20	1,00	0,80
21	FO	NG	1,00	2,00	0,14	1,00	0,73
22	FO	NC	9,00	4,00	0,17	9,00	2,71
23	FO	SCSP	1,00	0,50	0,17	5,00	0,80
24	FO	SPV	1,00	0,33	0,17	5,00	0,73
25	FO	TD	1,00	1,00	0,14	9,00	1,06

26	FO	WOF	1,00	1,00	0,14	3,00	0,81
27	FO	WON	1,00	1,00	0,14	3,00	0,81
28	GT	HC	0,20	3,00	5,00	1,00	1,32
29	GT	HYD	0,14	0,50	2,00	1,00	0,61
30	GT	IGCC	1,00	2,00	3,00	9,00	2,71
31	GT	IC	1,00	3,00	5,00	5,00	2,94
32	GT	LGT	1,00	3,00	6,00	1,00	2,06
33	GT	NG	1,00	3,00	6,00	1,00	2,06
34	GT	NC	9,00	6,00	4,00	9,00	6,64
35	GT	SCSP	1,00	0,50	5,00	9,00	2,18
36	GT	SPV	1,00	0,25	5,00	9,00	1,83
37	GT	TD	1,00	3,00	4,00	9,00	3,22
38	GT	WOF	1,00	2,00	5,00	5,00	2,66
39	GT	WON	1,00	2,00	5,00	9,00	3,08
40	HC	HYD	0,14	0,33	0,33	1,00	0,35
41	HC	IGCC	1,00	2,00	0,50	7,00	1,63
42	HC	IC	1,00	1,00	0,50	7,00	1,37
43	HC	LGT	1,00	1,00	0,25	1,00	0,71
44	HC	NG	1,00	0,50	0,25	1,00	0,59
45	HC	NC	9,00	3,00	0,17	9,00	2,52
46	HC	SCSP	1,00	0,50	0,14	9,00	0,90
47	HC	SPV	1,00	0,25	0,14	9,00	0,75
48	HC	TD	1,00	0,50	0,17	9,00	0,93
49	HC	WOF	1,00	0,50	0,14	5,00	0,77
50	HC	WON	1,00	0,50	0,14	9,00	0,90
51	HYD	IGCC	7,00	4,00	4,00	7,00	5,29
52	HYD	IC	7,00	3,00	5,00	5,00	4,79
53	HYD	LGT	7,00	3,00	5,00	1,00	3,20
54	HYD	NG	7,00	3,00	4,00	1,00	3,03
55	HYD	NC	7,00	6,00	5,00	9,00	6,59
56	HYD	SCSP	7,00	3,00	6,00	9,00	5,80
57	HYD	SPV	7,00	0,50	6,00	9,00	3,71
58	HYD	TD	7,00	2,00	5,00	9,00	5,01
59	HYD	WOF	7,00	2,00	7,00	5,00	4,70
60	HYD	WON	7,00	2,00	7,00	9,00	5,45
61	IGCC	IC	3,00	0,33	1,00	1,00	1,00
62	IGCC	LGT	3,00	0,33	0,33	0,11	0,44
63	IGCC	NG	3,00	0,33	1,00	0,11	0,58
64	IGCC	NC	7,00	3,00	0,25	1,00	1,51
65	IGCC	SCSP	1,00	0,50	0,25	1,00	0,59
66	IGCC	SPV	1,00	0,25	0,25	1,00	0,50
67	IGCC	TD	1,00	1,00	0,20	1,00	0,67
68	IGCC	WOF	1,00	0,50	0,20	1,00	0,56
69	IGCC	WON	1,00	0,50	0,20	1,00	0,56
70	IC	LGT	1,00	2,00	0,25	0,14	0,52
71	IC	NG	1,00	2,00	0,25	0,14	0,52
72	IC	NC	7,00	0,20	0,25	5,00	1,15
73	IC	SCSP	1,00	3,00	0,20	1,00	0,88
74	IC	SPV	1,00	4,00	0,20	1,00	0,95
75	IC	TD	1,00	3,00	0,25	1,00	0,93
76	IC	WOF	1,00	3,00	0,14	2,00	0,96
77	IC	WON	1,00	3,00	0,14	1,00	0,81
78	LGT	NG	1,00	2,00	0,25	1,00	0,84
79	LGT	NC	7,00	0,20	0,33	9,00	1,43

80	LGT	SCSP	1,00	3,00	0,25	9,00	1,61
81	LGT	SPV	1,00	4,00	0,33	9,00	1,86
82	LGT	TD	1,00	3,00	0,50	9,00	1,92
83	LGT	WOF	1,00	3,00	0,50	5,00	1,65
84	LGT	WON	1,00	3,00	0,50	9,00	1,92
85	NG	NC	7,00	0,17	3,00	9,00	2,37
86	NG	SCSP	1,00	3,00	2,00	9,00	2,71
87	NG	SPV	1,00	3,00	1,00	9,00	2,28
88	NG	TD	1,00	2,00	0,50	9,00	1,73
89	NG	WOF	1,00	2,00	0,50	7,00	1,63
90	NG	WON	1,00	2,00	0,50	9,00	1,73
91	NC	SCSP	1,00	5,00	2,00	1,00	1,78
92	NC	SPV	1,00	7,00	2,00	1,00	1,93
93	NC	TD	1,00	4,00	3,00	1,00	1,86
94	NC	WOF	1,00	4,00	3,00	0,14	1,14
95	NC	WON	1,00	4,00	3,00	1,00	1,86
96	SCSP	SPV	1,00	3,00	6,00	1,00	2,06
97	SCSP	TD	1,00	1,00	6,00	1,00	1,57
98	SCSP	WOF	1,00	1,00	6,00	0,14	0,96
99	SCSP	WON	1,00	1,00	6,00	1,00	1,57
100	SPV	TD	1,00	4,00	5,00	1,00	2,11
101	SPV	WOF	1,00	4,00	5,00	0,14	1,30
102	SPV	WON	1,00	4,00	5,00	1,00	2,11
103	TD	WOF	1,00	2,00	4,00	0,14	1,03
104	TD	WON	1,00	2,00	4,00	1,00	1,68
105	WOF	WON	1,00	1,00	4,00	0,20	0,95