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# An Overview of Financial Aspect for Thermal Power Plants

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## 1. Introduction

Thermal Power Plants are facilities that produced electrical energy which is a secondary energy source by using the primary energy sources. In reference to International Energy Outlook Report, marketable energy consumption in the World, taking 2007 as the base year, is expected to grow 49 percent until 2035 (IEO, 2010). According to this report, the distribution of estimated energy consumption by primary sources is shown in Fig. 1.

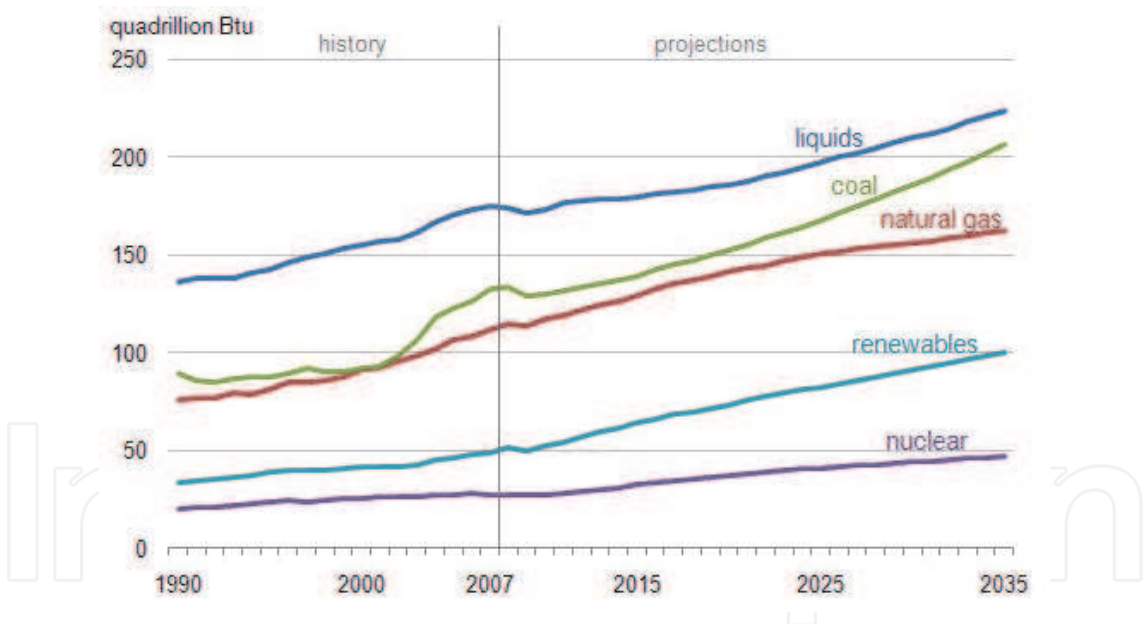


Fig. 1. World marketed energy use by fuel type, (IEO, 2010)

The revealed projection provides a picture concerning what kind of primary sources of energy should be appealed on producing electricity. It is put forward that the production of electricity with an increase of 87 percent until the year 2035 will respectively reach up to 25 trillion in 2020 and to 35.2 trillion kilowatt hours in 2035, taking 2007 as the base year in the report. As can be seen in Figure 2, coal is primary energy source, the most preferred, in production of electricity and natural gas, renewable energy sources and liquid energy sources, respectively, follow it. At present, 80 percent of the World's production of electricity is carried out by fossil fuel power plants (coal, petroleum products, natural gas),

20 percent of the World use the different types of primary energy source like hydraulic, nuclear, wind, solar, geothermal and biogas (SRWE, 2007).

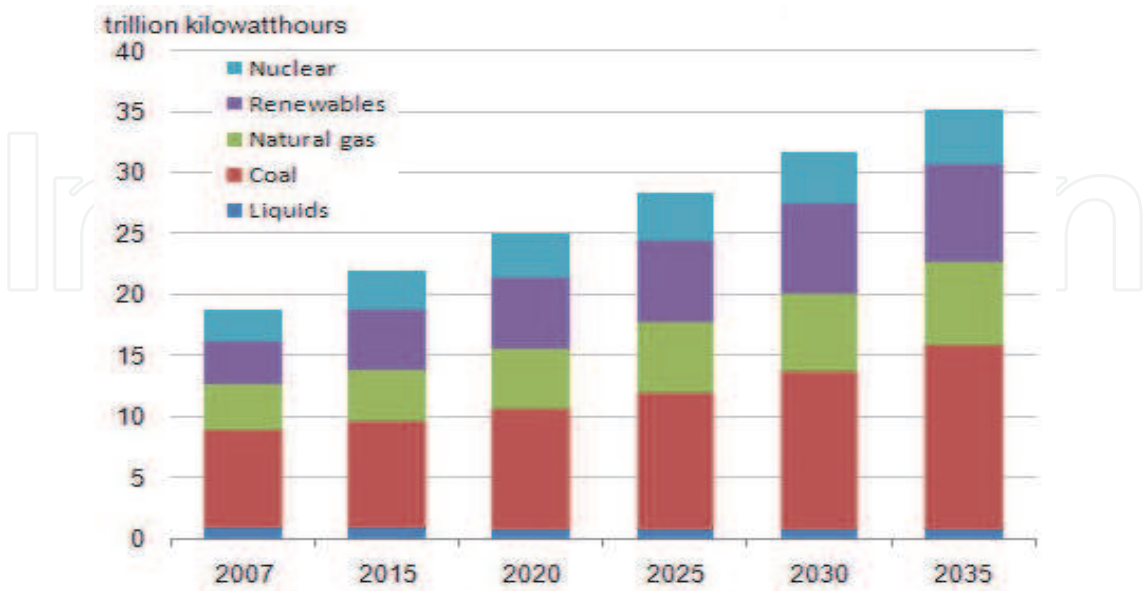


Fig. 2. World net electricity generation by fuel, (IEO, 2010)

Undoubtedly, the choice of the primary sources for electricity production depends on many factors and these factors are fundamental to determine the types of thermal power plants. Thus, these factors also drivers of the decision making processes of financial management function in thermal power plants. Also, the close relation, between financial development and economic growth, increases the importance of financial perspective in management of thermal power plants.

Financial management decision making process is applied on the basis of present value maximization within the framework of the investment and operating costs. Therefore, the factors, influencing decisions related to thermal power plants, affect investments and operating costs indirectly. In this study, it is tried to examine the components that related with financial decision and to present the internal relations between the financial management and thermal power plant in a panoramic view. In the following sections, financial decision making process in thermal power plants are discussed, under the titles of 'The Factors Affecting Decision Making Processes', 'Investment, Operating and Supporting Costs' and 'Long-Term Supply Contracts' respectively. Concluding remarks are then offered.

## 2. The factors affecting decision-making processes

Energy sector is a dynamic market that contains many guiding factors. Human beings, especially after industrialization, understood the vital importance of the sector and became to mobilize its ability to obtain energy. Playing such a critical role of energy sector made inseparable part of public sector for the developed and developing countries. Namely, energy sector must not be evaluated on the basis of market economics. This kind of effort will not reflect the truth. Because the invisible hand of public is always on the sector, while the private sector rules seem working.

Thermal power plants is one of the most important element of the energy sector and they are masterworks that enable producing electrical energy which can be thought as one of the basic needs of life after water and food. Preference of the thermal power plant's type in electricity production is a big dilemma and prior discussion subject for related parties in recent years. For instance, environmentalists act against fossil-fuelled thermal power plants or nuclear power plants and they try to warn decision-makers about environmental pollution, global warming, carbon emissions etc. There is no doubt that eliminating the existence of such kind of industrial elements, playing a major role in environmental issues seems true, but only with a view of environmentalism because when many other factors were considered, thoughts of environmentalists cannot be accepted in short- or medium-term. The thoughts, agreed and supported by everyone, can be ignored suddenly and quickly because the needs, called energy, especially in economic frame, have a vital importance. Financially; a bird in the hand is better than two in the bush.

All decisions on the type, innovation and improvement efforts of thermal power plants depend on many factors. It is impossible to execute decision making process as taking only one of these factors. The effective factors in the establishment and operation decision of thermal power plants can be classified as follows;

- Government Policies and Preferences
- Environmental Factors
- Macroeconomic Factors
- Research & Development Opportunities

2.1 Government policies and preferences

Countries compete with each other within the framework of the energy production nearly. Energy, especially for the developed countries, is one of the most important factors within the frame of competitive advantage. The energy consumed by the countries is illustrated in the figure below.

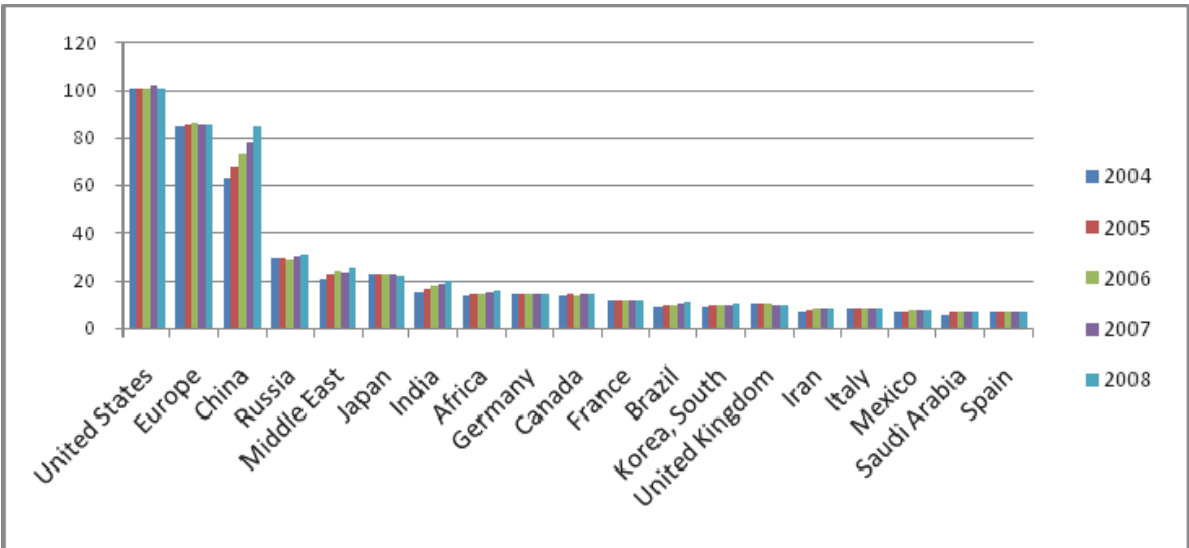


Fig. 3. Countries by energy consumption (Quadrillion Btu), (EIA)

The close relations between industry and energy consumption, especially when looking the data of China, can be observed easily. Namely, energy consumption of Republic of China

increased every year from 2004 to 2008. China industry, increasing production capacity, is reportedly building an average of about one coal-fired thermal power plant a week to meet the requirement of its high-level of electrical energy consumption (Figure 4) (Bradsher and Barboza, 2006).

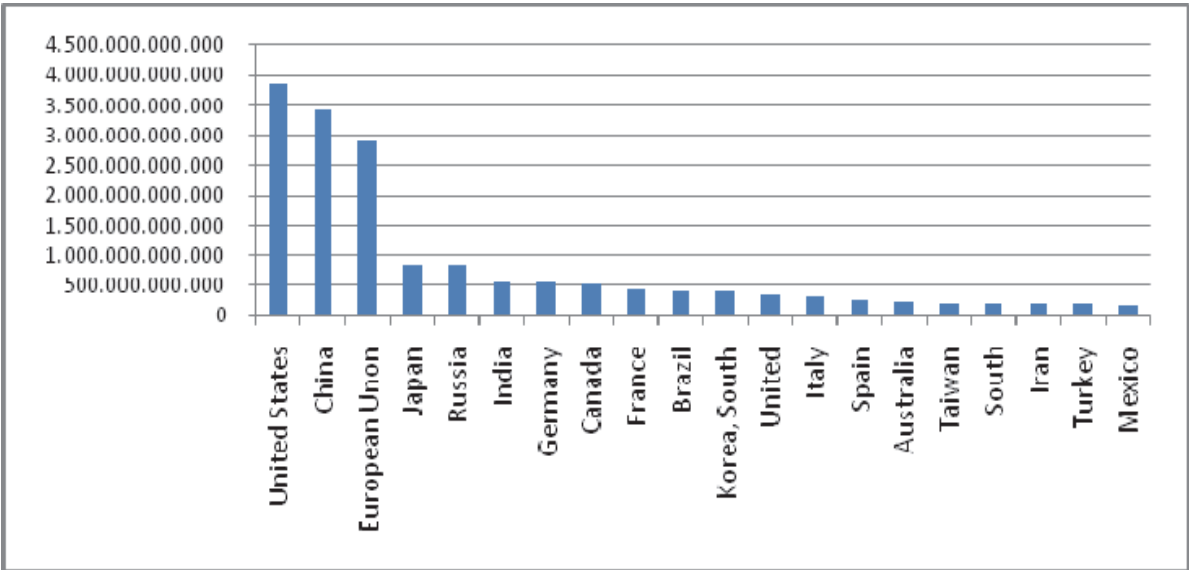


Fig. 4. Countries by electric energy consumption (kwh), (EIA)

Primary energy source possibilities of countries are one of the basic factors that determine the preferences of a thermal power plants. Namely, U.S.A., Germany, India and China produce more than 50% of their electrical energy by coal-fired thermal power plants, while most of the thermal power plants, in the countries has an abundance of natural gas such as Qatar, are gas-fired. This choices are directly related with the reserve capabilities of the primary energy sources which are one of the main issues for government policies and preferences. For example, the coal-fired thermal power plants are preferred to operate reserves, without taking into consideration of performance criteria and environmental factors, although coals has a poor heat value and high carbon content in Turkey.

2.2 Environmental factors

The basic element with energy production and environment interaction is the danger of climate change. Carbon dioxide, methane, nitrous oxide etc. is piling up on the layers of atmosphere, continuing of this situation by increasing prevents the reflection back and faced to a heating risk of the earth. Melting of glaciers and rising sea water are the natural results of warming phenomenon. Undoubtedly, to tackle with the kind of this problem requires a global consciousness and joint actions. In this direction, the studies begin at the end of the 1980s, were brought to the agenda of the world in 1992 with Rio summit and a joint consciousness was formed by courtesy of the United Nations Framework Convention on Climate Change, accepted on 21st March, 1994. The UNFCCC, embraced a good faith at the point of decreasing its greenhouse gas oscillation based on 1990 by the parties in the contract. However, it seems insufficient because of the poor sanctions and absence of quantitative targets. Kyoto Protocol, accepted in 1997, 3rd Parties Conference of The Agreement of United Nations

Framework Convention on Climate Change and came into operation in 16th February, 2005 is the first concrete step to achieve the ultimate purpose of the contract. Since the protocol includes concrete quantitative targets for the period of 2008-2012 and open sanctions, it creates possibilities for other international agreements to conflict with climate change.

The major role of energy sector in greenhouse gas oscillation as a principal cause of climate change; the measures, to be taken and apply against to such danger, is necessitated predominantly in energy sector. At this point, the most serious press is dragooned by environmental protectionist about fossil fuelled thermal power plants. According to them, fossil fuels should use just a bit in indispensable situation or new substances must be exist for taking substitute. There is no doubt that coal-fired thermal power has the highest rate of carbon emissions among the fossil fuelled thermal power plants. Many countries which want to use their primary energy sources in a most efficient way; invest a lot of money for technological research to develop clean coal, line to keeping carbon emissions, arrested, confinement, isolation, treatment, swallowed, destruction and storage. Several alternative methods investigated continuously (Prisyazhniuk, 2008). Many important leaders reckon on clean coals technologies in order to continue coal-fired based electricity production.

### 2.3 Macroeconomic factors

The close relationship between economic development level of countries and energy or electric energy consumption is one of important elements which directly effects necessity of thermal power plant. There are a lot of works in literature that try to analyze the relationship between energy or electric energy consumption and economic growth.

The relationship between economic growth and energy consumption was found as casual for Japan by Erol and Yu (1987), for Turkey, France, Germany, Italy, and Korea by Soytaş and Sari (2003), for Canada by Ghali and El-sakka (2004), for Taiwan by Holtedahl and Joutz (2004). Lee and Chang (2008) found unidirectional causal relationship in the long-term between energy consumption and economic growth for 16 Asian Countries between 1971-2002 in their works. Moreover, in studies of Lee et al (2008), it was worked on 22 OECD countries base on 1960-2001 period, and as a result, a bi-directional causal relationship was found between energy consumption, capital, and GDP. Confessed works are very important, especially, for policy makers. Because, way of relationship between energy consumption and economic growth represents various options to decision-makers related to interaction between energy and GDP. Important works related to determination of the relationship between energy consumption and economic growths were represented chronologically in Table 1. These works, at the same time, suggest to be understood what energy dependency is in economically.

Mentioning about energy dependency needs to accept energy consumption as the most important part of economic growth. In other words, we add energy consumption between capital and work elements which are basic inputs of economic growth and accept that a decline in energy consumption effects real GDP negatively. To confirm this kind of hypothesis, causality must be realized as runs from energy consumption to economic growth. On such an occasion, country economy is expressed dependent on energy, and decision-makers try to prevent the negative effect on real GDP to apply energy conservation

Researcher(s)	Method	Countries	Result
Kraft and Kraft (1978)	Bivar. Sims Causality	USA	Growth → Energy
Yu and Choi (1985)	Bivar. Granger test	South Korea Philippines	Growth → Energy Energy → Growth
Erol and Yu (1987)	Bivar. Granger test	USA	Energy → Growth
Yu and Jin (1992)	Bivar. Granger test	USA	Energy → Growth
Masih and Masih (1996)	Trivar. VECM	Malaysia, Singapore & Philippines India Indonesia Pakistan	Energy → Growth Energy → Growth Growth → Energy Energy ↔ Growth
Glasure and Lee (1998)	Bivar. VECM	South Korea & Singapore	Energy ↔ Growth
Masih and Masih (1998)	Trivar. VECM	Sri Lanka & Thailand	Energy → Growth
Asafu-Adjaye (2000)	Trivar. VECM	India & Indonesia Thailand&Philippines	Energy → Growth Energy ↔ Growth
Hondroyiannis et al. (2002)	Trivar. VECM	Greece	Energy ↔ Growth
Soytas and Sari (2003)	Bivar. VECM	Argentina South Korea Turkey Indonesia & Poland Canada, USA & UK	Energy ↔ Growth Growth → Energy Energy → Growth Energy ↔ Growth Energy ↔ Growth
Fatai et al. (2004)	Bivar. Toda and Yamamoto (1995)	Indonesia & India Thailand&Philippines	Energy → Growth Energy ↔ Growth
Oh and Lee (2004b)	Trivar. VECM	South Korea	Energy ↔ Growth
Wolde-Rufael (2004)	Bivar. Toda and Yamamoto (1995)	Shanghai	Energy → Growth
Lee (2005)	Trivar. Panel VECM	18 developing nations	Energy → Growth
Al-Iriani (2006)	Bivar. Panel VECM	Gulf Cooperation C.	Growth → Energy
Lee and Chang (2008)	Multiv. Panel VECM	16 Asian countries	Energy → Growth
Lee et al. (2008)	Trivar. Panel VECM	22 OECD countries	Energy ↔ Growth
Narayan and Smyth (2008)	Multiv. Panel VECM	G7 countries	Energy → Growth
Apergis and Payne (2009)	Multiv. Panel VECM	11 countries of the Commonwealth of Independent States	Energy ↔ Growth
Apergis and Payne (2009)	Multiv. Panel VECM	6 Central American countries	Energy → Growth
Lee and Lee (2010)	Multiv. Panel VECM	25 OECD countries	Energy ↔ Growth

Table 1. Overview of Selected Studies, (Belke et al., 2010)

policies. On the contrary, if the unidirectional causality runs from real GDP to energy consumption, decrease in the energy consumption will not affect real GDP significantly. If bi-directional causality happens between energy consumption and economic growth, energy consumption and real GDP effects each other simultaneously. This kind of interaction directs policy makers to take measures on energy use. But, at the point of declining energy use in arrangements, it is necessary to separate industrial dimension of energy use to avoid from potential negative effects of energy consumption on real GDP. In this frame, decision-makers can assume that to head for more efficient energy sources or to use energy generating technologies which creates less environmental pollution as an alternative.

The basic relationships, mentioned above, represent a macroeconomic point of view related with which the reasons the countries faced to energy dependency or had bi-directional causality between economic growth and energy consumption, prefer thermal power plant. Because, each country is not able to fulfil the Kyoto Protocol completely and it seems impossible to quit thermal power plants with fossil fuel for some countries in economic frame. Primary sources are the most important inputs for production process in thermal stations. For this reason, fuel costs are important economic factors for coal, nuclear, and natural gas based thermal power plants. The thermal power plants, use solar, geothermal, and wind energy, are excluded because of none of fuel cost. Historical costs related to coal and natural gas costs are represented in the figure 5 and 6 respectively. Uncertainties of costs of primary sources using as a fuel in electric production have critical effects on policies that are applied by the countries in energy sector. The easiest way to manage mentioned uncertainties is to build thermal power plants according to domestically existing primary sources of the countries. Otherwise, management effectiveness cannot be provided in the relationship between energy consumption and economic growth.

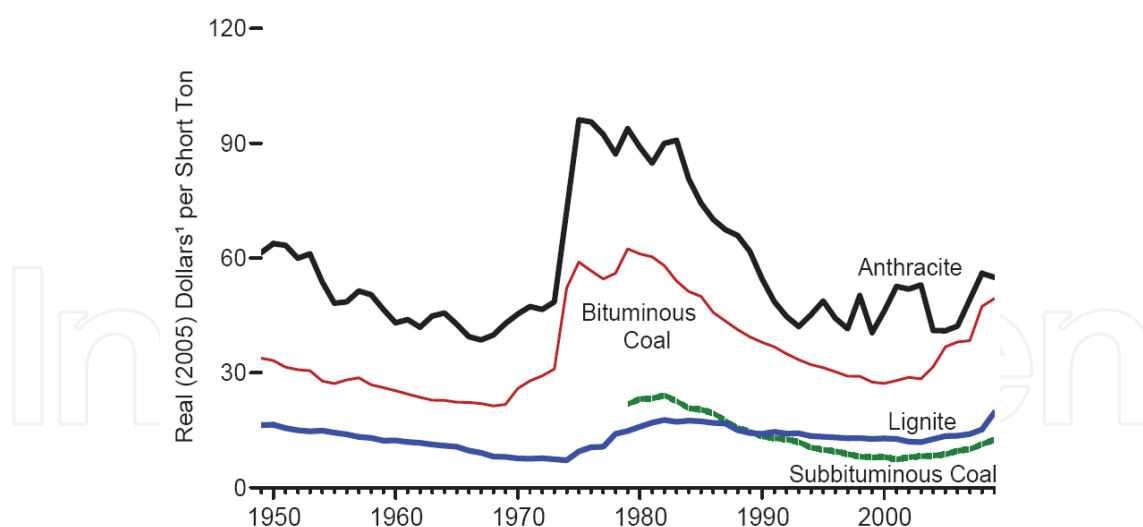


Fig. 5. Coal prices by type for the period of 1949-2009, (AER, 2009)

Countries which have high-level coal reserve still prefer coal-fired thermal power plants in primary level despite with environmental problems. Costs of coals, used as fuel are directly dependent on calorie rate which determines heat capacity of coal. Nonetheless, the inorganic elements within coal caused environmental pollution. Anthracite has highest heat rate and least ash and poisonous exodus for environmental pollution, is a coal. Nonetheless, reserve size of it is much less than the reserve size of lignite because, it's history bases on 300 million

years ago. Water and a lot of foreign substance exist within lignite, approximately started to form 60 million years ago. Therefore, it shows a increasing feature of environment pollutions.

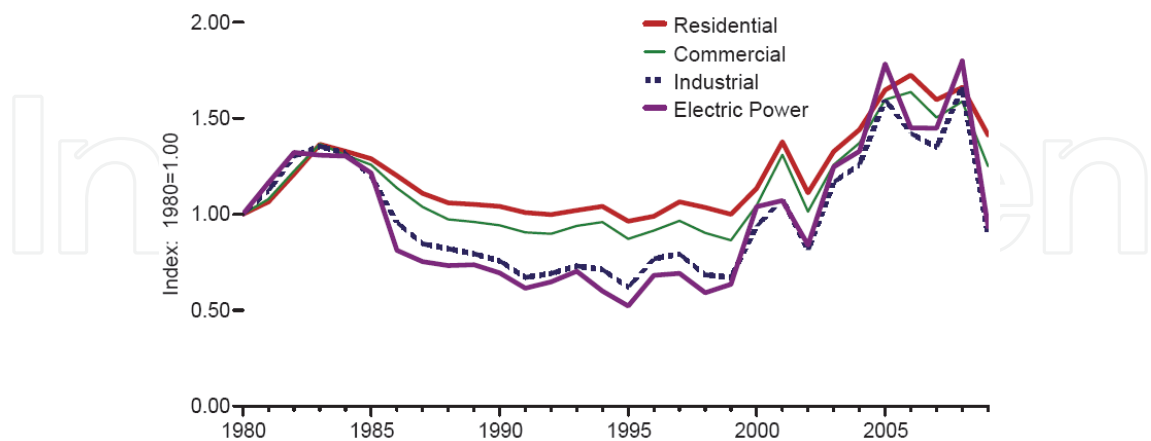


Fig. 6. Natural gas indexed prices by sector for the period of 1967-2009, (AER, 2009)

As it has been seen in the figures, natural gas price which is used as fuel in electric production, is especially more unstable than coal price. Especially, lignite price has almost been stable during years. It will be able to be understood why coal is more preferable in energy production, if it is taken into consideration that coal price is much less than natural gas cost. Leaving coal-fired thermal power plants, because of environmental pollution, for a country which has high-level lignite reserve, is as unreasonable as depending on an uncontrolled price formation while built gas-fired thermal power plant for a country which has not enough natural gas reserve. Dilemma in this example becomes more complex when all factors are handled together about thermal power plant management and its construction.

2.4 Research & development opportunities

The Thermal power plants, besides being the facilities producing electricity, are one of the towering sectors in the world with the technologies they have. Countries positioning their research and development strategies in the thermal power plant construction and formation frame work in a right way derives revenue by selling the know how knowledge they got to other countries. In this framework, countries sometimes pioneer various thermal power plant investments for creating research and development opportunities and bringing the related technologies in their countries or they prompt the related field by making required arrangements related with decisions of thermal power plant type in their countries.

Nuclear Power plant is in the position of an important laboratory especially for the countries wanting to own nuclear technology. Up until now, many countries utilize the nuclear power plants as a device for the studies of developing nuclear technology or they swell the number of them.

Countries that can observe the future in a right way, namely the ones having vision, seriously make investments to research and development activities on types of thermal power plants, moreover they try to switch the energy production in their countries to the stated technology in spite of the potential damage risks. One of the most important sample of this is Spain. In Spain, among the towering leaders in renewable energy field, important

studies are made especially in solar energy field. Forasmuch as, Spain is in the position of an important producer and exporter country in photovoltaic industry.

At the root of this success of Spain, there is its displaying the special importance it gave to renewable energy sources with Renewable Energy Plan considering the period between 2005-2010 as a government policy and paving the way of research and development activities by switching solar thermal power plants. In accordance with Renewable Energy Plan big importance is given to developing photovoltaic batteries and also producing energy with this way. According to this plan, supporting R&D activities that develop the evolution, producing, trading and setting periods of photovoltaic battery technologies is decided. Spanish government gives the purchase guaranty of the electricity produced from the renewable energy sources and subsidizes in system installations.

Another field in which research and development studies gain speed is also wind power based thermal power plants. Germany, a world leader in wind energy, belongs to approximately one -third of total production capacity of the world. Australia, Canada, China, France, India, Italy, Philippines, Poland, Turkey, England, and USA can be showed as the other countries that can lead utilizing the wind power in the world.

### 3. Investment, operating and supporting costs

We tried to examine the factors affecting the decisions on thermal power plants: 'Government Policies and Preferences, Environmental Factors, Macroeconomic factors and Research and Development Opportunities'. Appearance of stated effects on financial side realize via costs.

These costs can be handled into three groups;

- Investment Costs
- Operating Costs
- Supporting Costs

Decision process on need of thermal power plants, type selection, establishment decision, managerial factors, etc. are carried on in financial framework over the three cost group stated above. Each cost factors are affected from the factors, details of which we expressed, and jointly make out a financial bill to decision makers. Figure 7 illustrates that in what kind of interaction the financial point of view in decision process is happened.

#### 3.1 Investment costs

Investment cost covers engineering, procurement, construction, transmission and capitalized financing costs within. Engineering, procurement and construction costs include preparing the project of the stated facility, providing required equipment and materials and all kind of costs related with construction activities following the decision of establishing thermal power plant. Type of thermal power plant is the basic phenomenon determining the capacity of cost item occurring from these three factors. In general, Nuclear power plant is the type of thermal power having the highest investment cost and respectively coal-fired, wind or solar and at last row gas-fired thermal power plants follow this. Moreover, increases in price of construction materials as iron and steel that show raw material and semi finished material features, increasing demands on machines and equipments used in electricity production facilities, increases in occupational wages and lack of educated manpower recently cause continuously increasing in these three costs.

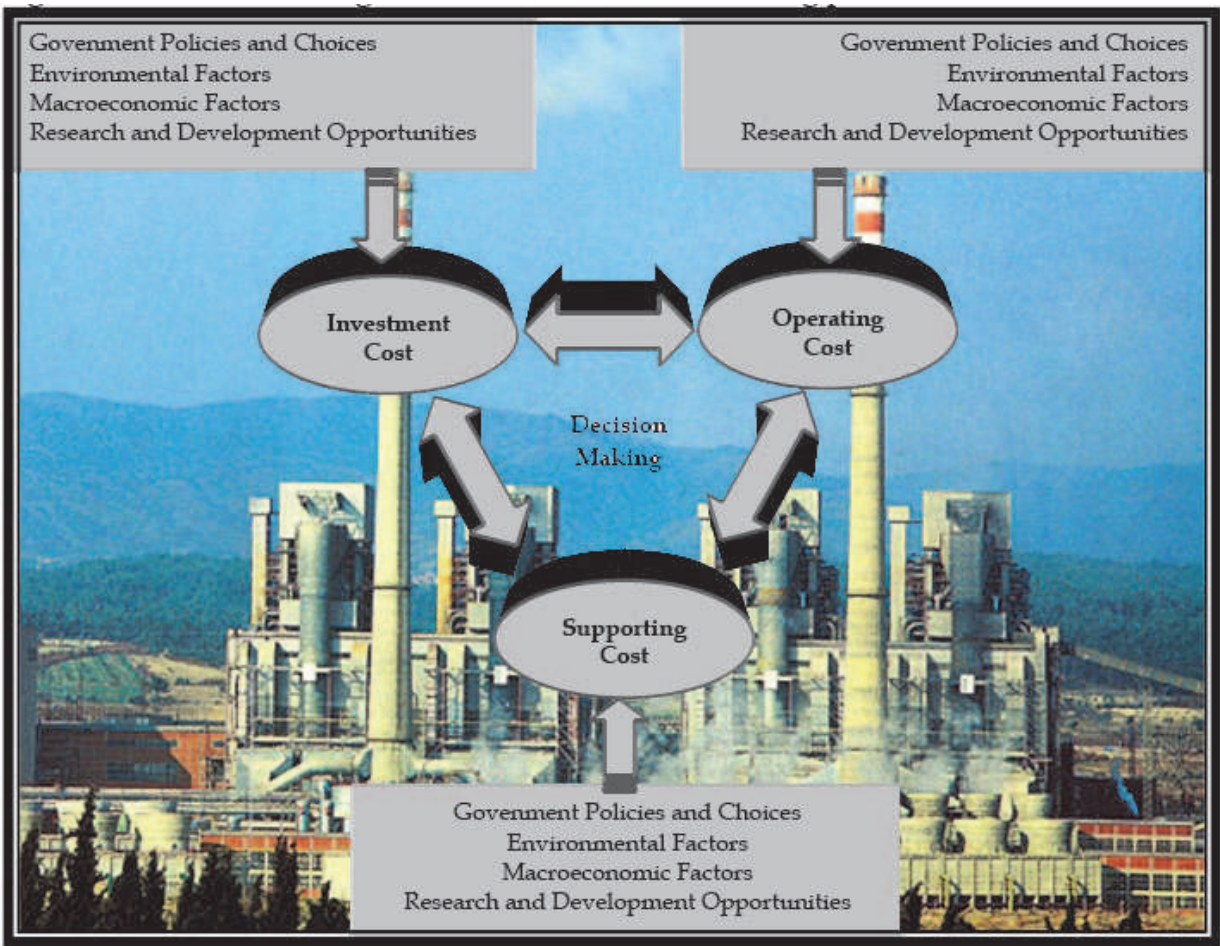


Fig. 7. Interaction diagram of decision making process

Transmission costs are obligatory investments of thermal power plant establisher in primary source supply and distribution of produced electricity framework. How to make the transmission especially in primary source supply framework must be meticulously appraised in feasibility studies. Namely, basic reason that the coal-fired thermal power plants are established close to coal mines, nuclear power plants are established in seaside and lakesides by reason of water need etc. is decreasing required transmission investment costs.

Financing costs endured for supply of required fund for establishing thermal power plant are included in investment cost by being capitalized in framework of feasibility studies. Interest and equity costs take place in it.

**3.2 Operating costs**

Operating costs consist of expenditures that thermal power plant endures in order to fulfill the main activity. Stated costs are grouped in themselves as direct labor cost, direct material cost, manufacturing overhead cost, marketing cost, and administrative cost. Direct labour cost includes the wages directly paid to working staff, direct material cost includes the expenditures for raw and semi-finished materials, manufacturing overhead cost includes

direct or indirect expenses on production. These three cost groups make the producer reach the unit production cost. In addition to this, as it can be understood from their names, marketing cost and administrative cost include the expenses on marketing and administrative functions. All costs can show fixed, variable or semi-variable features.

The most important cost item in operating costs of thermal power plants framework is the primary source of energy, in other words fuel expenses. Fuel expenses are in direct material costs. While the ratio of stated cost for thermal power plants using natural gas and fuel oil in the total operating cost is around ninety percent, this ratio is remained around at the level sixty per cent to seventies for coal-fired thermal power plants. There is no fuel cost in the thermal power plants using renewable energy such as hydraulic, solar and wind energy.

Fuel cost means charging the production cost of the primary energy source cumulatively into the production cost of thermal power plants. Namely, for example, the coal price of coal-fired thermal power plants using coal mine also includes expenses endured for removal of the coal from the mine. For this reason, thermal power plants highly depend on reserve status, manufacturing activity, price formations of the primary energy source.

### 3.3 Supporting costs

Among the factors affecting decisions on thermal power plants, costs formed depending on environmental, strategic, socio-political and socio-economic all kind of factors, not for the influence of affecting investment and operating costs, must be evaluated in this group.

Two above-mentioned groups are often introduced in thermal power plant decisions and supporting costs are ignored. Many cost-create events and elements as activities of environmentalists, revision of energy policy in view of natural disasters, building new facilities in order to induce to use clean coal because of environmental factors, supporting the R&D activities needed for developing an energy production technology that will be standing out in the future can be evaluated in supporting cost group. Two basic features of supporting costs can be mentioned: (1) These costs are generally invisible or less visible. In other words, it is difficult to take into an account, because it shows facility that can be calculated depending on several possible scenarios. Therefore, the effectiveness of the energy sector could be increased if they could be planned before they occur. For example; when it is started to establish coal-fired thermal power plants, in what extend is it thought to meet with Kyoto Protocol? (2) These costs can show a negative or a positive feature for the countries. In other words, it can turn into sunk cost according to the way of occurring the event and it can create yields. Spain's research & development costs spent for departure of solar thermal power plants, has not been sunk costs and started to turn into yields within the framework of exports. For this reason, all possible event that can occur while decisions of thermal power plants are being financially evaluated should be analyzed.

## 4. Long-term supply contracts

The construction decisions of thermal power are taken in the frame of strategic plans and long-term supply contracts made between primary energy source producers and thermal power plant operators. The main reason for this is that each one of them wants to minimize

risks depending on fluctuations in the spot market (Joskow, 1987, 1988, 1990; Williamson, 2000).

If the members of long-term supply contracts are both state-owned companies, occurred disagreements between these companies can be settled according to directives of the authority. In this sense the contract price cannot reflect world prices. However, potential private investors seek a contract with powerful sanctions and governance mechanism for the exchange (Uner et al., 2008).

Here, we will try to search the answer of the question 'What kind of a long-term supply contract should be made between thermal power plant and the primary energy source, in condition of the fuel supplier?' Each of following sub-sections briefly describes the parts are to be included in long-term supply contracts.

#### **4.1 Maturity of contract and suspensory conditions**

Maturity of supply contracts can be formed as 5 years, 10 years and multiplies of them. However, because the supply contracts cover long periods, many substances taken place in the contract show revisable qualifications. The basic element is that the number of factors which may be needed to be revised will also increase in parallel with prolongation of the maturity of the contract. Because the longer-term increases uncertainties about the future, which increases the number of condition and requirement in making the value chain reached at an optimum level the framework of increasing the number of terms and conditions.

Depending on prolongation of supply contract, transforming many factors into revisable form is not an desired condition. The main reason for this is the paradox of making political risks increased, despite the minimization of operational risks increased. Also, increase in revisable factors will increase the numbers of correction and/or adaptation transactions. In the long term, each correction and adaptation work can have possible negotiation request its train. Negotiations are source of political risks and they prevent the job from being done in a systematically continuous way. For this reason, determination of maturity for long-term supply contracts takes place at the beginning of the most important decision items. It is desired in maturity decision that contracts which do not create political risks in parties, do not have any revisable factors more than required and take into consideration the possible stability period on market in which the transactions will be realized.

"First delivery date" taking place in the parts on long term supply contracts is accepted as maturity beginning of the contract. So, signing date expresses the starting point of the "first delivery date" in association of activities with maturity framework while giving effect to the contract in legal framework. Occations in which induring of contracts clauses are subjected are described as suspensory conditions. Betrayed obligation belonged to parties within the context of contracts should be fulfilled in the whole suspensory conditions as of the singing date. In other words, parties, must provide the conditions presented as suspensory conditions ,during the contract. Suspensory conditions determined for seller exposes the qualification criteria of the seller for works and products.

Suspensory conditions determined for purchaser are formed especially according to the using aim of primary energy source mentioned in the contract. Such that, at the same time,

for what the fuel is bought by purchaser, in which test and how it will be used and what kind of production process will it be met from the criteria that the purchaser must have. The importance of the suspensory conditions that will be exposed for purchaser is that supply contract is signable before start of the work. Thus, that the work for which fuel will be used as raw material have high operating leverage makes necessary to produce solution for supply trouble before facility construction of the purchaser. Hence, purchaser is responsible for the facility that he will establish because he is to determine "the first delivery date" following the signing of the contract.

#### **4.2 Sale and purchase obligations**

Determination of moral rules of commercial processes in long term supply contracts is necessary to make supply relationship effective in long term. While responsibilities evaluated in Sale and Purchase Obligations concepts framework regulate alternative supply resources, using fields of the subject product of commercial processing and similar subject for purchaser; for seller, they regulate the points as stock control, supply mechanism.

Minimization of the operational risk possessed by continual production activity presents importance in long term supply contracts. According to this, enterprise which will use its fuel as a raw material will need continuousness of input to provide continuity in production. For this reason, the purchaser's amount of input stock must be followable for seller, deliveries and supply contact network must be processed according to purchaser's stock. Long term supply contracts must guarantee the fuel need of purchaser. Especially, if fuel supply cannot be realized due to the negativenesses occurring except force majeure, providing the short term need of purchaser is needed. Stated necessity makes defraying the loss and similar arrangements obligatory.

#### **4.3 Amount and delivery of fuel**

Amount of related fuel is called contract amount in long term supply contracts. Naturally, contract amount forms the important part of supply contracts.

Contract amount expresses total amount of fuel supplied during a whole working year. Calendar of working year can be determined either standard 12 months or less than 12 months. Hence, the amount of contract amount per a month is accepted as "planned amount-PM". So, contract amount is the main factor for determination of delivered fuel amount. Such that, contract amount is stable factor especially in planning the monthly deserving. In this context, in order to protect the parties' obligations, contract amount and planned amount do not change. In other words, amount of fuel supplied during the working year cannot be less than contract amount.

#### **4.4 Fuel quality**

Clearly expressing the quality of fuel introduced in long term supply contract as well as maturity and pricing one of the most important factors of the contract.

Defining the quality factor as gaps instead of a clear definition make the effective practice of the contract possible. For example, three gaps can be determined for coal according to calorie value. From higher to lower, these can be described as (1) Incitement, (2) Normal, (3) Discount. Price is not revised in normal gap. It is increased in incitement gap (Premium);

it is decreased in discount gap (fine). Thanks to this, an mutually acceptable price fixing for purchaser and seller is created.

#### **4.5 Fuel price**

The most importing issue in the long-term supply contracts is pricing. Pricing can be done by using three approach, called: cost approach, market approach and income approach.

The necessity of certainly reflecting the production costs of the enterprise that produce the primary energy source to the price is the thing wanted to express by cost approach. It is reached to this price as a result of profit margin that will be included at the base price by using of income approach. Base price shows a price feature that can be fixed according to conjectural movements in the market and in this framework, it forms the beginning period price of the contract. Besides, it is corrected in the periods determined in the contract and correction is realized in market approach framework. At the base of the market approach, prices of all fuels that can be equal to the stated fuel and all other macroeconomic factors can be evaluated in correction of base price.

#### **4.6 Payments and collections**

It is the part of long term supply contracts that organizes the decisions practiced by both parties as purchaser and seller. Delivering of the fuel in delivery point and doing the quality measurements make data flow obligatory together. So, preparing the bills show that the parties fulfil the obligations mutually in the consequence of the processes is highly important to provide this data flow.

Generally, Purchaser is obliged to advance money to the seller in exchange for specific ratio of the fuel and /or show bank guaranty. By way of requital, seller is obliged to deliver the fuel promised to the purchaser and document the process. After fulfilling the mutual obligations and finishing the contract, seller are to give the advance taken from purchaser and bank guaranty back.

#### **4.7 Force majeure**

The most important feature of long term contracts is that each clause is adjudicated in usual, considerable conditions. Howsoever, realization of the activities and contracts planned in long term has risks within, initially political risk, as is due the structure of long term contracts, these risks are wanted to be lowered to minimal level.

Force majeure concept is one of the main concepts of law and practice of it is seen in all branches of law. Force majeure is an extraordinary, incidental event, fact, condition that blocks the fulfilment of a responsibility partly or entirely, permanently or temporarily, due to this feature cancelling or delaying the responsibility its fulfilment and maturity or changing the feature of the responsibility, unexpected and unpredictable; even if expected or predicted, that cannot be blocked. Even if in long term supply contracts precautions are taken for the risks that are possible to come across depending on ordinary conditions, it is possible to come across with extraordinary conditions.

### **5. Conclusion**

Thermal power plants are the masterpieces realizing the production of electricity, sine qua non need of our world. The common aim embraced by everyone is preferring thermal

power plants realizing the clearest production. However, various factors sometimes militate and they conduct the decision making process on thermal power plants contrary to the environmental sensations. It is needed to look the picture with a financial point of view to understand the reasons of this.

Nearly all of the decisions on type and administration of thermal power plants are made on gathering at the cost base in other words; at finance base. Therefore, it is needed to manage the factors affecting decision-making process for clearer electricity production, transform the supportive costs into investments that can create yields.

## 6. Acknowledgment

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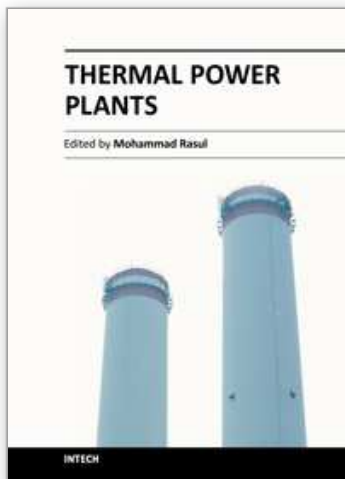
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Thermal power plants are one of the most important process industries for engineering professionals. Over the past few decades, the power sector has been facing a number of critical issues. However, the most fundamental challenge is meeting the growing power demand in sustainable and efficient ways. Practicing power plant engineers not only look after operation and maintenance of the plant, but also look after a range of activities, including research and development, starting from power generation, to environmental assessment of power plants. The book *Thermal Power Plants* covers features, operational issues, advantages, and limitations of power plants, as well as benefits of renewable power generation. It also introduces thermal performance analysis, fuel combustion issues, performance monitoring and modelling, plants health monitoring, including component fault diagnosis and prognosis, functional analysis, economics of plant operation and maintenance, and environmental aspects. This book addresses several issues related to both coal fired and gas turbine power plants. The book is suitable for both undergraduate and research for higher degree students, and of course, for practicing power plant engineers.

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