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“Energy sources as an economic problem”

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1 Introduction

“More than ever energy dictates our lives. Once viewed as a utility, an enabler with limited consumer interest, energy is now the key word in our struggle for a sustainable future... The need for sustainability has turned energy into a highly relevant product, even approximating a lifestyle item. It is fair to state that when it comes to energy, we are indisputably experiencing a big shift in value perception, stretching far further than just utilitarian or even economical value.”

- Sam Collot d’Escury (Dorsman, Simpson & Westerman, 2013, v)

The current Bachelor thesis has focused on contributing to a better understanding of how important the energy sources are for the global economy. It also refers to the role of the power sources in economic development and their influence on financial markets. The centerpiece of this thesis is to give an introduction to a variety of public conceptions of the so-called “energy problem” and to review different popular energy policies. The paper analyzes these problems and policies with the help of past and present world energy supply and demand patterns, showing that the lack of power or the inappropriate energy management programs could lead to economic problems, which may sometimes have devastating results.

The thesis is organized as follows. The definition of energy sources is presented at the beginning of this paper. Afterwards some examples for energy sources are discussed. The third section explains the important role of the energy commodities and resources in economic development. Section four gives a short description of the term energy policy and shows the link between energy and economics. Energy planning models such as decentralization, centralization, top-down and bottom-up model are pointed out and analyzed in this segment of the current paper. The benefits and disadvantages of privatization are discussed in the next chapter. Historical examples are provided in this part of the thesis. Section six outlines liberalization of a country’s energy sector as a popular policy among both developed and developing countries. It analyzes pros and cons of the approach and reviews some examples. The conclusion summarizes the results and rounds of this thesis.

2 Definition and examples

In physical science, the term “energy” is defined as “capability to do work”, e.g. change in position, speed, state, or heating material. There are many forms of energy – kinetic, mechanical, nuclear, electric, etc. All of them are well used and studied by humanity nowadays because with their help everyday life is easier, they give greater comfort. Every single machine needs some kind of energy source in order to perform, e.g. electricity, gas, coal. Another thing, the human body itself needs power so that it could function properly. Water and food can also be described as an energy provider for human muscular efforts (Travis et al. 2011, URL 6). History shows us, that since ancient time people have been cultivating plants and animals in order to eat them and therefore gain power. Slavery could also be distinguished as one of the oldest energy sources known to mankind.

The inanimate energy sources are more efficient and productive than the animated ones. For example, some scientists state that wood is one of the most important industrial fuel sources. It played its role in the past as a fuel for heating and illumination. But even nowadays some households still use it as main energy source (Griffin et al. 1980, page 2).

Wind was always energy “spring” for sea transportation. Despite the fact that ships today use oil engines, there are many stories where the engine of a ship breaks down or the tank is empty and in order to sail further the sailors are forced to use wind energy as this kind of power is unlimited. Though it also has its disadvantages - wind is not constant, which makes it in some cases inefficient (Geoghean 2012, URL 3).

Another power source is water. Being used prior to the period of industrialization, it is also being widely utilized nowadays to generate electricity. However, during the Industrial Revolution the production rose strongly, thus the demand for steam power also rocketed and coal was named to be one of the biggest energy suppliers.

Nature gas and crude oil played their huge part in human history as well (Griffin et al. 1980, page 4). Today, known as our primary energy source, these nature products help humanity in everyday life (Storey 2002, URL 5).

Another example for energy source is nuclear power. The uranium fuel in the reactor creates electricity for more than 20% of the world's demand, making it one of the most useful ways to satisfy the earth population's electricity needs (Aman 2008, Pages 2-3).

These are just some of the most famous and worldwide acknowledged energy sources. Scientists work very hard in order to discover new and better power sources for mankind to use, because some of the earth's resources, which are limited, will at some point vanish or they will be so expensive that it would be a luxury to operate with them, e.g. petroleum, gas, oil. This is why alternatives, such as wind, hydro and solar energy are being constantly researched. The ultimate goal for satisfying the high power demand of the 21st century is an energy source, which can be relied on.

3 Energy sources and their role in economic development

The energetic sector takes key place in the economic development of every country. The energy needs to be available continuously and in adequate amounts, affordable and environmental friendly. Nowadays, for most of the earth's population, life without it is unthinkable (Blum et al 2012, page 3).

There is also another explanation for "energy" on which this thesis paper will concentrate. In the economic terminology "energy" also means all the energy commodities and resources that include significant amounts of physical energy and hence offer work abilities. Examples for energy commodities are coal, natural gas, benzene fuel, etc. With their help it is possible to heat water, cook, drive a car and etc. (Sweeny 2001) As we can see the study of physics is not the only one which deals with the "energy issues". Many other questions must be answered in order to determine the efficiency of an energy source. The study of economics observe matters such as safety precautions needs, transportation costs, cost of utilizing fuel, storage expenses, initial investment and other factors. Productiveness of an energy source is determined by the amount of energy that is produced, but it is also very important how much of that energy could be absorbed, used and turned into energy services for human activities (Grönross et al. 2004, pages 414-423).

4 Energy policy

The keywords for the term “energy policy” are security, independence and sustainability. Every household and firm buys or produces their own energy. They all participate in global economy and they have to worry about their energy independence, about insuring their own sustainable energy source. Hence the economical problems arise. Every energy consumer has to face them and create his own energy policy. He has to improve and adjust it to the everyday change in markets.

A country’s energy policy depends on long-term energy investment decisions, resource depletion, necessary concern about environment and how developed the energy technologies in the state are. As we can see the sectors of energy, economy and environment in a country “interact” with each other in order to determine the best policy. Macroeconomics uncertainties and changing the government policy are making energy sector decisions harder. The study of mathematics has found wide application in this area lately. It “assists” the energy policy modelers and helps them clarify some of these uncertainties and changes (Pandey 2001, page 101).

Though many countries use similar energy policies, they still differ from each other. It is not very simple to create a solid energy state policy and it is also a tough job to copy one. Nowadays developing countries are trying to follow the model of the developed ones. The increasing attempts of technology transfer, fuel imports and move towards less-regulated energy markets are examples which prove that point. But these countries, e.g. Bulgaria, Mexico, Turkey, Egypt (according to AMS American Mathematical Society 2013) etc. encounter another type of problems. They are characterized by poverty, social inequity, economic and technological barriers or sometimes radical nature of the government policy (Abdalla 1994, pages 29-36). Therefore every country has to choose its policy wisely. Each model has its own aspects of policy priorities which have to be followed.

4.1 Decentralized energy planning

In general decentralized energy is produced close to where it will be used. These days there is a great number of rural areas in many countries which remain remote. It has been suggested certain options for decentralized energy planning as economically essential propositions for such areas.

4.1.1 Decentralized vs. centralized energy planning

Bottom-up modeling frameworks for assessing electricity demand and evaluating supply options for decentralized village electrification have already been discussed by Banerjee et al. (2000) and Pandey et al. (2000). Despite having analyzed these options as a single matter modelers have not assessed them together with centralized supply options in energy policy models. To make a decision on whether centralized or decentralized energy planning is more adequate for a particular region is both - an issue of utmost importance and an essential policy concern. There is general agreement that a complete framework for energy policy analysis should involve centralized planning options as well as decentralized ones. Modeling of demand distribution, remoteness of area as an economic issue, dispersed availability of resources like biomass, specific requirements of decentralized technological systems like local maintenance support and locally sustainable fuel supply is really significant for objective correlation of decentralized options to the centralized ones.

Many remote regions, being rural, are experiencing transition from traditional to contemporary life style. Thus modeling of transition dynamics turns out to be also important for evaluating long-term patterns of demand and supply for decentralized energy planning (Pandey 2001).

4.1.2 South stream and Nabucco

A few years ago a big problem in Europe arose, because of the fact that a very large part of European gas supply comes from Russia. The Russian gas pipeline delivers the fossil fuel through Ukraine and there is so called transition tax. As a result of this tax Ukraine engaged in an argument with Russia. The fuel supply was cut off by the Ukrainians causing a large gas deficiency in Europe. During the clarification of the dispute, the countries in Europe started the

establishment of two drafts – Nabucco and South stream. They did not want to depend only on one gas pipeline (Russia as a main gas supplier) and wanted diversification of this energy source.

Nabucco is the name of a future pipeline that will deliver gas from the eastern border of Turkey to Austria through Bulgaria, Romania and Hungary. The pipeline will have a total length of 3900 km and the planned annual capacity is 16 billion cubic meters of gas (Karadjinov 2011, URL 4).

South stream represents a Russian - Italian project for a gas pipeline, which will transport gas from Russia to Bulgaria (through the Black sea) and from that point on to Austria (through Serbia, Hungary and Slovenia or Italy (through Greece). The length of the pipeline is planned to be 900 km (BBC News 2006, URL 1).

There are still some economical and political issues which have to be discussed in order to invest in one or both projects. For Europe and especially for the developing countries on the Balkan Peninsula launching of at least one of the projects will mean “higher” energy independence and therefore economic stability. The new pipelines will minimize the transportation costs of gas and the decentralization of the energy source could also bring more energy security in Europe. Problems like the “transition costs argument” will be less possible to occur.

4.2 Integration of top-down and bottom-up paradigms

Bottom-up essentially means that the small or subordinate units progress into a larger or more important unit, as in an organization. Top-down is the opposite of bottom-up and is described as the process that progress from a large, basic unit to a smaller subunit.

Having unique strong points top-down and bottom-up modeling approaches can give an answer to different types of policy questions. Bottom-up models are well equipped to estimate involvement of certain policy options for technology mix, fuel mix logistic sand emissions in the energy sector or coal sector. According to Kydes et al. (1995) bottom-up models are able to give a detailed presentation of energy supply processes, conversion technologies and end-use demand patterns owing to explicit absence of activities external to the energy sector. On the other hand, top-down models throw a light on energy policy questions referring to implications for macroeconomic indicators and economy-wide emissions, due to their explicit inclusion of inter-

linkages between energy sector and the rest of the economy. In other studies (Zhang and Folmer, 1998, pages 101-120) different bottom-up and top-down economic models have been discussed, most precisely in the context of carbon dioxide emissions mitigation.

Hence, a detailed energy policy research will require modeling of effects of short-term and micro-level improvement decisions in technologies and operational practices, effects of long-term policies referred to investments, market structures and technological development, and their feedback effects. As a whole, it is a necessity to achieve integration between both paradigms - top-down with its economic equilibrium character and bottom-up one with the optimization or accounting frameworks. Some attempts have been made for such integration - examples of these are studies of Wilson and Swisher (1993), Bohringer (1998), and Jacobsen (1998). Using MARKAL-MACRO Kypreos (1999) correlated a detailed bottom-up model to a macroeconomic growth model in order to analyze long-term energy policies for Switzerland. Bunn et al. (1997) have applied bottom-up optimization and top-down system dynamics methods as an adjunct to his analyses of various aspects of electricity privatization policy.

4.3 Energy policy of the developing countries

Understanding of the history and current trends of policy regime and social-economic dynamics in the developing countries contributes to understand their energy policy modeling concerns. Some modelers are of the opinion that equity of distribution and sustainability of resource use have to be the most important priorities for this type of countries, but looking back at the past, problems like long-term uncertainties in domestic policy regimes or on-going radical changes in market structure make pursuing those first concerns very hard (Pandey 2001).

Others think that following the models of the developed states is the right way for achieving the goals of the developing ones. Good examples are countries like India, Brazil and China. The growth of deregulation and privatization of their energy sectors leads to a significant increase in the inflow of foreign capital and ownership. Robust empirical affirmation shows that privatization increases profitability and efficiency in both competitive and monopolistic sectors (Sheshinski et al. 2003, pages 429–459).

4.3.1 Bottom-up and top-down models

Numerous future investment trajectories are in disposal of most developing countries so that to be able to choose from that one which can significantly change their long-term technology mix, fuel-mix and consumption pattern. In comparison to developed countries most of their investment decisions can be made before the stage of economy saturation. Their economies will continue to experience alterations in all industries for the next several decades. Policies concerning privatization, prices, taxes, trade norms, regulatory measures, R& D investments will affect significantly the consumption patterns in different end-use sectors and the competitiveness of various technologies over long-term period. Therefore, top-down modeling has been proven to be an apparent candidate for analyzing energy policies (Pandey 2001, pages 99-100).

Bottom-up models are also beneficial for developing countries. They can be used to assess and implement short to medium-term improvement options in technologies, fuels and operational practices. This is due to the availability of micro-level technology and operational options in almost any sector of these economies and the significant range they offer for improvements in energy efficiency and economic performance. It is not the same with developed economies where the rate of efficiency and capital investments has reached close to saturation levels. Accumulated over the years effect of multiple short-term investment decisions will have an impact on determining long-term profiles of technology-mix, fuel-mix and resource intensity. Thus there is an urgent need for coherence between short-term, micro-level decisions and long-term, macro-level policies. For example, the policy decisions of privatization and investments currently introduced in energy sector of India will concern other sectors' investments and prices (supply and demand) over short to medium-term. These alterations will definitely influence the energy sector - its demand patterns, prices and supply requirements. Such effects may have certain long-term implications like establishing of irreversible tendencies in consumption patterns and mixture of technologies in capital intensive industries like energy (Pandey 200, page 101)

5 Privatization

Privatization is a process that changes the possession of a business, agency, enterprise, public service or property from the public sector (government sector) to the private one (business, which operates for profit) or to non-profitable organizations. This term could also mean the government outsourcing of services to private companies (Chowdhury 2006). As we can see the word implies the definition – going private.

This could happen in three different ways. The first method is privatizing through direct sale of shares. State or municipal authorities may sell the whole or just a part of the object. Selling a part of the shares means that the government retains the ability to either participate in the management of the organization (possession of less than 51%) or to manage it (possession of at least 51%). This type of privatization usually happens at auctions. Another famous method is selling shares on the stock market. That way the enterprise can obtain numerous smallholders. So called voucher privatization is also a well-known type of privatization. In this version the government distributes shares of ownership among all citizens (Sheshinski et al. 2003, page 431).

5.1 Advantages and disadvantages

There are different opinions among economists about the advantages and disadvantages of privatization and also about the process itself. Every denationalization method has its own weak point, as a whole there is no “best privatization way”. A good example of that is the former communist country Bulgaria. In the 90-es of the 20th century voucher privatization occurred. Unfortunately because of the high corruption level in the country, the citizens couldn’t use their vouchers properly, which leads to a monopoly in most of the sectors. Bulgaria lost its stability in the energy sector, which resulted negatively in the economic power of the country (Katchanovski 2000, pages 55-81). Nowadays achieving energy independence is one of the main goals of Bulgarian government.

Though privatization is a widely used method, it is clearly not a certain solution to the “energy problem”. The most emphasized advantages are the higher efficiency of the private sector, the

higher productivity and hence higher competitiveness, more foreign investment (which could lead to a faster technological progress) and higher utilization of resources. Price increase in the long term, creating oligopolistic and monopolistic situations and the total loss of government control over resources could lead to inability to satisfy the basic needs of the population. These can be specified as disadvantages of denationalization (Friedman 2000, pages 1-3).

5.2 Examples of energy source privatization

History shows that the formerly-state owned energy companies have been among the largest of companies to be privatized. Some of the world's petroleum "giants" have been partly denationalized, e.g. British Petroleum, British Gas, Elf Aquitaine (France), ENI (Italy), Petro Canada, Repsol (Spain), and TOTAL (France). Other large petroleum companies from the former Soviet Union and Latin America have also turned private, which led to big investments in the energy sectors of the states. That move, made by the governments of those countries diminished the public ownership and control of the companies and increased the private ownership and control, which, as we discussed, can be a double-edged sword.

5.2.1 Non-U.S. OECD petroleum companies

Privatization of the main oil companies located in countries-members of the Organization for Economic Cooperation and Development (OECD) has inflicted only small alterations in industry behaviour. Generally, OECD governments have supervised their nationalized petroleum companies much less compared to government in most other regions (Davis et al. 1996, page 5).

In spite of the fact that many of the OECD's petroleum giants have been publicly held until 1996, in many respects even such companies have operated nearly as autonomously as some of the world's privately-held petroleum companies. Thus the most prominent impact of privatization is probably the increased ownership level of several petroleum companies which are formerly-state run by foreign investors - mainly those from the United States. Many of these privatized petroleum companies with reduced government control may have freed management in order to focus on decisions affecting politics such as redirecting investment spending overseas,

and undertaking downsizing initiatives, especially where reductions in labor force have been recorded (Davis N. et al. 1996, page 5).

5.2.2 Petroleum in Latin America

According to Neal Davis et al. (1996) Latin America is a region of advancing exploration and development for U.S. energy companies. Despite the sweeping free market economic reform privatization of petroleum operations in Latin America has taken place. The privatization of a range of state-owned industries - from phone companies to natural gas and electric utilities, to petroleum companies has been of utmost significance to Latin American economic reforms. However, the routes for privatization have been different for any specific country of Latin America - for instance, Argentina and Mexico lying at both ends of the spectrum. At one extreme is Argentina totally privatized its formerly-state held petroleum company, YPF, and Mexico at the other end largely maintaining its state-held petroleum monopoly, Pemex, despite being more tolerant to foreign investors in Mexican petrochemicals. As a whole, privatization has provided more freedom for Latin American companies in their pursuit of joint ventures with foreign companies. It has also brought about a sudden increase in overall Latin American petroleum investment and could have led to taking over of some Latin American petroleum companies by foreign firms as well as the acquisition of foreign companies by some Latin American firms (Davis N. et al. 1996, page 6).

5.2.3 Eastern Europe and Socialist Asia

The regimes in most Communist and former-Communist countries warrant a need to rebuild their economies. Therefore, they are in a transition period at present since they start adopting different market reforms. Each regime has imposed its own specific petroleum privatization scheme, introducing structures to emerge for different industry and ownership (Davis N. et al. 1996, page 6).

Privatization in Russia has led to the outcomes as follows - the creation of a domestic and largely privately-run industry out of the former state-owned petroleum monopolies and the opening up of Russian petroleum to foreign investors.

Because of delays in the passage of a property rights law foreign investments in Russia had been long held back. Even after the legislation, the Oil and Gas Law, was enacted, there was still apprehension about the ability of Russian democracy and corresponding economic reform to survive, which continued to put on hold foreign investment. For example, in Caspian Sea area, where are Azerbaijan and Kazakhstan, in addition to Russia, an agreement on the route of an export pipeline was delayed as there were political differences among the countries involved. As a consequence billions of dollars in upstream investment in this region have been held up (Davis N. et al. 1996, page 6).

Privatization of petroleum in other eastern European countries has generally been a downstream affair. Except for Romania, Eastern Europe encourages petroleum production. Several eastern European nations have let foreign petroleum companies invest in petroleum refining and marketing operations. Chinese and Vietnamese communist governments are also trying to adjust to economic reform, although they are keeping a monopoly hold on political power. The reforms in China and Vietnam favor opening up areas for petroleum exploration whose access was previously restricted to foreign investment. Most of the resulting foreign participation in these countries is realized in the way of joint ventures and production-sharing agreements, whereas investment in petroleum exploration and development activity has not proceeded smoothly. Political uncertainties and legal difficulties remain the most serious obstacles to investment in these countries (Davis N. et al. 1996, page 6).

5.2.4 Coal privatization

The privatization of the coal industries in Germany and the United Kingdom has seriously influenced coal investment both in Europe and overseas. Due to the removal of coal subsidies (an act of privatization) by these two European countries their domestic coal industries have been constricted and billions of investment dollars have been redirected from coal operations in the United Kingdom and Germany to coal operations overseas. Australia and United States as well established producing countries have received large shares of this redirected investment capital. Others as Columbia and Venezuela with significant growth in coal production have shown a rise in foreign investment in domestic coal operations, as well. Undoubtedly this fact explains transformation of these nations into substantial coal explorers (Davis N. et al. 1996, page 7).

5.2.5 Global power privatization

Brazil, China, India and Indonesia are densely populated countries, which leads to enormous future power generation needs and respectively imposes investment demands beyond the financial means of domestic capital markets. In developing countries, privatization is the main cause for constructing new generating capacity and transmission lines. Foreign companies taking part in these privatization efforts come from different countries and represent various industries (Davis N. et al. 1996, page 6).

In Latin America, privatization of electricity generation facilities has occurred over a large area and among many people. The leading country in the privatization of electric power has been Argentina, which took the first place in petroleum, as well. Latin American electricity privatization has been primarily spurred by a rapid increase in electricity demand, combined with a shortage of domestic capital to meet future electric power generation investment needs. Privatization has led to the sale of power operations to investors (both foreign and domestic) and agreements to allow an increase in private investment (both and domestic) in new electric facilities. A number of U.S. electric utilities and some non-U.S. foreign utilities are considered to be prominent among foreign investors. Several petroleum companies have become a part of the Latin American electricity market. For Latin American nations, the privatization of electric utilities and that of natural gas exploration and development operations have strong relationships. The appearance of a regional natural gas transportation system is a determinative factor for the development of new natural gas-fired electricity generation units (Davis N. et al. 1996, page 7). As a result, many international petroleum companies (especially those with substantial share in natural gas production and transportation businesses) have directly incorporated themselves further downstream towards electricity generation in several Latin American countries.

Many developed countries have also privatized their electric power sectors. Australia and the United Kingdom have turned out to be the most remote areas where these privatizations occurred. As a result of privatization energy industries have developed and grown more integrated in both directions – vertically and horizontally. In the United Kingdom, the emergence of full service companies providing both power generation and distribution and natural gas

production and distribution has become a fact. Recently privatized water and electric utilities have been united in some cases. Another consequence of privatization has turned out to be the large-scale entry of foreign companies into these industries mainly through mergers and acquisitions. The most distinguished foreign investors for Australia and as well as the United Kingdom (UK) have been U.S. investors – namely U.S. electrical utilities (Davis N. et al. 1996, page 7)

5.3 Privatization as solution for the “energy problem”

As we can see Neal Davis (1996) has discussed the privatization of a country’s energy sector (petroleum, gas, electricity etc.) comprehensively. History shows that privatization could be a reliable economic concept for solving energy source problems such as monopoly in the energy sector, national security against arbitrary deprivation of energy supplies by foreign governments (Griffin et al. 1980, page 19) or raising the price of the crude oil. On the other hand there are also many modelers, scientists and doctors who oppose to that statement (Davis C. et al. 2012, URL 2). They believe that liberalization of the energy sector is the right economical “way” for achieving greater economical power.

6 Liberalization of the energy sector

“Liberalization leads to and consists of policies that reduce and/or remove tariff and non tariff barriers for the free exchange of goods” (Gairuzazmi 2012, page 285). It is a type of policy which could include the participation of foreign investors in the economy. There has been an argument lately about the static and dynamic gains from trade. It is said that because of them liberalization increases economic growth and improves welfare. Static gain could emerge from the cost reduction due to economies of scale, increased variety of the product, lower distortion from imperfect competition and efficiency gain from exploiting comparative advantage (Gairuzazmi 2012, page 285). The transfer and adoption of better management practices and energy-efficient technologies are known as the dynamic gains from trade (Gairuzazmi 2012, Page 286).

For more than ten years energy sector liberalization has been expanding worldwide in terms of scope and importance. Undoubtedly, it has affected greatly national governments and economies and energy companies.

6.1 The “California” example

However, the crisis erupted in California’s liberalization program definitely indicates the necessity for a review of liberalization process and progress. The California sample has been adopted in local formats by many countries, including Spain, due to the fact that it was proven to be the best example of liberalization. At present, some years after, the failure of this model casts doubts on reliability of theoretical samples applied to difficult economic realities. Its current problems warrant studying this case as the country has become a source of concern for many governments, regulatory bodies and power companies all over the world. The main characteristics of the California power deregulation involved a retail rate cap, mandatory use of the spot market, free choice of supplier and vertical de-integration of utility companies aimed at separating the traditional activities of power generation, transmission, distribution, and marketing. Apparently from March 1998 to May 2000 California’s new system seemed to work properly and adequately - this was a period with an excess power supply (Mossavar-Rahmani et al. 2001, page 4).

From the summer 2000 until now while the supply-demand balance broke down, wholesale electricity costs in the state reached record heights. Simultaneously it was recorded a decline in the available generation capacity leading to skyrocketing prices, shortages, and rolling black-outs. Until recently most Americans had never been familiar with the term “rolling black-out”. However, everybody in California knows it and lots of people in other U.S. regions have an apprehension about turning all this into a routine part of their own states, respectively their own life (Mossavar-Rahmani et al. 2001, pages 5-6). Moreover, due to the rate freeze and price caps, financial situation of some major California utilities got worse and they even faced bankruptcy. There is general agreement between experts that structural problems account for the California crisis. The following are claimed to be the most important (Mossavar-Rahmani et al. 2001, page 5):

- Lack of new generation capacity and facilities for natural gas and power transmission. The gap was brought about by environmental limitations, site approval procedures which were commonly long and complicated, and inadequate regulatory legislation that hinder investment.
- Due to the structure of the energy market companies were made to separate their activities and to be deprived of generation plants, hence weakening their business structure.
- A system of price caps was served as prevention from normal market mechanisms - for instance, a demand response mechanism to price increases - from operating.

Even in the case of taking into consideration the events in one particular corner of the world, the larger issues that are raised by liberalization should not be forgotten. Companies and their shareholders risk investing in new infra-structure and production plants as energy markets are still developing. The renovation and efficiency of existing energy facilities need to be ensured and require large investments. This could happen only in the presence of a close, flexible relationship between companies, financial institutions, and capital markets (Mossavar-Rahmani et al. 2001, page 5).

6.2 Liberalization of the energy sector - advantages and disadvantages

Discussing the advantages of the free market, there should not be an underestimation of the fact that governments and regulators have been greatly reluctant to give freer rein to markets and their agents. Actually, they often try to direct the market by forcing upon price and supply policies, controlling investment, employment and diversification strategy (Mossavar-Rahmani et al. 2001, page 6). Such behaviour enhances regulatory-induced risk and reduces the opportunities for developing financially viable projects. To sum up, as liberalization is a global process it is worth mentioning the following valuable lessons from the California crisis (Mossavar-Rahmani et al. 2001, page 6):

- It is vitally important to create truly open markets, where operators and agents may trade freely.
- Retaining the vertical integration of companies is of great necessity in order to limit transaction costs, provide risk coverage and optimize investment.
- The construction of new facilities should be based on better coordination between companies and government agencies and the time involved in granting permits should be shortened.
- A sufficient return on their investments must be received by operators in a deregulated market.
- Freedom for market forces is required so that end-users should be charged realistic prices.

However, there is one clear lesson to bear in mind from government intervention in markets. Undoubtedly, excessive regulatory intrusion may provoke tightness in the energy market and therefore inevitable detriment of consumers.

7 Conclusion

This thesis studied the role of energy sources in global economy. Some scientists state that energy is essential to mankind and equally important as food and water. The fact that the major traditional energy sources are a finite constant and at last they will be depleted turns energy production, delivery and trade into a global economic problem. There are different types of energy policies and they all have advantages and disadvantages. The “perfect” method for increasing energy security, efficiency and independence has not been found yet.

History shows us that economically complicated energy issues and difficulties can be surmounted with the help of liberalization or privatization of the energy sector, decentralized or centralized energy planning and top-down or bottom-up models. Many factors could influence the policy approach of a country (economical situation in the country, geographical location of the country and politics of the country) and this is why every state decides on its own which strategy to rely on. Last but not least, we, people, ought to act responsively and do our best to help solve this global economic issue.

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