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LEAST-COST POLICY STRATEGIES FOR CO₂-REDUCTION IN PASSENGER CAR TRANSPORT: LESSONS FROM EUROPE FOR EMERGING COUNTRIES

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ABSTRACT

Emerging countries currently have the highest growth rates in transport energy consumption and straightforward greenhouse gas emissions. In recent years many policy approaches in EU countries have been implemented to cope with problems in transport sector. The core objective of this paper is to derive lessons learned from different EU policies for road passenger transport which can also be implemented in emerging countries. Of high relevance in this context are especially the costs of measures to reduce GHG emissions from road passenger transport and how to derive a corresponding least-cost-portfolio of measures.

The major conclusions and recommendation for emerging countries based on analysis of European policies for road passenger transport are: (i) Improving energy efficiency is a very important measure but implemented alone it does not necessarily lead to an equivalent energy and CO₂ saving effect because rebound effect - people purchase larger cars and drive more; (ii)

The major recommendation is that standards have to be accompanied with fuel taxes to reduce km driven as well as with size-dependent registration taxes to limit the size of cars.

Keywords: road transport, emerging countries, policies, Europe, least-cost approach

1. INTRODUCTION

In most countries the transport sector is the major barrier for heading towards sustainable economies. In virtually all OECD and emerging countries greenhouse gas (GHG) emissions from transport have the highest growth rates among all sectors [1]. It is the only sector where world-wide energy consumption has doubled as well as GHG emissions [1]. Due to the IEA the largest share of this growth did take place in the non-OECD regions mainly in the emerging countries. Of specific relevance is this context is road transport which causes more than 90% of transport emissions in all countries.

Aside from GHG emissions other road transport related problems are energy supply security, air pollution, accidents and congestions. Some of these problems are especially expressed in urban areas.

The dynamics of these problems is actually much more pressing in emerging countries with rapidly growing economies, urbanization and corresponding rising need for transport. Currently, the situation with respect to motorization in these countries is quite different in comparison to Europe. With respect to emerging countries it is especially important to consider that a large

part of individual transport especially in Asian countries is also provided by two-wheelers, see Fig.1¹.

As Fig.1 depicts countries like Malaysia, Brazil, Mexico and Turkey are “leading” in this category with about 200 cars/capita (total: 300-500 road vehicles/capita) while the largest emerging economies China and India show only 20 cars/capita (total: about 80 - 100 road vehicles/capita). In the light of the looming increases to catch up with the Western “levels” it is extremely important for these countries to avoid the mistakes made in the OECD countries and to learn the lessons from implemented policies.

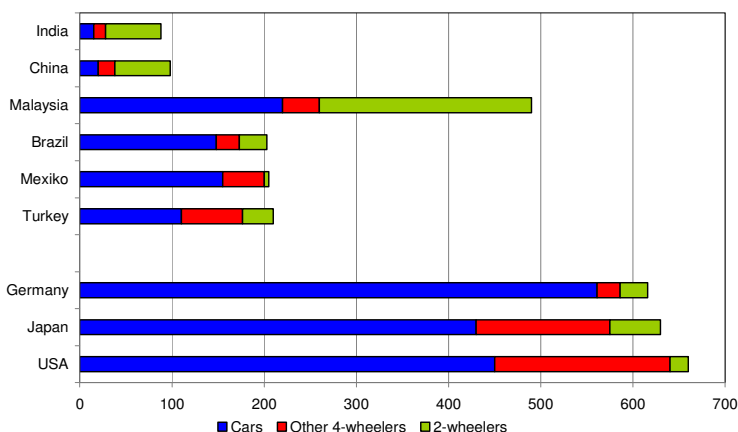


Fig. 1: Motorization in different OECD- and emerging countries (Road vehicles per capita) in 2007 (figures for India and Turkey estimated based on values from 2005) (Sources: [2-4])

¹ Two-wheelers have been discussed by Ajanovic/Dahl/Schipper [5], IEA [6] and Schipper et al. [7] and they are not focus of this paper. However, policies also have to take into account this aspect.

To cope with the problems mentioned above in almost all of these countries policy measures are implemented or at least thought about. Yet, so far the most comprehensive portfolios of policies have been implemented in Western European countries and to some extent in the USA and Canada. The most widely known categories of policies are standards (like the CAFE standards in the USA), promotion of biofuels (as in the USA, Brazil and Europe) and electric and fuel cell vehicles (as currently discussed in the USA, Europe and many other countries), fuel taxes (which were implemented already in the 1970s in Western Europe and by mid of the 1980s in Canada) and registration taxes (mainly in Denmark).

The core objective of this paper is to derive lessons learned from different EU policies for road passenger transport which can also be implemented in emerging countries. Of high relevance in this context are especially the costs of measures to reduce GHG emissions from road passenger transport and how to derive a corresponding least-cost-portfolio of measures². In this context it is also very important to consider the conceivable backlashes of policies e.g. the rebound-effect due to more efficient cars and resulting lower service prices.

2 METHOD OF APPROACH TO REDUCE CO₂ EMISSIONS

To get a reliable appraisal of the effect of different policy

² This work is based on the outcomes of the EU-funded project ALTER-MOTIVE, see Ajanovic et al. [8], and www.alter-motive.org.

measures on the CO₂ reduction it is very important to recognise what are the major factors that influence CO₂ emissions. Fig. 2 shows how CO₂ emissions in passenger car transport come about and how they can be reduced.

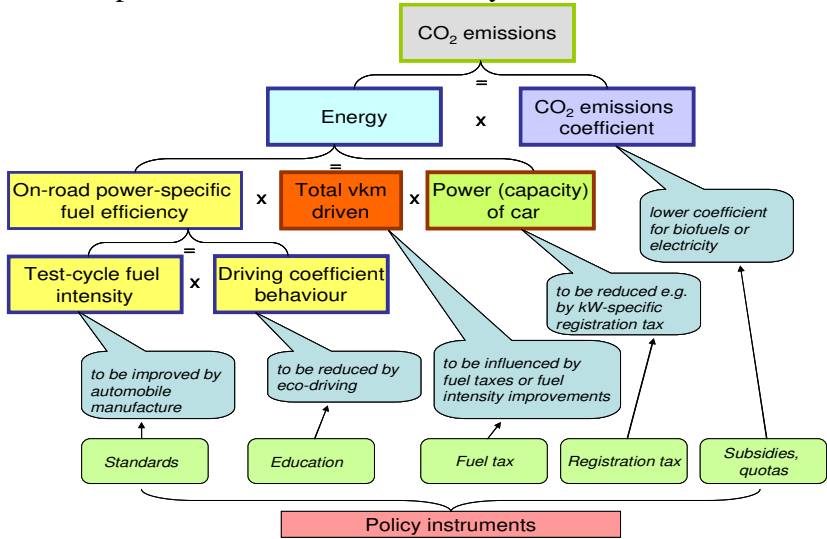


Figure 2. Impact factors on CO₂ emissions in the car passenger transport sector (Source: [8])

As discussed in Ajanovic et al. [8], CO₂ emissions from passenger car transport depend in principle on energy used for transport and the average specific CO₂ emissions coefficient of different fuels used. The coefficient f_{CO_2} can be improved, e.g. better quality of fossil fuels, better ecological performance of biofuels, more electricity from renewable energy sources.

CO₂ emissions EM_{CO_2} come about as follows:

$$EM_{CO_2} = vkm \cdot FI \cdot f_{CO_2} \quad (1)$$

With vkm is vehicle km driven, F is fuel intensity in litre per 100 km and f_{CO_2} are specific CO_2 emissions per litre fuel.

$$vkm = f(P_s, Y) \quad (2)$$

With P_s is service price and Y is income.

$$P_s = P_F FI \quad (3)$$

With P_F is fuel price.

Total energy consumption can be reduced by increasing on-road fuel efficiency (lower energy consumption per km driven and per kW), lower travel activity (less vkm driven) and smaller cars (less kW).

On-road power specific fuel efficiency is influenced by (theoretical) test-cycle fuel efficiency and the individual driving behaviour.

Note that different policies can have multiple and even contradicting impacts. Total vkm driven can be reduced by fuel taxes or increased by fuel intensity improvements due to the rebound as shown in Chapter 5.

Finally, the method of approach is based on calculation of total costs for society and resulting CO_2 reductions:

For taxes these costs are the welfare losses for society;

For the technologies we consider the additional investment costs of the technology and the energy cost reduction respectively the increased producer surplus if

the technology is produced in the region³;

For alternative fuels we have to consider the additional production costs minus the increased producer surplus if the technology is produced in the region.

For the last two categories it is also important to consider technological learning effects.

3 A SURVEY ON POLICY MEASURES

Policy measures implemented in transport sector could be put in three main categories:

Switch from fossil fuels to alternative fuels, in the first line to biofuels;

Improve efficiency of cars including switch to alternative and more efficient powertrains;

Reduce energy consumption with taxes and standards.

Switch

Currently most important alternative fuels are 1st generation biodiesel (BD-1) and bioethanol (BE-1). Although low, share of biofuels in total transport fuels demand is increasing all over the world mostly due to biofuels targets and different government incentive programs. Reason for this policy is the fact that biofuels have potential to contribute to replacing fossil fuels and reduce CO₂ emissions in transport sector. However, over the past decade, biofuels have been more expensive than fossil fuels and reduction of CO₂ emissions was moderate. Since the preferred feedstocks for current

³ It is assumed that 75% of the value chain of new technologies is produced within the EU countries and hence these additional costs are converted into producer surplus.

biofuels are corn, wheat, sugarcane, rapeseed, soybean and sunflowers, the very important issue is relation between biofuels production and increasing food prices see also [9].

Improve

To reduce energy consumption and at the same time CO₂ emissions, it is important to improve efficiency of conventional diesel and gasoline vehicles as well as to increase the number of alternative and more efficient powertrain systems (such as battery electric vehicles (BEV) and fuel cell vehicles (FCV)) in the total vehicle stock.

Hybrid internal combustion engine vehicles are an alternative with slightly higher costs but clearly better environmental performances than conventional vehicles. BEV and FCV have much better CO₂ balances than conventional cars if electricity and hydrogen are produced from renewable energy sources. However, these technologies are very expensive and not competitive on the market.

Reduce

Fiscal policies currently applied for conventional vehicles need to be distinguished between one time measures such as vehicle purchase tax (also called registration tax) and annually levied road taxes. Vehicle purchase taxes have proven to be influential on the magnitude of car sales and the consumer's choice for a certain model. Annual taxation schemes based on vehicle's CO₂ emissions (and the car footprint, not weight) are seen as a more direct way of influencing

consumer decisions. In this case, the limit needs to be defined for maximum allowed emissions level together with penalties that are imposed if the limit is exceeded. Favourable company car depreciation schemes do currently weaken the impact of purchase taxation schemes, therefore more personalized schemes targeting the behaviour of the individual motorist (e.g. incentivising reduction of kilometres driven per car through fuel taxation) are seen as the next step.

4 EU POLICIES

In this chapter we give a short introduction why it is relevant to learn from EU-countries.

In recent years in EU ambitious policies have been implemented in transport sector with the goal to move toward more sustainable transport system. Most important policies are:

Taxes related to fuels and vehicles

Standards

Subsidies and other support policies for alternative fuels and alternative automotive technologies.

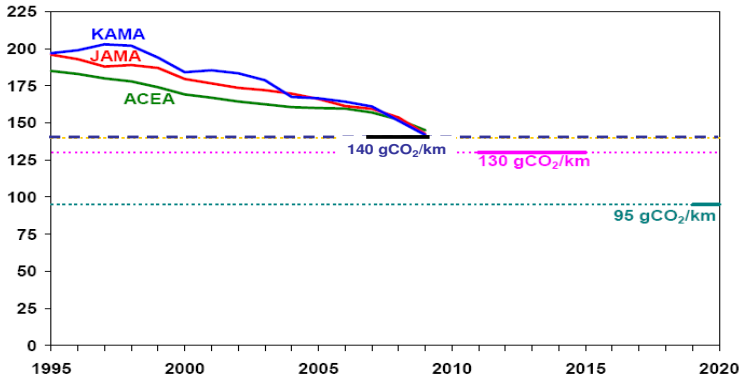


Figure 3. Evolution of CO₂ emissions from new passenger cars by association (adjusted for changes in the test cycle procedure) [11]

Tax

Fuel taxes in EU are the highest in the world. They are slightly different across EU countries. Tax on gasoline in EU countries is ranging from about 42% to 63% of the total gasoline price. The share of tax on diesel is ranging from 36% to 58% [10].

In most of EU countries a registration tax for vehicles is applied as well. This tax is paid once, by each vehicle owner, for each vehicle purchased and entered into service. The most of criterions for this tax are based on fuel consumption, on cylinder capacity, CO₂ emissions and price [10]. This tax is currently by far highest in Denmark.

Additionally there are also taxes on ownership. These taxes are paid annually, regardless of how often the vehicle is used. They are usually based on power (kW), cylinder capacity, CO₂ emissions, fuel consumption and weight.

Standards

The European Commission has designed a comprehensive strategy for reduction of average CO₂ emissions from new cars. The reduction of CO₂ emissions from new passenger cars is based on the voluntary commitments with the European, Japanese and Korean car manufacturer associations. The target for average CO₂ emissions from new car is 130 gCO₂ per km in period 2012-2015. Target for 2020 is 95 gCO₂ per km, see Fig. 3. The reduction of average CO₂ emissions from new cars can be achieved by means of improvements in vehicle motor technology (e.g. air-conditioning systems, pressure monitoring systems, etc.) as well as with the increased use of biofuels or electric vehicles powered by renewables.

Support policies for alternative fuels

For the currently in Europe not competitive biofuels tax exemptions are implemented and there is a binding target for Member States to achieve a 10% share of renewable energy in the transport sector by 2020 [12].

5 THE PROBLEMS OF STANDARDS

In spite of different implemented measures for the reduction of energy consumption in passenger car transport, energy consumption has been increasing, especially between 1990 and 2000. Fig. 4 depicts the development of vehicle km driven (10⁹ vkm), energy

consumption (PJ) and the fuel intensity (litre/100 km)⁴ of the stock of vehicles in EU-15 from 1990 to 2010. It can clearly be seen that fuel intensity has decreased continuously. However, this effect did not lead to significant energy conservation. Due to the fact that service demand, vkm, has increased almost continuously the over-all energy consumption just stagnated in last years.

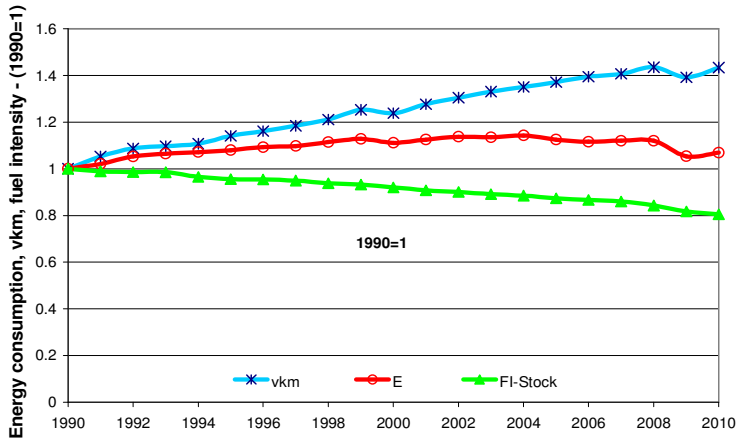


Figure 4. Normalised development (1990=1) of vehicle km driven (vkm), energy consumption (E) and fuel intensity (FI) of stock of vehicles in EU-15 from 1990 to 2010 [13]

However, in Fig. 4 fuel intensity (FI) does not reflect the real efficiency improvement because it is distorted by the switch to larger cars. To correct this we define a power-

⁴ Note, that litre refers to litre gasoline equivalent throughout the reminder of the paper.

specific fuel intensity (FIP), see also [13-14]:

$$FIP = \frac{FI}{kW} \quad (l/(km \text{ kW})) \quad (1)$$

kW....vehicle power.

It can clearly be seen from Fig. 5 that the decrease in FIP from 1990 to 2010 was virtually twice as high as the decrease of FI.

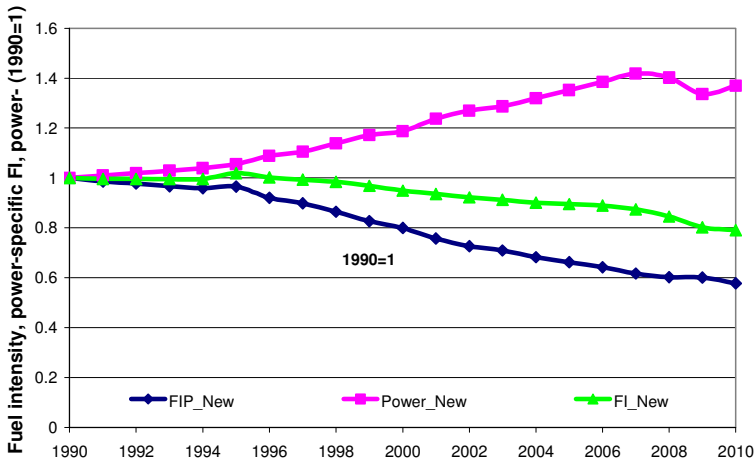


Figure 5. Normalised development (1990=1) of fuel intensity (FI), power-specific fuel intensity (FIP) and power of new vehicles in EU-15 from 1990 to 2010 [13]

A major problem recognised in EU countries is that despite better fuel efficiency energy consumption, as well

as CO₂ emissions, are in the best case stabilised. The fact is that better energy efficiency leads to higher service demand (e.g. more vkm, larger vehicles) whereby achieved energy savings due to better fuel efficiency are lower than theoretically it can be expected.

6 THE EFFECTS OF TAXES

There is often the argument that car drivers are not sensitive to fuel prices and hence taxes do not have an impact on fuel consumption and do not lead to fuel savings. There are at least two arguments against this statement:

Fuel demand in Europe is significantly lower than in the USA (where fuels are virtually not taxed);

Analyses by several authors in the literature show that price elasticity is in a range of

-0.3 to -0.6 leads to energy savings of 30% to 60% due to the introduction of a tax.

We think that these two arguments are sufficient to justify the introduction of a higher tax.

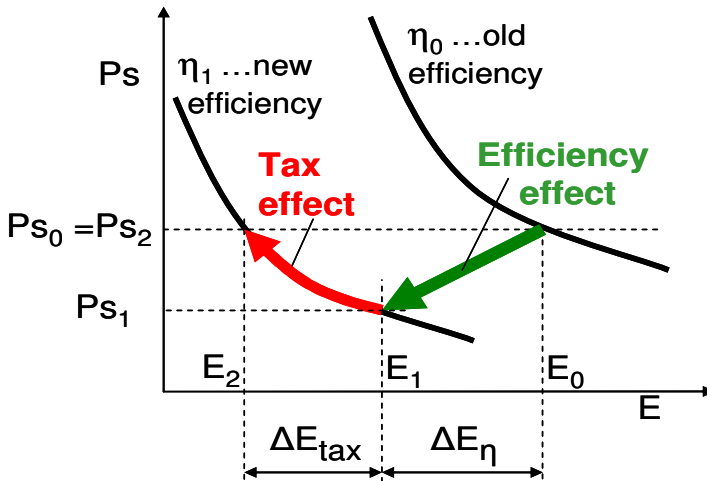
Yet, to provide sound evidence for the impact of price, income and fuel intensities (as a proxy for efficiency) in Europe we conducted econometric time series analyses, see [15].

We extracted a long-term price elasticity of about -0.42 for the service vehicle km driven. This result has the following implications:

If we improve the fuel intensity e.g. due to technical standards, the result is that the service price for vkm driven decreases and driving gets cheaper. Straightforward the price elasticity of -0.42 implies a so-

called rebound effect of 42%. That is to say, if efficiency is improved by 1% the number of km driven is enhanced by 0.42% and the remaining energy conservation effect is only 0.58% (see ΔE_η in Fig. 6)⁵.

This effect can be compensated more or less, by the simultaneous introduction of a fuel tax, as shown in Fig. 6. In this case the additional tax – increasing the price P_{s1} to P_{s2} for the service km driven – would fully compensate the rebound and for the owner of a new car the service price would remain the same ($P_{s2} = P_{s0}$).



⁵ Example: Assume FI of old car was 60 kWh/100 km. If it is improved by 10 % and we have initially 10000 km driven we calculate theoretical savings of $60/100 * 0.1 * 10000 = 600$ kWh. Yet, due to the rebound – now we drive 420 km ($=10000 * 0.42 * 0.1$) more, this is 10420 km – we now save only 348 kWh ($=58\%$ of 600 kWh).

Figure 6. How taxes and standards interact and how they can be implemented in a combined optimal way for society

7 WHICH MEASURES CONTRIBUTES TO CO₂ REDUCTION AND TO WHICH COSTS?

The portfolio of policy measures which can be implemented to reduce CO₂ emissions is very wide. However, the cost of implemented measures could be very different. For all countries but especially for emerging countries, it is important to identify least-cost policies.

The most important policy measures for the reduction of CO₂ emissions in passenger road transport are fuel taxes, standards, biofuels, registration tax and E-mobility. For the example of EU-15 with an appropriate mix of these measures in an ambitious policy scenario we can reduce CO₂ emissions in 2020 by about 100 million tons CO_{2eq}/year comparing to business as usual scenario, see also [16].

However, the crucial question is which price citizens have to pay for achieving these goals.

In the following we give a survey on the costs of various measures to head towards the least-cost approach. Fig. 7 shows the basic principle of the least-cost approach. The different measures are put in the least-cost order for achieving finally 100 million tons CO₂ reduction up to 2020 (about 20% compared to 2008).

The major result of this analysis is that the costs of taxes up to 36 million tons CO₂ reduction at a price of about 40

EUR/ton CO₂ are cheapest for society. Therefore reducing the vkm driven and valuing the corresponding welfare loss has the first priority. Next cheapest option is switch to biofuels first generation – biodiesel, bioethanol and biogas (BM). This implies that by 2020 biofuels save at least 70% CO₂ compared to fossil fuels. Based on this pre-condition the biofuels in our scenario save 28 million tons CO₂ at costs between 180 and 350 EUR/ton CO₂. Measures of technical efficiency improvements – starting with start/stop automatics, over electric power assistants (mild hybrids) to power splits (full hybrids) and efficiency improvements of the classical gasoline and diesel engine – are ranging from about 1000 to 1500 EUR/ton CO₂. The most expensive measures are to promote fuel cell cars and battery electric vehicles with saving costs above 2000 EUR/ton CO₂. This is the reason why neither BEV nor FCV show up in this figure for least-cost reduction of 100 million tons CO₂. Also BF 2nd generation are not among the least-cost solutions up to 2020 and do, hence, not show up in Fig. 7⁶.

⁶ For a more detailed description of our calculations see [16]

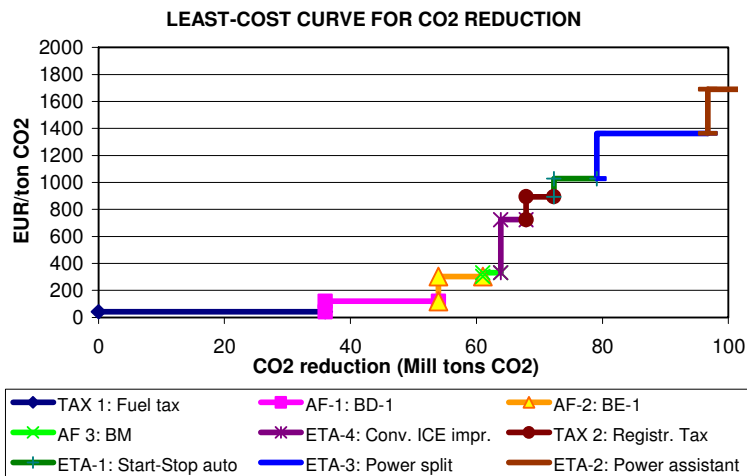


Figure 7. Least-cost curve for CO₂ reduction in passenger car transport in the EU-15 in 2010

8 CONCLUSIONS

The major conclusions from this analysis and the major recommendations for emerging countries regarding passenger car transport policies are:

Regarding electric vehicles and fuel cell cars in the next decade no CO₂ savings at reasonable costs for society will be achieved. If these vehicles might reach in a very optimistic scenario 1% market share by 2020 they will straightforward only contribute at the maximum in the same range to CO₂ reduction. This aspect applies in principle to all countries world-wide. Some reasonable niches where these new technologies can be applied are e.g. taxis in large cities;

The use of biofuels is strongly depending on the country-

specific circumstances and potentials and no general conclusions can be drawn. However, it is very important that biofuels production process is very effective and sustainable as well as that competition with food production is avoided;

Improving energy efficiency is a very important measure but implemented alone does not necessarily lead to an equivalent energy and CO₂ saving effect. We have seen this problem in recent years in passenger car transport from two major features: (i) Europeans purchased larger cars which reduced savings that were expected due to efficiency improvements by about half; (ii) Car owners increased vehicle km driven – to some extent due to lower service prices due to lower fuel intensity (as well as increase in income);

Therefore it is very important that standards are accompanied by taxes. It should be an additional focus on energy conservation by introducing fuel taxes to reduce km driven and by introducing size-dependent registration taxes to limit the size of cars;

There are also other important measures which were not part of this investigation such as changes in the modal split, switch to public and non-motorized transport and implement proper measures of spatial and urban planning.

Currently, standards and taxes are relatively cheap and in short-term effective measures for the reduction of CO₂ emissions. A simple but very important message is that if targets are set they have to be pursued very strictly and that continuous pressure is put on the involved stakeholders: international and national policy makers, car manufacturers and also the citizens regarding their

driving and car purchase behaviour.

Of course, in the long-term in every country only a very broad portfolio of policy instruments (taxes, standards, quotas, emissions free-zones...), new technologies (electric and fuel cell vehicles...) and alternative fuels (biofuels, hydrogen...) can reduce energy consumption and straightforward specific CO₂ emissions per km driven significantly.

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**KIZILLI SOLID WASTE SANITARY LANDFILL
SITE WILL BE TRANSFORMED INTO
ENVIRONMENTALLY SUSTAINABLE
IMPLEMENTATION**

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ABSTRACT

Antalya Metropolitan Municipality will build an integrated waste facility. In addition to actual units in Kızıllı Solid Waste Sanitary Landfill Site, waste parsing and recycling, compost, recycle, power plant facilities, solid waste sanitary landfill site, healthcare waste sterilization facility, waste batteries storage cell and gaseous of storage collector and recycling system will take place in the scope of “Integrated Waste Utilization, Recycling and Aside Facilities with Construction and Management of Sanitary Landfill”. After the facility is settled down in the 30 decares of 100 hectares land, organic wastes will be recycled in the compost, power plant and gaseous of storage collector and recycling system facilities. And also, recoverable wastes will be recycled in the waste parsing, recover and recycling facilities. After these processes, recoverable wastes will be used as packaging material again and will gain economic energy consumption and conservation of

naturel resources. And also, especially, recycling of vitreous and metallic wastes will prevent mining wastes for many packages that are not remanufactured. On the other hand, emission of CO₂ and other negative gases will decrease. Thus, it will reduce global warming and will effect positively on the environment.

Keywords: Waste, Recycling, Energy Conservation, Global Warming.

1- INTRODUCTION

Discarded by the manufacturer of the requested materials and waste must be disposed of in an orderly manner. With the Metropolitan Municipality Law, Municipality Law No. 5393 No. 5216 collection and transport of these substances according to district municipalities, the disposal is made by the metropolitan municipalities. Due to the increasing urban population; amount of waste is increasing. Therefore, wastes must be disposed with technical methods. The main components of municipal solid waste are paper, glass, plastic, metal and decay substances (organic waste), and inert substances. This is the amount of the basic components and vary from country to country, city to city, local conditions, seasons, depending on consumption patterns. In this study, Kızıllı Field Integrated Waste Landfill Solid Waste Facility obtained by the environmental and economic gains will be examined.

2 - EXISTING SOLID WASTE MANAGEMENT SYSTEM

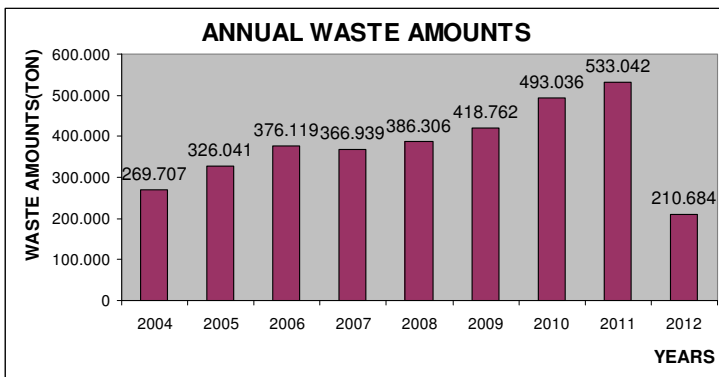
2-1 - Antalya City

Antalya is 2171.26 km² between the coordinates 39-52 N, 32-42 E. According to official data of 2011 the population of Antalya is 1,088,004 annual population growth is 3.2%. In the borders of Antalya Metropolitan Municipality; Aksu, Döşemealtı, Kepez, Lara and Muratpaşa districts are located and the waste from the settlements close to five counties are disposed in Kızıllı solid waste disposal site. Kızıllı Solid Waste Landfill Site is located 27 km from the city center, operated by the method of procurement services under the Public Procurement Law No. 4734.

2-2 - Waste Amount and Composition

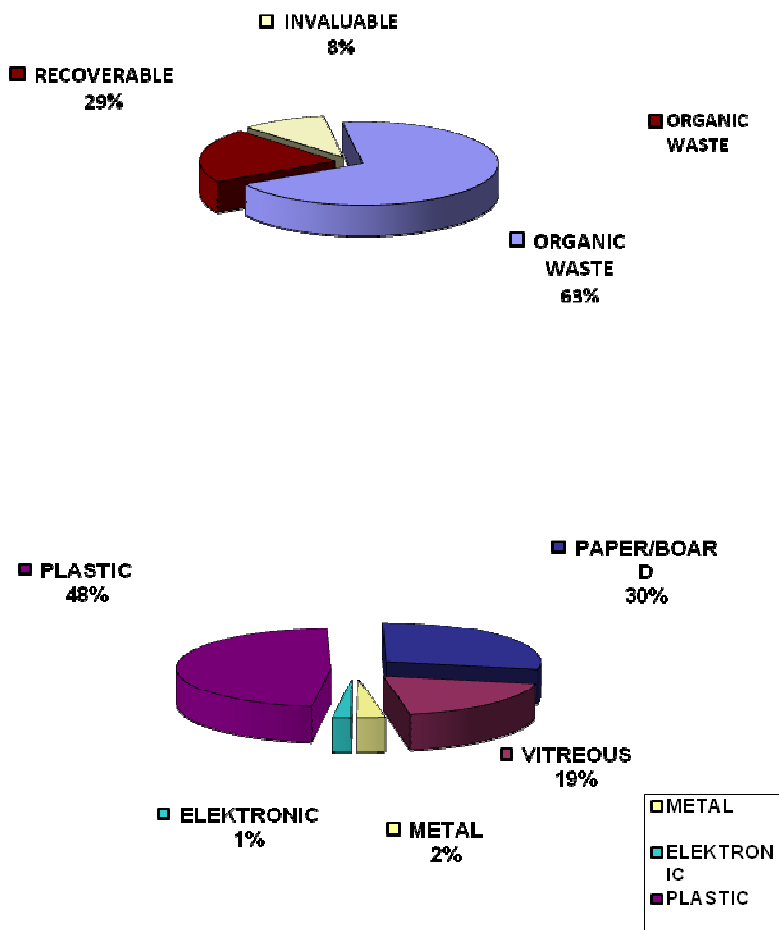
2-2-1 - Waste Generation

Amount of solid waste coming to Solid Waste Landfill Ground Kızıllı for the last years is 3 481 613 tons per year. Kızıllı Solid Waste Landfill Site has been operated since 2003, 3,380,636 tonnes of domestic solid waste has been disposed.



2-2-2 - Waste Composition

62.58% of waste from landfill site is organic, 28.97% percent is recyclable, and 8.45% i is the waste can not be evaluated. 8.75% recyclable wastes is paper and cardboard, 5.42% percent glass, 0.70%' s metal, 0.36% is electronics 13.74% percent is composed of plastic waste.



2-3 - Waste Management

2-3-1 - Collection and Transportation System

With the Metropolitan Municipality Law, Municipality Law No. 5393 No. 5216 collection and transport of these substances according to district municipalities, the disposal is made by the metropolitan municipalities.

2-3-2 - Final Disposal (Treatment)

Disposal is the responsibility of the metropolitan municipality, service procurement method is operated under the Public Procurement Law No. 4734. The method of final disposal is landfill. Since 2003 under the first stage of the work, landfill has been completed in 4 lots. If the landfill continued to be done until the year 2029, a total of 6 stages would be completed and 671 581 m² area would be used

2-3-3 - Financial Status

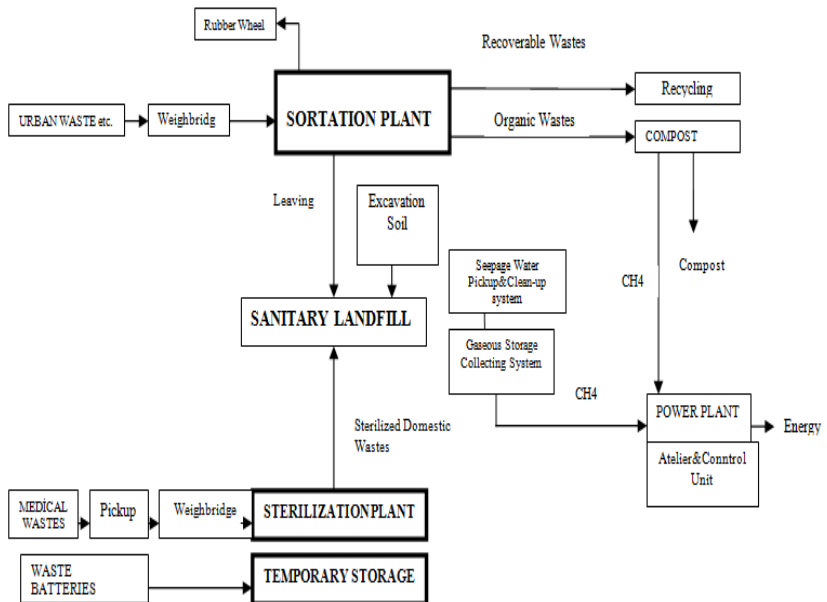
For the waste disposal brought and collected by Antalya Metropolitan Municipality and municipalities in the district no fee is charged. According to parliamentary resolution No. 530 dated 28.11.2011, the areas outside the borders of metropolitan municipality, TL 32.70 is charged per tonne for domestic waste. Outside the boundaries of metropolitan municipalities, 54713.5 tons of domestic waste were brought in 2009, , 97398.45 tons in 2010 and in 2011 121,558.35 tons were brought for disposal. 91223.433 tons were the last three year's average.

3 - PROPOSED WASTE MANAGEMENT SYSTEM

The final destination of integrated waste management model is the evaluation of waste to maximum extent and to minimize the amount of waste sent to landfill. After the acceptance of waste site model of integrated waste management will be directed to the facility or storage area according to the content. Wastes subjected to sorting will be separated as recyclable waste, organic waste and residues by their type. Organic waste will be directed to composting facility, recoverable waste will be directed to companies about recycling. After sterilization of medical waste, it is directed to the storage area regularly. Temporary storage will be created for the waste batteries and this waste will be directed to the relevant authorities. The investment cost of the facility by ITC is approximately TL 45 million, and Antalya Metropolitan Municipality will take 1% of annual turnover and rent of TL 160 000 TL for the first year. The rent will be updated each year by CPI.

Plant	Plant Capacity
Fermentation System	400 tons / day
Waste Separation and Recycling Plant	2000 tons/day
Medical Waste Sterilization Plant	4-6 tons/day
Electric Power Generation Plant	8.0 MW
Landfill Plant	2000 tons/day

3-1 - Integrated Waste Management Flow Chart



Integrated Waste Management System

3-2 - Separation and Recycling Plant

Planned to establish an area of approximately 5000 m² which will consist of two lines, the facility will be approximately 2000 tons / day capacity. Mixed household waste will be accepted to the facility, as a result of the parsing process; organic wastes and recyclable wastes will be obtained. Organic materials will be sent to fermentation plant, recyclable materials

can be used in recycling industry. Recyclable waste will be separated as recycled paper, metal, plastic, glass and so on in the plant.

3-3 - Medical Waste

With licensed medical waste collection vehicle and staff appointed for medical waste collection medical waste will be collected on a regular basis. In the facility to be built in accordance with provisions of the Medical Waste Control Regulation and the European norms EN 866-3 and / or TS EN ISO 11138-2/3 "Biological systems for testing the sterilization process units" standards, will be used whether infected waste, subjected to sterilizing, is harmless or not; using chemical and biological indicators. During and after the sterilization process in air and water; precautions will be taken in a way that there isn't any contamination and toxicity. It is planned to sterilize medical waste approximately 4-6 tons / day in the facility.

3-4 - Energy Production, Efficiency and Environmental Benefits

Gas, resulting from organic waste gained from waste stored in the area and new arrivals since 2003, will be used in electricity production. Approximately 8 MW / day electrical energy is planned to obtain in the facility. In addition, the use of recyclable packaging back for recycling waste, energy and natural resources will be saved, they will be used for reproduction, re-production

of glass and metal waste will be revealed, especially the formation of mineral waste will be prevented, Reducing emissions of CO₂ and other gases will contribute to slow down global warming.

The annual average 481,613 tons of household waste is 139523.3 tons of recoverable, approximate distribution is as follows:

Paper&Cardboard	: 41.857 tons
Glass	: 26.509,4 tons
Metal	: 2.790,5 tons
Electronic	: 1.395,2 tons
Plastic	: 66.971,2 tons

41 857 tonnes from an area for disposal of paper / cardboard waste recycling; annual:

- 519 026 800 m³ of CO₂ greenhouse gas disposal
- more 519 026 800 m³ of formation of O₂
- 16,073,088 m³ of water saving
- 219 749 250 liters of fuel-oil savings
- 100,456.8 m³ of storage space savings
- 171 613 700 kw / h of electricity savings will be provided.

In addition, glass waste has 100% recyclable characteristics. In a ton of glass recycling 100 liters of petroleum product is prevented. Also, because of the melting of soda ash and limestone for glass production, the decomposition of the CO₂ is revealed. The recycling of glass prevents this and greenhouse gas emissions, also for 1 ton of glass, 1.2 tonnes of primary raw materials

saving is provided.

26509.4 tonnes recycling of glass waste for disposal in the area,

- 2.65094 million liters of fuel savings
- 31811.28 tonnes of primary raw materials saving
- 80% reduction in mining waste
- a 20% reduction of air pollution, , 50% reduction of water pollution will be provided.

In a ton of plastic recycling, 1.8 tons of oil products are prevented, and 14,000 kW of energy savings is provided.

66971.2 tons of plastic waste for disposal from the recycling area,

- 120,548.16 tons of fuel savings
- 937 596 800 kw of energy saving will be provided.

In one ton of metal waste recycling, 1.3 tons of bauxite, 15,000 liters of cooling and with 860 liters process water saving and 1083 m³ of CO₂ and 0.616 m³ of SO₂ emissions are reduced.

2790.5 tons of metal waste for disposal from the recycling area,

- 3627.65 save tons of bauxite
- 41,857,500 liters cooling, and 2.39983 million of process water savings
- reduction of 3022111.5 m³ of CO₂ and 1718.948 m³ of SO₂ emission will be provided.

Thus, with the use of a potential but unused resource,

positive contribution to the economy will be provided. With all these processes, less evaluated waste and residue can be disposed and storage life of sanitary landfill site will be increased. The land which is a scarce resource, will be used effectively.

Resources

ITC Solid Waste Management Implementation Report
2012

Kızıllı Solid Waste Landfill Site Implementation Project
2007

Landfill of Waste Regulation on the Ministry of
Environment and Forestry, 2010

Municipality Law No. 5393

Metropolitan Municipality Law No. 5216

Public Procurement Law No. 4734

EN 866-3 and EN ISO 11138-2/3 "Biological systems for
testing the sterilization process units" standards

Antalya Metropolitan Municipality Waste Quantity and
Composition Data

RESULT ORIENTED PRODUCT SERVICE SYSTEM BASED ENERGY PROVISION

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ABSTRACT

Utility service provision is one of the most important aspects of modern life. Households are served with many different utilities such as water and energy (e.g., gas, electricity). All these utility provision is billed to the customer based on product (material, quantity or volume) count. In other words, people buy the products in various amounts. Today's market moves from product sale to service sale in many areas. Selling the service is popular, since the users are interested in the service provided by the product rather than the product itself. This is often a win-win situation for both companies and the customers. Companies may increase their profit by increasing the efficiency of their products, whereas the customers do not deal with the operational hassles such as maintenance or repair of the assets. Thus, the shift from product-based utility provision to service based one has potential to create greater impact on reaching sustainable and eco-friendly solutions. This paper suggests and discusses a new idea of result oriented service based utility provision

with its opportunities and challenges. This suggested approach offers a radical shift for the responsibility of implementing relevant energy efficiency measures (e.g. insulation) of assets from end-users to the providers. In such a business model, for example; a service provider sells the indoor temperature of a house rather than cubic meter of gas or kW of electricity. This requires evaluation of energy efficiency of each building (e.g. houses, schools, campuses, companies, business centers, apartments, residential sites, etc.) for billing.

Keywords: Product Service System; carbon footprint; mitigation strategies; energy efficiency; future technologies.

1 INTRODUCTION

Utility service provision is one of the most important aspects of modern life. Households are served with many different utilities such as water, energy (e.g., gas, electricity), and communication. Creating more comfort using fewer resources has been a great pressure on humanity in recent decades. Energy provision as service and its utilization involves interactions of many actors such as; end users (i.e., customers), energy provision companies (i.e., providers), construction companies of buildings, manufacturers of devices that consume energy and companies that maintain/repair these devices [1, 2]. Each actor in this network has its own objective to achieve, which does not necessarily lead to overall best. Delivering better, more widely available energy sources and services is the main goal of the providers. However,

the reduction of energy consumption is not their main objective, in contrary more energy demand means more profit for the providers [3]. On the hand, customers (e.g., residents, companies, or institutions) do not specifically demand energy utility products (e.g. electricity, gas, coal, etc.), but rather they need the services provided (e.g. heating, cooling, and cooking, etc.). Contrary to energy providers, energy consumers desire to decrease their energy consumption to pay fewer bills with sacrificing less on their comfort.

In this study a novel product service system (PSS) based idea on utility service provision was suggested and discussed. This new PSS design has a potential to remove or change the fundamental assumptions regarding the roles and objective of the actors in the energy service provision network by a new business model 'selling service rather than material/power supplied'. This business model has potential to contribute to fulfil the future energy requirements and to increase the possibility of reaching the overall best for the network. Even though utility service provision can be discussed in general, the main focus of this paper is energy provision, which will be in the rest of the paper.

The structure of this paper is as follows: Definition of PSS business models are given in Section 2. Some tools and methodologies for the evaluation and development of a new PSS design are highlighted in Section 3. Literature review about the existing PSS designs and suggestions in energy provision sector are given in Section 4. In Section 5, the suggested PSS business model for energy service provision with its opportunities and challenges is discussed. Section 6 concludes the paper.

2 PRODUCT SERVICE SYSTEM (PSS)

In literature there are several definition of PSS and its types [4 and reference herein]. Tukker and Tischner (2006) identified four main components in all available PSS definitions: i) a product service, ii) actors network and governance structure, iii) eco-efficiency manner, and iv) sustainability. Recently, one of the best definitions of PSS is given by Yang et al. [5] as “*a focus shift from selling just products to selling functions through a mix of products and services while fulfilling the same consumer demands with less environmental impact*”. Product Service System (PSS) is basically the concept of selling the service that the customer needs rather than the product itself. It is recent business trend to deliver a complete PSS in many different areas such as office furniture sales [6], aerospace and defence industry [7], point-of-care biomedical devices [8], bring-in waste glass collection [9], the adoption of micro-factory retailing in the automotive industry [10], and the design of a telecentre [11]. In a PSS model, customers directly satisfy their needs by the service provided without dealing with management issues of the product such as repair/failure of the car. On the other hand, PSS offers more profit for the providers by expending their businesses. When the providers take the responsibilities (e.g. maintenance and repair) they will be more powerful and efficient in the business than customers in dealing with such issues and they may better increase the efficiency of the product in use by introducing effective

operational support.

Three types of PSS are available as business models; product-oriented, use-oriented, and result-oriented [4, 5]. Product-oriented services are dominantly turned on sales of products and not focussed on the services, but some extra services can be provided. Selling household appliances and providing routine, maintenance and repairmen services (if any needed) for them can be a typical example of this business model. This model also implies that the provider can offer to make a maintenance contract, a financial scheme, the supply of consumable, and an end-of-life take back agreement. In use-oriented services, the product is owned by the provider, and the service provided by the product is paid by the user, and sometimes shared by a number of users. For example, the provider can provide shared photocopy machines and the user only pay for the number of printouts. The provider is also responsible to provide all consumables (papers, cartridges, etc.) and related services (repairs, maintenance, replacements, etc.). This model can be subcategorised into four different model; product lease, product renting or sharing, product pooling, and pay per service unit [4]. In the last one, the result-oriented services, the provider and customer agree on a result, they do not predetermine on any product involved. The provider guaranties the quality of service and provides it by any means of any products and services. Activity management or outsourcing, and functional results are the specific types of the result-oriented services.

Result oriented PSS design can be a good strategy in achieving social, economic and environmental sustainability in energy sector. The concept of the PSS

model in utility provision sector also suggests a systematically shift from selling the household utility products to selling functions through a mix of products and services. This requires a change of focus from traditional ‘pay as you consume’ oriented approach, which concentrate on intensive use of energy, to ‘pay as you satisfy your needs’ which have a potential to save energy and provide better service.

3 EXISTING PSS DESIGNS AND SUGGESTIONS IN ENERGY PROVISION SECTOR

There exist studies and applications in the literature suggesting PSS designs and ideas for energy utility provision systems and product-service mix business solutions [5, 12-17].

A real life example of the MEPSS has been realised by the French electricity provider Electricité de France (EDF) to develop a new, integrated product service offer [13]. In this case study, EDF offered an individual diagnostic tool that enables each home to get a detailed view of its electricity consumption, and suggests a range of possible solutions to optimise electricity consumption. However, they only focused on electricity usage and consumption, and they did not offer a complete solution for all type of household energy utilisation, e.g. gas and electricity.

Another case study of MEPSS methodology was studied by Parkersell [14]. They developed a product service integrated lighting system solution, a typical energy utilisation application providing more efficient in life cycle costing and environmental improvement for

Sainsbury. Similar to previously example of MEPSS they had particular target providing “cradle-to-rebirth” lighting solutions, including design, installation, maintenance and recycling.

Eastern Energy is one of the energy service providers in the UK. Recently they decided to offer services to their business customers to help in monitoring and saving energy, e.g. sub-metering, energy management data through load consumption and profiling, process monitoring, training in utility awareness, and post training facilitation as well [17].

Yang et al. suggested a typical scenario for realizing product-oriented PSS for the life cycle assessment of the household appliances (e.g. fridge/freezer) [5]. Electrolux initiated a similar PSS business model and offered households on the Swedish island of Gotland free washing machines with functional sales. Their offer aimed not to sell a washer, but consumers pay according to how much they use it, and it covers the cost of installation [12]. This was a pilot project called Pay-per-Wash. They stated that this idea was feasible, since the Gotland Island in Sweden was the only place in the world at that time with intelligent electrical meters installed in 7000 households, which allows for remote reading.

In a recent study, Steinberger et al. suggested a performance-based energy economy (PBEE). They explored the implications for energy suppliers and consumers as well as the conditions for PBEE diffusion and consequences for technological changes [16]. They suggest an application of the performance economy (such as PSSs or performance contracting) for energy-using equipment manufacturers to improve their

competitiveness.

Vercalsteren and Geerken reviewed possible and existing PSS designs in the sector of households. Their key emphases on the requirements of PSS in the household sector are mostly related to the social structure of the population (e.g. the tendency of having smaller houses as a result of the falling share of large families, and increasing in the age of the population, more seniors in the society) [15]. They classified household PSS applications into four main groups; after sales services, shared distribution networks, hiring/leasing, and contracting people. In their study they addressed household management systems that can be potential PSSs which cover advisory /consultancy service to advise households on possible energy savings and installation of meter in households, according to the principle 'to measure is to know'. However, there is not a complete solution addressed for the household energy utilisation problem in their study.

The literature review revealed that there is no available PSS business model which offers a complete solution for energy utilization for customers (e.g. houses, schools, factories, business centres, and any commercial buildings). In our suggested model the household utility products, electricity, gas, etc., are substituted by services, e.g. adequate level of comfort, continues (no wall socket option) or batch energy supplies for appliances, devices and work equipment, which can be owned or bought, run and maintained by the energy service provider. The physical products are not identified or billed. This PSS concept can be classified as a result-oriented (functional result) PSS [4]. Here the provider agrees with the

customer to deliver the results; ‘space heating and cooling’, ‘running cost of household /work appliances and devices’, and ‘providing energy for any other activities including leisure time activities’. The provider in principle is fully free to choose the utility products and services, as well as the appliances and energy transformation systems to deliver the customer’s needs. There is a significant difference between this PSS model and the above mentioned applications. This model is not only focus or deliver one particular utility product (e.g. electricity), but also include energy transformation systems and devices, several tangible and intangible services (e.g. education, insulation) and functional results (e.g. pay-per-service unit for laundry). It offers a wide range of availabilities to use any proper energy sources, devices and functional results to cover the customer’s needs in a building which maybe houses, schools, factories, business centres, and any commercial buildings.

4 SUGGESTED PSS IN ENERGY PROVISION SECTOR

This design has some aspects of the PSS which includes a new organizational structure and new actors. It also addresses the changes in the customer and provider perspectives. Related aspects of the suggested PSS model are discussed in the following sections. Firstly, we identified new actor network and discussed the possible role changes and their effects on the energy market. Second, the assets of this new design were identified and discussed. Customer requirements (CRs) are of the

important aspects of a business model. The PSS planning approach can improve product competitiveness for the providers to better satisfy customer requirements (CRs) through providing both higher quality products and services. Consequently we discussed this component in the third order. As well as these management oriented aspects, a reliable technological infrastructure should be provided to setup up this business model. Thus, the need of a smart and reliable communication and data transfer/acquisition system is discussed in forth order. Recently PSS designs have been taking great attention due to their potential to offer sustainable and eco-friendly business solutions by compensating the ‘blind side’ of the energy market. In the last order, these two aspects are focused under the subtitles ‘Life Cycle Assessment of the devices’ and ‘implementing energy efficiency measures’ focusing on the sustainably and eco-friendly solutions.

4.1 Identifying the new actor network

The actors of the current household energy provision network are summarized in three layers (main, regulations, and social) which are located outer peripheries according to their relations to customers, as illustrated in Figure 1. In the existing business model, customers are located at the centre of all the interactions. This logic characterizes a centric actor model [2]. The main interaction layer, the first outer one, involves four actors: customers (energy consumers), energy providers (represents energy production, energy distribution, or contracted sellers), manufacturers of devices that use energy at buildings, companies specializing on

maintenance and repair of devices or assets. Customer has a direct relationship with all the actors in this layer by buying products or services. The regulatory layer is the second layer. The objectives of the actors in this layer are to establish a financially viable, stable and transparent energy market. This energy market functions in accordance with “the provisions of private law and within a competitive environment to ensure the independent regulation and supervision of the market in order to provide sufficient ” energy utility products (electricity, natural gas, petroleum and LPG) in a good quality to consumers, at low cost, in a reliable and environment friendly manner. The last interaction layer is the social layer. The actors in this layer have similar objective as the regulatory layer, but they have no law power, but social power on the market and all the actors.

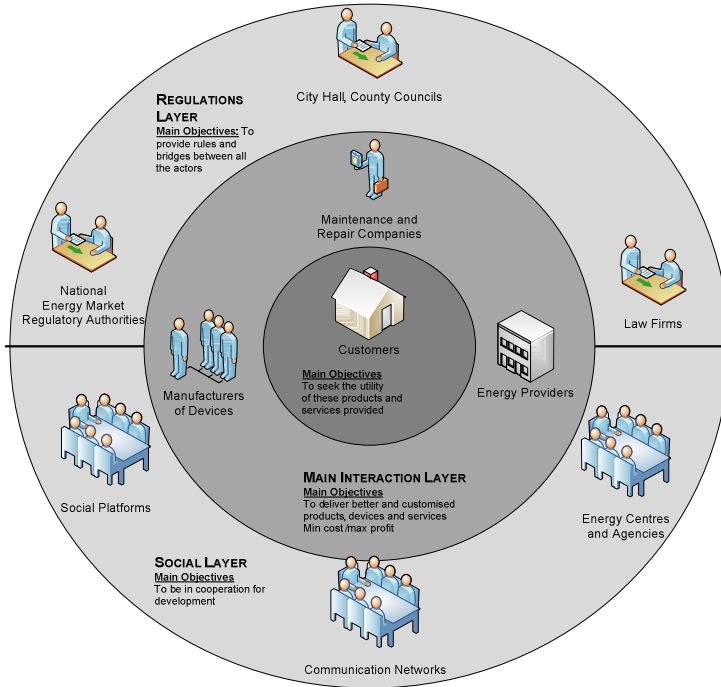


Figure 1. Actors of the current household energy provision business and their key objectives

Suggested PSS design involves several partners, each of them has its own motivation (e.g. goals, expected results and problem-solving criteria) [11]. Shifting from product sale to service sale requires re-designing the actor network. The actors network in the sub-processes in this PSS design is combination of household utility product producers/companies, technology providers, device or equipment providers and suppliers, building industry, local software providers, system providers, client organizations, local and regional authorities,

communication networks, social platforms, energy centres and agencies, local energy suppliers, etc. As a result of role changing possibilities of two main actors (customer and service supplier), the centre of the model would be shifted from customer to service provider in this new PSS design. The roles of other partners involved in the sub- process in this business model, e.g. boiler or a house appliance providers, are addressed. A schematic presentation of identified new actor network and the key objectives of the each layer are given in Figure 2.

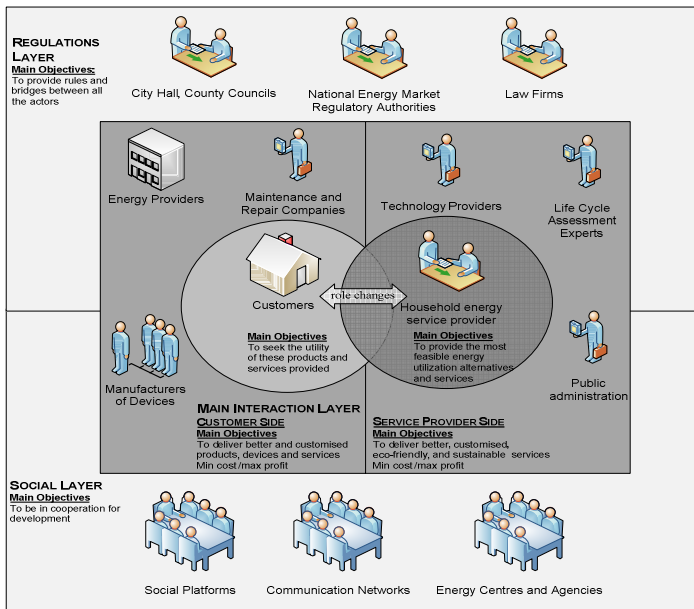


Figure 2. Actors of the suggested PSS business model for household energy provision service

4.2 Assets of the PSS

In this business model, service provider will be responsible to provide abstract/intangible (technology, database, blueprints, reputation, networks, etc.) and concrete/tangible (financial and physical) PSS assets that are required for service provision, e.g. utility products, materials, devices, and services for household energy provision. These assets include some activities and devices to maintain ambient temperature (heating and cooling) on a comfort level, to provide indoor air quality comfort (air filtration, ventilation, and dehumidification), to provide energy for working household appliances (for food preparation, daily activities, leisure time activities, work devices, machineries and equipment can also be included into system under specific agreements, etc), and to provide adequate level of water for all type of consumptions.

Assets of the PSS model were classified into two sub-groups; tangible and intangible assets (Figure 3). Figure 3 summarizes all the assets classified based on their characteristics. Intangible assets covers and they are related to the tangible assets. Intangible assets include 7 main components from 'information and knowledge' to 'vicarious liability'. Information and knowledge are explicitly represented among intangible assets. SP can provide all these services or buy from other actors. In the case of second alternative, any other actor, hired by the SP, will not bill to the customer but to the SP. This is one of the key ideas in our PSS design. Coordination in the accessible energy grid is also of the important intangible assets in this PSS. Recent improvements in the energy sector showed that, future energy grids will not only

provide one way energy to customer, but also it will be possible to get or buy energy from the customers. This idea supports the smart grid approach, which is an inevitable trend of power grid. The SP will be able to produce energy or sell the excess amount of energy to other customers. For example, one boiler system can be used to provide energy to two attached houses. Another example is that solar panels can be located at the chimneys of top flats or any available open place over to one customer's properties, and then the produced solar energy can be shared by the other customers or in the case of having excess energy, it can be supplied to energy grid to make profit. All these activities would be planned, organized, invested, and operated by the SP. 'Education and trainings' are designed to improve or change the behaviour and habits of the customers to improve energy savings. The SP can make some strategic investments to provide energy, or buy/sell cheaper energy and services that requires a 'strategic management'. In this business model, the SP takes the 'vicarious liability, the responsibility of any customer that had the "right, ability or duty to control" the activities of a violator.

Tangible assets are the second group assets. These assets were also divided into three subgroup; energy utility products and materials, optional devices used in household/work energy provision, and unconvertible improvements and upgrades. Firstly, all the energy utility products and materials which are gas, electricity and water, will be provided. The Service Provider (SP) will provide all the maintenance and repair costs and services related to devices and equipment utilized in the energy provision, as well as the structural and building related

improvements. In addition to the utility products, PSS design suggest to provide (if it is needed) any appliances (e.g. fridge freezers, washing machines, oven, etc), heating or cooling systems (e.g. boiler systems, air conditioners), insulation and building related improvements (e.g., roof, loft, wall, cavity wall, solid wall, floor insulations, draught-proofing, and double glazing), all the maintenance and replacement costs and services for the above mentioned equipment and systems. On the other hand, the customer, who does not demand for energy itself, but rather demand for energy services, will only pay one monthly bill as an “all in one” energy service.

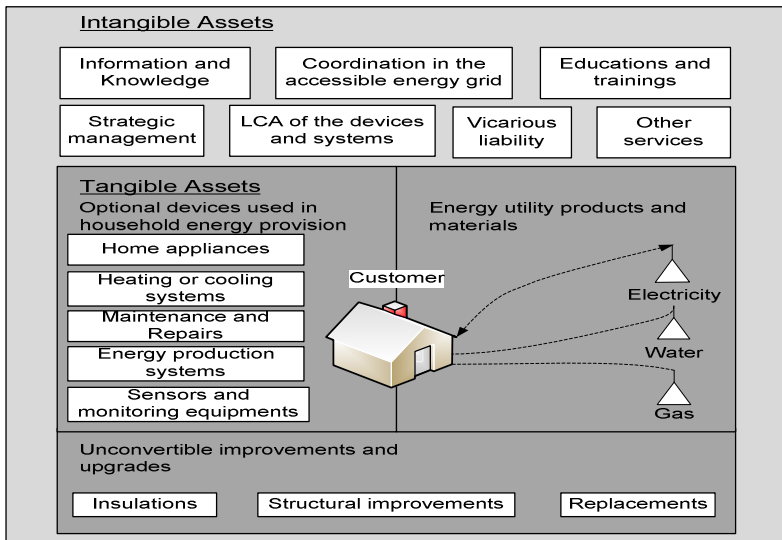


Figure 3. Assets of the PSS model for household energy provision

4.3 Customer requirements (CRs)

In a PSS design the roles and responsibilities of customers and service providers must be clarified [21]. In the current energy market, household/workplace owners, as energy users/consumers, have a focal point to have better, cheap and reliable utility products and materials to satisfy their needs. This new business model suggests shifting their perspectives to a new paradigm that aims at qualitative satisfaction rather than quantitative sufficiency. In this new model, customers will not worry about some previously aspects; e.g. dramatic increases in monthly bills during colder periods, maintenance and repair costs, and the life cycle of the products. The future customer requirements are the targets of this business model. It is obvious that by achieving the goals of this new paradigm, the customer satisfaction is expected to be increased dramatically. Most of the customer requirements will become the requirements of the SP, which obviously provide better solutions to obtain maximum benefit by lowest cost.

4.4 Communication and data transfer/acquisition system

This PSS design should be based on the correct estimation of household energy demand, however it includes some measurable and no-measurable products and services (e.g. in energy units), since they rely on specific technologies (heating and cooling technologies, appliances, etc.) and local conditions (such as climate, building type and location). These factors introduce more

complexity, but also the great potential for this business model. It is possible to improve or suggest better household energy utilization systems, to reduce the amount of energy consumption by some technical applications (e.g. insulation), to buy cheaper energy taking into account local conditions and timing (cheaper electricity can be utilized in heating during low energy demand periods). This component is one of the technological components required to run such a business model. In some previously PSS designs and applications some serious limitations and problems were reported regarding to communication and data transfer [18]. A secure, reliable, adaptive, adaptable and smart data processing is required.

4.5 Life cycle assessment of the energy transformation devices

In the case of providing energy transformation or utilisation devices by the service provider, a product life cycle assessment module should be added in to PSS design, thus any data elements which have potential of assisting the actual service may be regarded as part of the service content. For example; company can make a contract with a new residential site to install any required heating system under a 10 year contract to provide space heating for the apartment flats. In this case, it is very important to acquire information related life cycle data of the installed system to make a better prediction about the operational and maintenance costs as well as energy consumption rates. Another option is that, company cannot provide any energy transformation device or

system but uses the existing ones. This also brings a necessity to have a reliable life cycle data for any possible equipment to have a better estimate for future costs. For both of the option an automatic identification technology can be employed to gather data in dealing with information capture accurately and efficiently during a product lifecycle, and then the company can increase its possible profit by making correct decisions in critical time. This will be very helpful to make any shift in the devices which are owned by the company e.g. natural gas boiler systems for each apartment/building can be used or be replaced by coal based central heating systems after a critical life cycle period, or an estimation of dramatic price increases in natural gas market can be decision criteria to make correct investments or equipment shifts. This type of technologies and software agents are available, e.g. the service enabler [5, 19].

4.6 Implementing energy efficiency measures

The dramatic increase in the world population and industrial activities are directly correlated to energy consumption. For instance, the primary energy consumed in the UK has increased by 7.15% between 1990 and 2006 [20], that is more dramatic in developing countries [21]. However, energy consumption has causes numerous damages to ecology and environment (e.g. global warming, acid rains, marine pollution, air pollution, damages to vegetation and animal life, destruction of the buildings and cultural heritages, increased level of atmospheric corrosion and material deformations, carbon footprint, etc.). One of our bases is that this PSS design

should be structured to favour certain types of environmental protection and energy consumption outcomes. In order to provide better environmental benefits and eco-friendly solutions, SP should consider all possible actions and strategies to reduce the resource usage. The environment friendly goals of this PSS design are intended to support the overall goal of minimizing the negative environmental and social impacts while maximizing social wellbeing and economic added value. Actually, this strategy is perfectly associated with the key idea of the PSS, since any SP will always prefer to use less amount of energy source to provide maximum benefit. It is clear that an SP can implement any cost effective energy efficiency measures in a better way than any individual (SMEs owners, company bosses, home owners, etc.). This strategy can be considered first during this economically challenging time. The measures/actions to create more environment and ecology friendly PSS solution for the energy sector should be built on the criteria; reduce energy consumption; find sustainable alternative energy sources, reduce energy waste, increase equipment/device/appliances and system efficiency, create healthy indoor environments for people.

6 CONCLUSION

The design of a new PSS is a challenging task because it does not already exist in the market. However it provides good opportunities and ideas for service providers in the related market. In addition to that, the European economy and energy consumption rates are getting greater and

having more potential impact on globe in terms of material and resource usage. This increasing trend of resource use is an important question mark over the global society, hence it should be considered as an important environmental and sustainability issues. In this study, we suggested a result oriented product service system for ‘billing energy services based on the service provided rather than product/material distributed’ to buildings (such as houses, schools, campuses, companies, business centres, apartments, residential sites, etc.). The opportunities and challenges for billing based on service for energy provision were discussed in the scope of this paper. This new business design has great potential and benefits for customers and providers, not only from the business perspective but also environmental and eco-friendly solutions for future energy provision sector.

The idea ‘billing based on service for energy provision’ come from the possibilities offered by a new organisational structure (service providers) and from the perceived needs of people (customers) that can be fulfilled satisfactorily in a better way than today. This idea is not only focus on ‘profit’ perspective for the both sides (customer and provider), but also based on the global ‘eco-friendly and sustainability’ perspectives (e.g. greater dematerialisation and significant reductions in the quantity of energy resources required by increased efficiency, better shared usage, providing more reusable energy, and implementing smarter systems).

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TURKEY'S ROLE IN GLOBALIZATION AND AXIS ENERGY POLICIES

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ABSTRACT

The past half century, compared to previous periods, due to developments in communication and transportation technologies, the differences observed to supply. Elapsed time, perceived levels of societies and their ability to interpret the world-identification, depending on the communication and transportation technologies, has led to change. As can be seen here last time, a social transformation / change has been subjected to. Thus, far removed from the antagonism between closely with the development of cross-border dimensions of globalization, the concept of interaction has occurred. With the simplest form of the definition of the phenomenon of globalization, far from ignored by the distance between the nearest places, countries and their people closer together and with each other in economic and social interaction can be expressed as.

Along with the concept of globalization, states, economic, political, cultural, environmental and security policy, however the increase in mutual dependence, in parallel with developments in these policies, changes in the international arena, be experienced in matters of wars

that might occur in the near future, implying the energy issue at the beginning of them.

This study tries to determine, when they are followed by great powers of energy policies in international arena, with new energy sources and deposits in which they were oriented. Turkey is due to the geo-political and geo-strategic position, both in terms of structure and resources of the rich energy deposits, is a country with an important position in terms of the existing powers of global forces, and develop energy scenarios for the region of Turkey on track, will focus on strategies and politics.

Key Words: Globalization, Energy Policy, Turkey.

1.INTRODUCTION

Recently an internationalizing part of world geography has been taking place within the wholesale transformation. With the advent of new technologies some people living in the world have been involved in this transformation process. A new mode has been penetrated into the ongoing system while domination of capitalist system keeps its validity all around the world.

Now the capitalist accumulation cannot be kept in defined boundaries. We are in process of which the nation states make outmode; with the new geographic developments, the boundaries of the nations are redefined and concepts of localization, identity and diversity are suddenly taken into account. This all process is called as globalization and it has a lot of dimensions; from economic to political, from social to cultural and from

technological to ecological.

In that way the world has become smaller in economic, cultural and social sense. These changes in information and communication technologies have caused different ways of global acting. Huge and ever-increasing amounts of economic activity have started in the form of cross-border relationships with the integration of world-wide economy and fast urban growth.

An economic growth, free markets without government 'interference' as the most efficient and socially optimal allocation of resources, economic globalization, privatization, which removes the inefficiencies of public sector.

Among the global transformations, the dissolution of what social scientists call the "Keynesian consensus" among the state, labor market and big business enterprises in the late 1970's, the transformations of welfare states, globalization, neoliberal ideology and deregulation of national economies are the prominent ones. These global transformations led to the momentous emergence of new poverty structures and new inequalities in the global context. In addition, as the regional and national developments to frame the participation of the civil society organizations in the poor relief and poverty alleviation activities.

The global processes relevant to the discussion here are the ebbing of the Keynesian consensus, which aimed to administer the national economies and nation-state based financial system between the labor market, the state and the business sectors in the late 1970s the rise of the supranational bodies such as IMF and World-Bank to manage national and transnational economies in the early

1980s and globalization.

The story of the Turkey for the energy policy, actually, started with the discovery of the first oil deposit in the Middle East and the drilling of the first well in the Ottoman age, in the 19th century. After this period Turkey increased its importance because of its geographical advantage. But we can not say that Turkey is energy rich country and this situation is a burden for the country's economy. For this reason in this short essay I will try to give knowledge about energy dependence of Turkey in energy sector. The paper consist a few headings; Turkish energy resources, Turkish energy sector and Turkish energy policies.

2.GLOBALIZATION PROCESS AND ENERGY

2.1.Globalization

1990s were marked by an accelerated sequence of fluctuations which in times past might have taken several decades. In the early 1990s in addition to sharp resumption in innovations, technologies, that provides multiplying the production, processing and exchange of information, called "information technologies" Knowledge has become the main feature of this economic geography (for example in some cities new technology based and innovation agglomerations started to emerge such as Silicon Valley)

The expansion of technology has made more direct, faster communication possible over greater distances. The fax machine, the Internet, and cellular networks have greatly expanded the scope and speed of business decisions and have therefore deepened the possibilities

for remote management and logistic coordination across large distances.

As a result of progress in the areas of information and communication, computers have enabled the systematical arrangement, storing and processing and returning of information if needed. Internet, which came into existence in 1967, is now in every walk of daily life and it has come to an effective position on the works of people, enterprises and state establishments. The presentation of information via Internet is much more cost-effective compared to the other general distribution systems and it has enabled the information to be delivered to a great mass of people in a shorter time. As being free from time and space limitations, it has been used in commercial enterprises and it has brought up the online (real time) selling system.

At the same time, advances in technology have also allowed for greater travel and an increase in the human flows across borders, although these numbers pale in comparison to those for information and financial transactions. Also, changes in container shipping have resulted in significant decreases in the cost of transporting goods, so that globally integrated production has become viable and previously unreachable markets have been targeted by multinational firms. Thus knowledge widened all over the world.

From a different viewpoint by means of globalization technological developments had significant importance in social and economic life. There has been immense development in science and technology in a wide range of areas such as biotechnology, microelectronics and telecommunication. More knowledge has been produced

since 1970s than the past five thousand years.

These new technologies and their considerably low costs for storing and transmitting had significant effects on economic processes. In terms of manufacturing and services sectors, these new technologies were being used for process control, automation and automatic data processing.

3. ENERGY AND TURKEY

3.1. Turkish Energy Resources

There are mutual interactions between the composition and structure of a country's energy system, its economic development and its environmental quality. The cost of energy is a major item of the production cost in most sectors of the economy. A sharp increase in energy prices therefore creates an upward pressure on the price level of many goods and services.

Despite Turkey is surrounded by the world largest energy rich regions, it can be called as an energy poor country. As a reaction to the oil crisis in the late seventies, the focus of Turkish energy policies has been on the development of domestic resources in order to reduce the dependency on important oil. Lignite coal and hydropower constitute presently the most important domestic energy resources in Turkey.

According to 2002 data, oil is still the most used energy resource in Turkey by 39%. Coal is at the second level with its 27% consumption. Natural gas became the third most used energy resource by 21%. And lastly 13 per cent of energy is produced by hydroelectric power stations. In electricity generation, while gas is at the first

level with its share of 40.6%, hydroelectric power takes the second level [2].

In line with the data above, Turkey can be classified as an energy dependent country. National resources meet only 31% of its primary energy needs. Despite this data, Turkey is relatively less dependent when compared with some European countries. Whereas the proportion of meeting energy demand with primary energy production was 42% in Turkey in 1995, it was 12% in Portugal, 32% in Spain, 19% in Italy, and 38% in Greece⁷⁶. Nevertheless, it is foreseen that this level in Turkey will decrease in near future [2].

Current gas production in Turkey meets 2.8% of domestic consumption requirements. It is predicted that this level will decrease due to increase in gas consumption. For the oil, Turkey meets 10% of domestic consumption requirements.

3.2.Turkish Energy Sector

The Turkish energy sector is dominated by State Economic Enterprises whose management and corporate decisions are under government influence. The Turkish Ministry of Energy and Natural Resources is currently studying ways to restructure the electricity and gas markets and increase privatization.

At the beginning of the 1960s, energy consumption in Turkey is too low for that level of industrialization. Approximately half of this energy consumption was met by the renewable energy sources. It is quite interesting that Turkey's energy production met 80% of its energy consumption in 1960s.

The first oil crises of 1973 showed that the Turkish

economy is also dependent on external energy supplies as the other developing and developed countries in the world. Oil crises of the 70s and sky-high oil prices, caught Turkey off balance and caused the worst economic crisis in its history. Turkey was severely affected by the oil price increasing in 1973. During the years following the first oil crisis, economic conditions deteriorated, with high unemployment, a nearly five fold increase in the balance of payments deficit between 1973 and 1979, large external debt and annual inflation rates exceeding 100 percent in 1980 [3].

This crisis situation lasted till 1984. 1980s is another period of rapid industrialization both in the world and in Turkey. For this reason new energy resources are needed. It was mainly natural gas that became a serious alternative to oil.

The year of 1990 can be called as a corner stone for the Turkey's energy policy as well as foreign policy. At the beginning of 1990s the winds of change were carrying the new opportunities, possibilities and chances as well as new threats, destruction and problems. There were incredible disorder all over the world and Turkey was in the center of this turmoil.

At the beginning of the last decade of the 20th century, a 50 year polarized world was over and new age opened up under the name of Age of Globalization. The collapse of the Soviet Empire was followed by some regional conflict, disputes and even war. In the eastern border of Turkey the struggle between Armenia and Azerbaijan became more intensified, in the west, the demise of the Yugoslavia caused ethnic and religious conflict between the components of the former federation. In the south

border, the invasion of Kuwait by Iraq and the first Gulf War damaged Turkey both economically and politically. On the other side, collapse of the Iron Curtain would open up new way and create opportunities for Turkey. After 1991 Turkey could make relationship with nations of the Central Asia and Caucasus. New opportunities and new dangerous emerged, and in the year of 1990 Turkey entered new landscape as well as the world. National and common energy policies and attainment of the energy resource is the core of this new world.

Turkey is a rapidly growing importer and consumer of natural gas, due to the fact that it is surrounded by major gas-exporting countries in the Middle East and Central Asia, and interstate natural gas transport infrastructure leading to Turkey continues to be developed.

There is no nuclear energy generation in Turkey. There is much debate and civil opposition to nuclear energy. Protests from Turkish and foreign environmental groups has led the government to postpone the nuclear energy decision. Concerns about security measures, fear of nuclear leakage and the problem of radioactive waste disposal are the main arguments opponents put forward against nuclear energy.

Energy dependency of Turkey shows in medium and long term investments should be increased in energy sector. For this reason nuclear energy plans such as Akkuyu as well as Sinop is in agenda of the government. On the other side Turkey has important oil refining capacity, and it is an exporter of refined oil products. Refining and other downstream operations in Turkey are dominated by partly-state-owned company Tüpras, which has four main refining complexes: Batman in the

southeast, Aliğa, İzmit, and the Central Anatolian Refinery at Kırıkkale.

In Turkish electricity production, mostly state institutions do transmission and distribution activities. There are two main bodies; Türkiye Elektrik Üretim - İletim A.Ş. (TEAŞ) responsible for production and transmission activities, and Türkiye Elektrik Dağıtım A.Ş. (TEDAŞ) responsible for distribution activities. Private sector newly takes part in the electricity generation activities [4].

On the other hand, the most used energy resource of Turkey that is oil receives more consideration. As the magnitude of Turkish oil market reaches \$27-30 billion, the regulation of the market should have the most weight. However, the “Oil Market Law” has been recently adopted in December 2003. This law intends to reach transparent, equal and stable market activities for the secure and economical supply of oil to the costumers.

This law also requires licenses for the companies who desire to carry out market activities. Law also brings out the mandatory duty of holding insurance regarding the companies. Moreover, obtaining of oil from domestic and foreign reserves by the persons is liberalized within certain limits. Therefore, the pricing will be ensured by the market mechanisms freely in the market.

3.3. Turkish Energy Policies

Energy has emerged as an important factor influencing Turkish internal and foreign policy. Turkey's increasing energy needs have given Turkey a strong interest in developing ties with Russia and energy producing countries in the Middle East, the Caspian Region.

The gap in Turkey's energy supply and demand is the key element which determines Turkey's energy policy. As a country with an emerging and rapidly growing economy, Turkey at the same time is facing a rising growth in its demand for energy.

The last one, nowadays, is the most important part and aim of the Turkey's energy policy and has two dimensions which are as follows;

In order to diversify and guarantee its requirements
Regain its importance which reduced after the end of the Cold War for facilitating accession to the EU.

This aim of Turkey is clearly explained by the Prime Minister of Recep Tayyip Erdogan and he stated that “one of the main factors of Turkey’s energy strategy is making use of its geography and geostrategic location by creating a corridor between countries with rich energy resources and energy consuming countries [1].

As Shaffer puts that “as part of its drive to serve as a significant energy transit state, Ankara has signed a number of important agreements in the last decade with neighboring natural gas producers, inaugurated the BTC oil pipeline project, launched the Baku-T’bilisi-Erzurum natural gas pipeline, and is exploring additional projects [1].

Indeed Turkey should undertake a serious dialogue with Russia concerning the energy issues. Oil should remain an economic rather than a geostrategic problem. Turkey should assure Russia that its companies will be included in future economic ventures in the region.

Within this sense, they are the most appropriate examples

for displaying the 21st century geopolitical competition for access to energy and transport routes from the Caspian region. Turkey's gas supply deals with Azerbaijan (through SCP), Turkmenistan (TCP) and also Iran apart from Russia's Blue Stream bring about the issue of insatiable exports over the projected increase in domestic consumption.

On May, 28th of 2006, the first crude oil arrived at the Ceyhan port of Turkey on Mediterranean and a new age opened for participant of the pipelines as well as Caspian region states. So-called pipeline projects are important to mention in advance so as to explicate the dynamics of strategic struggle behind the pipeline decisions. BTC Project, in many respects, began more as a geopolitical project than a commercial one, and as such it became a three-pronged tool in the regional policy of the United States.

Actually, the three strategic objectives, concretized by the BTC project, could be described as the general policy attitude of the United States over the region as a whole and its preference for the most appropriate route regarding the transportation of the Caspian resources to international markets. The three strategic goals are to create an East-West transportation corridor from the Caspian to the Black Sea that would avoid Iran to the south; strengthen the position of Turkey as the new bridge between the Caspian and Europe; and break dependence on Russia to the north. The BTC pipeline is the most expensive alternative of all western options up to date. On the part of the IOCs, the intense oil diplomacy of the United States proved more difficult to go thorough a common interest as opposed to the

former's success with the host governments of Azerbaijan, Georgia and Turkey.

On November 17, 2005 the Blue Stream Gas Pipeline between Russia and Turkey was officially inaugurated. Blue Stream Pipeline is the deepest pipeline to date and any damage to pipeline is alleged to carry significant environmental risks to the detriment of coastal life. Moreover, there is also doubt about the greater dependence of the Turkish market on Russia. According to the gas purchase agreement signed by Turkey and Russia, Russia's Gazprom would supply up to 16bcm of gas annually over a period of 25 years through the Blue Stream, which results in approximately a 70-75 percent of Russian gas dominance over the Turkish domestic consumption over the next decade.

4.CONCLUSION

Significance of energy with regard to economy of nation-states and international relations has been increasing day by day in parallel with the increasing need for energy. Energy is a crucial input for the economy of any country. Energy allows an economy to grow and increase its output.

Countries that do not have sufficient energy sources must import energy from elsewhere. The availability and cost of energy have a large impact on the competitiveness of a country or economy, but it also impacts the cost of living. Access to energy is therefore a precondition for economic growth and economic stability.

The consumer countries' dependence on energy, i.e. oil and gas, has repercussions on their foreign and security policies. Energy imports and exports may have enormous

effects on balances of payments of countries. Energy prices have direct effects on inflation and exports of an economy hence its international competitive position. As we indicated in this paper Turkey is energy dependent country. Turkey's energy consumption is growing much faster than its production.

Depends on population, economy and energy demand growth, Turkish oil consumption has increased in recent years. Thus the last decade the main goal of Turkey's energy policy is prioritizing consumption of indigenous energy resources to meet demand, diversifying energy sources and to avoid dependence on energy imports and become a transit country by transporting energy sources produced in the Caspian Region and Middle East to the European markets, contributing to the realization of the East West Energy Corridor and to improve natural gas supply diversification and security both for Europe and itself transit country.

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KYOTO PROTOCOL: TURKEY ANALYSIS

WITHIN THE CONTEXT OF ENERGY-ENVIRONMENT, CLIMATE CHANGE AND SUSTAINABLE DEVELOPMENT

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ABSTRACT

The problem of global climate change is one of the biggest global problems of our present-day. This problem, which has become a current issue because of the energy crisis happened in 1970s and the raising consciousness on environment, not only changed the content of the development notion but also led to a transformation of the non-renewable energy resources. With the rapid population growth, using up the non-renewable energy resources and the raising consciousness on global climate change, while traditional development comprehension has yielded to sustainable development, energy structure and preferences have also changed from non-renewable energy resources to renewable energy resources. As this changed pattern and problem are global, they have removed the borders among the governments and required international cooperation. This pattern has also caused some conflicts between developing and developed countries. In this study, as a developing country, Turkey's energy and climate policies, attitude towards the Kyoto Protocol and the positive and the negative effects of the Protocol on

the country are investigated. Moreover, while Turkey's policy on energy and climate change is investigated, the policies Turkey will pursue both during and after the protocol – after 2012 – and understanding the objective of Turkey's present and future situation in the international arena is investigated. In this sense, it has been observed that the Protocol's contributing or not contributing to the economy of the developing countries' correlates with these countries being a side of the Protocol or not and it has also been observed if to be on the side of the Protocol is a threat for Turkey's development or not.

Key Words: Global Climate Change, Energy Policy, Environment Policy, Renewable Energy Sources, Non-renewable Energy Sources, Kyoto Protocol and Turkey

1. INTRODUCTION

The problem of global climate change is one of the biggest global problems of our present-day. This problem, which has become a current issue because of the energy crisis happened in 1970s and the raising consciousness on environment, not only changed the content of the development notion but also led to a transformation of the non-renewable energy resources. With the rapid population growth, using up the non-renewable energy resources and the raising consciousness on global climate change, while traditional development comprehension has yielded to sustainable development, energy structure and preferences have also changed from non-renewable energy resources to renewable energy resources. This pattern has caused

some conflicts between developing and developed countries. In this study, as a developing country, Turkey's energy and climate policies, attitude towards the Kyoto Protocol signed within the scope of United Nations and the positive and the negative effects of the Protocol on the country are investigated. Moreover, while Turkey's policy on energy and climate change is investigated, the policies Turkey will pursue both during and after the protocol – after 2012 – and understanding the objective of Turkey's present and future situation in the international arena is investigated. In this sense, it has been observed that the Protocol's contributing or not contributing to the economy of the developing countries' correlates with these countries being a side of the Protocol or not and it has also been observed that to be on the side of the Protocol is not a threat for Turkey's development. The policies that Turkey will pursue within the scope of the Protocol, if applied correctly, will help the country reduce foreign energy dependency and being cooperative with other countries.

2. A NEW PERIOD IN GLOBAL CLIMATE CHANGE: KYOTO PROTOCOL

Kyoto Protocol is the most comprehensive agreement prepared within the context of fight against climate change. Following United Nations Framework Convention on Climate Change (UNFCCC)'s entering into force, it was prepared as a result of ongoing for 2,5 years negotiations and opened for signature in 1997. But it was not implemented instantly [1]

The main objective of the Protocol is defined as; “achieving to stop atmospheric greenhouse gas

concentrations in the atmosphere, dangerous anthropogenic effect on system of climate at a level that will prevent”[2]. How the protocol would work in practice was determined in 1998 in the Fourth Conference of the Parties.

Kyoto Protocol, which is a document supporting and strengthening the UNFCCC, has the same objectives and foundations with the agreement. To become a party to the Protocol, it is also required to be a party to the UNFCCC. According to Kyoto Protocol’s Article 3; The Parties included in UNFCCC Annex I shall, individually or jointly, ensure that their aggregate anthropogenic carbon dioxide equivalent emissions of the greenhouse gases listed in Annex A do not exceed their assigned amounts, calculated pursuant to their quantified emission limitation and reduction commitments inscribed in Annex B and in accordance with the provisions of this Article, with a view to reducing their overall emissions of such gases by at least 5 percent below 1990 levels in the commitment period 2008 to 2012.[3]

According to the protocol, in the list of UNFCCC’s Annex-II developed member countries of OECD, in addition to obligations determined for Annex-I countries, will provide the developing countries with financial and technological support in the efforts of greenhouse gas reduction.

According to the Kyoto Protocol’s 25. Article, protocol’s accomplishment is possible only if *“This Protocol shall enter into force on the ninetieth day after the date on which not less than 55 Parties to the Convention, incorporating Parties included in Annex I which accounted in total for at least 55 per cent of the total*

carbon dioxide emissions for 1990 of the Parties included in Annex I, have deposited their instruments of ratification, acceptance, approval or accession.”[4]. Kyoto Protocol entered into force with the sign of Iceland on 23 May 2002, condition of 55 countries was achieved and on 18 November 2004 with Russia’s participation in Protocol 55% proportion was achieved, and Protocol entered into force with the approval of 156 states and EU on 16 February 2005.

Kyoto Protocol has two Annex, these are Annex-A and Annex-B. States in the list of Annex-I of FCCC are

obliged to decrease 5% of their total emission of CO₂,

CH₄ and N₂O out of six greenhouse gases expressed in

Annex-A list, under 5% of the level in 1990 for the period of 2008-2012 and 5% of total emission of HFC, PFC and SF₆’s gases under the level in 1995.

Protocol’s Annex-B also shows the numerical target of emission reduction of the Party states in the list of FCCC based on the year of 1990 compared to this year. Accordingly, target determined for each state is different. All of the parties of Convention are obliged to fulfill the obligations related to the climate change. So that each state will prepare an inventory related to their greenhouse gas emissions and present a report of “National Notification” including the activities realized related to

the implementation of the Convention.

Mechanisms aim to make parties' enterprises for reducing emissions active by ensuring the opportunity to realize it in different states at a lower cost. In this way, on the one hand developed countries will achieve their goals at a lower cost and on the other hand developing countries will get rid of the load on their shoulders.

2.1. ATTITUDE OF DEVELOPING COUNTRIES TOWARDS KYOTO PROTOCOL

The primary objective for developing countries is economic development. Though there have occurred high increases in greenhouse gas emissions in these countries in recent years, taking precautions against climate change are not among their priorities. The fight against poverty and development projects come before the problems of climate change and reducing emission. Accordingly, developing countries do not care for whether Kyoto Protocol will contribute to their economic development or not. It is necessary to develop strategies to ensure both adaptations of these countries to Kyoto Protocol and economic development to speed up the participation of developing countries into the Conventions of climate change.

There is no limitation in greenhouse gas emission for developing countries in Kyoto Protocol. But because of the rapid economic growth of the countries like India and China, amount of their emission has reached serious proportions. Although India and China have approved the Protocol, they are not under any obligations as they are not taken as developed countries yet. It will not be wrong to say that these countries have approved the Protocol to

direct the process after 2012 and to benefit from flexibility mechanisms.

2.2. ATTITUDE OF DEVELOPED COUNTRIES TOWARDS KYOTO PROTOCOL

Kyoto Protocol sees the developed countries as the prominent responsible for the increase in greenhouse gas emissions to date. Accordingly, these countries are asked for an adaptation to the policies for preventing climate change and reducing emission. But, among developed countries such as; especially USA, China and India of whose greenhouse gas emission is very high, object to the decision of not limiting gas emissions and blames the developing countries as much as the developed ones. So that Kyoto Protocol causes a conflict between developed and developing countries.

3. TURKEY'S ATTITUDE TOWARDS POLICIES OF ENERGY-ENVIRONMENT, CLIMATE CHANGE AND KYOTO PROTOCOL

Turkey has a significant role due to its geographic location in the subject of energy. It is in a position of a transition area between EU and Middle East and Caucasus where energy resources are located.

It meets its need for energy's 31,7% from natural gas, of 31% from coal, of %25,8 from oil and of 11,4% from renewable energy resources.[5] Since the end of the 2010, Turkey's total primary energy production is 32,5 million TEP, total primary energy consumption is 83,4 million TEP and importation is 87,4 million TEP. 42% of this amount of importation belongs to oil, 40% to natural gas and 17% to pit coal, coking coal, and petro coke.[6]

The country in terms of reserve and capacity is richer in respect of renewable energy resources than non-renewable energy resources.

3.1. TURKEY'S NON-RENEWABLE ENERGY RESOURCES

Turkey's non-renewable energy resources are oil, natural gas and coal. It is not a rich country in oil reserves. However there are activities of exploration performed by Turkish Petroleum Corporation (TPC) which is the Turkey's national oil company.

Except TPC, there have been 42 companies performing research and exploration both in the sea and on the land since the end of 2008.

Only 18 of them are domestic companies, other 24 of them are foreign companies. *

Although there are many discussions about the amount of the oil reserves of Turkey, according to the data of Turkish Republic General Directorate of Petroleum Affairs; proved, probable and possible oil reserve is 1030 million tons, recoverable oil is 183 million tons, cumulative production is 138 million tons and remaining recoverable oil is 45 million tons.[7] Turkey's average petrol production from 2000 to 2010 was 2,5 million tons per year. As it can be seen in Table 1, though there are slight increases and decreases in Turkey's petrol consumption, it has ranged between 29,5 and 31,1 million tons since 2000.

Turkey's petrol importation is mainly from Saudi Arabia, Iran, Libya, Russian Federation, Kazakhstan and Syria

and the amount of import was 14,2 million tons at the end of 2009.[8] Its exportation is, as the production is very low, performed with one time agreements at very low levels and it is not consistent.

Table 1 Turkey's Petroleum Production and Consumption by Years

Years	Production (million ton)	Consumption (million ton)
2000	2,7	31,1
2001	2,6	29,9
2002	2,4	30,6
2003	2,4	31
2004	2,3	31
2005	2,3	30,2
2006	2,2	29,5
2007	2,1	30,5
2008	2,2	30,9
2009	2,4	28,8
2010	2,5	28,7

Source: Production Statistics are acquired from Republic

of Turkey General Directorate of Petroleum Affairs, “Crude Oil and Natural Gas Production by Years”, <http://www.pigm.gov.tr/istatistikler.php> , [Date of Access: 20.05.2012], and Consumption Statistics are acquired from BP Statistical Review of World Energy, June 2011, p. 12 and the table constituted by the author.

As it can be seen in Table 1, Turkish petroleum consumption is 12 times bigger than its production. This makes the country dependent in petroleum. In addition to this, the 57 % of the companies that implement petroleum prospection and exploit are foreign which shows obviously the position of Turkey in petroleum industry.

According to the data of GDPA in 2011, after Turkey’s cumulative production, remaining recoverable oil reserve’s being 45 million tons is one of the indicators of the necessity for Turkey to steer for renewable energy resources.

Turkey is also quite poor in natural gas as it is in oil reserves. *“Use of Natural Gas in Turkey was started with the use of natural gas explored in the fields of natural gas areas, Hamitabat and Kumrular, in 1970 in the factory of cement in 1976”*. [9] Then use of natural gas was popularized to prevent air pollution and to meet the demand of energy. Respectively with Russian Federation, Algeria, Nigeria, Iran, Turkmenistan and Azerbaijan contracts which are also valid today were signed.

By the end of 2011 country’s proved, probable and possible natural gas reserve was 25 billion m³, its recoverable natural gas 19,9 billion m³, cumulative production was 12,8 billion m³ and the remaining recoverable gas was 7,2 billion m³. [10] Production of

Natural Gas between the years of 2000-2010 was 700 m³ on average.

Turkey's consumption of natural gas increased from 14,6 million TEP to 39 million TEP by showing a 167% increase from 2000 to 2010. 90% of Consumption of Natural Gas has been met by the main supplier of the market, Petroleum Pipeline Corporation since 2009. And rests of it done by the six companies, 4 of them are foreign companies and other two are domestic companies, having license for wholesale trade.

Table 2 Turkey's Natural Gas Production and Consumption by Years

Years	Production (million m³)	Consumption (billion m³)
2000	639,2	14,6
2001	311,6	16
2002	378,4	17,4
2003	560,6	20,9
2004	707	22,1
2005	896,4	26,9
2006	906,6	30,5
2007	893,1	35,1
2008	1.013,9	36
2009	729,4	32,1

2010	725,9	39
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Source: Production Statistics are acquired from Republic of Turkey General Directorate of Petroleum Affairs, <http://www.pigm.gov.tr/istatistikler.php> , [Date of Access: 20.05.2012], Consumption Statistics are acquired from BP Statistical Review of World Energy, June 2011, p.23 and the table constituted by the author.

The status of natural gas is worse than the oil's in Turkey. Although country's remaining recoverable natural gas reserve is 7,2 billion m³, the annual consumption is 39 billion m³. Accordingly, even the consumption of its reserve is far from meeting the demand for consumption in any way. Natural gas production is just the one-forty four of its consumption so that the country is highly foreign depended. Natural gas is mainly imported from Russian Federation (46%), Iran (20%), Azerbaijan (11%), Algeria (10%) and Nigeria (3%). Turkey's import by the end of year 2010 is 38 billion m³. [11] Turkey can be regarded at moderate levels in world-ranking in terms of brown coal reserve and production, and for pit coal at the lower levels. 1,6% of the world's total brown coal reserve is in our country. Brown coal reserves was spread throughout the country, total reserve is 12,3 billion tons, recoverable reserve is 3,9 billion tons. Pit coal reserve is mostly in the area of Zonguldak and amount of the total reserve is 1,3 billion tons. %21 of Brown coal reserves' right belongs to General Directorate of Turkish Coal, and the rest it belongs to Electricity Generation Company, General Directorate of Mineral Research and Exploration and private sector.

Although share of Turkey's coal production in consumption has gradually increased since 2002, production does not still meet the demand.

Table 3 Turkey's Coal Production and Consumption by Years

Years	Production (million ton)			Consumption (million ton)		
	Pit Coal	Brown Coal	Total	Pit Coal	Brown Coal	Total
1999	2	65,1	67,1	11,4	64	75,4
2000	2,4	60,9	63,3	15,5	64,4	79,9
2001	2,5	59,6	62,1	11,2	61	72,2
2002	2,3	51,7	54	13,8	52	65,8
2003	2,1	46,2	48,3	17,5	46,1	63,6
2004	1,9	43,7	45,6	18,9	44,8	63,7
2005	2,2	57,7	59,9	19,4	56,6	76
2006	2,3	61,5	63,8	22,8	60,2	83
2007	2,5	72,1	74,6	25,4	72,3	97,7
2008	2,6	76,1	78,7	22,7	75,3	98
2009	2,9	75,6	78,5	23,7	75,6	99,3

Source: Ministry of Energy and Natural Resources, “Mavi Kitap 2011”, it was constituted by using the data on p.10 and 11 by the writer. Access: http://www.enerji.gov.tr/yayinlar_raporlar/Mavi_Kitap_2011.pdf , Date of Access: 21.05.2012

Turkey is a rich country in coal reserves and these reserves are expected to increase. The cost of coal production is less than the production of other resources and, it is important, as it ensures the supply of energy security. But, as it is a source of energy which pollutes the environment and air most, it requires clean energy technologies while it is used.

As a result, Turkey is highly dependent on foreign countries for oil and natural gas. Oil reserves are enough for at most 1,5 years, and natural gas resources cannot meet the consumption. Although, among non-renewable resources, coal, which stirs up the climate change, has the less dependence on importation, if the current policies are continued, its use will cause problems in long-term.

As a solution for all these problems because Turkey is highly-dependent on importation, leaving non-renewable resources aside completely and making the use of renewable resources would be the realist solution. Above oil, natural gas and coal are revealed by being taken their present state into consideration. In Turkey dominant view since 1980 in energy politics is that domestic energy resources are not enough, even if all of the resources are used, energy shortage will not be met. But this view, which is ignoring domestic resources, is one of the main reasons of energy shortage.[12]

Turkey’s rate of meeting domestic energy consumption is 36%. In other words, Turkey meets its 64% of energy

need from imported resources. If current politics are continued and Turkey is considered to be a developing country, these statics will increase rapidly by years.

Turkey as a country which pays a premium for oil and natural gas, should reduce its dependence on these two resources, should start and speed up coal exploration which was stopped 40 years ago, should develop and popularize the use of clean technologies for coal, beyond all of these proportion of natural gas of which almost whole of it is imported and its share in generating electricity is 67% and oil of which 90% is imported and its proportion in transportation is 52% should be decreased.

This state of non-renewable energy resources and the transformation towards renewable energy resources requires improvement of Turkey's non-renewable energy resources and determination of its potential for energy clearly, and necessary steps should also be taken without losing any time in this matter as well.

3.2. TURKEY'S RENEWABLE ENERGY RESOURCES

Turkey is a rich country in renewable and clean energy resources. Turkey's renewable energy resources are hydroelectric energy, geothermal energy, bioenergy, solar and wind power.

Turkey's gross potential is 433 billion kWh, technic potential 216 billion kWh, economic potential is, although there is no unanimity, detected technic and economic hydroelectric potential for energy is 129,9 billion kWh by the beginning of 2006.

On total 772 hydroelectric plant are making up on average 129,9 billion kWh of energy generation and 142 of them are in service, 41 of them are at construction level and 589 of them are at project level.[13] Moreover, hydroelectric plants whose capacity is 5000 MW was started to be constructed and are planned to be completed by 2013.

45,9 billion kWh of Turkey's energy potential which is 129,9 billion kWh per year, in other words one of there is used and if its share in total primary energy consumption is considered to be just 8,7%, plants at construction level should be started to service and necessity for making most of these resources for the sake of the country comes up.

Geothermal energy is thermal energy generated and stored in the Earth. Geothermal energy is used to generate electricity, to heat, in heat pumps, spas, fishing farms, greenhouse cultivation and industry but in Turkey it is used just for generating electricity and for heating. The country is the fifth largest country in the world in applications of non-geothermal electric.

Turkey's total potential for probable geothermal resources in electricity is 2000 Megawatt electric (MWe), for thermal is 31.500 MWt, elucidated capacity is in electricity is 93 MWe, in thermal 4000 MWt.[14] Turkey is the tenth country with 31.500 MWts energy potential.

Turkey has used 77,2 MWe of the total capacity of electric which is 93 MWe with 4 geothermal area on total since May 2009 .[15]

On condition that Turkey uses it all of its potential for geothermal, it will ensure the net income of 6,8 billion dollar and its natural gas importation is expected to

decrease 1 billion m^3 per year.[16] Accordingly geothermal resources should be in service as soon as possible both in generating electricity and in heating.

When solar power is examined, if a part of Eastern Black Sea Region is excluded, it is technically and economically possible to make use of solar power in countrywide. Solar power reaches to Turkey on total is ten thousand fold of the electricity power of 1997. General Directorate of Meteorology's studies between the years of 1966 and 1982, Turkey's sunshine duration per year on average is 2640 hours. It is on average 7,3 hours per a day. But later some of the measurements made by Electrical Power Resources Survey and Development Administration show that these studies are performed with low values and do not reflect the genuine potential.[17] Turkey has a significant potential for solar power, if the necessary investment are made, on average 1500 kWh solar energy can be produced from a square meter.

Turkey's best solar energy fields are respectively Southeastern Anatolia Region, Mediterranean Region, Eastern Anatolia Region, Central Anatolia Region and Black Sea Region. Furthermore, the month in which most solar energy can be generated is July, the month in which least solar energy can be generated is December. But the averages are considered, Turkey is above the limit of 2000 hours for benefiting from solar power economically.

The field in which solar powers is widely used is the systems of heating water. The amount of installed solar collectors is 11 million m^2 in Turkey. Turkey is one of the foremost country in the world with this amount and

has the industry with capacity for exportation.

History of investments made in wind power dates back to 1998 which is really early. One of the other remarkable point in wind power is that whole of the private sectors is in the hands of the private sector. Public sector has not made any investments in this field.

Turkey's the most productive regions in wind power are Marmara, Aegean, Eastern Mediterranean coast regions. There are 33 wind farms in service with an installed capacity of 1029,85 MW on total, 11 wind farms at construction level with an installed capacity of 492,35 MW is expected to be completed in 2010 and 17 wind farms which will be with an installed capacity of 644,45 MW.[18] In other words when all of the farms start to generate, Turkey's installed capacity will be on total 2166 MW of wind power.

After preparation period of wind farms is completed, these farms will be in service in a year which is a short time and this is an advantage. Besides this, there are no disadvantages such as high turbine cost and compensation of investment's cost in long years. Although there are diverse incentives are offered when compared to other countries and lack of turbine manufacturers is taken into account these incentives are not enough.

To sum up, there is a clear lack of non-renewable energy resources in Turkey. When it is considered in terms of economy, the country is highly dependent on importation. Besides traditional energy resources that we are using causes important environmental problems such as pollution and forest destruction. However, our country is very rich in renewable energy resources. But, we

cannot make use of them as much as it should be.

Renewable energy resources are cheap except the capital cost. It was supported by the technological developments occurring over the years. These resources are rich, do not cause independence on foreign, pollution and out of the effects of all crises and as they do not have the problem of transportation, can be found when needed.

The most suitable energy resource among renewable resources is hydroelectric energy. But many plants which are at construction level should be put into service as soon as possible; all of the potential in this resource should be used. Our country should be successful in generating electricity from geothermal energy as it is successful in applications of non-electricity. Our country is one of the foremost countries in using solar power for heating but generating power with photovoltaic batteries should be included among its plans. Incentives for the wind power of which cost of capital is very high should be increase with the laws made to ensure more investment as soon as possible.

3.3. TURKEY'S ENERGY-ENVIRONMENT AND CLIMATE CHANGE POLICIES

Production and consumption of energy was at quite limited level in pre-Republic period in Turkey. In the early years of Republic energy was used not in industries but in houses with the purpose of heating. Kerosene was used for lightning. In the period between the years of 1293 and 1930, the necessity of a creation of an independent economic model in all sectors was emphasized based on the speech of Mustafa Kemal

Atatürk in the First Economic Congress of İzmir.[19] But foreign capital was not excluded; investments in energy sector were concentrated in the coupling of public and private sector. With the statist politics performed in 1930s, this period is important in terms of first enterprises and organizing. But, enough amount of accumulation of private capital was not ensured in this period.[20] In the First and Second Five-Year Development Plans prepared for the years between 1933 and 1942, objectives were to increase the production of energy and reduce the dependence on foreign sources. Electrical Power Resources Survey and Development Administration and Mineral Research and Exploration Institute were founded in 1935.[21] Oil was explored for the first time in Raman in 1940. In addition to these, Etibank was established in this period and planned to carry out the activities of generation, transportation and distribution of electricity. In this period, pit coal mines in Ereğli, which were foreign-capitalized, were nationalized and transferred to Etibank. Moreover, Petroleum Office was established in 1941 and foreign-capitalized and privileged foreign partnerships were also nationalized. Despite all of these regulations generation of electricity was at a very limited and local level and so cost of energy was extremely high.

When the period of Post-Second World War is considered, it was seen that priority was given to energy sector. With the attempts of industrialization and urbanization, increase in demand for energy caused priorities to be given to energy sector. “Turkish Economic Development Plan” was entered into force in 1947 and energy politics of Etibank were included.

“Liberal Economy” politics were started to be applied after Democrat Party come to power in 1950 and the role of the government was aimed to decrease. But occurring developments were opposite to what is planned and public sector developed in energy field. In 1953 State Hydraulic Works, in 1957 Turkish Coal Institute and TPC were established. State investments in the field of hydraulic energy were made. Moreover, among the resources based on purchasing and selling share of oil was quite high.

Dealing with the renewable energy resources for the first time in Turkey, occurred in the fourth development plan. But the first enterprises related to this had been realized just in the early 1990s.

Consumption of non-renewable energy resources showed an increase on a large scale over the years in Turkey. Therefore, emissions of total greenhouse gas increase 102% from 1990 to 2009. [22]

The first inventory for greenhouse gas according to Tier I Method determined by IPCC in Turkey was prepared for the years between 1990 and 1997 by State Institute of Statics, of whose name is Turkish Statistical Institute at present. Accordingly, as Turkey’s greenhouse gas

emission was 200,7 million CO₂, in case Turkey

becomes a party to UNFCCC, Turkey must reduce its greenhouse gas emission to the rate between the years of 2008 and 2012.

As it can be seen in Table 4, CO₂ has the highest rate in greenhouse emissions of Turkey. The rate of the other greenhouse gases is lower compared to CO₂.

Table 4 Turkey's Greenhouse Gas Emission between the years 1996-2010

Years	Carbon Dioxide Emission (Mt CO ₂)	Methan (Mt CO ₂)	Nitrose Oxide (Mt CO ₂)	F Gases (Mt CO ₂)	Total Greenhouse Gas Emissions (Mt CO ₂)
1996	192,1	49,31	16,40	0,89	258,62
1997	205,18	50,59	14,98	1,13	271,88
1998	204,32	51,90	16,65	1,18	274,05
1999	203,68	53,14	16,93	1,03	274,78

2000	225,43	53,30	16,62	1,66	297,01
2001	208,99	52,74	14,69	1,70	278,11
2002	217,93	50,43	15,32	2,41	286,09
2003	232,64	51,63	15,67	2,80	302,75
2004	243,43	49,37	16,00	3,46	312,26
2005	259,61	52,35	14,18	3,73	329,87
2006	276,72	53,33	15,55	4,05	349,64
2007	307,92	55,58	12,35	4,13	379,98
2008	297,12	54,29	11,57	3,51	366,50
2009	299,11	54,37	12,53	3,64	369,65
2010	326,47	57,54	13,03	4,89	401,92

Source: The table was prepared by the author by using the data in T.R. Prime Ministry Turkish Statistical Institution, Environmental Statistics., Access: http://www.tuik.gov.tr/VeriBilgi.do?alt_id=10, Date of Access: 22.05.2012

Turkey's emission per head is 3,6 tons CO₂ which is

under the world average of 4 tons. (Emissions per head in

USA 19.10 ton CO₂, in China 4,58 ton CO₂, in EU 7,92

ton CO₂ and in India 1,18 ton CO₂)[23] Accordingly, it wouldn't be wrong to say that Turkey's per-head responsibility for CO₂ emissions causing global climate

change is lower compared to other countries.

Turkey's studies on climate change were started in the preparatory process of FCCC. In this context, Turkey created working groups by establishing National Climate Coordination Group under the leadership of General Directorate of Turkish State Meteorological Service in Turkey in January 1991. These groups prepared reports on the determination of present state in Turkey, energy technologies, protection of the atmosphere and climate change. Later, in 2010 Coordination Committee on Climate Change was established with Prime Ministry Circular and this committee was revised and 8 working groups were created on the subjects of "examining the effects of the climate change", "industry, house, waste management and reducing greenhouse gas in service sector", "reducing greenhouse gas in energy sector", "emission inventory for greenhouse gases", "reducing greenhouse gas in transport sector", "land use and change in land use and forestry", "developing policy and strategies" and "education and raising the awareness of the public."

T.R. Ministry of Environment and Forestry published

two studies; one of them is called “Turkey Becomes a Solution Partner” in December 2009 and Document of National Climate Change Strategy” in May 2010, these studies involved basic indicators related to climate change and Turkey, control of greenhouse gas emission, energy, transportation, industry, wastes, land use, agriculture and forestry, adaptation to climate change and in the subjects of technology, financing, education, related to these in short, medium and long term plans.

In addition these studies, Department of Climate Change was established within the body of Ministry of Environment and Forestry in July 2010. Primary duties of this department are;

Control of the substances causing climate change and the thinning of ozone layer, monitoring national and international developments for recycling and eradication of them and assess them, helping to determine the policies and strategies related to the subject, maintaining the negotiations as a part of the international agreements and protocols made related to climate change and protection of ozone layer, carrying out studies on fulfilling the obligations given to Turkey, determining the criteria related to the importation and exportation of the substances causing climate change and the thinning of ozone layer and control of them, maintain the studies on the project and market based activities as a part of emission trade, in the studies of reduction, adaptation, transfer of technology and financing within the context of climate change, monitoring national and international developments and assess them and make studies about its implementation, making studies on renewable energy resources and use of clean energy, making collaboration

with national and international organizations on the studies made.[24]

Despite all these studies and the developments, members of the working groups changed frequently so that required expertise could not be fulfilled. Even if the parties, which are realized by UNFCCC, participated in the meetings, the number of the participation was very minimal and continuity could not be ensured, there was no participation in the meetings and technical meetings organized by UNFCCC.

There is not any legislation for climate change and greenhouse gases yet, diverse phrases such as protection of the environment, prevention of environmental pollution, incentives of clean technologies, compulsory standards for the prevention of environmental pollution and taxes were added to the Environmental Law and various regulations. There is not any comprehensive study made in this field.

3.4. TURKEY'S ATTITUDE TOWARDS KYOTO PROTOCOL

Turkey's attitude towards UNFCCC differs from its attitude towards Kyoto Protocol. While Turkey's attitude was in the way of cancelling the Convention's Annex Till the Rio Summit which was including the years of 1992-1997, for the period of after 1997 which started in Kyoto, still in the way of cancelling the Annex of the Convention but at the same time determining a softer target for greenhouse gases.[25]

Kyoto Protocol was approved by TBMM (Grand National Assembly of Turkey) on 5 February 2009 with the law 5836 and on 17 February 2009, with the law

27144 was put into force by being published in Official Newspaper.[26]

Obligations in Protocol which are required to be fulfilled between 2008 and 2012 are not binding for Turkey. Obligations which will be determined will be binding for Turkey for post-2012.

By approving the Protocol, Turkey has made great progress related to the environmental obligations which are required to be fulfilled in the EU process. Furthermore, the country took a stance, which is a solution-based and requiring collaboration, for the problem of global warming which is a very important matter and causes many negotiations and search for a solution in the international arena. In addition to all of these, Turkey took the opportunity of participating as a country which has the right to speak, to vote and to look after its own benefit in the negotiations as part of the 16th Conference of Parties organized in Kankun between the dates of 29 November and 10 December 2010.

There are advantages as well as disadvantages of the Protocol. If the actions which, taken to reduce the having increased greenhouse gases at a high level by fulfilling the obligations required by the Protocol, after Turkey became a party, are insufficient, it is possible for Turkey to expose to the sanctions.

Turkey is not under any obligations in the framework of Kyoto Protocol to reduce the emission during the process till 2012. Documents of National Climate Change Strategy and Department of Climate Change established within the body of Ministry of Environment and Forestry of which details are defined in the previous chapters can be regarded as a concrete proof of Turkey has started to

make the preparations for the process of post-2012.

4. CONCLUSION

Energy-Environment and global climate change are the concepts which are like the parts of a whole occupying the agenda of the international arena exceedingly. In the process of establishing the energy-environment policies and performing them, even these policies differs because of the countries' economic systems, political regimes and the differences in their international policies common objectives can be summarized as ensuring people to live in a health environment, protection of environmental values, ensuring the obligations', which are required by policies of energy-environment, compatibility with the principles of justice. International collaboration in the matter of the energy-environment causes conflicts as it requires reorganization and allocating fund. Accordingly at this point economic and politic factors more than scientific concerns become a part of the work. In addition to this unfair allocation in energy resources embitters the conflicts.

During the solution seeking process in international scale on energy-environment and climatic change, the main issue in the energy-environment policies is the issue of divvying the charge up between the countries.

If we look from the view point of Turkey, on one hand the country is utterly nonrenewable energy resources and import dependent, on the other hand it has the makings of renewable energy resources. The policies that Turkey will implement in order to reduce the greenhouse gas emission within the context of the Protocol—for

example, progress in terms of the renewable energy resources—may also be a contributing cause which will clear away the foreign dependency of Turkey. Our country's concern on the climatic change issue on the international scale, its co-operation and its taking sides with the countries that make an effort has played as a gesture of goodwill. This is also important in the way of Turkey's having a voice in international negotiations and assemblies relevant to this matter.

The main problematic question in Turkey, as it is in the other ever-developing countries, is whether being a party to the Kyoto Protocol will create trouble or not. Being a party to the Protocol whose long form purpose is only to reduce the greenhouse gas emissions is not a trouble to militate against Turkey's development. There is no doubt that Turkey will successfully get through it only if it looks after its own economic and national interests without bringing in the domestic politics. Those are the policies that Turkey should follow to resolve the problem: First of all, Turkey should comprehend the potential of the renewable energy resources and buck up them as early as possible. Turkey should play a part with its own companies in the process of searching for nonrenewable resources and petroleum production. It should have control over the production and the portage. When import of the resources is statutory then a policy of diversifying the resources instead of sticking to a few should be implemented. Turkey should not only focus on the issue of increasing the renewable resources, but also it should do emergency research on how-to-use coal, which is of capital importance and which abounds, via clean energy technologies and should in no time restart

the researches across the country that has been stopped for forty years.

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**ENERGY BALANCE SHEET ASSESSMENT IN
OYSTER MUSHROOM (*PLEUROTUS
OSTREATUS*) AND ITS OPTIMIZATION
METHODS**

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ABSTRACT:

Away to assess stable development in agricultural organization province is to use energy flow method. Therefore in this research we have discussed oyster mushroom energy balance sheet of West Azerbaijan in 2008. To assess energy balance sheet in this semi-

Industrial research institute, all data was converted to equivalent amounts of used and produced energy with applying special indices and formulas and then Energy Efficiency was computed. Amount of used energy in the production per each period was assessed 9841659.7 kilo calories and the amount of produced or output energy including biomass was separately calculated as 738000 kilo calories per each growth period. Also, amount of energy efficiency for biomass function was separately computed as 0.073. Data shows that most of energy was accordingly related to gas oil fuel and electrical energy respectively, and the least consumed energy was for the Mushroom seed. That can be affected by compost kinds and climate conditions (humidity, temperature, air condition and act). However results show that energy balance in oyster mushroom production is strongly unfavorable. The continuances of these conditions of cultivation using extra energy for production can threats sustainable development of this part of agriculture.

Key word: *Pleurotus ostreatus* , Energy, output and input, Energy efficiency.

INTRODUCTION:

Energy flow is one of the important subjects in agricultural ecology and the ratio of input and output energies is calculated for different agricultural ecosystems in different parts of the world [1, 2]. One of the ways of evaluating the agricultural development and persistence of production in the agricultural regions is the

use of energy flow method [3 ,4]. Understanding the methods of energy distribution is important in developing and designing the agricultural management and it needs to ecologically relate the energy and persistent environmental management with the development [13, 14, 15, 18] . Production of different edible mushrooms has much importance nowadays and may contribute to agriculture development. Although mushroom feeds with the remains of excessive vegetable materials especially cellulose materials, it overflows with protein, necessary amino acids, carbohydrates, and the organic materials, which are important for the body of human [6, 8]. Mushroom indiets might supply proteins, vitamins K, E, D, C, B, A and important organic salts such as calcium, phosphor, iron, potassium, magnesium, manganese, and etc., that are important for body especially in children, old people, pregnant women and generally all the people in whichever phase on growing years [11, 19 ,20]. In addition, according to the researches done in different countries such as Japan and China, many of the kinds of mushrooms have medicinal properties and are recommended for some of the significant diseases [16, 17]. In Iran, although, there are potential abilities and favorable geographical conditions and also there are a lot of natural species of edible mushrooms, this industry hasn't found its real prosperity. Though nowadays, the technology for edible mushroom cultivation has cumulated lot of developments in many of the world countries. Consequently the total production in the last ten years reached to four million ton from 700 thousand ton. Edible mushroom biology and development of technology for mushroom growing are studied in famous

universities around the world. The core centers of research has interesting action in different investigation to find appropriate and fruitful mushrooms, which are resistant against pests and diseases and to find the technology of production and others [17].

The oyster mushroom, *Pleurotus ostreatus*, is a common edible mushroom. It was first cultivated in Germany as a subsistence measure during World War I and is now grown commercially around the world for food. Oyster mushroom can also be used industrially for mycoremediation purposes and it may be considered as a medicinal mushroom, since it contains statins such as lovastatin that work to reduce cholesterol [6, 7, 8, 9]. In this study the necessary researches were done to evaluate the energy balance sheet of the production of oyster mushrooms in Iran.

MATERIALS AND METHODS

The current system in Iran is traditional and usually all of the works are done in the factory. Nowadays the advanced countries don't use of this system. It includes four basic phases, A: supplying spawn mushroom seed, B: supplying composite or cultivation bed, C: cultivating the mushroom seed on the cultivation bed, D: doing the keeping and picking up that were analyzed here.

The production of the Oyster Mushroom Producing Mushroom Institute in West Azarbayjan geographic area northwest parts of Iran representing 3 Ton of oyster mushroom per year was studied. The information was obtained from the relative authorities in each sector of the

institute and by completing a questionnaire. Data were collected for the year 2008. The data were averaged. The amount of energy expressed as kilocalorie in each phase and so the energy per saving unit is specified (table 1). In the next phase, the amount of energy efficiency (ration of earning to the saving) was calculated as follow [5, 8].

Efficiency of the biomass energy= $\frac{\text{the biomass produced energy}}{\text{The total consumed energy}}$

Efficiency of the protein energy= $\frac{\text{the protein produced energy}}{\text{The total consumed energy}}$

RESULTS AND DISCUSSION

The amount of each of the consumed earning and saving per year is supplied without the use of special formulas and by using the available statistics and information and questions, which are done from the relative authorities and are provided in table 1.

Table 1: Consumed energy of factors and savings in the production of 3 tons of oyster mushrooms in Iran

Kind of consumed Energy	Unit	The amount of consumption per phase	Amount per unit (kilocalorie)	The amount of energy per phase (kilocalorie)
Labor (all the phases)	Hour	1200	500	600,000
Gas oil	Liter	728.6	9853	698,2173.8
Water	Square meter	999.3	272.2	272,009.5
Mushroom seed	Kilogram	32	175.5	5616
Electricity	Kilowatt	479.7	2863	1,37,3381.1
Wheat straw	Kilogram	2333.3	221	515,659.3

Poisons	Liter	4	23205	92,820
Total	----	----	----	9841659.7

The percent of the compounds in the oyster mushroom is provided in table 2. We can calculate the produced energy of each of the compounds in the oyster mushroom, the ratio of the produced to the consumed energy (earning to the saving) or the efficiency of the energy and the ratio of the consumed to the produced energy by using these data.

Table 2: value of generative energy from oyster mushroom chemical products

Blend type	Blends Percent	Energy balance per gr(kcal)	Amount of production per phase (kilogram)	Amount of Produced energy kilocalorie per phase)	Consumable To generative energy	Generative To consumable energy
Protein	2.76	4	82.8	331200	29.7	0.033
Hydrate carbon	2.85	4	85.5	342000	28.7	0.034
Oil	0.24	9	7.2	64800	151.8	0.006
Total	---	---	---	738000	210.2	0.073

The reports of Oyster Mushroom Producing Mushroom Institute in West Azarbaijan Province show that the productive operation in 2008 in this production institute is about 3000 Kg in total period. The produced energy in this production institute is reported in table 3.

According to the information in tables 2 and 3, the energy balance sheet was calculated in this institute for biomass and protein yield, and reported in table 4.

Table 3 : The produced energy of oyster mushroom

Amount of energy per unit (kilocalorie per phase)	Amount of production (kilogram)	Amount of produced energy (kilocalorie per phase)	Kind of produced Energy (kilogram)
246	3000	738000	Biomass yield

Table4: Efficiency energy of oyster mushroom

Outputs	Consumable energy	Generative energy	Efficiency energy
Biomass operation	9841659.7	738000	0.073

The figures in table 4, clearly indicates the energy efficiency and the amount of necessary (consumed) energy to produce biomass per unit of the compounds such as protein, oil, and hydrate carbon in the production of oyster mushroom. In this study, energy efficiency for Biomass Operation has been calculated as 0.073. In this study, it has been shown that the most amount of energy was related to consumed fuel and electricity and the least amount of energy was concerning consumed seed. When spawn is developed, oyster mushroom needs a

temperature of 25-28 °C and a humidity of 70-80% in no-light conditions. During crop production, the oyster mushroom needs the temperature of 25-30 °C and the humidity of 80-90%. In order to provide the required humidity at different cultivation stages at this Institute, steam producing equipment has been used. Due to excessive use of the said equipment, the consumed electrical power has reached the highest level. In order to decrease the consumed electrical energy, instead of use of equipment producing steam, one can do irrigation every day, therefore, humidity will be produced in the hall. Due to its geographical position in Iran, West Azarbaijan is a mountainous region that enjoys cold climate. Due to drop of temperature at this Institute and in order to provide the required temperature by this kind of mushroom, i.e. oyster mushroom, gas oil and oil steams have been used. Excessive use of equipment that produced heat had led to high energy consumed by fuels. In order to decrease this amount of energy, it is recommended that the hall be perfectly and thoroughly insulated preventing cold air to arrive. Seeds of the best quality have been used in cultivation of this kind of mushroom. Desirable and appropriate amount of seed has been used accordingly. Consequently, the amount of energy consumed by the seeds has been at the lowest level. In order to achieve high and desirable function, such superabsorbent as A200 and A300 is recommended. It means that a little amount of superabsorbent together

with the consumed seed is added to cultivation bed per each layer of wheat straw. Because of lack of sufficient orientation with such compounds as mentioned earlier, the said materials have not been used by this Institute for producing oyster mushroom. This is why the Institute has not achieved desirable function. According to some researches, the increase of the consumed seed from 1.25 of the seedbed to 5%, it may lead to rise of crop by 50%. Hence, the amount of consumed seed (per percentage of wet weight of the seedbed of mushroom cultivation) will have an enormous effect on cropping. It is hoped that through benefiting from modern science in production of the oyster mushroom, we may achieve desirable and appropriate function. Consequently the ratio of earning to saving may be at a desirable level as well.

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NEW ELECTRICITY MARKET IN TURKEY

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Electricity Market Law No. 4628 which has come into force in 2001 is one of the important steps taken by Turkey about the Electricity Markets. As specified in the purpose of the law, the target is to bring electricity into use for the consumers in an adequate, qualified, continuous, cost-efficient and environment-friendly manner.

Within the context of liberalization of Electricity Markets, European Union has included articles regulating eligible consumer practices, Wholesale Electricity

Markets and Retail Electricity Markets and consumer use portfolios and tariff practices in order to provide security of supply in the Directives issued in 1996 and 1998. In addition, in order to support weak consumers, social tariffs have been developed and consumers having different characteristics in the context of geographical, social, economic and political structures have been evaluated in social tariff status and have been supported in this way.

In this study, opinions and suggestions will be presented related to the Regional tariff model and New Electricity Market model as a result of the rapidly changing Electricity Market and Privatizations.

Key Words: Tariff, Electricity, Market, Liberalization

Regulation concept

One of the main responsibilities of the state is to ensure both economic and social development of its citizens. In order to provide this; it tries to reach the goals such as implementation of policies that will assure economic stability, increasing gross domestic product per capita, improving education level and ensure equality in this area, creating policies for the protection of environment which is an exhaustible resource, providing high standard health care services [1] . Two main tasks are fulfilled by the state for economic development of the society. First is to push the profit gain incentive, which is the most important factor in free market economy, into the background and doind the investments required to sustain public order. The second one is to assure that the

competitive economic conditions are applied [2].

“Regulation” concept; which was put forward in USA since early 1980 ; is considered as solemnly “arrangement” activity by some authors and by some authors it is perceived with two perspectives as “arrangement and control” [3].

However; in today’s implementation, the regulation function which is generally operated by public corporations independently from the state. It has three dimensions such as arrangement, control and instruction. In other words; “regulation” concept has a meaning that covers arrangement, control and instruction activities [4].

Why Regulation in Electricity Sector?

It is a common understanding that the data obtained in electricity sector is in direct proportion with the economic growth indicators of the countries. Thus; the structure and operation of this sector is of great importance. Huge investments are required to assure high quality and continuous operation of electricity sector. When the sector is evaluated on the whole, the existence of both a natural monopoly and competitive structure is one of the prominent features.

Because of the problems experienced in electricity activities, which are managed by public authorities with a vertical integrated model; caused by this vertical integrated model and in order to fulfil this requirement of the citizens in a qualified, continuous way and at low cost, it has been required to establish a market structure

which is regulated and which also ensures competition.

This organization and management model has emerged as a result of the specific attributions of the electricity industry in a period when the quick infrastructure growth is driven by fast industrialization..Considering its supply to the end user; electricity energy differs from many other consumption services and transmission of electricity energy requires continuous control of demand and supply. In those days when the scale economy is of great importance in industry; integrated structure of generation, transmission and distribution components of the sector necessitates that high capacity power plants and transmission systems to be constructed together and to be managed from a central corporation. This model gave a chance to distribute the electricity to the whole country including the rural areas and it has enabled to supply energy to relatively undeveloped regions. [5].

Upon the beginning of free competition in electricity markets of several countries, monopoly of the public administrations started to be terminated through the vertical integration model. We may say that main reason behind the reference to regulation studies is to ensure a completely competitive environment in electricity market. By this means; in several countries monopoly in electricity market was given up and the companies that showed monopoly were subjected to regulation and the areas that might be active in competitive markets were also privatized. In this context; the corporations that are willing to invest in electricity markets were incentivized.

Regulations History in Turkish Electricity Market

Regulation studies in Turkey Electricity Market were initiated in relation to EU process. As a result of Turkey's initiatives to be an EU member; Report regarding the Adoption of EU Legal Acquits was issued in 1999 after Helsinki Summit. Upon these developments; within the framework of this legal acquits, Turkey brought the law number 4628 into effect as a first step of the improvements in Electricity Market.

In 1996/98 and 2003/54 EU instructions; it was aimed to prepare market conditions for the electricity energy generation, distribution and electricity trading in EU member countries and to ensure competition between the participants. The provisions of Consumer Rights Protection were specified and especially it was ensured that the rights of residential or small scale industries were protected. Eligible customer definition was made and it was stipulated that all the customers excluding residential ones would be eligible until 1.7.2004 and all customers would be eligible as of 1.7.2007. Also it is requested to mention the existence of an efficient regulation, competition in the markets, customer's supplier changes, scope of tariff negotiation and the existence of network access without any discrimination. Protection of small consumers is especially emphasized. Social Tariff structures in EU member countries have been improved in order to avoid any damage to those consumers.

Hence; the aim of Law Number 4628 is defined as *“to create a economically strong, stabilized and transparent*

electricity energy market that can be operated in line with exclusive law provisions in order to supply sufficient, high quality, continuous, affordable electricity to the consumers; and to assure independent regulation and control in this market.” [6]. As it is seen; also in Electricity Directives issued by EU, there are provisions about security of supply, service without any discrimination and protection of vulnerable customer.

With the 2004/3 Numbered Electricity Energy Sector Reform and Privatization Strategy issued after Law Number 4628 , it is aimed *‘to reduce the costs through efficient and effective operation of electricity generation and distribution assets, ensure electricity energy supply security and to improve supply quality, reduce the technical losses in distribution sector to the level of OECD countries and to prevent losses, to ensure that the necessary renewal and expansion investments are made by private sector without any burden to public legal entities, to reflect the improvement in service quality, that is obtained through the competition in electricity energy generation and trading activities, to the customers”.*

In 2009; Electricity Energy Market and Security of Supply Strategy Document was prepared and it was stated that *“Free market composition on the basis of competition in electricity energy sector requires a transition period. Within this scope; considering the requirements in transition period , improvements and regulations up to now; the targets should be fixed about the steps to be taken in the following period and resources to be used in short and long term electricity supply.”*

New Law Draft of the Regulation in Electricity Market

With the Electricity Market Draft Law issued by Ministry of Energy and Natural Resources; our country took a step in order to create a new structure in Electricity Market. Related to the Draft Law; new markets, actors and various arrangements have been introduced. The reasons behind the requirement of a new law can be listed as liberalization policies that have been going on in our country since 1980s, Turkey's demand of EU membership in line with EU Directives, Security of Supply, Structural changes in the sector, Economic and Social Causes.

Organized Wholesale Electricity Markets have been defined as day ahead market, daily market, energy balancing market, supplementary services market, over the counter markets and derivative markets. While; day ahead and energy balancing market and supplementary services market among those markets are operated by TEİAŞ, all the markets to be created by the draft Law will be operated by Electricity Markets Incorporated Company.

With the unbundling of distribution and retail activities as of 1.1.2013; Wholesale Markets and Retail Markets will be able to sell energy all over the country under the name of Supply Company. Namely; with the new draft law, retail activities will be performed in free market. This can be considered as one of the important steps for free market.

Price Equalization Mechanism and National Tariff Model; which are expected to terminate on 1.1.2013; seem to be extended until 2015. Within this context; it seems that the studies for creating the market will prolong to 2015-2020 which is the II. Implementation Period. In this scope; considering that the eligible customer limit can not be decreased under the expected limit, the fact that regional tariff model conversion is not likely to be fulfilled and as there are deficiencies in infrastructure; we can say that 2011-2015 Tariff Period can also be named as Transition Period. Hence; we see that the transitions in Electricity Markets do not take long time only in our country, but they do take long time in the European countries, as well.

CONCLUSION

Electric Distribution Activity which was exclusively carried out by TEDAŞ in 2001 has been distinguished to 21 Distribution regions in 2006 and the model based on Wholesale Competition was adopted. In this model, the distribution companies that have been separated can buy electricity from any supplier. However, distribution companies are in a monopoly position regarding energy provision. Currently, this model is implemented in our country.

This regulation that has started with 2001 Electricity Market Law prepared within the context of Union Acquis and by the strategy documents issued, signal have been given about the New Electricity Market and the

disclosure ratio in the market has been increased to % 78s from % 20s as from 2011 with the reduction in the eligible consumer limit and by the licenses issued to the private sector.

Retail Sale Competitive Model is a model that is planned to be implemented within a 5-years period according to the Electricity Market Law. In this model, the mechanism of the market is based on the trade between suppliers, consumers and the intermediaries in the system. On the demand side, consumers can freely choose their suppliers and can negotiate and make contracts. On the supply side, suppliers can sell the electricity produced by them to any market actor.

In the light of the purposes specified in the law, the necessary legislative studies have been made, privatizations have gained speed and the necessary regulations in order to establish a consumer-oriented structure of a pure competition market have been prepared. It is planned that this process will be completed in 2015.

The conditions of competition have gradually increased with the decline in the eligible consumer limit each year and the rapid privatization process in the field of electricity distribution. However, Distribution Companies will continue to be involved in this competition only in their distribution regions until 2013 when retail and distribution activities will be distinguished. This situation causes Distribution Companies to have some difficulties in the 1st Implementation Period.

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THE POSITION AND IMPORTANCE OF BALTIC SEA COUNTRIES FOR RUSSIAN ENERGY MARKET

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ABSTRACT

Russia, which is in a crucial position in terms of oil and natural gas reserves in the world, continues its ascendancy in the energy market depending on the energy need of developing and developed countries. A big amount of income in the country depends on the energy export, in this context energy sector becomes the most important sector which carries Russian economy.

Latvia, Lithuania and Estonia, which are the countries near Baltic Sea and declared their independence in early 1990's, have their energy politics under the authority of Russia. After the independence, structural changes in the economies of these countries are directly proportional with energy politics of them.

The aim of this study is to analyze the position of three Baltic Sea Countries for Russian Energy Market and review the effect of energy for their economic growth. Also, the position of Latvia, Lithuania and Estonia-which are like the doors of European Union for Russia-in European Energy Policy will be questioned.

Key Words: Energy, Baltic Countries, European Union, Russian Energy Market,

THE IMPORTANCE OF BALTIC COUNTRIES (LATVIA, LITHUANIA AND ESTONIA) IN ENERGY MARKET IN RUSSIA

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1. Introduction

After collapsing of the Soviet Union, A new process has started in terms of Baltic countries (Lithuania, Latvia and Estonia). These countries which achieved their independence have entered restructuring process, and tried to take a place in current world politics. Therefore, prior to the 1990s, Baltic countries, which were dominated by the Soviet Union and determined their policies in that way, headed towards West, and tried to

rule out the Soviet Union traces in the past since 1990's. After entering European Union have rivet his situation, performed all their connections with western countries and achieved a safety zone against the effect of current Russian government's policies.

Achieving sustainable economic growth to the countries depends on reaching energy sources safely. Transferring of energy demand to the European countries is of importance in terms of relations between Russia and EU; for that purpose, the position of Baltic countries gain in value. In particular, as well as determining a common energy policy, and strengthen alternative energy sources, keeping on negotiations with Russia about energy take place in the most important policies for current countries. Thus, playing mediator role between two regions increase the role of countries that we called Baltic countries (Latvia, Lithuania and Estonia).

In the first part of our study about the importance of Baltic countries in Russia energy market, we will try to evaluate energy infrastructure of Latvia, Lithuania and Estonia, and import dependency relation, and in the second part, it will be studied on the energy links and projects that Russia have in these countries. In the last chapter, EU will be questioned

EU, and highlighted the importance of Baltic countries about distribution of energy supply. In the conclusion, It will be a general assesment about these countries which are members of EU, and also have historical retalions with Russia, and tried to made a sense their new situations in the world energy market.

2. The Energy Infrastructure of Latvia, Lithuania and

Estonia, and Dependency Relation to The Import

While there wasn't any data about oil production between 1991-1995 when Lithuania gained its dependence. Coal production was 19.768,9 tons Lithuania's oil production had increased until 2005. After 2005, in the production of Nazeikiu Nafta that is the most important tax payer of the country has occurred reductions according to the Russians because of cutting oil flow with technical reasons by Transneft, and selling company shares to PKN Orlen that is one of the Poland company (Crane et al; 2009;p:29). Although there is no crude oil and natural gas production in Estonia, oil production from transit ports (Tallinn and Muuga) was about 7.642 as from 2010. The most important feature of Estonia is the only country that used oil shale in the world. A large part of the country's electricity generation is provided through this energy sources. Thereby it can be said that its electrical production is more than other countries. However, It can be thought that oil shale production volume will reduce, and this makes increase dependency to Russia in terms of energy supply according to emission volume about environment of EU. The following **Table 1** shows the distribution of energy sources of Baltic countries.

Table: 1 The Production of Primary Energy Sources of Baltic Countries (1991-2010)

	1991	1995	1999	2002	2005	2009	2010
Oil Supply (Thousand Barrels Daily)							
Latvia	-	0	0	0	0	0	0
Lithuania	-	5,58042	8,30742	13,43742	9,63302	5,73221	5,73221
Estonia	-	0	3,02	5,5304	6,9	7,6	7,64192
Gas Supply (Thousand Cubic Meters)							
Lithuania	-	0	0	0	0	0	0
Latvia	-	0	0	0	0	0	0
Estonia	-	0	0	0	0	0	0
Coal Supply (1000 Tone)							
Lithuania	-	13.705,04	11.780,4	13.669	16.083,83	16.467,43	19.768,9
Latvia	-	0	0	0	0	0	0
Estonia	-	0	0	0	0	0	0
Electrical Supply (1000 kWh)							
Lithuania	-	8,172	7,772	8,010	9,5943	8,559	12,893
Latvia	-	3,887	4,001	3,860	4,7786	5,4571	6,46
Estonia	-	12,157	12,254	16,133	13,35309	13,4669	NA

Source: EIA, www.eia.gov (18.04.2012)

According to **Table 2** below the country that the has the highest energy sources consumption is Lativa, and then Lithuania, and Estonia respectively. Primary energy sources consumption in these three countries is more than their productions, and due to the fact that they have high dependency to import in terms of energy sources. The main source of energy source is gas instead of oil, and at the same time it has tried to meet a large part of its electrical needs via Ignalina nuclear power plant; however, as from 2009 this facility was closed because of a danger like Chernobyl according to EU's negotiations, and this situation caused for Lithuania to search new ways related to energy supply of Lithuania.

(Maigre,2010,p:5)

Table 2: Consumption of Primary Energy Sources of Baltic Countries (1991-2010)

	1991	1995	1999	2002	2005	2009	2010
Oil Consumption (Thousand Barrels Daily)							
Latvia	-	41,5753	30,746	28,2306	35,4331	38	41
Lithuania	-	73,1478	61,9646	53,0353	68,352	73	67
Estonia	-	25,532	24,311	23,523	28,4756	29,6754	30,9577
Natural Gas Consumption (Thousand Cubic Meters)							
Latvia	-	38,85	45,5564	60,0355	68,5111	55,0914	53,6788
Lithuania	-	98,88	75,5741	102,06	107,358	96,41	109,477
Estonia	-	26,31	35,315	47,3221	53,6788	23,0607	24,7558
Coal consumption (1000 tone)							
Lithuania	-	286,601	152,119	123,459	139,994	139,994	143,3
Latvia	-	410,06	210,541	246,918	336,205	277,342	337,307
Estonia	-	14699,3	14053,4	14394	16339,6	15253,8	19763,3
Electricity Consumption (1000 kwh)							
Letonya	-	4,874	4,699	5,077	6,0906	6,3701	NA
Lithuania	-	8,419	8,234	8,219	9,15809	9,5657	NA
Estonia	-	5,577	5,698	6,06	6,8833	7,755	NA

Source: EIA, www.eia.gov (18.04.2012), NA: Not available

When we take a look at their energy dependencies; it is seen that gas dependencies of these three countries continue at a rate of over 100%, and their oil dependencies shows increasing a longside fluctuating course. This is because these countries have got into process of rapid economic growth. Therefore, due to the fact that energy supply is not sufficient in current countries, The part that cannot be met domestically is tried to be imported. **Table 3** shows the energy dependencies on energy types according to the years.

Table 3. Energy dependency status according to kinds of energy between 1999-2009

Energy Dependency	1999	2005	2006	2007	2008	2009
Estonia						
Oil	80,5	69,4	75,2	73	64,1	64,3
Gas	100	100	100	100	100	100
Heavy coal and derivatives	100,3	88,4	170,7	152,3	100,3	4
Lithuania						
Oil	86,3	92	97	94,4	92,5	90,1
Gas	100,7	100,6	101	102,9	96,3	100,4
Heavy coal and derivatives	84	101,2	99,6	99,3	101,8	97,4
Latvia						
Oil	83,5	102,4	102,4	98,1	99	99,4
Gas	103,6	105,6	108,8	96,8	82,2	114,1
Heavy coal and derivatives	98,6	97,7	122	92,1	99,9	94,1

Source: Eurostat, <http://epp.eurostat.ec.europa.eu/> (15.04.2011)

3. The production and consumption of Russia

When we look at below the **Figure 1** energy production of Russia, it is seen that it increased continuously between 1999-2009, and its consumption remained constant at about 2 million barrels. Thereby, it can be said that approximately 80% of production was exported. A large part of Russia's oil export is carried out through the pipeline by state-owned company Transneft. Teengiz-Novorossiisk all except for pipeline is under control of this company (EIA/Russia,2012). Another Russian company in this field is Gazprom, and natural gas needs of European countries is needed by this company.

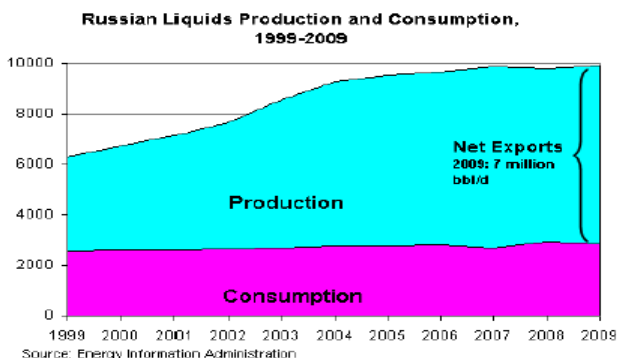


Figure 1: The production and consumption, and export of Russia between 1999-2009

Source: EIA, www.eia.gov (18.04.2012)

According to the below **the figure 2**, Russia's gas production is 33.578.4 cubic meters and takes out from Ural region. And the rest of it in Far East, South, North Gagus region, Siberia region, and Privolzhsky fields. Similarly, its oil production is 1785 million tonnes and Ural region is the first in oil production with 1451,6 million tonnes. In 2010, Gazprom's gas production increased, and reached to 508 billion cubic meters, and concentrated gas production was 11,3 million tonnes, oil production was 32 million tonnes (Gazprom, 2012). Russia exports the energy it obtains via the pipeline system built by Russia itself in the regions previously owned Baltic countries are transit systems and they are important in terms of distribution of oil. The two major ports in Baltic countries Ventspils in Latvia were completed in 1961, and Butinge in Lithuania were completed in 1999. Except that, oil and oil production

export are also provided over Tallinn and Kallingrad even though it is small share. After Primorsk port was finished in 2002, It has become a terminal that Russia's largest oil export. It can be said that it has oil carrying capacity oven Baltic countries. (Eoearth/Article, 2012).

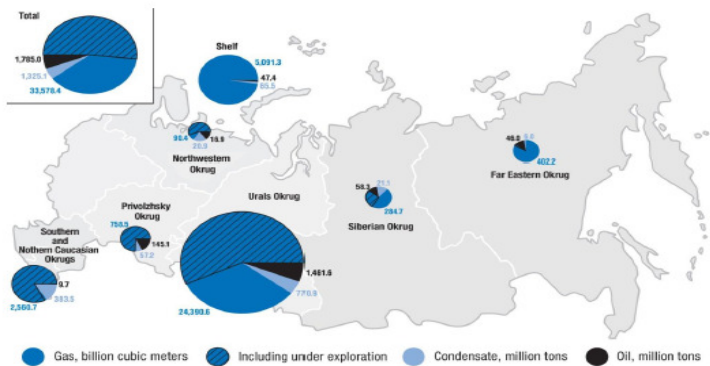


Figure 2: Distribution of Russian's Energy Sources as per regions (2009)

Source: Gazprom, <http://gazprom.com/about/production/extraction/2012>, (17.04.2012)

Table 4: Crude oil export of three regions by means of Transneft.

Million Tonnes	2000	2009
Region		
Baltic Sea	20.8	70.1
Druzhba	52.4	55.7
Black Sea	43.1	46.7

Source: Adnan Vatansever, Russian's Oil Exports, Carnegie Papers, 2010,p.7

As shown in Table 4 above, it is Baltic region Where

most of the crude oil is carried out in the last nine years, and also respectively Druzhba in Odessa region of Ukraine (Black Sea). After constructing of Primorsk port, share of Baltic Sea increased 2,5 more, and reached 70.1 million level. It was followed by Druzhba, and also it provides energy supply to Mazeikiu refinery in Lithuania. After 2009, export from this port was 55.7 million tonnes. Export volume in Odessa region reached 46.7 million tonnes by increasing when compared to 2000.

Except for Baltic countries become transit countries of Russia's oil export, Gasprom has 37% share of Eesti Gaas company in Estonia, Ruhrgas has 33%, Fortum company in Finland has 18%, Iteira in Lithuania has 10% (Eesti Gaas, 2012). Latvijas Gaze company's share has Ruhrgas (%47) as of 2008 in Latvia and Gasprom has followed it (%34) share with and Iteira Latvija. Which is Latvian company has share of 16% (Latvijas Gaze, 2012). Previously, in Lithuania while Dujutekama was controlling 40% of gas import, gas conversion, gas distribution and export operations have tried to be provided by means of this company as a result of agreement in 1999 between Gasprom and Lietuvos Dujos. Lietuvos Dujos company is the only gas transport system in the country, and there is not another alternative to meet gas needs of the country. The largest partner of Lietuvos Dujos is Ruhrgas with its 38.9% and followed by Gasprom with its 37.1%. state's share is approximately 18% (Swedbank, 2012)



Figure 3: The flow of Russia's gas to European countries.

Source: <http://jia.sipa.columbia.edu/russia-and-europe%E2%80%99s-mutual-energy-dependence> (17.04.2012)

At the same time, the Baltic countries are concerned about occurring of a new Russian imperialism due to strengthening of Russia and occurring a monopoly. It is stated that Gazprom has increased its investments in South America, Asia, Middle East as the reason of this putting off Amber project, and North Stream flow was constructed are shown as an example of this (Molis, 2011, p.86). Another project of Russia is to export over Baltic Sea called Baltic pipeline system. In this way, Russia is aimed to decrease the costs in Ventspils and Odessa, and

to export over itself. (Leningrad Region,2012). After becoming involved to EU, Financing of energy projects have been carried out by the Union. First of all all electrical systems in these countries are connected to a system of Russia called IPS/UPS. Western's electrical system or an electrical system is not linked to Scandinavia.

Therefore, the first electrical wire is between Estonia and Finland with Estlink Project. The second is planned to complete in 2013. At the same time, It is thought to finish energy system called NordBalt and connected to Western Lithuania as of 2016-2017. Another Project is Litpol between Lithuania and Poland, and it is aimed to complete between 2012- 2015. However, these projects need to be considered again according to the current capacities of these countries (Molis, 2011a, p.42).

Baltic countries want to prevent Russian's political repression both construction their infrastructure left from Russia and occuring common competitive policies with these countries. For this purpose, it is determine more reasonable and general policy in the relations of EU countries with Russia. So, the structure of Gasprom's monopoly broken and it is provided energy supplies of European countries as convenient and secureBecause Baltic countries (Latvia, Estonia, and Lithuania) perform a bridge duty between two regions, it can be said that they will have an important position between Russia and EU in future.

CONCLUSION

Baltic countries that have cultural and historical ties with

Russia have continued growth by providing the improvement of current energy sources, and performing economical reforms. With the process of their involving process to EU, they have put into economical development like Asian Tigers. Consequently, energy consumption emerges directly proportional economical growth, and this is an inevitable process to reach energy sources safely.

Although Baltic countries (Latvia, Lithuania and Estonia) are not oil producers and consumers, they are located in gas distribution lines through oil and gas of Russia. The structures of Baltic countries, which obtain transit revenue from these transit points, and also import energy to meet their own needs, vary. There is an energy system in Estonia that is the only oil shale, and provided the large part of the energy. However, despite this system, the country needs to direct towards new energy sources according to EU's emission standards in the future. The reasons such as to wanted Mazeikiu Nafta refinery in Lithuania, which is the largest oil refinery of the country, and closed Ignalina nuclear power plant caused the energy sources to the limited and strategic position. Because another Baltic country Latvia has not sufficient production, it is dependent on Russian gas like the other countries, and this causes to be effected political decisions that made by Russia.

Russia provides a large part of its energy production from Ural Mountains region, and exports 80% of this production. While oil export is carried out over Transneft with state backed, Gas is provided by other state backed company Gazprom. Although Butinge and Ventspils are important ports in terms of transit of energy, Primorsk

port, constructed by Russia, caused to decrease energy supply in these ports.

Beside these, South Currency Project is being implemented as an alternative to North Currency, Yamal Europe and Nabuco projects for providing gas currency to European countries. This renders the Russian- EU relationships important in terms of energy. Baltic countries states that reciprocity principle should be adopted for Russia-EU relationships and there should arise a strategical partnership in parallel with the benefits of both sides. They also emphasize that in order to break monopol price power of Gazprom, alternative energy areas should be tend to and free market mechanism should come into prominence in terms of energy prices subject. They argue the fact that a predictable pricing that is free from political effects could emerge.

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