

EVALUATION AND RECOMMENDATIONS ON THE NATIONAL ENERGY EFFICIENCY ACTION PLAN (*)

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Abstract

Energy, which is the essence of the matter, is one of the fundamental inputs of all economic sectors. Reducing energy consumption per unit without leading to a reduction in service and product quality is called energy efficiency. In this study, the National Energy Efficiency Action Plan of 2017-2023 enacted in the Official Gazette No. 30289 dated 02.01.2018 was evaluated. The plan includes the implementation of 44 actions in five sectors. Promotion and awareness training should be given to protect the environment and increase the efficiency in energy resources and energy use. Measurement, monitoring and evaluation audits should be conducted frequently. Continuous new projects for energy efficiency must be developed at the national and international arena. Efforts to improve energy efficiency in each sector should be made. The number of authorized companies that will carry out energy efficiency measurement, monitoring and evaluation audits should be increased. The organizations of congress and fairs on energy efficiency activities should continuously be encouraged.

Keywords: National Energy Efficiency Action Plan, Energy Sources, Energy Supply, Energy Demand, Protect The Environment.

JEL Codes: Q28, Q42, Q48.

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Ulusal Enerji Verimliliği Eylem Planı'nın Değerlendirilmesi ve Öneriler

Öz

Maddenin özünü oluşturan enerji tüm ekonomik sektörlerin temel girdilerinden biridir. Hizmet ve üretim kalitesinde azalmaya yol açmadan birim başına enerji tüketiminin azaltulmasına enerji verimliliği denilmektedir. Bu çalışmada 30289 sayılı Resmi Gazete'nin 02.01.2018 tarihli nüshasında yürürlüğe giren Ulusal Enerji Verimliliği Eylem Planı 2017-2023 değerlendirilmiştir. Söz konusu plan beş sektörde 44 eylemin hayata geçirilmesini içermektedir. Çevrenin korunması, enerji kaynakları ile enerjinin kullanımında verimliliğin artırılması için tanıtım ve bilinçlendirme eğitimleri verilmelidir. Ölçme, izleme ve değerlendirme denetimleri sıklıkla yapılmalıdır. Enerji verimliliğine yönelik ulusal ve uluslararası düzeyde sürekli yeni projeler geliştirilmelidir. Her sektörde enerji verimliliğini artırma çalışmaları yapılmalıdır. Enerji verimliliğini ölçme, izleme ve değerlendirme denetimlerini gerçekleştirecek olan yetkili firmaların sayısı artırılmalıdır. Enerji verimliliği faaliyetlerini konu alan kongrelerin ve fuarların sürekli düzenlenmesi teşvik edilmelidir.

Anahtar Kelimeler: Ulusal Enerji Verimliliği Eylem Planı, Enerji Kaynakları, Enerji Arzı, Enerji Talebi, Çevrenin Korunması.

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1. Introduction

Energy is one of the basic needs of human beings (Erdoğan, 2016: 79) and used at every point of life (Karakaya, 2017: 27). Energy demand and energy consumption are increasing day by day due to population growth, an increase in welfare level, industrialization and the use of technological devices etc. However, energy efficiency has become very important today due to problems such as energy supply problems, the constant increase in energy prices, rapid depletion of primary energy sources, trends in energy independence of countries and climate change caused by global warming.

The word energy comes from Greek in origin and the force that moves objects and the capacity of the system to run is called energy (Uzun and Değirmen, 2018: 84; Erdoğan, 2016: 80; Aydın, 2016: 411). The classification of energy is in the form of primary and secondary energy sources. The original state of energy found in nature is called primary energy sources. These are coal, oil, natural gas, nuclear, water, solar energy, geothermal, biomass consisting of wood and straw, wind and so on. It must be converted to secondary energy sources to use primary energy sources (Uzun and Değirmen, 2018: 84). Secondary energy resources consist of electric energy, petroleum product fuels, steam, heat and compressed air.

Energy efficiency is understood to ensure energy supply security, prevent energy losses and waste, effective and efficient use, reduce cost, reduce energy imports, contribute to low carbon emission targets in greenhouse gases and protect the environment (Meral,

Teke, and Tümay, 2009: 36). Energy efficiency is also defined as the use of energy at the highest efficiency in all phases from production to consumption and precautions for total energy use without reducing production (Uzun and Değirmen, 2018: 85; Aydın, 2016: 411; Peker, 2010: 33; Kavak, 2005: 8). Energy efficiency is an obligation for a country to stand out in the global competition and for sustainable growth.

The right policies need to be identified and implemented. The aim of this study is to evaluate the applicability of energy efficiency policies through the “National Energy Efficiency Action Plan (NEEAP)”, which is a roadmap for Turkey's energy efficiency. In addition, the importance of energy efficiency has been pointed out with the literature search. Suggestions on what can additionally be done for energy efficiency are presented.

2. National Energy Action Plans in World Literature

Electronic databases were searched to reveal the worldwide applications of the energy efficiency action plan. Hartman, Börcsök, Groma, Osan, Talamon, Török and Boruss, (2017:1187), pointed out that the Hungarian government had adapted the 2009/28 EU directive and intended to increase the share of renewable energy. The country's National Renewable Energy Action Plan has been revised in five dimensions. These are: the economy, environment, climate, employment and innovation (Hartman et al., 2017:1187). Hungary will ensure maximum improvement, especially in buildings. The country has a low potential in wind power. For Hungary, what is essential in renewable energy are production from bioenergy and geothermal energy sources (Hartman et al., 2017:1193).

The second study that through literature search had been conducted by Berghi (2017). In particular proposals of this study (Berghi, 2017: 414), had been made within the context of urban transportation. Strategic activities to be carried out by the local authority to achieve the 20-20-20 sustainability goals established by the EU are explained in the research. There are three factors of this strategy: energy efficiency, renewable energy sources and reduction of greenhouse gas emissions (Berghi, 2017: 415). The use of LNG fuel on public buses is the focus topic. This dynamic process will be reviewed every two years with new action plans.

The action plan put forward by Jouni, Najjar and Mourtada (2016), for the Lebanese state exists in the literature on this subject. The only original proposal that drew attention here was to ban against incandescent lamp imports in Lebanon (Jouni et al., 2017: 2). The National Energy Action Plan is a strategic document that demonstrates the policies needed to achieve the energy saving target. The framework of the action plan is made up of the consumption and distribution of energy and increase of transformation efficiency of energy to achieve the 20% energy saving target in 2020. The action plan developed by the Ministry of Energy and Water covers 14 activities. These are (Jouni et al., 2017: 2);

- 1) Prohibition of incandescent lamp imports to Lebanon,
- 2) Adoption of the energy saving law,

- 3) Encouraging the private sector to invest in solar and wind energy,
- 4) Installation of solar water heaters in buildings,
- 5) Implementation of effective and economic strategies in the lighting of roads,
- 6) Electricity generation from wind power,
- 7) Electricity generation from solar energy,
- 8) Electricity generation from water power,
- 9) Energy production from geothermal and biomass,
- 10) Issuance of energy efficiency certificates to buildings,
- 11) Creation of financial mechanisms,
- 12) Determination of the rates of inadequacy and overflow of capacity,
- 13) Energy control,
- 14) Promoting the use of energy-efficient equipment.

In the study conducted by Amorim (2014: 1188), it is recommended that all sectors that produce and consume energy act together for the success of the action plan. By setting the 20-20-20 targets, the EU has actually set an example for the whole World. Local governments play an important role here. As carbon dioxide emissions and 80% of energy consumption are accompanied by activities in cities (Amorim, 2014: 1184).

In 2008, the European Commission approved a plan titled "Energy for a Changing World", known as the 20-20-20 targets. This plan has three purposes (European Commission, 2008);

- The EU greenhouse gas emissions will reduce by 20%.
- The EU will increase energy production from renewable energy sources by 20% in the share of energy consumption.
- EU will improve energy efficiency by 20%.

2.1. National Energy Efficiency Action Plan 2017-2023

Energy efficiency begins with the production of energy, continues with transmission and distribution and in the final stage, its use takes place. In order to reduce energy consumption and make more efficient use of energy, it is necessary to know how energy is used (Öztürk, Öztürk and Dombaycı, 2018: 21). When look at the sectoral distribution of energy demand in Turkey; 30% of energy consumption is used in conversion plants, 24% in residential and service sectors, 23% in industry and 19% in transportation (Karakaya, 2017: 28).

With the help of NEEAP, energy-saving areas have been identified and activities to be done in these areas have been put forward. The National Energy Efficiency Action Plan, to be implemented between 2017-2023, focuses on increasing energy efficiency

in five categories. These are: 1) Buildings, 2) Energy, 3) Transportation, 4) Industry, 5) Agriculture. Therefore, 44 actions were planned for these categories.

The European Union has introduced the obligation of member states to prepare national energy efficiency action plans (Directive 2012/27/EU). Although not a member of the European Union, Turkey has prepared a National Energy Efficiency Action Plan (NEEAP). The NEEAP was published in the Official Gazette No. 20289 dated January 2, 2018 as the Supreme Planning Board Decision No. 2017/50. The NEEAP, the latest policy document on energy efficiency in Turkey, covers the period between 2017 and 2023.

A total of 44 actions related to the building and services, industry and technology, energy, transport and agriculture sectors are included in this action plan. The target is to reduce Turkey's primary energy consumption by 14% in 2023 thanks to the activities that will be carried out in line with these actions. Many sectors and stakeholders are concerned about the issue of energy efficiency. Therefore, the General Directorate of Renewable Energy under the Ministry of Energy and Natural Resources is authorized to the implementation of the actions defined by NEEAP, the evaluation of its results and coordination and cooperation between the responsible organizations.

2.1.1. Buildings

According to the Turkish Statistical Institute data, there are ten million buildings in Turkey as of 2018. Dwellings account for 87% of this amount. The housing sector is one of the largest energy consumers (Öztürk, Öztürk and Dombaycı, 2018: 19). Turkey's building stock is growing rapidly. The share of the building sector in the final energy consumption is rising rapidly and has outstripped the industrial sector (<https://www.resmigazete.gov.tr>).

Energy efficiency in buildings can only be achieved by increasing the use of energy-saving materials in heating, cooling and lighting (Meral, Teke and Tümay, 2009: 35). Within the scope of the action plan, 12 actions have been defined to increase energy efficiency in buildings. These are as follows (<https://www.resmigazete.gov.tr>);

- 1- Efficiency classes of new and existing buildings will be improved.
- 2- Energy efficiency studies of public buildings will be conducted to realize the saving potential in the public sector.
- 3- The use of renewable energy in buildings will be increased.
- 4- A comprehensive building inventory study will be carried out.
- 5- Awareness studies will be carried out addressing all society.
- 6- Reducing the energy demand and carbon emissions of buildings as much as possible is the main goal.
- 7- Especially environmentally friendly buildings will be disseminated.

8- New buildings will be required to have at least a Class C Energy Identity Certificate. Existing buildings have already been required to have energy identification certificates.

9- It will be possible to save significant amounts of energy both by making new buildings more efficient and by improving existing buildings.

10- Maximum energy needs and maximum emission limits will be imposed on buildings and administrative sanctions will be imposed on those whose carbon dioxide emissions are above the minimum values defined in the relevant legislation.

11- Actions will be taken to disseminate decentralized production practices in public housing.

12- At least a quarter of the building stock will be made sustainable by 2023.

2.1.2. Industry

The industrial sector uses 32% of the final energy consumption and 48% of the electricity consumption in the Turkish economy. (<https://www.resmigazete.gov.tr>). Turkey's economy is one of the energy-intensive economies compared to other countries. One of the biggest burdens on businesses is energy costs. Therefore, energy efficiency is a priority area in the industry. The main activities for this purpose are as follows: reducing energy consumption, ensuring process efficiency, raising the technological level and reducing greenhouse gas emissions. In this sector, priority has been given to certain sized industrial organizations to conduct energy efficiency studies and to establish energy management. Various support mechanisms have been implemented for projects that increase energy efficiency. It is aimed to reduce energy density in each industry sub-sector by not less than 10% through sector collaborations.

There are 7 actions to be taken under the plan. These are as follows (<https://www.resmigazete.gov.tr>);

- 1- Low-efficiency engines will be replaced with higher efficiency ones,
- 2- Training, study and consultancy services on the energy efficiency of small and medium enterprises (SMEs) will be encouraged,
- 3- Project diversity will be increased,
- 4- New support mechanisms will be defined,
- 5- Cogeneration systems will be disseminated in large facilities,
- 6- Environmentally sensitive design and labeling system will be applied in the devices,
- 7- Energy efficiency technologies and examples of good practice will be widespread in SMEs.

2.1.3. Energy

Electrical energy must be cheap, uninterrupted and free from the problem of power quality (Meral, Teke and Tümay, 2009: 31). According to the values of electricity

consumption per capita, one of the most important energy indicators, Turkey average is 3224 kWh and the OECD average is seen as 8106 kWh (TEİAŞ, 2017). These data indicate that the consumption of electrical energy per capita will rise with increased levels of well-being.

Ten actions have been identified in the plan: (<https://www.resmigazete.gov.tr>)

- 1- It is aimed to reduce transmission and distribution losses to 8% by 2023.
- 2- The share of renewable energy in electricity generation will be increased.
- 3- The use of smart meters will be encouraged. The main application tool for reducing non-technical losses, monitoring and controlling current flow is the smart meter (Düzdoğan, 2018: 627).
- 4- Energy efficiency will be increased in general lighting.
- 5- Cogeneration applications will be disseminated.
- 6- Projects will be developed to take advantage of the waste heat of coal-fired thermal power plants in regional heating and agricultural activities.
- 7- Management of heating and cooling induced scoring loads will be ensured.
- 8- Efficiency standards will be established for natural gas infrastructure.
- 9- Comparable and detailed invoice will be presented to the consumer.
- 10- Energy data platform for measurement information management will be put forward.

2.1.4. Transportation

As a result of the concentration of the population in the cities, the demand for transport services increased. The development trend in the transport sector continues especially in the axis of oil-dependent road transport. Approximately 25% of Turkey's total energy consumption occurs in the transportation sector, of which 92% is by road transportation. Since energy consumption is met with petroleum derivatives, it is a necessity to use energy effectively and efficiently in this sector. With a number of precautions, it is possible to increase energy efficiency in the transport sector.

The plan includes 9 actions primarily to promote energy efficiency. These are as follows (<https://www.resmigazete.gov.tr>);

1- Combined transportation applications will be developed in freight and passenger transportation. Turkey's rail freight transport share is targeted to increase to 15% by 2023 and passenger transport share to more than 10%. By 2023, the road's share in freight transport will be reduced to 60% and passenger transport to 72%.

2- The high average age of motor vehicles registered in traffic is a negative situation both for fuel consumption and for the environment. For this reason, incentives for the scrapping of old vehicles will continue to be implemented. Energy-efficient vehicles will be encouraged.

3- Transportation infrastructure will be planned and operated in an integrated manner.

4- Reducing the unit fuel consumption of motor vehicles and disseminating the use of clean vehicle technologies will be ensured.

5- In order to prevent unnecessary fuel consumption in transportation, efforts to raise awareness of the owners of vehicles will be made.

6- It is aimed to reduce emissions harmful to the environment.

7- In order to reduce traffic congestion in cities, the use of cars will be reduced and the share of public transport will be increased.

8- Bicycle and pedestrian transportation will be improved.

9- Sea and rail transportation will be strengthened.

2.1.5. Agriculture

In creating a competitive agricultural sector, the use of renewable energy sources comes to the fore with the effective use of energy and resources, land regulation and consolidation, raise of the level of agricultural mechanization and environmentally friendly applications such as eco-efficiency. The support programs for agricultural production carried out by various public institutions indirectly influence the improvement of energy efficiency.

The National Energy Efficiency Action Plan identifies 6 actions aimed at increasing energy efficiency in the agricultural sector. These are as follows (<https://www.resmigazete.gov.tr>);

1- The renewal of tractors and harvesters by energy-efficient ones will be encouraged.

2- The transition to energy-efficient irrigation methods will be provided.

3- Energy efficiency projects will be supported in the agricultural sector.

4- The use of renewable energy resources in agricultural production will be encouraged.

5- The use of biomass (agricultural by-products and wastes) will be encouraged.

6- Energy efficiency in the aquaculture sector will be supported.

2.2. Evaluation of the National Energy Efficiency Action Plan

a) Energy efficiency concerns many sectors and stakeholders. Close cooperation between the institutions responsible for implementing the actions described in the plan is needed. Every action in the NEEAP supports other actions. It's been studied quite well. It is a holistic and functional action plan.

b) The action for “establishing energy management systems and increasing their efficiency”, one of 44 actions in total, shows that the Ministry of Energy and Natural Resources approaches the issue with a macro insight (Kavak, 2018).

c) NEEAP is considered to be an effective tool in carrying out activities related to the problem of climate change and global warming.

3. Suggestions

Energy consumption per capita is no longer an indicator of development. The goal is not to increase energy consumption per capita but to generate the most production and prosperity with one unit of energy consumption (Kavak, 2005: 72). Energy efficiency will accelerate economic growth, greenhouse gas emissions will decrease and energy dependence on foreign countries will be reduced to a minimum. The sectors with the most potential for improving energy efficiency are industry and buildings.

The main recommendations for energy efficiency are:

1) The largest part of energy consumption in homes is spent on heating the space. Roof, wall and glass insulation of the majority of buildings in Turkey is insufficient (Kavak, 2005: 147). The walls, roof, floor, windows and door should be well insulated to prevent heat loss. In buildings, heat loss is 7% from the roof, 40% from the exterior wall and 17% from doors (<http://www.ibb.gov.tr>). Since it is possible to save 50% energy only by insulating buildings. The conversion to the insulated buildings must be accelerated.

2) Daylight should be utilized to the maximum degree. In order to ensure energy efficiency, the indoor temperature should be kept no more than 22 degrees during the heating period and at least 24 degrees during the cooling period. Cooling systems should not be run if the outdoor temperature is not above 30 degrees (Öztürk, Öztürk and Dombaycı, 2018: 25).

3) Energy efficiency is not a matter that will only be achieved by the organizations of the State alone. Everyone must mobilize and take responsibility for the realization of energy efficiency throughout the country.

4) Public spotlight, training programs and awareness-raising activities related to the efficient use of energy should be made continuously through the media. The efficient use of energy is only possible through collective applications throughout the country (<https://www.yenienerji.com>). Thus, the importance of energy efficiency will be understood by all society.

5) Thanks to energy efficiency, each unit of energy will be transformed into more products and services. Prices and inflation will decrease as a result of reducing the share of energy costs between 8% and 50% in production. In order to meet energy demand, the construction of energy production plants near the consumption points should be allowed (Düzdoğan, 2018: 629). Cogeneration energy systems should be encouraged in large residential sites, shopping malls, hospitals and hotels (<http://www.mimdap.org>).

6) Inner-city public transport and rail systems (trains, subways, and trams) should be disseminated.

7) Consumers using Class A energy-efficient devices in their homes may contribute to energy saving. There is an energy efficiency classification for electrical tools from A⁺⁺ to F. Class A products consume an average of 20% less energy than Class B products (Peker, 2010: 57). On the other hand, device manufacturers should be encouraged by the State to focus on developing energy-efficient products.

8) Twelve to fifteen percent of the electrical energy in households is used in lighting (Meral, Teke and Tümay, 2009: 36). In this respect, LED bulbs should be preferred in lighting. Looking at watt and lumen values is important for efficiency in selecting energy-efficient lighting bulbs (Öztürk, Öztürk and Dombaycı, 2018: 27)

9) The use of vending machines with photocell sensors that are motion-sensitive in the illumination of stairwells may reduce the common electricity expense share of buildings.

10) The use of fuel cells on the frontage and roofs of buildings should be encouraged and disseminated. In this way, the produced energy should be used to supply the energy needs of the buildings.

11) In order to supply the hot water needs of the houses, it should be encouraged to install a solar collector especially.

12) It should be noted that the most profitable investment is energy efficiency investments and the source of financing is provided from within the project itself (Peker, 2010: 53). Therefore, more strategic efforts should be done and implemented to guide energy efficiency.

4. Conclusion

The way to minimize energy requirements without decreasing quality and performance is possible by saving energy and using energy efficiently. In order to increase energy efficiency, the saved energy must be accepted as an energy source. The goal is to improve energy efficiency in all areas where energy is used. Energy efficiency will increase the global competitiveness of enterprises. It will lead to sustainable growth (Yıldız, Akgül and Güvercin, 2018: 17). Barriers to increasing energy efficiency should be eliminated. Energy efficiency policies also support low carbon emissions targets.

In order for NEEAP to be successful and produce the foreseen results, it is necessary to make the contribution of all interested parties, especially the private sector, permanent and to keep their excitement fresh. Turkey's energy efficiency potential is high. According to the calculations, Turkey has 30% savings potential in buildings, 20% in industry and 10% in transportation (Peker, 2010: 15). It is important that NEEAP progress reports are published regularly. With these progress reports, it will be possible to make the necessary revisions.

More efficient use of energy is of great importance for the public interest. Individual awareness will also increase the level of social consciousness. Energy costs will be reduced thanks to energy efficiency applications. The effects of each energy-efficient activity will be seen in a very short time (<https://tutasi.com>). The culture and awareness of the people's energy efficiency should be developed and energy efficiency should be turned into a philosophy of life. Regional heating systems should be disseminated. The use of alternative fuels and resources within the framework of energy efficiency should be increased. Projects to disseminate environmentally friendly structures and improve the energy efficiency of existing structures should be accelerated.

Energy is necessary and strategically important. It is very important to obtain sustainable and secure energy, to use it efficiently, from domestic and renewable sources. Increasing energy efficiency is the most sensible way to produce and consume more energy. At the end of certain periods (periods of two or three years), the current situation needs to be reviewed, also deficiencies to be addressed and new targets to be identified. In parallel with the development of technology, new applications to ensure energy efficiency will continue uninterrupted. Based on the fact that the most expensive energy is wasted energy. Last words are that energy efficiency should be increased in every sector where energy is used.

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