RESTRUCTURING THE SOCIAL FABRIC THROUGH TRANSITION TO A LOW-CARBON ECONOMY

Emine Tokgöz

REKABET KURUMU

etokgoz@rekabet.gov.tr

ABSTRACT

Climate change, as the greatest externality, has now penetrated into policy agenda irreversibly around the world on both national and international/global levels. Climate change is not only a challenge to be tackled through various public policies, but it also is an opportunity for construction of better polities around the world. This paper will argue that on the way to sustainable development, smart policy making that increases genuine citizen participation will benefit deliberative democracy considerably. However, policy makers and institutions need to undertake several reforms on the public policy front with a long term and consistent vision supported by strong and determined institutions so that optimal solutions can be implemented. Specific policy recommendations, in particular in terms of competition policy, will be provided for Turkey in view of the experiences of the US and the EU.

ÖZETÇE

En büyük dışsallık olan iklim değişikliği artık tüm dünyada hem ulusal hem de uluslararası ölçeklerde geri dönülmez bir şekilde politika gündemine girmiştir. Iklim değişikliği yalnızca çeşitli kamu politikalarıyla karşısında durulacak bir zorluk değil, aynı zamanda tüm dünyada daha iyi politikalar üretmek için bir olanaktır. Bu bildiri, sürdürülebilir gelişim yolunda, gerçek vatandaş katılımını artıran akıllı politika üretiminin ciddi ölçüde bilinçli demokrasiden faydalanacağını öne sürecektir. Ancak, politika oluşturanlar ve kurumlar, en iyi çözümlerin uygulanabilmesi için güçlü ve kararlı kurumlar tarafından desteklenen uzun vadeli ve tutarlı bir vizyonla kamu politikası cephesinde çeşitli reformlara gitmek durumundadır. Türkiye'ye yönelik belirli politika önerileri, özellikle rekabet politikası anlamında, ABD ve AB tecrübeleri ışığında sağlanacaktır.

INTRODUCTION

Transition to a low carbon economy has been motivated by a will of reversal of the world economy's over-reliance on fossil fuels. As fossil fuels will be depleted in time, are carbon-intensive and whose ownership is concentrated in few geographies, nations and international organizations have been seeking to transform economies so that sustainable development can be achieved. Sustainable development is defined by the United Nations' World Commission on Environment and Development as development that "meets the needs of the present generation without compromising the ability of future generations to meet their own needs" . While sustainable development is defined broadly in this way, at the center there is the issue of carbons because the main challenge to the future populations is sourced from the concentration of carbon emissions.

William Rees and Mathis Wackernagel, in the early 1990s, have contributed to the climate change literature the concept of "ecological footprint" which is "the amount of land and water area a human population would hypothetically need to provide the resources required to support itself and to absorb its wastes, given prevailing technology" . As the definition shows, thought as a whole, humanity's ecological footprint on the planet needs to be less than the total area of land and water on Earth so that sustainability could be achieved. However, as of today, humanity's footprint is forty times larger than the sustainable level. Due to such an unsustainable trend, natural catastrophes have already become more frequent. Also, scientists stress more evidence showing mankind as the main cause of climate change. All these facts and concerns combine *with fossil* fuels' ownership by countries that are relatively politically unstable and carry sustainable development onto the top priorities of policy makers' agenda.

Climate change, as mainly an externality that needs to be corrected through public policy, requires several steps and actions which imply significant changes to the extant policies and actions. One of the main reasons behind this need for a wide-scale transformation is that measures to mitigate climate change are implemented in various areas of economic and social spaces. Climate change has shown environmental and social systems and problems to be "inseparable" . This inseparability and interconnectedness between environment and socio-economic issues have led governments and international organizations to take action against the negative effects of climate change.

The EU has set 20-20-20 target and constituted the 2050 Roadmap. The stated aim of the EU's sustainable development strategy is to "promote sustainable consumption and production by addressing social and economic development within the carrying capacity of ecosystems and decoupling economic growth from environmental degradation." The US has earlier chosen the path of sustainable consumption as documented in National Academy of Sciences' "Towards Sustainable Consumption" where it is stated that although the core of the debate has been population growth, increased consumption and the existing consumption patterns need to change for sustainable development to be accomplished.

This study will not focus on how sustainable development can be achieved because there are many areas to take action in. Still, the energy industry, as the central industry causing carbon emissions, needs a special focus and this study takes energy policy and related public policies as its focus. Energy is both a main and an intermediate input to the whole economy as many industries, facilities and infrastructures use some form of energy to run. For the sake of coherence, this paper will focus on the electricity industry.

Liberalization of the energy industry, making it more competitive, allowing innovation to thrive in the energy industry are aimed at by the policy makers and governments around the world so that energy can be supplied and used in a secure, affordable and sustainable manner. Energy policy, in order to reach its targets, needs to be supported by competition and regulatory policies because energy industry comprises both natural monopoly segments and competitive segments. While competition policy and competition authority take precedence in competitive segments such as generation, retail and wholesale markets, regulatory policy and regulatory authority take precedence on issues related to natural monopoly segments of transmission and distribution.

There are three main policy measures in energy industry in transition to the low-carbon economy. The first measure is the promotion of renewable energy and thus technologies related to renewable energy. The second measure is putting a price on carbon or enabling carbon trade. The third measure is deployment of smart grids in transmission and distribution of electricity. Each of these measures is interrelated with each other and they all have the commonality of contributing to carbon emissions reduction. Another commonality, and where the problems arise, is that these measures' realization is very costly. Renewable generation technologies, carbon pricing and most of all, smart grids are expensive, especially for the developing world. Also, since their realization means an overall transformation of the existing fossil-fuel based energy paradigm, institutions and legal norms have to be proactively ready to incentivize them. As this paper will argue, successful energy transformation cannot be achieved by changing the existing public policy structure and institutions. A new understanding has to be adopted in all related institutions so that the needed transformation can be timely managed. At the core of this new understanding lies the citizen, who is more than just a consumer.

One of the most referred to hurdles on the road to energy transformation is the need for active consumers/citizens. Being very large in number, consumers suffer from Mancur Olson's collective action problem. They are rationally ignorant in terms of energy policy transformation because the costs of organization and the high probability of free-riding make the efforts of active citizenry organizations futile. However, even though consumer organizations and forums are needed and highly valued, they are already being convened by the leadership consumer advocates, regulatory bodies and similar entities. As social capital literature suggests, institutions can bridge between private and public spheres and communicate to the citizens for building trust and contribution. What also matters here is that individually, each consumer has a role to play in building the sustainable energy industry. By changing their supplier and thus increasing competition, by demanding more renewable energy, by participating in the market through decreasing his/her demand during peak hours, by switching to efficient appliances and by consuming less, each citizen can contribute to less generation and investment in infrastructure. This is the main reason why citizens, as consumers, are at the heart of the debate. Without their consent and participation, energy transformation cannot be achieved. As this paper argues, a transformation in energy through active citizens/consumers will have other positive spill-over effects of less consumption, sustainable lifestyles, and better demographic policies by the governments and so forth.

This paper explains each of three measures of renewable energy promotion, carbon pricing and smart grid deployment to determine what kind of actions need to be taken and what obstacles need to be addressed by energy, regulatory and competition policies by referencing to illustrations from the EU and the US. In the second section, public policy improvement will be discussed to see how to achieve better cooperation of different policies for effective outcomes and how citizens play a vital role in the process. Social capital and democratic consolidation implications of the energy transformation will also be given in this section. In the following section, some policy recommendations for Turkey will be proposed as Turkey is a very important case with a high level of important dependency in energy as well as being an emerging economy with increasing energy demand and a relatively recently liberalized energy market.

Energy in Transformation: Public Policies in Transition to a Low Carbon Economy

The environment, until the 1960s, was not high on the public policy agenda. Pollution was not priced in practice and the externality debate was only being practiced in economics textbooks. Externality is the main pillar of sustainable development and energy transformation measures. Externality is a market failure where the costs of an activity is not born by the producer and externalized. At the core of this market failure in terms of environment resides the lack of property rights as clean air and environment are public goods. Ronald Coase put forward his fundamental theorem in externality in his seminal article "The Problem of Social Cost" (1960). In his article, he proposed that with no transaction costs, the parties would negotiate and share the costs in the most efficient way, meaning that the costs to the society will be the least when an externality is internalized through negotiation of parties. Coase was later challenged pointing to the existence of numerous types and high level of transaction costs in the real world. The point, however, was that laws and rules should be made in a way that could minimize transaction costs and thus facilitate the ground for negotiation and bargaining by the parties.

Other than leaving the issue to the market, taxation, emission caps, cap-and-trade regime have been proposed and started to be implemented. Contemporary market trading practices deserve attention because their use by major energy companies (mainly oil companies) is widespread. The tradable permits approach was first recognized and promoted as a `cost-effective approach` in 1992 by the UNFCCC, which turned to be Kyoto protocol five years later in 1997. The Kyoto Protocol's implementation officially started in 2005 and the industrialized countries listed in Annex I initiated their cap-and-trade system.

The initial four types of emissions trading options as practiced in the US are given below:

Netting: This option can only be practiced by the firm itself with no trade option with other firms. Here, the total decrease of emissions is counted to see whether one equipment's contribution to the decreases is bigger than another equipment's increases of emissions.

Offsets: This option allows the firm to build new facilities in a part of the country where the set emissions cap is exceeded, provided that the firm buys pollution offsets from an existing facility.

Bubbles: This option looks at the total emissions from a given plant, with no regard to which equipment is the source.

Banking: This option allows the firm to store emissions rights and use in the future.

Another mechanism available in the US is the ETS established in various individual states including the advanced California trading system, where basically supply and demand decide the price of carbon, hence the externality is internalized either in the market (the opportunity cost phenomenon is at work or through innovation, installation of new/clean energy technologies). In Chicago Exchange, a separate Climate Exchange was also set up to facilitate trading in the country, pointing to the virtues of exchange as a facilitator for more liquid and efficient markets.

The EU uses an emissions trading scheme, EU Emissions Trading System (henceforth EU ETS), where it has set a cap of total emissions and distributed allowances to carbon intensive companies (electricity generation, oil refining, iron and steel, pulp and paper, cement and aluminum) that then were left free to trade their allowances with the condition of meeting the set target.

OECD has found that pricing carbon through ETS can contribute to emissions reduction and also create additional public revenue. For such outcome to be realized, the carbon emission permits should not be allocated freely, but should be auctioned. Auctions can achieve allocative efficiency and give right incentives to the firms. Moreover, free distribution of allowances to large-scale firms create a distorted carbon market from the start, with repercussions on contiguous markets as well. In order for ETSs to work properly, they should be designed in a way to guarantee genuine and fair competition for the permits so that the competitive, efficient price can be found and thus long term sustainability can be achieved.

The other carbon pricing measures include carbon taxes and subsidizing particular actions but they will not be dwelled upon this paper as ETS is believed to be the prevailing form of pricing of carbon around the world with Australia, China, Canada, New Zealand and Japan also have adopted this mechanism of carbon pricing. Moreover, as Coase proposed, with effective market design where transaction costs are low the parties can negotiate and the carbons can be reduced in the cheapest way. What should be emphasized here is that design of the trade scheme, putting a cap and allocating the permits should be very carefully analyzed ex ante with attention on the effects of the contiguous markets as well as the small-scale competitors in the same industry.

The most visible distortion in contemporary carbon market design is that permits are given, even gifted, to large-scale, dominant firms, which is called "grandfathering". Secondly, because the EU ETS scheme has over-allocated permits, the price of carbon collapsed in 2007. While the experts claim that the efficient price should be around 30-40 Euros per MW, it is only around 4-5 Euros on the market due to over-generous allocation of permits distributed at the start of the scheme. Realizing such distortion, the EU Commission has announced its policy of `backloading` which will see 900 million allowances (permits) to be cut from the market so that price distortion can be fixed.

An important market manipulation case has been experienced in the Czech Republic and Germany which signaled the inefficiency of EU ETS. In both countries, the dominant electricity generation firms have overstated their emissions amounts (forecasts) and thus have been allocated an artificially high level of permits. Moreover, these dominant energy firms put this emissions costs into the electricity price equation, meaning that the price of electricity on the wholesale market was inflated (as these dominant firms had

high market share in generation they were the ones to profit most from the inflated prices). Also, Czech firm CEZ had sold the carbon permits when the prices were high and bought them back when prices fell. This market manipulation strategy can be employed and create profits only because these firms are dominant, being able to shape price and quantity conditions in the market regardless of their rivals. This abuse of dominance is one of the main pillars of competition policy's prohibition of distortion of competition. Competition law in the EU, as well as around the world, prohibits abuse of dominance by exploitative and exclusionary practices by firms with a dominant position. In industries such as energy where some segments of the market are exposed to permanent market failures and which are still in the process of liberalization (opening to competition) competition law and regulatory law and policy coexist. Whereas regulatory policy is very specific and more about setting tariffs, competition policy prevents economic concentration, and thus serves to promote democratization and democratic stability. From all these points, it is seen that pricing carbon requires effective cooperation of energy, regulatory and competition policies.

The second measure of energy transformation on the path to sustainable development is the promotion of renewable energy. Renewable energy promotion, however, cannot be thought in isolation from the costs of technology and because of these costs, the presence of state aid. Although liberalization of energy markets around the world has seen the state mostly retreat to the regulatory role rather than an active player in the market, sustainable development has brought the state back into the energy markets with an increasing importance. As stated above, electricity markets comprise both competitive and natural monopoly segments. While the natural monopoly segments of transmission and distribution is not open to competition and their operation by single firm is more efficient, competitive segments of wholesale (and generation) and retail need to be protected from exclusionary and abusive conducts of the incumbent firms. Not only does renewable energy distort wholesale markets because of zero variable costs but also state subsidies and incentives to push technological innovation risk `picking winners` and thus foreclosing the electricity generation to better technologies.

Incentives and subsidies to the firms and the distortion of wholesale prices inevitably reflect to the end consumers, who have been carrying the burden of energy transition. In this respect, communication with the public plays a critical role. The EU and the US employ Impact Assessments ex ante in major policy implementations. Impact assessment is basically a cost-benefit analysis where a policy's or rule's future effects on social welfare are measured beforehand to decide whether or not to deploy. Impact Assessment is an effective tool for major policies such as renewable energy promotion to be used both measure its benefits and costs and also make citizens participate into the process. Impact Assessment can be practiced by a supervisory body or by a commission whose members are appointed from the Ministry, regulatory agencies and the competition authority . As citizens, NGOs and associations are made part of the policy making process, both their civic learning is improved and smoother and effective transition to the new policy world is achieved.

The third pillar of energy transformation is deployment of smart grids. Although the other pillars of transformation, carbon pricing and renewables' supports also have technology dimension inherent in them, smart grids are the most technology-oriented part of transition to low carbon economy and the smart grid can be claimed to be a final destination in achieving the target of decarbonization. The vitality of smart grid is that it actually makes the citizen part of energy world by allowing citizens to know how much they consume, at what price they consume, to be efficient and conserving in their energy use, and more importantly to benefit from better quality, innovative energy services. The conventional, existing electricity grid works only one-way that all control of supply and demand rests with the distribution company. Therefore, the citizen has mostly no knowledge and discretion about costs, prices, the existence of dynamic variables during the day, in different seasons and also different parts of the country. The smart grid, on the other hand provides two-way communication, uses dynamic pricing, allows for efficient appliances to be integrated into the grid. In essence, by putting the citizen at the helm of an industry that is critical for climate change mitigation, smart grid becomes the facilitator of energy transformation, and thus the sustainable development.

Smart grid is defined by Carvallo and Cooper as "the integration of an electric grid, a communications network, software, and hardware to monitor, control, and manage the creation, distribution, storage and consumption of energy". The authors point to interaction of citizens with the industry stating that "the smart grid of the future will ve distributed, it will be interactive, it will be self-healing and it will communicate with every device." As seen, transparency and awareness succeeded in energy area will promote transparency and awareness in other processes and areas as well, leading to more participatory democracy.

Carvallo and Cooper make an analogy between the computer and telecommunications industry evolution and the evolution of electricity industry. They see that smart grids will make the evolution and empower the consumers by making demand side be part of the market. They point out that this change will be challenged by two aspects: a) pace b) cultural and organizational approach. They propose that in order to overcome those challenges, a holistic focus by the related bodies is required. For the smart grid to penetrate, states have to take action to make innovation part of electricity distribution equation. Currently, distribution is not innovation-oriented and Distribution System Operators (DSOs) are focused on only the distribution system's balancing, which is rather primitive with no innovation for the past many decades. One of the reasons for the lack of innovation is the need for keeping the electricity system balanced at all times. Smart grids, however, are needed because the traditional system is weak in integrating the renewable energy to itself. As renewable energy is intermittent, the balancing of the system becomes more important. Moreover, as demand side participates into the market and consumers start to produce their own electricity with solar rooftops and respond to market prices in a dynamic

manner, innovation by distribution companies becomes a requirement.

As stated above, transmission and distribution are regulated segments of the electricity market. They need to be incentivized by the government and regulatory agency in order for a competition for innovation to be instigated. A paradox of this transitory period is the heavy existence of unknowns and uncertainties on the government, climate, global carbon regime sides. Moreover, ongoing liberalization process in the electricity market adds to the pressure on firms. While smart grids are cost-effective and democratic, they are costly in the deployment phase. The benefits of smart grids should be communicated to the public, firms should be incentivized to innovate and policy and regulatory uncertainties need to be addressed by the relevant bodies in a timely manner. If smart grids, advanced metering infrastructure (AMI), energy-efficient appliances are to become part of energy lives of citizens, they need to be nudged. Citizens, in this energy paradigm, will be more than consumers. They will be "ecological citizens" under whose command information and control will be joined for efficient management of their energy use. Such participation in markets and also participation in the policy making process (since smart grids are still deployment and development phase, and not prevailing in any part of the world) will mean civic education, learning and have a spill-over effect in other public policy areas.

Smart Policy, Social Capital and Democratic Consolidation

As the prior section has shown, transition to low carbon economy and transforming of the energy industry through renewable energy promotion, carbon pricing and smart grids are multi-dimensional requiring systematic, holistic thinking and understanding on the side of the government. Energy is vital for economic stability and also plays a part on the peaceful and prosperous social fabric in any country. Not only regulatory and competition policies, but also social policy and industrial policy are important in building this holistic focus.

As Tom Christensen finds in his article, there has been an overall attempt to improve government and public policy since the 1980s, especially by the OECD countries' reformers. Public services, importance of consumer, free markets and efficiency considerations have driven reformers in making public management absorb efficiency, effectiveness attributes of the private management. As the timing of the reforms indicates, the neoliberal framework, with its general suspicion of strong government was behind this view of government as public service provider and putting the consumer at the center. The UK, US, New Zealand and Australia have been important examples where New Public Management (NPM) was initiated through several laws and policies. Christensen argues that on the road to improving government and public policy, NPM is problematic with its emphasis on efficiency and rationality, with weak normative guidance. Also, consumers and citizens have failed to participate in policy processes and their exclusion meant ineffectiveness:

"…whether consumers really influence public service provision under NPM. While certain strong and coordinated groups of consumers may do so, possibly to the detriment of others, the overall picture is that service providers think primarily about profit. Allowing consumers too much participation or influence takes time and resources and is therefore not efficient. In this respect the consumer orientation of NPM may have symbolic overtones."

Therefore, rather than copying private management, Christensen proposes that a `joined-up government` approach (JUG) can be adopted. JUG mainly emphasizes more coordination and communication as more promising route to an improved government.

Sustainable development and transition to a low carbon economy have played a role in government and public policy reforms undertaken in Europe and the US since the motivation of both are the same: policies and economies need to be smarter, more inclusive of the public, and more equitable. Sustainable development's motivation for more policy integration and better coordination for effective holistic governance are studied by Ian Bartle and Peter Vass, who argue that the concerns about sustainability require new thinking on the public policy front. Independent regulators in economic, social, environmental and energy policies need to cooperate and communicate in order to better respond to sustainability. In this sense, the independent regulatory authorities should use their information to propose more integrative policies. Britain (renewable energy policy and energy efficiency policy where the Ministry worked in coordination with the regulatory authority) has been an important example for the achievement of such policy integration between the independent regulation and public policies. While top-down economic regulation had efficiencies in the past, today's challenges of sustainability call for more bottom-up and integrative (horizontally, amongst different policies) approaches to policy making and implementation.

Public policy generally is an intersection of rule of law, distribution/redistribution concerns and rational decision making by choosing the least costly/cheapest alternative for the society. Since policy inevitably has a politics (distribution, redistribution issues) part in it, not always rational outcomes can be registered. Nevertheless, the challenge of sustainable development and reforms and approaches on the public policy front will catalyze the transition to more rational and equitable policy making in transforming the energy industry with a spill-over impact on other policy areas. Bartle and Vass describe this relationship as follows:

"The standard model with top-down policy integration is also seen to be compatible with a particular notion of democracy and the nature of economic, social and environmental decisions. Economic regulatory decisions are technocratic that is they are amenable to rational analysis by experts drawing on established economic theory. Social and environmental decisions on the other hand are political: they involve value

judgments about equity, distribution and the value of nature all of which are not as amenable to rational analysis."

As the British example shows, the challenge of addressing climate change through successful energy, regulatory and competition policies, institutional cooperation, awareness and active participation of citizens, knowledgeable NGOs are very important. Not only rationality, but also politics becomes important in the new energy paradigm.

Rationality in policy making, if over-relied upon, also has dangerous aspects in terms of equity and practicality. Anne C. Witt writes in her article that the EU's emphasis on effects and quantification of costs and benefits has weakened the effectiveness of competition and environmental policy, as well as energy policy. The EU reached a consensus that "consumer welfare" should be set as the benchmark in its competition policy from 2000 onwards. From then on, unquantifiable impacts have thus been ignored and issues like well-being, equity, link with other policy goals have been automatically overlooked. Witt believes that the latest crisis was a clear signal that better policy coordination and a modification of single-dimensional approach are now indispensable. The following quotation well clarifies how climate change and the changing energy context need to be better taken into account in related public policy areas: "Given the ever growing political significance of environmental protection, the question of whether ecological benefits should be capable of counterbalancing an agreement's anticompetitive effects has long become a permanent fixture in academic discourse."

As the preceding paragraphs and literature show, energy, competition and regulatory policies' improvement and cooperation are vitally important for citizens' participation, their understanding of the new paradigm of how important their role in transition to low-carbon economy. If public policy only focuses on a single anchor such as consumer welfare and only takes account of quantifiable costs and benefits, then the wider picture is missed. As the preceding section showed, state action and incentives market creation are not enough; citizens have to be aware and give their consent so that costs can be shared. They can participate in the market by adopting/responding to market prices, being more efficient and conserving, consuming less, asking for better services and thus increasing competition in the market. Otherwise, inefficient investment decisions will continue, market manipulation would be conducted by the firms and the citizens will remain unaware about present and future challenges in terms of energy in their lives.

Smart policy through better coordination at the government level, however, needs to be supported by direct and indirect measures to increase social capital. Boix and Posner, studying on how social capital comes into being and its impact on government performance, find that social capital is a set of institutionalized expectations in which other social actors will reciprocate cooperation. This reciprocation requires trust on both sides ex ante. On the other hand, inequality makes cooperation difficult to be formed and fostered. This inequality problem is mainly exacerbated due to lack of social trust, external forces and steep social hierarchy. The authors thus argue that social capital should be endeavored as it would bring with it more political competition, more accountability, more civic virtue, less antagonism among the elite, less principal-agent problem and thus better government ability for development. As consumers are taken as ecological citizens and put at the core of public policies in transition to low carbon economy, both inter-agency and between government and public communication, cooperation and trust can be enhanced. Here, it should be noted that social policy and protection of the vulnerable consumers need to be carefully addressed as well.

Policy Recommendations for Turkey

Turkey's electricity market has been undergoing liberalization for the last decade. The liberalization process has seen an acceleration this year with a new market law that further brought regulations for more competition in wholesale and retail markets. Turkey also is struggling to decrease its dependency on foreign primary energy resource imports through promotion of renewable energy. Still, carbon pricing and smart grid deployment are not yet on the agenda.

Turkey has adopted independent regulation structure of the EU and other Western democracies since 1997 and energy markets are being regulated in cooperation by the Energy Ministry, the regulatory agency and also at times competition authority. As an emerging economy, Turkey is also struggling to keep high levels of economic growth on track not to lose momentum. As a developing country, it has no binding carbon emissions target in accordance with the Kyoto Protocol. Still, smart grids, carbon trade and other elements of sustainable development and transition to low-carbon economy will need to be addressed by Turkey as well in the near term given its economic targets, political ambitions and quest of EU membership. As explained above, the EU is very determined in leading low carbon technologies as well as digitalization of economy. Therefore, Turkey, from today should adopt long term visions for the medium and long terms.

Such a vision, first of all, should endeavor to place consumers and citizens at the core of all public policy initiatives and the public should be reached through various media and communicated with. London Citizens Forum, as implemented in the EU, can be taken as a benchmark in this sense. Every year on pre-announced dates officials and citizens can convene together and build mutual trust . Moreover, renewable energy, externalities, environmental realities, global warming and climate change should be integrated into mindset of both institutions and citizens.

Secondly, energy's strategic and security dimensions, as well as technological development's importance should be better understood. Industrial policy should be based on innovation in sectors like energy, as well as better advanced sectors of telecommunications and the Internet. If the current and traditional lack of innovation, and R&D continues to prevail, then the costs would be higher in the future when adoption of new technologies becomes indispensable to be able to surmount climate change problems. Again, citizens' awareness and support are critical because if they are better

communicated with and educated, then they also can push politicians who are the representatives of the people.

Social capital building and fostering of trust should always be endeavored to by all implementers on both central and local levels. Energy is a part of the citizens' daily lives and if they know better they can transform into "ecological citizens" who consume less, participate in the market through responding to dynamic pricing and who is virtuous in a civic republican sense, contributing to consolidation of democracy. As Peter Evans has argued, rule of law and transparent procedures, when combined by "embeddedness", create social capital and thus overall welfare improvement. Sustainable development, as today's challenge, can make humanity realize this window of opportunity and create a better future.

"Responsibility for the information and views expressed in this article lies entirely with the author."

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AKILLI ŞEBEKELERİN GEREKLİLİĞİ VE DÜNYADA UYGULAMALARI
REQUIREMENT OF SMART GRID AND APPLICATIONS IN THE WORLD

Ömer Faruk DEMİRKOL

T.C ENERJİ VE TABİİ KAYNAKLAR
BAKANLIĞI
demirkol@enerji.gov.tr

ÖZETÇE

Teknolojinin gelişmesi ve mevcut elektrik sistemlerinin ihtiyaçlara cevap verememesi ile birlikte, dünya genelinde ülkeler akıllı şebeke yatırımlarına yönelmişlerdir. Birçok hükümet akıllı şebeke ile ilgili hedefler belirleyerek, programlar uygulamaya koymuştur. Dünyada uygulanan akıllı şebeke projelerinin ana hedefi; kayıp ve kaçak oranını azaltarak enerjiyi verimli kullanmak olmuştur. Bunun yanında diğer ana hedefler; rüzgar ve güneş gibi yenilenebilir kaynaklardan enerji üretmek, karbon emisyonunu azaltmak, elektrik hatlarını iyileştirmek, ileri ölçüm altyapısı kurmak, elektrikli araçları ve akıllı binaları sisteme entegre etmek, akıllı yönetim sistemleri kurmaktır. Akıllı şebeke projeleri yüksek bütçeli maliyetler gerektirse de yapılan tasarruf ve edinilen faydalar ile bunlar birkaç yılda kendini amorti edebilmektedir.

Avrupa Birliği, Akıllı Şebekeler Teknoloji Platformunu kurmuş ve akıllı şebeke ile ilgili yol haritası belirlemiştir. Avrupa Birliği'nin ana hedefi; 2020 yılına kadar yenilenebilir enerji kaynaklarını % 20 oranında sisteme entegre etmek, enerji verimliliğini % 20 artırmak, ve karbon salınımını % 20 azaltmak olmuştur. Amerikan hükümeti, ülkesinde yapılan birçok akıllı şebeke projesini belli oranlarda geri ödemeli olarak finanse etmektedir. Japonya akıllı şebeke projelerini bir adım ileriye taşıyarak, akıllı şehir pilot uygulamalarını başlatmıştır. Avrupa, ABD ve Japonya haricinde Çin, Güney Kore, Brezilya, Hindistan, Kanada gibi birçok ülke, akıllı şebekeler ile yakından ilgilenmeye başlamış ve çalışmalar yapmaktadır.

Türkiye olarak, süratle bu yönde çalışmalarımıza devam etmemiz ve enterkonnekte sistemi akıllı şebeke ile entegre hale getirmemiz gerekmektedir. Sistem olarak bize paralellik gösteren İtalya, Almanya gibi Avrupa devletleri ile aşamalı programlar yapan Güney Kore, Brezilya gibi ülkeler örnek alınarak tutarlı pilot çalışmalar yapmamız çok fayda sağlayacaktır. En önemli unsur ise, akıllı şebeke sisteminin kurulması için ülkemize ait ürünler ve yerli projeler geliştirmemizdir. Gerekli ar-ge çalışmaları ve yerli imalatın, planlama aşamasında, ana başlık olarak mutlaka yer alması şarttır. Stratejimiz, elektrik enerji sisteminin akıllı şebekeye uygun hale getirilmesini sağlamak ve bunu ithal ürünler ile değil, kendi imkanlarımızla gerçekleştirmek şeklinde olmalıdır.

Anahtar Kelimeler: Akıllı şebeke gerekliliği, verimli enerji yönetimi, dünyadaki uygulamalar.

ABSTRACT

With the technologic development and the fact that existing electricity systems do not satisfy the requirements, world countries have headed towards smart grid investments. Many governments have identified goals for smart grid and applied programs. The main goal of the smart grid projects applied worldwide is to use energy efficiently by decreasing the lost and illegal rates. Other main goals besides this are to generate power out of renewable resources such as wind and sun, improve electricity lines, install an advanced metering infrastructure, integrate electric devices and smart buildings into the system and to install smart management systems. Even though smart grid projects require high budget costs, the savings and benefits allow these costs to be compensated within few years.

European Union has founded Smart Grid Technology Platform and identified a roadmap for smart grids. The main goal of European Union is to integrate 20% of renewable energy sources into the system until 2020, increase the energy efficiency of 20% and decrease the carbon emission by 20%. American government finances many smart grid projects within the country on a pay-back basis in specific rates. Japan took smart grid projects one step further and started smart city pilot implementations. Besides Europe, USA and Japan, many countries such as China, South Korea, Brasil, India, Canada also started to take a close look to smart grids and studies are being held.

In Turkey, we have to continue our studies on this subject and integrate the interconnected system with smart grid. It will be very beneficial for us to perform pilot studies by following the example of European countries who have a parallel system with us such as Italy, Germany and countries who adapt a multi stage program such as South Korea and Brasil. The most important thing is to develop local products and local projects in order to install the smart grid system. Required R&D studies should take place and local production should be the main subject in the planning level. Our strategy should be to ensure making electricity energy system suitable for smart grids

and realizing this not with imported products, but with our own opportunities.

Key words: Smart grid requirement, efficient energy management, examples in the world.

1. GİRİŞ

Elektrik enerji sistemlerinde, talebin güvenli, zamanında, sürekli, ekonomik ve kaliteli bir şekilde karşılanması büyük önem arz etmektedir. Günümüz güç sistemlerine baktığımızda ise, 1883 yılında Tesla'nın dizayn esaslarına göre kurulmuş olup, artık sistem için yeterli düzenlemeyi sağlayamamaktadır. O günler için merkezi üretimler, talep kontrolü ve tek yönlü iletim sistemleri mantıklı olmasına karşın, günümüz ihtiyaçlarına artık yeterince cevap verememektedir.

Ülkemizde ve dünyanın bir çok ülkesinde elektrik şebekesi; enerji santrallerinin birbirlerine uzun iletim hatları ile enterkonnekte sistemi oluşturacak şekilde bağlandığı bir yapıdadır. Enterkonnekte şebeke alternatif akım ile işletilmekte olup herhangi bir kısmında sistemin çökmesi durumunda meydana gelen dengesizlik bütün sistemin çökmesine, ülkede ve enerji alışverişi yaptığı diğer ülkelerde de enerji kesintilerine sebebiyet vermektedir.

2003 yılında Amerika Birleşik Devletleri'nde meydana gelen enerji kesintisi nedeni ile ABD'de yaklaşık 55 milyon kişi enerjisiz kalmıştır. Birbirini takip eden zincirleme olaylar sonucu oluşan büyük çökme, yedi dakika gibi bir sürede oluşmuş ve komşu ülke Kanada'da enerji kesintisine yol açmıştır. Güç eksikliklerini şebekedeki sensörler vasıtasıyla anında tespit etmek, kesinti olmadan beslemek, iletim ve dağıtım hattındaki kayıp enerjinin azaltılması, verimin arttırılması ve yenilenebilir enerji kaynaklarından enerji üretilebilmesi için mevcut elektrik şebekelerinin iyileştirilmesi ivedilikle yerine getirilmesi gereken hususlardır.

2. AKILLI ŞEBEKE UYGULAMASI

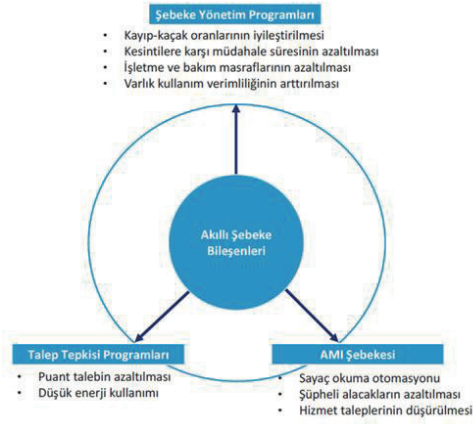
Akıllı şebeke uygulamalarının güç sistemlerine tatbik edilmesi ile mevcut halde enerji dağıtım sistemlerinde otomatik sayaç okuma, izleme ile enerji dağıtım ve yönetim uygulamaları kullanılmaya, kısaca SCADA sistemi uygulamasına başlanmıştır. Ayrıca, bu sistemlerin altyapısı kullanılarak şebekeden anlık olarak alınacak verilerin değerlendirilmesi ile enerji kalitesinin standart sınır değerler aralığında sağlanması ve kesintisiz enerji güvenirliği temini hususunda da gerekli altyapının oluşturulması sağlanabilecektir. Böylece, şebekedeki en büyük sıkıntılardan biri olan kayıp/kaçak oranının daha da azaltılması, enerji kalitesinin yükseltilmesi ve kesinti sürelerinin en aza indirilmesi mümkün olabilecektir.

Akıllı şebeke, sistemdeki paydaşların çift yönlü olarak birbirleri ve kontrol merkezi ile haberleşebildiği, enerjinin anlık olarak takip edildiği ve dinamik olarak yönetildiği bir sistemdir. Ayrıca, yenilenebilir enerji kaynaklarından elde edilen elektriğin sisteme entegre edilmesi, akıllı şebeke sayesinde rahatlıkla yapılabilmekte ve böylece çevre dostu enerji üretilerek karbon salınımı azaltılmaktadır. Akıllı şebekenin bir diğer avantajı da tüketiciye tercih ettiği dağıtım şirketinden elektriği satın alma şansı sunmasıdır. Tüketici farklı enerji tarifelerinden yararlanabilmekte, elektriği ucuz olduğu saatte satın alırken, evinde, işyerinde yenilenebilir enerji kaynaklarından ürettiği fazla enerjiyi, enerjinin pahalı olduğu saatlerde şebekeye satabilmektedir. Böylece tüketici üretici konumuna geçmektedir. Enerji sektörünün daha da liberalleşmesi adına bu avantajların hayata geçmesi, sisteme pozitif etki yapacaktır.

2.1. Akıllı Şebeke ile Elektrik Sistemine Bakış

Ülkemizde akıllı şebeke kavramı, özellikle elektrik enerjisi sektörünün liberalleşme eğilimi ve dağıtım şirketlerinin özelleştirilmesi ile daha fazla gündeme gelmiştir. Akıllı şebekeler üreticiler, tedarikçiler ve son kullanıcılar arasında doğrudan iletişimi sağlayarak, tüketicilerin saatlik elektrik fiyatlarına göre kendi elektrik tüketimlerini yönetmelerine olanak tanımaktadır. Şebekeyi etkin ve verimli kullanmak, şebekenin güvenliğini sağlamakla birlikte, şebeke operasyon maliyetlerini de düşürmektedir. Akıllı şebekeler sürekli büyüyen enerji talebine karşı sürdürülebilir çözümler sunarken, arz güvenliğini sağlamakta, müşterilere kesintisiz ve kaliteli hizmet verilmesini temin etmektedir. Bunlar da enerji sisteminin olmazsa olmaz unsurları arasında yer almaktadır.

Akıllı şebeke bileşenlerini incelediğimizde, talep tepkisi programlarının etkin talep yönetimi sağlayarak, sistem güvenliğini korumanın yanı sıra, son kullanıcılar ile dağıtım şirketinin tüketimlerini kontrol etmelerini sağladığı görülmektedir. Bu sayede kullanıcılar, yük yönetim stratejileri oluşturmakta, kaynak portföylerini optimize etmekte ve son tüketici davranışlarını analiz edebilmektedir. Gelişmiş sayaç altyapıları (AMI) ile şirketler, gelişmiş müşteri hizmetleri ve iki taraflı iletişim yapabilen otomatik sayaçlar ile operasyonel verimlilikler sağlamaktadır.



Kaynak: Deloitte Analizi

Şebeke yönetim programlarında ise şebeke varlıkları etkin ve verimli bir şekilde kullanılarak, şebekedeki hizmet kalitesinin arttırılması ve maliyetlerin düşürülmesi hedeflenmektedir. Akıllı şebeke, işletmelere, operasyonel verimlilik, finansal risk, mevzuata uyum, müşteri hizmetleri gelişimi ve gelir artırımı alanlarında değer katmakta ve şirketlere çeşitli fırsatlar sunmaktadır.

2.2 Akıllı Şebekenin Klasik Şebekelere Göre Sağlayacağı Avantajlar

Akıllı şebekenin başlıca üstünlüklerini şu şekilde sıralayabiliriz;

• Yenilenebilir enerji kaynaklarının daha kolay ve hızlı bir şekilde enterkonnekte sisteme entegre edilebilmesi sağlanacaktır. Böylece tüketiciler de üretici konumunda olacaktır.
• Elektrik tüketim oranları belirli noktalarda gerçek zamanlı olarak karşılaştırılarak elektrik kayıp-kaçak oranı azaltılabilecektir.
• Tüketicilere daha kapsamlı bilgi ve enerji tüketim tarifeleri sunabilir.
• Akıllı ev otomasyon projelerinin hayata geçirilebilmesine olanak sağlayarak, tüketicinin elektrik sistemindeki işletme optimizasyonunda kendi rollerini oynama imkânı tanınabilir. Tüketiciler daha dinamik fiyatlandırma ile elektrik satın alabilir.
• Kullanılacak elektrik enerjisi kadar elektrik üretimi yapılacağından Kyoto protokolünde kabul edilen karbon salınımı azaltma hedefi için önemli bir adım olacaktır.
• İletim ve dağıtım altyapısının iyileştirilmesi ve geliştirilmesini sağlayacaktır.
• Dağıtım ve iletim şirketlerine daha fazla şebeke yönetim imkânı sunacaktır.
• Sistemin ihtiyaç duyacağı enerji yatırımları, elde edilen ölçümler ve analizler sayesinde daha iyi planlanabilecektir.
• Elektrikli araçlar için sağlam bir altyapı oluşturacaktır.
• Düşük kullanım maliyetlerinin yanı sıra üretim yönetim sistemine de büyük kolaylıklar sağlayacaktır. En önemlisi de mevcut kapasite daha etkin ve doğru bir şekilde kullanılacaktır.

3. DÜNYADA YAPILAN AKILLI ŞEBEKE UYGULAMA ÇALIŞMALARI

1890'lı yıllardan bu yana hemen hemen aynı şekilde çalışan elektrik enerjisi şebekelerine, 21. yüzyıl haberleşme teknolojisi entegre edilerek oluşturulan Smart Grid konseptinin Dünya üzerindeki uygulama çalışmaları giderek yaygınlaşmaktadır. 2005 yılında tamamlanan Telegestore projesi kapsamında İtalya, akıllı şebekeler ile ilgili olarak ilk adımı atan ülke olmuştur. Bu proje ile 27 milyon adet sayaç uzaktan okunabilen akıllı sayaçlar ile değiştirilmiştir.

AB'nin yapmış olduğu toplantıda, 2020 yılı için iklim değişikliği ve enerji politikası hedefleri doğrultusunda elektrik altyapısının büyük bir dönüşüm gerektiği vurgulanmıştır. Mevcut ağları güçlendirme ve yükseltme, şebeke güvenliğinin artırılması, iç enerji piyasasının geliştirilmesi, enerji tasarrufu bilincini artırmak ve enerji verimliliğini geliştirmek, yenilenebilir enerji üretimini artırarak sisteme entegre etmek büyük önem taşımaktadır. Bu hedeflere ulaşmak için yalnızca yeni hatlar ve trafolar inşa etmek yeterli değildir. Bilgi ve iletişim teknolojileri entegrasyonu ile tüm elektrik sistemini akıllı yapıya dönüştürmek gerekmektedir.

ABD; Akıllı şebeke mevzuatı Amerikan Kongresinde 2007 yılında yürürlüğe giren Enerji Bağımsızlığı Yasası (EISA) ile düzenlenmiş ve ulusal iletim ve dağıtım sisteminin modernleştirilmesine karar verilmiştir. Bu yasa kapsamında, elektrik şebekesinin güvenliği, kalitesi ve verimliliğini sağlamak için hayata geçirilmesi gereken dijital bilgi ve kontrol teknolojileri, şebeke faaliyetleri ve kaynaklarının dinamik optimizasyonu, enerji verimliliğini ve talep tepkisini sağlayacak donanım ve uygulamaların şebekeye entegrasyonu konularında çalışmalar yapılacaktır. ABD'de akıllı şebeke yatırımlarının önümüzdeki 20 sene içinde toplam maliyetinin 300 ile 450 milyar dolar arasında olması beklenmektedir.

Brezilya; Brezilya'da pek cok şirket akıllı şebeke ile ilişkili pilot çalışmalar yürütmektedir. Brezilya'da 2012 itibariyle 1 milyonu aşkın uzaktan otomatik okumalı sayaç kurulumu yapılmıştır. 2021 yılı sonuna kadar 63 milyon elektrik sayacı akıllı sayaçlar ile değiştirilmesi planlanmaktadır.

Hindistan; Hindistan Enerji Bakanlığı'nın yapmış olduğu araştırmada dünyadaki en büyük iletim ve dağıtım kayıpları oranı Hindistan elektrik şebekelerindedir. Bu kayıpların, kaçaklar dâhil edildiğinde ortalama

%50 olduğu ifade edilmektedir. Bu nedenle 2008 yılında "Smart Grids India" konferansı ile ilk adım atılarak akıllı şebekeler üzerindeki çalışmalarını başlatmışlardır. 2020 yılına kadar 130 milyondan fazla akıllı sayacın kurulumu planlanmaktadır.

Çin; Çin, nüfusu ve sanayisi sebebiyle elektrik enerjisinin verimli kullanımını birincil politika haline getirmiştir. Çin'in Akıllı Şebeke yol haritası, üç aşamada tanımlanmıştır: Planlama ve Pilot (2009-2010), Kurulum (2011-2015), Geliştirme (2016-2020)'dir. Çin'de enerji üretimi yapılan kaynaklar, enerji tüketiminin yoğun olduğu bölgelere çok uzak olduğu için, yatırımların çoğu daha verimli bir şekilde enerji taşınabilmesi amacıyla iletim ağlarına yapılmıştır. Çin devleti, her hafta, Dallas veya San Diego'daki tüm ev uygulamalarını karşılayacak büyüklükte kömür santralleri kurmaktadır. Çin'de akıllı şebeke çalışmaları 2007 yılındaki MIT (Massachusetts Institute of Technology) forumundan sonra başlatılmıştır 2009-2020 yılları arası akıllı şebeke teknolojisinin geliştirilmesi için 101 milyar dolar yatırım planlanmıştır.

Japonya; Japonya'da büyük endüstri ortakları tarafından kurulmuş Japonya Akıllı Toplum İttifakı, Japonya'nın akıllı şebeke yol haritasının çıkarılmasında önemli rol oynamaktadır. Japonya, 1990'lardan bu yana, akıllı şebeke için çok büyük yatırımlar yapmış ve dünya lideri konumuna gelmiştir. Yatırımlarına çok önceden başladığı için de, akıllı şebeke çalışmalarına, talep tarafında (home-side) devam etmektedir. 2010 yılında, 4 şehirde akıllı şebeke kapsamında akıllı şehir pilot uygulamalarına başlamışlardır.

Güney Kore; Güney Kore hükümeti, 3 aşama ve 5 fazdan oluşan programıyla, 2030 yılına kadar akıllı şebeke uygulamasına tamamen geçmeyi planlamıştır. Aşamalar, 2010-2012, 2012-2020 ve 2021-2030 olarak ayrılmış, fazlar ise akıllı şebeke, akıllı tüketici, akıllı taşımacılık, akıllı yenilenebilirler ve akıllı elektrik hizmetleri olarak adlandırılmıştır. Bu yol haritasında, şebekenin uzaktan izlenebilmesi, akıllı evlerin enerji yönetimlerinin yapılabilmesi ve pilot araç şarj ünitelerinin kurulması gibi adımlar bulunmaktadır. Program tamamlandığında ise, şebekenin kendi kendini onarabilmesi, gerçek zamanlı fiyatlandırmanın mümkün kılınması ve enerji depolama cihazlarının yaygınlaştırılması gibi pek çok akıllı sistemi kapsaması beklenmektedir.

Rusya; Rusya'da 1,5 milyonu aşkın apartman dairesi akıllı elektrik şebekesine bağlanmıştır.(Erikson şirketi) Dairelerin her birine, elektrik tüketiminin enerji şirketi tarafından kontrol edilmesine imkân veren sayaçlar kurulmuştur.

Avustralya; Avustralya Enerji Piyasaları Düzenleme Kurumu tarafından elektrik dağıtım şirketlerine, tüketicilere akıllı sayaç bağlama zorunluluğu getirilmiştir. Buna ek olarak, Avustralya devleti, "akıllı şebeke, akıllı şehirler" projesi kapsamında enerji sektörü ile ortak bir proje yürütmekte ve bu projeye 52,5 milyon Euro ayırmış durumdadır.

Avrupa; Avrupa Birliği müktesebatında 3. Enerji Paketi hükümleri ve buna bağlı 2009/72/EC no'lu Enerji Direktifi'nin Ek I.2 maddesi kapsamında Avrupa Birliği üye ülkelerinin akıllı şebeke yatırımları yapmaları teşvik edilmektedir. Paket kapsamında 2020 yılına kadar Avrupalı tüketicilerin %80'inin akıllı sayaçlara sahip olması gerekiyor. Bu direktifler ve yönetmelikler neticesinde, son 10 yılda 300 kadar akıllı şebeke projesine yaklaşık 5,5 Milyar Euro yatırım yapılmıştır. 2020 yılına kadar ise toplam 240 Milyon akıllı sayacın Avrupa genelinde aktif olması beklenmektedir.

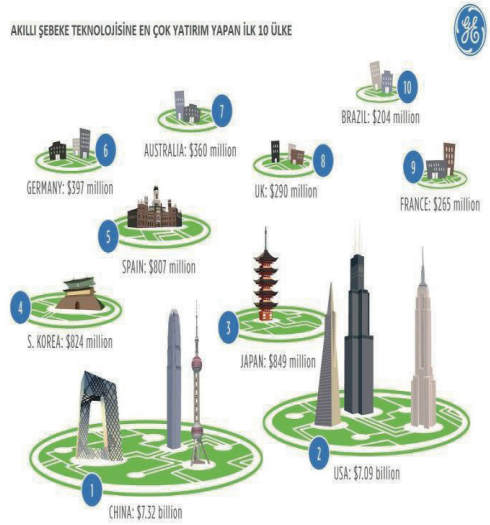
Fransa; Ağustos 2010'da çıkan mevzuat ile birlikte 2016 yılının sonuna kadar ülkenin %95'ini kapsayacak şekilde akıllı sayaç kurulması hedeflenmektedir.

İspanya; 2008 yılında çıkardığı yasa ile dağıtım şirketleri tarafından tüketicilerin kullandığı sayaçlar yerine, tüketicilere ek yük olmaksızın, akıllı sayaç yerleştirmelerini zorunlu kılmıştır. Bu yasa çerçevesinde, Endesa dağıtım şirketi 2010- 2015 yılları arasında 13 milyon tüketicisine akıllı sayaç kurulumu yapacağını açıklamıştır.

İngiltere; akıllı şebekelere geçiş için 2 aşamalı bir program uygulayacaktır. Programın ilk aşaması olan 2010-2015 yılları arasında akıllı şebeke tasarımının araştırılması ve gerçekleştirilmesi, 2015-2020 yılları arasında ise ikinci aşamasında olarak akıllı sayaç kullanımının yaygınlaştırılarak 2019 yılının sonuna kadar 50 milyon elektrik ve gaz akıllı sayacının sisteme entegre edilmesi hedeflenmektedir.

Malta; akıllı şebeke uygulamasına başlayan ilk ülke olarak nitelendirilir. Malta devleti, vatandaşların elektriği ne zaman ve nasıl kullanılacaklarına ilişkin halkın eğitimine büyük önem vermiştir. Tüketiciler, 250.000 akıllı sayaç kurulumu ile elektrik tüketimleri gerçek zamanlı izlenerek daha uygun tarifelere yönlendirilmiş ve buna uyarak az enerji tüketenler ödüllendirilmiştir.

Almanya; 2010 yılı itibarıyla ülkedeki tüm binaların akıllı ölçüm cihazlarıyla donatılmasına karar vermiş, 2011 itibarıyla da "Demand Response" ve "Time of Use" gibi programları kullanıcıya sunmuştur. Hükümet teşvikinin yanı sıra birçok sektör devi şirket ve Yello Strom gibi hizmet şirketlerinin katılımıyla Almanya'nın akıllı şebeke yatırımlarının 2020'ye kadar 40 milyar Euro'ya ulaşacağı öngörülüyor.



4. TÜRKİYE'DE AKILLI ŞEBEKE ÇALIŞMALARI

Enerji Verimliliği Strateji Belgesi'nde (2012-2023), akıllı şebeke uygulamaları, Enerji ve Tabii Kaynaklar Bakanlığı koordinatörlüğünde kamu, özel sektör ve sivil toplum kuruluşlarının katılımları ile hazırlanan eylemlerden biri olarak gösterilmektedir. SA-04/ SH-02/E-01 kodlu eylemin konusu, enerji ve güç miktarına göre kademelendirilmiş tarife, çok terimli sayaç ve akıllı şebeke uygulamalarının yapılması olarak belirtilmiştir.

EPDK elektrik piyasası mevzuatında yer alan Elektrik Dağıtımı ve Perakende Satışına İlişkin Hizmet Kalitesi Yönetmeliği uyarınca, tedarik sürekliliği kalitesi ile ticari ve teknik kalitenin denetlenmesi için otomatik izleme sistemlerinin gerekliliği açıkça ortaya konmaktadır.

Ayrıca, Coğrafi Bilgi Sistemleri'ne ilişkin yatırımların da başlatılmasına yönelik mevzuat düzenlemeleri bulunmaktadır. Dağıtım şirketleri tarafından otomatik sayaç okuma sistemi (OSOS) yatırımlarına mevzuat gereklilikleri nedeni ile başlanmıştır. Yukarıdaki mevzuat düzenlemelerinden de yorumlandığı üzere uzaktan izleme ve kontrol (SCADA), dağıtım sistemi yönetimi, Coğrafi Bilgi Sistemleri (CBS), akıllı sayaç altyapısı gibi bilgi ve iletişim sistemleri bileşenleri bu sektör için bir gereklilik olarak öngörülmelidir.

Türkiye'de, TEİAŞ ile başlayan sonrasında dağıtım şirketleri bünyesinde devam ettirilen ve şimdilik akıllı sayaçlar ve uzaktan okuma sistemleri olarak belirlenen bir vizyon ve uygulama süreci bulunmaktadır. Ayrıca şebekenin gerçek zamanlı izlenmesine ve yönetimine ilişkin bağımsız olarak yürütülen "şebeke izleme ve dağıtım sistem yönetimi" yatırım faaliyetleri arasında yer almaktadır. Bu yatırımların, uluslararası iyi uygulama örneklerini dikkate alarak, müşteri hizmetleri ve faturalama sistemleri ile de tam entegre bir şekilde tasarlanması beklenmektedir.
Ayrıca, talep yönetimine ilişkin çalışmalar yapılmakta ve akıllı şebekeler ile bu yönetimin gerçekleşmesi sağlanacaktır. Tüketim tarafının da fiyata tepki vermesi sağlanacak ve kısa dönemli fiyat hareketlerine cevap veren bir talep tarafı gündeme gelecektir. Bu da tüketici açısından olumlu sonuçlar getirmektedir.

5. SONUÇ VE DEĞERLENDİRME

Akıllı şebeke çözümlerinin var olmasıyla, enerji tüketimine ve üretimine dair problemlerin zamanla ortadan kalkacağı öngörülmektedir. Bu sebeple, mevcut şebeke sistemlerinin, bu teknolojiye entegre olabilmesi için bir değişim geçirmesi kaçınılmazdır. Kesinti olmaksızın hattı beslemek ve onarmak, iletim ve dağıtım hattındaki kayıp enerjiyi minimum seviyeye indirmek, verimin arttırılmasını ve yenilenebilir enerji kaynaklarından enerji üretilebilmesini sağlamak için mevcut elektrik şebekelerinin akıllı şebekeye dönüştürülmesi ziyadesiyle elzemdir. Bu değişim ne bir lüks, ne de bir hayaldir. Bir an önce planlaması bitirilmesi ve uygulamaya geçilmesi gereken önemli bir hususdur.

Dünyadaki çalışmalarını incelediğimizde, 2000 yılından bu yana planlamalar ve mevcut uygulamalar görülmektedir. Birçok ülke yatırım planlamalarını bitirmiş, hatta akıllı sayaçlar, akıllı şehirler v.s. çalışmalar ile ciddi oranlarda mesafe kat etmişlerdir. Bizim de ülke olarak, süratle bu yönde çalışmalarımıza devam etmemiz ve enterkonnekte sistemi akıllı şebeke ile entegre hale getirmemiz şarttır. Sistem olarak bize paralellik gösteren İtalya,

Almanya gibi Avrupa devletleri ile aşamalı programlar yapan Güney Kore, Brezilya gibi ülkeler örnek alınarak tutarlı pilot çalışmalar yapmamız çok fayda sağlayacaktır.

En önemli unsur ise, akıllı şebeke sisteminin kurulması için kendi ürün ve yerli projeler geliştirmemizdir. Gerekli ar-ge çalışmaları ve yerli imalatın yapılmadığı bir süreçte, ithal ürünlerin fiyatına göre hareket etmek durumunda kalırız ki bu da başka sorunlar doğurur. (cari açığın artması, fiyatların düşüşünü bekleme ve neticesinde vakit kaybı, dışa bağımlılık v.s.) Sonuç itibari ile sistemin bu dönüşümü yaşaması kaçınılmazdır ve sürecin kendi öz kaynaklarımızla yönetilmesi en doğru yol olacaktır.

6. KAYNAKLAR

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