Provisional Translation

Long-term Energy Supply and Demand Outlook

July, 2015

Ministry of Economy, Trade and Industry

(Introduction)

Following the Strategic Energy Plan, which the Cabinet approved in April 2014, the Ministry of Economy, Trade and Industry (METI) established the Long-term Energy Supply and Demand Subcommittee under the Strategic Policy Committee of the Advisory Committee for Natural Resources and Energy, and after the consideration in the subcommittee, the Long-term Energy Supply and Demand Outlook has been decided.

Upon promoting the energy policy, the Government of Japan (GOJ) and business operators must deeply reflect upon that after the Great East Japan Earthquake and the accident at Tokyo Electric Power Company (TEPCO)'s Fukushima Daiichi Nuclear Power Plants (hereinafter referred to as the "TEPCO's Fukushima nuclear accident"), the confidence has been significantly reduced. Approximately 110,000 people are still being forced to live as evacuees at this moment. Efforts toward recovery and reconstruction of Fukushima should be placed at the starting point in order to re-establish the energy policy. As its top priority, the Government of Japan (GOJ) must do its utmost to achieve the restoration and reconstruction of Fukushima through implementing the measures for decommissioning and contaminated water, compensation for the nuclear accident damage, decontamination, constructing an interim storage facility and control of damage caused by groundless rumors about the accident, and also do its utmost to recover the confidential relationship.

The Strategic Energy Plan notes that "interest in energy issues has surged in Japan compared with before the accident, and various people have expressed various opinions, such as 1) that use of nuclear power should be stopped immediately, 2) that nuclear power generation should be abandoned someday if possible, that 3) large-scale, concentrated power sources like nuclear power plants are unnecessary for Japan, 4) that even if nuclear power generation continues, its scale should be kept at a minimum, and that 5) there will be continued need for nuclear power generation, and discussions are ongoing. GOJ must take these various discussions seriously and squarely." Therefore, the subcommittee was held open to the public, and the consideration by the subcommittee referred to various opinions including opinions received through the "opinion box regarding energy mix" which were reported to the subcommittee each time, and finally, after conducting calls for public comment, the Long-term Energy Supply and Demand Outlook has been drawn as below.

1. Position of Long-term Energy Supply and Demand Outlook

The point of the energy policy is to first and foremost ensure stable supply ("Energy Security"), and realize low-cost energy supply by enhancing its efficiency ("Economic Efficiency") on the premise of "Safety." It is also important to make maximum efforts to pursue environment suitability ("Environment"). This has been clarified in the Strategic Energy Plan[1] as the basic perspectives for the energy policy.

The Long-term Energy Supply and Demand Outlook is a forecast and also a vision of a desired future energy supply-demand structure to be realized, in light of the Strategic Energy Plan, by executing the policies based on the basic direction of the energy policy, and assuming the policy goals to be achieved regarding safety, energy security, economic efficiency and environment which are the basic perspectives for the energy policy.

Accordingly, this Outlook shall be based on the demand projection in light of the macroeconomic indicators and industrial trends, and shall be a practicable outlook based on the accumulation of countermeasures and technologies.

The Long-term Energy Supply and Demand Outlook draws up the outlook of the energy supply-demand structure in FY2030 from a mid- to long-term viewpoint in light of the Strategic Energy Plan.

2. Basic Principle for Drawing the Long-term Energy Supply and Demand Outlook

In drawing the Long-term Energy Supply and Demand Outlook, the specific policy goals to be achieved regarding safety, energy security, economic efficiency and environment which are the basic perspectives mentioned in the Strategic Energy Plan are shown as below.

(1) Safety

Confidence in nuclear power has been reducing due to TEPCO's Fukushima nuclear accident. In addition, the public are more concerned with resistance of other fuel supply facilities such as oil and gas, and wind power generation facilities to natural disasters, etc. Therefore, in addition to the world's highest level of the new regulatory requirements,

[1] The Strategic Energy Plan is drafted by the Minister of Economy, Trade and Industry and decided by the Cabinet. To draft the plan, the Minister listens to the opinions of the heads of related administrative agencies and the Advisory Committee for Natural Resources and Energy as to the policies, etc. to be comprehensively executed on energy supply-demand based on the Basic Act on Energy Policy (promulgated and enforced in 2002).

efforts will be made to voluntarily improve safety, and maintain and develop technologies and human resources necessary for safety securement. Safety improvement will be addressed for oil, gas, and other facilities as well.

(2) Energy security

It is a significant challenge to realize a multilayer diversified supply-demand structure capable of ensuring energy security not only in normal times, but also in times of crisis.

Improvement of energy self-sufficiency rate has been a major goal of our energy policy over the years. On the other hand, our energy self-sufficiency rate has dropped to a mere 6% due to the shutdown of the nuclear power plants, which is the second lowest figure among 34 OECD countries and an extremely low level compared to non-resource-producing countries such as Spain (26.7%), Italy (20.1%) and South Korea (17.5%)[2].

Therefore, the goal is to diversify energy-supplying countries and develop domestic resources, reduce procurement risks, and improve self-sufficiency rate to the level higher than before the Great East Japan Earthquake (approx. 25%).

(3) Economic efficiency

Since the Great East Japan Earthquake, the electricity prices have rose greatly for both household and industrial uses, causing an outcry from the industrial sector including small and medium-size enterprises and small-scale business operators in various regions. Therefore, it is an urgent issue to control the electricity prices in order to maintain employment and people's living, and the electricity prices should be controlled stably in the mid-long term as well.

Under the circumstances where a positive economic cycle is starting to move in a steady manner, it is important to secure industrial competitiveness and place the Japanese economy on a full-fledged growth track, and is necessary to build an energy supply-demand structure to support economic growth.

The government has already been addressing to minimize energy prices and promote the energy system reform. On the other hand, dependence on the nuclear power plants will be reduced compared with the level prior to the Great East Japan Earthquake, and use of renewable energy will be increased, which are large factors pushing up electric

[2] The energy self-sufficiency rates are actual values of 2012 according to IEA Energy Balances 2014.

power costs.

Therefore, the goal is to lower electric power costs than at present.

(4) Environment

Since the Great East Japan Earthquake, greenhouse gas (GHG) emissions have been continuously increasing due to the additional thermal power generation caused by the shutdown of the nuclear power plants, etc., increasing the necessity to address global warming control measures proactively.

Under such circumstances, in preparation for the 21st session of the Conferences of Parties (COP21) in December this year, Japan is expected to present an ambitious reduction target and lead the world in tackling global warming as an advanced country.

Therefore, the goal is to set the Long-term Energy Supply and Demand Outlook which contributes to a reduction target comparable to EU and the U.S., and lead the world.

The Strategic Energy Plan provides the basic direction of the energy policies such as lowering dependency on nuclear power generation to the extent possible through energy efficiency and conservation and introducing renewable energy as well as improving the efficiency of thermal power generation, etc. The basic principle is to draw a future energy supply-demand structural outlook which achieves the policy goals related to safety, energy security, economic efficiency and environment suitability assumed above.

3. Structural Outlook of Energy Supply and Demand in FY2030

The following describes the energy supply-demand structural outlook in FY2030 in light of the basic principle mentioned above.

(1) Energy demand and primary energy supply structure

While expecting an increase in energy demand due to economic growth, etc., significant improvement of energy efficiency, comparable to after the oil shock, is expected by promoting thorough energy efficiency and conservation.

Specifically, based on the economic growth rate estimated referring to the Economic Revitalization Case in “Economic and Fiscal Projections

for Medium to Long Term Analysis"[3] published by the Cabinet Office (Feb. 2015), latest population projection by the National Institute of Population and Social Security Research (Medium-Mortality Assumption), activity levels of steel industries, etc., energy demand without energy efficiency and conservation is estimated, and technologically feasible and realistic energy efficiency and conservation measures in the industrial sector, commercial sector, residential sector and transportation sector are accumulated to achieve approx. 50.3 billion liters (crude oil equivalent) in terms of final energy consumption, resulting in the final energy consumption of 326 billion liters in FY2030[4].

As a result, the primary energy supply structure in FY2030 will be as follows.

This will improve our energy self-sufficiency rate to approx. 24.3%, which has dropped greatly since the Great East Japan Earthquake[5]. Also, CO_2 emissions from energy sources will be 21.9% lower[6] than the total GHG emissions in FY2013[7].

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3 The Economic Revitalization Case assumes the average annual economic growth rate between FY2013 and FY2022 to be 1.7% in real terms. This 1.7% is applied to FY2024 onward.

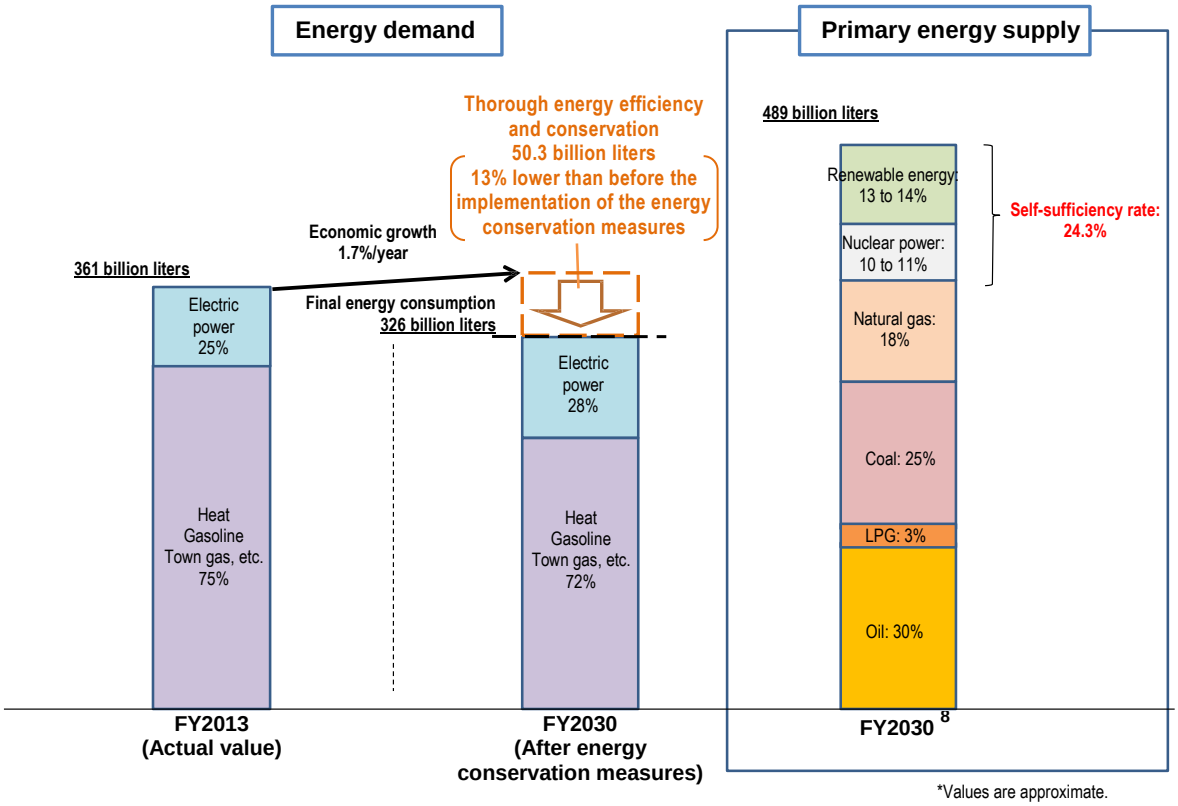
4 Energy efficiency will be improved by 35% by FY2030.

5 Renewable energy and nuclear are included in energy self-sufficiency rate as domestic and semi-domestic energy resources.

6 Greenhouse gas emission reductions in Japan totalize the above-mentioned CO_2 emission reductions from energy sources, other greenhouse gas emission reductions, measures for absorption sources, and the like. Specifically, the emissions are 26.0% lower than in FY2013.

7 The U.S. has proposed a reduction goal of 26 to 28% from the 2005 level by 2025, and the EU 40% from the 1990 level by 2030. Compared with the 2013 level, it is 18 to 21% for the U.S. and 24% for the EU, respectively.

8 Figures are adjusted to add up to 100%.



(2) Power source mix

The basic principle for the power supply-demand structure is to lower dependency on nuclear power generation to the extent possible through energy efficiency and conservation and introducing renewable energy as well as improving the efficiency of thermal power generation, etc., while simultaneously achieving the policy goals related to safety, energy security, economic efficiency and environment suitability.

For instance, to improve the self-sufficiency rate and reduce CO_2 emissions, it is necessary to increase renewable energy and limit coal-fired thermal power. To lower electric power costs, for instance, it is necessary to limit renewable energy and increase coal-fired thermal power. Accordingly, well-balanced power source mix is essential in order to simultaneously achieve safety, stable supply, economic efficiency and environment suitability.

Specifically, while estimating an increase in electric power demand due to economic growth and higher electrification rate, thorough energy efficiency and conservation (power-saving) will be promoted to suppress power demand in FY2030 to nearly the same level as in FY2013.

Next, renewable energy is regarded as an important low carbon domestic energy and the use of renewable energy shall be accelerated as far as possible for three years since 2013 followed by continuous active promotion. In this context, to increase the use of renewable energy to the maximum extent taking into consideration of the natural conditions and

the characteristics of each source, geothermal, hydro and biomass, which can be operated stably despite weather conditions, are expected to replace nuclear power. These sources are expected to be introduced to the maximum extent possible in light of restrictions such as environmental and locational restrictions, but in case such restrictions cannot be overcome, the introduction rate will be suppressed. Solar power and wind power, which fluctuate greatly in output depending on the weather conditions and need to be accompanied by thermal power as adjusting power source, are expected to be introduced to the maximum extent where the electric power costs will be reduced from the current level, in light of a balance with public burden[9].

Regarding thermal power generation, coal and LNG thermal power generation are expected to be utilized while reducing environmental impact[10] and improving power generation efficiency, and oil thermal power generation is expected to be utilized to the minimum required extent, with back-up use considered in case of emergency and the peak shift through demand response[11], etc.

While simultaneously achieving the policy goals: on the major premise of ensuring its safety, improving energy self-sufficiency, reducing energy cost and setup, greenhouse-gas reduction equal to Europe and the United States, it is expected to lower dependency on nuclear power generation to the extent possible through energy efficiency and conservation and introducing renewable energy as well as improving the efficiency of thermal power generation, etc.

As a result, the electric power supply-demand structure in FY2030 will be as follows.

This will greatly reduce the dependence on the nuclear power plants, which was approx. 30% before the Great East Japan Earthquake, to approx. 20 to 22%. Also, the base load rate consisting of hydropower, coal-fired thermal power, nuclear power, etc., will be approx. 56%.

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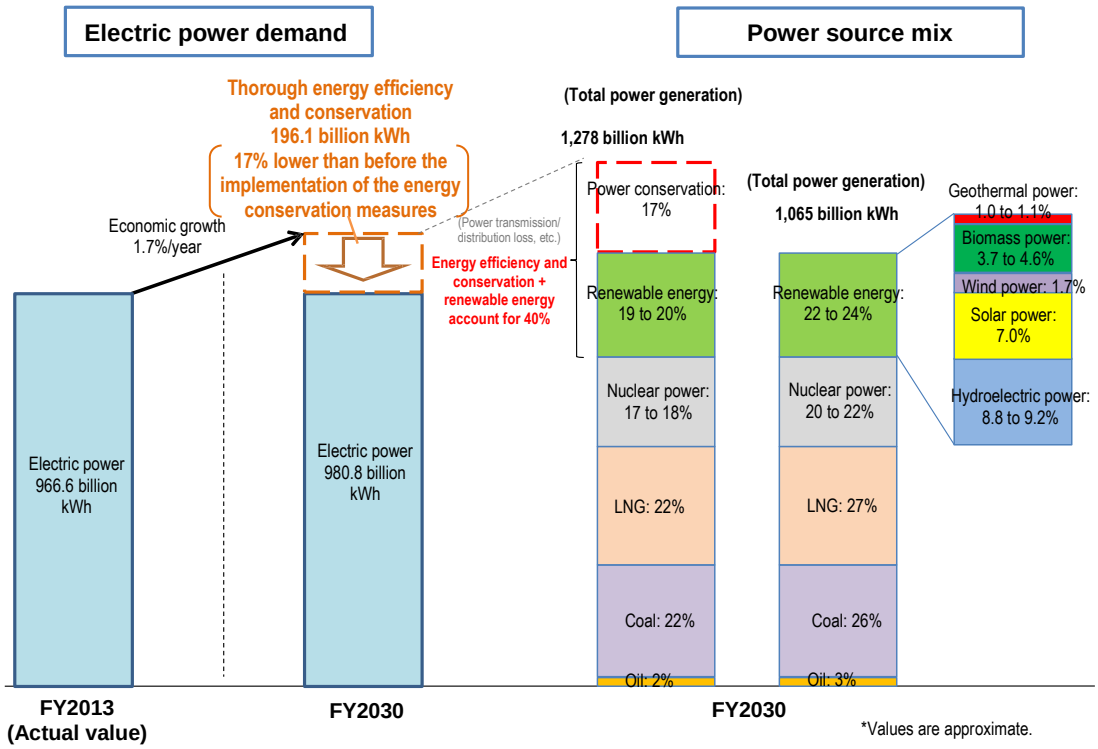
9 The amount of solar power use is calculated based on the assumption that the cost will decline according to the "IEA World Energy Outlook 2014 New Policy Scenario (International Price Convergent Case)" presented by the Electric Generation Cost Verification Working Group.

10 The assumptions of the calculation are that for CO2 emission per generated power, LNG thermal power < oil thermal power < coal thermal power, and for power generation cost, coal thermal power < LNG thermal power < oil thermal power.

11 Demand response is an approach to change the consumption pattern in a smart way according to the energy supply situation. It is largely divided into two types depending on the demand control method; (1) electricity price-oriented type to control the demand by electricity price setting, and (2) negawatt trading in which a customer controls the demand according to the request from an electric power company, based on the contract between the electric power company and the customer.



4. Major Approaches in Each Field

(1) New view point in the Long-term Energy Supply and Demand Outlook

As pointed out in the Strategic Energy Plan, the energy situation has been greatly changing both in Japan and foreign countries since the Great East Japan Earthquake and the TEPCO Fukushima Daiichi Nuclear Power Plant accident. It is necessary to take measures following the change in the development of policies toward FY2030. In particular the following environmental changes need to be correctly taken account of under the development of the domestic system renovation such as electricity system renovation and the change of the international energy supply structure such as LNG procurement from North America.

1) The progress of energy system reforms in power, gas and other sectors removes the barrier between industrial sectors on the supply side, develops demand responses including negawatt trading, thus allowing expansion of new energy business and increasing customers' options.
2) The Organization for Cross-regional Coordination of Transmission Operators established in April of this year starts functioning and enhances cross regional operation, allowing operations based on ascending order of cost (merit order), etc., across the country.
3) The progress of information and communication technology allows to understand and collectively manage the real-time energy

consumption of home appliances, cars, factory internal facilities, etc.

4) In light of increased long-term uncertainty due to the progress of the shale gas revolution in the North American continent, violent oil price fluctuations, unstable Middle-East situation, etc., and international energy supply-demand structural changes such as a shift of the international energy market to Asia, it is necessary to secure inexpensive and stable supply of oil, LNG, coal, and others.

(2) Approaches in each field

Considering the circumstantial changes mentioned above, based on the basic policies mentioned in the Strategic Energy Plan, it is necessary to consider in a more specified and detailed manner in promoting the following approaches in each field, and enhance public understanding at all levels of Japanese society.

1) Energy efficiency and conservation

In the industrial, commercial, residential, and transport sectors, further promotion to make facilities and equipment more efficient, optimal use of energy by energy management, and making the energy consumption visible by detailed survey and analysis of actual situation of the energy consumption should be advanced in order to create smart and finely-tuned energy efficiency and conservation.

In the industry sector, development and introduction of factory energy management, innovative technologies, and highly-efficient facilities are promoted.

In the commercial or residential sector, energy management using BEMS/HEMS is aimed, to mandate energy efficiency and conservation standards for newly constructed buildings/houses in stages, and to promote people's movement at every level to save energy.

In the transport sector, promotion of next-generation vehicles, fuel efficiency improvement, and traffic flow improvement are aimed at.

Also, use of hydrogen-related technologies such as residential fuel cell (Ene-Farm) and fuel cell vehicles is promoted.

In addition, negawatt trade and other demand responses are promoted.

2) Renewable energy

Ensure compatibility between maximum introduction and expansion according to the individuality of each power source, and

inhibition of public burden. To this end, expand positively utilization of geothermal, hydroelectric and biomass powers stably operable independent of the natural conditions, thereby securing base load power sources and reducing dependence on the nuclear power plants.

For solar and wind power which fluctuate greatly in output depending on the natural conditions, introduce and expand them to a maximum extent through utilization of large-scale wind power, and so on, while reducing costs and considering inhibition of public burden.

From these viewpoints, improve the environment so that renewable energy can be introduced at low cost, through measures to various regulations and restrictions, support for geothermal power generation accompanied by high development risk, improvement of electric system and expansion area of electric system operation, technological development for higher efficiency, lower cost and advanced system operation technology, and the like.

The feed-in tariff serves as the driving force for promoting introduction of renewable energy. On the other hand, considering one-sided introduction of solar power generation, concerns about increased public burden, progress of the electric power system reform, and the like, and based on the characteristics and reality of renewable energy, review the system so as to allow well-balanced introduction between renewable energies, and compatibility between maximum introduction and expansion, and inhibition of public burden.

3) Fossil energy

Realize higher efficiency of coal-fired and LNG-fired thermal power generation, and promote their effective utilization, while ensuring compatibility with reduction of an environmental load. Secure the minimum required extent of oil-fired thermal power in light of backup utilization in case of emergency.

From these viewpoints, introduce a mechanism capable of inhibiting introduction of non-efficient thermal power generation, including coal-fired thermal power, and promote approaches for low-carbon energy such as urging early construction of a voluntary framework by an electric utility.

Also, in order to enhance an approach to secure resources for the purpose of stably supplying inexpensive fossil fuels, go ahead with approaches such as diversified procurement for lower dependence on the Middle East, promotion of independent development, development of domestic resources, toughening of a domestic energy supply network, and diversify transportation fuels.

4) Nuclear power

On the major premise of its safety, in case that the Nuclear Regulation Authority confirms the conformity of nuclear power plants with the new regulatory requirements, which are of the most stringent level in the world, GOJ will follow the judgment and will proceed with the restart of the nuclear power plants. In this case, GOJ will make best efforts to obtain the understanding and cooperation of host municipalities and other relevant parties.

Also, promote untiring voluntary safety improvement not limited to simply satisfying the regulatory requirements, appropriate risk communications with stakeholders, approach by GOJ for the final disposal of high-level radioactive waste including presentation of location that is scientifically considered to be better suited.

Furthermore, considering the lowering dependency of nuclear power and the electric system reform, establish business environment for nuclear operation for smooth decommissioning of reactors and stable, efficient implementation of nuclear fuel cycle business.

(Note) The ratio of nuclear power generation indicates an outlook in power source mix in FY2030 and does not affect examinations on safety of individual nuclear power plants by the Nuclear Regulation Authority.

5) Utilization of various energy sources and securement of the supply system

Encourage fuel diversification in each sector, a shift to natural gas in the industrial field, and so on. Promote domestic solar power generation and an approach for local production and local consumption such as aerial expansion of thermal utilization including waste heat recovery and renewable energy heat. Also, promote introduction of cogeneration (approx. 119 TWh) including ENE FARM which is expected to be utilized as a distributed energy system. At the same time, secure a fuel supply system, etc. for supporting these.

(3) Approaches looking beyond FY2030

In order to realize the policy goals related to safety, energy security, economic efficiency and environmental adaptability in a reliable manner and build a multilayer diversified flexible energy supply-demand structure, we will encourage development and utilization of innovative storage batteries, technologies for realizing a hydrogen-based society, next-generation renewable energy, and new technologies including those related to carbon capture and storage (CCS) and utilization, and promote approaches for utilization of resources left untapped in our exclusive economic zone such as methane hydrate.

5. Periodic Review of Long-term Energy Supply and Demand Outlook

This long-term energy supply-demand outlook has been drawn up on the premise of presently assumed power generation costs, technologies, international fuel prices, and other assumptions.

It is necessary for both the government and people to make continuous efforts for further improvement of safety, energy security, economic efficiency and environment. In addition, it is expected that various elements of the Long-term Energy Supply and Demand Outlook may change, such as progress in energy efficiency and conservation, introduction of renewable energy, power generation cost of each power source, and trends over nuclear power plants.

In light of these situation changes, accordingly, the Long-term Energy Supply and Demand Outlook shall be reviewed as required in response to the consideration of the Strategic Energy Plan implemented at least every three years.