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Japan Energy Newsletter

**Japan Electric Power
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1 METI's Power Generation Cost Verification Working Group Released a Comparison Study on Power Generation Costs

In September 2021, the Japanese Ministry of Economy, Trade and Industry (METI)'s Power Generation Cost Verification Working Group released a comparison study of the power generation costs for various power sources, including coal-fired power, nuclear power, and renewable energy, by 2020 and 2030. The study aims to support the development of Japan's energy policies for 2030 and highlight potential generation sources for the future energy mix. The comparison study indicates that the generation cost of solar power will be lower than nuclear power in 2030 for the first time. This cost estimation is likely to impact the controversial decision of how to position nuclear power as a part of the future energy portfolio.

1.1 General Overview of Cost Estimations of Power Sources by 2020 and 2030

On September 8, 2021, the Power Generation Cost Verification Working Group under the Advisory Committee of the Agency for Natural Resources and Energy of METI released a comparison study on the generation cost of major power sources, including thermal power and renewable energy sources, by 2020 and 2030.¹ The study provided recommendations for the most ideal power sources types in the future energy mix for developing Japan's energy policy by 2030, considering the cost characteristics of each power source. The study will be an important reference when METI begins drafting Japan's 6th Energy Basic Plan.²

The study estimated and compared the power generation costs per kWh of different energy sources, including coal-fired power, liquefied natural gas (LNG), nuclear power, onshore and offshore wind power, and solar power³, by both 2020 and 2030. In 2020, the cost of commercial solar power was US\$0.12⁴ per kWh, which is higher than the cost of nuclear power of US\$0.11 or more. However, for the cost in 2030, the cost of commercial solar power is estimated to be US\$0.075 to US\$0.11, while the cost of nuclear power will be US\$0.11 or more, marking the first time that the estimated cost of solar power will fall below that of nuclear power. The estimated cost of coal-fired energy in 2030 is US\$0.12 to US\$0.21; LNG-fired power is US\$0.098 to US\$0.13; onshore wind power is US\$0.091 to US\$0.16; and offshore wind power is US\$0.23. The power generation costs of each power source as of 2030 are as follows.

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https://www.enecho.meti.go.jp/committee/council/basic_policy_subcommittee/mitoshi/cost_wg/pdf/cost_wg_20210908_01.pdf

² The Energy Basic Plan, based on the Basic Act on Energy Policy enacted in 2002, provides mid-term and long-term energy directions and aims to ensure a stable energy supply, energy efficiency, and address environmental issues. The Basic Plan, approved by the Cabinet after consultations with utilities and municipalities, was first issued in 2003 and has been updated every three to four years since then.

³ For commercial and residential use.

⁴ 1USD=0.0092Yen. As of September 21, 2021

Comparison of the generation costs of each power source in 2030
(Unit: Japanese Yen/kWh)⁵

電源	Coal-fired	LNG-fired	Nuclear	Oil-fired	Onshore wind	Offshore wind	Solar (Comm.)	Solar (Resi.)	Small Hydro	Mid-size Hydro	Geo-thermal	Biomass (Mixed-Combustion, 5%)	Biomass	Gas Co-gen.	Oil-fired Co-gen.
Cost (Yen/kWh) * () is the cost without the policy-related cost	13.6~22.4 (13.5~22.3)	10.7~14.3 (10.6~14.2)	11.7~ (10.2~)	24.9~27.6 (24.8~27.5)	9.8~17.2 (8.3~13.6)	25.9 (18.2)	8.2~11.8 (7.8~11.1)	8.7~14.9 (8.5~14.6)	25.2 (22.0)	10.9 (8.7)	16.7 (10.9)	14.1~22.6 (13.7~22.2)	29.8 (28.1)	9.5~10.8 (9.4~10.8)	21.5~25.6 (21.5~25.6)
Capacity Factor	70%	70%	70%	30%	25.4%	33.2%	17.2%	13.8%	60%	60%	83%	70%	87%	72.3%	36%
Operation years	40年	40年	40年	40年	25年	25年	25年	25年	40年	40年	40年	40年	40年	30年	30年

Source: METI

The study estimated the generation costs for each power source based on the construction and operational costs for a newly-built power generation facility. The total power generation costs were calculated by dividing the total cost by the output of power generation (kWh), normally called the levelized cost of energy (LCOE).⁶ The LCOE only contains the construction and operation costs, but it does not include the associated costs of the grid connection and stabilization. In addition, the total costs consist of capital costs, operation and maintenance costs, fuel costs, and social costs. The formula for calculating the LCOE is as follows.

Formula for power generation cost

$$\text{Yen/kWh} = \frac{\text{Total costs (capital + operation \& maintenance + fuel + social costs)}}{\text{Total Power Generation (kWh)}}$$

Capital cost: construction cost, fixed asset taxes, waste disposal cost, etc.

Operations & maintenance cost: Human resource cost, maintenance cost, associated cost, etc.

Fuel cost: Fossil fuel price and nuclear fuel recycling cost

Social cost: CO2 price, Fukushima nuclear accident compensation cost, policy compliance cost (e.g. technical development budget and plant siting subsidy)

Total power generation: output x operation years x capacity factor

Source: METI

The power generation costs will fluctuate if some factors of the estimated assumptions will change, such as the outlook for fuel costs, plant capacity factor and operation years for certain power sources, the adoption rate of solar power, etc. In addition, when a developer physically constructs a new power plant, it is necessary to comprehensively

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https://www.enecho.meti.go.jp/committee/council/basic_policy_subcommittee/mitoshi/cost_wg/pdf/cost_wg_20210908_01.pdf

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https://www.enecho.meti.go.jp/committee/council/basic_policy_subcommittee/mitoshi/cost_wg/pdf/cost_wg_20210908_01.pdf

evaluate all costs by considering not only the power generation costs but also any additional costs associated with the siting conditions in a specific location.

1.2 The discussions over positioning nuclear power and its power generation cost

The Working Group released a draft of the comparison study on July 12, 2021. Since then, it has drawn attention for its implications for positioning nuclear power in Japan's future energy mix according to cost estimation methods. The draft showed that in 2030 the generation costs of nuclear power, which has been the lowest cost energy option to date, will increase by approximately 10%. At the same time, solar power will become cheaper than nuclear power and will be the cheapest energy among all types of generation sources for the first time.⁷ The 10% increase in nuclear power generation costs is reported to reflect the costs from all of the increases in the safety measures after the Fukushima nuclear accident. However, METI addressed the importance of the use of nuclear power while ensuring safety, given that nuclear power can provide stable and inexpensive electricity and help to tackle climate change issues. Since there is no single magical power supply that meets all of Japan's energy needs, especially considering the scarcity of natural resources, Japan will consider the characteristics of each power source in order to develop the best energy mix for achieving carbon neutrality by 2050.⁸

During the Strategic Policy Committee of the Subcommittee of the Advisory Committee under the Agency for Natural Resources and Energy held on July 13, 2021, the estimated generation cost for nuclear power was reportedly based on the assumption that the capacity utilization rate was 70% and the operating duration was 40 years. However, the cost could be reduced by maximizing the operational efficiency. The Committee also emphasized that the average capacity utilization rate of all nine currently restarting nuclear power plants would be 80.4% if excluding the operations suspension period, reaching a world-class utilization level.⁹

⁷ https://www.enecho.meti.go.jp/committee/council/basic_policy_subcommittee/mitoshi/cost_wg/2021/data/07_05.pdf

⁸ <https://www.meti.go.jp/speeches/kaiken/2021/20210713001.html>

⁹ https://www.enecho.meti.go.jp/committee/council/basic_policy_subcommittee/2021/045/

2 Japan Business Federation's Proposal for Tax Reform mentioned a Carbon Tax

2.1 Japan Business Federation Released a Tax Reform Proposal (FY2022)¹⁰

On September 14, 2021, the Japan Business Federation (the Federation) released a Proposal for Tax Reform for FY2022.¹¹ The introduction of a carbon tax was mentioned in the proposal, though the proposal recommended a restrained approach to carbon taxes.

The Federation publishes an annual tax reform proposal in September based on Japan's current economic situation and business performance. The proposal released this year mentioned the potential for adopting carbon pricing mechanisms, including a carbon tax, which would aim to build a sustainable economic society to achieve the 2050 carbon-neutral goal. The proposal noted that a professional and technical review of the adoption of such a tax would be necessary to ensure that the tax system will contribute to economic growth. As a method of securing financial resources, a carbon tax would have a tremendous impact on consumers' purchasing behaviors and business activities. The proposal recommended that the government of Japan should develop an optimal tax system by considering international policy trends and the business environment, alternative choices to carbon pricing technology, the timeline for technological development and social distribution, and economic stability.

The Federation recommended the following three basic aspects for a tax system that contributes to growth.

(1) As companies have begun realizing the value of CO₂ reduction, there should be incentives for proactive efforts that contribute to CO₂ reduction. It is necessary to further promote not only Research & Development (R&D) investment in innovative technologies by companies but also capital investment for the social deployment of clean technologies. Property taxes should be reduced or exempted for capital investments for carbon pricing in order to make the societal transition towards clean energy.

(2) Japan's energy costs are still high compared to foreign nations. Japan seeks to achieve an ambitious energy mix, including the expansion of non-fossil energy deployment, based on the 6th Basic Energy Plan. There is a concern that this will lead to further increases in energy costs, so it will be crucial to understand the public's thoughts on the issue. With this in mind, a carbon tax should not have a negative impact on people's lives or the international competitiveness of industry.

(3) It is important to secure international cooperation and industrial competitiveness. Global warming is a worldwide issue and cannot be solved by the efforts of Japan alone.

¹⁰ <https://www.keidanren.or.jp/policy/2021/077.html>

¹¹ http://www.keidanren.or.jp/policy/2021/077_honbun.html

Though Japan does not have many energy resources and lacks renewable energy, it is important for Japan to contribute to and support the innovation of carbon pricing in the international community.