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Today's Challenges for Onshore Wind Power Foreshadow Tomorrow's Challenges for Offshore Wind Power (Possibly)

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In a news search of "wind power" in Japan, most of the positive projects listed near the top recently are offshore wind power.

On February 2, 2024, the top article in Japanese was "Lowering the cost of floating-type wind power, Tokyo Gas pursues volume production with a block division method[1]." Another one was "Study group on offshore wind power being held in Esashi (Hokkaido)[2]." Many of the top articles are related to offshore wind power. Regarding onshore wind power, however, while there are some favorable articles, such as joint financing by Akita Bank and Japan Finance Corporation for the Noshiro Port (onshore) wind power project[3], negative articles stand out, including Takashima (Shiga) voices opposition to a plan to build a large-scale wind power plant in a mountainous area[4] and a report issued by Fukui Prefecture's Environment Council, Living Environment Sub-committee that requests revisions to the installation plan[5].

Based on these media trends, there appears to be substantial expectation for offshore wind power, while onshore wind power is currently confronting challenges. Why is this happening?

My hypothesis to this inquiry is that "while 20 years have passed since the start of onshore wind power deployments, there are still not any offshore wind power sites in Japan." During the fast-paced deployment of onshore wind power in Japan that took place from 2002 to 2006, operators and vendors had almost no experience, and few people recognized the impact on the ecosystem and also the consequences for scenery, noise pollution and other health damage, and shadow flicker.

In response to opposing opinions concerned about these impacts that subsequently manifested with an increase in wind power deployment volume, the Ministry of the Environment conducted a "Fact-finding survey on noise pollution and low-frequency sound related to wind power facilities" in 2010[6]. This survey cited considerable influence on the

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[1] Newswitch, 2024-1-30, <https://newswitch.jp/p/40252>. Tokyo Gas issued an official press release on this topic. "Regarding completion of a verification of a mass production method for floating-type foundations as part of research & development work on mass production aimed at lowering the cost of offshore wind power" 2024-1-26, <https://www.tokyo-gas.co.jp/news/press/20240126-01.html>.
[2] Hokkaido Shimbun, 2024-2-1, <https://www.hokkaido-np.co.jp/article/970476/>.
[3] Nikkei, 2024-2-1, <https://www.nikkei.com/article/DGXZQOCC015GA0R00C24A2000000/>.
[4] Kyoto Shimbun, 2024-2-1, <https://www.kyoto-np.co.jp/articles/-/1194715>.
[5] Chunichi Shimbun, 2024-1-31, <https://www.chunichi.co.jp/article/846344>.
[6] Ministry of the Environment, 2010-10-7 <https://www.env.go.jp/press/13011.html>.

extent of complaints to wind power operators from communication between operators and regions, rather than distance from the wind turbine or the wind turbine size[7]. Separate research implemented more recently also noted "social factors," such as dissatisfaction with the operator and transparency and fairness of the plan decision process, in determining whether there is support for wind power[8]. This led to operators placing emphasis on dialogue with the local community, and the revision of the Environment Impact Assessment Act in 2012[9] further complicated procedures. Operator profitability from wind power hence became a very serious issue.

More time and costs are spent on environmental impact assessment procedures than expected and opposition from local residents in planning, construction, and operation stages are issues that surfaced precisely because of the broad adoption of onshore wind power. It could be said onshore wind power is confronting unavoidable challenges that arise in the transition from the demonstration stage to the commercial stage and growth into a major power source often seen with other technologies too.

The disparity in "expectations" for onshore and offshore technologies respectively shows up in cost simulations as well. Simulation results for the power cost by power source prepared by the "Power Generation Cost Verification Working Group (WG)" as of 2015 were onshore wind power at 9.8-15.6 yen/kWh and offshore wind power at 20.2-23.2 yen/kWh (both amounts excluding policy expenditures). However, the latest report issued in 2021 indicates a smaller cost disparity between onshore and offshore power with onshore wind power at 8.3-13.6 yen/kWh and offshore wind power at 18.2 yen/kWh.

The Working Group report explains the approach used in the cost simulations as including Japan's results in facility utilization rates and other items for onshore wind power while relying on various criteria presented in public offerings for offshore wind power. It is not possible to make cost forecasts on the same basis for onshore wind power that factors in over 20 years since the start of commercialization and less favorable realities and offshore wind power that factors in expectations prior to full-fledged deployment.

There have already been multiple reports of opposition and concerns raised near planned

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[7] Besides the Ministry of the Environment's survey report, refer also to Kyoto University Graduate School of Economics, Renewable Energy Economics Course, Program-Specific Assistant Professor Seiichi Ogata's "Societal acceptance of renewable energy – Local consent from the standpoint of wind power issues." https://www.econ.kyoto-u.ac.jp/renewable_energy/wp-content/uploads/2017/07/20170418-doc.pdf>.

[8] Memi Motosu, Yasushi Maruyama, Social survey related to impact of wind power plants on nearby residents, Japan Wind Energy Association Papers Vol.44, No.4 (2020) <https://www.jstage.jst.go.jp/article/jwearonbun/44/4/44_39/_pdf/-char/ja>.

[9] New Energy and Industrial Technology Development Organization's basic materials on an environment impact assessment method for bottom-mounted offshore wind power (final version), March 2018, pp. 8-9 <https://www.nedo.go.jp/content/100890006.pdf>. This law was revised again in October 2022 and raised the size of wind power facilities subject to environmental impact assessments from 10,000 kW to 50,000 kW.

areas for offshore wind power projects[10]. Furthermore, even if the power plants smoothly reach the point of starting commercial operation, it is unclear what type of other issues besides scenery and noise pollution might arise. Some voices have noted that the assessment of ecological risk to the marine ecosystem is still just beginning[11].

The current challenges facing onshore wind power suggest the possibility of offshore wind power also encountering major challenges in the future process of full-fledged deployment. If Japan's wind power industry is unable to overcome onshore wind power challenges, the future of offshore wind power might be in jeopardy too.

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[10] For example, the opposition movement to a plan for floating-type wind power off the Goto coast. Iki Shinpou, 2023-7-25, Refer to http://ikishinpou.com/news/%E3%80%8C%E6%B4%8B%E4%B8%8A%E9%A2%A8%E5%8A%9B%E7%99%BA%E9%9B%BB%E3%80%8D%E4%BB%8A%E6%9C%9F%E3%80%81%E5%9B%BD%E3%81%B8%E3%81%AE%E6%89%8B%E7%B6%9A%E3%81%8D%E8%A6%8B%E9%80%81%E3%82%8A/, and other articles.

[11] Galparsoro I. et al., Reviewing the ecological impacts of offshore wind farms, *npj Ocean Sustainability*, 2022-8-10, <https://www.nature.com/articles/s44183-022-00003-5>.