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RENEWABLE ENERGY INSTITUTE

## Executive Summary

Renewable Energy Institute has published to date a series of reports shedding light on issues associated with coal-fired power projects in Japan, including the “Risk Analysis of Coal-Fired Power Plant Investment in Japan” unveiled in October 2019.

Another issue of Japan’s coal-fired power policy is the export of such plants to foreign countries, especially to Southeast Asia. The government and some companies are justifying themselves, arguing for example, “Japan’s latest coal-fired power is highly efficient, contributing to reducing global greenhouse gas emissions.” However, such argument is not understood in the rest of the world, facing bitter international criticisms.

This Information-Package is intended to elucidate, the myths of arguments supporting the current coal-fired power export policy. We publish this now, when the decade begins leading to 2030, the decisively important year in our battle against climate crisis, in anticipation of progress in future energy policy debate based on precise data.

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(Reference)

# 5 Fallacies of Japan’s Coal-fired Power Export Policy

March 2020

Renewable Energy Institute

## ■ Growing international criticism against Japan's coal-fired power exports

Los Angeles Times (2019/05/13)

"China, Japan and South Korea, while vowing to go green at home, promote coal abroad."

Washington Post (2019/06/27)

"Japan seeks climate leadership at G-20 summit but can't kick its coal habit."

Al Gore (2019/10/04)

"Japan would abdicate leadership responsibilities as a top global economy if it sustains its support for coal."

U.N. Secretary General António Guterres (2019/09)

"World needs to break its addiction to coal to fight climate change."

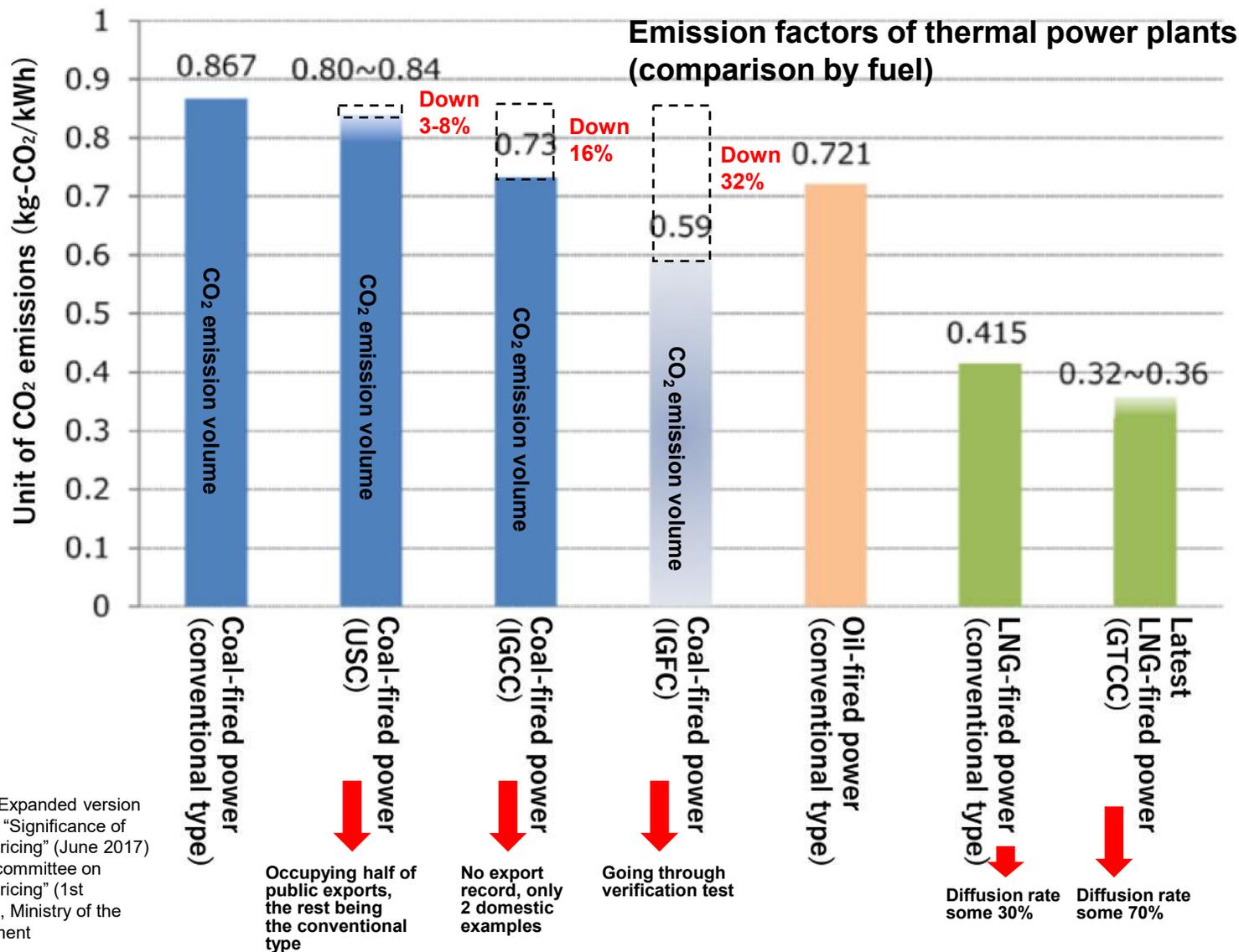
Environment Minister Shinjiro Koizumi (2019/12/11)

"Of course, I am aware of global criticism, including on our coal-related policies. Last week, U.N. Secretary General António Guterres called for stopping our "addiction to coal". I took this as a message to Japan. "

# 5 fallacies of arguments justifying coal-fired power exports

	Fallacies	Source		In reality?
1.	Recent coal-fired power generation is quite clean. New, highly efficient generation systems replace old coal-fired plants, reducing CO <sub>2</sub> emissions.	Agency for Natural Resources & Energy: "Why does Japan keep using coal-fired power generation?" (April 2018)	➔	(1) "High-efficiency coal-fired power generation (USC)" reduces CO <sub>2</sub> emissions, but only a mere few percent than conventional plant and it emits twice of gas-fired power.
2.	If Japan's most efficient technology is applied to coal-fired power in China, India & the U.S., CO <sub>2</sub> reductions total about 1.2 billion tons.	Agency for Natural Resources & Energy: "Why does Japan keep using coal-fired power generation?" (April 2018)	➔	(2) Emission reduction rate stops short of 20%, locking-in over 80% of emissions for an extended period of time.
3.	The efficiency of Japan's coal-fired power generation is at the world's highest level. Japan's technology, which has a good track record of operations, is considerably more excellent.	Agency for Natural Resources & Energy: "About Japan's coal policy" (May 2015)	➔	(3) China equals Japan in coal-fired power generation technology, having a construction track record more than 60 times of Japan.
4.	Coal-fired power exports included in infrastructure export strategy targeting 30 trillion JPY worth for 2020.	43 <sup>rd</sup> meeting of Management Council for Infrastructure Strategy, Prime Minister's Office (June 2019)	➔	(4) Public coal-fired power export record is around 1% of infrastructure export goal; completely lost to China in price competition.
5.	Japan is exporting its high-efficiency power generation technology to countries that have no choice but coal-fired power.	Agency for Natural Resources & Energy: "Why does Japan keep using coal-fired power generation?" (April 2018)	➔	(5) Use of renewable energy is expanding in Southeast Asian countries as well; it is Japan's very role to support their shift away from coal-fired power.

**Reality 1:** “High-efficiency coal-fired power generation (USC)” reduces CO<sub>2</sub> emissions, but only a mere few percent less and emits twice of gas.



Source: Expanded version of Ref. 5 “Significance of carbon pricing” (June 2017) for “Subcommittee on carbon pricing” (1st meeting), Ministry of the Environment

Even “ultra super critical (USC)” generation meeting the government’s four conditions for coal-fired power exports cuts CO<sub>2</sub> emissions only a few percent more than conventional coal-fired power.

Even with the IGCC & IGFC, which are under development, CO<sub>2</sub> emissions are about twice of gas-fired power in commercial use.

No coal-fired power technology is effective in an era when the world is in pursuit of “decarbonization.”

Japan gov’t’s 4 conditions for coal-fired power exports	
1	Limited to countries having no choice but to select coal as energy source from energy security and economical perspectives
2	Requested by partner country for supply of Japan’s high-efficiency coal-fired power generation technology
3	Compatible with partner country’s energy policy & climate change measures while being based on OECD rules
4	In principle, power generation technology should be equaling or exceeding ultra super critical (USC) power plant, which is world’s latest technology

Source: Infrastructure System Export Strategy, Prime Minister’s Office (June 2019)

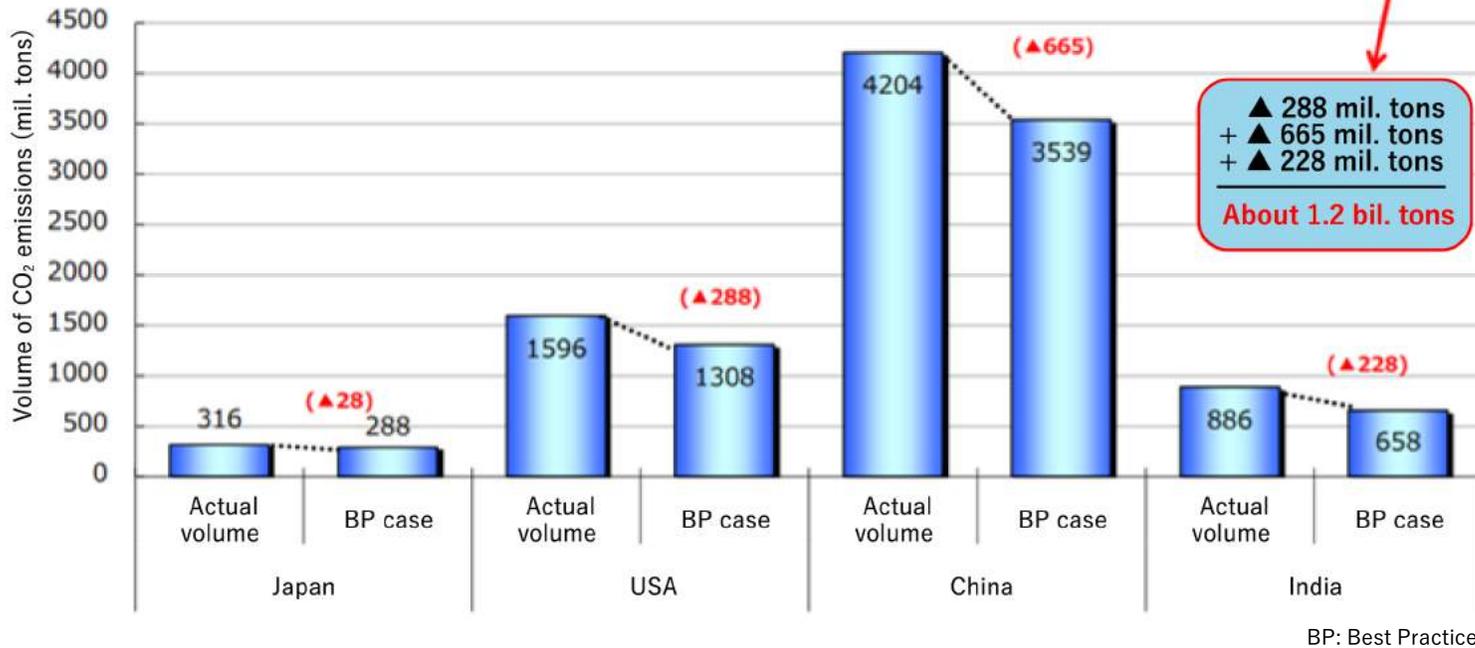
**Reality 2:** Even if switched to high-efficiency coal-fired power, the total emissions can be cut by only 20%, locking-in over 80% of emissions for an extended period of time.

“If Japan’s USC technology is applied to all coal-fired power generation in China, India & the U.S., 1.2 billion tons of CO<sub>2</sub>, equaling Japan’s total CO<sub>2</sub> emissions, will be reduced”. (Agency for Natural Resources & Energy)

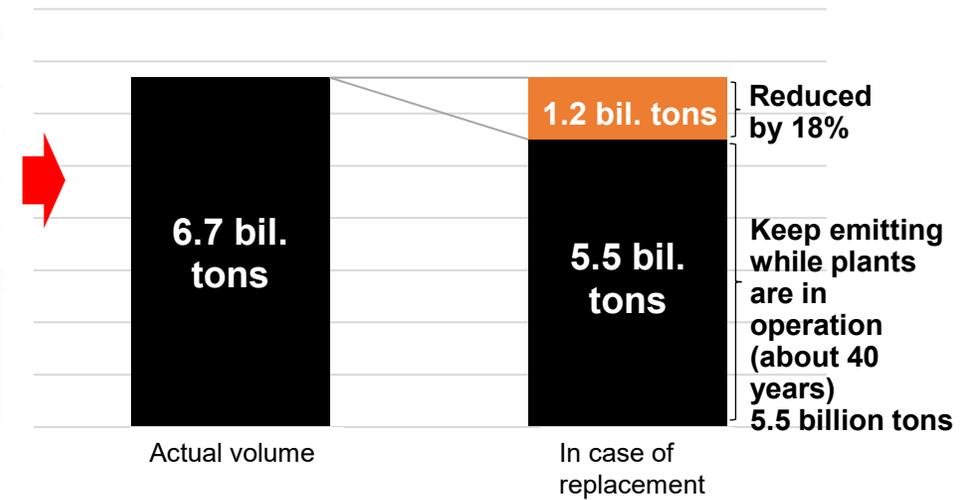
The reduction amount of 1.2 billion tons is only 18% of 6.7 billion tons, the total amount of emissions from coal-fired power generation by China, India and the U.S.

If such replacement is made, more than 80% of emissions from current coal-fired power generation will remain fixed for as long as 40 years, eventually hampering decarbonization in the three countries.

[Actual amount of CO<sub>2</sub> emissions from coal-fired power generation (2013) & estimated figures applying Japan’s most high-efficiency technology]



Source: “Measures for realizing ideal energy mix in 2030,” Agency for Natural Resources & Energy



Source: Renewable Energy Institute

**Reality 3:** China equals Japan in coal-fired power generation technology, having a construction track record more than 60 times the level of Japan.

China has commercialized ultra super critical (USC) coal-fired power since 2006, realizing generation efficiency (CO<sub>2</sub> emission volume) no different from Japan's latest type.

Technological comparison of coal-fired power plants (USC formula) between Japan and China

	Plant/generator name	Capacity	Pressure/steam temperature	Year of launch	Generating efficiency
Japan	Matsuura No. 2	1,000MW	24.5Mpa/600/600°C	2019	About 46%
	Hitachinaka No. 2	1,000MW	24.5MPa/600/600°C	2013	45.2%
	Maizuru No. 2	900MW	24.5MPa/595/595°C	2010	About 43%
	Maizuru No. 1	900MW	24.5MPa/595/595°C	2004	About 43%
China	Shenergy Anhui Pingshan No. 1	1,350MW	30MPa/600/620/610°C	2018	48.92%
	Guodian Taizhou No. 1-2	1,000MW × 2	31MPa/600/610/610°C	2015	47.82%
	Huaneng Anyuan No. 1-2	660MW × 2	31MPa/600/620/620°C	2015	46.86%
	Huaneng Laiwu No.6	1,000MW	31MPa/600/620/620°C	2015	48.12%

Source: Compiled by Renewable Energy Institute from "China's R&D of advanced ultra-supercritical coal-fired power generation for addressing climate change" (February 2018) authored by Fan Haojie, associate professor at Shanghai Jiao Tong University

Coal-fired power plants (USC) of above 600 MW in size built in Japan and China (2006-2017)

	No. of plants	Capacity
Japan	4*	3,100MW
China	239	199,000MW

\*Isogo New No. 2, Maizuru No. 2, Hirono No. 6, Hitachinaka No.2

Source: Compiled by Renewable Energy Institute from "Status of coal-fired thermal power and development of circulating fluidized bed combustion technology in China," Yue Guangxi, professor, Department of Thermal Engineering, Tsinghua University (November 2017)

Generating efficiency of coal-fired power company groups in China  
(transmission end, low heating value)

	No. of plants owned (1GW-class USC)		2017	2018
	2017	2018		
Huaneng Group	14	14	43.8%	43.8%
Datang Group	5	5	43.9%	44.2%
Huadian Group	6	6	44.1%	44.0%
CHN Energy Group	23	23	43.0%	43.0%
State Power Investment Group	8	8	43.8%	43.3%
Other groups	26	26	43.1%	43.0%

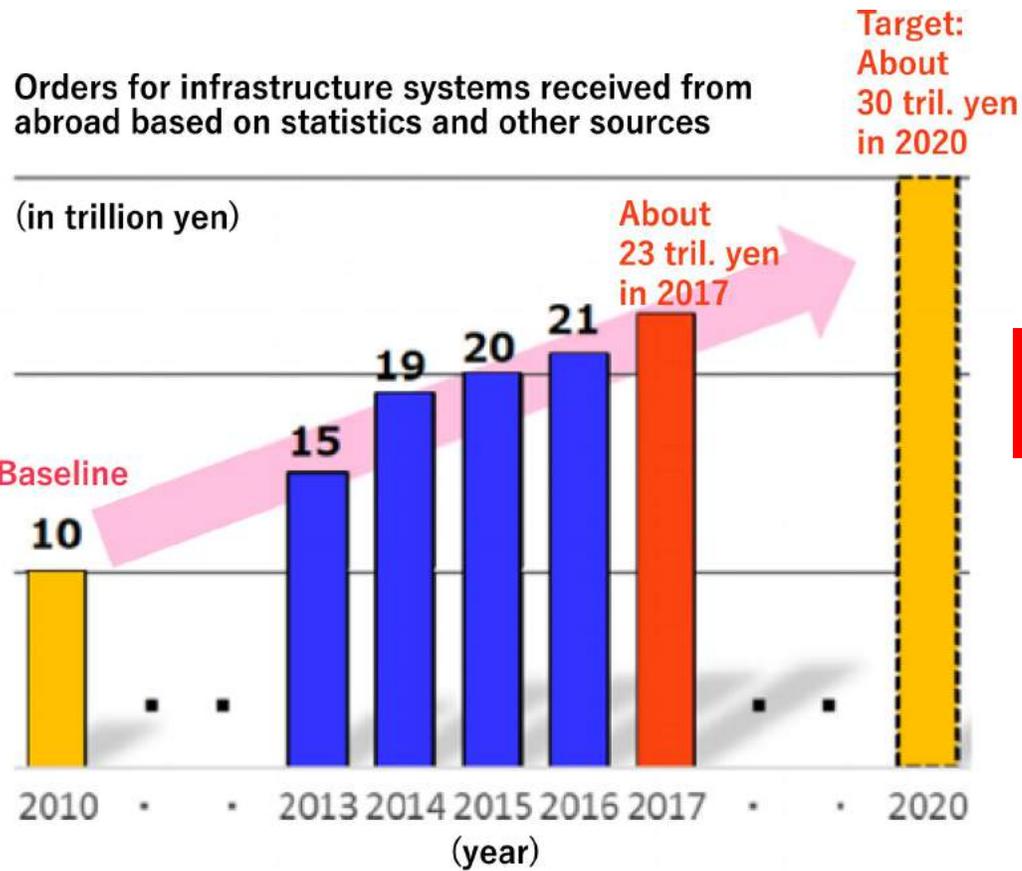
Source: Compiled by Renewable Energy Institute from "China Electric Power Industry Annual Development Report 2019" (China Electricity Council)



**Reality 4:** (1) Actual public coal-fired power export record is around 1% of infrastructure export goal of 30 trillion yen.

Gov't target for overseas orders for the 2020 infrastructure system: about 30 trillion yen

Track record of public coal-fired power exports:  
Around 40 billion to 260 billion yen a year



(in US\$1mil. \$1 ≒ 100 yen)

Year signed	Project name	Country	Total syndicated loan	JBIC lending/investment	Total
2015	Duyen Hai 3	Vietnam	683	409	409
2016	Lontar (Banten)	Indonesia	179 (& 16.4 bil. yen)	107 (& 9.8 bil. yen)	2,257
	Batang (Central Java)	Indonesia	3,421	2,052	
2017	Tanjung Jati B	Indonesia	3,355	1,678	2,613
	Vinh Tan 4	Vietnam	84	50	
	Kalselteng 2	Indonesia	89 (& 16.9 bil. yen)	53 (& 10.1 bil. yen)	
	Cirebon 2	Indonesia	1,740	731	
2018	Nghi Son 2	Vietnam	1,869	560	560
2019	Van Phong 1	Vietnam	1,998	1,199	1,199

Source: Japan Bank for International Cooperation (JBIC)

0.1% to 0.9% of 2020 order target. The total value, including private-sector investment, is only around 0.2% to 1.8%. Exclusion of coal-fired power has little impact; continuation runs greater risk of inviting international censure.

Source: 43<sup>rd</sup> meeting of Management Council for Infrastructure Strategy, Prime Minister's Office (June 2019)

**Reality 4: (2) Japan has completely lost to China in price competition for high-efficiency coal-fired power, Chinese/S. Korean technology adopted even in Japan's publicly financed export deals.**

Defeated by China in international bidding

Country	Plant name	Capacity	Generating type	Year of launch	Competitors	Bid price	Price per kW
Egypt	Hamrawein	6,000MW	USC	2025	Mitsubishi Hitachi Power Systems	650 bil. yen (lost)	108,333 yen
					Shanghai Electric, Dongfang Electric	460 bil. yen (won)	76,667 yen
Thailand	Krabi	800MW	USC	2024	ALSTOM, Marubeni	104.7 bil. yen (lost)	130,875 yen
					PowerChina, Italian-Thai Development	96.0 bil. yen (won)	120,000 yen

Source: "China Sole Winner in Infrastructure Orders Taken," Yomiuri Shimbun (August 2019 ) and others.

Source: "Thai Power Project in Dispute," Nikkei Shimbun (November 2016) and others.

	Country	Plant name	Year signed	Amount of investment and loan by JBIC (mUSD)	Boiler	Turbine generator
1.	Chili	Cochrane	2013	500	IHI	Ansaldo
2.	India	Kudgi	2014	210	Doosan Power Systems India	Toshiba
3.	Indonesia	Cirebon 1	2010	214	Doosan Heavy Industry	Doosan Heavy Industry
4.	Viet Nam	Vung Ang 1	2011	58	Babcock & Wilcox Beijing	Toshiba
5.	Viet Nam	Thai Binh 2	2013	85	Babcock & Wilcox Beijing	Toshiba
6.	Viet Nam	Vinh Tan 4 (reactor: 1-2)	2014	202	Doosan Heavy Industry	Toshiba
7.	Viet Nam	Duyen Hai 3	2015	409	Babcock & Wilcox Beijing	Toshiba
8.	Viet Nam	Vinh Tan 4 (reactor 3)	2017	50	Doosan Heavy Industry	Toshiba
9.	Viet Nam	Nghi Son 2	2018	560	Doosan Heavy Industry	Mitsubishi-Hitachi Power Systems

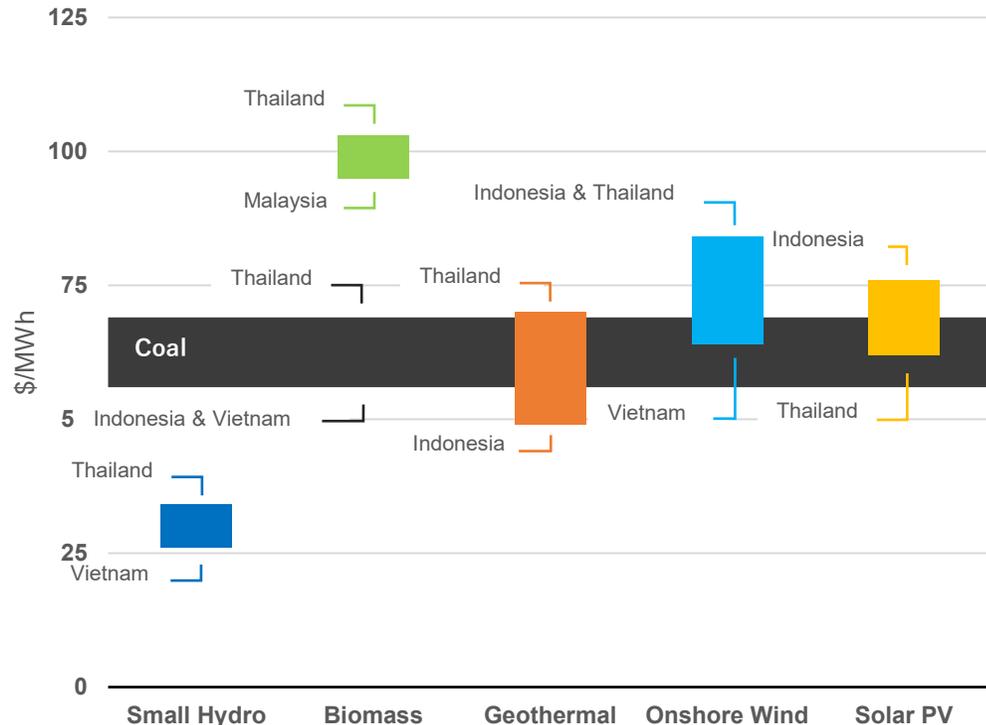
Of 23 coal-fired power export deals financed by Japan Bank for International Cooperation (JBIC) since 2010, nine adopted technology other than Japan's.

Source: Compiled by Renewable Energy Institute from various published data

**Reality 5: (1) Use of renewable energy is expanding in Southeast Asian countries as well; it is Japan's very role to support their shift away from coal-fired power.**

In Southeast Asia, renewable energy is still costlier in general than coal-fired power in generating electricity. However, renewable energy is getting highly cost-competitive, resulting in the launch of projects equivalent in cost to coal-fired power.

Unsubsidized LCOE of Most Competitive RE and Coal Power in Southeast Asia 2019-1H



Source: Compiled by Renewable Energy Institute in "Renewable Energy to Replace Coal Power in Southeast Asia: Pragmatism to Deliver a Sustainable Bright Future" (December 2019) from BloombergNEF, Levelized Cost of Electricity (July 2019)

In India, the cost of solar power generation has dropped to less than a quarter in 7 years, becoming cheaper than coal-fired power.

Average unit price of trading in solar power in electricity market (Rs/kWh)

Average Solar Auction Price	
FY 2010-11	12.16
FY 2011-12	8.58
FY 2012-13	7.61
FY 2013-14	7.51
FY 2014-15	6.75
FY 2015-16	5.41
FY 2016-17	4.25
FY 2017-18	2.74

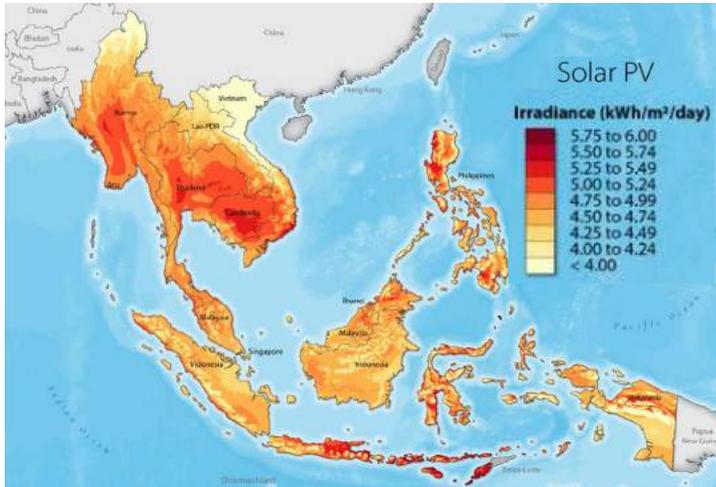
← Coal-fired power  
3.46 Rs/kWh  
(FY2018-19)

Source: "Risks Growing for India's Coal Sector" (September 2019), Institute for Energy Economics & Financial Analysis (IEEFA)

**What Japan should do is to aid renewable energy development in Southeast Asian and other countries to accelerate its price fall.**

**Reality 5: (2) Use of renewable energy is expanding in Southeast Asian countries as well; it is Japan's very role to support their shift away from coal-fired power.**

**Solar Resource Potentials of Southeast Asian Countries**

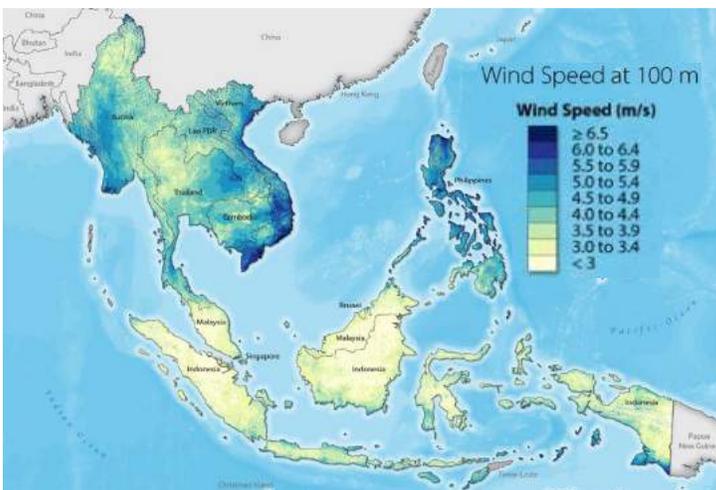


Solar irradiance throughout Southeast Asia is very strong, averaging over 1,500-2,000 kilowatt-hour per square meter annually, enabling capacity factors of 20% and above.

**Volume of hydropower introduced & its potential**

Southeast Asia has one of the world's highest hydropower potential. Indonesia and Myanmar have potential hydropower of some 75GW and 50GW respectively. Cambodia, Laos and Malaysia also have significant room for growth. It is necessary to undertake development paying attention to effects on the environment and society.

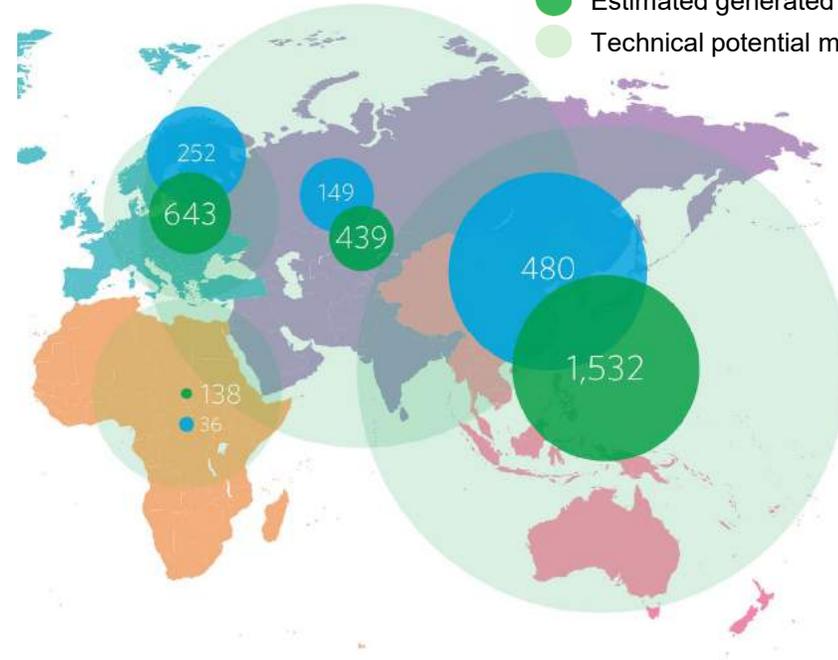
**Wind Resource Potentials of Southeast Asian Countries**



In some countries such as Myanmar, the Philippines, Thailand, and Vietnam there are regions along the coasts and inland where wind speeds average between 6 and 7 meters per second, allowing for capacity factors higher than 30% .

Source: Compiled by Renewable Energy Institute in "Renewable Energy to Replace Coal Power in Southeast Asia: Pragmatism to Deliver a Sustainable Bright Future" (December 2019) from USAID, NREL" "Exploring Renewable Energy Opportunities in Select Southeast Asian Countries" (June 2019)

- Installed capacity in 2018 (GW)
- Estimated generated in 2018 (TWh/y)
- Technical potential max generation



Source: "2019 Hydropower Status Report," May 2019, International Hydropower Association (IHA)

## (Reference) The Japanese and foreign banks' trend to finance coal-fired power projects in Asia

Bank name		Lending policy for coal-fired power projects			Source
Japanese banks	Mitsubishi UFJ FG	No lending for newly built plants	No lending for newly built plants in principle, continuing projects to be screened. Financing may be examined after discussing alternative technologies in light of OECD's arrangement on official export credits and other international guidelines. Supports cutting-edge high-efficient power, CCS.	MUFG Sets Sustainable Finance Goals and Revises Environmental and Social Policy Framework	May 2019
	Sumitomo Mitsui FG	Limited to USC or more efficient plants	New projects limited to USC and more efficient plants irrespective of countries. Will cautiously examine as exceptions, projects for which support was expressed before policy application or support by the Japanese government or Multilateral Development Bank.	Establishment of policy for businesses associated with Environmental and Social risk	June 2018
	Sumitomo Mitsui Trust Holdings	No lending for newly built plants	No lending for newly built plants in principle. But there are exceptions where projects will be cautiously examined individually, with greater focus on environmental load, based on OECD guidelines, generating efficiency, with a comprehensive consideration of backgrounds and characteristics undertaken on a case-by-case basis.	2018 Integrated Report -Annual Report-	July 2018
	Mizuho FG	Limited to USC or more efficient plants	Limited to cases consistent with international guidelines (OECD's official export credit arrangement), the energy policies and climate change measures of host countries and Japan. Restricted in principle to projects of USC or more high-efficiency level (except projects for which support was unveiled before policy announcement).	Overview of responsible investment and financing, and details of this revision	May 2019
	Resona Holdings	No lending for newly built plants	No lending for newly built plants except in truly inevitable cases such as response to disaster damage.	Initiatives for Socially Responsible Investing and Lending	November 2018
Foreign banks	HSBC (UK)	No lending for newly built plants	No lending for newly built plants, but Bangladesh, Indonesia & Vietnam excluded on condition that (1) there is no choice but coal-based power, (2) the plant emission factor is less than 810g-CO <sub>2</sub> /kWh, and (3) the lending period is by the end of December 2023. →Withdrawing from Vietnam's Vinh Tan 3 involving Japanese corporate investment (Asia Times report, Jan. 2020)	HSBC Energy Policy	July 2018
	Standard Chartered (UK)	No lending for newly built plants	No lending for newly built plants anywhere; gradually excluding corporate borrowers from customers according to profit dependence on coal-based power, eventually limiting customers to those with such dependence less than 10% by 2030. →Withdrawing from Vietnam's Vinh Tan 3 & Vung Ang 2 involving Japanese corporate investment (Reuters report, December 2019)	Climate Change/TCFD Report	December 2019
	OCBC (Singapore)	No lending for newly built plants	No lending for newly built plants in any country; current 2 projects in Vietnam are to be the last. →Withdrawing from Vung Ang 2 involving Japanese corporate investment (Eco Business report, November 2019)	CEO Samuel Tsien's press conference (Bloomberg report)	April 2019
	DBS (Singapore)	No lending for newly built plants	No lending for newly built plants in any country regardless of generating efficiency; completely withdrawing in and after 2021 when a borrower's existing project is completed.	CEO Piyush Gupta's press conference (Nikkei Shimbun)	May 2019
	UOB (Singapore)	No lending for newly built plants	No lending for newly built plants; no new loans extended since January 2018.	Sustain Growth Responsibly	May 2019

 Financial institutions' coal-fired power divestment (investment withdrawal) is gaining momentum.

Source: Prepared by Renewable Energy Institute from various published data

# **5 Fallacies of Japan's Coal-fired Power Export Policy**

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