Measuring of policies to improve efficiency of fossil fuel-fired power plants

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Indicator for fossil fuel-fired power sector

The category of typical mitigation policy for this sector;

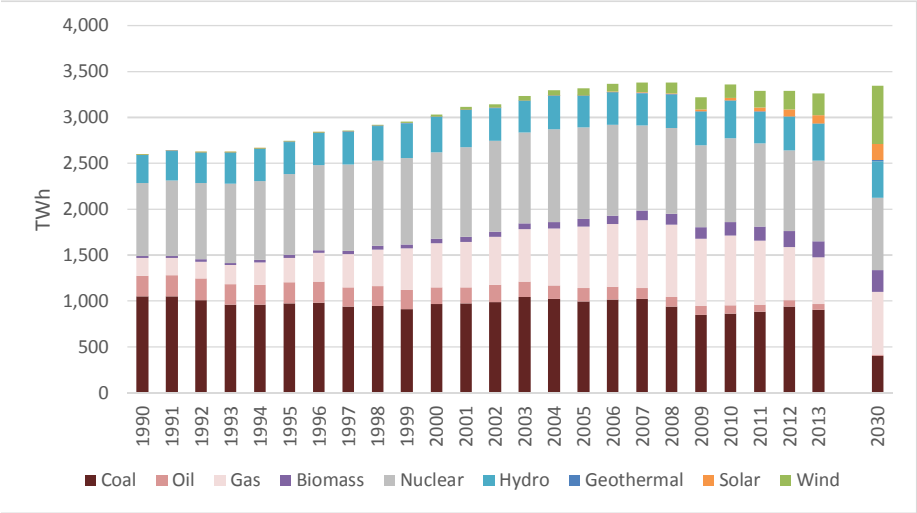
A) Emission intensity target (individual power plant or whole electricity sector)
B) Absolute emission target with emission trading system
C) Development of carbon capture and storage (CCS) technology

=> First part of this presentation

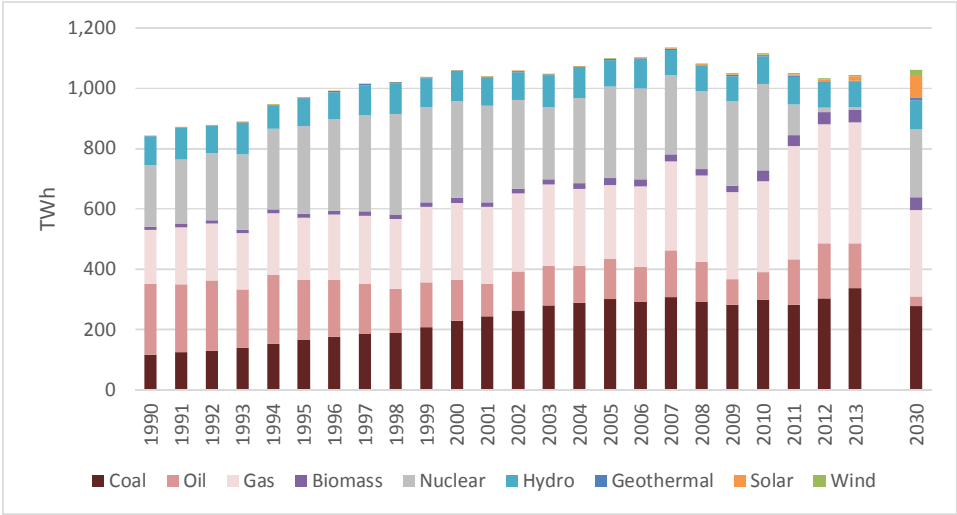
Policy indicators towards two degree pathway should follow the category

=> Second part of this presentation

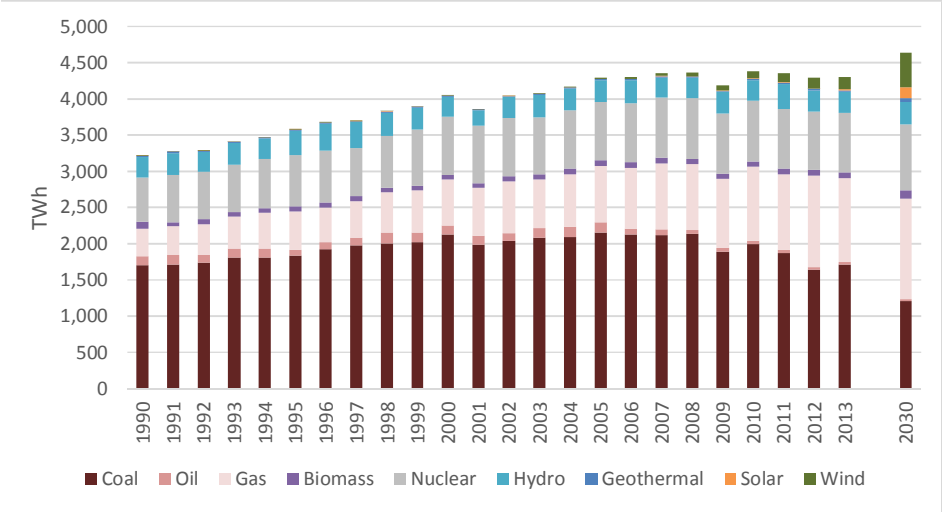
Transition of electricity mix during 1990-2013 and 2030



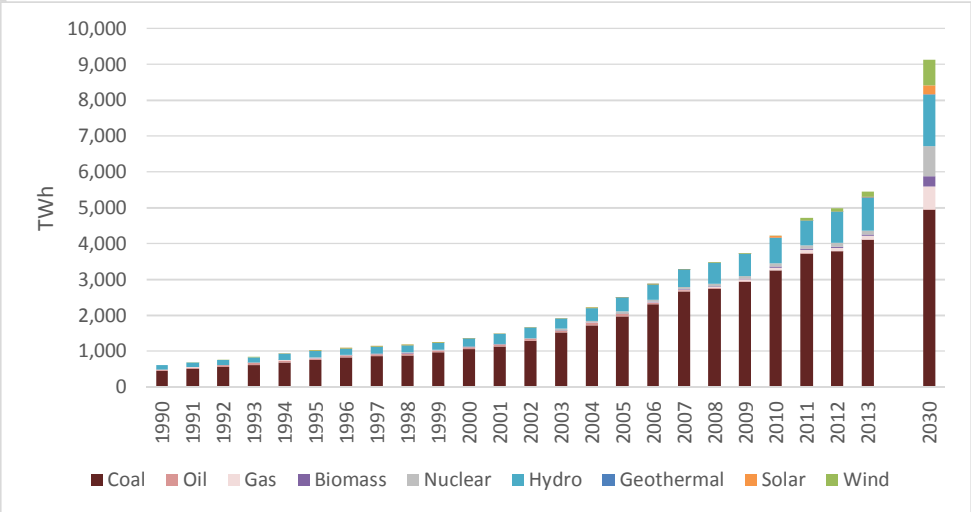
Electricity mix in EU



Electricity mix in Japan



Electricity mix in the US



Electricity mix in China

Action Indicator (A)&(B): CO_2 Emission Regulation on fossil-fueled power plant

	2005～2012	2012～2025
Japan	• Voluntary carbon intensity target for the power sector (305gCO_2/kWh) (2008～2012)	• Voluntary carbon intensity target to meet INDC (332gCO_2/kWh) • To complement the voluntary framework, policy and measures (benchmarks for coal-fired power plants at 777gCO_2/kW; Mandatory ratio of non-fossil fuel electricity at retail level)
US	• Emission Standards at state-level • Regional Greenhouse Gas Initiative (RGGI)—C&T for the power sector since 2009 • California's C&T (2012)	• Emission standards for new power plants under CAA (600gCO_2/kWh for coal-fired power plants) • Clean Power Plan (up to 2030) ✓ 32% reduction from 2005 levels ✓ Emission standards for existing power plants (580gCO_2/kWh)

Action Indicator (A)&(B): CO_2 Emission Regulation – cont'd

	2005～2012	2012～2025
EU	Power sector was covered by the EU-ETS	Phase IV: 2021-2030 The overall number of emission allowances under EU-ETS will decline at an annual rate of 2.2% from 2021 onwards, compared to the current 1.74%.
GER	—	—
UK	—	Emission standards for new thermal power plants (450gCO_2/kWh) (Energy Act 2013)
Fra	—	—
China	No specific measures	• Coal consumption intensity (300g/kWh ≈ 700gCO_2/kWh) for new coal-fired power plants under the Energy Development Strategy Action Plan (2014-2020) • Nation-wide emission trading scheme covering the power sector from 2017

Action Indicator (3): Development and diffusion of CCS

	2005～2012	2012～2025
JPN	Support for R&D and pilot projects; Marine Pollution Prevention Law revised in 2007	One demonstration project in Tomakomai aiming at the commercialization by 2020
US	Support for various projects including EOR and R&D Progress in legislative preparation	Supporting 5 pilot projects in the power sector up to 2020
EU	EU Flagship Programme (2007) aiming at the operation of 10 to 12 pilot plants by 2015; CCS Directive (2009)	Delayed progress in the EU Flagship Programme (4 plants are at the final preparation stages by now)
GER	2 pilot projects, but little progress in domestic law/regulation.	Entry into force of “strict” CCS law (2012); With one cancellation of pilot project, there’s no domestic project.
UK	Support for R&D Domestic law requiring CCS ready	Cancelation of the £1bn budget for commercial-scale demonstration programme (2012~) in 2015
Fra	No project in the power sector	No project in the power sector
China	Since the 10th FYP（2001-2005）, support for R&D; 9 pilot projects	Through int’l collaboration, R&D support and 6 feasibility projects

Indicator 4: CO2 Emission Regulation on fossil-fueled power plant

The country sets an individual or nationwide emission intensity target on power plants satisfying at least one criterion:

a. less than 612 gCO2/kWh for coal-fired power plant,
<= based on the heat efficiency of IGCC power plant

b. less than 303 gCO2/kWh for gas-fired power plant,
<= based on the heat efficiency of 1,500℃- level combined cycle power plant

c. less than 256 gCO2/kWh for whole electricity sector,
<= based on emission intensity of electricity sector for all the country under the 450 degree scenario by 2030 of WEO 2015

or

A total emission allowance, including power sector, under an emission trading scheme is consistent with mid-term or long-term emission reduction target in line with two degree emission pathways.

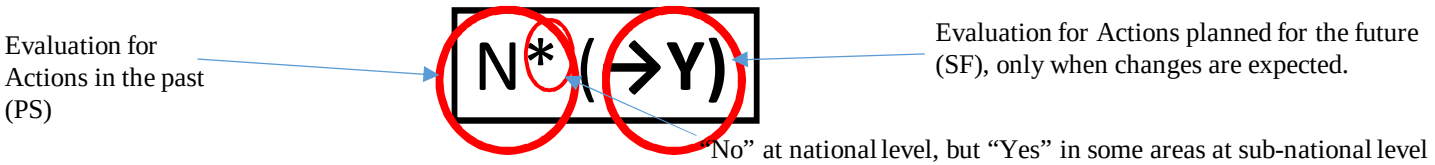
Indicator 5: Progress of CCS development

Indicator 5: The total number of demonstration and commercialized CCS projects in the country during an assessment period are larger than the one during the former assessment period.

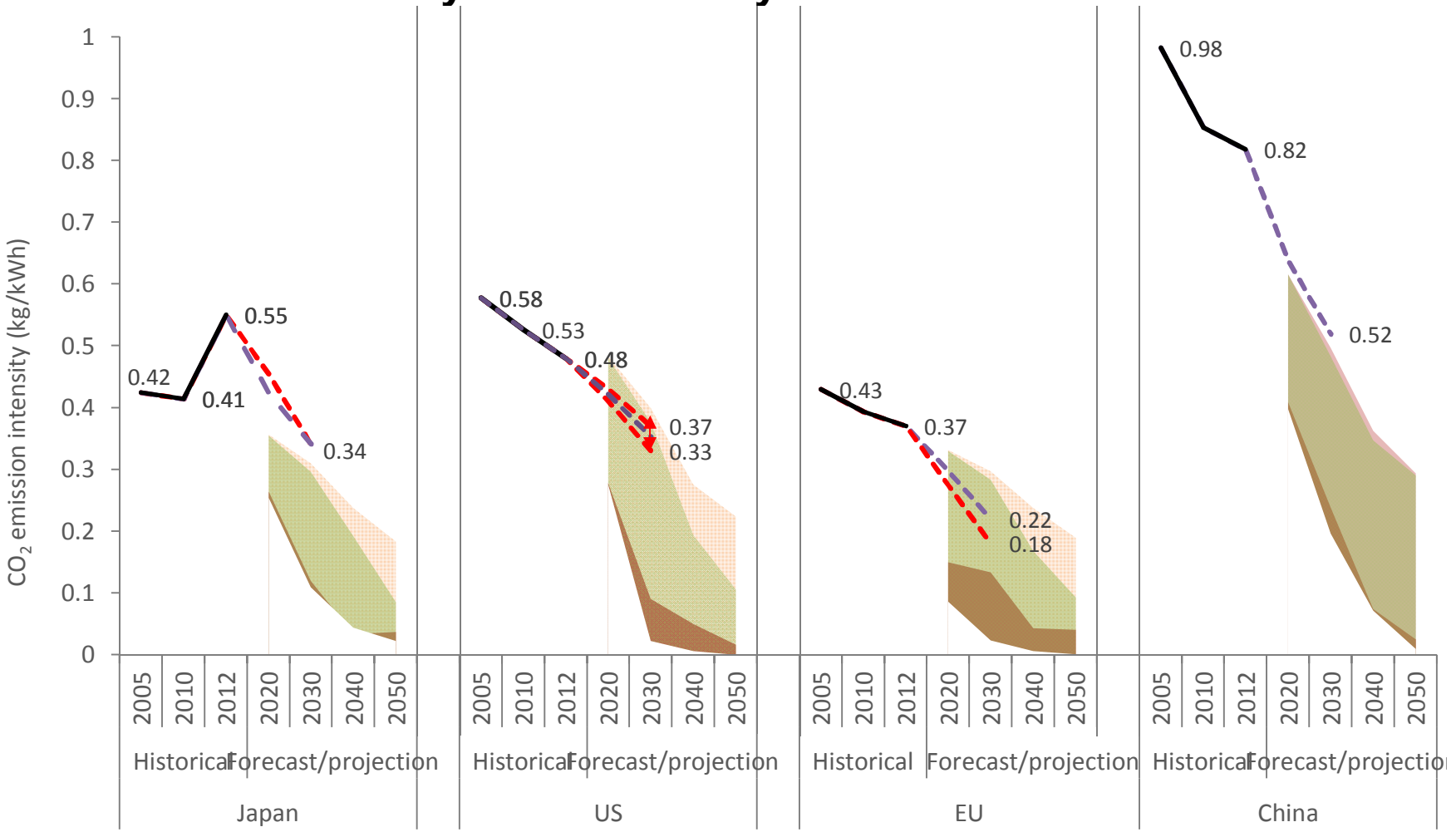
Goal 1 Rating of countries by the new rule

	Conditions for evaluation	China	Japan	US	GER	UK
2. Other energy sources	・Does the country set an emission intensity target satisfy with at least one criterion? (a) less than 612 gCO2/kWh for coal-fired power plant (b) less than 303 gCO2/kWh for gas-fired power plant (c) less than 256 gCO2/kWh for whole electricity sector Or A total emission allowance, including power sector, under an emission trading scheme is consistent with mid-term or long-term emission reduction target in line with two degree emission pathways.	N	N	N (→Y)	N (→Y)	N (→Y)
	・Did the total number of demonstration and commercialized CCS projects in the countries increase during the assessment period? Or, is it expected to increase in the future?	Y	Y	Y	Y (→N)	Y (→N)

Jump to Reason



Emission Intensity in the Electricity Sector:



Emission intensity of electricity sector that reflects on current policy of the country

Emission intensity of electricity sector that reflects on IEA new policy scenario under WEO 2016

Updated!

Range of emission intensity of electricity sector that reflect on the scenarios to achieve the 2 degree target with CCS
(Scenarios are taken from the LIMITS project, DDPP, WEO2016)

Range of emission intensity of electricity sectors that reflect on scenarios to achieve the 2 degree target without CCS
(Scenarios are taken from the LIMITS project, DDPP, WEO2016)

Thank you very much!

Summary of Trends and Projections in the Power Sector

	1990—2012	2030 projection
Japan	Oil was substituted by coal	Gas and coal keep the same levels of 2010. Decrease in oil and nuclear is filled by RE.
US	Coal was substituted by gas after 2009	The current trend that gas is substituting coal continues; Increase in demand will be met by RE.
EU	While coal decreased slightly, gas increased. After 2008, RE substituted thermal power.	RE will substitute coal and also meet the increase in demand.
GER	Coal was substituted by gas; Nuclear was substituted by RE.	Substantial decrease in demand; nuclear phase out and coal substantially decrease; RE esp. wind will increase substantially.
UK	Gas substituted coal and met the increasing demand.	The current trend that gas is substituting coal continues; Increase in demand (electrification of transportation) will be met by RE and nuclear.
Fra	Increase in demand was met by nuclear and gas.	Increase in demand (electrification of transportation) will be met by RE and gas.
China	Substantial increase in electricity demand was met largely by coal and partly by hydro.	Substantial demand increase will be met by gas, nuclear and RE. While coal continues to increase, but its ratio decreases.

Action Indicator (2): Initiatives for Lowering Carbon Intensity of Thermal Power Plants (other than Emission Regulations)

	2005～2012	2012～2025
Japan	Support R&D in next-generation, high- efficiency thermal power plants	Support R&D in next-generation, high- efficiency thermal power plants
US	Support R&D in shale gas	Support R&D in shale gas
EU	Amendment to the Large Combustion Plant Directive (Directive 2001/80/EC)	—
GER	—	—
UK	Closure of old coal-fired power plants based upon Directive 2001/80/EC	Announcement of phasing-out unabated coal-fired power plants by 2025 (Nov. 2015)
Fra	—	—
China	Notice for Enhancing the Closure of Small-scale Power Plants (2007)	Suspend the construction of new coal power plants including those ones that have been already approved in 15 Provinces (up to 2018)