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Japan's role in achieving the global nuclear industry Harmony goal

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Director General

Harmony
12 April 2017
50th Annual JAIF Conference

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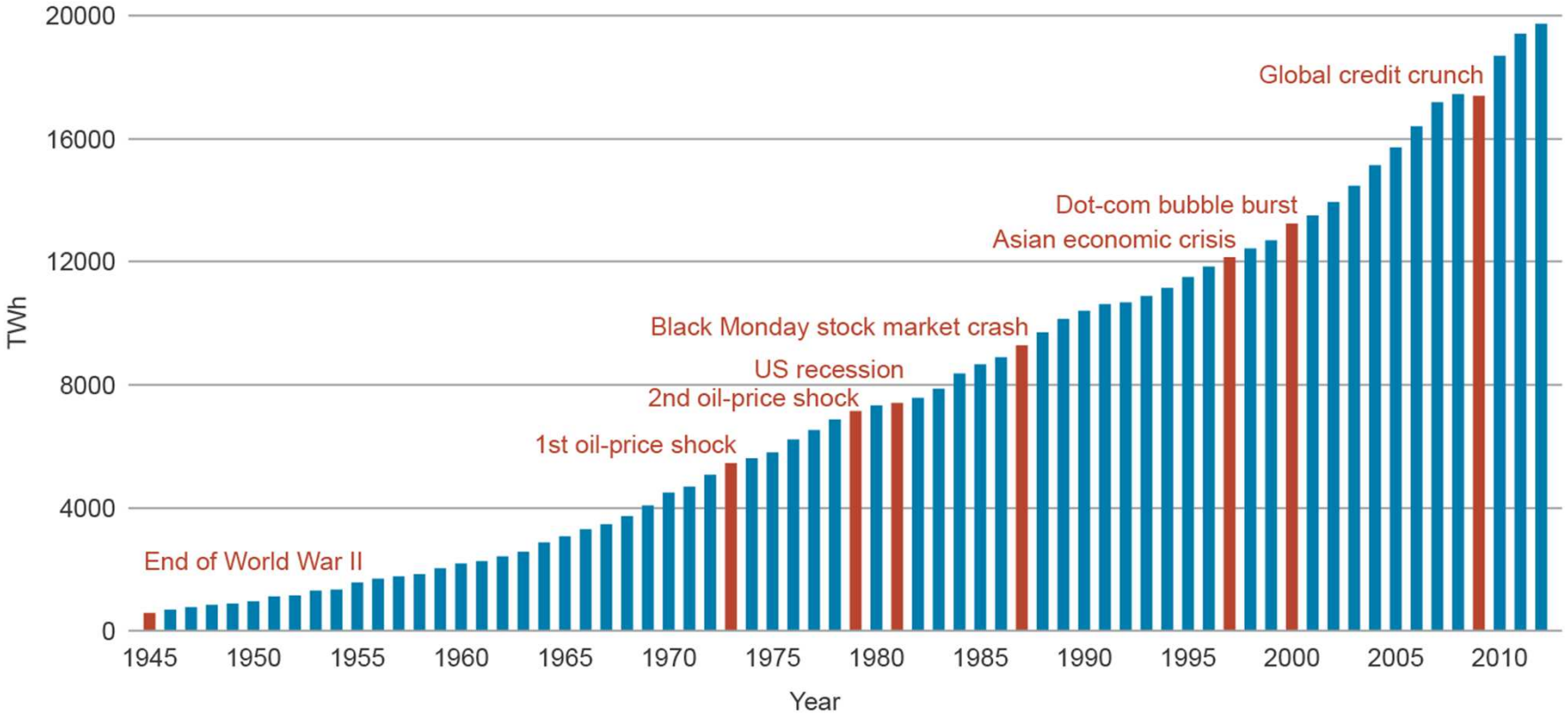
Demand for electricity has risen dramatically regardless of economic shocks



Source: 1945-1979, International Energy Agency databases and analysis
1980-2012, Energy Information Administration

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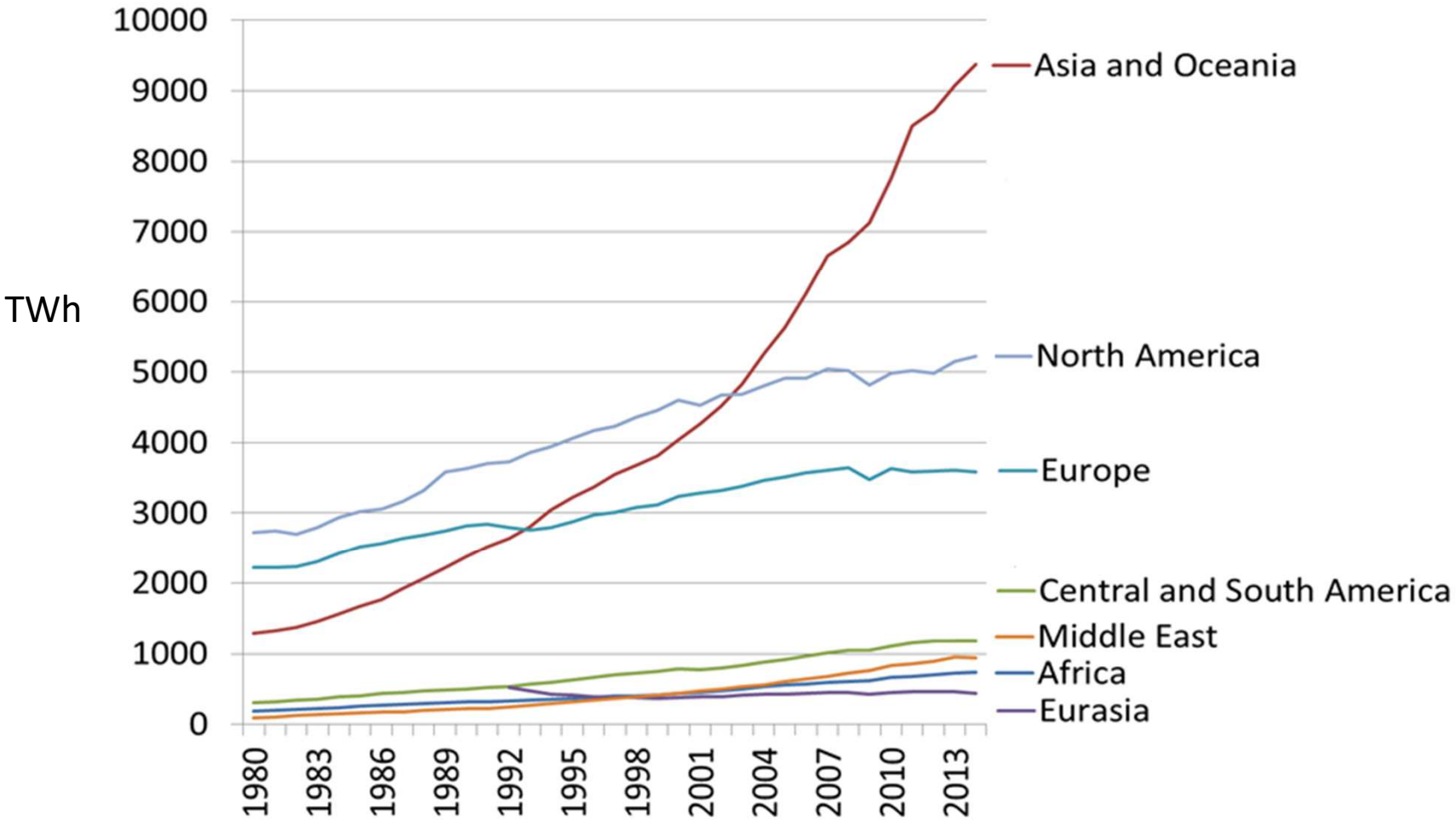
Global Electricity Production



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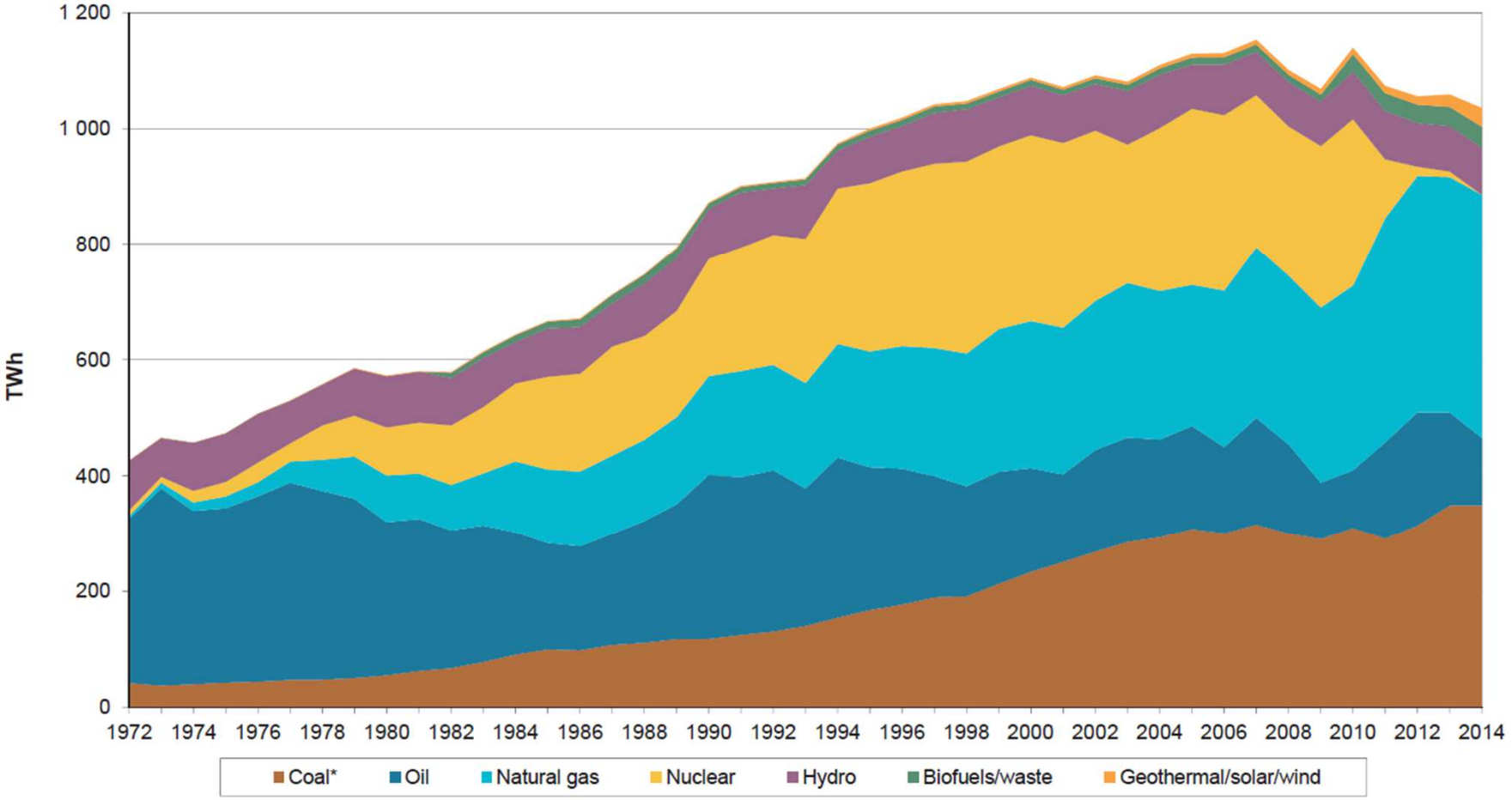
Japan: Electricity Production



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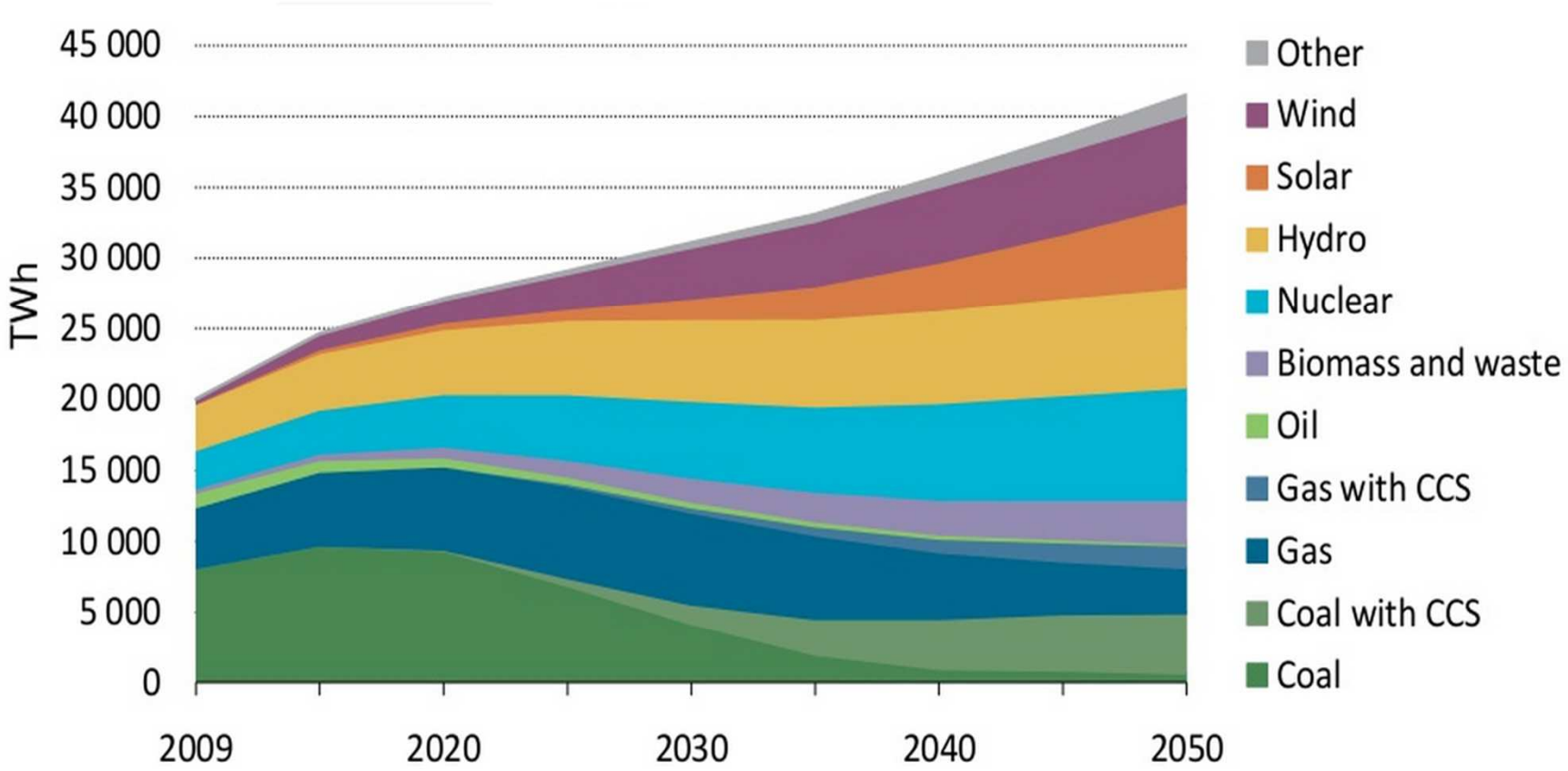
IEA 2 Degree Scenario is a common benchmark



Source: DECC, December 2013 "EMR Delivery Plan", 100g 2030 scenario with central fossil fuel price projections and demand

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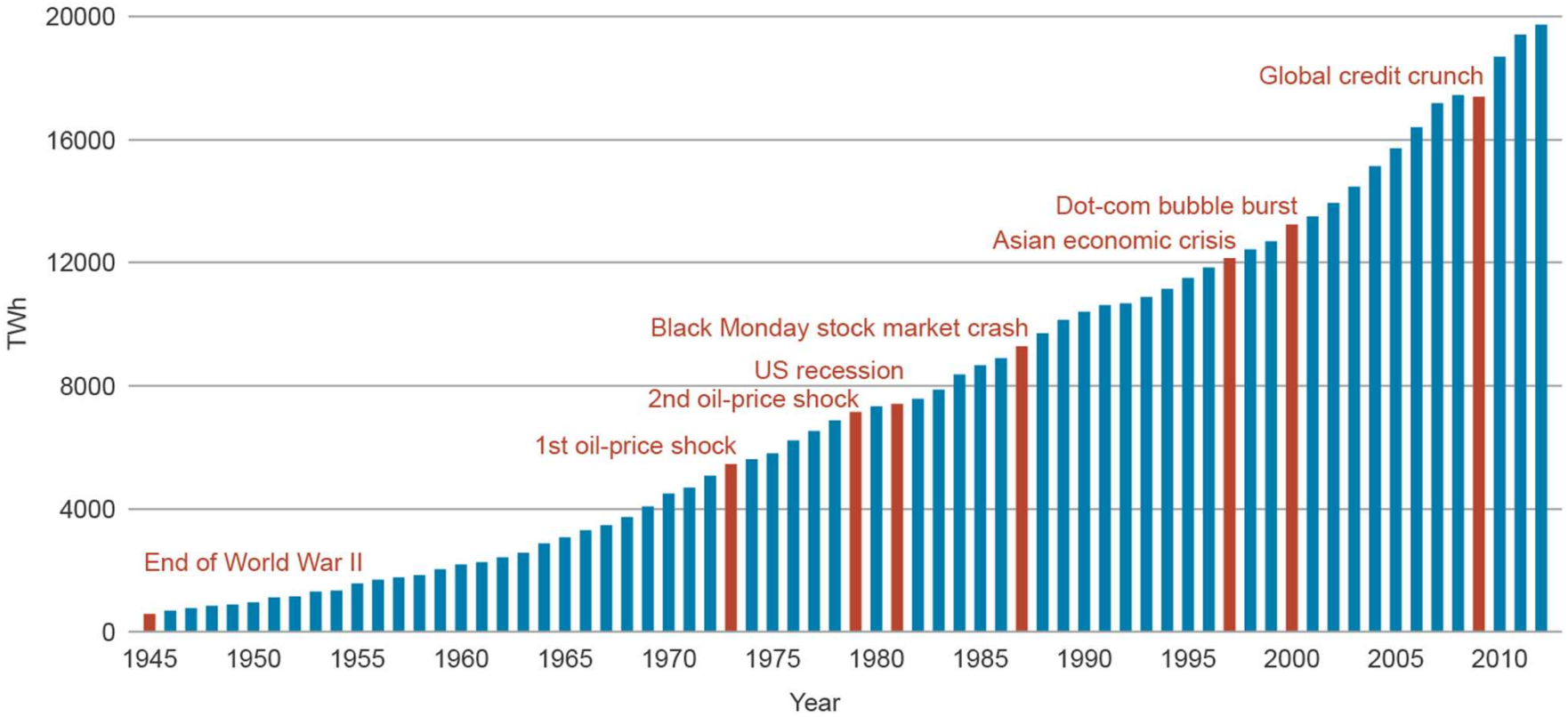
Accelerating rise in world electricity consumption



Source: 1945-1979, International Energy Agency databases and analysis
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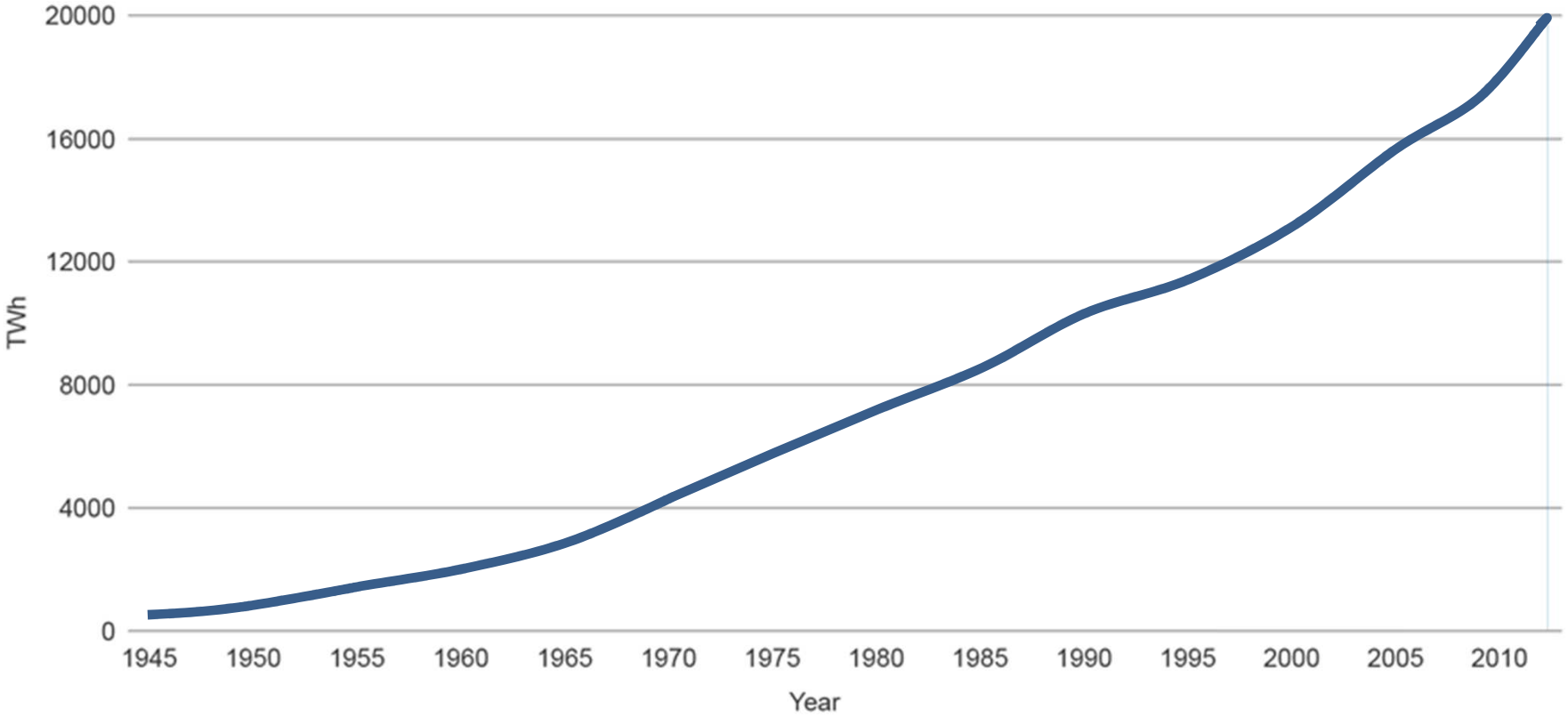
Accelerating rise in world electricity consumption

Global consumption of electricity



Source: 1945-1979, International Energy Agency databases and analysis
1980-2012, Energy Information Administration

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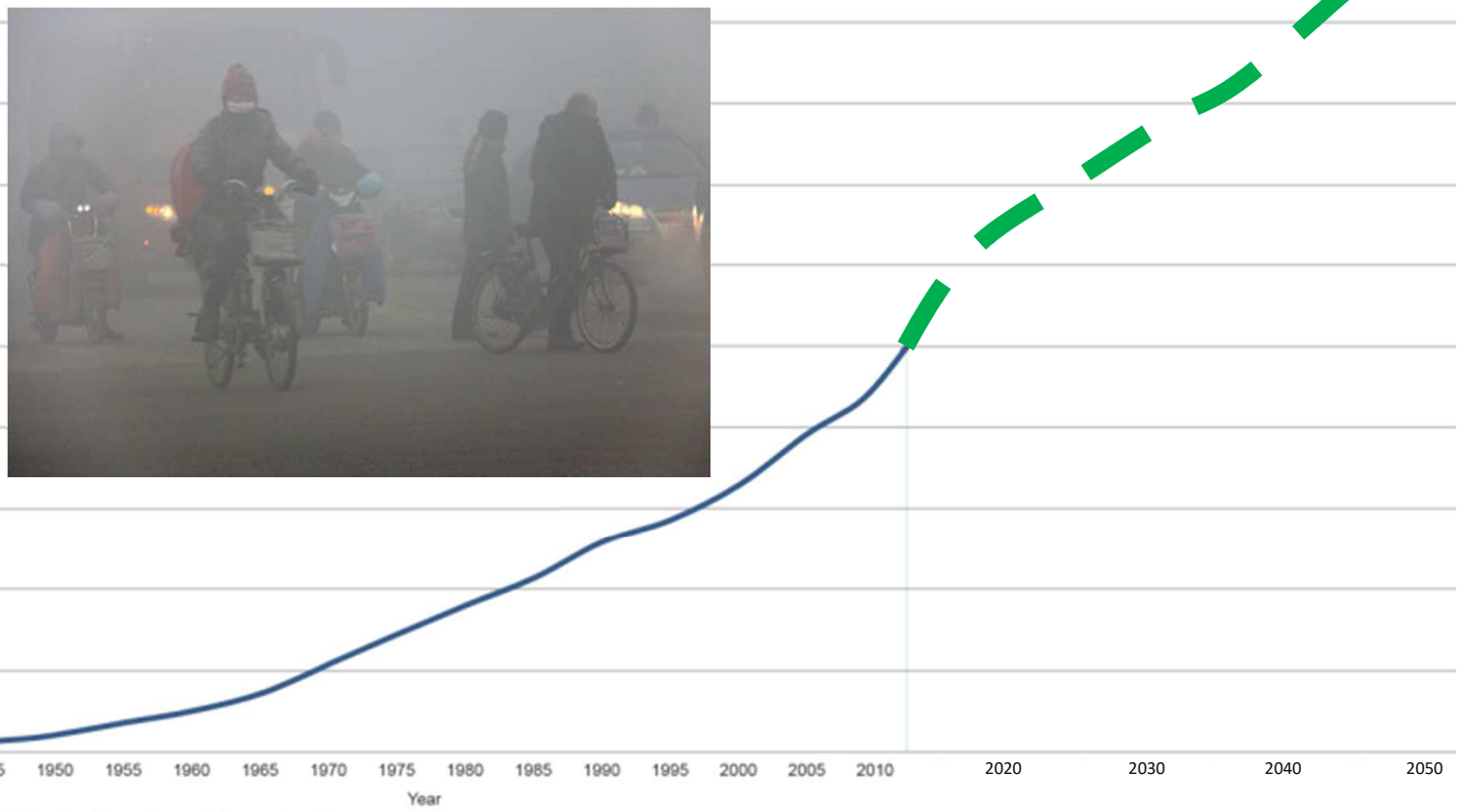
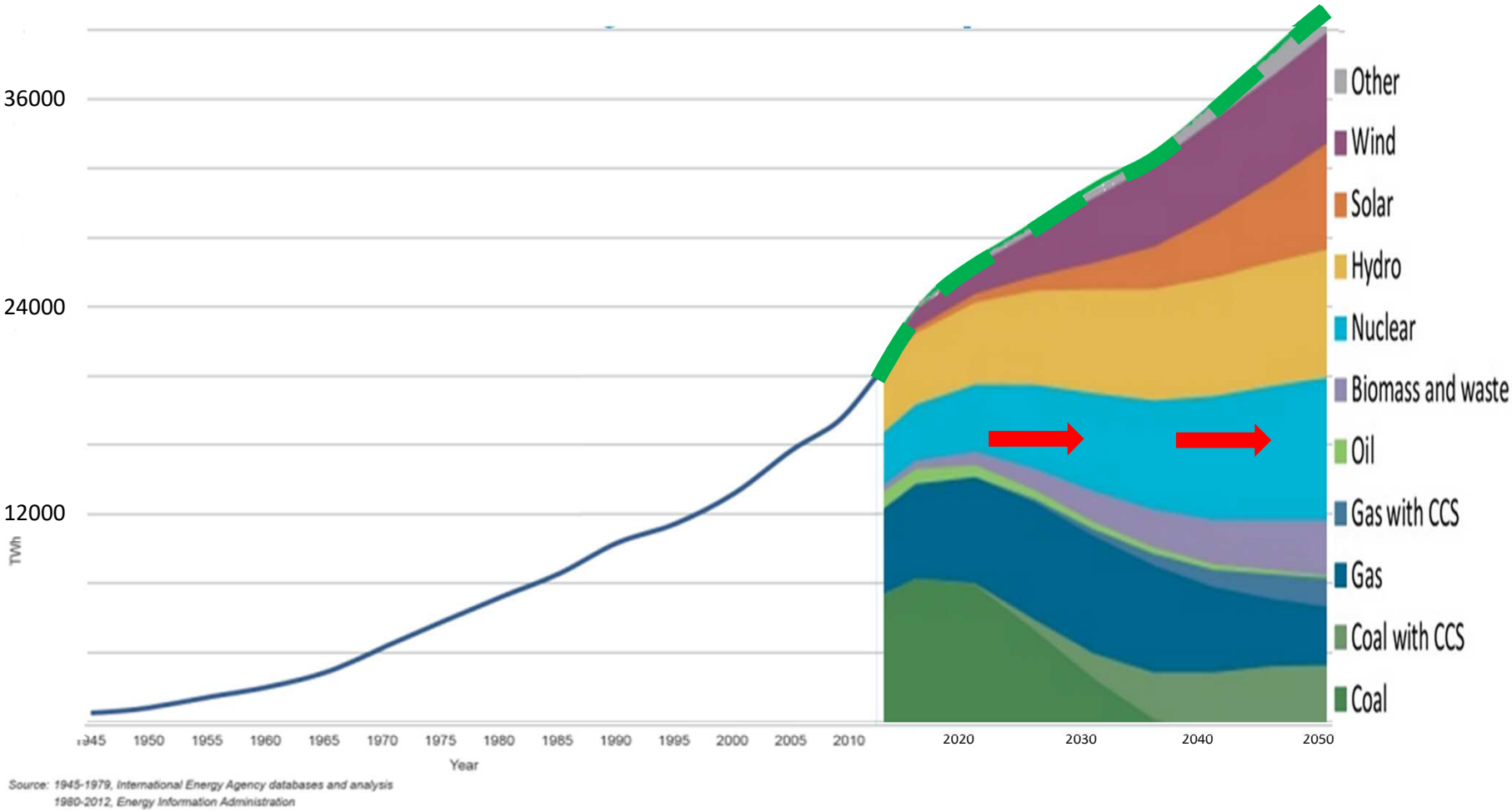
IEA 2 degree scenario: electricity growth in low carbon scenario



IEA 2 degree scenario: generation mix



Source: 1945-1979, International Energy Agency databases and analysis
1980-2012, Energy Information Administration

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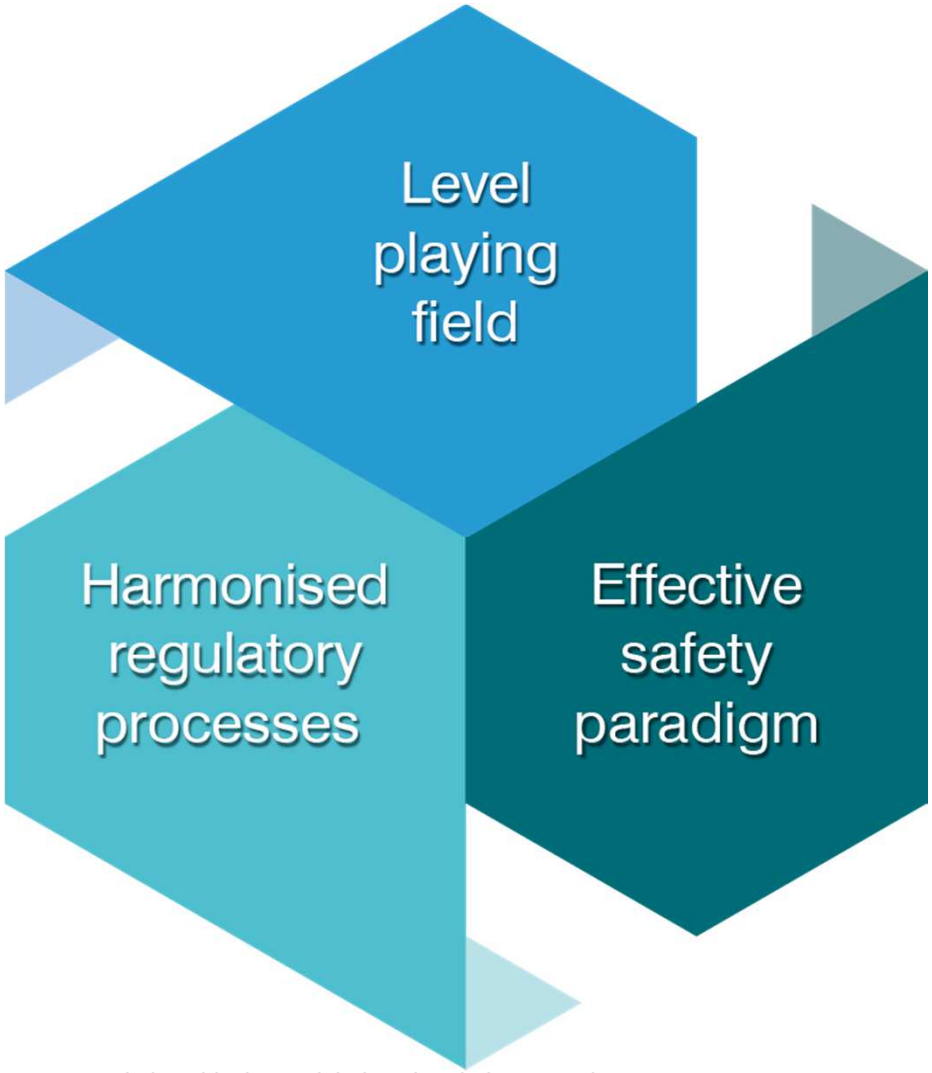
Harmony goal: ready to deliver more nuclear to ensure 2 degree scenario



1000 gigawatt new nuclear capacity by 2050

25% of electricity supply 2050

Nuclear energy to deliver reliable, affordable and clean electricity

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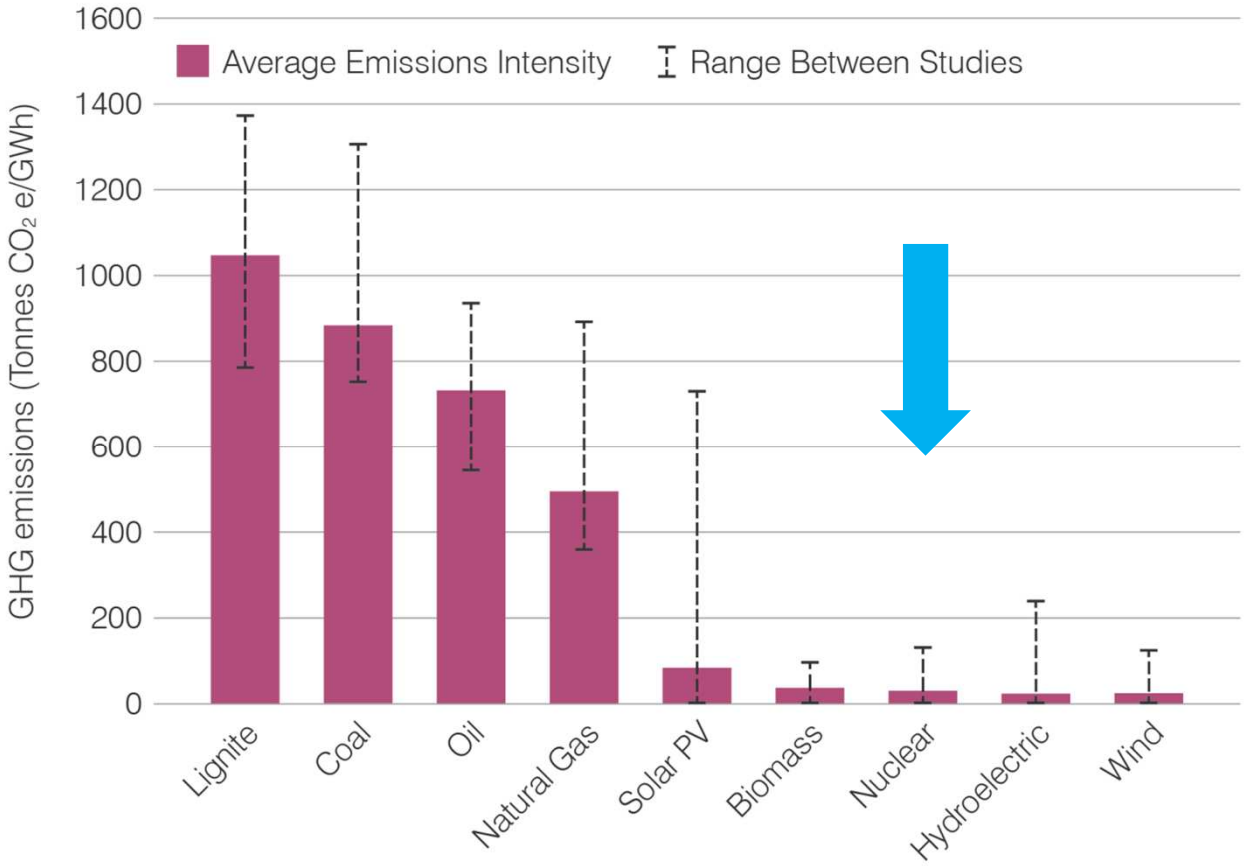
Decarbonising electricity generation – need for low life cycle emissions: Nuclear energy is among the best



Source: World Nuclear Association meta study, incl. IPCC 2014

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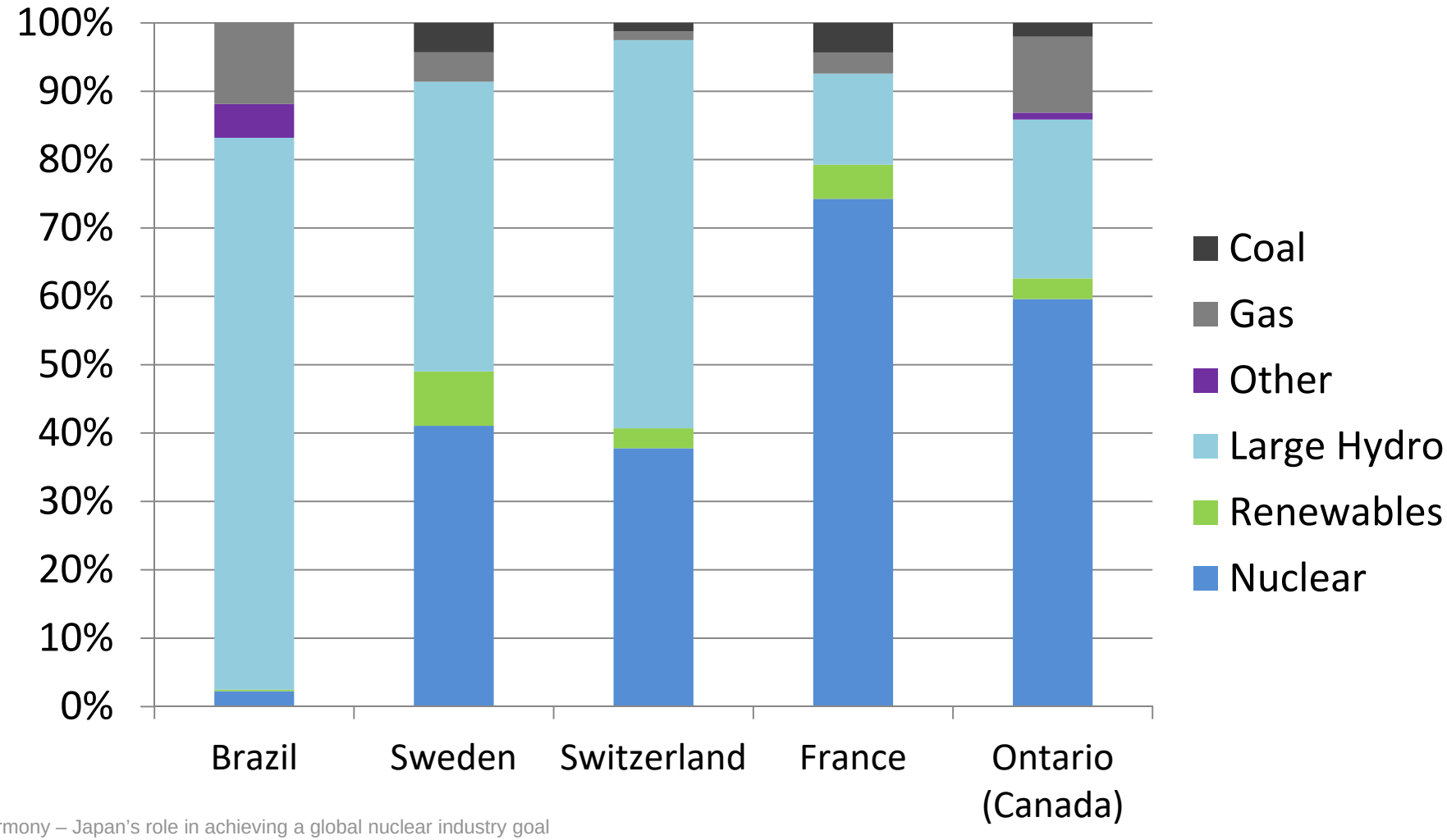
Nuclear is an important part of the low carbon solution



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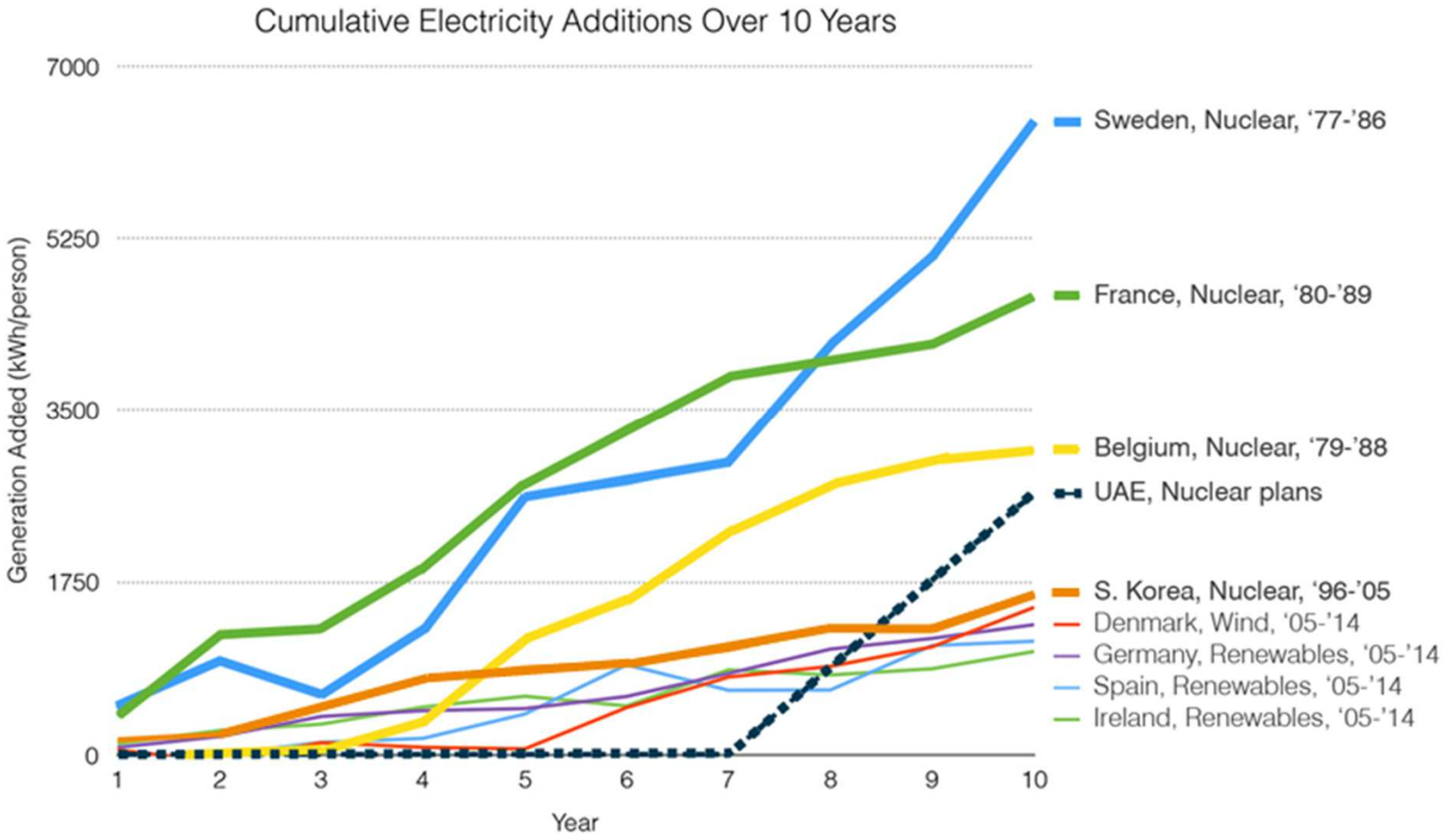
Nuclear makes quick, lasting decarbonisation possible



Source: Breakthrough Institute

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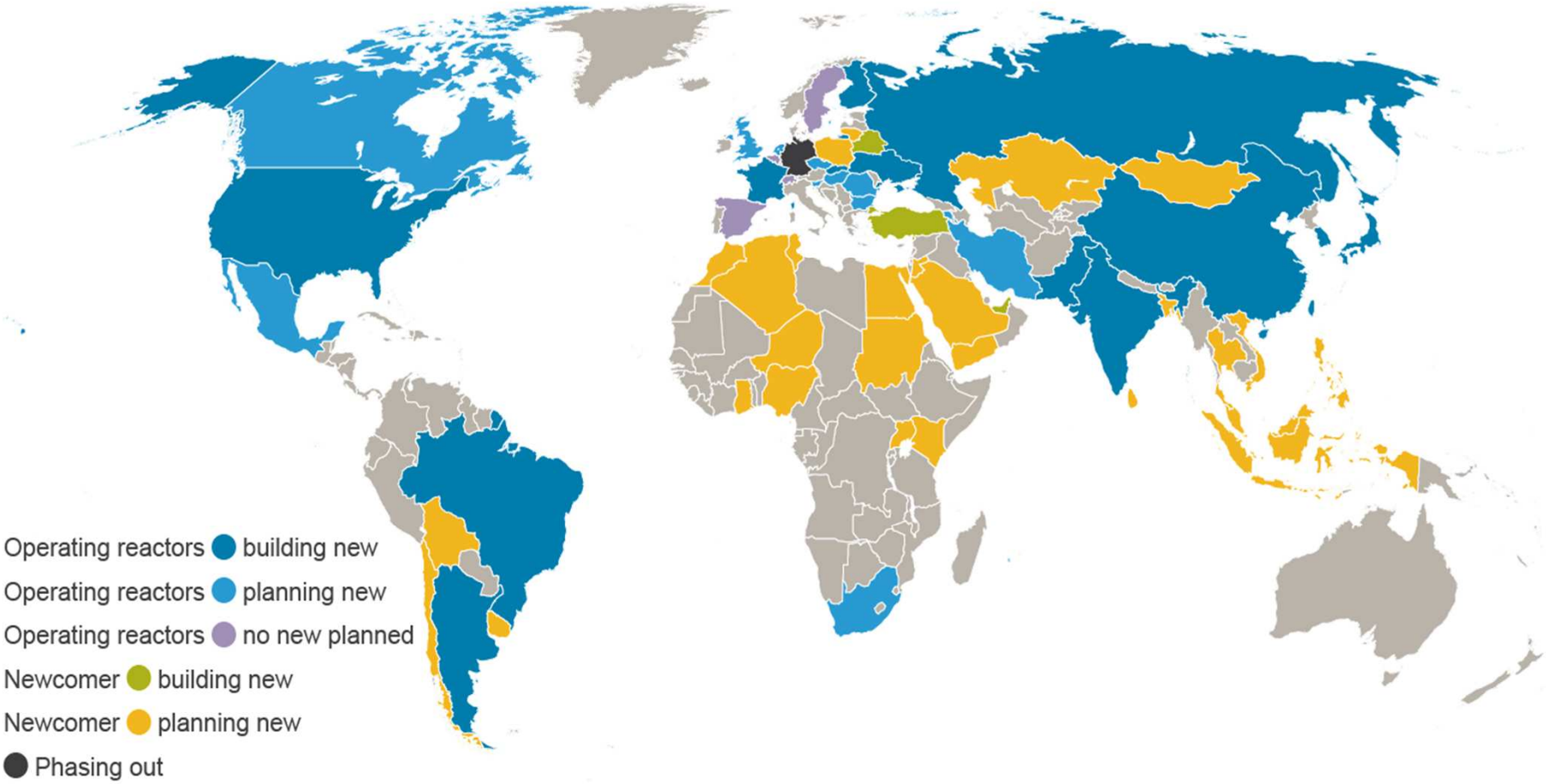
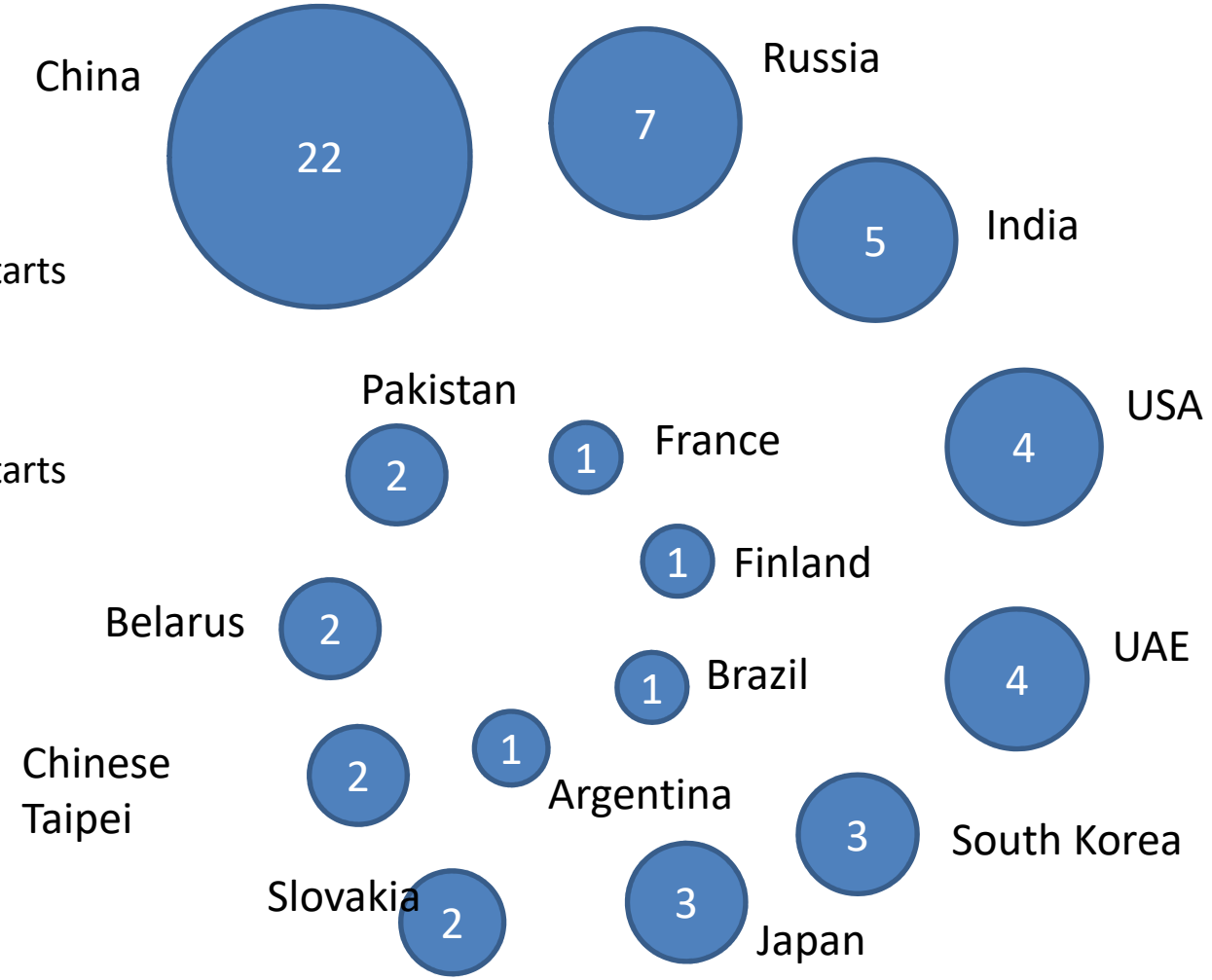
Global nuclear status



Highest level of construction in twenty five years: 60 reactors worldwide

China 2016:
5 reactor starts
2 construction starts

China 2015:
8 reactor starts
6 construction starts



Source World Nuclear Association

Nuclear makes major contribution in IEA World Energy Outlook

Global nuclear generation output increasing by almost two and a half times by 2040

Nuclear generation is a cost-competitive low-carbon generation option.

Low carbon energy sources dominate the generation mix in 2040: hydro 20%, nuclear 18%, wind 18% and solar PV 9%

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The scale assumptions for low-carbon sources…

Source	TWh generated in 2012	Additional TWh in 2050	Growth factor
Biomass and waste	439	+2651	**7.0x**
Geothermal	70	+985	**15.0x**
Wind (onshore)	505	+4880	**10.7x**
Wind (offshore)	15	+1352	**91.1x**
Solar PV	97	+3646	**38.6x**
Solar CSP	5	+3123	**625.6x**
Coal with CCS	13 (in 2020)	+3184	**245.8x**
Natural Gas with CCS	9 (in 2020)	+1786	**199.4x**
Biomass with CCS	7 (in 2025)	+67	**10.6x**

…often overlook established low carbon sources

Source	TWh generated in 2012	Additional TWh in 2050	Growth factor
Nuclear	2461	+4341	**2.8x**
Hydro	3672	+3256	**1.9x**

Nuclear and hydro: 84% of low-carbon today

Credible, strong growth of 2-3x to 2050
(Electricity as a whole grows 2x)

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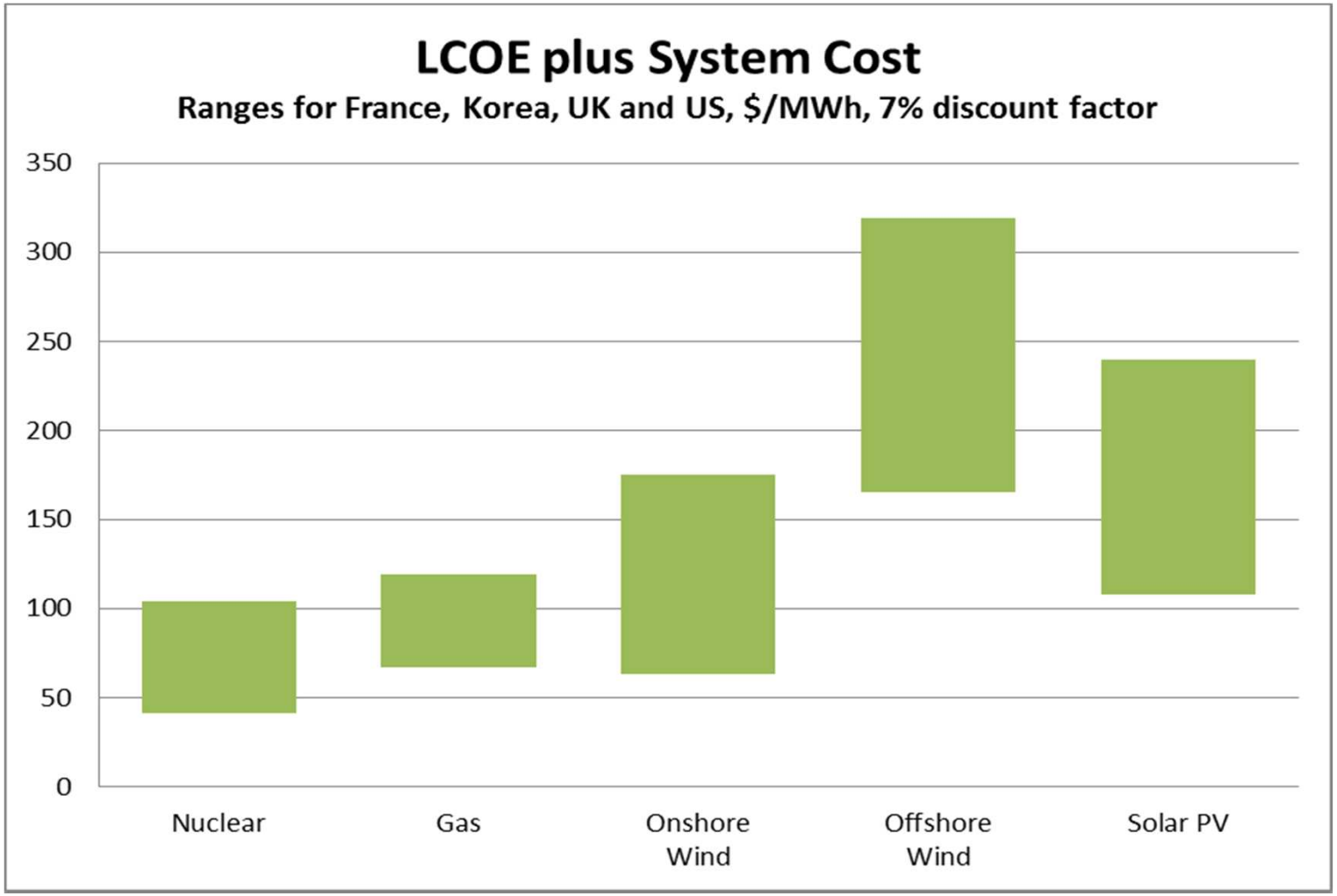
Levelised cost of electricity



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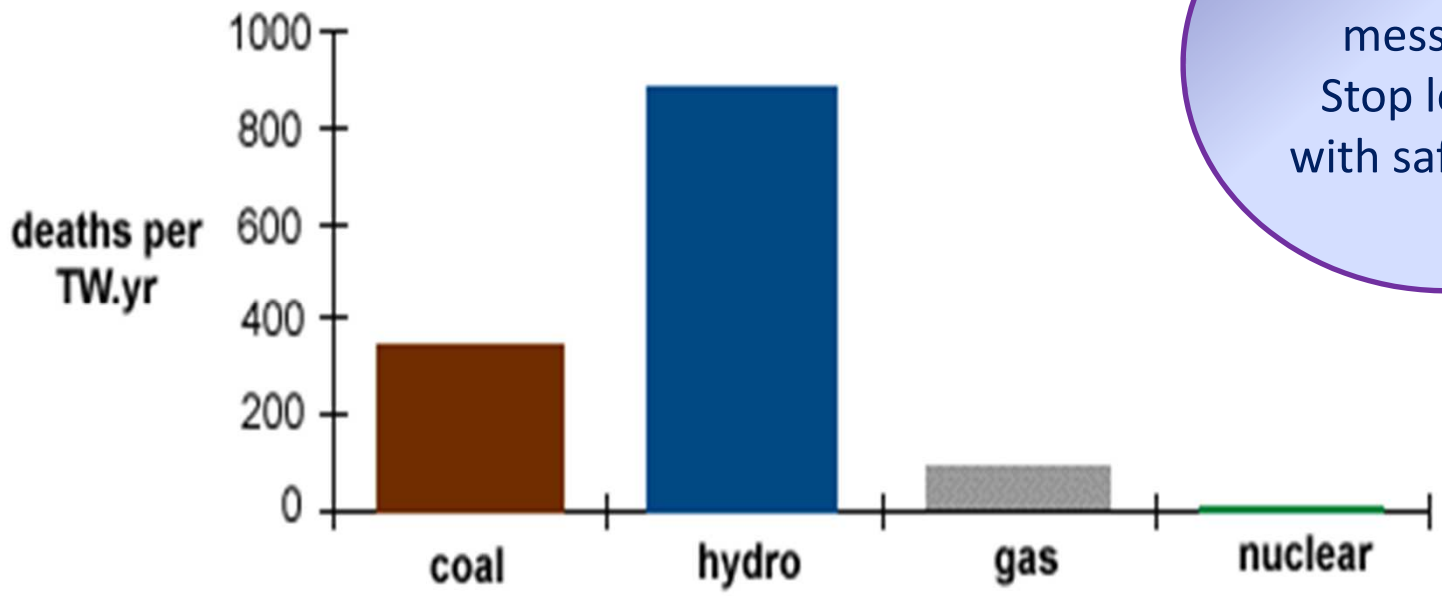
The alternatives to nuclear are far more dangerous – even including accidents



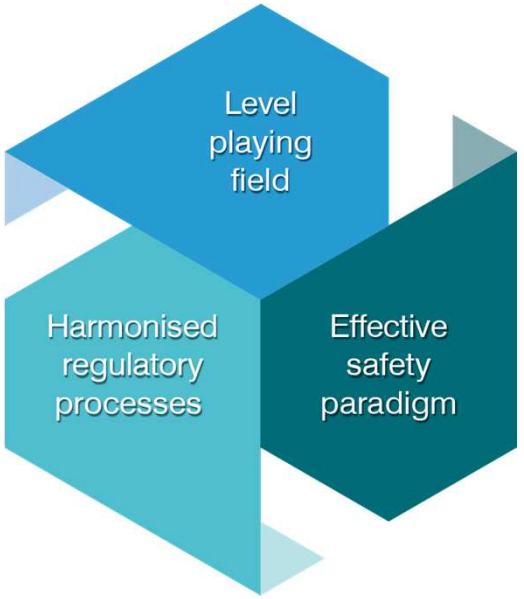
For external messages: Stop leading with safety first

Paul Scherrer Institut 1998: considering 1943 accidents with more than 5 fatalities

The global nuclear industry: tackling barriers, engage in dialog, develop key actions

Level playing field:
Establish a level playing field for all low-carbon technologies, valuing not only environmental qualities, but also reliability and grid system costs.

Harmonised regulatory processes:
Enhance standardisation, harmonise and update global codes and standards.
Timely licensing of new technologies.

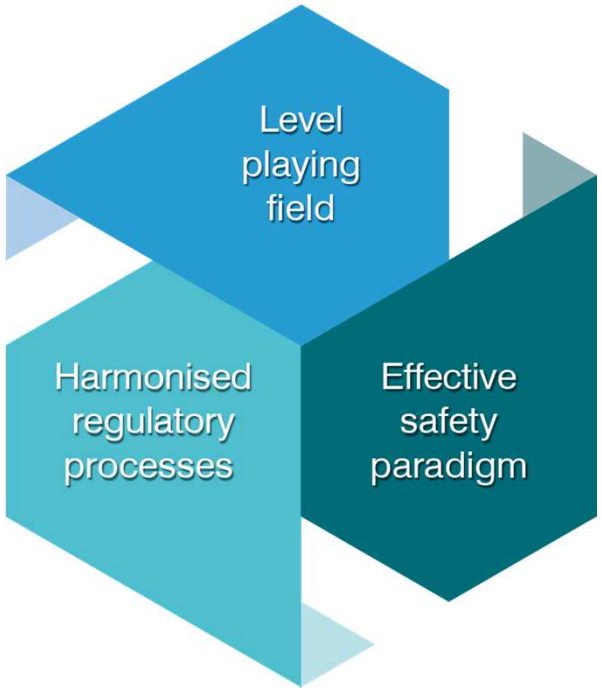


Effective safety paradigm:
Increase genuine public wellbeing from a society perspective. Ensure global nuclear safety. Confidence in management of nuclear technology and operations.

Level playing field

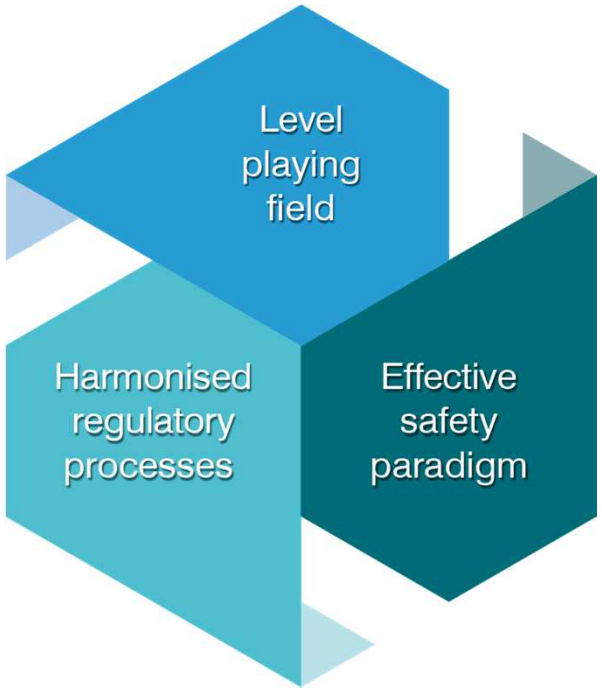
Markets should be reformed to:

- support capital investments
- include grid system costs
- eliminate nuclear-only taxes
- reform subsidies
- give credit for low carbon emissions
- value 24/7 reliability
- support innovative finance solutions



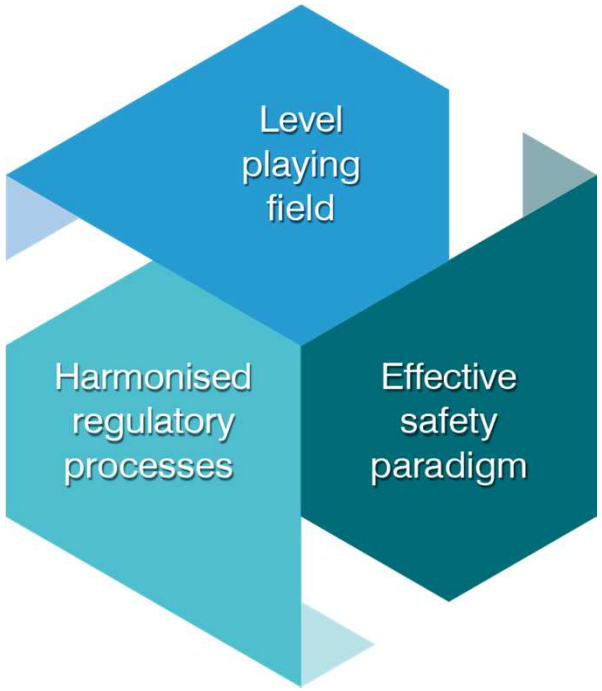
Harmonised regulatory processes

- enhance standardisation
- streamline licensing processes
- harmonise and update global codes and standards
- enabling international trade
- ensure efficient and effective safety regulation
- nuclear innovation: enable development and timely licensing of new technologies

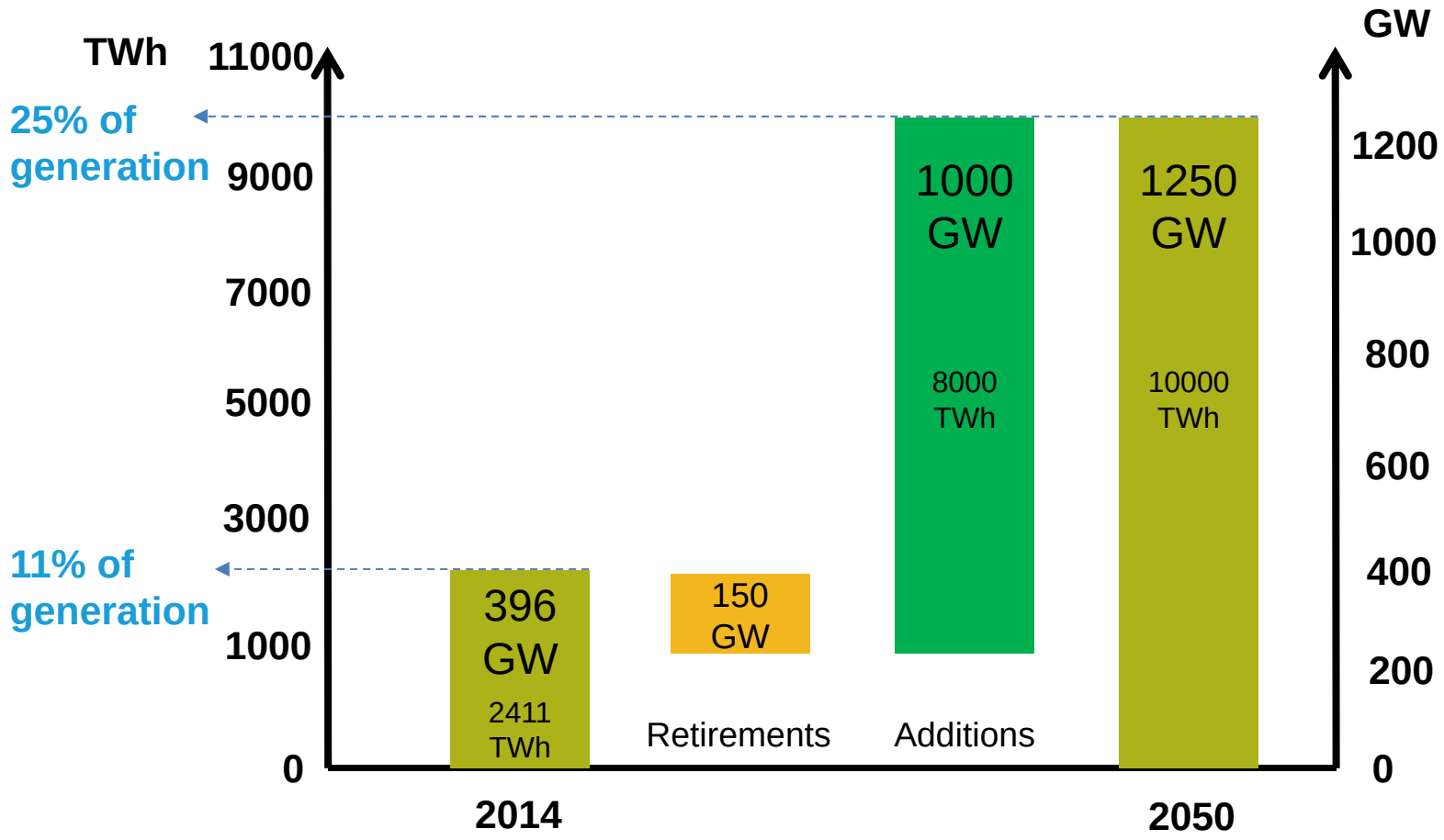


Effective safety paradigm

- Strong political and industry leadership to communicate long term benefit versus risk
- Embrace a holistic approach to society risks from electricity generation so that health and environmental benefits of all sources are maximised
- Recognise the health impacts of the alternatives to nuclear energy
- Introduce accident response measures that genuinely increase public wellbeing – to limit overall impact, not just radiation



Harmony goal for new nuclear build is 1000 GW



Source: World Nuclear Association. Growth required for nuclear energy to supply 25% of electricity in 2050 under demand forecast of two-degree scenario (see IEA, 2015, Energy Technology Perspectives 2015.
Assumption: 91% capacity factor

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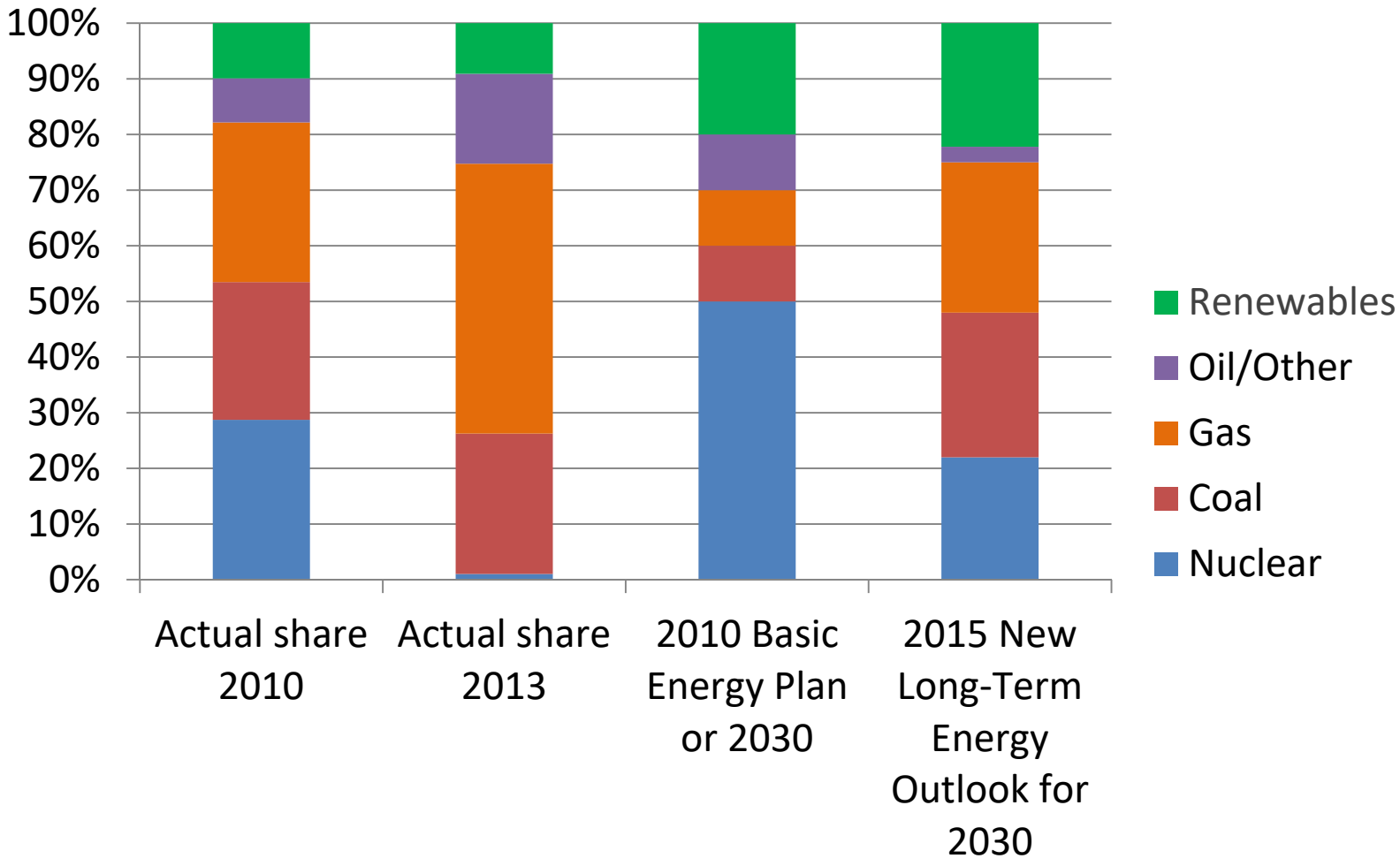
Japan's Electricity Mix



Actions expected from Japan

- Building on the experience with restarts according to the new safety regulation and safety system: Process reactor restart applications with thoroughness and with increased urgency.
- Prioritise future generation mix based on nuclear, renewables and energy efficiency. Reject proposals for continued dependence on fossil fuels.
- Continue and further develop dialogue with local groups around the nuclear sites
- Support international collaborations of Japanese nuclear industry.

These actions will reduce expensive fossil fuel imports, improve air quality and enable Japan to make a fair contribution to global emission reduction efforts.

To deliver 1000 GW new nuclear capacity to 2050

Period	Connection rate	Added capacity
	GW per year	GW
2016-2020	10	50
2021-2025	25	125
2026-2050	33	825
Total new nuclear capacity		1000 GW

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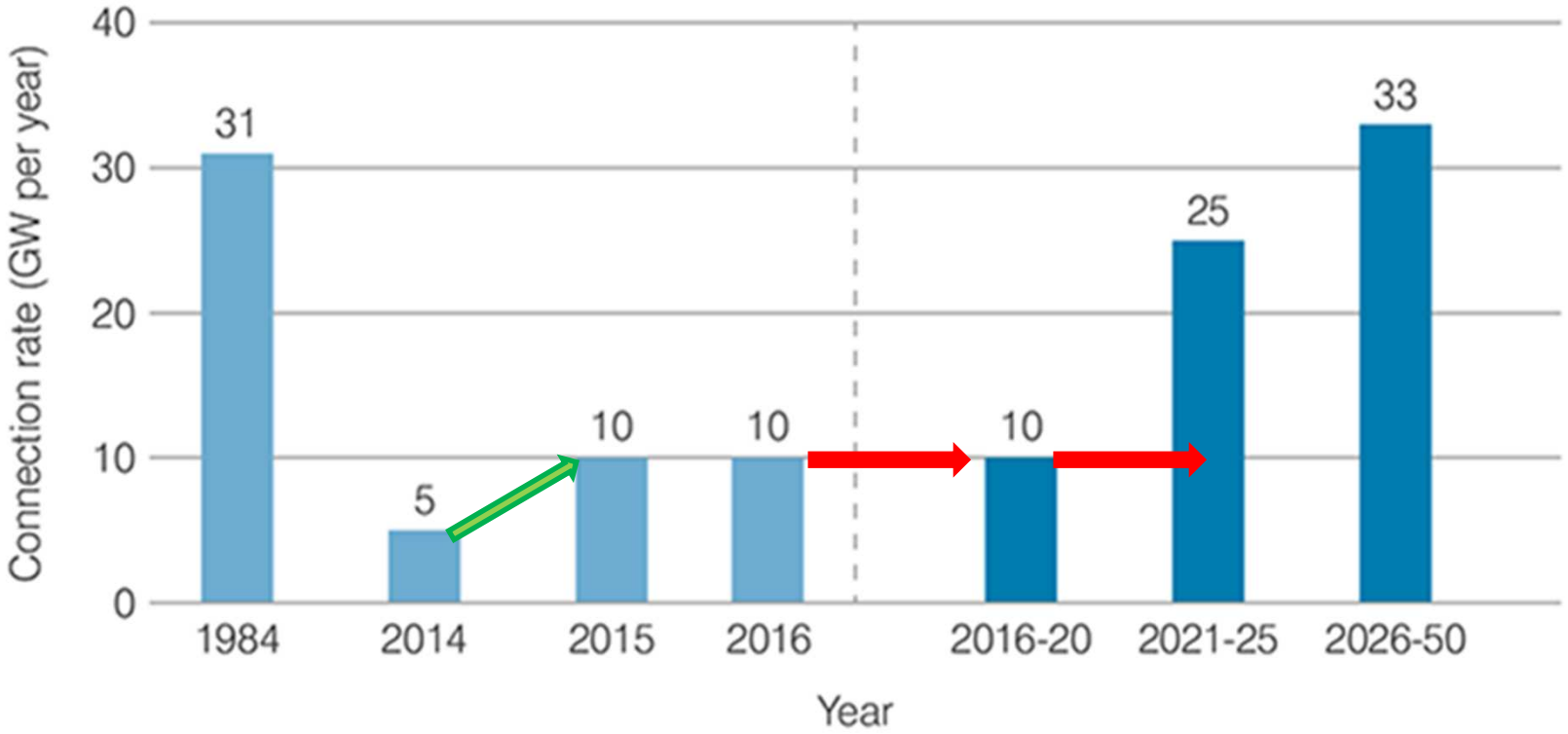
To deliver 1000 GW new nuclear capacity to 2050



Source: World Nuclear Association, Nuclear Fuel Report 2015

Basis for achievement: Harmony in nuclear energy deployment

Strong framework in policy and regulation

Demand for reliable, affordable and clean electricity.

Confidence among stakeholders

www.world-nuclear.org