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Changing Drivers for Energy and Climate Policy in the Electricity Industry

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Sydney Symposium on Carbon Capture (S2 C2)

FLEXIBLE OPERATIONS OF POWER PLANTS WITH CARBON CAPTURE

16-17 October 2013

Possible energy priorities *(World Energy Council, 2010)*

Maslow pyramid of human needs

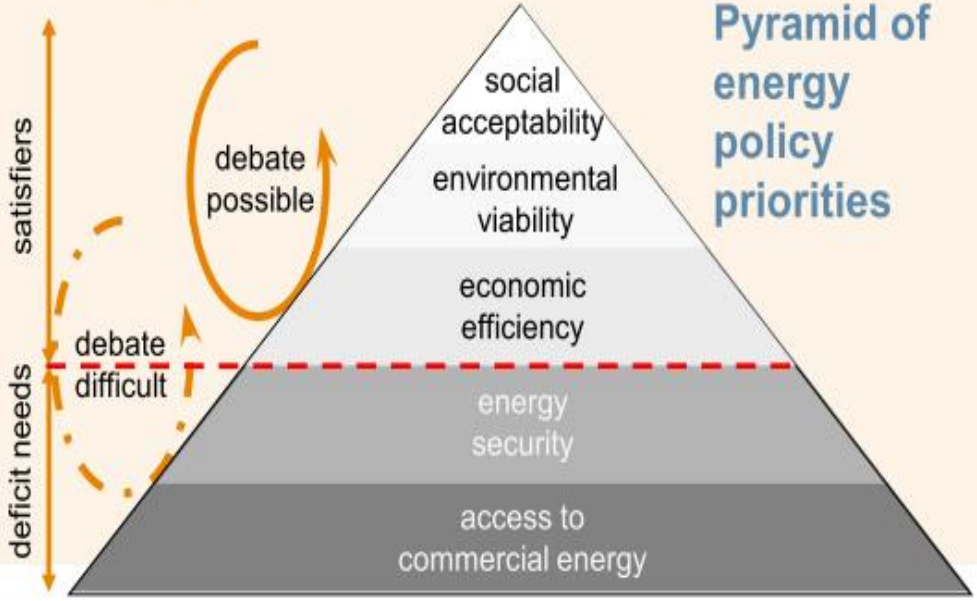
"A person who is lacking food, safety, love and esteem would most probably hunger for food more strongly than for anything else," stated the American psychologist Abraham Maslow in 1943 while formulating a theory to explain the motivational structure of a healthy person.

If Maslow were in Energy Politics…


Abraham Maslow

… he would argue that access to energy, supply security, energy costs, environmental issues and social acceptance are not subject to trade-off, but to a hierarchy: we cannot successfully address higher order needs before proposing and implementing solutions for lower order ones.

Pyramid of energy policy priorities



Other possible priorities – IEA

We must seize the opportunity for a clean energy future.
Let me be straight: our ongoing failure to realise the full potential of clean energy technology is alarming. Midway through 2012, energy demand and prices are rising steadily, energy security concerns are at the forefront of the political agenda, and energy-related carbon dioxide (CO_2) emissions have reached historic highs. Under current policies, both energy demand and emissions are likely to double by 2050.

To turn the tide, common energy goals supported by predictable and consistent policies are needed across the world. But governments cannot do this alone; industry and citizens must be on board. The public needs to understand the challenges ahead, and give the necessary support and mandate for policy action and infrastructure development. Only decisive, effective and efficient policies can create the investment climate that is ultimately needed to put the world on a sustainable path.

The good news is that technology, together with changed behaviour, offers the prospect of reaching the international goal of limiting the long-term increase of the global mean temperature to 2°C. By reducing both energy demand and related greenhouse-gas (GHG) emissions, strategic application of clean energy technologies would deliver benefits of enhanced energy security and sustainable economic development, while also reducing human impact on the environment.

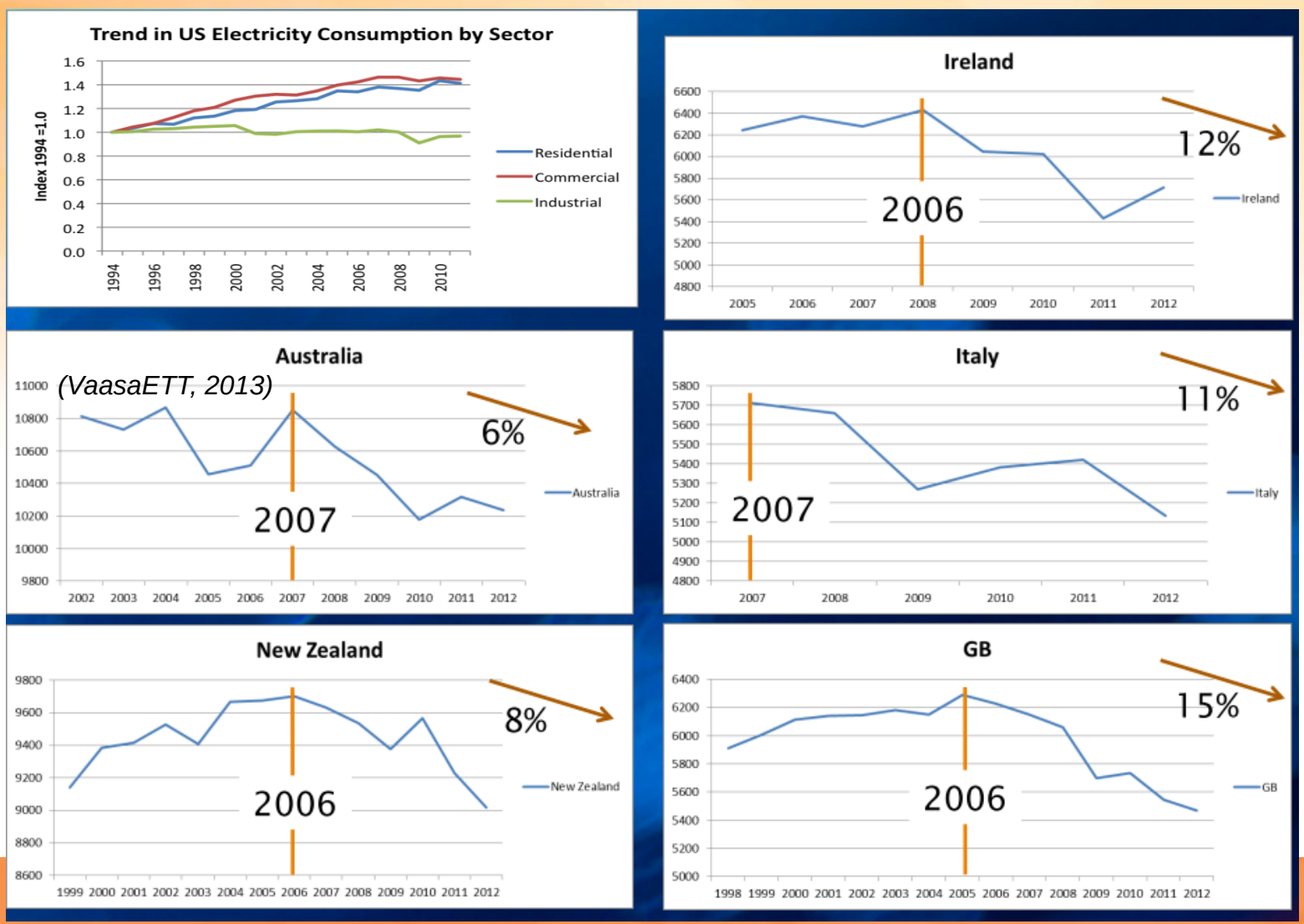
(IEA, *Energy Technology Perspectives*, 2012)

The elephant in the room – Climate Change

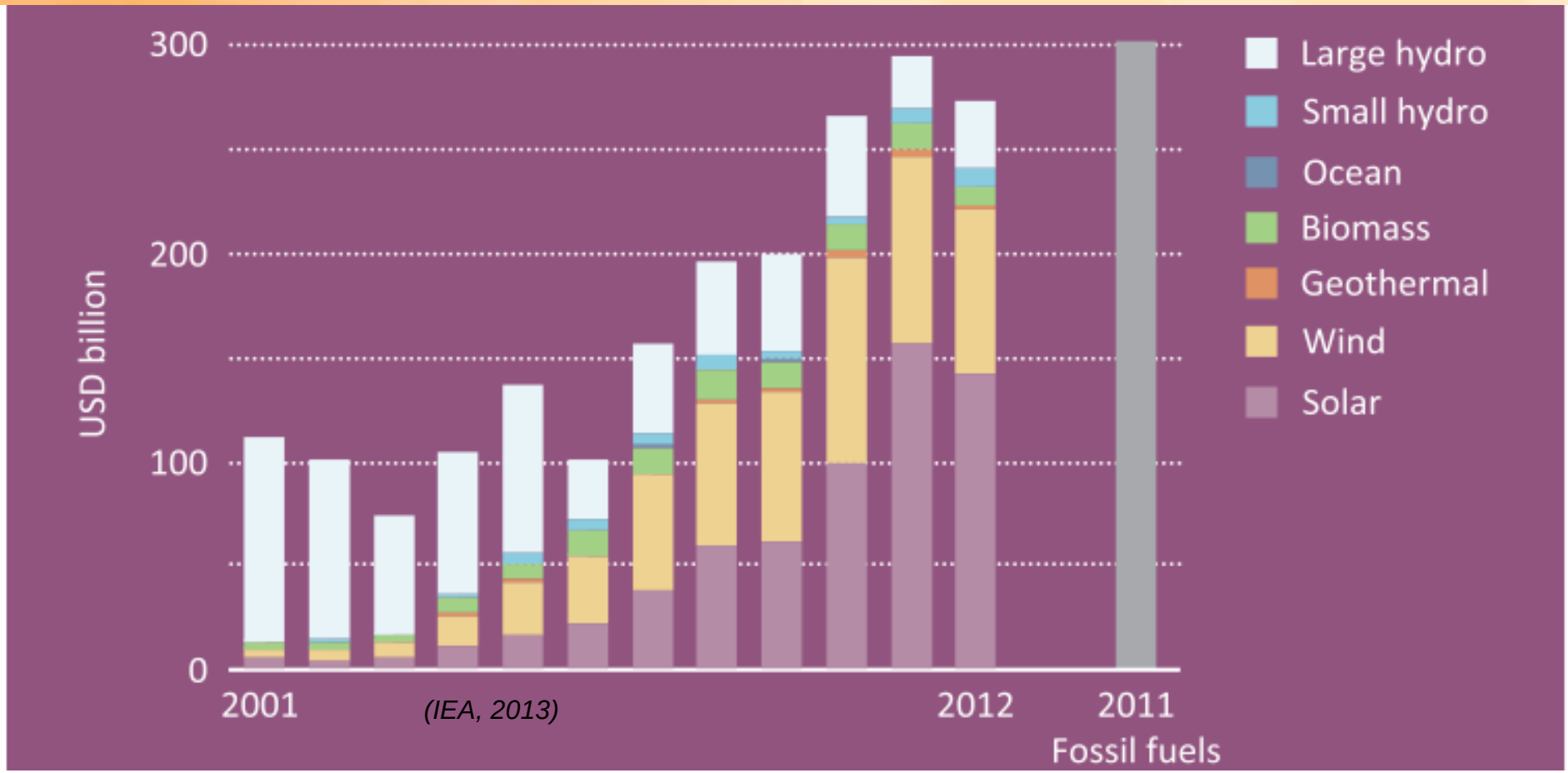
- Currently a lack of domestic and international progress, apparent loss of public and political interest and will
- … but even a dead elephant in the room is a problem

Falling demand in some OECD countries

…& falling demand growth in some others eg. China 5.5% - 2012, 11.7% - 2011



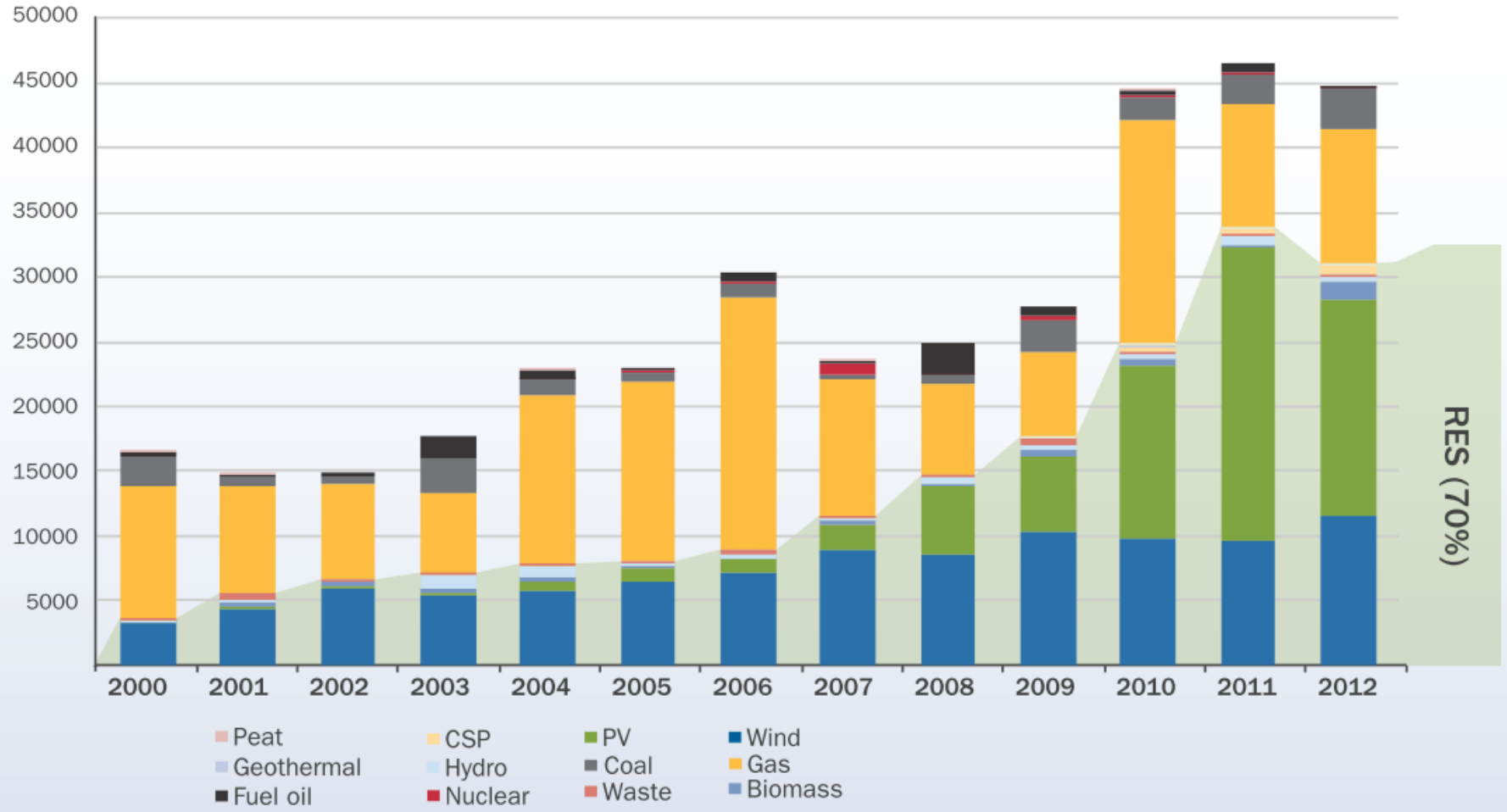
RE investment growing – still largely policy driven



(IEA, 2013)

EU a renewables leader

FIGURE 2.1 INSTALLED POWER GENERATING CAPACITY PER YEAR IN MW AND RES SHARE (%) *(EWEA, 2013)*

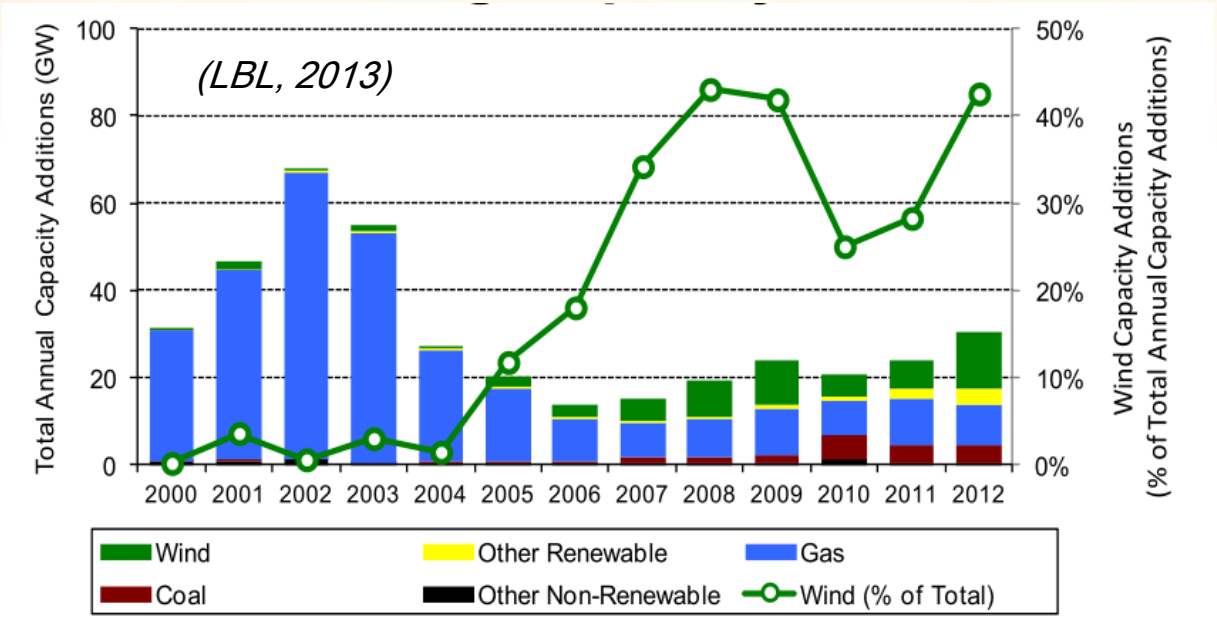


… but not the only renewables leader

"According to the China Electricity Council, China's wind power actually increased more than coal power production for the first time ever in 2012. Thermal (coal) power use grew by only 0.3% (12TWh)… In contrast, wind power expanded by 26 TWh. This rapid expansion brings the total amount of wind power in China to 100 TWh, surpassing China's 98 TWh of nuclear power."

ANNUAL INVESTMENT/ADDITIONS/PRODUCTION IN 2012 *(REN21, 2013)*

	New capacity investment	Hydropower capacity	Solar PV capacity	Wind power capacity	Solar water collector (heating) capacity[1]
1	China	China	Germany	United States	China
2	United States	Turkey	Italy	China	Turkey
3	Germany	Brazil/Vietnam	China	Germany	Germany
4	Japan	Russia	United States	India	India
5	Italy	Canada	Japan	United Kingdom	Brazil



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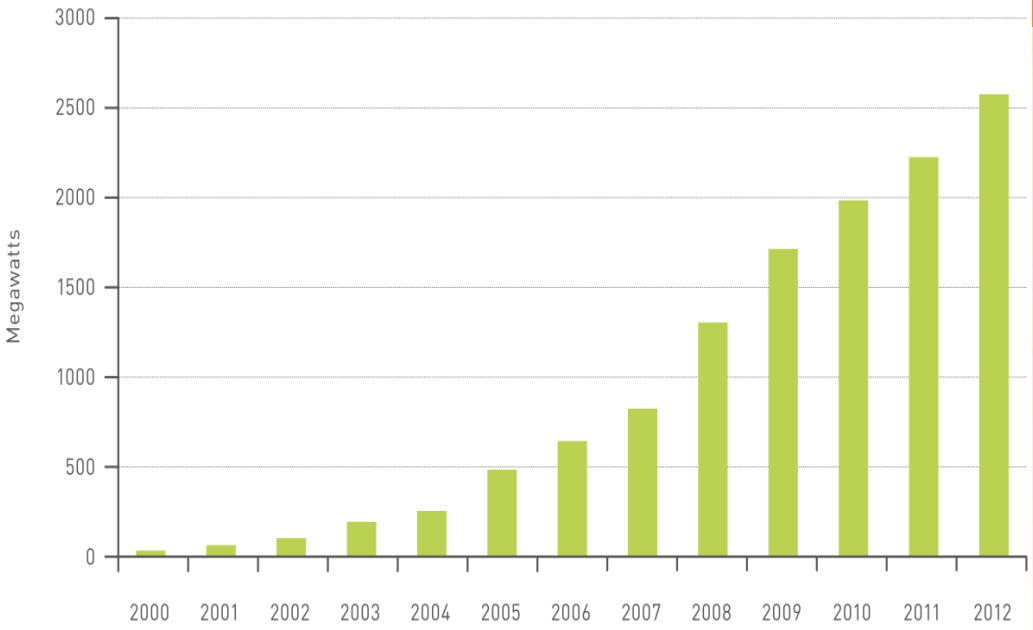
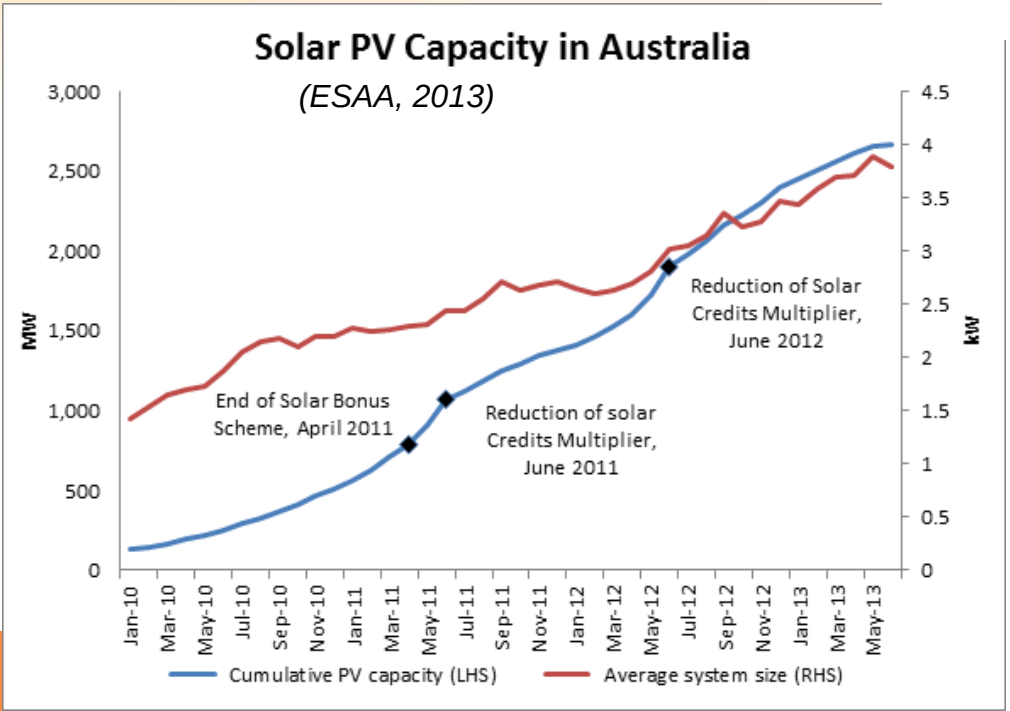
Australian renewables progress

Cumulative installed wind capacity in Australia (2000-2012)[1]

(*Clean Energy Council, 2013*)





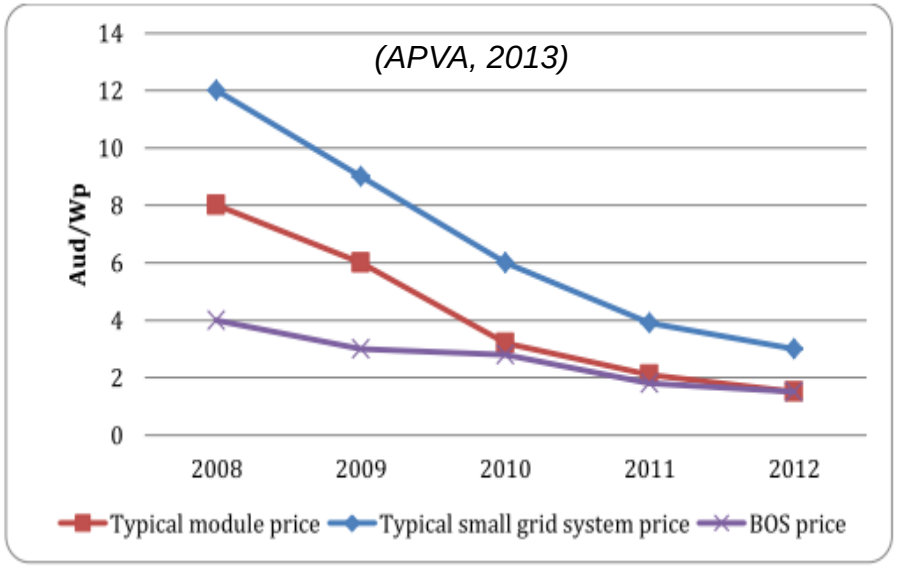


Figure 2: Typical module, system and balance of system costs Australia 2008-2012

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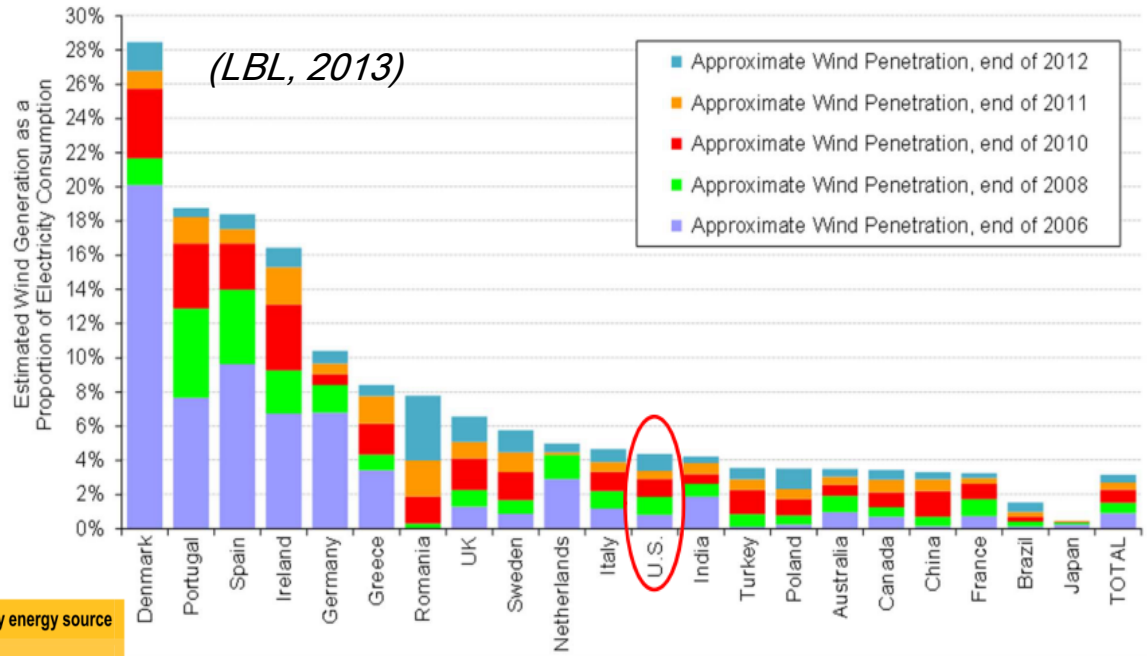
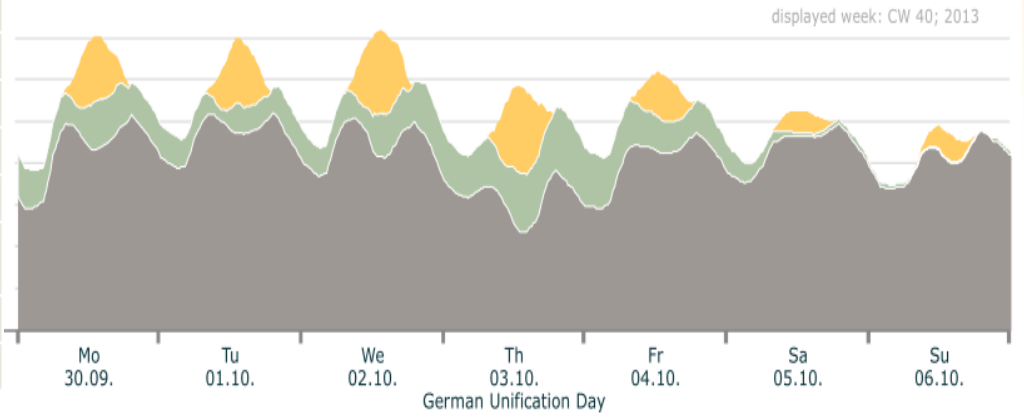
Renewables starting to transform electricity industries globally



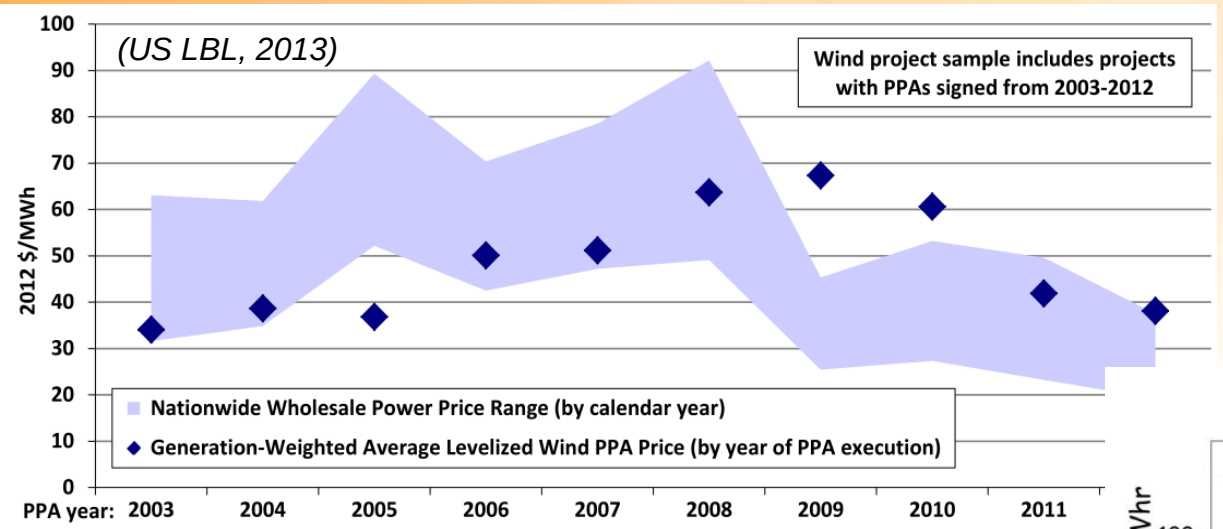
Energy source	South Australia registered generation capacity		Electricity generated in 2012–13 by energy source	
	Megawatts (MW)	Percentage of total	Gigawatt hours (GWh)	Percentage of total
Gas	2,672	50%	6,786	52%
Wind	1,203	23%	3,483	27%
Coal	770	14%	2,238	17%
Rooftop PV[a]	400	7%	497	4%
Diesel	270	5%	12	<1%
Landfill methane/ landfill gas	16	<1%	55	<1%
Hydro	3	<1%	6	<1%
Total	**5,334**	**100%**	**13,077**	**100%**



	max. power	date max. power	weekly energy
Solar	20.5 GW	03.10., 13:00 (+2:00)	0.62 TWh
Wind	16.6 GW	03.10., 20:45 (+2:00)	1.2 TWh
Conventional > 100 MW	52.1 GW	01.10., 19:00 (+2:00)	7.0 TWh

Challenging conditions in some markets

… falling demand / demand growth, policy driven RE contributing to over-capacity, falling prices



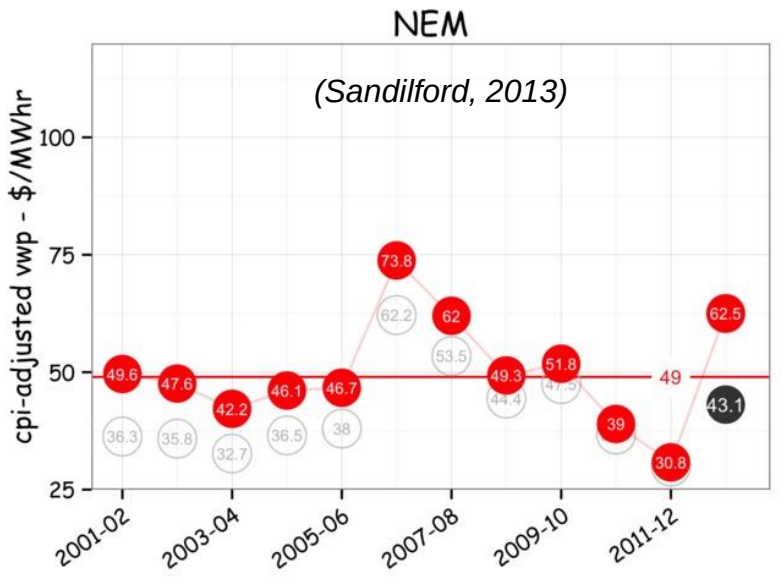

Eon warns of more plant closures as first-h
profits fall 42%

(VaasaETT, 2013)

By Chris Bryant in Frankfurt

Eon blamed a decline in European wholesale power prices and the boom in renewable energy for a fall in first-half earnings as capacity utilisation in its fossil power generation business declined.

The German utility reiterated that it would consider shutting or mothballing fossil power plants in Europe in response to what it describes as "interventionist" energy policies and regulations that subsidise and prioritise renewable energy.



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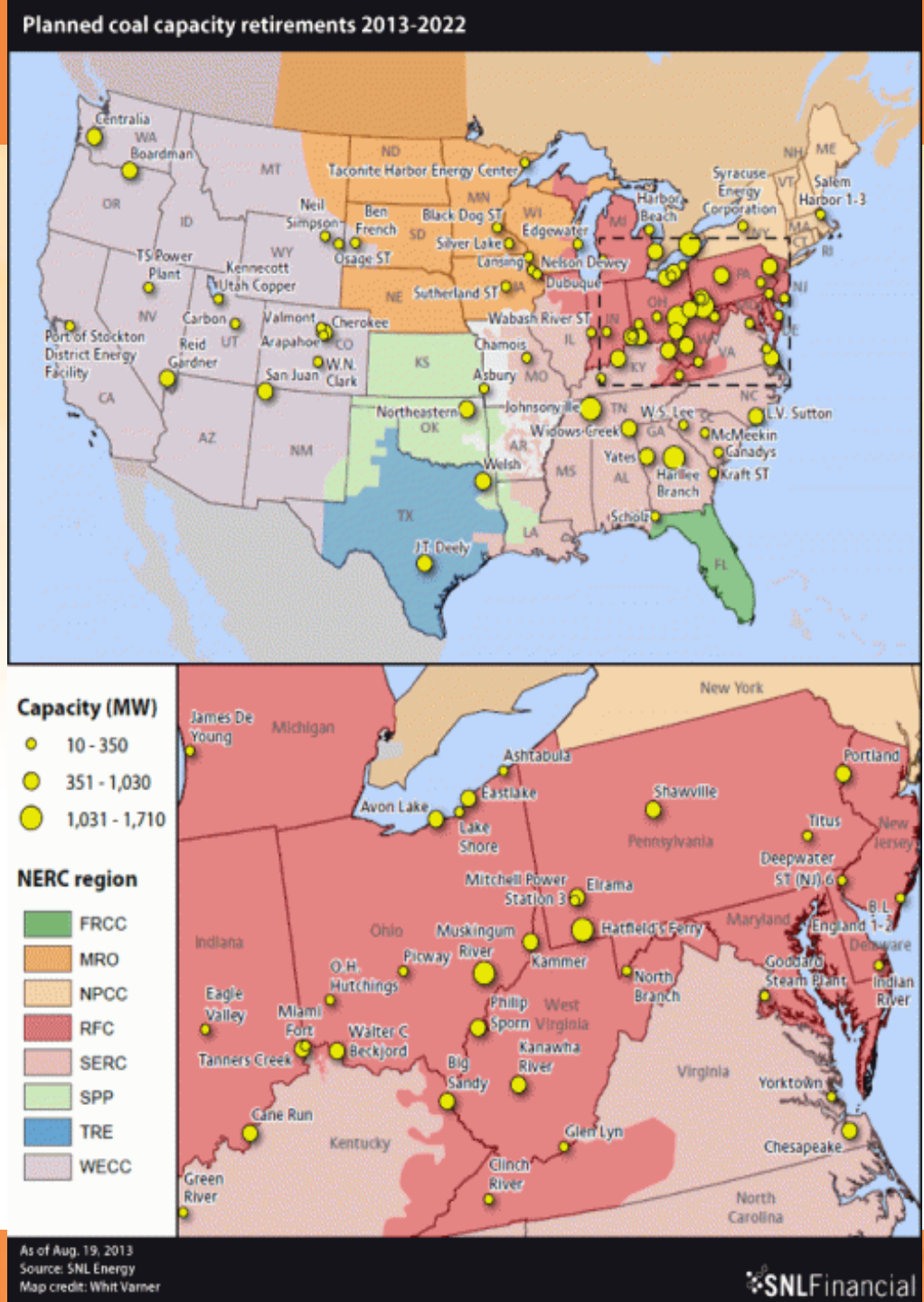
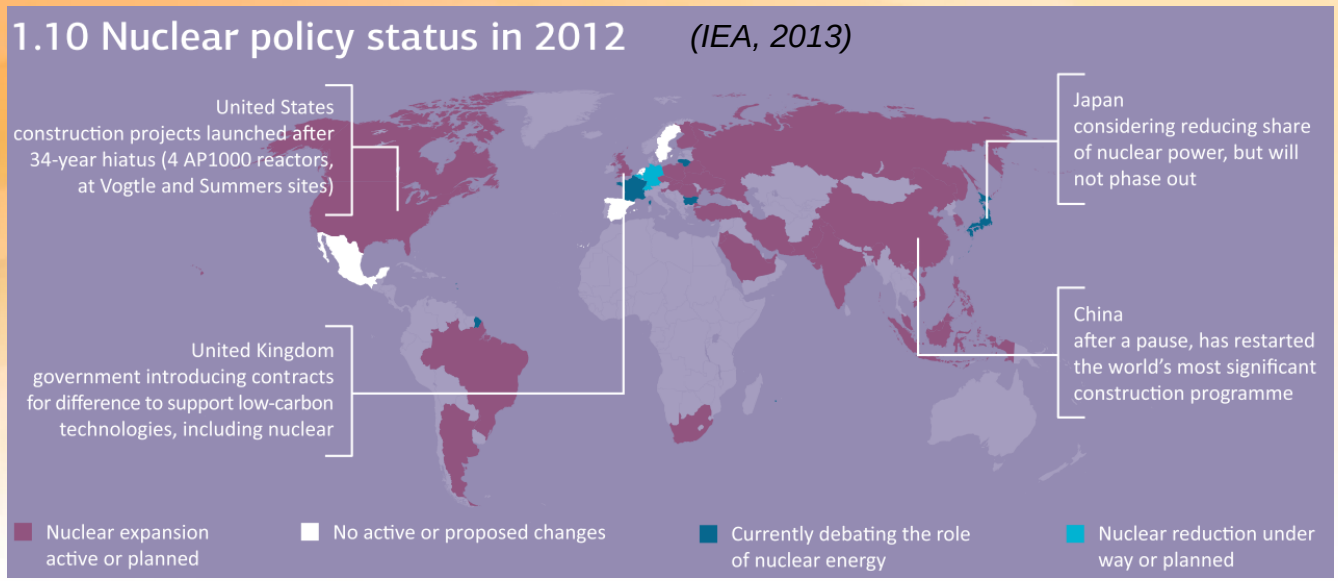
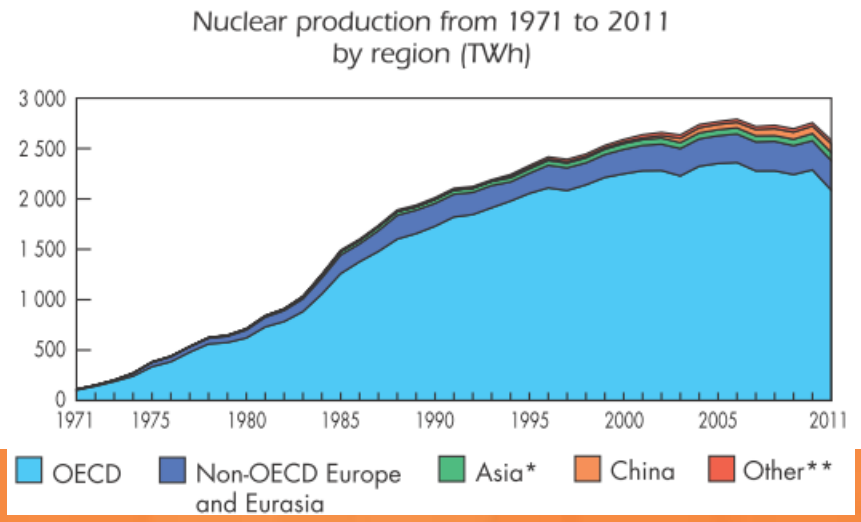
Non-climate enviro impacts also now key drivers

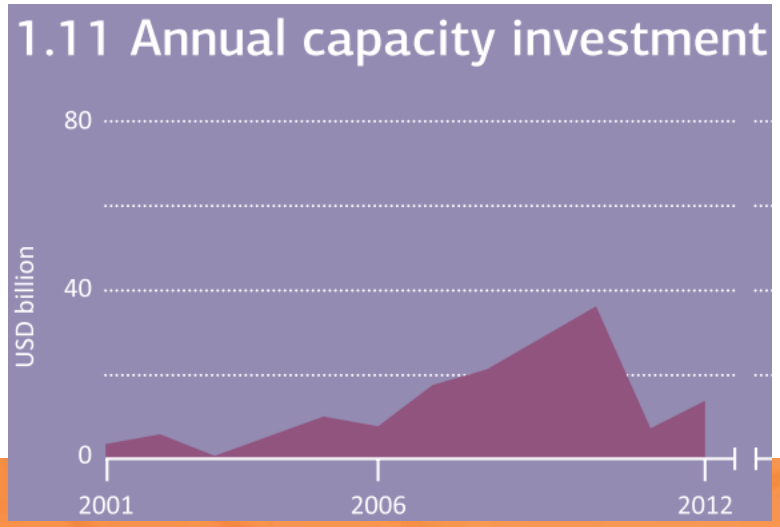
"China's State Council has announced that it is banning the construction of new coal-fired power plants near Beijing, Shanghai and Guangdong. The goal is to cut air pollution in the country's eastern megalopolises. The hope is that by 2017 Beijing residents will be breathing in 25% less fine particulate matter than in 2012."



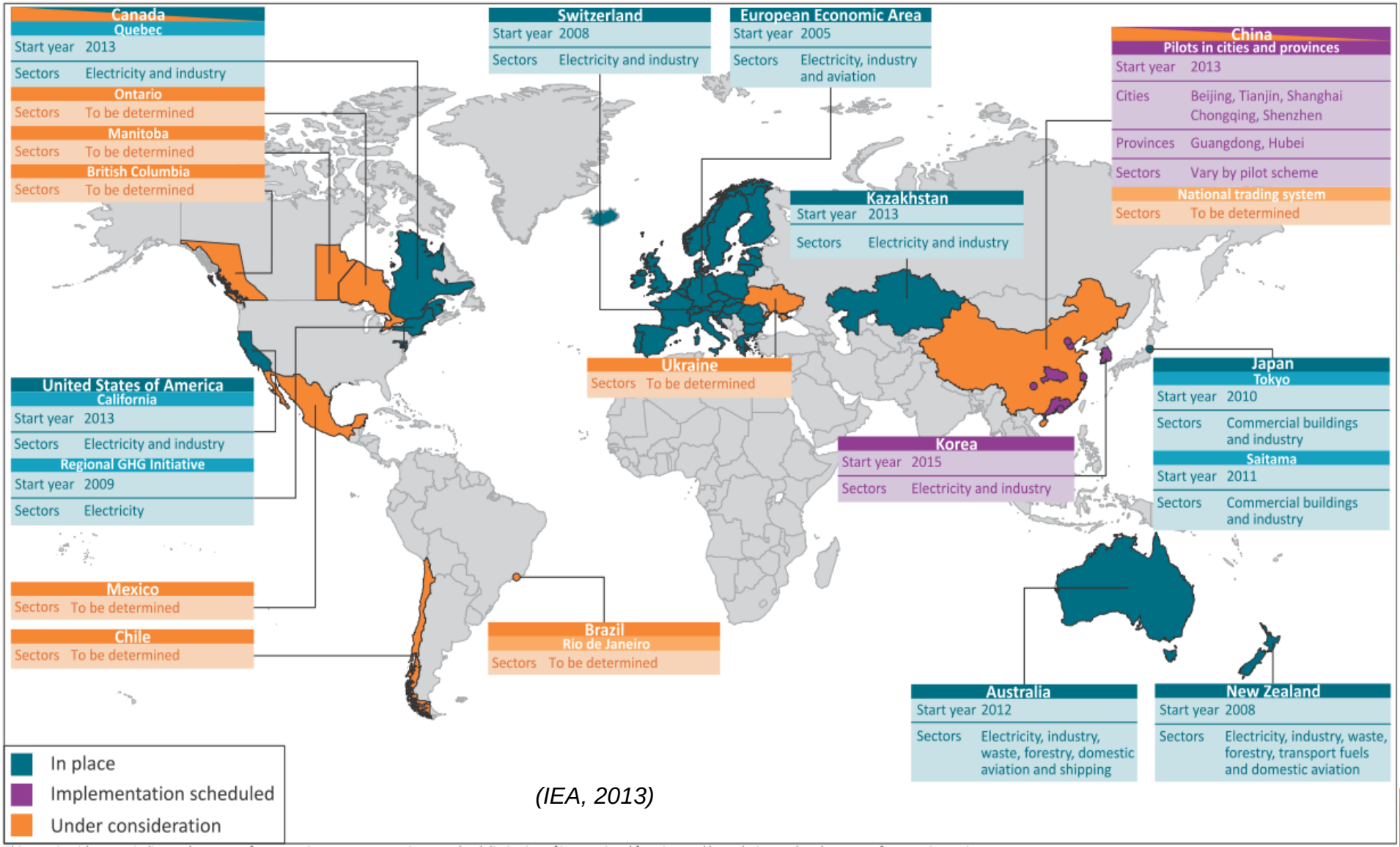
Challenging conditions for nuclear





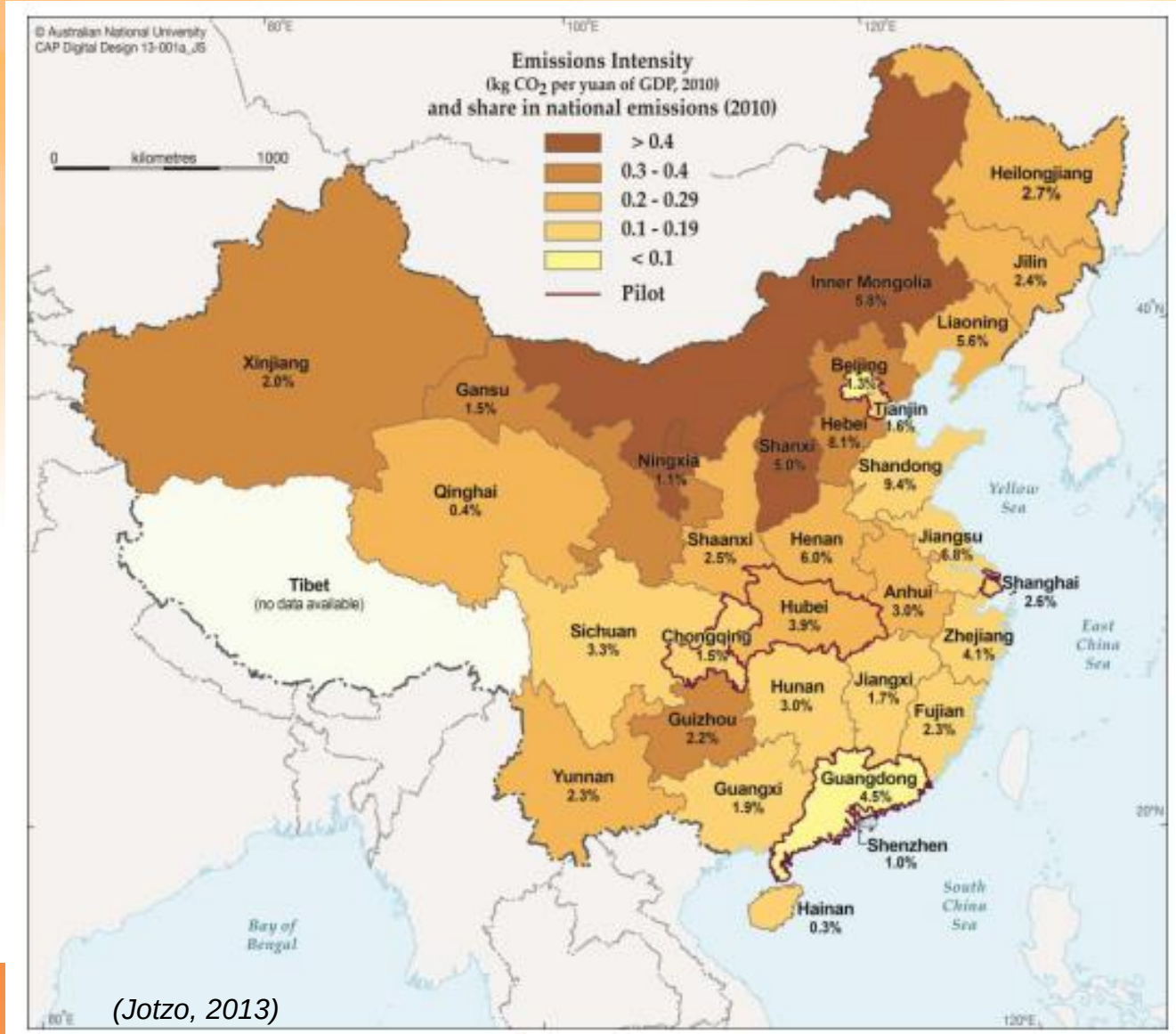


Carbon pricing efforts globally evolving



(IEA, 2013)

Chinese province/city ETS pilots



(Jotzo, 2013)

These are significant pilots

Statistics for pilot provinces and cities, 2010

	Population (million)	GDP (RMB billion)	GDP per capita (RMB 1000's)	Energy use (million tonnes SCE)	Energy use per capita (tonnes SCE/ person)	Carbon dioxide emission (million tonnes)	Emissions per capita (tCO2/person /year)	Emissions intensity (kgCO2/ RMB)	Electricity use (Gwh)
Shenzhen SEZ	10	903	87	49	4.7	n.a.	n.a.	n.a.	69
Beijing	20	1182	60	70	3.5	103	5.2	87	83
Tianjin	13	781	60	68	5.3	134	10.3	172	68
Shanghai	23	1556	68	112	4.9	211	9.2	136	130
Chongqing	29	616	21	79	2.7	125	4.3	203	63
Hubei	57	1250	22	151	2.6	320	5.6	256	142
Guangdong	104	4016	39	269	2.6	444	4.3	110	406
China	1341	31234	23	3895	2.9	8146	6.1	261	4193
Pilot schemes combined	*256*	*10303*	*40*	*798*	*3.5*	*1337*	*5.2*	*130*	*960*
Pilot schemes share of national total	*19%*	*33%*		*20%*		*16%*			*23%*

(Jotzo, 2013)

The IEA status report

Table I.1 Summary of progress *(IEA, 2013)*

On track?	Status against 2DS objectives	Policy Recommendations
Renewable power	On track to meet 2DS objectives in terms of absolute generation and investment levels. Concentrating solar power, offshore wind, enhanced geothermal not advancing quickly enough.	▪ For more mature markets and technologies, policies to enable greater market and system integration of higher penetrations of variable renewables are vital. ▪ For less developed markets and technologies, strategies should focus on market expansion or stimulating early-stage deployment. ▪ Policies must be predictable and transparent. ▪ Markets must be designed to allow recuperation of capital cost of investments. This is particularly important for technologies with very low marginal costs.
Nuclear power	Projected 2025 capacity 15%-32% below 2DS objectives. Both new-build activity and long-term operation of existing reactors required to meet 2DS goals.	▪ More favourable electricity market mechanisms and investment conditions required to de risk investments and allow investors to recuperate high upfront capital cost. ▪ Post-Fukushima safety upgrades should be quickly implemented to foster public confidence.
Gas-fired power	Share in thermal generation has increased at the expense of coal in some regions, but not all.	▪ Higher carbon prices and other regulatory mandates are required to drive coal-to-gas switching outside the United States. ▪ Development of unconventional gas resources would help bring down gas prices and potentially trigger coal-to-gas switching in regions that currently rely heavily on coal. Scaling up unconventional gas extraction requires careful regulation and monitoring, in order to avoid adverse effects on the environment.
Coal-fired power	Growth is outpacing increases in generation from non-fossil energy sources. Projected global coal demand exceeds 2DS levels by 17% in 2017, higher than 6DS pathway.	▪ Governments must explicitly recognise the impact of increasing coal-fired power generation. ▪ To reduce the impact of increasing coal use, ultra-supercritical units should be installed unless there is strong reason not to do so. ▪ Pricing and regulation that reduce CO_2 emissions, control pollution and reduce generation from inefficient units are vital.
CCS	Capture capacity of projects currently operational or in pipeline is only 25% of 2DS 2020 target. Still no large-scale integrated projects in power sector; and few in industry.	▪ Governments must show real financial and policy commitment to CCS demonstration and deployment. ▪ Near term policies should be supported by credible long-term climate change mitigation commitments. ▪ Recognise the large investments and long-lead time required to discover and develop viable storage capacity. ▪ Address CO_2 emissions from industrial applications and introduce CCS as a solution.
Industry	Reasonable progress in improving energy efficiency, but there remains significant potential to deploy best available technology and optimise processes.	▪ Implement policies to ensure that new capacity is developed with best available technology and that industrial plant refurbishment projects are promoted to meet energy efficiency targets. ▪ Measures to facilitate access to financing are vital. ▪ Particular efforts are needed to improve energy efficiency in light industry and SMEs. ▪ To avoid technological lock-in of inefficient technology in developing countries, technology transfer efforts must be enhanced.

Not on track Improvement, but more effort needed On track, but sustained deployment and policies required

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Thank you… and *questions*

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