

Nuclear Power and Climate Change

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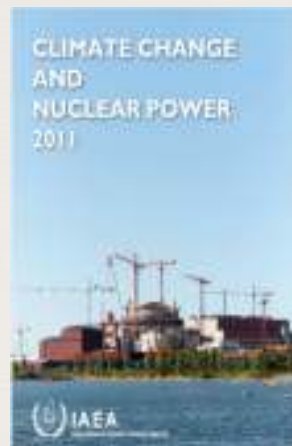
Africa Side Event, UNFCCC COP17

ICC, Durban, South Africa, 6 December, 2011



Main Messages

- **Global energy demand increases**
- **Global GHG emissions must peak and decline**
- **Nuclear energy is a low GHG technology**
- **Nuclear power can make a substantial mitigation contribution in any serious long-term mitigation strategy**



Overview

1. The energy-climate challenge
2. Need for NP
3. Supplying NP
4. Concerns about NP
5. Future of NP
6. Main messages



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1. Challenge: Energy

Energy: All projections: fast increase in global energy demand over the next few decades

IEA: WEO (2011) and ETP (2010) Reference Scen

Total *primary energy* demand (TPED):

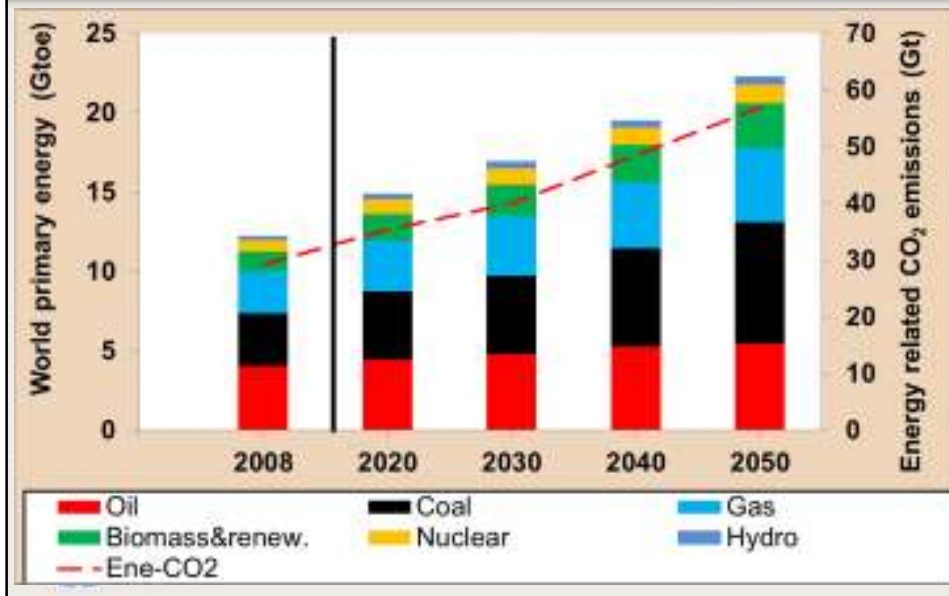
to ~17 Btoe (2030), ~23 Btoe (2050)

→ **EneCO₂**: from 2008 ~50+% (2030) ~100+% (2050)



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1. Challenge: IEA Reference scenario



1. Challenge: Climate

Climate:

UNFCCC Article 2: stabilize atmospheric GHG concentrations to avoid dangerous CC

IPCC AR4 (2007) confirmed:

Dangerous anthropogenic interference (DAI)

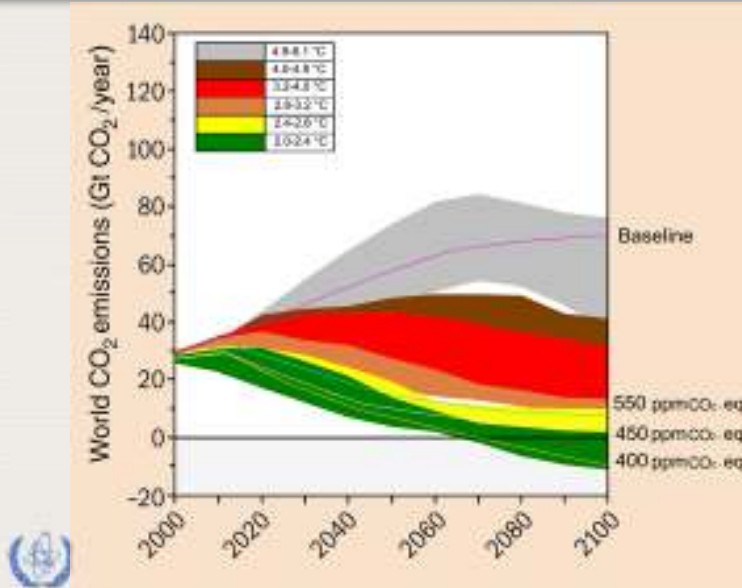
not a scientific question; science informs;

a social and political decision

CPH target: 2°C GMT above pre-industrial,
confirmed by G8 and G20 meetings



1. Challenge: Stabilization levels



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1. Challenge: To close the GHG gap

Contrast:

IEA scenarios: EneCO₂ up 100+% by 2050

IPCC <2.4°C GMT: GHG -50 to -80% by 2050

Feasible?

IPCC AR4 (2007): technologies are available

IEA Energy Technology Perspectives (ETP 2010):
energy revolution needed

Next: how to do it – mitigation potential
role for nuclear energy?



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2. Need: CO2 mitigation potential

IPCC WGIII Chapter 4 Focus: *Costs and potentials* for low-carbon *electricity* supply technologies

- Baseline: IEA WEO 2004 Reference

Mitigation components:

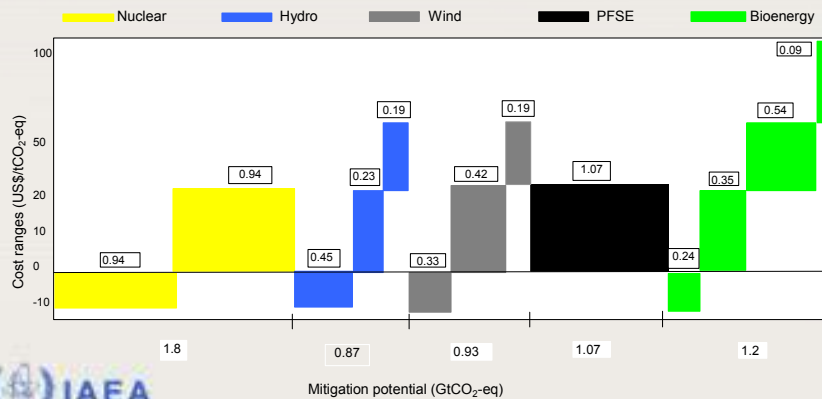
- *Fossil* sources: technology change (conversion efficiency); fuel switch (coal-to-gas: emission intensity) + decarbonisation (CCS)
- *Nuclear*
- *Renewables*: Hydro, wind, bioenergy (incl. biofuels for transport), geothermal, solar



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2. Need: CO2 mitigation potential

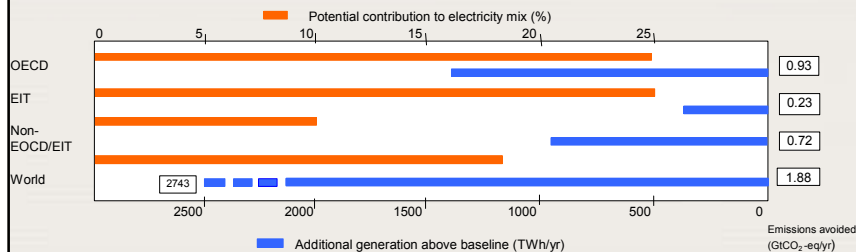
Result: Potential GHG emissions avoided by 2030 in power generation: potential and cost ranges (potential > 0.5 GtCO₂-eq) (Based on IPCC AR4)



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2. Need: CO2 mitigation potential

IPCC AR4: Nuclear contribution and emissions avoided by 2030



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2. Need: Nuclear provides low CO2 energy

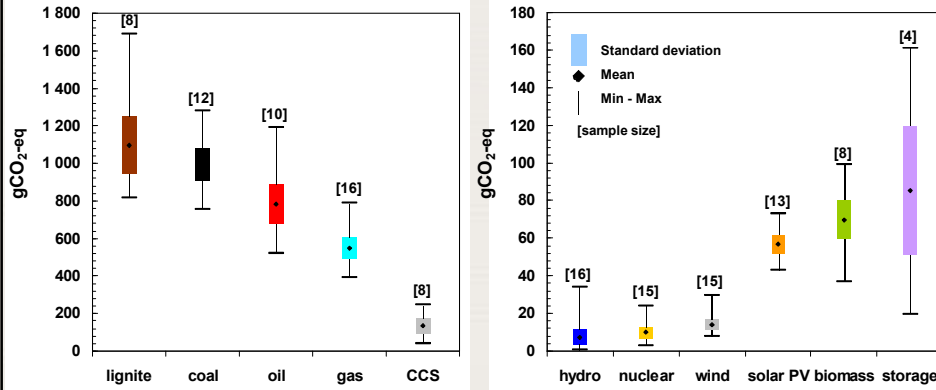
- Almost no GHG emissions during operation
- Some emissions in construction, fuel cycle, decommissioning
- *Very low emissions on life-cycle basis:*
 - 15 studies; range: 2.8-24 gCO₂-eq/kWh
 - Mean: below 10 gCO₂-eq/kWh
- Contributions: GHG emissions avoided in past
- Low-carbon electricity sectors: countries with large shares of renewables and nuclear



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2. Need: Nuclear provides low CO₂ energy

Life cycle GHG emissions of different electricity generating options

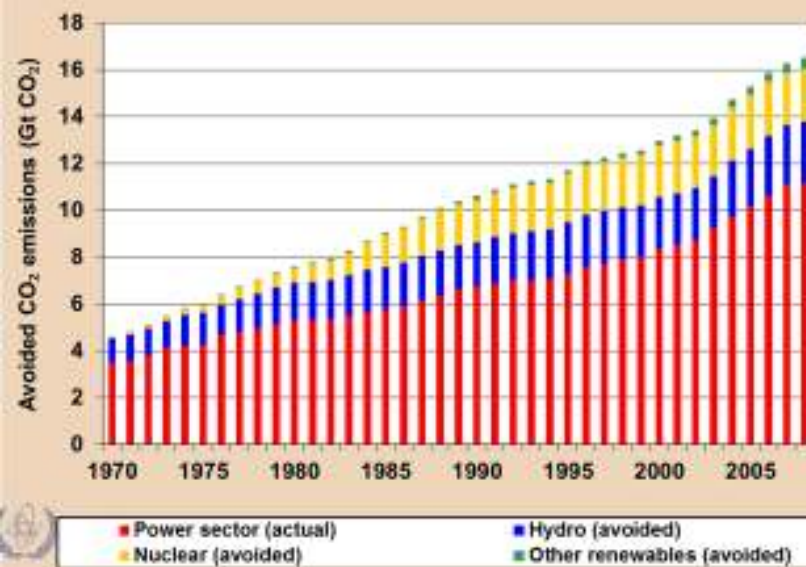


Nuclear power: Very low lifetime GHG emissions make the technology an effective climate change mitigation option

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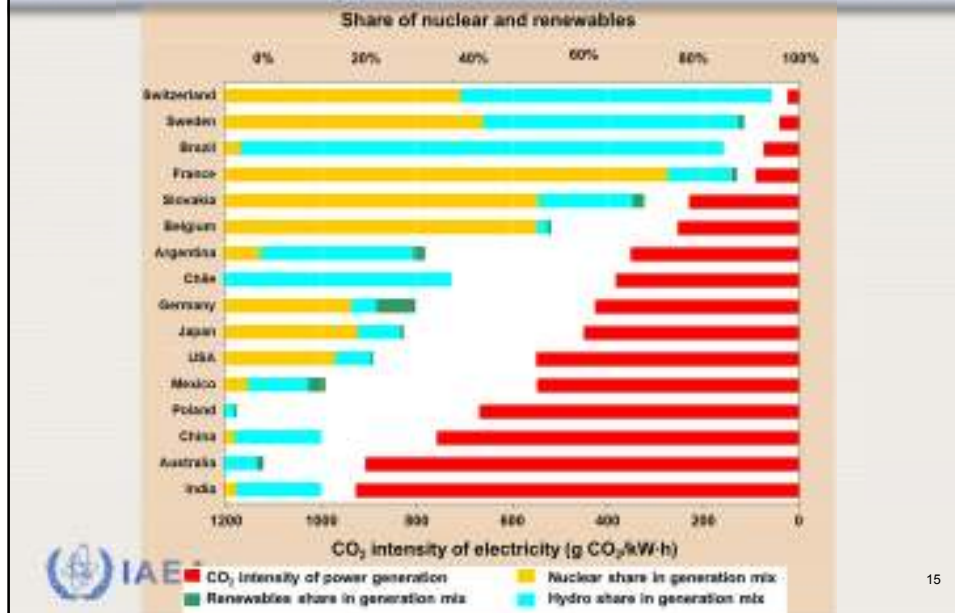
Source: Weisser, 2007

2. Need: avoided CO₂ emissions by hydro, nuclear, renewables



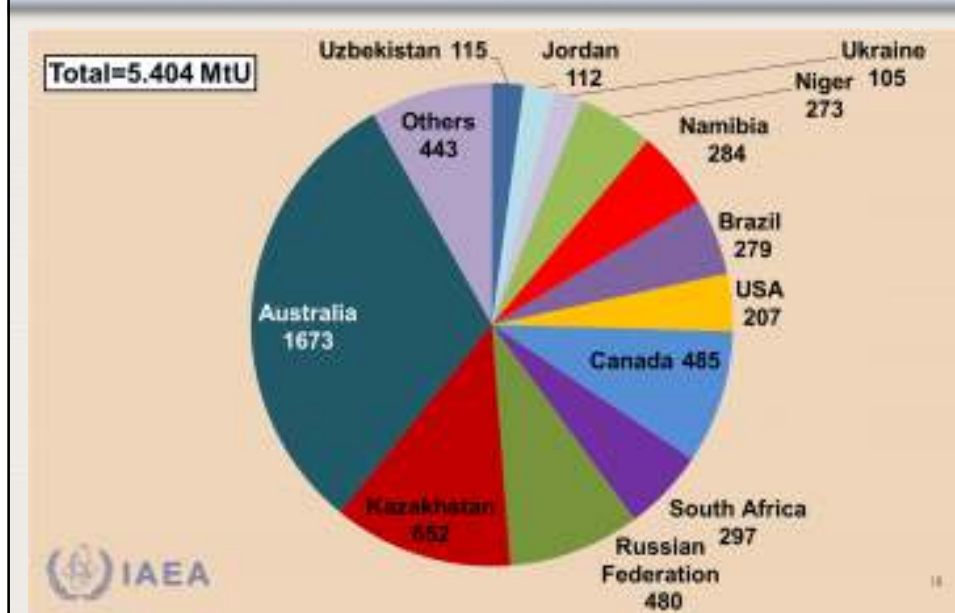
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2. Need: Power Sector CO₂ Emissions vs Shares of Renewables & Nuclear Power



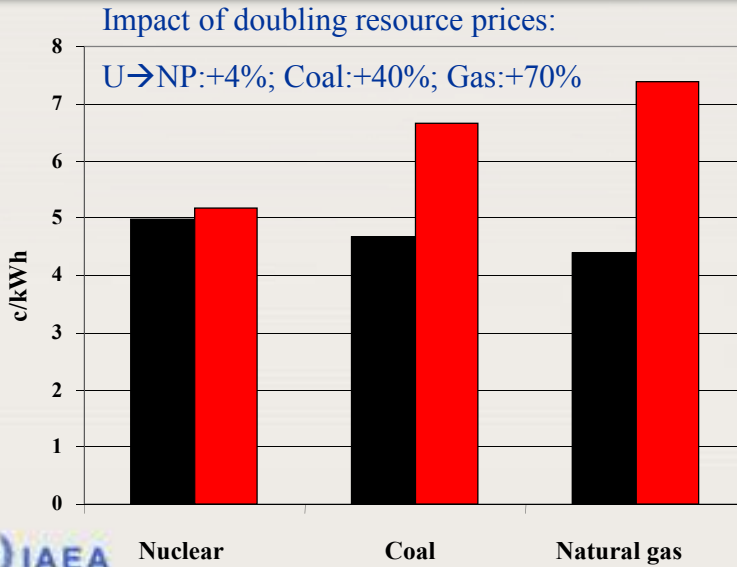
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2. Need: Supply security concerns Resources spread, fuel market competitive



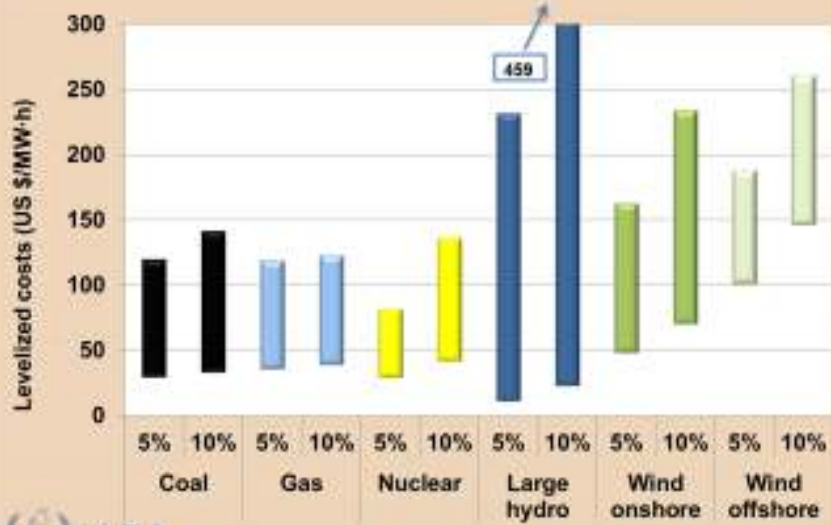
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2. Need: Supply security concerns Fuel cost a small fraction of electricity cost



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3. Supply: Competitive costs

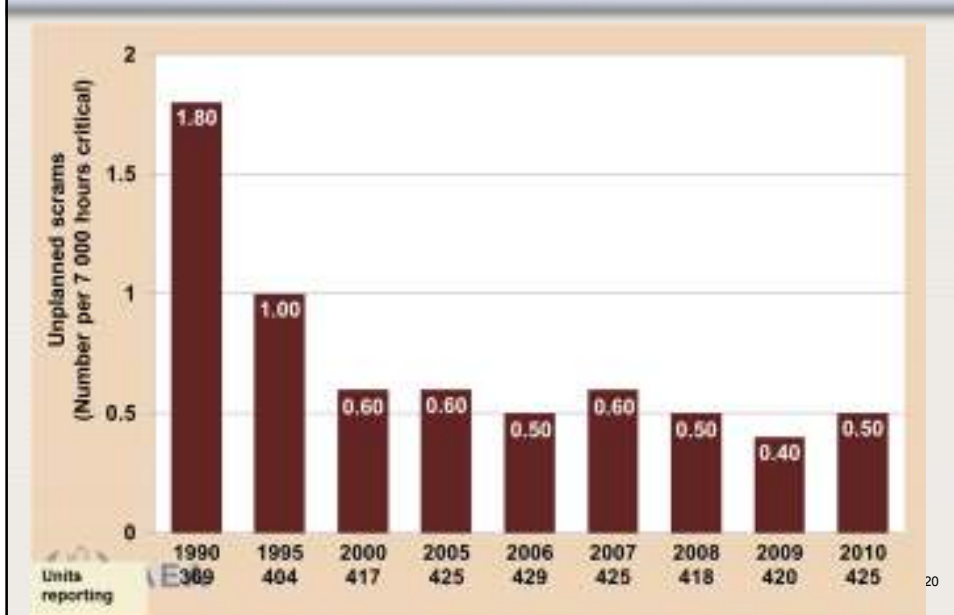


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3. Supply: Sufficient uranium available



4. Concerns: Plant safety improving - but then Fukushima happened



4. Concerns: Nuclear power after Fukushima: IAEA Action Plan

Objectives of the Action Plan

- To define a programme of work to strengthen the global nuclear safety framework ...
- ... building on the Ministerial Declaration, the conclusions and recommendations of the Working Sessions including the INSAG letter report (GOVIN/2011/11), and facilitation of consultations among Member States.



4 Concerns: Action Plan consists of 12 key actions

1. Safety assessments in the light of the accident;
2. IAEA peer reviews;
3. Emergency preparedness and response;
4. National regulatory bodies;
5. Operating organizations;
6. IAEA Safety Standards;
7. International legal framework;
8. Newcomers;
9. Capacity building;
10. Protection of people and the environment;
11. Communication and information dissemination;
12. Research and development.



4. Concerns: Players in the Action Plan

- This is *not* an Action Plan only for the employees of the IAEA Secretariat.
- It *must involve* Member States, regulators, nuclear operators, vendors, international and intergovernmental organizations involved in nuclear matters.
- Successful implementation necessitates *full cooperation* and participation of all.
- Actions is explicitly addressed either to MS or to IAEA, or to other stakeholders

4. Concerns: Transparency in the Action Plan

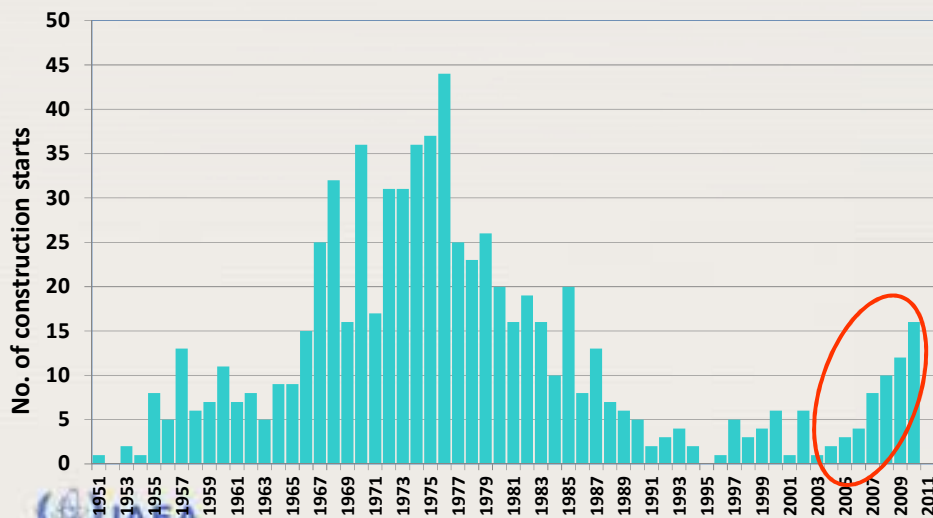
- Transparency on the evaluation by peers is a key element of the Action Plan.
- It is the necessary first step to rebuild trust in nuclear energy.
- Systematic use by Member States of peer review missions will play a decisive role towards harmonization and strengthening of safety practices.



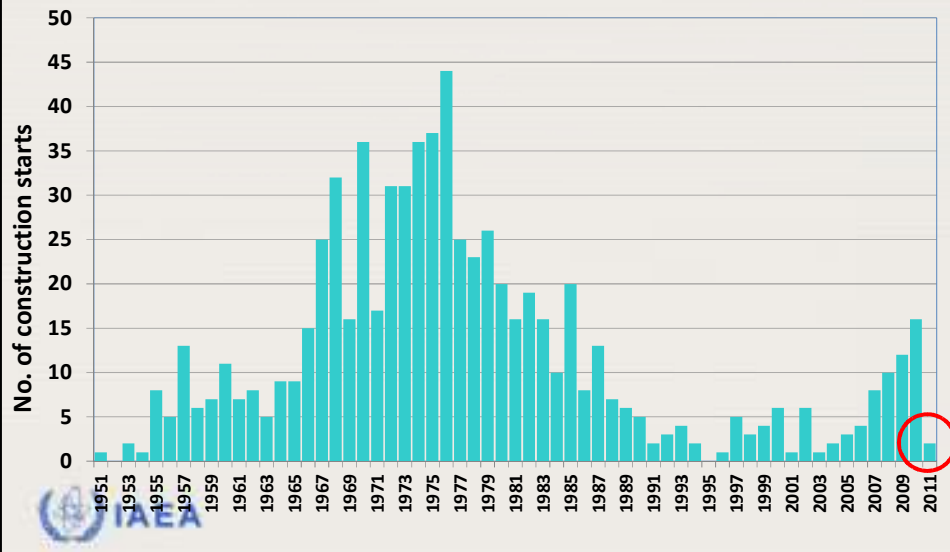
5. Future: Nuclear power after Fukushima

- Continued use of existing NPPs challenged in Germany
- Continued use of NP in principle not opposed in other countries
- New build disputed in Japan, Italy and Switzerland
- A lot will depend on the
 - Transparency and effectiveness of dealing with the aftermath in Fukushima
 - Short- and long-term impacts on the local population
 - Full understanding of causal chain
 - Availability and economics of alternatives
- So far: no significant retraction of NP programmes globally

5. Future: Construction starts (1 Dec 2011)



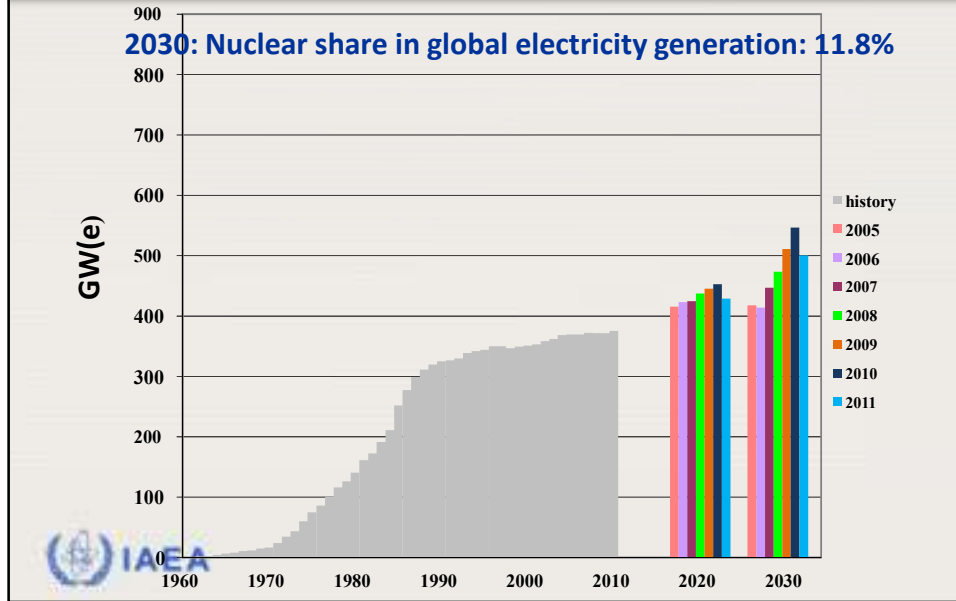
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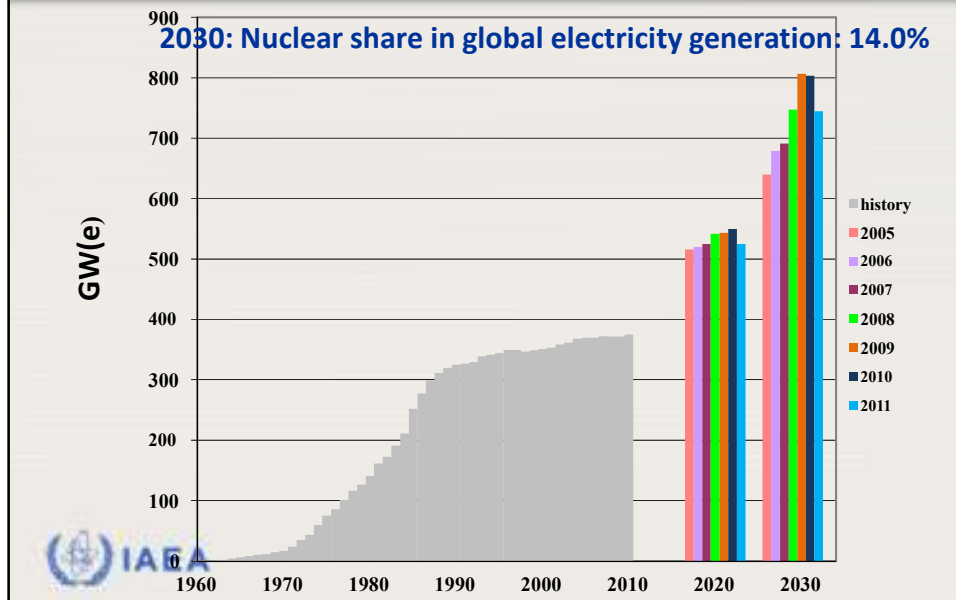
5. Future: After Fukushima - drivers of renewed interest in nuclear power remain

- Global energy demand is set to grow →
Nuclear power expands supply options
- Environmental pressures are rising →
Nuclear power has low life-cycle GHG emissions
- Energy supply security back on the political agenda →
Nuclear power contributes to energy security
- Reliable base load electricity at predictable and affordable costs for meeting MDGs →
Nuclear power offers stable and predictable generation costs based on low resource costs

5. Future: IAEA – LOW projection



5. Future: IAEA – HIGH projection



6. Summary

3E problems: climate change, fast growing energy demand, domestic energy sources, supply security, import prices, current account balance, competitiveness, sustainability ...

Nuclear energy is *not a magic cure* but:
it could be *part of the remedy*

Where, when, how much, what arrangements:
depends on *national* circumstances and
priorities → *decision of sovereign states*

IAEA mandate: tools, capacity building,
information, support, services to MSs



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IAEA - <http://www.iaea.org/OurWork/ST/NE/Pess>



...atoms for peace.

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