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National Nuclear Policy- Why, What and How?

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National Nuclear Policy- Why, What and How?

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National Nuclear Policy- Why, What and How?

Nuclear Power and Energy Mix

- Energy Policy: Catalysts, Pathways and Objectives
- Role of nuclear in the energy mix
- Nuclear power: Advantages and Disadvantages, Safety and Security of energy supplies
- Factors that influence nuclear policy.

Climate Mitigation and Nuclear Power

- Climate mitigation efforts and nuclear policy
- Trade-off between climate mitigation targets and nuclear power

Nuclear Power in Developing Economies

- Energy policy making of developing economies : challenges and opportunities
- Regional nuclear capacities in Asia

Emerging Debates on Energy and Nuclear

- Nuclear power and public perception
- Role of public perception in nuclear policy making
- Inferences

Energy and Policy

- Energy is the capacity of a physical system to do work
- Energy policy is the way a state approaches the issues related to the resources that fuel its economic activities. It is a plan to achieve specific objectives related to energy availability, affordability and accessibility.
- Energy Security is ensuring uninterrupted supply of all types of energy sources to fuel the economic engine of a country, at an affordable price and at all times
- Energy Security of an import dependent economy and exporting economy are different
- Challenges to energy security is a challenge to national security

Energy Policy: Catalysts, Pathways and Objectives

Catalysts

- Demand for fuelling Transport, Industry etc., Geopolitical Challenges, Demand for energy transition, Technological changes and inventions, Resource findings, Natural Disasters, Sustainable development

Pathways

- Exploration and development, Diversification of resources, Import, Export, Enhancing domestic supply capability, Deployment of new resources, Financial tools to promote energy innovations, Energy efficiency

Objectives

- Energy Security, Economic targets, Poverty alleviation, Wellbeing of citizens, Climate mitigation, Security Perceptions

Which is a better fuel?: Risk-Priority Perception

Fuel Types / Policy targets	Fossil Fuel Dependency		Renewable Dependency		Nuclear Dependency	
	Priority	Risk	Priority	Risk	Priority	Risk
Climate Targets	Low (High emissions)	High (high emission)	High (cleaner energy supply)	Low (Low Emission)	High (low emission)	Low (low emission)
Energy Security	High-low (depending on energy mix share)	High (supply security, geopolitics)	High (self-reliance if developed adequately)	High-Medium (intermittency concerns)	High (meeting electricity demand)	Low (less vulnerable to geopolitics)
Self-reliance	Low (overseas dependency)	High (volatile supply)	High (Low overseas dependency)	Low (domestic supply)	High (Electricity supply)	Medium (fuel supply concerns)
Domestic economy	High (role in domestic economy)	High (High energy bill)	High (no overseas dependency)	High-Medium (capital cost, intermittency)	High (economic activities)	High (spent fuel, reprocessing.)
Public Acceptance	Medium (Environmental damage)	Medium (environmental damage)	High (no geopolitical challenge, no fuel cost)	High (perception of high electricity cost)	Low (perception of radiation effect)	High (radiation hazards, natural disasters)

The matrix is only indicative. Source: www.iges.or.jp/en/news/press/pdf/12_06_04.pdf

Nuclear Energy Policy

- The fuel choices a country make is a political decision based on resource availability, accessibility and affordability, prioritising its economic, social and national security considerations.
- Nuclear policy should define
  - plans, actions and objectives towards building, developing, operating nuclear facilities, and guiding and regulating the use of nuclear power for the purpose of meeting the energy demand of an economy.
- Nuclear policy is not a simple yes or no question- it is built on economic priorities and national interests
- Nuclear energy policy constitutes Economic, political, technological, legal, educational and social components

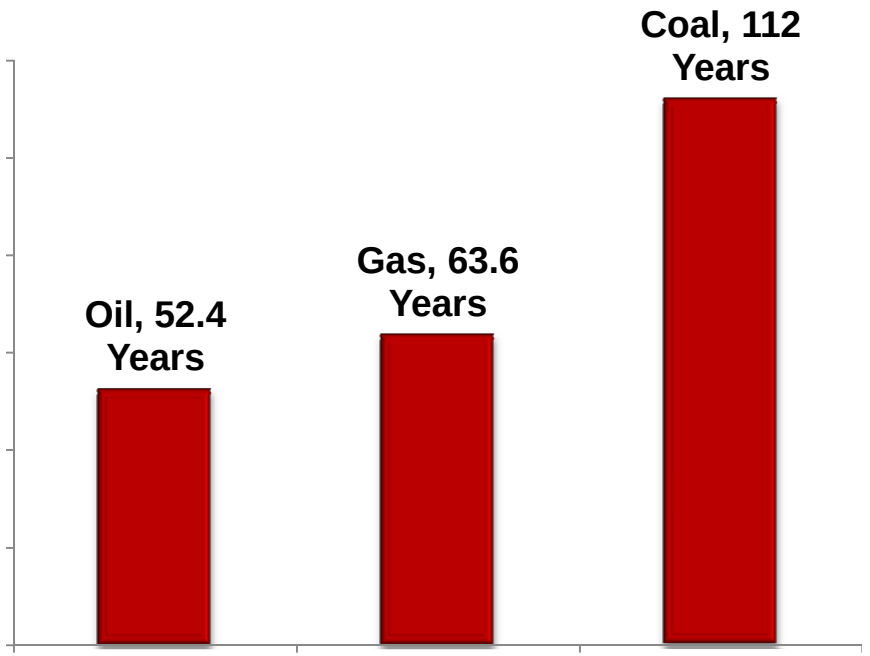
Nuclear Energy Policy contd…

- Relevance of Nuclear Energy: To meet growing electricity demand in technologically and economically feasible way, keeping the energy related GHG emission lower than conventional fossil fuel sources.
- It is a long term power supply option, less vulnerable to geopolitical issues and price fluctuations etc.
- Each country must make its own energy choices; one size does not fit all.
- Energy Demand from three different perspectives: Population Growth, Energy Security Concerns, Climate Change

Why Nuclear Energy?: Policy Concerns

- Key Concerns
- Resource Availability: Can the finite fossil fuels alone meet growing energy demand?
- Concerns on Peak Oil- How long will fossil fuel last? (Peak Oil)
- How effectively alternative sources can replace fossil fuels in the energy mix
- Resource Distribution: Unequal geographic distribution demands transportation which entails high costs
- Geopolitical challenges: What is be the long term implications of dependency on overseas energy supply
- Oil price fluctuations: What is the impact of fuel price fluctuations on an economy

Reserve Production

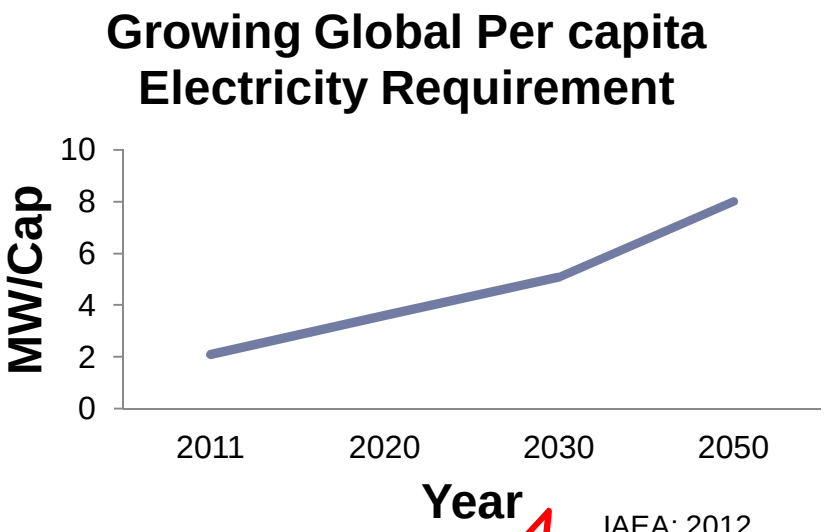


British Petroleum: 2012

Why Nuclear Energy?: Population and Energy Demand

- 300 Million in '0' AD

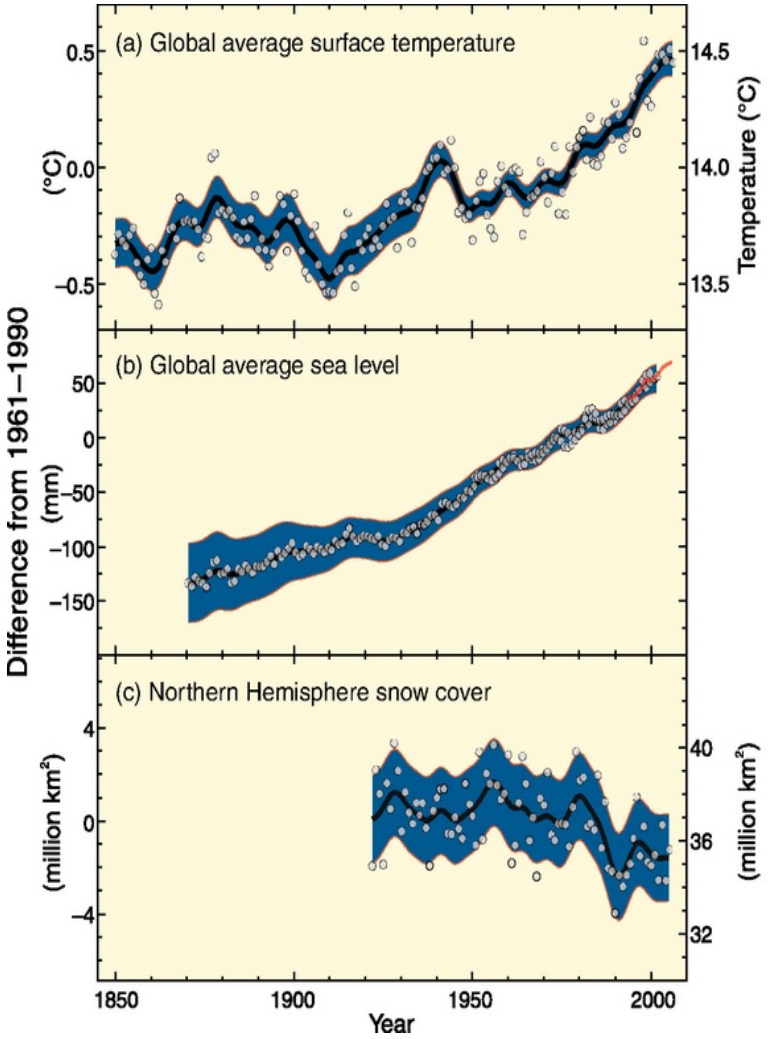
- 9 Billion in 2050



IAEA: 2012

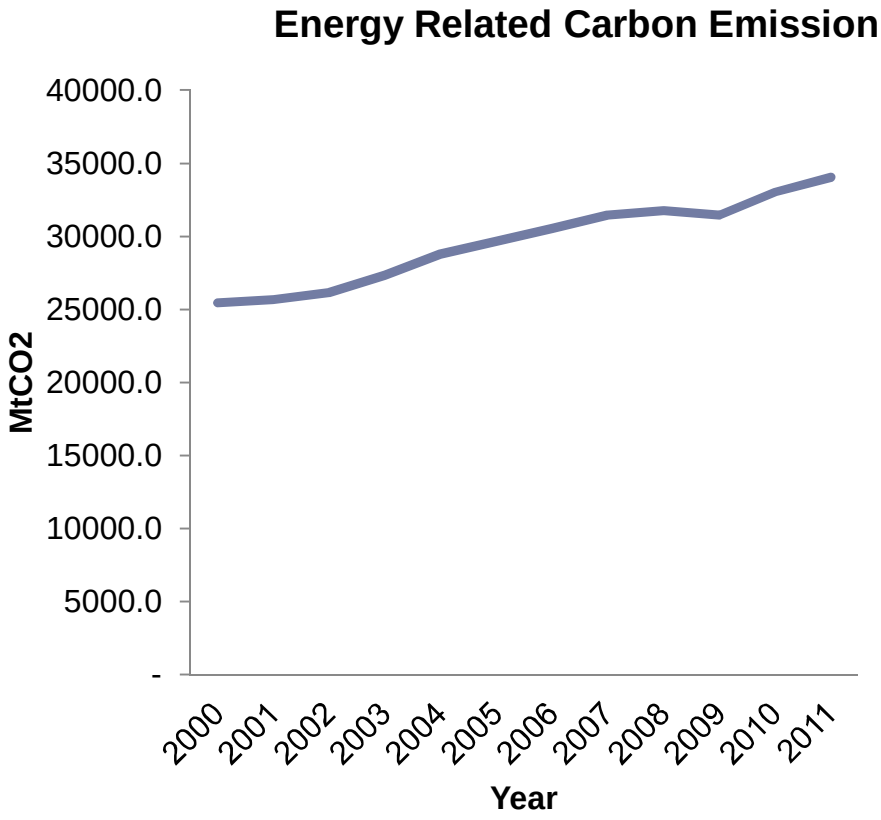
Global Climate Change Mitigation

- At UNFCCC 3rd Conference of Parties in 1997 Kyoto Protocol was adopted which sets binding targets for industrialized countries for reducing greenhouse gas emission.
- CoP 13 at Bali sets *Bali Action Plan* directing developing nations to frame Nationally Appropriate Mitigation Actions (NAMA)



Energy Related Carbon Emission

- Climate change is a serious threat to the planet and humanity
- Need to urgently take efforts to minimise energy GHG emission
- Energy related CO2 constitute a significant portion of anthropogenic emissions
- Developed countries to take emission reduction targets, and voluntary targets for developing economies



British Petroleum: 2012

Climate Mitigation and Nuclear Power

- Two prevailing schools of thought on the role of nuclear power in the global climate change mitigation.

One school see nuclear as proven low carbon energy source and argues that relying on nuclear power could contribute to climate mitigation efforts and hence must

The second school presents the view that the actual benefits of nuclear power is outweighed by the potential impact on environment in the event of an accident.

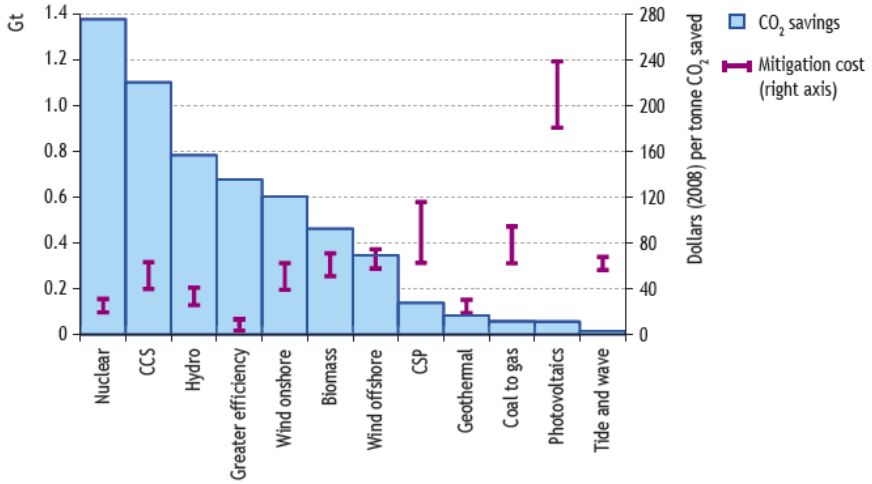
Intergovernmental Panel for Climate Change (IPCC) states:

Total life-cycle GHG emissions per unit of electricity produced from nuclear power are below 40 gCO_2-eq/kWh (10 gC-eq/kWh), similar to those for renewable energy sources. Nuclear power is therefore an effective GHG mitigation option, especially through license extensions of existing plants enabling investments in retro-fitting and upgrading. (IPCC AR4, WGIII)

Nuclear and Climate Mitigation Trade-off

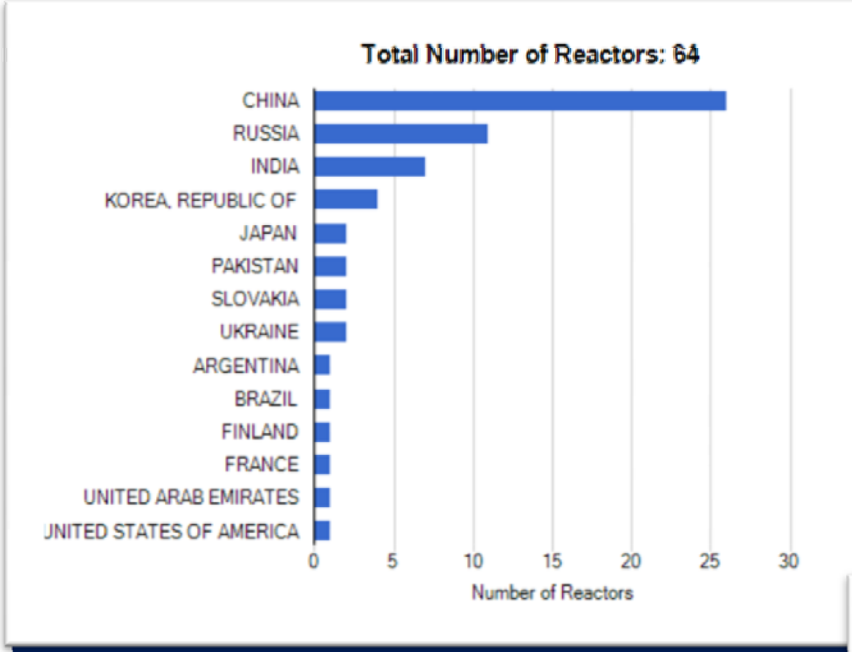
- Limiting global warming to 2degree above pre-industrial period is of critical importance to the planet's health
- Without any action to stabilize the concentration of GHG, the average temperature increase to be between 1.1 to 6.4 degrees C by end of this century (IPCC Chair), endangering life on this planet
- Global energy mix is dominated by fossil fuel and responsible for major share of energy related emission
- Techno-economic, and geographic factors may limit the share of alternative fuel in the global energy mix.
- Still 1.6 billion people are without access to electricity
- What is the relevance of nuclear power in achieving the emission reduction targets?

Mitigation cost and avoided CO2, 450 scenario (2030)



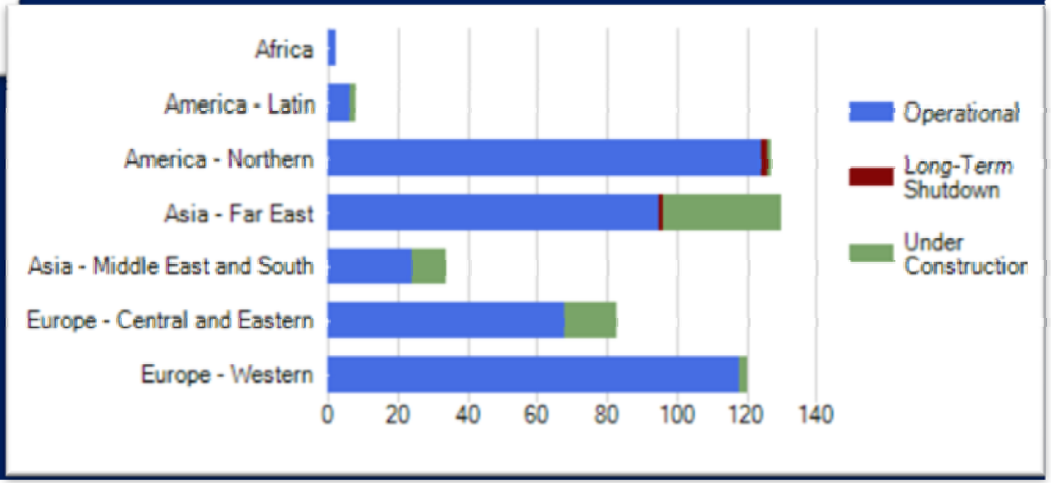
- To limit to 50% the probability of a global average temperature increase in excess of 2°C, the concentration of greenhouse gases in the atmosphere would need to be stabilised at a level around 450 ppm CO2-eq. In this scenario,
- Under 450 scenario global energy-related CO2 emissions peak at 30.9 Gt just before 2020 and decline thereafter to 26.4 Gt in 2030 — 2.4 Gt below the 2007 (IEA, WEO 2009)

Nuclear Power in Developing Asia



- Developing Asia will be responsible for a significant share of the global energy demand.
- Oil import in India and China to reach 92% and 74% of their total demand (IEA, WEO 2009)

- The region has the highest number of nuclear reactors under construction
- China and India to lead the nuclear power plant construction



India's Nuclear Energy Policy

Drivers

- Climate Mitigation
  - National Action Plans for Climate Change (NAPCC) missions
  - 20-25% of emission intensity cut by 2020
  - NAPCC highlights the importance of Nuclear power in the country's energy mix
  - Third largest CO2 emitter
  - 38% emission from power sector
- Energy Security
  - Reducing import dependency
  - Access for all, Reliability, Low carbon
- Socio economic objectives
  - Poverty alleviation
  - Employment generation

Challenges

- Cost competitiveness
  - Capital cost
- Political perception
  - Conflicting views from political sections
  - Signing 123 agreement faced political hurdles
  - Ideological differences
- Public perception
  - Concerns about nuclear safety culture
  - Post-3/11 public perception
  - Land acquisition concerns
  - Nuclear waste management

China's Nuclear Energy Policy

Drivers

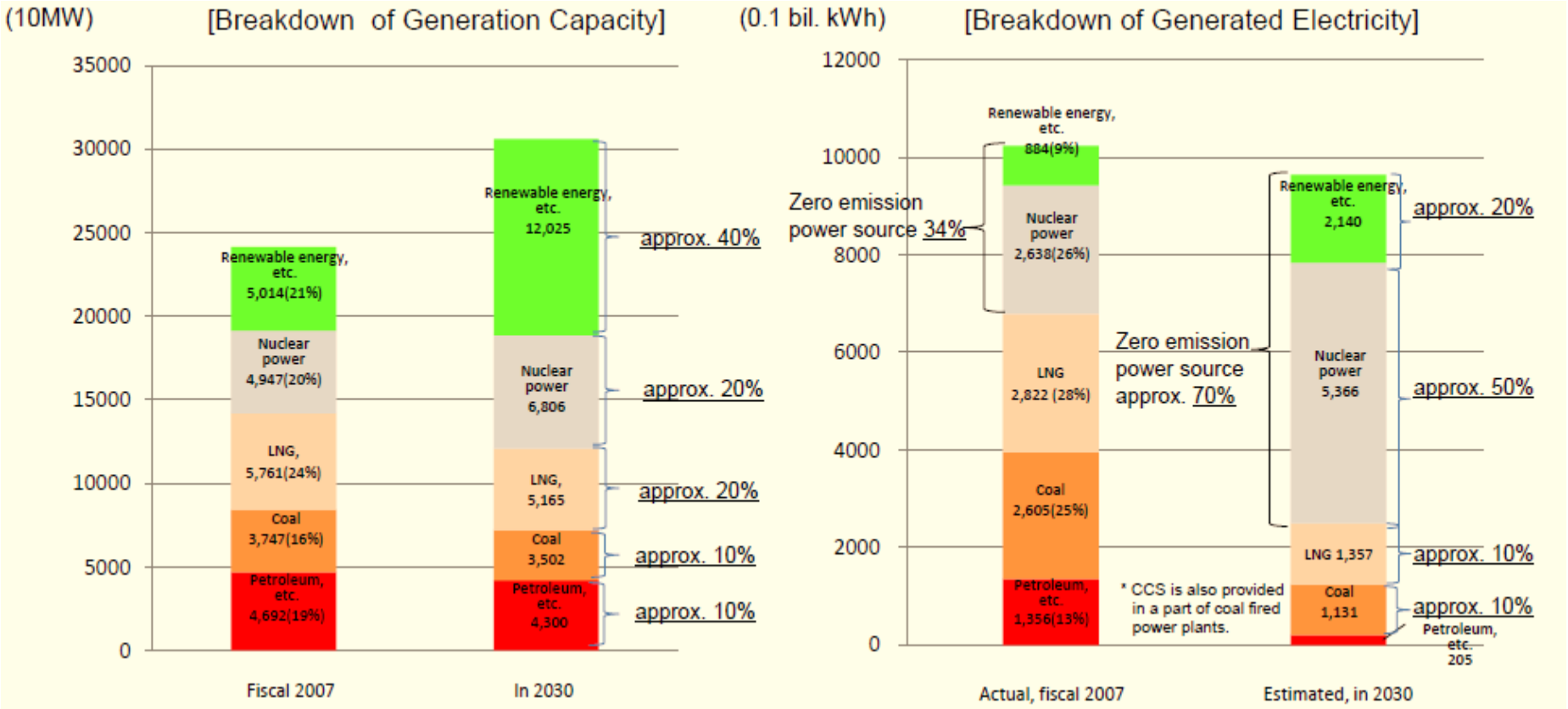
- Economic Drivers
  - Close to double digit GDP Growth rate
  - Efforts to minimise energy related emission
- Energy Security
  - 'Nuclear Energy Mid-term and Long-Term Development Plan' set to reach 40 GW capacity by 2020 (revised targets in consideration 80GW)
  - Surging energy demand
  - Highest energy consuming in Asia and second highest in the world
- Climate Mitigation
  - 40-45% emission intensity reduction by 2020
  - Nuclear power generation to grow to meet the climate mitigation targets

Challenges

- Challenges to Industry
  - Stringent safety standards demand more investments
  - Technology support
  - Finance
- Public perception
  - Post-Fukushima public perception
- International
  - International concerns about proliferation
  - North East Asia politics

Japan's Energy and Nuclear Policy: Strategic Energy Plan (2010)

- Building 9 additional nuclear plants by 2020 and more than 14 by 2030 (pre-3/11 plan).
- Nuclear considered a key role in emission reduction
- Emerging changes in the energy policy changes in the Post-3/11



METI: 2010

Post 311 Debates on Nuclear Policy

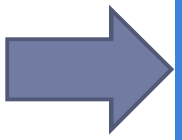
- Anti Nuclear Perception
  - Fukushima generated public policy dilemmas to governments on energy planning
  - A strong new wave of anti-nuclear sentiments emerged
  - Conventional nuclear allergy surfaced in many countries
  - Catalysed nuclear phase out debates in Germany
- Energy Security Concerns
  - Dependency on fossil fuel: To continue or not
  - Arab Spring: Will there be price fluctuations?
  - What are the possible alternatives?
- Climate Mitigation Challenges
  - Retracting on the climate target?
  - Energy or Climate: Trade off

Nuclear Energy Policy: Critical challenges

Areas that require greater attention

Conventional Challenges

Radiation contamination, Public perception, Nuclear proliferation, challenges from mining facilities



Long term challenges: lesser importance to safety culture and regulation and standards, technology limitations, liability issues etc.

Technology Concerns: Safety, technological support to withstand natural disasters, strengthening emergency responsiveness

Public perception: conflicting views from scientists on radiation threat, conflicting views and politically motivated perceptions, ideological, vested interest

Role of Public Perception in Shaping Nuclear Policy

- Public policy formulation cannot be solely based on public perception. Governments or institutions need to generate awareness to mould ‘informed opinion’ on nuclear energy

- Public opinion influences in shaping the policy (Post 3/11 approach in Japan, referendum in Italy, energy policy in Germany)

- Fear Psychosis: Even a small scale ‘accident’ at a nuclear facility ignites fear of nuclear weapons (Nuclear allergy)

Inferences

- Communication for generating awareness among citizens is of critical importance. No public policy can be built on weak understanding of its applications
- Climate Change: Meeting energy demand while cutting down GHG emission is a global priority
- Relevance: anti nuclear debates may not consider nuclear as an essential ingredient in energy mix, however it is a proven low carbon energy technology
- Accountability: Nuclear policy needs to be equipped to face challenges and demonstrate its preparedness to address the risks associated with its usage.

Thank you

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