

Fukui International Meeting on Human Resources Development for Nuclear Energy in Asia

Tsuruga-City 26-27 March, Fukui, Japan

Nuclear Power Strategy after the Fukushima Daiichi NPP Accident

Pal Vincze

IAEA

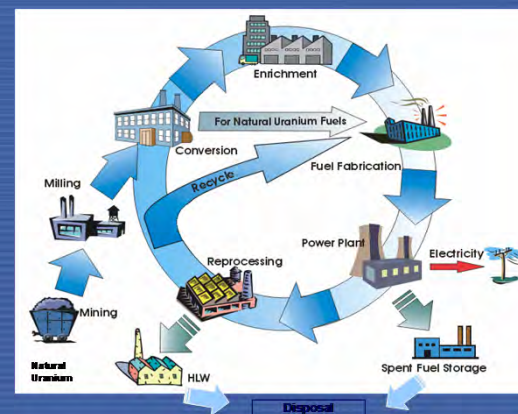
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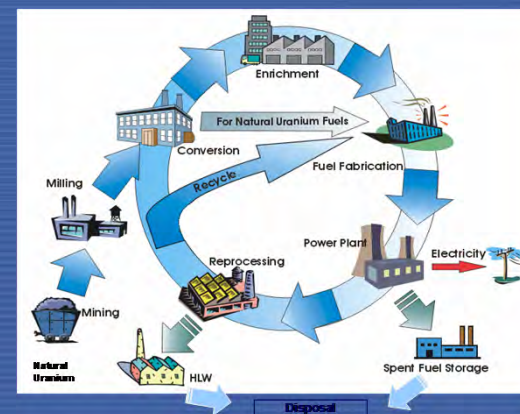
Content

- Background
- Status of nuclear power worldwide
- Strategies of nuclear power after the Fukushima accident
- Conclusions



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Nuclear Power

- Nuclear energy since 1954
- Fast development from 1960s to 1980s
- An important part of a global energy mix – 12.3%
- More than 15100 reactor-years of operating experience
- Since F-A in 2011, nuclear energy continued to play an important role in global electricity
- World energy demand is expected to more than double by 2050,
 - Expansion of nuclear energy is a key to meeting this demand while reducing pollution and greenhouse gases

Statutory objective

- “The Agency shall seek to accelerate and enlarge the contribution of atomic energy to peace, health and prosperity throughout the world...”



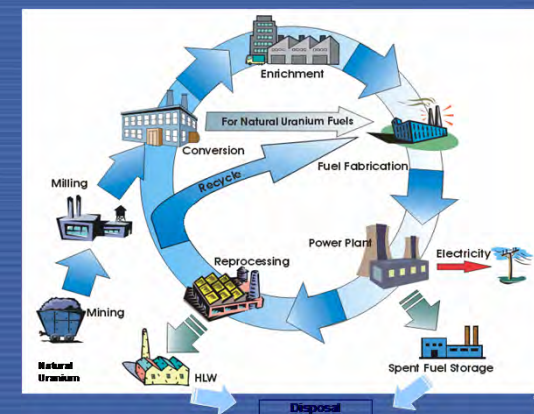
Director General Speech, Mr Amano

Despite the accident at the Fukushima Daiichi nuclear power station, it is clear that nuclear energy will remain an important option for many countries, as it can help improve energy security, reduce the impact of unstable fossil fuel prices, mitigate the effects of climate change, and make economies more competitive



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31 December 2012



437 nuclear power reactors in operation

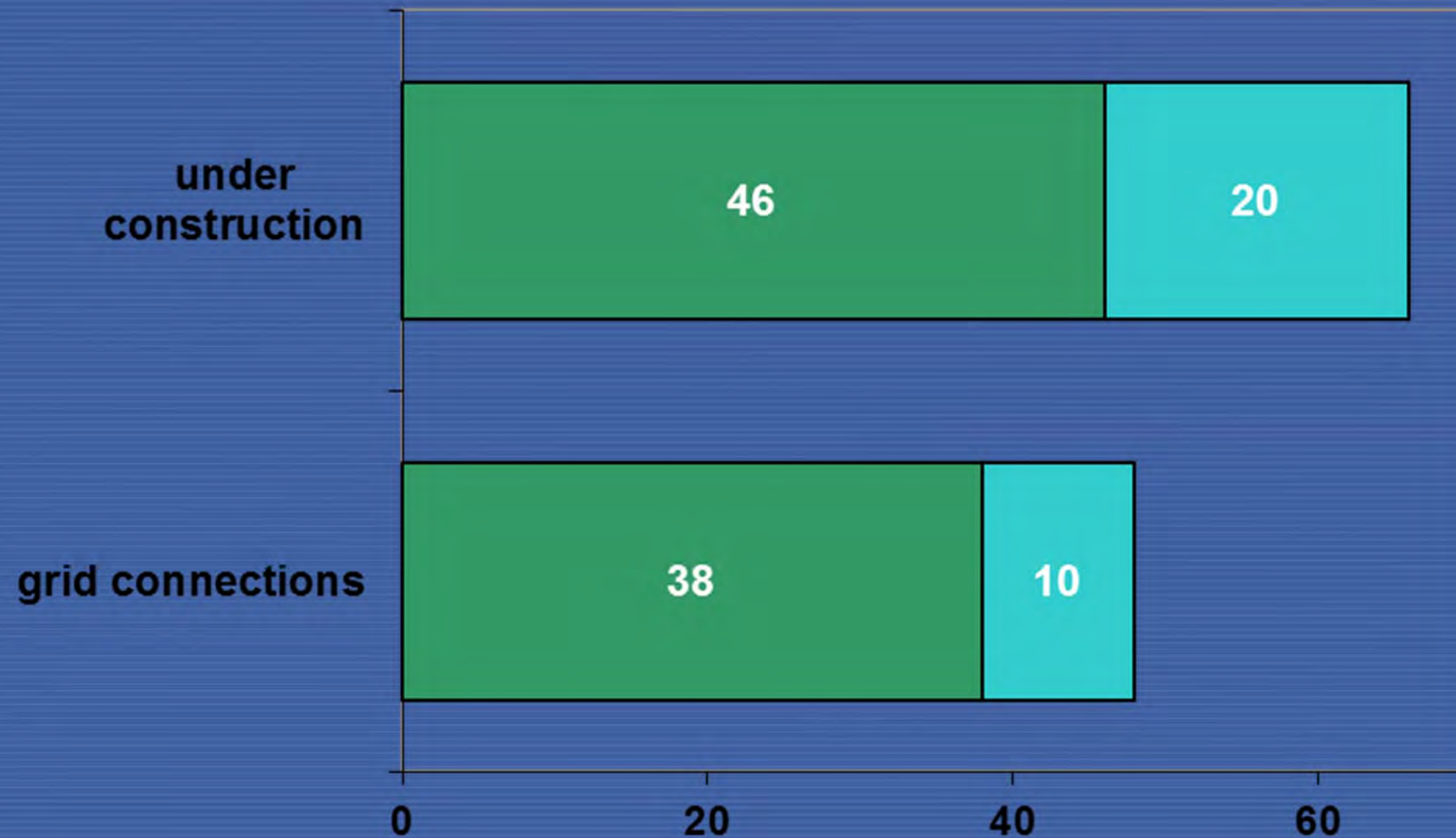


372.5 GW(e) Global Generating Capacity

66 reactors under construction



Expansion centred in Asia



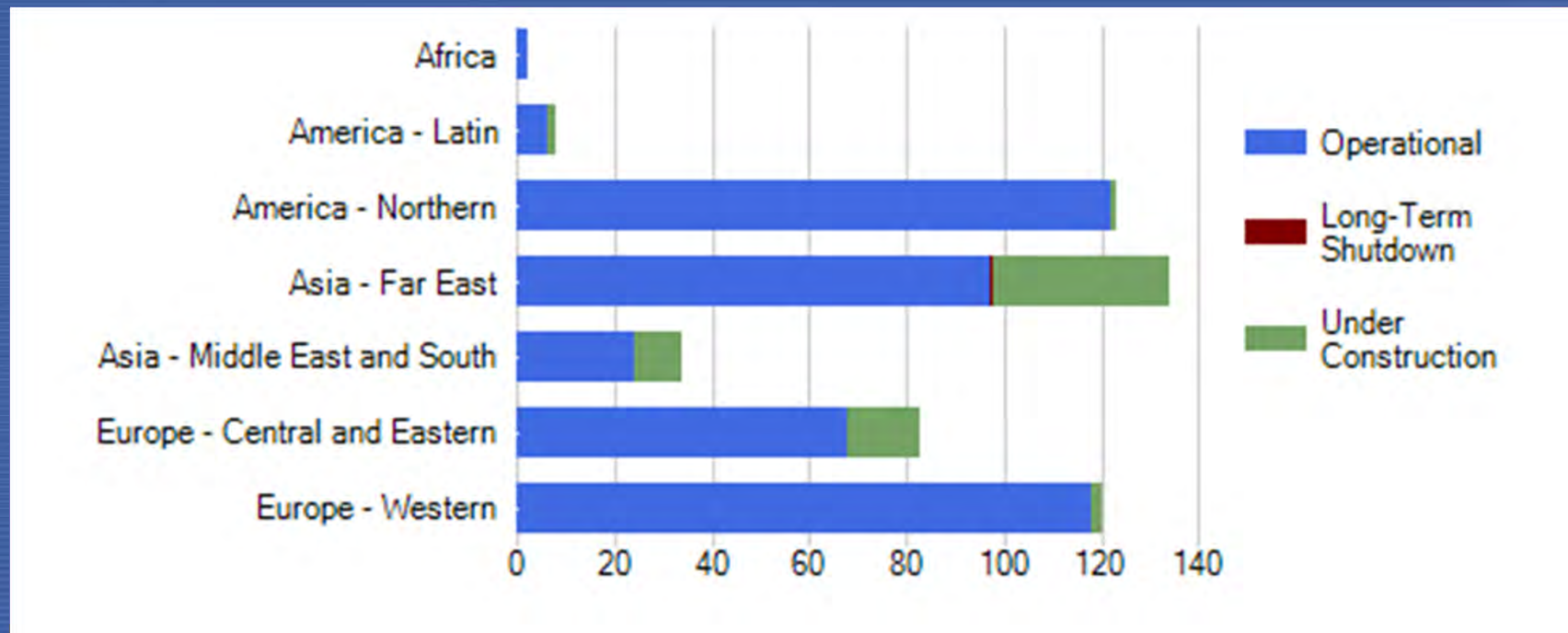
Nuclear Reactors in the World



Reference: IAEA-PRIS

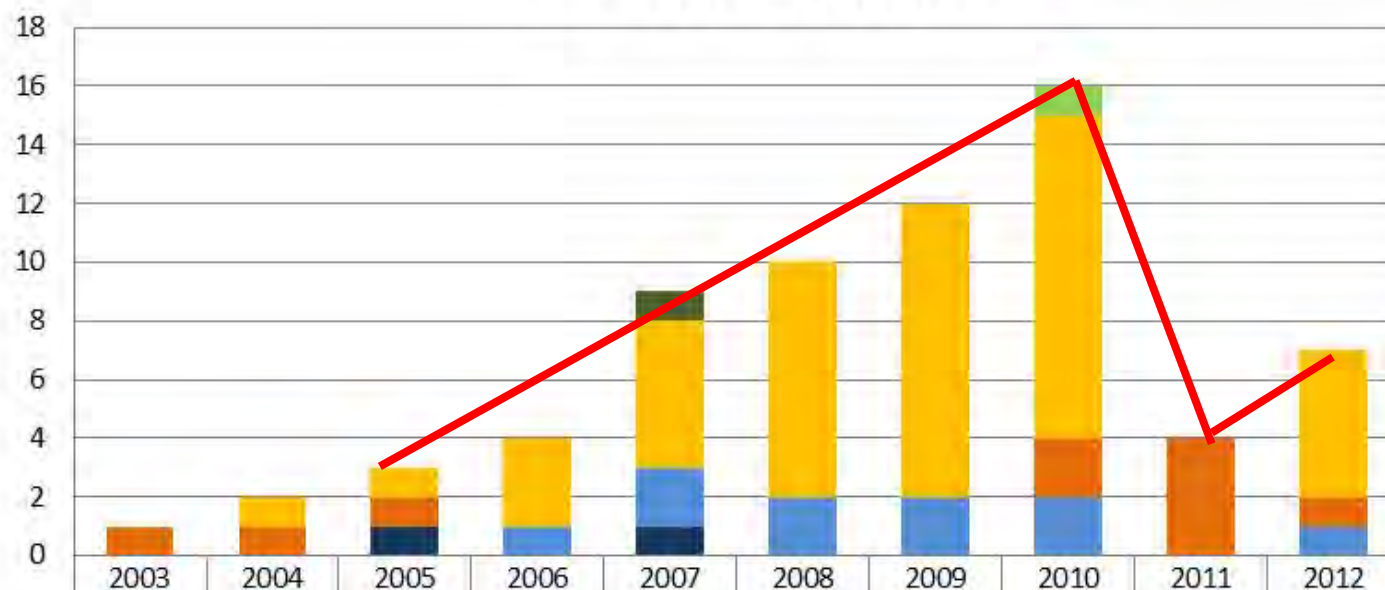
Current status

- 437 reactors in operation (372 GWe) :
 - increase of some 3 GW(e) in capacity, compared to 2011.
- Three new NPPs - grid connections in 2012,



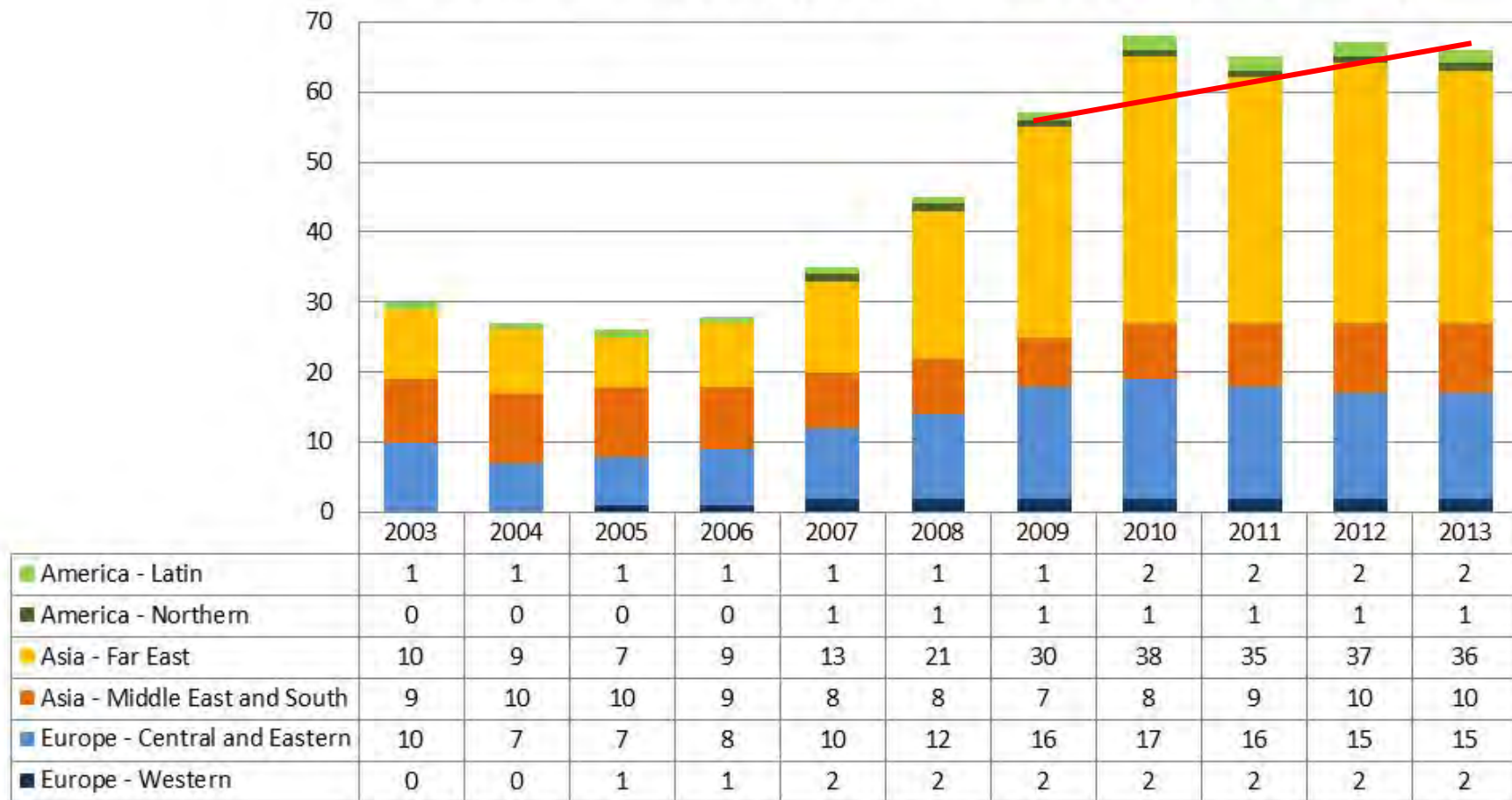
Trend in construction starts

NPP Construction Starts



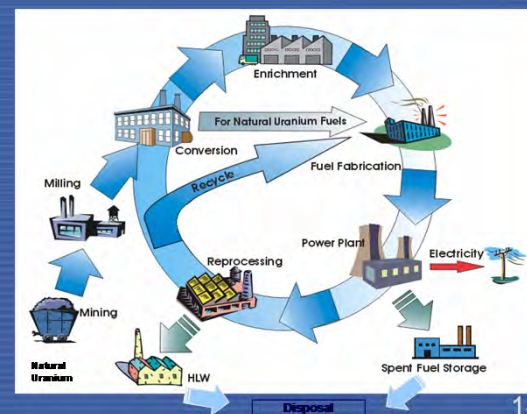
History of NPP construction

Number of reactors under construction by region

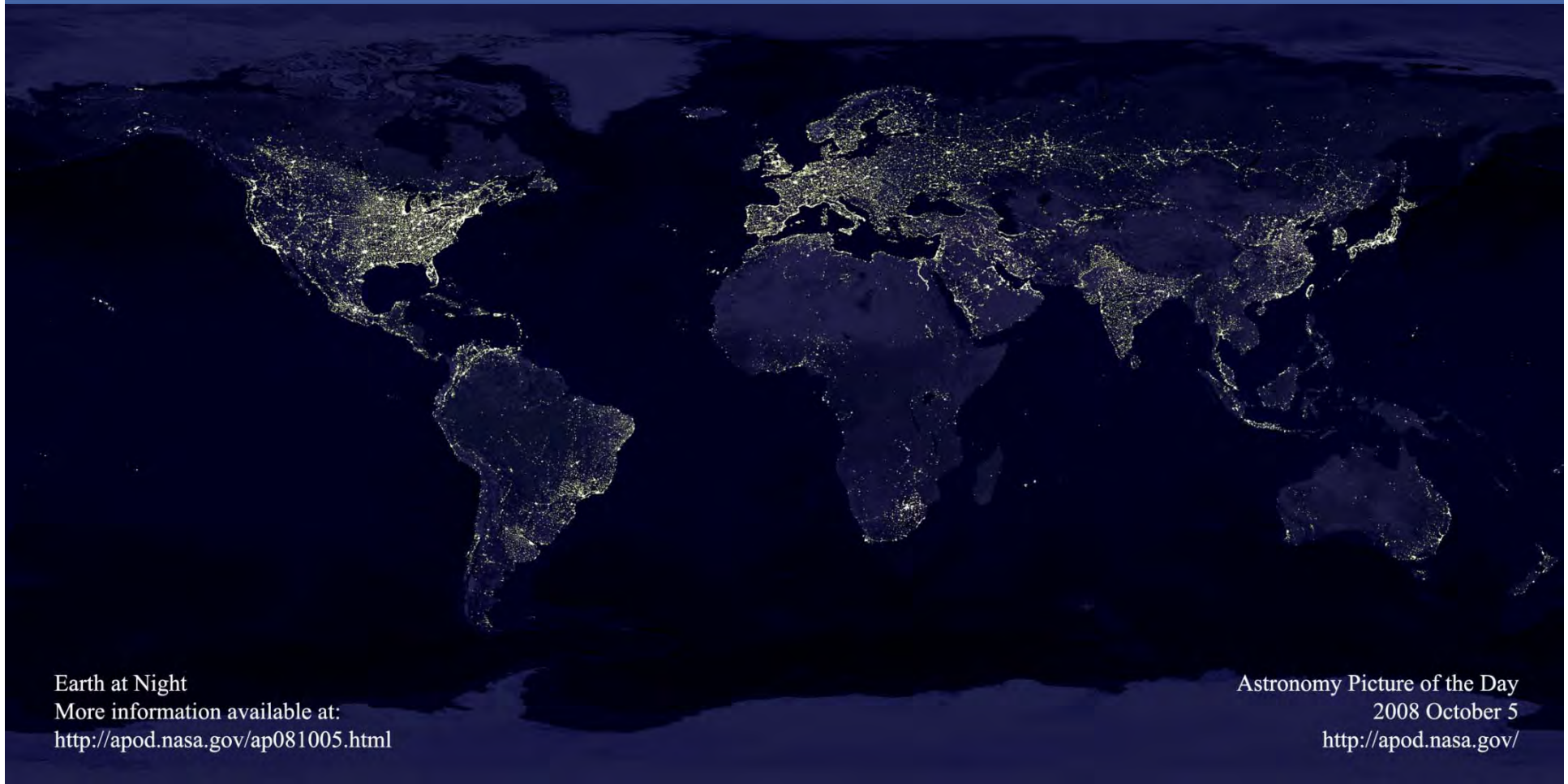


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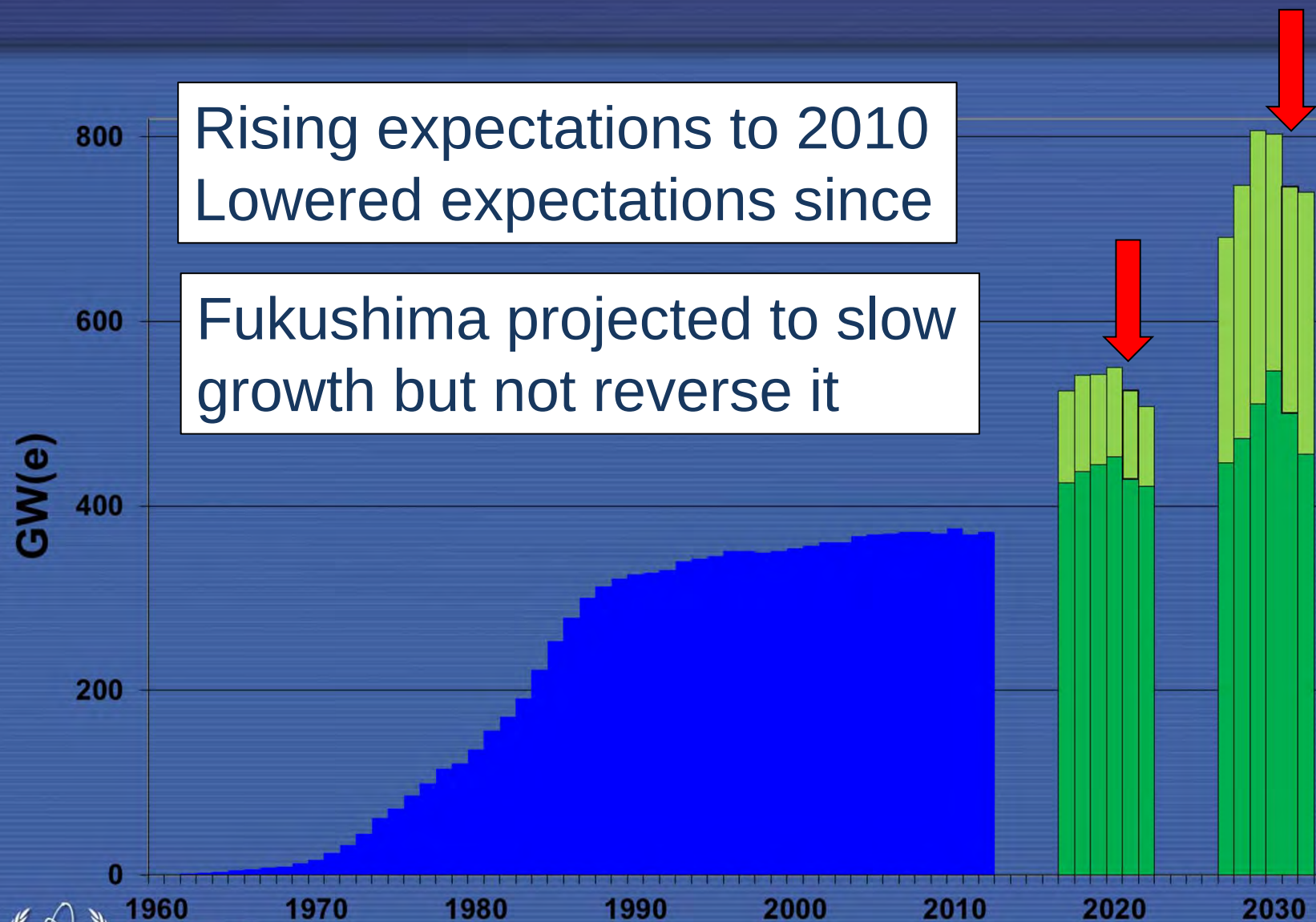
Countries Looking to Nuclear to Meet Increased Energy Demand



Earth at Night
More information available at:
<http://apod.nasa.gov/ap081005.html>

Astronomy Picture of the Day
2008 October 5
<http://apod.nasa.gov/>

Global installed nuclear power capacity



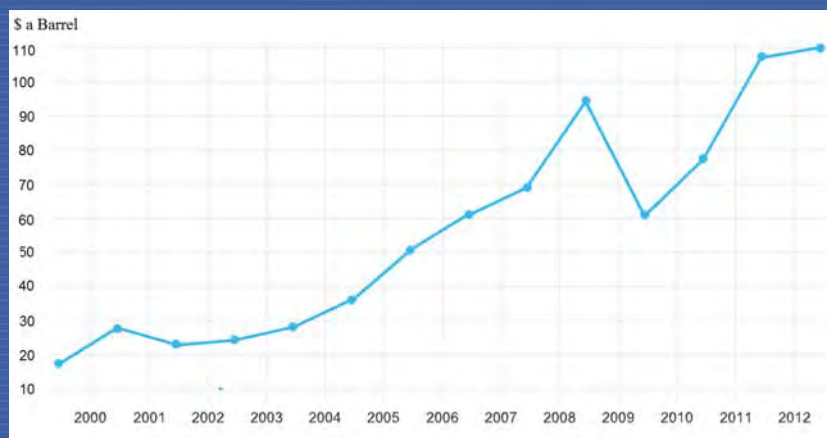
Nuclear Power

- Nuclear power continues to be an option, but public confidence has been shaken
- Some countries have decided to delay decisions regarding nuclear power in order to take the lessons into account
- Many countries are continuing with their plans for their first NPPs, and have said they will incorporate the lessons learned from Fukushima accident

Nuclear Power

Drivers for consideration of nuclear have not changed:

- Increased demand for energy
- Energy independence
- Volatile fossil fuel prices
- Climate change



OPEC Oil Basket Price History

http://www.opec.org/opec_web/en/data_graphs/40.htm



Hurricane Sandy

picture from National Post

<http://news.nationalpost.com/2012/10/29/hurricane-sandy-strengthens-remains-on-course-to-hit-canada-monday-bringing-7-metre-waves-to-great-lakes/>

Newcomers Post-Fukushima Concrete Steps Forward



**UAE, Barakah Unit 1,
Under Construction as of Aug 2012**

<http://www.iaea.org/newscenter/news/2012/uaenewcomer.html>



Belarus, Ostrovets Unit 1, May 2012

http://www.world-nuclear-news.org/NN_Contract_complete_for_nuclear_power_in_Belarus_1907121.html



Bangladesh and Russia NPP Agreement, Nov 2011

http://www.world-nuclear-news.org/NP-Russia_agrees_to_build_Bangladeshi_nuclear-0211114.html



**JAPC and Vietnam Agreement to Conduct
Feasibility Study of Vietnam's Second NPP project,
Sept 2011**

http://www.world-nuclear-news.org/NN-JAPC_to_assess_Vietnamese_project-2809114.html

Top Issues for New Nuclear Power Programs

- How do I start?
- Is there public support?
- Do I have the people?
- Can I find the money?
- What am I going to do with the waste?
- Is it safe? Can I manage if there is an accident?

How to Start a Nuclear Programme?

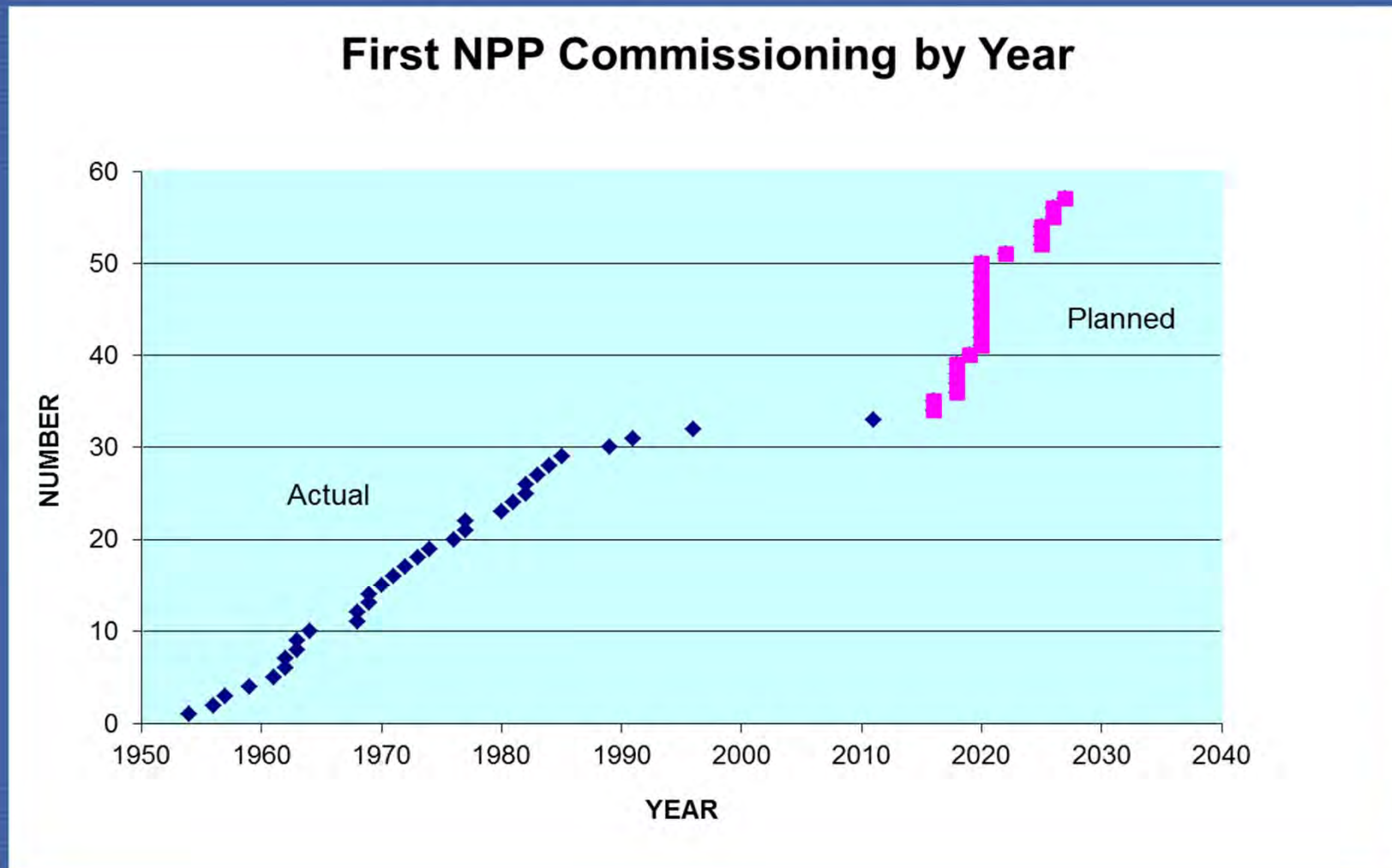
The nuclear power option emerges...

- Political leader makes an announcement
- Energy planners identify the option in the mix
- Policy makers see potential benefits



King Abdullah of Jordan

“Newcomers” Facing Different Challenges Than Countries Faced in Previous Decades

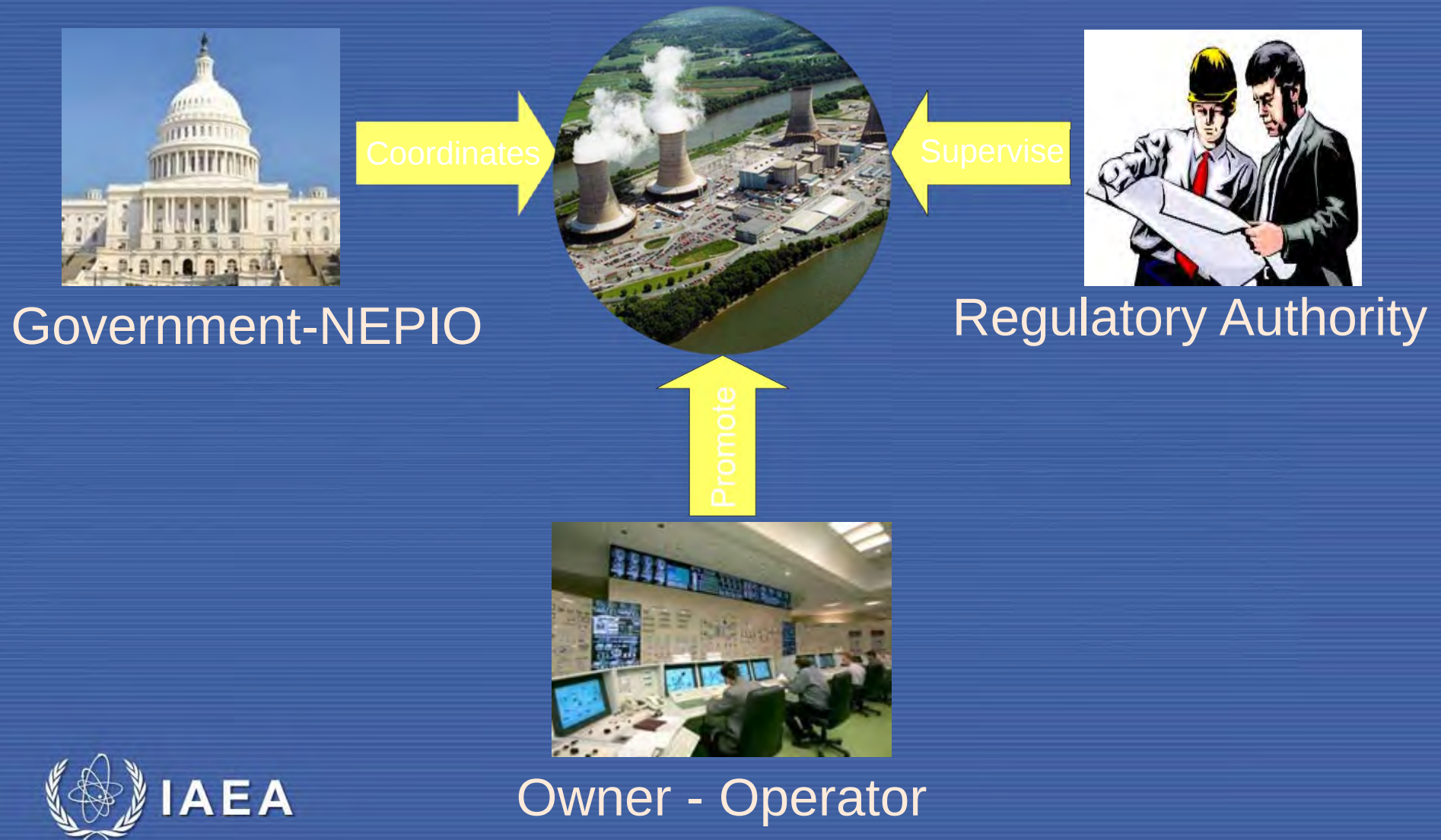


Nuclear Power

- High level of Safety and Security
- Capital intensive investment
- Well-trained human resources
- Control nuclear materials
- Long-term nuclear waste management
- Public perception
- Long-term Government Commitment needed



NPP Project – Roles and responsibilities



Nuclear Power Programme/Projects - Strategies

- Comprehensive – many stakeholders
- Integrated – coordinated planning
- Government Commitment – essential to long-term sustainability

Nuclear Power Programme/Projects

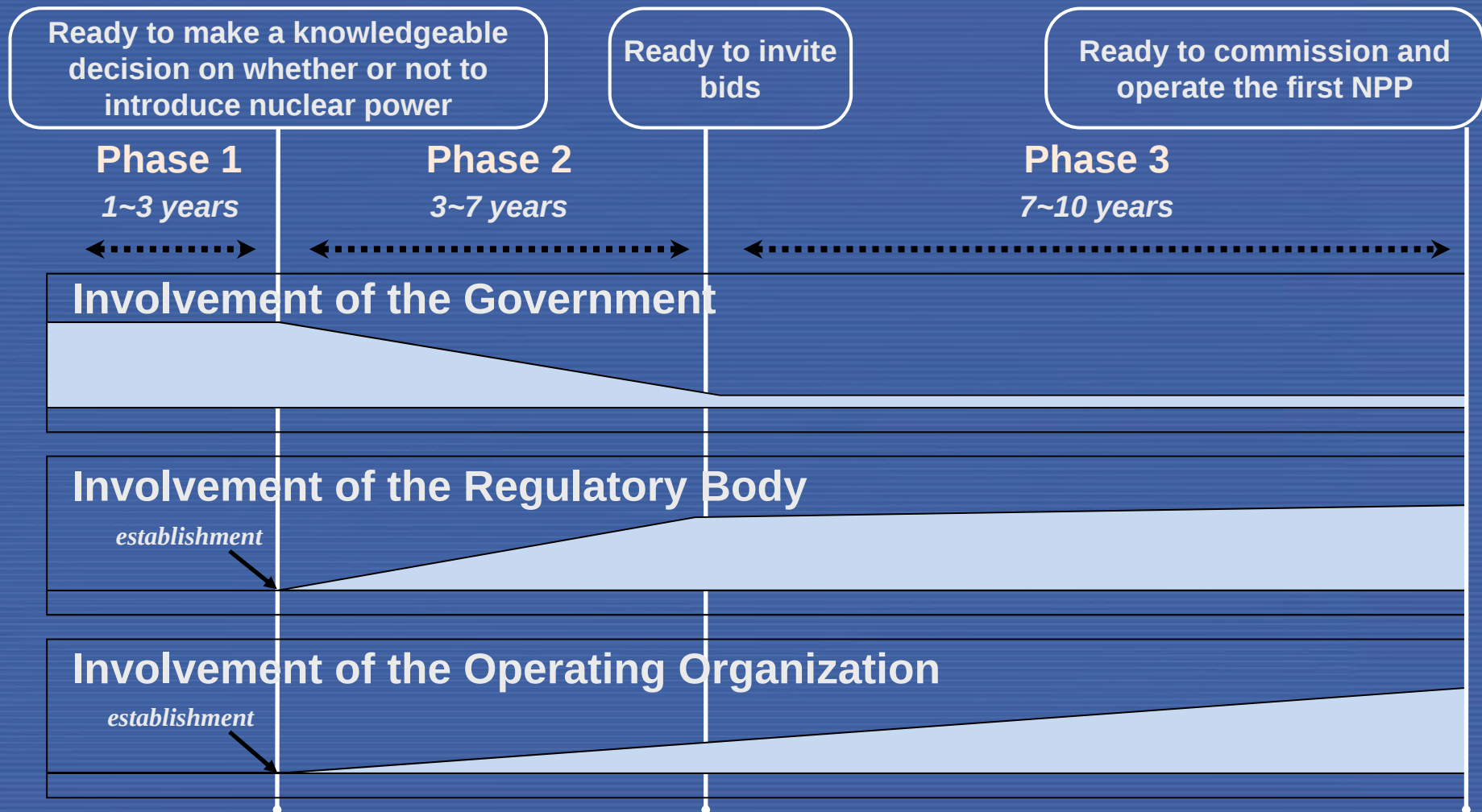
NP Programme:

- National view of nuclear power use in the country
- Supporting infrastructure
- Ensuring Long-term commitment, resources, capabilities

NPP Projects:

- Site-specific NPP feasibility, construction, operation

Transition of Leadership in the Project



Human Resource Development



UAE Regulatory Authority Management Team, July 2012



International Cooperation

- Government-to-Government Agreements for transfer of technology
 - Bilateral Assistance with the NPP Project
 - Bilateral Assistance with infrastructure development
 - World Association of Nuclear Operators
- And...don't forget -- international consultants, contractors



Contract Signing Ceremony for Belarus NPP with the Russian Federation , July 2012

<http://www.rosatom.ru/en/presscentre/highlights/ee7a3c004c07babea190b3f629e8bf65>



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Signing Ceremony For the NP Economic Cooperation Agreement Between the UAE and South Korean Consortium, Dec 2009

<http://www.thenational.ae/news/uae-news/abu-dhabi-signs-nuclear-power-deal-with-south-korean-group>

Action Plan for Nuclear Safety – “Embarking Countries”

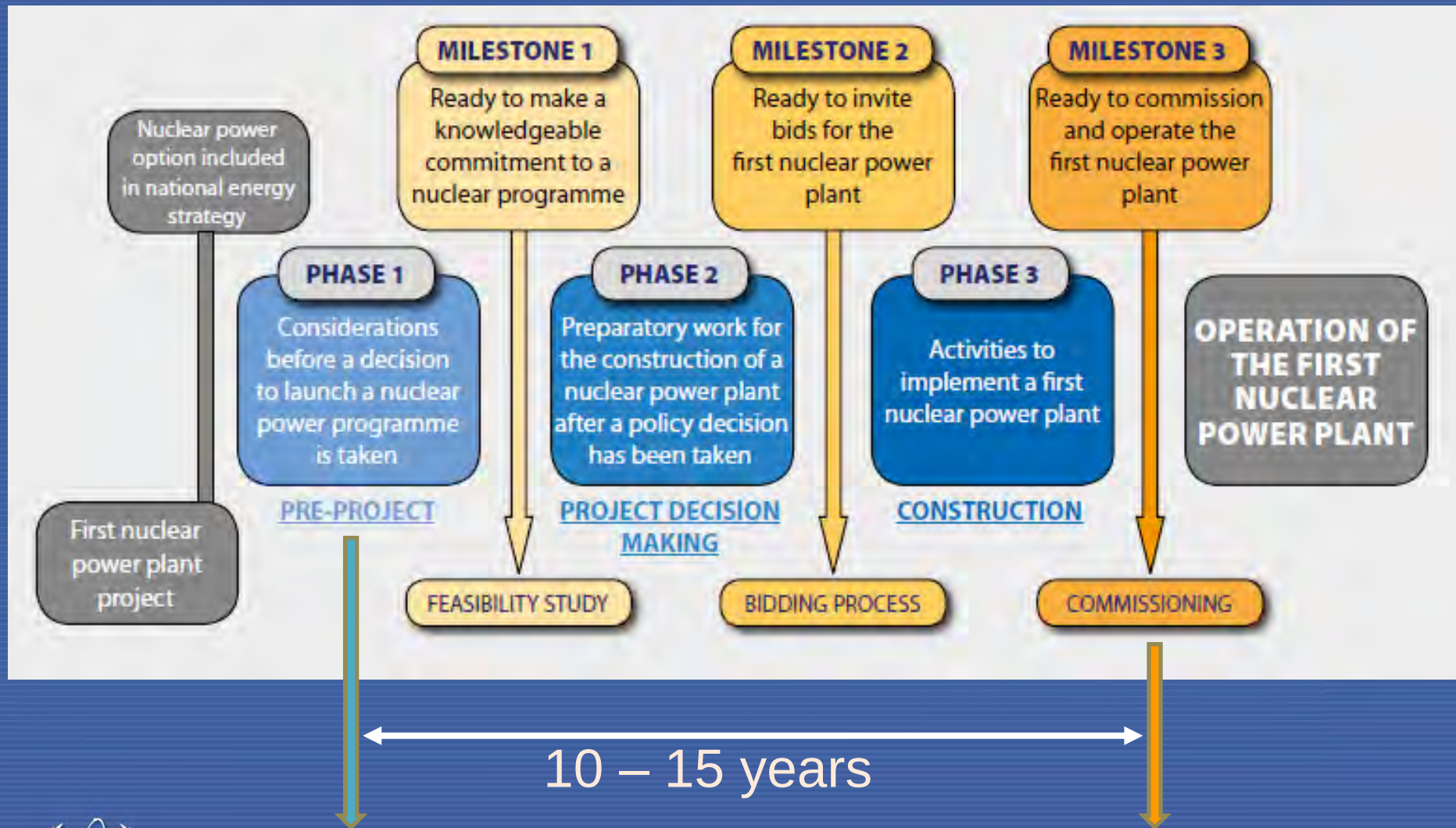
8. Facilitate development of infrastructure necessary for Member States embarking on a nuclear power programme

- Member States to create an appropriate nuclear infrastructure based on IAEA Safety Standards and other relevant guidance, and IAEA Secretariat to provide assistance as may be requested.
- Member States to voluntarily host Integrated Nuclear Infrastructure Reviews (INIR) and relevant peer review missions, including site and design safety reviews, prior to commissioning the first nuclear power plant.

9. Strengthen and maintain capacity-building

- Member States to strengthen, develop, maintain and implement capacity building programmes
- Member States to incorporate lessons learned from the accident into their programme infrastructure

Milestones in the Development of a National Infrastructure for Nuclear Power (NG-G-3.1)



Milestones in the Development of a National Infrastructure for Nuclear Power (NG-G-3.1)

- National position
- Nuclear safety
- Management
- Funding and financing
- Legislative framework
- Safeguards
- Regulatory framework
- Radiation protection
- Electrical grid
- Human resources development
- Stakeholder involvement
- Site and supporting facilities
- Environmental protection
- Emergency planning
- Security and physical protection
- Nuclear fuel cycle
- Radioactive waste
- Industrial involvement
- Procurement

Who are the Newcomers



Status of Newcomers Post-Fukushima

		2010	2011	2012
Phase 3	First nuclear power plant started construction/under construction	1	0	1
Phase 3	First nuclear power plant ordered	2	3	2
Phase 2	Decided to introduce nuclear power and started preparing the appropriate infrastructure	10	6	6
Phase 1	Active preparation for a possible nuclear power programme with no final decision	7	6	6
Phase 1	Considering Nuclear Power Programme	14	14	13

IAEA Support to Operating, Expanding and Embarking Countries



**Operating
NPP
Programme**



**Expansion
NPP
Programme**



**New
Comers
Programme**

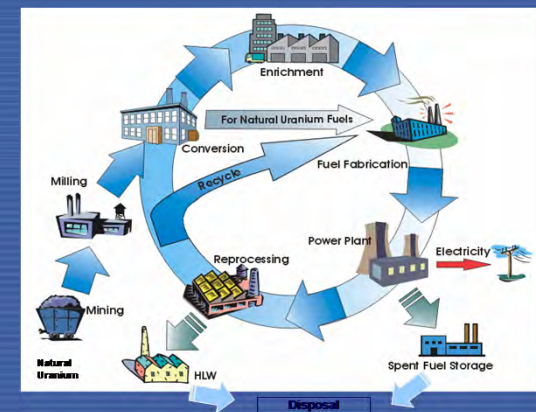


Conclusions

- Nuclear power's global generating capacity grew to 372.5 GW(e) in 2012 with 437 reactors in operation
- Three new reactors were connected to the grid, and two reactors that had been in 'long term shutdown' were restarted
- Sixty-seven new reactors are under construction at the end of the year, a figure which remains quite high
- Significant growth in the use of nuclear energy worldwide is anticipated
- Most of the growth is expected in countries that already have operating nuclear power plants, particularly in the Far East where projected growth is strongest.

Conclusions

- Although some countries delayed decisions to start nuclear power programmes, others continued with their plans to introduce nuclear energy
- In July 2012, the United Arab Emirates (UAE) became the first country in 27 years to start the construction of a first nuclear power plant
- In addition to the UAE, several other countries, including Belarus and Turkey, have made progress towards their first nuclear power plant in 2012



IAEA and Nuclear Power expansion



“The Agency has a key role to play in ensuring that (this) expansion in nuclear power takes place in an efficient, responsible and sustainable manner.”

“Assistance to newcomers, especially those which are most advanced on the road to having operational reactors, will remain a high-priority issue.”

Yukiya Amano

IAEA Director General

How to get information?

- Action Plan:
 - <http://www.iaea.org/newscenter/focus/actionplan>
- Annual publications:
 - [Nuclear Power Reactors in the World](#) (since 1981)
 - [Operating Experience with NPP](#) (since 1970)
- Public website
 - www.iaea.org/pris
- Web-based on-line system “PRIS-Statistics” for registered users
 - prisweb.iaea.org/statistics

