



# Future for Nuclear in Malaysia



Energy Forum  
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Sheraton Imperial,  
Kuala Lumpur

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# Outline

1. Introduction
2. Economics and Environmental Benefits Review
3. Policy Consideration and Status
4. Infrastructure and Implementation Status
5. Public Awareness Programme
6. Public Acceptance & Risk Perception Issues
7. Concluding Remarks



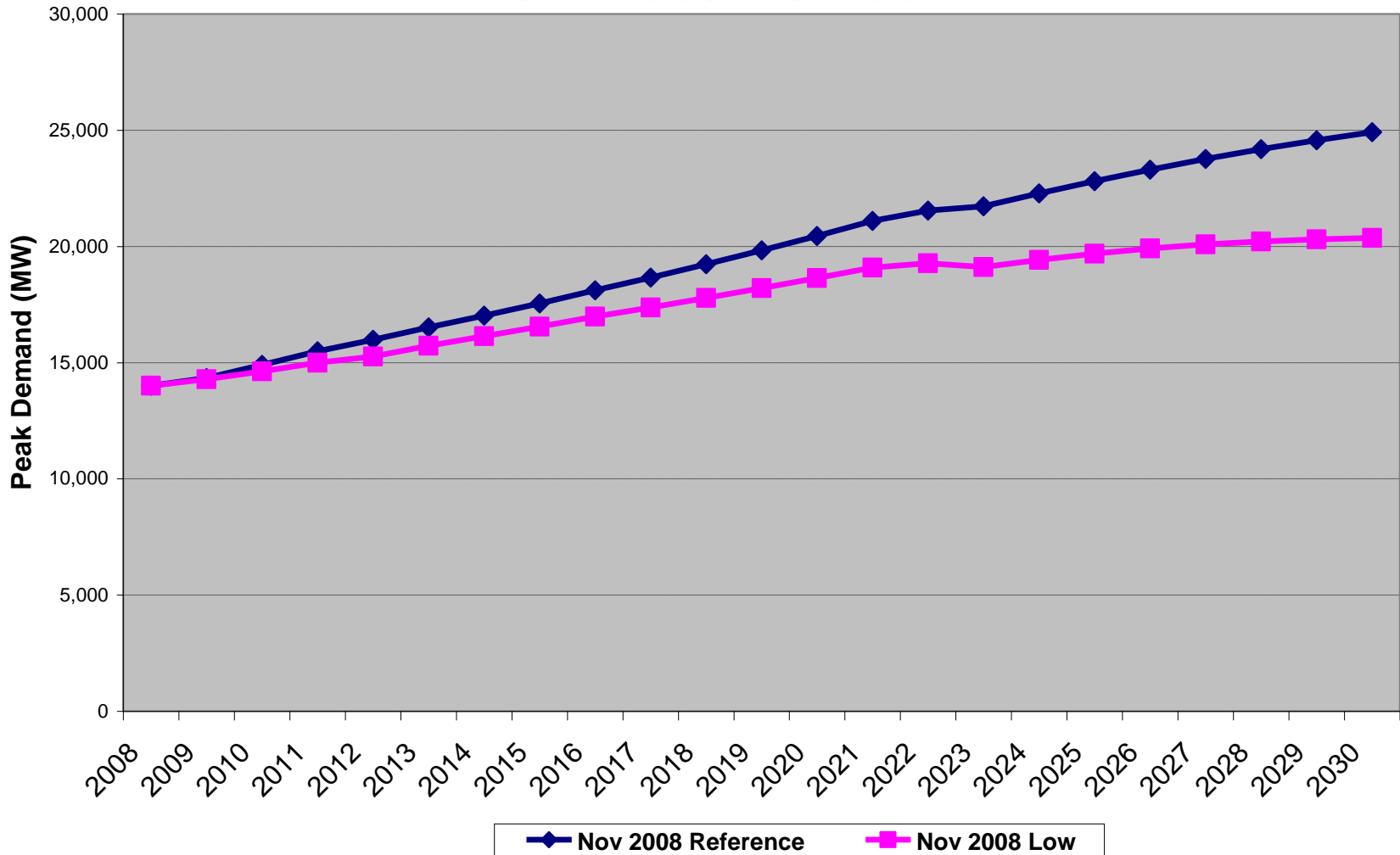
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# **Introduction**

# National Energy Policies

- 1981: four-fuel diversification policy  
(oil, hydro, natural gas, coal)
- 2000: five-fuel diversification policy  
(all the above + renewable energy)  
5% target on RE

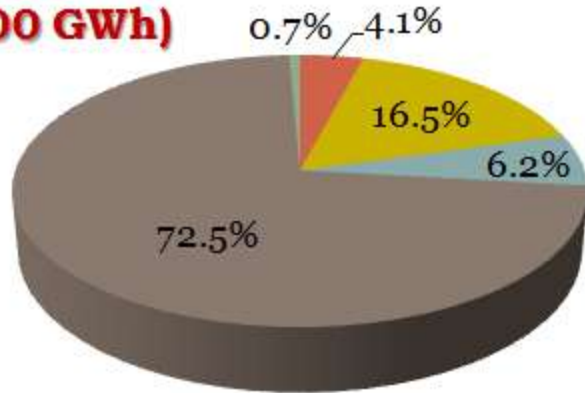
# MALAYSIA ELECTRICITY DEMAND FORECAST FROM 2008 TO 2030





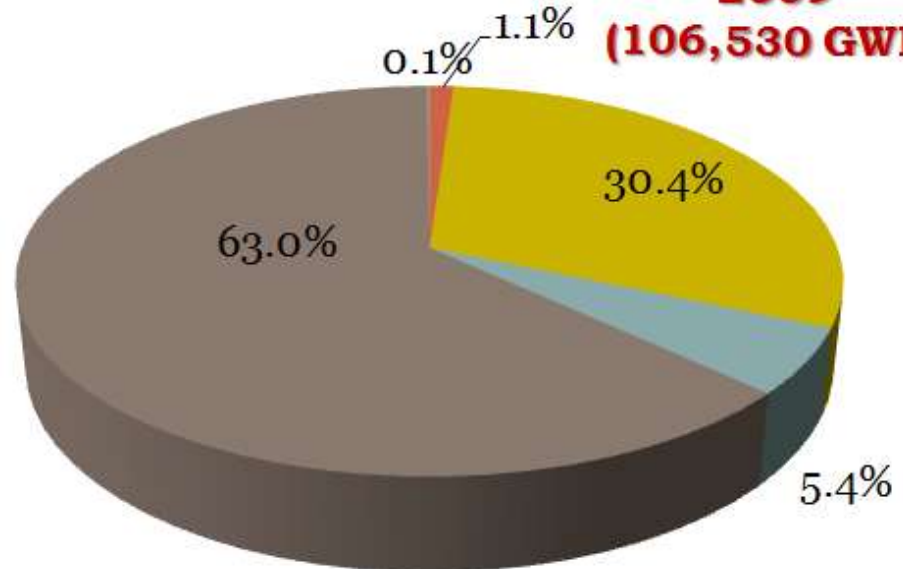
## NATIONAL POWER GENERATION FUEL MIX

**2003**  
**(83,300 GWh)**



■ Oil ■ Coal ■ Hydro ■ Gas ■ Others

**2009**  
**(106,530 GWh)**



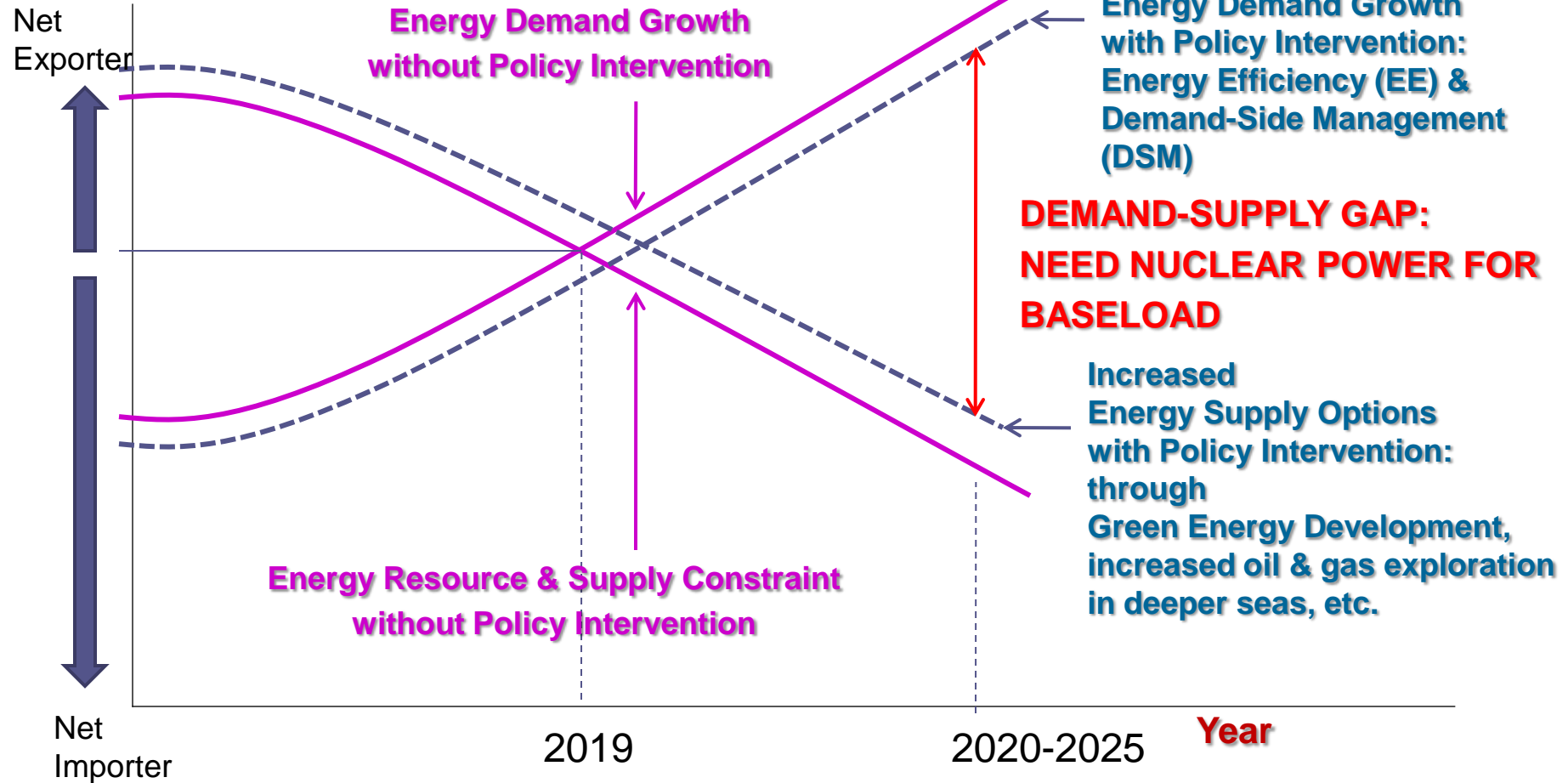
**Only three major energy sources, despite Five-Fuel Diversification Policy, with coal mostly imported, indigeneous gas supply uncertain in long-term, and hydropower mostly in Sarawak & may be adequate to only around 2030.**

# Fuel Issues

<b>Existing Fuel</b>	<b>Issues</b>
Oil	Net importer by 2014, Price fluctuation
Gas	Gas field depleted by 2027, Net Importer by 2019
Coal	100% Imported, Price fluctuation, Dwindling and Security of Supply
Hydro	Supply-demand geographical mismatch
Renewables	Small, Decentralized, Economic of scale, Best Serving Peak Load

# DEMAND - SUPPLY GAP ISSUE

## Energy





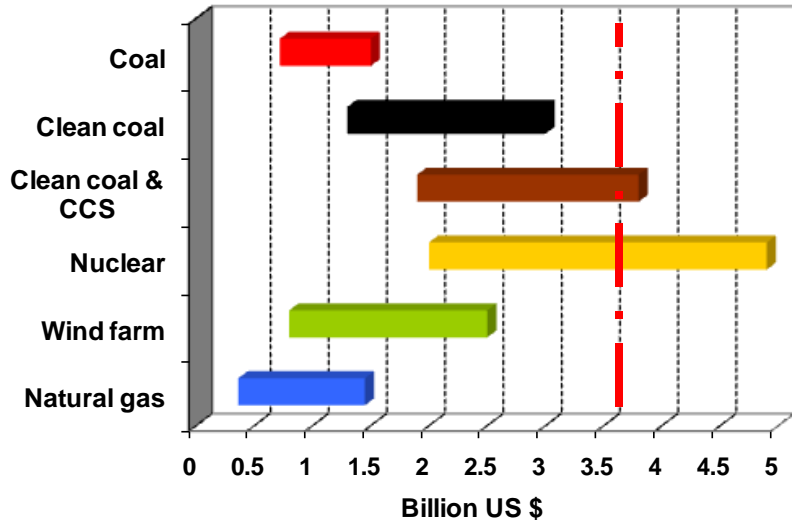
# Energy Requirement Analysis

- Increasing demand
- Lack of competitive, sustainable, commercial energy resources beyond 2020 for Malaysia
- Dwindling and uncertain supplies
- Environmental consideration
- RE unable to fill in the gap adequately and not for base load
- **Nuclear is seen as a candidate for base load energy source**

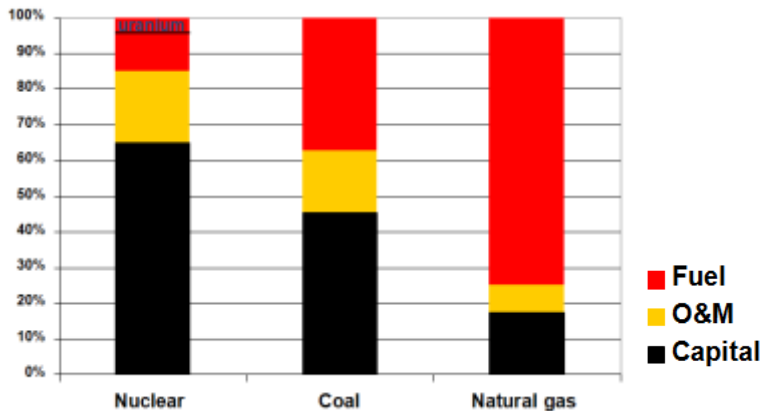
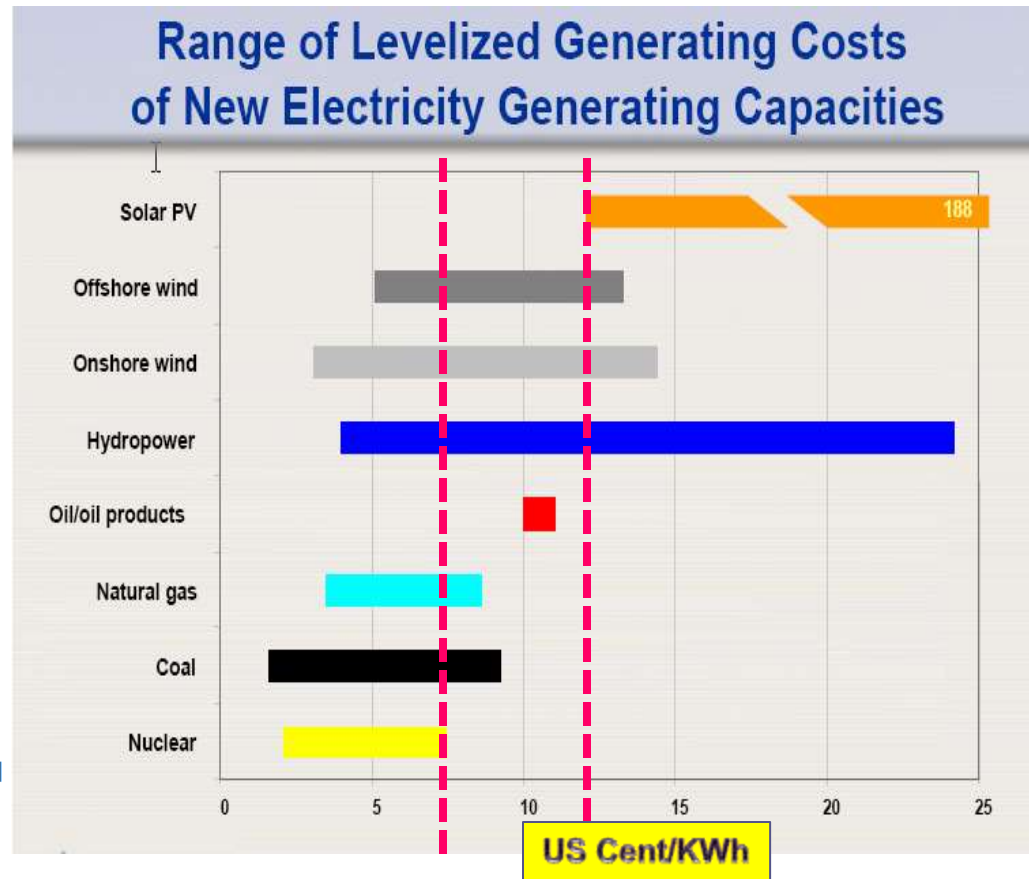
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**Economics and Environmental Benefits:  
A Review**

# COMPARATIVE POWER GENERATION ECONOMICS



Investment Costs for 1,000 MWe Plant



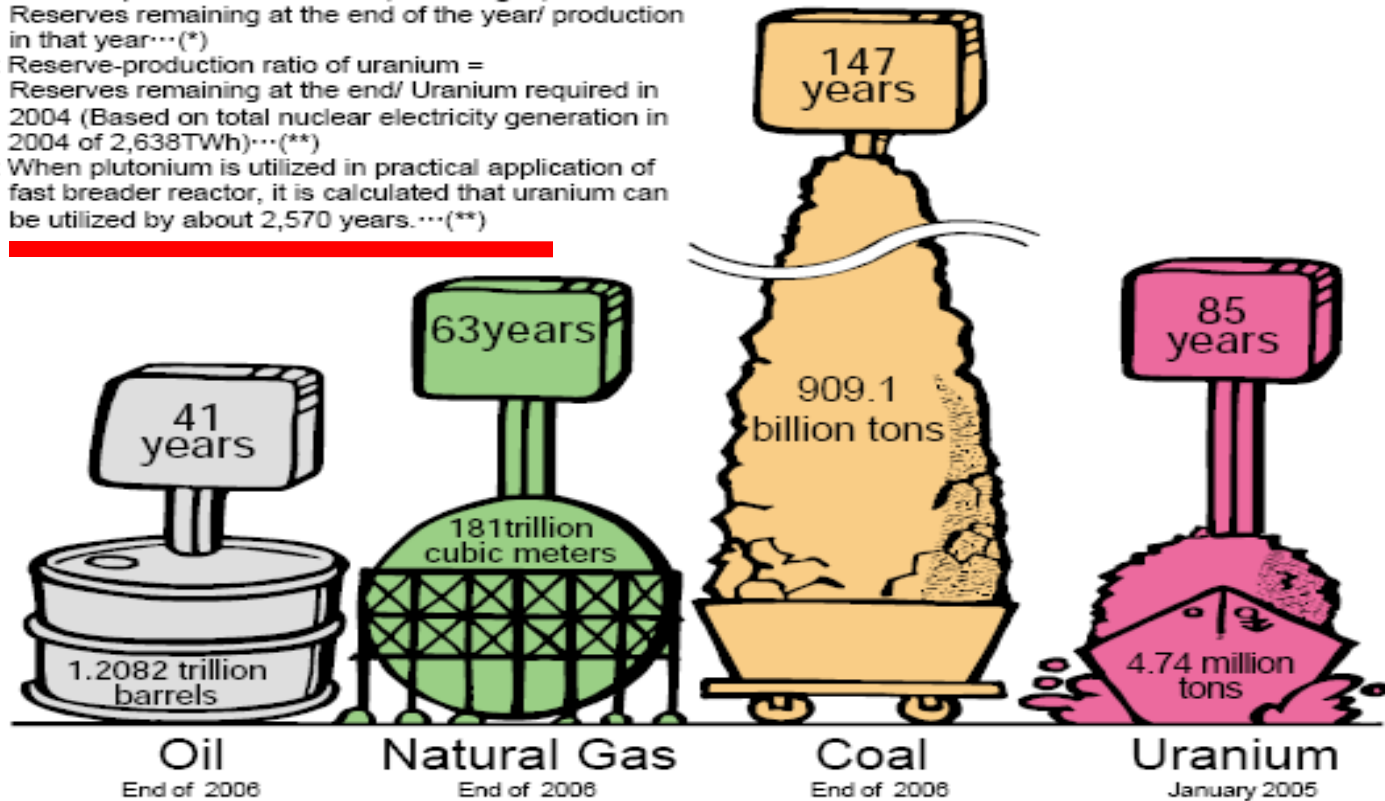
Comparative Cost Structure by Fuel Type

## Proved Reserves of Energy Resources

Note1: Reserve-production ratio of oil, natural gas, coal =  
Reserves remaining at the end of the year/ production  
in that year...(\*)

Note2: Reserve-production ratio of uranium =  
Reserves remaining at the end/ Uranium required in  
2004 (Based on total nuclear electricity generation in  
2004 of 2,638TWh)...(\*\*)

Note3: When plutonium is utilized in practical application of  
fast breeder reactor, it is calculated that uranium can  
be utilized by about 2,570 years...(\*\*)

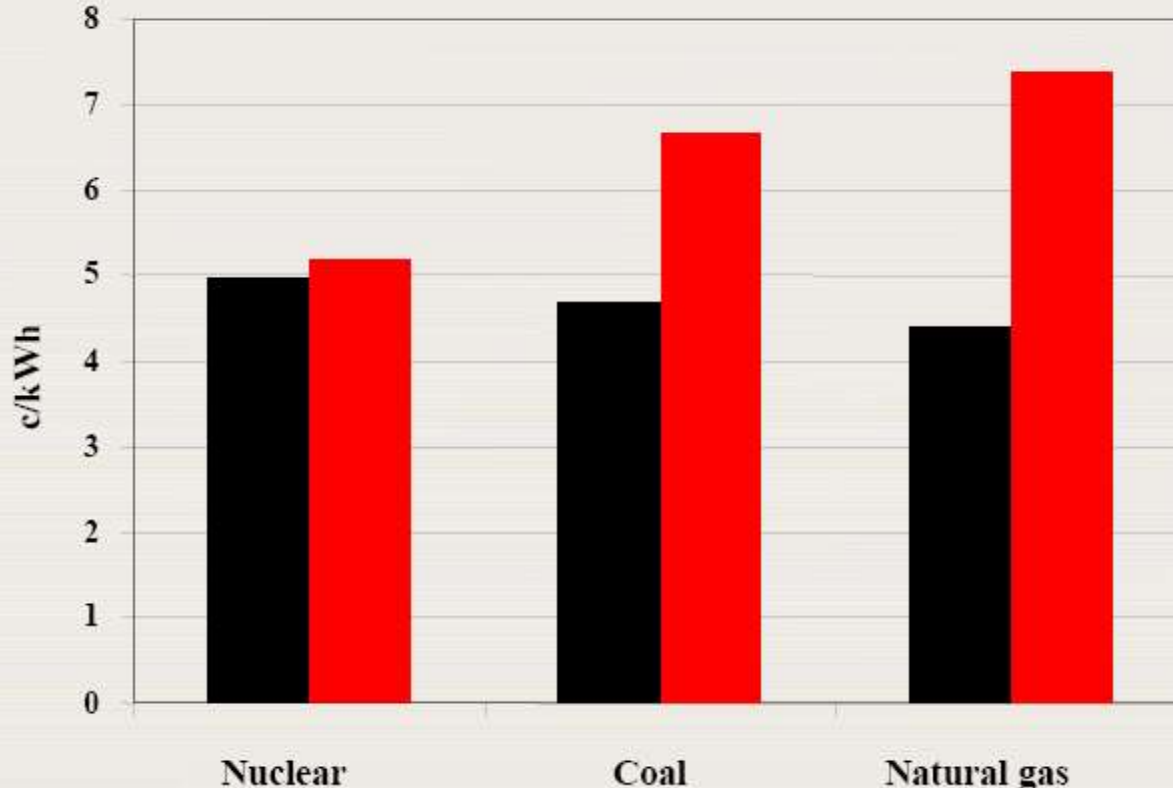


(Source) (\*)BP Statistical Review of World Energy June 2007

(\*\*) Uranium 2005

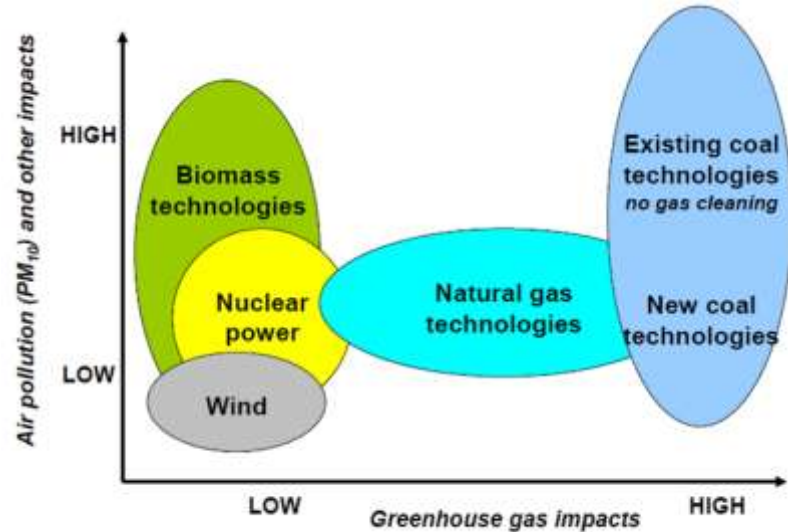
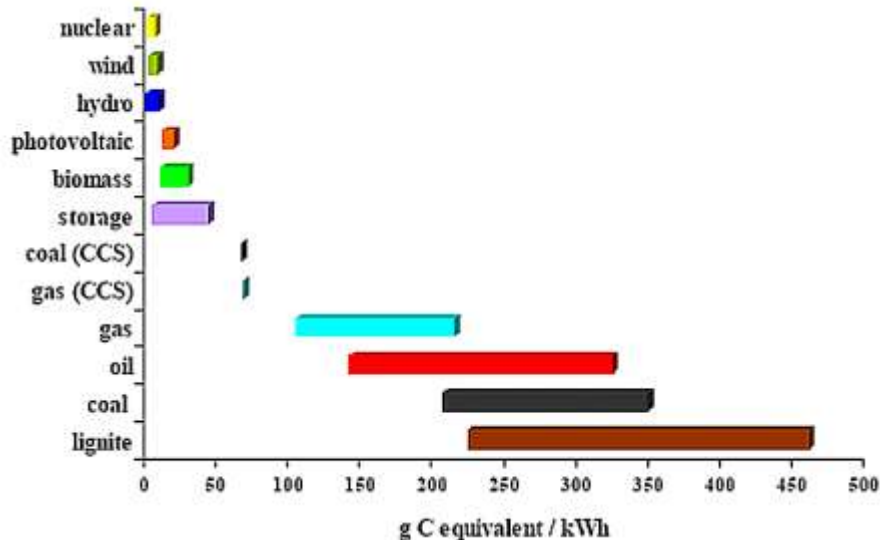
**The Above Does Not Account for Thorium  
and Uranium from Sea Water Potential**

## Impact of a doubling of resource prices



(E.g. Due to Market Constraints or Using Uranium From Sea Water Which is About Double the Current Uranium Spot Price in the Future, etc)

# COMPARATIVE GREENHOUSE GAS (GHG) EMISSION FROM POWER GENERATION SOURCES



Source: EU-EUR 20198, 2003

**Nuclear energy has low life cycle carbon burden & is more competitive if carbon penalty is imposed, compared to alternative commercial energy sources.**



From These Analysis, Nuclear Energy Is Well Justified in Terms of Supply Security, Environment and Economics For Base Load

### **However, Main Issues Need to Be Addressed**

- Policy Considerations
- Infrastructures (HRD, Technology, Act and Regulation, etc)
- Public Acceptance



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## **Policy Considerations and Status**

## GOVERNMENT DECISION

- **26 June 2009: Cabinet agreed to:**
  - ❑ consider nuclear energy as one of the options for electricity generation post 2020 particularly in Peninsular
  - ❑ set up Nuclear Power Development Steering Committee (JPPKN) and three (3) Working Committees
  - ❑ allocate RM25 million for a period of 3 years to implement activities under JPPKN

## GOVERNMENT DECISION

- **16 July 2010: Cabinet agreed to**
  - ❑ adopt National Nuclear Policy as a guideline for the development of nuclear sector for electricity generation and non electricity generation
  - ❑ The main player for this policy are Ministry of Science, Technology and Innovation (MOSTI) and Ministry of Energy, Green Technology and Water (KeTTHA).

**New energy policy is being formulated to include nuclear option**



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## **Infrastructure and Implementation Status**

# ORGANISATION STRUCTURE FOR NATIONAL IMPLEMENTATION COORDINATION

**Cabinet Committee on Energy**

**Nuclear Power Development Steering Committee (JPPKN)**

**Ministry of Energy, Green Technology & Water (KeTTHA)**

**Nuclear Power  
Programme Development  
Working Committee**

**Malaysian Nuclear Agency**

**Nuclear Power  
Project Development  
Working Committee**

**Tenaga Nasional Bhd. (TNB)**

**Nuclear Power Legislative Development Coordination  
Working Committee**

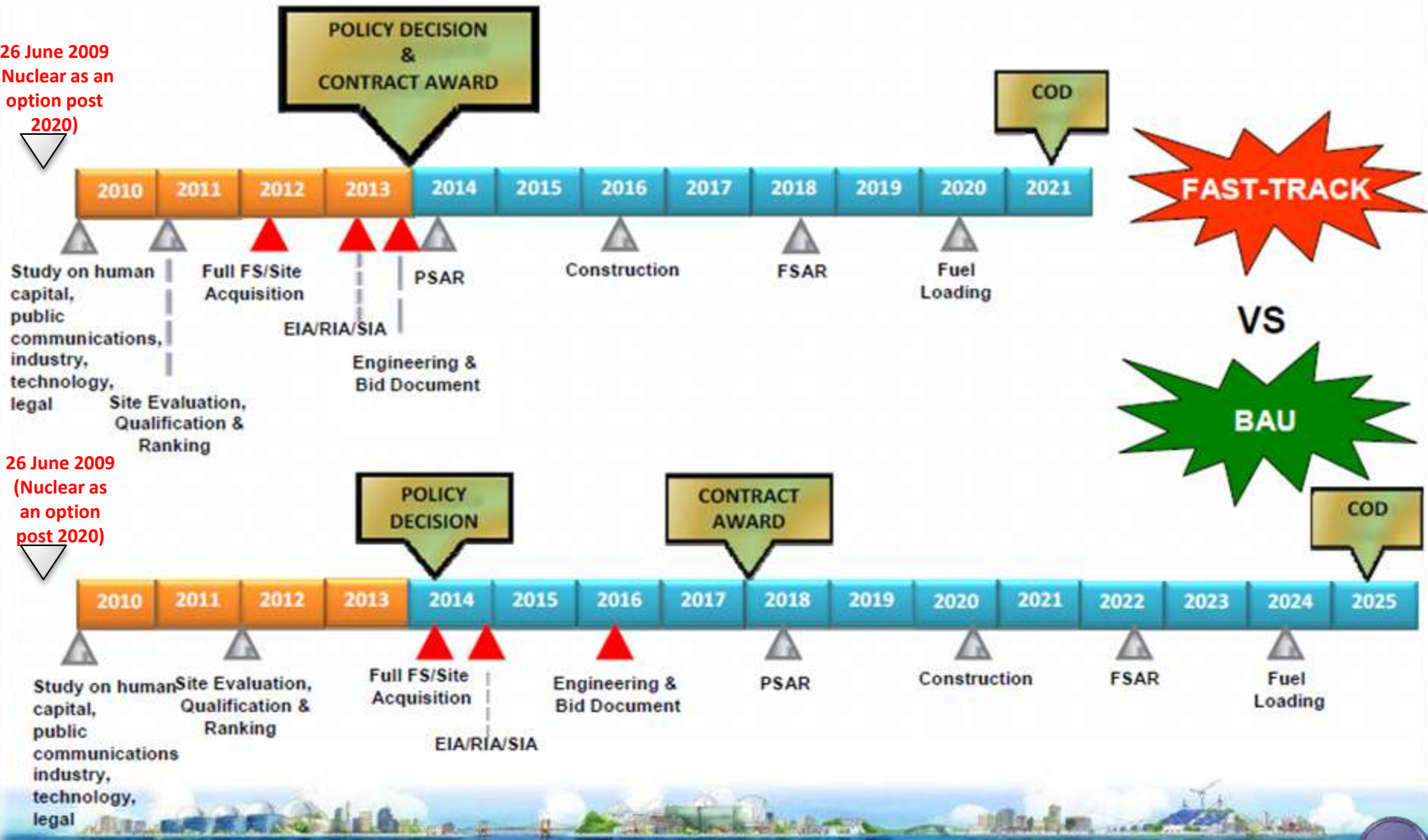
**Atomic Energy Licensing Board (AELB)  
& Energy Commission (ST)**



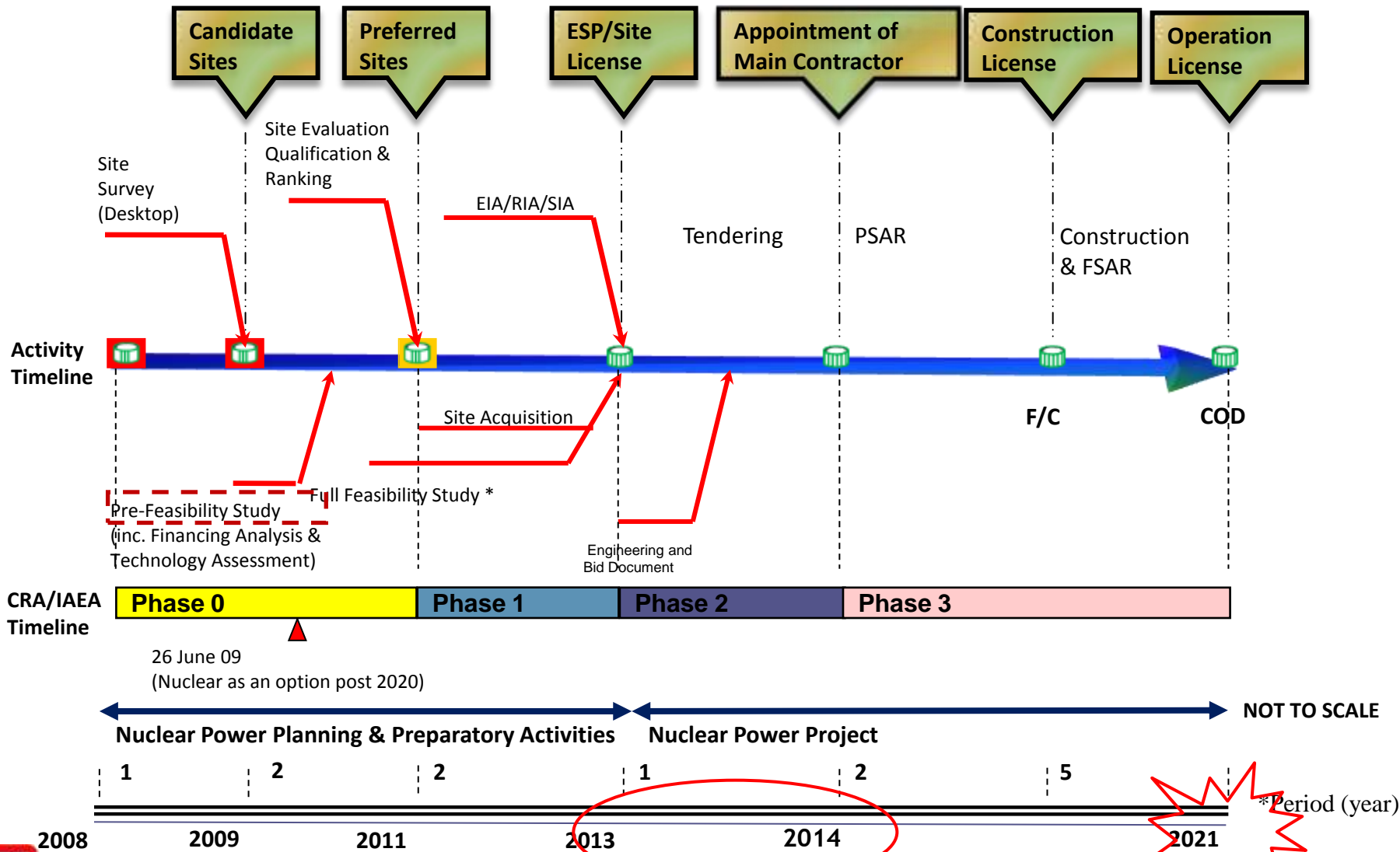
# ROADMAP FOR FAST-TRACK IMPLEMENTATION OF NPP

26 June 2009  
(Nuclear as an option post 2020)

26 June 2009  
(Nuclear as an option post 2020)



# NPP Master Plan 2009 - 2021



\*Including Site FS, Financial Analysis, Technology Assessment, Manpower Development, Public Acceptance, Nuclear Fuel Survey, etc

(as of February 2010)

# Progress Made So Far

IAEA Guideline	Activities	Status
Phase “0”	Establishment of JPPKN	Completed
Phase “0”	Pre-Feasibility Studies	Completed
Phase “0”	Prelim Siting Screening	Completed
Phase “1”	Infrastructure Development (HRD, Industry Support, Technology Development, Legal)	Started Inter Agency Level, Consultant Appointment to Enhance
Phase “1”	PI/PA	Started Inter Agency Level, Need Enhancement, Consultant Appointment
Phase “1”	Full Feasibility Studies and Siting	Consultant Appointment

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## **Public Awareness Programme**



# PAST PIPA ACTIVITIES



**Nobel Laureate Talk by Dr. Mohamed El Baradei,  
Director General, International Atomic Energy Agency (IAEA),  
Kuala Lumpur Convention Centre, 17 July 2007**





**3<sup>rd</sup> National Seminar on Public Information on Nuclear Energy (PINE3),  
Kuala Lumpur, 9-11 November 2009**





**Luncheon Talk  
for Political Stakeholders  
on Nuclear Energy  
at the Parliament building,  
25 November 2009**



## PLANNING ACTIVITIES FOR 2010-2012

	ACTIVITY	FREQUENCY
1.	Talk & exhibition at various secondary schools in Malaysia	Throughout the year and on-going activities Target: 40 schools per year
2.	Talk & exhibition at various Institutes of Teacher Education in Malaysia	Throughout the year and on-going activities
3.	Seminar and exhibition of <i>Public Information on Nuclear Energy (PINE)</i> *	Once a year according to the region (2010 - PINE 4 South Region)
4.	Workshop on 'Train the Trainers for NPP Public Communicator' (TOT) *	Once a year (2010 : 17-19 November)
5.	Working Visit by Members of Parliament, Politicians, Community Leaders to nuclear power plant's community area in advanced country*	Once a year or according to the needs.
6.	Public Opinion Survey*	Will commence after the appointment of consultant
7.	Jingle & airtime*	Once a week starting 2011

\*Special allocation under JKPPN

## PLANNING ACTIVITIES FOR 2010-2012

	ACTIVITY	FREQUENCY
8.	Media Interview	According to the needs & request from media
9.	Public Visit to Malaysian Nuclear Agency (Visit Nuclear Facilities)	Throughout the year. - Visitors will be exposed to the environment and nuclear facilities
10.	Mobile Exhibition – equipped with exhibition materials e.g. interactive nuclear power reactor model	Throughout the year for exhibition purposes
11.	Printed brochures/pamphlets/posters*	Publications will be done periodically and according to needs e.g. Warta Nuklear
12.	Website as One-Stop Centre* (Dedicated website for latest development of NPP in Malaysia)	Will commence after the appointment of consultant

\*Special allocation under JKPPN

## WAY FORWARD FOR PA/PI

- All annual activities will be carried out continuously until the COD of first nuclear power plant (e.g. PINE, TOT, Jingle).
- Further consultation between Nuclear Malaysia and representatives from KPKK, TNB, KeTTHA and other agencies involved in PA/PI activities, to better enhance public awareness activities.
- Simultaneously, the relevant agencies will accomplish PA/PI activities internally to further increase awareness and understanding among the staff.
- Appointment of Experience Consultant To Develop Strategies, Plans and Manage PI/PA



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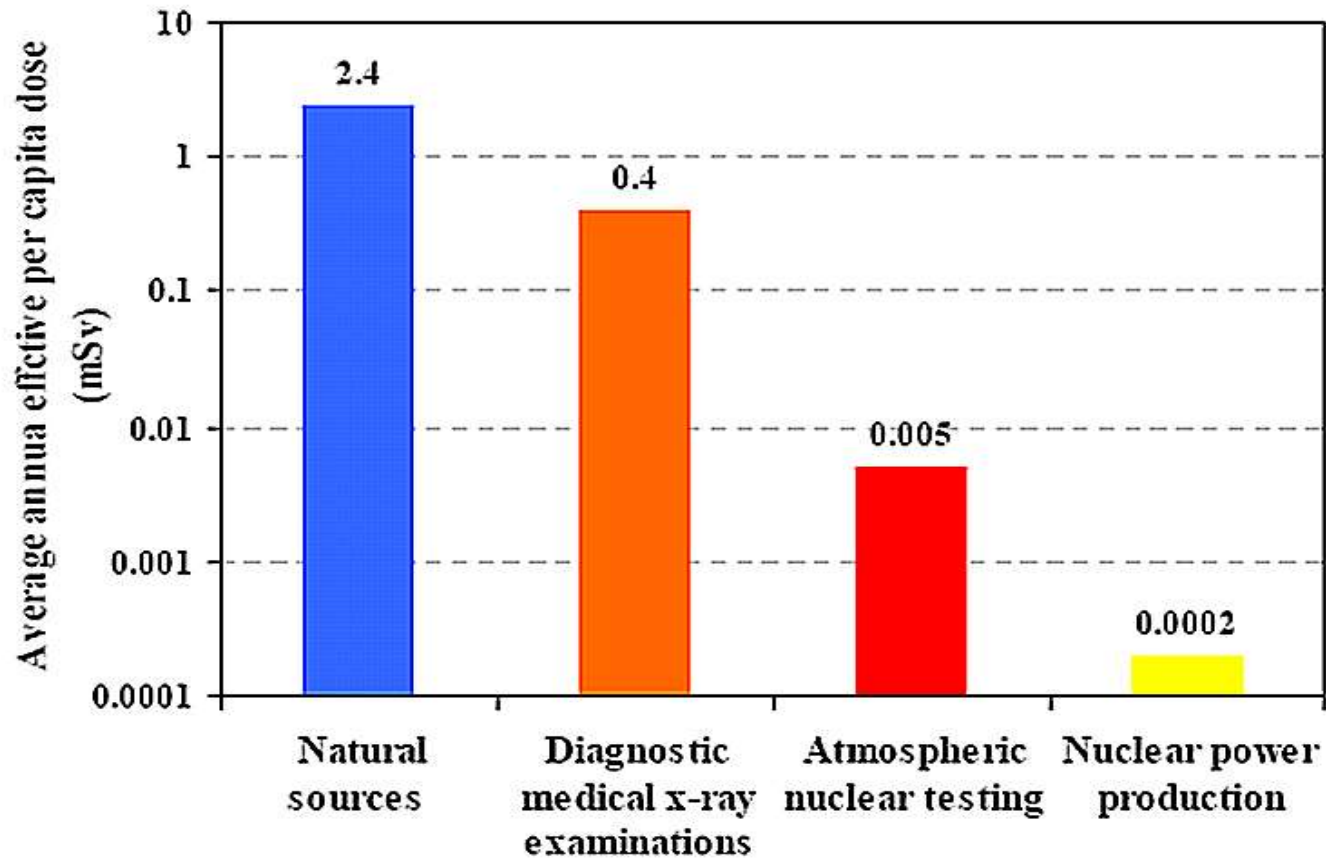
**PUBLIC ACCEPTANCE  
& RISK PERCEPTION ISSUES**

## **KEY PUBLIC ACCEPTANCE & RISK PERCEPTION ISSUES**

**Nuclear Plant Safety & Accident Risks;**  
**Siting of Nuclear Power Plants & Facilities;**  
**Nuclear & Radioactive Waste Disposal;**  
**Nuclear Weapon Proliferation Threat.**



# COMPARATIVE RADIATION EXPOSURE



Source: United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR)

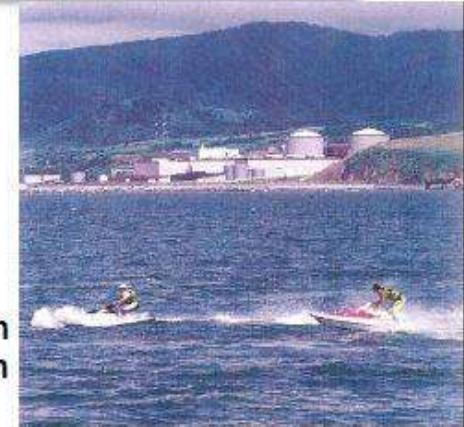
### Coexistence of Nuclear Power Plants and Local Life 1

- There are resident areas near the nuclear power plants in Japan. It is possible for nuclear power plants to coexist with regional industry, such as tourism and fishery.



Mihama NPP and Fishery

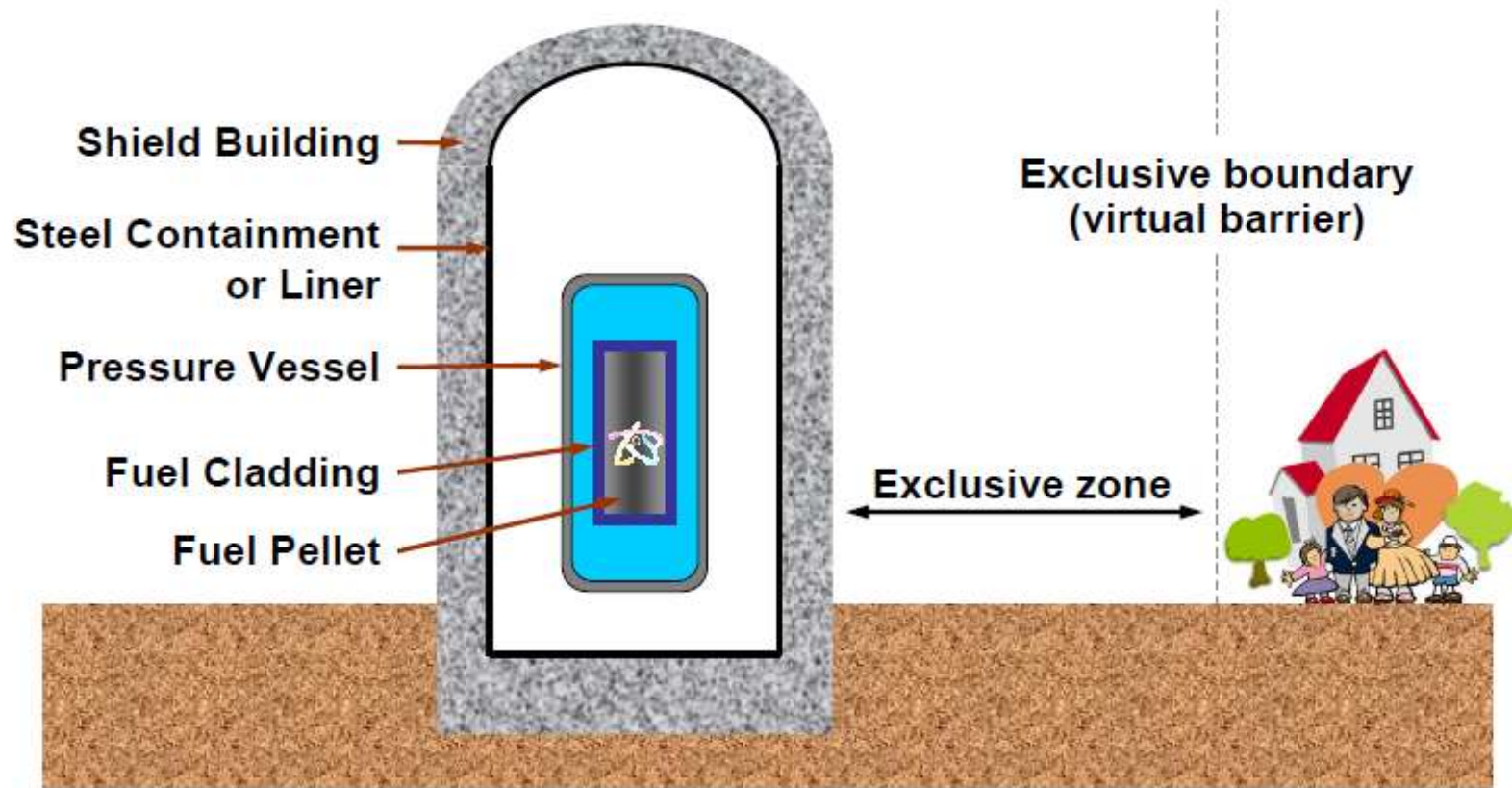
Tomari NPP and an event on the ocean



The beach near  
Mihama NPP

Source : H. Yoko'o ANRE/METI, 2010

# CONCEPT OF MULTIBARRIER CONTAINMENT





## NUCLEAR POWER PLANT SITING HIGHLIGHTS

### Kashiwazaki Kariwa Nuclear Power Plant, Japan:

**6.8 Richter earthquake that struck the plant  
7 Units of 4 x 1,067 MWe plus 3 x 1,315 MWe,  
in Niigata Prefecture on 16<sup>th</sup> July 2007  
did not cause structural damage to the plant,  
except for some spillage of contaminated water from  
spent nuclear fuel storage pool in Unit 6 to the sea  
& some atmospheric release of  
radioactive iodine gas from the turbine in Unit 7,  
with both accidental releases below regulatory limits.**

- In July 2007, Kashiwazaki-Kariwa NPP survived a strong earthquake exceeding the assumed strength at the time of engineering.
- IAEA expert missions came to Japan and appreciated the safety assured even soon after the earthquake, through proper “shut down, cooling, and confinement”.
- Japan will utilize to establish the IAEA seismic qualification guideline based on feedback from its experience.

**“Shut down”** → Automatic scram of the reactor, all units automatically shut down safely.

**“Cooling”** → To remove decay heat after the shut down, every system for heat removal was properly operated.

**“Confinement”** → To confine radioactive materials in containment vessel. There was no leakage from containment vessel.

Kashiwazaki-Kariwa NPP



### Niigata-ken Chuetsu Earthquake in July 2007



Source: <http://coastal.nagaokaut.ac.jp/~jsin/chuetsuoki/index.shtml>



Source: <http://www.yomiuri.co.jp/feature/2007/news10/06.htm>

Source : H. Yoko'o ANRE/METI, 2010

## KEY NUCLEAR & RADIOACTIVE WASTE DISPOSAL ISSUES

Generally accepted technological solution for long-term disposal of high-level nuclear waste arising from spent nuclear fuel reprocessing is permanent storage in deep geological formations.

Best natural example is a “natural nuclear reactor” created by high concentration of uranium ore that operated as a natural nuclear reactor with presence of ground water as neutron moderator for 2 billion years in **Oklo, Gabon**, and with no migration of nuclear fission products beyond the geographical area of the ore deposits.

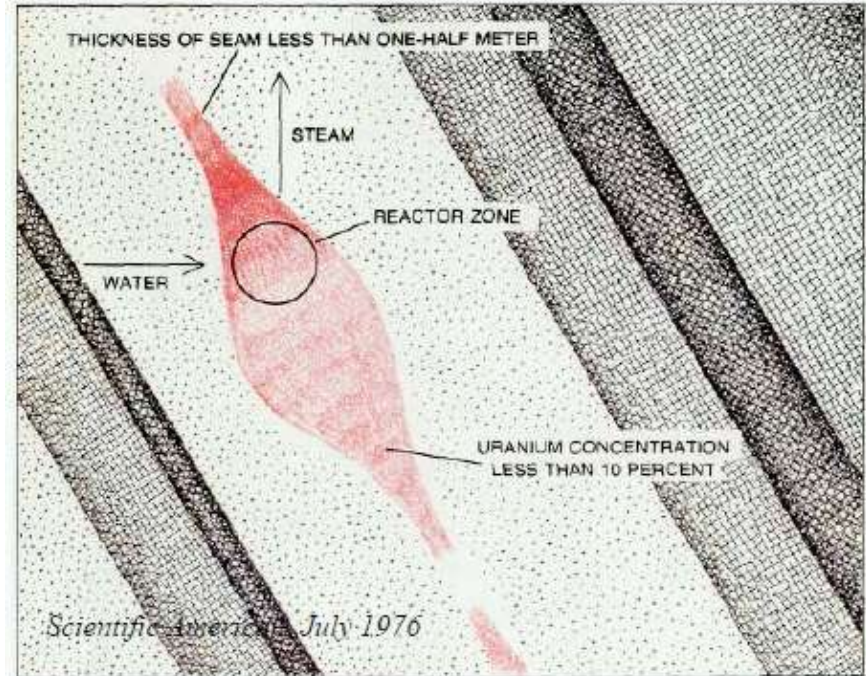


# NATURAL NUCLEAR REACTOR IN OKLO, GABON



*Scientific American, July 1976*

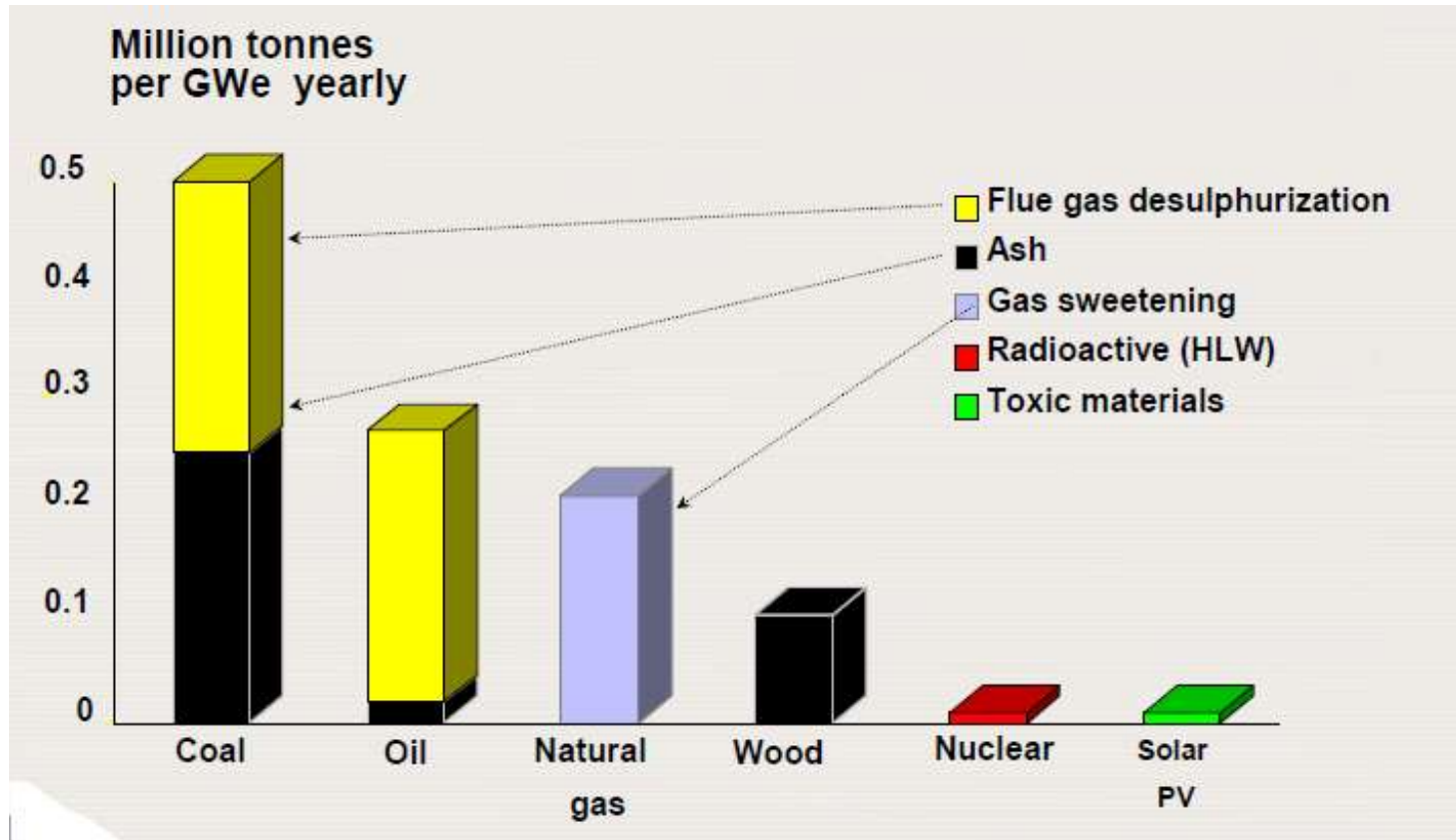
**Started  
nuclear reaction  
2 billion years ago**



*Scientific American, July 1976*

- **15 natural reactors discovered**
- **16,000 MW-years**
- **Used 5 tons uranium**
- **5 tonnes waste**
- **1.5 tonnes of Pu**

## WASTE VOLUME FOR FUEL PREPARATION & PLANT OPERATION BY ENERGY SOURCE



## KEY NUCLEAR WEAPON PROLIFERATION THREAT PERCEPTION ISSUES

Malaysia is not generally considered  
by global nuclear weapon proliferation strategists  
as posing a nuclear weapon proliferation threat  
for following reasons:

Malaysia does not have a tradition of militarist nationalism that would motivate threats to neighbouring countries or development of nuclear weapons;

Instead, Malaysia pursues a policy of Prospering Thy Neighbour with a belief that regional economic development will open new markets & opportunities for economic growth, while mitigating problems like economic migrants;

## **KEY NUCLEAR WEAPON PROLIFERATION THREAT PERCEPTION ISSUES**

**Malaysia is not located in a geographic region that has a long history of military conflict, which could spur nuclear weapon development.**

**Malaysia does not regard regional superpowers as a threat to spur nuclear weapon development, but has instead established trading relations with countries like India & China since 15<sup>th</sup> Century;**

**Malaysia's policy has consistently been against the development & acquisition of nuclear weapons by any State or non-State parties in the world and called for a Nuclear Weapons Convention to ban all nuclear weapons in the world.**



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## **CONCLUDING REMARKS**

# Conclusion

- Malaysia Have Justifications to Use Nuclear Power for Long Term Energy Security and Environment Controls
- Nuclear Energy Policy and New National Energy Policy Are The Drivers for Nuclear Energy Development
- Preparations and Implementations are Underway and in Good Progress
- Issues Including the Delicate Public Acceptance are Being Addressed and Managed With Most Care

Thank you.

