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**WORKSHOP ON NUCLEAR POWER PLANT
TECHNOLOGY ASSESSMENT**

Vienna, 17-20 November 2008

The case of Portugal



Nuclear Power Plant Technology Assessment The case of Portugal

- **An Atypical Country**
- **A Special Case regarding Nuclear Power**
- **An Atypical Presentation**



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- Developed country
- 19th highest quality of life in the world
- Lowest GDP per capita of western european countries

USD 22,677

- 7th most peaceful country in the world
- Exports more technology than it imports. 20th in the Technology Index .\
- Down to 44th (2007) from 22nd place (2005) in global competitiveness



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- No Nuclear Power Plants and no Plans
- Many national personalities mention NP as option to be studied and debated.
- Present administration considers NP as taboo and places emphasis on renewable resources
- The main opposition party has presently no position.
- Strong anti-nuclear and renewables (wind) lobbies
- Little if any knowledge on NP technology and limited on nuclear applications.



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- Paper and PP presentation submitted to Workshop are excerpts of a document prepared to start a public dialogue on Nuclear Power in Portugal
- The full document has 2 annexes:
 1. Summary of Situation in Spain, Finland and Switzerland
 2. Summary of main R&D projects on Nuclear Systems
- Paper represents the views of author and not the Government



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Nuclear Technology and Energy in Portugal

- Background on Nuclear Technology in Portugal
- Energy policy, supply and demand
- The role of the IAEA
- Present role of Nuclear Energy
- Technologies available for Nuclear Systems
- Financial considerations
- Technologies for nuclear applications
- Dialogue/ National debate
- Road map for Portugal



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Institute for Nuclear Technology (1954)

- Nuclear power and applications
- Two particle accelerators (2 MeV and 0.6 MeV) + research reactor of 1 MW
- Now only applications and oriented to education and training

Projects for NPPs

1954, 1974/75, 2004 with 1600 MW(e)



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Policy, Supply and Demand

- **Electricity production:** 49.04 TWh (2006)
- By source:
 - *fossil fuels:* 55%
 - *hydro:* 40%
 - *nuclear:* 0%
 - *renewables:* 5 %
- No oil or gas reserves
- **Current account balance in energy :- USD 21.75 billion (2007 est.)**



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- Government goal is to have by end 2010 40% from renewables
- Nuclear Power not being considered.
- Goal doubtful in view of production cost (in particular solar) and unproven technologies (wave)
- Even if this goal is met , 20 % remains for fuel based electricity = 10TWh
- Kyoto target is to keep greenhouse emissions for 2008-2012 to less than 27% above 1990 emissions. On target.



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The role of the IAEA

- IAEA little known in the country except in Foreign Affairs and INT (the regulatory authority)
- Unique role in controlling international norms of safety and security and compliance with the **NPT**
- It is a meeting point for specialists on nuclear energy systems and applications
- It organizes a series of scientific meetings of interest to newcomers and advanced participants



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Present role of Nuclear Energy

- Economic considerations :
 1. Cheapest form of energy but higher initial investment
 2. Less vulnerable to fossil fuel price fluctuations
 3. Financing of NPPs seems no problem
- Meeting Kyoto Targets in EU impossible without NP
- € 1.4 billion is spent annually on R&D by the Nuclear Industry and Governments on innovative designs not counting generation IV and fusion technologies.



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Brief notes on technologies available for Nuclear Systems

- Emphasis on refrigeration and moderation by water:
PWR, BWR and HWR
- References made to CANDU, European Pressurized reactor and Pebble Bed reactor
- 13 projects under development of third generation NPPs
- Problems to be solved: Spent fuel, nuclear waste and public acceptance



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Technologies for Nuclear Applications

- -Health
- - Agriculture
- - Management of hydraulic resources.
- - Geo-thermal energy
- - Environmental protection in air, land and water



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Dialogue/Debate at national level

- Importance of dialogue: cases of France, Spain, Switzerland, Finland and Austria
- Combine debate with awareness on applications
- Even if ultimate decision is **no**, debate is still necessary.



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Road Map for Portugal

- Based on IAEA methodology with 3 phases:
 1. Considerations before the decision is taken
 2. Preparatory phase
 3. Implementation of the programme
- Changes proposed to methodology :
 1. Stress central role of private sector
 2. Not a linear path but more like CPM
 3. Increased economic considerations
 4. Stress public dialogue



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Road map for Portugal (cont.)

- Time frame of 15 years for the 3 phases
- Joint project with Spain (grid, know-how , fuel cycle and economies of scale considerations)
- Start work NOW!



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Thank you for your attention!