

The Future of Nuclear Energy as a Primary Source for Clean Hydrogen Energy System

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WORLD ENERGY REQUIREMENTS

- **International Energy consumption grows very fast**
- **Energy generation needs careful consideration of environmental impact**
- **Various Scenarios were considered for future energy needs.**
- **An increase ranging between 1 – 8 % is required in electricity production**

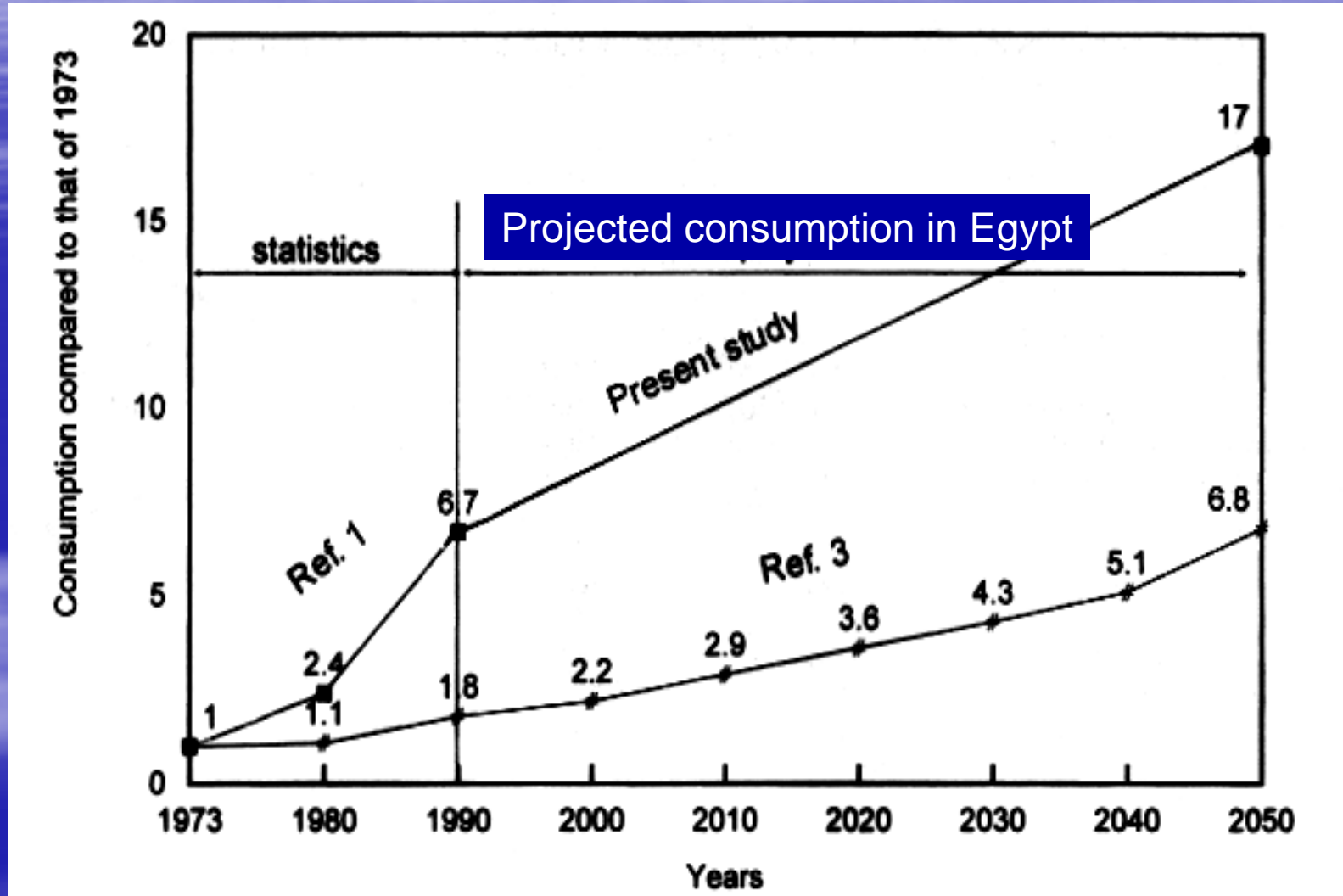
Energy needs for Developing Countries

- 70% of the world population lives at a per capita energy consumption level one-quarter of that of Western Europe and one-sixth of that of the United States.
- Comparisons show more discrimination. The electrical consumption /year/capita is 100 kWh in Penglaladish, while it is 25,000 in Norway and 6700 in France .
- Other studies showed that 20% of the world population consumes 75% of the total world energy consumption by the year 2003.

Electric Power Production in Egypt

Year	Available Electricity (Billion kwhr)	Consumption kwhr/Capita
1995	82.5	1000
1997	89.0	1400
2000	95.0	1450
2002	100.0	1550

Present and projected annual electricity demand in Egypt and worldwide in the period 1973-2050.



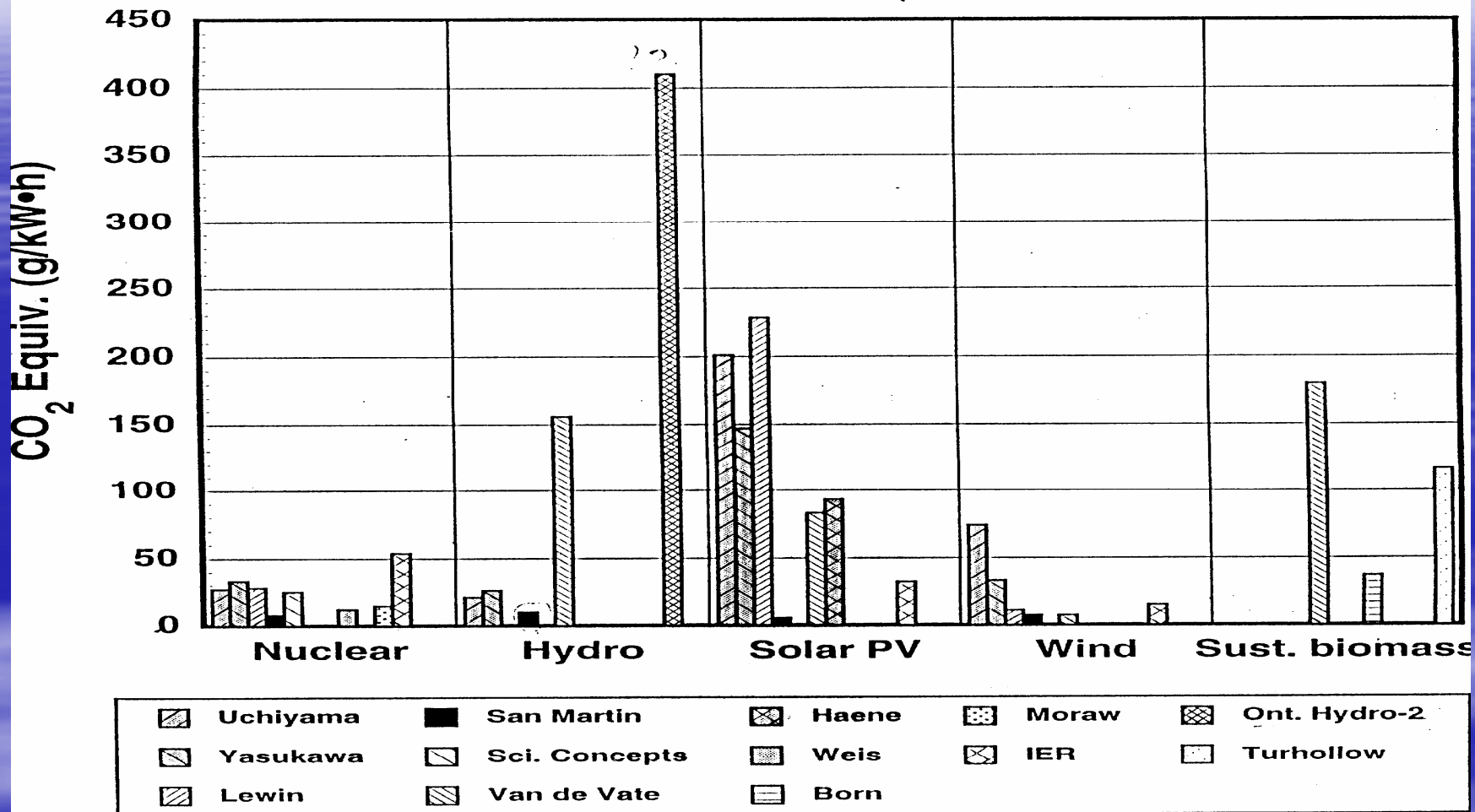
The previous information shows two important facts :

1. The need for tremendous new power generation to satisfy the requirements of population growth
2. The lack of diverse sources for power generation, since the only two main sources are fossil thermo power and hydropower.

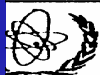
Nuclear Power as a proposed Alternative

- The generation of nuclear power proved to be the only alternative.
- Safe operation of nuclear power proved to have less environmental impact than most of the other energy sources

Greenhouse Gas Emissions from Electricity Generation by Nuclear and Renewable Energy Systems



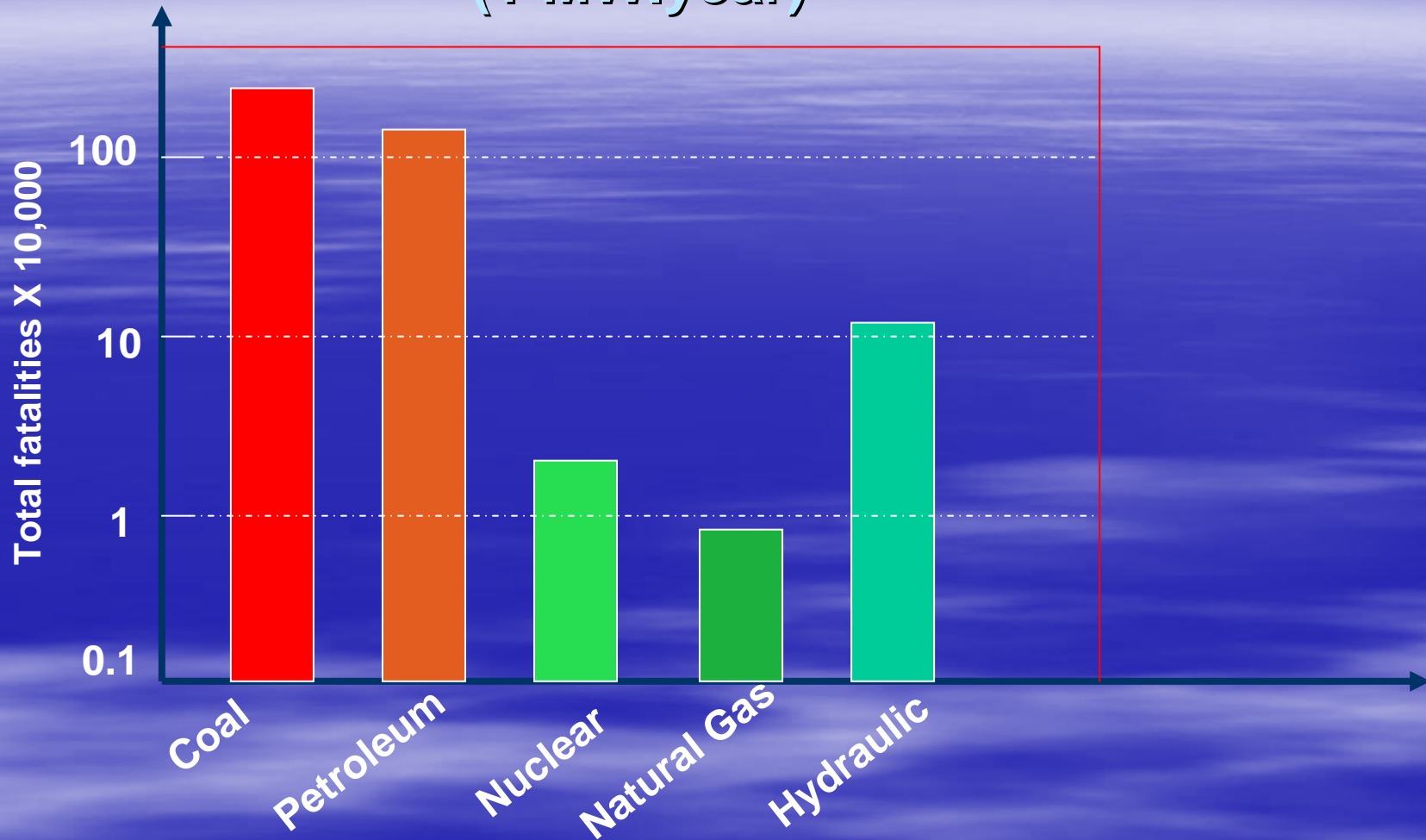
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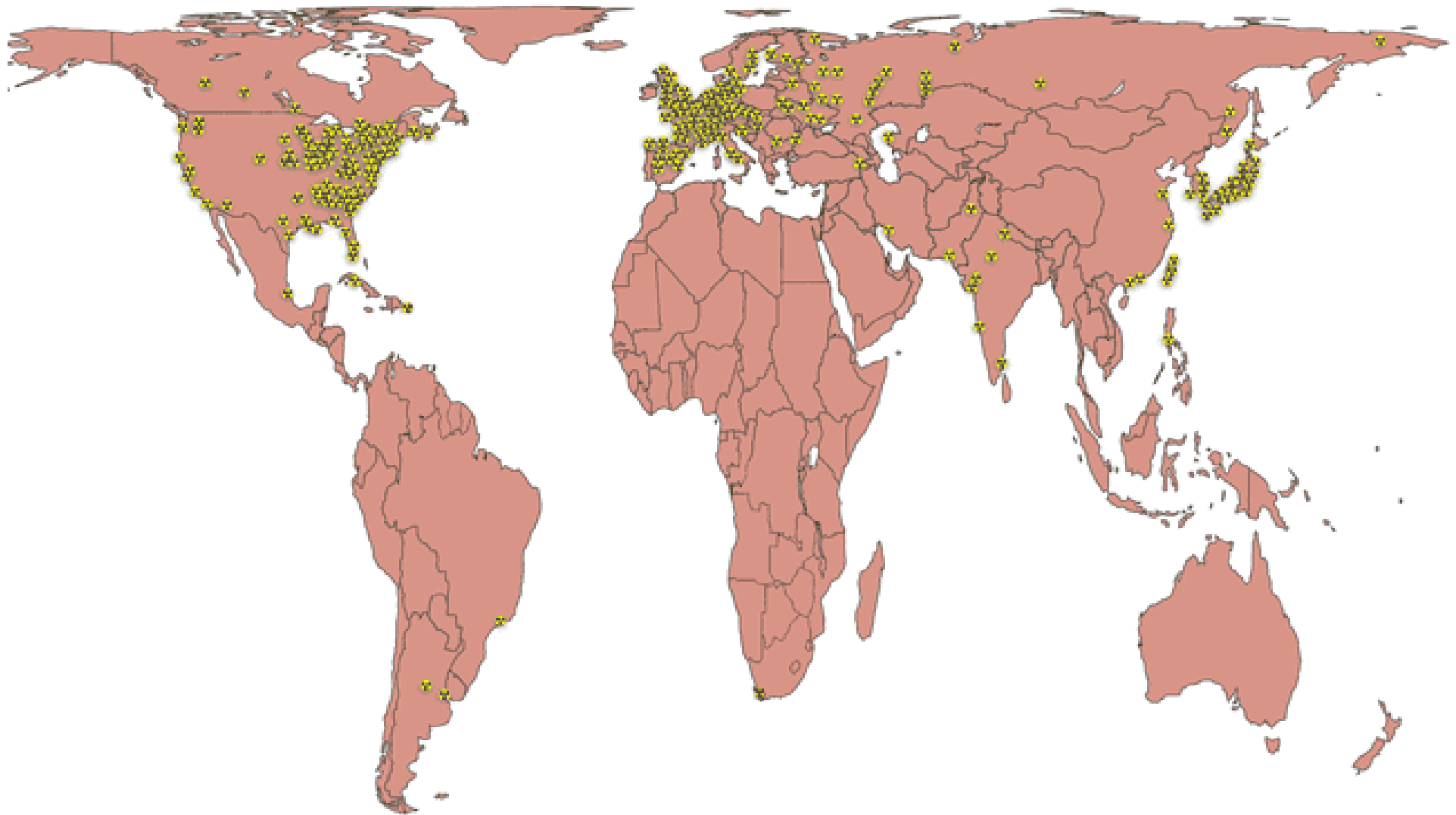


Risk per each generated energy unit (1 MW.year)



Adopted from a study by AECL

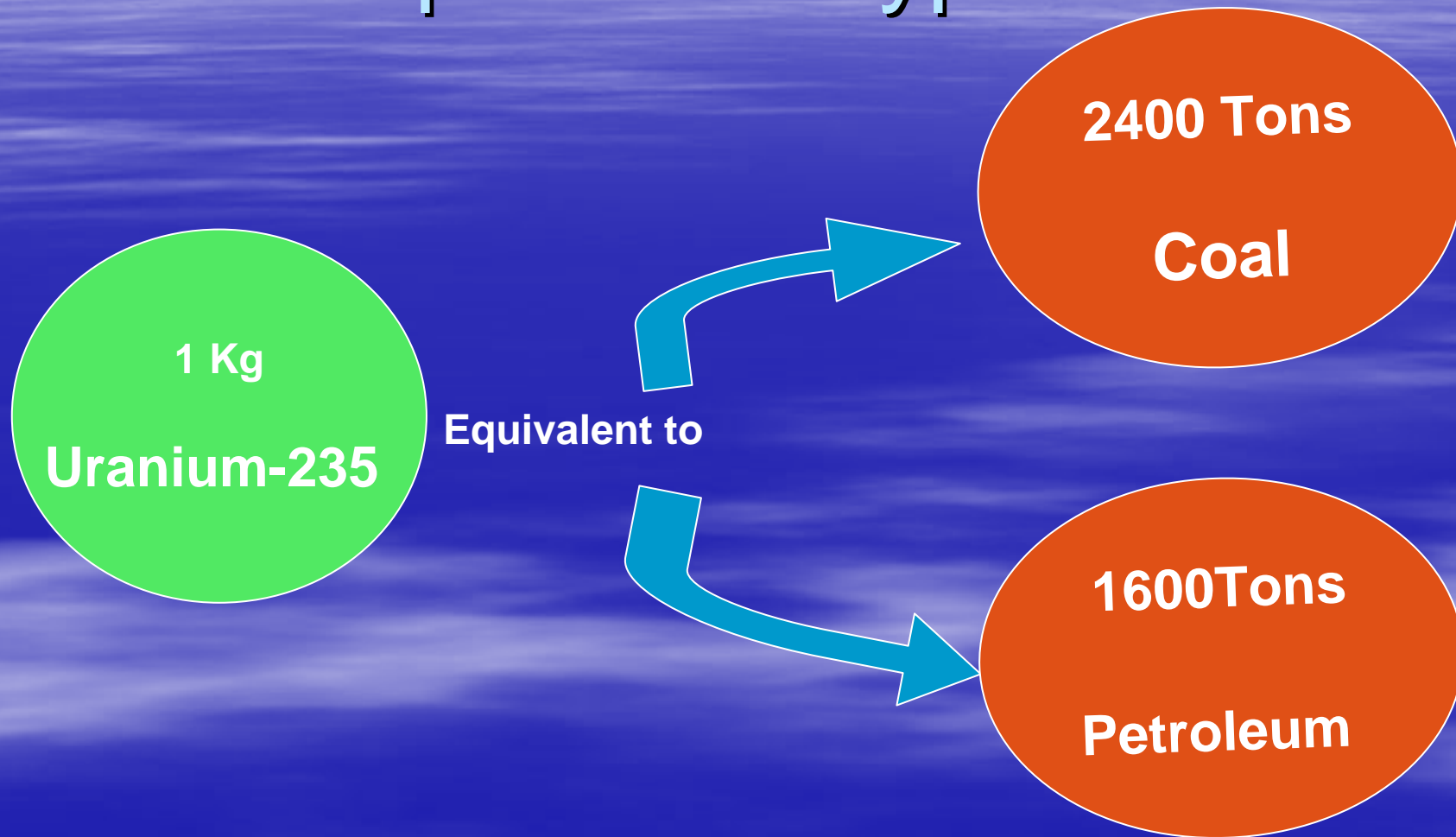
Nuclear Power Plants Around The World

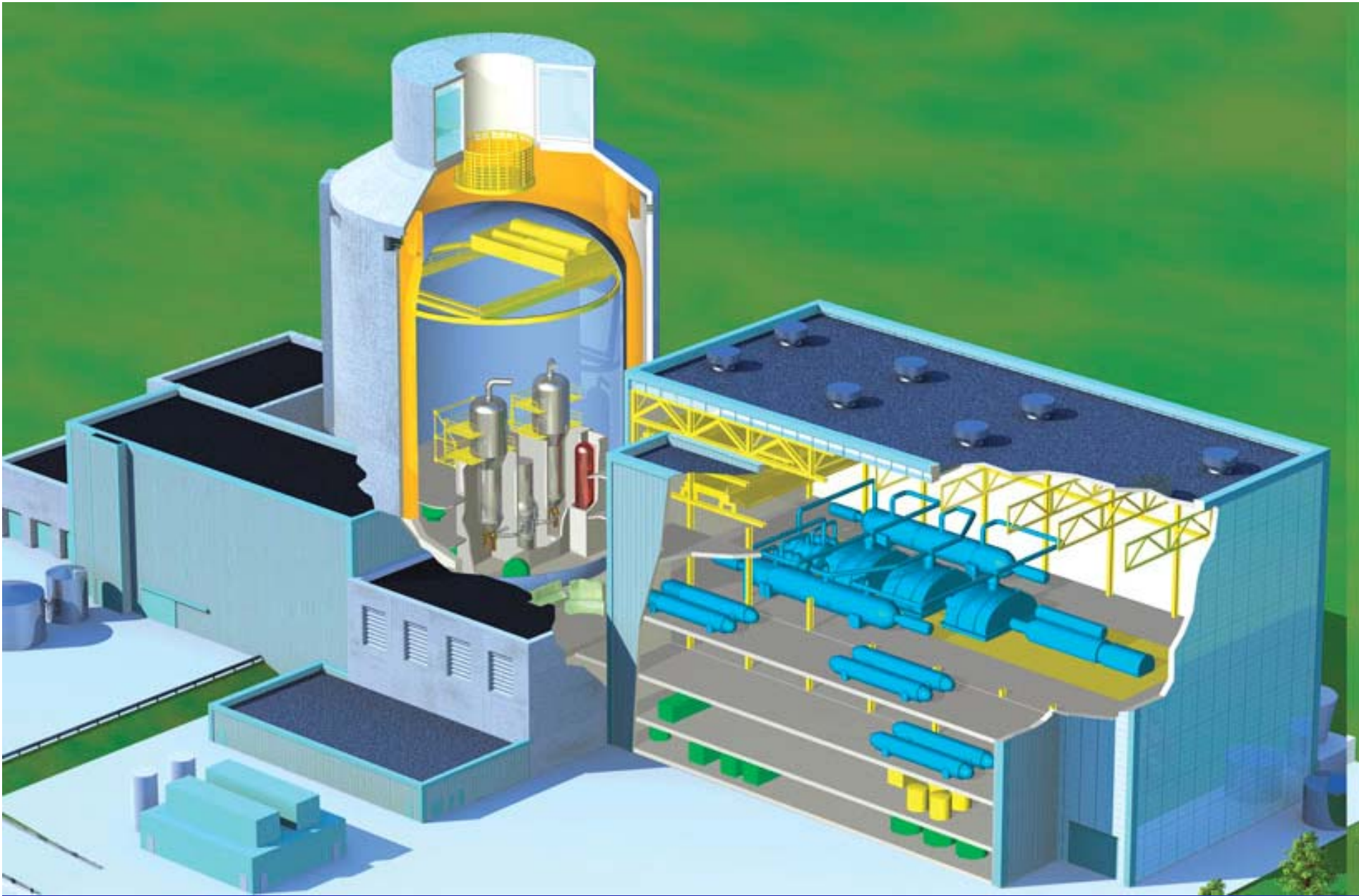


For Remote Areas

- For remote areas like TOUSHKA and AL-EWAYYENAT (South-West of Egypt), it was found that energy supply by either transmission lines or petroleum pipelines is quite expensive.
- Nuclear power does not need extensive effort to transmit fuel to such remote areas. e.g. 1 Kg of Uranium 235 gives energy equivalent to 1600 tons of petroleum.

ENERGY Production per Fuel Type





NUCLEAR-ELECTRIC-HYDROGEN ENERGY SYSTEM

- Nuclear energy requires a gaseous vector as a partner for electricity.
- This partner could well be hydrogen as intermediate carrier of energy.
- A combination of nuclear energy associated with hydrogen could be an excellent solution for remote areas as a clean energy chain.
- Nuclear power could be a clean source for electricity and also for hydrogen production as a clean energy carrier.

WHY HYDROGEN

1. Hydrogen could be used in its end-use as a non-polluting and versatile fuel.
2. Non-fossil fuel.
3. it has the advantage over electricity that it enables direct storability and transmission as a material flow.
4. The production of hydrogen from nuclear power could be either by electrolysis, or by thermolysis.

5. Storage and transfer of hydrogen could be accomplished with “state-of-the-art” technologies with reasonable cost. Most of these technologies are now in use.
6. Hydrogen is being used now in many prototype hydrogen automobiles which have been manufactured and tested.
7. The hydrogen motor reaches efficiency is close to that of the natural gas motor.

Advantages of the Proposed System

This proposed chain may have the following advantages:

1. Very little pollution, especially greenhouse gas emissions.
2. Satisfying most, if not all, of the energy needs in any clean, remote and newly developed areas.
3. Some economical benefits by saving the costs of energy transmission to these remote areas, either as electricity or as fossil fuels.

**Thank you
for
your Attention**