

Nuclear Energy: Is It A Viable Energy Resource for the World?

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Objectives

- Identify the costs and benefits of nuclear energy
- Identify whether renewable energy sources are a realistic solution for developing economies
- Compare different energy sources
- Identify what solutions are available to meet the world's energy demands.

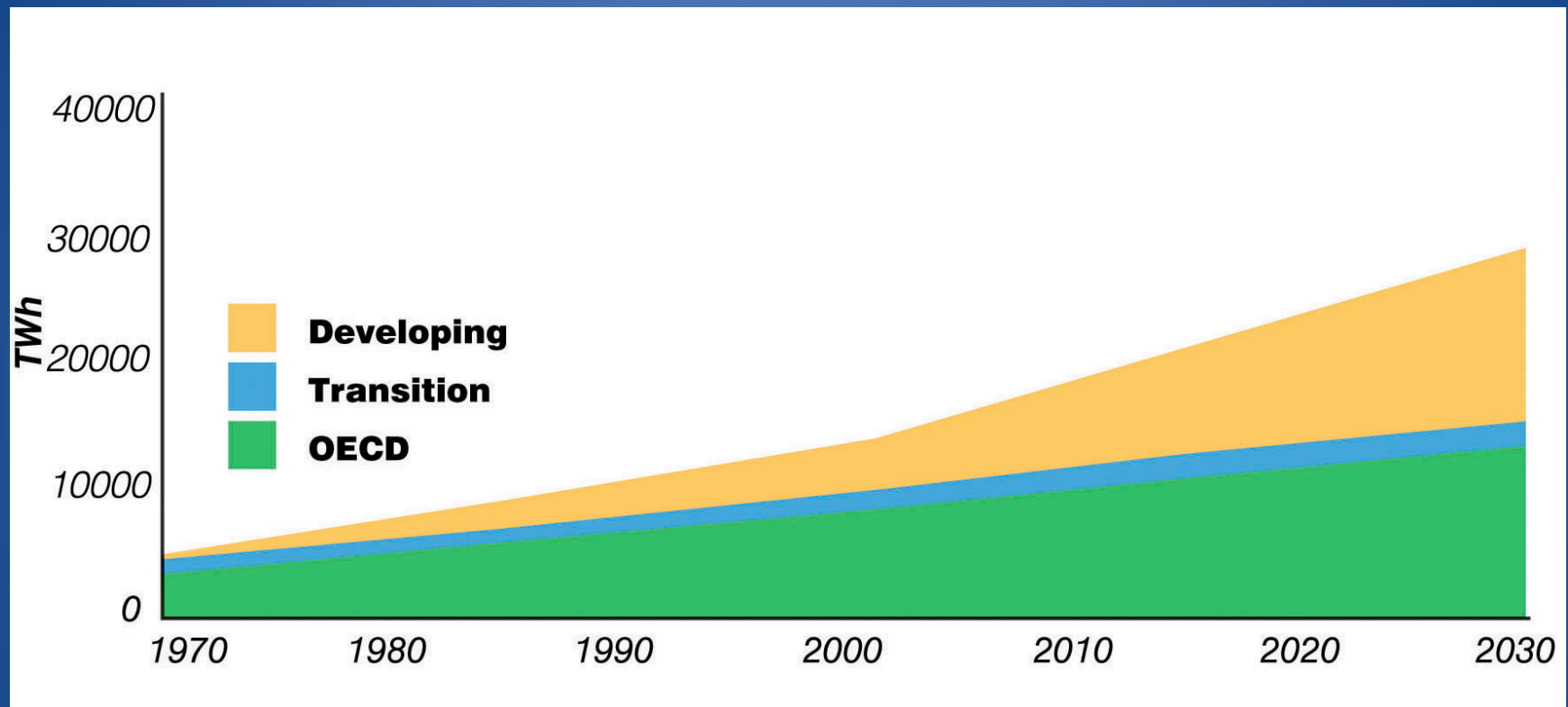
The Nuclear Debate

- Risks
 - Waste management and storage concerns
 - Chance of power plant meltdowns
 - Use of nuclear byproducts to make weaponry
 - Health concerns from nuclear waste
 - Threat of terrorist groups

The Nuclear Debate

- Benefits
 - Cheaper and more available source of energy than fossil fuels i.e. oil, natural gas or renewable energy
 - Profitable export
 - Provides employment
 - Increased economic development

Energy Demand



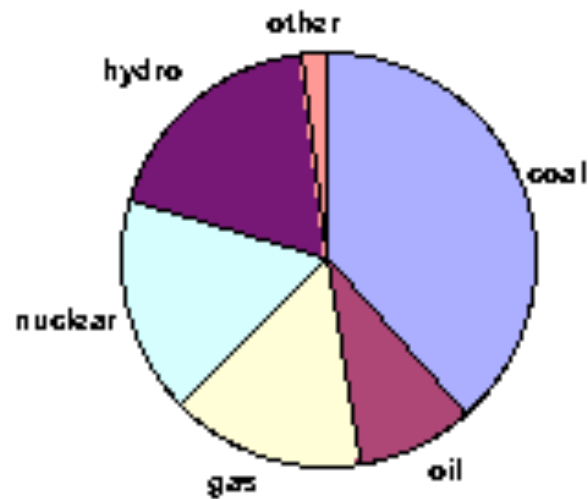
www.world-nuclear.org

OECD - Organization for Economic Cooperation and Development

How do we meet the increasing energy demand?

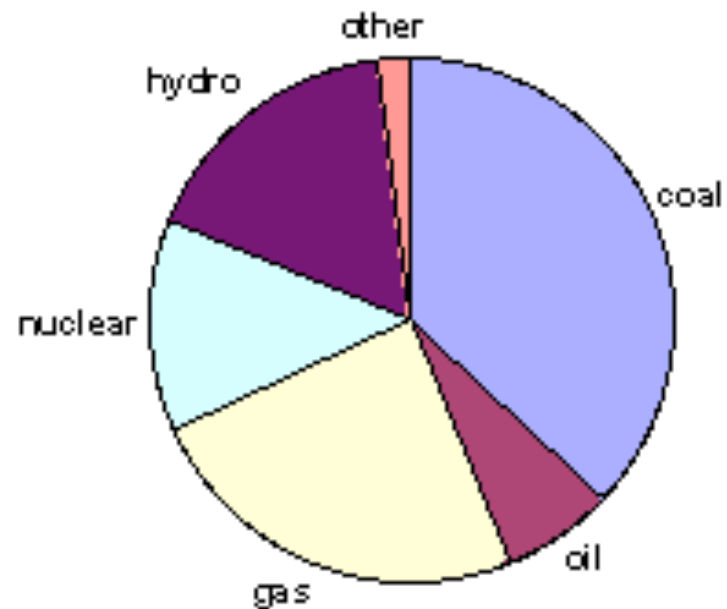
WORLD ELECTRICITY GENERATION 1997 AND 2010

1997



Total 14 000 TWh

2010 (projected)

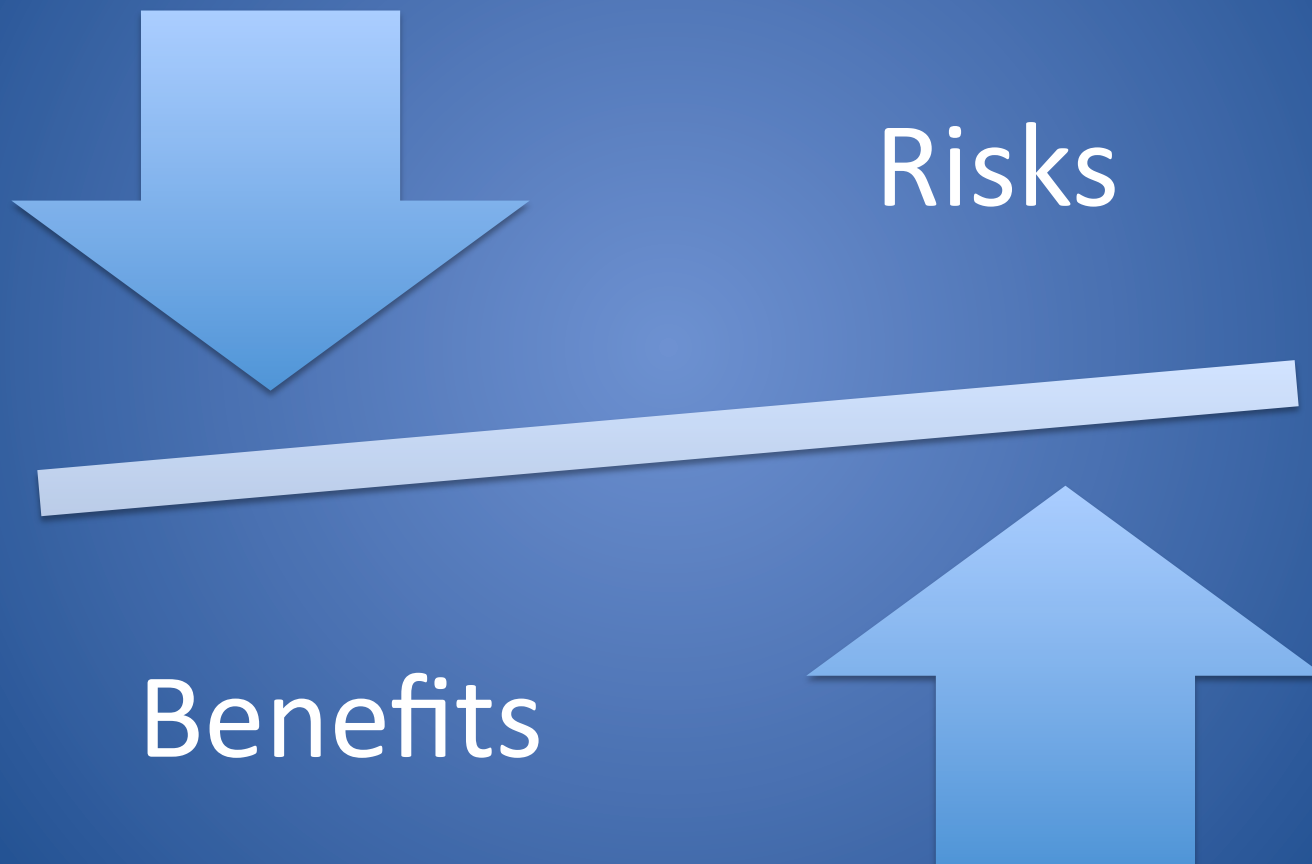


Total 20 000 TWh

Nuclear Power vs. Fossil Fuels Circa 1999

Country	Energy Usage (Metric Tons Oil)	% from fossil fuels	% from Nuclear Energy
USA	2,269,985	88.6%	8.8%
Russia	602,952	91.3%	5.4%
France	255,043	54.9%	40.3%
Germany	337,196	86%	13.1%
China	1,088,349	78.5%	0.036%
Japan	515,447	80.7%	16%
Canada	241,780	76.3%	7.9%

What is the ratio of Risks to Benefits?



Nuclear Energy

Advantages

- Fuel Inexpensive
- Concentrated energy source
- Waste is more compact than other sources
- No acid rain/greenhouse effects

Disadvantages

- Large capital cost i.e. (construction, containment and waste)
- Waste storage issue
- Nuclear weapon proliferation issues

Gas/Oil

Advantages

- Easy to obtain
- Better as heating energy source

Disadvantages

- Limited availability, prone to shortages
- Global warming issues
- Expensive for electricity
- Prices swing due to supply and demand

Renewable Energy

Hydroelectric/Wind/Solar

Advantages

- Inexpensive after the development of a dam
- Government investments
- Good for farming demands on energy
- Well suited to rural areas
- Sun and Wind is free

Disadvantages

- Limited source because of need for water elevation
- Dams affect fish supply
- Flood danger
- Need 3 times the amount of energy wind can produce
- Limited to windy areas
- Need expensive energy storage
- Climate dependence
- Large amounts of land for small amounts of energy

Biomass

Advantages

- Fairly new industry and open to research
- Small plants
- Decentralized

Disadvantages

- Inefficient due to small plants
- Contributes to global warming

Energy Production Costs 1995-2006

U.S. Cents/Kilowatt Hour
(Not including capital costs)

Year	Coal	Gas	Nuclear	Petroleum
1995	2.41	3.51	2.53	5.51
1996	2.27	4.28	2.37	5.60
1997	2.19	4.34	2.47	5.03
1998	2.14	3.80	2.30	3.53
1999	2.06	4.11	2.07	4.24
2000	2.00	6.80	2.03	6.14
2001	2.09	6.87	1.89	5.62
2002	2.05	4.38	1.90	5.40
2003	2.03	5.98	1.86	6.41
2004	2.13	6.22	1.84	6.18
2005	2.31	7.79	1.76	8.47
2006	2.37	6.75	1.72	9.63

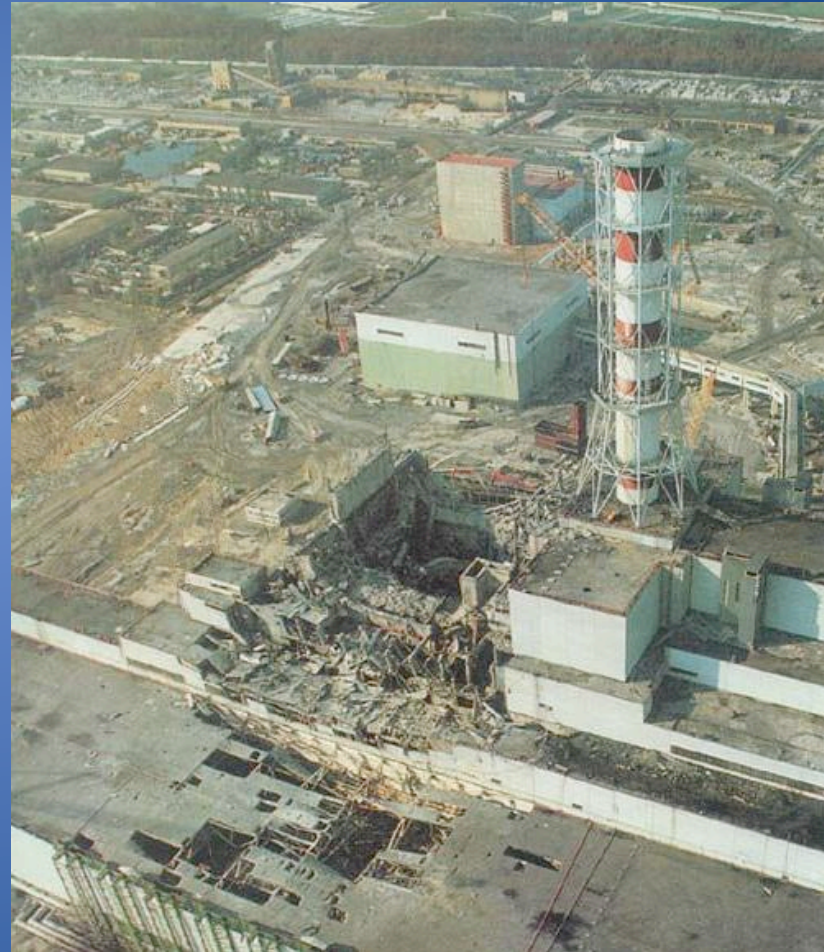
Safety Concerns

- Fear of radiation
- Nuclear fission waste used for creating nuclear weapons
- Nuclear power plant meltdown i.e. Chernobyl, Three Mile Island

Disasters



http://www.fda.gov/centennial/this_week/images/13_06/3_mile_island.jpg



http://content.answers.com/main/content/wp/en/thumb/2/2f/300px-Chernobyl_Disaste

Why Nuclear Energy?

- Due to increased regulations, disasters like Three-Mile Island and Chernobyl are rare.
- Nuclear energy has the most compact waste of all energy sources.
- Once the plant is built it pays itself off quickly and becomes a cheaper form of energy.

Why Not Renewable Energy?

- Although the sun and wind are free, the amount of area needed to meet the energy demand is extreme and not viable.
- Although technologies are improving, the cost of harvesting renewable energy is unrealistic at this point.

Conclusions

- Although Nuclear Energy is under much international scrutiny, The benefits outweigh the risks overall.
- Fossil fuels will become increasingly scarce and costs for fuel will soar, causing international conflicts.
- Renewable energy sources can not realistically deal with the increasing demand of energy
- Nuclear energy is a viable power source for the world.

Bibliography

“Comparison of Various Energy Sources.” Why Nuclear Power. 1996. The Virtual Nuclear Tourist. 15 Apr. 2008.

<<http://www.nucleartourist.com/basics/why.htm>>

“Key Issues: Operational Safety.” Nuclear Energy Institute – Operational Safety. 1994. Nuclear Energy Institute. 13 Apr. 2008.

<<http://nei.org/keyissues/safetyandsecurity/operationalsafety/>>

Robinson, Berol. “The benefits of nuclear energy.” The Benefits of Nuclear Energy. Date Unkown. Ecolo. 13 Apr. 2008.

<http://www.ecolo.org/documents/documents_in_english/BenefitsOfNuclearEnergy.doc>

“Reliable and Affordable Energy”. Nuclear Energy Institute. 1995. Nuclear Energy Institute. 15 Apr. 2008.

<<http://nei.org/resourcesandstats/documentlibrary/reliableandaffordableenergy/graphicsandcharts/uselectricityproductioncosts/>>