“The Reactor Down the Street”

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http://engineeringworks.tamu.edu/2010/the-reactor-down-the-street/

Which emits more radiation? [1]

Nuclear power plant

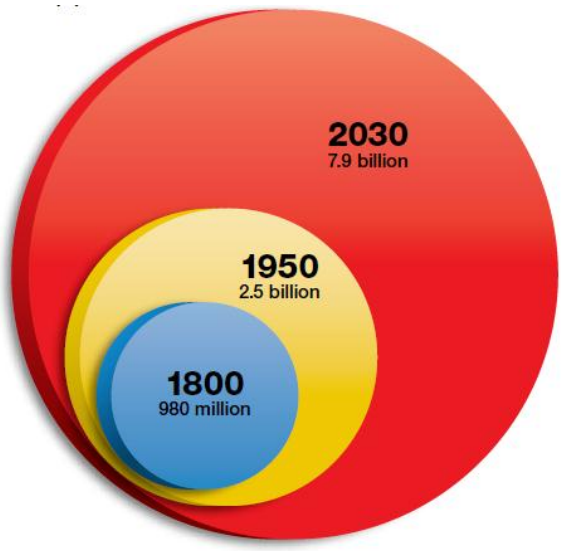
http://www.associatedsource.com/wp-content/uploads/2010/06/Nuclear-Power-Plant.jpg

Coal power plant

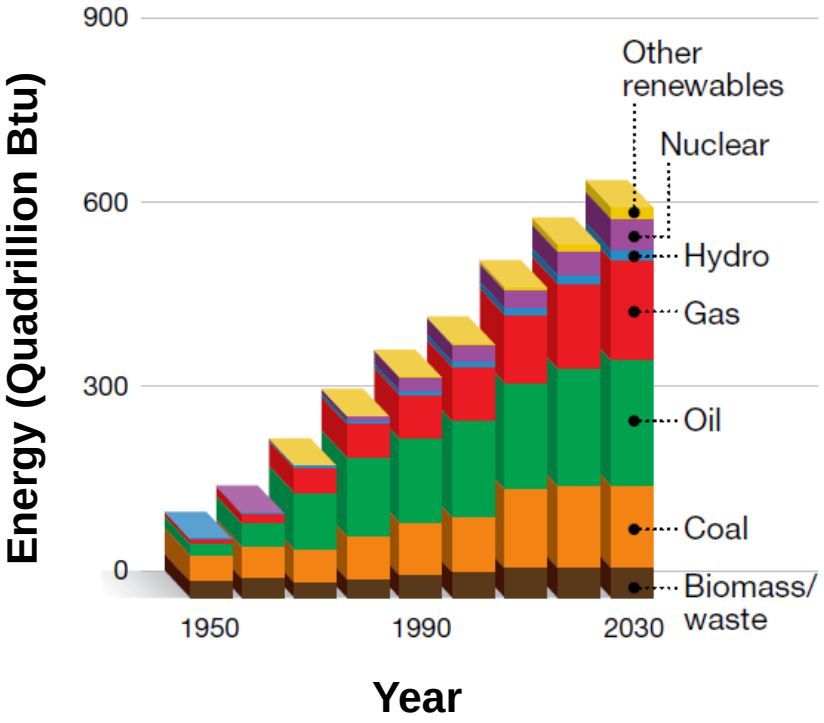
http://energynewspaper.com/wp-content/uploads/2010/12/coal-burning-power-plant.jpg

Why is it important?

- Population Increase (energy demand) [2]

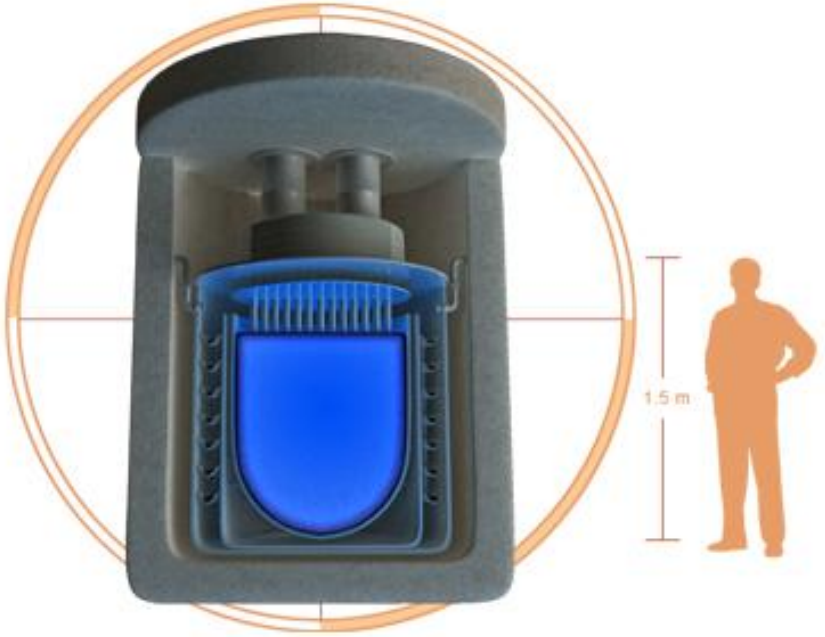


Global Population Expected Growth



Outline

- How a nuclear plant works
- What is different
- Primary companies
- Benefits
- Cost
- Safety
- Other Considerations
- Spent Nuclear Fuel
- Road Ahead
- Conclusion



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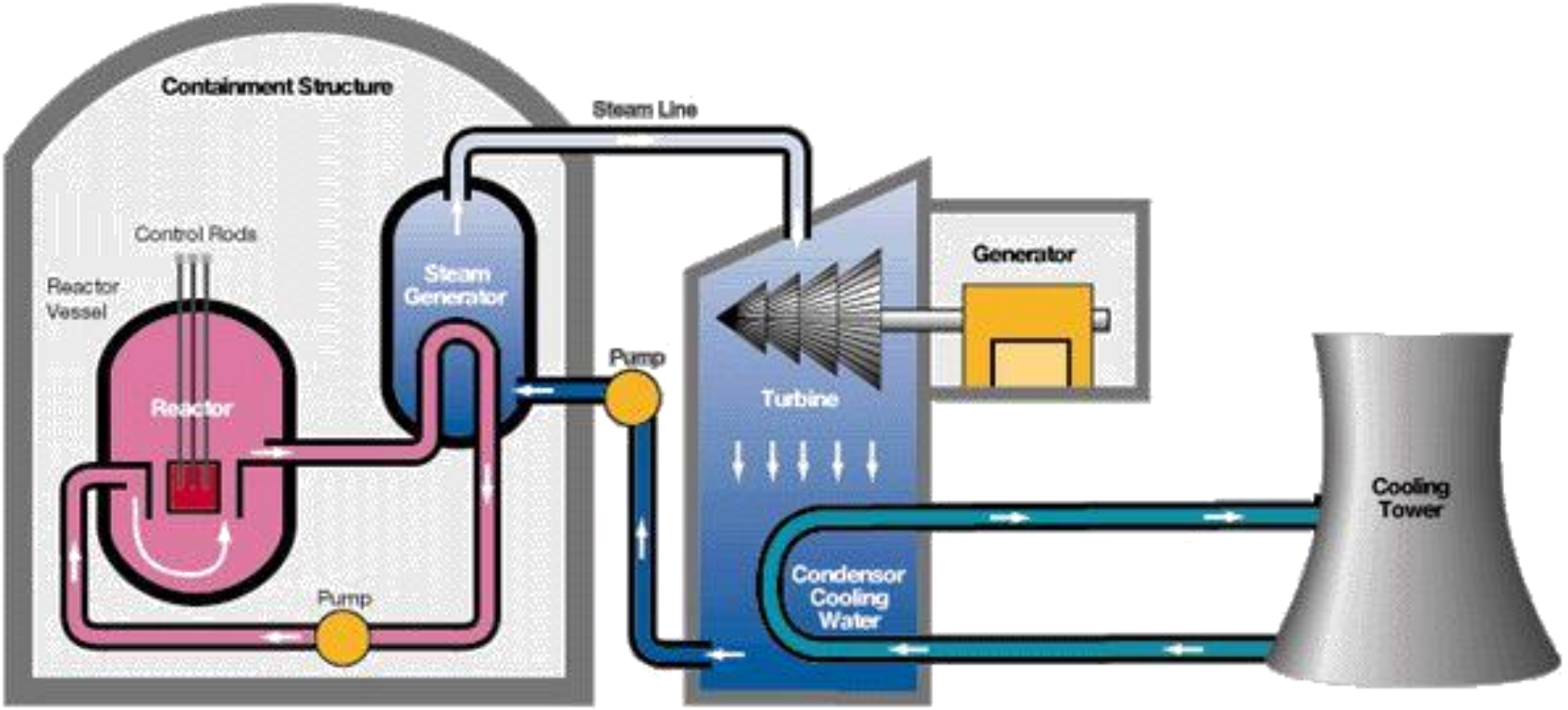
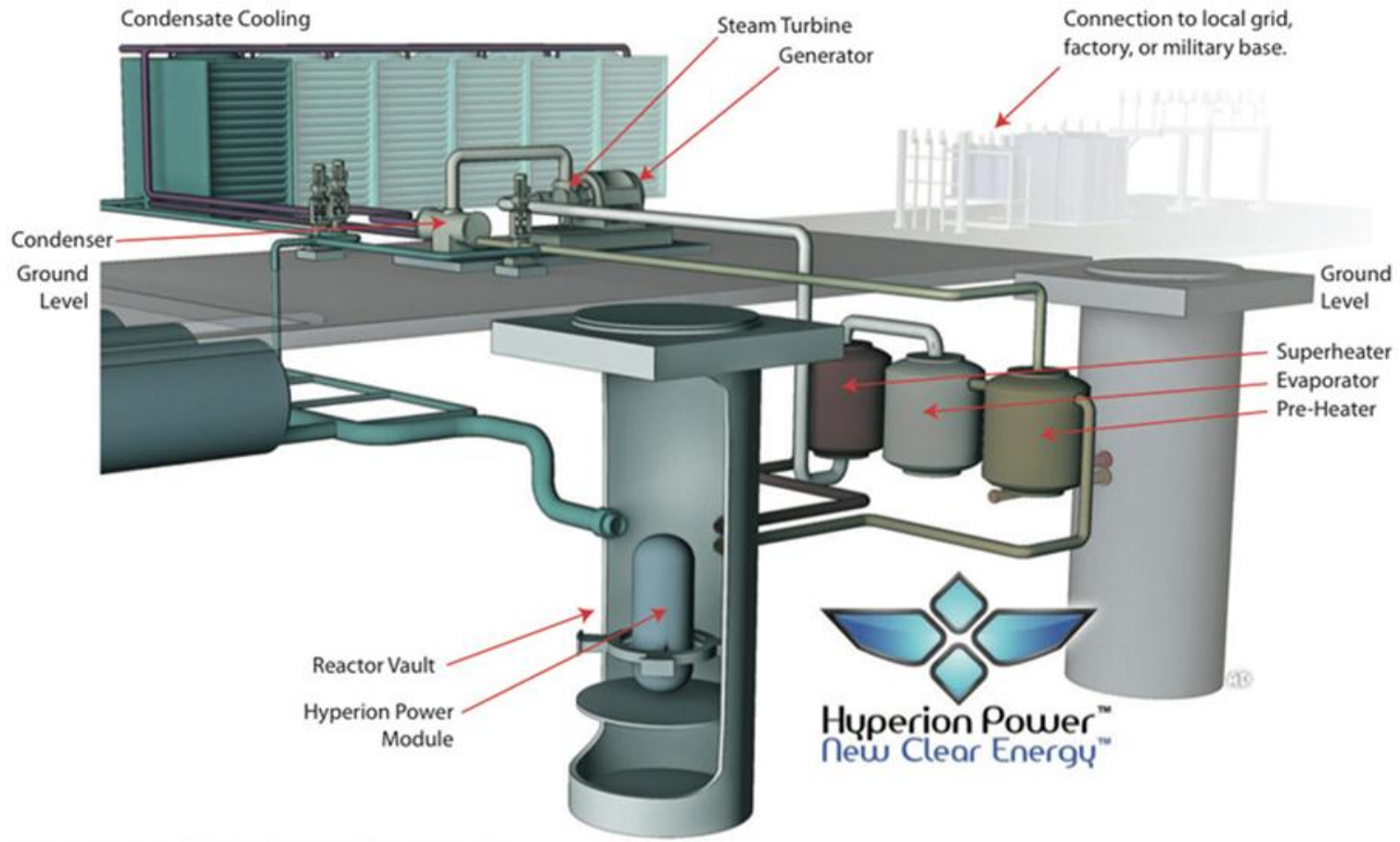
Process

- How a nuclear plant works



http://www.freeinfosociety.com/site.php?postnum=3115

What's Different?



Hyperion Power Module-based 25MWe Electric Power Plant

Primary Companies

- TerraPower
- Hyperion
- Oak Ridge National Laboratory
- Babcock & Wilcox
- NuScale Power
- Toshiba

*Images taken from corporate websites

Benefits

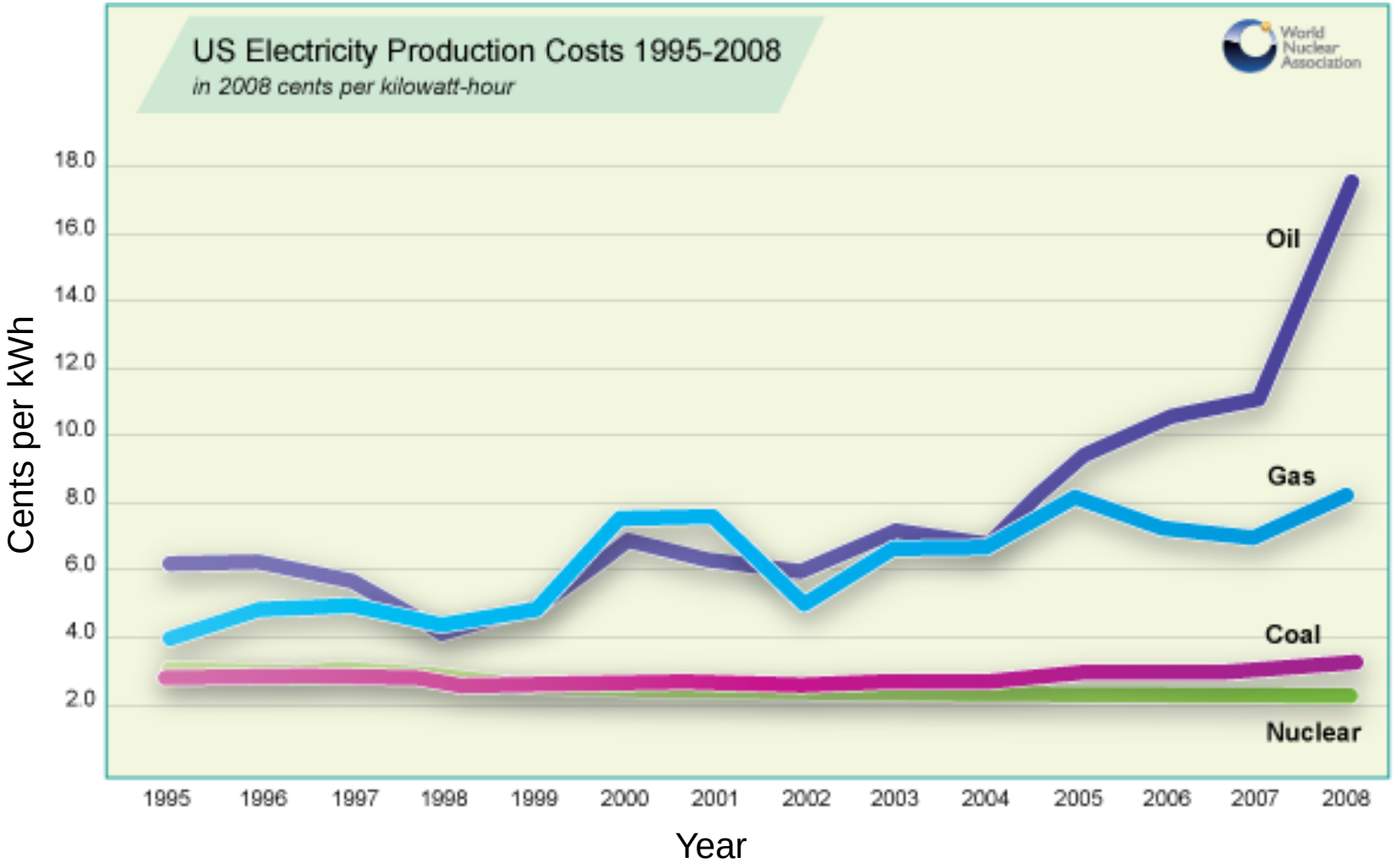
- Power Savings [3]
- Incremental
- Cheaper start-up cost
- Cheaper Operation
- Low $C0_2$ Emissions
- Low Radiation
- Job Creation

http://www.nolandgrab.org/archives/2007/01/

Cost

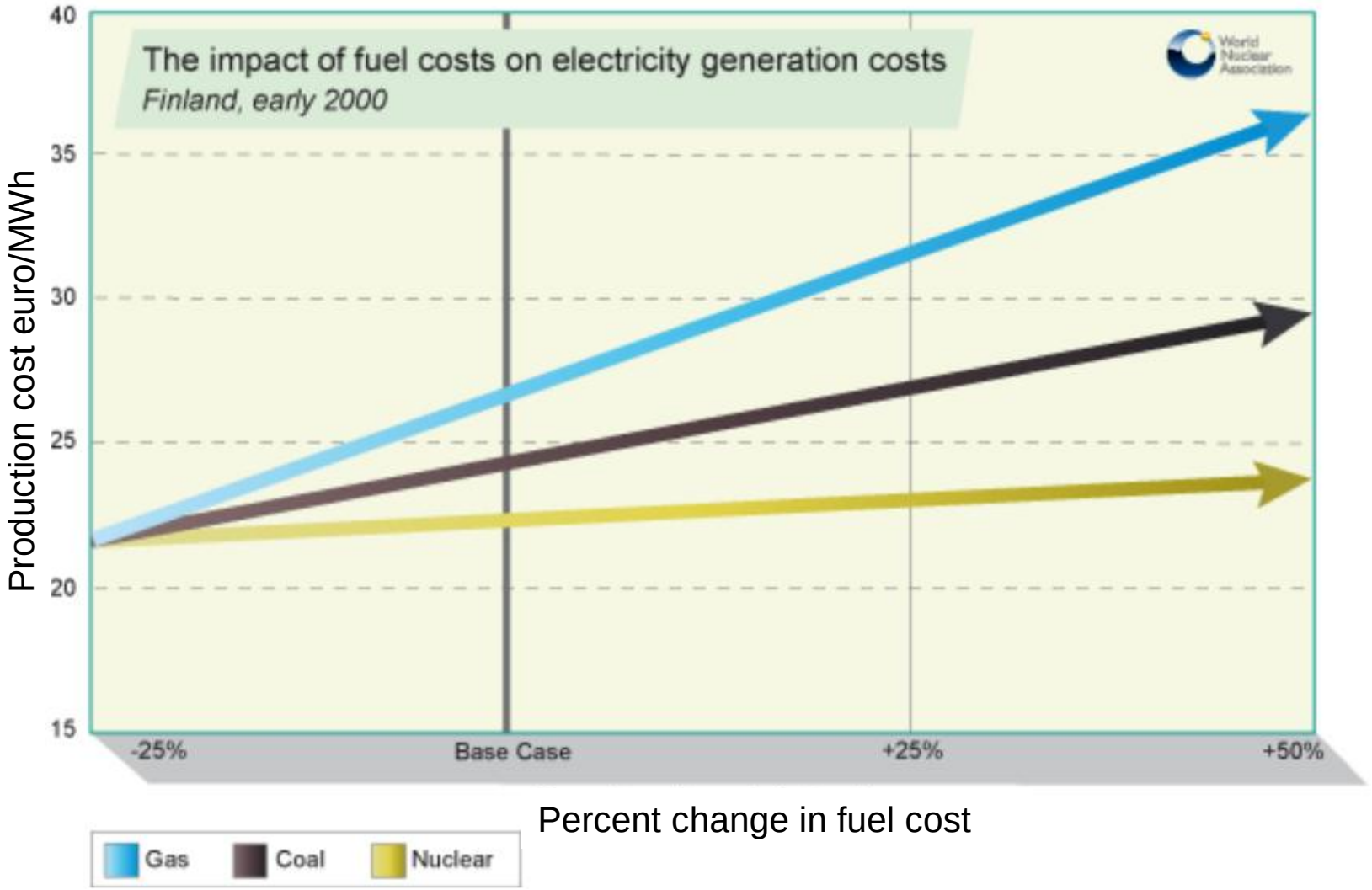
Component [4]	$$$
Construction	$2,000-$3,000 per kW
Production - Fuel - Waste Disposal - Decommissioning	1.8 cents per kWh 0.5 cents per kWh 0.1 cents per kWh 0.2 cents per kWh

Cost



http://www.world-nuclear.org/info/inf02.html

Cost



http://www.world-nuclear.org/info/inf02.html

Cost

- Hyperion:
  - 25 MW reactor for $50 Million
  - 50% reduction in operating costs
  - 30% reduction in capital costs

- Save 4-10% on electricity cost

Safety

- Hijacking [5]
  - Hyperion using approved transportation methods
- Leaks
  - Hyperion will ship in multi-chamber canisters
- Tampering or Natural Disasters
  - Hyperion will install underground and use guards and dogs for security

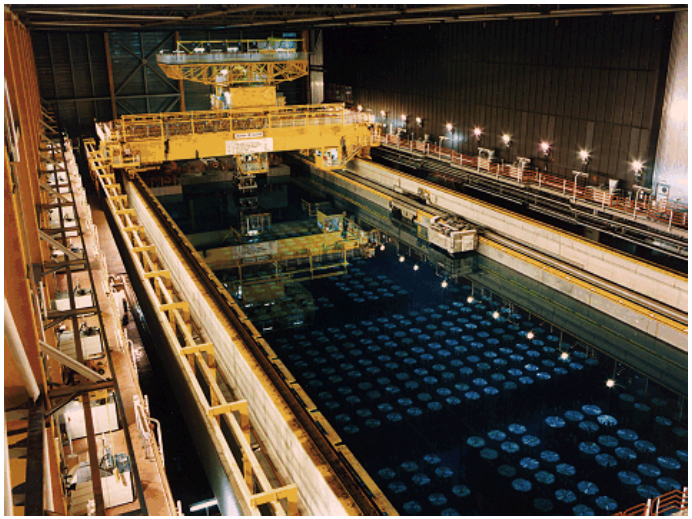
Other Considerations

- Terrorists
  - Disguise bomb building
  - Target nuclear plants
    - Blow up
    - Steal materials
- Increase nuclear waste
  - No existing long-term waste storage

http://blogs.citypages.com/blotter/2009/10/today_congress.php

Spent Nuclear Fuel

- Current Methods:
  - Store in water on-site
  - Federal Mined Geological Disposal Repositories [6]
- Reprocessing:
  - European based practice
- No permanent methods:
  - Innovative ideas to use waste



Road Ahead

- Terra Power [3]
  - Use depleted Uranium - U-238
  - “traveling wave technology”
  - 60 year progression
  - Massive energy capabilities

http://www.terrapower.com/Technology/TravelingWaveReactor.aspx

Conclusion

- Advances in technology
- No plants have been approved by the NRC
- Various uses → great potential

References

[1] Hvistendahl, Mara. "Coal Ash Is More Radioactive than Nuclear Waste: Scientific American." *Science News, Articles and Information | Scientific American*. Web. 08 Feb. 2011. <http://www.scientificamerican.com/article.cfm?id=coal-ash-is-more-radioactive-than-nuclear-waste>.

[2] ExxonMobil. *2010 The Out Look for Energy: A View to 2030*. PDF

[3] Palmer, Brian. "Miniature Nuclear Reactors Might Be a Safe, Efficient Source of Power." *Washington Post - Politics, National, World & D.C. Area News and Headlines - Washingtonpost.com*. Web. 07 Feb. 2011. pg. 1-3 <http://www.washingtonpost.com/wp-dyn/content/article/2010/09/13/AR2010091304026.html?sid=ST2010092902924>.

[4] World Nuclear Association., 2010, “The Economics of Nuclear Power,” PDF.

[5] "Small Nuclear Reactors Are Becoming Big Business - BusinessWeek." *BusinessWeek - Business News, Stock Market & Financial Advice*. Web. 07 Feb. 2011. <http://www.businessweek.com/magazine/content/10_22/b4180020375312.htm>.

[6] "Nuclear Energy: Assessing the Emissions : Article : Nature Reports Climate Change." *Nature Publishing Group : Science Journals, Jobs, and Information*. Web. 08 Feb. 2011. <http://www.nature.com/climate/2008/0810/full/climate.2008.99.html>.

Questions?

Back Up Slides

Facts

- 1979 Three Mile Island reactor meltdown (no deaths or injuries)
- 2010 State of the Union address, President Obama advocated "building a new generation of safe, clean nuclear power plants.“
- No construction of nuclear power since 1970’s
- The ash coming from a typical coal plant carries plenty of radiation: According to some estimates, it carries 100 times more radiation into the surrounding area than a nuclear reactor producing the same amount of energy.
- 25 Mw reactor could power 20000 homes and could fit inside of a room