

Nuclear Power in Idaho

A First Look at Issues

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What's been Changing?

1. Nuclear Regulatory Commission (NRC)

- Combined construction/operating license (COL)
- Early site permit (ESP) option
- Security requirements for terrorism

2. Department of Energy

- Funding several COLs and ESPs

3. Utility Consortium/Teams

- Sharing costs to test the new process
- Preparing plant projects for application to NRC

4. Vendors

- A few designs are advancing into design certification

What's been Changing?

5. Congress

- EPA Act 2005 provisions
- Debating national portfolio standards
- Debating CO2 cap and trade

6. Public

- Mounting evidence of global climate change
- Continued challenges to energy security
- Concerned with pace of actions to address the challenges

Key Issues in Idaho

- **Environmental Impact**
 - Water
 - Nuclear waste
- **Safety**
 - Public exposure and risk
 - Worker safety
- **Cost**
 - Power cost
 - Dependence on subsidies
- **Fit with Energy Needs and Plans**
 - Growth
 - Replacing greenhouse gas-emitting sources

Environmental Impact

- **Water**

- Most use ‘once through’ cooling
 - 2500 cfs withdrawal, 1% consumed
- Some use cooling towers
 - 50 cfs water withdrawal, 90% consumed
- Some use cooling ponds
 - 50 cfs water withdrawal, 75% consumed
 - Large pond needed (sq miles)

- **Nuclear waste**

- DOE is contractually committed to receipt and long-term disposal
 - Yucca Mtn and DOE receipt of fuel are decades late
- All operators moving to ‘dry storage’
 - NRC-licensed spent fuel storage at the plants
 - The largest casks can store about 1 year of spent fuel

Safety

- **Public exposure and risk**

- Annual exposure

Average annual radiation dose	3.0 mSv
additional from man-made sources	0.66
10,000 miles air travel (for example)	0.1
living within 50 miles of a nuclear plant (avg)	0.00009
living near a coal plant (stack emissions)	0.00030

- Accidents

- For people near a nuclear plant, NRC policy is to keep the risk of:
 - Immediate fatality $<1/1000^{\text{th}}$ the sum of all other risks they're normally exposed to
 - Latent cancer fatality $<1/1000^{\text{th}}$...” ...

- **Worker safety**

- US nuclear plants achieved a record low in 2006: 0.12 injuries or illnesses per year per 100 workers

Cost and Subsidies

- **Nuclear power cost**

- Not easy to predict
- Est. to be 5-6¢/kWhr
 - MIT 2003
 - U Chicago 2004
 - EPRI 2006

- **Dependence on subsidies**

- All sources are subsidized
- For nuclear, R&D is the biggest ‘subsidy’
- EPLRA 2005 brought several new subsidies
 - Production tax credits for first 6000 MW built
 - Loan guarantees; amount being debated in Congress
 - Risk insurance for licensing delays to first 4 plants
 - Idaho plant not likely to enjoy any of these
- Price-Anderson Liability Limit is sometimes claimed
 - Current pool is \$10B, with annual premiums of \$40M
- Security, decommissioning, waste management are all ‘self-funded’

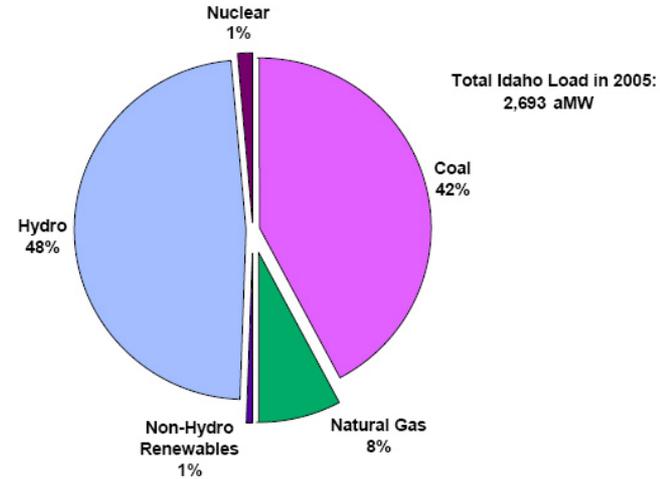
Cost of Federal Incentives for Energy Development Through 2003								
(Billions of 2003 Dollars)								
	Nuclear	Hydro	Coal	Oil	Nat Gas	Solar	Geoth	TOTAL
Research & Development	60.6	1.2	27.3	6.7	5.6	16.4	2.9	120.7
Regulation	9.9	4.1	6.2	106.1	2.9	0.0	0.0	129.2
Taxation	0.0	10.5	26.7	155.4	75.6	11.7	1.4	281.3
Disbursements	-8.3	1.4	6.4	2.1	0.0	1.5	0.0	3.1
Government Services	1.2	1.3	12.6	27.2	1.3	1.7	0.0	45.3
Market Activity	0.0	54.1	1.7	4.5	1.7	1.3	1.4	64.7
TOTAL	63.4	72.6	80.9	302.0	87.1	32.6	5.7	644.3

R. Bezdek and R. Wendling, *Int. J. Global Energy Issues*, Vol 27, No 1, 2007

Idaho's Energy Picture - current

- **Idaho imports 80% of all its energy**
 - \$2.5B sent out of state annually
- **Idaho imports 45% of its electricity**
- **Used 2,693 aMW in 2005**
 - 48% from hydro
 - 42% from coal
 - Only 1% from non-hydro renewables, mostly wind

Figure 2.8. Idaho's 2005 Electricity Fuel Mix



Idaho's Energy Picture – in 8 years

- **2007 Energy Plan: 3,240 aMW by 2015**

- Projects need for an additional 550 aMW
- Conservation avoids further 190 aMW
 - Hydro ↓8 points (flat aMW)
 - Coal flat % (+230 aMW)
 - Wind ↑7 points (+230 aMW)
 - Nat gas ↑1 point (+75 aMW)

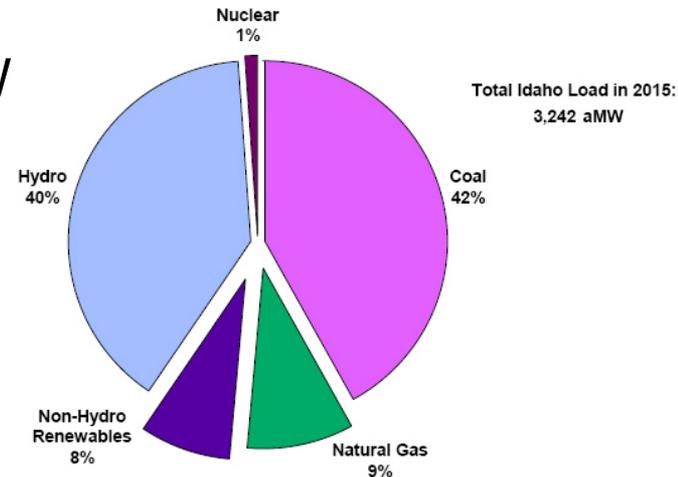
- **Recent change to Idaho Power's plans**

- Coal no longer a preferred option
- Natural gas addition of 250 MW in 2012

- **Regional long-term additions (by 2015)**

- PacifiCorp +3820 MW (1600 wind)
- Idaho Power +358 MW (250 wind)
- Avista +357 MW (100 wind)

Figure 3.2. 2015 Fuel Mix for Electricity Production



Fit with State and Regional Plans

- **Growth**
 - A nuclear plant could fit within regional needs
 - It would reduce the need for natural gas, and mitigate against price volatility of gas
- **Replacing greenhouse gas-emitting sources**
 - If current utility plans are followed, a nuclear plant would be able to replace 850 MWe coal and 750-850 MWe of natural gas additions in the region
 - Avoids about 10 million tons CO₂ emissions/year
 - This is more than Idaho emits today for its electricity
- **Added economic benefits**
 - 500 jobs, with a payroll of about \$50M
 - \$15M plant property tax revenue, and \$25M indirect revenues

References for “Nuclear Power in Idaho”

Slides 2 and 3

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<http://www.nrc.gov/reactors/new-licensing/licensing-process.html>

Energy Policy Act (EPAAct) 2005 full text
http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=109_cong_public_laws&docid=f:publ058.109.pdf

Intergovernmental Panel on Climate Change (IPCC) AR4 Synthesis Report
<http://www.ipcc.ch/>

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Water & Sustainability (Vol 3), U.S. Water Consumption for Power Production, EPRI Technical Report 1006786, Mar 2002
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NRC Fact Sheet on Dry Cask Storage of Spent Nuclear Fuel
<http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/dry-cask-storage.pdf>

An interesting perspective on the history and outlook for spent fuel disposal, by NRC Commissioner Merrifield can be found at
<http://adamswebsearch.nrc.gov/idmws/ViewDocByAccession.asp?AccessionNumber=ML060670032>

For an example of a dry storage spent fuel installation, see
<http://www.energy-northwest.com/generation/cgs/isfsi.php>

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<http://www.bls.gov/iif/home.htm>

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<http://www.aspo-australia.org.au/References/Bezdek/IIST-Spring-06.pdf>

Nuclear insurance and Price-Anderson liability limit
<http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/funds-fs.pdf>

Slides 8 and 9

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Idaho Power Integrated Resource Plan 2006
<http://www.idahopower.com/energycenter/irp/2006/>

Idaho Power 2007 Third Quarter 10Q
<http://www.idacorpinc.com/pdfs/10Q/10q20073a10q.pdf>

Avista Integrated Resource Plan 2007
<http://www.avistautilities.com/resources/plans/electric.asp>

PacifiCorp Integrated Resource Plan 2007
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Slide 10

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http://www.nei.org/financialcenter/economic_benefits_studies/