NUCLEAR POWER
EAS 4010

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What is Current Nuclear Technology?

- The US Department of Energy has created 4 classifications of nuclear reactors:
  - Generation I: earliest prototypes and reactors developed
  - Generation II: reactors built commercially through the 1990’s
  - Generation III: “evolutionary improvements on Generation II”
  - Generation IV: new reactor designs currently being researched
Breeder Reactors:
- All reactors generate fissile material, but breeders produce more fissile material than they consume (Pu-239!).
- Nuclear proliferation concern.
- VERY expensive.
- Reprocessing required.

Thorium:
- Potential source of massive amounts of energy, with less waste.
- Never been produced on a large scale.
- Definitively Generation IV technology.
Breeder Reactors

• Can produce *more* fissile material than they consume.

• Require an initial stock of fissile enriched uranium or plutonium.

• Successful designs to date have NOT used water as a coolant (usually molten sodium).

• Have been successfully built before! Notably the French Superphénix produced electricity from 1985 to 1997.

• Can be rigged to burn fertile Thorium or naturally occurring uranium.

• Very few made for commercial production – highly experimental.

• Generally considered *Generation IV*. 
Thorium

Pros

More abundant than uranium
Less long-lived waste products
Less overall radioactive waste
Relatively difficult to weaponize (it is not fissile)

Cons

Difficult to reprocess
Still requires an initial stock of enriched uranium or plutonium
No large scale commercial reactors are currently operational
Generation IV fuel source
A reactor with less than 300 MWe of capacity is considered small.

- SMRs provide flexibility and require less capital investment.
- Unfortunately, SMRs are NOT currently available on the market, and it may be a long time before they are commercially available in the United States.

A reactor with less than 700 MWe of capacity is defined as medium.
Small and Medium Sized Reactors: SMRs

Smaller reactors have a smaller capital investment. By rigging several smaller plants to achieve the same output as a larger plant, revenue can be generated before the project is completed, limiting the maximum negative cash flow of the project. This is the concept behind the 225 MWe International Reactor Innovative and Secure (IRIS), which will boast a built time of 2-3 years for a single unit.

SMRs can also be hooked up independent of the grid to serve remote locations.

Many, many, many design concepts for SMRs have been developed besides the pressurized water reactor, IRIS. Here are a few of the front-runners:

The 80-165 MWe Pebble Bed Modular Reactor uses helium gas as a coolant and graphite as a modulator. Since it can operate at higher temperatures than conventional reactors, it is more efficient with its fuel: metal-alloy pellets. The design is in the pre-application process with the NRC, and is on schedule to be the first commercially produced High Temperature Gas Cooled Reactor.
The Toshiba Super Safe, Small, and Simple (4S) is a sodium cooled 10MWe reactor that is intended to be buried at a depth of 30m, and operate without maintenance for 30 years before being excavated and returned to the company. It is in the pre-application stage with the NRC, and there is a proposed site for a prototype in Galena, AK. It is scheduled to perhaps be the first of its kind to reach the commercial market, but there are significant safety concerns. A lack of routine maintenance for 30 years poses a problem, as unexpected problems could go undiagnosed. Since sodium is reactive with water, an unnoticed breach in the system could lead to a large explosion. The lack of maintenance, while initially appealing, is possibly a potential snag for many SMRs.

The 25 MWe Hyperion Power Module (HPM) is designed to be buried and maintenance free for a period of 7-10 years before refueling. It would use a 20% enriched uranium nitride fuel, and would be lead bismuth cooled. A mere 1.5m x 2.5m in size, the HPM is highly portable, completely sealed, and has no moving parts. Hyperion plans to submit a proposal for design certification in 2012, and to build a prototype by 2015.
SMRs are not currently available on the commercial market, and even the most advanced ones still have a long way to go before they can be sold commercially in the US. This is for a few possible reasons:

1) In general, it is not possible to simply scale down a full sized reactor – SMRs require new technology, and this technology has not been as readily available as that of large reactors.

2) Furthermore, regulatory barriers prevent SMRs from being economically viable at this point, even if the capital costs are lower. That is because regulations put in place by the NRC are specifically for large plants, and they do not translate well to SMRs. For example, the NRC requires an annual fee of $4.5M for each operating license it issues. This is not a huge fee for a large plant, but for the small rate of power SMRs produce, the number can be stifling. Similar regulatory issues exist with decommissioning funds, insurance, and liability that make it easier and more economical to build a larger plant. Until these regulations are tailored to the new situation, SMRs will have difficulty reaching the commercial market in the US.
<table>
<thead>
<tr>
<th>Design Characteristics</th>
<th>Coolant</th>
<th>NRC Status</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Generation III</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Advanced Boiling Water Reactor (ABWR)</td>
<td>Similar to Current Reactors, 1350Mwe</td>
<td>Water</td>
</tr>
<tr>
<td>AP600</td>
<td>Passive Safety Features, 600MWe</td>
<td>Water</td>
</tr>
<tr>
<td><strong>Generation III+</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AP1000</td>
<td>Passive Safety Features, 1,100MWe</td>
<td>Water</td>
</tr>
<tr>
<td>U.S. Advanced Pressurized-Water Reactor (AS-APWR)</td>
<td>Similar to Current Reactors, 1700Mwe</td>
<td>Water</td>
</tr>
<tr>
<td>International Reactor Innovative and Secure (IRIS)</td>
<td>Innovative Modular Design, 325MWe</td>
<td>Water</td>
</tr>
<tr>
<td><strong>Generation IV</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supercritical Water Cooled Reactor (SCWR)</td>
<td>Large Plant, 1,700MWe</td>
<td>Water</td>
</tr>
<tr>
<td>Lead Cooled Fast Reactor (LFR)</td>
<td>Low-power reactors, Long refueling period; 50-1200 MWe</td>
<td>Liquid Lead or Lead Bismuth</td>
</tr>
<tr>
<td>Sodim-Cooled Fast Reactor (SFR)</td>
<td>150-1,700 Mwe</td>
<td>Liquid Sodium</td>
</tr>
</tbody>
</table>
AP 1000: An Overview

- Generation III+ Pressurized Light Water Reactor
- Many simplified passive safety measures in place.
- 1154 MWe
- 12 units are scheduled for operation in China by 2015.
- 14 licenses have been filed for reactors in the US, and 1 contract has been agreed upon in Vogtle, GA.

**First Generation III+ reactor to have been approved by Nuclear Regulatory Commission (2005)**
Our Recommendation

Tried and True
Westinghouse AP1000

VS

Innovation
Great Things to Come!
Lifetime Nuclear Plant Costs

Construction

Operation

Decommissioning

0 3 5 65
Key Costs: Construction & Capital

Capital
• Material costs vary widely over time and geography

Construction
• Delays and unexpected hurdles inevitably occur

Discount Rate
• Interests rates have a significant effect in this period
• All construction performed with negative profit

Solution: Modularization
• Westinghouse has attempted to cut construction time to 36 months though modularization of AP1000 reactor sections
AP1000 Construction Cost Estimates

- Westinghouse AP1000: $1.32 B
- 2008 MIT Study: $2.2 B
- World Nuclear Association: $3.3 B
- 600 MWe Coal Plant: $1.8 B
AP1000 Levelized Cost Estimates

- Westinghouse AP1000: $1200/KW
- $2000/KW
- $3000/KW
- 600 MWe Coal Plant: $3000/KW
**Fuel Costs**

Uranium
- Consistently the lowest cost energy resource
- Front end contributes only 15-20% of total cost/KW
- Electricity price inelastic with respect to fuel price

**Monthly Fuel Cost to U.S. Electric Utilities**

*1995 – 2010, In 2010 cents per kilowatt-hour*

Source: Nuclear Energy Institute (NEI):
http://www.nei.org/resourcesandstats/documentlibrary/reliableandaffordableenergy/graphicsandcharts/monthlyfuelcosttouselectricutilities
Electricity Cost Comparison (c/kWh)

- Low (5%)
- High (5%)
- Low (10%)
- High (10%)

Legend:
- Nuclear
- Gas
- Coal
Low-Level Waste Disposal

- Only 3 licensed facilities in U.S.
  - EnergySolutions Barnwell Operations in South Carolina
  - US Ecology in Washington State
  - EnergySolutions Clive Operations in Utah
Transporting Low Level Waste

<table>
<thead>
<tr>
<th>Test</th>
<th>Explanation</th>
<th>Container Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Spray</td>
<td>Simulates rainfall</td>
<td>A + B</td>
</tr>
<tr>
<td>Temperature</td>
<td>Between -40 and 100 degrees Fahrenheit</td>
<td>A</td>
</tr>
<tr>
<td>Compression</td>
<td>A weight 5 times as heavy as the package sits on top of the package for 24 hours</td>
<td>A + B</td>
</tr>
<tr>
<td>Free Drop</td>
<td>Package is dropped 1 to 4 feet, depending on weight of package</td>
<td>A</td>
</tr>
<tr>
<td>Penetration</td>
<td>A 13 pound 1.25-inch diameter steel cylinder is dropped on the package from a height of 40 inches</td>
<td>A</td>
</tr>
<tr>
<td>Vibration</td>
<td>Simulates normal transportation vibration</td>
<td>A + B</td>
</tr>
<tr>
<td>Pressure</td>
<td>Tested in both increased and decreased external pressures</td>
<td>A + B</td>
</tr>
<tr>
<td>Free Drop</td>
<td>Package is dropped 30 feet onto an unyielding surface</td>
<td>B</td>
</tr>
<tr>
<td>Puncture</td>
<td>Package is dropped 40 inches onto a steel bar in a vertical position</td>
<td>B</td>
</tr>
<tr>
<td>Heat</td>
<td>30 minutes at a temperature of 1475 degrees Fahrenheit</td>
<td>B</td>
</tr>
<tr>
<td>Immersion</td>
<td>Under 50 feet of water for 8 hours</td>
<td>B</td>
</tr>
</tbody>
</table>
Storage of Commercial Spent Fuel by State through 2011

Note: Idaho is holding used fuel from Three Mile Island, Unit 2. Data are rounded up to the nearest 10 tons.

On-Site Storage

- At least 5 years in cooling pools
- Under 40 ft of water
- Safety controls include water-level monitors and radiation detectors
ISFSIs

- Independent Spent Fuel Storage Installations
- Each holds up to 40 PWR fuel assemblies
- For AP1000 over 10 yrs, produce enough fuel assemblies to fill 28 ISFSIs
High-Level Waste Disposal

- Immobilization
  - Vitrification
  - SYNROC
- Stored on-site for 40-50 years, after which 1/1000 of original radioactivity remains
Reprocessing

- 5x less high-level waste
  - Faster rate of decay
- Recovery of uranium and plutonium for re-use
- Further development through U.S. partnership with GNEP
Status of Yucca Mountain

• In 2010, construction halted and Office of Civilian Radioactive Waste Management was disbanded

- NY, VT, CT and environmental groups now suing NRC.
- US nuclear energy industry suing Energy Department
Nuclear Safety

- Nuclear Accidents are not viewed as a good thing due to loss of life and long term effects on the land
  - Chernobyl, Fukushima, 3 mile island
- In all 3 cases, critical safety precautions were overlooked (this is true in Fukushima Japan too even though it was spurred by a tsunami)
- Nuclear Plants feature “defense in depth”, a series of redundant safety features that will properly shut down a plant during an emergency
- Most accidents occur because these redundancies are overridden
Safety Mechanisms

- Control of Radioactivity
  - Most common method is to introduce neutron absorbing control rods into the reactor

- Maintenance of Core Cooling
  - Usually achieved with water however in high temp environments, sodium may be needed

- Maintenance of Physical Barriers
  - Concrete walls, vacuum building, PPE and SOP
Safety In Today’s Reactors

- Strong Emphasis on Passive Safety Systems
- Use natural forces (gravity, natural circulation and compressed gas/simple physics)
- Virtually no moving parts (lack of pumps, fans, diesel generators, chillers, etc) required for safety system
- Valve (only moving part) movement is made using stored energy from springs, compressed gas or batteries.
Safety and the AP1000

- The AP1000 can establish and maintain core cooling and containment indefinitely with no operator or AC power support requirements.
- Passive safety injection
- Passive residual heat removal
- Passive containment cooling
Emergency Core cooling system in AP1000

- Designed to protect against leaks in the reactor cooling system
- Safety Injection and Depressurization
  - Relies on water from core makeup tanks, accumulators, and in-containment refueling water storage tank
- Passive Residual heat removal
  - PRHR heat exchanger
- Passive Containment Cooling system
  - Relies on air circulation passing over containment vessel to cool reactor (not shown)
Nuclear Plant Decommissioning
Decommissioning (Cont.)

- Not always taken into consideration when discussing Nuclear Power
- Includes Shutdown, waste disposal, dismantling, and restoration of overall site to a state in which it is no longer hazardous to the general public
- Three main kinds
  - Immediate Dismantling: relatively quick
  - Safe enclosure: average 40 to 60 years before doing anything
  - Entombment: site is designed to retain everything it generates over the course of its active life forever onsite in a safe manner
Greenhouse Gas Emissions

- Nuclear power plant operation emits no or negligible amounts of carbon dioxide.

Source: IAEA 2000

http://depletedcranium.com/greenpeace-issues-top-ten-against-nuclear-power/
A European treatment of production and external costs, specifically of power generation in Switzerland (the GaBE Project), has been done by the Paul Scherrer Institute and shows that the damage costs from fossil fuels are 10 to 350% of the production costs, while those for nuclear are very small.

The twin bars represent the range of values for plants operating in Switzerland (Rp = cents SFR)
Carbon Footprint Comparison
Continued

Full Lifecycle CO2 Emissions from Energy Production Systems

Wind is the only more carbon neutral power generation source

Figures published from Japan’s Central Research Institute of the Electric Power Industry give life cycle carbon dioxide emission figures for various generation technologies. Nuclear power is only bested by wind and hydro.

http://www.world-nuclear.org/climatechange/nuclear_meetingthe_climatechange_challenge.html

http://world-nuclear.org/info/inf68.html
Average CO$_2$ Emissions Per Plant

Emissions of a nuclear power plant at various stages of operation showing the fossil CO$_2$ contributions from fossil fuel derived sources.

Cap and Trade

- Nuclear power has higher overall lifetime costs.
- Cap and Trade may drive down that cost by “trading” credits.
- Cap and Trade has little impact on the nuclear power option because of its negligible production of greenhouse gases.
- Policies are currently being considered to increase reliance on nuclear power in conjunction with renewables and Cap and Trade to decrease dependency on foreign fuel.
Major U.S uranium reserves

http://www.energy-net.org/01NUKE/u-mining/us-uranium-usgs.jpg
Heat from the plant would add approximately 6 billion Btu per hour to the water, over and above the reported 1.3 billion Btu per hour heat rejection from Milliken.

- Maximum depth of 435 feet, and a mean depth of 179 feet.
- A volume of 331 billion cubic feet.
Simple Calculation of Temp. incensement

- Capacity of power plant: 830 MW
- Flow rate of cooling water: 1100 cubic feet / second
- The thermal efficiency of nuclear power plants: 32%
- Energy production of one megawatt = 947 Btu of energy
- 1 Btu of heat that will raise the temperature of one pound of water by 10°F
- 1 cubic foot of water = 62.4 pounds
- it will be heated at a rate of (68/32) x 830 = 1780 megawatts.
- 1780 x 947 = 1,680,000 Btu (of energy are put into 1100 cubic feet of water every second.)
- The water will be heated 1,680,000 / (62.4 x 1100) = 25°F

The water is being heated 25°F in the condensers.
The effects on Cayuga Lake

- **Thermal Stratification** - refer to a change in the temperature at different depths in the lake, due to the change in water's density with temperature.

![Diagram showing thermal stratification in summer and autumn. In summer, temperature is high at the surface and low at the bottom, with density low at the surface and high at the bottom. In autumn, the layers mix due to heat transfer.](image-url)
The effects on Cayuga Lake

- Prolonged stratification will extend the period of oxygen depletion in the large underlying layer of cooler water, where trout live, during the summer. Thus oxygen levels will become lower than they do at present, before being replenished by the delayed fall mixing of the upper and lower layers.
Government Support for New Projects

Why?
- The typical U.S. electric company cannot afford to independently finance new projects
  - High construction costs
  - Political and regulatory risks
    - Cost overruns by the licensing process and litigation
Energy Policy Act of 2005

- Affords support through:
  - tax credits
  - loan guarantees
  - standby support
Energy Policy Act of 2005

- **Production Tax Credits**
  - allows 6,000 megawatts of new nuclear capacity to earn $18 per megawatt-hour for the first eight years of operation. The maximum tax credit for any one plant is capped at $125 million per year.

- **Requirements**
  - The construction and operating license application had to have been submitted to the U.S. Nuclear Regulatory Commission by Dec. 31, 2008.
  - The plant must be under construction by January 1, 2014.
  - The plant must be operating by January 1, 2021.
Energy Policy Act of 2005

- **Loan Guarantee**
  - through the Department of Energy
  - General Objective of the Loan Guarantee: *to support the commercial deployment of innovative technologies that reduce emissions*
  - allows a more highly leveraged capital structure (the statute specifies that guaranteed project debt cannot exceed 80 percent of total project cost)
Energy Policy Act of 2005

- **Standby Support**
  - pay a premium for the insurance coverage
  - covers licensing and litigation risk for the first six new nuclear plants. Standby support covers delays caused only by factors outside a company's control
  - administered by the Department of Energy
State Policies

- State-specific policies
- Some states may:
  - guarantee that capital costs associated with construction will be added to the rate base when the plant comes online
  - allow for the financing cost associated with construction to be passed on to ratepayers during construction.
    - *Note: Allowing CWIP reduces the cost ratepayers will pay for power from the plant when it goes into commercial operation.
  - assist with financing for unregulated plants by allowing pre-negotiated, long-term power purchase agreements (PPA).
    - PPAs guarantee the project will have a source of cash flow (and cost recovery) once it is operational
Government Support for Research and Development (R&D)

Why?

- The U.S. wants to develop in collaboration with other nations reprocessing and fuel treatment technologies that are:
  - cleaner,
  - more efficient,
  - less waste intensive, and
  - more proliferation-resistant
Government Support for Research and Development (R&D)

- On February 6, 2006 the Global Nuclear Energy Partnership (GNEP) began as a U.S. proposal, announced by then Secretary of Energy Samuel Bodman
  - GNEP represents an international partnership to promote the use of nuclear power and close the nuclear fuel cycle in a way that reduces nuclear waste and the risk of nuclear proliferation
- In July 2007, DOE announced that, through its Advanced Fuel Cycle Initiative, it would be making $20 million available to conduct detailed siting studies for public or commercial entities interested in hosting GNEP facilities
Political and Regulatory risks

• Who is the primary regulating agency?

The United States Nuclear Regulatory Commission (NRC)

The NRC is Responsible for regulating the **construction** and **operation** of commercial nuclear power plants.
The Extent of Federal Authority over Nuclear Power

- *Exclusively regulates* nuclear plant construction ("licensing") *and operations, including:*
  - nuclear health and environmental safety concerns and
  - onsite physical security

- *Exclusively controls* the transportation and storage of spent nuclear fuel
  - The NRC has authorized nuclear power plant licensees to store spent nuclear fuel at reactor sites
The Licensing Process

- The Construction License Application
  - includes a Safety Analysis Report, which contains:
    - design information for the proposed reactor,
    - comprehensive data on the proposed site,
    - various hypothetical accident situations and the safety features of the plant that prevent accidents or will contain them, and
    - assessment of the environmental impact
The Licensing Process

- If the application is accepted, the NRC holds a public meeting near the proposed site to familiarize the public with:
  - the safety and environmental aspects,
  - the regulatory process, and
  - the provisions for public participation in the licensing process

- NRC then conducts:
  - a safety review,
  - an environmental review, and
  - an antitrust review
The Licensing Process

- **Safety Review**
  - The NRC reviews characteristics of the site, including surrounding population, seismology, meteorology, geology and hydrology;
  - design of the nuclear plant;
  - anticipated response of the plant to hypothetical accidents;
  - plant operations including the applicant's technical qualifications to operate the plant;
  - emergency response
  - Safety Evaluation Report, prepared by the NRC summarizing the anticipated effect of the proposed facility on public health and safety
The Licensing Process

- **Environmental Review**
  - The National Environmental Policy Act requires the NRC to evaluate the potential environmental impacts and benefits of the proposed plant.
  - The NRC then issues a Draft Environmental Impact Statement for comment by the appropriate Federal, State, and local agencies as well as by the public.
  - The NRC issues a Final Environmental Impact Statement that addresses all comments received.
The Licensing Process

- Atomic Energy Act requires that a public hearing be held before a construction permit is issued.
- The public hearing is conducted by a three-member Atomic Safety and Licensing Board.
- The Board is composed of one lawyer, who acts as chairperson, and two technically qualified persons.
The Licensing Process

- NRC may authorize the licensee to do some construction at the site prior to the issuance of a construction permit.
- This authorization is known as a Limited Work Authorization and is done at the risk of the licensee.
The Licensing Process

- Operating License Application
  - Includes a Final Safety Analysis Report
    - describes the final design of the facility and
    - operational and emergency procedures
  - NRC prepares a Final Safety Evaluation Report
  - public hearing is not mandatory for operating license applications
    - the NRC publishes a notice in the *Federal Register* that it received an application for an operating license, providing notice to those whose interest might be affected by the issuance of the license to request a hearing
The Licensing Process

Key Licensing Steps in Building First New Reactors

- OPH Early Site Permit
- Application Development
- Design Certification
  - Application Submitted
  - NRC License Issued
- NRC Review/Approval of Application (27 to 48* months)
- Opportunity for Public Comment
- Opportunity for Public Hearing
- Plant Construction/Verification
  - OPH
- Commercial Operation

The NRC’s new licensing process offers multiple opportunities for public input.
Oversight of Operations

- The NRC ensures that the plants are operating in accordance with regulations.
- Three tiers of oversight to ensure:
  - Reactor safety - avoiding accidents
  - Radiation safety - for plant workers and public from radiation exposure during routine operations
  - Safeguards - protection against security threats
Oversight of Operations
Oversight of Operations

- Measuring and Inspecting Nuclear Plant Performance: Two Tier Process
  - **objective performance indicators**
    - reported by the plant operator
      - provides plant operational insight about, among other things, the possible occurrence of:
        - unplanned reactor shutdowns
        - safety system failures
        - reactor cooling system leakage
        - security breaches
        - etc.
  - **inspection findings**
    - provides greater depth and breath of information
Oversight of Operations

- NRC looks at both performance indicators and inspection findings in its plant assessment
  - the quarterly review of both will sets of information will determine if the NRC will take any action
  - responses to plant performance declines may include:
    - meetings with plant operators
    - additional inspections
    - operating license suspension
Securing Nuclear Facilities

Detecting, preventing, and responding to terrorist attacks requires government coordination among:

- Nuclear Regulatory Commission Intelligence Staff
- Department of Defense
- Department of Homeland Security
- Federal Bureau of Investigation
- National Counterterrorism Center
- State and Local Government law enforcement
- etc.
NRC Security Experts inspect facilities for the following Onsite Security Requirements:

- Vehicle barriers and checks before plant entry
- Trained security patrols
  - Force-on-Force inspections
  - Including simulated combat between mock adversary force and plant security force
- Comprehensive employee background checks
  - Criminal record checks
  - Psychological assessments
  - Behavioral observations
- Emergency response personnel
Exclusive federal control over spent nuclear fuel transportation and storage

- The Nuclear Waste Policy Act of 1982 dictates how high level radioactive waste and spent nuclear fuel generated by civilian nuclear power reactors must be disposed
  - The DOE enters contracts with commercial nuclear reactors (e.g., utilities)
  - DOE "takes title" to the nuclear waste
  - Commercial reactors pay DOE for this service
The Federal Government holds the responsibility of building a permanent storage site

- DOE has a contractual obligation to accept nuclear waste from commercial reactors
  - Several utilities have sued the federal government civilly for damages.
    - Earlier Federal Court decided that the government indeed had breached its contracts, but the courts did not award damages
    - Later decisions awarded monetary damages to nuclear power plant owners
Should the Obama Administration have terminated the Yucca Mountain nuclear waste repository?

- Maybe, if the health and environmental fears were sufficiently well grounded
  - However…from a financial standpoint the political stammering has been costly…
    - The government had invested two decades and $10 billion on the project
    - Recent court decisions awarding damages to nuclear power plant owners have been in the tens, if not hundreds, of millions of dollars
Getting Ithaca Onboard

- **Safeguards** Exist to Protect the Ithacan Community Against Health and Safety Threats

- **Petitioning** represents an additional means for the public to raise safety concerns

  - The other means for the public to raise concerns:
    - Rulemaking
    - Licensing
Public Petitions to Safeguard Against Health or Safety Threats

- Anyone may petition the NRC to take enforcement action related to NRC licenses or licensed activities
- NRC may modify, suspend or revoke an NRC-issued license
  - How to petition?
    - In writing the petitioner can identify the affected licensee or licensed activity
    - The NRC evaluates whether the petition includes supported assertions of “safety problems”
      - E.g., the NRC will not take action in response to general opposition to nuclear power
Getting Ithaca Onboard

- Nuclear risks associated with power production are covered by:
  - a **private liability insurance fund** made available by a pool of U.S. insurers called *American Nuclear Insurers* ($375 million liability limits), and
  - a **public fund** has been made available by assessments on nuclear power plant operators, which was created in 1957 as part of the *Price Anderson Act* ($12.2 billion of liability protection)
Getting Ithaca Onboard

- **Coverage under *Price-Anderson* is comprehensive and includes injuries caused by:**
  - theft,
  - sabotage,
  - transporting or storing nuclear fuel or waste, and
  - the operation of reactors

- **Covered Injuries include:**
  - physical illness (e.g., bodily injury sickness, disease resulting in death)
  - property damage and losses, and
  - reasonable living expenses for people who have been evacuated from an affected area