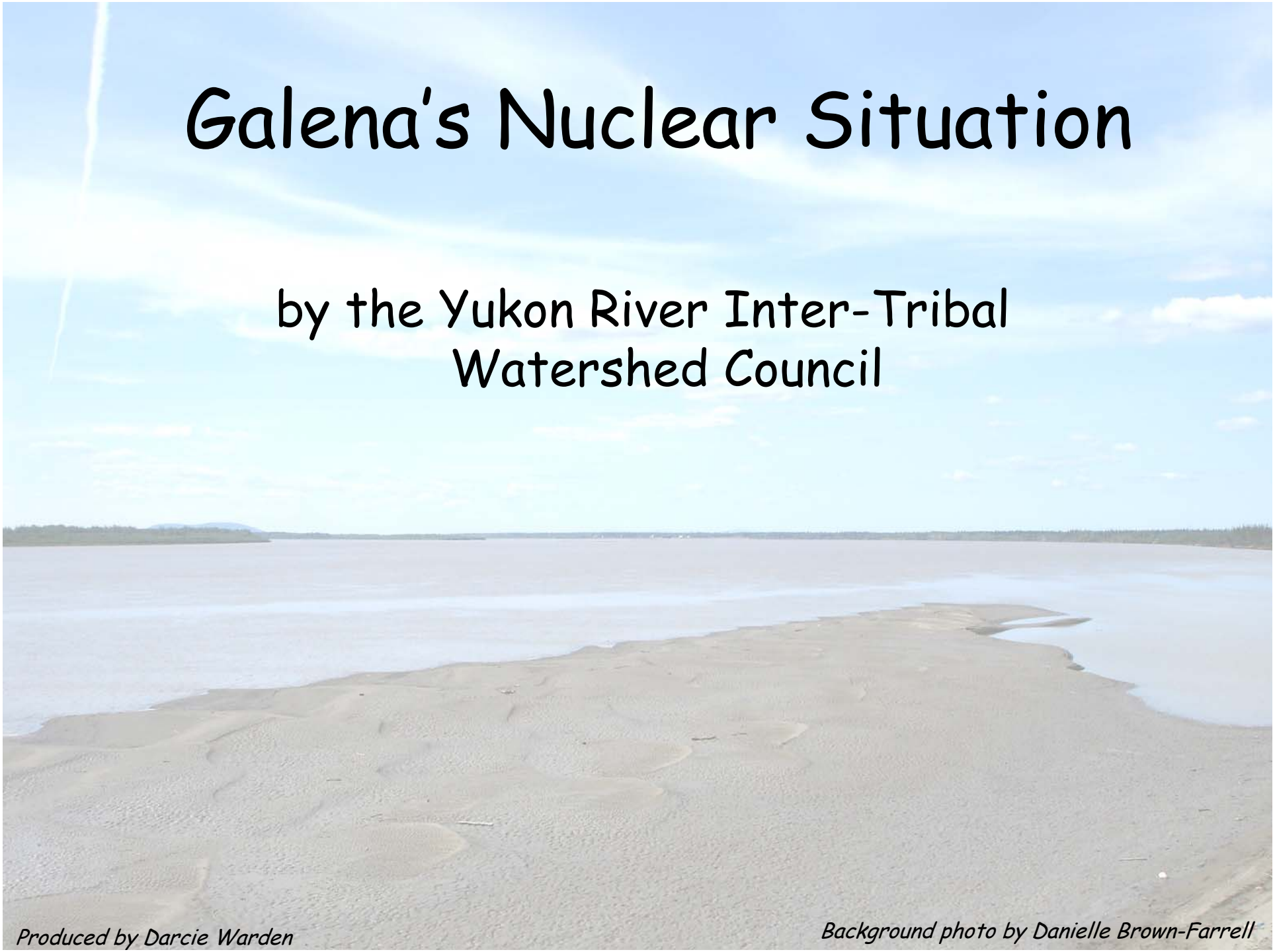


Galena's Nuclear Situation

by the Yukon River Inter-Tribal Watershed Council

Produced by Darcie Warden

Background photo by Danielle Brown-Farrell

Overview

- Toshiba is offering a "free" nuclear reactor to the community of Galena
- The 4s reactor is an experimental design that has not been manufactured or tested yet
  - There are similar 20mw designs
  - The small size of this reactor is the new feature
- Initial feasibility study neglected to include significant costs
- There are many concerns that need to be addressed through the licensing process
  - The YRITWC submitted concerns to the City of Galena

YRITWC Questions as Requested by the City of Galena

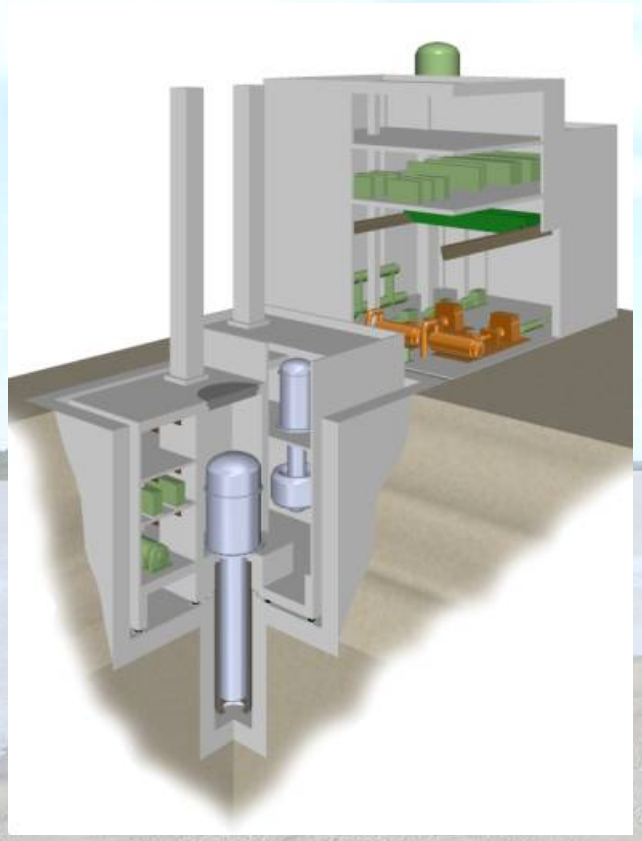
Approved by the International Executive Committee on June 30, 2005

1. What are the risks to the Yukon River, the fish and wildlife, and to the people, if the reactor fails or cracks from a natural disaster or from malfunction?
2. How big of an earthquake can the proposed reactor withstand? (Galena is very close to a fault line; most reactors have been built to withstand a 7.0 earthquake not to withstand a 9.0 earthquake which has recently occurred in Asia.)
3. If the radioactive materials stay in Galena, who pays for the human health risks and the security risks for the half life of the radioactive substances? The half life is approximately 705 million years. Who will guarantee that the radioactive materials will be safely stored for 705 million years?

YRITWC Questions Continued

4. If the radioactive materials are shipped out of Galena, where will they go?
5. Can the 4S Reactor withstand the consistently changing permafrost conditions?
6. How many times will the core need to be taken out in 30 years?
7. What is the feasibility of transporting natural gas to Galena by barge or pipeline?
8. What will the reactor's cooling system be and what would be the potential impact on the natural environment?

4S Reactor is a Pilot Project



- 4S=Super Safe, Small and Simple
- Uranium fuel; Liquid sodium cooled fast reactor
- Toshiba claims no refueling for 30 years
- Uranium core buried 60-100' underground and sealed
- Emergency response in a remote location may be difficult
- Galena is a testing ground for the 4S reactor

Pilot Project Continued

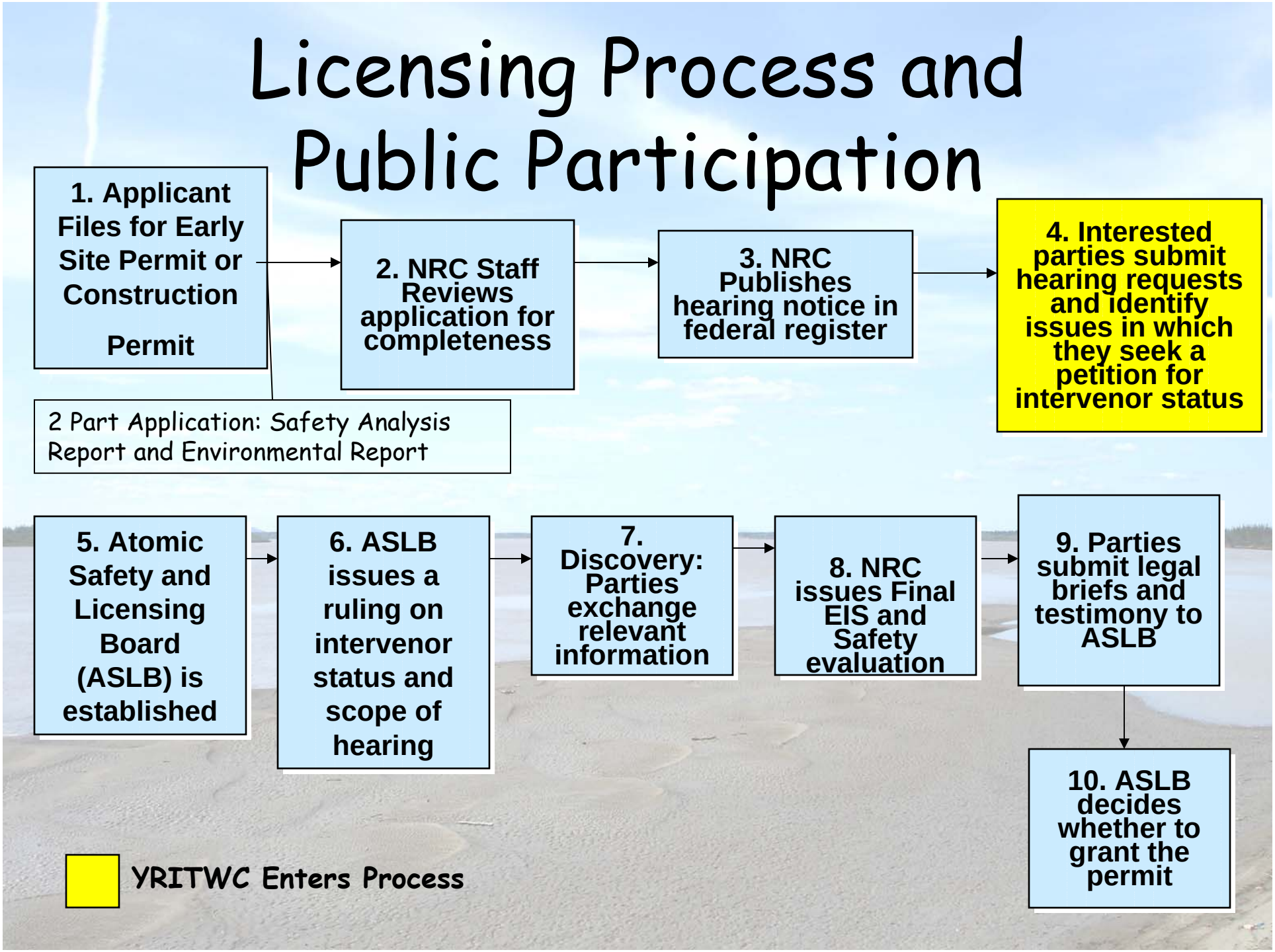
"It would also not be possible to fully test the fuel by heating it to extreme levels, creating a heavy reliance on testing at the theoretical modeling level. Given these and other factors, social acceptance might be low for new designs that do not allow for on-site inspections of the core during its operation"

Ed Lyman, scientific director of the Nuclear Control Institute in Washington D.C. NEW ENERGY TECHNOLOGIES: *A POLICY FRAMEWORK FOR MICRO-NUCLEAR TECHNOLOGY*

Pilot Project continued

"The new Small Innovative Reactor (SIR) designs, which involve small, highly pressurized containments, do not eliminate the possibility of failure in the containment structure or problems that may arise from a degradation of materials, leaking pins or other kinds of leaks. Moreover, autonomous systems can also fail or problems can arise with the fuel" Ellis Merschoff, Administrator for Region 4 of the U.S. Nuclear Regulatory Commission (NRC). NEW ENERGY TECHNOLOGIES: *A POLICY FRAMEWORK FOR MICRO-NUCLEAR TECHNOLOGY*

Licensing Process and Public Participation



Concerns

- The 4s reactor is an experimental design
- Procedural
  - Limited resources in Galena to deal with any nuclear emergency
  - Proprietary technology
- Storage of radioactive waste containing sodium
- Operation and Maintenance
  - Moving parts in a system that Toshiba claims will not require maintenance for 30 years
- Economic – hidden costs to local residents
- Siting - There are added challenges when considering permafrost, nearby fault lines, and the floodplain

Technical Concerns

Liquid Sodium

- Most problems with Sodium Reactors occur at startup
- Monju Reactor in Japan - Toshiba was directly involved in the construction and design.
  - Liquid sodium, fast breeder reactor (FBR)
  - Had to be shut down due to a sodium leak
- Sodium explodes when it contacts water
- Sodium must be kept oxygen free

Liquid Sodium Continued

- High thermal stress complicates reactor vessel and steam generation design
- Special precautions must be taken to contain sodium leaks from the primary or secondary loop.
  - Monju reacted violently to just such a leak
- Sodium piping is thinner than Light Water piping and has caused problems in the past: Monju, and in France's Phenix FBR

Economic Feasibility

- Price of Uranium has gone from 2002 at $10/lb to 2004 at $20/lb
  - Uranium price has doubled last two years
  - The Uranium market is peaking and is estimated to be depleted in 50 years
- Hidden cost for emergency response and remediation not included in feasibility study and community may bear those costs
- Historically, dozens of communities throughout the world have been stuck with the cost and environmental health problems of nuclear waste

Economic Feasibility Continued

- The YRITWC is looking for long term viable solutions on a watershed basis
  - A rural community on the Yukon River probably cannot afford the reactor if it isn't a gift from a manufacturer
- Challenging energy policy
  - Need to develop fuel management systems and Emergency Response for nuclear reactor for one community based on a watershed wide plan
- More detailed economic projections are necessary to accurately determine least cost options

Points of Clarification and Corrections

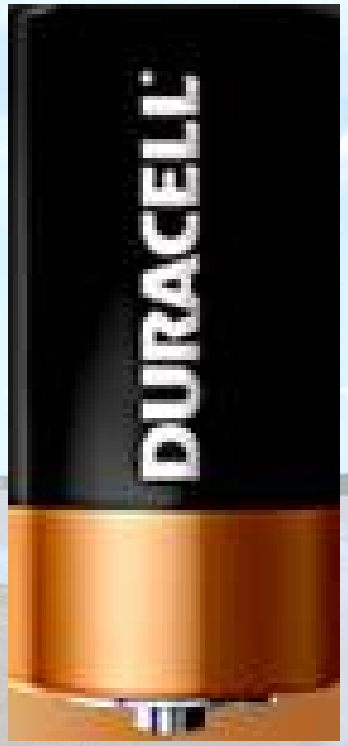
- Cost of Energy
  - Diesel will not go to zero

- "No rotating parts requiring frequent maintenance" pg. 158 Toshiba/Central Research Institute of Electric Power Industry (CRIEPI) report
  - Parts are moving in the reactor itself at a speed of 1 mm a day.
  - Extra set of paradox planetary gears as back up if gears malfunction.
  - Question: If paradox planetary gears fail, what systems are in place to address the repair?

- "Completely automatic operation is possible" pg. 158 Toshiba/CRIEPI report
  - Removal of battery 60' below grade will be dangerous work.
  - How will the integrity of the system be monitored?

Point of Clarification Continued

- Disagreement on the disposal of core and nuclear waste
  - Toshiba slide show p.12 – N. Waste goes to Japan
  - Galena report p. 55-56 – N. Waste goes to Yucca Mt., Nevada
- Is the 4s a battery?
  - "I wouldn't characterize the 4s as a 'battery', it is a small, sealed reactor, that produces heat" Rick Poeton, EPA – Radioactive Materials Disposal Program



Reactor Fuel - Uranium

Mining

- Uranium mining impacts indigenous people all over the world
- Environmental impacts change land forever

Disposal

- Transport of nuclear waste on barge
- Yucca Mountain not a viable option for sodium cooled waste
- Japan was offered as an option but nothing is confirmed
- Galena may have to store the waste
- Currently, there are no long term approved storage methods or locations in the US

What does half life mean?

- Uranium 235, 236 and 238 is in the Core of the reactor.
  - Half life for 235= 704 million years.
  - Half life for 238= 4.46 billion years
- Future Generations
  - U235: 23 future generations live through one half life
  - U238: 15 billion generations live through one half life
- Economic Perspective
  - Save $1/yr for one half life of U235 = $704,000,000

Conclusion

- Many questions remain regarding 4S nuclear reactor safety
  - Potential watershed wide impact requires multiple parties to participate in resolving questions
- Participation in the NRC hearing process is important for critical examination of proposed nuclear reactor in Galena

Existing Resolutions

YRITWC Standing Resolution

- Requesting a moratorium on the experimentation with transport or storage of radioactive materials within the Yukon River watershed

Tanana Chiefs Conference (TCC) Resolution

submitted by Tanana Tribal Council and Huslia Tribal Council

- Opposing establishment of radioactive energy sites and transportation and storage of radioactive materials

YRITWC Organizational Goal as approved by the full board in 2004

Policy and Management Decisions

We will become a body that is responsible for the watershed and participates in policy and management decisions that impact the health and future of the watershed

Recommendations to be Considered by the YRITWC Full Board

1. The YRITWC obtains standing to become a party in NRC hearing process with ILRC legal support
2. A vote by the YRITWC full Board requesting that no party begin the application or permit process until long-term storage of spent fuel is fully resolved

Other Information Resources

- Los Alamos www.web.em.doe.gov/cercla/5-05lanl.html
- Toshiba http://www.toshiba.co.jp/product/abwr/english/index.htm
- Pacific Northwest Laboratories www.pnl.gov
- Alaska Community Action on Toxics www.akaction.org
- Environmentalists for Nuclear Power (EFN) www.mfk.nu/english.html

Resources Continued

- Nuclear Information and Resource Services http://www.nirs.org
- Nuclear Energy Institute http://www.nei.org
- EPA, Radioactive Materials Disposal Program – Rick Poeton 800-424-4372
- Institute for Energy and Environmental Research http://www.ieer.org