

Public Information and Outreach in Galena, Alaska

Pacific Basin Nuclear Conference

March 23, 2004



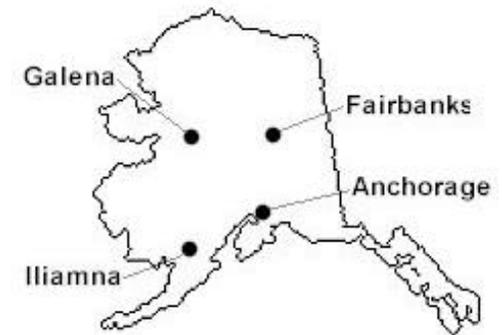
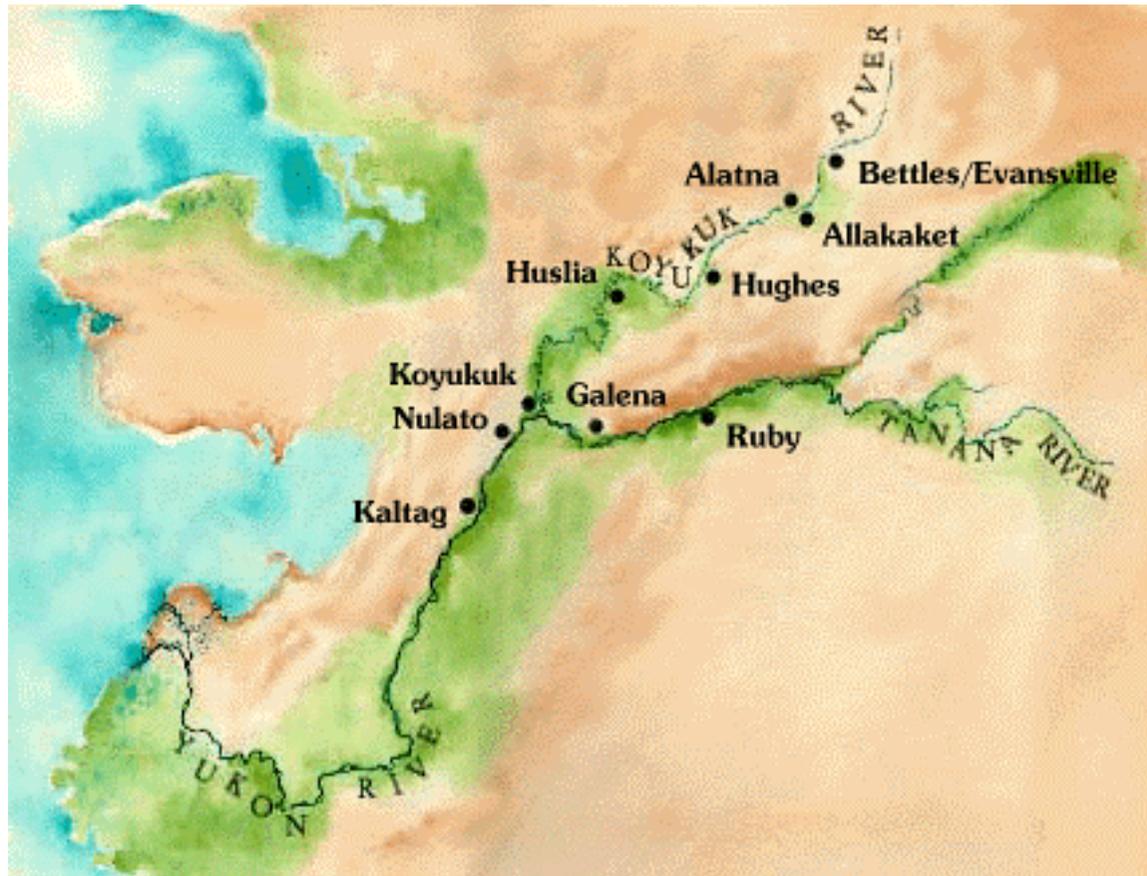
Opportunity

Power for rural Alaska

-  Deploy new nuclear unit as the preferred option
-  Turn “conventional wisdom” on its head
-  Move “nuclear renaissance” out of the laboratory



Central Alaska





Galena, Alaska

- ✍ Middle Yukon Region on the Yukon River
 - Homeland of the Koyukon Athabascan People
 - Approximately 750 residents
- ✍ No roads - transportation by air or barge
 - Barge service limited to 3 to 4 ice-free months
- ✍ Center for World Class Educational Services
 - Charter school for youth from around the state
 - GM, Suzuki automotive shops
 - FAA flight school
- ✍ USAF Galena Air Station



Galena Energy Data

City Electric Utility

- Six (6) diesel electrical generators
- 4,300 kw capacity
- 8.7 miles of distribution system

Heating

- 62% Fuel Oil, Kerosene
- 31% Wood
- 3.5% Tanked Gas
- 3.5% Electric

Fuel Storage

- 2,000,000 gallons - City and fuel suppliers
- 1,000,000 gallons - U.S. Air Force



Galena Energy Issues

- ✍ Existing electrical generation facility built in 1988
- ✍ Fuel shipment and storage environmental concerns
 - Transfers from barge to storage tanks
 - 55-gallon drum handling (home fuel oil)
 - Risk from large capacity tanks
- ✍ Increasing fuel costs -- \$2 million year and rising
- ✍ Tightening regulation of diesel emissions
- ✍ **City is conducting a review of alternatives**



Galena Non-Nuclear Diesel Alternatives

Coal bed methane

- No proven reserves

In-stream hydro

- Unproven under arctic conditions
- Lacks hydraulic head
- Diesels needed for stand-by

Coal-fired boiler

- Efficiency, economics of small facility
- Environmental impacts
 -  Mining
 -  Transportation
 -  Burning

Wind

- Lacks reliable wind resources
- Effects of extreme cold, icing
- Diesels needed for stand-by

Solar

- Cost issues
- Months of limited sunlight
- Diesels needed for stand-by



Problem

Extremes

- Small, isolated population centers
- Limited infrastructure
- Harsh conditions

Economics

- \$0.20 to \$1.00 / kw/hr
- Millions \$\$\$ annual “equalization” costs

Environment

- Diesel/fuel oil not environmentally benign -- no fishing in Yukon
- Coal-fired generation polluting/expensive
- Other energy alternatives unproven/unavailable/unreliable



Ideal Solution for Rural Alaska

Extremes

- Small, self-contained facility
- Limited infrastructure requirements
- Low visual impact

Economics

- Less than \$0.20 / kw/hr O&M costs
- Less than \$1.5 million annual fuel costs

Environment

- No or low emissions
- Modular/factory construction
- Reliable



4S Solution

 Toshiba and CRIEPI project

 **Super Safe, Small, & Simple**

 Sodium-cooled, metallic-fueled, small reactor

 Key features for Alaska

- No refueling - 30 year life
- Passive safety - no operator actions
- Secure - housed underground
- Factory built - delivered by barge
- Reasonable cost

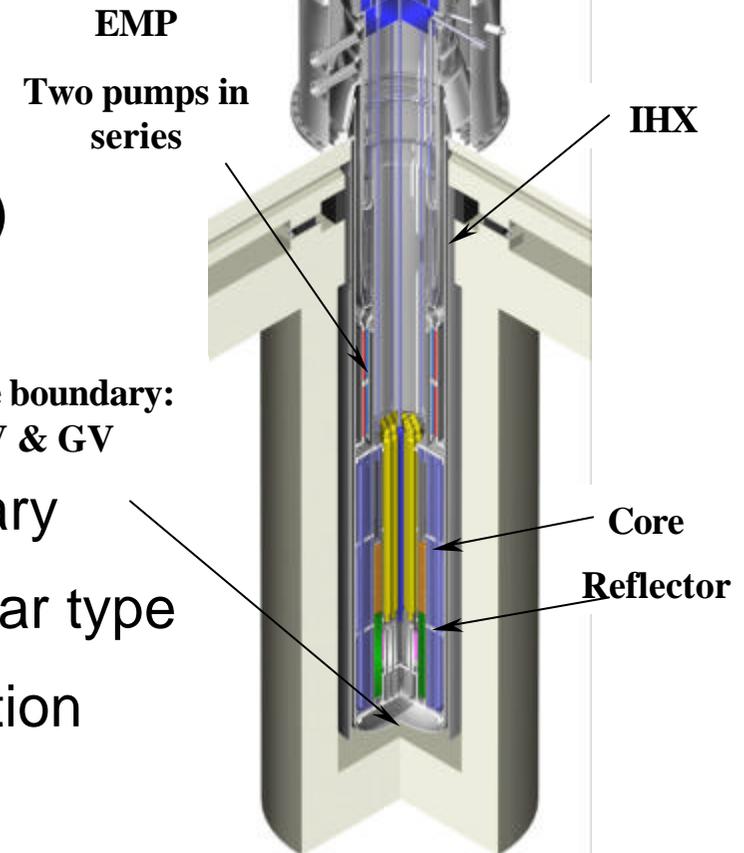
See T.Yokoyama (TOSHIBA), and N.Ueda (CRIEPI), ICONE11-36284, April 20-23, Tokyo, JAPAN, 2003.



4S Technology

- Output: 10 MWe (30 MWt)
50 MWe (135 MWt)
- Coolant: Sodium at 510 F / 355 C
- Intermediate Heat Exchange Loop (IHX)
- Reactivity control: Movable reflectors
- Reactor Vessel: Integral type
- Guard Vessel: Second coolant boundary
- Coolant Pumps: Electromagnetic annular type
- Emergency Cooling: Natural air circulation
- Proliferation resistant fuel

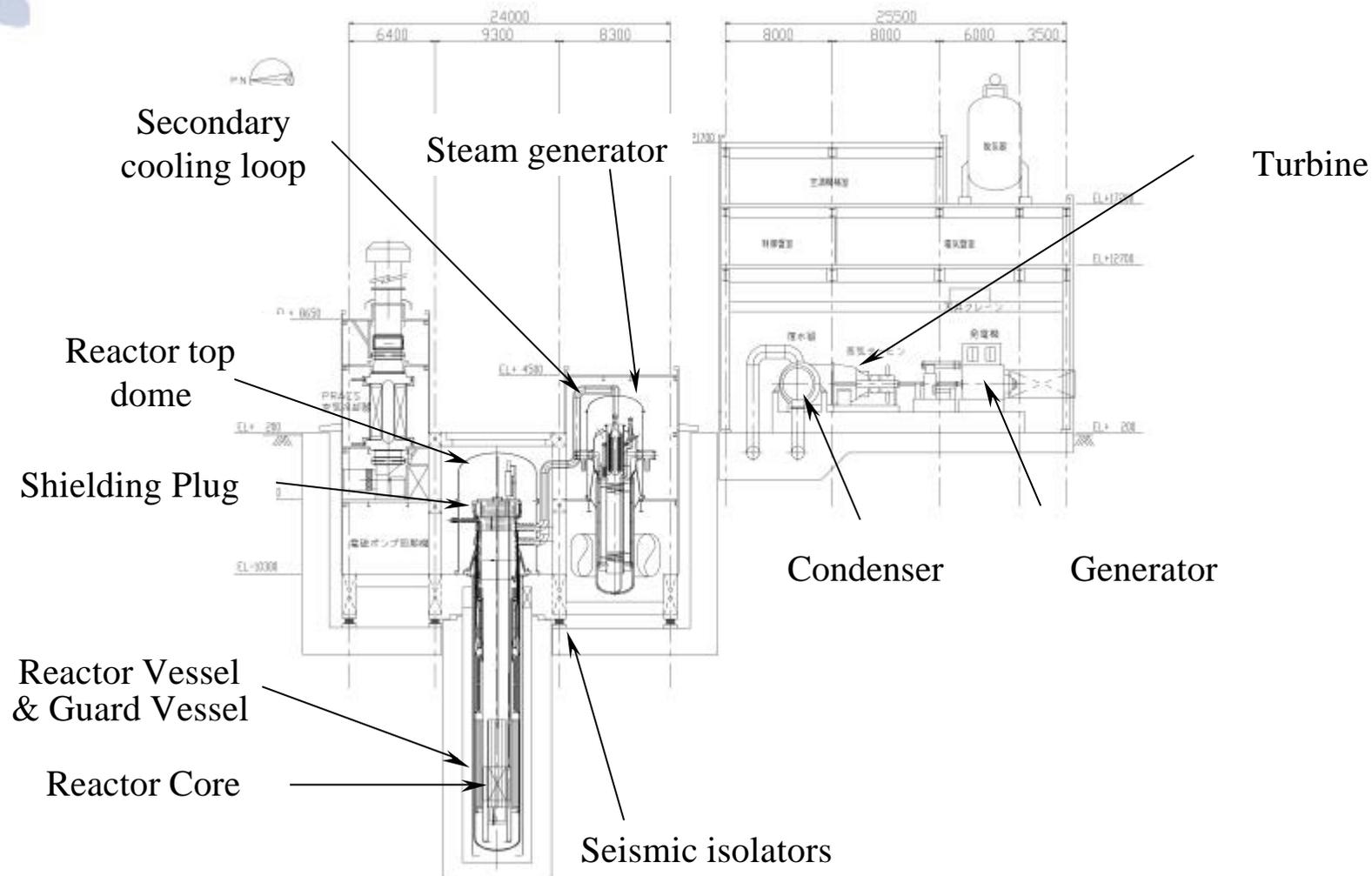
Double boundary:
RV & GV



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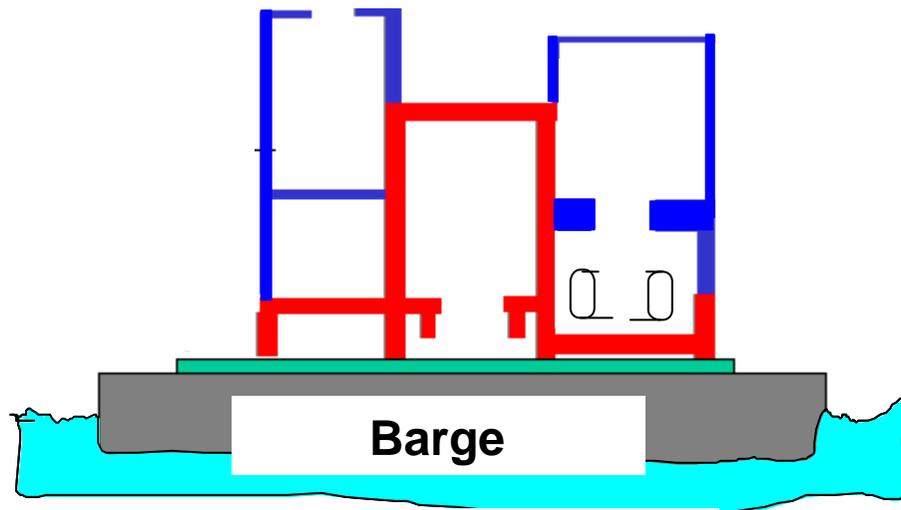
4S Cross Section



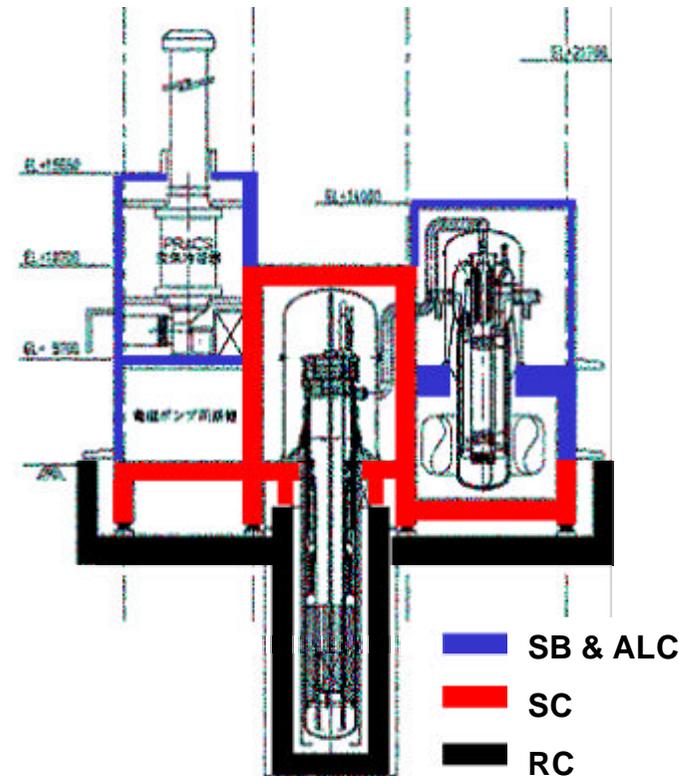
See S.Maruyama, et al., Mechanical Engineering Congress, 2003 Japan (MECJ-03), August 5-8, Tokushima, Japan, 2003.



Modular Construction & Transportation



Marine transport



See S.Maruyama, et al., Mechanical Engineering Congress, 2003 Japan (MECJ-03), August 5-8, Tokushima, Japan, 2003.



Environmentally Sound

- Eliminate diesel air emissions
- Eliminate fuel spills
- Enable hydrogen economy research
 - Produced by “excess” energy
- Replace other hydrocarbon fuels
 - Automotive conversion shop in Galena
 - Infrastructure exists to supply hydrogen to nearby villages
 - Generate own backup fuel source

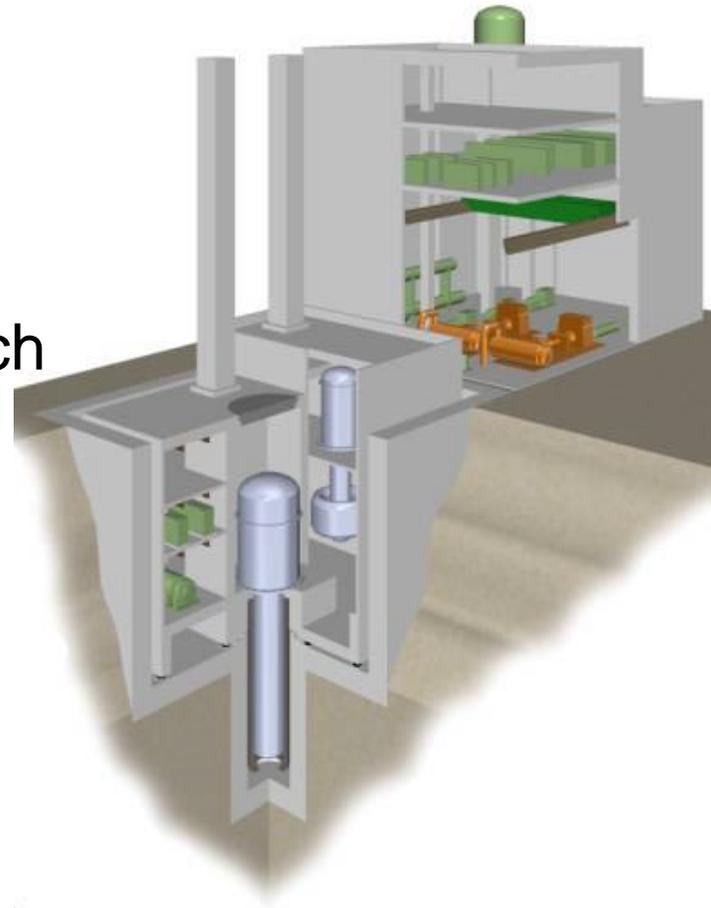


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Our Up-Side-Down Approach

- ✍ Look to solve the problem - not sell products or services
- ✍ Informal first contact at local level
- ✍ Personally visit the locality - understand local issues
- ✍ Hold public discussion of all issues with all interested parties
- ✍ Do not limit scope or content of discussions
- ✍ Work 'with' community to select power source – if it is not nuclear, help with the other solution
- ✍ Fund locality efforts – they do not fund you
- ✍ Enlist community in developing outreach plan – they know best
- ✍ Work for win/win solution regardless of result



Recognize Broader Impact

Fundamental Social-Economic Change

- Abundant electricity at low, fixed cost
- Shift to electric heat - eliminate fuel oil, kerosene, wood burning
- Greenhouses
- Sewage lagoon operations
- Ice-free runway - reduce machinery, fuel expenses

Hydrogen Economy

- Zero emission, marginal cost production
- Replace other tanked fuels
- Storage, distribution research



Grass Roots Success

-  Local population engaged and championing
-  Quickly shifted from “push” to “pull”
 - Growing interest and positive momentum
-  State fully supports project -- NRC and DOE calling
-  Environmentalists intrigued, willing to listen
-  Critical design improvements identified
 - Arctic construction issues
 - Reliability
-  Identified additional needs



More Opportunities

Mining/Resource Recovery

- Many millions of gallons diesel consumed annually
- Transportation of fuels difficult

Seafood Industry

- 90,000,000 gallons diesel consumed annually
- Summer ice production cost exceeds product cost

Other Industrial/Residential Users

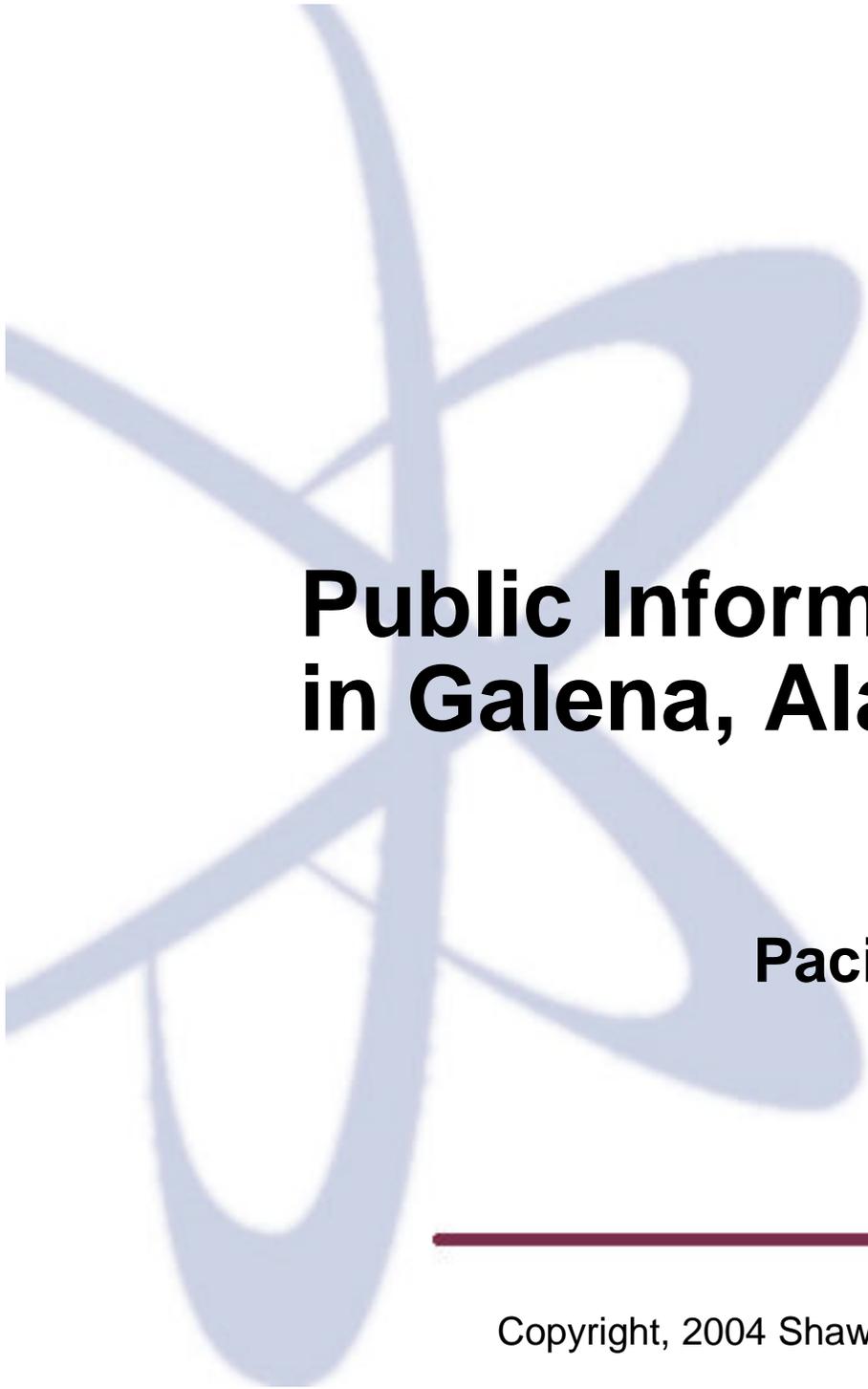
- Isolated, unreliable generation systems
- Aging generating facilities

New 'Clean Coal' plant never operated



Path Forward

- ✍ Form not-for-profit organization to coordinate the interest of Alaskan communities and industries
- ✍ Obtain initial funding for planning
 - Energy alternatives
 - Environmental impacts
 - Preliminary siting assessment(s)
 - Regulatory challenges
- ✍ Prepare “case” for deploying nuclear where it is needed
- ✍ Develop design certification/construction funding plan
- ✍ Implement

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