



# **Public Information and Outreach in Galena, Alaska**

**Pacific Basin Nuclear Conference**

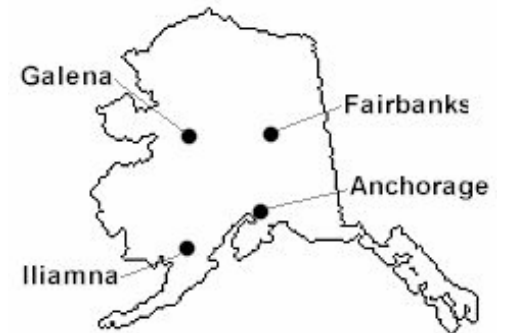
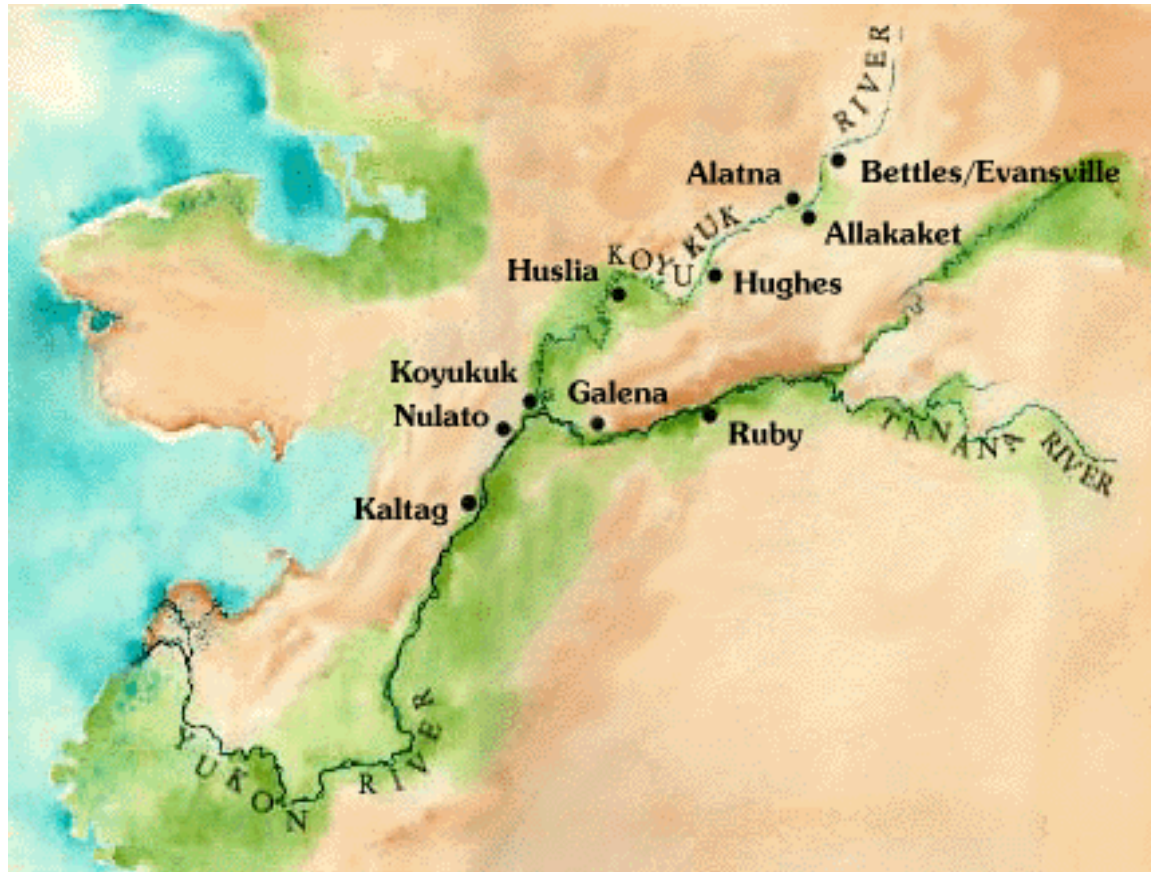
**March 23, 2004**



- **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



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# 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

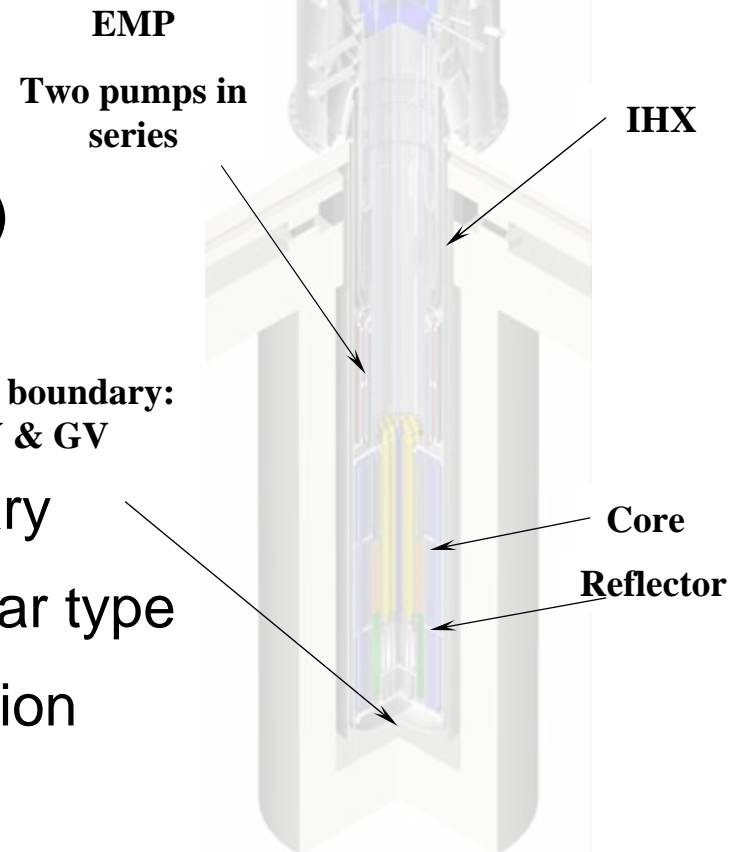
- Toshiba and CRIEPI project
- **Super Safe, Small, & Simple**
- Sodium-cooled, metallic-fueled, small reactor
- Key features for Alaska
  - No refueling - 30 year life
  - Passive safety - no operator actions
  - Secure - housed underground
  - Factory built - delivered by barge
  - Reasonable cost

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



# 4S Technology

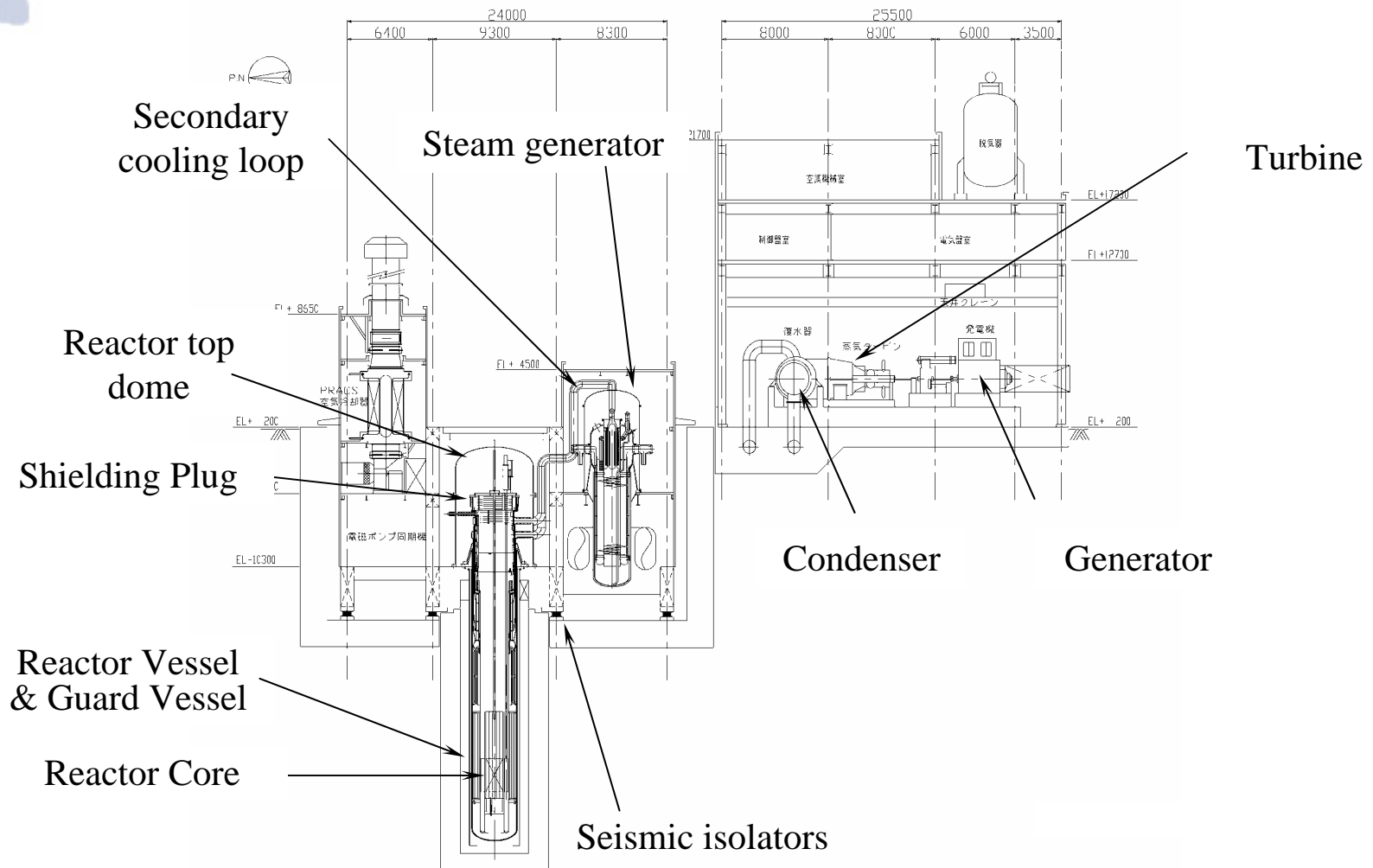
- Output: 10 MWe (30 MWt)  
50 MWe (135 MWt)
- Coolant: Sodium at 510 F / 355 C
- Intermediate Heat Exchange Loop (IHX)
- Reactivity control: Movable reflectors
- Reactor Vessel: Integral type
- Guard Vessel: Second coolant boundary
- Coolant Pumps: Electromagnetic annular type
- Emergency Cooling: Natural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



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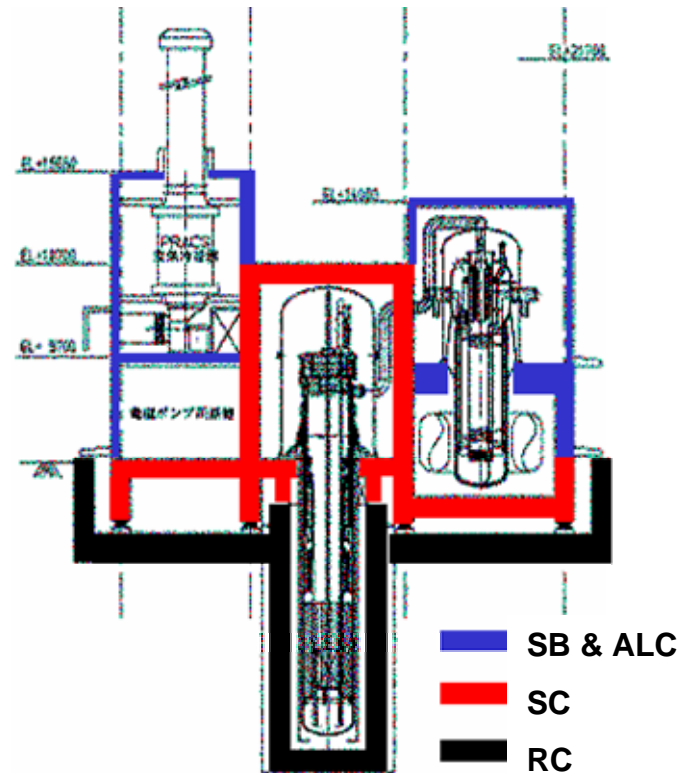
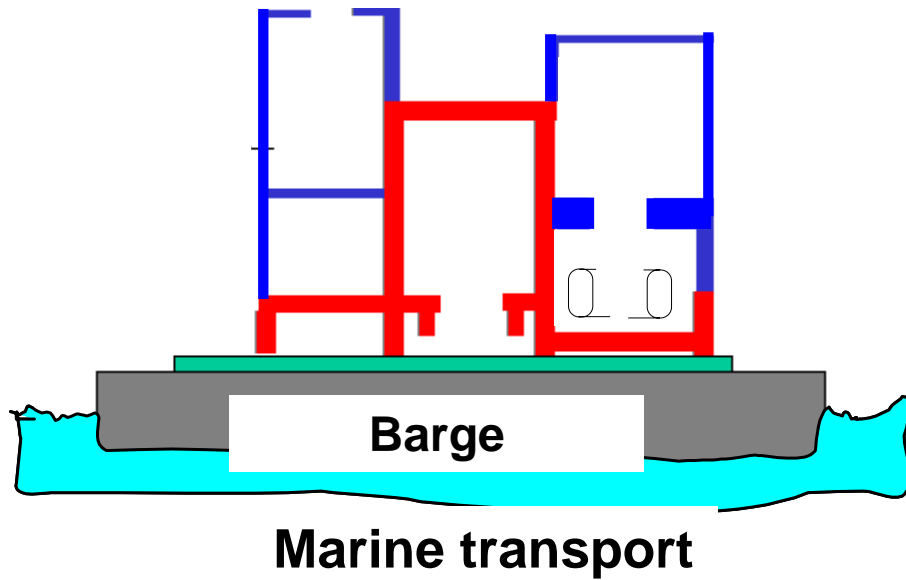


# 4S Cross Section



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

# Modular Construction & Transportation



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

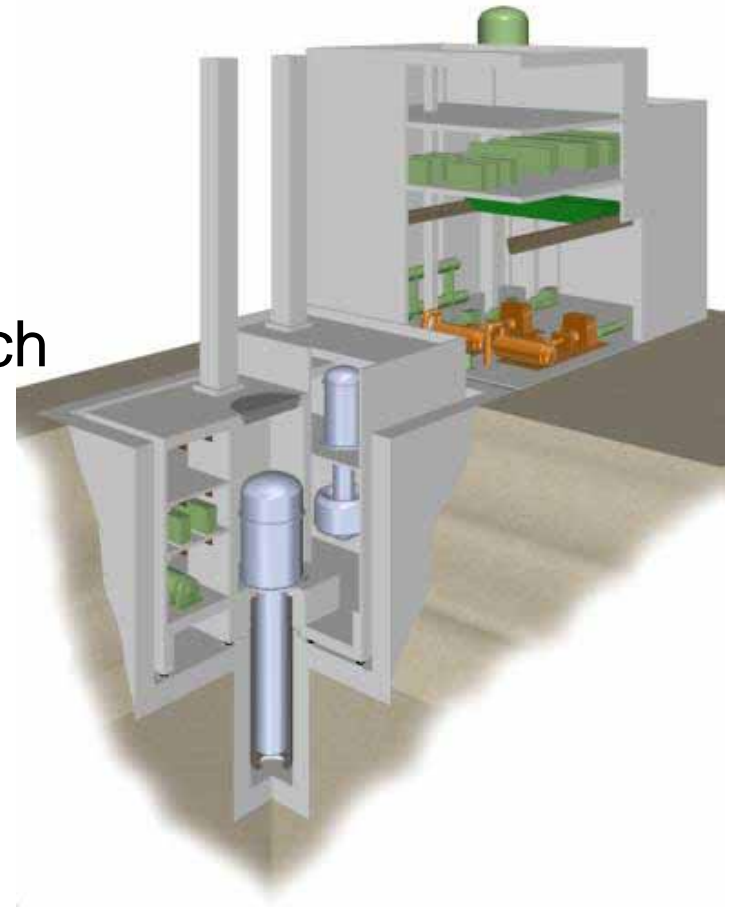


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# Our Up-Side-Down Approach

- 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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