Nuclear Microreactors & Alaska?

Alaska State Senate
Community and Regional Affairs Committee
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Local energy solutions for Alaska and beyond through:

ACEP Energy Technology Facility

- Research in appropriate energy technologies
- Lab and field testing of emerging technologies
- Commercializing energy innovation
- Knowledge sharing/information clearinghouse
- Workforce development / STEM / student engagement

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Discussion topics

- Highlights from prior (2010-2011) study of small modular reactors
- Observations from 4/18 workshop
- Proposed next steps

Context for 2010 Study on SMR's

"Small Modular Nuclear Power: *an option for Alaska?*"

- Requested by Alaska State Legislature in 2009
- Response to 2008 Global oil price spike that exposed vulnerabilities of Alaska to annual (and intra-annual) fluctuations in oil prices
- Interest in solutions that can provide baseload power (many remote locations only have access to intermittent renewables)
- Interest in options that can offset heating loads as well as electric power
- Fukushima disaster occurred the same month the study was finalized

Icebreaker supported fuel delivery to Nome in 2012

Report Authors

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Citation

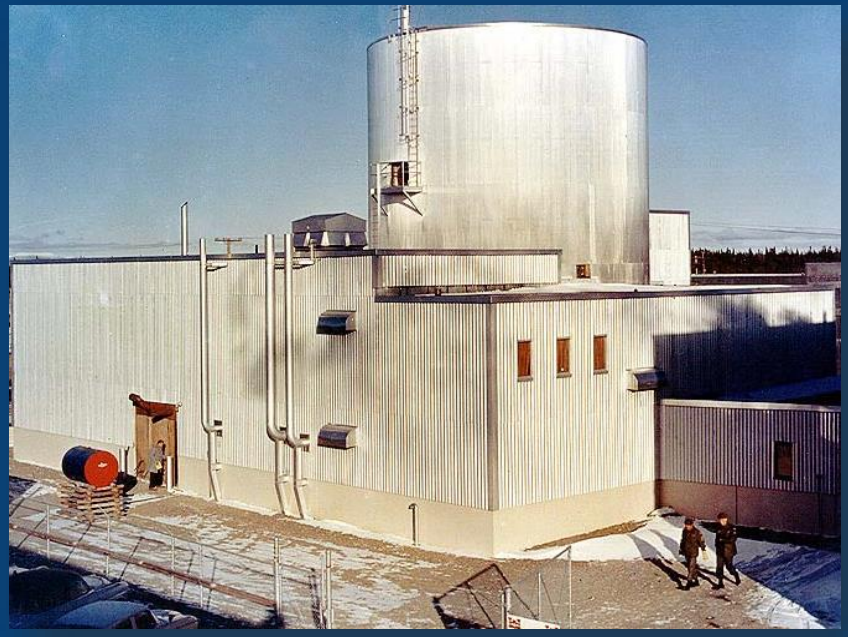
Holdmann, G., Fay, G., Witmer, D., Williams, F., Schwörer, T., Pride, D., and Stevens, R., Small Scale Modular Nuclear Power: An Option for Alaska Executive Summary, prepared for the Alaska Energy Authority, February 2011. 185 pages.

Available for Download at:

acep.uaf.edu under publications

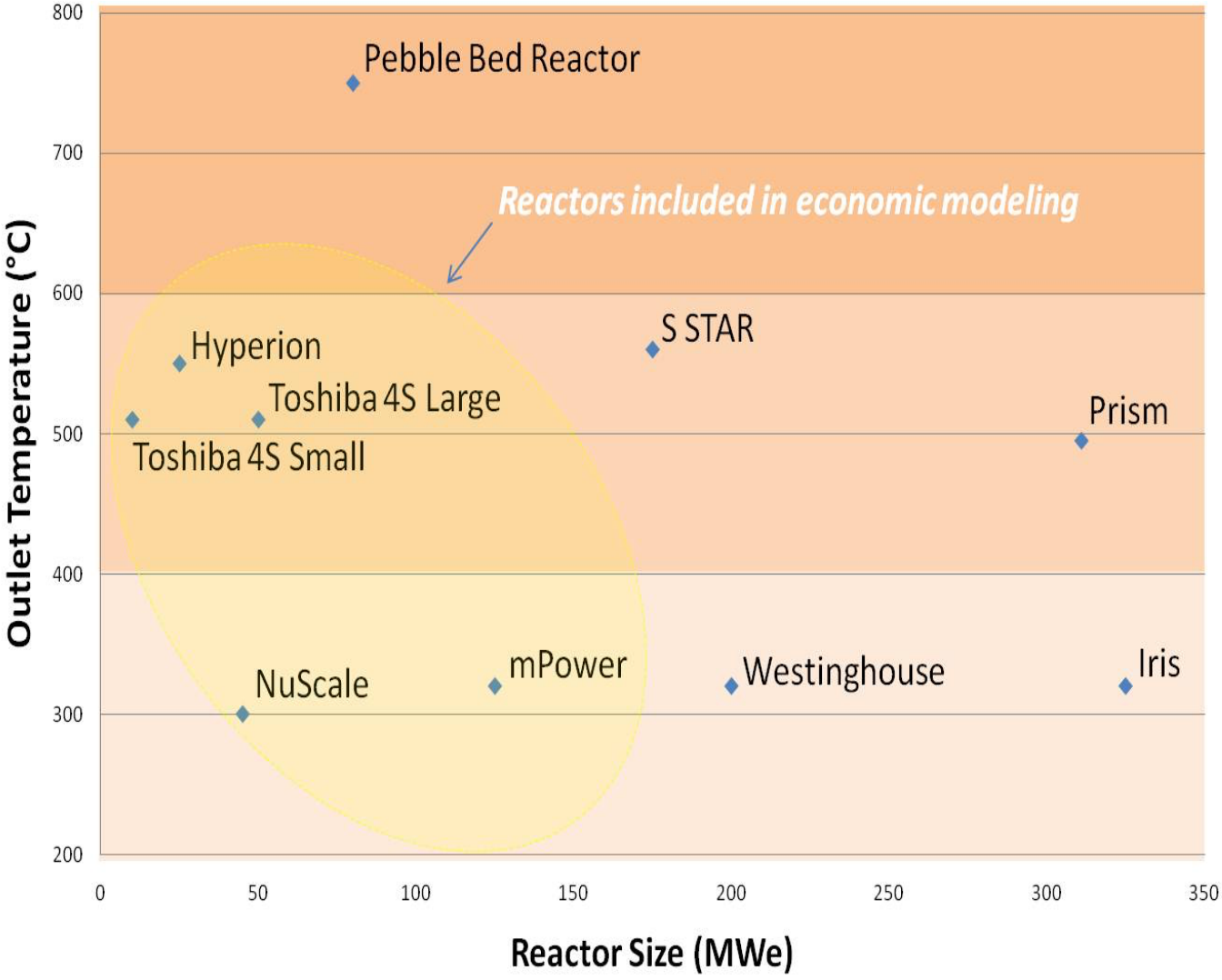
Emphasis of Study

- Review history of nuclear technology utilization in Alaska
- Consider technical and economic feasibility of proposed SMR technology
- Assess siting and permitting requirements/barriers to implementation
- Host a workshop as a forum for discussion and knowledge exchange
- Create recommendations for the State of Alaska



Fort Greely SM1 primary reactor facility. Commissioned in 1962, decommissioned in 1972. 20.2 MW_{th}, generated 1.6 kW_e

Representative Small Reactor Sizes and Operating Temperatures



Includes SMR designs that have been proposed for the US market

Reactor Size Appropriate for:

- Power and Waste Heat
- Power and Cogeneration
- Direct Process Heat

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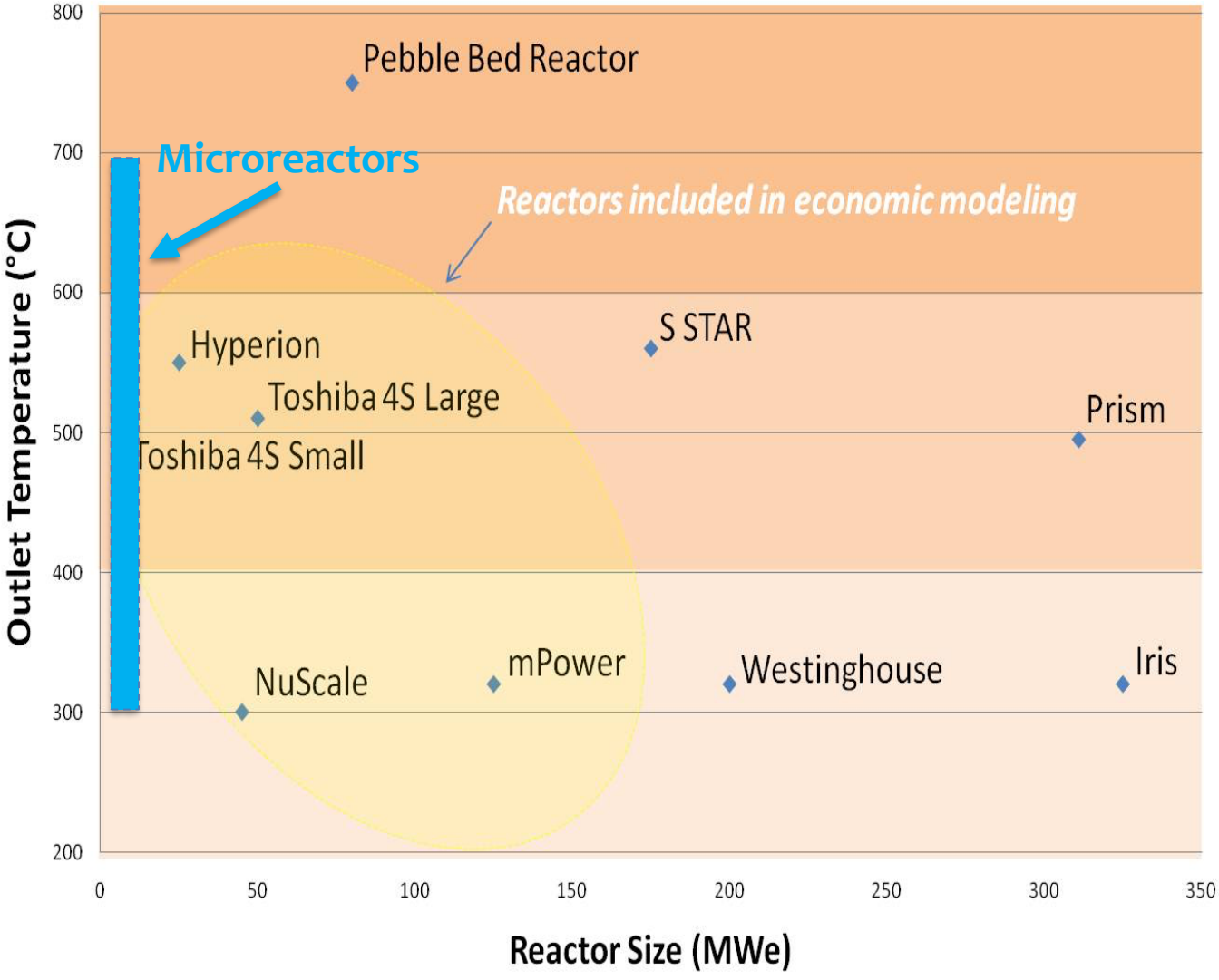

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Reactor Size Appropriate for:

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Communities with sufficient heating and electric loads to match small modular reactor capacities currently under development.

The communities of Cordova, Juneau, Ketchikan, Kodiak, Petersburg, Sitka, Valdez and Wrangell were not considered because of currently installed hydroelectric capacity.

Kotzebue (4 MW)

Nome (9 MW)

Galena (1 MW)

Fairbanks (223 MW)

Tok (2 MW)

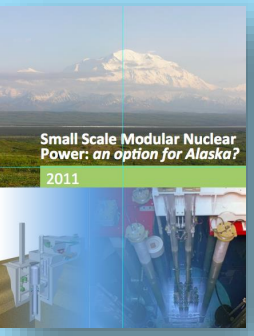
Bethel (7 MW)

Anchorage (652 MW)

Dillingham (3 MW)

Naknek (8 MW)

Unalaska (7 MW)



N

0 100 200
Miles

0 100 200 300
Kilometers

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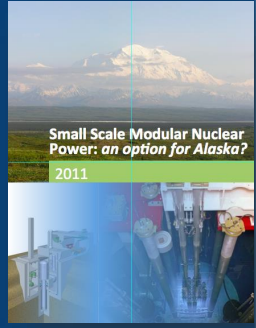
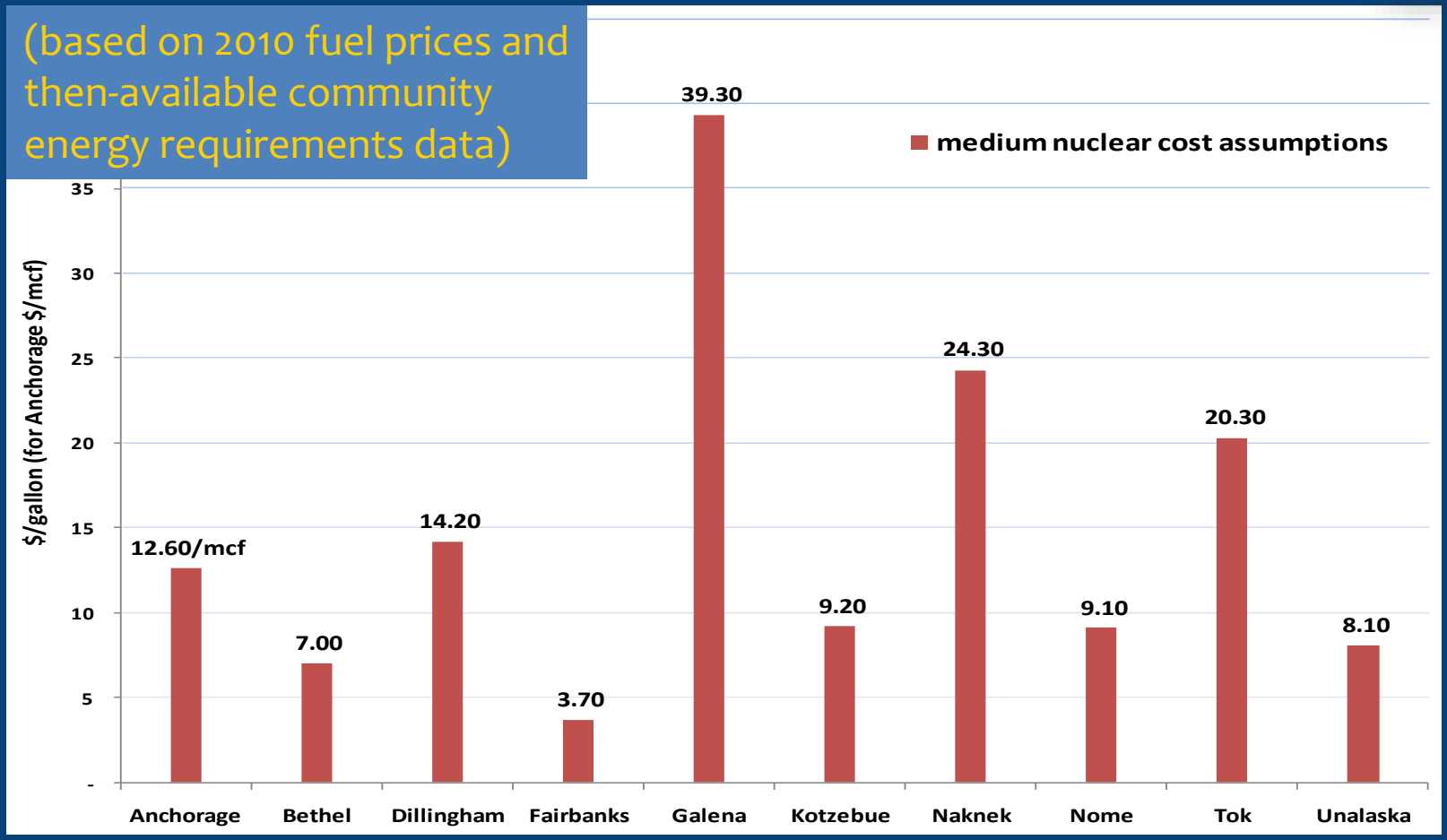
Local Price Thresholds

for SMR economic feasibility



(based on 2010 fuel prices and then-available community energy requirements data)



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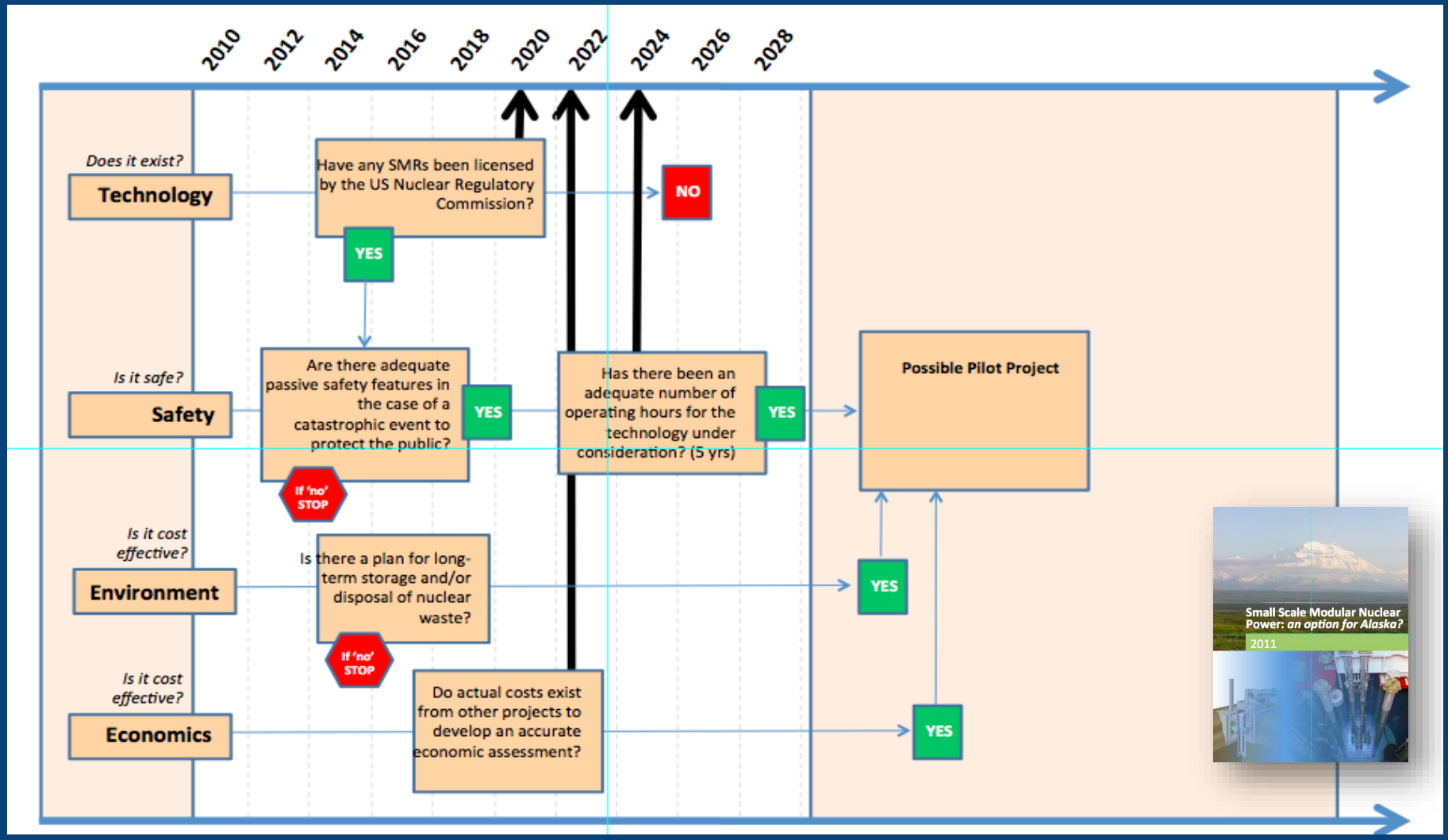
Report Findings

- Lots of proposed designs exist, but what most people consider small is quite big by Alaska standards.
- The technology is not mature, with detailed engineering data for most small reactor designs only 10-20% complete, and very preliminary cost data is available.
- Current project investment decisions cannot be made, since the technology is not expected to be available for a decade or more.
- There are limited sites for deploying SMR's in Alaska.

Decision Making Chart for Alaska



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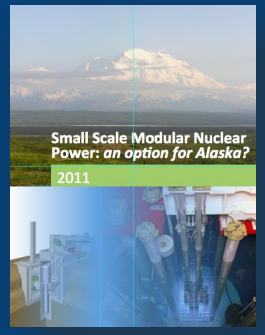
Action items

1. Maintain active monitoring effort to stay abreast of developments in the nuclear power industry.
2. Provide input to NRC on unique needs, circumstances in Alaska.
3. Identify mechanism to address ownership/insurance issue.
4. Remove technical and siting barriers in state statutes.
5. Explore options for small scale (<10 MW) reactor technology.



4/18 Information session objectives

- Microreactor technology introduction
  - Features & attributes
  - Status & plans
- AK heat & power perspectives & priorities
  - Applications & capacities
  - Challenges & concerns
- AK engagement with technology pilot programs & demonstration programs
- Items for consideration by microreactor co's

Multiple & diverse stakeholders

- ANCSA Corporations
- Community Representatives
- Economic Dev't Organizations
- Entrepreneur Support
- Industry (Construction, Mining, Oil & Gas, Energy Project Developers, Seafood)
- Investors
- Military Base Representatives
- Non-gov'tal Organizations
- Nuclear Industry & Associations
- University of Alaska
- State & Federal Elected Officials
- State of Alaska Departments
- Utilities
- Workforce Development

65+ in-person & 6 virtual

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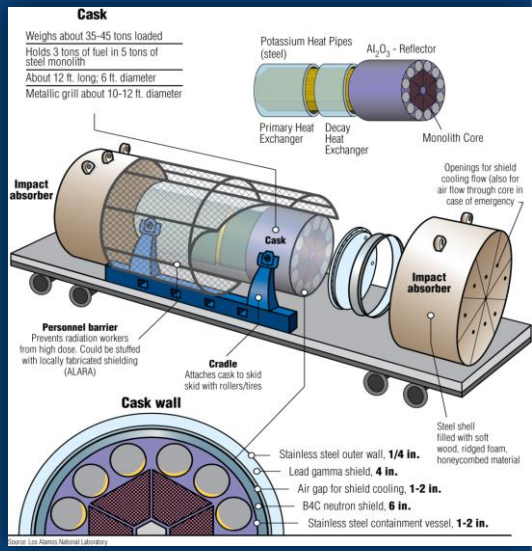
Nuclear microreactor applications?

- Stationary
- Baseload / Baseload with load-following
- TBD capacity & electrical / thermal mix
- Applications
  - Military bases
  - Industrial or institutional sites
  - Remote locations



Los Alamos National Lab
MegaPower Microreactor

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Participant discussion summary

- Stakeholder consultation
- Assess reliability, safety, environmental risks
- Determine siting requirements
- Characterize regulatory and policy environment
- Incorporate cradle-to-cradle thinking
- Develop integrated commercialization roadmap
- Monitor industry / regulatory developments
- Incorporate Alaska interests & use cases in any microreactor pilot program(s)

Proposed next steps

- 18 June workshop in Idaho Falls
- Roadmap development
- Alaska information / applications incorporated in pilot program(s)
- 2019/20 Alaska Microreactors Study

Thank You

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