



Alaska Energy Authority: Renewable Energy Fund and Susitna-Watana Hydro

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House Energy Committee
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Alaska Energy Authority: Mission

“To Reduce the Cost of Energy in Alaska”

- AEA is an independent and public corporation of the State of Alaska
- Created by the Alaska Legislature in 1976
- 44.83.070: “ The purpose of the Authority is to promote, develop, and advance the general prosperity and economic welfare of the people of the state by providing a means of financing and operating power projects and facilities that recover and use waste energy and by carrying out the powers and duties assigned to it under AS 42.45.”

Focusing on Communities



- Emphasizing community-based approach to projects
- Technical assistance, regional planning and project management
- Provide synergy between planning, projects and funding sources
- Assist communities to move to project-ready status
- Break down internal silos



Renewable Energy Grant Fund

- Grant recommendation program supports communities
- Helps achieve state renewable goal 50% by 2025
- Displaces volatile-priced fossil fuels
- Provides a vetting mechanism for energy projects
- Capitalizes on local energy resources
- Expands Alaska's renewable energy knowledge base
- Provides local employment
- Benefits businesses not eligible for PCE
- Reduces State expenses through Schools and PCE



Coffman Cove School Garn boiler.

Photo courtesy of Karen Petersen

Renewable Energy Grant Fund

- Strong technical and economic evaluation process
- Emphasis on high cost areas and regional balance
- Eligible applicants:
 - Utilities, local governments, tribal councils, Independent Power Producers
- Eligible projects:
 - Wind, hydro, biomass, heat recovery, heat pumps, geothermal, solar, wave, tidal, river hydrokinetic, landfill gas, local natural gas, transmission of renewables



St. Paul Island Wind and Flywheel

Renewable Energy Fund Achievements



Atka: Hydro



Prince Wales Island: Biomass

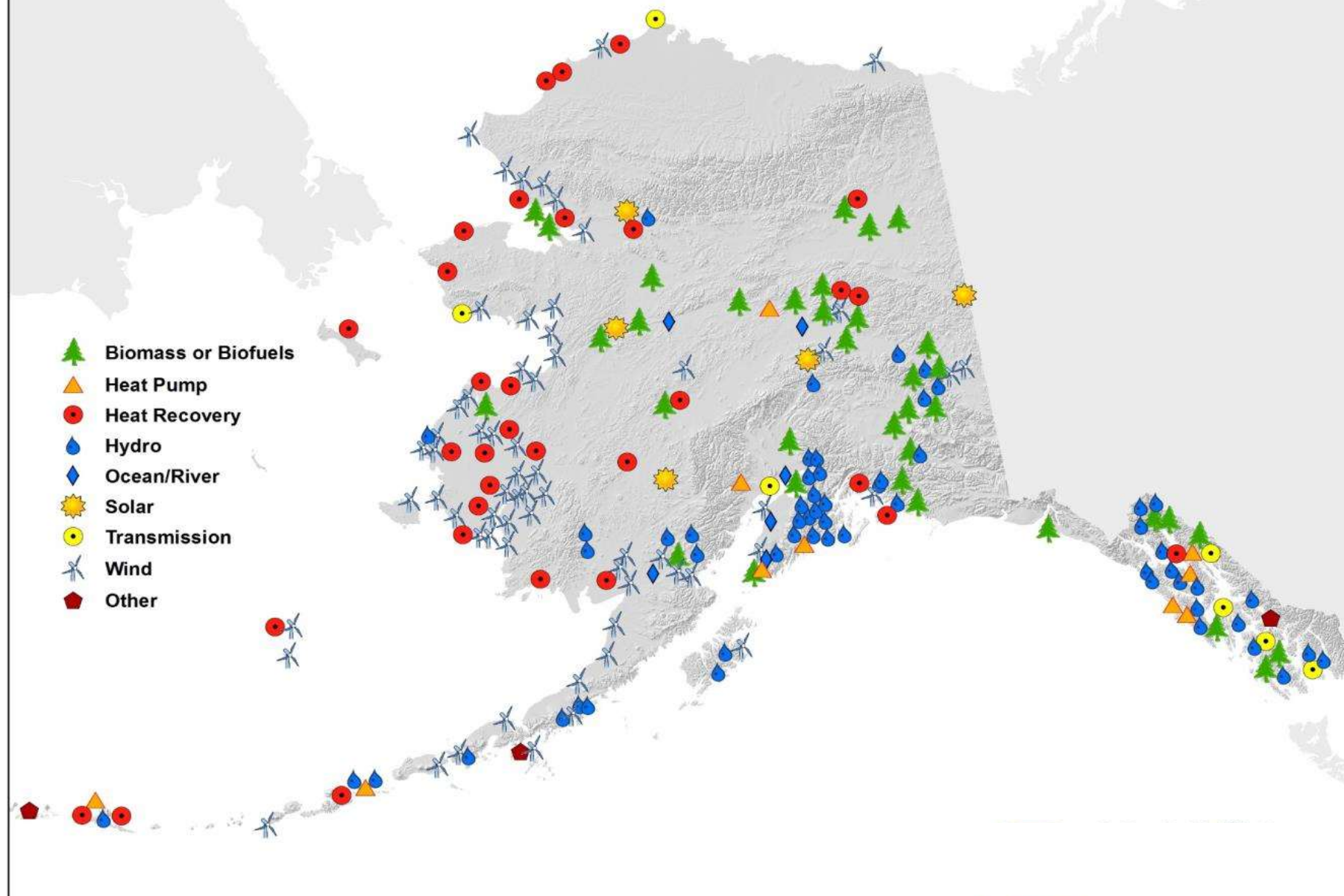
- Earned national recognition for excellence from the Clean Energy States Alliance, 2014
- In 2014 15 million gallons of diesel equivalent were displaced
- Overall program benefit cost ratio: 2.8
- Leveraged more than \$200 million of other investments
- First 44 constructed projects have lifetime benefit of \$889 million (NPV)

REF Grant and Funding Summary

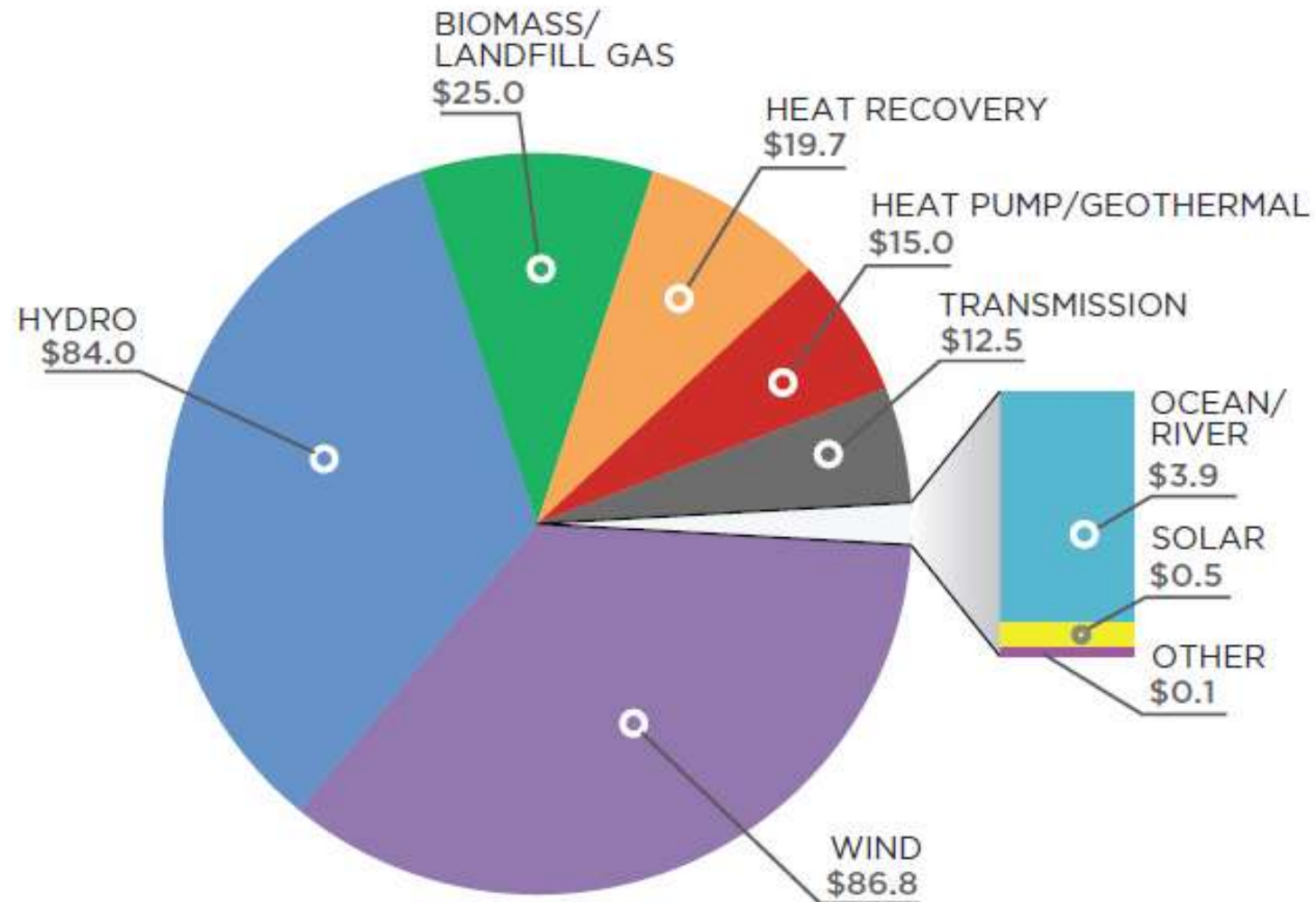
	Rounds I-VII
Applications Received	732
Applications Funded	277
Grants Currently in Place	125
Amount Requested ¹ (\$M)	\$ 1,442.3
AEA Recommended (\$M)	\$ 398.3
Appropriated (\$M) ²	\$ 247.5
Match Budgeted (\$M) ³	\$ 152.1
Cash Disbursed (\$M)	\$ 167.9

1. Total grant amount requested by all applicants.
2. \$12.8 Million was re-appropriated from earlier rounds for use in Round IV (\$10M) and Round VII (\$2.8M).
3. Represents only amounts recorded in the grant document and does not capture all other funding.

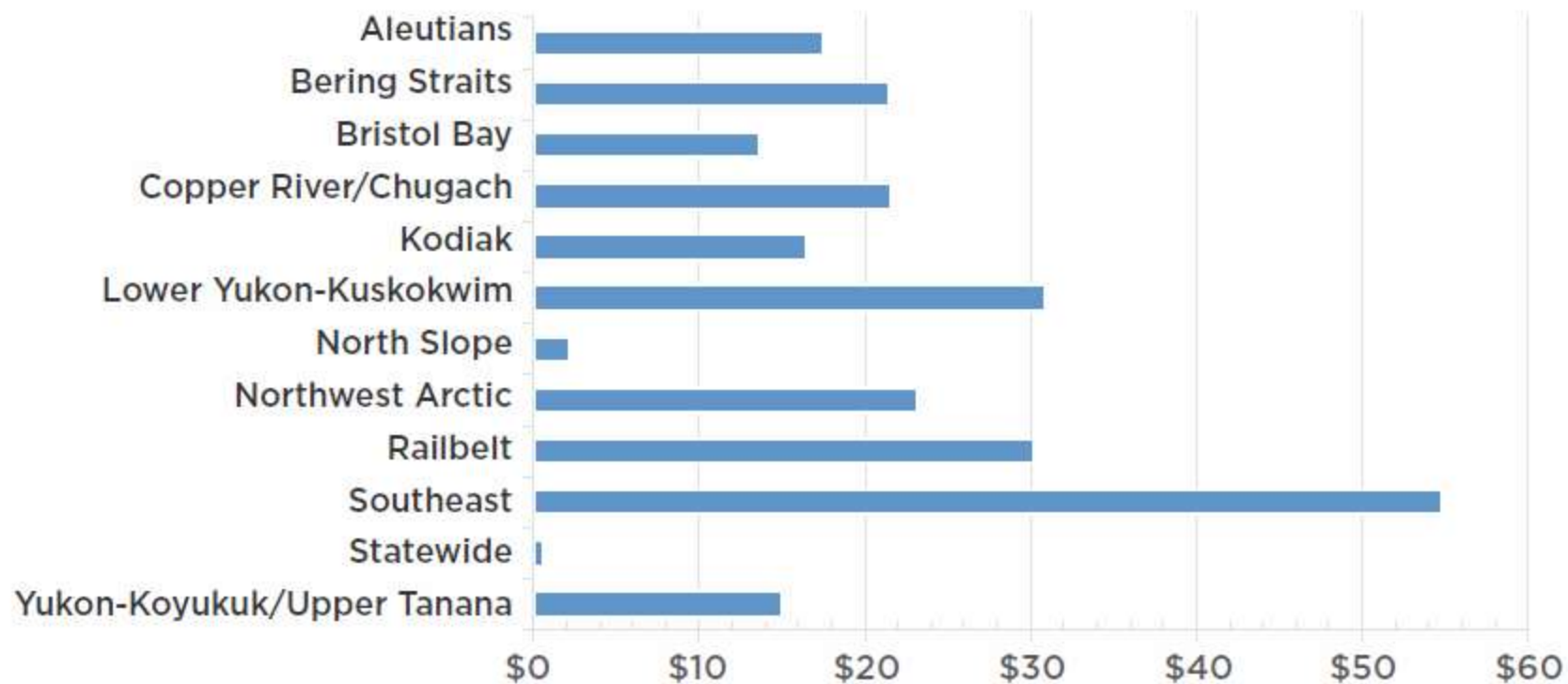
Renewable Energy Fund Projects, Rounds I - VII



FUNDED GRANTS BY ENERGY RESOURCE ROUNDS I-VII



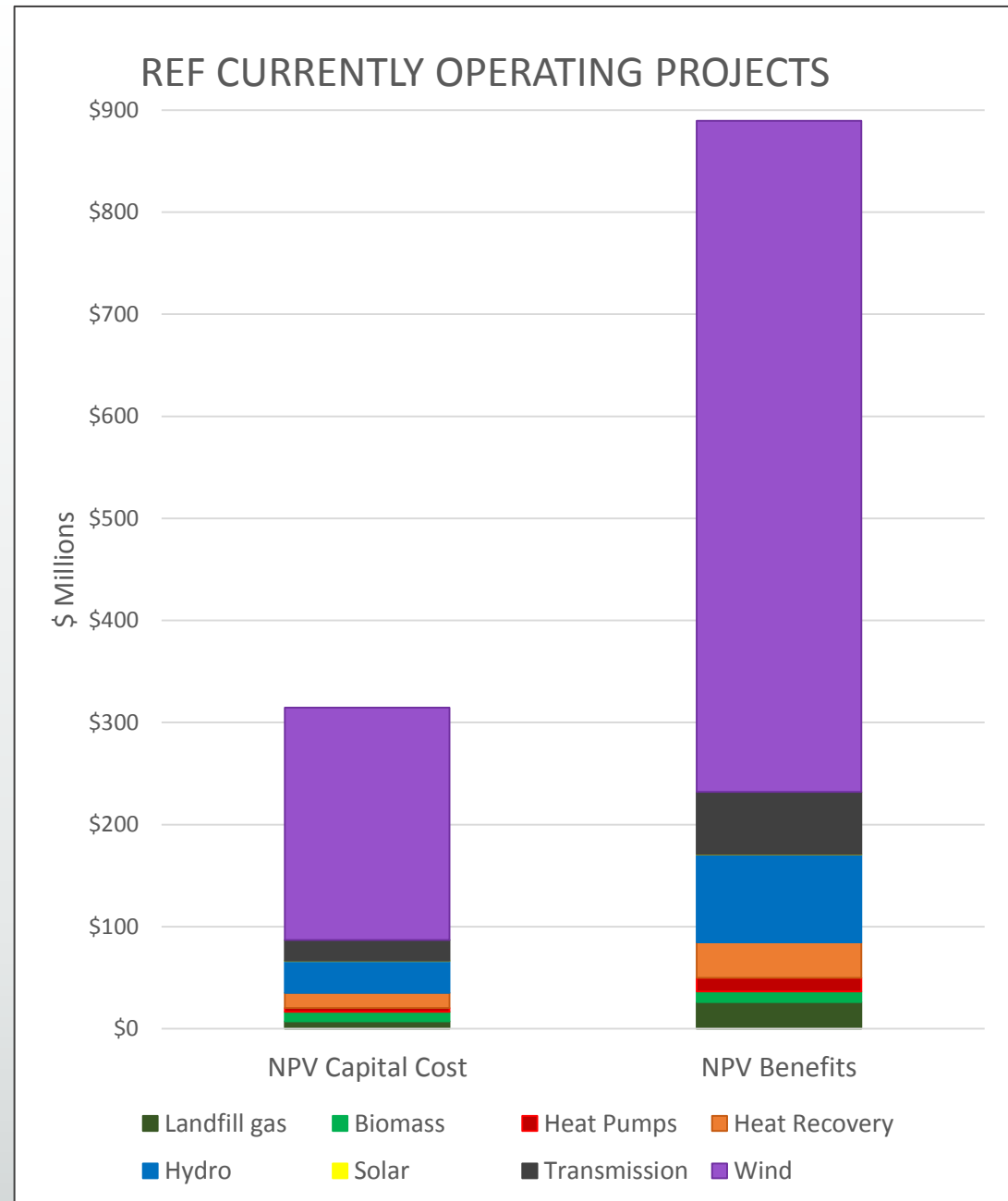
FUNDED GRANTS BY ENERGY REGION ROUNDS I-VII



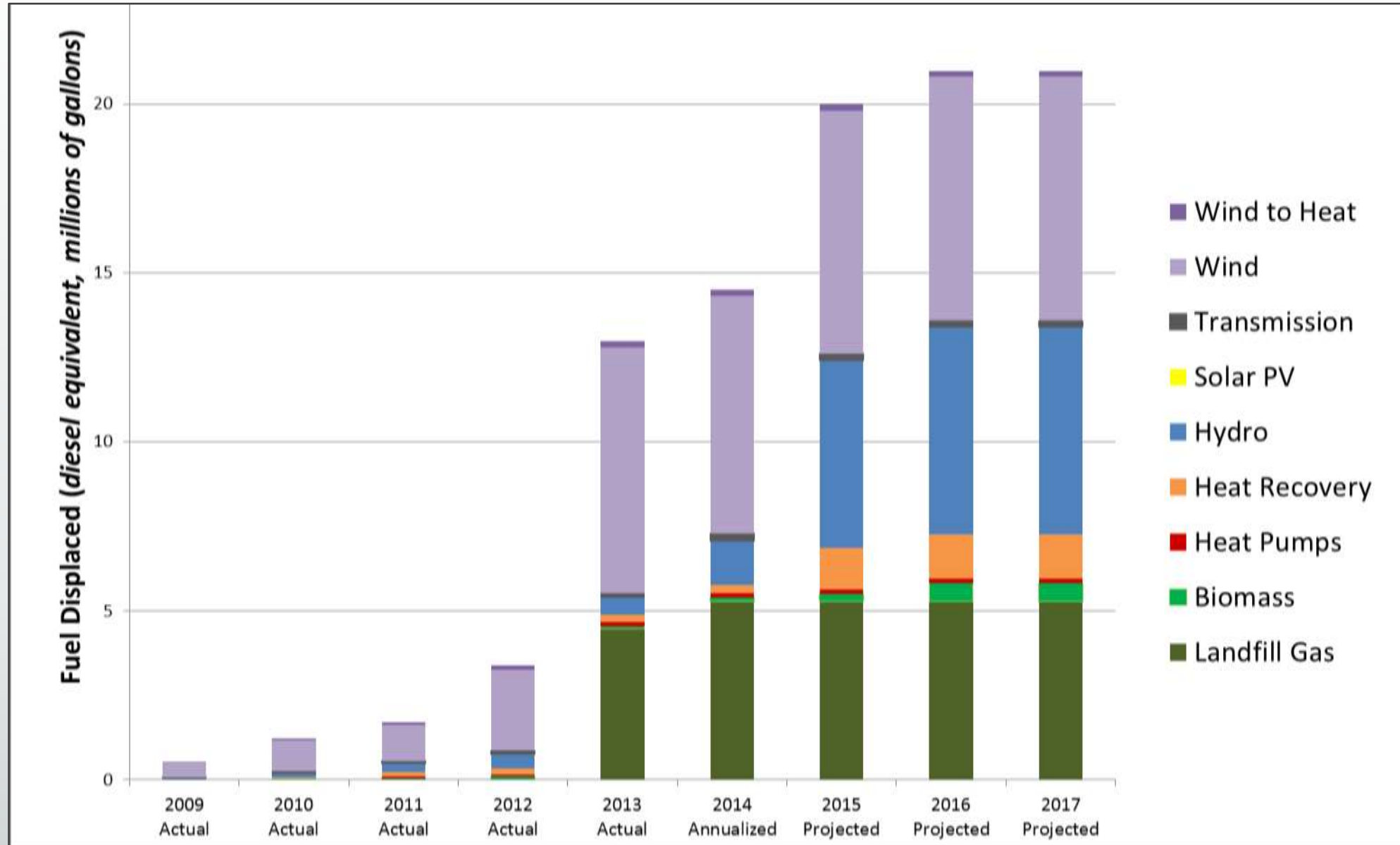
Renewable Energy Fund: Value Generated

- For first 44 projects in operation
- Total NPV cost of \$314M
- NPV Benefits: \$889M

Overall Program
Benefit/Cost Ratio: 2.8



Renewable Energy Fund: Annual Fuel Savings



Rounds I-VII Funded Projects			
	\$	Count	% \$
Southeast	54,830,472	50	22.15%
Lower Yukon-Kuskokwim	30,835,187	37	12.46%
Railbelt	30,173,642	41	12.19%
Northwest Arctic	23,203,362	14	9.38%
Copper River/Chugach	21,630,131	19	8.74%
Bering Straits	21,429,215	18	8.66%
Aleutians	17,491,232	23	7.07%
Kodiak	16,486,919	7	6.66%
Yukon-Koyukuk/Upper Tanana	15,018,377	31	6.07%
Bristol Bay	13,647,042	23	5.51%
North Slope	2,185,342	11	0.88%
Statewide	565,439	1	0.23%



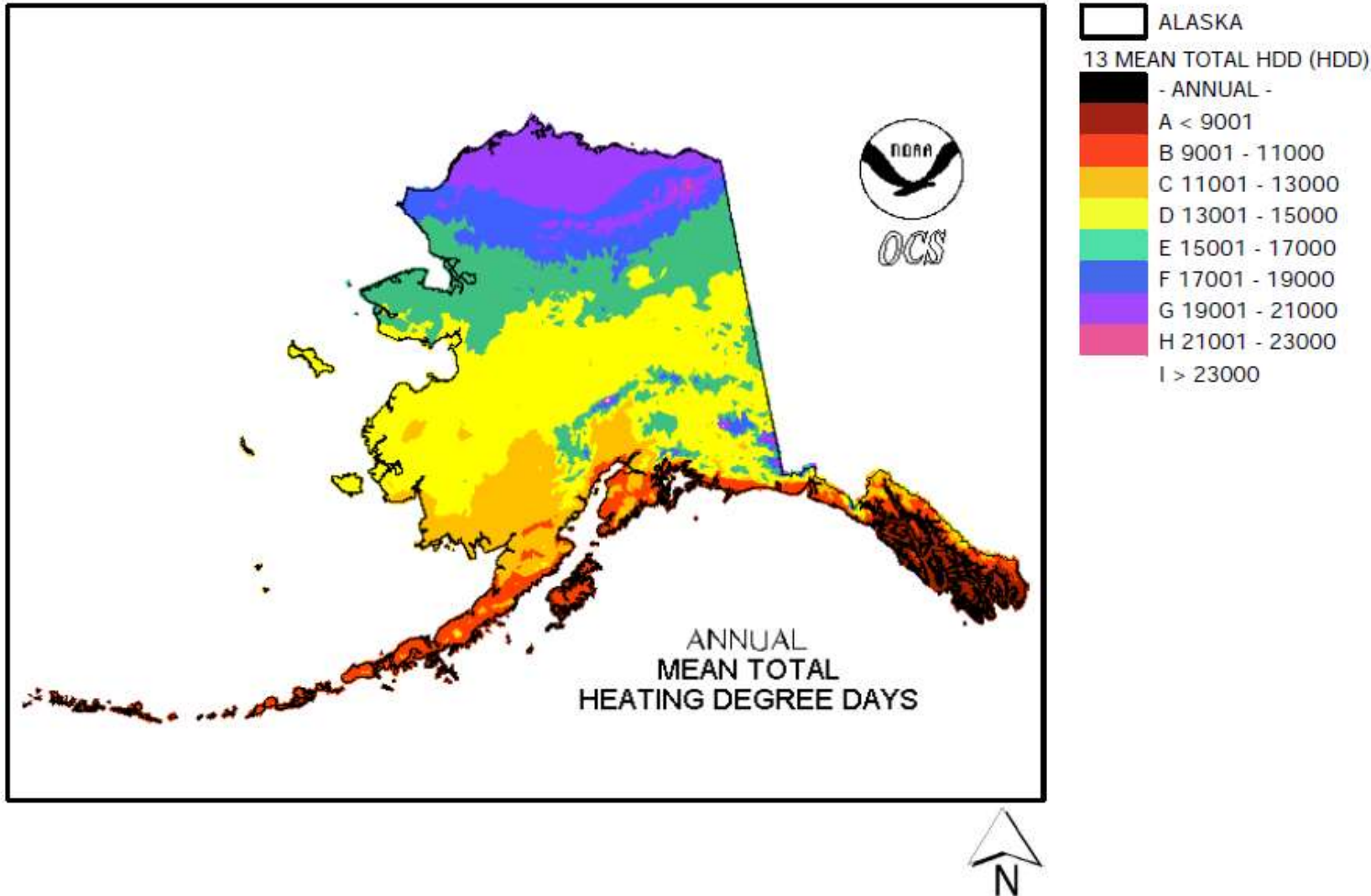
*Allison Creek Hydro Powerhouse Construction
Copper Valley Electric*

Round VIII Recommendations

- AEA recommends 40 projects \$28.3M
- To fit within \$15M budget, AEA recommends 34 projects with funding caps
 - 18 Heat projects, \$5.1M
 - 16 Standard projects, \$9.8M
- Regional distribution equity
 - Worked with advisory committee
 - Using energy cost burden (HH energy cost/income) rather than cost of electricity
 - Held Southeast Alaska to 22.15%

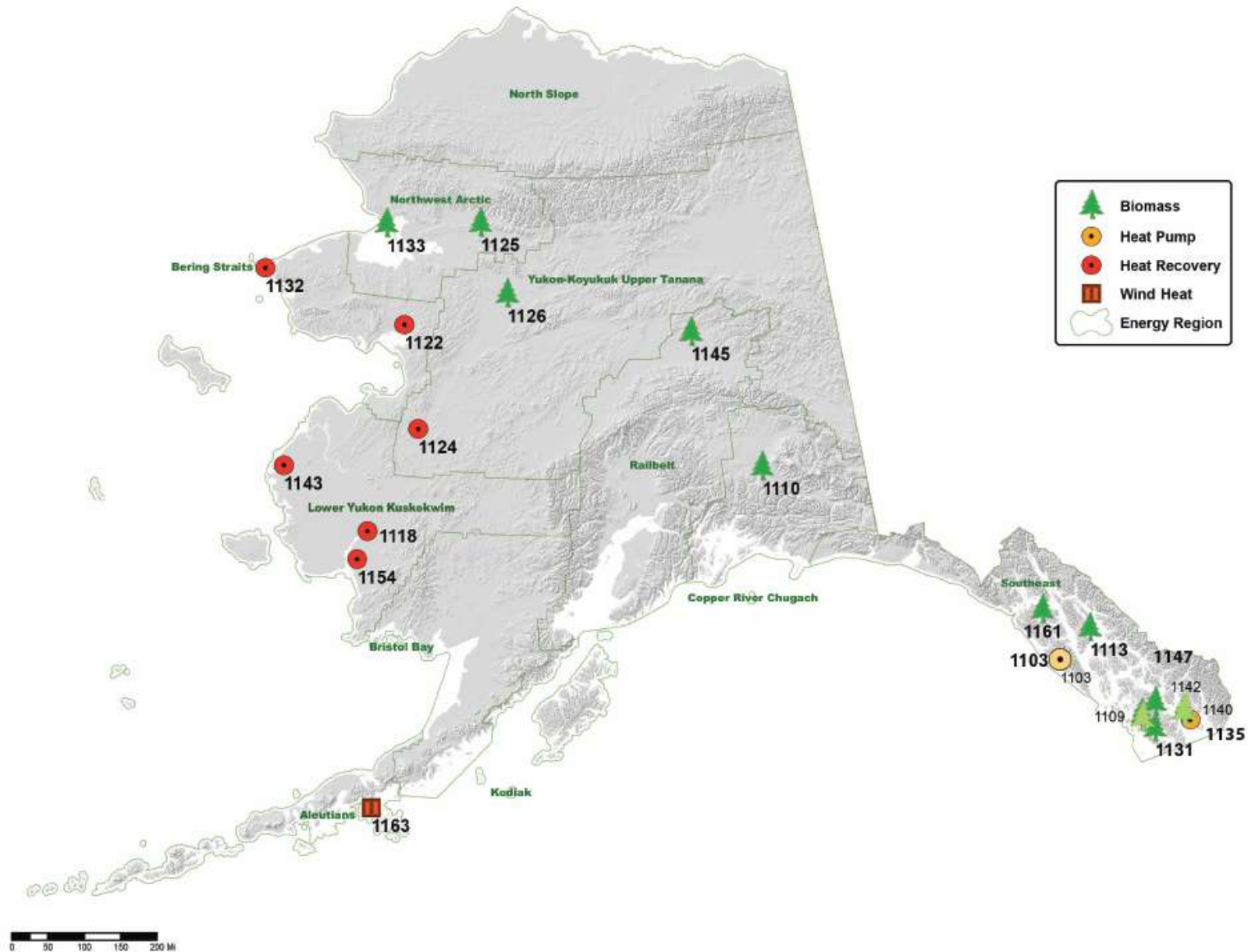
Heating Degree Days

ElDoradoCountyWeather.com

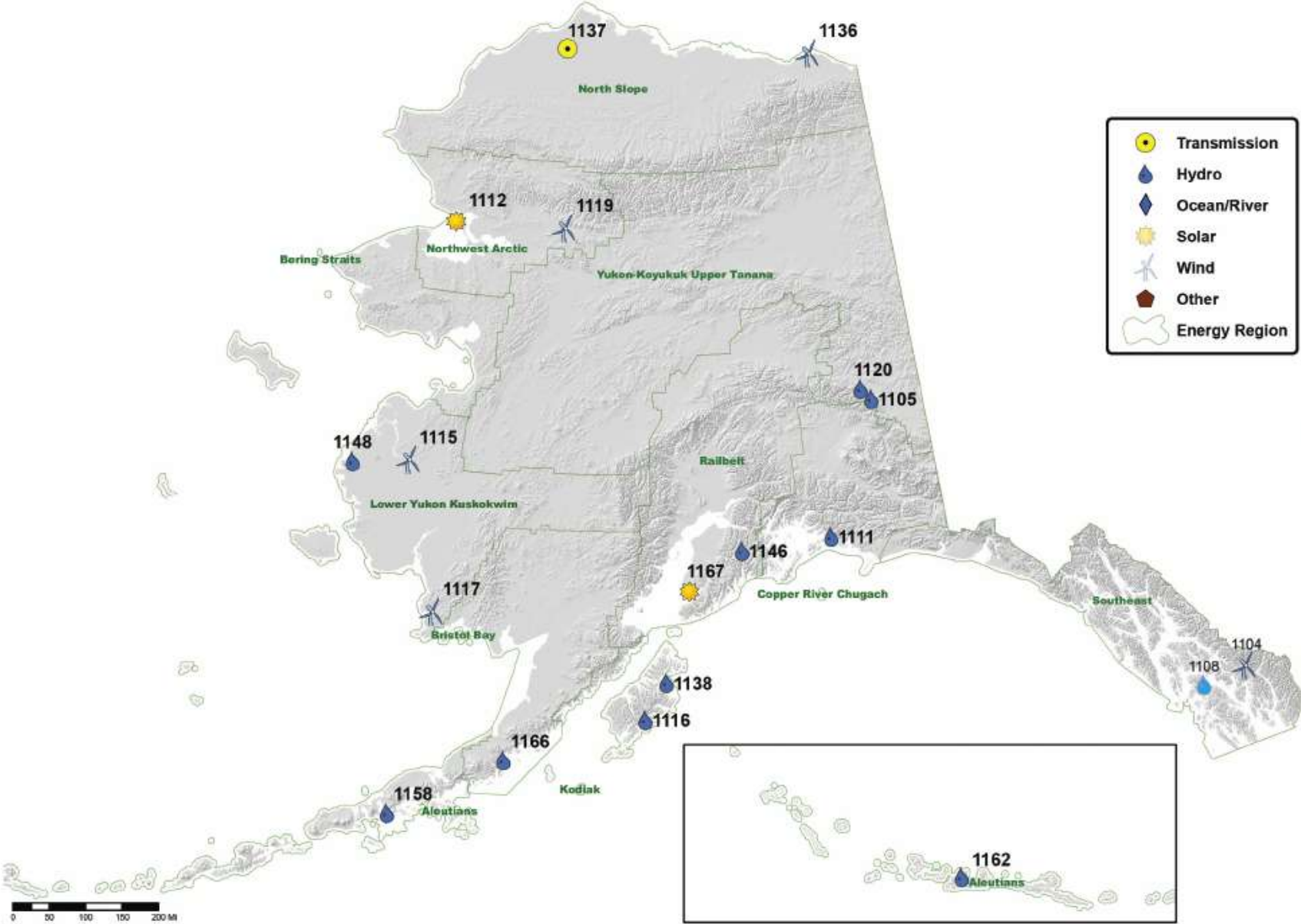


- Cold temperatures create operational challenges for utilities
- Reliable power is vital for remote communities in winter
- Climate impacts the availability of some renewable resources
- Cold temperatures increases energy use for heating

RENEWABLE ENERGY FUND ROUND VIII | RECOMMENDED HEAT PROJECTS



RENEWABLE ENERGY FUND
ROUND VIII | RECOMMENDED STANDARD PROJECTS

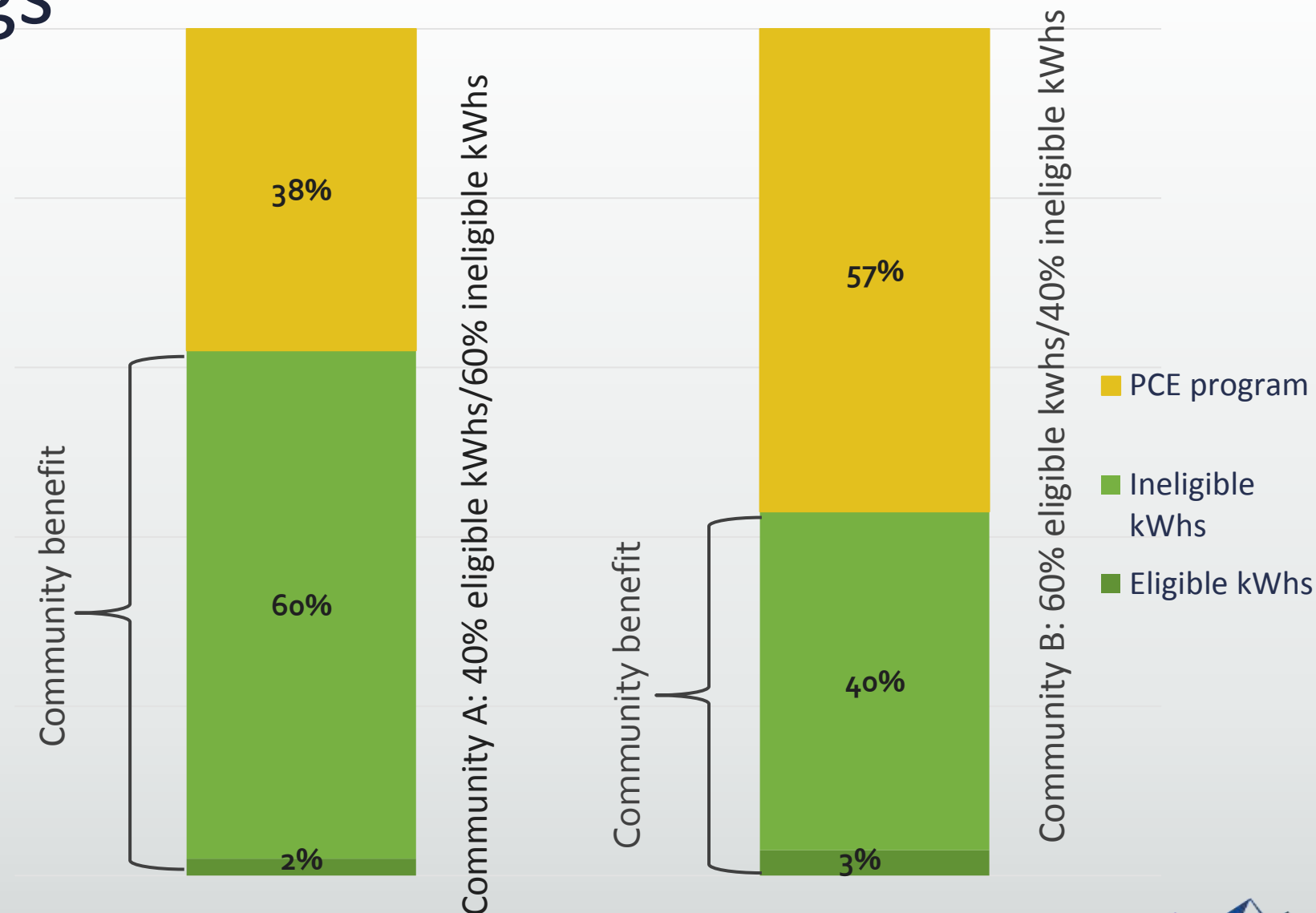


Sharing RE savings

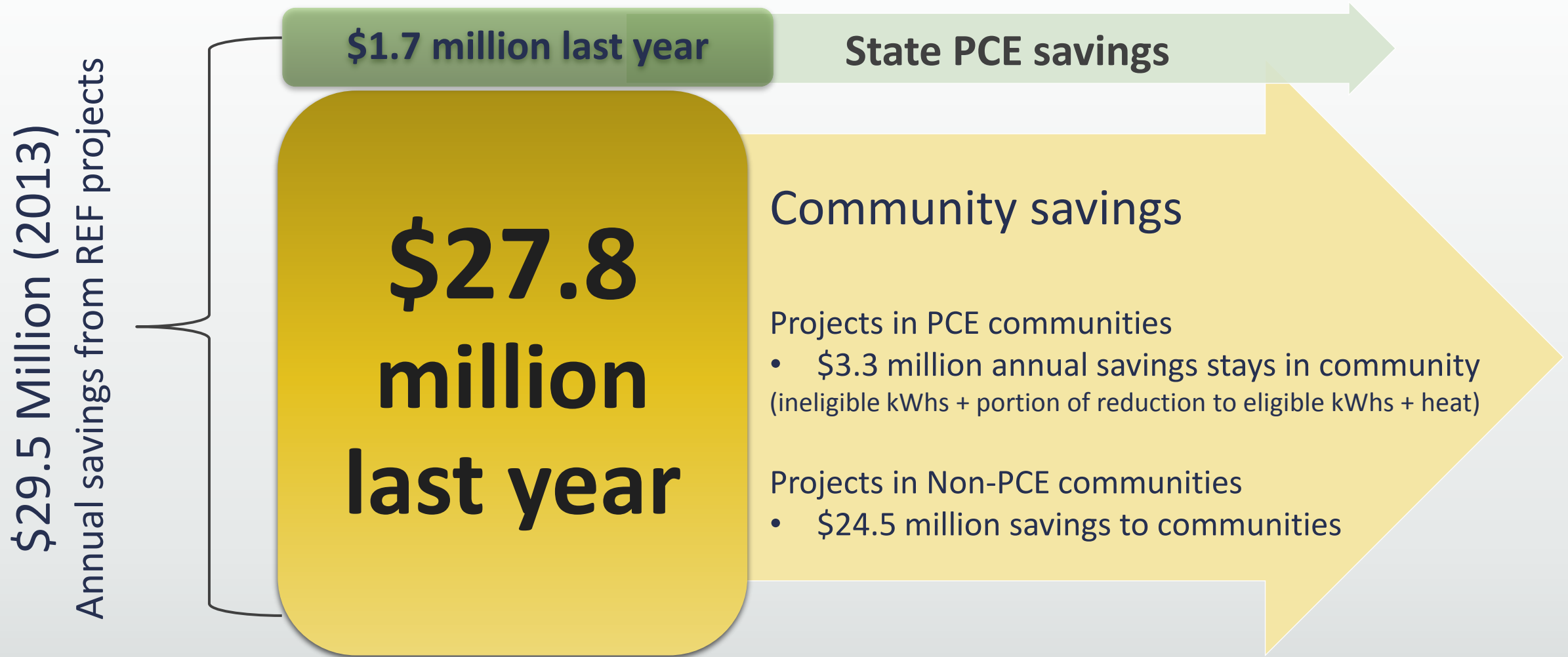
Assumptions:

- Cost based rates means that savings are passed through to ineligible PCE kWh customers
- The RE project reduces fuel costs and has zero impact on non-fuel cost

Distribution of RE benefits - 2 community profiles



REF benefits statewide from the first \$75.6 million spent on the first 37 projects to start generating energy





Sitka Blue Lake



Atka Chuniixsax Creek



Igiugig Hydrokinetic

Types of Hydroelectric

- Conventional/Storage
 - Dam
 - Lake tap
- Run of River
- Other
 - Hydrokinetic (River In-Stream Energy Conversion)
 - Tidal
 - Pumped Storage



Gulkana Wood Boiler



Sealaska Plaza Pellet Boiler



Tok Chip Boiler

Types of Woody Biomass

- Cordwood Boilers
- Pellet Boilers
- Chip Boilers
- Other
 - Bricks
 - Microchips

Comparison of Woody Biomass Technologies

Cordwood	Chips	Pellets
Manual Feed	Automatic Feed	Automatic Feed
Part-time Jobs	Part-time or Full-time Jobs	Potential Part-time jobs for pellet delivery
Residential - Small Commercial Applications	Medium - Large Applications	Residential - Large Applications
Low Fuel Cost	Low Fuel Cost	High Fuel Cost
Easy to Operate	Complex to Operate	VERY Easy to Operate

Story: Thorne Bay Biomass

- School biomass boiler
 - Feasibility funded through Alaska Wood Energy Development Task Group
 - Design & construction funded by REF
- Displaces 9,000 gal. diesel/year
- Parents and students raise money for activities by splitting and stacking wood
- Heats greenhouse; students grow vegetables; served in school lunch; extra sold locally
- Part of curriculum, economic development, local health, local jobs, local energy



Thorne Bay Biomass and Greenhouse
Photos courtesy of Dan Bihn

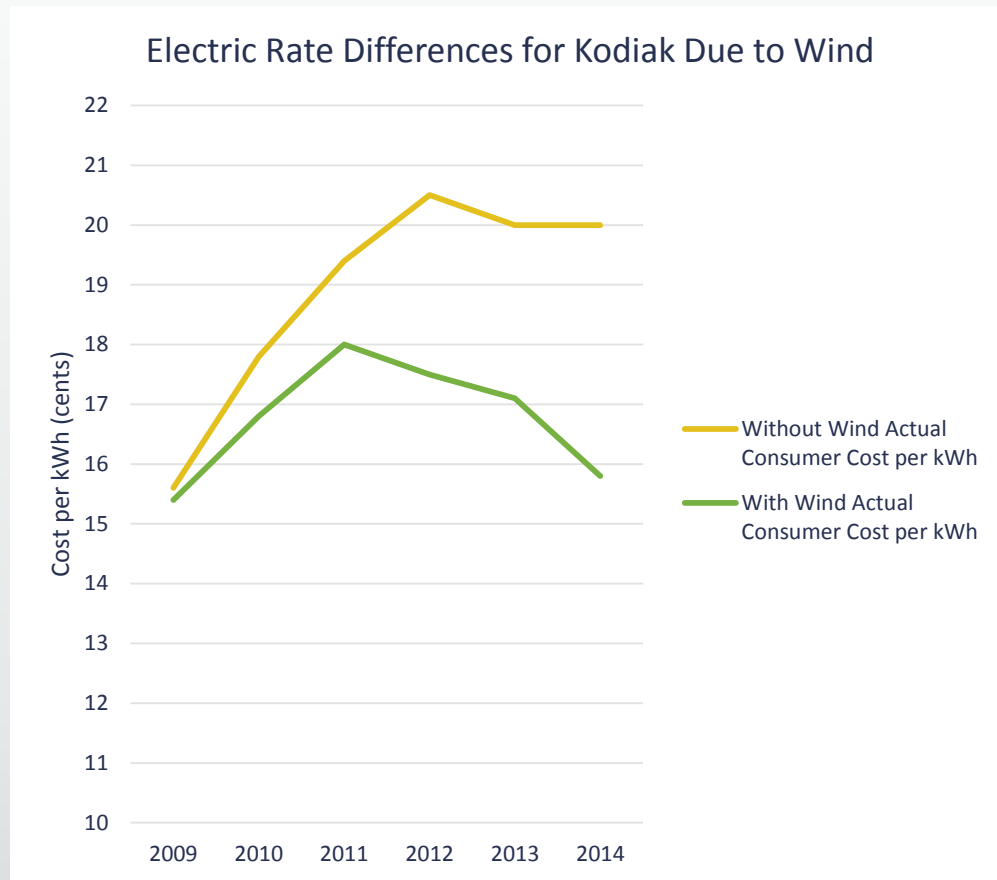
Story: Kodiak, Alaska



Pillar Mountain Wind

- 99.4% Renewable in 2014
 - 79% Hydro
 - 21% Wind
- Terror Lake Hydro added 3rd turbine
- Wind: 9MW installed capacity
6 GE 1.5MW turbines
- Battery
- Next: Flywheel to lengthen battery life and add electric crane at port

Renewable Energy Impact on Rates in Kodiak

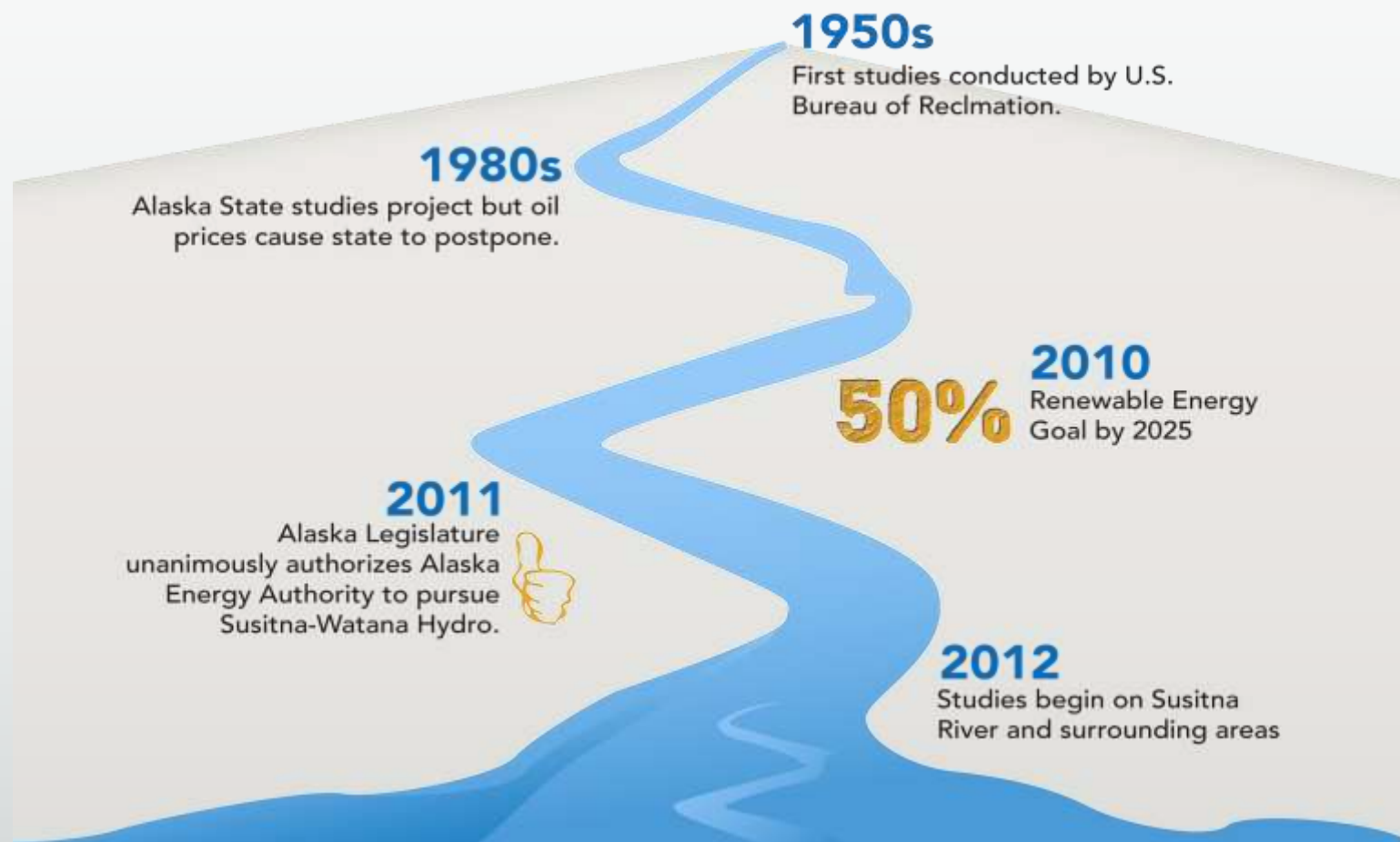


- Savings: \$4.5M/year of fuel costs
- Current electric rate: \$0.159 per kWh

Why Hydro?

- Affordable energy is the building block of a healthy economy
- Hydroelectric projects provide clean, reliable, affordable and long-term power
 - Residential rates
 - Business growth and development
 - Attract new industry
- Long-term diversification
- Promotes integration of variable power sources
- Clean, sustainable and reliable energy
- Reduces dependence on volatile-pricing of fossil fuels

Susitna Hydro: History



Susitna-Watana Hydro



Susitna-Watana Hydro: Artist's Rendering

- Would serve ~80% of state's population
- Would provide ~50% of Railbelt's power
- 1,000 jobs during peak construction
- Stable electricity rates for 100+ years
- Long-term diversification
- Supports Alaska's Renewable Energy Goal
- Maximizes the value of Alaska's fossil fuels
- Susitna-Watana Hydro would displace an estimated 1.3 million tons of CO₂ annually
 - That equals the annual emissions from 231,246 cars, or more than half of all registered passenger vehicles in the state.

Project Status

- Federal Energy Regulatory Commission Integrated Licensing Process
- Three Environmental Field Seasons Supporting 58 FERC-Approved Studies
- Filed Initial Study Report June, 2014
- 50 Tech Memos filed with FERC 2013-2014
- Engineering Feasibility Report Released January 2015
- Licensing Abeyance

Environmental Study Process



- ✓ Study Plan Development
- **Study Implementation Phase**
- Impact Assessment
- Development of Protection, Mitigation and Enhancement Measures (PMEs)

Safe and Effective Field Work

- More than 200 in the field annually
- Completed data collection for 13 FERC-approved studies
 - Water Quality, Bioaccumulation of Mercury
 - Ice Processes, Glacier and Runoff Changes
 - Salmon Escapement, Aquatic Habitat Characterization, Fish Passage Barriers
 - Wolverine, Terrestrial Furbearers, Bat, Wood Frog
 - Subsistence
 - Probable Maximum Flood

Economic Impact

- Majority Alaska Hire
 - 65% Alaskans employed
 - Capitalizing on Pacific Northwest hydroelectric experience while maintaining Alaska Hire
- In 2014, nearly \$7 million earned in Alaska wages
- In 2013, \$6 million spent in goods and services in the Mat-Su Valley

Understanding the Susitna Basin

- Advanced the state of science for agencies to better manage resources
 - Wildlife, fish, recreation, subsistence surveys etc.
 - Contributed >4,500 tissue samples to ADF&G Gene Conservation Lab
 - Expanded distribution data for species such as Chinook Salmon, Lake and Rainbow Trout , and invasive Northern Pike
 - Maximized value of Mat-Su fisheries research
- Expanded public knowledge of Susitna Basin
 - Environmental, fish and game, aerial imagery, hydrology data, etc.
 - Coordinated with the Alaska Department of Fish & Game

Wildlife Studies and Coordination



Increased ADF&G's Understanding for Game Management Unit 13E

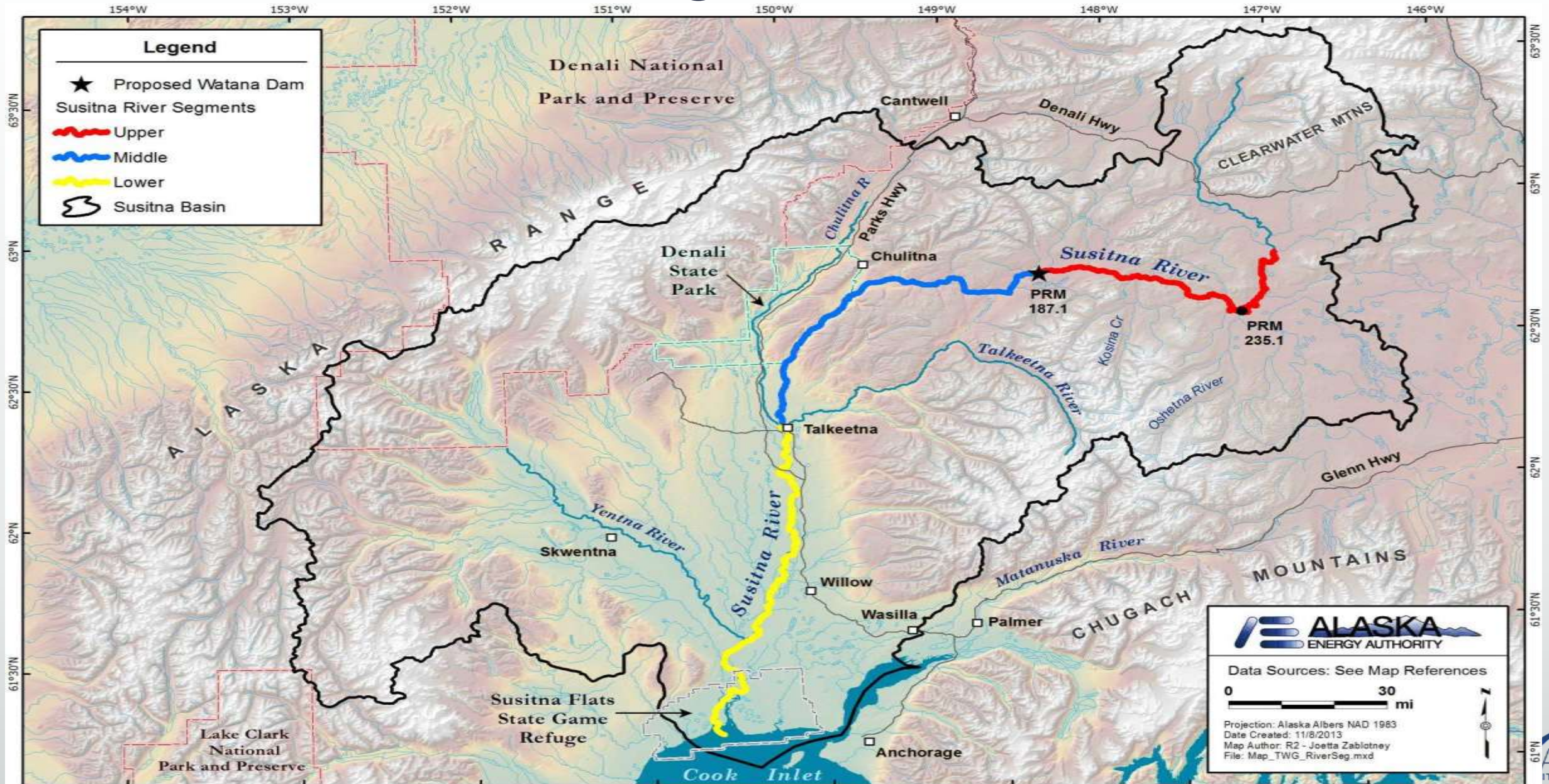
- **Moose** habitat use and movement; population estimates and bull and calf ratios; productivity and survival
- **Caribou** seasonal use and movement; interactions between neighboring herds and population dynamics
- **Dall's Sheep** surveys



Cultural Resources

- Developing a better understanding of historical and current human use of the Susitna region
 - Subsistence, cultural resources, archeology, ethnogeography, recreation, health, etc.
- Ahtna Ethnogeography Study
 - Interviewed Ahtna elders to discuss traditional uses
 - Documented Ahtna place-names, Athabascan groups and territorial boundaries, traditional routes, trails, artifacts.
- Comparable effort for Dena'ina people part of FERC-approved study plan, not completed

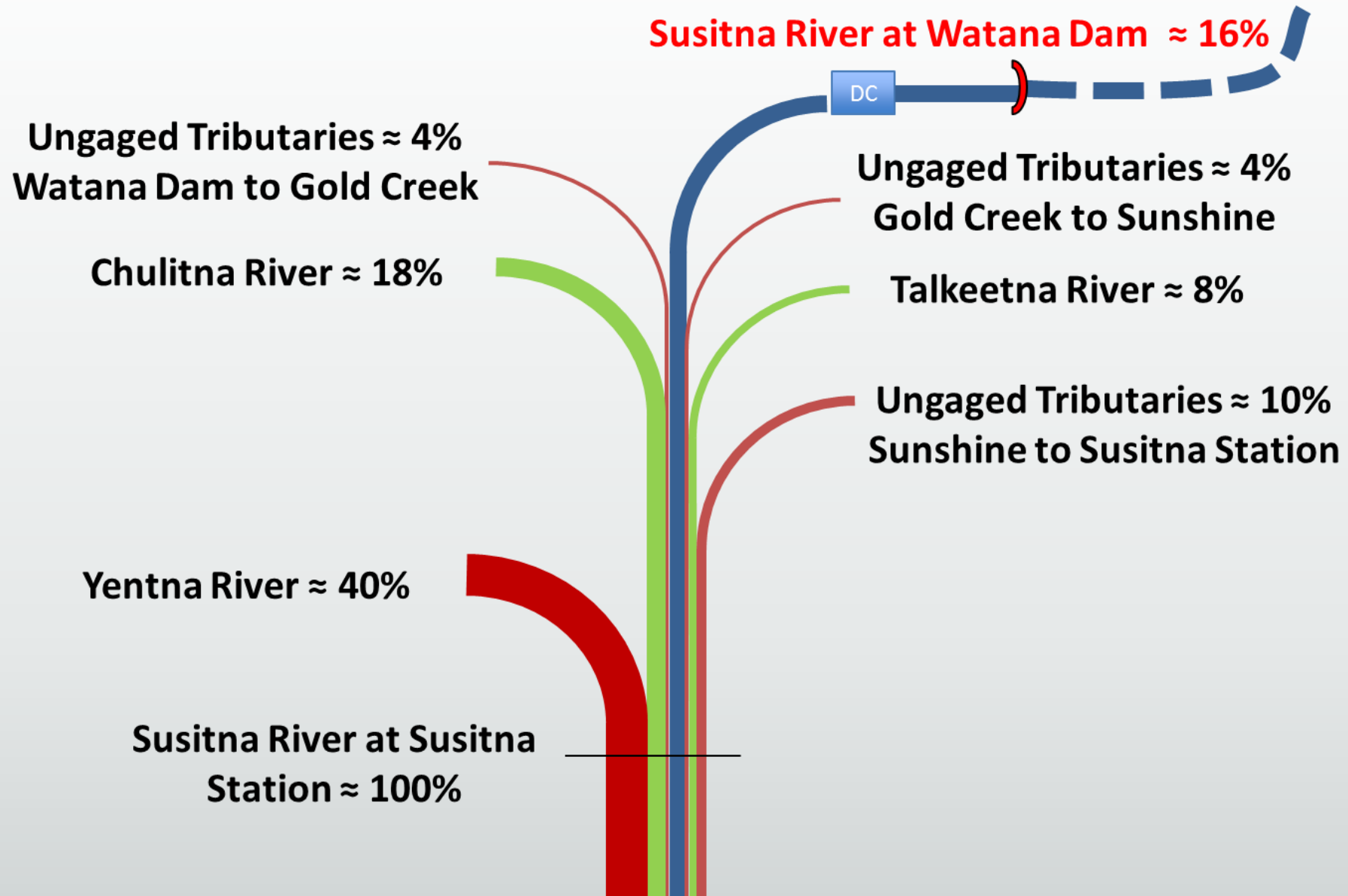
Understanding Potential Impacts



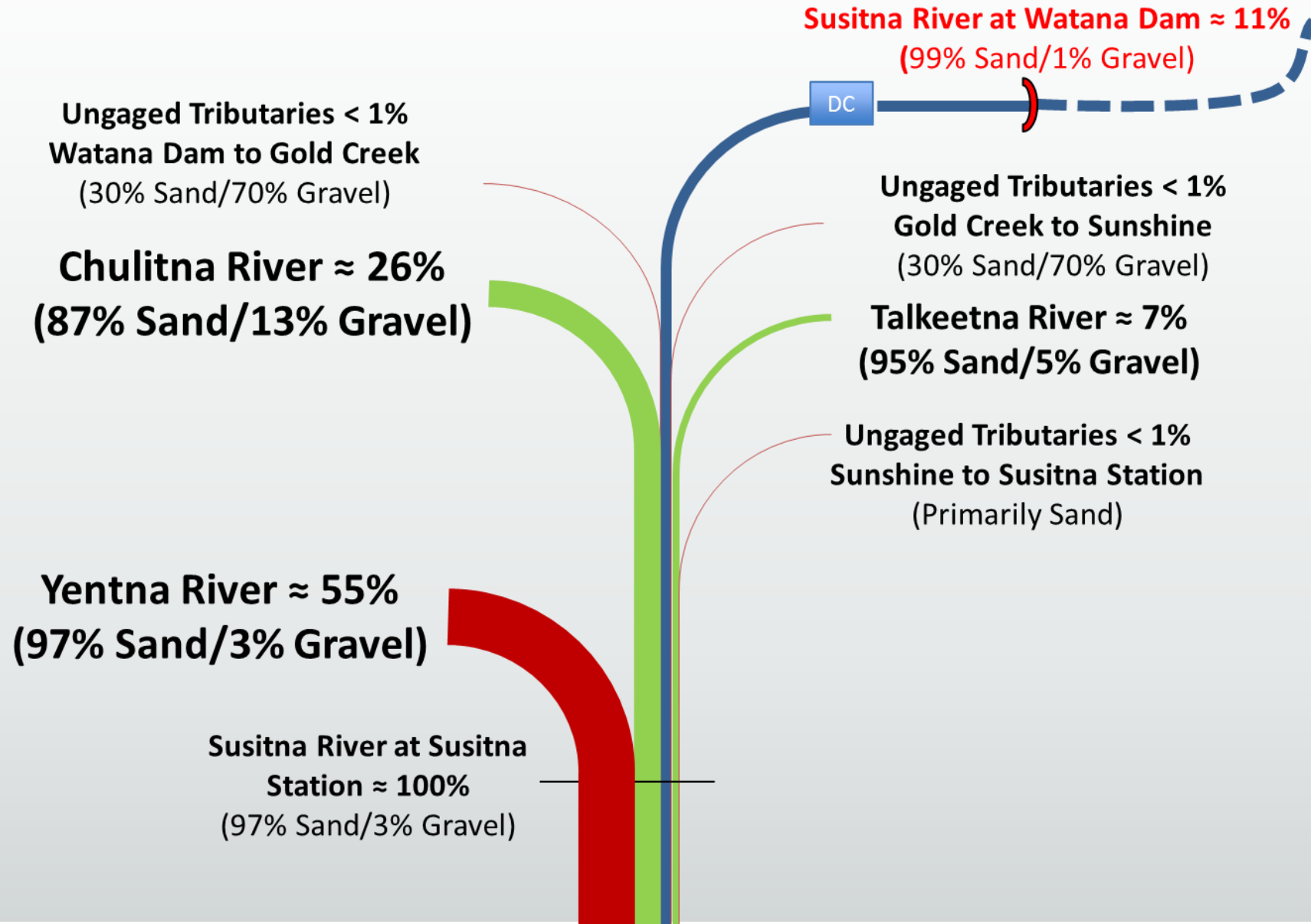
Confirming Results and Defining Areas of Impacts

- Observations similar to 1980s
 - Fish distribution
 - Chinook salmon only documented anadromous fish above Devils Canyon
 - Water chemistry and seasonal changes in chemistry
 - Geomorphically stable river system
 - Magnitude of bird migration and breeding distribution
- Defining potential areas of impacts
 - Insignificant water quality or geomorphic impacts below Yentna River Confluence (No further modeling proposed in this reach)
 - Minor impacts on main channel geomorphology in Middle River (Dam site to Chulitna River confluence)

Average Annual Flow Contributions

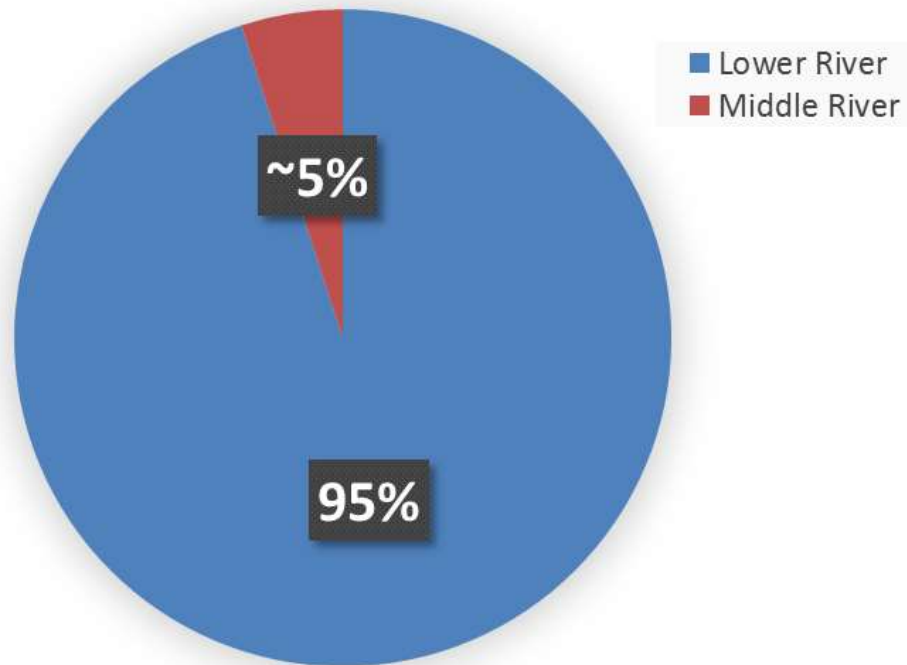


Average Annual Bed Material Load Contributions

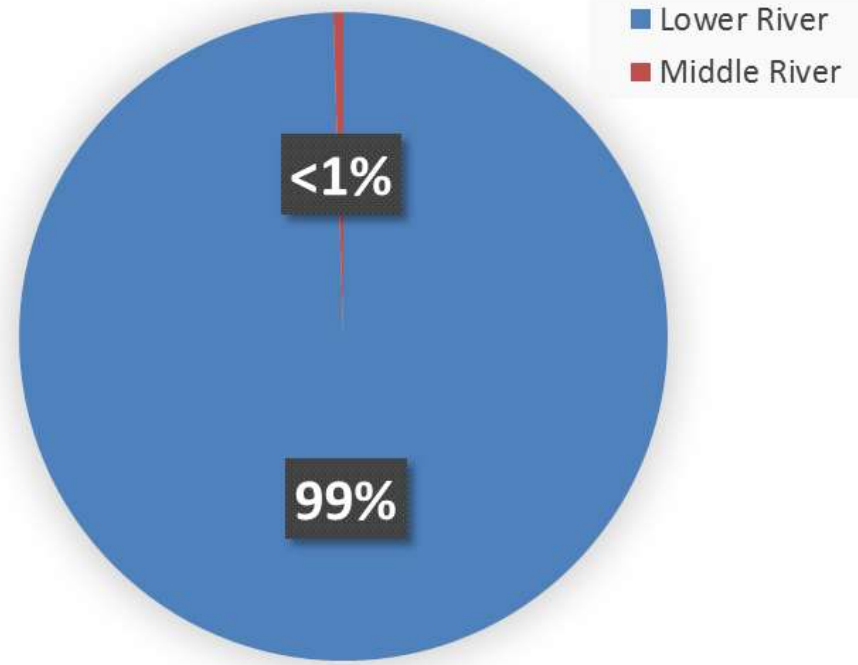


Salmon Spawning Distribution

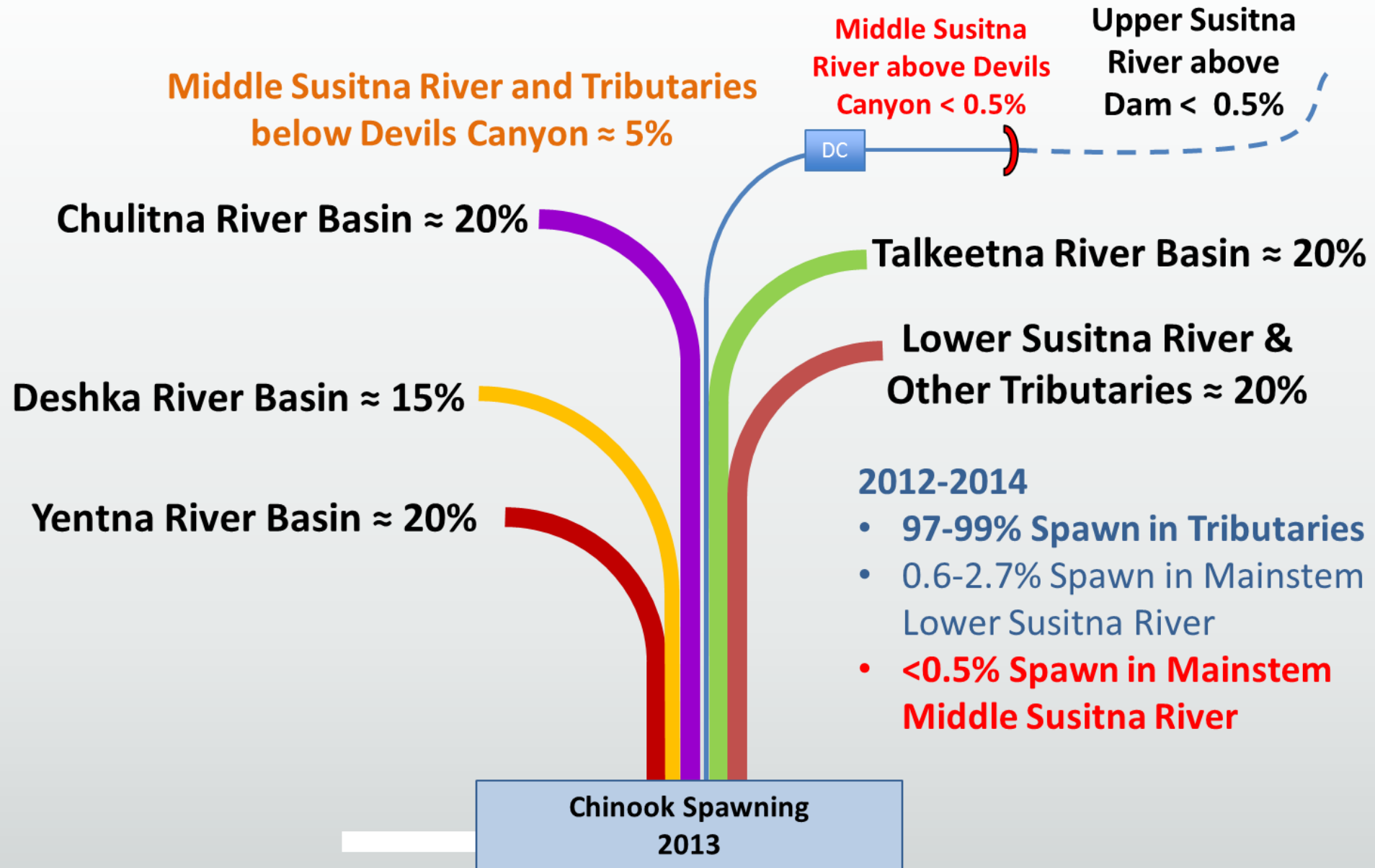
Chinook/Coho/Chum



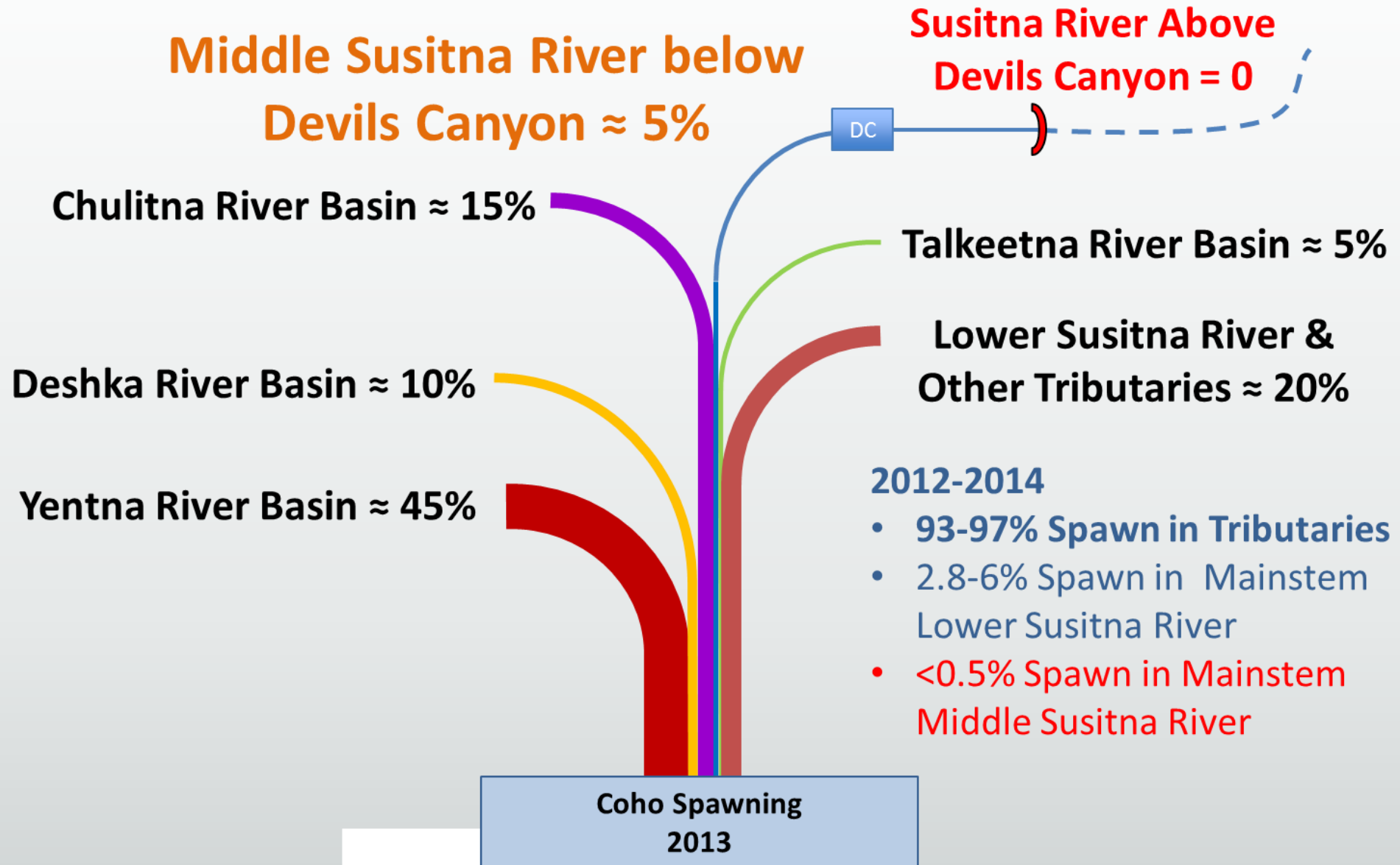
Sockeye



Chinook Salmon Spawning Distribution by Basin



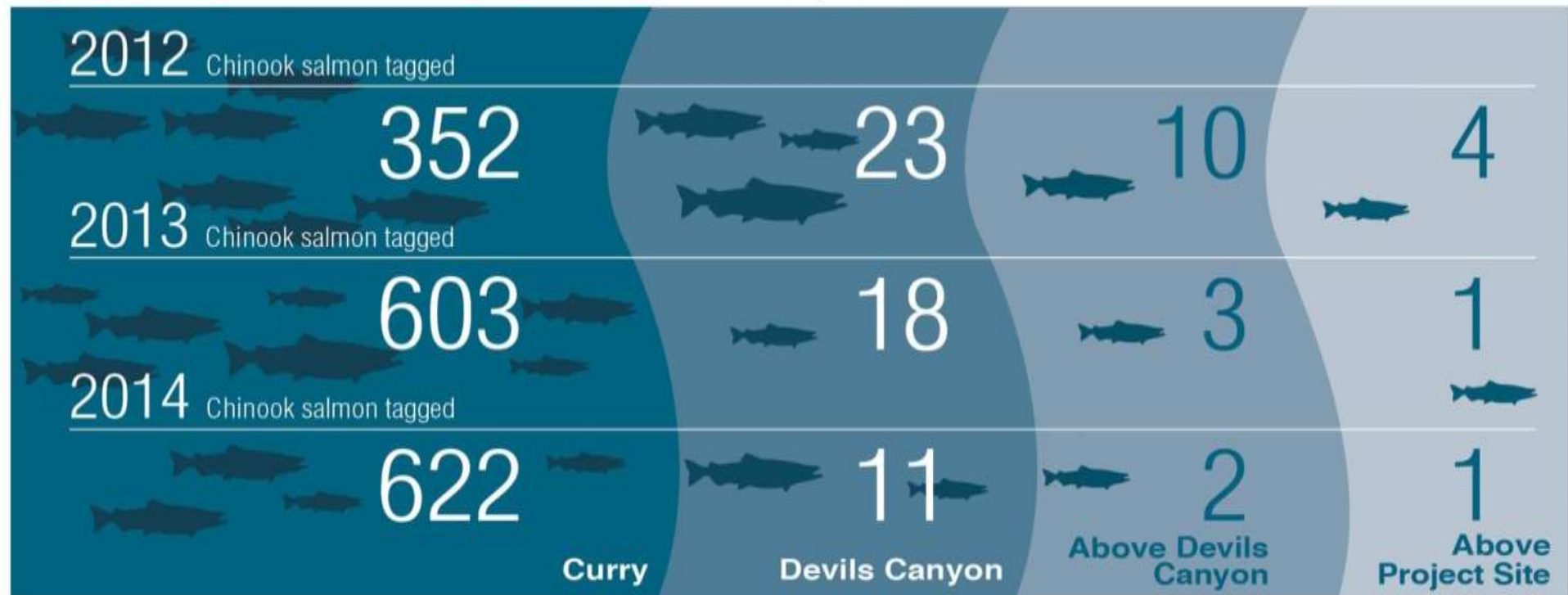
Coho Salmon Spawning Distribution by Basin



Chinook by the Numbers

Tagged Chinook Salmon and Devils Canyon

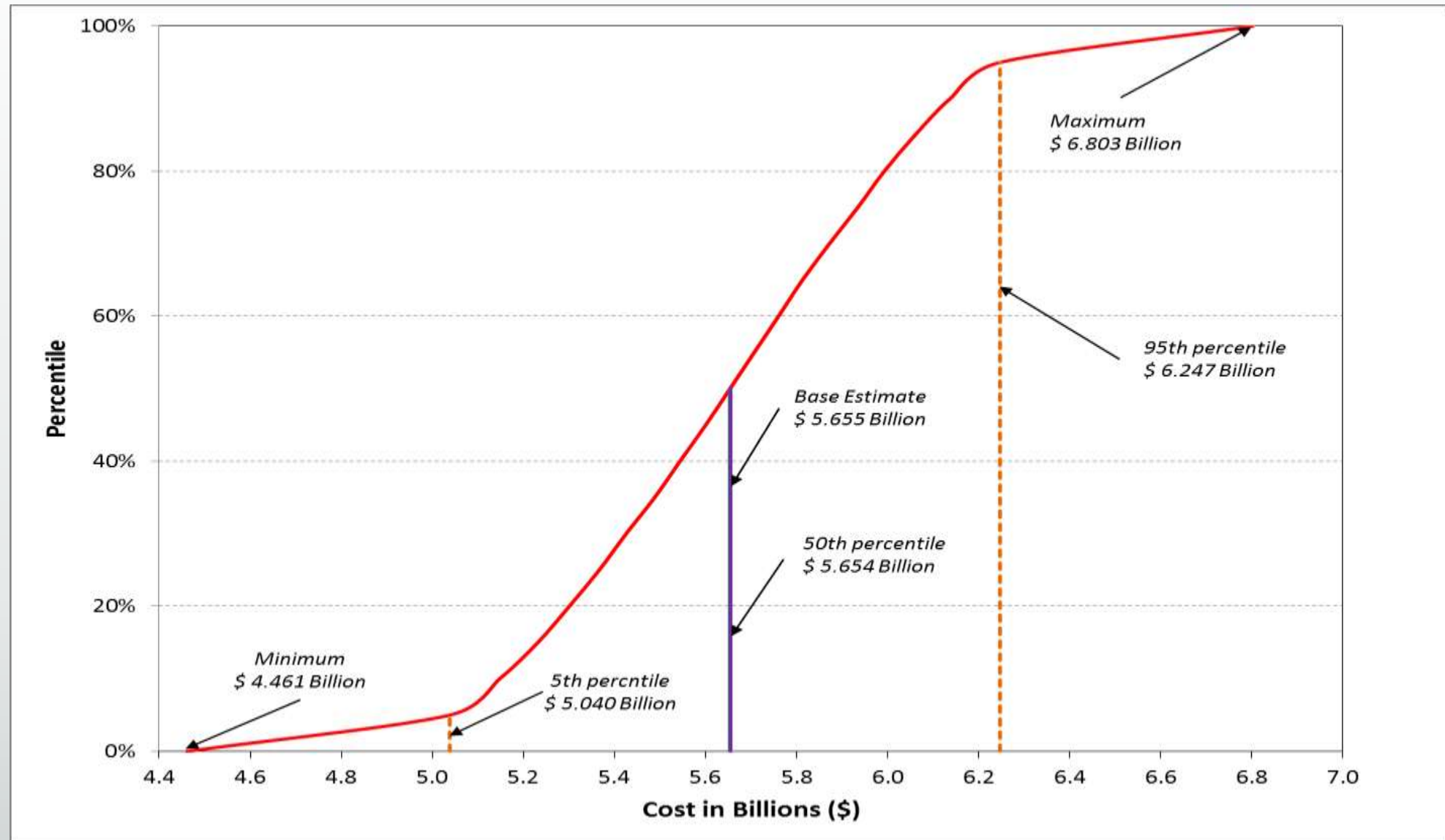
Only one salmon species has been documented within 30 miles of the project site.



Engineering Accomplishments

- Board of Consultants Endorsed Roller Compacted Concrete and Dam Configuration
- 2014 drilling confirmed no active faults found at dam site
- Engineering Feasibility Report - January 2015
 - Optimized dam height, capacity and power generation
 - Dam Height 705 feet
- Comparing Hoover Dam and Susitna-Watana Hydro Power Generation
 - Hoover Dam: Capacity 2,080 MW ➡ Annual Generation: 4,200 GWh
 - Susitna-Watana Hydro Capacity 459 MW ➡ Annual Generation: 2,800 GWh

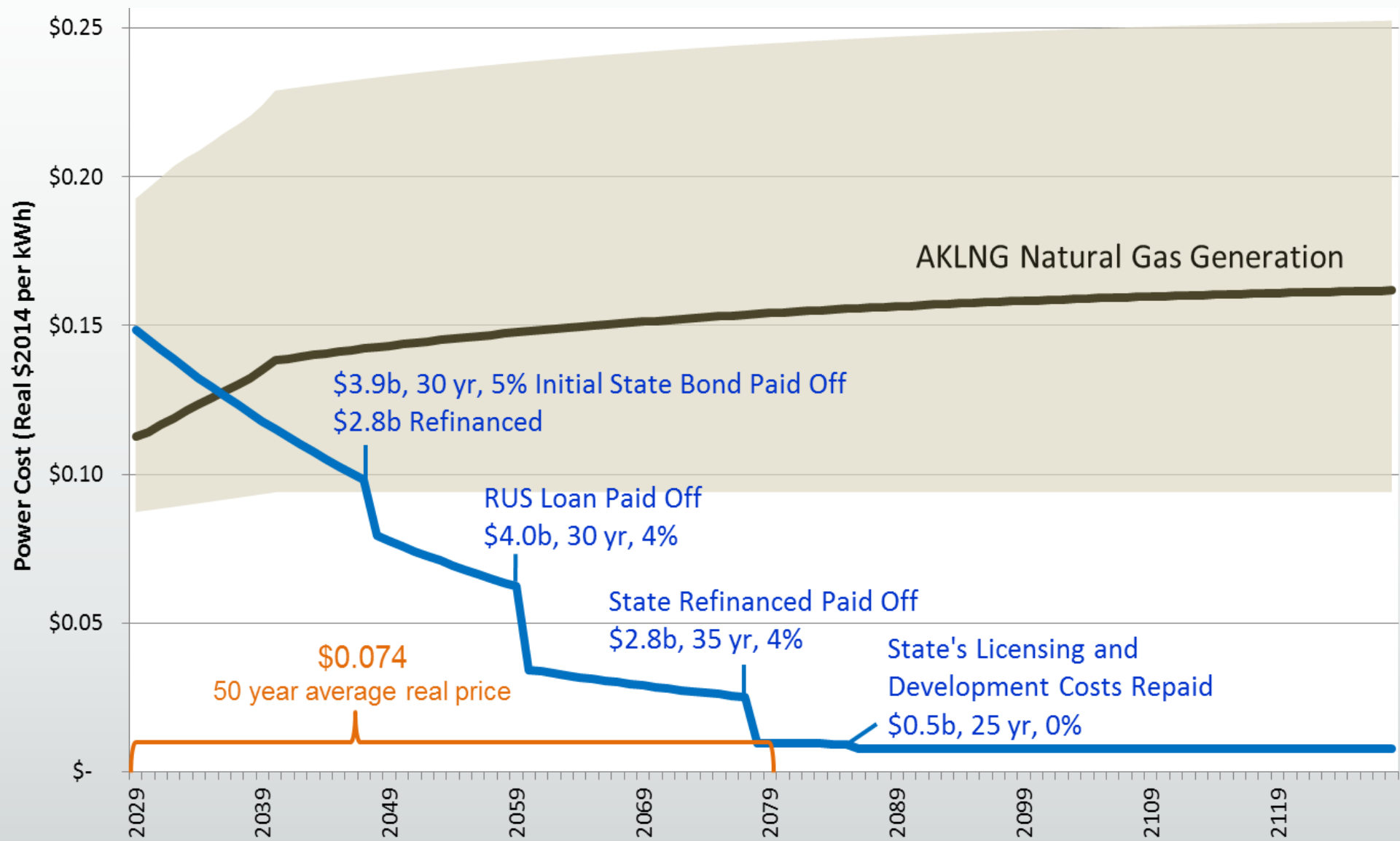
Project Cost Range



Comparing 3 Finance Options

- Bond & RUS Financing
 - \$0.064/kWh 50 year average real price (2014\$)
- All Bond Financing
 - \$0.073/kWh 50 year average real price (2014\$)
- State Loan & RUS
 - Similar to Bradley Lake model
 - \$0.037/kWh 50 year average real price (2014\$)

Susitna-Watana Hydro vs. Natural Gas Power Costs



AKEnergyAuthority.org

