



Rural Alaska Energy
ANTHC Innovation and Design



Rural Alaska Energy

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What is the Relationship of Energy to Sanitation?

- Living in Utility Scarcity: Energy and Water Insecurity in Northwest Alaska published in the American Journal of Public Health found that water and sewer are the single largest energy consumer in NW villages. As energy costs rise public health suffers.



The Rural Conundrum

“ The poorest Alaskan households spend up to 47% of their income on energy, more than five times their urban neighbors.” - *Commonwealth North 2012*

Energy Program overview

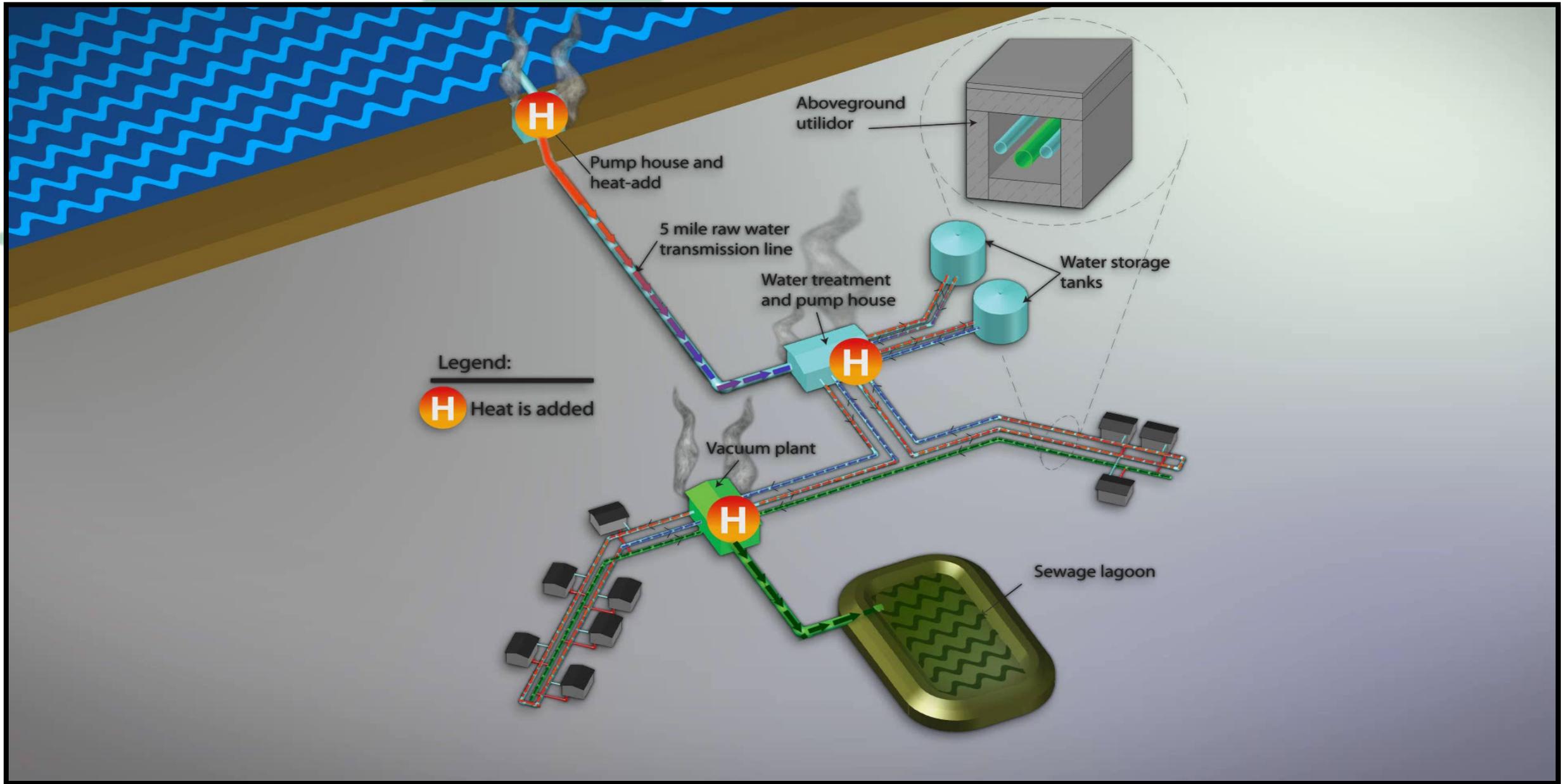


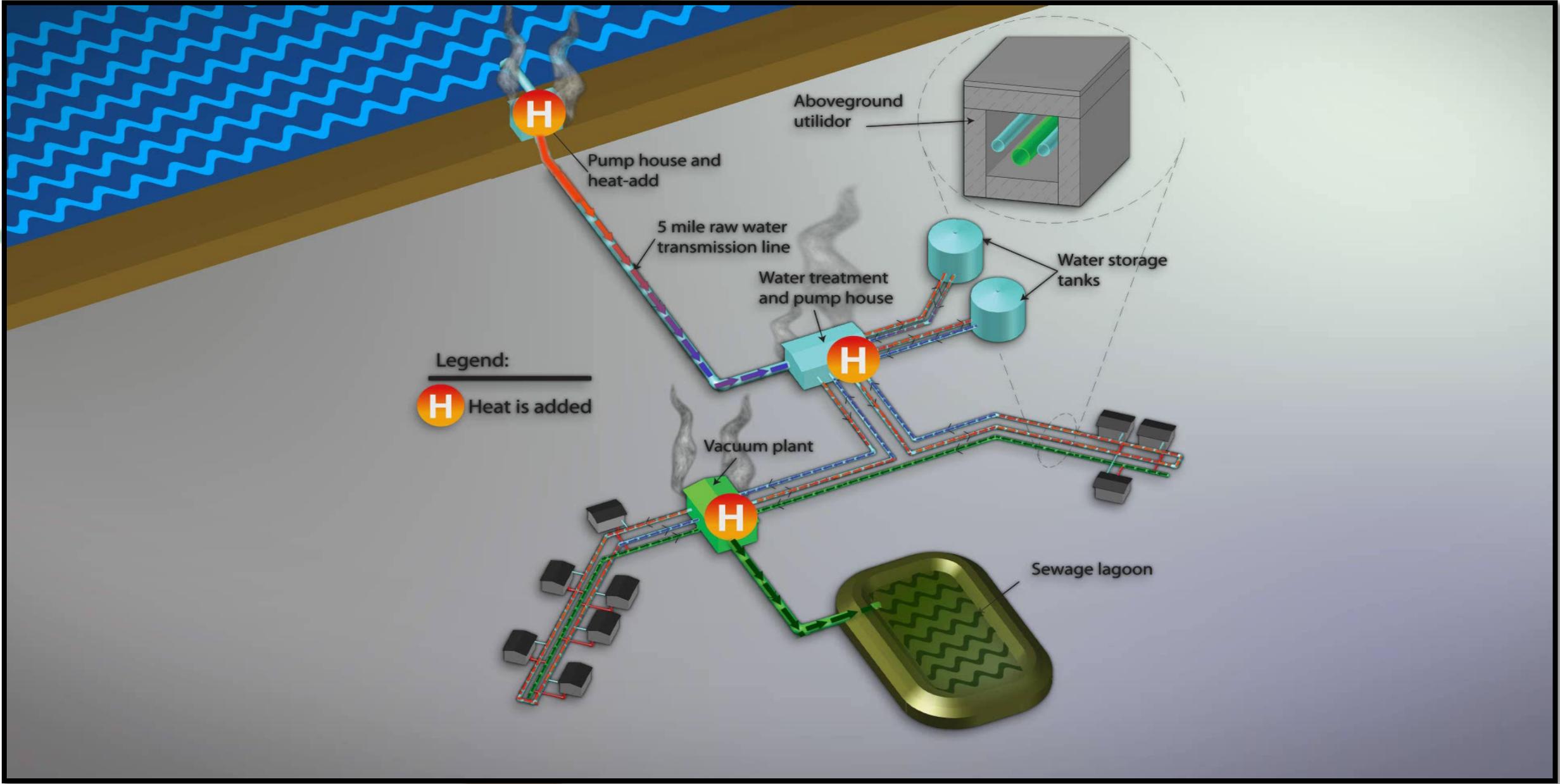
- Initial Survey 2011
- Energy Audits
- Energy Efficiency Upgrades
- Heat Recovery Projects
- In home TED meters
- Biomass heating
- Wind Energy
- Education

Energy Survey of 2011

- Circulating arctic water and vacuum sewer
- Circulating arctic water and conventional gravity sewer
- Conventional water distribution and gravity sewer
- Washeteria/watering point with honeybucket sewage disposal

Energy needs comprise 30 to 60 percent of a community's water system operating costs and up to 30 percent of a community's total energy.







**ENERGY USE AND COSTS FOR OPERATING
SANITATION FACILITIES IN RURAL ALASKA**

A SURVEY

October 3, 2011

Written By:

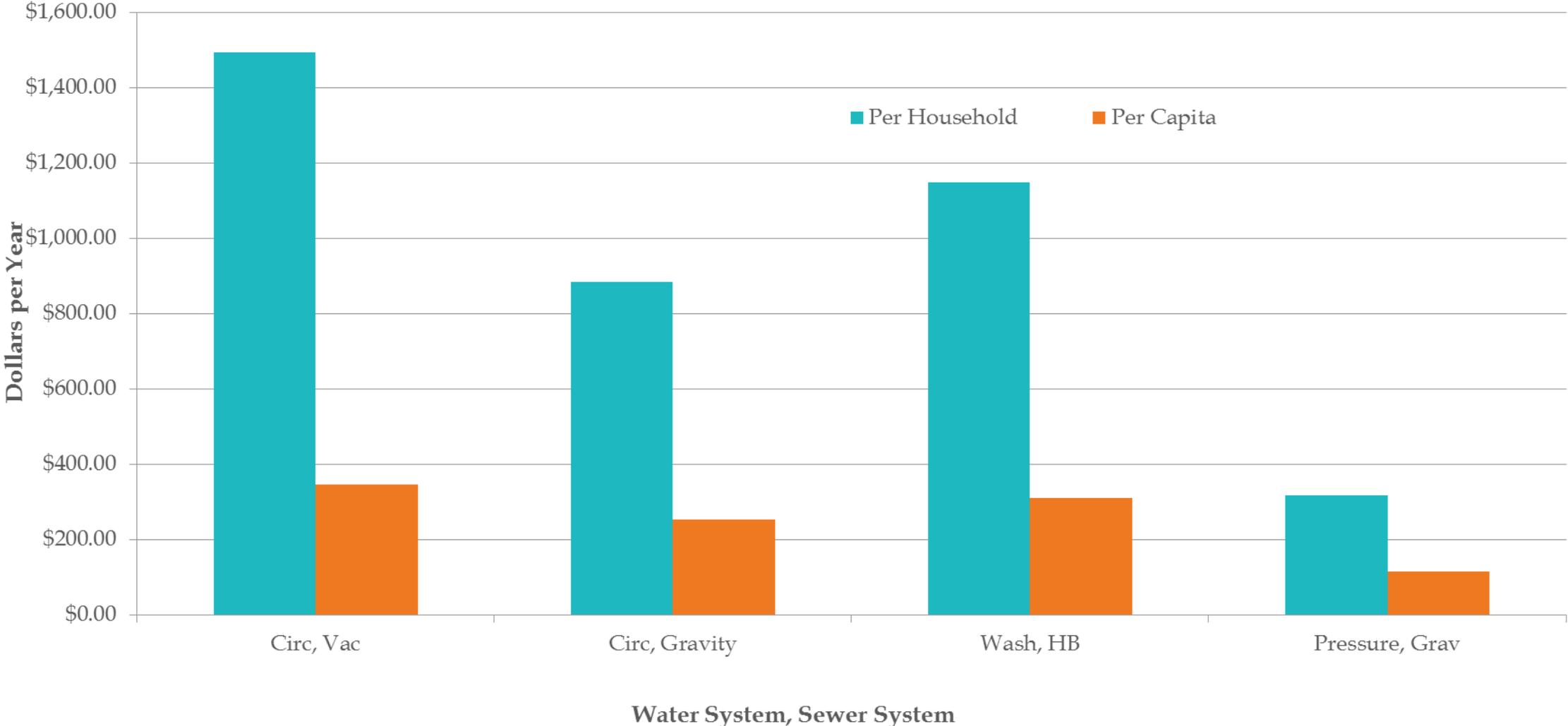
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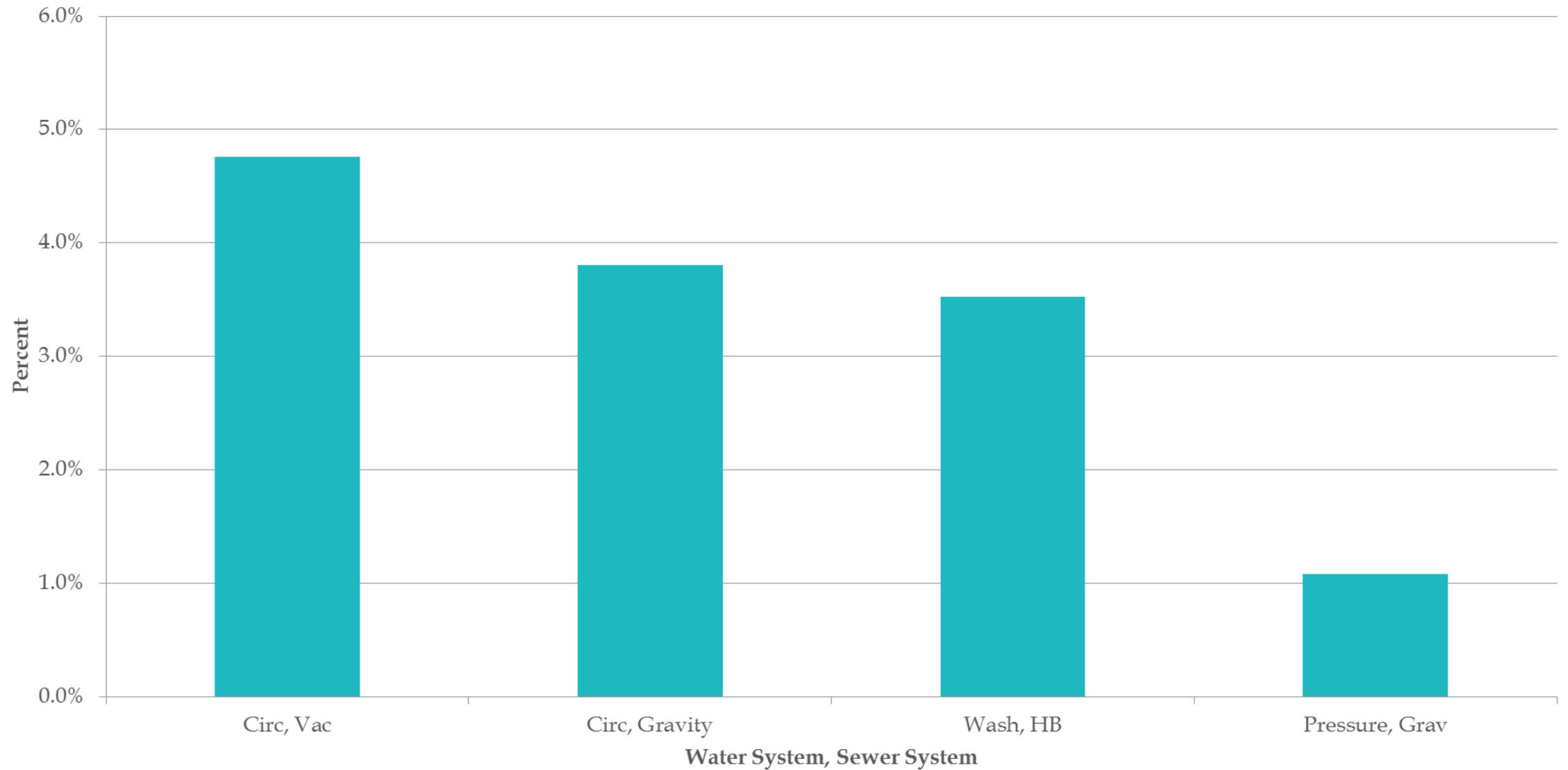
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Reported Average Annual Energy Expenses of the Water System for Various Alaskan System Types



Energy Expenses of the Water System as a Percentage of the MHHI for Various Alaskan System Types



Energy Audits

- 44 villages, all tribal buildings, water systems
- Audits can be complex, interrelationships between components
- Findings grouped into 4 broad categories
- 25 were summarized into paper, all 44 will be included upon project completion in March.

Preliminary Audit Findings

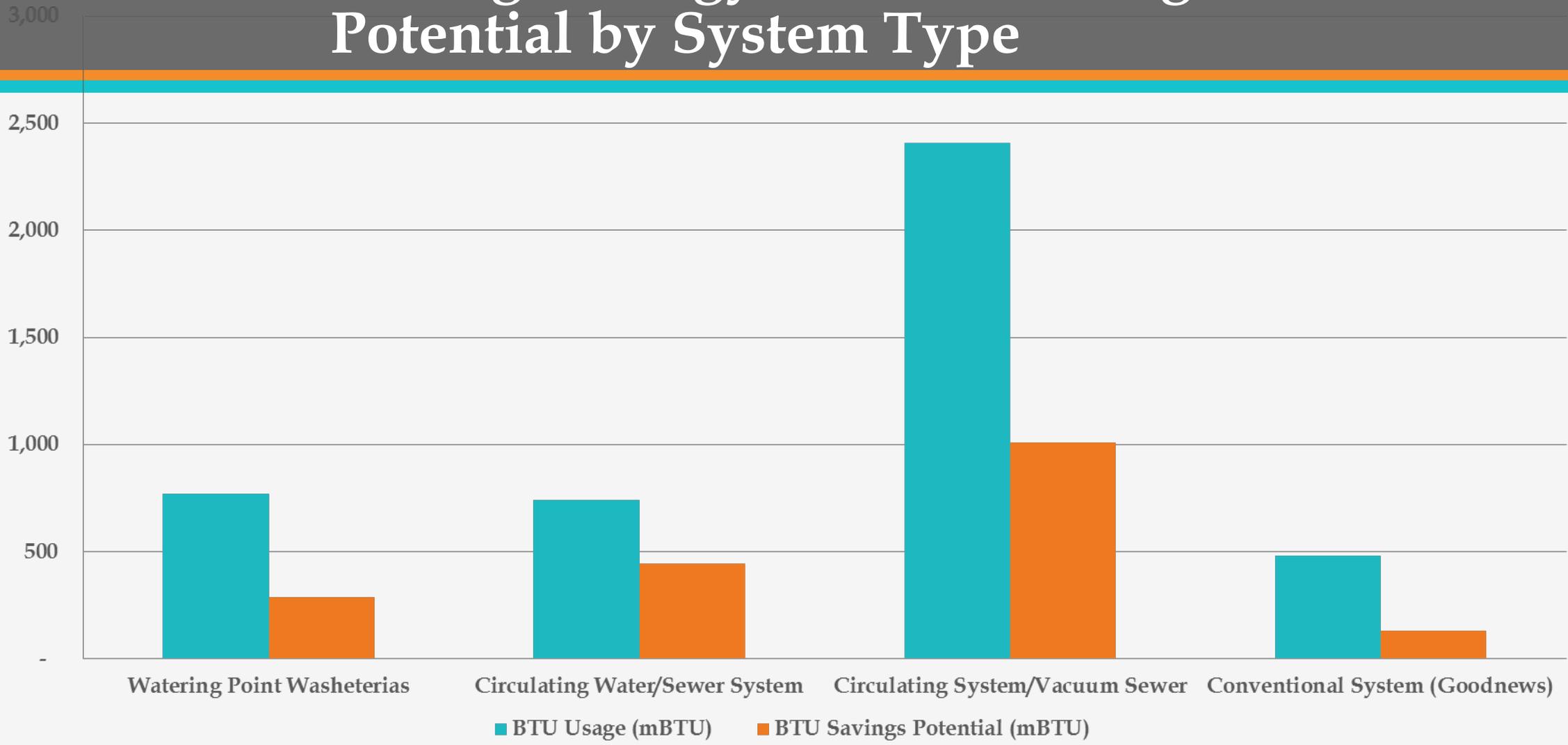
Potential Energy Savings Identified in Audits of 25 Communities

	Community Savings	State Savings	Total Annual Savings	Project Cost	Simple Payback
Heat Recovery*	\$225,882	TBD	\$225,882	\$1,828,200	8.1
Energy Efficiency in 40 Communities**	\$393,896	\$322,698	\$716,594	\$1,275,835	1.8
Total for 25 Communities	\$619,778	\$322,698	\$942,476	\$3,104,035	3.3

Audit Finding Totals (First 25 Villages)

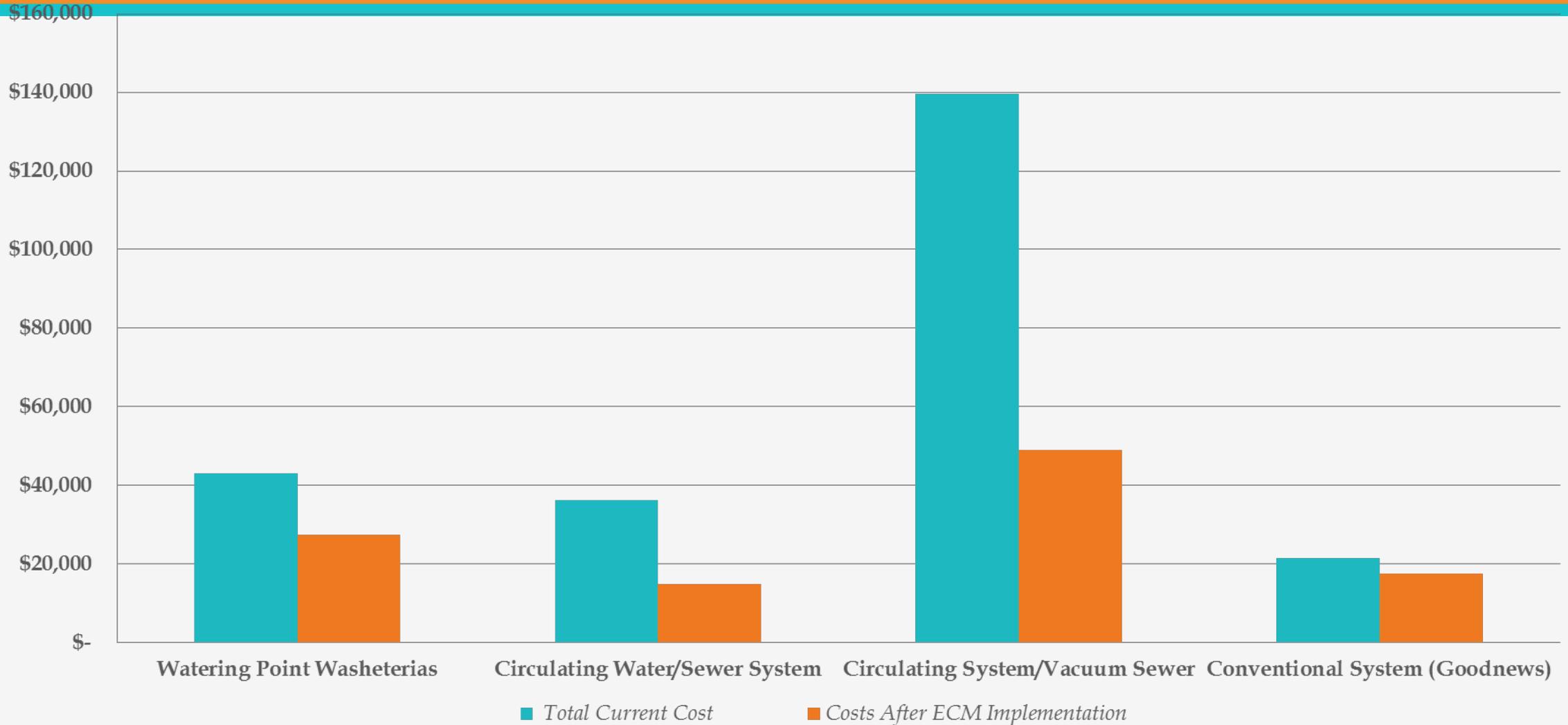
Building Type	Potential Fuel Savings (gals)	Potential Electrical Savings (kwh)	Potential Savings	Retrofit Cost	Simple Payback
Water System totals	52,837	640,303	\$ 402,658	\$1,913,379	4.75
Clinic Totals	8,235	91,145	\$71,586	\$222,256	3.10
Tribal Building Totals	11,209	58,279	\$ 87,338	\$350,557	4.01
All Facilities (25 villages)	72,281	789,727	\$561,582	\$2,486,192	4.43

Average Energy Use and Savings Potential by System Type



Energy Cost Before and After ECM Implementation by System Type

Energy Cost Before and After ECM Implementation by System Type



How are Savings Achieved ?

Retrofit Type	Tribal Facilities	Health Clinics	Water Systems	Total by Retrofit Type
Operations and Maintenance	\$ 22,180	\$ 17,240	\$ 13,198	\$ 52,618
Local Project	\$ 71,466	\$ 30,970	\$ 47,455	\$ 149,891
Substantial Project	\$ 28,755	\$ 21,152	\$ 135,130	\$ 185,037
Major Project	\$ 39,298	\$ 6,242	\$ 92,284	\$ 137,824
Total by Facility Type	\$ 161,699	\$ 75,604	\$ 288,067	\$ 525,370

What is the Payoff for Implementation ?

AVERAGE PAYBACK (years)	Tribal Facilities	Health Clinics	Water Systems	Average by Retrofit Type
Operations and Maintenance	2.2	0.7	1.9	1.6
Local Project	3.7	3.0	2.0	3.0
Minor Project	4.4	1.7	4.6	4.4
Major Project	3.8	0.0	10.3	8.0
Average by Facility Type	3.8	1.9	5.9	4.7



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Identify energy issues through audits, assessments, etc

Behavior changes

Hardware changes

Proper
O&M

Education

Ongoing
monitoring

ARUC

Best
practices/
New Tech

New and
ongoing
projects

Renewable
energy

\$

THE VILLAGE ENERGY BUCKET

- Diesel Electricity
- Fuel Oil
- Heat Recovery
- Renewable Energy

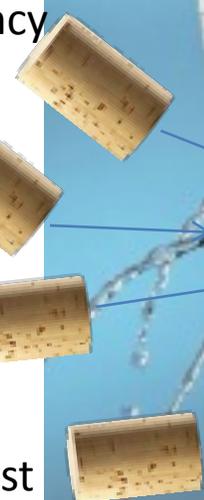


Energy efficiency

Education

Efficient operations

Improved Best Practices



Deferred Maintenance

Lack of full operation understanding

Man/ops Disconnect

Old Technology

Inefficient operations



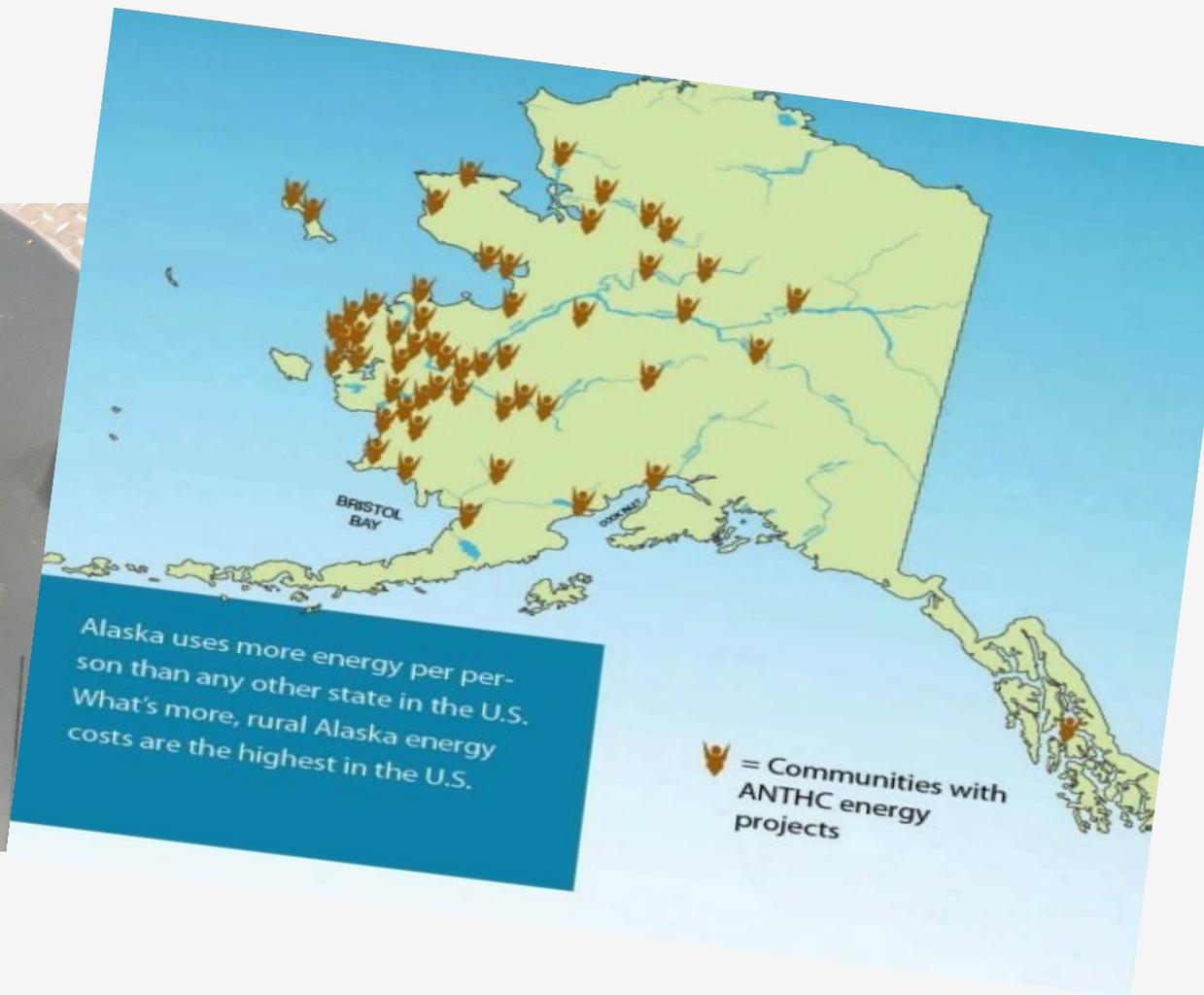
Old versus New Technology



New verses Old Technology – Alaskan Arctic Water Systems



Renewable Energy Projects



Heat Recovery

Community	Energy Savings (annual gallons of fuel)	Annual Cost Savings (DCCED fuel price report January 2012)	Present Value of Lifetime Savings (20 years, 3.5% real cost increase of fuel)
Minto	11,000	\$ 55,550	\$ 1,698,000
Allakaket	7,300	\$ 45,041	\$ 1,370,000
Kwigillingok	4,500	\$ 29,025	\$ 858,200
Goodnews Bay	5,000	\$ 26,500	\$ 1,732,900
McGrath	6,000	\$ 44,820	\$ 1,319,200
Savoonga	9,000	\$ 50,490	\$ 1,477,200
Selawik	11,875	\$ 73,268	\$ 2,157,000
Shungnak	10,400	\$ 64,168	\$ 1,889,400
Ambler	10,300	\$ 63,551	\$ 1,871,200
Sleetmute	2,068	\$ 15,199	\$ 450,000
Russian Mission	2,200	\$ 12,650	\$ 375,500
Totals	81,843 gal	\$ 491,058	\$ 15,198,700

Wind Harvesting Present and Planned

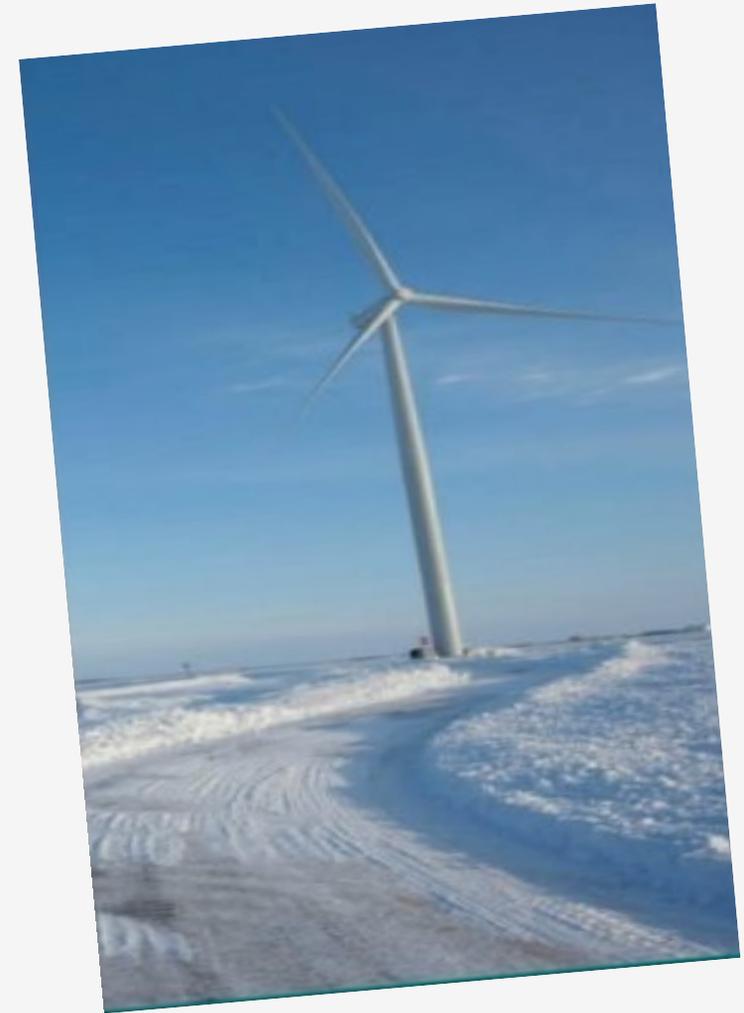
Goodnews Bay Micro Wind Turbines

Gambell- AVEC Surplus \$54,979/Yr

Mekoryuk- AVEC Surplus \$39,680/Yr

Chevak – AVEC Surplus \$51,618/Yr

Shaktoolik – AVEC Surplus \$ 33,343/Yr



Elim Biomass Project

Operation

- Procure fuel
- Produce heat
- Transfer heat



Elim Biomass Project

Economics (estimated per year)

- 1 cord of wood = 100 gallons of fuel oil
- Average fuel consumption = 7,500 gal.
- Cost of fuel at \$5.00/gal. = \$37,500
- Number cords needed = 75
- Cost of wood at \$300/cord = \$22,500
- Potential savings = \$15,000



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Questions?