



**ANTHC**

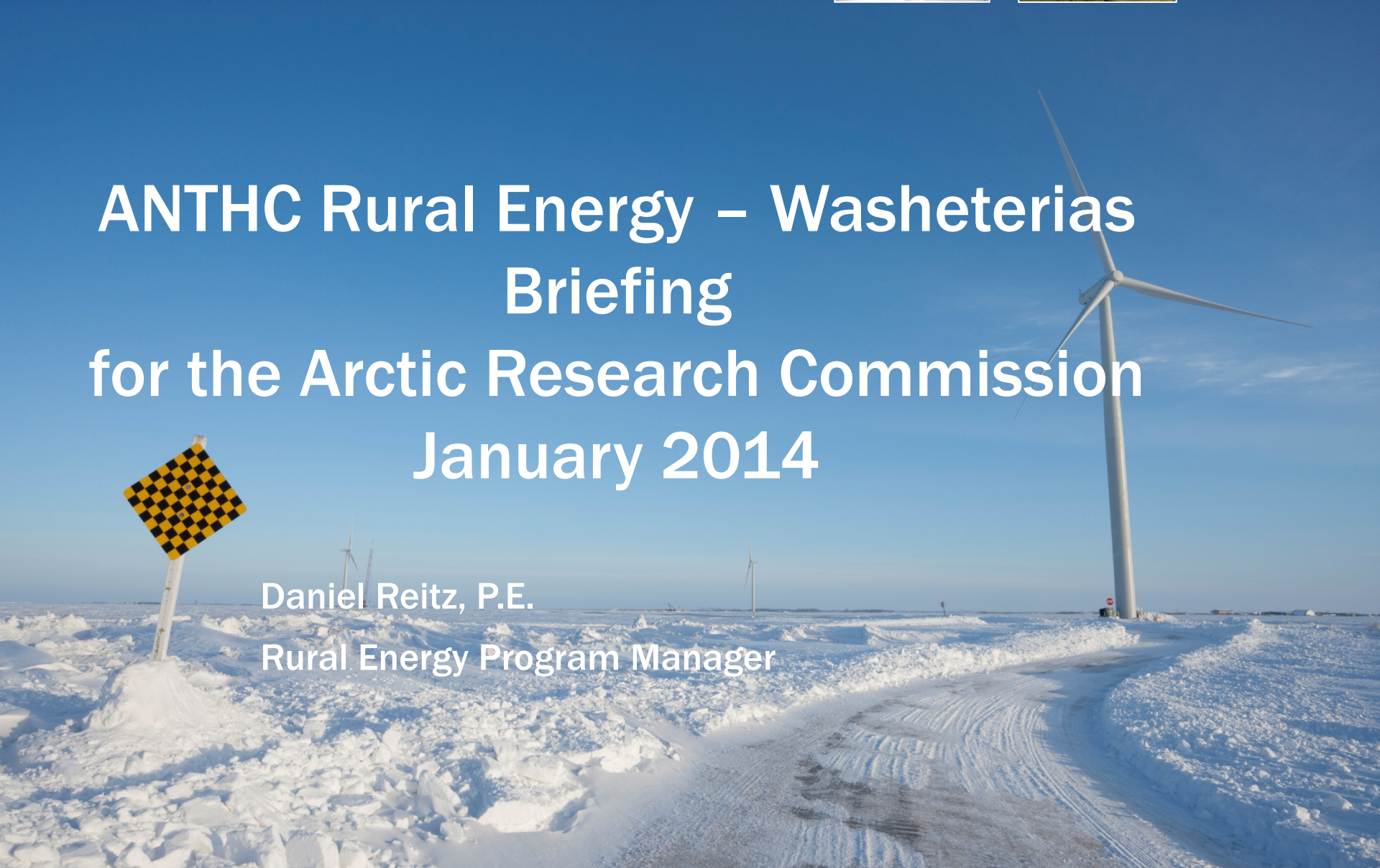
DIVISION OF ENVIRONMENTAL  
HEALTH & ENGINEERING



# ANTHC Rural Energy – Washeterias Briefing for the Arctic Research Commission January 2014



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# 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*

# ANTHC Energy Program Overview



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

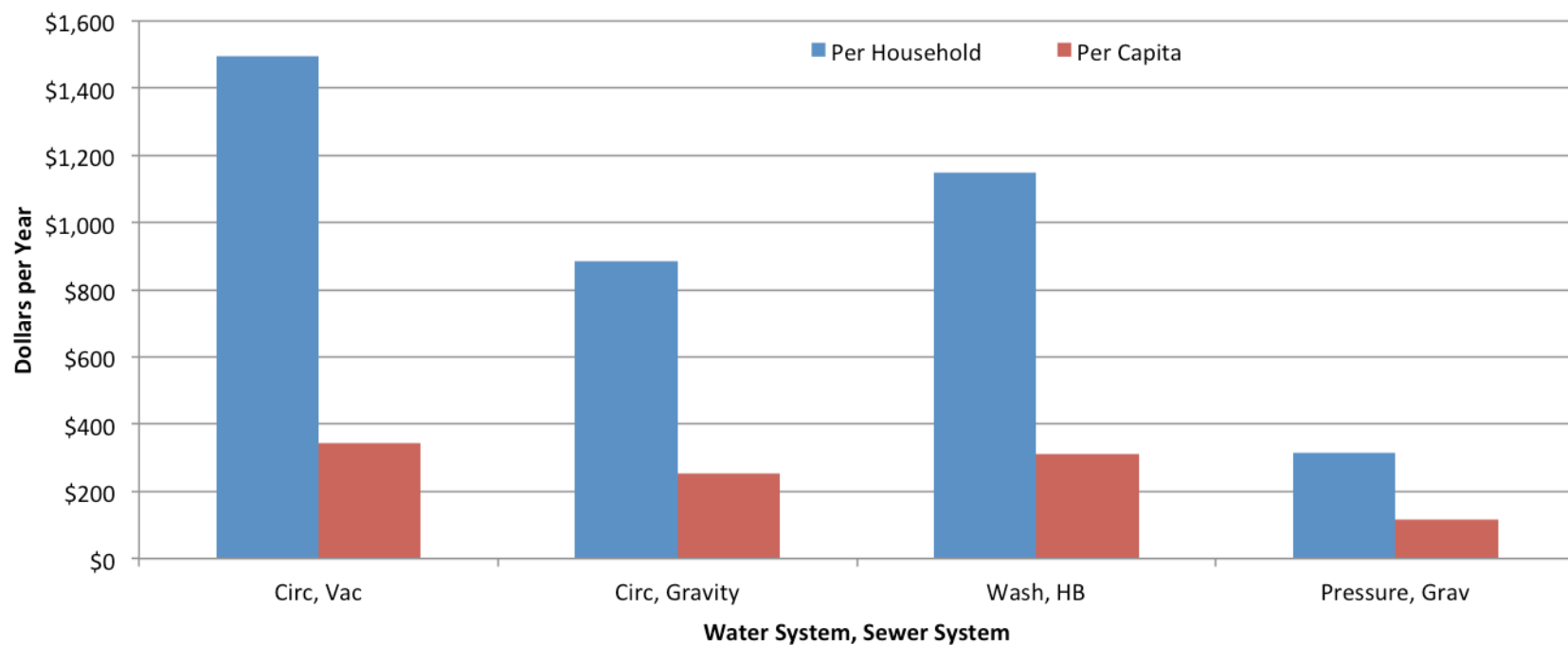
# Energy Survey of 2011

- 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.***

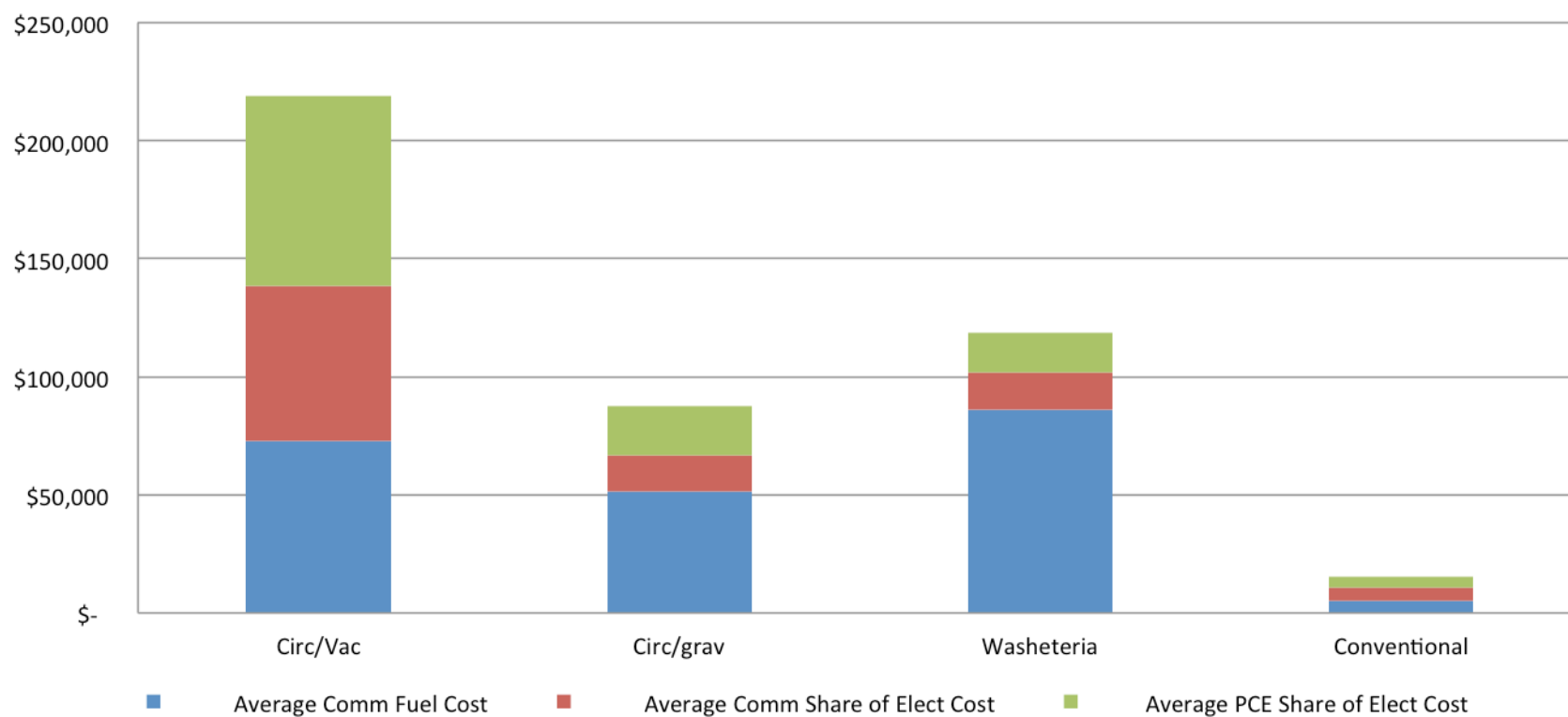


### Reported Average Annual Energy Expenses of the Water System for Various Alaskan System Types





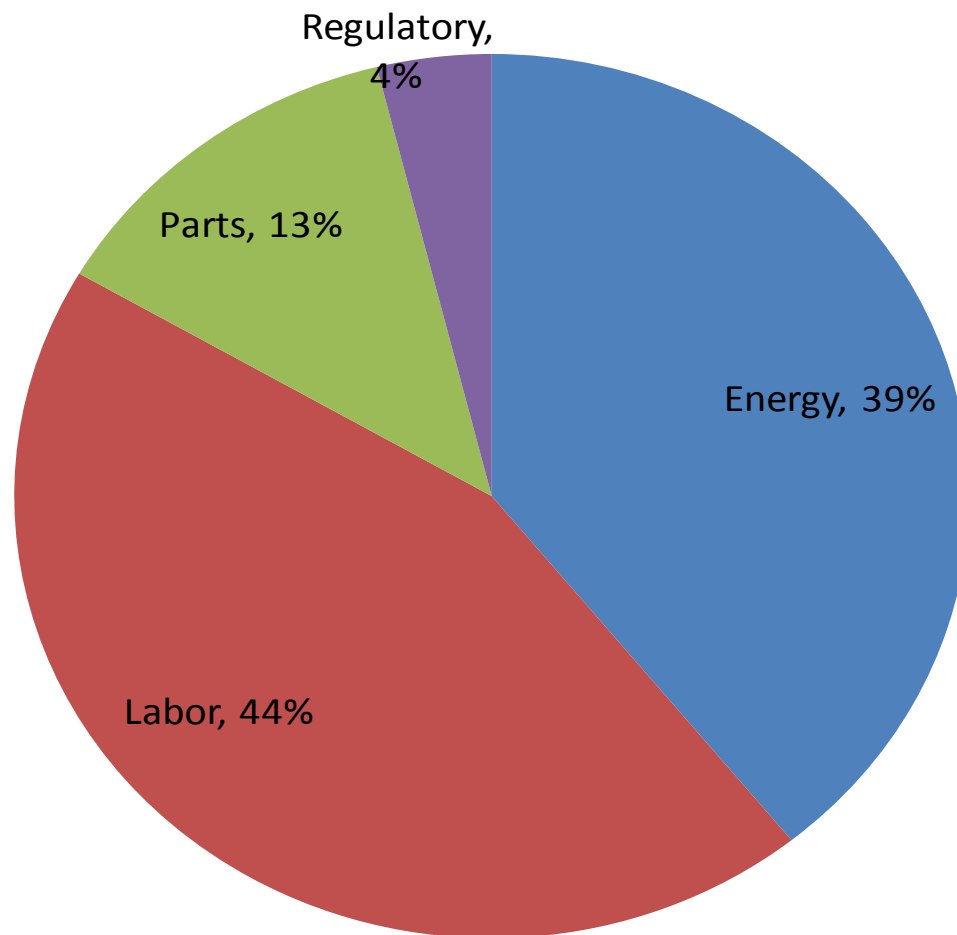
### Reported Average Annual Energy Cost To Operate Various Water Systems and the PCE Share of the Cost







### Typical WTP Expenses- ARUC 2013

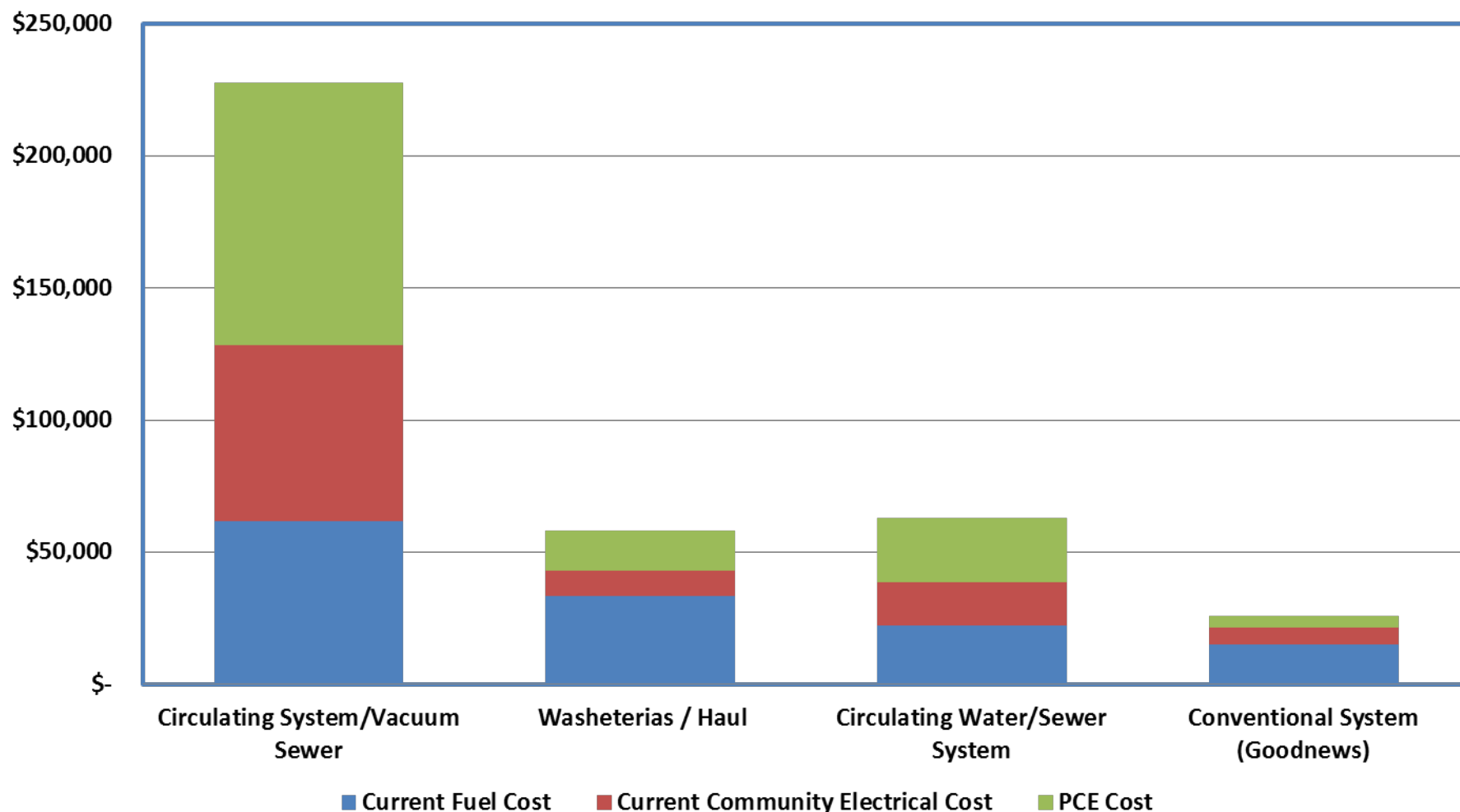


# Energy Audit Overview

- What is a water plant and are they all the same?
- How important are energy costs in keeping rates down?
- How much energy do water plants use?
- How much can be saved?
- What can be done short term to reduce energy costs?
- What can be done long term to reduce energy costs?
- Is renewable energy a good idea in water plants?



## Total Sanitation System Energy Cost by Energy Component



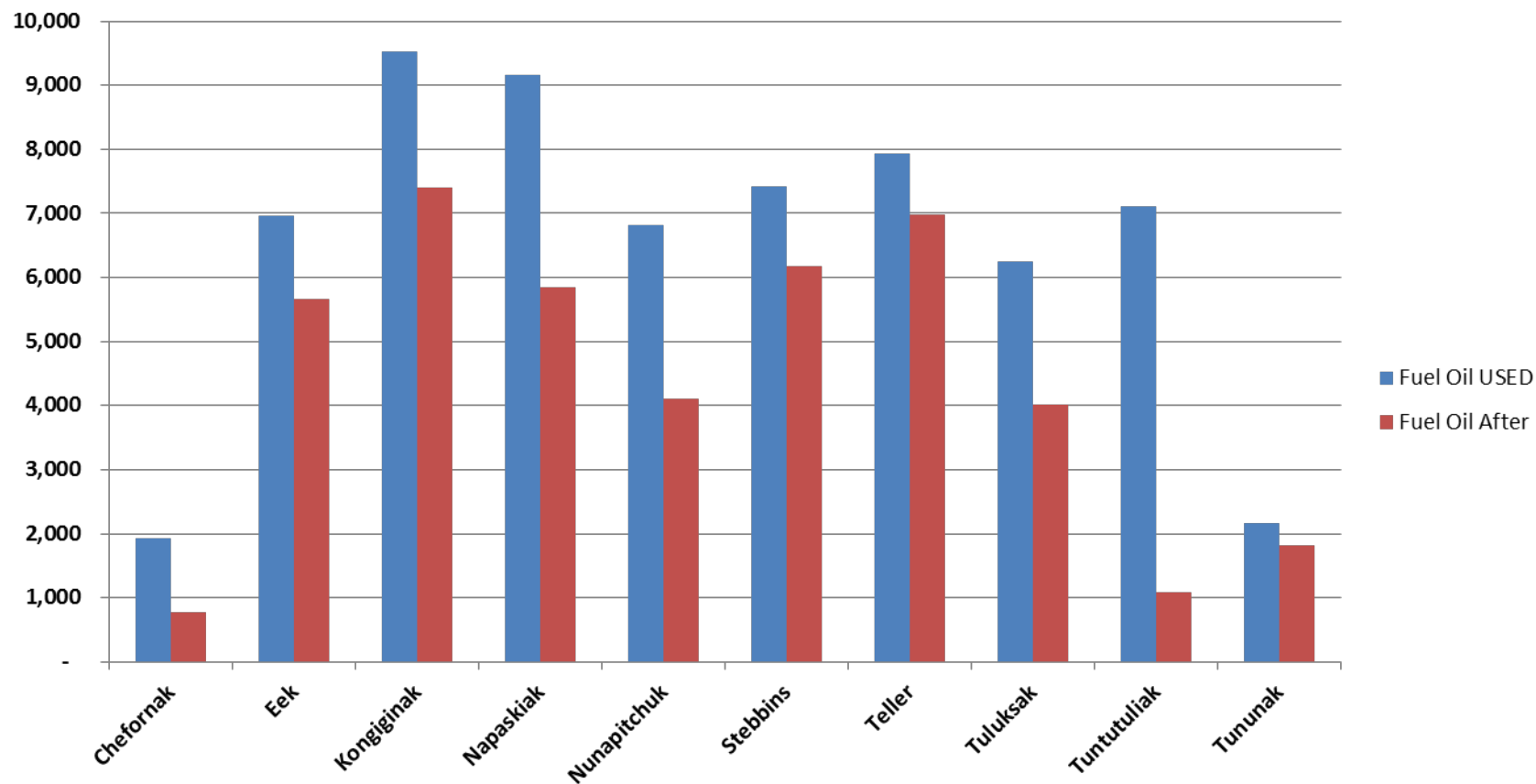
# Audit Finding - Averages

## (40 Villages)

Average by Facility Type	Potential Fuel Savings (gals)	Potential Electrical Savings (kwh)	Potential Cost Savings	Retrofit Costs	CO2 SAVINGS (lbs/yr)	SIMPLE PAYBACK (Years)
Water and Sewer Facilities	1,890	24,400	\$ 14,575	\$ 65,447	61,098	4.5
Health Clinics	417	4,974	\$ 3,544	\$ 11,582	18,015	3.2
Tribal Buildings	387	2,047	\$ 2,999	\$ 12,032	11,826	4.0
Average Per Village	2,694	31,421	\$ 21,118	\$ 89,061	90,039	4.2

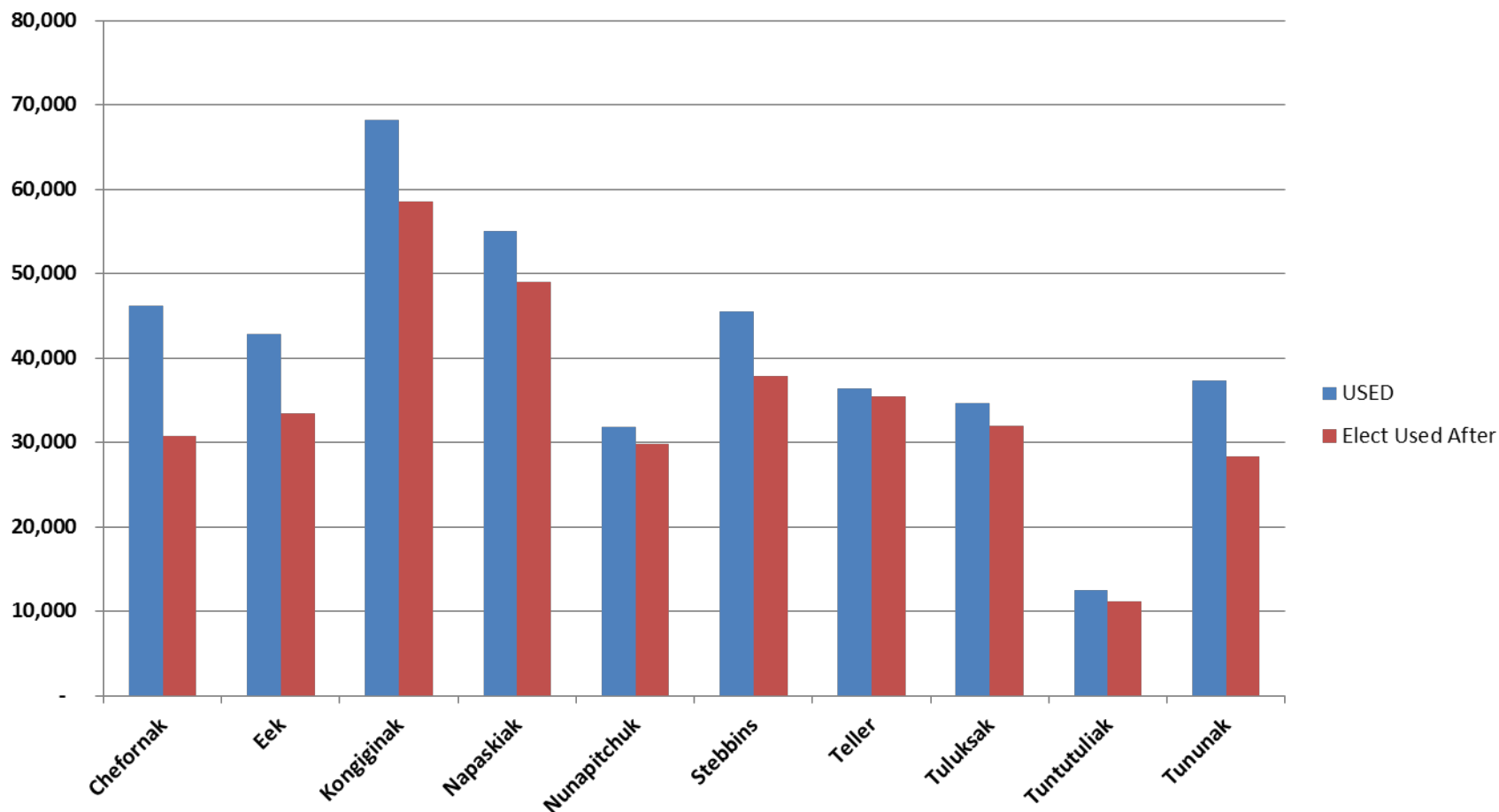


### Washeteria Fuel Oil Usage Profile (Gallons)



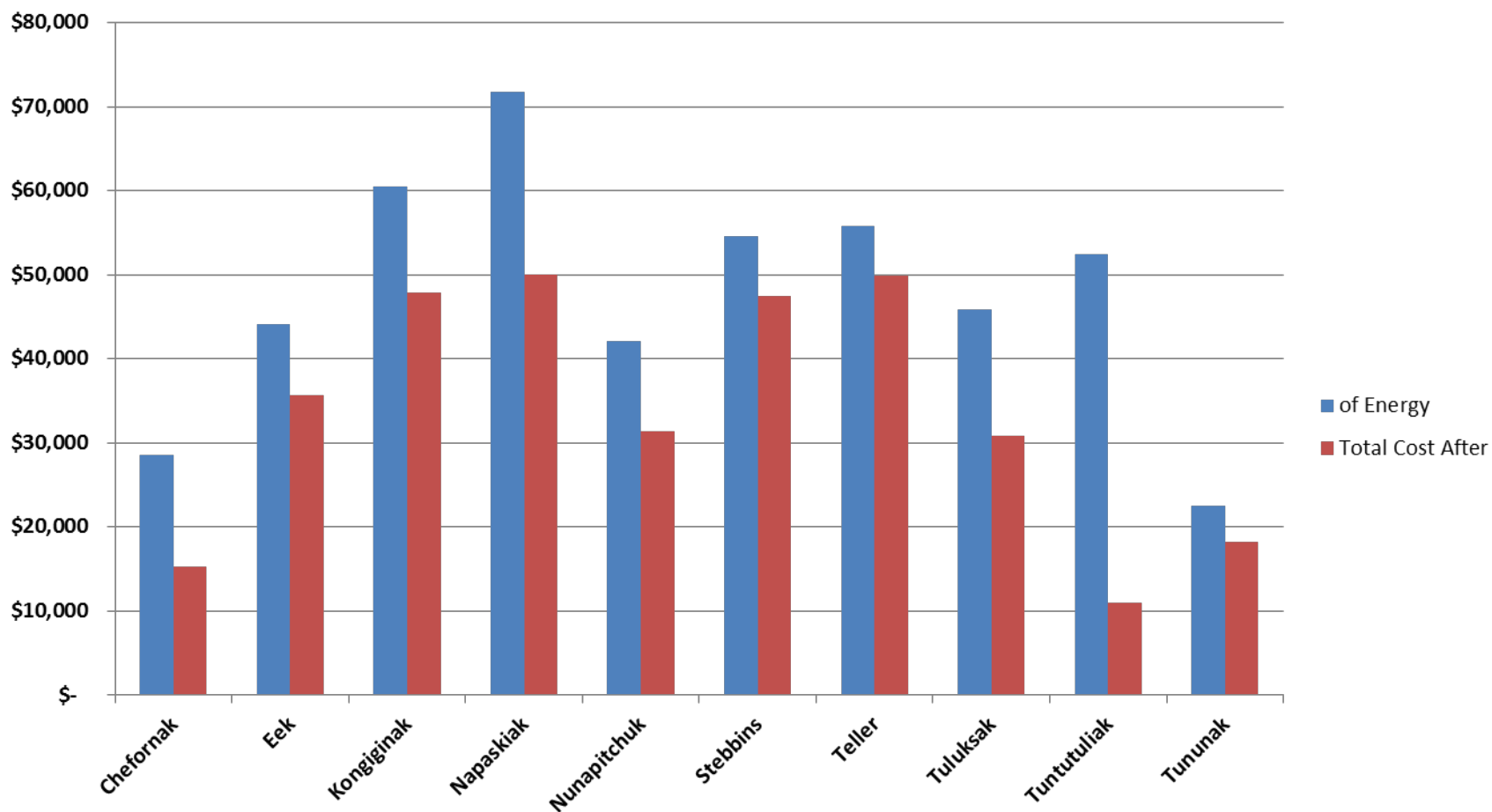


### Washeteria Electrical Usage Profile (Kwh)





### Washeteria Energy Cost Profile (Annual Dollars)

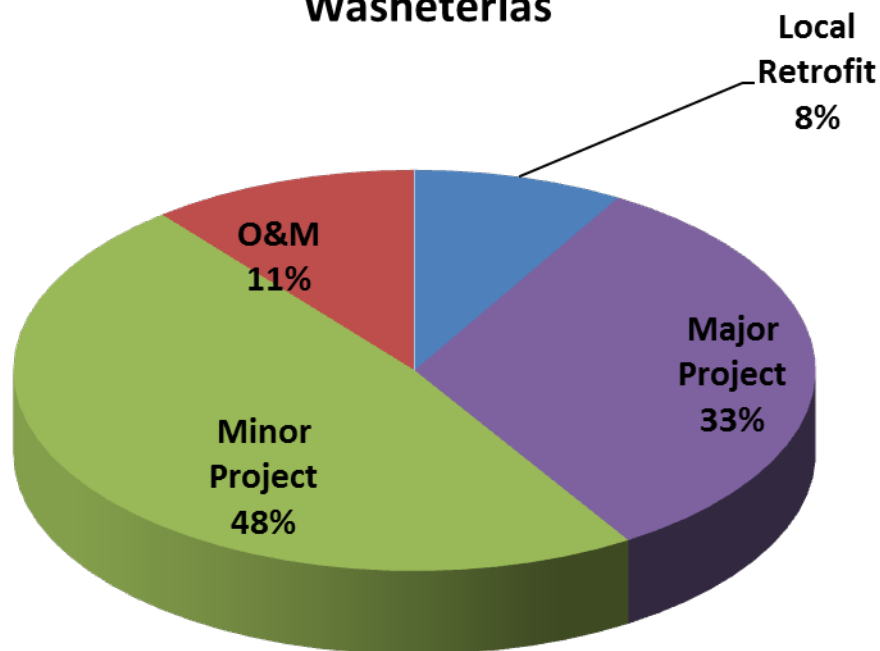


# Retrofit Type Description and Examples

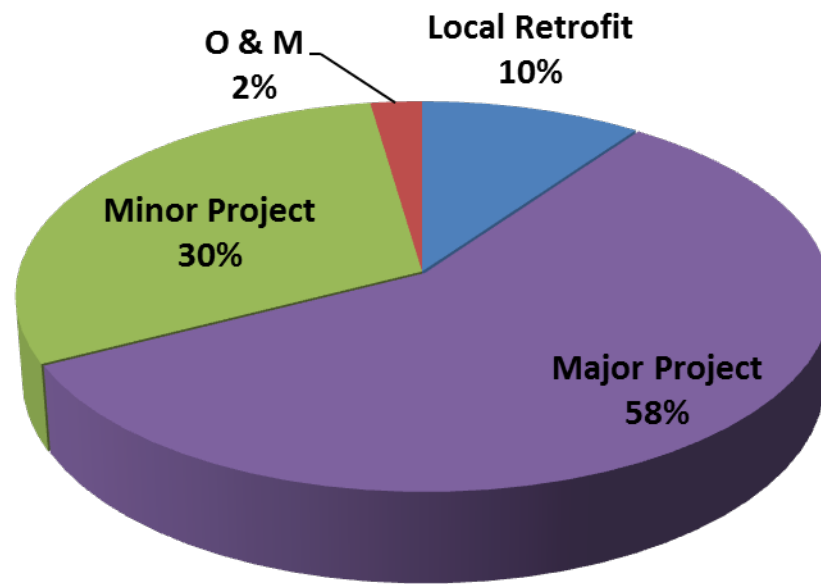
Retrofit Types	Description	Example
Operations and Maintenance	Simple projects that require little time or money to accomplish. Local village fully capable of doing.	Shut off heat tape, setback thermostat, shut off pumps, Reduce temperature in loop
	Projects that may require a specialized person from the village, but the village has most necessary supplies. May need some funding.	Clean Boilers, Reduce air transfer, Clean and adjust floats in lift station
Local Retrofit	Projects that may require significant funding, but local village has all necessary skills and capabilities. Village may or may not have supplies for the job.	New Thermostats, New lights, Replace aquastats, insulation additions
Minor Project	Larger scale projects that require outside assistant. Project may require technicians to assist and/or very significant funding.	Controls retrofitting, new boiler installation, resizing and replacing pumps
Major Project	Largest scale projects that will require significant outside assistance. Projects may potentially need an Engineer, Superintendant, or other Professionals. Technical experts and very significant funding required.	Waste Heat projects, Outfall Replacement, Excess Wind to Heat

## Operation and Maintenance Pays !

**Annual Savings of Implementing  
Energy Conservation Measures in  
Washeterias**



**Cost of Implementing  
Energy Conservation Measures in  
Washeterias Audited**





## **Typical Minor Projects and Operational Issues Identified in the Audits of Washeterias**

- Boilers need to be cleaned and tuned
- Boilers settings are too high and not properly staged
- Boilers are operated all summer when they are not needed
- Boiler optimization controls are bypassed
- Building temperature is not set back during unoccupied hours
- Water storage tank temperature set higher than needed
- Water storage tank heat add controls not operational
- Electric heat trace used all winter (or all year) when designed for emergency thaw only

## Longer Term Energy Upgrades

- Improve the building shell by adding insulation and replacing windows
- Replace old and tired boilers with new appropriately sized high efficiency cold start boilers
- Replace pumps with new high efficiency pumps and variable speed drives
- Repair and or replace process pipe insulation
- Add remote monitoring to identify energy waste
- Re-commission the building and all associated processes
- Upgrade both interior and exterior lighting
- Improved operator training
- Evaluate the cost effectiveness of all types of renewable energy including:
  - Heat Recovery
  - Biomass
  - Wind to Heat
  - Wind
  - Solar

# Barriers to Energy Efficiency

- Lack of Awareness - Communication between operations and management
- Aversion to Risk – (sometimes real)
- Change May Imply Problem with the Status Quo – threatening
- Subsidies – Unintended consequences
- Poorly Financed Operations
- Age – Inherent to the time period of development

## **For More Information:**

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