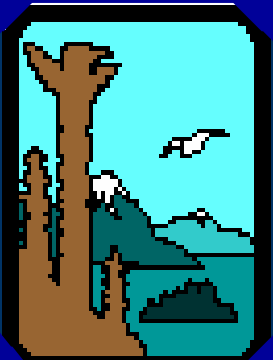


# Diesel Retrofit Projects and Ideas to Reduce Diesel Emissions

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# Diesel Retrofit Projects

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## Presentation Overview

### Efforts to reduce diesel exhaust

- Retrofit projects
  - Anchorage School District Bus Project
  - National Park Service
- Alternative energy
  - Biodiesel
  - Wind
  - Other

# Diesel Retrofit Projects

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## Village Diesel Use

Kotlik (pop. 579)-200,000 gal. diesel per year for power

At about \$3.00/gallon ~ \$600,000 a year

Space Heating use as well ~ 20,000 gallons

Emissions from power plant – per year

60 tons NO<sub>x</sub>

13 tons CO

4 tons Sox

4 tons PM<sub>10</sub>

# Diesel Retrofit Projects

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## Retrofit Background

- Two types of retrofits
  - oxidative catalysts
    - 20% to 50% reduction of PM, CO, HC, NO<sub>x</sub>
    - Generally works best with low sulfur fuel (<500 ppm sulfur)
  - particulate traps
    - 90% reduction in PM and NO<sub>x</sub>
    - Must have ultra low sulfur diesel (<15 ppm)

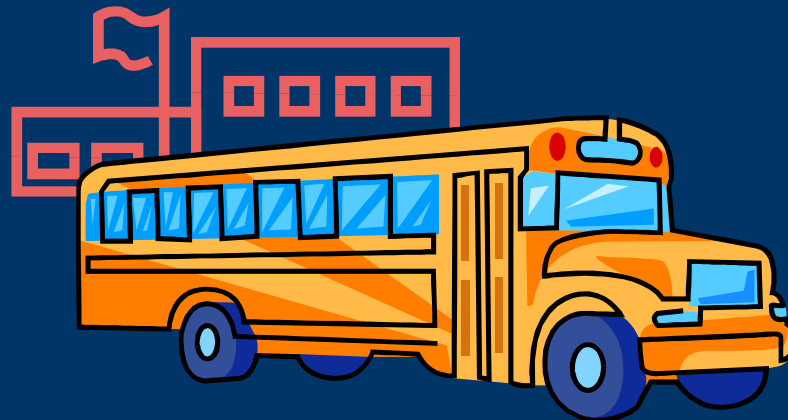
# Diesel Retrofit Projects

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Have any retrofits been done

The Anchorage School District expressed interest

It was the start of a long bus ride ...



# Diesel Retrofit Projects

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## Anchorage School District Bus Project

The numbers:

- 100 buses potentially needing retrofits
- About half bought within the last five years

# Diesel Retrofit Projects

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## Anchorage School District Bus Project

The numbers:

- 74 buses eventually retrofitted with oxidative catalysts
  - Only able to afford 64
  - Contractor mistake allowed ten more

# Diesel Retrofit Projects





# Diesel Retrofit Projects

## Anchorage School District Bus Project

### Why it really worked



Jay Adams

# Diesel Retrofit Projects

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What would diesel oxidative catalyst do for the generator

Install a Johnson Matthey CEM Catalyst Muffler and use low sulfur diesel

PM – 20% reduction ~ 0.8 tons removed

CO – 40% reduction ~ 5.2 tons removed

SO<sub>x</sub> – not available – reduced with low sulfur diesel

NO<sub>x</sub>, – not available

# Diesel Retrofit Projects

## Other Projects?



# Diesel Retrofit Projects

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## The Importance of Stationary Diesel Sources

- Provide much of rural Alaska power
- Isolated, stand-alone systems
- Primary user of fuel in rural communities

# Diesel Retrofit Projects

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## The Importance of Stationary Diesel Sources

- Negative cost impact from federal fuel rules addressing diesel emissions from mobile sources
- There is interest in seeing if these sources can be retrofitted

# Diesel Retrofit Projects

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## National Park Service Retrofit Project

- Denali National Park involved in a project to test fish oil derived biodiesel in power generators
- Fish oil derived biodiesel is low in sulfur
- Willing install retrofits
- Ideal because we are not using a village power system as a test (risking people's power supply)

# Diesel Retrofit Projects

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## National Park Service Retrofit Project

Why it will really worked -

The mechanics and maintenance personnel  
of Denali National Park

# Diesel Retrofit Projects

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What would a particulate matter trap do for generator emissions

Ultra low sulfur diesel

Install a Johnson Matthey Particulate filter and use ultra low sulfur diesel

PM – 60% reduction ~ 2.4 tons removed

CO – 60% reduction ~ 7.8 tons removed

SO<sub>x</sub> – not available – but nearly eliminated

NO<sub>x</sub>, – not available



# Diesel Retrofit Projects

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Why Any Retrofit Project will work

**Dedicated people willing to put up with  
the bureaucracy**

**Are there other options to reduce diesel emissions?**

**Diesel displacement**

**Conservation**

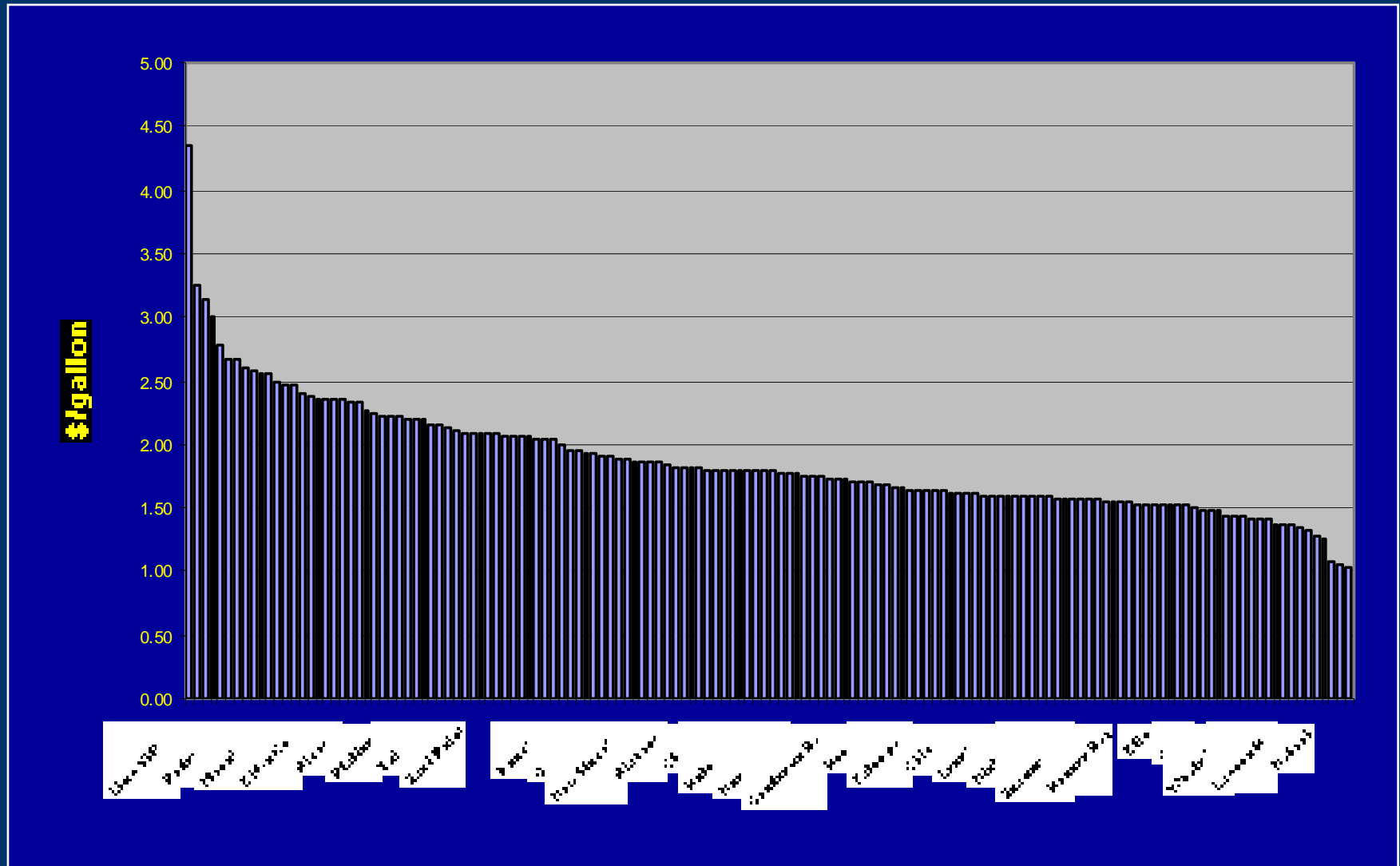
**Generation efficiency**

**Wind**

**Hydro**

**Others like biodiesel**

# Diesel prices as of end of 2004



# Improve efficiency & use local energy sources

Rural energy plan: Decrease costs in most places by

- *End use efficiency (conservation)*
- *Diesel generation efficiency*
- *Heat recovery (co-generation)*

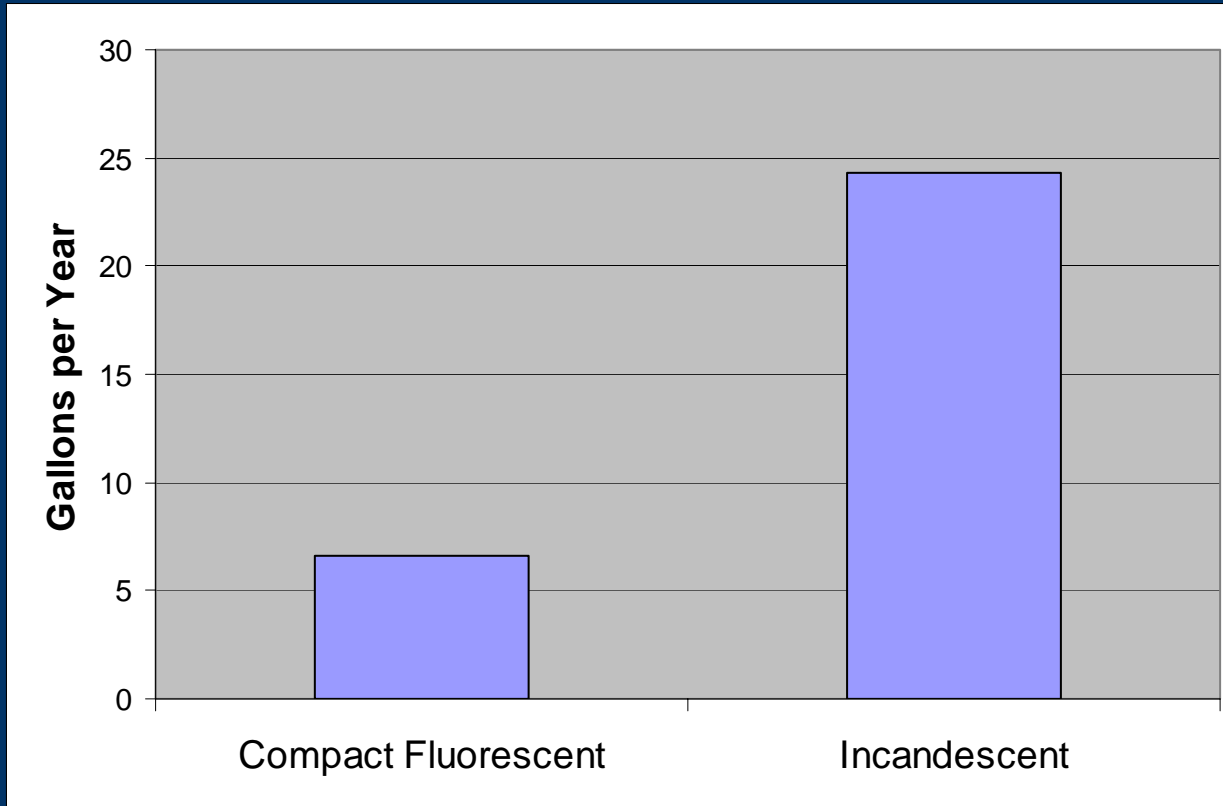
# End Use Efficiency



McGrath School:

- Better lighting
- \$10,000/yr savings

# Fuel Needed to Power a 100 W Light Bulb 8 hr/day



What does this mean in terms of emissions?

Switch to fluorescent bulb saves around 25 gallons per bulb

139 housing units in Kotlik – assume 120 bulbs

Change all 120, save 3000 gallons diesel & \$9000 fuel costs

That is a reduction of

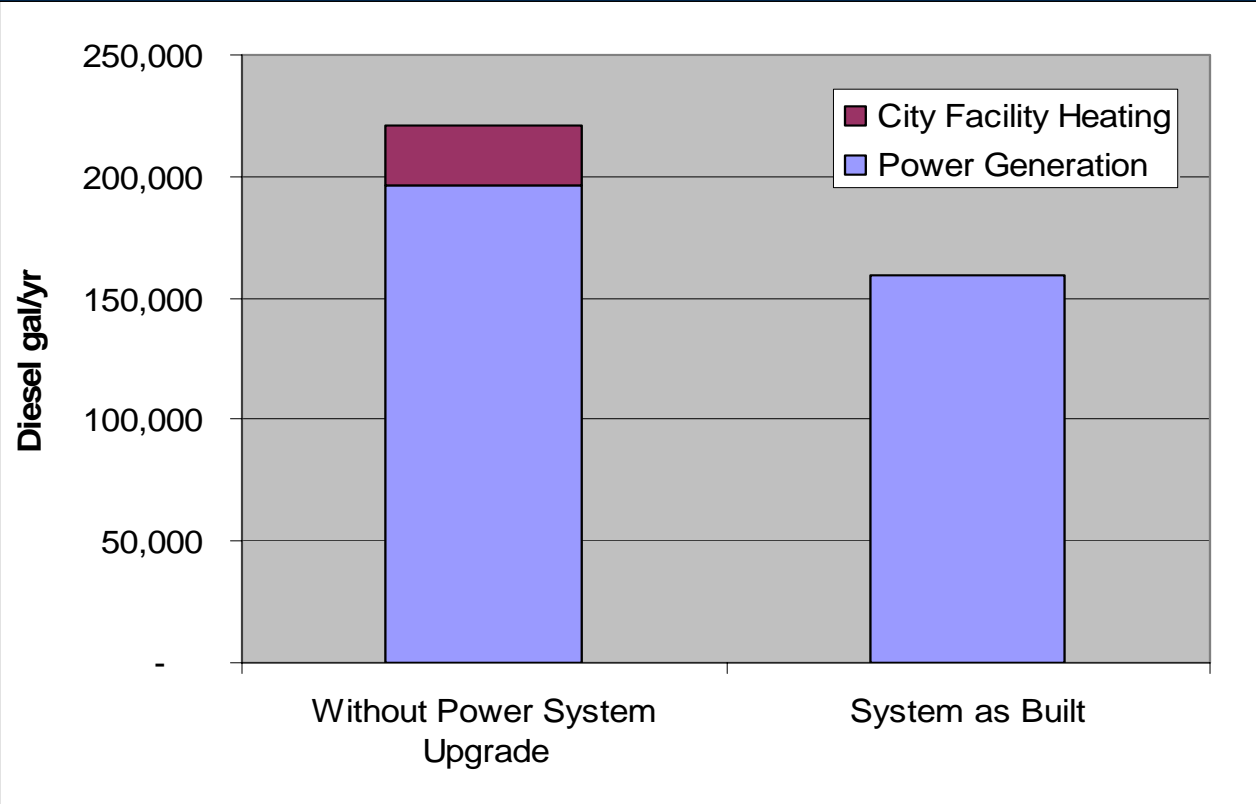
1 ton of NO<sub>x</sub>

0.24 tons (485 pounds) CO

0.1 tons (150 pounds) SO<sub>x</sub>

0.1 tons (158 pounds) PM<sub>10</sub>

# Kotlik: New engines and heat recovery





What does this mean in terms of emissions?

Upgrade of generator and heat recovery saved approximately 70,000 gallons and \$210,000 fuel costs

That is a reduction of

21 tons of NO<sub>x</sub>

4.6 tons CO

1.4 tons SO<sub>x</sub>

1.5 tons PM<sub>10</sub>

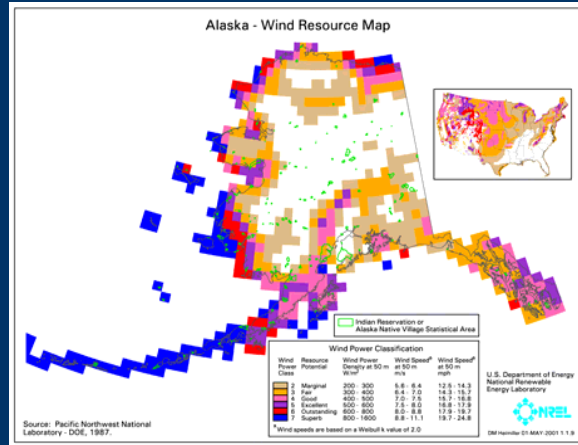
# Improve efficiency & use local energy sources

Decrease costs in many places by developing

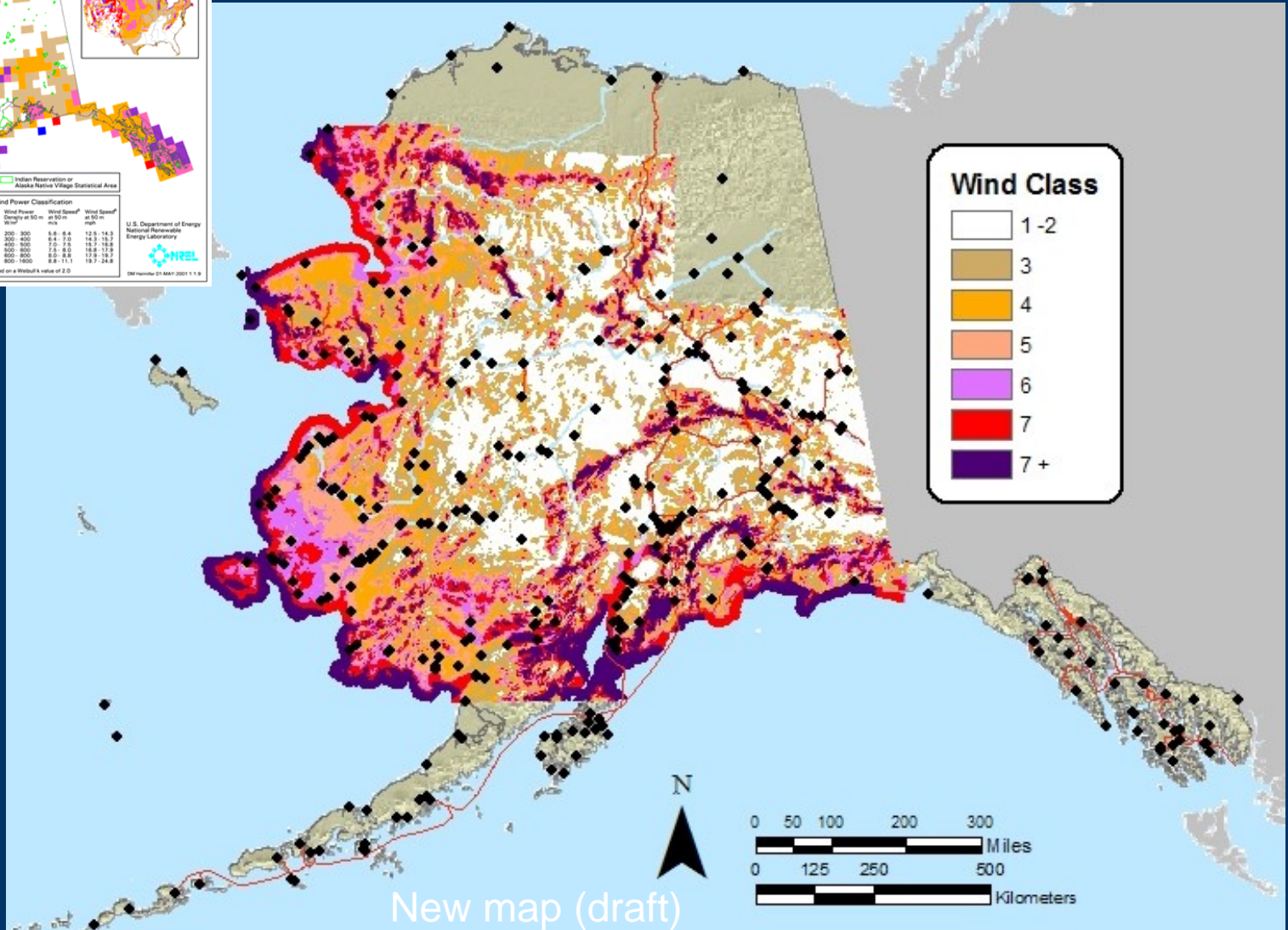
- *Wind energy*
- *Hydroelectric*

*If you are not burning fuel – you are not creating emissions!*

# Wind: Need to know the resource

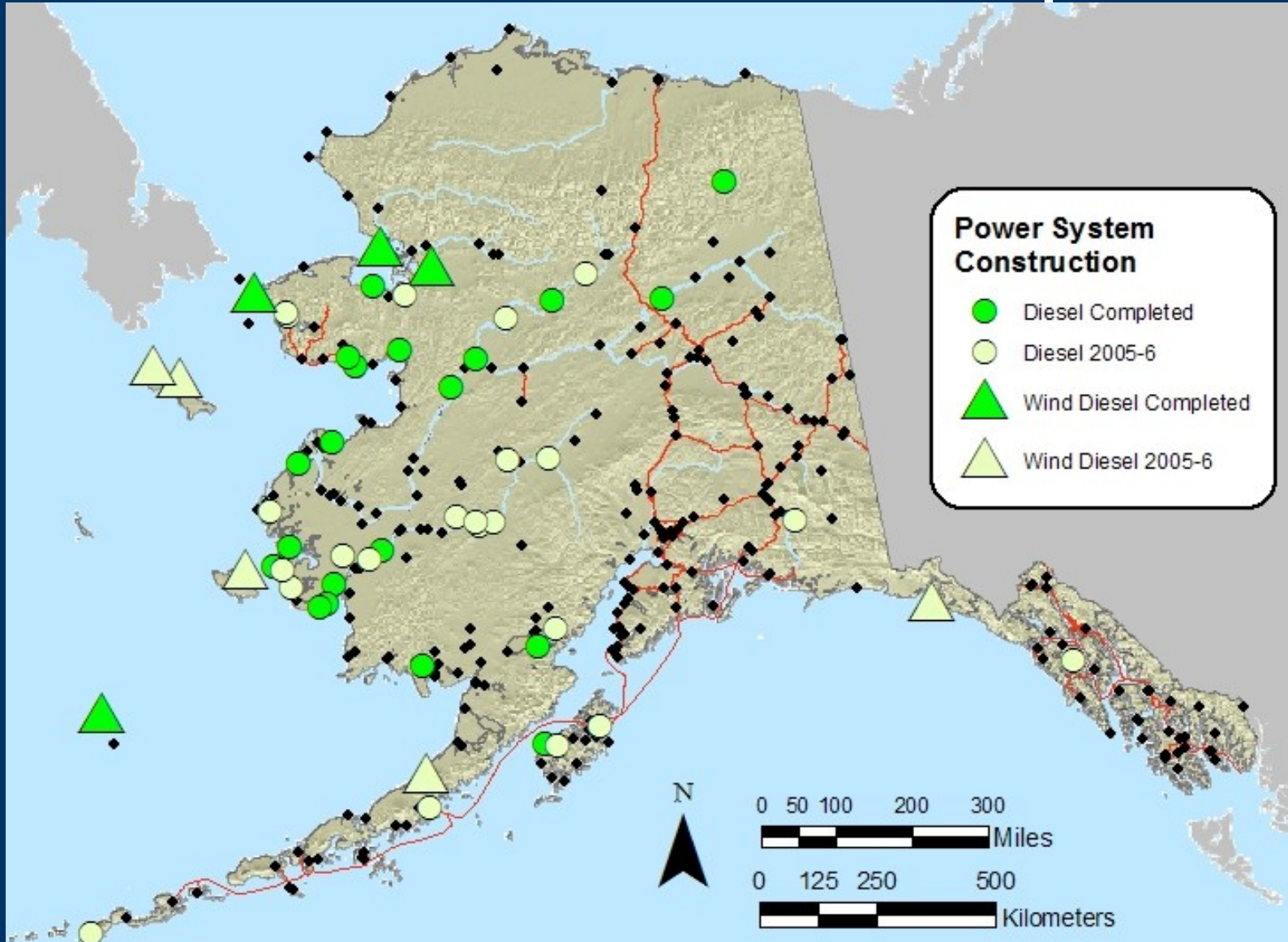


Old map



New map (draft)

# Wind development



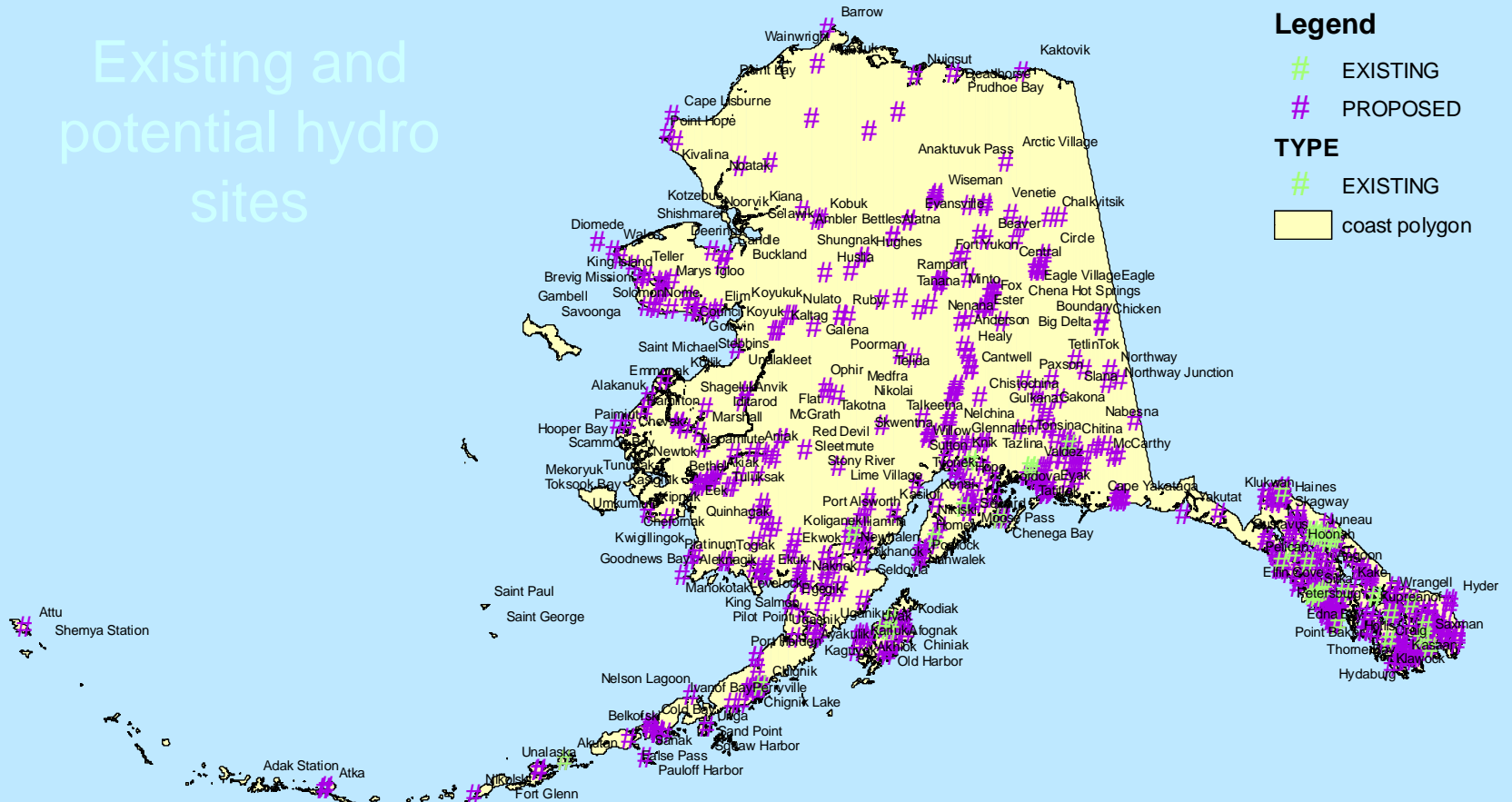
# Hydroelectric

- Largest renewable energy source in Alaska
- Provides
  - 24% of statewide electricity generated (5.6 billion kWh)
  - 6% of PCE community electricity

## Existing and potential hydro sites

### Legend

- # EXISTING
- # PROPOSED
- TYPE**
- # EXISTING
- coast polygon



# Improve efficiency & use local energy sources

Other alternatives under consideration, assessment or testing

- *Photovoltaic (solar panels)*
- *Geothermal*
- *Waste-to-energy*
- *Fish oil biodiesel*
- *Small nuclear*
- *Wood waste to liquid fuels*

Basically, lower energy cost and fewer emissions will be derived through local resources and local knowledge

With Help





# Energy program contacts

Alaska Energy Authority

[www.aidea.org/aea.htm](http://www.aidea.org/aea.htm)

907-269-3000

or

1-888-300-8534

Peter Crimp

# New Federal Diesel Fuel Regulations & Impacts on Alaska

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