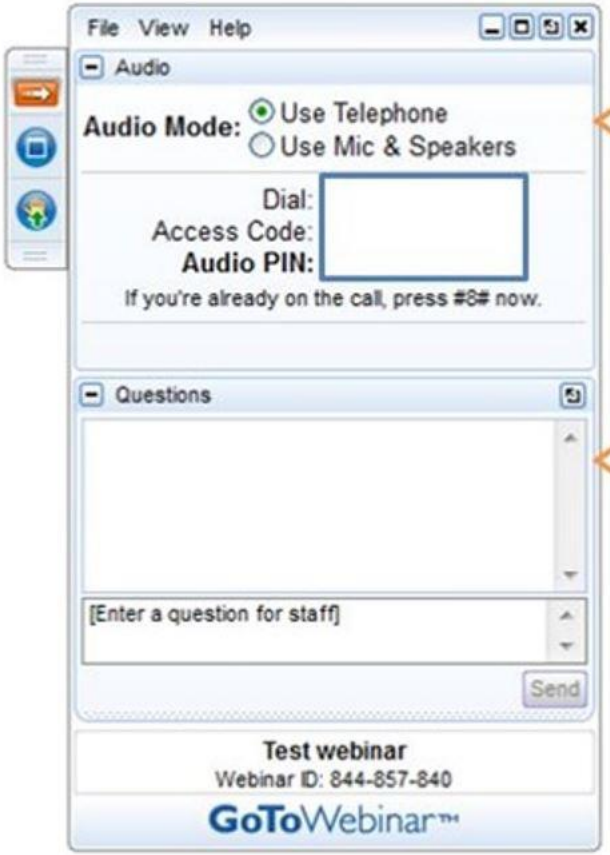
Clean Energy States Alliance
State Leadership in Clean Energy Webinar Series

Achieving Net Zero in Alaska and Oregon

Hosted by
Todd Olinsky-Paul, Project Director, CESA
Friday, January 23, 2015

CleanEnergy States Alliance

Housekeeping



All participants are in "Listen-Only" mode. Select "Use Mic & Speakers" to avoid toll charges and use your computer's VOIP capabilities. Or select "Use Telephone" and enter your PIN onto your phone key pad.

Submit your questions at any time by typing in the Question Box and hitting Send.

This webinar is being recorded.

You will find a recording of this webinar, as well as all previous CESA webcasts, archived on the CESA website at

www.cesa.org/webinars

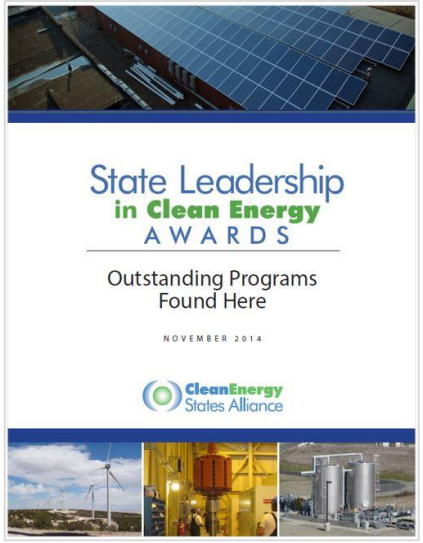
About CESA

Clean Energy States Alliance (CESA) is a national nonprofit organization working to implement smart clean energy policies, programs, technology innovation, and financing tools, primarily at the state level. At its core, CESA is a national network of public agencies that are individually and collectively working to advance clean energy.

The 2014 State Leadership in Clean Energy Awards

CESA's State Leadership in Clean Energy Awards recognize state and municipal programs and projects that demonstrate leadership, effectiveness and innovation in advancing renewable energy and other clean energy technologies.

An independent panel of distinguished judges selected eight recipients for the 2014 Awards. More information, including case studies and webinar recordings, is available on our website: http://www.cesa.org/projects/state-leadership-in-clean-energy/2014/



Today's Featured Projects

Kodiak, Alaska: A 99% Renewable Energy Community

Alaska Energy Authority/ Kodiak Electric Association

The City of Gresham Wastewater Treatment Plant

Energy Trust of Oregon/ City of Gresham

Today's Guest Speakers

Sean Skaling, Program Development and Project Evaluation Director, Alaska Energy Authority

Darron Scott, President/CEO, Kodiak Electric Association

Dave Moldal, Renewable Energy Project Manager, Energy Trust of Oregon

Alan Johnston, Senior Engineer, Wastewater Services Division, City of Gresham, Oregon

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EnergyTrust of Oregon™

CITY OF GRESHAM 1905

Achieving Net Zero in Alaska and Oregon: The Alaska Renewable Energy Fund

CESA Webinar January 23, 2015

St. Paul Island Wind

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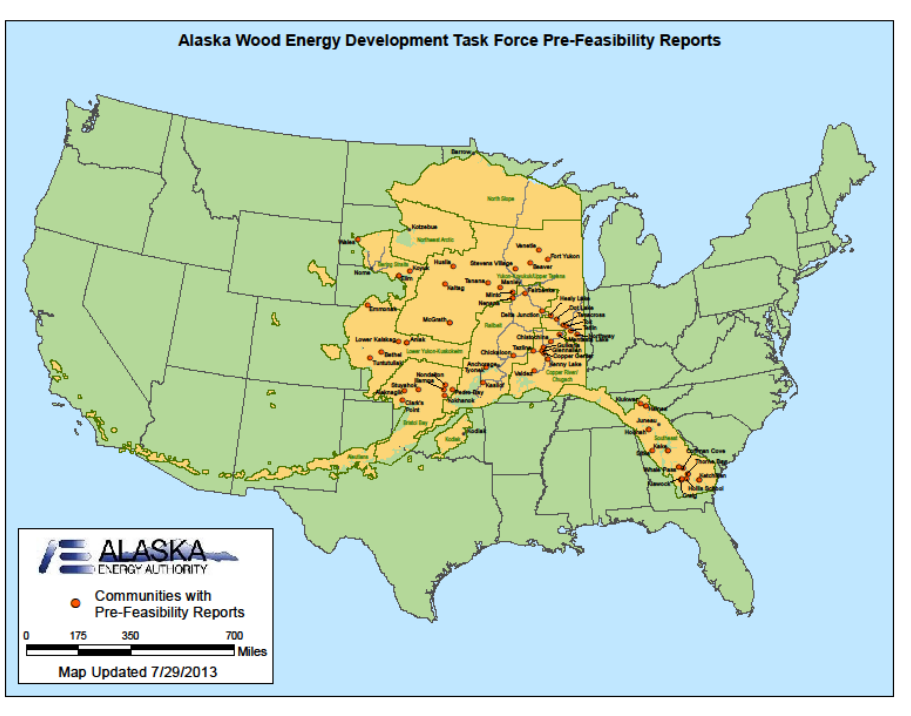
Energy in Alaska



- Population: 735,000
- Area: 660,000 sq. miles
- 1.2 people/sq. mile (CA = 246; NJ = 1,210)
- Mostly stand-alone community grids powered by small diesel engines
- 190 communities eligible for Power Cost Equalization = High energy costs!
- Diesel fuel for electricity and heating is barged or flown to most communities

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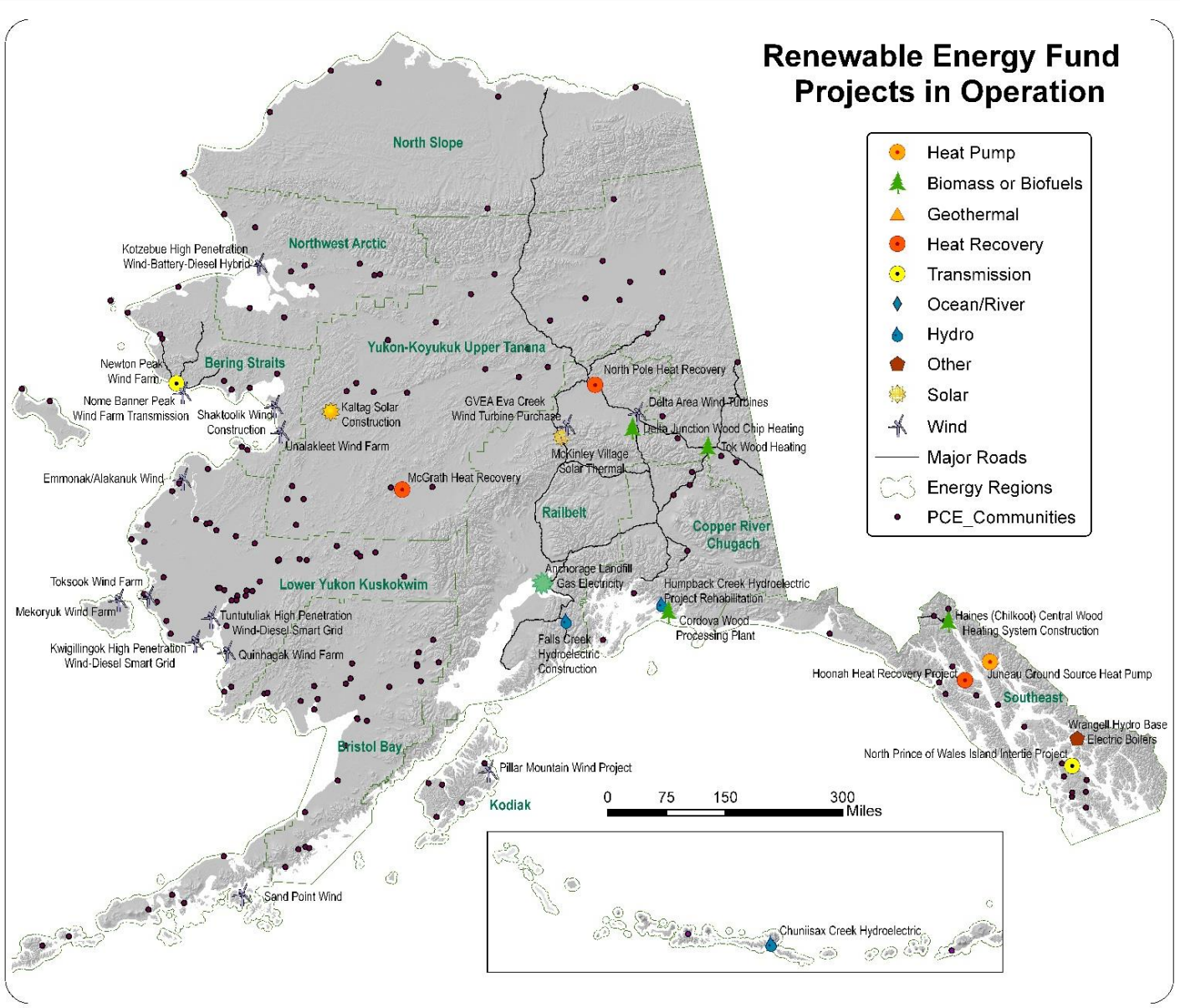
Most Communities Not On Road System



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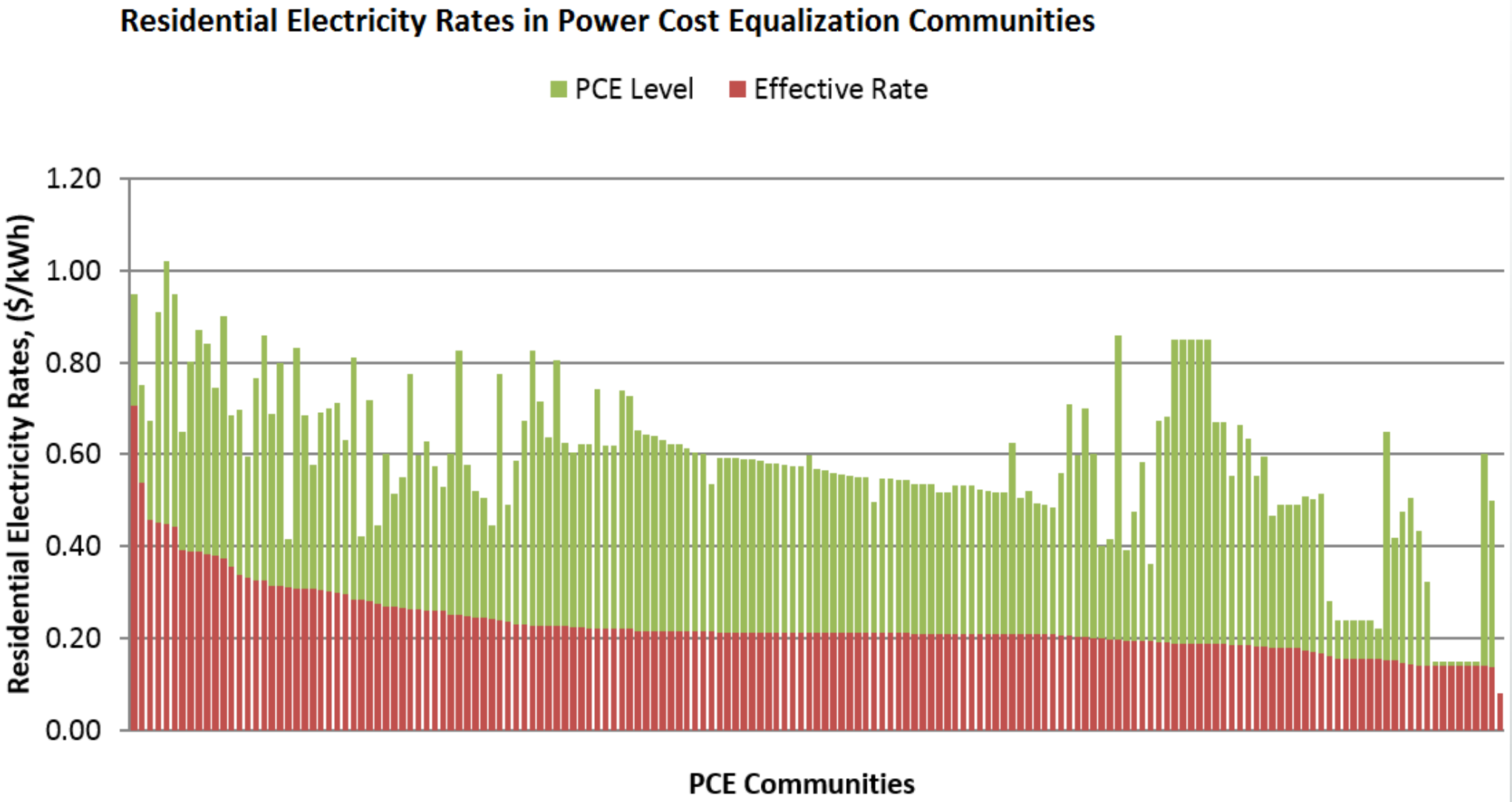
The Cost of Power in PCE Communities



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Renewable Energy Grant Fund

- Grant program to support 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

Coffman Cove School Garn boiler.

Photo courtesy of Karen Petersen

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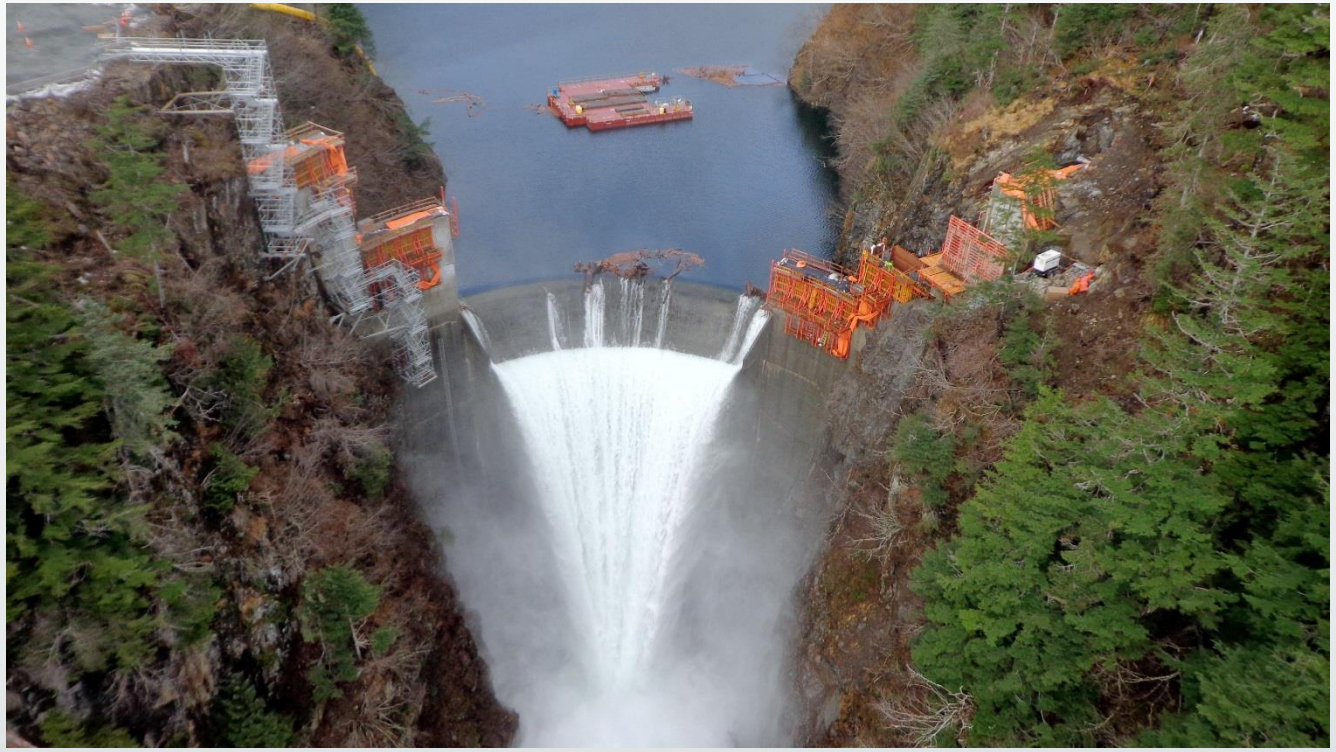
Renewable Energy Grant Fund

- Established 2008, renewed in 2012 for 10 more years
- Annual application process
- Strong technical and economic evaluation process
- AEA recommends project list to Legislature
- Legislature funds projects
- Typically ~$25M per year, 7 years



Blue Lake Hydro Expansion

Photo courtesy of City of Sitka

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Renewable Energy Grant Fund

- Strong public benefit focus
- Emphasis on high cost areas and regional balance
- Eligible applicants:
  - Utilities, IPPs, local governments, tribal councils
- Eligible projects:
  - Wind, hydro, LEHE biomass, solar, heat recovery, geothermal, heat pumps, wave, tidal, river hydrokinetic, landfill gas, local natural gas, transmission of renewables

Anchorage Landfill Gas Project

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REF Grant and Funding Summary

	Totals R1-7
Applications Received	732
Applications Funded	277
Grants Currently in Place	122
Amount Requested[1] ($M)	$ 1,442.3
AEA Recommended ($M)	$ 398.3
Appropriated ($M)[2]	$ 247.5
Cash Disbursed ($M)	$ 163.3
Match Budgeted ($M)[3]	$ 152.1

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.

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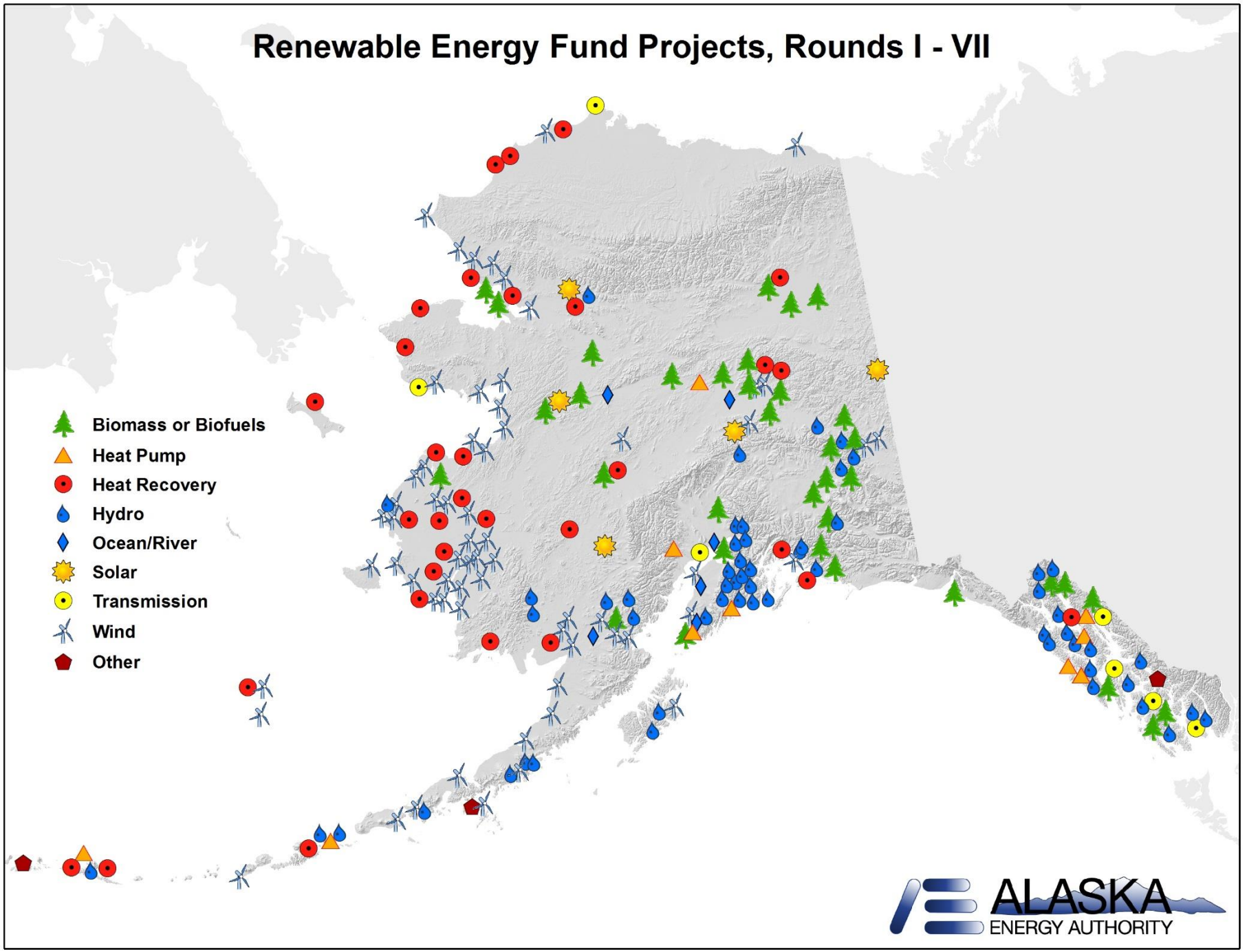
Renewable Energy Fund Projects, Rounds I - VII
Biomass or Biofuels
Heat Pump
Heat Recovery
Hydro
Ocean/River
Solar
Transmission
Wind
Other
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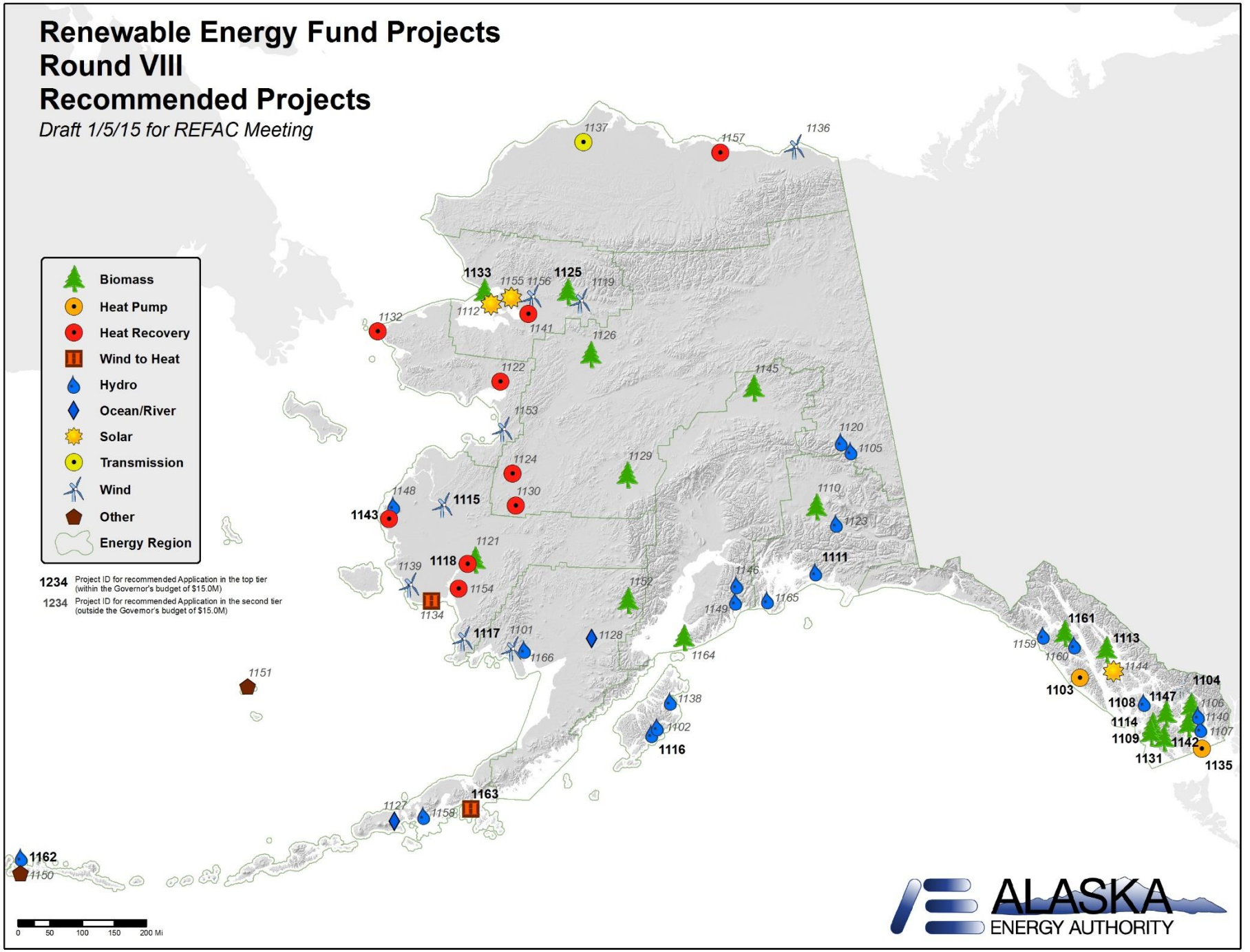
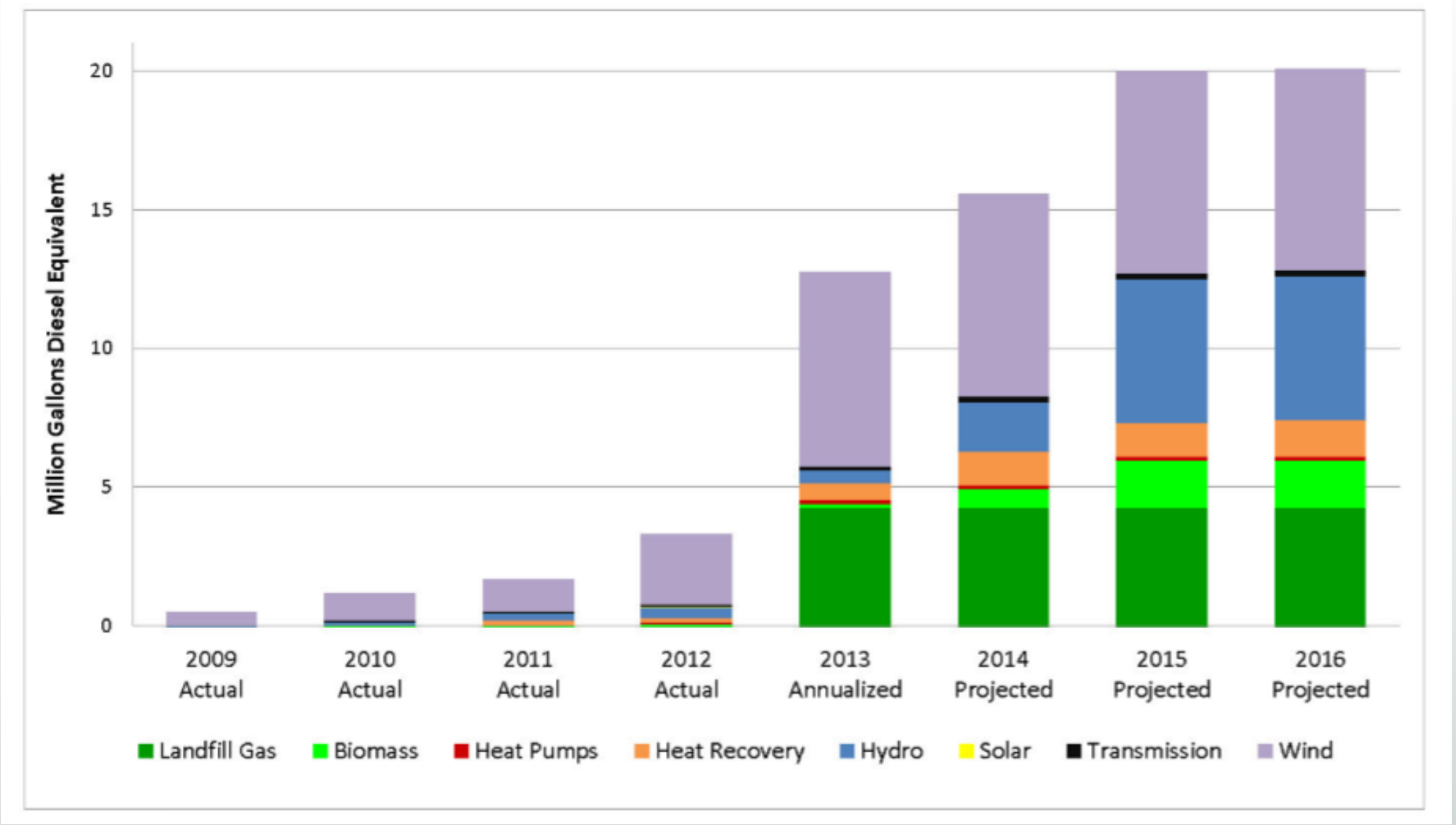
Renewable Energy Fund Projects
Round VIII
Recommended Projects

Draft 1/5/15 for REFAC Meeting



Renewable Energy Fund: Annual Fuel Savings

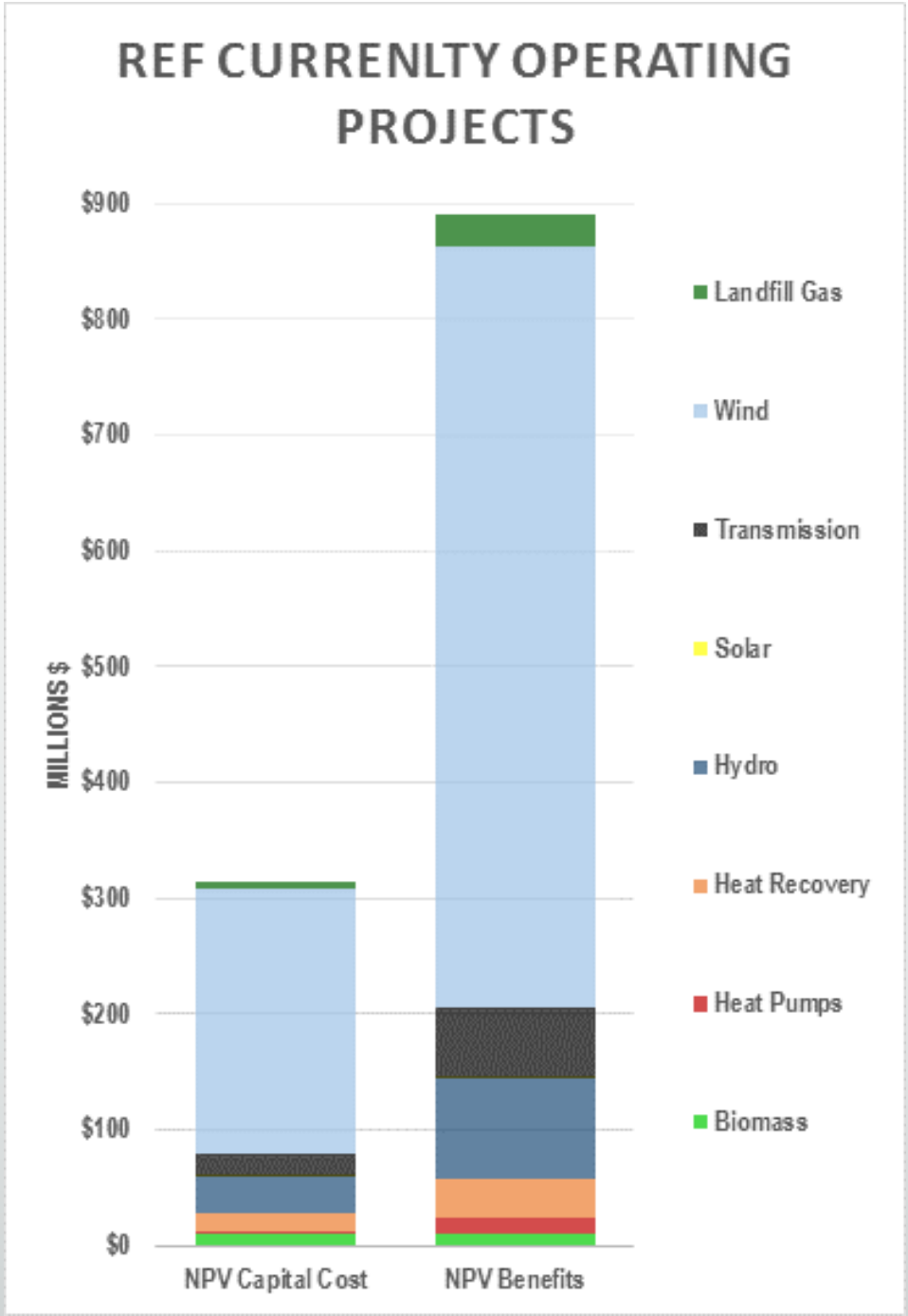


Renewable Energy Fund: Value Generated

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

Overall Program

Benefit/Cost Ratio: 2.8



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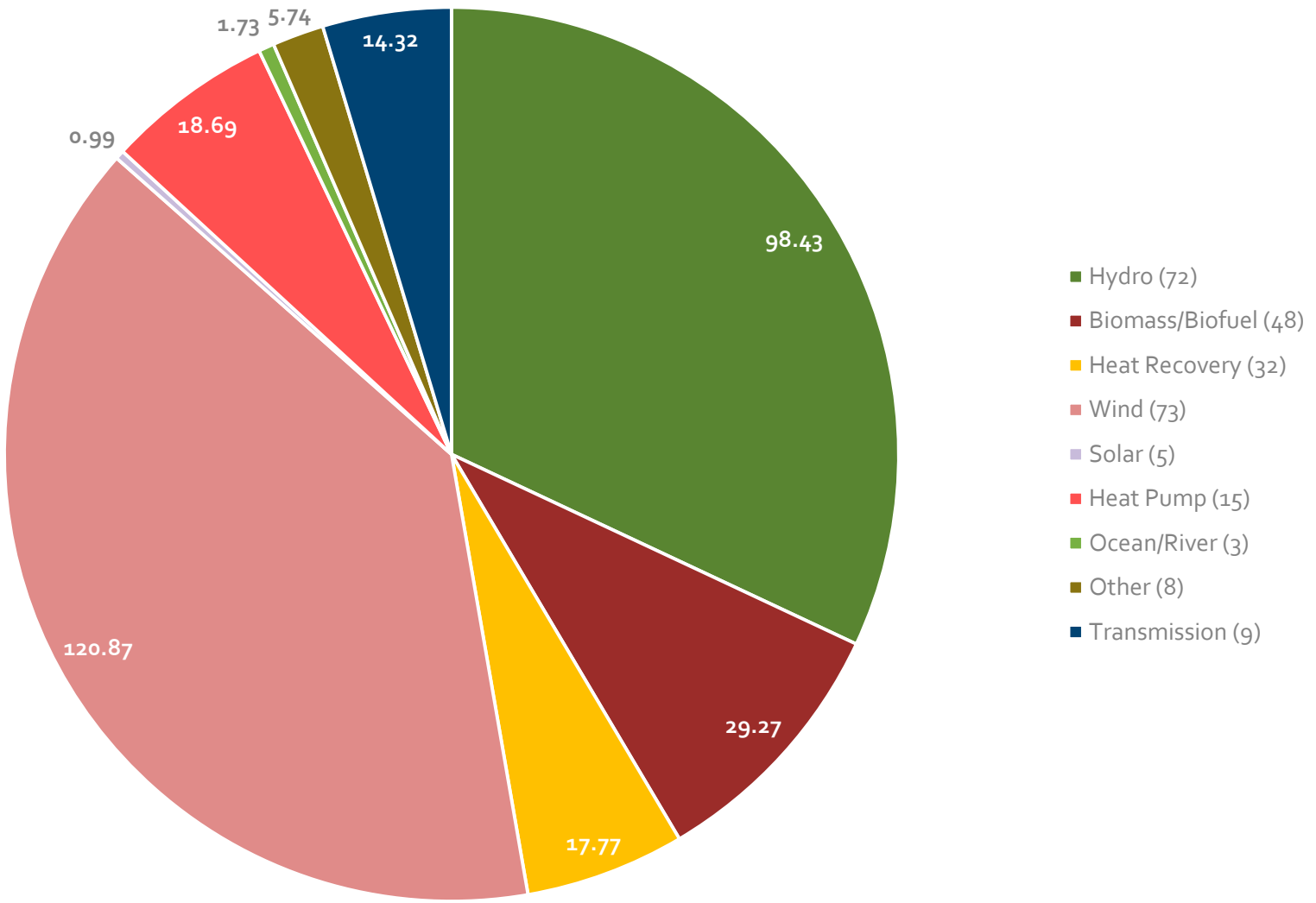
Round I-VII Funded Projects by Energy Source (Million $'s)



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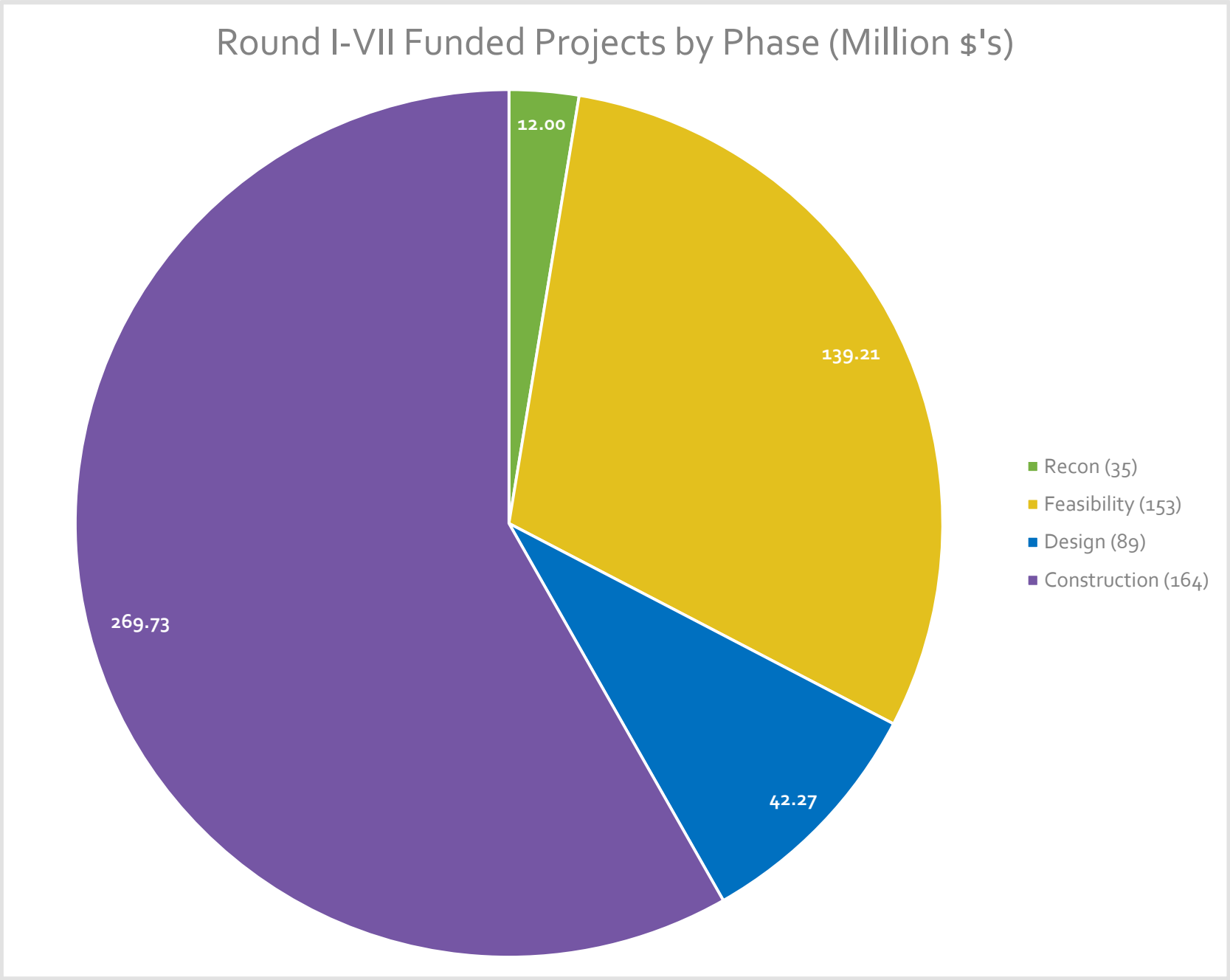

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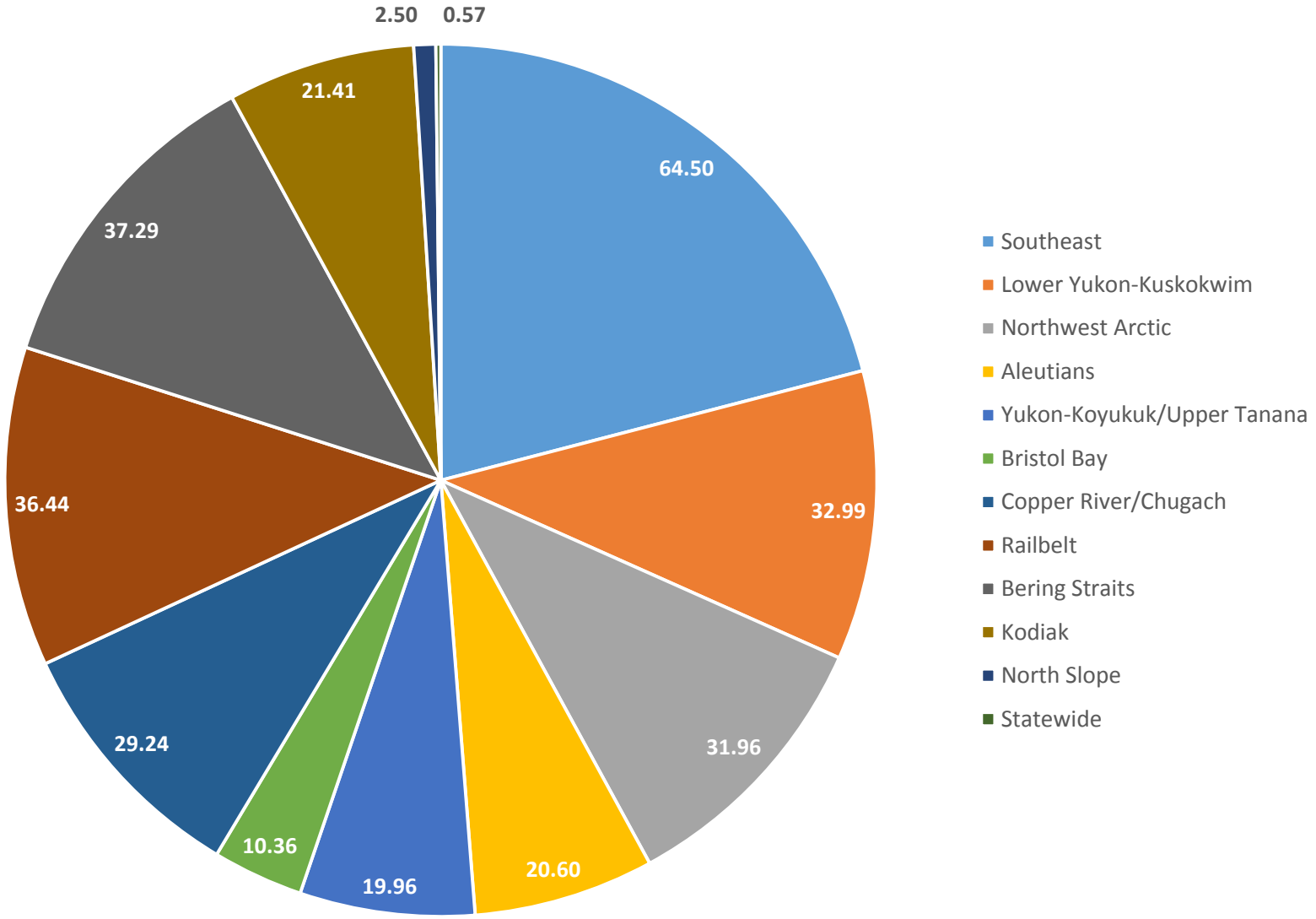
Round I-VII Funded Projects by Region (Millions $)



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Juneau Airport Ground Source Heat Pump

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Unalakleet Wind

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Humpback Creek Hydro, Cordova

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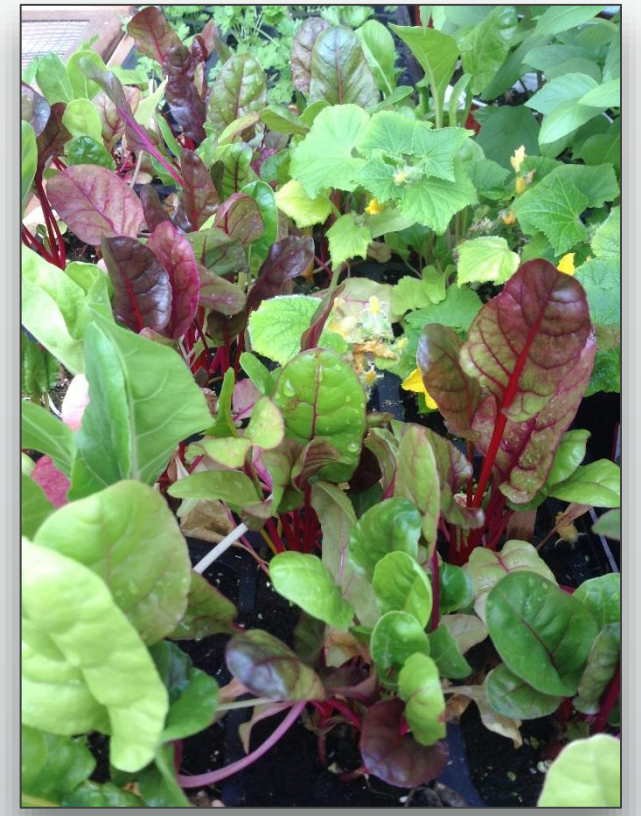
Thorne Bay School
Biomass and Greenhouse



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Akutan Geothermal Exploration

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Fire Island Wind, Anchorage

REF Impacts in Alaska

- The state's investment in renewable energy has significantly impacted the rate of adoption of renewables
- Investment in early stages of project development helps leverage private investment in construction phase
- The program helps communities lower and stabilize energy costs
- Alaskans know how to implement RE much more effectively
- Public learning is implemented through vetting process
- The momentum is strong, good state-wide support
- Larger emphasis on heating projects in recent years

ALASKA ENERGY AUTHORITY

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Kodiak Electric Association, Inc. CESA Slice Award Presentation

Darron Scott

President/CEO

Kodiak, Alaska

The Emerald Isle

- Island wide population (includes Port Lions, Ouzinkie, Larsen Bay, Karluk, Old Harbor and Akhiok) is nearly 14,000; with 11,000 on the Kodiak road system.
- Home to the nation's largest US Coast Guard Base.
- The fishing port is the largest in the state of Alaska, and ranks among the top in the country.
- Second largest island in the entire United States.
- Home to approximately 3,000 Brown Bears.

Kodiak Electric Association, Inc.

- Energized in 1941
- About 4000 Members
- About 6000 Meters
- 377 Miles of Line
- Hydro, Wind and Diesel
- System peak: 27,800 kWh

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KODIAK ELECTRIC ASSOCIATION

Vision Statement

Kodiak Electric Association, Inc. shall endeavor to produce 95% of energy sales with cost effective renewable power solutions by the year 2020.

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Our Plan Has Come Together

Total of Six 1.5MW Wind Turbines
BESS - bridge between wind and water
Third 10MW Hydroelectric Turbine

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Pillar Mountain 2009

- **Wind Power from 2009 – 2012**
  - **47,925,828 kwh's**

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Pillar Mountain Wind (9MW)

- **Wind Power from 2013-Present**
  - **49,610,391 kwh's**

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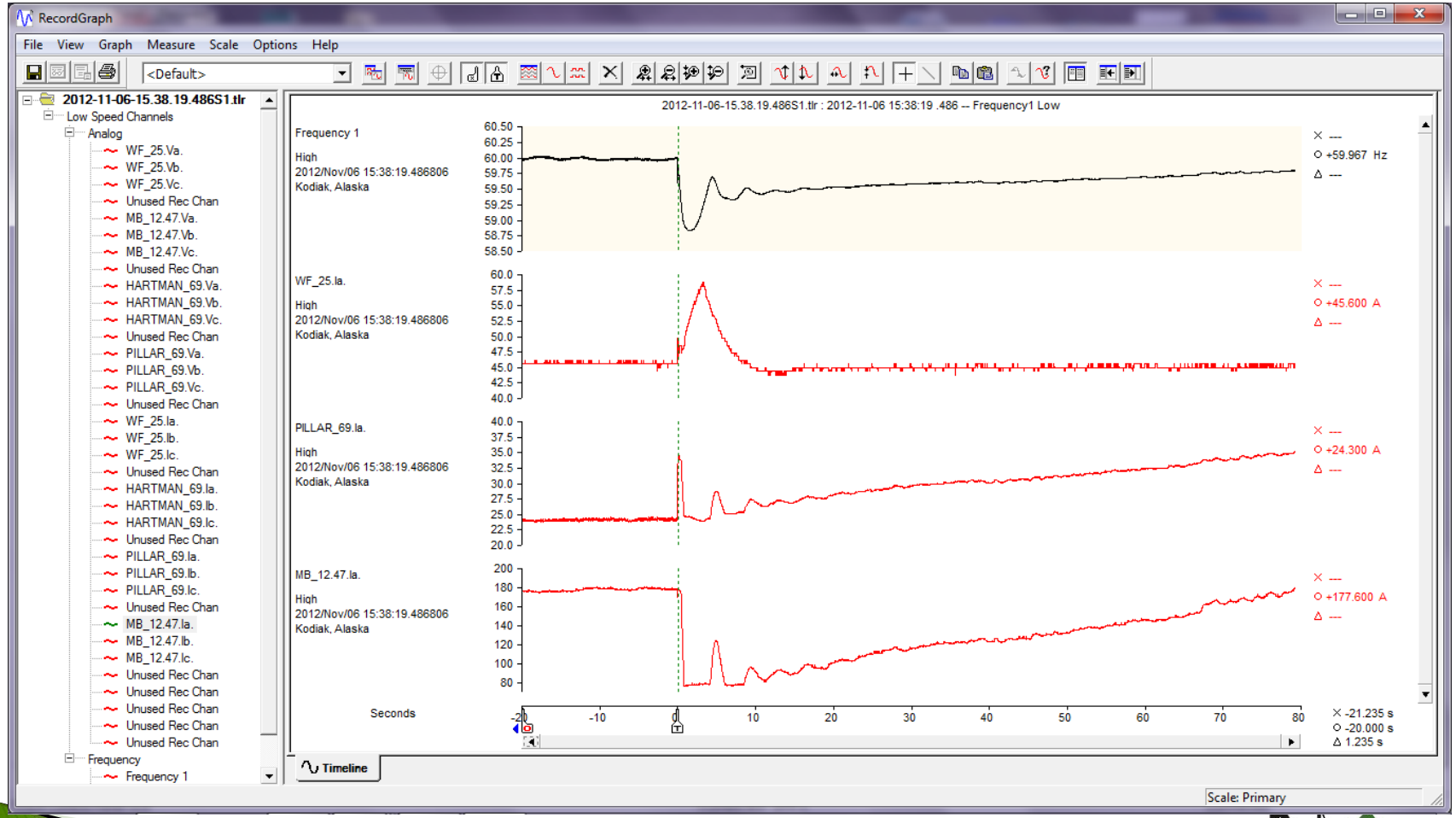
Battery Energy Storage System 2012



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Terror Lake Third Hydroturbine 2014

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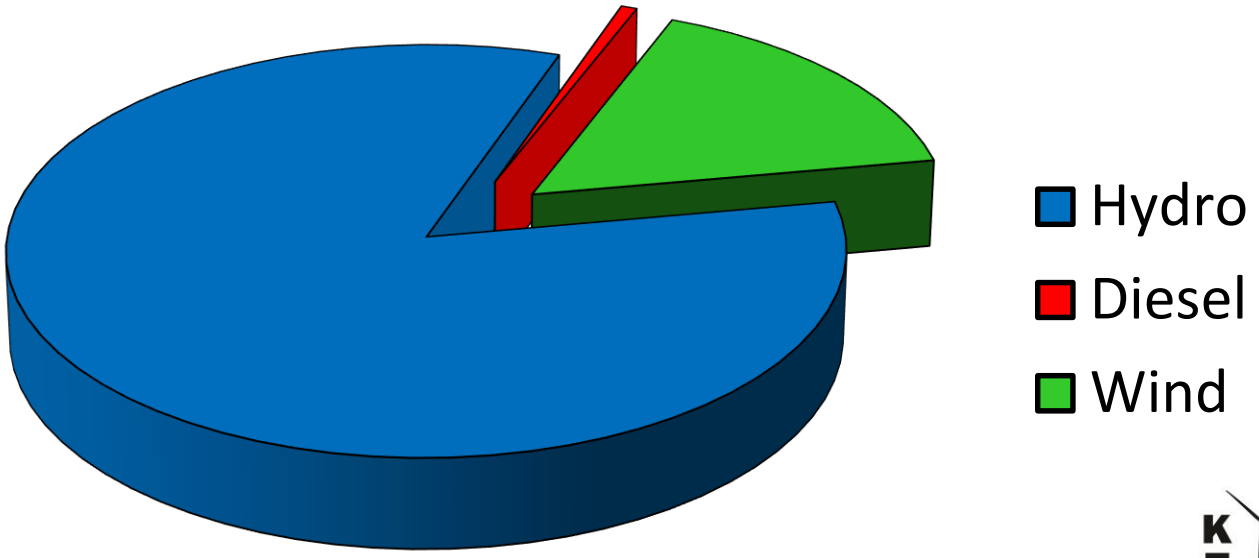
Renewable Generation

- 2014 = **99.7%**



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How Well It's Working

Emission Savings

- 6,873,493 Gallons of Diesels
- 77,743 tons of GHG (equivalent to taking 14,848 cars off the road)
- About 2.2 million tons of Nox (Smog)
- 86 tons of Carbon Monoxide
- 47 tons of Particulate Matter (soot)
- 43 tons of Volatile Organic Compounds (VOCs)

iStockphoto/Dino Ablakovic

KODIAK'S COST OF POWER… HOW ARE WE DOING?

Residential Electric Energy (January 2001 Compared to January 2015):

2001 (600 kWh) = $105.54

2015 (600 kWh) = $102.89

14 Years = 2.5% Lower

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Future Projects

New Renewable Power Sources

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Vision Statement

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Putting Waste to Work in Oregon

Focus → Gresham wastewater treatment plant's journey to net zero

January 23, 2015 - Dave Moldal, Renewable Energy Project Manager

Energy Trust of Oregon

About

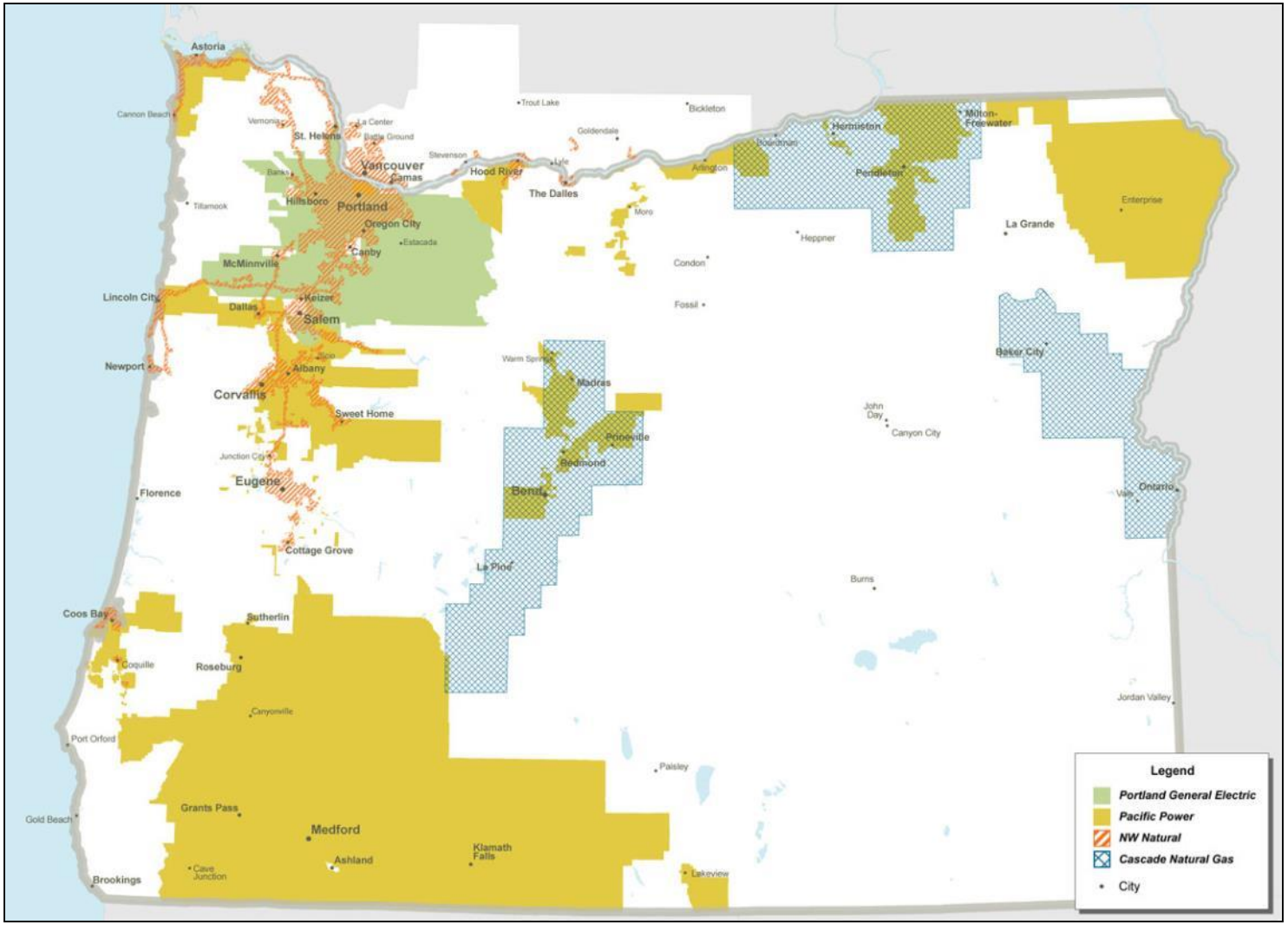
- Independent nonprofit
- Serving 1.5 million customers of Portland General Electric, Pacific Power, NW Natural and Cascade Natural Gas
- Providing access to affordable energy
- Generating homegrown, renewable power
- Building a stronger Oregon and SW Washington

Purpose

Stable, dedicated funding to provide comprehensive, sustainable energy efficiency, conservation and renewable energy solutions to all customers we serve.

1. **Deliver least-cost energy efficiency**
2. **Lower above-market costs for new renewable energy projects**
3. **Transform markets to higher efficiency products and practices**

Energy Trust service territory

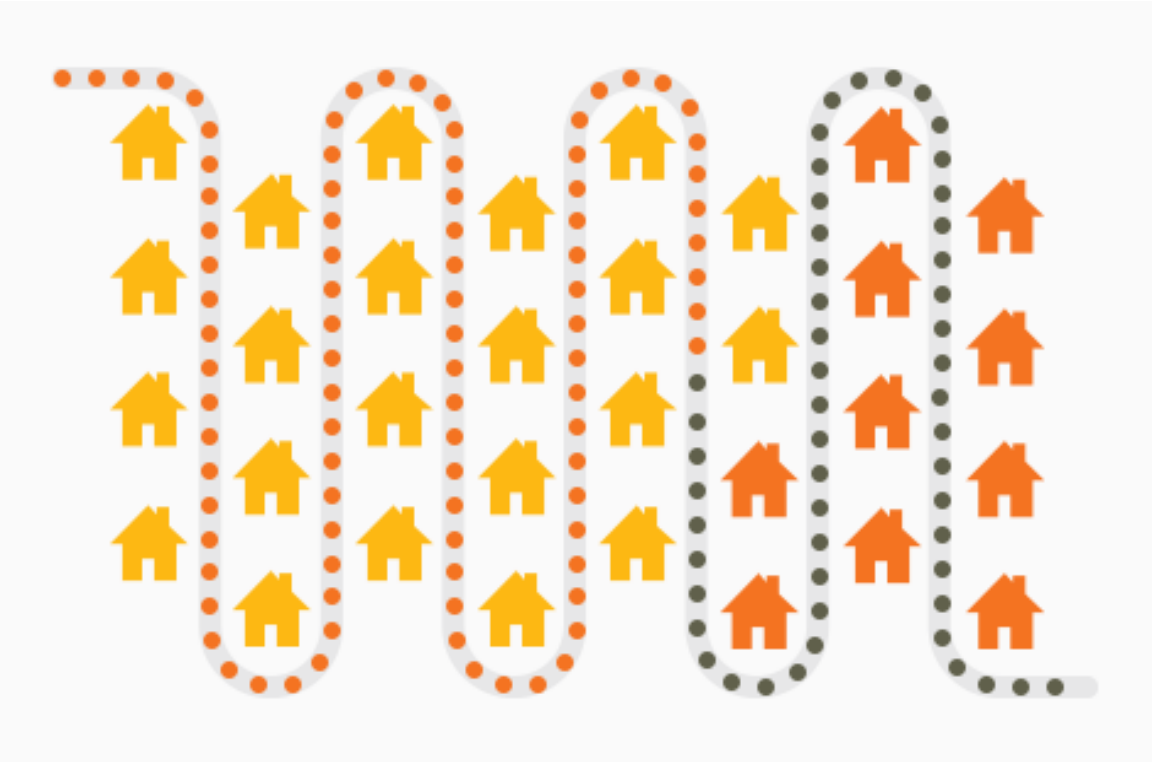


What We Provide

1. Information – What can I do to save energy and use renewable energy in my home or business?

2. Expertise – What technical assistance and objective advice can I get?

3. Dollars – What financial incentives and rebates are available?



A clean energy power plant

- 368 average megawatts saved
- 110 aMW generated
- 28.2 million annual therms saved
- Enough energy to power 370,000 homes and heat 55,000 homes for a year
- Avoided 8.4 million tons of carbon dioxide

Biopower program focus

Extracting energy from waste streams as part of a larger process of improved practices in waste management.

- Wastewater Treatment Plants
- Agricultural operations (e.g. dairies)
- Food processing facilities (e.g. breweries)
- Post consumer food waste

Energy Trust Support for Biogas Energy Projects

WWTPs (5,096 kW)

- Gresham (2), Portland-Columbia, Medford, Pendleton, Clean Water Services (Durham)
  - ➢ 36,155 MWhs / yr.
- Incentives = $4.67MM

Dairy Digesters (1,285 kW)

- Three operating projects
  - ➢ 9,245 MWhs / yr.
- Incentives = $1.88 MM

Food Waste (3,150 kW)

- Two operating projects
  - ➢ 17,900 MWhs / yr.
- Incentives = $2.83 MM

JC Bio Open House
September, 2013
Junction City, Oregon.

Biopower Incentives

Project Development Assistance – grant writing assistance, feasibility studies, final design, permitting, utility interconnection, construction management…

Incentive payments up to 100% of the above market cost of the renewable energy resource

Biopower Opportunities

Challenging biogas to renewable electricity market fundamentals

- Low avoided (wholesale) power rates
- Dwindling state and federal tax incentives
- Competition from transport fuels initiatives

Biopower focus → WWTPs

- Project Development Assistance
- Lower O&M costs; existing project optimization
- Identify other sources of co-digestible feedstocks (secure tipping fees, increased biogas volume…)

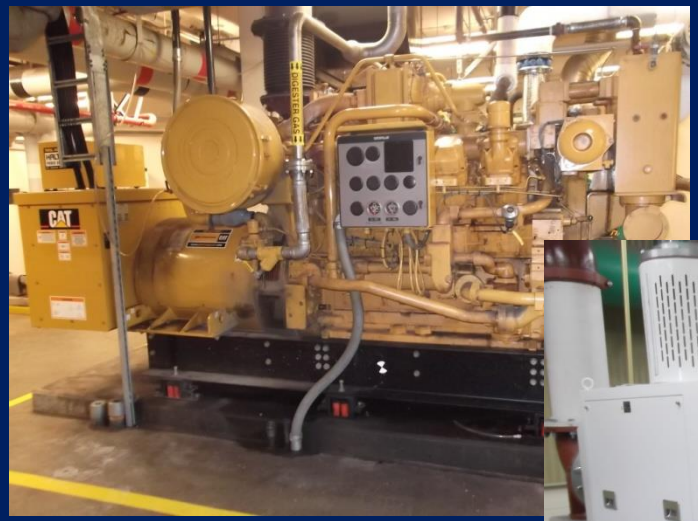
Gresham's WWTP Journey to Net Zero

- Energy Trust's first biopower incentive (2005) – cogen engine
- Project development assistance
- Incentives for energy efficiency measures
- Incentive for 420 kW (DC) solar array
- Incentive for FOG receiving phase II and cogen expansion

Anaerobic Digestion Case Study: *Putting Waste to Work in Oregon*

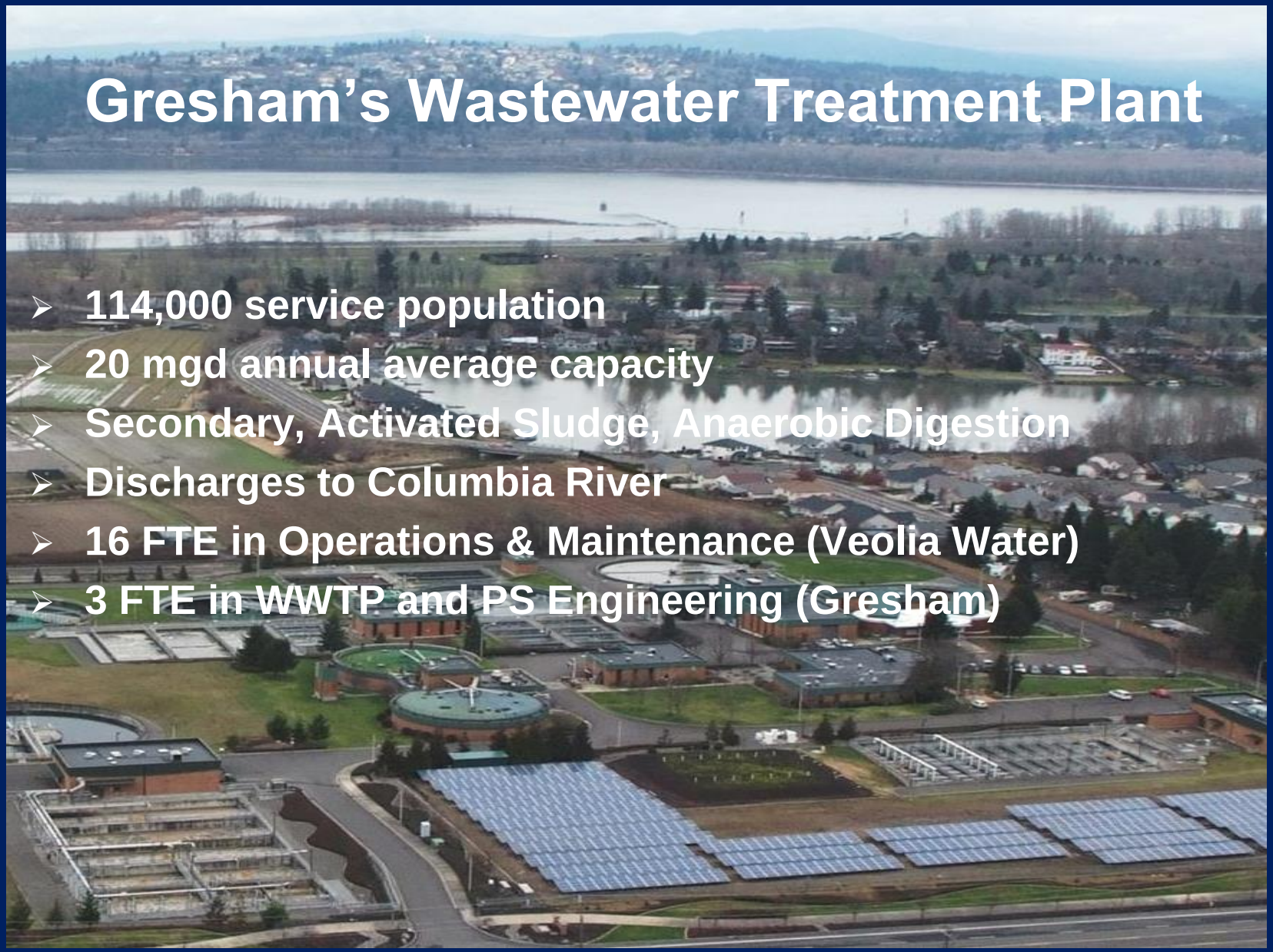
→ http://energytrust.org/renewable-energy/

Update on the Gresham WWTP Energy Net-Zero Journey



Alan Johnston, Senior Engineer, Wastewater Services Division

Gresham's Wastewater Treatment Plant



- 114,000 service population
- 20 mgd annual average capacity
- Secondary, Activated Sludge, Anaerobic Digestion
- Discharges to Columbia River
- 16 FTE in Operations & Maintenance (Veolia Water)
- 3 FTE in WWTP and PS Engineering (Gresham)

City of Gresham WWTP

Energy Net-Zero Milestones

- 2005 400 kw Cogenerator Installed with Biogas Treatment
- 2008 ACWA / Energy Trust Energy Independence Study
- 2009 City of Gresham Sustainability Policy Adopted
- 2009 FOG Feasibility Study
- 2010 Formal Monthly Energy Management Team Kickoff
- 2010 420 kw Peak Ground Mount Solar Installed
- 2011 Energy Projects included in WWTP Master Plan
- 2012 FOG Receiving Station Phase 1
- 2013 Large Energy Conservation Project
- 2014 FOG Receiving Station Phase 2A expansion
- 2015 Cogeneration Phase 2B Expansion (under construction)
- 2015 Lofty Goal: Energy Net-Zero by 2015/16?

400 kw CAT Cogenerator (Installed 2005)

City of Gresham WWTP

Cogeneration by the Numbers

- 93% Runtime since 2005 (off about 48 hours per month)
- Produces power and heats buildings with jacket water heat
- 72,000+ Operating Hours
- 26,000,000+ kwh of power production
- 2.6 cents per kwh operation/maintenance expenses
- 50% of WWTP Power needs
- $250,000 in annual avoided electrical costs.
- 3.5 year payback

Kennedy/Jenks Consultants

Engineers & Scientists

Energy Independence Project

A Project for

Oregon Association of Clean Water Agencies

and

The Energy Trust of Oregon

Prepared by

Kennedy/Jenks Consultants

June 2008

General Recommendations

- Do Energy Efficiency First!
  - Most cost-effective option
  - An energy audit can help identify cost-effective EEMs
  - Install identified EEMs and seek funding $
- Resource Options
  - IC Engines are the most cost-effective and highest scoring resource option
  - Investigate a FOG and Green Waste program to enhance digester biogas supply

Gresham's Sustainability Policy
Key Goals

- 1) 80% Reduction in City Greenhouse Gas Emissions by 2050
- 2) 100% Renewable Energy by 2030
- 3) Zero Waste in City Operations by 2020
- 4) Ongoing Protection of Natural Resources (including water quality and availability, and habitat)
- 5) Toxin Reduction and Eventual Elimination

This discussion involves Goals 1 and 2 at the WWTP.

Final Report

Feasibility Study of Digester Grease/Food Waste Injection System

Wastewater Treatment Plant Process Improvements Pre-Design

Contract No. 3009

Prepared for

City of Gresham, Oregon

December 2009

Prepared by
CH2MHILL
2020 SW 4th Ave, Suite 300
Portland, OR 97201

FOG Feasibility Study Highlights

- $40,000 Grant from State Economic Development Dept.
- Adding FOG Receiving Facilities is Economically Viable
- There is a market for this service in our area
- An additional 400 kw Cogenerator is economically viable
- FOG Tipping Fee of at least 3 cents per gallon required
- Need 7,000 to 11,000 gpd of FOG
- Estimated cost of $3.7 million
- Leverage $1.5 million in potential grants
- Simple payback of 7 years

Energy Management Plan

- First written EMP and EM team developed in 2010
- Selected Energy Team Members (Management, Ops, engineering, maintenance)
- Meet Monthly for 1 hour and talk only energy
- Update and review energy production and consumption numbers every month
- Select and evaluate projects
- Stay on track!
- Assign projects to team members
- Keep Running agenda in EMP
- Update plan monthly (keep it alive!)

420 kw Solar Update

- Installation completed in Dec. 2009
- 420 kW peak capacity
- 1+ acre ground-mounted system
- Power Purchase Agreement with SunEdison in July 2009
- PGE net metering agreement
- No capital cost to City
- kwh charge 2/3 PGE rate
- Fixed annual escalation of 3%

City of Gresham WWTP

2011 Master Plan included Chapter on Energy Independence Alternatives

City of Gresham WWTP

FOG Receiving Station, Phase 1, 2012

- 10,000 gallon FOG Receiving Tank
- FOG Grinder, FOG Unload/Tank Mixing Pump and FOG Feed Pump
- FOG Heat Exchanger with Cogen Heat Loop

FOG Receiving Station, Phase 1, 2012

- Advertised a FOG Hauler RFP
- 3 FOG Haulers Contracted
- 7,500 gpd Received since 2012
- 8 cents per gallon tipping fee
- $250,000 revenues in 2014

2 Energy Efficiency Projects, 2012

- Energy Efficiency Study financed by ETO

- Replace gas mixing system (3 - 40 hp compressors)
- Install Linear Motion Mixers (LMM) for both digesters
- Each LMM consumes 5 hp
- Essentially trading 80 hp 24 hrs/day for 10 hp 24 hrs/day

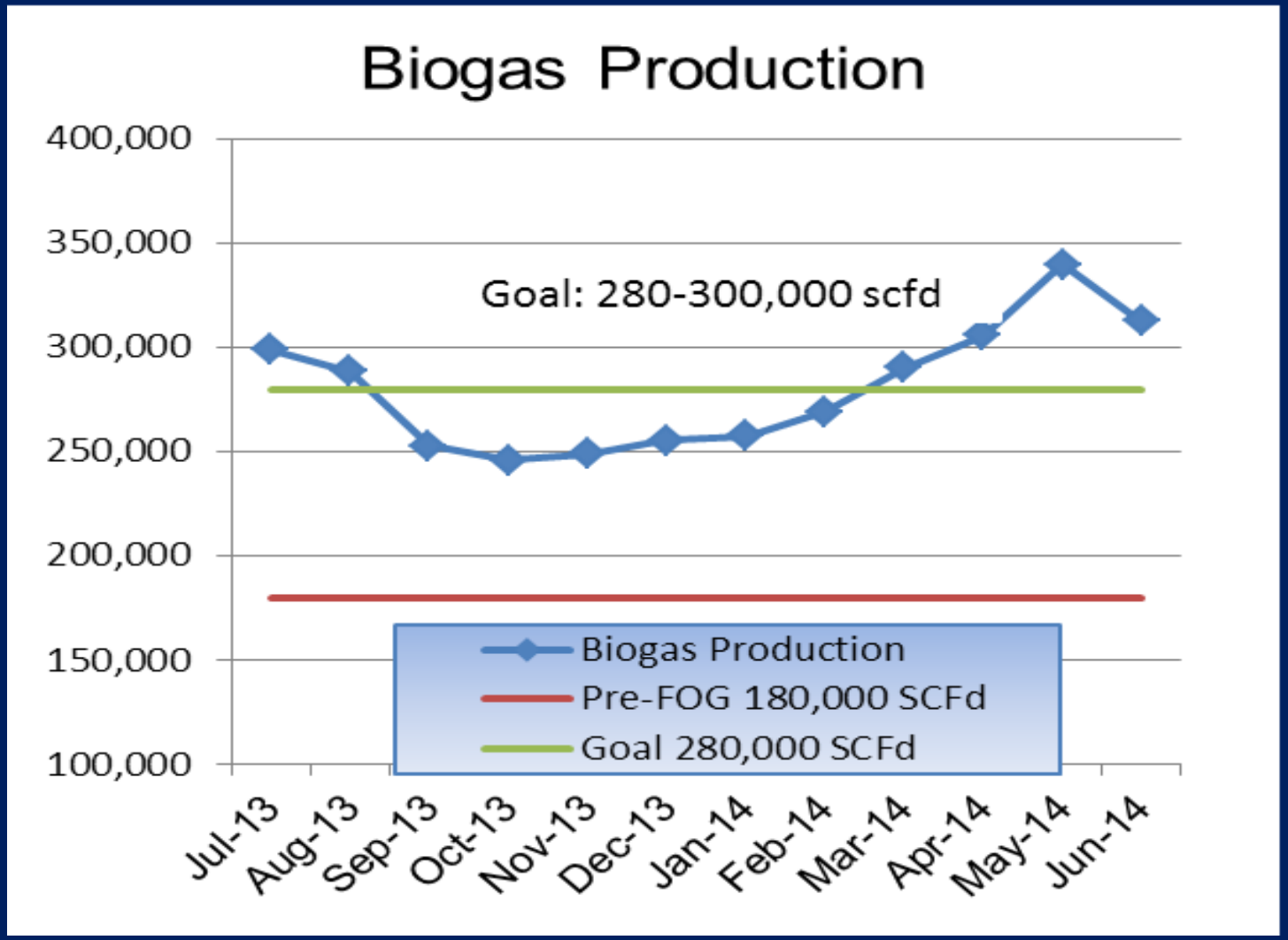
- Replace 2 Hoffman mutistage blowers (100 hp each)
- Install 2 Neuros Turbo blowers (100 hp each)
- Install fine bubble diffusers in Aeration basins

City of Gresham WWTP

FOG Receiving Station, Phase 2A, 2014

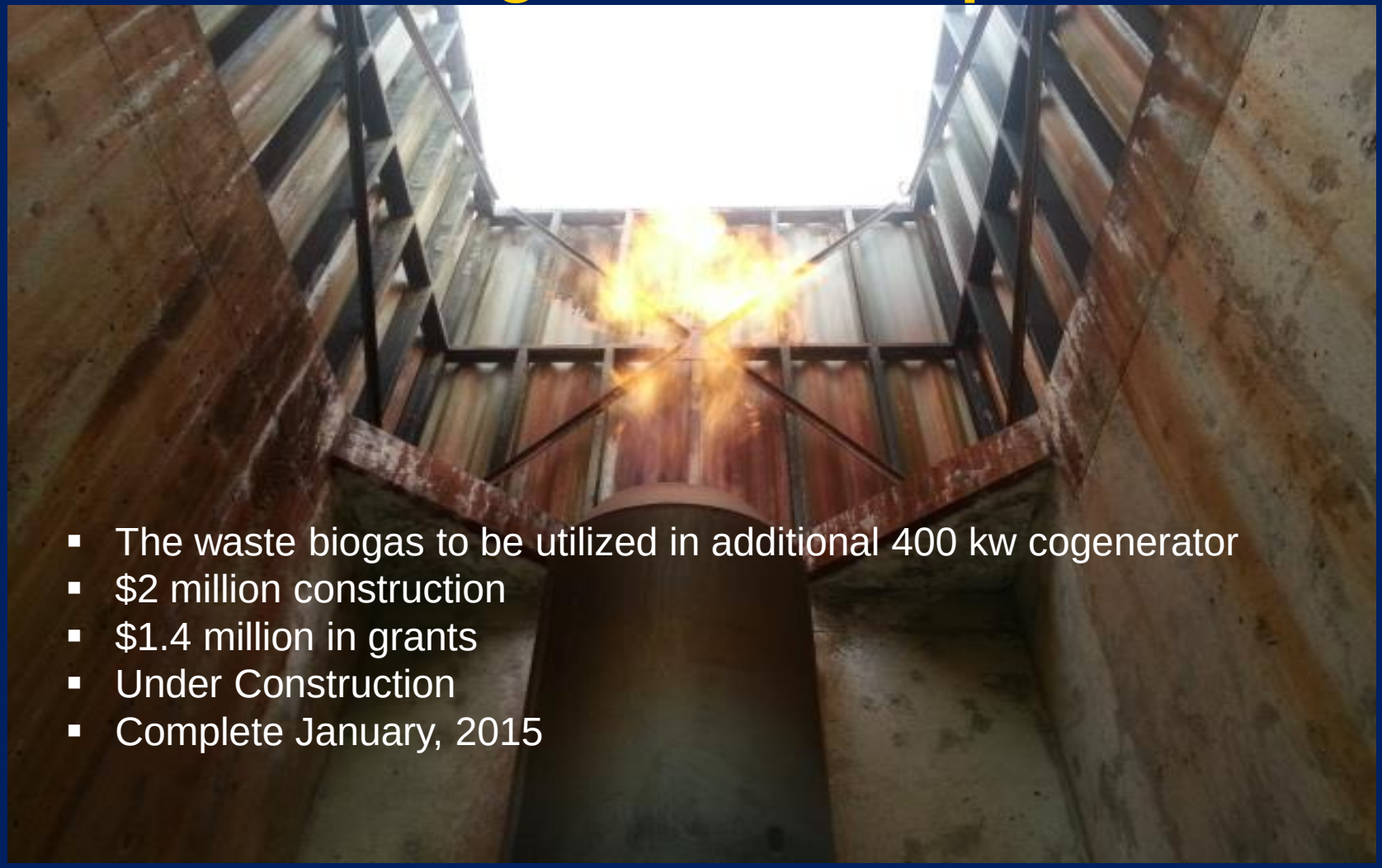
- Added 20,000 gallon receiving tank
- 30,000 gallon total capacity as of April, 2014

FOG Receiving Station, Phase 2A, 2014



- **180,000 to 300,000 SCFD Biogas Production**

FOG Phase 2B:
400 kw Cogeneration Expansion

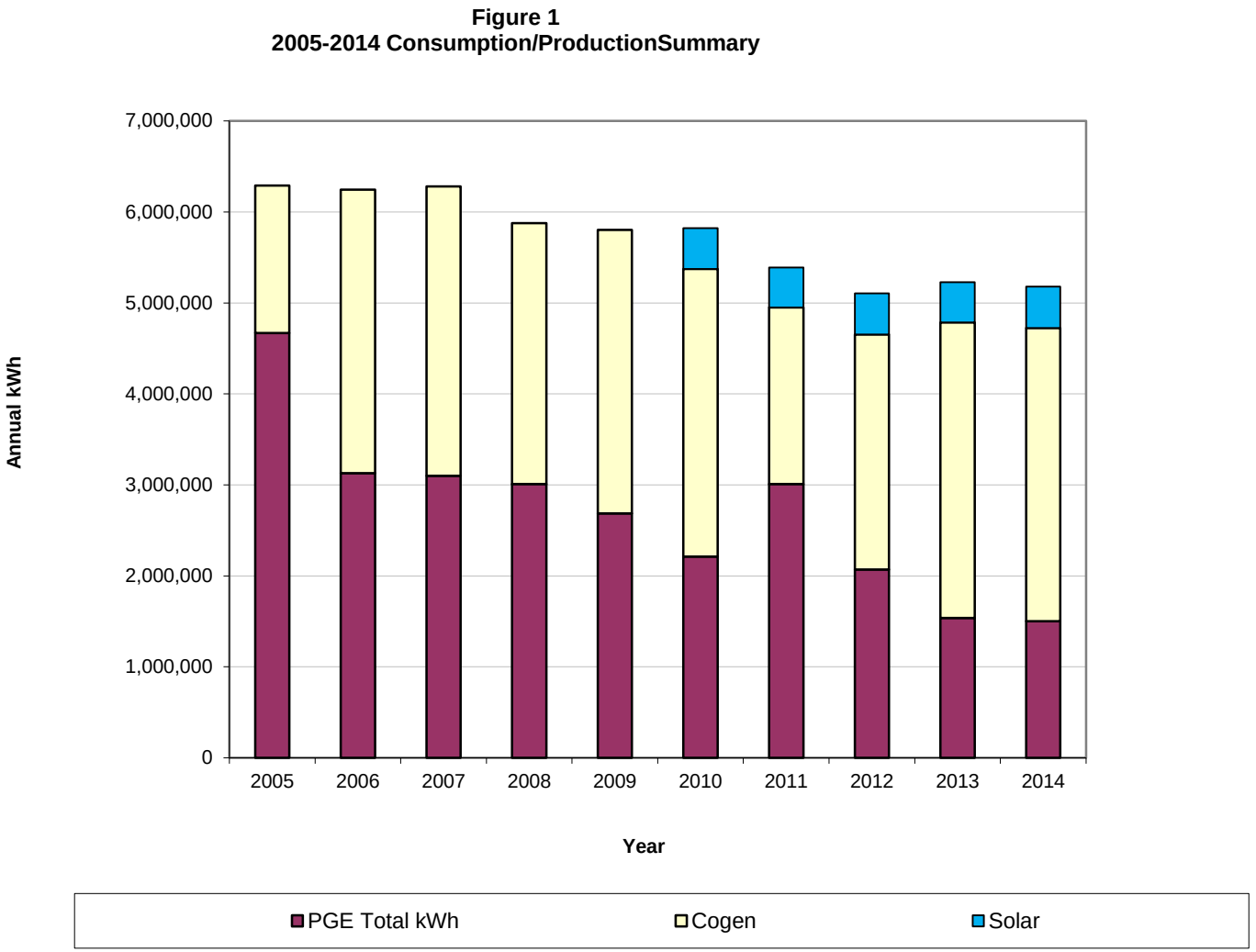


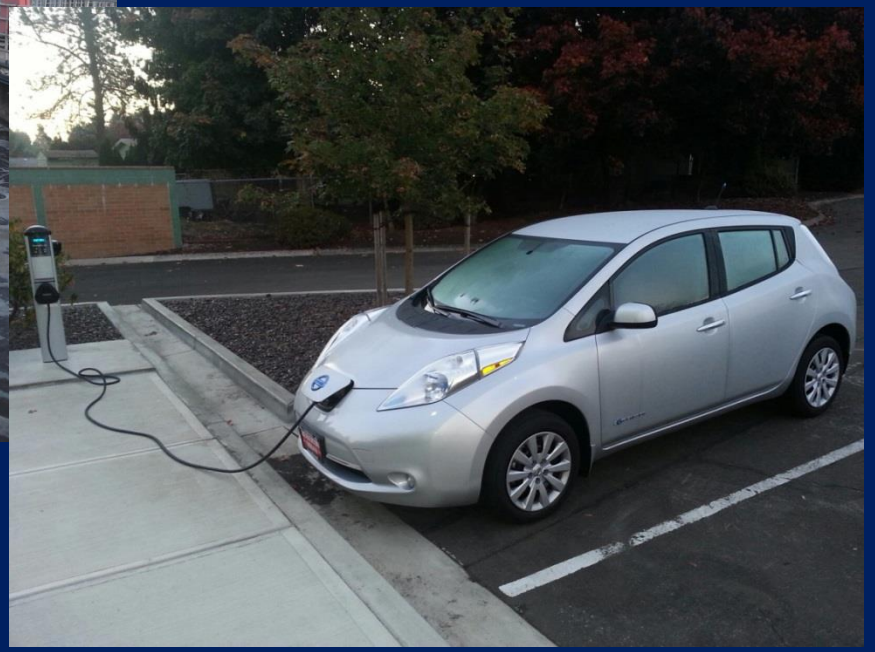
- The waste biogas to be utilized in additional 400 kw cogenerator
- $2 million construction
- $1.4 million in grants
- Under Construction
- Complete January, 2015

Energy Related Grant Summary

Project Name	CIP No.	Other	Energy Trust	State	City of Gresham	Total
2005 400 kw Cogen	313800		$82,000	$288,000	$760,000	$1,130,000
2009 420 kw DC Solar Array	N/A		$500,000	$551,303	$0	$1,051,303
2011 Process Improvements	315300	$40,000	$273,021	$220,048	$2,304,212	$2,837,281
2012 FOG Phase 1 FOG Receiving Station	318200		$40,000	$183,838	$673,331	$897,169
2013 FOG Phase 2A and 2B FOG and Cogen Expansion	318500		$330,000	$1,011,749	$1,868,387	$3,210,136
2012 Micro-Hydro	317800		$40,000		$73,448	$113,448
2012 Small Wind	318700		$9,360		$9,360	$18,720
2013 Upper aeration basin mixers (Wilo)	317400		$14,104		$14,104	$28,208
Total		$40,000	$1,288,485	$2,254,938	$5,702,842	$9,286,265
			Grant Total:	$3,583,423	38.6%	

Energy Accomplishments Since 2005





Questions?

Alan Johnston, Senior Engineer, Wastewater Services Division

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