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
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
CESA Webinar January 23, 2015
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
Most Communities Not On Road System
The Cost of Power in PCE Communities

Residential Electricity Rates in Power Cost Equalization Communities

- PCE Level
- Effective Rate

[Graph showing residential electricity rates in PCE communities with PCE Level and Effective Rate indicated.]
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
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

Renewable Energy Grant Fund

Blue Lake Hydro Expansion
Photo courtesy of City of Sitka
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
# REF Grant and Funding Summary

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<th>Totals R1-7</th>
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<td>ApplicationsReceived</td>
<td>732</td>
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<td>Applications Funded</td>
<td>277</td>
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<tr>
<td>Grants Currently in Place</td>
<td>122</td>
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<td>Amount Requested¹ ($M)</td>
<td>$1,442.3</td>
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<td>AEA Recommended ($M)</td>
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<td>Appropriated ($M)²</td>
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<td>Match Budgeted ($M)³</td>
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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: Annual Fuel Savings

The chart illustrates the annual fuel savings in million gallons diesel equivalent from 2009 to 2016. The savings are categorized into different types of renewable energy sources:

- **Landfill Gas**
- **Biomass**
- **Heat Pumps**
- **Heat Recovery**
- **Hydro**
- **Solar**
- **Transmission**
- **Wind**

The data shows a significant increase in projected savings from 2014 to 2016 compared to the actual savings from 2009 to 2012.
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
Round I-VII Funded Projects by Energy Source (Million $'s)

- Hydro (72)
- Biomass/Biofuel (48)
- Heat Recovery (32)
- Wind (73)
- Solar (5)
- Heat Pump (15)
- Ocean/River (3)
- Other (8)
- Transmission (9)
Round I-VII Funded Projects by Phase (Million $'s)

- Recon (35): 12.00 million dollars
- Feasibility (153): 139.21 million dollars
- Design (89): 42.27 million dollars
- Construction (164): 269.73 million dollars

Total: 620.25 million dollars
Round I-VII Funded Projects by Region (Millions $)

- **Southeast**: 64.50
- **Lower Yukon-Kuskokwim**: 21.41
- **Northwest Arctic**: 37.29
- **Aleutians**: 36.44
- **Yukon-Koyukuk/Upper Tanana**: 32.99
- **Bristol Bay**: 31.96
- **Copper River/Chugach**: 29.24
- **Railbelt**: 20.00
- **Bering Straits**: 19.96
- **Kodiak**: 10.36
- **North Slope**: 7.50
- **Statewide**: 2.50

- **Total**: 230.50
Juneau Airport Ground Source Heat Pump
Unalakleet Wind
Humpback Creek Hydro, Cordova
Thorne Bay School
Biomass and Greenhouse
Akutan Geothermal Exploration
Fire Island Wind, Anchorage

Photo Courtesy of Chuck Berray
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
Sean Skaling
Programs and Evaluation Director
sskaling@aidea.org
(907) 771-3000
AKEnergyAuthority.org
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
Vision Statement

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

Total of Six 1.5MW Wind Turbines
BESS - bridge between wind and water
Third 10MW Hydroelectric Turbine
Pillar Mountain 2009

- Wind Power from 2009 – 2012
  - 47,925,828 kwh’s
Pillar Mountain Wind (9MW)

- Wind Power from 2013-Present
  - 49,610,391 kwh’s
Terror Lake Third Hydroturbine
2014
Renewable Generation

2014 = 99.7%
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)
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
Future Projects

New Renewable Power Sources
Vision Statement

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

Update on the Gresham WWTP
Energy Net-Zero Journey

Alan Johnston, Senior Engineer, Wastewater Services Division

City of Gresham WWTP
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)
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)
400 kw CAT Cogenerator (Installed 2005)
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
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
CH2M HILL
2020 SW 4th Ave, Suite 300
Portland, OR 97201
$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%
2011 Master Plan included Chapter on Energy Independence Alternatives
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

City of Gresham WWTP
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 multistage blowers (100 hp each)
- Install 2 Neuros Turbo blowers (100 hp each)
- Install fine bubble diffusers in Aeration basins
Added 20,000 gallon receiving tank
30,000 gallon total capacity as of April, 2014

City of Gresham WWTP
FOG Receiving Station, Phase 2A, 2014

- 180,000 to 300,000 SCFD Biogas Production

City of Gresham WWTP
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

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<th>Project Name</th>
<th>CIP No.</th>
<th>Other</th>
<th>Energy Trust</th>
<th>State</th>
<th>City of Gresham</th>
<th>Total</th>
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<td>2005 400 kw Cogen</td>
<td>313800</td>
<td>$82,000</td>
<td>$288,000</td>
<td>$760,000</td>
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<td>2009 420 kw DC Solar Array</td>
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<td>2011 Process Improvements</td>
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<td>2012 FOG Phase 1</td>
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<td>FOG Receiving Station</td>
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<td>2013 FOG Phase 2A and 2B</td>
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<td>FOG and Cogen Expansion</td>
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<td>2012 Micro-Hydro</td>
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<td>$73,448</td>
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<td>2012 Small Wind</td>
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<td>2013 Upper aeration basin mixers (Wilo)</td>
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<td>Total</td>
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<td>$40,000</td>
<td>$1,288,485</td>
<td>$2,254,938</td>
<td>$5,702,842</td>
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Grant Total: $3,583,423 38.6%
Energy Accomplishments Since 2005

Figure 1
2005-2014 Consumption/Production Summary

PGE Total kWh
Cogen
Solar
Questions?

Alan Johnston, Senior Engineer, Wastewater Services Division
Thank you for attending our webinar

Find CESA online:

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@CESA_news on Twitter

More information about the 2014 State Leadership in Clean Energy Awards, including case studies about the winning programs and recordings of previous webinars, is available on our website: