


City of Gresham, Oregon

## Energy Independence Initiatives at Gresham's Wastewater Treatment Plant (WWTP)

### **ACWA Annual Conference 2008**

Mt. Bachelor Village, Bend, OR


July 24, 2008



City of Gresham, Oregon

### What We're Up To

- Energy conservation – lighting, pumps/motors, procedure revisions, etc.
- Co-generator (heat and electricity) utilizing biogas
- Negotiating a solar PPA for ~0.4 mW PV installation
- Feasibility/Pre-design Analysis for micro-hydro installation
- Participated in ACWA "Energy Independence" Project
- Applied for ODOE grant (feasibility study) to evaluate additional biogas production from FOG/food waste (i.e. from grease interceptors/traps) injected into anaerobic digesters




City of Gresham, Oregon

### Energy Conservation & "Green" Efforts at Gresham WWTP:

Some Examples:


- Replaced Magnetic T12 ballasts with electronic T8 ballasts
- Replaced all magnetic drives with electronic variable frequency drives
- Replace motors as they wear out with super efficiency motors
- Specify high efficiency heating, lighting, pumps and motors in all design projects
- Participate in PGE's "Clean Wind" Program



City of Gresham, Oregon

### The Gresham Co-generator Experience:

- Engine Performance/Operation
  - Old engine down 41% of the time during the final 5 years
  - New system down < 5% since going on-line in November of 2005 (96.5% "Up Time" since start-up)
  - Manufacturer discontinued replacement parts
- Gas production exceeded engine capacity
  - Old 250-kW engine used 5844 scf @ 211 kW, on average
  - New 395-kW generator uses 7000 scf @ 380 kW, on average
- City's first Design-Build contract
  - Allowed start-up 6-8 months earlier than possible with conventional design-bid-build (resulting in >\$100k in energy production and savings)
- The "co-generator" produces electricity and heat
  - The power has provided 50.8% of the plant's electricity since start-up
  - The heat warms the plant's digester, which must maintain a temperature of about 93° F, and also provides space heat for buildings
- A small volume of unused gas is "flared" at the plant's open flame enclosure (~2%)



City of Gresham, Oregon

### The Economics:


Cost breakdown (\$)

|                                     |                  |
|-------------------------------------|------------------|
| Design-Build Contract               | 1,119,045        |
| Project Admin & overhead            | 197,443          |
| Permits/Inspection                  | 24,009           |
| Other (substation relay upgrade)    | 11,708           |
| Energy Trust of Oregon grant        | (82,379)         |
| Bus. energy tax credit pass-through | <u>(287,801)</u> |
| <b>Total</b>                        | <b>982,094</b>   |

- Total energy produced since start-up\* = 8,307 million kWh
- Equivalent cost of energy produced since start-up\* = \$ 664,560.00
- Operation and maintenance costs for co-generator and gas treatment systems = \$ 0.015/kWh
- Anticipated break-even date:\*\*
  - January 2011

\* As of June 30, 2008 (@ \$0.08/kWh, Gresham "blended rate")

\*\* Capital Costs less Energy Trust grant and BETC pass-thru, plus operational costs (media change outs, parts, Vesicle and Filter costs, etc.) equal Energy Production equivalent (based on observed anticipated co-generator performance).



City of Gresham, Oregon

### Other Benefits with Cogenerator

- Good public relations outreach (i.e. half the WWTP energy demand met by co-gen.)
- Very favorable with policy makers (i.e. City Council)
- Help to demonstrate effective utility management (i.e. lowest life-cycle costs for services) and "walking the talk"
- High "cool" quotient
- Major contributor to helping our WWTP become energy independent (i.e. achieving 100% of energy needs through renewable sources)
- Link to Energy Trust of Oregon case-study:
  - [http://www.energytrust.org/library/case\\_studies/GreshamWastewater\\_CS.pdf](http://www.energytrust.org/library/case_studies/GreshamWastewater_CS.pdf)



What's Ahead:

- Implement recommendations from ACWA Energy Independence Study as opportunities become available:
  - Reduce non-potable water system pressure (implemented in June 2008)
  - Install premium efficient motors on 4 (of 6) aeration blowers – lower plant
  - Replace bubble sock diffusers with fine bubble diffusers – lower plant
- Follow-up on FOG/food waste to energy opportunities (i.e. feasibility study)
- Install micro-hydro installation at WWTP outfall (if R.O.I. is justifiable)
- Consider future additional PV facilities at WWTP



Questions?



Thank You!

Guy R. Graham, P.E.  
Wastewater Services Division Manager  
City of Gresham, Department of Environmental Services  
503-618-2438 (voice)  
guy.graham@ci.gresham.or.us (e-mail)