

**INLAND EMPIRE UTILITIES AGENCY**

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***Regional Wastewater Reclamation  
Facility No. 5 Renewable Energy  
Efficiency Project  
Case Study***

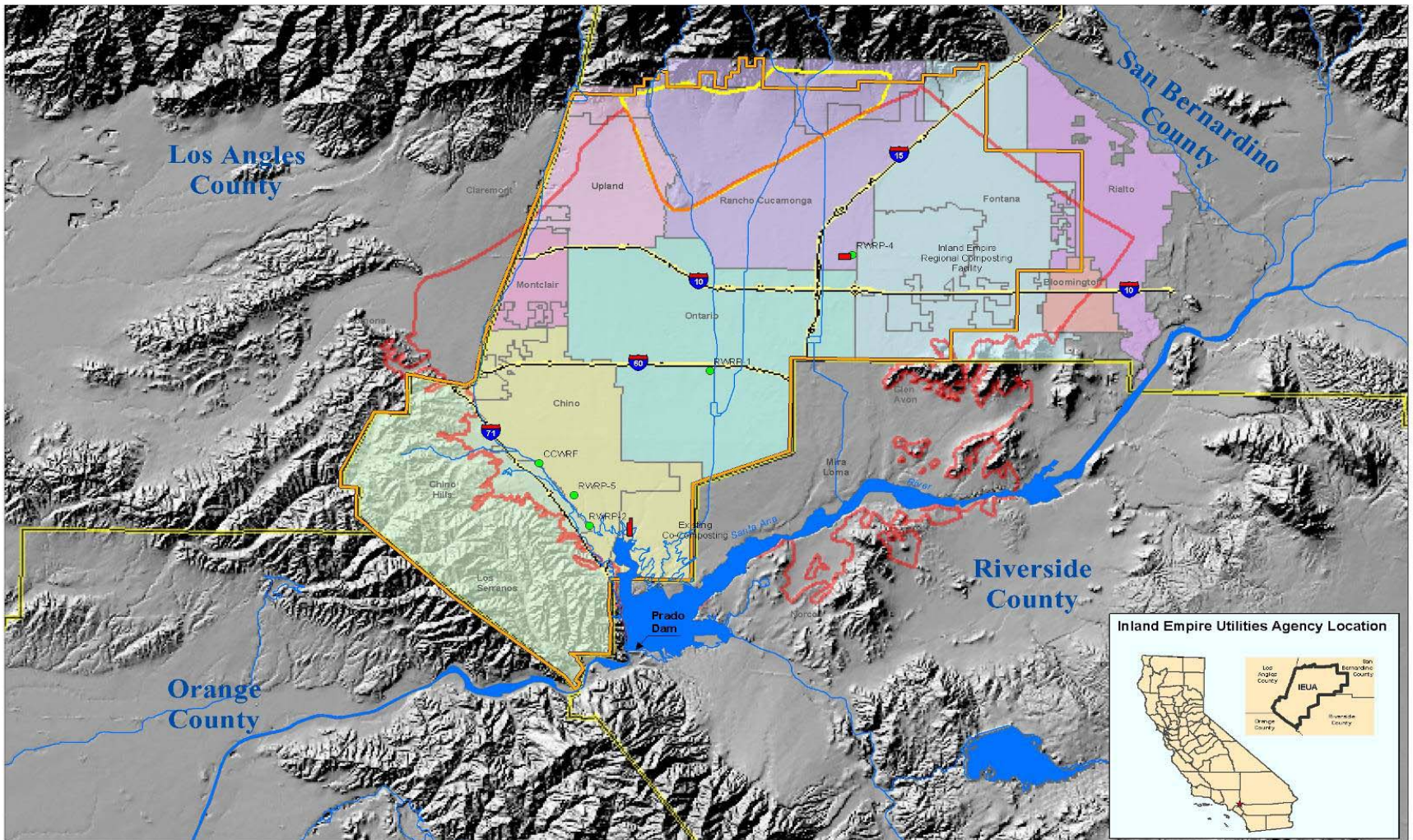
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*Clean Fuels for Southern California Conference*

*September 19, 2006*

# IEUA'S SERVICE AREA IN CALIFORNIA



Regional wholesale distributed water and wastewater treatment for 7 cities, 2 water districts, and 2 water companies

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# IEUA Profile

- *Municipal Water District in Southern California serving 242 square miles of the Chino Basin in the western portion of San Bernardino County*
  - Regional wastewater service provider and distributor of wholesale water and recycled water
    - Regional wastewater sewer interceptors
    - Two non-reclaimable wastewater sewer pipeline systems
    - Five regional wastewater treatment plants (current flow 61 mgd)
    - Biosolids management and composting
    - Sales of recycled water, compost and renewable energy
  - High urban growth – Inland Empire one of the most rapidly growing regions in the State
    - Annual population growth between 1990 and 2000 > 3% per year
    - Conversion of agricultural lands to urban use will increase municipal and industrial demand for water
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# Energy and Water Challenges Facing IEUA

- Over the next twenty years:
  - Population within the service area will grow by 40%
    - 800,000 people in 2006 to over 1.1 million people
  - Retail water needed to serve growth is expected to increase
    - Conservation
    - Recycled water 8,000 AF to 95,000 AF
    - Groundwater production increase from 180,000 AF to 220,000 AF
  - Wastewater treatment needs will almost double
    - 60 million gallons per day to 100 million gallons per day

***IEUA's electric demand to provide core services (wastewater treatment, recycled water distribution, composting, provision of power for groundwater desalination) is projected to double ( from 7 MW to 15 MW) within the next five years!!***

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# IEUA'S EXPANDING ENERGY PROJECT PORTFOLIO

- Of current energy needs of 7 MW, IEUA is self-generating about 5 MW – recognized in July 2006 by the U.S. Environmental Protection Agency as one of the nation's top ten local government “purchasers” of renewable energy from its own facilities
  
  - Core Projects:
    - “Cow Power” Anaerobic Digester Program: 3 MW by 2007 (Partners include California Energy Commission, USDA Natural Resources Conservation Service and the Milk Producers Council)
  
    - Renewable Energy Efficiency Project: achieve minimum 65% generation efficiency by combining innovative processes including a Stirling Engine, Organic Rankine Cycle Unit, thermal energy storage and a fuel cell (Partners included the U.S. Department of Energy)
  
    - Biogas Innovation Program
      - Three-Phase Thermophilic Digestion
      - Food Waste Additions
      - Flared Biogas Recovery (fuel cells)
      - Gassifier with or without production of liquefied biofuel
      - Digester Optimization
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# IEUA'S EXPANDING ENERGY PROJECT PORTFOLIO

## ■ IEUA's Energy Load

- CURRENT: 10 MW (Average) / 13 MW (Peak)
  - Annual energy budget is over \$6 million
- FUTURE: 180% load increase by 2010
  - Increased wastewater treatment
  - Composting
  - Recycled water pumping

## ■ Energy Costs

- Significant increase over next five (5) years
- Current California increases
  - Electricity: **25%**
  - Natural Gas: **50%**

## ■ IEUA Self-Generation

- **43%** of IEUA electricity
- **64%** of IEUA gas used for power production
- Estimated Annual Savings = **\$1.2 Million**

*Existing Power Generation: Types and Rated Capacities*

Facility	Internal Combustion Engines (kW)	Microturbines (kW)	Diesel Engines (kW)
RP- 1	2 @ 1,300 <sup>(1)</sup> 1 @ 625 <sup>(1)</sup>	7 @ 30 <sup>(1,3)</sup>	3 @ 1,250 1 @ 600
RP- 2	1 @ 580 <sup>(1)</sup>	2 @ 30 <sup>(1,3)</sup>	1 @ 600 1 @ 350
RP- 4	1 @ 500 <sup>(2)</sup>	6 @ 30 <sup>(2,3)</sup>	1 @ 1,500
RP -5 REEP	2 @ 1500 <sup>(4)</sup>	-	1 @ 2000 <sup>(5)</sup>
RP-5 SHF	-	4 @ 30 <sup>(2,3)</sup>	-
Desalter	1 @ 1,000 <sup>(1)</sup> 1 @ 820 <sup>(1)</sup>	-	3 @ 150 6 @ 100 2 @ 60
CCWRF	1 @ 1,000 <sup>(2)</sup>	-	1 @ 1,500

(1) Digester gas engine  
 (2) Natural gas engine  
 (3) Out of Service

(4) Operational in April 2007  
 (5) Removed after RP-5 REEP effective operation

# IEUA INNOVATIONS TO ADDRESS ENERGY NEEDS

Constructed the nation's first platinum LEED-rated headquarters by a public agency (2003). With installation of cogeneration in 2007, it will become a Zero Energy facility.



Constructed the nation's first and largest centralized anaerobic digester to convert dairy manure, biosolids and food waste to methane gas (2003). With planned expansions, it will generate 3 MW.



# IEUA INNOVATIONS TO ADDRESS ENERGY NEEDS

## CO-DIGESTION (FOOD WASTE ADDITION) PROGRAM

- RP-1 Plant Food Waste Implementation
  - CEC funded bench scale test
  - Construction completed
  - Evaluation in progress
  - 30-40% digester gas production increase
- RP-5 Manure Digester
  - Food waste addition in Phase I and Phase II
  - In-house preparation and evaluation
  - 30-40% digester gas production increase
- RP-2 Plant Food Waste Implementation
  - Coming up in 2007
- Food waste addition helps food processing industry dispose their wastes properly at reduced costs



*RP-1 Food Waste System*

# CHP APPLICATIONS AT IEUA

- Digester Sludge Heating
- Headquarter Building Heating
- Absorption Chillers
- Bottoming Cycle (Organic Rankine Cycle) for additional power generation from IC engines waste heat in the exhaust
- Dewatered Sludge Drying (under evaluation)



*RP-5 Manure Digester Building*

# CHP IMPLEMENTATION AT IEUA

GOAL – 100% OFF OF THE SCE POWER GRID

## Regional Plant No. 1 (RP-1)

- Two (2) IC engines, 1,300 kW each
- Heat recovery from engine jackets and exhaust
- Utilization in sludge heating
- Built in 1998



## Regional Plant No. 2 (RP-2)

- One (1) IC engine, 580 kW
- Heat recovery from engine jackets and exhaust
- Utilization in sludge heating
- Built in 1990

# CHP IMPLEMENTATION AT IEUA (Cont'd)

## Regional Plant No. 5 (RP-5)

- Two (2) IC engines, 1,500 kW each (in construction)
- Heat recovery from engine jackets and exhaust
- Utilization in absorption chillers system
- ORC secondary power generation (200 kW)
- Future digester sludge heating
- Headquarters building heating
- Completion in 2007



*1.5MW Caterpillar Engine at RP-5*

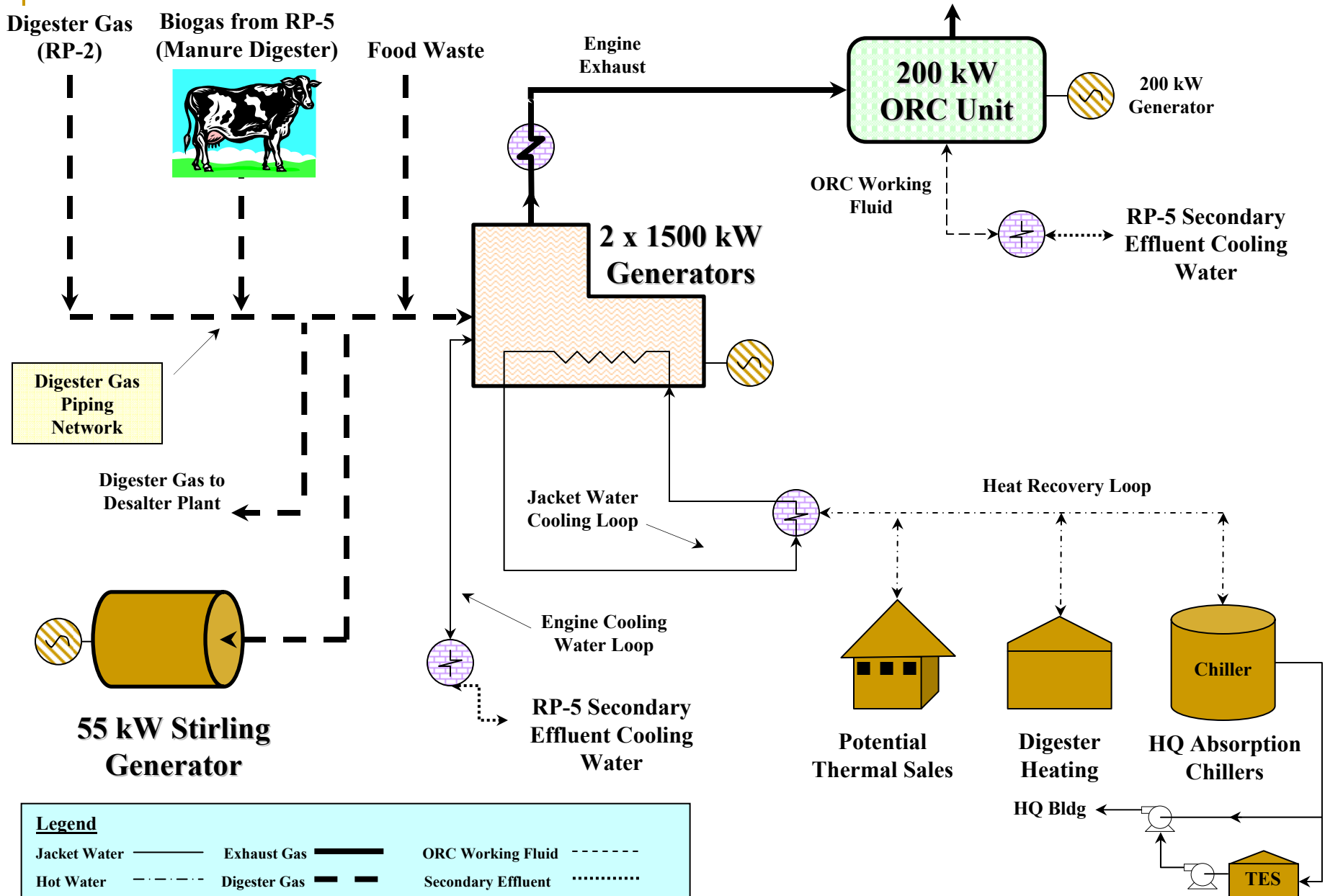
## Desalter Plant

- Two (2) IC engines, 1,000 kW and 820 kW
- Heat recovery from engine jackets
- Heat recovery from engine exhaust (in design)
- Utilization in manure digester heating
- Built in 2001-2002

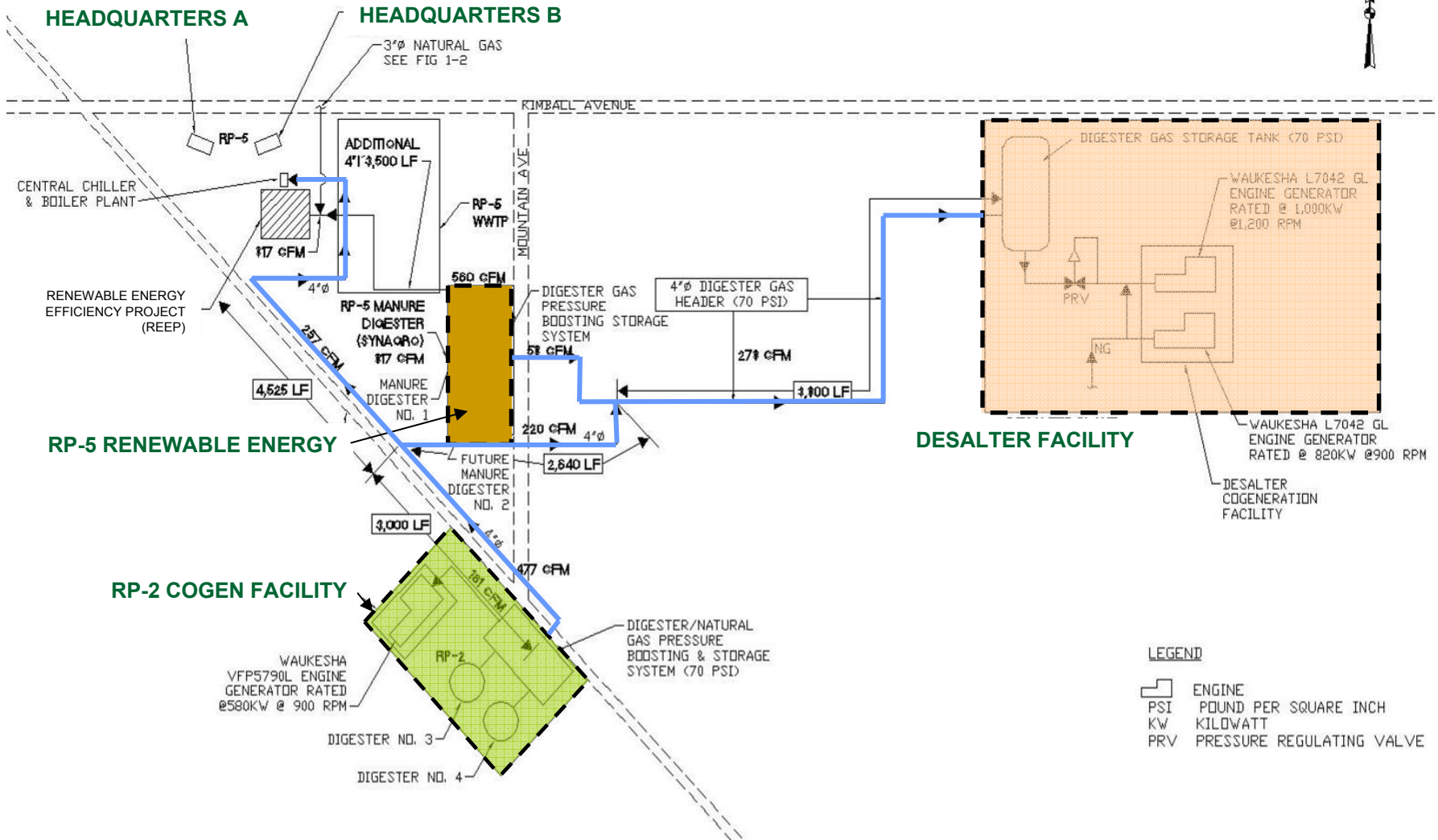






*Desalter Engines*

# RP-5 GENERATION AND HEAT RECOVERY



# RP-5 COMPLEX LAYOUT



- LEGEND**
-  ENGINE
  -  PSI POUND PER SQUARE INCH
  -  KW KILOWATT
  -  PRV PRESSURE REGULATING VALVE

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# EXISTING AND PROPOSED LEGISLATION

- Qualifying Facilities
  - Net Energy Metering
  - Utility Agency Power Distribution Utility  
Power Purchase
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# QUALIFYING FACILITY

## Two types of Qualifying Facilities (QFs)

- Cogeneration Facility (applies to IEUA)
- Small Power Production Facility

Cogeneration Facility: A Generating Facility using renewable or alternative fuels as a primary energy source or facilities that use the thermal energy given off by the generation process for some other useful purpose.

## Benefits

- Right to sell power to the utility company at the avoided cost rate
- Allows the QF to run power lines between the Generating Facility and adjacent facility

## IEUA Qualifying Facilities

- RP-1, RP-2 and RP-5 (application process)

# NET ENERGY METERING (NEM) / INTERCONNECTING

- The NEM program uses a bi-directional meter to measure net difference between the amount of electricity you produce and the amount of electricity you consume during each billing period.
- At the end of each billing period, you will be billed for the net difference of energy used, or receive credit for any energy generated that is in excess of the energy consumed based on Time of Use (TOU).
- General Qualification\*: An eligible SCE customer must produce energy from an electric generating system using solar, wind, manure biogas, or fuel cell technology, or a hybrid generating system.

# NEM APPROVED IEUA FACILITIES & BENEFITS

Approved Facility	Adjacent Facility *	Approved	Capacity
Desalter	14 Fields and Pump Stations	January 2006	1,820 kW
RP-5 Renewable Energy Efficiency Project	Carbon Canyon Wastewater Reclamation Facility	August 2006	3,000 kW

\* NEM Adjacent Facilities are those with which the NEM Approved Facility is allowed to net meter.

## NEM Benefits:

- Allows for continuous load aggregation of the generation facility that have dairy operations with more than one TOU metered service account.
- Exemption from Standby Charges - approx. 2 cents/ kWh
- Exemption from Departing Load-Customer Responsibilities Charges (DL-CRS) – approx. 1 cent/ kWh
- Exemption from any new or additional charges not included in the respective facility Otherwise Applicable Tariff

# IEUA GRANTS & INCENTIVES



PV Panels at IEUA Headquarters

*Generally, State and Federal Agencies offer grants and incentives for CHP projects to promote and encourage renewable energy and innovative technology implementation for the purpose of enhancing performance and cleaning the environment*

- Department of Energy (DOE)
  - RP-5 Renewable Energy Efficiency Project (\$2,326,000)
  
- California Energy Commission (CEC)
  - Biogas Digester Power Production (\$5,000,000)
  - RP-5 Solids Handling Facility Phase II (\$3,000,000)
  
- Western United Resource Development (WURD)
  - RP-5 Solids Handling Facility Phase IB (\$773,175)
  
- California Public Utilities Commission (CPUC)
  - RP-5 Renewable Energy Efficiency Project (up to \$1,000,000 per site)

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# ENVIRONMENTAL BENEFITS

- **Renewable Energy – Increase Self Sufficiency, Green Power**
    - Self Sufficiency/Reduced Peak Load
    - Support State’s Goals for Renewable Energy Portfolio
  - **Water Quality – Reduce Salt and Nitrates**
    - Achieve Goals of Santa Ana Region Water Basin Plan/Chino Basin Watermaster/CAFO rules
    - Support Recycled Water/Conjunctive Water Management Programs and regional goal of reducing demand for imported water supplies
    - Protect Downstream Water Users
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# ENVIRONMENTAL BENEFITS

- **Air Quality – Reduce Pollutants, Greenhouse Gases, NH<sub>3</sub>**
    - Achieve Goals of South Coast Air Quality Management District including New Composting and CAFO Regulations
    - Reduce Global Warming Gases (Federal Clean Skies)
    - Reduce Diesel Truck Traffic
  - **On Farm and Quality of Life Improvements**
    - Less odors and flies
    - Improved herd health
  - **Regional Soil Quality Benefits**
    - High quality compost improves low organic soils
    - Secondary benefits (NRCS Soil Quality Inst. Web site)
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# CHP CONCERNS AND STRATEGIES

## ■ CHP Concerns

- ❑ Intricate Energy Management
- ❑ Extensive Performance Tracking
- ❑ High Maintenance Cost
- ❑ Stringent Air Quality Compliance
- ❑ Complex Interconnecting Agreements
- ❑ Intensive Operation Procedures

## ■ Strategies

- ❑ Proper and Timely Planning
  - ❑ Proactive Staff Training
  - ❑ Preventive Maintenance Scheduling
  - ❑ Proper and timely coordination with Utility Companies
  - ❑ Familiarization with State and Federal Agencies Regulations
  - ❑ Early Start of Permitting Process
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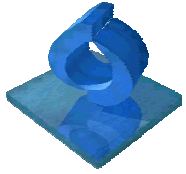
# SUMMARY OF CHP BENEFITS

- High Performance – Efficiency increase from 35% for power generation only to more than 65% for CHP systems
  - Natural gas cost savings (avoided cost)
  - Onsite power generation cost savings
  - Additional power generation, example: ORC
  - Shorter payback period
  - Grant opportunities
  - Energy self-sufficiency
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# SUMMARY OF CHP BENEFITS Cont'd

- Backup power reliability and flexibility
  - Peak load management
  - Net Energy Metering operations eligibility
  - Qualifying Facility eligibility
  - Environmental benefits
  - State and Federal recognition
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# ***QUESTIONS AND COMMENTS?***

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***Thank you***