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Water/Wastewater Case Study:  
*Inland Empire Utilities Agency*

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### **Background**

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- Type of Agency: Wastewater
- Location: Rancho Cucamonga, Calif.
- Size: Approximately 221 employees
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### **Summary**

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Inland Empire Utilities Agency (IEUA) operates four sewage treatment plants in Southern California with an annual energy demand of 70,000 Megawatts/hour. IEUA currently has 17 accounts served by Southern California Edison (SCE). But in 2001 when electricity and natural gas prices were estimated to rise 19 percent and energy sources became unreliable, the agency decided to seek independence from the commercial electricity and natural gas markets. It achieved a large degree of self-sufficiency by implementing an energy efficiency and conservation program in its wastewater plants, which resulted in energy cost savings for IEUA, while keeping IEUA services safe and reliable.

Referenced in Water/Wastewater Guides:

- #1, "Reduce Energy Use in Water and Wastewater Facilities Through Conservation and Efficiency Measures"
- #2, "Promote Energy Conservation and Efficiency Through Public Outreach, Incentives and Assistance"

### **Plan**

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IEUA staff hired consultants RW Beck and Holmes Narver to help the operators and engineers conduct a rapid review of energy used by each treatment plant. The goal was to find ways in which plants could be operated more efficiently. The group analyzed the amount of energy consumed by the primary, secondary and tertiary processes and determined which process could be run at off-peak hours.

The engineering department helped operators collect necessary data and helped to design conservation and effi-

ciency projects. The group then analyzed conservation and self-generation options for implementation by July 2001.

The staff (engineers and operators) was instrumental in performing energy audits, finding areas of improvement and carrying out the plans. The management was key in developing the Seven Point Emergency Energy Action Plan, which identified the following efficiency and conservation targets:

1. Maximize efficiency of existing office and plant operations.
2. Minimize external energy, natural gas and other fuel costs. IEUA renegotiated power contracts and realized substantial cost savings: It ended its two-year, spot market contract with DGS in favor of a modified, staggered six-month to two-year contract with BP – and saved more than a dollar/therm from the start. Average power costs during first quarter of the 2001/02 fiscal year were 16.25¢ per kilowatt-hour (kWh). Average power costs during second quarter 2001/02 were 7¢ per kWh.
3. Maximize operational flexibility of plants to "roll off" electric grid and natural gas sources, particularly during peak usage periods. IEUA currently has emergency standby generation for all plant operations except Chino Desalter (law requires that wastewater agencies have standby generation). IEUA wanted to run generators more often to reduce on-peak demand but because diesel generation operations have long-term air quality issues and are only allowed to operate 200 hours/year by the Southern California Air Quality Management District (SCAQMD), IEUA has begun to evaluate cheaper and cleaner air technologies.
4. Maximize "self-sufficient" operations, including: modifying the biodigestion process to maximize methane gas production (five months); implementing an RP-1 digester pilot project to use "wet manure" to generate additional biogas (five months); implementing an RP-2 Digester/Microturbine demonstration project using dairy manure to increase biogas production (five months); purchasing and installing more efficient motors and generators (five months); installing microturbines at water plant Chino 1 Desalter (to run on nat-

ural gas and biogas, part of a proposed dairy digester, five-month to two-year project); and exploring implementation of a fuel cell demonstration project.

5. Generate new local sources of energy for plant operations, support of related facilities and ultimately sale into the grid, including: implementing Dairy Digester Project – Tenuinissen Property (digesters and fuel cells); installing three biodigesters at RP5 (Dairy Sewering Project); constructing a 30,000-ton biosolids composting plant at RP-5/CIM with fuel cells; constructing compost facilities at RP-4 and RP-1 (with fuel cells); identifying related regional facilities that could benefit from local energy projects; exploring and developing opportunities to sell excess power into the grid; and exploring and developing opportunities to obtain/sell air quality credits resulting from these projects.
6. Promote regional energy and water conservation programs by: partnering with California Department of Water Resources (DWR), Metropolitan Water District (MWD) of Southern California, Southern California Edison (SCE) and member agencies to promote energy and water conservation and identifying opportunities to support member agency efforts to reduce energy consumption and improve efficiency of water operations.
7. Promote development of local water supply options. The goals of the projects were to:
  - Provide uninterrupted service;
  - Develop a strategy to minimize or eliminate future wastewater rate increases resulting from higher power supply costs;
  - Build self-sufficiency and local control over long-term energy supplies;
  - Help improve electric generation for the benefit of the IEUA service area (e.g., municipal power Joint Power arrangements with the cities); and
  - Assist the region and California in meeting its energy needs.More specifically:
  - Reduce energy consumption by 25 percent within the next five months. Reduce electric energy use within Southern California by 20 percent.
  - Develop a least-cost strategy with no rate increases to the extent possible. Negotiate best-price possible for long-term contracts for natural gas as a supply source for the IEUA regional water recycling plants.
  - Provide uninterrupted service. Ensure 100 percent back-up for all plant operations, including

Chino Desalter. Achieve operational flexibility to be off the grid for extended periods each day.

- Increase methane gas production through anaerobic digestion of biosolids and dairy manure.
- Generate 50 MW with local biogas, microturbines and fuel cells by 2006.
- Build self-sufficiency and local control over long-term energy supplies. Increase investment and development of local water supply and water storage projects in Southern California to improve ability to reduce SWP/Colorado River pumping during peak energy use periods.
- Develop surplus electric generation for the benefit of the IEUA service area (e.g., municipal power Joint Power arrangements with the cities).
- Assist the region and California in meeting its energy needs.
- Help improve air quality.

### **Programs: Conservation**

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- ✓ **HVAC:** Raised temperatures to 78 degrees in summer in headquarters and operations buildings where staff was located.
- ✓ **Lighting:** Turned off 50 percent of lighting in headquarters, administration and operations building throughout plant; lights only left on critical for operation and maintenance. Financial savings for lights was 15 to 20 percent energy usage.
- ✓ **Office equipment:** Told employees to turn off lights and computers before going home.
- ✓ **Pumps:** Shut down nonessential pumps in wastewater treatment and decreased aeration during peak hours.
- ✓ **Schedules:** Shut down the sewage treatment plant between June 4 and October 7, which was a large energy consumer because of the use of ultraviolet (UV) lamps; instead used a more energy-efficient plant during peak hours. This required significant changes in staff work schedules. Reduced energy consumption by 393,571 kWh.
- ✓ **Employees:** IEUA sent e-mails to employees reminding them to turn off lights and computers before they left for home.
- ✓ **Alternative and/or renewable energy sources:**
  - Generation equipment:
    - Installed 20 microturbines, which would provide 4,200 MWh annually;
    - Installed three natural gas/methane fueled internal combustion engines; 2,260 MWh of generation for IEUA's plants (reducing grid

- energy usage during peak period by 100 percent);
- Installed two natural gas/methane consuming internal combustion engines, with a capacity of generating 1.915 MW for the regional Chino Basin Desalter (providing the ability to reduce grid load during peak periods by 100 percent); and
  - Installed 11 diesel generators to back up Desalter wells, with combined capability of generating 1.4 MW. Based on rates, 1 MW of generation power cost \$1 million to design, construct and install. The payback was five to seven years.
  - **Methane gas production:** Developed a pilot 1 MW renewable energy project using dairy manure to reduce natural gas demand.
  - **Local water supply option:** Sought state and federal financial incentives for local conjunctive management, water conservation, water recycling, desalination and other water management projects for Southern California. Coordinated activities with Chino Basin Watermaster, SAWPA (and its other member agencies), MWD and SCAP. IEUA is working with member agencies, Ontario and Chino to conserve by capturing storm water where available. IEUA is designing a system that will provide recycled water for customers and is applying for grants to fund the project.

### **Programs: Efficiency**

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✓ **Pumps:** Installed high-efficiency pumps, achieving a 10 percent reduction in energy demand and saving 475,000 kWh annually. IEUA also performed maintenance on UV lamps in its sewage treatment plant, reducing power consumption by 80,285 kWh from the previous year and saving \$5,620 in energy costs for the second quarter of the 2001/02 fiscal year.

### **Programs: Public Outreach**

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✓ **Low-flow toilet replacement program:** Partnered with DWR, MWD, SCE and member agencies to give out free low-flow toilets. At least 5,000 toilets were replaced. This was a joint program between MWD and local agencies; the local city implemented the program.

### **Budget and Finance**

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The IEUA Board of Directors realized the projects were worthwhile, i.e., low-flush toilets meant less water to treat and IEUA would not need to expand its treatment plant. The money saved could be used later for other expenses/projects.

Pacific Gas and Edison (PG&E) provided incentives for the installation of microturbines. MWD and DWR financed the toilet program.

### **Results**

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IEUA reduced grid energy demands by up to 90 percent during peak hours and saved 2,991,980 kWh during the 120 days in the summer of 2001. During the summer months, energy use at the administrative building fell by 14 percent. Achieved 12 percent reduction in energy usage, or 6,200 MWh through conservation measures.

During the first quarter of the 2001/02 fiscal year, power costs were up by 8 cents: Average power costs during the first quarter of 2000/01 fiscal year were 8.5¢ per kWh and 16.25¢ per kWh during first quarter of the 2001/02 fiscal year. IEUA reduced the impact of the price hike by: increasing power production at two recycling plants to an all-time high of 6,435.5 MWh; maximizing digester gas usage at these two plants to fuel the generators; and bypassing flows at the least-efficient plant during peak periods. This reduced operational costs by \$379,209 during the first quarter of the 2001/02 fiscal year.

IEUA renegotiated power contracts and realized substantial cost savings. Average power costs during first quarter of the 2001/02 fiscal year were 16.25¢ per kWh. Average power costs during the second quarter of the 2001/02 fiscal year were 7¢ per kWh.

In the second quarter of fiscal year 2001/02, utility power consumption was reduced by 1,418,944 kWh over the previous fiscal year. Operational costs were reduced by \$264,001 through conservation, generation and negotiation efforts. Conservation efforts reduced plant consumption from the previous year by 57,007 kWh. This provided a net savings to the agency of \$3,990 for the second quarter of the 2001/02 fiscal year.

### **Lessons Learned**

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IEUA found that projects sometimes took longer than expected, but agency engineers, operators and maintenance worked as a team to see projects through.