



# CHP at Wastewater Plants from Bio-Waste in California

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Pramod Kulkarni

Electricity Analysis Office

Electricity Supply Analysis Division

pkulkarn@energy.state.ca.us 916-654-4637

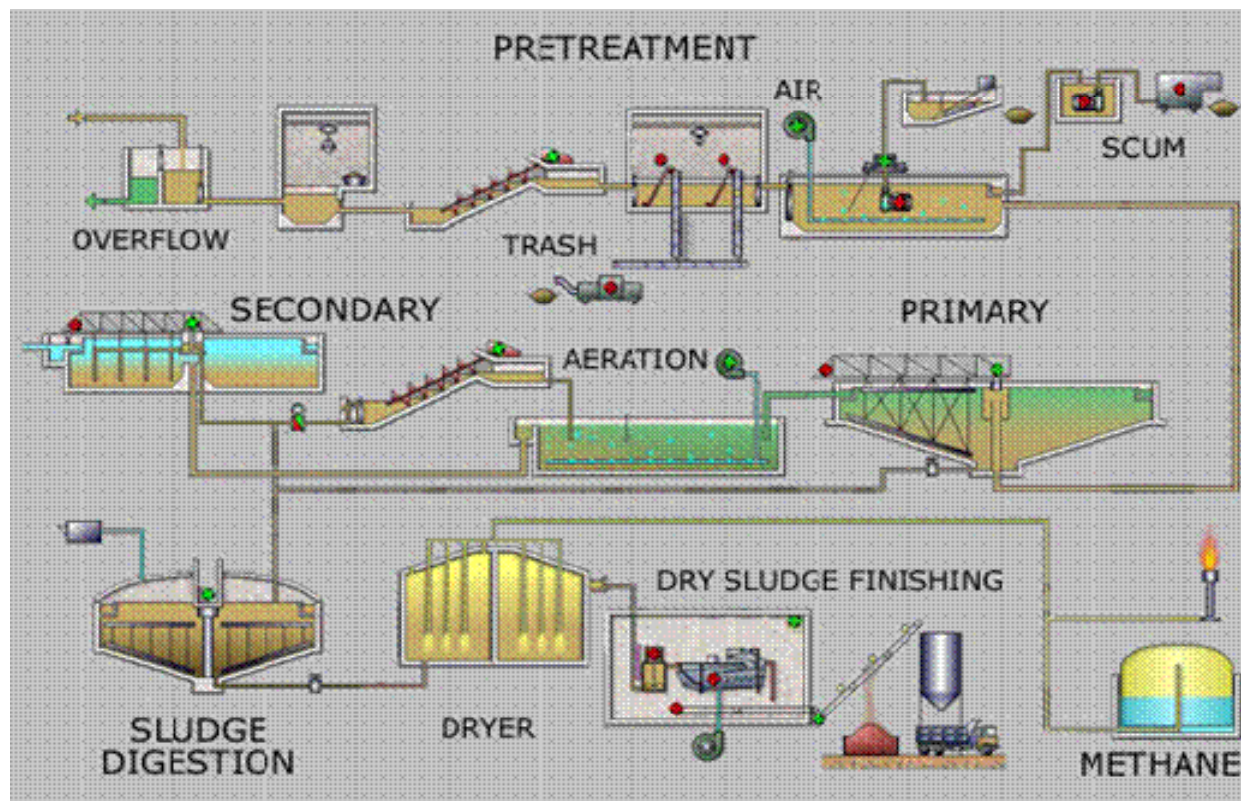


## California Policies Support & Recommend CHP Deployment

- IEPR 2005 & IEPR 2007 specifically recognize and support inclusion of clean and efficient CHP in California's portfolio of energy resources.
- ARB Scoping Plans includes CHP as an energy strategy to reduce Greenhouse Gas (GHG) emissions in California.
- CHP at Wastewater Treatment Plants (WWTP) help reduce GHG and meet RPS goals by using renewable resources such as sludge and other bio-waste for electric generation.



## Wastewater Treatment Process





## WWTP: Current Practices & Impact

- WWTP sludge treatment process:
  - Send to landfills, composting or spread in fields
  - Anaerobic digestion to produce methane
  - Flare or use for electric generation – CHP
- Energy & emission impact in California
  - Sewage Emitted 2.2 million tons CO<sub>2</sub> equivalent per year
  - WWTPs used 1.8 million MWh of electricity in 2008





## CHP Technical & Market Potential in California Using Sludge

- 265 plants with 1 Million Gallons per Day (MGD) or more flow
- Combined flow >3000 MGD, can produce 17 billion scf gas/yr
- Can generate approximately 100 MW through CHP
- 117 plants have anaerobic digesters, few have CHP
- Current CHP capacity at California WWTP is 35 MW.



## CHP Potential from Other Biodegradable Waste in California

- Research shows dairy manure, food processing waste & oil/grease from restaurants can be co-digested with sludge.
- Co-mixing and digesting increases digester gas production by 40% to 50%
- In the short-run, current excess digester capacities at WWTP can be used. In the long run, need to increase digester capacities.



## PIER Projects Prove Mixing Bio-wastes Increase Production of Digester Gas

- Technical and market feasibility is based on the RD&D funded by Energy Commission
- Assessment done by CH2M Hill & Others
- Pilot plants at Inland Empire Utilities Agency
- Plant mixed food waste & dairy manure with sludge
- Proved technical, economic & logistic feasibility.



## Dairy Manure Co-digestion with Sludge at WWTP

- There are 2700 dairies in California, but only 12 operating digesters.
- Anaerobic digesters at dairies find it difficult to secure air emission and water discharge permits, this limits CHP potential.
- High concentrations of dairies with food processing waste in Central Valley make co-digestion technically, economically and logistically possible.



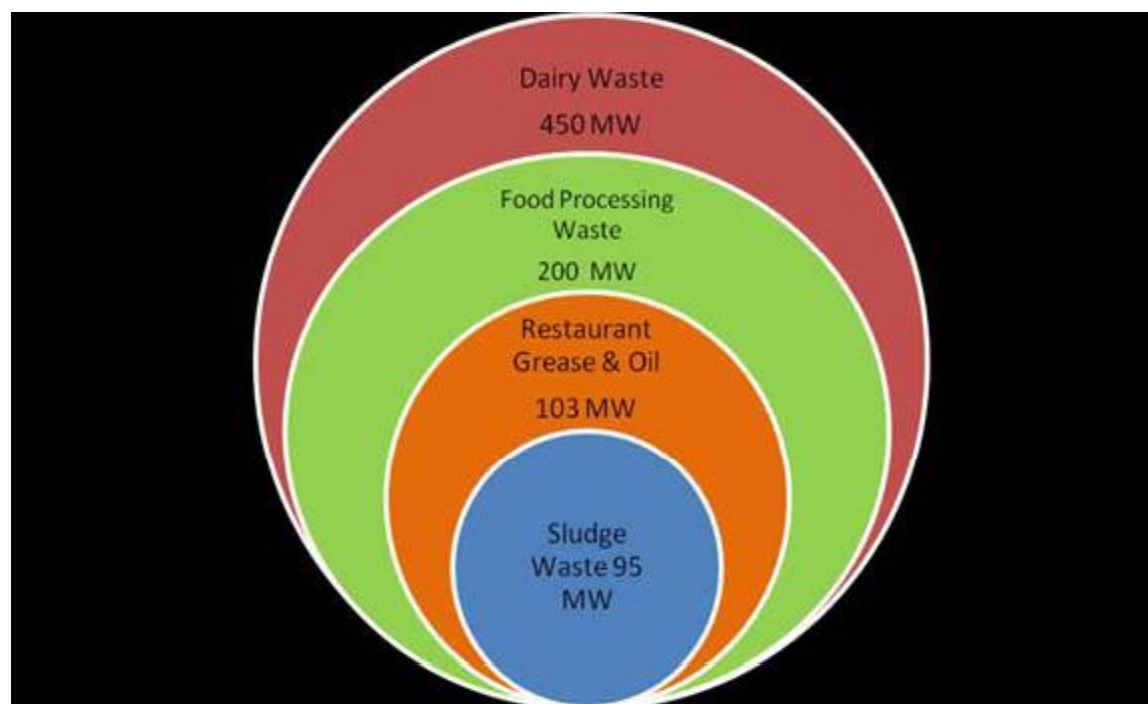


## Potential from Adding Fats, Oil & Grease to Sludge

- Wastewater plants have demonstrated increased biogas production by mixing restaurant fats, oil & grease (FOG) with sludge.
- Currently many food establishments pay waste haulers to take away FOG.
- The restaurant FOG is a major problem for the sewer system creating overflows.
- Anaerobic co-digestion of FOG turns a liability into an opportunity.



## Co-digesting Sludge with Other Bio-wastes Substantially Increases CHP Market Potential





## Barriers to Realizing CHP Potential at WWTPs.

- Insufficient digester gas production at some WWTPs do not justify economic deployment of CHP.
- Cost of cleaning gas to a level suitable for some generation technologies is costly and sometimes uneconomical.
- Securing air emission permits is becoming difficult. Attaining increasingly stringent air emission rules is expensive.
- Different emission standards for flaring and electric generation results in foregoing generation option.
- On-site demand for electricity and waste heat at a WWTP makes easier to be cost-effective without export of power, yet having higher feed-in tariff & restoring SGIP incentives will help.



## Policy Options for Facilitating CHP Development at WWTPs

- Reinststate combined heat and power eligibility for engines & turbines under the Self-Generation Incentive Program.
- Support air emission regulations that will stop penalizing WWTPs who want to change from flaring to electric generation.
- Fund development and demonstrations of technologies that improve digester gas yields and gas cleaning systems.
- Develop methods to accurately measure & validate carbon and other emission reduction for CHP systems.
- Finance development of new or expansion of existing digesters & CHP systems to support co-digestion and increase CHP installed capacity in California .
- Differentiate feed-in tariffs by a technology's contribution to meeting the state's renewable energy and environmental goals.