Shifting Water Resource Recovery Facilities to a Circular Economy Business Model:

Lessons Learned

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Food Waste Co-digestion at WRRFs: Business Case Analysis

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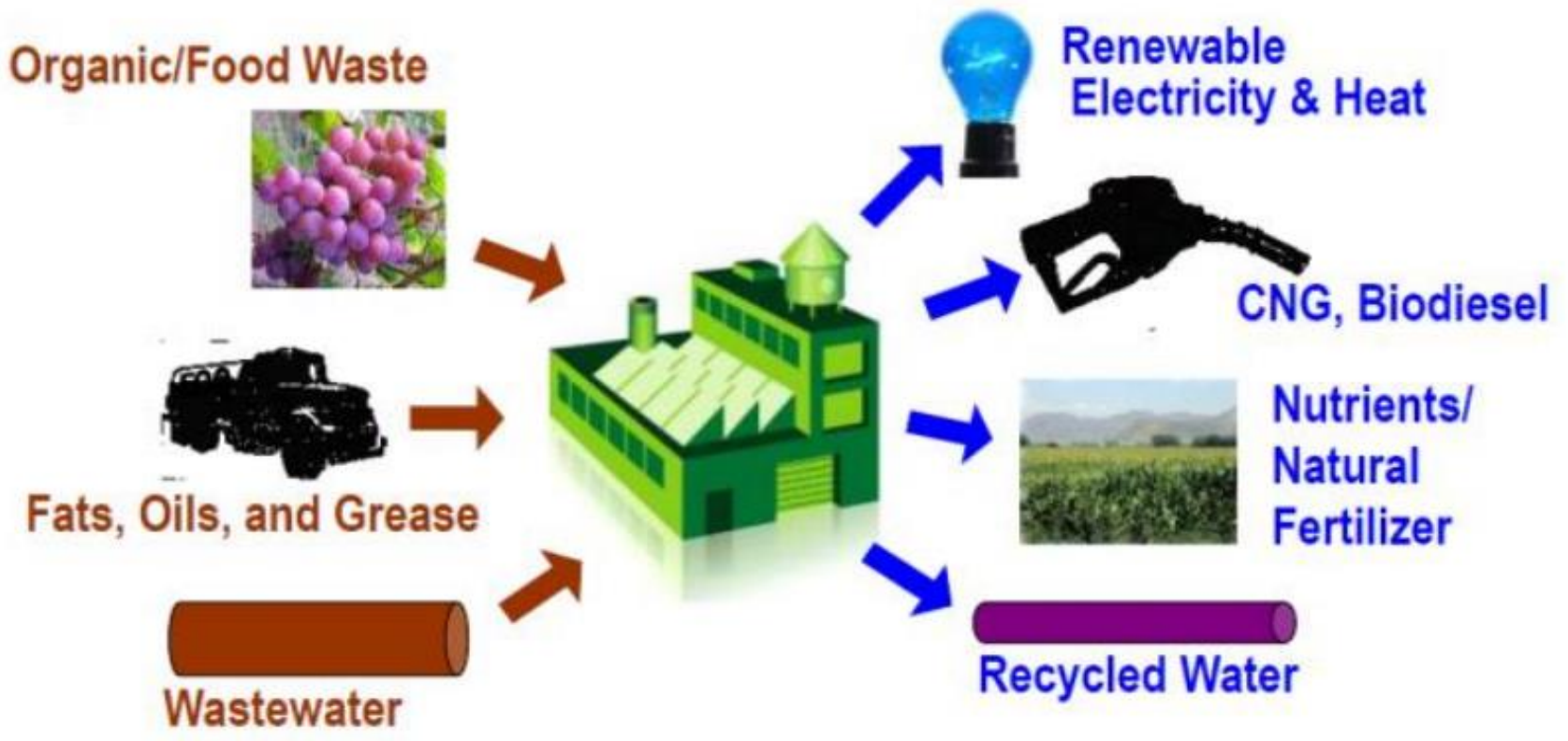
Utility of the Future (UoTF):
Resource recovery at water resource recovery facilities (WRRFs)



Research approach

- *Question*: Can we identify alternative business models for co-digestion, suited for different contexts?
  - *Answer*: NO! WRRFs need to tailor strategy to utility mission, resources, and scale; and its market and policy context
- Our report offers general principles and case study examples of how to create value, manage risks
  - Lessons learned about successful business strategies
  - Solutions to address financial impediments and manage financial risks
  - Lessons learned about the role of public policy
- *Plus* a diagnostic framework for utility self-assessment of opportunities and business case for co-digestion

Methods and products

- Conducted structured interviews with more than 65 organizations (WRRFs; *plus* from energy, solid waste, finance, technology, engineering & consulting sectors)
- Report with 6 major case studies, 25 thumbnail sketches, which represent full range of WRRFs by
  - Characteristics: size, regional location
  - Policy and market environments
  - Strategic choices: food waste feedstocks, energy uses, biosolids uses, contracting and financing
- *Plus* examples of co-digestion no-goes, suspensions, and cutbacks
- 2021: Updated/expanded 6 case studies of co-digestion of food scraps (the least common food waste feedstock), with a focus on sourcing and preprocessing strategies

Lessons learned

To create a successful co-digestion program requires the right context

- A co-digestion champion in the utility or municipal government.
- Enough site space for vehicles to deliver feedstocks and for other equipment needs
- A business mindset to resource recovery
- Visionary utility board or municipal decision-makers who will support projects beyond the core wastewater mission that make economic sense for ratepayers
- Location with access to a sufficient supply of feedstock at a good price

Successful business strategies generally evolve over time

- WRRFs learn from past successes and failures how to improve economic performance
- With learning and growth, strategic questions evolve:
  - For example, for AD capacity, the focus may evolve from identifying whether/how much excess capacity,
    - *to* rationing capacity to the highest-value feedstocks, and then
    - *to* examining the potential for co-digestion to support expansion in AD capacity.
  - For energy, the focus may evolve from achieving onsite energy neutrality,
    - *to* breaking down barriers to accessing the power grid, and then
    - *to* exploring the potential for supplying RNG to the market

Why: No-goes, suspensions, cutbacks?

- **No-goes:** lack of sufficient ROI is main reason
  - Low energy purchase prices (low savings), low sales tariffs
  - Uncertain/low feedstock supply and revenues
  - Lack of financial incentive programs
  - Small size with resulting limited economies of scale
  - *Also*: NIMBY, no co-digestion champion, no political support
- **Suspensions of co-digestion**
  - Market changes: energy, feedstock markets
  - Major problems with feedstock quality (shut down digester)
  - Unanticipated capital investments (e.g., for pre-processing food wastes), unfavorable timing for accessing capital
- **Cutbacks in scale of co-digestion**
  - Loss of major supplier (with limited effort for feedstock development)
  - Equipment or other failures: No longer able to recycle biogas (loss of capacity to produce energy) or biosolids (lack of storage, suitable land for application)

Solutions exist for impediments and risks

Challenges	Solutions
Operational risks of new feedstocks (upsets, regulatory compliance)	• Research identifies best technologies/practices • Conduct initial feasibility/risk studies • Added maintenance, staffing may be required
Stakeholder/political concerns	Extensive public meetings and consultations, backed up with facts and figures
Feedstock economic risks: feedstock supply; tip fees	• Conduct market analysis • Develop contracts for feedstock supply with haulers
Energy economic risks: equipment hard/ expensive to maintain, not WRRF expertise; energy prices uncertain	Public-private partnerships: • Private energy developers can acquire and operate equipment, provide expertise WRRFs do not have • Power-purchase agreements set long-term prices
Scarce financial capital	• Various incentive program grants • Public-private partnerships can provide financing

Best practices

A successful business strategy…

Will not compromise plant environmental compliance

- The wastewater sector has important responsibilities for public health and environmental quality, which are central to its mission.
- Violation of those responsibilities can result in substantial financial penalties.

Evaluates the financial analysis over the full investment life-cycle

- Can the utility establish the operational and financial capacity to support the program over the life-cycle of the investment?
- Need to identify revenues and costs from initial investments thru replacement, apply a ROI criterion
  - Full set of capital investments (which may be sequenced over time): feedstock preprocessing, AD, energy generation, biosolids management capacity
  - Full capital investment life-cycle, including maintenance and upgrades

Leverages available drivers consistent with WRRF mission

Important drivers creating value include:

- Regulatory policies mandating renewable energy, regulating wastes (including food) and biosolids
- Market-based opportunities to generate revenues and cost savings,
- Policies providing green payments to support investments in sustainability,
- Utility and community commitments to environmental quality and community service, including support for waste haulers

Incorporates strategies to address financial risks

Risk management strategies include:

- Diversifying sources and product outlets, establishing long-term contracts
- Building in equipment redundancies to allow for scheduled or unscheduled maintenance needs
- Using public-private partnerships/contracts to share ***operating*** risks (as well as construction risks) with the private sector.

Evaluating business strategy: now and for the future

We provide a diagnostic framework for WRRFs to evaluate potential business strategy suited to their market, policy and organizational context

- Provides a basis for assessing the fit of co-digestion
- And if life-cycle economic potential is not favorable at the time, may provide insights into how to create a path to future success

Thank you!

Project publications can be found here:

https://www.eli.org/food-waste-initiative/publications

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