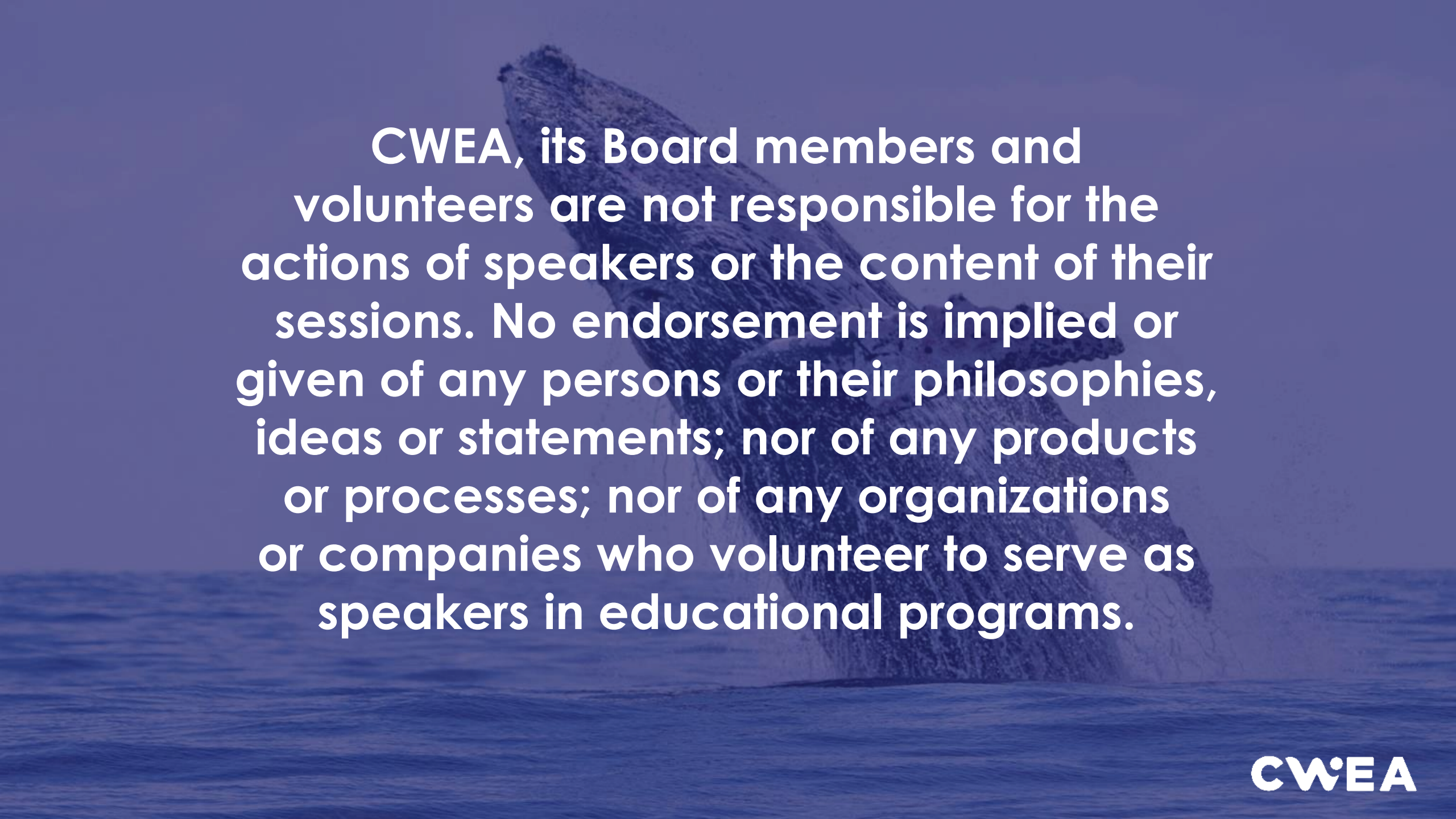
Maximizing Food Waste Co-Digestion Statewide: Investments Needed and Lessons Learned

Webinar, October 13, 2020, 9am-10am



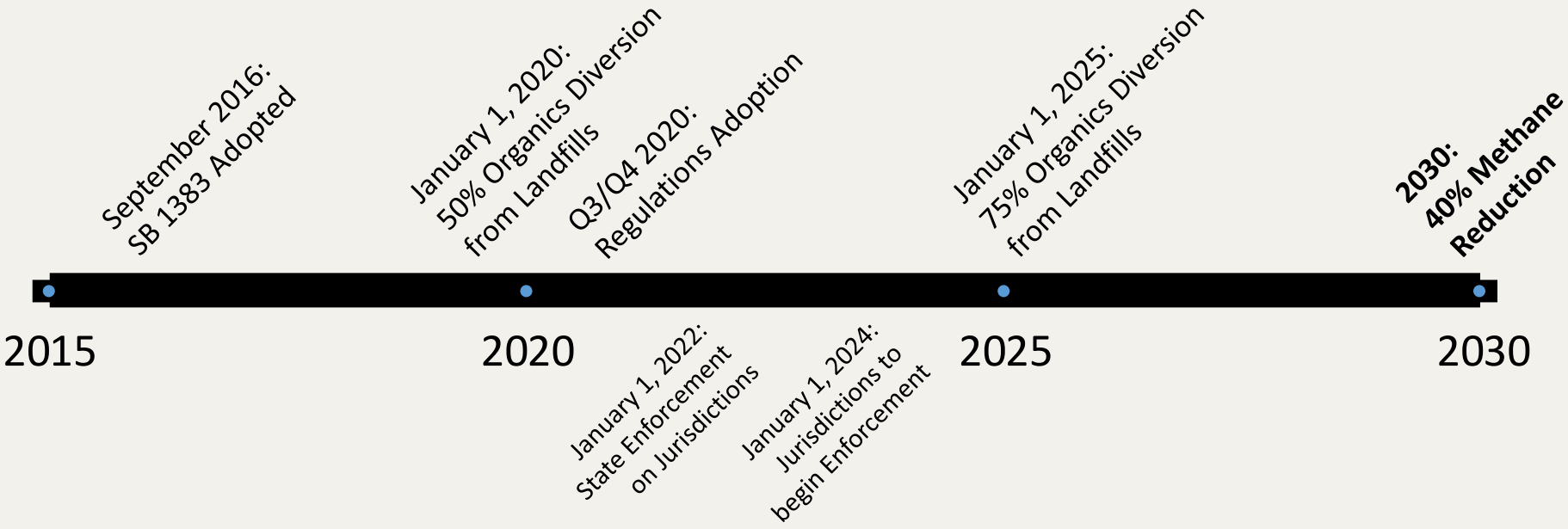
CWEA, its Board members and volunteers are not responsible for the actions of speakers or the content of their sessions. No endorsement is implied or given of any persons or their philosophies, ideas or statements; nor of any products or processes; nor of any organizations or companies who volunteer to serve as speakers in educational programs.

Rashi Gupta

Vice President / Project Manager

CAROLLO ENGINEERS

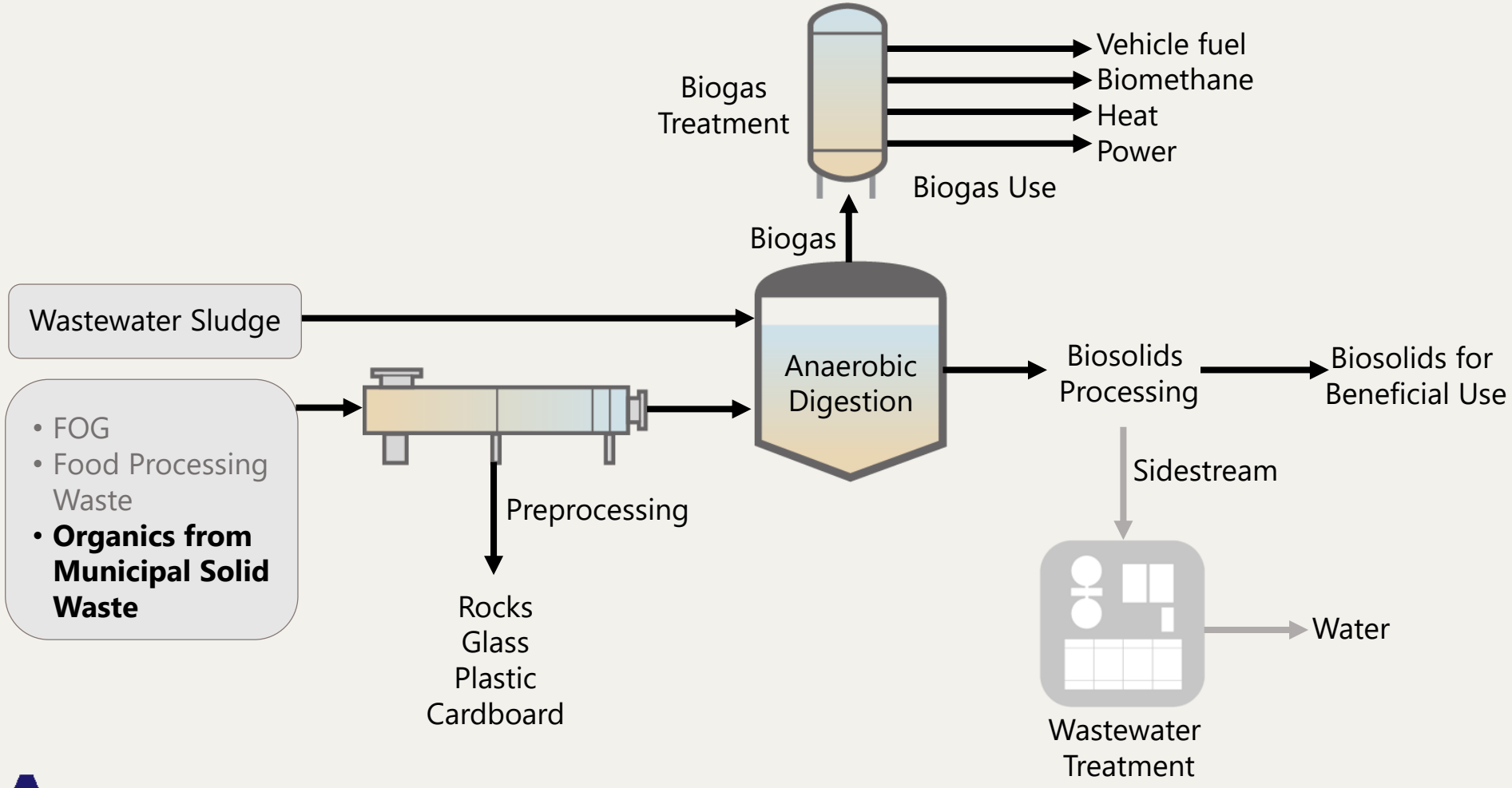
California's Senate Bill 1383 (SLCP Reduction Implementation): Organic Waste Reduction Timeline



SLCP: Short-lived Climate Pollutants, including methane.
Methane reduction relative to 2013 levels.
Diversion relative to 2014 levels.

CWEA

What does co-digestion look like at a WRRF?



How much capacity do we really have?

How much additional capacity do we need?

What could impact feasibility?

How much food waste can we accommodate?

Could WRRFs generate revenue from it?

If it's so great, why isn't everyone already doing it?

How much will it cost to implement?

How much of an impact will it make?

CALIFORNIA Water Boards
STATE WATER RESOURCES CONTROL BOARD
REGIONAL WATER QUALITY CONTROL BOARDS

Co-Digestion Capacity Analysis
Prepared for the California State Water Resources Control Board under Agreement #17-014-240

CO-DIGESTION CAPACITY IN CALIFORNIA

FINAL | June 2019

carollo

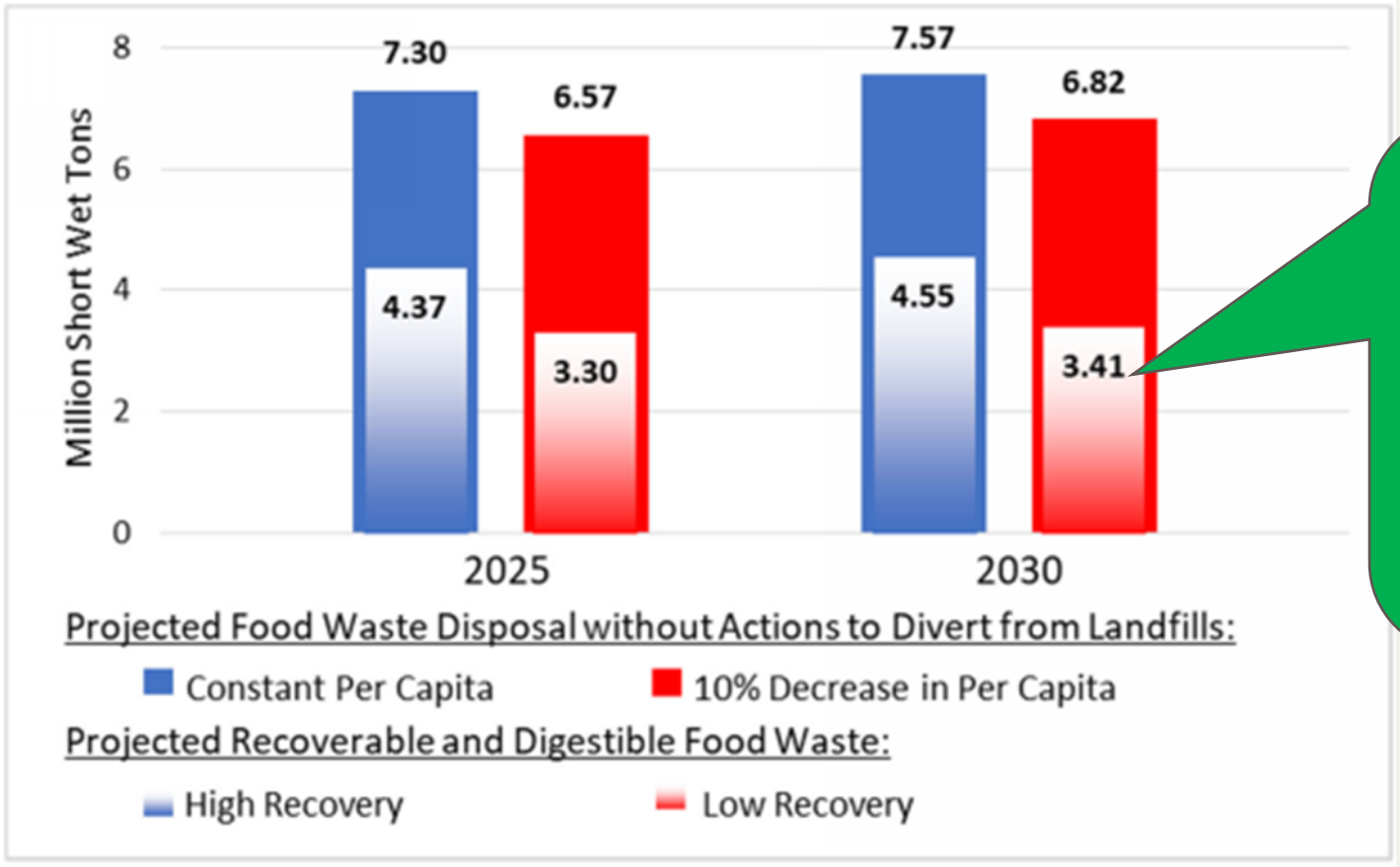
Co-Digestion Capacity in California

Six Chapter Report with Appendices

- Finalized June 2019
- Multi-agency review at State level
- Governor's Office approval
- Published August 2020

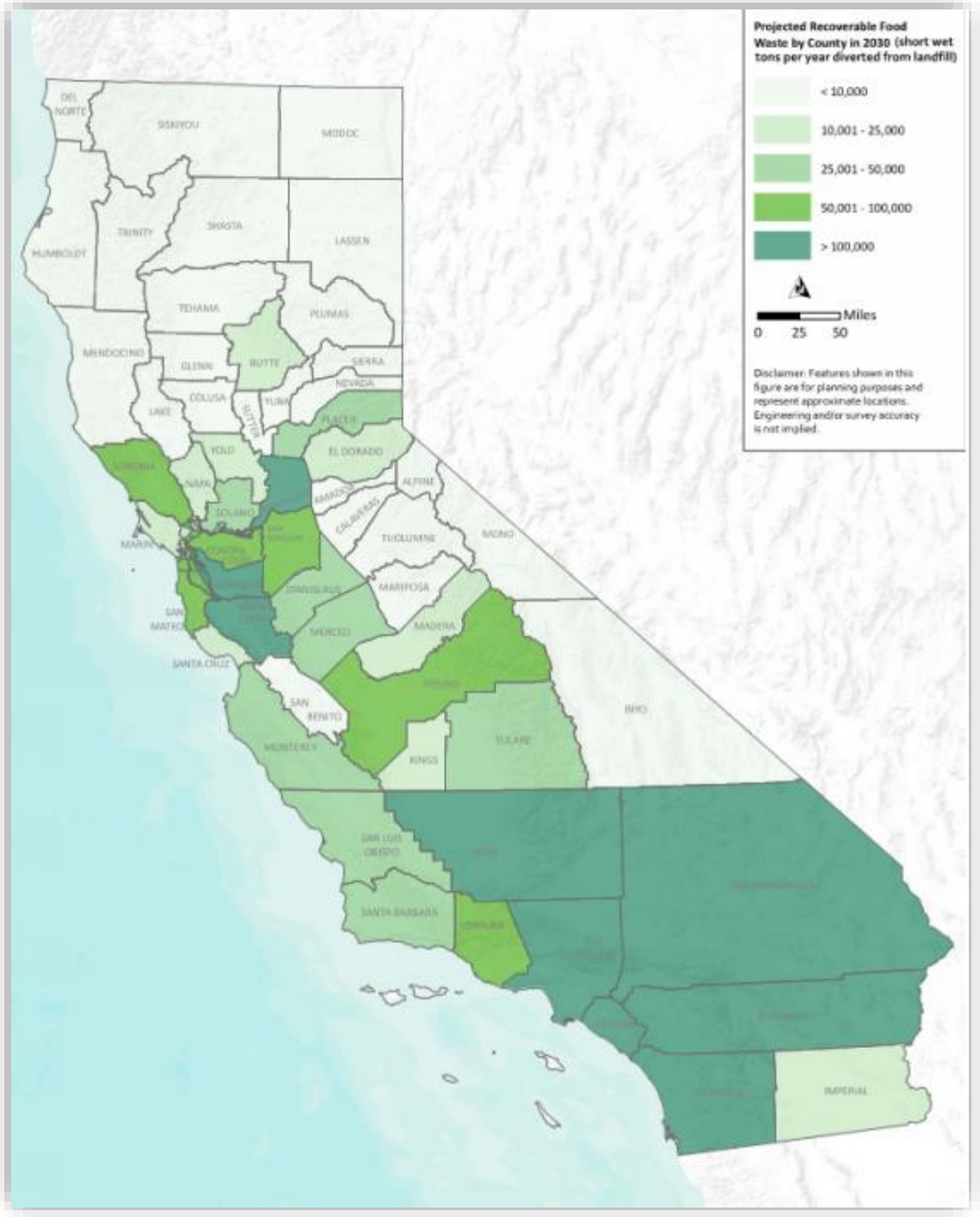
Chapter 1: Food Waste Disposal Analysis

How much food waste will there be in CA in 2030?



- Avoid over-estimating GHG reduction
- Allow for continued reduction in per capita disposal/recession
- Accounts for 50% recovery of digestible food waste

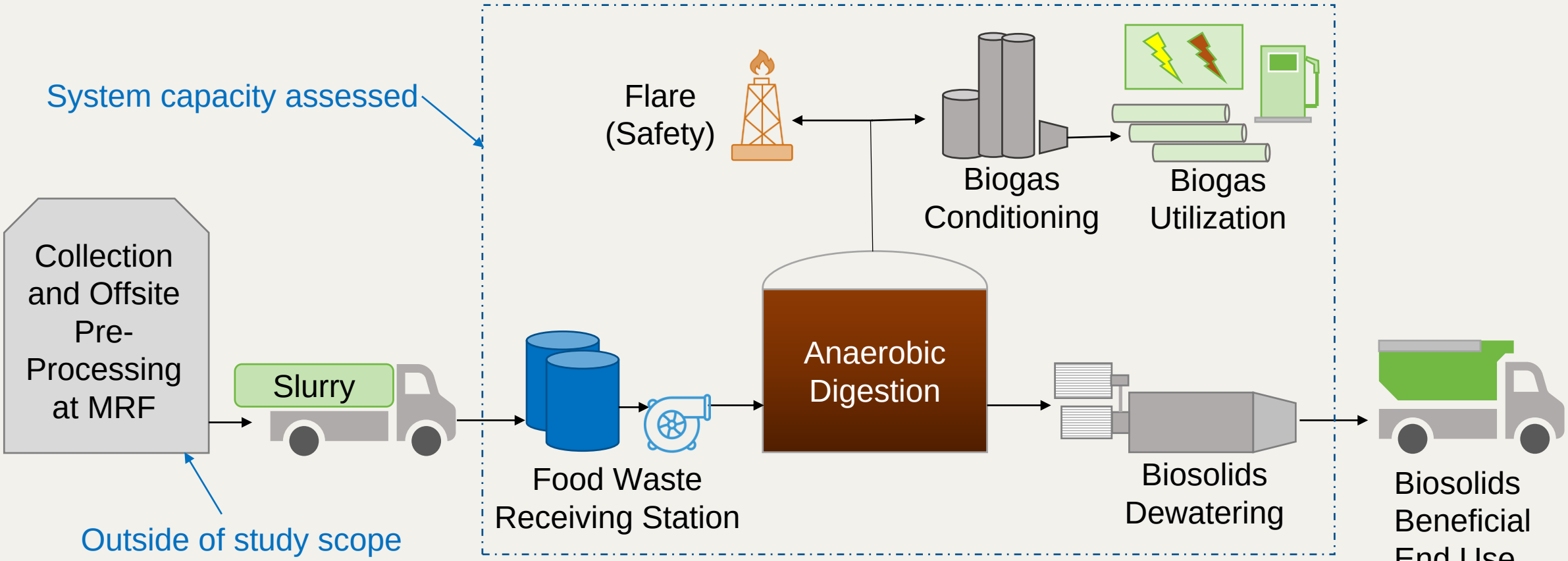
CWEA



Food waste comprises ~ 18% of MSW and 30% of total organics disposal, so diversion can play a major role in meeting the State's SB 1383 goals.

Chapter 2: Analysis of Existing Capacity for Co-Digestion

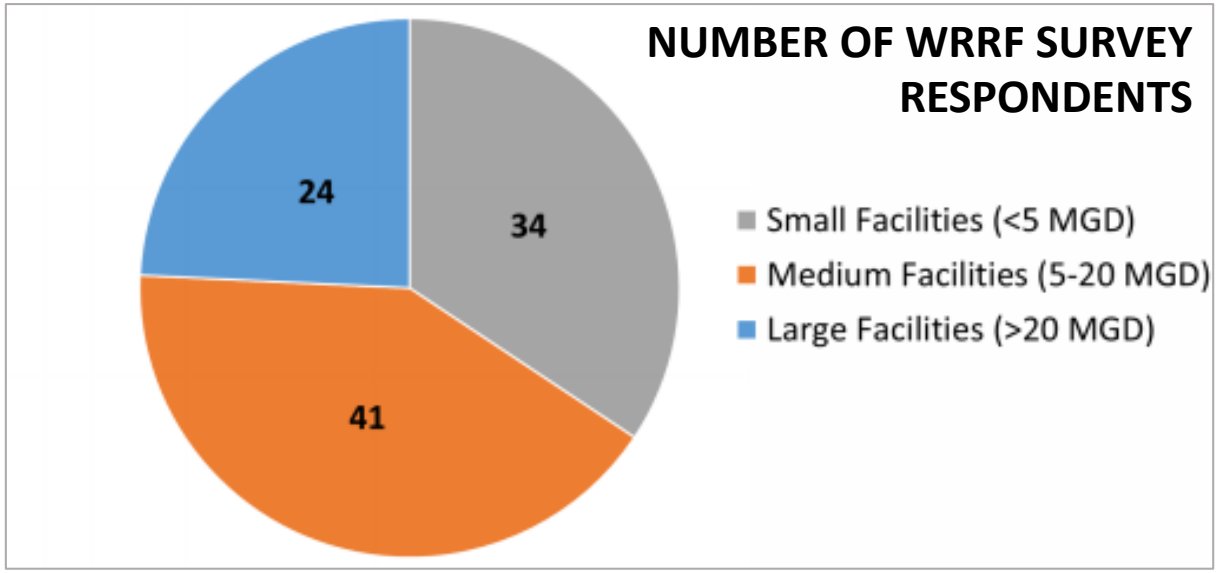
What key processes are needed for co-digestion?



Co-Digestion System Components Within WRRF

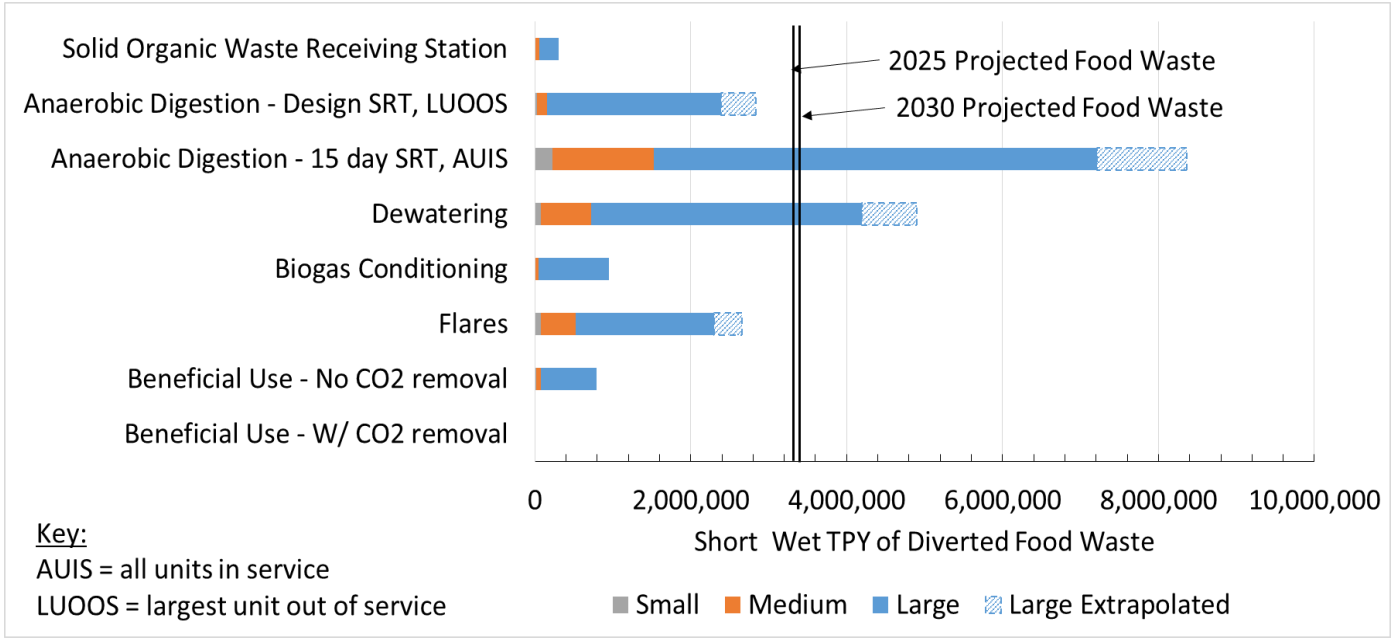
Conducted comprehensive survey of CA WRRFs

- Survey focused on solids and biogas systems
- 99 of 223 WRRFs responded
- Comprised ~80% of state's total WRRF design flow capacity



Compared current + projected loads to existing capacity to identify excess capacity in key processes

- Sufficient *digestion* capacity for most diverted food waste at 2030
- Overall capacity limited by other processes



STATEWIDE EXISTING EXCESS CAPACITY FOR KEY PROCESSES

Chapter 3: Investments to Maximize Co-Digestion

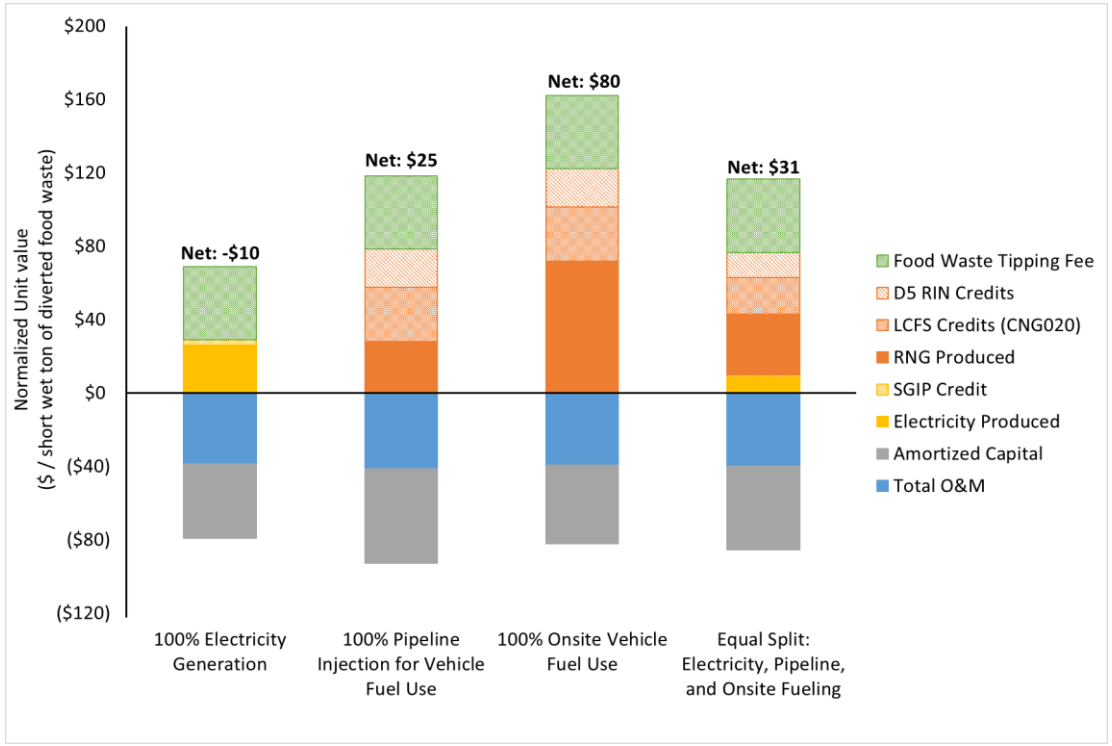
Summary of estimated costs illustrate potential WRRF investments required and annual O&M, revenue

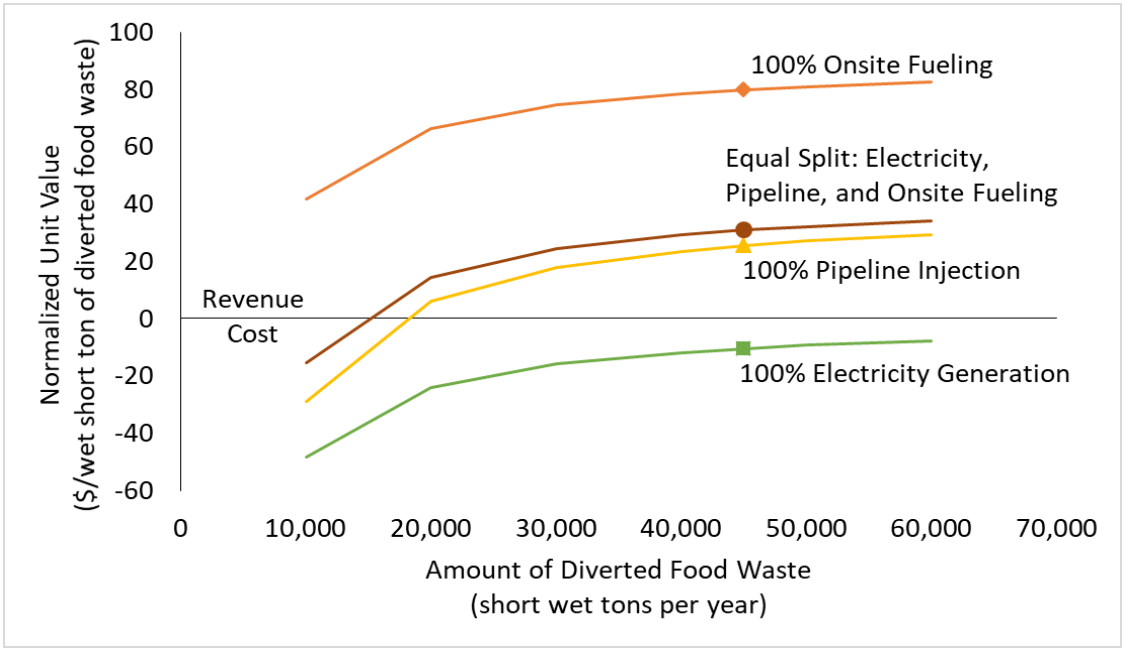
Case	Wet Tons Diverted Food Waste/Year	Coverage	Estimated Capital Cost, $M	Estimated O&M Cost, $M/Year	Estimated Revenue, $M/Year	Biogas Use
Scenario 1	2,400,000	Statewide	968	97.6	278	Split
Scenario 2	3,400,000	Statewide	1,436	138	393	Split
Illustrative Facility	45,000	For Facility	22.4	1.8	7.3	CNG Vehicle Fuel

Notes:

1. *Costs do not include collection of food waste, pre-processing at MRF, or fleet conversion.*
2. *Capital costs represent planning level estimates, corresponding to AACE Class 5.*

Conducted sensitivity analyses for biogas end use, facility size, and CNG/power prices





Renewable energy incentives currently favor CNG/RNG and positive economic outcomes more likely for higher-capacity facilities.

Outlined regulatory considerations that could affect feasibility

Water

Air

Land

Chapter 4: GHG Emissions Reductions

GHG emissions reduction from co-digestion of food waste could go a long way towards meeting the State's goals

Case	Wet Tons Diverted Food Waste/Year	Net Emissions Reductions Potential (MT CO_2e)	
		Electricity Production	RNG Vehicle Fuel Production
Scenario 1	2,400,000	1,564,000	1,696,000
Scenario 2	3,400,000	2,210,000	2,397,000

Diversion of food waste for co-digestion could reduce 1.6 to 2.4 million MT CO_2e, up to 60% of the state's goal to reduce landfill emissions by 4 million MT CO_2e by 2030.

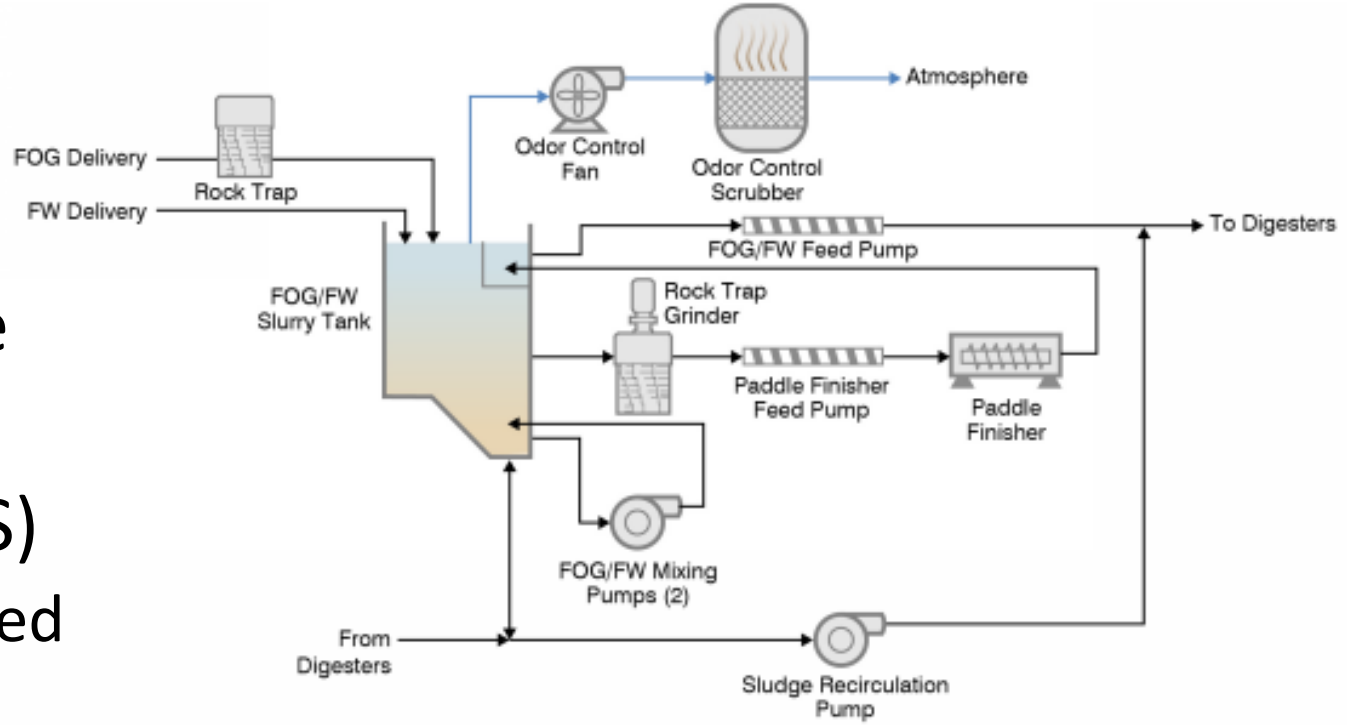
Chapter 5: Co-digestion at Small / Mid-Sized WRRFs

Case studies illustrate factors that facilitate implementation or pose barriers at smaller plants

- Central Marin Sanitation Agency – 10 mgd
- Manteca Wastewater Quality Control Facility – 9.9 mgd
- Delta Diablo – 19.5 mgd
- Silicon Valley Clean Water – 29 mgd

CMSA's Food to Energy (F2E) Program

- In Marin County
- Receive FOG, food waste slurry, food processing waste (started 2013-2014)
- Marin Sanitary Services (MSS)
  - Pre-consumer source-separated commercial food waste
- Biogas used for cogeneration
  - Working on modifications to export excess power to grid



MSS collects, sorts, and processes food waste into slurry and trucks it to the plant

- 6-8 wet tons/day of 18% TS slurry delivered 6 d/wk to below-grade pit
- Mixed with thinner FOG received 5 d/wk at ~15,000 gpd
- Paddle finisher to polish
- Blend fed to digesters at ~7% TS

CMSA Organic Waste Receiving Station

CMSA Organic Waste Receiving Station

Typical O&M activities are more than expected, but still worth it

- Costs (2018): $216k
  - O&M
  - Administration
  - Supplies
- Revenues (2018): $312k
  - FOG Tipping Fee
  - Food Waste Tipping Fee
  - Biogas Value

Frequency	Maintenance Activity
Daily	• **Hose down equipment and receiving station** • Rinse out pumps and piping • Clean out heavy object trap
Weekly (or every other day)	• Clean out pomace bins • Inspect and clean out rock trap grinder • Inspect equipment area
Monthly	• Check clearance on pumps and paddle finisher • Inspect bearing seals on pumps
Every two months (on average)	• **Replace hoses in hose pumps**
Quarterly	• Clean receiving tank • Inspect coating on receiving tank
Every six months or yearly	• **Replace pump impellers if corroded**
Annually	• **Replace pump impeller and housing**
Every 2 years	• Siloxane media change-out • **Replace odor scrubber media** • Replace biogas conditioning scrubber media

Lessons Learned

- Feedstock quality is important – a good partnership is invaluable
- Keep critical spare parts on hand – consider consequence of failure to identify and plan
- Critical to have organic waste coordinator with versatile skill set – from admin to logistics, lab/sampling, billing, and O&M
- Coatings fail and tanks are slippery – add cleats on floor
- Design well hatch covers to avoid bending

Operational Impacts

- Dewatering required more polymer to achieve same cake dryness
- Biogas production and utilization needs balance – made operational changes to help equalize and avoid flaring
  - Sludge feed
  - Gas storage
  - Stop organic waste feed
  - Varying digester mixing speeds
- “Buffer” loads with sludge to digester

What are the common factors facilitating co-digestion?

- State laws and regulations that drive change
- Supportive partnerships with waste management firms and utility providers
- Board/community support
- Robust planning/feasibility studies
- Financing assistance through loans/grants
- Revenue/cost offsets through tipping fees and biogas utilization

What are the common barriers impeding co-digestion?

- Insufficient planning
- Regulatory hurdles – effluent, air, solid waste
- Inadequate funding and uncertainty about revenue
- Feedstock contamination
- Competition for organics diversion through composting and impacts on tipping fees

Chapter 6: Co-digestion at Large WRRFs

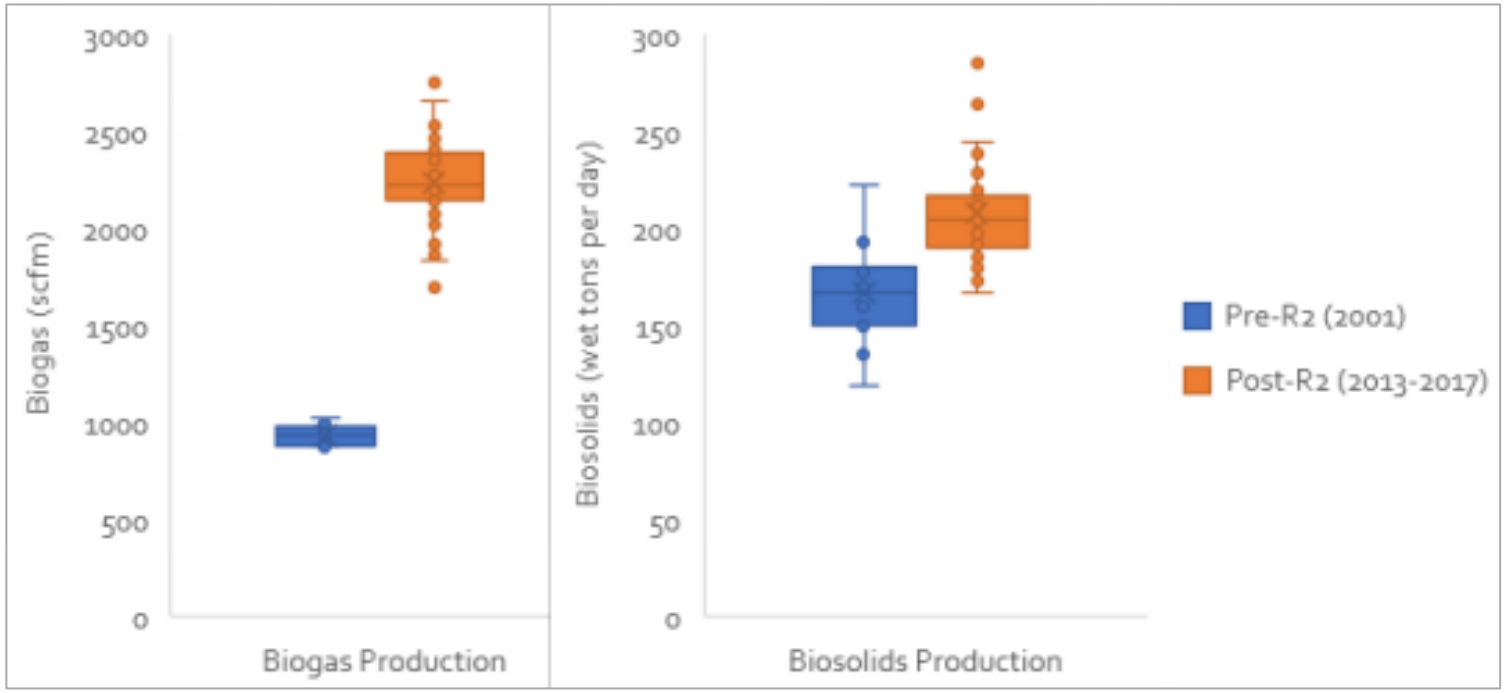
Case studies illustrate benefits and challenges associated with co-digestion

- Main Plant, East Bay Municipal Utility District (EBMUD) – 120 mgd

- Joint Water Pollution Control Plant, Sanitation Districts of Los Angeles County (LACSD) – 400 mgd

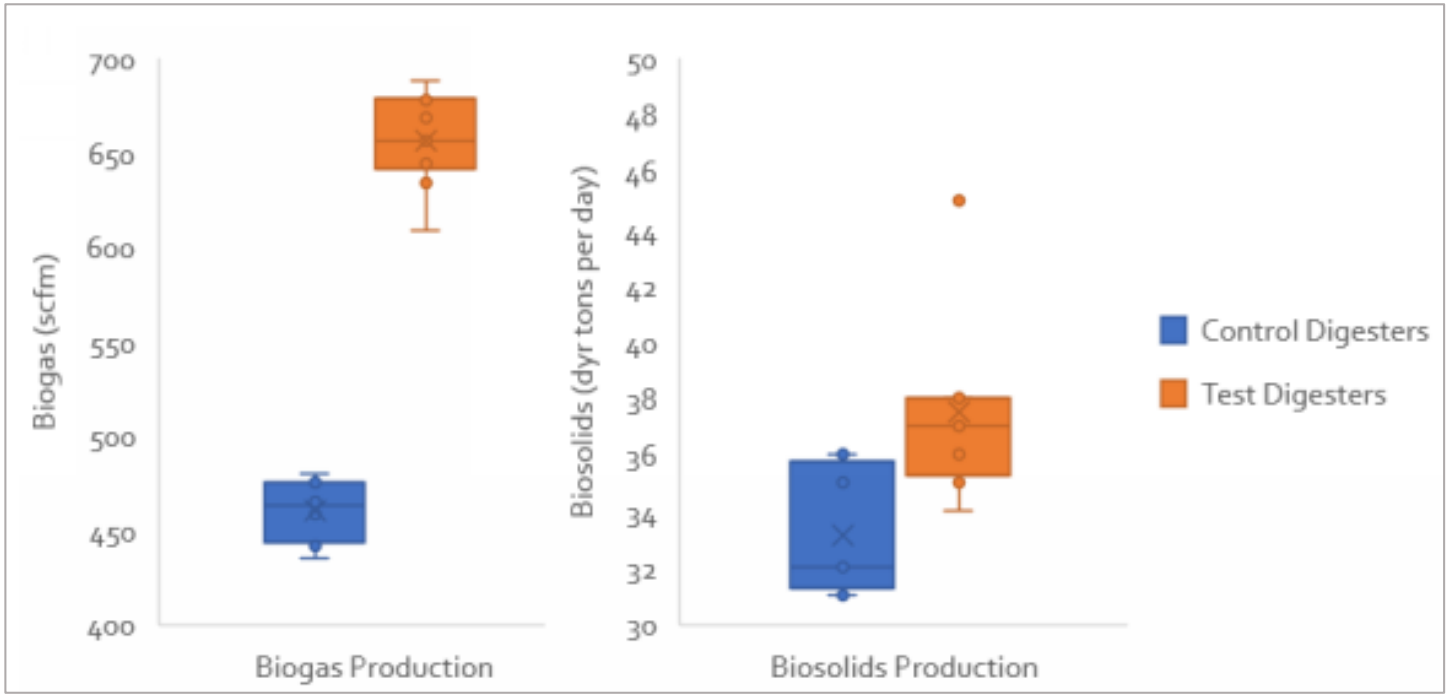
EBMUD's R2 program produced tipping fee revenue and energy that exceeds added costs for biosolids

- 100-150 trucks/day with all R2 feedstocks
- Biogas (140%) and biosolids (25%) production increased
- $3M/yr net revenue/cost offset
- Challenges: Grit, biogas variability, future utilization, future effluent limits



LACSD conducted long-term demonstration of food waste slurry co-digestion to study impacts

- During demo, received up to 70 wet tons/day of bioslurry
- Four test/control digesters used
- Biogas (43%) and biosolids (13%) production increased
- Primary challenge during test: grit, glass and associated O&M
- Constructed pre-processing system at MRF
- Vehicle fueling system project underway
- Will construct larger slurry receiving station next



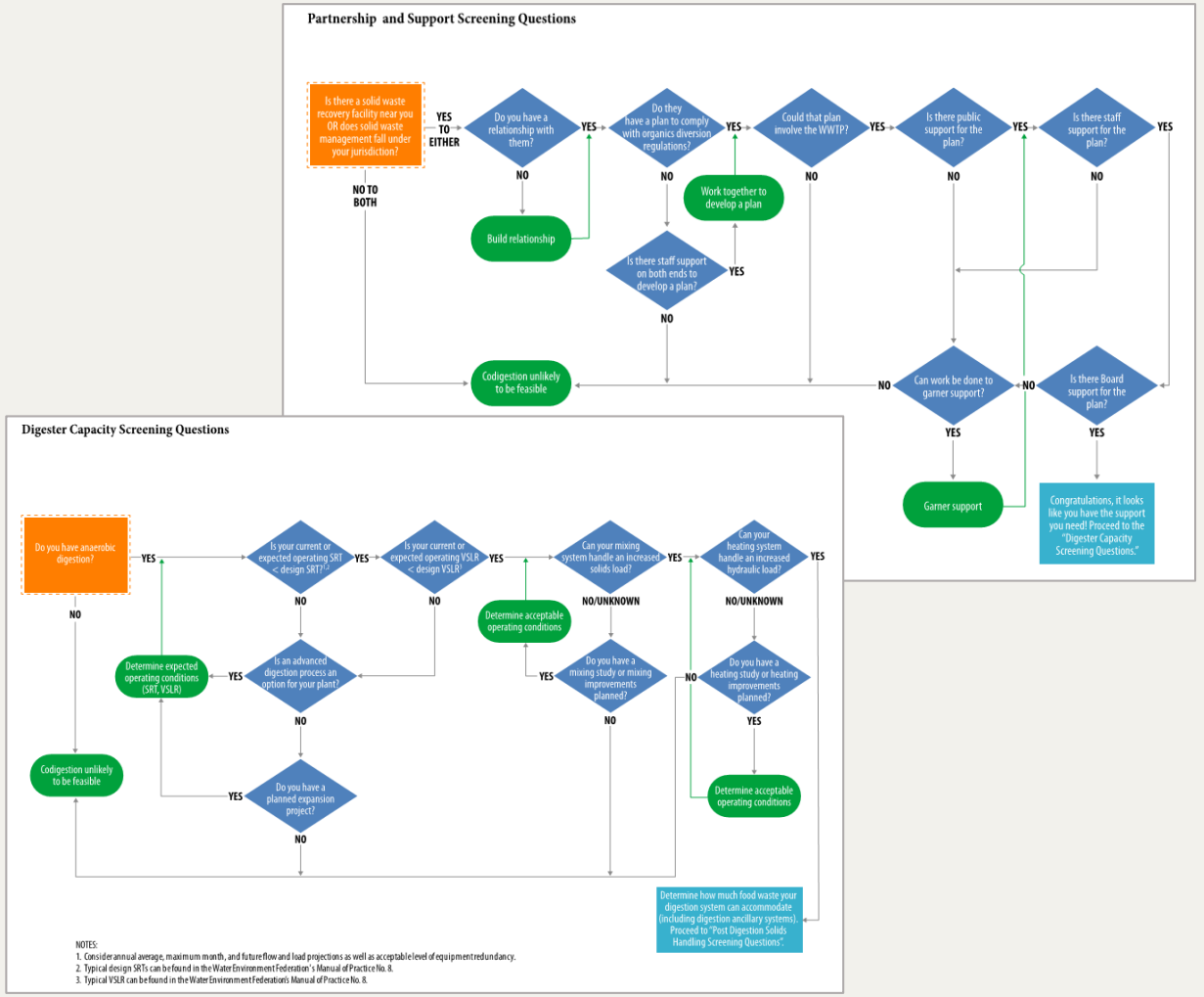
Results represent data from September-November 2016

In Closing…

- Co-digesting food waste slurry at WRRFs can help achieve CA's mandates/goals if challenges & investment needs are addressed

- Feasibility of co-digestion and various biogas utilization options at the individual facility level requires case-by-case assessment

DECISION SUPPORT TOOL



Thank you to the project team, SWRCB, participating CA facilities, technical advisors / reviewers!

- Project Team
  - Elizabeth Charbonnet
  - Sarah Deslauriers
  - Chelsea Ransom
  - Rob Williams
- State Water Resources Control Board
  - Charlotte Ely
  - Max Gomberg
  - Jelena Hartman
- Facilities who participated in survey and case studies
- Technical reviewers and advisors

QUESTIONS & ANSWERS

CWEA

7677 Oakport Street Suite 600 Oakland CA 94621
510.382.7800 | www.cwea.org