



CampusEnergy2021

BRIDGE TO THE FUTURE

Feb. 16-18 | CONNECTING VIRTUALLY

WORKSHOPS | Thermal Distribution: March 2 | Microgrid: March 16

Renewable Fuel for Campus Generation Systems:

EPA-Approved
Carbon and GHG Reduction
90% Landfill Diversion
Complements Recycling

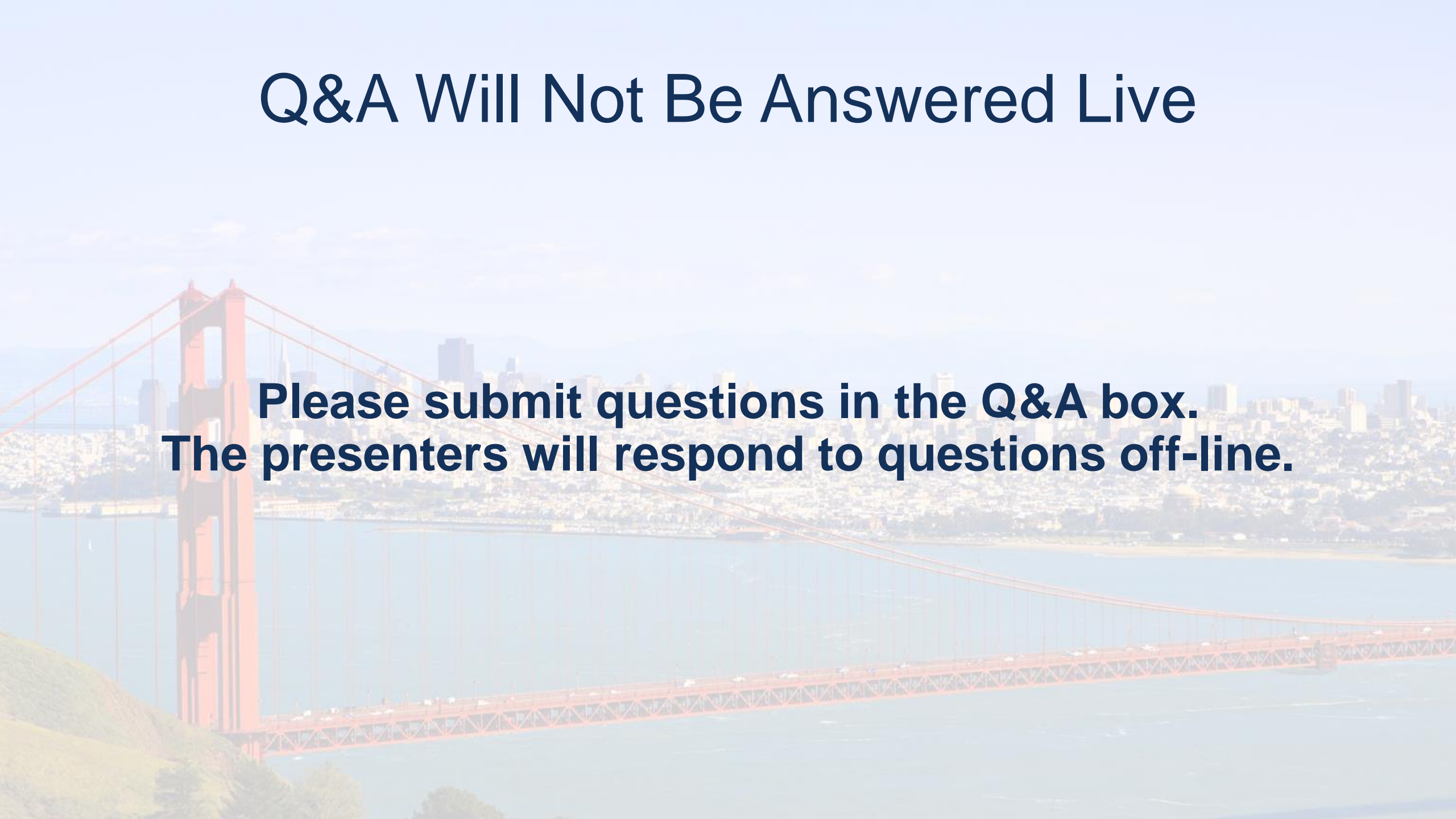


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WāstAway®
Proven. Sustainable. Solutions.

Q&A Will Not Be Answered Live

**Please submit questions in the Q&A box.
The presenters will respond to questions off-line.**



Opportunities for IDEA Members

- ☐ Offset coal or biomass with a thoroughly vetted, consistent high-BTU fuel
- ☐ Measurably reduce carbon footprint and GHG emissions
- ☐ Partner with local community to achieve zero landfill goals
- ☐ Complements and completes recycling efforts....full circle economy
- ☐ Use food waste to produce energy without sorting
- ☐ Extend life and value of generating assets
- ☐ Lock in continuing source and price of clean fuel
- ☐ Straightforward financial feasibility models

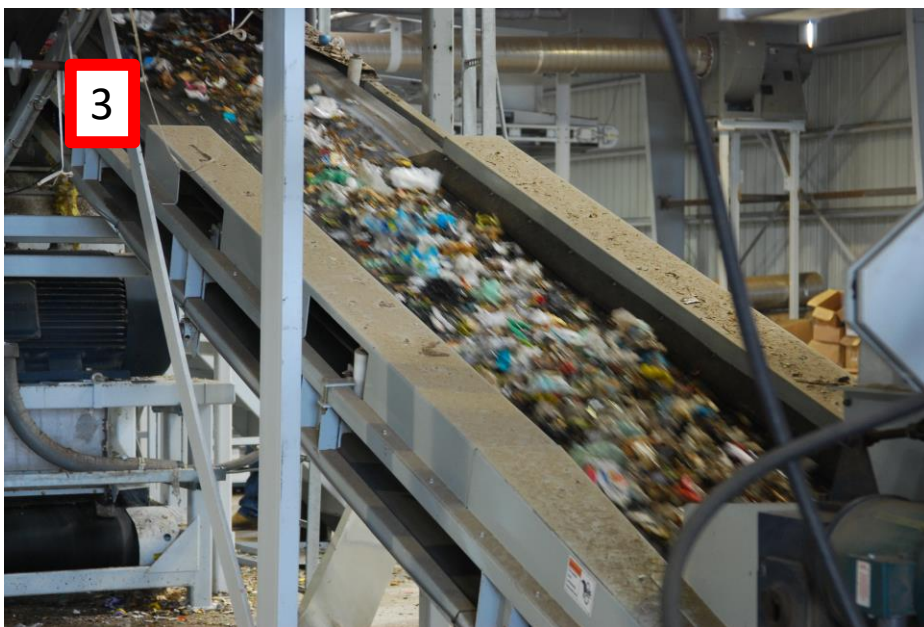
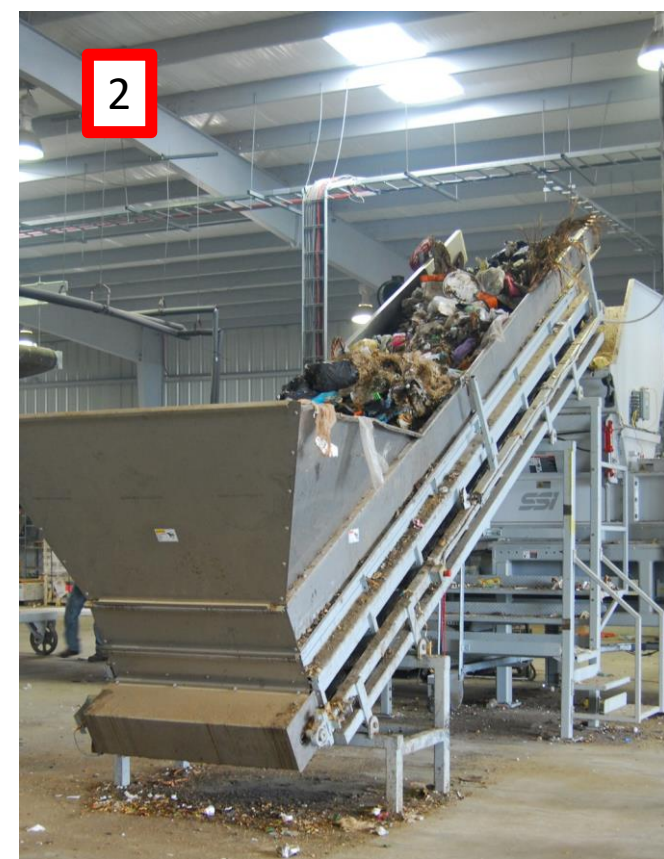


The Process:

A Holistic Approach

- Municipal Solid Waste (MSW) shredded and the most reliably valuable recyclables - aluminum and ferrous metals - removed.
- Inert material (rock/glass/dirt) removed for disposal or beneficial use.
- Organics (including food waste, contaminated material) and plastics processed and sterilized to form a clean, consistent, high energy, EPA-approved fuel to offset coal, biomass, or natural gas in power generation.
- Up to 90% of MSW diverted from landfill.







1. High Energy
2. Consistent Performance
3. Clean and Safe



- *Moisture content can be customized.*
- *Can be pelletized if needed.*
- *Transports easily, stores indefinitely*



Offset Coal or Biomass

High Energy – Works in existing equipment

- 9,000 BTU per pound similar to coal (21 GJ/T)
- Twice the calorific value of refuse derived fuels (RDF)
- EPA recognizes as drop-in replacement for coal or wood fuels

Consistent – Promotes Efficient & Predictable Fuel Use

- Fuel characteristics more consistent than biomass
- Multiple third party analyses to verify consistency

Clean & Safe – Better for the environment and workers

- EPA certified Non-Waste Fuel means user is not classified as incinerator
- EPA Non-Hazardous Secondary Material (NHSM) designation minimizes transport and handling regulations
- SE3 is sterile protecting employees and extending shelf-life
- Also meets European solid recovered fuel (SRF) standards





Five Years of Intensive Testing

2013

**CanmetENERGY
Research**

*First extensive
testing of co-firing
SE-3 and coal*

Tetra Tech Review

*Review of
recommended safe
handling practices
for SE-3*

National Cement

*First cement kiln test
burn*

2014

**Koogler
Engineering**

*Concludes SE-3
meets EPA NHSM
standards*

CEMEX Test

*Multi-day cement
kiln test burn*

**Blue Source
GHG Analysis**

*Calculates 1.7 tons
of GHG reductions
per ton of SE-3*

2015

**CCEMC \$10MM
Grant**

*Project estimated
to save almost
1,000,000 tons of
CO_{2e}*

Argos Cement

*Co-fires SE-3 at
35%*

Florida DEP

*Approves recycling
credits for SE-3*

2016

**Southern
Research Test**

*Successful test
burn co-firing SE-3
and coal*

2017

**430 MW Test
Burn**

*Successful large-
scale co-fire test in
pulverized coal
boiler.*

Lehigh Cement

*Signs commercial
fuel purchase
agreement*

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2019 EPA Comfort Letter

EPA Publishes Letter Designating ™

Sustainable Engineered Fuel

1. Non-Waste Fuel

“Accordingly, we would consider this NHSM (non-hazardous secondary material) a non-waste fuel under the 40 Part 241 regulations....”

2. Replace Coal or Wood

“...we believe that your operations... will transform waste into a processed, non-waste fuel appropriate for use in units designed to combust coal or wood and biomass.”

3. Low Contaminants

“Overall, based on this contaminant-to-contaminant comparison, all contaminants in SE3 are comparable to or lower than those contaminants in coal or wood/biomass.”





Analysis: Canmet Energy

Reduces GHG emissions

“...diverting refuse (and co-products) from the landfill and then displacing coal from the generating station will result in a considerable reduction in greenhouse gas emissions.”

No impact on combustion

“SE3 could be co-fired with Highvale coal without considerable impact on the overall combustion behaviour of the primary coal.”

Compatible with emissions controls

“... there was no obvious impact on emissions of NO_x and SO₂, or dioxins, furans and polynuclear aromatic hydrocarbons (PAHs). Emissions of HCl were found to increase, as expected given the higher concentration of chlorine within the SE3.”



A division of Natural Resources Canada



Analysis: Southern Research Institute

“...NO_x, SO_x and CO₂ reductions are apparent over the coal when introducing 8% by heating value of WastAway fuel”

“...mercury emissions did not increase with the WastAway fuel”

“... a low to moderate potential for slagging”

“... there is no apparent change in Ash Fusion temperatures, which suggests no appreciable change in slagging from Illinois Basin coal alone”



Tests conducted at Southern Company's Combustion Research Facility



Environmental Benefits Summary

- Blue Source calculates 1.7 ton of GHG reductions for every ton of fuel used.
- Replacing 21% of coal with SE3™ reduces coal-fired GHG emissions to EPA AVERT levels as called for in Clean Air Act Plans.
- 60%+ of thermal content derived from non-fossil constituents.
- Prevents harmful methane emissions from landfills.
- Renewable Energy Credits available through the measurable reduction of carbon footprint in power generation



Blue Source™

For over 20 years, the Company has been a leader in climate change and low carbon environmental products and services.

WāstAway®
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430 MW Commercial Generation Test Burn

Engineering Report:

“...a technically acceptable method of reducing CO2 emissions from coal with manageable operational impacts.”

“...minimal adverse effects to heat rate, plant performance, fly ash content or stack emissions.”





Making Coal Cleaner

	Coal Alone Actual	Coal + 5% SE-3 Actual	Coal + 21% SE-3 Calculated
CO2 Intensity (MT/MW)	.9897	.9491	.8128
Methane Avoidance Bonus	0	.0243	.1058
Effective CO2 Intensity	.9897	.9248	.7070
Annual CO2 Savings	0	141,449	616,971

[These results are from 430 MW commercial test burn]

Case Study: Commercial Facilities

Warren County, Tennessee

Problem - MSW transportation and landfill costs steadily increasing coupled with local commitment to recycling and beneficial use

Solution - 50 ton/day WastAway system built to process all municipal MSW collection along with office/cafeteria waste from local manufacturing plants.

Results - 16 years of operation and recognition by State for 95% Recycling Rate. Now utilized for test fuel production and continuing R&D.



Case Study: Commercial Facilities

Island of Aruba:

Problem - Landfill leaching into precious ground water, plus extensive use of illegal dumping. High price of electricity generated through oil-fired systems.

Solution - WastAway system installed to process 150 tons/day of waste, taking major portion of MSW. Met plan to provide fuel for new generating system.

Results - Successful operation for several years, utilizing fuel product as landfill cover material. Production now paused awaiting construction of proposed generation plant.



Case Studies: Projects in Development

Florida Campus Community

- Problem: Utility District desires to reduce landfilling, increase green energy. Has MSW flow control and authority over local power generation plant.
- Solution: Process 300 tons/day of campus and muni MSW with WastAway facility and provide fuel to augment new natural gas combustion system.
- Results: Positive financials, generation plant now being retrofitted with feed system to use WastAway fuel. Full scale testing set for 2nd quarter 2021.

California County

- Problem: Must increase landfill per capita diversion rate to meet new State environmental regulations
- Solution: Process 400 tons/day with WastAway facility and produce fuel for sale to local cement kilns.
- Results: Positive financial pro forma. Fuel purchase agreements in place. Project design and engineering contracted by County. Next step is full state approval of processing plant operation/permits.

Case Studies: Projects in Development

Michigan County

- Problem: Officials seek to reduce landfill use and provide renewable energy for industrial business park.
- Solution: Process 500 tons/day with WasteAway facility (as first step) and produce green power at competitive rates for local use.
- Results: Financial model shows project will be attractive to private or public funding with production of 15 MW electric power, or 200,000 PPH steam. RFP response analysis is ongoing.

British Columbia Tribal Council

- Problem: Environmentally proactive First Nations island community wants to stop expensive MSW hauling/landfilling and find beneficial use.
- Solution: Process 300 tons/day of MSW with WasteAway facility and market resulting green fuel to regional paper mills to offset coal.
- Results: Tribal ownership and substantial positive cash flow will benefit community. Now in fuel sales contracts and permitting stage.

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