Meeting Summary
Climate Tech Network Meeting
October 21, 2019
10:00 a.m. to 12:30 p.m.
Bay Area Metro Center – Yerba Buena Conference Room

Meeting Summary:

Welcome, Introductions and Agenda Review
Ben Gettleman, facilitator, opened the meeting by thanking attendees for participating and introducing Chad White, Program Lead for the Climate Tech Finance (CTF) program at the Bay Area Air Quality Management District (BAAQMD) and Rebecca Fisher, Program Lead for Outreach and Partnerships in the Technology Implementation Office at BAAQMD.

Chad White began by explaining that the Climate Tech Network (CTN) seeks to collaborate with members of the industry, public agencies, and facility managers to help disseminate insights and support new ideas. He summarized the three primary objectives of the CTF program are as:

1) Identify and accelerate emerging technologies that reduce greenhouse gas emissions;
2) Broker partnerships between technology providers and technology adopters to drive climate action; and
3) Provide attractive financing to incentivize the adoption of cost-saving climate technologies.

Chad White explained that the first generation Climate Tech Finance products include 1) loans ranging from $500,000 to $30 million, with terms of up to 30 years that is available for public organizations, , and 2) loan guarantees of up to $20 million, with a maximum guarantee of $2.5 million for small businesses on loans.

Microgrids from Start to Finish: Case Studies in the Wastewater Sector
Gettleman introduced the panel topic and noted that presenters would discuss their efforts to create microgrids at wastewater treatment plants. The panelists gave presentations that were each followed by a brief Q&A with members of the CTN.

Richard Swank, Trane U.S. presented on the process of constructing a microgrid at the Laguna (Santa Rosa) Subregional Wastewater Treatment Plant (WWTP). Starting at a high-level, Swank provided an overview of the California wastewater treatment sector and discussed existing challenges such as aging infrastructure, regulations, droughts, water conservation, and costs. Swank mentioned the California Independent System Operator (CAISO) "Duck Curve" (Figure 1), which depicts energy usage during the day and emphasized that the steep incline in daily energy usage from 4pm to 6pm could be addressed by deploying microgrids and battery storage.

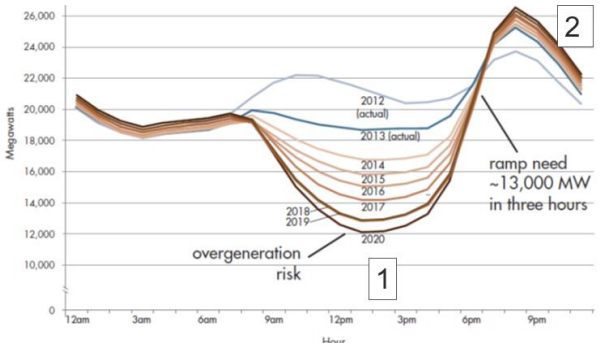

Figure 1. CAISO Duck Curve

Swank provided an overview of the Laguna WWTP Microgrid:

- Average plant power is 3.5MW typically
- Carport Solar PV (126 kW DC) (Figure 2) 2 MW Microgrid Energy Storage System (ESS)
- SCADA interface to microgrid and Trane S/W platform
- Flow Equalization Basins (FEB)
- 4 CHP's at 1.1 MW each
- 2 CHPs with Silicon Controlled Rectifiers (SCR) dispatched from the microgrid
- Instantaneous controllable power resource kW/kWh
- Load balancing or peak shaving
- Non-export application; non-island
- 4 MW diesel generator back-up (not controlled by the microgrid)

Figure 2. Laguna WWTP Carport Solar

Reflecting on his experience constructing the microgrid, Swank provided key takeaways from the planning and construction process. He indicated that ongoing communication with all relevant parties including plant operators, city/municipality representatives, attorneys, and technical partners was critical to keeping the project affordable and attainable, while still being cutting edge. He also emphasized the importance of starting the paperwork early in the design phase and the need to incorporate multiple review loops throughout the project design process.

He closed by explaining how the system is controlled entirely by operators who can instantaneously dictate how power is used at the WWTP, which allows the system to be efficient and malleable to fit changing needs on a daily basis.

<u>Questions and Comments</u>

The following questions, comments and responses were recorded following the presentation (Q= question, R= response, C= comment):

- Q: What was the total cost of the project?
    - $7.5-8 million. There was an initial California Energy Commission (CEC) grant for $5 million with matching funds provided by the City of Santa Rosa, Trane U.S. and partners.
- Q: Is a microgrid necessary if the FEB capacity is almost as big as the daily flow?
    - R: We are trying to combine different technologies to keep the system diverse. We use the battery to make up the slowness of the FEB in hitting certain energy targets. In addition, part of the reason why we won a CEC grant was because of the proposal to use different technologies including a CHP, FEB, Microgrid, and SCADA all in one system.
- Q: Do you have any interest in islanding/disconnecting the system? If so, why was that not done here?
    - R: Islanding is very effective but also very expensive, so we omitted that feature as it would have added a huge cost.
- Q: What funds do you see CAISO making available for projects like this?
    - R: There are many programs that you can apply for. In our case we used the PDR program, which is like a stock market for energy generation and distribution.

Generally, there are many grants out there that interested parties should investigate and apply for.

- Q: How quickly will the project pay for itself?
  - R: We received a grant for $5 million, the City of Santa Rosa invested $750,000 and, contractors put in an additional $2 million. The cities return on investment (ROI) is one year, while Trane, which invested a lot more, might have an ROI of 10 years.
- Q: Where did Trane U.S. get its funds?
  - R: This initiative was a research and development investment that will be recouped over time.

Tom Jackson and Ryan Hougham, Climatec, presented their work developing a microgrid at the City of San Leandro WWTP. Hougham, who specializes in wastewater treatment, provided an overview on the challenges facing reclamation facilities that include rising power costs, public safety power shutoffs (PSPS), limited funds, and increasing pressure from municipalities to reduce overall greenhouse gas (GHG) emissions.

To provide context, Hougham spoke about San Leandro's three-phase comprehensive approach which, in its current and final stage, will result in the deployment of a microgrid at a water pollution control plant. Hougham explained that the city has shifted its goals from aiming for net zero energy production to becoming a net exporter of power to Alameda County and generating revenue from the city's electricity production. Hougham emphasized that microgrids are the optimal solution to going beyond net zero generation because they provide resiliency and critical power, maximize generation from multiple sources of power, provide the opportunity to island, and fully utilize renewable fuel sources as shown in Figure 2.

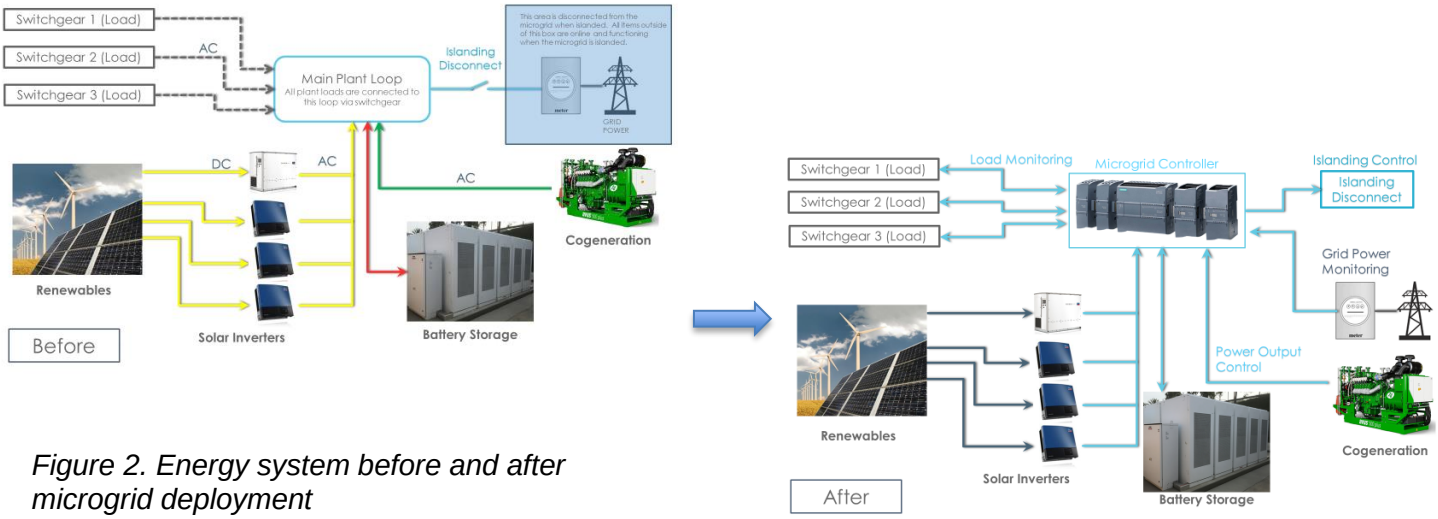

Figure 2. Energy system before and after microgrid deployment

Prime candidates for microgrids include:

- Treatments plants with:
  - Existing cogeneration capacity
  - Underutilized cogeneration capacity

- Excess flared biogas
- Excess digester capacity

- Organizations/facilities with:
  - Available real estate for solar
  - Fire risk areas
  - Disadvantaged communities
  - Community Choice Aggregation areas

Jackson added that, through a combination of time of use policies and efficient battery storage technology, microgrids have become more financially viable than other forms of renewable energy generation. He emphasized that, in addition to monetizing risk to set up a treatment plant to be a sustainability leader in the community, potential developers need to be aware of funding sources available. Among these programs he highlighted two new Self Generation Incentive Programs (SGIP) starting in April 2020:

- SGIP Equity Budget – $63 million available
- SGIP Equity Resiliency Budget - $100 million available

Jackson closed by discussing the anatomy of a successful energy program (Figure 3), highlighting the importance of building sponsorships and awareness at the executive level, finding partners, and communicating successes after the fact.

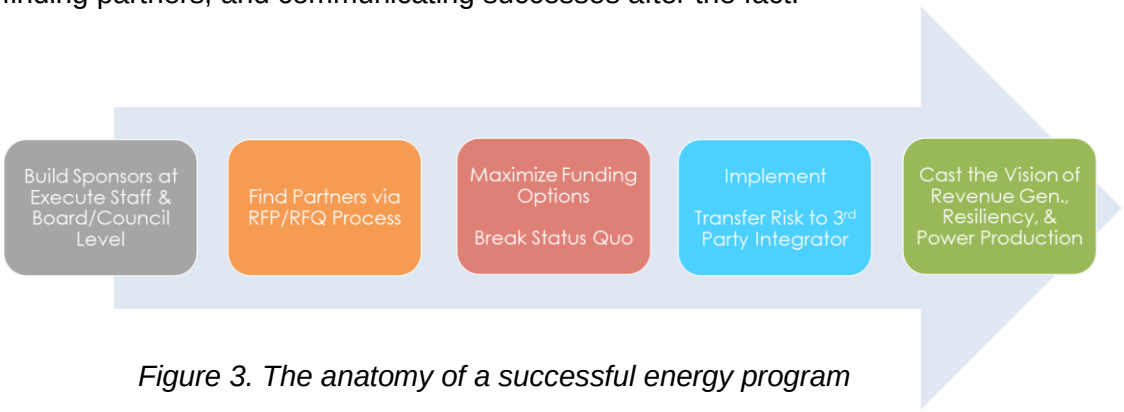

Figure 3. The anatomy of a successful energy program

Questions and Comments

The following questions, comments and responses were recorded following the presentation (Q= question, R= response, C= comment):

- Q: At what point will we no longer need to rely on state funding and grants for these projects to become financially viable? Given the high cost of the recent power outages it seems that the ROI is going to greatly increase.
  - Ryan Hougham: You are correct that as the costs of these outages go up, the ROI for our technologies will improve. However, it is all about monetizing a risk which is not a simple task and might be easier to do once the actual failures have occurred more often.
  - Tom Jackson: In addition, these technologies will become more desirable and financially viable as needs change and prices decrease. While the cost curve naturally adjusts itself, it is important for pioneers to keep seeking funding for projects that break the status quo and introduce new technologies into the energy production landscape.

    - Richard Swank: Conservation is crucial in order to create an adequate and scalable system that is affordable and innovative. It is important to get the energy baseline cost down and not oversize the project. This will allow you to conserve as much as you can at the beginning and help decrease the overall cost of the project.
- Q: How do you suggest transitioning from an energy efficiency project with some solar to a microgrid.
    - Ryan Hougham: Generally, it is important to make sure all components of the system are optimized at the local level. You need to create a system that fits your needs and produces energy at the most efficient rate possible given specific conditions.

Flash Presentations on Microgrid Technology
After thanking panelists for their presentations, Gettleman introduced a panel of "flash" presenters highlighting their experiences with energy storage technology. Each presenter provided a brief overview/summary of their organization/featured project. Following the presentations, participants were encouraged to network with panelists and other members.

Catherine Von Burg, SimpliPhi Power, indicated that SimpliPhi designs, manufactures, and distributes efficient, non-toxic batteries that store power from any generation source, for both grid-tied and off-grid applications. They produce a portfolio of stationary and mobile energy storage solutions that range from fully integrated portable personal power batteries to large scale commercial systems that can produce up to 2 Megawatt-hours (MWh) at 800 volts (V). Von Burg emphasized their use of lithium ferro phosphate (LFP) chemistry, which is much safer than the cobalt based (NMC & NCA) lithium batteries. Today, the company has its products in over 40 countries with a cumulative production of 70+ MWh. Their customers include commercial & industrial, residential, utility, emergency response, and off grid power & security.

In reference to a recent case study pairing SimpliPhi batteries with diesel generators to extend fuel reserves during an emergency with extended power outages, Von Burg noted that their batteries can optimize any generation source, including traditional generators. She added that they have been endorsed by the U.S. Marine Corps and Army after successfully deploying SimpliPhi batteries to offset diesel usage on forward operating bases in Afghanistan and Iraq. Von Burg shared other case studies that deployed energy storage to optimize a generation source including combinations of on- and off-grids. Through integrations with different types of equipment, SimpliPhi batteries create energy security and resilience by eliminating the intermittency of renewable generation, as well as the grid during PSPS, and optimize power and cost savings on a daily basis.
Peter O'Brien, AMS, presented on the software and development services provided by AMS, and discussed advanced intelligence for energy markets. Currently, AMS has a capacity of 70 MW at 98 sites including wastewater treatment plants, schools, and community colleges.

O'Brien talked about their Armada software platform which provides optimization for (1) retail bill savings, (2) grid services and demand response, and (3) incentive and regulatory compliance. In addition, AMS development services include:

- OEM hardware and software technology integration,
- Interconnection, permitting and regulatory compliance,
- DER procurement and vendor management,
- Engineering and construction,
- Project financing.

O'Brien concluded by presenting on two case studies: Resiliency Solution for CSU Chancellor's Office and Inland Empire Utilities Agency.

Vijay Srivatsan**,** gave an overview of ***Bloom Energy***, a clean energy manufacturer with manufacturing facilities in California and Delaware that provide clean, reliable, and onsite energy. They have 350MW installed over 600 sites and among their clients are 25 members of the F100.

Bloom Energy's technology is highly efficient because it (1) generates power electrochemically, which reduces CO2 emissions, (2) does not use any water, (3) can use natural gas, biogas, or hydrogen as fuel input, and (4) has high power output in a small footprint. In addition, their systems are flexible and able to design based on different scales.

Next, he gave an overview of "bloom on biogas" as illustrated in figure 4.

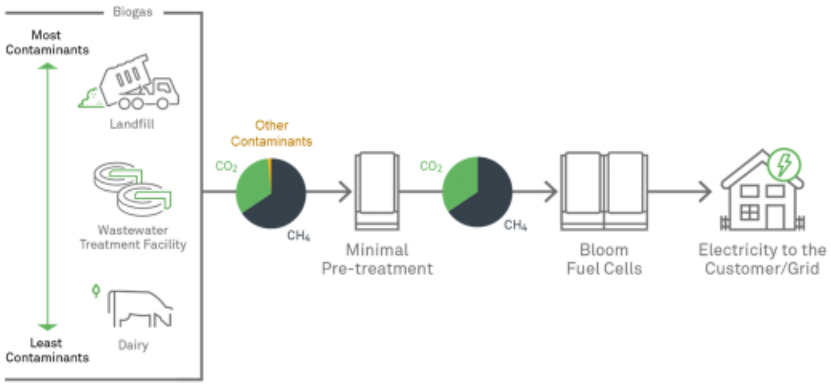

Figure 4. Bloom on BioGas

Through its efficient, flexible, and innovative technology, Bloom can help solve challenges for the Bay Area as it adapts to the new energy considerations in light of the PSPS.

Before closing, Srivatsan discussed a landfill gas pilot project that accepts construction waste. Looking ahead, Bloom has major commercial installations coming up including one in partnership with CalBio for a dairy digester developer.

Action Items and Next Steps

- Presentations from the meeting are available on the Network's Box file sharing site at the following link (please contact Kelsey Rugani, krugani@kearnswest.com, for access to the site).
- A video recording of the meeting is available at the following link.
- Climate Tech Network participants are encouraged to send recommendations to BAAQMD and Kearns & West on additional organizations to join the Network.
- Climate Tech Network participants are encouraged to send suggestions on content and format for future Network meetings.

Appendix A: Meeting Attendees

The Air District is happy to connect people via email, if there is someone on the list that you want to reach out to, please let us know.

Organization/Agency	Name
Alameda County	Brittani Gallagher
AMS	Peter O'Brien
ASU	Mark Bernstein
Bloom Energy Corporation	Sam Schabacker
Bloom Energy Corporation	Vijay Srivatsan
Central San	Rita Cheng
City of Brisbane	Adrienne Etherton
City of Brisbane	Randy L. Breault
City of Milpitas	Linda Grand
City of Pacifica Public Works Department, Wastewater Division	Louis Sun
City of Pacifica, Wastewater Treatment Plan	Mark A. Harris
City of Sunnyvale	Tanner McGinnis
Climatec, LLC	Ryan Hougham
Climatec, LLC	Thomas Jackson
Delta Diablo	Amanda Roa
EASCor	Jess Marguz
East Bay Municipal Utility District	John Hake
ergSol, Inc.	Monika Weiss
HDR	Victoria Strauss
Marine Municipal Water District	Matt Sagues
MCE	Alice Havenar-Draughton
MMWD	Kristin Arnold
Peninsula Clean Energy	Peter Levitt
San Francisco Public Library	Todd Robinson
Scale Microgrid Solutions	Shea Hughes
Sewerage Agency of Southern Marin	Mark Grushayev
SF Department of the Environment	Kathleen Bryan
Simpliphi Power	Catherine Von Burg
Sustainable Energy Inc.	Mark Roest
Table Rock Infrastructure Partners	Megan Matson
Table Rock Infrastructure Partners	Peter Luchetti
Tamalpais Community Services District	Sarah Mehtar
Town of Atherton	Robert Ovadia
Trane U.S.	Richard Swank
VFWD	Frank Silveira

VFWD	Johnson Ho
WCWD	Aaron Winer
	Suzan England
CTN STAFF	
Bay Area Air Quality Management District	Chad White
Bay Area Air Quality Management District	Rebecca Fisher
Bay Area Air Quality Management District	Tamara Kohne
Kearns & West	Ben Gettleman
Kearns & West	Jorge Kalil