2022 Better Buildings SUMMER WEBINARS

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Implementing Renewable Energy in Industrial Facilities

August 2nd, 2022
11:00am – 12:00pm ET
Clifton Yin
ICF
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Today’s Presenters

Ahmad Abbas
Oak Ridge National Laboratory

Luis Quinones
Bendix Commercial Vehicle Systems

Barry Wenskowicz
Narragansett Bay Commission
Implementing Renewable Energy in Industrial Facilities

Presenter: Ahmad Abbas

Co-authors:  
Chris Price  
Paulomi Nandy  
Thomas Wenning

Oak Ridge National Laboratory

August 2nd, 2022
Renewable Energy Mechanisms

- Solar Energy
- Wind Energy
- Waterpower
- Biogas
- Geothermal

Retail Supply Options
- Unbundled RECs
- Competitive Green Power
- Utility Green Power
- Community Choice Aggregations (CCA)

Project-specific Supply Options
- Self Supply
- Shared Renewables
- Utility Green Tariffs
- Physical PPAs
- Virtual (Financial) PPAs
Wholesale electric power markets (ISOs/RTOs)
Credit: ISO/RTO Council (IRC)

*States may be partially regulated/deregulated, regulated only in some utility markets, or
deregulated for industrial consumers. Additional information is available at the American
Coalition of Competitive Energy Suppliers
Renewable Electricity Purchasing Options

Renewable Energy Certificates (RECs) are tradable, non-tangible commodities in the energy market that represent the benefits associated with **1 MWh of generated renewable energy**.
Power Purchase Agreements: PPAs & VPPAs

- PPAs are agreement to purchase energy from a third party
- Consumer buys electricity at a set rate and the associated RECs
- Benefits include reduce energy costs, shifted O&M costs, and renewable energy
- There are two main types of PPAs:
  - **Physical PPA**: Energy is delivered directly to consumer
  - **Virtual PPA**: Energy is delivered to the grid through wholesale market
- PPAs are location dependent
  - State regulations can affect your ability to enter into PPAs
Green Power/Tariffs

1) Competitive Green Power Products

2) Utility Green Power Products

3) Utility Green Tariffs

Utility Green Tariff versus Utility Green Power Products:
- Both offered by utilities in regulated markets
- Consumer receives bundled green power through both
- Green Tariff attached to a specific project through utility (long-term agreement)
- Green Power Products, customers pay premium for extra line item on bill to support “off-the-shelf” renewable electricity product from a mix of renewable energy resources.

States with utility green tariff programs as of December 2020
Source: CEBA, U.S Electricity Markets: Utility Green Tariff Update
Other Common Supply Options

1) **Community Choice Aggregations (CCAs), or Municipal Aggregation**
   - CCAs allow local governments to procure power on behalf of their residents, businesses, and municipal accounts.
   - CCAs are an attractive option for communities that want more local control over their electricity sources.

2) **Shared Renewables**, also known as or Community Renewables or Community Solar
   - A procurement model allowing multiple customers to buy, lease, or subscribe to a portion of a shared green power system.
   - Legislation has been enacted in 20 states.

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**Credit:** Local Energy Aggregation Network (LEAN) Energy US website: [https://www.leanenergyus.org/cca-by-state](https://www.leanenergyus.org/cca-by-state)

**CCAs Status in the US**

- Authorized in 30 states:
  - California
  - Illinois
  - Maryland (Montgomery Co. PIUE)
  - Massachusetts
  - New Hampshire
  - New Jersey
  - New York
  - Ohio
  - Rhode Island
  - Virginia

- Actively Investigating:
  - Arizona
  - Colorado
  - Connecticut
  - Michigan

- Watch List/Potential:
  - Oregon
  - Washington
  - New Mexico

*Not yet implemented*
## Comparison of Renewable Electricity Supply Options

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<td>Virtual (Financial) PPAs</td>
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¹Dependent on RECs ownership

Unlikely ➞ Most Likely
Tools and Resources
Renewable Energy Software Tools

- **EPA Green Power Supply Options Screening Tool**
  - Survey style MS Excel-based tool
  - Helps organizations identify supply options available to them

- **System Advisor Model (SAM)**
  - Detailed technology performance
  - Detailed economic modeling

- **REopt/REopt Lite**
  - Optimized system size and dispatch
  - High-level economics

- **PVWatts Calculator**
  - PV energy generation (no economics)

- **Economic Site Analysis (ESA)**
  - Map interface with geospatial layers
  - High-level economics
Better Buildings Renewable Energy Resource Hub

Does renewable energy make sense for your organization?

Are you in need of funding/financing for a renewables-related project?

Are you facing technical/physical limitations to deploying onsite renewable energy?

Are you looking for information on working with your utility, accessing incentives, and overcoming regulatory boundaries?

Do you need help incorporating green power into your energy procurement strategy?

https://betterbuildingssolutioncenter.energy.gov/renewables
Other Programs and Platforms for Renewable Energy

- **EPA Green Power Partnership (GPP) Program**
  - The program helps corporations procure renewable energy technologies and resources. Partners of this program commit to adopt renewable electricity for, and in return, they receive technical assistance, recognition, and updates.

- **Clean Energy Buyers Association (CEBA)**
  - Membership association for corporations interested in expanding their corporate renewable energy portfolio. Members get access to helpful tools, resources, education, and several other programs.

- **Database of State Incentives for Renewables & Efficiency (DSIRE)**
  - A comprehensive source for looking up federal, state, and local incentives and policies on energy efficiency and renewable energy with summary maps for some of the renewable energy policies such as net-metering and PPAs.

- **RE100**
  - A global corporate renewable energy initiative lead by The Climate Group in partnership with Carbon Disclosure Project (CDP) in which companies commit to use 100% renewable energy electricity in the shortest time possible, with 2050 being the latest for companies with interim goals.
Renewable Energy Guidance for Industry

- Access the Main document here.
- Access the Supplemental document here.

Additional Questions:
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Bendix Commercial Vehicle Systems
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Implementing Renewable Energy in Industrial Facilities

Bendix Huntington Solar System

2022 DOE Better Plants Webinar Series

Setting the course together.
Knorr-Bremse for the Sustainable Development Goals.
Bendix Commercial Vehicle Systems LLC

Company Overview

- Bendix Commercial Vehicle Systems, a member of Knorr-Bremse, develops and supplies leading-edge active safety technologies, energy management solutions, and air brake charging and control systems and components under the Bendix® brand name for medium- and heavy-duty trucks, tractors, trailers, buses, and other commercial vehicles throughout North America. An industry pioneer, employing more than 4,100 people, Bendix – and its wholly owned subsidiary, R.H. Sheppard Co., Inc. – is driven to deliver the best solutions for improved vehicle safety, performance, and overall operating cost.

- Bendix Commercial Vehicle Systems is headquartered in Elyria, Ohio, with manufacturing plants in Bowling Green, KY, Hanover, PA, Huntington, IN, Lebanon, TN, Wytheville, VA and Acuna, Mexico.

- Bendix’s Health, Safety and Environmental Policy:
  - BENDIX COMMERCIAL VEHICLE SYSTEMS LLC is committed to being a responsible corporate citizen. By establishing high standards of health, safety and environmental performance (HSE), we improve the quality of life of our employees and positively impact the surrounding communities.
Bendix CVS LLC Huntington Manufacturing Campus has achieved milestones in growth, performance, and corporate sustainability in the years since it was first opened in 1980, now with 4 facilities and 564 employees it leads the way for self-produced renewable electricity with the first solar photovoltaic system building for North America operations. Already a well-established community member with a long history of commitment to the city of Huntington and the state of Indiana, Bendix Huntington was awarded with the first solar photovoltaic system in North America for the Knorr-Bremse AG portfolio. The conditions of the site and the availability of a well-located piece of real state made the business case align with the company’s climate strategy goals.

Solar System Details:

- 2,612 Ground mounted panels
- 1,260 kW DC / 1,000 kW AC
- PV System Array: 1,500,000 kWh / year

Bendix Huntington P1 covers 30% of its demand with the solar power produced
Bendix’s Goals and Objectives

Bendix CVS LLC is committed to halving its CO2 emissions by 2030, via a three-lever approach encompassed in the Climate Strategy that is based on the UN Sustainable Development Goals SDG13 Climate Action. Bendix’s goals are validated via the Science Based Target Initiative and there is further commitment to the DOE’s Better Plants Program, Climate Challenge and EPA Green Power Partnership. The three levers of the Climate Strategy:

1. Energy Efficiency
   - HVAC Unit Retrofit
   - LED lighting
   - Sub Metering
   - Retrofit washing operations

2. Renewable Generation
   - Solar PV system

3. Renewable Purchases
   - The Huntington Manufacturing Campus is already a carbon neutral operation, as for the past 2 years all the electric consumption of the site has been offset via the purchase of high-quality Green-E Certified REC (Renewable Energy Credits) from USA Renewable Sources.
With the deployment of the Phase II of the Climate Strategy, Knorr-Bremse launched a comprehensive approach to act on SDG13 activities, allocating a central budget specifically created to tackle CO2 reduction efforts. Bendix North America was already prepared with a large pipeline of energy related projects and promptly applied for a solar on-site system in the United States. The overall project took around 10 months of preparation:

**Solar PV System Project Overview**

**Implementation and Execution**

With the deployment of the Phase II of the Climate Strategy, Knorr-Bremse launched a comprehensive approach to act on SDG13 activities, allocating a central budget specifically created to tackle CO2 reduction efforts. Bendix North America was already prepared with a large pipeline of energy related projects and promptly applied for a solar on-site system in the United States. The overall project took around 10 months of preparation:

- **2019**
  - August 2020: Request for Project (RFP) for solar companies

- **2020**
  - September 2020: Top 3 bidders after a multidepartment review. HSE, Sustainability Operations, Purchasing, Finance, Legal
  - October 2020: Vendor selection
  - November 2020: Knorr-Bremse AG Board submission and approval

- **2021**
  - February 2021: Construction started
  - August 2021: System Started Operations

**Key Details:***

- **Investment:** 1.7 Million USD
- **Yearly savings:** $140k/year
- **Federal tax incentive:** 26%
- **Net Metering:** 36k USD/year
A plan and a strategy is a very important part of the overall Climate Strategy. Based on the success of the implementation of the Huntington PV system, we explored and develop several business cases.

This is a living document that gets reviewed every 4 - 6 months to keep identifying opportunities as capital becomes available.

For 2022 the next best available option was a rooftop array in our Bowling Green, KY facility, however after further inspection we found the ceiling needed additional reinforcement and a piece of land was tagged for further expansion.

For 2023 the next best available location is another location in Huntington, IN (Dampers Manufacturing Operations Huntington Plant 2).
Knorr-Bremse identified the need to better evaluate the feasibility of renewable energy systems for the worldwide locations since current circumstances are so complex and different on the international level. Currently the company is working to produce a guideline that would consider several factors besides the business cases and the savings that a PV system would produce.

This guideline is based on the European Standard EN17463 Valuation of Energy Related Investments

Provides a framework to evaluate an energy project in 3 scenarios and different circumstances.
Measuring Success

Main KEI (Key Energy Indicators)

1. **50% CO2 tons reduction from 2018 baseline:**

   The facility has a baseline of 9,726 CO2 tons, For 2021 the site has reduced a 6% of its emissions, when the operational footprint has increased from 460,905 ft² to 883,305 ft² with the addition of the Bendix Distribution Center which houses the North America Distribution Operations with an additional 422,400 ft². In another words the operations have expanded by 48% while still managing to get a 6% reduction in the CO2 emissions of the Huntington Manufacturing Campus. This demonstrates the efforts made by the sites in energy efficiency and renewable energy.

2. **2% Total kWh reduction vs previous year (same month) consumption:**

   This metric ensures that the site is on track to meet the 50% CO2 reduction goals by 2030, using absolutes increases the importance of designing any projects, business expansions to account for the additional energy to be consumed.

Bendix Huntington Solar PV project has become a key part of the Knorr Bremse Climate Strategy, as it contributes with 1 MWh to the worldwide goal of 15MWh of renewable self-produced electricity. This is the first non PPA Solar system in North America and spearheaded 3 additional solar projects for the company (3 installations in Mexico and 1 project in Brazil).
Measuring Success

Main KEI (Key Energy Indicators)
Measuring Success

Main KEI (Key Energy Indicators)

HGN Site, Electricity 2021 vs 2022

- Actual duke consumption (Without net metering) Estimation
- Internal PV consumption, billing kWh
- Net Metering
- Electricity Cost, 2022
Measuring Success
Additional Sites with Renewable
Thank you very much for your attention
Barry Wenskowicz
Narragansett Bay Commission
Self-Supplied Power of Narragansett Bay Commission

Barry Wenskowicz, Environmental Sustainability Engineer
Field’s Point WWT Facility

Field’s Point (FP) Operations
- 43 MGD Avg Daily Flow
- 77 MGD Secondary Treatment with Biological Nutrient Removal
- 200 MGD Primary
- Chlorination/De-chlorination
- Sludge Gravity Thickeners

FP Average Energy Values
- 1.6 MW Demand
- 13.9 million kWh/yr

Renewable Energy (RE) considered:
- Wind turbines installed in 2012
- Small hydro-electric potential
- Small onsite solar potential
Bucklin Point WWTF

Bucklin Point (BP) Operations
- 20 MGD
- 46 MGD Secondary Treatment with Biological Nutrient Removal
- 116 MGD Primary
- UV Disinfection
- Anaerobic Digestion

BP Average Energy Values
- 1.4 MW Demand
- 12.4 million kWh/yr

Renewable Opportunities:
- Biogas Project recently installed
- >2 MW Solar Project possible
Options to lower electric bills in RI

- Direct Net Metering through a bi-directional meter co-sited with load saves at near the retail rate. It’s an efficient form of distributed generation that reduces regional distribution and stack losses. NBC uses it to offset kWh fees on the electric bill.

- “Virtual” net metering can be used by public entities and some others in Rhode Island. It is one way that electric customers can install generating projects offsite. Most of NBC remote production gets valued at a higher rate than what target accounts pay. Credits can offset all the fees on the electric bill. Projects can be 1.) owned by the entity or 2.) owned by a 3rd party on behalf of entity via a Net Meter Financing Arrangement/contract.

- The (REG) Feed-In Tariff requires a bid below a preset ceiling-price and the sale of production and RECs to the electric utility at that fixed price for 15 years or more.
Fields Point Wind Turbines FY20

3 NBC-owned turbines each with 1.5 MW capacity
Exports over 3MW at times by Direct Net Metering
20% Annual capacity factor, Max Height 364 ft AGL
Cost of producing power is 8.6 ¢/kWh (neglecting SRF interest)
Operates behind Bi-Directional facility billing meter saving 11 ¢/kWh
Produced 7.8 million kWh/yr in FY 2020
Coventry Turbines FY2020

3 NBC-owned turbines each with 1.5 MW capacity
NBC Virtually Net Meters to accts paying about 14 ¢/kWh
Exports power to Utility’s Coventry Substation
22% Ann Capacity Factor, Max Height 413 ft AGL
Produced 8.6 million kWh/yr
Cost of power is 8.3¢/kWh (neglecting interest)
Meets availability and power curve guarantees of 95%
Commissioned in 2015 and purchased in 2016
Kingstown Road Arrays

Third-Party owned and operated
Virtually Net Metered by contract
NBC buys the discounted credits
Nominal Capacity $5.4\text{ MW}_{dc}$
Estimated Capacity factor 1,190 kWh/kW$_{dc}$
Average Production 6.8 million kWh/yr (2019-2020)
Cost was 8.0¢/kWh (FY20) accounting for REC sales
Annual Average Allocation Expected was 6.4 million kW/yr
90% guarantee was met
Solar PV Site Location

- 2 Solar Arrays separated by wetlands
- Total array area is about 15 Acres
- Each array has a separate grid interconnection
- Kingstown 1-West: 1,696.32 kW_{dc}
- Kingstown 2-East: 3,745.28 kW_{dc}
- Total Capacity 5.44 MW_{dc} (about 4.5 MW_{ac})
- COD: 12/31/2017
Johnston Green Hill Turbine

Third-Party owned and operated
Virtual net metered using discounted NMC contract
Turbine capacity is 3 MW
NBC contracts for 74.9% of production
Maximum height about 518 feet AGL
Annual Capacity Factor 24% (CY20)
5.1 million kWh/yr expected (2019-2021)
4.8 million kWh/yr allocated NBC (met guarantee)
Cost was 7.8 ¢/kWh (FY20) accounting for RECs
GDIM 1 Solar

Third-Party owned and operated
Virtual net metered using discounted NMC contract
Nameplate Capacity is 9,601 MW_{ac}
NBC receives 12.45% of production starting in June 2022
Expected allocation is 2 million kWh in the first year
Same annual allocation guarantee as other contracts
Bucklin Point Biogas Engine

CHP System with 644 kWe gross capacity
Operates behind conventional billing meter
Blends biogas with limited natural gas if needed
Potential to offset facility load by over 1/3
Does not export power to the local supply grid
Electric Accounts Comprising Total Use

4 biggest are 97% of the total use

5 have received net meter credits (NMCs)

One Master acct has 55 sub-accts
Generating Projects Offset 80% of 2021 Use
Monthly Production

Mix of Wind and Solar production is shown
100% kWh may be produced soon if economical
Most production is allocated via Schedule Bs
Allocating over 100% of kWh used annually undesirable
Bucklin Point Offsets

Monthly Offset in kWh

Monthly Offset in Dollars

- Credits from K2, WED1, WED3 (kWh)
- Facility Electric Use (kWh)

Electricity ($/month)

- Electric Cost (if no credits)
Fields Point Offset Example

Account reached annual average allocation of 100% of kWhs used

Then the Schedule B allocation was lowered as preventative measure to avoid risk of excess credit production and associated loss

Factors including natural variations make it challenging to consistently self-supply all accounts with 100% of kWhs used annually
Thank You

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Q & A

Submit Questions
www.slido.com event code #DOE
Better Climate Challenge Peer Exchange

RECs and Renewable Energy Accounting
Wednesday, August 17, 1:00 – 2:00 pm ET

Speakers:
• Michael Leschke, Director of Certification Programs, Center for Resource Solutions
• Lisa Brunie-McDermott, HNI Corporation
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