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Integrating Wind and Solar Renewables

Agenda

- PITT OHIO Overview
- Sustainability Focus / Goal
- Overview of Renewable Projects
- The Path to the DC Microgrid Integration Project in Harmar
- Other Future Applications

About PITTOHIO

Established in 1979 as an LTL carrier

Core values and business practices
passed down from generation to
generation

Reliable, Dependable Service
Focused on Quality and Innovation

Transportation Solutions

HAMMEL COMPANIES

At PITT OHIO, it has and always will be about the solution. And with this solution comes a promise of professionalism, collaboration, and complete customer satisfaction.

SUPPLY CHAIN – Pitt Ohio; U.S.Cargo

By working with you first to gain an understanding of your unique supply chain needs, we can provide you with a solution that exceeds your expectations.

GROUND – Pitt Ohio

PITT OHIO's GROUND service provides the solution customers need in small package transportation - flexibility and value.

LESS-THAN-TRUCKLOAD (LTL) – Pitt Ohio; Dohrn Transportation

Since our inception in 1979, PITT OHIO has been building its legacy Less-Than-Truckload (LTL) service by delivering dependable solutions in response to our customer's needs.

TRUCKLOAD (TL) – ECM and MCS

By teaming up with truckload specialist, ECM TRANSPORT, we've developed a reliable TRUCKLOAD solution that fulfills our customer's expectations.

Sustainability and PITT OHIO

- Starts from the top – owner and President Chuck Hammel III
- All over PITT OHIO, various initiatives were happening as part of our core values
- PITT OHIO partnered with Duquesne University professors Dr. John Mawhinney and Dr. Robert Sroufe to develop a custom carbon calculator
- We combined efforts across the organization under the umbrella of Sustainability and formed a cross-functional Steering Committee
- Publish monthly sustainability metrics, including carbon.

Sustainable Beginnings...

New Build based in Hamilton Township, NJ

- Worked with a local developer
- 19 Acres
- Office 5500 sf; Dock 21,800 sf; VM Garage 5300 sf = 32,600 TOTAL SF
- Site worked well for the place of a major distribution center



1094 Solar Panels
Land Mount on
1.5 Acres

- Approached by Nexus Solar
- Third Party Host

Hamilton Twp., NJ Terminal

- Able to fully support the electricity needs of the entire terminal through solar technology – net zero



AVERAGE electric usage annually is 200,000 kWh at the Terminal + 50,000 kWh at the Shop = approximately 250,000 kWh. As we complete our second year in operation:

SOLAR GENERATION

From July 2013 to June 2014 – 251,441 kWh

From July 2014 to June 2015 – 255,246 kWh

RESULTING IN A NET USAGE OF (2,412) kWh, creating MORE than we used on both accounts combined

OVERALL COST SAVINGS FOR CURRENT BILLING YEAR (July 2014 to June 2015) **\$33,000**

Pittsburgh Terminal – LEED Certification Pending – Gold/Silver



PITTOHIO

SUPPLY CHAIN · GROUND · LTL · TL

Pittsburgh Terminal – LEED Certified

- 96,000 square feet on 32 developed acres
- 40% - 50% Locally sourced and recycled building materials
- Innovative design and building placement to maximize daylight
- Roofing is sloped and white-coated to reflect solar heat and reduce the heat index.
- Geothermal heating and cooling
- Direct Current electricity
- Bio-swales to detain water

Pittsburgh Terminal – Solar

University of Pittsburgh Swanson School of Engineering
enhancing use of DC current through solar and wind.

180 Solar Panels installed on the roof in September



Pittsburgh Terminal – Wind

University of Pittsburgh Swanson School of Engineering enhancing use of DC current through solar and wind.

- Windstax Turbine installation later in October
- Wind – 30+ kWh/day; Solar – 150+ kWh/day = 180 to 200 kWh/day



WindStax™
WindPowerSystems



Collaborative Partnership between the University of Pittsburgh and PITT OHIO



PITT | SWANSON
ENGINEERING
ELECTRIC POWER SYSTEMS LAB

PITT OHIO
SUPPLY CHAIN • GROUND • LTL • TL

PITT OHIO – Harmar Facility

- **Renewable Energy / Energy Storage / DC Microgrid Integration**
- This project represents the successful outcome of an on-going collaboration between the University of Pittsburgh's Electric Power Systems Lab and PITT OHIO, a transportation solutions provider based in Pittsburgh and committed to promoting sustainability and energy efficiency practices.
- Understanding that the nature of its business has an impact on the environment, PITT OHIO is committed to improving its environmental and social sustainability performance. One of its other goals is to promote PITT OHIO and the Pittsburgh region as leaders in environmental sustainability and efficiency through the use of DC power integration of on-site renewable energy resources (solar and wind).

PITTOHIO – Harmar Facility

- **Renewable Energy / Energy Storage / DC Microgrid Integration**
- PITTOHIO has partnered with the University and other local industry partners to integrate renewables through a DC backbone into its Harmar facility as a means to promote the program objectives and also because it makes good business sense. This project will include the installation of both solar and wind power at the facility, coupled with battery storage capability.
- A recent extension of the partnership includes a similar role for PITTOHIO's new distribution facility in Parma OH (now in the design phase) and initial R&D activities towards potential electric trucking fleet concepts.

PITT OHIO – Harmar Facility

- The University partnered with PITT OHIO in 2013, through a corporate gift agreement, to facilitate the planning and design of the Harmar facility project. This role included identifying local industry partners, hosting project meetings and providing technical contributions to the design of the innovative facility.
- Additional support was leveraged in 2014/2015 through the DC-AMPS program, funded by the Henry L. Hillman Foundation.
- As part of the installation at Harmar, PITT OHIO will provide the University of Pittsburgh with a test room / lab to directly research the benefits of DC power. This project provides a leadership opportunity for the University of Pittsburgh to bring together industry partners to promote the Pittsburgh region as a global leader in the application of DC power.

PITTOHIO – Harmar Facility

- The 9 local industry partners helping to make the program a success include:
Adam Solar Resources, Aquion Energy, BDA Engineering, Inc., Eaton, Elecyr, Emerson, Power Conversion Technologies Inc. (PCTI), Sargent Electric, Universal Electric, and WindStax. Most vendors have been involved in the whole design process and others are equipment suppliers local to the Pittsburgh region. Elecyr, located in New Hampshire, is the only vendor not from the Pittsburgh region.
- The project construction phase began in late August 2015 after all design engineering, drawings, and township permits, etc. had been approved, with an anticipated project completion schedule of 90 days.

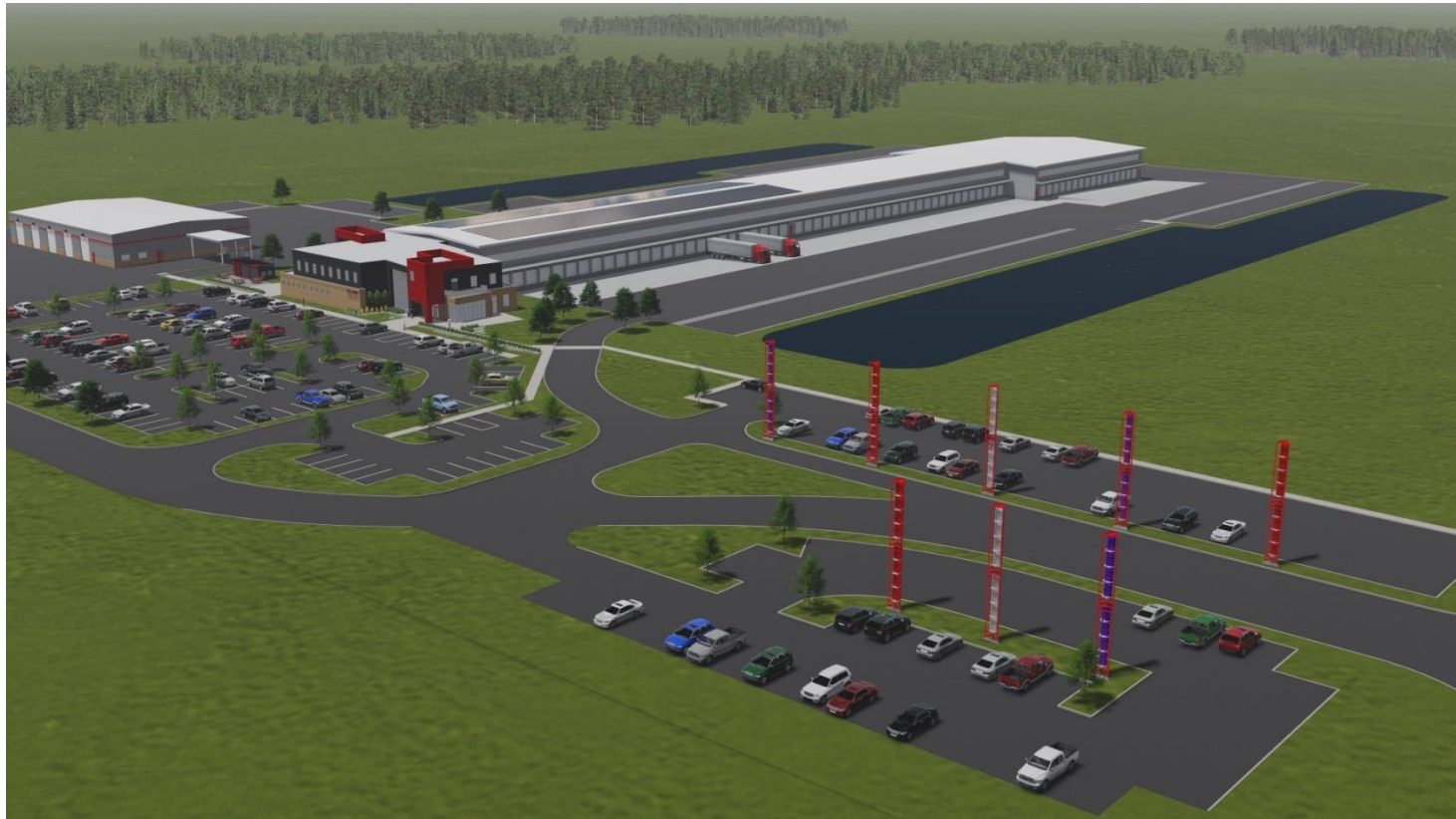
Example of True Community Partnership

- Renewable DC Microgrid Installation in Pittsburgh (PITT OHIO)
- Collaboration of Regional Organizations



New Cleveland, OH Terminal

Construction to be begin on our state-of-the-art, sustainable Terminal and Shop in Parma, Ohio



6 Year Plan

- Central Indiana
- Southeast Michigan
- Northwest Ohio
- Cincinnati (e)
- Philadelphia (e)
- Columbus (e)



Photovoltaic DC Powered Straight Trucks

- Heavier payloads
- Longer battery life
- Rechargeable every night on a quick charge solar powered battery
- Grant funded by PITT OHIO

