Sustainable Substation Solutions

IEEE Substation Conference

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Jim Hogan, VP of Transmission & Distribution
Marshall Bird, LEED® AP
Why Sustainable Sub?

LEED® - Like for Substation

• Trendy
• Benefits
• The Right Solution

Investigate Possibilities

• Partner with Northeast Utilities
Sherwood Substation Overview

• 115-kV/13.8-kV Substation in Westport, Connecticut
• Built on existing residential property
• Site drains to existing wetlands
• Located adjacent to Metro North commuter rail line park-n-ride lot
• Study done in parallel with conventional design and construction
• Sherwood Substation built in 2011 using standard design criteria
Sustainable Substation Initiative

• Concepts modeled after:
  – LEED® Reference Guide
  – Sustainable Sites Initiative

• Reasons for the Initiative
  – Lack of utility green building standards
  – Underutilization of sustainable building practices in substation design
  – Demand environmental responsibility
Overview

Sustainable Practices

• Site Development
• Stormwater Management
• Material Strategies
• Control Building Optimization
• Electric Vehicle Integration
• Public Education and Awareness
Site Development

Site Selection

• Select Brownfield/Redevelopment Sites
• Avoid Sensitive Ecological Areas
  – Wetlands
  – Riparian Buffer Zones
  – Endangered/Protected Species Habitat
Sustainable Site Development

• Minimize Area of Disturbance
  – Compact electrical configurations
  – Minimize disturbance to surrounding undeveloped and vegetated areas

• Provide Erosion Control BMPs
  – Prevent excessive sedimentation

• Shield Station Lighting

• Minimize Heat Island Effect
Water Efficient Landscaping

- Choose Native Plants
- Specify Plant Types that Minimize Erosion
Stormwater Management

Goals

- Control stormwater rates
- Remove 80% or more of Total Suspended Solids
- Minimize erosion of developed areas
- Exceed minimum municipal or state regulations

Pervious Pavement for Driveways

Sedimentation Basin
Stormwater Management Within Substation Fence

- Use Grass Pavers Where Practical
- Plant with Low Growing Native Vegetation
Stormwater Management

Grass and Gravel Pavers

• Benefits
  – Reduce impervious areas
  – Promote infiltration
  – Stabilize drive surface
  – Reduce Heat Island effect
  – Improve aesthetics

• Drawbacks
  – Increase maintenance procedures inside substations

Stormwater Benefits

• Meet or Exceed Required Stormwater Design Requirements
• Purchase/Use Smaller Plots of Land
• Less Disturbance and Erosion Potential
• Simplify Permitting Approval Efforts with Smaller Footprints
Material Strategies

Construction Waste Management Plan

• Waste Recycling and Landfill Diversion
  – Wood
  – Metal
  – Concrete
  – Masonry
  – Asphalt

• Source Reduction

• Coordination Between All Contractors
Recycled Content Building Materials

- Fly Ash in Concrete
- Reclaimed Crushed Concrete
- High Recycled Content Steel
- Recycled Plastics
  - Block retaining walls
  - Pipe
  - Geogrids and geotextiles
Material Strategies

Regional Materials and Local Suppliers

- Reduction in environmental impact of transportation/shipping

Vendor Selection

- Sustainable Manufacturing
- Responsible Business Practices
Control Building Opportunities

- **Building Envelope**
  - Increased Insulation
  - Higher R-value

- **HVAC**
  - Geothermal Heat Pump

- **Lighting System**
  - High Efficiency Lighting
  - LED Lighting Fixtures

- **Auxiliary Power**
  - Photovoltaic Panels
  - Small Wind Turbines
Charging Stations

• Possible Installation Locations
  – Commuter Parking Lots
  – Parking Garages
  – Shopping Centers
  – Residential Buildings
  – Office Complexes

Types of Charging Stations

• Quick Charge – DC Charging Stations
• Slow Charge – AC Level II
Public Education and Awareness

Partnership with Local Schools
• Utility Involvement in the Community Highlighting:
  – Substation purposes and need
  – Sustainable practices used in the substation
  – Renewable energy projects

Display Boards
• Locations
  – Substations
  – Charging station locations
Cost

- Est. Traditional Substation Cost: $9.2 mil
- Est. Sustainable Substation Cost: $9.35 mil
- Estimated Cost Increase: 1.0%
Next Steps

• Implementation
• Performance Review
• Cost Evaluation
• Bidding With This Design
• Request LEED Accreditation for Utility Projects
Questions?