New Solar facility added to existing wind farm in Dodge Center, MN
Introduction

• Dragonfly Solar completed construction of a 979.2 kW_{DC}, 720 kW_{AC} solar photovoltaic Project which began commercial operations on September 11, 2018.
• Project funding provided by customers of Xcel Energy through a grant from the Renewable Development Fund.
• Power is being supplied to NSP through a Solar Energy Purchase Agreement
Project Goals and Objectives

• Demonstrate Improvements in infrastructure efficiency
• Increase aggregate production that is closer to firm capability
• Increase knowledge of construction techniques
• Reduce interconnection costs
• Help increase market penetration of distributed generation
Project Description

• Capacity: 979.2 kW/DC, 720 kW/AC
• (2,880) 340 watt PV modules, (12) 60 kW inverters
• Connected to 34.5kV collection system from the wind farm
• Built on an abandoned railroad right away
• 1,650’ x 75’8”
• Fixed tilt Unirac racking system on driven piers
• Power delivered to NSP through existing 69kV transmission line
Overview of site

The array is located on an abandoned railroad right away adjacent to the McNeilus wind farm.
Site selection

• Privately owned abandoned railroad right away
  • Required a variance from set back restrictions from Dodge County
  • Zoning board was appreciative that we didn’t compete with agricultural interests
  • Created no hardships for the neighbors

• Required creative design and construction techniques
  • Managing drainage
  • Electrical design
  • Minimizing the impact from shading
  • Creative work flow

• Connecting with transmission system
  • Close proximity to AC line
  • Reduce scope and cost of MISO study
Permitting and Legal Agreements

• Conditional Use Permit
• Variance from Setback
• Zoning Permit
• MISO Interconnection Agreement Amendment
• NPDES
• Electrical Permit

• Solar Power Purchase Agreement
• Amended Generator Interconnection Agreement
• Land Lease
• Transmission and Interconnection Agreement
• Construction Agreements
Site Design and Construction techniques

• Proximity of Wind Turbines
  • Shadows
  • Ice shedding

• Grading
  • Retaining existing water flow
  • Not affecting neighboring land

• Construction flow
  • Working in Zones
  • De-watering
  • Staging equipment
Before Construction

The array is located on an former railroad bed which served as a service drive for the McNeilus wind farm.
Initial Grading
Staging

Work was performed in zones. Here staging is begun for the first zone.
Zone 1 completed

Racking, underground electric and modules installed in 1st zone.
Water Diversion

- Here the trench that runs throughout the array is temporarily used to divert storm water from a work zone. It was later de-watered and back-filled to accommodate electrical conduit.
Equipment area before and after water control procedures.
Array Design

• Racking
  • Unirac GMT
  • Pier Driven

• Modules - Heliene

• Inverters - Chint Power Systems

• String Design
  • String layout
  • Multiple Maximum Power Point tracking

• Voltage drop considerations
Project Benefits

• Doesn’t compete with agricultural interests
• Demonstrates construction techniques to keep construction costs down
• Non-traditional site use
  • Increases the supply of sites suitable for distributed generation
  • Increase affordability by increasing the supply of sites
• Reduce project cost and complexity by co-locating and utilizing existing wind infrastructure and interconnection agreements
• Increase supply of On-peak energy
• Environmental benefits
• Economic benefits
Lessons learned

• Construction techniques for non-traditional sites
• Shared Interconnection and infrastructure
• Project timing
Usefulness of Project Findings

• Using non-traditional sites can increase the supply of sites for solar generation facilities
  • The increased supply of sites can exert downward pressure on project costs
  • Reduce the cost of generation from solar

• Reduce amount of agricultural lands taken out of production for generation

• Increase market penetration of distributed generation
  • Shared interconnection will make more projects viable
  • Increases the efficiency of existing infra structure
  • Increased availability of suitable sites and downward pressure on pricing will lead to more developers able to participate in the market

• Combining wind and solar makes the over all output more predictable and benefits grid managers

• Foster good relationships with local jurisdictions and the community by taking less crop land away from other uses