Dragonfly Solar EP4-29

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 selction

- 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