

---

# VERMONT WEATHER ANALYTICS CENTER PROJECT



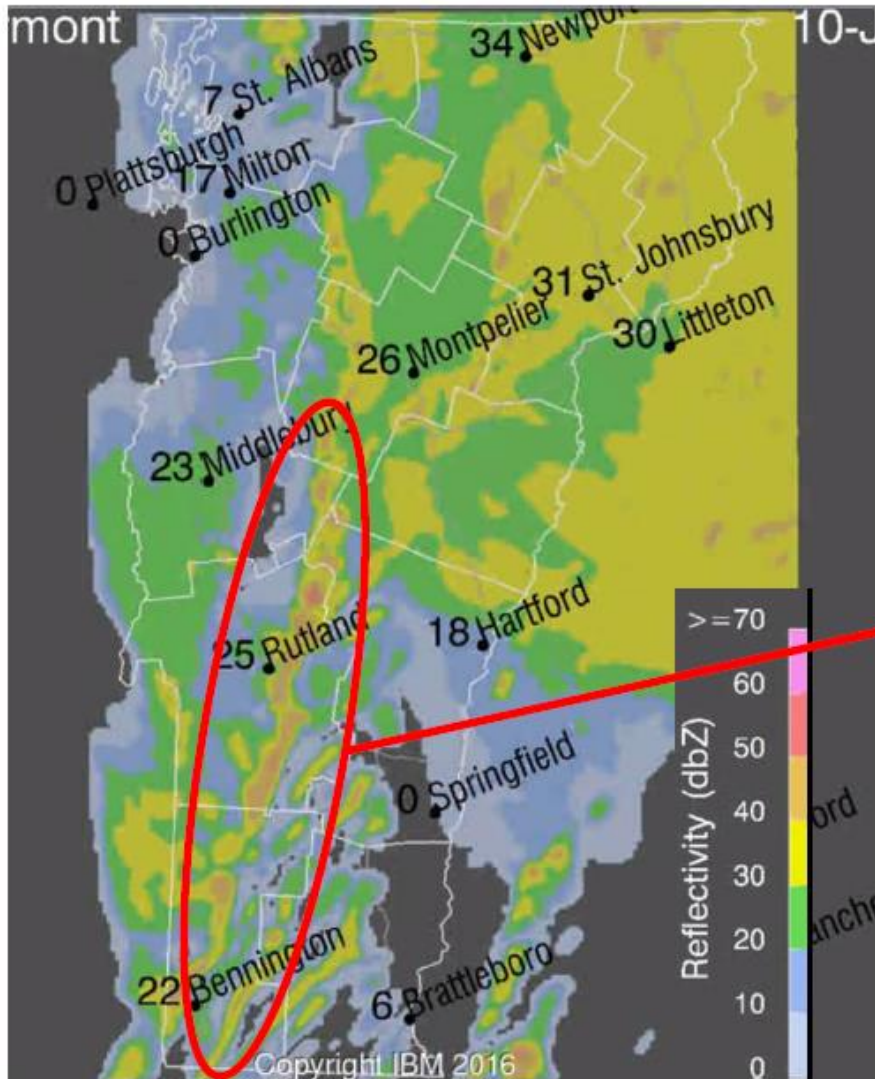
# VTWAC update - delivering value

- Confirmed VELCO/DU benefits delivered or to be delivered by this project:
  - **Safety/Reliability:** more informed emergency response calls and crew augmentation decisions; targeted wind chill index, lightning potential info, and road condition updates provided to line crews; more accurate, geographically targeted updates provided to customers
  - **Operations:** improved outage scheduling; ability to determine grid capacity for additional solar on the transmission system down to the substation level; demand analysis capability to the substation level; contingency analysis with reliable 72-hour forecast of expected system conditions
  - **Maintenance/Construction:** greater assurance of successful cold-weather work, e.g., ice bridge construction, mat placement, wetland construction, etc.; scheduling wind farm maintenance, etc.
  - **Planning:** increased reliability of planning assessments due to AMI data integration; improved NTA development; refined assessment of SHEI constraint storage need, reduced power supply market risk due to more accurate supply need assessments; improved developer/customer collaboration on solar installations; comparative generation assessments of competing prospective solar/wind sites
  - **Demand Management:** greater visibility to potential demand response events as demand forecast is built from substation level up to DU territory and state; increased peak management capability; efficiency measures validation

# Thunderstorms (Radar)

DT forecasted the early evening squall line with very high accuracy with respect to location and timing

DT – Storm Intensity Forecast @ 1730 hrs



Observed Radar @ 1725 hrs

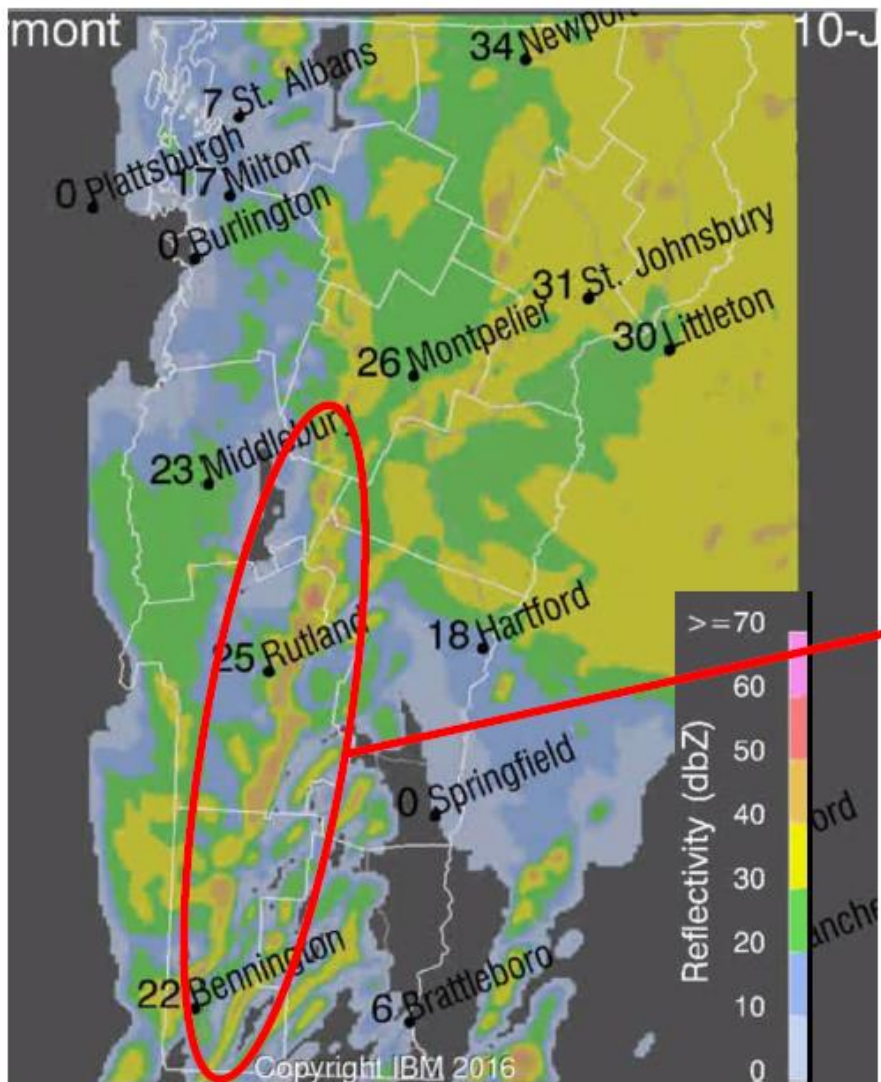




# Thunderstorms (Radar)

DT forecasted the early evening squall line with very high accuracy with respect to location and timing

DT – Storm Intensity Forecast @ 1730 hrs



Observed Radar @ 1725 hrs





# Outages/Impact

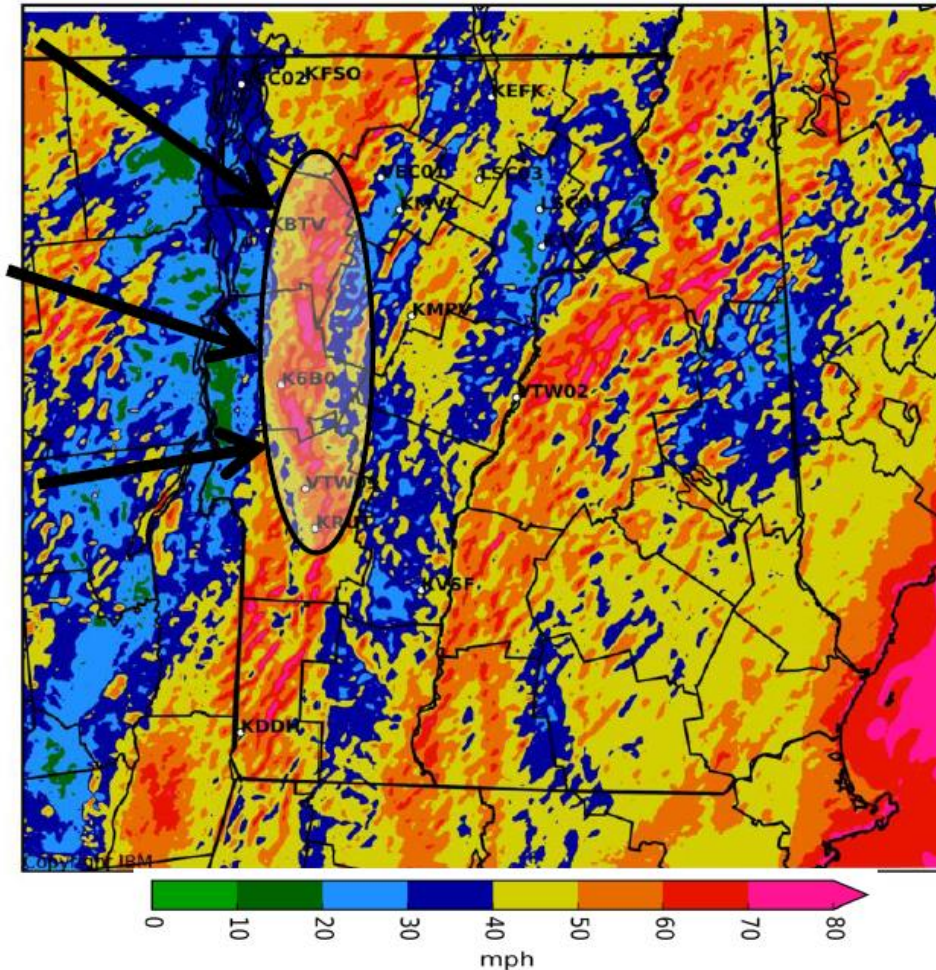
Areas of the strongest forecasted wind gusts matched well with the highest density of outages

## DT – Max Wind Gust Forecast

Maximum Wind Gust

Valid: 2016-01-09 19:00:00 - 2016-01-10 19:00:00 LT

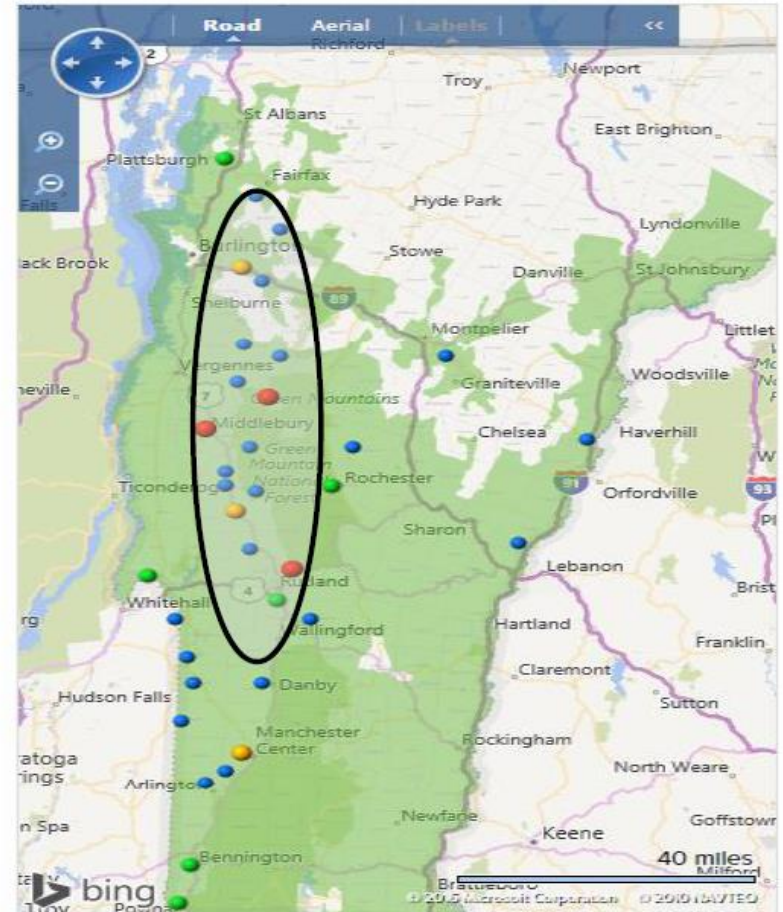
DT Forecast: 2016-01-09 19:00:00 LT



## GMP Outages @ 1300 hrs

### Customers Affected

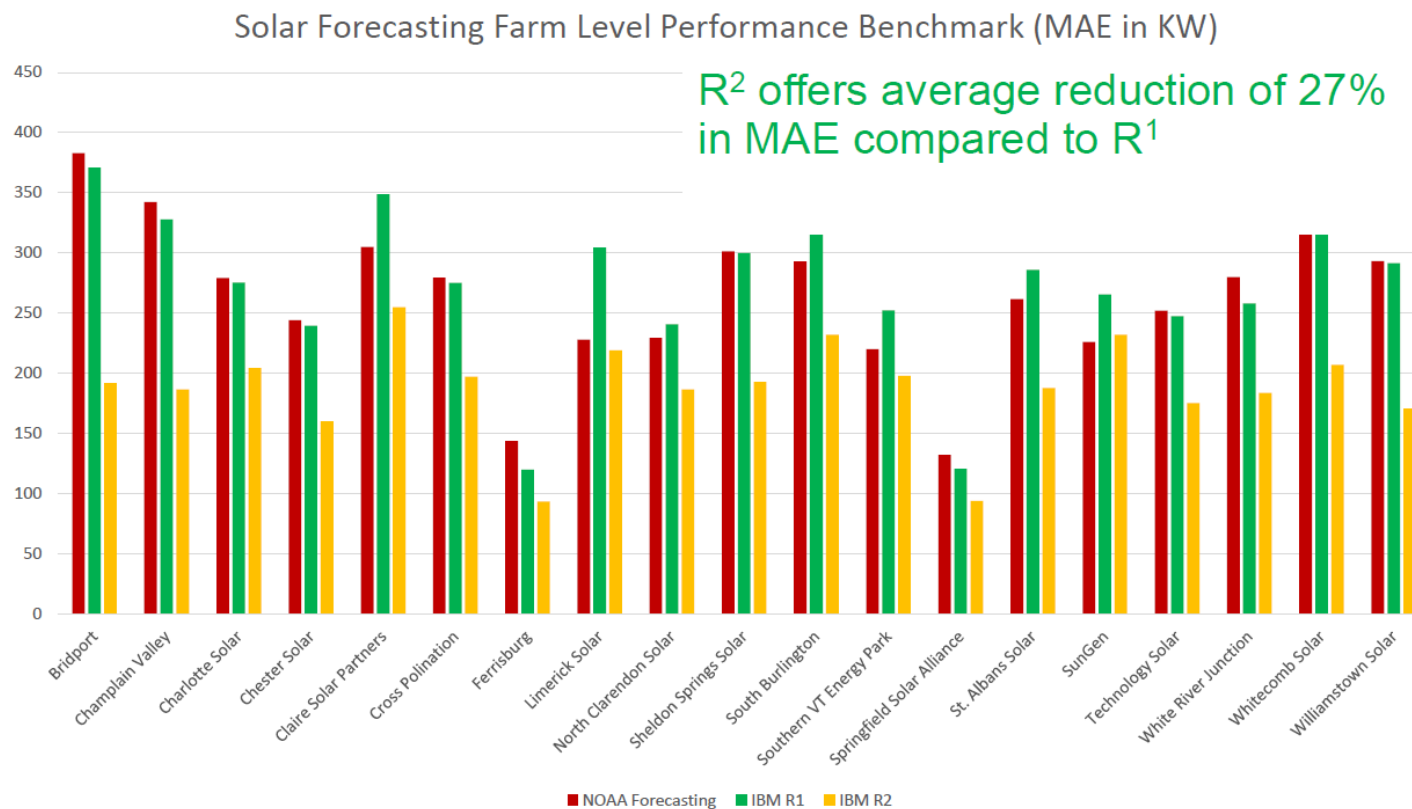
- 0 - 50
- 51 - 150
- 151 - 500
- 501+
- GMP Territory
- Display GMP Service Territory Layer
- Refresh Reset View



# VTWAC update – forecasting breakthrough

## Second Generation Renewable Forecasting (R<sup>2</sup>)

- Current generation/load forecasts incrementally better than ISO-NE, wind turbine mfg.ers
- **Forecasting breakthrough just realized: referred to as “R<sup>2</sup>” by IBM**
- Utilizes what appears to be the optimal mix of physics and machine learning techniques
- Achieves unprecedented forecasting accuracy, e.g. solar forecasting accuracy improved from 80-85% to 90-95%
- Not yet operational, additional work required to deliver production software



# VTWAC update – next steps

## Near-term work

- Complete tasks identified under existing Joint Development Agreement (expires Feb. 11, 2016) to include providing alerts to DU customers
- Install High Performance Computer Clusters to enable VELCO to run software models independently – (currently 102 portal users)
- **New** – collaboratively establish scope of work necessary to link VTWAC output with VELCO EMS in order to improve day-ahead contingency analyses
- **New** – collaboratively establish scope of work necessary to link VTWAC output with emerging ISO-NE pilot project on data collection and solar forecasting
- Collaboratively develop next step options with a preferred choice for review and action by the VELCO board of directors February 4.

## Project options for VELCO board review and action

- Stop work completely with no operationalization of work to date
- Operationalize work to date and end research with conclusion of current JDA
- Operationalize what we have and extend existing JDA for one quarter
- Operationalize what we have and develop a new two-year JDA with opt-out provision at one-year mark