



VWAC Operating Committee Meeting
9/15/2016

VWAC Phase II

DU Meeting on 7/22

- Continue focus on operational results
- Platform and Infrastructure work is critical path for other subprojects (example Peak Energy)
- DU co-ownership of objectives
- DU integrating VWAC into their operations
- Metrics work to continue

VWAC Phase II

Meeting Cadence/Team Leads

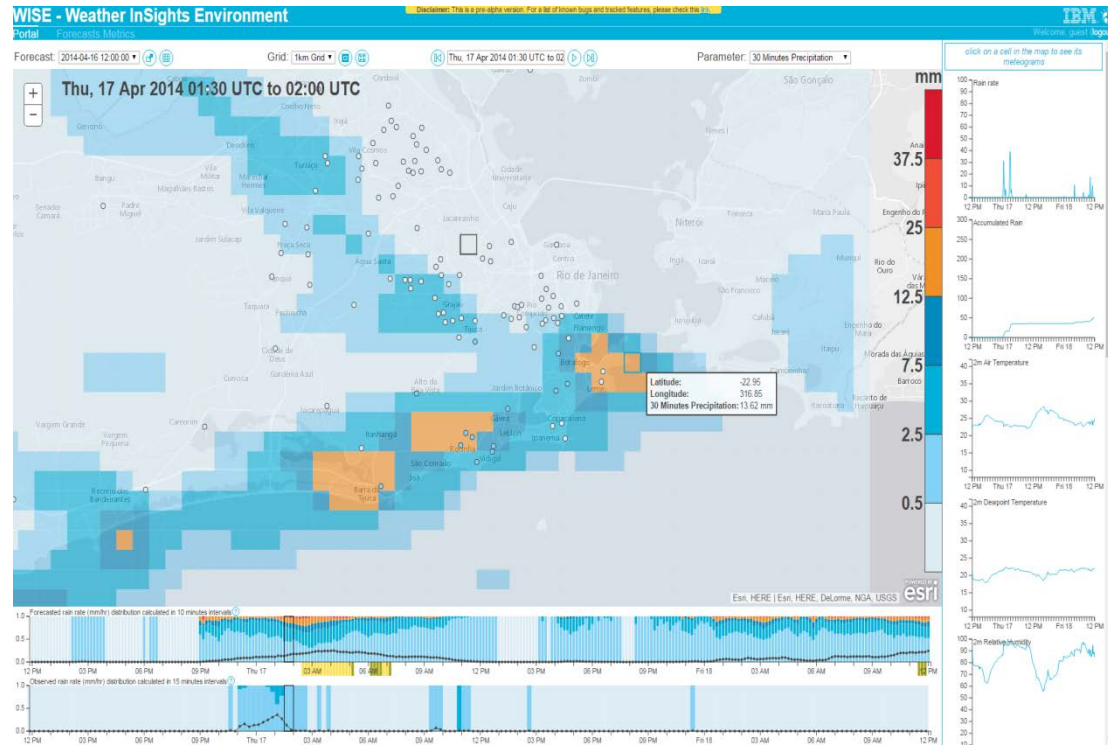
Weekly Meeting	Workstream	VELCO Lead	IBM Lead	DU Lead
Tuesday 1000-1100	Portal Platform and Infrastructure	Bambi Rivera	Tarun Kumar	Cyril Brunner Scott Caps Don Tougas Fred Wiseman
Tuesday 1330-1430	Weather Enhancements	Rob D'Arienzo	Tony Praino	Cyril Brunner Ken Tripp Ken Couture Bill Powell
Wednesday 0900-1000	Short and Long Range Planning	Hantz Presume	Mathieu Sinn Younghun Kim	Cyril Brunner Michael Beaulieu Doug Smith
Thursday 0830-0930	Peak Energy Management	Frank Etori	Ron Ambrosio	James Gibbons Katie Orost Craig Kieny Amanda Simard Steve Fitzhugh Ken Couture Paul Hines Patty Richards

VWAC Phase II

Weather

Visualizations

- **Goals:** Enable additional visualizations (e.g. WISE, categorical winds, precipitation type), color map improvements, and geospatial maps
- **Progress:** Announced weather team for JDA #2. This includes the existing weather sub-team plus VEC (Cyril Brunner/Ken Tripp), GMP (Mike Burke), WEC (Bill Powell), Scott Capps, and IBM-Brazil
- **Next Steps:** Kickoff meeting scheduled for 8/8 to discuss initial requirements, scope of work, and timeline



WISE: Weather InSights Environment

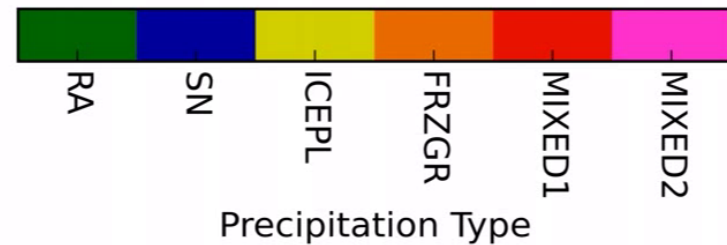
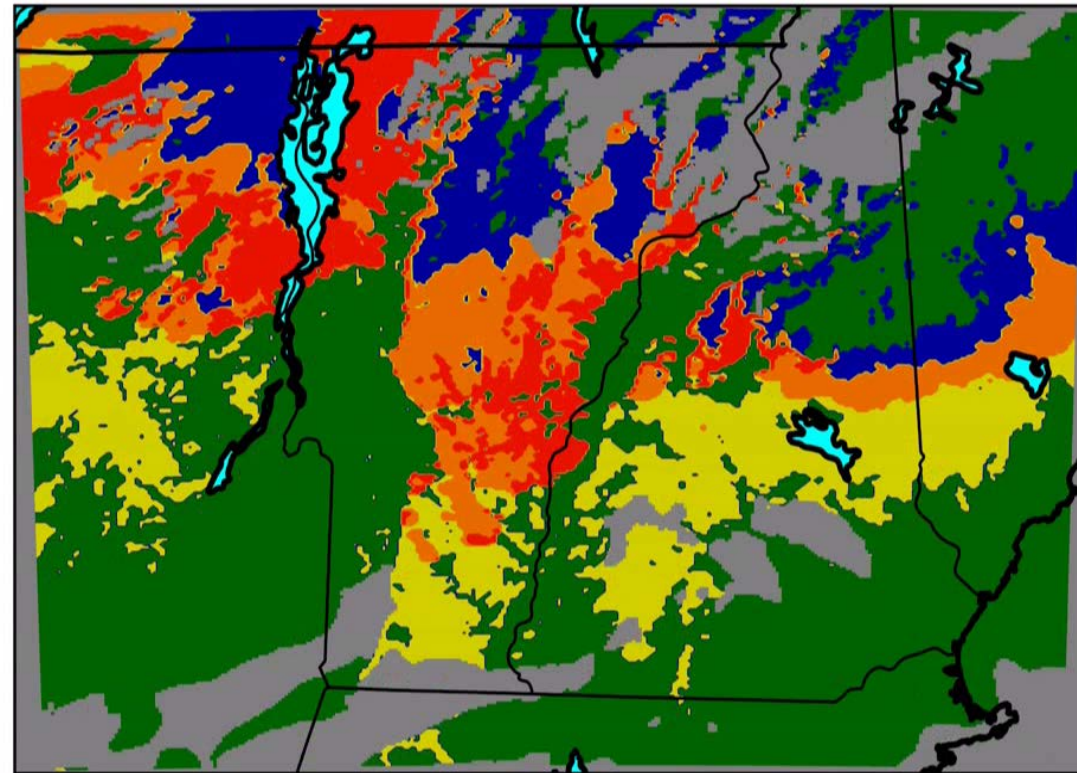
VWAC Phase II

Weather

Ice Accretion Forecasts

- **Goals:** Explore the development and application of ice accretion forecasting (e.g. physical, data driven methods) for all levels, data gaps and infrastructure requirements
- **Progress:**
 - Generated precipitation type examples for 4 events during the 2015-2016 winter
 - Reached out to GMP and VEC to discuss acquiring vegetation/tree-cutting data (to be used for outage/weather research via LSC)
- **Next Steps:**
 - Run verification statistics for precipitation type examples and finalize model configuration
 - Deploy precipitation type output on portal (to be available for upcoming winter)

Time (UTC): 02/24/2016 14:50



VWAC Phase II

Short and Long-term Planning

Developments

- Development and review of sub-project scope and roadmaps completed
- Kick-off discussions on use cases:
 - Evaluation of wind farm curtailment to identify ways to improve wind integration
 - Evaluation of solar farm prospecting to understand economical and operational impacts
 - Transmission system planning (VELCO / GMP study for St Albans)
 - Distribution system planning (VEC feeder planning & operations)
- Added community scale solar farm forecasting for operation
- Developed automated AMI data feed from VEC (60-min interval data from 38K meters)

Next steps

- Tie use cases to business & technical metrics, and develop strategy for collecting metrics
- Gather feedback on solar prospecting and develop realistic prospecting tool for solar
- Gather requirements for reducing curtailment and possible economical benefits of proposed approach
- Further automation of data feeds for transmission / distribution planning (GMP SCADA & MV90, VEC SCADA), with tie into the platform work (Track IV)
- Automated monthly reports of Vermont installed PV capacity
- Finalize requirements for demand model extensions for
 - Integration with OSI and Spirae
 - Peak management (Track II)
 - Short-term feeder planning

VWAC Phase II

Portal Performance/Security

Tested user access rights to content on the portal.

Found one additional access violation (relating to video animations) which was corrected.

IBM working on additional automated methods for access and security testing.

Portal security will continue to evolve into the integrated design and deployment in portal version 2.0 and the platform.

DT overall availability is 96.7% (all forecasts missed + delayed)
DT was on time 98.1% of the time and forecasts were completed (not missed) 98.8% of the time

VWAC Phase II

Platform and Information Systems

Business and technical requirements for VWAC integration to VELCO systems

- Performed complete security sweep and access validation of the VWAC Portal
- Phase II Plan review and finalization
- Opus architecture introduction and functional review
- In preparation of Opus Deployment worked on:
 - Defining a plan for roadshow to DUs
 - Mapping user roles to analytics insights
- Review API needs with GMP and Spirae to consume demand forecasting results
- Updated PI to VWAC data integration service to auto-alert status on incomplete run
 - Improves runtime operations and reduces time to recover from data stream interruptions

VWAC Platform status

- Activities for scheduled December 2016 delivery of HPCC
 - Quote for materials received and currently under evaluation
- Coordination of IBM support activities and VELCO IT service management model
 - Communication process
 - Change management process

Next Steps

- Define existing VWAC architecture and integration approach
- Define existing VWAC architecture vis-a-vis proposed OPUS architectural design
- Analysis of existing VWAC architecture and fit to VELCO systems

VWAC Phase II

Information Systems

Business and technical requirements for VWAC integration to VELCO systems

- Application integration
 - Define existing VWAC architecture (Tarun to deliver detailed documentation)
 - Define existing VWAC architecture vis-a-vis proposed OPUS architectural design
 - Analysis of existing VWAC architecture and fit to VELCO systems
- API research with GMP and Spirae
- Updated PI to VWAC data integration service to auto-alert status on incomplete run
 - Improves runtime operations and reduces time to recover from data stream interruptions

Platform status

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VWAC Phase II

Performance Metrics

- Performance metrics will help to quantify project value, focus team alignment, help ensure accountability and improve our ability to earn greater interest and support.
- Metrics will track the projects' operational objectives and comprise four components:
 - Technical Measurement – a quantifiable work feature or output
 - Performance Result – a measured, grid-related, quantifiable goal
 - Economic Benefit – the financial benefit of achieving the performance result
 - Societal Benefit – the public benefit, as can reasonably be established, of achieving the performance result

VWAC Phase II

Objective	Project outcome that we want to improve or demonstrate success at.
Measure Name	Short name of measure used in reports
Measure Description	Description of the measure and how it either directly or indirectly measures performance relative to the established objective.
Define key terms	Define any terms that are not in common usage to avoid ambiguity or confusion.
Formula	How is the measure calculated?
Measure Target	What is the target and how is it established?
Business Unit(s)	What business areas perform the activities being measured?
Measure Owner	Who is responsible for collecting the data and performing any required calculations?
Data Source(s)	Where does the data come from? What is the system of record?
Collection Frequency	How often is the data collected?
Reporting Frequency	How often is the data reported to the scorecard?
Verified by	Who is responsible for ensuring the accuracy of the data?
Presentation	How is the data presented? e.g., graphically, tables, etc.

VWAC Phase II

Performance Metrics

- Measures should satisfy certain parameters established by management and best practice. When thinking through the project objectives and measures, keep the following questions in mind.
- Are the objectives clearly articulated – what is the desired result?
- Is there clear responsibility for the activities that contribute to meeting the objective?
- Do the objectives reflect the cross-functional contribution of work to successful project outcomes?
- Is the measure meaningful – does it help us understand whether we are meeting our objective(s)?
- Can the measure be trended, providing insight into performance through time?
- Is the measure quantitative?
- Is the measure based on objective and defensible methods?
- Does the measure target include a stretch over previous year's target?
- Is responsibility for the collection and calculation of the measure clear?
- Is the measure incremental? Should it be phased in?

VWAC Phase II: Performance Metrics (Draft)

Operational Objective	Technical Measurement	Performance Result	Economic Benefit	Societal Benefit
Weather	<ul style="list-style-type: none"> Temperature: bias 0.8, MAE 3.6 °F Precipitation accuracy: 97% Wind location/direction: bias 2.7°, MAE 18.8° Wind speed: bias 0.9, MAE 3.0 mph Icing occurrence accuracy: 80% 	<ul style="list-style-type: none"> 5% reduction in emergency response costs 5% reduction in outage time for affected customer (costs savings focused on prepositioning crews) 	<ul style="list-style-type: none"> \$300k in reduced costs VWAC contribution to SAIFI/CAIDI improvements 	<ul style="list-style-type: none"> Increased responder safety Reduced rate pressure Increased community resiliency
Renewable Forecasting	<ul style="list-style-type: none"> 5% MAE solar day-ahead lead time 7% MAE wind day-ahead lead time 	<ul style="list-style-type: none"> 10% in increase in asset utilization Stafford Hill Battery Pilot (intermittency or freq. regulation metric to be provided) 	<ul style="list-style-type: none"> \$2M annual Vermont savings in combined increased efficiency and avoided losses* 	<ul style="list-style-type: none"> 0.6 tons of CO₂ per MWh reduction Community investment goes up
Peak management	<ul style="list-style-type: none"> xxx% accuracy in predicting statewide peak hour on a daily/monthly basis 24-hr lead time alerts with 5% MAE rate 	<ul style="list-style-type: none"> 1% drop in Vermont peak (approx. 8 MW) Demand response program efficiency (batting average metric to be defined by BED, GMP, VEC) 	<ul style="list-style-type: none"> \$1M savings (\$700K for VT + \$300K for exceeding other NE states' reductions) \$250k annually in peak power purchase savings/cost avoidance 	<ul style="list-style-type: none"> 0.6 tons of reduced CO₂ per MWh Increased grid reliability Reduced transmission build imperative Improved customer engagement/collaboration
Grid Operations/ Asset Planning	<ul style="list-style-type: none"> xxx% accuracy in refining "Do Not Exceed" limits Scenario-based identification of CapEx (last 5 years baseline) that promotes an "Energy future aligned with Vermont values" Reduced curtailment (last 2 years baseline) 	<ul style="list-style-type: none"> Verify and refine "Do Not Exceed" limits CapEx identification that aligns with reliability, sustainability, and promotes regulatory goals 5% curtailment reduction (last two years baseline) 	<ul style="list-style-type: none"> \$250k annual OpEx savings \$45M in annual Capex identification (increase over last 5 years baseline) \$yyy from reduced curtailment 	<ul style="list-style-type: none"> Increased operator confidence 0.6 tons per MWh of reduced CO₂ Curtailment case/storage case Reduced build imperative

*Extrapolating this capability to New England will yield an estimated \$1.364M in annual fuel cost savings alone



VWAC Phase II

Linking VWAC with other utility applications

Developments

- Mapped resources and equipment with the three models – Planning, Operations, and VWAC
- OSI engineer on-site August 22-26, 2016, work with EMS and Operations to incorporate model enhancements resulting from Planning, Operations and VWAC model mapping

Next steps

- Evaluate number and configuration of Vermont load zones for Short Term Load Forecast (STLF)
- Incorporate additional weather station data into STLF
- OSI development “coding” (currently on hold until after model enhancements are complete)

VWAC Phase II

ISO-NE Pilot Study

Developments

- ISO has provided analysis of solar capacity using our data and is currently validating that information
- Additional data being provided to ISO (MV-90 Data)
- Review of instrumentation is ongoing
- ISO has asked us to look at significant forecast errors or weather misses to compare results

Next steps

- Arrive on instrumentation strategy for study (if needed)
- Continue to develop “middle ground” approach to PV forecasting
- Review of ongoing results of forecast and historical analysis

VWAC Phase II

Overall Next Steps

- DU input needed on work with Marc Montalvo on Metrics
- Refine use cases that are under development with sub groups
- Work with team on visualization efforts – not only weather, but other utility use cases as the OPUS platform is developed
- Continue to seek opportunities to add data VWAC efforts-example synchrophasor data