

Storm Outage Management System (SOMS) Background & Overview

vermont electric power company



Decision

- Dr. Jay Shafer, from LSC, has created a startup company to forecast customer outages based on ice, wet snow, and wind weather forecasts.
- He is looking for VT to be his first client.
- The software seems most applicable for distribution utilities.
- We need to determine if this is something we should pursue.

SOMS - Background

- Robustly applies existing weather forecast data and connects to electric distribution infrastructure
- Creates probabilistic forecasts to develop objective risk profiles
- Provide information to help optimize crew resource storm pre-planning
- Integrates new research into operations

Key Scientific Results – VLITE Research

- Identification of wet vs dry snow: results support use of surface wet bulb temperature near freezing to identify wet snow
- Infrastructure – damage relationships:
 - Identified critical cut-in thresholds
 - Linearized damage relationships
 - Created icing outage model – back testing shows skill:

Storm Date	Icing Type	Outage Model Total Events	Observed Events
Dec 21, 2013	Freezing rain	403	547
Jan 24, 2017	Freezing rain	2	37
Dec 9-11, 2014	Wet Snow	1843	3915
Apr 1, 2017	Wet Snow	582	382

SOMS - Design

- Optimized for:
 - 1-5 days ahead:
 - How much precipitation
 - Type of precipitation
 - Amount of freezing rain, ice thickness, and wet snow icing
- Probabilistic framework:
 - Uses 66 weather forecast models (European ensemble coming)
 - Provide objective risk assessment
- Outage forecasting:
 - Based on outage model developed from research

Data Analytics: Outage Risk Profiles

Outage Risk Profile – January 13, 2018 Icing Event (total forecast events depicted within cells)					
Probability of Exceedance	10%	86	783	174	100
	25%	0	200	2	5
50%	0	0	0	0	0
75%	0	0	0	0	0
90%	0	0	0	0	0
		Day 4	Day 3	Day 2	Day 1
Forecast Horizon					

10% chance that there will be 100 or greater events

25% chance that there will be 5 or greater events

90% chance that there will be zero or greater events

Data Analytics: Outage Risk Profiles

**Outage Risk Profile – January 13, 2018 Icing Event
(total forecast events depicted within cells)**

Probability of Exceedance	10%	86	783	174	100
	25%	0	200	2	5
	50%	0	0	0	0
	75%	0	0	0	0
	90%	0	0	0	0
			Day 4	Day 3	Day 2
		Forecast Horizon			

Over time the outage risks declined getting closer to the event from three to one days prior

Operational Event Table Example for VEC

Area	Mean	Mean	Mean	Mean HR	Mean HR	90th	90th	90th	90th HR	90th HR	75th	75th	75th	75th HR	75th HR
	HR1-24	HR1-48	HR1-72	48-96	72-120	HR1-24	HR1-48	HR1-72	48-96	72-120	HR1-24	HR1-48	HR1-72	48-96	72-120
Newport	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	73.1	77.3	0.0	0.0	0.0	4.0	4.7
Richford	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	32.2	32.3	0.0	0.0	0.0	2.5	3.0
Johnson	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	48.3	52.7	0.0	0.0	0.0	11.3	11.6
Grand Isle	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	41.6	42.2	0.0	0.0	0.0	4.5	4.2
VEC Full Service Territory	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	195.2	204.6	0.0	0.0	0.0	22.2	23.5

75th Percentile (25% chance of exceedance)

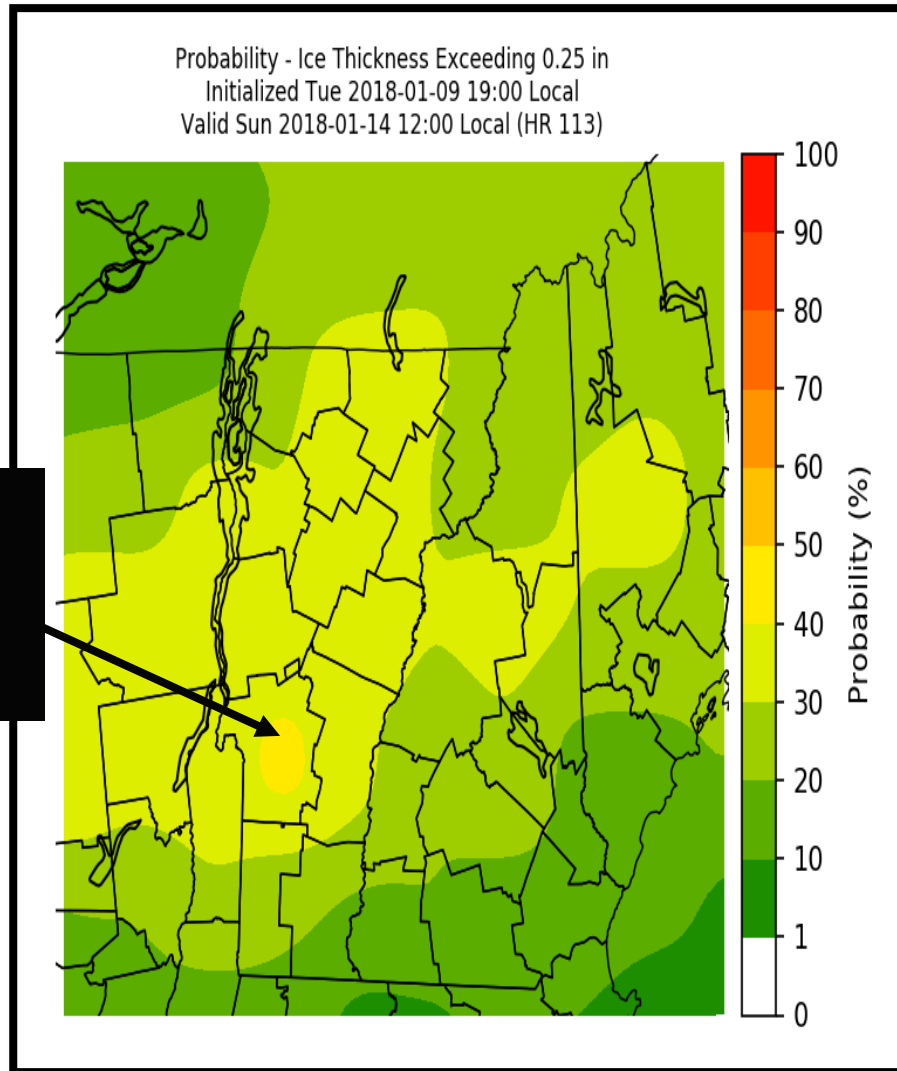
90th Percentile (10% chance of exceedance)

the most likely (mean) forecast shows zero events

there is a 10% chance of 195 events or greater from the hour 48 to 96 forecast

there is a 25% chance of 22 events or greater from the hour 48 to 96 forecast

Where will the most significant icing occur?



Maximum probabilities of 40 to 50% of exceeding 0.25" ice thickness

What do you think?

- Jay has submitted an MOU for a 3 year agreement for \$400k.
- Seems to be more applicable to DU's than TO's.
- Should we pursue this?
- If yes, how should it be funded?