

SHEI CONTEXT AND OBSERVATIONS

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When is SHEI typically congested, and what does that mean?

Implications for GMP customers

Initial observations on evaluation of solutions

Primarily when generation in the area is high

- ▶ Wind (Kingdom Community Wind, Sheffield) and hydro
- ▶ Deliveries over Highgate Converter
- ▶ This typically means winter & spring months

And any time of year when major transmission system maintenance / outages occur

During most hours of the year, SHEI is not congested

- ▶ Typically ~20% of the time on average, but big fluctuations (monthly, and Day Ahead vs. Real Time markets)
- ▶ Varies greatly by day/hour, and even within hours (real time)
- ▶ But typically at times when a lot of power is being produced >> significant customer value at stake

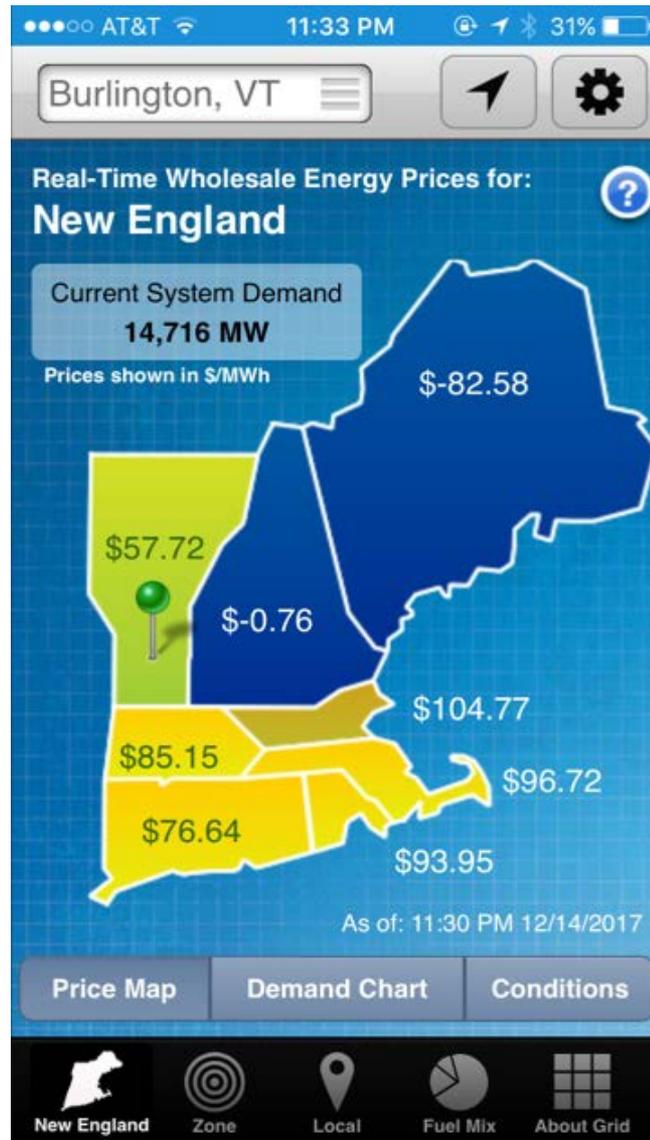
Total amount of generation within SHEI area exceeds the interface limit

- ▶ ISO-NE monitors interface flows, if/when reductions are needed
- ▶ Some source(s) need to limit their output, so interface limit is not exceeded

Framework governing dispatch of larger generators is known as “DNE” (Do Not Exceed)

- ▶ Intermittent generators (like Sheffield, KCW, Sheldon Springs) are included – starting late May, 2016
- ▶ Transmission constraints are now resolved based on offer prices of resources (and other factors)
- ▶ Market prices (LMP) can diverge much more strongly across interfaces
- ▶ A significant change for the regional market (not only VT/SHEI)

Congestion in ISO-NE: One Extreme Example



When SHEI is congested, three primary mechanisms:

- ▶ Reduced generation output (e.g., at KCW)
 - ▶ Lose value of energy, Renewable Energy Certificates, Production Tax Credit
 - ▶ Almost all power generated/delivered in SHEI is renewable
- ▶ Lower LMP payments to generation in SHEI
 - ▶ Affects all sources in the area, not just the one(s) being reduced
- ▶ Offsetting: lower cost to purchase load requirements

Estimated net impact for GMP: several \$million of net cost increase, over 18 months

- ▶ Key: in the SHEI area, much more generation than load
- ▶ True for VT in total, but there are exceptions

Enough to justify meaningful effort on finding solutions

- ▶ To cost-effectively increase interface capacity >> reduce frequency & magnitude of interface congestion
- ▶ And to exercise caution re: addition of new generation in the area

A complex evaluation

- ▶ Electrical engineering; wholesale power markets
- ▶ Range of operating conditions

VELCO/EIG study (Q4 2017) was a big step

- ▶ How much would potential solutions increase SHEI limits?
- ▶ Under different system conditions?

Other important ingredients

- ▶ Breadth/depth of lost generation and congestion to date
- ▶ How representative was this recent history?
- ▶ Some potential solutions not yet scoped/studied?

Significant range of potential solutions

- ▶ Type, scale, complexity, permitting/time required

Estimation of capital costs

- ▶ For some, also operating revenues/expenses

Effectiveness of solutions in different system conditions

- ▶ How much would potential solutions increase SHEI limits?
- ▶ Under different system conditions?

Ideally, an initial screening step

- ▶ Solution feasibility, scale, benefit/cost, timing
- ▶ Narrow the focus to a subset of options

Can a mix of small/mid-size options cost-effectively address today's SHEI congestion?

Are there any solutions that should be deployed ASAP?

- ▶ Initial GMP evaluation: AVR at Sheldon Springs could be one

Or, additional solutions that should be explored in parallel?

Process for broad solution evaluation = TBD

- ▶ Technical/financial analysis suitable to small groups – particularly with VELCO and VDUs
- ▶ But need to involve other parties/stakeholders
- ▶ Working group, with periodic briefing to PUC?

Key first step: how to cost-effectively de-congest the current system?

- ▶ Current generation sources and loads

If additional generation is then added in SHEI, gains could be eroded

An ongoing dialogue will likely be needed re: proposed future generation in the area

- ▶ Likely impacts (MWh, \$\$) on existing sources (almost all renewable) in the area
- ▶ Benefits of the proposed generation to VT customers
- ▶ Future options to mitigate congestion, and who should pay