Benefits of DLR

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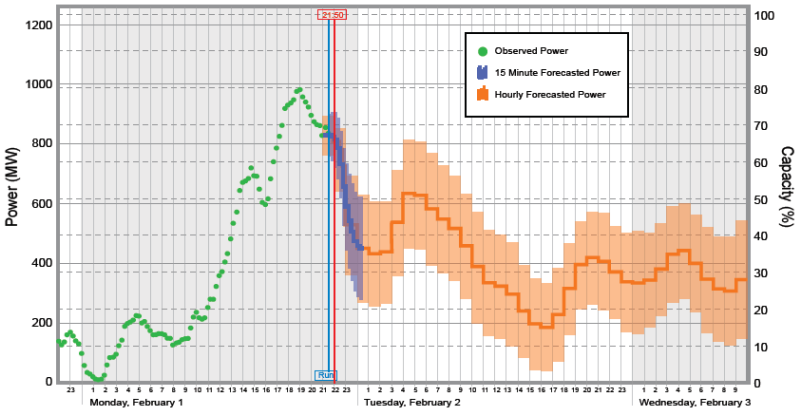
DLR Overview

Section 1

FORECASTING

- Accurate models for load forecasting are essential to the operation of a utility
  - Next day loads can usually be predicted to within 1-3%



- Statistic-based numerical weather prediction (NWP) models utilize weather data to forecast wind energy day out output

We FORECAST these because they vary

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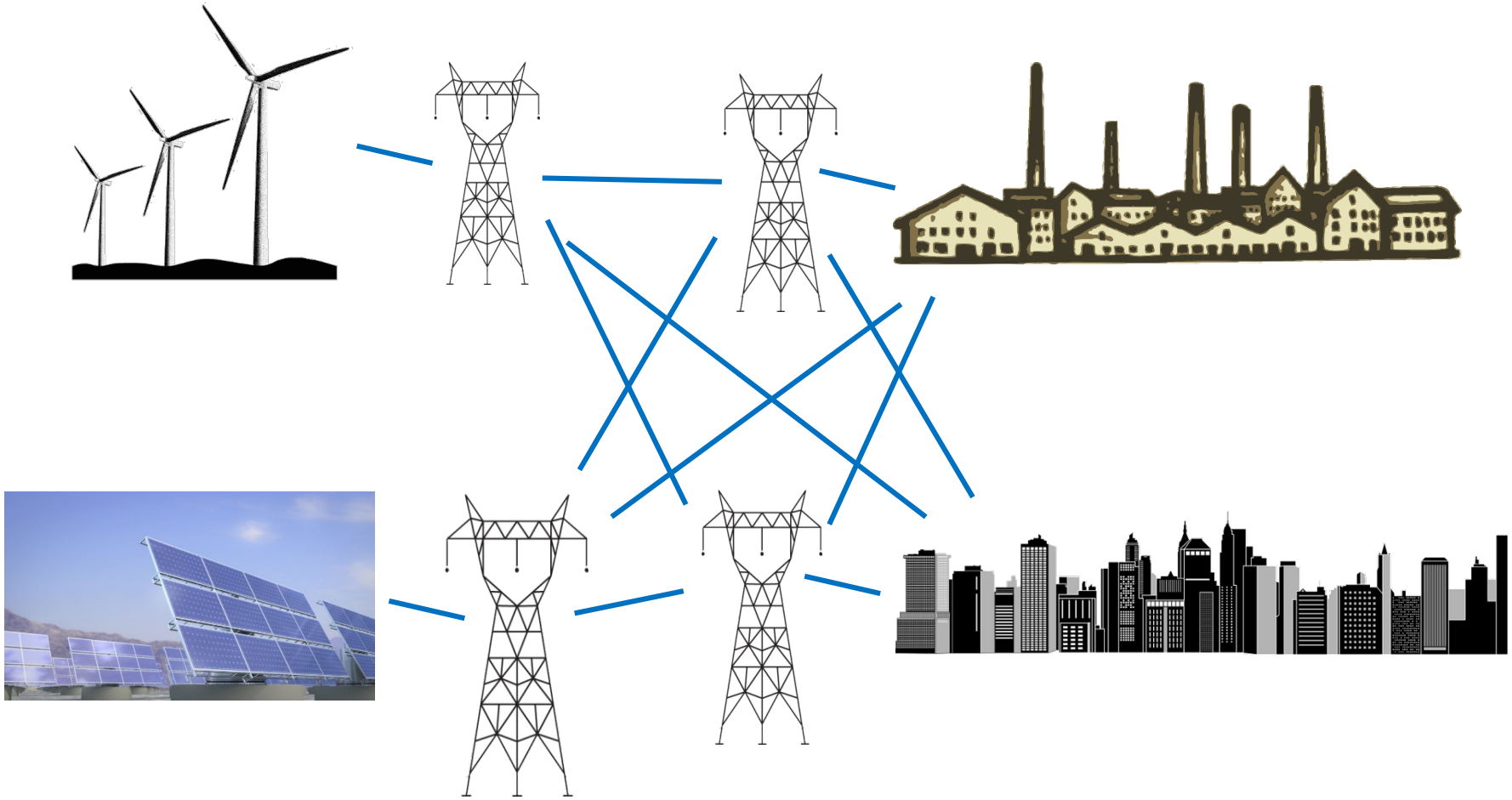

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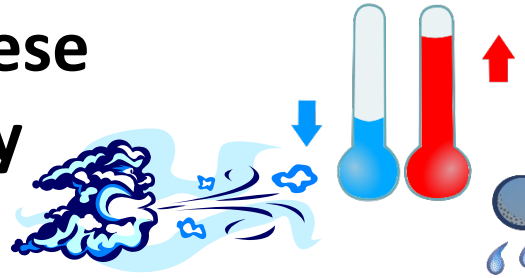

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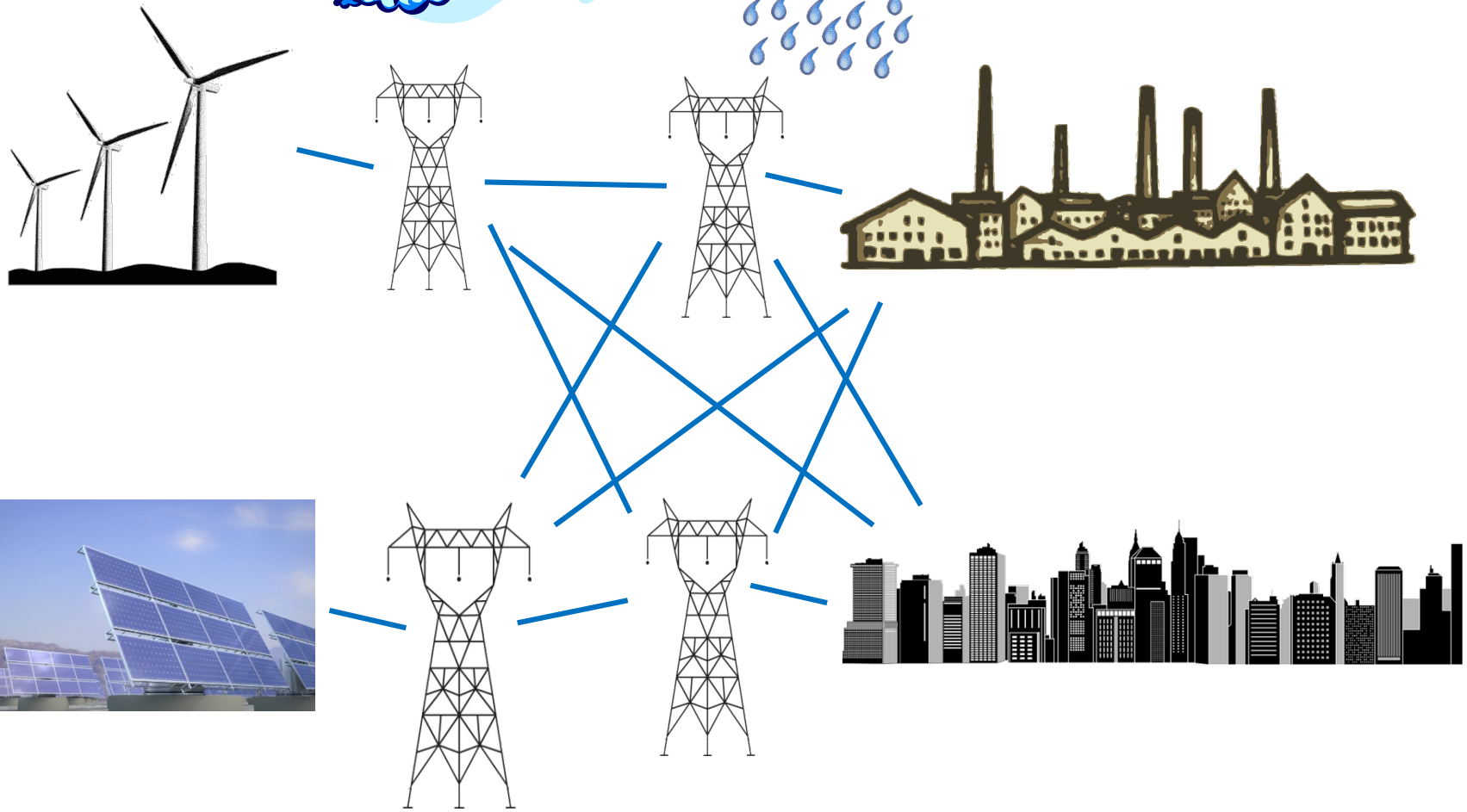

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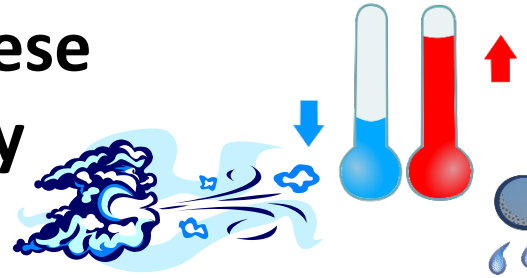

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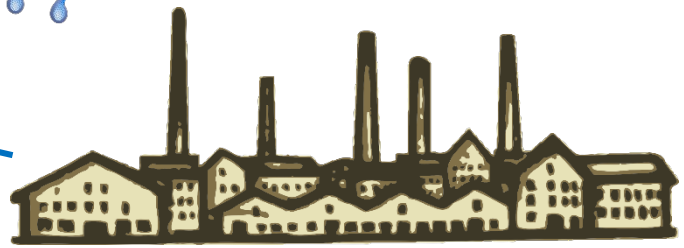


These vary too.

Dynamic Line Rating

Line ratings are based on environmental factors including wind speed and direction

Static ratings use very conservative values for these environmental conditions

Many utilities recognize this by using seasonally adjusted or ambient adjusted ratings.

- Most lines have separate Summer and Winter ratings, for normal and emergency conditions.

DLR techniques have revealed that based on real-time weather, especially wind, significant additional line capacity exists most of the time

BUT….this is *real-time*

Transmission Capacity Forecasting

Some next generation DLR systems also include transmission capacity forecasting (TCF) capability

TCF uses:

- Learned conductor behavior
- Learned weather forecast to actual weather conditions
- Advanced statistical engine to correlate the above

The results are highly accurate 2- to 48-hour transmission capacity forecasts with utility-defined confidence factors

Benefits to RTOs

Section 2

Dynamic Line Rating

Provides more accurate ratings

Calculates ratings based on actual monitored conditions rather than fixed worst-case assumptions

Improves reliability

Provides forecasted ratings up to 48 hours ahead, and improves reliability by alerting operators to conditions such as clearance violations

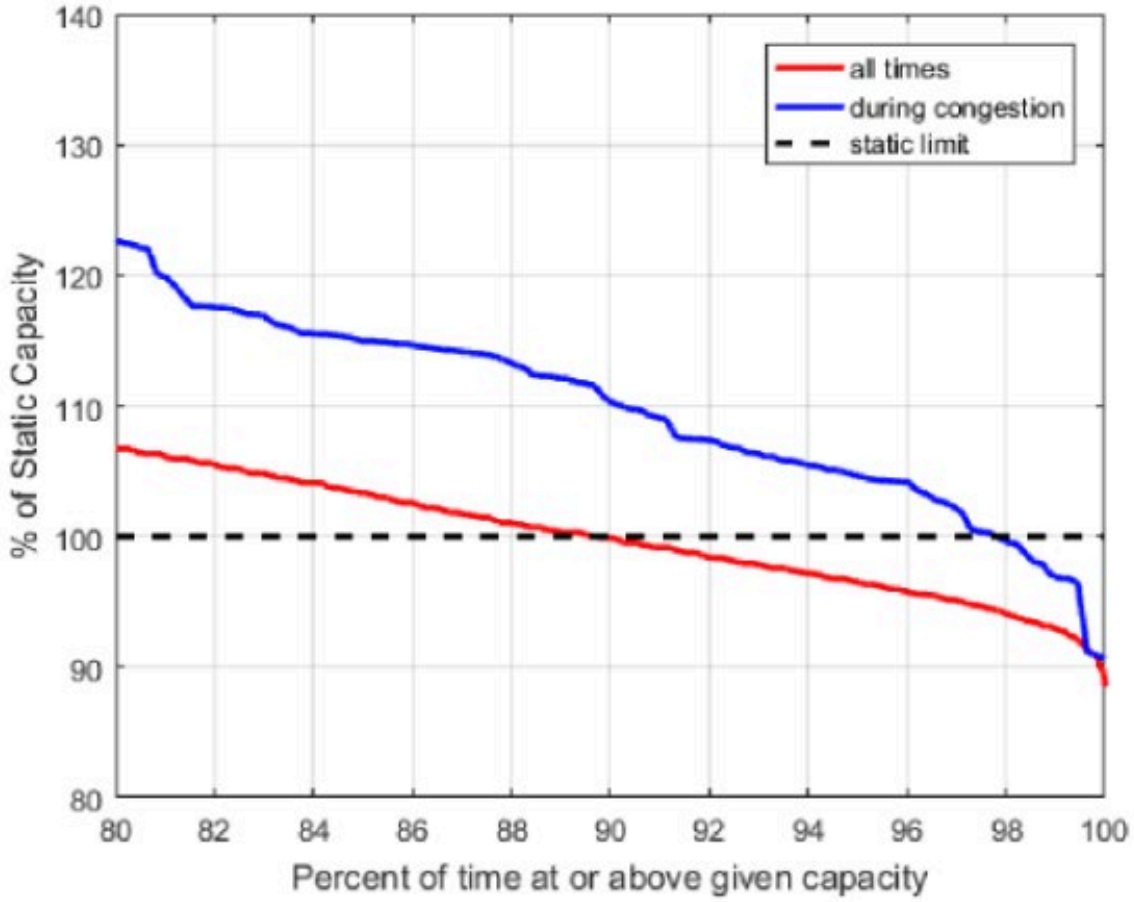
Tends to increase line capacity in Operations

Even a relatively low amount of wind can cool the line, significantly increasing its rating and reducing curtailments and congestion

Estimates of increased capacity have been 40 percent, 30 to 70 percent, and 30 to 44 percent on three different tests*

*(US Department of Energy, Dynamic Line Rating Systems for Transmission Lines, April 2014, https://www.smartgrid.gov/files/SGDP_Transmission_DLR_Topical_Report_04-25-14_FINAL.pdf)

Neosho-Riverton Transmission Line Case Study



(Red) DLRs calculated for Neosho-Riverton over all hours in the study period
(Blue) DLRs calculated during hours in which Neosho-Riverton posted congestion on the SPP market

(Source: https://watttransmission.files.wordpress.com/2017/11/cigre-gotf-2016-genscape-finalsubmission1.pdf)

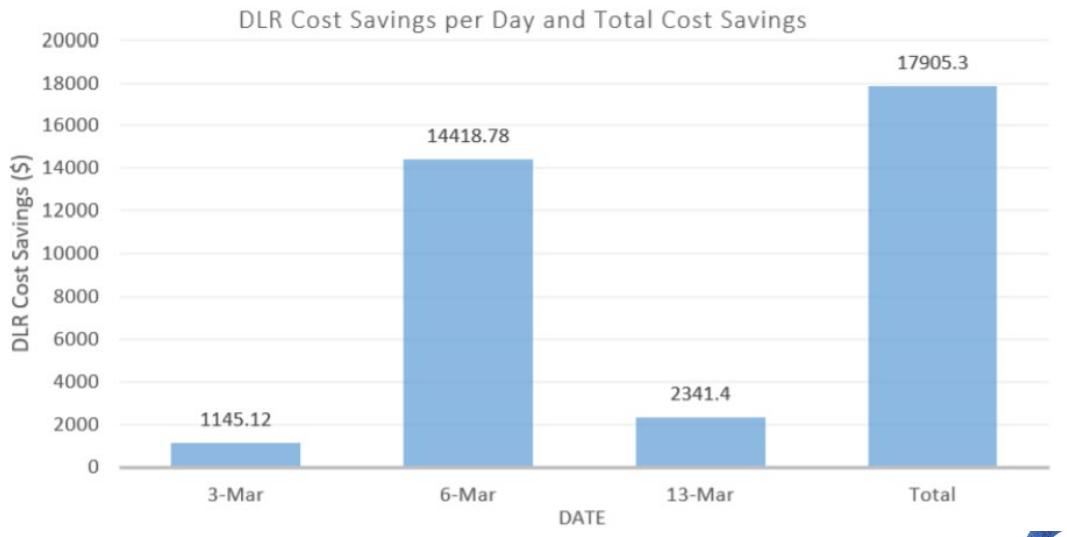
DLR on SPP lines

Figure 2: Transmission Capacity Forecast System Output showing 2- and 24-hour ahead forecasts

Case Studies are Good, but Pilots are Better

SPP partnered with AEP to demonstrate potential benefits of DLR to capture data due to delayed rebuild of Siloam Springs – West Siloam Springs 161kV in Feb 2018.

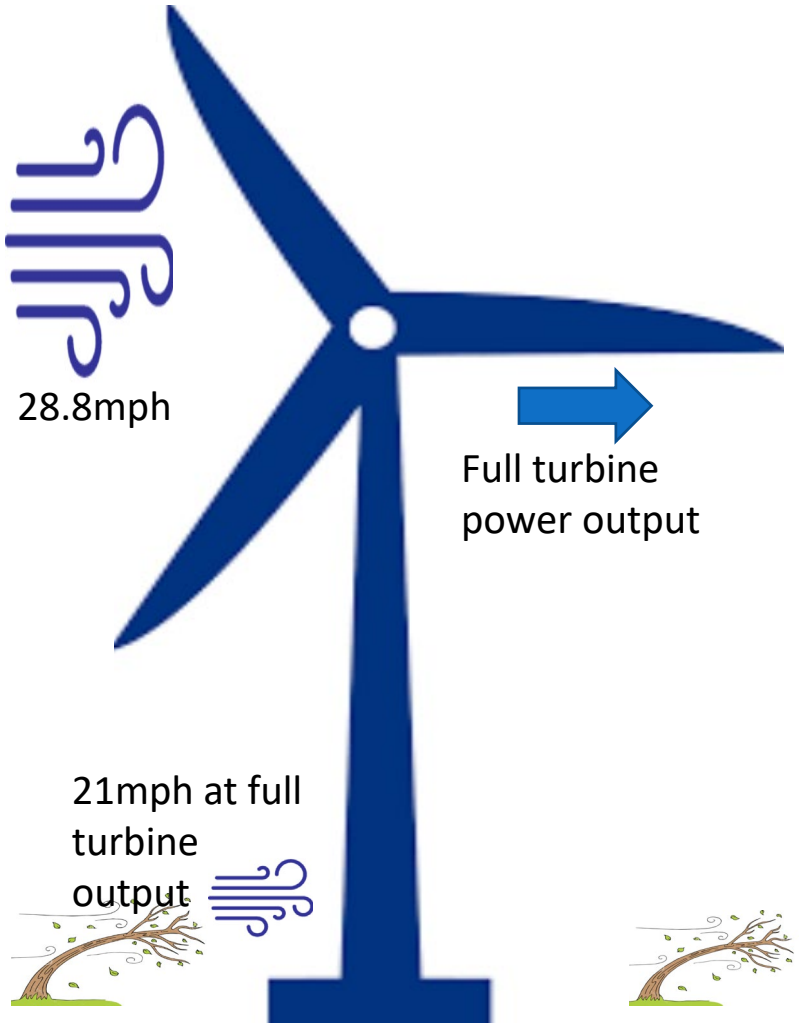
Flowgate was binding/breached for 300 minutes on 3 dates and projected savings were $18k without considering benefits of redispatch / unit commitment.

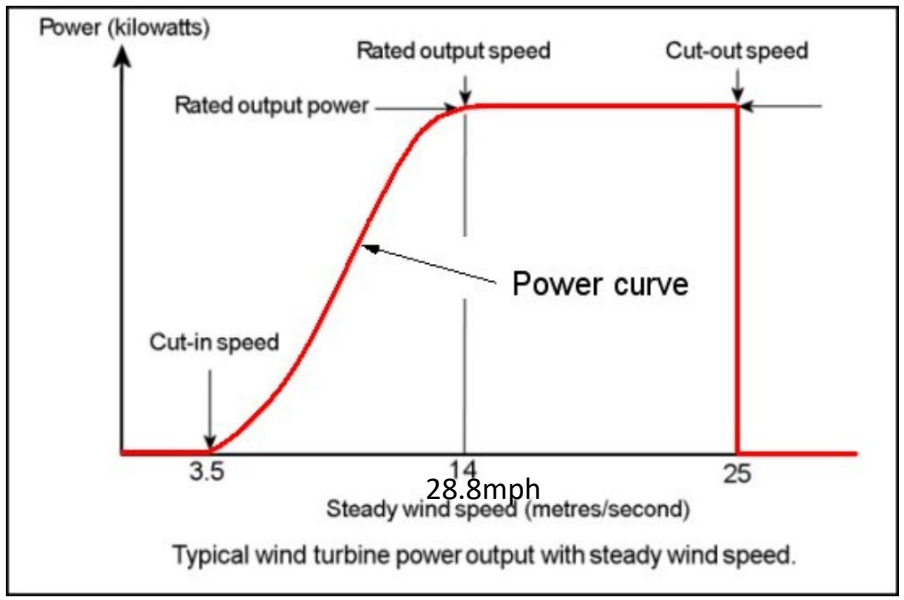


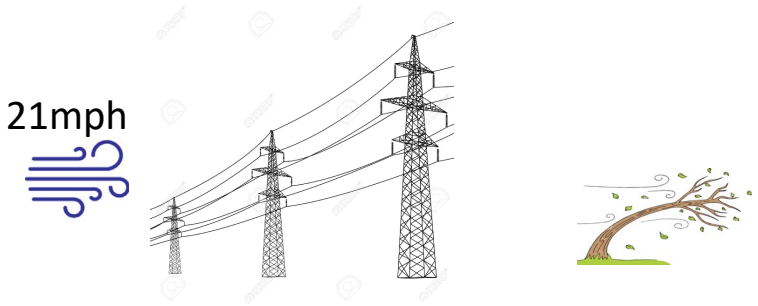
Sunflower Electric Coop LineVision Project

- Equipment recently installed under Mingo – Setab 345kV line in western KS
- Data collection efforts underway
- Analyses and reports regarding findings / benefits to follow

Do Wind Curtailments Make Sense?







Average annual wind speed at Project X 15.2 mph → Only 6.7 mph wind speed needed at lines to produce 1.5 X its rating

Barriers to Implementation

Section 3

No Incentive to Innovate

Prudency – utility staff are not rewarded for taking risks

Can’t be blamed for doing things the same way as usual

Deploying new technology is perceived as adding complexity and risks to operations. In reality, risks may be higher without DLR to provide transparency and actual data regarding system capacity.

Business models support robust transmission expansion

Undesirable to get lower returns on lower capital cost expenditures

Lack of Awareness

Many planners, utility executives, regulators, and stakeholders are unfamiliar with advanced transmission technologies and their benefits

Technical vetting process required by each utility. Understandable that stakeholders need a level of comfort with new technology.

- Consider streamlining this effort within a given market with leadership from RTO staff to minimize the overall time spent by utility SMEs and technology company SMEs?

Path Forward

Section 4

Implementation Needs to be Phased

Encourage demonstration pilots to help individual operators gain an understanding regarding the benefits of DLR, as well as issues that must be addressed.

These pilots will provide both the TO and RTO experience with these technologies and work through data and operational issues required for a subsequent broader implementation.

Market issues regarding FTRs and the use of snapshot models can be dealt with using stochastic approaches like ERCOT

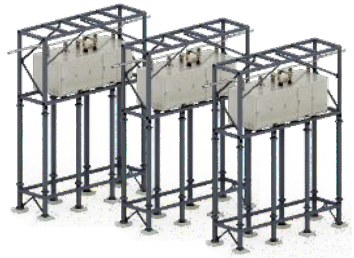
Appendix

Section 7

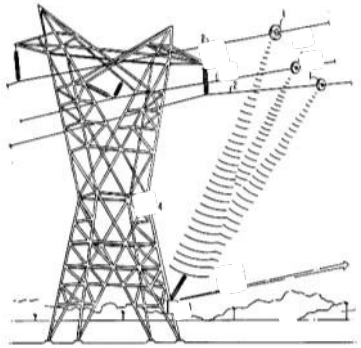
WATT Coalition

Working for Advanced Transmission Technologies

Advanced Power Flow Control



Dynamic Line Rating



Advanced Topology Control

Get more out of the current grid

2
3

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Papers available at

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