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Power Flow Control as an Accelerator for Renewable Integration

Frank Kreikebaum
SVP of Products and Solutions

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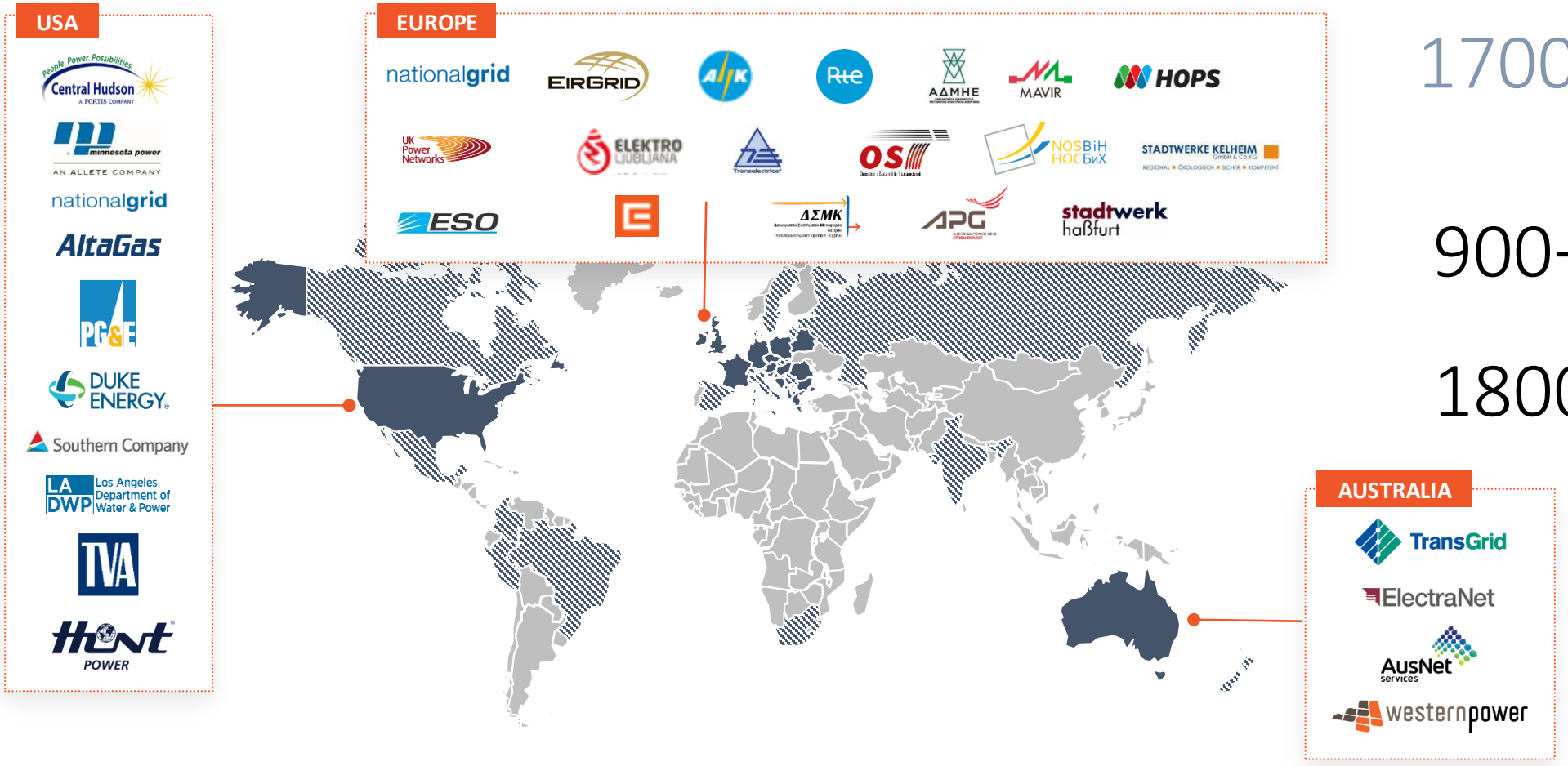
Modular Power Flow Control (PFC) Users



1700+ DEVICE-YEARS TODAY

900+ MVA INSTALLED BY Q4 2020

1800+ MW OF INCREMETNAL TRANSFER CAPACITY BY Q4 2020

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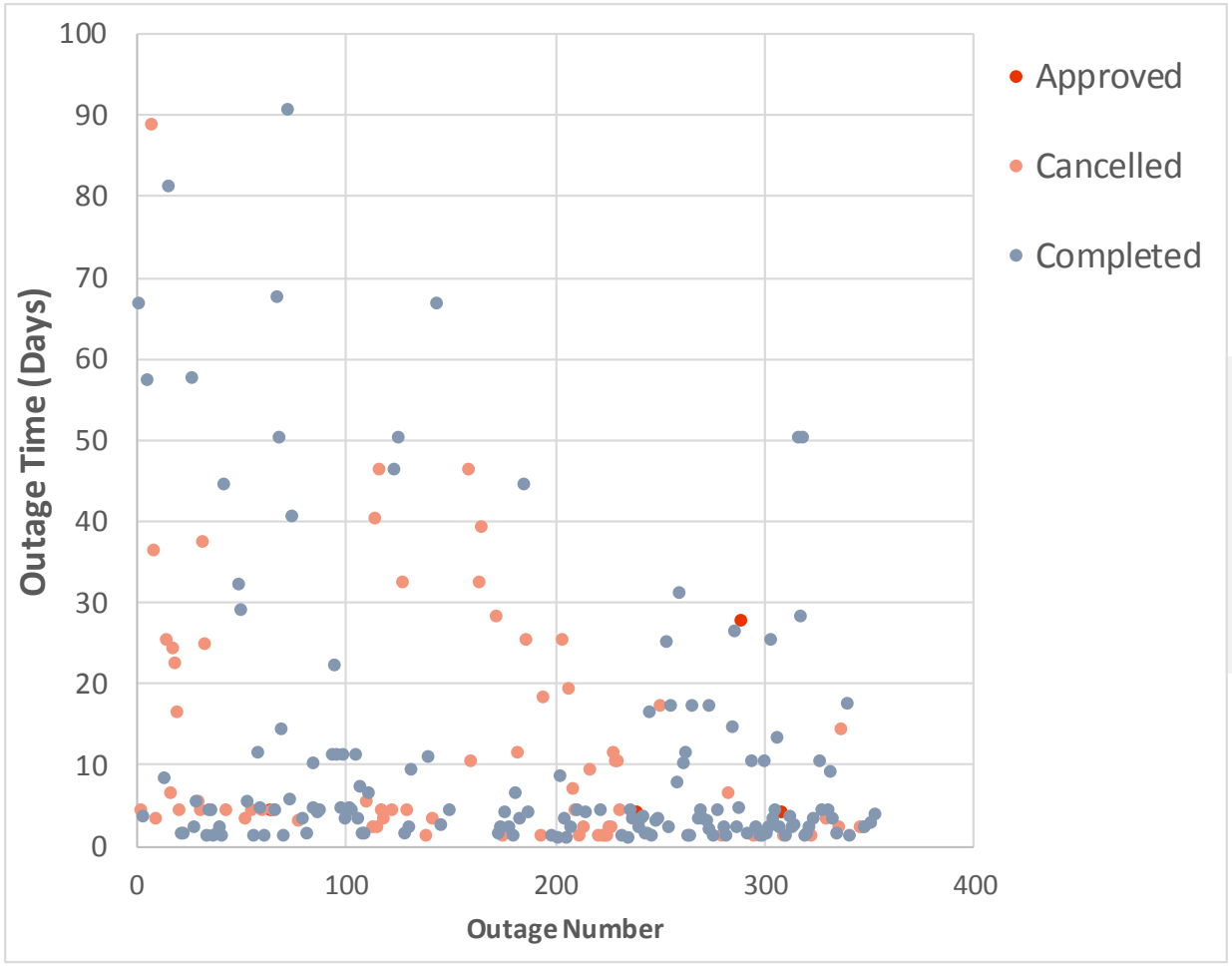
Difficulty Scheduling Transmission Outages – BC Hydro Example

13,000 line-miles of transmission



360 OUTAGES OVER 1 DAY

70 OUTAGES CANCELED

10 OUTAGES DENIED

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Congestion is Costly and Slowing Renewable Development

>$3B ANNUAL COST OF CONGESTION IN US ISO/RTOs

>25% CONGESTION CAUSED BY TRANSMISSION OUTAGES IN US ISO/RTOs

10 AVERAGE NUMBER OF YEARS REQUIRED TO DESIGN, PERMIT AND BUILD A NEW TRANSMISSION LINE

2 AVERAGE NUMBER OF YEARS REQUIRED TO DESIGN, PERMIT AND BUILD A UTILITY-SCALE RENEWABLE PLANT

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Example of PFC Impact on Congestion

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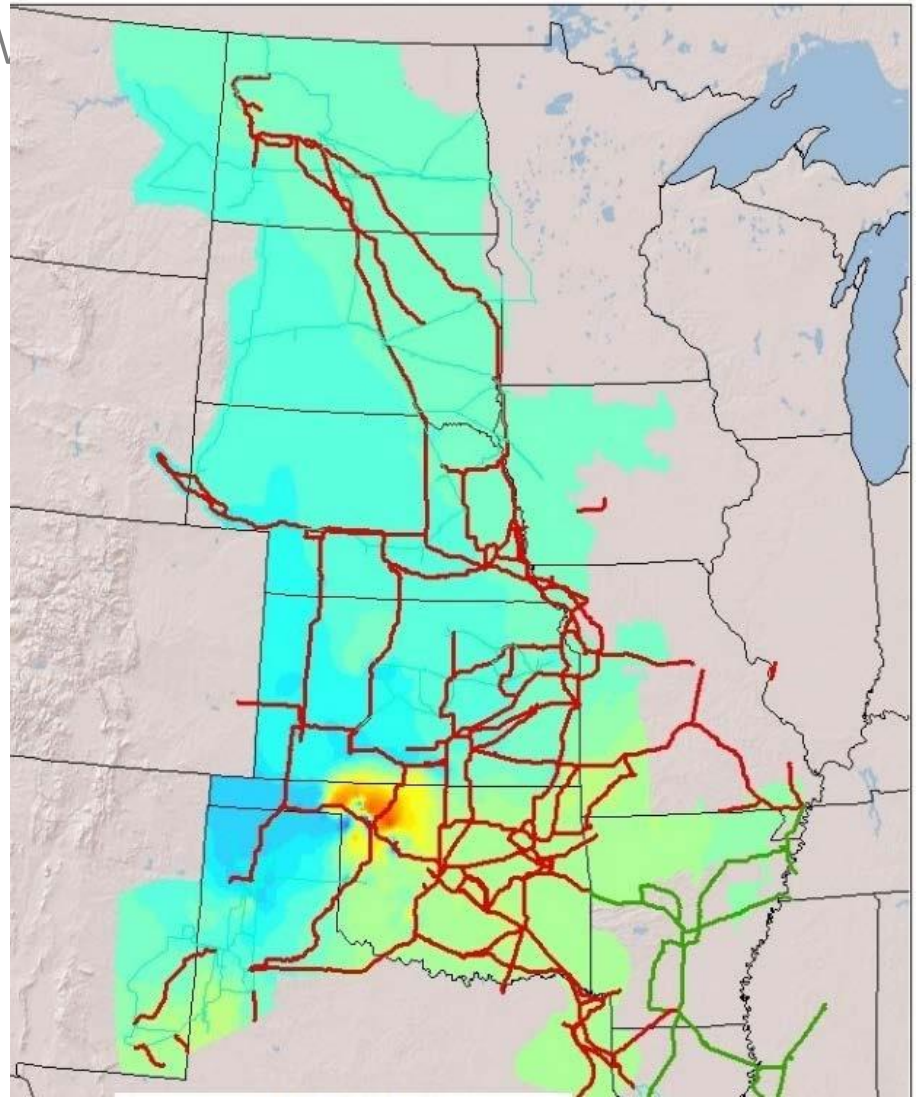
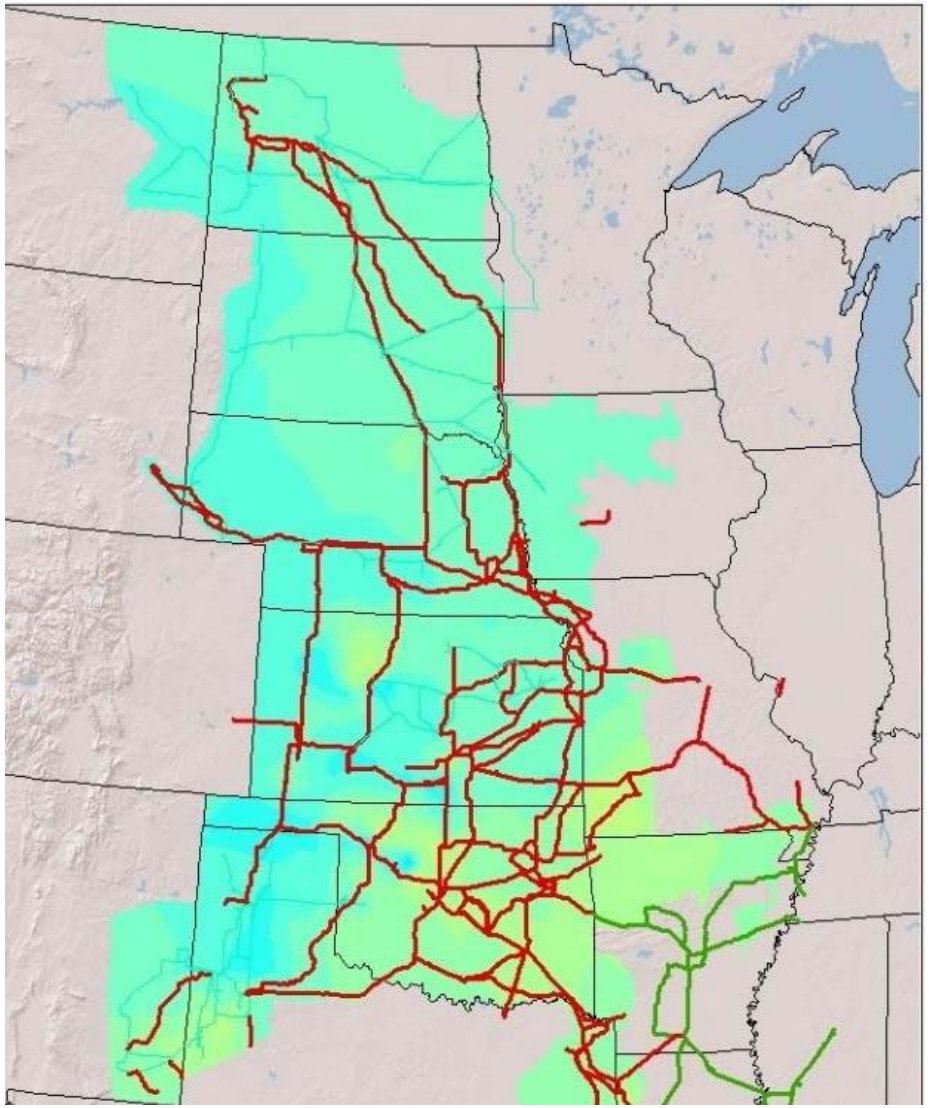
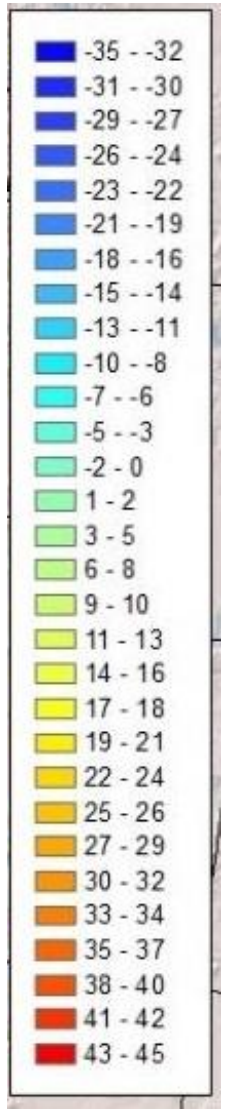


Before Woodward PST Installation



After Woodward PST Installation



Average DA MCC ($/MWh)

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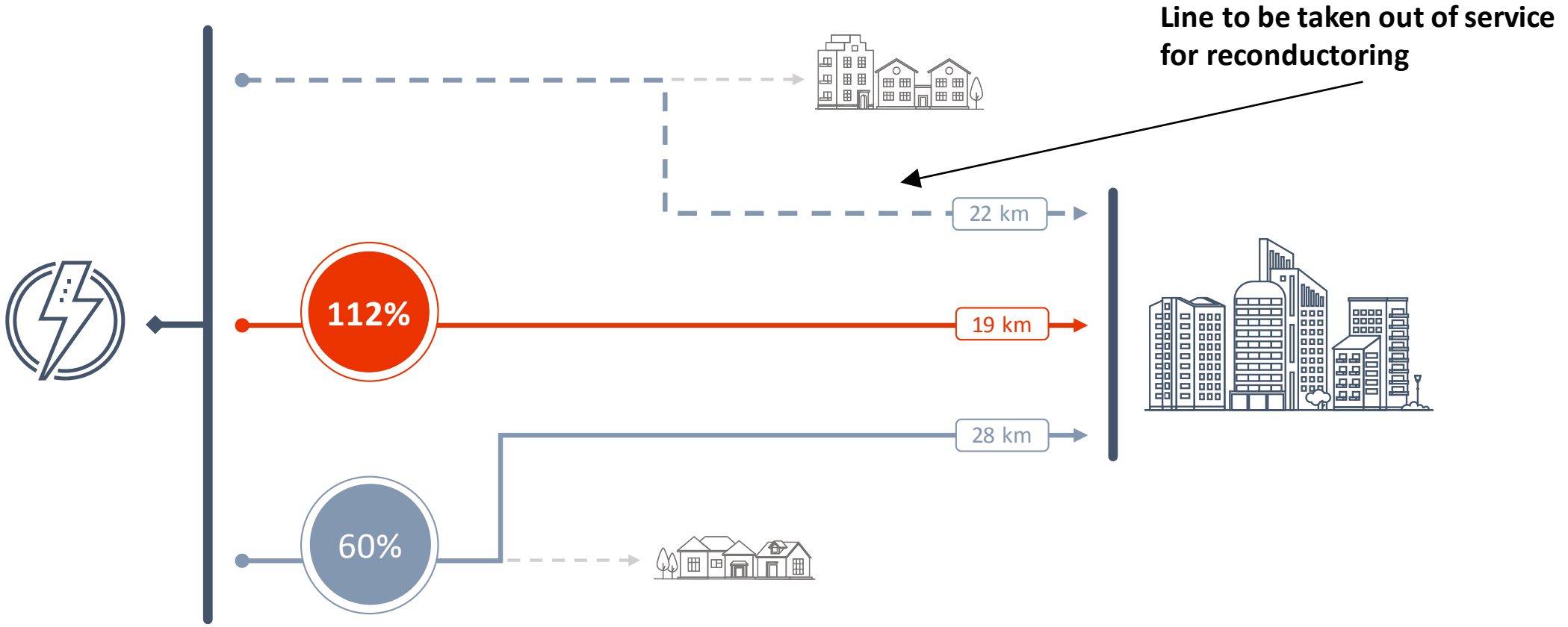
Facilitating Transmission Construction with Mobile PFC Solutions



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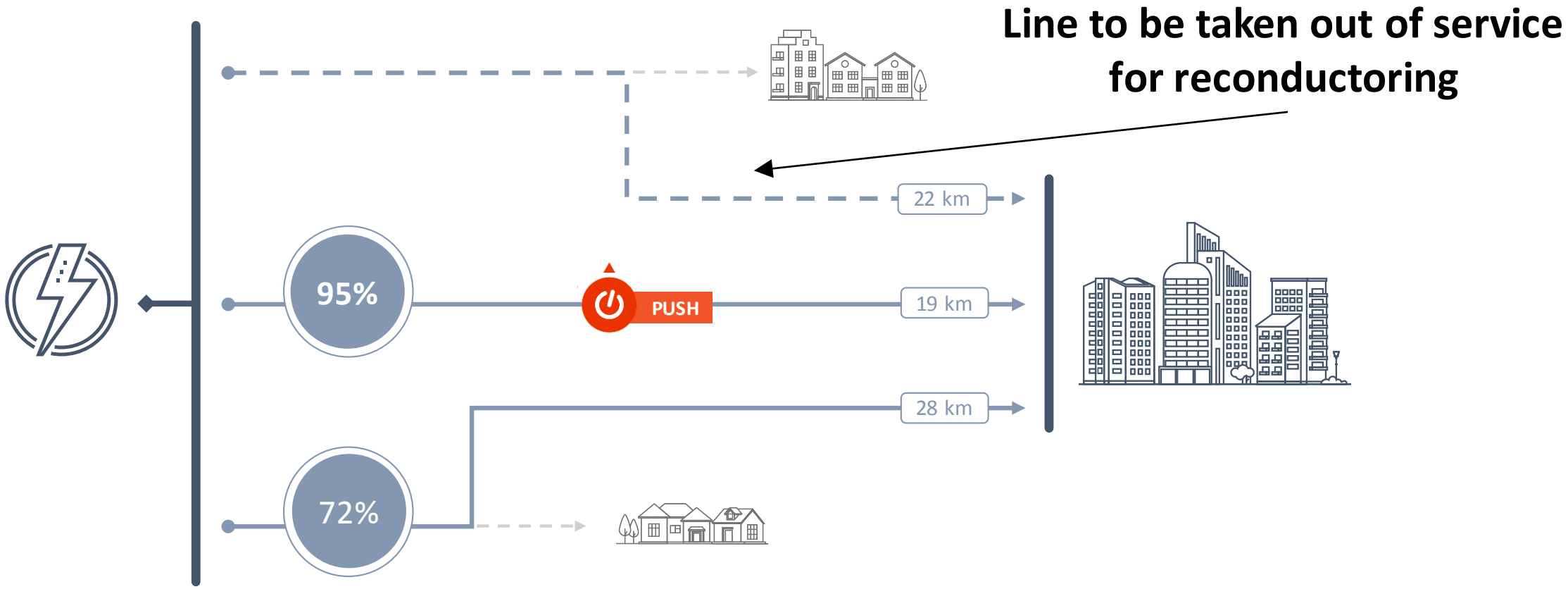
Facilitating Transmission Construction with Mobile PFC Solutions



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Examples of PFC Impact on Outage Scheduling

Europe

- A large European TSO identified 16 construction projects that were infeasible due to outage concerns
- Deploying 5 Mobile PFC trailers enables 14 of these 16 outages to be feasible

United States

- A top-10 TO studied 6 maintenance and construction projects that were infeasible
- 5 of the 6 projects were feasible with no more than 2 Mobile PFC trailers per site

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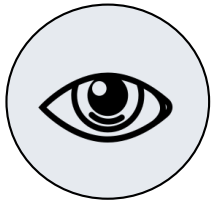
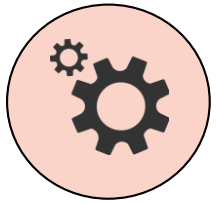
CHALLENGES
AHEAD

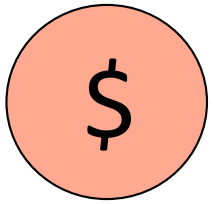
Challenges to Full Integration of PFC into Operations



Integration of PFC into situational awareness tools

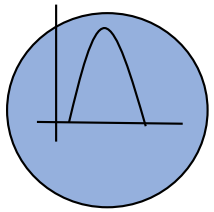


Embedding PFCs into the core EMS/MMS functions



Ensuring market participants have visibility to how PFCs will be dispatched

Developing best practices for the proper mix of control modes - operator controlled, centrally controlled automatically, locally controlled automatically



Accounting for the impact of devices on limits that are exogenous to the tools (e.g. stability limits in SCUC)

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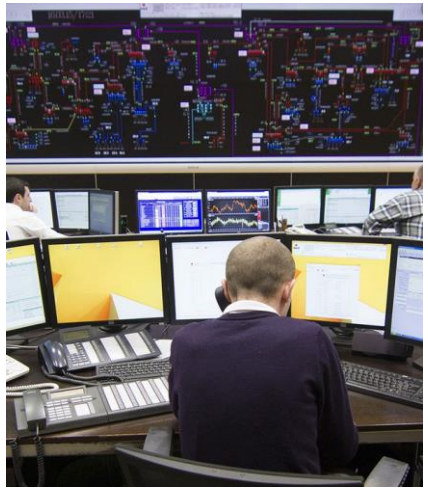
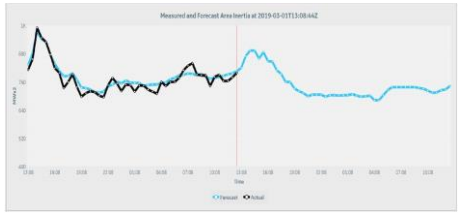
Advancements in Ops Automation

Staffed substations directed by centralized operators

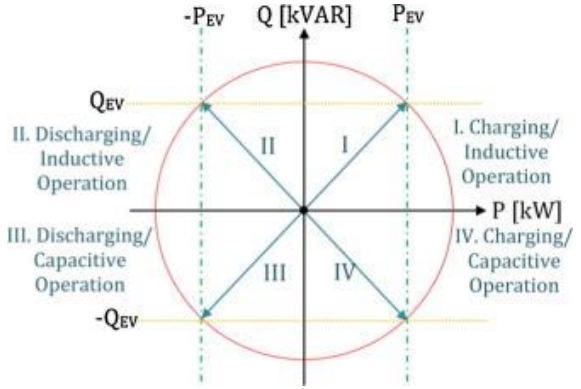


Automated Volt-VAR dispatch

AEMO
AUSTRALIAN ENERGY MARKET OPERATOR



Centralized control via EMS



Measuring and forecasting effective area inertia with machine learning

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OPPORTUNITY
AHEAD