



Fall 2018 Conference

Infrastructure Challenges in the Electricity Sector

Peter Tyschenko
Manager Capacity Planning

October 30, 2018



INSTITUTE FOR
REGULATORY
POLICY STUDIES
Illinois State University

- ✓ Distributed Energy Resources (DER)
 - Intermittent solar & wind
- ✓ Electric vehicles (EV)
 - Smart charging
- ✓ Distribution Automation (DA)
 - Reclosers
- ✓ Smart instrumentation and sensors
 - “Smart” means it has communications
 - Fault Indicators
 - Phasor Measurement Units (PMU) - time synchronized measurements of voltage and current
- ✓ Central intelligence and control
 - Advanced Distribution Management System (ADMS)
 - Distributed Energy Resource Management System (DERMS)
- ✓ Bid data analytics and machine learning...

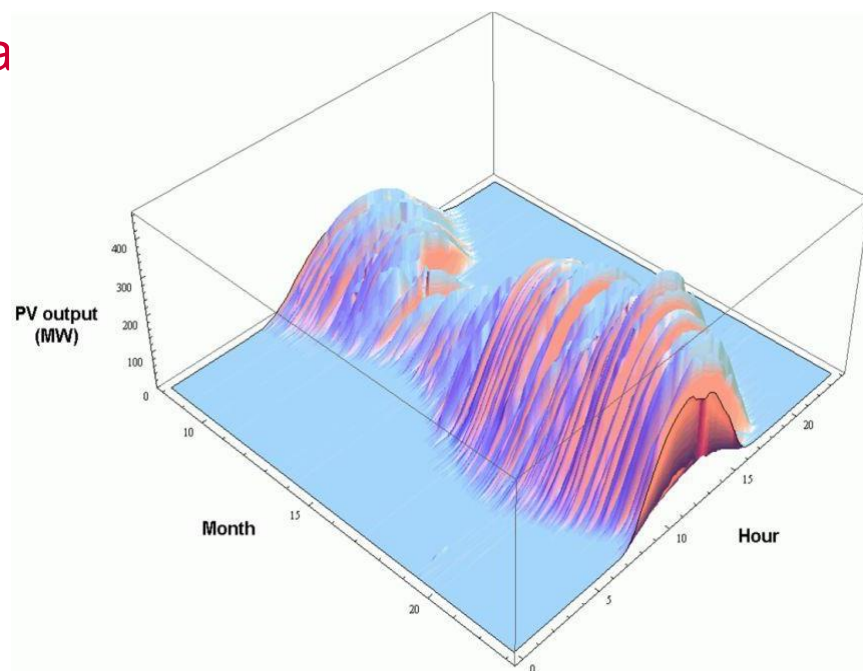
**Some
examples
include...**

The Planning Process Of Today Is Complex But, It Will Still Need To Evolve...

From (today)...	... to (how planning will evolve)
<ul style="list-style-type: none">✓ Peak Load is the Planning Criterion<ul style="list-style-type: none">• Based on Short Term Load Forecast<ul style="list-style-type: none">– Weather adjusted historical data– Known new development– Known customer request• Time Horizons<ul style="list-style-type: none">– New feeders – 2 years– Substation expansion – 5 years– New substations – 20 years	<ul style="list-style-type: none">✓ Still considers Peak Load; also considers Peak Renewables/Minimum Load; 8760 Analysis<ul style="list-style-type: none">• Based on Short Term Load Forecast as Today• But also accounts for DER Adoption and Usage• Must incorporate controllable DER✓ Will include more granular data sources<ul style="list-style-type: none">• AMI, weather, etc.
<ul style="list-style-type: none">✓ Planning is deterministic against forecasted peak load	<ul style="list-style-type: none">✓ Probabilistic / stochastic planning (e.g. likelihood of N successive low solar days)✓ Spatial Forecasting becomes increasingly important
<ul style="list-style-type: none">✓ Impact of weather considered in 1 in 10 Year Weather Conditions	<ul style="list-style-type: none">✓ Granular weather impacts (wind speed and cloud cover) considered in planning
<ul style="list-style-type: none">✓ Considers only “grid” solutions	<ul style="list-style-type: none">✓ Considers both grid solutions and non-wires alternate solutions as options

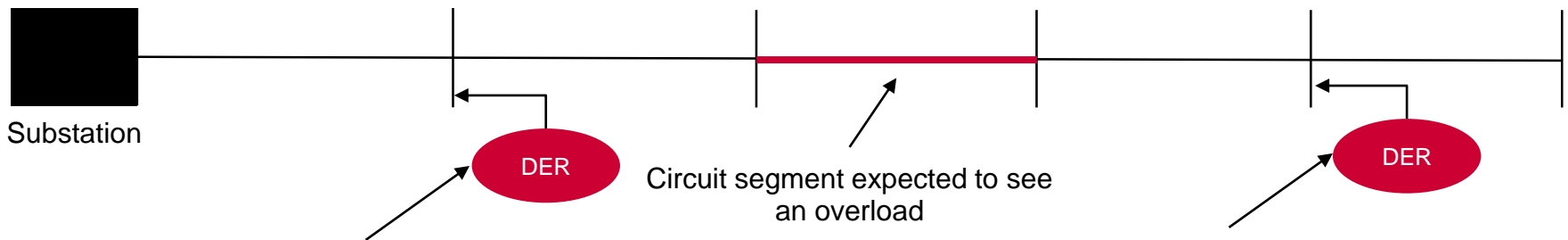
- ✓ DER proliferation can create problems on loading conditions other than traditional summer or winter peaks.
 - Lowest annual **daytime minimum load**
 - A weekend in Spring or Fall – may create **highest voltage** violations
- ✓ Total feeder power flow does not necessarily decrease as we move away from the substation.
 - **Reverse power flows** may create **capacity violations** on feeder assets (lines, protective and switching equipment, voltage regulation and control devices) downstream while no violations are observed at the substation.
 - Seasonality of PV output

Seasonal and Daily Variation of PV output



Non-wires alternatives (NWAs) represent investments to defer or avoid traditional T&D projects (such as installing new poles, wires, and transformers)

- ✓ NWAs may include the promotion of Energy Efficiency (EE), Demand Response (DR) programs, and the installation of Distributed Energy Resources (DERs).
- ✓ NWAs can be considered in locations where they provide value to the distribution system.
- ✓ Value of NWAs needs to be determined on a case by case basis.
 - **What** is needed - **Real power, reactive power, or reserve**.
 - **Where** it is needed - **Locational** in relation to constraint
 - **When** it is needed - **Temporal** in relation to constraint
- ✓ If there are no constraints on the feeder (e.g. segment that is expected to see an overload), DER will have no value in deferring a distribution investment.



Upstream DER: Provides no value to mitigate projected overload.

Downstream DER: May be able mitigate projected overload depending on the DER type (i.e. generation pattern).

ComEd Hosting Capacity Map...

ComEd Hosting Capacity **Address Search** ComEd.com: Customer Generated Power **Apply Online!**

Zoom In/Out **Home** **Basemap Gallery** **Links:**
Interconnection and Net Metering Homepage
Customer Generated Power Homepage

Legend
Hosting Capacity Township
kW
> 2000
> 1500 - 2000
> 1000 - 1500
> 500 - 1000
> 250 - 500
> 0 - 250

Legend

Estimated Hosting Capacity (kW)
3,072
Apply Online!
Click here to access ComEd's Interconnection and Net Metering Homepage:

Apply Online!

Expand/Collapse Legend

Esri, HERE, Garmin, FAO, USGS, EPA, NPS
Lafayette POWERED BY **esri**

- **Advanced Distribution Management System (ADMS)** is an integrated technology platform that provides advanced capabilities (D-SCADA, OMS, Advanced Apps) currently achieved through discrete legacy systems
- **ADMS is a journey** taken over a number of years and is **not a single system implementation**.

D-SCADA



Distribution - Supervisory Control & Data Acquisition

- Remote Real-time Device Monitoring
- Device Control
- Distribution Power Flow

OMS



Outage Management System

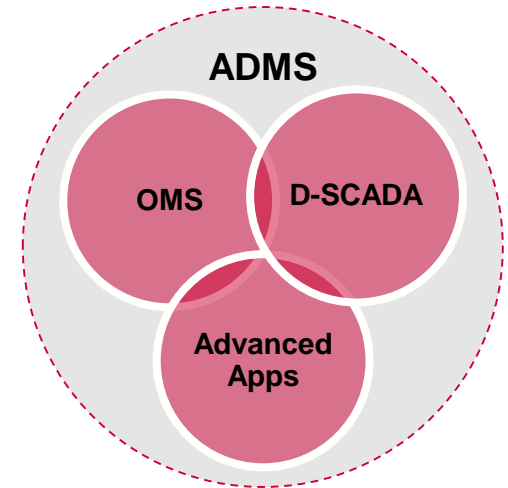
- Outage Analysis and Prediction
- Trouble Call Mgmt.
- Outage Reporting & Notifications
- Planned Outage Mgmt.
- Crew Dispatch & Mgmt.
- Storm Management

Advanced Apps



Advanced Applications

- Fault Locations, Isolation, and Service Restoration (FLISR)
- Distributed Energy Resources Mgmt. (DERMS)
- Conservation Voltage Reduction (CVR)
- Feeder Reconfiguration (FR)
- Fault Protection Analysis (FPA)
- Switch Order Mgmt.
- Short Circuit Analysis



Potential EV Screening Considerations...

Level 2 Charging	DC Fast Charging
<ul style="list-style-type: none"> ✓ Level 2 charging targets locations with long dwell-time, typically work and long-term parking facilities in high density areas – EV drivers typically use public L2 chargers as an alternative to home charging 	<ul style="list-style-type: none"> ✓ DC Fast Charging targets locations that are in close proximity of transportation corridors or select “fast retail” locations with short dwell time – EV drivers use these locations for emergency or quick charging
<ul style="list-style-type: none"> ✓ Key data components include landmarks with long dwell time patterns, population (customer) density and existing Level 2 charging stations 	<ul style="list-style-type: none"> ✓ Key data components include distance to major highways, landmarks with potential EV volume and short dwell time as well as existing DC Fast Charging locations
<ul style="list-style-type: none"> ✓ Target landmarks include: <ul style="list-style-type: none"> • Commercial office buildings • Government buildings • Public parking garages • Commuter train stations • Hospitals and clinics • Schools • Entertainment centers • Retail and dining locations 	<ul style="list-style-type: none"> ✓ Target landmarks include: <ul style="list-style-type: none"> • Gas and rest areas • Highway exists • Fast retail (grocery stores, pharmacies and coffee shops)

Data Components	Description
Feeder Loading	System loading as a potential indicator of grid preparedness for ZEV charging
Points of Interest (Landmarks)	Business and public areas where chargers can be located for customer convenience - Landmarks prioritized qualitatively by potential EV traffic and dwell time
Population Density	ComEd customers (proxy for population) as a way to align charging infrastructure locations with high density areas
Existing Charging Stations	Number of existing ZEV charging stations, in order to focus on areas with an infrastructure gap
Distance to Highway	Proximity to transportation corridors for locating fast charging stations