



Commonwealth

IMPACTS AND MITIGATION OF DISTRIBUTED ENERGY RESOURCES ON LOCAL UTILITIES

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WHO AM I? WHY AM I PRESENTING?

Isaac Trueblood

- Who?
 - 6 years at Commonwealth Associates Inc.
 - Consultant for utilities and owners
- Why?
 - Sharing experience



INTRODUCTION TO DISTRIBUTED ENERGY RESOURCES

Definition and Examples

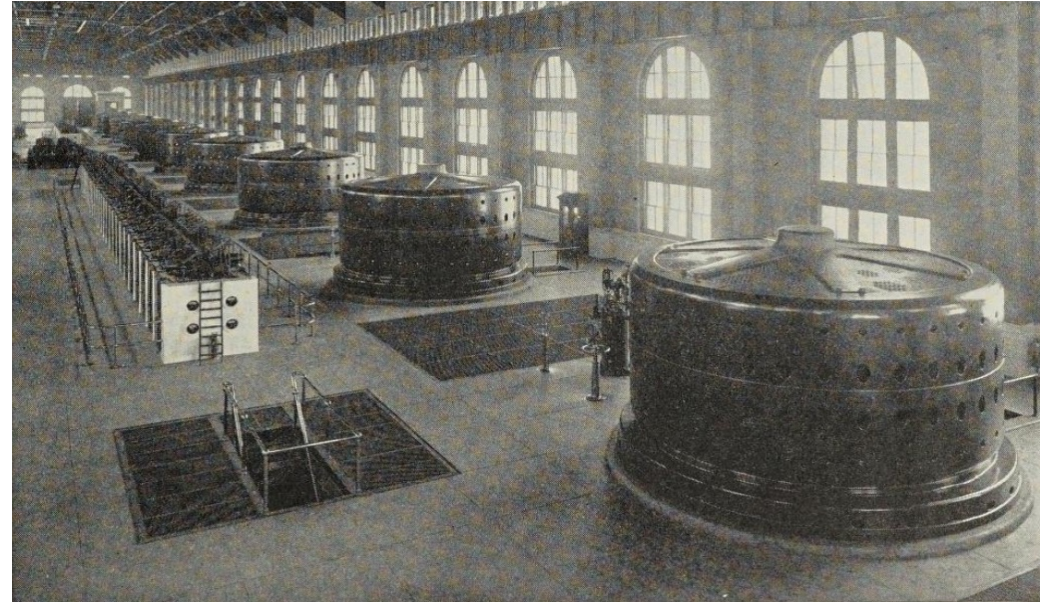
- Distribution Energy Resources (DERs)
 - NERC Definition
 - ≤ 100 kV Generation Interconnection
 - Examples
 - Solar Panel
 - Wind Turbines
 - Battery Storage



BRIEF HISTORY

Electrical Grids and DERs

- Before transformers
 - Generating resources distributed
- Widespread adoption of Transformers
 - Generating resources remote
- Adoption of DERs
 - Generating resources remote and local



Niagara Canadian Power-House, 1913

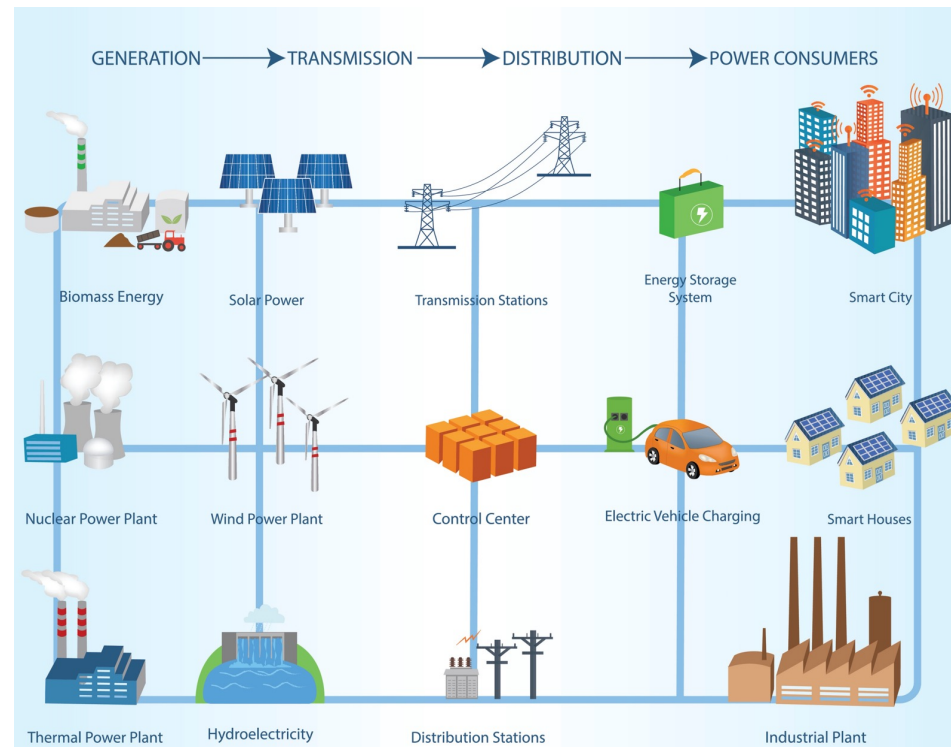
Source: Niagara power; history of the Niagara Falls Power Company, 1886-1918; evolution of its central power station and alternating current system by Adams, Edward Dean, 1846-1931



DER IMPACTS ON LOCAL UTILITIES

Overview

- Voltage
 - Fluctuation
 - Regulation
- Power Flow
 - Power System Ampacity
 - Backflow
- Reactive Power
 - Capabilities
- Short Circuit Current
 - Protection Coordination



Source: monicado, istockphoto.com

DER MITIGATION

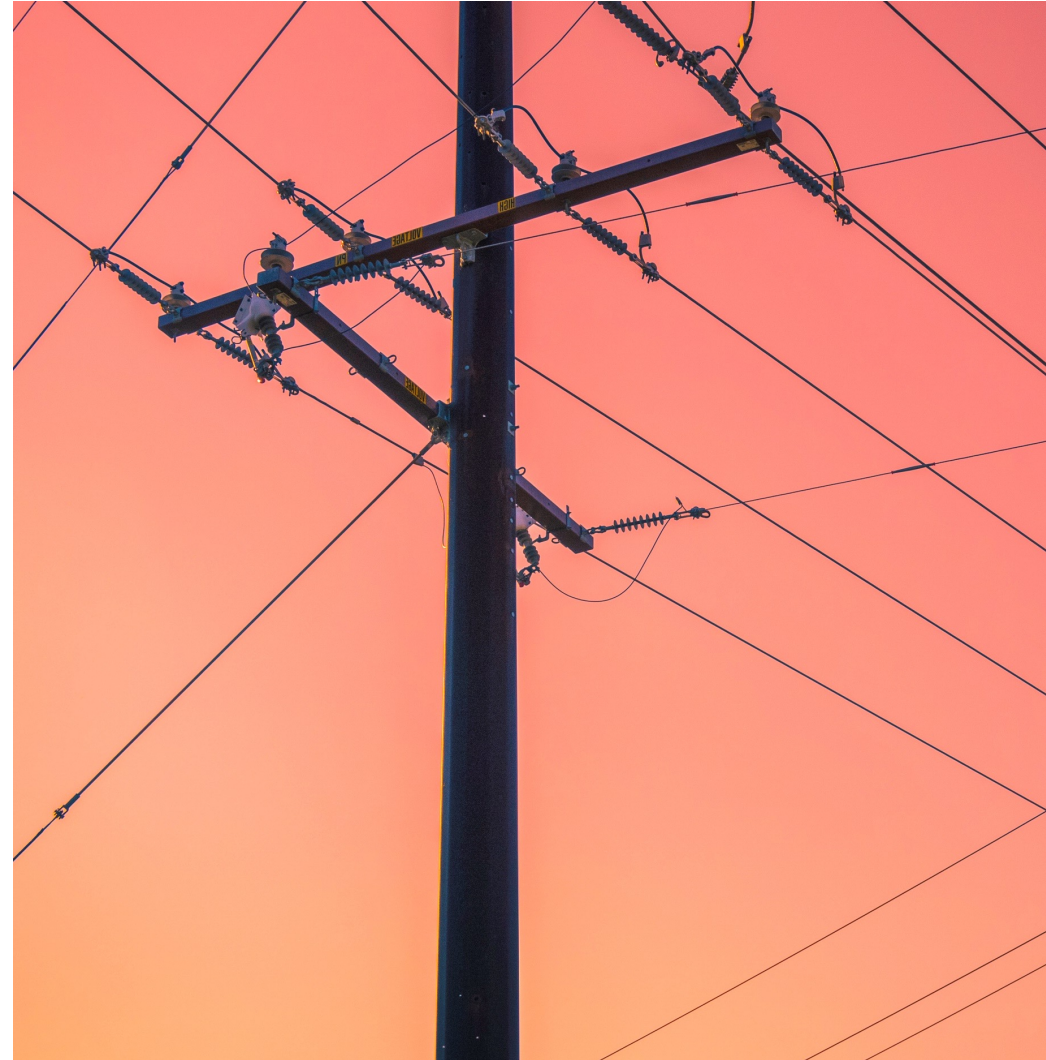
Voltage

- Fluctuation
 - Ramp Rates
 - System Stability
- Regulation
 - Voltage Regulators
 - Inverter Settings

DER MITIGATION

Power Flow

- Backflow
 - Reduced DER Output
 - Additional Feeder Load
- Power System Ampacity
 - New Power Lines
 - Increase Feeder Ampacity



DER MITIGATION

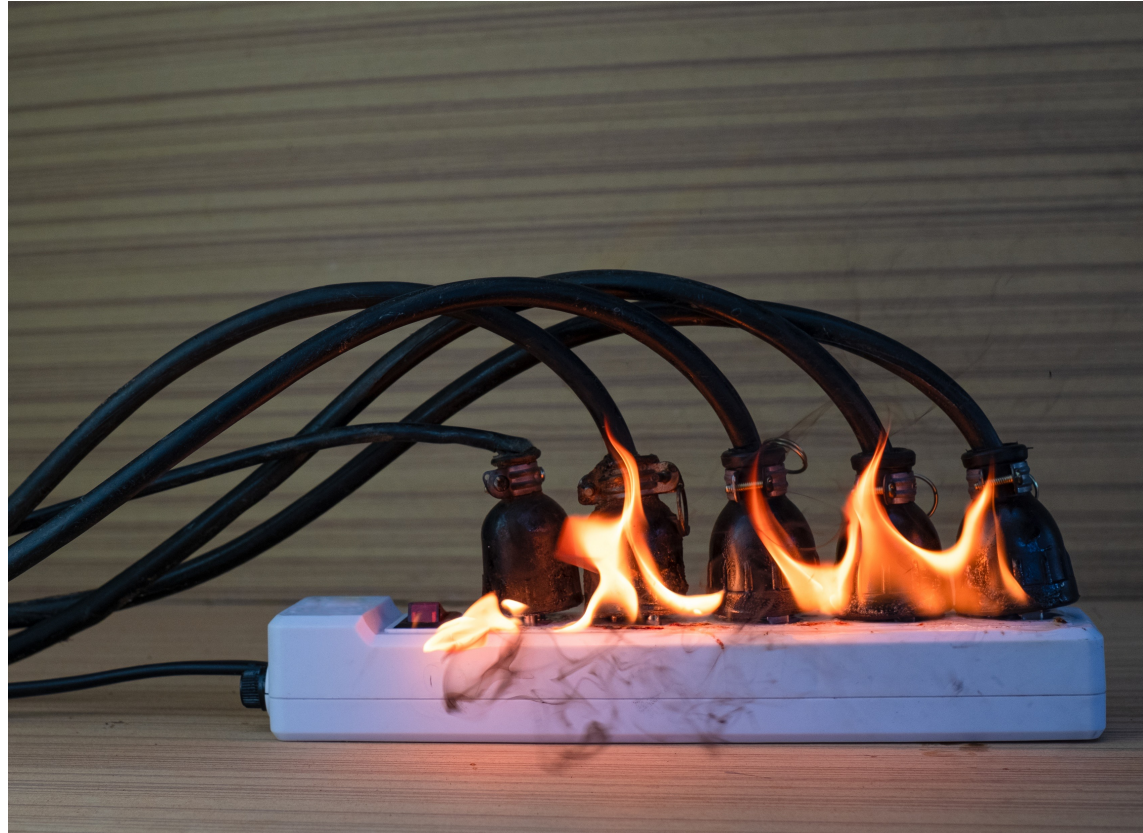
Reactive Power

- Capabilities
 - Oversizing

DER MITIGATION

Short Circuit Current

- Protection Coordination
 - Protection Ratings
 - Relay Settings



CONCLUSION

- DERs are:
 - Useful,
 - Complex
 - Disruptive
- What's next?
 - Plan for the future



The slide features several decorative geometric shapes. In the top right, there is a red triangle pointing down, a grey hexagon, a lime green triangle pointing up, and a light grey hexagon. In the bottom right, there is a light grey hexagon and an orange triangle pointing up. In the bottom left, there is a grey hexagon, a red triangle pointing down, and a dark grey triangle pointing up. The word "QUESTIONS?" is centered in blue text.

QUESTIONS?

THANK YOU

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