Community Solar and The Grid

The Impact of Community Solar on the Electricity Network

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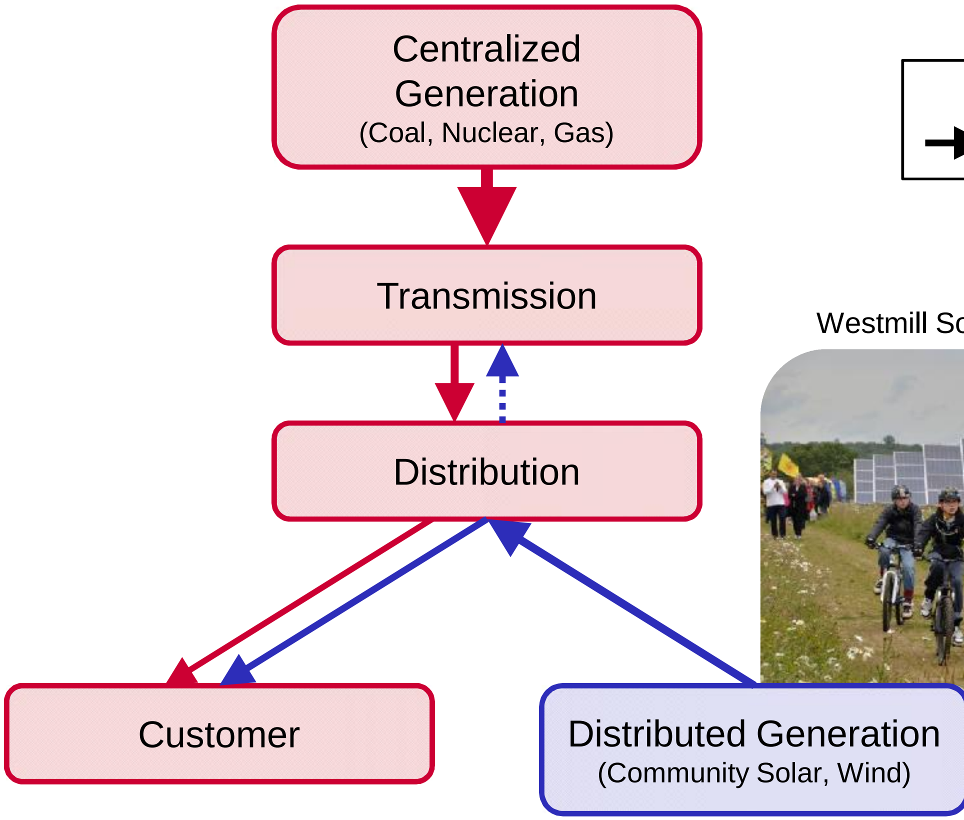
Contents

Introduction

- Traditionally electricity has operated with one-way power flow
- Distributed generation like community solar is changing this



Key

Direction of power flow

Westmill Solar Co-operative in the UK

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Challenges

- Network has predominantly been designed for one-way power flow
- To a certain point network can accommodate distributed generation
  - This limitation is known as Hosting Capacity
  - Every feeder is unique and will have a different hosting capacity
- Beyond this network performance is negatively impacted and mitigation measures may be required

Main Network Issues from Distributed Generation

Voltage	Overvoltage
	Voltage regulation
	Phase imbalance
Loading	Equipment overload
Protection	Loss of coordination
	Higher short-circuit level
	Anti-islanding

Important to consider **location** on network and **size** (MVA) of distributed generation

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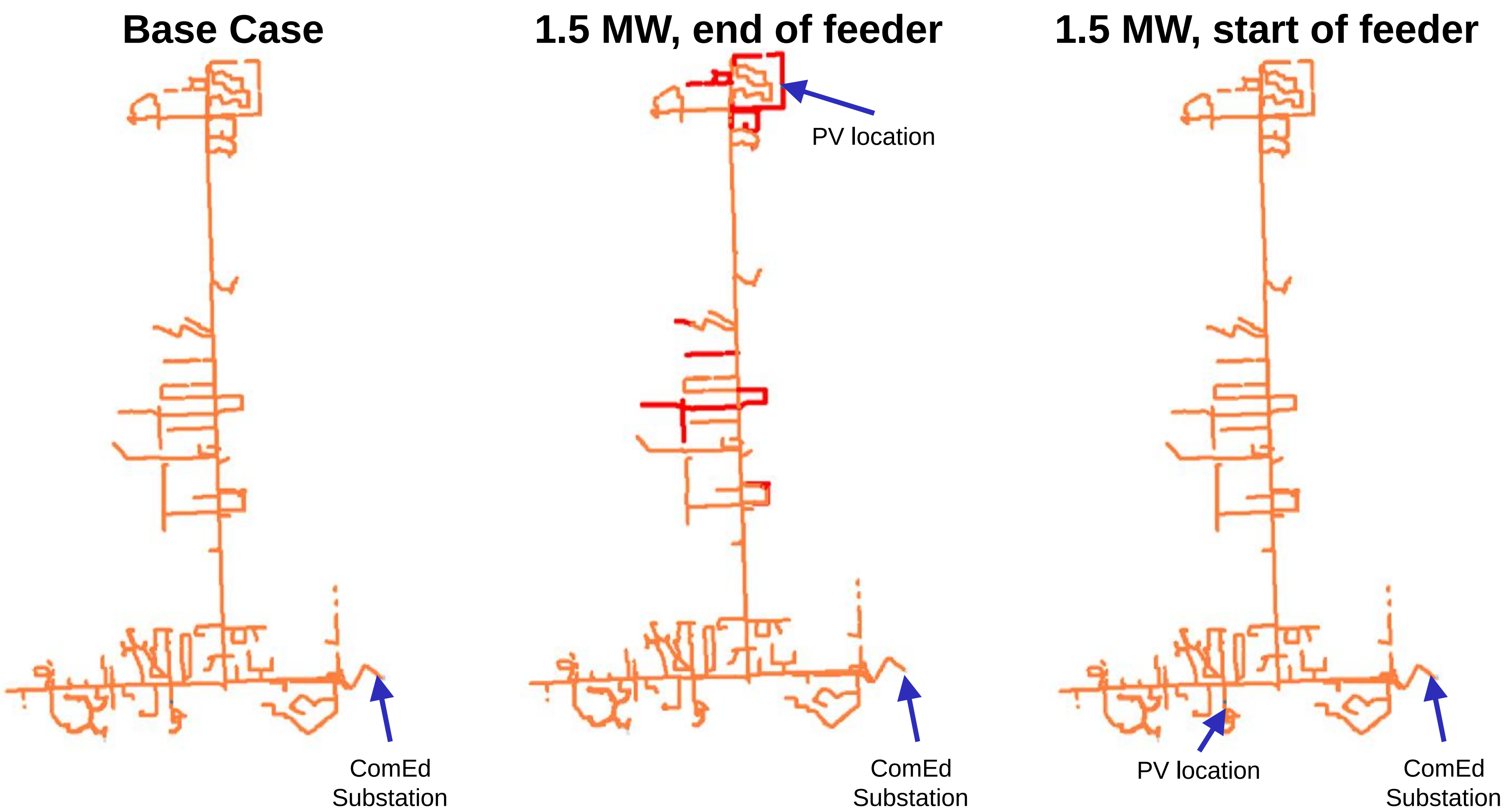
Understanding the Impact

- Demonstrating the importance of size and location

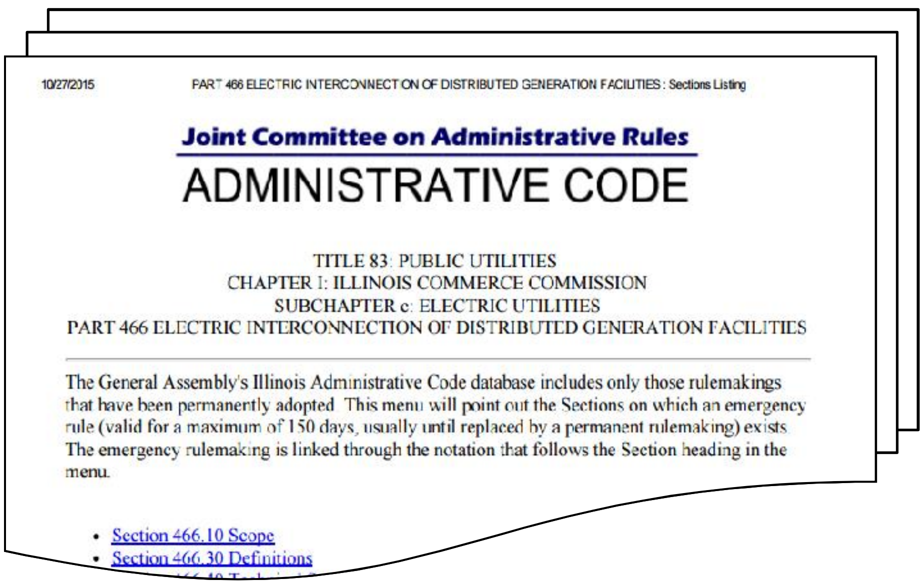
Key

Acceptable Voltage   Overvoltage Voltage



Interconnection Process (I/II)

- Existing interconnection process designed to expedite assessment process while minimizing the impact of distributed generation on network
- See *ICC Standard 466: Electric Interconnection of Distributed Generation Facilities*
    - Builds on *FERC Order 2006: Standardization of Small Generation Interconnection Agreements and Procedures*



10/27/2015 PART 466 ELECTRIC INTERCONNECTION OF DISTRIBUTED GENERATION FACILITIES : Sections Listing

Joint Committee on Administrative Rules

ADMINISTRATIVE CODE

TITLE 83: PUBLIC UTILITIES
CHAPTER I: ILLINOIS COMMERCE COMMISSION
SUBCHAPTER c: ELECTRIC UTILITIES
PART 466 ELECTRIC INTERCONNECTION OF DISTRIBUTED GENERATION FACILITIES

The General Assembly's Illinois Administrative Code database includes only those rulemakings that have been permanently adopted. This menu will point out the Sections on which an emergency rule (valid for a maximum of 150 days, usually until replaced by a permanent rulemaking) exists. The emergency rulemaking is linked through the notation that follows the Section heading in the menu.

- Section 466.10 Scope
- Section 466.30 Definitions

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Interconnection Process (II/II)

ICC Standard 466 defines the process ComEd required to follow in assessing interconnection requests:

- Level 1 – connections < 10kVA (Expedited Review)
- Level 2 – connections < 2MVA (Expedited Review)
- Level 3 – connections < 10MVA (Expedited Review)
- Level 4 – connections <10MVA (Special Cases)

Feasibility study would cover (at a minimum):

- Protection device capabilities
  - Short circuit capability, protection reach / coordination, grounding requirements etc.
- Possible thermal overloading of equipment
- Voltage impacts (overvoltage, regulation, flicker)
- Impacts on system operation and stability
- Impacts of reverse power flow

Additional Benefits

- If sized and located correctly, distributed generation can actually benefit performance of network
  - Reduction of network loading (if midday peak)
  - Voltage regulation (with smart inverters)
  - Reduced losses (generation closer to customer)
  - Increased diversity in generation resources (enabler for microgrids)
- Using modelling techniques it is possible to understand the impact of distributed generation size and location on a specific feeder
  - Enables calculation of optimal location and size of distributed generation to minimize impact on network

Note: Achievable benefits are feeder specific

Summary

- Impact of distributed generation on the network is largely dependent on size and location
  - This is something that can be modelled and understood to provide optimal sizing and location of distributed generation

- If distributed generation is well sized and located it can also provide additional benefits to the network, community and consumers

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Questions?