

Methods and Application Considerations for Hosting Capacity

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Hosting Capacity Methods – Different Methods Have Different Ramifications

Method	Approach	Advantages	Disadvantages	Computation Time	Recommended Use Case
Stochastic	+Increase DER randomly +Run power flow for each solution	+Similar in concept to traditional interconnection studies +Becoming available in planning tools	+Computationally intensive +Limited scenarios	Hours/feeder	+DER planning
Iterative (Integration Capacity Analysis)	+Increase DER at specific location +Run power flow for each solution	+Similar in concept to traditional interconnection studies +Becoming available in planning tools	+Computationally intensive +Limited scenarios +Vendor-specific implementations can vary + does not determine small distributed (rooftop PV)	Hours/feeder	+Inform screening process +Inform developers
Streamlined	+Limited number of power flows +Utilizes combination of power flow and algorithms	+Computationally efficient +Not vendor tool specific	+Novel approach to hosting capacity +Not well understood method +Limited scenarios +Not available in current planning tools	Minutes/feeder	+Inform screening process +Inform developers
DRIVE	+Limited number of power flows +Utilizes combination of power flow and algorithms	+Computationally efficient +Many DER scenarios considered +Not vendor tool specific +Broad utility industry adoption and input +Becoming available in planning tools	+Novel approach to hosting capacity +Not well understood method +Lag between modifications/ upgrades and associated documentation	Minutes/feeder	+DER planning +Inform screening process +Inform developers

Mandating only one approach is short-sighted and not recommended as it discourages innovation and limits flexibility to adapt to the changing grid. Methods are in their infancy, and if allowed will continue to evolve to meet industry needs.

Comparison of Methods

Comparison of “Iterative” vs “PG&E’s Streamlined” show similar results with some inconsistencies

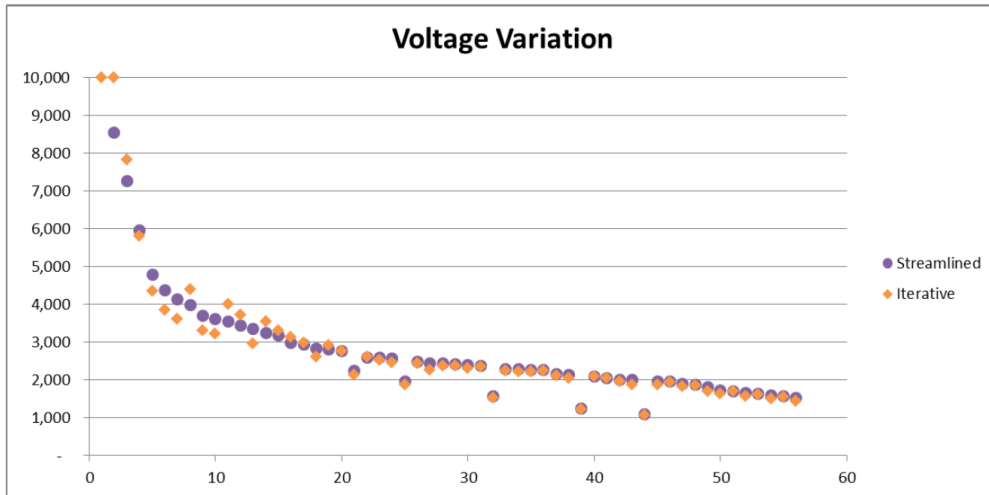
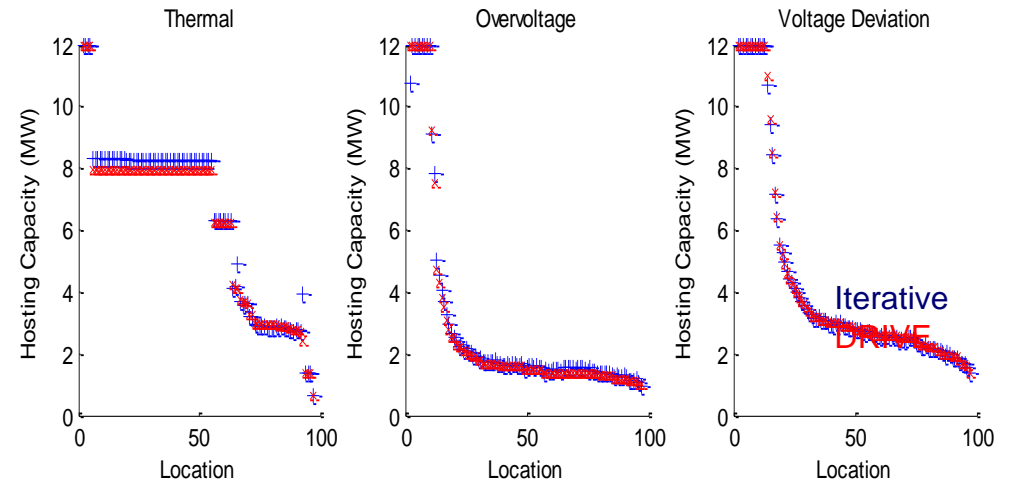


Figure 64: IEEE 123 Voltage Variation IC Results over Distance

Comparison of SDG&E “Iterative” and DRIVE show similar results across multiple feeders



Sample results from report to be published Dec 2017

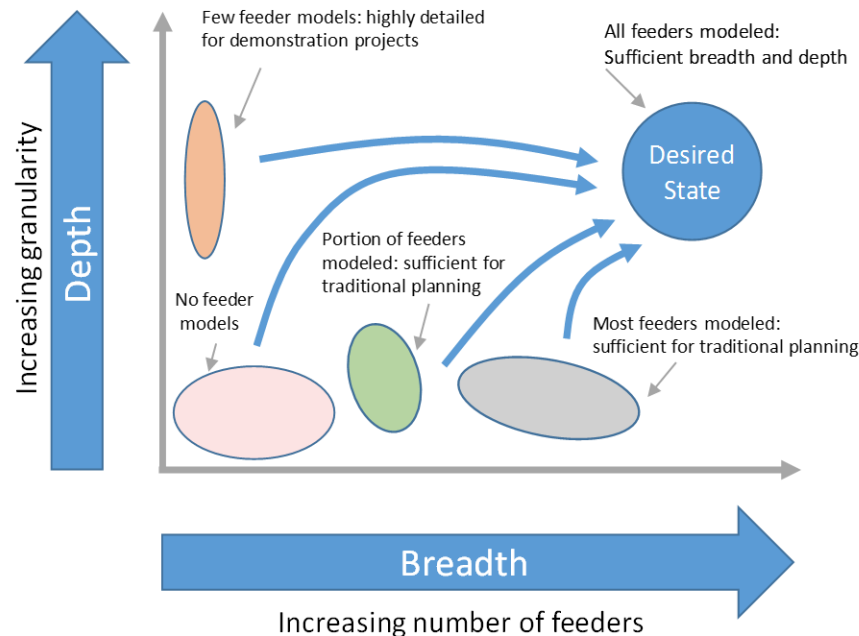
Different methods can produce similar results

Hosting Capacity Challenges

Models and Impact Factors

Minor variations in input assumptions and impact factors have greater impact on results than one method vs another

- Calculations are based on available models
- All models are approximations at best
 - Do not always reflect design and/or “as operated” conditions
 - Do not always reflect DER (queued, approved)
- Various factors impact hosting capacity
 - Some more important than others
 - Modeling all impact factors extremely difficult

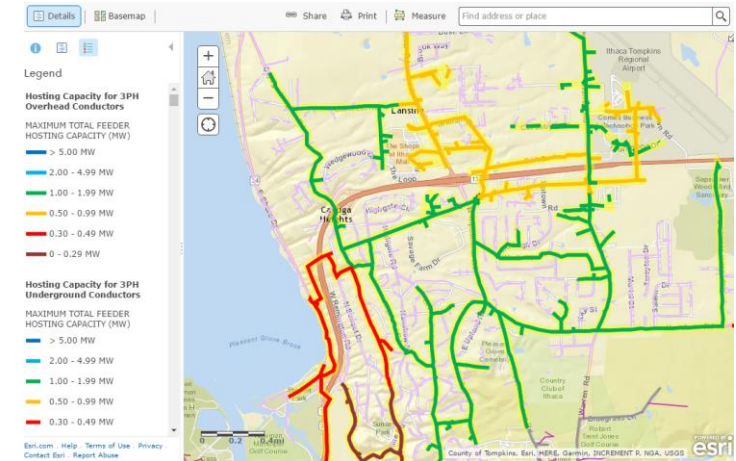


Impact	Hosting Capacity Impact Factor	
High	DER	Location
High		Type/Technology/Portfolio
High		Smart Inverter
High		Communication and Control
High		Aggregation
Medium	DER	Efficiency
Medium		Single-Phase
Low	DER	Vendor
Low		Plant layout
Medium	DER	local weather patterns (renewables)
Medium		Panel orientation (PV)
High	Distribution	Voltage control scheme
High		Configuration/reconfiguration
High		Load level and allocation
High		Phasing information (load/laterals)
Medium	Distribution	Protection system design
Medium		Granularity of MV models (# of nodes)
High	Distribution	Grounding practices
High		Time
Medium	Misc	Modeling of service transformers
Medium		Modeling of services/secondaries
Low		Planning software platform
Medium		Transmission constraints
Medium	Misc	Transmission grid configuration/dispatch

Each Use Case Has Important Considerations

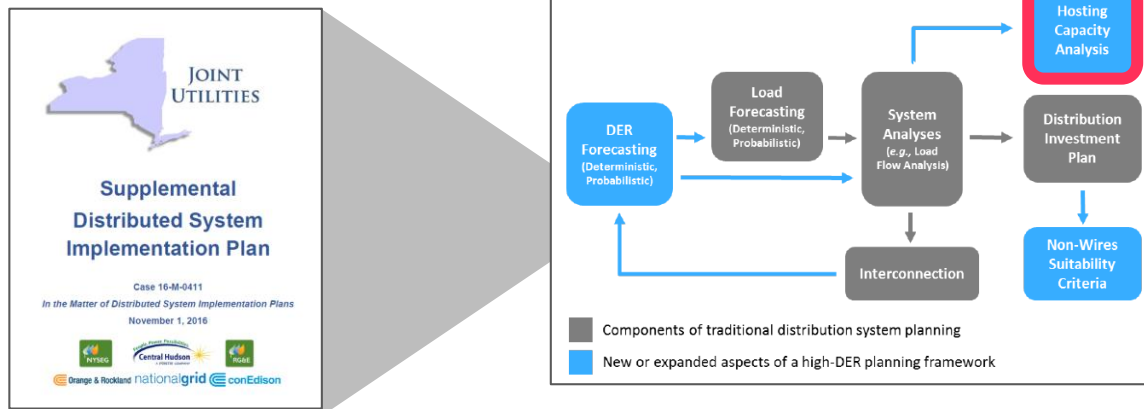
- Enabling DER Planning
 - Scalability of method, scenarios
- Informing Developers
 - Granularity, frequency of updates, existing DER
- Assisting Interconnection Screening
 - Accuracy, impact factors, need for engineering judgement

Informing Developers

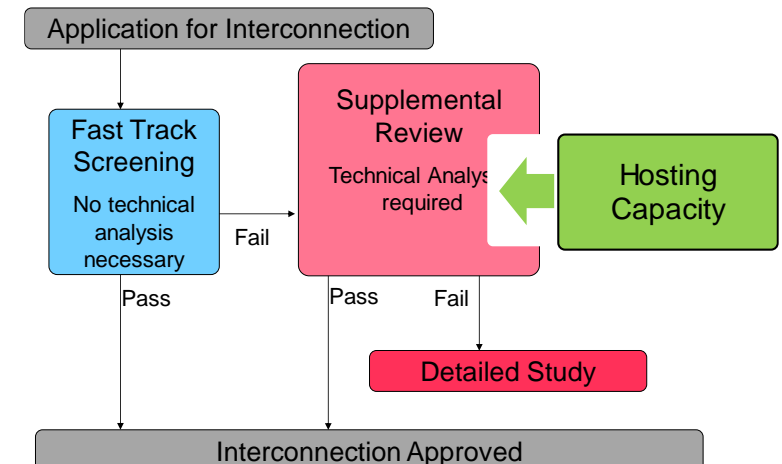


Hosting Capacity Maps courtesy of NYSEG/RGE

Enabling DER Planning

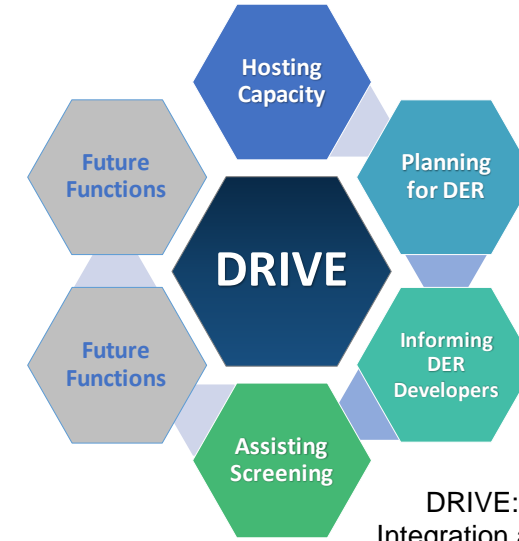


Assisting Screening



Next Steps in Hosting Capacity Methods

- Continue to utilize all methods, encourages innovation
- Enhanced methods need to address new challenges (DER Value assessments, mitigation solutions, automation, etc)
- Perform ongoing validation to better understand each approach
- **DRIVE user group an example of these efforts**
 - Evolving hosting capacity methods and applications through broad industry engagement
 - Over 25 utilities joined to date (US, Europe, Asia, Africa)



DRIVE: Distribution Resource Integration and Value Estimation Tool

Utility's Using and/or Participating in DRIVE-Related Projects



~ 30 Utilities