

California's Rule 21

Donald M. Prien, P.E.

Sacramento Municipal Utility District

Topics of Discussion

- How Rule 21 simplifies Interconnections for California Utilities
- Certified Equipment
- Real Life Examples
- Ongoing Improvements
 - IEEE 1547.1, 1547.2

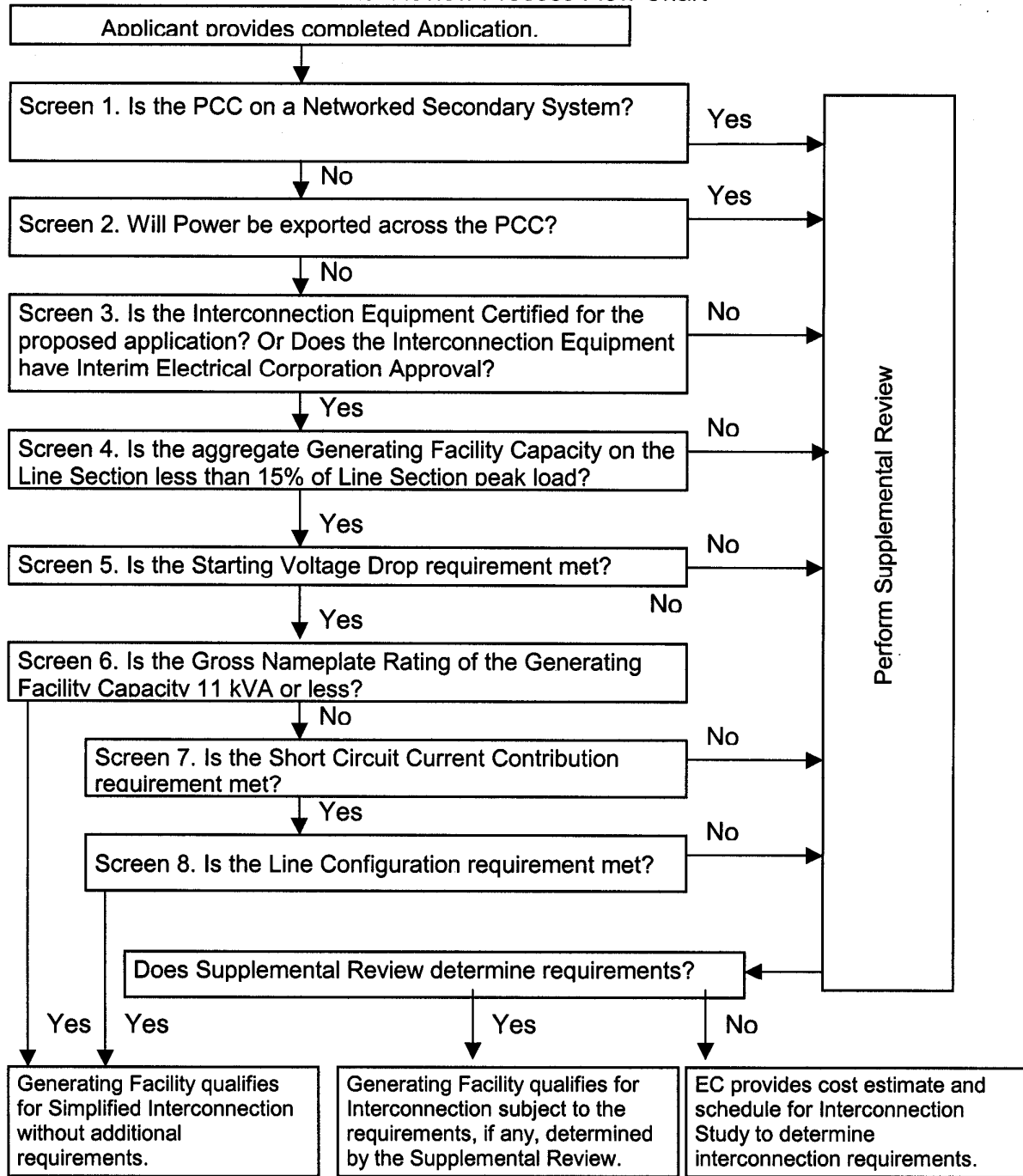
Why Did We Need Rule 21?

- Different processes across California's utilities
- Inconsistent applications of the rules (even within a Utility)
- Conservative, size based, rules
- Net-metering Legislation
- Inverter based technologies

How Rule 21 Simplifies Interconnections

- Common Process for all interconnection reviews for California
- Common Application of Rules
- Defines Certification Process for Equipment
- Quickly Identifies “Plug & Play” installations
 - Certified Inverters

Initial Review Process Flow Chart



Certified Equipment

- Integrated Relaying Functions
- Tested by a Nationally Recognized Testing Laboratory (UL, CSA)
- Set to IEEE 1547 relaying set points
 - Under/Over Voltage - 88% to 110% of Nominal
 - Under/Over Frequency – 59.3 Hz to 60.5 Hz (assuming 60 Hz nominal)
 - Active Anti-Islanding

Real Life Examples

- Premier Gardens - Photovoltaics
- Kaiser South – Capstone Microturbine
- Cal Denier Dairy Digester
- Hydrogen Refueling Station

Premier Gardens – Photovoltaic's



Kaiser - Capstone Cogen System

- The 240 kW plant, which produces about two-thirds of the building electricity needs and all of its domestic hot water and heating.
- System consists of four (4) 60 kW Microturbine generators.



Cal Denier Dairy Digester



SMUD's Hydrogen Refueling Station



Ongoing Improvements

- Grid (Mesh) Network Interconnection Rules
- Combined Technologies Business Rules
- Certification Reviews of Increasingly Larger Units

IEEE SCC21 1547 Series of Interconnection Standards

IEEE Std 1547™ (2003) Standard for Interconnecting Distributed Resources with Electric Power Systems

P1547.6 Draft Recommended Practice for Interconnecting Distributed Resources with Electric Power Systems Distribution Secondary Networks

IEEE Std 1547.3™ (2007) Guide for Monitoring, Information Exchange and Control of DR Interconnected with EPS

P1547.2 Draft Application Guide for IEEE 1547 Standard for Interconnecting Distributed Resources with Electric Power Systems

P1547.5 Draft Technical Guidelines for Interconnection of Electric Power Sources Greater Than 10 MVA to the Power Transmission Grid

Guide For Interconnection System Certification

P1547.4 Draft Guide for Design, Operation, and Integration of Distributed Resource Island Systems with Electric Power Systems

IEEE Std 1547.1™ (2005) Standard for Conformance Test Procedures for Equipment Interconnecting Distributed Resources with Electric Power Systems

Guide for Impacts

DP Specifications & Performance (includes modeling)

(publication year in parentheses; P1547.X are under development; other topics are under consideration by SCC21 work group members)

Conclusion

- Simplified and standardized rules for interconnection
 - reduce time to deploy
 - cost to connect
 - eliminate the uncertainty
- Establish an environment that supports renewable technologies