

Interconnecting Customer Generation

*Southern California Edison Company
Distributed Energy Resources*

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June 9, 2005*

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This Presentation will Discuss...

Customer Generation at SCE

- Overview of SCE and Customer Generation
- Generation Operation Options
- The Interconnection Process
- Generation Interconnection Considerations
- Self Generation Incentive Program
- Distributed Generation Research Efforts at SCE

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About SCE

Overview of Southern California Edison

- California's second largest electric IOU
- Over 100 years old
- Serves 11+ million people
- 4.3+ million business & residential accounts
- 50,000-square-mile service territory
- Within Central, Coastal & Southern California
- Has 2,700 projects and 200+ MW of DER interconnected to its grid

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SCE's Customer Generation Base has Expanded Since 1998

Technology	Interconnection Applications as of 12/31/04		Projects Proposed for Development	
	Number of Projects	Total kW	Number of Projects	Total kW
Microturbines	50	7,206	19	4,230
Gas Turbines	1	1,770		
Internal Combustion Engines (< 5,000 kW)	93	97,470	54	53,169
Large Projects (IC-GT 5,000 kW)	7	99,061	4	38,080
Fuel Cells	2	10	2	1,082
Small Hydro	1	643		
Combined Technologies (PV/GT)	2	8,345		
Solar (PV & Wind) (includes NEM)	2,581	19,069	235	6,969
Total	2,737	233,574	314	103,530

The Self-Generation Puzzle

**Generator
Types &
Characteristics**

**Intended and
Possible uses of
Generation**

Metering

**Utility
Tariffs &
Rules**

**-Isolated Operation
-Parallel Operation
-Energy Used "On-site"
-Energy "Exported"**

**Interconnection
Requirements**

**Permitting
Requirements**

**Reliability &
Safety**

**Environmental
Regulations**

Generation Operational Options for SCE Customers

- **“Supplemental” or “Bypass” Generation**
(Parallel or Isolated)
- **Net Energy Metering**
(Solar, Wind, & Animal Waste Only)
- **Merchant Generation**
(Scheduling Energy with ISO)



Large Central Power Plant



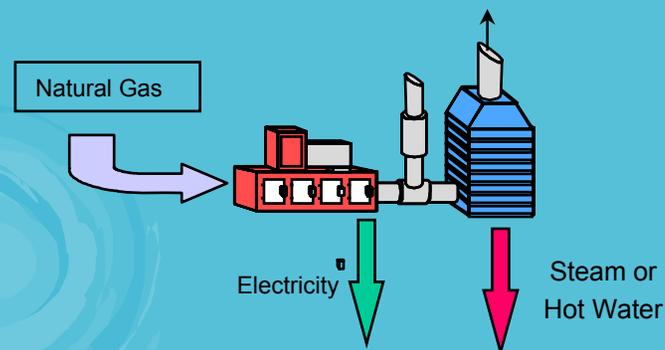
Wind



Solar



Biomass



Cogeneration

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Supplemental or By-Pass Generation

- Any generation technology may be used
 - Parallel or isolated interconnections may be elected
- Generation may be used for back up or economic purposes
- CPUC regulates interconnections. California Rule 21 applies, based on IEEE 1547 rule.
- Typically “non-exporting,” but small (<100kW) “Qualifying Facility” units may sell energy directly to SCE

Net Energy Metering

- Special form of supplemental or bypass generation
- Available only to solar, wind, and animal waste generation facilities with a maximum installed capacity of 1000 kW or less (See PUC Sec. 2827)
- All energy produced must be used by “host” customer during a 12-month “netting period”
- Use of approved equipment allows SCE to waive some application fees



Wind



Solar



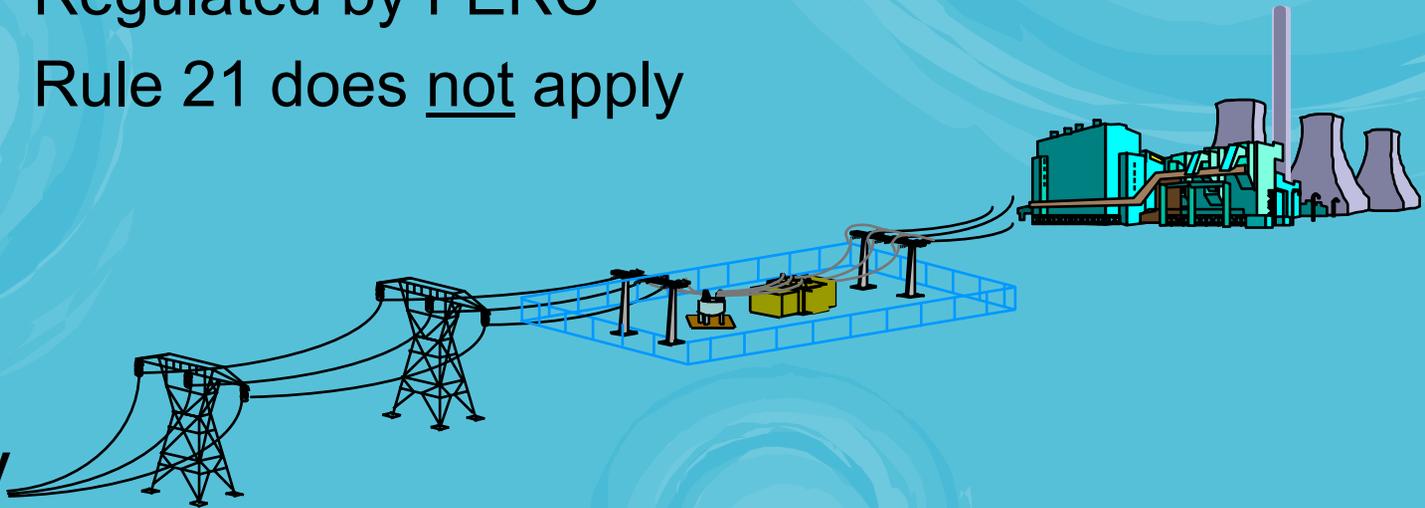
Animal Waste

Merchant Generation

- Best suited to larger installations
- Energy must be scheduled with ISO
- Regulated by FERC
- Rule 21 does not apply

Merchant Power Plant

ISO/Utility
Grid



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CPUC vs. FERC Regulations & Processes

- **CPUC “Rule 21” Applicability**

- Generators operating to serve on-site loads through their own equipment
- Qualifying Facility generators entitled to sell energy directly to SCE
- Net Energy Metering is controlled by Rule 21 and Section 2827 of the California Public Utilities Code

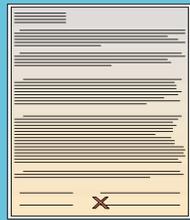
- **FERC Tariff Applicability**

- Merchant Plants (QF, EWG, or Utility) scheduling energy with CalISO
- Wholesale Distribution Access Tariff (“WDAT or WDT”) applies to Merchant Plants connecting to utility controlled distribution lines
- Transmission Owner Tariff (TO) applies to Merchant Plants connected to ISO controlled transmission lines

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SCE's Interconnection Practices for Generation Interconnected Under Rule 21

- “Isolated” Units normally reviewed and inspected within 15 Days
- “Parallel” units normally allowed to interconnect within 30-60 days
- Larger, more complex installations may take longer due to study and equipment requirements



SCE Receives Application and Application Fee

SCE Performs Initial Review, Approves Installation or Specifies Additional Requirements and Costs

Applicant Obtains Local Agency Approvals & Permits

SCE/Customer Execute Pro Forma Agreements

SCE/Customer Install Generator and Related Equipment



Customer's Generation Facility is Inspected and Allowed to Interconnect

- Customer installs generator
- SCE installs metering and distribution system modifications – if required

- Equipment can be “pre-approved” by SCE, or “certified” by a nationally recognized testing laboratory to simplify interconnection reviews and costs
- Generation equipment may include all of the equipment required for interconnection
- SCE's requirements vary depending on size, type, and application of the generating facility
- SCE's review and studies include load flow and fault duty assessments, protective relay coordination, and determination of metering and control requirements

Self Generation Incentive Program

Incentive Levels	Eligible Technologies	Incentive Offered (\$1Watt)	Minimum System Size	Maximum System Size	Maximum Incentive Size
Level 1	Renewable fuel cells	\$4.50/W	30 kW	5 MW	1 MW
	Photovoltaics	\$3.50/W decreasing to \$3.00/W on 1/1/2006			
	Wind turbines	\$1.50/W			
Level 2	Non-renewable fuel cells	\$2.50/W	None	5 MW	1 MW
	Renewable fuel micro-turbines	\$1.30/W			
Level 3-R	Renewable fuel internal combustion engines and large gas turbines	\$1.00/W	None	5 MW	1 MW
	Non-renewable & Waste Gas fuel micro-turbines	\$0.80/W			
Level 3-N	Non-renewable & Waste Gas fuel internal combustion engines and large gas turbines	\$0.60/W	None	5 MW	1 MW

DER and Distribution Planning

- Collaborative workshops facilitated by EPRI with SCE & DER interests to develop standardized contracts aimed at using DER to defer distribution upgrades
- SCE is developing methods, processes and agreements to allow for customer owned DG
- Received praise from DG community and produced useful revisions to SCE's proposed contracts
- CEC Funded

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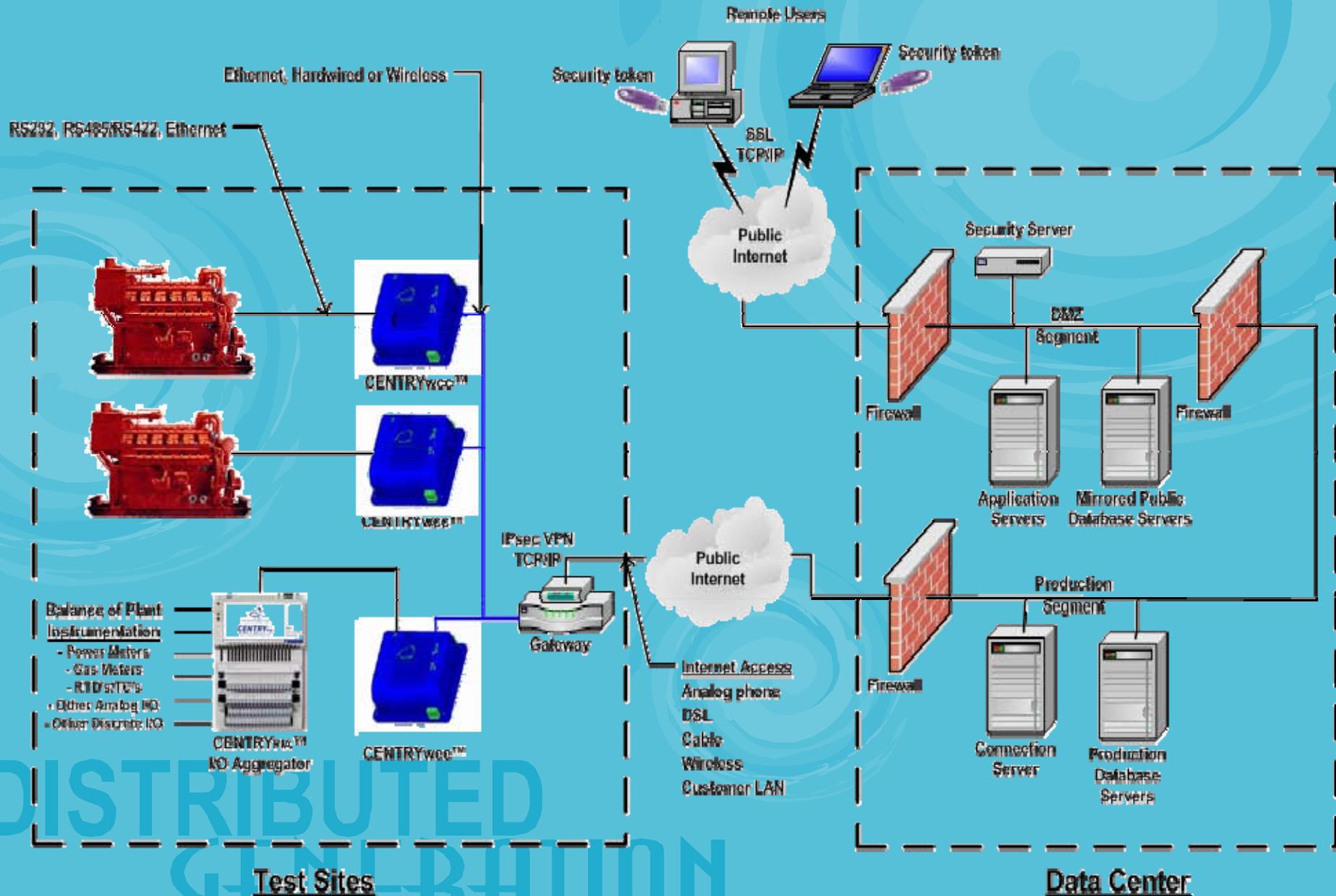
DER and Distribution Planning

- Changes as result of EPRI Collaboration
 - Generation requirement replaced by demand limitation (physical assurance)
 - Limitation on DG Customer exposure from “24-7” to 200-400 hours per year
 - Solicitation package more detailed as to market reference point, customer locations, etc.
- Future follow-up work possible pending funding.

Communication & Control of DER with Connected Energy – Phase II

- Demonstrates practical use of internet to monitor and control DER in an individual and aggregated manner by multiple parties with differing authority
- Phase 1 SCE's Catalina units monitored
- Phase 2 LA County Sanitation 4 units with over 50 MW of DER to be monitored
- Combines demand response (smart thermostats) and DG to lower T&D capacity peaks
- DOE Funded

Connected Energy – Phase II



Portable DG system for Substations

- Design and construct portable interconnection facility to allow up to 3 MW connected to 12 kV system
- System to help reduce circuit overloads during critical summer months
- Fuel supply and air emissions critical issue
- Ultimate goal of 5 mobile units
- Internally funded