ACC Workshop:

Distributed Generation & Interconnections

Date:	June 28, 1999
Time:	9:30 AM to 3:30 PM
Location:	Hearing Rms. 1 & 2 1200 W. Washington Phoenix, AZ 85007

Sponsored by: Arizona Corporation Commission
Utilities Division

Facilitator: Jerry D. Smith, P.E.
ACC Utilities Consultant

Purpose: Workshop to consider advancements in distributed generation technology and requirements for interconnection to the electric grid from an Arizona retail electric competition paradigm.

Agenda

1. Welcome	**Jerry D. Smith**	**5 min**
2. Workshop Overview	**Ray T. Williamson**	**5 min**
3. Industry & National Perspective	**Sarah McKinley**	**20 min**
4. Local Experiences	**Panel A**	**90 min**
LUNCH		**60 min**
5. Distributed Generation Breakout Session	**Barbara Keene**	**45 min**
6. Interconnections Breakout Session	**Dennis Gerlach**	**45 min**
7. The Retail Competition Paradigm	**Panel B**	**60 min**
8. Where Do We Go From Here	**Ray T. Williamson**	**30 min**

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Fax Memorandum: 7 Pages (including this cover)

To: Sarah McKinley

From: Marshall Goldberg

Subject: Ariz study

Date: 6/25/99

Hello Sarah,

Skip Laitner asked me to send you a copy of the study he and I did for Arizona. Here it is. If you have any questions give a call. (Cover + Exec Sum)

Marshall

Arizona Energy Outlook 2010:

Energy Efficiency and Renewable Energy Technologies as an Economic Development Strategy

Prepared for the

National Renewable Energy Laboratory

Land and Water Fund of the Rockies

Arizona State Energy Office
a Division of the Arizona Department of Commerce

Prepared by

Skip Laitner and Marshall Goldberg
Economic Research Associates
1205 Collingwood Road, Suite 100
Alexandria, VA 22308-1729

July 1998

Executive Summary

The state of Arizona has long been noted for its sunny days, dry, warm climate, and scenic beauty. The Grand Canyon, deserts, mountains, rivers, and attractive business climate make the state a very popular tourist destination and a desirable place to live, work, and retire. As a result, the state is experiencing startling population and job growth, and the economy is thriving. This growth and economic prosperity is shaping a growing demand for energy.

The access to quality energy resources ensures the availability of adequate power to drive the state's industrial processes, electricity to provide light and water to homes and businesses, and fuels to transport both people and goods throughout the world. Yet Arizona's most significant resources — energy efficiency and solar energy technologies — are relatively untapped.

A recent study by the National Renewable Energy Laboratory notes, for example, that Arizona has one of the best markets in the nation for cost-effective customer-sited photovoltaic systems. Moreover, the state has a high-technology manufacturing capacity that is well-above the national average, and the financial resources to support new industrial initiatives. Combined, these and other factors make Arizona a prime area for developing the manufacturing capacity to produce its own renewable energy technologies. Hence, Arizona is poised to take advantage of its renewable energy resources and the many associated job and economic development benefits.

Policy and business leaders are looking at more productive strategies to meet the nation's economic and environmental needs. Energy efficiency and renewable energy technologies offer Arizona one such opportunity.

At the same time, energy that is inefficiently used will constrain the Arizona economy. Conversely, energy efficient technologies will lower energy bills for residents and increase the productivity of Arizona businesses. The lower energy bills and higher productivity levels, in turn, will promote overall economic efficiency in ways that create new jobs in the state. Moreover, accelerated investments in both energy efficiency and renewable energy technologies will enhance Arizona's air quality. Such investments will also diversify the mix of energy resources available to homes and businesses to ensure a stable and reliable resource base to meet future energy needs. Finally, new investments in energy efficiency and renewable energy technologies will encourage the development of new clean technologies and industries in Arizona.

In 1994, Arizona consumers and businesses spent approximately $7.5 billion to provide for their overall energy needs. This total is 33 percent more than the combined annual tax collections authorized by the Arizona legislature during that same year. Many community

and business leaders are looking for ways to use state tax dollars more efficiently, yet few think about energy expenditures as a source of inefficiency. The size of the state's total energy bill suggests that Arizona consumers and businesses may also want to explore ways to use energy more efficiently.

Growing uncertainty about the economy and concern for continued environmental degradation are stimulating greater interest in energy efficiency and renewable energy technologies throughout the world. Largely due to significant increases in energy consumption, energy expenditures, and the resulting impact on the environment, interest in energy efficient technologies grows in spite of dramatic reductions in real energy prices in the past decade. Policy analysts and business leaders are looking at more productive strategies to meet the nation's economic needs, but to do so in a way that enhances environmental benefits. Energy efficiency and renewable energy technologies offer Arizona one such opportunity.

An alternative energy future in the year 2010 means an energy bill savings of $1.4 billion for Arizona ratepayers and a net gain of 11,100 jobs for the Arizona economy.

This report examines the current energy consumption patterns and expenditures within the Arizona economy. It projects what "business-as-usual" energy patterns might look like through the year 2010. The findings suggest that by 2010 the state will be almost 15 percent more efficient in how it uses energy (compared with 1994) to support a dollar of economic activity (measured as Gross State Product). But the findings also show that total energy consumption will increase by 35 percent as a result of a rapidly expanding population and a growing economy.

The study then analyzes the economic benefits of an accelerated investment in energy-efficient and renewable energy technologies. The energy efficiency target evaluated in this study is the level of investment needed to create an economy that is almost 26 percent more efficient by the year 2010. This target is somewhat lower than the 30 percent target suggested by the Energy Policy Act, first enacted by Congress and signed by then-President George Bush in October 1992, but represents a more realistic short-term target for Arizona. Although the federal target is not a mandate, it is a reasonable objective to encourage the aggressive development of a more energy-efficient economy whenever cost-effective technologies are available to ratepayers and businesses.

The findings of the study suggest that Arizona has made important strides in reducing the inefficient use of energy, especially in the period 1977 to 1987. But there is a larger opportunity available for the state's economy. More important, the untapped potential of energy efficient and renewable energy technologies represents a critical economic development strategy for Arizona. This study provides a benchmark to understand the economic potential that clearly exists in Arizona from adopting and actively pursuing an energy future which incorporates energy efficiency and renewables.

The study paints two pictures of Arizona. The first, follows a "business as usual" energy course. The second, identifies an "alternative energy Arizona" which, in the year 2010, pays approximately $1.4 billion less in energy bills, has 11,100 more jobs, and enjoys a cleaner environment. Hence, increased investments in both energy efficiency and renewable energy technologies are important steps toward promoting a sustainable energy future for Arizona. More specific findings of the report include:

- In 1994, Arizona consumed a total of 1,033 trillion Btus of energy for all end-uses, the latest year for which energy consumption data are available. That level of consumption represents a per capita consumption of 254 million Btus. If we were to think of this energy use in terms of an equivalent amount of gasoline, the Arizona economy annually consumes the equivalent of just over 2,000 gallons of gasoline per capita to maintain the economic well-being of each of its residents.

The Arizona economy annually consumes the equivalent of just over 2,000 gallons of gasoline per capita to maintain the economic well-being of each of its residents.

- Under the baseline projections, Arizona's economy — represented by the change in Gross State Product (GSP) — will grow from $89.4 billion in 1994 to $141.5 billion in 2010 (measured in constant 1996 dollars). This is a 58 percent growth in GSP in that period. At the same time, the number of Btus of energy needed to support a dollar of GSP will decline by only 15 percent under the business-as-usual projection. This implies that total energy consumption will increase 35 percent to 1,395 trillion Btus in the year 2010.

- The accelerated energy efficiency and renewable energy scenario outlined in this study would lower the number of Btus needed to support a single dollar of Arizona GSP by another 11 percent — from a 15 percent decline in the baseline projection to a 26 percent decline in the alternative energy scenario. This combination of factors would lower Arizona's energy requirements to 1,216 trillion Btus. This change represents a 13 percent reduction in total energy consumption over the baseline energy projections for the year 2010 — without reducing either the services or standard of living for Arizona residents and businesses.

- Under the alternative energy scenario for the year 2010, new energy efficiency investments would provide 179 trillion Btus of energy savings while new renewable energy technologies would provide another 5.6 trillion Btus. Arizona ratepayers in 2010 would save approximately $1.4 billion in lower energy costs. Energy efficiency and renewable energy investments, on the other hand, would require a total of $461 million from residents and businesses in 2010. Net energy bills, therefore, would decline by approximately $952 million in 2010 (in 1996 dollars).

- The energy efficiency and renewable energy scenario would require a $4.8 billion (in 1996 dollars) cumulative investment in the years 1998 through 2010. This relatively small level of investment (less than 0.3 percent of Arizona's cumulative GSP in that same period) can be achieved by redirecting technology investments toward more productive energy efficiency investments and a mix of renewable technologies. This includes $4.1 billion for efficiency in all end-use sectors, and $700 million for electricity generating renewables.

The benefits of Arizona's energy efficiency and renewable energy scenario can be achieved by redirecting less than 0.3 percent of the state's cumulative GSP toward more productive energy investments.

- If successful, Arizona ratepayers would enjoy a cumulative energy bill savings of almost $9.2 billion over that same period of time. With all values in 1996 dollars, the energy efficiency and renewable energy scenario generates a positive benefit-cost ratio of 1.92 over the 13-year period of analysis. But even this value understates the cost-effectiveness of the alternative energy investments since the energy savings and environmental benefits will continue for many years after the year 2010.

- New investments in energy efficiency and renewable energy technologies would increase Arizona's employment base — from a net increase of 900 jobs in the year 2000 to a net gain of 11,100 jobs by the year 2010.

- In 2010, renewable electricity generation accounts for 15 percent of total electricity consumption. This includes existing hydro resources and a mix of new renewable energy technologies. New renewable technologies (providing 534 million kilowatt-hours) account for 1 percent of total electricity consumption in 2010.

- The rise in employment in year 2010, driven largely by an increase in net energy bill savings, is equivalent to the number of jobs supported by the expansion or relocation of almost 90 small manufacturing plants in Arizona. Total wage and salary compensation would similarly rise by a net of $233 million by 2010 (in 1996 dollars), the equivalent of tourist expenditures from approximately 1.5 million visitor days.

- While the average wage would fall by about $27 per job in 2010 under the alternative energy scenario (the result of a slightly larger increase in the number of jobs relative to the rise in wage and salary compensation), the cost of living would also fall by an average of $161 per job. Hence, Arizona's overall standard of living

would be expected to increase by an average of $133 per job, or $195 per household by the end of the study period.

- The alternative energy scenario examined in this study is aggressive and at the same time achievable. In fact, other studies suggest that additional gains in cost-effective energy efficiency improvements and greater use of renewables are highly possible. If these additional savings are pursued, the net return would extend the energy and economic benefits described in this analysis. Furthermore, if Arizona is able to develop a renewables manufacturing industry capable of producing 50 MW by 2010 — to meet in-state renewable electricity generating needs and take advantage of growing export opportunities — the market potential will be $115 million in 2010 and generate 1,100 new jobs in that year.

Distributed Generation & Interconnection Workshop

Arizona Corporation Commission

June 28, 1999

~~*ACC Workshop*~~

Background

1. Electric Rules for Retail Competition
   - Rules Stayed on January 1999
   - Rules Revisions Proposed April 1999
     - Deleted Solar Portfolio
     - Silent re: Distributed Generation
2. Retail Competition Began June 1999
3. Consider Rulemaking Needs for 2000

~~*Distributed Generation & Interconnections*~~

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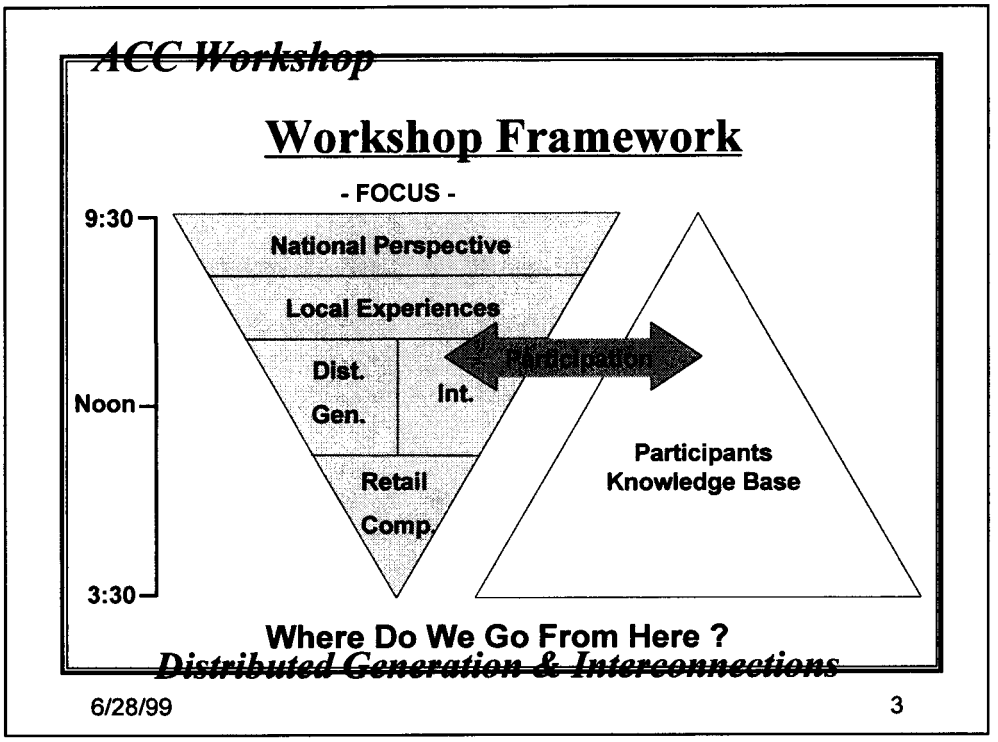
Purpose of Workshop

1. Establish "State of The Art" Point of Reference
   - Distributed Generation Technology
   - Technical Requirements for Utility Interconnection
2. Impact of Shift to Retail Electric Competition
3. Concerns Requiring Regulatory Consideration

Notes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Workshop Framework
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Noon
3:30
National Perspective
Local Experiences
Dist. Gen.
Int.
Retail Comp.
Participation
Participants Knowledge Base
Where Do We Go From Here ?
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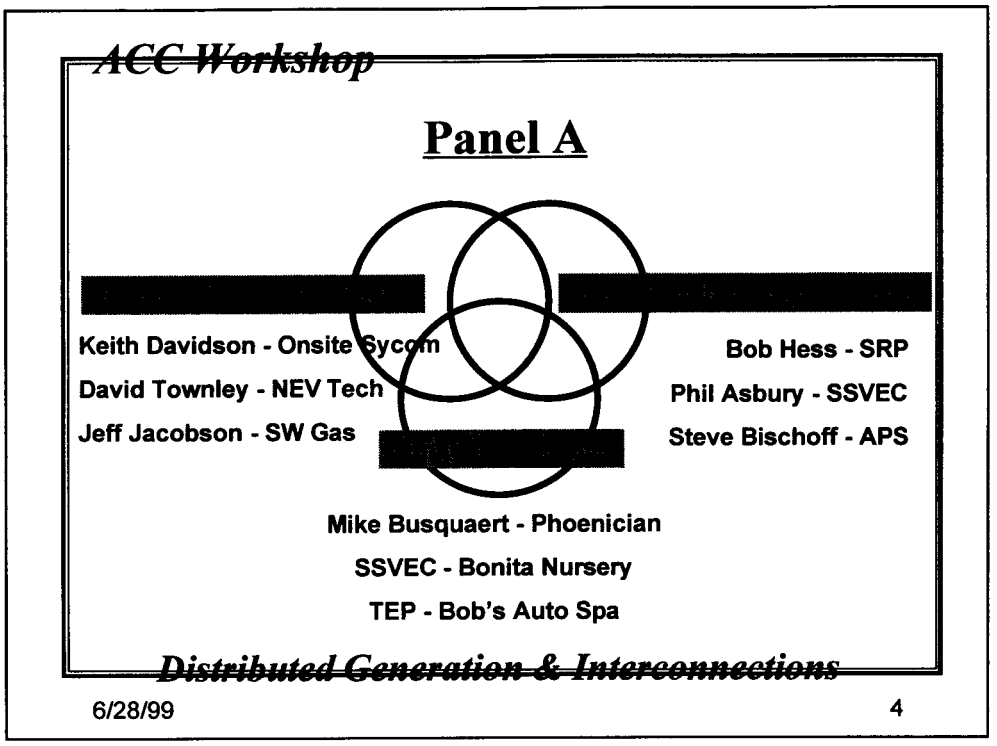
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Panel A
Keith Davidson - Onsite Sycom
David Townley - NEV Tech
Jeff Jacobson - SW Gas
Bob Hess - SRP
Phil Asbury - SSVEC
Steve Bischoff - APS
Mike Busquaert - Phoenician
SSVEC - Bonita Nursery
TEP - Bob's Auto Spa
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DG Question Set

1. DG Technology Best Suited for AZ & Why
2. Technical Specs & Economics of Each Technology
3. Functional Applications of Each DG Technology (Gen for Off-site, Self-Gen, Emergency Backup)
4. AZ Retail Consumer DG Market Potential
5. Potential Electric System Benefits

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Consumer Project Question Set

1. DG Technology in Use / Scope of Project
2. Incentive / Motive for DG Choice
3. Operational Experience of Project
4. Capital Cost & Production Cost of DG Power
5. Nature of Utility Interconnection

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Utility Question Set

1. DG Technologies in Use & Operational Experience
2. Applicability of PURPA (IPP & Qualifying Facility) Interconnection Requirements for DG
3. System Locations Best Suited / Least Suited to Accommodate DG
4. DG as Solution to System Constraints

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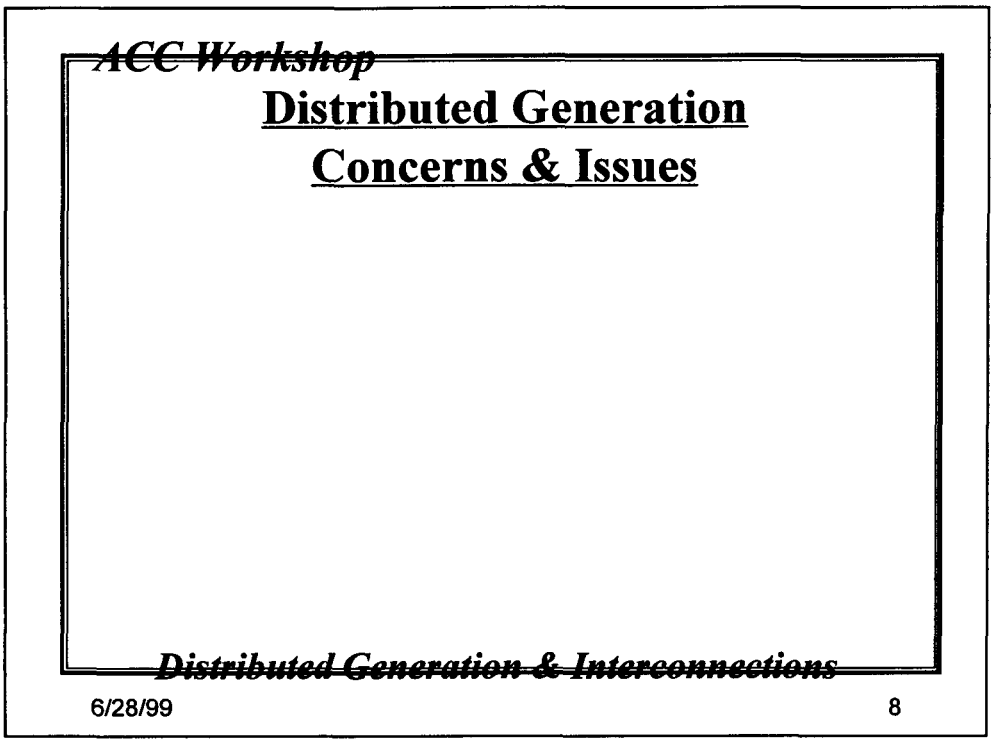
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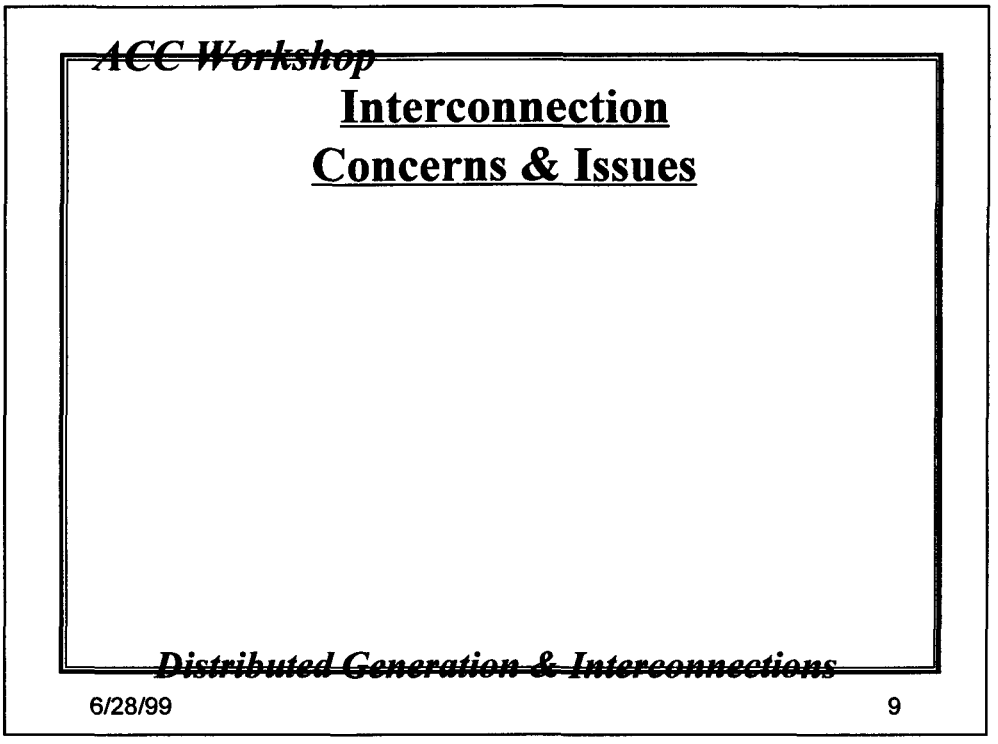
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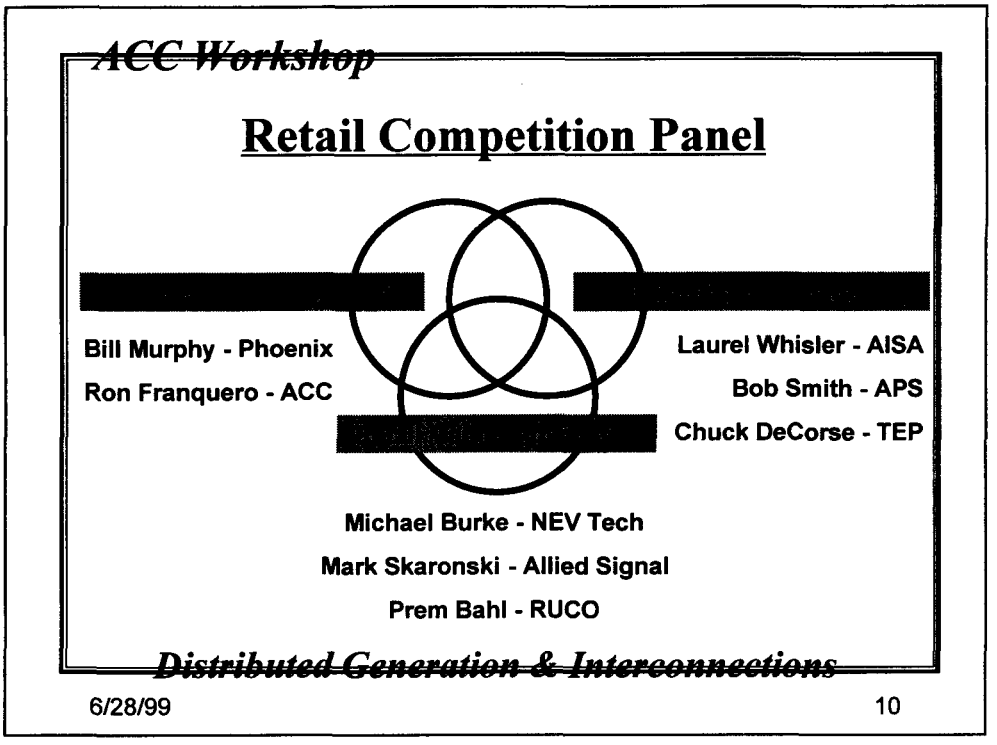
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Retail Competition Panel
Bill Murphy - Phoenix
Ron Franquero - ACC
Laurel Whisler - AISA
Bob Smith - APS
Chuck DeCorse - TEP
Michael Burke - NEV Tech
Mark Skaronski - Allied Signal
Prem Bahl - RUCO
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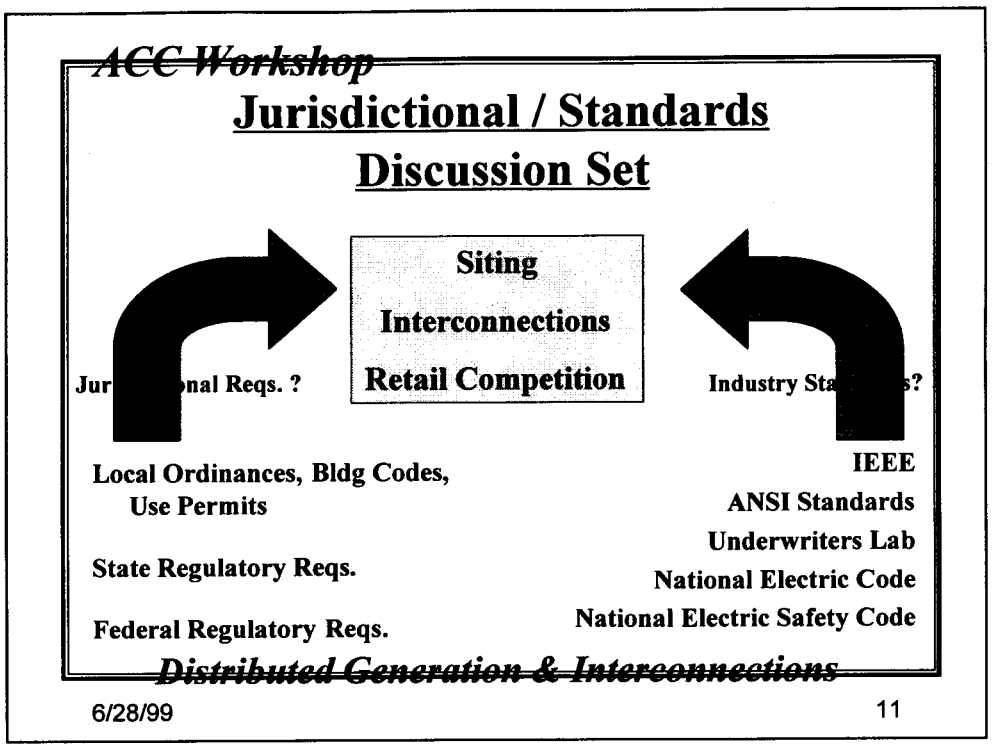
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Jurisdictional / Standards
Discussion Set
Siting
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Retail Competition
Jur nal Reqs. ?
Industry Sta s?
Local Ordinances, Bldg Codes,
Use Permits
State Regulatory Reqs.
Federal Regulatory Reqs.
IEEE
ANSI Standards
Underwriters Lab
National Electric Code
National Electric Safety Code
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Utility Discussion Set

1. Framework of Retail Electric Competition in AZ
   - Independent Scheduling Administration / Independent System Operation
   - Open Access / Scheduling & Dispatch Control
2. Affect of DG on Distribution & Transmission Planning / Operating Practices
3. System Constraints Limiting DG Applications

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Retail Consumer Advocacy Discussion Set

1. DG Consumer Electrical Energy Strategies (Purchase, Self-Generate, Sell)
2. Consumer Load / DG Schedule Profiling
3. System Disturbances / DG Outage Accommodation
4. Consumer Aggregation

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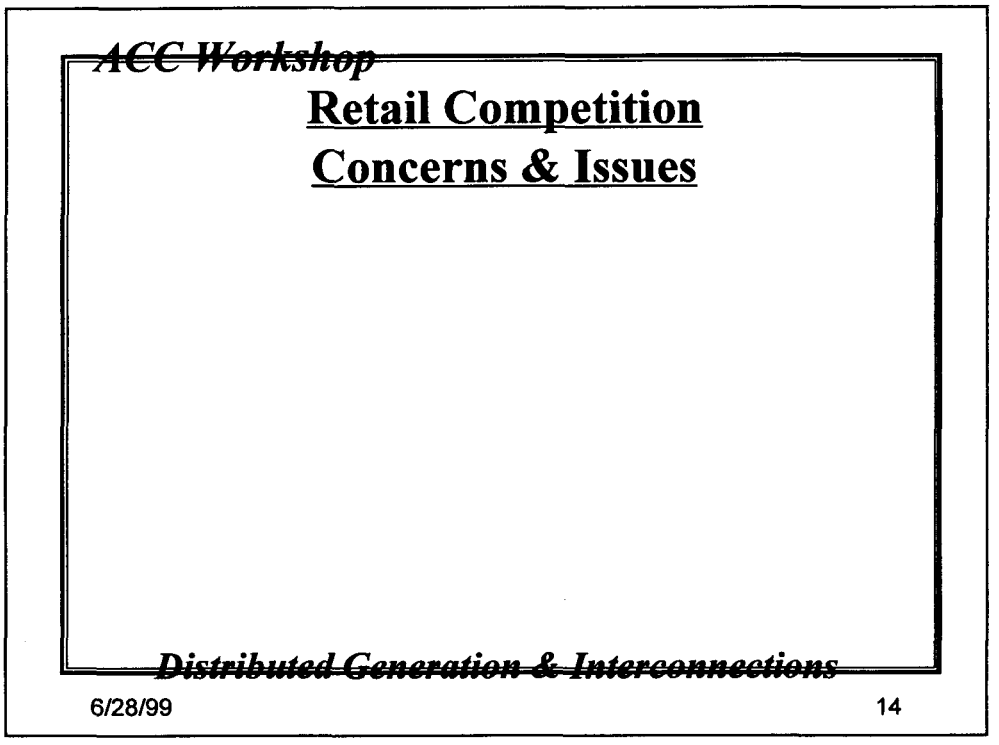
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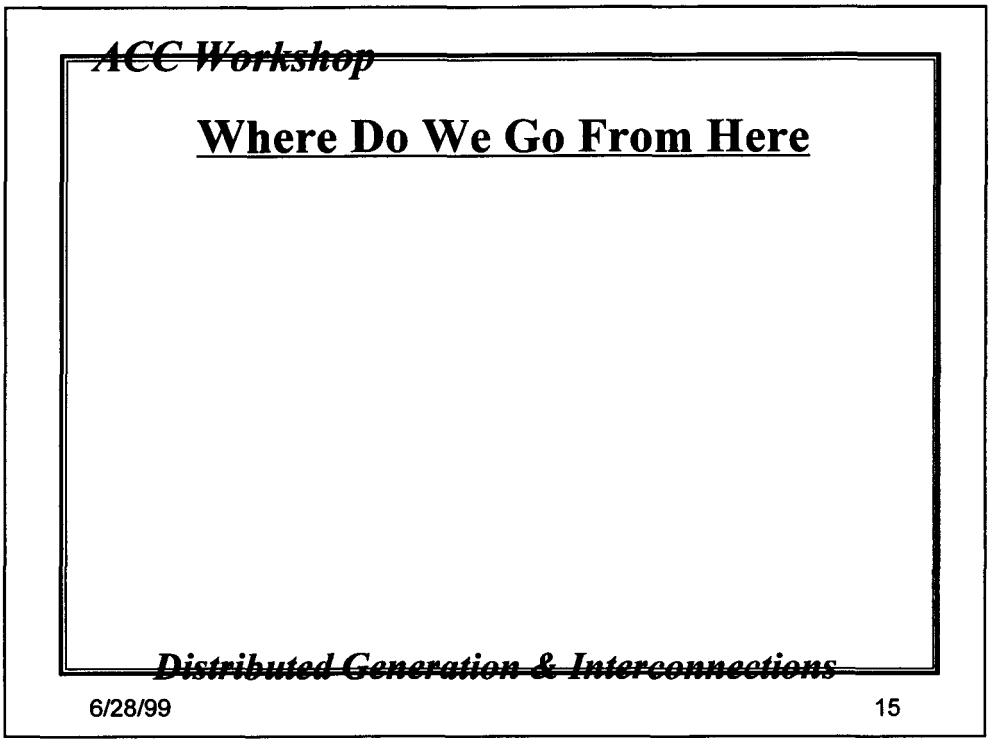
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An Overview of State and Federal Initiatives for Distributed Generation

Sarah McKinley
Executive Director

DPCA
Distributed Power Coalition of America

DPCA

- A national organization advocating the optimal use of distributed power.
- Established in 1997, with over 50 members, including equipment manufacturers, natural gas and electric utilities, energy service companies, consultants and research organizations
- Active on a federal and state level.

DG:The New Paradigm

- **Production of electricity in close proximity to the consumer, as opposed to "central station generation."**
- **Installed on the customer side of the meter or as part of the utility's system.**
- **Grid connected or separate from the grid.**
- **Owned and operated by the consumer, a utility company, energy service company or other third party.**
- **Sizes range from 3-7 kW for single family homes to 35-200 kW for small commercial operations up to 50+ MW for industrial sites or utility applications.**
- **Incorporates a wide range of technologies, including turbines, reciprocating engines, storage systems, microturbines, fuel cells, renewables and other technologies.**

The Benefits of DG

- Customer Choice
- Increased Reliability
- Power Quality
- Backup and Peaking Service for End Users
- Ancillary Services for UDCs/Third Parties
- Flexibility
- Efficiency
- Savings in fuel costs and air emissions

Federal Initiatives - Congress

- Administration's Comprehensive Electricity Competition Plan (S. 1047/H.R. 1828)
- Largent/Markey's "Electric Consumers' Power to Choose Act of 1999" (H.R. 2050)
- Hearings before Senate and House Energy Committees

Federal Agency Initiatives

- June, 1999 Executive Order
- DOE - the CHP Challenge Initiative
- EPA - modifying permitting & new source review

Other National Responses to DG

- IEEE Committee on Interconnection
- GRI - the DG Forum
- NARUC study on DG policies
- EEI Committee - identifying system types
- EPRI - field testing & modeling DG equipment

State Restructuring Efforts

- Illinois: exit fee exemption for onsite generation
- Michigan and Virginia: CTC recovered through wires charge (DG exempt)
- New Jersey: Exemption from stranded costs for DG units up to 7.5% of utility's kWh sales.
- Virginia: Expedited permitting for 50 MW or less systems.
- Ohio: Interconnection and metering standards; net metering for renewables, microturbines and fuel cells.
- Texas: Natural gas-fired generation defined as "green" power

Interconnection for Renewables

Interconnection standards for small-scale renewable energy, primarily home photovoltaics (and some wind) units have already been adopted in a number of states:

California	**New York**
Maryland	**Rhode Island**
Nevada	**Texas**
New Jersey	**Vermont**
Washington	

New York Standards

- **Eight-month collaborative process with stakeholders**
- **"Standard Interconnection Requirementes" (SIRs) for units 300 kVa (roughly 300 kW) or lower on radial lines.**
  - **--Technical requirements**
  - **--Application process with timetables**
  - **--Standard interconnect agreement**
- **Coined the concept of "Type Testing"**
- **Report expected within a month - six weeks**
- **PSC is expected to approve SIRs this summer.**

Texas

- **As a result of 1,200 MW projected shortfall, Texas PSC approved "Guidelines" for Interconnection in Feb. 1999.**
  - **--Nondiscriminatory access to grid**
  - **--60 kW - 10 MW connected at 2.4 - 60 kV lines**
  - **--Market forces should rule**
  - **--Utilities required to respond to requests within 4 weeks**
- **PUC staff are working on identifying contact names at utilities, creating an interconnection contract for review, and establishing procedures for reporting interconnection requests to PSC. These are now under review**
- **No rulemaking on the agenda yet, but it's a possibility.**

California

- California Energy Commission has launched stakeholder meetings--INCOM
- The CPUC, CEC and EOB issued an order instituting rulemaking on distributed generation and distribution competition.
- Comments and reply comments were filed; a formal hearing on June 1; interconnection was a top issue.
- The CPUC is expected to issue an Order Instituting Rulemaking in August/September. Interconnection requirements are likely to be addressed.

IV. APPLICATIONS OF DISTRIBUTED GENERATION

DPCA members are pursuing a number of strategies to employ DER. Any policy initiatives considered should address the full range of applications of DER technology. These include:

- *Enhancement of existing distribution and transmission systems.* Constraints on existing wires systems – either in the distribution system or long-line transmission lines – can sometimes be economically offset by strategic placement of DER facilities. This may be particularly cost-effective when natural gas distribution lines lie in close proximity (since gas is the fuel of choice for many – though not all – DER options). In densely populated distribution areas that are experiencing incremental load growth, the creation of local "power islands" could benefit the overall system by reducing system demand and freeing up capacity for customers without other options. DER can also enhance grid reliability when transmission or distribution service is disrupted through mechanical failure, crippling storms or other natural disasters. In those situations, DER can allow individual sites or even whole sections of the grid to remain in service.

- *Remote power applications*, including rural or mountainous areas and outlying districts where connection to the grid is prohibitively expensive or results in frequent outages.

- *Residential or small commercial use.* "Net metering" provisions in California and other states allow easy hook-up for some small customers, with electricity flowing back and forth through one meter. Net metering customers pay for the net amount of electricity they use each month, with no utility obligation to pay for excess power the customer may produce, and with minimal transaction costs for both utility and customer. Adoption of net metering has varied by state, with eligible technologies ranging up to 1 MW capacity. Photovoltaics and wind turbines so far have been the main beneficiaries, but regulators are now considering extending net metering to fuel cells and other clean technologies.

- *Commercial use of DER, primarily for peaking load.* Real-time pricing can allow customers to take advantage of the "spark spread" between peak electricity prices and local costs to produce equivalent energy or other benefits, mostly from natural gas. Pricing software, combined with control technology, would allow units like microturbines to be turned on at economically opportune moments to capture these efficiencies, and diverse strategies are available to make economic use of thermal energy that would otherwise be wasted.

- *Connecting existing backup gensets for peak use by utilities.* In several areas of the country utilities and others have instituted programs to connect standby generators for use during peak periods to compensate for capacity shortfalls.

- *Combined heat and power applications(CHP).* Many commercial and industrial users can use waste heat generated in their operations to produce electricity.

- *Industrial or large commercial applications, in which on-site energy production would displace existing load.* These large users are actively pursuing two different strategies: (1) relying on DER as base load and purchasing peaking services from the utility or another service provider; or (2) purchasing base load from another party and using on-site production for peaking purposes. On-site equipment could be owned and operated by the user. However, it is more likely to be leased from others, or owned and operated by a third party, such as an energy service company or energy marketer, which would "sell" energy to the industrial user by producing it on-site.

- *Industrial applications of on-site energy production, in which the host company would install more generating capacity than it needs, with the intent of selling excess to others.* Purchasers could include other nearby industries, or power marketers using the grid. Again, this equipment also could be owned and operated by a third party.

- *Off-grid applications for users that require energy independence.* Some industries are considering disconnecting from the grid primarily to achieve greater control over power quality and reliability. Examples include companies with sensitive computer equipment, industrial operations with very low tolerances for power variances, *and* military facilities concerned about the threat of sabotage of the electric infrastructure by terrorists. Energy cost savings may also play a role in this decision, particularly as DER operations evolve, combining several units or different technologies to create on-site back-up or storage.

- *District heating and cooling(DHC).* Used for decades in Western Europe and other parts of the world, district energy systems use waste heat from electric generation and other sources to supply hot water or steam to buildings and industries for space and process heating. More recently, cooling technology has boosted efficiencies further through trigeneration (the simultaneous production of electricity, heating and cooling). District energy is not confined to new facilities, as evidenced by the installation of DHC in existing buildings in downtown Trenton, New Jersey, and retrofits of older district heating systems in many other cities.

- *Micro-grids to provide service for industrial parks or housing developments.* Service companies are already exploring the use of DER to create micro-grids, providing electric service through master metering. Another option is folding electric service into the overall cost of rental space on a square-foot basis, with no metering.

- *Creation of "virtual" utilities through the use of sophisticated control technology.* This plan would allow a central operator, like a utility dispatcher, to control production from hundreds or thousands of distributed units installed throughout the service territory. In some scenarios this could include load management devices that would allow the controller, for example, to turn on small DER units in individual homes during summer afternoon peaks to achieve the greatest cost savings across the system.

Interconnection

The DPCA has identified interconnection, and the need for industry-wide standards, as the top priority for the adoption of distributed generation in the marketplace.

Standards Adopted to Date

Several states have already adopted interconnection standards for small-scale renewable energy, primarily home photovoltaic (and some wind) units. These include:

California
Maryland
Nevada
New Jersey
New York
Rhode Island
Texas
Vermont
Washington

Electric utilities, under PURPA, were required to have interconnection standards. As a result, some regulators assume that standards already exist. However, the standards now in place are ten years out of date, and vary widely from utility to utility. To date, no state has adopted interconnection standards for commercial or industrial-sized onsite generating units that would be uniform, across technologies, for all utilities. However, three states have taken action:

New York
Texas
California

Interconnection Activity in the States

State	Activity	DG Unit Sizes	Outcome
New York	Under a directive by the New York Public Service Commission, staff initiated a collaborative, bifurcated process with Technical and Non-Technical Working Groups composed of industry stakeholders. This process has resulted in consensus on some, but not all, issues.	300 kVa (300 kW) or lower on radial lines [Note: Because the debate has been limited to small sizes on radial lines, the New York standard would eliminate market opportunity in densely populated, network areas, like Manhattan.]	Staff recommendations are expected at the end of April for PSC approval of standards, at which point it is expected that the process will be expanded. Phase II will address economic issues, including backup and standby charges. Industry groups would also push for standards for larger sizes on non-radial lines.
Texas	As a result of a projected 1999 shortage of 1,200 MW of generating capacity for the state, the Texas PSC Approved "Guidelines" for interconnection on Feb. 4, 1999. Staff is now pursuing limited, targeted actions to facilitate the adoption of the guidelines.	• Nondiscriminatory access to the grid • 60 kW - 10 MW connected at 2.4 - 60 kV lines • Market forces should rule • Utilities would be required to respond to requests within four weeks.	PSC staff actions: • identifying and publishing contact names within each utility for interconnects • establishing a procedure for reporting interconnection requests to the Commission • Creating a 2-3 page standard interconnection contract
Cali-fornia	As part of its electric restructuring, the California Public Utilities Commission issued an Order Instituting Rulemaking on Distributed Generation. Comments and reply comments have been received, one hearing was held June 1. As a separate action, the California Alliance for Distributed Energy Resources (CADER), initiated discussion on interconnection through its Interconnection Committee (INCOM). Other acronyms include: ICBM (INCOM Consensus Building Meetings) and FOCUS-Interconnection (Forging a Consensus on Utility System Interconnection)	The OIR—a collaborative effort between three agencies (the CPUC, CEC and EOB) asks the industry to identify key policy issues for DG; interconnection is obviously one of them. At present, there are no size limits. INCOM is attempting to establish a collaborative process with stakeholders to develop consensus on interconnection. Such consensus would eliminate the need for CPUC action. [Note: CADER, originally a brainchild of the California Energy Commission, is now being established as a separate, non-profit group]	The California OIR has over 200 intervenors. Public debate on DG, as well as competitive utility services, is expected to culminate in a report at the end of August (or later). A formal rulemaking on distributed generation would follow. INCOM is drafting a chart to identify technical issues for different sizes of units. This chart is being used in the ICBM meetings to help reach consensus on what the standard requirements should be.

The following table is a working draft of technical issues being used in the California ICBM meetings.

Draft Consensus Proposal to the ICBM, San Diego, Feb. 11, 1999				
Requirement	**<10kW**	**10-200kW**	**200kW-1MW**	**>1MW**
Distribution Line Ground Fault Detection?	NO	Yes	Yes	Yes
Synchronization method****	Auto or manual	Auto or Manual	Auto reqd	Auto reqd
Dedicated Transformer Reqd?	No	Yes*	Yes*	Yes**
Utility Study Reqd?	No	Yes**	Yes**	Yes
Relay Setting Reqmts (ANSI 59,51 or 51V,27, 81, 32)****	Factory settings OK	Factory settings OK	Field Setting capability reqd., coordinate settings with utility.	Field Setting capability reqd., coordinate settings with utility.
Discrete Relays Needed?****	No, they may be part of the control system with fail-safe features.	No, they may be part of the control system with fail-safe features.	No, they may be part of the control system with fail-safe features.	EM or microprocessor with backup protection.
Periodic Relay function Testing Needed?****	No	No	Yes	Yes
Disconnect Reqd?	No	Yes	Yes	Yes
Power factor control reqd?***	Minimum 0.95 p.f. must be achieved	Minimum 0.95 p.f. must be achieved	Minimum 0.95 p.f. must be achieved	Minimum 0.95 p.f. must be achieved
Voltage control reqd?****	Voltage must follow line volts	Voltage must follow line volts	Voltage must follow line volts	Voltage must follow line volts
Metering Reqmts?****	Later	Later	Later	Later
Communication/Remote Control Reqmts?	Later	Later	Later	Later
Power Quality Std	Conform to IEEE 519-1992	Conform to IEEE 519-1992	Conform to IEEE 519-1992	Conform to IEEE 519-1992
DC Injection	DC current ≤ 0.5% of rated, per P929	DC current ≤ 0.5% of rated, per P929	DC current ≤ 0.5% of rated, per P929	DC current ≤ 0.5% of rated, per P929
Note: These gudelines assume that the interconnectio voltage will be below 25 KV. It is not anticipated that any DG vendor will desier to interconnect at higher voltages				
* The Dedicated transformer does not have to be new. An existing transformer connected to that customer is adequate. Multiple units from one party may connect to one transformer, but each party must have its own dedicated transformer.				
** If generator output is less than transformer, simplified study. Otherwise, detailed review				
***Line power factor compensation capability reqd for capacity certification				
**** These may be solid state or electromechanical devices, but must be UL listed. See PG&E guide, pages G2-21 and -22 for explanation of device numbers.				

Highlights of The New York Interconnection Standard

The creation of **"Standard Interconnection Requirements" (SIRs)**, which consist of three elements:

- A set of technical requirements for interconnection
- An application process that establishes procedures and timetables for approval of interconnection requests
- A standard, interconnection contract that would apply to all utilities

Type-testing of equipment and installations

Independent organizations would be allowed to "Type Test" equipment to verify that they meet certain technical requirements of New York. The DG owner who purchases a piece of equipment (like a fuel cell or microturbine) would receive a certificate that could be presented to the utility. This would eliminate the need to pay for separate studies on equipment for each installation.

In addition, the application of a DG package consisting of several pieces of equipment would also have to be approved. Under the New York SIRs, the application process would establish type testing for these installations. Once a particular combination were certified for installation, that combination would then be considered type-tested. Future sites using the same configuration would not be required to undergo a separate study.

Type testing does not eliminate the possibility that the utility would require a system impact study to determine that the unit (or package) could operate *safety at that point on the grid.* However, other safeguards have been proposed that would limit those costs.

SIR Issues Under Debate

The Distributed Power Coalition of America was a major player in negotiating all three elements of the New York SIR. The standards have moved forward rapidly in the six weeks, with consensus reached on many issues. However, there are still critical elements yet to be resolved, which would be major impediments to the adoption of DG. These issues will be resolved at the PSC level.

SIR issues still in debate:

- Whether technical requirements can be altered by the utilities, or through an independent process within the PSC.
- The length of time utilities would have to conduct their own studies (at the DG owner's expense) to certify installation.
- Whether the interconnection contract can be further simplified, both in content and legal language, into a commercially-viable agreement.

Federal Electric Deregulation Legislation:

The Clinton Administration's *Comprehensive Electricity Competition Plan*
and
Reps. Largent and Markey's Electric *Consumer's Right to Choose Act of 1999*

Shared Issues:

- Interconnection: Facilities allowed to connect with utility if owner of facility is located in utilities service area. Non-discriminatory standards established and FERC will be in charge of development and enforcement of further standards.

- Accelerated Depreciation: Distributed Power Properties included under 15-year property section of IRS Code.

- Investment Tax Credit: Credit is given for an amount equal to ten percent of the energy produced for each energy property. For combined heat and power systems (only recognized between 1/1/2000 –12/30/2002), credit is given for eight percent. In the Administration's legislation, this credit will start to be given after December 31, 1999; for the Largent/Markey bill, after December 31, 1998.

- Open Access to Distribution Facilities: Must be granted by January 1, 2003 for the Clinton Administration bill and by January 1, 2002 for the Largent/Markey bill.

- RTOs: Regional Transmission Organizations established to take control of a utility's transmission facilities.

- Net Metering: Must be made available to customers generating 20 kilowatts or less for all those who produce energy by "solar, wind, geothermal or biomass resources."

- Stranded Costs: States and nonregulated utilities have the right to charge for and to determine the amount of stranded costs. The Clinton deregulation package authorizes a reduction in the stranded costs for a consumer producing on-site energy through distributed energy resources (fuel cells, combined heat and power, etc.)

Differing Issues:

- Granfathering Provision: The Largent/Markey legislation mandates that states are grandfathered if they enact open access legislation by January 1, 2001.

- Assistance to Rural and Remote Areas: The Clinton Administration includes clauses to give a significant amount of money to Indian Tribes, Southeast Alaska, and other rural and remote communities.

- Nuclear power: The Administration's bill calls for decommissioning costs of a nuclear plant to be considered nondischargeable priority claims

Comparison of the H.R. 2050, Electric Consumers' Power to Choose Act of 1999 (Largent/Markey) and the Comprehensive Electricity Competition Plan (Administration)

As of 6/8/99	H.R. 2050 Largent/Markey	Administration
Open Access Date A. Regulated Utilities (IOUs)	Flexible mandate. State regulated utilities must provide open access to their distribution facilities by 1/01/2002. A state may "opt out" if its regulatory authority finds, after notice and opportunity for hearing, that retail competition will have a negative impact upon a class of customers that cannot reasonably be mitigated. Such election shall be made by 1/01/2001.	Flexible mandate. State regulated utilities must provide open access to their distribution facilities by 1/01/2003. A state regulated utility may "opt out" of its state's regulatory authority finds, after notice and opportunity for hearing, that retail competition will have a negative impact upon a class of customers served by that utility that cannot reasonably be mitigated. Such election shall be made by 1/01/2002.
Open Access Date B. Non-regulated utilities (Municipal utilities and Co-ops)	Flexible mandate. Non-regulated distribution utilities must provide open access to their distribution facilities by 1/01/2002. A non-regulated distribution utility may "opt out" if it finds, after notice and opportunity for hearing, that retail competition will have a negative impact upon a class of customers of that utility that cannot reasonably be mitigated. Such election shall be made by 1/01/2001.	Flexible mandate. Non-regulated distribution utilities must provide open access to their distribution facilities by 1/01/2003. A non-regulated distribution utility may "opt out" of it finds, after notice and opportunity for hearing, that retail competition will have a negative impact upon a class of customers served by that utility that cannot reasonably be mitigated. Such election shall be made by 1/01/2002.
Failure to Elect	Any person may bring an action in the appropriate State court against a State regulatory authority or a distribution utility for failure to comply.	Same provision
Grandfathering	All states enacting legislation by 01/01/2001 providing open access of all state-regulated distribution facilities are grandfathered.	No provision
Private Use	Private use limitations not applicable to outstanding bonds for facilities used in connection with retail competition or open access transmission. Utilities may elect to terminate issuance of tax exempt bonds for new generation in order to avoid private use restrictions for competition. Tax exempt bonds still available for distribution and transmission facilities subject to private use limitations under current law.	Private use limitations not applicable to outstanding bonds for facilities used in connection with retail competition or open access transmission. No new tax exempt bonds for new generation or transmission. Tax exempt bonds still available for distribution facilities (69 kv or less) subject to private use limitations under current law.
Stranded Costs	States and non-regulated utilities may impose a non-bypassable charge to recover stranded costs. States and non-regulated utilities determine the amount of stranded costs under applicable state law.	States and nonregulated utilities determine the amount of recoverable stranded costs. FERC given "backup" authority to establish stranded cost recovery if a state or nonregulated utility lacks authority. States must consider reducing stranded costs for an electric consumer producing energy on-site by a fuel cell or a combined heat and power, distributed power or renewable power facility.

http://www.house.gov/largent/deregside.htm

Regional Transmission Organizations	Grants FERC authority to oversee creation of Regional Transmission Organizations (RTOs) and compel utilities to turn over control of their transmission facilities to such organizations.	Grants FERC authority to oversee creation of Independent Regional System Operators (RSOs) and compel utilities to turn over control of their transmission facilities to such organizations.
Regional Transmission Planning Organizations	Encourages regional agreements that facilitate coordination among States with regard to siting and planning of transmission and generation facilities; Provides for FERC approval of such agreements.	Same provision
Renewable Mandate	Energy Information Agency to determine on 1/1/2005 the percentage of non-hydroelectric renewable resources (wind, solar, biomass or geothermal) used for electricity generation. If renewables constitute less than three (3) percent of generation, a renewable portfolio system (RPS) shall go into effect. Under the RPS, each seller of electricity shall be required to use, as a generation source, renewable resources equal to at least three (3) percent of total generation. The RPS sunsets in 2015. Those sellers unable to reach the requirements may purchase credits from other utilities, or, may purchase credits from the Department of Energy for 1.5 cents per kilowatt hour. Revenues from the sale of these credits will be used to fund grants in support of clean burning fuel technology.	Creates renewable portfolio system mandating that sellers use, as a generation source, a percentage of non-hydro electric renewable technology such as wind, solar, biomass or geothermal generation. Initially the percentage would be equivalent to the percentage of renewable energy currently sold in the U.S. There would be an intermediate increase in 2005, followed by an increase to 7.5 percent in 2010. The RPS sunsets in 2015. Those sellers unable to reach the requirements may purchase credits from other utilities or, may purchase credits from the Department of Energy for 1.5 cents per kilowatt hour. Revenues from the sale of these credits will be used to fund the Public Benefits Fund.
Market Power	Authorizes FERC to require generators to submit a plan mitigating market power. If FERC determines the plan will be insufficient to mitigate market power, FERC may order cost-based rates for wholesale or retail sales, or order a utility to turn its transmission facilities over to an RTO.	Authorize FERC, upon petition by a state to require generators to submit a plan mitigating market power which FERC can accept or modify. Modification may include mandatory divestiture. FERC merger review over generation-only companies and holding companies clarified.
Reliability	FERC required to approve the formation of and oversee an organization that prescribes and enforces mandatory reliability standards	Same provision
Nitrogen Oxide Trading Authority	No provision	Clarify EPA authority to require an interstate trading system for nitrogen oxide pollutant reductions.
Universal Service	Allow states to impose a non-bypassable fee to fund such programs. "Sense of the Congress" that every consumer should have access to electricity and that FERC and the states should ensure competition does not result in	Creates a $3 billion "Public Benefits Fund" for low-income assistance, energy efficiency programs, consumer education and development of emerging technologies. The fund will be funded in part through the DOE's collection of

	disadvantages for rural, residential or low-income consumers.	1.5 cents per kwt/hr from utilities that purchase credits to meet their renewable portfolio standard requirements. Require States to hold proceedings to consider a Federal principle that all consumers in the State shall have reasonable access to competitive suppliers.
PUHCA	Holding companies exempted from PUHCA 18 months after enactment unless they provide retail service in two or more "closed" states. FERC and states granted access to utilities' books and records.	Repeals PUHCA 18 months after enactment; FERC and states granted access to utilities' books and records.
PURPA	Repeals section 210 of PURPA on date of enactment. Provides FERC backstop for recovery of stranded costs.	Repeals section 210 of PURPA on date of enactment.
TVA	TVA transmission subject to FERC jurisdiction; Power wheeled through TVA subject to open access requirements; Other utilities may sell inside TVA at both wholesale and retail beginning 1/01/2003; TVA subject to antitrust laws; TVA may sell *excess* power at wholesale outside the TVA fence beginning 1/01/2003 subject to FERC oversight; Sales at retail inside the fence to existing retail customers only; TVA must renegotiate existing full-requirements contracts within one year of enactment - FERC to resolve conflicts if parties cannot reach agreement; FERC shall issue rules for recovery of stranded costs - such costs not recoverable after 09/30/2007; FERC may order TVA to join an ISO; TVA may not purchase new generation unless customers agree to be liable for such purchase.	TVA transmission subject to FERC jurisdiction; Power wheeled through TVA subject to open access requirements; Other utilities may sell inside TVA at both wholesale and retail beginning 1/01/2003; TVA subject to antitrust laws; TVA may sell at wholesale outside the TVA fence beginning 1/01/2003; Sales at retail inside the fence to customers of its distributors if distributors purchase less than 50 % of their power from TVA; TVA must renegotiate existing full-requirements contracts within one year of enactment - FERC to resolve conflicts if parties cannot reach agreement. FERC shall issue rules for recovery of stranded costs - such costs shall no longer be recoverable after 11/01/2007; TVA authorized to join an ISO.
Bonneville Power Administration	BPA subject to FERC authority under the Federal Power Act for purposes of determining transmission rates; FERC may order BPA to join RTOs; Allow BPA to impose a surcharge for recovery of future otherwise nonrecoverable costs such as fish and wildlife costs.	BPA subject to FERC authority under the Federal Power Act for purposes of determining transmission rates; Authorize BPA to join RSOs; Allow BPA to impose a surcharge for recovery of future otherwise nonrecoverable costs such as fish and wildlife costs.
Power Marketing Administrations	PMAs must use the same accounting principles used by other public utilities; Authorizes PMAs to participate in FERC-approved RTOs; PMAs subject to antitrust laws.	The Western Area Power Administration (WAPA) and the Southwestern Power Administration (SWPA) are subject to FERC authority under the Federal Power Act for purposes of determining transmission rates; Authorize WAPA and SWPA to join RSOs; Allow WAPA and SWPA to impose a surcharge for recovery of future otherwise nonrecoverable costs such as fish and wildlife costs.
Retail Reciprocity	Provide States that have implemented retail competition with the authority to preclude an out-of-State utility with a retail monopoly from selling within the State unless that out-of-State utility permits customer choice.	Same provision

Consumer Protection	Prohibits illegal changes in retail customer selections or "slamming" and the billing of customers for unauthorized services or "cramming". Suppliers of power must provide to customers information regarding price, terms, conditions and type of generation source as well as generation emissions characteristics. Includes privacy protections for consumers.	Same as Largent bill except DOE will use such information to create a publicly accessible "Electricity Shopper" database.
Net Metering	Suppliers must make net metering available to any retail electric consumer currently served by such supplier. The service is limited to those consumers whose generating capacity is 20 kilowatts or less and who produce such energy with solar, wind, geothermal or biomass resources.	Same provision
Aggregation	States must allow aggregation	States must allow aggregation
Indian Tribe Assistance	No Provision	$20 million in grants authorized to create a tribal assistance program; Office of Indian Energy Policy and Programs created;
Southeast Alaska	No Provision	$20 million authorized to assist the Southeast Alaskan area with electricity needs
Rural and Remote Communities	No Provision	$140 million authorized over seven years for grants to assist rural and remote communities
Tax Credits	Provides an 8% investment tax credit for Combined Heat and Power systems placed in service from 2000 to 2002; Renewable resource tax credit extended; New credit for energy efficient homes; Reforestation credit instituted.	Same provision
Distributed Power	Establishes non-discriminatory standards connection of distributed power generation systems to distribution utilities.	Establishes non-discriminatory standards connection of distributed power generation systems to distribution utilities; Distributed Power assets assigned a 15 year recovery period for depreciation purposes.

Nuclear Power	No provision	Eliminate antitrust review by the Nuclear Regulatory Commission; Amend the Internal Revenue Code relating to deductions to a qualified nuclear decommissioning fund.

BIOGRAPHICAL NOTES

KEYNOTE SPEAKER

Sarah McKinley
Executive Director
DPCA

Sarah McKinley is Executive Director of the Distributed Power Coalition of America, an advocacy organization representing: distributed power manufacturers and suppliers; electric and gas utilities; natural gas transmission companies; energy marketing and service companies; and research organizations. Its mission is to remove regulatory impediments that either block distributed power or tilt the rules against its optimal use.

Before joining the DPCA earlier this year, Ms. McKinley served as senior editor of *Natural Gas Intelligence* and conference director of the Gas Mart trade fair from its inception in 1986 to 1996. She also authored educational materials that have become standard reference guides for the industry, including simplified maps of natural gas pipelines, natural gas storage, and the electric transmission system

PANEL A

Phillip Asbury
Planning/Design Supervisor
SSVEC

Mr. Asbury is Planning and Design Supervisor for Sulphur Springs Valley Electric Cooperative in Wilcox, Arizona. He has been with SSVEC since 1980 and has served in a variety of technical and engineering positions. Mr. Asbury's educational background includes Electrical Engineering studies at the University of Arizona.

Mike Busquaert
Central Plant Mgr
Phoencian Resot

Mr. Busquaert is the Central Plant Manger of the Phoenician Resort in Scottsdale, Arizona. He is charged with the responsibility to oversee operation of a 1.6 megawatt cogeneration project and climate control operation for the resort. He has worked in Central Plant operations for several companies in Michigan and Arizona. Mr. Busquaert has been with the Phoenician since January 1997.

Keith G. Davidson
Senior Vice President
ONSITE SYCOM Energy Corporation

Mr. Davidson is responsible for Onsite's consulting practice and energy services business in the Midwest, Texas and Latin America. Mr. Davidson has over twenty years of diversified management experience in energy and environmental technology development, product commercialization and market development. Prior to joining Onsite, Mr. Davidson was a Director at the Gas Research Institute in Chicago, Illinois, where he led the gas industry's collaborative development programs directed at natural gas growth markets of electric power generation, cogeneration and gas cooling.

Mr. Davidson was past President of the American Cogeneration Association and a member of the American Society of Heating, Refrigerating and Air Conditioning Engineers. He is the recipient of several industry honors, including the Association of Energy Engineers' Cogeneration Professional of the Year in 1989, and was inducted into the American Gas Association's Industrial and Commercial Hall of Flame. Mr. Davidson earned a B.S.M.E from the University of Missouri and a M.S.M.E. from Stanford University. Mr. Davidson is a current member of the Association of Professional Energy Managers.

Robert O. (Bob) Hess, PE
Principal Engineer
SRP

Mr. Hess is a responsible for generation technology assessments at SRP, where he has worked for 20 years as a mechanical engineer. He has performed feasibility studies and economic evaluations for hydro plants, solar plants, landfill gas, co-generation and distributed generation. He was a member of the technical review committee for the Solar Two 10 MW central receiver project in Barstow, California.

He has also designed and managed various power plant improvement projects at coal, hydro and natural gas plants, including performing equipment selection and piping systems design.

Mr. Hess is a Registered Professional Mechanical Engineer (PE) in the State of Arizona, a Certified Cogeneration Professional (CCP) by the Association of Energy Engineers (AEE) and a Member of American Society of Mechanical Engineers (ASME) and holds a Bachelor of Science in Mechanical Engineering (BSME) from West Virginia University.

PANEL B

Prem K. Bahl
Chief Engineer
RUCO

Mr. Bahl has been with the State of Arizona Residential Utility Consumer Office (RUCO) as Chief Engineer since July 1998. He is involved in the development of Desert STAR, an ISO for the southwest region, including Arizona, Nevada, New Mexico, and west Texas. He is also participating in the development of Arizona Independent Scheduling Administrator (AISA), which is designed to facilitate retail competition in the state of Arizona and be integrated with Desert STAR in the future. He is involved in the deliberations of the Market Interface Committee of the North American Electric Reliability Council. His other responsibilities include analysis of and testifying in the utility rate cases filed by the jurisdictional utilities at the Arizona Corporation Commission.

Mr. Bahl worked at the Arizona Corporation Commission from January 1988 to July 1998, as a Utilities Consultant. He was responsible for conducting utility generation and transmission plan reviews, power plant inspections, and compliance investigations of electrical systems. He was Chairman of the ISO and Spot Market Development Working Group and the Electric System Reliability and Safety Working Group, which determined the impact of retail competition on system reliability with and without an ISO. He conducted engineering evaluation of utilities' facilities to support determination of appropriate rate base. He testified in utility rate cases and was involved in analyzing integrated resource plans for utilities, including renewable resources, and energy conservation measures.

Prior to joining the Commission, Mr. Bahl had approximately twenty-eight years' experience in the electric utility generation and transmission planning. He worked for electric utilities such as Arizona Public Service Company and Arizona Electric Power Cooperative, and for Consulting Engineering firms such as Commonwealth Associates and R.W. Beck and Associates.

Mr. Bahl received a Master of Science in Electrical Engineering degree from South Dakota State University in 1972, and is a registered Professional Engineer in the State of Arizona. He is a member of the Institute of Electrical and Electronics Engineers and the Association of Energy Engineers.

Michael C. Burke
Chairman
NEVTechnologies

Mr. Burke has over 24 years of experience in the areas of energy policy, regulation, permitting, development, and marketing. He is the founder and Chairman of NEVTechnologies, a technology delivery subsidiary of New Energy Ventures. NEVTech provides distributed generation, energy management, and information management solutions to NEV Customers throughout the U.S., and to foreign markets in over 20 countries. Mr. Burke was cofounder of New Energy Ventures, and served as its Executive Vice President. New Energy Ventures has grown from a small startup in early 1995, into the nation's leading non-utility electric service provider, with over 200 employees, and offices in eight U.S. cities.

Prior to forming NEV, Mr. Burke served as Director of Utility Services for Dames & Moore, a multi-national consulting firm. He provided strategic planning, project planning, and project permitting services for clients throughout the world. In five years with Dames & Moore, Mr. Burke permitted over 5000 MW of generating capacity worldwide. He consulted with the Philippine Department of Energy in development of their Geothermal Power Plant Siting regulations, and provided strategic and regulatory advice to dozens of public and private utilities and energy project developers in the U.S.

Mr. Burke began his career with 14 years in state service in California. He served as the Special Assistant to the Executive Director at the California Energy Commission, and as Manager of Regulatory and Environmental Programs at the California Public Utilities Commission.

Mr. Burke holds a Bachelor of Science degree in Environmental Planning and Management from the University of California at Davis. He has received training in Program Analysis and Evaluation from the Harvard School of Business, and training as an expert witness from the McGeorge School of Law.

Ron A. Franquero, PE
Utilities Division
ACC

Mr. Franquero has been an Electrical Engineer with the Arizona Corporation Commission since 1991. He investigates utility accidents and outages and recommends safer operating procedures. He prepares engineering evaluations, cost of service studies, prepares testimony, and testifies in utility rate cases.

Mr. Franquero previously worked as an Electrical Engineer for Arizona Public Service Company. He performed short term distribution planning for the East Phoenix Metro area and performed demand side planning including economic analysis of load management systems, and did generation planning analysis. Ron also was a communications engineer and a protective relaying engineer at Arizona Public Service Company.

As a Generation Planning Engineer for Public Service Company of New Mexico he performed long range planning studies to determine the company's future generation additions.

He also has worked for San Diego Gas & Electric as an Electrical Engineer where he did generation planning, transmission planning, distribution planning, and distribution design.

Mr. Franquero received a BSEE from the University of Arizona, a MSEE in Power Systems from New Mexico State University and a MBA in Finance from the University of New Mexico. He is a Licensed Professional Engineer in California.

Charles F. DeCorse
Technical Advisor Group
TEP

Mr. DeCorse has worked for Tucson Electric Power Company since 1979.As a member of the Technical Advisor Group he is currently responsible for Photovoltaic applications, power electronic applications for photovoltaic balance of systems, serves as technical advisor on new technology and applications related to power transmission, distribution, and generation. He was a TEP liaison engineer to Bechtel / Brown and Root for design of the Springerville Generating Station. He has been responsible for substation design and was previously responsible for retail marketing technical issues for energy related matters and power quality and power electronics problems. Mr. DeCorse has a B.S.E.E. from Northern Arizona University and has complete Graduate Electrical Engineering courses at Arizona State University. He is a registered Profession Engineer in Arizona and Certified Energy Manager, an IEEE member and is an Association of Energy Engineers local board member.

Bill Murphy
Energy Conservation Mgr.
Public Works Dept
City of Phoenix

Bill Murphy has been Energy Conservation Manager for the Phoenix Public Works Department since April 1992. Presently he is in charge of the Cities preparation for electric deregulation. The City buys approximately $40 million /year of electricity. This places them in the position of being close to both APS and SRP's largest customer. With a total load of over 100MW the City buys electricity for such diverse loads as small as homes and as large as the 91st Ave Waste Water Treatment Plant. The City has consistently had an award winning Energy Conservation program; Spending over $1,000,000/year to lower its energy costs. It is considered a leader in all aspects of energy management, having recently received a DOE grant to install a microturbine. Prior to joining the City of Phoenix, Bill was a Manager of Power Contracts for APS and chaired that Companies Cogeneration Committee. Bill is a mechanical engineering graduate of the University of Arizona.

GROUP FACILITATORS

Dennis Gerlach
Mgr Electric Plng & Engr
SRP

Dennis Gerlach is the Manager of Electric System Planning and Engineering at SRP. This organization plans the SRP electrical distribution systems and works with customers to solve problems caused by power quality. They are also responsible for developing design and construction standards and applying, specifying, and testing major equipment for electrical transmission and distribution facilities. Before coming to SRP, Mr. Gerlach worked for the General Electric Company and for RW Beck and Associates, a national consulting firm. Mr. Gerlach earned his BSEE from the University of Nebraska, Lincoln and his Master of Engineering in Electric Power Engineering from Rensselaer Polytechnic Institute, Troy, NY. Mr. Gerlach is a Registered Professional Engineer in Arizona and is a past Board Member of the Arizona State Board of Technical Registration.

Barbara Keene
Senior Economist
ACC

Barbara Keene is a senior economist with the Utilities Division of the Arizona Corporation Commission. For almost ten years, she has been preparing Staff recommendations and presenting testimony on electric resource planning, special contracts, rate design, tariffs, and energy efficiency programs; using a computer model to estimate electric utility production costs and marginal costs; and coordinating working groups of stakeholders on various issues. Before joining the Commission Staff, she was Labor Market Information Supervisor with the Arizona Department of Economic Security. She has an Associate of Arts degree in Economics, a Bachelor of Science degree in Political Science, and a Master of Public Administration degree.

SUMMARY OF STATE "NET METERING" PROGRAMS (CURRENT)

State	Eligible Fuel Types	Eligible Customers	Limit on System Size	Limit on Overall Enrollment	Treatment of Net Excess Generation (NEG)(*)	Enacted	Citation / Reference
Arizona	Renewables & cogeneration	All customer classes	≤ 100 kW	None	NEG purchased at avoided cost	1981	AZ Corp. Comm. Decision No. 52345
California	Solar and Wind	Residential and Small Commercial	≤ 10 kW	0.1% of 1996 peak demand	Net metering customers are billed annually; excess generation is granted to the utility	1998	CA Public Utilities Code § 2827
Colorado	All resources	All customers	≤ 10 kW	None	NEG carried over month-to-month	1994	Public Service Co. of CO, Advice Letter 1265; Decision C96-901
Connecticut	Renewables & cogeneration	All customer classes	≤ 50 kW for cogeneration; ≤ 100 kW for renewables	None	NEG purchased at avoided cost	1990	CT Dept. of Public Utility Control, CPUCA No. 159
Delaware	Renewables	All customer classes	≤ 25 kW	None	Not specified	1999	DE Legislature, S Amend 1 to HB 10
Idaho	Renewables & cogeneration	Residential and small commercial	≤ 100 kW	None	NEG purchased at avoided cost	1980	ID PUC Orders No. 16025 (1980); 26750 (1997)
Indiana	Renewables & cogeneration	All customer classes	≤ 1,000 kWh/month	None	No purchase of NEG; excess is granted to the utility.	1985	170 IN Admin Code § 4-4.1-7
Iowa	Renewables	All customer classes	No limit	None	NEG purchased at avoided cost	1983	IA Legislature & IA Utilities Board, Utilities Division Rules § 15.11(5)
Maine	Renewables & cogeneration	All customer classes	≤ 100 kW	None	NEG purchased at avoided cost	1987	ME PUC, Code Me. R. Ch. 36, § 1(A)(18) & (19), § 4(C)(4)
Maryland	Solar only	Residential customers & schools	≤ 80 kW	0.2% of 1998 peak demand	NEG carried over to following month; otherwise not specified	1997	MD Legislature, Art. 78, Sec. 54M
Massachusetts	Renewables & cogeneration	All customer classes	≤ 60 kW	None	NEG purchased at avoided cost	1997	Mass. Gen. L. ch. 164, § 1G(g); Dept. of Tel. & Energy 97-111
Minnesota	Renewables & cogeneration	All customer classes	< 40 kW	None	NEG purchased at "average retail utility energy rate"	1983	Minn. Stat. § 261B.164(3)
Montana	Solar, wind or hydro	All customer classes	≤ 50 kW	None	NEG credited to following month; unused credit is granted to utility at end of 12-month period	1999	S.B. 409
Nevada	Solar and wind	All customer classes	≤ 10 kW	100 customers for each utility	Annualization allowed; no compensation required for NEG	1997	Nev. Rev. S. Ch. 704
New Hampshire	Solar, wind & hydro	All customer classes	≤ 25 kW	0.05% of annual peak	NEG carried over to following month	1998	NH Rev. Stat. §§362A:1-a & 362-A:9
New Jersey	Photovoltaic and wind	Residential and small commercial	No limit	0.1% of peak **or** $2,000,000 annual financial impact	NEG credited to following month; unused credit is purchased at avoided cost.	1999	NJ Legislature, S.B. 7
New Mexico	Renewables, fuel cells, micro turbines	All customer classes	≤ 1,000 kW [as corrected]	None	NEG credited to following month; unused credit is granted to utility at end of 12-month period	1998	NM PUC Order 2847 (11/30/98)
New York	Solar only	Residential only	≤ 10 kW	0.1% of 1996 peak	NEG credited to following month; unused credit is purchased at avoided cost	1997	NY Public Service Law § 66-j
North Dakota	Renewables & cogeneration	All customer classes	≤ 100 kW	None	NEG purchased at avoided cost	1991	ND Admin. Code § 69-09-07-09
Oklahoma	Renewables & cogeneration	All customer classes	≤ 100 kW and annual output ≤ 25,000 kWh	None	No purchase of NEG; excess is granted to the utility.	1990	OK Corp. Comm. Schedule QF-2
Pennsylvania	Renewables only (includes fuel cells)	All customer classes	≤ 10 kW	None	NEG granted to utility at end of month	1998	PA PUC, Miscellaneous Individual Utility Tariffs
Rhode Island	Renewables & fuel cells	All customer classes	≤ 25 kW	1 MW for Narragansett Electric	NEG credited to following month; unused credit is granted to utility at end of annual period	1998	RI PUC, Order, Docket No. 2710
Texas	Renewables only	All customer classes	≤ 50 kW	None	NEG purchased at avoided cost	1986	PUC of Texas, Substantive Rules, § 23.66(f)(4)
Vermont	Solar, wind, fuel cells using renewable fuel, anaerobic digestion	Residential, commercial, and agricultural customers	≤ 15 kW, except ≤ 100 kW for anaerobic digesters	1% of 1996 peak	NEG carried over month-to-month; any residual NEG at end of year is granted to the utility	1998	VT Legislature, H. 605
Virginia	Solar, wind and hydro	Residential and commercial	≤ 10 kW (residential); ≤ 25 kW (commercial)	0.1% of annual peak demand	Net metering customers are billed annually; excess generation is granted to the utility	1999	S.B. 1269 (effective by 7/1/2000)
Washington	Solar, wind and hydropower	All customer classes	≤ 25 kW	0.1% of 1996 peak	NEG credited to following month; unused credit is granted to utility at end of annual period	1998	WA Legislature, House Bill 2773
Wisconsin	All Resource	All retail customers	≤ 20 kW	None	NEG purchased at retail rate for renewables, avoided cost for non-renewables	1993	WI PSC, Schedule PG-4

(*)Net excess generation occurs only when total generation exceeds total consumption over the entire billing period, i.e. the customer has more than offset his/her total electricity use and has a negative meter reading.

SUMMARY OF STATE "NET METERING" PROGRAMS (PROPOSED)

State	Eligible Fuel Types	Eligible Customers	Limit on System Size	Limit on Overall Enrollment	Treatment of Excess Generation	Enacted	Citation / Reference
Connecticut (enacted) [replaces existing rule after 1/1/2000]	Solar, wind, hydro, fuel cell, sustainable biomass	Residential only	No limit	None	*Not specified*	*1998*	*CT Legislature, Public Act 98-28*
Maine (enacted) [replaces existing rule after 2/29/2000)	Renewables, fuel cells & recycled municipal solid waste	All customer classes	≤ 100 kW	None	NEG carried over month-to-month; any residual NEG at end of 12-month period is eliminated w/o compensation	1998	Code Me. R. Ch. § 313 (1998); see also Order No. 98-621 (December 19, 1998).
North Carolina	Solar, wind, hydro, and biomass	All customer classes	≤ 10 kW (residential); ≤ 100 kW (non-residential)	1.0% of annual peak demand	NEG credited to following month; unused credit is eliminated at end of annual billing period (residential customers only)	(Pending)	NC Utilities Commission, Docket No. E-100, Sub 83 (November 18, 1998)
Oregon	Solar, wind and hydro	All customer classes	≤ 25 kW	None	NEG credited to following month; unused credit is granted to low-income assistance programs	(Pending)	H.B. 3219

(*) "NEG" refers to the "net excess generation" of electricity by the customer-generator (i.e., generation exceeds consumption) during the billing period.