



ADVANCED ENERGY 2009

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Solar Distributed Generation Projects in the US – Market Drivers

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- This talk will examine key market factors and drivers shaping and influencing successful solar DG projects.
- Factors include:
 - technology availability and selection, including collector/generators, balance of plant and installation
 - regulatory – interconnection, utility, tax and carbon
 - capital cost and structures
 - energy values – customer avoided cost and load management
 - operations, including maintenance, equipment replacement, taxes, insurance.
- Will be analyzed comparing commercial/ industrial scale projects in the Southwest and Northeast.
- The perspective will be that of the project developer / owner / operator.

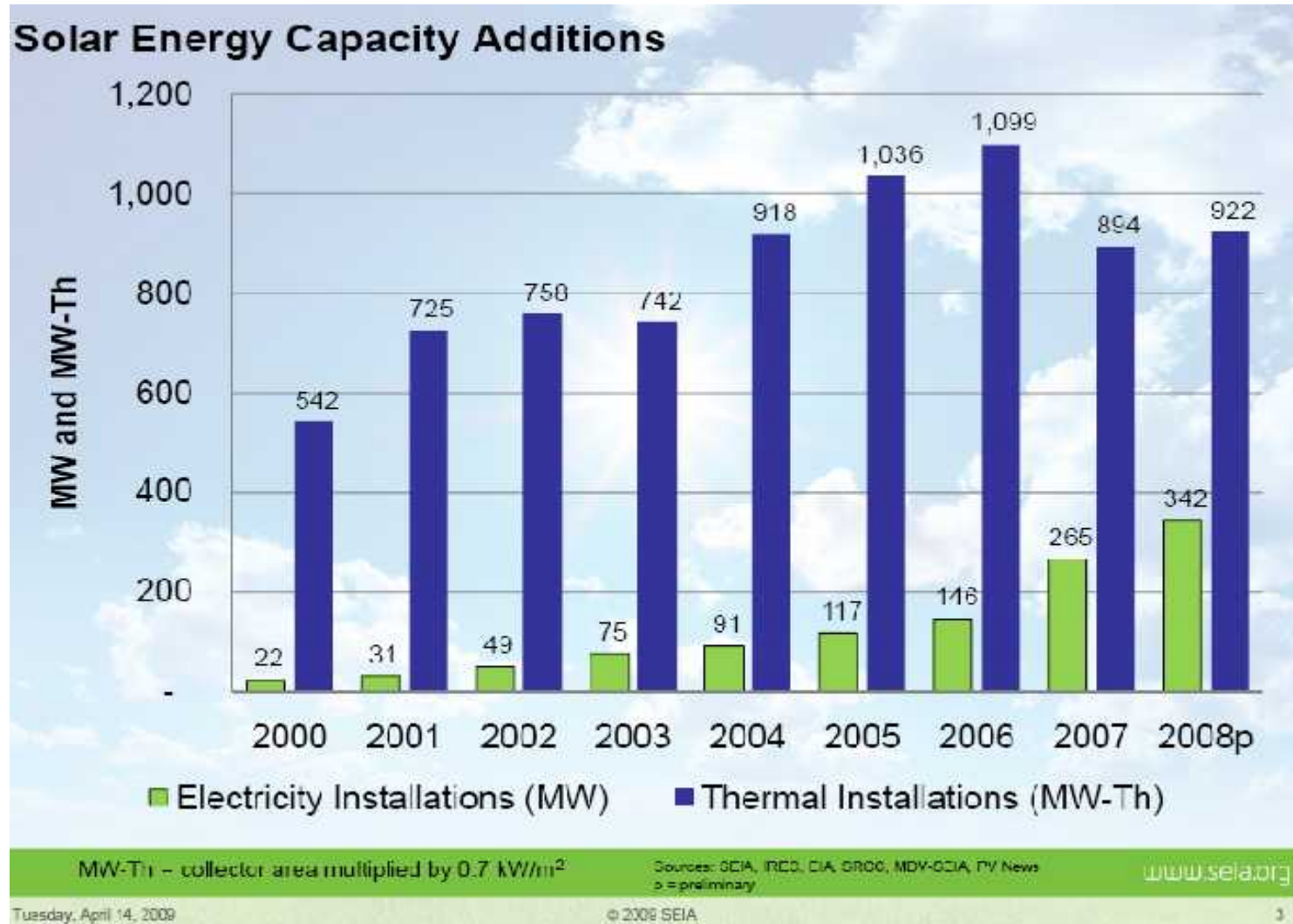
Why Distributed Generation?

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- Why DG and why now?
 - Increasing customer acceptance and interest
 - Decreasing capital costs
 - Regulatory federal and state incentives and mandates (e.g., RPS), including rebates, access to capital, REC purchases and net metering
 - Transmission uses existing infrastructure with lower build and operating cost
 - Shorter development cycle results in nearer term contribution to RPS and other compliance
 - DG project generally take 1-2 years from idea to production. By contrast, utility-scale projects can take 4-6 years.
 - Growth in solar installations and production (see charts)

Market Growth – Installed Capacity

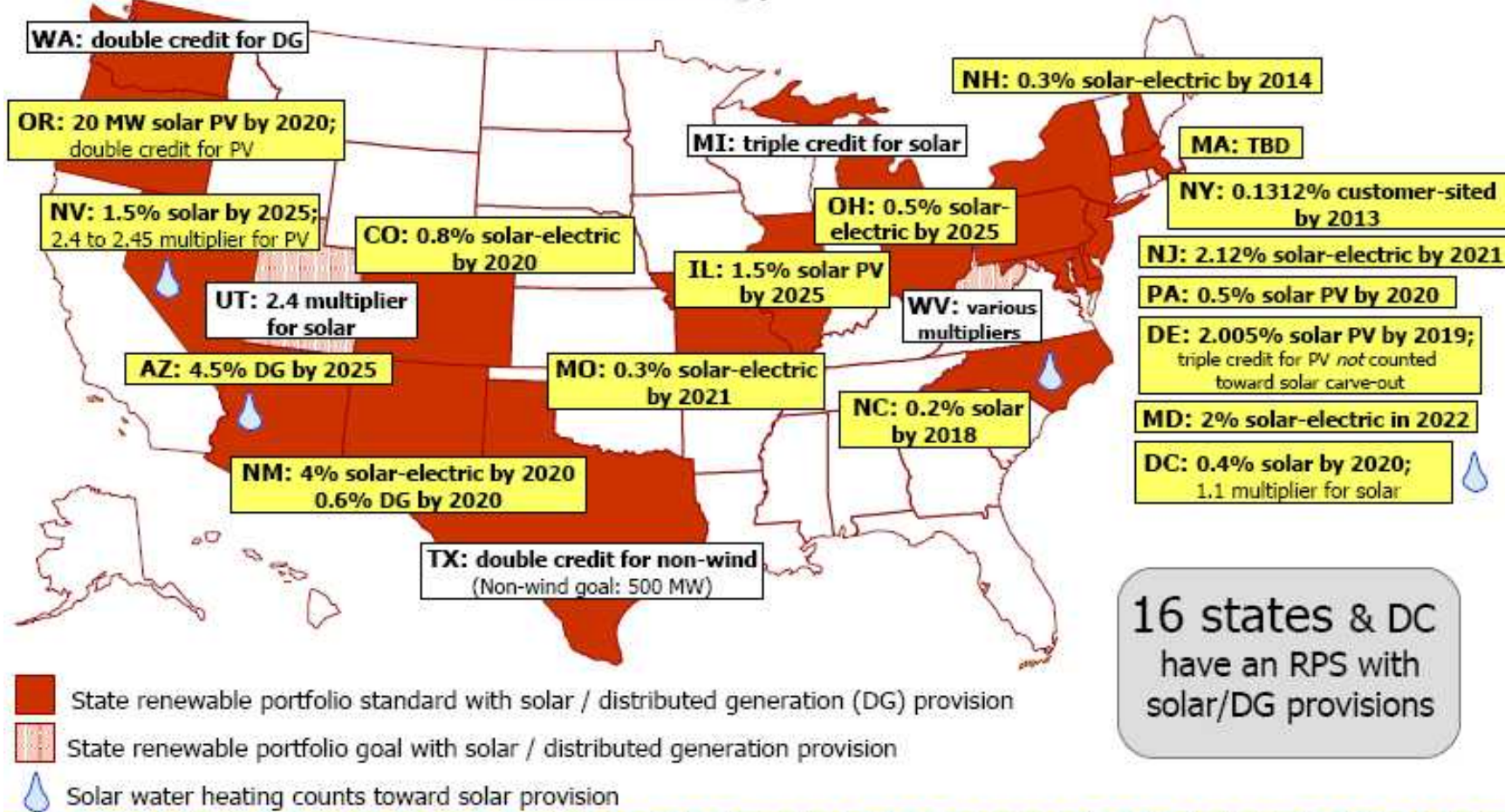
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RPS Policies with Solar/DG Provisions

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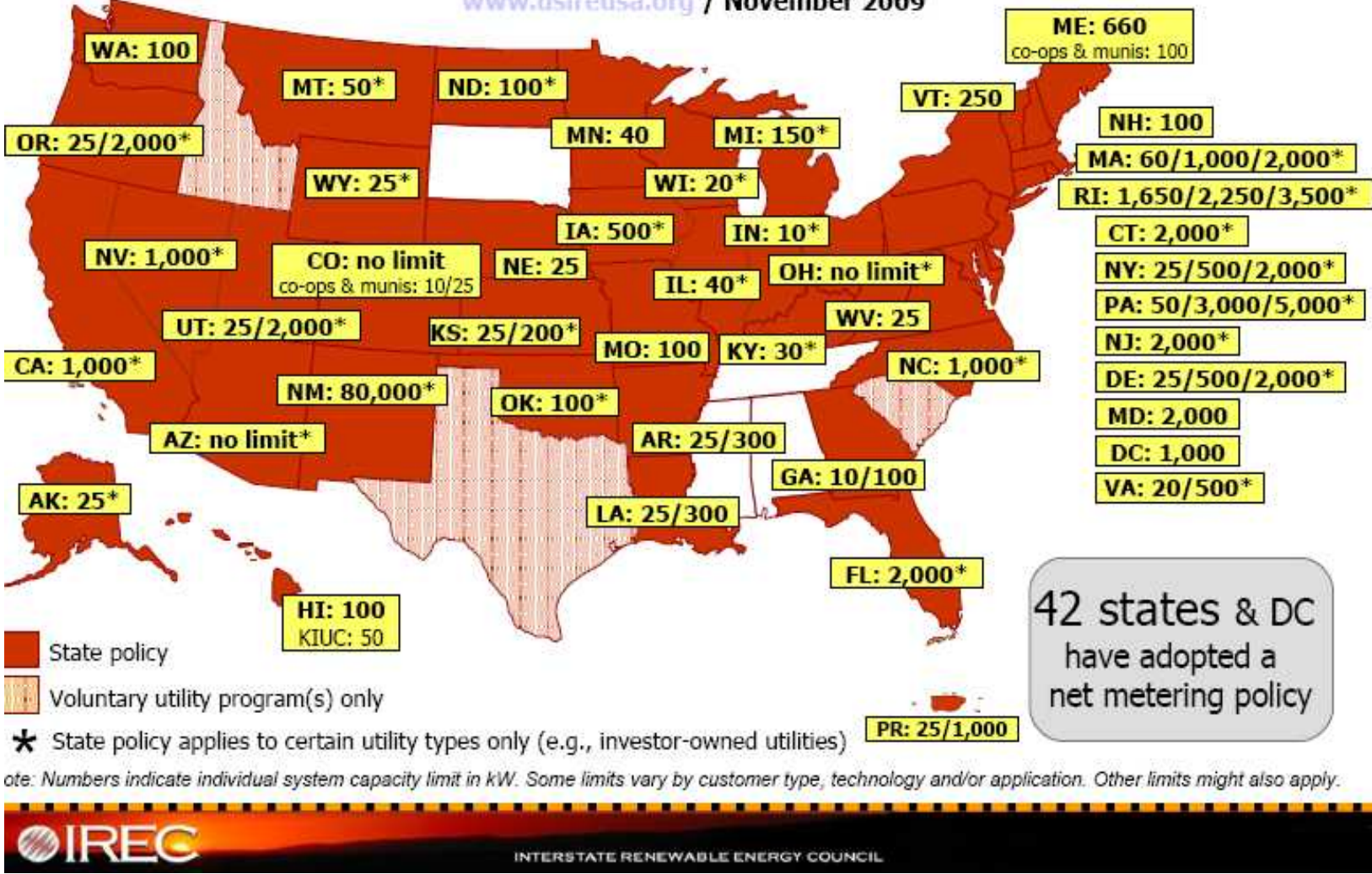
16 states & DC have an RPS with solar/DG provisions

Market Growth - Regulatory

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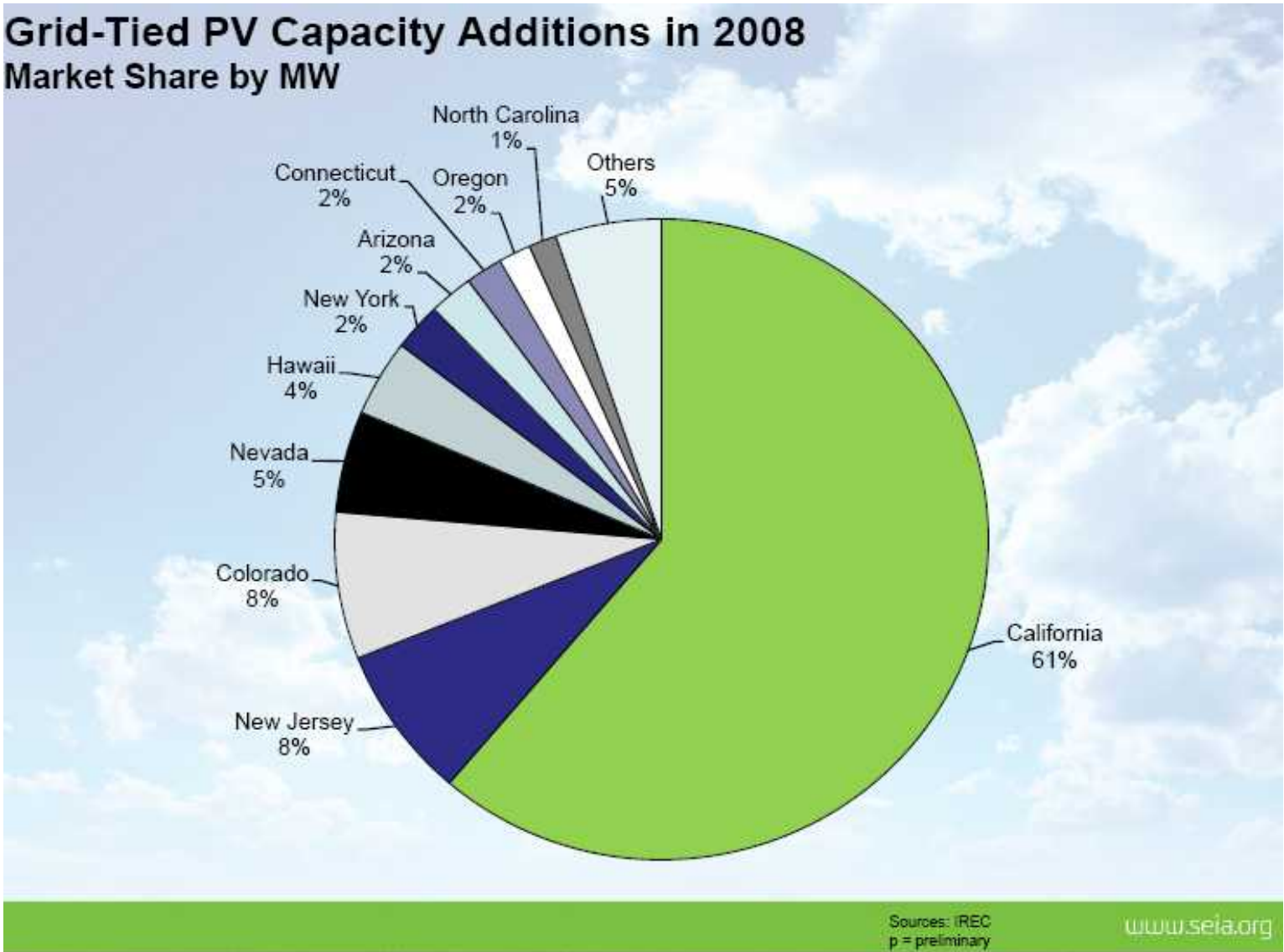
Net Metering

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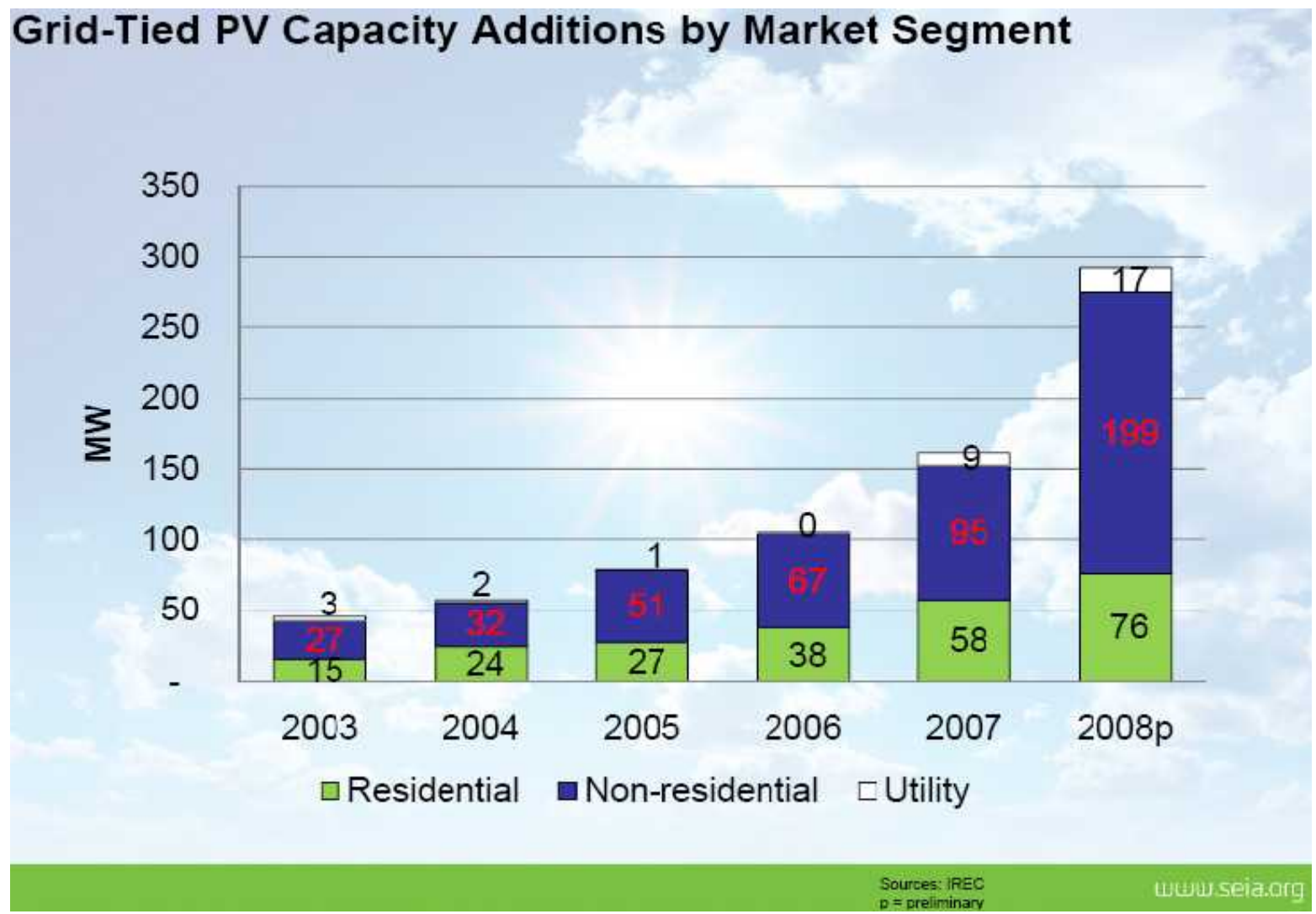
Market Growth – by State

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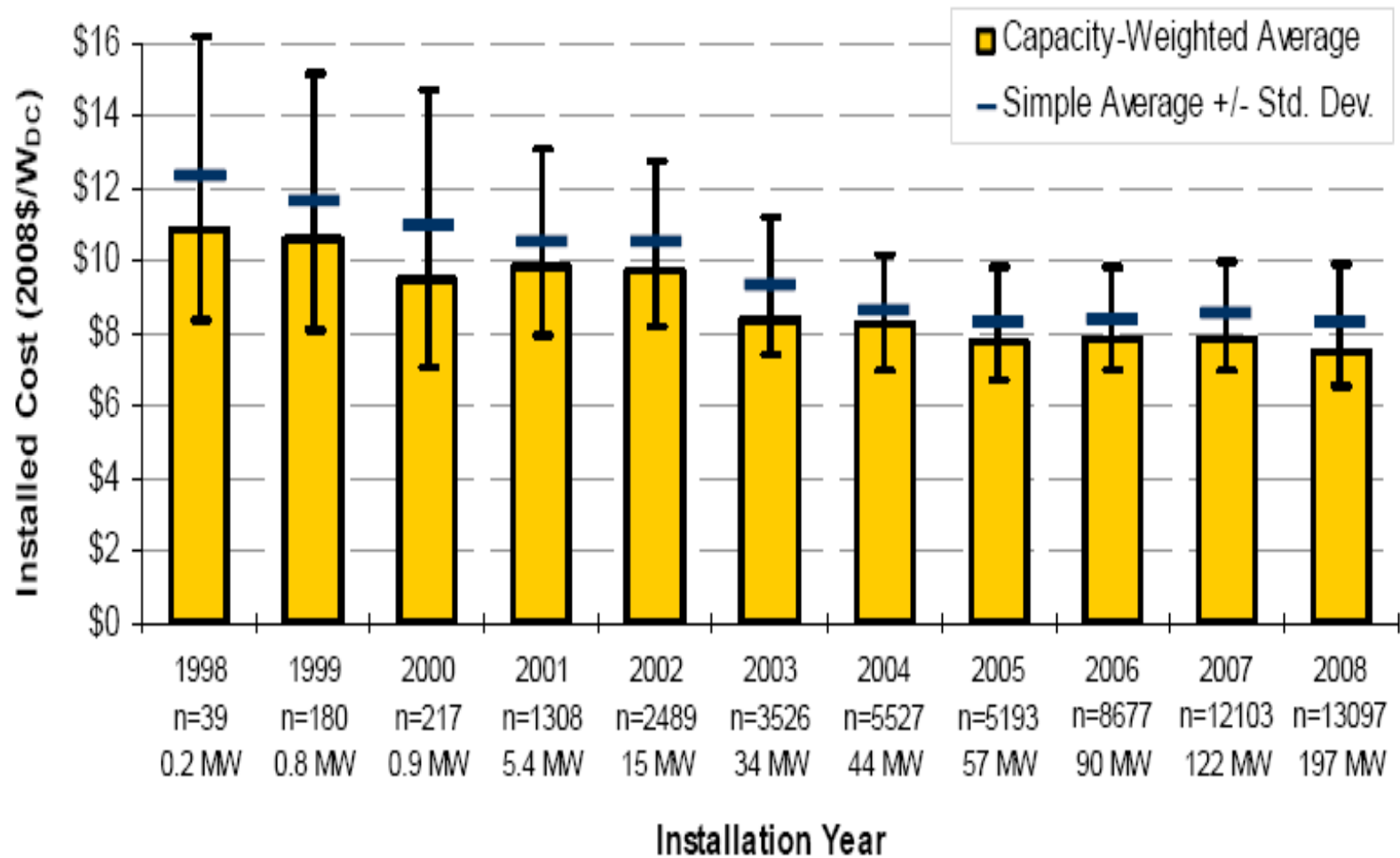
Market Growth – by Segment

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Market Growth – Installed Costs

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In addition to PV technology efficiency improvements and cost reduction from production scaling, the solar DG market is seeing increased participation of new technology asset classes such as thermal electric, water heating and water cooling.

An example of is the 3kW dish-Stirling system (picture left) developed by Infinia Corporation and offered by PowerPlay Solar, its US behind-the-meter partner.

This system produces about 20% more generation in high DNI areas (Southwest) at about a 25% higher capital cost (2010).

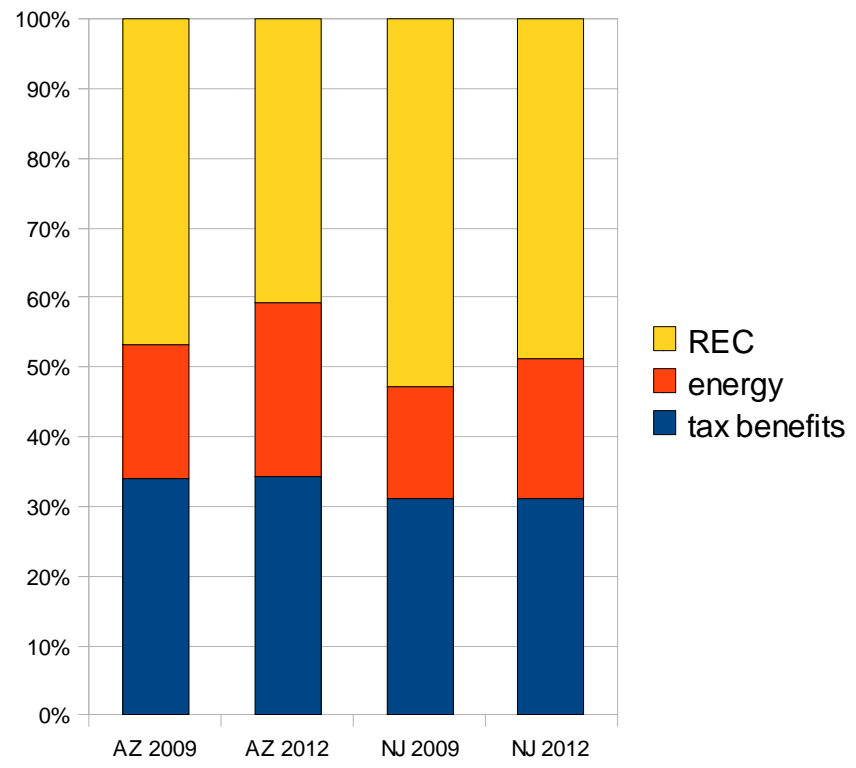
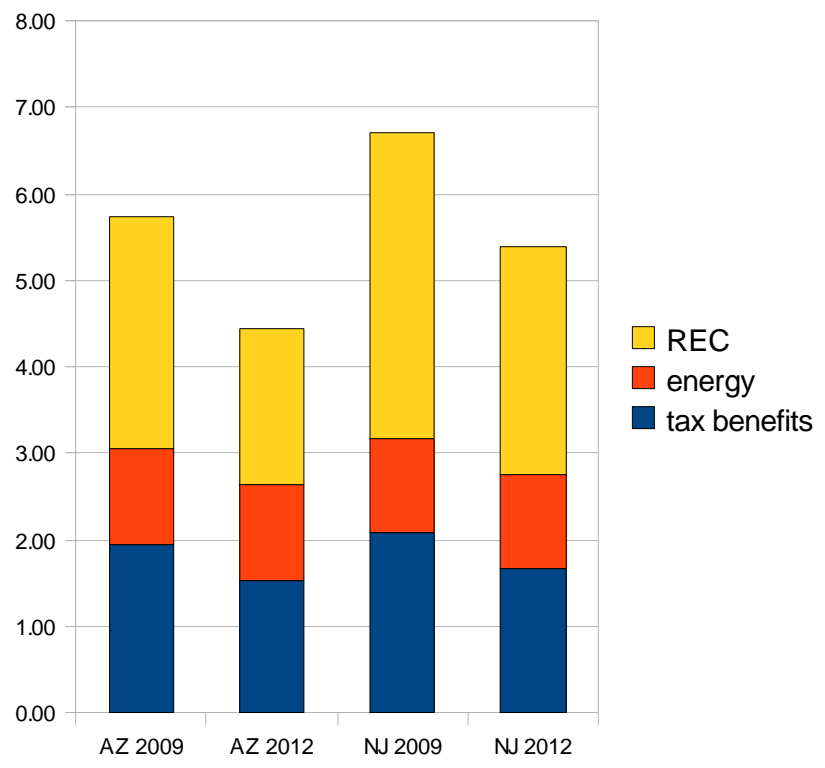
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- Installed system cost, including prime electrical generation, balance of plant and soft development costs
- Annual production (including technology efficiency improvement)
- Renewable Energy Credits and other emission attributes
- Operating costs - O&M, taxes, insurance
- By region - compare 2009 and 2012 in 2 regions - Southwest and Northeast installed system cost includes balance of plant and other development costs.
- Other factors - assumes 20+ year power purchase agreements and system economic life.
- Operating costs include maintenance, insurance, taxes, labor, warranties.
- Solar generated electricity sold retail only avoids the energy component of utility tariffs. No wholesale values included.
- Net metering credits time of use; however, this generally does not capture the full real-time market value.
- Tax benefits not include deductibility of ordinary expenses (including debt) as this is typical of infrastructure investments and not policy-driven issue.

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- As the solar DG market evolves, to continue the development of the market consistent with current and contemplated policy, the type and amount of tax and other subsidies will change in amount, type and relative project importance. As these subsidies remain material, *this is a critical factor*.
 - Rebate
 - FIT
 - PTC
 - REC
- Another key factor is the anticipated change in installed cost. Note the *relationship with subsidies and the* sensitivity to capital cost.
- Relative lesser importance to energy values shows lower sensitivity to avoided cost, although this is increasing

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Mr. Levine is a Managing Director and General Counsel of Encap Renewables LLC and Encap Development LLC, project development and consulting firms specializing in analysis, valuation, development and financing of energy projects and assets, with a focus on renewable energy.

Mr. Levine was a founder and CEO of Tersus Energy plc, a London Stock Exchange (AIM) renewable energy investment company.

Previous positions include serving as: Vice President, New Energy, Inc. (now Constellation New Energy), one of the largest US deregulated electricity power retailers; President of Metro Energy, a total energy private utility located in NY, acquired in 2005 by KeySpan (now National Grid); President of the unregulated independent power generation subsidiary of Besicorp Group Inc.; and principal and general counsel of Indian and Chinese hydropower development companies.

Mr. Levine currently serves on the boards of digester, solar and energy management technology companies and has served as a board member of Stirling Energy Systems.