

Renewables R&D at SMUD Making PV More Affordable

Bruce Vincent

Sacramento Municipal Utility District
6201 S Street, MS-B205
Sacramento, CA 95817

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ReGen Program Goals - Affordability

Develop new products to create competition

Increase sales volume by filling market niches

Reduce balance-of-system costs

Develop products with faster installation times

Reduce shipping costs

Add value by improving aesthetics

California's Energy Problems

- GROWTH, GROWTH, GROWTH
- Transmission capacity into California is constrained
- Transmission capacity inside California is constrained
- Intensely summer peaking
- Emission credits may be used up
- Water
- Natural gas fields are in decline
- Most new generation uses natural gas
- Pipeline capacity into California is constrained
- California has a number of aging fossil-fuel fired plants
- The regulatory process for new generation is intimidating
- Large hydro, coal, nuclear are not possible

Why Utilities Need PV

- Locally sited – no transmission system hassles
- Support for the distribution system
- Can be owned by the ratepayers
 - ✓ Big increase in the value of the electricity produced
 - ✓ Shift maintenance costs to the system owner
- Can usually be oriented to match the system load curve
- Roofs are good locations for PV
- No emission credits required
- Energy Independence
- Energy security

PV – Why It is Expensive

Modules cost a lot to manufacture

Lack of sales volume

Balance of system costs

Installation time

Permitting costs

Sales overhead

Layers of mark-up (manufacturer, distributor, contractor)

Lack of competition in market sectors

R&D to Reduce the Cost of PV

Reduce the cost of balance of system

Create new products for market sectors for more sales volume

Create new products to increase competition

Stimulate the development of easy-install systems

Residential BIPV

Commercial sector flat roof systems

Programmatic projects to improve SMUD's performance

Projects Designed to Reduce Cost

Reduce the cost of PV modules

Unisun – Non-vacuum process for manufacturing PV

Reduce the cost of installation

UniSolar – Laminate and batten mounting system

Schott – Non-roof-penetrating, flat-roof mounting system

Residential BIPV

BIPV

AstroPower – System is on the market

UniSolar – System is on the market

RWE Scott – On the market in perhaps 6 months

PowerLight – Available by the end of 2004

Projects Designed to Reduce Cost

Commercial-sector flat roofs

RWE Schott

- Non-penetrating, non-ballasted flat roof mounting system
- Commercially available now

PowerLight

- Modified existing product line
 - Easier installation
 - More diverse applications
- Elevated panels for better performance

Reducing Balance of System Cost

All BIPV projects – eliminate the need for conventional roofing on the PV portion of the roof

- Probably most important in the retrofit market

- Production homes - \$1.50 per square foot

- Residential retrofit - \$2.50 to \$10.00 per square foot

Schott flat roof mounting system

- No roof penetrations

- No ballast

- Minimal hardware

- Easy installation

Inverter - SMA

- Develop an inverter that works well with batteries

- Batteries as an option for residential PV systems

- PV available upon grid failure – commercial sector

Improving SMUD's Delivery of PV

Performance indexing system

PV Markets and Programs – SEPA

Quantifying the value of PV – Christy Herig, Tom Hoff

PV and direct load control – Richard Perez

Other Renewables R&D at SMUD

Clipper – Distributed Generation Geartrain

- Multiple generators per turbine

- Reduced equipment cost

- Lower maintenance cost

- In testing at NREL

Yolo County – Accelerated Decomposition Landfill

- Add water to garbage in landfill gas collection system

- More methane over life of the landfill

- Much faster production

- Test cells are fully operational

Other Renewables R&D at SMUD

Biomass technology evaluation – UC Davis

Concentrating solar power

 Slat array concentrator – S.V.V. Technology Innovations

 Dish Stirling - SAIC