Solar Technology Trends and Costs

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Farm Applications – Solar Thermal

Chicken barn heating

Hot water

Chicken barn heating

Chicken barn heating

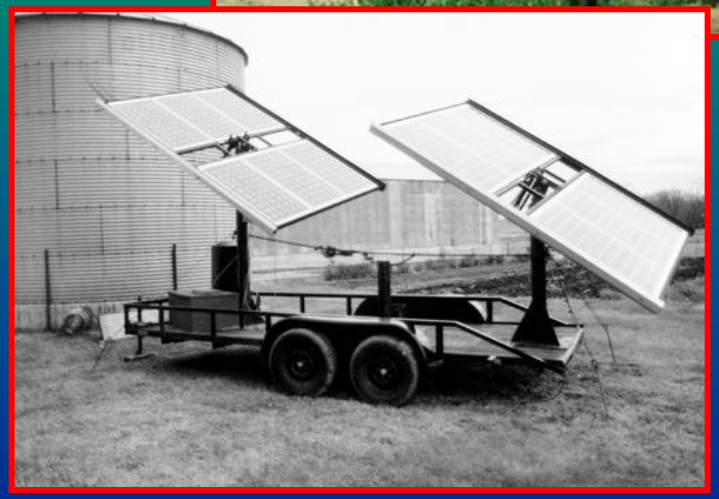
Hot water

Home heating

Farm Applications - PV

Water pumping

Electric fences



Grain ventilation

Lighting

Irrigation control

System Mounting - PV

System Mounting – Solar Thermal

Residential
- 1970s

Residential -today

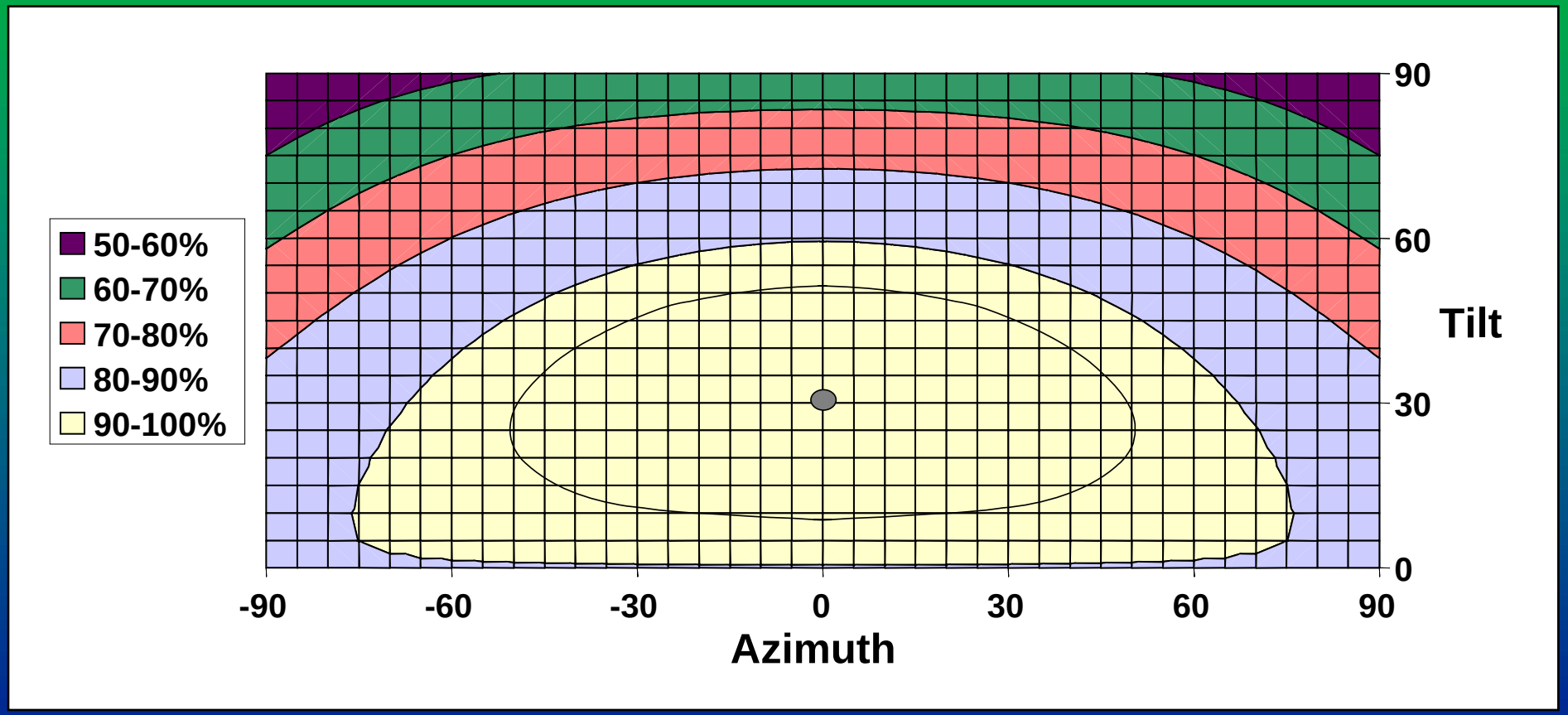
Commercial
- today

Residential
- 1990s

System Mounting – Latest Concept

- Historic Rule: Tilting your solar panels at the same angle from horizontal as your latitude will maximize your annual production
- Analysis of 30-year solar data shows that this is rarely true – all solar technologies have wide latitude
- Additionally, the extra installation costs or aesthetics may not be worth the effort
- Solar panels that are flush with a roof look better

Percent of Solar Energy Collected Based on PV Module Orientation



Christensen and Barker, Effects of Tilt and Azimuth on Annual Incident Solar Radiation for United States Locations, ASES 20

Solar Thermal Trends

- Solar thermal systems of today are vastly improved in reliability and cost
- A typical SHW system costs $3,500 to $7,000 depending on size
- General rule: Most residential solar hot water heating systems are designed to provide 50 – 85% of the annual demand. Most will provide 100% during the summer months

Solar Thermal System Sizing

- Cool climates: 20 square feet of collector and 20 gallons of storage capacity for each person in the household. For large families, this can be reduced by 10 percent for each person over four members in the household.
- Warm climates,15 square feet of collector and 25 gallons of storage for each person in the household, with the same reductions for larger families.
- These sizing methods will give the best return on investment. Systems smaller than these certainly will work well, but your savings will be less

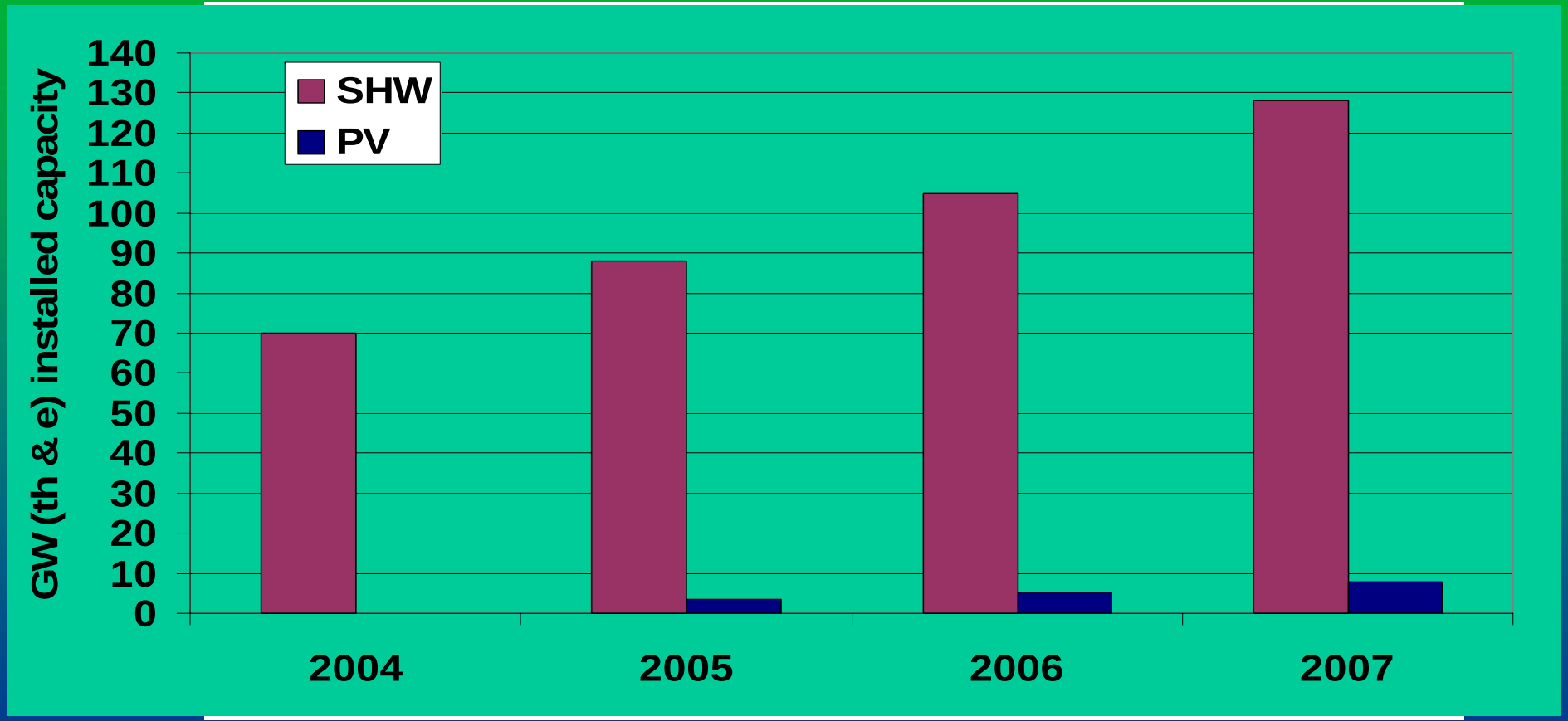
How Much Does PV Electricity Cost Today?

- Without subsidies, PV electricity costs 20 to 35 cents per kWh depending on location, size and amount of storage (independence)
- PV systems for a typical residence range from $6-9/watt for grid-tied systems to $20/watt, or more, for grid independent systems, depending upon location, amount of storage, backup generator, size, etc.
- Larger commercial systems may cost $5/watt or less, fully installed

PV Trends

Market Sector	Current US Market Price (¢/kWh)	Benchmark 2005 (¢/kWh)	Target 2010 (¢/kWh)	Target 2015 (¢/kWh)
Residential	5.8 – 16.7	23 – 32	13 – 18	8 -10
Commercial	5.4 – 15.0	16 – 22	9 – 12	6 - 8
Utility	4.0 – 7.8	13 - 22	10 - 15	5 - 7

Relative Installed Capacity of SHW and PV



0.7 kW_{th} per m2

Renewables 2007 Global Status Report
www.ren21.net

Resources

- http://www.nrel.gov/learning/farmers_ranchers.html,
- www.eere.energy.gov/consumer
- http://www.solar-rating.org/
- http://www.dsireusa.org/

Thank You!

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