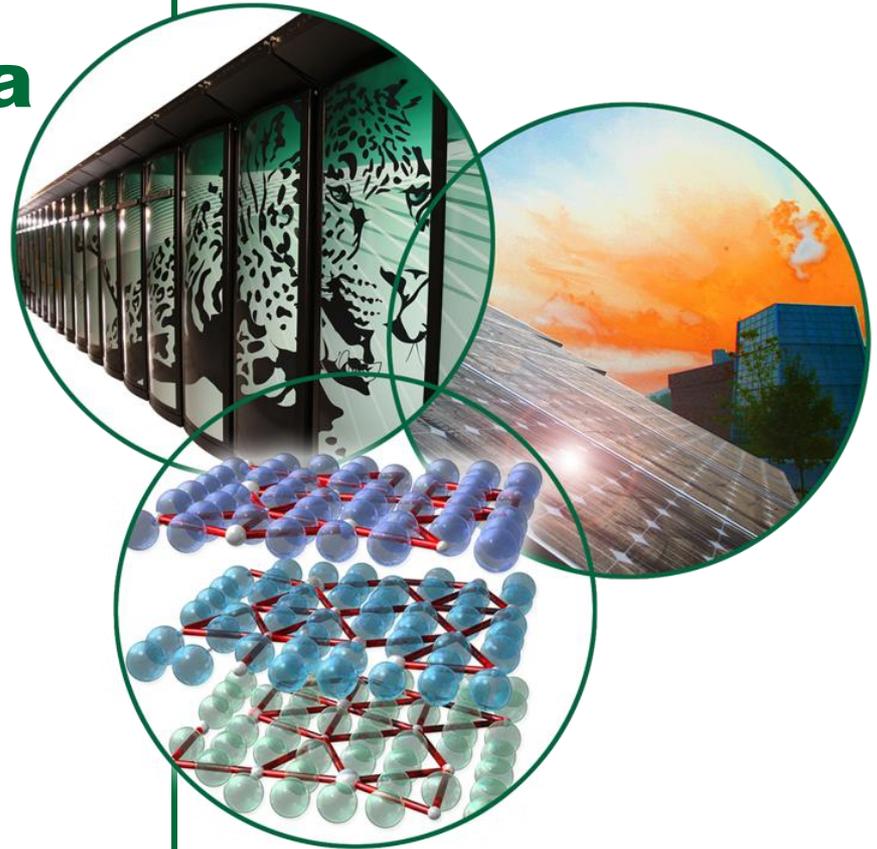


Solar Deployment and Integration in the Greater Knoxville Area

L. Curt Maxey

Solar Energy and Energy Storage Workshop

September 14, 2010



Solar Deployment and Integration - Topics

- **Keeping energy in perspective in a global market**
- **Solar deployment and integration in Knoxville and surrounding areas during the last 3 years**

Sustaining our future is all about how we choose to use and produce energy

We live in a global energy market

Supply is decreasing, demand is increasing

OIL AND GAS LIQUIDS
2004 Scenario

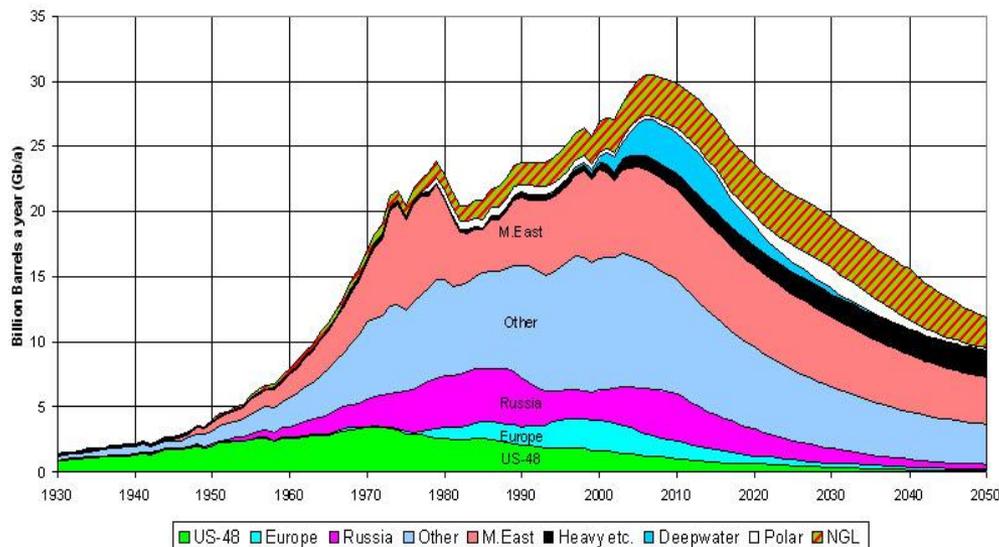
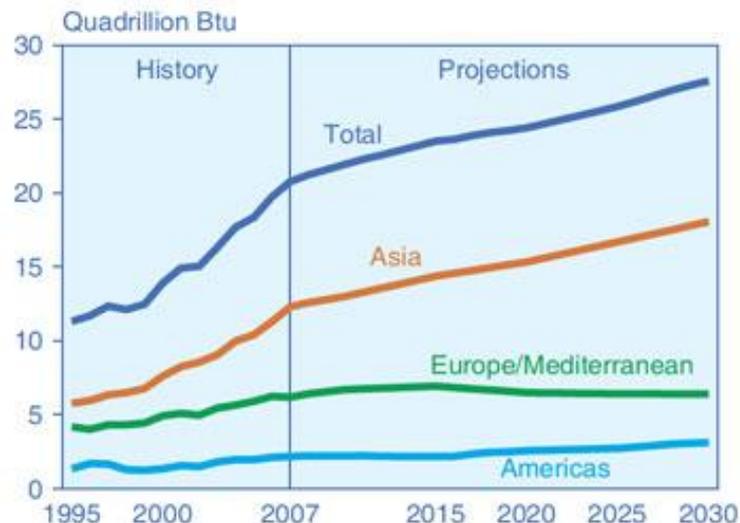


Figure 47. Coal Imports by Major Importing Region, 1995-2030



Sources: **History:** SSY Consultancy and Research, Ltd., *SSY's Coal Trade Forecast*, Vol. 17, No. 1 (London, UK, July 2008); International Energy Agency, *Coal Information 2008* (Paris, France, August 2008), and previous issues; and Energy Information Administration (EIA), *Quarterly Coal Report*, October-December 2007, DOE/EIA-0121(2007/4Q) (Washington,

Our energy future will involve choices about how we use energy, how we fund energy research, and how we “view” energy

Regardless of our Solar Progress, it is important to keep our perspective (domestic use of solar energy has actually steadily declined)

Until recent decades, virtually every home came equipped with a hybrid solar/wind energy system for drying clothes

These systems are now prohibited in almost every neighborhood, especially those with the highest concentrations of hybrid automobiles ...



Assuming average annual clothes dryer energy usage at about 1 MWh[†] per household, the energy offset of a clothesline is comparable to installing a 750W solar PV system*

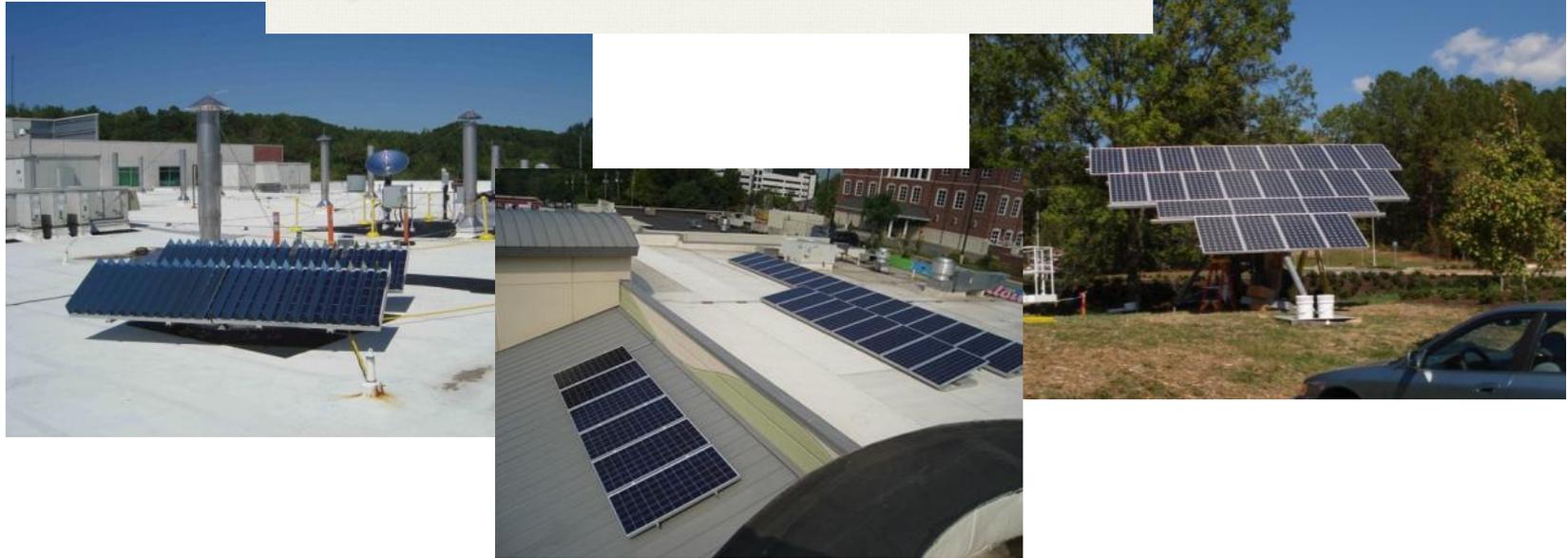
*based on typical Knoxville solar data

[†] http://www.eia.doe.gov/emeu/reps/enduse/er01_us_tab1.html

Local Solar in 2007

- Knoxville area begins year with ~15 kW of grid-connected PV
- 5.25 kW of PV installed on Mellow Mushroom (Sept.)
- ORNL installs 750 W low-concentration research tracker (Sept.)
- ORNL installs 4.2 kW tracking array on campus (Sept.)
- ORNL hosts *Southeast Solar Summit* (Oct.)
- Work begins on Solar America City proposal for Knoxville

Local Solar in 2007



A good year – Area solar capacity increases by 68% to end the year at over 25 kW of grid-connected PV

Local Solar in 2008

- **Knoxville named Solar America City (Mar.)**
- **Domestic 1.3 kW array added (May)**
- **ORNL installs 51.25 kW solar array (Sept.)**
 - **2nd largest PV array in TN at that time**
- **Solar America City kickoff (Oct.)**
- **Plans begun for a 5 kW array as part of new Knoxville Transit Center**
- **Hemlock Semiconductor announces plans to locate in Clarksville, TN**

Local Solar in 2008

Solar America Cities: Jumpstarting Knoxville's Sustainable Solar Energy Infrastructure



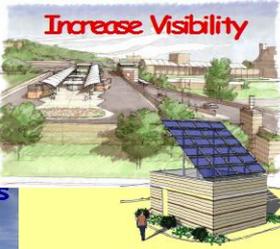
CITY OF KNOXVILLE
BILL HASLAM, MAYOR



Educate Citizens

- Design and finance educational displays to accompany existing displays in the community
- Develop materials to explain solar power technology and financing options to citizens.

Increase Visibility



- Survey local market for companies focused on solar, renewable energy, and energy-efficient technologies and the challenges they face.
- Develop high quality solar installation certification courses for local contractors.
- Create technical training programs for relevant city and utility staff to expedite permitting and inspection process.

Strengthen Local Markets



- Incorporate solar technology in visible municipal projects such as the new Downtown Transit Center (above) and Community Development housing plans.
- Demonstrate to public that solar power is attractive, economical, and productive.

Inspire

- Model success
- Share ideas, s
- with other co
- power throug



Another good year – Area solar capacity increases by 208% to end the year at almost 78 kW of grid-connected PV

Local Solar in 2009

- Knoxville SAC team hosts a series of solar educational workshops for community and business audiences
- ORNL adds 2.5 kW domestic PV at Campbell Creek research homes
- Southern Alliance for Clean Energy's president Steven Smith adds 7.1 kW domestic PV
- Efficient Energy of Tennessee adds 24 kW PV system
- Wampler's Sausage (Loudon Co.) adds 24 kW PV
- Additional domestic PV in adjacent counties ~11.3 kW
- Wacher Chemie announces plans to locate in Cleveland, TN
 - *TN poised to become world's largest supplier of polysilicon*

Local Solar in 2009



Another good year – Area solar capacity increases by 88% to end the year at over 146 kW of grid-connected PV

Local Solar in 2010

- **Confluence Solar announces plan to locate in Clinton, TN**
- **Sustainable Future completes 22 kW commercial PV install**
 - largest in Knoxville city limits when completed in April 2010
- **Knoxville finalizes plans for 120kW PV on convention center**
- **ORNL installs 30 kW on new Laboratory Building**
- **ORNL installs 50 kW on solar-assisted electric vehicle charging parking lot (by end of year)**
- **Knoxville completes Transit Center with 4.8 kW array**
- **Knox Co. installs largest solar water heating system in the region at Detention Center (300 collectors; 14000 gallon/day capacity; \$60k per year saved in natural gas)**
- **Natural Energy Grp. with EETN installs 1MW solar PV in Knox Co.**

Local Solar in 2010



The local area has experienced a 5000% increase in grid-connected solar capacity in the last three years

Summary:

Comments from a local solar installer

(Harvey Abouelata, with Efficient Energy of Tennessee)

- Three years ago I was working with a solar company developing their sales and marketing plan. We were very focused on small mostly off grid systems
- That year we sold about 25kW and had a typical installed cost of \$10.50/W
- The following year our business went from the 2-5 kW off grid systems to 19-21kW grid tied systems for small businesses - we sold about 250kW and by the end of the year we could easily install a system for around \$7.50/W
- This year we already have 1.8MW of Solar PV under contract! I think we will be around 2.5 MW [for the year]. We recently installed 1 MW system in less than 12 weeks. On the larger systems we have gotten as low as \$4.65/W
- I am not sure we will see these dramatic changes over the next three years – but if we do Solar will be in every home across our state