Concentrating Solar Power Dish Systems

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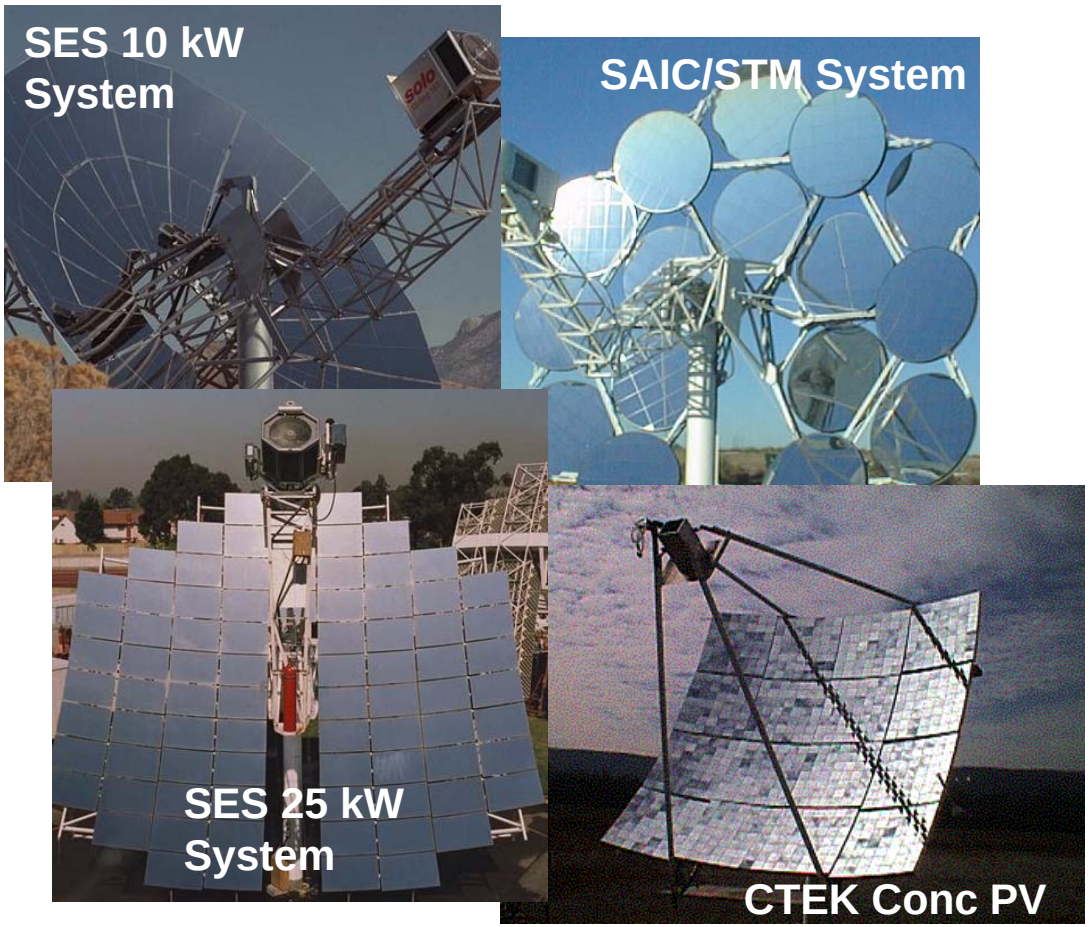
What are Dish Systems?



Characterized by:

Tracking Concentrators

Receiver, engine, PV generator at focal point

Capable of hybrid operation

Primarily Stirling engines but evaluating concentrating PV

SES 10 kW Systems

Dish Systems are …..

- Modular (10 to 25 kW) deployable in fields of few kW to MWs
- Low-cost deployment due to modularity compared with trough and power tower systems
- High performance achieving 23 – 25% annual conversion
- Currently at prototype stages of development

What is current status?

- Operating 6 systems in U.S.
- Accumulated > 40,000 hours on sun
- generated > 300 MWhrs
- Demonstrated hybrid operation solar or gas on natural gas, hydrogen, and landfill gas
- Demonstrated remote (non-gridtie) operation
- Reliability needs improvement
- Manufacturing improvements needed

What are barriers?

Technical Barriers (performance)

- Installed Cost (tech. and production levels)
- Operating Costs (tech. and reliability)

Reliability database under development. Data will guide future R&D needs. The problem is that 10s or 100s of systems are needed to develop the data.

Solution – leverage prototype deployment opportunities.

What are costs?

Installed Cost

- Current Prototype Costs ~ $10,000/kW
- Intermediate targets -- $2500 – 3500/kW
- Long-term goals < $1200/kW

O & M Costs

- Current O & M at prototype costs
- Intermediate targets – 1 – 2 ¢/kWhr
- Long-term goals < 1 ¢/kWhr

Potential cost reductions?

Solar Concentrators

- Advanced, lower-cost designs to reduce construction and installation costs
- Optical surface development
- Concentrator azimuth drives
- Cleaning and maintenance issues

Status: conventional glass and metal construction; mass production could reduce installed costs by factors of 4 to 6; O&M centers on cleaning reflectors.

Potential cost reductions?

Engines/converters

- Engine focus on solar-specific issues
- Engine seals and controls need work
- Tubular receivers potentially replaced by lower maintenance heat pipes
- Evaluate advanced converters (cpv and microturbines)

Status: Engine cost reductions by factors of 10 – 20 possible with mass production for other applications.

Potential cost reductions?

Balance of System

- Prototype, diagnostic controls need to be turned into field-level commercial controls
- Design for shipping, installation, and repair
- Controls for deployment of multiple systems at a single location
- Operational strategies for single and multiple systems
- O&M strategies and procedures

Bottom Line on Dish Systems

- Over the past 5 years, DOE, labs, and industry have made significant progress
- Still much to be done on reliability and manufacturing cost reductions
- Advanced components will improve reliability and simplify systems
- Potential applications in niche market situations including remote, small village, and high-value applications.