UNLV
Center for Energy Research

Concentrating Photovoltaic Projects at UNLV

Rick Hurt
Research Engineer
University of Nevada, Las Vegas
Center for Energy Research

Research at the UNLV Center for Energy Research

Research Areas Include:

- Concentrating Solar Technologies including:

  -Solar Dish Stirling,

  -Concentrating Solar Thermal,

  -Concentrating Photovoltaics,

  -Solar Hybrid Lighting,
- Energy Efficient Homes,
- Building Technologies,

Research at the UNLV CER

Research areas continued:

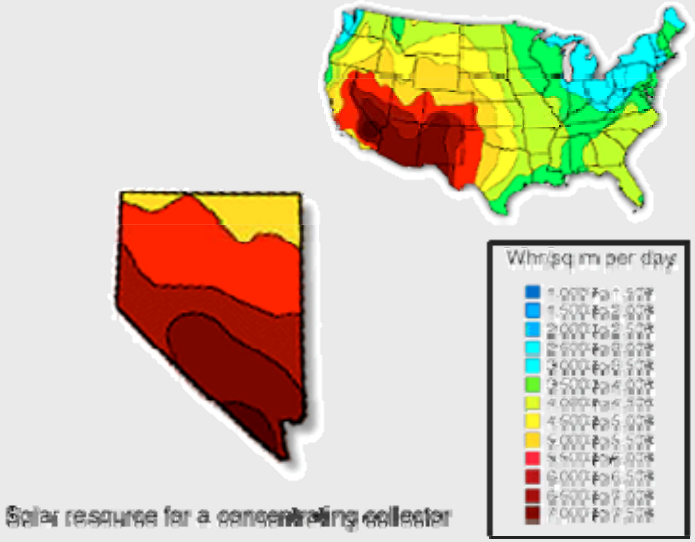
- Hydrogen Technologies including:

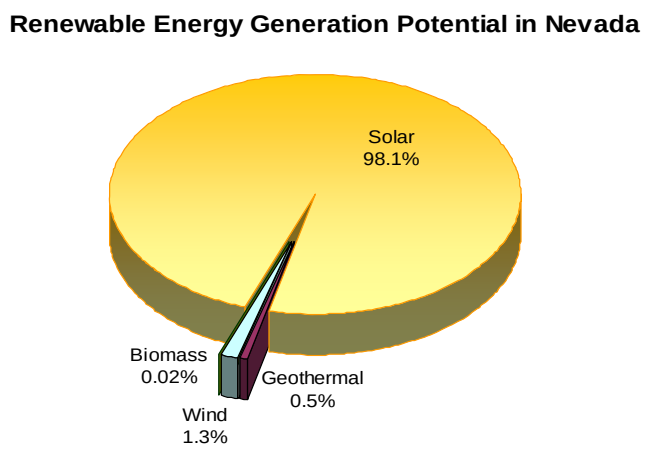
  -Photo electrochemical Hydrogen Generation,

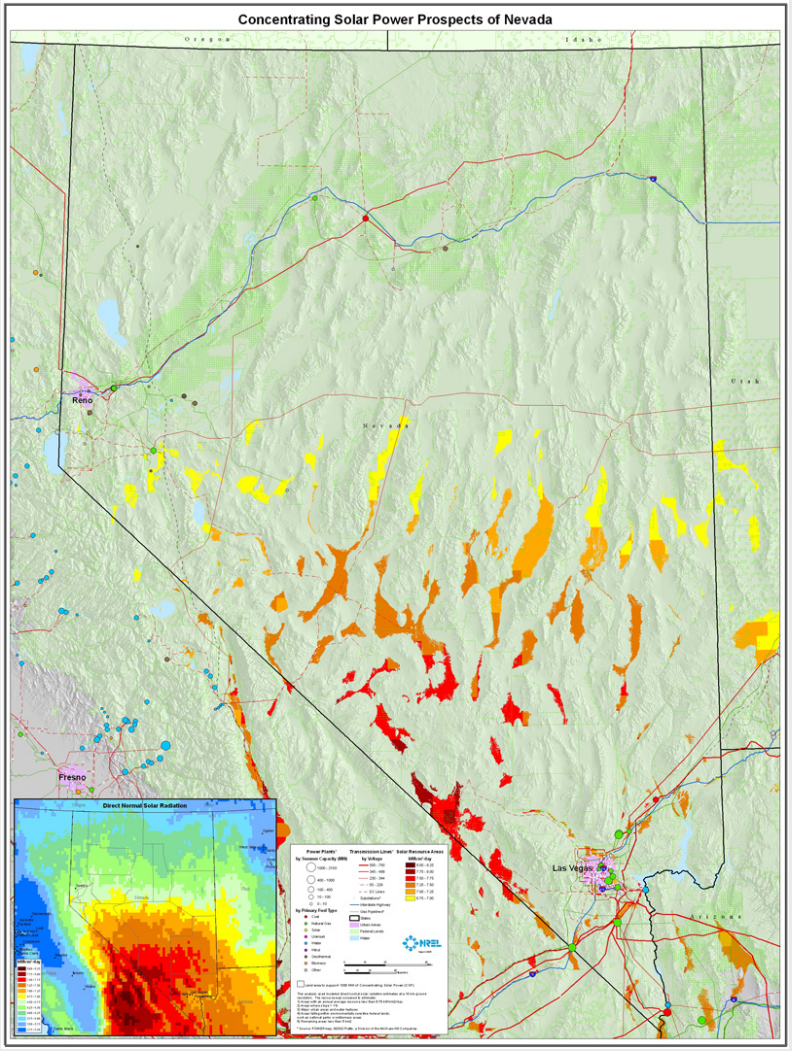
  -Renewable Hydrogen Generation (Filling Station),

  -Hydrogen Vehicle Conversions,
- Modeling and Computational Methods,
- Resource Assessment.

Concentrating Solar Potential in Nevada







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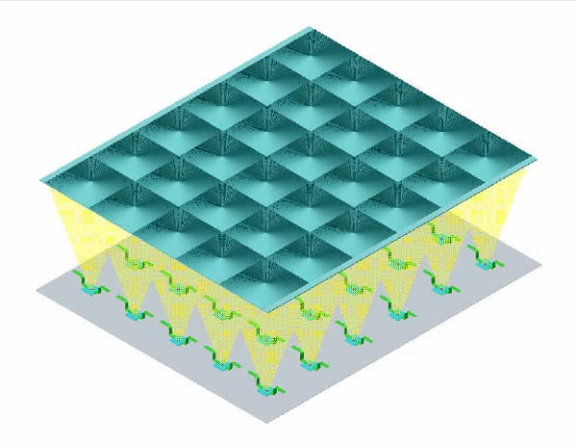
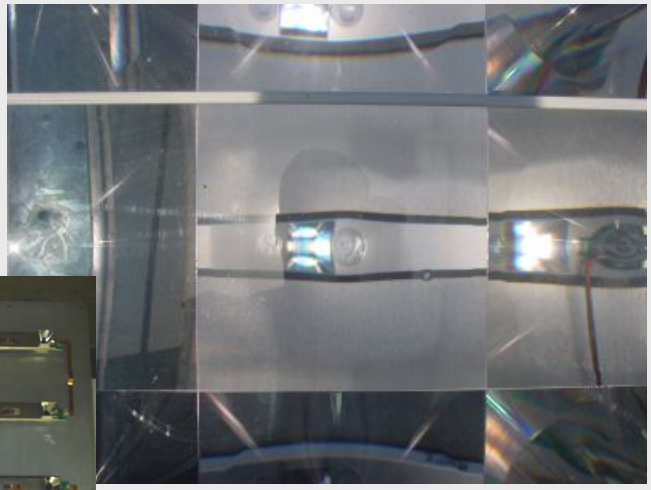
Concentrating Photovoltaic Projects

Amonix High Concentrating Photovoltaic (HCPV)

- Project began in 2003
- 25kW installation
- Objectives
  - Generate a data base for MTBF/MTBI
  - System characterization
  - Test bed for testing new advanced technologies



Amonix HCPV



System Description:

- 21” module depth
- Fresnel lense that has 24 lenses in the parquet.
- Geometric concentration ratio of 250:1

Amonix HCPV

Advanced Module Testing

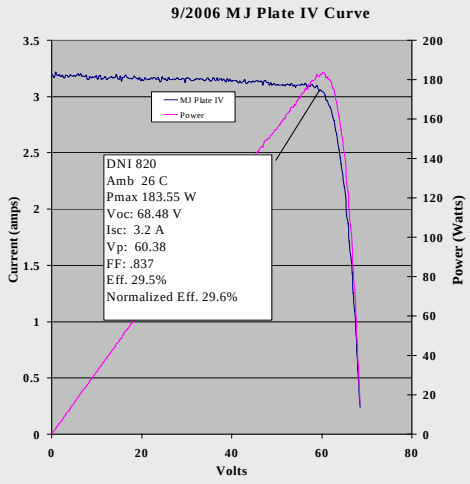
- Next Generation MegaModules using less materials, higher concentration ratios, and will allow reductions in fabrication of tracking system.

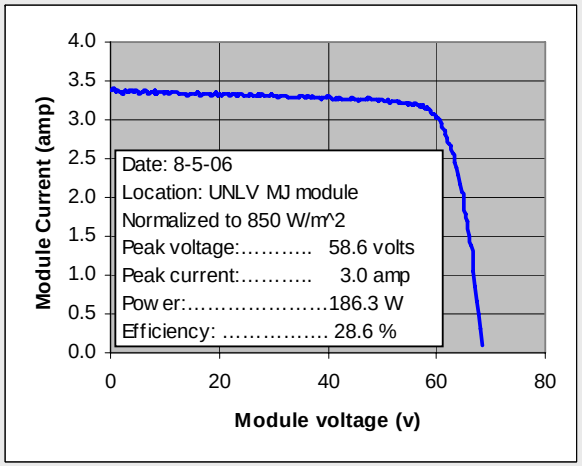
Amonix HCPV

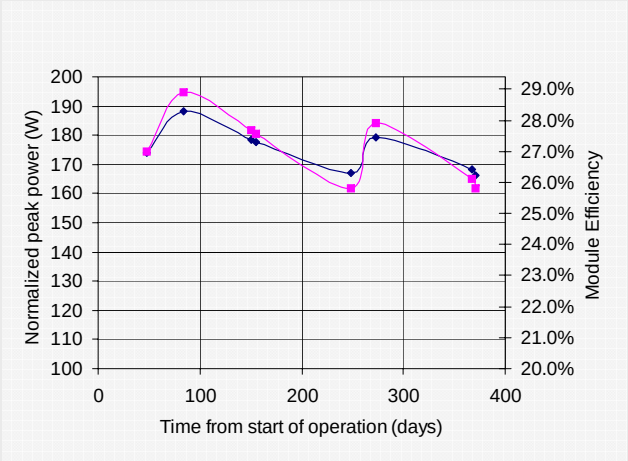
Advanced Module Testing

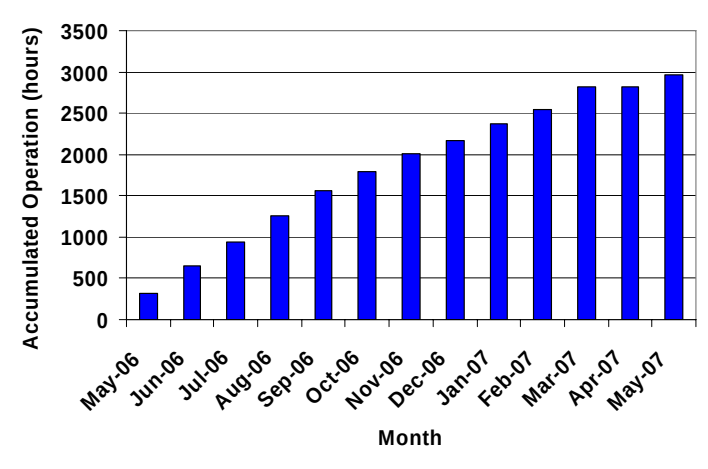
- Multijunction cells
  - Potential installed cost reduction,
  - More energy generated per area,
    - Spectrolab cells (~35%)
    - Amonix cells (~25%)
  - Stable operation under high flux densities,
- Individual solar cell packages
  - Void free soldering,
  - Improvements in the packaging process.

Amonix HCPV









- The module has been in on-sun operation for over 2900 hours
- Efficiencies ranging from 25% -29.6%.

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Amonix HCPV

Other UNLV CER assisted Amonix Projects:

- Nevada Power Company Clark Generating Station 75 kWe installed

  - system monitoring, operation and maintenance,

  - resource monitoring and assessment,
- Southern Nevada Water Authority up to 1 MWe to be installed.

Amonix's ongoing Spain installation is shown.

Evaluation of Advanced PV Cells for a Concentrating PV Dish System

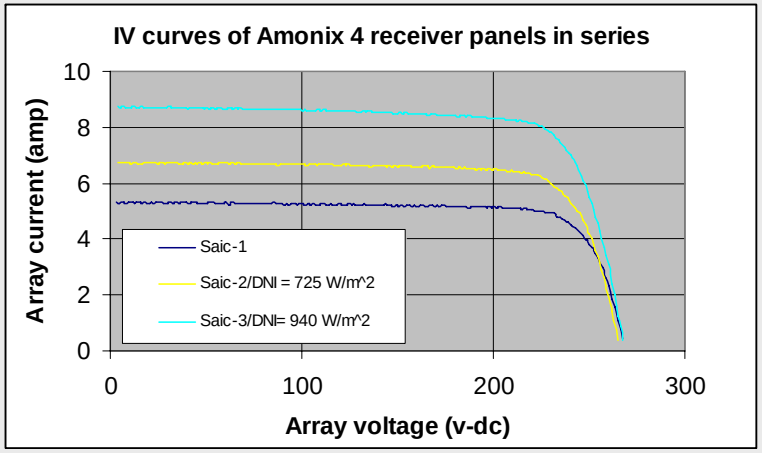
- DOE/NREL funded project,
- System uses Amonix's HCPV cells mounted on a water-cooled receiver assembly,
- Receiver mounted on air-cooled radiator package,
- Science Applications International Corporation (SAIC) dish refitted with fixed-focus mirrors.

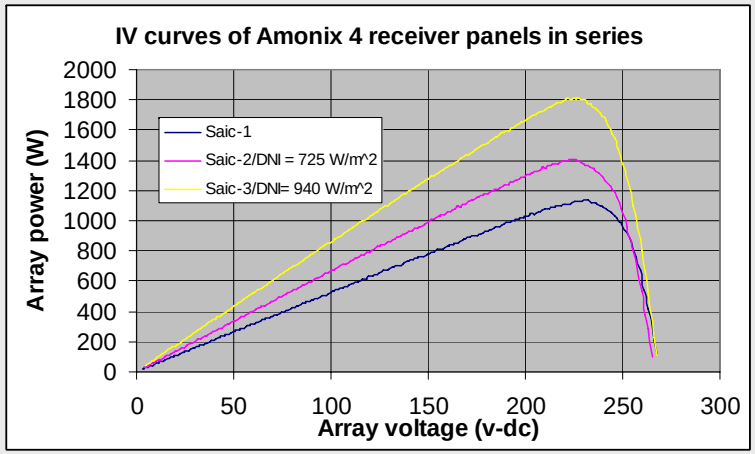
Concentrating PV Dish System

- Receiver assembly optimized by UNLV researchers and fabricated at NREL,
- Insulation and cells installed by Amonix,

  -triple junction cells were proposed but not available during assembly,
- Radiator package designed by SAIC, optimized and assembled by UNLV,
- 7 day (50 hour) testing by SAIC and UNLV CER researchers recently completed.

Concentrating PV Dish System





- Methods developed to laminate cells and electrical insulation on cooling surface, cell soldering techniques were tested and perfected during initial assembly,
- Flux distribution during first phases of testing caused poor performance,
- System reconfigured and retested,
- I-V characteristics run on cells with positive results,
- Testing has been completed and is being evaluated by SAIC and NREL.

Current and Future Work at UNLV CER

- Large Amonix installation at the SNWA has been proposed and in negotiation, site is available for research, development, and demonstration projects at large secure pumping station.
- New testing facility in Eldorado Valley with CSP thermal loop. Project is before the city council for approval. Site is available for CPV projects.
- Discussions with El Dorado Energy for locating systems at large combined-cycle plant education/solar PV facility. Site available for research, development, and demonstration projects.

Information on the
UNLV Center for Energy Research
is available on the web at
www.cer.unlv.edu
with links to project websites.

Questions?