SIERRA NEVADA AUTOMATED SOLAR PANEL CLEANING SYSTEM
PROBLEM
- Dirty Panels
- Decreased efficiency
- Not aesthetically pleasing

PREVIOUS METHOD
- Takes two individuals three weeks to clean panels (biannually)
- Cost $10,000 per year
- Dirty within weeks
- Few available commercial options

ALTERNATIVES
One commercially available alternative with:
- Inferior panel coverage
- No control system

SOLUTION
- Automated solar panel cleaning system
SPECIFICATIONS

• Maintain 90% of current maximum power output

• 5 year payback period

• Reliable
  • Stress system in initial testing to find weak points

• 10 year Life Expectancy
  • Inherent in part selection

• System must not operate between 12pm-6pm

• Withstand local weather extremes
  • $-12 \leq T \leq 47$ degrees C

• Fully Automated

• Aesthetically Pleasing
DESIGN CHANGES

• Bracket eliminated from design

• Switched piping from HDPE to UV-Resistant SolarBlock

• Changed controllers from MicroLogix1400 to Arduino Mega

• Forced to use city water instead of R.O. water

• Size of prototype installation decreased
DESIGN SOLUTION
DESIGN SOLUTION

• Water Delivery
  • City water from hose bib
  • 2” UVR Piping
  • TeeJet v-10 nozzles

• Mounting
  • Simple Bracket
  • Economical

• Controls
  • Arduino Mega
  • Calibration Cells
  • Rain, Freeze, Wind Sensors
  • Valve Relay Boards
DESIGN SOLUTION

- 2" Main
  - Hunter PGV-201 Solenoid Valves
  - Compression fittings to allow for panel rotation and maintenance
  - Pipe Blocks
DESIGN SOLUTION
FABRICATION

- Simple Processes
- Cutting pipe to pre-determined lengths
- Gluing pipe
- Assembling fittings with Teflon tape
- Mounting to panels
- Wiring
### TESTING

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- Currently not completely tested
- Delay in design freeze led to delayed installation
- Testing planned to be completed by 5/18/13
FULL SCALE BUDGET

Total Cost (10,000 Panels)

- Labor: $108,000.00
- Material: $64,709.30
- Purchased Parts: $571,960.09
ANNUAL USAGE

- **Water Usage**
  - 2 gallons per cycle (30 seconds), bi-weekly
  - $491.92

- **Electricity Usage**
  - 2 amps per cycle, bi-weekly
  - $1.25

- **Energy Savings @15% increase**
  - $549.72

- **Overall Savings**
  - $56.55
REFLECTION

• Large water consumption

• Collection and reuse method needed

• Design changed vastly over the scope of the project

• Issues with compression couplers (suggest union joints instead)
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  • Dr. Mehl [CSUC]
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• Rusty Sage [Gestamp Solar]
  • Ben Wilson [JW Wood]
• Josh Brannon [PBM Supply]
  “Sprinkler Dave” [Chico Sprinkler]
CONCLUSION

- Efficient and easily expandable system
- Effective cleaning method for maintaining cleanliness
- Meets and exceeds design specifications
QUESTIONS?