RE<C: Heliostat Design Principles

Here are a few of the design principles we used when designing our heliostat system:

Use smarter software to drive down hardware cost: If it's possible to reduce mechanical costs (including materials used, complexity, and tolerances) by using low cost electronics and capable software/controls, it's probably worth it from a business standpoint.

Prioritize factory assembly over on-site construction: Shifting most of the assembly processes to the factory increases quality and decreases deployment time. Decreasing field assembly time decreases the overall time required to build a heliostat field.

Minimize or automate field calibration: Field calibration adds costs to each heliostat and increases the amount of time required to deploy a heliostat field. Building software processes that automate heliostat calibration eliminates the need for more on-site work.

Future cost trends influence design choices today: Technologies like CSP take up to several years between design and implementation, and cost trends over this time period have to be taken into account. Cost trends we closely watched included:

- Raw materials (steel, aluminum, copper, concrete) will likely go up as demand grows worldwide.
- It's unclear how labor rates will change, however factory labor rates will continue to be lower than field labor rates on an hourly basis.
- The cost of electronics, sensors, processors, and network connectivity will go down significantly. While Moore's Law doesn't directly apply to the overall cost of solar, it does apply to the electronics within solar systems.

Accept design choices that reduce performance, if there's a net win on cost: Our analysis suggested that the difference in performance between a conventional heliostat and a less expensive, lightweight heliostat design was negligible. The most notable difference was performance during high-winds, which are rare and thus of minimal significance over all. Our conclusion was that the larger cost savings exceeded the threat from occasional profit loss due to reduced performance.

Design for long term success, ignore short term incentives: Subsidies for new technologies like concentrated solar power (CSP) diminish over time. However, without subsidies, CSP required at least a 20% reduction in cost to be economically compelling. With this 20% reduction goal set, we focused our design on riskier approaches that could be viable in the long term, without subsidies.