Green Parabolic Trough Collector (GPTC)

Inspired by an architectural paradigm

Philip Gleckman, Sunvapor, Inc.
Overview

• Principal Investigator: Philip Gleckman, Sunvapor, Inc.
• Project Partner: Prof. Caitlin Mueller, MIT Dept. of Architecture
• Total Project Budget: $2,175,937
• Project Duration: Two years
Objective

- Demonstrate disruptive reduction in the cost/performance ratio of the collector to enable steam sales...
  - at < $7/MMBtu
  - with an IRR > 10%
Problem statement

Single axis parabolic troughs collectors (PTCs) are CSP’s Gold Standard with 85% installed capacity

- *But power plant levelized cost is still too high*
Problem statement: Collector cost

- Single axis collector performance cannot be significantly improved but there is a significant opportunity to reduce the cost

Need for fresh perspective

(2013)

(1913)
“Digital structures” architectural paradigm

Structural design
- Materials
- Typologies
- Sizes
Value proposition

• We have proposed three surprising features to reduce structural cost:
  ➢ Use of a lower cost, low embodied-energy structural material
  ➢ A new material-efficient structural typology
  ➢ Low-cost manufacturing processes
• We propose a GPTC that meets COLLECTS goals with <$50/m^2 and >55% annual optical efficiency
## Milestones and Results

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| Year 1 | • Lab tests of subassemblies combined with full scale computer models demonstrate 90% intercept factor for Solar Collector Array (SCA) in worst-case operational wind  
  • Accelerated testing for 30 years equivalent does not lead to significant reduction of intercept factor  
  • Cost estimate using supplier quotations consistent with $50/m² |
| Year 2 | • Outdoor testing of Solar Collector Element yields intercept factor > 95% over 90 days  
  • Total installed cost estimate < $50/m² based on actual assembly & installation  
  • Complete SCA predicted to have >55% annual efficiency |
Path to Market

Nearest term market is solar process heat in the USA

Steps following Phase 2:

• Install new collectors to augment capacity at existing process heat plant owned and operated by Sunvapor
• Achieve Solar Rating and Certification (SRCC) for steam production
• Perform sufficient testing to be able to offer warrantee on performance
• Deploy for new projects