

# Hybrid Ground Source System Analysis and Tool Development

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Ground Source Heat Pumps Demonstration Projects

## – Timeline

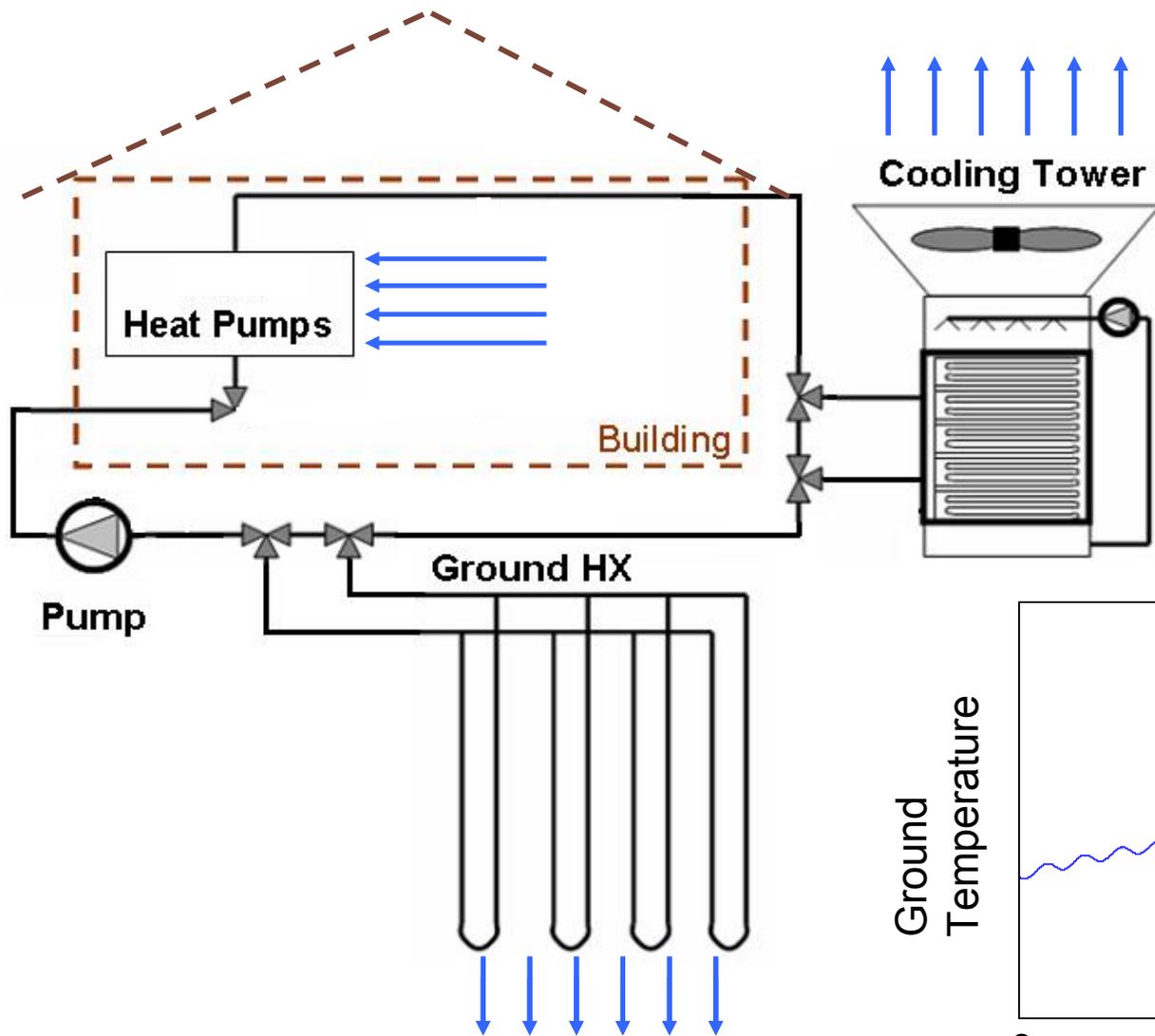
- Start: December 2010
- End date: June 30, 2010
- Percent complete: 20%

## – Budget

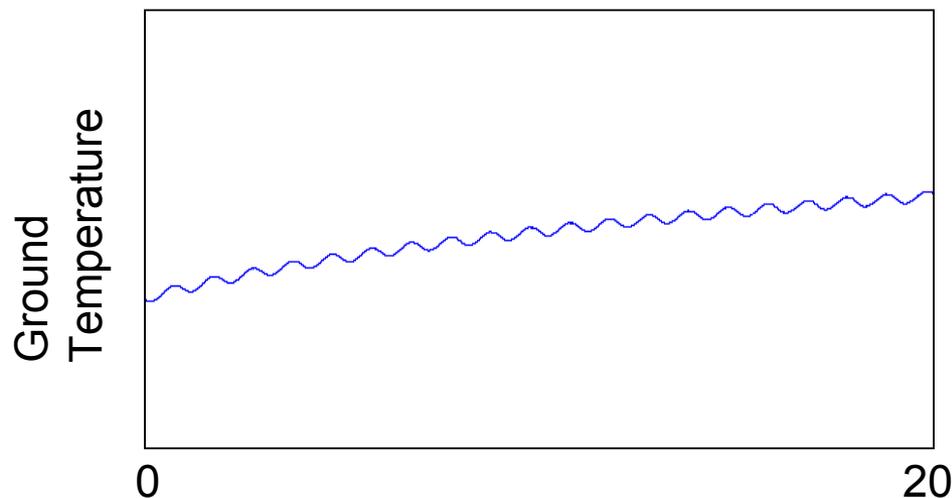
Total project funding	\$246,000
DOE share	\$190,395
Awardee share	\$55,605
FY09: Funding received	\$0
FY10: Estimated funding, DOE	\$142,796
FY10: Estimated funding, awardee	\$41,704

## – Partners

- University of Wisconsin – Madison  
Solar Energy Laboratory



**Hybrid ground-coupled heat pump (HyGCHP) system**



## Objectives

1. Compile filtered hourly data for three monitored hybrid installations.
2. Validate existing HyGCHP model.
3. Refine and enhance the HyGCHP model (usability / capability).
4. Demonstrate impact of actual hybrid installations.
5. Report lessons learned and impacts of HyGSHPs to design/engineering community.

## Impact

Better understanding of design and savings of HyGCHP



Further penetration of ground source heat pump systems



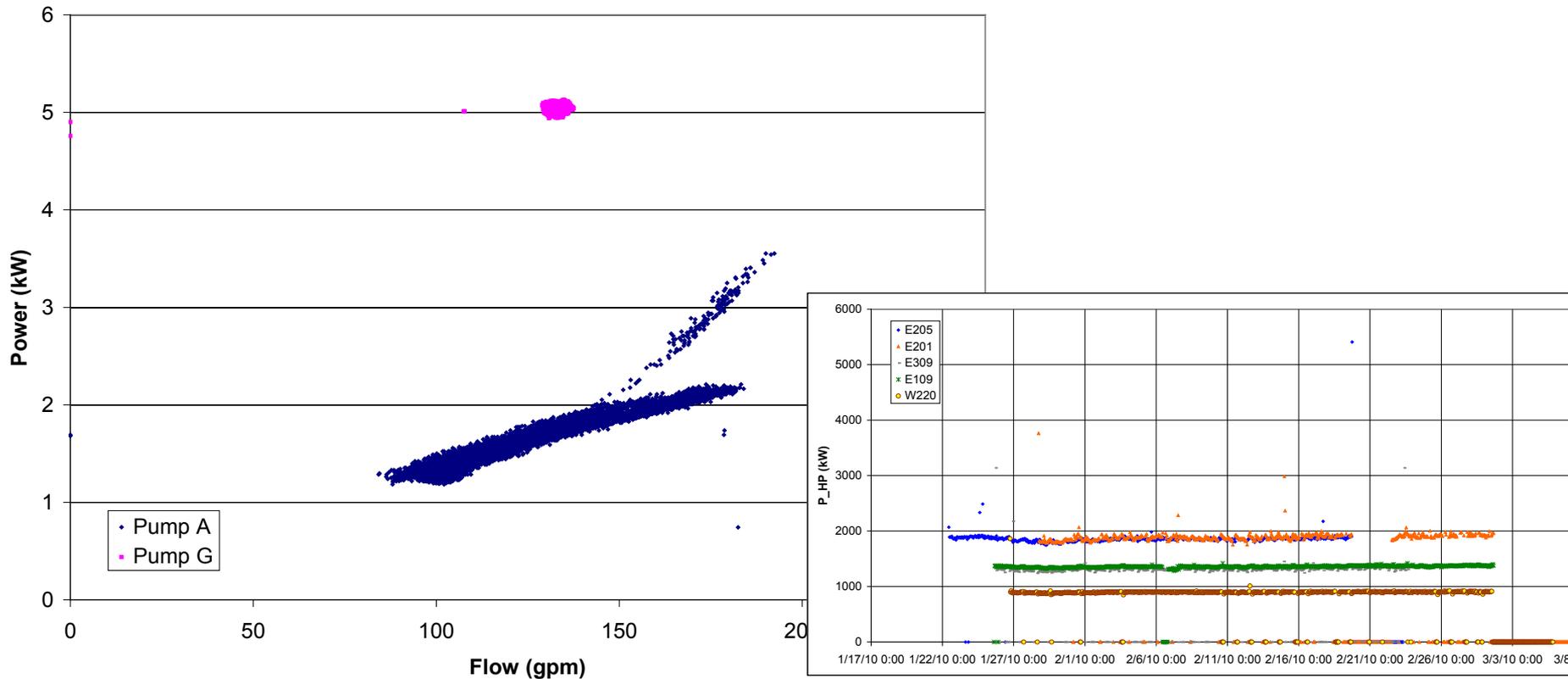
More efficient building stock

Plus, better hybrid installations...

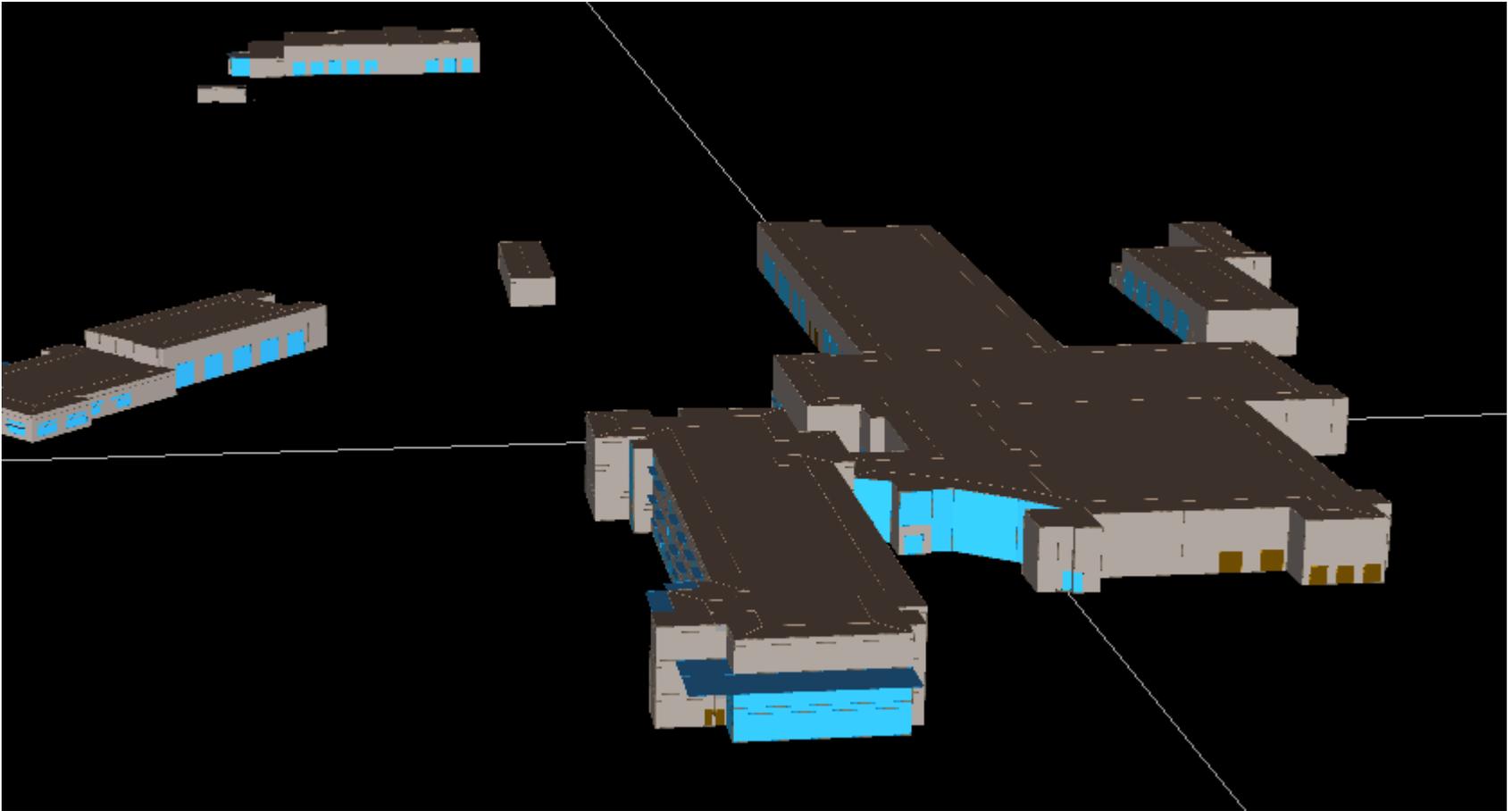
1. Collect data at building sites (following IPMVP guidelines)
2. Model buildings (using calibrated eQUEST models)
3. Validate HyGCHP model using input:
  - a) Loads from building model
  - b) Third-party thermal conductivity / temperature tests
4. Improve HyGCHP for additional usability / capability
5. Use model to demonstrate impact (energy, economic/LCC, and emissions) of hybrid system for monitored buildings
6. Report to the engineering/design community

- Actively monitoring systems in three hybrid installations
  - 2 Las Vegas, NV sites, via building DDC system
  - 1 Madison, WI site, via installed monitoring equipment
- Initial data has been validated
  - Flow
  - Temperature
  - Power consumption: heat pumps, pumps, towers, other
  - Other data, needed for model calibration

- Actively monitoring systems in three hybrid installations
- Initial data has been validated



- Building models constructed



- Calibrate building models, then validate HyGCHP (by December 2010)
- Increase usability and capability of HyGCHP (by April 2011)
  - Better interaction with DOE2.2/eQUEST
  - Other usability improvements
  - Add other hybrid configurations and controls
  - Add night-cooling

- Demonstrate cost impacts, performance, lessons learned for actual installations (by December 2010)
- Report to the engineering community (by June 2010)
  - Conclusions (lessons learned, impacts)
  - Distributable version of HyGCHP model
  - Collected raw data from three building sites

- Energy Center manages all aspects of project, also:
  - completes building models
  - conducts simulations
  - writes reports
- UW Solar Energy Lab
  - conducts HyGCHP validation
  - improves HyGCHP usability and capability

- Milestones and Go/No-go:
  - Quality monitored data .... 
  - ( Valid HyGCHP model .... late summer 2010 )
- After technical completion ('deployment')
  - Create case studies of three installations
  - Release sub-hourly data set for all three installations
  - Market HyGCHP model (free, open source)
  - Release public report on hybrid impact, lessons learned
- Future research?

- Hybrid systems show potential for increasing ground-source heat pump deployment
- This project will generate two items required for more progress:
  - 1) general models and
  - 2) specific, well-publicized demonstrations.