Lake Elizabeth Micro-Utility

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Charles Isaac, Principal Investigator

Skychaser Energy, Inc.

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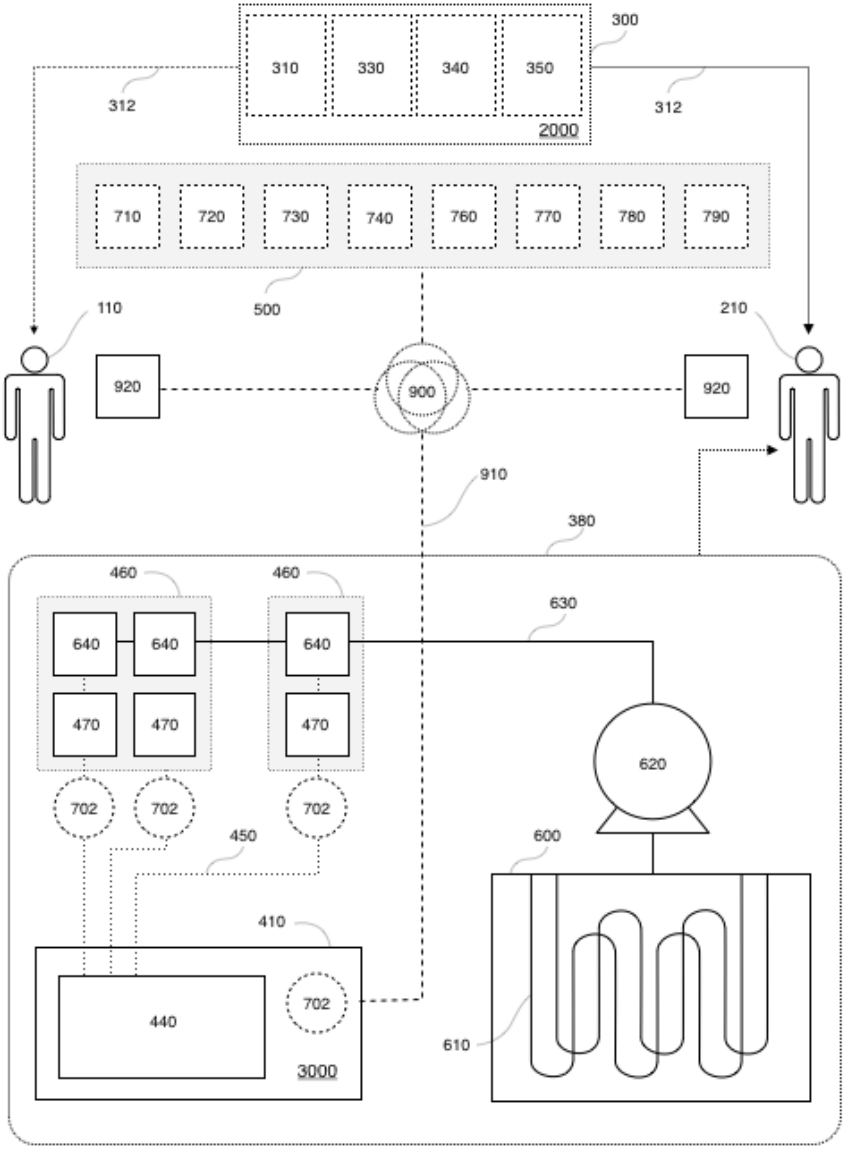
U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy



Project Overview

- New construction project consisting of 12 residential condominiums in a single 33,270 sq ft multi-story structure; 72-tons heating cooling
- Timeline
  - Project start date: 10 January 2010
  - Project end date: 12 October 2012
  - Less than 5% complete
- Budget
  - $788,956 Total project funding
  - $325,124 DOE share
  - $463,832 Awardee share
  - $0 received in FY09
  - $258,450 projected funding for FY10

Project Overview

- Barriers
  - GHP players compete in a fundamentally asymmetric market
  - High ‘first cost’
  - Fragmented market
  - Lack of scale
  - Competes within and against standard HVAC paradigm
  - A ‘one-off’ service model
  - Low probability of extracting additional energetic efficiencies (i.e., beyond incremental)
  - Energy efficiencies alone do not change the NPV analysis for decision makers
- Partners
  - Rockwell Automation

Relevance / Impact

- Demonstrate replicable systems, methods, and apparatus that transform the Net Present Value calculations used to determine the HVAC purchasing decisions of property owner developers
- Define a new industry service category in which property owner developers and end-user customers can purchase geothermal space conditioning, secure long-term discounts on the cost of energy services, eliminate maintenance costs, while substantially reducing HVAC-related carbon emissions
- Establish the use of certain special purpose contractual instruments as both a demand aggregator and project cost recovery mechanism
- Establish the use of certain special purpose contractual instruments that provide for the long-term delivery of efficient thermal energy
- Develop distribution and transactional control systems for remote administration, support, and billing

Scientific / Technical Approach

- New construction project consisting of 12 residential condominiums in a single 33,270 sq ft multi-story structure; 72-tons heating cooling
- This effort exploits price discrepancies between commercial energy rates and geothermal space conditioning efficiencies to advantage the creation of a new service category
- Business and financial innovations secure both a revenue and an asset base
- Technology innovations provide the control and cost recovery mechanisms
- The applied technologies serve specific business goals:
  - Provide administrative control over major system components
  - Support variable pricing models;
  - Collect run-time data; compute utilization;
  - Process end-user transactions; provide for granular reporting
  - Facilitate automated end-user support

Accomplishments, Expected Outcomes and Progress

- 2010 Primary Task Schedule

Milestone	*Start*	*Complete*	*Status / Dependencies*
2.0 Finalize Agreements			
2.1 Special purpose contractual instruments	02.09	05.31	In progress; subject to legal review
2.2 Service agreements	02.09	05.31	In progress; subject to legal review
3.0 Engineering Design			
3.1 Geothermal design	10.01	11.01	Scheduled
3.2 Mechanical system design	10.01	11.01	Scheduled
3.3 Prototype thermal energy control hardware, sensor integration	04.02	06.30	In progress; subject to schedule and resources at Rockwell Automation
3.3.9 Thermal energy control hardware release	06.30	09.30	Planned; subject to unit testing and QA results
3.4 Prototype admin system	05.22	06.30	In progress; subject to API documentation and support from Rockwell Automation
3.4.9 Admin system release	06.30	10.29	Subject to unit testing and QA results

Project Management / Coordination

- Q1 efforts for the Lake Elizabeth Micro-Utility project focused on four activities:
  - Recalibrating project plans based on unexpected budget revisions and fewer available resources
  - Draft and review of key agreements
  - Prototype logistics, and
  - Administration
- Q2 and remaining 2010 efforts are directed to:
  - Completing hardware and software prototypes
  - Completing GHP loop and mechanical design
  - Commencing with GHP installation
- National Geothermal Data System
  - Functional specification requirements for admin software prototype include provisions to supply NGDS data in an appropriate format
- Senior management draws from a cross-disciplinary background of seasoned executives with substantial project management experience

Future Directions

- The technical implications of this endeavor are expected to
  - Substantially influence one or more aspects of ground source heat pump manufacturing; and more broadly,
  - Transform the existing price discovery mechanism for geoexchange systems and services,
  - Spur adoption under a new service paradigm
- The business and financial model of the Micro-Utility precludes adopting a goal for reducing levelized cost of electricity
  - Lower energy costs will retard adoption of geoexchange specifically, and ultimately, spur higher consumption

Future Directions

- What's needed as we move forward
  - Hidden subsidies in the retail energy markets necessitate continued correctives to incent property owner developers (the primary decision makers)
  - Because the Micro-Utility is fully replicable, amending the Production Tax Credit to include the generation of electricity "or BTU equivalent" is suggested
  - Loan guarantees to future Micro-Utilities would no doubt further accelerate market transformation
  - A clean energy bond market as a renewable energy project funding mechanism
- Validation
  - This approach has already generated considerable support in the market
  - Several installations are under discussion or actively being pursued

Summary

- The Micro-Utility represents a new service category and paradigm shift that overcomes historic market impediments to adopting geoexchange solutions
- The Micro-Utility is a fully replicable solution that can scale
- Continued DOE support in the form of loan guarantees or clean energy bonds is vital to market adoption
- The Micro-Utility is a game-changing approach with the potential for market transformation