

Review of GSHP Sub-task of US-China CERC-BEE

Xiaobing Liu, Ph.D., CGD, LEED AP

Oak Ridge National Laboratory

9/16/2011

中美清洁能源研究中心地源热泵研发工作

GSHP R&D in US-China CERC

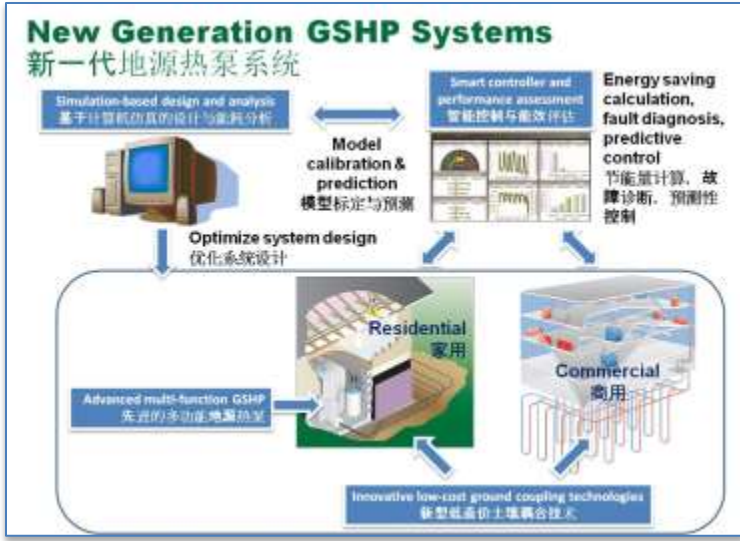


橡树岭国家科学研究院



中国建筑科学研究院, 同济大学, 天津大学, 重庆大学及若干企业合作伙伴

Chinese Academy of Building Research,
Tongji University, Tianjin University,
Chongqing University and industry partners



Joint Work Plan for GSHP

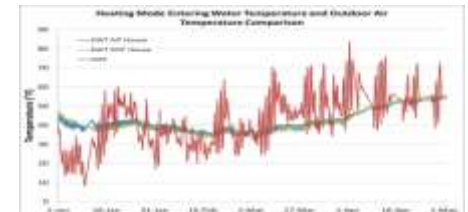
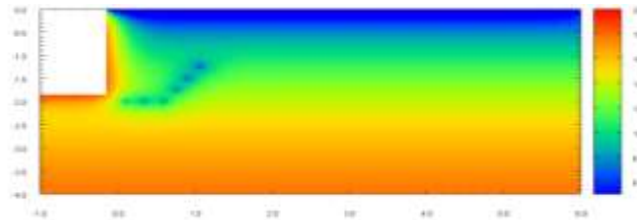
Research Objective

- Compare differences in applications of ground source heat pump (GSHP) technology in China and the U.S.
- Develop methodologies and necessary tools to evaluate the suitability of GSHP applications at various conditions in both China and the U.S.
- Evaluate emerging technologies or products in both China and the U.S., including system configurations, ground coupling technologies, heat pump equipment, monitoring and control systems, and design software that may help break the cost barrier and/or further improve the efficiency of GSHP systems

Proposed Work 1: Innovative Low-Cost Ground Coupling Technologies

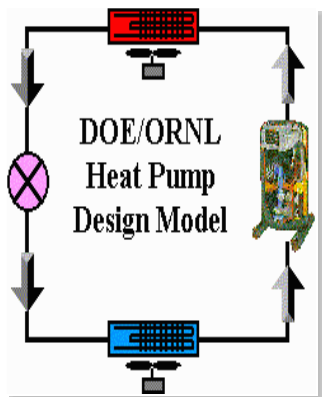
新型低造价土壤耦合技术

- Review emerging innovative low-cost ground coupling technologies
检查现有新型低造价土壤耦合技术
- Develop new designs (if necessary)
开发新设计 (若有需要)
- Evaluate selected designs through analytical and/or experimental analysis
对有潜力的设计通过理论和/或实验分析进行评估
- Document the design and analysis results
汇总设计和分析结果



Proposed Work 2: Advanced Multi-function GSHP Unit

先进的多功能地源热泵机组



Simulation



Lab Test



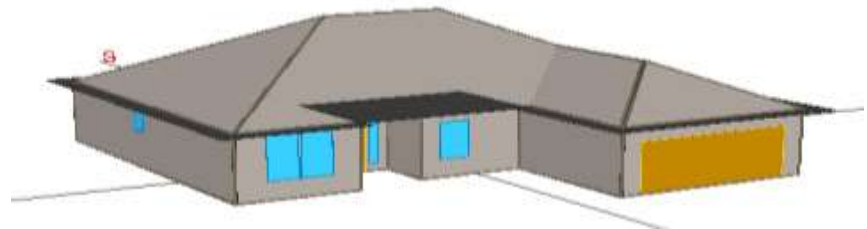
Field Test

- Field test prototype production (ClimateMaster)
现场实测用样机生产 (ClimateMaster)
- Field test of prototype in US & China at various climates and buildings
在中国与美国的不同气候和建筑条件下对样机进行现场实测
- Laboratory test to diagnose problems identified in field tests
在实验室诊断现场实测中发现的问题
- Analyze test results and further improve design
分析测试结果并改善样机设计
- Generate complete performance data
生成完整的性能数据

Proposed Work 3: Integrated Simulation-based Design and Energy Analysis Tool

集成的基于计算机仿真的设计与能耗分析工具

- Integrate models of ground heat exchanger and heat pump with existing building energy analysis program
地源换热器和热泵模型与现有的建筑能耗分析软件集成
- Collect information and built database required for simulation
收集数据并建立计算机仿真所需的数据库
- Validate developed simulation tool through various approaches
对开发的计算机仿真工具用多种方法进行验证
- Develop user manual and training material for the simulation tool
编制该计算机仿真工具的用户手册和培训教材



Collaboration in GSHP

- A delegation of Chinese researchers and industrial partners for the GSHP sub-task of CERC-BEE will visit US in October to meet their US counterparts and discuss the work proposed in the joint work plan
- A session dedicated for the Chinese delegation to present the status and experience of GSHP applications in China will be held in the 2011 International Ground Source Heat Pump Conference in the US (Oct. 5-6 at Tulsa, OK)
- It has been planned that a US delegation will visit China early next year to share the progress of the collaborated work in the GSHP sub-task