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中國地能

CHINA GROUND SOURCE ENERGY



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2000-2015

恒有源科技发展
集团有限公司

EVER SOURCE SCIENCE & TECHNOLOGY
DEVELOPMENT GROUP CO.,LTD

浅层地能热恒有

循环利用暖无忧



恒有源科技发展集团有限公司
EVER SOURCE SCIENCE & TECHNOLOGY DEVELOPMENT GROUP CO., LTD.

恒有源科技发展集团有限公司（简称恒有源集团），是中国节能环保集团公司旗下的中国地能产业集团有限公司（香港上市号 8128.HK，简称中国地能）在北京的科技实业发展总部。

在京港两地一体化管理框架下，恒有源集团专注于开发利用浅层地能（热）作为建筑物供热替代能源的科研与推广；致力于原创技术的产业化发展；实现传统燃烧供热行业（有燃烧、有排放、有污染）全面升级换代成为建筑物无燃烧供暖（冷）的地能热冷一体化的新兴产业；践行生态文明建设，促进传统产业升级换代；走出中国治理雾霾的新路子。

- **我们的宗旨：** 求实、创新
- **我们的追求：** 人与自然的和谐共生
- **我们的奉献：** 让百姓享受高品质的生活
- **我们的愿景：** 原创地能采集技术实现产业化发展——让浅层地能作为建筑物供暖的替代能源；进一步完善能源按品位分级科学利用；在新时期，致力推广利用浅层地能无燃烧为建筑物智慧供暖（冷）；大力发展地能热冷一体化的新兴产业。

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风雨漫漫创业路 岁月悠悠恒有源

——恒有源十五载方兴未艾

**WIND AND RAINS EN ROUTE TO BE AN
ENTREPRENEUR
TIME AND GLORY EN ROUTE TO BE HYY
——RECORDS ON HYY 15TH ANNIVERSARY, WITH
EAGER EXPECTATION OF GREAT FUTURE**

作者：臧毅然 戴 祺 孙韶云

恒有源科技发展集团有限公司（以下简称恒有源集团）是中国节能环保集团公司旗下的中国地能产业集团有限公司（香港上市号 8128.HK，简称中国地能）在北京的科技实业发展总部。

在京港两地一体化管理模式下，恒有源集团始终专注于利用可再生能源——浅层地能作为建筑物供热替代能源的科研与推广，将原创技术——单井循环换热地能采集技术与国际上地埋管技术相结合，让浅层地能这个 0-25℃

的低品位的可再生能源，成为建筑物供热的替代能源，实现了供热能源的一次革命；实现了传统燃烧供热行业（有燃烧、有排放、有污染）全面升级换代成为无燃烧智慧供热的地能热冷一体化新兴产业。

自 2000 年成立至今，恒有源集团在近十五载的科研与经营实践中，始终秉承着“求实、创新”的企业宗旨，坚持以原创的“单井循环换热地能采集技术”为核心，全力打造集科研



开发、设计咨询、装备制造、工程安装、运维保障为一体的全产业链运营体系；为不同地区、不同类型的建筑物提供完整的供热（冷）能源整体解决方案。近些年，恒有源集团为响应政府节能减排的号召，针对“雾霾成因的30%以上是由于量大面广的燃烧加上低空排放所致”的现状，配合政府治理雾霾，支持政府履行节能环保第一责任人的义务，始终专注浅层地能的开发与利用，以浅层地能作为建筑物供热的替代能源，实现为建筑物无燃烧供热。

集团十年如一日，积极推动无燃烧供热地能热冷一体化新兴产业的发展，截至目前，集团已推广用地能采热（冷）工程超过700项，建筑面积达到1300多万平方米。相当于建设了一座780MW分布式地能冷热源站；相比电锅炉供暖方式，每年节约电力9.75亿度（37.3万吨标煤），减排二氧化碳94.3万吨，减排二氧

化硫0.89万吨，减排氮氧化物0.59万吨，减排颗粒物1.6万吨，减少排烟量50.2亿标立方米；相当于减少建设了一座580MW电厂，节省火力发电厂投资约23亿元。

恒有源集团项目的推广应用已由北京辐射至上海、天津、西藏、青海、辽宁、四川、河北、山东、山西和新疆等地，形成了住宅、学校、办公、宾馆、商场、医院、场馆、厂房、污水场站和景观水池等各种类型的供热（冷）系统。

今后，恒有源集团将不断丰富和完善地能无燃烧智慧供热产品系列，将原创技术的产业化发展与金融资本和工业互联网相结合，建立全新的供热能源体系；在促进经济健康发展、保证百姓生活品质提高的同时，最有效地追求人与自然的和谐共生，真正践行生态文明建设，走出中国治理雾霾的新道路。

恒有源科技发展集团有限公司 大事记

CHRONICLE OF EVER SOURCE SCIENCE & TECHNOLOGY DEVELOPMENT GROUP CO., LTD.

一. 公司发展历程大事记

2000年12月5日，北京恒有源科技发展股份有限公司成立。

2002年10月，公司被中关村科技园区管委会（海淀园）核准为高新技术企业。

2002年10月18日，经北京市工商行政管理局核准，北京恒有源科技发展股份有限公司更名为北京恒有源科技发展有限公司。

2002年11月，北京控股集团有限公司（香港联交所上市编号：392.HK）入股，北京恒有源科技发展有限公司由内资企业变更为中外合资企业。

2004年8月24日，经北京工商局核准，北京恒有源科技发展有限公司更名为恒有源科技发展有限公司。

2008年3月31日，中国地能有限公司（香港联交所上市编号：8128.HK）控股恒有源科技发展有限公司。

2010年5月，公司与北京北机机电工业有限公司合资成立北京永源热泵有限责任公司。

2012年8月20日，中国节能环保集团公司增资入股，成为单一最大股东。

2012年8月，恒有源科技发展有限公司更名为恒有源科技发展集团有限公司。

2015年4月，恒有源科技发展集团有限公司与四川长虹空调有限公司合资成立了由恒有源控股的宏源地能热宝技术有限公司。

二. 产业化进程大事记

2000年10月，恒有源公司第一口单井循环换热地能采集井投入运行，恒有源公司为此进行了详细的地下温度场测试，并组织专家论证，得出结论：单井循环换热地能采集井只取热不消耗水，也不污染地下水，较传统地下水源热泵技术有突出优点。

2000年12月，公司推出第一批以浅层地能为冷热源的供暖、制冷和提供生活热水的产品，定名为“中央液态冷热源环境系统”（后改名为“恒有源地能热泵环境系统”）。

2001年5月14日，国家经贸委发文，将北京恒有源科技发展股份有限公司研制的“中央液态冷热源环境系统”列入“2001年国家重点技术创新项目计划”。

2001年5月，公司的“中央液态冷热源”产品获国家经济贸易委员会认定为“2001年度国家重点新产品”。

2001年5月，海淀区人民政府在《关于推广中央液态冷热源环境系统的批复》中要求：区政府直接投资的建设项目和中关村西区周边的政

府安置工程全部使用该系统。

2002年4月4日，“中央液态冷热源环境系统”被列入建设部“科技成果推广项目”。

2002年12月13日，“中央液态冷热源环境系统”被北京市计委、北京市科委认定为“北京市重大高新技术成果转化项目”。

2003年1月27日，“中央液态冷热源环境系统”获得中国环境保护产业协会颁发的“绿色之星”产品证书。

2003年4月，建设部发布《中央液态冷热源环境系统设计施工图集》。

2003年9月25日，北京市水利局印发《关于推广应用中央液态冷热源环境系统的意见》。文件指出，“中央液态冷热源环境系统”单井抽灌技术较好的解决了移砂、地面不均匀沉降等问题，对保护环境有利，我局完全同意推广运用该技术。

2003年9月30日，北京市环境保护局印发《关于推广中央液态冷热源环境系统的意见》。文件指出，“中央液态冷热源环境系统”应在新建建筑中大力推广使用，环保部门在项目审批过程中应予以推广。

2004年8月10日、2005年8月9日、2006年8月1日，连续三年获得美国专利局颁发的专利证书。

2005年，公司的企业技术中心被国家发改委、财政部、海关总署、国家税务总局批准认定为国家级企业技术中心。

2004年11月1日，公司成立浅层地能（热）工程技术研究中心。中心下设专家委员会，由国际地热协会主席、国际能源协会副主席吕贝克教授等十余位国内外专家组成。

2005年4月8日，在恒有源公司办公楼举行蒙古国项目应用恒有源地能热泵环境系统工程项目签约仪式。2006年5月，蒙古国乌兰巴托市项目安装成功，蒙古国总统办公室主任、建设



（图为2006年5月蒙古国项目剪彩仪式现场）

部长、财政部长、中国驻蒙古国大使及北控公司总裁张虹海、恒有源公司总裁徐生恒出席了剪彩仪式。这是“恒有源地能热泵环境系统”的首个海外应用项目。

2005年7月，公司与美国贝伦公司签订协议，在美国奥马哈市成立HRC合资公司，并与内布拉斯加州立大学建筑研究院、俄克拉荷马州立大学的美国地热实验中心建立合作关系，开始在美国推广公司的单井循环地能采集技术。

2006年2月，原中国建筑科学研究院总工

程师、副院长吴元炜教授在恒有源组织的专家会上，首次厘清了浅层地能的概念，并将行业称谓统一为“浅层地能（热）”。

2006年9月，在财政部、建设部联合印发的《可再生能源建筑应用专项资金管理暂行办法》的通知中，“浅层地能”的可再生能源属性首次在官方文件中得到确认。

2007年5月18日，公司将中央液态冷热源环境系统等名称统一为“恒有源地能热泵环境系统”。

2008年11月18日，公司荣获北京市工促局和北京市人民政府2008工程建设指挥办公室颁发的“参与奥运、服务奥运贡献单位”称号。



2008年12月，公司项目获中华全国工商业联合会颁发的“科技进步一等奖”。（上图左三为恒有源公司总经理徐生恒）

2009年8月，公司在美国内布拉斯加州的第一个示范项目 Hershey School 成功运行，该项目于2011年获得美国能源部和环境总署颁发的“能源之星”奖。

2010年5月11日，恒有源公司与辽宁大连瓦房店市政府签订合作协议，共同开发低碳经济生态示范区及推广浅层地能作为瓦房店市房屋供暖（制冷）系统之替代能源。

2013年3月16日，“北京节能环保促进会浅层地（热）

能开发利用专业委员会”成立大会在合众建国饭店召开。

2013年4月1日，北京市质量技术监督局颁布了北京市地方标准文件《单井循环换热地能采集井工程技术规范》。

2013年9月27日，为强化产、学、研融合，促进科研成果转化，恒有源科技发展集团有限公司、北京市水科学技术研究院、中国矿业大学（北京）水害防治与水资源研究所共同组建浅层地能（热）开发利用系统工程实验室，由中科院院士、青海大学校长王光谦任主任，中国矿业大学教授、博士生导师武强任副主任。

2013年12月16日，在节能大厦举行了“地能热冷一体化新兴产业研讨会”，与会的专家和领导有：中国工程院院士、原国防科工委主任丁衡高，中科院院士、青海大学校长王光谦，原国家地震局地球物理研究所副所长王福山，国务院资深参事王秉忱，原北京建筑设计研究院院长吴德绳，国家发改委环资司副司长吕文斌，住房和城乡建设部节能与科学技术司副司长韩爱兴，财政部经建司副司长曾晓安，大连市副市长刘岩等。与会期间，公司与大连市金州小窑湾国际商务区签署“共同建设900MW分布式地能冷热源站的战略合作框架协议”。

2014年，随着公司新产品增加，市场范围扩大，公司产品系

列增加至“恒有源地能热泵环境系统”、“恒有源地能热宝环境系统”、“恒有源分布式地能冷热源站”三大系列。

2014年12月29日,恒有源科技发展集团与大连市金州新区签署了《小窑湾国际商务区900MW恒有源分布式地能冷热源站供热特许经营协议》。此次签约标志着双方建立了稳固的战略合作伙伴关系,也标志着小窑湾地能供热国家级示范园区建设正式启动。这也是恒有源第一个分布式冷热源站落地建设。900MW恒有源分布式地能冷热源站将在10年内实现为小窑湾20.4平方公里、不少于1500万平米的建筑物供热,是全国乃至全世界最大的地能供热项目。

2015年6月1日,公司获得首都精神文明建设委员会授予的“首都文明单位”称号。

三. 学术交流大事记

2001年2月9日,北京市经济委员会委托北京市技术创新服务中心,组织专家鉴定委员会对中央液态冷热源环境系统(后改名为“恒有源地能热泵环境系统”)进行了鉴定验收,并出具鉴定结论:中央液态冷热源系统将是二十一世纪取代传统供暖(冷)方式的有力竞争者。

2003年5月,国际地热协会主席龙德,副主席吕贝克教授应北京市政府邀请来华调研奥运会筹备工作,来我公司参观调研后给予高度评价,联名致信刘淇书记推荐奥运会场馆建设使用我公司技术。同年8月,吕贝克教授再次来公司考察调研,并应聘为公司国际技术顾问。

2003年8月21日,在恒有源公司召开恒有源地能热泵环境系统“单井抽灌”水质保护阶段成果专家评审会。专家评审意见认为:“单井抽灌”这种浅层地能(热)提取方式是一种以水为介质的土壤换热装置而不是取水装置,单井抽

灌回灌水未对地下水质量造成影响。

2003年10月12~15日,在墨西哥蒙瑞利亚召开的国际地热资源理事会2003年年会上,吕贝克教授和恒有源公司总裁徐生恒共同发表的《浅层地能的开发与利用》获“最佳论文奖”。

2004年2月12日,公司邀请业内专家座谈。徐生恒总经理向专家们汇报了恒有源地能热泵环境系统的技术发展和推广应用工作。出席座谈会的专家吴元炜、郎四维、李娥飞、徐伟、赵文德、郭瑞茹、彦启森、江亿、许文发联名签署给奥组委刘淇主席及各位领导的信,推荐在奥运工程中采用中央液态冷热源环境系统。

2004年4月,中科院院士汪集旻来公司调研,并与徐生恒总裁共同赴肯尼亚联合国环境署总部参加国际研讨会,介绍公司技术。

2004年7月23日,美国工程院院士马佐平、中国科学院院士李家明、美国耶鲁大学电机工程系研究员徐德清等到公司考察恒有源地能热泵环境系统,详细了解了系统的工作原理。

2006年7月,美国联邦参议员,国会预算委员会主席尼尔森先生在华盛顿会见公司总裁徐生恒,对在美国开发使用我公司技术给予充分支持。

2007年,国际热泵协会、国际地热协会、美国地热资源理事会邀请恒有源公司成为会员。

2007年2月7日,中国能源研究会地热专业委员会主任郑克棧教授陪同国际著名地热专家、联合国大学冰岛地热培训中心主任、前国际地热协会主席英格瓦·弗里得莱弗森(Ingvar Fridleifsson)博士和冰岛大学教授、地热专家保尔·瓦尔迪玛森(Pall Valdimarsson)博士来公司参观,听取了关于公司技术及其应用的介绍。

2007年5月31日,市环科院王凯军主任为编写浅层地能供暖技术推广研究和技术指南的指定一文,召集汪集旻院士、吴文桂教授、侯景岩、戴玉华等专家在公司进行座谈。

2010年4月25日,公司总裁徐生恒、顾问宋心鲁一行前往印度尼西亚参加WGC2010(世界地热大会),会上公司顾问吕贝克教授宣讲了与我公司总裁徐生恒共同完成的论文《地下水源热泵在中国和美国建筑制冷供暖系统中的创造性应用》。

2010年10月17日,北京节能环保促进会组织召开“恒有源科技发展有限公司在京运行七年以上的地(热)能热泵系统专家评审会”。评审专家经过认真讨论形成了“应大力推广恒有源地能热泵环境系统为建筑物供热”的评审意见。

2013年9月,国务院资深参事、中国地质勘探大师王秉忱亲赴美国实地参观考察恒有源公司在美国的示范项目。

2013年12月,中国节能环保集团董事长王小康陪同芬兰议会代表团来恒有源集团参观考察。

2014年1月20日,公司邀请北京建筑设计研究院顾问总工吴德绳教授作为主讲嘉宾,举办了专题为《知识与文化》的讲座。吴教授帮助员工正确理解知识与文化的关系、智商与情商的关系,客观定位自我,激发敬业尽责的精神。

2014年12月12日上午,中国工程院院士唐孝炎应邀至恒有源集团,出席题为“雾霾与能源的燃烧及排放”座谈会。唐孝炎院士表示:雾霾的产生与燃烧排放有重要关系,提倡为建筑物无燃烧供热对解决全国性雾霾天气至关重要。

2015年1月14日,公司主持召开了恒有源集团2014年度向专家汇报座谈会。专家从地(热)能供暖的前景、恒有源单井循环换热地能采集技术的应用效果、大气污染的防治以及地(热)能的供暖推广等方面交换了意见。

2015年5月,北京市建筑设计研究院顾问总工吴德绳赴美国对恒有源的示范项目作深入考察和调研。

2015年5月28日,由全国工商联新能源商会与中国新能源建筑产业联盟共同主办、恒有源集团承办的“浅层地能与新能源建筑研讨会”在恒有源集团公司报告厅举行,国务院资深参事王秉忱,北京市建筑设计研究院顾问总工程师吴德绳等专家领导参加了会议。会议指出,浅层地能因其具有能效高、储量丰富、便于采集、无需储存环节及输送距离短的特点,是建筑业使用的理想新能源。

四. 领导调研大事记

2001年3月27日,北京市副市长汪光焘由海淀区区长李进山陪同,到公司调研。

2001年3月31日,北京市市长刘淇由副市长孟学农、海淀区区长李进山等陪同,到公司调研。

2001年10月27日,中共中央政治局委员、北京市委书记贾庆林到北京恒有源科技发展股份有限公司,视察恒有源地能热泵环境系统样板工程。贾书记表示,这套系统能实实在在地提高百姓生活质量,政府会加大力度在宏观上支持,在微观上要靠你们自己努力。你们的产品要真正做到既不污染天,也能有效地保护水,同时要做到运行成本低。

2003年12月20日,中央电视台原台长杨伟光到公司调研。

2004年9月24日,北京市政协主席程世峨率市政协常委视察恒有源公司,副市长孙安民、国资委主任熊大新、市委办主任薄钢等陪同视察。

2004年11月18日,北京市市长王岐山、副市长吉林在指导奥运筹备工作中,到恒有源集团的恒有源地能热泵环境系统示范项目——北京市海淀外国语实验学校调研。王市长指示,奥运工程应考虑使用这一新技术,要革除体制性障碍,制定政策予以支持,做到“增量上推广、存量上



(图为 2004 年 11 月 18 日，北京市市长王岐山到恒有源集团示范项目——北京市海淀外国语实验学校调研)

改造”。

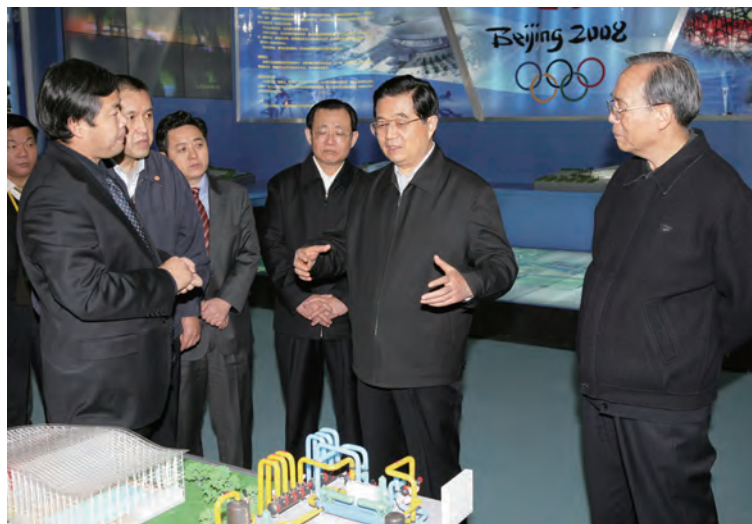
2005 年 2 月 1 日，国务院副总理曾培炎、建设部部长汪光焘、国家发改委副主任张国宝、北京市市长王岐山等领导在海淀区政府办公楼组织了现场调研会，考察了恒有源地能热泵环境系统机房项目，与会领导对恒有源地能热泵环境系统的技术和推广前景给予了充分的肯定。(见右图)

2005 年 12 月 21 日，



本期焦点 CURRENT FOCUS

公司总经理徐生恒在建设节约型社会展览会上向中共中央总书记、国家主席、中央军委主席胡锦涛及全国人大委员长吴邦国、国务院总理温家宝、全国政协主席贾庆林等国家领导人做了有关替代能源项目的汇报。(见下图)



2006年1月5日，全国政协副主席、全国工商联主席黄孟复来公司视察，全国工商联经济部部长欧阳晓明等领导陪同。黄孟复主席在视察中充分肯定了公司所作出的成绩，并对系统在研发、应用、推广等方面存在的困难和问题进行了专题调研。

2008年7月17日，全国人大环境与资源保护委员会主任委员毛如柏一行来公司考察，参观了恒

有源地能热泵环境系统部分运营项目。

2010年7月13日，青海省副省长、教育厅厅长来我公司考察，听取关于公司技术和应用的汇报，参观了我公司海淀外国语实验学校项目并探望在此学习的青海地震灾区学生。

2013年4月3日，全国政协副主席、全国工商联主席王钦敏，全国工商联专职副主席安七一，全国工商联副主席、北京市副市长、北京市工商联主席程红等领导一行到访公司，听取了

公司领导有关地能热冷一体化产业推广的汇报，视察了公司运行的重点项目。

2013年11月28日，全国政协人口资源环境委员会贾治邦主任一行40余人，到公司海淀外国语学校项目考察。

2014年6月3日，国务委员、国务院党组成员、国家减灾委员会主任王勇、国务院副秘书长肖亚庆、国资委副主任张喜武等领导到北京市海淀外国语实验学校进行了现场调研，详细了解



（2014年6月3日，国务委员、国务院党组成员、国家减灾委员会主任王勇、国务院副秘书长肖亚庆、国资委副主任张喜武等领导到北京市海淀外国语实验学校进行了现场调研，图中从左至右是：徐生恒、肖亚庆、王彤宙、李文科、王勇、王小康、张喜武、章鹏、杨家义）

了恒有源集团的单井循环地能换热采集技术，对公司的科技创新成果给予了充分肯定。

2014年6月4日，国家能源局发展规划司副司长李福龙等人到公司视察，并听取了有关恒有源地能热泵环境系统的介绍。

2015年2月8日，中共十八届中央委员、

中央直属机关党委副书记、中央直属机关党校校长孟学农一行到公司调研，对恒有源原创技术的应用和产业推广情况做了详细了解。

2015年3月8日，中国科学院院士王光谦及南阳开发区郭书记一行视察恒有源无燃烧供热地能热冷一体化技术。

恒有源科技发展集团有限公司 企业文化建设

COMPANY CULTURE CONSTRUCTION IN EVER SOURCE SCIENCE & TECHNOLOGY DEVELOPMENT GROUP CO., LTD.

作者：胡建

恒有源科技发展集团有限公司（以下简称集团或公司）高度重视企业文化建设。2000年集团公司成立伊始，公司总裁徐生恒就提出了把“忠诚与责任”作为企业的核心价值观。

所谓“忠诚”，首先就是公司要忠诚于每一个用户，为每一个使用公司产品的用户提供舒适、安全、可靠的学习工作和生活环境；其次就是公司要忠诚于社会，就是要通过无燃烧供热自身的优势和千百万使用公司产品的用户，在最大程度上解决因燃烧供热产生的雾霾污染。在此基础上，公司的全体员工要忠诚于自己的职业和职责，通过每一个员工的精湛技艺，生产出用户和社会满意的地能无燃烧供热产品。

所谓“责任”，一方面体现在企业的社会责任上，因为企业研发、设计、安装、调试和维护的每一个环节，都关系到千家万户冬季供暖的民生大事，来不得半点失误和瑕疵，可以说责任大于天；另一方面，体现在公司每个员工的工作责任上，因为每个员工的工作细节，决定了企业社会责任的成败。因此对社会负责、对用户负责、

对企业负责、对本职工作负责的全员责任体系，就构成了恒有源集团的工作常态。

十五年来，恒有源集团围绕“忠诚与责任”的企业核心价值观，为最大限度控制燃烧供热产生的雾霾污染，把“人与自然和谐共生”作为企业的追求；结合人民群众不断提高生活品质的愿望，把“让百姓享受高品质的生活”作为企业的奉献；为引领地能无燃烧供热行业的发展趋势，实现智慧供热，把“求实、创新”作为企业的宗旨；在此基础上，又进一步提出“安全第一、标准当家，扎扎实实打基础，反反复复抓落实，负责任做每件事，愉快工作每一天”的员工行为准则，不断丰富恒有源集团企业文化的内涵。

恒有源集团采取党政工团齐抓共管、职工群众广泛参与的方式，积极开展形式多样的企业文化创建工作。

针对企业年轻人多且学历高的特点，邀请建筑设计行业的老前辈吴德绳院长给青年员工做《知识与文化》的专题讲座，帮助他们正确理解知识与文化的关系，情商与智商的关系，客观定位自我，激发敬业尽责的精神。



（图为北京市建筑设计研究院顾问总工程师吴德绳给青年员工做《知识与文化》的专题讲座）

针对近年来雾霾严重的问题，邀请中国工程院唐孝炎院士，组织专家学者共同剖析雾霾成因及解决对策，进一步明确了地能无燃烧供热是解决冬季雾霾的可行措施。（见下图）



针对我国能源资源紧缺、急需开发新能源的现状，邀请国务院资深参事王秉忱先生多次考察企业并做专题建议，为国家开发地能等可再生能源献计献策。



此外集团还通过各种形式加强人才引进和后备人才储备，加强对项目管理人才和技术人才的培养，不断推进学习型组织建设，有针对性地对员工进行各类培训，强化职工的责任意识、危机意识、团队意识和终身学习的理念。

实行业绩奖励制度，坚持优化公司薪酬福利制度，使之符合“职能部门与销售业绩挂钩，职工收入与公司效益挂钩”的原则，激励每一位员工在各自工作岗位上创造出更大的个人价值，实现员工与公司的共同成长。

为增强员工的使命感、归属感和荣誉感，集团利用重大节日，开展“向祖国献礼，职工才艺展示”活动，得到员工们的积极响应，通过国画、油画、摄影、书法等各种形式展现自己的才艺；通过组织登山等体育活动，激发



（图为恒有源集团部分员工参加野外拓展活动）



(图中左一为恒有源集团党支部书记王满全)

员工的挑战自我、超越自我的潜能；通过“奉献爱心，捐资助贫”的活动，除向本公司身患重病的员工捐款外，还先后向地震灾区、贫困地区捐款捐物奉献爱心，极大地提升了员工的精神素质。

可以说十五年来，集团围绕“忠诚与责任”的企业核心价值观，追求“人与自然和谐共生”，把“让百姓享受高品质生活”作为企业的奉献，在经营中体现“求实、创新”的宗旨，在工作中

落实“安全第一，标准当家，扎扎实实打基础，反反复复抓落实，负责任做每件事，愉快工作每一天”的行为准则，通过公平有效的激励机制和各级各类培训，强调人的理想、道德、价值观、行为规范在企业管理中的核心作用，注重人的全面发展，用愿景鼓舞人，用精神凝聚人，用机制激励人，使公司获得国内外各种荣誉的基础上，还被评为“首都文明单位”，实现了精神文明和物质文明双丰收。

无燃烧供暖及其商业模式分析

COMBUSTIONFREE HEATING PRODUCTS SERIES AND DIFFERENT BUSINESS MODALITIES

作者：臧毅然 戴 祺

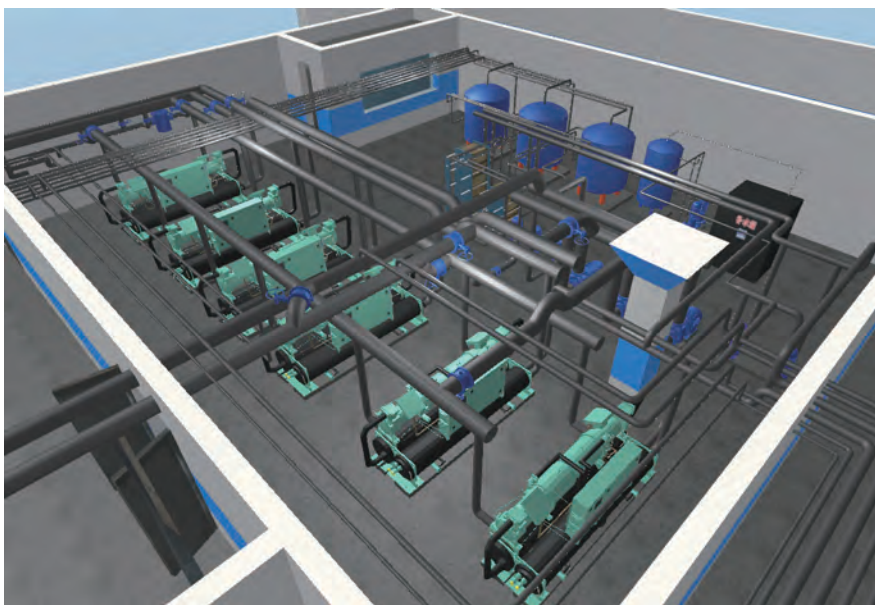
恒有源科技发展集团有限公司（以下简称恒有源集团）通过近年来的努力，其原创的高效、省地的单井循环换热地能采集技术实现了产业化发展。它与国际上地埋管技术相结合，让“浅层地能”这个25℃以下的低品位的可再生能源，成为了建筑物供热的替代能源，实现了供热能源的一次革命。

一、无燃烧供暖的产品系列

经过十五年的发展，恒有源集团的浅层地能无燃烧为建筑物供热已形成了以单井循环换热地能采集技术为核心的，能够服务于不同地区、不同地质情况、不同类型、不同使用功能的建筑物的多样化产品系列，可实现传统燃烧供热产品的全覆盖。

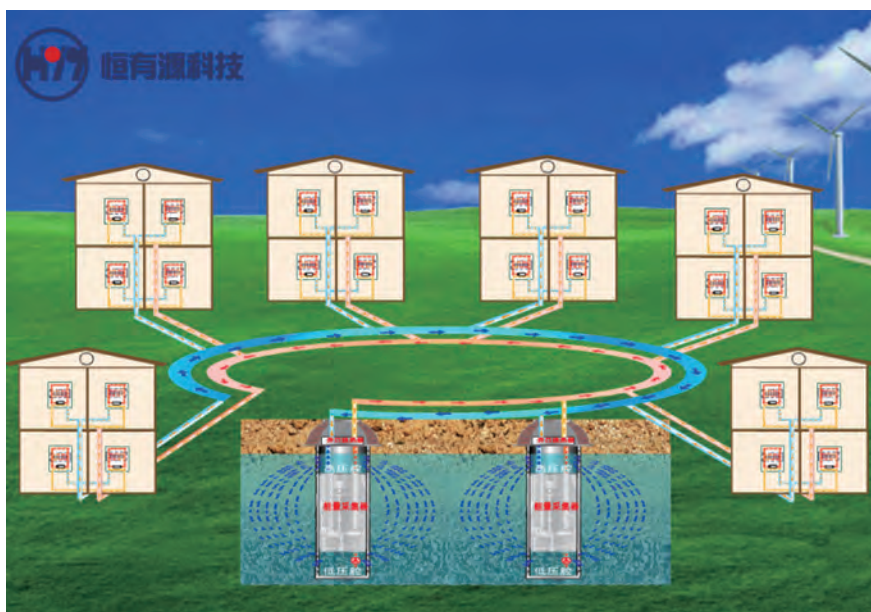
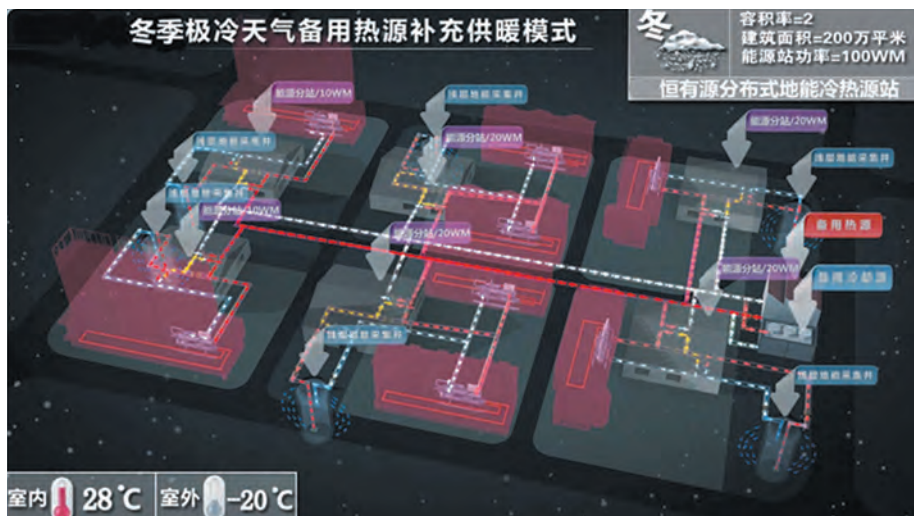
1. 恒有源地能热泵环境系统

可满足单体或群体建筑物供热的楼宇自供热系统，与传统燃烧供热产业的区域供热锅炉房相对应，设计供热规模100 ~ 30000kW，可为2000 ~ 50万平方米建筑物供热、制冷、提供生活热水。



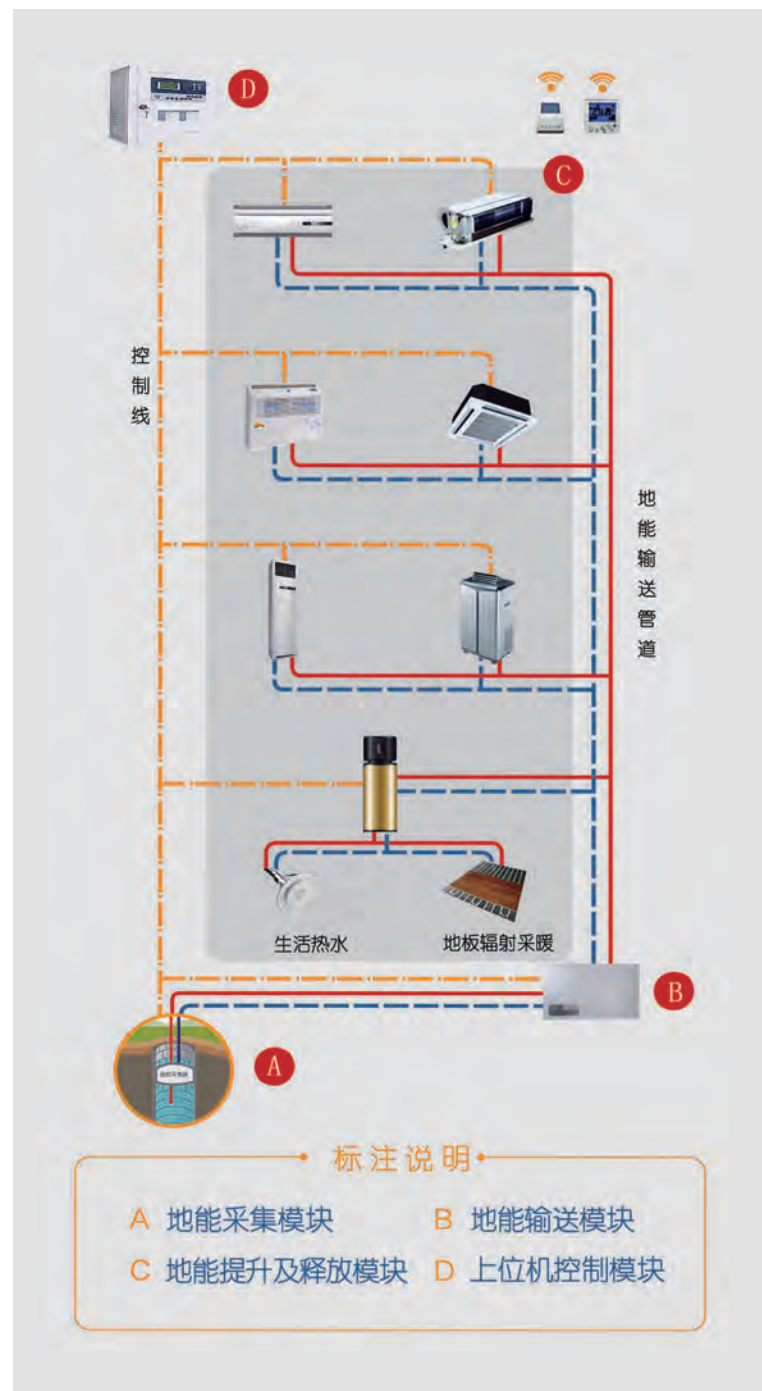
2. 恒有源分布式地能冷热源站

恒有源分布式地能冷热源站是将恒有源地能热泵环境系统区域连通，技术上更安全可靠，实现地能热冷一体无燃烧为新兴城市建筑物供热、制冷、提供生活热水，设计供热规模 5 ~ 900MW，与传统燃烧供热产业的市政热力系统相对应，是新兴城镇配套供热的公共基础设施，可满足城镇 10 万 ~ 1500 万平方米的区域建筑物使用。



3. 恒有源地能热宝系统

是为农村农户服务的自采暖设备，可低能耗的解决差异化采暖需求，为使用 50 ~ 2000 平方米建筑物的住户供热、制冷、提供生活热水。适用于布置分散或可差异运行的办公、学校、住宅等建筑，可替代城镇分散式锅炉系统。



二、无燃烧供暖的商业模式

浅层地能无燃烧为建筑物供热的本质是一种服务，它以建

筑物为服务对象，以冷热能源的供给为服务内容，以恒有源地能热泵环境系统、恒有源分布式地能冷热源站和恒有源地能热宝系统作为服务载体，服务于广大人民群众供暖制冷需求、服务于各地政府的节能减排需求、服务于日益严重的雾霾治理需求。

通常来说，浅层地能无燃烧为建筑物供热的产品系列，主要通过EPC（工程总承包）、BOT（建设-运营-转让）、PPP（公私合作）和EMC（合同能源管理）等商业模式向客户提供服务。

1.EPC（工程总承包）模式

EPC（Engineering Procurement Construction）是指公司受业主委托，按照合同约定对建设工程的设计、采购、施工、试运行等实行全过程或若干阶段的承包。通常公司在总价合同条件下，对所承包工程的质量、安全、费用和进度负责。

此模式即工程服务模式，建设方按照业主的需求为建筑物匹配冷热能源，对业主提供设计、采购、施工、调试等产品及安装服务。对业主来说，需自行筹集项目投资资金，在项目建设完成时即支付全部费用。通常来说，此模式适用于项目规模相对较小、投资总额较少的地能热泵环境系统和地能热宝系统项目。

2. BOT（建设 - 运营 - 转让）模式

BOT(build—operate—transfer)即建设—经营—转让，是指政府通过契约授予社会资本以一定期限的特许专营权，许可其融资建设和经营特定的公用基础设施，并准许其通过向用户收取费用或出售产品以清偿贷款，回收投资并赚取利润；特许权期限届满时，该基础设施无偿移交给政府。

此模式本质上是一种项目融资模式，由业主向项目投资方（服务提供方）进行授权特许经营（通常是为建筑物提供冷热能源服务），有投资方负责筹集项目建设所需资金，并在特许经营期内按特许经营协议约定的内容提供相应服务，收取服务费用，以此费用偿还项目融资并获得合理项目回报，并在特许经营期满后时将项目资产无偿转移给业主方。此模式通常适用于项目规模较大、投资总额较多的分布式地能冷热源站项目。

3. PPP（公私合作）模式

PPP（Public-Private-Partnership）即公私合作模式，指政府和社会资本为提供公共产品或服务而建立的全过程合作关系，通常以政府和社会资本签订特许经营权协议为基础，以利益共享和风险分担为特征，发挥双方优势，提高公共产品或服务的质量和供给效率。

此模式是一种新型项目融资模式，相较于BOT模式，更多考虑政府在项目中的参与程度，如政府参与部分直接投资或者参股项目公司以分担风险，分享项目收益。政府通常与提供贷款的金融机构达成一个直接协议，向借贷机构承诺将按与项目公司签订的合同支付有关费用，为项目融资提供进一步便利。此模式与BOT模式没有本质区别，二者适用范围基本相同。

4. EMC（合同能源管理）模式

EMC（Energy Management Contracting）方式是一种以减少的能源费用来支付节能项目全部成本的节能投资方式。这样一种节能投资方式允许用户使用未来的节能收益为工厂和设备升级，以及降低目前的运行成本。此方式适用于既有项目的节能改造，项目原能源成本可比、明确且有较大的节能收益，项目收益期通常在5-7年。

此模式本质上也是一种项目融资模式，即用项目节约的能源费用支付项目融资，重点在于节约的能源费用的可比性和可计量性。应用此模式的关键在于建筑物供热冷能耗的节能量足以在项目运行期内覆盖项目投资，与项目规模并没有显著关联，适用于上述所有产品模式。

综上所述，恒有源集团在浅层地能无燃烧为建筑物智慧供热的产业化推广中已形成较完整的产品系列，多种商业模式的灵活选择可以匹配不同客户的需求，为客户提供包括产品、资金、支付方式的多种选择。这将极大的提高原创技术的产业化推广能力，增强产品的市场竞争力，并加快促进传统燃烧供热产业全面升级换代成为地能热冷一体化新兴产业。



以差异化市场策略构建 可持续竞争优势 实现新能源时代 智慧供热生态战略

**ESTABLISH SUSTAINABLE
COMPETITIVE ADVANTAGE AND
REALIZE INTELLIGENT HEATING
ECOLOGICAL STRATEGY THROUGH
DIFFERENTIAL MARKETING
STRATEGIES IN NEW ENERGY ERA**

作者：聂丹

恒有源科技发展集团有限公司（以下简称“恒有源集团”）是中国地能产业集团有限公司（8128.HK）在中国内地的实业发展总部。中国地能产业集团有限公司是在香港联交所上市的唯一一家专门以浅层地能的开发利用为主业的高科技新能源企业，其单一大股东是中国国资委下属的中国节能环保集团公司。

恒有源集团专注于浅层地能作为建筑物供热（冷）替代能源的科研、开发和推广，拥有设计、能源合同管理、系统装备生产、安装、维修等结合成全产业链的多个专业公司。恒有

源集团最主要的产品是以应用其原创的“单井循环换热地能采集技术”为核心的“恒有源地能热泵环境系统”。

“恒有源地能热泵环境系统”将地上建筑物热（冷）系统与地下的浅层地能（热）供给量相匹配区域相结合，用一小部分花钱的电能，在动态平衡中提取大量不花钱的浅层地能，并且循环使用，做到使用区域零污染、零排放，按能源品位为建筑物供热、制冷、提供生活热水。该产品由能量采集系统、能量提升系统和末端能量释放系统三部分组成，在中国内地及海外地区已推广千余万平方米。

恒有源集团的多元化市场定位策略

恒有源集团采用多元化的市场定位策略，以其原创的“单井循环换热地能采集技术”为核心竞争力，建立差异化优势；在不同的细分市场中，

突出自身强项作为卖点，通过规模生产和协同效应建立成本优势。从竞争宽度上来讲，恒有源集团将无燃烧地能供热系列产品分为三大类，针对不同的目标顾客推出不同的产品系列，进行市场推广。

表 1 恒有源集团的多元化定位策略

产品名称	可供建筑物供热冷面积（单位：平方米）	运用的地能采集方式	对应可替代的传统供热方式	目标顾客	卖点	卖点优势
分布式地能冷热源站	50 万 - 1,500 万	单井循环换热	城市集中供热系统	政府	节能环保效益；系统稳定性；示范作用	差异化优势：采用原创的“单井循环换热地能采集技术”，换热效率高、占地面积小，节能环保效益可观。 成本优势：规模生产、协同效应。
地能热泵环境系统	2,000 - 50 万	单井循环换热 + 地埋管	区域供热锅炉房	地产开发商	节能环保效益；初装成本；宣传作用	
地能热宝	≤ 2,000	1. 单井循环换热； 2. 地埋管； 3. 蓄能罐； 4. 联合换热经济运行	自采暖	独栋别墅业主	美观适用；操控方便；成本相当	
				农村用户	舒适度；成本相当；支持行为节能	

1. 顾客需要

从建筑物供热(冷)市场的顾客群分析,“政府”较关注产品的节能环保效益、追求示范作用；“地

产开发商”对设施的初装成本较为关注；“独栋别墅业主”对产品的占用空间、美观、操控、初装成本和运维成本均较为关注；而“农村用户”除考虑初装成本和运维成本以外，还较关注产品设

计是否支持行为节能。

2. 产品和服务特质

恒有源集团的产品具有“快速了解高科技产品”、“产品性能高效稳定”、“价格优势”、“节能环保效能优势”的突出特质，能够迎合上述这些主要顾客群的顾客需要，满足顾客所期望获得的价值。

（1）快速了解高科技产品

由于在绝大部分地区，供热或者供冷设施属于建筑物的必备设施，是居住的刚性需求；而且设施与建筑物紧密结合，需要经久耐用，不能随意更换。所以，必须有快捷的途径使顾客在短时间内对高科技节能环保产品有全面深入的了解。

恒有源集团的产品数据形式多样，包括文字、数据、图片数据、专业期刊、计算机演示文稿和三维动画展示数据等，以深入浅出、生动直观的方式，将高科技产品的技术原理通俗化，同时配备示范体验项目，使顾客可身临其境感受产品的性能。使快速了解高科技节能环保产品成为可能。

（2）产品性能高效稳定

如前所述，建筑物供热供冷是刚性需求，产品性能必须高效稳定。

“恒有源地能热泵环境系统”将地上建筑物热（冷）系统与地下的浅层地能（热）供给量相匹配区域相结合，用一小部分花钱的电能，在动态平衡中提取大量不花钱的浅层地能，并且循环使用。该产品采用的是无燃烧供热方式，与传统燃烧系统相比，其运营费用是燃油锅炉和电锅炉的四分之一、是燃气锅炉的二分之一。

该产品由恒有源集团自主研发，十余年来不断改进，诸多政府、军队、学校项目已稳定运行十年以上。国家大剧院、“鸟巢”等2008年北京奥运场馆，也采用了“恒有源地能热泵环境系统”。这些案例也增强了顾客信心。

（3）价格优势

“恒有源地能热泵环境系统”的初装成本与传统建筑物供热（冷）设施相当，安装新兴节能环保产品不会给顾客带来额外的经济负担。

由于该产品在动态平衡中提取大量不花钱的浅层地能循环使用，运维成本相当于传统建筑物供热（冷）的50%，价格优势对任何顾客群来说均构成吸引。

（4）节能环保效能优势

虽然各类顾客群关注产品的节能环保效能的出发点会有所不同，但“恒有源地能热泵环境系统”具备鲜明的节能环保优势。

“恒有源地能热泵环境系统”以其原创的“单井循环换热地能采集技术”为核心，利用电能搬运浅层地能，以“节能”的方式实现高效的热交换。

与其他浅层地能采集技术相比，“单井循环换热地能采集技术”是唯一能够做到使用区域零污染、零排放的地能采集技术，是真正的“环保”技术。

3. 资源和能力

恒有源集团是地能热冷一体化行业中唯一一家由央企控股的企业，也是唯一一家以此作为主营业务的上市公司，其有形资产与规模在行业内处于领先地位。“恒有源”是北京市著名商标，恒有源集团受到诸多国务院资深参事、国内建筑暖

通行业泰斗等业界专家学者及政府要员的大力支持，所以该企业在品牌、商誉、信誉和关系网络等无形资产方面也占有相当大的竞争优势。

创新、不断改善与学习是恒有源集团诞生的原动力，该企业持有以“单井循环换热地能采集技术”为核心的二十几项国内外专利，更参与制定了北京市地方行业标准《单井循环换热地能采集井工程技术规范》，为该技术的大规模应用创造了条件，树立了典范，建立了企业的竞争优势。

恒有源集团还具备敏锐的市场触觉及远见和敏捷的市场操控能力，早在十几年前，就关注到日益严峻的城市环境问题，并迅速将无燃烧供热的意念转化为行动，开发出一系列地能热冷一体化产品，迎合了环境保护和城镇化建设的双重市场需要，抓住了市场机遇，建立了竞争优势。

4. 卖点优势

恒有源集团的定位策略虽然将无燃烧地能供热系列产品分为三大类，针对不同的目标顾客推出不同的产品系列，进行市场推广，但是三大类产品的核心是同一项原创核心技术——“单井循环换热地能采集技术”，该技术换热效率高、占地面积小，节能环保效益可观，为恒有源集团建立了差异化的卖点优势。

另一方面，恒有源集团通过多元化的市场定位策略将完全不同的三大类产品的目标顾客整合到一起，使核心设备和零部件的设计和生产成本实现规模经济和协同效应，为企业带来成本优势。

构建可持续竞争优势，谱写新能源时代智慧供热新篇章

竞争优势建基于顾客需要、企业所提供的产品和服务、企业的资源和能力，以及对手和其他

利益相关的行为这几个因素之间的互动。恒有源集团以原创技术为核心的多元化市场定位策略，使其可以从多层次、多角度，擅用企业的资源和能力，突出其产品及服务和特质，满足不同层次、不同领域的顾客需要，建立差异化的卖点优势，不断巩固和提升企业的综合竞争力。

进入二十一世纪，以燃烧化石能源的传统供热领域发生了巨大的变化，以燃烧方式为主的低效率能源利用，导致全球发生多次以化石能源为代表的能源危机、以及因燃烧化石能源而造成的生态环境危机；另一方面，人民群众生活品质的日益提高，特别是对生活环境质量要求的不断提高，也导致对能源的需求进一步加大。

恒有源集团践行人与自然和谐共生的企业使命，运用自身的可持续竞争优势，结合新时期的互联网思维方式，倡导建立以地能无燃烧智慧供热方式为核心、地能与其他化石能源和可再生能源融合发展的互联网时代的建筑物供热能源体系，提出了“以地能无燃烧智慧供热方式搭建地能热冷一体化新兴产业”的兼顾长远利益和全局考虑的生态战略目标。

所谓智慧供热，是指地能无燃烧为建筑物供热的环境系统能够“感知环境信息（如温度等）并做出恰当响应”。智慧供热最大的意义就在于，在低成本、低能耗、高效率、无污染、低依赖的前提下，满足人们舒适稳定的生活环境要求。

习近平总书记提出的四位一体的“能源革命”战略指明了我国能源利用和发展的目标和方向。在新能源时代，以智慧供热的实际行动推动供热能源消费革命，不仅是恒有源集团运用自身优势实现企业价值的有效途径，更是政府决策者构建可持续发展的宏观能源体系的必经之路，或许也是眼前快速有效治理建筑物燃烧供热排放造成的污染、引导燃烧供热行业升级换代的唯一出路。

用低品位能源为建筑物供暖 是高尚的追求

**IT'S A HIGH CLASSIC PURSUIT
TO REALIZE BUILDING HEATING
THROUGH LOW-GRADE ENERGY.**

作者：吴德绳 北京市建筑设计研究院顾问总工程师

一、建筑业的供暖改革是大势所趋

建筑业已有万年的历史，供暖总是伴随着建筑业有需要地域和季节存在着，人类自走出洞穴时，就有了建筑业。多年以来建筑业的供暖技术变化不大，几千年都沿用火盆、炭盆等烧火方式取暖。现存最高贵的皇家建筑紫禁城也不例外，也只是改进为火地、火墙、火炕等形式烧火供暖。

机电专业逐渐发展，有了科技成果和产品发明之后，进入建筑业已有近百年历史，使建筑业的供暖技术有了发展。比如，蒸汽供暖系统、水暖系统、小区锅炉、热电联产、城市热网、燃气热电冷联产等的推广应用，适应着时代的进步、城市的规模化发展以及各种能源的更换。但是，总体来说直至近年，建筑以燃烧得热供暖的技术路线从未改变。

当全球出现了能源危机，燃烧产热更突显效率低下等缺点。直至地球变暖等对人类生存的严重危害被共识之后，更加暴露了其对环境损害，改变建筑供暖热源的使命才紧迫地提了出来。

我国改革开放之后，对国际义务所承担的责任日益加强。改变建筑供暖能源的工作就不再只是技术、经济问题，已提升为涉及人类生存的全球问题 and 政治问题。



二、建筑供暖以营造冬季室内舒适的温度环境为主旨

建筑供暖的任务简单说就是：在不同气候区建造的房屋，冬季室内需要保持温度达到 20℃ 左右，保证居民能舒适地生活和进行各种活动。所以

向室内供热的热源，温度要求并不高，作为供热介质，只要其温度比室温 20°C 再高约 $20\sim 30^{\circ}\text{C}$ 就能以循环水等形式向室内地板供暖系统或暖气片系统通水供暖。目前常用的供水温度也只是 $40\sim 50^{\circ}\text{C}$ 至 $70\sim 80^{\circ}\text{C}$ 之间，这种供暖末端介质品位不高，容易获取。

三、能源有“品位”的概念

热源有热量和温度的含义，比如一根火柴点燃后可把一根缝衣针的针尖烧红，也能达 400°C 左右，但一根火柴的热量却是很小的。一盆洗脸温水只有 40°C ，温度不高。但它从凉水用火炉加热或电热棒加热也得花一定时间，表明它热量不是太少。这说明热量和温度是两个独立概念。

从能源角度，我们用能源可发生的最高可利用温度来评价它作为人类所作的贡献，把可以产生高温的称为高品位能源，只能产生较低温度的称为低品位能源。比如好的煤、燃油或是天然气，它们燃烧后可以炼钢铁，归于高品位能源；而用树叶柴草燃烧就无法炼钢，只能煮饭，就归于低品位能源。所以我们对能源又提出了节省能源品位的概念，其实就是物尽其用的意思。

四、建筑供暖的用能特点和科学原则

建筑供暖本不需用高品位能源，只需能产生 80°C 以下的温度足矣！可我们多年来，用煤或燃气等把能够炼出近 1000°C 钢水的能源只烧出 150°C 以下的蒸汽为建筑供暖，这是能源品位的浪费！而且这 150°C 的蒸汽常又交换成近 80°C 左右的循环热水，再次把热源温度降低，这是我们多年建筑供暖和市政供热的实际状况。虽然我们一直努力节能，但只是节省了热源的热损失，并未认清建筑供暖“能源品位相应”的科学原则，所以没太注意选择能源的品位。这种能源品位的浪费和损失被科技界揭示并被管理者、投资者认知后，极大地提升了我们建

筑供暖能源革命的积极性和社会责任感，现已取得了很大实效。

能源品位是资源，也是自然界的赐与，必须节省使用。建筑供暖可以用低品位能源，而一些工业或交通业等却必需使用高品位能源，那就该把高品位能源留给他们使用。而建筑供暖今后只用低品位能源，不浪费能源的品位。再不大量使用高品位能源，正是建筑业供暖能源最合理的技术路线和使用能源的高尚道德。

五、机电专业的伟大核心技术

在机电专业进入建筑业的近百年中，自身发展出了一个伟大的核心技术——热泵技术。

热泵技术的发明和发展是从蒸发制冷循环理论起始的，逐渐研发了系统，发明了设备，形成了产品，并逐渐在应用中完善和进步。当年这项技术曾被归入“全球最重要的十大科技”成果之中，至今仍能感受到它的伟大意义。

热泵技术可用水泵技术作个类比，在此简要的介绍。

自然界的水都是从高处向低处流，这是个天然规律。而水可能从低处向高处流吗？不能！但人类发明了水泵就能。水泵用机械带动，耗费了能量，使用了水泵这个产品，水就能从低处流入水泵入口，从水泵出口流向高处，人驾驭天然规律，为人类创造出了很多精彩。

自然界的热都是从高温体向低温体传递，这也是个天然规律。热可能从低温体向高温体传递吗？不能！可是人类发明了热泵就能。热泵用机械带动，耗费了能量，使用了热泵这套设备，热就能从低温体向高温体传递，人驾驭天然规律，为人类开辟了一番更广阔的新天地，电冰箱就是热泵技术的产品，它对于人类的生活起到了很大作用。

要提醒的是水泵是一个设备，常为一件单体，而热泵则是个系统。热泵的热入口是蒸发器，热泵

的热出口是冷凝器。它们是靠管道联接着，成为系统。主要部件并不都紧靠着，这不同于水泵的形象，不能把“热泵”误认为只是压缩机这个部件。热泵其实是套系统，有的很大，管道可上百米，有的很小，形成机电一体化。

六、热泵对能源应用的重大意义

能源有不同的品位，合理的品位能源通过设备，产生热量成为热源用在合适的地方，这是热源的合理应用原则。但热源应用中，温度常常有具体要求，各种能源产生的温度恰好适合需求的情况较难碰到，但“大体适合”却是很常见的。由于有了热泵就可把大体适合的能源产热用热泵恰当地提升调整成合适的温度，作为实用热源，就是我们能源应用技术的重要进步，这大大扩展了可应用能源的范围。

比如浅层地能经过设备转换最终提供了 10℃ 的循环水，直接用来为 20℃ 的建筑室温供暖是不行的。而配合热泵的应用，提升它到 40℃ 以上就行了。这就扩展了建筑供暖中利用低品位能源的机会，克服了高品位能源低用的浪费。这说明热泵技术给低品位能源应用的巨大支持，扩展了低品位能源利用的范围。使用少量的电能，搬运大量的冷、热量供我们应用，就是热泵伟大的本质。

七、热泵提温与常规加热供暖的异同

常规的循环热水供暖，送水温度 60℃，回水温度 35℃，那么送出的热量就是这 25℃ 温差的热含量。回锅炉在用燃气火焰最终把水又加热到 60℃ 再供暖，这些燃气耗量就是高品位能源（燃气）供出的供暖热量。

而热泵采集了低品位能源，比如从浅层地能用单井回灌技术取出 10℃ 的介质温度，再从介质取出热量，约 3℃ 传回浅地层中，这温差就是低品位能源提供的能量。但是 10℃ 的介质温度，不足

以为建筑供暖，我们要把它提升到 40℃ 才行，而这段的温升仍由低品位的浅层地能提供，用热泵搬运热量，从低温介质搬向高温的循环水中，再向建筑供暖。可见供暖的热量都来自于低品位的浅层地能，而热泵只消耗了少量的电能起了搬运的作用。其实少量的电能，除了搬运大量的热能外，自己最终也以热能的形式进入了供出的热量之中，再尽一份贡献。当然在供冷应用热泵时，就没有这优越性了，少量的电能最终以热能形式进入散热循环。

八、浅层地能和恒有源单井循环换热地能采集技术

地球有巨大的热容量，又有巨大的表面积可接受太阳辐射能。在地球表面之下近 100 米左右深度内的热能，一般在 0~25℃ 左右，我们称之为浅层地能，它存在于岩土和地面下各种水流和湿土中。

恒有源单井循环换热地能采集技术是我国原创的专利技术，是从地面之下的浅层岩土体中采集热量的成套技术，经过热泵技术的调温之后，对建筑物供暖。现已经达到技术成熟、被市场接受并发展到了产业化的程度。在国内、外多项工程已成功应用，成为了一种新兴产业。从原理，到可行性、优越性、可靠性和配套性，都有良好的例证。这套建筑供暖的替代技术已具有巨大的推广应用前景，而且适应近年人类不断对能源提出的新期望，它可以称作是建筑供暖能源革命性的替代者。

恒有源集团自主创新的单井循环换热地能采集技术，属于浅层地热能提取的范畴，但与其它同类技术不同，它规避了很多不足。首先，这项技术不是简单提取地下水而取热后回灌，它实现了不污染水体、不损失水资源，不产生地下土壤、沙层迁移等危险；再者，由于它的技术机理科学、成井技术系列化、工程可设计性强，所以具有很大的适应性和更广范的应用范围。相信它的推广将会在节能环保领域里不断显见其优越性，也将在科学性、合理

性以及市场化的选择过程中逐渐被证实，在建筑供暖领域比重更会不断扩大。

需要区别的是，在上世纪中叶，曾用石油开采钻井技术从地下近千米的深度获取 60℃ 以上的高温水，用于建筑供暖和其他需用热水的产业中，这是与浅层地能采集应用截然不同的技术。前者是地下资源的开采和直接消费，有较多的危害。而浅层地能的采集只是提取了地下百米左右的浅层中 0~25℃ 左右的热能，绝不消耗物质资源，所以属于可再生能源的利用，能够持续性发展。

九、应用单井循环换热地能采集技术提取浅层地能为建筑供暖的天然优势

1、无需设置热能的存储环节

虽然提取浅层地能属于可再生能源的应用，也与太阳辐射能有关，但浅层地能存储的热能量巨大，淡化了太阳辐射的即时性，不论白天、晚间，不论晴天、阴天，存储量几乎没有差别，随时可以提取热能为建筑供暖。地热能和热需求无时间差的特点与光伏太阳能照明系统完全不同，有太阳时不用电灯，用电灯时没太阳能发电，所以后者必设储电环节。

2、可利用峰、谷电价制度以最廉运行费供暖

如上所述取热可随时进行，在有峰谷电价制度的地区可全用谷价电，建筑供暖因建筑物本身有极大的热容量，间歇供暖引起的室内温度波动十分微小，特别是对舒适性供暖的建筑，可以有较宽容的室温要求范围。冬季在绝大多数情况下，可以只用谷电费运行，峰价时关机，间歇“省钱”运行（不是节能，只是节省电费）。用程序自动控制，既可节约运行费用，又可缓解电网产、销差的难题，供暖效果仍完全满意。

3、无需建设长距离热能输送管网并消除输送热能的大量功耗和热损失

用浅层地能供暖系统的建筑规模无需过大，无

论是一个大型建筑物，还是一群小型建筑物，甚至是一座小型建筑物均有适用的成套产品，因为热采集和热需求两者之间距离不会很远，基本是就近取热就近供暖，所以避免了建设很大的管网系统，更不会对输送过程中耗费大量功耗，也不会产生太多的热量损失，这就是应用单井循环换热地能采集技术提取浅层地能为建筑供暖的天然优势。

十、为建筑供暖、供冷和提供热水的综合解决方案

单井循环换热地能采集技术为建筑供暖的优势已经有目共睹了。其实，如夏季需要供冷的工程项目，单井循环换热地能采集技术也完全可以直接适应，在冬季采集热量的设备在夏季就可用作采集冷量。而且这种一套系统可冬夏兼用，也是本项技术的绝对优势。这还能使浅层地能利用得更为充分。比如碰到特殊情况，该系统冬季供暖取用的热量与夏季供冷回输的热量相近的话，浅层地能其实只起了季节储存能源的作用，未发生从地下周边传入能量的现象，这说明本项技术对全年空调的工程更加优越，更能减少工程投资。

除了建筑物供暖和供冷之外，日常生活热水也是近年提高居民生活水平的必要需求。以浅层地能供暖相同工况的取热，完全可以把供水加热为生活热水，温度参数与供暖可以统一，说明建筑的供暖、供冷、供生活热水这几项功能，利用浅层地能单井循环换热地能采集技术可以通过同一系统同时满足，只要与末端设备统一设计即能完全解决问题。把恰当的技术恰当地应用在工程恰当的部位，并且要把它们恰当地综合好，这就是我对工程设计本质的体会。

可喜的是，通过单井循环换热地能采集技术利用好浅层地能为建筑业提供安全、高效、节地、无燃烧的节能环保可再生能源智慧供能的新时代，已经到来！

大力推进地能无燃烧供暖

——地能热冷一体化新兴产业的发展

VIGOROUSLY PUSHING FORWARD COMBUSTIONFREE HEATING WITH GROUND SOURCE ENERGY — DEVELOPMENT OF THE EMERGING INDUSTRY OF INTEGRATED HEATING AND COOLING WITH GROUND SOURCE ENERGY

《中国地能》专家组

浅层地能供热技术出现于 1912 年，至今已有 100 多年历史，上世纪 30 年代后开始逐步在北欧、美国等地普及；随着世界能源价格的提升和公众环保意识的增强，进入 21 世纪后，更多的国家开始采用这一供热技术。西方发达国家的专家称浅层地能是适合于任何地方的地热能源，又称其是最节能的单项技术。

十多年来，以恒有源科技发展集团为代表的一批新兴企业对浅层地能开发利用进行研发推广，将原创的单井循环地能采集技术与成熟的热泵技术相结合，为 1300 多万平米的建筑物冬季供热。而对有夏天供冷需求的建筑，还可一系统综合满足冷、热的供给，使浅层地能成功替代了传统燃烧方式为建筑物供冷、热，并发展成为无燃烧供热——地能热冷一体化的新兴产业。



丁衡高（原国防科工委主任 / 院士）：现在的污染基本上都是通过燃烧得来的，以前说过的以气代煤解决了污染问题，目前来讲还是个误区。实际上气是燃烧着的，也存在污染，这个问题要从理论或

者实践上讲清，否则不能突出无燃烧的重要性。所以，无燃烧的供热（制冷）是一个很重要的方向，其中地热就是一种非常有利的方向。根据恒有源这么多年的工作，其规模越来越大、地域越来越广，并且总结出了很多经验，证明其技术并没有什么问题。我所疑虑的唯一一个问题是该项技术是否会牵扯到水污染，但恒有源在北京海淀中关村三小所做的试验工程项目，来证明其无污

染，这是非常重要的。



唐孝炎（中国工程院院士，北京大学环境科学系教授，环境科学专家）：我参观过恒有源的项目以后，有一个最大的感触，就是用浅层地能来解决农村采暖用煤的问题，这对于北京来讲是当务之急。北京现在天然气的

管道只铺到城区的边缘，如果往郊区铺设天然气管道，这个价钱是不得了的。江亿院士等做过一些研究，在近郊造一个热电联供，它产生的 NO_x 的污染不会比用煤少，这个结论在美国能源基金会的会议上做过的一个报告，所以我感觉在农村采用恒有源的技术解决采暖问题可能更为重要。

如果把恒有源的技术推广一下的话，我觉得也可以解决四合院的供暖问题，我觉得在农村推广是大有前途的。



王秉忱（国务院资深参事，中国工程勘察大师）：我国城市化的快速发展直接带来对能源、资源的更多需求，迫切要求提高建筑能源利用效率，在保证合理舒适的前提下，降低建筑能耗，这将直接表现为对既有居住

建筑节能改造、可再生能源建筑应用、绿色建筑和绿色生态城（区）建设的需求急剧增长。

对于建筑节能，对搞好低碳建筑和低碳城市化建设来说，利用地源热泵技术开发浅层地能是一条可行之路。它最大的特点就是用比较少量的高品味能源，也就是电能来开发地下的低品味能源，这显然是节能的；从而把这种绿色的可再生

能源与建筑业紧密联系在一起。此外，它节约了传统的常规能源——煤炭，也必然实现了减排；而当把开发浅层地能与空调制冷相结合之后，它的优势就更加突出了——因为把热排放到地下，就减少了对空气，特别是对城市的热污染。所以利用地源热泵技术开发浅层地能，对推动建筑节能，搞好低碳经济，加速低碳城市化会起很大的促进作用。



汪集旻（中科院地质与地球物理研究所研究员/院士）：我参观过恒有源公司的样板房，它的无燃烧供热非常好，特别是对可移动式的集中供暖锅炉房印象深刻。但我觉得还可以缩小它的体积，或者将一些

零部件变轻。恒有源公司的样板房，跟新农村建筑是非常切题的，成本是 350~400 元/平方米，像上海郊区、广州郊区、杭州郊区、深圳郊区等经济较发达农村绝对可以使用。

在治理雾霾方面，是让北京最为头疼的。除了要有资金的支持以外，还得要有技术、要有人实干，恒有源公司是既有技术又能实干，能够担负起这个重任。



郑克棧（中国能源研究会地热专业委员会）：我国南方冬季供暖的原则，应该是兼顾提供舒适与节能减排两大首要目的。住建部及我国许多供暖专家都认为南方没有必要同北方一样实行集中供暖，即建设供热站、铺设管网、对所有楼房及平房全都统一供暖。北方的供暖方式耗能较大，对于

南方居民的需求而言，北方供暖系统的模式浪费较大。

从资源禀赋看，我国南方能源缺煤少油，如果供暖与发电争煤，显然是不可取的。另外南方供电本就紧张，所以不宜使用耗电量大的电阻采暖方式，应该尽量利用可再生能源，节省常规能源，同时减少二氧化碳等温室气体的排放。

总之，南方应该提倡分散式供暖，因地制宜，各自根据自己（小区）的需要程度，可以一栋楼、一排房为单位分别对待，分散解决。

不同采暖方式的热利用系数（COP）对比

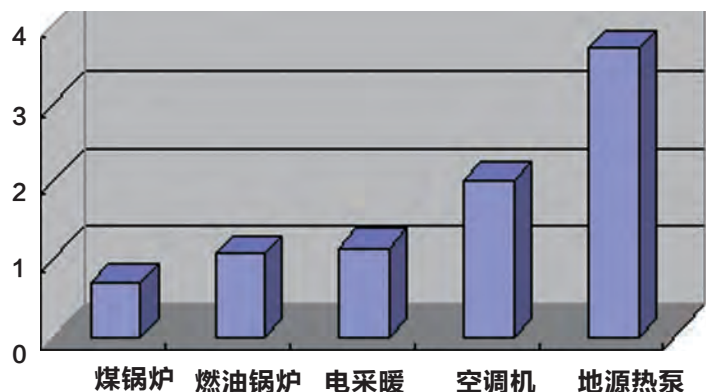


表 1 各种采暖方式的能效系数

在现有清洁供热技术群中，既能减少使用地污染，又能减少总体污染物，还能减少温室气体排放的是利用浅层地能供热技术。从能效比的角度看，浅层地能利用（地源热泵）的性能系数（COP）是最高的（见表 1）。也就是说：燃煤的性能系数（热效率）为 0.6；燃油的性能系数为 0.9；电的性能系数为 1.0；空调机的性能系数平均为 1.8，它在工作时依靠 1kW 的电耗、从空气中提取额外 0.8kW 的热；地源热泵的性能系数平均为 3.5，它在工作时依靠 1kW 的电耗、从浅层地能（地下水、地表水或土地）中提取额外 2.5kW 的热。地源热泵比空调机（即空气源热泵）的性能系数强得多，这使浅层地能更节能。另外，从提高能源利用率的角度来看，使用浅层地能供暖技术明显优于使用燃

煤锅炉供热。山东建筑工程学院的方肇洪教授指出：“在中国现有技术条件下，以煤炭为一次能源，火力发电与热泵联合的间接供热方式比燃煤锅炉直接供热的方式提高能源利用率的一倍以上。”

浅层地能供热技术不仅具有节能、高效的优点，在改善生态环境方面也可发挥大作用。与直接使用燃煤供热比较，SO₂ 的排放可减少 10% 左右，CO₂ 气体的排放也可减少 56% 左右；相比直接电采暖，CO₂ 气体的排放可减少 80% 左右。在减少温室气体排放的同时，因利用分布于地下的可再生能源——浅层地热能，是名副其实的“绿色能源”，浅层地能热泵系统的运行环境零污染、零排放，能真正做到保护生态环境，减少对环境的污染；被美国环境保护署（EPA）评为“是环境最友好的供热技术”。

浅层地能利用还可以在夏季减少制冷的能耗，如果在冬冷夏热的南方普及，除了减少能耗，降低污染外，还可以明显压低城镇地区冬日供热、夏季制冷时的用电峰值，保证极端气候条件下的电力供给。武汉市政府曾提出了“冬暖夏凉工程”，提倡用浅层地能工程造福全市民众，不但使“长江三大火炉”之一的武汉可以安享夏季制冷的待遇，而且推广浅层地能制冷比家用空调制冷给武汉节省大量电能。



王光谦（中国科学院院士，清华大学博导）：雾霾的重要成因之一是量大面广的以燃烧方式为建筑物供热所产生的低空排放，

排放物中含有有害气体、尘等细微颗粒物，遇有适合的气候条件就会形成雾霾。

目前我国原创的浅层地能采集技术成熟，可适用性和可设计性强；已经陆续出台相关标准；且地能供热不额外增加建筑物成本。从市场开发的角度看，已经培育出的行业的品牌企业和产品有：可以用于新兴城镇供热冷基础设施的“5 ~ 900MW 地能分布式冷热源站”、可以用于单栋或多栋建筑物的“地能热泵环境系统”和重点用于农村农户供热的“地能热宝”等。这些原创技术的产业化无疑带动了传统供热行业（有燃烧、有排放、有污染）向地能热冷一体化新兴产业（无燃烧、无排放、使用区域零污染）转换。而地能热冷一体化新兴产业是生态环境文明建设促进传统产业转型升级换代适应新时期发展的非常典型的例子，也是依靠产业发展，推动加速治理雾霾的最经济和有效的手段。大力推广无燃烧供热，是治理雾霾的重要出路之一。

柴晓钟（北京节能环保促进会会长）：

北京节能环保促进会对恒有源科技发展有限公司专门针对农村地区开发的、采用地能热泵技术采暖的产品——“地能热宝”进行了调研，发现它比较适合农村特点，是解决农村地区应用清洁能源采暖的好方式，很值得推广。



“地能热宝”是基于地源热泵原理开发的一款适合农村家用的采暖产品，通过输入少量电能的 1 份，实现从土壤中取热 3 份，向室内供热 4 份的能量转移，能源利用效率是同功率电采暖的 4 倍以上。产品如下图所示，主要由地能采集器、分体热泵机组、地能输送系统三部分组成，其中地能采集器是土壤热源部分，采用农村挖薯窖的方式（只需农家院内 1 平米区域，埋深 6 米即可）将其放入地下，提取土壤中的热量；分体热泵机组与家用柜式空调机组类似，分室内、室外两部分，室内供暖，室外放置压缩机等核心部件；地能输送系统是连接地能与热泵机组的管线，换热介质通过管线实现能量的转移和输送。



产品属于可再生能源利用技术，农村建筑一般都能满足安装条件，安装成本可接受，使用方便灵活，运行成本低。据用户介绍，产品操作和使用很方便，屋里暖和了就可以关掉，冷了再开。还可以提供生活热水，夏天还可以提供制冷，比起燃煤采暖时需要搬运煤炭、清理煤渣、易煤气中毒等问题，地能热宝替代燃煤取暖更加干净、省事、安全。



浅层地能开发利用正当时

作者：胡建

TIME TO DEVELOP AND UTILIZE SHALLOW GROUND ENERGY

人类的能源利用经历了薪柴时代、煤炭时代，目前处于以油气为主的时代。随着人们大量地使用化石能源，以致能源对经济社会发展的制约和人类赖以生存的生态环境的影响越来越明显。进入 21 世纪，世界范围内的能源必将出现新的转型，能源资源多元化、低碳化发展是一个不可逆转的趋势。

从目前的发展趋势看，可再生能源将是最具现实性的选择；从国家能源安全的战略高度

看，开发利用环境友好的可再生能源，已经成为我国可持续能源战略的主框架。其中包括地能、风能、水能、太阳能、海洋能、生物质能等在内的可再生能源，均具有资源分布广、利用潜力大、环境污染小、可永续利用等特点，是有利于人与自然和谐发展的重要能源。

在这些可再生能源中，长期以来被忽视，但应用范围最广、开发潜力最大、使用历史最长的是地能（特别是浅层地能）。我国国土南



北所跨越纬度近 50 度，大部分在温带，其气候分布的特点是冬季气温普遍偏低，南热北冷。因此冬季采暖是人们赖以生存的必需品，我国的集中供暖区域以秦岭淮河为界，包括严寒和寒冷地区的 15 个省（市）、自治区，占全国陆地面积的 70%，以致中国建筑能耗占全社会总能耗将近三分之一。而且当前我国建筑供热仍然长期以煤炭、天然气等化石能源为主，个人方式以燃烧为主，这种能源消费方式带来的直接结果，一方面是北方城市冬季饱受雾霾天气的困扰，另一方面组织煤炭、天然气等能源供给，并维系能源价格稳定，也成为政府的一个重要负担。

浅层地能通常是指埋藏岩土体、地下水（或地表水）中，埋藏深度在 300 米以内，温度低于 25℃ 的低品位能源。在此基础上，人们利用热泵工作原理，通过输入少量的高位电能，实现低品位热能向中品位热能（40℃ -- 60℃）提升，从而实现以无燃烧方式为建筑物

供热的目标。正是由于地能分布范围广、资源储量大、埋藏深度浅、使用操作安全、无污染无地质灾害，兼具经济性和环保性的特点，使得地能在诸多可再生能源中脱颖而出，尽管地能的认知度不如同属可再生能源的风能和太阳能，但可以预见的是，地能无论是占有的市场份额、技术成熟度、产业化规模还是其巨大的发展潜力，将无疑拔得可再生能源的头筹。

我国现存的能源结构以煤炭为主，能源供给严重依赖化石能源，能源消费方式粗放，能源消耗水平居高不下，温室气体排放居世界首位。而我国工业化、城市化目前仍处在快速发展之中，今后较长时期（20--30 年）内能源消费将持续增长，面临的能源供给压力和环境压力也将越来越大。在此背景下，2005 年 2 月 28 日，第十届全国人民代表大会常务委员会第十四次会议通过了《中华人民共和国可再生能源法》，2006 年 1 月 1 日开始施行。该法律明确了可再生能源的法律地位，把可再生能源作为能源发展的优先领域。国家发改委于 2007 年发布了《可再生能源中长期发展规划》，提出加快地能、风能、太阳能等可再生





能源的产业化发展,逐步提高优质清洁可再生能源在能源结构中的比例,力争到2010年使可再生能源消费量达到能源消费总量的10%,到2020年达到15%,使可再生能源成为能源供给体系中的有效补充能源,提供每年6亿吨标准煤以上的能源供给量,同时使现有可再生能源技术大多趋于成熟,具备更大规模发展的条件。到2030年,使可再生能源在新增能源系统中占据主要地位,成为能源供给体系中的主流能源之一,提供每年10亿吨标准煤以上的能源供给量,占一次能源消费总量的比重达到20%左右。

针对可再生能源政策体系不完善、扶持措施不配套;企业技术研发投入不足,自主创新能力较弱;产业体系薄弱,配套能力不强;以及资源评估不深入,限制规模化发展的现状,各地政府围绕鼓励可再生能源(或称为“新能源”)开发利用,结合节能减排陆续出台了一系列扶持政策。

从北京、上海等十四个省、市、自治区发展可再生能源的政策取向看,节能减排、

循环经济、可再生能源、环境规划、环境保护、优惠政策等关键词出现的频率最高,可见各地政府不仅把发展可再生能源作为一项重要任务,更把开发利用可再生能源作为节能减排保护环境的一个重要手段。从政策层面看,尽管考虑到各地经济发展水平、能源结构、产业结构、环境威胁程度以及地理气象条件的差异,但不难看到各地政府在环境保护方面的关注点和节能减排政策的共同点。

一、各地政府均把集团(居民)供热制冷作为关注点

十四个省、市、自治区所处的纬度涵盖了冬冷夏凉的东北地区、夏热冬冷的华中地区、夏热冬暖的华南地区以及西部的宁夏回族自治区。这些地区的政府在保证对集团(居民)供热制冷的前提下,均对本地区供热制冷提出节能减排的要求,并以文件形式正式下发。特别是东北、华北地区燃烧供热造成的大气污染更为突出,而供热是民生的生活必需品,因此更为强调改变能源结构,支持可再生能源建设。

二、开发利用可再生能源政策的共同点

十四个省、市、自治区开发利用可再生能源、节能减排优惠政策特征主要表现在政府主导性强、政策指向性强以及可操作性强等三个方面。其政策的共同点是:

1、强调完善财政激励政策。其主要措施:一是各级政府加大节能减排的投入力度,并将其纳入各级政府的财政预算,甚至建立节能减排的专项资金,专款专用;二是用“以奖代补”、“以奖促治”、“生态补偿”等形式实施;三是推行政府绿色采购,甚至提出“由优先采购改为强制采购”;四是进一步加大财政基本建设投资对节能环保项目的倾斜力度。

2、强调落实鼓励开发利用可再生能源，实现节能减排的税收政策。其主要措施：一是对从事开发可再生能源、环境保护、节能减排项目免征减征企业所得税；二是对企业购置开发可再生能源、环境保护、节能减排、安全生产等专用设备的投资额按一定比例实行税额抵免。

3、强调加大开发利用可再生能源，实现节能减排工作的金融支持。其主要措施：一是通过政策性调节手段，鼓励和引导金融机构加大对开发利用可再生能源、环境保护和节能减排项目的信贷支持；二是加大对开发利用可再生能源、环境保护、节能减排项目的直接融资力度；三是为开发利用可再生能源、环境保护和节能减排项目积极争取国际金融组织和外国政府优惠贷款；四是强化从事开发利用可再生能源、环境保护和节能减排企业上市辅导。

三、强调突出政府的主导作用

政府的主导作用主要表现在：在财政预算

中安排开发利用可再生能源、节能减排和环境保护的专项资金；在政府采购中实施强制性的绿色采购；建设使用可再生能源、节能减排的示范项目，并纳入政府的重点工程；政府机构在使用可再生能源、节能减排和环境保护方面做出表率；重点支持以合同能源管理为代表的节能减排服务公司发展；政府牵头强化开发利用可再生能源、节能减排和环境保护方面的科技支撑以及人才培养；进一步加大可再生能源、节能减排和环境保护的宣传力度。

由此可见，发展可再生能源是实现我国经济社会和能源可持续发展、建设生态文明的必然要求，是我国应对气候变化，强化环境保护的重要措施，是改善能源供给多元化、保障能源供给安全、解决边远地区用能、促进经济转型和区域经济发展的有效途径。

可以说，可再生能源发展正当时，浅层地能开发利用正当时。



面对地能热泵行业快速发展的思考

作者：老马

THINKING BEFORE RAPID INDUSTRY DEVELOPMENT OF GROUND ENERGY HEAT PUMP

地能热泵行业是伴随着浅层地能的规模化利用发展起来的，近十几年在我国发展很快。一方面，雾霾横行，促使人们寻找无燃烧的供热方式。另一方面，采集浅层地能的技术不断完善，特别是单井循环换热技术出现以后，为大规模安全地开发利用浅层地能提供了技术保障。目前，我国浅层地能在建筑供热领域已进入规模化发展阶段（图1）。地能热泵行业的快速发展还得益于政府发布的一系列的支

持政策。

2005 年国家发布《中华人民共和国可再生能源法》，2006 年财政部发布《可再生能源建筑应用专项资金管理暂行办法》，2009 年又发布《可再生能源建筑应用城市示范实施方案》和《加快推进农村地区可再生能源建筑应用的实施方案》，示范项目扩展到区县。2011 年发布的《关于进一步推广可再生能源建筑应用》引导可再生能源的应用范围向深度和广度发展。现在地热能作为清洁的可再生能源，已纳入“十二五”规划，在未来 6 年，我国计划完成地源热泵供暖 / 冷总面积近 3 亿平方米，总投资金额超过 1000 亿元。

客观上的需求和政府的扶持给地能热泵行业带来了空前的大发展的机遇。

我们感觉到，客户的“胃口”越来越大了，常常可以遇到动辄几十万平方米的大项目，几平方公里的区域全部采用地能热泵供热也已经在详细规划之中。

客户的要求也越来越高了。他们不但在设计上关心设备选型、材质等，而且在运行方面也提出近于苛刻的节能降耗的要求。应当说，随着地

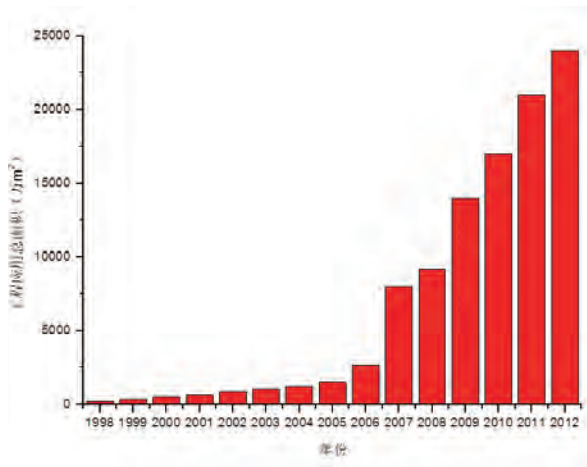


图1 我国浅层地能应用面积



图2 山西省农科院 总面积 14 万平方米，2013 年投入使用

能热泵产品的普及，客户的成熟度大大地提高了。

还有一个变化就是原来长江沿线传统上冬季没有采暖的地区，地能热泵同一套系统夏季制冷冬季可以采暖的优势让当地居民看到了冬季采暖的希望，这些地区的市场发展很快。广大农村地区在摒弃了传统的燃煤和秸秆燃烧采暖之后，也把目光投向地能热泵，他们对地能热泵采暖系统的性价比提出了更高的要求。

为顺应社会的需求，地能热泵行业近几年来也有了显著的变化。一方面是制定了相关的标准和手册，如《地源热泵系统工程技术规范》《单井循环地能采集井工程技术规范》和《地源热泵技术手册》等，企业执行这些标准可以提高产品质量、降低成本、提高可信度。另一方面，新产品不断涌现，像“地能热宝”这样的分户甚至可

以分室运行的产品，很受农村和别墅类用户的欢迎。因为它对环境条件要求不高，与行为节能相结合，可以大大降低运行费用。

近来，互联网的理念也影响到了地能热泵行业，业内一些企业期望运用互联网的成果，建立“大数据”系统，达到为客户“量身定制”出有特色的产品。另一方面，也可以对现有的业务模式进行更新改造，提高效率、降低成本。

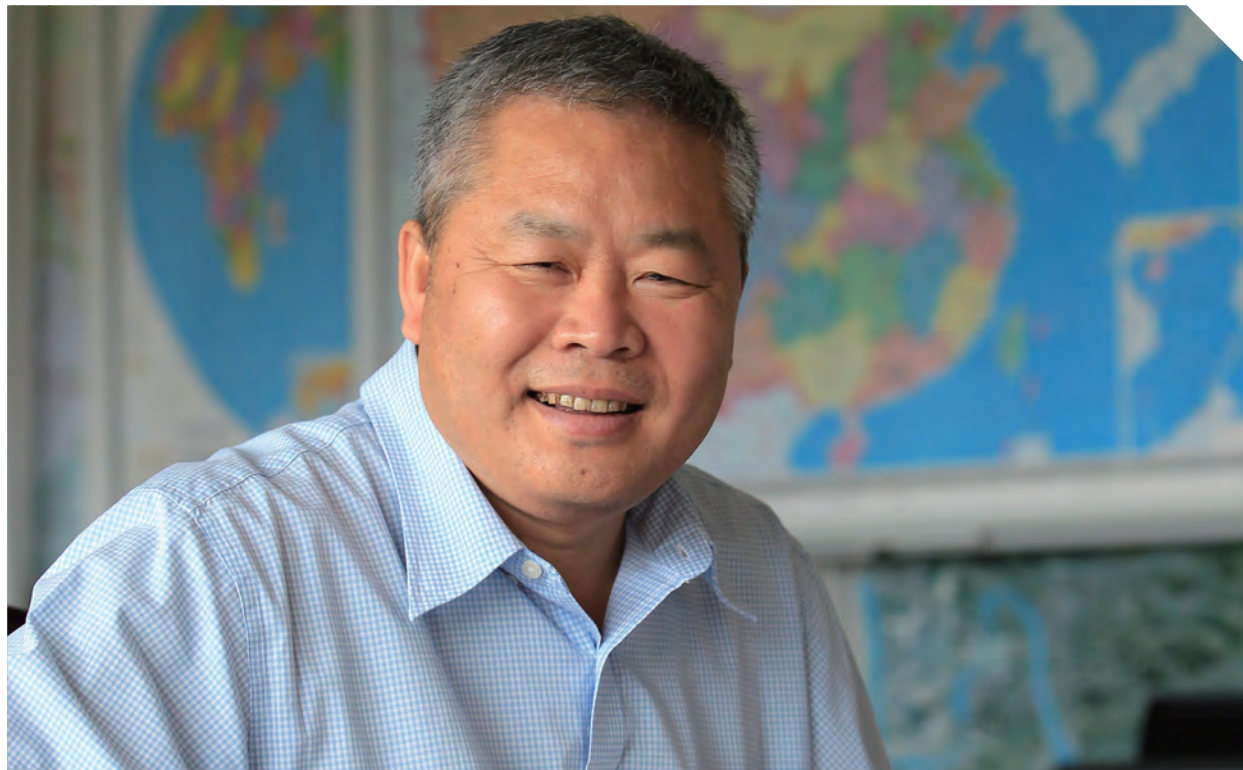
由于项目的规模不断扩大，项目的范围已经不再是一个建筑或一个建筑群，而是发展到要为一个几平方公里的区域提供采暖和制冷。因此，以地能热泵为核心的区域能源规模应运而生。与通常的能源规划不同的是，这样的能源规划很注重浅层地下的供热能力的评价与估算，有许多新问题需要研究和解决。

让无燃烧的智慧供热 由梦想成为现实

访恒有源科技发展集团有限公司总裁徐生恒

**A DREAM OF NONCOMBUSTION
INTELLIGENT HEATING TO BECOME TRUE
——AN INTERVIEW WITH MR. XU SHENGHENG,
THE PRESIDENT OF EVER SOURCE SCIENCE &
TECHNOLOGY DEVELOPMENT GROUP CO., LTD.**

撰文：本刊记者



昨日夜里刚刚从大连回到北京，今天下午又要飞赴绵阳，虽然连日奔波，可徐生恒先生脸上没有丝毫倦意。一大早他就来到办公室，赶在起飞前的几个小时接受了我们的专访。恒有源科技发展有限公司近年来通过原创地能采集技术，实现了开发利用地能的产业化发展，上马的工程项目越来越多，作为公司总裁，他当然也越来越忙，时间对于他，几乎是没有一刻是白花了的。

记者：徐总，今年是恒有源科技发展有限公司成立十五周年，请您简要回顾一下公司十五年的发展。

徐生恒：公司成立伊始，就聚焦开发利用浅层地能为建筑物无燃烧供热这个大方向，把“求实、创新”作为企业的宗旨，把“人与自然和谐共生”作为企业的追求，把“让百姓享受高品质生活”作为企业的奉献，把“安全第一，标准当家，扎扎实实打基础，反反复复抓落实，负责任做每件事，愉快工作每一天”作为员工行为准则，用“忠诚与责任”这个企业核心价值观，凝聚公司全体员工和一批顶级国内外专家，把原创的单井循环换热地能采集技术，发展成能为新兴城市供热的“城市热站”、满足单体或群体建筑物供热的“楼宇自供热系统”，以及为农村农户自采暖的“地能热宝”，使恒有源的原创技术实现了规模化和产业化的跨越式发展。在此基础上，结合工业互联网时代特点，走出一条地能无燃烧为建筑物智慧供热的新路子。

记者：建筑物智慧供热是当前比较流行的话题，恒有源是智慧供热的积极推广者，能否请您谈一下智慧供热的发展历史及未来发展状况。

徐生恒：说到“智慧供热”就不能不先说说“智慧供热”的背景。

二十世纪五十年代后，以燃烧化石能源的传统供热领域发生了巨大的变化。一是以化石能源为主的能源低效率利用（如：世界能源平均利用率为50.3%，我国能源利用率仅为36.8%），导致

全球多次发生以化石能源为代表的能源危机，以及燃烧化石能源造成的生态危机（如：雾霾、酸雨、全球气温升高等）。反过来，这些危机也成为利用浅层地能智慧供热的外在压力。二是人民群众日益提高生活品质的要求，特别是提高生活环境质量的要求（表现为冬暖夏凉），导致能源需求进一步加大（我国目前石油对外依存度已经超过60%，天然气的对外依存度已经达到30%），因此如何在现有能源供给的条件下，满足人民群众提高生活环境质量的要求，就成为了利用浅层地能智慧供热的内在动力。三是大数据、互联网的快速扩张和广泛应用，以及带来的工业革命、可再生能源开发和相关新技术井喷，就成为智慧供热的现实助力。四是习近平总书记提出“四位一体”的能源革命（即：能源消费革命、能源供给革命、农业技术革命和能源体制革命），指明了我国能源利用和发展的方向。五是我们恒有源公司原创的地能采集技术实现了规模化和产业化发展，使量大面广的存在于自然界中可再生的0--25摄氏度的低品位地能，成为无燃烧为建筑物智慧供热的替代能源，实现在任何地质条件下都能够做到仅花费1200元的成本，就能采集1kw的热量，开始了新时期供热能源的一场革命。

记者：那么如何来定义“智慧供热”呢？

徐生恒：所谓智慧供热，就是指地能无燃烧为建筑物供热的环境系统能够“感知环境信息（如：温度等）并作出恰当响应”。

记者：“感知环境信息”好理解，但是你说的“恰当响应”有什么特征呢？

徐生恒：这种“恰当响应”具有六个方面的特征。首先，这种“恰当响应”系统能够根据地能（热）品位和周围温度等信息变化，自动为人们提供一个舒适和稳定的生活环境。这种舒适稳定的环境是建立在大数据处理（如：地能（热）品位、环境温度、个人偏好、客户数量、建筑物

保温系数等数据处理)和云计算基础上的互联网+分布式能源系统。其次,这种“恰当响应”必须是低能耗但同时又是高能效的。这种低能耗是相对于燃烧化石能源为建筑物供热而言,表现为用一小部分花钱的电能,驱动压缩机和水泵,利用相变原理,结合换热技术,搬运土壤中自然存在的大量不花钱的地能为建筑物供热,最终实现供热能源利用率高于108%。第三,这种“恰当响应”必须是低成本的。这种低成本不仅体现在化石能源价格攀升及需求价格弹性降低时,低能耗带来的较低的使用成本,以及能够省去化石能源在运输、储存过程中的高额投资,并且还体现在省去治理因燃烧化石能源而造成大气污染的高额费用。第四,这种“恰当响应”在使用区域必须是无污染的。由于使用浅层地能为建筑物无燃烧供热,因此人们在享受舒适和温度的生活环境时,在使用区域是没有二氧化碳、二氧化硫、氮氧化物和挥发性有机物等污染物排放的。第五,这种“恰当响应”必须是有资源保障的。由于浅层地能广泛存在于沙石土壤、江河湖海之中,具有分布广、易开采,可再生、无气象条件制约(相对太阳能、风能)的特点,因此在现有的可再生能源中,只有开发利用浅层地能才能给“恰当响应”提供取之不尽用之不竭的资源保障。第六,这种“恰当响应”必须是可以复制的。正是由于浅层地能这种资源保障的特征,就使得利用浅层地能无燃烧为建筑物智慧供热具有了可复制性,也就是说,在任何地区、任何地形、任何地质和任何气象条件下,都能为人们提供舒适稳定的生活环境。

记者:在现实生活中有“智慧供热”的基础吗?

徐生恒:首先,智慧供热是决策者工程。因为决策者必须从清洁发展、能源依赖、能源管理三个维度出发,去构建宏观能源体系。而能够构建一国一地宏观能源体系的决策者,就只有政府。由此可见政府不仅是生态环境保护的第一责

任人,而且还是构建宏观能源体系最大的决策者。智慧供热最大的意义就在于,在低成本、低能耗、高能效、无污染、低依赖的前提下,满足人们舒适稳定的生活环境要求。在一个使用化石能源为主的供热能源体系下,是不可能实现三个维度最优化的。所以就要求决策者以智慧供热为目标,从燃烧供热行业升级换代入手,动员社会广泛参与,通过法律体系和能源体制机制创新,推动能源消费革命、能源供给规模、能源技术规模和能源体制革命,构建可再生能源与传统能源并



存，以可再生的浅层地能为主，作为为建筑物供热的替代能源。因此我国先后制定了《中华人民共和国大气污染防治法》和《中华人民共和国可再生能源法》，从而奠定了开发利用浅层地能无燃烧为建筑物智慧供热的法律基础。其次，中国有全球最大的建筑市场，据不完全统计，2004年至2013年的十年间，全国建筑物竣工面积达到280万平方米，随着国民经济和社会稳定发展，以及人民生活水平提高的刚性需求，保守预计，未来五年全国新增建筑规模将突破100亿平方



米，按50%的新增建筑物需要供热，以及在需要供热的建筑物中，40%采用浅层地能为建筑物智慧供热推算，未来五年开发利用浅层地能智慧供热的市场将达到20亿平方米以上，由此可见利用浅层地能为建筑物智慧供热有着坚实的市场基础。第三，以原创的《单井循环换热地能采集井工程技术规范》为代表的地能采集技术、成熟的热泵技术、无毒无害的弹性填料，以及保障供给的地能（热）品位决定产品配备的动态设计理念，系统运行的精细管理，品牌物业能源合同管理服务保障体系，质量优先的设计研发—装备制造—安装调试—物业运行—维护保养的全产业链，以及以浅层地能作为供热替代能源为支撑的产业发展模式，构成了适用于城市热力的大型恒有源分布式地能冷热源站、适用于区域供热（冷）的恒有源地能热泵环境系统和适用于农村农户的小型地能热宝，实现了浅层地能无燃烧为建筑物智慧供热的城乡无差别全覆盖。由此可见，原创的浅层地能采集技术和成熟的热泵技术，以及全产业链的规模化发展，为推广智慧供热提供了坚实的技术保障。第四，进入21世纪以来，开放和全球化的网络，把人、数据和机器连接起来的工业互联网；把所有物品通过信息传感设备与互联网连接起来，强化物流及物流信息管理的物联网；利用计算技术和数据处理技术形成的各种工业软件构成的工业云；以及互联网思维主导的观念营销等泛产业化新概念，使智慧供热由梦想成为现实，可以说工业互联网、物联网、工业云等新技术应用，以及先进的观念营销等泛产业化新概念，为智慧供热创造了创新的外围条件。

不知不觉中时间过得很快，徐总必须赶往机场了。最后，他借用了习近平总书记的一句话结束了我们的访问：“人民对美好生活的向往，就是我们奋斗的目标”！

新农村建设中的自采暖新星

——恒有源地能热宝系统产品之一

作者：刘宝红

SELFHEATING NEW STAR IN NEW RURAL CONSTRUCTION

——HYY GROUND SOURCE HEATING DEVICE

恒有源地能热宝是首选浅层地能作为建筑物供暖（冷）替代能源，以地能热（冷）一体化机组为终端设备，为农村农户服务的自采暖（冷）产品。产品可以做到每户甚至每个房间都是一套独立的系统，遥控器操作、系统全自动控制、安全可靠、运行费用低、零污染、零排放，是新农村建设中的节能环保自采暖新星。

一、产品研发及发展路线

目前，我国广大农村地区居民的采暖形式比较落后，以燃煤为主。因为适合农村选用的新型采暖技术不多，有相当一部分农民家中选用燃煤的土制采暖炉采暖（土暖气），甚至很多地区仍靠小煤炉、火炕等取暖，效率低、运行费用高、不安全。并且随着煤资源的紧张，不可再生能源的逐渐枯竭，更加剧了农村建筑供暖节能的严峻形势。加上农村人口相对分散，绝大多数地区没有完善的供暖、供热管网，电

力负荷也比不上城镇地区，如此情况下，传统的燃气、电采暖方式很难实行开来。因此，市场急需一种初始投资相对低廉、简单易装、安全方便的节能环保产品为农村建筑供热（冷），来满足城乡建设和发展的需要。

恒有源地能热宝是恒有源科技发展集团针对农村建筑供热（冷）的特殊需求研发的一项无燃烧供热（冷）热泵系统产品，能符合农户操作简单、各户自采暖独立灵活、户内各房间差异化供暖（冷），用户谁省钱谁得益。

2009年起由恒有源公司自主研发，解决了以下技术难题：

（1）结合简单易装的蓄能罐地能采集技术，可与多种形式的地能采集系统匹配，适用于多种地质条件；

（2）解决了分户计量的问题，采用传统的电计量与水流量计量解决分户计量与收费问题，供电系统与分户电表结合，水流量与分户用热量匹配；



(3) 噪声控制技术，将噪声源压缩机移至室外，从根本上解决噪音难题；

(4) 低温供热技术，能满足严寒地区供暖；

(5) 小型化技术，产品采用数值模拟和试验，解决分户热泵家用小型化的关键问题。

恒有源地能热宝系统产品已获得多项国内发明专利和实用新型专利，同时已获评北京市2015年节能低碳技术产品。产品类型已拓展为7种系列13种规格型号，能全面覆盖用户供暖（冷）、生活热水需求。产品通过全国代理模式销售、规模化和标准化生产降低成本和确保质量、全国建立运维网点产业化发展，带动热泵行业技术进步和可再生能源产业结构调整，促进产

业联动发展。

二、最可靠的供暖替代产品

工作原理：由热泵吸收土壤、岩石中的浅层地能热制取热水（风）为建筑供暖，用一小部分花钱的电（1度），提取土壤、岩石中大量不花钱的地能（3度），相当于电锅炉4度电产生的热能。

产品的特点：

①节电省钱：供暖电耗相当于传统电锅炉的25%，制冷比传统中央空调省20%左右。

②安全可靠：没有煤气中毒的担心，没有燃气（油）的爆炸风险。系统具有防冻功能机组不开管道不会冻裂，符合农村农户间歇或差异化使用习惯。

③操作简单：遥控器按需控制启停操作，家用空调的操作模式，系统设备全自动联控控制。

④施工简单：产品模块化连接安装，管路简单，安装技术成熟。

⑤质量保证：集成化的系统，质量在工厂中保证。

产品的适应性：

①属于可再生能源利用技术：产品运行过程中只有少量电能消耗，与土壤进行能量交换。土壤能量可以再生，源源不断，相对稳定，可以保证系统的可靠运行，运行零污染、零排放。

②农村建筑一般都能满足安装条件：采集器可就近埋设于农家院内外；室内机组可放在室内任何位置；室外机组体积小，可立于墙边或墙角。产品所需电力与家用空调一样，电压

220V 即可，基本可以不考虑电力增容，入户电线也不用更换。

③使用方便灵活，运行成本低：农户根据需求可以任意设定温度和开停，适应农户的不同房间差异式、间歇式供热需求，还可以提供热水，夏天可以供冷。如果节约使用，一个采暖季的运行费用甚至比用煤采暖还要低。

三、地能热宝产品应用情况

目前，恒有源地能热宝已在北京及其他区县 7 个省份、约 40 个地点应用。按产品运行时间来说，稳定运行 5 年的项目有房山某厂房改造项目，工程总用地面积 20989.44 m²，总建筑面积 16347.35 m²；按地理区域来说，严寒的北方地区有哈尔滨市巴彦县民居住宅，又冷又热的南方地区有绵阳市科学城，均已成功应用。典型案例如下：

① 房山某厂房改造项目

建筑原为厂房以及厂房配套建筑，园内改造为单元式画室。根据改造后单元式画室分户出租的业态，要求分户供暖、分户计量、节能降耗。改造采用恒有源地能热宝产品为建筑供暖（冷），通过简单电计量实现了分户计量，简单公平且公正。改造后较燃煤锅炉 + 冷水机组系统年节省运行费用 18.57 万元，年节约标煤约 120 吨，减少排烟量约 165 万 Nm³，减排 CO₂ 约 360 吨，减排 SO₂ 约 3 吨，减排 NO_x 约 2 吨，减排颗粒物约 5 吨。

② 某新农村替煤改造项目

后期跟踪系统运行情况，以开启时间最长、室温控制最高的一户为例，机组日运行 13-15 小时，控制温度至 22℃，平均日耗电

量 13.14 kWh（某老平房建筑，有外墙保温），整个采暖季运行费用仅 821 元（电价按 0.5 元 / kWh 计算），与原先燃煤（3.5 吨 × 800 元 / 吨 = 2800 元，室温仅能维持在 13.5-15.5℃）取暖相比，节约运行费用 70% 左右。

某农户采暖方式变化前后比较

	原先燃煤取暖	地能热宝取暖
室温控制	13.5-15.5℃	22℃
运行费用	2800 元	821 元

③ 替空气源改造项目

以门头沟洪水口村某用户家（70m²）为例，24 小时开机供暖面积 30 m²，房间温度控制在 20℃，日耗电量 28-30 kWh（山区老平房建筑，普通 240 墙体、单层玻璃）。

该户原采用“空气源热泵机组 + 散热器 + 地暖系统”供暖，每天耗电 47-50 kWh，室温在 15-17℃；改成恒有源地能热宝产品后，日耗电量节省约 17 kWh，每天能节省 7 元运行成本，节约 37% 的运行成本。

某村农户采暖方式变化前后比较

	原先空气源取暖	地能热宝取暖
室温控制	15-17℃	20℃
运行费用（日耗电）	每天 47-50 kWh	每天 28-30kWh

结束语：

恒有源地能热宝产品易安装、操作简单、运行费用低、稳定安全可靠，已被用户接受和喜欢，是可替代城镇分散式锅炉系统最为可靠和节能环保的产品，是新农村建设自采暖供热的新星产品。

浅层地能开发利用的金钥匙

——恒有源单井循环换热地能采集技术简介

作者：李大秋

单井循环换热地能采集井技术是一项由我国原创的、先进的、适用于多种地质条件的浅层地能采集技术。它以循环水为介质采集浅层地下温度低于 25℃ 的热能，可以实现地下水就地同层全部回灌。不消耗也不污染地下水，对地下水是安全的。截止 2014 年底，单井循环换热地能采集技术在我国各省市自治区和直辖市已推广应用浅层地能为建筑物供暖近 1300 万平方米，每年可实现用浅层地能替代传统供暖能源约 9 万吨标煤。《单井循环换热地能采集井工程技术规范》已被政府有关部门批准，作为北京地方标准正式发布实施，标志着这项技术具备了实现产业化发展的条件。北京市有许多重要工程都采用了单井循环换热地能采集技术供暖和制冷。现在这一技术已走出国门，在美国等国家的示范工程也已投入运行。

一. 地能采集方式

1. 有蓄能颗粒采集井

有蓄能颗粒采集井适合地层岩性以粉细砂为主的项目，该采集方式具有运行稳定、高效节能等优势。

其换热原理是：循环水由置于隔热管底部抽水区的潜水泵抽出，进入热泵机组放热或吸

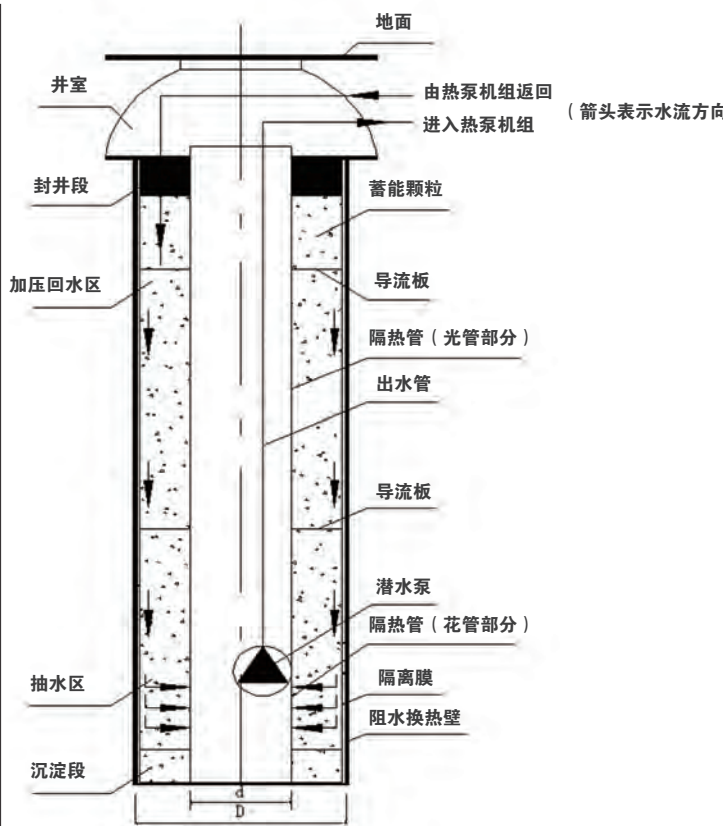


图 1 有蓄能颗粒地能采集井

热后，由热泵机组返回进入蓄能颗粒的上部加压回水区内。水流在有蓄能颗粒的环形空间内向下流动至抽水区，透过隔热管下部的花管部分进入隔热管，再由潜水泵抽出，见图 1。

2. 无蓄能颗粒采集井

无蓄能颗粒采集井适合地层岩性以粗砂、砾石为主的项目，该采集方式具有运行稳定、建设成本低、施工周期短等优势。

单一水层无蓄能颗粒地能采集井的换热原理是：井水由置于隔热管底部抽水区的潜水泵抽出，进入热泵机组放热或吸热后，由热泵机组返回进入隔热管上部的加压回水区，通过花管流出地能采集井外与周围岩土体进行热交换后，通过隔热管下部的花管进入隔热管内再由潜水泵抽出。上述抽水区和加压回水区应在同一水层内，实现同层回灌，见图 2。

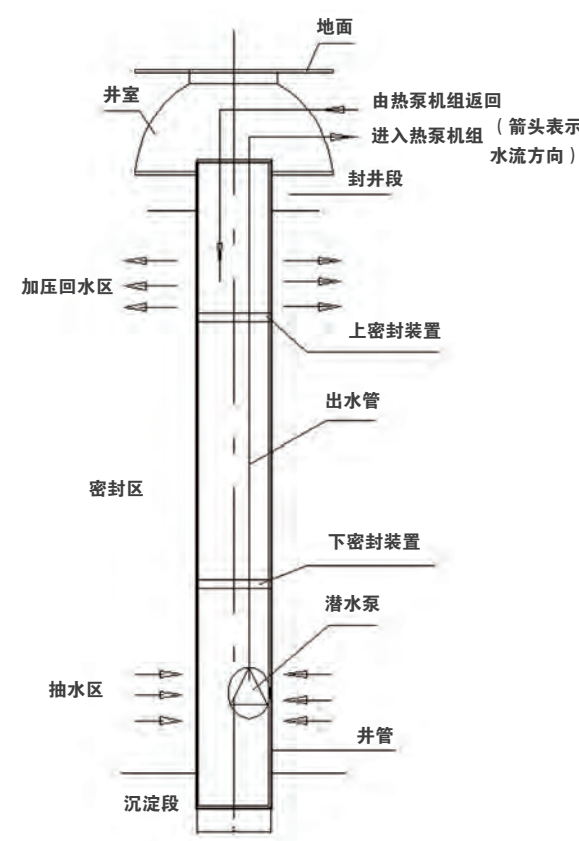


图 2 单一水层无蓄能颗粒地能采集井

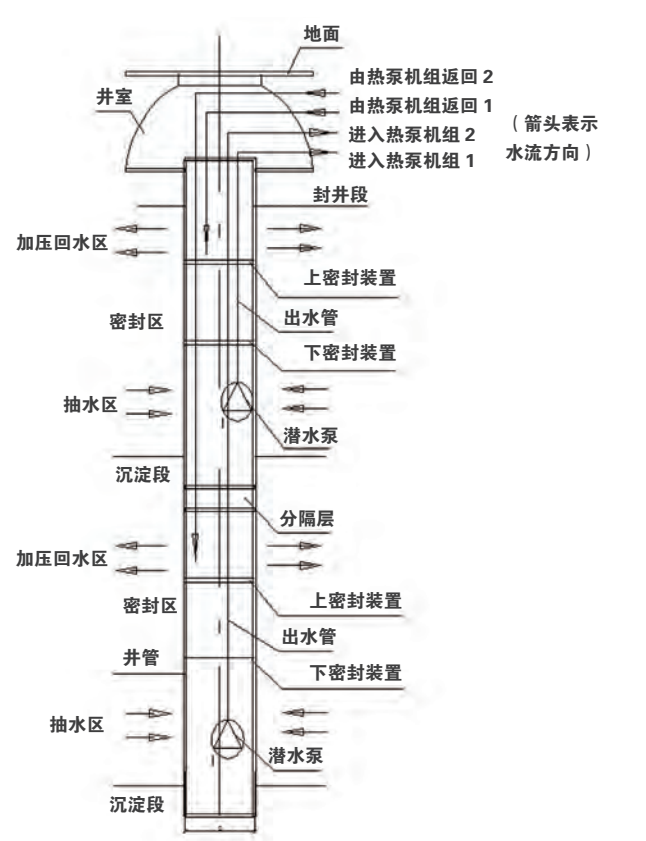


图 3 多水层无蓄能颗粒地能采集井

多水层无蓄能颗粒地能采集井在多水层地质结构的地区可采用两个或多个井上下叠加的结构，上下井之间的分隔层应符合当地相关主管部门的要求，见图 3。

二. 分布式地能冷热源站

恒有源分布式地能冷热源站就是恒有源公司基于地方城镇集中供热的需求而研发出的区域供热产品，

可以根据区域建筑现状，建设“点网结合”的区域集中供能系统，可代替城镇供热基础设施，实现为城镇建筑（群）集中供能。通过与其他能源的联合，极大降低了传统化石能源消耗，不仅为浅层地能作为建筑物供热替代能源提出了新的应用模式，更是一种全新的思路和尝试，开辟了传统市场之外的广阔空间。

恒有源分布式地能冷热源站是以恒有源公司原创的“单井循环换热地能采集技术”（以下简称单井技术）为核心，以可再生浅层地能为主要能源，选择联合天然气、燃气或地热等清洁能源，集成引进创新的可再生能源综合利用技术，为城镇建筑供热（冷）及生活热水的集中供能系统。冷热源站供热期间向用户提供 50 - 55℃ 的热水源，制冷期间提供 7 - 12℃ 的冷水源。其供热（冷）方式具有显著优势：清洁、节能、多功能、建设周期短、配套条件低、占地面积小、运行可靠；不增加城市电网负担，不增加其他公用设施，与基础设施建设同步规划，同步施工；采用模块化配置，可适应不同建筑规模的运行需求，保证了投资及运行的高效率；可实现无人值守，智能化监控，系统运行安全可靠；用户实现分户计量，运行费用低。与传统燃煤发电机组对比，恒有源分布式地能冷热源站具有投资少、建设快、成本低等特点。

2014 年 12 月 29 日，恒有源科技发展有限公司与大连市金州新区签署小窑湾国际商务区 900MW 恒有源分布式地能冷热源站供热特许经营协议。项目建成后每年可实现利用浅层地能替

代传统供暖能源约 16.2 万吨标煤。900MW 恒有源分布式地能冷热源站将在 10 年内实现为小窑湾 20.4 平方公里、不少于 1500 万平米的建筑物供热，是全国乃至全世界最大的地能供热项目。

三. 总结

单井循环换热地能采集井技术具有两项功能（冬供热、夏制冷）的特点，它融合了已有和新建建筑物现有的供热与制冷两个行业的产品功能，其部分工程实例为：中华全国工商联项目、武警某学院项目、国家行政学院项目、国家大剧院（景观水池）项目、中国残疾人体育综合训练基地项目等。

而在 2009 年 8 月，公司在美国内布拉斯加州的第一个示范项目 Hershey School 成功运行，因同其他项目相比该项目节能 25% 以上，于 2011 年获得美国能源部和环境总署颁布的“能源之星”奖。



图 4 美国内布拉斯加州项目

恒有源地能采集技术成熟稳定，能够在任何地质条件下以 1200 元 /kW 的价格采集浅层地能。同时，系统不会造成地下水的流失和污染，也不会因为移砂而造成取水井坍塌和回灌井堵塞等问题，不会产生潜在的地质灾害。这一技术保证了浅层地能与其他可稳定利用的自然能源一样，完全能够成为建筑供热的替代能源。

项目	常规燃煤发电机组	分布式地能冷热源站
规模（兆瓦）	300	300
建设工期（年）	4	4
使用寿命（年）	30	30
建设总费用（百万元）	3510	360
单价（元 / 千瓦）	11700	1200

表 1：冷热源站与燃煤发电站建设费用对比

恒有源地能热泵环境系统安装及暖通空调系统

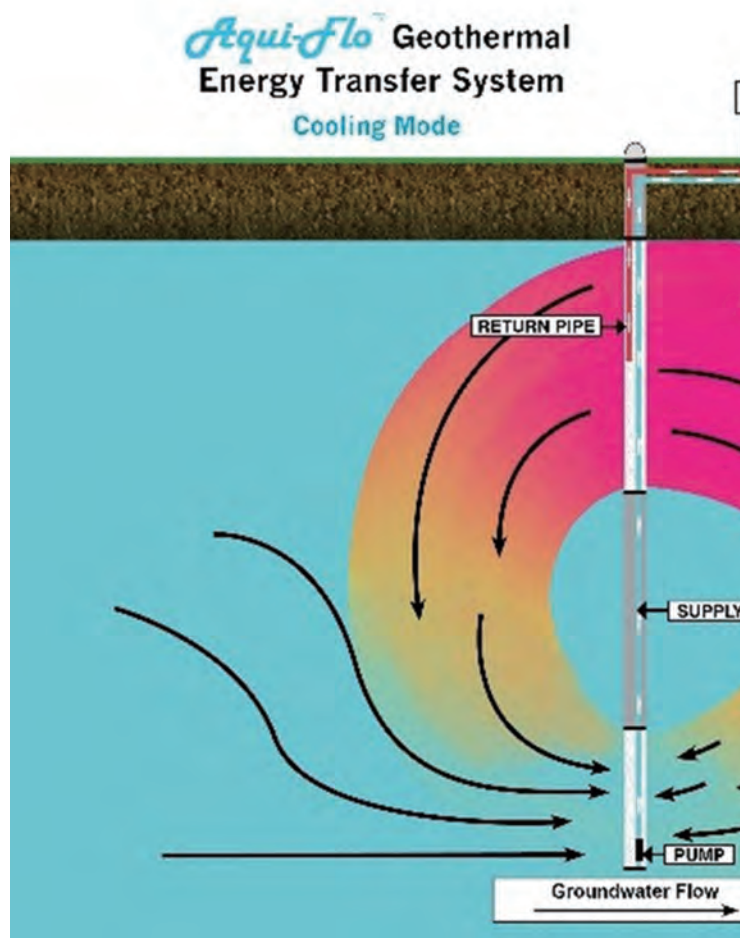
提供专业护理服务的设施——美国内布拉斯加州戴维城圣约瑟养老院

作者：罗纳德·盖瑞 / 凯特琳·盖瑞

1939 年，圣约瑟养老院为内布拉斯加州东南部的老人打开了大门，作为他们的第一家园。在过去的 75 年间，这座养老院经历了几次翻修及扩大以容纳不断增多的住民。2014 年的一次翻新涉及老式的暖通空调系统的整体替换。系统的整体翻新工作于 2014 年的 10 月完工。



作为服务于不同健康水平的常住居民的设施，暖通空调系统始终要求做到独立温度控制，厨房和公共区域做到供热和制冷的可调节，以



及与新系统的不间断供热切换。建筑委员会倾向于一个高效的地能供热系统，而这需要 96,000 BTUH 的容量。这样一个系统使用地面恒温的可再生能源实现热传递。因圣约瑟养老院受到城市空间的限制，无法使用传统的闭环多钻孔地热系统。

2012 年，为了开始暖通空调系统的革新进程，圣约瑟养老院建筑委

员会选择专业的联合公司及盖瑞工程公司负责新的暖通空调系统的工程设计工作。针对现有系统的评审之后，盖瑞推荐恒有源地能热泵环境系统，由贝伦制造负责市场推广，并使用三菱的变制冷剂流量系统。

恒有源地能热泵环境系统是一个独特的系统，已在美国获得专利。系统使用单井循环换热地能采集技术，与热泵系统相结合可实现供热制冷。在单井循环换热的设计中，该系统通过单井抽取并注入同样的水，将对环境的破坏及对建筑物的影响降至最低。尽管内布拉斯加州东南部经历着寒冬及酷暑天气，但是恒有源地能热泵环境系统能全年保持稳定的温度。

盖瑞的提议包括 HVAC 暖通空调系统更新的工作范围、初步成本预估、基础工程设计。针对该提议的评估之后，建筑委员会批准了一座探勘井，为完成恒有源地能热泵环境系统的设计工作提供必要的地质资料。



2012 年五月，盖瑞工程公司完成了测试井的规范书并发出投标。该测试井收到两个投标，最终选择萨金特钻井公司来执行该项目。然而，这一项目曾被暂停，因为戴维市规划委员会担心造成水污染，暂未发放该项目的许可证申请。

应规划委员会要求，普拉特南部自然资源区于 2012 年八月与盖瑞工程公司、圣约瑟教堂和贝伦制造公司会面，讨论和审查了恒有源地能热泵环境系统的工程设计方面。普拉特南部自然资源区充分支持地能井的理念，并强烈推荐使用了隔离热交换器以避免室内热

泵循环管路和地热井管路之间可能存在的污染。

盖瑞工程公司向戴维市规划委员会提交了自然资源区的批准信，并促成了一场听证会以考虑所提议的地能采集井。经过多次讨论并最终确定增加一个锁盖以防止恶意篡改的设计要求，规划委员会批准了该测试井项目。

2012 年 10 月，萨金特钻井公司根据规范



执行测试井项目。测试井为地能采集井设计的完成提供了必要的信息。此外，测试井提供了足够的含水层细节，以确认该井将能够为建筑物提供所需的热量。测试井的设计包括了 26 英寸直径的孔、12 英寸的 PVC 套管、不锈钢丝网、一个流量为每分钟 300 加仑的潜水泵和一个隔离换热器。盖瑞工程公司于 11 月份收到了测试结果，该测试结果已经建筑委员会批准。

2012 年 12 月份，专业单位和盖瑞工程公司开始了最终的设计工作。新的暖通空调系统包括八个连接制冷剂管路和远程蒸发器的 10 吨级的压缩机，向建筑的北半部分提供新鲜空气的全热交换器，以及一个向建筑的南半部分提供新鲜空气的专用室外装置。该项目于 2013 年 3 月份招标，并于 2014 年 10 月份完成建设。萨金特钻井公司被选择为地能采集井的承包商。沙纳汉机械电气公司被选择负责建筑内变流量

热泵系统的建设和安装。

马克柯伐 - 环境服务 / 维护作为圣约瑟别墅项目的总承包商。马克协助沙纳汉和萨金特钻井公司一起完成了暖通空调系统的安装和别墅的其他的一些装修工作。

随着工程的进行，因不间断供热切换新的暖通空调系统的需求，拆除旧式热水器的进程受阻，直到供暖季节结束、在 2014 年夏季，设备同时在老的冷却装置 / 冷却塔和新的多联机热泵系统上运行了。工程于 2014 年 10 月完成，养老院完全转移到新系统上。

在项目完成将近一年之后，恒有源地能热泵环境随着多联机热泵系统高效地运行着，该系统易于维护，允许个人住户在他们的房间内控制温度。别墅也从较低的能源消耗和增加的居民满意度中获益。

与之前的锅炉、制冷机、冷却塔系统相比，新的暖通空调系统的安装节省了 21% 的能源。

柯伐先生对于项目的情感和勤奋促成了这个项目的成功。他的努力和随和的职业精神都是不可或缺的。



恒有源集团部分 项目工程实例

SHOWCASE OF HYY PROJECTS (PARTIAL)

恒有源科技发展集团有限公司拥有的单井循环换热地能采集技术，是在北京奥运申办过程中诞生，在北京奥运建设中得到验证，在北京成功举办奥运会后的中国经济持续发展健康中成长。截止 2014 年底，集团在全国共推广供热、制冷应用建筑面积近 1300 万平方米。推广应用已由北京辐射至上海、天津、江苏、西藏、青海、四川、河北、山东、山西、陕西、宁夏、新疆、内蒙古、辽宁、贵州等地，形成了住宅、学校、办公、宾馆、商场、医院、场馆、厂房、污水场站和景观水池等各种类型的供热系统。

1. 奉献奥运



项目名称：国家大剧院（景观水池）
建筑面积：35000 平方米（池水面积）



项目名称：奥林匹克公园网球中心
建筑面积：26514 平方米



项目名称：芦城体校自行车训练场
项目面积：6449 平方米

2. 行政办公



项目名称：国家行政学院港澳公务员培训中心
建筑面积：43365 平方米



项目名称：全国工商联办公楼
建筑面积：50000 平方米



项目名称：雁栖湖国际会展中心
建筑面积：79000 平方米



项目名称：海淀区法院
建筑面积：28978 平方米



西藏地区共建办公建筑约 120000 平方米

3. 学校院所



项目名称：北京市海淀区外国语实验学校
建筑面积：10 万平方米



项目名称：山西农科院
建筑面积：143105 平方米



项目名称：北京市海淀区外语电子职业高中
项目面积：8308.17 平方米

4. 商业生产



项目名称：北京稻香湖景国际酒店（五星级）
建筑面积：53655 平方米



项目名称：金四季购物中心
建筑面积：140000 平方米



项目名称：北京市朝阳区蟹岛生态度假村
项目规模：21531 平方米

5. 住宅别墅

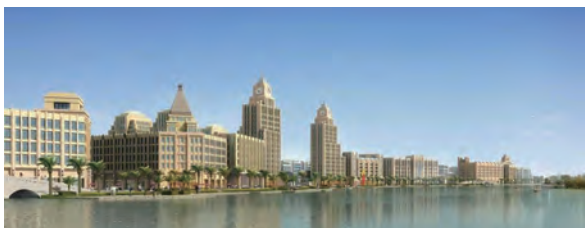


项目名称：四季香山小区
建筑面积：131800 平方米



项目名称：香山清琴别墅
项目面积：98380 平方米

6. 区域发展



四川绵阳在施的中国科技城金家林总部经济试验区工程项目，总建筑面积约为 40 万平方米。

恒有源集团除为建筑物提供制热（制冷）外，也非常重视技术的推广和产业化的发展，并在辽宁大连和江苏邳州等全国十几个地区建立了地能热冷一体化新兴产业园区。



辽宁省大连市仙浴湾旅游度假区（下图为嘉乐比温泉度假酒店），建筑总面积 20.0492 万平方米。



7. 走出国门



蒙古国乌兰巴托市别墅项目
建筑面积：300 平方米



Hershey School Recognized With Energy Star Award



From left to right: Hershey School Board members Floydene Brown and Bob Arnett, Superintendent Dr. Michael Cunniff, and school board members Steve Koch and Roger Stockall met Wednesday morning to receive the prestigious Energy Star Award for their energy-saving improvements at Hershey School. Presenting the award were David Raymond and Larry Cihal of the Trane Company. They explained how the school began Phase I of the project 18 months ago. (Story continued on page 3)

美国 Hershey 学校因采用恒有源地能热泵环境系统，获得由美国能源部和美国环境总署共同颁发的能源之星奖。

Hershey 学校项目建筑面积：6700 平方米



美国 Chase County School 项目

项目面积：2500 平方米



美国林肯市法院和执法培训中心项目

项目面积：2500 平方米



美国大卫城养老院项目

项目面积：3600 平方米

Wind and Rains En Route to be an Entrepreneur Time and Glory En Route to be HYY ——Records on HYY 15th Anniversary, with eager expectation of great future

Author: ZangYiran, Dai Qi,
SunShaoyun

Ever Source Science & Technology Development Group Co.,Ltd.(hereafter referred as HYY Group) , located in Beijing, is the science, technology and industry development headquarter of China Ground Source Energy Limited, with Hkex code 8128.HK and briefly referred as China Ground Source, a subsidiary of China Energy Conservation and Environmental Protection Group(referred as CECEP).

Under the module of Beijing-Hongkong integrated management, HYY Group has been focusing on science study and development of utilization of shallow ground source, a type of recyclable energy, as the replacing energy for building heating to complete a revolution in heating energy by combining the innovative single well heat exchange circulation for ground source energy collection technology with international buried pipe technology to realize shallow ground source, a low-grade recyclable source to become the replacing energy for building heating and to realize all-around transition from traditional heating industries which are combustion relied with emission and pollution to the emerging industry of integrated heating and cooling system with ground source energy which are combustion free with no emission and no pollution.

In 15 years from 2000 when it's founded, HYY Group, under the guidance of enterprise idea of Practice and Innovation, is devoted fully to build up a whole industry

chain management system integrating science study and research, design and consulting, equipment manufacturing, engineering and installing and operation and maintenance to provide package heating/cooling energy solution to different buildings at all regions by adopting its core technology of single well heat exchange circulation for ground source energy collection technology. In recent years, to answer government's call of energy saving and emission reduction, cooperate with government in solving the haze problem of which 30% is caused by vast and wide combustion and low altitude emission and support government as the first person responsible for carrying out energy saving and environment protection, HYY Group has always been specializing in development of shallow ground source to realize shallow ground source to become the replacing energy for building heating.

In past years, HYY Group has kept promoting the development of the emerging industry of integrated non-combustion heating and cooling system with ground source energy in an active manner. HYY Group has successfully promoted and carried out 700 ground source heating/cooling projects with a construction area of more than 13,000,000 sqms, equal to building up a 780MW dispersed ground source station for cooling/heating. Compared with electricity boiler heating, there have been 975 million units

of electricity (equal to 373,000 tons of standard coal) saved, 943,000 tons of carbon dioxide emission reduced, 8,900 tons sulfur dioxide emission reduced, 5,900 tons of nitrogen oxide emission reduced, 16,000 tons of particle emission reduced and 5.02 billion cubic meters of smoke exhaust reduced, which is equal saving of building up a 580MW electricity plant, and thus 2.3 billion invest funds on thermal power plant saved.

Promotion and application of HYY Group projects have spread from Beijing to cities and provinces like Shanghai, Tianjin, Tibet, Qinghai, Liaoning, Sichuan, Hebei, Shandong, Shanxi and Xinjiang by forming different types of heating/cooling systems for living buildings, schools, offices, hotels, shopping malls, hospitals, venues, factories, sewage processing station and landscape pools.

HYY Group shall, in coming years, continue to enrich and improve its smart combustion -foreground source energy heating products and establish fully new heating energy system by combining industry development of innovative technology and financial funds and industrial network to pursue harmonious co-existing between human and nature and realize ecological civilization construction in a practical way by exploring a new path for haze problem in China while effectively promoting economy's healthy development and maintaining a high quality living.

Chronicle of Ever Source Science & Technology Development Group Co., Ltd.

I.Event Chronicle of Company Development

December 5, 2000, Beijing Ever Source Science & Technology Development INC., Ltd. was founded.

October 2002, the company approved and licensed as High Technology Enterprise by Administration Committee of Haidian Sub-park, Zhongguancun Technology Park.

October 18, 2002, Beijing Ever Source Science & Technology Development INC., Ltd. renamed as Beijing Ever Source Science & Technology Development Co., Ltd. upon approval of Beijing Administration for Industry and Commerce.

November 2002, partnership with Beijing Enterprises Group Company Limited(Hkex code 392.HK). Thus Beijing Ever Source Science & Technology Development Co., Ltd. became a joint venture from a domestic owned company.

August 24, 2004, Beijing Ever Source Science & Technology Development Co., Ltd. renamed as Ever Source Science & Technology Development Co., Ltd. upon approval of Beijing Administration for Industry

and Commerce.

March 31, 2008, China Ground Source Energy Limited (Hkex code 8128.HK) became the holding company of Ever Source Science & Technology Development Co., Ltd.

May 2010, Beijing Yongyuan Heat Pump Co., Ltd founded by co-investment between Ever Source Science & Technology Development Co., Ltd. and Beiing Beiji Machinery and Electronics Industries Co., Ltd.

August 20,2012, China Energy Conservation and Environmental Protection Group became a sole leading stockholder of Ever Source Science & Technology Development Co., Ltd. by increasing its investment into Ever Source Science & Technology Development Co., Ltd.

August 2012, Ever Source Science & Technology Development Co., Ltd. renamed as Ever Source Science & Technology Development Group Co., Ltd.

April 2015, Ever Source Science & Technology Development Group Co., Ltd.and Sichuan Changhong Air Conditioner Co., Ltd. established a joint venture named HongYuan Ground Energy Heating Device Technology Co., Ltd., which holding by HYY.

II.Event Chronicle of Industry Development

October 2000, HYY Single-well Heat Exchange Circulation for Ground Source Energy Collection started its operation. HYY carried out detailed underground temperature tests and organized an expert evaluation to conclude that the Single-

well Heat Exchange Circulation for Ground Source Energy Collection outweighs traditional underground heat pump technology with many advantages by not consuming water but only collecting heat and causing no pollution to ground water.

December 2000, HYY launched its first series of products for heating, cooling and daily hot water based on shallow ground source energy with a brand name called Central Liquid Cooling and Heating Source Environmental System.

May 14, 2001, the National Economy and Trade Committee filed a document to enlist the Central Liquid Cooling and Heating Source Environmental System by Beijing Ever Source Science & Technology Development INC., Ltd. into 2001 National Technology Innovation Major Project Program.

May 2001, HYY's Central Liquid Cooling and Heating Source environment system products appraised as 2001 National New Products by National Economy and Trade Committee.

May 2001, Haidian District Government required of the document "On Promotion of Central Liquid Cooling and Heating Source Environmental System" that all construction projects directly invested by the district government and all government resettlement projects nearby Zhongguancun west area should be applied with the system.

April 4, 2002, the Central Liquid Cooling and Heating Source environment system enlisted into Science and Technology Achievement Promotion Program of the

Ministry of Construction.

December 13, 2002, the Central Liquid Cooling and Heating Source environment system was approved as Beijing Major High-tech Outcome Transformation Program by Beijing Municipal Planning Committee and Beijing Municipal Science Committee.

January 27 2003, the Central Liquid Cooling and Heating Source environment system appraised with Green Star certificate from China Association of Environmental Protection Industry.

April 2003, Ministry of Construction issued Design and Engineering Photos of Central Liquid Cooling and Heating Source Environmental System.

September 25, 2003, Beijing Water Authority printed Opinions on Promotion of Central Liquid Cooling and Heating Source environment system and pointed out "single-well pumping technology of Central Liquid Cooling and Heating Source environment system successfully solves problems of sand displacement and uneven ground subsidence and quite environment-friendly. Thus we agree to promote and develop the technology."

September 30, 2003, Beijing Environment Protection Bureau printed Opinions on Promotion of Central Liquid Cooling and Heating Source Environment System and pointed out "the Central Liquid Cooling and Heating Source Environment System should be promoted for application in new buildings and environment protection departments should promote the system in all new

approved projects”.

August 10, 2004, August 9, 2005 and August 1, 2006, patent certificates appraised by United States Patent Office for three consecutive years.

In 2005, HYY's enterprise technology center was approved and recognized as a national enterprise echnology center by National Development and Reform Commission,Ministry of Finance,General Administration of Customs of the PRC and State Administration of Taxation.

November 1, 2004, shallow ground source geothermal energy technology research center established with an expert committee which consists of dozens of domestic and foreign experts like chairman of International Geothermal Association, professor Lubeck from International Energy Association,etc.

April 8, 2005, a signing ceremony held at HYY's office building on Central Liquid Cooling and Heating Source Environment System Engineering Project for a Mongolia project. May, 2006, a ribbon cutting ceremony held to celebrate completion of the system project at Ulaanbaatar, Mongolia,



May,2006, ribbon cutting ceremony at a Mongolia project

with presentation of Mongolia's Presidential Office Director, Minister of Construction, Minister of Finance, ambassador of China Embassy in Mongalia, Zhang Honghai, president of Beijing Enterprises Group Company Limited and Xu Shengheng, HYY's president. It's the first overseas project for Central Liquid Cooling and Heating Source Environment System.

July 2005, HYY signed an agreement with Behlen Mfg. Co. in United States to build up a joint-venture in Omaha city and also established cooperation with School of Architecture of State University of Nebraska and US geothermal experiment center of Ohio's Oklahoma State University to start promotion of single-well heat exchange circulation for ground source energy collection.

February 2006, professor Wu Yuanwei, the former chief engineer and VP of China Academy of Building Research explained clearly for the first time the concept of shallow ground source and named it as

shallow ground source energy to be its industry term on an expert conference organized by HYY.

September 2006, shallow ground source energy recognized as recyclable energy in official papers for the first time through an announcement of Interim Measures for Special Funds Management for Recyclable Energy Buildings.

May 18, 2007, HYY products united as "HYY Ground Source Energy Heat Pump Environment System".

November 18, 2008, HYY honored as



Contributing Company for Participation and Service in 2008 Olympics Games by Beijing Industry Promotion Bureau and General Office of 2008 Project Construction Command of Beijing Municipal Administration Commission.

December 2008, HYY projects honored with First Class Award of High Science and Technology by All-China Federation of Industry and Commerce.(Mr.Xu Shengheng HYY's general manager, the third person

from left in the above picture).

August 2009, the first demonstrating project Hershey School in Nebraska, United States started to operate successfully and the project won a prize of Energy Star appraised by US Department of Energy and Environment Program.

May 11, 2010, HYY signed an agreement with Liaoning Dalian Wafangdian municipal government to co-develop low-carbon economy ecological demonstrating region and shallow ground source energy as the replacing energy for building heating/cooling system in Wafangdian city.

March 16, 2013, foundation ceremony of Professional Committee of Shallow Geothermal Energy Development, BJJHNB launched at Union Life Jianguo Hotel.

April 1, 2013, Beijing Municipal Administration of Quality and Technology Supervision implemented Beijing's local standards document "Engineering Technology Specification of Single-Well Heat Exchange Circulation for Ground Source Energy Collection".

September 27, 2013, shallow ground source energy development and utilization system project laboratory established by cooperation between Ever Source Science & Technology Development Group Co.,Ltd., Beijing Water Science and Technology Institute and Water Damage Prevention and Water Resource Research Center of China University of Mining and Technology(Beijing) with Wang Guangqian, academician of CAS

and president of Qinghai University as the director and Wu Qiang, professor of China University of Mining and Technology and doctor tutor as the depute director.

December 16, 2013, an industry seminar on Integrated Heating and Cooling System with Ground Source Energy held at Energy Conservation Building with participating experts and leaders like Ding Henggao, academician of Chinese Academy of Engineering and former director of Science and Industry Committee of State Defense Ministry, Wang Guangqian, academician of CAS and president of Qinghai University, Wang Fushan, VP of Institute of Geophysics, China Earthquake Administration, Wang Bingchen, senior counselor at the State Council, Wu Desheng, former president of Beijing Architecture Design Institute, Lv Wenbin, depute head of Environment and Funds sector of SDPC, Han Aixing, depute head of Energy-saving and Scientific Technology sector of MOHURD, Zeng Xiaolan, deputy head of Economy and Construction sector of Ministry of Finance and deputy mayor of Dalian city, etc. During the seminar, HYY signed a frame contract with Dalian Jinzhou Xiaoyao bay International Business Region on strategic cooperation to co-build a 900MW Dispersed Ground Source Station for Cooling /Heating.

2014, with increasing of products and market development, HYY product series increased with three series: HYY Ground Source Heat Pump Environment System,

HYY Ground Source Heating Device Environment System and HYY Dispersed Ground Source Station for Cooling /Heating.

December 29, 2014, Ever Source Science & Technology Development Group signed a franchise agreement with Dalian Jinzhou New Region on 900MW HYY Dispersed Ground Source Station for Heating at Xiaoyao bay. The agreement symbolized stable strategic partnership of both parties and also declared an official start of Xiaoyao bay ground source heating national demonstrating park. It's also the first engineering project of HYY Dispersed Ground Source Station for Heating. 900MW HYY Dispersed Ground Source Station for Heating shall realize building heating for an area of 20.4sq kms with a building area of not less than 15,000,000 sqms at Xiaoyao bay in the coming 10 years. It's the biggest ground source heating project in the country and in the world.

June 1, 2015, HYY awarded as Capital Civilized Enterprises by Capital Spirit Civilization Construction Committee.

III. Event Chronicle of Academic Exchange

February 9, 2001, Beijing Technology Innovation Service center, entrusted by Beijing Economy Committee, organized an expert evaluation committee to evaluate the Central Liquid Cooling and Heating Source Environment System. Evaluation results were reached: the Central Liquid Cooling and Heating Source environment system shall be a strong competitor

in replacing energy option of traditional heating/cooling method in 21st century.

May 2003, Roland, president of International Geothermal Association(IGA) and professor Lubeck, VP of IGA invited to study preparation work of 2008 Olympics by Beijing Municipal Government and paid a visit to our company. Both of them highly appraised our company and co-wrote a letter to Mayor Liu Qi to recommend to adopt our technology in Olympic venues. In August, professor Lubeck came to our China again and was honored as HYY's international consultant.

August 21, 2013, an expert evaluation conference on sectional achievement of water resource protection of single-well pump of central liquid cooling and heating source environment system held at HYY. Expert groups believed single-well pump, a way of shallow geothermal energy collection, is a equipment that exchanges heat through water but collects water and has no impact to underground water quality.

October 12 to October 15, 2003, on 2003 annual conference of international geothermal resource committee held at Monterrey, Mexico, "Exploration and Development of Shallow Ground Source", an thesis written jointly by professor Lubeck and Xu Shengheng, HYY's president, won the Best Thesis.

February 12, 2004, HYY invited industry experts for a meeting. General Manager Xu Shengheng made a report to all presenting experts on technology development and

promotion of Central Liquid Cooling and Heating Source Environment System. Presenting experts including Wu Yuanwei, Lang Siwei, Li Efei, Xu Wei, Zhao Wende, Guo Ruiru, Yan Qisen, Jiang Yi and Xu Wen jointly wrote letters with all their signature to Liu Qi, the chairman of Olympic Committee and other leaders to recommend application of central liquid cooling and heating source environment system in Olympic projects.

April 2004, Wang Jiyang, academician of Chinese Academy of Sciences(CAS) came to HYY for research and joined HYY's president Xu Shengheng's trip to Kenya to take part in an international seminar at UNEP's headquarter to introduce HYY's technology.

July 23, 2004, Ma Zuoping, academician of US National Academy of Engineering, Li Jiaming, academician of CAS and Xu Deqing, researcher of Department of Electronic Engineering of Yale University paid a visit to HYY to learn about Central Liquid Cooling and Heating Source Environment System and its working theory.

July 2006, Nelson, senator of United States and president of State Budget Committee met with HYY's president Xu Shengheng at Washington and expressed his support for HYY technology's application and development in United States.

2007, HYY invited to become a member of International Heat Pump Association, International Geothermal Association and United States Geothermal Council.

February 7, 2007, Zheng Keyan, director

of Geothermal Council of China Energy Research Society accompanied Dr. Ingvar Fridleifsson, international renowned geothermal expert, director of Iceland geothermal training center of United Nations University and the former president of International Geothermal Association and Dr. Pall Valdimarsson, professor of Iceland University and geothermal expert to visit HYY and listened to introduction of HYY technology and application.

May 31, 2007, Wang Kaijun, director of Beijing Academy of Environmental Science gathered experts like academician Wang Jiyang and professor Wu Wengui, Hou Jinyan and Dai Yuhua, etc. to come to HYY for a discussion meeting in order to compile an article on development, promotion and technical guidance of shallow ground source heating technology.

April 25, 2010, HYY's president Xu Shengheng and HYY's consultant Song Xinlu fled to Indonesia to take part in WGC 2010, where HYY's consultant professor Lubeck gave a speech with the co-written thesis done by himself and HYY's president Xu Shengheng titled as Innovative Application of Underground Water Source Heat Pump for Building Heating/Cooling System in China and in United States.

October 17, 2010, Beijing Association to Promote Energy Conservation and Environmental Protection launched an expert evaluation conference on Geothermal Heat Pump System by Ever Source

Science & Technology Development Co., Ltd. That Keeps Running for more than 7 years in Beijing. After serious discussion, the conference reached concluded with an opinion that HYY ground source heat pump environment system should be promoted for building heating in a strong way.

September 2013, Wang Bingchen, senior counselor at the State Council and China's Prospecting Expert, fled himself to America to visit HYY's demonstrating project there.

December 2013, Wang Xiaokang, chairman of CECEP, accompanied Finland senate representatives to pay a visit to HYY Group.

January 20, 2014, HYY invited professor Wu Desheng, consultant of Beijing Architecture Design Institute, as the guest host of a speech titled as Knowledge and Culture. Professor Wu helped staff to understand relation between knowledge and culture, sense and sensibility to define oneself in an objective way and explore more working passion by being responsible.

December 12, 2014, Tang Xiaoyan, academician of China Engineering Academy was invited to HYY Group to participate in a seminar called "Haze and Combustion and Emission of Energy". Academician Ms. Tang Xiaoyan claimed there is close connection between haze and combustion and emission and recommended it's important to realize combustion-free building heat to solve the national-wide haze problem.

January 14, 2015, HYY hosted a conference for HYY Group's 2014 report to experts.

Experts exchanged their opinions on prospect of geothermal heating, application situation of HYY Single-Well Heat Exchange Circulation for Ground Source Energy Collection technology, prevention of air pollution and promotion of geothermal heating.

May 2015, Wu Desheng, consultant of Beijing Architecture Design Institute, flew to America to carry out deep research and study on HYY's demonstrating project.

May 28, 2015, Shallow Ground Source and New Energy Building Seminar, co-hosted by New Energy Chamber of All-China Federation of Industry and Commerce and China New Energy Architecture Industry Union and organized by HYY Group, was held at HYY Group's Reporting Hall with participation of leaders like Wang Bingchen, senior Counselor of State Council and Wu Desheng, consultant and chief engineer of Beijing Architecture Design Institute, etc. The seminar pointed out that shallow ground source is an ideal new energy for buildings with its high efficiency, abundant resource, easy collection, no storage need and short transportation distance.

IV. Event Chronicle of Leaders' Investigation

March 27, 2001, Wang Guangtao, deputy mayor of Beijing city, accompanied by Li Jinshan, district director of Haidian District, came to HYY for investigation.

March 31, 2001, Liu Qi, mayor of Beijing city, accompanied by some leaders including Li Jinshan, district director of Haidian District, came to HYY for investigation.

October 7, 2001, Jia Qinglin, Member of the Political Bureau of the CPC Central Committee and Secretary of the Beijing Municipal Committee, came to Beijing Ever Source Science & Technology Development INC., Ltd. to investigate the sampling project of central liquid cooling and heating source environment system. Secretary Jia said "the system can greatly improve people's life quality and the government shall support in a macro and better way but you need to work harder in a micro way. Your products need to not only cause no air pollution and protect water effectively but also to be low cost.

December 20, 2003, Yang Weiguang, former director of CCTV, came to HYY for investigation.

September 24, 2004, Cheng Shie, Chairman of CPPCC Beijing Committee, accompanied by deputy mayor Sun Anmin, Xiong Daxin, the director of SASAC and Bo Gang, director of Beijing Municipal Committee, led committee members to come to HYY for investigation.

November 18, 2004, Wang Qishan, Mayor of Beijing City, during his busy schedule on preparation works of 2008 Olympics, and Ji Lin, deputy Mayor of Beijing City went for investigation at the Experimental School of Beijing Foreign Language University at Haidian district, the demonstrating project of HYY central liquid cooling and heating source environment system and called for a site meeting to listen to reports done by general manager Xu Shengheng on



On November 18, 2004, Wang Qishan, mayor of Beijing city, went for an investigation at the Experimental School of Beijing Foreign Language University at Haidian district, Beijing, a demonstrating project of HYY Group, and listened to reports from general manager Xu Shengheng on the application situation of development of shallow ground source energy.

application situation of development of shallow ground source energy. Mayor Wang directed that Olympic projects should consider this new technology and policies should be implemented to support the technology by removing systematical barriers to “promote on aggregate and renovate on current quantity”.

February 1, 2005, Zeng Peiyan, vice premier of State Council, Wang Guangtao, Minister of Construction, Zhang Guobao, deputy director of SDPC and Wang Qishan, Mayor of Beijing city and other government



leaders organized a site investigation at the office building of Haidian district. They investigated the equipment room project with central liquid cooling and heating source environment system and listened reports done by general manager Xu Shengheng on exploration and development of shallow ground source energy. All presenting government leaders appraised the technology of central liquid cooling and heating source environment system and assured its promotion prospect.

December 21, 2005, HYY's general manager Xu Shengheng reported, on the exhibition of Building a Conservation-minded Society, to national leaders including Chairman Hu Jintao, general secretary the Communist Party of China and Chairman of the Central Military Commission of the Communist Party of China, Wu Bangguo, chairman of the Standing



Committee of the National People's Congress, Wen Jiabao, premier of State Council, Jia Qinglin, chairman of CPPCC on replacing energy projects. (Picture attached).

January 5, 2006, Huang Mengfu, vice-chairman of CPPCC and chairman of All-China Federation of Industry and Commerce, accompanied by Ouyang Xiaoming, director of economy section of All-China Federation of Industry and Commerce(ACFIC) and other leaders, came to HYY for investigation. During his investigation, Chairman Huang Mengfu highly appraised HYY's achievement and had a special investigation on difficulties and problems for research, application and promotion of the system.

July 17, 2008, Mao Rubo, director member of Environment and Resource Protection Committee of NPC, came to HYY for investigation and listened to reports done by general manager Xu Shengheng on introduction of company technology and paid visits to some running projects.

July 13, 2010, deputy governor of Qinghai province and director of Education Department of Qinghai came to HYY for investigation and listened to reports on company technology and its application and also paid a visit to our project at the Experimental School of Beijing Foreign Language University at Haidian district and also paid a caring visit to students from Qinghai earthquake region.

April 3, 2013, a group of government leaders including Wang Qinmin, deputy chairman of CPPCC and chairman of ACFIC, An Qiyi, deputy chairman(sole duty) of ACFIC, deputy chairman of ACFIC, deputy mayor of Beijing city and Cheng Hong, chairman of ACFIC came to HYY for a visit and listened to reports done by company seniors on promotion of the emerging industrial of integrated heating and cooling system with ground source energy and checked HYY's undergoing key projects.

November 28, 2013, Jia Zhibang, director of Population, Resources and Environment Committee of CPPCC, led a team of more than 40 people to investigate HYY's project at the Experimental School of Beijing Foreign Language University at Haidian district.

June 3, 2014, Wang Yong, committee member of State Council, member of Communist Party's Organization of State Council and director of National Disaster Prevention Committee, Xiao Yaqing, deputy secretary of State Council and Zhang Xiwu, deputy director of SASAC and other government leaders had a site investigation at the Experimental School of Beijing Foreign Language University at Haidian district and highly appraised HYY's innovative technology achievement after learning about HYY single-well heat exchange circulation for ground source energy collection technology.



On June 3, 2014, Wang Yong, committee member of State Council, member of Communist Party's Organization of State Council and director of National Disaster Prevention Committee, Xiao Yaqing, deputy secretary of State Council and Zhang Xiwu, deputy director of SASAC and other government leaders had a site investigation at the Experimental School of Beijing Foreign Language University. From left to right in the picture: Xu Shengheng, Xiao Yaqing, Wang Tongzhou, Li Wenke, Wang Yong, Wang Xiaokang, Zhang Xiwu, Zhang Peng and Yang Jiayi.

June 4, 2014, Li Fulong, deputy director of Department of Planning of National Energy Association and other leaders came to HYY for an investigation and listened to reports done by general manager Xu Shengheng on introduction of company technology and products.

February 8, 2015, Meng Xuenong, central committee of the Eighteenth National Congress of the Communist Party of China, vice chairman of Communist Party under the CPC Central Committee and

president of Communist School under the CPC Central Committee led a team to come to HYY for investigation and learned in detail about application and industry development of HYY's innovative technology.

March 8, 2015, Wang Guangqian, academician of CAS and secretary Guo of Nanyang developing region investigated on HYY's technology of combustion-free integrated heating and cooling system with ground source energy.

Company Culture Construction in Ever Soure Science & Technology Development Group Co., Ltd.

Author: Hu Jian

The HYJ Science and Technology Development Group Ltd. (hereinafter referred to as the Group) attaches high importance to the construction of company culture. Ever since the year of 2000 when the Group was just set up, Mr. XU Shengheng, the Group President has defined “loyalty and responsibility” as the core culture and value of the Group.

What is loyalty? It means loyalty of the company to its every client, reflected in its persistence to creating comfortable, safe and reliable living and working environment for each user of the company’s products. It also means loyalty of the company to the society, embodied in its unremitting endeavor in tackling heating-related air pollution by constantly bettering its combustion-free heating technology and substantially promoting its applications. More than that, staffs of the company

shall remain loyal to their career and responsibilities, realized in every step forward achieved in their working skills and each quality product produced for clients and the society in promoting combustion-free heating with ground energy resources.

What is responsibility? Firstly it is social liability of the company. Every link throughout the production and service sections done by the company as a heating provider, including R&D, design, installment, test and trial and maintenances, is directly connected with the livelihood of the people, therefore permits no mistake and carelessness. Such a social responsibility is of utmost importance. Secondly, it is working responsibility of all staffs in the company. The fulfillment of the company’s social responsibility can only be achieved with every success in details by each individual. As such, it has become a professional norm for all staffs in the HYJ Group, i.e., to honor his/her responsibility to the society, clients, the company and every practice he/she engaged in.

In the past 15 years, the HYJ Group has been placing “loyalty and responsibility” at the core of its culture value in pursuing harmonized coexistence between human and nature, so as to exert maximum effort to curing air pollution caused by combustion-based heating. In line with the ever increasing demand of the people for better living qualities, the company

has been targeting all its endeavors at enabling the people to enjoy better lives. In a bid to lead the development trend of ground energy combustion-free heating industry and implement intellectual heating, the company has set it as its mandated mission to pursue truth and encourage innovation. Further on, to constantly enrich its culture, the company has formulated the Code of Conducts for its Employees, where working safety and standardized working behavior are prioritized and sense of responsibility and appreciation to every job are advocated and which advocates perfect come from repetitive trainings and practices.

Moreover, the HYY Group has been

actively engaged in various company culture construction activities under the joint efforts of all parties and with broad participation from staffs at different levels.

As many young employees have quite advanced diploma of education, the company invited Mr. WuDesheng who is a senior experts in the building sector to hold a seminar titled “knowledge and culture”with the youth in the company. The seminar is aimed as assisting the youth to acquire correct understandings on the relations between knowledge and culture and between IQ and EQ, and to properly define themselves in the career and stimulate their sense of responsibility in job and life.

Wu Desheng, consultant and chief engineer of Beijing Architecture Design Institute, is giving a lecture on Knowledge and Culture to young employees



As air pollution becomes an increasingly acute challenge, the company invited Mr. Tang Xiaoyan, Academician of China's Academy of Engineering, together with other experts and academic professionals to the company to jointly analyze the causes and solutions of smoggy weather, and further confirmed that combustion-free heating with ground energy is a highly applicable measure to cure smog in winter.



In the context of energy tension an acute need for new energy development in China, the Group invited Mr. Wang Binchen, Senior Counsel of the State Council to visit the company for many times and flag professional proposals to the Government on development and utilization of ground energy.

In addition, the Group also makes extra efforts in introducing more talents and building up a back-up talent pool, while strengthen trainings on talents in areas of project management and special techniques. Though targeted training programs, the Group tries to reinforce its



staffs' consciousness of responsibility, awareness of crisis, teamwork spirit and beliefs in lifelong study.

The Group sticks to the performance-based awarding system and keeps improving its salary and welfare system, to fully honor the principle of linking salaries of functional department with sales performance, and linking individual income of staffs with the company's entire performance. The system is designed to create incentives to every staff member with more enthusiasm to realize great individual value in respective positions, so as to realize common development of the staffs and the company.

As a way to enhance the sense of mission, affiliation and honor of the staff member, the Group takes use of

big holidays and festivals to carry our various activities, which have been well received by the staffs. For instance, the Group organized a talent show as tributes to the motherland, where company staffs have shown their talent in various field including oil painting, Chinese painting, Cinematography, calligraphy and others. Some sports activities such as mountaineering helped to tap and expand the potentials of the participants' in continuous self improvement and self-transcendence. The company has also launched several activities to mobilize love donations from the staffs to the needed and the poor, including working mates in the company who are seriously ill, as well as people in the earthquake-stricken areas and impoverished areas.

A glimpse of HYY staff's outdoor training activities



For fifteen years after its establishment, the Group has been making persistent efforts in pursuing its corporate core values featured with “loyalty and responsibility”, seeking for realization of “harmonious co-existence between human and the nature”, dedicating all to improve the people’s living quality, fulfilling its mandate of being pragmatic and innovative, honoring its Code of Conducts to ensure work safety and strict working standardization and to nurture responsible and appreciative

working spirit. The company has been putting people in the core and stressing on the crucial role that an individual can play in the corporate management, and therefore value highly the all-round development of staff members by setting up encouraging development visions, building up group cohesion and implementing right incentives. As a result, the Group has been awarded with many titles and honors such as the “Award of Model Unit of Beijing”, and retreated with both spiritual and material good returns.

Mr.Wang Manquan, Party branch secretary of HYY Group, the first person from left



Combustion-free Heating Products Series and Different Business Modalities

**Author: ZANG Yiran,
DAI Qi**

The HYY Science and Technology Development Group Co.Ltd. (hereinafter referred to as the HYY Group), through years of endeavors has achieved industrial development of its patent and original technology of the Single-well Circulation Heat Exchange Ground Energy Collection which is highly effective and economical. Integrated with the international technology of buried-pipeline heat exchange, the HYY Group's original technology empowers the shallow ground energy as a low-grade renewable energy below 25℃ to work as a substitute energy for heating

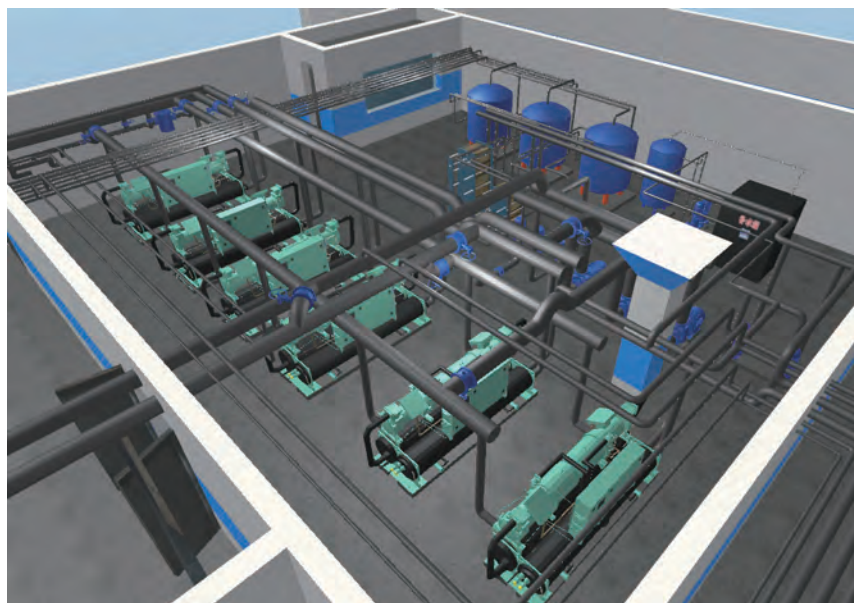
of buildings. It spikes another energy revolution in the heating sector.

I. Combustion-free Heating Products Series

Fifteen years unremitting efforts by the HYY Group is paid off with a full series of diversified products that can be applied in different regions and geologies, and for different building of diverse purposes and functions. The Group with its core technology of single-well ground energy collection has managed to develop substitute solutions for all traditional heating modalities and products.

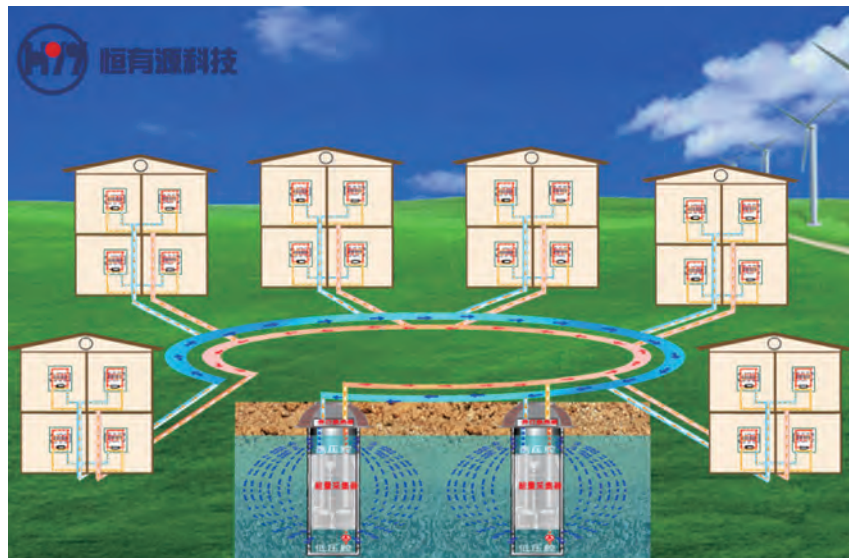
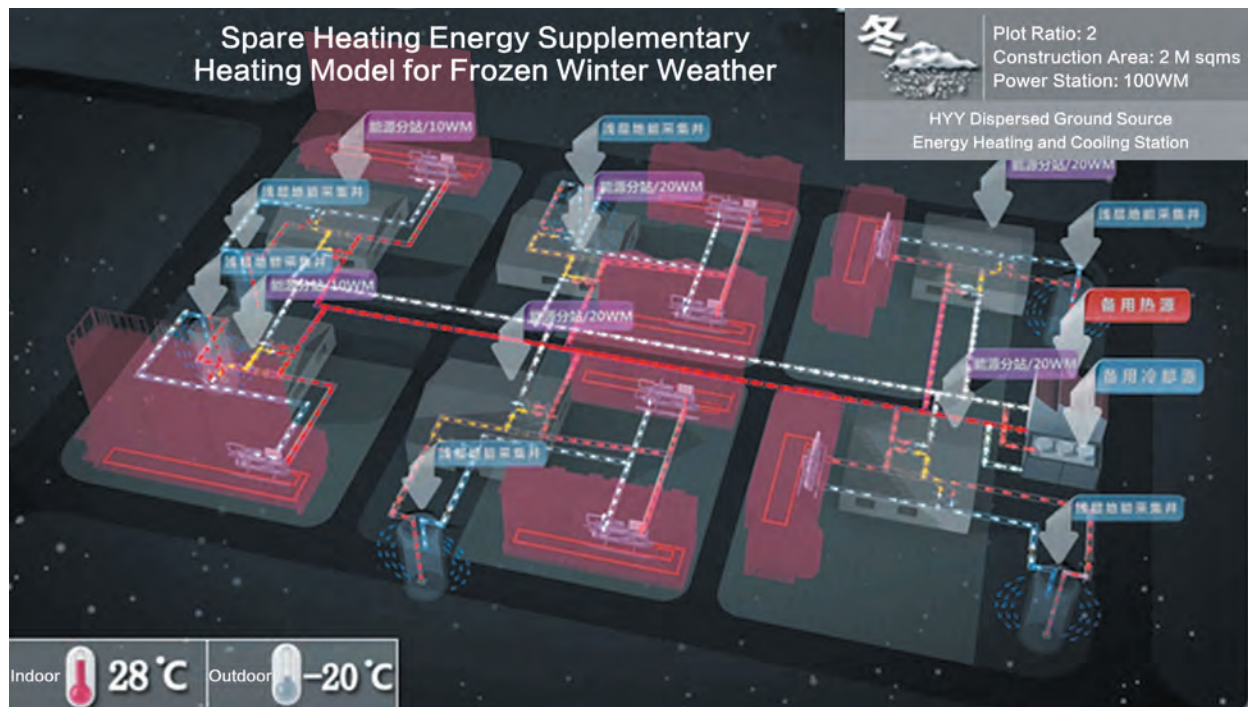
1. HYY Ground Energy Heat Pump Environment System

The system aims at provide independent heating for individual buildings or building blocks. Equivalent to traditional district heating with boilers, the design heating capacity of the system is 100-30000kW sufficient to provide heating, cooling and domestic hot water of 2000-500,000 m² floorage areas.



2. HYY Distributed Stations of Ground Energy Cooling and Heating

The HYY Distributed Stations of Ground Energy Cooling and Heating is a regional application of HYY Ground Energy Heat Pump Environment Systems. Technically speaking, it is a more reliable way to provide heating, cooling and domestic hot water in a combustion-free way for newly emerging cities. The designed heating production capacity of the station is 5-900MW, equivalent to the capacity of traditional concentrated combustion-based heating system by municipal governments. As such, the station can serve the need of newly emerging cities for supporting infrastructures of heating. And each station can serve up to 100,000-150,000m² floorages of building in a region.

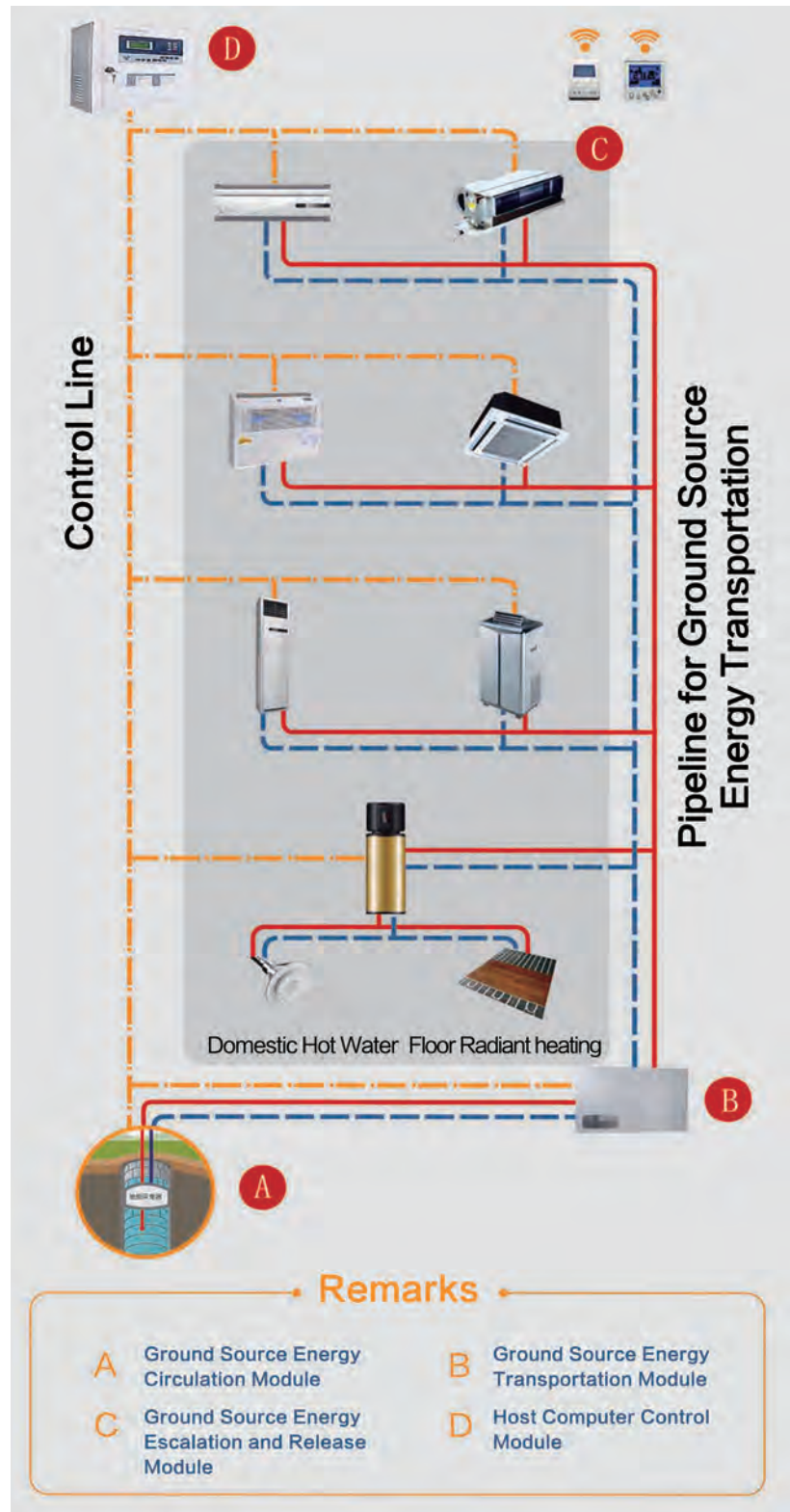


3. Ground Energy Heating Devices

Ground Energy Heating Devices is an independent heating device designed for rural residents. It provides an effective solution to meet differentiated individual heating needs at low cost of resources. The device can be used to provide heating, cooling and domestic hot water for single residential buildings of 50-2000m². It is applicable to scattered buildings that request differentiated operation, such as office buildings, school structures and residential houses, as a good substitute to the dispersed heating boilers in small urban and township areas.

II. Business Modalities of Combustion-free Heating Products

By nature, providing heating for buildings in a combustion-free way with shallow ground energy is a kind of service. It works as a provider of cooling and heating services for buildings, taking use of the HYY product series, including the HYY Ground Energy Heat Pump Environment System, the HYY Distributed Ground Energy Heating and Cooling Station, and the HYY Ground Energy Heating Devices. The



objectives are to better saturate people's need for heating and cooling, effectively assist local governments to achieve energy conservation and emission reduction, and actively face up to the acute need in tackling severe air pollution.

In general, the HYY heating products series are mainly marketed via certain business modalities, including EPC, BOT, PPP and EMC etc.

1.EPC Modality

EPC (Engineering Procurement Construction) means that entrusted by the estate owners, the company undertakes parts of or entire project by contracts including design, procurement, engineering and trial operation. Based on the contracting terms, the company is often held responsible for the quality, safety, cost and progress of the contracted works.

This modality, i.e., engineering service modality requires the contractors to identify appropriate cooling and heating resources for the subject buildings and provide a series of products and installment services for the owner, including design, procurement, engineering and trial operation. Whereas, the owner shall raise enough funds to ensure timely payment in full once the project is completed. This business modality applies better to projects utilizing Ground Energy Heat Pump Environment System and Ground Energy Heating Devices, which are comparatively small in scale and in

overall investment.

2.BOT Modality

BOT (build-operate-transfer) means the government entrusts an enterprise with a special franchise or exclusive right of certain valid period, which empowers the enterprise to raise fund to build and undertake the responsibility to operate certain public utility infrastructure projects, allows the enterprise to charge using fee from its clients or sell its products for the purpose of paying back its loans, recover its investment and earn profit. Once the franchise right expires, the facilities or projects built by the enterprise will be transferred to the government at no cost.

This modality is by nature a project financing modal, that is to say that the investor (also the service provider) by getting the exclusive franchise right (to provide heating and cooling service for buildings) from the owner is required to raise fund to implement the project and claim charges on services provided so as to pay back its loan according to the franchise contract within the franchise period. When the right is expired, the investor is required to transfer the project to the owner free of charge. This modality is often used on projects of distributive ground energy cooling and heating station, which are large in scale and high in capital input.

3.PPP Modality

PPP (Public-Private-Partnership) means that government and private entity establish

a full-process partnership for the sake of providing certain public products or services. Such partnership is often based on a Franchising Agreement, and features co-sharing of benefits and risks, thus it gives full play to respective advantages of both sides and therefore enhances the quality and supply efficiency of public goods or services.

4. EMC Modality

EMC (Energy Management Contracting) is energy conservative investment modality, which finances an energy saving project with the cost saved by reducing energy consumption. This business modality allows the client to reduce its current operational cost by utilizing future earnings from energy-saving to escalate its equipments and machineries. Such modality is often used in energy-saving reforms of existing projects, where energy cost is easy to calculate and define, and energy-saving earnings are substantial. Average duration of return for such modality is 5-7 years.

This business modality is also a kind of project financing model, namely funding the project with earnings from reduced energy consumption. A decisive factor should be the comparability and accountability of energy cost that is saved or reduced. The applicability of this modality lies on the fact whether the energy cost saved in providing heating and cooling for buildings can meet the capital need of the project in the operational period, regardless of the project

scale and types of the heating or cooling products.

All in all, the HYY Group in its marketing promotion process has formulated a fairly complete product series to achieve intelligent heating for buildings with shallow ground energy in a combustion-free way. The Group has also developed various business modalities to saturate diverse needs of clients. As such, the Group offers its client with many different options in terms of product types, funding resources and payment methods. It will help to substantially enhance the Group's ability in promoting scale marketing of its original technology and increase market competitiveness of its products, and therefore promote comprehensive escalation of traditional combustion-based heating industry into new emerging integrate heating and cooling industry based on ground energy.



Establish Sustainable Competitive Advantage and Realize Intelligent Heating Ecological Strategy through Differential Marketing Strategies in New Energy Era

Author: Nie Dan

Ever Source Science & Technology Development Group Limited (here after referred as HYY Group) is the industry development headquarter in mainland China of China Ground Source Energy Limited (HKex code 8128.HK). China Ground Source Energy Limited is the sole company listed on Hong Kong stock connect market as a high-tech new energy company specializing in development of shallow ground source energy. Its sole leading stakeholder is CECIC under SASAC.

Focusing on scientific research, development and promotion of building heating/cooling with replacing energy of shallow ground source energy, HYY Group owns many professional companies that are integrated into full chain industry on design, energy contract management, system equipment production, installation and maintenance.

I.HYY Group's Multiple Market Positioning Strategies

HYY Group establishes its own advantages through multiple market positioning strategies based on its core competing strength of single-well heat exchange circulation for ground source energy collection technology and distinguishes its strength as its selling points among market segmentation and establishes its own cost advantages through mass production and collaborating effect. From the perspective of competition range, HYY Group divides non-combustion ground source heating series products into 3 categories to carry out market promotion by offering different product to different customer.

1.Customer Needs

Based on analysis on customers of building heating/cooling market, government emphasizes more on products' energy saving and environment protection efficiency by seeking modeling effect, real estate developers focuses more on initial investment, villa owners pays more attention to space occupation, appearance, operation, initial investment and maintenance cost while rural users cares more about whether product design is compatible with behavior energy-saving besides its initial investment and maintenance cost.

2.Products and Service Features

(1) Fast Knowing about High-tech Products

Product Name	Heating/ Cooling Area in Building Heating (Unit: sqms)	Ground Source Energy Collection Method Adopted	Corresponding Replaced Traditional Heating Method	Target Customer	Selling Points	Advantages of Selling Points
HYY Dispersed Ground Source Station for Cooling / Heating	500,000- 1,5 million	single-well heat exchange circulation	City central heating system	Government	Energy saving Environmental Effect Systematic stability Demonstrating Effect	Differential advantages: high heat exchange efficiency, small area occupation and obvious energy-saving and environment protection effect through innovative
HYY Ground Energy Heat Pump Environment System	2,000- 500,000	single-well heat exchange circulation plus buried pipes	Regional heating boiler room	Real estate developers	Energy saving environmental Effect Initial investmetn Marketing effect	
HYY Ground Source Heating Device	≤2,000	1.single-well heat exchange circulation; 2.Buried pipes; 3. Energy storage tank; 4.Economical operation through comprehensive heat exchange mode	Self-heating	Villa Owners	Comfortable and practical Easy operation Similar cost	Cost advantage: mass production and cooperation effect
				Rural users	Comfortable Similar cost Compatible with behavior energy-saving	

In most region, heating or cooling equipment, as a rigid living demand, is essential for buildings with its sustainability of long time utilization without change by integrating closely with buildings. Therefore, it's important to get customers to know about high-tech energy-saving and environment protection products in short time in a comprehensive and deep manner.

HYY Group's data can be obtained through many ways, including writings, data, pictures, professional journals, PPT files

and three dimensional exhibition animation, which explain technical theory of high-tech products in a vivid and plain manner and in a easily-understood way. Meanwhile, experiencing programs are facilitated to make customers feel products and make it possible for them to understand high-tech energy-saving and environment protection products fast.

(2) Efficient and Stable Products

As said, building heating is a rigid demand and thus products need to be efficient and

stable.

HYY ground source heat pump environment system with its innovative well heat exchange circulation combines ground building heating/cooling system with allocated region of supply quantity of shallow geothermal energy by spending a small amount of power to collect a large amount of free shallow ground source energy in a circular manner. Compared with traditional combustion system, its operation cost is 1/4 of oil combustion boiler and electricity generated boiler through non-combustion heating. And 1/2 of gas combustion boiler.

It's designed and developed by HYY Group itself and keeps improving in the past dozen of years with stable operation over 10 years in many government, army and school projects. The National Theater and many 2008 Olympic venues such the Bird's Nest also adopt single-well heat exchange circulation combines ground building heating/cooling system. All these projects increase customer's trust in us.

(3) Competitive Price

The initial investment of single-well heat exchange circulation combines ground building heating/cooling system is similar to traditional building heating facilities without causing economical burden to customers by installing this energy-saving and environment protection product.

Its operation and maintenance cost, benefited from its collecting a large amount of free shallow ground energy for circulation

from dynamic balance, is only equal to 50% of traditional building heating/cooling with great price advantage which is attractive to all customers.

(4) Energy Saving and Environment Protection efficiency

Though different customer group may have different thoughts on energy-saving and environmental protection, HYY ground source heat pump environment system enjoys obvious advantages in the aspect of energy-saving and environment protection.

HYY ground source heat pump environment system realizes efficient heat exchange through an energy saving way by moving shallow ground energy with power energy based on its core innovative single-well heat exchange circulation for ground source energy collection technology.

Compared with other shallow ground energy collection technology¹, single-well heat exchange circulation for ground source energy collection technology is the only ground source collection technology that realizes zero pollution and zero emission to the utilization region, a true and real environment protection technology.

¹Presently China's shallow ground energy collection technology ranks among the top in the world. According to different methods of energy collection adopted, there are four types of technology in the world: buried pipes, water pumping well, ground water and single-well circulation.

3.Resource and Capability

HYH Group, being the unique company with holding company being a central SOE in the industry of integrated heating and cooling system with ground source energy and the sole company listed on stock which specializes in the industry of integrated heating and cooling system with ground source energy, leads with its tangible assets and scale in the industry. HYH is a famous brand name in Beijing with much support from many senior consultants of State Council and top experts and scholars in the industry of construction and HVAC and many other government leaders and also has many competition advantages in intangible aspects such as brand name, commercial reputation, reputation and relationship.

Innovation, keeping improving and learning are engines bring HYH Group into existence and keep HYH Group going. HYH Group owns dozens of patents home and abroad with its core technology of single-well heat exchange circulation for ground source energy collection technology and participates in formulation of Beijing local industry standards of Technical Specification of Single-well Heat Exchange Circulation for Ground Source Energy Collection Project by creating conditions for the technology's development in scale, setting good example and establishing enterprise competition advantages.

HYH Group also has keen market sense and quick and long-visioned market

operation ability. Dozens of years ago, HYH had paid attention to city's more severe and severe environment problems and changed concept of non-combustion heating into action to develop a series of integrated ground source heating/cooling products to cater for two markets' demands in environment protection and civil construction to establish its competition advantages by catching the chance.

4.Advantages of Selling Points

To cater for different target customers, HYH Group's positioning strategy is to divide its product series into 3 categories and promote accordingly. Nevertheless, the core of the 3 category products is the essence: single-well heat exchange circulation for ground source energy collection technology with high heat exchange efficiency, small area occupation and obvious energy-saving and environment protection, which establishes HYH Group's advantages of differential selling points.

On the other hand, through multiple market positioning strategies, the target customers of 3 different category products are integrated together by HYH Group and thus mass production and cooperation effect on core equipment and component design and manufacturing are realized to constitute cost advantages for HYH Group.

II.Establishment of Sustainable Competition Advantages to Start a New Chapter of Intelligent Heating in New Energy Era

Competition advantages are based on dynamic interaction between customer demands, products and service provided by companies, enterprise resource and capability, components and other interest factors. By taking full use of enterprise resource and capability from different angles and different aspects with a multiple market positioning strategy based on its innovative core technology, HYY Group products and service features are distinguished from others and are able to satisfy different customers from different level and different area and thus HYY group establishes its own differential advantages and selling points to strengthen and raise up its comprehensive competitiveness.

Upon entry of 21st century, huge changes happen to the traditional heating area based on fossil energy combustion. Low energy utilization efficiency resulted from combustion methods caused many times of energy crisis representing by fossil energy across the world and ecological environment crisis also happen because of fossil energy combustion. On the other hand, with raising up of people's life quality, especially their demand of living environment, energy demand is becoming stronger and stronger.

HYY Group practices its enterprise mission of harmonious co-existence between human and nature and calls for building heating energy system in internet era based on integration of non-combustion intelligent heating essence, ground source energy

and other fossil energy and recyclable energy by taking use of its own sustainable competition advantages and combining with new era internet thinking mode and raises an ecological strategic goal of building up an emerging industry of integrated intelligent heating and cooling system with combustion-free ground source energy with a balance on long-term interest and broad vision

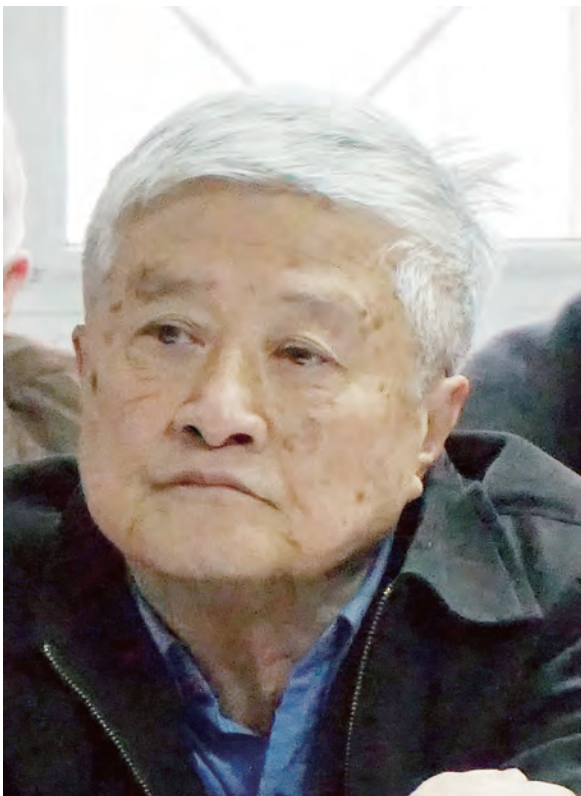
Intelligent heating means the combustion free ground source building heating environment system can sense environmental information such as temperature and be able to respond properly. The greatest meaning of intelligent heating is to satisfy people's demand of a comfortable and stable living environment after satisfaction of low cost, low energy consumption, high energy efficiency, zero pollution and low dependence.

General secretary Xi Jinping's address of four in one energy revolution strategy² has laid goals and direction for energy utilization and development in China. In new energy era, practical action of intelligent heating is pushing building heating energy revolution. It's an effective way for HYY Group to realize its enterprise value through its own advantages and it's also an inevitable path for government decision makers to build up a sustainable macro-energy system and even it could be the only fast solution to pollution caused by combustion building heating and guiding upgrading of combustion heating industry.

It's A High Classic Pursuit To Realize Building Heating Through Low-grade Energy

Author: WU Desheng

Chief Engineering Consultant of
Beijing Institute of Architectural Design



I.Evolution of Heating Industry

Development history of building industry can be traced back to thousands of years ago, and heating industry as needed by buildings in certain areas and seasons has been evolving together with the development of building industry. If we say building industry started its debut at ancient times when human beings moved out from caves and into structured shelters, then we have to admit heating industry in that early times had been truly stagnating. For thousands of year, people had relied on fire for warm. Good evidence is the Forbidden City, where we can see even the imperial families in old days had to rely on fireplaces, firewalls or fire pits for warm in winters.

As time went by, and with the emerging of mechanical electronics, especially after some scientific and technical products were utilized in the building industry, development in building heating technology started burgeoning and witnessed various technical applications such as steam heating system, boilers heating system, regional heating boilers, urban heating supply network and CCHP systems. However, despite of the progress of times, scale development of urbanization and various upgrading of energies, the technologies applied to building heating have mostly been based combustion ever after and till recent years.

As energy crisis looms, combustion-based heating is getting more blame on its low energy efficiency. When global warming arises as a severe challenge to human beings' livelihood, combustion-based heating is bitterly accused of doing harm to environment. As a result, the mission to transform and upgrade building heating industry has been put on the agenda.

With the inception of reform and opening up policies and rapid growth of national strength, China is undertaking more and more international responsibilities. Upgrading heating industry is therefore no longer a mere technological or economical issue, but more a political task with global impact that is closely related to living environment of human beings.

II.Characteristics of Energy Resources Used for Building Heating

1.Aim at providing comfortable indoor temperature

The purpose of provide heating for buildings is to make sure that buildings built in different climates can all achieve 20 Celsius indoor temperature so that the residences inside the buildings can enjoy comfortable living and working environment. It means heat sources used to warm up building do not have to be of high temperature. A temperature about 20-30 Celsius higher than the needed room temperature of 20 Celsius is enough to

warm up the circulating liquid that runs through pipes of floor heating or radiator heating systems. Normally the circulating liquid is around 40-50 or 70-80 Celsius. So, it shows that heat resources used to provide heating for buildings need not to be high grade and therefore should be easy to acquire.

2.Energy resources shall be classified by grades.

Heat resource is normally differentiated by its temperature and thermal amount. For instance, a piece of match stick once fired can burn a needle tip red and reach to 400 Celsius. However, the thermal amount of a burning matchstick is very little. Whereas, to warm a pot of water with fire, you got to take a while before it reaches merely 40 Celsius in temperature. So it means though the temperature of such warmed water is not high, but the thermal amount is not low. As such, temperature and thermal amount are two terminologies with different meanings.

Energies are usually evaluated by the highest temperatures they can reach via various equipments, and therefore classified into high grade energy that can produce high temperature heat, and low grade energy that can produce low temperature heat. Coal, oil or natural gas is high grade energies that can be used for steelmaking. Heat from burning of tree leaves and dry grasses is low grade as it can just boil water or cook food. So,

bearing in mind the different grades of energies, we can not only save energies, but also make full use of different energies.

Building heating itself does not ask for high grade energy. Heat under 80 Celsius is sufficient enough to produce heating for buildings. However, for years, we have been using coal or gas that can produce heat of 1000 Celsius to burn iron into liquid to acquire heat of just 150 Celsius to achieve steam heating for buildings. Such kind of consumption mode is a great waste of energies. As a matter of fact, such 150 Celsius steam is often further lowered to 80 Celsius water for circulation to produce heating for buildings. This is the actual practice that has been followed for years in the building heating and urban heating industry. Most of the energy saving effort we have been making is to reduce heat losses, and not to utilize energies by grades. The concept of consuming energies by grades as it is acknowledged by scientists as well as managers and investors, has contributed greatly to promote a new round of energy revolution.

The grade of energies is a blessing of nature and shall be well respected. Heating for buildings shall be produced by low grade energy instead of high grade. This is the most rational way to produce heating for buildings and most reasonable practice in energy consumption.

3. Development in Mechanic Electronics

gave birth to a great core technology

In the past century after mechanical electronics entered into building industry, a great core technology came into being, i.e., heat pump technology.

The invention and development of heat pump technology was triggered by the evaporation cooling circulation theory. And based on the theory, the technology was developed into systems, then equipments and later products. With gradual progress and improvement, the technology has been entitled as one of the ten most important science and technological invention in the world. And till to date, we are still overwhelmed by this great invention.

It is easier to explain the working rational of heat pump by making an analogy with water pump.

As a natural phenomenon, water always flows from high to lower altitude. But is it possible for water to flow from low to high? No way, until water pump is invented. Water pump is driven by power and with the help of water pump, water can move from low to high places. Technologies help human beings to overrule the nature and create a lot more wonderful things.

As a natural phenomenon, heat moves from low temperature resource to low temperature resource. But is it possible for heat to move from low to high-temperature? No way, until heat pump is invented. Heat

pump is driven by power and with the help of heat pump, heat can move from low to high temperature. The new technology enables the human being with more ability to overrule the nature and opens a new future of greater significance for human beings.

To better illustrate the operation of heat pump, we may use some daily life experiences. For example, we buy some meat from market. On the way back home, the meat is around 28 Celsius. Then we put the meat in refrigerator and it is cooled down to about 7 Celsius. In the process, the meat actually cools down by discharge its heat. But where does the heat go? Simply speaking, the heat goes out of the refrigerator to the room. As the room temperature stays at 25 Celsius, the meat cools to 15, 10 and finally 7 Celsius. The heat leaves from the meat into the room air, namely transfers from low-temperature to high-temperature environment. Refrigerator is a practical application of heat pump technology and a vivid example of how human beings by means of high technology maneuver the nature for the sake of better living conditions.

It should be noted that water pump is actually individual equipment, while heat pump is often a system. The inlet of heat pump is “evaporator”, and the outlet is “condenser”. Connecting the two ends with pipelines forms the heat pump system. As a system, heat pump looks

very different from water pump. People tend to equalize heat pump with its main component -- compressor. But being a system, heat pump can be huge with hundreds of meters pipelines and can be very small with mechanical and electronic integration.

4.Heat pump technology transforms energy consumption structure significantly

Since energies can be classified by grades, a rational energy consumption principle should be to match energy grade with its purpose. However, in practical applications, it is hard to achieve exact match and even a rough match is rare to find. Fortunately what heat pump can do is to upgrade or adjust heat produced by various resources to an appropriate temperature level to meet the need. Therefore, heat pump technology represents a remarkable progress in energy application technology sector as it greatly amplifies the application area of energies.

As for shallow ground technology, through normal heat exchange process, it can warm circulating water to 10 Celsius, far lower than 20 Celsius as needed for building heating, but can be upgraded to 40 Celsius by heat pump, sufficient for building heating. Heat pump technology creates new opportunities for low-grade energy being utilized for building heating and saves energy waste and heat loss caused by burning high grade energy

for building heating. Low grade energy application scope is therefore greatly enlarged by heat pump technology. The greatness of heat pump technology lies in the fact that it consumes little power but transfers enormous amount of heat or cool energy for the benefit of human beings.

III. Differences between heat pump heating and conventional heating processes

In a conventional water-circulation heating process, water is heated to 60 Celsius and then cooled to 35 Celsius after circulation. As such, the heat is provided by the 25 Celsius temperature difference. When cooled water reenters into boilers, burning gas or fuels warm up the water to 60 Celsius again. In the process, high grade energy is consumed to provide the needed heating for buildings.

Heating with heat pump system relies on low grade energy. Shallow ground source energy as a low grade energy is the appropriate resource for the process, being extracted by the Single-well Heat Circulation technology. In the process, the liquid media is warmed up to 10 Celsius by shallow ground energy and then enters into heat pump to discharge heat before it cools down to 3 Celsius. The temperature difference show the heat shallow ground energy produces, which is too low to be directly used for building heating. Then, heat pump helps to upgrade the heat to high-

temperature energy of 40 Celsius which in turn provides heating for buildings. What heat pump consumes is just a small amount of electricity as motion power to drive the system. Some residue heat resulted from the motion also joins the output of the system to provide heating for buildings. Of course, when the system is used for cooling supply, the residue heat form motion power joins the heat to be discharged to the underground.

IV. Shallow Ground Source Energy and the Single-well Circular Heat Exchange Energy Collection Technology

The Earth is full of thermal capacity and boasts enormous surface areas to take in solar radiation. The so-called shallow ground source energy lies around 100 meters under the earth surface with its temperature falling within 0-25 Celsius. It is reserved in rocks and soils, as well as various underground water flows and wet soils.

The HYY Single-well Circular Heat Exchange Energy Collection Technology as an originally developed patent technology is a packaged technology to extract heat from shallow underground rocks and soils. The shallow ground heat after being extracted goes through heat pump to achieve high temperature so as to provide heating for buildings. Up to now, the single-well technology being mature and well received by the market, has attained industrialized development. Many

projects both home and abroad have been completed with great success and prove to be good evidences of high feasibility, superiority, reliability and adaptability of the technology system. The technology system can well substitute conventional heating method to provide heating for buildings in a clean and green way, and therefore enjoys enormous prospect for future development. It also helps to meet the expectations raised in recent years on energy efficiency and indentify the most fit energy substitute for building heating in the new era.

The HYY Single-well technology aims at collecting shallow ground source energy, but it differs itself from many other similar technologies by being free from many deficiencies and potential risks. The technology is not just to draw water from the underground but to inject water back after heat exchange. The technology causes no water pollution, no water loss, and no underground soil and sand move, therefore incurs no potential geological hazards. The technology being advanced in its scientific working rational and systematic in its product designs is endowed with high adaptability and wider applicability. It is firmly grounded to believe that wider application of the technology will bring about tangible and solid benefit to energy conservation and environment protection undertakings. Its practical superiority will be further

consolidated by constantly expanding applications in heating sectors.

In mid 20th century, there were some projects utilizing oil-drilling technology to withdraw high-temperature water from underground about 1000 meters deep to provide heating for buildings and other hot water-based industries. Such technology or heating method is totally different from the shallow ground energy heating technology. It is an exploitation and direct consumption of underground resources and thus gives rise to many potential dangers. Whereas, shallow ground energy refers to heat of 0-25 Celisius reserved at around 100 meters underground. It consumes no material resources and therefore is by nature a truly renewable energy to support sustainable development.

V.Natural advantages of the single-well system in providing heating for buildings

1.No need for heat storage

Though shallow ground energy is also a result of solar radiation, but thanks to its tremendously constant and enormous reserve which is rarely affected by weather, time and season, it can be withdrawn at no time for the purpose of providing heating for buildings. In contrast, the photovoltaic solar power generation as intermittent energy is highly constrained by time. It generates power only in daytime when the sun shines and power illumination is not needed, but when illumination is needed at nighttime, it

stops to generate power in lack of sunshine. In this aspect, shallow ground energy is far more advantageous.

2. Taking full advantage of the peak valley pricing mechanism to minimize operational cost

As said above that shallow ground energy can be extracted any time, in places where peak valley power pricing mechanism is implemented, the heating system can lower its operational cost by extracting shallow ground energy at valley time. This is viable because buildings can reserve certain heat and also intermitting heating makes little change to indoor temperatures. During most of the time in winter, the system may operate only at valley times and shut off at peak times. Such process can be programmed as automatic shift, to save operational cost of the system and also help to ease the mismatch pressure of grid.

3. No need to build long transmission lines and therefore no loss of heat or power

Different system products have been developed to saturate heating needs of different buildings or areas with regard to shallow ground energy application. As such, the shallow ground energy collection sites are normally close by the buildings they serve, therefore save construction of transmission lines and avoid losses in heat or power. This is another imbedded advantage of shallow ground energy heating.

VI. Integral Solution of heating, cooling and domestic hot water for buildings

The above-said mainly focuses on the heating service that the single well shallow ground energy collection technology can provide to buildings. However, the technology can also provide cooling for buildings in summers using the same system as used for heating in winters. This is also a superior advantage that the technology boasts. Projects for integral provision of heating and cooling for buildings is more cost effective in this regards.

Besides heating and cooling, domestic hot water has also gradually become a living necessity for building residence as the overall living standard of the people is enhancing. With the same operating mode as producing heating, the system can warm up tap water of buildings. So, with installation and operation of the same single system, heating, cooling and domestic hot water can be produced to serve the needs of buildings.

The essence of high quality engineering is to utilize the right technologies in right projects and in right combination and ways.

The Single Well Circular Heat Exchange Technology provides a mature technical solution for combustion-free heating that is safe, efficient, economical and highly cost effective. It is gratifying and encouraging to cheer for arrival of the intelligent heating era in building industry.

Vigorously Pushing Forward Combustion-Free Heating with Ground Source Energy --Development of the Emerging Industry of Integrated Heating and Cooling with Ground Source Energy

Specialist Panel of China Ground Source Energy

Heating technology with shallow ground source energy has a history of over 100 years with its first appearance in 1912. In 1930s, the technology gradually became popular in north Europe and America. In the 21st century, with constant increase of world's energy price and enhancement of public awareness in environment protection, more and more countries have started to apply the technology. Experts from developed countries define shallow ground source energy as a type of geothermal energy adaptive to all regions and acknowledge the technology as a unique technology with the greatest energy-saving effect.

Over a decade, research and promotion

on development and utilization of shallow ground source energy have been carried out by emerging enterprises represented by the Ever Source Science & Technology Development Group Co.,Ltd.(here after referred as "HYY") which has successfully combined its innovative single-well ground source energy collection technology with mature heat pump technology to supply heating for buildings of an area of more than 1300 sqms in winter.



Ding Henggao (Former director of COSTIND/Academician): At present, pollution is primarily caused by combustion. Previously, we believed burning gas instead of coal could solve pollution issue. But this is proved to be a misconception. As a matter of fact, so long as gas is fired, pollution is unavoidable. This is a key point that should be presented clearly to the public; otherwise it would be difficult to understand how important it is to achieve heating in a combustion-free way. Therefore, non-combustion heating/cooling is an important direction while ground energy acts as a very effective media to achieve it. With years'

of successful practices, ever increasing scales and widening coverages, the HYY has proven with its own action the technology is reliable. The only concern that bothered me was whether the application might cause water pollution. And the test result from the experimental project at the No.3 Zhongguancun Primary School in Haidian District of Beijing confirms that the technology is pollution-free. This is vital.



Tang Xiaoyan(Academician of China Engineering Academy; Professor of School of Environmental Science, Beijing University; Environmental Science Expert): I have a strong feeling, after visiting HYY's projects, that shallow ground source energy is a good substitute to coal especially for heating in rural areas. It well meets the urgent needs of Beijing. Till now Beijing's natural gas pipes reach only to urban edges and it will cost greatly if gas pipes reach to suburb areas. Academician Jiang Yi and other academicians have done research with a proposal of setting up a CCHP, which will cause no less NOx pollution than coal heating. The research result had been

reported at a conference of the United States Energy Foundation. I think it's more meaningful to solve rural heating problem with the HYY's technology.

Furthering the effort, I believe the HYY technology can be used to produce heating for independent compounds and therefore enjoys enormous development potential in rural areas.



Wang Bingchen(Senior Counselor at the State Council; China Engineering Exploration Master): Rapid expansion of urbanization process in China directly leads to higher demand of energies and resources. It therefore becomes even more pressing for us to enhance energy efficiency in buildings. While ensuring a reasonable level of comfort, buildings and constructions shall strive to lower their energy consumption. That is to say, demands for energy saving transformation of existing structures, application of renewable energies in buildings, and construction of green buildings and ecological cities (or zones) will increase sharply.

In terms of energy saving in buildings, utilization of shallow ground source

energy and ground source heat pump technology is an applicable way to achieve low carbon construction and low carbon urban development. The most outstanding feature of the technology is energy saving, since it explores and utilizes low-grade underground energy by consuming a small amount of high grade energy, usually electricity. Thus, this green and renewable energy is closely linked with building industry. Moreover, it saves consumption of coal, the regular traditional energy, and therefore reduces emission. Furthermore, when shallow ground source energy is used for air conditioning, the advantages of the technology have become ever more outstanding, because it manages to release heat under the ground surface and therefore lowers heat pollution to the air which is crucial for cities. As such, development of ground source energy and utilization of ground source heat pump technology can act as a forceful propeller in promoting energy conservation in buildings, achieving low-carbon economic growth and accelerating low-carbon urbanization.



Wang Jiyang (Research Fellow/Academician of the Institute of Geology and Geophysics, Chinese Academy of Sciences): I've visited HYY's sample house and have been deeply impressed by its combustion-free heating, esp. its movable central heating boiler room. I believe it can be smaller in size and some parts/facilities can be much lighter. HYY's sample house with a cost of RMB350-400 per sqm suits well the rural needs and absolutely fits those comparatively more developed rural areas like the suburbs of major cities such as Shanghai, Guangzhou,,Hangzhou and Shenzhen.

Haze problem is one of the most headache issues faced by Beijing. To solve it, we need not only sufficient financial support, but also effective technologies and pioneering entrepreneurship. HYY has the technology and entrepreneurship, therefore can be charged with this important mission.



Zheng Keyan(Geothermal Council of China Energy Research Society): Winter heating provision in South China shall follow the basic principle of energy conservation and emission reduction. Ministry of Housing and Urban-Rural Development and many

other heating experts believe, different from north China, it is not necessary for south China to adopt central heating by building up heating stations, laying out pipeline networks and supplying unified heating to all buildings and bungalows. The winter heating module in north China is highly energy-consuming and not suitable for south China.

In terms of resource entitlement, South China lacks coal and oil. A heating module depending too much on coal which is acutely needed for power generation is obviously not acceptable. Meanwhile, as power supply in South China is already tight, it's not feasible

to adopt a heating module which consumes large amount of electricity. Instead, it should take use of recyclable resource energy to save conventional energy resources and lower emission of greenhouse gas like carbon dioxide.

In general, it is better for the South China to adopt decentralized heating for building. Namely, based on individual need and conditions, different buildings or building blocks can construct their own heating systems.

Among all currently available clean heating technologies, shallow ground energy heating technology is the one that is most effective

COP Comparison under Different Heating Methods

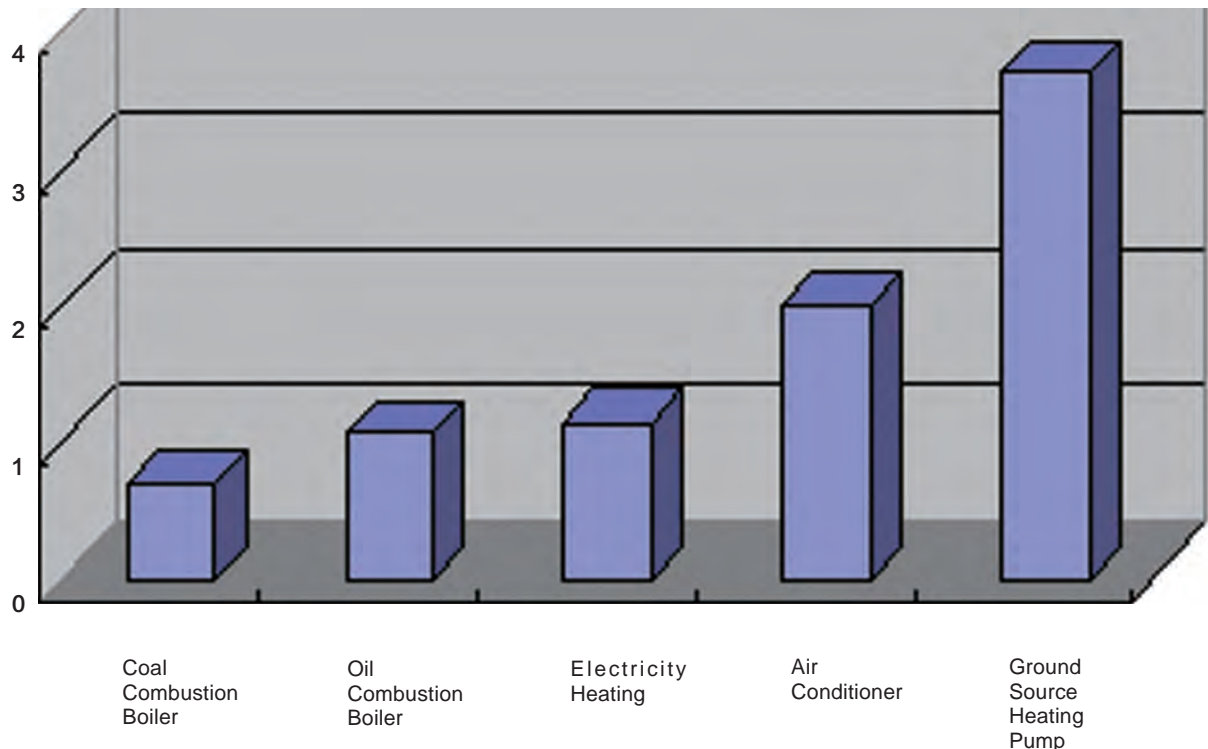


Table 1: COPs of Different Heating Methods

in reducing local land pollution and pollutant discharge, as well as greenhouse gas emission. With regards to energy efficiency in heating, shallow ground energy heating technology (ground source heat pump) boasts the highest index of COP(see Table 1) with COP of coal combustion being 0.6, oil 0.9, electricity 1.0 and air conditioners 1.8.as for the 1.8 COP of air conditioner, it means with a consumption of 1kw electricity it absorbs an extra 0.8 kw heat energy from air while working. With the COP being 3.5, the ground energy heat pump technology works with to absorb an extra 2.5 kw heat energy from shallow ground such as underground water, surface water or soil by consuming 1kw electricity. The COP of ground source heat pumps is much higher than that of air conditioners (also known as air source heat pump), meaning shallow ground source heating technology is the most energy-saving. Additionally, from the point view of energy efficiency, shallow ground source heating technology is far better than coal combustion boiler heating. Professor Fang Zhaohong of Shandong Jianzhu University points out: "Under China's present technology condition with coal being the primary energy, energy efficiency of indirect heating with heat pumps driven by thermal power doubles that of the direct heating with coal-fired boilers.

Shallow ground energy heating technology system is not only highly advantageous in energy saving and efficiency, but also

quite outstanding in protecting ecological environment. Compared with direct coal combustion heating, its sulfur dioxide emission can be reduced by app. 10% and its carbon dioxide emission can be reduced by app. 56%. Compared with electric heating, its carbon dioxide emission is app. 80% less. In addition to effective reduction in greenhouse gas emission, the system relies on a truly green and renewable energy resource, i.e., shallow ground source energy, and therefore achieves zero pollution and zero emission to its working environment. Being 100% friendly to environment, the technology is awarded by the Environment Protection Agency (EPA) of the United States as "the most environmental friendly heating technology".

Utilization of shallow ground energy in providing cooling in summer can help to reduce energy consumption. If it is used for heating and cooling in South China, it can help not only to reduce energy consumption and air pollution, but also to substantially bring down the peak power loadings of heating and cooling seasons in urban areas. It therefore contributes to safeguard power supply in extreme weather conditions. The city government of Wuhan has initiated a "warm winter and cool summer" project, utilizing shallow ground energy to generate tangible benefit to its residences. The purpose is to build Wuhan though known as one of the three cities of most burning summer in China into a place

with sufficient and secured cooling supply in summer. Moreover, cooling with shallow ground energy can save enormous power consumption for Wuhan, compared with household air conditioners.



Wang Guangqian(Research Fellow/Academician of the Chinese Academy of Sciences; Doctoral Tutor in the Qinghua University): One of the most important reasons of haze is low-altitude emission of large quantity and wide coverage caused by combustion-based heating for buildings. Such emission contains fine particles like harmful gas and dust and easily leads to haze when weather condition meets.

Nowadays the shallow ground source energy collection technology as an indigenous technology in our country has become mature enough with high applicability and strong flexibility. Relevant standards have been formulated gradually. Besides, the application of ground source energy heating system incurs no additional cost on building construction. From marketing perspective, several brand names and brand products have been cultivated in this market, including

5~900MW dispersed ground source station for heating/cooling working as heating/cooling infrastructures for new townships and cities, ground energy heat pump environment system suitable for single or multiple buildings and ground source heat devices best for heating of rural households. Commercialization of the indigenous heating technology can greatly promote transition of traditional heating industry that relies on combustion and produces emission and pollution into an emerging industry of integrated heating and cooling system with ground source energy that is free of combustion, emission and pollution. The newly emerged industry of integrated heating and cooling system with ground source energy sets a typical example that shows ecological and environmental construction triggers industrial escalation in traditional sectors so as to meet up with challenges in the new era. It is also proven to be the most economical and effective way to solve the haze problem through industrial development. Promotion of non-combustion heating is an important solution for haze problem.

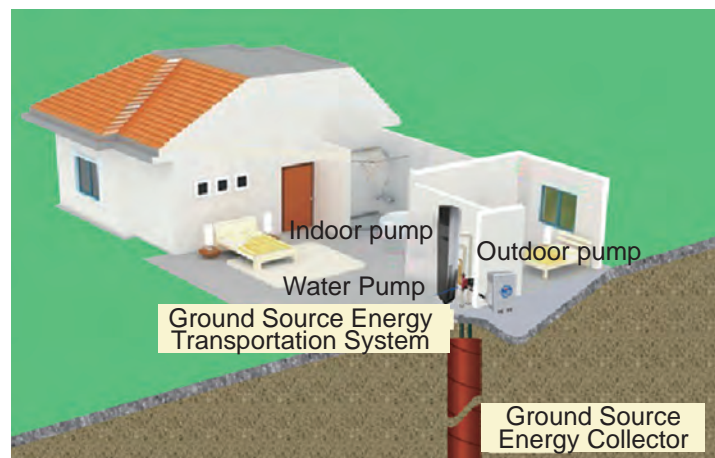


Chai Xiaozhong (President of Beijing Association to Promote Energy Conservation and Environmental Protection): The Beijing Association to Promote Energy Conservation and Environmental Protection has carried out a special research and study on the Ground Energy Heating Device, which is invented by the HYY Group for the purpose of meeting the heating needs in rural areas by using ground source energy. The study shows that the device is worthwhile to be widely promoted in rural areas, because as a clean heating solution, it is well tailored to the specialty of rural areas.

Ground Energy Heating Device is a household heating device for rural families derived from ground source heat pump technology. By consuming 1 unit of electricity, the device extracts 3 units of heat from soil and produces 4 unit of heat to households. Its energy utilization efficiency is over 4 times more than that of electric heater of the same power capacity. The device, as shown in the following chart, is composed of three parts: ground source energy collector, split-type ground energy heat pump group and ground source energy transportation. The ground source energy collector is placed underground in a way similar to digging underground cellar in rural areas (merely 6 meters deep taking up an area of 1 sqm in a rural backyard)to absorb heat source from soil The split-type ground energy heat pump group like cabinet air conditioner has indoor and outdoor units with indoor unit for heating and outdoor for holding

core components like compressors etc. The ground source energy transportation system is a pipeline network connecting ground source energy and heat pump group to complete heat transition and transportation via flow of heat-exchange media.

Ground Source Energy Heating Device System



As an applied technology of renewable energy, the device can be easily installed in all common rural buildings at acceptable installation cost, low running cost and great ease in operation. According to its users, the device is easy to use by just turning it on and off as feel needed. Besides, it can also supply domestic hot water and cooling in summer. Comparing to coal heating, which requires coal transportation and residue cleaning and produces poisonous gas, ground source energy heating device supplies heat in a much cleaner, more convenient and secured manner.

Time to Develop and Utilize Shallow Ground Energy

Author: Hu Jian

Energy utilization history of the human beings has undergone wood-burning times and coal-burning times, and then entered into current oil- and gas-burning era. Together with massive utilization of fossil energies by human activities, energy and environment constraints to economic and social development have been more and more acute. Whereas, in the 21st century, the World's energy structure is doomed to transform and the trend for a more diversified and low-carbon energy mix is becoming more and more irreversible.

The current momentum tells us that renewable energies will be the most practical option. And from the strategic perspective of national energy security, development and utilization of renewable energies that are environmental friendly have become the key tone of China's sustainable energy strategy. Renewable energies, including ground thermal energy, wind power, hydro power, solar power, tidal power and biomass power, are characterized with wide distribution, enormous development potentials, environmental friendly and renewable,

and therefore have important roles to play in achieving harmonious development of human and nature.

Among all the above-mentioned renewable energies, ground thermal energy (especially the shallow ground thermal energy) is the one that has been ignored for quite a long time. However, ground thermal energy enjoys the most potentials for application and development and boasts the longest history of utilization. Covering a latitude of 50 degrees from north to south, China's territory mostly locates in the temperate zone, with apparent seasonal and geological changes in weathers. Heating in winters has always been a living necessity. North to the Qingling Mountains-Huai River Line is the area heated by centralized heating systems in winters, which includes 15 provinces (municipalities) and autonomous regions, taking up 70% of China's total land area. As a result, energy consumption by buildings in China has reached to approximately one third of total energy consumption. Moreover, heating for buildings in China is still dominated by burning of fossil energies, such as coal and



gas. Such energy consumption activities lead to severe consequences. On the one hand, northern cities are seriously bothered by severe smoggy air; on the other hand the governments are burdened with responsibilities to ensure efficient supply and stable price of coals and gas.

Shallow ground energy normally refers to the low-grade heat energy of less than 25°C located in underground soils, rocks, ground or underground water within 300 hundred meters beneath the earth surface. Using the heat pump technology, the low-grade shallow ground heat is upgrade to medium-grade heat (40-60°C) by consuming a small amount of high-grade power energy. Then the upgraded energy can be used to produce heating for buildings in a combustion-free way. Shallow

ground energy outstands itself from all the many renewable energies with its unique advantages of being both economical and environmental, in addition to its features in broad distribution, enormous reserve, shallow buried depth, danger-free utilization, pollution and geological risks free. Although for the time being shallow ground energy is not as well known as wind and solar powers, it is foreseeable that it will take the lead in renewable energy development for the years to come in terms of market shares, technology applications, industrial scale and development potentials.

The current energy consumption structure in China is heavily dependant on fossil energies, dominated by coal. The extensive consumption pattern makes the country's overall energy consumption persistently



high and greenhouse gas emission top in the world. As the industrialization and urbanization process in China are expediting, energy consumption in China will continue to increase in a fairly long period of time (20-30 years), and energy shortage and environment pressure will become more and more acute. In this backdrop, on Feb. 28, 2005, the 14th Assembly of the Standing Committee of the 10th National Peoples' Congress endorsed the Law on Renewable Energies of the People's Republic of China which entered into force on Jan. 1st, 2006. The law affirms the legal status of renewable energies in China and gives development priorities to renewable energies. In 2007, the National Development and Reform Commission stipulated the Medium-to-long-term Development Plan of Renewable

Energies in China. The plan calls on industrial development of renewable energies including ground energy, wind power and solar power, so as to progressively enhance the proportion taken by quality and clean renewable energies in the energy mix of China. It is intend that by 2010, renewable energy consumption shall take up 10% of the total energy consumption and 15% by 2015. As such, renewable energies will become effective complementary energy in the energy supply system to provide power of more than 600 million tons SCU every year. In the due process, current technologies for renewable energy application can be improved in practices and get ready for full commercialization. By 2030, renewable energies shall join the mainstream and take a dominant position in China's newly increased energy consumption, to provide more than 1 billion tons SCU every year, about 20% of the total consumption of the



primary energies.

In face of various challenges, including defected renewable energy policy in lack of supporting incentives, insufficient R&D input by companies due to low independent innovation capacity, and severe needs for in-depth evaluation on energy reserve to unleash scale development, governments at different levels and in different localities have been making great efforts in development and utilizing renewable energies (or so called “new energies”) and promulgating a series of policies in aim of promoting energy saving and emission reduction.

In the renewable energy policies adopted in 14 provinces, municipalities and autonomous regions including Beijing and Shanghai, expressions such as energy saving, emission reduction, circular economy, renewable energies, environment strategy, environment protection, preferential policies etc. have occurred with high frequencies. It, on the one hand demonstrates the strong importance attached by the local governments on development of renewable energies, and on the other hand, shows that renewable energy utilization has been taken as a key means in achieving environment improvement, energy saving and emission reduction. In the policy perspective, it is easy to recognize that all local governments of different regions share a common vision in promoting environment protection, energy saving and emission reduction, despite of the facts that they may vary in economic development levels, energy

consumption mix, industrial structure, and environment pressure.

I. Local Governments Focus on Provision of Heating and Cooling for Residentials

The above-mentioned 14 provinces, municipalities and autonomous regions almost cover all the Northeast China (cold in winter and cool in summer), Central China (cold in winter and hot in summer), Southern China (hot in summer and warm in winter) and Ningxia Autonomous Region in West China. The local governments have all stipulated policies to encourage energy saving and emission reduction in heating industry under the premises of ensuring adequate heating and cooling services to its residents. Special emphasis on transforming energy consumption mix and supporting renewable energy utilization has been made in Northeast areas and Northern China, where heating is a necessity but has caused severe air pollution.



II. Points in Common in Local Policies on Renewable Energy Development and Utilization

In the above-mentioned 14 provinces, municipalities and autonomous regions, the policies and incentives on renewable energy development and utilization, as well as energy conservation and emission reduction embrace three key features, namely, clear governmental guidance, strong policy directions, and high maneuverability. They share some common points as follows:

1. Stress on Improving Fiscal Incentives.

Firstly, the policy calls on governments at all levels to increase their input in promoting energy saving and emission reduction and to include such input into their fiscal budget, or to earmark a special fund for energy saving and emission reduction. Secondly, encouragement is implemented in different ways, such as using incentives instead of subsidies, promoting improvement by awarding good activities, or imposing ecology subsidies. Thirdly, green government procurement is advocated, and some even proposes to change preferred procurement to mandatory procurement. Fourthly, expanded fiscal capital inputs to energy-conservative and environmental projects are called on.

2. Emphasis on Encouraging Renewable Energy Development and Utilization and Imposing Energy and Emission Taxes

Main measures include: firstly exempt

corporate income taxes on enterprises engaged in development of renewable energies, environment protection, energy conservation and emission reduction. Secondly, entitle enterprises that have procured specialized equipment for development of renewable energies, environment protection, energy conservation, emission reduction and production safety with proportional tax credit.

3. Focuses on Reinforced Effort in Developing and Utilizing Renewable Energies and Mobilizing More Financial Resource to Support Energy Saving and Emission Reduction.

Main measures in this regards include: Firstly, financial institutions are encouraged and actively guided to expand their credit support to projects engaged in renewable energy development and utilization, environment protection and energy saving and emission reduction, through policy regulatory measures. Secondly, direct financing is reinforced to support renewable energy development, environment protection and energy saving and emission reduction. Thirdly, concessional loans from international financial institutions and foreign governments shall be actively mobilized to promote renewable energy development and utilization and energy saving. Fourthly, more pre-listing tutoring is further stressed for enterprises in sectors of renewable energy development and utilization, environment protection and energy conservation and

emission reduction.

III. Leading Role Played by Governments.

The leading role by governments mainly refers to: earmarking special funds in fiscal budget to support development and utilization of renewable energies, energy saving, emission reduction and environment protection; implementing mandatory green purchase in government procurement; construct demonstrative projects of renewable energy utilization and energy conservation as key government projects; render targeted support to energy service providing companies that are engaged in Energy Management Contracts; set good examples by governmental institutions in renewable energy utilization, environment protection and energy saving;

expand efforts in personnel training and publicities.

As such, we should say that development of renewable energies has become a must for China to achieve sustainable development in economy, society and energy, and to construct ecological civilization, an important measure for China to tackle climate changes and reinforce environment protection, and an effective way to improve diversification of energy supply, safeguard secured energy supply, meet the energy need in remote areas, and promote economic transformation and regional economic development.

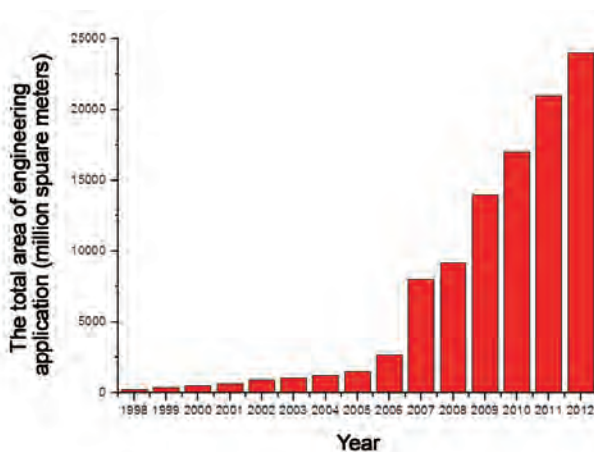
It is fair to say, currently it is a good time to develop renewable energies, and a better time to develop and utilize shallow ground energy.



Thinking before Rapid Industry Development of Ground Energy Heat Pump

Author: Mr. Ma

The industry of ground energy heat pump develops along scale development of shallow ground source energy and it develops in a very fast mode in the past decade. On one aspect, haze problem pushes people to look for combustion-free heating method. On the other hand, shallow ground source energy collection technology has been improving, esp. single well heat exchange technology which offers technical guarantee for big scale and safe development of shallow ground source energy. Presently, building heating with shallow ground source energy has entered an era of big scale development (see picture



Picture 1 Application Area of Shallow Ground Source Energy in China

1). Rapid development of ground energy heat pump has been benefited from a series of supporting policies implemented by government.

In 2005, *Renewable Energy Law of the People's Republic of China* was implemented. In 2006, *Interim Measures for Special Funds Management for Recyclable Energy Buildings* was launched. In 2009, *Demonstration Implementation Plan of Recyclable Energy Building Application Cities* and *Implementation Plan of Promoting Recyclable Energy Building Application in Rural Region* were issued with demonstration projects spreading to districts and counties. In 2011, *On Promotion of Recyclable Energy Building Application* was released to intrigue deep and scale development of recyclable energy application. Now ground source energy, as a type of clean recyclable energy, has been enlisted into *12th Five-year Plan*. In the coming 6 years, our country shall complete building heating with an area of 0.3 billion sqms with ground source heat pump with an investment value over 100 billion.

Objective demands and government

support have brought enormous opportunity to the industry of ground energy heat pump.

We're feeling our client has a bigger and bigger demand by coming across giant projects with an area of hundreds of thousand sqms and area as vast as a few square kilometers has been planned with full coverage by ground source energy heating.

Clients are also having higher and higher demands by not only caring about equipment type and materials, but also raising strict requirement in energy-saving and power reduction on operation. It should be put in another way that clients are getting more and more mature with the popularity of ground energy heat pump products.

Another change is the region along Yangtze river where there is no winter heating traditionally and sees the hope of winter heating through ground energy heat pump which enables winter heating and summer cooling with the same system. The development of these region is really fast. A lot of rural area shows great interest in ground energy heat pump after giving up traditional coal and straw combustion heating and even raises higher demands to cost and effect of ground energy heat pump system.

To meet up social demands, there has been obvious changes in the industry of ground energy heat pump in the past few years. On one side, there have been relevant standards and brochures like *Technical Specification*

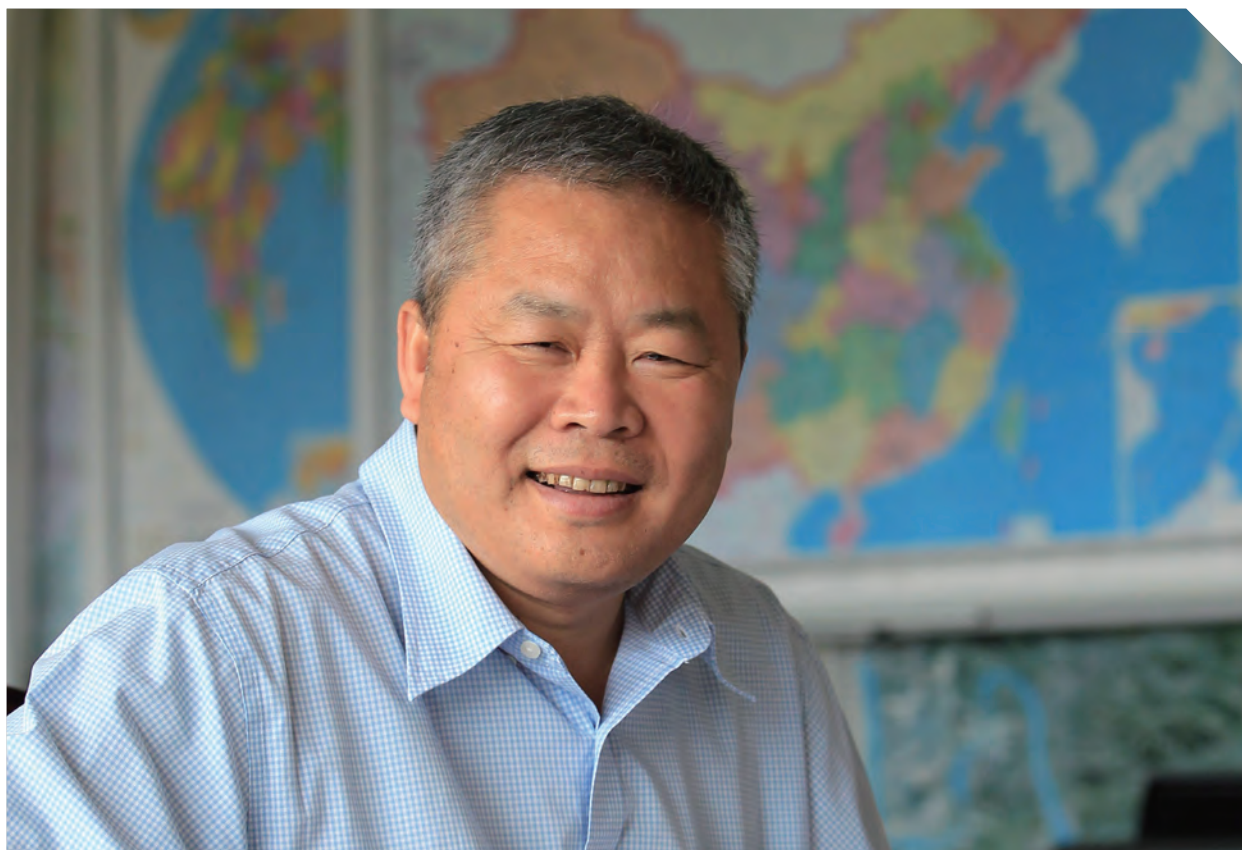
of Ground Source Heat Pump System Project, Technical Specification of Single-Well Heat Exchange Circulation for Ground Source Energy Collection and Technical Brochure of Ground Source Heat Pump, etc., of which companies can rely on to improve product quality, lower cost and raise up their authentication. On the other side, new products keep showing up. Products like HYY ground source heating device which enables room operation are popular among rural users and villa owners because it has low requirement of environmental requirement and can reduce operation cost greatly.

Concept of internet has also affected the industry of ground energy heat pump recently. There are some companies who expect to build up big data system to serve clients with tailored products based on internet achievement. Additionally, it can also benefit to the existing business mode by raising up efficiency and lower cost.

With larger and larger project scale, projects cover rather than one building or a building cluster but are required to offer heating/cooling service for a region with an area of a few square kilometers. Therefore, regional energy scale based on ground energy heat pump comes into shape. Compared with regular energy planning, it emphasizes greatly on evaluation and estimates on heating capacity of shallow ground source energy. There are many new issues to be solved.

The Dream of Intelligent Heating Free of Combustion Comes True

An Interview with Mr.Xu Shengheng, the President of Ever Source Science&Technology Development Group Co.,Ltd.



Back to Beijing from Dalian last night and flying to Mianyang this afternoon, Mr.Xu Shengheng has been traveling a lot these days. However, it is hard to catch a glimpse of tiredness on his face. As usual, he came to the office very early this morning.

Fortunately, he managed to squeeze some time to review my interview just a few hours before his flight to Mianyang. In recent years, after successful innovation on ground energy collection technology, Ever Source Science&Technology Development Group

Co.,Ltd. has realized industrialized growth in ground energy development and utilization. As more and more projects coming along, Mr.Xu Shengheng, as the President, becomes ever busier and works every minute to its full value.

Reporter: *Mr.Xu, this year is HYY's 15th anniversary. How do you view the past 15 years' development of the HYY?*

Xu Shengheng: Since the first day of its establishment, the company has been honoring its mission of promoting combustion-free heating for buildings with ground source energy, sticking to its principle of being pragmatic and innovative, observing its mandate of promoting harmonious co-existence between human and nature, devoting to its objective of creating better quality living condition for people, establishing its Code of Conducts for employees to ensure work safety and strict working standardization and to nurture responsible and appreciative working spirit, and holding high its corporate value of "loyalty and responsibility". By uniting all the staff and a group of renowned experts from home and abroad, and based on our independent innovative technology of single well ground energy collection, a series of technology products have been developed which have paved the way for the company to attain great leap forward in industrialized and scale development, These products include city heating stations for new cities, independent

heating systems for single or multiple buildings and ground source heating devices for rural households. Based on all these achievement and in combination with features of industry network era, our company has explored a new path on intelligent building heating with combustion free ground source.

Reporter: *Intelligent building heating is quite a popular word now. The HYY is a strong advocator of intelligent heating. In your view, what is intelligent heating?*

Xu Shengheng: To explain intelligent heating, it is necessary to talk about the background against which the concept was initiated.

Since 1950s, tremendous changes have taken place in traditional heating sector based on fossil energy combustion. 1. The low energy efficiency of fossil energies (the world's average is 50.3% and China's average is 36.8%) has led to several occurrences of fossil energy crisis and ecological crisis caused by burning of fossil energies such as haze, acid rain and global warming etc. Such crisis forms external pressure for development of intelligent heating with shallow ground source energy. 2. The ever enhancing requirement of the people for higher living quality, especially requirement for enhanced quality of living environment (such winter heating and summer cooling) have further increased energy demand. For the time being, foreign-trade dependency of

oil in China has exceeded 60% while natural gas 30%. As such, it becomes the core driving force for development of intelligent heating with ground source energy, in order to saturate the increasing demand of the people for better quality living environment without worsening the current tension in energy supply. 3. Rapid expansion and broad application of big data and internet, together with related industrial revolution, renewable energy development and outbreak of new technologies have become the booster for development of intelligent heating. 4. The four energy revolutions advocated by Chinese President Xi Jinping (i.e., energy consumption revolution, energy supply revolution, agricultural technology revolution and energy system revolution) clarifies goals and directions for energy application and development in China. 5. The HYY's innovative ground source collection technology has realized scale and industrialized development and made the low-grade renewable energy (around 0 to 25 degrees) that is widely distributed in the world into substitute energy for non-combustion intelligent heating for buildings. In whatever geological conditions, the utilization of ground source energy can produce heating of 1kw at a constant cost of around 1200RMB yuans. This manifests a revolution in energy source for heating in the new era.

Reporter: *Then, how do you define "Intelligent heating"?*

Xu Shengheng: Intelligent heating means an environmental system that can produce heating for buildings in a combustion free way, which can perceive and properly respond to environmental changes (such as temperatures).

Reporter: *"Perceiving environmental changes" seems easier to understand. However, what do you mean by saying "respond properly"?*

Xu Shengheng: A system that can "respond properly" has six features. Firstly, the properly responding system can automatically adjust to new changes in ground energy temperatures and environment temperatures to provide a comfortable and stable living environment for its users. Such an ability is based on the technology of big data processing (such as temperature of ground source energy (heat), environment temperature, personal preferences, client quantity, building's heat preservation coefficients, internet with cloud computing and dispersed-type energy system. Secondly, the properly responding system shall be energy-saving and energy-efficient. Compared with building heating through combustion of fossil energies, the system is much more energy-saving. Thanks to the phase transformation theory and mature heat exchange technology, the system utilizes a large amount of unpaid ground energy reserved in rocks and soil masses by consuming only a small amount of paid electricity to drive compressors and water

pumps. It therefore achieves high energy efficiency of over 108%. Thirdly, the properly responding system shall be low in cost. Its low cost is not only reflected in its consistently low operational cost even when price of fossil energy increases and price-elasticity of energy demand decreases, but also in its huge saving of transportation and storage cost needed by using fossil energy, as well as savings of high cost for treatment of air pollution caused by combustion of fossil energy. Fourthly, the properly responding system must be pollution-free to its surrounding areas. Using shallow ground source energy to provide heating for buildings can not only create comfortable and stable living indoor environment for its users, but also preserve the good outdoor surrounding environment for its users as it emits no pollution of carbon dioxide, sulfur dioxide, nitrogen oxides and volatile organic compound. Fifthly, the properly responding system shall be backed up with sufficient energy resource supply. Shallow ground source energy can be found in sands, soil, rivers, lakes and oceans and enjoys characteristics of wide distribution, easy exploration, natural renewability and all-climate applicability (in contrast to solar power and wind power). Therefore, in the currently available renewable energy resources, shallow ground energy is the only one that can truly stand as an inexhaustible resource to support such a properly responding system. And last but not the least, the properly responding system shall be replicable. Thanks

to widest distribution of shallow ground energy, the system can be easily replicated, which means it can provide comfortable and stable environment at any location and any place and under any geological and climate conditions.

Reporter: *Is it feasible for smart heating in our society?*



Xu Shengheng:First of all, smart heating shall be an undertaking led by decision makers. Usually it is the decision maker who takes the responsibility to design macro energy utilization system from three dimensions including clean development, energy dependency and energy management. And government is the only decision maker who has the power to promulgate the macro



energy utilization system of one country or on locality. Therefore, government is not only the first person responsible for ecological and environmental protection, but also the decision maker in constructing macro energy systems. The greatest significance of intelligent heating lies in, besides its low cost, low energy consumption, high efficiency, no pollution and low dependence, its satisfaction to people's requirement of comfortable and stable living conditions. Under the current energy system which mainly depends on fossil energy, it's impossible to realize optimization in three dimensions. Decision-makers are thus required to focus on intelligent heating by firstly upgrading of combustion heating industry, encouraging social participation and promote energy consumption revolution, energy supply revolution, energy technology revolution and energy system revolution through innovations on legal system and energy systems so as to build up a modern energy system with co-existence between renewable energies and traditional energies while taking the shallow ground energy as the substitute energy to provide heating for buildings. The enactment of the Law on the Prevention and Control of Atmospheric Pollution and the Law on Renewable Energies in China then laid the legal foundation for development and application of shallow ground source energy. Secondly, China is the largest construction market in the world. According to incomplete statistics, domestic buildings completion has reached to 28 billion sqms during the

decade from 2004 to 2013. With stable social and economic development and constantly enhancing living standards of the people, new buildings in the upcoming five years will increase by 10 billion sqms. If 50% of new buildings require heating and 40% among the 50% new buildings utilizes non-combustion intelligent heating with shallow ground source energy, the market for intelligent heating with shallow ground source energy shall reach to over 2 billion sqms. It's fair to say that the market for non-combustion intelligent heating with shallow ground source energy is truly solid and enormous. Thirdly, the company takes the innovative single well heat exchange circulation system as the core technology, uses mature heat pump technology and harmless elastic padding as well as applies a concept of dynamic design to decide facilities designations according to ground source energy grade. Together with the refined management in system operation, service guarantee of brand name energy contract management, the company has formulated a vertical development modality with products and services covering the entire industrial chain including good quality R&D--facility manufacturing--engineering and installation--operation--maintenance. In addition, the company has developed a full range of products that can provide same quality combustion-free heating services with ground source energy to all areas both urban and rural, including large dispersed smart heating and cooling source city stations,

middle-scale smart regional environment system with ground energy source and small-type ground energy source heating devices for rural areas. As such, it is fair to say that the original technology of shallow ground energy collection together with mature heat pump technology and scale development covering the entire industrial chain help to provide solid technology guarantee to market promotion of intelligent heating. Fourthly, upon entry of the 21st century, with the wide spread of the open and global internet, industry internet which connects human, data and machines, the IoT which connects all things through information sensory equipment and internet and improves logistics and logistic information management, as well as the industry cloud computing which is composed of various industry software through computing technology and data treatment technology and a new trans-industry concept like concept marketing led by internet ideology, intelligent heating is no more a mere dream. The application of new technologies like industry internet, IoT and industry clouds and advanced new trans-industry concepts like concept marketing have entitled the intelligent heating industry with favoring external conditions.

Time elapsed quickly and Mr. Xu has to rush to the airport to catch his flight. The interview ends with Mr. Xu's quoting of one remark made by General Secretary Xi Jinping "people's yearning for better life is what we'll fight for"

Self-heating New Star in New Rural Construction

——*HYY Ground Source Heating Device*

Author: Liu Baohong

By using shallow ground source energy as the replacing energy for building heating and cooling and taking for integrated heating and cooling system facilities with ground source energy as end equipment, HYY ground source heating device is a product to realize self-heating/cooling for rural users in rural area. The device can be designed to be equipped with separate system for each house or even each room with remote control and automatic system control without pollution and emission, safe and reliable and low costing. It's a self-heating new star

for energy saving and environmental protection in new rural construction.

I. Product R&S and Development Route

Presently our vast rural area has a poor self-heating method which is mainly relied on coal combustion. There have been not so many new type self-heating technology choices for rural area and a large portion of villagers choose local soil-made heating stoves by coal combustion (soil heating) and even some region still rely on small coal stoves and Chinese Kangs for heat generation, very inefficient, expensive and unsafe. And with short supply of coal resource and gradual reduction of non-recyclable resource, the situation of rural building heating and energy saving is becoming worse and worse. Besides, rural population is comparatively isolated with most area having no full set of heating pipe network and having lower electricity load than urban area. It's difficult to promote traditional gas combustion and electricity heating. Therefore, it's urgent that a type of product which requires low initial investment and is energy-saving and environment-friendly and is easily to be installed with high safety and convenience shall be able to realize rural building heating/cooling and satisfy needs of urban and rural construction and development.

HYY ground source heating



device, designed by HYY for special needs of rural building heating/cooling, is a product with combustion free heating/cooling pump system and is suitable to rural residents with its easy operation, separate and flexible self-heating and differential heating to different rooms in one house. Rural residents are the ones who benefit the most.

From 2009, HYY has been doing R&S to solve technical issues as the following:

(I) Combining with convenient energy storage tank ground source collection technology to be compatible with various ground source energy collection system and suitable for different geological conditions.

(II) Solving the problem of household measurement by using traditional power measurement and water-flow measurement to solve the problem of household measurement and charges with combination of power supply system and separate household power measurement and water-flow measurement allocated with heat consumption.

(III) Noise control technology to solve noise problem from fundamental perspective by moving the noise source compressor outdoor and thus

(IV) Low temperature heating technology to satisfy heating at frozen region.

(V) Small size technology with products adopting numerical simulation and experiments to solve the key problem of separate small-sized household heat pump.

Series of HYY ground source heating device products have gained many national innovative patents and new practical patents and has been appraised as Beijing's Energy Saving and Low Carbon Technical Product in 2015. Product patterns have been developed

into 7 series and 13 patterns to fully satisfy people's heating/cooling and living water needs. Products are sold through agents nationwide and its development of big scale and standard production brings down the cost while maintaining good quality and promoting industry development by building up operation and maintenance station. These will drive improvement of heating pump technology and adjustment of recyclable energy industry structure and push integrated industry development.

II. The Most Reliable Heating Replacing Device

Working theory: shallow geothermal ground source energy, by absorbing from soil and rocks through heat pump, to supply heating to building. It's realized by taking use of the power which cost only a little(1 degree) to obtain 3 degrees of heating energy from soil and rocks which costs none and outputting heating energy as equal to that through 4 degrees of electricity through electricity boiler.

Features

① Power-saving and less cost: heating's power consumption is equal to only 25% of traditional power boilers while cooling saving 20% in comparing with central air conditioners.

② Reliability: there is no worries to be gas-poisoned and no risk of gas/oil explosion. The system is equipped with anti-frozen machines and shall not be frozen to crack till pipelines are broken, which fits well with rural residents' habits of heating pause and diversified competition.

③ Easy operation: remote control on turning on and off according to needs with operation module like household air conditioners and with automatic integrated control on system equipment.

④ Simple engineering: all products are modularized to be connected with each other and installed with simple pipelines and mature installation technology.

⑤ Quality insurance: integrated system with quality assured in factory.

Adaptivity

① Recyclable energy utilization technology: there is only a small amount of electrical energy consumed for energy exchange with soil during operation. Soil energy is recyclable, continuous, and comparatively stable to enable system's reliable operation, which has no pollution and no emission.

② Its installation can be fulfilled in rural buildings: the collector can be buried in or out of rural bungalows while indoor equipment can be located anywhere indoor and outdoor equipment can be positioned along walls or at

corners with their small size. Power requirement is same with household air conditioners with a voltage of 200V with no need of power uprating and even no need to change power wires.

③ Convenience and flexibility: rural residents can set temperature and turn off and on in a casual way according to different rooms and their non-continuous heating needs. Besides, hot water can be supplied while cooling can be realized in summer. Operation cost in one heating season can even be lower, under an economical mode, than cost of coal combustion heating

III. Application of HYY Ground Source Heating Device

Till now, HYY ground source heating device has been applied at 40 projects in Beijing counties and 7 provinces. From the perspective of device operation time, a plant reconstruction project at Yanlu road, Fangshan district has been running stably for 5 years with a project area of 20989.44 sqms and a building area of 16347.35 sqms. From geological point of view, there are successful application projects at residential buildings at Bayan county, Ha'erbin city in cold north and the science city at Mianyang in south where both cold and hot weather co-exist. Typical projects are as below:

① Plant Reconstruction Project at

Yanlu road, Fangshan District

Buildings are divided into workshops and auxiliary buildings with reconstruction into unit art studio. Separate heating, household measurement and energy-saving and lower consumption are required according to its unit art studios which are for rent after reconstruction. The reconstruction is applied with HYY ground source heating device products for building heating/cooling and household measurement is realized through separate power measurement, fair and reasonable enough. After reconstruction, every year there have been savings on operation fee by RMB185,700 and on standard coal by 120 tons, compared with the combination of coal combustion boiler and cooling water system, and a reduction of smoke exhaust by 1,650,000, CO₂ emission by 360 tons, SO₂ emission by 3 tons, NO_x emission by 2 tons and particle emission by 5 tons.

② Coal Replaced Reconstruction Project-Shayugou New Village

According to system tracking records and by taking an example on a resident who keeps the system running for the longest time and whose indoor temperature is the highest, the system has been kept running for 13 to 15 hours per day with a temperature of 22 ℃. The average daily power consumption is 13.14

KWh(old bungalow house at Shayugou with external thermal insulation system) and the whole cost in one heating season is only RMB 821 by calculating on a basis of RMB 0.5 per KWh, compared with the original cost of RMB 2800 in one heating season through coal combustion heating which can only keeps indoor temperature at 13.5 to 15.5 °C . The operation cost is saved as high as around 70%.

③ Air Source Replaced Reconstruction Project

Let's take committee member Mr.Yang's house at Hongshuikou village, Mentougou district as an example. In winter,his house,old mountainous bungalow building with common walls and single layer window glass,has been kept heating for 24 hours per day with a heating area of 30 sqms with indoor temperature at 20 °C with a daily power consumption of 28 to 30 KWh.

Heating Method Change at Shayugou, Before and After

	Heating with Original Coal Combustion	Heating with HYY Ground Source Heating Device
Indoor Temperature	13.5-15.5°C	22°C
Operation Cost	RMB 2800	RMB 821

Originally Mr.Yang adopted the combination of air source heat pump system,radiator and geothermal system for heating with a daily power consumption of 47-50 KWh with a temperature of 15 °C to 17 °C .After reconstruction and replaced with HYY ground source heating device,his daily power consumption is reduced by 17 KWh with a saving of RMB 7 on operation cost, which saves about 37% on operation cost.

Heating Method Change at Hongshuikou Village, Before and After

	Heating with Air Source Heating	Heating with HYY Ground Source Heating Device
Indoor Temperature	15-17°C	20°C
Operation Cost(Daily Power Consumption)	47-50 KWh,Daily	28-30KWh,Daily

Conclusion:

Being safe and reliable, HYY ground source heating device is easy to be installed and easy to operate with low operation cost and has been popular among users.It's a product that can replace dispersed boiler system in cities and towns with its reliability and energy saving and environmental protection effect and it's the new star for self heating in new rural construction.

The Key of Developing and Utilizing Shallow Ground Energy——

Brief Introduction of HYY Single-Well Heat Exchange Circulation for Ground Source Energy Collection

Author: Li Daqiu

Single-well heat circulation technology for ground source energy collection is an advanced shallow ground source energy collection technology independently innovated by our country and adaptive to various geological conditions. The technology collects shallow ground heat energy under 25 degrees through the media of circulating water and can realize rejection of underground water back to original layer without waste and pollution to keep underground water safe. By the end of 2014, single-well heat circulation technology for ground source energy collection has been widely promoted for application in many provinces, autonomous region and municipalities

throughout China with areas of building heating with shallow ground source reaching over 13 million sqm, saving app. 90,000 tons of standard coal every year by replacing traditional heating energy with shallow ground source energy. Technical Codes and Standards for Engineering of Single-Well Heat Circulation Technology for Ground Source Energy Collection as being approved by relevant government and officially implemented as Beijing's local standards, also proves that the technology is well ready for industrial development. Many major projects in Beijing have utilized single-well heat circulation technology to produce heating and cooling for buildings. Now the technology has gone abroad and demonstrating projects in foreign countries like America have started their operation.

I. Various Collection Methods of Ground Source Energy

1. Collection Well with Energy Storage Grains

Collection well with energy storage grains is suitable for projects located in geologies dominated by silty sand. This method has advantages of stable operation, high efficiency and energy saving.

The heat exchange rationale of this collection method is as follows: being pumped out by diving pump located in the water-pumping area at the bottom of heat-insulated tube, the circulating water

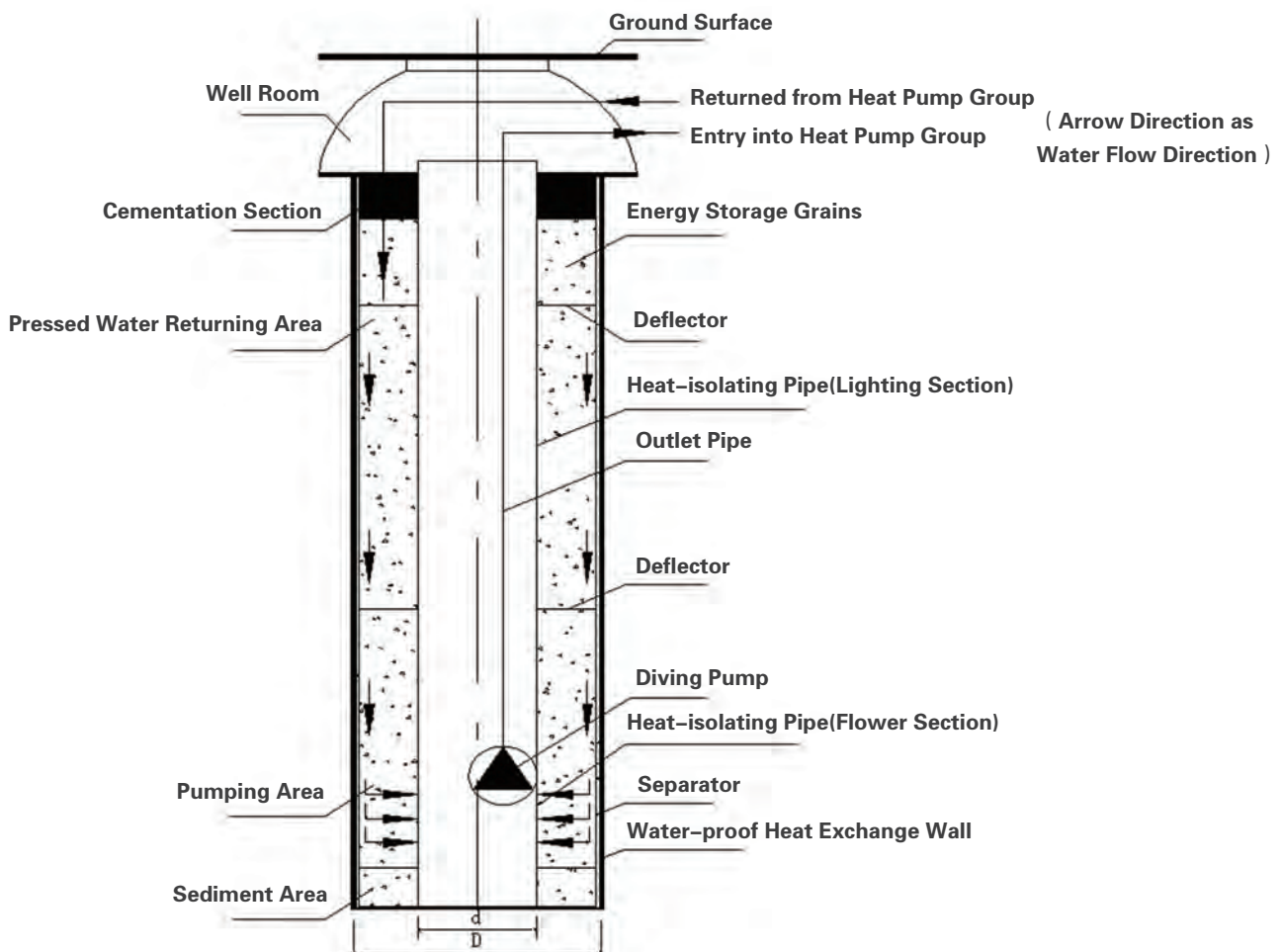
flows into heat pump unit to release heat or absorb heat and then enters into the pressurized water rejection area on the top of energy storage grains. Then, the circulating water flows through the annular space filled with energy storage grains and down to the water-pumping area, and enters into heat-insulated tube through perforated pipe at the bottom of heat-

insulated tube before it is pumped out by diving pumps. Please refer to Figure 1.

2. Collection Well without Energy Storage Grains

Collection well without energy storage grains is suitable for projects located in geologies dominated by coarse sand and gravels. This method has advantages of

Figure 1: Collection Well with Energy Storage Grains

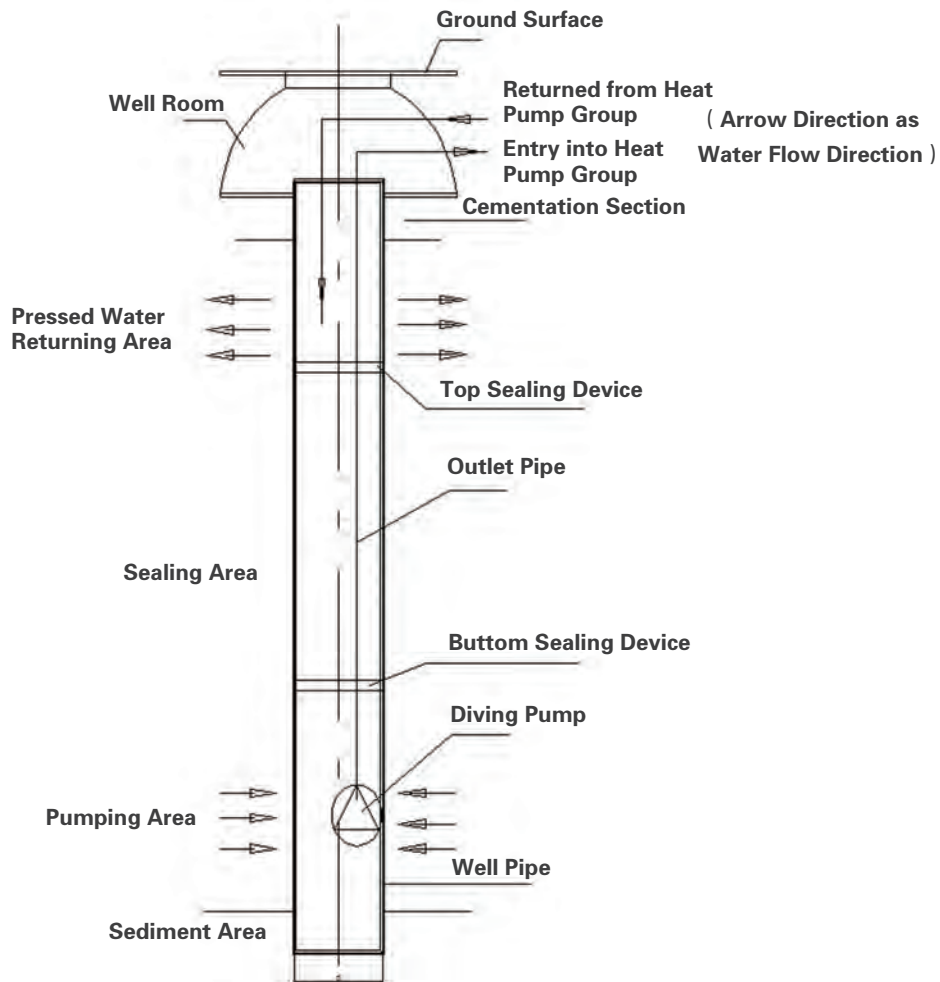


stable operation, low construction cost and short engineering time.

Heat exchange rational of the collection well without energy storage grains is as follows: water pumped out by diving pump located in the water-pumping area at the bottom of the heat-insulated tube flows into heat pump to release or absorb heat and then returns to the pressurized water rejection area at the top of the heat

insulated tube. Then the water flows out through the perforated pipe at the top of the heat insulated tube to exchanges heat with surrounding rocks and re-enters into heat-insulating pipe through perforated pipe at the bottom of heat-insulated tube before it is pumped out by diving pumps. The water-pumping area and pressurized water rejection area locate in the same water layer, to achieve water circulation at the

Figure 2: Collection Well without Energy Storage Grains for Single Underground Water Layer

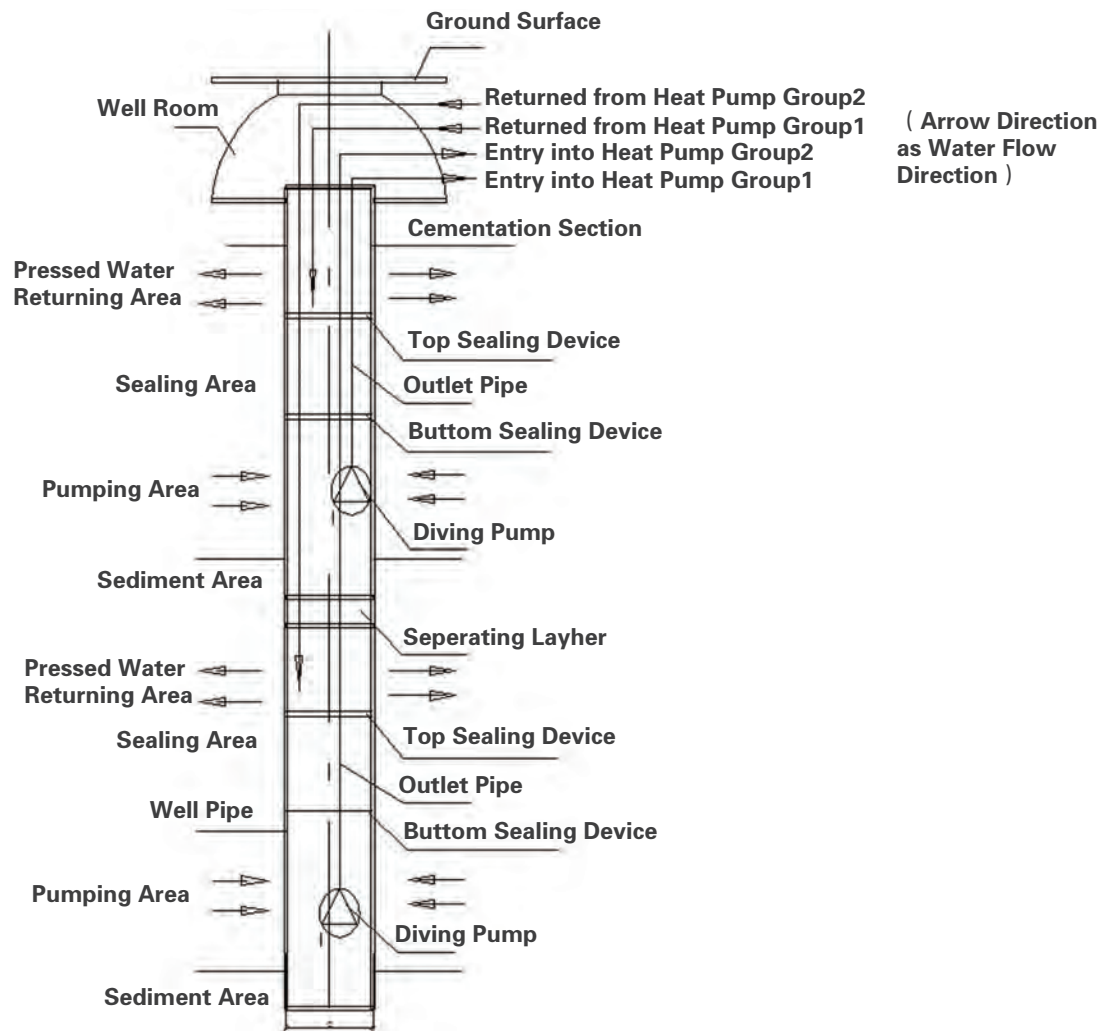


same water level. Please refer to Figure 2 for details:

Collection well without energy storage grains is also feasible in geologies with

multiple underground water layers. Such well can be structured with two or several segments vertically segregated according to groundwater levels. The boards used

Figure 3: Collection Well without Energy Storage Grains for Multiple Underground Water Layers



as segregators shall meet the rules and regulation as duly required by local competent authorities. Please refer to Figure

3. Ground Energy Collection with Buried Pipes

Ground Energy Collection with Buried Pipes is applicable to small-scale projects of which the heat exchange volume is less than 50kW. This method of energy collection is easy for installment and low in initial investment. In such ground energy collection system with buried pipes, heat exchange is realized through fluid media flows in U pipes with two ends fixed on two sides of each plate tube.

II. Dispersed-type Ground Source Station for Cooling /Heating

Dispersed-type ground source station for cooling /heating is a heating product designed by HYY to meet central heating needs of small cities and townships. It can function as central heating infrastructures to provide central heating and cooling in clusters, cities or townships, by constructing proper networks based on regional architectural features. With combined utilization of different energies and by substantially lowering the consumption of traditional fossil energy, the dispersed-type ground source station not only stands as a new application model for using shallow ground energy as substitute energy for building heating but also provides a total new thinking and opens a new and vast market space beyond traditional market.

HYY dispersed ground source station

for cooling /heating is a central heating and cooling supply system to provide heating, cooling and domestic hot water for urban and township buildings, which takes the innovative HYY single-well heat exchange circulation for ground source energy collection technology as its core technology and recyclable shallow ground source energy as the main energy for combined utilization with other clean energies like natural gas, gas or geothermal energy, and integrates with innovative comprehensive utilization technology of recyclable energy. HYY dispersed-type ground source station can supply hot water of 50 to 55 Celsius in heating seasons and cold water of 7 to 12 Celsius in cooling process. It boasts unique advantages of being clean, energy-saving, multi-functional, short in construction time, highly adaptable, space-saving and reliable in operation. Besides, it provides modularized solution to meet up with various needs of different buildings to ensure high efficiency of investment and operation, relies on full-automatic control with guaranteed reliability and stability in system operation, and achieves low operational cost by household heating metering. Compared with traditional coal-fired generators, HYY dispersed-type ground source station for cooling /heating has unique advantages in low investment, fast installation and low cost.

December 29, 2014, the HYY company

**Table 1: Construction Cost Comparison
Between HYY dispersed ground source station
for cooling /heating and Coal-fired Generator**

Project	Regular Coal-fired Generator	HYY dispersed ground source station for cooling /heating
Scale (MW)	300	300
Construction Time (Year)	4	4
Life Span (Year)	30	30
Construction Cost in Total (Million)	3510	360
Unit Price (Yuan per KW)	11700	1200

signed a franchise agreement with Dalian Jinzhou New Development Zone on constructing a 900MW HYY Dispersed-type Ground Source Station for Heating of the International Business District of Xiaoyao Bay. Once completed, the project can save around 162,000 tons of standard coal by replacing traditional heating energy with shallow ground source energy heating. The 900MW project utilizing the HYY Dispersed-type Ground Source Station for Heating is designed to provide heating for buildings of no less than 15,000,000 sqms in the Xiaoyao bay district which covers an area of 204,000 sq kms in the coming 10 years. It's by far the biggest ground source heating project in the country and in the world.

III. Conclusion

Single-well heat exchange circulation

for ground source energy collection technology is featured with two functions: winter heating and summer cooling. It can be used to provide heating and cooling for new buildings as well as existing buildings. Some typical projects are: ACFIC project, Armed Police University project, National Administration University project, National Theater (landscape pool) project and project at the National Comprehensive Sports Training Base for Disable.

In August 2009, Hershey School, HYY's first demonstrating project in America, started to operate. Due to its high performance in energy efficiency that is 25% higher than similar buildings, the project has been awarded with "Energy Star" prize in 2011 by the Ministry of Energy and the Environment Protection Agency of the United States.

HYY shallow ground source energy



collection technology has been fairly mature and stable, as it can collect shallow ground source energy under any geological condition at a constant cost of RMB 1200 per KW. Meanwhile, the system causes no loss or pollution of underground water and leads to no potential geological disasters, as well as no problems of well collapsing and block of returning well. This technology enables the shallow ground source energy to act as stable and reliable as other traditional natural resources to become the primary substitute energy for building heating.

EPA Honors Hershey Public Schools with Energy Star Award



An awards ceremony is planned for Monday, Jan. 10, 2011 at 6:30 p.m. at the school in room #1.

Hershey, Neb., Jan. 4, 2011 The Environmental Protection Agency (EPA) has awarded its prestigious "Energy Star Award" to Hershey Public Schools in Hershey, Neb. The Energy Star Award recognizes facilities that are among the nation's top 25 percent for energy efficiency. The Energy Star-labeled schools use an average of 35 percent less energy and release 35 percent less carbon dioxide than non-Energy Star schools.

Each year, the EPA and the U.S. Department of Energy (DOE) honor organizations that have made outstanding contributions to protecting the environment through energy efficiency. Using a complex formula, the program assigns ratings of 1-100 for each building. Facilities receiving a rating of 75 or above are considered for the Energy Star Award. The EPA's Energy Star energy performance scale helps organizations assess how efficiently their buildings use energy relative to similar buildings nationwide. A building that scores a 75 or higher on EPA's 1-100 scale is eligible for the Energy Star.

Story continued on page 3

American Mortgage Company and Farmers State Bank on Monday presented an \$8,000 donation to the North Platte Community College Foundation to be used towards building a Health Complex at the college. Pictured from left to right are Terri Burchell, Area Director of Institutional Advancement and Campaign Manager; Marilyn McGahan, NPCC Vice President; Dr. Robert "Bob" Buckland, NPCC Health Complex General Campaign Co-Chair; Dr. Michael Chippe, Mid-Plains Community College President; E. Dean Niedan, American Mortgage Company President; Jean Niedan, AMC Executive Vice President; and Bob Mayber, Farmers State Bank Executive VP Branch Manager/ AMC Business Development Director.

See Story on page 3



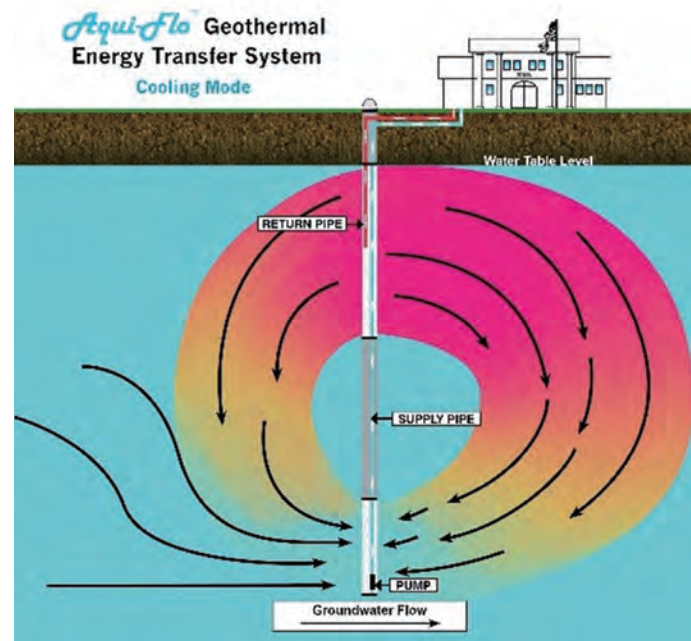
HYY Ground Energy Heat Pump Environment System Installation and HVAC System Skilled Nursing Facility - St. Joseph Villa, David City, Nebraska, USA

Author: Ronald Geary/Katelyn Geary

In 1939, St. Joseph's Villa opened their doors as the first home for the elderly in Southeastern Nebraska. Over the past 75 years, the Villa underwent several renovations and expansions in order to accommodate their increasing number of residents. A renovation in 2014 included a complete replacement of the obsolete heating, ventilation and air-conditioning (HVAC) system. The total system renovation was completed in October of 2014.



As a facility for permanent residents with varying levels of health, the HVAC system required individual temperature control at all times, adjustable heating and cooling for the kitchen and common areas, and a seamless transfer to the new system. The building committee preferred a highly efficient geothermal water-source system which would need a capacity of 96,000 BTUH. Such a system uses the renewable energy of the consistent ground temperature for heat transfer. St. Joseph villa's space limitations within the city limits prevented the use of a traditional closed-loop multiple-bore hole geothermal system.



In 2012, to begin the process of renovating the HVAC system, the St. Joseph's Villa Building Committee selected

Professional Associates and Geary Engineering Inc. to do the engineering design work for a new HVAC system. After a review of the existing system, Geary recommended HYY Ground Energy Heat Pump Environment System, marketed by Behlen Manufacturing, with use of the variable refrigerant flow (VRF) system by Mitsubishi.

HYY Ground Energy Heat Pump Environment System is a unique system that is patented in the United States. The system makes use of HYY Single-Well Heat Exchange Circulation for Ground Source Energy Collection capable of supplying heating and cooling when coupled with a heat pump system. In Single-well Heat Exchange Technology, the system extracts and injects the same water through a single well, minimizing environmental impact, and using a very small amount of real-estate. Despite the cold winters and blazing summers that Southeast Nebraska experiences, HYY Ground Energy Heat Pump Environment System provides steady temperatures the entire year.

Geary's proposal included the scope of work for the HVAC replacement, a preliminary cost estimate, and a basic engineering design. After a review of the proposal, the Building Committee approved a test well to provide the necessary geological data to complete the design of HYY Ground Energy Heat Pump

Environment System.

In May 2012, the specifications for the test well were completed by Geary Engineering and sent out for bid. Two bids for the test well were received and Sargent Drilling was selected to do the work. However, the work was suspended because the David City Planning Commission rejected the permit application over the concern of water pollution.

At the request of the Planning Commission, the Lower Platte South Natural Resources District met with Geary Engineering, St. Joseph Villa, and Behlen Manufacturing in August 2012 to discuss and review the engineering design aspects of HYY Ground Energy Heat Pump Environment System. The Lower Platte South NRD fully supported the concept of the geothermal well and highly recommended the use of a double-wall type heat exchanger to prevent possible contamination between the interior heat pump loop piping the geothermal well piping.

Geary approached the David City Planning Commission with the NRD's letter of approval, instigating a public hearing for consideration of the proposed geothermal well. After much debate and the added design requirement of a locking cover to prevent malicious tampering, the Planning Commission granted approval of the well.



In October 2012, Sargent Drilling performed the test well per the specifications. The test well provided the information required to complete the design of the geothermal well. Additionally, the test well provided sufficient detail of the aquifer to affirm that the well would be capable of providing the heat transfer necessary for the building. The well design included 26" diameter hole, 12" PVC casing, stainless steel screens, a 300 GPM submersible pump, and a double-wall heat exchanger. Geary received the test results in November, which were approved by the Building Committee.

In December 2012, Professional Associates and Geary Engineering commenced the final design work. The new HVAC system consisted of eight

10-ton compressors connected with refrigerant piping to remote evaporators, energy recovery ventilators (ERV's) that provide fresh air to the north half of the building, and a dedicated outdoor air unit that provides fresh air to the south half of the building. The project was bid in March 2013 and construction completed in October 2014. Sargent Drilling was selected as the contractor for the geothermal well. Shanahan Mechanical & Electrical was selected for the construction and installation of the VRF heat pump system in the building.

Mark Kovar - Environmental Services/Maintenance with St. Joseph Villa acted as the general contractor for the project. Mark coordinated the work of Shanahan and Sargent Drilling for the installation of the HVAC systems and other remodeling work being done in the Villa.



As the construction progressed, the need for the seamless transfer to the new HVAC system prevented removal of the outdated boiler until after the heating season. During the summer of 2014, the facility operated on both the old chiller/cooling tower and the new VRF heat pump system. Construction was completed in October 2014, and the Villa fully transferred to the new system.

Nearly a year after the completion of the project, HYY Ground Energy Heat Pump Environment System runs efficiently and effectively with the VRF heat pump system. The system has been easy to maintain and allows the individual residents to have control over the temperature in their room. The Villa benefits from the lower energy bills and the increased satisfaction of residents.

The installation of the new HVAC system has resulted in an overall energy savings of 21% when compared to the previous boiler, chiller and cooling tower system.

Mr. Kovar's enthusiasm for the project and his diligence throughout the construction process made this a successful project. His efforts and accommodating work ethic have been indispensable.

The Villa's renovation has proven the adaptability of HYY Ground Energy Heat

Pump Environment System coupled to VRF heat pump systems. The cost-effective nature and versatility of the system provided an alternative method of implementing environmentally friendly earth coupled geothermal HVAC systems. The project was made possible in part by St. Joseph's Villa of David City, Nebraska, Professional Associates, Geary Engineering, Behlen Manufacturing, Shanahan Mechanical & Electrical, and Sargent Drilling. We thank all parties for their contributions to the successful renovation.



Showcase of HYY Projects(Partial)

Single-well heat exchange circulation for ground source energy collection technology, owned by Ever Source Science & Technology Development Group Limited(here after referred as HYY Group) , was born during Beijing's bidding of 2008 Olympic Games and was tested during construction of Beijing 2008 Olympics and was improved with development of Chinese economy after 2008 Olympic Games. HYY Group has achieved an area of 13 million sqms of heating and cooling application area across the country with region from Beijing to Shanghai, Tianjin, Jiangsu, Tibet, Qinghai, Sichuan, Hebei, Shandong, Shanxi, Shaanxi, Xinjiang, Inner Mongolia, Liaoning and Guizhou to form a heating system with various types of living building, schools, office building, hotels, shopping malls, hospitals, venues, factories, sewage stations and landscape pools.

1.Contributing to Beijing 2008 Olympic Games



**Project Name: National Theatre
(Landscape Pool)**

Project Area:35,000 sqms (Pool Size)



**Project Name: Tennis Center of the
Olympic Park**

Project Area:26,514 sqms



**Project Name: Velodrome Training Center
of Lucheng Sports School**

Project Area:6,449 sqms

2.Administration and Office



Project Name: Public Servant Training Center for Hongkong and Macau of National School of Administration
Project Area: 43,365 sqms



Project Name: Office Building of ACFCI
Project Area:50,000 sqms



Project Name: Yanqi Lake International Exhibition Center
Project Area:79,000 sqms



Project Name: Haidian District Court
Project Area:28,978 sqms



Office buildings in Tibet with a project area of 120,000 sqms

3.Schools Institutions



Project Name: Haidian Foreign Language Experimental School
Project Area:100,000 sqms



Project Name: Shanxi Academy of Agriculture
Project Area:143,105 sqms



Project Name: Haidian District Foreign Language Vocational High School, Beijing
Project Area:8, 308.17 sqms

4.Commercial Production



Project Name: Beijing Nirvana Resort Hotel
Project Area:53,655 sqms



Project Name:Jinsiji Shopping Mall
Project Area:140,000 sqms



Project Name: Xiedao Ecological Resort Village, Chaoyang District, Beijing
Project Area:21, 531 sqms

5. Residential villa



Project Name:Siji Xiangshan Community
Project Area:131,800 sqms



Project Name: Qingqin Villa, Xiang Mountain
Project Area:98,380sqms

6. Regional Development



Engineering Project of China Science and Technology Town Jinjialin Headquarter Economy Experimental Region, under construction

Project Area: 300,000 sqms

Besides providing building heat/cooling service, HYY Group focuses a lot on technology's promotion and industry development and has built industry parks at dozens of regions like Dalian, Liaoning, and Pizhou ,Jiangsu across the country



Xianyu Bay Resort, Dalian, Liaoning (the below picture is a factual view of Jialebi Hot Spring Resort Hotel)

Project Area: 200,492 sqms



7.Walking Abroad



Villa Project at Ulan Bator, Mongolia
Project Area:300 sqms



Hershey School Recognized With Energy Star Award



From left to right: Hershey School Board members Floydene Brown and Bob Arnett, Superintendent Dr. Michael Cuning, and school board members Steve Koch and Roger Stockall met Wednesday evening to receive the prestigious Energy Star Award for their energy-saving improvements at Hershey School. Presenting the award were David Raymond and Larry Cihal of the Trane Company. They explained how the school began Phase I of the project 18 months ago. (Story continued on page 3)

Hershey School in Nebraska, United States, won a prize of Energy Star appraised by US Department of Energy and Environment Program because of its adoption of HYY ground source heat pump environment system

Project Area:6,700 sqms



**Chase County School
Project, United States
Project Area:2,500 sqms**



**City Court and Law
Enforcement Training Center,
Lincoln City, United States
Project Area:2,500 sqms**



**A Geracomium Project, United States
Project Area:3,600 sqms**

为推广地能热冷一体化新兴产业的发展，恒有源科技发展有限公司与四川长虹空调有限公司合资成立了宏源地能热宝技术有限公司。公司以智慧供热市场为导向，专注于地能热冷机各类产品的开发和各种形式的地能热宝系统的产品集成，推广地能无燃烧方式为建筑物智慧供热，满足人们舒适稳定的生活环境需求。



可靠性技术：航空领域先进的数字控制系统，拥有能与战机媲美的可靠性



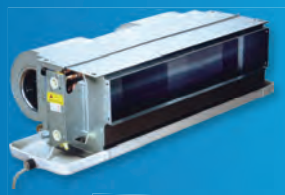
防腐技术：新工艺军工防腐技术 抗氧化腐蚀，经久耐用



军用雷达防电磁干扰技术



1



2



4



3



5



6



7



9

8



1. 地能热（冷）吸顶机
2. 地能热（冷）风管机
3. 地能热（冷）柜机 A
4. 地能热（冷）柜机 B
5. 地能热（冷）卧机

6. 地能热（冷）壁挂机
7. 地能热泵热水器（生活热水）
8. 地能热泵锅炉
9. 地能热泵多联机

**航天飞机燃料箱
真空氮检技术**

**航天飞机防腐防锈
处理技术**



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