



An Energy Efficiency Workshop & Exposition
Palm Springs, California

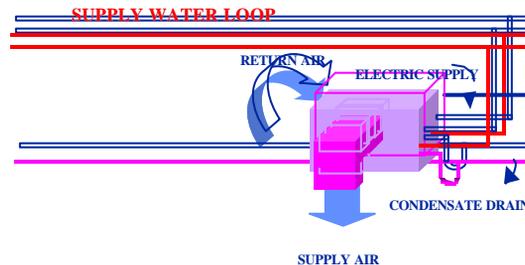
GEOTHERMAL CASE STUDY AT ABERDEEN PROVING GROUND

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What is a GHP?

A Heating & Cooling System that takes advantage of the earth's relatively constant temperature by using the ground as a heat sink for cooling and heat source for heating.

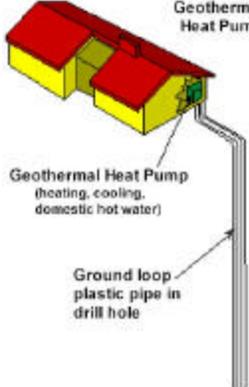


Geothermal Heat Pump

Geothermal Heat Pump
(heating, cooling, domestic hot water)

Ground loop plastic pipe in drill hole



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 **CESource Video** 



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The Problem



- 643 Military Family Housing Units
 - Marginal ATAHP's originally installed
 - High failure rate, end of useful life
- APG needed replacements
- No Funding Budgeted for this need!

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APG Options



- Do Nothing
 - Tenant complaints high, Increasing APG Man-hours, inefficient equipment costly
- Utility Energy Services Agreement
 - Limited to 10 year financing
 - Stipulated savings
- Energy Savings Performance Contract
 - Financing up to 25 years
 - Performance Guarantee, M&V
 - Includes Maint, R&R, Emergency Response

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Solution



- DOE's FEMP Super ESPC
 - National Geothermal Heat Pump Super ESPC
 - GHP equipment and Performance Period Costs paid through energy savings
 - No Capital Required !
 - Established Contract Vehicle
 - DOE, DESC, ORNL supported
 - Existing relationship with CESource

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APG Constraints on GHP - ESPC



- \$0 Buydown
- Financing not to exceed 20 years

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APG - GHP Scope of Work



- Engineer, Design & Construct 643 GHP Systems to replace ATAHP's
 - Install de-super heater to existing HWH's as applicable
- 20 year Full Service Contract
- M&V of GHP Unit Efficiencies over 20 year performance period
- Savings to exceed all costs over 20 years

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Keys to Successful Award



- **Innovation, Diligence and Persistence by DOE, DESC**
- **Good & Trusting Relationship between APG & ESCO**
- **Being VERY Conservative with Savings Estimate**
- **Risk/Cost Mitigation efforts between parties**

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Risk / Cost Mitigation Efforts



- Development of mutually acceptable termination and prepayment language
- Utilization of construction period savings to “buydown” principal
- M&V for performance guarantee of unit efficiencies

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Risk / Cost Mitigation Efforts (con't)



- Title Conveyed to APG after acceptance
- Structured P&I payments to effect a positive cash flow each year
- Additional savings over annual payment to be reserved for unknown conditions during construction

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Construction Findings



- Existing deficiencies with ATAHP's
 - Many units had little to no refrigerant
 - Clogged filters
 - Corroded resistive heating elements
 - Inadequate duct work in some units
- Deficiencies found with HWH's
 - Corroded heating elements
 - Excessive sediment buildup
- Correction of these deficiencies results in additional savings to APG

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APG – GHP Award



- \$5.7M Contract
 - \$0 Buydown
 - 12 Month Construction
- 20 Year Performance Period
 - \$4M over 20 years
 - Includes M&V
 - Maintenance & Repair
 - 24/7 Emergency Response

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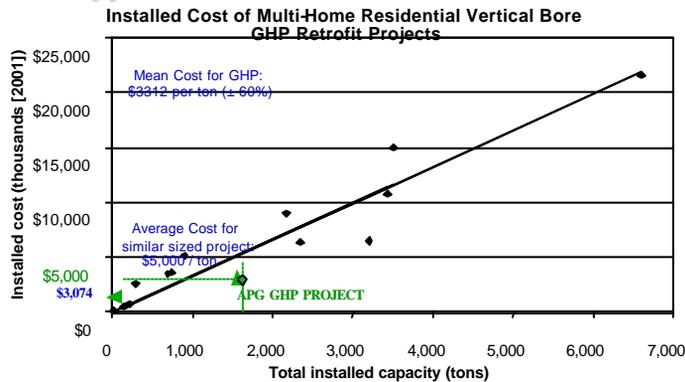


Results



- \$600K Annual Savings
- 8,600,000kWh saved per year
- Reduced Emissions
 - Equivalent to 785,000 gallons of gasoline saved per year, 2500 acres of trees planted per year, or over 1200 vehicles removed from the road
- Assist APG's energy reduction, reduced emissions and renewable energy goals

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NOTE: ASHRAE will be adopting this Database for GHP Projects

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DISCUSSION