



TN Energy Efficient Schools Initiative GSHP Program

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Principal Investigator :
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FASHRAE, LEED®AP

Ground Source Heat Pumps
Demonstration Projects

- **Three Tenn. School Districts in Program**
 - * Hamilton County – Brainerd High School
 - * Hardeman County – Bolivar High School
 - * Lawrence County – Lawrence Public School and South Lawrence Elementary
- **Tenn. EESI Hy-GSHP Grant Program Administration**
 - * Ron Graham, Executive Director EESI
 - * Jay Enck, Program Administrator, CxGBS
 - * Terry E. Townsend, Principal Investigator, Townsend Engineering/TAC-EESI

Types of HY-GSHP Systems

- GSHP Sized for Base Load; CT Sized for Peak Cooling Loads
- GSHP, CTs and Innovative Interior Distribution Loop Piping Concept
- GSHP, CTs, Innovative Interior Distribution Loop Piping Concept and Common Geothermal Loops Serving Multiple Buildings

- **Hamilton County Brainerd High School**
 - * Renovation Project – 400 Tons
 - * Vertical Bore-field, Cooling Tower, Combination of Fan Coil Units and Rooftop Units using Reverse-Return Interior Piping Loop. All pumps to have Variable Frequency Drives. Performance Monitoring thru BAS.
 - * RFP for Consulting Engineering Design Services – Selection Process Underway

- **Hamilton County Brainerd High School**

Total Project Cost = \$4,120,000

DOE Grant Amount = \$1,676,160 (41%)

Estimated Simple Payback = 7.9 Years

Estimated Life Cycle Payback = 5.0 Years

Permanent Jobs Created = 31

- **Hardeman County Bolivar Central High School**
 - * Combination Existing Loop Expansion + Renovation of a 2nd School Wing = 150 Tons
 - * Existing Vertical Bore-field with New Vertical Bore-field + Common Cooling Tower using both Reverse-Return (existing) & Single Pipe (new) Interior Loop Piping, VFD Pumps, and New BAS for Performance Monitoring
 - * Engineering Design Consultant Chosen

- **Hardeman County Bolivar Central High School**

Total Project Cost = \$1,545,000

DOE Grant Amount = \$721,680 (47%)

Estimated Simple Payback = 9.9 Years

Estimated Life Cycle Payback = 6.4 Years

Permanent Jobs Created = 15

- **Lawrence County Lawrence Public School**
 - * Renovation of Gym Facility's and Separate Cafeteria Facility's HVAC and DWH Systems = 65 Tons
 - * Existing Horizontal Bore-field with Cooling Tower, Single Pipe Distribution Loop Serving Rooftops w/ERVs and Water-to-Water HPs and VFD Loop Pump. New BAS for Performance Monitoring
 - * Engineering Design Consultant Chosen

- **Lawrence County Lawrence Public School**

Total Project Cost = \$515,000

DOE Grant Amount = \$197,880 (38%)

Estimated Simple Payback = 11.6 Years

Estimated Life Cycle Payback = 7.7 Years

Permanent Jobs Created = 8

- **Lawrence County South Lawrence Elementary School**
 - * Renovation of Gym and Separate Fieldhouse Facility's HVAC and DWH Systems = 75 Tons
 - * Existing Horizontal Bore-field with Cooling Tower, Reverse-Return Distribution Loop Serving Rooftops w/ERVs, Packaged WSHPs and Water-to-Water HPs and VFD Loop Pump. New BAS for Performance Monitoring
 - * Engineering Design Consultant Chosen

- **Lawrence County South Lawrence Elementary School**

Total Project Cost = \$515,000

DOE Grant Amount = \$197,880 (38%)

Estimated Simple Payback = 12.2 Years

Estimated Life Cycle Payback = 7.7 Years

Permanent Jobs Created = 7

- **Project Management Approach**

Principal Investigator – Coordinates All Grant & Funding Activities Between SDs, Program Administrator, TN EESI and DOE

Program Administrator – Ensures Grant Program Meets Goals/Objectives Within Defined Time-lines and Conducts Cx Activities with Participating SDs During All Project Phases

- **Project Targets/Milestones**

- * **Design Ø** – Lawrence & Hardeman SDs = 6 Wks; Hamilton SD = 8 Wks → **THIS IS THE ONLY PHASE THAT DOE HAS RELEASED FUNDING TO EESI**
- * **Construction Ø** – Lawrence SD = 6 Wks; Hardeman SD = 10 Wks; Hamilton SD = 40 Wks
- * **Acceptance Ø** – Hamilton, Hardeman & Lawrence SDs = 4 Wks

- **Project Targets/Milestones**

- * **Warranty Ø** – Hardeman & Lawrence SDs = 2 Wks; Hamilton SD = 3 Wks
- * **Data Collection** – Hamilton, Hardeman & Lawrence SDs = 2 Yrs
- * **Grant Closeout** – Hamilton, Hardeman & Lawrence SDs = 4 Wks

- **Roles, Responsibilities & Capabilities**
 - * PI & Project Administrator + EESI/TAC
Collective Hy-GSHP Experience > 75 Years
 - * Cx Experience with Hy-GSHP > 25 Years
 - * Performance Measurement & Monitoring
Experience > 60 Years
 - * Performance Database > 20 Years

- **Future Direction by EESI**

- * Based Upon the Hy-GSHP Installation Costs, Annual Performance and Annual O&M Costs, EESI will Promote the Most Cost Effective Hy-GSHP Concept(s) to the 130 SDs in TN Without Geothermal Systems
- * EESI will Provide One-time Grant Monies (per Prescriptive Guidelines) and/or Low Interest Loans to any SD Seeking to Install a Hy-GSHP System if Annual Cost Savings (Energy + O&M) will Repay Loan Amount

- **Future Awards by EESI**

- * EESI will Provide Grant Funding @ \$1,000 per Ton for Hy-GSHP Applications per EESI Prescriptive Measure Guidelines

- (www.tn.gov/eesi/prescriptive)

- * EESI will Provide Low Interest (1 ½% to 2 ½%) Loans (max. term 12 years) to SDs Seeking to Install Hy-GSHPs as a Custom Application (www.tn.gov/eesi/custom) if Total Annual Savings (Energy + O&M) = Annual Loan Payments

- **TN SDs Setting on “GO” for Hy-GSHP Funding by DOE (\$2 Million Req’d)**
 - * Hardeman SD – Middleton High School, 150 Tons (\$1,545,000); Building Renovation & Upgrade To Geothermal Stopped
 - * Lawrence SD – Coffman Elementary, 120 Tons (\$1,235,000); Vertical Bore-field Installed; Construction Stopped
 - * Blount SD – Morrison High School, 215 Tons (\$2,215,000); Vertical Bore-field Installed; Construction Stopped