Success story of Ground Source Heat Pumps – Metro Bhavan, Nagpur

Project Details

This story focuses on the successful implementation of a ground source heat pump application for a Metro station. Metro Bhavan is the head office of MahaMetro (Maharashtra Metro Rail Corporation Limited) located in Nagpur, India. It is an energy efficient building with Rooftop Solar PV and Net Zero Water design.

Further information on the project can be accessed at: https://www.metrorailnagpur.com/green-metro-initiative

Investments / financing

Capital investment: The GSHP system is installed at an additional cost of ₹ 2.2 Cr. (EUR 261,525)

Financing: The GSHP system was not financed as a stand-alone energy efficiency project, rather, was an integral part of the Nagpur metro project. The project was entirely funded by Central and State joint funding.

Key success factors for the project

- **Payback period:** The system has potential to payback for itself in 4.3 years. Apart from the low operational energy use and low maintenance cost, the building will also benefit from a long service period of the GSHP (25 years) against air-cooled chillers (12-13 years). The system is projected to generate over ₹ 11 Cr. in its lifetime (EUR 1.3 million).

- **Energy Efficiency:** The system caters to 175 TR cooling load with power consumption of 0.6 kW/TR against air cooled chiller with 1.6 kW/TR, which means energy efficiency improvement of 62.5% in terms of overall system efficiency.

- **Working Example:** The Metro station acts as a successful example for future infrastructure projects. As awareness about GSHP technology is low, financiers and developers might be uncomfortable exploring designs including this application. A fully operational and savings generating facility that is environmentally sustainable can be used to showcase the benefits of GSHP in greenfield projects.

Social and environmental benefits

The system is designed to yield 46% energy savings over an air-cooled chiller-based system, which equates to 0.5 million units of electricity and 420.6 tCO_2 GHG emissions, annually. This precedence would help commercial real estate projects adapt this technology in the future.

Potential Interventions for growth of the subsector

The following elements would be beneficial in supporting the future growth of the GSHP sector:

Permit Processes: India should explore unifying the drilling permit process across all states. Further, India can develop a streamlined authorization timeline with nodal agencies in each state to facilitate seamless permit approval processes. Often, the lengthy permit processes hinder the progression of GSHP projects and developers seek alternate fuel-based technologies to meet their cooling requirements.

Financial Mechanisms: India needs to initiate and promote government incentives such as subsidies, tax credits, grants and low interest rates for GSHP technology. Presently, government allocation towards this technology is limited. Moreover, government funded projects comprise of a lot of administrative & bureaucratic procedures and receiving timely payment can pose a challenge. These can act as barriers to keen stakeholders.

The involvement of large private banks can motivate various stakeholders to promote the use of GSHP. The involvement of banks would add a sense of security of payment and availability of adequate funding would increase the momentum of the central and state governments towards such projects.

Policy & Regulatory Framework: There is a need for regulatory push to promote the adoption of GSHPs, wherever applicable. For instance, this may start with inclusion of this technology in the public procurement process at state and central level.

Skilling and employment opportunities: India needs to develop skilled and certified resources to design and execute GSHP applications across various requirements. Further it needs to develop and implement certified geothermal drilling focused training programs that are updated yearly based on new sector knowledge. Expected increase in the number of such projects, would offer skilling and employment opportunities to the local population.

Technology Awareness: India needs to initiate awareness programs through stakeholder engagement with government agencies, industry players, research institutes, universities, and NGO's

Key Learnings

Based on the success story of the Metro Bhavan project, a few key learning are listed below:

1. GSHP technology is still at nascent stages in India. The GSHP ecosystem and value chain is limited due to lack of financing, skilled persons and targeted regulatory frameworks.

2. Financing is a key element for the growth of GSHP applications. Installing or retrofitting a GSHP system shows immediate payback, investment is usually re-couped within 3-5 years. If capital subsidy or concessional financing is available, it would greatly help reduce the initial investment costs. This could help cultivate interest and awareness of this technology for commercial purposes and propel growth in this sector.

3. Mandates at a policy level, specific to GSHP, will help penetrate this technology for commercial and industrial uses. Mentioning GSHP as a viable RE source would help the technology be better recognized.