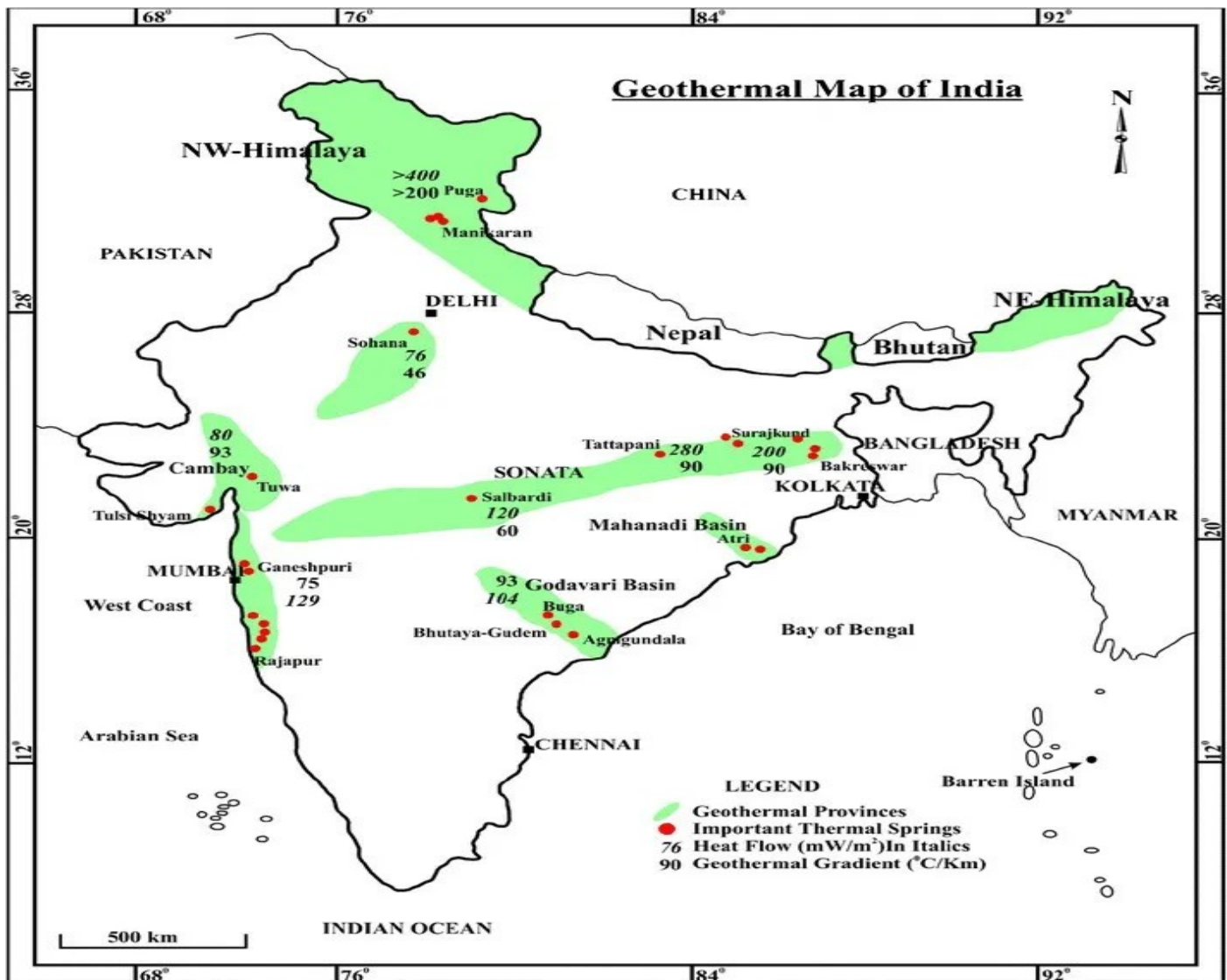


6. Geothermal Project – Geography

EESL to set up India's largest geothermal energy technology pilot project in Andhra Pradesh. Energy Efficiency Services Limited (EESL), a joint venture of four power PSUs, is launching India's largest geothermal energy pilot project in Andhra Pradesh's Araku Valley. Geothermal energy, derived from the Earth's internal heat (often from radioactive decay), is a reliable baseload power source, and India's potential (mostly in medium-low enthalpy zones) is estimated at around 10,600 MW.

India's Largest Geothermal Project



Announcement – Energy Efficiency Services Limited (EESL) has announced plans to establish a new geothermal energy technology pilot project.

Scale – This is set to be India's largest project of its kind.

Location – The project will be established in Araku Valley and Visakhapatnam in Andhra Pradesh.

About Energy Efficiency Services Limited (EESL)

Structure – EESL is a joint venture of four major Public Sector Undertakings (PSUs) under the Union Ministry of Power.

Joint Venture Partners –

1. NTPC Limited
2. Power Finance Corporation (PFC)
3. Rural Electrification Corporation (REC)
4. Power Grid Corporation of India

Mandate – It was established to lead large-scale energy efficiency projects across India.

Role – It functions as a 'Super ESCO' (Energy Service Company).

Other Key Initiatives By EESL

UJALA (Unnat Jyoti by Affordable LEDs for All) - Focuses on the distribution of LED bulbs and appliances.

Smart Metering - Manages the deployment of advanced metering infrastructure.

National Efficient Cooking Programme (NECP) - Promotes the use of induction cookers to reduce cooking costs.

Energy Efficient Fans Programme (EEFP) - Facilitates the nationwide distribution of high-efficiency BLDC (Brushless Direct Current) fans.

About Araku Valley

Location - The valley is located in the Alluri Sitharama Raju (ASR) district of Andhra Pradesh.

Geography - It is situated within the Eastern Ghats Mountain range.

Key Landmark - The Galikonda Hill is located within the Araku Valley.

About Geothermal Energy

Etymology - The name comes from "Geo" (Earth) and "Thermal" (Heat).

Definition - It is the heat that is stored within the Earth's crust.

Origin - The energy comes from the natural heat of the Earth. This heat is primarily generated by the decay of naturally radioactive isotopes of elements like uranium, thorium, and potassium.

Geothermal Gradient - On average, the temperature of the Earth increases with depth. This gradient is approximately 25–30°C per kilometer of depth (measured above the surface ambient temperature).

Heat Transfer - The Earth's internal heat is transferred from the interior towards the surface, mostly by conduction.

Types of Geothermal Resources

Resource Type	Characteristics	Primary Use
High-enthalpy Resources	Often associated with volcanic regions, geysers, and hot springs. (High temperature/pressure).	Electricity generation.
Low to Medium-enthalpy Resources	Found in hot rocks and shallow ground layers. (Lower temperature).	Direct-use applications (like heating buildings) and geothermal heat pumps.

Advantages and Disadvantages

Advantages (Pros)	Disadvantages (Cons)
High Capacity Utilization - Geothermal plants can operate at over 80% capacity, much higher than intermittent renewables.	Capital-Intensive - Requires high up-front investment.
Reliable Baseload Supply - It provides continuous, stable power, unlike solar or wind.	Site-Specific - Can only be built in specific locations with geological potential.
No Recurring Fuel Costs - Once built, the heat source (the Earth) is free.	High Upfront Costs - Exploration, drilling, and infrastructure are very expensive.
Economically Viable (Long Term) - Low operational costs make it viable over the plant's lifespan.	

Global and National Geothermal Potential

Global Geothermal Capacity

Total Capacity - 15.4 GW.

Leading Countries -

1. United States
2. Indonesia
3. The Philippines

4. Turkey
5. New Zealand

Geothermal Potential Sites in India

GSI Exploration - The Geological Survey of India (GSI) began assessments in 1973.

Findings - GSI has identified 381 hot springs across the country.

Temperatures - These springs show surface temperatures ranging from 35°C to 89°C.

Future Technology - This potential can be utilized more effectively with advancements in -

1. Enhanced Geothermal Systems (EGS)
2. Advanced Geothermal Systems (AGS)

India's Enthalpy Zone - India predominantly falls within a medium to low heat enthalpy zone (estimated 100–180°C at depth).

Geographic Spread - This potential is spread across 10 geothermal provinces.

Estimated Potential - The 'Geothermal Atlas of India, 2022' estimated India's total geothermal power potential to be about 10,600 MW.

Source - <https://www.thehindu.com/news/national/andhra-pradesh/eel-to-set-up-indias-largest-geothermal-energy-technology-pilot-project-in-andhra-pradesh/article70243182.ece>

