

South Hungarian Enhanced Geothermal System (EGS) Demonstration Project

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Corporate Information

- Founded in 1963
- Employee-owned by over 100 shareholders
- Management Systems certified: ISO 9001, ISO 14001, OHSAS 18001



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Agenda

- The SHEGSDP
- Project Development So Far...
- Current Status
- Project Execution Approach
- Challenges and Innovation
- EGS and the NER300 Programme for Innovative Renewable Energy Projects

The SHEGSDP

Scope

- Drilling;
- EGS – Reservoir Creation;
- Binary Cycle for power generation;
- (CHP option for cogeneration of heat).

Technical Approach

- EGS in a compressional tectonic setting; variegated crystalline basement rocks;
- Multi-zone stimulation techniques for reservoir creation;
- High temperature drilling down to 4.000 meters;
- Innovative down-hole pump solutions;
- Proven surface technology based on ORC.

Project Development So Far...

- Awarded 39,9 MEUR from the first call of the NER300 funding programme;
- Highest recommendation by The Steering Group of the EU Strategy for the Danube Region;
- Partly upfront funding granted by the EC;
- Legally Binding Instrument between the project company and the Hungarian Ministry for National Development (NFM);
- Mannvit kft. as EPCM consultant;
- Optimisation of project design, concept and approach;
- Execution preparations.

Current Status

Ongoing work within the following project functions:

- Geosciences;
- Engineering;
- Licensing;
- Procurement;
- Risk Management;
- Health, Safety and Environment (HSE);
- Quality Management (QA/QC);
- Knowledge Sharing and Public Relations.

Current Critical Tasks:

- Concession Agreement;
- Geoscientific investigations and final well siting;
- Planning and Procurement of Drilling;
- Planning and Procurement of Reservoir Creation;
- Planning and Procurement of Seismic Monitoring.

Current Status (cont.)

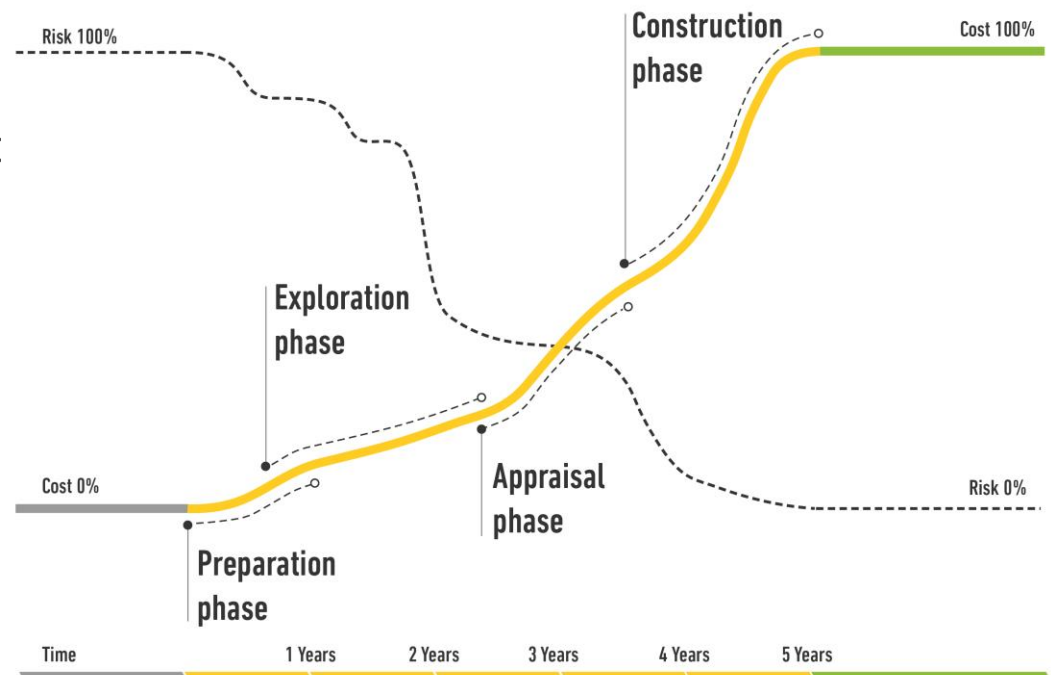
Major Milestones:

- Geothermal Exploration Plan established;
- Concession Application for Battonya currently assessed by the authorities - deadline for concession agreement in November 2014;
- Technical approach for Reservoir Creation soon to be selected and defined.



Project Execution Approach

- Project Execution Plan (PEP) – Foundation of the EPCM approach to deliver the project safely on time and within cost;
- Systematically scheduled Decision Gates to minimize Risk and increase project success;
- Allow for evaluation of the project that may lead to changes;
- Proactive Risk Management;
- Focus on Health, Safety and Environment.



Innovation challenges

Challenges in Reservoir Creation :

- Increase heat exchange capacity of the created reservoir;
- Avoid negative environmental impact;
- Mitigate risk posed by induced earthquakes;
- Keep costs at acceptable level;
- Contribute to development of EGS-technology.

Heat Exchange Capacity

- Most EGS projects have only generated a single main fracture zone;
- The number of such zones need to be increased to improve heat exchange and fluid flow;
- Each zone must be stimulated separately from others;
- Different methods of achieving this are being studied.

Environmental Impact

Keys to protecting the environment include:

- Limiting the use of chemicals for stimulation;
- Prevent such chemicals from polluting surface waters and ground water aquifers;
- Avoid inducing earthquakes that can cause damage at the surface;
- Different methods of achieving this are also being studied.

Induced Seismicity

- EGS reservoir creation is known to induce low-intensity seismicity;
- Technology and protocols exist that reduce the risks of inducing damaging earthquakes;
- A sensitive seismic array monitoring reservoir creation operations in near-real time is key to mitigating the seismic risk;
- The project will make use state-of-the art seismic monitoring technology.

Cost

- The cost of reservoir creation technology has to be kept down to make the project economically viable;
- The cost/risk profile of different reservoir methods is being studied.

Innovation

- The project will contribute to the development of EGS-technology;
- The ability to independently create/stimulate several fracture zones is a key target in this respect;
- The goal is to demonstrate that this can be achieved at a reasonable cost.

NER300 vs. Geothermal/EGS

NER300 Conditions:

- Deadline of “Final Investment Decision” 24 months after decision adoption;
- Disbursement of NER300 funding only based on amount of energy produced (MW_e online);

Conclusions:

- Nature of Geothermal / EGS vs. modularity of Solar, Wind etc.
- Unrealistic timeline for private investment funding a geothermal project;
- Actual implementation of an EGS project depending on Member State’s and Developer’s capability/willingness to accept the technical and geological risk;
- Risk of a EGS projects loosing its funding in mid-execution;
- NER300 not optimally serving its purpose of being a catalyst for innovative, new renewable energy technology development.

Geothermal / EGS

- At least 50% of power behind pipe before private investment - exploration drilling required;
- Majority of Investment needed before any energy is produced.

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