



**steam**

Company presentation

Tuscan Geothermal Countryside



WHO WE ARE



OUR SERVICES



REFERENCES





WHO WE ARE

**STEAM** provides **engineering, environmental and geological consultancy services** in the **Geothermal Energy development** business since 1987

Company and personal track record of our key people extend

**over 35 years of experience** in the geothermal field, so that we can offer:

- **underground/upstream:** geological-geophysical survey studies, reservoir engineering, supervision of drilling activities
- **above-ground/downstream:** power plant design, owner's engineering, geothermal fluid management, well and power plant testing
- **consultancy:** Feasibility/ESIA, operational support, training and capacity building

**Our customers and business partners include:**

- governmental and multilateral institutions (World Bank, IDB, EBRD, MISE)
- geothermal investors (Enel, KenGen, many private developers)
- consulting and engineering firms (DAL, GI, Saipem)
- technology providers (Toshiba, Ormat, Exergy, Turboden)



# steam

## IN THE LAST 8 YEARS

20+

NATIONS

20+

FEASIBILITY STUDIES

30+

RESOURCE ASSESSMENTS

40+

WELLS COMMISSIONED

10+

DRILLING  
SUPERVISIONS

80+

KMs OF GATHERING  
SYSTEMS ENGINEERED

220+

PLANT MWs SUPERVISED

375+

PLANT MWs ENGINEERED

STEAM's presence in international geothermal markets is increasingly that of a global player.







OUR SERVICES

# WIDEST GEOTHERMAL SUPPORT

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RESOURCE  
ASSESSMENT



DRILLING  
SUPERVISION



FEASIBILITY  
STUDY



ENGINEERING AND  
CONSTRUCTION



OPERATION & MAINTENANCE  
STRATEGIES



CAPACITY  
BUILDING



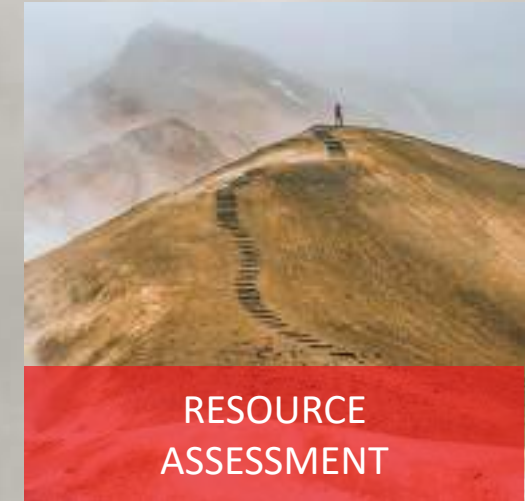
**STEAM** is able to support international organizations, geothermal project developers, investors, consulting firms, services suppliers and technology provider in all the phases of a geothermal project development, by:

- **RESOURCE ASSESSMENT**  
**Identifying** the existence of commercially exploitable **geothermal reservoirs**
- **DRILLING SUPERVISION**  
**Mitigating the risks** during most expensive exploratory and development phase
- **FEASIBILITY STUDIES**  
Identifying the **best development and exploitation strategies**
- **ENGINEERING AND CONSTRUCTION**  
**Maximizing performances** of environmentally friendly generation
- **OPERATION AND MAINTENANCE STRATEGIES**  
**Smooth, prolonged and optimized** resource management and plant operation
- **CAPACITY BUILDING**  
**Sharing geothermal knowledge** with most qualified Experts



## ACTIVITIES:

- Collection and analysis of available geological, hydrogeological, geochemical and structural studies, geophysical surveys, and stratigraphic and thermal data from wells
- Gap analysis – identification of which data are missing
- Acquisition of National basic background information (institutional and regulatory frameworks, environmental and social issues, ecc)
- Surveys:
  - Geological
  - Geochemical
  - Geophysical
- Geological – Geothermal and structural mapping
- Integrated analysis of the geological, geochemical and geophysical data and other available data



## ACTIVITIES:

- Issuing of technical specifications for Drilling;
- Assistance during Tendering and Procurement Plan;
- Drilling methodology and well design (mud and cementation program, safety measures);
- Well siting and pad preparation;
- Full time on site supervision of drilling procedures, safety protocols, data collection;
- Definition of proposed well logging and testing methods;
- Assessment of drilling based upon the chemical and physical characteristics of the produced fluid;
- Interpretation, review and reporting of results





## ACTIVITIES:

- Conceptual model update and preparation of a Numerical model
- Definition of the exploitation strategy (with a preliminary field development and drilling program)
- Plant technology choice
- Business Plan with CAPEX and OPEX assessment
- Identification of the main environmental and social impacts both during project implementation works and project operations
- Elaborate mitigation measures for negative effects and conditions for their implementation and monitoring



## ACTIVITIES:

- Conceptual model update and preparation of a Numerical model
- Environmental and Social Impact Assessment (ESIA);
- Heat and Mass Balances;
- Conceptual, Basic and Detailed Design :
  - Gathering system
  - Power plant
  - Infrastructures and accessories (roads, bridges, electric line, etc...)
- Owner's Engineering and Project Management;
- Issuing of Technical Specifications for Plant EPC, PC, EPCM or for Equipment and Components Supply;
- Assistance during Tendering and Procurement Plan;
- Assistance, Supervising and/or Management during Execution and Construction;
- Technical Support during the Project Test and Commissioning



ENGINEERING  
AND CONSTRUCTION



## ACTIVITIES:

- Audit and Due Diligence on existing Plants;
- Ongoing CAPEX and OPEX evaluation;
- OPEX mitigation strategies;
- Strategy for Remote Control & Operation;
- Issuing of Technical Specifications for Operation and Maintenance Services;
- Automation & Control, Remote Diagnostics;
- Geothermal Reservoir Management and Reinjection Strategies to “cultivate” the geothermal resource in a sustainable way;
- Naturalistic Engineering, restoration and management

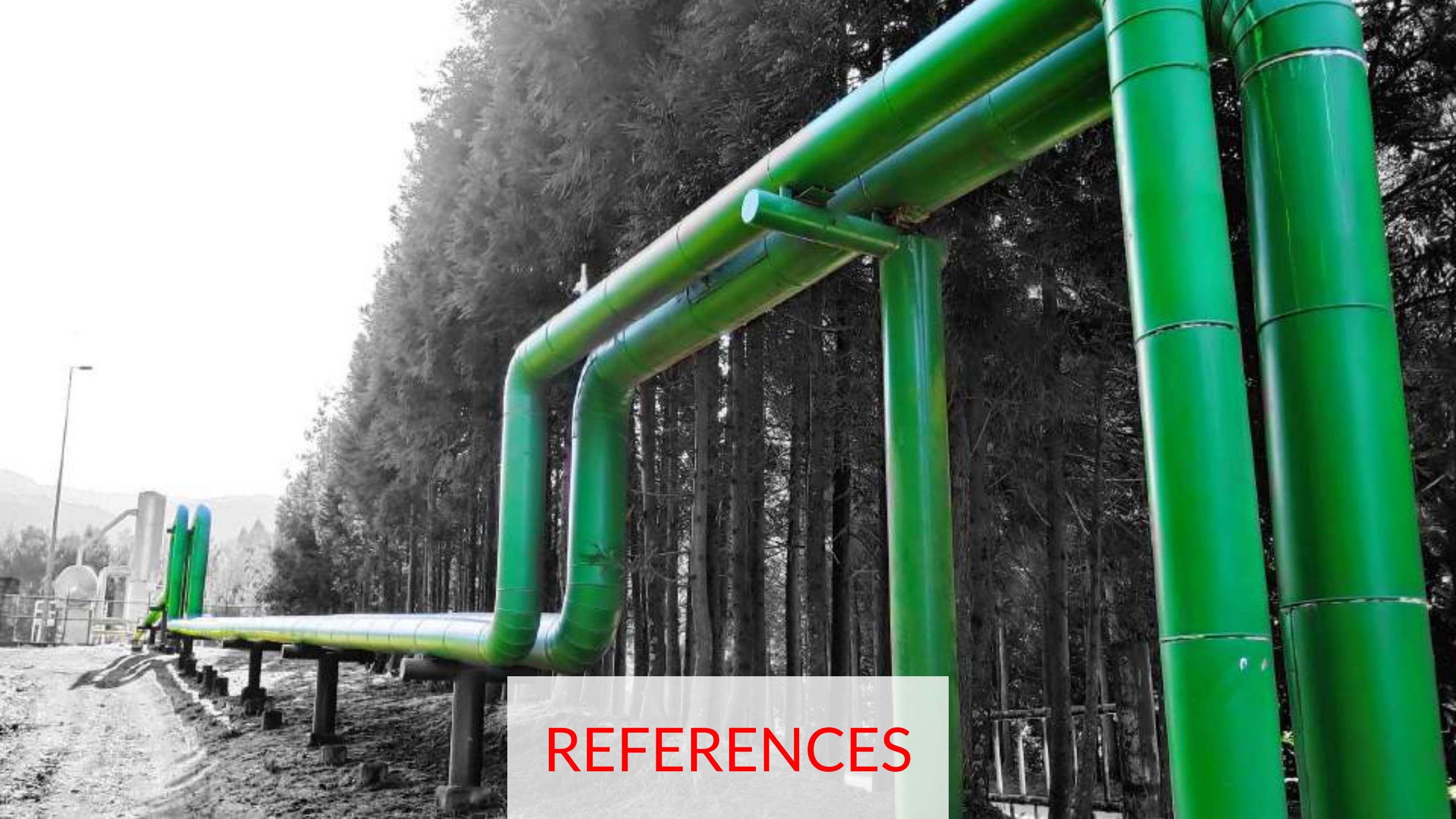


## ACTIVITIES:

- Tailor-made training courses:
  - 360° courses covering all geothermal disciplines and aspects (geology, reservoir, drilling, process, chemical, civil, mechanical, electrical, environmental);
  - for institutional and companies professionals and newly-grad, in multiple languages (English, Spanish);
  - lead by STEAM expert, professors of University, scientist of National Institutes;
  - in multiple locations: On-Job – during project execution, On-Field – visiting operating plants, In-Lab – visiting geothermal laboratories, In-Factory – visiting turbine manufacturers;
  - “On-demand” or “Master” courses;







REFERENCES



Project name	Scope	Location	Size [MW]	Year
<b>Heat pump Massification</b>	Pre-feasibility studies to enable massification of low enthalpy geothermal energy technology (heat pumps) in Chile	Chile	-	2021 - 2022
<a href="#"><u>San Jacinto</u></a>	Owner's Engineering	Nicaragua	12	2021 - ongoing
<b>Olkaria I – Unit 6 and Menengai</b>	Commissioning Management of the geothermal wells and of the Steam and Brine Gathering and Reinjection System	Kenya	83+105	2021 - ongoing
<a href="#"><u>Olkaria V</u></a>	Project Management and Owner's Engineering	Kenya	160	2015 - 2020
<a href="#"><u>Olkaria I - U1,2&amp;3</u></a>	Project Management and Owner's Engineering	Kenya	45	2015 - ongoing
<a href="#"><u>Saragiolo</u></a>	Basic design for detail budgeting of the binary power plant project	Italy	5 net	2020
<a href="#"><u>Volcan Cosiguina</u></a>	Environmental Impact Assessment for geothermal development	Nicaragua	TBD	2020 - 2021
<a href="#"><u>Tete and Metangula</u></a>	Mapping Northern Mozambique's Geothermal Potential	Mozambique	TBD	2020 - ongoing
<a href="#"><u>Alasehir</u></a>	Pre-acquisition technical due diligence & Technical support in the project development	Turkey	10	2019 - ongoing
<a href="#"><u>Wotten Waven</u></a>	Review of the masterplan for the binary project development	Dominica	10	2020
<a href="#"><u>Darajat, Salak, Wayang Windu</u></a>	Geochemical consulting for the exploitation of the geothermal fields, interpretation and revision of the hydrogeological data	Indonesia	TBD	2018 - ongoing
<a href="#"><u>Rantau Dedap</u></a>	Geochemical consulting for the exploitation of the geothermal field, processing and interpretation of the geochemical data	Indonesia	TBD	2018 - ongoing
<a href="#"><u>San Jacinto</u></a>	Review of the binary project development	Nicaragua	10	2020
<a href="#"><u>Kuyucak</u></a>	Pre-acquisition Preliminary Due Diligence of the Development Program	Turkey	120	2017
<a href="#"><u>Kuyucak</u></a>	Basic and Detailed Design and Technical Specification for the Steam and Brine Gathering and Reinjection System	Turkey	18	2016-2017
<a href="#"><u>Pico Alto</u></a>	Basic and Detailed Design and Technical Specification for the Steam and Brine Gathering and Reinjection System	Azores, Portugal	4	2015-2016
<a href="#"><u>Sabalan</u></a>	Basic and Detail Engineering Plant Design	Iran	5	2015-2016
<a href="#"><u>"Zero emission" geothermal plants</u></a>	Feasibility Study, Environmental Impact Assessment, Definitive Project, Concept and detailed design of: drilling phase, steam gathering system and plant	Italy	30	2011 – ongoing



# SAN JACINTO

## ENGINEERING AND CONSTRUCTION

### DESIGN AND IMPLEMENTATION OF AN ORC BOTTOMING PLANT

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**CUSTOMER:** Polaris Energy

**YEAR:** 2021-ongoing

**COUNTRY:** Nicaragua

**SIZE:** 12 MW

**TECHNOLOGY:** Binary bottoming ORC

**ACTIVITIES:**

- Plant Concept design
- Technical specifications for ORC
- Procurement management
- Design review
- Technical support to Project test and Commissioning

# OLKARIA V

## ENGINEERING AND CONSTRUCTION

### DESIGN AND IMPLEMENTATION OF A 160 MW PLANT



**CUSTOMER:** KenGen

**YEAR:** 2015-2021

**COUNTRY:** Kenya

**SIZE:** 160 MW

**TECHNOLOGY:** Steam turbine

**ACTIVITIES:**

- Plant Concept design
- Steam-field Detailed design
- Technical specifications for Plant EPC and for Equipment and components
- Procurement management
- Design review
- Technical support to Project test and Commissioning
- Construction Management of Power Plant, HV substation and Transmission line



# OLKARIA I

## ENGINEERING AND CONSTRUCTION REHABILITATION OF A +35 YEARS OLD PLANT

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**CUSTOMER:** KenGen

**YEAR:** 2015-ongoing

**COUNTRY:** Kenya

**SIZE:** 45 MW

**TECHNOLOGY:** Steam turbine

**ACTIVITIES:**

- Review Plant Concept design
- Review and Detailed design of Steam-field, MW Power Plant and HV rehabilitation
- Technical specifications for the rehabilitation
- Procurement management
- Design review
- Technical support to Project test and Commissioning
- Construction Management of Power Plant, HV substation and Transmission line



# SARAGIOLO POGGIO MONTONE

ENGINEERING AND CONSTRUCTION

BASIC DESIGN AND DETAIL BUDGETING



**CUSTOMER:** Sorgenia

**YEAR:** 2020

**COUNTRY:** Italy

**SIZE:** 8 MW

**TECHNOLOGY:** Binary ORC

**ACTIVITIES:**

- Basic design (PFD, P&IDs, DS, lists, specifications)
- Technical specifications and data sheets for procurement of the main components
- RFQ and alignment of the proposals for the main components
- Detail CAPEX budget of the full project
- CAPEX, OPEX and risk assessment



# VOLCAN COSIGUINA

## RESOURCE ASSESSMENT AND FEASIBILITY STUDY

## ENVIRONMENTAL IMPACT ASSESSMENT FOR GEOTHERMAL DEVELOPMENT



**CUSTOMER:** IDB/BID (InterAmerican Development Bank)

**YEAR:** 2020-ongoing

**COUNTRY:** Nicaragua

**SIZE:** TBD

**TECHNOLOGY:** TBD

**ACTIVITIES:**

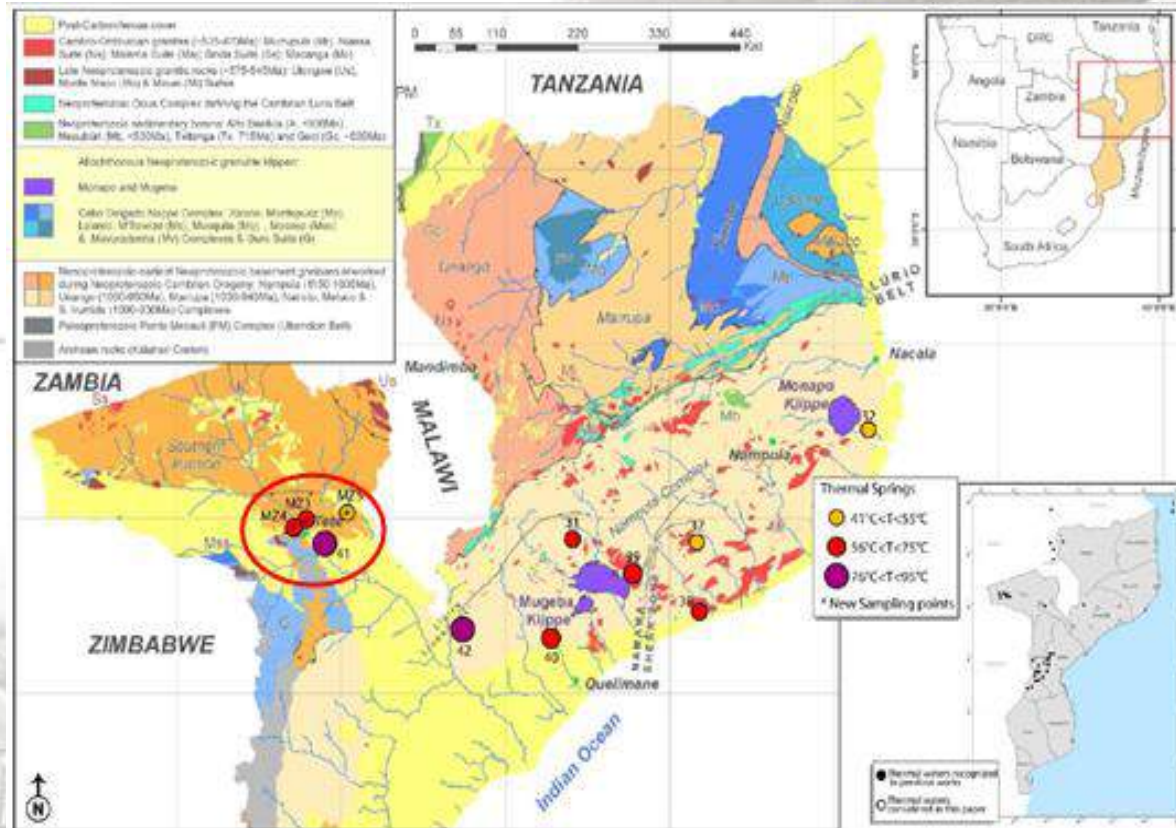
- Review of the existing studies for the geothermal development
- Elaboration of the environmental impact assessment
- Public consultation



# NORTHERN MOZAMBIQUE

## RESOURCE ASSESSMENT

### LOCATING, MAPPING AND ESTIMATING THE GEOTHERMAL POTENTIAL



**CUSTOMER:** DANIDA (Danish International Development Agency)

**YEAR:** 2020-ongoing

**COUNTRY:** Mozambique

**SIZE:** TBD

**TECHNOLOGY:** TBD

**ACTIVITIES:**

- Collection and analysis of available geological, hydrogeological, geochemical and structural studies
- Gap analysis
- Field studies to locate springs and to collect geological and geochemical data for analysis

Procesi et al. 2015 - Mozambique and the feasible development of the geothermics. A first geochemical survey.



# ALASEHIR

## RESOURCE ASSESSMENT, FEASIBILITY STUDY AND ENGINEERING GEOTHERMAL INNOVATIVE PLANTS IN TURKEY

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**CUSTOMER:** OME

**YEAR:** 2019-ongoing

**COUNTRY:** Turkey

**SIZE:** 10 MW

**TECHNOLOGY:** Binary ORC

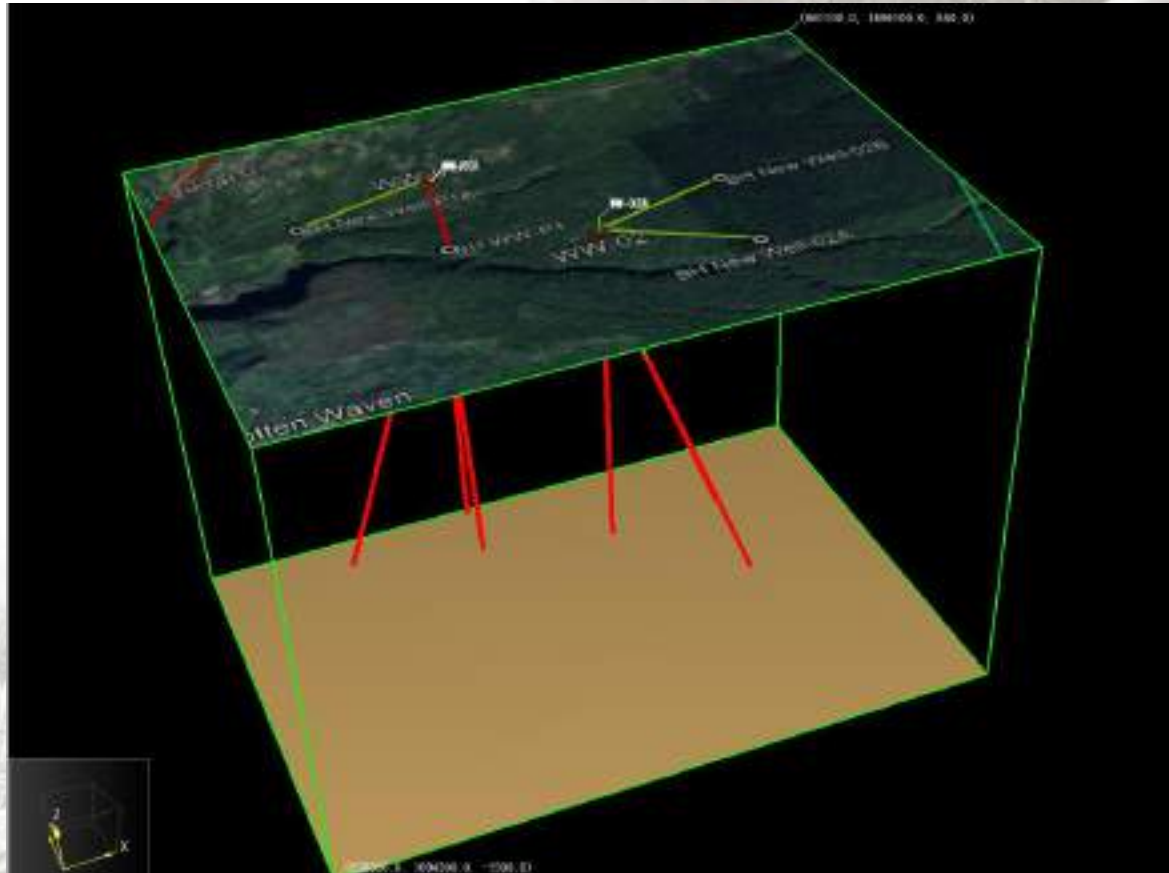
**ACTIVITIES:**

- Pre-acquisition technical due diligence
- Resource assessment
- Well design, Drilling supervision, Well testing
- Feasibility Study
- Design of Gathering System and ORC Power Plant

# WOTTEN WAVEN

## RESOURCE ASSESSMENT AND FEASIBILITY STUDY

### REVIEW OF THE MASTERPLAN FOR THE PROJECT DEVELOPMENT



**CUSTOMER:** Dominica Geothermal Development  
Company

**YEAR:** 2020

**COUNTRY:** Dominica

**SIZE:** 2x 3.5 MW

**TECHNOLOGY:** Binary ORC

**ACTIVITIES:**

- Review of the masterplan for the development and construction of the geothermal power plant
- Development of concepts to improve the feasibility of the project



# STAR ENERGY

RESOURCE ASSESSMENT, FEASIBILITY STUDY AND ENGINEERING  
HYDROGEOLOGY AND GEOCHEMICAL CONSULTANCY



**CUSTOMER:** Star Energy (Termochem)

**YEAR:** 2018-ongoing

**COUNTRY:** Indonesia

**ACTIVITIES:**

- Geochemical consulting for the exploitation of the geothermal fields of Darajat, Salak-Awibengkok, and Wayang Windu as well as for the exploration of other geothermal prospects of Indonesia
- Interpretation and revision of hydrogeological data
- Studies on geothermal fluids characterization
- Geothermal fluid exploitation study, scaling prevention and chemical dosing
- Owner's personnel mentoring



# SUPREME ENERGY

RESOURCE ASSESSMENT, FEASIBILITY STUDY AND ENGINEERING  
GEOCHEMICAL CONSULTING FOR THE EXPLOITATION OF THE  
GEOTHERMAL FIELD OF RANTAU DEDAP



**CUSTOMER:** Supreme Energy (Dyfco)

**YEAR:** 2018-ongoing

**COUNTRY:** Indonesia

**ACTIVITIES:**

- Processing and interpretation of the geochemical data acquired by Supreme Energy in the geothermal prospect of Rantau Dedap, Indonesia through surface exploration and deep geothermal drilling activities.
- Integration the results obtained for the thermal manifestations and the exploration/development wells to provide a geochemical contribution for the elaboration of the conceptual geochemical model(s)
- Review of the development drilling plan
- Risk analysis on the fluid chemistry on surface facilities and advice on technology selection for the production stage.



# SAN JACINTO

## RESOURCE ASSESSMENT, FEASIBILITY STUDY AND ENGINEERING REVIEW OF THE BINARY PROJECT DEVELOPMENT



**CUSTOMER:** Polaris Energy Nicaragua

**YEAR:** 2020

**COUNTRY:** Nicaragua

**SIZE:** 12 MW

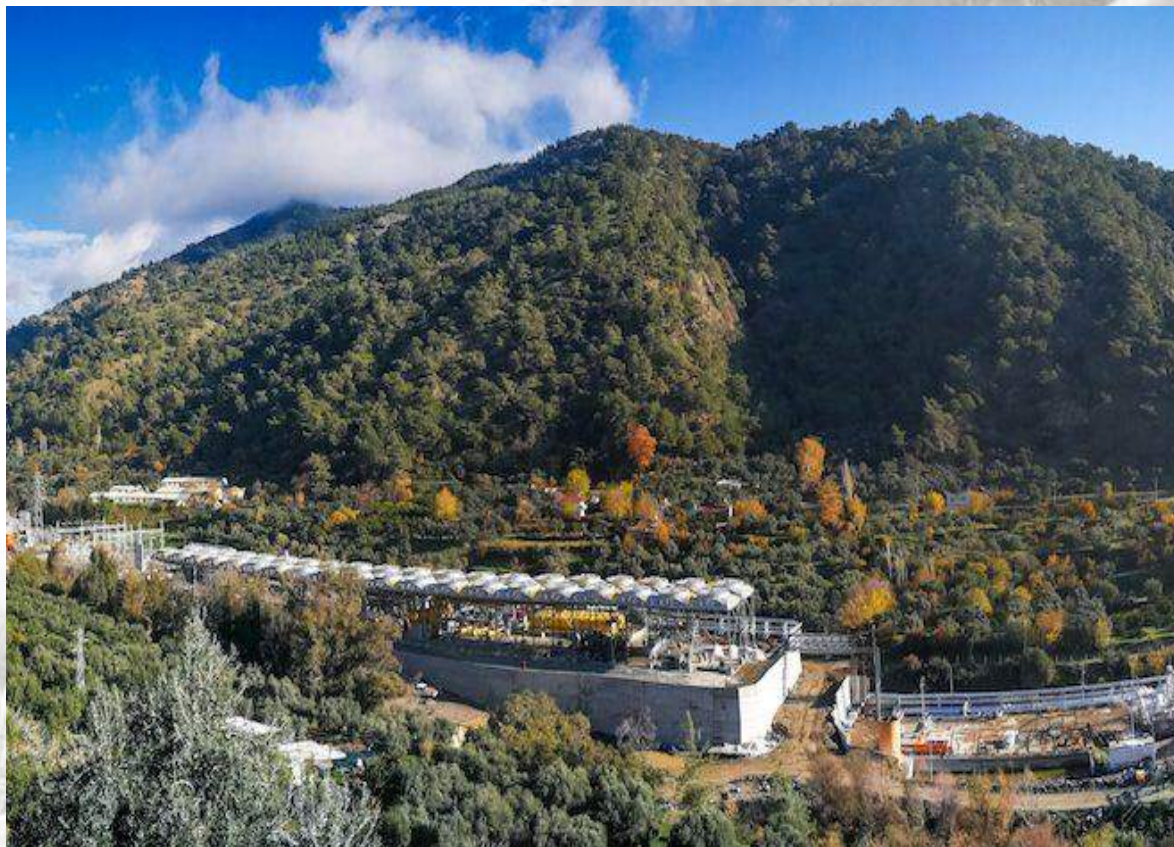
**TECHNOLOGY:** Binary bottoming ORC

**ACTIVITIES:**

- Review of the plan for the development and construction of the binary power plant
- Geothermal fluid study and analysis of the optimum condition of exploitation, taking into account scaling issues and reservoir conditions







**CUSTOMER:** Exergy / Turcas

**YEAR:** 2016-2017

**COUNTRY:** Turkey

**SIZE:** 18 MW

**TECHNOLOGY:** Binary ORC

**ACTIVITIES:**

- Design of Steam and Brine Gathering and Reinjection System



# PICO ALTO

## ENGINEERING AND CONSTRUCTION

### GATHERING DESIGN IN ISLAND / REMOTE CONDITIONS

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**CUSTOMER:** Exergy / EDA Renovaveis

**YEAR:** 2014-2017

**COUNTRY:** Azores Islands, Portugal

**SIZE:** 4 MW

**TECHNOLOGY:** Binary ORC

**ACTIVITIES:**

- Design of Steam and Brine Gathering and Reinjection System
- Consultancy on operation philosophy of the batch-pressurized wells



# SABALAN

## ENGINEERING AND CONSTRUCTION FIRST IRANIAN GEOTHERMAL PLANT



**CUSTOMER:** Petro Tech Sun

**YEAR:** 2014-On going

**COUNTRY:** Iran

**SIZE:** 5 MW

**TECHNOLOGY:** Steam turbine

**ACTIVITIES:**

- Plant Conceptual design
- Detailed engineering review
- Project Management

# MONTENERO

RESOURCE ASSESSMENT, FEASIBILITY STUDY AND ENGINEERING  
GEOTHERMAL INNOVATIVE PLANTS IN ITALY



**CUSTOMER:** Gesto Italia

**YEAR:** 2011-2014

**COUNTRY:** Italy

**SIZE:** 5 MW

**TECHNOLOGY:** Binary ORC

**ACTIVITIES:**

- Resource assessment
- Feasibility Study
- EIS for the Authorization Procedure
- Concept and Detailed Design of Drilling Phase, Steam Gathering System and ORC Power Plant



# LATERA and MARTA

RESOURCE ASSESSMENT, FEASIBILITY STUDY AND ENGINEERING  
GEOTHERMAL INNOVATIVE PLANTS IN ITALY



**CUSTOMER:** ITW-LKW

**YEAR:** 2011-2013

**COUNTRY:** Italy

**SIZE:** 5 MW

**TECHNOLOGY:** Binary ORC

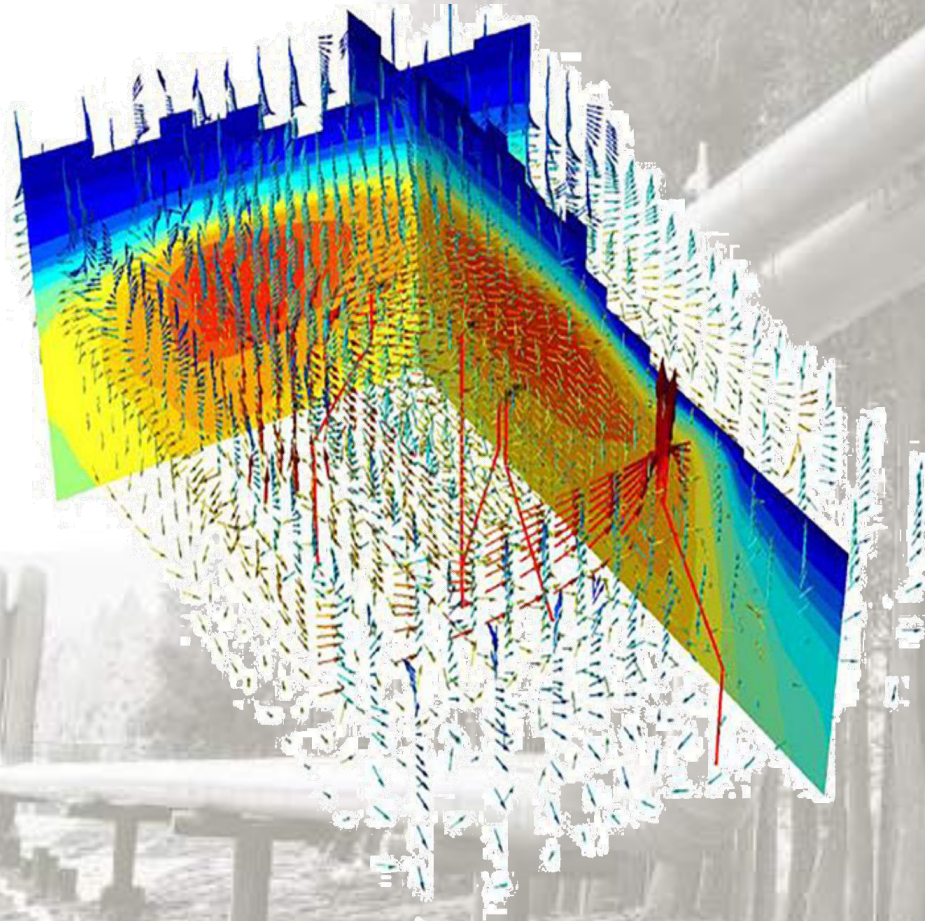
**ACTIVITIES:**

- Resource assessment
- Feasibility Study
- EIS for the Authorization Procedure
- Concept and Detailed Design of Drilling Phase, Steam Gathering System and ORC Power Plant



# CASTEL GIORGIO – TORRE ALFINA

RESOURCE ASSESSMENT, FEASIBILITY STUDY AND ENGINEERING  
GEOTHERMAL INNOVATIVE PLANTS IN ITALY



**CUSTOMER:** ITW-LKW

**YEAR:** 2011-2013

**COUNTRY:** Italy

**SIZE:** 5 MW

**TECHNOLOGY:** Binary ORC

**ACTIVITIES:**

- Resource assessment
- Feasibility Study
- EIS for the Authorization Procedure
- Concept and Detailed Design of Drilling Phase, Steam Gathering System and ORC Power Plant





# steam

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