Scaling high-enthalpy geothermal: GEMex - 40 MWe plants in Mexico Geothermal Village – 250 kWe plants in East Africa

Walter Wheeler and Eivind Bastesen

GEMex: Europe-Mexico collaboration for developing Enhanced Geothermal Systems and Superhot Geothermal Systems

Fractured Reservoir Characterization: Walter Wheeler, Eivind Bastesen, Anita Torabi

Photogrammetry, LIME & Hyperspectral scanning: Benjamin Dolva, Kari Ringdal, Simon Buckley and Tobias Kurz

EM inversion with constraints: Trond Mannseth and Sven Tveit

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 727550

www.gemex-h2020.eu

Project overview

Mexico

World's 4th largest Geothermal producer

Funding:

€ 10 M EU funding (H 2020)

€ 10 M Mexican funding (CONACYT)

Mexico
UMSNH (U. Michoacan)
UNAM (Autonomous Univ. Mexico),
5 Institutes /Campuses
CICESE (Ensenada Tech.)
IIE – (Electrical Research)
GEOMINCO SA (exploration)
CFE (Commission Federal de Electricite)

Germany
GFZ Potsdam,
KIT, UFZ,
RWTH Aachen,
TU Darmstadt,
H Bochum,
IGA Service
Italy CNR, UniTo, UniBari,
OGS, UniRoma3,
ENEA, SSSA
Netherlands TNO, Utrecht
Belgium: EGEC
Island: Isór
Poland: PIG-PIB
Greece: CRES
France: brgm
UK: NERC (BGS)
Norway: Uni Research,
IFE

Objectives:

R&D for increased production at Los Humeros superhot field (in production)

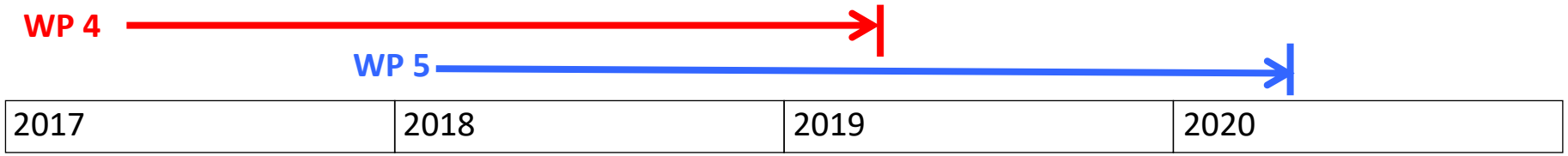
R&D for production plan for Acoculco hot-dry-rock field (no production yet)

NORCE / CIPR involvement:

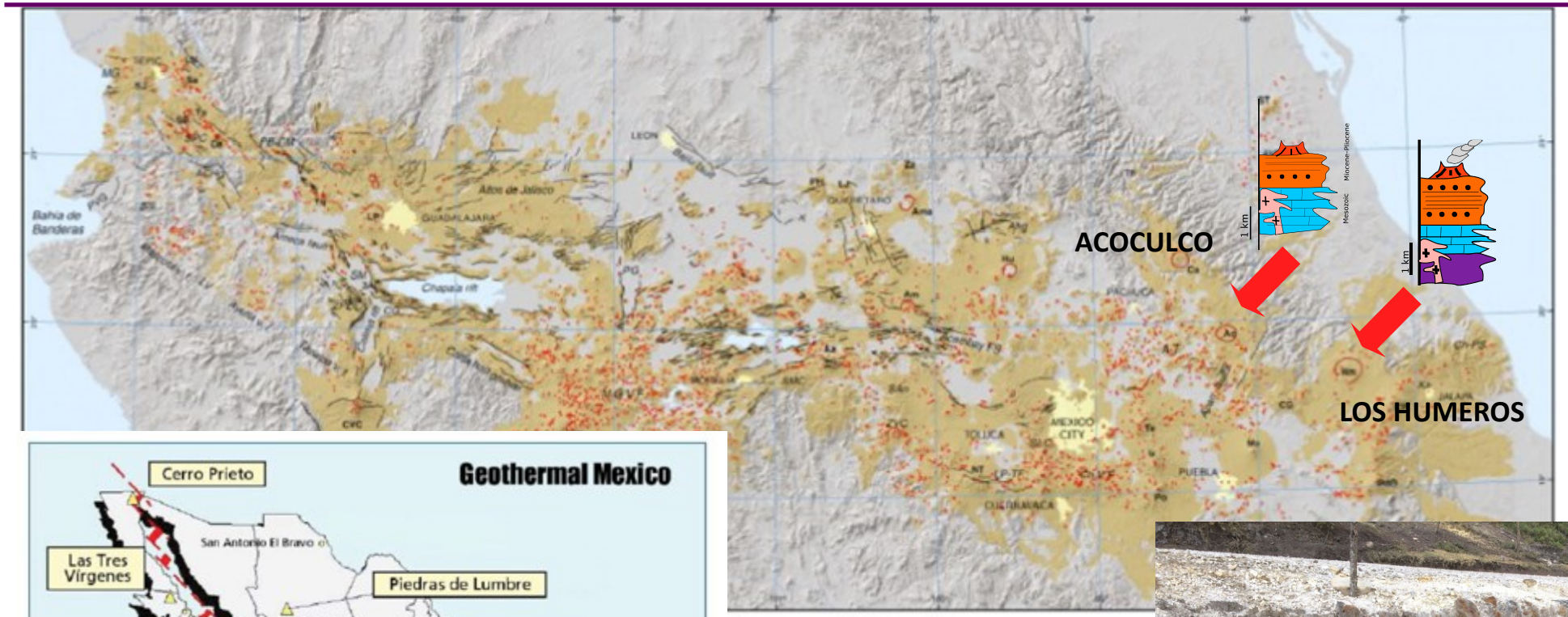
EUR 450 000

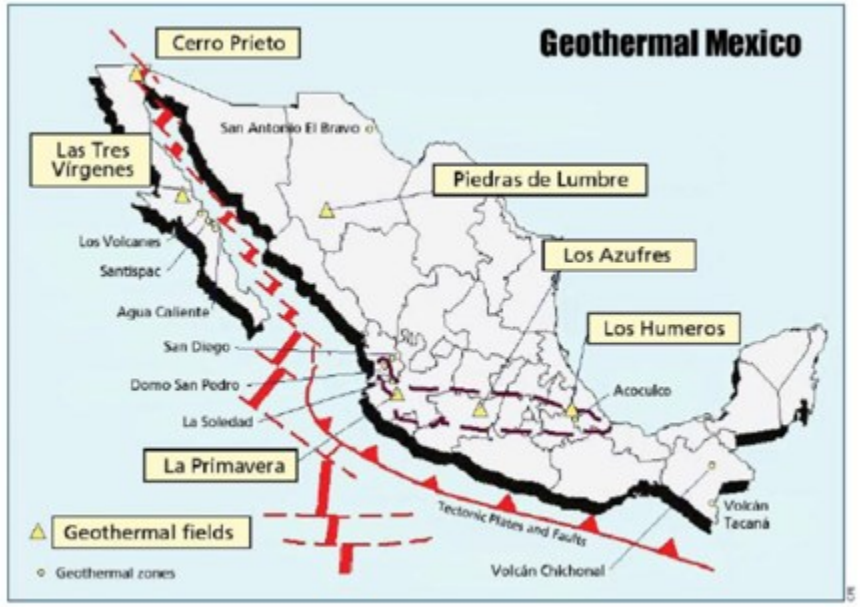
WP 4 Reservoir analog / fracture characterization / VOG

WP 5 Inversion of geophysical data (EM, ensemble methods)



Project overview





GEMex project - CGER GeoEnergy 2017
Wheeler et al.

LEAP-RE KICK-OFF MEETING

23-24 MARCH 2021

Quick presentation of the 4 sites

Jacques Varet

Géo2D

LEAP-RE

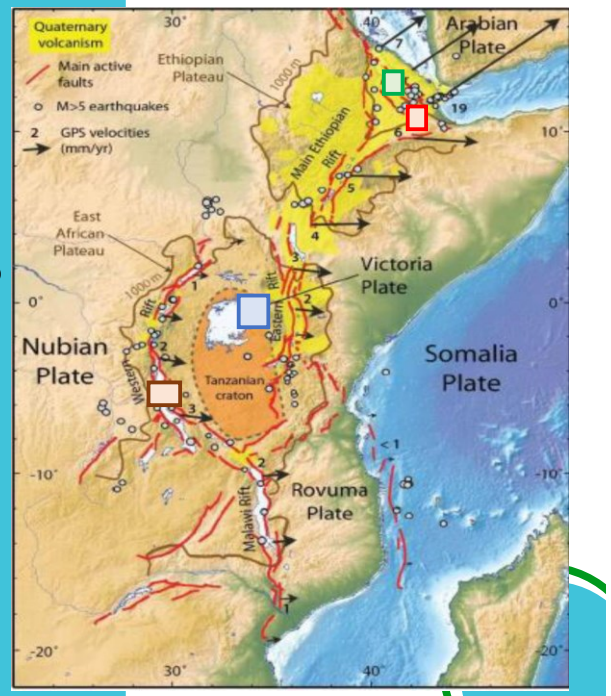
Long-Term Joint EU-AU Research and Innovation Partnership on Renewable Energy

The LEAP-RE project has received funding from the European Union's Horizon 2020 Research and Innovation Program under Grant Agreement 963530.

The 4 sites proposed for GV1:

1. Djibouti : Abhé
2. Ethiopia : Tat'Ali or Era Boru **AGAP**
3. Kenya : Homa Hills **HHCBO**
4. Rwanda : Bugrarama **EDCL**

They display a variety of situations in terms of resources social demand and applications, representative for the EARS



1. Djibouti : Abhé site

Left : Travertine chimneys fed by geothermal fluids (steam at top, spring at bottom) along regional faults (sub-E-W). Middle: hotspring at the bottom of a travertine chimney. Right : local herdsmen family living along Abhé lake shore (photos J.Varet)

2. Ethiopia: TatAli or EraBoru

AGAP

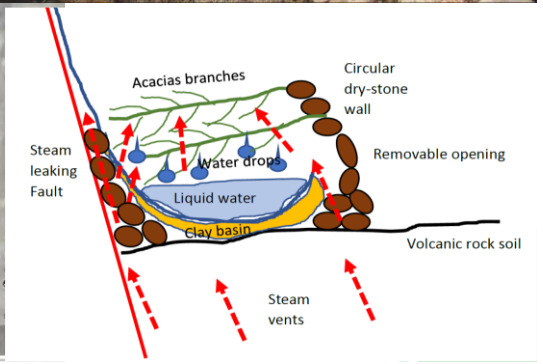
LEAP-RE

In the two rather arid areas, there is no liquid water available at the surface (except NaCl saturated at Lake Afdera and the solution implemented for milleniums by the Afar communities is to capture the steam from natural vents with artisanally engineered devices allowing water condensation answering numans and hereds needs (photos J.Varet)

2. Ethiopia: TatAli or EraBoru

AGAP

LEAP-RE



Hot Spring	Place Name	Location			Temp. (˚C)	Sample No	Gas Geothermometers (˚C)		
		Eastings	Northings	Alt. (m)			TH2S	TH2	TH2S-CO2
HS-1	Abundu	668166	9960431	1140	88	348-I	223	-	205
						348-II	184	-	157
HS-2	Kakdhimu	669675	9951270	1180	72	349-I	194	-	169
						349-II	197	-	174
HS-3	Kokoth	671171	9962598	1140	43	350-1	197	204	174
						350-II	201	209	179
HS-4	Rakombe	667537	9960475	1197	78	351	190	235	163

TH2S	Arnorsson and Gunnlaugsson (1985)
TH2	Arnorsson et al (1998b)
TH2S-CO2	Nehring and D'Amore (1984)

2. Ethiopia: TatAli or EraBoru

AGAP

LEAP-RE

NORCE

Site visit with Ismail Ali Gardo (President APDA and AGAP) & Vote of the status and of community representatives for the Afar Geothermal Alternative Power Company (AGAP) at Ab'Ala (Afar regional state, Ethiopia). *Photos J.Varet (2014)*