

**GEAA**

advocating development of geothermal energy sources through  
increased investment and awareness

**Chris Sladen**

**Energy Day: Future Minds**

British Chamber of Commerce Mexico

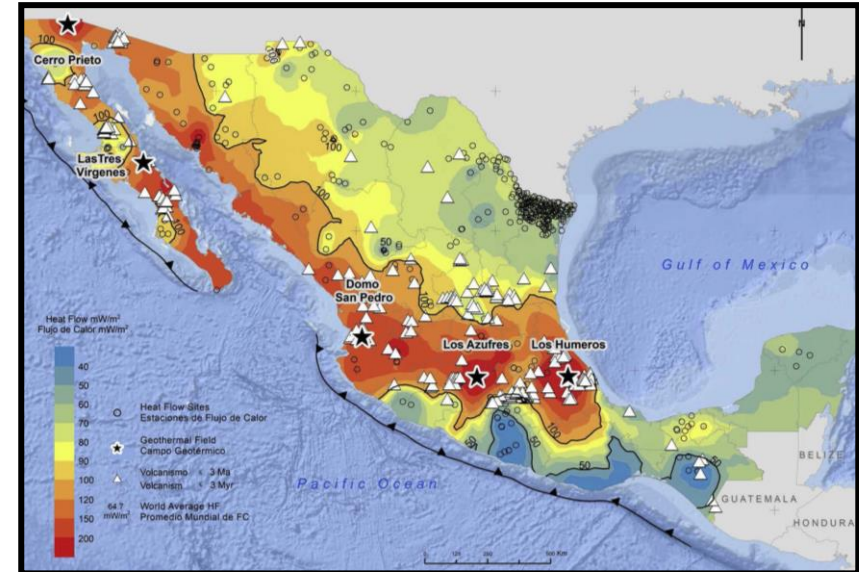
26<sup>th</sup> October 2022

Universidad Iberoamericana

# Geothermal in Mexico - overview (1)

## History

- pre-Hispanic use of hot springs
- Pathe (Hidalgo) 3.5MW, start-up 1959, closed 1973
- Cerro Prieto surveyed 1958, start-up 1973
- 6<sup>th</sup> largest global producer of geothermal power (6%)
- ~1,000MW installed, ~1% Mexico's current power
- over 650 wells drilled, mostly pre-2014
- reservoirs - sandstones, andesites, granodiorites
- tourism - Las Grutas Tolantongo (Hidalgo), ~35°C



Source: Prol-Ledesma & Morán-Zenteno, 2019

## Current production

- Cerro Prieto (Baja Calif.) 280-350°C, 2.5kms, 720MW
- Los Azufres (Mich.) 240-280°C, 1.6kms, 188MW
- Los Humeros (Pueb.) 280-310°C, 2.2kms, 35MW
- Las Tras Virgenes (BC Sur) 250-275°C, 2.0kms, 10MW
- Domo San Pedro (Nayarit) 270-280°C, 2.7kms, 25MW
- wellhead temperatures usually >150°C
- limited direct use, 30-50°C hydrothermal widespread
- agriculture, drying, tourism



Source: Gonzalez & Garcia-Zarate, 2018

# Geothermal in Mexico - overview (2)

## Resource opportunities

- hot water, steam, brines; 100's hydrothermal sites
- 48 recently active volcanoes; Pacific 'Ring of Fire'
- EGS targets, ?40GW power potential
- 34,000 oil & gas wells; 32,000 onshore, 2,000 offshore
- retrofit onshore oil & gas wells, ?10-20 GW potential
- shallow geothermal - GSHPs - available everywhere
- direct use, eco-tourism, Bitcoin mining, hydrogen
- energy reform enables private investment

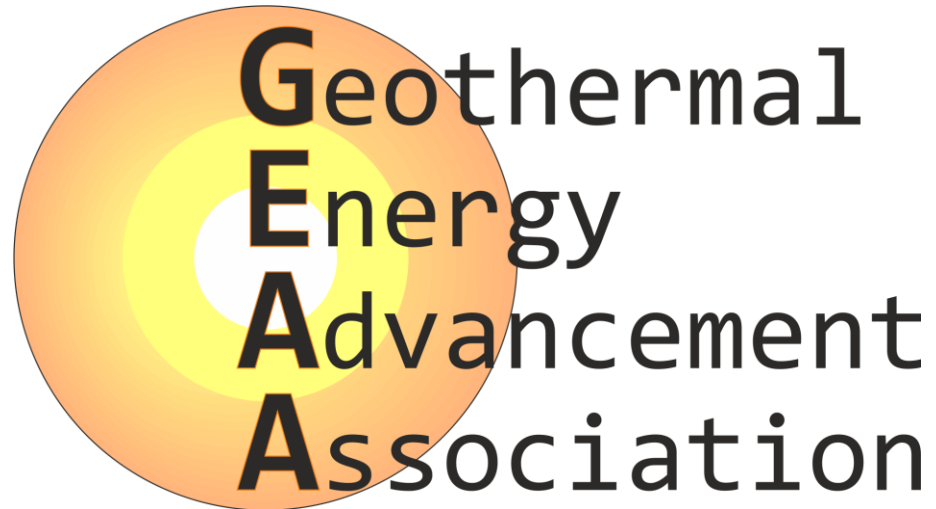


## Investment outlook

- investment to date US\$ ~1.5bn; ~700 man years/year
- little in last 4 years; 1<sup>st</sup> private project 2016 Gp. Dragon
- target 1,670MW by 2030; CFE undertaking studies
- Cerritos Colorados (Jalisco), 1.4kms, ~75MW, standby
- off-grid power; Maguarichic (Chi.) 300kW, closed 2007
- current focus is natural gas, LNG, wind, solar
- overlooked source of low/zero carbon baseload
- ideal resource for energy transition



# What is GEAA? How to join GEAA?



- GEAA advocates development of geothermal energy sources through increased investment and awareness of this sustainable source for near zero-carbon heat, power & minerals derived from the Earth's shallow crust
- GEAA is a not-for-profit organisation offering leadership, dialogue & information for the energy transition and reaching Net Zero. It supports the role that geothermal energy can play in transitioning to a future in which fossil fuels make a much reduced contribution to global energy demand



- free for all students
- <https://www.linkedin.com/groups/12521761>
- executives, CEO's, regulators, government officials, leading academics, students, scientists, technologists
- 6 active working groups
- <https://www.geothermal-advancement.com>
- Twitter @advancegeotherm
- member of Global Geothermal Alliance (IRENA)

# Contribute to GEAA activity

## LinkedIn

**Geothermal Energy Advancement Association**  
Private group  
894 members including Jeroen Posma and 7 other connections

Invite Share

Start a post in this group

Post will be visible only to the group members.

All Recommended

Chris Sladen · You  
Reconnoitre Ltd. founder  
3d

Happy world geothermal energy day!  
:Feliz día mundial de la see more

## Twitter

**advance-geothermal**  
@advancegeotherm

GEAA advocates geothermal for 24/7 low-carbon heat, hot water, power & critical minerals in a world using much less fossil fuel. Account managed by Chris Sladen

Non-Governmental & Nonprofi...  
Global, six Working Groups  
geothermal-advancement.com  
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\*\*\*La traducción español-inglés estará disponible para todos los paneles\*\*\*  
Bienvenida 07:50am

## Website

# THE CLIMATE CHALLENGE

Achieving Net Zero

It's time to face the facts:  
Deep geothermal is the only 24/7 true baseload green energy, which will play a key role in the

## Briefing notes

**Geothermal Briefing Note** No.01/22  
GEAA advocates increased investment in geothermal energy and increased awareness of this sustainable source for near zero-carbon heat, hot water, power & minerals. GEAA is a not-for-profit organisation offering leadership and dialogue in the energy transition. Our focus is advancing geothermal energy and transitioning to a world using less fossil fuels.

### Geothermal in Agriculture and Food Sustainability in the UK

**Significance**  
Geothermal can play a significant part in decarbonisation of the UK agriculture sector. Heat from the ground is available everywhere and can be extracted providing clean 24/7 baseload heat that can be used commercially using existing resources, skills and extensive expertise. This can provide a sustainable energy source for heating, cooling and, if suitable conditions exist, electric power. Technology in the geothermal sector has advanced significantly over recent years drawing on extensive knowledge in the Oil & Gas industry.

**Key takeaways**  
**Typical 1 hectare (Ha) greenhouse development:**  
 1 MW electricity p.a.  
 0.5-0.6 MW heat p.a.  
**Target heat price:**  
 £22-35/MWh  
**Target electricity price:**  
 £55-90/MWh  
**Typical lead time:**  
 24-36 months  
**Targeted lead time:**  
 12-18 Months  
**CO2 reduction per Ha p.a.:**  
 500,000 kg CO2 Ha  
**Jobs created per Ha:**  
 5-10 direct - full time  
 30-40 indirect - contract/part time  
**Potential revenue p.a.:**  
 Geothermal >£100m  
 Farming >£1bn  
**Shovel-ready opportunities:**  
 >500 existing wells in UK onshore have potential  
**New expansion opportunities:**  
 Existing sites serve as great development opportunities due to existing oil and gas relationships with land owners

**Technical aspects**  
Agriculture requires significant energy in the UK, around 25,000 GWh per annum, 37% of which is used for direct heating and 61% of this is used to protect crops through greenhouse heating and humidity control, and to heat & cool buildings. Energy consumed by UK Agriculture accounts for 21% for food production, ~2.1 quadrillion Btu of energy per annum equivalent. This energy is consumed through growing and harvesting of crops, as well as raising livestock. The importance of reducing energy costs and encouraging local produce to be accessible and economic is becoming a concern; as an island, the UK can focus on becoming more sustainable and less dependant on imports. This in turn will significantly reduce our carbon emissions. In the last 15 years, the Netherlands has shifted from net importer to net exporter of flowers, plants and vegetables developing >£8bn business from climate controlled glasshouses, many running on heat from geothermal energy.

**Commercial advantages**  
Geothermal provides baseload 24/7 heat, providing UK farmers and land owners a lucrative business opportunity, with lower energy running costs, creating jobs, and providing taxable revenue from local grown produce which could also be exported. This can contribute to significantly lowering carbon emissions and reducing the UK's logistical carbon footprint, the final cost to the end consumer, and supporting farming in the UK to be import independent within 10 years.

**Community sustainability**  
Local community engagement can support all year-round local produce grown within the UK. We have seen during the COVID pandemic and lockdowns how the growth in demand of locally grown produce at farm shops, fish, meats, fruits and vegetables has increased ten fold. Agriculture can become a key part of our economy creating up to 50 direct and indirect jobs per hectare of land.

**Policy & regulatory implications**  
UK has over 500 onshore Oil and Gas wells covering some 100 sites where wells toward the end of their productive life could be reused, harvesting the in-place heat with no environmental impact. Many are virtually shovel-ready projects already located in rural agricultural locations. Companies like CeraPhi Energy and UK Oil & Gas plc are working on pilot projects to reuse former oil and gas wells for this purpose. At present, the Oil & Gas Authority (recently renamed as the North Sea Transition Authority) manages all wells through to end of life. This means that at the end of their productive use the wells would normally have to be closed. There is currently no provision to change the usage of such assets from an oil or gas well to a geothermal well within the regulatory framework.

**Way forward & solutions**  
We recommend: i) Fast-track approvals between OGA, BEIS and the Environmental Agency to allow controlled transfer of non-productive onshore oil and gas wells to become clean energy geothermal assets used for agriculture heat networks, and ii) Geothermal requires stand-alone recognition and a regulatory framework which reflects the cost base and risks, and reflects the renewable energy transition; this should not fall under current Oil and Gas regulations once wells have met certain safety and environmental criteria.

**Example: new geothermal greenhouse completed in Sandikli, Turkey (photo courtesy of Hortidaily)**

**Contacts:**  
Karl Farnon - CEO - CeraPhi Energy - karl.farnon@ceraphi.com  
Karl Farnon - CEO - CeraPhi Energy - karl.farnon@ceraphi.com  
Steve Whittaker - TSBM - Head of Technical Services - steve.whittaker@tsbm.com  
David McNamee - Lecturer/Research Academic Lead - University Engineer - D.McNamee@liverpool.ac.uk  
Maat Beeking - Senior Lecturer in Sustainable Engineering - University Manchester - maat.beeking@manchester.ac.uk  
Pete Leachman - Geothermal UK - Leachman@geothermal-uk.co.uk  
Fred Le Grand - fred@geothermal-uk.co.uk

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