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Viceministerio
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Ministry of Energy and Mines
Electricity General Directorate
Electricity Concessions Directorate

Geothermal energy in Perú



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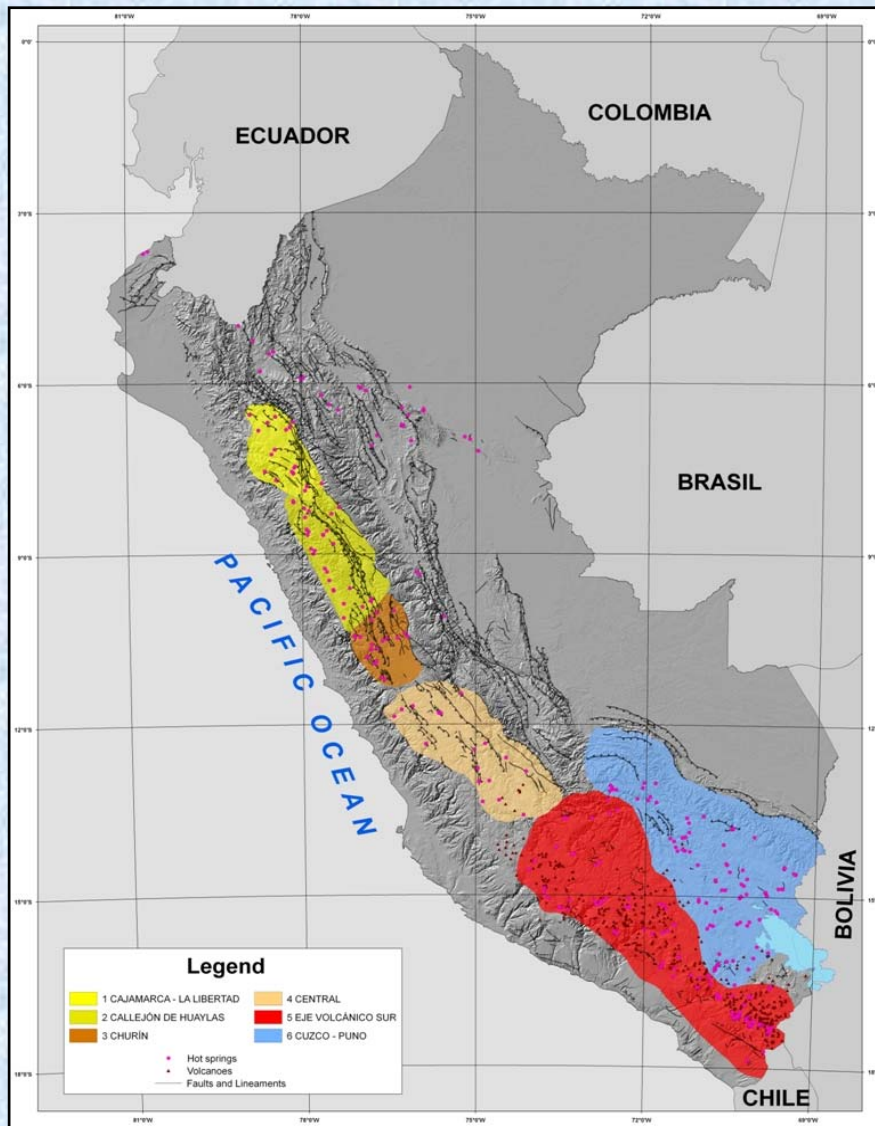
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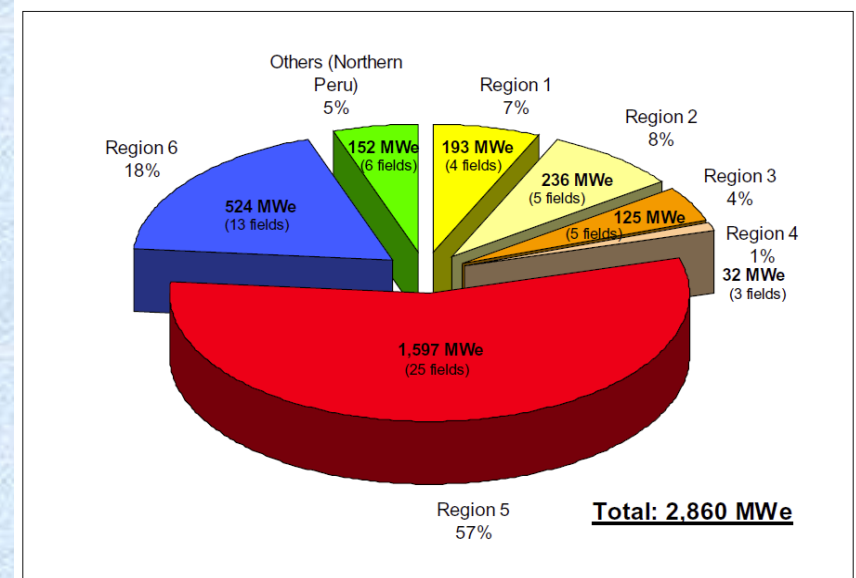
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Current situation of the development of geothermal energy



Peruvian geothermal potential

- According to the Geothermal Master Plan, there is a potential of close to 3000 MW.
- The "Southern Volcanic Belt" is the region has the greatest potential.

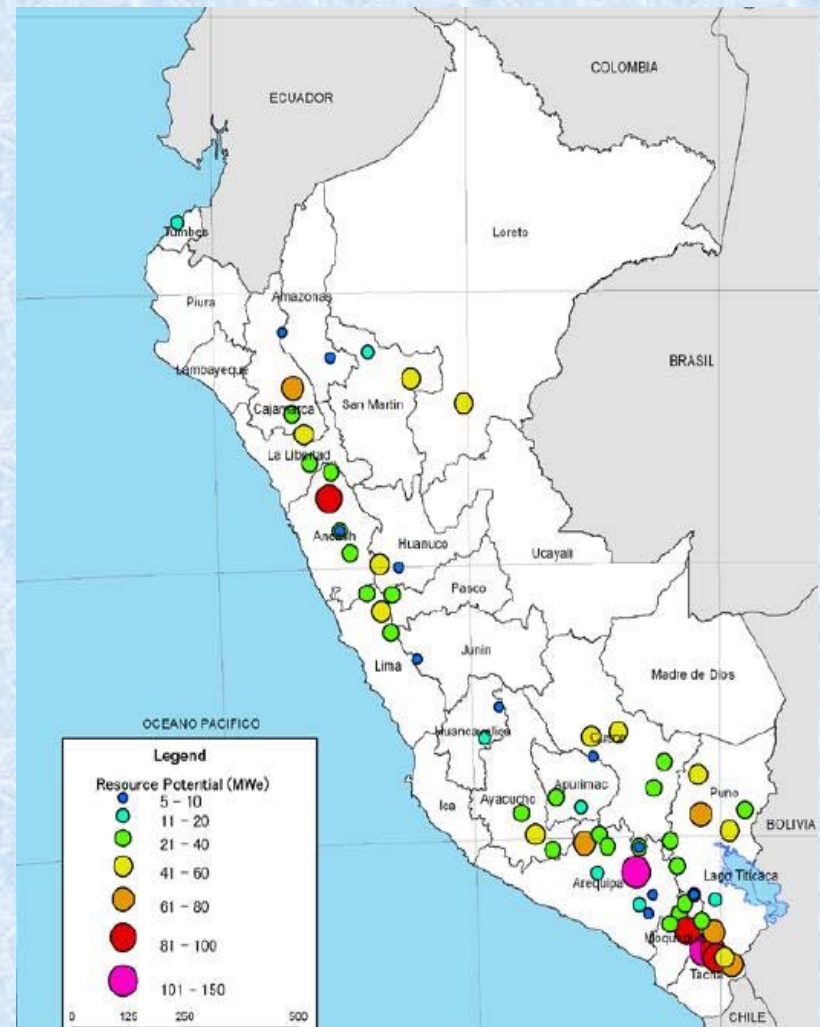


Current situation of the development of geothermal energy

Geothermal map

DEPARTAMENTO	Resource Potential MW	
	CAMPOS PROMISORIO	OTROS CAMPOS
Tacna	436	132
Moquegua	192.6	140
Puno	36.8	268
Tacna - Moquegua	79.4	3
1287.8 MW ≈ 45% Of potential Perú	744.8	543

FTE: Geothermal Mater Plan - 2012





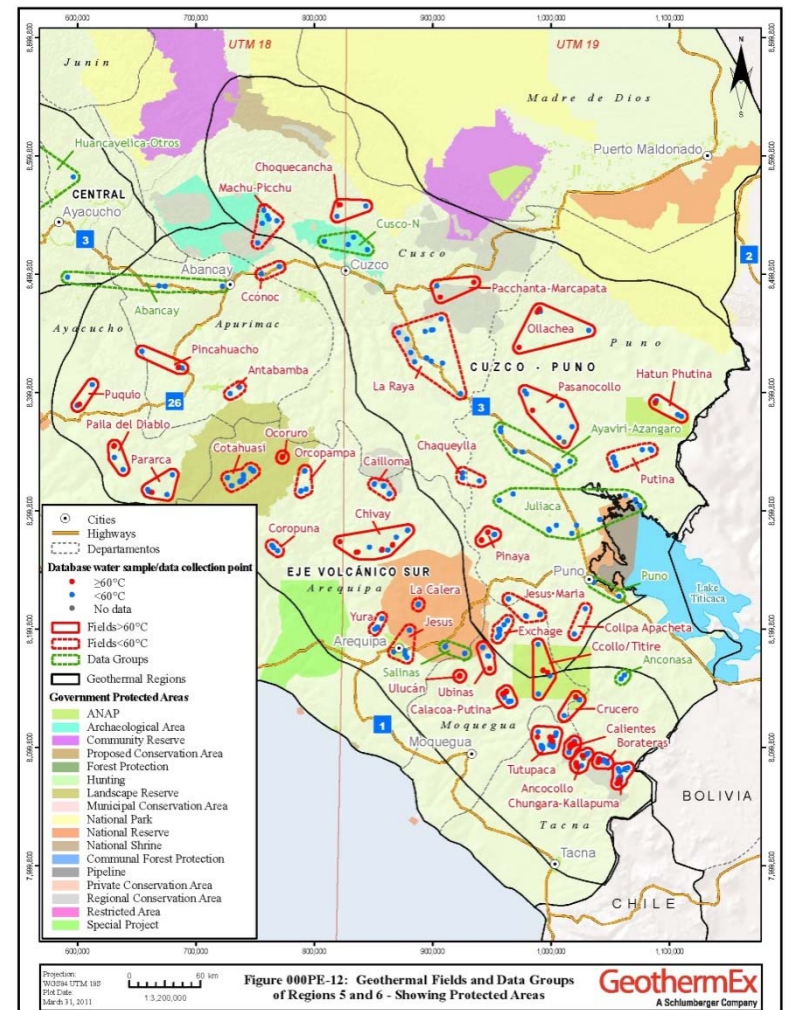
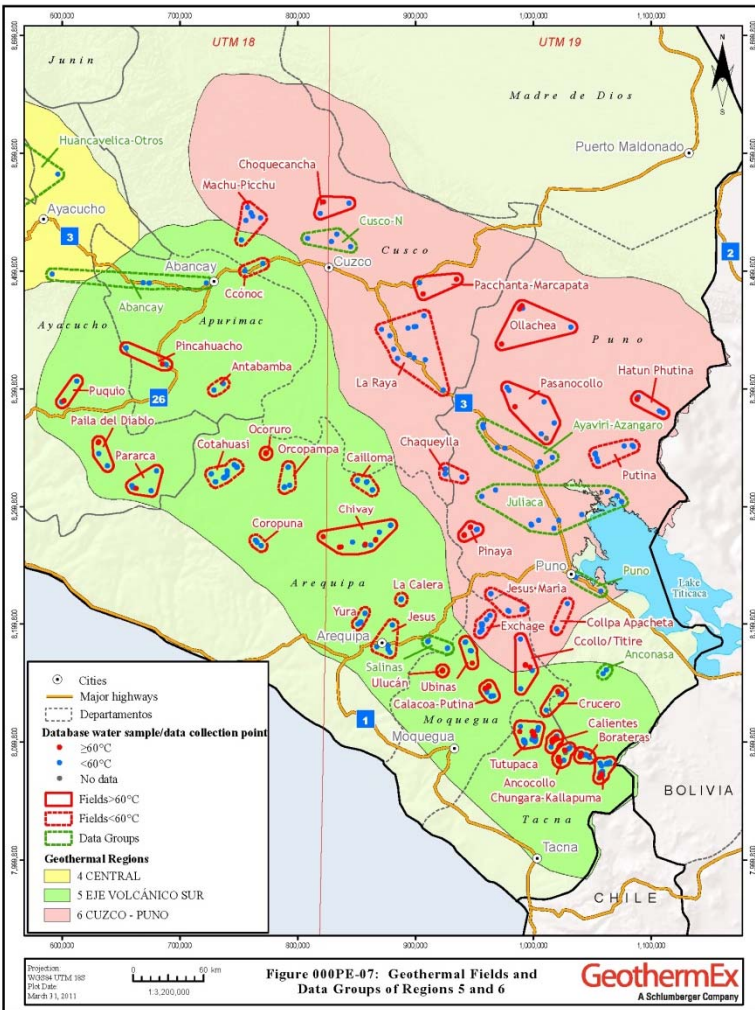
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Promising fields according to the Master Plan





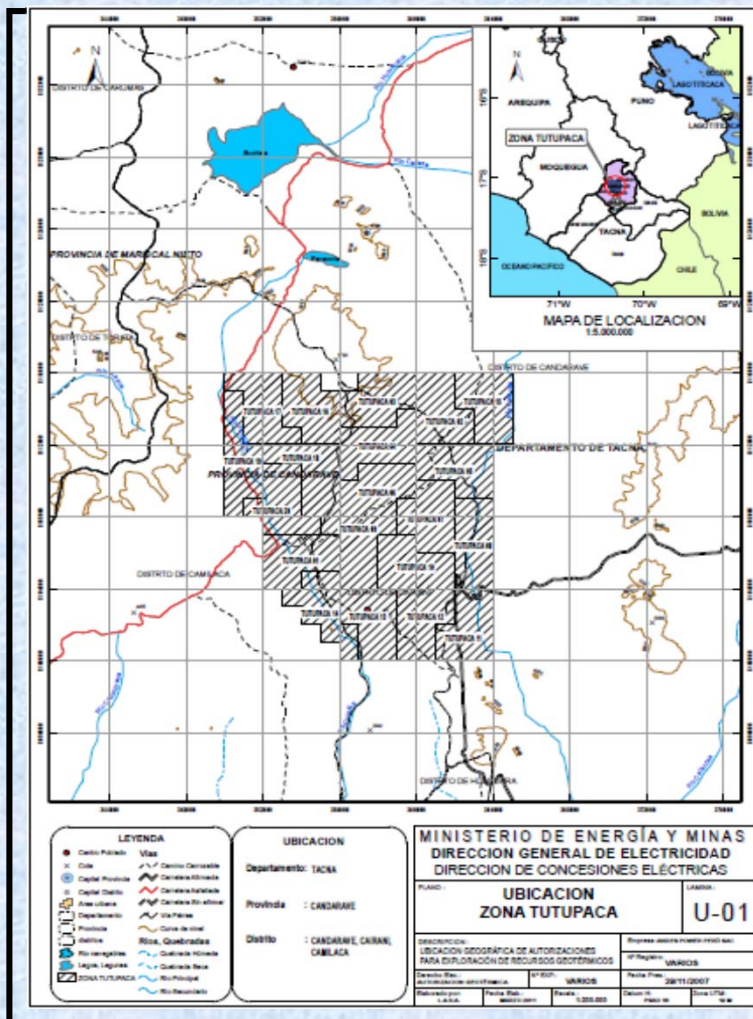
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Project Area Tutupaca



- MAGMA Energía Geotérmica Perú S.A.
- Área: 20 000 Ha (20 areas)
- Fases:
 - First: 2 years
 - Second : 1 year
- Budget:
 - First: US\$ 472, 450.00
 - Second: US\$ 3' 346, 196.25





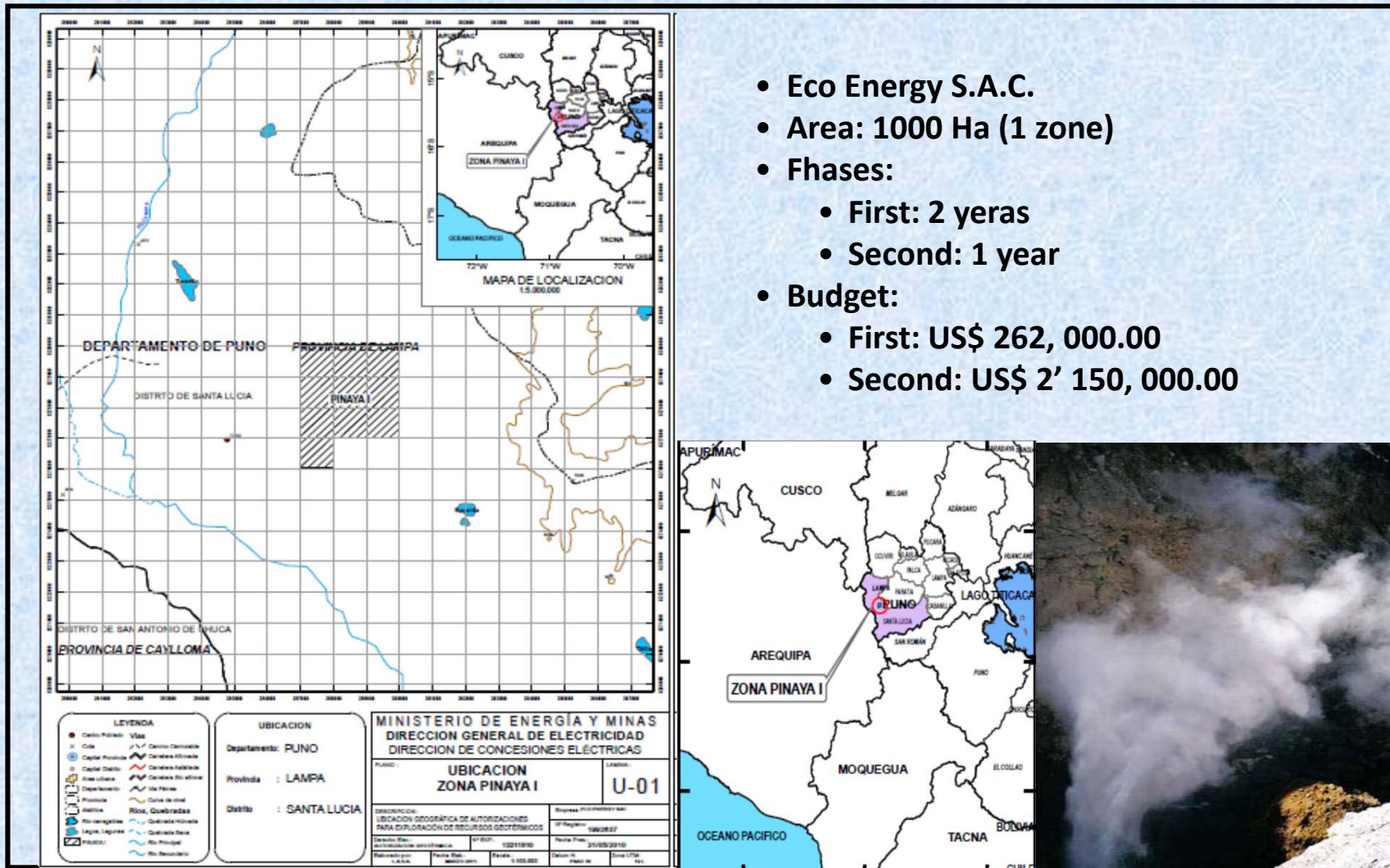
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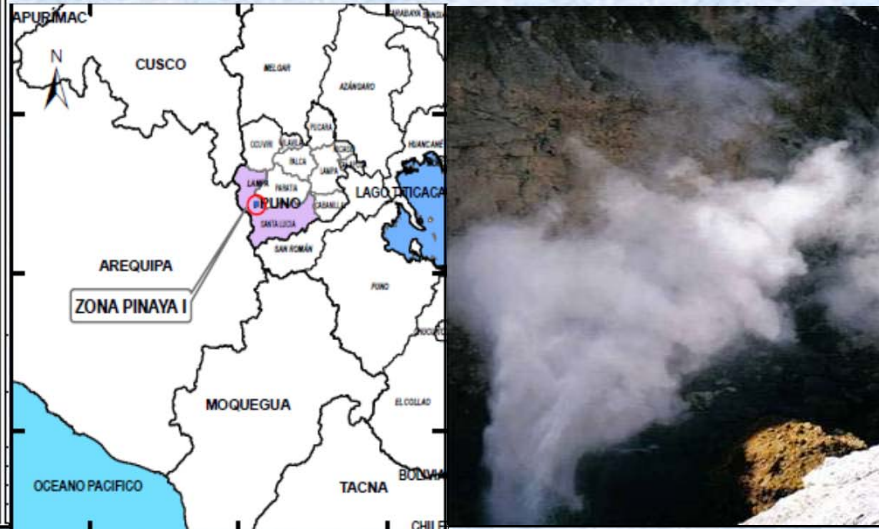
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Project Area Pinaya I



- Eco Energy S.A.C.
- Area: 1000 Ha (1 zone)
- Phases:
 - First: 2 yeras
 - Second: 1 year
- Budget:
 - First: US\$ 262, 000.00
 - Second: US\$ 2' 150, 000.00





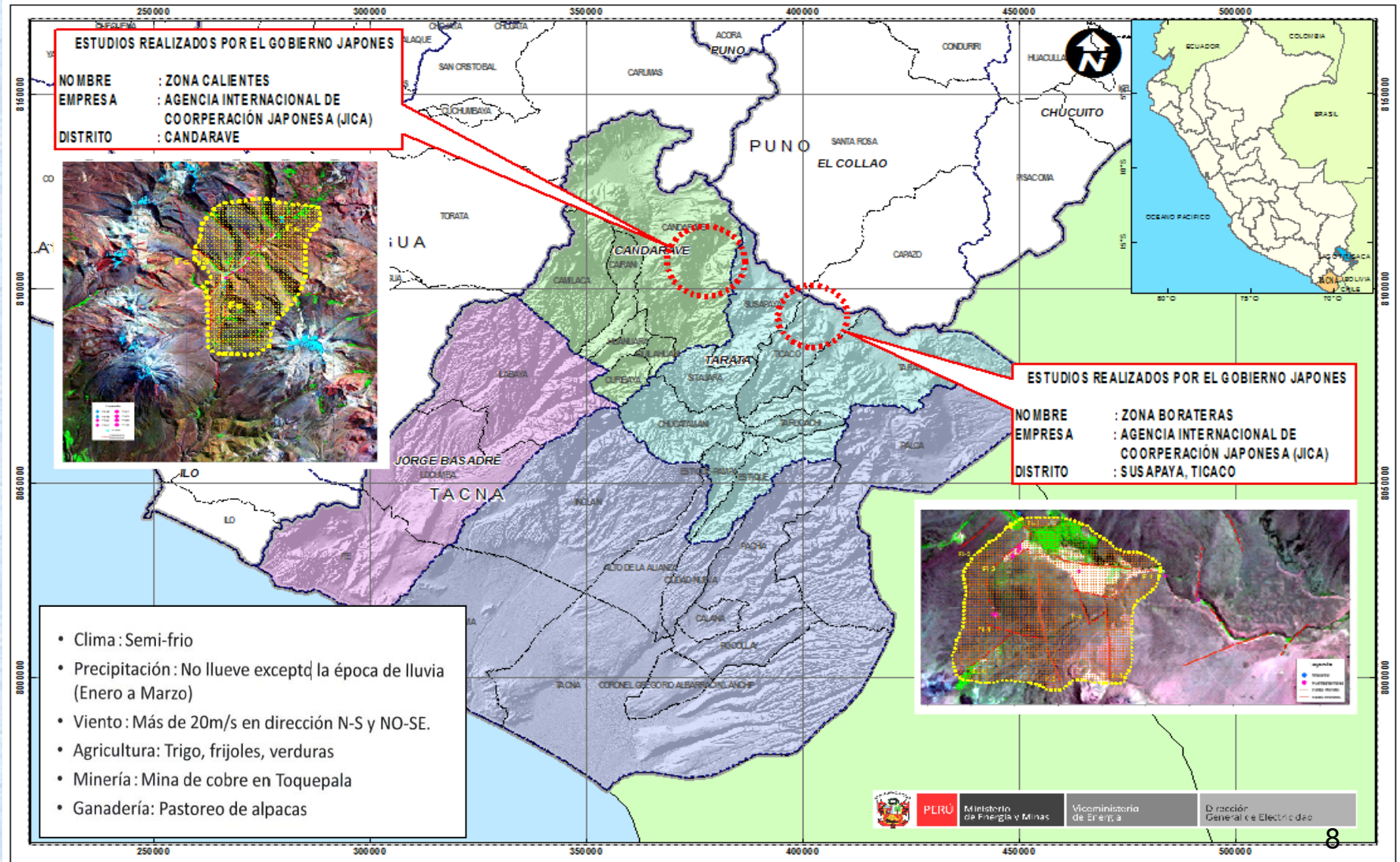
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Borateras and Calientes Fields



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Exploration Permits

Nº	Titular / EMPRESA	Proyecto	Nº de Zona	Area Total (Ha)	Ubicación	Fecha de Autorización
1	ECO ENERGY S.A.C.	GERONTA II	1	1000	Ayacucho	19-may-2011
2		UMACUSIRI I	1	1000	Ayacucho	19-may-2011
3		UMACUSIRI II	1	1000	Ayacucho	19-may-2011
4		GERONTA I	1	1000	Ayacucho	19-may-2011
5		PINAYA I	1	1000	Puno	4-feb-2011
6		PINAYA II	1	1000	Puno	4-feb-2011
7		PINAYA III	1	1000	Puno	19-may-2011
8		PINAYA IV	1	1000	Puno	12-dic-2012
9		PINAYA V	1	1000	Puno	12-dic-2012
10		PINAYA VI	1	1000	Puno	18-dic-2012
11	EDC ENERGÍA VERDE PERÚ S.A.	ACHUMANI	12	10800	Arequipa	27-oct-2012
12	GEOTÉRMICA QUELLAAPACHETA PERÚ SAC	QUELLAAPACHET A	14	12600	Moquegua	6-abr-2011
13	MAGMA ENERGÍA GEOTÉRMICA PERÚ S.A.	TUTUPACA NORTE	19	19000	Tacna Moquegua	30-nov-2011
14		PINCHOLLO LIBRE	12	10800	Arequipa	7-jul-2013
15	ENEL GREEN POWER PERU S.A.	CARMEN	11	8800	Ayacucho	7-feb-2013
16		CHILATA	23	19900	Moquegua	19-abr-2013
17	EMX GEOTHERMAL PERU S.A.C.	PUMAHUIRI	5	3900	Ayacucho	26-abr-2013
18		TAMBOCHACA	6	4800	Pasco	26-abr-2013
19		SENGATA	6	5500	Ayacucho	26-abr-2013
20		COROPUNA	20	18600	Arequipa	26-may-2013

- There are 20 licenses have been granted to develop exploration of geothermal resources in 138 areas.
- There are being tested about 30 areas.



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Policies to develop the use of renewable resources such as Geothermal Energy

- **Having a diversified energy mix, with emphasis on renewable resources.**
- **Sustainable development, self-sufficient and with minimal environmental impact of renewable energy**
- **Encourage private investment in the development, providing financial and tax incentives.**
- **Perform Auction processes on Energy Renewable Energy Resources, to ensure the sale and energy fee.**

Investment options on geothermal energy

- AUCTION GENERATION ON RENEWABLE ENERGY

RESOURCES (RER):

- It is held every two years, according to the established basis for each auction.
- RER generation projects involving wind, solar, biomass, geothermal and hydropower (until 20 MW)
- Bidders offered amount of energy and unit price.
- The offers are presented and evaluated by type of RER technology. The competition factor is the price offered
- The selected project rate is fixed for the duration of the contract

Investment options on geothermal energy

- **NATIONAL INTERCONNECTED SYSTEM (SEIN):**
 - The operation of the electricity market is the responsibility of COES.
 - Plants with renewable energies, after hydropower, natural gas plants and then the diesel power plants are dispatched first.
 - The project sells energy to SEIN at the market rate.
 - Geothermal energy rate is about 8-9 Ctps US\$/kWh
 - The rate of hydropower is approximately 4-4,5 Ctps US\$/kWh.
 - The alternative is to contract directly with a mining company or other which is supplied with a central diesel.



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Cost Comparison of Renewable Energy

Technology	Auction 2009	Auction 2011	Auction 2013
	average price awarded (US\$/MWh)	average price awarded (US\$/MWh)	average price awarded (US\$/MWh)
Hidro	60,33	53,21	56,17
Wind	80,36	69,00	-
Biomass	63,45	99,99	-
Solar	221,09	61,96	-
Geothermal	-	-	-

FTE: MEM



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Barriers to the development of Geothermal Energy

- Resources for exploration (including drilling) are significant and involve a very high risk.
- Geothermal legislation has only affected the utilization of geothermal energy for electricity generation purposes regardless of their multipurpose use (district heating, greenhouses, etc.).
- Location of some geothermal fields in national parks or protected areas.
- The location of geothermal fields in areas of indigenous or original delay the development.

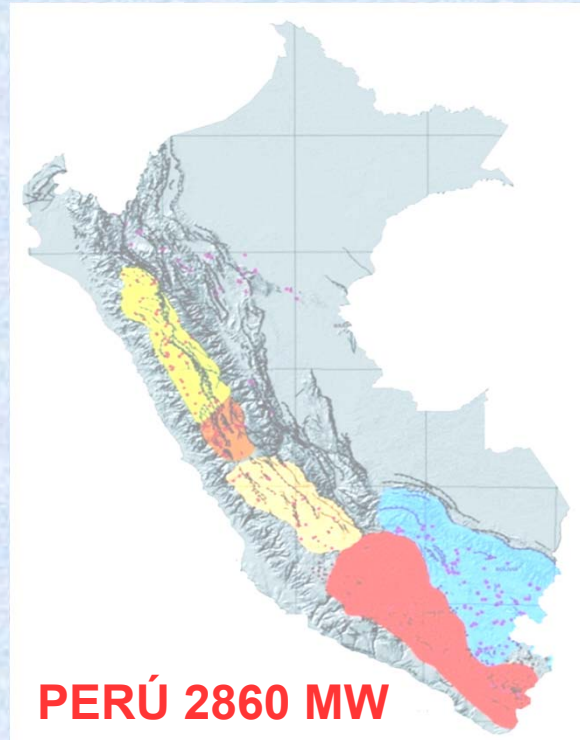


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Thank you very much