South American Geothermal Update: Investing in Opportunity

GRC Annual Meeting & GEA GeoExpo+
October 1 – October 4, 2017
Salt Lake City, Utah – USA
“Geothermal Energy: Power to Do More”

A Really Good News Story

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¹Dewhurst Group, L.L.C.
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- A quick overview of the region
  - South America
    - Colombia, Ecuador, Peru, Bolivia, Chile, Argentina
- Risk Mitigation Facilities
- Geothermal Development Facility for Latin America (GDF)
- First Call Results
- Summary
• Considered the last frontier for geothermal development
• First Geothermal power plant on the continent commissioned in 2017 in the Chilean area of Cerro Pabellón (48 MW)
OVERVIEW OF COLOMBIA

- Confirmation drilling phase
  - Nevado del Ruiz Volcano, 115 MW Potential
- Exploratory phase
  - Binational project Chiles-Cerro Negro in the border between Ecuador and Colombia

Nevado del Ruiz, Colombia (source: Colombian Geological Survey)
• Exploratory phase
  • Chacana
  • Binational Geothermal Project
• Other places with potential for development
  • Chachimbiro
  • Chalupas
  • Chalpatán
OVERVIEW OF PERU

• Confirmation drilling phase
  • Achumani
  • Quelloapacheta

• Exploratory phase
  • Crucero- Tutupaca
  • Ocururane

• Other potential sites for development
  • Calientes
  • Borateras
• Under construction
  • Laguna Colorada potential for at least 300 MWe
  • JICA provided USD$ 552M for the construction of the power plant (2017 press release)
• Exploratory phase
  • Empexa
OVERVIEW OF CHILE

- Cerro Pabellon 48MWe Power plant (2017)
- Confirmation drilling phase
  - Peumayen
  - Tinguiririca
  - Mariposa
- Exploratory phase
  - Puyehue
  - El encuentro
  - Irruputuncu
  - El valle
  - Los lagos
ARGENTINA OVERVIEW

- Confirmation drilling phase
  - Copahue
  - Domuyo
- Exploratory phase
  - Los Despoblados
  - Tocomar
  - Tuzgle
- Copahue produced a 0.6 MW “Pilot Project” in 1988
  - decommissioned

Domuyo volcano, Neuquen province, Argentina (source: Flickr/pablodf, creative commons)
GDF is an early stage risk mitigation fund conceived by KfW to help offset the disproportionate risk involved at the early stages of development.

- IDA Fund Management LLC
  - Dewhurst Group, LLC
  - Interlink Capital Strategies
ELIGIBLE COUNTRIES

- More than € EUR 50M available!
- Mechanisms
  - **Surface Studies:** Up to €600,000 or 40% of the Project budget
  - **Confirmation Drilling:** Up to €5,800,000 or 40% of the project budget
GDF OBJECTIVES AND GOALS

- 8 Surface study projects
- 14 Confirmation drilling projects
- Technical assistance forums
- 350+MWe of geothermal generation
The GDF will provide grants to developers through a four-phase application process.
FIRST CALL MAIN RESULTS

Pre-EOI stage

- **September 10\textsuperscript{th} 2016 - January 15\textsuperscript{th} 2017**
- **73 projects identified in LATAM**
  - **38 in South America**
  - **35 in Central America**

<table>
<thead>
<tr>
<th>Country</th>
<th>Projects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chile</td>
<td>15</td>
</tr>
<tr>
<td>Peru</td>
<td>7</td>
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<tr>
<td>Colombia</td>
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<tr>
<td>Ecuador</td>
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</tr>
<tr>
<td>Bolivia</td>
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<table>
<thead>
<tr>
<th>Country</th>
<th>Projects</th>
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<tbody>
<tr>
<td>Guatemala</td>
<td>13</td>
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<tr>
<td>Nicaragua</td>
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<td>Costa Rica</td>
<td>5</td>
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<td>Honduras</td>
<td>4</td>
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<tr>
<td>El Salvador</td>
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</tr>
</tbody>
</table>

- **Number of Projects Per Country**

- Chile
- Guatemala
- Nicaragua
- Peru
- Colombia
- Ecuador
- Costa Rica
- Bolivia
- El Salvador
- Honduras
EXPRESSION OF INTEREST (EOI)

EOI Stage

- **January 15\textsuperscript{th} - February 28\textsuperscript{th} 2017**
- **25 Projects all over LATAM**
- **More than €60M in grant requests**
- **A total project expenditure of more than €258M. Aprox \approx 4 times the amount requested**
- **Almost 1200MWe Geothermal programs in LATAM**
**EOI - SOUTH AMERICA**

- **17 projects expressed the interest in South America**
- **Almost 1GW of geothermal programs in South America**

<table>
<thead>
<tr>
<th>Country</th>
<th># of Projects</th>
<th>Estimated power MWe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chile</td>
<td>8</td>
<td>438</td>
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<tr>
<td>Peru</td>
<td>5</td>
<td>365</td>
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<td>Colombia</td>
<td>2</td>
<td>110</td>
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<tr>
<td>Ecuador</td>
<td>1</td>
<td>20</td>
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<tr>
<td>Bolivia</td>
<td>1</td>
<td>15</td>
</tr>
</tbody>
</table>

**Projects per Country**

- Chile: 8 projects
- Peru: 5 projects
- Colombia: 2 projects
- Ecuador: 1 project
- Bolivia: 1 project

- Almost 1GW of geothermal programs in South America
CALL FOR PROPOSAL (CFP)

CFP Stage

- May 15\textsuperscript{th} – July 24\textsuperscript{th} 2017
- 8 projects respond to the Call
- 285 MWe from geothermal programs ready to start in LATAM

<table>
<thead>
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<th>Country</th>
<th>Projects</th>
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<tbody>
<tr>
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<td>Colombia</td>
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<tr>
<td>Ecuador</td>
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<tr>
<td>Bolivia</td>
<td>1</td>
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<table>
<thead>
<tr>
<th>Country</th>
<th>Projects</th>
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<tbody>
<tr>
<td>Guatemala</td>
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</tr>
<tr>
<td>Honduras</td>
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</table>
CFP Stage

- **5 projects applied for funding**
  - 3 surface studies grants
  - 2 confirmation drilling
- **Project potential of 210MWe to be developed for this call in South America**

<table>
<thead>
<tr>
<th>Country</th>
<th># of Projects</th>
<th>Estimated power MWe</th>
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<tbody>
<tr>
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<td>115</td>
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<tr>
<td>Chile</td>
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<td>Ecuador</td>
<td>1</td>
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<td>Bolivia</td>
<td>1</td>
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</table>
**APPROVED GRANTS FOR THE FIRST CALL**

*4 Programs for confirmation drilling - €68M+ in investments*

<table>
<thead>
<tr>
<th>Company</th>
<th>Project</th>
<th>Estimated MWe</th>
<th>Country</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central Hidroeléctrica de Caldas S.A. ESP</td>
<td>Proyecto Geotérmico Macizo Volcánico del Ruíz</td>
<td>65</td>
<td>Colombia</td>
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<tr>
<td>ISAGEN</td>
<td>MVR Geothermal Project</td>
<td>50</td>
<td>Colombia</td>
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<tr>
<td>US Geothermal</td>
<td>El Ceibillo</td>
<td>25</td>
<td>Guatemala</td>
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<tr>
<td>ORMAT</td>
<td>San Ignacio</td>
<td>20</td>
<td>Honduras</td>
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</table>
## APPROVED GRANTS FOR THE FIRST CALL

*4 Programs for surface studies - €5M+ in investments*

<table>
<thead>
<tr>
<th>Company</th>
<th>Project</th>
<th>Estimated MWe</th>
<th>Country</th>
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<tbody>
<tr>
<td>Adage Geothermal</td>
<td>Joaquina</td>
<td>30</td>
<td>Guatemala</td>
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<tr>
<td>Corporación Eléctrica del Ecuador (CELEC)</td>
<td>Proyecto Geotérmico Chacana</td>
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<td>Ecuador</td>
</tr>
<tr>
<td>Empresa Nacional de Electricidad (ENDE)</td>
<td>Empexa Geothermal Project</td>
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<td>Bolivia</td>
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<tr>
<td>Compañía Minera Doña Inés de Collahuasi SCM</td>
<td>San Ignacio</td>
<td>60</td>
<td>Chile</td>
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</table>
CHANCES OF BEEN AWARDED

- 100% Success ratio
- 8 of 8 projects were approved to receive funds
- More than €22M in contingency grant agreements for €73M+ in projects
The goal is to promote consistent policies to enable geothermal development

Generate awareness of climate change in the electricity sector

Created to provide opportunities to Governments and private sector

Provide clarity regarding applicable policy to the fund process
FUTURE OF THE GDF

• First round has been an overwhelming success, second round looks even more promising

• the GDF have agreed to make an application to the EU Green Climate Fund for additional funds
## Approx. Schedule of Events - Second Call GDF 2017/18

<table>
<thead>
<tr>
<th>Second Call</th>
<th>Open</th>
<th>Closed</th>
<th>Weeks (Approx)</th>
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<tbody>
<tr>
<td>EOI</td>
<td>1-Dec-17</td>
<td>12-Jan-18</td>
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<td>EOI Evaluation</td>
<td>15-Jan-18</td>
<td>26-Feb-18</td>
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<tr>
<td>IC Review</td>
<td>27-Feb-18</td>
<td>13-Mar-18</td>
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<td>Selection</td>
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<td>CFP</td>
<td>15-Mar-18</td>
<td>24-May-18</td>
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<td>CFP Evaluation</td>
<td>25-May-18</td>
<td>6-Jul-18</td>
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<td>IC Review</td>
<td>9-Jul-18</td>
<td>23-Jul-18</td>
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<td>Selection</td>
<td>24-Jul-18</td>
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<td>Contract Negotiation</td>
<td>25-Jul-18</td>
<td>22-Aug-18</td>
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<tr>
<td>Contract Signed</td>
<td>23-Aug-18</td>
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</table>

**Total Time-lapse for Call**: 36
• Most projects still untapped
• More than 1GWe of power could be developed in Latin America within the next decade
• More information? Please Visit the GDF Website!

http://gdflac.com/