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June 2020

Development of a national roadmap for the use of low-temperature geothermal energy for thermal conditioning in the residential, industrial and commercial services sectors in Uruguay

Product 2

CTCN
CLIMATE TECHNOLOGY CENTRE & NETWORK

UN environment programme

UNIDO

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Product 2: Mapping of stakeholders in the use of low-temperature geothermal energy in Uruguay

Deliverable 2.2

Presentation of results, report with the information gathered during the meeting and list of participants

1 Introduction

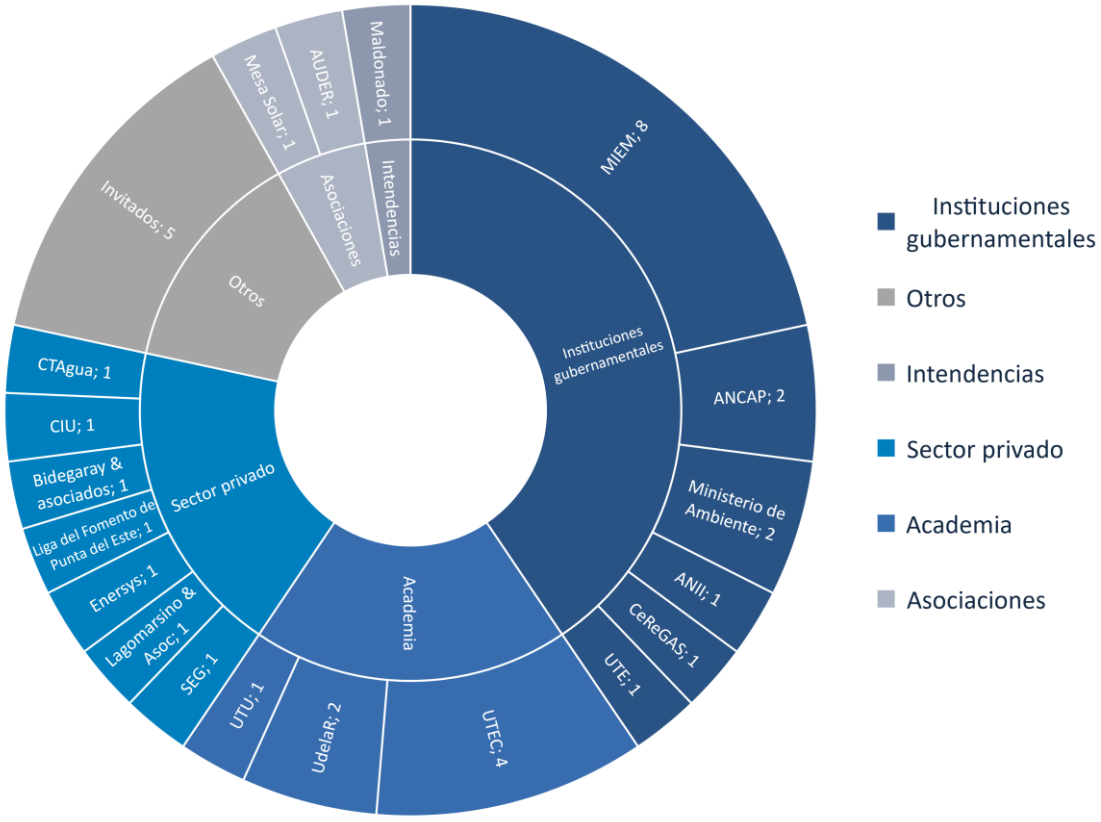
This report contains the second deliverable of the second product of the Technical Assistance developed by DEUMAN for CTCN, entitled "Mapping of stakeholders in the use of low-temperature geothermal energy in Uruguay". It will present the results with the information collected during the first preliminary presentation to stakeholders, with the attendance list.

After the interviews with organizations that it was possible to contact or whose interest it was possible to raise for the first deliverable of the second product, the technical team held the event under the name of "First Meeting with Stakeholders" on 5 June at 10 am (Uruguay time).

The event was attended by 37 participants from government institutions, academia, the private sector and municipalities, as shown in Figure 1. The information collected was presented, creating a space for information and discussion to answer stakeholders' questions about the implementation of low-temperature geothermal energy (See Minute No. 25).

The meeting was also attended by the Department of Climate Change of the Ministry of Environment and the National National Energy Directorate of the Ministry of Industry, Energy and Mining (MIEM).

Figure 1: Distribution of attendees



The presentation shared the information collected in the first instance through the interviews with stakeholders and described the potential in Uruguay for non-conventional renewable energy, such as thermal energy, as detailed below.

2 Background: previous interviews

For the conduct of each meeting and interview with selected stakeholders under the Terms of Reference and in the judgement of the technical team, Deuman developed a number of *Structured Enquiries* containing: the content of the technical assistance presentations; the explanation of low-temperature geothermal energy and the questions that would help to contextualize the current situation; each institution's knowledge, projects and other information; as well as legal, social and economic aspects of Uruguay.

Scheduled to last a maximum of 1 hour, the meetings were supported by a standard PowerPoint presentation that went hand in hand with the structured enquiries. As mentioned in Deliverable 1, due to the global situation caused by the pandemic, the meetings were held using video conferencing.

Although we were able to contact 66 stakeholders from the list, we were not able to secure responses from all (for various reasons). Even so, as it becomes possible to obtain a response outside the time limits set for this product, the technical team will meet with stakeholders contacted in order to continue to strengthen the technical assistance and duly map them. Future meetings will be suggested with stakeholders with whom we consider it relevant to work during products 3 and 4.

Figure 2 below presents the format of the structured enquiry developed to learn about the experience, capacity and engagement of the interviewee. It should be noted that the questions depended on the organization to be interviewed.

Figure 2: Example of structured enquiry

Structured Enquiry: Enersys

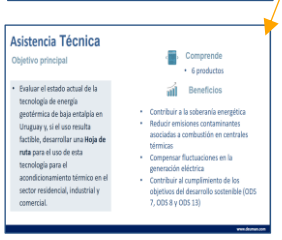
1. Stakeholder Information Sheet

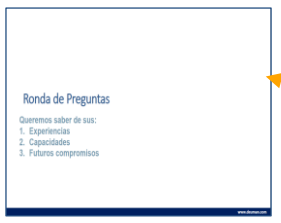
Entity	Enersys	**Description** ENERSYS is an undertaking formed in 2005. It manufactures, imports and sells equipment and designs and installs low-energy-consumption systems. It has experience in: - Solar pool heating - Heat-pump pool heating - Heat-pump heating and cooling - Solar-powered water pumping It specializes in solar thermal and geothermal energy and solar electricity generation. Website: http://www.enersys.uy/index.html	
Identification code	STKH 63		
Interviewee	Director: Mr Arturo Correa Falcone		
Priority	2		
Specific objective	**Objective 1:** Learn about the company's lines of work and speciality as an energy service company.	**Objective 2:** Find out what it knows about implementation of technologies for using low-temperature geothermal energy.	**Objective 3:** Learn about the degree of participation and expectations that the interviewee may have for the promotion of low-temperature geothermal energy.

Information about the entity to be interviewed; a brief description used to help establish the objectives and, therefore, the questions to ask.

2. Programme for Structured Enquiry

Activity	Time, Leader	Activity
Welcome and introductions	3 mins, General Coordinator *(PPT slide 1)*	**1. Thanks for giving up time** Attendees thanked for giving up their time **2. Introductions of those present** The names and roles of attendees and invites STKH to introduce self and any colleagues present *(PPT slide 1)*
Presentation of Technical Assistance and objectives and scope of consultancy	5 mins, General Coordinator *(slides 3 and 4)*	**3. Presentation of TA** Presentation of TA actors *(slide 2)*, the service *(slide 3)*, the main objective, the phases (products) and the benefits. Also present the consultancy team and Deuman *(slide 4)* Floor then passed to CEGA to present on their experience (main focus on commercial aspects, applications, business)
Presentation of low-temperature geothermal energy	4 mins, Geothermal energy specialist *(slides 5, 6, 7, 8, 9)*	**4. Definition of low-temperature geothermal energy** Brief explanation. If possible, specify applications of deep and shallow geothermal energy to denote a clear difference *(slides 5 and 6)* **5. Examples of projects in other countries** Mention projects that have worked in other countries such as Chile from the experience of CEGA or in general. Explain its economic and environmental viability *(slides 7 and 8)* **6. The importance of geothermal energy in Uruguay** Briefly set out the progress made to date in low-temperature geothermal energy and the possible potential in Uruguay The ideal thing would be to leave open the possibility of developing low-temperature, mentioning the sectors in which it could be developed *(slide 9)*
Discussion on the subject using questions prepared by the consulting team and obtaining responses according to the enquiry objectives	28 mins, Local support *(slide 10)*	**7. Company's area of work** **8. About low-temperature geothermal energy** **9. Expectations of technical assistance**
Agreements and commitments between the parties	3 mins, head of study	Mention agreements or commitments
Close	1 min, head of study	Plenary, thanks and farewells



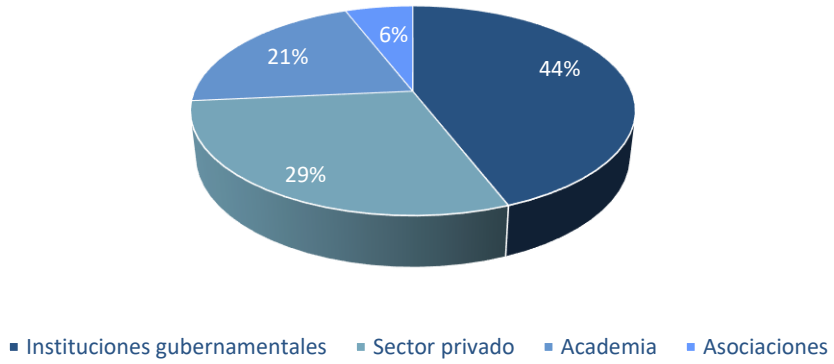


3 Preliminary Primary Source Results

The meetings and interviews were used to form a source of primary data on opportunities, benefits and barriers to implementation of a Roadmap for Low-Temperature Geothermal Energy in Uruguay.

With a total of 34 stakeholders interviewed, the distribution shown in the pie chart in Figure 3 was obtained. Interviewees were from government institutions (15), the private sector (10), academia (7) and associations (2).

Figure 3: Distribution of entities interviewed



As noted in the attendance list in each set of minutes, some meetings were attended by more than one representative per organization, up to a maximum of 6 persons (on the interviewee side) per meeting. It is also important to note the participation of women. A total of 18 women took part, accounting for 31% of those present, as shown in Figure 4. This will be used as the basis for defining the Gender-Equity Plan to be proposed by our gender specialist in future products.

Figure 4: Gender-distribution of stakeholders

Total number of women attendees: 18

- 4 meetings with just 1 woman representative (4 women)
- 3 meetings with 2 women representatives (6 women)
- 3 meetings with women as the sole representatives (8 women)

There now follows the information gathered about opportunities and barriers and/or gaps identified during the meetings.

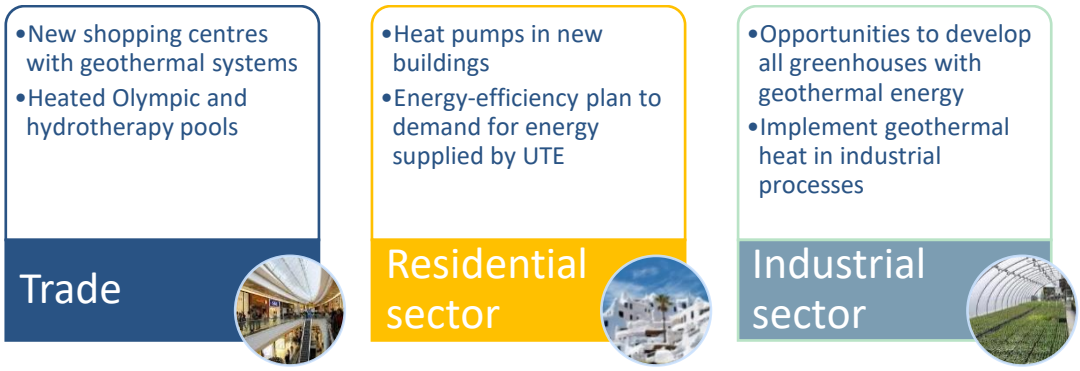
3.1. Opportunities

For the development of low-temperature geothermal energy, a series of opportunities have been identified through the interviews conducted, as listed below:

- ***Excellent electricity supply by UTE,*** with the addition that there are no problems with electrical connections in Uruguay, which facilitates air conditioning and electrical production of domestic hot water, and simple electrical resistance (air-source and geothermal) over other heat-producing technologies such as gas or oil.
- ***Seeking a 100% renewable electricity matrix,*** which provides an impetus for searching for further clean energy sources, such as geothermal.
- ***Experience of some ESCOs,*** the energy service companies that have worked with or know about geothermal heat pumps.
- ***Government incentives for energy-efficiency projects,*** with a range of instruments to promote energy efficiency such as the Energy-Efficiency Helpline (LAEE), Energy-Efficiency Trust (FEE) and Energy-Efficiency Certificates (CEEs), in addition to the Investment Act.
- **Regional Government *(Intendencia)* of Salto** Use of "left-over" water from geothermal complexes to heat neighbouring spaces, in addition to the geothermal wells already in place throughout the region.
- ***Financing of pilots by ANII and ANDE,*** which are funding university research projects or pilot projects by industrial companies or enterprises.
- Mapping the aquifers of Uruguay, by academia and CeReGAS.
- ***There are large numbers of wells*** and drilling companies able to drill shallow wells, who generally make information available.
- ***Academia has an important role in the development of the capacities*** of the technology; there are research projects and the capacity to develop new projects researching the geothermal potential of the region and developing innovation.

Opportunities to be explored for each sector were also compiled, as shown in summary form in Figure 5.

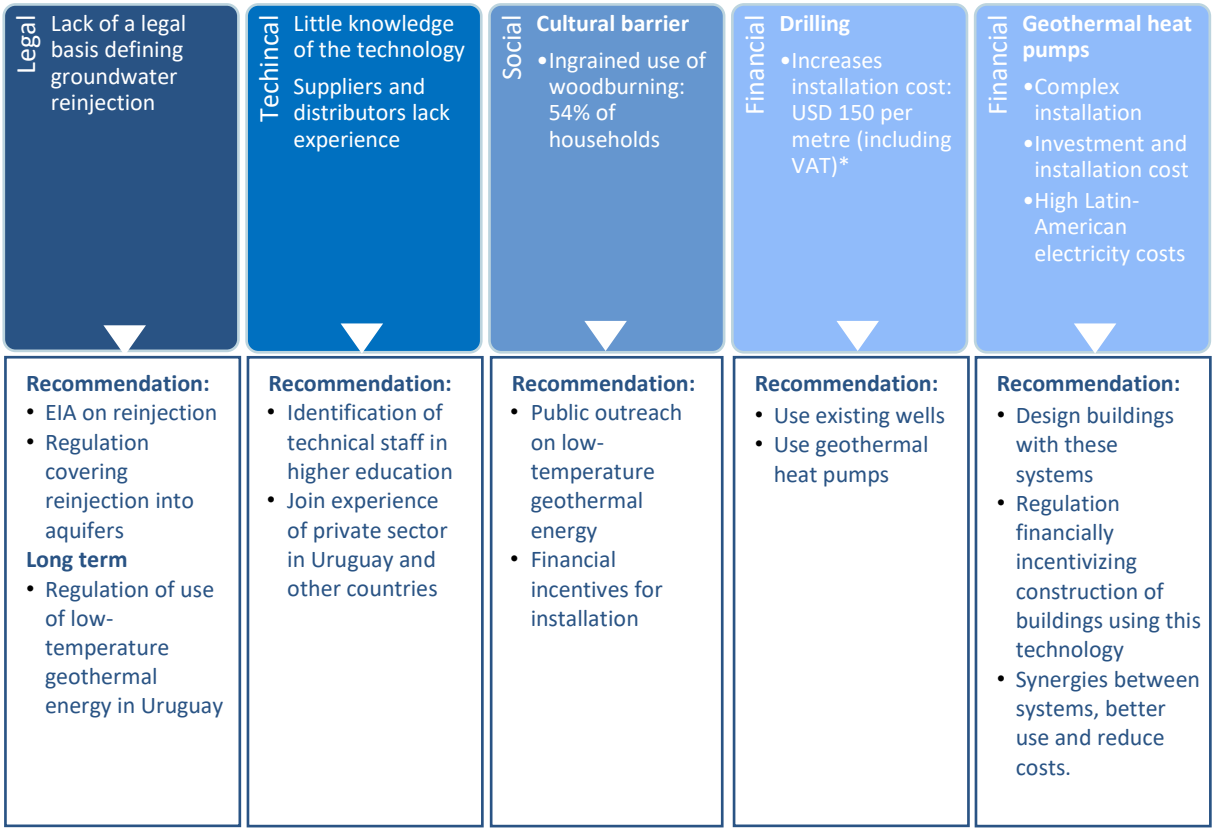
Figure 5: Opportunities for geothermal energy by sector



3.2. Preliminary barriers and/or gaps

As well as opportunities, the main barriers from the perspectives of the interviewees were also identified. These were put into 4 groups: legal, technical, social and economic. Figure 6 sets out the background to these barriers and the recommendations put forward by stakeholders.

Figure 6: Identified barriers and/or gaps



4 Annex 1: First preliminary presentation

Minutes of Meeting: No. 025

Consultation: Development of a national roadmap for the use of low-temperature geothermal energy

1. Event details

1.1. Event: First preliminary presentation to stakeholders
1.2. Place Video conference
1.3. Date: 05 / 06 / 2020
1.4. Time: 08:00 PE – 09:00 CL – 10:00 UY

2. Items discussed:

2.1. Presentation by the director of the National Energy Directorate on the importance of developing low-temperature geothermal energy and by the director of the Department of Climate Change on the background that led to the current technical assistance.

2.2. Presentation by technical specialist Joshua Carvacho of two successful case histories in Chile: Viña Maquis and Forestal Araujo. In addition to presenting a financial comparison between geothermal heat pumps and split air conditioning, in respect of their "equivalent heat tariffs", for the same demand conditions and tariffs, it was ultimately explained how the first of these starts to become the better solution for industrial-scale situations and use factors in excess of 50%.

2.3. Presentation by local consultant Lucía Samaniego of the preliminary results from the information obtained in the interviews as the opportunities and benefits identified, and the main discussion points on low-temperature geothermal energy.

3. Q & A round

3.1. *Question 1.* Javier San Martin: For those of us with little knowledge of technical terminology, what does "low-enthalpy" mean? And what is shallow geothermal energy?

- *MM*: Low-enthalpy or shallow geothermal energy is the term for the use of heat at low depth or low temperature, between 30°C to 90°C. This heat is suitable for heating buildings and for certain industrial and agricultural processes.

3.2. *Question 3.* Pablo Vladimir Gristo Savornin: Joshua, what reference prices are you taking for split vs. geometric geothermal pumps? What is the payback time on the equipment? Are there equipment maintenance costs?

- *JC*: We are taking approximately UYU 95,000 for split systems and UYU 280,000 for heat pumps. The payback time is 5 years for split systems and 7 years for heat pumps (note that no account has been taken of tax or Investment Act benefits). Yes, there are maintenance costs: around USD 200 per year for split systems and about USD 50 per year for heat pumps.

3.3. *Question 4.* Pedro Galione Klot: For the cost comparison between air conditioning and heat pumps in Uruguay: Could you elaborate on how the use factor is defined (you said 50%)? Is it on total hours of winter? Or the year, or something else?

- *JC:* The factors were defined taking account of the total hours in the year.

3.4. *Question 5.* Pablo Vladimir Gristo Savornin: Lucía: When you say that no GHG or other emissions are generated, are you assuming that the primary source (electricity) is 100% renewable? The right thing would be to compare against split, for example, and to take account of the entire life cycle, including equipment and installation for each case.

3.5. *Question 6.* Pablo Vladimir Gristo Savornin: Jorge Castro: Are other GHG emissions that you are not taking into account those related to drilling, installation and final disposal? Are you only taking account of operation?

- *JP:* That's right. We are assuming that the source is primarily renewable, as is the case for Uruguay and its energy matrix. Regarding questions 5 and 6, as this is a simple exercise, the presentation and demonstration did not go into the life cycle of heat pumps.

3.6. *Question 7.* Carlos Bello: What is the payback time on the initial investment in a typical installation?

- *JC:* The payback time is 5 years for split systems and 7 for heat pumps (note that no account has been taken of tax or Investment Act benefits).

3.7. *Question 8.* Pablo Vladimir Gristo Savornin: How is the water generally disposed of? What are the impacts of the alternatives of reinjection into the aquifer or surface discharge?

- *LS:* Usually, the water is reinjected, used for an industry production process or used for irrigation. Most of these systems use reinjection, because if done properly, it causes no alterations to the aquifer (for example, it must be reinjected at the same depth from which it was extracted). For clarification, the chemical properties of the water do not change as a result of its being used in a geothermal process.

3.8. *Question 9.* Lucia Vivanco: Lucía: you mentioned using existing wells. Do you see any barriers to the use of data, such as, is there sufficient data and of what quality on the BHT temperatures of wells?

- *LS:* Although ANCAP put forward the possibility of an agreement to access its data, this is for deep wells, which are not the direct subject of this consultancy. There is practically no information on the BHT temperatures of shallow wells.

3.9. *Question 10.* Ethel Morales: Lucía: I wanted to ask you about the database for analysis of geothermal potential as well. Have you been able to access the databases of the different institutions in Uruguay?

- *LS:* We have the support of ANCAP and CeReGAS to access their databases, but unfortunately, we have not been able to get in touch with DINAMIGE or DINAGUA, both of which have large wells databases. We are going to carry on making every effort to secure an interview with these stakeholders.

3.10. *Question 11.* Federico Rehermann: Considering the geological characteristics of Uruguay, are there any specific areas of the country where the topographical conditions are more favourable to the possible development of this type of installation?

- *LS:* Geothermal installations are very flexible, so they can be adapted to the terrain and to the existence or not of local groundwater. That depends on the energy needed, which means that using groundwater is better since, if there is groundwater, that improves the efficiency of the equipment compared to systems that do not use groundwater.

3.11. *Question 12.* Martín Scarone: For split systems, were you assuming an air-air or air-water heat pump? If what you assumed was air-air, did you take into account the difference in the use of electricity tariffs between split and geothermal, bearing in mind that you can accumulate with geothermal?

- *JC:* We assumed air-air split pumps. We did not take the difference in electricity tariffs into account. This is an overview exercise, not a comprehensive review of a particular case.

3.12. *Question 13.* Pablo Vladimir Gristo Savornin: Lucía: Is the project thinking of preparing guidelines or protocols for drilling? To take into account all aspects of health and safety and environment?

- *CA:* The technical assistance to be carried out includes the Roadmap for the Use of Low-Temperature Geothermal Energy, or in other words, reviewing the potential required and presenting on pilot projects for submission to the Green Climate Fund. The roadmap does include, however, recommendations on policy or legal regulations to be implemented and suggests guidelines or protocols for drilling for geothermal purposes and reinjection.

3.13. *Question 14.* Javier Ciganda: Is there any information on the composition of the subsoil of Montevideo, to enable feasibility studies based on calculation programs?

- *LS:* There is a geological map of Montevideo, but for calculating potential, more localized studies would be needed in the area where it was planned to install the system, since there can often be errors if we base our work only on a map with a scale of 1:100,000.

4. Comments

4.1. *Comment 1.* Carlos Bello Cáceres: Could you send us the presentations? That's better for making a more detailed analysis and generating new questions, thank you.

- The presentations will be sent to all those invited or present, after the presentation.

4.2. *Comment 2.* Beatriz Olivet: Hello. When you mentioned subsidies and incentives, nothing was said about the Law on the Promotion of Investment.

4.3. *Comment 3.* Carlos Bello Cáceres: With regard to Lucía's answer, we already discussed on another occasion that UTEC has a 60-m well at its site in Durazno for analysis and to assess its feasibility in a future geothermal installation.

5. Present

No.	Name	Institution
1	Hector de Santana	National Fuel, Alcohol and Portland Cement Administration
2	Pablo Gristo Savornin	National Fuel, Alcohol and Portland Cement Administration
3	Jorge Dosil	Uruguayan Renewable Energies Association, AUDER
4	Flavio Caiafa	National Agency for Research and Innovation, ANII
5	Federico Bidegaray	Bidegaray
6	Julio Sosa	Uruguayan Chamber of Industries
7	Alberto Manganelli	CeReGAS
8	Alejandro Carbajales	Water Technology Centre
9	Carla Zilli	Climate-Change Division, Ministry of the Environment
10	Jorge Castro	Climate-Change Division, Ministry of the Environment
11	Fitzgerald Cantero	National Energy Directorate, MIEM
12	Lucia Vivanco	Guest
13	Maria Pia Olave	National Energy Directorate, MIEM
14	Martin Scarone	National Energy Directorate, MIEM
15	Stephanie Grunvald	National Energy Directorate, MIEM
16	Wilson Sierra	National Energy Directorate, MIEM
17	Carolina Mena	National Energy Directorate, MIEM
18	Javier Ciganda	National Energy Directorate, MIEM
19	Arturo Correa	Enersys
20	Ethel Morales	Faculty of Science, UdelaR
21	Pedro Galione Klot	Faculty of Engineering, UdelaR
22	Beatriz Olivet	National Energy Directorate, MIEM
23	Virginia Villarino	Government of Maldonado
24	Agustin Bertolotti	Lagomarsino & cía
25	Javier San Martin	Punta del Este Promotion League
26	Pablo Franco	Uruguayan Solar Workgroup
27	Ernesto Elenter	SEG Ingeniería
28	Daniel Primucci	University of Work of Uruguay
29	Carlos Bello Caceres	Technology University of Uruguay
30	Juan Marcelo Aguilar	Technology University of Uruguay
31	Vitoria Olave	Technology University of Uruguay
32	Eben Machado	Technology University of Uruguay
33	Eduardo Bergerie	National Electricity Generation and Transmission Administration
34	Federico Rehermann	Guest
35	Grundel Campos family	Guest
36	NAME	Guest
37	Marcos Zefferino	Guest
38	Jaime Parada (JP)	DEUMAN
39	Cristhian Abanto (CA)	DEUMAN
40	Lucia Samaniego (LS)	DEUMAN
41	Joshua Carvacho (JC)	DEUMAN
42	Mauricio Muñoz (MM)	DEUMAN
43	Diego Aravena (DA)	DEUMAN
44	Itala Ferrer (IF)	DEUMAN