

**ARGENTINA  
RENEWABLE  
ENERGIES:  
DIAGNOSIS,  
BARRIERS AND  
PROPOSALS**

J u n e 2 0 0 9



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Last, the authors would like to thank all those persons that have answered the Survey, who have contributed to the development of this Project.

## ► ACRONYMS

<b>AGEERA</b>	Association of Electric Power Generators of Argentina
<b>ASADES</b>	Argentine Association of Renewable Energies and the Environment
<b>BIRF</b>	International Bank for Reconstruction and Development
<b>CAMMESA</b>	Wholesale Electric Market Administrator
<b>CDM</b>	Clean Development Mechanism
<b>CEAMSE</b>	Metropolitan Area Ecological Coordination (State Enterprise)
<b>CEMSA</b>	Comercializadora de Energía del MERCOSUR S.A.
<b>CFEE</b>	Federal Electric Power Federal Council
<b>CITEFA</b>	Technical Research Center of the Armed Forces
<b>CNEA</b>	National Commission of Atomic Energy
<b>CONICET</b>	National Council of Scientific and Technical Research
<b>CREE</b>	Regional Wind Energy Center
<b>DW</b>	Domestic Waste water
<b>EE</b>	Electric Power
<b>ENARSA</b>	Energía Argentina S.A.
<b>ENDESA</b>	Energía de España S.A.
<b>FAO</b>	Food and Agriculture Organization
<b>FC</b>	Fuel Cell
<b>FEDEI</b>	Special Fund for Domestic Electrical Development
<b>GEI</b>	Greenhouse Gases
<b>GENREN</b>	Renewable Generation Program
<b>GIS</b>	Geographic Information System
<b>GT</b>	Geothermal Energy Generation
<b>GWh</b>	Gigawatt-Hour
<b>IMPSA</b>	Industrias Metalúrgicas Pescarmona
<b>INENCO</b>	Non-Conventional Energies Research Institute
<b>INIFTA</b>	Physical-Chemical Theoretical and Applied Research Institute
<b>INOMEM</b>	Non-Dispatched Electric Interconnected Market
<b>INTA</b>	National Agricultural Technology Institute
<b>INTI</b>	Nacional Institute of Industrial Technology
<b>INVAP</b>	Applied Research
<b>ISW</b>	Industrial Solid Waste
<b>IW</b>	Industrial Waste Water
<b>JICA</b>	Japan International Cooperation Agency
<b>kW</b>	Kilowatt
<b>LPG</b>	Liquefied Petroleum Gas
<b>MEM / WEM</b>	Wholesale Electric Market
<b>MW</b>	Megawatt
<b>MWh</b>	Megawatt-hour
<b>MWp</b>	Peak Megawatt
<b>NG</b>	Natural Gas
<b>ONGs</b>	Non-Governmental Organizations
<b>O&amp;M</b>	Operation & Maintenance
<b>PAEPRA</b>	Electric Power Supply Program for the Argentine Disperse Rural Population
<b>PDD</b>	Project Design Document
<b>PEN</b>	National Executive Power
<b>PERMER</b>	Renewable Energies Program for Rural Markets
<b>PROINSA</b>	Proyectos de Ingeniería S.A.
<b>RE</b>	Renewable Energies
<b>REEEP</b>	Renewable Energy & Energy Efficiency Partnership
<b>R&amp;D</b>	Research & Development
<b>SAyDS</b>	Environment and Sustainable Development Secretariat
<b>SAGPyA</b>	Agriculture, Livestock, Fishing and Feeding Secretariat
<b>SEGEMAR</b>	Argentine Mining Geological Service
<b>SHD</b>	Small Hydroelectric Developments
<b>T</b>	Tons
<b>TOE</b>	Oil Equivalent Ton
<b>TERI</b>	The Energy and Resources Institute
<b>UBA</b>	University of Buenos Aires
<b>UTN</b>	National Technologic University
<b>USW</b>	Urban solid waste

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## “PROSPECTIVE STUDY ON RENEWABLE ENERGIES AIMED AT REMOVING THE TECHNICAL, ECONOMIC, REGULATORY AND FINANCIAL BARRIERS OF ELECTRIC POWER GENERATION”

### WHY HAS THIS PROJECT BEEN DEVELOPED?

The Renewable Energies Area -which is part of the National Development Agency (Dirección Nacional de Promoción) of the Secretariat of Energy- is responsible for the public policies design process and is undergoing a stage in which it expects to receive strong signals in relation to the promotion of renewable energy sources. Towards that direction, the following objectives have been proposed:

- The identification of renewable energies projects by expanding the existing database.
- Institutional support for the promotion of projects within the national and provincial spheres.
- The updating of information databases on different technologies that are being applied in energy production.
- The coordination of international cooperation actions in order to ensure a proper application of the resources in terms of subject matter, quality and opportunity.
- The identification of the barriers<sup>1</sup> that may prevent a sustainable development of renewable energies sources and related technologies and the recommendation of support actions that may promote them.

It was precisely within the scope of these objectives that we decided to carry out this study.

Actually, in compliance with Act No. 26190/09 of the National Promotion Regulations for the use of renewable energy sources destined to the electric energy production, and Regulatory Decree 562/09 thereof, the expectation is to reach the goal of supplying 8% of the national electric power demand with renewable energies by the year 2016, based on a series of benefits such as: an additional compensation over market prices, which establishes differentiated incentives by source during the term of 15 years, tax benefits for investors, etc. All the sources and technologies are covered by the Act, except for the hydroelectric stations exceeding a capacity of 30MW<sup>2</sup>.

There are numerous precedents -at least 60 countries of the world have implemented renewable energy promotion policies for electric generation, many of them with national scope. In some countries such as the USA and Canada, the provisions are set forth at the state or provincial level. Among them, 27 countries belong to the European Union and they intend to reach 21% of the generated electric power with Renewal Energies, which would represent 12% of the total primary energy<sup>3</sup>.

Out of the countries included in the study, 37 are industrialized countries and countries with transitioning economies, while 23 countries are developing countries. In all of them, the most important promotion policies have been the following:

- Feed-in acts or provisions (37 countries). It is the case of price tariffs or guaranteed benefits, additional to the cost/price of the market that promotes production with renewable energies.
- Portfolio standards or renewable energies portfolio (also known as obligations or quotas), such as a binding renewable energy participation percentage in the total electric power generation.
- Subsidies or tax refunds for capital investments; tax incentives and credits; sales taxes and value added tax exemptions; payments for energy production or tax credits; net measurement (in accordance with grid transactions); public investment or financing; and calls for competitive bid.

In view of the background above and in order to assess the multiple aspects related to renewable energies -such as state-of-the-art, the identification of the obstacles that need to be removed, the most attractive niches and the need to implement additional measures- this study was performed. The purpose is to gain better knowledge and adjust the process in such a way as to guarantee the expansion of renewable energies and the attainment of the objectives set forth by Law<sup>4</sup>.



Additionally, the Renewable Energies Area further decided, in a complementary but not least important way, to implement a consultation mechanism on a permanent basis that may allow for the feeding and enrichment of the information deriving from and targeted to the different players involved in or who could be interested in participating in the Renewable Energies field.

Finally, it should be mentioned that this Project is financed by REEEP (Renewable Energy and Energy Efficiency Partnership), a public-private international entity that promotes policies and regulations in support of Renewable Energies and Energetic Efficiency. The Secretariat of Energy has acted as beneficiary of the project, while Fundación Bariloche has been the executor thereof.

This report that is available in <http://energia3.mecon.gov.ar/contenidos/verpagina.php?idpagina=2974>, is divided into three parts:

- The **First Part** includes the project objectives for each of the parts that make it up, and a Preliminary Diagnosis of the situation of renewable energies in Argentina regarding the available resources and applications within the framework of the effective legal framework.
- The **Second Part** develops the main results of the Project,

namely in relation to the implementation of the Renewable Energies WEB page of the Secretariat of Energy; a presentation of the related players database structure, and the process and results of the survey performed between September 2008 and January 2009.

- The **Third Part** includes the main conclusions and proposals suggested in the project.

It should be noted that for the execution of the different areas object of the study, trips, meetings and interviews had taken place, without which it would have been impossible to attain the results that we have reached.

Particularly, it should be noted that one of the most important activities was the Meeting of REEEP Project Coordinators held on February 4 and 5 of 2008 at the Teri Institute of New Delhi, India. A professional of the Renewable Energies Area of the Secretariat of Energy attended such meeting. The Meeting had two main objectives: the first one was to provide a meeting point for the different projects of the REEEP network, and the second one was to evaluate the progress of REEEP's strategic plans and to generate ideas for the increase of the future programs impact.

Throughout this document, other similar activities performed within the framework of this Project will be further analyzed.

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*1. Barrier shall mean any obstacle that may be overcome by political actions. The applied terminology arises from widely used methodologies in which the situations related to a problem affecting the development of new options (or the deepening of the existing ones) to be implemented are analyzed within the most diverse spectrum of issues. Particularly in relation to Renewable Energies, there is an infinite number of studies worldwide, without which it could not have been possible to carry out specific actions to overcome the inconveniences that may have been detected.*

*2. Provided they are incorporated to the Ministry of Energy and Mining or they belong to the Public Electric Power Service.*

*3. Source: REN21. 2008. "Renewables 2007 Global Status Report" Paris. Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH.*

*4. Even though the initial objective of the Project was strictly aimed at electric power generation with renewable energies as provided by Act 26190, other uses were incorporated to the analysis as for example, the caloric, as well as other associated technologies as for example the bioclimatic architecture.*







1

FIRTS  
PART

## OBJECTIVES

The main objectives that we established at the moment of deciding to carry out the Project are listed below.

### Objectives of the Secretariat of Energy:

- To identify the economic, institutional, financial and regulatory barriers that may affect the development of renewable energy projects in Argentina.
- To identify the strategies, actions and instruments that may ease the removal of such barriers.
- To publicly release the results that may be obtained.

### Objectives of the Donor (REEEP):

- To gain knowledge on renewable energies and energy efficiency in Latin America.

- To develop the necessary capacity to replicate the proposed institutional consultation model.
- To gain more knowledge on existing financial instruments for the development of renewable energies.
- To share knowledge on renewable energy projects.

### Specific Objective of the Project:

- To design an institutional consultation model and implement the necessary consultation mechanisms among the selected players in order to identify the perception on renewable energy projects and the evolution of their respective markets in Argentina.

## PRELIMINARY DIAGNOSIS

As a starting point, a brief preliminary diagnosis was carried out on the renewable energies sector of Argentina. Below are the most prominent aspects both regarding availability of resources and their effective application and the regulations in relation to renewable energies in the country.

This is complemented by maps, pictures, schemes and tables in which relevant experiences in the development of renewable energies in Argentina are highlighted.

Exhibit A shows the different entities that are related to the issue. Exhibit B shows a significant legal precedent: Municipal Ordinance of Venado Tuerto No. 3633/2008.

## RESOURCES AND APPLICATIONS

Which and how many are the main renewable resources available to us? Are they being used? How are they being used? Where are they being used? In this section we will try to provide a detailed answer to these questions.

### ► SOLAR ENERGY

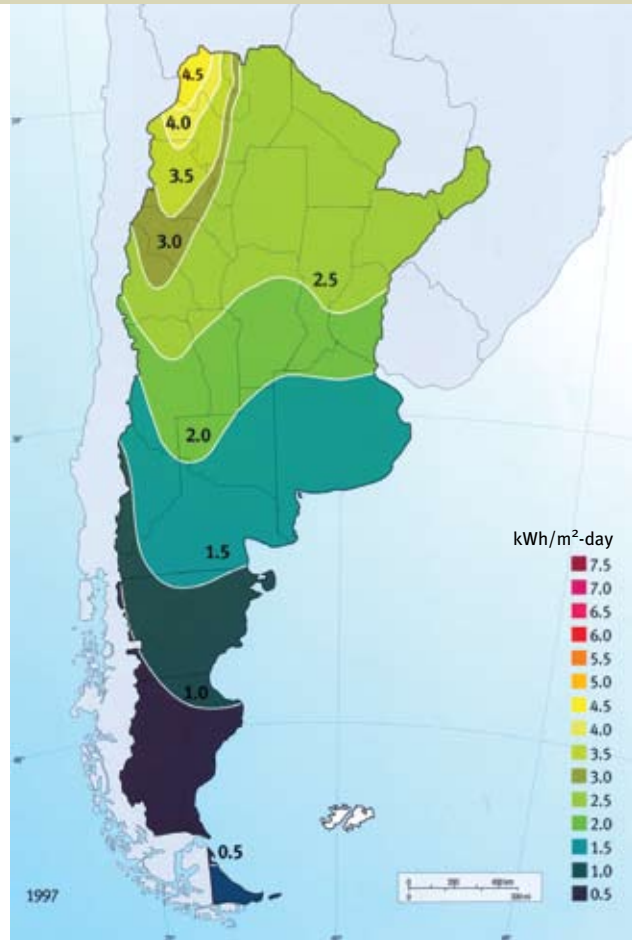
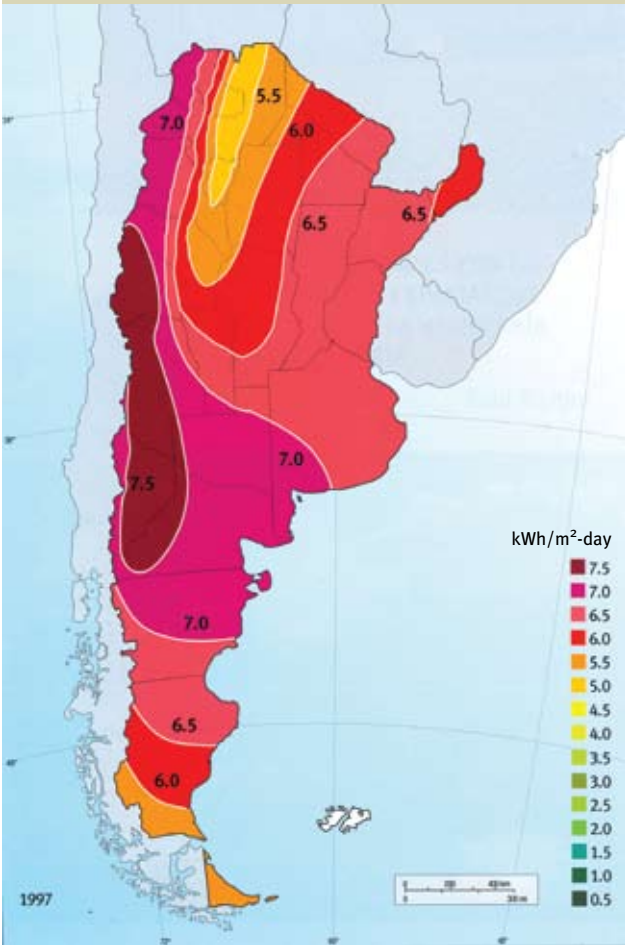
There is a reasonable knowledge of the solar energy available in the country and its geographic distribution, even though there are regions of the country that would have to be studied in more detail. Therefore an ongoing measurement of the resource improving the spatial coverage and the instruments used is required. In any case, it is considered that the existing charts <sup>5</sup> adequately represent the data available in Argentina.

Currently the National Solar Measurement Station Network operates only three measurement stations. A university network is being structured, which will add 20 measurement stations.

In the solar radiation maps of the Secretariat of Energy prepared for PAEPRA, it may be noted that 11 out of 23 provinces of the country show annual mean values above 5 kWh/m<sup>2</sup>-day, which shows that it is apt for the installation of photovoltaic panels. These provinces are located to the north of the Colorado River (Catamarca, Corrientes, Chaco, Formosa, Jujuy, La Pampa, La Rioja, Mendoza, San Juan, San Luis y Santa Fe). On the other hand, the provinces of Santa Cruz and Tierra del Fu-

5. "Atlas de energía solar de la República Argentina", H. Grossi Gallegos y R. Righini. Published by the National University of Luján and the Secretariat of Science and Technology, Buenos Aires, Argentina, March 2007.

► RADIATION LEVELS MAPS



Source: Grossi Gallegos, Hugo. "Red Solarimétrica del Servicio Meteorológico Nacional (SMN)". Argentina. 1998

ego show annual mean values much below 5 KWh/m<sup>2</sup>-day and a great variation between winter and summer, which would not allow for the obtainment of equal levels of generation as in the Northern provinces for the same installed capacity.

There are more provinces with the adequate quality of resource for thermal solar uses than those having the resource for electrical uses, and the former cover a large part of the national territory. Therefore, there is a great potential for the substitution of LPG, NG and firewood in thermal uses (water heating, cooking, room conditioning) in a large area of Argentina, including urban and cold areas.

Photovoltaic installations constructed within the framework of PERMER in bidding or awarding stage amount to around 1MWp (residential, schools and public utilities).

The accumulated capacity estimated for photovoltaic installations will be of approximately 10 MWp for the year 2007. The calculated generation for that year was of approximately 17 GWh. These figures represent the 0.016% of the installed capacity and the 0.016% of the electric power generated in the country.

► AZUL PAMPA SCHOOL (HUMAHUACA DEPARTMENT) WITH PHOTOVOLTAIC PANELS AND SOLAR WATER HEATER



Source: EJEDSA

Among the projects that are not included within the scope of PERMER but contribute to installed capacity we can mention: the electrification of rural schools of the Province of Buenos Aires, the provision of residential Electrical Power and public utilities in Neuquén and experiences of water pumping in Catamarca.

In turn, by mid 2009 the province of San Juan called for an international bid for the creation of a solar station with photovoltaic solar panels of around 1.2 MW. Additionally, and within the scope of the GENREN<sup>6</sup> program, 10 MW of Electric Power photovoltaic generation, and 25 MW with electric thermoelectric solar generation shall be called for bid.

In the area of thermoelectric generation, ENARSA is participating in the development of a prototype based on a Stirling engine (500 W), together with the Instituto de Investigaciones en Energías No Convencionales of the National University of Salta. The estimated potential for thermoelectric generation might reach several hundred MW.

► **SOLAR PROTOTYPE FARM  
LINEAL FRESNEL TYPE GENERATOR**



Source: INENCO – Salta – Secretariat of Energy

**PERMER PROJECT**

The most important project that is being currently implemented by the Secretariat of Energy is called PERMER (Renewable Energies Program for Rural Markets). The total amount of the project was obtained by means of a loan granted by the International Bank for Reconstruction and Development (IBRD) (USD30 M), a donation of the World Environment Fund–WEF- (USD 10 M), Provincial Funds which namely include the Special Fund for the Domestic Electric Development (FEDEI), contributions of the Ministry of Education for the electrification of rural schools, concession holders and clients.

The first stage involves the provision of the service to approximately 87,000 users and 2,000 public institutions mainly for lighting

and social communication purposes. It includes the use of different systems such as photovoltaic, wind, fuel cells, hydraulic micro turbines and, eventually, diesel generators. The installation of the equipment is subsidized in order to stimulate users and make the investment of private providers possible. The implementation of the project will take place through agreements between the National State and the Provincial Governments. In turn, those Provinces interested in taking part in the PERMER shall be legally entitled to grant the concession to private or public companies including the areas of their scattered rural market and availability to allocate resources of the Electrical Funds as matching local financing.

As part of the Project, different market research has been conducted (residential use, productive capabilities) in the provinces of Santa Fe, Jujuy, Salta, Buenos Aires, Chaco, Tucumán, Neuquén, San Juan, La Pampa, Misiones, Tierra del Fuego, Corrientes, Chubut, Mendoza and Formosa. The possibility of developing new projects in Santa Cruz, San Luis, Entre Ríos and Santa Fe is currently under study.

Projects of photovoltaic cells of different sizes, in total amounting approximately to another MWp, are currently being deployed. Also, thermal solar systems (solar furnaces and ovens) are under implementation.

As regards the use of solar energy with thermal purposes, although water heating installations have not been quantified, it is estimated that they are limited to high purchasing power niches and certain businesses and services using LPG. The promotion of other technologies for cooking, drying and purification is also restricted to academic unit extension programs and to the action of certain NGOs. There are an important amount of research and demonstrative projects in bioclimatic architecture (schools, health centers, academic institutions), even though they have been scarcely promoted as regards their potential.

► **WIND ENERGY**

Within the scope of the National Wind Strategic Plan and with a view to the promotion of the resource, the Regional Center of Wind Energy (CREE)<sup>7</sup>, together with the National Technologic University (UTN) –with the support of the MINPLAN– developed the Wind Atlas of Southern Argentina’s Potential for each one of the provinces that form part of it. These data have been transferred to a Wind GIS available online<sup>8</sup> offering information about winds in any part of the country. Thanks to this information it is possible to calculate the technically developable wind potential of our country approximately estimated in several thousand MW.

6. Renewable Generation” Program, launched on 05/20/09. The National State through ENARSA will call for bids for the purchase of renewable energy for a total of 1.015 MW. The life of the contracts shall be of 15 years and their awarding shall take place in modules of up to 50 MW.

7. The CREE was created in the year 1985 by means of an agreement between the Province of Chubut, the National University of the Patagonia (Universidad Nacional de la Patagonia) and the Secretariat of Energy. Since the year 1990 it depends exclusively on the Province of Chubut and is currently working as consultant entity nationally and internationally.

This is reflected in a portfolio of high voltage projects around the 5000 MW<sup>9</sup>.

It is estimated that the projects under development (or in an advanced stage of preparation) exceed the 2800 MW. An example of this can be the bid called in the year 2007 for the first stage of the project "Vientos de la Patagonia I" ("Patagonia Winds I") (an association between ENARSA and the province of Chubut) which was awarded to two companies. Each of them has already installed a prototype of around 1.5 MW, from a total of 60 MW which the farm would have. The evaluation of prototypes would last until October 2009.

Another example is the first stage of the Arauco wind farm in La Rioja to be financed by the National State. The first aerogenerator of 2.1 MW (IMPISA) from a total of 25 MW is about to be installed. On the other hand, the National Wind Strategic Plan includes the installation of a total of 300 MW for the year 2012 (Chubut, Santa Cruz, Buenos Aires, La Rioja, Neuquén, Río Negro). Additionally, there are private projects which could add extra 400 MW to that date.

There are currently almost 30 MW **medium/high capacity wind** installed in Argentina (0.11% of the total installed capacity in 2007), most of them belonging to Electric Cooperatives, as it is shown in the following Chart. During that year, the existing turbines produced almost 62 GWh, constituting a contribution of approximately 0.06% of the total generation of electricity<sup>10</sup>.

#### ► WIND FARMS INSTALLED IN ARGENTINA

CITY	PROVINCE	START SERVICE	POWER OVERALL (KW)	DETAIL MACHINES	MAKE AND MODEL	SPEED, HALF ANNUAL (M/S)	OWNER OPERATOR	COMMENTS
Comodoro Rivadavia	Chubut	19/1/94	500	2 x 250 KW	MICON M530	9,4	PECORSA	P.E. "COMODORO RIVADAVIA"
Cutral-Co	Neuquén	20/10/94	400	1 x 400 KW	MICON M750-400/100	7,2	COPELCO Coop. Ltda.	
Pehuen-Co	Buenos Aires	17/2/95	400	1 x 400 KW	MICON M750-400/100	7,3	Coop. Electric de Punta Alta	
Tandil	Buenos Aires	26/5/95	800	2 x 400 KW	MICON M750-400/100	7,2	CRETAL Coop. Ltda.	
Rada Tilly	Chubut	18/3/96	400	1 x 400 KW	MICON M750-400/100	10,2	CO AGUA Coop. Ltda.	
Comodoro Rivadavia	Chubut	12/9/97	6.000	8 x 750 KW	NEG-MICON NM750/44	9,4	SCPL Com. Riv.	P.E. "ANTONIO MORÁN"
Mayor Buratovich	Buenos Aires	22/10/97	1.200	2 x 600 KW	AN BONUS 600 KW/44	7,4	Coop. Electric de M. Buratovich	
Darregueira	Buenos Aires	19/9/97	750	1 x 750 KW	NEG-MICON NM750/44	7,3	CELDA Coop. Ltda.	P.E. "HERCULES"
Punta Alta (Bajo Hondo)	Buenos Aires	10/12/98	1.800	3 x 600 KW	AN BONUS 600 KW/44	7,8	Coop. Electric de Punta Alta	P.E. "CENTENARIO"
Claromecó	Buenos Aires	26/12/98	750	1 x 750 KW	NEG-MICON NM750/48	7,3	Coop. Electric de Claromecó	
Pico Truncado	Santa Cruz	5/3/01	2.400	4 x 600 KW	ENERCON (WOBVEN) E-40	10,3	Municipality de Pico Truncado	P.E. "JORGE ROMANUTTI"
Comodoro Rivadavia	Chubut	10/01	10.560	16 x 660 KW	GAMESA G-47	9,4	SCPL Com. Riv.	P.E. "ANTONIO MORÁN"
Gral Acha	La Pampa	11/02	1.800	2 x 900 KW	NEG-MICON NM900/52	7,2	COSEGA Ltda.	
Veladero	San Juan	9/07	2.000	1 x 2000 KW	DEWIND D8.2	--	BARRICK GOLD Corp.	Self Production
		POWER OVERALL:	29.760					

Source: Secretariat of Energy, Renewable Energies Area.

8. <http://www.sigeolico.com.ar/frameset.php>.

9. MR Consultants. "2ª Comunicación Nacional del Gobierno de la República. Mitigación de emisiones a través del desarrollo de la utilización de energías renovables," "Evaluación del mercado de las energías renovables en la República Argentina". October 2005.

10. According to SEE. Electric Power Yearbook. Electric Sector Report 2007.



### DEVELOPMENT OF HIGH CAPACITY WIND TECHNOLOGY

Three national companies are currently developing prototypes of aerogenerators with a capacity similar to or higher than 1 MW and with state-of-the-art technology (INVAP, IMPSA, NRG). These include a significant number of components manufactured in Argentina. Two of them have participated in bids within the framework of the National Wind Strategic Plan as equipment providers.

These technological developments are almost unique in Latin America and they show the interest for the magnitude of the wind potential of Argentina and of the Region. In particular, IMPSA has installed a factory in Brazil, oriented both to the local market and to exportation where about 300 wind MW have been installed. Very soon, equipment for the wind farm located in Arauco, La Rioja, will be manufactured locally.

As regards **low capacity wind** energy, according to the National Agricultural Census 2002, that year there were 1162 aerogenerators installed for the production of electricity. Assuming an average value of 500 W per equipment, the approximate installed capacity is of 0.6 MW.

Notwithstanding the aerogenerators installed, according to the said Census, 93 kW were identified as installed in school areas in scattered villages in the Province of Chubut.

Within the framework of the PERMER Program, there was a call for bids for the installation of 1500 aerogenerators (0.9 MW) for isolated population in the province of Chubut. On the other hand, the Government of the province of Neuquén, together with INVAP is working on the installation of 4.5 kW aerogenerators for productive activities in rural areas.

### ► BIOMASS

In order to assess the potential of biomass, first we should consider as such all the organic matter both of vegetable and animal origin, including those materials deriving from their natural or artificial transformation. We can classify it as follows:

- Natural Biomass: produced by nature without human intervention.
- Residual Biomass: produced by any human activity, mainly in agricultural and livestock processes and those specifically of human-beings such as waste and residual waters.
- Produced Biomass: cultivated in order to obtain biomass which can be transformed into fuel, instead of producing food, such as sugar cane, oriented to the production of ethanol for fuel.

In this sense, the FAO, within the institutional framework formed by the Secretariat of Energy, the Secretariat of the Environment and Sustainable Development, and the Secretariat of Agriculture, Livestock, Fishing and Food and the INTA, has evaluated the natural biomass resource in detail using the WISDOM model. This evaluation includes an estimation based on secondary information obtained from productive statistics with data about the geographical distribution of the firewood potential, another woody biomass (generated by roundwood processing), from the bagasse, agricultural and agro-industrial waste.

### ► MOUNTING OF THE FIRST HIGH CAPACITY WIND GENERATOR. VIENTOS DE LA PATAGONIA I



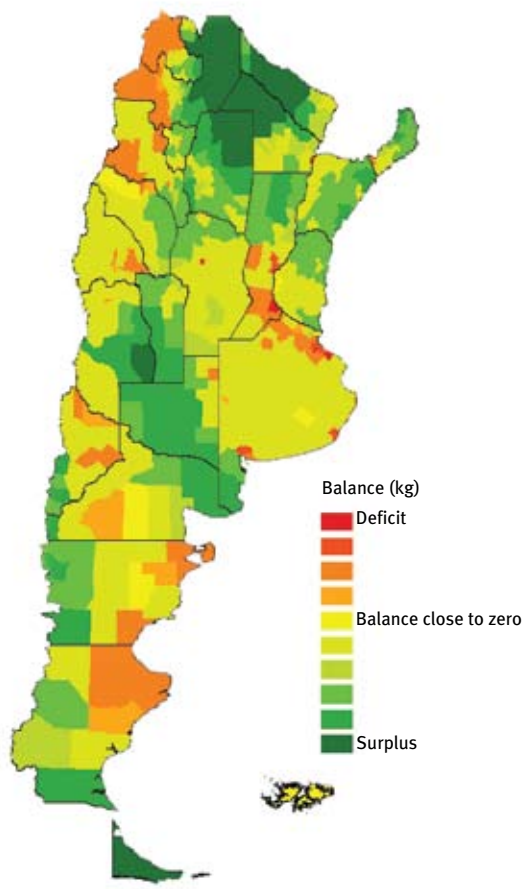
Source: Regional Center of Wind Energy (CREE).

The study of the FAO project shows that according to the model used the total accessible and potentially reported biomass, amounted to more than 148 million Tons, while the so called "Commercial Biomass" which is accessible and potentially available amounted to more than 124 million Tons.

In order to dimension the available potential, the Secretariat of Energy has carried out a survey of Projects for the generation of electricity with biomass, quantified by means of field studies. This survey shows a potential of almost 422 MW.



► **DISTRIBUTION OF THE BIOMASS RESOURCE**



Source: Wisdom Argentina, Final Report, FAO-INTA, May 2009.

Among the identified projects, the following shall be given special attention:

In the Province of Entre Ríos:

- San Salvador, with a generation potential of 7.5 MW using rice paddies waste and with fluidized bed combustion (refer to the following scheme) and vibrating grid (currently under bid process).
- Villaguay with a generation potential of 2 MW using rice paddies waste and vibrating grid technology.
- Concordia with a generation potential of 25 MW, using forest industrial waste by means of combustion and gasification technologies.
- Federación with a potential of 25 MW, using forest industrial waste, by means of combustion and gasification technologies (currently under bid process).

In the Province of Corrientes:

- The station proposed for the population of San Antonio Isla, in the Province of Corrientes is a gasification system of 10 kWe. The station would be manually operated and would need 300 kg/day waste.

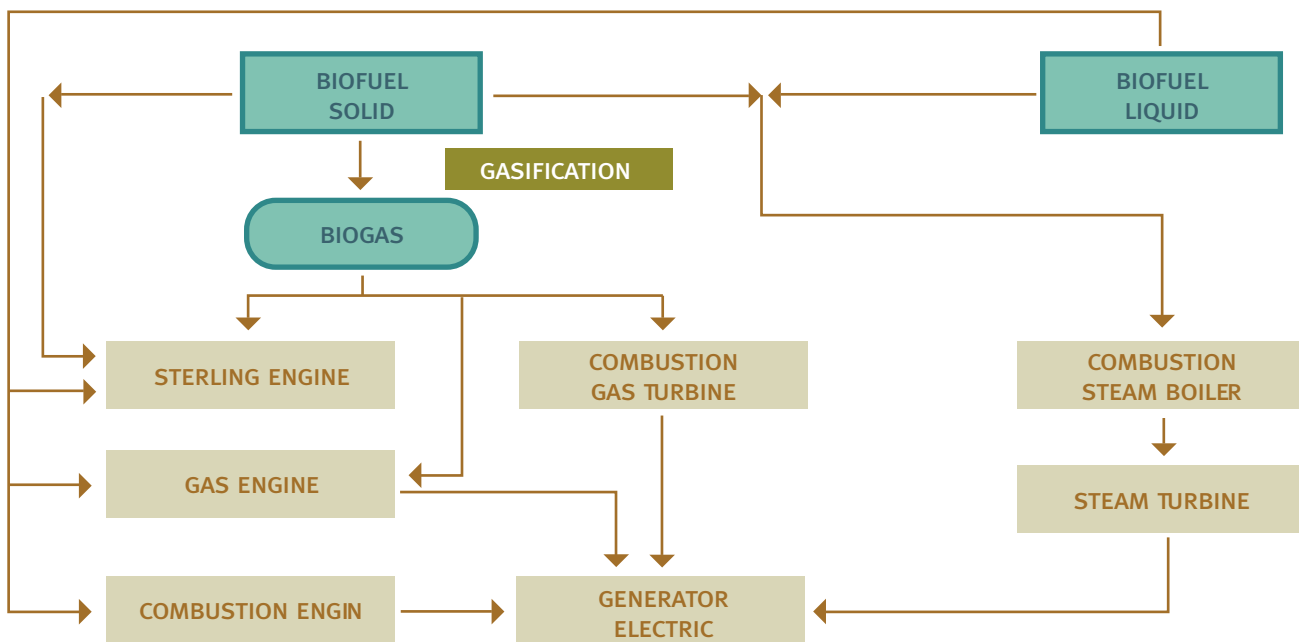
In the Province of Misiones:

- For the population of Picada Unión, the proposal includes a gasification system with a 20 kWe capacity, manually operated, requiring 300 kg/day waste.

In the province of Mendoza<sup>11</sup>:

- Locality of San Martín. This station could be supplied with 142,563 T/year of biomass (originated in the wine industry) with an installed capacity of 26 MW.
- Locality of Villa General Gutiérrez (Maipú), with 112,523 T/year of biomass (originated in the wine industry, timber saw-

► **TECHNOLOGICAL ALTERNATIVES FOR THE OBTAINMENT OF ELECTRIC POWER FROM BIOFUELS**



Source: Secretariat of Energy. Area of Renewable Energies.

11. Flores Marco, Noelia; Anschau, Renée Alicia; Carballo, Stella; Hilbert, Jorge. "Bioenergía como vehículo de valoración de las cadenas agroforestoindustriales regionales, para el desarrollo de las comunidades locales. Perspectivas de desarrollo con criterios de sustentabilidad ecológica, social y económica".

mills and waste of the oil industry) with a capacity of 20 MW.

- Locality of Cordón del Plata, department of Tupungato, with an availability of 48,757 T/year of biomass (originated in the wine industry), which could generate 6 MW.
- Locality of San Rafael (originated in the wine industry) with a biomass potential of 53,391 T/year, a station of 6 MW could be installed.

As regards the projects under development (or in an advanced stage of preparation) there are several associated to the current potential in reconversion and modernization of sugar mills. Their total number is about 156 MW, to be installed with cogeneration technology. They are located mainly in Tucumán and Salta provinces.

Nowadays, one of the greatest developments of biomass is to use the sugar cane bagasse as fuel for the boilers in sugar mills (1014 ktep, 145 for a self production of electric power<sup>12</sup>). In certain cases, this resource allows for the energetic self-sufficiency thereof, and in other cases, the excess of electric power is supplied to the Public Utilities network.

We can also find installed equipment using agro-industrial waste of peanut shell, sunflower, bagasse and forest industrial waste<sup>13</sup>. The Secretariat of Energy calculates a total installed capacity of almost 720 MW exploiting biomass waste.

Another power source considered as a subcomponent of natural biomass is related to the production of livestock manure, associated to the number of heads of the main country animals and their relevant daily production of dry manure. In order to determine the exploitable manure, the total production should be allocated and multiplied by a percentage which varies according to the type of animal producing the manure reflecting the potential which could be collected.

Taking into account an energy content of 3500 Kcal/kg of manure, we obtain the tons of oil equivalent (Toe) representing those tons of exploitable dry manure. The best technology for the use of this resource is that of biodigesters which convert manure into gas (with approximately 60% content of methane). The average performance of this technology is around 15%. There is an estimation of a potential capacity of 0.75 million Toe, equivalent to the consumption of LPG in 3.8 million poor households, considering they consume 1.5 10kg cylinders monthly per household<sup>14</sup>. In Argentina, we can already find a certain development of these resources. As an example we can mention an integrated company for the production of grain and poultry. They produce food and electric power from biogas obtained from the treatment of agro-industrial waste and from the poultry stock reaching a generation of 50% of the total daily consumption (23 MWh/day)<sup>15</sup>.

Finally, it is worth noticing, that although the largest part of this livestock waste would be available, in many cases it would

► DETAIL OF HUMID FILTERS TO CONTROL THE EMISSION OF ASHES (SCRUBBER). SANTA BÁRBARA SAWMILL



Source: Courtesy of Geographer Pablo Carulla.

be very difficult to collect it because the animals are widely scattered on the fields. The most accessible waste would be the one collected in dairy farms, feed-lots, pigpens or poultry farms. It should be noticed, that in contrast to what happens with agricultural waste, the use of livestock waste for the production of biogas does not take away nutrients from the soil provided one of the products obtained is an excellent organic compensation which can be composted or mixed with other organic materials and added directly to the soil.

On the other hand, research carried out by the School of Engineering of the National University of the Centro, shows that the development of this waste with energy-related purposes is still in its early stages and faces several obstacles, and it points out that in order to generate a change in the current situation, "it is necessary to establish an undisputable compromise between the producer and the environment, assuming that there is no sustainable form of production if we ignore to what extent the ecosystems are capable of generating resources and reducing the impacts caused by anthropogenic activities. We should make the producers aware that waste is a part of the productive process, and its management costs must be necessarily included in the economic equation of this activity notwithstanding the intervention of the State in order to facilitate certain aspects such as the inclusion of technology or the promotion of the energetic exploitation"<sup>16</sup>.

Another component of the biomass category is associated to urban solid waste (USW). In the country, 95% of the methane emissions from Urban Solid Waste come from 4 fills: CEAMSE, Córdoba, Rosario and Mar del Plata. Domestic Wastewater (DW) and Industrial Wastewater (IW) are also included in this category. The estimation is that approximately 75% of meth-

12. According to the Secretariat of Energy, Electric Sector Report, Electric Power Yearbook 2007.

13. Ditto 11.

14. Di Sbroiavacca Nicolás, Nadal Gustavo. "Estimación de los Recursos Energéticos Renovables de la República Argentina" Fundación Bariloche, July 2004.

15. Daziano Marcos – University of Buenos Aires. "Tratamiento de residuos en el campo aviar con tecnología alemana". Presented in "Desafíos y estrategias para implementar la digestión anaeróbica en los agrosistemas". May 2007, Buenos Aires, Argentina.

16. National University of The Centre of the Province of Buenos Aires, School of Engineering. "Evaluación, diagnóstico y propuestas de acción para la mejora de las problemáticas ambientales y mitigación de gases de efecto invernadero vinculados a la producción porcina, avícola y bovina (feedlots y tambos)". Executive Summary. December 2008. Contract UNCPBA-World Bank 7145486.





ane of these sources can be recovered and be reused for heating or generation of electricity<sup>17</sup>.

It is worth mentioning that only 32 projects (PDDs) have been submitted to the Argentina's Clean Development Office to apply for Carbon credits through the reduction of GG emissions. A 75% of those projects are initiatives for the energetic development of biomass in its different forms of presentation, with a special attention given to the ISW (industrial) and USW (urban). These low levels of participation represent the lack of in-

terest in these kinds of projects although there are numerous available resources.

In order to promote the use of all these resources there are currently bid processes within the framework of the GENREN program in order to guarantee the purchase of the power generated by 120 MW based on USW, 20 MW based on biogas, 150 MW based on biofuels, and 100 MW based on unspecified biomass.

### RENEWABLE ENERGIES IN THE MUNICIPALITY OF VENADO TUERTO

The Municipality of Venado Tuerto, in the Province of Santa Fe, has been a pioneer in the support and deployment of projects related to renewable energies and sustainable waste management. It is the only municipality in Argentina which has passed an Ordinance (Number 3633-08 in EXHIBIT B) for the research, development, production and use of renewable energies explicitly focused on thermal applications. This Ordinance also provides for the implementation of a promotional system by means of benefits, tax-exemption, etc. from the municipal General Real Property Rate. This Municipality has an Area within the Secretariat of Public Space and Environment specialized in Renewable Energies and Sustainable Development. Professor Lorenzo Pérez, the head of this area, states that together with the Municipality there are a number

of institutions, government agencies, private entities, universities, schools, companies, foundations and legislators taking part in it. Among other actions taken by them we should mention the creation of the School Network, the organization of the Solar Cooking marathon; the Master in Renewable Energies and Sustainable Development in cooperation with the Universidad Nacional de Rosario. Additionally, training is given for the installation of solar collectors, biodigesters and photovoltaic panels. The preparation of a local power plan with the participation of the Secretariat of Energy and the local Cooperative of Popular Consumption of Electricity and Services should be noticed.  
[http://www.venadotuerto.gov.ar/1\\_gobierno/espacios\\_publicos/espacios\\_publicos.htm](http://www.venadotuerto.gov.ar/1_gobierno/espacios_publicos/espacios_publicos.htm)

### ► GEOTHERMIC

The Geothermic Department of the Directorate for Geological-Mining Resources of the Argentine Mining Geological Service (SEGEMAR)<sup>18</sup> of the Secretariat of Mining carried out a study of the theoretical potential of the geothermal resources in Argentina.

This survey is an important step towards the understanding of the geothermal resources in Argentina as it allows for a previous knowledge of the main parameters of the thermal fluids in future research. In turn, there is a different degree of in-depth studies according to the different regions of the country under study, but the level of knowledge allows for a characterization of all the geothermal resources and delimitation of the areas where hydrothermal deposits are located. According to SEGEMAR: "The knowledge gained about thermal resources in Argentina is currently satisfactory. However, the degree of use of the Thermal Areas studied is not. Ninety percent of the country regions having possibilities of high enthalpy have been covered by some studies, while 75% of the regions with possibilities of low enthalpy presenting super-

ficial evidence have been covered by other studies. This research has been taking place in the Andean and extra-Andean regions of Argentina".

Based on the recommendations resulting from the survey activities, there were deeper studies of 25 geothermal areas with favorable characteristics that advanced towards the following prefeasibility stage. These were developed for high enthalpy projects (over 150°C) in volcanic areas formed by four reservoirs: Tuzgle, Domuyo, Copahue-Caviahue and Valle del Cura<sup>19</sup>.

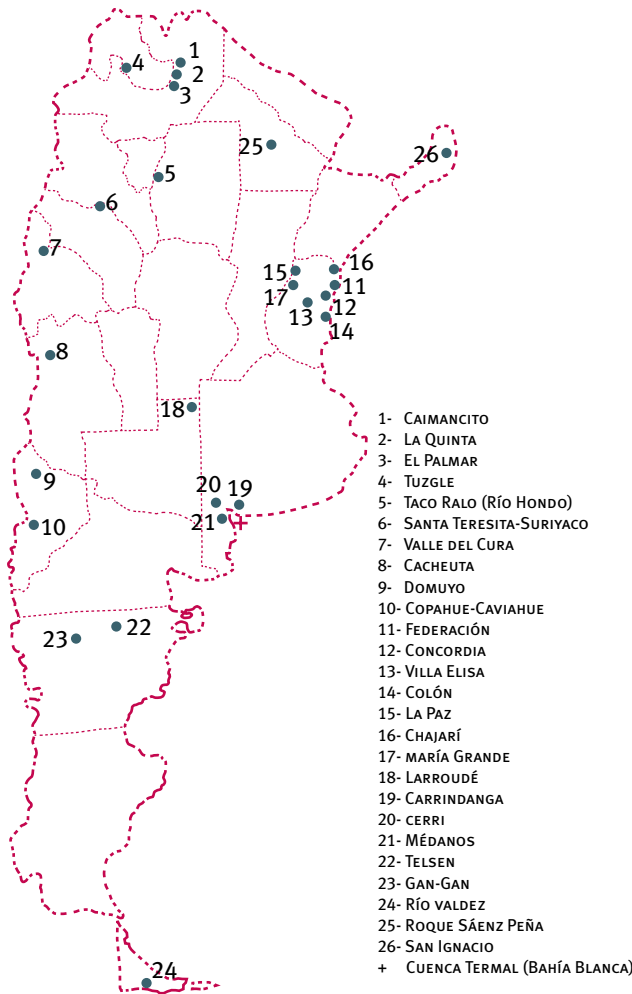
For low-enthalpy projects studies were carried out in the areas of Cerri, Médanos, Carrindanga, Caimancito, La Quinta, El Palmar, Tacorralo-Río Hondo, Río Valdez, Santa Teresita-Suriyaco, Colón, Villa Elisa, Federación, Concordia, La Paz, Chajarí, Larroude, Telsen, Gan Gan, Roque Saenz Peña and San Ignacio. The feasibility phase continued with thermal drilling in the geothermal fields of Copahue-Caviahue, Tacorralo-Río Hondo, Cerri, Médanos, Carrindanga, Colón, Villa Elisa, Federación, Concordia, La Paz, Chajarí and Larroude.

17. As an example of this we can mention the State of Minas Gerais where gas is recovered and reused in the fleet of garbage trucks and in the fleet of taxis. Ricardo Vicari in "Argentina: Diagnóstico, Prospectivas y lineamientos para definir Estrategias posibles ante el Cambio Climático" Fundación Bariloche/ ENDESA CEMSA S.A. Buenos Aires, Argentina, September 2008.

18. SEGEMAR is the Technological and Scientific Agency of the State responsible for the production of geological, technological, mining and environmental know-how and information necessary for the promotion of the sustainable development of non-renewable natural resources, their rational exploitation and the prevention of natural and anthropic risks.

19. The private company Geotermia Argentina and the public company Energía Provincial Sociedad del Estado (EPSE) have recently signed an agreement for the installation of a power station located in the area of Despoblados, in the Valle del Cura, which shall contribute 5 MW to the provincial electrical system of San Juan during the first stage. There have been statements in the sense that a second stage where a capacity of 150 MW could be reached is about to take place.

► LOCALIZATION OF SURVEY STUDIES CARRIED OUT BY THE SEGEMAR



Source: SEGEMAR

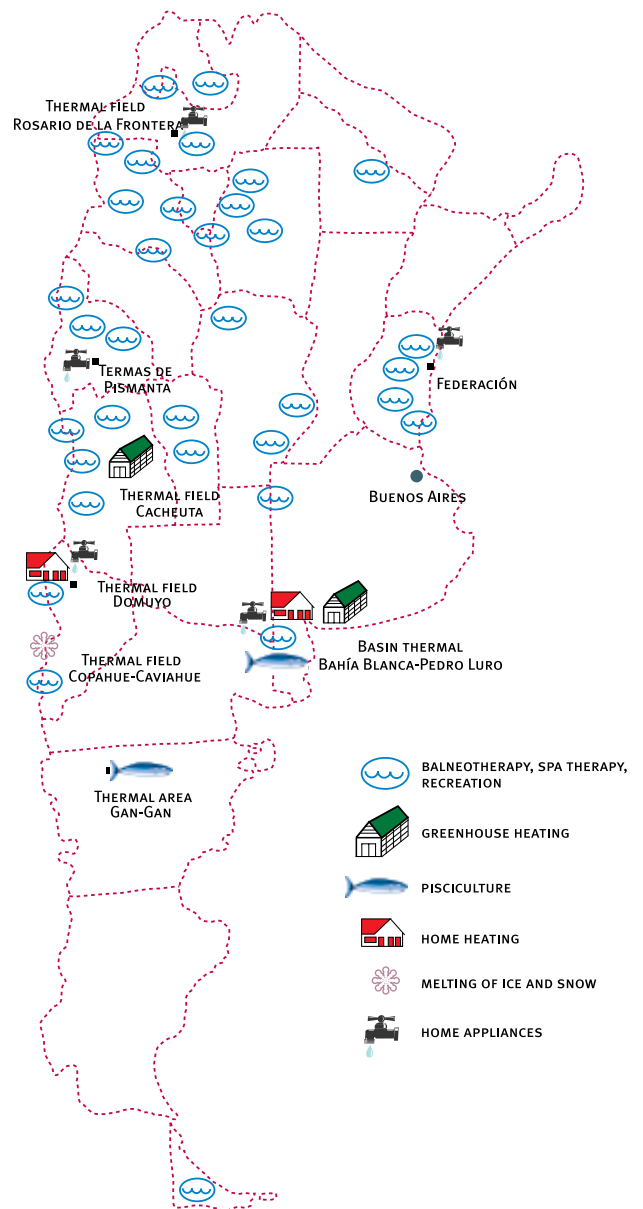
The Copahue geothermal field is the one which has been more thoroughly studied with a proven potential of 30 MW electric, according to the feasibility of the JICA in 1992. The provincial government, through the Agency for the Promotion and Development of Investments (ADI-NQN SEP), has invited private investors to construct and operate the electric power generation station of 30 MW of installed capacity called “Las Mellizas de Copahue”. The project will use the endogenous steam of the field and shall demand a 70 million dollar investment.

The only demonstrative project that has taken place in Argentina for high enthalpy geothermal energy is the Pilot Power Station of 0.67 MW binary cycle installed in 1988 in the Copahue geothermal field, in the Province of Neuquén, which has been closed for several years.

Within the framework of GENREN, there will be a call for bid for the construction of 30 MW originated in any of the four potential reservoirs stated above (Copahue, Domuyo, Valle del Cura or Tuzgle).

The main uses of geothermics in Argentina are: balneology, thawing of streets and routes, greenhouses, heating and aquaculture (Pesce, 1998b). According to SEGEMAR “there are currently one hundred and thirty-four (134) undertakings with an annual installed capacity of 25.7 MWt, which use thermal fluids for thermal use. Balneology is the main type of use, with 52.7%, which is equivalent to an annual installed capacity of 13.56 MWt. Other common types are: domestic use with 24.6% of the annual installed capacity (6.33 MWt); domestic heating with 4.6%, equivalent to 1.17 MWt; greenhouses with 4.5% of installed capacity (1.14 MWt); aquaculture with 1.5% with an equivalent of 0.38 MWt; industrial uses with 6.7% of the installed capacity (1.72 MWt) and snow melting with 5.4% corresponding to an installed capacity of 1.4 MWt”<sup>20</sup>.

► LOCALIZATION OF THERMAL DEVELOPMENT



Source: SEGEMAR

20. <http://www.segemar.gov.ar/geotermia/pagina/sintesis.htm>.

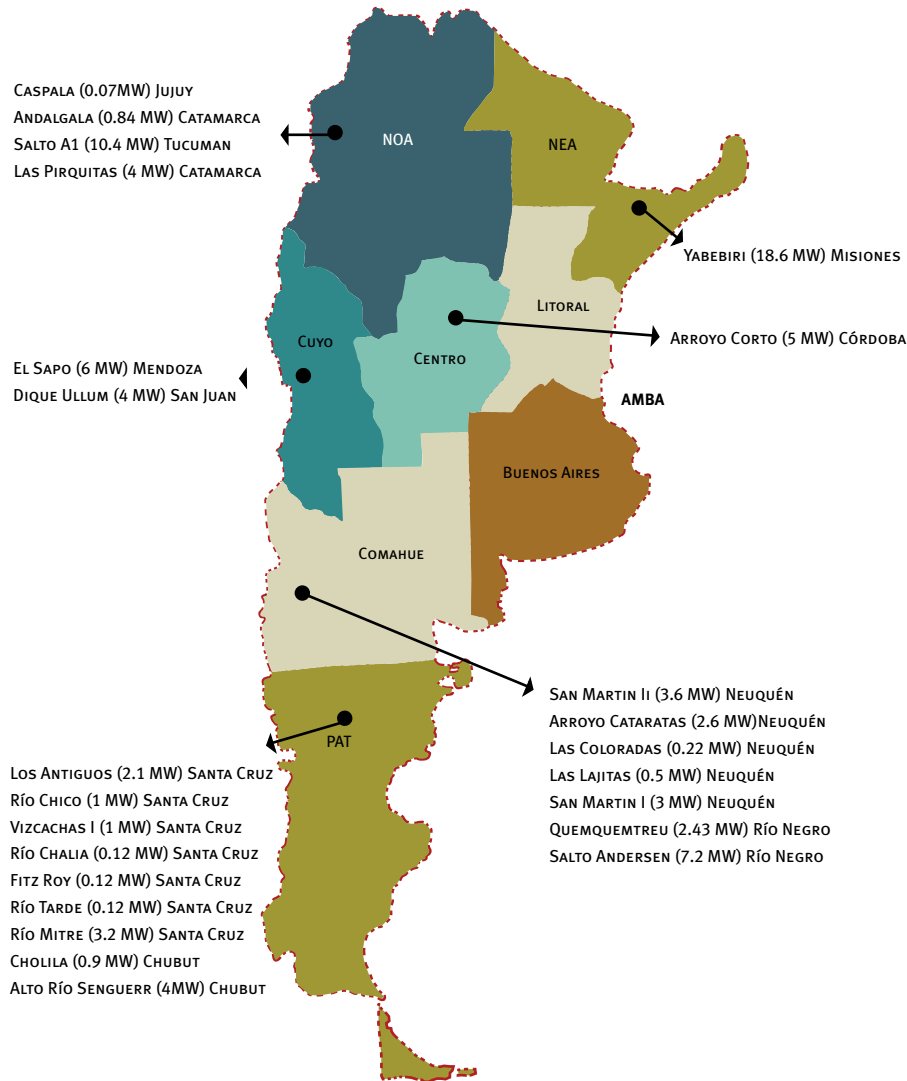


► **SMALL HYDROELECTRIC DEVELOPMENTS** <sup>21</sup>

The Secretariat of Energy has a National inventory of Small Hydroelectric Developments (SHD)<sup>22</sup>, covering 116 projects of

capacities lower than 15 MW and represents a Capacity offer of almost 430 MW and an Average Annual Power of more than 1,900 GWh. The following map shows the localization of the main SHD projected and in service.

► **LOCALIZATION OF SHD (PROJECTED AND IN SERVICE)**



Source: “Study for the Gaining of Knowledge and Promotion of Hydroelectric Offer in Small Developments” PROINSA, 2006.

The results of the study above promote, among others, the SHDs located in the southern region of the country, generally isolated, improving their economic results. However, the studies have a low level of development since out of the 116 projects analyzed only 4 have reached the stage of Executive Project and only 20 the Feasibility stage. The need for a SHD development plan is therefore proposed. In this sense, it will be necessary to deepen the hydrologic, geologic, geotechnical and environmental impact studies (only 12 SHD have performed them). The assessment of additional environ-

mental benefits, the social cost of external factors as well as the provision of drinking water is also suggested in order to include them in the compensation for the potential interested generators.

Finally, among other considerations, the suggestion was to study the following projects in more detail: SHD Aluminé III (Prefeasibility Stage), SHD Manzano I and II (Preliminary Project Stage), SHD Chilecito I (Inventory Stage), SHD El Sapo (Preliminary Project Stage), SHD Arroyo Cataratas (Advanced Inventory Stage), SHD La

<sup>21</sup>. It should be noted that as regards larger hydroelectric projects, there has been an “Expedient Evaluation of Hydroelectric Developments” Lic. Albina L. Lara and Ing. Luis A. Bergman. 2006 EBISA-SEE. 30 projects were evaluated therein with potentials amounting to 8,169 Mw and 27,783 Gwh of average power. Refer to: <http://www.ebisa.com.ar/ebisa/archivos/Resumen%20Ejecutivo.pdf>

<sup>22</sup>. PROINSA. Proyectos de Ingeniería S.A. (Engineering Projects Corp.) “Study for the Gaining of Knowledge and Promotion of Hydroelectric Offer in Small Developments,” prepared by Hydroelectric Projects in Argentina of lower capacities. IBRD Loan Number 4454 AR 2006.

Angostura (Prefeasibility Stage), SHD Solco Salto I (Prefeasibility Stage), SHD Los Céspedes km 15.8 (Engineering Stage: Scheme), SHD “Ullúm Dam-Javier de la Rosa Dam Path” Scheme 2 Project G (Project at Inventory Stage), SHD “Ullum Dam-Javier De La Rosa Dam Path”, Scheme 2 Project A with Hydroelectric Station at Morro at the left margin of the Javier de La Rosa Dam” (Project at Inventory Stage), and SHD Caspala (Preliminary Project Stage).

It is therefore estimated that the initial potential is higher than 400 MW; however the inclusion of a new installed capacity of 100 MW in 10 years to be located in different regions of the country has been considered possible.

Those SHD projects under development amount to 30 MW.

The existing and operating SHDs amount almost to 380 MW (Source: SE, National Forecast Directorate). They produce 1,152 GWh of power. This mini-hydraulic capacity represents about 1.3% of the total installed capacity in Argentina and 3.7% of the total hydroelectric capacity. As regards power it represents 1.1% and 3.0% of the total power produced in Argentina and of the hydroelectric energy respectively.

#### ► HYDRAULIC MICROTURBINE IN THE LOCALITY OF VALLE GRANDE (DEPARTMENT OF VALLE GRANDE - JUJUY)



Source: Courtesy of EJEDSA.

#### ► HYDROGEN

One of the most interesting applications of hydrogen as clean fuel is its use in land vehicles' engines such as cars, trucks, buses, motorized forklifts, locomotives, and in airplanes and buses' engines. Another possible use is the steady electrical generation in isolated places or urban centers as proprietary or cogeneration where, due to different reasons, the decision is not to use the local electric network, either for safety reasons, quality of service or a combination of both. In this case, the latest generators are Fuel Cells (FC) or internal combustion engines especially adapted for H<sup>2</sup><sup>3</sup>.

A fuel cell is an electrochemical device which converts chemical power (stored in the chemical bonds) into electric power. It is different from batteries in that the substances (fuel) consumed in the oxidation (anode) and reduction (cathode) reactions are not inside the device, but they are introduced from outside<sup>24</sup>.

The fuel of fuel engines is air oxygen (O<sub>2</sub>) and hydrogen (H<sub>2</sub>). Hydrogen can be obtained by electrolysis of water or, more frequently, by conversion of fuels such as gasoline, methanol (of vegetable origin) or natural gas (methane) in a reformer at high temperatures.

Therefore, it is possible to obtain hydrogen from hydroelectric, solar and/or wind energy. Hydrogen can be obtained directly from solar energy in electrochemical cells where a semiconductor is in contact with the electrolyte solution or generating electric power with a photovoltaic panel and using that electric power in an electrolyzer. There are several methods for the generation of hydrogen from biomass: gasification followed by reforming with water steam, pyrolysis followed by the same kind of reforming, enzymatic decomposition of sugars and catalytic decomposition.

In turn, the variation in the speed and flow of the available wind transforms this kind of energy in an energy that is highly complementary with the generation of hydrogen through electrolysis and its subsequent use to generate electric power in fuel cells.

There is only one project for the development of hydrogen: the small experimental station located in Pico Truncado for electrolysis of water from wind-originated electricity.

There is no manufacture of electrolyzers in Argentina, and basic studies are being carried out at the University of the Litoral and at the University of Buenos Aires (UBA). There are several research groups involved in the subject, particularly in the development in fuel cells and in aspects related to storage (National Atomic Energy Commission, University of Buenos Aires, University of La Plata, Technical Research Center of the Armed Forces, etc.). On the other hand, the National State through ENARSA supports some of these teams.

#### ► SUMMARY

The main ideas stated above are summarized below in order to provide a general overview about the availability of Renewable Energies and their degree of use.

The following table presents the main Identified Projects which provide a close overview of the potential of each Renewable Energy. Then, there is an introduction to the Projects under Development, formed by those which are in construction process and/or under bid process. Finally, there is a presentation of the current Installed Capacity, data that has been obtained from different qualified sources.

23. Asociación Argentina de Hidrógeno (Argentine Association of Hydrogen) <http://www.aah2.org.ar/hidrogeno.htm>

24. IEDS. “Study of Opportunities for the Use of fuel cells for the provision of electric power with renewable resources”. SEE/PERMER.



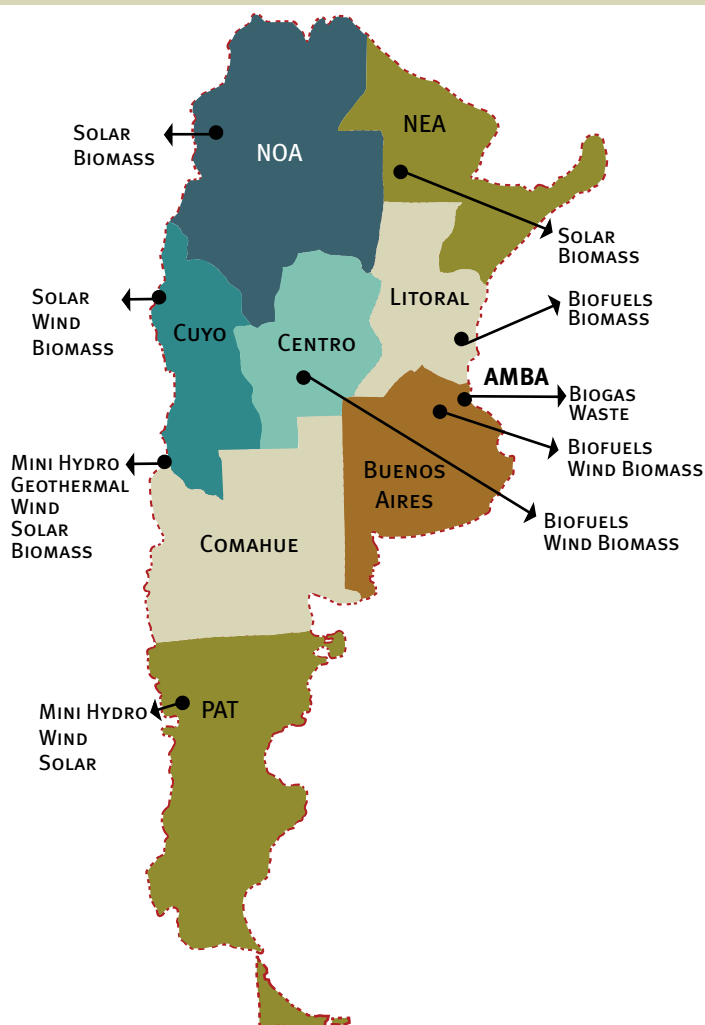
► CLASSIFICATION OF RENEWABLE ENERGIES' PROJECTS (2009)

CLASSIFICATION OF PROJECTS	PHOTOVOLTAIC SOLAR	THERMAL SOLAR	WIND	BIOMAS	GEOTHERMAL	MINI-HYDRO
Identified Projects or Potential	5 kWh/m <sup>2</sup> DAY, AVERAGE ANNUAL, NORTH OF THE RÍO COLORADO.	100 MW A YEAR 2015, 1000 MW <sup>25</sup>	5000 MW	422 MW	4 Reservoirs	430 MW + 100 MW IN 10 YEARS.
Projects under development	1.2 MW IN SAN JUAN + PERMER (1 MWp)	PROJECTS UNDER DEVELOPMENT: 0.5 MW	0,9 MW (PERMER) + 2850 MW	156 MW	30 MW IN COPAHUE	30 MW
Installed Capacity	10 MWp (PERMER + OTHER SCATTERED ESTIMATES)		29.76 MW + 0.6 MW LOW CAPACITY+ 0.2 CHUBUT AND OTHERS	720 MW	0,67 MW (without service)	380 MW

Fuente: Secretariat of Energy.

The following map shows the regional distribution of renewable resources, and the objectives presented in the framework of the GENREN Program.

► POTENTIAL RENEWABLE RESOURCES



Source: GENREN.

25. Final report of the Technical Assistance project for the preparation of the "Energy Strategic Plan of the Argentine Republic" prepared by IDEE/FB for the Secretariat of Energy, 2007.

The following table represents the Capacity proposed by the State to be installed by means of bids of electric generation

based on Renewable Energies which ENARSA shall organize, for a total of 1015 MW.

▶ INSTALLED POWER OBJECTIVES OF GENRE			
REGION	TECHNOLOGY	POWER TO HIRE	COMMENTS
1	WIND	500 MW	Projects with capacity factor equal or higher than 35%, with adequate supporting documentation
2	THERMAL WITH BIOMASS	150 MW	The blend to be used must have a minimum biofuel content of 50%
3	BIOMASS	100 MW	Supported by regional biomass superavit
4	URBAN SOLID WASTE	120 MW	
5	SMALL HYDROELECTRIC DEVELOPMENTS	60 MW	Up to 15MW for individual plants
6	BIOGAS	20 MW	
7	THERMAL SOLAR	25 MW	Projects with solar radiation levels equal or higher than 5kWh/m2 with adequate supporting documentation
8	THERMAL PHOTOVOLTAIC	10 MW	Projects with solar radiation levels equal or higher than 5kWh/m2 , with adequate supporting documentation
9	GEOTHERMAL	30 MW	High enthalpy (reservoirs with temperatures higher than 150°C)
	<b>TOTAL</b>	<b>1.015 MW</b>	

Source: GENREN

## LEGAL FRAMEWORK

Below there is a brief summary of the regulations related to the use of Renewable Energies in the country. Even though the electric power generation is particularly included, the energy related to other uses is also included, such as renewable energies for caloric use or bioclimatization architecture.

### ▶ ACT 26,190

The legal framework of reference for this study is mainly constituted by Act No. 26190/12-2006 – National Development Regulations for the use of Renewable Sources of Energy destined to Electric Energy Production. It should be noted that this Act has been recently regulated by Decree 562/2009.

This Act complements Act No. 25019/1998, Decree No. 1597/1999 (National Wind and Solar Energy Regulations), also applicable to the other renewable sources (geothermal, tidal, hydro, biomass, dump gases, depuration plant gases and bio-gas)

The generation of electric power from renewable energies for the provision of a public service has been declared of national interest, and the purpose of this regulation is to achieve a contribution of the renewable energy sources equivalent to 8% of the national electric power consumption in a 10-year term as from the effective date of this Act (year 2006)

The physical and/or juridical persons who have invested in, and/or have been granted a license to execute new works for the production of electric power from renewable energies, located in the national territory, whose production is targeted at the Wholesale Electrical Market (WEM) and/or at the provision of public services, will be the beneficiaries of this regime.

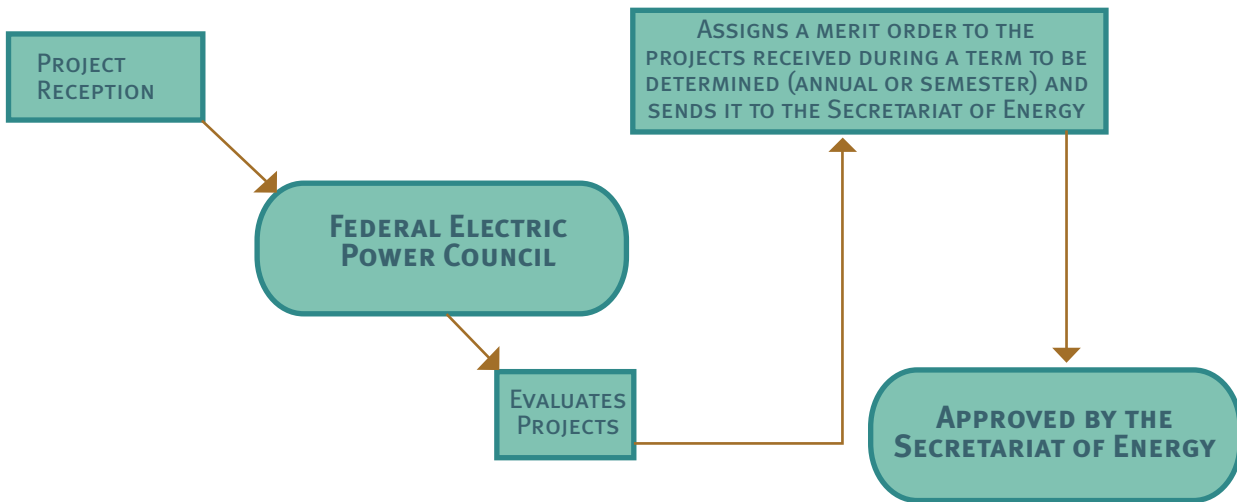
The Act provides for a mechanism of presentation of Renewable Energy projects, which starts with the filing at the Federal Electric Power Council which, according to the following scheme, evaluates and assigns a merit order that must be eventually approved by Secretariat of Energy.

The Act proposes, for a 10-year term, an Investment Plan for the construction of works destined to the production of electric power using renewable energy sources that includes different tax benefits (VAT and early amortization).

Within the framework of these Investments Regulations, the Law provides that special priority will be given to those enterprises that may favor, both in terms of quality and quantity, the creation of employment and propose the integration with capital assets of national origin.



► **ACT 26,190: MECHANISM OF PRESENTATION AND PROJECT APPROVAL**



Source: Secretariat of Energy, Renewable Energies Area.

**ACT 26190 COMPENSATIONS**

Act 26,190 updates the remuneration established by Act 25,019 increasing the tax applied for the creation of the RENEWABLE ENERGIES TRUST FUND, which will be administered and assigned by the Federal Board of Electric Power, and will be used to:

- I. Pay up to ONE POINT FIVE CENTS PER KILOWATT HOUR (0.015 \$/kWh) that may be effectively generated by wind systems installed or to be installed delivering their energy to the wholesale markets and/or destined to the provision of public services.
- II. Pay up to ZERO POINT NINE PESOS PER KILOWATT HOUR (0.9 \$/kWh) made available to the user through solar photovoltaic generators installed or to be installed, destined to the provision of public services.
- III. Pay up to ONE POINT FIVE CENTS PER KILOWATT HOUR (0.015 \$/kWh) effectively generated by geothermal, tidal, biomass, dump gas, depuration plant gas and biogas energy systems installed or to be installed, delivering their energy to the wholesale markets and/

or destined to the provision of public services. Those included in Act No. 26,093 are exempted from this remuneration.

- IV. Pay up to ONE POINT FIVE CENTS PER KILOWATT HOUR (0.015 \$/kWh) effectively generated by hydro systems of up to THIRTY MEGAWATTS (30MW) installed or to be installed, delivering their energy to the wholesale markets and/or destined to the provision of public services. The value of the Fund as established compensation, shall be adjusted to the Quarterly Adjustment Coefficient in relation to the seasonal periods and contained in Act 25957. Compensate, for up to ONE POINT FIVE CENTS PER KILOWATT HOUR (0.015 \$/kWh) effectively generated by wind systems installed or to be installed that may pour their energy in the wholesale markets and/or destined to the provision of public services.

The equipment to be installed shall enjoy of this compensation for a term of FIFTEEN (15) years, as from the date of request of commencement of the benefit's period.

Regulatory Decree of Act 26190, 562/2009 of the National Development Regulations for the use of Renewable Energies, destined to the production of electric power (in new generation plants or existing generation plants expansions and/or repowering), provides that it will promote the research for the technological development and the manufacturing of equipment to that end; it further lists the tax incentives and establishes the authority of application (Ministry of Federal Planning, Public Investment and Services through the Secretariat of Energy). As regards tax matters, the authority of application shall be the Ministry of Economy and Public Finances.

► **OTHER ACTS**

Below there is a list of other acts of general nature related to renewable energies, detailed by province and by chronological sanction order (or by project):

- Córdoba: Act No. 8810/1999: It declares power generation through renewable energies of provincial interest.
- Buenos Aires: Act No. 12603: It promotes electric power generation through the use of renewable energy sources (Year 2001, without effective application).

Act No. 13059/03: It makes compliance with the IRAM regulations on the Thermal Conditioning of Buildings mandatory for every building to be inhabited by human beings. It further requires the use of solar hot water systems in every public building and household with no natural gas within the grid, together with the use of thermal solar energy for heating purposes.

The Municipality of Bragado, Province of Buenos Aires, has prepared an ordinance on renewable energies, which has not been approved by the Deliberative Council yet.

- Chubut: Wind Act No. 4389/98, Decree No. 235/98.
- La Pampa: Act 2380/2007. It adheres to National Act No. 26190.
- Mendoza: Act No. 7822/2008: It declares power generation through renewable energies of provincial interest and it adheres to Act No. 26190.
- Misiones: Act No. 4439/2008. It declares the investigation, development and generation of electric power and the sustainable use of non-conventional soft energies based on the use of renewable energies of provincial interest. It includes the Promotion Regulations for the use of biomass and hydrogen.
- National: Act No. 26093/06, Decree 109/07. Regulation and promotion regulations for the production and sustainable use biofuels.
- National: Act No. 26,123/06. Regulations for the development of hydrogen technology, production, use and applications as fuel and energy vector.
- Neuquén: Act No. 2396/2008. It adheres to Act No. 26190 of renewable energies usage promotion.
- Río Negro: Act No. 3930/2004. It corresponds to the Provincial Department of Waters and promotes the development of hydroelectric developments.
- Santa Cruz: Act No. 2796/2005. Provincial Regulations of Renewable Energies.
- Santa Fe: Act No. 12503/2005.
- Santa Fe - Municipalities:

Municipal Ordinance of Santa Fe 12692/2006, which motivates generation with non-conventional energies and is related to Provincial Act No. 12503/2005.

Venado Tuerto, Municipal Ordinance No. 3633/2008 (See Exhibit B) provides for the research, development, generation, production and use of products related to renewable energies. It further provides for the implementation of a system of promotional benefits by means of the General Real Properties Fee for private constructions or public services that may install equipment related to Renewable Energies.

The Municipality of Rosario has prepared an ordinance that has not been approved by the Deliberative Council yet.

Different regulations<sup>26</sup> related to the **use of water in general with electric generation purposes have also been implemented in many provinces of the country**, in which territories the 116 PAH of the PROINSA Study are located.

In this work we specifically tried to identify the main requirements that a private investor would have to meet if he wanted to develop PAH with the purpose of exploiting them commercially. In their regulations, some provinces provide for the specific figure of Private Initiative, while others regulate these developments and the private participation potential in the Waters Code.

Below there is part of the regulations compiled at the provincial level, particularly indicating the numbers that identify them:

- Catamarca: Act No. 2577, Waters Code, modified by Acts No. 3074, 3244, 3803 and 4616.
- Chubut: Act No. 5460 of Economic Promotion for Investment Projects: it redeems investors from payment of the Gross Income Tax and the Stamp Tax.
- Córdoba: Act No. 5589: Waters Code of the Province of Córdoba; Act No. 8853: Amendment to Section 124 of Act 5589, which provides that: "Concession by law: whenever the capacity exceeds 3000 HP, concessions shall be granted by law."
- Jujuy: Act No. 4090: on Hydro Resources Management and Water Services, Cleaning and Energy Regulations.
- La Pampa: Act No. 607, Waters Code. Sections 50 to 57 provide for the criteria for the use of energy.
- Misiones: On February 2002, the PE of the province submitted to the House of Representatives of Misiones a Waters Code Project for the province. On May 2006, a bill was submitted for the declaration of the province free of new hydroelectric dams on the rivers Paraná, Uruguay and Iguazú.
- Mendoza: Act No. 7543, amendment to Act 6497: Provincial Regulatory Framework.
- Neuquén: Act No. 378: Revised text with the amendments introduced by Act No. 2266.
- Río Negro: Act No. 2902, Provincial Regulatory Framework.
- San Juan: Act No. 4392: Waters Cod for the province of San Juan; Act No. 6703. The Private Initiative provides for the procedures for the presentation of privatization proposals, which may be spontaneous or through call for bid by the Executive Power.
- Santa Cruz: Act No. 1451: Study, use and preservation of provincial non-maritime public waters prior authorization by the Executive Power.
- Tierra del Fuego: Resolution M.P. 282 /2004; it includes the Procedural Regulations for the Authorization and Registration of Special Uses of Public Waters.
- Tucumán: Act No. 6705 - Private Initiative Promotion and Protection; EDET SA (Electric Distribution Company of Tucuman) Concession Agreement.

#### ► OTHER REGULATIONS AND PROCEDURES

Below there is a summary of the regulations that could be granting potential incentives to the use of Renewable Energies. They are mostly targeted to potential power generators:

- Resolution SEE No. 1281/2006. It defines the supply priority in the case of public services deficits. It assigns contractual State generation, hydroelectric and Spot in small demans (<300kW). It defines the Base Demand (>300kW) for Large Users that may be backed and that may be contracted with backup by means of: thermal generation, hydroelectric generation and with new generation to which end the Plus energy service may be implemented with a capacity exceeding 300 kW. New bidders may be generators, co-generators and new self generators (or non Wholesale Electricity Market agents).

<sup>26</sup>. PROINSA op.cit.





- Resolution SEE No. 220/2007. Secretariat of Energy. Electric Power (Supply Agreements). The said resolution authorizes the execution of Supply Agreements between the Wholesale Electric Market (MEM) and the additional generation and association energy availability offers submitted by Generation Agents, Co-generators or Self-Generators that as of the date of submission were not agents of the Wholesale Electric Market.

- Resolution SEE No 280/2008. Secretariat of Energy. This regulation authorizes Electric Power Distribution Public Service Providers of provincial and/or municipal jurisdiction to offer the Entity Responsible for Dispatching the operation of hydroelectric generation units with installed capacity lower than Two Thousand Kilowatts (2000 kW) that may not be currently authorized for commercial operation, in agreement with the particular conditions for its authorization, programming, dispatching and economic transactions thereof.

In agreement with the previous resolutions and the intent of promoting the mini-hydro developments, there is an attempt to reduce alleviate the Electric Power deficit through all the existing facilities.

- CAMMESA Procedures

CAMMESA has established its Procedures in Exhibit 17, together with the conditions for the acceptance of new agents to the Wholesale Electric Market, while Exhibit 40 establishes the conditions for the treatment of a wind generator in the Wholesale Electric Market. Some contents of this Exhibit are summarized below:

**Object:** Treatment of Wind Energy in the Wholesale Electric Market in view of the specific conditions of the resource and equipment.

**Acceptance Requirements:** For a capacity equal or higher than 1 (one) MW.

**Voltage Control and Reactive Dispatching:** It must comply with the reactive delivery obligations as a synchronic thermal unit.

**Characteristic Data, operation and restrictions:** It shall supply information on the randomness of the resource. The OED shall have the authority to limit the wind generator's operation if it goes against the operative established limits.

**Other CAMMESA requirements:** in process of implementation.

There are regulations that even though they do not promote directly the use of Renewable Energies, such as those stated above, they regulate and allow for a better quality control of the equipment for the development of such sources. An example of the above are the regulations of national promotion such as those of the Argentine Institute of Standardization and Certification (IRAM) for plain solar collectors and photovoltaic panels, as well as the biomass fuel quality.





2

SECOND  
PART

# MAIN RESULTS OF THE PROJECT

## WEBSITE

The Secretariat of Energy's website has been restructured in such a way as to obtain more visibility and content in the renewable energies area.

The feedback received in the expert and pilot surveys was included in the site (on which comments will be made later on).

The web page design has the intent to unify two different needs under the same portal:

- The approach to renewable energies by non-specialized public in the search of not too technical content information, namely for communication purposes.
- The search for detailed information by players of the sector, providing them with business opportunities, a compilation of current legislation updates, specialized databases, a relevant events guide, etc.

Even though the website is targeted to the public in general, there are also some sections that can only be accessed through subscription and an inquiries service, including:

### a. "HOME PAGE"

1. Who are we?
2. Objectives
3. Where are we? - Contact

### b. "COMMUNICATION"

1. Renewable Energies
  - Types and Characteristics
  - Existing developments review
2. Information on Publications
3. Glossary

### c. "CONSULTING"

1. News
2. Agenda

### 3. Legislation and Regulations

- Related Acts
- Incentives
- International Commitments

### 4. Financing

### 5. Database

- Renewable energies-related companies
- Available resources in the region (theme maps)
- Other...

### 6. Business Opportunities

- Bids
- Effective Projects

### 7. R&D Project

### 8. Technical Publications

### d. "SITES OF INTEREST"

Links especially related to renewable energies

1. National Sites: Official (government, provincial, municipal, ministries, secretariats, Universities, INTI, INTA, CNEA, NGOs, etc.)
2. International Sites: Institutions, governments, programs, etc.

Other sections dealing with potential niches for the development of renewable energies in Argentina and financial sources could also be included. Users will have the possibility of submitting information in order to contribute to the site's content.

The Secretariat of Energy of the Nation has already implemented the site structure in agreement with the sections listed above. Such site may be accessed through the following link:

<http://energia3.mecon.gov.ar/contenidos/verpagina.php?idpagina=2974>

We continue working on the further development of the sections' content.



## PLAYERS DATABASE

We developed a database that includes 1500 relevant players for the renewable energies sector in Argentina. Such database includes the following information:

The following list corresponds to that database's fields:

1. Original Registration Number
2. Type of renewable
3. Work Area
4. Type of Activity
5. Occupation
6. Last Name
7. First and Second Names
8. Entity / Organization
9. Title
10. Email 1
11. Email 2
12. Email 3
13. Website
14. Telephone / Fax
15. Address
16. Location
17. Province

The database includes players that are directly and indirectly related to renewable energies. The latter cannot be related to a particular renewable technology and includes numerous public entities.

At least 500 players included in the database work specifically with renewable energies and could be related to the technologies. A prior evaluation of the contents of the database indicates that 39% of the actors work in issues related to biomass (namely biofuels), 30% with solar energy, 27% with wind energy, and 7% with hydroelectricity, while a minor part works with geothermal energy, hydrogen and tidal energy.

## SURVEY

The most significant activity within the REEEP Project was the performance of a survey of a scope as wide as possible within the broad spectrum of Renewable Energies players in the country. The objective of this survey was to learn about the political/institutional, technical, economic, regulatory and financial barriers detected by those players.

The definition of the universe to be surveyed as well as the definitive format was based on two participating processes:

- On the first place, a survey was conducted with 10 experts (mostly through personal interviews).
- Secondly, throughout the whole general consultation process, a Pilot Survey was performed (to 25 professionals) in consideration of the previously consulted experts' proposals.

### PILOT SURVEY

Most of those who have been consulted in the Pilot Survey recommended the feedback of the following players:

- Legislators and specialized jurists.

- Regulators (national and provincial) and Electric Sector Regulators Association.
- Entities involved in the definition of policies: Secretariats of the Environment, Agriculture, Livestock, Mining, Electrification, Rural, etc.
- Wholesale Electric System Operating Entity and players associations (generators, distributors, large users, consumers defense, etc.)
- Renewable energies generators associations, companies, cooperatives, municipalities, etc.
- Renewable Energies Research Centers (Universities, Public and Private Institutes).
- Equipment Manufacturers and/or importers (INVAP, IMPSA, foreign).
- Entities devoted to Science and Technology.
- Technical Assistance Official Entities: National Institute of Industrial Technology, National Institute of Agricultural Technology (regional representatives).
- NGOs related to the environment and to Renewable Energies.
- Financial Entities (consultants, Banks, Investment Funds, etc.).
- Standardization Entities and product certification, processes and management systems (IRAM).
- Municipalities, Distributed Users.
- Etc.

Regarding the format, a permanent readjustment was agreed in relation to the feedback received on it, as well as the difficulties related to its understanding.

The structure of those interviewed for the Pilot Survey was broken down as follows: Project Manager/Developer (36%), researchers (24%) and manufacturers (24%). The remaining 12% are generators and only one is an operator.

Regarding the renewable sources in which they develop their activities, 36% of the respondents indicated that they worked namely with wind energy; 20% work with solar energy (thermal, photovoltaic or thermoelectric); another 20% with biomass energy and the remaining 16% with hydroelectricity. Only one of the respondents worked with all the sources.

Regarding the experience with development of projects, only 40% stated that they have worked with already executed projects.

### DEFINITIVE SURVEY

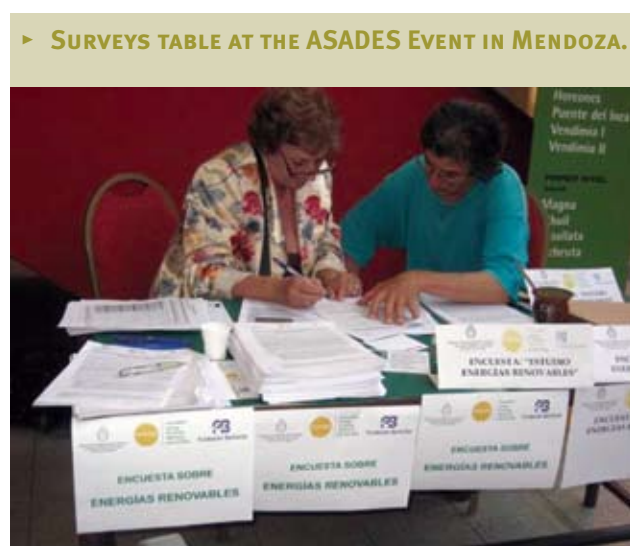
As a result of the Pilot Survey, the definitive format and scope of the survey were finalized. In order to obtain a significant number of answers, different actions were carried out. In spite of them, it should be noted that it has not been a fast or simple process. Among the most significant activities that were carried out, the following may be highlighted:

- A significant number of personal interviews was carried out, together with telephone calls and conversations with professionals in different events related to the issue. Among them, the following should be noted: the roundtable called "Wind Energy in Argentina: Developments and Perspectives"<sup>27</sup>, in which more than 200 persons participated. Surveys were handed out and contact was made with players of the sector; the Workshop called "Towards a sustainable energy future," organized by the Inter-American Network of Academies of Sci-

27. Board of Director's Room of the School of Engineering, Paseo Colón 850, October 10, 2008.

ences (IANAS) at the Argentine Center of Engineers, in which more than 100 scientists from different countries participated, where 30 surveys were handed out. The REEEP project was also presented in different work meetings, in which various surveys were handed out.

- Promotion was made in various professional networks, including Argentine Association of Renewable Energies and the Environment (ASADES); the Consejo Nacional de Investigaciones Científicas y Tecnológicas (National Council of Scientific and Technological Research); the Secretariat of Science and Technology; the Agencia Nacional de Promoción Científica y Tecnológica (National Agency of Scientific and Technologic Promotion); the Consejo Federal de Ciencia y Tecnología (Federal Council of Science and Technology); the Red Científica and Tecnológica Nacional (National Scientific and Technological Network), etc.



► **SURVEYS TABLE AT THE ASADES EVENT IN MENDOZA.**  
 Source: Surveys in the Thirty Day Labor Association Argentina Renewable Energy and Environment (ASADES), Mendoza.

- The survey was also promoted in the print and electronic publication called Digital Papers (which reaches 2000 professionals on a daily basis).
- The survey was further promoted through the SEE's Website (<http://energia3.mecan.gov.ar/contenidos/verpagina.php?idpagina=2496>) and Fundación Bariloche's Website (<http://www.fundacionbariloche.org.ar>).
- Additionally, the SEE was invited to participate at the Thirty First Roundtable organized by the Argentine Association of Renewable Energies and the Environment (ASADES) in the Center of Congresses and Exhibitions of the city of Mendoza. A team of four professionals (two from the SEE and two from Fundación Bariloche) attended the event and worked on the project. During four days personal interviews were carried out, and 300 surveys were handed out to participants. We succeeded in completing almost 150 surveys (see picture below). In one of the roundtables, the SEE's official representative presented REEEP's project objectives.

All these actions allowed us to get better answers. The number of respondents represents a significant fraction of the play-

ers involved in renewable energies in Argentina since we were able to obtain more than 300 answers.

It should be noted that in order to process the answers, a special software was designed.

Some of the main quantitative results are shown in this section. The contents are classified according to the following scheme corresponding to the order of questions of the survey:

- The **First Section** develops the characterization of respondents and their activities.
- The **Second Section** introduces the barriers that they have to face and develops one of the main objectives of the study.
- The **Third Section** introduces the proposals aimed at overcoming the identified barriers.

Aside from filling the survey form, respondents made additional comments, some of which have been included in each section and have constituted a great contribution when making the proposals and final recommendations.

### ► RESPONDENTS, THEIR PROJECTS AND PERSPECTIVES

This first part of the survey is aimed at characterizing the respondents, i.e., to learn about their activities, geographic location, Renewable Energies and the projects they are working on. It further has the object of making a preliminary evaluation of the results that may be obtained in their activities, future perspectives of their activities, and the Renewable Energies in general.

A significant number of respondents indicated that they have developed more than one activity involving Renewable Energies. As it may be noted in Table 1, most of the respondents belong to the academic world.

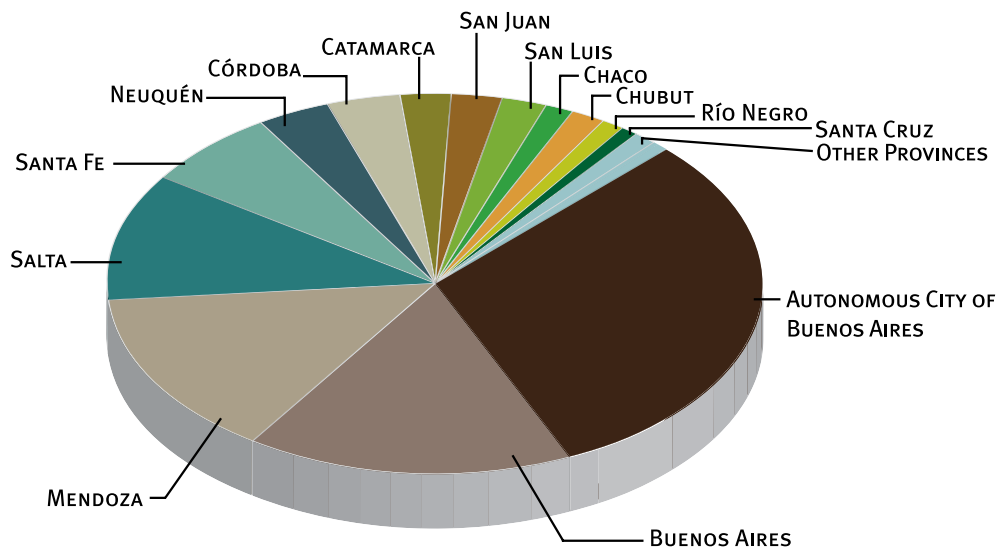
**TABLE 1. RESPONDENT'S OCCUPATION (QUANTITY AND PERCENTAGE)**

OCCUPATION	QUANTITY	%
Manufacturer	26	10
Importer	10	4
EP Generator	13	5
Manager	100	38
Researcher	177	66
Other	118	45
Non-Respondent	1	0

Regarding the origin of respondents, as it may be noted in Figure 1, they represent 16 provinces and the Autonomous City of Buenos Aires. Approximately 31% of the respondents belong to the Autonomous City of Buenos Aires, and 16% to the province of Buenos Aires. Other provinces relevant to the survey were: Mendoza, Salta and Santa Fe, followed by Neuquén, Córdoba, Catamarca, San Juan, San Luis, Chaco and Chubut. Río Negro, Santa Cruz and Formosa had very little participation.



► **FIGURE 1: PROVINCIAL ORIGIN OF RESPONDENTS (%)**



As it may be noted in Table 2, a large number of respondents is involved in solar and wind energy (includes both photovoltaic, thermal and bioclimatic buildings). Other significant areas included biomass and hydro. A significant number of the respondents expressed that they have worked with various renewable energies. We also received answers from professionals involved in the development and implementation of cogeneration projects.

**TABLE 2. RESPONDENTS AREA OF INVOLVEMENT REGARDING RENEWABLE ENERGIES (QUANTITY AND PERCENTAGE)**

SOURCE	QUANTITY	%
Wind	86	33
Solar	176	67
Hydro	49	19
Geothermal	24	9
Hybrids	5	2
Biomass	79	30
Other	45	17
Non-respondent	21	8

Regarding the results obtained in the projects that are being developed by the respondents, a high percentage believes that they were successful or had acceptable results, as it may be noted in the tables below.

**TABLE 3. RENEWABLE ENERGIES PROJECTS – LEVEL OF SUCCESS**

¿WAS IT SUCCESSFUL?	NUMBER OF PROJECTS	%
Yes	145	82
No	20	11
Fairly	12	7
<b>Total</b>	<b>177</b>	<b>100</b>

**TABLE 4. RENEWABLE ENERGIES PROJECTS – ACTIVITIES PRELIMINARY RESULTS ASSESSMENT**

RESULTS	NUMBER OF PROJECTS	%
Very Good	17	13
Good	79	59
Fair	24	18
Poor	12	9
DK/NA	1	1
<b>Total</b>	<b>133</b>	<b>100</b>

Respondents preliminary indicated that the problems that they most frequently encountered during the implementation of projects were of an economic/financial nature, at a lower degree of a political/institutional nature, while the lowest degree seemed to be of a technological/training type. This order of priorities is modified as we went further into the analysis of renewable energy projects' barriers.

On the other hand, the majority indicated that the future possibilities for the development of their activities in the renewable energies field in which they are involved are good or very good.

The following Table depicts the feedback on the opportunities that the different renewable energies sources/technologies could have in Argentina. Most of the respondents chose more than one technology.

According to the respondents' opinion, the renewable source that would have the most development opportunities in Argentina in the next 10 years is wind energy due to, among others: the large existing potential to interconnect large capacities to the grid, the cost per installed kW and the local technological capacity.

On the second place, respondents listed solar energy, somehow reflecting the numerous experiences known in small scale and the high percentage of participation of the respondents involved in this technology (including photovoltaic and thermal generation, and the bioclimatic architecture).

Regarding the use of solar energy with exclusively thermal purposes, they indicated that even though there is a significant potential, the price competition as regards NG discourages it.

**TABLE 5. DEVELOPMENT OPPORTUNITIES IN ARGENTINA**

SOURCE	QUANTITY	%
Wind	154	59.0
Solar	140	53.6
Hydro	83	31.8
Geothermal	38	14.6
Hybrids	8	3.1
Biomass	79	30.3
Other	19	7.3
Non respondent	63	24.1

**► QUESTIONS ON BARRIERS**

The objective of this section was to learn about the main barriers that the respondents have noted, which have an impact on the number of renewable energy projects regarding the potential of existing resources in the country.

A summary of the answers is shown below, organized depending on the different barriers:

1. Political and Institutional Barriers
2. Economic/Financial Barriers
3. Regulatory Barriers
4. Technological Barriers
5. Social Barriers

**TABLE 6. QUESTIONS ABOUT INSTITUTIONAL BARRIERS (IN FIGURES)**

QUESTION	NUMBER OF ANSWERS				
	VG	G	F	POOR	DK/NA
What's your opinion about the coordination capacity existing among the different participants, agencies and projects in the RE field?	1	19	128	90	23
What do you think about the promotion of activities for the dissemination and development of demonstrative projects?	5	49	131	62	14
How would you qualify the current level of treatment of the projects related to the extension of the electrical grid as regards the distributed generation projects using renewable energies?	5	26	59	47	124

**TABLE 7. QUESTIONS ABOUT INSTITUTIONAL BARRIERS (IN PERCENTAGES)**

QUESTION	STRUCTURE OVER THE TOTAL (%)				
	VG	G	F	POOR	DK/NA
What's your opinion about the coordination capacity existing among the different participants, agencies and projects in the RE field?	0%	7%	49%	34%	9%
What do you think about the promotion of activities for the dissemination and development of demonstrative projects?	2%	19%	50%	24%	5%
How would you qualify the current level of treatment of the projects related to the extension of the electrical grid as regards the distributed generation projects using renewable energies?	2%	10%	23%	18%	48%

**1. Political and Institutional Barriers**

Tables 6 and 7 summarize the answers received regarding three barriers of political and institutional nature. Herein below we present some of the main comments that we have received.

It is worth noting that the majority of the respondents qualified the possibility of coordination by the different authorities responsible for the area as fair or poor. These responses are based mainly on the argument that there are disperse efforts when addressing the subject. For instance, they pointed out that the Secretariat of Energy establishes active policies but in different sections such as in the electric area, in fuels, in strategic planning, etc. On the other hand, the Secretariats of Mining, of the Environment and Sustainable Development, of Agriculture, Livestock, Fishing and Food, among others are also involved in Renewable Energies.

Additionally, there is overlapping of efforts as regards Research and Development (R&D) activities. It seems that as there are no clear objectives in the specific policies for the promotion of the Renewable Energies, the in-depth studies and development of certain technologies is almost free and without coordination of the different activities carried out by several work teams in the country.

In this sense, it is argued that there is a need to strengthen the actions oriented to the coordination and training of human resources working in the field of renewable energies both for the achievement of common goals and for the allotment of funds and the institutional adapting in the promotion of the development of renewable energies.

Furthermore, we should point out that there were many comments expressing the need to continue the energy guidelines and policies in order to give coherence to short, medium and long term policies as well as to address the energy system as a whole.





As regards the evaluation of the impulse given to the promotion and demonstration projects, opinions have qualified it as fair, although some additional answers qualified it as Good. In general, Renewable Sources have a different status as regards their articulation to public policies when compared to conventional sources.

In relation to the question about the extension of the electric grid vs. isolated projects, the respondents expressed that in general priority is given to the extension of grids at the expense of distributed generation projects involving Renewable Energy. This is explained partly because of the experience and background of decision-makers and the urgency to satisfy concentrated demand, in the short term. Additionally, they expressed that conventional energies receive certain subsidies which Renewable Energies do not, and this makes it impossible to compare alternative projects on similar grounds.

## 2. Economic and Financial Barriers

Tables 8 and 9 summarize the answers received regarding four questions on barriers of economical and financial nature. Herein below we present some of the main comments furnished with these results.

In the tables we can see that the majority of the respondents consider that the investors receive fair to poor signals.

It may be noted that Renewable Energies projects in general involve more capital in their cost structure and higher transaction costs than conventional projects. This implies additional financing requirements with more adequate schemes, particularly in the development of projects for the poor sectors of the population with extremely reduced payment capacity.

Risk management and insurance are also essential aspects for private investors and they have not yet been solved. These mechanisms could help improve the financial performance of large or medium sized renewable projects.

On the other hand, respondents pointed out that private investors demand a coordinated national policy articulating the different players and activities at national and provincial levels. Furthermore, they demand further incentives than those included in the laws for the promotion of renewable energies which have proved to be insufficient to trigger a massive promotion process.

In particular, as regards the investment and overprice regulations of Act No. 26190, the largest number of respondents did

not answer the question because they do not know it. Those who did answer this item qualified it either as Good or as Poor.

The information on the tables shows that the majority of the respondents consider that the disposition of banking and financial institutions is between fair and poor, although there are some good qualifications.

Complementary comments point out that the companies working with Renewable Energies have no adequate financial support. On the other hand, the guarantees demanded by the banks are high and they prevent the possibility of requesting new loans for other projects. Furthermore, the absence of soft loans/subsidies and the lack of incentives reduce even more the possibility to obtain loans.

As regards financing entities, respondents mentioned that the requested guarantees are difficult to comply with because the amounts demanded by the banks are high and are not released until the total amount of the loan has been repaid, many years after. Therefore, during the refunding period, companies are not granted new loans for further undertakings, thus blocking new projects.

In general, the opinion is that public and private credit institutions in Argentina lack special regulations and experience to handle renewable energies projects, or special incentives taking into account their social and strategic importance from the point of view of amounts, periods and other conditions of the loans for this sector. There are no specific financing schemes for this kind of projects and many involving renewable energies in Argentina have been partially financed with provincial funds, electric development funds and those of the Ministry of Education with the aid of international organizations.

There are certain possibilities of obtaining financing from funds of national or international organizations whose aim is the investment in projects in order to mitigate the GG (Greenhouse Gases). The CDM (Clean Development Mechanism) projects are an example of this. However, in Argentina there are only about 11 projects registered, 7 approved and 1 under evaluation process.

The majority of the respondents agreed about assessing the external factors associated to the projects, provided in that way they would be in better conditions to compete with conventional energies.

**TABLE 8. QUESTIONS ABOUT ECONOMICAL AND FINANCIAL BARRIERS (IN FIGURES)**

QUESTION	NUMBER OF ANSWERS				
	VG	G	F	POOR	DK/NA
For the development of RE projects, what sign do you think the investors perceive ?	1	22	105	92	41
How would you qualify the investment system and the surcharge established by Act 26.190 for RE?	3	39	35	16	168
How would you qualify the inclination of the banking and financial institutions to finance RE projects?	8	42	62	81	68
What do you think about quantifying the external factors when evaluating a project?	115	77	13	8	48

**TABLE 9. QUESTIONS ABOUT ECONOMICAL AND FINANCIAL BARRIERS (IN PERCENTAGES)**

QUESTION	STRUCTURE OVER THE TOTAL (%)				
	VG	G	F	POOR	DK/NA
For the development of RE projects, what sign do you think the investors perceive?	0%	8%	40%	35%	16%
How would you qualify the investment system and the surcharge established by Act 26.190 for RE?	1%	15%	13%	6%	64%
How would you qualify the inclination of the banking and financial institutions to finance RE projects?	3%	16%	24%	31%	26%
What do you think about quantifying the external factors when evaluating a project?	44%	30%	5%	3%	18%

### 3. Regulatory Barriers

Tables 10 and 11 summarize the answers received regarding three questions on barriers of regulatory nature. Herein below we present some of the main comments furnished with these results.

It can be noticed, that the majority of the respondents did not answer the questions regarding the regulatory area stating this is an unknown area to them. Those who did answer them noted the regulations of the Wholesale Electric Market and the overprice set forth in Act 26190 as fair.

On the other hand, there were claims about the delay and the lack of definitions existing at the time when the survey was

made (at that time, Act 26190 had not yet been regulated). Moreover, among other issues they pointed out that incentives are insufficient, they do not take into consideration the price of conventional energies and they lack an update mechanism providing flexibility to them.

The comments addressed the need for a compendium of all the direct and indirect regulations regarding Renewable Energies.

Respondents also pointed out that there is an important legal vacuum and/or inexistence of regulations promoting thermal uses of renewable energies.

**TABLE 10. QUESTIONS ABOUT REGULATORY BARRIERS (IN FIGURES)**

QUESTION	NUMBER OF ANSWERS				
	VG	G	F	POOR	DK/NA
How would you qualify the rules applicable in the WEM for the development of renewable energies?	1	19	56	19	166
How would you qualify the criterion adopted by Act 26.190 to fix a surcharge for RE?	0	28	57	27	149
How would you qualify the existing rules as regards the rights of easement and use of soil or other rights concerning the development of RE?	1	21	24	21	194

**TABLE 11. QUESTIONS ABOUT REGULATORY BARRIERS (IN PERCENTAGES)**

QUESTION	STRUCTURE OVER THE TOTAL (%)				
	VG	G	F	POOR	DK/NA
How would you qualify the rules applicable in the MEM for the development of renewable energies?	0%	7%	21%	7%	64%
How would you qualify the criterion adopted by Act 26.190 to fix a surcharge for RE?	0%	11%	22%	10%	57%
How would you qualify the existing rules as regards the rights of easement and use of soil or other rights concerning the development of RE?	0%	8%	9%	8%	74%



#### 4. Technical Barriers

The following tables summarize the answers received regarding five questions on barriers of technical nature. Herein below we present some of the main comments furnished with these results.

In general, the availability of information is considered fair, with a large gap between satisfactory and poor.

The respondents' perception shows that the availability of information varies, with a great disparity of data depending on the type of renewable energy and the area in the country involved. They express the need to make up for the lack of information. Although it is evident that there is the necessary capacity to collect, organize and promote the communication of information, this is still to be done.

Additionally, many of the respondents consider that there is no geographical information relating the resources, the demand and the available (or necessary) infrastructure. This is considered an essential tool for an adequate planning and for the identification of the sites with the best potential for the development of projects for each type of renewable energy. A great number of experts consider that partly as a result of insufficient knowledge and of the urgent need to cover the demand, the electrification process is privileging the extension of the electric grid and the deployment of conventional generators over the development of renewable energies. Furthermore, they have pointed out that there is a poor diffusion of information to society (consumers and producers) and there is no associated education program.

**TABLE 12. QUESTIONS ABOUT TECHNICAL BARRIERS (IN FIGURES)**

QUESTION	NUMBER OF ANSWERS				
	VG	G	F	POOR	DK/NA
How would you qualify the availability of RE information in Argentina?	9	33	133	68	18
How would you qualify the availability of infrastructure (technical, interconnection, etc.) for the use of renewable resources?	6	46	122	39	48
How would you qualify the availability of local technical capacities?	41	149	42	10	19
What's your opinion about the quality of the equipment used in the small-scale RE projects?	13	123	57	16	52
How would you qualify the requirement to certify all small-scale project equipment, if any?	145	54	11	4	47

**TABLE 13. QUESTIONS ABOUT TECHNICAL BARRIERS (IN PERCENTAGES)**

QUESTION	STRUCTURE OVER THE TOTAL (%)				
	VG	G	F	POOR	DK/NA
How would you qualify the availability of RE information in Argentina?	3%	13%	51%	26%	7%
How would you qualify the availability of infrastructure (technical, interconnection, etc.) for the use of renewable resources?	2%	18%	47%	15%	18%
How would you qualify the availability of local technical capacities?	16%	57%	16%	4%	7%
What's your opinion about the quality of the equipment used in the small-scale RE projects?	5%	47%	22%	6%	20%
How would you qualify the requirement to certify all small-scale project equipment, if any?	56%	21%	4%	2%	18%

On the other hand, the availability of existing infrastructure is considered fair, even though there is a large gap between satisfactory and poor. A significant number of respondents pointed out that there are great renewable resources in areas with low population density lacking an adequate electric transmission infrastructure. This represents an additional barrier for the development of these resources in large scale, as it happens in the Patagonia with the wind resource. Therefore, the development of transmission infrastructure is a prerequisite in these cases in order to grant access to the national network and provide economic feasibility to the projects. It is expected that the new interconnection lines of the Region may facilitate this development.

Advanced renewable technologies for the interconnection with the electric grid also face certain problems related to the failure to acknowledge capacity credits, the characteristics of voltage regulation and the contribution to the strength and reliability of the electric grid. However, more flexibility from CAMMESA is being perceived.

As regards the quality of the available equipment, in general it is classified as Good although it is considered variable, requiring the application of quality standards in order to guarantee an adequate performance of the facilities, especially as regards more complex technologies.

Several comments point out that within the industrial area there is a high potential for the manufacture of a large portion of the technologies associated to renewable energies which have reached the commercial stage in other countries. In case of less complex technologies, it has been noticed that there are small companies manufacturing equipment in the field of small hydroelectric, high and low power aerogenerators, windmills used for pumping, solar water heaters, biodiesel stations, biodigesters, geothermal energy development, ethanol stations components, biomass boilers, and photovoltaic system components.

Some more simple technologies could be easily developed at the industrial level provided there is sufficient capacity to do so. However, the lack of an attractive market accounts for the almost inexistent level of application in these areas. The industrial capacity associated to the above mentioned technologies could be strengthened or developed in the short and long term.

Particularly, it has been noticed that there is a certain lack of technology in the solar and biomass area for domestic and productive uses.

As regards technical capacity, it has been classified as Good. Although the lack of significant human resources in the technological area has not been noticed, these are sub-used and request periodical training. There is an overlapping of efforts in certain areas and difficulties in the coordination, thus resulting in a deficient organization. We have already commented about the existence of important geographical differences as regards the location of institutions related to research, development and promotion of Renewable Energies, and about the need for training in public organizations as regards the characteristics of the systems, their potential, limitations, project development, players, etc.

Additionally, some public institutions still present legal and bureaucratic obstacles for the conversion of technological developments into commercial undertakings, making the possibility of association with private players and the development of patents even more difficult.

As a complement to these conclusions and as regards the research and development activities, we have collected additional comments in the sense that in Argentina there is a large capacity and degree of activity involving technologies such as photovoltaic, wind, hydraulic, thermal solar, biomass and hydrogen. On the other hand, the absence of further development in some technologies, especially anaerobic digestion and biomass gasification has been noticed.

It is then possible to assert that there exist capacities at individual and even at institutional level but there are mistakes in the so-called systemic capacity, that is to say the constructive articulation in order to generate comprehensive and specific results.

A very important aspect is related to the numerous difficulties arising when it is necessary to precise the Operation and Maintenance infrastructure of this kind of projects. Indeed, in contrast to the projects of conventional energies, the greatest part of the projects involving renewable energies (especially in rural areas) involve low density population and the participation of a variety of players requiring coordination. Due to these characteristics, in general the O&M infrastructure shows important deficiencies as regards geographical coverage all along the country as well as regards the times assigned for the repair of equipment. Sometimes this is an essential aspect when deciding whether to develop a project or not. Manufacturers and distributors must expand their coverage networks and the scope of their guarantees so as to reduce the rejection of technology due to lack of adequate maintenance. In rural

#### RESEARCH & DEVELOPMENT

In Argentina there is an important capacity in the area of R&D (Research and Development) oriented to renewable energies, showing specific examples of the development of processes, systems and concepts which could be the objective of a massive application. Some of the best known teams are:

- INENCO (National University of Salta) thermal solar applications and thermal solar generation.
- Laboratory of Catalytic Processes (FIUBA) hydrogen from ethanol.

- Laboratory of Human Environment and Housing and Energy (INCIHUSA).
- Research Center Habitat and Energy (FADUUBA) Solar and bioclimatic architecture.
- Institute for Research and Policies for the Constructed Environment (IIPAC) – Former IDEHAB School of Architecture of the National University of La Plata (UNLP).
- Laboratory of Architecture and Sustainable Habitat - (LayHS) - Former IDEHAB School of Architecture of the UNLP (Na-

- tional University of La Plata).
- Study Team on Solar Radiation (GERSolar), Physical Division, Department of Basic Sciences, National University of Luján (UNLu). National Program of Bioenergy.
- Center of Research of Agroindustry, INTA.
- Center of Research and energy development, Technological Strategic Renewable Energies Area, INTI.

areas there is some infrastructure which should be developed, supported and expanded to that end.

### 5. Socio-cultural Barriers

Tables 14 and 15 summarize the answers received regarding three questions on barriers of socio-cultural nature. Herein below we present some of the main comments furnished with these results.

The majority considers that the beneficiaries' perception is between Good and Fair with a high percentage of no answers. In general, they also agree with the implementation of mechanisms facilitating the access to energy and local training actions.

In general, respondents mentioned that when designing or approving a project, the compatibility between technology, the requirements and cultural characteristics of the users are not always taken into account. The degree of awareness of the projects' beneficiaries throughout their development is generally low. Furthermore, the majority of the respondents consider that the costs of renewable energies projects for isolated rural

population should not be undertaken by the beneficiaries who are below the poverty line.

Complementary comments related to the users show that training is essential as it is linked to the correct operation of the systems and their better acceptance, two critical aspects to guarantee the sustainability of a project over the years. In particular, it is important that in low capacity projects, the user may be conscious of the limitations of his electric generation system and its implications from the point of view of the adequate management of the energy demand.

Nowadays, importance is also given to the cultural aspects when introducing a new technology so as to estimate the potential degree of compatibility and acceptance.

Experience shows that when Renewable Energies projects are associated to other productive ones, there is a better acceptance by future users during all the developmental process, thus ensuring a better future sustainability.

**TABLE 14. QUESTIONS ABOUT SOCIO-CULTURAL BARRIERS (IN FIGURES)**

QUESTION	NUMBER OF ANSWERS				
	VG	G	F	POOR	DK/NA
What's the perception of the RE project beneficiaries about the effects of such projects on the environment?	30	76	77	17	61
What do you think about the existence of mechanisms that facilitate the access to energy to the poor or indigent sectors?	159	71	15	7	9
What do you think about the need to provide local operation and maintenance training?	182	63	6	0	10

**TABLE 15. QUESTIONS ABOUT SOCIO-CULTURAL BARRIERS (IN PERCENTAGES)**

QUESTION	STRUCTURE OVER THE TOTAL (%)				
	VG	G	F	POOR	DK/NA
What's the perception of the RE project beneficiaries about the effects of such projects on the environment?	11%	29%	30%	7%	23%
What do you think about the existence of mechanisms that facilitate the access to energy to the poor or indigent sectors?	61%	27%	6%	3%	3%
What do you think about the need to provide local operation and maintenance training?	70%	24%	2%	0%	4%

## PROPOSALS

Table 16 summarizes the proposals received to overcome the detected barriers.

In agreement with the order of priority assigned to different barrier categories, the steps that have been proposed correspond in part to the political/institutional area and to the economic/financial area, followed by the regulatory area and the technological and social areas.

**TABLE 16. ORDER OF PROPOSALS (IN QUANTITIES AND PERCENTAGES)**

ASSOCIATED TO BARRIERS	QUANTITY	%
Institucional	76	32%
Economic	60	25%
Other	41	17%
Regulatory	33	14%
Social	23	10%
Technological	4	2%
Total	237	100%



**Generally**, respondents indicated some of the conditions necessary to attain the promotion of renewable energies projects:

- To reconcile the short term energetic policy with the long term energy and environmental policy. To plan the supply preventing the adoption of structural solutions that may be counterproductive in the long term. To insert renewable energies in the long-term planning.
- To implement from the Executive Power an institutional and inter-institutional framework that may favor the coordination of players and initiatives regarding renewable energies, strengthening the existing workgroups and activities.
- To provide stability, transparency, continuance and flexibility to the regulations, decreasing the level of uncertainty in the rules of the game.

Below there is a summary of the proposals received under the format of an integrating and coherent proposal in order to advance in the overcoming of some of the barriers that have been identified.

Below there is a draft of an integrated proposal aimed at moving forward with the development of renewable energies in Argentina. The objectives and recommendations have been organized by areas, by priority order, establishing one objective per area.

The recommendations have been identified by area in accordance with the priority order established in the surveys. For each of these areas, the objective to be reached has been established.

### Proposals for the Institutional Areas

**Objective 1:** It would be convenient to implement from the Executive Power a mid and long term energy policy that includes renewable energies and to provide the means for the execution thereof.

#### Recommendations:

There must be a political will so that renewable energies may form part of the agenda and a favorable institutional framework may be created for the development thereof. This step is fundamental for the attainment of all the objectives and action guidelines cited below. It is clearly the largest challenge since it determines basic issues such as the definition of policies and the assignation of funds and responsibilities among different players.

The State has to assume its role as coordinator among players and activities in the renewable energies area, as fund provider, and as policy maker responsible for implementation as well. To that end, it is necessary to strengthen, train and renew the technical and political roles that may be assigned in order to comply with this goal. To that end, the work areas should be in charge of experienced professionals in the field, to which end it is necessary to develop the capacity of the relevant players

(policies, incentives, financing). Such areas have to minimally comply with the objectives set forth by the Secretariat of Energy for the Renewable Energies Area.

As part of the development of a policy in the renewable energies area, it would be necessary to define the priority technologies for the country and to help developing them through incentives and the assignation of resources. The starting point could be the performance of an integral energy study at the regional level that may complement the planning and participation actions of the relevant players. It would be necessary to integrate this policy into the regional development strategies and into sectors such as health, education, etc.

The general policy would have to be transversally articulated with the different and necessary sectors. Particularly, the policies of the Ministry of Science and Technology in the definition of areas of vacancy and priorities of Research and Development; the Ministry of Education regarding the formation of technicians and professionals involved in the development and maintenance of technologies related to renewable energies; CONICET regarding the support to and promotion of the researchers involved in the analysis of the resources and technologies defined as priority; the Secretariat of the Industry so that it may identify the mechanisms that may promote the orientation towards the proper technological developments; the Secretariat of the Treasury of the Ministry of Economy so that it may agree to the generation or resignation of the necessary resources to the regional development areas so that they may incorporate the energy infrastructure into their analyses and, within it, the role of renewable energies, to name a few aspects.

It would be necessary that the policy promotes the diffusion of the renewable energies advantages by means of demonstration projects and the strengthening and support of the provincial and municipal agencies involved in the implementation at the local level.

The relevant information for the development of renewable energies should be compiled systematically, and it should be available for all the players.



## Proposals for the Economic/Financial Area

**Objective 2:** It would be convenient to create mechanisms that may allow for the reduction of the renewable energies technologies' costs and for the easing of the amortization and/or the granting of an additional reasonable compensation.

### Recommendations:

A Fund with a significant economic State contribution for the development of projects, the granting of guarantees and the promotion of industrial modernization should be created. Furthermore, a transparent management of the funds and mechanisms that may prevent its use for other objectives should be guaranteed.

The use of equipment demand from state entities for housing and public buildings plans would be convenient in such a way that an incipient market could be developed; manufacturers should be supported in order to promote improvements in the manufacturing processes and design, expand capacity and reduce costs. A minimum sales volume for renewable energies equipment could also be guaranteed through the development of niches and the creation of small and mid capacity projects.

It would be necessary to establish alternative financing or incentives schemes recognizing the benefits of renewable energies, granting stable rules of the game that may guarantee the efficiency of instruments. There should be a soft credit line for simple proceedings and reimbursements in the mid and long term for the development of certain niches (e.g. the acquisition of solar water heaters for LPG users), that have only been implemented in a few places. It is hard to expect that these credits be granted by conventional financial entities without the existence of the proper legal instruments and the State intervention. Additionally, specific mechanisms for the management of risks and uncertainty in renewable energy projects are further required.

A project evaluation methodology that may consider the externalities and direct and indirect costs and benefits thereof should be applied. Actual generation costs should be transparent so that the existing subsidies could be reviewed and eventually reassigned to the promotion of renewable sources.

The incentives included in Act 26190 should be reviewed and if possible, the costs associated with the approval of projects and the installation of equipment should be reduced (facilities inspection costs, redundant protection equipment, construction permits, etc.).

## Proposals for Regulatory Area

**Objective 3:** A coherent regulatory and legal framework would be necessary. Such framework should be coherent, clear, foreseeable, and flexible, and it should properly promote the development of renewable energies in Argentina.

### Recommendations:

It is necessary to revise Act 26190, namely in relation to incentives, incorporating mechanisms that may allow for a proper updating thereof, taking as a reference conventional generation costs. Such modifications should be accompanied by the

assignment of the respective budget. It would be further necessary to establish regulations for the calculation of the additional compensation that the projects set forth in Section 14 of Regulatory Decree 562/2009 would receive. It would be further convenient to review the objectives in such a way that fulfillment thereof may be feasible.

All the regulations that may directly or indirectly affect renewable energies sources should also be revised with the purpose of eliminating the restrictions that may lack support, providing them with coherence and updating them in general. These regulations would have to be complemented with regulations designed to promote renewable energies that may better adjust at the municipal, provincial and national level including, aside from the electric power generation, thermal applications. As a critical aspect, the proper application of the legal and regulatory framework would have to be efficiently controlled, and the stability of the rules of the game would have to be guaranteed in the long term.

It would be necessary to review and eventually redirect the subsidies assigned to conventional sources of energy, providing for the potential impacts of this process.

Construction codes would have to be modified in such a way as to allow and promote the incorporation of renewable technologies and guarantee compliance with construction insulation and thermal conditioning standards.

## Proposals for the Technical Area

**Objective 4:** It would be convenient to reduce the costs and improve the quality, performance and the area of application of the commercially available renewable energy equipment.

### Recommendations:

The existing R&D groups should be coordinated and strengthened based on the fulfillment of the objectives defined at the national, provincial and local level, preventing the duplication of efforts. The relationship between academic entities and the industry should be promoted, in such a way that the improvement of commercially available technologies and the reduction of costs may be attained. To that end, it is necessary to eliminate the restrictions to the participation of researchers in such cooperation.

The technological development of renewable energies should be promoting, covering all the stages (research, production, design, and implementation). Maintenance and post-sale services should be substantially improved through the support of the local infrastructure and training actions. It would therefore be necessary to promote the modernization of production through the development of niches (housing plans, public sector).

It is further necessary to develop quality standards and implement a certification system with the object of improving the quality of equipment, production systems, installation, and consumer orientation. Such system should be accessible, i.e., it should not become a barrier to manufacturers, especially small ones. To that end, the certification should be related to incentives of the economic-financial type for the moderniza-

tion of production lines and technologies, and the possibility to participate in state bids. The relevant entities should be equipped and they should receive financing for the performance of measurement tasks and the certification of equipment and installations.

More efforts should be dedicated to the building integration of certain systems (e.g., photovoltaic, solar water heaters, etc.), particularly in urban areas.

Research should also be promoted in order to attain a higher participation of renewable energies in the interconnected system without affecting the reliability thereof. Solutions should be developed for isolated networks (as for example in hybrid systems).

The attainment of a better knowledge on the existing renewable resources in order to identify the areas with higher potential through a joint mapping of requirements, infrastructure and capacities would be necessary. It is recommended the development of the local infrastructure and human resources for the expansion of O&M grids in rural areas.

### Proposals for the Social Area

**Objective 5:** Players should be aware of the benefits and limitations of the Renewable Energies since their application contributes to the improvement of the life quality of the most segregated sectors.

#### Recommendations:

The Renewable Energies issue should be introduced at every level of the educational curricula. The public means of communication should be used to report and generate awareness on this issue, and to promote training and provide information to manufacturers, constructors, project developers, installers, and users, among others.

The existing initiatives for the training of technicians and professionals in renewable energies should be supported. Existing initiatives for the communication of the proper renewable technologies aimed at low income sectors should also be supported.

A program based on renewable energies should be drafted for the development of productive activities and the improvement of the rural areas population income. Policies and actions should be coordinated with other governmental areas involved in the development of rural areas and employment generation.

The intention is to develop pilot experiences and communicate the results thereof, showing the advantages of the renewable energies projects in the environmental and social areas.









3

THIRD  
PART

## OBJECTIVES FULFILLMENT

The tasks performed within the framework of the Project have enabled the fulfillment of the objectives that have been initially established. Among them the following could be highlighted:

- As a result of the elaboration of the preliminary diagnosis and the surveys that have been performed, it has been possible to learn preliminarily about the main renewable energies activities that are being carried out in the country, as well as the potential of available resources. We have been able to identify the economic, institutional, financial and regulatory barriers that could affect the development of renewable energies projects in Argentina.
- Learning about these obstacles has allowed us to prioritize them and to define the relevant objectives. Proposals of the

strategies, actions and instruments to ease the removal thereof have been prepared.

- Based on the approach we have followed to reach hundreds of players who are directly or indirectly involved with renewable energies, by means of interviews, the SEE's website, the participation in different events and the distribution of this summary document, we have been able to publicly communicate the project's results.
- We expect that the institutional consultation methodology that has been developed to carry out the project, as well as the interaction experience with the players of the sector and the work team and the Secretariat of Energy authorities may expand the necessary capacity that has been replicated.

## SUMMARY AND CONCLUSIONS

There are significant renewable energy resources in Argentina that could be used for electric power generation and for other uses. Previous studies have made a preliminary quantification of the generation potential and identified the existence of institutional and technological capacity to carry out the projects (See Exhibit A). However, a number of barriers of a very diverse nature hinder the implementation thereof in the short and mid-term, as it is the case with other countries of the world.

The process of consultation with the involved players has generated valuable information in order to advance in the overcoming of the barriers that affect the renewable energies sector in Argentina.

Despite the average level of replies, it can be considered that the respondents comprise a representative sample of the renewable energies sector in Argentina, with an important participation of the academic sector and participants from 16 provinces and the Autonomous City of Buenos Aires. As regards technologies, the respondents' most common working area is related to solar energy, followed by wind energy and biomass. Hydro and geothermal energy are further away in the list. By contrast, wind energy was considered as the tech-

nology with higher development potential in Argentina in the medium term, closely followed by solar energy, and then by hydro-energy and biomass. This perception is probably biased by the participants' working areas but also takes into account the costs of each technology, the abundance of the resource and generation potential, the existence of local capacity and technology, and the experience in project development.

The analysis of the non-quantitative results of the survey shows that an important part of the respondents think that the development of renewable energies in Argentina has been obstructed by a great number of barriers, which strongly contrasts with the existing local capacity and the available renewable resources. Among such barriers, the institutional and economic/financial barriers would be the most important to overcome, followed by the regulatory ones. On the other hand, respondents assigned a low priority level to technical and social barriers.

The analysis of the comments and the survey itself show that the respondents feel that there are political difficulties and structural limitations of the governmental entities responsible for the establishment of policies and the coordination of this



area for the resolution of such problems, as well as for the execution of effective actions. That is why high priority has been assigned to overcoming the institutional barriers, as it is perceived that the resolution of many other barriers largely depends on that.

Within the institutional sphere, a greater commitment from the State in the formulation and implementation of an energy policy, including renewable energies, and the necessary means to develop them in an effective way is highly claimed. As part of this strategy, it is felt that there is a need to have a strong and technically solvent organization that may formulate objectives and coordinate player and activities nationwide in the renewable energies area, providing continuous support to the existing work teams.

Furthermore, the survey reveals that the regulatory and legal framework continues to be insufficient and does not include the treatment of non-electrical usage of renewable energies. Specifically, there is a mention the need to revise the incentives established by Act 26190.

In the economic/financial area, there is the perception that there is lack of support and instability. Respondents agree on remarking the need of a strong state intervention to generate mechanisms that may enable the reduction of the costs of technologies and the affording of the initial investment. The need for the creation of a banking and financial system, especially public banks and specific funds for the development of renewable energy projects is widely highlighted.

In the technical area, the local capacity is highlighted, even though it is recognized that there are specific training needs for certain areas (design, installation, production). The equipment quality is considered good in general terms, but the implementation of a program for the certification of the equipment and installations, and for the modernization of the production lines is recommended.

It is important to highlight that the potential for the use of renewable energies outside the electric generation is high (as for example caloric uses). However, the regulations and main policies that have been implemented so far have not taken it into consideration.

Finally, respondents recommend the implementation of a program for the communication of the characteristics and benefits of renewable energies, and the specific support of projects aimed at improving the quality of life and income of the low-income socioeconomic sectors.

As a final conclusion, we could say that the players consider that now that the barriers have been properly identified, it would be possible to advance in the implementation of some of the proposals stated above; yet, to that end, the State decisions are essential.

Finally, and in view that the development of the renewable generation is still marginal, and based on the analysis of the different studies that have been performed, it may be preliminary concluded that the objective established by Act 16190 of covering 8% of the electric demand of renewable energies is not easy to fulfill without the implementation of policies, instruments and specific promotion actions, particularly aimed at financing. These policies have to be namely aimed at the development of approximately 3000 MW of projects of wind energy, generation in mills based on bagasse mini-hydro and thermal stations based on biomass residues. Act 26190's regulations (Decree 562/2009) and the launching of GENREN seem to be going in that direction. Then the fast implementation of actions that may guarantee its actual efficiency would be necessary.

## EXHIBIT A. RENEWABLE ENERGIES. INSTITUTIONAL FRAMEWORK<sup>28</sup>

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**28.** Revised, based on the Second Communication of the National Government of the Republic of Argentina. MR Consultores, Emissions Mitigation through the Development of Renewable Energies Use. “Evaluación del mercado de las energías renovables en la República Argentina”. October 2005.



## NATIONAL INSTITUTIONAL FRAMEWORK

MINISTRY	ENTITY	PROGRAM	REMARK
Ministry of Science, Technology and Productive Innovation (MINCYT)	Secretariat of Science, Technology and Productive Innovation (SECTCIP)	Special Program of Renewable and Non-Renewable Resources. Energy and Transportation Sub-Program	It contribute funds for specific projects in FNRE
	National Scientific and Technological Development Agency (ANPCyT)	Fondo para la Investigación Científica y Tecnológica (FONCYT)	They contribute funds for research, equipment development and for the implementation and manufacturing thereof.
		Argentine Technological Fund (FONTAR)	
	Federal Council of Science and Technology (COFECyT)	National Program of Science, Technology and Innovation Federalization (PROFECyT)	
	National Council of Scientific and Technical Research (CONICET)		CONICET supports the research and development of New Energies and Renewable Energies, among others. It is important for the training of specialized human resources.
Ministry of Education	Infrastructure Department		It contributes 20 % to the electric supply program for PEMER schools
Federal Planning, Public Investments and Services	Secretariat of Energy (SE)	Undersecretariat of Electric Power, "Renewable Energies in Rural Markets Project" (PERMER)	It has a loan granted by the World Bank (30 MM USD) and a subsidy from the GEF (10 MM USD)
		Undersecretariat of Electric Power, National Development Agency, Renewable Energies Coordination Area.	Design of programs and actions aimed at the development of FNRE and the development of pilot demonstration projects in all their aspects.
		Undersecretariat of Fuels	Biofuels
		Electric Power Federal Council (CFEE)	Participation in the process of projects presentation, Act 26190, and all other activities in relation to renewable energies.
	Secretariat of Mining	Department of Geothermics	Responsible for the use of geothermal energy in the country
		National Wind Energy Strategic Plan	Generation of an integral development of wind capacity farms
Economy and Production Ministry	Secretariat of Agriculture, Livestock, Fishing and Food	Department of Agriculture	Biofuels Program (Biodiesel and Bioethanol)
		National Institute of Agricultural Technology (INTA)	National Program of Bio energy
	Secretariat of Industry, Trade and of the Small and Medium Company	National Institute of Industrial Technology (INTI)	Center of research and development of Energy, Technological Strategic Renewable Energies Area
Health and the Environment Ministry	Secretariat of the Environment and Sustainable Development	Sustainable Energy Development Unit	It has the purpose of studying the applications of FNRE in its relation to the environment.

## OTHER ENTITIES

Local Rural Electrification Council	Integrated by: - Secretariat of Energy of the Nation. - Argentine Federation of Electric Cooperatives. - Electric Power Distributors Association of the Republic of Argentina. - Regional Wind Energy Center.	Promotes the Exchange of experiences in rural electrification and in rural energy supply among its associates.
Energía Argentina Sociedad Anónima (ENARSA)	“Renewable Generation Program”, launched on 05/20/09. The National State through ENARSA will call for bids for the purchase of renewable energy for a total of 1.015 MW. The life of the contracts shall be of 15 years and their awarding shall take place in modules of up to 50 MW.	

## INVESTIGATION, DEVELOPMENT AND FORMATION OF HUMAN RESOURCES

ENTITY	PROGRAM	REMARKS
National Council of Scientific and Technical Investigations (CONICET)	Institute of Human, Social and Environmental Sciences. Human (NCIHUSA) and Housing Environment Lab. (LAHV) Non-Conventional Energy Research Institute (INENCO)	The are the only CONICET institutes involved in FNRE issue. There are some other Institutes that we do not mention and do some research on the above issues.
Universities	National Univ. of Salta National Univ. of Catamarca National Univ. of La Plata National Univ. of Bs. As. National Univ. of Rosario National Univ. of Nordeste National Univ. of Lujan National Univ. of Litoral National Technological University (Different Regions). National Univ. of San Luis National Univ. of Patagonia Austral National Univ. of San Juan	There are groups specifically involved in the issue of FNRE, with significant dedication to the training of specialized human resources.
National Atomic Energy Commission (CNEA)	Solar Energy Group Institute of Energy and Sustainable Development	Specifically involved in photovoltaic cells and panels. Involved in Technology, Research and Development especially in relation to the energy field.
Regional Wind Energy Center (CREE)		Specifically involved in wind energy.
Argentine Association of Renewable Energies and the Environment (ASADES)	Since its creation, it has made great contributions to the maintenance of the continuance of the Research, Development and Transference activities regarding the development of new and renewable energy sources.	





## EXHIBIT B

# VENADO TUERTO MUNICIPAL ORDINANCE Nº 3633/2008

### PROVIDES FOR THE RESEARCH, DEVELOPMENT, GENERATION, PRODUCTION AND USE OF PRODUCTS RELATED TO RENEWABLE ENERGIES

► **VISTO:**

La necesidad de implementar en todo el ámbito de la ciudad de Venado Tuerto la utilización racional de fuentes de energías Renovables y en particular la solar; y, Considerando:

Que los informes de la Comisión Internacional sobre el Cambio Climático (CICC) es un alarmante documento que deja en claro que el calentamiento global es una realidad y se debe con un 90% de certeza a la mano del hombre.

Que la Municipalidad de Venado Tuerto desde marzo de 2002 se halla asociada al Programa de la Comisión Europea URB-AL Red Nº 4 –“La Ciudad como Promotora del Desarrollo Económico”– Proyecto “Energías Renovables y Redes de Desarrollo Local”.

Que el grado de avance y difusión del mismo entre las instituciones y empresas del medio local y de otras jurisdicciones del Departamento General López, cuenta con la adhesión y participación de distintos gobiernos comunales.

Que es importante el número de emprendimientos vinculados al uso y desarrollo de tecnologías vinculadas a las Energías Renovables.

Que existe la necesidad de adecuarse en el Área de Energía y Sostenibilidad a las políticas activas impulsadas desde la Secretaría de Desarrollo Productivo.

Que la decisión del gobierno de la Provincia de Santa Fe de privilegiar el desarrollo productivo de los biocombustibles y las distintas energías renovables se expresó a partir de las leyes recientemente sancionadas, las que fueron presentadas ante la Legislatura Provincial para su sanción por iniciativa del señor Senador Provincial por el Departamento General López, don Ricardo Spinozzi.

Que el país depende de manera extrema de los combustibles fósiles como fuentes energéticas. Además, dichas fuentes no son renovables, con un horizonte de vida limitado en este país, y es previsible que deberán ser importados en una alta proporción, lo que incidirá sobre la balanza comercial de pagos y los costos locales.

Que la ciudad de Venado Tuerto ha evidenciado posibilidades para convertirse en un polo de desarrollo tecnológico a partir de las energías renovables.



Que de acuerdo a la Ley Nacional N° 24.295, se aprueba el texto de la Convención de Marco de Naciones Unidas sobre Cambio Climático, y en la misma se expresa en su artículo 4° (compromisos) incisos 1.b y 1.c que las partes (los países) deberán "...Formular, aplicar, publicar y actualizar regularmente programas nacionales y, según proceda, regionales, que contengan medidas orientadas a mitigar el cambio climático, tomando en cuenta las emisiones antropogénicas por las fuentes y la absorción por los sumideros de todos los gases de efecto invernadero no controlados por el Protocolo de Montreal, y medidas para facilitar la adaptación adecuada al cambio climático; Promover y apoyar con su cooperación el desarrollo, la aplicación y la difusión, incluida la transferencia, de tecnologías, prácticas y procesos que controlen, reduzcan o prevengan las emisiones antropogénicas de gases de efecto invernadero no controlados por el Protocolo de Montreal en todos los sectores pertinentes, entre ellos la energía, el transporte, la industria, la agricultura, la silvicultura y la gestión de desechos..."

Que la situación geográfica de Venado Tuerto es sumamente privilegiada para la utilización de la energía solar como fuente energética.

Que es posible incorporar en edificios y casas-habitación sistemas de calentamiento de agua mixtos a través del uso de energía solar, permitiendo la reducción del consumo de gas y otras fuentes energéticas.

Que el municipio debe tener políticas activas para eliminar las barreras existentes para la implementación de la misma, y su papel como promotor de prácticas sustentables debe sostenerse en políticas públicas de incentivo económico.

Que la implementación de estas medidas de promoción económica posibilitará el desarrollo local ya que las tecnologías necesarias son de fácil implementación, promoviendo de esta manera el empleo y compra local para su puesta en práctica.

Que con fundamento en lo expuesto, el Concejo Municipal de Venado Tuerto, en uso de sus facultades y atribuciones, sanciona la presente

#### ► ORDENANZA

Art. 1º.- Declárese de interés municipal la investigación, desarrollo, generación, producción y uso de productos relacionados con las Energías Renovables.

Art. 2º.- Entiéndase como energías renovables a todas aquellas que se producen naturalmente, poseen carácter inagotable y no perjudicaren el medio ambiente.

Art. 3º.- Promuévase la investigación y uso de las distintas energías renovables utilizando para ello artefactos que se abastezcan de las mismas, como cocinas, hornos, secaderos y colectores solares, pantallas fotovoltaicas, aerogeneradores, biodigestores, etcétera.

Art. 4º.- Promuévase la producción de biocombustibles (biodiesel y etanol) a partir de materias primas no comprometidas en la producción de alimentos.

Art. 5º.- Se propiciarán las inversiones de riesgo a los efectos de promover la conformación de un polo productivo en torno a las energías renovables.

Art. 6º.- Facilítase la difusión y expansión a través de ferias y muestras de la energía, como asimismo a través de congresos, cursos y jornadas.

Art. 7º.- Dispóngase que a los efectos del cumplimiento de lo señalado en los artículos 3º, 4º, 5º y 6º del presente dispositivo, se implementará un sistema de beneficios promocionales de exención y/o reducción y/o diferimiento de la Tasa General de Inmuebles para aquellas construcciones que instalen sistemas de energía fotovoltaica, colectores solares o biodigestores; o del Derecho de Registro e Inspección, para aquellas empresas o emprendedores que presten servicios, fabriquen o instalen equipos vinculados con las energías renovables, por el término de cinco años a partir de la puesta en marcha del proyecto, previa certificación de la autoridad competente. Asimismo se proporcionará para que las empresas de servicios de electricidad, gas, agua, cloacas, etcétera, adopten similar criterio.

Art. 8º.- Establézcase que el Poder Ejecutivo Municipal definirá a la autoridad competente que tendrá a su cargo el registro de estas actividades, su seguimiento y control, quién deberá establecer los alcances de los beneficios, prioridad de radicación y condiciones de habilitación, sobre la base de que los proyectos se encuentren radicados en jurisdicción de Venado Tuerto y sean propiedad de emprendedores o sociedades constituidas en el país.

Art. 9º.- Autorícese al Poder Ejecutivo Municipal, como medio para fomentar los emprendimientos en torno a las energías renovables, generar infraestructura básica para atender necesidades de provisión de datos, información, capacitación y recursos materiales.

Art. 10º.- Constrúyase la Mesa Local de la Energía Renovable a partir de lo estipulado en el Art. 1º de la Ordenanza N° 3.184/04, tomando como antecedente y punto de partida la conformación del actual equipo de trabajo que acompaña la labor desarrollada desde el Área de Energías Renovables y Sustentabilidad - Secretaría de Espacios Públicos y Medio Ambiente.

Art. 11º.- Propíciase la incorporación sistemática y progresiva de sistemas de captación de energía solar de baja temperatura para la producción de agua caliente sanitaria en los edificios e instalaciones situados en la ciudad de Venado Tuerto, promoviendo para ello un sistema de desgravación de tasas, derechos y contribuciones de mejoras.

Art. 12º.- Considérese oportuno contemplar la incorporación de los sistemas de captación de energía solar a partir del año 2015 en los siguientes casos:

- Todo tipo de construcciones públicas implementadas por el Municipio u otros entes públicos dentro del ejido urbano de Venado Tuerto.
- Planes de nuevas viviendas a través de los diferentes sistemas de promoción.

- La autoridad competente, basándose en criterios técnicos, podrá determinar la imposibilidad de aplicación y otorgará excepciones a la presente ordenanza.

Art. 13º.- Aconséjese que los usos para los cuales se prevé la instalación de colectores de energía solar de baja temperatura con el objetivo de producir agua caliente sanitaria serán: residenciales, industriales, comerciales, deportivos, culturales y aquellos relacionados con la salud.

Art. 14º.- Nomínese a continuación las características de las futuras instalaciones:

- El sistema a instalar constará por un lado de un dispositivo de captación mediante captadores solares.
- El sistema podrá ser concebido como fuente única de calentamiento de agua sanitaria o bien como parte de un sistema mixto, en el cual el sistema de captador solar y acumulador actúan como precalentador de agua.
- En las instalaciones sólo podrán utilizarse colectores aprobados por la autoridad municipal de aplicación y control. En el proyecto deberán incluirse los datos propios de los colectores a utilizar incluyendo rendimientos, curvas características, etcétera.
- Para evitar un impacto visual inadmisibles, las instalaciones en los edificios deberán prever las medias necesarias para conseguir su máxima integración al mismo.
- Las instalaciones deberán disponer de un sistema de control. Para ello se dispondrá de los elementos adecuados que permitan medir caudal, presión y temperatura de manera de poder comprobar el funcionamiento del sistema, a lo largo de la vida útil del equipamiento.

Art. 15º.- Establézcase que a todas la instalaciones previstas en la presente Ordenanza le serán aplicables las normas urbanísticas generales, destinadas a impedir la desfiguración de la

perspectiva del paisaje. La autoridad municipal de aplicación y de control verificará la adecuación de las instalaciones a las normas urbanísticas.

Art. 16º.- Impleméntese por parte de la autoridad municipal de aplicación y control un sistema de permiso de obra en el cual se deberá incluir entre otros ítems: memoria de cálculo del proyecto, con los cálculos necesarios para justificar el tipo de instalación; características de la construcción; materiales a emplear; plan de obra y toda aquella información adicional que el organismo de control estime necesario y que se establecerá en la oportuna reglamentación de la presente normativa. Así mismo, y previo a la puesta en marcha las instalaciones de energía solar deberán ser habilitadas por la autoridad competente.

Art. 17º.- Dispóngase que el titular de las actividades que se desarrollen en el o los inmuebles donde se ha implementado el sistema de captación solar, deberá realizar las operaciones de mantenimiento necesario a fin de garantizar el perfecto estado de uso y conservación del mismo.

Art. 18º.- Crease el Plan Energético Municipal enmarcado en el Programa 1- “Planificación Energética Local” - “Proyecto Energías Renovables y Redes de Desarrollo Local” – URB-AL R4- B6-04, lo que consistirá en elaborar la metodología, desarrollar estudio de diagnóstico, elaborar propuesta de Plan Energético Local, procesos de debates, participación social y aprobación del Plan.

Art. 19º.- Comuníquese, publíquese y archívese.

Dada en la Sala de Sesiones del Concejo Municipal de Venado Tuerto, a los diez días del mes de setiembre del año dos mil ocho.



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