

**Seeing the Light: Adapting to
climate change with decentralised
renewable energy**

Perspectives from Argentina

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**Climate Change Knowledge Network (CCKN)
Side Event at COP-9, Milano, 3 December 2003**

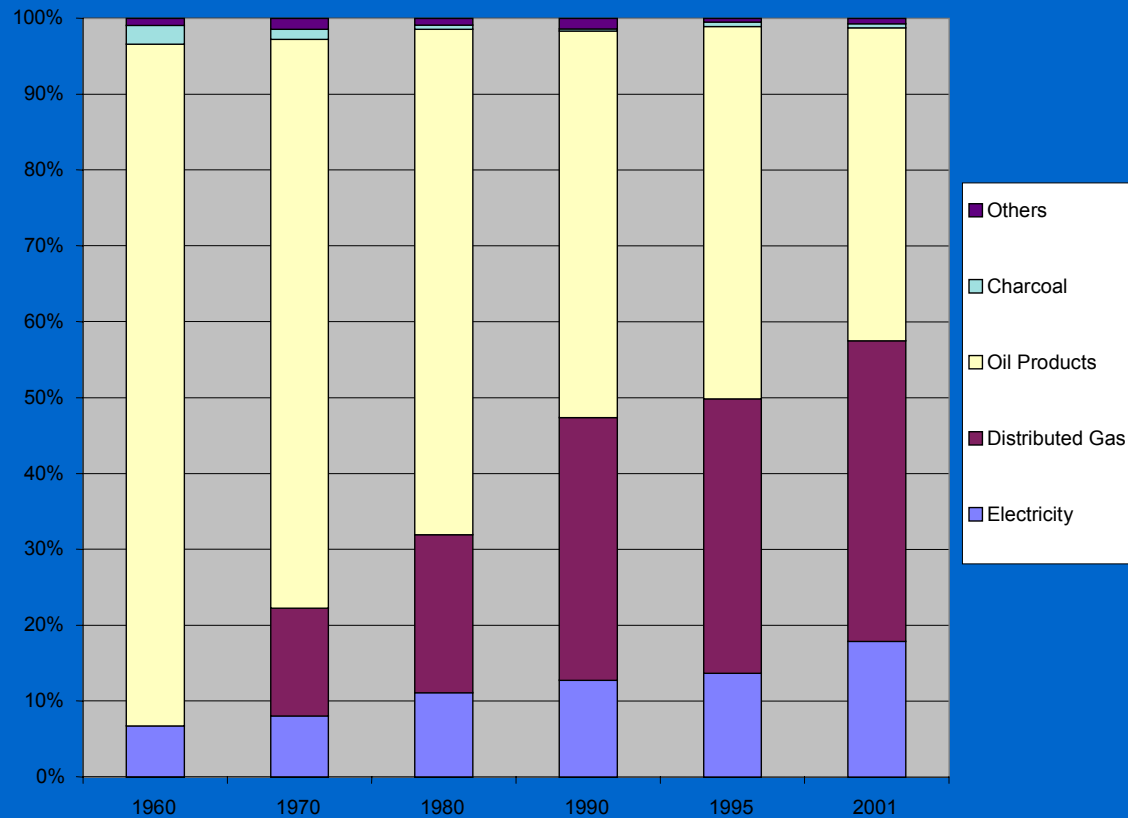
Introduction

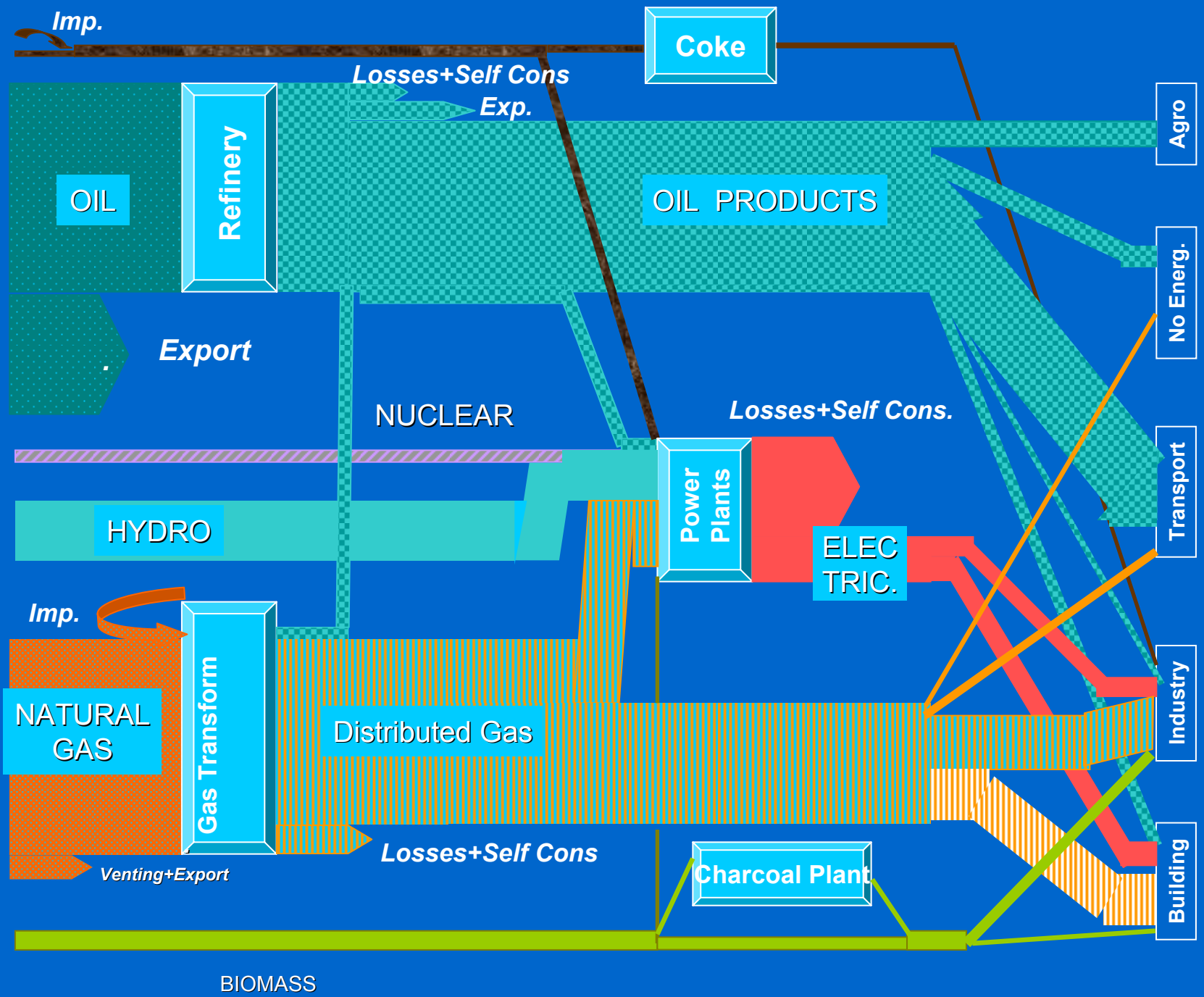
- **Argentina energy situation is quite different from most DC's.**
- **Has a high national electrification rate: 95% of the population have access to electricity (2002: delay in payment because socio-economic events).**
- **But 5% of total population (30% of the rural population / 2% of the urban) do not have access to electricity: economic and physical reasons (rural areas in particular). Potential market for disperse electricity supply systems using renewable energies.**
- **Several programmes, projects normative frameworks were implemented to respond those unsatisfied demand. Not only public but private. At National, Inter-Provincial and Local level. Also oriented to develop any particular renewable sources (solar, wind, micro-hydro).**
- **Nevertheless efforts done, there was not an in depth assessment of the results of these programmes.**

Introduction (cont.)

- **Near 730.000 households use firewood/charcoal mainly in cooking and water/room heating.**
- **Consumption: 3.2 tons./household/year (2.3 million tons./year). 50% within agriculture developments, 50% in rural settlements.**
- **Visible cause of deforestation: land use change for agriculture purposes (soybeans with a high profitable technology package) and to meet solvent demand of forestry products. Only isolated examples could be attributed to rural inhabitants.**
- **Argentina is a country with surplus capacity of wood. Country has 36 million has. of natural forests with a production capacity of 12 million tons. of wood (2.8 million coming from forest dedicated to energy; 9.2 million from forest that produce wood used for furniture and buildings. Demand (1999): 3.6 million tons. (1.4 firewood; 2,2 charcoal).**
- **Biomass: little importance in the Argentina energy matrix.**

Argentina - Evolution of the Final Consumption Structure





BIOMASS

Argentina - rural and urban population according to 1991 and 2001 censuses

Argentina – Rural and Urban Population, according to 1991 and 2001 censuses

Country - Years	Total Urban Population	Total Rural Population	Total Rural Grouped	Total Rural Scattered	Total Population
ARGENTINA					
1991	28,436,110	4,179,418	1,118,092	3,061,326	32,615,528
2001	32,352,909	3,871,038	1,232,226	2,638,812	36,223,947
Differences	3,916,799	(308,380)	114,134	(422,514)	3,608,419

Argentina - Vulnerability of the rural areas to Climate Change

- **Vulnerability to Climate Change of energy providing for rural population (and the potential role of DRE) were not the core issue in the studies carried out.**
- **Energy resources used by rural population to meet their needs do not seem to be threatened by CC, even in coldest areas. The main threat to the woods is the land use change for expanding agricultural areas (soybeans).**
- **Rural settlements are strongly vulnerable to other factors acting against their activities (availability of water for irrigation, minimum infrastructure to use water resources, soil aridity limitations, floods, etc.).**

Argentina - Vulnerability of the rural areas to Climate Change

- **Some of the main obstacles faced by rural inhabitants:**
 - **Low technological level of the current production, low sanitary and nutritional level, inadequate plowing equipment, need to adapt technologies to current production systems or modify these systems.**
 - **Difficulty to invest in irrigation water collection and channeling.**
 - **Inhabitant isolation and difficulty to access urban centers.**
 - **Land holding problems and Small development size problems.**
 - **Insufficient size of the regional market for some of the produce, falling demand of traditional products, commercialization problems, strong variations in the prices of certain products.**
 - **Ignorance on the management of alternative crops, with resulting diversification difficulties.**
- **These barriers clearly show the need to take adaptation measures for the purposes of making viable the survival of rural communities. The basic relation being registered through climate change is the exacerbation of already-existing difficulties rather than the rise of new difficulties.**

Rural Electrification - Prior to the Reforms

- Energy Secretariat tried for several decades to implement conventional rural electrification plans, with different results.
- Census 1980: 15% population lacked electricity, 44% rural households had services. (55% in 1989).
- Rural electrification began its development in Argentina with the National Rural Electrification Plans: (a) 1970-1975 (40% financed by IADB); (b) 1978-1981 (50% IADB). The rest of the funds: Energy Secretariat, and Special Hinterland Development Plan (FEDEI) funded by the nation's electricity consumers and the National Bank of Argentina.
- But conditions imposed for the credits did not contribute to its success:
 - High cost of the connection resulting from the required technical specifications.
 - High consultancy costs because the stipulation of contracting international consultants.
 - High financing costs caused by the system used to update and index the capital of the credits.
 - Lack of adequate legal framework to contemplate the activity.

Rural Electrification - Prior to the Reforms

- Land ownership structure and the way of produce and trade goods determined impoverishment and migration of farmer population within a context of rising national socio-economic deterioration, resulting from macroeconomic measures (some of which had negative impacts on the Argentine agriculture sector).
- After the two mentioned stages, rural electrification continued basically financed by FEDEI / Energy Secretariat, co-operative funds and provincial funds.
- Provincial companies played an active role giving continuity to the expansion of the networks and to supply to scattered rural settlements.
- The financing scheme for these projects was modified after the reform and was different in each province according to their degree of adherence to the process.

Rural Electrification - After the Reforms

- **1992. Was established a Wholesale Market and broken down the generation, transmission and distribution function chain. Law 24.065 does not allow electricity generators to be distributors at the same time, although it promotes horizontal competition among them.**
- **In the years immediately after the state-owned companies went private (1993-1994), many provinces were reluctant to emulate the national reforms (substantial incomes / represents the possibility for developing policies and actions).**
- **WB/IADB aid to provinces if they accepted to adapt to the national reform scheme.**
- **The conditions imposed by the banks and the Federal Government proved partially successful. Nevertheless 10 of 24 provinces (including Córdoba and Santa Fe, the most important ones after Buenos Aires) have not begun or have interrupted the privatisation of their electric distribution system.**

Rural Electrification - After the Reforms

- **Within the framework of the provincials reforms there was difficulty to expand or maintain the basic access to electricity of more isolated rural settlements.**
- **At national level, access to electricity: 91% prior the reform (1992), 95% towards 2001. Improvement to access was largely due to the normalisation of previous clandestine connections in urban and suburban areas rather than expansion of electricity services towards rural areas.**
- **More of the inhabitants that remain without a connection, are located in areas distant to the sub-transmission and distribution lines being either fully isolated households of minor settlements where it is costly to expand the transmission or distribution networks (30% of the rural population).**
- **Private distributors are not tempted to connect these settlements. They have focused their investments in densely populated urban areas.**

Rural Electrification - After the Reforms - PAEPRA

- 1995. Energy Secretariat. 5 years programme Electricity Supply to Isolated Rural Areas (PAEPRA), with initial support of GEF/WB.
- Programme set to supply electricity to 314.000 rural consumers (1.4 million people) and 6.000 community centres. Expected power: 17.000 KW.
- Costs of those services are mostly above the payment possibilities of the consumers. It was contemplated to apply subsidies that allow concession holders to manage a profitable business.
- Programme involved use of equipment powered by renewable energy (wind/solar/hydro micro-turbines) instead of diesel generation. 75% photovoltaic, 9% wind, 8% hydro and 8% diesel for aggregate systems.
- Only in two provinces (Salta / Jujuy) the concentrated and isolated electricity systems were given in concession separately. Began operating in 1997. In Salta government gave priority to the electrification of public services (schools and medicine dispensaries).
- Main problem affecting PAEPRA: reluctance of provincial governments to subsidise concession holders and the lack of interest by the potential investors.

Renewable Energy Project for Rural Electricity Markets - PERMER

- **World Bank (USD 30 million) + GEF (USD 10 million) + Provincial Funds (concession holders + consumers). End of 1999.**
- **Only for those Provinces that have begun the reform on their electricity sectors (technical assistance funds lack such restriction)**
- **Objectives:**
 - **Eliminate existent barriers for the use of new technologies.**
 - **Would allow providing basic electricity services to some 85.000 scattered consumers and some 3.500 public services.**
 - **To be the instrument for provinces to be able to use WB-GEF funds for their rural electrification plans.**
 - **Aim to develop sustainable electricity markets in scattered areas using renewables.**
 - **Minimise government subsidies and allow profitable management for private sector.**

Renewable Energy Project for Rural Electricity Markets - PERMER

- **During 2002: implementation of the project seriously undermined (financial and economic crisis; particularly the devaluation of Argentine Peso).**
- **Project came to complete standstill due to lack of disbursements from WB, which were re-established during 2003.**
- **Necessity to reschedule activities and amend the original agreement to adapt them to the new scenario and to the real possibilities of all parties involved in the project (finally signed during 2003).**

Renewable Energy Project for Rural Electricity Markets - PERMER

- The project comprised sub-projects in each of the participating provinces, consisting in the concession of the electricity services in scattered electricity market to a private company that is technically and financially capable of meeting PERMER objectives.
- Subprojects under progress include:
 - Individual wind systems pilot subprojects (two pilot subprojects to evaluate viability of household electricity supply).
 - Technical assistance (renewable energy).
 - Technical assistance to the Energy Secretariat (reform of the electricity sector)

Renewable Energy Project for Rural Electricity Markets - PERMER

- **Degree of progress in execution:**
 - **Jujuy: case study under analysis.**
 - **Tucumán: solar panels to be installed in rural schools.**
 - **Salta: study to provide electricity to 157 schools using solar energy.**
 - **Santiago del Estero: 200 schools lacking electricity. 70 of them will be provided through solar energy.**
 - **Río Negro: solar panels for 33 rural schools (in bidding process).**
 - **La Rioja: bidding conditions are being drafted for solar panels for rural schools.**
 - **Chubut: wind pilot project. Wind development in natural reserves.**
 - **San Juan / Buenos Aires: technical assistance agreement**

Renewable Energy Project for Rural Electricity Markets - PERMER

- Slow degree of advance is observed in the concretion of the initial objectives of PAEPRA-PERMER.
- Some main causes detected would be motivated in the characteristic of the market:
 - **Supply of only one market:** In this context, provincial governments oriented their priorities to other needs of local electric sector, delaying supply to rural areas, with the objective to diminish the impact on tariffs of concessionaire areas.
 - **Supply of scattered markets:** Only two provinces concrete this scheme (Salta, Jujuy) with different results. Two companies were established: one for concentrate markets (part of the Wholesale Electricity Market) and the other specifically for Scattered Market. The degree of advance showed in Jujuy is based in 2 factors: (a) capacity of adaptation and collaboration of the company with the situation of local settlements; (b) the degree of agreement of the provincial government accepting to subsidy the electric service.

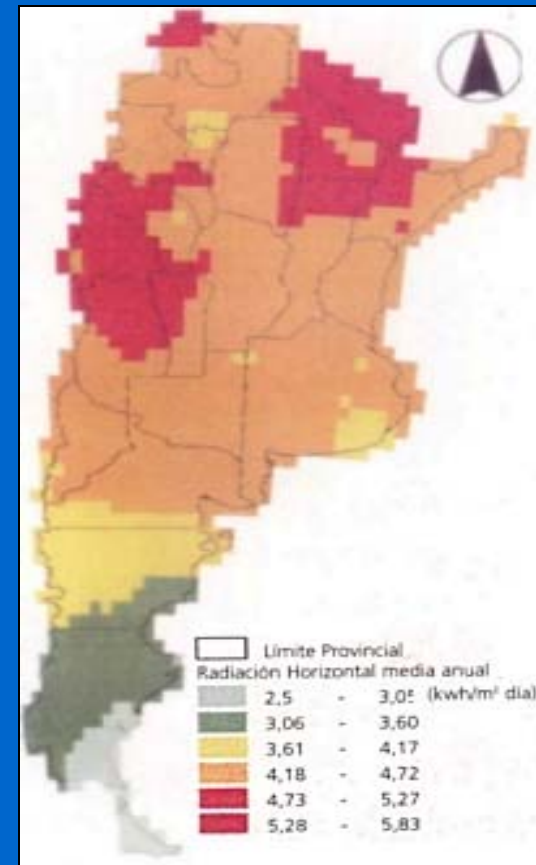
Projects outside PERMER

- **Buenos Aires:** Energise Rural Schools with Renewable Energies. 362 schools in 100 districts. Provincial Funds and FEDEI. Power differing from school to school.
- **Catamarca:** Photovoltaic technology to pump underground water. Argentine-German Programme of photovoltaic pump, with the co-ordination and execution of the Science and Technology Secretariat.
- **Neuquén:** The electricity company (EPEN) that supplies the provincial electrical market is State-owned. It could not access the benefits of PERMER. Provincial company began a process of energy supply to scattered areas through alternative generation systems. Diesel generation were replaced with alternative photovoltaic systems. Photovoltaic energy was supplied for rural schools between 1994 and 1995 partly supported by IADB, and between 1996 and 1998 with provincial funds (also households and a health centre).

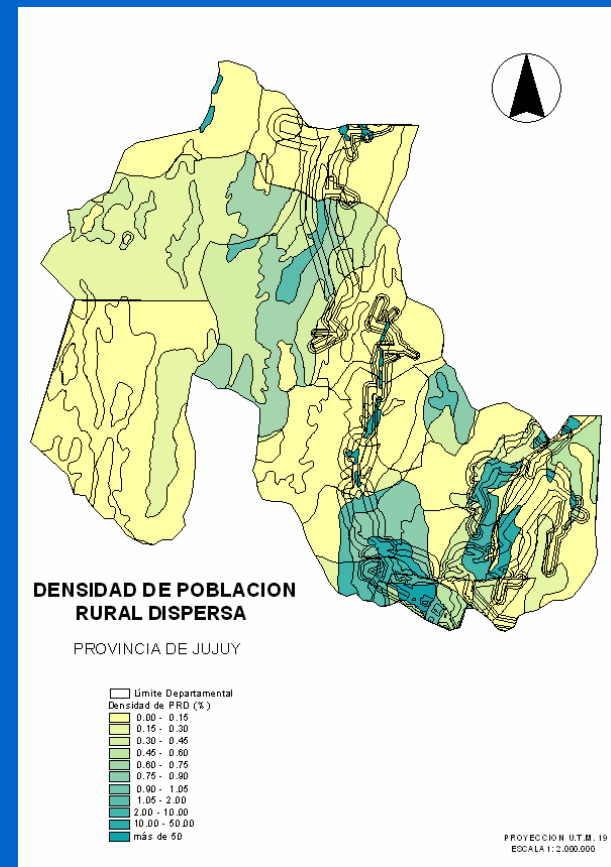
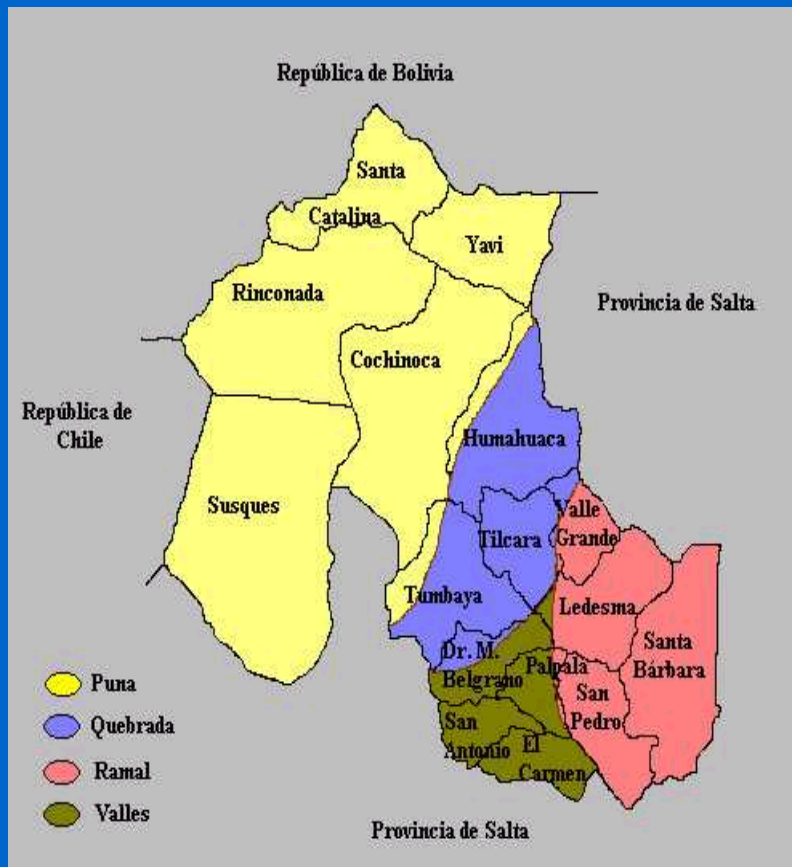
Province of Jujuy case study

- **Prior to the sector reform: the former provincial company had begun a process of rural electrification and electrical power supply to the scattered market through diesel, solar and hydro generation systems.**
- **Four main regions: Valley, Mountain Branch, Mountain Pass and Puna: the last three have most of the isolated rural communities.**
- **Similar characteristic for Isolated Rural Settlements:**
 - **High elevation.**
 - **Long distance to markets.**
 - **Difficult access.**
 - **Low socio-economic development associated with subsistence economy.**
 - **Poor endowment of natural resources.**
 - **Activities: cattle breeding, agriculture, handicrafts weavings.**
 - **High vulnerability to CC (floods and droughts).**
 - **Firewood: main energy source, specially for cooking and heating.**
 - **Firewood consumption is not the causal factor driving deforestation but is an indicator of the low level of development in those communities.**

Jujuy Province and levels of solar radiation in Argentina



Jujuy - Provincial main areas and density of scattered settlements



Province of Jujuy case study

- The Argentine Wholesale Electric Market meets most of the urban and suburban electricity demand in Jujuy. The rest (11% was provided by provincial generation).
- EJEDSA continuing the labour of the state provincial utility, electrifying isolated rural communities with diesel, solar and hydro. EJEDSA, within the framework of PERMER installed photovoltaic systems in individual homes and schools, providing electricity for basic development, lighting for education, communication and livelihoods promotion.
- Surveys were carried out in some remote communities to estimate existing expenditure on energy sources for lighting and social communication, the degree of interest in availability electric lighting, the acceptance of the installation if the units and the potential future demand of lighting and social communication.
- Relative high household existing expenditures.
- Despite de interest, many isolated households could not pay the full cost of photovoltaic electrification. After a negotiation between the provincial government, the company and the community representatives, a subsidy system was established.

Province of Jujuy case study

- **The subsidy system essentially confirms that, providing basic electrification in these remote communities scattered electricity market, must still be subsidized as it is intrinsically unprofitable, due to the scale diseconomies resulting from the capital used and the small per capita income of the consumers.**
- **One of the major reasons for the success of the project was the comprehensive development approach that EJESDA practiced, which involved visits to all remote and inhospitable rural areas to understand the social, economic and cultural characteristics of their development needs. The professional staff involved in the project came from the region.**
- **Other features of the comprehensive development approach practiced by EJSEDSA that PERMER project funding facilitated, include micro-credit financing and medical student exchanges. In the Puna Region, EJESDA also partnered with a local women's development NGO, the Asociación Warmi Sayajsunqo of Abra Pampa (AWSAP) to form a local micro-credit institution by providing an endowment of US\$ 10000. This seed money which was in turn distributed between 10 producers who bought wire, seeds, and high quality reproductive livestock. Returns from these investments in turn flowed to other communities.**

Province of Jujuy case study

- **Social significance of schools, which serve as community centres and hostels. Schools now host community social events in the evening after the daily labour, made possible by electric lighting. All of schools have access to electronic information services including satellite TV. Another frequently mentioned benefit of electrification has been the improved public security associated with street lighting.**
- **The relative success of the project (88% uptake among potential clients), can be attributed as much to EJESDA implementation program as to the inherent attractiveness of the technology.**
- **The EJESDA-Jujuy example illustrates that rural electrification based on decentralised renewable energy is not always a direct climate adaptation strategy, but the livelihood and social opportunities that electrification allows are extremely important in building adaptive capacity.**

Conclusions

- **An important lesson learned is that the efforts to provide electricity services to rural areas, always call for more complex subsidy schemes (to investment and maintenance), as well as institutional (sectoral and of other government areas), management and regulatory aspects that are not solved by slightly modifying the models operating in urban and suburban areas of the centralized system.**
- **The new phase of the Program will be adapted to the real economic possibilities of all parts involved in the project. Also is important not forgot the lessons learned in the past.**
- **The rural isolated populations are very poor and if it is not an ancillary productive uses for electricity is difficult to sustain the system without increasing subsidies.**
- **This is a big issue because is one of the reasons for the lacking of involvement from most of the provinces.**

Thank you !

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