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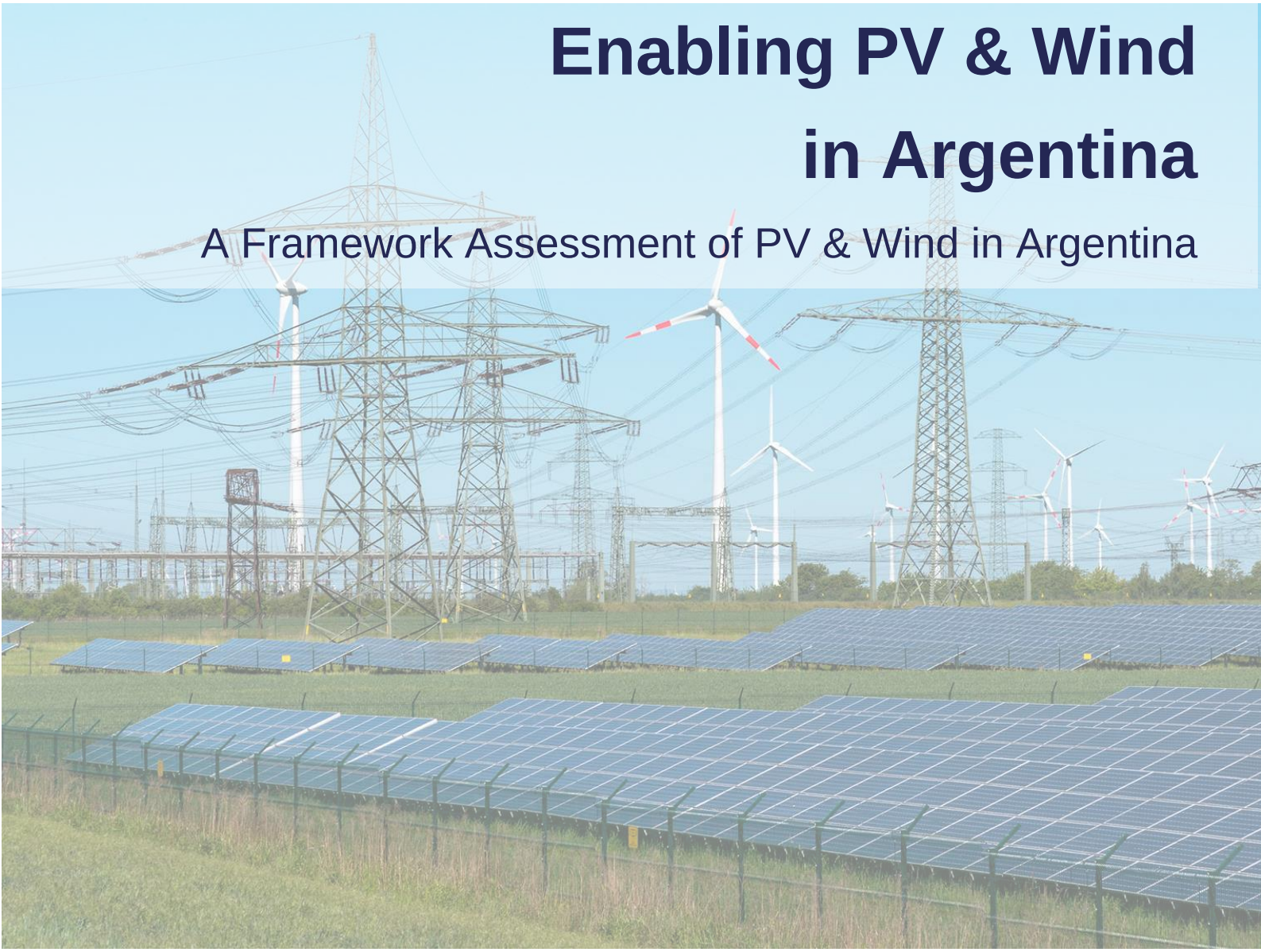
Enabling PV & Wind in Argentina

A Framework Assessment of PV & Wind in Argentina



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eclareon

BWE German Wind Energy Association

BSW German Solar Association

Enabling PV & Wind in Argentina

Study about the solar and wind market as well as the business environment for installing solar PV and wind power systems in Argentina

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Cámara Argentina de Energías Renovables

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BOO	Build-Own-Operate
BOT	Build-Operate-Transfer
CADER	Cámara Argentina de Energías Renovables
CAMMESA	Compañía Administradora del Mercado Mayorista Eléctrico
DSO	Distribution System Operator (used here for distribution grid company)
ENRE	Electricity National Regulator
EU	European Union
FiT	Feed in Tariff
FODER	Fund for the Development of Renewable Energy
GDP	Gross Domestic Product
GW	Giga Watt
IADB	Inter-American Development Bank
IPC	Consumer Prices Index
IPCBA	Consumer Prices Index of Buenos Aires
INDEC	National Statistical Institute
IPP	Independent Power Producer
KV	Kilo Volt
kW/h	Kilowatt Hour
kW/p	Kilowatt Peak
LCOE	Levelized Cost of Electricity
MEM	Wholesale Electricity Market
ME&M	Ministry of Energy and Mining
MW	Megawatt
kW	Kilowatt
O&M	Operation and Maintenance
PPA	Power Purchase Agreement
PV	Photovoltaic
RE	Renewable Energy
RES	Renewable Energy Sources
RfP	Request for Proposals
TSO	Transmission System Operator (used here for transmission grid company)
UN	United Nations
US$	US dollar
WACC	Weighted Average Cost of Capital
WB	World Bank

1. Description of the Project

The international consulting company eclareon GmbH, specialised in the sector of renewable energy and energy efficiency, in cooperation with the German Wind Energy Association (BWE), the Argentine partners CADER and the Energy Secretariat of Salta analyse in the present project the procedures and barriers of the Argentine PV and wind onshore sectors. In the project “PV and Wind Framework Assessment in Argentina” the focus is on the national level and the province of Salta.

The general goal of the project is to support the development of the PV and wind sector in Argentina improving the knowledge of both industries through knowledge transfer and exchange of best practices between Germany and Argentina. To achieve this goal the following activities are foreseen:

- Describe business models for PV and wind energy in Argentina for ground-mounted installations. Here it is analysed the Power Purchase Agreements (PPA) signed with the national electricity market (MEM in Spanish abbreviation) under the auction program “RenovAR”. For PV, it will be also analysed self-consumption installations interconnected to the national grid under the Salta Net-Metering model. The business models will benefit from public access.
- Identify the regulatory and administrative framework of the referred business models and make the results available to international investors.
- Strengthen cooperation and transfer of knowledge between relevant stakeholders, in particular between the private sectors of Argentina and Germany.

The project “PV and Wind Framework Assessment in Argentina” offers several opportunities for investors, project developers and for other local actors of the solar PV and wind sector that may benefit from:

-The information about the existent business models for investors and project developers that are currently initiating their activities in the renewable energy area in Argentina;

- the experience of PV and wind project developers and international investors that are interested in the Argentine market, especially by establishing contacts to German companies through the German Wind Energy Association (BWE) as well as the German Solar Association (BSW-Solar);

- the knowledge of German experts with a thorough understanding of German and international solar and wind markets and current trends regarding business models for solar PV and wind energy.

2. Electricity Market

2.1 Macroeconomic Conditions in Argentina

Under a deteriorated macroeconomic scenario in Argentina, characterized by high inflation rates and lack of investments in various sectors including electricity, the government, elected in November 2015, implemented some economic reforms to mitigate inflation, return to international capital markets and attract investments. Yet, the accumulated inflation for 2016 was very high, amounting to 41% (annual Consumer Prices Index (IPC) of the General Direction of Statistic from the Autonomous City of Buenos Aires 2017)[1]. This rate meant an increase in comparison with the inflation rate registered in 2015, which was about 26.9% (INDEC 2016, based on the data provided by the General Direction of Statistic from the Autonomous City of Buenos Aires) or 31.6% (INDEC 2016 based on the data provided by the Provincial Direction of Statistic from the province of San Luis)[2].

For 2017, the government has set as objective an accumulated inflation rate below 20%, namely 17%. The interviewed stakeholders think that the projected inflation rate for 2017 will be about 21-25%, yet tending to decline in the next years. The IMF projects an inflation rate of 25.6% for 2017 and 18.7% for 2018.

In fact, on December 2015, the elected government announced the lift of the clump (cepo in Spanish) and the implementation of a single exchange rate applied to transactions, allowing the national currency to float freely and putting an end to the

[1] See the Consumer Prices Index of Buenos Aires's (IPCBA) inter-annual report from July 2012 until March 2017 in: https://www.estadisticaciudad.gob.ar/eyc/?p=64809.
Note that due to methodological reforms within the National Statistical Institute, Instituto Nacional de Estadística y Censos (INDEC), there is no INDEC's statistics on the accumulated inflation rate for 2016. For the year 2016, INDEC conducted the calculation of the inflation rate only from May on, doing the calculation on a monthly basis.
For January, February, March and April 2016, the Consumer Prices Index (IPC) provided by the General Direction of Statistic from the government of the Autonomous City of Buenos Aires and the Provincial Direction of Statistic from the province of San Luis can be checked out as references. For the months May-Dec, it can be checked out the IPC of INDEC. See the Technical Reports for 2016 in: http://www.indec.gob.ar/informesdeprensa_anteriores.asp?id_tema_1=3&id_tema_2=5&id_tema_3=31

[2] Note that for the year 2015, INDEC did not conduct the calculation of the inflation rate and instead took alternative IPCs as references like the one from San Luis and the Autonomous City of Buenos Aires. See more information in: http://www.indec.gob.ar/uploads/informesdeprensa/ipc_alternativos_01_16.pdf

parallel foreign-exchange market.

Moreover, Argentine companies and individuals were allowed to purchase up to US$ 2,000,000 per month to make direct and portfolio investments abroad as well as to keep the currency in a foreign or domestic bank account. The 35% tax applicable to Argentine residents on the purchase of goods and services made abroad using a credit or debit card and on purchases of foreign travel services made through Argentine travel agencies (among others) was eliminated (KPMG 2016).

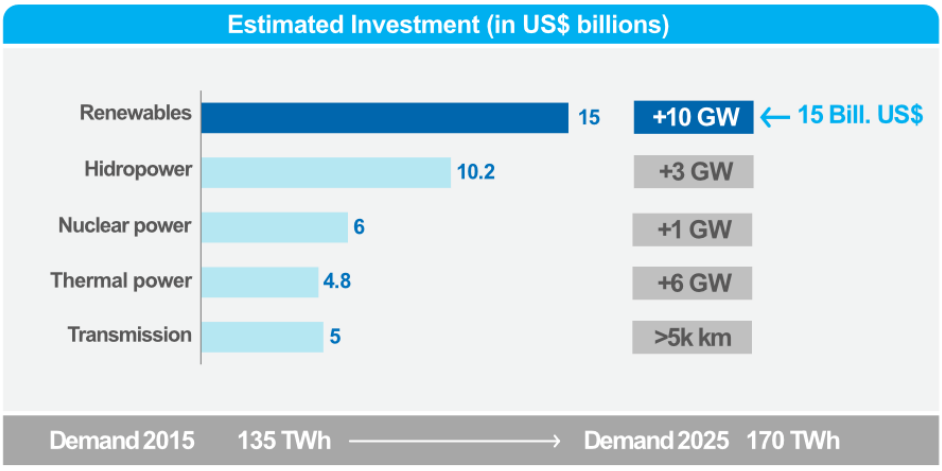
The country risk for Argentina has been only slightly reduced in 2017, being about 388 points (as of 5 September 2017). As a consequence, Argentina did not move to the category of "emerging country" as it was expected.

Regarding RES, bank interest rates for RES loans were reduced from 15% in 2015 to 7%-8% in 2017. However, due to the still high country risk, interest rates will not be further reduced in 2017 (see Section 6).

2.2 Electricity Market Profile in Argentina

Electricity demand in Argentina has been experiencing a constant increase since 2003 and it is projected to increase from 135 TWh in 2015 to 170 TWh in 2025 (see Figure 1).

Figure 1: The next 10 years of the electricity sector in Argentina



Source: Ministry of Energy and Mining 2017[3].

[3] http://www.latamwindpower.com/img/presentaciones/1/Argentina_Congreso_EEolica.pdf

As stated in the report “PV Framework Assessment in Argentina”, the expansion of the electricity demand and the low rate of private investment in generation capacity in the country resulted in the following difficulties for the electricity sector (eclareon and BSW-Solar 2015):

- Increase of fossil fuels imports reached a peak of 13 billion dollars in 2013, being the principal reason for the trade balance gap (Platform Energy Scenarios 2035, 2015).[4]

- Electricity shutdowns affect thousands of households and commercial locations, especially during the summer season. Therefore, the Ministry of Energy and Mining (ME&M) decided to implement a plan of energy shutdowns that are geographically distributed in different zones of Buenos Aires City and the greater Buenos Aires. The calendar showing the planned energy shutdowns is public and can be checked on the website of the Electricity National Regulator (ENRE) (Financial Red 2017).

- The large use of fossil fuels in the electricity mix has led to low participation of new RES, except for hydropower. The RES share in Argentina’s electricity mix is very marginal in relation to the share of RES in other Latin American countries. The share of renewable electricity generation is 0.4% including wind energy and PV (Compañía Administradora del Mercado Mayorista Eléctrico (CAMMESA 2016).

To address the electricity generation deficit**,** the national government in office since December 2015, has implemented a set of measures aimed at attracting investments in the electricity sector and at promoting energy savings and responsible consumption. In early 2016, the Energy Minister declared the state of emergency of the electricity sector and established the calendar of the planned electricity shutdowns. Under the emergency state of the electricity sector, the ME&M launched a set of policies and programs to reduce electricity subsidies, expand renewable energy capacity. The most important policies and regulatory changes on RES and energy efficiency can be

[4] Platform Energy Scenarios 2035 (2015) in an initiative coordinated by Fundación Avina, Fundación Ambiente y Recursos Naturales (FARN), Centro de Estudios de la Actividad Regulatoria Energética de la Universidad de Buenos Aires (CEARE) and Instituto Tecnológico Buenos Aires (ITBA). The report was written by Fernandez, R.

summed up as follows:

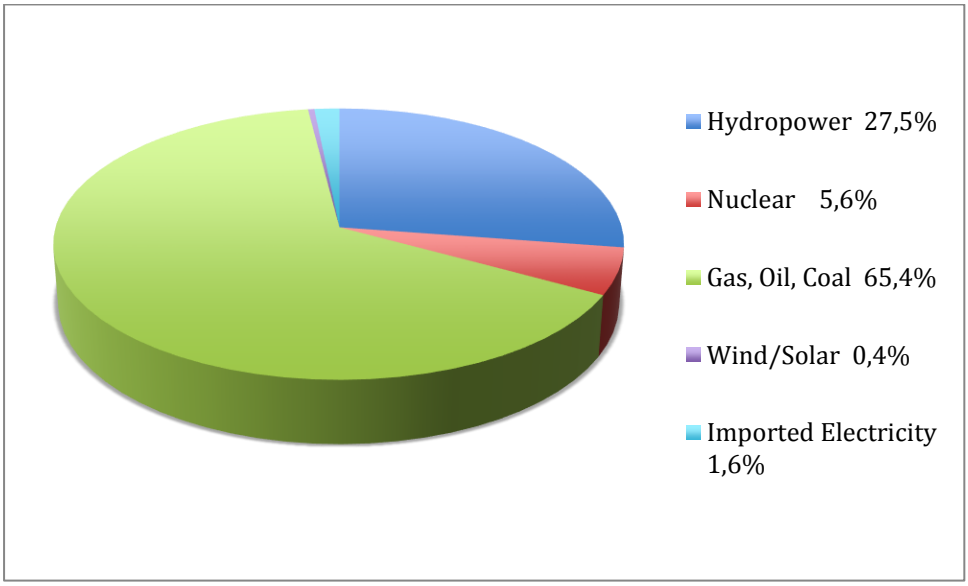
1. In February 2016, subsidies for artificially low electricity prices were reduced to a certain extent for a large part of the population while they were retained for the lowest-income households under the so-called social tariff. The increased tariffs provoked a big debate in the country; nevertheless, the government upheld the decision (Jimeno 2016). Yet, it did not reduce them further due to resistance of the population.
2. The Act No. 27191, which was approved in 2015 and enacted in 2016 through Decrees 531/16 and 882/16, stating that 8% of the consumed energy must be produced from RES by 2018 and 20% by 2025. Different alternatives to comply with these targets were provided (see section 4).
3. The launching of the Auction Program RenovAr (see section 4).
4. The creation of the *Fund for the Development of Renewable Energy (*FODER), guaranteed by the World Bank, providing credits for the development of renewable projects and also a guarantee for the investors of RES (see section 4).
5. The Resolution No. 1-E / 2017, which is a joint resolution of the Ministry of Energy and Mining and the Ministry of Production, to grant a preferential tariff to electricity intensive large users based on improvements in energy efficiency measures in their production process.

2.3 Electricity Mix and Share of Renewable Energy

In 2016, the share of renewable electricity generation, excluding hydropower, was 0.4%, consisting mostly of wind and photovoltaic (PV) and corresponding to an installed capacity of 201 MW. Large-scale hydropower is an important source of electricity (27.5%) (Figure 2), but its share has decreased since 2001. Nuclear installed capacity has increased by 74% with the third nuclear power plant, Atucha 2, commissioned in mid-2014 (World Nuclear Association 2017). However, nuclear power provided merely 5.6% of the overall electricity generation in 2016 (Figure 2).

The electricity generation mix is still dominated by thermal power plants of fossil fuels (65.4%) (Figure 2), fed mostly by natural gas (69%) and oil (28%) as well as some coal (3%) (CAMMESA 2016). This represents one of the main problems in Argentina's electricity system because these thermal power plants are already at a level of obsolescence and, thus, they are uneconomical and inefficient in operational terms (CADER 2015). Since 2006 thermal power plants (combined heat and power plants and gas turbines) have been using diesel fuel, which is mainly imported. In 2015 the country imported 2,240,000 m^3 of diesel, increasing the imports by about 540,000 m^3 in relation to 2014, when Argentina imported about 1,700,000 m^3 and spent a total of US$ 1,200 million, including the fossil fuel cost and the logistics (CAMMESA 2016 and CADER 2015). The average cost of the imported gasoil is about 390 US$/MWh (Alvarez 2015). The costs for imported diesel fuel together with those for Liquefied Natural Gas (LNG) and Fuel Oil (FO) amounted to more than US$ 10 billion in 2014 (CADER 2015), almost US$ 3 billion less than the peak reached in 2013 (US$ 13 billion) (Platform Energy Scenarios 2035 2015).

Figure 2: Electricity Generation Mix in Argentina 2016



Source: eclareon based on the "Annual Report 2016" of the "Mercado Eléctrico Mayorista de la República Argentina" (CAMMESA 2017a).[5]

2.4 Electricity Regulatory Framework

In the early 1990s, the national government introduced a significant reform in the electricity sector. In 1991, the Electricity Law (No. 24065/91) was issued, being since then the principal legal framework that regulates the Wholesale Electricity Market, Mercado Eléctrico Mayorista (MEM). Law 24065/91 liberalized Argentina's electricity sector and unbundled it into separate industries responsible for generation, transmission and distribution. The ME&M has the authority to publish additional rules when required (eclareon and BSW-Solar 2015).

The sectors of electricity transmission and distribution were completely privatized, while the electricity generation was largely privatized. The most prominent example was the privatization of the fossil fuels sector. Until the 1990s, the latter had been characterized by a limited participation of private companies (domestic and foreign) due to the state ownership of the largest oil company YPF. In the 1990s, YPF was sold to the Spanish company Repsol, but partially re-nationalized in 2012 with 51% of the assets being in public hands since then. Electricity generation is to a great extent in private hands, except for the nuclear generation and the two bi-national hydropower plants (Yaciretá and Salto Grande) (eclareon and BSW-Solar 2015).

[5] Source: Base de Datos of CAMMESA found in http://portalweb.cammesa.com/default.aspx

2.5 Renewable Energy Legal Framework

2.5.1 Law 25019

In 1998, the national government enacted the first RES law (No. 25019). Law 25019 declared wind and solar generation a national interest and introduced a premium tariff to set up additional payment per generated kWh, which in 1998 meant a 40% premium on top of the market price (ECOFYS Germany GmbH 2009). The tariff was set in Argentine peso that in 1998 was pegged to the US dollar. However, the devaluation of the Argentine peso in 2002 made the premium unattractive to invest in renewable energy.

2.5.2 FIT Law, GENREN and PPA Resolution

In 2006, the government introduced the feed-in tariff (FIT) Law 26190 for the development of RES aiming to improve Law 25019. The FIT law extended the support to other RES and established a renewable energy goal of 8% for 2016 (Villalonga 2013). The law went into effect in 2009, the same year that the government launched GENREN I, a competitive auction round to allocate renewable energy PPAs with the FIT and achieve the target of 8% electricity from RES by 2016. GENREN was executed by ENARSA (Energía Argentina SA), which opened the call to purchase 1000 MW of renewable energy (500 MW only of wind energy) and planned to provide awarded bids with a fixed price through 15-year power purchase agreements (PPA). ENARSA would then sell the purchased electricity to the MEM. The former Secretary of Energy estimated that the GENREN would mobilize investments amounting to a total of US$ 2,500 million (Villalonga 2013) (eclareon and BSW-Solar 2015).

ENARSA allocated bids for a capacity of 895 MW, of which the majority were wind energy projects. Of the 895 MW only 139.4 MW were constructed, representing around 10-15% of the allocated projects. Although the assigned PV and wind energy tariffs were very attractive (about 550-240 US$/MWh and 180 US$/MW respectively), the lack of access to international funding and very high interest rates together with limited local funding lines created significant barriers to develop the projects. In 2010, a second tender round, namely GENREN II, was launched. Of this call no project was executed, however the failure of the auction rounds resulted in the issuance of the so-called “Resolution 108”. Under Resolution 108, project developers were legally allowed to sign renewable energy power purchase agreements (PPA) with the body that represents the wholesale electricity market, called CAMMESA in Spanish abbreviation (eclareon and BSW-Solar 2015).

2.5.3 RenovAr Program

On 24 September 2015 Argentina's Chamber of Deputies approved a new Renewable Energy Act (Law No. 27191), which set the basis for a new legal framework to promote RES, modifying and improving Law 26190. It postponed the target to cover 8% of the electricity demand from renewables in 2016, set in Law 26190, to 2018 and declared that RES should cover 20% of the demand by 2025 (Law 27191/2015). Law 27191 was enacted through the regulatory Decree N° 531/2016, that entered into force on 30 March 2016. The law and its regulatory decrees establish that the mentioned targets will be achieved by the purchase of electricity from CAMMESA or from distribution utilities, which guarantee a portfolio mix of at least 8% of RES in 2018, or 20% in 2025. In the case of wholesale market large users, i.e. users with annual constant demand equal or larger than 300 kW (so-called Gran Usuario habilitado- GUh- in Spanish), this compliance can also be achieved through PPAs in the private market or through self-generation (Law 27191/2015; Decree 531/2016 and Resolution 281).

The law also introduces a maximum price of US$ 113/MWh for each RES contract set by the generators and opens the possibility to modify the price two years after the law takes effect, but only for new contracts (Law 27191/2015). This tariff was set to provide an orientation for project developers of the prices they may receive under the contracts signed with CAMMESA. In order to comply with the renewable energy law and its implementing decree, the government launched RenovAr as a public tender program which includes some fiscal incentives and financial support mechanisms like the national trust fund, called Fund for the Development of Renewable Energy (FODER for its Spanish Acronym), already created in the Law 27191.

FODER, which came into force through Resolution 147/16 issued by the ME&M, is a public trust structured with two main trust accounts (financing and guarantee). The role of FODER is to backstop CAMMESA, providing awarded projects with a guarantee for energy payment (liquidity) and for early termination (solvency). It is a three level fund. At the first level, FODER guarantees that the renewable energy delivered to the grid under the PPA is duly paid for. To comply with this Energy Payment Guarantee, ME&M (as FODER´s trustor) is obliged to fund FODER (Undersecretariat of Renewable Energy 2016).

The second level of guarantees or “solvency guarantee” is a put option mechanism. Under the PPA, project companies can terminate the contract with CAMMESA if no payment occurs (and FODER does not pay on its behalf under the Energy Payment Guarantee) for four consecutive months or six non-consecutive months within any 12-month period and/or if CAMMESA does not comply with a firm arbitration sentence. In

this case, the company may transfer the project assets to FODER receiving compensation. ME&M assumed the obligation to provide funds to FODER so that it can pay for the project's assets. In the case that ME&M cannot provide the funds, a sovereign guarantee has been implemented whereby Treasure Bills are issued by the National Treasury in favour of FODER (Undersecretariat of Renewable Energy 2016).

Under RenovAr Rounds 1 and Round 1.5 an optional “third level” of guarantee was offered to all bidders. The national government reached an agreement with the World Bank under which it backstops FODER for up to US$ 500 million in its obligation to pay for the project assets in case project companies exercise the put option and the government does not provide the funds to pay either in full or in part (Undersecretariat of Renewable Energy 2016).

Among the promotional measures are, furthermore, an anticipated decrease of Value Added Tax (VAT)[6], exemption of the national income tax, exemption of the returns distribution tax (10%) as far as the returns are re-invested, exemption on import duties on capital goods and equipment until December 2017, as well as provincial and municipal extra taxes. Moreover, the legal framework establishes a tax credit equal to 20% of the locally supplied content if the projects include at least a 60% share of local components (excluding civil works, transport and assembly of equipment), or a 30% share if the company evidences the insufficiency of local components to meet the 60% benchmark (Law 27191, Decree 531/2016 and Resolutions 123-313/2016).

2.6 National Institutional Framework

The ME&M elaborates the national energy policy and sets the regulatory framework for its execution. The National Electricity Regulator (ENRE) is an autonomous entity under the ME&M that is responsible for regulating and supervising national electricity activity, but has no competence for the provinces. ENRE supervises compliance of generation, transmission and distribution entities with safety, quality, technical and environmental standards set in the regulatory framework and the license agreements.

The Compañía Administradora del Mercado Mayorista Eléctrico (CAMMESA) is the administrator and representative of the Wholesale Electricity Market (called MEM in Spanish abbreviation). Its main functions include the operation and dispatch of the electricity and the management of commercial transactions in the MEM. The national government, large users as well as generators, distribution and transmission utilities

[6] In Argentina the VAT is 21%.

are represented in CAMMESA´s board of directors, each group holding 20% of the company´s equity. Under RenovAr, awarded companies enter into a 20-years PPA with CAMMESA, who acts as off-taker on behalf of distribution utilities and large users of the MEM (Undersecretariat of Renewable Energy 2016).

Electricity generation units are connected to the interconnected national network (called SIN in Spanish abbreviation). The Electricity Power Federal Council (CFEE) is the administrator of funds for electricity operations (i.e. National Fund for Electric Power) and is also adviser of the National and Provincial Governments on electricity market issues and legal questions in the electricity sector (BSW-Solar and eclareon, 2015).

2.7 Provincial Institutional Framework

As Argentina is a federal country, provinces have the legal capacity to regulate energy issues in their jurisdictions in addition to national legislation, implementing their own laws, regulations and support policies. Provincial energy laws and regulations cannot contradict the national regulatory framework. To regulate the electricity activity in their jurisdictions, provinces have their own Provincial Electricity Regulators (ENRESP). ENRESPs are responsible to supervise that the electricity generation, transmission and distribution activity follows the safety, quality, technical and environmental standards established in their provincial regulatory frameworks (BSW-Solar and eclareon 2015). In the present study, the case of Salta will be analysed for the implementation of a Net-Metering scheme to promote renewable energy sources in the province. In Salta, the ENRESP is responsible for issuing a Resolution to allow the user and Distribution System Operators (DSOs) to sign an Act of Commencement of the work needed for the execution of the renewable energy net-metering project.

As was referred above, the distribution sector is privatized. Usually, there is one distribution company per province having the provincial monopoly for the electricity distribution. Only three exceptions where provinces have more than one distribution company exist: the provinces of Buenos Aires and Tierra del Fuego as well as the Autonomous City of Buenos Aires together with the Greater Buenos Aires (eclareon and BSW-Solar 2015). In Salta EDESA is the only provincial distribution company.

3. Solar PV and Wind Energy Market in Argentina

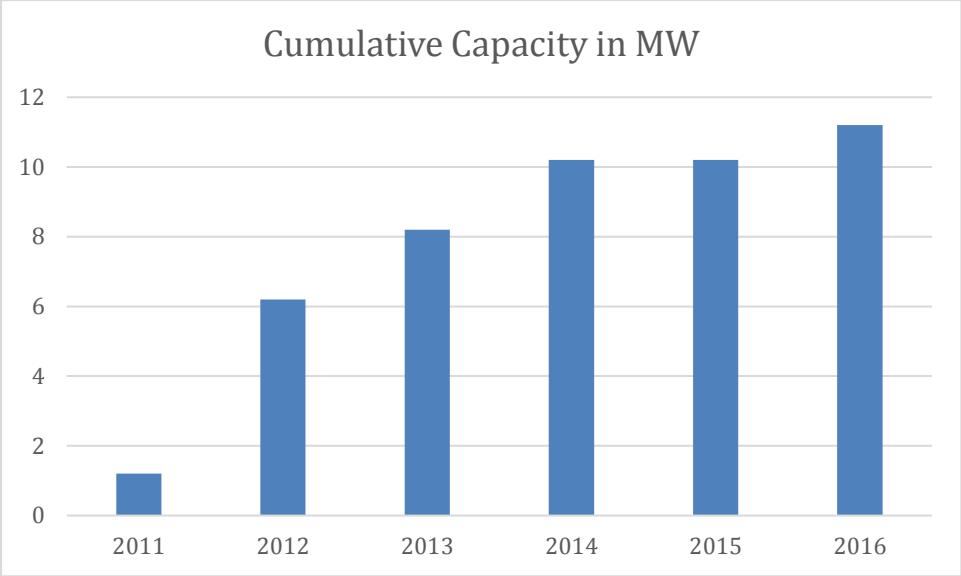
3.1 Solar PV Market and Solar PV Potential in Argentina

The first solar PV installations in Argentina were promoted by the Renewable Energy in the Rural Market Project (PERMER). PERMER ran from March 1999 until December 2012, aiming to support off-grid photovoltaic installations in rural areas and being financed by the World Bank (WB), the Global Environmental Facility (GEF), and the Argentine's national government. About US$ 58.2 Million were invested. The project was the first pillar for PV, as private and public companies could develop a project in any remote rural area and apply for the financial support (eclareon and BSW-Solar 2015).

On April 2011, the first Argentine's on-grid PV plant, Ullum, was installed in San Juan. It was a pilot project of 1.2 MW that was executed by the San Juan utility in the framework of the Solar San Juan Program. The following year the solar park Cañada Honda, a project allocated by GENREN I, started to be installed. From the 20 MW allocated, 8 MW have been installed and connected to the central network. Additionally, a 1 MW solar PV project, Terrazas del Portezuelo, was developed by the San Luis utility in San Luis in 2014. This project is not connected to the national grid, but instead of, it provides electricity to provincial government facilities directly. Similar to San Luis, in 2016 the provincial Energy Secretariat of Santa Fe developed an on-grid PV project of 1 MW. Moreover, in Salta under the net metering model there are two operative projects, one of 5.5 kW, located in Salta city, and another of 7 kW, located in Cafayate, operative since the 30.12.2015 and the 17.04.17, respectively.

In the following figure, it is possible to see the evolution of the solar PV market since 2010 until 2016 (Figure 3).

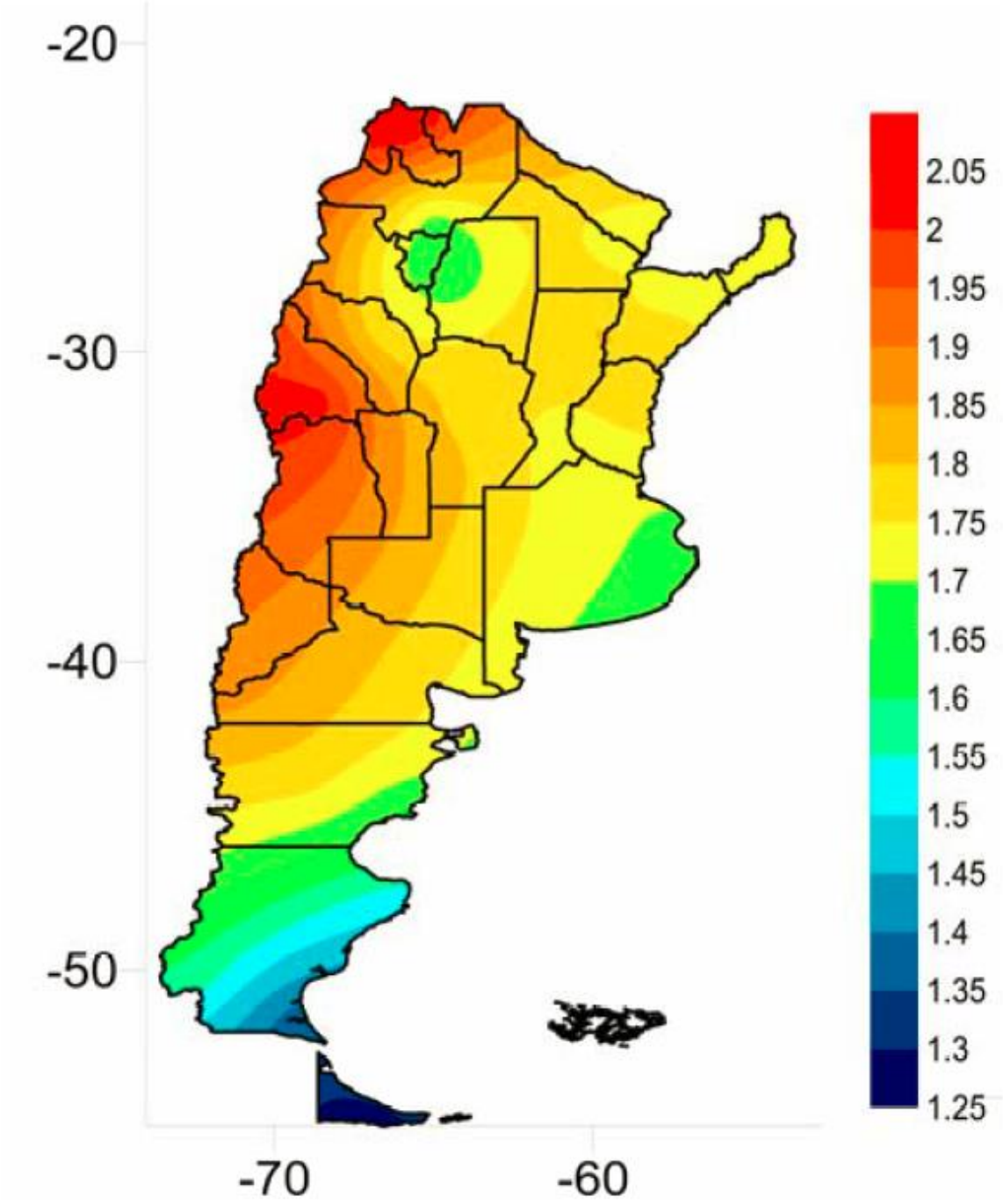
Figure 3: PV Cumulative Capacity (MW) in Argentina



Source: eclareon 2017.

Argentina has a significant number of very attractive sites for the installation of solar power plants, due to the low cost of land, high solar irradiation and the existence of many available and good network connection points (CADER 2015). The areas that have the best solar irradiation in the country are the Northwest region (NOA), which encompasses La Rioja, Salta and Jujuy, as well as Cuyo, which encompasses the provinces of Mendoza, San Juan and San Luis. In NOA and Cuyo the solar irradiation ranges from about 1,800 kWh/qm to 2,200 kWh/qm per year (Righini and Gallegos 2011). The rest of the country has also appreciable values of annual irradiation almost throughout all the regions, except for specific zones such as the province of Tucuman, part of Buenos Aires and the Southern provinces of Tierra del Fuego, Santa Cruz and part of Chubut (Righini and Gallegos 2011). In the solar map below it is possible to see the annual solar radiation in MW /m^2 throughout the country (Figure 4).

Figure 4: Mean Annual Solar Radiation in Argentina (west longitude and south latitude)

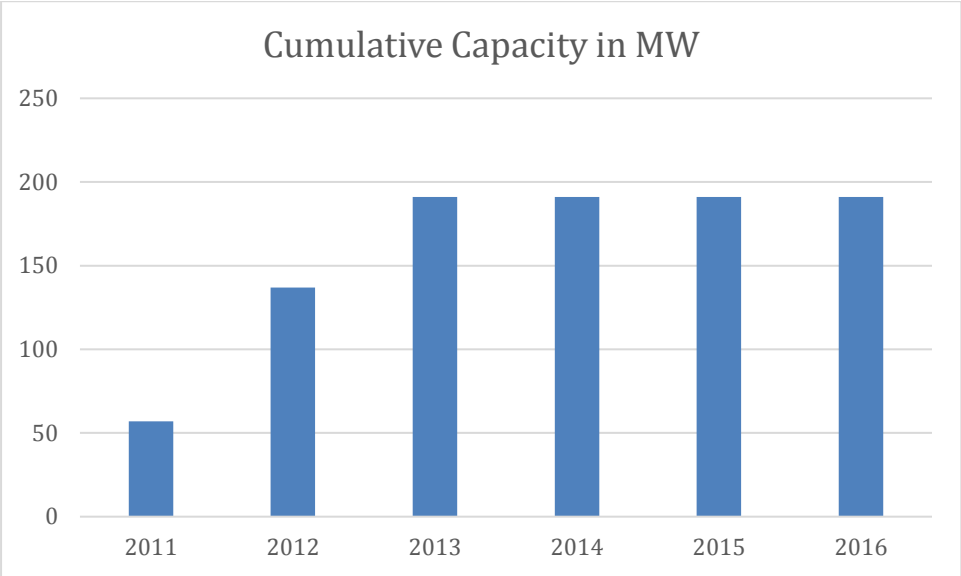


Source: Righini and Gallegos 2011.

3.2 Wind Energy Market and Wind Energy Potential in Argentina

The following figure, illustrates the evolution of the on-grid wind market from 2011 until 2016 (Figure 5).

Figure 5: Wind Cumulative Capacity (MW) in Argentina



Source: eclareon based on "Annual Report 2016" of the "Mercado Eléctrico Mayorista de la República Argentina" (CAMMESA 2017a).[7]

Argentina, especially the south (in the region of Patagonia), has one of the richest wind resources in the world (Gerlach et al. 2011). Apart from Patagonia (e.g. Neuquén, Chubut, Rio Negro, Santa Cruz and Tierra del Fuego), there are attractive sites in the central provinces of the country (e.g. Buenos Aires, La Pampa and Santa Fe), which have high wind speeds and low cost of land. Wind speeds in the Patagonian region and in the central provinces average 10 m/s. According to some interviewed stakeholders there is a capacity factor of about 45-55% (CREE found in Energías Sustentables and interviewed stakeholders). The wind map below shows the wind speeds throughout the country (Figure 6).

It has to be noted that the government of Chubut together with the provincial electricity cooperatives of Southern Argentina were at the forefront of wind energy development. In 2001 Chubut had the largest installed wind power capacity in the country with about 17.5 MW, most of them off grid projects (Jimeno 2015).

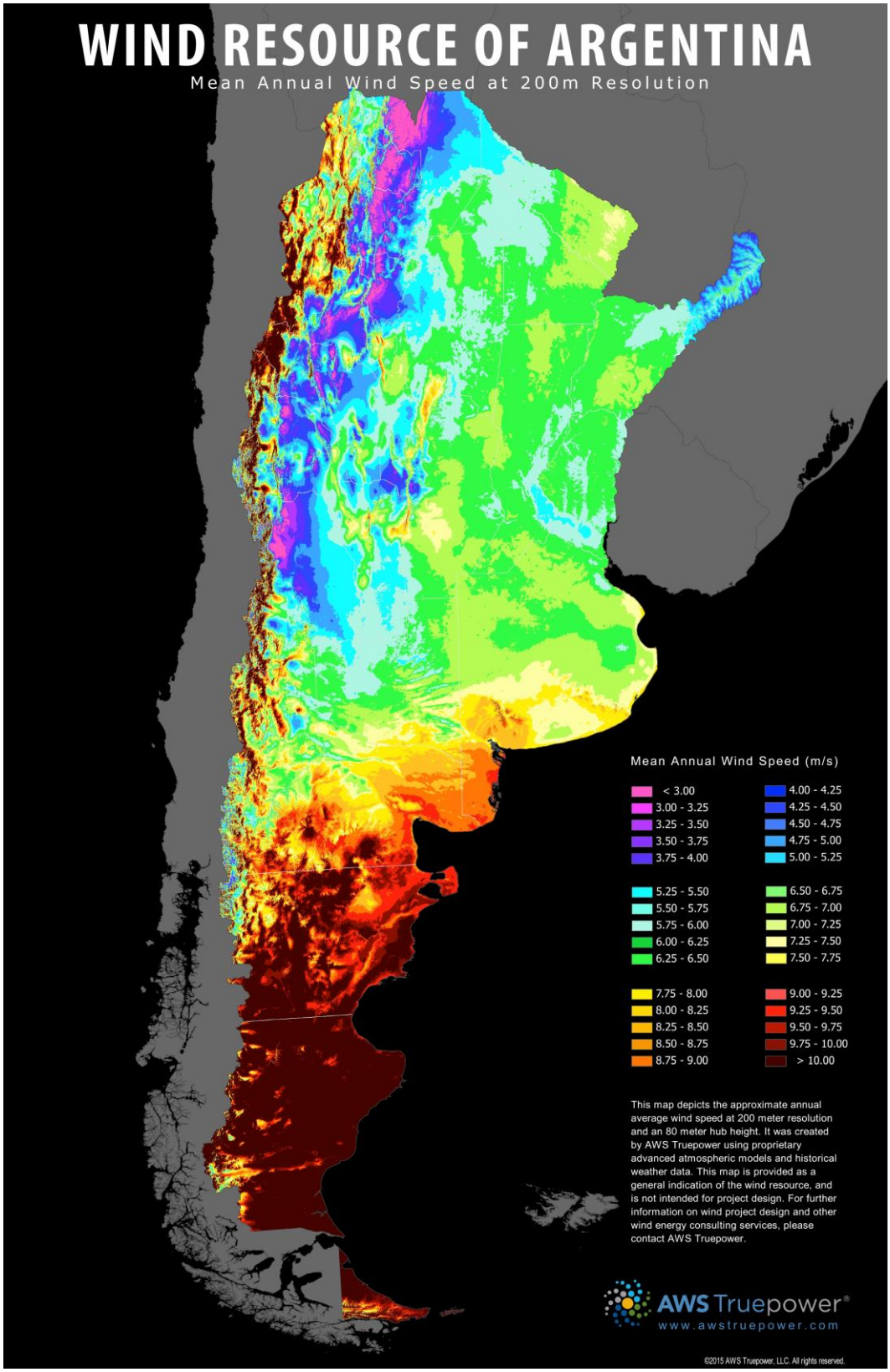
Moreover, under national Law No. 25019/1998, mentioned in section 2.5, there were some off-grid wind power developments in Patagonia until 2001. However, under the devaluation of the national currency in 2002, Law No. 25019 became unfit for its

[7] Source: Base de Datos of CAMMESA found in http://portalweb.cammesa.com/default.aspx

designed purpose because the premium tariff was set in Argentine peso. The result was the suspension of all planned wind energy projects (Jimeno 2015).

The first large-scale wind project connected directly to the SIN was Arauco I with 25.2 MW of capacity. It went into operation in 2011 and it was then extended under Arauco II. Arauco I and II were financed by the national administration and the provincial government of La Rioja. Also in 2011, the wind farm “Diadema” was connected to SIN with a total capacity of 6.3 MW. This project was financed by the Inter-American development Bank (IADB) and was installed in Chubut. Under GENREN I, ENARSA approved 754 MW of wind power capacity of which only 131 MW (three wind farms) have been constructed. The three parks, i.e. Rawson I, Rawson II and Loma Blanca IV, have 50, 30 and 51 MW of capacity, respectively, and were constructed between 2012 and 2013.

Figure 6: Wind Speed in Argentina



Source: AWS Truepower 2015[8]

[8] Source: https://www.awstruepower.com/knowledge-center/maps/

3.3 Key points for PV and Wind energy at national level

- Enormous potential to develop both solar and wind energy in Argentina: high solar radiation and high wind speed. Therefore, the increasing electricity demand could be met through the generation of solar and wind power.
- In 2016 came into force a national regulatory framework to support PV and wind power generation projects (RenovAr auction plan).
- Some provinces like Salta have set their own programs and laws to support PV and other RES investments in the self-consumption sector that will be explained in chapter 5.

4. PV and Wind Framework Assessment - Business Models in Argentina

4.1. Auctions for Renewable Energy—RenovAr Program

The present chapter will describe the conditions as well as the required steps to participate in the tender rounds for RES launched under the RenovAr Program. At the end of the chapter the main challenges identified in the RenovAr Program will be explained and recommendations to reduce the barriers for the deployment of wind energy and PV will be provided.

4.1.1 Description of RenovAR Program

The Argentine RES legal framework set the target to cover 8% of the electricity demand from renewables by end 2018 and 20% by end 2025, excluding hydropower. In line with current demand this represents approximately 3,000 MW of total installed capacity by 2018 and 6,000 MW by 2025. It also established that end users can achieve the mentioned targets by purchasing electricity from CAMMESA or directly from distribution utilities (Law 27191/2015 and Decree 531/2016). In order to comply with the Renewable Energy Act 27191, the government launched RenovAr (under Resolution 71/2016) as a national program that foresees auction rounds and fiscal incentives along with financial mechanisms like guarantees aimed at reducing some of the investment barriers that resulted in the failure of previous governmental attempts.

RenovAr foresees the call for auction rounds to tender RES, including solar PV, wind power, biomass, biogas and small hydro. Two rounds– RenovAr 1 and RenovAr 1.5– have been called so far. RenovAr 1 was launched in July 2016, while RenovAr 1.5 in October 2016. In RenovAr 1, 1,000 MW of RES were tendered. However, as the offered capacity was 6,343 MW, the awarded capacity was 1,142 MW and it was decided to open a second call to give the possibility to the unsuccessful companies to present their offers again, taking as reference the price of the former winning projects. In RenovAr 1.5, 600 MW RES were tendered, while the offered capacity was 2,486 MW. Thus, the total awarded capacity round 1.5 was 1,281 MW.

Under RenovAR 1, four PV projects with a total capacity of 400 MW won the tender call in the provinces of Salta and Jujuy and twelve wind projects with a total capacity of 707 MW won the call in the provinces of Buenos Aires, Chubut, Río Negro, Santa Cruz, Neuquén and La Rioja. Under RenovAR 1.5, there were 20 successful PV

projects with a total capacity of 546 MW in Catamarca, Salta, La Rioja, Mendoza, San Juan and San Luis and ten successful wind projects with a total capacity of 765 MW in Buenos Aires, La Pampa, Río Negro, Santa Cruz, Chubut, Mendoza, La Rioja and Córdoba. As a reference of the average awarded prices and the share of national and foreign companies in the last tender rounds, the details of RenovAr 1.5 are summed up in the following table (Figure 7).

Figure 7: Awarded PV and Wind projects under RenovAR 1.5

Technology	Number of projects	Awarded Capacity MW	Annual Energy Generation (GWh/y)	Average Awarded Price (US$/MWh)	Share national & foreign companies
Solar PV	20	516.2	1,274	54.94	15 Arg & 5 Foreign (US, Ch, Sp, Br)
Wind	10	765.4	3,037	53.34	7 Arg & 3 Foreign (Sp, Ch)
Total	30	1281.5	4,311	53.98	22 Arg & 8 Foreign

Source: eclareon 2017 based on data of the ME&M.

4.1.1.1 Eligible Participants

Argentine or foreign legal entities and individuals are eligible to participate in the bid under the condition that they constitute a specific purpose vehicle entity (SPE for its Spanish abbreviation) in the Argentine Republic, which should be of their ownership in both cases. Moreover, they shall have an irrevocable right upon the acquisition of such SPE or they shall be obliged to constitute and register the SPE in the face of the Ministry of Energy and Mining (ME&M) prior to the Execution Date, if they are successful (CAMMESA, RfP RenovAr 1 and RenovAr 1.5, 2016).

4.1.1.2 Bid and Performance Bonds

The bidders that participate in the tender should guarantee the performance of the obligations required by the different Requests for Proposals (RfP)[9] through a “bid bond” created to that end. The bond will guarantee the bids in favour of CAMMESA.

[9] Request for Proposals (RfP) is the name assigned to the document that rules each open call for tenders, which includes a document with annexes and Clarifying Circular Letters. The annexes contain detailed information like the schedule of the open call for tenders, templates for requiring tax benefits, project economic proposal, renewable energy PPA, annual adjustment ratio to the awarded price, incentive factor and World Bank guarantee costs.

The bid bond shall amount to US$ 35,000 per MW of the offered capacity and last for at least 180 consecutive days, automatically renewable for further 90 days, unless the bidder decides to withdraw the bid by the date that the original term of the guarantee will be expired. If the bidder does not win the auction round, the bid bond is paid back to him. If the bidder succeeds, he receives the bid bond back and shall issue a "performance bond" that complies with all the obligations foreseen in the PPA. The performance bond shall amount to US$ 250,000 for every MW of the contracted capacity from the power plant with a duration period of at least one year. The guarantee shall be renewed for the same period of time and it shall be delivered to CAMMESA before its due date. It shall be kept effective until 180 days after the date of commercial operation defined in the PPA. After this period, the performance bond is paid back to the bidder. If the successful bidder does not install the plant in the scheduled period, he loses his guarantee. If the bidder is constituted of two or more individuals or legal entities, the bid guarantee shall be issued under the name of the financial strategic partner for 100% of the bidder's obligations. The bidder shall submit as many bid and performance guarantees as offered projects (CAMMESA, RfP RenovAr 1 and RenovAr 1.5, 2016).

4.1.1.3 Local Content Rules

For participating in the auction there is no legal obligation to comply with a minimum share of local content. However, having local content represents an advantage to be awarded in the selection process. Under *ceteris paribus* in terms of price and commercial operation dates, the projects with the largest percentage of local content will be selected over the ones with smaller percentages.

Law 27191 and Decree N° 531/2016 establish a tax credit equal to 20% of the value of the locally supplied content and Priority Access to FODER project financing, if the projects include local content share of at least 60% (excluding civil works, transport and assembly of equipment), or 30% if the company evidences the insufficiency of local components to meet the 60% benchmark (Law 27191/2015, Decree 531/2016 and Resolutions 123-313/2016).

4.1.1.4 Price

The ME&M sets a secret Maximum Award Price for each renewable technology and it delivers a sealed and closed envelope with the prices to CAMMESA on the date set in the RfP for the submission of bids. The maximum Award Price for each technology

shall be applied in the assessment and awarding of offers (CAMMESA, RfP RenovAr 1 and RenovAr 1.5 2016).

CAMMESA calculates the PPA price for the successful bidders, the so-called Adjusted Offered Price (AOP), based on the offered price of the bidder and a formula which varies depending on the different RfPs. It has to be noted that the bidder has the option to ask for the World Bank Guarantee in which case the AOP will include the referred guarantee. Once the AOP for each bid is calculated, CAMMESA discards all those bids whose AOP may exceed the Maximum Award Price established by the ME&M for each renewable technology.

In case that there are two or more bids having an AOP with a difference below 3% in the same renewable technology, the selection criterion is the highest score with regard to Stated Local Content (SLC), provided that there is a difference higher than three points in the score based on SLC. If the difference between the projects is lower than three points, the bid with the highest AOP shall be selected. The selection process is conducted for each renewable technology separately, as Maximum Award Prices differ depending on the technology. Under RenovAr, CAMMESA guarantees the PPA price, or AOP, to successful bidders for a period of 20 years (CAMMESA, RfP RenovAr 1 and RenovAr 1.5, 2016).

4.1.2 Project Development Procedure

The main steps to develop a RES project, including administrative and grid connection, can be summarized as follows:

Figure 8: Main steps to prepare a RES project and conclude the grid connection

Site selection	**Identification of the renewable energy resource and of the potential grid connection points for the site selection. Signing of the land contract (rent or buy).**
	**Duration: 3 – 5 months**
Preparation of the RES project	**Wind or Solar prefeasibility study (resource measurements) Electricity prefeasibility study Environmental Impact Assessment (EIA) - Environmental Impact Declaration (DIA) Projected average energy output of the RES plant Preliminary financial studies and CAPEX**
	Duration: 12 months
Due diligences to become MEM agent	**In parallel to the preparation of the prefeasibility studies and EIA, the generator must conduct the due diligences according to Phase I of the "Procedures of CAMMESA" to become an agent of the "Wholesale Electricity Market" (MEM).**
	**Duration: 5 months**
Approval of the Ministry of Energy and Mining (ME&M)	**Subsequently, the ME&M should approve by means of resolution the request to become generator agent of the MEM.**
	**Duration: 2 months**
Connection permit for the local electricity grid	**Once approved a new MEM generator agent, the latter asks for a connection permit to the local grid. The local TSO issues a preliminary decision and submits it to CAMMESA.**
	**Duration: 1 month**
Commercial qualification and grid access (phase II of the CAMMESA procedures)	**CAMMESA evaluates the preliminary decision of the TSO and submits it to ENRE. The latter issues a final resolution on the electricity grid access. With this final resolution, the MEM generator has the commercial qualification.**
	**Duration: 1 month**
Public auction	**Submission of the offer to RenovAr auction rounds and bid selection.**
	
Signing of PPA and financing closure	**The projects that have been awarded in the auction rounds must sign the PPA contract and then obtain the required financing to start the construction of the RE plant.**

Source: eclareon 2017.

The steps mentioned in figure 4 can be explained in detail as follows:

I Administrative procedure

The administrative procedure includes the negotiation of the selected site, the preparation of the project with all the required information regarding the electricity prefeasibility, the evaluation of the renewable energy resource availability and the Environmental Impact Assessment (EIA) as well as the request to be a MEM agent.

I.a Land acquisition

After the suitable land is selected, project developers can proceed to rent or in some cases to buy the land where the PV or wind power plant will be built. The negotiation with the land owners to sign the contract lasts between one and four months. The prices of lands vary a lot depending on their characteristics and the provinces where they are located.

In the case of lands for wind parks, the rental price is about 5,000 – 10,000 US$/MW/year. For lands designated for PV and to be located in the province of Mendoza, the buying price can be estimated about 2,000 US$/ha. In other solar provinces, the price can range from 2,000 to 5,000 US$/ha. In some provinces like Jujuy and Salta there are lands that belong to provincial governments (called “terrenos fiscales”), which can be obtained for very low costs (eclareon and BSW-Solar 2015).[10]

I.b Prefeasibility studies

The project developer should measure the renewable energy resource (met mast installation in the case of wind energy) and assess the capacity of the line to feed-in the projected electricity output production at the identified grid connection points. In parallel to these prefeasibility studies the EIA should be carried out. The process varies according to the provinces, as the implementation of environmental policies constitutes a competency of the provincial control bodies. Usually, the process starts with the elaboration of an environmental impact folder, describing a matrix on the project’s potential environmental risks. The environmental impact folder, elaborated by certified experts with experience in the sector, should also propose an environmental management plan indicating how potential risks will be managed. It may also be required to conduct public hearings. If after assessing the folder and the results of public hearings the provincial control authority considers that the project will not have negative impacts or will not violate any environmental regulation, the Environmental

[10] Land property restrictions for PV use for investors should not be an issue since Argentine Law (Ley 26737) restricts foreign ownership as a measure to prevent “land grabbing” only if more than 15% of available land has been distributed to foreign ownership.

Impact Declaration (DIA in Spanish abbreviation) is issued. The latter is required for the construction and connection of all electricity generation projects.

I.c Approval of the ME&M: Generator Agent of the MEM

In parallel to the preparation of the RE project, including the prefeasibility studies and EIA, the generator must conduct electricity measurements and prepare an assessment report according to phase I of the “Procedures of CAMMESA”. These “due diligences” are required to ask for the ME&M to become generator agent of the “Wholesale Electricity Market” (MEM). Becoming generator agent of the MEM implies that the energy producer is able to feed-in the generated electricity into the national grid and sell it at the wholesale market. The ME&M should then approve by means of resolution the request to become generator agent of the MEM. Subsequently the ministry will inform CAMMESA, the generator, the local TSO and the national electricity regulator (ENRE).

I.d. Quality and certification issues

Under the RenovAr framework a certification for the PV and wind equipment is not mandatory and there is no specific regulation available. It is commonly accepted that the renewable equipment meets the European certification like IEC and TÜV. In case of wind energy, the most used certificate is the IEC 61400-12-1. Moreover, the “Instituto Argentino de Normalización y Certificación” (IRAM) has completed and updated its own set of standards (IRAM 21000), which is based on the European IEC. Regarding imported PV equipment, certification from the IRAM or the Instituto Nacional de Tecnología Industrial (INTI) might be required (eclareon and BSW-Solar 2015).
Technical specialists responsible for the design and the engineering of the project must prove experience of at least 1000 MWp track record in similar PV or wind power plants.

II Connection to the grid

For the connection to the grid the project developer should be approved by the ME&M as MEM generator agent. The latter then applies for a connection permit to the local TSO. The local TSO issues a preliminary decision and submits it to CAMMESA. The latter evaluates the preliminary decision and, if it agrees with it, submits the decision to ENRE, which publishes a final administrative decision on the access to the electricity grid system but leaving this open for five days for possible opposition. If no other company is opposed to this administrative decision, the connection permit is bestowed

and the MEM generator agent has the commercial qualification according to phase II of the CAMMESA procedures.[11] After the approval of the connection permit, the interconnection agreement is signed between the transmission or distribution company and the developer, ad referendum of CAMMESA, which is ultimately responsible to approve and validate the interconnection agreement. CAMMESA can also ask for changes or additional works to those established by the developer and the transmission or distribution company in the first place.[12]

It is often the local electricity distribution and transmission company closest to the project that suggests the interconnection point and complementary works to be carried out. A project developer is responsible to reach the connection point and must pay for the connection line from the plant to the connection point. In case grid reinforcement is necessary due to a plant's connection, project developers may negotiate with the local TSO or DSO to share these reinforcement costs. Local transmission or distribution companies might be willing to assume a part of the reinforcement costs as it may be considered a benefit for the area.

In Argentina there is open access for RES, meaning that utilities are obliged to connect every renewable plant that obtains the connection permit. Moreover, renewables have in theory priority of dispatch, yet restrictions may occur due to electricity network problems.

4.1.3 Bidding procedure under RenovAR

Figure 9: Main steps from the tender call to the bid award

Submission of the Bids	The submission of the bids shall be made in a closed general envelope or box on the date set forth in the schedule of each RfP. The general envelope or box shall, in turn, contain two envelopes, i.e. Envelope A (Technical Bid) and Envelope B (Economic Bid).
↓	
Opening of Envelope A	Right after the submission is finished, the general envelope together with Envelope A are opened. Envelope B shall be verified to be effectively closed and a public notary shall stamp it, sign it and keep it in custody for a later assessment.
↓	
Assessment of Envelope A	The day after Envelope A is opened, CAMMESA will check compliance of documentation submitted by the bidders with all legal, financial and technical requirements. Then, CAMMESA will prepare a merit order of the bids, according to the Stated Local Content (SLC) value, and will send a non-binding

[11] See more details on the technical procedures of CAMMESA here: http://portalweb.cammesa.com/Pages/BackupBotoneraAneriorIzquierda/Normativa/procedimientos.aspx

[12] Idem previous.

	prequalification report together with the documentation contained in Envelope A to ME&M.
Publishing of the Qualification of Tenders	ME&M will analyse the tax benefits requested by the bidders and will determine which bids are in a position to be qualified. Subsequently, it will instruct CAMMESA on the qualification of the bids. The latter will notify the bidders if they have qualified and, if so, the amount that is to be granted for requested tax benefits.
Opening and assessment of Envelope B	Once the evaluation of Envelopes A has been completed, CAMMESA will open the Envelopes B of the qualified bids. The date and place for the opening of Envelopes B will be then communicated. CAMMESA will sort out Envelopes B according to each technology, calculate the bids' AOP and then discard the bids with an AOP exceeding the Maximum Award Price established for each technology.
Award of Winning Bids	After the assessment of the eligibility and qualification requirements for the bids' award, CAMMESA will furnish a non-binding report, recommending the award of PPAs to the selected bidders. The report will be submitted to ME&M for its supervision and confirmation. Then, ME&M shall instruct CAMMESA to give notice of the confirmation of awards. Within three business days after having received the instruction, CAMMESA will give notice of the award to successful bidders.
Signing of Renewable PPA	Within 60 business days after having received the award confirmation, the successful bidder will be summoned by CAMMESA so as to sign the PPA by means of the specific purpose vehicle entity (SPE) constituted in Argentina.

Source: eclareon 2017.

The steps mentioned in figure 9 can be explained in detail as follows:

I Submission of the Bids

As referred above, bids shall be submitted in a general envelope (or box), which in turn shall contain two envelopes, i.e. the so-called Envelope A (Technical Bid) and Envelope B (Economic Bid). The Envelope A or technical bid shall contain the following documents:

- Index of content of Envelope A;
- Legal Requirements of the SPE constituted in the Argentine Republic[13];
- Legal Requirements of each individual or legal entity which constitutes the bidder;
- Bid bond
- Financial Requirement, which proves a minimum amount of US$ 250,000 equity for each MW of offered capacity; or in the event that the bidder is

[13] It should be noted that the documentation of the legal requirements must be in Spanish. Documents issued in a different language should be translated into Spanish by a sworn translator in the Argentine Republic and it should be legalized in the corresponding professional association.

constituted of different individuals or legal entities, at least one of them shall prove to comply with the Financial Requirement (Financial Strategic Partner);
- Description of the Project (generation capacity of the plant, schedule of project execution and SLC);
- Availability of a real property for the installation of the plant;
- Availability or Feasibility of the Resources;
- Technology (documentation that certifies the performance of the equipment included in the bid, capacity to be installed as well as the technical description of the plant components, equipment and ancillary facilities);
- Production Estimate;
- Environmental authorizations;
- Copy which shows the number for the registration of the Project as Generator Agent of MEM;
- Access to Transmission Grid;
- Tax benefits request on the Renewable Energy Legal Framework and its detailed quantification.

The Envelope B or economic bid shall contain the following documents:

- Bid's Offered Price in US$/MWh;
- Notification on whether it is opted to take the World Bank Guarantee;
- Minimum Capacity for Partial Award;
- Guaranteed Energy;
- Minimum Guaranteed Energy.

II Selection of the Awarded Projects

For projects to be selected, they have to comply with the reference terms of the RfP and have to present all the documents and studies required by Envelop A. Once this is confirmed, the final approval will be given to those projects whose AOP does not exceed the Maximum Award Price established by the ME&M for PV and wind energy (Envelop B).

In case of delay in reaching the commercial operation by the date foreseen in the project (Envelope A), a penalty of US$ 1,388 for each megawatt of the contracted capacity for each day of delay will be applied to the successful operator. If the latter does not comply with the penalty or part of the penalty (or any other compensation) after the due date of the corresponding payment term, CAMMESA will be entitled to make the performance bond effective to collect any amount which remains unpaid. CAMMESA will be able to use the performance bond once the commercial operation is reached or after the period of 180 days following the scheduled commercial operation date (after considering any extension of such date). In case the RES

operator terminates the PPA agreement, CAMMESA will be able to make use of the performance bond by the effective termination date of the agreement.

4.2 Funding of Solar PV and Wind Energy Projects

Financing access continues to be a critical issue for the execution of the awarded RE projects. In fact, several of the awarded projects under the RenovAr round 1.5 have not obtained funding to execute their projects and are still looking for international credits. This is why the signing of these PPA contracts under RenovAr round 1.5 is delayed. It is expected that a large part of the awarded projects will obtain the required financing, as it happened under RenovAr 1, in which awarded projects had delays in securing loans but eventually many could obtain them. According to the experts, the realization rate of wind and PV tenders will be of about 80%. Interest rates for RES loans have significantly decreased in the last two years, from 15% to about 7% - 8%. However, these rates are still relatively high for some companies, which thus try to obtain funding from multilateral financial entities.

It is expected that about 10 - 15% of the awarded projects will receive loans from multilateral support banks like Corporación Andina de Fomento (CAF), KfW and IADB. A few others will be financed by Chinese banks (as of August 2017). In these cases, the interviewed stakeholders agree that the interest rate will be slightly lower, namely 5% - 6%.

In the past, the state bank for Investments and Foreign Trade (BICE), which is financed by the China Development Bank and the CAF, has financed three wind farms and three solar PV parks. However, at present BICE does not foresee credits for the projects awarded under the auction program RenovAr.

4.3 Barriers and Recommendations

Barrier 1: Financing of RES Projects

The availability of financing and financing conditions play a crucial role for solar and wind investments, as renewable energies need high up-front investments.

a. Guarantee under FODER

RE project developers encounter problems to obtain funding for their projects as the profitability is based on the tariff guaranteed for 20 years by CAMMESA, whose economic resources are not sufficient to guarantee the payments. CAMMESA is a highly indebted company but receives state subsidies in order to comply with the tariff

payment obligations towards electricity generators. The financially weak position of CAMMESA has constituted a serious risk to investments in wind and PV projects. This risk has been reduced with the implementation of FODER backstopped by the national state and the World Bank (see chapter 2.5.3).

However, the guarantee provided by FODER to CAMMESA covers only 50% of investments. Therefore, a risk of losing 50% of the investment if CAMMESA does not comply with its payment obligations under the PPA remains. This additional country risk increases the WACC of renewable investments for international companies and may lead to investment decisions in favour of less risky markets.

This hardship poses a greater challenge for medium size international companies than for big local players like Pampa Energía or Genneia or for international large corporations, which are more capable of assuming the additional country risk and a higher WACC. Local companies are familiar with Argentine market conditions and usually well-prepared to deal with its particular risks. In addition, they often have less investment options than international companies. Large international corporations often have excess liquidity and are willing to enter new markets.

Moreover, the additional country risk and high WACC constitute a barrier for those seeking to fund projects through project finance. In fact, most of the successful local companies will fund their projects through corporate finance.

Recommendation:

Development and national banks should provide more guarantees to support developers and generators in accessing international financing. According to some of the interviewees, BICE will provide guarantees to support some renewable energy investors to close the financing with international funding bodies. Moreover, multilateral banks like CAF and IADB are also providing additional guarantees as well as some financing to support the execution of the projects.

b. National financing

There is a lack of national financing credit lines, as private national banks still do not offer RE credit lines and BICE may offer a few loans but only for buying local components. The plan is to launch a fund of US$ 100 million with the purpose of buying local components to be used by successful bidders under the RenovAr round 2.0. The loan tenor would be of 15 years and with a subsidized interest rate of about 3 - 4%.

Recommendation:

As RE constitutes a new market in Argentina, national banks have only limited experience with the characteristics and particularities of investments in this field. Hence, capacity building in terms of know-how and technical capabilities is essential. Banking staff should be trained with a view to obtain specific expertise in the RE sector. Cooperation within each bank's international branch in countries with more RE experience (even regional branches in Chile, Uruguay and Brazil), as well as with institutions such as foreign chambers of commerce, the World Bank or technical development agencies could facilitate the exchange of experiences and know how taking into account the conditions of the Argentine market. This will enable banks to develop and provide more and targeted and standardized national credit lines for renewable energy investments reducing the dependence of investors on international funding. National credit lines can be often obtained at a lower interest rate than the ones of the private international funding.

Barrier 2: Low prices under RenovAr auction rounds

Prices were considerably reduced in the last two RenovAr auction rounds compared to prices awarded under the GENREN auction program. Prices have decreased from 240 US$/MWh for PV and 180 US$/MWh for wind in 2015 to 54.94 US$/MWh and 53.34 US$/MWh, respectively. Several examples in Latin America demonstrate that the implementation of auctions has reduced the prices of renewable technologies significantly, see the cases of Peru, Mexico, Uruguay and Brazil (Factor 2017).

According to the interviewees, one of the main reasons for the price reduction is that several multinational corporations force prices down to enter the market banking on profits in the long run. At this price level only a few large-size companies, mostly from China, Spain and US, are in a position to compete, being well-equipped with liquidity or under high pressure to tap into new markets to utilize existing production capacities. SME´s usually cannot compete with low-price strategies in markets like Argentina with a relatively high investment risk. Therefore, to face the Argentine risk, several large international IPPs bid too high and lost. Moreover, SMEs usually have a hard time developing projects as large as those presented in the RenovAr auction rounds. This is not just the case for Argentina. Many Argentine SME companies, however, won in RenovAr, because they are used to doing business in Argentina and they are comfortable with the national risk. These companies have the financial strength to provide parent company guarantees for foreign loans under corporate financing.

Recommendation

Smaller international developers, i.e. medium size companies, have additional and alternative possibilities to invest under the Independent Power Producer's (IPP) Resolution Nº 281, in force since 18 August 2017. This regulation allows direct PPAs between large users (Gran Usuario habilitado- GUh), which are obliged to comply with 8% of RE in their electricity demand by 2018, and the IPPs. Alternatively, the IPP resolution allows the large users' self-generation. In Argentina there are about 9,000 large users, among which there are several international companies, being a big potential market for medium size RE generators. According to interviewed German stakeholders, the fact that international project developers will not have to deal with CAMMESA but rather with (international) private companies may facilitate the investments in renewables. Moreover, large users include the mining sector, which constitutes an energy intensive industry whose demand could be met with RES or with hybrid generation plants (i.e. combining diesel, PV and wind).

Furthermore, it might make sense that other countries follow the example of Denmark in setting up funds particularly directed towards backing renewable energy investments of national stakeholders in developing countries and emerging markets like Argentina[14]. By providing risk capital, such funds can support national investors, including SMEs, to compete in markets with relatively high risks and with other more risk-affine competitors.

Barrier 3: Import taxes uncertainty

One of the most important fiscal incentives to promote RE investments are the import taxes exemptions that are valid until December 2017. The purpose of limiting the exemption was to incentivize a learning curve in the local RE manufacturing industry preparing it to produce and supply components locally from 2018 onwards and increasing the local content in projects. However, as the local manufacturing industry is not in a position to supply RE components by 2018, there are currently discussions whether and until when the time limit for the tax exemptions will be extended. This uncertainty hurts the sustainability of RenovAr, as it generates concerns among investors that will start their construction works in 2018 and among those who are currently applying for the auction round RenovAr 2.0 launched in August 2017 (as of

[14] The Danish Climate Investment Fund provides advice and risk capital in the form of share capital for the establishment of businesses in cooperation with Danish companies or by acting as co-investor in larger climate projects including Danish technology or know-how.

September 2017). Import taxes account for 15% of the CIF (cost, insurance and freight) value, representing a significant factor in the costs of imported components. It can, therefore, have a significant negative impact on the CAPEX and pose uncertainty for investors and banks.

Argentina has potential for local production of towers and other wind turbines generators components, but the lack of experience and uncertainty of timely delivery of a high quality product add significant risks to project developers and investors. In addition, the local content premium (or the import tax) tie investors into supplying these components in Argentina at a higher risk.

Recommendation

For investors it is fundamental to have the greatest possible visibility in terms of project costs and revenues before submitting a bid. With increased insecurity credit risk rates and project financing costs will grow. In order to minimize costs and to ensure a high project realisation rate the Argentine regulator should, thus, provide clarity with regard to parameters relevant for project financing well in advance of upcoming auctioning rounds. This is important especially for less risk-affine investors, such as SMEs. To this end, it is important that there is prompt clarification on the possible extension of import tax exemptions beyond 2017.

Barrier 4: High turn-key costs for PV and wind system

a. Turn-key costs

Costs for PV systems in Argentina have decreased from 2,000 US$/kW in 2015 (see the study conducted by eclareon and BSW-Solar 2015) to 1,100 – 900 US$/kW by 2017. For wind systems, the specific cost amounts to about 1,500,000 US$/MW by 2017. Current PV and wind system costs are by far closer to the European level than they were in 2015, showing that Argentina has already a competitive RE market. Costs could still be further reduced if the immaturity of the sector and lack of qualified labour are improved.

b. Logistics costs

The cost of the renewable energy equipment is higher in the provinces located far from Buenos Aires, Zárate and Rosario due to high domestic logistic costs.

Domestic logistic costs are higher than international logistic costs and these costs should be added to the final price of the RE equipment that will be installed in the provinces of the NOA, Cuyo and Patagonia regions. These provinces have among the

best solar and wind resources of the country but are far from the main ports, increasing the costs of the imported equipment. This problem is even more critical for wind energy. However, although inland provinces have to face additional transport and logistic costs, it has to be noted that these might be compensated with higher energy yield and capacity factors due to more favourable resource conditions.

For wind turbines, there will be bottlenecks in the in-land transport due to the limited number of available tow trucks to transport the turbines and blades from the custom to the installation sites, especially because of the large awarded capacity under RenovAr. If the tow trucks are used to transport all the wind equipment that will arrive at the ports, other industrial sectors will be paralyzed. Thus, there is a risk that turbines and blades will be stranded in ports for days at the cost of investors. Moreover, several ports do not have sufficient capacity in terms of space to receive the wind blades and at the same time lag tow truck availability. This applies for the ports of Buenos Aires and Puerto Madryn. Only the ports of Rosario and Zárate provide the required room capacity and tow truck availability.

In the case of solar parks, PV equipment demand large quantity of containers that should be timely unstuffed. In case they are not unstuffed on time, containers start to be accumulated in the port producing a financial loss for developers and investors because storage costs in the ports are high. Furthermore, north paths via Chile for the solar parks to be installed in the NOA region might be blocked during the winter season due to hard weather conditions.

Recommendation

The Argentine RE market is still in its infant stage lagging component suppliers, adequately qualified labour force and appropriate logistic infrastructure. However, as the market is starting to develop, it is the right time to attract foreign and to promote national experts to facilitate the streamlining and optimization of processes in the project deployment and logistics as well as the capacity building in technical and financial know-how and skills.

In the case of wind energy systems, on-time delivery of the components at the installation sites is required. In the immediate term, a suggestion would be that wind components are unloaded at the same place where the turbines will be assembled and installed. Furthermore, idle logistic resources from neighboring countries such as Brazil or Chile could be used. To this end, bilateral collaborations between the Argentine and Brazilian or the Argentine and Chilean industries should be sought.

Argentine ports would benefit from additional resources in the coming rush of deliveries of wind turbines in 2018. Future analysis should elaborate and advise on how the national government can support the development of a logistic sector, for example by investing in the infrastructure and providing training to the respective stakeholders.

Barrier 5: Grid expansion uncertainty

Currently, the national authorities are in the process of setting up a grid expansion plan. However, it is still unclear which lines will be build. The government is in a situation where it has set ambitious RE deployment targets but at the same time is still facing budgetary difficulties. As such, it will probably be necessary to prioritize certain grid lines and respectively RE installations over others. This will be a challenge for the authorities and could pose some uncertainty for investors.

Recommendation

Clarity in grid expansion projects and definition of areas for development of RE projects is key to reduce investment uncertainties, as the development timeline for wind and PV projects is long and costly. It may be suggested that the grid planners involve RE stakeholders in the planning of the electricity network expansion to reduce the uncertainty in their investments. Participating the investors from the beginning will enable to consider their possibilities, objectives and concerns in the planning, improving the overall investment environment. This will also mitigate possible conflict of interests in the future and enable project developers to focus their efforts effectively.

4.4 Key points for the Auction business model at national level

- Under RenovAr 1 and RenovAr 1.5, 1,142 MW and 1,281 MW of RES capacity were awarded respectively.
- Financing continues to be problematic, but less than in the past as the risk of CAMMESA has been reduced thanks to the implementation of FODER, backstopped by the national state and the World Bank.
- International medium size companies will have additional possibilities to invest under the IPP regulation.
- Current PV and wind system costs have been reduced compared with 2015, yet still high due to the immaturity of the sector.

5. PV Framework Assessment at Provincial Level - Net Metering

5.1 Net Metering in the Provinces: The case of Salta

Six provinces, e.g. Mendoza, Salta, Santa Fe, San Luis, Neuquén and Misiones, have currently net metering regulations in place. From these provinces, only in Mendoza, Salta and Santa Fe net metering is implemented and operative (as of August 2017). The case of Salta constitutes an interesting example to be explained here, as it offers good business opportunities for PV project developers. In fact, Salta is the province that has received more net metering application requests so far, having two systems already in operation and some under administrative request process (see section below).

5.1.1 Description of the Salta Net-Metering

The net metering law (No 7824) in Salta was issued the 26 June 2014 and was implemented in November of the same year through the Decree "Reglamentación Ente Regulador de los Servicios Públicos Nº 1315/14". In May 2017, a new Resolution Nº 0448/17 was published that replaced the previous Decree and introduced amendments to the net metering mechanism such as the introduction of single-phase connections for installations up to 5 kV and the allowance of medium voltage (MV) connections (13 kV and 33 kV) (see below).

The support scheme in Salta it is an adaptation of the net metering, as it promotes the distributed generation with the connection made directly to the low voltage network and medium voltage connections and there are no bidirectional meters. Under the Salta's support mechanism, customers have two different meters, the one that counts their consumption of electricity and a new one that counts the produced electricity from renewable sources. Self-consumption is not allowed because of the infrastructure cost. To allow self-consumption it would be required to count not only the costs of PV equipment installation but also the costs of the adaptation of the inner electricity infrastructure. Presently, the majority of the residential buildings are not prepared for electricity self-consumption system (eclareon and BSW-Solar 2015). The eligible technologies under the net metering regulation are solar PV, biomass, small-scale hydropower and small-scale wind energy.

Currently, the net metering scheme establishes a limit installation capacity of up to 4 MW throughout the province (previously the limit was 1 MW). The allowed network connections of renewable installations are three-phase, or single-phase for

connections up to 5 kW. The following two users' categories are foreseen under the net metering system in Salta:

- Residential users can install a capacity of up to 30 kW under three-phase connections, or 5 kW under single-phase connections.
- Industrial, commercial or productive users can install a capacity of up to 150 kW in Low Voltage (LV) or 300 kW in MV.

The current status of the Salta net metering projects is:

- Two operative projects of 5.5 kW (Salta city) and 7 kW (Cafayate), operative since the 30.12.2015 and the 26.07.17, respectively.
- An approved project of 30 kW located in the municipality of Embarcación to be connected in the next months.
- Four projects under administrative approval process, e.g. a 100 kW project to be located in a university (this would be the first project to be connected in MV), a 150 kW plant in LV to be installed in a commerce and two smaller ones of 30 kW and of 7.5 kW.
- A project under preparation of 100 kW to be located in the industrial area of Salta.

The hybrid support scheme for distributed generation in Salta foresees three financial incentives for the users:

1) Feed-in Tariff (FiT): The first two years all the produced electricity is bought at the supported tariff that is fixed every three months by the Regulator of the Public Services (ENRESP) in Salta, while the electricity consumption is paid at the tariff that corresponds to the user category established by the distribution company.
2) Net –Billing: From the third year starts to apply the net metering, which is more a net billing incentive mechanism, as there are differing rates used to value the excess electricity fed into the grid and the energy received from the grid. From the third year, the user pays the tariff that corresponds to its user category established by the distribution company, and offset its purchases with the output coming from the plant. If there is an electricity excess fed into the grid, the user receives the supported tariff that is fixed every three months by the ENRESP in Salta, while for the electricity consumed the user pays the tariff that corresponds to its user category. For example, for residential users receiving the electricity subsidy, the tariff is about ARS 600 (40.81 in US$) per MWh,

while the tariff for residential users not receiving the subsidy is about ARS 1,335 – 1,160 (90 – 78.90 in US$), depending on the electricity saving. For the industry sector, the tariff is about ARS 1,810 (119 in US$) average per MWh in peak hours (as of April 2017) for all the consumed electricity (Salta ENRESP 2017). The net billing incentive applies for a period of 5 years and it is extendible for periods of 5 years.

3) Provincial Tax Credit: The provincial tax credit, which is set in Argentine pesos, finances between 35-70% of the renewable energy equipment but can be received only after the PV equipment is in operation. The credit line is paid in bonds that can be exchanged for shares or services, has no interest rate and a grace period of 5 years. From the 6th year the bonds' loan must be paid back in five annual payments. Some of the payments can be replaced by goods. For example, hoteliers might be eligible to replace payments by offering some free room nights to the provincial government. The provincial tax credit constitutes an incentive that Salta has already implemented before to promote the tourism and other industrial sectors (eclareon and BSW-Solar 2015). The process to obtain this credit and the final amount of the tax credit are not clear. In fact, the final amount seems to be based on free negotiation.

The supported tariff is set by ENRESP according to two parameters: 1) the non subsidized energy price of the wholesale electricity market (MEM), which is established by the Energy Ministry, and 2) the so-called Correction Factor of the Tariffs (FCCR) that is reviewed every three months. The FCCR has the purpose to modify the tariffs in order that they could be in line with the prices that are paid in the national electric market for generation sources of the same type and origin. Under the net metering scheme, the distribution company should remunerate the user for its generated and excess energy, according to the supported tariff set and published by ENRESP (Giubergia 2017).

It has to be noted that the 2017 Ordinance establishes that in the case of plants under the ownership of the National, Provincial or Municipal governments as well as of the Judicial and Legislative branches, compensation for electricity cession will be only made under the net billing mechanism, which in the case of general users applies from the third year.

It is expected that under the 2017 Ordinance, the residential sector would be in better conditions to adopt the net metering support, as single-phase connections up to 5 kW

are now authorized. Single-phase network connections are cheaper for households than three-phase ones

5.1.2 Development Procedure under Salta Net-Metering

The parties involved in the Net-Metering are the Salta Secretary of Energy, DSO of Salta (named EDESA S.A.), Professional Council of Surveyors, Engineers and Related Professions (COPAIPA) and the Regulator of the Public Services (ENRESP) in Salta. The main steps to conclude a Net-Metering contract can be summarized as follows:

Figure 10: Main Steps to Conclude a Net-Metering Contract

Request for the Technical and Commercial Feasibility	**The client must submit to the Distribution Operator (DSO) a written Request for a Technical and Commercial Feasibility attaching, as a sworn declaration, the required information asked by the DSO. The latter has up to 15 working days to provide the requested feasibility. The 15 days period can be extended under exceptional justified circumstances. The Technical and Commercial Feasibility is valid for a maximum period of 6 months, counting from the client notification. Together with the technical feasibility, the DSO will communicate the user the Technical Procedure for later connection of the net-metering.**
Presentation of the "Executive Project" for its provisional authorization	**The Executive Project in two copies (one printed and one digital) must be presented to the DSO to obtain its provisional authorization. The DSO will examine the Executive Project within a period of 15 days. If the DSO makes observations to the Executive Project, this should be submitted again with the requested improvements until the DSO provides the provisional approval (without a pre-defined time).**
Submit of the Executive Project to COPAIPA	**Once the Executive Project has been provisionally approved by the DSO, it shall be submitted to the Professional Council of Surveyors, Engineers and Related Professions (COPAIPA) for the verification of the technical regulations established in Art. 1 of Provincial Law No. 7469.**
Final approval of the Executive Project	**After the verification of COPAIPA, the Executive Project should be submitted again to the DSO for its final approval, enclosing the number of copies indicated in the Certificate of Technical and Commercial Feasibility. Once the Executive Project has been approved by the DSO, it will be sent to the Salta Secretary of Energy for its technical and administrative verification. Subsequently, the Secretary of Energy will send it to the Regulator of the Public Services in Salta (ENRESP) for its verification. With the compliance of both public bodies, ENRESP will issue a Resolution and the user and the DSO will sign an Act of Commencement of the work required for the execution of the renewable energy net-metering generation project.**
Approval of the equipment's installation	**Once the Act was signed, the client is able to acquire the equipment that should be declared to the DSO for its test. The DSO has up to 15 working days to test and approve the installation of the equipment.**

Approval of the commissioning of the plant	**After the equipment is installed, the DSO will proceed, within a period of up to 30 working days, to the inspection of the commissioning. This consists in the verification of the operational requirements required in the Technical Procedure for the connection of the renewable energy net-metering generation project.** **Once the commissioning has been approved, the client must:** **a) Send the "Documentation According to Work" to the DSO, in printed and digital format;** **b) inform the DSO the contact details of a responsible Head Operator; and** **c) pay the fee of the Qualification and Technical Inspection.**
	
Connection Permit	**Once a), b) and c) have been complied with, the DSO will grant the client the "Connection Permit" for the net metering. The DSO will also order the connection of the meter or measuring equipment, as appropriate, registering the measurement point in the computer system for the purposes of measurement and billing.**

Source: eclareon 2017.

The estimated overall duration of the net-metering process from the Request for the Technical and Commercial Feasibility until the Connection Permit is about 4 - 6 months.

In detail the procedures are explained as follows:

I Presentation of the Executive Project for its provisional authorization

After the requested Technical and Commercial Feasibility and the Technical Procedure are provided to the user, and if the latter agrees with the feasibility conditions, he must comply with the “Presentation of the Executive Project for its provisional authorization”. The Executive Project to be presented to the DSO should at least include the following information:

I.a Land Title Deed, not older than 30 days from the date of presentation of the renewable energy project

I.b Technical memory

I.c Electric single line diagram

I.d. Plans of the renewable energy plant

I.e. Detail of the equipment to be installed, which must respond to what is defined in the Technical Procedure for the net balance connection[15].

[15] The technical characteristics of all the maneuvering, protection, signaling and communication equipment should comply with the DSO Technical Specifications and Norms (TSN).

I.f. Sheets of guaranteed technical data for the equipment, duly certified, to be used in the net balance installation in the network of the DSO.

I.g. Provision of control and automatism modules of the generator, as well as all relevant technical specifications of the generator and synchronising control panel (except for the PV and wind installations)

I.h. Certificate including the test standard that guarantees the safety and operating condition required for the equipment to be installed. The certificate should be issued by an independent nationally or internationally authorized Certification Body.

I.i. Certificate of Environmental Aptitude as a sworn declaration in accordance with Law No. 7070 for Environmental Protection.

II Act of Commencement of the Work

With the compliance of both public bodies, ENRESP will issue a Resolution and the user and the DSO will sign an Act of Commencement of the Work required for the execution of the renewable energy net-metering generation project.

In this Act it shall be expressly established:

- The commitment of the user to fulfill the obligations set forth in the Net-Metering Regulation and, in particular, in the required technical documentation, approved by the DSO.
- The user's commitment to face the costs of the necessary works in the Distribution network, if applicable, and to undertake the effective connection of the RES installation to the DSO network within a maximum term of six months, counted from signature of the Act. This term may be only extended by the implementing authority, by means of a duly well-grounded document.
- The commitment of the user to pay the established fees of habilitation and technical inspection.
- The user's commitment to allow free access to the DSO's staff to the net-metering facilities for the technical inspections already established in the Regulation and others that might be necessary.

Once the Act of Commencement of the Work has been signed, the user will be in a position to acquire the equipment and related labor.

The contract between the user and the DSO lasts minimum five years, starting from the connection of the renewable energy plant to the network of the DSO, except in case of force majeure duly justified by the ENRESP. After the first five years, the contract is automatically renewed for another period of five years, unless it is expressly otherwise communicated. After ten years, the contract is again automatically renewed for further five years, unless it is expressly otherwise communicated.

5.1.3 Connection to the Grid

The user should connect its renewable energy plant to the electricity network of the DSO. The maximum available capacity will be determined by the DSO, depending on whether the connection point is in a distribution line or in a transformation center.

If the maximum available capacity at a particular connection point is lower than the capacity of the projected plant, there are two options. Under the first option, the DSO may deny the connection request for the moment and determine the specific elements of the network that need to be modified. In this case, the costs for the required changes or reinforcement of the grid must be borne by the user, but can be reimbursable according to the Reimbursable Energy Contribution Regulation (CER). Under the second option, the DSO indicate the maximum available capacity without modification of the grid and the user modifies its project until the maximum available capacity of the grid.

The access of the renewable energy plant to the distribution network may also be denied according to safety criteria and / or continuity of supply. The user is responsible for the tasks and maintenance costs of the plants, provided in the Technical Procedure for the net metering connection. Moreover, the user is responsible for all the materials, equipment and labor necessary to comply with the requirements established in the Technical Procedure for the net metering connection, as well as for the cost of all the tests and commissioning made by the DSO. These costs are not reimbursed.

5.2 Barriers and Recommendations

Barrier 1: Financing

1.a. Financing for small scale projects

Financing is very complicated due to the high interest rates of the loans, about 7% - 8%. Companies face huge difficulties to obtain loans for the installations. Therefore, the debt/equity ratio for the PV projects installed in Salta is 0/100, being until now full

financed by the users. High financing costs, limited access and fully equity projects hinder a greater deployment of projects and it is not sustained in the medium and long term.

1.b Provincial tax credit

The procedure to obtain the tax credit provided by the government of Salta and the final amount that can be obtained are not clear. This does not provide a reliable outlook for the project financing. The provincial tax credit can be received only after the PV project is in operation, which means an additional obstacle for the financing of the project. Moreover, the possibility to repay the credit line via services or goods involves a very high risk of corruption.

Recommendation

A more streamlined and clearer procedure describing how to obtain the tax credit and the exact amount that can be obtained for the financing should be established beforehand. Consumers planning to install a PV plant in Salta should be able to calculate their cash flows in order to decide more precisely whether they can invest.

It is suggested to launch a provincial credit line that can be obtained after the approval of the commissioning of the plant and before the construction works of the PV installation. Also, it is recommended to set a clearer procedure to apply for these provincial loans and a pre-established sum in USD or its equivalent in Argentine pesos. National soft loans with subsidized interest rates from national credit lines might be also provided to encourage local/ provincial PV investments from the national level.

Barrier 2: Incentive tariff

The so-called net-metering in Salta is a hybrid support scheme, combing FiT and net-billing. As described above, there is a FiT which is paid for all the energy production for the first two years, and from the third year the operator receives the FiT for its excess energy. Yet, three problems are encountered under the incentive tariff. First of all, no contract model for the FiT exists, as the tariff should be set every three months by the Salta's regulator. This does not give the users a reliable and certain outlook to develop the project.

Second, it is not clear how many years the FiT will be paid, contract time with the grid operator is established for 5 years, extendable to further 5 years, which is not enough to build up a reliable business case. Last but not least, the incentive tariff does not show a direct link to real inflation rate which brings additional risks and difficulties to calculate business cases.

Recommendation:

In order to achieve the national RES targets, national guarantees and support for the companies aiming at building projects in Salta should be provided. A recommendation would be the set of a FiT in an international currency like US$, in order to reduce the investment risk, generated by inflation and devaluation. Establishing a fix contract time with the grid operator, which in the best case would correspond to a rentable time for the company, would mitigate further the investment risk.

Barrier 3: Time spent carrying out the project development

According to the stakeholders, the time track spent carrying out the whole project development is longer than in other markets (about 5 - 8 months) due to the factors mentioned below.

3.a Special technical rules:

Particular technical rules of the “net metering” incentive in Salta like the requirement of a separate meter for the PV generator and no own consumption allowed, discourage potential users that are intensive energy consumers and have good sites to produce solar energy. PV projects have to be adapted to these special requirements, which are unusual in other international markets, provoking often problems in finding the best solution.

3. b Administrative procedures take too long:

The administrative process to obtain the grid connection permit and the incentive approval takes too long. There is a lack of coordination between the established formal process and the real responding time. Some steps in the process seem to be redundant, for instance the project approval is going several times over the desk of the grid operator, then to the Secretary of Energy and the Regulatory Entity which is contra productive.

3.c Lack of clear transparent scheme of responsibilities between the local authorities.

Technical issues are discussed in between the process of project development with long waiting time to get answers.

3.d Logistics:

Imports and logistics is a critical aspect in project planning, especially in Salta – Argentina. Due to high logistic costs and time delays in the domestic transport of the PV components, investors are confronted with long time frames and financial losses.

Recommendation

It would be helpful to implement a round table and communication platforms where problematic issues are discussed between authorities and developers in order to improve the efficiency of the administrative procedures. Possible topics of the round table might be (Eclareon, Öko-Institut 2012):

- Introduction of mandatory deadlines until a process has to be finalized by the public body, combined with a sanction regime if the public body fails to do so;
- Simplification of permission procedures through harmonisation of technical requirements (Network Code);
- Introduction of a “fast track” procedure for specific projects;
- Introduction of a one-stop-shop procedure.

5.3 Key points for the Net-Metering business model in Salta

- The Salta N-M approach foresees different instruments, e.g. FiT for the first 2 years, net-billing and a provincial tax credit.
- The implementation of the N-M model is progressing over time from 1 MWp cap in 2015 to 4 MWp in 2017 and from only three-phase network connections in 2015 to also single-phase connections for RE installations up to 5 kW.
- The challenge is to make the administrative process for the grid connection permit and the incentive approval simpler and less time consuming for the investor.
- Financing is also difficult for the investor, as the provincial tax credit procedure is not clear and the credit can be received only after the PV project is in operation.

6. Profitability of the PPA – Simulation

The present study shows the profitability of PV and wind plants under the current conditions of the tender business model. For PV, the profitability simulation was segmented in two categories, i.e. a 10 MW and a 50 MW plant, due to the different system and fixed operation costs as well as the different PPA tariffs for a 10 MW and a 50 MW plant.

The objective is to show how is the profitability of the PV and wind PPAs under the financial and natural resources conditions that apply for the current RenovAr 2 auction round (as of August 2017). That being said, the analysis is not focused on the financial, yield and capacity factors of the past RenovAr 1 and 1.5 rounds, rather more on the round RenovAr 2, launched in August 2017 and to be awarded in November 2017 (CAMMESA 2017b).

Regarding the current interest rates for RES loans, interviewed stakeholders agree in a value of about 7% - 8%. Until now only some of the awarded bidders in the RenovAr rounds 1 and 1.5 have obtained funding to finance their projects, as access to international credits continues to be a challenge for country's investments. Some of the PV and wind projects that have obtained international credits will be financed by development banks (mostly CAF and IADB) and a few others may be financed by Chinese banks (as of August 2017).

Both PV cases have the following common characteristics:

- a contract duration of 20 years,
- yield of 2,200 kwh/qm/a
- capacity factor of 85%
- interest rate of 7.5%
- an investment relation of 70% debt and 30% equity,
- a loan tenor of 8 years and
- a discount rate of 2%

As the PV plants have different sizes, their specific system, total system and fixed operation costs differ as well. Moreover, based on the last auction rounds it is assumed that as long as the PV plant is smaller, the PPA tariff increases, and vice versa (see below).

The 10 MW PV plant has the following particular characteristics:

- specific system cost of 1,000,000 US$/MW,
- total system cost of 10,000,000 US$
- fixed operation costs of 195,000 US$ p.a.
- PPA Tariff paid by CAMMESA = 56.5 US$/MWh.

For the 50 MW PV plant, it applies the following particular characteristics:

- specific system cost of 900,000 US$/MW,
- total system cost of 45,000,000 US$
- fixed operation costs of 807,500 US$ p.a.
- PPA Tariff paid by CAMMESA = 54.9 US$/MWh.

In the case of wind energy, the analysis was conducted based on a 50 MW plant, having the following particular characteristics:

- a contract duration of 20 years
- capacity factor of 45%
- specific system cost of 1,500,000 US$/MWp
- total system cost of 75,000,000 US$
- fixed operation costs of 2,437,500 US$ p.a.
- interest rate (IR), in the first three years IR is about 8% and in the following 5 years is about 7%
- an investment relation of 70% debt and 30% equity,
- a loan tenor of 8 years
- a discount rate of 2% and
- PPA Tariff paid by CAMMESA = 53.3 US$/MWh.

6.1 PV 1: PPA Business Model for a 10 MW plant

Under a 7.5% interest rate, the payback period is of 15.59 years, the Levelized Cost of Electricity (LCoE) is 0.06 US$/kWh, the Net Present Value (NPV) is of US$ 2,981,226 and the Equity Internal Rate of Return (IRR) is 5.92% (Figure 11). It can be stated that these figures do not present a profitable and attractive PPA business model for an investment in a 10 MW PV project.

Figure 11: PPA case for a 10 MW PV plant

Project Overview

PV Project		
PV System Size	kWp	10.000
Specific System Cost	USD/kWp	1.000
Additional CapEx (e.g. Battery)	USD	-
Investment Subsidy	USD	-
Total System Cost	USD	10.000.000
Fixed Operation Costs	USD p.a.	195.000
Variable Operation Costs	USD/kWh	-

PV Generation		
Yield	kWh/qm/a	2200
Performance Factor	%	85%
Specific Yield	kWh/kWp/a	1.870
Degradation	% p.a.	0,70%

Investment			
Project Duration		Years	20
Equity		USD	3.480.433
Debt (Gearing)	70%	USD	7.000.000
Loan Tenor		Years	8
Interest Rate		%	7,50%
Discount Rate		%	2,0%

PV Business Model			
Category	Share	Unit	Price
Feed-in Tariff	-	USD/kWh	-
Self-consumption	-	USD/kWh	-
Fees		USD/kWh	-
Net-metering	-	USD/kWh	-
Fees		USD/kWh	-
Excess Electricty		USD/kWh	-
PPA Tariff	100%	USD/kWh	0,0565
Fees		USD/kWh	-
Overysupply Price		USD/kWh	-
Undersupply Penalty		USD/kWh	-

Results		
Net-Present Value	USD	2.981.226
Project IRR	%	6,12%
Equity IRR	%	5,92%
Payback Period	Years	15,59
LCOE* (w/o subsidy)	USD/kWh	0,06
LCOE (w subsidy)	USD/kWh	0,06
Min DSCR**	x	0,73 x
Min LLCR***	x	0,73 x

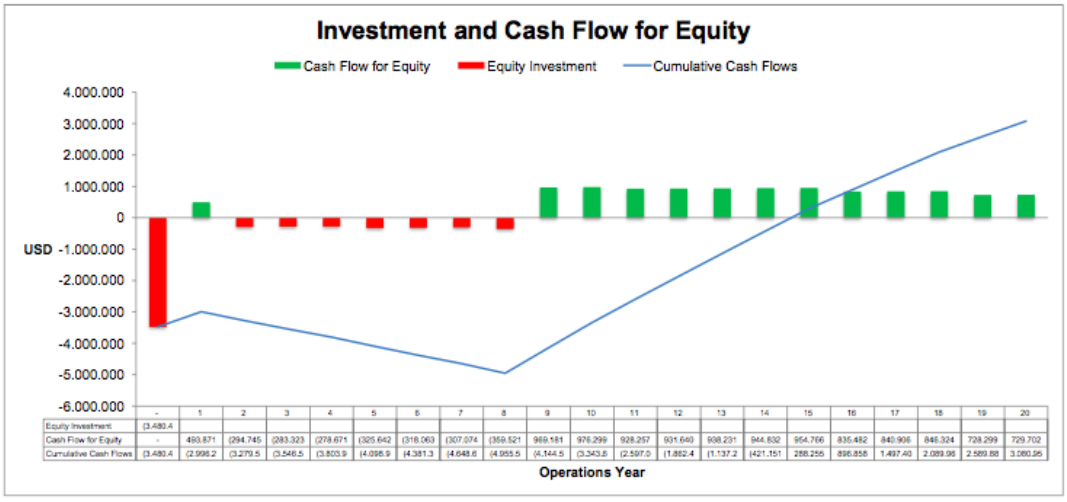
* LCOE: Levelized Cost of Electricity
** DSCR: Debt Service Coverage Ratio
*** LLCR: Loan Life Coverage Ratio

Source: eclareon 2017.

As the figure (12) below shows in terms of cash flow for equity, only from the mid of the fifteenth year, the investor can expect to start receiving benefits from the PPA. Taking into account that the PPA is signed for a period of 20 years, there are only five years and a few months left to make profits under the PPA scheme (Figure 12). Although the investor can amortize the investment, the period of time receiving benefits is short and, thus, unattractive for international investors as well as local ones.

Figure 12: Investment and Cash Flow for Equity Analysis

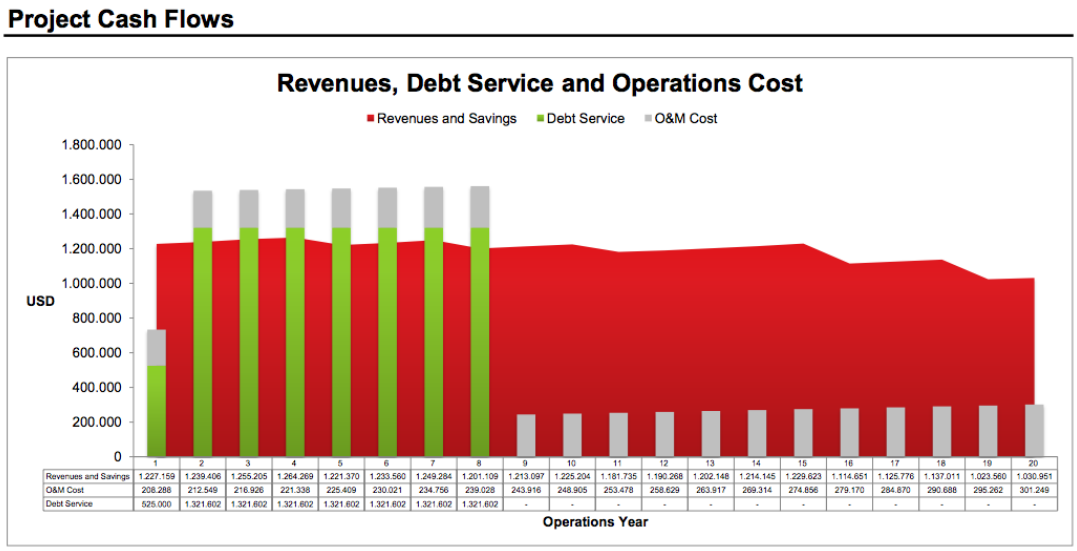
Project Cash Flows



Source: eclareon 2017.

As a consequence, until the eighth year debt service is extremely high, being higher than the revenues and savings. Over the first eight years the operator must pay debt service in addition to operation and maintenance costs incurring in financial loss. Operation and maintenance costs increase slightly over the PPA period of 20 years (Figure 13).

Figure 13: Revenues, Debt Service and Operation Cost Analysis



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Revenues and Savings	1.227.159	1.239.406	1.255.205	1.264.269	1.221.370	1.233.560	1.249.284	1.201.109	1.213.097	1.225.204	1.181.735	1.190.268	1.202.148	1.214.145	1.229.623	1.114.651	1.125.776	1.137.011	1.023.560	1.030.951
O&M Cost	208.288	212.549	216.926	221.338	225.409	230.021	234.756	239.028	243.916	248.905	253.478	258.629	263.917	269.314	274.856	279.170	284.670	290.688	295.262	301.249
Debt Service	525.000	1.321.602	1.321.602	1.321.602	1.321.602	1.321.602	1.321.602	1.321.602	-	-	-	-	-	-	-	-	-	-	-	-

Source: eclareon 2017.

6.2 PV 2: PPA Business Model for a 50 MW plant

Under a 7.5% interest rate, the payback period is of 13.80 years, the Levelized Cost of Electricity (LCoE) is 0.06 US$/kWh, the Net Present Value (NPV) is of US$ 21,617,030 and the Equity Internal Rate of Return (IRR) is 8.21% (see figure 14). It can be stated that an investment in a 50 MW PV project presents a more attractive business model than an investment in a 10 MW PV project.

Figure 14: PPA case for a 50 MW PV plant

Project Overview

PV Project			
PV System Size		kWp	50.000
Specific System Cost		USD/kWp	900
Additional CapEx (e.g. Battery)		USD	-
Investment Subsidy		USD	-
Total System Cost		USD	45.000.000
Fixed Operation Costs		USD p.a.	807.500
Variable Operation Costs		USD/kWh	-

PV Generation			
Yield		kWh/qm/a	2200
Performance Factor		%	85%
Specific Yield		kWh/kWp/a	1.870
Degradation		% p.a.	0,70%

Investment			
Project Duration		Years	20
Equity		USD	15.661.949
Debt (Gearing)	70%	USD	31.500.000
Loan Tenor		Years	8
Interest Rate		%	7,50%
Discount Rate		%	2,0%

PV Business Model			
Category	Share	Unit	Price
Feed-in Tariff	-	USD/kWh	-
Self-consumption	-	USD/kWh	-
Fees		USD/kWh	-
Net-metering	-	USD/kWh	-
Fees		USD/kWh	-
Excess Electricty		USD/kWh	-
PPA Tariff	100%	USD/kWh	0,0549
Fees		USD/kWh	-
Overysupply Price		USD/kWh	-
Undersupply Penalty		USD/kWh	-

Results		
Net-Present Value	USD	21.617.030
Project IRR	%	7,49%
Equity IRR	%	8,21%
Payback Period	Years	13,80
LCOE* (w/o subsidy)	USD/kWh	0,06
LCOE (w subsidy)	USD/kWh	0,06
Min DSCR**	x	0,81 x
Min LLCR***	x	0,81 x

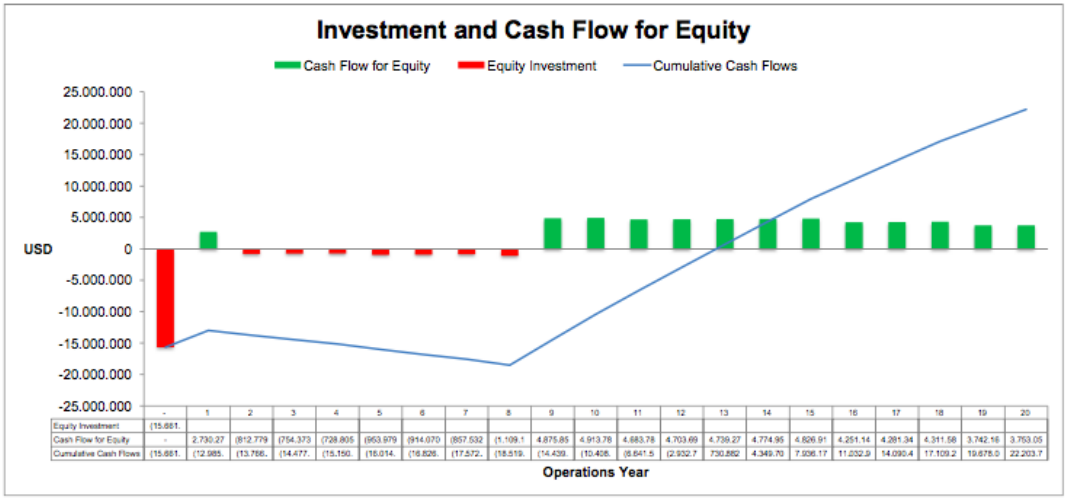
* LCOE: Levelized Cost of Electricity
** DSCR: Debt Service Coverage Ratio
*** LLCR: Loan Life Coverage Ratio

Source: eclareon 2017.

As the figure (15) below shows, in terms of cash flow for equity from the end of the thirteenth year, the investor can expect to have recovered the investment. Taking into account that the PPA is signed for a period of 20 years, there are seven years and a few months left to make profits under the PPA scheme (Figure 15). Moreover the cash flow for equity a 50 MW PV is higher (starting at about US$ 1,000,000) than in the case of the 10 MW PV project (starting at about US$ 500,000). Thus, the cumulated cash flows for the 50 MW investment is slightly improved compared to the smaller plant.

Figure 15: Investment and Cash Flow for Equity Analysis

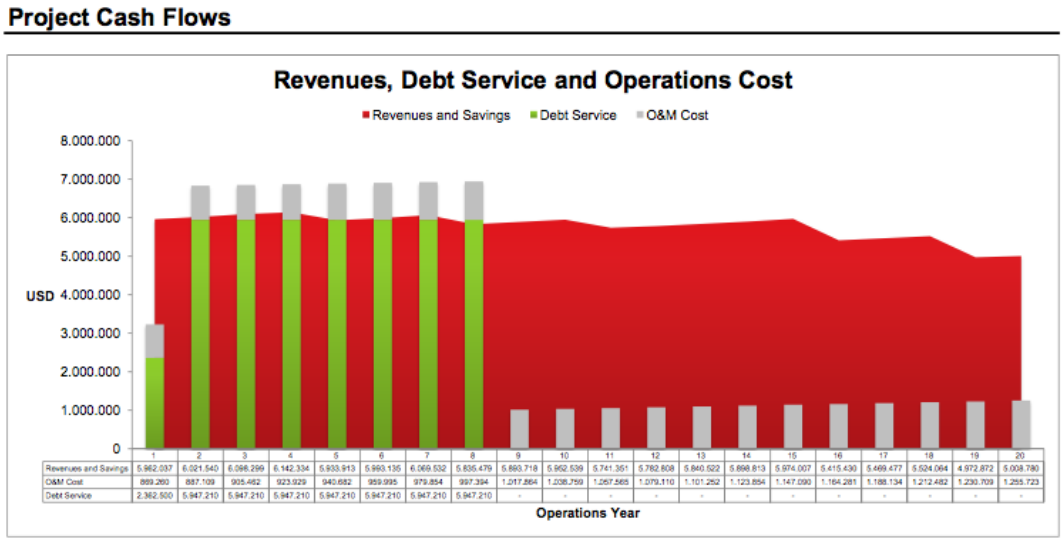
Project Cash Flows



Source: eclareon 2017.

Revenues and savings as well as debt service are comparatively higher than in the 10 MW project. In the 50 MW project revenues and savings almost equal the debt service (about 6,000,000 US$). Yet, the operator still must pay operation and maintenance costs incurring in a smaller financial loss than in the 10 MW project (Figure 16).

Figure 16: Revenues, Debt Service and Operation Cost Analysis



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Revenues and Savings	5.962.037	6.021.540	6.086.299	6.142.334	5.933.913	5.993.135	6.069.532	5.835.479	5.893.718	5.952.539	5.741.351	5.782.808	5.840.522	5.898.813	5.974.007	5.415.430	5.469.477	5.524.064	4.972.872	5.008.780
O&M Cost	869.260	887.109	905.462	923.929	940.682	959.995	979.854	997.394	1.017.864	1.038.759	1.267.565	1.079.110	1.101.252	1.123.854	1.147.090	1.164.281	1.188.134	1.212.482	1.230.709	1.255.723
Debt Service	2.362.500	5.947.210	5.947.210	5.947.210	5.947.210	5.947.210	5.947.210	5.947.210	-	-	-	-	-	-	-	-	-	-	-	-

Source: eclareon 2017.

6.3 Wind: PPA Business Model for a 50 MW plant

Under an 8% interest rate for the first 3 years and 7% interest rate for the rest 5 years, the payback period is of 11.80 years, the Levelized Cost of Electricity (LCoE) is 0.05 US$/kWh, the Net Present Value (NPV) is of US$ 59,572,463 and the Equity Internal Rate of Return (IRR) is 10.51% (see figure 17). It can be stated that this presents a profitable PPA business model for an investment in a 50 MW wind plant.

Figure 17: PPA case for a 50 MW wind plant

Project Overview

Project Parameters			
System Size		MW	50
Capacity Factor		%	45%
Specific System Cost		USD/MW	1.500.000
Investment Subsidy		USD	-
Total System Cost		USD	75.000.000
Fixed Operation Costs		USD p.a.	2.437.500
Variable Operation Costs		USD/kWh	-

Investment			
Project Duration		Years	20
Equity		USD	30.044.764
Debt (Gearing)	70%	USD	52.500.000
Loan Tenor		Years	8
Interest Rate (Year 1-3)		%	8,00%
Interest Rate (Year 4+)		%	7,00%
Discount Rate		%	2,0%

Business Model				
Category		Share	Unit	Price
Feed-in Tariff		-	USD/kWh	-
PPA Tariff		100%	USD/kWh	0,0533
	Fees		USD/kWh	-
	Overysupply Price		USD/kWh	-
	Undersupply Penalty		USD/kWh	-

Results		
Net-Present Value	USD	59.572.463
Project IRR	%	8,51%
Equity IRR	%	10,51%
Payback Period	Years	11,88
LCOE* (w/o subsidy)	USD/kWh	0,05
LCOE (w subsidy)	USD/kWh	0,05
Min DSCR**	x	0,99 x
Min LLCR***	x	1,00 x

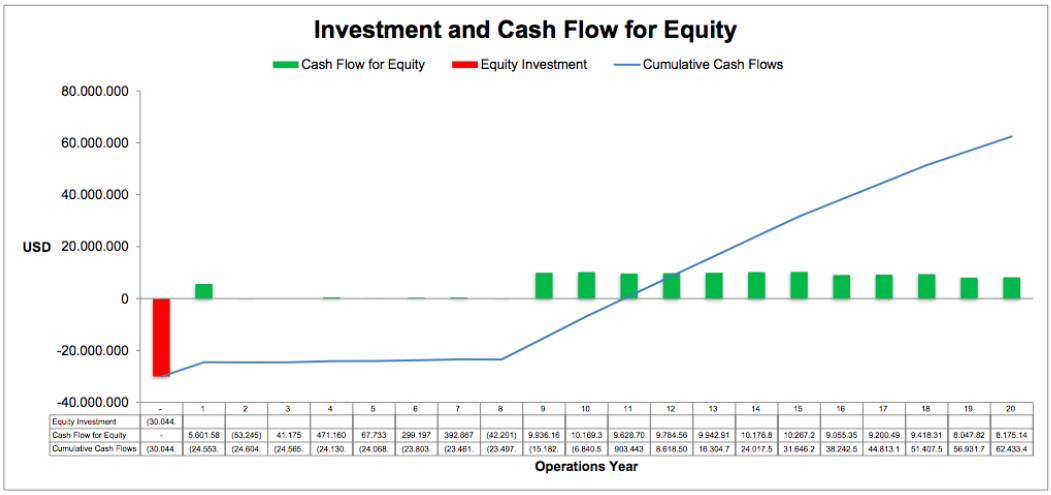
* LCOE: Levelized Cost of Electricity
** DSCR: Debt Service Coverage Ratio
*** LLCR: Loan Life Coverage Ratio

Source: eclareon 2017.

As the figure (18) below shows, in terms of cash flow for equity from the end of the eleventh year, the investor can expect to have already recovered the investment. Taking into account that the PPA is signed for a period of 20 years, there are still nine years and a few months left to make profits under the PPA scheme (Figure 18). As expected, the cash flow for equity for a 50 MW wind plant is higher than in the case of the 50 MW PV project. Therefore, the cumulated cash flows for the 50 MW wind investment is greater compared to the 50 MW PV plant.

Figure 18: Investment and Cash Flow for Equity Analysis

Project Cash Flows



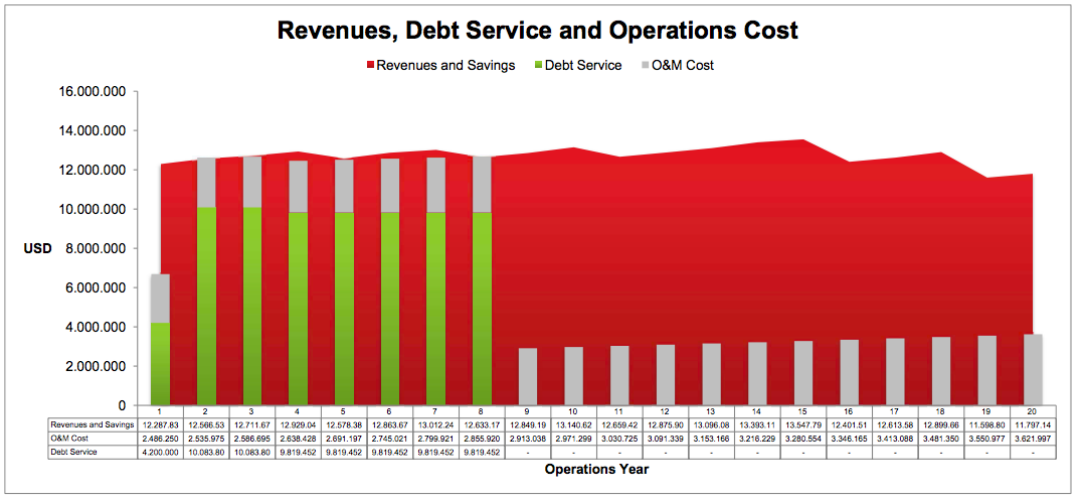
	-	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Equity Investment	(30.044.																				
Cash Flow for Equity	-	5.601.58	(53.245)	41.175	471.160	67.733	299.197	392.867	(42.201)	9.936.16	10.169.3	9.628.70	9.784.56	9.942.91	10.176.8	10.267.2	9.055.35	9.200.49	9.418.31	8.047.82	8.175.14
Cumulative Cash Flows	(30.044.	(24.553.	(24.604.	(24.565.	(24.130.	(24.068.	(23.803.	(23.461.	(23.497.	(15.182.	(6.840.5	903.443	8.618.50	16.304.7	24.017.5	31.646.2	38.242.5	44.813.1	51.407.5	56.931.7	62.433.4

Source: eclareon 2017.

As a consequence, revenues and savings as well as debt service are both comparatively higher than for the PV plants. However, until the eighth year debt service and operation and maintenance costs for the 50 MW wind power plant are always lower than the remaining revenues and savings (Figure 19).

Figure 19: Revenues, Debt Service and Operation Cost Analysis

Project Cash Flows



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Revenues and Savings	12.267.83	12.566.53	12.711.67	12.929.04	12.578.38	12.863.67	13.012.24	12.633.17	12.849.19	13.140.62	12.659.42	12.875.90	13.096.08	13.393.11	13.547.79	12.401.51	12.613.58	12.869.66	11.598.80	11.797.14
O&M Cost	2.486.250	2.535.975	2.586.695	2.638.428	2.691.197	2.745.021	2.799.921	2.855.920	2.913.038	2.971.299	3.030.725	3.091.339	3.153.166	3.216.229	3.280.554	3.346.165	3.413.088	3.481.350	3.550.977	3.621.997
Debt Service	4.200.000	10.083.80	10.083.80	9.819.452	9.819.452	9.819.452	9.819.452	9.819.452	-	-	-	-	-	-	-	-	-	-	-	-

Source: eclareon 2017.

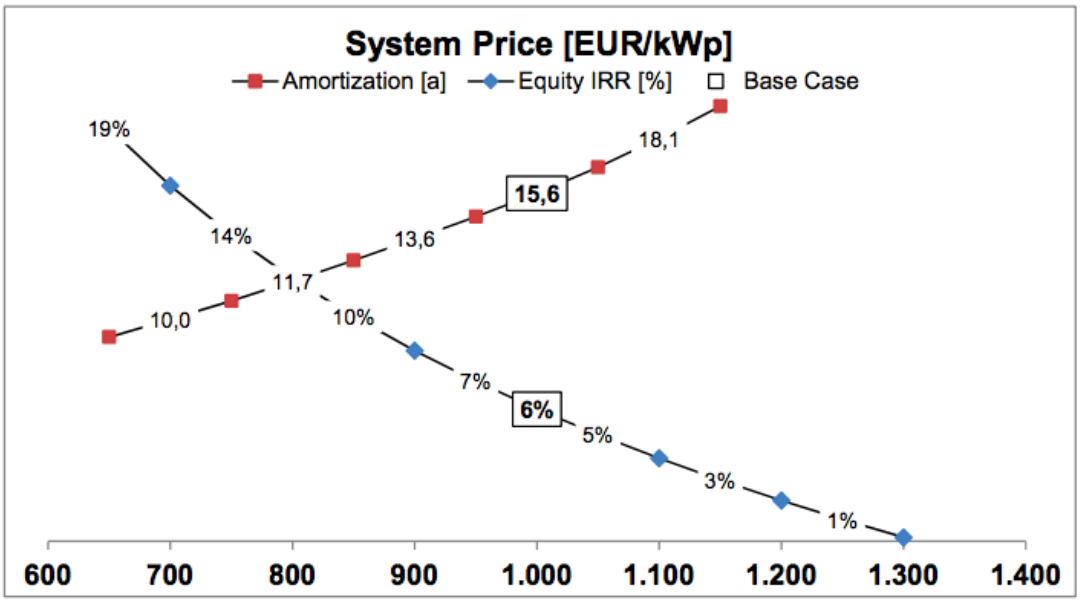
6.4 Sensitivity Analysis

Sensitivity analysis for a 10 MW PV plant

The figure below illustrates that the evolution of PV system prices has a great influence over the profitability of the project. At a price of 1,000 EUR/kWp the equity IRR

corresponds to 6% and the amortization period to 15.6 years (Figure 20). System costs have already been reduced greatly compared to 2015, when they amounted to 2,000 EUR/kWp. Yet, if systems prices were to be further reduced to for example 800 EUR/kWp levels, the investment's profitability would increase to 11.7% and the payback period would be reduced to 11.7 years (Figure 20), being by far more attractive.

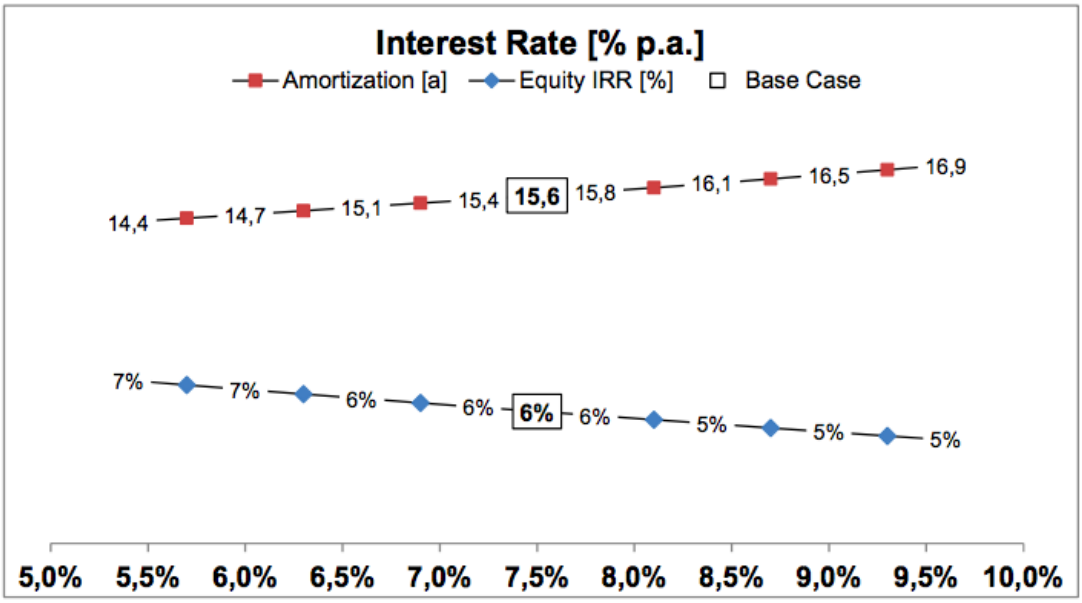
Figure 20: System Price for a 10 MW PV plant



Source: eclareon 2017.

The following graph shows the correlation between the interest rate (IR) and the amortization period as well as the profitability of the project. It can be noted that the amortization period increases considerably, while equity IRR or profitability decreases accordingly when the interest rate increases. Inversely, when the IR decreases from the base case of 7.5% to for example 6%, which is closer to European levels, the amortization period is reduced for almost one year and the profitability goes up to 1%, i.e. from 6% to 7% (Figure 21).

Figure 21: Interest Rate for a 10 MW PV plant

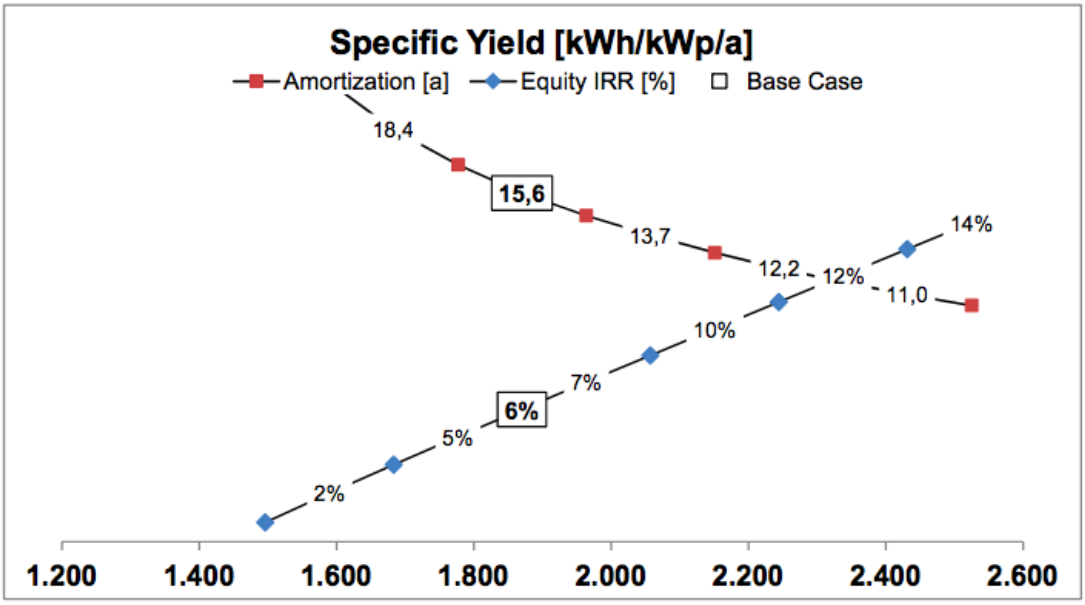


Source: eclareon 2017.

The following graph analyses the correlation between the specific yield produced by the installation and the profitability of the project. The increase of the irradiation and thus the yield has a great impact on the overall profitability and the payback period of the capital employed. In fact, a yield of 1,870 kWh/kWp/a has a great impact on the equity IRR and also on the payback period (see figure 22).

Noteworthy is the fact that with an energy yield of 1,900 kWh/kWp/a or more, the amortization time decreases slower than with an energy yield of 1,800 kWh/kWp/ or less. The advantage is that the energy yield of 1,900 kWh/kWp/a is available in the NOA and Cuyo regions in Argentina.

Figure 22: Specific Yield Sensitivity for a 10 MW PV plant

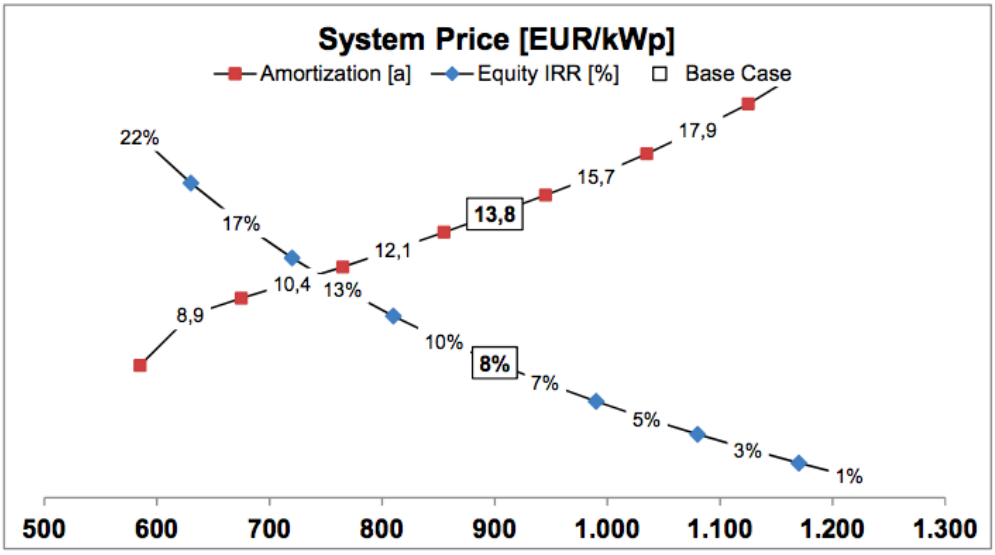


Source: eclareon 2017.

Sensitivity analysis for a 50 MW PV plant

Figure 23 illustrates that the evolution of PV system prices has a great influence over the profitability of the project. At a price of 900 EUR/kWp the equity IRR corresponds to 8% and the amortization period to 13.8 years (see figure 23). If systems prices were to be further reduced to for example 750 EUR/kWp levels, investments would have a profitability of more than 13% and an amortization period of less than 11 years (Figure 23), being more attractive for investors.

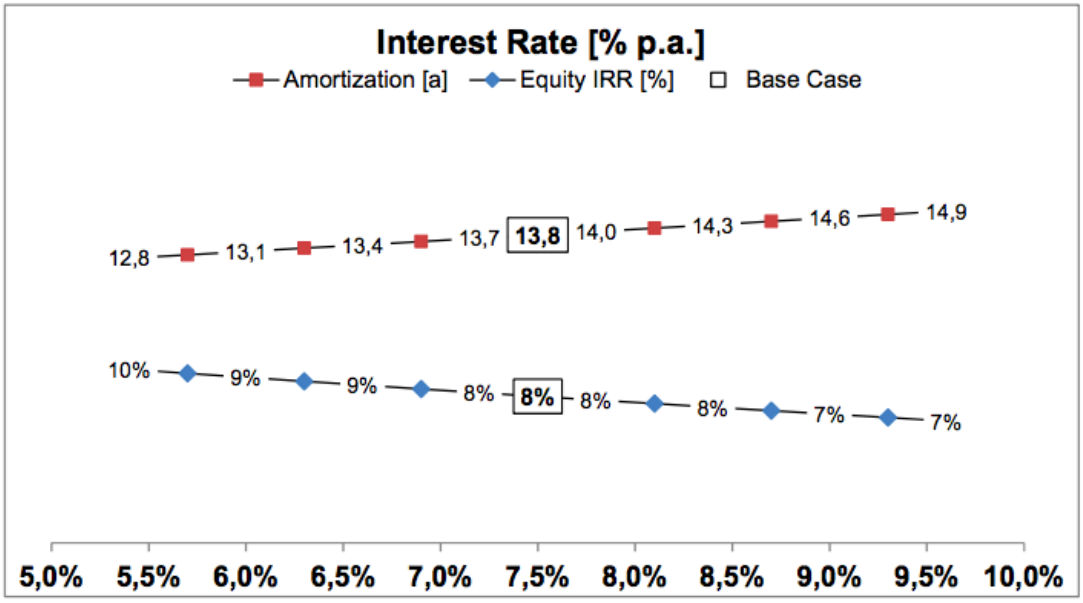
Figure 23: System Price for a 50 MW PV plant



Source: eclareon 2017.

The following graph shows the correlation between the interest rate (IR) and the amortization period as well as the profitability of the project. It can be noted that the amortization period increases considerably, while equity IRR or profitability decreases accordingly when the IR increases. Inversely, when the IR decreases from the base case of 7.5% to for example 6%, which is closer to European levels, the amortization period is reduced from 13.8 until 13.1% and the profitability goes up to 1%, i.e. from 8% to 9% (Figure 24).

Figure 24: Interest Rate for a 50 MW PV plant

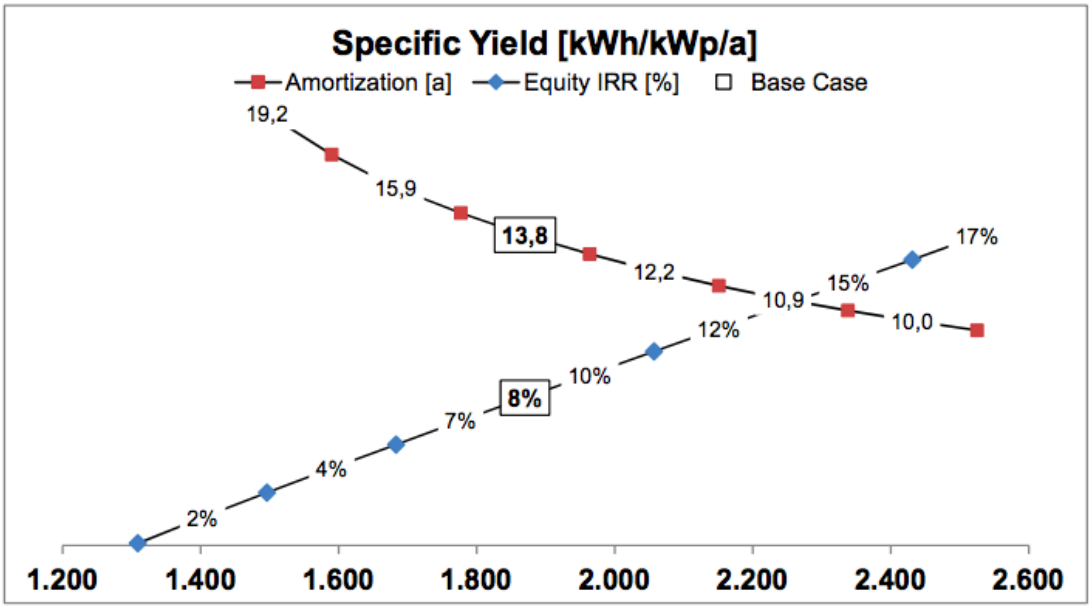


Source: eclareon 2017.

The following graph analyses the correlation between the specific yield produced by the installation and the profitability of the project. The increase of the irradiation and thus the yield has a great impact on the overall profitability and the payback period of the capital employed. In fact, a yield of 1,870 kWh/kWp/a has a great impact on the equity IRR and also on the payback period (see figure 25).

Noteworthy is the fact that with an energy yield of 1,900 kWh/kWp/a or more, the amortization time decreases slower than with an energy yield of 1,800 kWh/kWp/ or less. The advantage is that the energy yield of 1,900 kWh/kWp/a is available in many places of the NOA and Cuyo regions in Argentina.

Figure 25: Specific Yield Sensitivity for a 50 MW PV plant

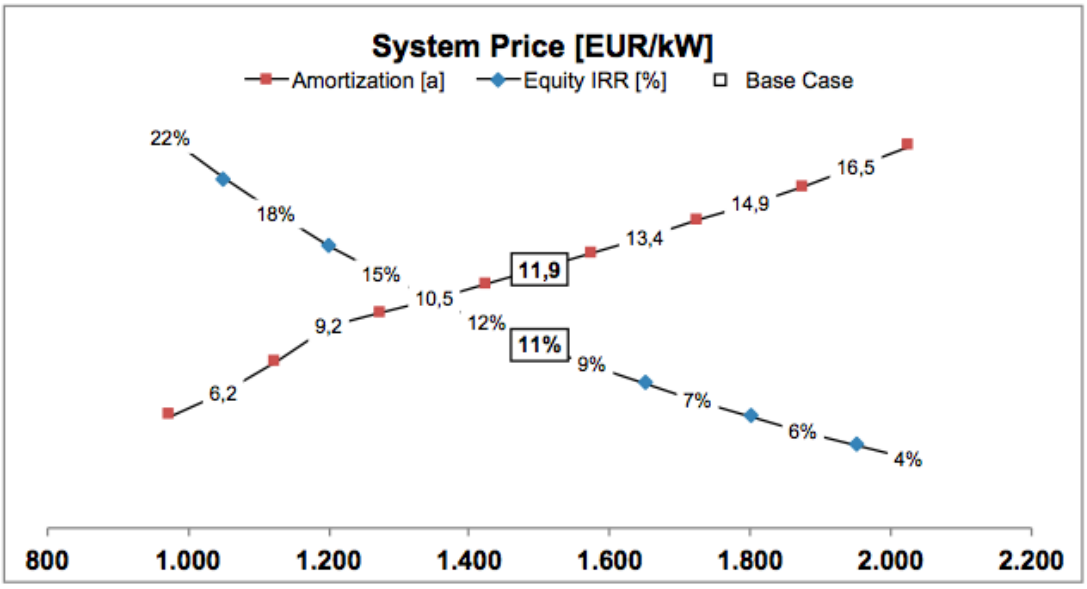


Source: eclareon 2017.

Sensitivity analysis for a 50 MW wind power plant

Figure 26 shows that the wind system prices have a great influence over the profitability of the project. At a price of 1500 EUR/kWp the equity IRR corresponds to 11% and the amortization period to 11.9 years (see figure 26). If systems prices were to be further reduced to for example 1400 EUR/kWp levels, investments would have a profitability of more than 12% and an amortization period of about 10.8 years (Figure 26), being more attractive for investors.

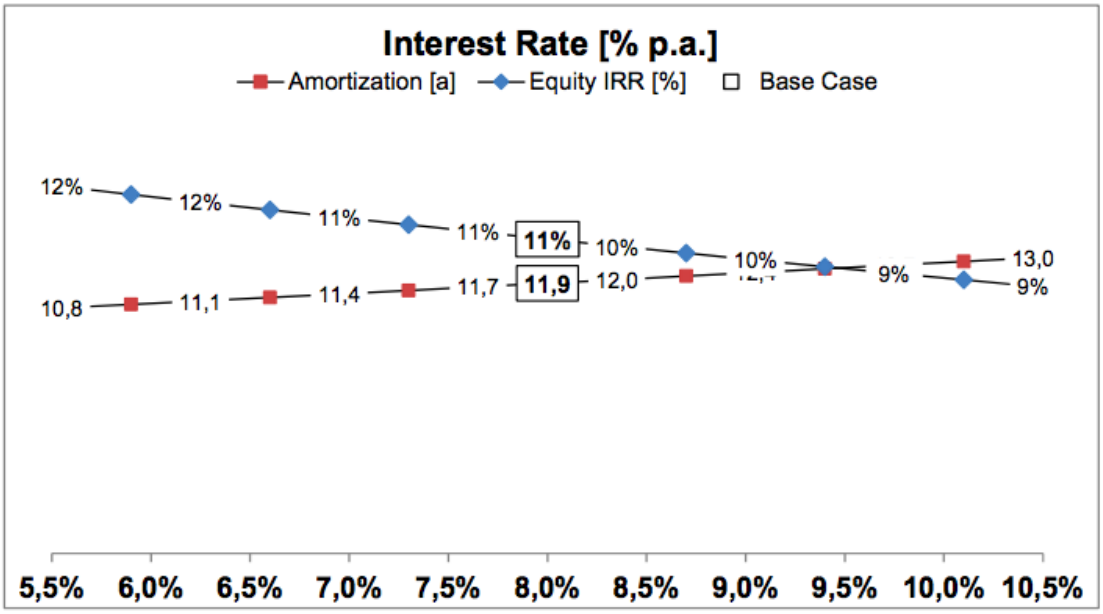
Figure 26: System Price for a 50 MW wind plant



Source: eclareon 2017.

The interest rate (IR) sensitivity was applied in order to analyse the impact of lower IR on the profitability of wind power projects. It can be noted that lowering the IR from 8% to for example 6%, which is closer to European levels, decreases the amortization period from 11.9 to about 11 years and increases the profitability to 1%, i.e. from 11% to 12% (Figure 27), being the overall investment more attractive.

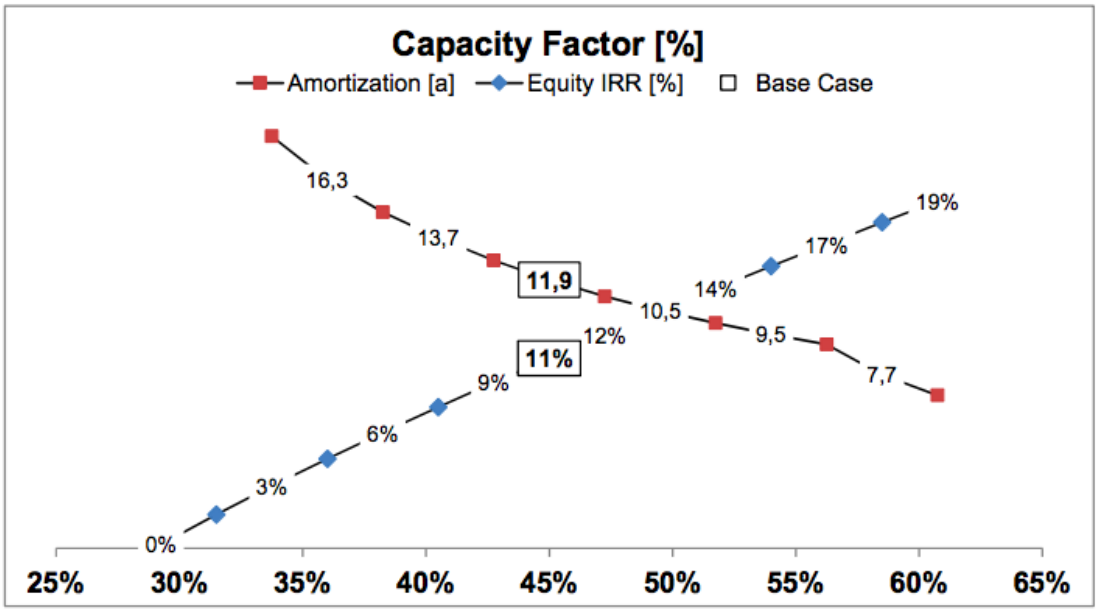
Figure 27: Interest Rate for a 50 MW wind plant



Source: eclareon 2017.

The following graph analyses the correlation between the capacity factor of wind power and the profitability of the project. The increase of the wind speed and thus the capacity factor has a great impact on the overall profitability and the payback period of the capital employed. A capacity factor of 45% has a significant impact on the equity IRR and also on the payback period, i.e. 11% and 11.9 years respectively (see figure 28). Only with a difference of 5% in the capacity factor, the IRR decreases to 7% and the amortization period increases to ca. 14 years. The advantage is that there are many places with a capacity factor of 45% in Argentina.

Figure 28: Capacity Factor for a 50 MW wind power plant



Source: eclareon 2017.

7. Opportunities for International Investors

Argentina's government has done the first steps to encourage RE investments in the country in regulatory as well as in financial terms. From 2016, the regulatory framework to promote RES has substantially improved compared with the legal conditions established before this time.

The government has set clear RE targets and has linked these to the auction programme RenovAr, providing a clear and structured framework. This formal link appears in the literature on LAC to be a requirement for a sound design of renewable auctions (Factor 2017). RenovAr shows the following strengths:

- Auction rounds are set on a regular basis announced well beforehand,
- PPAs are established for 20 years,
- the awarded PPA price is established in US$,
- the awarded PPA price is adjusted annually,
- PPAs include an incentive factor to accelerate the operation of the projects.

The above referred factors provide some of the guarantees needed to close the financing for the successful bids (Factor 2017). Yet, financial problems persist as the country risk and WACC are still high and access to debt at favourable rates is very limited. In addition, awarded prices in the two auction rounds have been too low, as they have been below the true country risk (St. James 2016). Prices in round 1.5 have been even lower than round 1 and this trend is very likely to be repeated in round 2.0. This is because prices are pushed down by large companies that bring their own debt and technology to enter the market. According to St. James (2016) these low-cost companies, mainly from China, distort pricing and there is a risk that not all the awarded projects will be built on time. This is not just the case for Argentina, however. This risk has been already pointed out for other countries of the LAC region where the PPA prices have been extremely low in the recent auctions (Factor 2017).

A major threat of this low price based auction system is that other (smaller) investors are out of competition and the market is highly concentrated in companies that are able to face the high financial costs and country risk. This is especially critical for medium size international companies that are not able to compete under these auction conditions.

Yet, the IPP Resolution Nº 281 (implemented in August 2017) and the distributed generation law, to be enacted at the beginning of 2018, will positively influence the RE

market in terms of the investments' scope. It is expected that it will lead to improved conditions for foreign medium-sized companies to participate in the Argentine RES market.

The new IPP resolution regulates direct PPAs between large users and IPPs, without having to buy the renewable electricity from CAMMESA, and the self-generation for this users' segment. Large users encompass small and medium-sized enterprises (SMEs) that are obliged to comply with 8% of RES in their electricity demand by 2019. Under this resolution, international RE developers will be able to either close PPAs with the SMEs for medium scale projects, or to develop and deploy the renewable installations for their self-generation.

Self-generation will represent an important niche for international RE developers, as for a large part of the SMEs it will not be possible to assume long term commitments (i.e. for 10 years) because it is uncertain whether they will be able to sustain a contract at a particular price in the long-run. In Argentina SMEs face several challenges to remain in the market and thus assume a long term commercial commitment is often beyond their possibilities. Conversely, investing in a renewable installation, either wind or PV, represents an increase in the companies' equity and assets. This means a long-term capital investment for the companies.

The future law on distributed generation could also generate an interesting market for SMEs. RE investors are expecting this law. Yet, they observe that electricity subsidies must be eliminated in order to make RE at a distributed generation level competitive. An alternative would be to implement additional incentives for distributed generation projects. In any case, the implementation of one of these two alternatives is required to encourage investments in distributed generation RE installations.

Experts also highlight that these two other investment modalities might not be exempted of the mentioned financial problems. Obtaining debt at low rates might be also a challenge under the IPP's resolution and distributed generation law, as the financial strength and guarantees of every project may be evaluated by lenders and banks. In fact, under the net metering framework in Salta, which encourages distributed generation, adequate financing represents one of the main challenges in the province. Projects encounter difficulties to obtain loans at reasonable interest rates and, thus, projects are being financed at 100% equity.

However, an improvement in the financial conditions and a decrease of the interest rate to lure investments in renewable energy is highly expected. According to Euler

Hermes (2017) inflation is expected to continue its descending path in the near-term. This should benefit corporates and SMEs to borrow debt from banks at lower interest rates.

To sum up, the first steps to establish a stable regulatory framework for RES and improve the financial environment through the implementation of additional guarantees (i.e. the FODER fund) have been carried out. However, availability of debt at low rate and cash inflows to invest in RES, mostly wind, PV and biomass, are still limited and difficult to obtain due principally to the high country risk and inflation rates. Yet, the trend shows an improvement of the financial parameters for the next years. Furthermore, the issue of the new rules to promote RES at diverse scales will, to a greater extent, favour the overall investment environment for wind, PV and biomass.

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Interviewed Experts

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Resumen en Español / Spanish Summary

En el proyecto “PV and Wind Framework Assessment in Argentina”, la firma internacional de consultoría eclareon GmbH en cooperación con la Asociación Alemana de Energía Eólica (BWE), la Asociación Solar Alemana (BSW-Solar) y las entidades locales como la Cámara Argentina de Energías Renovables (CADER) y la Secretaría de Energía de Salta analizaron los procesos y barreras del sector fotovoltaico (FV) y eólico argentino. En el proyecto se analizaron tanto el marco legal a nivel nacional como también el esquema de Balance Neto de la provincia de Salta.

El proyecto comprende una descripción del marco regulatorio y administrativo a nivel nacional bajo el modelo de licitaciones del programa RenovAr y a nivel provincial bajo el modelo de Balance Neto de Salta. A la descripción de los marcos legales le sigue un análisis financiero de los modelos de negocio descriptos para la energía FV y eólica que comprende modelos de flujo de cajas y análisis de sensibilidad.

Argentina posee un potencial significativamente alto para producir energía de fuentes renovables. El país tiene una de las mejores irradiaciones solares y velocidades del viento del mundo y una demanda de electricidad que necesita ser abastecida. Además el gobierno nacional ha emprendido los primeros pasos a nivel políto-legal estableciendo un marco regulatorio claro, transparente y conciso para fomentar el desarrolo de las energías renovables (ER).

Sin embargo, aún son muchos los desafíos que enfrentan las inversiones FV y eólicas. Si bien actualmente las condiciones económicas del país se encuentran en una tendencia hacia la mejoría, aún persisten dificultades financieras como la alta tasa de inflación, el acceso limitado al financiamiento internacional a tasas razonables y el endeudamiento de CAMMESA. Además de estos problemas financieros, a través del estudio se pudieron identificar algunos desafíos vinculados a un mercado que inicia su desarrollo y, que por lo tanto, es todavía inmaduro. Para afrontar estos nuevos desafíos se ha recomendado la implementación de políticas e instrumentos de incentivo que contribuyan a la curva de aprendizaje del sector.

El análisis financiero de los PPA bajo el modelo de licitaciones analiza dos segmentos para el sector FV, el de proyectos de 10 MW y el de 50 MW, en los cuales el resto de las variables permanece igual. Para la energía eólica se analizan proyectos de 50 MW. En cuanto a la comparación de los segmentos de energía FV, los proyectos de 50 MW presentan una ganancia mayor que los proyectos de 10 MW, lo cual es esperable debido a las economías de escala.

Lo que se resalta del análisis financiero tanto para los proyectos FV como eólicos a nivel nacional son los precios significativamente bajos obtenidos por los ganadores en la últimas rondas RenovAr 1 y RenovAr 1.5. Estos precios, que se ubican por debajo del verdadero riesgo país, son empujados por grandes corporaciones multinacionales que disponen de financiamiento con tasas de interés muy bajas y tecnología propia y pueden, por lo tanto, asumir riesgos más altos.

Los precios empujados a la baja junto a tasas de interés ligeramente más altas que las tasas de los países europeos, imponen un gran desafío a inversores medianos internacionales que quieran competir en las licitaciones. En este contexto, una de las principales amenazas del programa de licitaciones RenovAr es que diversos inversores queden afuera y el mercado sea dominado por algunas pocas empresas multinacionales, impidiendo una participación diversificada de actores.

El problema del acceso limitado al crédito internacional y a tasas razonables representa también un desafío para los proyectos a desarrollarse bajo el mecanismo de balance neto de la provincia de Salta. De hecho, la obtención de financiamiento adecuado representa uno de los proncipales desafíos ya que los usuarios ineteresados tienen serias dificultades en obetner créditos a tasas razonales y los proyectos terminan siendo financiados al cien por ciento con capital propio.

Sin embargo, se proyecta una mejoría en las condiciones financieras y una disminución de la tasa de interés que atraerán mas inversiones en energía renovable. Según Euler Hermes (2017) se espera que la inflación continúe su tendencia descendente en el corto plazo. Esto debería beneficiar a las empresas y a las PYMES para conseguir financiamiento a tasas de interés más bajas.

Además se espera que la Resolución Nº 281 del mercado a término entre privados (publicada en Agosto 2017) y la ley de generación distribuida, esperada para principios del 2018, influencien positivamente el mercado de ERs en términos del alcance de las inversiones. La nueva resolución establece un marco regulatorio para que los Grandes Usuarios habilitados (GUh) puedan comprar energías renovables por contrato a generadores privados o puedan autogenerarla. Cabe señalar que la resolución dispone que a partir del 2019 los GUh deben comenzar a consumir un 8 por ciento con ER. En este sentido, se espera que estas normativas beneficien a compañías europeas y nacionales de mediana escala que estarán mas capacitadas a participar de estos mercados que bajo el programma de licitaciones. Así, desarrolladores alemanes estarían en mejores condiciones para cerrar PPAs con PYMES para proyectos de mediana escala o de autogeneración.

Para concluir, Argentina ha llevado a cabo los primeros pasos para establecer un marco regulatorio estable para las ER y mejorar el entorno financiero mediante la implementación de garantías adicionales como el fondo FODER. No obstante ello persisten desafíos como la limitada disponibilidad de deuda a tasas bajas y de flujo para invertir en ER. Sin embargo, la tendencia muestra una mejora de los parámetros financieros para los próximos años que, sumado a la nuevas normativas de ER, favorecerá la inversión en energía fotovoltaica y eólica.