



RES4MED presents

THE DEVELOPMENT OF RENEWABLES ON  
THE MEDIUM VOLTAGE GRID IN MOROCCO

A Position Paper of RES4MED

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RES4MED Working Group led by



THE DEVELOPMENT OF RENEWABLES ON THE MEDIUM  
VOLTAGE GRID IN MOROCCO



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## ACKNOWLEDGMENTS

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## INTRODUCTION

Renewables Energy Solutions for the Mediterranean & Africa (RES4MED&Africa) is a network of international leaders, already engaged in promoting their core business in the South and East Mediterranean countries with a common mission to accelerate the deployment of renewables and their integration in the Mediterranean area and particularly in the Morocco energy market, with a special focus on the medium voltage (MV) grid.

Considering the pace of the current development trend in the integration of the renewables in the country, RES4MED aims at identifying short and medium term intervention areas, which might contribute on supporting the local institutions, local partners and stakeholders on speeding up the integration of renewable energies on the MV grid.

RES4Med and Pöyry carried out this study as basis for the promotion and the development of the renewables in Morocco.

## RENEWABLES IN MOROCCO

### *The evolution of the Moroccan electricity sector*

In 1963, the Moroccan electricity sector was organized as a public monopoly with the creation of a vertically integrated public utility, the *Office National de l'Énergie et de l'Eau* - ONEE (former ONE).

In 1994, Morocco started the implementation of a long energy market reform process, which is still to be completed. The energy reform aims at establishing a new industrial organization and a new market design in order to achieve:

- A more competitive market and
- Ambitious targets for renewable energy in 2020 and 2030.

The liberalization process was marked by two phases (Figure 1):

- **In Phase 1 (started in 1994) the country opened both the generation and distribution sectors to private players.**

In 1994, the first pillar<sup>1</sup> of the Moroccan reform introduced competition in the generation sector, authorizing ONEE to enter into Power Purchase Agreements (PPAs) awarded through public tenders with private Independent Power Producers (IPPs).

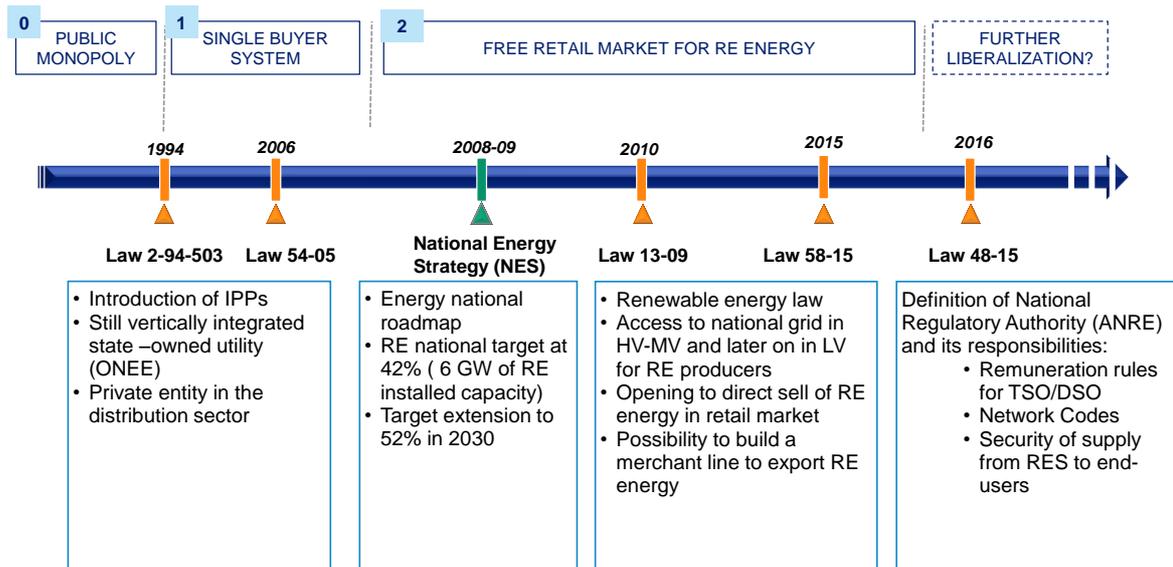
At the same time ONEE remained a vertically integrated company acting also as the authorized Single Buyer (SB) of the market. ONEE centralizes energy procurement from all the contracted generators and is the only authorized reseller to distribution companies. It is the only responsible of central system planning and dispatch, operating the national transmission network.

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<sup>1</sup> Law Decree- n° 2-94-503.

In 2005, the Government opened also the distribution sector to private investments. Distribution companies operate under concession schemes granted by the state or the local authorities<sup>2</sup>, which remain the owners of the grid assets. Both public (“*Régies Multiservices*”) and private (“*Gestionnaires Délégués*”) companies are currently operating in this market.

**Figure 1 - Timeline of Moroccan liberalization in the power sector**

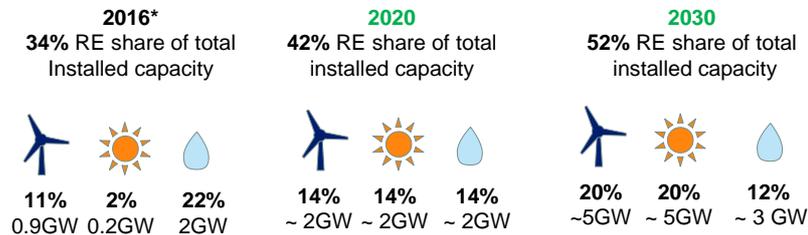


Source: Pöyry Management Consulting

- **In Phase 2 (2009) the Moroccan Government introduced national renewable energy targets and a partial free retail market.**

In 2009, the Government adopted the new National Energy Strategy (NES), setting the national energy policy targets to 2020. The development of renewable energy sources (RES) is one of the core components of this policy with the target to reach a renewables share of 42% of the total installed capacity by 2020 and a share of 52% by 2030. This means reaching around 13 GW of renewable capacity (notably solar, wind and hydro) by 2030 compared to 3.2 GW at the end of 2016, see Figure 2.

<sup>2</sup> Law n° 54-05.

**Figure 2 – Morocco energy targets**

Source: Pöyry analysis on ONEE's data and NES targets

In order to achieve the ambitious renewable target, the Moroccan Government, in 2010, introduced the second pillar<sup>3</sup> of the electricity reform through a partial opening of the retail electricity market; such intervention is aimed at allowing the access right to the high and medium voltage grids (the right has been extended to low voltage in 2015<sup>4</sup>) to all renewable producers that sell their energy directly to end-consumers.

In the new retail market, consumers can bilaterally negotiate energy supply agreements with renewable producers. In this setting, security of supply to end customers is ensured by regulated suppliers<sup>5</sup> (which coincide with the network operators), having the obligation to provide renewable-supplied consumers with back-up energy ("*énergie complémentaire*") to meet their load requirements.

During the second phase, the governance of Morocco's power sector evolved in parallel with market design. The most important evolution has been the establishment of an independent regulatory authority<sup>6</sup>, ANRE, responsible for monitoring and supervising the implementation and the functioning of the new market model. The law gives clear responsibilities to the regulator:

- the definition of commercial and technical rules of the electricity market;
- the adoption of a grid code and grid access rules;
- network and retail tariff methodologies.

The result of the Moroccan energy reform is an hybrid market model where a regulated market, supplied by the single-buyer and distributors companies, coexists with a free retail market supplied by renewables producers and self-producers<sup>7</sup> (up to date mainly fossil-fired self-producers), as shown by Figure 3.

<sup>3</sup> Law n°13-09.

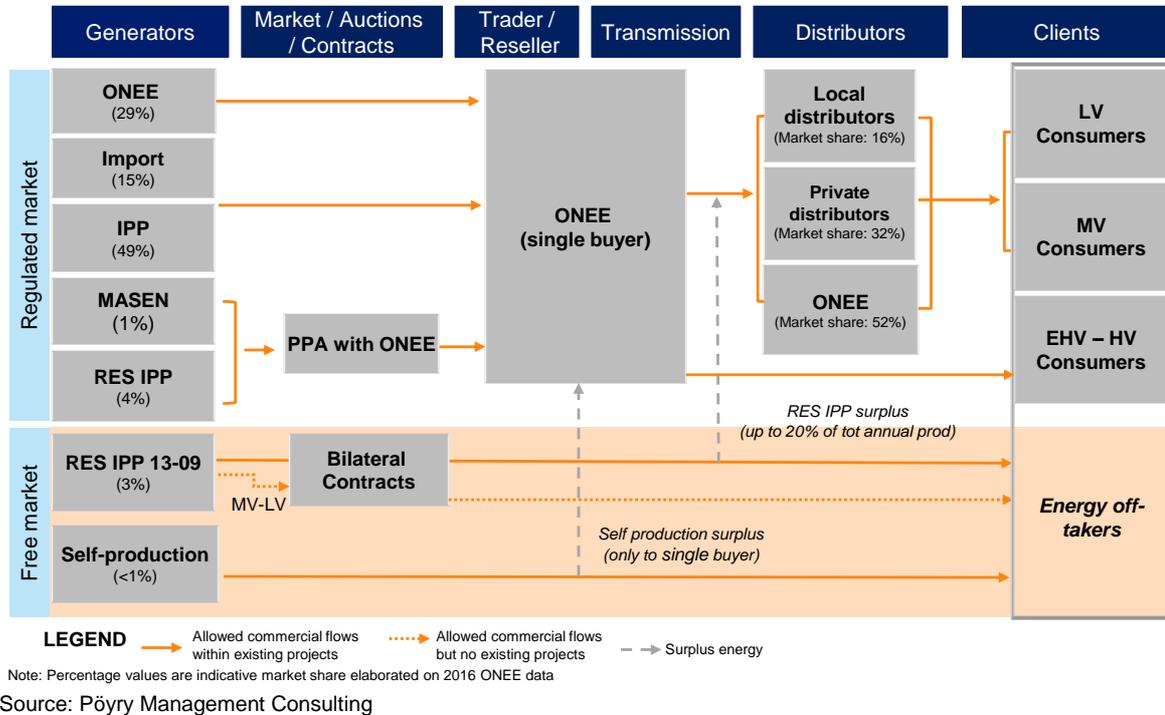
<sup>4</sup> Law n°58-15.

<sup>5</sup> Resellers are not envisaged in the current regulatory framework.

<sup>6</sup> Law n° 48-15.

<sup>7</sup> Self-production was introduced by the Law n° 16-08, initially for fossil –fired self-producers and later on extended to renewables.

**Figure 3 - Moroccan electricity market structure**



*The routes to market of renewables*

The new market design envisages three main routes to market for renewable energy in order to achieve the ambitious targets set by the Government:

- *TSO procurement scheme*<sup>8</sup>

The first instrument launched in Morocco to deploy renewables is the implementation of a “TSO procurement” model through public auction programs.

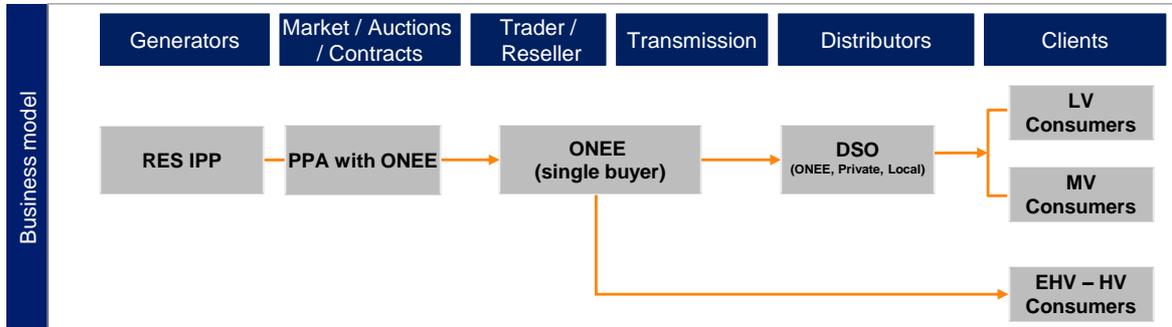
This model, as shown in Figure 4, allows the development of utility scale RE installations<sup>9</sup> by IPPs through public auctions procedures. MASEN (Moroccan Agency for Sustainable Energy) supervises to the development of RE tenders (with the exception of large hydro) and is responsible for auction design and organization in cooperation with ONEE.

ONEE is the only authorized off-taker of the renewable energy produced under this scheme.

<sup>8</sup> Law n° 2-94-503.

<sup>9</sup> Utility-scale renewable energy projects are typically defined as those with a capacity equal or above 10 MW.

**Figure 4 - TSO procurement model scheme**

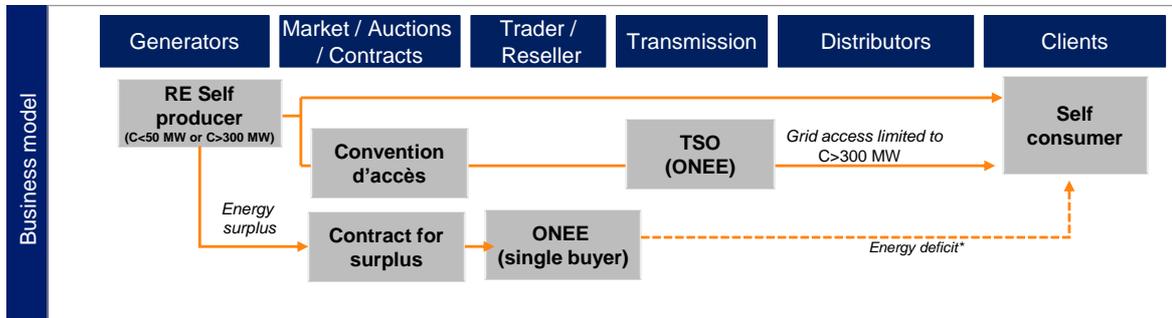


Source: Pöyry Management Consulting

▪ *Self-production*<sup>10</sup>

Morocco regulation entitles any public, private or physical person to produce its own electricity within a capacity cap of 50 MW<sup>11</sup>. The energy surplus can be sold exclusively to ONEE, under commercial terms and conditions (i.e. price of the energy surplus) bilaterally negotiated between the self-producer and the system operator (Figure 5).

**Figure 5 - Self-production model scheme**



Source: Pöyry Management Consulting

▪ *Retail direct sales*<sup>12</sup>

Law 13-09 introduced private off-site PPAs, entitling renewable producers to sell their energy directly to end-users through the use of EHV, HV, MV grids (notoriously known as wheeling), Figure 6. This right was extended to final customers connected to LV grid<sup>13</sup> in 2015.

<sup>10</sup> Law n° 16-08.

<sup>11</sup> According to the law n° 54-14 the self-production was extended to plants with size above 300 MW. Self-producers are entitled to produce their own energy, obtaining access to the grid and to the wheeling service.

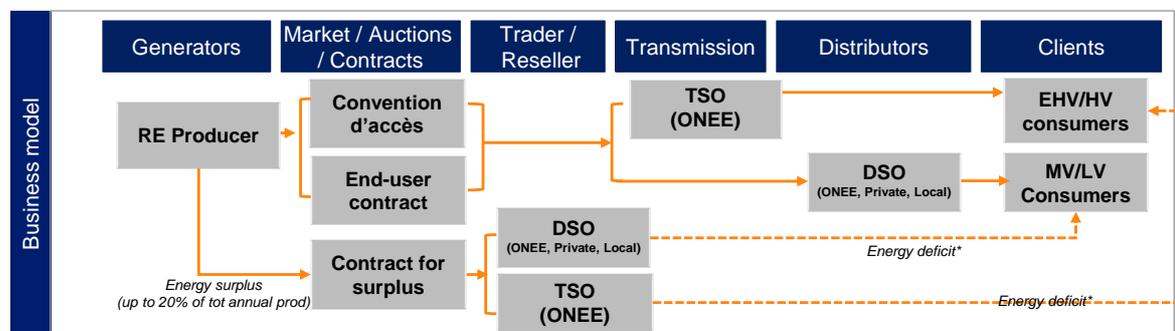
<sup>12</sup> Law n° 13-09, Law n° 58-15 and Decree Law n° 2-15-772.

<sup>13</sup> Law n° 58-15.

Commercial terms of energy supply are bilaterally negotiated between RE producers and customers. RE producers are also allowed to sell at a regulated tariff the energy surplus to the TSO or to distributors, with a cap of 20% of their annual production. In order to ensure security of supply to end customers having concluded a PPA with a RE producer, the relevant network operator has the obligation to supply the difference between the renewable production profile and the consumption profile of the customer.

To guarantee a smooth but effective integration of renewables, especially under this scheme, notably on the MV grid, the Government set a progressive target for renewable integration to all distributors<sup>14</sup>. Distributors are required to issue yearly renewable integration plans (“*enveloppes*”) covering a ten year period (“*trajectoire*”). The amount of RE to integrate for each DSO has to be calculated as a fraction (between 5 and 10%) of yearly consumption of their end consumers and it is progressive<sup>15</sup>.

**Figure 6 - Retail direct sales model scheme**



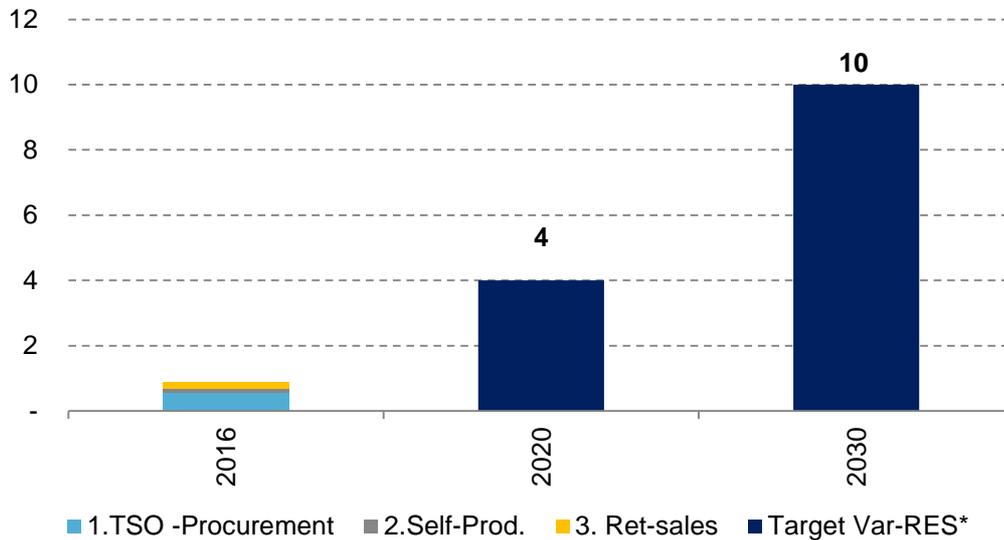
Source: Pöyry Management Consulting

As of today, the most developed scheme is the TSO-procurement which has been adopted to develop projects on transmission (high-voltage) grid within a TSO procurement and self-production models (see Figure 7).

<sup>14</sup> Decree Law n° 2-15-772.

<sup>15</sup> For the first year, the amount of renewable energy to integrate has to be calculated on the demand of captive consumers connected on MV with demand equal or above 2 MW; this demand cap will be yearly reduced and will totally disappear after 5 years.

**Figure 7 – Variable RES Integration versus national targets\* [GW]**



\* Target RES does not include hydro

Source: Pöyry Management Consulting on MASEN data

The implementation of the other renewables routes to market has encountered some difficulties which have undermined the effective development of renewable energies and their integration in the Morocco’s electricity system. The main developed renewable projects are showed in Figure 8.

**Figure 8 - Tracking renewable projects in Morocco**

	ENTITLED			EXISTING			NOTES
	HV*	MV	LV	HV*	MV	LV	
<b>TSO Procurement</b>							<ul style="list-style-type: none"> <li>First RE implemented scheme: <b>more than 69%</b> of total** RE generated energy sold to ONEE via 20 years PPA</li> <li>A wind farm (0.3 GW) at Tarfaya was realized by Nareva, in JV with Engie (TAREC), to sell RE energy exclusively to ONEE on HV grid</li> </ul>
<b>Self Production (SP)</b>							<ul style="list-style-type: none"> <li>Third RE scheme: <b>4% of total RE energy</b></li> <li>Industrial customers (Lafarge, Holcim) developed a wind-farm (10 MW) selling their surplus (up to 50% of total capacity) to ONEE</li> <li>Few PV installed by households especially in rural/remote areas but not relevant</li> </ul>
<b>Retail Direct Sales (RET-SALES)</b>							<ul style="list-style-type: none"> <li>Second relevant project (<b>27% of total RE energy</b>): only three projects developed up to date.</li> <li>A wind farm was realized under Law 13-09 by Nareva and connected to transmission network to sell energy to industrial customers</li> <li>Energy wheeled by ONEE through national grid</li> </ul>

\* RE on HV is out-of-scope

\*\* Total RE energy excluding hydro (exclusively owned by ONEE)

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Source: Pöyry Management Consulting

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### *Limits of today's renewable energy system*

The slow deployment of renewables on medium voltage grids and the delays accumulated by the Moroccan renewable policy are the result of two combined factors:

1. **An incomplete regulatory framework** due (also) to the absence of an operational Regulator. As a consequence of the above, important aspects for the deployment of renewables are still missing:
  - the tariff of the surplus energy which sets the price of the renewable energy injected into the grid and sold to distributors;
  - commercial terms and prices for the back-up energy which sets the conditions between distributor-supplier and the renewables supplied-consumers;
  - the grid code which is the basis for setting transparent rules on transmission and distribution grids management;
  - network remuneration methodology and tariffs which are necessary for reducing any regulatory risk on the profitability of renewables investors<sup>16</sup>.

As a consequence, new renewable producers have to negotiate with distributors about relevant operational aspects of renewable plants such as grid access, wheeling service tariffs and curtailment rules, BUT ...

2. **Distributors-suppliers have no incentive to integrate renewables.** The absence of unbundling between distributors and suppliers implies that incumbent operators have no incentive to facilitate the access of RES producers to their grids as:
  - the access of other renewable producers reduces the market share of current incumbents;
  - distributors will need to perform significant new investments to ensure the adequacy and reliability of the grid in order to accommodate higher renewables, but no clear remuneration scheme is currently defined by the Regulator in order to stimulate such investments. This effect is further exacerbated by the high level of uncertainty on the future of distribution concessions.

In order to cope with this issue, the Government has defined an obligation on distributors to integrate renewables according to a ten year plan. Unfortunately

- such obligations are not clear in terms of targets and the information on integration plans is not accessible to potential investors and
- the institutions have not prospected any penalty for non-compliant distributors.

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<sup>16</sup> Up to date no direct or indirect incentives are envisaged for renewable producer and renewable supplied end-users (only a net-metering scheme is currently envisaged).

As a consequence, distributors might slow the renewables deployment on their grid thanks also to a weak and incomplete regulatory framework.

## INTERNATIONAL BEST PRACTICES

International case studies document that a wide range of mechanisms and instruments can be used to accommodate high penetration of variable renewable resources.

Looking at both emerging and mature power markets similar to Morocco<sup>17</sup>, Figure 9, a significant deployment of renewables on distribution grids has in many cases been achieved through direct sales to **distributor-suppliers** (DSO-Sales - see Box 1). Under such scheme, all energy suppliers must procure from eligible renewable resources to meet the policy goals as portion of their retail sales (California<sup>18</sup>) or as a target directly imposed by the Government (Brazil). In some cases, the obligations have been envisaged through a well-designed auction mechanism (Brazil) or by entitling the suppliers to invest in their own power generation assets (California).

Nevertheless Morocco has opted for a different route to market for renewables on distribution grids, adopting a Retail direct sales (RET-SALES) scheme. Such approach has been successfully developed in some countries thanks to<sup>19</sup>:

- **A clear and stable regulatory framework:** clear rules and long term stability measures are necessary to ensure investors attractiveness. Mexico is a good example of fast and stable regulatory framework arranged also to accommodate renewables.
- **Firm grid access rights for renewables.** In Europe this has been achieved by the definition of standard and specific procedures for grid access that have avoided any discriminatory rejection or delay in connection. In other markets (e.g. Mexico) it has been achieved through the creation of a specific entity (identified with the system operator in Mexico) in charge of controlling the technical evaluation of the new applicants (although the connection is bilaterally negotiated with the distributor-supplier).
- **Well and diversified financial mechanisms** (i.e. FiP, FiT, upfront cash incentives) and **clear dispatching rules** (i.e. dispatching priority, rules for curtailment).
- **Efficient network tariffs definition:** in many countries it is envisaged a direct discount on the network charges (e.g. Italy, Germany) or on advantageous prices for the energy sold to the grid (e.g. Brazil<sup>20</sup>).

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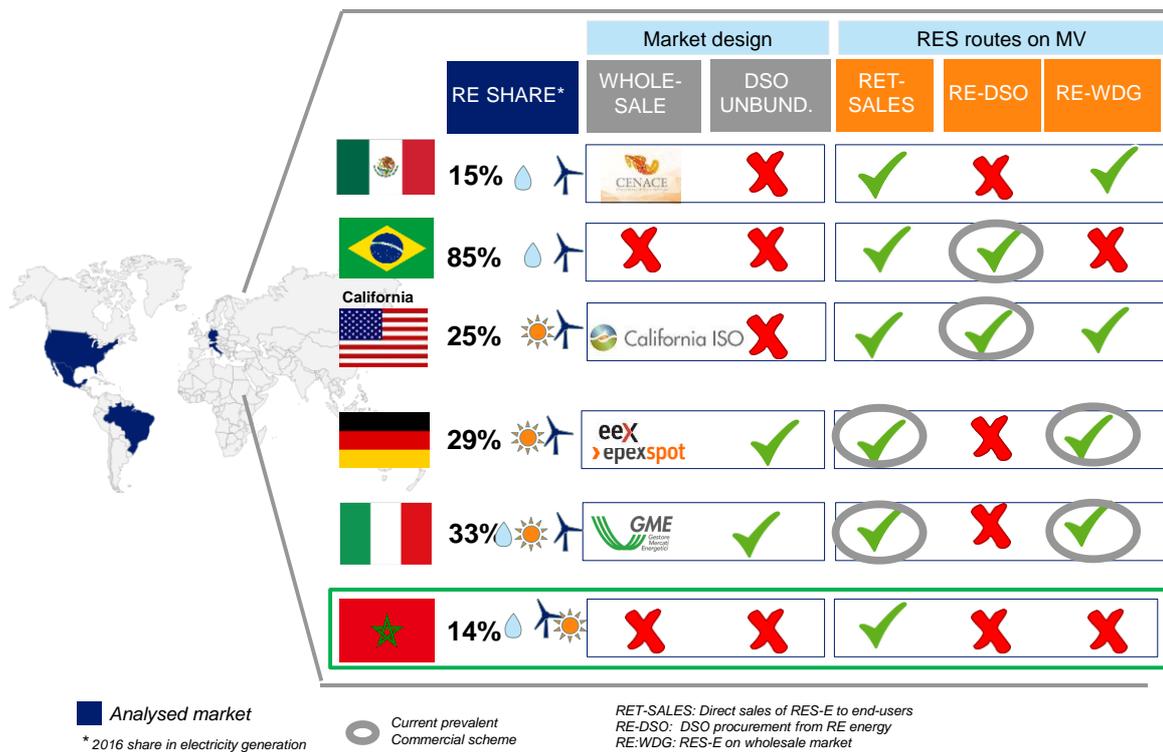
<sup>17</sup> I.e. countries characterized by the absence of wholesale market and/or distribution services separated from retail.

<sup>18</sup> All energy suppliers (including utilities, service providers) must procure, as portion of their electricity retail sales, from eligible renewable resources to meet the policy goals. The utilities might prove compliance through Renewable Energy Credits, purchasing them from others or investing in their own renewable power generation assets.

<sup>19</sup> A summary of the main regulatory framework and support schemes worldwide implemented for renewables is depicted in Table 2.

- Public tracking of the renewables projects:** a public register is usually available to track and monitor the progress of the renewable projects in the country/region: in California the Energy Commission every year tracks and publishes the RPS-eligible generation operational and non-operational with permits, by county and by technology<sup>21</sup>; in Mexico CCER monitors every year the progress by the National Inventory of Clean Energies.

**Figure 9 - Country selection and renewables routes on MV grid**



Source: Pöyry analysis on IEA, TSO and Energy Ministry data

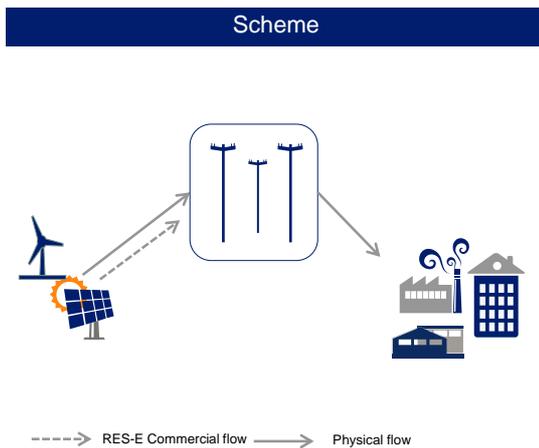
<sup>20</sup> The successful development of distributed generation in Brazil must be attributed to: (i) a discount on network tariffs for end-consumers supplied by renewable energy; (ii) a net-metering scheme allowing consumers, with an installed RE generation capacity between 75kW and 5 MW, to offset the surplus energy fed into the grid from their electricity demand. The credits received by such consumers for the surplus injected could be valorised at an advantageous rate, as for solar energy. Moreover, regulation allows participating consumers to distribute energy credits among multiple electric service accounts on the same distribution grid.

<sup>21</sup> [http://www.energy.ca.gov/renewables/tracking\\_progress](http://www.energy.ca.gov/renewables/tracking_progress).

**Box 1 – Overview of the main renewables market routes on distribution grid**

Below we provide a short description of three main renewable market routes worldwide developed on distribution grid:

- **Sales to Distributor-suppliers (DSO-SALES)** – This scheme is aimed at the direct procurement of distributor-suppliers from RES, typically under PPAs and/or market based reverse auctions, RAM.

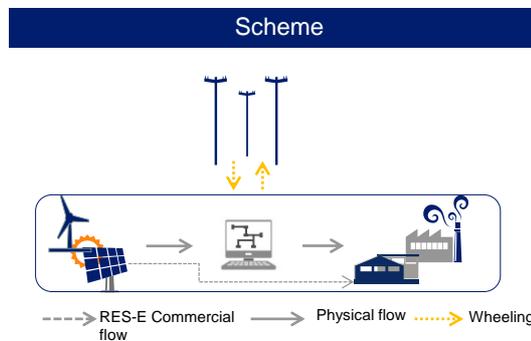


It is commonly associated with green-energy procurement obligations (e.g. Renewable Portfolio Standards, RPS).

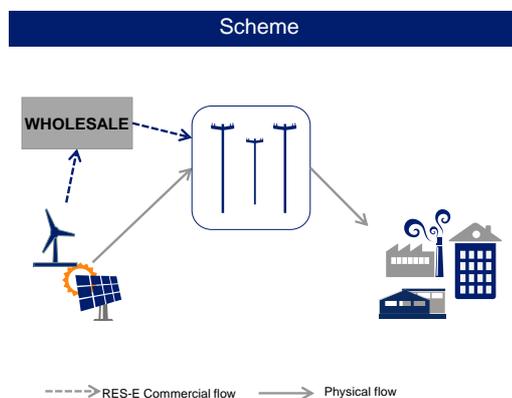
This scheme has required, in most of the markets, relevant investments of distributors in the grid adequacy and reliability in order to accommodate high renewables, in addition to a balancing role responsibility of the DSOs. The main advantage is that the renewables are not a threat for retail-market share since they

sell energy to the distributors and not directly to end-consumers.

- **Retail direct sales (RET-SALES):** RE producers sell energy directly to end-customers. Sometimes such renewable business model collapses in self-consumption and closed distribution systems (CDS), private network within a geographically confined industrial, commercial or shared services sites .



Generally such scheme is associated with reduced network tariffs or net-metering schemes. Potentially RE producers are a threat for the existing distributor-suppliers since they erode the incumbents market share.



- **Wholesale distributed generation (RE-WDG)** – Under this regime the distributed generation RES participation on wholesale markets (sometimes also on ancillary markets).

Typically small plants can participate to wholesale market through aggregator service provider. Such solution might need a strong DSO-TSO coordination for balancing and dispatching the grid.

**Table 2 Relevant regulatory and support schemes in place for RES deployment**

GRID ACCESS	STANDARD ACCESS	Negotiated terms with the system operator <b>✗</b>	Negotiated with CFE but ensured by CENACE <b>✓</b>	Negotiated terms but grid code available <b>✗</b>	Terms and conditions for all producers (in grid code) <b>✓</b>	Terms and conditions for all producers (in grid code) <b>✓</b>	Specific terms and conditions for RES (i.e. TICA, REDIGI) <b>✓</b>
	CONNECTION PRIORITY	<b>✗</b> N.A.	<b>✗</b> N.A.	Negotiated terms of connection but grid code <b>✗</b>	Standard terms and condition for all producers <b>✗</b>	Connection priority but negotiated conditions <b>✓</b>	Guaranteed by DSOs <b>✓</b>
GRID MANAGEMENT	DISPATCHING PRIORITY	Defined but no transparent grid management <b>✓</b>	<b>✗</b> N.A.	No clear priority rules <b>✗</b>	Economic dispatch <b>✗</b>	Recently under discussion <b>✓</b>	For the same offer price <b>✓</b>
	CURTAILMENT TRANSPARENCY	<b>✗</b> No clear rules	<b>✗</b> No clear rules	No clear rules <b>✗</b>	Open access to real time market data (OASIS) <b>✓</b>	Real-time data on grid status <b>✓</b>	Real time data on grid status <b>✓</b>
	CURTAILMENT CAP	Negotiated on annual basis <b>✓</b>	<b>✗</b> N.A.	<b>✗</b> N.A.	<b>✗</b> N.A.	<b>✗</b> N.A.	<b>✗</b> N.A.
	CURTAILMENT COMPENSATION	<b>✗</b> N.A.	<b>✗</b> N.A.	<b>✗</b> N.A.	<b>✓</b> Negative price allowed	<b>✓</b> If lost revenues are >1%/y full compensation	<b>✓</b> Programmable plants compensated at zonal price
	RES AGGREGATION	<b>✗</b> N.A.	<b>✓</b> Only demand aggregation	<b>✗</b> N.A.	<b>✓</b> Allowed for plants <0.5 MW into wholesale market	<b>✓</b> Demand and Supply aggregation	<b>✗</b> No participation to the market (up to date)
	RE DSO OBLIGATIONS	<b>✓</b> Foreseen but not implemented	<b>✗</b> Obligation only on generation	<b>✓</b> Procurement obligations through auctions	<b>✓</b> Obligation on utilities	<b>✗</b> N.A.	<b>✗</b> Obligation on generation
	GREEN CERTIFICATES	<b>✗</b> N.A.	<b>✓</b> CELs negotiated bilaterally or on the market	<b>✗</b> N.A.	<b>✓</b> Renewable energy credits	<b>✗</b> N.A.	<b>✓</b> CV negotiated bilaterally or on the market
SUPPORT SCHEMES	FIP	<b>✗</b> N.A.	<b>✗</b> N.A.	<b>✗</b> N.A.	<b>✗</b> N.A.	<b>✓</b> Including CfD	<b>✓</b> Including CfD
	FIT	<b>✗</b> N.A.	<b>✗</b> N.A.	<b>✓</b> FIT programme achieved in 2004	<b>✓</b> Small generators < 3 MW	<b>✓</b> Levied tax	<b>✓</b> Levied tax
	TAX CREDITS and INCENTIVES	<b>✓</b> Import tax reduction	<b>✓</b> Fast Depreciation	<b>✓</b> Financial incentives by BNDES	<b>✓</b> Upfront cash incentives	<b>✓</b> Dedicated financing from nat. bank	<b>✓</b> Fiscal deduction on PV for renovation
	NET METERING	<b>✓</b> Also for self-producer on MV	<b>✓</b> Only on LV (< 500 KW)	<b>✓</b> For DG up to 5 MW	<b>✓</b> For residential and commercial distributed generation	<b>✗</b> N.A.	<b>✓</b> Economic net metering
	OTHERs	<b>✓</b> N.A.	<b>✓</b> Soft Loan	<b>✓</b> Discount on connection fees	<b>✓</b> SP incentive programmes	<b>✓</b> Discount on connection fees	<b>✓</b> Discount on connection fees

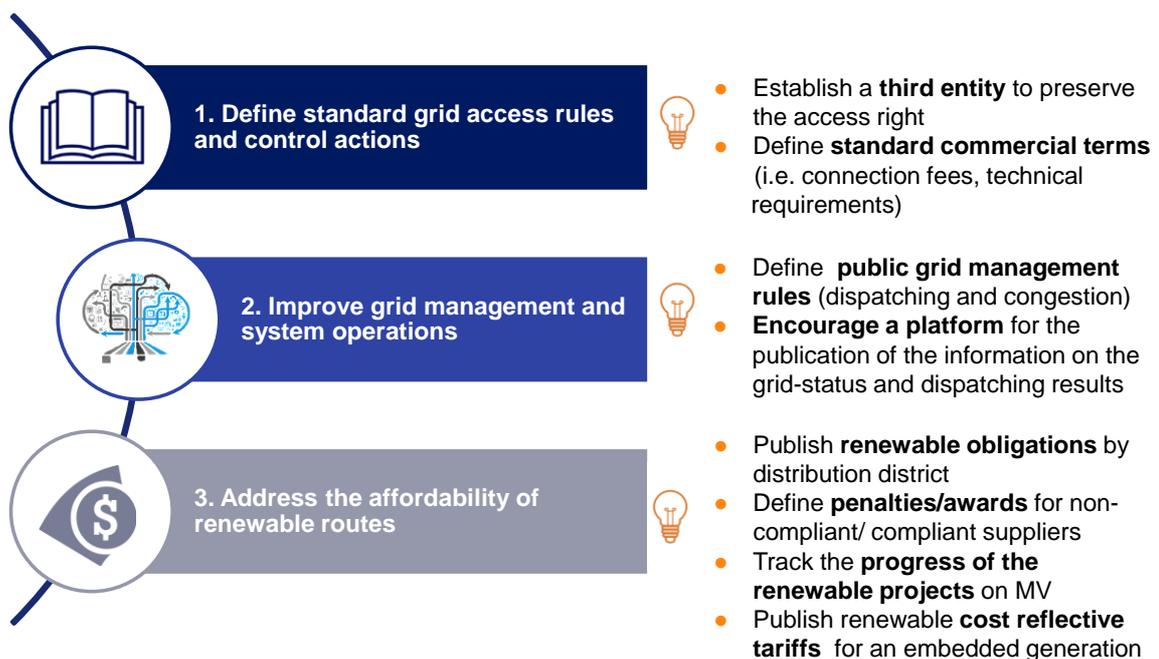
## OUR POSITION

The case-studies reveal that there is no one-size-fits-all approach for an efficient RE deployment, since it is strictly affected by the policy, market design and system operations of each specific country.

Nevertheless, the diversified approaches collectively suggest that Moroccan institutions and stakeholders might better accommodate high RE penetration by implementing the international lesson learnt, mainly in three ways (Figure 10):

1. *Defining standard grid access rules and control actions*
2. *Improving grid management and system operations*
3. *Addressing affordability*

**Figure 10 Our vision to encourage the deployment of renewables on MV**



Source: Pöyry Management Consulting

### *Define standard grid access rules and control actions*

#### *Rationale*

High variable RE penetration might require the definition of standard terms and technical conditions for the connection of new users to the grid.

Technical rules for the connection are a critical element for all power producers, especially in the energy markets characterized by dominant market players.

In Morocco the technical parameters for the connection are not published, nor grid codes and *cahier de charges* are available. Also connection fees and commercial terms are not public since they are currently negotiated between the applicant and the system operators (DSOs or ONEE) which are also suppliers.

Finally the absence of any control from a third party (i.e. Regulator or other entity) leaves renewables exposed potentially obstructive actions of current suppliers (ONEE or other distributors).

#### *Lessons Learnt*

It is quite common to publicly define the technical parameters that new applicants must fulfil to be connected. Most of the times, the definition of technical parameters and standard commercial terms involves the Regulator which controls and approves the proposals of the network operators (e.g. in the USA, Germany and Italy). Conditions can be defined in the grid code or in other specific documents (e.g. in Italy) submitted by network operators and approved by Regulator.

Nevertheless Mexico has shown that it is possible to protect the access rights of new applicants even when access conditions are negotiated with the dominant player (CFE) which owns the transmission and distribution assets.

CENACE, state-controlled company and system operator, is in charge of managing the national grid and to control the technical evaluation of the new applicants in order to preserve the access right of new resources.

#### *Actions*

**Establish a third entity to preserve the access right.** The institution must be designed to enable access to the grid (both on transmission and distribution). As happened in Mexico, it could be identified with the independent system operator, which is actually prospected in the current Moroccan regulation<sup>22</sup>.

Such proposal would require:

- The finalization of the unbundling process of ONEE and
- Strong cooperation of such entity with the distributors.

**Define standard commercial terms:** connection fees should be regulated in order to guarantee equal conditions to the applicants.

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<sup>22</sup> The creation of a separated company from ONEE responsible for the national grid management is envisaged in the Law n°48-15, art. 53.

### *Improve grid management and system operations*

#### *Rationale*

Renewable integration in Morocco may require changes in system operations in order to ensure a safe and reliable dispatching and congestion management. Currently ONEE is responsible for the dispatching but it does not provide the network users with clear dispatching and congestion rules, nor for renewable energy.

The dispatching priority of renewable energy is envisaged in the current framework, but congestion management rules are not transparently defined and no public rules exist.

Renewable generation could be curtailed without any information about the grid status. Moreover the curtailment is currently negotiated on an annual basis between the system operator and the producer.

Furthermore, Moroccan legislation does not envisage any compensation for the curtailed production.

#### *Lessons Learnt*

In the best RE committed countries, standard dispatching and curtailment terms are essential for achieving high variable renewable integration.

In Italy, Germany, USA and Mexico the system operator provides the network users with the information of dispatching results and real-time<sup>23</sup> data on the grid status which helps the users and the supervisor of the energy market (system operator and/or Regulator) in the verification of the right functioning of the electricity system.

In addition to that, in the same countries the renewable producers are mostly re-paid for curtailed production. Storage systems are also envisaged as flexible sources particularly relevant in case of curtailment and congestions.

#### *Actions*

**Define public grid management rules especially for dispatching and congestion:** based on that the network users and the Regulator can verify easier any discriminatory curtailment of the system operator.

**Encourage a platform for the publication of the information on the grid-status and dispatching results:** a website/platform available for network users favours the supervision of the market and the fulfilment of the dispatching priority. Such action reduce the market risk for renewable producers.

### *Address the affordability of renewable routes*

#### *Rationale*

Morocco has not developed yet any relevant renewable project on MV grid due also to the weak affordability of the current renewable energy route.

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<sup>23</sup> Mexico actually provide only daily information on the grid status

Currently Morocco has supported the sales of renewable energy (retail direct sales) with only two instruments: green energy obligation on distributor/supplier (not clearly defined) and net-metering.

The first instrument might be weak considering that if the distributor does not fulfil the obligation and/or integrate renewable plants, no sanction (nor control actions) are in place.

The second instrument, the net-metering, has a complex implementation: the surplus energy is capped at 20% and the price of the energy sold is bilaterally negotiated with the system operator.

### *Lessons Learnt*

In all case studies, the integration of the renewable was highly supported both with financial and non-financial schemes.

Net-metering is also an extensive policy tool in most analysed countries. The efficient design of such mechanism has favoured the development of small-medium renewable plants. Usually the energy in excess can be sold to the system operator or into the market without any limitation on the quantity injected. In many cases this support is combined with discount on network charges (i.e. in Italy on general charges) or with a competitive price for the electricity injected to the grid (i.e. Brazil).

### *Actions*

**Publish renewable integration targets by distribution district:** clear integrations target might better address the future investment decisions.

**Publish renewable cost reflective tariffs for an embedded generation:** wheeling prices and network tariffs assessed on real costs of the distribution service is the basis for renewables profitability.

**Define penalties/rewards for non-compliant/compliant distributor-suppliers:** the introduction of financial rewards or penalties could stimulate a faster integration of renewable generation.

**Track the progress of the renewable projects on MV:** the creation of an open-access database could help both institutions and market players in the identification of slowest districts, furthermore in addressing the authority investigations.

**Estimate grid reliability and required investments for grid adequacy and reliability to accommodate renewable on MV:** up to date no estimation on the grid adequacy and reliability costs (i.e. storages or other flexibility sources) are provided. It might be useful to assess or not any financial support for renewables in Morocco, currently absent.

## ABOUT RES4MED&AFRICA

(Renewable Energy Solutions for the Mediterranean & Africa)

Who we are: RES4MED&Africa promotes the deployment of large-scale and decentralized renewable energy and energy efficiency in Southern-Mediterranean and Sub-Saharan African countries to meet local energy needs. Since its inception in 2012, the association gathers the perspectives and expertise of a member network from across the sustainable energy value chain.

Our work: RES4MED&Africa functions as a platform for members and partners of emerging markets to foster dialogue and partnerships, share knowledge and build capacity to advance sustainable energy investments in Southern-Mediterranean and Sub-Saharan African countries.

Our mission: RES4MED&Africa aims to create an enabling environment for renewable energy and energy efficiency investments in emerging markets through on 3 work streams:

- Acting as a connecting **platform for dialogue & strategic partnerships** between members and partners to exchange perspectives and foster cooperation;
- Providing **technical support & market intelligence** through dedicated studies and recommendations based on members' know-how to advance sustainable energy markets;
- Leading **capacity building & training efforts** based on members' expertise to enable skills and knowledge transfer that supports long-term sustainable energy market creation;

At the end of 2015, RES4MED members decided to expand the geographic focus to Sub-Saharan Africa in light of the huge potentials and growth opportunities for Africa's renewable energy sector.

Members: RES4MED&Africa gathers a network of 38 members from across the sustainable energy value chain including industries, agencies, utilities, manufacturers, financing institutions, consultancies, legal and technical services providers, research institutes, and academia.

Partners: RES4MED&Africa works with local, regional and international partners, agencies and organizations to pursue its mission and promote renewable energy and energy efficiency deployment in the region of focus.

## ABOUT PÖYRY

Pöyry is a global consulting and engineering firm.

Our in-depth expertise extends across the fields of energy, industry, transportation, water, environment and real estate.

Pöyry plc has c.6000 experts and a local office network in 45 countries and net sales of EUR 571 million (2014). The company's shares are quoted on NASDAQ OMX Helsinki (Pöyry PLC: POY1V).

Pöyry Management Consulting provides leading-edge consulting and advisory services covering the whole value chain in energy, forest and other process industries. Our energy practice is the leading provider of strategic, commercial, regulatory and policy advice to Europe's energy markets. Our energy team of 400 specialists, located across 15 European offices in 12 countries, offers unparalleled expertise in the rapidly changing energy sector.

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