

## Renewable Energy Industry Roadmap of Spain

### EXECUTIVE SUMMARY

#### Context and goals:

This document represents the vision of the Spanish renewable energy sector on the development of renewable energy sources (RES) in Spain until 2020, prepared by the Spanish Renewable Energy Association (APPA), the only Spanish association that brings together all renewable technologies. The goal of this "RES roadmap" is to provide the Spanish government with a compendium of measures deemed necessary to fulfill and to surpass the RES targets for Spain in 2020 as laid down in the Directive 2009/28/CE (RES Directive). This would contribute to the concept of a sustainable economy and to make the ecological transformation of the energy sector a reality. This RES roadmap could also be a useful tool for the implementation of the new European RES Directive into Spanish law, based on best practice legislation of various countries and on a sustainable energy model which conceives the RES Directive not as a maximum but as a starting point for a change of the current energy model. But above all, this roadmap wants to submit proposals to provide security and stability to the investments needed for a sustainable and long lasting development of the full potential of RES in Spain.

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With this roadmap, RES get a strategic character, both to address the impacts of climate change and security of supply as well as to show that they are an important factor for industrial development, innovation and job creation. Besides, this document wants to demonstrate that RES contribute to the change of the current growth model, since they are an instrument of economic recovery. At the same time, RES are immersed in a fast and steady process of cost reduction which makes same each time more competitive and a key factor for the fulfillment of the Strategy for 2020 of the European Union ("EU 2020"). The proposals presented in this roadmap also seek to preserve the global leadership of the Spanish RES industry and its technologies as well as the importance of renewables in the Spanish GDP, (in different business sectors), in local development and as a factor of social cohesion.

The "RES industry roadmap" is based on the model provided by the European Commission establishing a template for the National Renewable Energy Action Plans (NREAP) under the RES Directive (2009/28/EC) [C(2009) 5174-1]. With its contribution APPA seeks to assist the Spanish Government in developing Spain's NREAP which has to be submitted no later than 30 June, 2010, under Directive 2009/28/EC. The RES industry roadmap of Spain is part of the European project "REPAP 2020" in which APPA has been the coordinator at Spanish level.<sup>1</sup>

<sup>1</sup> The European project REPAP2020 (Renewable Energies Policy Action Paving the Way Towards 2020), coordinated by the European Renewable Energy Council (EREC), aims to help Member States in implementing the RES Directive nationwide. The project's primary goal is to create a network of actors responsible for policy development at national level, members of national parliaments in EU-27, European

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Consequently with this document, the Spanish RES sector offers the Government its assistance in the preparation of an ambitious NREAP within the framework of the European RES Directive.

**The possible paths / development scenarios:**

After a brief summary of the current state of development of RES in Spain, the roadmap describes three different scenarios for the possible evolution of RES in Spain until 2020: From a business as usual trend to an accelerated deployment of RES in gross final energy consumption in 2020. As the Spanish RES sector perceives the targets established within the new RES Directive as minimum targets, the most optimistic scenario reaching a RES share of almost 28% in final energy consumption in 2020 is seen as clearly achievable (always provided that the measures proposed within the roadmap would be established).

The methodology used includes different variables for predicting the RES capacity to be installed in Spain until 2020. To this end, specific elements of each technology, regulatory aspects and macro-economic estimates to assess the trajectory/path the sector will follow have been identified.

1. **Business as usual/trend scenario (TEN) – Non-fulfillment of the targets:** Reflects the current trend for each generation technology, giving more weight/importance to recent development. It considers no changes in short-term regulation and therefore expects a non-fulfillment of the objectives established for the year 2020.
  - Regarding the participation of RES in gross final energy consumption the share of RES would reach 18.1%.
  - The production of electricity from renewable sources would reach 30.1% of gross electricity consumption in Spain in 2020.
  - The contribution of RES in heating and cooling (same value for all scenarios) would reach 16.3%.
  - Biofuels would represent 7% of final energy consumption in transport.
2. **Scenario of fulfillment of objectives (OBJ):** Considers the achievement of the objectives established at national and international level with relevant growth rates and according to the potential of each technology. Expects the immediate adoption of measures such as the establishment of a new regulatory framework, the elimination of many administrative barriers and the development of auxiliary industries of the different RES technologies.

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Parliament and the RES sector to share knowledge and best practice for the development of adequate and consistent National Renewable Energy Action Plans (NREAP).

Before the notification of the NREAPs to the European Commission in June 2010, the REPAP2020 project accompanied the drafting process by offering advice on the design of the NREAPs to the relevant authorities. Furthermore, REPAP2020 will empower national industry associations to come up with their individual national RES industry roadmaps which aim to support the development of the NREAPs. In a second phase, the project will evaluate the NREAPs and disseminate the results in order to facilitate a constant feedback and learning process.

- Regarding the participation of RES in gross final energy consumption the share of RES would reach 23.4%.
- The production of electricity from renewable sources would reach 43.4% of gross electricity consumption in Spain in 2020.
- The contribution of RES in heating and cooling (same value for all scenarios) would reach 16.3%.
- Biofuels would represent 10% of final energy consumption in transport.

**3. Optimistic scenario (OPT):** Assumes that very ambitious incentives are created, superior to those hitherto established. Additionally, it would be necessary to support the creation and maturation of ancillary sectors that would allow supplying the necessary equipment and components. The scenario requires a significant investment effort but also depends on other factors: the future development of fossil fuel prices, the price of CO<sub>2</sub> emission rights and the learning curves of the different RES technologies. It also takes advantage of the flexible mechanisms (as established in the RES Directive) and of distributed generation. This scenario would meet all the stated objectives and overcome them before the deadlines and it would have long-term and strong positive effects in particular regarding the reduction of energy dependency as well as environmental impacts.

- Regarding the participation of RES in gross final energy consumption the share of RES would reach 27.8%.
- The production of electricity from renewable sources would reach 54.3% of gross electricity consumption in Spain in 2020.
- The contribution of RES in heating and cooling (same value for all scenarios) would reach 16.3%.
- Biofuels would represent 13% of final energy consumption in transport.

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#### The proposed measures to achieve the objectives:

The most important part of the roadmap consists of an extensive list of measures which the Spanish RES sector considers important to implement to achieve the proposed targets. These measures are divided into several chapters, ranging from proposals to streamline administrative procedures to others concerning the increase of the availability of biomass. Below are summarized some of the most significant proposals:

#### Administrative procedures, regulations and codes:

- When sectorial regulations for the construction of RES installation require various approvals, licenses or prior permits of urbanistic, environmental or sectorial character, including concessions of public water and geological resources exploitation, the applicant may require that all of them should be accumulated and unified into a single procedure involving all relevant administrative bodies evacuating the report.
- In all administrative procedures concerning authorizations, permits or licenses for RES installations, the lack of notification of an explicit resolution within the established

deadline should have approving effects of the application which had been formulated (administrative silence).

- Until an installed capacity of 100 kW for low voltage grid connections and up to 500 kW for high voltage grid connections a simplified administrative procedure should be established.

**Measures concerning buildings:**

- Enact a new Technical Building Code (CTE), no later than 2016 (2015 in the case of public buildings), which provides that all new buildings and up to 20% of the existing buildings should produce the energy they consume with renewable energies and which should boost district heating and cooling systems.
- Fiscal measures:
  - o Reduced VAT rates for products and services related to renewable energy and energy efficiency.
  - o Favorable discrimination of the property tax for buildings that use renewable energies and district heating and cooling systems.
  - o Not removing at once the bonuses for the binding RES installations according to the Technical Building Code (CTE) but rather through a stepwise deduction.
  - o Apply the tax on construction, installations and works only on the civil works (with the intention that the use of renewable energies is an incentive and not just a revenue-raising measure).
  - o The new Technical Building Code (CTE) should include criteria of gradual deployment of renewable energies to encourage their use.
  - o Positive fiscal effects for the energy certification of buildings.

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**Measures on electricity infrastructure development & Priority/Guaranteed Access to the grid:**

- Defining an action plan for the deployment of smart grids, which includes an analysis on its application and the necessary investments, both by the general government and by private operators setting a calendar of synchronization of these investments in order to ensure maximum efficiency.
- Introduction of micro-grids that can perform the following tasks in a system of smart grids:
  - o Participation of (informed) costumers aimed at supporting the demand-side management;
  - o Monitoring and control of all options of generation and storage in the distribution grid;
  - o Demand-side management and virtual power plants;
  - o Local treatment of perturbations in the energy system, for example by automatic prevention of failures in the energy system or by automatic restoration in case of a black start.
- Promotion of energy storage technologies such as electric cars and pumped storage.

- Accelerating the construction of the new transmission line (440 kV) between Bescansó in the Catalan Pyrenees and Baixas (France) and realization of another new transmission line through the central Pyrenees.
- Progress in the administrative, technical and financing aspects of the Mediterranean Ring as soon as possible. Therefore it would be appropriate to split up the project – given its extent and scope – into geographical areas to facilitate this progress by enabling a more detailed and precise approach.
- The grid connection with Africa should be considered as a priority, in which variables of economic, social and technological development should be incorporated.
- Priority and preference for RES regarding their grid access and grid connection with particular preference for intermittent generation from RES, while being the last to be affected by technical limitations of the grid.
- Transmission and distribution grid operators should establish public and transparent rules for the sharing/allocation of costs of connecting renewable facilities to the grid taking into account the related benefits. When such costs correspond to actions foreseen in the mandatory planning, they shall be fully borne by the grid operator. In other cases the costs will be shared equally with the holders of the RES installations.

#### Support schemes for RES:

- Adoption as soon as possible of a RES Law as the basic norm setting out the targets and instruments necessary for the fulfillment of the commitments under the European RES Directive (including a precise timetable) and to overcome barriers for the development of renewables such as regulatory instability, the complexity of administrative procedures and the difficulties and lack of rules regarding grid connection.

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#### Support schemes for renewable electricity:

- Maintenance of the system of regulated tariffs (feed-in tariffs) / premiums, improved in the following aspects:
  - Inclusion in the Special Regime of all kind of renewables without any capacity limit (excluding large hydropower) and without any cap;
  - Revision of the feed-in tariffs/premiums according to the evolution of the technology, the externalities, the learning curve and the course of implementation and fulfillment of the targets (one possibility could be the adjustment of the level of annual degeneration of the tariffs/premiums for new installations to a predefined corridor of the annual installed capacity, according to the fulfillment of the annual/biannual sectorial target, depending on the trajectory established in the NREAP 2011-2020);
  - the remuneration of RES electricity should continue to be covered by the electricity tariffs including the right of the Government to revise the tariff levels annually, without retroactivity;
  - Introduction of tariffs / premiums for self consumption of RES electricity for installations of up to 30 kW (of installed capacity);
  - The right of being remunerated for the produced RES electricity by the established feed-in tariffs / premiums for the lifetime of each installation or for a minimum period of 20 years.

**Support schemes for renewable heating and cooling:**

- Establishment of feed-in tariffs and premiums for the production and consumption of RES for heating or cooling purposes and support programs based on soft loans or investment grants and fiscal measures, encouraging district heating and cooling systems.

**Support schemes for renewable resources in transport:**

- As an immediate measure, increasing the binding target of using biofuels to 10% in 2012.
- As for electric cars, initiatives should be promoted and regulations adopted ensuring that the energy needed to cover the power demand to recharge the electric vehicles is based on renewable sources.

**Flexibles mechanisms / joint projects / European perspective:**

- To offer other Member States the possibility to make use of the statistical transfer as established in the new RES Directive, the Spanish Government, once it has reliable estimates on any surplus in the trajectory and regarding the final target of 2020, should contact with other governments who need support to meet their own RES targets. The corresponding negotiations on the volume, period, costs, etc. should start as soon as possible. It is also necessary to establish as soon as possible a dialogue between the responsible authorities and economic actors to optimize the statistical transfer systems and, where appropriate, cross-border flows of electricity.

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**Estimated costs and benefits of the RES policy support measures:**

- The total RES consumption in the most ambitious/optimistic scenario could rise to 27,476 ktoe in 2020, with a RES share of 27.8% in gross final energy consumption.
- The reduction of greenhouse gas (GHG) emissions could reach up to 99.80 Mt CO<sub>2</sub>eq in 2020 (compared to 25.27 Mt CO<sub>2</sub>eq. in 2008).
- The monetary value of these avoided GHG emissions - assuming moderate prices of CO<sub>2</sub> emission allowance of 20 € / ton respectively 30 € / t in a higher price scenario – would reach 1,288 M€ and 1,932 M€ respectively in 2020.
- The avoided imports of fossil fuels could reach up to 51,108 ktoe respectively 20,439 M€ in 2020 according to the estimated price level of fossil fuels (compared to 10,082 ktoe respectively 2,725 M€ in 2008).

**ANNEX:**

**TOTAL PARTICIPATION OF RES IN GROSS FINAL ENERGY CONSUMPTION IN 2020 (IN %), AND FINAL CONSUMPTION OF RES IN THE SECTORS OF ELECTRICITY, HEATING AND COOLING AND TRANSPORT (IN KTOE)<sup>2</sup>**

Ktoe	2020		
	OBJ	TEN	OPT
Gross Final Consumption of electricity from RES	13,822	9,608	17,307
Final energy from RES consumed in transport	3,120	2,184	4,056
Gross final energy consumption from RES in heating and cooling	6,113		
Total share of RES in final energy consumption (in %)	23.4%	18.1%	27.8%

Source: Deloitte/APPA

<sup>2</sup> Estimated final energy consumption of Spain in 2020: 98,677 ktoe. Source: "Report pursuant to article 4(3) of Directive 2009/28/EC of 23 of April 2009 on the promotion of the use of energy from renewable sources", MITyC – IDAE.

## ESTIMATED EVOLUTION OF RES IN THE ELECTRICITY SECTOR

### FORECAST OF THE INSTALLED RES POWER CAPACITY IN SPAIN IN 2020 IN ACCORDING TO THE DIFFERENT SCENARIOS

Forecast of installed capacity	2009	2020		
	MW			
		Scenario OBJ	Scenario TEN	Scenario OPT
Biomass	488	2,142	968	3,293
Wind onshore	17,373	37,555	28,709	40,261
Wind offshore	0	2,000	0	3,000
Small hydropower (< 10 MW)	1,965	2,982	2,542	3,422
Conventional hydropower (> 10 MW)	16,658			
Solar Photovoltaic	3,274	15,167	9,360	18,625
Concentrated Solar Power	132	5,940	2,638	7,613
Others (Geothermal, ocean energy, small wind energy)	0	1,500	250	3,000
Biogas	160	850	160	1,000
<b>TOTAL</b>	<b>40,050</b>	<b>84,794</b>	<b>61,285</b>	<b>96,872</b>

Source: Deloitte/APPA

### ELECTRICITY GENERATION FROM RES (GWH / KTOE) AND PERCENTAGE OF RES IN GROSS ELECTRICITY CONSUMPTION IN SPAIN

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RES electricity generation	2020					
	GWh			Ktoe		
	OBJ	TEN	OPT	OBJ	TEN	OPT
Biomass	8,783	3,969	23,051	755	341	1,982
Wind onshore	76,237	58,279	81,730	6,556	5,012	7,029
Wind offshore	5,600	0	8,400	482	0	722
Small hydropower (< 10 MW)	7,454	6,355	8,555	641	547	736
Conventional hydropower (> 10 MW)	24,154			2,077		
Solar Photovoltaic	16,683	10,296	20,487	1,435	885	1,762
Concentrated Solar Power	16,632	7,386	21,318	1,430	635	1,833
Others (Geothermal, ocean energy, small wind energy)	2,375	750	10,250	204	65	882
Biogas	2,805	528	3,300	241	45	284
<b>Total RES electricity generation</b>	<b>160,723</b>	<b>111,718</b>	<b>201,245</b>	<b>13,822</b>	<b>9,608</b>	<b>17,307</b>
<b>Share of RES in gross electricity consumption (in %)</b>	<b>43.4%</b>	<b>30.1%</b>	<b>54.3%</b>			

Source: Deloitte/APPA

**BIANNUAL TRAJECTORY OF GROSS ELECTRICITY CONSUMPTION FROM RES (2010-2020)  
ACCORDING TO DIFFERENT SCENARIOS (KTOE)**

Electricity generation	2010	2012	2014	2016	2018	2020
Scenario OBJ	7,024	8,004	9,279	10,561	12,079	13,822
Scenario TEN	6,799	7,422	8,047	8,564	9,079	9,608
Scenario OPT	7,996	9,420	11,098	12,974	14,925	17,307

Source: Deloitte/APPA

**ESTIMATED FORECAST OF GROSS FINAL CONSUMPTION FROM RES IN HEATING AND COOLING  
IN THE 3 SCENARIOS**

Gross final energy consumption from RES in heating and cooling (ktoe)	2020
Biomass (fed into the grid and domestic or decentralized use)	4,700
Solar Thermal	1,298
Others	115
<b>TOTAL</b>	<b>6,113</b>
Share of RES heating and cooling in final heating and cooling consumption (in %)	16.3%

Source: Deloitte/APPA

**ESTIMATED FORECAST OF BIOFUELS/RES IN TRANSPORT**

	2020		
	OBJ	TEN	OPT
Biofuels consumption			
Biofuels (ktoe)	3,120	2,184	4,056
Share of biofuels in total fuel consumption for transport (energy content) (in %)	10%	7%	13%

Source: Deloitte/APPA