



Portugal's success stories in renewables deployment - the business case

João Manso Neto

EDP Renewables, CEO

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Agenda

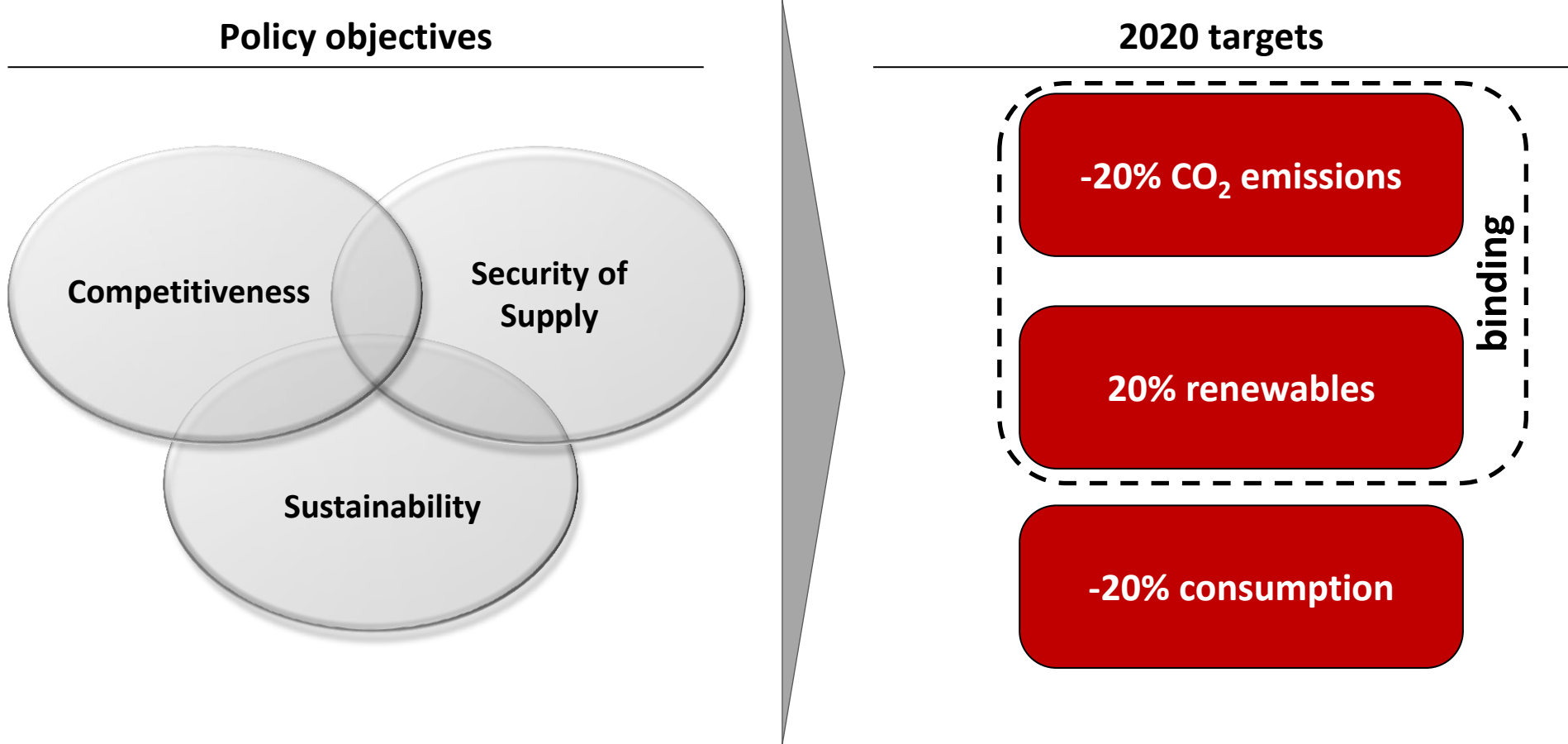
The progress so far

The way forward

Conclusions



EU Energy Policy is based on 3 key pillars that materialized into 3 specific targets for 2020 adopted in 2008 (20/20/20 package)



Under the Renewable Energy Directive, Portugal has a binding national target for raising the share of renewable energy to **31%** by 2020



Under these circumstances, the energy policy adopted in Portugal prompted a very significant change in the electricity mix

Main priorities of the Portuguese energy policy in the last decade

Modernization of the thermoelectric park

- Decommissioning of fueloil and gasoil plants
- ~3 GW of new CCGT (Ribatejo, Lares e Pego)
- Environmental improvements in coal plants (deSOx and deNOx)

Ambitious hydro program

- ~4 GW of new hydro plants (~50% already in operation or under construction)
- Investment of 5 €B up to 2020
- >30,000 jobs associated with EDP's projects alone

Ambitious wind program

- ~4,500 MW of new wind power (reaching 5,300 MW in 2000)
- Government organized tenders to award 1800 MW of installed capacity
- Associated with the bids, 2 industrial clusters linked to wind power were set-up (Eneop and Ventinveste), creating ~2,500 direct jobs

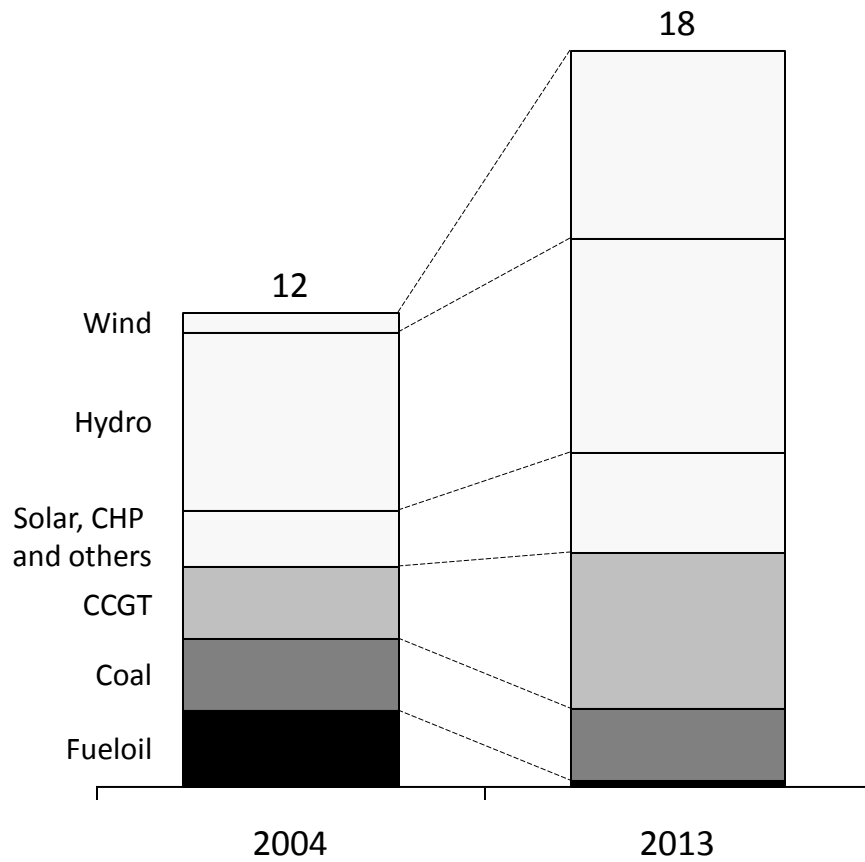
Mature renewables



Today, more than half of the electricity generated in Portugal comes from hydro and wind

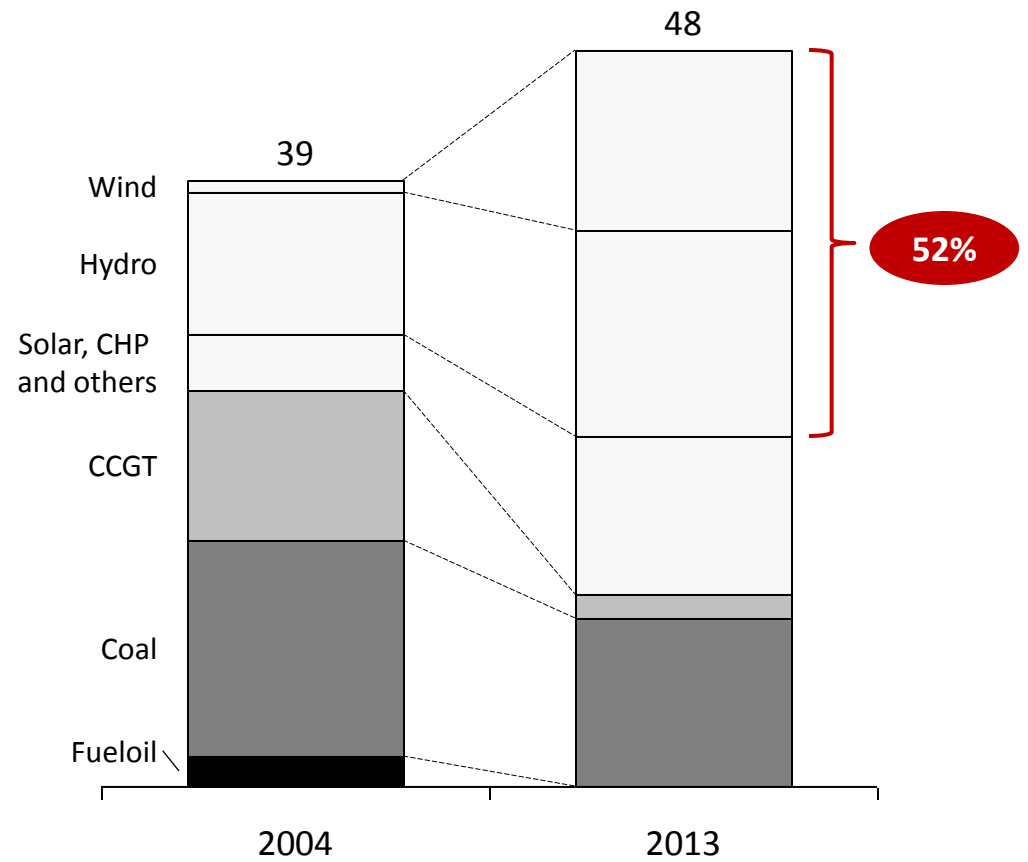
Installed capacity by technology

GW



Electricity generation by technology

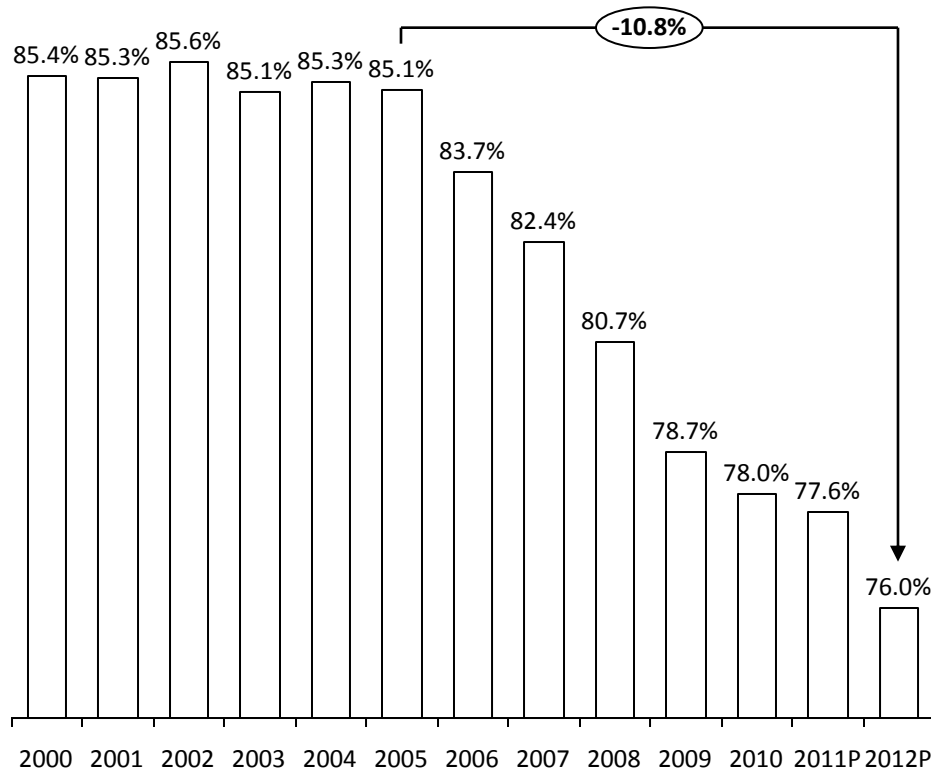
TWh



Since 2005, renewables have significantly reduced our energy dependence and improved the country's balance of payments

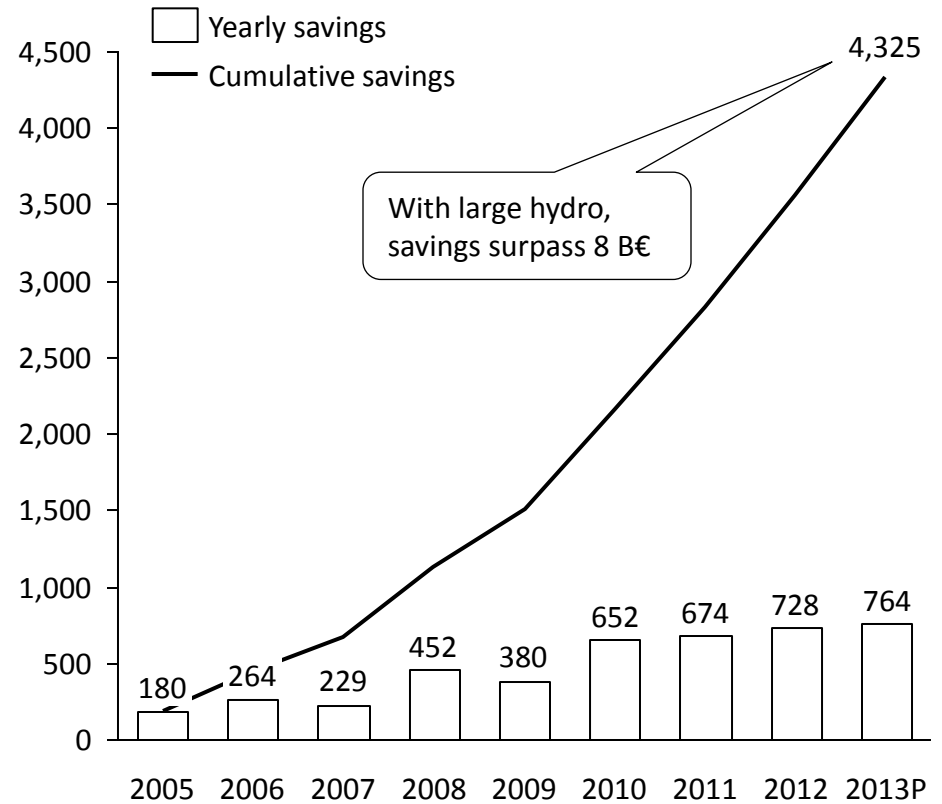
Evolution of energy dependence

2000-2012P, corrected for hydro capacity factor



National energy bill savings due to electricity production from renewable sources¹

MEur, excludes large hydro



Sources: DGEG, "Energy Balance" (yearly data), REN, EDP analysis

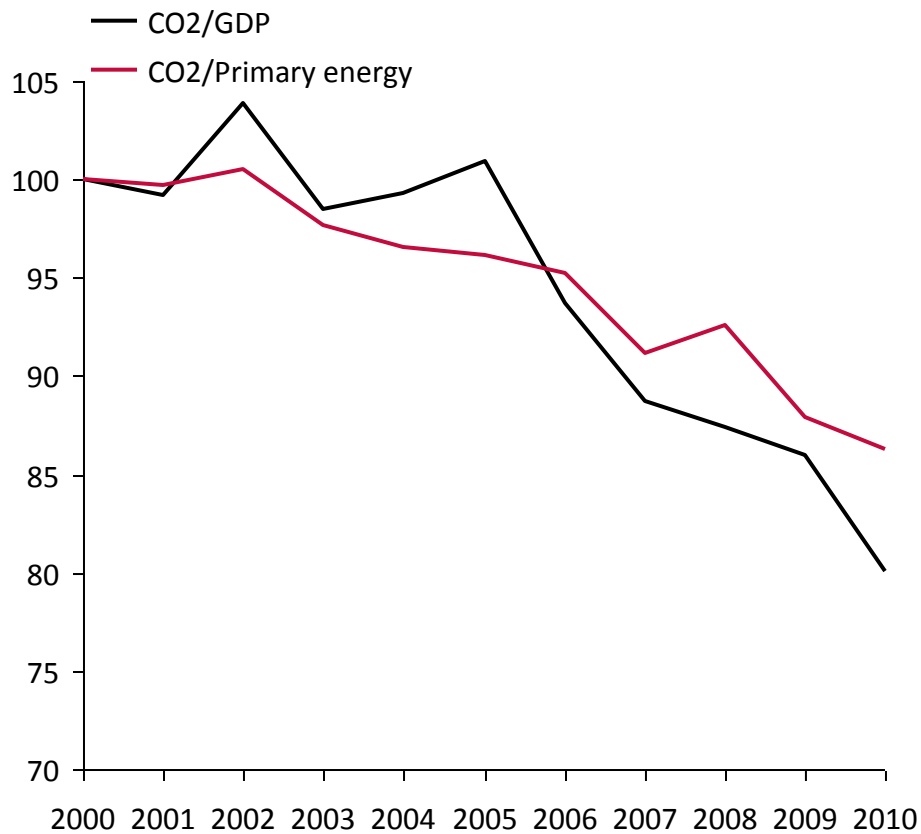


1. Assumes renewables substitution by CCGT (60%), Coal (30%) and electricity imports (10%). Includes savings from CO₂ avoided costs.

Emissions dropped and detached from GDP, while preserving the competitiveness of Portuguese industries related to EU average

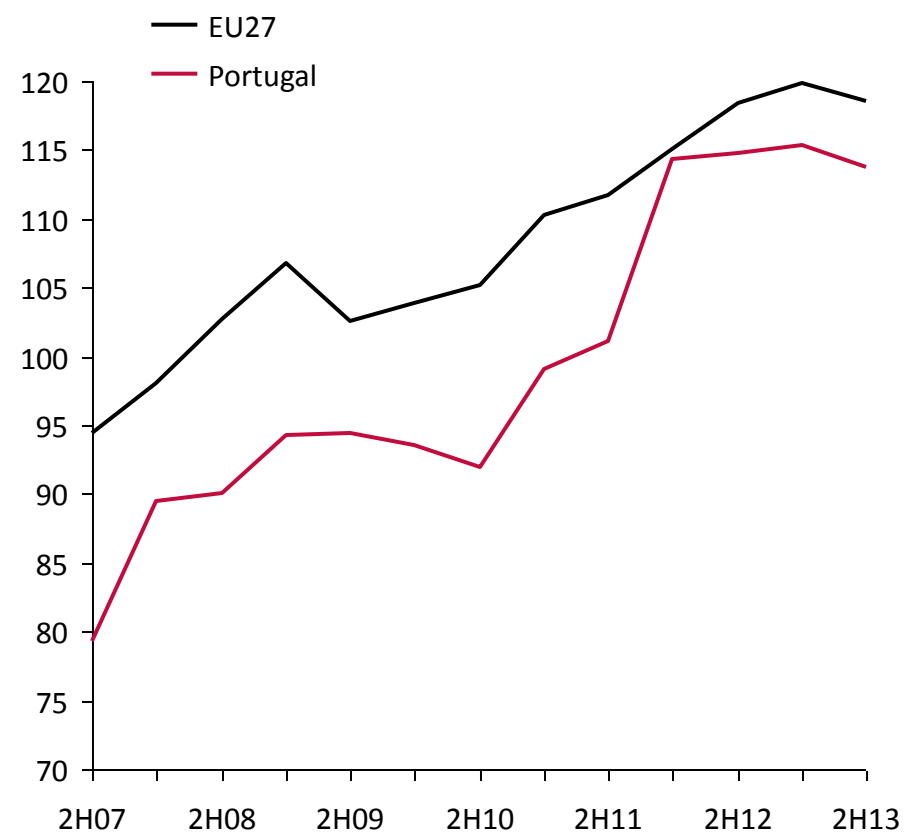
Carbon intensity and emission factor

2000-2010, index 2000 = 100



Electricity prices for industrial consumers¹

€/kWh, excludes recoverable taxes



1. Prices for Ic band (annual consumption between 500 and 2,000 MWh)

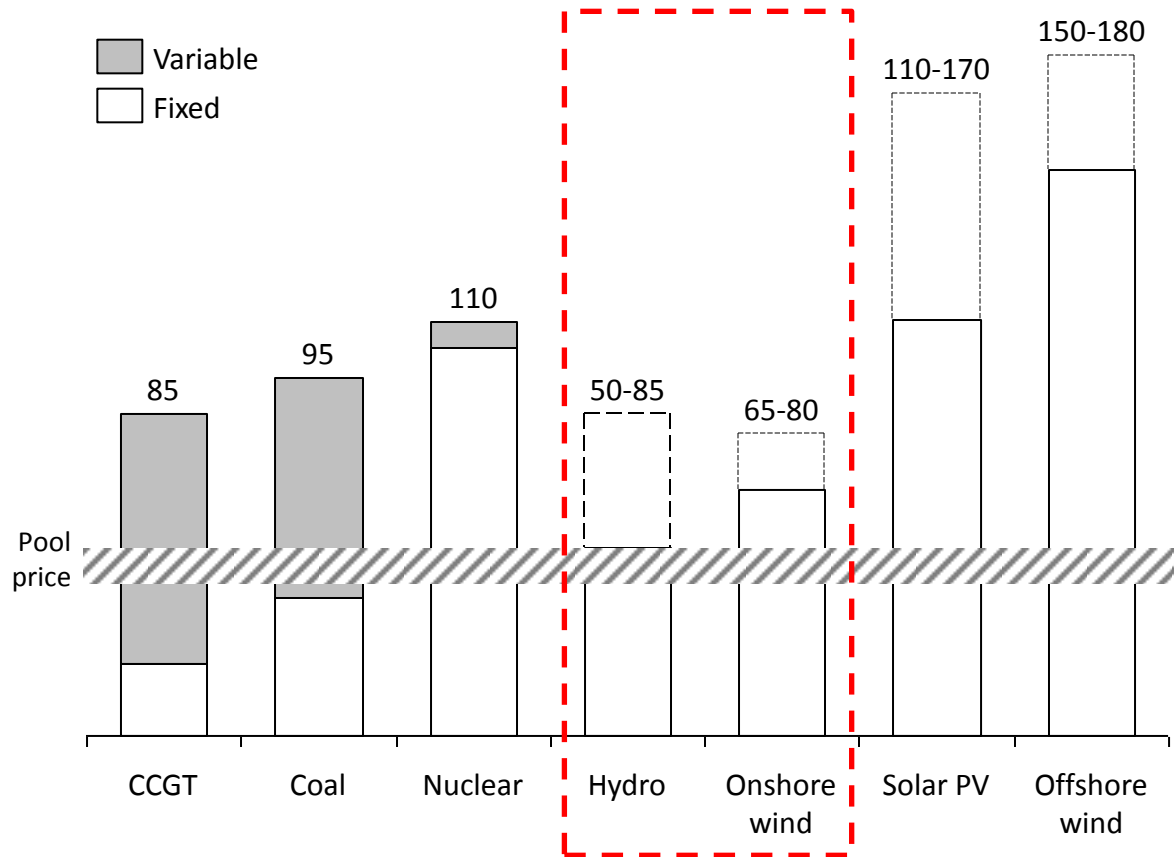
Sources: BNEF, FMI, Eurostat



Portugal invested in mature renewables (hydro and wind), which are the most competitive techs, despite their apparent overcosts

Cost of electricity generation for different technologies

€₂₀₁₄/MWh

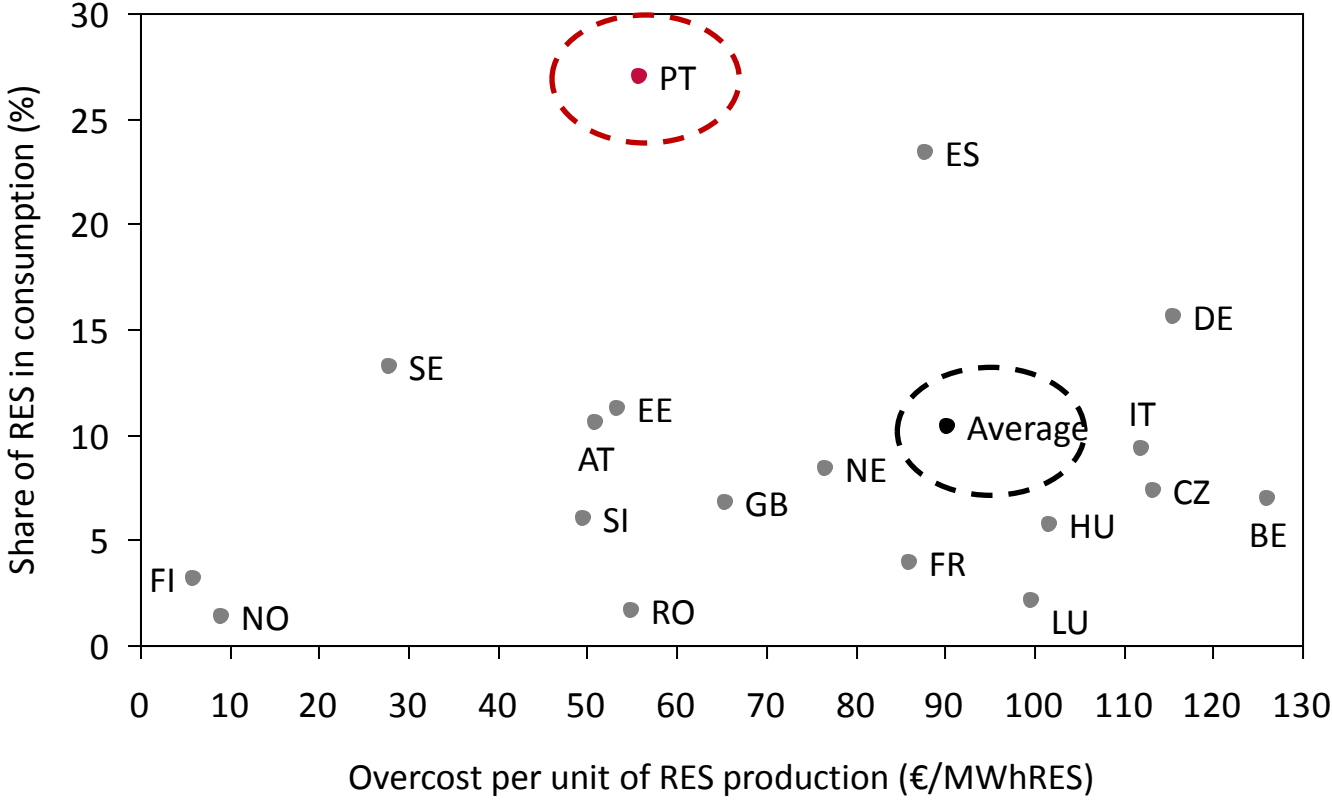


Comments

- The perception of renewables' overcost come from a biased comparison with pool prices, which are not adequately remunerating the full costs of any tech
- Low wholesale prices in Europe are a consequence of a generalized overcapacity and are not sustainable in the long-run
- In addition, renewables themselves push pool prices down, emphasizing the overcost notion
- Early investment in non mature techs created overcosts in some countries

As a result, RES overcosts in PT are below the EU average, despite being the country with the largest share of renewables in the system

Share of renewables (excluding large hydro) in consumption and respective overcosts in EU countries 2010

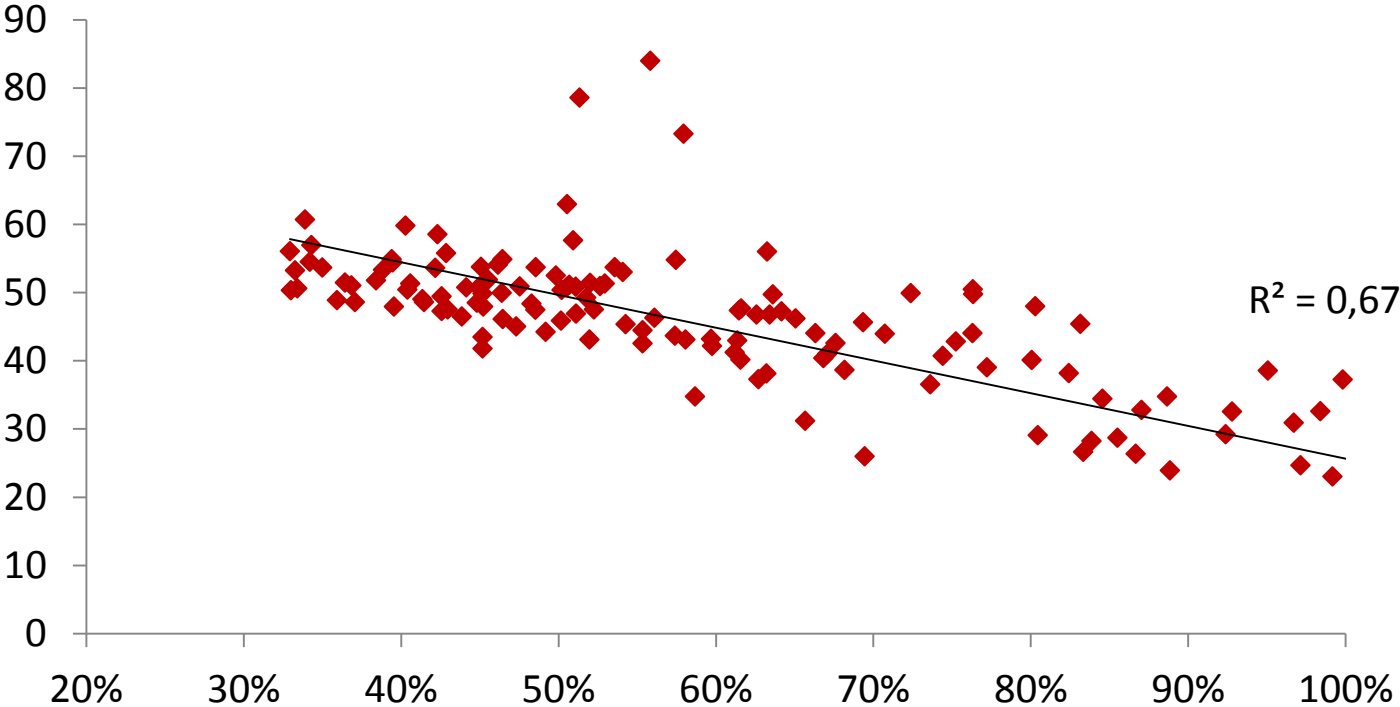


Source: CEER, Status Review of Renewable and Energy Efficiency Support Schemes in Europe, June 2013



Additionally, as the share of renewables increases, the wholesale price drops, rising the apparent notion of overcosts

Portuguese pool prices vs. share of renewables in national electricity consumption
€/MWh vs. %, weekly data, Jan 2012-Sep 2014

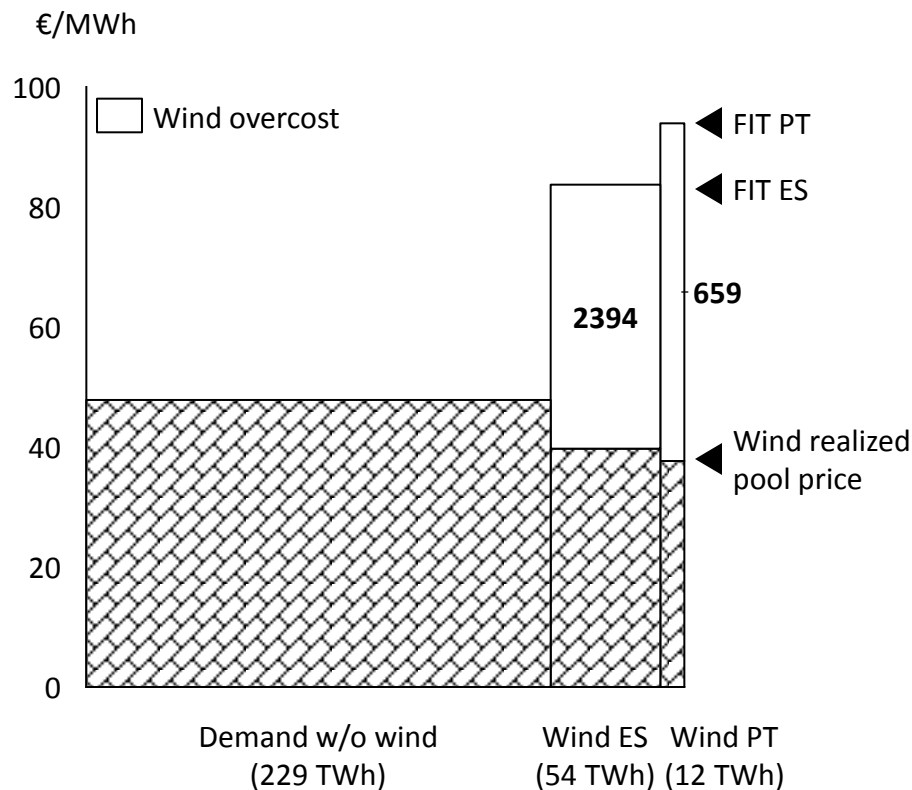


Source: Reuters, REN, OMEL, EDP analysis

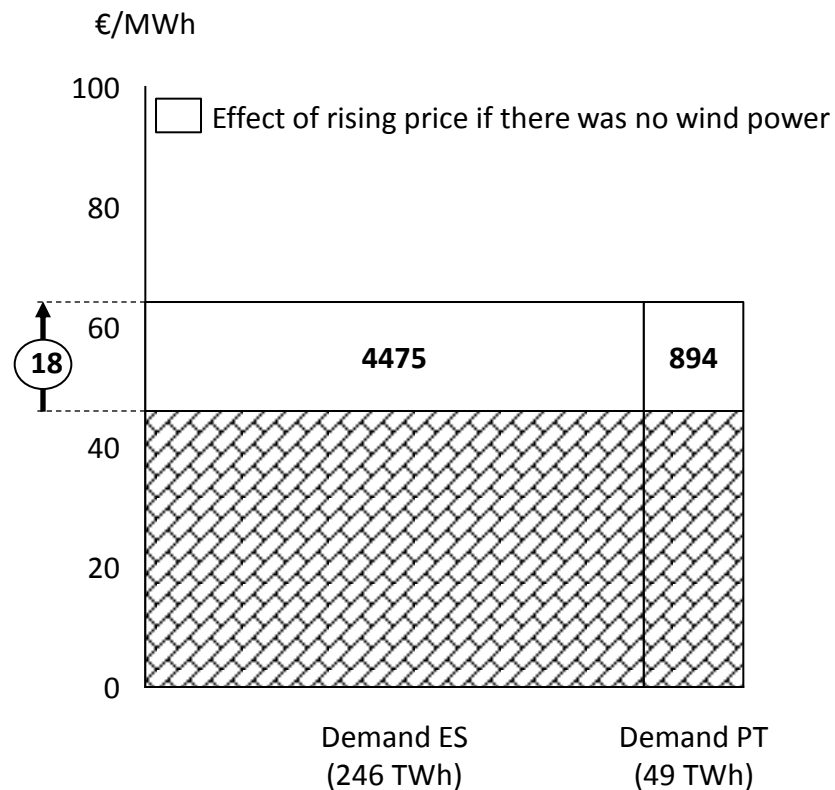


In Iberia, onshore wind has had a net positive cost impact on the power system of an estimated 2.3 B€ in 2013 alone

Overcost of onshore wind in Iberia
M€, 2013



Impact of onshore wind on the Iberian pool price
M€, 2013



- The Iberian system without wind would have been 2,300 M€ more expensive in 2013
- Likewise, in 2013, Germany had an estimated net benefit of 2,663 M€ because of wind power

Renewables in Europe are not the cause of rising EU prices neither of the widening gap between the US and European energy prices

1

Shale gas developments in the US are the main cause of the energy price gap

“EU industrial electricity prices ...are more than twice those in the US and Russia... Here again, lower US and Russian gas prices ... have helped bring down those countries' electricity prices”

– EC, *Energy prices and costs in Europe, Q&A memo*

“The development of US shale gas is likely to be at the root of this widening gap...”

– EC, *Energy Economic Developments in Europe*

“...the increasing EU-US energy price gap due to the development of shale gas and oil production in the US”

– EC, *Energy Economic Developments in Europe*

2

Europeans pay 56% more taxes than levies on their electricity bills

“... taxes still make up the bulk of the taxes & levies component. In 2012, average household consumer across the reporting countries paid 25 EUR/MWh in levies¹, but 39 EUR/MWh in taxes².”

– Eurelectric, *What really drives your bill up?*

3

In the US, renewables are mainly supported through fiscal incentives

- The major incentives for renewables in the US are Federal investment/production tax credits and other public financial schemes (Federal/State grants, loans, rebates, etc.)
- In Europe, renewables are mainly supported through the electricity bill

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Although renewables are competitive, the energy-only market design is not adequate for massive decarbonization

- **Low-C technologies and thermal backup units are all highly capex-intensive**
 - Most renewable techs and nuclear have virtually zero marginal costs
 - Thermal backup generators are idle for the vast majority of the time
- **Long-term stability and visibility are key to promote such capex-intensive investments**
 - Low cost of capital is main source of cost competitiveness
- **In the energy-only market, renewables are exposed to risks that they cannot manage, increasing risk premia at the expense of consumers**

Even in countries where generation adequacy is an issue (e.g., UK), pool prices are not signaling the need for investments

The market design needs to change and adapt to the new reality

Key elements of the new market design

Ex-ante competition + long-term contracting

- Ex-ante competition for long-term contracting (e.g., auctions, preferably EU-wide, which implies increased interconnections) to lower risk premium
- Countries such as USA, UK, Brazil or South Africa do that

Capacity mechanisms

- Implement competitive CRM to adequately value firm back-up capacity
- CRM being introduced in several EU countries (UK, FR, DE, IT)

Spot market

- Keep spot price for short-term optimization and dispatch signal

ETS

- Strengthen the CO₂ price signal by rebalancing the EU-ETS
- Backloading is an important step but does not avoid the need of a structural reform (dynamic supply)

Applicability

- Retroactive applications are not acceptable and should be condemned
- Regulatory stability is key

What principles should drive the auctions of long-term contracts?

Brief considerations

Designed to reduce risk premium

- **FiT and CfD** preferred over fixed premium
- Fixed premium exposes RES to risks that they cannot manage

Preference for technology neutrality

- **Different technologies offer different products** (e.g., firm thermal capacity addressing back-up needs)
- Other policy objectives besides competitiveness may require that at least some auctions be tech-specific

Induce efficient operations

- RES should assume responsibilities for deviations from schedule, provided that rules are clear and set from the beginning
- RES can provide **regulation down**, on a voluntary basis

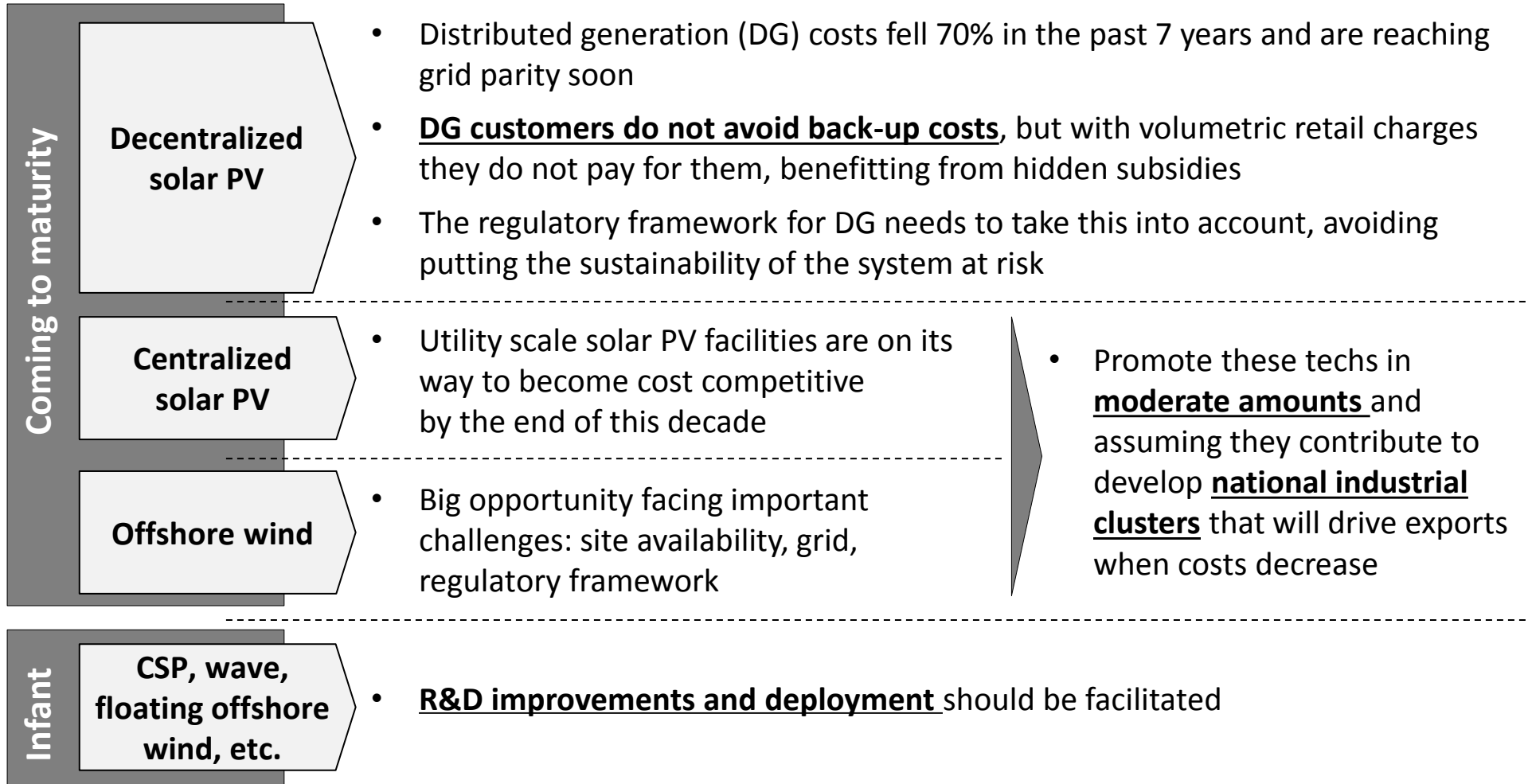
Tendentially, EU-wide

- Requires: (i) **strengthening of interconnections** supported by CBA, and (ii) EC capability to influence national plans and/or implement auctions at EU level

- Auctions of moderate amounts of RES should begin now
- Waiting for demand to recover and overcapacity to vanish would:
 - Risk European leadership role in RES
 - Penalize our external dependency

Non-mature technologies should be promoted in moderate amounts and under R&D frameworks

Brief considerations



Portugal must actively engage in this European debate, while promoting the needed adjustments to the national policy

Short-term adjustments to the Portuguese energy strategy

Renewables

- Meet 20/20/20 targets will require less RES capacity than initially thought:
 - Proceed with the **already licensed wind**
 - **Conclude hydro plants** under construction and the ones awarded under public tenders which are **economically viable** from a private investment point of view

Thermal plants

- No new conventional thermal capacity required until 2020

Energy efficiency

- Energy efficiency should remain a priority in the national energy policy
 - Support the roll-out of **smartgrids**
 - Promote the **ESCO** business, soft loans, etc.
 - Adopt a **green fiscal reform** that motivates EE investments (families and companies)

Transports

- Key sector (37% of final consumption, vs. 25% of electricity)
- Foster **electric and natural gas mobility**

Portugal will only benefit from an adequate market design, as well as strengthened interconnections (e.g., electricity exports under a EU framework of auctions to promote RES)

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- **In the last decade, Portuguese energy policy has ensured a competitive and cleaner energy mix, while contributing to decrease our external dependency and reduce our energy bill**
 - Modernization of the thermoelectric generation fleet
 - Ambitious hydro and wind programs
- **Renewables are becoming increasingly competitive, but some misconceptions and market failures are leading to erroneous assessments about their role**
 - Renewables overcost perception is biased, because of the dampening effect that renewables themselves have on the reference pool price
 - Wind is actually responsible for a net benefit in both the Iberian and German cases
- **Market arrangements need to be revised and delaying the implementation of an adequate market redesign has severe consequences for Europe**
 - Key elements of the new market design: long-term contracts, ex-ante competition (auctions), CRM, spot market for short-term optimization
 - Increased interconnections and a strengthened CO₂ price are crucial
 - Delaying would penalize European external dependency and leadership role in renewables