The Green Job Engine in Portugal

Kyle Herman
The Green Job Engine in Portugal
Kyle S. Herman
Coalition for Renewable Energy, Rutgers University

Abstract: Renewable energy technology has come under fierce criticism around the world through the duration of the Global Financial Crisis. Opponents of a state-oriented renewable energy policy infer that the high cost of such technology has negative macroeconomic effects on the economy. This paper investigates the broader economic effects of renewable energy policy in Portugal. Research indicates the government has built cohesive renewable energy policy to foster a strong network of jobs and technologies in the industry. The Wind Energy Industrial Cluster, an innovation centre to drive wind energy technology, is an example of government policy which has fostered strong industrial growth in renewable energy. The broader effects of this policy are examined here, most importantly the amount of highly-skilled jobs created. First, government policy to encourage renewable energy development is examined. Subsequently the Wind Energy Industrial Cluster is introduced and analysed. Finally, it is shown how clear and unambiguous government policy can successfully incubate renewable energy technology while also creating highly skilled and permanent jobs.

Keywords: wind energy industrial cluster; energy technology cluster; renewable energy technology; energy innovation; troika bailout; wind energy policy; renewable energy economics; global financial crisis; state oriented renewable energy; cohesive energy policy; energy job creation; green job engine, Portuguese renewable energy; Portugal policy; International Journal of Technology and Globalisation; technology globalisation.
1 INTRODUCTION

Over the past decade the “Green Economy” has been touted by governments and international agencies as the solution to the dual threat of high unemployment and harmful pollution from conventional energies (coal, natural gas, oil, nuclear etc.). In this paper the term “Green Job Engine” indicates jobs created in order to satisfy renewable energy demand. Renewable energy demand is met by highly skilled jobs in construction, consulting, finance, operating and maintenance, computer programming, transport, and communications. All of these jobs contribute to the viability of renewable energy grid integration and add to the Green Economy.


Although there is a broad accord among these agencies regarding normative policies, positive outcomes and cases are rare. In fact very little research has been done to sufficiently link renewable energy technology with job creation using a specific country example. Without evidence normative policies and statements hold little merit.

In order to bridge the gap between policies to stimulate the Green Job Engine and economic results, governments must construct the correct policy package. But what does this policy package consist of? Or, what set of policy measures will create jobs and bolster economies? Moreover, will conventional energy jobs simply be replaced by renewable energy jobs? Or do renewable energy jobs offer more job density per investment (more jobs created through less investment compared with conventional energy)?

According to the Organisation for Economic Co-operation and Development (OECD 2012: 23), renewable energy creates “more jobs per megawatt of power installed, per unit of energy produced, and per dollar of investment, than the fossil fuel-based energy sector.” That means fossil fuel jobs, which presently dominate the entire workforce in the energy industry, could be converted into more jobs in more places if a widespread diffusion of renewable energy is initiated. This is based on data from 13 independent reports which consider both economic and employment impacts of renewable energy in the Europe and the United States (European Commission 2012).

2 RESEARCH METHODOLOGY

Twelve qualitative interviews were conducted during July 2011. Interviewees, selected on the criteria of garnering a broad view of the economic ramifications of government energy policy, were selected from the energy industry, non-governmental organizations, academia, private consulting firms, and government agencies. Below is a list of the key interviewees with a small description of their
Gabriela Prata Dias, from CEEETA-Eco (Energy Consultants), has worked alongside the OECD (Organisation for Economic Co-operation) to develop a coherent energy policy plan for Portugal. In her book, “A Study of Green Jobs in Portugal” (Estudo Sobre Empregos Verdes em Portugal), she elaborates on the quantity and quality of green jobs in Portugal, including the different industrial sectors within the renewable energy sphere.

Isabela Cancela de Aberu, from APREN (Renewable Energy Association), serves as the Deputy Director for Portugal's most influential energy organisation. APREN works alongside the Portuguese government and within the European Parliament to help construct logical energy policy while disseminating new policy decisions to key stakeholders.

Jose Figueiredo Soares, from EDP (Energias de Portugal), is the Director for Sustainability and Environment. He is the spokesperson for EDP and renewable energy with over three decades in the industry. EDP is by far the largest energy company in Portugal, and has recently moved to become privatised due to stipulations of the government bailout programme.

Alex Raventos is the Chief Economist at Portugal's Wave Energy Centre. He has worked alongside the Massachusetts Institute of Technology (MIT) to develop commercialized offshore renewable energy systems and demand-side management. The Wave Energy Centre is the first agency in the world attempting to commercialize wave energy.

Professor Delgado Domings, Chairman of the board of directors at Lisboa e Nova (New Lisbon)--a municipal entity, has been in the renewable energy field for four decades. LisboaNova is responsible for making public transit in Lisbon highly efficient, saving the city from ballooning energy costs and making it easier for citizens to commute. He has over 150 publications in the subject of renewable energy and has been a professor since 1965.

Two qualitative questions, listed below, were central to each interview:

- Has the economic crisis (and the “Troika” bailout) had a negative or positive impact on Renewable Energy Systems? Are jobs being created in the renewable energy field in Portugal?
- What are some of the most important socio-political or socio-economic drivers of Renewable Energy Technology in Portugal? What are the most significant barriers?

A triangulation of interview data, past research from scholars and international organisations, and renewable energy statistics (from government, European Commission, EDP, and independent observations), are the basis for the present position offered in this paper. The interviewee's answers fall in line with the European Commission data pertaining to jobs created through the renewable energy industry. Meanwhile other independent research points towards the need to expose Portugal's renewable energy policy overlapped with their economic crisis.

3 PORTUGUESE RENEWABLE ENERGY POLICY TO CREATE JOBS

During the past several decades, and most obviously in the past few years, the Portuguese economy has been flat (Bloomberg Business 2013). Economic growth was bolstered by joining the Euro, but this was for the most part short-lived and the country had to be bailed out by the Troika of lenders (International Monetary Fund, European Commission, European Central Bank) in 2011. The
troika has threatened renewable energy subsidies, yet the government has continued to ambitiously pursue renewable energy policy in more innovative ways.¹

Despite these economic woes Portugal, through certain policies, initiated a number of new renewable energy projects even throughout its Troika bailout. These have led to significant increases in GDP, job growth, innovative technologies, and local policy innovation in the renewable energy space (European Commission: Renewable Energy Fact Sheet). Interestingly, the bailout has not negatively affected either the jobs being created by the renewable energy industry nor the growth of the green economy in general (Cancela de Abreu 2011, interview). It is becoming more appropriate to accept the bailout and subsequent privatization of the industry as a macroeconomic factor which will positively influence the renewable energy industry.

Figure (1) shows job estimates for direct and indirect jobs in the renewable energy sector in Portugal.

<table>
<thead>
<tr>
<th></th>
<th>Number of Direct Jobs</th>
<th>Number of Indirect Jobs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wind energy</td>
<td>19135</td>
<td>105066</td>
</tr>
<tr>
<td>Solar photovoltaic (centralised)</td>
<td>726</td>
<td>na</td>
</tr>
<tr>
<td>Solar photovoltaic (micro-generation)</td>
<td>1815</td>
<td>na</td>
</tr>
<tr>
<td>Biomass (including biogas)</td>
<td>302</td>
<td>na</td>
</tr>
<tr>
<td>Geothermal energy</td>
<td>37</td>
<td>na</td>
</tr>
<tr>
<td>Mini-hydro power</td>
<td>2779</td>
<td>na</td>
</tr>
<tr>
<td>Wave energy</td>
<td>210</td>
<td>na</td>
</tr>
<tr>
<td>Total</td>
<td>25004</td>
<td>&gt;105066</td>
</tr>
<tr>
<td>Solar thermal energy</td>
<td>284</td>
<td>na</td>
</tr>
</tbody>
</table>

Naumann, 2013: 3)

The Portuguese case reveals the renewable energy industries' capacity to both create and sustain jobs. This implies that even after the technology is implemented, many jobs are needed for operation and maintenance (O&M), monitoring and dispatch, and other technical assistance (sometimes placed in the indirect jobs category). Other indirect jobs such as research and development, which could very well add many more jobs to the industry if considered, are not represented in the data above. “Estimates indicate an increase of around 2.5 % in new direct and indirect jobs, in relation to total employment, accounting for 130 000 jobs by 2020” (Naumann 2013: 2). These increases in renewable energy jobs have persisted throughout the duration of the troika bailout.

3.1 POLICY MEASURES: HOW TO START THE GREEN JOB ENGINE?

Portugal was pitted against the daunting reality that many of their traditional industries were in decline. It was apparent support was needed for a new industry, namely renewable energy. R&D support for renewable energy began during the early 90's under the auspices of the Institute for Industrial Engineering and Technology (INETI). Although not the first government effort to support the industry,

¹ As part of Portugal’s broader economic restructuring under [the Troika of lenders] […] The government is required to revise, reduce and revoke several of its incentive mechanisms for renewables in 2012-13. The credit crisis also impacted on project financing in 2011-12. Therefore, Portugal’s planned 2014 review of its 2020 renewable energy targets will take place at a time of national economic restructuring and tight government budgets.” (International Renewable Energy Agency (IRENA), 2012: pg. 11)
it was a deciding factor in increasing the success rate of different energy technologies (Trennepohl et al. 2011).

Below are the most significant policy measures for renewable energy creation and use:

  - Amendment in 1995 allowed all renewable energy sources (IRENA 2012)
- Feed-in tariffs for renewable electricity
  - Differentiated by technology: guaranteed for a certain time frame and applicable until an upper limit of electricity produced is reached (Trennepohl et al. 2011).
  - The formula for calculating the feed-in tariff includes the opportunity for renewable energy producers to choose between different tariff levels for electricity generated during peak and off-peak hours.
- Direct subsidy payments (PRIME-Programme) and tax incentives.
  - Increase energy production through endogenous resources.
  - Guarantee the fulfilment of the agreements assumed by Portugal in the context of the climate change policies.
  - Reducing by 25% the energy imports balance with energy produced by endogenous sources.
  - Creating wealth and consolidating an energy cluster in the renewables sector in Portugal
- Decree-Law no. 118-A/2010: Micro-generation: to receive subsidized selling (Costa & Louro 2013)

The above laws and policy changes served as the backbone for developing, in particular, energy from endogenous resources using domestic labour (in particular ENE-2020). Tax structures encouraged local investment in renewable energy projects, while leading to innovation by crafting an industry which before did not exist. But even with all the correct policy measures in place, technical feasibility of renewable energy sometimes precludes it from integrating successfully into the grid. For that reason, the electricity grid had to be altered in tandem with renewable energy policy to promote technological innovations in the industry.

While tax incentives are preferred for small-scale renewable energy projects in Portugal, feed-in tariffs (FITs) and tendering schemes have proven successful in large-scale renewable energy projects (European Renewable Energy Council, EREC 2012). An innovative mixed tariff and tendering scheme has helped drive wind energy growth as well (IRENA 2012). Some of the largest projects have been initiated by EDP, which before the troika was still primarily a government-owned company.

4 THE WIND ENERGY INDUSTRIAL CLUSTER
The crux of the Portuguese wind energy policy is the wind energy industrial centre. The idea behind this conglomeration of wind energy companies was to spur out innovation, design, and locally produced wind energy turbines. It falls in line with government policy ENE 2020 comprising of competitiveness, economic growth, and energy. The cluster, in accord with ENE 2020, supports the increase in energy production through endogenous resources, reduces energy imports, and creates domestic wealth (Costa and Louro 2013).

The Portuguese wind energy industrial cluster consists of 29 companies surrounding the core Enercon wind turbine factory. The cluster provides all products in the value chain for manufacturing and installing turn-key wind farms. This includes fibreglass factories, steel factories for turbine towers, transformer factories, electrical equipment and installation factories, as well as crane companies. Within the cluster, nearly every part of the wind energy industry is housed, from raw material all the way up to project conception. The idea was to transform an old industrial centre, which had fallen into decadence since the early 1980's, into a wind energy industrial centre whereby all design, production, shipping—in short to confine all wind turbine construction within a single locality.

The industrial complex was built to include a logistics and transport centre, a concerted focus on research and development (R&D), a vocational training centre, and strategic research partnerships with domestic universities. It was the direct result of deliberate government policy to create a wind technology region. This government policy initiative served as the impetus for driving the renewable energy industrial job engine within Portugal. The ramifications of this innovative idea are numerous.

The chart below (Figure 2) proves the value, in terms of job creations and economic stimulation, of the government policy that created the wind cluster. Both jobs and direct investment are outlined in the table. This data demonstrates, quite clearly, the amount of jobs created in renewable energy in the wind cluster and other similar regions in Portugal.

![Figure 2: Investment and job creation within Viana do Castelo's and other clusters](source: ENEOP)

<table>
<thead>
<tr>
<th>Company</th>
<th>Unit/Project</th>
<th>Investment (in euros)</th>
<th>Direct, Permanent Jobs</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENEOP/Enercon</td>
<td>Rotor Blade Factory</td>
<td>34760000</td>
<td>510</td>
</tr>
<tr>
<td>ENEOP/Enercon</td>
<td>Concrete Tower Factory</td>
<td>21685000</td>
<td>108</td>
</tr>
<tr>
<td>EWG</td>
<td>Service Centre</td>
<td>17337000</td>
<td>78</td>
</tr>
<tr>
<td>Painhas</td>
<td>Electrical Installations Supply</td>
<td>45100000</td>
<td>63</td>
</tr>
<tr>
<td>Saertex</td>
<td>Glass Fibre Factory</td>
<td>4000000</td>
<td>40</td>
</tr>
</tbody>
</table>

Source: ENEOP

Some of the industry sectors within the cluster consists are:

- **Saertex** fiberglass factory
- **A. Silva Mattos** steel factory for turbine towers
- **Siemens** transformer factory
- **Siemens** switchboard and medium voltage cell
4.1 THE RENEWABLE ENERGY INDUSTRY AS A GREEN JOB ENGINE

As a result of the Wind Industrial Cluster and other projects directly resulting from government policy, it is estimated that between 55,000 and 65,000 people work in the renewable energy and energy efficiency industry in Portugal (direct jobs), out of a total population ten million (Gonçalves 2012). Though some estimates put the number at 35,000, these usually do not include part time or “indirect” employment in the industry (Kammen 2012; Naumann 2012; Dias et al. 2009). Even if the lowest estimate is taken, (32,000 people employed by the renewable energy industry), this number represents approximately .5% of all employment, which is not an insignificant job sector (assuming a working population of 6.4 million).

A report and website were built in order to convey the results of the Wind Industrial Sector. This does not include the greater rippling effect on the domestic economy. The following is a summary of the economic effects of the industrial cluster:

- Initial investment of 200 million euros.
- The creation of 2,000 direct jobs at the new industrial units; several thousand indirect jobs related to building and operating the wind farms or supplying raw material.
- The main industrial estate will account for 2.5% of regional GDP.
- Positive effect on the trade balance:
  - Increase in exports:
    More than 60% of what is generated will be exported.
  - Decrease in imports of wind components: National incorporation will be from the current 20% to practically 100% (eneop.pt)

Job Creation:

---

\(^2\) According to the National Statistics Institute’s (INE) Environment Statistics (Table 1), around 32 000 people worked directly in the environmental goods and services producing sector, in indicate an increase of around 2.5 % in new direct and indirect jobs, in relation to total employment, accounting for 130 000 jobs by 2020” (“Promoting Green Jobs Through the Crisis”).
• Between 2008 and 2015, indirect jobs from RE will increase by approximately 60%, or about 21,000 jobs.

• By 2015, direct jobs in the RE sector are estimated to represent more than 5,500 jobs.

• From 2008-2015, an increase of over 140% is expected in the business sector for renewable energy.

• The number of newly created direct jobs are expected to be 25,000, or an average annual increase of 8%.

Due to EDP's strategy, the wind energy industrial cluster, and distinct government policy, Portugal installed 500MW of wind energy each year from 2004-2009 (IRENA 2012). If each megawatt (MW) can supply 500 homes with electricity, that is the equivalent of supplying, each year, another 250,000 homes with renewable energy (EREC: Wind Energy Fact sheet). At the same time, renewable energy as a percentage of primary energy grew from 17% to 45% of total energy sources (EREC). That is, by some accounts, the highest in the EU and the industrialized world.

5 POLICY DISCUSSION

Innovative and unambiguous government policy clearly impacted the widespread diffusion of renewable energy technologies in Portugal. The sheer size of the Portuguese renewable energy workforce, (by some estimates up to 60,000-1000,000 people), combined with the very high installed renewable energy generation capacity (among the highest in the world), leave no doubt that Portugal's renewable energy policy was a success, despite its economy. This fact was echoed by all interviewees regardless of their political or industrial affiliation.

The success permeates not only the industry itself but also the economy at large. If 60,000-100,000 people is the ranger for jobs in Portugal's green economy, that means between .5%-1.5% of its entire workforce is employed in this field (Portugal's population is about ten and a half million). Furthermore, with an installed capacity of 47% renewable energy, there is little debate about the direct effect this change has brought upon Portugal's energy import costs. Whereas three decades ago Portugal imported nearly all of its energy, today it imports only about half.

Evidently three robust policy initiatives are responsible for the success of Portugal's renewable energy industry. First, the creation of the Wind Energy Industrial Cluster rapidly changed a dilapidated region into a technology innovation centre supporting nearly every aspect of the wind energy industry. Second, the government moved to quickly allow private renewable energy producers easy access to the...
electricity grid. Lastly, the government took control of the power grid for a short period, allowing the rapid integration of renewables. The wind cluster could survive on its own feet because it already had all the tools required to design, build, and ship wind energy technologies abroad while the domestic market stalled due to broader economic stresses.

Yet, though the number employed in the green economy is impressive, the fact that estimates vary so widely points to a gap in government policy. If the government is to keep pushing forward its renewable energy agenda, especially confronted with bailout requirements, it must formulate a cohesive database to more accurately keep track of employment, GDP increase, Foreign Direct Investment (FDI), and other economic indicators associated with the renewable energy industry. This will encourage foreign lenders and investors by instilling confidence in the industry.

Nevertheless, it is imperative that Portugal continues on its drive towards more renewable energy in the face of economic instability. The government bailout has sidelined FITs and other subsidies for renewable energy. But instead of witnessing the decline of the industry, because many predicted renewables could not survive without subsidies, data presented in this paper indicate the industry is thriving. It may, in fact, be one of the only growing industries in the country (Interview: Jose Figueiredo Soares, EDP). Even if renewable energy integration continues to stall domestically, the Portuguese now have the expertise and know-how to build wind energy, wind innovation centres, and other related renewable energy projects which can be exported abroad (most easily to Brazil, for example).

Furthermore, if the Wind Cluster is used as an example, subsidies have overwhelmingly proved successful doing exactly what they were required to do: fostering and incubating a domestic renewable energy industry capable of surviving without subsidies after the market balanced out. Perhaps the balancing out came at the exact time as the troika bailout. The aforementioned policy initiatives were the backbone for the rapid transition to a robust green economy, while FITs and open grid access merely served as the lifeblood to the policy plan. Ultimately, the success of Portugal's energy policy will only become clear in several decades since energy and infrastructure projects naturally embody long lead-times and financing is carried over through generations. Until then, it appears the renewable energy industry is creating sustainable jobs and will do so for at least the next decade.

CONCLUSION

It is critical to continue studying the direct economic effect of the renewable energy industry. In the absence of articulated and accurate data demonstrating the industrial successes investors, civilians, banks, and decision-makers will be left questioning its effects on both the environment and the economy. Though the former, the environment, is fervently fought for by emotional advocates of renewable energy, the latter, the economy, appeals to a wider audience and thus should become the focus of renewable energy policy. The case presented here is unique and offers a glimpse into the nexus between economics, energy, innovation, and technology. This nexus, though already important, will play an increasingly pivotal role in determining the health and robustness of economies throughout the world during the 21st century. With careful policy decisions many countries have the opportunity to exploit endogenous energy sources such as renewable energy. The Portuguese case demonstrates this possibility even despite a fledgling economy.
REFERENCES


"Renewable Energy Jobs and Lobbying in Portugal." Personal interview. 20 July 2011. CEEETA

"Renewable Energy Jobs and Lobbying in Portugal." Personal interview. 21 July 2011. APREN

"Renewable Energy Jobs and Lobbying in Portugal." Personal interview. 24 July 2011. Wave Energy Centre


"Renewable Energy Jobs and Lobbying in Portugal." Personal interview. 26 July 2011. Energias de Portugal (EDP)
ACKNOWLEDGEMENTS

The Coalition for Renewable Energy would like to thank the various industry professionals whose interviews served as the backbone for the impetus and research for this paper. In particular, cree thanks the following people: Gabriela Prata DiasIsabela Cancela de AberuJose Figueiredo SoaresAlex Raventos Professor Delgado Domings.