

# CLEO Consulting Partners

## Lessons from the Spanish Renewables Bubble

April 20, 2009

Spanish economists have recently released a report which cautions President Obama that the Spanish experience of creating massively subsidized “green jobs” has been economically counterproductive. CLEO Consulting Partners has come to a similar conclusion regarding renewable energy projects that need massive subsidies based on our analysis of recent forecasts prepared by the U.S. Department of Energy. (See our reports: “A Constructive Critique of President Obama’s Energy Plan” April 2, 2009 and “A Constructive Critique of Boone Pickens Energy Plan” April 12, 2009.) It should be noted that some renewable energy projects are economically feasible without massive subsidies. Wind energy could provide 5% to 10% share of our electrical generating capacity by 2050. Because of high costs, solar energy will only represent 1% of U.S. capacity by 2030.

The Spanish economists make three key points relating to the relevance of the Spanish experience of generating 20% of its electricity from renewables by 2010 to President Obama’s proposal to produce 20% by 2025: (quote)

1. As President Obama correctly remarked, Spain provides a reference for the establishment of government aid to renewable energy. No other country has given such broad support to the construction and production of electricity through renewable sources. The arguments for Spain’s and Europe’s “green jobs” schemes are the arguments now made in the U.S., principally that massive public support would produce large numbers of green jobs. The question that this paper answers is “at what price?”
2. .... we find that for every renewable energy job that the State manages to finance, Spain’s experience cited by President Obama as a model reveals with high confidence, by two different methods, that the U.S. should expect a loss of at least 2.2 jobs on average, or about 9 jobs lost for every 4 created, to which we have to add those jobs that non-subsidized investments with the same resources would have created.
3. Therefore, while it is not possible to directly translate Spain’s experience with exactitude to claim that the U.S., would lose at least 6.6 million to 11 million jobs, as a direct consequence were it to create 3 to 5 million “green jobs” as promised (in addition to the opportunity cost of private capital employed in renewable energy), the study clearly reveals the tendency that the U.S. should expect such an outcome. (unquote)

“Study of the effects on employment of public aid to renewable energy sources”  
March 2009 – University Rey Juan Carlos, Spain - Juan Ramon Rallo Julian, et.al

Attached is the full text of their 24 point executive summary and selected tables from the full report.

We trust that you will find the attached report informative and that it stimulates additional suggestions on improving America’s long term energy and environmental policy.

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# Study of the effects on employment of public aid to renewable energy sources

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## EXECUTIVE SUMMARY: LESSONS FROM THE SPANISH RENEWABLES BUBBLE

Europe's current policy and strategy for supporting the so-called "green jobs" or renewable energy dates back to 1997, and has become one of the principal justifications for U.S. "green jobs" proposals. Yet an examination of Europe's experience reveals these policies to be terribly economically counterproductive.

This study is important for several reasons. First is that the Spanish experience is considered a leading example to be followed by many policy advocates and politicians. This study marks the very first time a critical analysis of the actual performance and impact has been made. Most important, it demonstrates that the Spanish/EU-style "green jobs" agenda now being promoted in the U.S. in fact destroys jobs, detailing this in terms of jobs destroyed per job created and the net destruction per installed MW.

The study's results demonstrate how such "green jobs" policy clearly hinders Spain's way out of the current economic crisis, even while U.S. politicians insist that rushing into such a scheme will ease their own emergence from the turmoil.

The following are key points from the study:

1. As President Obama correctly remarked, Spain provides a reference for the establishment of government aid to renewable energy. No other country has given such broad support to the construction and production of electricity through renewable sources. The arguments for Spain's and Europe's "green jobs" schemes are the same arguments now made in the U.S., principally that massive public support would produce large numbers of green jobs. The question that this paper answers is "at what price?"
2. Optimistically treating European Commission partially funded data<sup>1</sup>, we find that for every renewable energy job that the State manages to finance, Spain's experience cited by President Obama as a model reveals with high confidence, by two different methods, that the U.S. should expect a loss of at least 2.2 jobs on average, or about 9 jobs lost for every 4 created, to which we have to add those jobs that non-subsidized investments with the same resources would have created.

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<sup>1</sup> The MITRE project was partially funded by DG TREN (Energy & Transport) of the European Commission under the Altener programme.

3. Therefore, while it is not possible to directly translate Spain's experience with exactitude to claim that the U.S. would lose at least 6.6 million to 11 million jobs, as a direct consequence were it to actually create 3 to 5 million "green jobs" as promised (in addition to the jobs lost due to the opportunity cost of private capital employed in renewable energy), the study clearly reveals the tendency that the U.S. should expect such an outcome.
4. At minimum, therefore, the study's evaluation of the Spanish model cited as one for the U.S. to replicate in quick pursuit of "green jobs" serves a note of caution, that the reality is far from what has typically been presented, and that such schemes also offer considerable employment consequences and implications for emerging from the economic crisis.
5. Despite its hyper-aggressive (expensive and extensive) "green jobs" policies it appears that Spain likely has created a surprisingly low number of jobs, two-thirds of which came in construction, fabrication and installation, one quarter in administrative positions, marketing and projects engineering, and just one out of ten jobs has been created at the more permanent level of actual operation and maintenance of the renewable sources of electricity.
6. This came at great financial cost as well as cost in terms of jobs destroyed elsewhere in the economy.
7. The study calculates that since 2000 Spain spent €571,138 to create each "green job", including subsidies of more than €1 million per wind industry job.
8. The study calculates that the programs creating those jobs also resulted in the destruction of nearly 110,000 jobs elsewhere in the economy, or 2.2 jobs destroyed for every "green job" created.
9. Principally, these jobs were lost in metallurgy, non-metallic mining and food processing, beverage and tobacco.
10. Each "green" megawatt installed destroys 5.28 jobs on average elsewhere in the economy: 8.99 by photovoltaics, 4.27 by wind energy, 5.05 by mini-hydro.
11. These costs do not appear to be unique to Spain's approach but instead are largely inherent in schemes to promote renewable energy sources.
12. The total over-cost – the amount paid over the cost that would result from buying the electricity generated by the renewable power plants at the market price - that has been incurred from 2000 to 2008 (adjusting by 4% and calculating its net present value [NPV] in 2008), amounts to 7,918.54 million Euros (appx. \$10 billion USD)
13. The total subsidy spent and committed (NPV adjusted by 4%) to these three renewable sources amounts to 28,671 million euros (\$36 billion USD).
14. The price of a comprehensive energy rate (paid by the end consumer) in Spain would have to be increased 31% to being to repay the historic debt generated

by this rate deficit mainly produced by the subsidies to renewables, according to Spain's energy regulator.

15. Spanish citizens must therefore cope with either an increase of electricity rates or increased taxes (and public deficit), as will the U.S. if it follows Spain's model.
16. The high cost of electricity due to the green job policy tends to drive the relatively most energy-intensive companies and industries away, seeking areas where costs are lower. The example of Acerinox is just such a case.
17. The study offers a caution against a certain form of green energy mandate. Minimum guaranteed prices generate surpluses that are difficult to manage. In Spain's case, the minimum electricity prices for renewable-generated electricity, far above market prices, wasted a vast amount of capital that could have been otherwise economically allocated in other sectors. Arbitrary, state-established price systems inherent in "green energy" schemes leave the subsidized renewable industry hanging by a very weak thread and, it appears, doomed to dramatic adjustments that will include massive unemployment, loss of capital, dismantlement of productive facilities and perpetuation of inefficient ones.
18. These schemes create serious "bubble" potential, as Spain is now discovering. The most paradigmatic bubble case can be found in the photovoltaic industry. Even with subsidy schemes leaving the mean sale price of electricity generated from solar photovoltaic power 7 times higher than the mean price of the pool, solar failed even to reach 1% of Spain's total electricity production in 2008.
19. The energy future has been jeopardized by the current state of wind or photovoltaic technology (more expensive and less efficient than conventional energy sources). These policies will leave Spain saddled with and further artificially perpetuating obsolete fixed assets, far less productive than cutting-edge technologies, the soaring rates for which soon-to-be obsolete assets the government has committed to maintain at high levels during their lifetime.
20. The regulator should consider whether citizens and companies need expensive and inefficient energy – a factor of production usable in virtually every human project- or affordable energy to help overcome the economic crisis instead.
21. The Spanish system also jeopardizes conventional electricity facilities, which are the first to deal with the electricity tariff deficit that the State owes them.
22. Renewable technologies remained the beneficiaries of new credit while others began to struggle, though this was solely due to subsidies, mandates and related programs. As soon as subsequent programmatic changes take effect which became necessary due to "unsustainable" solar growth its credit will also cease.
23. This proves that the only way for the "renewables" sector - which was never feasible by itself on the basis of consumer demand - to be "countercyclical" in crisis periods is also via government subsidies. These schemes create a bubble, which is boosted as soon as investors find in "renewables" one of the few profitable sectors while fleeing other investments. Yet it is axiomatic, as

we are seeing now, that when crisis arises, the Government cannot afford this growing subsidy cost either, and finally must penalize the artificial renewable industries which then face collapse.

24. Renewables consume enormous taxpayer resources. In Spain, the average annuity payable to renewables is equivalent to 4.35% of all VAT collected, 3.45% of the household income tax, or 5.6% of the corporate income tax for 2007.

## Selected Tables from the Report

By Juan Ramon Rallo Jullan, Universidad Rey Juan Carlos, Spain – March 2009

### Cost of Power Comparisons

**Table 2.- Average price paid to the production of wind, photovoltaic and mini-hydro and over-cost with regard to the same production paid at average pool price in Spain (1998-2008)**

	2000	2001	2002	2003	2004	2005	2006	2007	2008
<b>PHOTOVOLTAIC</b>									
Production (in GWh)	1.4	2	4,64	9	18	40	106	454	2054
Capacity installed (in MW)	1	2	5,47	11	21	42	142	451	2934
Average selling price (in € / MWh)	226.58	248.96	285.36	308.25	366.92	399.04	427.44	434.71	451.36
<b>WIND</b>									
Production (in GWh)	4544	6925	9564	12063	15965	20955	23143	26789	28579
Capacity installed (in MW)	2060	3295	4580	6273	8152	10021	11845	12931	14836
Average selling price (in € / MWh)	67.31	66.96	73.89	62.44	62.94	87.59	92.16	79.07	101.29

#### Average Solar and Wind Price versus Pool Price (2004-2008) c€/kWh

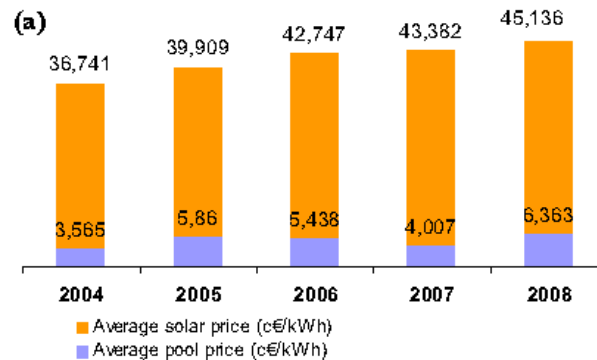
Actual Prices	2004	2005	2006	2007	2008
Photovoltaic	36.692	39.904	42.744	43.471	45.136
Wind	6.294	8.759	9.216	7.907	10.129
Pool Price	3.565	5.86	5.438	4.007	6.363
Relative Prices	2004	2005	2006	2007	2008
Photovoltaic	10.29	6.81	7.86	10.85	7.09
Wind	1.77	1.49	1.69	1.97	1.59
Pool Price	1.00	1.00	1.00	1.00	1.00

Source: Table 2

## Solar Power

These two economic regimes commented on have guaranteed extremely high retributions far beyond the average market selling price (pool price). The regulated price has ranged between 6.8 and 10.9 times the mean market price from 2004 to 2008. As a result, over-cost has skyrocketed during this period because of the installed capacity boom explained above. It represented an 85.9% in 2008 and a 90.8% in 2007 of the retribution obtained by photovoltaic producers.

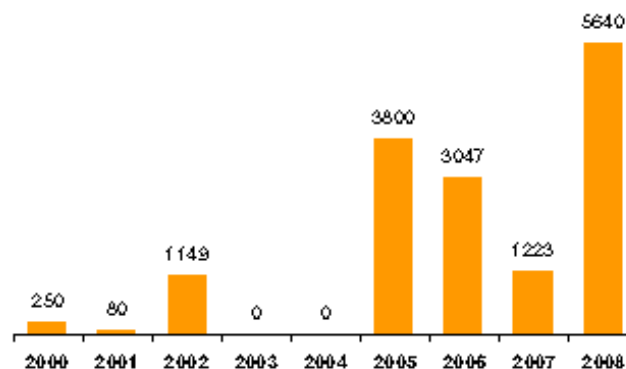
**Figure 6.- (a) Average solar price vs. average pool price per kWh. (b) Total retribution and over-cost (mill. €) of solar energy (2004-2008)**



The spectacular increase in solar plant deployment has accentuated the 2008 rate deficit. However, it will do so even more intensely in 2009, at which point every plant that became operational in 2008 will by then have an entire year online, and also because many of them, operating under RD 661, will begin billing in 2009 (around 1222 MW, inferring from CNE estimates). For 2008, the mean sale price of electricity generated from solar photovoltaic power is 7 times higher than the mean price of the pool.<sup>39</sup>

Thus, the over-cost of photovoltaic production, which has to be somehow subsidized affecting the rate deficit, is and will continue to be enormous. The accumulated rate deficit from 2000 to 2008 is around 15,189 million Euros (based on provisional settlements published by CNE). Just in 2008, it has amounted to 5,640 million Euros (over a third of the total deficit). The estimated 500% growth in installed capacity in 2008 implies that the rate deficit could increase uncontrollably in coming years.

**Figure 7.- 2000-2008 annual rate deficit (in millions of €)**



Source: From 2000 to 2007, based on the document "El déficit de tarifa"<sup>40</sup>, by "Energía y Sociedad". Rate deficit from 2008, source CNE: Settlement report for 2008<sup>41</sup>.



## Job Creation and the Cost of Government Subsidies

In table 3 we summarize the results achieved in terms of employment, subsidies and investment in the three main renewable industries. Since 2000, the renewable subsidies have created less than 50,200 jobs.<sup>53</sup> This amounts to 0.2% of Spain's workforce and 0.25% of Spain's employed workforce. We can see that the average subsidy per worker added in these three sources of renewable energies is more than half a million Euros (€571,138), ranging from €542,825 per worker added in or by the mini-hydro sector and two-thirds of a million Euros per worker added in or by the photovoltaic sector, to well over €1 million per worker added in or by the wind industry.

**Table 3.- Subsidy and investment per worker**

	Number of direct jobs	Number of indirect jobs (difference)	Total jobs	Total subsidy (spent and committed) in M€, NPV @ 4 %	Subsidy M€/ job	Total Investment (in M €)	Investment (in M€)/job
<b>WIND</b>	6825	8.175	15000	16436.38	1.095758667	14723	0.981533333879
<b>MINI-HYDRO</b>	1475	3225	4700	2551.28	0.542825532	1067.04	0.227029728682
<b>PHOTOVOLTAIC</b>	14500	0	14500	9683.48	0.667826207	16131.5	1.112517241

As shown in Table 8 the average capital employed per worker in the Spanish economy was €256,634 in 2005. Thus the wind investment per worker at €981,533 is 380% more.

**Table 8.- Average capital assignment per worker at constant prices (2008)**

<b>1995</b>	264,006
<b>1996</b>	262,858
<b>1997</b>	262,396
<b>1998</b>	261,032
<b>1999</b>	256,668
<b>2000</b>	253,835
<b>2001</b>	255,720
<b>2002</b>	259,099
<b>2003</b>	258,974
<b>2004</b>	259,353
<b>2005</b>	256,634

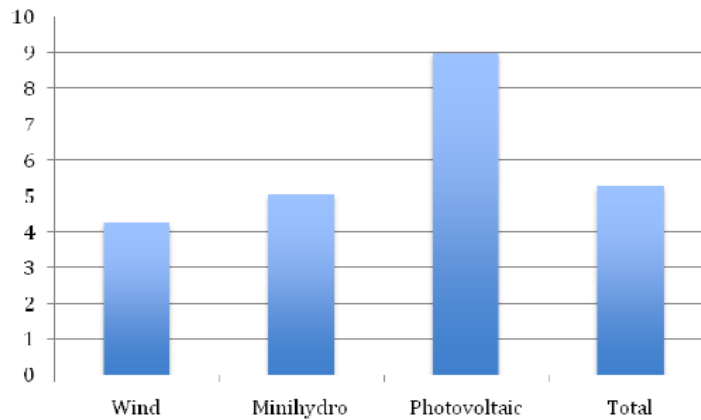
Source: Own elaboration based on INE's and BBVA (Banco Bilbao Vizcaya Argentaria) Research Foundation's publications.

Investment in green jobs will only prove convenient if the expense by the public sector is more efficient at generating wealth than the private sector. This would only be possible if public investment were able to be self-financing without having to resort to subsidies, i.e., without needing to absorb wealth generated by the rest of the economy in order to support a production that cannot be justified through the incurred incomes and costs. We have calculated that the total public subsidy in Spain, both spent and committed, totals 28,671 million Euros (€28.7 billion or appx. \$37 billion USD), and sustains 50,200 jobs.

And this leads us to the second possibility that we will mention to finance the rate deficit: an increase in taxation.

This method reduces the amount of income that consumers or businesses have available, reducing consumption and/or investment. For example, the average annuity payable to renewables is equivalent to 4.35% of all VAT collected, 3.45% of the household income tax, or 5.6% of the corporate income tax for 2007.<sup>39</sup> Regardless of whether the increase impacts consumption or investment more, the most affected sectors of the economy will be those with a greater pro-cyclical productions (such as automotive).

**Figure 10.- Employment destroyed per installed megawatt**



Source: Own elaboration.

As we can see in figure 10, each renewable megawatt installed, on average (given Spain's breakdown of individual source contributions), destroys 5.28 jobs, compared with the 4.27 jobs destroyed per megawatt of wind energy, the 5.05 jobs destroyed per megawatt of mini-hydro and the 8.99 destroyed per megawatt of photovoltaic installed capacity as a result of "green jobs" mandates, subsidies and related regimes.

**Table 11.- Destroyed employment per renewable installed megawatt in Spain 2000-2008**

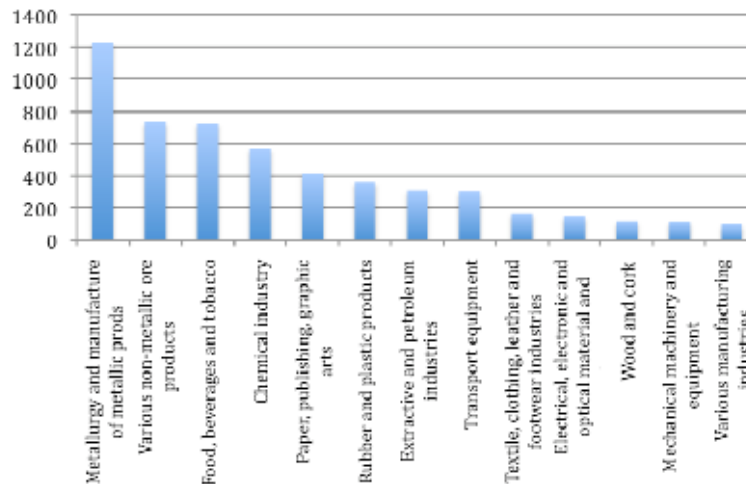
<b>Wind</b>	4.27
<b>Mini-hydro</b>	5.05
<b>Solar</b>	12.7
<b>Average</b>	5.06

Source: Own elaboration.

It is not possible to directly translate Spain's experience with similar exactitude or confidence, and claim that the U.S. should expect a loss of from 6.6 million to eleven million jobs as a direct consequence were the promise to create 3 to 5 million "green jobs" met (in addition to the jobs lost due to the opportunity cost of private capital employed in renewable energy), although the study clearly reveals that if President Obama would dedicate the massive resources needed to create those 3 to 5 million jobs, the U.S. should certainly expect its results to follow such a tendency.

It is obvious that, if the rates were to increase by 31% — or by a lower percentage which, while it would not eliminate the deficit, it would reduce it—the energy intensive companies would suffer a very pronounced decline in their profitability and would have to reduce or eliminate operations in Spain. In our country, the sectors that consume the most energy are metallurgy, non-metallic mining and food processing, beverage and tobacco.

**Figure 11.- Electricity consumption (in millions of €)**



Source: INE (National Statistics Institute). From the Energy consumption survey (2007), table "Energy consumption by groups of activity and product consumed." (In this figure, the product shown is electricity).

## Other Research Citations

Of course other studies including by U.S. academics have also noted several related impacts, for example:

- Raising energy costs kills. According to a Johns Hopkins study, replacing three-fourths of U.S. coal-based energy with higher priced energy would lead to 150,000 extra premature deaths annually in the U.S. alone (Harvey Brenner , "Health Benefits of Low Cost Energy: An Econometric Case Study," Environmental Manager, November 2005).
- Reducing emissions, a major rationale for "green jobs" or renewables regimes, hits the poorest hardest. According to the recent report by the Congressional Budget Office, a cap-and-trade system aimed at reducing greenhouse gas emissions by just 15% will cost the poorest quintile 3% of their annual household income, while benefiting the richest quintile ("Trade-Offs in Allocating Allowances for CO2 Emissions", U.S. Congressional Budget Office, Economic and Budget Issue Brief, April 25, 2007).
- Raising energy costs loses jobs. According to a Penn State University study, replacing two-thirds of U.S. coal-based energy with higher-priced energy such as renewables, if possible, would cost almost 3 million jobs, and perhaps more than 4 million (Rose, A.Z., and Wei, D., "The Economic Impact of Coal Utilization and Displacement in the Continental United States, 2015," Pennsylvania State University, July 2006)