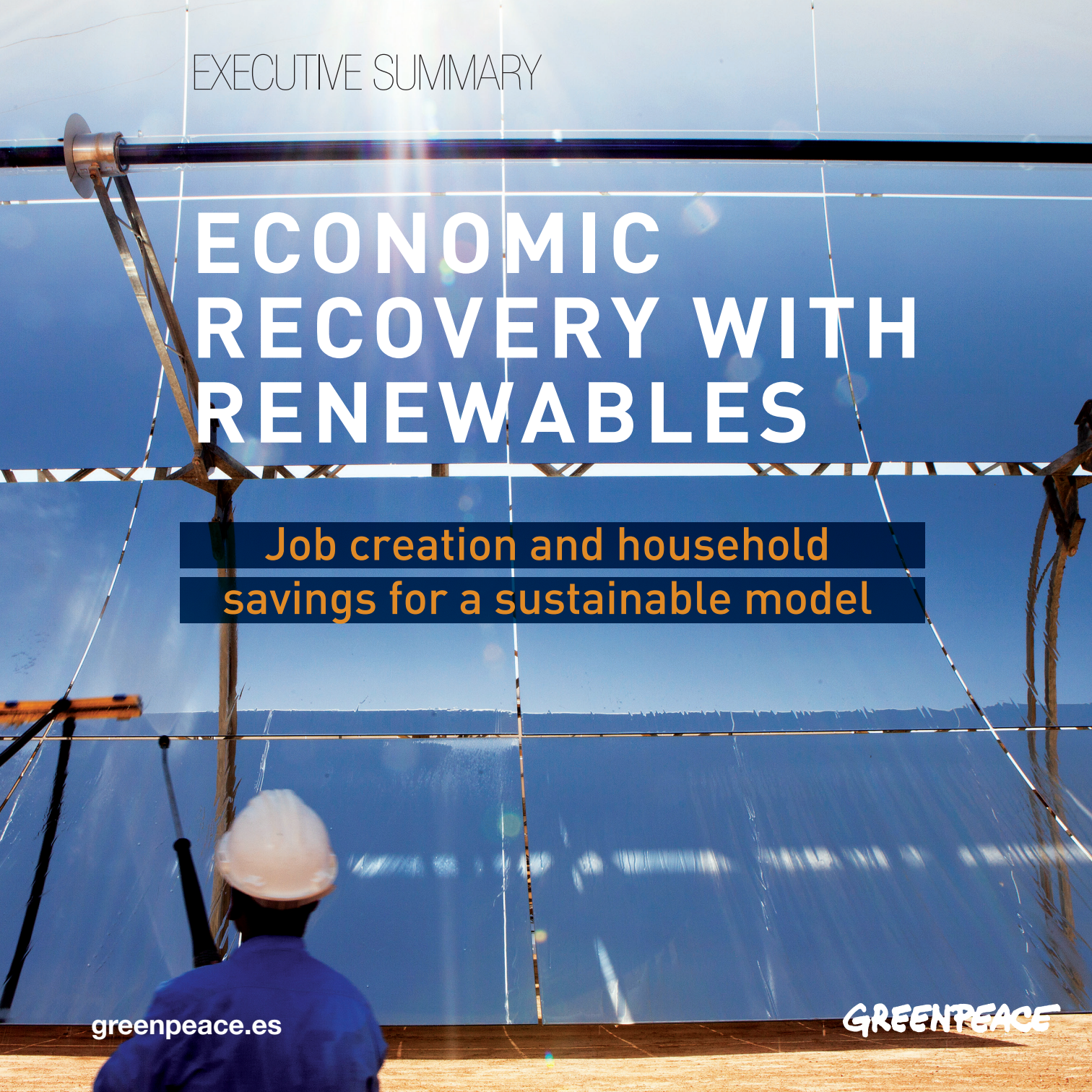
EXECUTIVE SUMMARY

ECONOMIC RECOVERY WITH RENEWABLES

Job creation and household savings for a sustainable model



GREENPEACE

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CREDITS

This summary has been elaborated by Alicia Cantero and Marina Bevacqua from the reports "El impacto de las energías renovables en la economía" and "El impacto de las energías renovables en los hogares" carried out for Greenpeace by Abay Analistas Económicos y Sociales.

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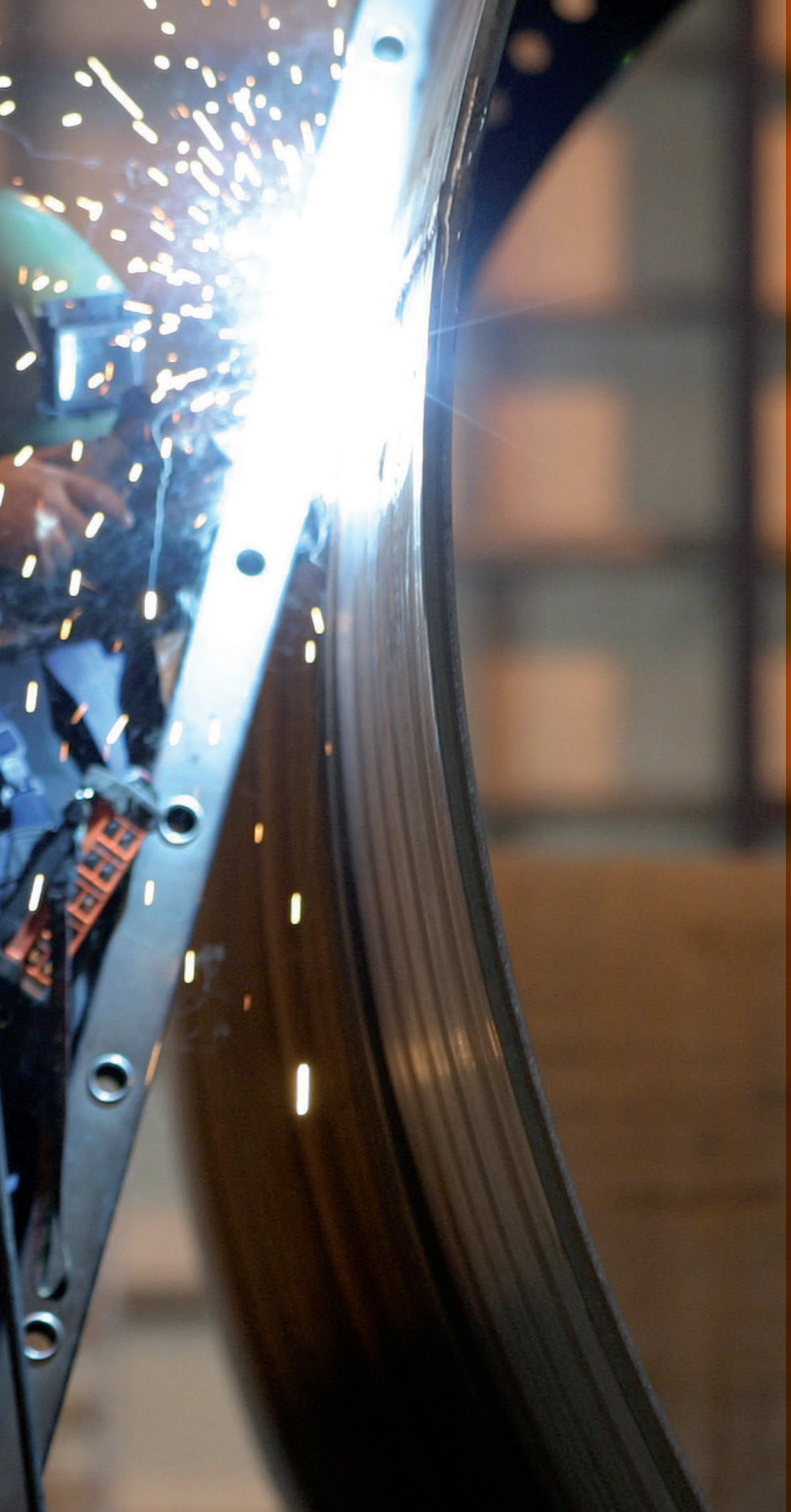
October 2014



INTRODUCTION

A change in the energy model that moves away from fossil fuels and towards renewable energies is key to tackling climate change, but also to economic progress, employment and peoples' wallets. A clear proof of this can be found in this Greenpeace executive summary based on two extensive reports by Abay Analistas Económicos y Sociales[1] for the environmental organisation.

The current energy system based on oil, gas and coal is the main cause of global warming. According to United Nations' experts, we must keep global temperature increases below 2ºC and leave at least two thirds of known fossil fuel reserves in the ground if we are to escape the worst impacts of climate change.

The Greenpeace Energy 3.0[2] report has already shown that an efficient system is technically and economically feasible, with smart demand-side management and technology based 100% on renewable energies. Nevertheless, in the last few years, the Spanish Government has blocked the development of clean energies, an energy policy U-turn, whose maximum expression is the new 2013 Energy Sector Law. This retroactively removes renewable energy incentives and the special schemes that included the support for these energies. The Government has committed to fossil fuels, the search for new hydrocarbons through fracking, off-shore drilling at the Canary Islands, Costa del Sol/Alborán Sea, Balearic Islands/Gulf of Valencia, Catalonia and Cantabrian Sea[3].

So, how has Spain gone from leading the change towards renewables, to blaming them for rising energy bills and the tariff deficit[4]? The main reason is the threat to major energy companies' bulk investments in fossil fuels, which has led to formidable lobbying[5].

This year, the European Union decides on energy and climate goals for 2030, an opportunity that the Spanish Government should take advantage of, to put Spain back at the forefront of world leadership in renewables development and to put an end to 86.2% dependence on foreign energy supplies. The real solution lies in clean energy.

The study La recuperación económica con renovables[6] (Economic recovery with renewables), offers a detailed vision on the effect that a real breakthrough in renewables would have on the economy, employment and the cost in household energy bills from 2015 to 2030. It delves into the effects of energy costs on people, above all, the most vulnerables, obliged to spend excessive amounts of their incomes on electricity and gas.

This Greenpeace report offers more arguments and information that enrich the debate on renewables' contribution to a sustainable future, not only to the environment, but also socially and economically, as well as the need for their urgent development.

METHODOLOGY

The study measures how the growth of renewable energies would affect the economy, jobs and the cost of energy in different households in three distinct scenarios with a view to 2030.

Two different types of comparative analyses have been undertaken: one called 'input-output,' which measures the impact of investment in renewable electricity generation on the economy as a whole, and a microsimulation model to determine the impact of the advance of clean energies on households.

The **input-output analysis** is a tool that is used to gauge the economic impact of some sectors on others and provides detailed information on an important number of macroeconomic variables, such as gross domestic product or employment. The database has been put together using the latest input-output tables (IOT) published by the Instituto Nacional de Estadística (Office of National Statistics) (INE, 2012)[7]. Furthermore, the electricity sector has been subdivided into eight sectors, six of them of renewable energies[8].

The impact assessment is complemented by three analyses on the specific effects on job creation, the fiscal aspect and the reduction in CO2 emissions within each scenario.

The development **of renewables along with energy efficiency measures and intelligence**[9] in the distinct scenarios will also affect households' economies through energy bills[10]. To understand the impact, a **microsimulation model**[11] has been designed using the Encuesta de Presupuestos Familiares (Family Budget Survey) (INE, 2012) permitting the obtention of tailored data for each type of household and more accurately assess the effects of the different measures in each scenario. The analysis considers the variation on the energy bill among the different households in each scenario and measures the effort that each type of household would have to make to pay the bill according to the percentage of income assigned to this expense.


SCHOTT
solar

2030 ENERGY SCENARIOS

The three energy scenarios utilised in this report relate to 2030. They demonstrate how much energy would be used, how it would be supplied and what proportion of renewable sources would cover the demand. They present distinct trajectories, highly advanced to less advanced, in order to reach a smart, efficient and 100% renewable energy system by 2050[13].

The scenarios vary in relation to the pace of renunciation of fossil fuels and nuclear power for their substitution by renewables. The way in which energy demand is met is also different, with ever increasing usage in sectors like transport or heating/air conditioning. The total final energy consumption is very distinct, also characterised by the different degrees of implementation of energy efficiency measures, self-supply and intelligence.

The three scenarios compared in this study are a development to 2030 of those undertaken in the *Energy 3.0* report. *Economic Recovery with Renewables* analyses the economic and social impact of these technical scenarios in Spain:

CONSERVATIVE SCENARIO.
This reflects the situation in 2030 if we remain committed to a limited reduction in polluting emissions. Its high percentage of conventional energies and high energy demand is environmentally unsustainable. Electricity would cover more than 28% of total energy consumption and the proportion of renewable electricity generation would be 29.6%[14].

PROGRESSIVE SCENARIO.
Renewables, efficiency measures and intelligence are gradually and proportionally incorporated into the energy mix. Energy demand is less than in the conservative scenario but more than in the responsible one. Electricity would cover 33.5% of total energy consumption. Renewable electricity generation in this scenario would rise to 67.6%.

RESPONSIBLE SCENARIO.
To tackle climate change, we would see the intensified incorporation of renewables, efficiency and intelligence. Compared to the other scenarios, energy demand would considerably decline and we would be able to almost completely dispense with fossil fuels. Electricity would cover 42.5% of total energy demand and would supply a large part of transport and heating/air conditioning consumption. Renewable electricity generation in this scenario would rise to 94.7%.

MAIN FINDINGS

JOB CREATION AND OTHER ECONOMIC BENEFITS THANKS TO RENEWABLES

The progressive replacement of conventional energies for renewables into the energy system would be a boost for the country's economy and jobs.

Strong **investment in new renewable** plants would be one of the principle drivers towards considerable economic growth and rising employment in the considered period, 2015-2030. It would also be an important source of income through the taxation of renewable energy enterprises, for the most part, local administrations.

Renewable electric power generation with the resulting electric system in 2030 would, likewise, generate wealth, employment and environmental benefits with an important reduction in CO2 emissions. The responsible scenario would make a noticeable difference.

In this chapter we present the main results on the overall effect of investments in renewables and electricity generation in the economy as a whole, especially employment, comparing the three scenarios considered for 2030. It also provides results on taxation and saving in polluting emissions.

Table 1 Economic and environmental benefits of investing in renewables
Source: Abay Analistas for Greenpeace

Period 2015-2030	PRODUCTION		JOBS (full-time equivalent, FTE)	
	Millions of euros	Rate of change compared to 2012 (%)	Number of jobs (FTE)	Rate of change (%)
Conservative scenario	150,383	8.10%	823,200	4.76%
Progressive scenario	377,567	20.3%	2,106,879	12.2%
Responsible scenario	545,160	22.7%	3,053,163	17.7%

IMPACT OF INVESTMENT OVER THE PERIOD 2015-2030

JOB CREATION

Each of the distinct scenarios examined imply an increase in the percentage of renewable sources for electricity generation, with major investment in new plants[15]. The necessary annual investment between 2015 and 2030 would be €5,42bn, €13,55bn or €19,54bn depending on the chosen scenario. Under the conservative scenario, investment in new plants would generate an increase in production[16] of €150.383bn and a net creation of 823,200 jobs[17]. This would suppose an increase in production of 8.1% and 4.76% in jobs compared to 2012.

The responsible scenario, with higher investment and therefore a greater impact, would increase production by €545.16bn and create a total of 3,053,163 new jobs in new plant build. This implies an increase of 22.7% in production and 17,7% in employment compared to 2012. On the other hand, the progressive scenario has intermediate values with respect to the other two in every aspect (see table1).

WORKER PROFILE

Bearing in mind the allocation of budgets in the investment projects, the sectors that would most benefit in any of the three scenarios would beproduction of mechanical machinery and equipment as well as production of mechanical machinery and electrical equipment.

The **Construction sector**, other business services sectors (mainly **engineering and technical assessment**) and public administrations would also see the most gains (see table 2).

Table 2 Activity sectors benefiting from investment in new renewable energy plants

Source: Abay Analistas and CNAE (National Classification of Economic Activities by its initials in Spanish) 2009

Sectors, period 2015-2030	Conservative scenario		Progressive scenario		Responsible scenario	
	Millions of euros	%	Millions of euros	%	Millions of euros	%
Production of mechanical machinery and equipment	40,394	49.7	92,463	45.5	130,388	44.5
production of mechanical machinery and electrical equipment	16,262	20.0	41,519	20.4	60,007	20.5
Building	11,385	14.0	31,395	15.4	46,704	15.9
Other business activities	5,848	7.2	21,539	10.6	32,995	11.3
Public Administration	3,595	4.4	7,838	3.9	10,914	3.7
Real estate	1,547	1.9	5,034	2.5	7,562	2.6
Extraction of non-metallic minerals	443	0.5	1,714	0.8	2,634	0.9
Extraction of metallic minerals	1,750	2.2	1,791	0.9	1,821	0.6
TOTAL	**81,224**	100	**203,293**	100	**293,025**	100

In all scenarios the majority of employees would have an average age of **between 26 and 45 years** (figure 1). These people would occupy around 60% of the new posts in any of the three scenarios (see table 3).

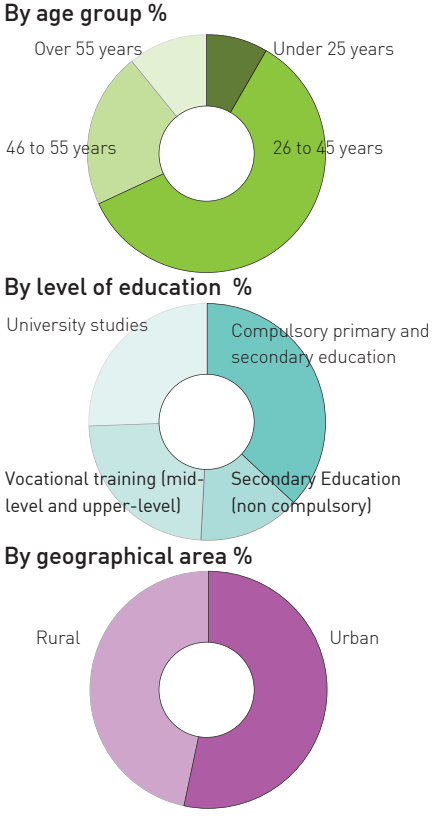
About 37% of the new jobs would be occupied by professional staff with compulsory or secondary education, another 23.8% would be taken up by people with vocational training along with 25.3% of workers with university degrees.

This type of employment would be spread between rural and urban areas, achieving greater territorial cohesion: close to 54% of workers would be based in urban areas and the other 46% rural based.

Table 3 Job creation by worker profile for each scenario
Source: Abay Analistas for Greenpeace

Number jobs in full-time equivalent (FTE)	Conservative scenario	Progressive scenario	Responsible scenario
TOTAL	**823,199**	**2,106,878**	**3,053,162**
By age group			
Under 25 years	70,359	181,015	262,727
26 to 45 years	489,188	1,256,213	1,821,752
46 to 55 years	175,557	447,383	647,594
Over 55 years	88,096	222,267	321,089
By level of education			
Compulsory primary and secondary education	308,488	779,323	1,127,869
Secondary Education (non compulsory)	113,100	292,280	424,367
Vocational training (mid-level and upper-level)	199,657	500,822	722,523
University studies (1st and 2nd cycle and doctorate)	201,954	534,454	778,404
By geographical area			
Urban	438,088	1,128,841	1,637,425
Rural	385,112	978,038	1,415,738

FIGURE 1 Job creation by worker profile for each scenario
Source: Abay Analistas for Greenpeace



INCREASE IN GDP

In the conservative scenario, investment in renewables would lead to an increase in gross domestic product (GDP) of some €5bn per year. This would signify a 2012 GDP annual growth of 0.5 percentage points per year over the period 2015-2030. The progressive scenario would have an annual impact close to €13bn, representing 1.4% of GDP per year, and the responsible scenario would reach €18.5bn, around a 2% increase in GDP. All of it sustainable throughout a decade and a half (see table 4).

Table 4 The impact of renewable investment on GDP
Variation with respect to the base scenario (2012)
Source: Abay Analistas for Greenpeace

	Overall for the period 2015-2030		Annual impact on GDP	
	Millions of euros	Rate of change on 2012 (%)	Millions of euros	Rate of change compared to 2012 (%)
Conservative scenario	76,703	8.10%	5,114	0.5
Progressive scenario	192,578	20.3%	12,839	1.4
Responsible scenario	278,058	29.4%	18,537	2.0

IMPACT ON ELECTRICITY GENERATION WITH RENEWABLE ENERGIES IN 2030

Apart from investment in new plants, electricity generation with renewable sources would itself create economic and employment advantages.

JOB CREATION

The resulting 2030 energy system with renewables would create 34,900 jobs in the conservative scenario, approximately 115,200 in the progressive case and 203,697 jobs in the responsible one. In this last option, direct and indirect employment created by renewables would be almost eight times more than 2012, which amounted to 27,000 jobs[18].

Solar thermoelectric energy would be the main source of employment in the progressive and responsible scenarios, generating more than 53,000 and 105,000 jobs respectively, followed by wind powered energy creating some 38,000 jobs in the progressive and 62,500 in the responsible scenario. With the responsible option, the number of direct and indirect jobs created by solar thermoelectric would be 36 times higher than 2012 and almost 22 times more than wind.

Table 5 The principle annual benefits of renewable generation in the electricity sector
Source: Abay Analistas for Greenpeace

	Year 2030		
	Conservative scenario	Progressive scenario	Responsible scenario
Production (millions of euros)	17,940	46,016	76,924
Gross added value (1) (millions of euros)			
Wind	4,240	10,565	17,378
Solar photovoltaic and thermal	489	1,412	2,421
Solar thermoelectric	905	6,695	13,252
Biomass energy	698	569	347
Geothermal and waves	0	429	921
Mini-hydraulic	1,560	2,594	3,616
Total	7,892	22,264	37,936
Direct and indirect job creation (jobs FTE)			
Wind	15,250	37,994	62,498
Solar photovoltaic and thermal	3,627	10,485	17,977
Solar thermoelectric Thermal solar	7,176	53,059	105,021
Biomass energy	4,770	3,894	2,375
Geothermal and waves	0	2,920	6,275
Mini-hydraulic	4,120	6,852	9,550
Total	34,943	115,203	203,697

(1) This corresponds to the total output of goods and services in the economy minus the total intermediate consumption used in all production processes.

INCREASE IN GDP

Renewable energies have a great capacity to create added value and contribute to GDP (see table 5).

The renewable electricity sector in the responsible scenario would contribute €37.936bn in the year 2030, five times as much as what the conservative scenario would offer.

FISCAL CONSEQUENCES

Renewable energy investment and production are subject to a specific tax framework, in addition to the general taxation of any type of economic activity. Therefore, the different taxes are mainly addressed to renewable enterprises and are collected by the different administrations: national, regional and local.

The fiscal impact of investments in the installation of new renewable energy generation plants has two distinguishing components for the companies involved:

- Local taxes associated with the implementation of the projects. Taxes and fees that the councils levy on new plant build: the tax on constructions, installations and works (ICIO -by its initials in Spanish), as well as distinct fees and licences.
- Collection linked to economic activity (production of goods and services) generated by investments in the sector activities involved: corporation tax, social security contributions or the tax on the value of the production of electrical energy (IVPEE -by its initials in Spanish) at the national level; the levies on wind power at the regional level as well as the tax on immovable property (IBI -by its initials in Spanish) and the tax on economic activities (IAE-by its initials in Spanish) at the local level.

Table 6 Tax collection associated with investment in new renewable power plants
Source: Abay Analistas for Greenpeace

(Millions of euros)	Period 2015-2030)		
	Conservative scenario	Progressive scenario	Responsible scenario
Local taxes associated with the implementation of the projects			
Wind	1,031	2,080	2,841
Solar photovoltaic and thermal	2,531	3,726	4,592
Solar thermoelectric	1,064	4,113	6,322
Biomass energy	152	156	158
Mini-hydraulic	0	0	50
Geothermal	**0**	**26**	**45**
Subtotal	4,779	10,100	14,008
Taxes linked to the economic impact of the investments			
Net taxes on products	613	1,605	2,336
Other net taxes on production	14	41	61
Social contributions	5,498	14,249	20,711
Subtotal	**6,125**	**15,895**	**23,108**
Total	**10,903**	**25,995**	**37,116**

Other taxes not directed at businesses are collected through income tax and paid by the workers in the sector. VAT and other special taxes are applied to the consumers.

We would also see a rise in tax collection linked to higher employment through income tax and social security contributions paid by the workers.

The construction of new renewable power plants over the period 2015-2030 would suppose a significant source of fiscal revenue. Tax collection from investment[19] in the conservative scenario would reach a total of €10.903bn, €25.995bn in the progressive and €37.116bn in the responsible scenario (see table 6).

A large part of these revenues would go to local councils. Local tax collection associated with the distinct scenarios in the period 2015-2030 would reach €14bn in the responsible scenario. These taxes would mainly affect small rural municipalities where the majority of new plants would be located. We would also see a rise in local council revenues due to taxes linked to production (economic activity, immoveable property), less than the previous mentioned ones but significant none the less.

The highest revenues would come from social security contributions from the newly created jobs. Employment creation in the responsible scenario linked to the construction of new renewable plants would amount to over 3 million jobs and with tax revenues of over €20.7bn for the whole period.

CO_2 EMISSIONS REDUCTIONS

Reducing CO_2 and other greenhouse gas emissions is the main aim of a sustainable energy model, both environmentally and socio economically. The key lies in renewables, energy efficiency plus a smart technological system and demand-side management.

In the reference year of this study, 2012, renewable energies prevented the emission of 31.48 million tonnes of CO_2[20] into the atmosphere, or to put it another way, they impeded around a third of polluting emissions. In the same year, conventional energies emitted some 61.75 million tonnes of CO_2 into the atmosphere, so that figure would have been 93.23 million tonnes if had not been for the presence of renewables in the energy mix.

The large of contribution of renewable energy in the power generation system in 2030 would bring about a significant reduction of CO_2 emissions. This could be achieved in the progressive scenario but, above all, in the responsible one.

Electricity generation in the conservative option in 2030 would provoke 203.25 million tonnes of CO_2[21]. In the present context of advancing climate change this figure would be impossible to assume, as it would triple the emissions of the current electricity system (see table 7).

Emissions would total 94.5 million tonnes in the progressive scenario and 15.7 million tonnes in the responsible one. This would imply a reduction of close to 75% of polluting emissions (46 million tonnes less) compared to 2012. Furthermore, this considerable reduction would be achieved in a scenario where 40% of energy needs would be covered by the electrical system (95% renewable), avoiding emissions from the burning of fossil fuels in the other sectors such as transport and heating/air conditioning.

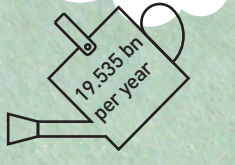
Table 7 CO_2 emissions in the electricity sector
Source: Abay Analistas for Greenpeace

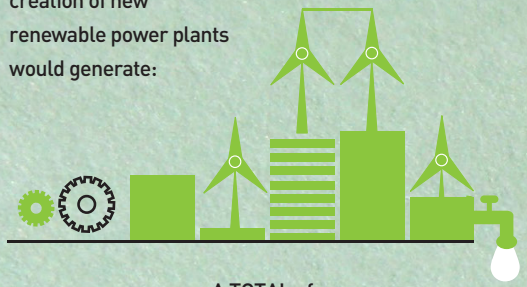
	Year 2030		
	Conservative scenario	Progressive scenario	Responsible scenario
CO_2 emissions (tonnes)			
Electric energy sector emissions	203,152,850	94,489,841	15,714,378
Emissions per TWh generated	312,500	143,796	23,731
Emissions per GW installed	1,012,743	452,758	73,236

INVESTMENT

FROM 2015 TO 2030

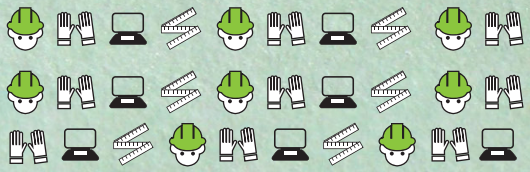
An annual investment of €19.535 bn linked to the creation of new renewable power plants would generate:





A TOTAL of

3,053,163 JOBS



An ANNUAL increase in GDP of around

2 POINTS

compared to 2012

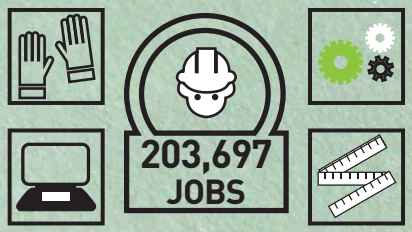
TOTAL economic growth of

€545.160 BN

in aggregated production

RESULT IN 2030

ELECTRIC GENERATION THROUGH RENEWABLES WOULD RESULT IN:



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A CONTRIBUTION TO THE GDP OF €37.936 BILLION

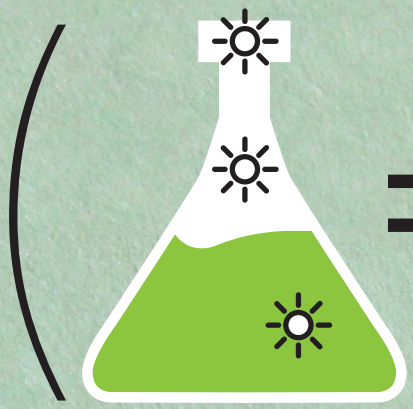
A **95%** RENEWABLE ELECTRIC SYSTEM:

would release

75% LESS CO_2

THAN IN 2012 AND IT WOULD AVOID EMISSIONS IN OTHER SECTORS SUCH AS TRANSPORT OR BUILDING

RENEWABLES



AN ENERGY SYSTEM
POSITIVE RESULTS FOR
BILL

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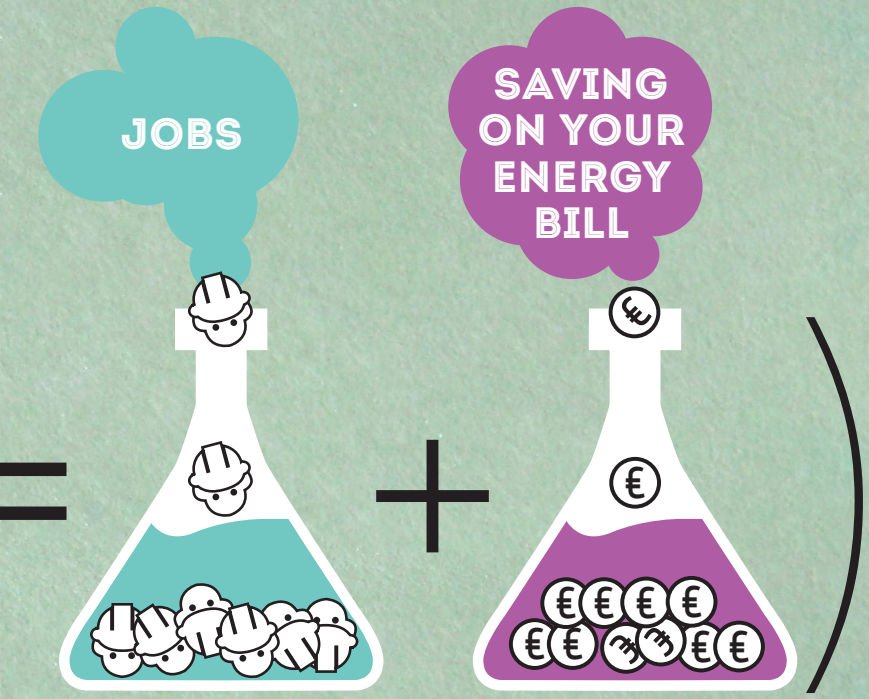


BASED ON RENEWABLES GENERATES VERY
R THE ECONOMY, JOB CREATION, HOUSEHOLD
LS AND FOR ENVIRONMENT

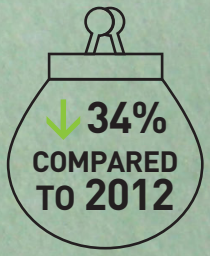
ORMULA FOR A NABLE FUTURE

GREENPEACE

BILL

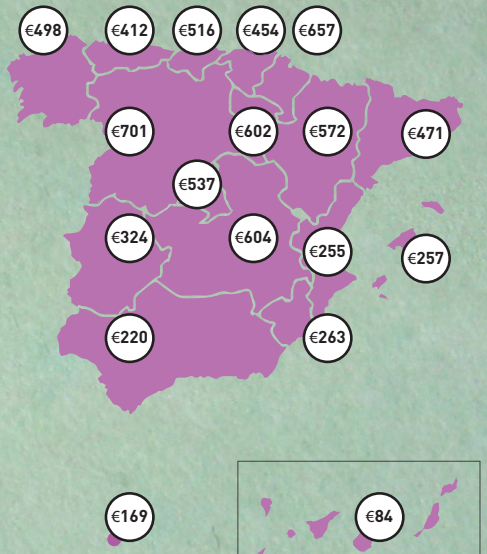
Only with **renewables, eficiency and smart demand-side management** will energy consumption and expenditure be reduced in all households. The greatest benefit would be for the most vulnerable.

Households **ENERGY BILLS** (heating, electricity...) **REDUCED** by



AVERAGE ANNUAL SAVING

BY HOUSEHOLD IN **2030**



TOWARDS A CHEAPER ENERGY FUTURE

THANKS TO RENEWABLES, EFFICIENCY AND INTELLIGENCE

Household energy bills would fall with the improving presence of renewable energies in the different scenarios to 2030.

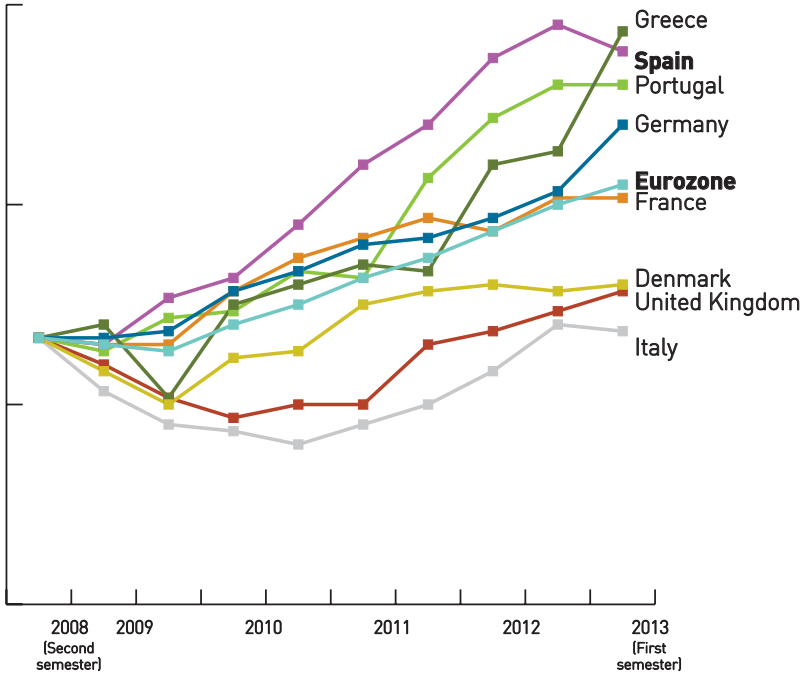
CURRENT SITUATION OF ENERGY EXPENDITURE

EVOLUTION OF ENERGY COSTS SINCE THE START OF THE ECONOMIC CRISIS

In recent years the cost of the two main sources of household energy, electricity and gas, has risen throughout Europe, but no other country has had to cope with such an increase in price as in Spain, especially in the electricity bill.

According to Eurostat data, when comparing the change in the electricity price for average Spanish domestic consumers between 2008 and 2012 with the change given in other European countries, there is no doubt that this price rise is the second highest in the whole eurozone over the last five years, only surpassed by Greece (figure 2). The average consumer in Spain has seen an increase of 43% compared to a eurozone average of 23%.

FIGURE 2 Evolution of electricity costs for domestic consumers
Source: Eurostat



This increase in the price of electricity comes along with the growing trend in energy consumption and the greater use of electricity to supply the energy needs at home. The high level of electrification promotes to to focus our efforts on increasing renewables in the electrical sector by progressively, but also rapidly, removing polluting energy sources.

RENEWABLE ENERGY INCENTIVES AND THE RISE IN THE ELECTRICITY BILL

Some voices claim that the increase in the price of electricity has been caused by the renewable incentive policy (the feed in premium), because as these energies have grown into the electrical mix, the total cost in premiums to renewable energies paid by consumers has also grown.

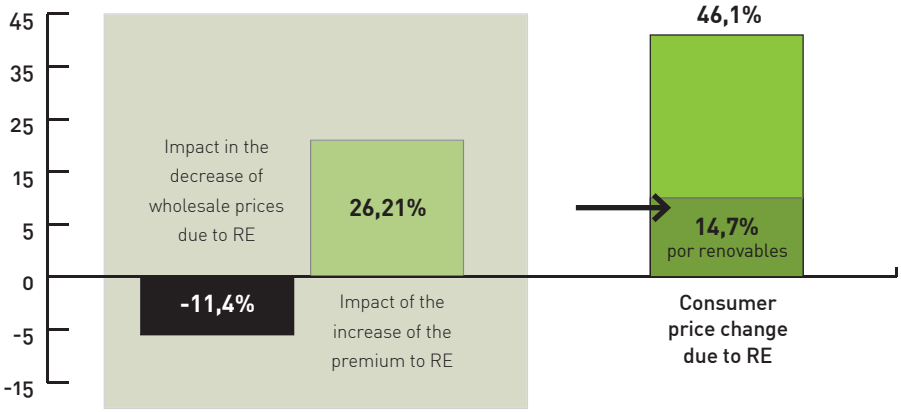
However, other European states show that this relation can not be generalised: according to Eurostat data, countries with similar or higher growth of renewables in the mix than Spain, show a much smaller rise in the price that the consumers have to pay for electricity. This is the case of Italy or Denmark, which have only raised these prices by 1% and 8% respectively between 2007 and 2013.

In economic terms, the main impact of renewable energy growth on households is the price of their energy bills (final cost) and it would directly affect two basic elements of the bill: wholesale market prices and the incentive premiums[22].

There is a major consensus[23] that believes renewable electricity generation reduces wholesale electricity prices. However, the final effect on the consumer's electricity bill has been more controversial as it involves two complex factors: whether or not lower wholesale prices compensate for the increase in premiums and the influence that wholesale prices and incentives weigh on the final price.

If the variation in price for electricity for the period 2008-2012 is taken into account, the fall in wholesale prices provoked an 11.4% reduction in the final price (figure 3). Likewise, the rise in incentive premiums affected household costs, raising electricity bills by 26.2%. Therefore, the net effect of renewable energies on the final cost paid by households rose 14.7%, an important figure, but a long way from the 46.1% increase observed over the period.

FIGURE 3 The influence of renewable energy incentives on the rise in price of the electricity bill in the period 2008-2012.
Source: Abay Analistas for Greenpeace



Renewable energy premiums have had a limited effect on the rise in the electricity price. The increase in the price of electricity is therefore conditioned by other factors related to the regulatory framework and the specificities of the national electricity markets that determine the major components of the total cost of energy.

INCREASE IN HOUSEHOLD ENERGY POVERTY

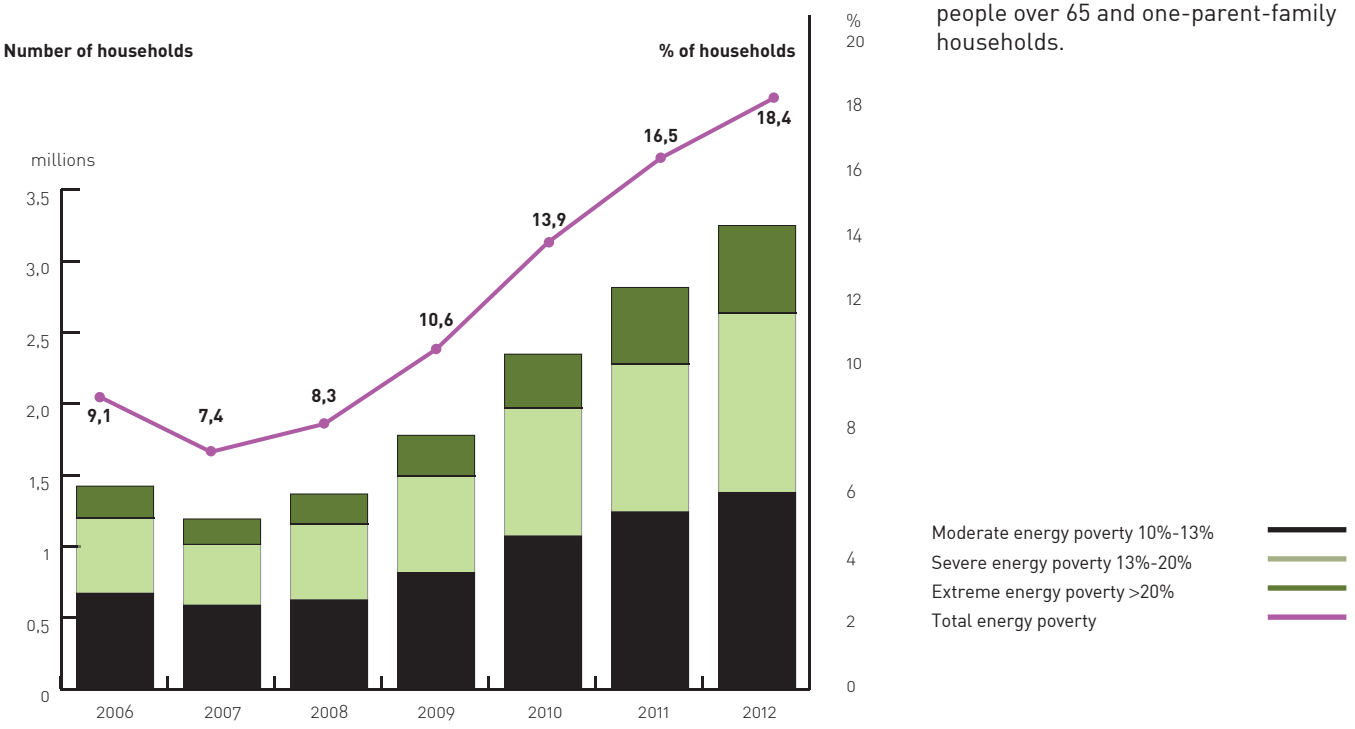
In recent years Spanish families have faced soaring energy costs in their homes which has coincided with significant reductions in average incomes due to the economic crisis. The costs that households have had to dedicate to energy bills[24] have grown 68% on average between 2006 and 2012. As a result, **energy poverty[25] now affects 3,250,000 households (18.4% of the total)** according to data from the 2012 Family Budget Survey. The rapid rise in energy poverty over recent years is evident when compared to 2007 data when 1,200,000 households (7.4%) were in this situation.

There are various categories of energy poverty: those homes spending 10%-13% of household income on energy costs are considered to be at moderate energy poverty level, 13%-20%, severe; over 20%, extreme.

All energy poverty categories have seen a rise in the number of households affected in recent years, however, those in the most difficult situations have risen much faster (figure 4): extreme energy poverty has increased by 244% affecting some 613,000 families in 2012; severe energy poverty by 195%, affecting 1,258,000 homes. This is mainly seen in low-income households: 38% of households with incomes of between €500 and €1000 per month are in energy poverty, this especially affects people over 65 and one-parent-family households.

FIGURE 4 Evolution of energy poverty in Spain

Source: Family Budget and Abay Analistas Continuous Survey



Household energy expenditure is a basic cost that cannot be renounced and the future energy model set out must not only be sustainable for the environment but also for family economies, especially the most vulnerables.

EVOLUTION OF ENERGY EXPENDITURE IN THE DIFFERENT 2030 SCENARIOS

The results of the impact assessment on households[26] shown below, take into account the advance of renewables, together with two key elements: higher or lower household energy consumption due to the implementation of efficiency measures and smart demand-side management as well as the different levels of electrification and self-supply.

The study demonstrates how greatly advancing the three factors considerably reduces household energy bills[27] and especially benefits the most vulnerables.

ELECTRICITY BILL

The greatest economic impact on homes with the increase in renewable energies would be the price variation on what households pay in the electricity bill.

One of the elements determining this variation is wholesale prices. The estimated evolution[28] of electrical energy prices for 2030 show that wholesale prices could notably fall with the increase in renewable energies in final consumption (see table 8). We could expect falls of 6%, 55%, and 83% in 2030 with respect to 2012, according to the chosen scenario.

The second element determining the evolution of household electricity expenditure is the evolution offeed in premium[29]. 2012 data places the unit unit of feed in premium[30] for combined renewable energies at 9.7 c€/kWh.

Table 8 Estimated evolution of electricity prices for 2030

Source: Abay Analistas for Greenpeace

	2012	Year 2030		
		Conservative scenario	Progressive scenario	Responsible scenario
RE share in the production of electricity generation (Iberian peninsular system)	25.6	29.6	67.6	94.7
Increase with respect to 2012 (%)		**4.0**	**42.0**	**69.1**
	2012	Conservative scenario	Progressive scenario	Responsible scenario
Wholesale price (€/MWh)	47.3	44.4	21.5	8.1
Decrease in the wholesale price compared to 2012 (%)		**-6.0**	**-54.6**	**-82.9**
Unit premium (cents of €/kWh)	9.7	5.9	7.5	5.7
Decrease in the unit premium compared to 2012 (%)		**-39.8**	**-22.6**	**-41.0**
Electrical energy load cost and premiums costs in total energy expenditure	2012	Conservative scenario	Progressive scenario	Responsible scenario
Total cost of electric energy / total cost of energy (%)	41.7	36.8	16.1	6.5
Premiums to renewables / total cost of energy (%)	16.7	15.4	40.8	47.0
Impact on the unit price paid by consumers.				
Variation with respect to 2012 (%):		**-8.3**	**-18.0**	**-24.7**
Variation by premium		-6.1	-9.2	-19.3
Variation in the wholesale price		-2.2	-8.8	-5.4
Consumer expenditure of 400 Kwh/month.	64.0	58.7	52.5	48.2

Nevertheless, the development of renewable technologies is very important, as their generation costs would be greatly reduced between now and 2030 and the premiums would evolve to reflect this.

The unit of feed in premium on all renewables would respectively be €0.59, €0.79 and €0.57 per kilowatt/hour for 2030 against the 9.7 c€/kWh in 2012.

The results obtained in this study to 2030 show that any increase in renewable electricity generation ALWAYS implies a reduction in the price paid by the consumer in the electricity bill. The greater the presence of renewables, the greater the savings: the consumer would pay 8% less in the conservative scenario and 25% less in the responsible scenario.

So, the consumer on 400 kWh in 2012 with a monthly bill of €64 would see this drop to €58.7, €52.5 and €48.2 in the distinct scenarios.

FAMILY ENERGY CONSUMPTION

Apart from the fall in price in electricity bills associated with renewables, we have to take into consideration other elements that influence the cost of household energy bills in the 2030 scenarios. One of those is the greater or lesser implementation of efficiency measures and smart demand-side management that would impact on energy consumption. Another factor is the increase in demand for electrical energy related to greater electrification in households[31].

The varying degree of electrification in households would lead to greater or lesser usage of fuel for heating, which would also determine energy costs.

Lower levels of efficiency measures smart demand-side management in the conservative scenario, as well as in the progressive, would bring about higher energy consumption in both cases[32].

This, together with higher levels of household electrification, would still leave us reliant on fossil fuels and energy consumption in these two scenarios would rocket.

Table 9 Average household energy consumption by energy source

Source: Abay Analistas for Greenpeace from Family Budget Survey (2012)

Amount in absolute value (euros)	Year 2012	Year 2030		
		Conservative scenario	Progressive scenario	Responsible scenario
Average expenditure in electricity	797	3,028	1,634	736
Average expenditure in natural gas	212	399	186	31
Average expenditure in liquefied gas	64	120	56	9
Average expenditure in liquid fuel	113	213	99	17
Average expenditure in solid fuel	13	9	4	1
TOTAL EXPENDITURE IN ENERGY	**1,199**	**3,769**	**1,979**	**793**
TOTAL EXPENDITURE IN THE HOUSEHOLD	**28,152**	**30,722**	**28,931**	**27,746**
Change in the expenditure Rate of change with respect to 2012 (%)				
Average expenditure in electricity		280.0	105.0	-7.7
Total expenditure in energy		214.3	65.0	-33.8
Total expenditure in the household		9.1	2.8	-1.4

With the conservative option, electrical energy consumption would increase by 280% and total energy consumption by 214.3%. This would imply a 9.1% rise in total household energy expenditure with respect to 2012. The impact on households in the progressive scenario would be less negative than the previous case, but they would still be unfavourable (see table 9).

The consumer would only see savings in the responsible scenario, thanks precisely to the integration of efficiency measures and intelligence, permitting a reduction in energy consumption. In this case, the high level of household electrification would not trigger soaring consumption, allowing homes to almost completely do away with fuel use. **Household energy expenditure would fall by 34% with respect to 2012.**

Table 10 Average household expenditure to pay energy bills

Source: Abay Analistas for Greenpeace from Family Budget Survey (2012)

% of expenditure by income	Year 2012	Year 2030		
		Conservative scenario	Progressive scenario	Responsible scenario
Expenditure in electric energy	3.6	13.6	7.4	3.3
Expenditure in other sources of energy	1.8	3.3	1.6	0.3
Total expenditure in energy	5.4	17.0	8.9	3.6

HOUSEHOLD COSTS

The amount of average household income needed to pay energy bills would soar under the conservative scenario by up to 17% (see table 10), indicating that the great majority of the country's homes would find themselves in energy poverty. In the progressive scenario, the average economic effort would be very high too (8.9%). Only under the responsible scenario would we see a fall with respect to 2012: from 5.4% to 3.6%.

The results of this analysis demonstrate the importance of taking further and decisive steps towards an energy model with an integrated strategy, not only to deal with the introduction of renewables, but also the implementation of efficiency measures and smart demand-side management.

IMPACT BY TYPE OF HOUSEHOLD

Higher or lower household energy consumption is determined by the characteristics of the housing, the level of occupation and/or the area of residence. Single-occupancy housing, rural areas or the regions in the interior of the Iberian Peninsula have higher energy consumption and in absolute terms would be most affected by cost variations.

In the conservative and progressive scenarios, the highest increase in costs in absolute terms is observed in those homes that consume most electricity: couples with children, homes with two or more occupants, homes with monthly incomes above €2,000, those living in family homes or high category or luxury urban residential areas (see table 11).

Table 11 Variation in energy bill costs by type of housing

Source: Abay Analistas for Greenpeace from Family Budget Survey (2012)

Variation in euros with respect to 2012	Year 2030		
	Conservative scenario	Progressive scenario	Responsible scenario
Total households	**2570**	**780**	**-406**
Type of building			
Family home	3232	896	-661
Family terraced or semi-detached home	2821	857	-441
With less than 10 flats	2409	750	-345
With 10 or more flats	2387	732	-363
Other	1716	522	-268
Area of residence			
Urban, luxury	4339	1208	-883
Urban, high	3233	973	-525
Urban, medium	2489	768	-370
Urban, low	2236	716	-285
Rural, industrial	2638	655	-679
Rural, fisheries	2498	776	-358
Rural, farming	2727	765	-540

These high energy-consuming homes would make the most savings in absolute terms in the responsible scenario, but in this scenario we would see homes in rural areas (industrial and agricultural) benefiting most.

This is due to the current, relatively high, usage of fuel (mainly heating oil), which would be substituted by electricity at a greatly reduced cost in this scenario.

MOST VULNERABLE GROUPS TO SEE GREATEST BENEFIT IN THE RESPONSIBLE SCENARIO

The negative or positive impact resulting from energy expenditure variation would not be the same in all households. In relative terms, the benefits would be significantly higher in the vulnerable ones, as they pay a much higher percentage of their incomes to obtain their electricity than the average.

Households benefiting most from price falls linked to renewables would, by and large, be those most economically or socially vulnerable: single-parent family households, those occupied by 65s or over, households with no one in work, those with monthly incomes below €500 or homes in deprived urban areas.

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If we compare with 2012, households with people at the age of 65 or over would see their percentage of income destined to the energy bill fall by 2.7 percentage points, 2.5 for unemployed households and 4.8 for homes with monthly incomes below €500 (see table 12).

Conversely, in the conservative and progressive scenarios, the most vulnerable would suffer a significant increase in their energy expenditure. In fact, under the conservative scenario, families with monthly incomes below €500 would see expenditure almost double (42.4 points), requiring them to dedicate 60% of their incomes to household energy bills.

The results demonstrate that an energy system which continues to take the same path as nowadays, one which increases household energy consumption in a context of rising prices in both electrical energy and fuel, it will be unsustainable. Not only in environmental terms, but also in economic and social terms, with a highly considerable negative impact on vulnerable households. In contrast, an advanced scenario integrating efficiency measures and intelligence, that drastically reduces household energy consumption, and focused on relatively cheap electricity thanks to renewable sources, would reduce energy costs in all households, especially vulnerable ones.

Table 12 Average effort to pay the energy bill in all types of households
Source: Abay Analistas for Greenpeace from Family Budget Survey (2012)

* In bold, values below average household levels.

	2012 % of expenditure by income	Year 2030		
		Conservative scenario	Progressive scenario	Responsible scenario
Total households	5.4	**17.0**	8.9	3.6
Type of family				
One person 65 or over	7.4	**23.0**	**12.0**	4.8
One person under 65	5.0	**16.1**	8.5	3.4
Couple with no children	5.3	**16.6**	8.7	3.5
Couple with one child	5.2	**16.3**	8.6	3.5
Couple with two children	5.3	**16.6**	8.7	3.5
Couple with three or more children	5.4	**16.9**	8.9	3.5
One adult with children	6.1	**19.3**	**10.2**	4.1
Other type of households	5.1	**16.0**	8.4	3.4
Number of members employed				
None	7.3	**23.0**	**12.1**	4.8
One working person	5.6	**17.6**	9.3	3.7
Two working people	4.3	**13.4**	7.0	2.8
Three working people	4.1	**12.6**	6.6	2.6
Four or more working people	3.5	**10.5**	5.5	2.1
Monthly income				
Less that €500	**18.3**	**60.7**	**32.2**	**13.4**
From 500 to less than €1,000	9.6	**30.8**	**16.2**	6.6
From 1,000 to less than €1,500	7.3	**23.1**	**12.2**	4.9
From 1,500 to less than €2,000	5.9	**18.6**	9.8	4.0
From 2,000 to less than €2,500	5.1	**15.9**	8.3	3.3
From 2,500 to less than €3,000	4.4	**13.6**	7.1	2.8
€3,000 or more	3.6	**11.2**	5.9	2.3

DATA BY AUTONOMOUS REGIONS

Household energy consumption varies depending on the geographical area, as this, in large part, determines different dwelling's climate control needs (cooling or heating).

Table 13 Average variation in household energy expenditure and the average effort by autonomous region

Source: Abay Analistas for Greenpeace from Family Budget Survey (2012)

* In bold, values below average household levels.

	Variation in the annual expenditure in the energy bill in households with respect to 2012 (€)			Year 2030. Economic effort (expenditure/income) to pay the energy bill.		
Autonomous regions	Conservative scenario	Progressive scenario	Responsible scenario	Conservative scenario	Progressive scenario	Responsible scenario
Andalusia	2602	894	-220	**19.0**	**10.1**	4.3
Aragón	2640	716	-572	**18.7**	9.7	3.7
Asturias	2223	640	-412	**13.8**	7.2	2.8
Balearic Islands Canarias	2837	965	-257	**16.6**	8.8	3.8
Cantabria	1932	708	-84	**13.9**	7.5	3.3
Castilla – La Mancha	2408	656	-516	**16.8**	8.7	3.3
Castilla y León	3088	873	-604	**24.6**	**12.8**	5.0
Catalonia	2473	579	-701	**18.3**	9.4	3.4
Ceuta and Melilla	2651	776	-471	**16.4**	8.6	3.4
Comunidad Valenciana	1954	670	-169	**10.7**	5.7	2.4
Extremadura	2509	839	-255	**17.3**	9.2	3.9
Galicia	2586	831	-324	**21.6**	**11.4**	4.7
Madrid (Comunidad de)	2551	720	-498	**17.8**	9.3	3.7
Murcia (Región de)	2683	752	-537	**15.0**	7.8	3.0
Navarra (Comunidad Foral de)	2719	916	-263	**19.2**	**10.2**	4.3
Basque Country	2543	631	-657	**15.9**	8.2	3.0
La Rioja	2298	647	-454	**12.8**	6.7	2.6
	2343	584	-602	**16.8**	8.6	3.2

If we look at dwelling's characteristics by autonomous region we see that in the conservative and progressive scenarios the greatest increase in electricity bills would be in Castilla- La Mancha, Balearic Islands, Murcia, Madrid, Catalonia, Aragón and Andalusia (see table 13). However, in the responsible scenario, the regions obtaining the greatest savings would be those that take advantage of the change from fossil fuels to low-cost renewable energy: Castilla y León, Navarra, Castilla- La Mancha, La Rioja y Aragón.

In the responsible scenario, household expenditure on energy bills would be greatly reduced across all regions and would leave energy poverty behind. In this scenario, the regions with lowest ratio of incomes spent on energy expenditure would be Basque Country, Asturias, Ceuta and Melilla, Navarra and Comunidad de Madrid.

CONCLUSIONS

The results of the study once again underscore that sustainable environmental models are also economically and socially sustainable, both in the medium and long term. A renewables based energy system would bring about very positive results in economic growth, employment and savings in household energy bills, as well as a very significant reduction of polluting emissions.

EMPLOYMENT CREATION AND OTHER MACROECONOMIC BENEFITS

- Over the period 2015-2030, investment in new renewable power plants would engineer a strong recovery for the Spanish economy. In the responsible scenario -with high renewable development- an annual investment of €19.53m in new plants would produce important economic benefits: production would increase by €545.16bn over the whole period, 3,053,163 direct and indirect jobs would be created and GDP would rise by 2%.
- The construction sector has a great opportunity to recover from the economic crisis thanks to the investment in renewables. It would be the third sector to benefit most, only behind machinery and mechanical equipment manufacturers (in the first place) and manufacturers of electrical machinery and equipment (in second place).
- A 95% clean-energy based electrical system in 2030 in the responsible scenario would see power generation from renewable sources create a further 203,697 direct and indirect jobs and would add 37.936bn to GDP in that year.
- The resulting electrical system based on renewable generation would emit just 15.7 million tonnes of CO2 emissions in 2030, which means a 75% decline in emissions with regard to 2012.
- Renewables also offer social advantages, including territorial cohesion thanks to the expected employment creation and tax income going mainly to small rural municipalities where the renewable power plants would be located. Local tax collection would reach €14bn over the period 2015-2030.
- The strong impact of investment on state industries would allow for the positioning of the related industrial sectors at a global level, as already happened in the last decade (basically in machinery, electrical components, R+D engineering and services).

TOWARDS A CHEAPER ENERGY FUTURE THANKS TO RENEWABLES, EFFICIENCY AND INTELLIGENCE

- The responsible scenario (with a great development in renewables, efficiency and smart energy demand-side management) would be the only way for households to make savings on their energy bills. Domestic costs would shrink by 34% with respect to 2012 and households would apportion 3.6% of incomes to energy bills, 1.8% less than 2012.

- An increase in clean-energy electricity generation would always imply a reduction in what the consumer pays in electricity bills. The greater the presence of renewables, the greater the savings: the consumer would pay 8% less in the conservative scenario and 25% less in the responsible one.

- In the responsible scenario, all households in general would see reduced energy bills, however, the most vulnerable groups would see the greatest benefits. These would proportionally experience the greatest relief in the economic effort needed to pay the bills. Therefore, over 65s who live alone would see their economic effort (ratio incomes/costs) reduced 2.7 points with respect to 2012, unemployed households 2.5 points and those on monthly incomes below 500, 4.8 points. Conversely, under the conservative scenario, families with monthly incomes below €500 would need to dedicate over 60% of their incomes to household energy bills.

- The impact of the conservative and progressive scenarios clearly demonstrates that to carry on with the current energy model, based on fossil fuels, is not only environmentally unsustainable, but also in economic and social terms. It would bring about increased energy use in homes and require an economic effort difficult to assume and would sink many more households into energy poverty.

- The results of the responsible scenario show the importance of integrating the rise of renewable energies with energy efficiency and smart demand-side management as it increases energy savings and benefits especially the most vulnerable homes, whether because of their incomes or area of residence.

GREENPEACE DEMANDS

Greenpeace calls on the Spanish Government to make deep changes to energy policy in Spain in order to achieve an efficient, intelligent and 100% renewable system. To bring this about, we specifically call for:

• The support of three ambitious and binding goals for 2030 in the European Union: a minimum of 55% reduction in domestic greenhouse gases (compared to 1990), a 45% of renewables in the energy mix and a 40% energy efficiency (these last two compared to 2005).

• A legal ban on prospecting conventional and unconventional hydrocarbons and their exploitation across the Spanish territory.

• The abandonment of dirty energy subsidies.

• The elaboratation of an energy plan, with a long-term vision and aligned to the European road map on energy and climate, including a schedule of closures of dirty-energy installations and their progressive substitution by renewables and energy efficiency, with the perspective of a 100% renewable horizon by 2050.

• A new law to reform the electricity sector which brings in the necessary reforms so that the Administration equips an efficient, smart and 100% renewable system with a predictable and stable regulatory framework that makes investment attractive in renewables and efficiency.

• The modification of electricity tariff regulation with the aim of:

- transparently reflecting the real costs of the system;

- facilitating consumer participation so that they can offer remunerated smart demand-side management;

- enabling self energy consumption with net metering;

• The integration of smart meters that actually permit the consumer to access all consumption information to be able to manage their demand.

• Protection of the most vulnerable consumers by creating a social contract to apply efficiency measures in homes.

GLOSSARY

- **Electricity generation system.** This is the combination of all the different plants that generate electricity.

- **Solar thermoelectric plant.** This technology uses the sun's heat to generate electricity. These work in a similar way to conventional power stations but instead of using coal or gas they use solar energy.

- **Integration and electrification.** In the energy system proposed in the responsible scenario all energy-consuming sectors (transport, building, industry, etc.) share resources and interchange energy. The best vehicle for such integration is electricity, which must come from renewable sources.

- **Efficiency measures.** Energy consumption in all sectors can be considerably reduced thanks to these measures. For example, reductions in consumption in building climate control can be made (bioclimatic design, optimum insulation thickness for each climate, solar and thermal control windows) and more efficient lighting and appliances used.

- **Intelligence.** The technology brings intelligence to the energy sector through smart electricity grids, buildings or transport systems. One example of this is smart demand-side management of energy; that is to say, the consumers themselves offer demand-side management services; smart technologies allow for the exchange of energy on the grid through their buildings and electric vehicles. Thus, enabling the integration of the system.

- **Economic production.** Production, in macroeconomic terms, is the value of goods and services that a sector or the economy of a country produces in a year.

- **Energy bill (energy expenditure).** Household energy costs mainly spent on electricity consumption and fuel for climate control (heating/cooling). Transport energy consumption is not considered.

- **Economic effort.** The percentage of household incomes spent, in this case, on the energy bill. The lower the homes' incomes and the higher the cost of the household energy bill, the closer they will find themselves to being in energy poverty.

- **Energy poverty**. The measure of a family's effort to pay the energy bill, according to a Scottish Government proposal. Those homes spending 10%-13% of household income on energy costs are considered as moderately energy poor; 13%-20%, severe and those spending over 20%, extreme.

- **Tariff deficit.** This is a debt, owed to electricity companies, incurred on consumers by the Government. It consists of the difference between the electricity companies' perceived revenues from consumer payments and the costs to these companies to supply the electricity that are recognised by the government. Therefore, the tariff deficit is a regulatory deficit, not an economic deficit.

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6 Abay Analistas Económicos y Sociales for Greenpeace, October 2014. 'El impacto de las energías renovables en la economía' (The impact of renewable energies on the economy). http://www.greenpeace.org/espana/es/Informes-2014/Octubre/renovables-impactos-macroeconomia/
El impacto de las energías renovables en los hogares' The impact of renewable energies in homes). http://www.greenpeace.org/espana/es/Informes-2014/Octubre/renovables-impactos-hogares/

7 The year 2012 is the reference for this study as it is the latest official data available of the different sources consulted when the report was elaborated.

8 Wind, solar photovoltaic and thermal, solar thermoelectric, biomass, geothermal and wave, small-scale hydro.

9 See glossary.

10 See glossary.

11 http://www.microsimulation.org/

12 The Family Budget Survey provides annual information on the nature and destination of consumption costs, as well as on the different features related to the households' living conditions. The sample size is around 24,000 households per year.

13 Greenpeace 2011, 'Energy 3.0. An energy system based on intelligence, efficiency and 100% renewable'.

14 In Spain 2012, electricity covered 23.2% of final energy consumption, according to data from the Instituto para la Diversificación y Ahorro de la Energía (IDAE) (Institute for Diversification and Saving of Energy). Renewable electricity generation in peninsular Spain accounted for 25.6% of that, according to Red Eléctrica de España (REE).

15 All of the different scenarios imply a significant increase in installed capacity from renewable sources (up to 99.162 to 207GW respectively), with major investments in new plants: €81.224m, €203.293m and €293.025m respectively.

16 In macroeconomic terms, production is the value of the goods and services which, in this case, the Spanish economy would produce over a year thanks to investment in renewables.

17 Throughout the study, job numbers are considered as one person working full time, so two part-time workers are counted as one full-time equivalent (FTE).

18 Number of employees in FTE according to Abay Analistas from an update to the Input-Output Table (OIT) to year 2012. This does not account for employment created by investments.

19 The only tax that could be affected in a significant way and that has not been included in this study is the income tax collection linked to the salaries on new jobs created by the investments. These figures could be much higher if revenue collected through income tax on the newly created jobs was included.

20 This figure is based on the Air Emissions Accounts (INE, 2013).

21 This refers to the emission of CO2 in the electricity system as a whole, including renewable and conventional energy sources.

22 In Spain, the renewable energy incentive policy has focused on the denominated "retribution policy" within the special framework, favouring renewable sources of electricity generation by the inclusion of a premium added to the wholesale market price that complements each kilowatt/hour produced by these sources. This support system has been substantially modified with the reform brought in by law 24/2011 of the electric system. The incentives established in 2012 have been used as a reference for this study.

23 Abay Analistas Económicos y Sociales for Greenpeace, October 2014. 'Economic recover with renewables. Impact on households. Annex 1. Análisis sobre el impacto distributivo de las energías renovables' (Analysis on renewable energies' distributive effect). http://www.greenpeace.org/espana/es/Informes-2014/Octubre/renovables-impactos-hogares/

24 See glossary.

25 The chosen method to measure energy poverty is the Scottish Government proposal (Wilson et al., 2012), which categorises energy costs in the home in relation to the household's incomes.

26 A household is considered as a person or group of people who occupy a family home or part of it, and who consume and/or share food or other goods on the same budget.

27 Only household costs are included (reconditioning of the home, lighting, electrical appliance usage, etc.) while other types of energy expenditure, like those associated with transport, are excluded.

28 Bearing in mind the different studies, Ketterer (2012) and Gelabert, Labandeira and Linares (2011) on the effect of wholesale prices by the advancement of renewables,the hypothesis considered in the present study is that for each percentage point in the advance of renewable generated electrical energy , wholesale prices would fall 1.3% in any of the scenarios.

29 We have not considered the variation of other components whose evolution is unforeseeable at this time (other fees not linked to renewable energies -transport and distribution, extra-peninsular compensation to Canaries/Balearic Islands etc., other premiums in the special regime for electrical energy generation, payment of debt accumulated in the system-or taxes and fees linked to electricity).

30 Premium per kWh.

31 Electricity covered 35% of energy demand in 2012 households. Electricity would meet household energy demand in 2030 by 59%, 64% and 78% according to each scenario.

32 Household energy demand varies significantly from one scenario to another according to the efficiency measures and intelligence established: 433 TWh/y in the conservative scenario; 237 TWh/y in the progressive scenario; and 94 TWh/y in the responsible scenario. See annexe

ANNEXE

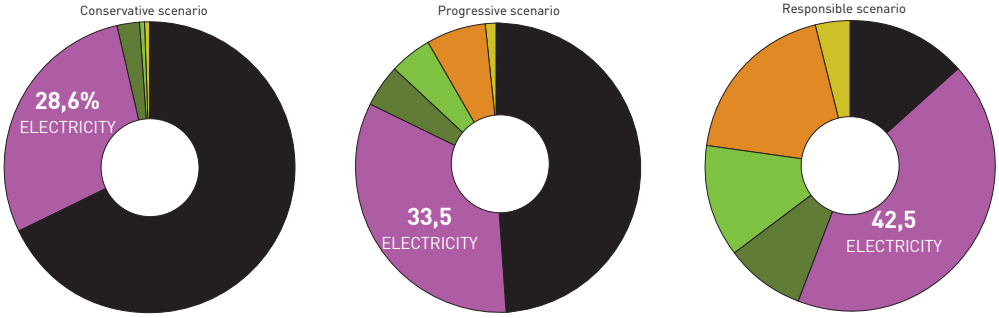
DESCRIPTION OF ENERGY SCENARIOS 2030

- Fossil fuel
- Electricity
- Direct biomass
- Biofuels
- Hydrogen
- Thermal solar

The following graphs show total final energy demand and residential demand for 2030 in the conservative, progressive and responsible scenarios. You can also see the data on installed power and the amount of electricity generation needed to meet this demand.

1 Total final energy demand in 2030 with non-energy uses. TWh/y*

Source: Drawn up by Greenpeace

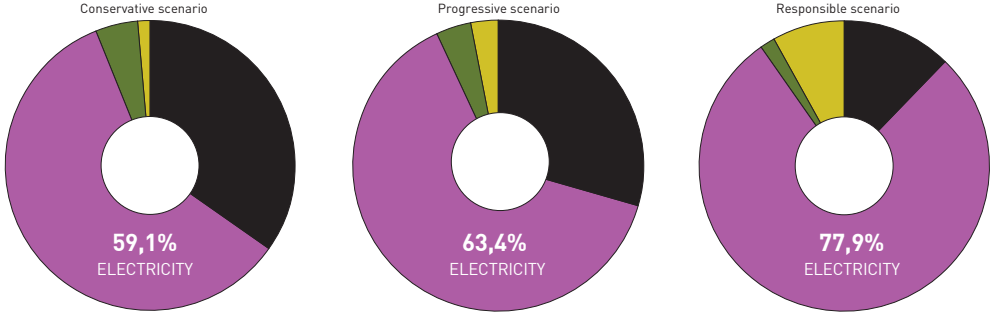


Total demand: 1.990 TWh/y **1.285 TWh/y** **774 TWh/y**

*Non-energy uses include the use of fossil fuels not destined to energy generation, for example plastics manufacturing.

2 Final energy demand in residential building. TWh/y

Source: Drawn up by Greenpeace

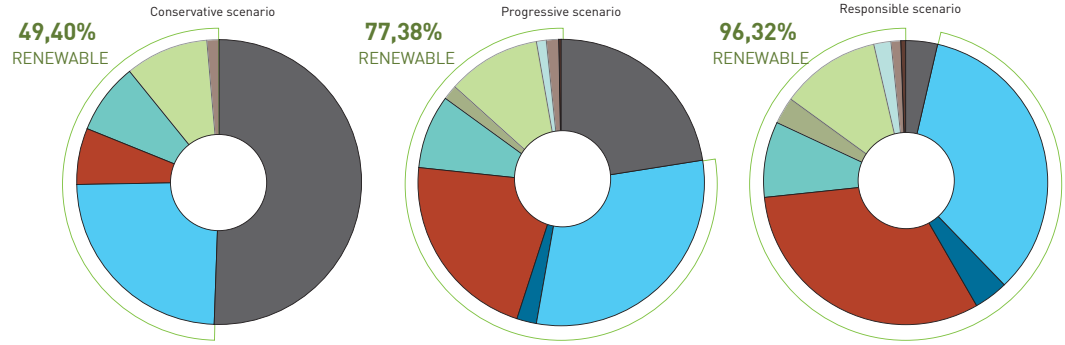


Total demand: 433 TWh/y **237 TWh/y** **94 TWh/y**

- On-shore wind
- Off-shore wind
- Thermal solar
- Hydroelectric
- Photovoltaic residential auto-consumption
- Other photovoltaic
- Wave
- Biomass
- Geothermal
- Conventional energies

3 Installed power in the distinct scenarios (GW)

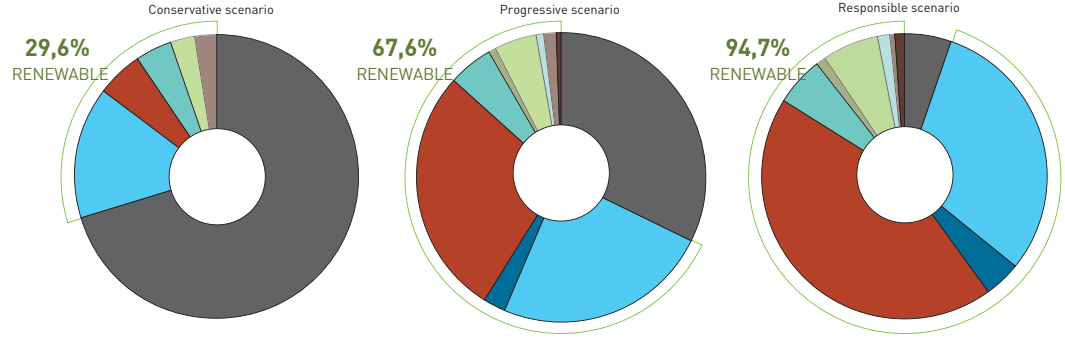
Source: Drawn up by Greenpeace



Total power: 201 GW **209 GW** **215 GW**

4 Electricity generation in power plant busbars* in the different scenarios

Source: Drawn up by Greenpeace



Total generation: 650 TWh/a **657 TWh/a** **662 TWh/a**

*Power plant busbars (pbc). Energy measures at the point of generation have already deducted plant consumption.

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