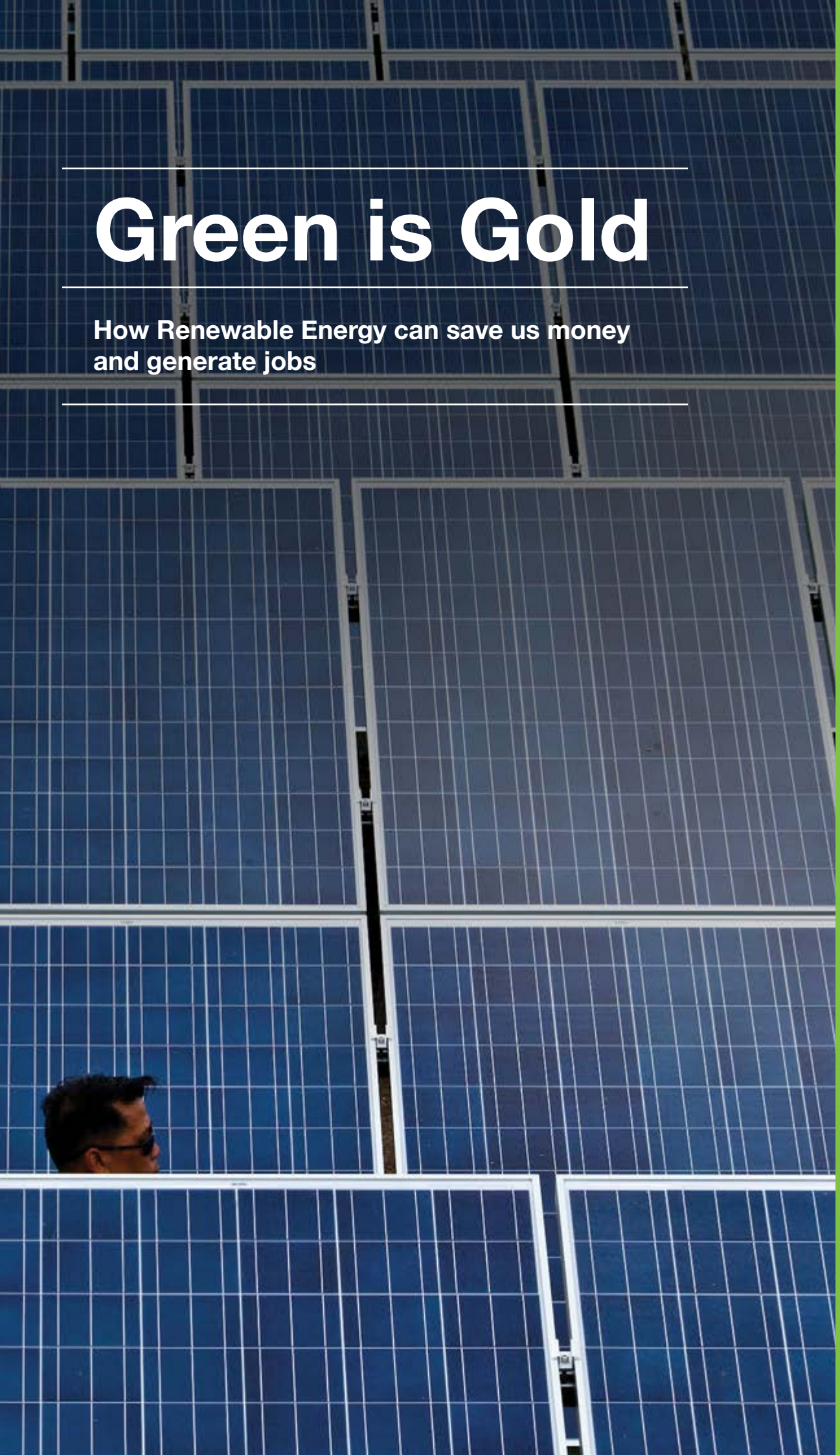

Green is Gold

How Renewable Energy can save us money and generate jobs

GREENPEACE

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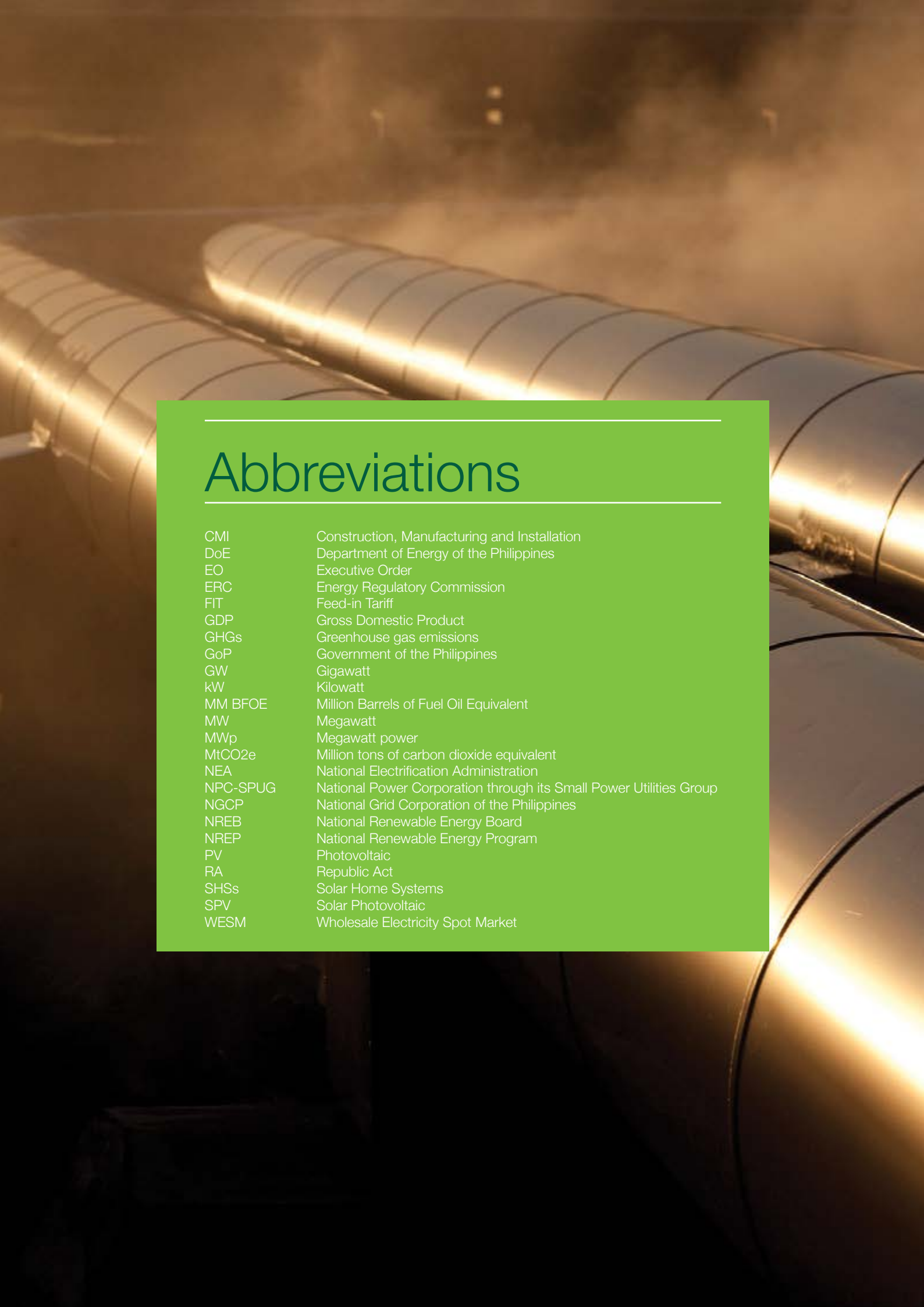
Contents

Solar Energy in Thailand



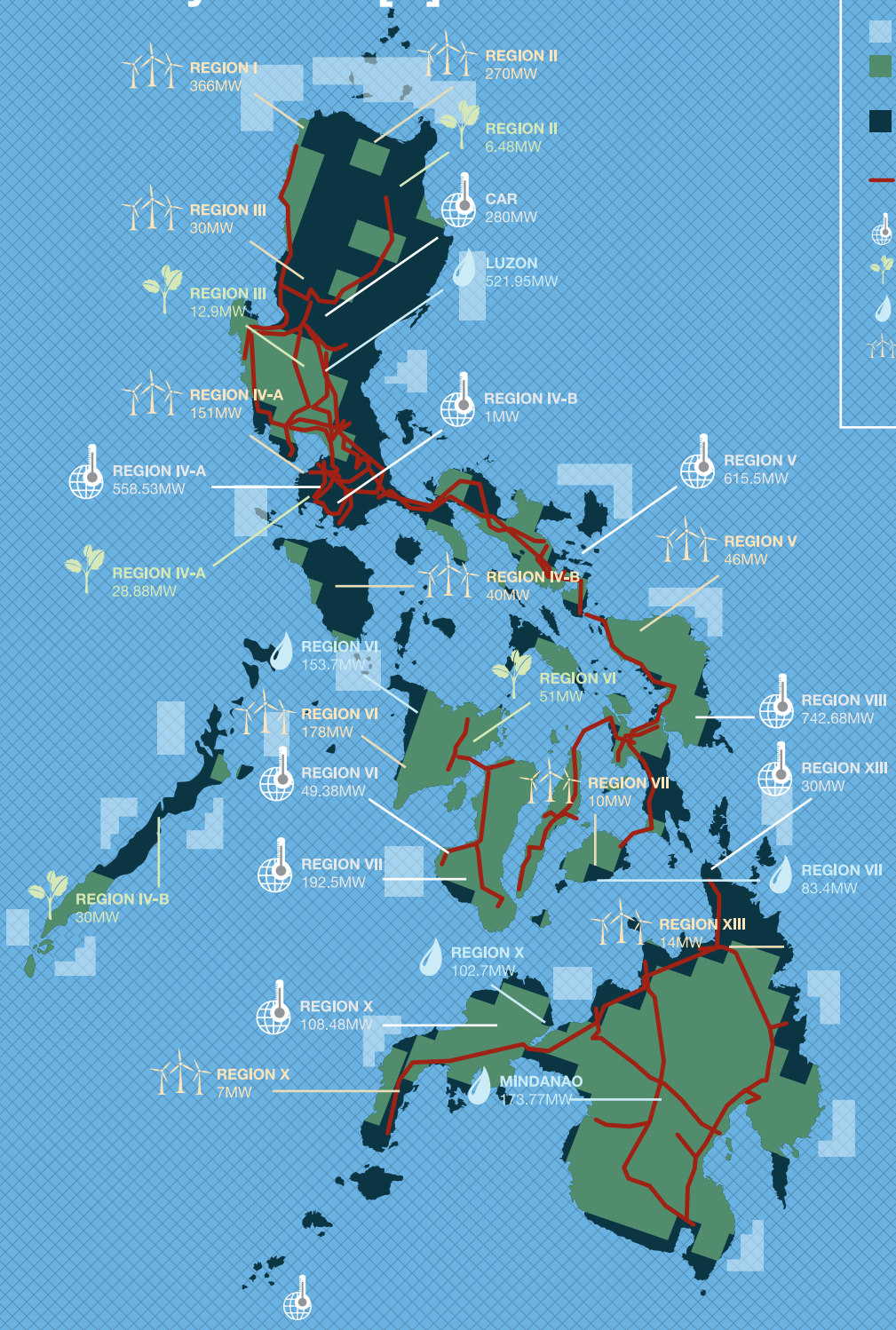
Abbreviations

CMI	Construction, Manufacturing and Installation
DoE	Department of Energy of the Philippines
EO	Executive Order
ERC	Energy Regulatory Commission
FIT	Feed-in Tariff
GDP	Gross Domestic Product
GHGs	Greenhouse gas emissions
GoP	Government of the Philippines
GW	Gigawatt
kW	Kilowatt
MM BFOE	Million Barrels of Fuel Oil Equivalent
MW	Megawatt
MWp	Megawatt power
MtCO2e	Million tons of carbon dioxide equivalent
NEA	National Electrification Administration
NPC-SPUG	National Power Corporation through its Small Power Utilities Group
NGCP	National Grid Corporation of the Philippines
NREB	National Renewable Energy Board
NREP	National Renewable Energy Program
PV	Photovoltaic
RA	Republic Act
SHSs	Solar Home Systems
SPV	Solar Photovoltaic
WESM	Wholesale Electricity Spot Market

Figures

Svartsengi Geothermal Plant in Iceland

The Country's Next [R]evolution



LEGEND

- Areas with wind potential
- Areas with solar potential (5.0-5.5 kWh/m2/day)
- Areas with solar potential (4.5-5.0 kWh/m2/day)
- Existing Transmission Network
- Geothermal
- Biomass
- Hydroelectric
- Wind

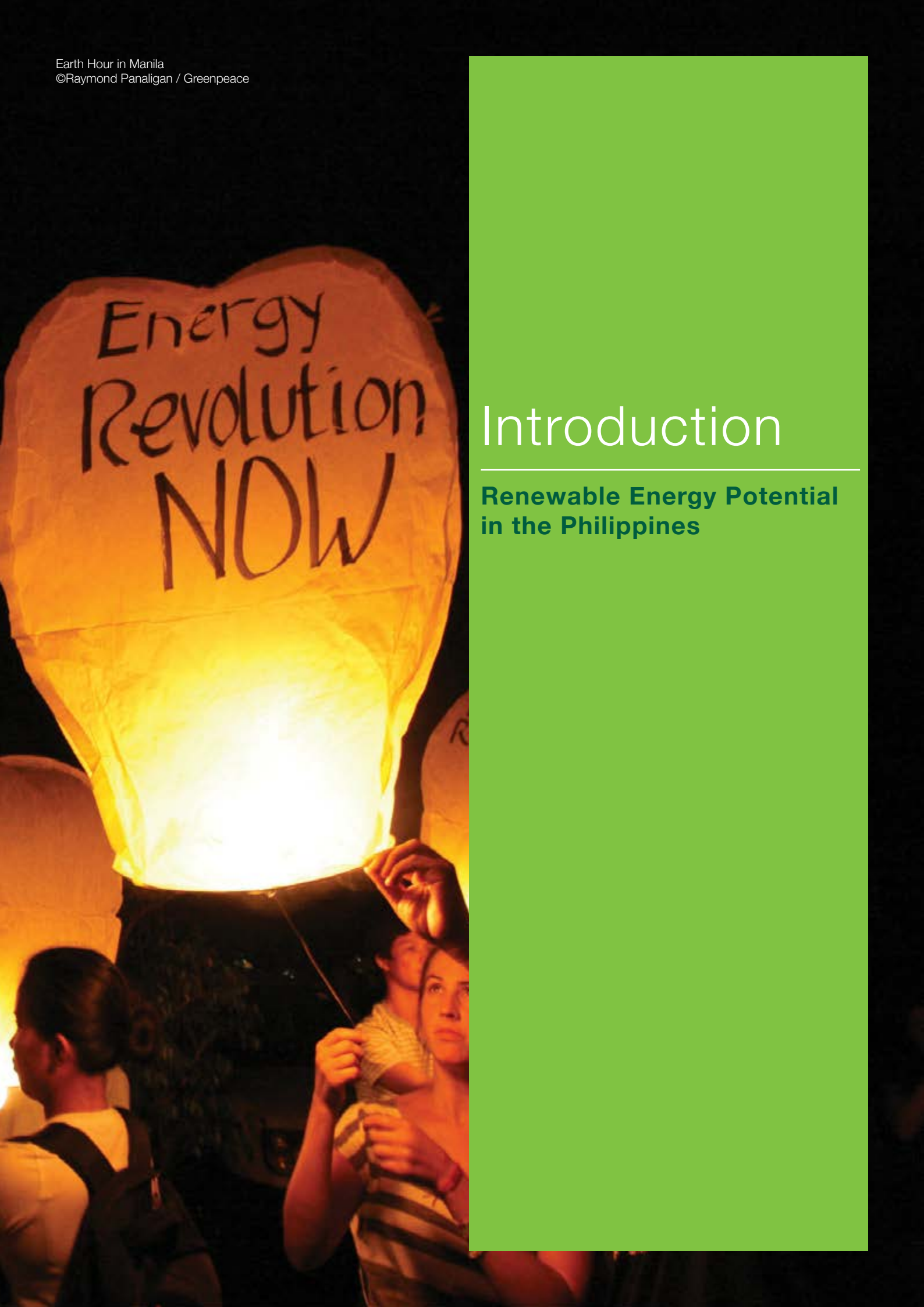
Total Capacities are indicated in Megawatts (MW)

Pending renewable energy projects

Proposed/Pending	
REGION	MW
REGION III (Central Luzon)	282
REGION IV-B (MIMAROPA)	25
REGION V (Bicol Region)	550
REGION VI (Western Visayas)	10

Proposed/Pending	
REGION	MW
REGION II (Cagayan Valley)	40
REGION IV-A (CALABARZON)	40
REGION IV-B (MIMAROPA)	1
REGION VI (Western Visayas)	20
REGION VII (Central Visayas)	192.5
REGION IX (Zamboanga Peninsula)	40
REGION X (Northern Mindanao)	50
REGION XII (SOCCSKSARGEN)	100

There is an abundance of renewable energy sources in the Philippines, some of which are already set to be harnessed. This map shows potential and approved facilities that should be operational by 2020.



Earth Hour in Manila
©Raymond Panaligan / Greenpeace

Introduction

Renewable Energy Potential in the Philippines

Green can bring us gold: renewable energy can bring jobs, cost savings, and money to the Philippines. However, in the Philippines, ordinary citizens, business people, government workers, and even the president, have been bombarded with misinformation about renewable energy for decades. Here are just a few examples of outright untruths, often peddled by polluting industries: "Renewable energy is expensive," or, "Renewable energy is a pie in the sky dream for tree huggers." An even more popular misconception: "Coal is cheap." This report is designed to fight such misleading rhetoric, debunk myths, and provide data-driven, balanced information about renewable energy in the Philippines.

Above all, this report lays out how renewable energy can save the government money, bring jobs to the country, create wealth, expand access to energy for the most vulnerable in poor communities, and foster national energy independence.

First, we lay out estimates of employment creation that renewable energy has brought and could bring to the Philippines, exploring the issue sector by sector and looking at solar, wind, mini hydro, geothermal, modern biomass, and ocean. We also touch on how manufacturing renewable energy products locally can generate employment. Renewables – as opposed to coal and other fossil fuel industries – typically have a relatively high labor intensity, which means they spend more on hiring people; have a higher domestic content than conventional fossil fuel sectors in the Philippines; and often produce higher-value, better paying, cleaner, healthier jobs than the fossil fuel industry does.[1] Workers in renewable energy sector have been found to enjoy better health conditions compared to traditional energy generation workers. After looking at the current and future possible employment opportunities, the result is strikingly clear: renewable energy can create thousands of good jobs in the Philippines.

Second, we refute some misinformation promoted by coal, oil, and other polluting industries, who have been engaged in fear-mongering campaign against renewables in the Philippines for years. Unfortunately, numerous lawmakers, opinion leaders, and businesspeople in the Philippines have been deluged with a cascade of deceptions and half-truths – which partially explains why they do not yet fully embrace renewable energy or explore how it can foster sustainable development for all. For example, many detractors of renewable energy claim that it is expensive. To clear up this matter, we describe potential long-term cost savings from renewable energy, focusing on its potential to bring down prices in the "spot market."

We particularly focus on discrediting the gross misrepresentation that "coal is cheap" and briefly give an overview of key costs of coal for our country. The costs are so high and so varied, that it is impossible to delve into all of them in one short report, but even a cursory overview exposes coal's hidden price tag. Coal forces the government and the people to spend vast sums on health care, as health facilities struggle to care for those who are poisoned by coal dust, toxic heavy metals, and other pollutants released by the industry. In addition, coal seriously damages our environment and lessens agricultural yields – leaving poor farmers and others to foot the bill for cleanup operations and failing or damaged crops. Moreover, coal-fired plants suck up vast amounts of water, contributing to our water scarcity problem, dumping hot water in the ocean, bleaching corals, killing fish, and outsourcing the costs of their water-guzzling ways. Last but not least, climate change fueled by coal-fired plants is already damaging the economy of the Philippines.

In the third part of our report we explore the economic growth potential of renewable energy, i.e. potential national wealth creation. The bottom line is that renewable energy will make the Philippines richer. Renewable energy can positively impact the country's economy, instead of forcing the Philippines to spend billions of dollars abroad for coal imports, benefiting the economies of Indonesia, China, and Vietnam.[2] When billions of dollars leave the economy to buy imported coal and oil, those dollars are not re-invested domestically. Renewable energy fosters "energy independence," protecting the Philippines from the vagaries of coal and oil price fluctuations Moreover, renewable energy's massive impact on foreign exchange, through displacement of imported fuels, can allow the Philippines to keep billions more dollars circulating domestically. Every country is different and the impact of a renewable energy boom on the Philippine GDP needs further research, and should take into account current fiscal realities and economic idiosyncrasies. However, it is already clear that investment in renewable energy would stop a hemorrhage of money out of the country towards coal and oil exporting nations, keep valuable revenue streams in-country, thereby freeing up far greater amounts of capital to be reinvested domestically, and potentially make the financial pie larger.

Naturally, investing in renewable energy cannot fix every problem, and our government desperately needs to focus on grid development and improvement, smart grid technology, load-shifting, peak shaving, and more if Filipinos were to stand a fighting chance of having affordable electricity in the next decade. However, renewable energy can make a cost-savings difference if government policies are well crafted and strictly implemented.

In a nutshell, our conclusion is that investing in and facilitating large-scale renewable energy projects can generate thousands of good jobs in the Philippines, make electricity more economical for customers in the long run, and increase GDP – while posing fewer risks for the nation, as opposed to investing in coal or oil. Renewable energy is good for the environment and good for business.

Methodology

For this report, Greenpeace used a range of data sources and methodologies to document and analyze the possible economic and employment benefits of renewable energy in the Philippines. These include interviews with renewable energy developers, representatives of the Department of Energy, the Department of Labor and Employment, and other relevant governmental entities, unions, economists, and representatives of the coal industry. We also conducted map analysis; an examination of government data with a focus on the FiT application; and an extensive literature review. Data in this report are drawn from direct contact with individuals, and information collecting from "known universe" firms, and a random sampling of businesses in construction, sales and distribution, and manufacturing.

At the time of this writing, the Philippine government surveys used to construct input/output tables did not recognize wind, solar, modern biomass, or other renewable energy industries as industries in their own right. Therefore this study was not able to use the Multi-Scale Regional Input/Output Model (Multireg), nor the Green-X, Nemesis and Astra models to assess effects of developments in the Renewable Energy Sources (RES) sector on other economic sectors.

This report also did not calculate expected losses due to renewable energy investment, such as replaced investments in conventional energy technologies. Further research and modeling should be conducted and Greenpeace calls on the Department of Energy of the Philippines (DoE) to measure and analyze the appropriate data.

Why other countries are already gaining jobs and riches from renewables

Area	No. of Jobs
Europe	650,000
Germany	370,000 direct and indirect
Spain	89,000 direct
	99,000 indirect
Denmark	21,000- 24,700
UK	99,000
Australia	10,370
	26,000 to be created
USA	1,079 in wind farm
	75,000 in wind industry
	100,237 in solar industry
China	approx. 1 million
	with 600,000 in solar industry
Bangladesh	18, 823 direct
	212,753 indirect
Global	2.3-3.5 million

Many other countries are already reaping big benefits from their renewable energy sectors,[3] and the Philippines can too – so long as the government truly stands behind a concrete timetable for renewable energy development, and takes steps to implement what some have described as paper tiger policies. A quick look around the world reveals the tremendous economic benefits of renewable energy.

Close to 650,000 people are employed in renewable energy in Europe.[4] Many sources differ, but overall, a strong consensus has emerged that renewables are an engine of job creation. In Germany, a Deutsche Bank study[5] found that the Germans have netted about 370,000 direct and indirect jobs out of their commitment to a renewable energy (especially solar) future.[6] According to the German Renewable Energies Agency more people work in Germany in solar than in coal and nuclear put together. In addition, "investment in new renewable energy plants reached 22.9 billion Euro in 2011" in Germany.[7] Spain has allegedly profited from its booming renewables industry to the tune of about 89,000 direct jobs especially in wind and PV and 99,000 indirect jobs,[8] while Denmark domestic wind employment is claimed to be about 21,000[9] - 24,700 jobs.[10] "Moreover, financial incentives such as tax-free income for wind generated by cooperatives has led to a high degree of citizen participation in the wind industry, with 80% of Denmark's turbines owned by over 150,000 Danish families."[11] Meanwhile, a study by Innovas in the UK[12] reports that "renewable energy employed just over 99,000 people in the 2010/2011 financial year" and that "the total UK turnover for all renewables and their supply chains in 2010/11 was around £12.5 billion. The weighted average market value increase from 2009/10 to 2010/11 was 11%. This is far greater than national economic growth rates of 1.4% over the same period."[13]

In 2009, there were already an estimated 10,370 people employed in renewable energy[14] in Australia, and that number is said to be climbing rapidly: "Renewable energy projects under construction or planned in response to the proposed emissions trading scheme will create 26,000 jobs, according to … research commissioned by The Climate Institute [which] shows $31 billion worth of clean energy projects already in the pipeline, many in regional areas, will generate 2,500 permanent jobs, 15,000 construction jobs and 8,600 associated positions. The research does not include jobs in domestic solar or insulation."[15] Such jobs are likely to be even more numerous, since over 858,000 of Australia's eight million homes have now gone solar, generating two gigawatts (GW) of installed capacity in solar PV, in addition to the 600,000 solar hot water systems installed.[16]

In the United States, a National Resources Defense Council report asserted that wind energy has provided thousands of high value jobs, with each typical new 250-megawatt (MW) wind farm creating 1,079 jobs, and that "the wind industry now employs 75,000 Americans."[17] Also in the USA, solar is creating new jobs ten times faster than the overall economy, according to a study by Pfund and Lazar.[18] The Solar Foundation reported that American solar companies produced more jobs much faster than the general economy and that in August 2011, the U.S. solar industry employed an estimated 100,237 solar workers, "providing much needed job creation despite an historic economic and workforce downturn."[19] A report by the University of Massachusetts-Amherst found "that clean-energy investments generate roughly three times more jobs than an equivalent amount of money spent on carbon-based fuels."[20] In 2012, in the state of Massachusetts alone, 4,955 clean energy firms employed 71,523 clean energy workers, making up 1.7 percent of the state's jobs.[21]

China can boast of having the world's largest installed wind power base as well as having the world's largest declared investment in renewable energy. Though the data on China is not clear or reliable yet,[22] around a million people may work in renewables there, with 600,000 people in solar alone.[23] China's government claims that the "biogas industry has employed some 90,000 people from 2006-2010, and its solar water heating (SWH) sector -- where it is the world's undisputed leader" involves hundreds of thousands of jobs.[24]

Other Asian countries have gotten onto the renewables fast track too. The International Labor Organization (ILO) estimated 18,823 "direct" sustainable energy jobs had been created in Bangladesh, and 212,753 "indirect" jobs associated with core sustainable energy jobs, for a total of 69,384 jobs.[25] The International Renewable Energy Association's (IRENA's) numbers are higher: "Bangladesh has an estimated 60,000 people who are involved in the SHS sector" in off-grid renewable energy."[26] The Indian government "estimates that its off-grid SPV sector employs 72,000 people and its biogas sector 85,000 people."[27]

In Thailand, the government has boldly invested in renewable energy and its policies have greatly encouraged the industry, which now employs thousands. These policies include the Energy Conservation and Promotion (ENCON) Act of April 1992; the 1996 "Divided by 2" campaign initiated by the National Energy Policy Office; the advent of Net Metering in 1992 with the EGAT

Act amendment and Regulation to Purchase Power from Small Power Producers ("SPP regulation" which complemented the 2001 Very Small Power Producer Program or "VSPP"); the reaffirmation of net metering in May 2002; and the 2012 Alternative Energy Development Plan for 25 percent in 10 Years (AEDP). These laws and other laws and policies (Thailand was one of the first Asian countries to implement a feed-in tariff program) combine to create a renewables-friendly enabling policy and regulatory environment. All this has paid off: "As of December 2011, Thailand has about 8,000 MW of renewable energy projects in the pipeline seeking adder and about 1,000 MW already connected and selling power to the grid;"[28] in addition to a Thai developer (Solar Power Company) building 34 solar plants to produce 204 MW by the end of 2012. Thailand is slated to have one of the largest solar power plants in Southeast Asia, in Bang Pa-In, Ayutthaya (owned by Bangchak and Solartron).[29] Moreover, "investment in renewable energy in Thailand totaled $700 million in 2011, representing an increase of 320 percent from the previous year."[30]

Renewable energy is the fastest growing energy sector in the world. Globally clean energy continues to set record levels for investment. Bloomberg New Energy Finance estimates that US$243 billion was invested in renewable energy in 2010, an increase in 30 percent from 2009.[31] Around 2.3 to 3.5 million people[32] around the world may be working either directly in renewables (construction, manufacturing, installing, operating, and maintenance), or indirectly in supplier industries.[33] Solar thermal industry in and of itself is thought to employ at least 624,000, and modern biomass/biofuels are providing around 1 to 1.5 million jobs.[34]

Looking at the global jobs future, in Greenpeace and the European Photovoltaic Industry Association's 2011 report "Solar Generation VI," we estimated that "PV could generate up to 3.7 million jobs in the world by 2020 and more than 5 million by 2050." In addition, "the PV market in 2010 will reach a turn-over of more than 34 billion EUR (48 billion USD) in the world; the total of yearly investments could reach 160 billion EUR (225 billion USD) until 2040."[35]

Renewable energy "supplied an estimated 16% of global final energy consumption. Renewable energy accounted for approximately half of the estimated 194 gigawatts (GW) of new electric capacity added globally during the year. Renewables delivered close to 20% of global electricity supply in 2010, and by early 2011 they comprised one quarter of global capacity from all sources… By early 2011, at least 118 countries had some type of policy target or renewable support policy at the national level, up from 55 countries in early 2005… Total investment in renewable energy reached $211 billion in 2010, up from $160 billion in 2009, continuing the steady annual increase seen since tracking first began in 2004. Including the unreported $15 billion (estimated) invested in solar hot water collectors, total investment exceeded $226 billion."[36]

The glowing long-term outlook for employment in renewables stands in sharp contrast to the hard numbers coming out of polluting, fossil fuel energy industries. Although coal companies may tout the alleged plethora of jobs they create, the truth is uglier: coal has been shifting towards more and more automation and

Andasol Solar Power Station in Spain
©Greenpeace / Markel Redondo

shedding jobs as machines progressively replace people. The same is true for oil and natural gas, which also tend to give us steadily fewer jobs around the planet, per unit of energy produced. The US coal industry's numbers illustrate the global trend. Although US coal production has risen by roughly 30%, jobs have ruthlessly been cut by about 50%, leaving many coal communities facing depression, joblessness, and a blighted future while coal companies profit.

A University of Massachusetts-Amherst study explained, "Our detailed analysis, based on robust economic-modeling methodologies… calculates that roughly 2.5 million new jobs will be created overall by spending $150 billion on clean-energy investments, while close to 800,000 jobs would be lost if conventional fossil fuel spending were to decline by an equivalent amount…Our key finding is that clean-energy investments generate roughly three times more jobs than an equivalent amount of money spent on carbon-based fuels."[37] This is not an isolated finding, and is largely due to the relatively high labor intensity of renewable energy, as well as its high domestic content. McKinsey & Company's report "Wind, Oil and Gas: the Potential of Wind" also "concludes that the wind industry generates more jobs than the coal, gas and nuclear power industries per MW hour generated. Research institutions such as Berkeley's Renewable and Appropriate Energy Laboratory (RAEL) have reached similar conclusions."[38]

Relevant laws and policies in force

The Philippines has a range of laws and policies in place that govern renewable energy. Indeed, in many ways, the government has done more than pass laws. It must be recognized for having embarked on a path of putting money where its mouth is, investing for the future of renewable energy, and providing fiscal incentives for RE developers.[39] For instance, renewable energy developers now get 99% the net sales results whereas the DoE gets 1%. This is a crucial change from where we were before, when 60% went to the government and 40% to renewable energy developers.[40]

The key laws and policies are:

1) 1971, Republic Act (R. A.) 6173, creating the Oil Industry Commission (OIC) to regulate the oil industry and ensure adequate supply of petroleum products at reasonable prices

2) 1972, P.D. 87 or Oil Exploration and Development Act of 1972, creating a Petroleum Board; P.D. 334 created the Philippine National Oil Company

3) 1976, P.D. 910 creating the Energy Development Board

4) 1977, P.D. 1206 creating the Department of Energy

5) 1978, P.D. 1442, Geothermal Law

6) 1978, P.D. 1397, transforming the Department of Energy into Ministry of Energy

7) 1987,Executive Order (E.O.) 193, transforming the Ministry of Energy into the Office of the Energy Affairs

8) 1987, E.O. 172, creating the Energy Regulatory Board

9) 1988, E.O. 338, creating the Energy Coordinating Council

10) 1993, R.A. 7648, Electric Power Crisis Act

11) 1990, R.A. 6957, authorizing the financing, construction, operation and maintenance of infrastructure projects by the private sector in the BOT scheme

12) 1991, R.A. 7156, Mini-hydro Law

13) 1997, E.O. 462, Ocean, Solar and Wind energy Law, amended by E.O. 232 of 23 April 2000

14) 1998,R.A. 8479 or the Downstream Oil Industry Act of 1998. O-llaw project was launched, aimed at electrifying 100 percent of barangays in the country by 2006

15) 1999,R.A. 8749 or the Philippine Clean Air Act

16) 2001, R.A. 9136, Electric Power Industry Reform Act (Implementing Rules and Regulations approved by the Joint Congressional Power Commission in 2002)

   a. Privatization of the National Power Corporation ("NPC")

   b. Creation of National Transmission Company ("TRANSCO")

   c. Creation of Power Sector Asset and Liabilities Management Corporation ("PSALM")

   d. Creation of new Energy Regulatory Commission ("ERC")

   e. Creation of Wholesale Electricity Spot Market ("WESM")

17) 2003, Kyoto Protocol ratified by Philippine Senate

18) 2003, Renewable Energy Policy Framework

19) 2006, R.A. 9367, Biofuels Act

20 2008, R.A. 9513, Renewable Energy Act

21) 2011, National Renewable Energy Program (NREP)

22) 2011, Rules Governing the Establishment of Renewable Portfolio Standards in the Philippines ("Philippine RPS Rules")

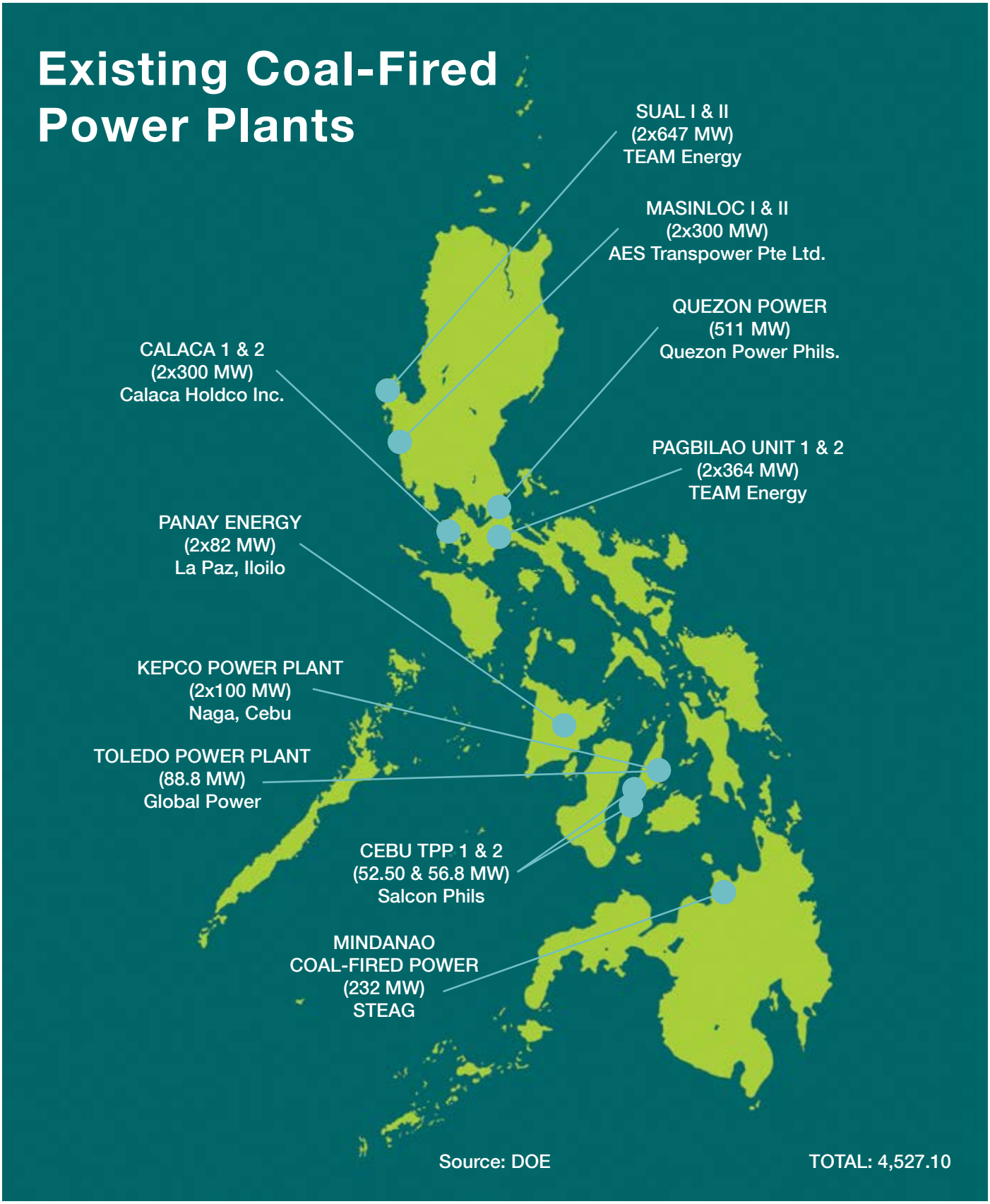
23) 2012, Feed-in Tariff Rules ("FiT Rules") and Feed-in Tariff Allowance ("FiT-All") approved

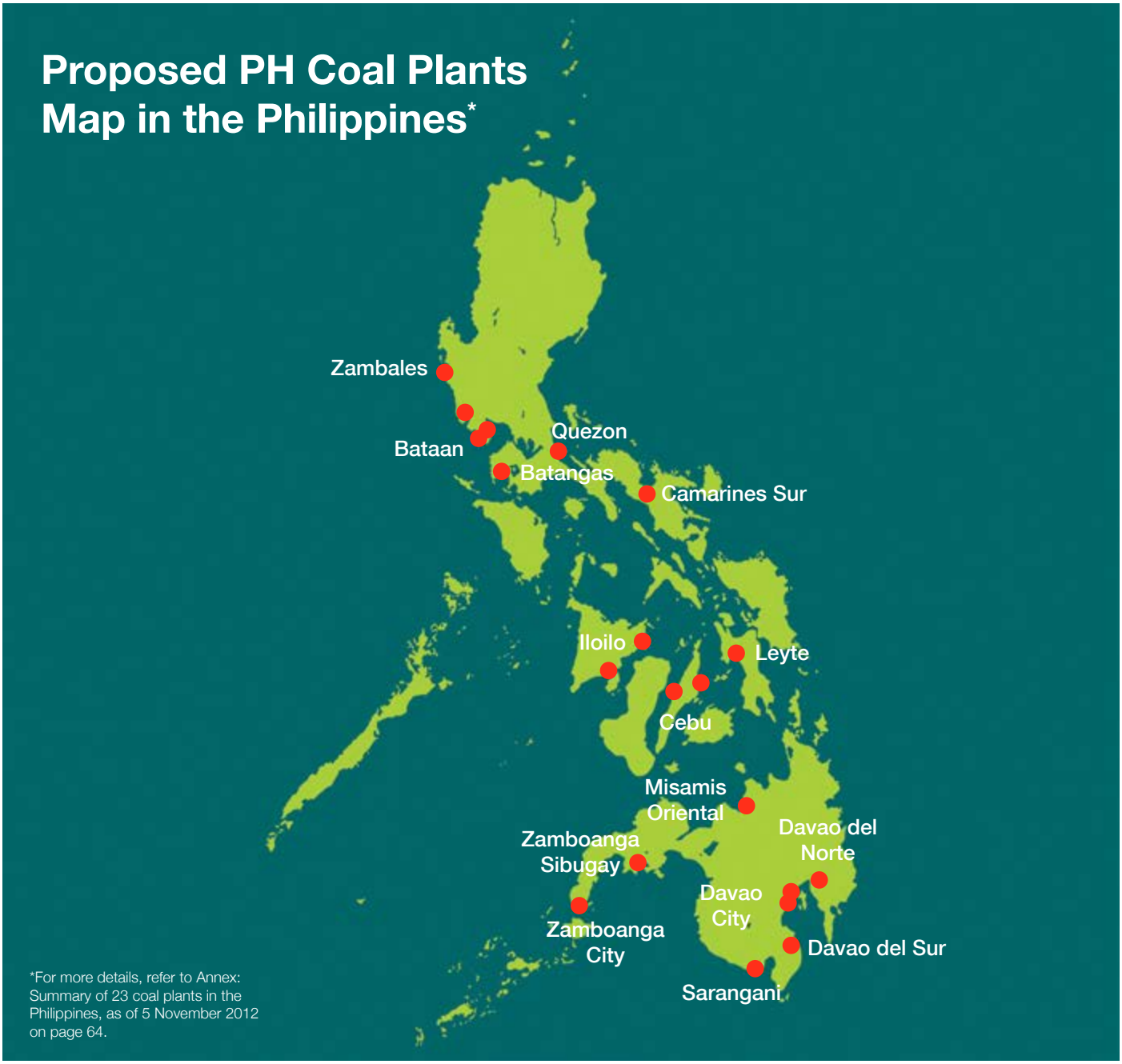
24 Proposed 2013, House Bill 5405 for the "One Million Solar Roofs Act" or "An Act Providing for Incentives and Credit Facilities for Consumers of Small Solar Power Systems in the Philippines"(proposed on 11 October 2011)

History and the big picture for renewable energy in the Philippines – where we are today

The Philippines stands today at a historic crossroads with respect to energy. Will we go clean or go dirty? Invest in the past or invest in the future?

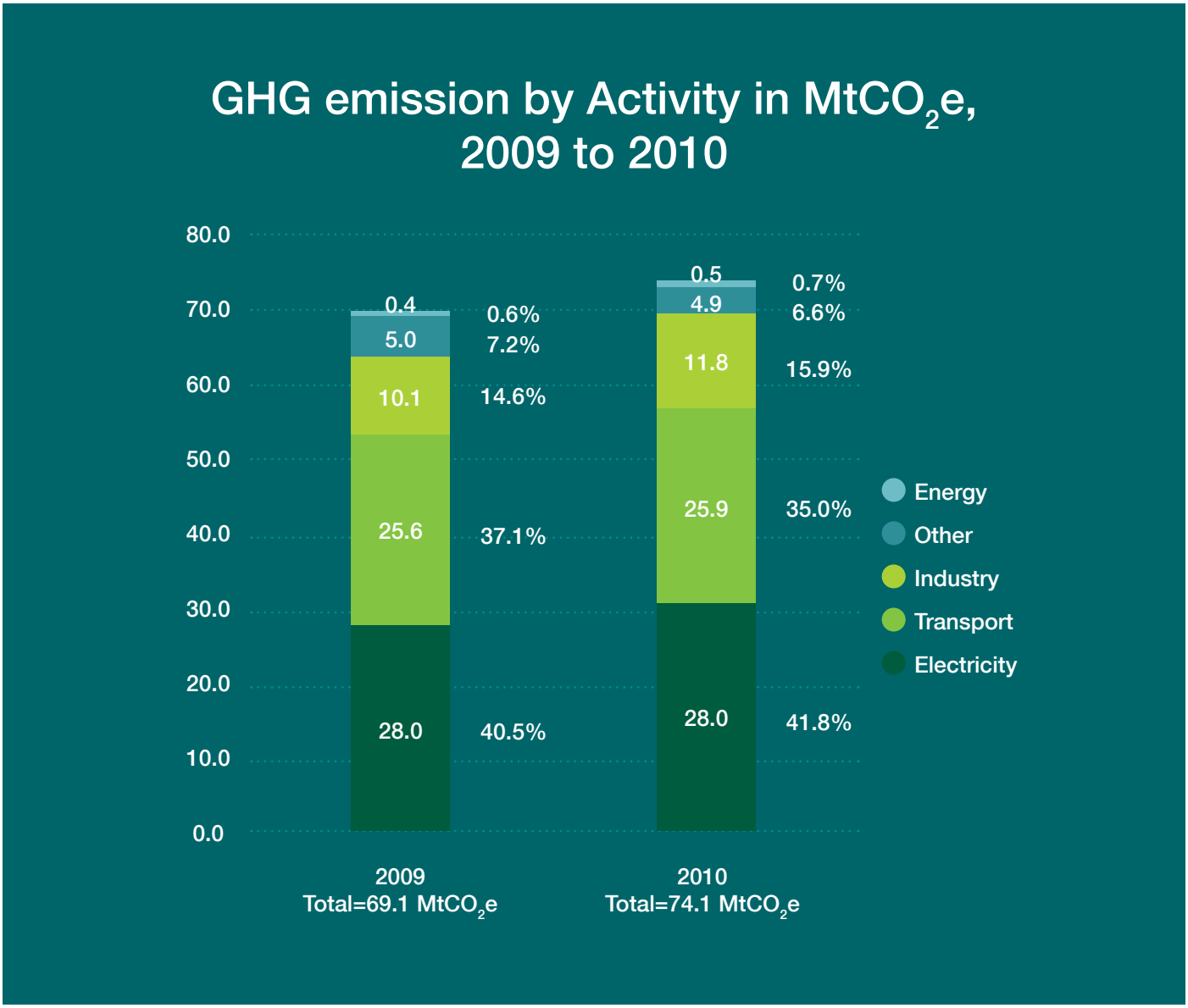
In addition to ten existing coal fired power plants, there are 23 proposed in the pipeline [41], which would bring us to 33 coal fired power plants. At least three possible new plants are in the middle of urban communities where they can inflict maximum damage.[42] Yet hope remains. The government has also made it possible for renewable energy to emerge in a big way.





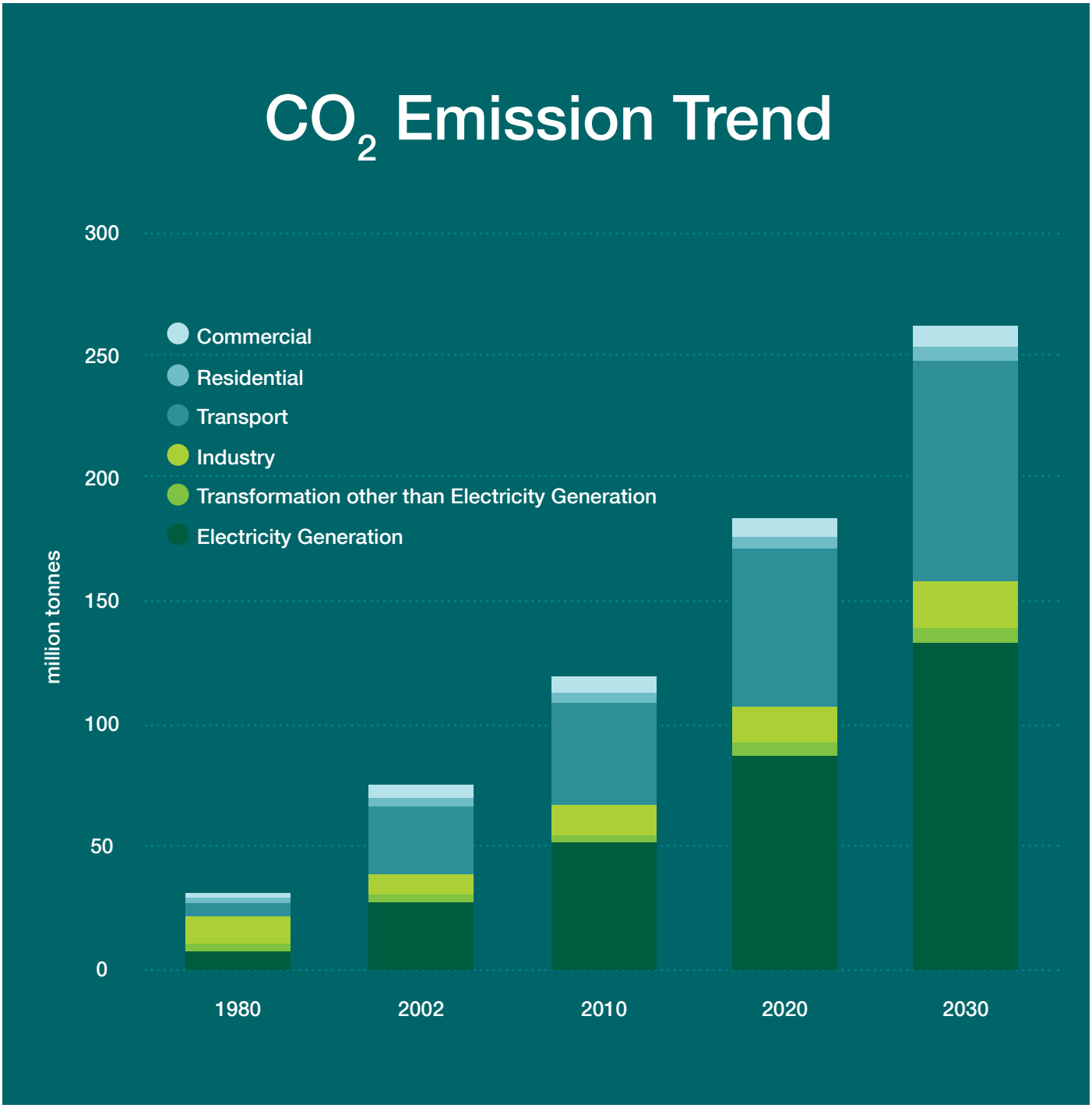
Here are some major challenges we face today:

- Energy rates here are the highest in all of Asia, placing a tremendous burden on vulnerable households and pushing many into energy poverty.[43]
- For decades, instability and unrest along with poor governance, corruption, and short-term rent-seeking behaviors left the grid in poor shape and fostered a last minute, reactive, coal driven energy policy.
- In the 1990s, the country was plagued by chronic power outages, which contributed to economic stagnation.
- Apart from geothermal, renewables remain relatively new industries in the Philippines and have yet to establish themselves as vibrant, major players.
- The challenge of providing energy to 7,107 scattered islands running from the south of China to the northern tip of Borneo has always raised costs and created tremendous challenges.
- Many thousands of families today have little or no electricity, and the rural poor are especially trapped by energy poverty.
- Moreover, the majority of our power comes from highly polluting forms of energy like coal and petroleum. “In terms of overall greenhouse gas (GHGs) emissions, the Philippines contributes about 0.4% of the world total, and is ranked 39th in the world in 2005 with about 142 million tons of carbon dioxide equivalent (MtCO2e)… [and] principal GHG emissions sources are the power and transport sectors.”[44] Electricity generation in the Philippines is the highest GHG emitting sector and contributes roughly 39.9% of the country’s MtCO2e.[45]
- “Total GHG emission from energy-related activities reached 74.1 million tons of CO2 equivalent (MtCO2e) in 2010, an increase of 7.3 percent compared to the 69.1 MtCO2e level in 2009. This was primarily due to the notable increase in consumption of fossil fuels across all economic sectors, specifically in the energy-intensive transport and industry sectors. Power generation continued to contribute the largest share of 41.8 percent in the total GHG emission. With a significant increment of 10.7 percent, it posted 31.0 MtCO2e total emissions in 2010 from its previous level of 28.0 MtCO2e in 2009.”[46]



Source: Philippine Energy Situationer 2010

Coal Action at Fisheries Ministry in Indonesia
©Yudhi Mahatma / Greenpeace

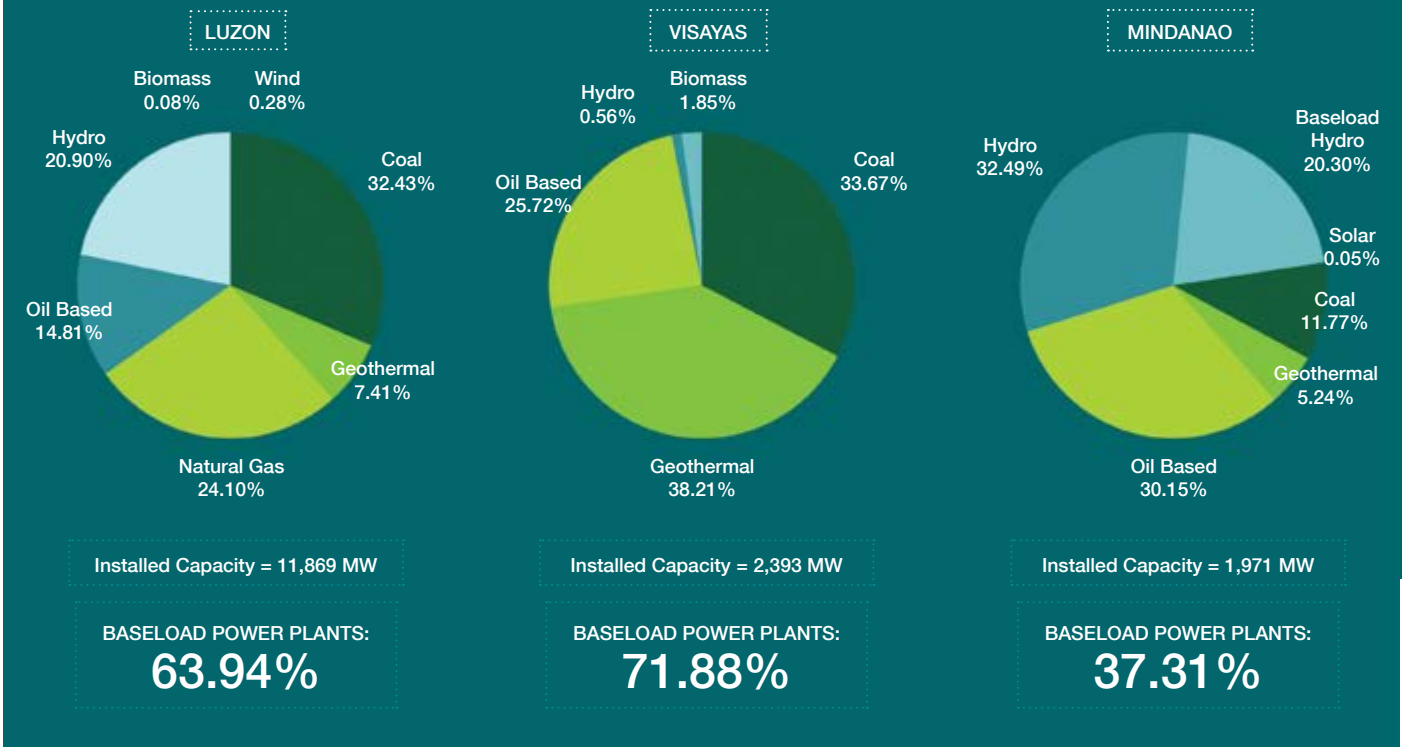


Source: APERC (2006)

However, several crucial positives emerge:

- Ever since the 1970s, in response to the Middle East oil crisis and fuel shortages, the Philippines invested heavily in geothermal and has become an undisputed global leader in geothermal energy, second only to the USA.
- Over a third of the country's total primary energy supply came from renewable energy resources with geothermal providing the lion's share.[47]

Capacity Mix



Source: DOE (Based on 2011 Figures)

- This does not even factor in the many thousands of rural individual "Solar Home Systems" or SHSs, micro-hydro systems and micro-wind turbine energy systems, especially in remote off-grid areas. Because these small-scale installations are off-grid, their contributions to the Philippines' energy supply is usually ignored and has never been comprehensively reviewed or documented – except for some scanty data available from the government's Expanded Rural Electrification Program / Accelerated Barangay Electrification Program.
- Moreover, the government established itself as a frontrunner in Asia with the Renewable Energy Act of 2008. This ambitious Act created a feed-in-tariff and a renewable portfolio standard for run-of-river hydro, modern biomass, wind, solar, and ocean power (but did not focus on geothermal, which is considered a mature industry in the Philippines). This law is far-reaching and tries to expand investment in renewables as well as capacity installation.

'Coal Monsters' Action in Philippines
©Jimmy Domingo / Greenpeace

The Feed-in Tariff

The most important recent development for renewable energy in the Philippines is the revolutionary Feed-in Tariff or "FiT." This is a renewable energy policy offering guaranteed payments on a fixed rate per kilowatt-hour (KW-hour) for emerging renewable energy sources (not geothermal, which is considered an older, more established industry). The policy lays out priority purchase/transmission of/payment for by grid system operators; and guarantees investments of renewables firms through fixed rates, which end-users will pay for over 20 years. Renewables are considered "must dispatch," which means they enjoy the benefit of priority dispatch, or connection to the grid.

Unfortunately, the government took almost two long years after the publication of the country's FiT Rules to announce its first round of financial incentives for renewable energy investors. In the end, the Energy Regulatory Commission (ERC) approved tariffs for run-of-river hydro, biomass, wind and solar projects, agreeing to pay renewable energy developers set rates for energy fed into the grid – but the targets are substantially lower than the ones suggested by the National Renewable Energy Board (NREB), and have dismayed investors, developers, and experts. This disappointment raises questions about whether the ERC has brought the Philippines closer to or further from the goal of P106.85 billion of renewable energy projects planned under the FiT scheme.

Greenpeace interview with Senator Angara, October 12, 2012

"Five years ago when I was pushing for the RE law I had a vision for a future where we would be a global leader for renewable energy. We were foreseeing that if we enforced the renewable energy law when it was passed we would already be getting 70% of our electricity supply from renewable sources. But because of the dilly-dallying over the FiT and the timidity of some of our bureaucrats – the politicians were almost unanimously for it – the application of the renewable energy law was rather slow. And because of that, as a result of that delay, we may have lost almost two billion dollars of investment… Now they approved the FiT but at a very low rate. The FiT rates for some energies were acceptable but for solar and wind the rates don't seem to be acceptable to many of the investors, which delays investors from taking up the offers they would have jumped on."

Moreover, the ERC was accused of "legislating science" by locking the tariffs into a set level for a three-year period, in spite of the fact that renewables technologies evolve rapidly, reaching new peaks of efficiency but also experiencing volatility and uncertainty (although ERC officials told Greenpeace however that if necessary, the tariffs would be reviewed and readjusted earlier[48]).

"The approved FiT for solar installations will be 9.68 Philippine pesos (PHP), or approximately 14.9 pesos per kWh generated regardless of the size of the installation. Run-of-river hydroelectric power sources will be entitled to 5.90PHP/kWh, wind 8.53PHP/kWh and biomass 6.63PHP/kWh," although "NREB proposed a rate almost double that… as part of its submission last year."[49]

The current installation targets for the RE technologies comes to 750 MW: of this, 250 MW is allotted for hydro and biomass projects each, while the target for wind projects stands at 200 MW, and solar projects have an installation target of 50 MW. All renewable energy developers interviewed by Greenpeace agreed that the installation targets are too low. For instance, experts in the wind industry indicated that the 200 MW allotted to wind were already oversubscribed, and that 350 MW would have been more realistic, since 200 MW would be taken up by 2 companies alone.

The feed-in-tariff allowance (FiT-ALL)

The feed-in-tariff allowance (FiT-ALL) is really a universal levy, which will be collected from all on-grid consumers of power in the Philippines. Essentially, the FiT-ALL equals the amount paid to the renewable energy developers for the feed-in-tariff rates. Because the government allows all energy costs to be passed directly to consumers (a disappointingly regressive policy that does not benefit or protect poor, vulnerable segments of the population), on-grid energy consumers have to cover not only additional tariffs paid by under the FiT scheme but also administrative costs for the fund administrator, which takes care of the remitted FiT-ALL revenues collected by power distributors, the grid operator, and retail electricity suppliers.

At this stage, with the FiT and FiT-ALL established, everyone is still waiting for issuance of the Renewable Portfolio Standards (RPS), and as of this writing it was not yet clear what is holding it back. Consultations that took place in 2011 were supposed to be last ones, but at the time of this writing the RPS still had not been made public.

Net metering

The National Renewable Energy Board (NREB) has also released draft guidelines on "net metering" in 2012 – a system that allows a two-way connection to the grid so that users can buy energy from the grid but also be paid for any energy they give to the grid, often from solar panels on their roofs. The ERC held a public consultation for the net metering rules on September 21 of this year, but thus far, the utility companies appear to have been dragging their feet or even blocking net metering rollouts. They may fear that net metering could make millions of people energy independent, freeing these end-users from the bind they are in now where they have no choice but to buy expensive energy from the grid, and that net metering could drive down demand for electricity overall, which would in turn make energy cheaper for all and eat into utility companies' profit margins. Utilities companies in the Philippines are very protective of their profits and have resisted allowing consumers to generate their own electricity or even reduce electricity consumption. It remains to be seen how the government can push through net metering and benefit the country as a whole, in the face of industry opposition.

Laws vs. realities

Problems for renewables in the Philippines typically cannot be ascribed to laws or policies on paper, which are often excellent. Instead, the problems lie in their application: sometimes not applied at all, sometimes applied late, haphazardly, in ways biased and shaped by corruption and influence peddling, or with prohibitively sticky, cumbersome bureaucratic procedures. At this stage, the government must stand firm behind the panoply of positive laws and policies that have been crafted, and act quickly to stay on track.

Because of its inaction, foot-dragging, and bureaucracy, the DoE itself is blocking the implementation of the Renewable Energy Law.

"The DOE has awarded 313 renewable energy service contracts but to this day, not one has been developed. The fate of these projects lies in the hands of the DOE, which has yet to establish the eligibility criteria for renewable energy developers to proceed. More than three years after its passage, the Renewable Energy Law remains a paper promise."[50]

Even within the DoE, some individuals are dismayed by their organization's lack of vision and leadership. As a member of the DoE succinctly stated: "In order for any policy or law to be fully implemented, the government must be firm and show resolute political will, especially with respect to energy planning. We launched the National Renewable Energy Plan (NREP) last year, saying by 2030 we would have 50% RE utilization in the energy mix. That is a firm target. There is that plan. Whoever sits in DoE must implement it."[51]

A number of individuals employed in a variety of government positions, including high ranking individuals in the Department of Energy, have previously worked for the coal and gas sectors, raising questions about conflicts of interest and potentials for undue influence by the coal lobby on government entities such as the Department of Energy.

Solar Energy in Thailand
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Jobs renewable energy could bring to the Philippines

Solar Energy in Thailand
©Athit Perawongmetha / Greenpeace

Note on direct, indirect, and induced jobs

Each section below looks primarily at direct effects – the "direct" jobs that each renewable energy industry can provide. "Direct jobs are those in the primary industry sector and include jobs in fuel production, manufacturing, construction, and operations and maintenance."[52] However, it is important to keep in mind that there are secondary, "indirect" jobs effects from investing in renewable energy such as lumber and steel production, roadwork, and more. Such jobs primarily accrue to infrastructure and manufacturing in the Philippines, or "secondary industries which supply the primary industry sector, which may include, for example, catering and accommodation."[53]

One example of direct employment would be the construction team needed to build a new wind farm. Indirect employment could be the extra services provided in a town to accommodate construction teams.[54] "The large number of assumptions required to make calculations mean that employment numbers are indicative only, especially for regions where little data exists."[55]

In addition to "direct" and "indirect" jobs, there are the "induced jobs," namely jobs created or enhanced when employees from renewables spend their wages on goods and services. Otherwise said, after calculating direct effects (an engineer for is hired for a wind farm) and indirect effects (a manufacturer supplying parts to build a warehouse for the wind company) one can consider induced effects (when the engineer buys a pizza, builds a pool in her garden, or hires a tutor for her child). This is sometimes called the "consumption multiplier" and it is not estimated in this report, but readers should bear it in mind when considering the value of renewable energies, and their job enhancement potential.

Indirect and induced jobs are usually calculated using input-output modeling. Some experts argue that the inclusion of indirect jobs would typically increase job numbers by 50 – 100%, while the inclusion of both indirect and induced jobs could increase job numbers by a 100 – 350%.[56]

1. Solar

This section delves into some of the potential for employment, cost savings, and wealth creation associated with solar energy, though aggregate wealth impact on GDP and fiscal policy of renewable energy is discussed in greater depth in the last section of this report.

Located in one of the sunniest countries on earth, near the equator, the Philippines benefits from a long, hot summer season guaranteeing it a competitive advantage in solar energy, with average solar radiation ranging "from 128 to 203 watts per sq. m. or an average of 161.7 watts per sq. m. Based on NREL's Climatological Solar Radiation Model for the Philippines, there is potential to generate 4.5 to 5.5 kWh/m2/day in the country."[57]

Large domestic solar initiatives

The Asian Development Bank sponsored the Philippines' first large solar rooftop project, and the biggest to date, with 26 people hired, over 15 months. If this model is anything to go by, a 500 KW system will generate approximately 95 person-months worth of employment, primarily in installation, as well as a few indirect jobs emerging, for fabricating solar module frames, engineering services, supplying wires, some other manufacturing jobs, and food services around the construction.[58]

In line with a non-rooftop model, a 1 MW grid-connected centralized solar photovoltaic power plant was put up in 2004 in Cagayan de Oro City: the Cagayan Electric Power & Light Co., Inc., located in Cagayan de Oro City, with 6,500 polycrystalline silicon solar panels spread over a two2-hectare area. Moving on from this successful smaller project to bigger things, CEPALCO has announced plans to install a 20-MW plant on a 30-hectare lot inside its service territory.

Although there are 49 solar energy service contracts up for review by the DOE, at present the DOE has only awarded one single solar energy service contract for pre development, to the Aurora Special Economic Zone Authority for a 1 MW solar farm in Aurora province.

Enfinity[59]

Enfinity, which is headquartered in the Philippines and maintains operations in many countries, has already applied for 324 MW in the Philippines, and is planning to hit a target of 500 MW in 3 years. Enfinity spokespeople explained that for an average 10 MW plant, they hire:

- **1000 people at peak, during construction;**
- **80-85 people to clean the 44,000 solar panels, which are each 1m x 1.50 m. and need to be cleaned continuously to maintain optimal efficiency;**
- **20 security guards, working in 3 shifts;**
- **1 site manager;**
- **1 or more administrative staff;**
- **and several engineers.**

The bulk of their labor force would be relatively unskilled, allowing Enfinity to hire locals with modest training. Moreover, they are training a number of engineers, with plans not only to employ them locally, but even to export their expertise in the future. A representative stated, "We expect to train our staff to over time, hire more engineers, and develop local expertise to design and build solar power plants throughout the region. We have a lot of engineers here in the Philippines who are underemployed and unemployed, so we hope to build on high-value employment. The main reason to relocate [to Manila] was the belief that the talent is here."

Moreover, Enfinity argues that by investing in the Philippines, it creates wealth for communities and the nation. "For a 10 MW plant we spend about 1.2 billion pesos. Twenty percent of that (or roughly 300 million) is spent in the locality. These are underprivileged municipalities, so it's a huge amount [for them]. It makes a difference to have 100 people employed there in steady jobs once the plant is running. And 1000 people during the 6 months of construction, at peak levels… Economists always talk about the multiplier effect. If you bring 1.2 billion pesos, you multiply it by 6, or 5 if you calculate conservatively. If you employ 100 breadwinners with good paying permanent jobs, you can be feeding about 600 mouths. Also the solar power plant does pay taxes to the municipality: Property taxes. This is also wealth creation."

Although the DoE has yet to approve Enfinity's applications for 324 MW worth of plants, the company is developing off-island grids/SPUG[60] small power utility grids in Philippines, and also has extensive international experience, upon which it bases its projected numbers for jobs. "We built solar power plants in 20 countries around the word, including the US, Canada, India, China, Belgium, Germany."

Regarding challenges in developing solar in the Philippines, Enfinity experts explained, "We also see that people are just not familiar with solar power plants yet. There is a fair amount of disbelief. People think and say: Will it work? Will it actually produce electricity? The answer is, we are confident it will be profitable. And it's clean, it's green, it's great. We don't know who would want to oppose this. This is real. There will be future income where now there isn't. We're excited about it, we're very passionate about this. We can bring substantial change in terms of the economic setting of the locality."

International data on jobs potential of solar

Moving from domestic to international indicators about the jobs potential of solar, "a recent study[61] estimates that 20 manufacturing job-years and 13 installation job-years are created for each Mega-Watt power (MWp) of solar panels installed. The majority of jobs created are white-collar or highly skilled craft labor, including engineers, assemblers, sales representatives and installers. In addition, a large number of indirect jobs are created in supporting industries, such as the production of raw materials. Statistics show that in some countries, for

every job created by the PV industry, between 1.8 and 2.8 jobs are created in other segments of the economy. The study validated its findings by examining Japan and the European Union solar energy job creation records. By 2002, 360 MWp of PV power were installed in Japan, which created an estimated 9,800 cumulative jobs or 27.2 job- years/MWp installed. European PV employment data estimates a job creation of 56,000 job-years/2000MWp or 28 job-years per MWp."Another study, 'The Job Creation Potential of Solar and Conservation: A Critical Evaluation,' posits that "solar PV creates 55-80 times as many direct jobs as natural gas, and solar heating creates 2-8 times more direct jobs than conventional power plants."[62] Moreover, researchers at the University of California at Berkeley pulled together and reviewed findings from 15 job studies. They found that "photovoltaic technology produces more jobs per unit of electricity than any other energy source. Most of the jobs are in construction and installation of solar facilities and can't be outsourced to other countries."[63]

Naturally, the Philippines may struggle to produce manufacturing jobs in the same way as Japan or Europe. However, it is highly likely that several installation job-years would be created for each MWp of solar panels installed.

Falling costs for solar materials worldwide: potential benefit for the Philippines

Setting aside the complex question of manufacturing capability, in solar you get more bang for your buck than ever before. Solar has seen massive recent technological advances that the Philippines can benefit from. Durability has increased and efficiency has improved, with CPV solar at a record 33 percent efficiency in the field this year.[64] Moreover, the cost of the panels has dropped, with prices falling everywhere along the supply chain from polysilicon to the module.

Economies of scale in the Philippines could also decrease the price of solar with increased solar installation, if trends in other countries' are anything to go by: "Since 2006, photovoltaics has become nearly 60 percent cheaper in Germany thanks to feed-in tariffs. Strangely enough, solar is now far less expensive in cloudy Germany than it is in the US. According to one recent estimate, an installed watt of PV cost less than one-half ($2.80) as much in Germany in the third quarter of 2011 as it did in the US ($5.20)."[65]

Specific economic benefits of small scale solar

Solar energy can be large scale, utilities energy, or it can be about "the little guy," or both. The Philippines is on track to embrace both philosophies, with the Renewable Energy Act boosting large scale solar production; and the proposed "Million Solar Roofs" Act set to encourage community energy, with the potential even to foster a small-town energy revolution by and for people, families, communities, farms, and small and medium size businesses. A million homes with solar (small solar panel installations, and solar hot water systems) in the Philippines could raise installed capacity of small scale solar considerably.

The second model is in many ways akin to the country's rural electrification programs, which have proved that using renewable energy technology is one major source of income for rural populations. Companies that are contracted by agencies (DOE, NEA, AMORE, etc.) to implement rural electrification hire local unskilled labor for porterage and construction. Eventually, locals with higher aptitude get trained to maintain the systems in their communities, as in the case of the AMORE projects. This is the most cost effective way of implementing a project and making sustainable.

However, in the end, jobs are created both by the first economic model of solar central-station (utility-scale plants run by corporations); and by the second model of truly distributed small scale renewable power.

Initiatives like the Million Solar Roofs Act, allowing "homeowners and entrepreneurs to take out loans from Pag-Ibig [the national housing loan system], GSIS [Government Service Insurance System], SSS [Social Security System] and other financial institutions to purchase solar panels and pay the amount from the ensuing savings in their electricity bills,"[66] can promise the Philippines more cost savings and wealth creation than meets the eye. The first and most obvious would be all the many installation-related and maintenance-related jobs. Renewed construction and electrical or maintenance work could make a substantial difference to employment. A renewable energy-driven economic recovery program would replace, at least, those lost construction jobs, and might result in some renewed investment in the housing sector, boosting investment into the construction industry and thus providing a transfusion of new credit.

Economic benefits of small scale solar: less pressure on the grid

But additional benefits accrue too: the Philippines as a whole could experience overall savings in terms of grid maintenance, transmission and distribution: with fewer burdens on existing wires and infrastructure, and less need for new ones, there would be cost savings for the entire archipelago. These cost savings could and should be passed down to consumers.

Given the Philippines' vulnerability to storms, the benefit of small solar also lies in disaster recovery value for serving whoever has panels, when central stations go offline or grids experience problems. The size of the savings here would be commensurate with the number of households and businesses whose partial or total energy resilience would make them suffer less in the aftermath of storm-induced blackouts. The loss savings value for preventing the above-named losses could be calculated by the DoE.

Solar products for the poor: moving the most vulnerable out of energy poverty

Solar products for the poor hold great promise in the fight against energy inaccessibility for rural areas – a major poverty-inducing factor. Small scale solar can help create pathways out of poverty. It should not be conceived of or planned merely as a one-off product-based deployment, but rather as a long term commitment to deploy, maintain, and expand products in an integrated and sustainable fashion.

In the Philippines, according to the Department of Labor, "as of 31 July 2010, although 99.87 percent of all barangays have electricity, this electrification coverage only benefits 74.0 percent of households nationwide, leaving 32.30 million households without electricity."[67] Other non-governmental sources have even more dire perspectives, arguing that "at the national level 62% of households are electrified… [and] most low-in come households cannot still afford modern energy services. Firewood and modern biomass residues are their main fuel sources. Currently rural poor rely on firewood for the 55% of their energy needs and meet another 25% from modern biomass residues… More than one-third of the population lives below the poverty line, despite gains in poverty alleviation over the last decade…"[68] Solar products for the poor can break the energy gridlock that many bottom-of-the-pyramid communities find themselves in. According to Energizer Holdings, in the Philippines "many spend up to half of their income on the kerosene, even though it provides inadequate illumination,"[69] which pushes vulnerable Philippines further into poverty.

A case study showing how pro-poor solar products enabled cost savings and helped vulnerable communities grow their wealth, was conducted by One Million Lights Philippines (OMLP), which distributes solar lights to areas without electricity, where poor households rely on kerosene.[70] OMLP found that solar products for the poor can free up some cash that can be used for other purposes, thereby enriching the poorest segments of the nation and in turn boosting sustainable development.

> **"About 800,000 households burn kerosene for lighting in Philippines and thousands of others use kerosene lamps during disaster situations. Kerosene is expensive, hazardous, damaging to human health and a pollutant. Toppling of kerosene lamps is the world's primary cause of house-fires… In an effort to assess the potential application of solar micro-technology in the Philippines, PFPI and illumination conducted a field trial of the Mandarin Ultra light among a sample of 500 rural off-grid households located in typhoon-prone areas of coastal Bohol (Visayas). Majority of the respondents were poor fisherfolk who typically spend 28% or more of their weekly income on kerosene for lighting. After switching to a Mandarin Ultra, the same households reduced their kerosene consumption and expenditure by 72%. Respondents also reported significant reductions in kerosene-related accidents (65%), house fires (49%), burns (51%), eye ailments (59%) and respiratory problems (49-63%), and dramatic improvements in children's study time after dark (78%)."[71]**

The study found an average of USD $78 in financial savings per light per year – not counting savings in health care expenditures or expenditures to cope with fires. For people living in poverty, such savings are considerable, and free them to spend their money in more productive ways. Moreover, the positive impact on the Philippine economy of educating children (78% increased study time), has been widely accepted.

Looking at the bigger nationwide picture, according to Congressman Teddy Casiño, the high process of energy "burden poor Filipinos, a big majority of whom are earning way below the living wage. In fact, energy, together with water, is the fourth biggest expenditure of Filipino families according to the latest Family Income and Expenditures Survey. For extremely poor families, it is third to food and house rental, eating up funds that could have been used for education or health care."[72]

An excellent in-depth study of energy poverty in the Philippines by the United Nations Development Program highlighted numerous clear financial benefits for the country, linked to rural electrification with micro-solar.[73] Moreover, many projects have been shown to create wealth, developed by the National Electrification Administration (NEA), National Power Corporation through its Small Power Utilities Group (NPC-SPUG), Alliance for Mindanao Off-grid Renewable Energy (AMORE), Solar Power Technology Support (SPOTS) Project, Global Village Energy Project (GVEP), Asian Alliance of Appropriate Technology Practitioners (APPROTECH ASIA) and others. Some have developed public–private partnerships to provide micro renewable technology to energy-poor communities, with solar home systems (SHSs), solar battery charging stations, solar pumping, briquetted fuels, biogas systems, solar drying, small windmills for water supply, and more.

Wind farm in Ilocos Norte
©Luis Liwanag / Greenpeace

2. Wind

Located right in the Asia-Pacific monsoon belt, the Philippines could harness tremendous amounts of wind energy, in particular in the north and center of the country.[74] With DoE identifying 16 wind energy potential sites and the industry waiting for the FiT to be implemented, the countries' facilities have yet to be built, with one exception: the brand new wind industry in the country kicked off in 2005 with the 15 turbine, 33 MW Northwind Power Project in Bangui, Ilocos Norte.

Beyond the Northwind Bangui wind farm, there are six additional wind farm projects under development: (1) PNOC-EDC 140 MW in Ilocos (2) UPC Asia, 100 MW (3) Energy Logics, 40-60 MW (4) Energy Development Corp. and the Spanish Isolux-Corsan, 10-15 MW (5) PetroEnergy Resources Corp., 30 MW (6) Phil Carbon, 30 MW. There are yet more additional wind farms, which have been studied and mapped comprehensively, which could all bring possible future jobs, revenue, and investment to the Philippines:

- Northwind Pamplona Project (Northeast Wind Systems Corporation) 30 MW capacity
- NorthwindAparri Project (Northwind Group of Companies) 40 MW
- Burgos Wind Power Project (Energy Development Corp.) 40+46 MW
- Mauban Wind Farm Project (Quezon Power Philippines) 12 MW
- Pagudpud Wind Power Project (Energy Development Corp.) 40 MW
- Camiguin Island Wind Power (Energy Development Corp.) 5 MW

Setting aside manufacturing jobs which wind energy could potentially bring to the Philippines (questions linked to manufacturing are reviewed below) we can roughly measure the jobs potential of wind farms, looking at the 14 key value chain activities throughout the whole process, from creation to maintenance.[75] Right at the beginning, wind energy site identification, assessment, and predevelopment all require Philippine expertise even if outsiders are brought in. Wind companies also need clerical and administrative staff, managers, and accountants as well as technical experts. The same is true for nacelle assembly, which needs skilled technicians and engineers or scientists who may need to come from outside the Philippines at first, but also trade workers, clerical staff, assemblers, and managers which could all be Philippine hires. (Again, as with manufacturing, the more units assembled locally, the more people will train to assemble locally.) In the long run, wind farms would provide good, steady jobs in maintenance, including inspecting blades and turbines, routine maintenance, and energy production management. Each wind farm project and certainly each company also needs to hire employees for project development like legal and regulatory analysis (which only attorneys familiar with Philippine law can provide), and project finance (of necessity involving finance specialists engaged with Philippine investment climate and realities). Connecting wind turbines to the grid and substations provides jobs for engineers, electricians, trade workers, inspectors, and managers, with many nationals qualified for such positions. The biggest boost to employment though would undoubtedly come in the construction phase, when on site-civil works would require heavy construction with clearing or grading sites, working on roads, pouring foundations, and preparing the site for tower construction and assembly. Each project is also likely to hire administrative

assistants, accountants, real estate professionals, and truck drivers, logistics managers, sales people.

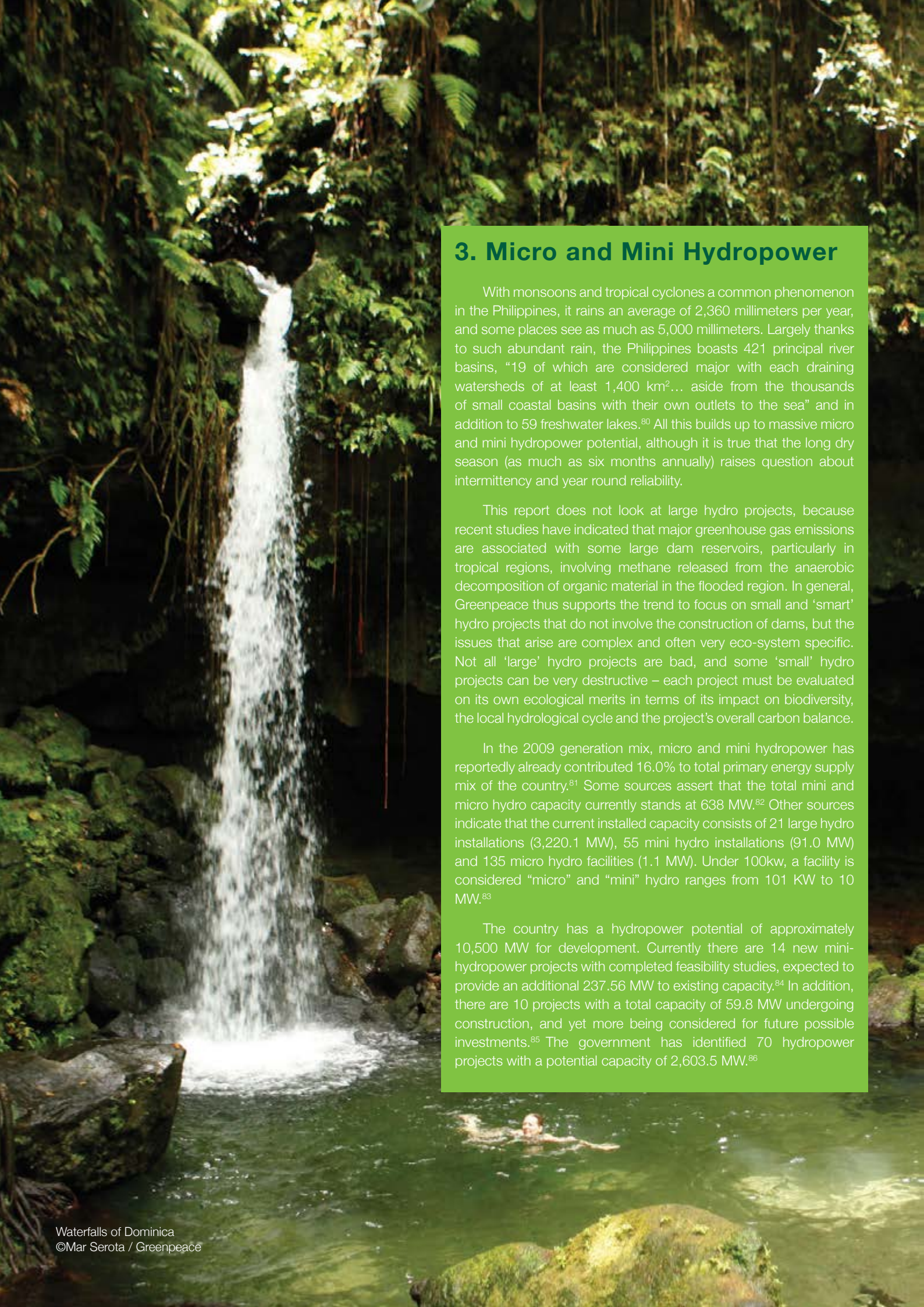
> Every country is different, of course, but a study by the Natural Resources Defense Council found that in the US, "one typical wind farm of 250-MW creates 1,079 direct jobs over the lifetime of the project… Importantly, these jobs aren't only created on the actual wind farm site during the installation of the wind turbines. These jobs are also created throughout the sizable wind farm economic "ecosystem"—the chain of activities and businesses that, over time, constitute the many steps of building a wind farm… The research identifies 18 in sales and distribution, and 27 in operations and maintenance… Construction jobs add 522 jobs to the overall project. These workers are spread among three categories, with 273 working on on-site civil works, such as roads, and foundations; 202 working on mechanical assembly, such as the installation of the wind turbines; and 47 working on site electrical work, such as grid connection."[76]

Even assuming that the Philippines cannot build manufacturing capabilities fast enough at first to capture the manufacturing jobs inherent in a wind farm, the country could still benefit from dozens of jobs in sales, distribution, operations and maintenance, and hundreds of construction jobs.

Moreover, wind power equipment is getting cheaper all the time, which partially explains the lower wind energy prices we see today. Taller, bigger turbines have led to performance increases, with capacity factor growing globally. Wind is already among the cheapest source of electricity generation. The Philippines stands to benefit from these trends, getting more bang for its buck with each wind-related investment. In fact, the Philippines will be in an even better position given a global problem facing the wind industry: with approximately 40 GW annual market size and 80 GW annual worldwide action capacity in 2012, there is currently an over-capacity for wind turbine manufacturing, which is pushing the prices down and will continue to do so in 2013.

Here is information on what kind of jobs the nascent wind industry is already able to provide. The Philippine wind energy company NorthWind has already created 21 direct jobs with a 33 MW facility, two thirds of which are on site. Moreover, NorthWind believes that Philippines can quickly develop expertise in auxiliary industries and complex tasks (like wind resource analysis and maintenance), as the country did with geothermal. NorthWind sent some of its employees from the site abroad to Canada for training, and once seconded to the manufacturer they quickly learned the ropes on maintenance. As one NorthWind representative explained, "The Vestas[representatives]… there were very impressed with our staff. They made a general comment about Philippine engineers – that they are very conscientious, sharp, hardworking…In the long run there is a lot of opportunity for domestic technical services rather than importing experts. These are… high value jobs, mechanical or electromechanical engineering… Operation and maintenance are very high value jobs though if we can capture that." NorthWind also estimated that it would be possible to hire two to five people per turbine. This would come on top of all the construction jobs and site prep, "which provides civil work. You need cement, and steel, and laying transmission lines. These construction jobs are plentiful, though for a short time only." NorthWind also explained that even tower construction can be partially built in the Philippines: "Look at our Malampaya platform – the legs were made here."[77]

There are obstacles however, that the wind energy faces in expanding and hiring. Although wind developers in the Philippines positively mentioned the FiT, they argued that to really see industry development and job creation, wind energy would need a 230 kilovolt transmission backbone of lines that connect the west to east, which has been on the drawing board with the National Grid Corporation of the Philippines (NGCP) and DoE for 10-12 years because of system security reasons. Moreover, installation targets set by the government are deemed too low by experts in the industry. "The 200 MW are already oversubscribed! 350 would have been more realistic. The 200 alone are already taken up by 2 companies."[78] In addition to the problem of installation targets, "Everyone still waiting for insurance of the RPS – we don't know what is holding it back." "And eligibility criteria issued by DoE are not helping. It's understandable that the DoE wants to be strict. But also at same time it's a disincentive. Very few, 1 out of 7 candidates, can proceed."[79]



3. Micro and Mini Hydropower

With monsoons and tropical cyclones a common phenomenon in the Philippines, it rains an average of 2,360 millimeters per year, and some places see as much as 5,000 millimeters. Largely thanks to such abundant rain, the Philippines boasts 421 principal river basins, "19 of which are considered major with each draining watersheds of at least 1,400 km^2… aside from the thousands of small coastal basins with their own outlets to the sea" and in addition to 59 freshwater lakes.[80] All this builds up to massive micro and mini hydropower potential, although it is true that the long dry season (as much as six months annually) raises question about intermittency and year round reliability.

This report does not look at large hydro projects, because recent studies have indicated that major greenhouse gas emissions are associated with some large dam reservoirs, particularly in tropical regions, involving methane released from the anaerobic decomposition of organic material in the flooded region. In general, Greenpeace thus supports the trend to focus on small and 'smart' hydro projects that do not involve the construction of dams, but the issues that arise are complex and often very eco-system specific. Not all 'large' hydro projects are bad, and some 'small' hydro projects can be very destructive – each project must be evaluated on its own ecological merits in terms of its impact on biodiversity, the local hydrological cycle and the project's overall carbon balance.

In the 2009 generation mix, micro and mini hydropower has reportedly already contributed 16.0% to total primary energy supply mix of the country.[81] Some sources assert that the total mini and micro hydro capacity currently stands at 638 MW.[82] Other sources indicate that the current installed capacity consists of 21 large hydro installations (3,220.1 MW), 55 mini hydro installations (91.0 MW) and 135 micro hydro facilities (1.1 MW). Under 100kw, a facility is considered "micro" and "mini" hydro ranges from 101 KW to 10 MW.[83]

The country has a hydropower potential of approximately 10,500 MW for development. Currently there are 14 new mini-hydropower projects with completed feasibility studies, expected to provide an additional 237.56 MW to existing capacity.[84] In addition, there are 10 projects with a total capacity of 59.8 MW undergoing construction, and yet more being considered for future possible investments.[85] The government has identified 70 hydropower projects with a potential capacity of 2,603.5 MW.[86]

Waterfalls of Dominica
©Mar Serota / Greenpeace

Run of river hydro plants[87]

Luzon

Magat: Ramon, Isabela 360 MW

Kalayaan: Kalayann, Laguna 300 MW

Angat: Norzagaray, Bulacan 246 MW

Casecnan: Pantabangan, Nueva Ecija 140 MW

Binga: Itogon, Benguet 100 MW

Pantabangan: Pantabangan, Nueva Ecija100 MW

Ambuklao: Bokud, Benguet 75 MW

Bakun: Alilem, Ilocos Sur 70 MW

Mindanao

Pulangui IV Maramag, Bukidnon255 MW

Agus VI Buru-un, Iligan City200 MW

Agus II Saguiaran, Lanao del Norte180 MW

Agus IV Baloi, Lanao del Norte158 MW

Agus I (Units 1 and 2) Marawi City 80 MW

AgusVBuru-un, Iligan City 55 MW

Agus VII Buru-un, Iligan City 54 MW

A representative eight MW run of river hydro plant, located in Antique, has provided around a thousand jobs. A spokesperson for the company (which has 47 mini hydro projects nation wide, seven wind, five solar) explained: "We employ 1,000 people from drivers, laborers, panel building or terracing to protect the slopes – over a period of three years. Now we are 80% complete but our existing labor force is 750. We bring in the top management engineers accountants etc., maximum 15 people, all Philippine and not expats, but the bulk of employment is to the locals. We construct roads. Most of the jobs are in construction, not engineering. Once the project is complete, it's 30 people in permanent full time jobs. Five to ten people are forest rangers. And livelihoods increase. There are indirect impacts for jobs in the community. You can see when you go there."

Run of river hydro development enriches the Philippines socially, environmentally and economically. It serves as a catalyst for economic activity, especially because run of river hydro facilities are typically located in the hinterlands, in areas without substantial development. An industry leader stated, "When we start developing it helps the host communities. Look just at the roads. In Antique we built 33 km of farm-to-market roads."[88] Beyond providing infrastructure, run of river hydro developers often focus on building communities. The renewable energy developer added: "We go to host communities. We are here not just to do business, but to build a relationship. Our facility will stay 70 years or more. We have hydro that is 100 or 90 years old in the Philippines. Hydro are located in rich winding valleys. When we create roads for hydro we see in-migration not out-migration, along the roads. We create communities. We look into these parameters."

Environmentally, the benefits are clear. Most run of river hydro facilities protect their entire watershed, and have them declared as protected areas, without logging, to ensure the reliable flow of water which only tree cover can provide. The renewable energy developer explained: "We planted 14,000 trees in Antique. We had so many tree planting activities because it was denuded before. We focus on environment and empowering the people, educating them, we finance fruit bearing tree planting, and we have foresters. Upstream we plant hard wood. We give them a livelihood. We give them salaries. We buy the fruit when it's bearing fruit. We do intercropping."[89]

Unfortunately in a number of places such as in Mindanao, negligent government authorities failed to appropriately maintain existing hydro plants, or engage in proper de-silting. The net result: silt just flows down and builds up. One energy expert explained his understanding of why this happened. "This was because Napocor [the National Power Corporation] was undercapitalized – they capitalized it only twice since the beginning. Everything else for operations… cleaning the river… de-silting… Napocor had to borrow, which is expensive. Their debts were so large compared to the equity; they over-borrowed. The whole point of privatization was to pare down the debt, but when they privatized facilities, money didn't really come in and they couldn't raise enough funds to rehabilitate the facilities. It got worse and worse in Mindanao. Now they say the fastest solution is to build coal plants. They say they can do it in three years. Why don't they use the money and clean up the hydro?"[90]

4. Geothermal

The government of the Philippines can rightly be proud of its prominent record in geothermal energy and its undisputed status as a global leader in the field. Geothermal emerged in the Philippines with the first pilot plant built in Barangay Cale, Tiwi, Albay in 1967. Because of the Middle East oil crisis of the 1970s, the Philippines invested heavily in geothermal, capitalizing on its natural potential in the "Pacific Ring of Fire," with 20 active volcanoes, and cemented its status as a trendsetter in geothermal. Today it ranks second largest producer of geothermal energy in the world after the United States In 2011, geothermal produced 21.7 percent of the energy mix. The Philippines boasts seven producing geothermal steamfields and eight power plants,[91] and around 38 geothermal power projects are expected to be commissioned by 2030 (based on National Renewable Energy Program targets).[92] The country's remaining untapped geothermal potential continues to draw investors to the exploration, development and expansions or optimization projects. Though reports differ in small details,[93] the government has claimed that based on the National Renewable Energy Program (NREP), it is targeting an additional capacity of 1,455 MW to reach a total of 3,303 MW by 2030"

"The Energy Development Corp. (EDC) is the largest geothermal producer in the country with an installed capacity of 1,189 MW accounting for 60% of the country's total geothermal capacity."[94] According to the Energy Business Review, EDC alone directly hired 2,582 employees, and reported a turnover of US$ 464.73 million[95] (Although Bloomberg Business Week cites the correct figure as 2,533 employees[96]). With exploration, development, and operation of geothermal steamfields and power generation, EDC operates five geothermal-producing fields in five contract areas. Its five geothermal power plants are located in Leyte, Sorsogon, Southern Negros, Northern Negros and North Cotabato. Originally known as Philippine National Oil Company-Energy Development Corporation (PNOC-EDC) the company was government-owned and -controlled, but was privatized, and recently First Gen acquired a controlling stake in EDC.

Other companies with stakes in the industry such as Biliran Geothermal Inc.; Chevron Geothermal Philippines Holdings Inc.; and Aboitiz Power Renewables Inc. also employed thousands of workers directly and created thousands more indirect jobs and induced for the Philippines. Industry spokespeople emphasized that geothermal provided opportunities for direct labor sourced from rural areas.

With an estimated potential of untapped geothermal energy at roughly 2,400 MW,[97] thousands more jobs could be created. "According to an employment study, an overwhelming majority of geothermal jobs are full time, permanent positions. Geothermal provides quality wages to people living in depressed economic communities and provides a stable source of employment. People directly employed by the sector include welders, mechanics, pipe fitters, plumbers, machinists, electricians, carpenters, construction and drilling equipment operators and excavators, surveyors, architects and designers, geologists, hydrologists, electrical, mechanical, and structural engineers, researchers, and government employees."[98] In the United States, an industry associated reported that geothermal generated "1.7 full time positions and 6.4 person years per MW. Induced and indirect impacts were calculated assuming a 2.5% multiplier; for a total direct, indirect, and induced employment impact of 4.25 full time positions and 16 person years per MW."[99] However, that figure of 1.7 jobs per MW was adjusted to 3 on the basis of the ratio between manufacturing and installation employment identified by WaterFurnace.[100]

Mayon Volcano – Philippines 2006
©Greenpeace / Gavin Newman

5. Modern biomass

This chapter focuses on biomass but not biofuels, because emerging research points to the uncertainties around the levels of emission savings that can result from switching to biofuels. In many cases emission savings in biofuels seem to be either very low or lead to a net increase in emissions compared to the use of fossil fuels. Furthermore, the production of biofuels leads directly or indirectly to the destruction of natural ecosystems such as tropical forests, can endanger food security and the livelihoods of the worlds' poor, and is often linked to cultivation of genetically engineered crops.

In terms of how energy is recovered from biomass like rice husks, coconut, abaca, and bagasse, Greenpeace supports the AD (Anaerobic Digestion) of organic and agricultural waste as opposed to the burning of mixed waste to produce energy. Unlike other WTE processes, AD does not burn organic discards but merely the methane gas these biodegradable wastes produce during decomposition, whereas some other forms of agri-waste-to-energy technology are essentially no different from the usual WTE suspects. While some "small-scale" non-AD technologies or burn may "favor locally available waste biomass and by-products" and appear to be "most appropriate bioenergy operations," it can still be argued that they are still wasting valuable resources that can be composted to supplement the needs of the agricultural sector, following methane recovery. It will be crucial in the months to come for the government to research and provide clear guidelines for processes used in recovering energy from these discards. Such guidelines should not contravene and undermine the spirit and intent of existing related laws such as the Clean Air Act and the Ecological Waste Management Act."

Moreover, the incineration of mixed municipal wastes to produce energy creates bottom ash, fly ash and a host of other toxic emissions, and this report does not endorse such renewable energy initiatives – whether they are packaged as "waste to energy plants" or so-called "refuse derived fuel." Indeed, incineration is prohibited under the Clean Air Act of 1999, and actually represents a total waste of energy. Nor do we endorse methane recovery from landfills or dumpsites since existing initiatives are sadly often used to justify more dumpsites and landfills.

Greenpeace also underscores the importance of not creating perverse subsidies for burning forest biomass, and not falling prey to accounting errors in biogenic emissions accounting in GHG emissions reductions. Large-scale forest biomass energy is not sustainable. Burning forests for energy is not clean, green, or carbon neutral.[101] Indeed, burning trees for energy is "like pouring gasoline to put out a fire," and using forest timber for heating, electricity generation or liquid 'biofuel' could severely harm forests and accelerate global warming.[102]

However, in this chapter, Greenpeace has explored the potential of renewables companies focusing on anaerobic digestion processes or methane recovery from composting. Likewise, the use of rice, coconut, abaca, bagasse for energy generation as biomass was studied. In particular, this report endeavors to focus on the jobs potential of "sustainable biomass" through "cascading use," i.e. when biomass is used for material products first and the energy content is recovered from the end-of-life products. This stands in sharp contrast to extraction of energy biomass from pristine forests, lands with high carbon stocks and high- biodiversity value, and wetlands, including from plantations made by the conversion of such areas. We believe that "small-scale bioenergy operations which favor locally available waste biomass and by-products, are the most appropriate bioenergy operations in that they (i) make use of waste, thus contributing to waste reduction and management, (ii) substitute other more damaging energy sources, (iii) contribute to the decentralization of the energy network and are more likely to be located close to heat demand areas, (iv) contribute to rural development, (v) result in supply chains whose sustainability can be more easily monitored and verified by regulators."[103]

Looking closely at modern biomass and bioenergy projects that fulfill strict sustainability criteria, we see that they essentially create value out of agricultural waste prompting a re-evaluation of what is commonly considered as waste material, such as rice straw, which now is overwhelmingly burned in fields or dumped in the Philippines. With modern biomass, rice straw becomes valuable. The same is true not only for rice straw but can also be true of the organic components of municipal solid waste, especially food waste which typically comprise more that 50% of urban waste streams. In the Philippines, modern biomass is primarily bagasse, rice hull, coconut husks and shells, wood chips/residues, followed by other less important agri-wastes.

"As of 2009 modern biomass contributed 13.59 percent of the country's total primary energy mix. Twenty-six (26) modern biomass power projects are now ready for development,"[104] which would have a combined capacity of 276.7 MW and could collectively employ thousands of people, directly, in addition to providing work and additional income for tens of thousands of famers, improving rural economies.

The Industry Studies Department Board of Investments[105] of the Philippines estimated that seven biomass projects which had been mapped out and proposed would generate 78,000 jobs to construct power plants; 4,000 jobs for plant operation; 7,000 in the feedstock supply chain; and additional employment/revenue for all the farmers producing agricultural wastes.[106] This is where the bulk of the employment impact of biomass could be felt.

The estimated volume of agricultural wastes gives a sense of the Philippines' vast biomass potential:[107]

- **Rice: 4.27 Million Hectares planted; Hull Biomass = 4.06 Million MT/Year ; Straw Biomass = 4.27 Million MT/Year**
- **Coconut:3.359 Million Hectares planted; Hull Biomass = 7.0 Million MT/Year Fronds Biomass = 6.95 Million MT/Year**
- **Sugarcane: 0.40 Million Hectares planted; Bagasse Biomass = 6 Million MT/Year; Field Trash Biomass = 6 Million MT/Year**
- **58.3 million urbanPhilippines generated and estimated 14.9 million tons of waste per year.[108]**

Four existing companies are already in place in the Philippines, creating energy: First Farmers Holding, Inc. with a 12 MW feedstock/bagasse facility in Negros Occidental; La Suerte Rice Mill with a 1 MW feedstock - rice hull facility in Isabela; Sure Eco Energy Philippines, Inc. with a 950 kW swine effluent facility in Bukidnon; and Pangea Green Energy with a 200 kW garbage facility in Quezon City.[109] Moreover, an industry insider[110] spoke about how the Philippines has already created two methane recovery and

electricity generation projects, with nine MW of capacity installed in Montalban and four in San Pedro – right at the landfill. Companies put wells in, create a collection system to gather and clean the gas, and then they use gas as fuel for engines.

However, critics including Greenpeace believe that the illegal Payatas dumpsite in Quezon City- which should have been closed following the enactment of RA 9003 or the Ecological Waste Management Act- remains in full operation because it has started to earn carbon credits from methane recovery and is even being showcased as a model for earning carbon credits from methane recovery, while producing an inadequate amount of energy. Critics also point out that in terms of employment, these facilities may compete with the same resources as recyclers. And because landfills and dumpsites perpetuate even more wasting, such dumping operations actually result in greater greenhouse emissions, as the need for primary resource extraction and processing increases. Importantly, Greenpeace does not support methane capture and recovery operations when they are used to justify the continued operation of illegal dumpsites and landfills.

Jobs boosted by biomass include additional employment for suppliers, farmers, gatherers, transporters, and of all renewable energies, modern biomass may hold the greatest promise for job creation, because typically modern biomass has the most people working in the facilities themselves.

A Department of Energy spokesperson explained that biomass may be a way to save the Philippines' struggling coconut industry, rescuing millions of Filipinos from unemployment and underemployment in the wake of global economic shifts: "We can't compete with coconut… globally any more. So you can see, we are decreasing our coconut lands… [From a] 3.5 to 2.5 million ton high of coconut oil we are down to 1.6-1.8 million tons. Biomass can save these industries… Coconut used to dominate. But Indonesia and Malaysia is now dominating palm oil, so our industry is losing ground. But 25 million Filipinos still work in coconut. If you add the use of coconut husks whether it is for biomass or making rope and matting out of husk fibers, which are even stronger than abaca, it is a cost plus."[111] The DoE has begun to map out how biomass can generate more revenue for the existing coconut industry, and how biomass cogeneration facility in rice mills etc. can have the effect of multiplying the wealth of those small businesses.

Global Green Power has bid to build multiple 35 MW modern biomass power plants in the Philippines (Panay; Nueva Ecija; Bukidnon, Mindanao; Cagayan, Luzon), with plans to spend roughly $40 million to construct each modern biomass power plant. "The company projects to produce around 900 local jobs for each new plant."[112] Government sources reported that ultimately, "the energy firm estimated to provide 3,400 jobs per host community, which can translate to 40,800 job opportunities nationwide upon completion of their three-phased projects in Panay, Nueva Ecija, and Bukidnon. This excludes the number of workers that can be hired during construction. Over the first year, the host community can earn an estimate of USD 19M from local taxes or a total of USD 795M in 25 years. At the national level, the total foreign exchange savings from non-use of imported fuels like diesel, coal, and from bunker will be USD 151.6M"[113] According to Global Green Power's website, each of their 35 MW modern biomass power plants can deliver:

a. **An estimated $US 19 Million or Php 817 Million to the host community through the purchase of biomass, biomass transportation, operations and ancillary services. Over 25 years this income would amount to an estimated $US 798 Million or Php 33 Billion over.**

b. **An estimated 3,400 "green jobs" from each GGPC 35 MW TBGC power plant through the collection of biomass waste, transportation and operations, with poverty alleviation benefits for those people and their families.**

c. **Foreign exchange savings to the nation, saving a projected $US 80 Million or Php 3.3 Billion of money spent on fossil fuels in the first year and $US 3.3 billion or Php 138 Billion over 25-years operation of just one GGPC 35 MW TBGC power plant.**

d. **Stable base-load power supply in formerly marginalized communities suffering from energy poverty**

e. **Additional income for the farming communities through biomass waste sales, which would replace burning or dumping of wastes.[114]**

One industry insider spoke about biomass' potential for general socio-economic benefits in communities: "We are going into a fifth class municipality. You go to that place – a low-income place. You build a billion peso facility. The value of the land goes up. The jobs boom. Economic activity thrives. Businesses mushroom, you can sell more food, cellphones, everything. There's less pollution, so long as you follow environmental regulations, there's not the impact of emissions [on the scale of coal fired plants]… It becomes a 2nd class municipality. People don't leave for the city any more. The property value keeps going up. Property taxes go up. Then the local government gets more, and it can spend more, improve the community more with public works. This is what happened in the case of Mina, Iloilo."[115]

Tidal Generation Limited in Orkney
©Steve Morgan / Greenpeace

6. Ocean renewable energy

The FiT rate for oceans renewable energy was deferred, as government authorities felt that the technology was not mature enough to have a FIT rate, and ocean thermal energy conversion (OTEC) was chosen instead of marine and hydrokinetic systems and components, (including wave power buoys, tidal power turbines, or oscillating water column wave energy converters).

"Ocean energy, particularly offshore wave energy, is a significant resource and has the potential to satisfy an important percentage of electricity supply worldwide. Globally, the potential of ocean energy has been estimated at around 90,000 TWh/year. The most significant advantages are the vast availability and high predictability of the resource and a technology with very low visual impact and no CO2 emissions. Many different concepts and devices have been developed, including taking energy from the tides, waves, currents and both thermal and saline gradient resources. Many of these are in an advanced phase of research & development, large-scale prototypes have been deployed in real sea conditions and some have reached pre-market deployment. There are a few grid connected, fully operational commercial wave and tidal generating plants. The cost of energy from initial tidal and wave energy farms has been estimated to be in the range of $ 25-95 cents/kWh66, and for initial tidal stream farms in the range of $ 14-28 cents/kWh. Generation costs of $ 8-10 cents/kWh are expected by 2030."[116]

A PNOC official spoke to OTEC's eventual "big job potential" and explained, "It's like an oil rig, plus a power plant. It really would bring lots of jobs."[117] A typical rig will hire some or all of the following personnel: an offshore installation manager, an operations team leader, an offshore operations engineer, an operations coordinator for managing crew changes; dynamic positioning operator; automation systems specialist; second mate; third mate; crane operators; scaffolders; coxswains; control room operators; catering crew; production techs; maintenance technicians; drill crew; a geologist; welders; well services crew; pump operator. In addition to the rig-related jobs, there is employment in pipe production, transmission lines, operation and maintenance, engineering, administration (accountants, attorneys, managers, etc.), and more. The same official noted, "you don't need a lot of external foreign experts – it's a simple technology, with the exception of the pipe technology… the pipe is the only thing manufactured without domestic content; it's a special pipe, using materials developed for outer space purposes."[118] Experts in manufacturing believed that Philippine companies had the potential to make offshore rigs as well as power plants for an OTEC facility. The day may come sooner rather than later, when OTEC will generate jobs, energy, and investment for the Philippines.

7. Manufacturing renewable energy products locally can generate jobs

The Philippine manufacturing sector is fully capable of developing capacity over the next decades, to play a substantial role in manufacturing renewable energy products. The Department of Labor and Employment (DOLE) pointed to parallels with several industries in interviews with Greenpeace. In particular, the strengths of the automotive industry in the Philippines were cited as indicative of manufacturing potential, with possible lessons to be learned and parallels to be drawn for the potential to manufacture domestically, for the renewables sector. When it comes to assembling auto parts and components in the Philippines, Toyota, Honda, Mistubishi, Isuzu, and Nissan hire 5,228 people, and account for around P13.8 billion in investments. More importantly, 256 companies produce different parts, with 124 first-tier manufacturers and 132 second and third tier (sub-contractors).[119] Like the automotive industry, the Philippine electronics sector saw a gradual expansion and growth in sophistication in the 1990s. Whereas in the 1970s, local manufacturing was purely assembly and delivery, with even testing done abroad, by the 1990s local competency increased to a point where full assembly, test, and delivery was possible and even local sourcing of materials, with across the board downward integration and downstream capability improving.

To hone in on existing renewables energy manufacturing expertise in-country, one crucial player in the scene is already present in the Philippines: SunPower,[120] whose solar cell production lines in the Philippines and global operations make it one of the most important solar manufacturers in the world.[121] SunPower Philippines Manufacturing Ltd. (SPML) is a subsidiary of SunPower Corp. (USA), which is ranked as world leader in high-efficiency mono-crystalline silicon solar cell production/solar-grade silicon wafers. It has the first semiconductor FAB in the Philippines and the first large-scale solar cell facility in Southeast Asia, in Laguna Technopark in Sta. Rosa, Laguna. Despite temporary problems linked to global overcapacity and waning demand, as well as stiff competition from China (currently being sued for dumping or exporting below-cost solar products), and uncertainty about European and American subsidies for green power, SunPower continues to hire thousands in the Philippines. In October 2012 SunPower temporarily idled "half of the 12 lines at its 330 MW Fab 2 cell manufacturing plant and 20 percent of its panel manufacturing in the Philippines" after closing "a plant in the Philippines earlier this year and streamlined its manufacturing processes at its other two plants in the country." However, as of January 2012, California-based SunPower "had about 5,220 employees worldwide… with 4,130 employees located in the Philippines." Moreover, First Philec Solar Corp. (FPSC), a large-scale silicon wafer slicing company in the Philippines, has manufacturing facilities located in Tanauan City and Sto. Tomas, Batangas. FPSC is a Joint Venture Agreement, with SunPower owning 20%.

It may be that with weaknesses in the domestic manufacturing sector, rapid shifts in the solar market and in solar technology, and with some countries dumping solar cells and panels, extensive manufacturing in solar could prove too challenging for most Philippine companies. So, in the Philippines, using the very conservative calculation of 13 installation job-years and only 2 manufacturing job-years created for each MWp of solar panels installed, 100 MWps would lead to the creation of 200 manufacturing job-years.

Though manufacturing wind power equipment may be a stretch at present for Philippine manufacturers, it doesn't have to stay that way. Philippine successes in geothermal prove that a steady investment in an energy industry can open paths for manufacturing locally – first some less complex equipment, and eventually more challenging elements. As it was with geothermal, the domestic content of wind turbines may grow, since companies tend to want to locate manufacturing near demand centers. In any case, the Philippines currently already has the capacity to manufacture many sub-components and raw materials for construction of wind farm, such as wiring, fasteners, composites or resins, metals, and concrete. This means jobs and money for lots of manufacturing actors along the chain.

As far as biomass is concerned, a leading industry expert acknowledged that design and technology still require foreign experts, but insisted that although "we don't yet manufacture locally… we have know-how to operate, maintain, design ancillary components. And some components are really suitable for local manufacture – like local storage banks. A lot of the common components, belt conveyors, have local manufacturing potential, even if we cannot make boilers or steam turbines."[122]

Speaking to domestic manufacturing for hydro, a renewable energy developer explained, "there is some local manufacturing of water turbines, but it could be more, if there were more demand. Of course, you need a licensed, credible supplier, and locally sourced equipment isn't always the best [quality] right now, but the more installations you have, the more manufacturing will develop. It will be the natural consequence of the growth of the industry. It will naturally provide a market. It has to be a market driven thing. We have a lot of capable engineers, many of whom are working abroad. It will be a question of giving them jobs here… Eventually if you create a big local market, you will have economies of scale, and then local manufacturing will grow. We don't have an industry yet, but we are trying to have one. We want to build it. By investing in renewable energy now, we get economies of scale, efficiency, and other factors that make renewable energy cheaper in the long run."[123]

Climate Rescue Station in Borobudur
©Ulet Ifansasti / Greenpeace

Debunking misinformation

promoted by coal and other industries, to spread fear about renewable energy in the Philippines

Earth Hour in Manila
©Raymond Panaligan / Greenpeace

1. Renewable energy is unrealistic, not deployable, isn't a mature industry: Not true

In the section above which lays out wealth and jobs creation from renewable energy in other countries from Thailand and Bangladesh to Denmark and the USA, it is obvious that renewables are realistic, deployable, and increasingly mature.

However, many decision makers, media, business executives, and political leaders in the Philippines are genuinely afraid that renewable energy is technically unreliable, unrealistic, characterized by unmanageable intermittence and not deployable – they truly do not understand hybridity, and how solar can be paired with winds and other forms of energy.

Many also do not understand that renewable energy wouldn't be considered as baseload. Rather, renewable energy should be embraced in extensive hybrid systems like Germany's "Renewable-Energy Combined Cycle Power Stations," which are integrated networks of wind, solar, biomass, and hydropower installations that allow for rapid adaptation and switching from one resource to another as needed.

Ultimately, it is vital for all concerned stakeholders to familiarize themselves with the latest realities and technological improvements, rather than succumb to fear mongering based on old, outdated information about renewable energy.

2. Renewable energy is expensive, and the cost to consumers is high: Not true

Geothermal cost savings

In the Philippines, geothermal has already clearly demonstrated its potential to drive down the price of energy. Moreover, "in 2001, geothermal energy cost between two and ten [US] cents per kwh" globally.[124]

The Wholesale Electricity Spot Market – in principle

Moving on from cost savings with geothermal to those from newer, emerging renewable energies in the Philippines, we must examine how power is sold and priced using the Wholesale Electricity Spot Market (WESM). This is the key to understanding how renewables can drive down the price of electricity for customers.

WESM is a market with sellers (power plant generators) selling their electricity to off-takers (utility companies like Meralco) during peak demand times, at a market price. (Note that WESM trades every hour hence cover not only peak demand requirements: due to uncertainty in demand, off-takers/utilities would normally not secure 100% of their off-peak needs through bilateral contracts, and hence would still require some spot volume). In principle, a power plant trying to sell electricity for too high a price is supposed to just get turned down, and the utility companies will refuse to buy, which means electricity from that expensive plant will not be dispatched. The idea is that power plants would then make zero profit, and this would incentivize them to offer lower prices. The "matching" of supply and demand happens every hour in the Philippines, and was structured to create competition between power plants and drive prices down. The competitive bidding mechanism, which is the basis of WESM, was meant to serve as market-based incentives designed to attract new generation capacity and ensure that more power plant generators would enter the market – at the time WESM was established the Philippines was plagued by terrible blackouts, brownouts, and energy shortages. Unfortunately, this only holds true if the supply situation of the market is long, i.e., more supply than demand. However, the current market is in a short supply situation, wherein demand is higher than supply; hence, the high market price as suppliers have more opportunities to take opportunistic positions.

The principle of Wholesale Electricity Spot Market

In the Philippines, the end result of WESM has proven a bit more murky and complex than the theory would have indicated. First, because demand exceeds supply so much, plants do not have to compete very hard and they can charge exorbitant prices. Second, the government cannot monitor all hourly changes, so opportunistic pricing and even perhaps some market manipulation are possible. It is not always the case that PEMC, the market operator, is able to produce surveillance reports to ensure maximum compliance with the market rules. Essentially, in the end, the prices are high and the consumer pays.

"The table below shows the variation in actual WESM average prices for 2011 depending on the supply/demand balance. After mid-night, WESM prices are typically lower due to a lower demand."[125]

Time Period	Typical Demand (MW)	WESM Price Range (PHp/kWh)
Peak (9am – 8pm)	6,000	8.2 – 11.5
Mid Merit (6am – 12pm)	4,500	5.5 - 7.8
Off-Peak (12pm – 5am)	4,000	2.8 – 4.3

Source: PEMC – 2011 WESM average prices

As the table above shows, WESM prices drove up the Meralco consumers' bills: At one point "the increase in demand and limited supply triggered an up tick in WESM prices, which more than doubled from7.91 pesos per kilowatt-hour in April 2012 to 16.30 pesos in May 2012… Although WESM accounted for only 5.5 percent of Meralco's power requirements for May, the steep 8.39 pesos per kilowatt-hour increase in the spot market's charges caused a rise in the overall generation charge… Meralco said the cost of power sold by the generating companies can fluctuate monthly based on several external factors such as fuel prices, the foreign exchange rate, and the supply-demand situation."[126]

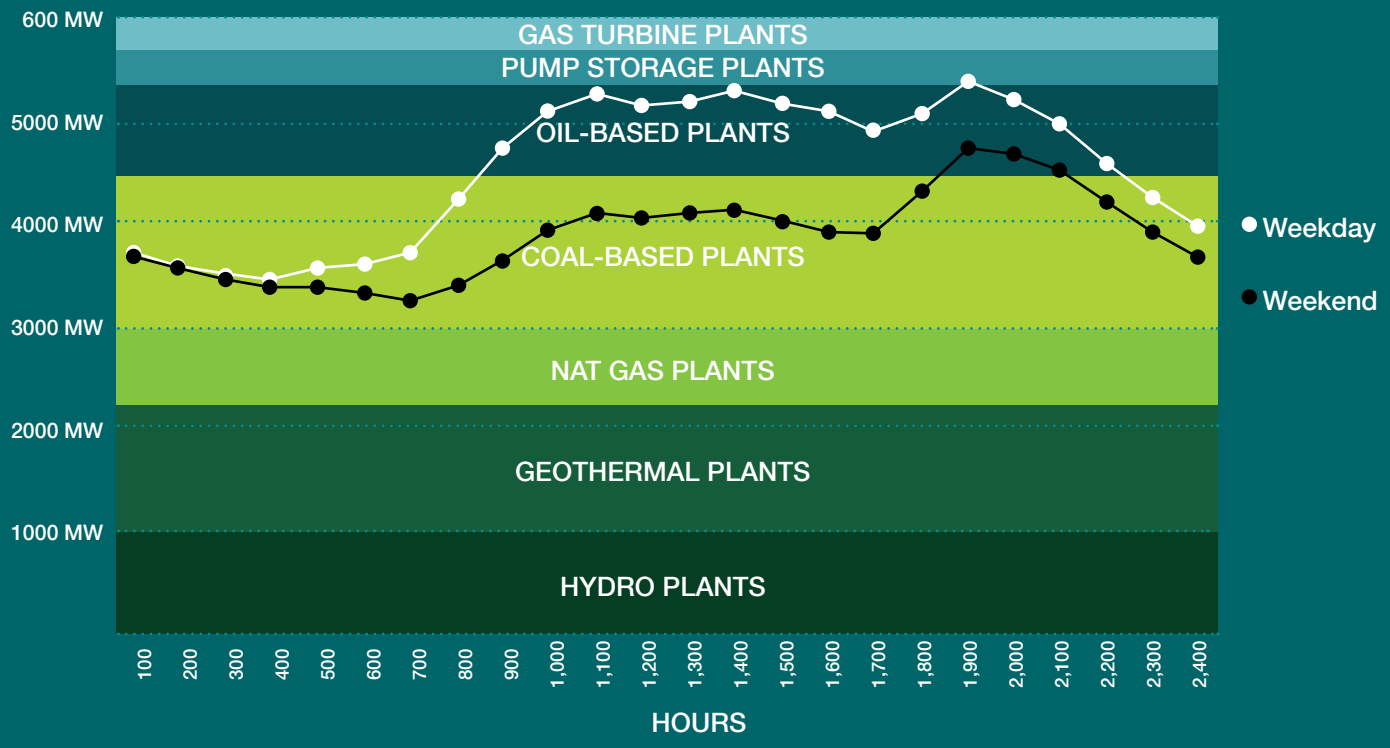
In WESM, the price for all bidders, even those offering to sell cheap electricity, will be set by the highest bid offer. When demand is high and supply is low, this benefits sellers playing in the spot market. "Participants are not required to submit bids based on their true cost of generation, which oftentimes results in bids that seem

to be very arbitrary in nature… Windfall gains are achieved by these players especially during times of peak demand. WESM members submit arbitrarily high bids that will be used as the price setting bid. It is not uncommon for WESM members to submit more than one bid, with the succeeding bids having higher prices than their initial bid. Their intent here is if their 2nd or 3rd bid, which has a much higher price gets accepted, their 1st bid will also benefit from the higher price of their succeeding bids. Because of the Merit Order Effect, all other power sources during a specific time frame also benefit from this high bid, even if their generation cost is much lower."[127]

The high cost of diesel plants drives up prices for electricity during peak hours. As one energy expert explained, "If, for example you are a coal operator and you have diesel power plants too (an operator may or may not have both plants), you can say that you will sell (produce) only 15 with coal for the spot market, when you know they need 20. So then diesel kicks in for the extra five, at a higher cost, and all the bidders get the amount of the highest bid. They all get the same money. Everyone gets the highest bid… So, on the spot market, the coal is sold at the diesel prices. This is how the company makes a killing…. We know there is manipulation because diesel comes in even at the lowest demand. [We see] opportunistic movement of the private companies. It's hourly bidding, which is hard to monitor all the time. If renewable energy is 'must feed in' or 'must dispatch,' then it bumps off the highest bid [off the spot market], and that lowers the WESM price altogether. The average price goes down to the next highest bid. [This is why] the wholesale spot market becomes more competitive with renewable energy. The more diesel is manipulating the market costs, the more solar [and other renewable energy] will lower costs."[128]

Tour around the South East of Asia to promote the use of clean energy
©Greenpeace / Kate Davison

Sources of Electricity at different times of day



Increases in load requirement in certain parts of the day forces MERALCO to source electricity from more expensive power plants, resulting to different rates for other time of the day

Source: MERALCO

How renewables can drive down prices in the Wholesale Electricity Spot Market

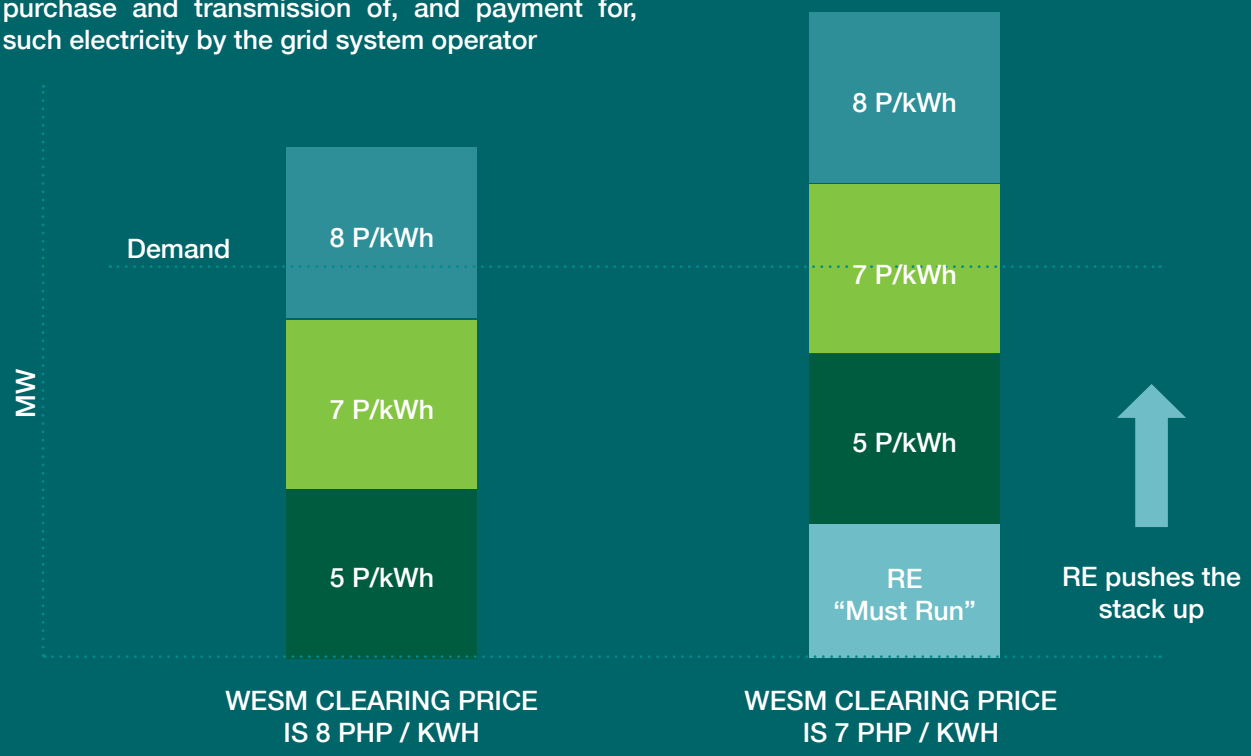
In terms of renewables' potential to drive down consumers' electricity bills, with the new Renewable Energy Law and the FiT, solar, wind, biomass and run-of-river hydro energy receive "priority purchase, transmission of, and payment for such electricity" and are called "unscheduled" generators, who operate without offering a "price". This means that they increase the supply, and send electricity into the grid whenever they have it, without being able to bid and charge really high prices, the way coal and diesel power plant generators can. Expensive power sources from WESM can be shaved off by renewable energy, because renewable energy sources are "must dispatch" at a fixed price.

> "Renewable energy sources will be the first to be dispatched, leaving the other conventional power producers competing to be dispatched to meet the remaining demand. With this scenario, it is expected that the WESM prices during peak hours will be lower and perhaps similar to the other operating hours of the day. It is also expected that overpricing and opportunistic pricing issues would be tempered; bids from conventional power generators will be closer to the true cost of generation; and the Wholesale Electricity Spot Market prices will be stable and could realize a competitive environment."[129]

So, emerging renewables can actually lower WESM prices, by supplying substantial amounts, approximately 70% of 2011 spot market sales, of power without being allowed to make utilities pay through the nose for it in "spot market" bidding.

Reduction on WESM Clearing Prices with the introduction of new RE Generation

As per RA 9513, Sec 7; FIT System - "The priority purchase and transmission of, and payment for, such electricity by the grid system operator



Source: WESM Price Impacts from New RE – Philippines, NREB Report, January 2012

Monthly Average WESM Price Reduction for 200MW of Additional RE Generation

Months (2010)	Average WESM Price NO RE	Average WESM Price with 200 MW "must run" RE	Average WESM Price Reduction with 200 MW RE
January	3.65	2.79	0.86
February	10.2	7.05	3.15
March	10.03	7.59	2.44
April	7.22	6.18	1.04
May	6.71	5.73	0.98
June	7.69	6.12	1.58
July	5.24	3.74	1.49
August	2.92	2.33	0.59
September	5.64	4.46	1.19
October	7.58	5.30	2.28
November	5.20	3.64	1.55
December	4.11	2.95	1.16

Source: WESM Price Impacts from New RE – Philippines, NREB Report, January 2012

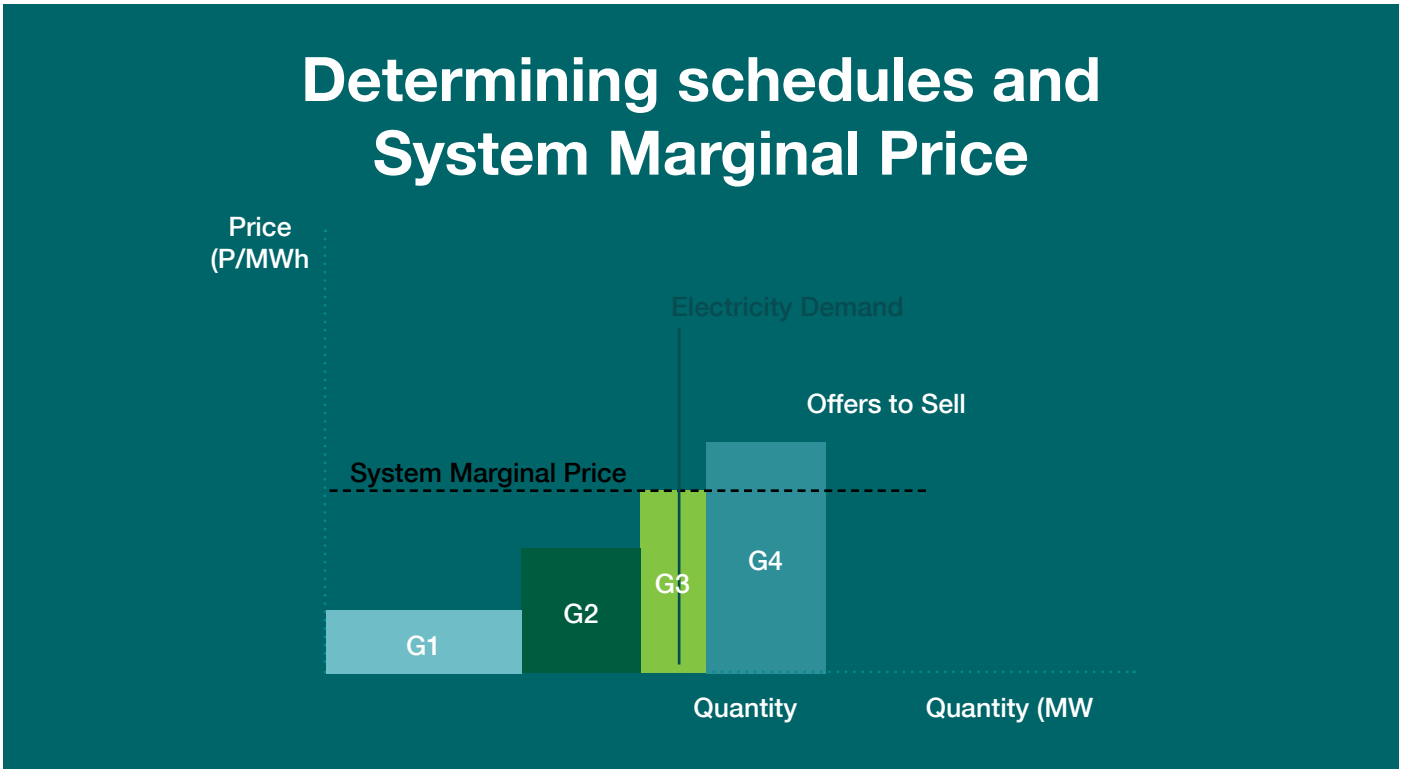
In many countries already, solar power can lower costs of electricity for people by allowing the government and utilities companies to keep expensive reserve plants offline.[130] Studies show how Germany and other countries have already benefited from renewables' impact on wholesale spot market prices. Solar kicks in most during the middle of the day, when demand is peaking, and the grid is struggling hardest to meet demand. This is also when the "spot market" is triggered, wherein the prices for energy can shoot up as companies engage in opportunistic bidding, taking advantage of higher demand to charge more. Because solar is usually there when people typically need energy the most, it can drive prices down. In Germany, "solar power lowers the average price at the Power Exchange EPEX by up to ten percent, even at lunch time by up to 40 percent… Price reduction amounts for 2011 are from 520 to 840 million EUR — the equivalent of a price reduction from four to six EUR per MW hour."[131]

Indeed, the price of solar energy-generated electricity, calculated by a legitimate levelized cost of energy (LCOE) method, is now cost competitive in a number of countries. A recent study revealed that in many places solar went past grid parity in 2012.[132] This reality is not limited to the US or Europe. "Today, solar-powered electricity in Japan is cost-competitive with electricity produced from coal. The solar industry is now subsidy-free."[133]

According to a DoE official, in the Philippines it could be "cheaper to generate from solar than from peaking plants. Plants' peak price can go to 50 pesos per hour."[134]

The 'Merit-order effect'

The 'merit-order' effect on WESM prices in the Philippines in 2011 was simulated and the reduction in WESM revenues calculated by a study conducted by the University of Melbourne, Australia in cooperation with the National Energy Renewable Board."[135] The study concluded that up to PHP 3.7 B could have been reduced from the revenues of non-FiT generators by effectively "reducing" WESM prices."[136] Further analyses of industry stakeholders reveal that a net benefit of about PHP 950 Million accrues, in fact, to electricity end users through lower generation charges faced by DU's sourcing power from the WESM. To sum up, PHP 3.7 B are potentially at stake – a large amount, the impact of which could truly affect consumers.



WESM Price Impact from NEWFiT Supported Renewable Generation in 2010–the "Merit Order" Effect National Renewable Energy Board (Philippines) January 2012, verified by the Melbourne Energy Institute (MEI)–University of Melbourne.

Whereas the WESM's pricing is driven by the last and highest bid offer that satisfies the demand, the FiT-ALL, given by the formulae below, is based on FiT Eligible RE capacity that actually lowers this WESM clearing price:

FiTAll = { (FiT Rate – Market Rate) * (RE kWh) + (Working capital allowance, Admin fee, Trustee fee) } /National Electricity Sales (kWh)

Where:

FiTRate is the peso per kW h rate approved by the ERC for each technology

$CRR_{i,t+1}$ is the market rate or the price of electricity displaced by FIT generation

National Electricity Sales is the Total sales of electricity in the entire country, to all on-gird customers net of own use consumption and system loss[137]

Other cost saving features of renewables in the FiT scheme

The FiT payment mechanism "caps" escalating power rates in the Philippines thanks to three features.[138]

First, "rates will only be paid when electricity is actually delivered, unlike conventional power contracts which have a 'take or pay' provision."[139]

Second, the renewables generators entitled under FiT (solar, wind, biomass, hydro run-of-river) will receive a "top up" – namely the difference between the FiT rate and the "market" rate which is used to value the electricity generated – and if the market rate (based on imported fossil fuels) exceeds the FiT rate, the FiT developers will be required to refund excess revenue to all grid consumers. Thus, FiT generators don't get windfall profits at the expense of consumers and the ERC pre-approved rate of return is maintained.[140]

Third, the FiT rates are awarded for 20-year periods, adjusted only for inflation and foreign exchange fluctuations, which eliminates the risk of power prices spiking the way they do with volatile coal and oil fuel imports.[141]

The bottom line is that renewable energy can in fact drive prices down, so long as the government structures systems properly.

Run of river hydro and biomass are already below the WESM price

Some renewable energy technologies are already below the WESM price, like run of river hydro and biomass. A DoE official exclaimed, "during the rainy season our electricity cost is lower because hydro is running. In the dry season our electricity is more expensive. If hydro is expensive, how come whenever hydro is running the cost of energy is lower?!"[142] Indeed, electricity prices do go down in the rainy season when mini hydro is at peak – so clearly mini hydro drives prices down, not up.

Multiple industry experts certified that focusing the installation targets more towards those renewable technologies, would bring the price of electricity down. "We all know that biomass and run of river hydro are already cheaper than generation coming from diesel… Hydro's not expensive. Hydro drags down the FiT-ALL, and can lower the cost to consumers by PHp 0.2."[143] In a nutshell, increasing the installation targets under FiT for the cheapest technologies like hydro and biomass would lower the cost to consumers.

Unfortunately, the installation targets were not designed primarily with a view to lowering the cost to consumers – but renewable energy risks being blamed for any price hikes, even though the problem lies in the structures and systems and not in the energy itself. One energy expert explained, "The question is: what is the correct target installation? You should not have an arbitrary 750 MW, you should work from how much you want to bump off the market. Currently, 750 MW is just becoming an introductory volume, but we need to look at the impact of this volume on electricity prices (pricing). We don't know if this FiT will bump or not. The more you increase the installation targets the more you can bump the cost down, past the most expensive bid, then the second most expensive bid, and so on."[144]

Renewables can drive down prices in the long run, as coal and diesel cost more

Renewable energy can insulate the Philippines from the vagaries of global fluctuations in fuel prices, volatility in the foreign exchange rate, and can increase supply, which improves the supply-demand situation. In the aggregate and in the long run, this lowers prices for consumers.

Even the ERC believes that renewable energy has the potential to lower electricity prices: "we are hoping to achieve that level of market penetration of renewables that would have a significant impact on spot [market] prices… Even if it's not for today, it could be for the future… We can't do it in an accelerated way at this stage, but for the future it's possible. [Moreover,] in the future, if the cost of fossil fuels continues to rise, because of rising fuel prices, renewable energy will may one day be the more cost effective solution for our energy supply."

A DoE representative explained, "coal price and crude oil prices keep going up. So this drives price of generated electricity up. If this made the average grid rate fixed at 7 pesos per KW/hr, then the RE [renewable energy] would give consumers a rebate of 1 centavo, under same condition of 750 MW in the FiT installation target."[145]

Remaining questions

In fact, NREB simulations around the FiT-ALL found that in 6 years there would be no more need for subsidies, because the cost of conventional would already have overtaken the approved FiT.

Real solutions to our high energy must be considered, instead of blaming renewables

Renewables are not to blame for current high prices: flawed systems are. Rather than shedding crocodile tears about the risk of renewable energy raising costs to consumers, the utility companies, National Grid Corporation of the Philippines, the ERC, and all other relevant government bodies would be better off embracing smart grid technologies and other cost savings measures.

For one, costs due to technical losses in the distribution network are well understood (conductor loss, transformer core loss, coils in metering equipment) and should be tackled more aggressively with engineering solutions.

Second, consumer costs linked to "non-technical losses" (which essentially means the range of evolving, sophisticated energy theft, meter-tampering, erroneous meter reading, and billing errors) require sophisticated, innovative, persistent responses. Pilferage and non-payment of electricity can be roughly equivalent to the output of an entire power station. In the Philippines, instead of solving the problem of non-technical losses with innovations and technological fixes, the "Energy Regulatory Commission of the Philippines allows distribution companies to recover electricity losses up to a cap of 9,5 % through rate setting."[146] Of course, the

costs get passed on straight to consumers. This should change.

Third, ignoring the vast potential of amazing technological smart grid breakthroughs, the Philippine utility companies like Meralco and the relevant governmental authorities appear lost in a by-gone era, relying on old-fashioned methods such as anonymous tips on Meralco's website, telephone calls, and emails from concerned citizens, or even more expensive, cumbersome interventions like off-cycle readings and analysis, random inspections, elevated meters, high voltage barriers, metal casings for meters, and 24-hour security guards.[147] The Philippines has not implemented a meter data management system, let alone the more complex IT that would allow one to use meter data for business processes and analysis, or operations processes like outage notification and power quality monitoring, doing real-time checks of grid health and assessing the results of corrective actions. Indeed, no public information appears to be available on exactly how the patterns of loss break down in the Philippines.

Smart grid investments are costly but they pay off massively down the line. "Deployment of smart grid technology from U.S. utility control centers and power networks to consumers' homes could cost between $338 billion and $476 billion over the next 20 years, but will deliver $1.3 trillion to $2 trillion in benefits over that period. The benefits will include greater grid reliability, integration of solar rooftop generation and plug-in vehicles, reductions in electricity demand, and stronger cyber security, according to a new study by the Electric Power Research Institute (EPRI)."[148] One reason that smart grids deliver so much cost savings is because of the negative impact of blackouts. For instance, "a variety of studies have estimated the cost of power interruptions to the American economy to be $79 billion to $160 billion. According to the U.S. Energy Information Administration, the economic losses due to outages are equivalent to four cents of additional cost per kilowatt-hour for consumers nationwide."[149] Unfortunately, the National Grid Corporation of the Philippines (NGCP) is structured to make a profit for the NGCP and not to benefit the nation per se.

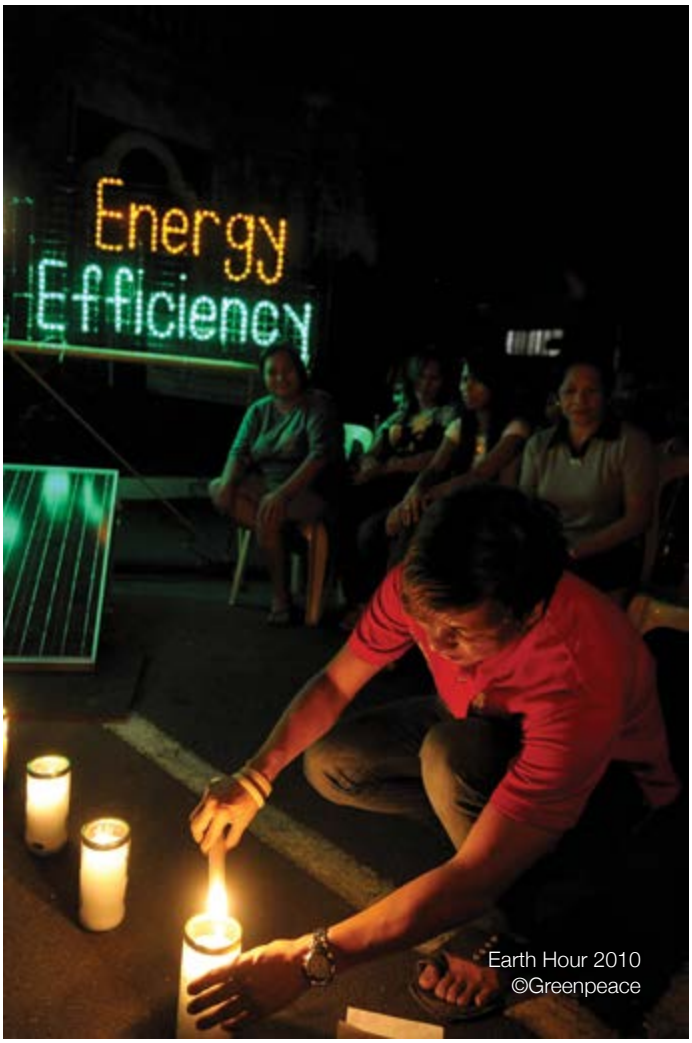
Few government representatives interviewed by Greenpeace, and no publicly available reports on government plans, appeared to reveal a grasp of smart grids' ability to enhance safety and efficiency, use existing assets better, improve power reliability/quality/security/availability, all of which would generate considerable economic plusses for the Philippines as a nation. Smart grids would also guarantee transmission systems' improved capacity to handle intermittent energy production from wind and solar. Thus far, there is little public discussion about a two-way flow of electricity and information between utilities and consumers, or ways in which smart grid technologies can deliver real-time information, making it possible to achieve near-instantaneous balance of supply and demand at the device level. All government entities should concert to ensure a connected future where homes and offices can talk to the grid in real time, shedding load to avoid blackouts; where "virtual power plant" technology aggregates and manages power loads and enable load-shedding (also known as peak shaving.[150] Smart grids can save money, save energy, and improve integration and interoperability. The Philippines can and should benefit from a plethora of technological innovations in smart grid companies that have proliferated in recent years.[151]

Fourth, the spot market should also be reformed so that bidders are paid what they bid for, not what the highest bidder bids for, which could substantially reduce aggregate spot market prices.

Fifth, another reason why electricity is expensive in the Philippines also has to do with systems and structures, and little or nothing with the amount of renewable energy in the mix per se: "The Philippines has an almost monopolistic utilities system, even more so in Mindanao, and Visayas. We did not set things up properly. We should have… regulated aggressively, broken down companies."[152] With large utility companies able to behave in monopolistic manners, customers suffer and prices remain high.

Last, the current flawed system imposes costs on Philippine consumers also as a result of transmission costs. "Now we can have decentralized, distributed generation. The technology is there, so why not tap into it?... You spend on transmission, so why not save that money? Distributed generation can help lower costs. You save one peso right off because you don't pay the national grid for the transmission charge. You can lower tariffs, which are high. Unfortunately, coal is lobbying so hard against renewable energy, and saying the opposite of this."[153] In terms of concrete examples, one solar company estimated rough potential cost savings of decentralized, distributed generation: "Yes, you would see cost savings. We connect to the DU directly. By not exporting to the national grid we save about one peso per kw hour. A ten MW solar plant produces 15 million. So, the savings are 15 million pesos annually. The savings are passed through – we pressure the DU to push the one peso of savings on to the consumer. The power we sell to the utility company is cheaper."[154]

In the end, emerging renewable technologies should not be held responsible for current high prices of electricity in the Philippines, when in fact prices are high right now thanks to deeply flawed systems and decades of poor decisions.



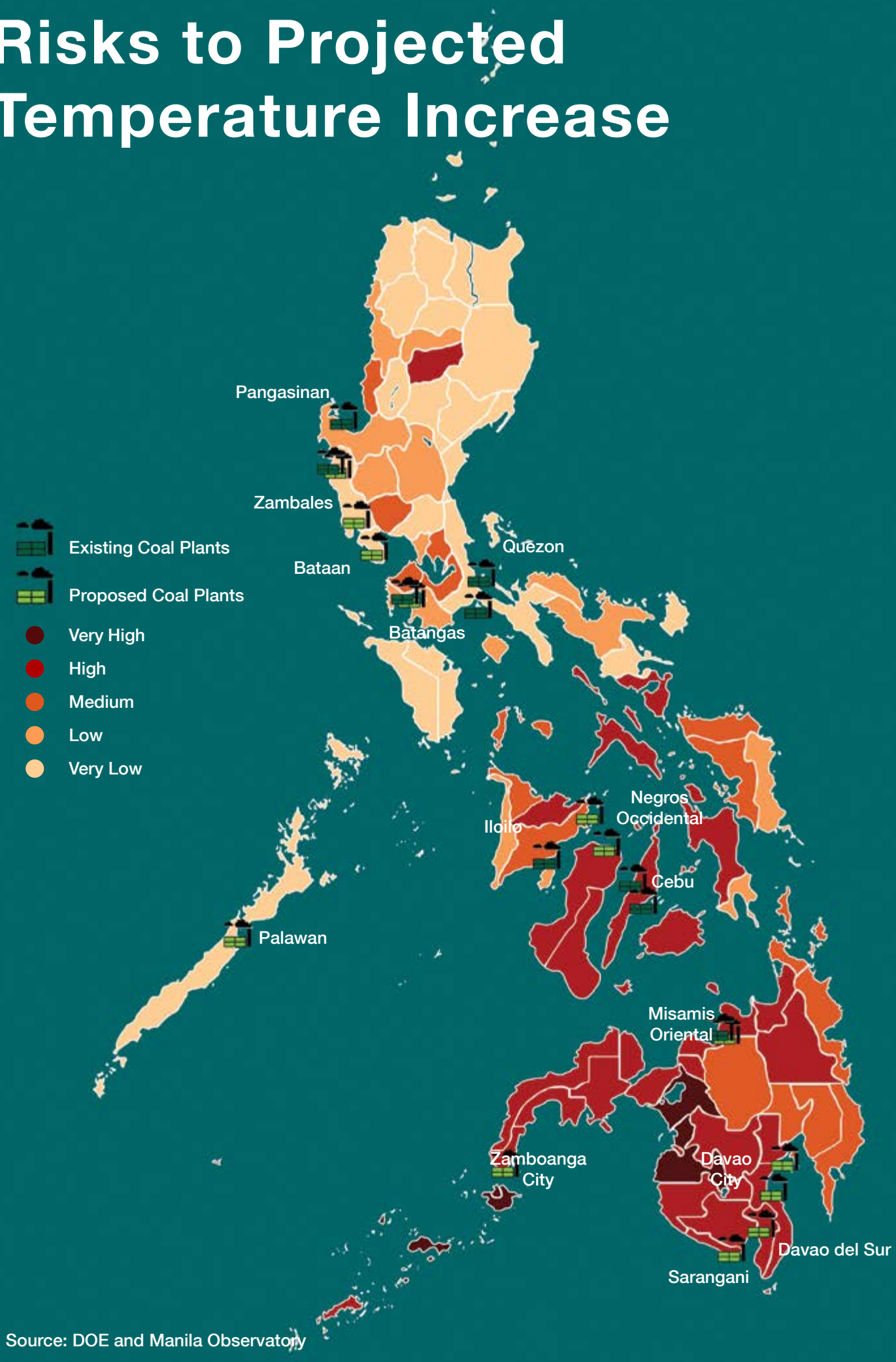
Earth Hour 2010
©Greenpeace

Climate Philippines, Cambodia drought documentation
(South East Asia : 2005)
©Jose Enrique Soriano / Silverlens / Greenpeace

3. Coal is cheap: Not true

In addition to the misinformation about renewables being costly, one often hears untruths about coal being cheap, even from some government officials. Indeed, as of this writing, the DoE website read a bit like an advertisement for a coal company. "Worldwide, coal is a sought-after energy source. It has the largest reserve and is often the cheapest of the fuel options… The Philippines has a vast potential for coal resources just awaiting full exploration and development… It is but [sic] very timely to invest in coal facilities as the price of oil continues to rise, coal being still the cheapest option with abundant supply worldwide."[155] Unfortunately, this kind of rhetoric is widely accepted in many circles, although it is not grounded in fact. In reality, the Philippines is paying a very high price for coal.

Risks to Projected Temperature Increase



Source: DOE and Manila Observatory

Risks to El Niño

Source: DOE and Manila Observatory

Cost #1: Water

Coal and oil fired plants are huge water guzzlers. In the Philippines, where water is an increasingly rare resource, sucking up river water poses grave threats, as does the discharge of cooling water and wastewater, which may be linked to bleaching of coral reefs surrounding the coal plant in Masinloc and elsewhere as well. The Masinloc Thermal Power Project (MTTP) in Zambales has "impacted on [sic] communities who use the Lawis River (where the plant gets water for cooling). The warm water from the cooling device goes directly into Oyon Bay." Residents alleged that fishing was greatly affected. Moreover, regarding a Davao coal plant to be located atop the city aquifer in Binugao, Toril, a United Nations expert on water resource management has warned of seawater intrusion into the city aquifer if the local government allows uncontrolled use of its groundwater reserve. When that happens, it would be irreversible, according to Dr. Shahbaz Khan, Chief of Section on Sustainable Water Resources Development and Management of the United Nation Educational, Scientific and Cultural Organization (UNESCO). The plant would need about 1,500 cubic meters of fresh water a day for its cooling system to be pumped out of the city's groundwater reserve. The city depends upon the underground reservoir for drinking water and other domestic needs of its 1.4 million inhabitants."[156] The Davao coal plant is not the only one feared to potentially affect aquifers.

Most coal-fired plants in the Philippines use salt water for cooling. A former industry insider explained that everyone knows, "you are changing the water temperature, and putting your effluent discharge out there… Jellyfish are attracted by the hot water pumped out… We don't monitor the marine ecosystem and our impact…We kill the fish; we know this. We also move all the fishermen out… But there are no real studies, except one study about fish kill and relocation costs. The fishing community wanted us to pay. We had to cost out if there was a fish kill, how much it would cost to move the fishermen. We had to determine if their claims were real, about fish killed."[157] He added that this will remain a problem "unless you have major water efficiency in production" and noted, "I can save money on skimping with cooling towers and things like that. There's no premium on engineering for saving water here."[158] With respect to the future, several proposed coal-fired plants stand to exacerbate the Philippines' water problems, outsourcing many costs that the plants will never pay. "Environmentalists fear that the Talomo-Lipadas Watershed, which protects the city's aquifer, an important source of groundwater, will further be strained if the 300-MW Aboitiz plant will start running in Toril. Moreover, the Conal plant in Maasim, Sarangani, intersects with the declared marine protected areas where the dugongs were known to thrive, according to Greenpeace."[159]

Cost #2: Building coal-fired plants is expensive

Renewable energy allows you to avoid building expensive, polluting new coal-fired power plants. Investing in renewable energy obviously saves money that would otherwise be spent on polluting energy sources. The avoided cost of building traditional generation can easily be calculated. Most experts agree that today it costs about $3,500 per kW to build a new coal plant, without even adding on financing costs. If you add on financing costs, a typical new 600 MW coal plant has a price tag of roughly $2 billion.[160] Proposed coal fired plants in the Philippines are estimated to cost many millions, if not billions. "Subsidiaries of private-owned Aboitiz Power Corporation and Alsons Consolidated Resources will run the power plants, costing more than a billion pesos ($24M) for the construction alone."[161] In 2010 "President Aquino reported that $3.7 Billion investments in the power sector, the bulk of which came from Marubeni Corporation which promised to invest in coal power projects. The Japanese company committed to rehabilitate and expand the 1,200-MW (MW) Sual and 735-MW Pagbilao coal-fired power facilities in Quezon province… [In April 2011] President Aquino condoned the P4 Billion ($92.4 million) debt of the Pagbilao Power plant which Marubeni owns."[162] There is also publicly available information about the cost of the Masinloc Thermal Power Project (MTTP) in Zambales: "The US$441-million project was jointly financed by the Asian Development Bank (ADB), Export-Import Bank of Japan and the local executing agency, National Power Corporation (NPC)."[163] Public information indicates that in "Sarangani, a PHP 19-billion, 200-MW coal-fed plant is also rising… owned by partnerships led by the Alcantara family," and that "Ayala-led AC Energy Holdings Inc. and A. Brown Inc. are spending PHP 12.5 billion to put up a 135-MW coal-fired power plant in Iloilo."[164] These are representative projects and contrary to what the coal industry may say, they are most certainly not cheap.

Cost #3: Health hazards from coal

Coal makes people sick – and that costs a lot of money, collectively. The sick people pay for the bulk of it themselves in cash and suffering, but so does the government, which has to provide public health care, and society, which loses productive workers to illness or death. Soot from coal plants can trigger asthma attacks, heart attacks and strokes, cause irregular heartbeat, and leads to premature death. Not only are coal-fired power plants a major source of soot pollution, they are also one of the largest contributors to smog – triggering increased risk of asthma attacks, permanent lung damage, and premature death.

Coal-fired power plants also emit large quantities of toxic air pollutants such as lead and arsenic, or sulfuric acid, and are one of the largest sources of man-made mercury pollution. Mercury enters our food chain after it rains down into our streams and lakes, poisons fish and seafood and accumulates in people who eat them, causing brain damage, mental retardation and other developmental problems in unborn children and infants, and a greater risk of coronary heart disease in men.

"The Philippine Environment Monitor estimates that, annually, due to air pollution the Philippine economy wastes $1.5 billion and the Philippines spends more than $400 million in direct costs on health expenses. The World Bank says that 5,000 annual premature deaths in Metro Manila may be due to respiratory and cardiovascular diseases from exposure to pollution."[165]

In addition to health hazards caused by burning coal, disposing of coal waste puts communities at risk as well. Every year, the nation's coal plants produce million of tons of coal ash, the toxic waste that is left after the coal is burned. All that ash has to go somewhere – and it's dumped in open-air pits lacking adequate safeguards, where chemicals like arsenic, lead, and selenium leak into the groundwater. "Living near a wet coal ash storage pond is significantly more dangerous than smoking a pack of cigarettes a day[166]… Toxins found in coal ash have been linked to organ disease, cancer, respiratory illness, neurological damage and developmental problems. People living within one mile of unlined coal ash ponds

can have a one in 50 risk of cancer… Exposure to toxic coal ash can lower birth rates, cause tissue disease, slow development [and] children are more susceptible to the health impacts of coal ash."[167] Back in 2002[168] Greenpeace revealed that fly ash samples taken from the Masinloc Coal Power Plant and two other coal-powered plants were contaminated with a range of toxic and potentially toxic elements including arsenic, chromium, lead and mercury.

Tallying up a comprehensive medical picture of the nationwide cost of coal to the Philippines has never been done, though other countries regularly measure these vital questions. However, it's fair to say that pieces of information have emerged[169] showing that pollution from coal plants is costing us large sums in terms of medical treatment for asthma attacks, other respiratory illnesses, lung damage, heart attacks, strokes, coronary heart disease, brain damage/neurological damage, mental retardation, developmental problems in unborn children and infants, organ disease, cancer, and premature deaths. "The Philippine Environment Monitor estimates that, annually, due to air pollution the Philippine economy wastes $1.5 billion and the Philippines spends more than $400 million in direct costs on health expenses. The World Bank says that 5,000 annual premature deaths in Metro Manila may be due to respiratory and cardiovascular diseases from exposure to pollution."[170] Dr. Jose Ali Bendano of Foundation of the Philippine Environment Regional Advisory Council stated that "People who are exposed and living near coal-fired power plants are more likely to have respiratory ailments."[171] A representative of the DoE noted, "During our defense for the passage of the renewable energy law we pushed for a full cost accounting provision of health costs of coal. But it hasn't happened. There was a fear in Congress of documenting, which would lead to accountability, which means the coal folks would pay for health costs eventually, which would make coal more expensive, and consumers would then pay the price."[172]

One study mapped out some aspects of the medical damage done by coal in the Philippines, and the financial costs of the medical harms. The study used a damage function approach, examining Luzon's four coal-fired power plants, "which together account for a significant share of the country's coal-based and total generating capacity. The approach involved modeling the changes in ambient concentrations of PM10, SO2 and NO2, determining the incremental health effects and valuing these in economic terms. The study focused on adverse health effects using dose-response functions established in other studies and economic values based on the benefit transfer technique. Air dispersion modeling was done to predict changes in ambient concentration of pollutants in areas surrounding major sources of emissions such as those surrounding the four coal-fired power plants in Luzon. The US-EPA ISCST390 air dispersion model was used.

For the morbidity effects, local data on the cost of illness (COI) were used as much as possible. WTP estimate of the morbidity effects were derived by applying the typical ratio of WTP to COI reported in other studies.

Fifty-three municipalities with an estimated population of 1.75 million in 2000 are within a 30-km radius from the location of the four coal-fired power plants… The estimated population at risk within 30 km from each facility ranges from 154,618 to 591,577 in 2000… Sixty percent of the population at risk is above 15 years old.

Action at Metrobank
©Greenpeace / Vinai Dithajohn

Number of Municipalities and Estimated Population at Risk of Exposure Within 30 km Radius: Four Coal -fired Power Plants, 2000[173]

	1NLW	2NLWO	1SLWO	2SLWO	Total
Number of municipalities	19	6	16	12	53
Population	591,577	154,618	472,194	532,206	1,750,595
Below 15	39.5%	39.2%	40.0%	39.7%	694,717
Above 15	60.5%	60.8%	60.0%	60.3%	1,055,879

Average Annual Premature Mortality and Morbidity Effects of Emissions from Four Coal-fired Power Plants in Luzon: 2000

Health Effect	Incidence, 2000*
PM10	
Mortality	445
Morbidity	
RHA	306
Emergency room visit	59,903
Restricted activity days	809,171
Acute bronchitis, children	16,147
Asthma attacks	60,336
Respiratory symptoms (RS)	3,712,142
Chronic bronchitis, adult	947
SO2	
Mortality	159
Morbidity	
RS, children	395
RS, adult	320,949
NO2	
RS, adult	278

*Unit is number of cases except for RAD and respiratory symptoms, which are reckoned in number of days.

Value of Health Effects Associated with Pollutant Emissions from Four Coal-fired Power Plants in Luzon by Type: 2000 (1994 Prices)

Health Effect	Value (Million Pesos), 2000
Total	2,887
Mortality	2,416
Morbidity	471
PM10	2,355
Mortality	1,887
Morbidity	468
RHA	7
Emergency room visit	50
Restricted activity days	89
Acute bronchitis, children	6
Asthma attacks	3
Respiratory symptoms (RS)	58
Chronic bronchitis, adult	255
SO2	532
Mortality	529
Morbidity	3
RS, children	-
RS, adult	3
NO2	-
RS, adult	-

Note: "-" means value is negligible.

Present Value of Health Effects of Pollutant Emissions from Four Coal-fired Power Plants in Luzon: Base Case (1994 Prices)

	PV of Health Effects (Million Pesos)				
Health Effect	1NLW	2NLWO	1SLWO	2SLWO	Total
Total	4,619	3,161	6,800	4,601	19,181
PM10	4,615	2,952	6,727	1,740	16,032
Mortality	3,759	2,402	5,482	1,417	13,060
Morbidity	856	550	1,245	323	2,972
RHA	11	7	16	4	38
Emergency room visit	81	52	119	31	283
Restricted activity days	144	93	209	54	500
Acute bronchitis, children	11	7	16	4	38
Asthma attacks	5	3	8	2	18
Respiratory symptoms (RS)	95	61	139	36	331
Chronic bronchitis, adult	508	327	738	191	1,764
SO2	5	209	73	2,861	3,148
Mortality	5	209	73	2,844	3,131
Morbidity	-	-	-	17	17
RS, children	-	-	-	-	-
RS, adult	-	-	-	17	17
NO2					-
RS, adults	-	-	-	-	-

Note: - indicates value is negligible

Value of Health Effects of PM_{10}, SO_2 and NO_2 Emissions from Four Coal-fired Power Plants in Luzon by Plant: 2000 (1994 Prices)

Plant	Value of Health Effects	
	Value (Million Pesos), 2000	Per Megawatt-hour (Pesos)
	2000	2000
Total/Average	2,887	210
1NLW	862	171
2NLWO	558	180
1SLWO	681	464
2SLWO	786	190
PM_{10}	2,355	218
1NLW	861	170
2NLWO	521	168
1SLWO	675	460
2SLWO	297	72
SO_2	532	33
1NLW	0.9	-
2NLWO	37	12
1SLWO	6	4
2SLWO	488	118

Note: PV of total health benefits over the period 2002-2011 discounted at r=15% in 1994 prices

Unit Values for Mortality and Morbidity Effects

Health Effect	Value per Case (1994 Pesos)*			Type of Estimate
	Low	Central	High	
Mortality (all causes)	1,584,295	3,075,400	6,150,790	WTP
Morbidity				
Respiratory hospital admissions (RHA)	6,525	13,050	19,570	Adjusted COI
Emergency room visits (ERV)	250	495	740	Adjusted COI
Child bronchitis	130	250	380	Adjusted COI
Restricted activity day (RAD)	35	65	100	WTP & Adj. COI
Asthma attack day	10	30	50	WTP
Acute resp. symptom day	5	10	15	WTP
Adult chronic bronchitis	117,420	195,710	313,130	WTP

*Adjusted from the original values reported in Rowe et al. (1995) for differences in income levels and exchange rates. Values were rounded to the nearest ten.

Cost #4: Damage to agriculture and fisheries

Coal fired power plants also cause irreparable harm to our lands, water, and air, and therefore cost the government and the people of the Philippines more money. These dirty power plants hurt agriculture with acidification of waters and soil nutrient depletion, both of which damage crops. Smog also harms plants and trees. Persistent smog pollution can alter and disrupt plant growth over time, potentially leading to millions of lost dollars due to reduced crop production. Toxic coal ash can kill plants and disrupt ecosystems, build up in plants and animals that are exposed, and sicken or even kill livestock.

For example, the "600-MW Sixteenth Power Masinloc Thermal Power Project (MTTP) in Zambales, Philippines started operating in 1998. The two-unit plant uses imported high-quality bituminous coal, which produces 385,000 tons of ash per year and releases massive amounts of carbon dioxide that is toxic to both human health and the environment."[174] For this power plant, "chemical analysis of fly ash samples in 2002 showed deadly arsenic, chromium, lead and mercury contamination."[175] "A provincial board member of Zambales was quoted as saying that the fruit yield dropped by 1/3 since the plant began operations." Another source noted, "the costs of agricultural degradation wrought by the ambient toxic coal. Fruit yield in the area went down by 33%."[176] Local news alleged that the harmful effects of the plant became apparent several years after the plant began operating, "affecting mostly farmers and fishermen, complained Masinloc Mayor Desiree Edora. 'The fruits of trees, especially mango trees for which we are well known for, have been stunted. They do not grow as big as before. Fishermen report less catch,' Edora lamented, adding that aside from the ash that fell on the town, the power plant discharged its waste materials directly to Oyon Bay."[177]

Farming is affected, but so are fisheries. Many residents of Zambales also "made a sustainable living from fishing. At present, their fish catch have become few and the bangus (milkfish) have disappeared. One fisherfolk said their catch has dwindled from 50 percent to only 10 percent. Meantime, a Barangay Bani officer said MTPP failed to provide jobs, at the same time damaged Oyon Bay. They no longer have income from seaweeds which have been gradually killed by the hot water coming from the coal-fired plant."[178] Near one power plant in the Philippines, "fish yield… fell to 50% while there was a significant loss of seaweed income in the bay."[179] Simply put, coal kills fish, which severely impacts many Filipinos' livelihoods.

Greenpeace Philippines Water Watch

Cost #5: Economic costs of environmental damage due to climate change

The Philippines is already paying a heavy price for climate change, with weather-related calamities last year, which "claimed over 3,000 lives, affected 15.3 million Filipinos, and resulted in economic losses of over P26 billion."[180]

"Climate change is already with us. It kills. It steals livelihoods. And it takes the most from those who have the least… Farmers face more hot days as they set to work. Families are sleeping outside in mosquito-infested areas because their homes are unbearable in the heat of the night… Rivers are drying up, causing transport shocks, while unprecedented floods are devastating other areas. Salt from rising seas harms fertile land and fresh water supplies. Coastlines erode. Land is submerged. Populations fail to make a living. People move. Pollution also kills. It acidifies lakes and oceans, poisons plants and animal life, corrodes infrastructure and contaminates the air we breathe. We pay for each of these damages in lives, suffering and dollars…climate change is already lowering economic output globally and will increasingly hold back growth – unless strong action is urgently taken… 5 million lives are lost each year today as a result of climate change and a carbon-based economy… Climate change is found to have already set back global development by close to 1% of world GDP… Inaction on climate change cost Least Developed Countries an average of 7% of their GDP for the year 2010 – with losses that will greatly increase in the years ahead."[181]

Coal-fired plants are the single largest source of stationary pollution in any country, and are responsible for 85% of the global carbon dioxide emissions, which fuels global warming. Even if the environment doesn't matter to you, climate change is costing the Philippines real money and hurting the country economically. Emissions from coal-fired power plant kill and disrupt marine life that Philippine coastal communities depend on for jobs and food, because these plants contribute to climate change, ocean acidification, changes in ocean temperature and chemistry. In the Philippines, millions of the most vulnerable depend on seafood for protein. In a study on the "Combined Vulnerability to Food Security Threats from Climate Change and Ocean Acidification Impacts on Seafood Availability…The Philippines is #34 in the combined ranking for vulnerability from climate change and ocean acidification."[182] Another study, the Global Climate Risk Index, ranks the Philippines 4th because of the country's very high vulnerability overall to climate change impacts and catastrophes: cyclones, drought, floods, extreme weather events, temperature rise, shifting rainfall patterns, sea level rise. The Philippines ranks 3rd in the United Nations world risk index,[183] and 6th in the Maplecroft climate change vulnerability index[184] – further validating that the Philippines consistently tops climate change vulnerability indexes.

In the end, it does not make sense for the Philippines to contribute to climate change through coal-fired plants, if that change will wreak havoc on the nation and its economy for generations to come.

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Economic growth potential with renewable energy

Tour around the South East of Asia to promote the use of clean energy
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Setting aside the benefits mentioned above, of avoided cost of building traditional generation; health/agricultural/fisheries/water scarcity/environmental value of reduced pollution; and the overall benefit of relieving pressure on the grid when you have widespread installation of mini solar, there are even further financial benefits to the Philippines for aggressively moving into renewable energy.

Much of renewable energy is domestic content and can become more so. Extractives on the other hand are inherently abroad, for the most part. Instead of having a balance of trade / trade deficit characterized by millions of dollars flowing out from Philippines to oil producing countries and coal producers, billions of dollars can be invested at home. This has the potential to shift the balance of trade, contribute to foreign exchange savings, boost domestic investments, minimize fossil fuel-driven price inflation, stabilize the economy and protect it from fluctuations in fossil fuel prices, increase wealth from an uptick in jobs – all the while improving domestic energy security.

Geothermal energy has already had a massive impact on foreign exchange over time, through displacement of imported fuels. The Philippines has saved over US$ 7 billion since 1977: US$ 7,074.87 million, to be precise.[185] "For the next ten years, geothermal energy is projected to displace an average of 25 [million barrels of fuel oil equivalent] MMBFOE of imported fuel yearly, which will be equivalent to foreign exchange savings of about US$ 588.4 million (based on an average crude price of US$25 per barrel."[186]

Biomass is thought to have the potential to make an impact on foreign exchange over time, through displacement of imported fuels. "The generation of 1,577 GWh from the target capacity of 250 MW in the next three years will displace power generated from fossil fuel, using 969,000 barrels of oil equivalent per year. At a price of US$ 100/barrel, this translates to US$ 96.9 M per year, or US$ 1.9B of savings in fuel importation."[187] Biomass can also generate PHP 460 M per year in terms of government share, real property taxes, local business taxes, and ER 1-94 contribution from the 250MW target capacity.[188]

OTEC may be able to generate 85 GWh under the 10 MW proposed capacity, and if so, could displace an equivalent of 52,000 barrels of crude oil per year. At a price of US$ 100/barrel, this translates to US$ 5.2 M per year.[189] OTEC could also generate PHP 120 M per year of benefits to government.[190]

Hydro may be able to generate 1,073 GWh under the 250 MW proposed capacity, displacing 659,000 barrels of crude oil per year and thus potentially saving US$ 65.9 M per year.[191] Hydro could also generate PHP 520 M per year of benefits to government.[192]

Solar might be able to generate 139.3 GWh under the 100 MW proposed capacity, displacing 85,400 barrels of oil equivalent per year and thus potentially saving US$ 8.5 M per year.[193] Solar could also generate PHP 201 M per year of benefits to government.[194]

Wind might be able to generate 481 GWh under the 220 MW proposed capacity, displacing 295,000 barrels of oil equivalent per year and thus potentially saving US$ 29.5 M per year.[195] Wind could also generate PHP 366 M per year of benefits to government.[196]

These potential changes could have a positive impact on the Philippines' balance of trade; and positively impact its foreign-exchange reserves (or official international reserves), allowing the government greater leeway to stabilize the value of the domestic currency to provide a favorable economic environment, defend the currency from speculative attacks if need be, influence exchange rates, better implement monetary policy, and even build reserves.

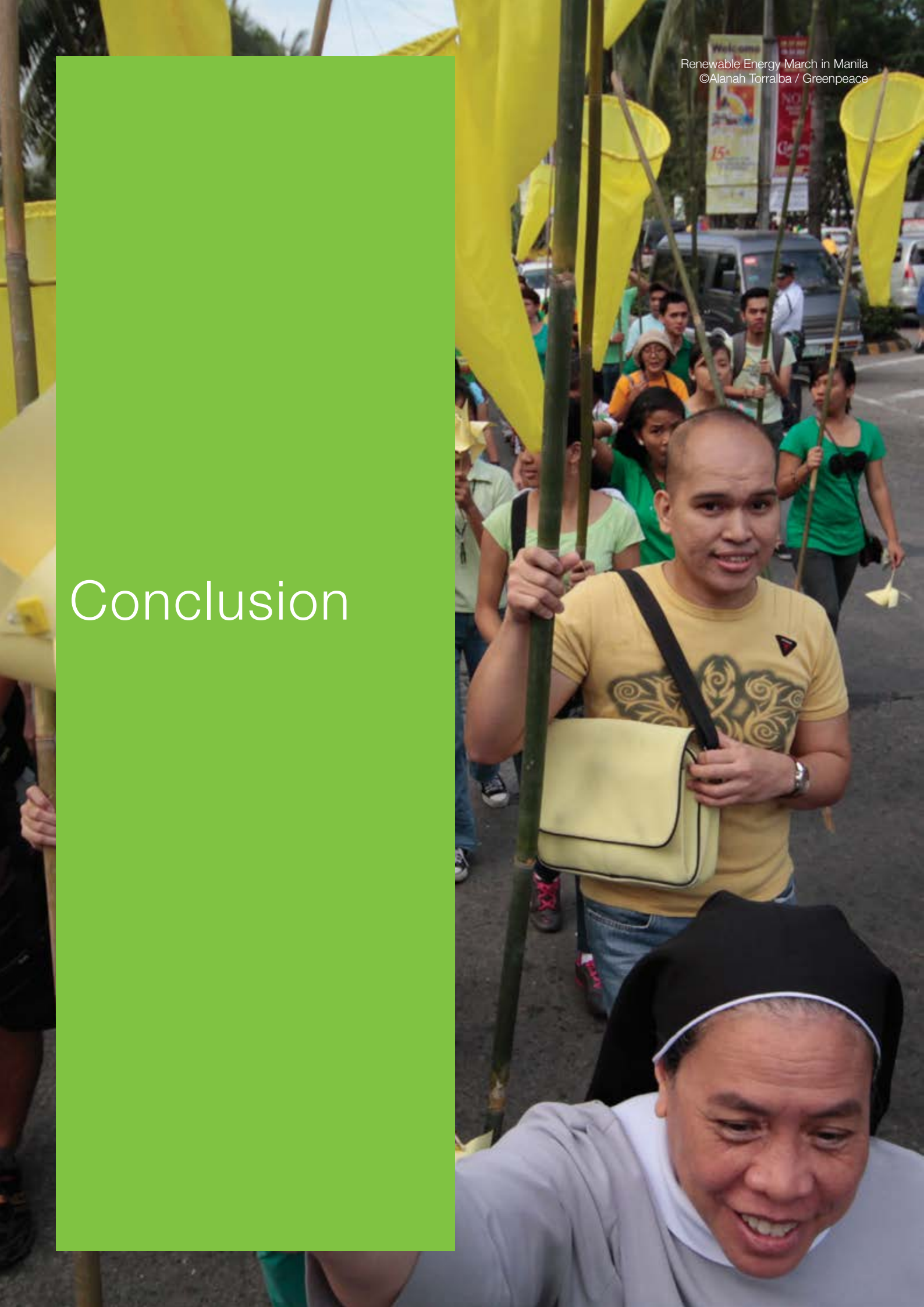
Because so much of renewable energy has high domestic content, investment in renewable energy is more likely to be linked to investment in the domestic economy. For example, wind developers posit that "the total investment for 220 MW [allocated to wind energy in the FiT] can likewise reach up to US$ 660 Million at ta project cost of US$ 3 Million per MW. The impact on the gross domestic product (GDP) can reach up to US$ 990 Million based on a GDO multiplier of 1.5x for power sector covering economic activity, additional revenue, and jobs generated.[197]

Moreover, fossil fuel driven price inflation is minimized, and with renewable energy we can see stabilization of economy and protection from fluctuations in fossil fuel prices. Studies have been done in other countries, exploring how much damage such inflation and fluctuations can do to an economy that failed to embrace energy security and energy independence enough to protect itself from the vagaries of international fossil fuel markets. For example, in a fossil fuel importing country, high and volatile energy prices or even a commodity price shock would result in "high commodity prices push[ing] up consumer prices directly and through the supply chain, squeezing household real income and dampening investment. Sectors hit hardest are those for which energy accounts for a large share of input costs – typically heavy manufacturing and transport services. These sectors see a large rise in relative output prices and are forced to scrap capacity as production becomes less profitable. Domestic demand is also hit through higher interest rates [established]… to contain second round inflationary pressure."[198] It is estimated that "the impact of a 50% increase in oil and gas prices (resulting from a supply shock)" could reduce UK GDP by around 1.0%.[199]

In 2005, the DoE calculated a Renewable Energy Pricing Study, which estimated financial benefits to the country.[200]

Summary of Costs	in US$	in million P
Incentives for REPF Projects	379,118,458	20,852
Increase in Capital Expenditures	1,454,869,342	80,018
Increase in O&M Expenses	211,531,562	11,634
Expected Taxes from Conventional Plants	849,023,793	46,696
Total Costs	2,894,543,154	159,200
Summary of Benefits		
Avoid Oil Imports	3,559,417,576	195,768
Accumulated carbon trading credits	165,610,409	9,109
Avoid health and environmental impacts	395,813,414	21,770
Total benefits	4,120,841,339	226,646
Net Benefits	**1,226,298,246**	**67,446**

Conclusion



Renewable Energy March in Manila
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Investing in renewable energy can 1) generate tens of thousands of jobs, 2) save the government money in terms of tax revenue and foreign exchange savings, 3) boost economic growth especially in vulnerable areas suffering from energy poverty, 4) lower the cost of renewable energy for the long run by impacting the spot market, and 5) save customers' money. Renewable energy has the technological potential to contribute more than 50% of the country's energy by 2020 from Geothermal (28.90%), Hydro (22.97%), Wind and Solar (2.90%), and Biomass (.73%).[201]

For the naysayers who argue that renewable energy is a tree-hugger's job-killing dream, we can show that 2.3 to 3.5 million people are probably working directly in renewables or indirectly in supplier industries worldwide, and that renewable energy is the fastest growing energy sector globally, with about US$243 billion invested in 2010. In the Philippines, we could stand to create thousands of jobs. Solar entrepreneurs explained that for each 10 MW plant in the country, they hire 1000 people during construction for 6 months, and 100 people full time. A representative 8 MW run of river hydro plant employs 1000 people during construction and 30 people in permanent full time jobs. The manufacturing company SunPower had 4,130 employees in the Philippines. One geothermal company alone already hired 2,582 employees, and reported a turnover of US$ 464.73 million. Seven proposed biomass projects could generate roughly 78,000 jobs to construct power plants; 3,400-4,000 jobs for plant operation; 7,000 in the feedstock supply chain; and additional employment for the farmers producing agricultural wastes. Moreover, these calculations are limited to direct jobs. If you include indirect jobs, the job numbers increase by 50 – 100%, while including (1) direct (2) indirect and (3) induced jobs could increase job numbers by 100 – 350%. The bottom line: renewable energy creates jobs, lots of them.

Moreover, savings to the government are already considerable because of tax revenue and foreign exchange savings, even more so if the country embraced renewable energy to the next level. Geothermal energy has already had a massive impact on foreign exchange over time, through displacement of imported fuels: in this context, the Philippines has saved over US$ 7 billion since 1977. Even with the current inadequate FiT installation targets, biomass can still manage to displace 969,000 barrels of oil equivalent per year in terms of power generated from fossil fuel, which roughly gives the government US$ 96.9 million in savings per year; while to give another parallel example, hydro can save US$ 65.9 M per year with the current FiT. Such changes can have a positive impact on the Philippines' balance of trade; foreign-exchange reserves; leeway to stabilize the domestic currency to provide a favorable economic environment; ability to defend the currency from speculative attacks; influence over exchange rates; flexibility to better implement monetary policy; and increased reserves.

Savings and wealth creation for the poorest and most vulnerable might be even more important in the long run, for sustainable development in the Philippines. Renewables can boost economic growth in vulnerable areas suffering from energy poverty, in a country where only 62 – 74 % of households are electrified, over 1/3 of the population lives below the poverty line, and many spend up to half of their income on kerosene. Solar products for the poor hold great promise in the fight against energy inaccessibility for rural areas – a major poverty-inducing factor. Small scale renewable energy products can forge pathways out of poverty.

Last but not least, we must address the question of the price of electricity for customers. The truth is that the system is failing right now, with or without renewables, thanks to decades of poor policies and planning. Energy rates here are the highest in all of Asia, placing a tremendous burden on the average family. Right now, the high cost of electricity has a lot to do with the spot market, which allows for predatory pricing during the middle of the day when demand is peaking. Solar kicks right then, when the grid is struggling hardest to meet demand and when the spot market sends prices for energy shooting up as companies engage in opportunistic bidding, taking advantage of higher demand to charge more. In the spot market, peak plants price can go to 50 pesos per hour. Because solar is usually there when people typically need energy the most, solar can keep expensive reserve plants offline, and therefore drive energy prices down in the long run by impacting the spot market, saving customers' money. All responsible parties must stop peddling untruths and half truths about this problem, and work constructively to find solutions to the high cost of energy, rather than seeking to shift the blame to renewables, without science or data to back up their claims. Moreover, the utility companies, NREB, and ERC and DOE should stop dragging their feet and delaying the implementation of net metering nationwide. Net metering could dramatically lower the cost of energy in the long run. Initiatives like the "Million Solar Roofs" Act stand to help homeowners achieve energy independence, relieving pressure on the grid, creating more energy nationwide, lowering aggregate demand, and thereby driving down prices.

And moving on from renewables to coal, we need to face facts and stop trying to twist them to suit a shortsighted political agenda. The truth is that coal is extremely costly. It's not cheap at all. A typical new 600 MW coal plant has a price tag of roughly $2 billion. Beyond that, it hurts our agriculture, it hurts our fisheries, it hurts our environment, and we pay for coal with our own health. Living near a wet coal ash storage pond is significantly more dangerous than smoking a pack of cigarettes a day. Coal makes people sick because of soot, smog, toxic air pollutants such as lead and arsenic, mercury pollution, and more. If you think this is not an economic question, think again. The nation pays a large health bill because of in terms of medical treatment for asthma attacks, other respiratory illnesses, lung damage, heart attacks, strokes, coronary heart disease, brain damage/neurological damage, mental retardation, developmental problems in unborn children and infants, organ disease, cancer, and premature deaths.

The Philippines can embrace an energy revolution, turn its back on coal, seize the moment, and lead the way for renewables in Southeast Asia, capitalizing on its success in geothermal and in solar panel production.

Renewables ensure our security of supply, help cope with rising demand, and provide decarbonized energy. We all need electricity. It is vital – it powers our lives, runs our hospitals and schools – we need it for every aspect of our lives. But we need it to be clean and sustainable. Embracing the energy revolution and harnessing renewables doesn't mean bankruptcy and sacrifice. The facts show that it can bring us wealth, cost savings, and employment.

NREB used data gathered from representative renewable energy projects when it was making submissions to the ERC, and included the following ratios in one of the spreadsheets used:

Sector Summary	MW	Direct and Indirect Jobs	Ratio
Solar	500	22,000	44
Wind	1000	4,545	5
Biomass	433	18,000	42
Hydro	500	6,000	12

SUMMARY OF PROJECTS (as of October 2012)

AWARDED PROJECTS UNDER RENEWABLE ENERGY (RE) LAW

RESOURCES	AWARDED PROJECTS		POTENTIAL CAPACITY MW		INSTALLED CAPACITY MW	
	Grid-Use	Own-Use	Grid-Use	Own-Use	Grid-Use	Own-Use
Hydro Power	160		2,588.06		118.52	
Ocean Energy	3		5.00			
Geothermal	33		785.00		1,902.69	
Wind	38	1	1,569.00	0.006		
Solar	27	2	387.715	0.62		
Biomass	27	22	186.30	32.70	119.35	182.78
Sub-Total	288	25	5,521.075	33.326	2,140.56	182.78
TOTAL	313		5,554.401		2,323.34	

- The projected green jobs generation from 7.828 MW RE projects for development is equivalent to about 62,625 employments (direct and indirect)
- With a rule of thumb of eight jobs per MW, according to a University of California, Berkeley, study.[202]

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- Income Tax Holiday (ITH) for the first seven (7) years of commercial operations
- Duty-free Importation of RE machinery, equipment and materials including control and communication equipment within the first ten (10) years upon issuance of a certification of entitlement to incentives
- Special tax rates on realty and other taxes on civil works, equipment, machinery, and other improvements actually and exclusively used for RE facilities not to exceed one and a half percent (1.5%) of their original cost less accumulated normal depreciation or net book value
- Net Operating Loss Carry-Over (NOLCO) during the first three (3) years from the start of commercial operation which had not been previously offset as deduction from gross income shall be carried over as a deduction from gross income for the next seven (7) consecutive taxable years immediately following the year of that loss
- Corporate Tax Rate of ten percent (10%) on net taxable income after ITH
- Accelerated Depreciation of plant, machinery, and equipment that are reasonably needed and actually used for the exploration, development and utilization of RE resources (depreciation rate not to exceed twice the normal rate)
- Zero Percent Value – Added Tax Rate on sales of fuel or power generated from renewable sources
- Tax Exemption on all proceeds from the sale of carbon emission credits
- Tax Credit on RE machinery, equipment, materials, and parts purchased from a domestic manufacturer, equivalent to one hundred percent (100%) of the value of the VAT and custom duties that would have been paid had these items been imported.

- Exemption from the Universal Charge under the following circumstances: a. if the power or electricity generated through the RE System is consumed by the generators themselves; and/or b. if the power or electricity through the RE System is distributed free of charge in the off-grid areas
- Cash incentive of RE Developers for Missionary Electrification.
- Payment of transmission Charges.
- Priority and Must Dispatch for Intermittent RE Resource.

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Balog-Balog Multipurpose Project Phase II (National Irrigation Administration) 43.5 MW
Jalaur River Multi-Purpose Project – Stage II 11.5 MW
Tumauini River Multi-Purpose Project 7 MW
Kabulnan-2 Multi-Purpose Irrigation and Power Project 110 MW
Kalayaan Pumped Storage Power Plant III (CBK Expansion, J Power and Sumitomo Corp.) 360 MW
Balintingon River Multipurpose Project (National Irrigation Administration) 30 MW

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Annex

SOURCE: DOE (21 November 2012)

Summary of 23 coal plants in the Philippines, as of 5 November 2012[1]:

Area	Rated Capacity	Total Projects	Status	
Luzon	3,810 MW	9	Commited	2
			Indicative	7
Visayas	454 MW	4	Commited	1
			Indicative	3
Mindanao	920 MW	6	Commited	2
			Indicative	4
Future Projects	1,190 MW	4		
		23		

PRIVATE SECTOR INITIATED POWER PROJECTS (LUZON)
As of 5 November 2012

	Committed / Indicative	Name of the Project	Project Proponent	Location	Rated Capacity (MW)	Project Status	Target Commissioning
		COAL			3,810.00		
1	**Committed**	**2 X 300 MW Mariveles Project**	**GNPower Mariveles Coal Plant Ltd. Co.**	**Mariveles, Bataan**	**600**	**ECC issued on 15 February 2007; SEC issued 17 March 2007; BOI Certificate issued on 13 June 2007; GIS on August 2007; Under construction; Project cost is $1B**	**Unit 1 (300 MW) - December 2012Unit 2 (300 MW) - January 2013**
2	**Committed**	**135 MW Puting Bato Coal Fired Power Plant Phase I**	**South Luzon Thermal Energy Corp. (SLTEC)(formerly TAOil)**	**Brgy. Puting Bato West, Calaca, Batangas**	**135**	**50-50 joint venture project of TAOIL and AC Energy Holdings, Inc.; Purchase of land signed on January 2010; EPC contractor was awarded to DMCI on 31 March 2011; DENR-ECC issued to TAOil for project on 30 April 2010, SEC issued on 29 July 2011; PPA between SLTEC and TAOil was signed on 28 Octtober 2011; BOC registration as importer issued on 2 December 2012; transfer of ECC to SLTEC on 14 Dec. 2011; GIS issued on 17 May 2012; financial close on 28 Oct. 2011; Project cost is Php12.9B**	**September 2014**
3	Indicative	2 X 20 MW FDC Camarines CFB Coal Power Plant	FDC Utilities, Inc. (FDCUI)	Camarines Sur	40	On-going feasibility study and plant site evaluation; On-going securing of regulatory requirements; Other required permits and endorsement to be secured upon completion of pre-con activities; Financial close targeted on November 2012	Q1 2016
4	Indicative	2 X 300 MW Coal-Fired Power Plant	Redondo Peninsula Energy, Inc.	Sitio Naglatore, Cawag, Subic	600	Environmental Compliance Certificate Unit 1 on 2008 and Unit II on 2012, Grid Impact Studies, other permits obtained; on-going financing arrangements; site preparation construction ongoing; 52% owned by Meralco PowerGen Corp. (MPGC); public consultations conducted in Subic on 29 June 2012; Project cost Php50B	Phase I - Q4 2014 Phase II - Q2 2015
5	Indicative	135 MW Puting Bato Coal Fired Power Plant Phase II	South Luzon Thermal Energy Corp. (SLTEC) (formerly TAOil)	Brgy. Puting Bato West, Calaca, Batangas	135	Ongoing feasibility study; SEC Registration Certificate issued July 29, 2011; LGU Endorsement issued Feb. 14, 2012; GIS issued on 17 May 2012; Land already acquired, ongoing Titling and Conversion of Land to industrial; EPC proposal under review, for forward on Q3 2012; ECC target date to secure on Q4 2012; financing close expected by end of 2012; Project cost is Php 9.6B	Q4 2015
6	Indicative	2 X 300 MW Mariveles Expansion Project	GNPower Mariveles Coal Plant Ltd. Co.	Mariveles, Bataan	600	Ongoing permits; Negotiation with financing resources to commence on Q4 2012; Project cost is $1B	Q4 2015
7	Indicative	Quezon Power Expansion Project	Quezon Power Phils.	Mauban, Quezon	500	ECC issued June 4, 2007; Extension of validity granted on May 31, 2012 for a 3 year extension; Municipal LGU endorsement issued April 19, 2005; Award EPC contract estimate July 2013; Design and construction to start January 2014	Q2 2016
8	Indicative	SLPGC Coal-Fired Power Plant (formerly Calaca Expansion)	Southwest Luzon Power Generation Corporation (formerly by SEM-Calaca Power Corp.)	Brgy. San Rafael, Calaca, Batangas	600	Land Lease Agreement with PSALM secured; SEC registration approved 31 Aug. 2011; on-going negotiations with off-takers; ECC application approved 21 Oct. 2011; GIS with NGCP approved 8 Nov. 2011	Phase I - 2014 Phase II - 2017
9	Indicative	2 X 300 Masinloc Expansion	AES Masinloc Power Partners Co., Inc.	Zambales	600	Grid Impact Studies obtained on 7 January 2011; Undergoing consultation with international / local banks; ECC Amendment was released by DENR on 23 April 2012; The amended DOE Certificate of Endorsement for BOI was released on 7 May 2012	Unit 3 (300 MW) - 3rd Quarter 2016 Unit 4 (300 MW) - 3rd Quarter 2016

PRIVATE SECTOR INITIATED POWER PROJECTS (VISAYAS)
As of 5 November 2012

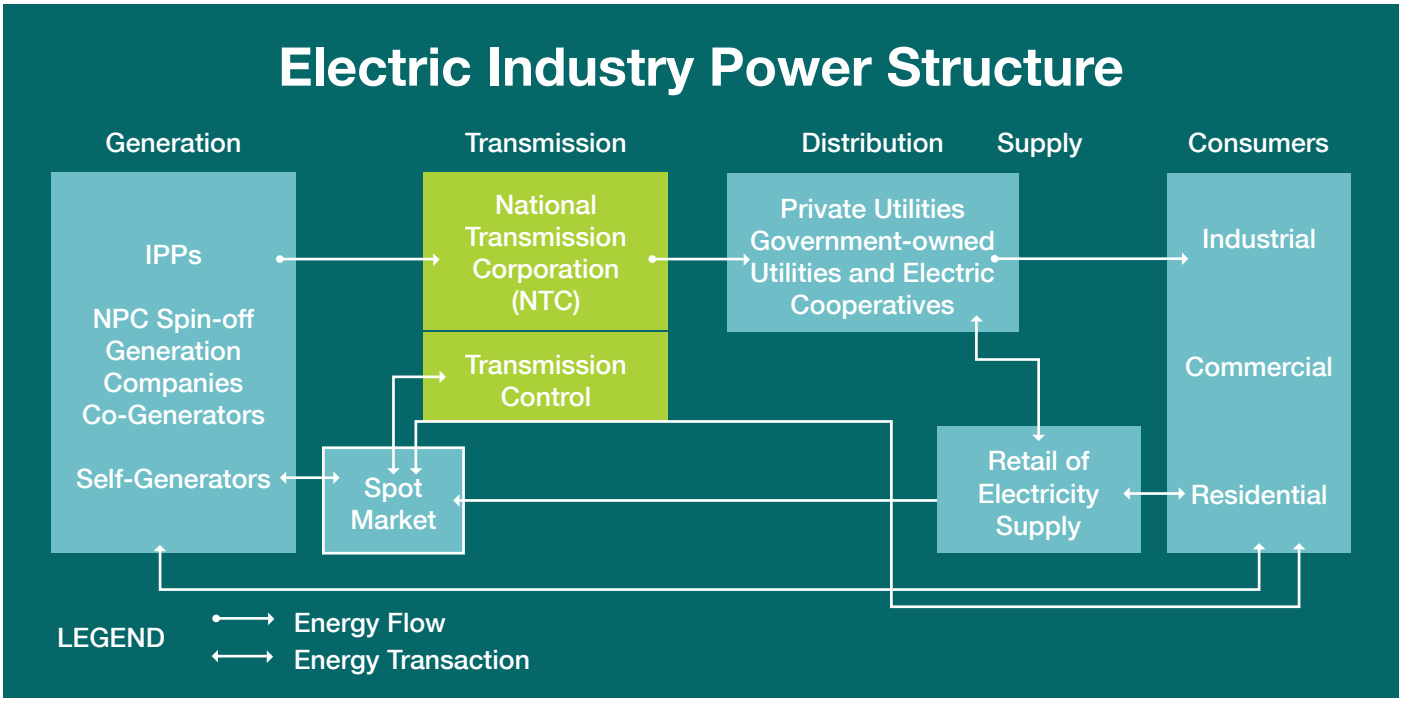
	Committed / Indicative	Name of the Project	Project Proponent	Location	Rated Capacity (MW)	Project Status	Target Commissioning
		COAL			454.00		
1	**Committed**	**2 x 135 MW Concepcion Coal-fired Power Plant**	**Palm Thermal Consolidated Holdings Corp. (Formerly DMCI Concepcion Power Corp.)**	**Brgy. Nipa, Concepcion, Iloilo**	**270**	**Acquired land on Nov. 2010; permits and other requirements obtained; Secured Letter of Intent from from CEBECO, PECO and ILECO 111; EPC Contractor expected by December 2012; appointed SNC-Lavalin, Inc. as the Owner's Engineer; secured clearance from DOE for the conduct of GIS, Signed Formal Coal Offer of Semirara dated 16 July 2012; awaiting for the release of final GIS by NGCP; on-going negotiations for the Connection Agreement, Transaction Services Agreement and other commercial and legal agreements with NGCP; negotiations with DUs/ECs are underway for the review of the proposed Power Supply Contract offered by PCPC; System Impact Study (SIS) received from NGCP last 17 July 2012; financial close by September 2012, BDO Capital's due diligence is now underway before the signing of Mandate Letter**	**1st Unit - 3rd Qtr. 2014 2nd Unit - Sept. 2016**
2	Indicative	1 X 20 MW FDC Danao CFB Coal Power Plant	FDC Utilities, Inc. (FDCUI)	Danao City, Cebu	20	Grid Impact Studies completed; On-going securing of regulatory requirements; Other required permits and endorsement to be secured upon completion of pre-con activities; Financial close targeted on December 2012	Q4 2015
3	Indicative	TPC Coal-Fired Power Plant Expansion Project (1 x 82 MW Coal-Fired Power Plant	Toledo Power Company (CEDC)	Toledo City, Cebu	82	Securing necessary permits; secured clearance from DOE for the conduct of GIS.	2015
4	Indicative	PEDC Expansion Project (1 X 82 MW Coal-Fired Power Plant)	Panay Energy Development Corporation	Brgy. Ingore, La Paz, Iloilo	82	Securing necessary permits; secured clearance from DOE for the conduct of GIS.	2015

PRIVATE SECTOR INITIATED POWER PROJECTS (MINDANAO)
As of 5 November 2012

	Committed / Indicative	Name of the Project	Project Proponent	Location	Rated Capacity (MW)	Project Status	Target Commissioning
		COAL			920.00		
1	**Committed**	**2 X 100 MW Southern Mindanao Coal Fired Power Station**	**Sarangani Energy Corporation (formerly Conal Holdings Corp.)**	**Maasim, Sarangani**	**200**	**Various permits obtained; BDO, DBP, RCBC and UCPB have obtained their respective pre-clearances to enter into the transaction; Power Sales Agreement for 70MW between Sarangani Energy Corporation and South Cotabato II Electric Cooperative, Inc (SOCOTECO II) was executed on June 3, 2011; Issuance of Notice to Proceed to the EPC Contractor is scheduled on March 2012; Project cost $450M; Testing and commissioning will commence 29 months after Notice to Proceed; Commercial operation will commence 35 months after issuance of Limited Notice to Proceed.**	**2014**
2	**Committed**	**2 X 150 MW Coal-Fired Therma South Energy Project**	**Therma South Inc.(Aboitiz Power Corporation)**	**Brgy. Binugao, Toril, Davao City and Brgy. Inawayan, Sta. Cruz, Davao Del Sur**	**300**	**Project cost Php24B; Secured right to land; Secured permits for site development works; Self-funded with on-going negotiation with financial institutions; various permits obtained; EPC contract awarded to Black and Veatch on June 2012; Secured SEC, BIR, BOC, BOI, ECC permits; LGU/Sangguniang Panlalawigan Davao City Reclassification already granted and issued on 12 Dec. 2011; On-going site preparation works; Site development works by 3rd Qtr. of 2012; Target commercial operation is Q1 2015**	**Q2 2014**
3	Indicative	Steag Expansion Project	Steag State Power Corp.	Phividec, Misamis Oriental	200	On-going feasibility study; on-going discussions with NPC/PSALM regarding the common facilities	December 2014
4	Indicative	ZAM 100 MW Circulating Fluidized Bed (CFB) Coal-Fired Power Station	San Ramon Power Inc.	San Ramon, Zamboanga City	100	On-going securing permits; DENR had issued ECC in April 2012; on-going marketing. Project cost is $280M	Q3 2015
5	Indicative	Davao del Norte 20 MW Circulating Fluidized Bed Biomass-Coal Fired Thermal Power Plant	FDC Utilities, Inc. (FDCUI)	Maco, Davao del Norte	20	Awaiting approval of sale from ERC on proposed plant connection at DANECO 69/13.2kV Canocotan Substation; On-going of securing of permits; Project cost is Php4.8B	Q1 2015
6	Indicative	Sibuguey Power Plant Project	Philippine National Oil Company (PNOC-EC)	Sibugay, Zamboanga	100	Technical and economic feasibility study was completed in July 2011; Eligible bidder for Transaction Advisor on 8 August 2012; On-going bid precessing for the EIS consultancy leading to ECC application and other permits	2016

PRIVATE SECTOR INITIATED POWER PROJECTS
As of 25 October 2012

	Name of the Project	Project Proponent	Location	Rated Capacity (MW)
	COAL			1,190.00
1	140MW Petron Coal	Petron Corporation	Limay, Bataan	140
2	600 MW Coal SMC Global Power Holdings Corp.	SMC Global Power Holdings Corporation	Leyte	600
3	150MW Coal SMC Global Power	SMC Global Power Holdings Corporation	Panay	150
4	300MW SMC Global	SMC Global Power Holdings Corporation	Malita, Davao del Sur	300



Estimated Average Annual PM_{10} Emissions from Power Generation by Type and by Grid: 2000[2] (Units in metric tonne)

Type	Luzon	Visayas	Mindanao	Philippines
	2000	2000	2000	2000
PM_{10}	2,993	101	224	3,318
Coal	2,043	47	0	2,091
Local	170	-	-	170
Imported	1,873	47	-	1,920
Oil-based	950	54	224	1,227
Diesel	420	54	224	697
Oil thermal	399	-	-	399
Gas turbine	3	0	-	3
Comb. cycle	127	-	-	127
Others			-	-

Estimated Average Annual PM_{10} Emissions from Power Generation by Type and by Grid: 2000[3] (Units in metric tonne)

Type	Luzon	Visayas	Mindanao	Philippines
	2000	2000	2000	2000
SO_2	171,272	4,674	11,436	187,382
Coal	80,895	2,299	-	83,193
Local	9,969	-	-	9,969
Imported	70,925	2,299	-	73,224
Oil-based	90,377	2,375	11,436	104,189
Diesel	18,631	2,368	11,436	32,436
Oil thermal	31,861	-	-	31,861
Gas turbine	695	7	-	702
Comb. Cycle	39,190	-	-	39,190
Others			2,500	-

Estimated Average Annual NO_2 Emissions from Power Generation by Type and by Grid: 2000[4] (Units in metric tonne)

Type	Luzon	Visayas	Mindanao	Philippines
	2000	2000	2000	2000
NO_2	38,459	2,287	-	43,247
Coal	28,411	1,686	-	30,098
Local	3,778	-	-	3,778
Imported	24,633	1,686	2,500	26,320
Oil-based	10,048	601	2,500	13,149
Diesel	4,688	599	-	7,787
Oil thermal	2,182	-	-	2,182
Gas turbine	74	2	-	76
Comb. cycle	3,104	-		3,104
Natural Gas				
Others				

Average Generation and Annual Emissions of Four Coal-fired Power Plants in Luzon: 2000[5]

Scenario	Annual Generation (GWh)	Annual Emissions (t)		
		PM_{10}	SO_2	NO_2
2000 (actual)	12,750	1,472	33,622	18,748
1NLW	5,534	51	12,748	9,307
2NLWO	3,078	18	140	129
1SLWO	None	-	-	-
2SLWO	4,138	1,403	20,734	9,312

Power plants are identified here in terms of location, namely, northern (NL) or southern (SL) Luzon and in terms of type of EOP (end-of-pipe) control, that is, with (W) or without FGD (WO) since all of them have ESP and only one has an FGD.

Average Generation and Annual Emissions of Four Coal-fired Power Plants in Luzon: 2000[5]

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Emission Rates and Maximum Predicted Ambient Ground Concentration within 30 km Radius: Four Coal-fired Power Plants, Luzon

Scenario	Emission Rate (mg/Ncm)[1]		
	PM_{10}	SO_2	NO_2
Emission standard (for fuel-burning equipt.)	50% of TSP std. –100	Existing – 1,500;	18,748
New – 700	Existing – 1,500;	12,748	9,307
New – 1,000	18	140	129
2000			
1NLW	na	na	na
2NLWO2	181.36	2,472.73	1,556.11
1SLWO	2.77	300.15	345.92
2SLWO2	138.59	2,873.44	1,139.77
	Max. Ambient Ground Conc. (mg/Ncm)3		

1 Other sources (including Ailun Yang And YiYun Cui "Global Coal Risk Assessment: Data Analysis And Market Research," Working Paper, World Resources Institute, November 2012, available at http://www.wri.org/publication/global-coal-risk-assessment) also confirmed some of the new plants proposed :

- Subic Bay (660 MW)
- Zamboanga (100 MW)
- Sarangani (200 MW)
- Davao (? MW)
- Unknown (Aboitiz) (? MW)
- Concepcion (200 MW)
- Subic (300 MW)
- Mariveles, Bataan (600 MW)
- Pagbilao, Quezon (300 MW)
- Concepcion, Iloilo (100 MW)
- Iloilo City (165 MW)
- Naga, Cebu (100 MW)
- Toledo, Cebu (200 MW)
- Masinloc, Zambales (300 MW)
- Olongapo, Zambales (300 MW)
- Sultan Kudarat (150 MW)

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3 Ibid.

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Green is Gold: How Renewable Energy can save us money and generate jobs

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