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Finding Solutions to the Mindanao Electric Power Problem

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Philippine Institute for Development Studies
Surian sa mga Pag-aaral Pangkaunlaran ng Pilipinas

Finding Solutions to the Mindanao Electric Power Problem

Adoracion M. Navarro

DISCUSSION PAPER SERIES NO. 2012-21

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Finding solutions to the Mindanao electric power problem

Adoracion M. Navarro ¹

Abstract

The Mindanao electric power problem, which led to a crisis situation in summer 2012, is primarily due to inadequate baseload capacity and unbalanced generation capacity mix. The crisis might stage a comeback when the days of relatively cooler weather and heavier rainfall are over and the annual system peaks, which can be expected in summer 2013, kick in once again. The short-term recommended actions are as follows: continue the rehabilitation and sustain the operations of Agus and Pulangui hydropower complexes; minimize the bureaucratic hurdles in the building up of electric cooperatives' embedded generation capacities but only up to the extent allowed by law; undertake a more aggressive information, education and communication campaign in Mindanao regarding the power situation and power outlook; and address the risk aversion problem in baseload power contracting. In the medium to long term, the possible policy responses include the following: decide with finality the fate of the privatization of Agus and Pulangui hydropower complexes and include the concession option in the range of options; facilitate the entry of new baseload capacity commitments and if no new investments would come in, the government could also explore a concession arrangement; accelerate the development of renewable energy projects through quick action in rules setting; strengthen the capacity of the regulator to deal with complex issues in the electric power industry; and pursue the interconnection of the Visayas and Mindanao power grids.

Key words: electric power, power generation, concessions, privatization

¹ The author is a Senior Research Fellow at the Institute. She gratefully acknowledges the excellent research assistance of Reinier de Guzman and Keith Detros. The views expressed are those of the author and do not necessarily reflect those of PIDS.

In the summer of 2012, many people in Mindanao suffered rotating brownouts of about one to eight hours daily as the island's power system experienced shortfalls in generation capacity. The specter of the power crisis first called in when a long dry season in 2010 reduced the Lanao Lake water level and decreased the generating capacity of the Agus and Pulangui hydropower plants. It visited the region again in summer 2011, and again in February 2012 through summer 2012. By summer 2012, there was no doubt that the region was already experiencing an electrical power crisis.

When the picture of a looming power crisis in Mindanao was raised in 2009, it was met with skepticism by some representatives of civil society and suspected as a ploy to make the Mindanaoans agree to hosting coal-fired power plants. Criticisms included the claim that electricity demand projections by the government had little statistical basis.² That the veracity of energy projections continued to be challenged as late as 2011³ reflected the government's failure to communicate with a greater sense of urgency the rationale for generation capacity expansion plans and the consequences of inaction. But at the same time, no one has held the naysayers in civil society responsible for the implications of their disaffirmation.

The existing analyses of the Mindanao situation thus far (which are mostly in popular media) tend to have emotional undercurrents owing to exasperation or distrust. As an alternative, the discussion in this paper presents an analysis that extracts evidence from data and applies economic principles. This paper describes the roots of the recent electric power crisis, assesses the likelihood of it recurring in the immediate future and analyzes the possible policy actions that can be undertaken by the government in the short term and medium to long term.

² Freedom from Debt Coalition. "Power crisis in Mindanao doubtful." Posted May 6, 2009. Accessed June 8, 2012. <http://fdc.ph>.

³ An environmentalist group was reported as saying that there were no concrete data validating the power shortage claim. (SunStar Davao. "Mindanao power crisis 'worsening'." Posted May 6, 2011.)

The roots of the crisis

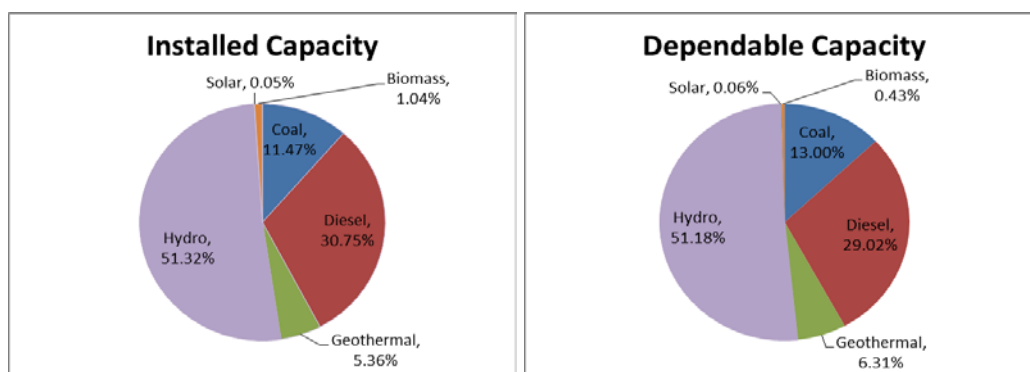
The electric power crisis in Mindanao primarily resulted from the failure to provide generating capacity that is sufficient to meet demand. The evidence of this is provided by a combined analysis of the existing generation capacity mix and the projected demand in the region. Table 1 and Figure 1 show that the Mindanao power grid is heavily dependent on hydropower—about 51 percent of supply are coming from hydropower plants. Thus the power system of the whole Mindanao region is susceptible to reliability problems when drought occurs. The system is also easily affected by decreases in the available capacity of the hydropower plants in the face of worsening deforestation of the watersheds and the river siltation problems associated with it (i.e., the siltation of the Agus River feeding the Lanao Lake and of the Pulangui River in Bukidnon).

Table 1. Generating capacity mix in Mindanao in 2011(in megawatts, MW)

Fuel Type	Capacity (MW)	
	Installed	Dependable
Coal	232	210
Oil-based		
<i>Diesel</i>	622	469
Geothermal	108	102
Hydro	1,038	827
Solar	1	1
Biomass	21	7
TOTAL	2,022	1,616

Note: Excludes off-grid generation.

Source: Department of Energy (DOE) PowerStat



Note: Excludes off-grid generation.

Source: DOE PowerStat

Figure 1. Generating capacity mix in Mindanao in 2011 (in percentages)

The heavy reliance on cheap hydropower in Mindanao translates to a low cost of generation in the region. Table 2 shows that the generation price faced by electric cooperatives in Mindanao is only Php2.90/kWh, whereas it is Php4.82/kWh in Luzon and Php4.88/kWh in Visayas. This allows consumers in Mindanao to enjoy cheaper power rates relative to their Luzon and Visayas counterparts.

Table 2. Electric cooperatives' unbundled average electricity rates, as of September 2011

Bill Subgroup	LUZON		VISAYAS		MINDANAO		NATIONAL	
	Php/kWh	Percent share	Php/kWh	Percent share	Php/kWh	Percent share	Php/kWh	Percent share
Generation	4.8264	48.6	4.8864	50.94	2.9009	39.8	4.2046	47.04
Transmission	1.1319	11.4	0.9885	10.31	1.4639	20.08	1.1948	13.37
System Loss	0.8392	8.45	0.7652	7.98	0.5377	7.38	0.714	7.99
Distribution *	2.2383	22.54	2.2033	22.97	1.9203	26.34	2.1206	23.73
Subsidies	0.0684	0.69	0.0395	0.41	0.0573	0.79	0.0551	0.62
Government Taxes	0.8275	8.32	0.7093	7.39	0.4091	5.61	0.6486	7.25

Bill Subgroup	LUZON		VISAYAS		MINDANAO		NATIONAL	
	Php/kWh	Percent share	Php/kWh	Percent share	Php/kWh	Percent share	Php/kWh	Percent share
Total	9.9317	100	9.5922	100	7.2892	100	8.9377	100

Note: * Includes distribution, supply and metering charges.

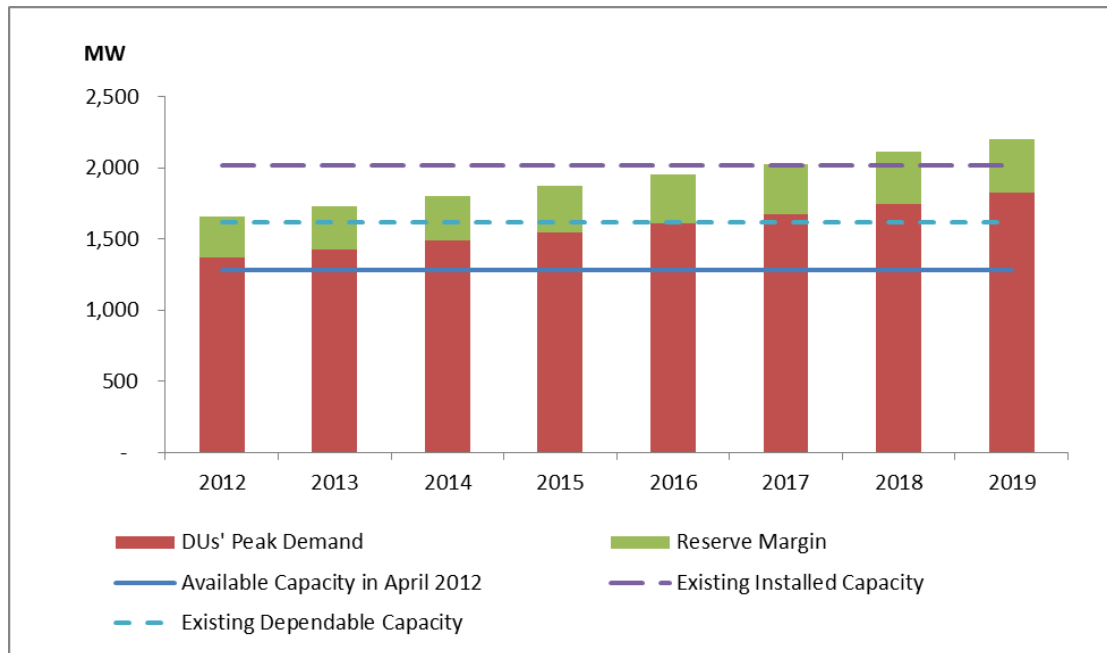
Source: National Electrification Administration, as cited in the 19th EPIRA Status Implementation Report

There are 39 distribution utilities in Mindanao, which consist of 34 electric cooperatives, four private investor-owned utilities and one local government-owned utility. From the individual forecasts submitted by these distribution utilities to the DOE, the consolidated forecast for 2012 peak demand is estimated at 1,373 MW and is projected to reach 1,823 MW in 2019 (see Figure 2). Observers say that much of the demand increases in Mindanao is due to high economic growth in the region, which is in turn brought about by cheap electricity rates. Gross regional domestic product (GRDP) in Mindanao from 2003 to 2009 grew faster than the national gross domestic product (GDP) during the same period. In 2003-2009, Mindanao GRDP (in constant 1985 prices) grew by an annual average of 5.04 percent whereas GDP grew by 4.73 percent.⁴

To meet the peak demand and at the same time maintain the security and reliability of the power grid, generation capacity must not only correspond to peak demand but also provide reserves for ancillary services needed in delivering electricity to the customers. Allowing for a required reserve margin of at least 21 percent of peak demand (as advised by the DOE), the estimated total generation capacity requirement during peak period in 2012 is therefore 1,661 MW. Clearly, the 1,616 MW dependable capacity (Table 1) is not enough. In fact, total available capacity during summer 2012 declined further due to the heavy siltation of the Pulangui River and the Lanao Lake, which then led to a significant reduction of the generating capacity of the hydropower plants drawing water from these sources. Matters were made worse with

⁴ Computed using data from the National Statistical Coordination Board.

the ongoing 30-month long repair of the Agus VI hydropower plant and the April 17 to May 8 shutdown for rehabilitation of the Pulangui IV hydropower plant. For instance, the NGCP power outlook for April 25, 2012 showed an available system capacity of 955 MW in the face of a system peak of 1,212 MW, resulting in a deficit of 257 MW.



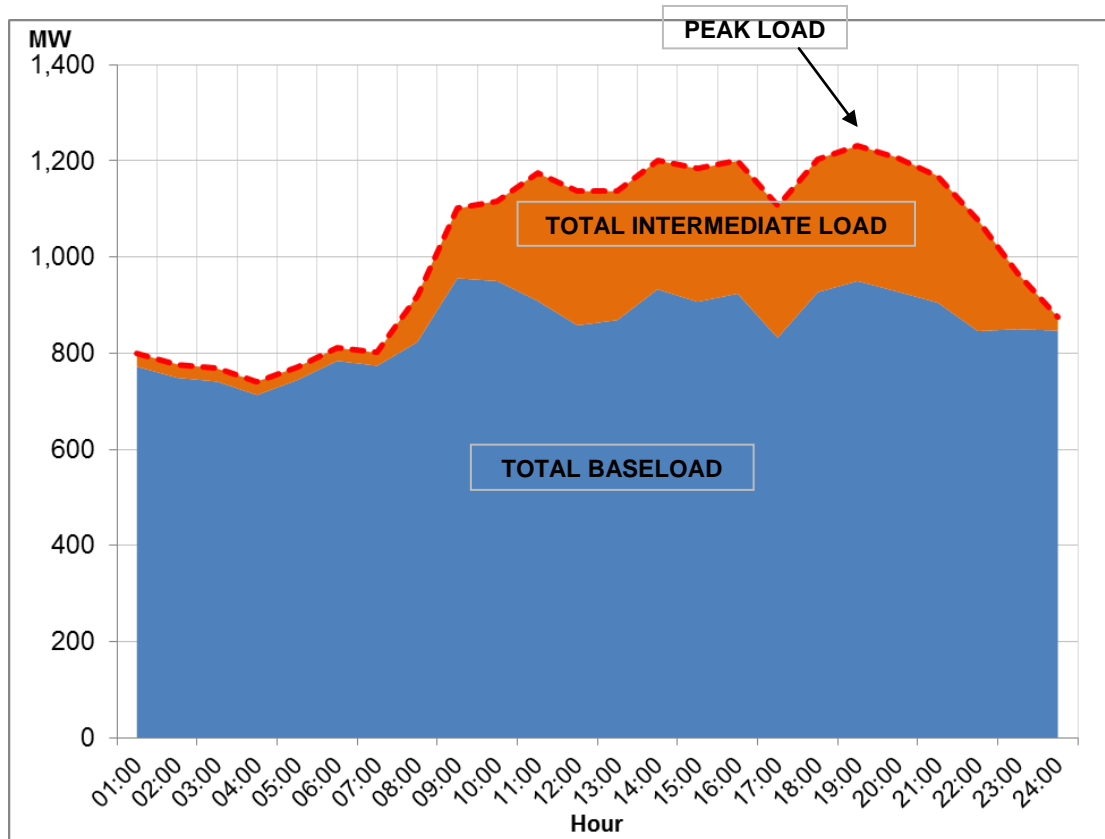
Sources: demand forecast - Distribution Development Plan 2010-2019; reserve margin - author's interpretation; installed, dependable and available capacities - DOE

Figure 2. Demand Forecast vis-à-vis Generation Capacity

Basically, supply had been insufficient to meet demand, but supply and demand in electric power systems have characteristics that are distinct from ordinary goods where a comparison of total supply versus total demand can be straightforward. What the Mindanao region is in dire need of right now is generating capacity capable of supplying base load. A brief additional explanation of supply and demand characteristics would help clarify this point.

As alluded to in the preceding paragraphs, there are different levels of supply capacities in power—installed, dependable and available capacity. (Figure 2 above also shows these three distinct types of capacities.) Installed capacity or rated capacity is the total of the maximum capacities of the generating units in a power plant, as specified on the nameplates of the units. The total installed capacity in a grid (2,022 MW in the Mindanao grid) is rarely delivered exactly because of changes in environmental conditions in each power plant site. Thus, dependable capacity (1,616 MW in the Mindanao grid), which depends on such factors as the generating units' efficiency ratios and temperature variations, is lower than the installed capacity. Available capacity (1,280 MW in the Mindanao grid in April 2012), or the total amount of power that is actually injected in a grid, could also be lower than the dependable capacity when there are generating units which are offline due to scheduled maintenance or forced outages.

With respect to demand, there is base load, which is the more or less constant part of the total load or total demand in an electric power system per unit of time, or the amount of electric power required to meet the minimum demand of connected customers. The maximum load in an electric power system, on the other hand, is called peak load. Somewhere in between base load and peak load is the intermittent load. Figure 3 illustrates these concepts using the Mindanao hourly loads on April 2, 2012.) To meet base load or base demand, so-called baseload power plants are needed. Baseload power plants are such generating plants which can produce energy at a constant rate and can be relied on to efficiently meet a region's continuous demand for electric power; thus, they run all year round. In contrast, intermediate-peaking plants run to provide load-following supply and when there is relatively higher demand for power, and peaking plants run only when there are system peaks.

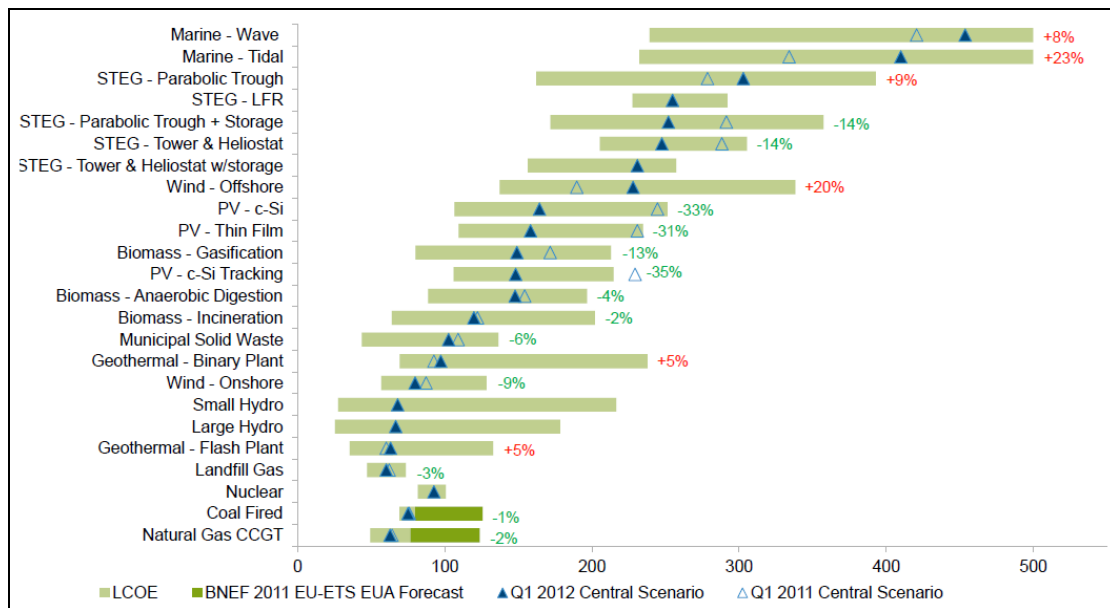


Source: National Grid Corporation (NGCP)

Figure 3. Hourly loads in the Mindanao power system (April 2, 2012 reference date)

The traditional baseload technologies are coal, geothermal and nuclear. Hydroelectric power plants can provide baseload capacity to a limited extent only because the water level is not constant and may run really low when a long drought occurs. With respect to intermittent power sources such as wind power and solar power, there are still much research and technological developments going on regarding their use for baseload capacity. Moreover, the cost of generation from these sources, although declining in recent years, is still prohibitively high for them to be used in providing baseload capacity. (See Figure 4 for a comparison of the levelized cost of electricity⁵ for different generation technologies.)

⁵ Levelized cost of electricity, a term usually used in investment analysis, means the price at which a generation technology recovers all costs, including the cost of equity (i.e., including allowance for a sufficient return to investors).



Notes:

LCOE - range of the levelized cost of electricity

BNEF - Bloomberg New Energy Finance

EU-ETS EUA - European Union Allowances for carbon emissions in the EU-Emissions Trading System

The “+/-” percentages indicate the change in the 2011 prices versus 2012 forecast prices in the Bloomberg New Energy Finance estimation model.

Source: Bloomberg New Energy Finance, as cited in *Global Trends in Renewable Energy Investment 2012*.

Figure 4. Levelized cost of electricity for different generation technologies (USD per MWh)

Current knowledge dictates that intermittent sources are relied upon for baseload when the plants are of appropriate capacities, abundant and in strategic geographic locations, such as large-scale wind farms geographically dispersed in strategic zones in a power grid to ensure system reliability. This, however, is not yet the case in the

Philippines. Note that the only windfarm in the country, the Bangui windfarm in Ilocos Norte, is not being used for baseload capacity and is instead given preferential treatment by allowing it to inject power to the Luzon grid whenever power is available while the so-called frequency regulating reserve in the system adjusts. Regulating reserve capacity, however, comes at a high price because the generating plants needed for this are non-intermittent, can be started and ramped up or down relatively quickly, and usually require expensive fossil fuels.

It is this baseload capacity that the Mindanao region is currently running short of. The DOE figures reveal that only 37.31 percent of the installed capacity in the Mindanao grid are baseload power plants, whereas the Luzon grid and Visayas grid have 63.94 percent and 71.88 percent baseload power plants, respectively.⁶ Thus, to meet power demand in Mindanao, there are times when even peaking plants (which are more expensive to run) have to act as baseload power plants and the reserve margin has to be very slim, thereby putting the security of the power grid at risk.

Is the crisis over?

With the onset of the rainy season and the Pulangui IV rehabilitation, rotating power outages are no longer being experienced in Mindanao. But the grid continues to operate with a slim reserve capacity. The solutions used to stem the crisis during the most crucial moments were at best stop-gap measures and some were controversial. The government asked the operators of embedded power generators (i.e., generators which are owned by distribution utilities or DUs) to make their capacities available to the grid during peak hours. Recently privatized diesel-fired power barges were also deployed. But the government directive for DUs to contract with the power barges was met with resistance by electric cooperatives who feared that the high rates charged by the former could lead them to bankruptcy. Some lawmakers and Mindanao officials even accused the private power producers and the grid operator of

⁶ As discussed by DOE representatives during the April 13, 2012 Mindanao Power Summit.

creating an artificial shortage to make a profit.⁷ However, when one looks closely at the data (as we have done in the preceding paragraphs), it is the significant reduction in the available capacity of government-owned hydropower plants that led to the crisis-level situation. Some environmentalists also alleged that the government is party to the ploy in order to justify the construction of coal-fired power plants and a dam for an additional hydropower plant in Mindanao.

These conspiracy theories have forced open to the fore the issue of government inefficiency as reflected in the delays in rehabilitating the hydropower plants, uncontrolled environmental degradation, and overall slow action in facilitating the contracting between prospective generators and Mindanao DUs for additional capacities. At the same time, however, they put blinders on the public in understanding the deeper roots of the problem—inadequate baseload capacity (no new investments since 2006) and unbalanced generation capacity mix (heavy reliance on non-constant hydrological sources). As the folk wisdom goes, understanding the problem is half the solution. By moving away from an appreciation and understanding of the problem, we are moving away from the solutions.

The crisis has passed, but it might stage a comeback when the days of relatively cooler weather and heavier rainfall are over and the annual system peaks (short-term trend in demand) kick in once again. Meanwhile, the medium- to long-term demand for electricity is growing, which must be met by additional increases in baseload capacity. Based on the consolidated forecasts of DUs, the Mindanao annual average growth rate (AAGR) is 4.34 percent in 2010-2016 and 4.28 percent in 2010-2019; these figures are higher than the national AAGR of 3.43 percent in 2010-2016 and

⁷ mindanews.com. “Power crisis in Mindanao artificial, says NorthCot gov.” Posted March 16, 2012. Accessed March 26, 2012.

inquirer.net. “Only winners in Mindanao crisis are power firms—Casiño.” Posted April 5, 2012. Accessed April 6, 2012.

philstar.com. “Mindanao power crisis artificial, officials claim.” Posted March 13, 2012. Accessed March 30, 2012.

rappler.com. “Mindanao power crisis ‘artificial’—Pimentel.” Posted March 26, 2012. Accessed March 26, 2012.

3.63 percent in 2010-2019.⁸ But the construction of the baseload plants committed by the private sector has not yet even started and judging from recent developments, only 258 MW could come online before 2014 ends⁹. There is no certainty yet when additional capacity from renewable energy projects could be expected due to at least three reasons: (i) the feed-in-tariffs (FIT) has just been recently approved; (ii) some investors are worried that the approved FITs are below levels that would make investments on renewables viable; and (iii) the rules for awarding renewable energy system development are not yet clear. Thus, as early as possible, the government must plan for short-term solutions for likely system peaks in summer 2013 and perhaps 2014. Of course, medium- to long-term solutions for widening the supply margin and managing demand must also be set in motion now.

Possible policy responses

Before we seriously think about policy responses, it is helpful to analyze which among the offered solutions can be excluded from the range of the policy options and the reasons for the exclusion. There are at least two offered solutions which can be excluded. First is the government take-over of the privatized power barges and “their use as cheap baseload power instead of expensive ancillary power” as recommended by one legislator.¹⁰ The power barges in question are Power Barge (PB) 117 and PB 118 which are being used to provide ancillary services for the Mindanao grid. The previous discussion of a type of ancillary service in a power grid, that is, regulating reserves, already reveals that these barges are more suited for that purpose and in fact, the Electric Power Industry Reform Act (EPIRA) of 2001 (Republic Act or RA 9136) requires that the grid operator contract for these services in order to maintain grid security. If PB 117 and PB 118 are to be used for baseload, which is by the way an

⁸ Distribution Development Plan 2010-2019.

⁹ Based on DOE's list of committed projects as of March 19, 2012, these are: 8-MW hydropower project of Cagayan Electric Power And Light Co.; 200-MW coal-fired plant of Conal Holdings, Inc.; and 50-MW geothermal power project of the Energy Development Corporation.

¹⁰ mindanews.com. “Gov’t urged to take over power barges.” Posted March 24, 2012. Accessed March 26, 2012.

expensive proposition since these run on diesel, other generating reserves with similar characteristics (i.e., non-intermittent and can be easily ramped up to their full capacity or ramped down) still need to take their place.

Another recommendation that must be excluded from the range of policy options is the suggestion that the cross-ownership between distributors and generators be totally prohibited, as raised by local government unit (LGU) representatives during the April 13, 2012 Mindanao Power Summit.¹¹ RA 9136 currently allows the sourcing of up to 50 percent of a DU's total demand from its associated firm engaged in generation. The question of a 100 percent prohibition on cross-ownership and sourcing from associated firms, however, may be more relevant in Luzon where Meralco's captive market is 75 percent¹² of the distribution market. The same is not true in Visayas and Mindanao where DUs are relatively smaller and the so-called embedded generation facilities (which are small-scale on-site generating units owned by DUs) can reliably fill up the gap in cases when reliability of supply is threatened or transmission constraints exist. Nevertheless, the issue of whether the 50 percent cap on sourcing demand is high and results in market power exercise is an interesting issue that can be examined through further study.

Let us now look at the possible policy responses. In the short term (i.e., within the year and up to the onset of next summer), the following are the recommended actions:

- Continue the rehabilitation and sustain the operations of Agus and Pulangui hydropower plants. Fast track the dredging operations for the Pulangui River. These efforts are meant to bring back or even upgrade the optimum capacities of the hydropower plants.

¹¹ Confed or the Confederation of Provincial Governors, City Mayors and Municipal Mayors League Presidents. "The LGUs' Outlook and Recommendations on the Mindanao Power Situation." April 13, 2012 Mindanao Power Summit. <http://minda.gov.ph/site/Mindanao/downloads/Presentations/6-The-LGUs-Outlook-and-Recommendations-on-the-Mindanao-Power-Situation>. Accessed May 20, 2012.

¹² According to the 2011 Meralco Annual Report, Meralco's consolidated energy sales in 2011 were 75% of the total Luzon grid energy sales.

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- Minimize the bureaucratic (both at the national government and LGU levels) hurdles in the building up of electric cooperatives' embedded generation capacities but only up to the extent allowed by law. During the Mindanao Power Summit, the Association of Mindanao Rural Electric Cooperatives, Inc. (AMRECO) expressed their concern over bureaucratic delays in the processing of embedded generation capacity applications by some electric cooperatives.
 - Undertake a more aggressive information, education and communication campaign in Mindanao regarding the power situation and power outlook. Civil society groups must be responsible in how they analyze the power situation and feed information to the public. But the government has an even greater responsibility to inform and educate the public and to take seriously the call for greater transparency.¹³ To start with, the robustness of region-wide projections must be ensured and argued based on the point that these are gathered from the ground, that is, consolidated from the demand forecasts by the Mindanao DUs themselves. Realistic expectations on the time frame for implementing renewable energy projects and adopting “cleaner” technology should also be explained. Transparency in how the NGCP shares information with the public can also be improved. At present, the NGCP releases through its website the current generation mix and the week-ahead power outlook only but not the historical data on these indicators. Posting historical data on system generation and demand can increase public trust as this practice readily empowers those who have the inclination and ability to analyze time series data.

¹³ Based on the statements of the head of the Mindanao Development Authority, doubts have arisen in Mindanao because the people felt that they were not given enough information by the energy bureaucracy. (gmanetwork.com. “Delays in Mindanao power projects happen at LGU level, says DOE.” July 3, 2012.)

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- With respect to the pending power purchase agreements (PPAs), address the risk aversion problem in baseload power contracting. There is an immediate need for additional baseload capacity and there are pending PPAs which will utilize coal technology. With respect to the PPAs which are in advanced stages of negotiation, the DUs are severely risk averse to locking in multi-year contracts with generating firms. Part of it is owing to the expectation that renewable energy projects can adequately supply future requirements. But the reality is that fossil fuels are still the “bridge” fuel to a future where renewable energy powers the economy. With respect to the risk aversion problem, measures that can be tried to address it include: (i) a more effective communication to local government leaders of the immediate need for baseload capacity and the intermittency of alternative renewable energy technologies, (ii) strict requirement that generating firms adopt cleaner coal technology, and (iii) more enforceable regulatory rules on the performance obligation of DUs to provide adequate and reliable electricity supply to their subscribers.

In the medium to long term, the possible policy responses are as follows:

- Decide with finality the fate of the privatization of Agus and Pulangui hydropower plants and implement a reforestation and watershed management program. The 10-year ban on privatization of the Agus and the Pulangui hydropower complexes has already lapsed and the EPIRA provides that the privatization of these complexes “shall be left to the discretion of PSALM in consultation with Congress.” Meanwhile, there is a current proposal that a government-owned and controlled corporation (GOCC) be created, tentatively called Mindanao Power Corporation (MinPoCor), to take ownership of the hydropower complexes. In the economics literature, there are evidences suggesting that it in the proper functioning of firms, it is not the ownership that matters but the incentives. For instance, in Bushnell and Wolfram (2005), operational efficiency improvements (using fuel efficiency as indicator) are examined in generating plants which changed ownership in the US between

1998 and 2001. The study finds efficiency gains in privatized plants but at the same time reveals that such gains are matched by non-privatized plants in states that adopted strong incentive regulation regimes.

To minimize uncertainty in the industry, a decision has to be reached immediately and whatever the decision will be, it must incorporate a proper design of incentives. Considerations must include (but should not be limited to) the following:

- (i) Dampening of incentives to exercise market power - There is a prohibition in RA 9136 that no company can own more than 30 percent of the installed capacity in a grid. Thus, the privatization of the Agus and Pulangui complexes, which consist 51 percent of installed capacity in the Mindanao grid, entails awarding them to more than one company. Proponents of MinPoCor are saying that Agus and Pulangui cannot be sold separately because they have the same water source and water rights. The literature, however, suggests that water rights conflicts by parties drawing from the same water source may be resolved through benefit sharing rather than water resource sharing, or in economic parlance, by transforming a zero-sum game of water resource sharing to a positive-sum game of water benefits sharing (Dombrowsky 2009). An agreement, a contract or a regulatory rule can be designed to implement this. Moreover, a careful reading of RA 9136 implies that the “not more than 30 percent ownership” rule equally applies to a government corporation (unless of course RA 9136 is amended to strike this out, but then this will go against the intent to dampen market power enticement to a firm). Therefore, more than one government firm must be created if government ownership is the option to be adopted.
- (ii) Incentives to reforest and manage the watersheds - Under the privatization option, reforestation and watershed management can be a condition in the contract award. This can also be a condition in the GOCC creation option. It is encouraging to note that the proponents of

the GOCC creation option are delivering statements on how committed they are to the protection of watersheds around the hydropower plants.

- (iii) The Philippine experience in operating public corporations and the inefficiencies associated with it - This is perhaps currently the most important consideration given the Philippine record in operating public corporations. In the first place, the wave of privatization in the Philippines was motivated by the fact that many public assets had been non-performing (Patalinghug 1997). In the energy sector, the privatization of the National Power Corporation (NPC) was motivated by its recurring inefficiency. Given this record, how certain are we that the organizational structure that will emerge in the proposed MinPoCor will not suffer the same fate?

A middle ground solution that may be explored is the possibility of the government retaining the ownership of these hydropower plants, and then allowing concession contracts for their rehabilitation, operation and maintenance, and with attendant watershed management obligations. Hydropower concessions are not something new and in fact are being used in countries such as France, Nepal, Albania, Uganda and Lao People's Democratic Republic. The concession period can also be considered a transition period for the eventual total privatization of these hydropower plants, or a test period for ascertaining whether or not continuing government participation in the generation sector is more efficient.

In the interim, and given the growing cases of generation capacity privatization in the Philippines, the purported efficiency gains from privatization should be assessed. (An empirical analysis framework that can be adopted is that electric power production is Leontief in inputs, meaning, the inputs are not substitutable, e.g., labor and equipment cannot substitute for fuel.) Such empirical assessment will require the cooperation of privatized firms and the regulator in making available the firm-level data needed for such analysis.

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- Facilitate the entry of new baseload capacity commitments. Thus far, the committed capacities in advanced stages of negotiation (i.e., coal projects with signed construction deals and with announced target dates on financial closure with lenders, as well as geothermal projects already awarded by the DOE) amount to a total of 640 MW, which could bring the existing installed capacity to about 2,662 MW. This, however, will still not be adequate to serve the projected peak demand and provide for a safe reserve margin. The timing of the start of operation of the committed power plants is also uncertain, which is understandable given that construction (a process which could take three to four years) has not yet started. There are a lot of uncertainties in the sector and to encourage new private investments, the government should address the uncertainties that are within its control. To minimize uncertainties, the sector needs clearer and time-bound policy directions, robust demand forecasts, and specific regulatory rules.

If no new investments would come in, the government could also explore a concession arrangement—the government can build baseload generating plants then hold competitive tenders for concessions to operate and maintain the power plants. There is no specific prohibition in the EPIRA about the re-entry of the government in the generation sector. What is specifically provided is that the government must privatize NPC-owned assets (except the small power generating units in missionary off-grid areas).

- Accelerate the development of renewable energy projects. The Philippines had a protracted rate-setting experience with FIT, reportedly one of the most protracted efforts in the history of FIT policy.¹⁴ The FITs were approved in July 2012, four years after the Renewable Energy Act (RA 9513) was passed in July 2008, and the process is still incomplete as the rate-setting was done for only four technologies, namely, run-of-river hydro, biomass, wind, and

¹⁴ windworks.org. “Philippines Finally Approves Feed-in-Tariff Program.” Posted July 27, 2012.

solar. The FIT-setting for ocean renewable energy, which was also mentioned in the law, is deferred pending further study and data gathering. In contrast, Thailand and Japan had a swifter rules-setting action. Thailand's FIT program was initiated in 2006 and implemented in early 2007 (Tongsopit and Creacen 2012). Japan approved the levels of FITs in June 2012, and the tariffs became effective in July 2012, the effectivity of the guiding law (i.e., Japan's Act on Special Measures concerning the Procurement of Renewable Electric Energy by Operators of Electric Utilities).¹⁵

Relative to other countries, it is obvious that our energy bureaucracy is not moving fast enough when it comes to deciding the policy, setting rules, and evaluating applications. While the FIT levels were being protractedly deliberated, it is unclear how efficiently the government approving bodies had used their time in developing rules for awarding rights to install renewable energy system installations. For instance, private sector developers have laid down interest in wind power amounting to a total of 220 MW generation capacity as of August 25, 2012¹⁶ but there are no approved rules yet on how the wind installation permits will be awarded by the government. The government needs to accelerate the building of the groundwork for renewable energy development. When the rules of the game for renewable energy are laid down clearly and it is definite that huge investments are coming in, the more advanced issues of dealing with intermittency and having rapid switching of generating assets (in short, the issue of investing in a "smart grid" technology) will surface and the transmission network operator as well as the private and local government utilities and electric cooperatives (to which the subtransmission assets are now being divested as provided in the EPIRA) will have to start thinking about these issues.

¹⁵ renewableenergyworld.com. "Japan Approves Feed-in Tariffs." Accessed July 27, 2012.

mofo.com. "Outline of Japan's Feed-In Tariff Law for Renewable Electric Energy." Accessed July 27, 2012.

¹⁶ Manila Bulletin. "Four firms eyeing wind installations." Posted August 25, 2012.

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- Seriously pursue specific demand-side management programs. This recommendation applies as well to Luzon and Visayas. As defined in the EPIRA, demand-side management refers to measures designed to “encourage end-users in the proper management of their load to achieve efficiency in the utilization of fixed infrastructures in the system.” An example of demand-side management is charging higher during peak hours and charging lower during off-peak hours. One of the declared objectives of the EPIRA is “to encourage the efficient use of energy and other modalities of demand-side management.” However, no concrete measures have yet been put in place to implement demand-side management. A proposal in Luzon (i.e., Meralco’s proposed prepaid electricity scheme) is still a proposal.
 - Strengthen the capacity of the regulator to deal with complex issues in the electric power industry. Tracing bottlenecks in the bureaucratic processes often lead to the insufficient capacity of the Energy Regulatory Commission (ERC) to deal with problems requiring regulatory interventions, not only in Mindanao but also in Luzon and Visayas. Key informant interviews at the ERC in May 2012 revealed that the manpower complement in the agency is insufficient; for example, the division tasked to review the business plans of DUs consists only of engineers since some economic specialists had already left the agency.
 - Internalize the negative externalities in the development cost of coal-fired plants in order to reduce the investors’ preference for coal over “cleaner” technologies. The adverse environmental consequences of using coal are to be felt not only by present and future generations, and that is why the negative externalities are called inter-generational. For internalizing the negative externalities, there are models in other countries which can be studied. For instance, China is supposed to implement a carbon tax scheme by 2015.

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- Explore the use of auctions for baseload capacity contracting. This recommendation was initially put forward by del Mundo et al (2011). This entails exploring the use of tested mechanisms in the Brazil and Chile electricity markets. However, in contrast with the recommendation by del Mundo et al that this be an immediate policy response, it is being suggested here that this be considered for the medium term. This is because there are important prerequisites which must be satisfied, namely, reliable and transparent DU demand forecasting and consolidation of forecasts, very advanced preparation because building power plants take time, and the participation of a reasonable number of generation players to ensure competition. Capacity building for the ECs in demand forecasting and communicating results effectively may also be needed to restore public trust in demand projections. At present, the DUs are guided by an ERC manual on demand forecasting which gives the ECs options on forecasting methodology.
 - Pursue the interconnection of the Visayas and Mindanao grids. This will increase the reliability of supply in Mindanao because the excess supply in Visayas and Luzon can be used in the Mindanao region at times when demand peaks coincide with low available capacity. The interconnection infrastructure (which includes a 455-kilometer overhead line and a 23-kilometer submarine cable) will take about seven years to build and therefore a decision must be made as early as possible to minimize uncertainties in the region. The points of contention in the current objections to the interconnection include the possible increase in Mindanao electricity prices after the interconnection, and the charging of the feasibility study cost (which is quite heavy at Php 91.4 million) to Mindanao consumers. On the first point, the increase in Mindanao rates is to be expected since the cost of generating electricity in Visayas and Luzon is higher than in Mindanao. However, a complete cost-benefit analysis must also take into consideration the disastrous economic losses arising from rolling brownouts due to supply unreliability. On the second point, since interconnection will also be beneficial to Visayas and to a certain extent Luzon, it makes sense for Visayas and Luzon to also share in the reasonably and prudently incurred cost of the pre-construction study.

Some quarters in Mindanao are also banking on the interconnection of Mindanao to Sabah (Malaysia) as a solution rather than on having a unified nationwide grid.¹⁷ Such Philippines-Malaysia interconnection via Zamboanga and Sabah was indeed proposed as part of the ASEAN Vision 2020, but the background studies for such proposal are premised on the unification of the nationwide grid and the further development of the Philippine electricity market.

The proposed solutions serve to address three major objectives in the Mindanao power system: maximize the existing capacity in order to avoid crisis-level situations; add new generation capacity in order to meet future demand; and expand the options for sourcing power in order to increase the reliability of supply. It will therefore be useful to highlight these objectives in dialogues between the officials in the energy bureaucracy and the stakeholders in Mindanao.

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¹⁷ As reported in bworldonline.com, "Short-term power prospects grim," on April 3, 2012.

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