On behalf of
Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety
of the Federal Republic of Germany

"Filipino 2040 – Energy: Power Security and Competitiveness EPDP Working Paper 2016 – 01R"

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Summary / General Comments

- While it is highly appreciated that EPDP is exploring the crucial topic of energy scenarios and future energy costs, GIZ strongly suggests that the Filipino 2040 paper on energy as published by UP-EPDP (EPDP Working Paper 2016 – 01R) **is not to be used as the basis for political decision making.** In many crucial parts, the paper **neglects scientific standards and presents assumptions, results and recommendations that are highly misleading and in certain cases clearly incorrect**. Furthermore, the paper does not take into account the most recent international developments in the energy sector and expected developments stemming from increasing shares of variable renewable energy.

- While future global and national developments in the energy sector remain very difficult to predict and are characterized by a large number of uncertainties, the authors of the working paper make specific policy recommendations based on a **very limited number of future scenarios** which vary only in the fuel mix composition, but not other external factors. Rational decision making by policy makers would however require a much larger set of scenarios taking into account a whole range of possible future developments and risk factors, e.g. price developments of energy technologies, environmental charges, etc.

- The authors of the working paper base their analysis on several **questionable assumptions**; the detailed comments below will focus mainly on three important key assumptions regarding a) cost developments of energy technologies, b) environmental charges, c) grid integration costs.

- The paper clearly **plays down the role of renewable energy** for future cost reduction and overemphasizes the role of coal: while the paper clearly provides evidence that considering even very conservative assumptions of RE cost reductions (3% a year), a scenario with high shares of variable RE would provide the cheapest overall costs, the paper keeps on emphasizing an initial "temporary utilization of less costly resources" (referring to coal) that "could potentially decrease the blended generation charge" (p.43). However, the paper never explains how coal power can be used in a "temporary" manner considering that coal power plants have a life time of 30-40 years. The paper does not discuss the real risk of a "coal lock-in" which would give the country little flexibility to integrate cheaper RE resources in the future without causing stranded coal investments in the mid to long term.

- The **depiction of data in figures is often misleading** and overemphasizing the cost difference of the compared policy regimes.

- **Important references used to back the paper's assumptions do not represent mainstream scientific/expert opinion**; this is in particular true for the topics environmental charges and grid integration issues.

- There are **errors and miscalculations** that need to be addressed.

Specific Comments

Assumptions Regarding Cost Developments of Energy Technologies

- **An "absence of data" is given as the explanation for keeping all generations costs constant at 2015 values until 2040 (p.21)**
  There are plenty of cost projections for RE technologies available, e.g. by IRENA, IEA, NREL. Long-term fossil fuel price projections beyond a 3-5 years framework are in fact close to impossible and associated with a very high level of uncertainty. Assuming constant fossil fuel prices at 2016 levels is completely negating fossil fuel price risks. Variables such as fossil fuel costs must be examined through separate high/low/medium price scenarios.
  Even considering an "absence of data" situation, choosing a conservative scenario would imply extrapolating and continuing past developments, not freezing generation costs (which is an extremely unlikely assumption).

- **The sensitivity analysis for RE cost reductions uses a) average FIT degression rates and b) a 3% annual decrease (p. 29)**
  The paper states that as per ERC case No. 2015-216 RC "degression rates for solar and wind no longer applies [apply]". It therefore remains unclear and is not explained why then average FIT degression is used for the sensitivity analysis. Generation costs in the Philippines have already decreased well under the FIT rates; future FIT rates are expected to be significantly lower, a development which will also be further boosted by the implementation of an auctioning scheme for FIT as currently under development by DOE. A future projection cannot focus on FIT rates, but has to focus on expected actual levelized costs of energy.
  While the paper states that the second sensitivity analysis aims at "asking to what extent the price of renewable[s] must go down for policy regimes 1 and 4 to be superior to the other policy regimes", this question is never answered. The actual sensitivity analysis is only performed using an annual generation cost decrease of 3% per year. The reason for selecting the 3% value remains unclear, as this still remains very conservative considering past developments and future projections, e.g. since 1998, reported PV system prices have fallen by 6-8% per year on average[1].

[1] http://www.nrel.gov/docs/fy14osti/62558.pdf

Assumptions Regarding Environmental Charges

- **The base social cost of carbon of 25 US$/tC is based on the paper by Tol, 2013, "Targets for Global Climate Policy: An Overview" (p.22).**
  The opinion of Tol to assume such a low social cost of carbon is highly controversial[2]. In his own paper, he mentions other studies with a total of 588 estimates for social cost of carbon values with a mean estimate of 196 US$/tC and a median of 135 US$. Again, as the future developments remain very uncertain also regarding potential future carbon fees, scenarios including higher and lower assumed social costs of carbon would have to be taken into account by the study. It is never explained why the paper chose the extremely conservative 25 US$ as provided by Tol.

- **The calculation of the CO2 equivalent of 25 US$/tC is incorrect (p.22)**
  Considering 3.67 tCO2 equals 1 tC, 25 US$/tC would equal 6.8 US$/tCO2 (25/3.67), as a ton of CO2 contains less carbon than a ton of pure carbon. The used value of 91 US$ is wrong.

- **The damages / social cost of carbon are downscaled to match the relative GDP of the Philippines compared to the rest of the world, based on Gayer, Viscusi, 2014, "Determining the Proper Scope of Climate Change Benefits" so that in the end only 0.44% of actual social costs are taken into account (p. 22)**
  The suggestion of a 0.44% share in global Social Cost of Carbon (SCC) does not properly reflect the discussion about global SCC vs. domestic SCC. The individual paper cited as reference for this approach was a critical suggestion in the US context suggesting that benefits of CO2 mitigation measures should only be accounted to US taxpayers to an extent that climate change impacts occur in the US. However, this view is not universally accepted and the US EPA is not following this approach when it comes to benefits of mitigation projects. This approach would imply that emitters in the Philippines would not have to show any financial responsibility for emission-related damages that would occur in other parts of the world (carrying the burden of the remaining 99.56% of social costs). However, this would then also imply that other countries applying the same concept would not take any responsibilities for their emission-related damages occurring in the Philippines. This would actually have catastrophic impacts on the Philippines as one of the most vulnerable countries to the negative impacts of climate change. As becomes clear, such an important debate about how a potential future carbon fee could be implemented must take place in the Philippines and the decision cannot be taken by the authors of the EPDP Working Paper, but must finally be left to the Government of the Philippines. Unfortunately, the paper never explains the rational for following the approach promoted by Gayer, Viscusi nor does it provide different scenarios with differing assumption about the carbon price methodology even though this simple decision has an immense impact on the outcome of the overall study.

- **The computation of the carbon tax of 1 US$/tCO2 remains unclear and is not further explained (p. 22)**

[2] E.g. http://frankackerman.com/Tol/Tol_on_climate_policy.pdf

- **Emissions of particulates and sulfur dioxide are described as "small" even though they make up 2/3 of the final environmental charge of 3 US$. Calculation of these values is not further explained.**

Assumptions Regarding Grid Integration Costs

- **P. 29, second paragraph is depicting the challenges around integration of variable renewable energy as very costly and difficult.**
  A 34% share of RE in the UK, of which a large share is variable solar and wind power, is a very steep increase, but in particular for variable RE not foreseen for the Philippines any time soon (current level of variable RE <1%). Such an increase obviously requires grid updates, but the quoted seemingly high absolute costs must be put into relation to total energy system costs. International experience shows that grid integration costs for variable RE generally range around 0.5 EURcents/kWh; most conservative estimates reach 2 EURcents/kWh (0.25-1.00 PHP/kWh)[3]. It must not be forgotten that other energy technologies such as coal or nuclear also have integration costs, an issue that is often forgotten in the debate.

- **"The intermittent nature of renewable generation such as in wind and solar, requires additional investment in new capacity from reliable conventional sources (or even in nuclear energy) to serve as back-up sources" (p. 29)**
  While a slight increase of reserve requirements can be expected in scenarios with higher variable RE, additional capacities will be required only in very rare circumstances as variable RE often frees existing conventional generator capacities that can use those capacities as reserves. The last sentence in this paragraph ("In the United Kingdom, the pursuit of a 15% renewables target requires roughly doubling the requirement for new capacity") remains unclear as it is not specified what new capacities the source refers to. Nuclear energy cannot act as a balancing plant for variable renewable energy as its immediate ramping capabilities are very limited and reduced power generation output would make the plant uneconomic.

Miscellaneous Comments

- Some of the figures comparing the generation costs of the different policy regimes depict the results in a very misleading way by not setting the y-axis at zero. This overemphasizes the actual very small differences, e.g. figure 6, page 28
- The paper does not account for the impact of high shares of variable RE on baseload requirements. Scenarios with higher shares of solar and wind need to incorporate a reduced requirement for baseload power plants and a higher need for mid merit and peaking plants to provide for balancing needs. Experience from countries like Germany have proven this effect over the recent years.

[3] https://www.agora-energiewende.de/en/topics/-agothem-/Produkt/produkt/248/The+Integration+Cost+of+Wind+and+Solar+Power/

- Abstract: “This paper looks at one major commodity that bears heavily on every Filipino consumer’s expenses: electricity”
  Could you present concrete data to back this up? Data on the percentage of electricity costs on the consumers’ monthly or annual expenditures?
- P. 7: high power costs are depicted as the main barrier for industrial development in the Philippines. This point should be backed up with concrete data for Philippine industries, as even though companies often complain about high power costs, those costs actually often represent a minor share of overall manufacturing costs and vary between industrial sectors. It is therefore not clearly obvious that power prices represent the main barrier for industrial development, as there might be other more significant issues.
- P. 7: the Philippines electricity rates are compared to the rates of other ASEAN countries. These rates cannot be easily compared as they don’t reflect actual power generation costs. All mentioned countries except Singapore highly subsidize electricity from their state budgets.
- P. 16: assumptions for capacities vs. generated power show several inconsistencies, e.g.
  - The capacity mix for policy regimes 3 and 4 are exactly the same, but the energy consumption mix is different. What is the basis for this assumption?
  - Conventional RE in Luzon has a 21% capacity share in 2040, but only generates 8% of power
  - In 2040 High vRE scenario, the installed vRE capacity is 16%, while the generated power share is also 16%. What assumptions are taken about capacity factors?
- P. 21, box 3: The paper does not give any supporting arguments how the distribution of base load, mid merit, peaking is established. It is common engineering and scientific standard to look at the demand load curve and the in 2040 existing composition of the different must-run power technologies (PV, Wind, biomass as CHP, Hydropower from run-off and Geothermal) and then define the residual load curve. Based on the then established residual load curve the base load requirement for conventional power technologies, like coal, gas etc. which need to be able to provide the required flexibility through ramping, is defined.
  The given composition does not reflect the development of variable RE and need of flexibility. More than 60% base load in 2040 will hinder any substantial development of variable RE in the country. That kind of composition between base load, mid merit and peak will lead to stranded investments in the time of 2030 and after.
- P.29: the last paragraph ends abruptly, some information seems to be missing.
- P.29: a 16 GW wind turbine does not exist. Neither in Scotland, nor anywhere else in the world.
- p. 39: it is suggested to expand the grid to cope with future RE capacities; while this is correct, it should also be mentioned that the government can actively steer the placement of RE resources to ensure that RE locations are in areas with best grid “absorption” capacity for RE. A future auctioning system could provide such spatial guidance.
- P. 43: "… nuclear energy, considered the cheapest source of power…"
  For many years now, nuclear is definitely not considered univocally as the “cheapest source of power”. As a scientific paper, making such statements should be avoided. A more balanced and reflected approach would be appreciated. Recent experience from the UK shows, that nuclear can be significantly more expensive than most other energy sources, including RE; not considering costs for future waste disposal which still remain an unsolved challenge and long-term cost factor. The fact that the paper asks to "soften resistance to nuclear power" (p. 43)

instead of suggesting a proper economic and environmental assessment for the Philippines is communicating the author's personal opinion without basing it on sound evidence.

- P.44, box: "The government can facilitate a more competitive environment by not mandating a fuel mix but rather by letting the market work. Following market signals, the generation sector will rationally adhere to utilization of least cost-resource"
  The market as is will not be able to account for cost-relevant factors such as carbon emissions or other externalities. Government regulation will have to be in place to steer the sector accordingly.