Energy Data Collection in Tonga – Processes, challenges and opportunities

Development Account Tranche 10

Evidence-based policies for the sustainable use of energy resources in Asia and the Pacific

Consultancy Report - Tonga Phase 1

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Introduction/Background

Tonga belongs to the Small Island Developing States (SIDS). The UN General Assembly (UNGA) adopted a resolution on the outcome document of the Third International Conference on Small Island Developing States (SIDS), the 'SIDS Accelerated Modalities of Action (SAMOA) Pathway' (A/69/L.6). "The Samoa Pathway" using SAMOA as an example of SIDS, recognizes the adverse impacts of climate change and the rise of sea-levels on SIDS' efforts to achieve sustainable development.

Improvement of energy security through sustainable channels is one of such efforts in Tonga for achieving economic prosperity. According to "Tonga Country Energy Security Indicator Profile 2009" prepared by the SPC, the total electrification rate was 89% and rural energy access to modern forms of energy was still at 73%. The electricity tariff in 2009 amounted to USD 0.36/kWh in 2009 as the household energy burden averaged 14%. This data is based on the census of 2006. Taking the case of electrification rate, the improvement has reached 97% in the latest census of 2016.

Another important issue to be considered in the improvement of energy security is the role of renewables. According to Tonga Power Limited ("Combined Utilities Business Plan 2018-2022"), the current share of fuel cost in the electricity tariff is about 48% (41.51 seniti/kWh) of the total (85.86 seniti/kWh – about 0.38 USD/kWh). This part can be reduced by using domestic renewables such as solar power to replace imported diesel fuels. Thus, the contribution of renewable PV to energy security and energy access is significant. But how significant?

To understand the significance of the role of various aspects of energy on national economy and national security, data is of critical importance. Particularly quantitative data that enables 'evidence-based practices'. It also helps to think about substantive measures in mitigating associated risks. Without quantitative data on energy supply and demand, it is difficult to identify the sources of these risks and their impact on welfare. By the same token, if data is available, there are chances to mitigate and improve the status of energy security using appropriate policy responses and ensuring that the country meets the "Tonga Energy Road Map" and "Sustainable Development Goals".

1 Current energy data collection

1.1 Identification of data required from the needs

National Needs

The national needs of energy data in Tonga are particularly strong for concerns on 1) energy security, 2) future energy planning, and 3) trade balance from energy imports/exports.

To analyze these concerns, capturing the national energy flow and constructing the energy balance are critical first steps. The problem starts here implying huge improvements are needed for data collection. For example, the most fundamental numbers are total energy supply and consumption in energy equivalent units (ex. kcal, toe, joule etc.). Neither of these indicators can be found in any official publications, domestically or internationally, even in the "Tonga Energy Road Map 2010-2020".

The energy flow explains in terms of quantity 1) who (sector) consumes what type of end use energy, 2) what types of sources are used and lost (ex. wasted to convert from diesel oil to electric power) to transform to the end use energy (particularly electric power—diesel oil to electric power), and 3) what types of energy sources are produced, imported, or exported as primary energy sources. Using this information, we can see who wants what type of energy, the needs of energy importation and the outcomes and risks associated with energy security as well as the contributors of CO2 emission from the point of consumers.

Roughly speaking, nearly 100% of energy or primary energy supply is imported as oil products. One third is used for power generation from diesel oil. Other data on the use of firewood and increased generation by renewables is scattered and not clear in terms of energy balance and flow.

There are three basic problems of note. Firstly, units are not unified in energy equivalent terms (toe or kcal), but in original physical units (kl, kWh, or ton). This lack of unification by energy units makes it difficult to capture the whole national energy flow. Secondly, data preparation is neither standardized nor systemized for capturing national issues such as energy security (ex. dataset in the format of energy balance table). Finally, the required data is also not accumulated and/or summarized within a centralized agency/place such as DOE or MEIDECC.

In this context, the required data for national needs is suggested to create the energy balance table – energy flows by energy products/type in DOE, MEIDECC. As a reference, the IEA Energy Balance Table – an internationally known framework – is used to identify the required data in Tonga.

Tonga's energy data collection and the availability of energy data and information fairs relatively well on the supply side of the power sector. The challenges lie with non-power data, particularly on the demand side – final consumption by sector for both power and non-power (particularly oil products) sectors. Final energy consumption data (by sector) can illustrate consumer preferences and thus, is very important to understand the future of energy utilization by types of energy. While TERM focuses on power, the analysis of non-power use is considered to be comparably difficult because of the lack of reliable data.

Energy data and the collection path required

The required data and the collection paths are shown below based on the flow of energy balance.





based on the data of household income expenditure from the Department of Statistics.

Figure 2 - Data Availability



<u>Needs beyond the energy market</u>: Future planning (ex. TERM) and regional (PRDR)/international (APEP) requirements

Decision-making in the energy sector takes into consideration data beyond the energy market. One type is socio-economic, particularly to be used as potential driver of the economy of Tonga and changes in energy consumption. This data includes demographics of population, labour, value added by sector –industry, services (particularly tourism is the largest source of foreign currency), agriculture, and fishery. Data of national accounts, income per household, number of cars for transportation among others are also important data as indicators of economic activities that rely on energy consumption. This data becomes important to estimate future energy demand and to develop supply plans such as the TERM.

International databases dedicated to energy such as the Asia Pacific Energy Portal (APEP) managed by ESCAP and the Pacific Regional Data Repository (PRDR) managed by SPC also emphasize socio-economic data. The former is a quantitative database based on standardized categorization. The latter is a database of individual report, survey, and project information the unit of each record in the database is not numeric data, but electronic file in the format of pdf and excel sheet.

The additional data required from APEP includes data on energy trade, price of electricity, fuels, subsidies, and foreign/domestic investments as a reflection of international needs. Given Tonga's energy context, the most important trade data required is within the oil sector. Also, there are no price subsidies, but the retail prices of oil products and power are regulated in Tonga (Price and Wage Control Act of 1988 for oil products and Electricity Act 2007 for concession agreement of electricity tariff). On the other hand, indicators of energy access and related data on investment can be important in terms of international contribution to the promotion of renewable energy in Tonga. There are other required data categories, such as energy efficiency, environment (CO2 and other emissions), and energy self-sufficiency, which can be estimated using other data such as the consumption of fossil fuels for estimating CO2 emissions. The requirement of data on the energy reserve can be neglected in case of Tonga. The last category of "socioeconomic context" is very important as explained later to be utilized as primary driver of the future energy demand, that should be considered for future energy planning.

The data of PRDR is categorized into five. They are 1) Economic and demographic data, 2) Petroleum and transport data, 3) Utility data, 4) Resource monitoring data, and 5) Renewable

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