Ministry of Public Service, Energy and Public Utilities

Energy Report 2015

Overview of Belize's Energy Sector in 2015

Energy Supply

A total of 8592 TJ of indigenous primary energy was produced in Belize in 2015; comprising of:

- 528,142 barrels of crude oil;
- 74,735 scf of petroleum gas;
- 235,936 MWh of hydro-electricity;
- 412,171 metric tons of bagasse (for steam and electricity generation); and
- 51,439 metric tons of wood fuel (firewood).

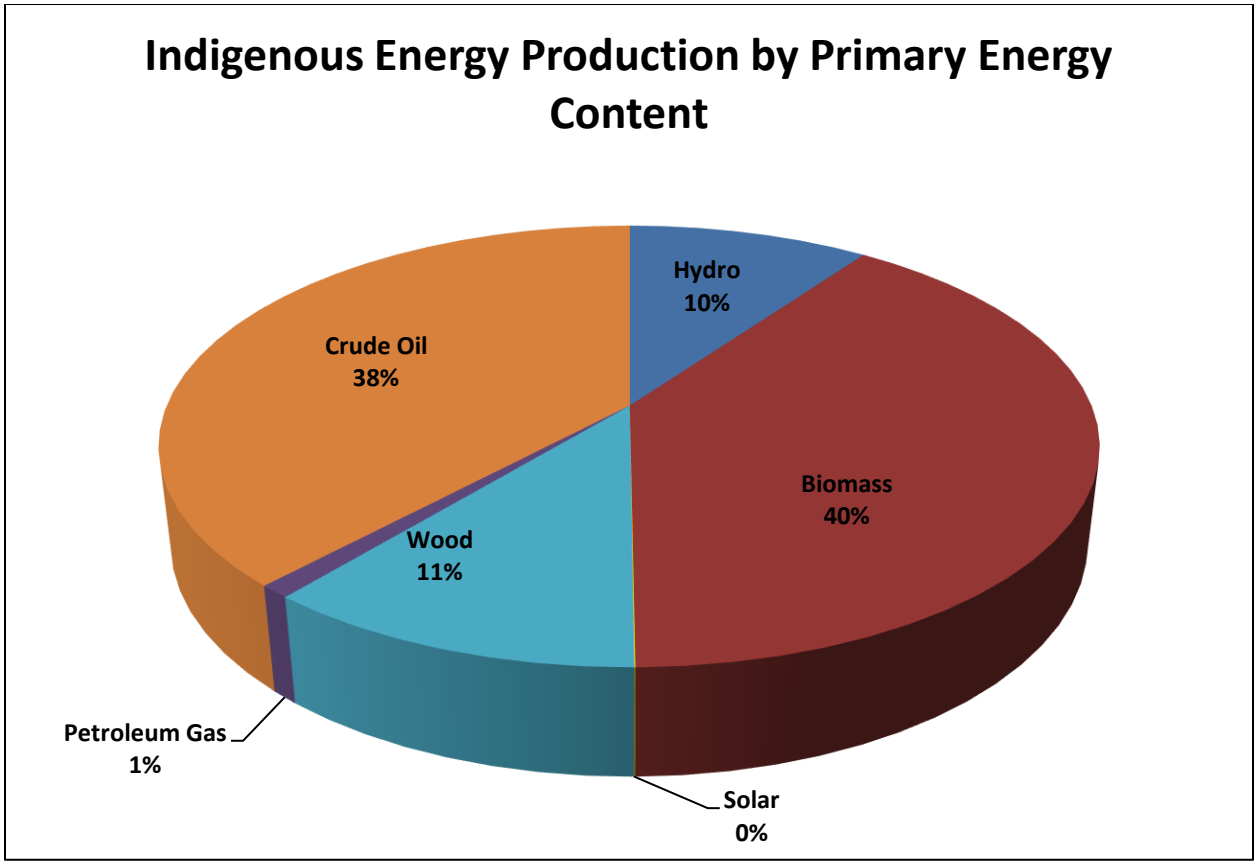

Figure 1: Domestic Energy Production by Primary Energy Content in 2015

Figure 1 shows that on the basis of energy content; crude oil accounted for 38% (3,269 TJ) of indigenous production and petroleum gas accounted for 1% (81 TJ). Renewables[1] made up the remaining 61% (5,242 TJ) of energy production, consisting of bagasse (40%), hydro (10%) and wood fuel (11%).

[1] There are a few small wind and solar installations by private generators. But the energy currently provided by these is negligible: less than 0.01% of total primary energy supply, if we extrapolate 2002 results from a 2003 Report by Launchpad Consulting (Launchpad Consulting Belize C.A; , 2003).

Despite a flurry of oil exploration activities after the recent discovery of oil in Belize, Belize Natural energy (BNE) remains the sole oil producer in the country. BNE estimates it currently has 5 million barrels of recoverable oil reserves in its portfolio. BNE was extracting roughly 4,130 barrels of crude oil per day from its Spanish Lookout field in 2010; this has fallen to approximately 1500 barrels per day in 2015.

The gas associated with crude oil extraction at the Spanish Lookout site is processed by BNE into three output streams: (i) a natural gas mixture of methane and ethane, (ii) LPG (propane and butane), and (iii) heavier hydrocarbons. Firstly, the natural gas mixture is used to fuel a 1 MW gas turbine that generates about 75% of BNE's electricity needs. Secondly, the LPG is stored and sold in the local market as cooking fuel. Assuming current crude oil properties and extraction rates the production is 1,097,354 kg (or 545,863 US gallons) of LPG per year. This is just over 23% of current LPG consumption used for cooking in Belize. Thirdly, the heavier hydrocarbons (occurring mainly as pentane, hexane, heptane and octane) are re-injected back into the crude oil production train.

As far as can be determined, no local refining of crude oil is taking place. Blue Sky, which commenced refining operations in 2007, abruptly ceased production after being acquired by BNE in early 2010.

Hydro is primarily exploited for electricity production; with the three-(3) power plants on the Macal River and one-(1) on the Columbia River.

Biomass is primarily bagasse derived from sugarcane processing at the BSI/BelCoGen complex at Tower Hill. Wood is not commercially tradable, except where it is converted into a secondary energy carrier, charcoal. Consequently, the volumes of fuelwood shown are best estimates of direct use or conversion (to charcoal) by households, and small scale commercial and industrial entities.

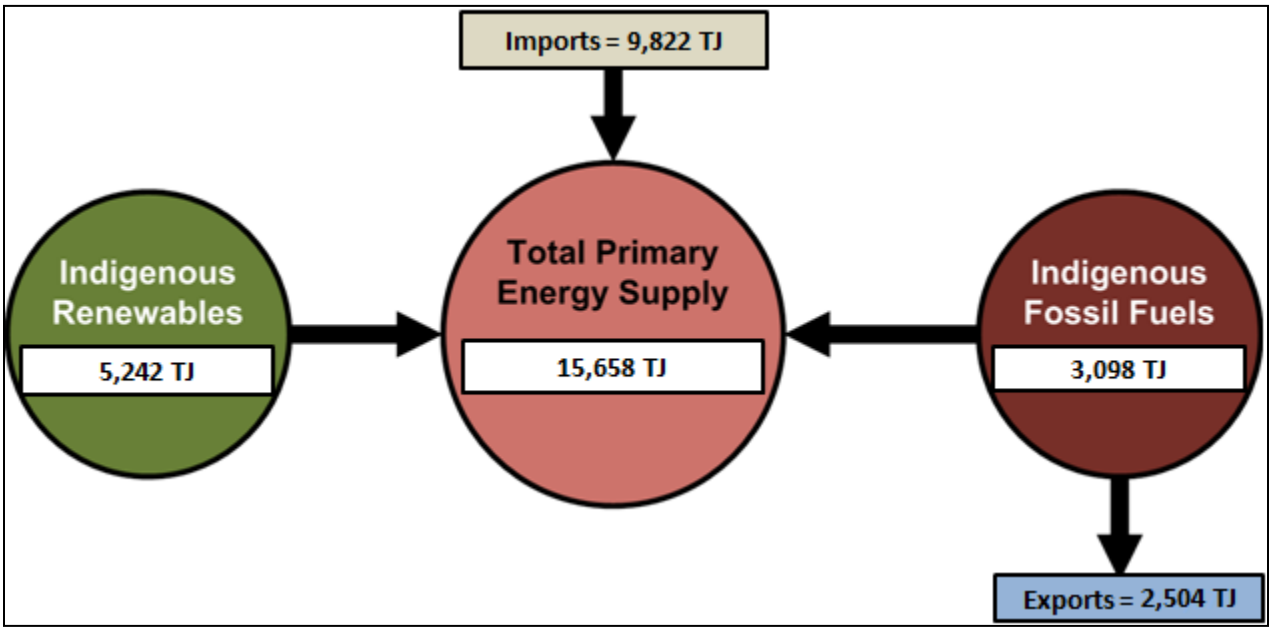

Figure 2: Primary Energy Supply in 2015

Domestic energy production of 8,340 TJ compares favorably with total primary energy supply (TPES) of 15,658 TJ. **Figure 2** above captures Belize's energy content of its TPES, including production and trade in energy. Of the 3,098 TJ of crude oil and associated gas produced in 2015, 2,504 TJ was exported as crude oil (404,490 barrels). On the other side of the trade account, 9,822 TJ of energy was imported in the form of refined petroleum products and electricity from CFE.

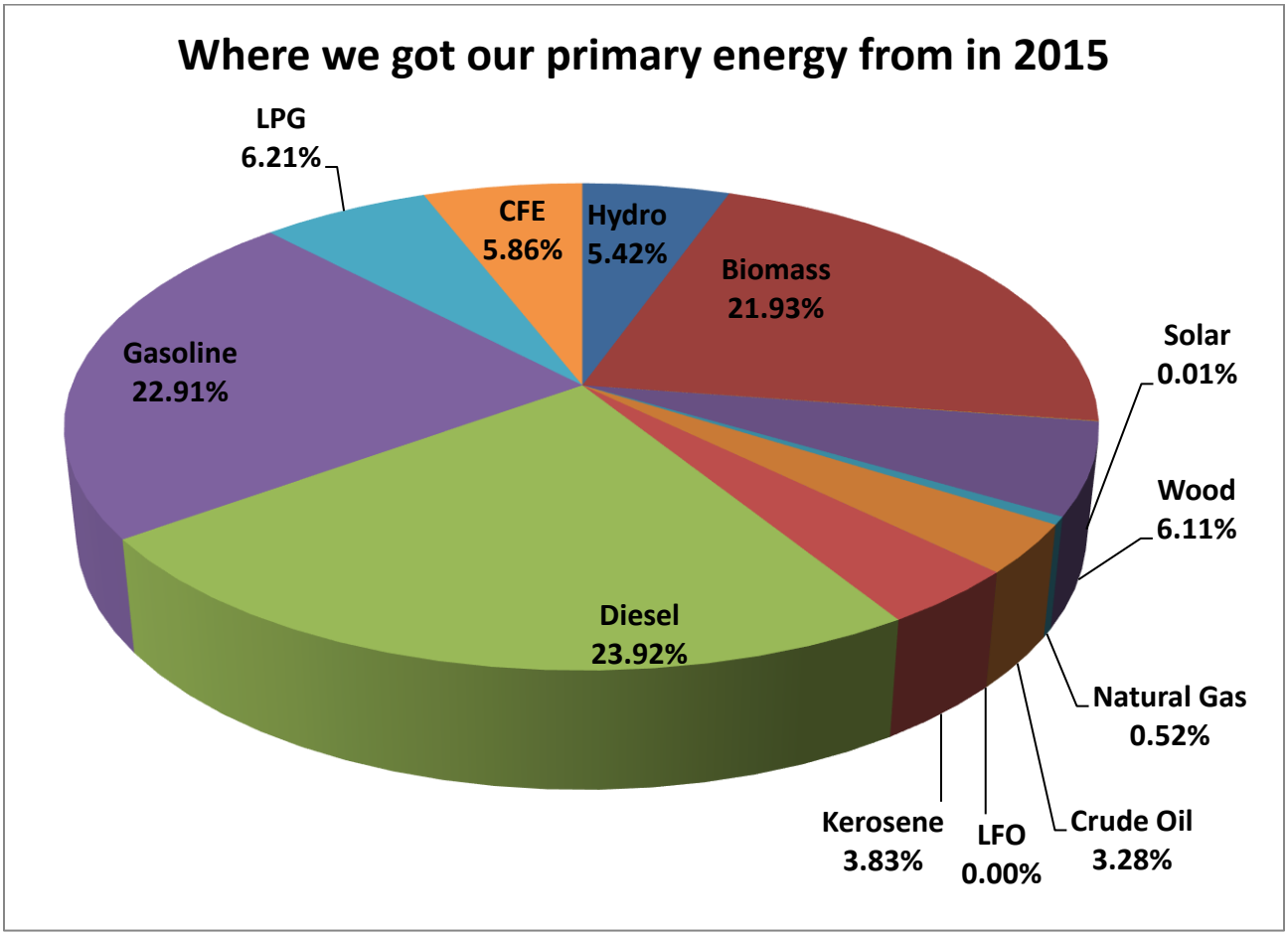

Figure 3: Primary Energy Supply by Fuel Type in 2015

Figure 3 above illustrates the breakdown of TPES by type of fuel in 2015. Importantly, 33.47% was exploited from renewable sources (biomass (21.93%), wood (6.11%), hydro (5.42%) and solar (0.01%)).

Electricity Supply and Distribution

In 2015, 27% (4,153 TJ) of the total primary energy supply was converted into 656,530 MWh (2,364 TJ) of electricity. The total installed capacity of licensed power producers was 141.78 MW_e in 2015 consisting of:

- Mollejon Hydroelectric Plant, equipped with 3 x 8.4 MW Francis turbines, located on the Macal River, having a typical output of 8 MW during dry season and 21 MW during wet season;
- Chalillo Hydroelectric Dam and Plant, with an installed capacity of 2 x 3.65 MW;

- Vaca Hydroelectric Plant outfitted with 2 x 9.0 MW and 1 x 1.0 MW turbines;
- Hydro Maya Limited (HML) has units of 1 x 2.4 MW and 1 x 0.6 MW housed in its run-of-the-river hydroelectric facility;
- BEL owns a diesel-fired gas turbine rated at 22.5 MW, but its actual output is typically 20.0 MW. In addition the utility deploys 6 x 1.1 MW mobile high-speed diesel units at different nodes in their network;
- Belize Co-Generation Energy Limited (BELCOGEN) generates electricity burning bagasse and heavy fuel oil using two-(2) 90 ton/hr boilers (high-pressure steam @64bar/480^{o}C) expanding into 1 x 12.5 MW (back-pressure) and 15 MW (condensing/extraction) turbines nominally exporting 13.5 MW into the Grid.
- Belize Aquaculture Limited (BAL) owns a power plant that operates 3 x 7.5 MW Wartsila medium-speed diesel units. The facility was initially a self-generator for its aquaculture operations; but it's currently an IPP having contracted 15MW on a standby arrangement to BEL.
- Farmer's Light Plant operates five-(5) diesel generators with rated capacities of 2 x 2.2 MW and 3 x 1.1 MW that run on crude oil.
- University of Belize Solar Farm- There is a solar installation at the University of Belize that has a rated capacity of 480 KW. This system is connected to the National Grid,
- Belize Water Services has a 70 KW Solar Plant installed on their Caye Caulker, Reverse Osmosis Plant to reduce the amount of electricity they draw from the island grid.

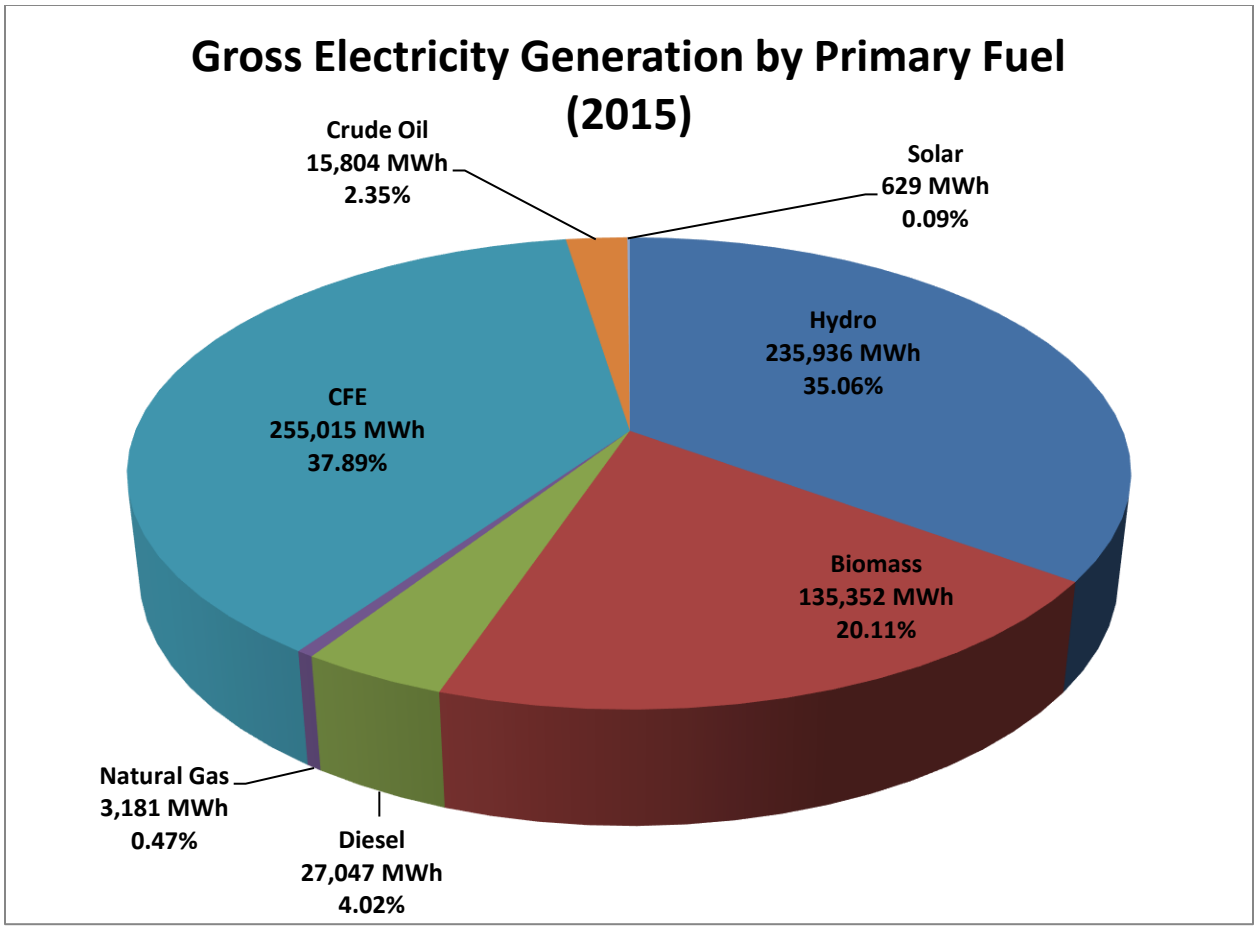

Figure 4: Breakdown of Electricity Generation Output by Primary Fuel in 2015

Figure 4 above provides a breakdown of electricity production (in MWhs) generated from the various primary fuel inputs. Importantly, 55.26% of electricity was generated from renewable energy sources, and 37.89% was imported from Comisión Federal de Electricidad (CFE) (the Mexican state-owned power company through a single circuit 115kV interconnection tie having a maximum transfer capacity of 50 MW.

Belize Electricity Limited (BEL) is the principal distributor of electricity in Belize, serving a customer base of approximately 84,441 accounts and a peak demand of 96 megawatts (MW) in 2015. All major load centers are connected to the country's national electricity system. The utility operates a transmission line backbone running generally from the north to the south, being interconnected with the Mexican national electricity grid in the north as shown in **Figure 5**. Of note, the 115 kV transmission line covers the entire northern and western sections of the country, the southern half of the country is fed through a 69 kV line. There are 34.5 kV circuits feeding-off the 115 kV backbone to Corozal, Orange walk and San Pedro. Caye Caulker remains the lone isolated load centre and is supplied by a diesel power plant.

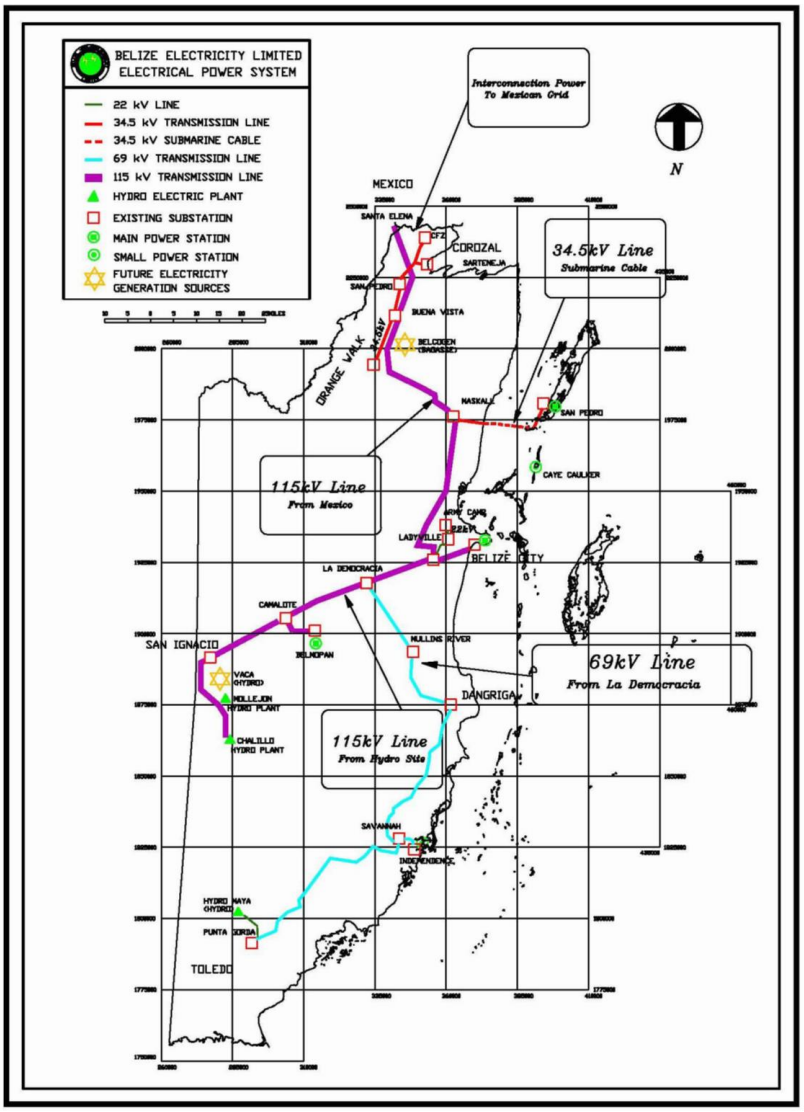

Figure 5: BEL's Transmission network

Farmers Light Plant (FLP) is an electric utility cooperative operating in Spanish Lookout and surrounding areas. Up until the end of 2010 it was purchasing the bulk of its power from then BEL; but more recently became self-generator using diesel units having rated capacities of 2 x 2.2 MW and 3 x 1.1 MW.

In other remote rural areas and cayes where there are no connections to the grid, households, communities and other entities use a mix of diesel gensets, small scale photovoltaic systems or small scale wind turbines to supply electricity for their own needs.

According to the 2010 census, 90% of the total households in the country are connected to an electricity supply, of which, 97% are urban households and 83% are rural households.

SUMMARY ENERGY BALANCE - 2015 (in TJ)								
	Petroleum	Petro-fuels	Bio-fuels	Hydro	Wind	Other RE	Electricity	TOTAL
Energy Supply	595	8,904	4,390	849	0	2	918	15,658
Indigenous Supply	3,098	0	4,390	849	0	2	0	8,340
Import	0	8,904	0	0	0	0	918	9,822
Export	-2,504	0	0	0	0	0	0	-2,504
Production Loss	0	0	0	0	0	0	0	0
Transformation Sector	-201	-3	-2,154	-849	0	-2	918	-2,291
Electricity Sector	-166	-3	-2,154	-849	0	-2	918	-2,257
Utilities	0	-3	0	0	0	0	0	-3
IPPs	0	0	-2,154	-849	0	-2	918	-2,087
Self-Generators	-166	0	0	0	0	0	0	-166
Petroleum Sector	-35	0	0	0	0	0	0	-35
Oil Refineries	0	0	0	0	0	0	0	0
NGL Producers	-35	0	0	0	0	0	0	-35
Distribution Loss	0	0	0	0	0	0	0	0
Electricity Output (MWh)	18,985	27,047	135,352	235,936	0	629	255,015	672,964
Utilities	0	14,852	0	0	0	0	0	14,852
IPPs	0	11,276	135,352	235,936	0	0	0	382,564
Self-Generators	18,985	918		0	0	0	0	19,903