Evaluate demand in either a essay

Faculty of Commerce Department of Business Management Master of Commerce Degree in Strategic Management and Corporate Governance 1. 2 Module : Production and Operations Management Module Code : MBM 705 NAME OF LECTURER : Mr A. Mafuka Semester 2, 2012 NAME: Gwyneth Ngoma Registration Number : R 12228 A Date: 31st August 2012 ASSIGNMENT 1 : Evaluate ways of reconciling capacity and demand in either a service or manufacturing organisation you are familiar with. . Submitted in partial fulfilment of the Master of Commerce Degree in Strategic Management and Corporate Governance Part 1. 1. DEFINITIONS Capacity is defined as the " specific ability of an entity (person or organisation) or resource , measured in quantity and level of quality , over an extended period. " (Source : http // : www. businessdictionary. com) Capacity utilisation is the " extent or level to which the productive capacity of a plant, firm, or country is being used in generation of goods and services. " It is expressed usually as a percentage and is calculated, it is computed by dividing the total capacity with the portion being utilized. (Source : http://www. businessdictionary. om) Demand – " An economic principle that describes a consumer's desire and willingness to pay a price for a specific good or service. Holding all other factors constant, the price of a good or service increases as its demand increases and vice versa. " (Source : www://investopedia. com) The following definitions have been extracted from the Electricity Glossary (Source : https://power2switch. com/glossary) and these are terminologies used in the electricity industry and will be referred to in this paper :- Megawatt(MW)- " A unit of energy equivalent to 1000 kW or 1, 000, 000 watts. Kilowatt(kW)- " A unit of energy equal to 1, 000 watts. " Grid – " used to describe the interconnected transmission system. " Thermal

power – “ power produced by converting heat into electricity. ” Hydro-power – “ Power that is derived from the weight or motion of water, used as a force to drive a turbine or other machinery. ” Co-generation is “ the use of fuel to produce electricity as well as another product such as steam or water. ” Capacity – “ The maximum electric power output of a generating unit (measured in megawatts(MW) or the maximum amount of power that lines or equipment can safely carry. Demand – “ The total amount of electricity used at any given moment in time usually measured in kilowatts(kW) or megawatts (MW). ” Installed capacity : “ It is the designed power generation capacity of a plant. It is expressed in terms of energy generated per unit time. ” Load – “ amount of end-use demand” Load curve – “ A graph that plots the power supplied by an electric power system versus time. ” Power : “ electricity” Load factor :“ Ratio of average energy demand (load) to the maximum demand (peak load) during a period. load-shedding –“ cutting off the electric current on certain lines when the demand becomes greater than the supply. ” Demand Side Management (DSM) “ The act of reducing energy consumption or moving energy use from peak to off-peak, periods in order to reduce overall energy costs. ” The Ministry of Energy and Power Development defines Demand Side Management as “ a process whereby an electricity supplier (with other stakeholders) influences the way electricity is used by customers. ” (Source : www. energy. gov. zw) 2. BACKGROUND

This paper analyses and evaluates ways of reconciling capacity and demand of electricity. ZESA group of companies is made up of two core business companies, which are Zimbabwe Power Company (ZPC) who are responsible for electricity generation and Zimbabwe Electricity and Transmission

Company (ZETDC) who are responsible for transmitting electricity to various distribution points and then distributing the electricity to customers. The evaluation in this paper looks at various ways that ZETDC employs in order to match available capacity and demand of electricity.

The electricity system is interconnected from power stations right through to the customer and for purposes of this paper, ZESA group of companies will be taken as one entity or organisation due to the synergetic relationships that exist between the companies. Electricity in Zimbabwe has been in short supply since 2007, when through supply and demand projections that had been done , it had been established that electricity demand will outstrip supply in 2007 and Zimbabwe would need to build new power stations in order to meet increased demand.

However, it was also realised that there are ways of ensuring that available capacity matches demand of electricity, without having to build new power stations. 3. 1 Status of Electricity Supply and Demand in Zimbabwe ZPC has five power stations operating in Zimbabwe, namely Hwange Power Station, Kariba Power Station and three small thermal power stations Bulawayo Power Station, Harare Power Station and Munyati Power Stations. Zimbabwe is characterised by severe power shortages as demand of power outstrips supply. The current electricity supply and demand situation is as follows :-

POWER STATION| INSTALLED CAPACITY| DEPENDABLE CAPACITY| ACTUAL CAPACITY| CAPACITY UTILISATION| Hwange Thermal Power Station | 920MW| 700MW| 534MW| 0. 58| Kariba Hydro-Power Station| 750MW| 750MW| 740MW| 0. 99| Small Thermal Power Stations| 230MW| 100MW| 64MW| 0. 27|

TOTALS| 1 900MW| 1 550MW| 1338MW| 0. 70| Thermal power stations are unable to attain the installed capacity due to the nature of the technologies used. Efficiency levels are very low, with the average being as low as 30% as the conversion processes involved in power generation cause a lot of energy to be lost thus causing inefficiencies.

As given in the table above, it is not possible for Hwange Power Station and the small thermal power stations to achieve 100% of their installed capacity. Kariba is a hydro-power station whose capacity utilisation reaches as high as 100% and this is caused by the type of technology used which conserves energy. The maximum demand for power in Zimbabwe is about 2200MW, which is realised during the winter peak period. During off-peak periods demand is about 1600MW. Available capacity is 1338MW. This means that there is a shortfall about 562MW during peak period and 262 MW during off-peak periods, which is met through imports and load shedding. . SHORT – MEDIUM TERM MEASURES OF MATCHING CAPACITY WITH DEMAND IN THE ELECTRICITY INDUSTRY Outlined below are short term measures that are used to reconcile available capacity and demand. 4. 2 Demand- Side Management (DSM) These are measures that allow management of the consumption /demand by consumers. 4. 3. 1 Prepaid meters for all domestic customers – Installation of prepaid meters will instil a culture of conserving electricity as consumers will utilise electricity based on their ability to pay for the electricity. Pre-paid meters allow consumers to use what they will have paid for only.

In order to save on the units of electricity, consumers will implement measures like switching off geysers, switching off lights, etc. Prepaid meters

enables consumers to manage their own electricity consumption. 4. 3. 2 Ripple Control Systems – Installation of ripple control systems for geysers enables automatic switching off of geysers when demand of electricity rises above capacity, thus saving electricity. Ripple control geysers enable switching off geysers during peak periods, resulting in anticipated savings of 45MW in short term and up to 250MW in the long term.

These savings are quite significant and are equivalent to building a stand-alone power station. ZETDC is in control and ensures that the power savings are realised. 4. 3. 3 Substitution of incandescent lamps with compact fluorescent lamps (CFLs) ZETDC is currently implementing a programme of replacing incandescent lamps with compact fluorescent lamps (CFLs) , which are energy efficient . The programme will result in savings of 80MW. The effectiveness of this measure depends on consumers' willingness to use the CFLs and could be difficult for ZETDC to control. . 3. 4 Time of Use Pricing– ZETDC intends to introduce Time-of-Use pricing where electricity is priced in such a way that it is expensive during peak periods and less expensive during off-peak periods. This reduces demand during peak periods and the lower prices during off-peak periods entice customers, especially those in industry to change their manufacturing schedules so that they produce during off-peak periods. This optimises the load curve and ensures that large customers use power at night, when is usually adequate and the price is lower.

That way capacity and demand are reconciled. This measure in within control of ZETDC and is quite effective. 4. 3. 5 Promotion of use of renewable sources of energy like solar geysers, solar water pumps, biogas digesters

and solar lighting systems, will release power from the grid to productive sectors of the economy. Instead of using electricity for lighting, cooking and water pumping, alternative sources are used thus saving a significant amount of electricity from the grid. The power saved helps is reducing the deficit between available capacity and demand.

However, this measure is beyond ZETDC's control and can only be effective insofar consumers take the initiative to use renewable energy technologies. 4. 3 Promotion of co-generation – Co-generation is generation of electricity for own consumption. Cogeneration is simultaneous generation of two different forms of useful energy using one single primary energy source, most usual electrical, which is for own use and for thermal heating, which can further be used to produce electricity. This is beneficial as it reduces energy bills of the entity as it is generates its own power.

Since electricity is generated at source and also consumed at source, there is a reduction in transmission and distribution losses. Examples of organisations that do co-generation are Hippo Valley Estates, Triangle Estates and Chisumbanje Ethanol Plant. These do not get the electricity from ZETDC but they generate power using bagasse, the waste product from sugar cane. Encouraging companies to engage in co-generation saves a lot of power hence, it is used as a way of reconciling capacity and demand. If they have excess power they sell it to ZETDC, which also adds to available power.

However, this measure is beyond ZETDC control and can only be effective insofar as some consumers take the initiative to take the route going into co-

generation. 4. 4 Statutory maintenance – Statutory maintenance is done regularly after a power generator unit has run for a certain number of hours and this is done to ensure safety and reliability of the generator units so that the generator unit is always available. In order to ensure that there is a balance between available capacity and demand, timing of the maintenance is done when demand is low, especially in summer.

The winter period is always avoided as it is the time when demand is at its peak due to increased demand caused by water and space heating. However, statutory maintenance does not increase available capacity, it only contributes to reliability of generators. Effectively, the measure ensures that there are no unplanned power cuts due to breakdowns of generator units. 4. 5 Rehabilitation of HPS and Small Thermals – This involves refurbishing Hwange Power Station and small thermal power stations in order to increase their generating capacity.

This would add 90MW to 340MW in next two years. Rehabilitation is costly as the power stations have outlived their lifespan and need outright replacement. Although rehabilitation is being done, it is done piecemeal due to funding problems. As a result refurbishment is done only for critical components of the generator units while refurbishment of some ancillary equipment is ignored. This results in frequent breakdowns of generators and power disruptions. 4. 6 Imports- Zimbabwe currently imports about 35% of its electricity requirements from the Southern African region.

There are some firm import contracts that exist with Hydro Cahorra Bassa(HCB) of Mozambique and Zambia Electricity Supply

Corporation(ZESCO). However, when the shortfall is huge, ZETDC goes on the spot market to import more electricity. Importation of electricity has its shortcomings as excess power may not be available if ZESCO and HCB experience shortages of power. Availability of power on the spot market depends on the availability of excess power in countries that sell power on the market.

If there are technical problems with interconnectors that are used to transmit power, the country will not be able to access power imports. 4. 7 Load shedding – up to 700MW load shed during peak periods. Load shedding is the last resort used to balance available capacity and demand. When demand outstrips supply and the shortfall is too huge, ZETDC has no option but to switch off some customers in order to balance supply and demand. This option is the last option that employed by ZETDC. It has its own shortcomings as it adversely affects production in industry.

Short to medium term measures will enable Zimbabwe to have adequate power for its needs and would not need to import power as its internal resources would be adequate, as shown on the table below. | 2011 | 2012| 2013| 2014| 2015| 2016 | Demand projections | 2100 MW| 2, 200 MW| 2, 267 MW| 2, 430 MW| 2, 585 MW| 2659 MW| Net Imports | 100 MW| 100 MW| 100 MW| 100 MW| 0 | 0 | DSM Savings | 0 | 100 MW| 220 MW| 255 MW| 255 MW| 255 MW| Available Generation Capacity (inclusive of DSM) | 1400 MW| 1640 MW| 1870 MW| 2275 MW| 2635 MW| 3235 MW| Shortfall to be met by imports | 600 MW| 560 MW| 397 MW| 55 MW| | | Surplus| | | | | 50MW| 576MW|

SOURCE : Zimbabwe Electricity Transmission and Distribution Company The table above shows that ZETDC can employ the above-given measures to match available capacity and demand without having to develop new power stations up to the year 2014. From 2015, planned projects of expansion of Hwange and Kariba Power Stations will come on stream and add 900MW to the grid. The country will then have surplus power as indicated in the last two columns for 2015 and 2016. Ordinarily, surplus power is required to ensure that reserves are maintained o as to ensure that supply is maintained in the event unplanned events when a generator comes out of service due to external causes or technical fault. However, this is not possible with ZETDC, given the power deficit that already exists. 4. LONG-TERM MEASURES TO BALANCE SUPPLY AND DEMAND OF POWER Give the shortcomings of the above-given various ways of reconciling capacity and demand, a lasting solution that would match capacity and demand would be to develop new projects, which are as follows :- * Sengwa Thermal Power Station(1400MW) * Batoka Hydro Power Station(800MW) Coal-bed Methane Gas Fired Power Station (470 MW) * Conho Hydro Power Station (100MW) Development of these projects also has its problems as it would require a lot of financial resources, amounting to billions of dollars, which the country does not have. Development of all these projects would also have the effect of creating excess capacity, which could lead to redundancy of some power stations if there is no uptake in the Southern African region of the extra electricity produced. Other countries in the region are also developing power stations and they intend to export excess power.

The market for the electricity may not be available as each country in the region may have attained self-sufficiency in terms of local power production. Demand is driven by economic growth. As the economy grows and the productive sector expands, demand of electricity also rises. Projections are made to establish future electricity needs based on growth rates of the economy and these determine the projects to be implemented in future. 5. CONCLUSION The above analysis shows that that there are various measures of reconciling capacity and demand in the electricity industry, but the measures can only be implemented in the short term.

In the long term, new power projects are required. References 1. Collins Dictionary 2. http://encyclopedia2. thefreedictionary. com – The Free Dictionary by Farlex 3. https://power2switch. com/glossary 4. Norconsult – ZESA Holdings Report on Zimbabwe Power System Development Plan, Prioritising the Critical Actions for the Development of the Zimbabwe Power System Final Report , December 2010 5. www. energy. gov. zw 6. www://investopedia. com) 7. www. sapp. co. zw