Assessment of Thermal Generating Plants in Nigeria.

Kenneth E. Okedu, M.Eng.

Department of Electrical and Electronic Engineering,
University of Port Harcourt, Nigeria.

E-mail: kenokedu@yahoo.com

ABSTRACT

The states of the thermal generating stations in Nigeria are presented in this paper as of 2004-2006. There is little or no change in the states of these thermal generating plants through this period. With the help of these status assessments for the thermal plants cited in this paper, remedial solutions and measures to improve electricity generation and to avoid erratic power supply to the populace could be carried out by the Federal government and stake holders (Power Holding Company of Nigeria) involved in the sale of electricity in the country.

(Keywords: electricity supply, thermal generating plants, installed capacity, generating capacity, electricity demand, plant status, plant maintenance)

INTRODUCTION

The development of electric power and its use affects the standard of living in a country. With increased industrial development in a country, there is more and more demand for electric power. In order to meet the large and ever-increasing power demand, it becomes necessary to tap all the sources in the country for the development of electric power and utilize those most economically to produce maximum power.

Since the advent of electricity generation at the Edison direct current Pearl Street power station, the electricity industry has grown to become an essential part of our lives. The industry which was built and operated under a "supply follow demand" philosophy has always been able to fulfill its obligation of providing adequate and secure supplies of energy at the lowest practical cost (X. Wang and J.R. McDonald, 1994).

With the electric power sector reform bill in existence and the privatization of the energy sector in Nigeria, there is a need for accurate forecasting of electricity demand in the country and to encourage competition in the electricity industry (A.O. Ibe and K.E. Okedu, 2008).

For optimum energy production, it is necessary to design a scheduling program of power stations to identify the plants to use for base load and the plants to come on stream during peak load using the primary fuels available (A.O. Ibe and K. E. Okedu, 2007). The load on the power plant is seldom constant; rather it varies across time. These loads can be conveniently considered in two parts; namely base loads and peak loads.

This paper presents an assessment of the state of the thermal plants in Nigeria, with a view to suggesting solutions to remedy the deteriorating states of the plants, in order to improve the power supply system in the country.

AN OVERVIEW OF THE MAJOR POWER PLANTS IN NIGERIA

Shiroro Hydro-Electric Power Station

The hydro plant is located on river Kaduna at Shiroro Gorge in Niger State. It was commissioned in June, 1990. The power station has an installed capacity of 600 Megawatts from four units rated 150 Megawatts each (PHCN, 2001). The present generating capacity of Shiroro is 600 MW.

Kainji Hydro-Electric Power Station

The station is located at river Niger on Kainji Island. It is the first hydro-electric power station in Nigeria. It was commissioned in 1969, with a total installed capacity of 320 Megawatts from four units, which was later raised to a total installed capacity of 720 Megawatts from a total of eight

units in 1978 (PHCN, 2001). The present generating capacity of Kainji is 640 MW.

Jebba Hydro-Electric Power Station

The station is located on river Niger and adjacent to the town of Jebba. It was commissioned in April 1985. The station has an installed capacity of 578.4 Megawatts, from a total of six units rated 96.4 MW each at a net head of 27.65 meters (PHCN, 2001).The present generating capacity of Jebba plant is 560 MW.

Sapele Thermal Power Station

The station is located in Ogorode in Delta State. The station is composed of six steam turbines and four gas turbines with their respective generators and auxiliaries. The total installed capacity is 1200 Megawatts (6 x 120 MW + 4 x 12 0MW). The station was officially commissioned in 1979 (PHCN, 2001). The present generating capacity of Sapele station is 240 MW.

Lagos Thermal Power Station

This is the most modern amongst all the other thermal power stations. It was built and commissioned in 1986, with a total installed capacity of 1320 Megawatts; from six units rated 220 MW each (PHCN, 2001). The present generating capacity of Lagos thermal station is 1200 MW.

Delta Thermal Power Station

This station is located at Ughelli in Delta State. It is composed of Delta I units (1 and 2): Delta II units (3, 4, 5, 6, 7, and 8), Delta III units (9, 10, 11, 12, 13, and 14), and Delta IV units (15, 16, 17, 18, 19, and 20) gas turbines.

Delta IV was built and commissioned in 12th March 1991. Delta I, II, and III were built in the early 70's. The installed capacity of Delta I and IV is 912 Megawatts. The present generating capacity of Delta thermal station is 900 MW.

Afam Thermal Power Station

The station is located in Afam, Rivers State, with a present generating capacity of 456 MW.

AES Lagos (IPP)

This is an independent power project with a generating capacity of 300 MW.

Agip Okpaii (IPP)

This has a generating capacity of 400 MW.

Ajaokuta Steel Company (IPP)

This has a generating capacity of 80MW.

Thus, the existing power projects (the federal and the independent power projects) has available generating capacity of 5376 MW.

STATE OF EACH THERMAL GENERATING PLANT AND THEIR MEGAWATTS AVAILABLITY

The state of each thermal generating plant and their megawatts availability between the year 2004 and 2006 are presented in Tables 1 to 9 below (NCC Oshogbo, 2006). The states of these stations are the same till date with little no change in most of the generating stations.

CONCLUSION

Unfortunately, the status of most of the thermal generating plants presented above, remains the same at present because of a lack of concern of the Federal government and the stakeholders, namely, the Power Holding Company of Nigeria (PHCN), in maintaining and providing the necessary requirements for the proper operation of these power stations, hence allowing the populace to suffer erratic power supplies. If proper maintenance and replacement of failed parts in these thermal stations could be carried out based on the above mentioned status, electricity supply would definitely be improved in the country.

Table 1: Sapele Thermal Power Station.

UNITS	2004 STATUS	2005/2006 STATUS
ST1	Available throughout the year except 13th to 18th of February 2004 on planned outage.	Available from January to the first week of Feb. On outage between 2nd and 3rd week of Feb. Remained on bars thence till 29th September, when it tripped on fire outbreak on the cables after system collapse.
ST2	Unavailable throughout the year due to generator transformer problem that commenced on 28th May, 2001.	Developed high bearing problem on September 2002. It still remained out of service by 31st December, 2005.
ST3	Nil	Was unavailable throughout the year due to generator transformer problem that developed on the 28th May, 2000.
ST4	Was forced out of the grid by the third quarters of 1994 due to high winding temperature fault. By December 2004 it was out .	Status remained the same.
ST5	Was on outage on 2nd March, 1986 when its unit transformer and associated sun fib gear got burnt. It was still out by December 2004.	Status remained the same.
ST6	Was in service from January to April 24th 2004. Was shut down for maintenance between 24th and 27th April. Unit was on bars till 21st June when it was shut down on boiler oil leakage. Following maintenance the unit was restored to the grid in the 1st week of September. It generated from then to the second week of December when it tripped on high turbine thrust bearing temperature.	Was available in the first two weeks of January. It was on planned outage in the third week. The unit remained available from thence till the first week of August when it tripped following system disturbance. It shut down in early September on fire outbreak that affected the generator cable. Having been restored back, it tripped two weeks later on burner failure. The unit was restored in the third week of September. It ran between the last week of October and the 3rd week of November after which it developed bearing vibration. The unit was still unavailable by December 2005.
Sapele GT1	Had been out of service due to damaged turbine blades since September 1998. It was still out of service by December 2004.	Status remained the same.
GT2	Had been out of service since July 2002 when it developed high compressor vibration problem. It remained unavailable by December 2004.	Status remained the same.
GT3	Had been on outage since April 1990 due to generation transformer faults. Foreign exchange was required to complete its rehabilitation that commenced in 1992.	Status remained the same.
GT4	Developed starting equipment failure and generator transformer fault in April 1990. By December 2004 it was still out of service.	Status remained the same.
Sapele Unit Availability Summary	Total monthly average availability was 134.42MW in January. A half annual peak of 160.19MW was attained in May 2004. That was also the annual peak. The annual average availability was however 120.63MW. This rose by 12.74% on comparison with 2003 value of 107MW.	Total monthly average availability was 122.55MW in January 2005. A half annual peak of 153.77MW was recorded in April 2005. The annual average generation availability was 104.68MW. This was 13.22% lower than 10.63MW figure of 2004.

Table 2: Afam Thermal Power Station.

UNITS	2004 STATUS	2005/2006 STATUS
AFAM GT1	Had been out of service since the last quarter of 1993. It was unavailable by December 2004.	Status remained the same.
GT2	Scrapped	Scrapped
GT3	Had been out of service since February 1990 on damaged exciter and generator bearing problem. By December 2004, the unit remained unavailable.	Status remained the same.
GT4	Was unavailable due to rotor balancing and labyrinth seal problem since 1998.	Status remained the same.

UNITS	2004 STATUS	2005/2006 STATUS
GT5	Was forced out of the grid due to turbine failure, in the third quarter of 1994. By December, 2004 it is still unavailable.	Was still out because of turbine failure and was undergoing major overhauling between January and the 2nd week of April 2005. The unit ran the 3rd week of April and tripped on the same week on AC failure. The unit was resorted back and available from the fourth week to the 12th of August, 2005. It then tripped on shaft axial position and remained out of service till the last week of August. It ran for 3 days and tripped on loss of excitation for two weeks in September. It was available in the 3rd week of September and then tripped due to high vibrations, remaining out till first week in November 2005. Having been restored back on 26th it tripped on AC failure in the last week of November. It was unavailable in the 2nd and 3rd weeks of December, but available in the first and last week of December 2005.
GT6	Was available throughout the year.	Was available from January to the first week in September 2006. The unit was then out of service from the 2nd week in September to November ending due to the sparking of exciter carbon brushes.
GT7	Was unavailable in the year due to burnt generator breaker and control cable faults.	Status remained the same.
GT8	Had been out of service since April 3rd 1988 on damaged turbine inner casing and turbine blade failure.	Status remained the same.
GT9	Major overhaul was suspended in the last quarters of 1995. It was still unavailable by December 2004.	Status remained the same.
GT10	Rehabilitation that commenced in 2002 was still in progress in year 2004.	Status remained the same.
GT11	Was forced out of service in September 1997 due to the fatal fire outbreak at Afam. It was unavailable for two weeks in January 1998. It then tripped on oil drain high temperature. It remained out of service by December, 2004.	Status remained the same.
GT12	Was shut down in August 1998 due to compressor blade failure. It was still unavailable by December, 2004.	Status remained the same
GT13	Had been on outage due to turbine failure since February 1997. It was still unavailable by December 2004.	Status remained the same.
GT14	Had been out of service due to compressor blade failure since April 1992. It was still out by December 2004.	Status remained the same.
GT15	Had been out of service since 1995. It required major overhaul.	Status remained the same.
GT16	Was still unavailable since 1992 due to damaged compressor blades.	Status remained the same.
GT17	Was available from January to 16th February 2004 when it tripped on loss of excitation. It was tied back to the grid on 1st March. It tripped again on July 25 on under-frequency and loss of flange. Since 29th August, when the unit was restored, it remained on bars up till 31st December 2004.	Was available from January to April 6 2005, when it tripped following system collapse. From 14th April when it was restored, it generated till July 12 when it was out on condensate problem. The unit was available between the last week of July 2005 and September 21 when it was out due to burnt generation circuit breakers and control cables. On restoration by the end of September, the unit was shut down again due to serious oil leakage. Restored by 12th October, the unit was available till 27th December when it tripped on low gas pressure.
GT18	Was out of service in July 2002 on compressor blade failure. It was still available by December 2004.	Status remained the same.

UNITS	2004 STATUS	2005/2006 STATUS
GT19	Was on bars from 1st to 16th January 2004. It then tripped on stator earth fault. It remained out of service by December 2004.	Was tripped on 16th January 2004 on station earth fault. Was restored to the grid by 24th July 2005. It was then available till 31st December 2005.
GT20	Was available till 2nd week in February when it was shut down for air inlet filter clearing. It was tied to back by 13th March. The unit was shut down by 20th April for changing of pre-filters and inspection of combustion chambers. It was however available from 21st June to December 2004.	Was available in the first to third week of January. It then tripped on excitation problem on the last two weeks of January. It remained out of service in February on starting equipment problem. The unit generated into the grid from March to 19th December when it tripped on low gas pressure.
Afam Unit Availability Summary	Afam power station average plant availability was 213.65MW in January. The figure was the half annual peak from July to December 2004 was 189.40MW, obtained in September. An annual peak of 213.65MW was recorded in January. The year's average was 162.70MW. A 48.35% drop was noticed when compared with the year 2003 of 315MW.	Afam power station average plant availability was 117.74MW in January 2005. The first half annual peak of 224.07MW was recorded in June. Second half annual peak of 339.84MW occurred in August, while the year's average was 221.20MW. This was 35.95% higher than 2004 figure of 162.70MW.

Table 3: Delta Thermal Power Station.

UNITS	2004 STATUS	2005/2006 STATUS
GT1	Has been scrapped.	Status remained the same.
GT2	Was forced out of service on high lubricating oil temperature in July 1998. It was still awaiting major overhaul at the end of 2004.	Status remained the same.
GT3	Was available from January to the third week in October when it developed starting problem. By the third week in November, the unit was registered to the grid. It remained on the grid by 31st December 2004.	Was available from January to 21st September 2005. It went on planned outage between 21st September and 11th October, 2005.
GT4	Was available from January to 22nd June, 2004 when it tripped on excitation problem. It was tied back to the grid on 27th June. On 27th September, it developed starting problem. From 11th October when the unit was restored till 31st December 2004, the unit was available.	Was available up till 21st September 2005 when it was shut down for installation of new scrubbers. The unit was restored back by 11th October and later went on outage for maintenance of 81MVA 11/132kV transformer.
GT5	Was available from January to 17th July when it tripped on excitation problem. It was restored to the grid on 21st August, 2004 and then remained on bars up till 31st December, 2004.	Was available between Januarys to 21st September 2006 following which it was shut down for scrubber installation. The unit was tied by 11th October, but was shut down 3 days later for 81MVA 11/132kV transformer maintenance.
GT6	Generated throughout the year 2004.	Was available throughout December.
GT7	Was available throughout the year 2004.	Was available between January and 21st September 2005 when it went on outage for scrubber installation. The unit was restored on 11th October and remained on the grid till 20th November when it was on a 5 day outage. The unit was available throughout December 2005.
GT8	Was available throughout the year 2004.	Was available from January to September 2005, when it was shutdown for scrubber installation. Having been restored back by 11th October, the unit generated till 20th November when it went on a 5-day planned outage. The unit was however available throughout December 2005.
GT9	Tripped on the 2nd week of April 1993 due to vibration problems and compressor blade failure. Spares were being awaited by December 2004.	This had been unavailable since April 1993 due to vibrations and compressor blade failure and was restored to service on 15th November, 2005. It continued running till 31st December, 2005.
GT10	This was tripped on ground fault on 8th July, 2002 and was still unavailable by December 2004.	That tripped on ground fault on 8th July, 2002 was restored to the grid early November 2005.
GT11	Was available from January through March. It was out of service in the 2nd week of April, 2004. The unit had hardly stayed on bars for a week when it tripped on transformer fault. It remained unavailable by December, 2004.	Which tripped by mid April, 2004 on transformer faults was synchronized by November, 2005. It remained on the grid for the rest of the year.

UNITS	2004 STATUS	2005/2006 STATUS
GT12	Developed field ground fault in April 1998. It was unavailable by December, 2004.	That developed generator field ground fault in April 1998 was restored to service by 15th November, 2005.
GT13	That had been unavailable on general inspection to rectify high exhaust temperature and vibration was still unavailable by 31st December, 2004.	That had been on general inspection to rectify high exhaust temperature and vibration was synchronized on 19th November, 2005. It remained on the grid and throughout December, 2005.
GT14	Had been out of service since October 1986 on burnt generator windings. It was awaiting rehabilitation by December 2004.	This had been out of service since October 1986 on burnt generator windings was restored to service on 2nd December, 2005.
GT15	Was available from January to March. It was then shutdown to replace the burnt supply cable. By the 2nd week of April, the unit was tied to the grid. It generated into the grid till 4th September when it tripped on hydraulic protection trouble. From 19th September till 31st December 2004, the unit remained on bars.	Was available from January to mid July, 2005 when it developed serious hydrogen leakage. On restoration by the end of July, the unit remained on the grid till December, 2005.
GT16	Was generally available in the year 2004.	Was available from January to June, 2005. It developed combustion trouble between 1st and 18th July. It was available from then till the 31st August when it went out on rehabilitation. By December, 2005 through early 2006, the unit was still out.
GT17	Was available from January to September 8, 2004 when it tripped on exciter trouble/generator differential lockout. It was tied back on 3rd October. It then remained on bars till December 31st 2004, with exception of the 2nd week of November when the unit tripped on transformer fault.	Was pooled to the grid from January to 20th August 2005, when it tripped on gas fuel problem. Having been restored by the first week of September, the unit remained on the grid by 31st December, 2005.
GT18	Was available from January to 8th September 2004. It then tripped on high exhaust temperature fault. After its restoration on 15th September, it remained on bars up till 31st December 2004.	Was available in January 2005. It was unavailable between February and August. It was restored to the grid by early September and remained on the grid by 31st December, 2005.
GT19	Had been on outage since April 1998 due to combustion trouble. Rehabilitation was still in progress by 31st December, 2004.	Status remained the same.
GT20	Was unavailable throughout 2004 due to accessory gear compartment oil leakage.	Was unavailable accessory compartments fault from January to 16th September,2005. The unit was synchronized to the grid thereafter. It remained on the grid by 31st December, 2005.
Delta Units Availability Summary	Delta power station monthly average availability was 498.16MW in January 2004. Half annual peak of 499.61MW was attained in May. Delta peak generation availability in the second half of the year was 486.32MW by December. The station's annual average availability 463.32MW. This was 1.48% higher than year 2003 value of 456.67MW	Delta monthly average availability was 499.9MW in January 2005. That was the first annual peak. Delta peak generation in the second half of the year was 498.90MW which was attained in December, 2005. the station's annual average availability was 393.45MW. This was 15.09% lower than the year 2004 value of 463.38MW.

Table 4: Egbin Thermal Power Station.

UNITS	2004 STATUS	2005/2006 STATUS
EGBIN ST1	Was in service from January to 31st August 2004. From 1st to 29th September 2004, annual inspection of the unit took place. It hence remained on bars up till December 31st, 2004.	Was available from January to April 2005. It tripped on intercept control valve problem in the first week of May. It remained on the grid till the first week of June when it was out of service due to boiler leakage. It generated from 12th June to 12th August when it went on 18 days planned outage for inspection. The unit was available from September to December, 2005.

UNITS	2004 STATUS	2005/2006 STATUS
EGBIN ST2	Was available from January to 16th June 2003 when it was out on outage from refractory job on the furnace. It was restored back to the grid on June 24, 2004. By 9th October, its annual inspection commenced. The unit was available in November and December 2004.	Was available from January to September 29th, 2005 when it tripped during system disturbance. The unit was on the grid from the 1st week of October till the 2nd week of November when it went out of service for annual maintenance. It was restored on 8th December, 2005.
EGBIN ST3	Was available from January to 2nd February, 2004. It was out on 3rd February to rectify its ability to attain 3000rpm speed. From the 2nd week of February to 18th June, the unit was available. It was then shut down for 6 days to correct slip ring re-matching problem.	Was available from January to 10th October when it was shut down for annual maintenance. The unit was restored to the grid till the end of October and remained available by 31st December, 2005.
EGBIN ST4	Was available in the 2nd week of January, 2004. It then tripped on intercept gate control valve problem. On restoration at the end of January, it generated continuously for the rest of the year.	Generated into the grid from January to 12th December when it was shut down on planned outage. Having been restored to the grid, the unit was available by 31st December, 2005 through 2006.
EGBIN ST5	Was tied to the grid from January till June 25, 2005 when it developed builder problem. By 11th July, the unit was restored to the grid. It remained on bars till the 3rd week of November when it shut down due to system collapse for a week. The unit was then available throughout December, 2004.	Was in service in January and February, 2005. It tripped on excitation in March till 12th September when it was on annual maintenance. Having been restored by the 4th October, it remained available by December, 2005.
EGBIN ST6	Was available in the months of January and February 2004. In the first two weeks of March, it was on planned outage. The unit was continuously on bars from 15th March to December, 2004.	Was available throughout the year 2005.
Egbin Unit Availability Summary	Egbin plant generation availability was 1060.48MW in January 2004. It peaked at 1225MW by May of that year. The second half peak of 1249.84MW was attained by December 2004. Annual average generation availability of 1053.48MW was recorded in the year. It was 2.13% greater than the year 2003 figure of 1031.01MW.	Egbin plant generation availability was 1127.90MW in January, 2005. It peaked at 1269.64MW by February. In the second half of the year, the peak plant generation availability of 1266.45MW was attained in July, 2005. Annual average availability of 1147.78MW was recorded in the year. It was 8.95% greater than year 2004 value of 1053.48MW.

Table 5: Ijora Thermal Power Station.

UNITS	2004 STATUS	2005/2006 STATUS
GT4	Was waiting commissioning throughout the year 2004.	Status remained the same due to political problems.
GT5	Was available between 1st and 3rd January, 2004. It was unable to generate between 3rd and 11th January due to lack of fuel. The unit was available in the 2nd and 4th week of February. In the 1st week of March, it could not generate as there was no fuel. From 13th April to 24th July, GT5 was declared available. From then to November, it could not generate due to lack of fuel. It was however declared available in December, 2004.	Was available throughout the year 2005. It however could not generate into the grid due to insufficient fuel availability in 2006.
GT6	Had been unavailable due to high vibration since May, 1999. By December, 2004, it was still unavailable.	Status remained the same.

Table 6: Calabar Thermal Power Station.

UNITS	2004 STATUS	2005/2006 STATUS
EE1	Was unavailable in 2004 due to burnt bearing. The fault commenced in the 2nd week of March, 2002.	Status remained the same.
EE2	Was available from January to June 24, 2004. From June 25 to November 15, an abnormal noise problem occurred. Having effected repairs, the unit was available from November 16 through December, 2004.	Was available from January to 16th February, 2005 when it tripped on abnormal noise. It was restored two weeks later but tripped again on 21st March to 31st December, 2005.
GM2	Had water leakage problem at the commencement of year 2004, from the 3rd week of January to June 23rd, the unit was declared available. There after, starting problem developed. By December, 2004, it remained unavailable.	Status remained the same.

Table 7: AES Independent Thermal Power Station.

UNITS	2004 STATUS	2005/2006 STATUS
GT202	Was tied to the grid between January 1st and 12th. It was unavailable for generation for the next 19 days due to shattering of 132kV line 2. From February to 3rd April 2004, the unit was available. It was there after shut down due to maintenance job on 132kV west bus bar. By 27th April, the unit was restored to the grid and remained on bars till the last week of June and then shut down for major overhaul. On restoration on 12th July, the unit remained on bars till 31st December 2004.	Was available from January to 10th February, 2005. It then tripped on lube oil header pressure between 10th and 19th of February. The unit was then on the grid till 6th September when it tripped on over speed. On restoration, a few days later the unit was available till December 31, 2005.
GT203	Was available from 1st to 12th January 2004 after which it was shut down due to shattered 132kV West and East bus bars. The unit was tied back on 24th January and generated till 18th April when it was shut down for the commencement of maintenance job on 132kV West and East buses. From 27th April to the last week in August GT203 was available. It was then out on mechanical water cleaning. It generated from the 2nd week of September to 31st December with exception of 6th to 12th October when the unit was shut down due to exhaust temperature problem.	Was on the grid in January 2005. It tripped on gas fuel hydraulic pressure low in the first week of February. On restoration, the unit was available till 11th April when it went out of service on over speed boiling trip. It was then unavailable till 2nd week in June to 11th August; the unit was out of service on turbine high vibration. It was available from 11th August to December, 2005.
GT204	Was available from January to 18th April, 2004. It then went on outage for maintenance job on 132kV West and East buses. From 27th April to 31st December, 2004 the unit was available. The only exception was 7th to 15th August when the unit was shut down due to 132kV line limitation.	Was available from January to 18th February 2005 when it was shut down as fire was detected in the turbine. On restoration in the 3rd week of February, it generated for a week and shut down on oil leakage. The unit was on grid from the 2nd week of March to the third week of April. It tripped on high exhaust temperature between 21st March and 20th April, 2005. The unit ran from 20th May to 7th June and then shut down on mechanical over speed bolt trip. On restoration on 22nd June, the unit remained on the grid by 28th December, 2005. It then tripped on low gas pressure.
GT205	Was generally available throughout year 2004.	Was available from January to 6th March, 2005, when it shut down on combustion trouble. It was available from the third week of March to 26th September when it tripped during system collapse. Throughout November, the unit was on major inspection. It was restored on 3rd December and remained on the grid throughout the month.
GT207	Was unavailable due to compressor problem in the 1st week of January 2004. It generated from then up to 3rd April when the unit was shut down for 132kV West bus maintenance work. From 15th April when the unit was tied back to till 10th July, the unit was available. It was then forced out of the grid. The unit was available from the 2nd week in August through December. The exceptions were the 3rd week in September and 3rd October when the unit was on planned outage for net dependable capacity test.	Was available from January to mid May, 2005, when it was shut down for weeks for turbine inspection. It then generated till 22nd June when it went on planned outage. It was out of service from July to 5th October because of generator high vibration and bearing. The unit was on the grid from 5th October to December 31, 2005.
GT208	Was available for must part of the year 2004. The exception was the 3rd week of January when the unit was forced out of the grid due to shattering 132kV line 2.	Was tied to the grid from January to the first week of December when it tripped on high exhaust temperature. It was restored on the 15th December and remained on the grid by 31st December, 2005.
GT209	Was tied to the grid from January to the end of June 2004. It was out on fault for the first two weeks of July 2004. It then ran for a week after which rotor problem developed. The unit was unavailable by 31st December, 2004.	Was unavailable in the first two weeks of January 2005, due to bearing No. 2 problem. It then generated into the grid till December 31st, 2005.
GT210	Was generally available in 2004. It was however shut down twice in the last week of January for inspection and the last week of July due to line limitation.	Was tied to the grid from January to 18th March when it was out of service on loss of exhaust stock metal. The unit was available till 3rd December when it tripped due to fire out break. By 31st December 2005, and early 2006, the unit was still out of service.

UNITS	2004 STATUS	2005/2006 STATUS
GT211	Was available through out the year 2004 with exception of the 3rd week of April when the unit was shut down for maintenance jobs on the shattered 132kV line 2.	Was on service till 23rd January when it was out on high vibration. Having been restored by the end of January, the unit was available throughout February to December 2005.
AES'S UNIT AVAILABILITY SUMMARY	AES'S generation availability was 199.04MW in January 2004. A half annual peak of 272.311MW was attained by March, and peaked at 268.25MW in the second half of the year. An annual average generation of 224.06MW was recorded in the year. This dropped by 7.48% in comparison with year 2003 value of 242.18MW	AES'S generation availability by January 2005 was 236.67MW. A half annual peak of 248.68MW was attained by February 2005. It peaked at 248.70MW in the second half of the year. An annual average generation of 235.46MW was recorded in the year. This was 5.08% greater than 2004 value of 224.06MW.

Table 8: OKPAI Independent Thermal Power Station.

UNITS	2005/2006 STATUS
ST1	Commissioning test commence early December, 2005. The unit was fully commissioned on 17th December, 2005. The unit tripped on low pressure bearing on the 3rd week of December, 2005. The unit was restored back by December 31st, 2005.
GT11	Commissioning commenced in the month of April, 2005. The commissioning was complete by 19th April, 2005. It shut down due to gas condensable in the first week of June. It generated into the grid from 2nd week of May to 14th July when it went out of service for preventive maintenance. It was available from the 2nd week of August to the 3rd week of October when it was shut down on routine maintenance. The unit was available in November and December, 2005 and early 2006.
GT12	Commissioning test commenced in March, 2005. It was completed by 26th March. It was under check in the first two week of May. It generated to the grid in the 3rd week, but tripped on high bearing temperature on the 4th week of May. The unit was tied to the grid from June to the 14th July, when it was shut down for preventive maintenance and commissioning. The unit was available from 2nd week in August to 21st September, when it was shut down for turbine inspection. The unit was available from October to December 2005.
OKPAI UNIT AVAILABILITY SUMMARY	Okpai peaked average generation between March and December, 2005 with a value 434.13MW attained in October 2005. Annual average availability was however 196.70MW.

In the year 2005, OKPAI Independent power plant came on stream, into the grid system.

Table 9: AJAOKUTA Independent Thermal Power Station.

UNIT	2005/2006 STATUS
AJAOKUTA ST2	Was tied to the grid on 1st September, 2005. It tripped due to boiling problem on the 2nd September. The unit was restored by mid September and generated till 31st October when it tripped on generating, shut down resistor rotor winding. It was restored by mid November and remained on the grid till 17th December 2005, when it went out due to leakage on the stream value. It was tied to the grid by 28th December and remained on the grid by 31st December, 2005.
AJAOKUTA UNIT AVAILABILITY SUMMARY	Ajaokuta's peak average generation availability was 44.81MW in October, 2005. Annual average was 10.56MW.

In the year 2005, AJAOKUTA power station came on stream, into the grid system.

ACKNOWLEDGEMENT

The following persons are to be acknowledged for their effort and support in data acquisition: Engr. S. Olufotobi of NCC Oshogbo; Mr. Prince Onyeke of Sapele Thermal Station; Engr. P.I Umunna of Delta Power Station Ughelli; Engr. C. Ajayi of Delta Power Station Ughelli; Mr. S. Anozie of Delta Power Station Ughelli; and Mr. Samuel Okonkwo of Afam Power Station.

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ABOUT THE AUTHOR

Eng. Okedu Kenneth Eloghene is currently a visiting researcher/lecturer to the Petroleum Institute, Department of Electrical and Electronic Engineering, Abu Dhabi/Dubai, United Arab Emirates, from the Kitami University of Technology, Japan where he is a Ph.D. student in the department of Electrical and Electronic Engineering. He is a lecturer in Electrical and Electronic Engineering Department, University of Port Harcourt Nigeria, where he earned his B.Eng. and M.Eng. degrees in Electrical and Electronic Engineering and power systems, respectively. His research interests are in power systems stability analysis, optimization of power generation and renewable energy systems.

SUGGESTED CITATION

Okedu, K.E. 2010. “Assessment of Thermal Generating Plants in Nigeria”. *Pacific Journal of Science and Technology*. 11(2):122-131.

Pacific Journal of Science and Technology