

SF6 REDUCTION OPPORTUNITY IN AFRICA – NIGERIA AS A CASE STUDY

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*Bayo Adeniyi,
PHCN PMU,
Abuja Nigeria
bayoadeniyi@nepapmu.org.*

Nigeria Power (System)

- Access: 40%
- Generation
 - No of Generating stations:
 - Thermal: 6no
 - Hydro: 3no
 - Installed Generation Capacity: about 6,000MW
 - Available Generation Capacity: 4,006MW

Nigeria Power System (2)

- Transmission
 - No of Transmission substations $\geq 132\text{kV}$: 120
 - 330/132 transformer capacity: 6,098MVA
 - 132/33kV transformer capacity: 7,805MVA
 - 330kV line length: 4,738km
 - 132kV line length: 6,227km

Major Developments (Post - 1999)

- Unbundling of the power sector into 18 autonomous business units is on-going and near completion**
- Power Sector Reform Bill passed and signed into law as EPSR Act in March, 2005**
- Emergence of the Power Holding Company of Nigeria on 31st May, 2005 in Place of NEPA**
- Establishment of Electricity Regulatory body**
- Inauguration of the seven member Board of the Nigeria Electricity Regulatory Commission (NERC) on October 31st, 2005**

Major Developments (Post - 1999) contd.

- **Significant increase in generation capacity imminent due to introduction of private generation and successful rehabilitation efforts on old plants**
- **Enhancement of Transmission line capacity and general grid reinforcement**

National Integrated Power Project

- To support the reform project, the government embarked on an aggressive power expansion project aimed at doubling the available generation in three years.
- Investment of about US\$4 billion in generation, transmission, distribution and gas infrastructure
- Project is expected to be completed in 2008
- Generation capacity expected to be increased to 10,000MW on completion

Impact of NIPP

- Available Generation (MW) 8212 from 4006
- 330/132kV trx cap.(MVA) 11,590 from 6098
- 132/33kV trx cap. (MVA) 11,118 from 7,805
- 330kV trx lines (km) 6,932 from 4,738
- 132kV trx lines (km) 7,036 from 6,227
- Distribution infrastructures; lines, transformer capacity will also increase by about 26% as result of the NIPP investment
- These increase in the power system will translate into increase in the number of circuit breakers and consequently in the amount SF6 in the Nigeria power system, since HV circuit breakers in Nigeria are mainly SF6 breakers

SF6 Containing Equipment in Nigeria Power System

- 330/132kV GIS S/S 1no
- 132/33kV GIS S/S 4no
- 330kV circuit breakers 243no
- 132kV circuit breakers 341no
- 33kV circuit breakers 229no
- There are also a substantial number of 33kV SF6 breakers in the distribution network
- With the on going reforms and the NIPP the number of SF6 containing equipment will increase tremendously

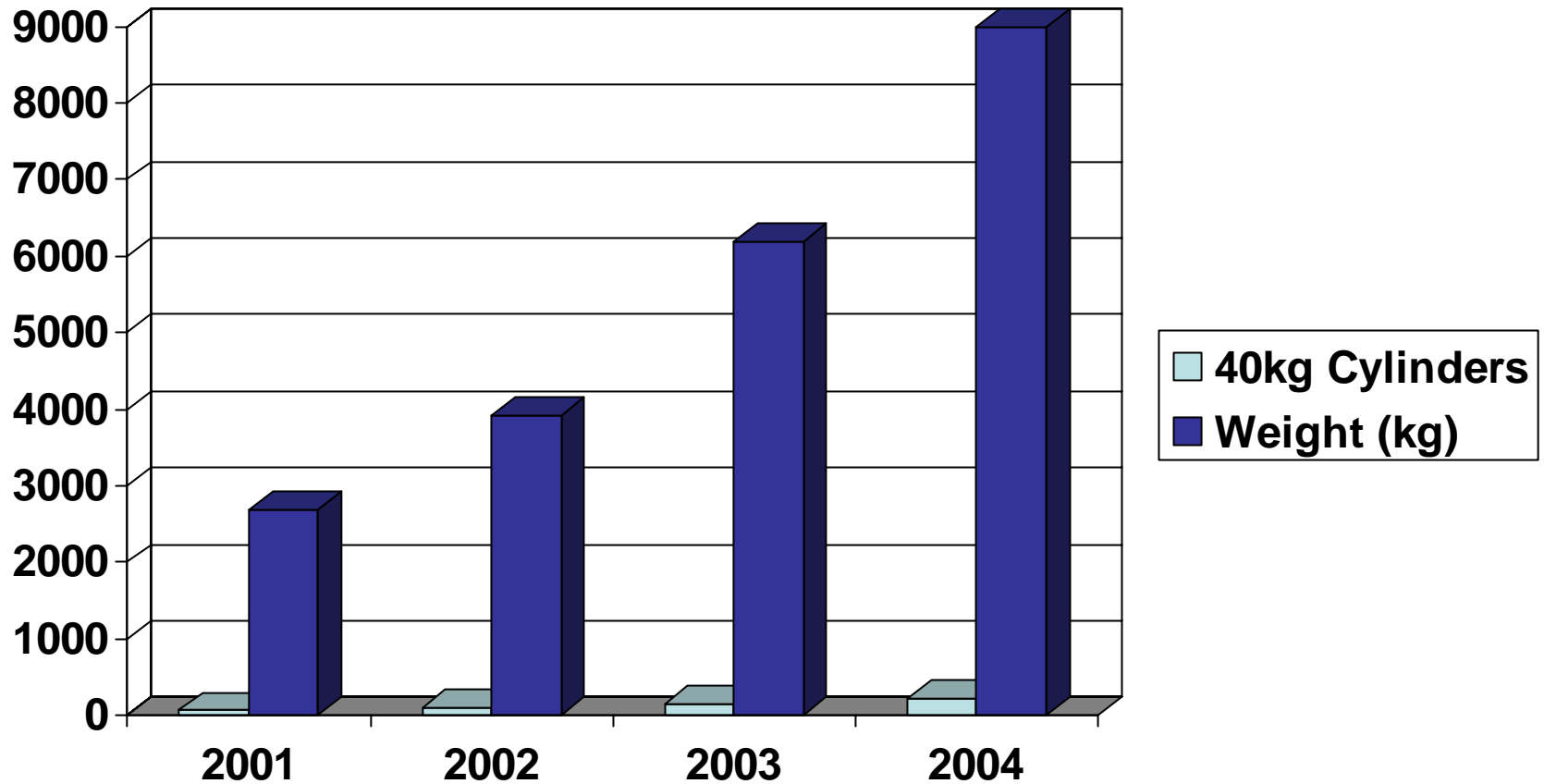
Maintenance of SF6 Containing Equipment

- Maintenance schedules are prepared for major electrical equipment, including SF6 containing equipment.
- Preventive/routine maintenance according to the manufacturers' recommendations
- One of the major maintenance activities is the replacement of seals to prevent the loss of SF6 from the breakers
- However when seals are unavailable, the equipment is constantly refilled to maintain an acceptable level of SF6

Constraints to Reducing SF6 Emission in Nigeria

- Lack of awareness of the effect of SF6 emission
- Lack of training on the handling of SF6
- A lot of the SF6 containing equipment are quite old and ought to have been retired from service, due to lack of inadequate funding, they are still kept in service
- Lack of adequate spare parts like seals leads to continuous emission
- Non availability of proper tools and equipment for refill and recycling

SF6 Utilization Pattern



Activity to Reduce SF6 Emission

- Negotiations on Emission Reduction Purchase Agreement between TCN and IBRD as trustees for the Italian Carbon Fund has been completed
- Purpose is to reduce SF6 emissions in the High-Voltage Transmission/ Distribution Systems in Nigeria
- Emission reduction is about 129,000 tonnes of CO2 equivalent per annum between 2006 and 2012
- Representing about 60% of current total emission in Nigeria
- The first of its kind in Nigeria

Benefit to be Derived

- Globally SF6 emission reduction
- Acquisition of modern techniques and technology in handling of SF6 and hence further SF6 emission reduction
- Additional revenue to the power utility