We Do Green

An Indonesian Operator's journey towards a Green Network

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The Green Road

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Early Days



Natrindo Telepon Seluler (NTS) Regional GSM Operator in East Java with ambition to become a national operator

The Parents

Saudi Telecom Company and Maxis joined forces in 2007 .





Two established Mobile Operators, recognised as brand leaders in their respective fields bring their collective know how to NTS

Axis is Born

February 08 NTS network is branded;

GSM YANG BAIK | AXIS

Progressive Accountable Distinctive Dynamic

The Green Challenge



- Indonesia suffers from a shortage of capacity or complete lack of grid.
- Long term development plans are attempting to improve this shortage.
- Often the fastest solution for the operator is to utilise diesel generators.
- A cost effective Green solution with a TCO less than that of diesel generators is desired by Axis.

Green Initiatives

- In 2002, a project to install a number of photovoltaic sites for remote BTS was implemented.

- Given the harsh temperatures experienced in Saudi Arabia (daytime temperatures $\leq$ 55°C) and the environmental capabilities of the BTS and transmission equipment, all sites used indoor equipment.

Green Initiatives

- Our Parent company, STC has significant experience in the use of photovoltaic power
- An extensive rural radio network was implemented and expanded over the period from 1990 to 2000.
- 250 photovoltaic sites were constructed to supply power to sites without network power

Green Trials

- Various Vendors provided PV systems for the trial.
- Whilst the majority of the sites were 100% PV, one hybrid site was constructed.
- Passive cooling, or passive cooling supplemented by small DC powered air conditioners, was used at the majority of sites
- The hybrid site used conventional AC air conditioners.

Adapting to the Environment

- Equipment and batteries are underground
- The tower and PV array are on the surface
- Daytime temperature 10°C cooler underground
- 30 sites added each year

Axis Green Rollout Photovoltaic

- AXIS has started rollout of its first 100% PV powered sites.
- Use of new outdoor BTS equipment with RF components mounted close to the antenna has enabled power consumption to be reduced to less than 1kW which has allowed PV array sizes of 50 m^2.
- Regions subjected to unpredictable weather and areas subjected to smoke from land clearing, system availability is unpredictable.
  - For sites in these areas hybrid solutions are desirable. These are also applicable for larger loads and key sites requiring higher availability.
- Prime power sources for hybrid solutions might include diesel generators, fuel cells or wind turbines.

Axis Green Rollout
Fuel Cells

- NTS's first fuel cell has been shipped to Indonesia
- These will provide clean and silent backup power at sites with unreliable PLN, and as part of a hybrid solution with PV.





- The fuel is commercial grade hydrogen gas
- The only by-product is water vapour.

Axis Green Rollout
Wind Turbines

- Early next year AXIS will introduce wind turbines at off-grid BTS sites having usable wind resource.
- Wind turbines will be used in conjunction with photovoltaic power and/or fuel cell.
- More than 10,000 litres of diesel fuel could be saved annually for each site.



Axis Green Rollout
Economy Measures

- Power supply units are high efficiency (>95%)
- Shelters use inverter air-conditioners.
- Free cooling systems will be introduced this year.





- Trials with delayed start diesel generators are ongoing.
  - Generator start up commences after battery state reaches pre-defined capacity
  - Batteries take over once they have reached 80% SOC

Axis Green Rollout
Working with the Community

- AXIS is setting up a pilot program to collect and recycle used cooking oil from restaurants and hotels.



- The collection program will largely be operated by disadvantaged people.



- Recycled oil will be blended with diesel fuel to produce B10 biodiesel, which will be used in existing generators.

- Recycling of office waste paper and plastics is in place. The initiative is operated on a non-profit basis with proceeds going to support local orphanages.

Lessons Learned

- Vendor PV designs should be reviewed by experienced engineers. If you don't have in-house staff, look for help.
- Materials should come from reputable suppliers. Short cuts and skimping can spell disaster.
- Materials such as batteries and PV panels have long lead times – plan ahead.
- Panels are high value items – adopt measures to dissuade vandalism and theft.
- Consider minimum power requirements, challenge maximum dimensioning, significant savings are possible.

Axis Management Commitment



We Do Green

Axis Management adopts a holistic approach



Thank You – Terima Kasih - Shukran



Back Up Slides

The Partner Experience



100% PV Site



The Partner Experience



PV Diesel Hybrid site

The Partner Experience



Hybrid site power room, constructed in ISO container.



The Partner Experience





Hybrid site power room, showing Trace inverters and batteries.