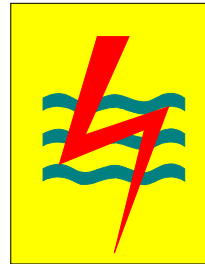


Energy Efficiency and Power Quality Improvement



*Electricity
For
A Better
Life*

Dr. Herman Darnel Ibrahim
Director Transmission and Distribution PT PLN [Persero]

Presented in the PLN-ADB Workshop
Jakarta, 5 June 2006

www.pln.co.id



Electricity

Energy Efficiency and Power Quality: Why?

Energy Efficiency: Why?

- Energy resources deplete, energy becomes more and more scarce.
- The combustions of fossil energy in the power plants contributes to climate change.
- Primary energy prices increase with its scarcity.

Power Quality: Why?

- Electricity become more and more important in life. Life is very hard and not comfortable without electricity.
- Customers want a continuous and reliable supply of electricity. Power reliability is an absolute need.
- Power quality with appropriate and stable voltage and frequency will give comfort, efficiency and longer life of appliances

Addressing of Energy Efficiency and Power Quality

	Planning Stage	Construction Stage	Operation Stage
Generation	<ul style="list-style-type: none"> ▪ Type ▪ Location ▪ Technology 	<ul style="list-style-type: none"> ▪ Design Scheme ▪ Equipment Specification 	<ul style="list-style-type: none"> ▪ Heat Rate ▪ Load Frequency Control ▪ MVAR Control
Transmission	<ul style="list-style-type: none"> ▪ Voltage Level ▪ Technology ▪ Configuration 	<ul style="list-style-type: none"> ▪ Specification ▪ Quality of Material ▪ Construction Quality 	<ul style="list-style-type: none"> ▪ Network Configuration ▪ VAR Compensator ▪ Protection System
Distribution	<ul style="list-style-type: none"> ▪ Voltage Level ▪ Technology ▪ Configuration 	<ul style="list-style-type: none"> ▪ Specification ▪ Quality of Material ▪ Construction Quality 	<ul style="list-style-type: none"> ▪ Power Factor ▪ Load Balance ▪ Load Density ▪ Protection System

Losses and Reliability Targets 2006-2010

Electricity

Water

Indicators	2006	2007	2008	2009	2010
Losses [%]	9.7	9.5	9.4	9.2	9.1
SAIDI [minutes per customer per year]	250	217	177	164	140
SAIFI [times per customer per year]	8.8	7.5	6.3	5.4	4.5



Efficiency Improvement [Losses Reduction] in Distribution

- **Network Reconfiguration**
For the networks that are distorted and overloaded and for long feeders in order to reduce system losses
- **Feeders Reconductoring**
For feeders that are heavily loaded to manage load density that lead to reduce losses.
- **Power Factor Control**
Shunt capacitors compensate inductive loads and improve power factor. These reduce system losses.
- **Connectivity Improvements**
The use of appropriate connectors and its construction quality improve connectivity
- **Load Control and Balancing**
The loads must be balanced in order to minimise losses



tricity

ttter

Power Reliability and Quality Improvement in Distribution

- **Power Factor Control**

Shunt capacitors are more frequently installed on systems for power factor control. These do cause voltage rises.

- **Network Reconfiguration**

For the networks that are distorted and overloaded and long feeders in order to increase voltage level.

- **Feeders Reconductoring**

For feeders that are heavily loaded to improve voltage level

- **Power Quality Equipment**

Installation of voltage stabilizer and harmonic filters

- **Protection System**

Dependability and selectiveness of protection lead to reduce frequency and duration of outages



Conclusions

- The depletion of fossil energy resources and the high consumption of energy that lead to high energy prices will make energy efficiency become more and more important.
- The distribution network losses reduction that contributes to energy efficiency will become more and more viable as the primary energy prices increase and the technology and solutions prices decrease.
- These days and in the future the customers become more and more critical to the reliability and the quality of power. Power reliability and quality improvement is not only a need but a must.
- The efficiency and power quality of distribution system can be enhanced by continuously reconfiguring the network, reconductoring the feeders, controlling the power factor.