Power For India – Efficient, Cost effective and Clean

INDIA POWER
Adding power to life

Agenda

- Introduction
- Projected Power Supply Position in INDIA
- Current Installed Capacity from Various Sources
- What is Clean Energy?
- Important factors for Clean Energy
  - Harmonics (Cause of Dirty Power)
  - Power Factor
- Way forward

Business Snapshot

Kanoria Foundation
WORK WITH DEVOTION

Financial Services

SREI | Austrian Anadi Bank (Erstwhile Hypo Alde Adria Bank, Austria)

Srei Infrastructure Finance Ltd

A Srei Venture

- Srei Equipment Finance Ltd (Srei BNP Paribas)
- Bengal Srei Infrastructure Development Ltd
- Srei Capital Markets Ltd
- Srei Alternative Investment Funds
- Srei Mutual Fund Asset Management Pvt. Ltd
- Srei Mutual Fund Trust Pvt. Ltd
- Srei International Infrastructure Services GmbH
- ZAO Srei Leasing
- Srei Infrastructure Advisors Ltd
- Global Investment Trust Ltd
- Srei Insurance Broking Pvt. Ltd

A Srei Initiative

- Viom Networks Ltd
- Quippo Construction Equipment Ltd
- Quippo Oil & Gas Infrastructure Ltd
- Quippo Valuers and Auctioneers Pvt. Ltd
- Quippo Energy Pvt. Ltd
- Sahaj e-Village Ltd
- Swach Environment Pvt. Ltd
- Attivo Economic Zone (Kolkata) Pvt. Ltd
- Attivo Economic Zone (Mumbai) Pvt. Ltd
- Bharat Road Network Ltd
- I-Log Ports Pvt. Ltd

Power

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- **India Power Corporation Ltd**
- **India Power Corporation (Bodhgaya) Ltd**
- **India Power Corporation (Haldia) Ltd**
- **IPCL Power Trading Pvt Ltd**
- **IPCL Pte Ltd**

Hospitality & Housing

SHRISTI — WELCOME TO LIFE

- **Shristi Infrastructure Development Corporation Ltd**
- **Shristi Housing Development Ltd**

A Shristi Venture

- Shristi Hotels Ltd
- Bengal Shristi Infra Dev. Ltd
- Shristi Urban Infra Dev. Ltd
- TSCCF Shristi Infra Dev. Ltd
- Kanchunjunga Integrated Infra Dev. Ltd
- Vithal Hospitality Private Ltd
- East Kolkata Township Private Ltd

Health Care

Su'asth

- **Suasth Liver Centre**
- **Suasth Hospital**

Education

Suryodaya

- **Suryodaya School**
- **Institute of Inspiration and Self Development**
- **Srihari Global School**

Media

- **Business Economics**

SREI Group: India's leading financial institution in Infrastructure sector

FUND BASED

- EQUIPMENT FINANCING
- PROJECT FINANCING
- EQUIPMENT LEASING

FEE BASED

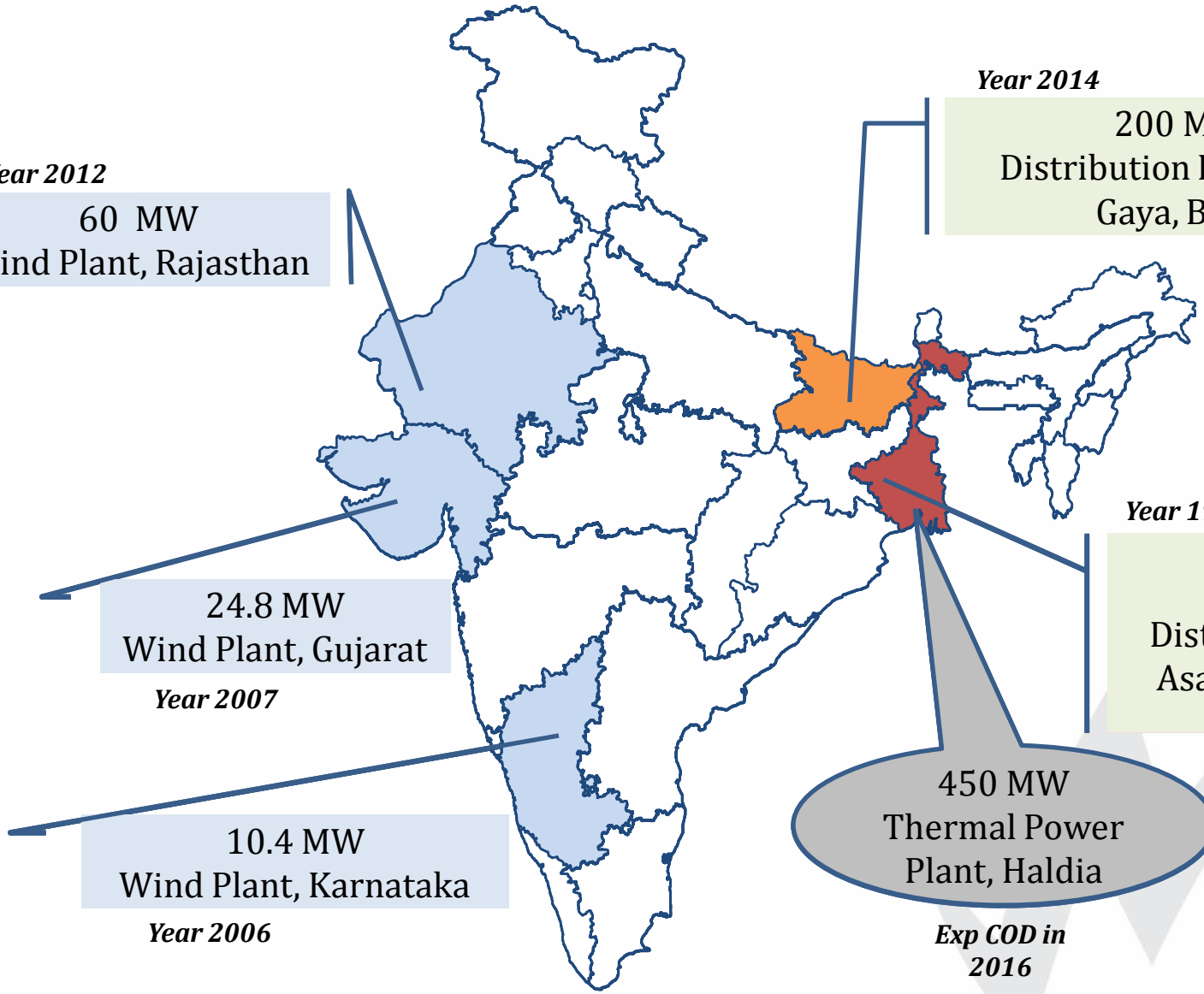
- PROJECT ADVISORY
- PROJECT DEVELOPMENT
- INSURANCE BROKING
- INVESTMENT BANKING
- ALTERNATIVE INVESTMENT FUNDS

STRATEGIC INVESTMENT

- TRANSPORTATION
- TELECOM INFRASTRUCTURE
- INDIA POWER CORP LTD.
- RURAL IT INFRASTRUCTURE
- RENTALS
  Construction / Oil & Gas / Energy
- SEZ & INDUSTRIAL PARKS
- ENVIRONMENT
  Water Mgmt. / Waste Mgmt.

Total Assets Exposure - ~ USD 10 billion

Evolution of India Power Corporation Ltd.



Year 2012

60 MW
Wind Plant, Rajasthan

Year 2014

200 MVA
Distribution Franchisee
Gaya, Bihar

Year 1919

250 MVA
Distribution Licensee
Asansol, West Bengal

24.8 MW
Wind Plant, Gujarat

Year 2007

10.4 MW
Wind Plant, Karnataka

Year 2006

450 MW
Thermal Power
Plant, Haldia

Exp COD in 2016

Generation - Thermal

Portfolio

- 12 MW embedded TPP
- 450 MW TPP in Haldia, West Bengal –
  - expected COD within 2015
- 540 MW TPP in West Bengal - Planned

Capabilities

- Operation and maintenance of power plants handled by in-house team
- In-house project development and implementation team
- Fuel sourcing and intermediation handled by group company – **Swyambhu Natural Resources Ltd.**

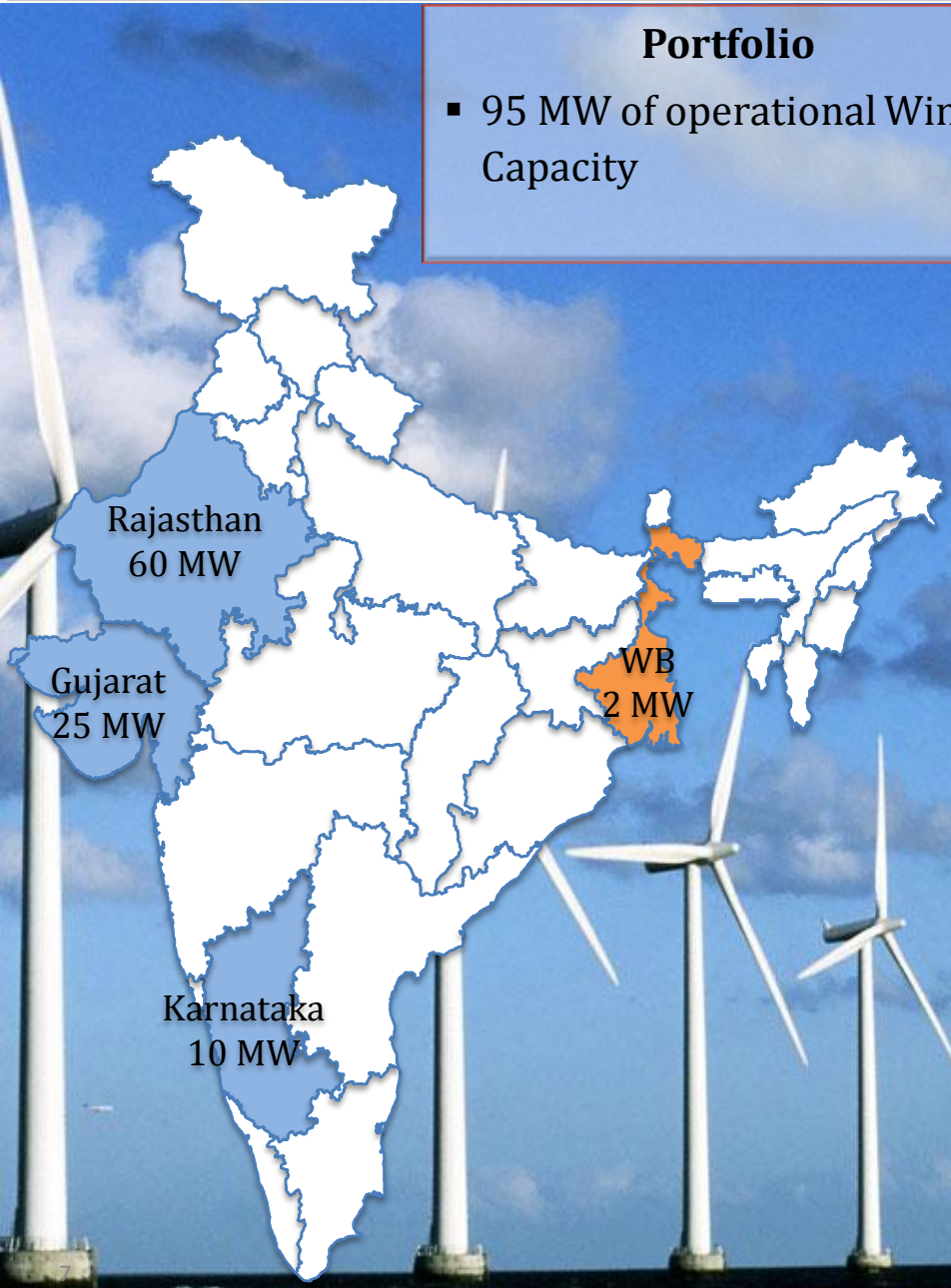
Generation - Renewables

Portfolio

- 95 MW of operational Wind Capacity

Capabilities

- In-house project development team
- Operation and maintenance coordinated by internal teams
- Ensures high machine availability and PLFs



Distribution Business

Distribution License Area

- In operations since 1919
- Geographic Area:
  - Asansol –Durgapur- Ranigunj area in Burdwan District of West Bengal.
- Licence area - 618 sq. km
- Connected Load of 250 MVA
- Input Energy > 1000 GWh

Distribution Franchisee Area

- In operations since 01 June 2014
- Geographic Area –
  - Includes Gaya, Bodh Gaya (hub for Buddhist Pilgrimage), Manpur and their adjoining areas.
- Franchise Area – 1500 sq. km
- Connected Load of 200 MVA
- Input Energy > 600 GWh

Distribution License Area - Asansol, West Bengal

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License Area

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Achievements

- T&D Loss levels <2.7% (One of the lowest in India)
- Grid reliability >99.8% (One of the highest in India)
- Multiple power feeds to ensure supply stability
- Advanced grid with smart grid initiatives – auto FPIs, Automated Meter Reading, integrated Metering, Billing and Collection

Distribution Franchise Area - Gaya, Bihar

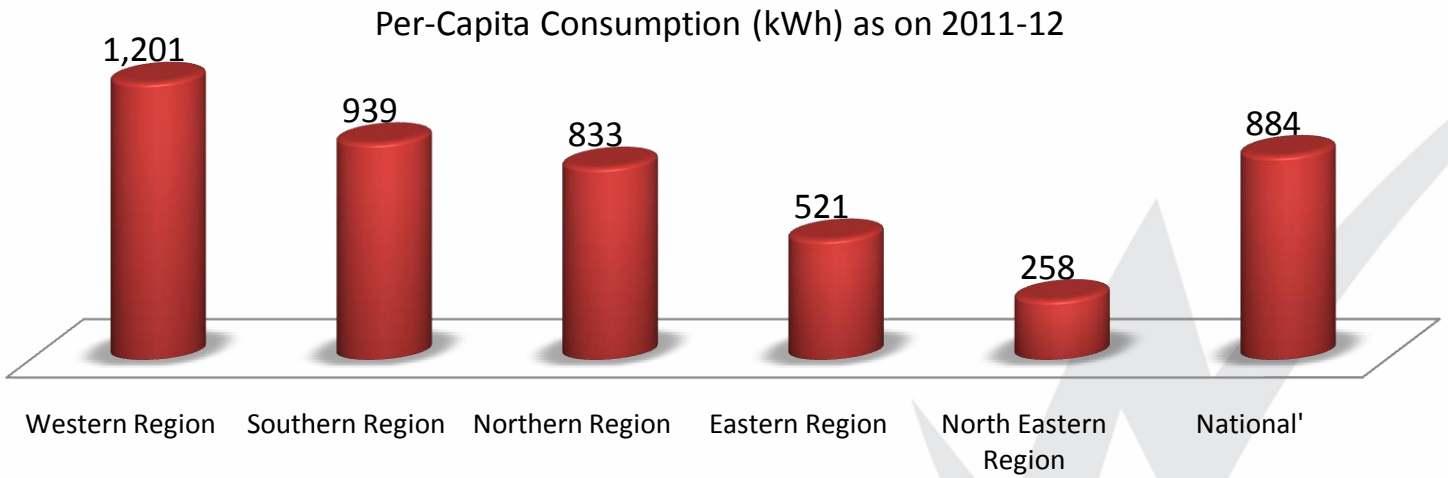
Key Statistics as on 1st June 2014 (prior to takeover)	
No of Consumers	1,00,000
Connected Load	200 MVA
Input Energy (Annual)	600 MU
AT&C Losses	71%
Collection Efficiency	84%

DISTRIBUTION FRANCHISE (DF) – GAYA, BIHAR

- IPCL awarded Distribution Franchisee of Gaya town and adjoining area of about 1500 sq kms.
- Taken over operations from 01st June 2014
- IPCL procures power at "Input Rate" and supplies power to consumers at tariff fixed by the State Electricity Regulatory Commission (ERC) "Regulated Tariff".
- Average Power availability increased from 14 hours to 22 hours in a day
- 10% - AT&C loss reduction

Projected Power Supply Position in INDIA

All India Power Supply Position in Fy 2015-16			
Region	**Requirement in MU**	**Availability in MU**	**Surplus/Deficit**
Northern	3,55,794	3,54,540	-0.40%
Western	3,53,068	3,64,826	3.30%
Southern	3,13,248	2,77,979	-11.30%
Eastern	1,24,610	1,27,066	2.00%
North-Eastern	15,703	13,934	-11.30%
Total	**11,62,423**	**11,38,345**	**-2.10%**



- *All DISCOMs accumulated losses are more than* ***~Rs. 2,50,000 Crore***

*Source as per PFC report Mar-13

Current Installed Capacity from Various Sources in INDIA

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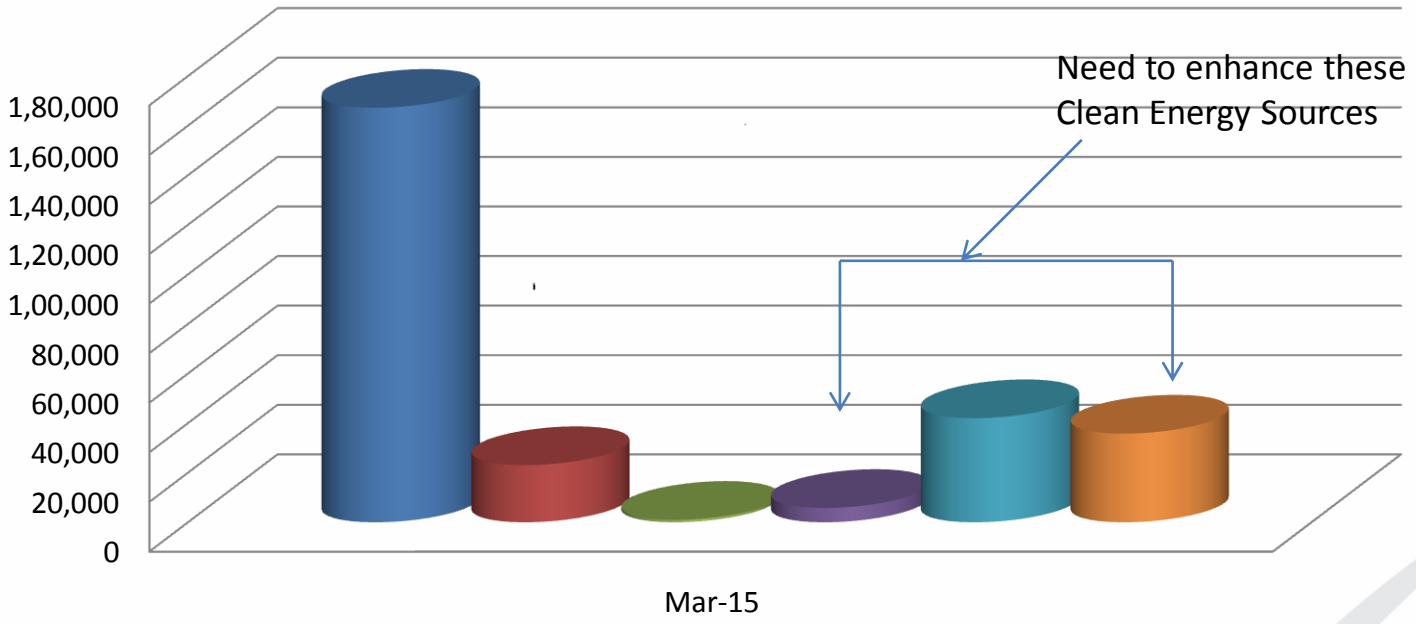


	Mar-15
Coal	1,67,208
Gas	23,062
Diesel	994
Nuclear	5,780
Hydel	41,997
Renewable Energy	35,777

What is Clean Energy?

- 'Clean Energy' is normally synonymous with 'Renewable Energy' (i.e. wind energy, solar energy, hydro energy, and geothermal energy), it also relates to Clean & Quality Power
- Since, ultimate requirement is to get ***24*7 Quality Power*** with ***Reasonable Cost*** in an ***Environment Friendly*** system for Sustainable Growth
- It can be achieved from renewable source as well as conventional source with little bit of efforts for better Energy security,

Some strategies to enhance Energy Security:

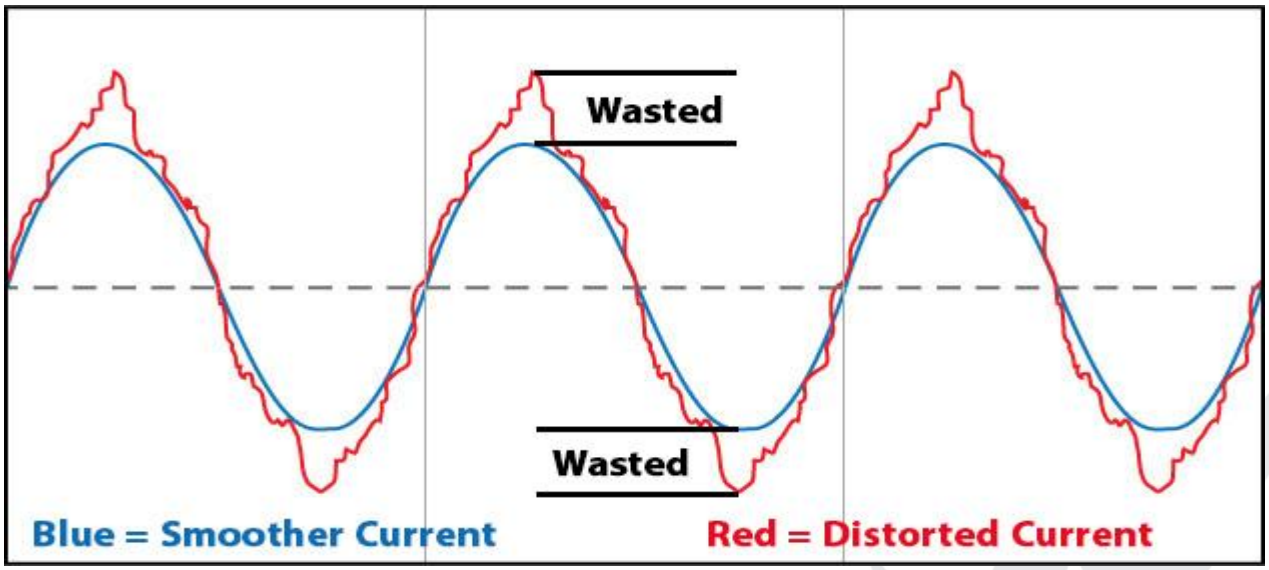
- Improving the efficiency of extraction of fossil fuels
- Improving Fuel efficiency of new coal fired power plants
- Adopting energy efficiency & demand side management
- Controlling Harmonics in Power System
- Improvement of Power Factor & voltage regulation
- Developing Renewable energy Sources like Solar, Wind etc

Important Factors for Clean Energy - Quality Power

- ***Harmonics*** *(Cause of "Dirty Power")*
- ***Power Factor***

What is Harmonics?

- Harmonics are multiples of fundamental frequency of an “Electrical Power system”
- Harmonics in power systems result in ***increased heating in the equipment and conductors***, misfiring in variable speed drives, and torque pulsations in motors
- Total Harmonic Distortion expresses the amount of harmonics in the system, presence of harmonics is the cause of ***‘Dirty Power’***

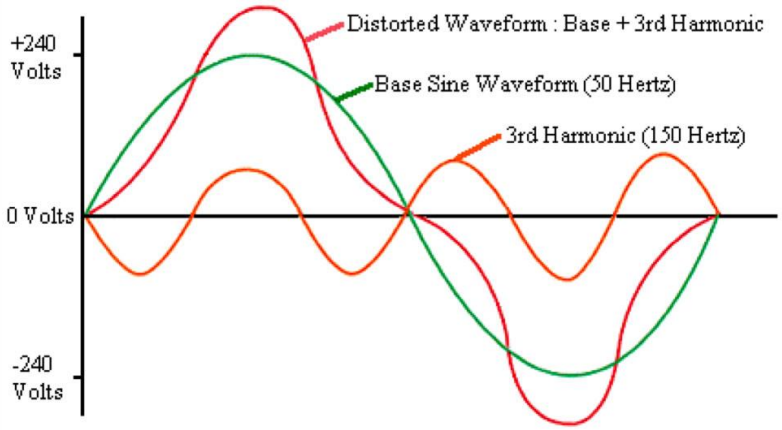


$$THD\ (\%) = \sqrt{\frac{\sum P_{Harmonics}}{P_{Fundamental}}} \times 100$$

Major Causes of Harmonics

Major Causes of Harmonics

Devices that draw non-sinusoidal current when sinusoidal voltage is applied creates harmonics



- ***Electronic Switching Converters***
  - Computers, UPS, Solid state rectifiers
  - Electronic process control equipments, PLC's,
  - Lighting ballast, including light dimmer
- ***Arcing Devices***
  - Discharge Lighting like Sodium & Mercury Vapors
  - Arc Furnace, Welding Equipments
  - Electrical Traction system
- ***Ferromagnetic Devices***
  - Transformers operating near saturation level,
  - Magnetic ballast (Saturated iron Core)
  - Induction heating equipments, chokes, motors
- ***Appliances***
  - TV Sets, Air Conditioners, Washing Machines, Microwave Ovens
  - Fax Machines, Photocopies, Printers

To Overcome Harmonics

Tuned Harmonic Fillers – Capacitor Bank & Reactor in series are adopted to suppress harmonics

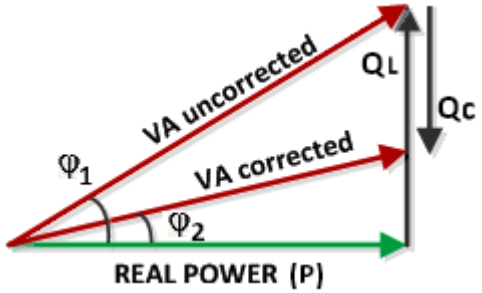
Power Factor

What is Power Factor?

- **Power Factor (PF)** is defined as the ratio of the 'Active power' (kW) flowing to the load to the 'Apparent Power' (kVA) in the circuit, which is always ***less than or equal to 'unity'***
- Theoretically Unity PF means transfer of ***maximum power for the same distribution system capacity***

Cause of Low Power Factor

- ***Inductive Load*** is the major cause of Low PF



How to Improve?

- Reactive power compensation by putting suitable '***Capacitor Banks***'
- Capacitor Bank should be installed near the load

Advantage of PF Improvement

- Reactive component of total current in the system from source is reduced
- Power losses are reduced in the system
- Voltage level at the load end is improved
- kVA loading on the source & network is reduced – resulting imporovement of system capacity

- To Achieve 24*7 ‘Energy Security’ with Quality Power in Reasonable Cost in an Environment Friendly system for Sustainable Growth
  - Better Voltage Regulation
  - Improved Power Factor
  - Harmonics Free System
  - Maintaining Rated Frequency
  - Improving the Energy Efficiency of the system by reducing Techno-Commercial Losses

Thank You