Smart Grid Research at IITH

Dr. Pradeep Kumar Yemula
Dr. Siva Kumar

Smart-X Team at IITH

Faculty involved in smart-x research

- Pradeep Yemula (Power)
- Siva Kumar (Power)
- Kiran Kuchi (Communications)
- Zafar Khan (Communications)
- Rajalakshmi (Communications)
- Kotaro Kataoka (Networking, Data Analytics)
- Bheemarjun (Networking, Data Analytics)
- …. may be more

10+ PhD Students, 15+ Masters Students

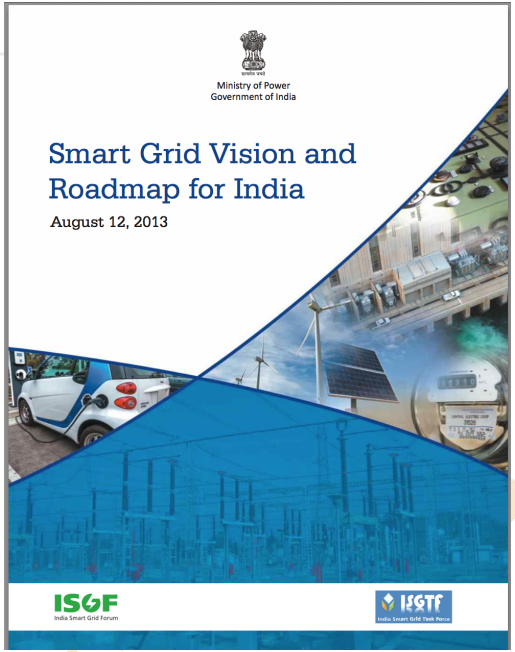
Motivation for Smart Grids in India

Customers:

- Power for All
- Improve reliability
- Improve quality of supply
- User friendly utilities
- Increased choices
- green power
- “Prosumer” enablement
- incentives for shifting loads

Utilities:

- Reduction of T&D losses
- Peak load management
- Reduction in power purchase cost
- Better asset management
- Increased grid visibility
- Self-healing grid
- Renewable integration



Government and Regulators:

- Satisfied customers
- Financially sound utilities
- Tariff neutral system
- upgrade and modernization
- Reduction in emission intensity

Smart Grid Vision @ IITH

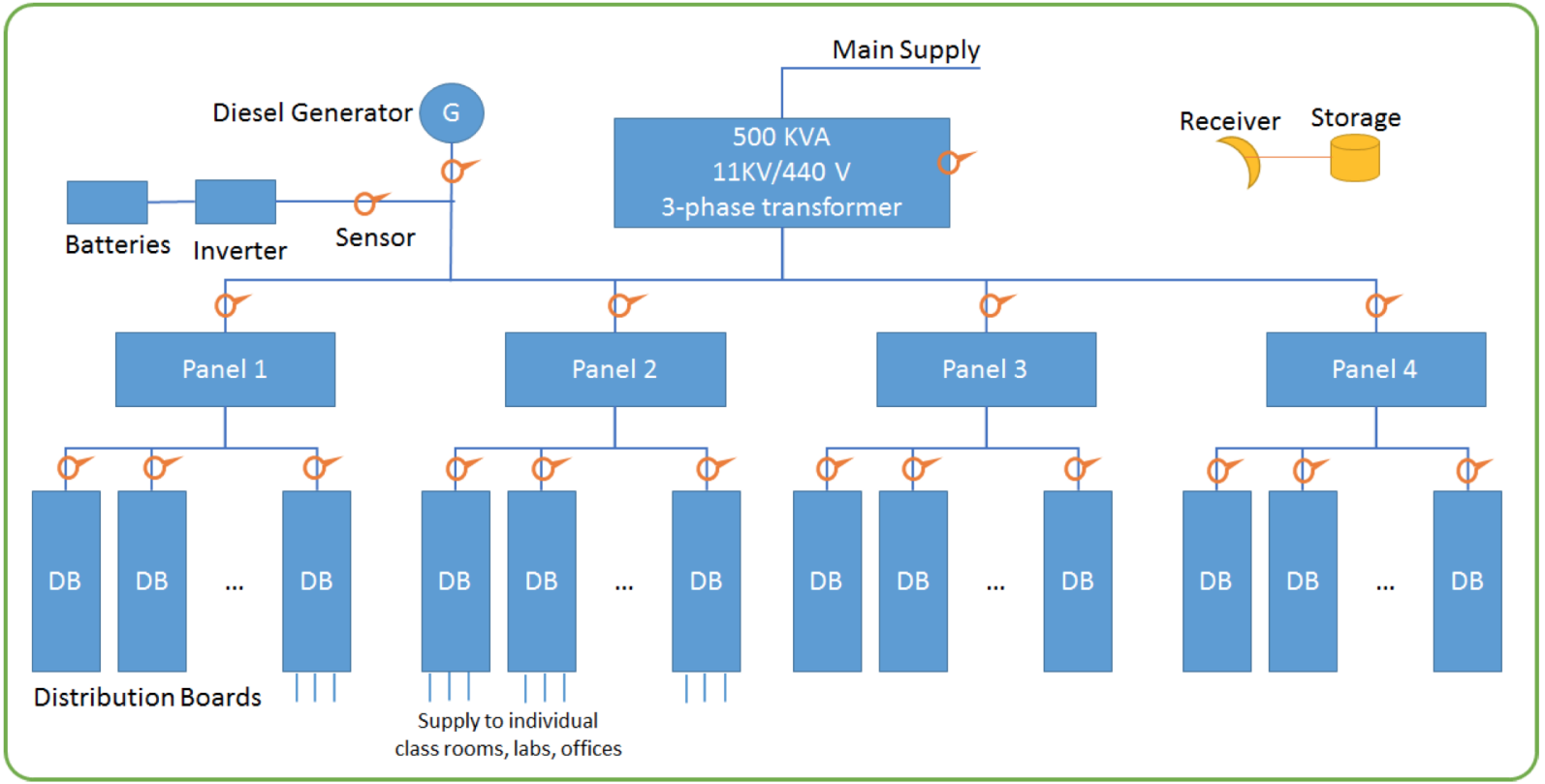
Establishment of Smart Campus @ IITH

Smart Campus caters to the real life requirements of the fast growing IITH campus, and also acts as a test bed for smart grid research

Focus Areas in Power

- power quality issues
- load scheduling especially in the case of heavily loaded grids
- demand response
- theft detection
- loss reduction
- two way information exchange from source and loads
- prosumer enablement
- protection issues
- microgrids
- wide area measurement system (WAMS)
- Multi level inverters
- Drives

Schematic of Power Distribution Network in IITH campus



Schematic of Power Distribution Network in IITH campus

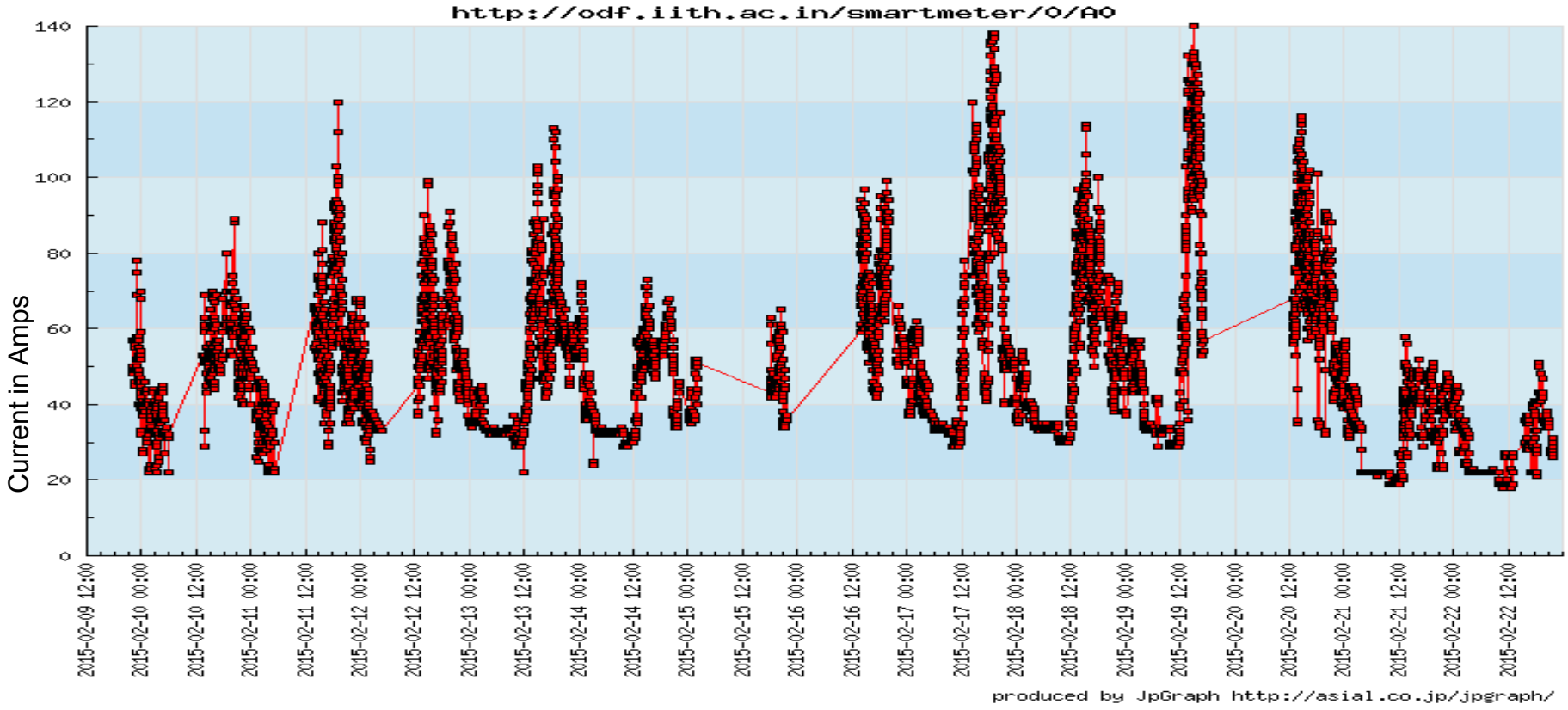
Transformer Sensor
Measures 3 phase currents, 3 phase voltages, 1 oil temperature, 1 oil level Frequency of measurement 1 min

Panel and Distribution Sensor
Measures 3 phase currents, and 3 phase voltages
Frequency of measurement 1 min
No. of panels = 4
No. of distribution boards (DB) = 30 (approx.)
Mapping of DBs to classrooms, offices, or labs

Diesel Generator and Inverter Sensor
Measures 3 phase currents, and 3 phase voltages Frequency of measurement 1 min

Receiver and Data Storage
All measurements to be wirelessly received and stored for use by analytics applications.

Preliminary Results



Plot Courtesy: Hiroyuki Ikegami (Student from Univ of Tokyo)

Future applications

- Power Quality Monitoring
- Load Profile Modeling
- Reduction of Unbalance
- Peak Load Shifting
- Smart Load Shedding
- Theft Detection
- Analytics and many more....

Thank You....!

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