

# Smart Grids

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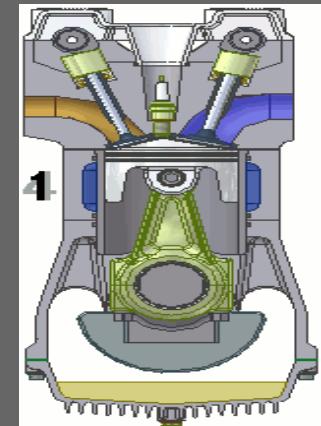
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# Energy Distribution Theme

- Smart Grids
  - Technologies for Smart Grids
  - Mobile Communication and Sensor Networks
  - Intelligent Algorithms
  - Cloud Computing
  - Reconfigurable Computing
  - Information Security (Cyber Physical Security)
  - Human-Computer Interaction
- Smart Utilities/Trenchless Technology (Professor Chris Rogers)

# The Third Industrial Revolution

- The First Industrial Revolution
  - brought together print and literacy with *coal steam and rail.*
  - triggered by the invention of the steam engine in 1776 by James Watt
- The Second Industrial Revolution combined the telegraph and telephone with the internal combustion engine and oil



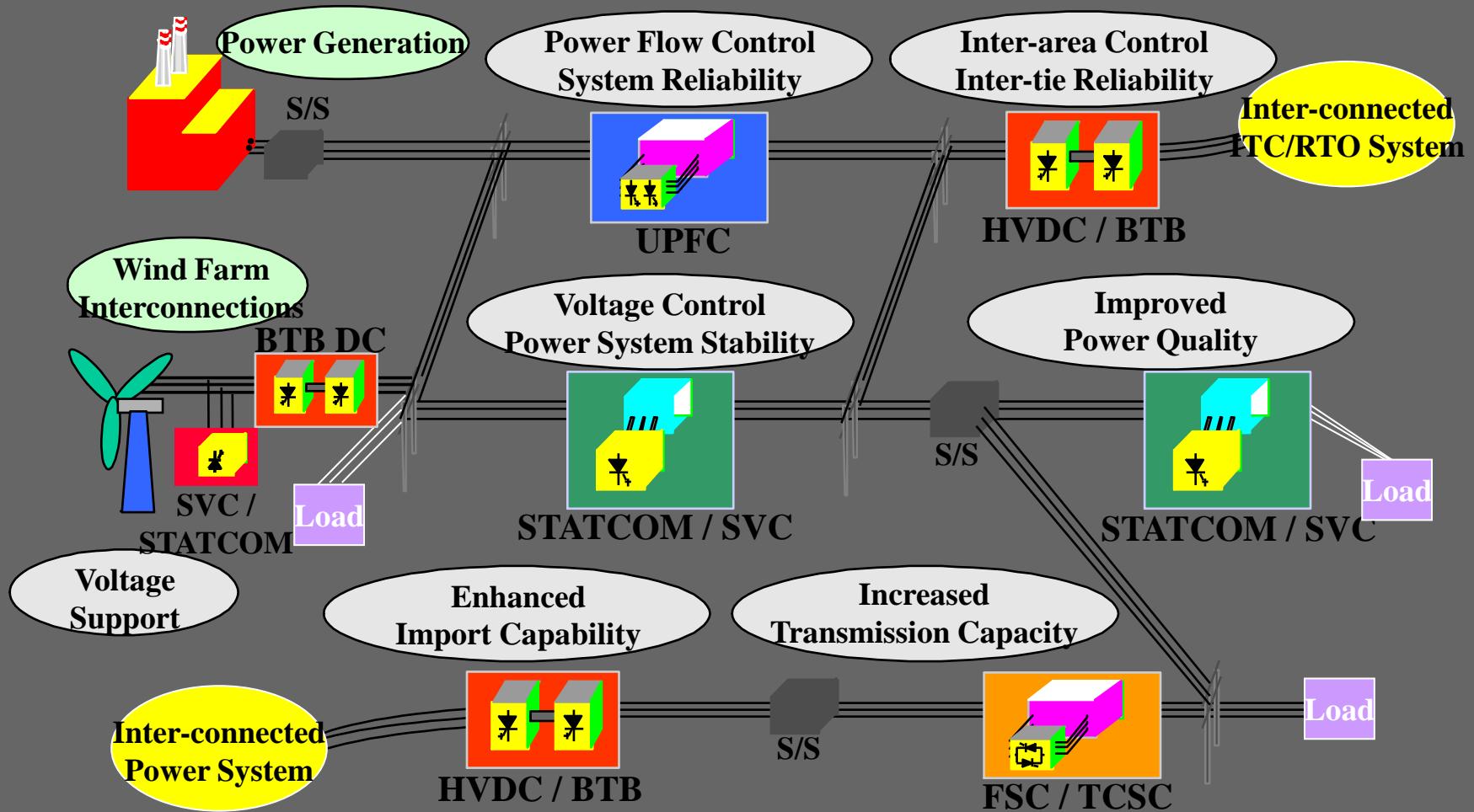
# The Third Industrial Revolution

- The Four Pillars
  - Renewable Energy Generation
  - Buildings as Positive (Active) Power Plants
  - Hydrogen and Other Energy Storage Technologies
  - Smart Grids and Plug-in Vehicles
- The 3rd Industrial Revolution brings energy supply revolution!
- Smart Grid is the Key Pillar
  - fundamental infrastructure to enable or support other three pillars

# Vision on Smart Grids

- Drivers: Energy Market, Security of Supply & Environment
- Smart Grids
  - Smart Grid is an electricity network that can intelligently integrate the actions of all users connected to it - generators, consumers and those that do both – in order to efficiently deliver sustainable, economic and secure electricity supplies
- Key Elements
  - Intelligent
  - Efficient
  - Sustainable
  - Economic
  - Secure

# What a Smart Grid looks like?



# What a Smart Grid looks like?



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# Global Power Internet: Is This real?



# Research Facilities on Smart Grids

## □ Smart Grid Facilities

- A smart power grid and real-time simulator that provides the capability to realistically simulate smart power grids with the integration of distributed power generation including wind, wave and fuel cell generation systems.
- Monitoring and control capability as well as real-time information integration, monitoring, protection and closed-loop control functions.

# Research Facilities on Smart Grids



# Discussions

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