



# Microgeneration and the Smart Grid

**Dr. Malabika Basu**

**Dublin Institute of Technology**

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# Orientation of the talk

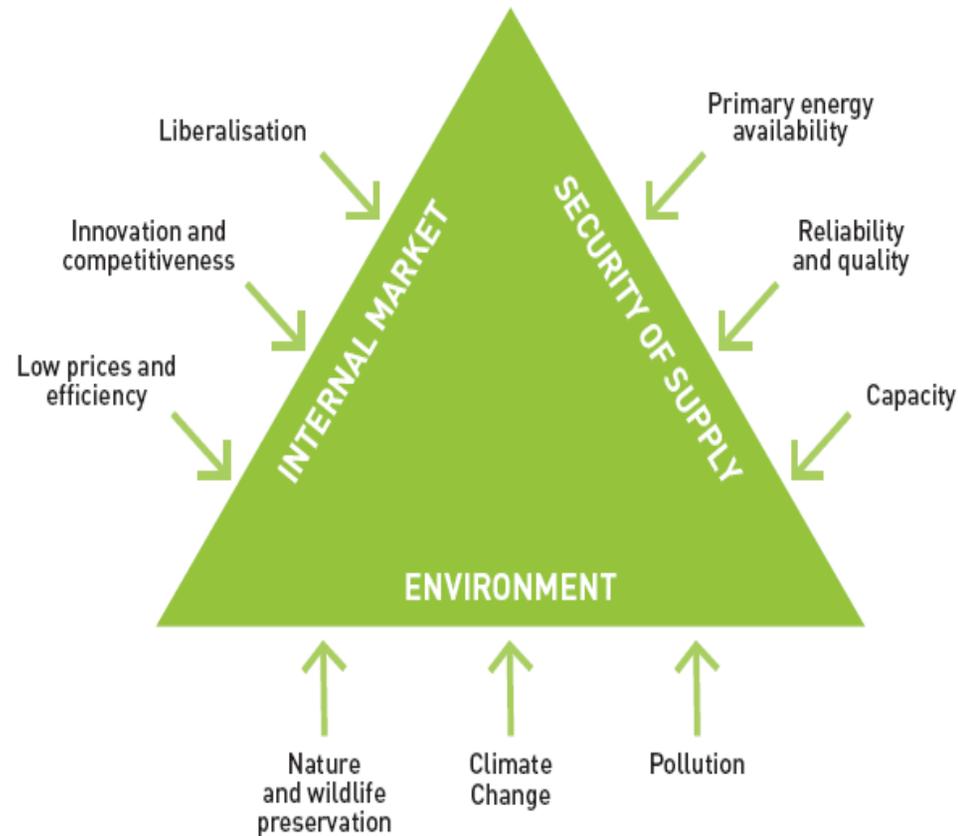
- Current status of the Smart Grid
- Comparison with current structure and operation of Grid
- Role of Smart Grid in Integration of Microgeneration
- Value of Smart Metering



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# Setting the background....



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# Smart Grid; Overview

- What is Smart Grid?
- What are the components of Smart Grid?
- Why is the Smart Grid needed?
- Changes brought about by the Smart Grid
- Benefits and impact of the Smart Grid
- Utilities Implementing the Smart Grid



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# What is Smart Grid?

Definition: Amalgam of communication and electrical capabilities that allow utilities to understand, optimize, and regulate demand, supply, costs and reliability.

This advanced technology allows electrical providers to interact with the power delivery system and determine whether electricity is being used and from where it can be drawn during the time of crisis and peak demand.

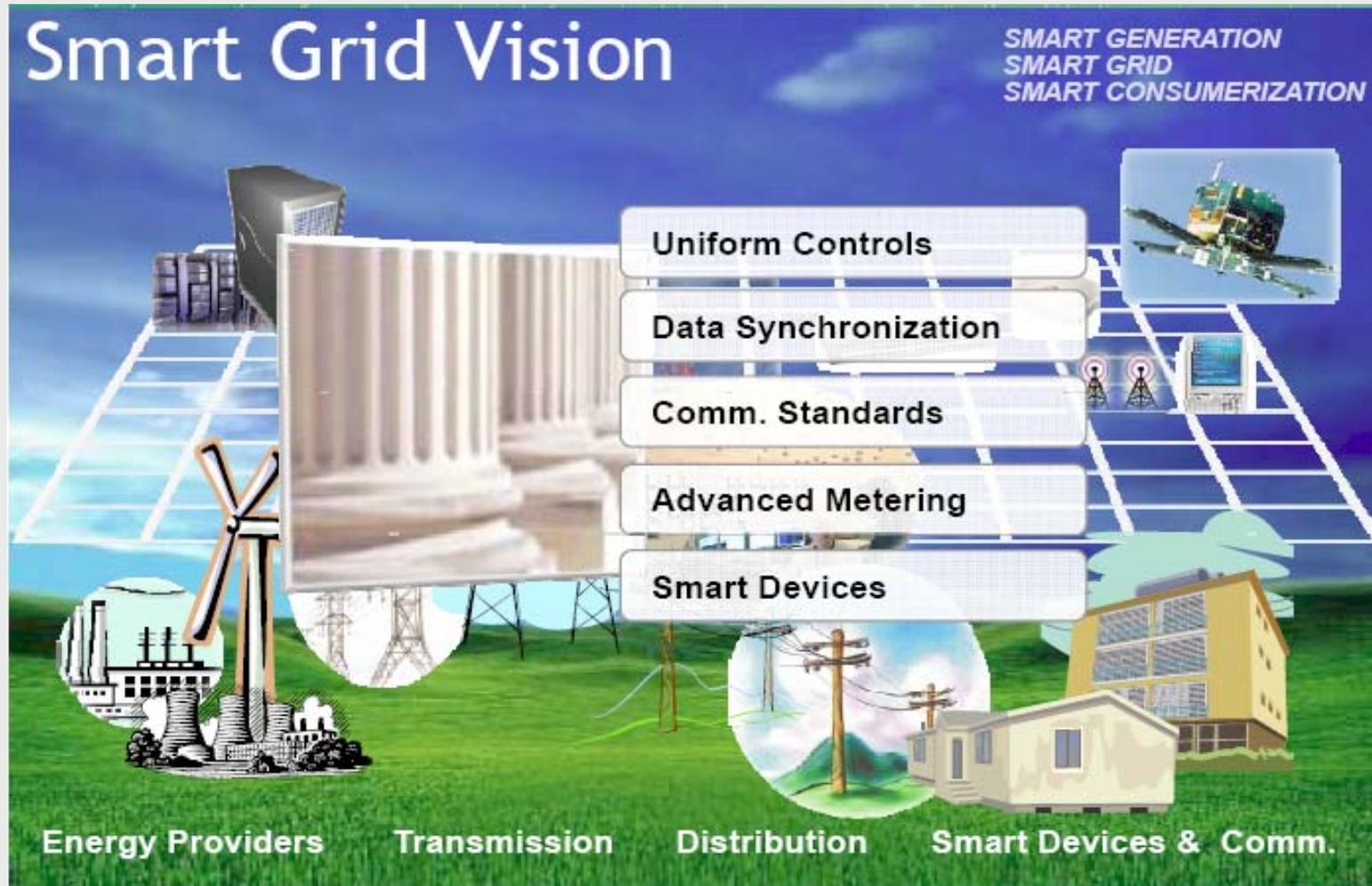
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# What are the components of Smart Grid?



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# Why is the Smart Grid needed?

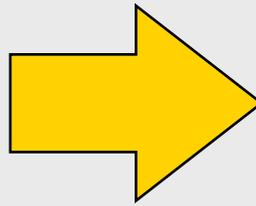
- Future grid network must be competitive and supporting environmental objective and sustainability.
- Reliable, Flexible, Accessible and cost-effective will be the primary objective.
- Should accommodate both central and dispersed generation
- Options for end-users to be more interactive with both market and grid



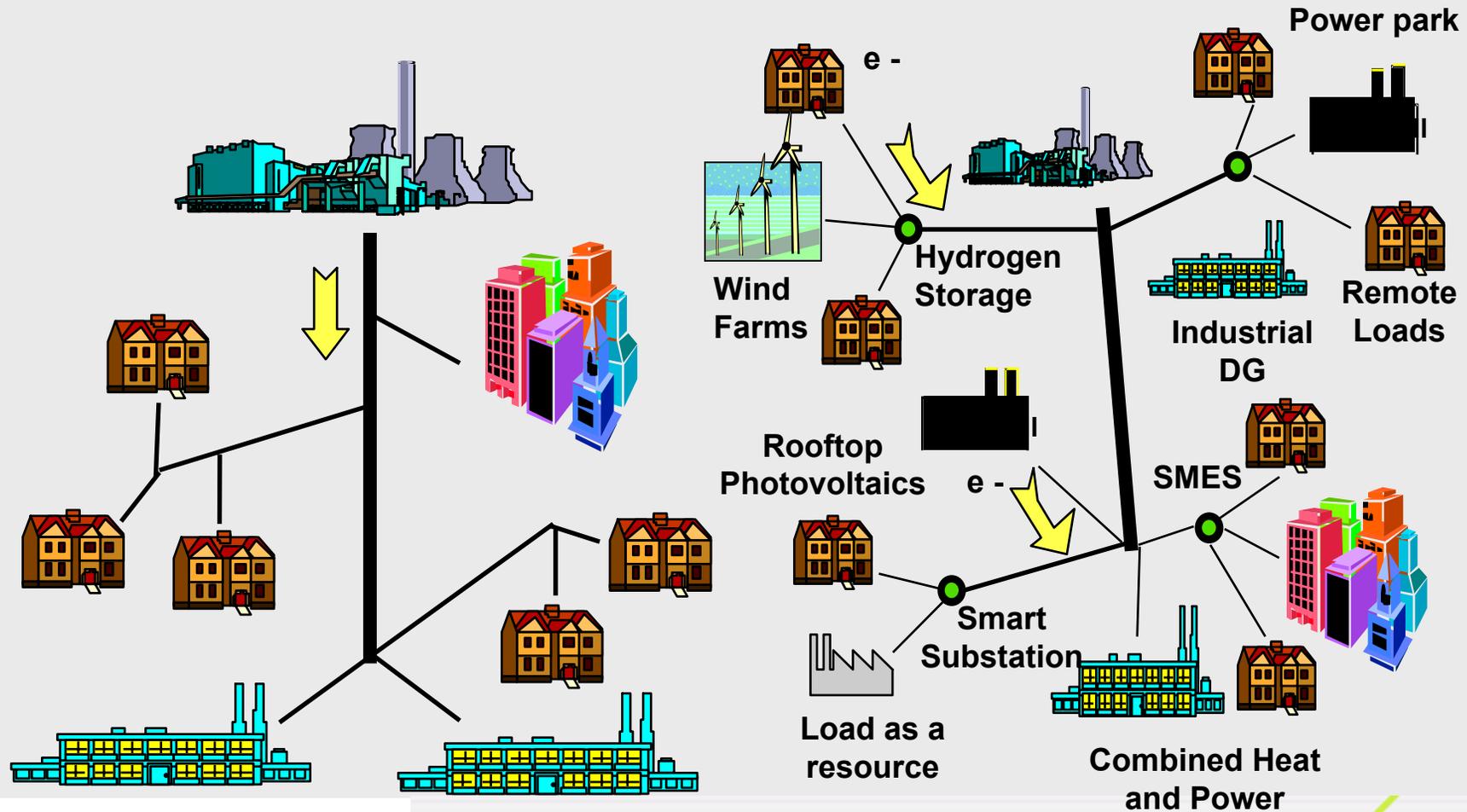
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# Today's Electricity ...



# Tomorrow's Choices ...



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# Today's Grid



# Smart Grid

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Electro-chemical	Digital
One way communication	Two way communication
Built for central gen	Accommodates DG
Radial topology	Network topology
Few sensors	Monitors and sensors through out
"blind"	Self- monitoring
Manual restoration	Self automated restoration and eventually self healing
Prone to failure and blackouts	Adaptive protection and islanding
Check equipment manually	Check equipment remotely
Emergency decision by committees and phone	Decision support system, predictive reliability
Limited control over power flows	Pervasive control systems
Limited price information	Full price information
Limited customer choices	Full customer choices



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# Key Characteristics of Smart Grid

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It is

- Self-healing
- Adaptive
- Optimized
- Distributed
- Integrated
- secure

It isn't

- Self-despatching
- Self-optimising
- Self-planning
- Limited to advanced metering



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# Smart Grid in Integrating Microgeneration



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- Remote meter reading
- Remote connect / disconnect
- 'On Site' Auto Outage Reporting
- Improved meter accuracy
- Reduced energy theft
- Improved safety

Back Office / Control Center

- Energy Efficiency
- More customer choices
- Peak Load Management

"Intelligent" Communication Infrastructure

Smart Metering / AMI

Behind the Meter Applications

Distribution Line Automation

Substation Automation

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- Improved efficiency, reliability & power quality:
- Automated Cap Banks/FACTS/FRIENDS
- Automated Electronic Reclosers
- Automated Line Voltage Regulators (SE)
- Increased Sectionalization
- Self Healing
- Reduced manual inspections
- Line Sensors
- Real time field data

- Improved efficiency, reliability & power quality:
- Automated Breakers
- Automated Station Voltage Regulation
- Automated Capacitors (SE)
- Reduction in load via Volt / Var Optimization
- Reduced energy consumption
- Reduced manual inspections
- Real time data / asset management
- Replacement of obsolete equipment (breakers, regulators, control panels)



## Smart Meter will bring change in business style

- Meter reads on premise each month → • Daily automated reads
- Respond to high bill complaints → • Provides energy education
- Minimal information about energy usage → • In-home displays with message and information
- Monthly validations → • Daily validation
- Assigned due date for billing → • Customer selected due dates
- Traditional billing → • Prepaid billing, pricing options and standard offers

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# Value of Smart Metering

Smart Grid will aid revolution in 2 levels

- Enhance ability to generate and export power locally
- Enable more consumer choice and control



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## Advantage of Smart Metering: Example

- Suppose wind is blowing- can the system in your house react to surplus of cheap energy by switching immersion heater, or charging your EV?



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## Example of advantage of Smart Metering

- Would you like to sell your Microgeneration at peak grid demand?
- Would you like to charge your car battery at low demand?
- Would you like to do active load management?- example washing machine

My washing machine can be moved everyday between 17- 24 hrs

My washing machine can be moved everyday between 8 -23 hrs

The connection of my washing machine can be delayed for maximum 4 hours

No possible control over washing machine

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# Conclusion

- A paradigm change is inevitable
- Vision of Smart Grid is laid out, but only technology is not enough
- Need research demonstration and deployment
- Commercial and regulatory issues sorted out
- Its about making connection- issues for Gov, customer and individual
- Smart Metering is the best opportunity to extend the concept of full active distribution management allowing full use of renewable power sources and increasing energy use



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