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Invent the Future

An Energy Internet Platform for Sensor-driven Transactive Energy Applications

Keynote Speech

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What is the Energy Internet ?

The Internet allows information to flow to anyone from anywhere.

The Energy Internet is a vast network that will allow efficient distribution of electricity to anyone and from anywhere.

EI will utilize smart sensors, ICT technologies and algorithms to facilitate power supply in real-time, enhance storage applications, and integrate renewable energy into the grid.

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Mission of the Energy Internet

Energy Internet is an online marketplace that transacts in energy
(One-to-One, One-to-Many and Many-to-One)

O-to-O: Between individual users for bilateral transactions
O-to-M: One electric utility sells to Many customers
M-to-O: Many customers sell to One electric utility

But in the Energy Internet:

All transactions must be done in real-time
All network constraints must be met

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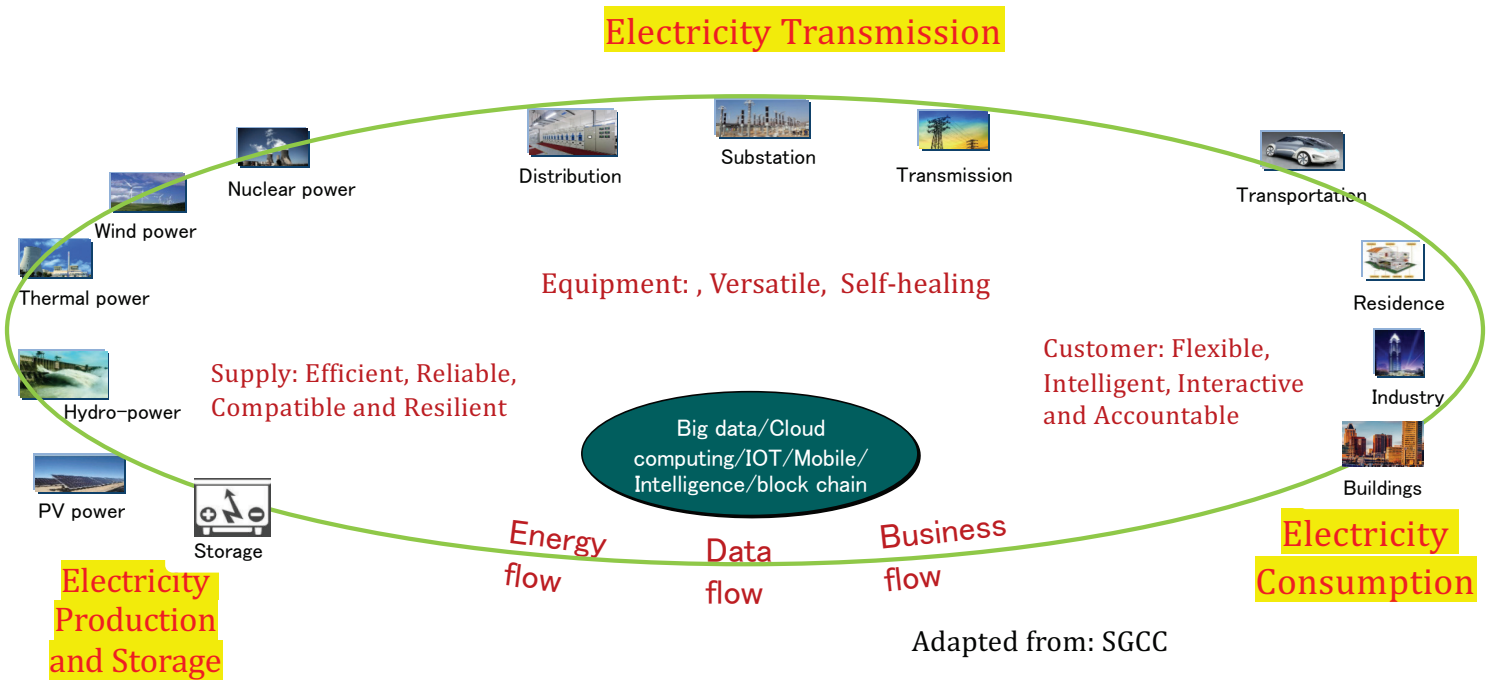
Vision of the Future Grid



Adapted from: SGCC

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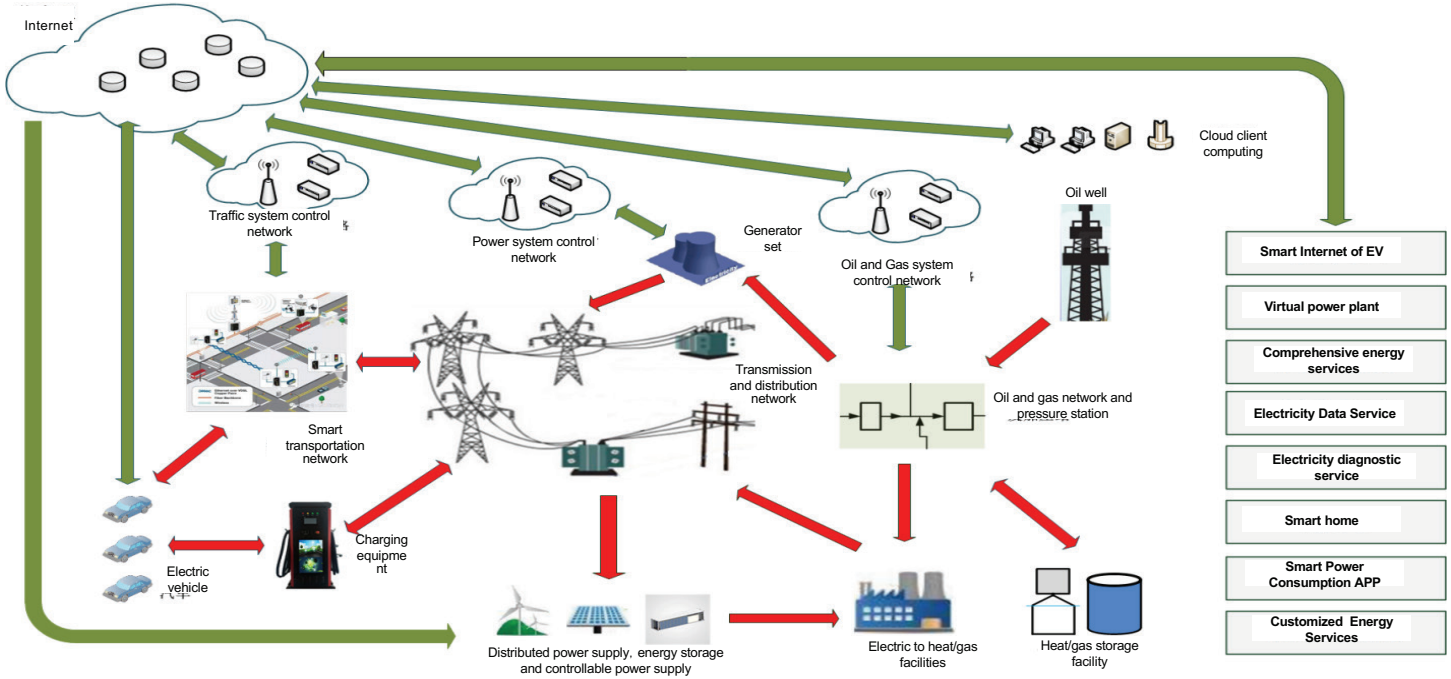
Mapping the Energy Internet into the Future Grid



Source: SGCC

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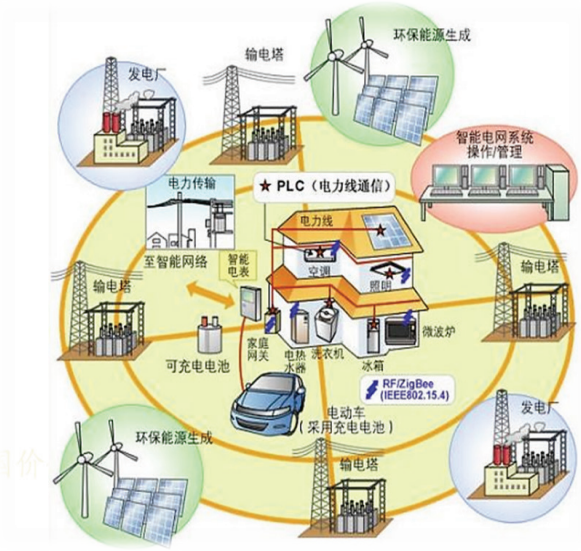
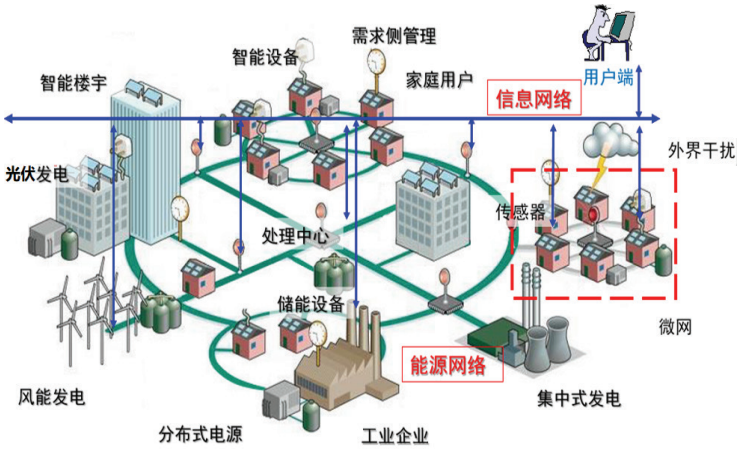
Energy Transaction in a Future Power System



Future power system



Future power system integrated with modern information technology

Source: SGCC

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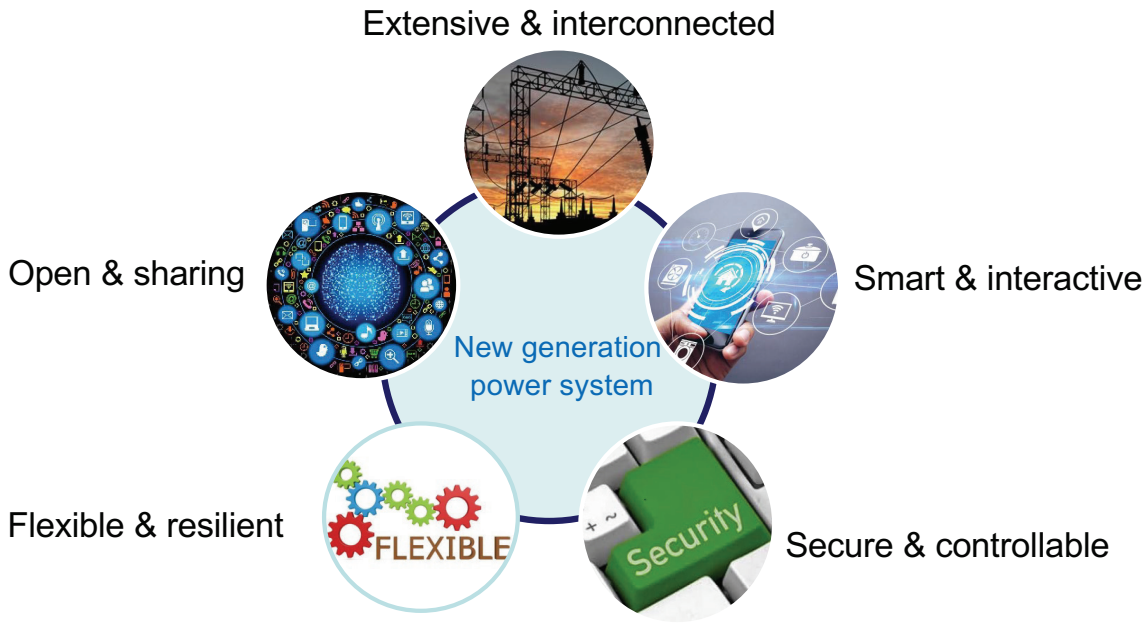
Future Power System: Pathway to Energy Internet



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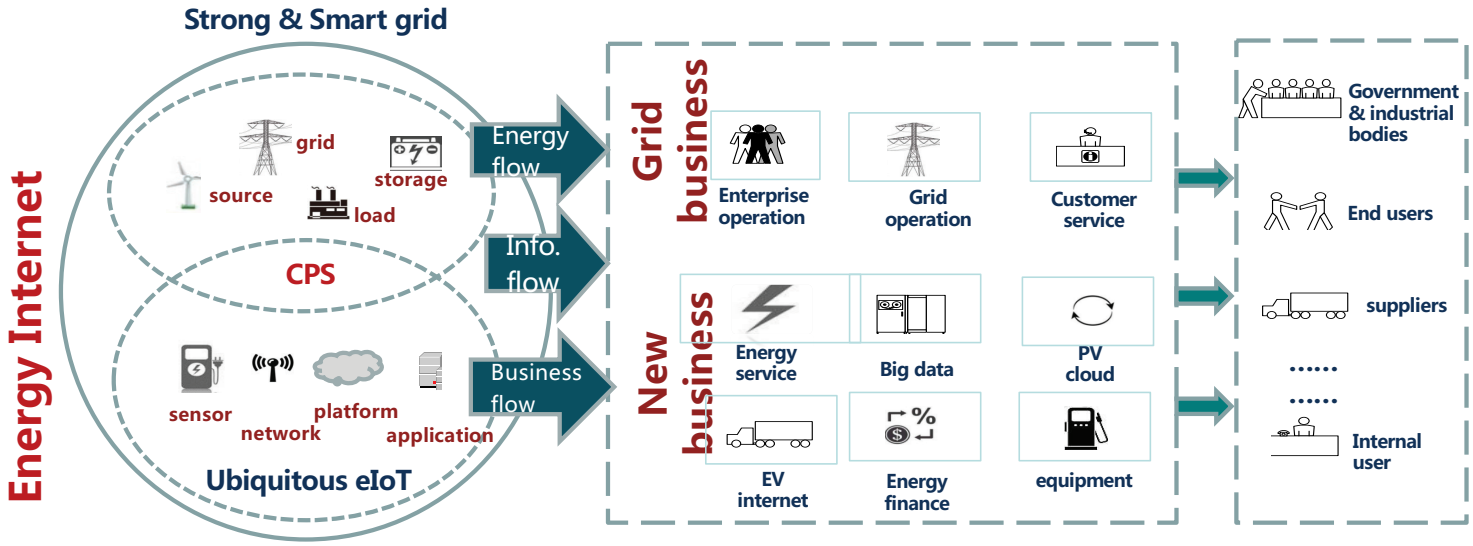
Functions of the Energy Internet



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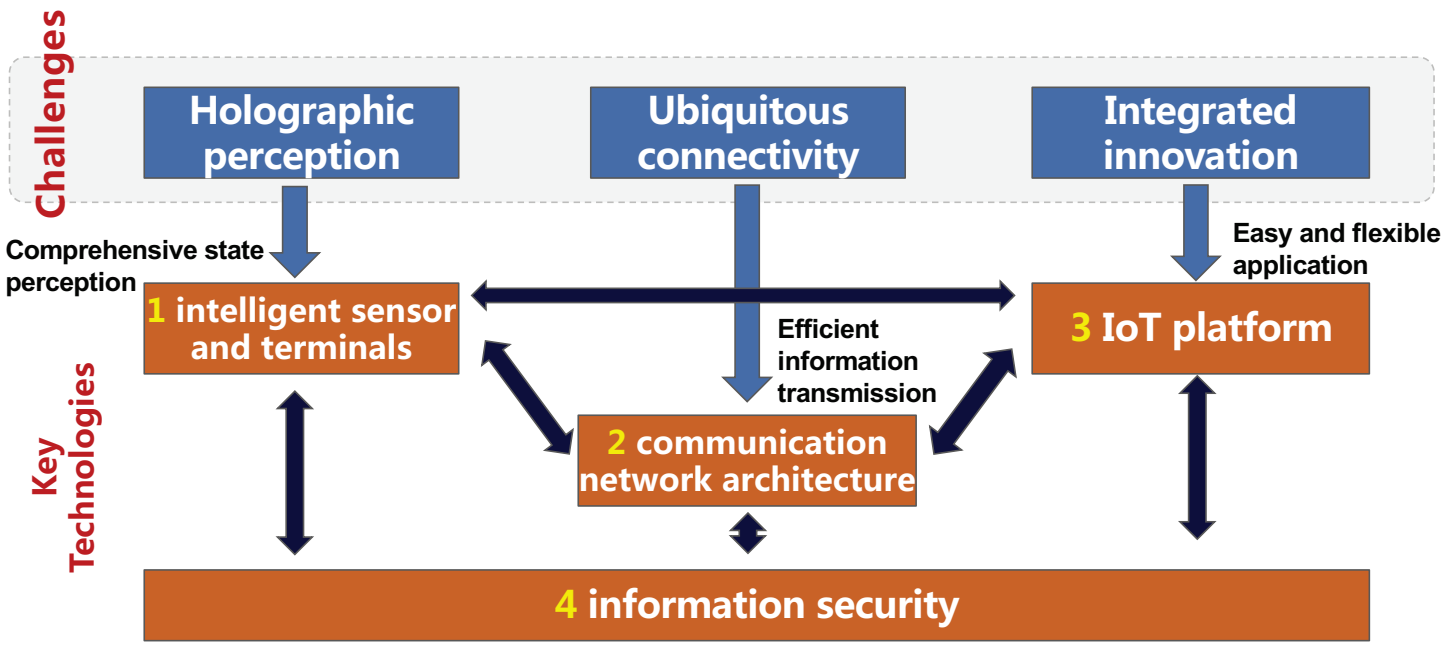
Key Technologies of the Energy Internet



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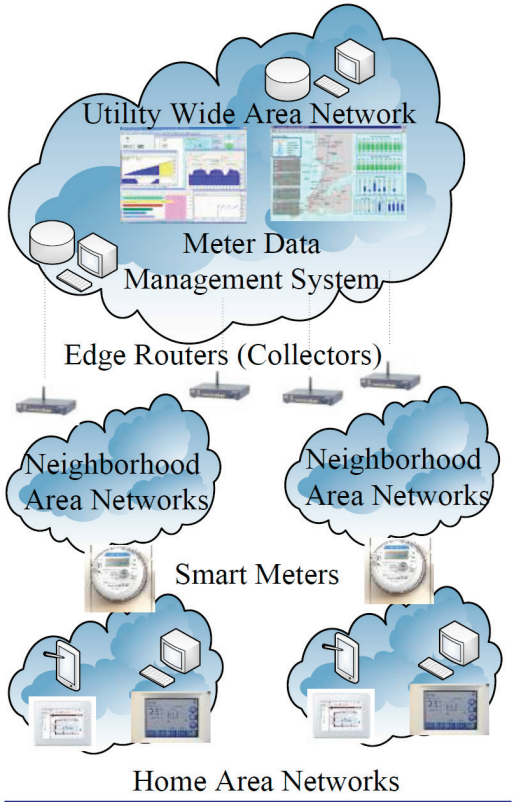
The ICT Framework



Source: P. Siano

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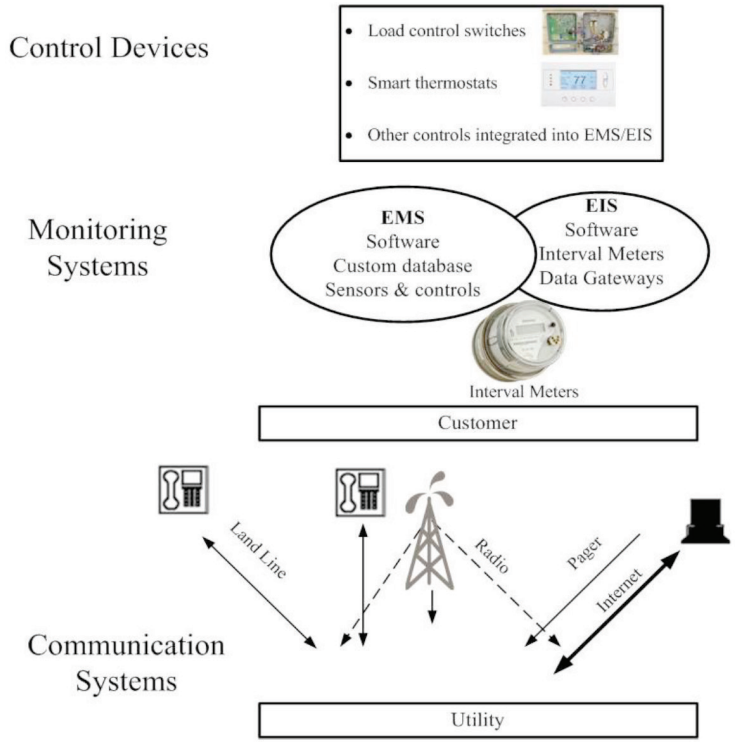
Field Implementation



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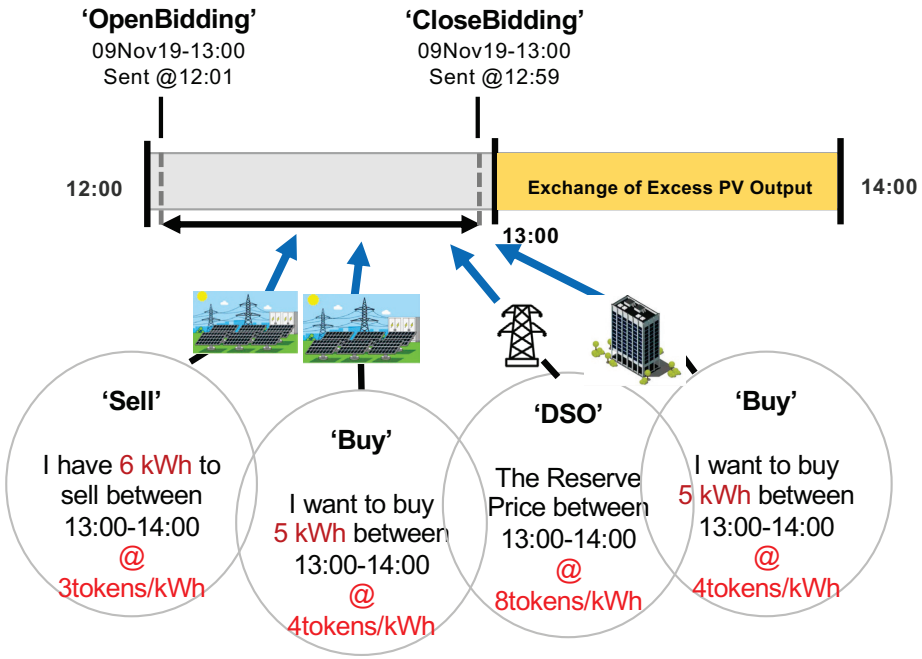
Basic Transactive Energy Process



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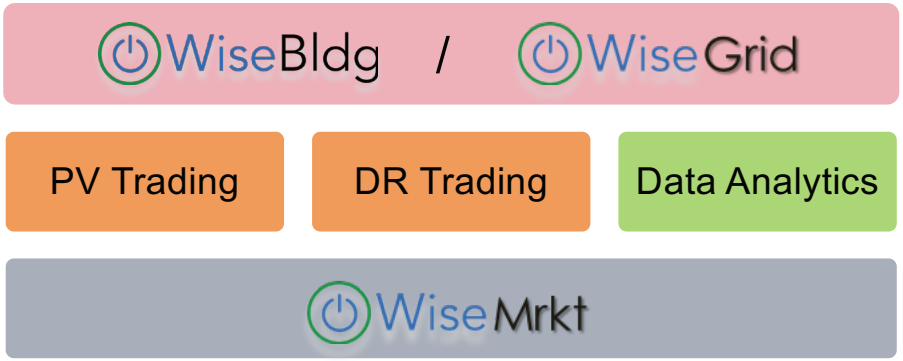
Small Scale Realization of EI



- ★ Control/user interface
- ★ Intelligent control mechanisms
- ★ Energy insights
- ★ Historical data
- ★ Current status
- ★ Locational data
- ★ Immutable data

Source: www.bemcontrols.com

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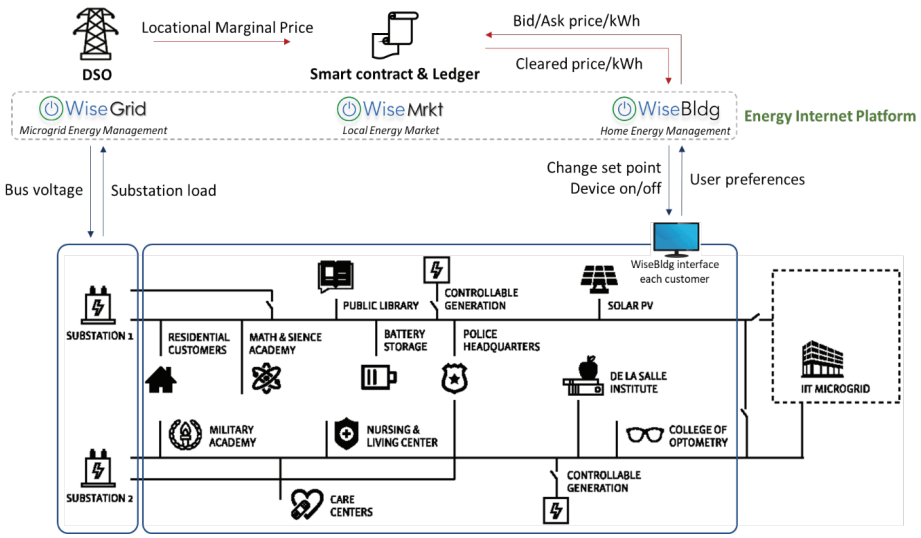
Transactive Energy in a Microgrid

Focus: Top develop & pilot an Energy Internet platform that provides higher efficiency, cost reduction, and energy insights for both utilities and end-customers by leveraging

1) Existing IoT/smart devices in homes
2) Blockchain/distributed ledger/related technology to execute smart contracts and maintain records of all transactions



Source: www.bemcontrols.com

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Roof-top Solar Photovoltaics

Source: Saifur Rahman

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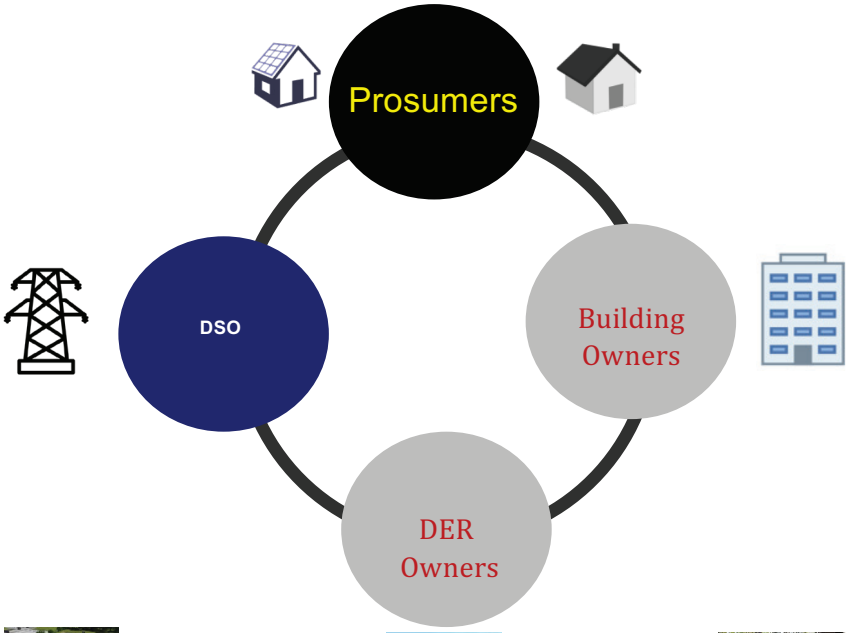
Participants



Community battery storage

Distribution-scale solar PV

Energy stored in EVs

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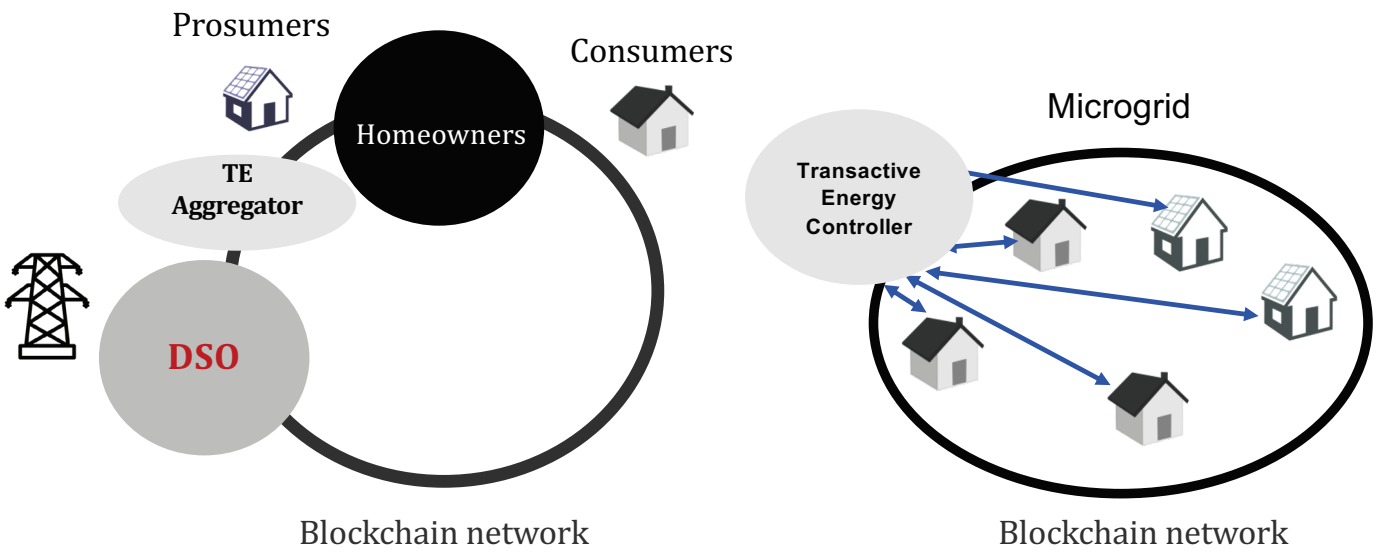
Energy Transaction in a Microgrid



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Transactive Controllers

Active controllers enable customers to adjust their energy consumption depending to price changes.

Transactive controllers represent the most promising evolution for energy users aiming at participating in Local Energy Markets since they allow both prosumers and active users to make bids considering the real time price of electrical energy and their own energy requirements.

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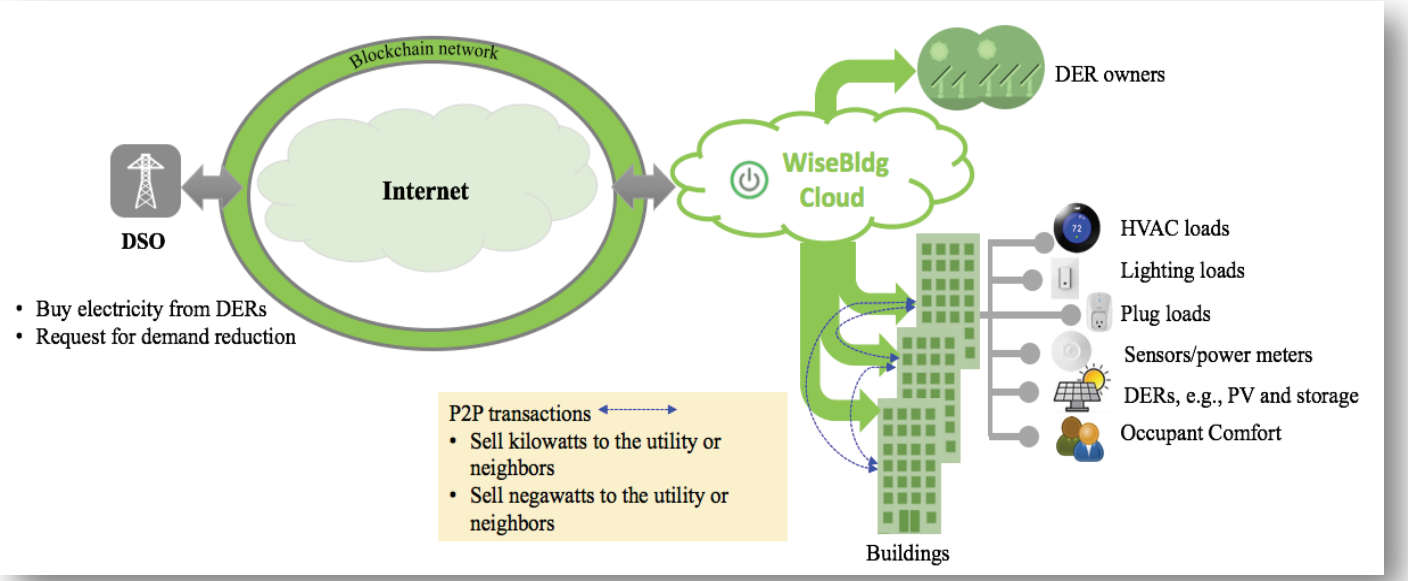
Application: Building Automation Platform



Open source software platform: www.bemoss.org
WiseBldg is a commercial software platform, www.bemcontrols.com

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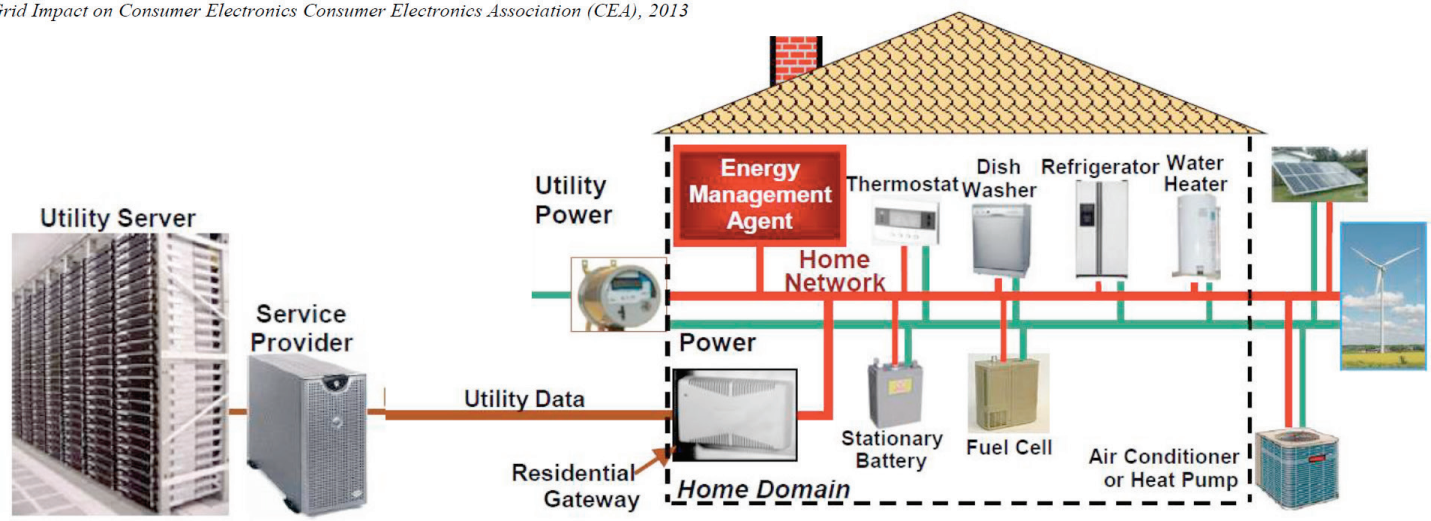
Building Energy Management

These signals enter the house through a **Home Gateway**.

Smart Grid Impact on Consumer Electronics Consumer Electronics Association (CEA), 2013



Distributed Load Control with an Energy Management System (via Utility or Aggregators)

Source: P. Siano

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Covid-19 and IEEE

The COVID-19 outbreak is incredibly fast moving, uncertain and complex.

We need to ensure that we are “READY FOR RECOVERY”, when we get back to the “NEW NORMAL”. Let us enhance cooperation, collaboration and community spirit.

For this we need to make IEEE broader so that IEEE is more relevant to the work our members do regardless where they work.

We need more participation from volunteers globally in IEEE governance. A broader based IEEE will make the Institute more relevant to technologists and academics from all parts of the world.

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Prof. Saifur Rahman

Past-President of IEEE Power & Energy Society
Past-Chair, IEEE Publication Services & Products Board

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