Integrating urban energy & transportation into user communities

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23 October 2014
Alstom Group
Clean Energy and Transport Solutions

Power Generation
Thermal & Renewables

Low & No-Carbon Energy Solutions
Renewables
Efficiency Improvements
Carbon capture & Storage

Grid
Smarter, more Reliable, more Flexible Power Transmission
Renewable Integration
Advanced Network Management
‘Evergreen’ Smart Grid Strategy

Transport
Faster, Cleaner and less congestion
High-speed Rail
Light Rail
Urban Tramways

Alstom Group
Clean Energy and Transport Solutions
Climate Change : A Choice of 3 Futures

2DS
a vision of a **sustainable** energy system of reduced Greenhouse Gas (GHG) and CO₂ emissions

The 2° C Scenario

4DS
reflecting pledges by countries to cut emissions and boost energy efficiency

The 4° C Scenario

6DS
where the world is now heading with potentially **devastating** results

The 6° C Scenario
A new revolution is required

Is a clean energy transition urgent? **YES**

Are we on track to reach a clean energy future? **NO**

Can we get on track? **YES**
Stress test on energy scenarios

The Adaptive Globe
A prolonged crisis and climate change ignorance cause a lack of necessary political and investment decisions. Power generation and grid infrastructure remain structurally unchanged. Global warming accelerates; climate change adaptation gets crucial and a market opportunity.

The Gas Wave
Gas is cheap and abundant, and comes with comparatively low carbon emissions – it is seen as the silver bullet for climate change mitigation, the readiness for a radical system change is low. Renewables take over at the end.

The Asian Dragons
Thanks to a determined top-down policy, Asia dominates the world’s power and grid market. While the dominant fuel is still coal, Asia starts developing a low carbon strategy, with a focus on CCS, nuclear, renewables, smart grid and storage. Western based producers of power and grid equipment are left behind.

Urban Sustainability
Smart Cities and consumers all over the world push and pioneer sustainability solutions in power and grid. A small-scale, distributed renewables boom leads to a smartening of the grids, changes in business models and new IT-players governing power and grid markets.

The 2°C World
A global effort curbs global warming to below 2°C by 2100, through massive reduction of CO₂ emissions from power generation and transportation. All low carbon technologies are utilised – renewables, CCS, and the necessary amount of nuclear – and a new smart grid layout allows for the integration of more intermittent sources.
How could this happen?

- Global mitigation negotiations stalemate
- Market security: price drops of small-scale PV and Wind
- Smart metering and Demand Response Programs
- New Smart City 3.0

2012
- Municipal Authorities, Consumers, and Industry drive cleantech revolution
- New players and social business models
- Erection of Storage and Smart Applications form Local Smart Grids
- No more new Coal & Nuclear plants in the West
New energy price profiles
Flatening base price with higher volatility

Need to balance consumption against renewables
New step in the electrification of urban transportation system

Significant impact on Distribution Grid Sizing

Strong expectations to connect charging points with EV drivers

Acceleration of multi modal transportation

Emerging needs for electrical & transportation infrastructure coordination
New Energy Positive Buildings

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2012: Grenelle 1
Low Consumption Buildings

2020: Grenelle 2
Energy Positive /Zero Net Buildings

Green Office®
Meudon (2008-2010)
Urban energy infrastructures are facing new constraints

- Increased energy density during peaks
- Deregulation & Real-time Pricing
- Difficulty to expand Grid Infrastructures
- The new active “Prosumers”
- Smart Energy Positive Infrastructures
- Integrated Mobility Services
- Urban Virtual Power Plant: An Eco city with generation and consumption capacity above 100MW interconnected with the global energy wholesale.

New coordination needs of Distributed Energy Resources
Need to turn « Consumer turning into active « Prosumers » leveraging IoT

Putting consumers at the center its energy & transportation decisions

- My CO2 footprint
- My energy demand response strategy (elec/gas/heat)
- My transportation strategy (EV/Public/Car Sharing)
- My Telecom/IT set of services

New IT Connection & real-time interactions
Emerging Community Energy Management & Retail Market Places
New multi-energy Microgrids

Challenger Eco District Microgrid

Real-time monitoring & benchmarking

Generation & storage management

Demand response management

Real-time carbon footprint measurement

Integrated green mobility

Grid Operator Interfaces
Next Steps

Initiate Large Scale Living Labs
Welcome in the new interoperable Smart City world!