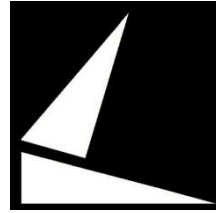


8-10 March 2011  
Manchester



**EES-UETP Protection of Future Networks with Distributed Generation**

# **Protection of Future Networks with Distributed Generation - Introduction**

**Prof Vladimir Terzija**



The University of Manchester

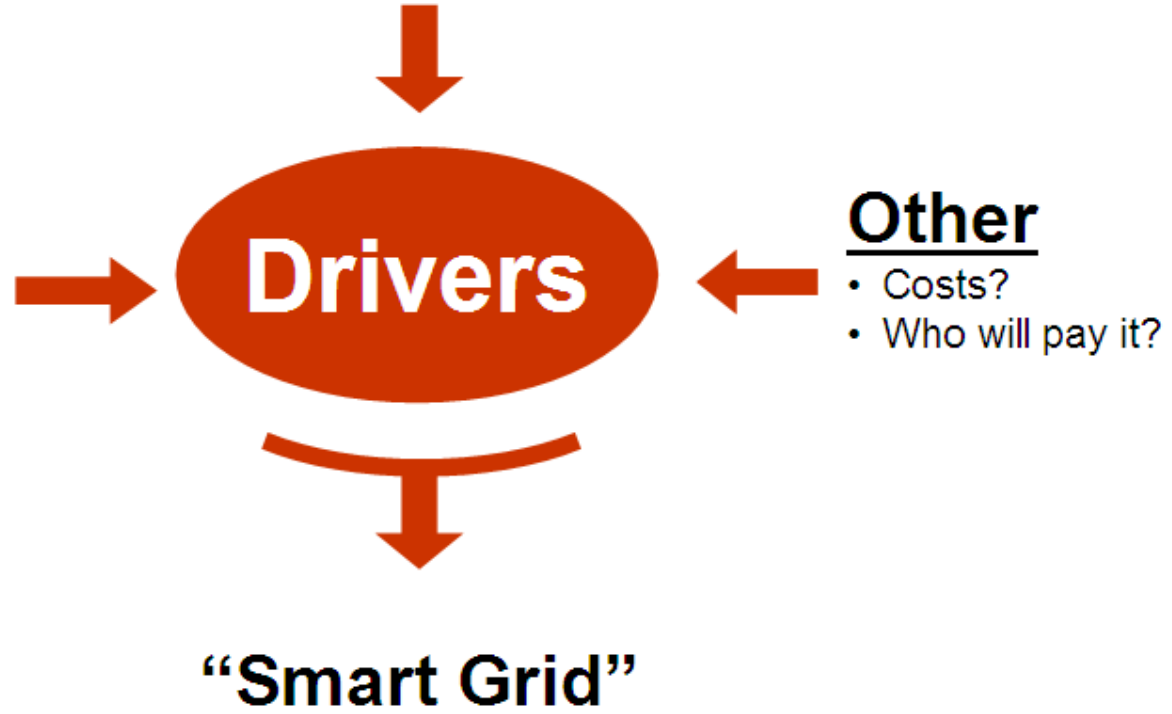
## Key Drivers For Change:

## Technologies

- Information and Communication Technology
- Distributed resources, Storage, Electric Vehicles
- Advanced protection and control
- Advanced metering and monitoring

## Performance

- Aged Infrastructure
- Energy efficiency
- Renewable energy
- Power quality
- Reliability and security
- Increased uncertainty level



## Other

- Costs?
- Who will pay it?



# Emerging Trends in Energy Investments

Electrical Energy is best viable source of untapped new energy

- Renewable energy (wind, solar, geothermal, bio-mass, ocean tide, etc.)
- Need for massive electricity Storage
- Deployment of Plug-in Hybrid Electric Vehicles (PHEV) – Major system impact
- Carbon Sequestration Technologies
- Energy efficiency and Demand response
- Nuclear power

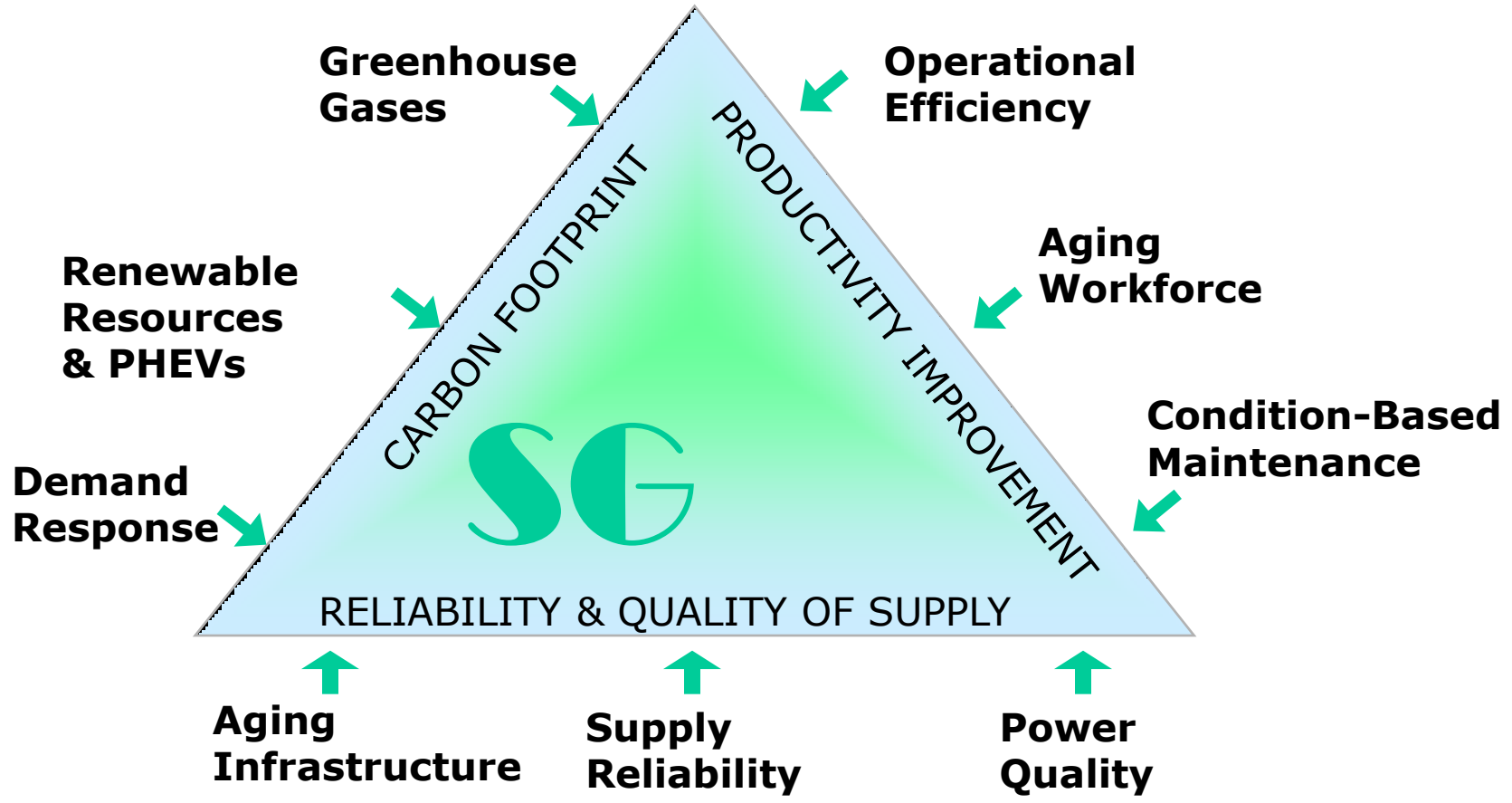
Requires system infrastructure reinforcement,  
integrated system planning and automation

Complex infrastructure requires “Smart Grid”



# Smart Grid Business Drivers

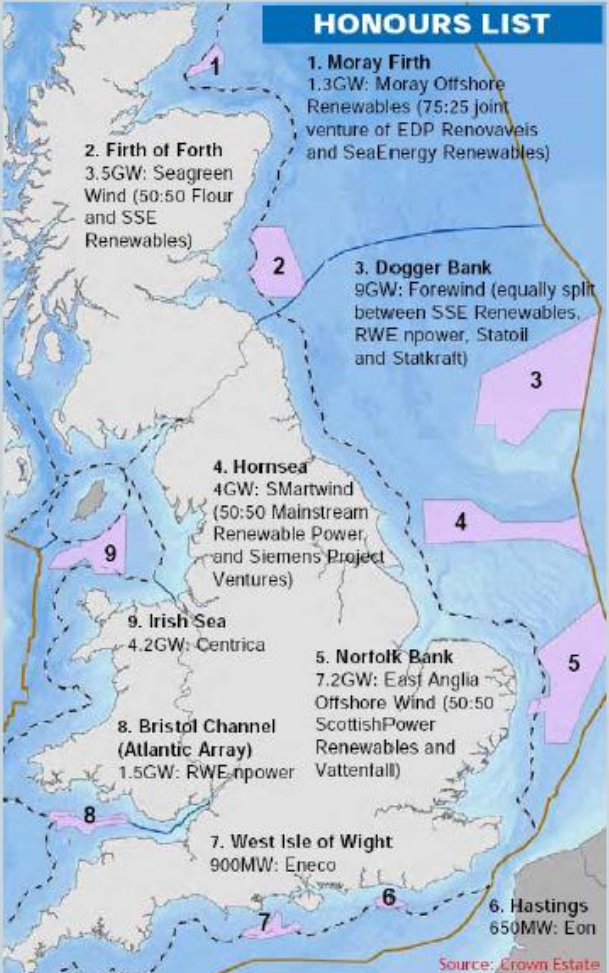
## New Business Environment



# National Grid Vision 2020

## Total Plans for Offshore Wind by 2020 > 40GW

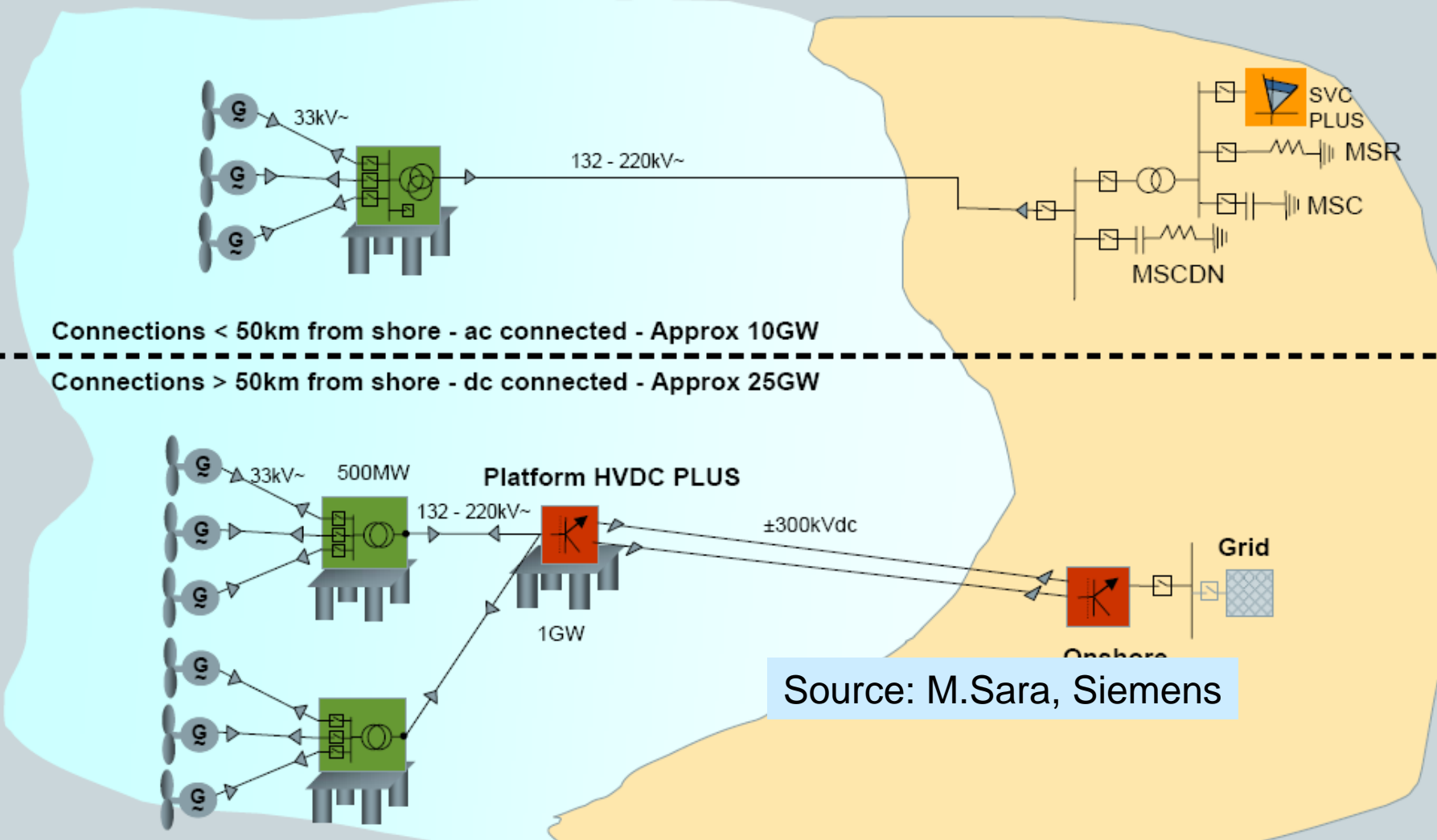
Round 3:



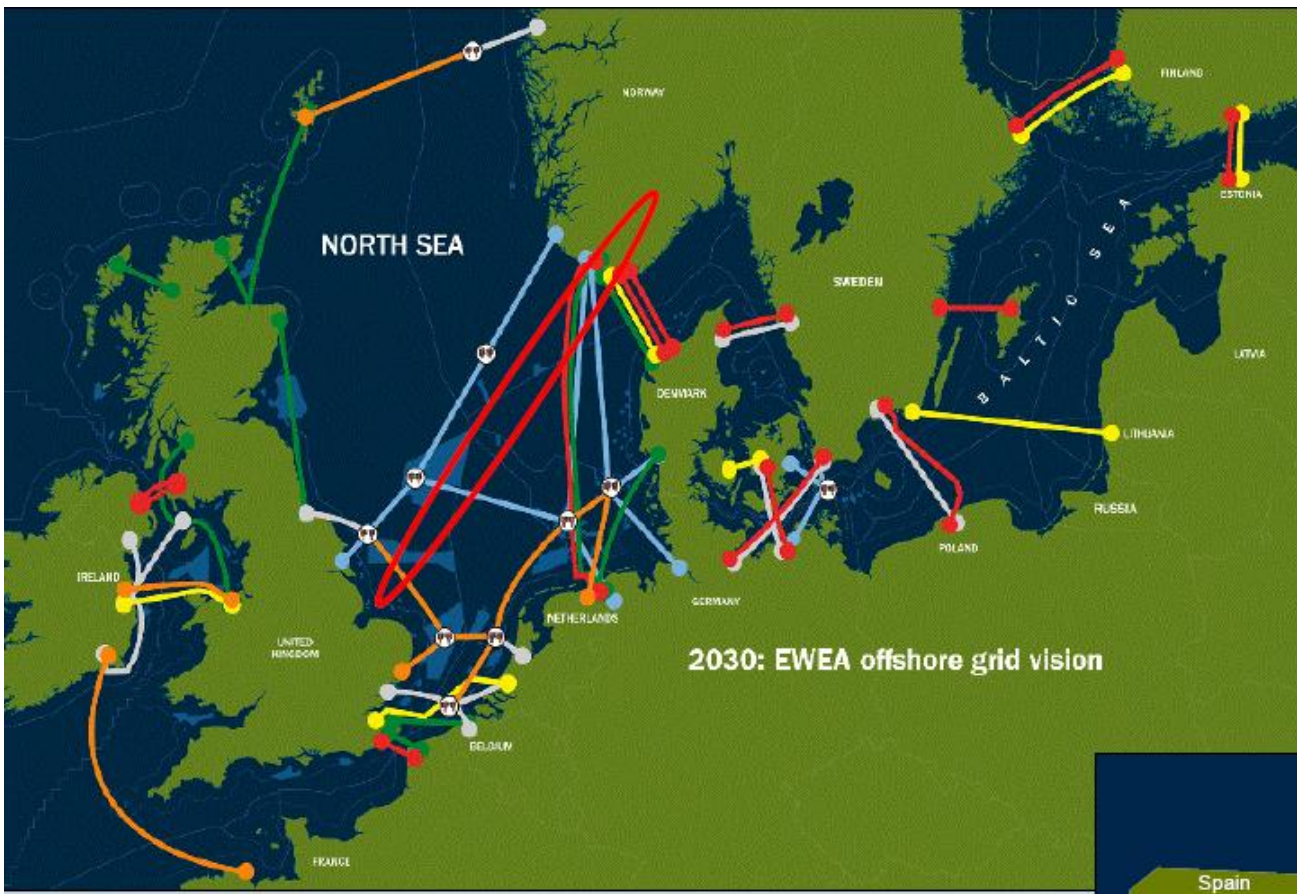
- Remaining Round 2 Projects 6GW
- Round 3 Projects 32GW
- Large onshore windfarms in Wales/Scotland 4GW

Source: M.Sara, Siemens

# National Grid Vision 2020



# The European SuperGrid



Operational	7,350MW
Planned	4,950MW
Under Study	10,400MW
Under Study (with EWEA Recommendation)	9,600MW
EWEA Recommendation	7,100MW (2020) – 11,100MW (2030)

€13bn+  
of investment



# A Need For New Protection Concept and Principle !

