The Supergrid, Integrated Marine Information for Offshore Wind and Marine Renewable Energy

Ana Aguado, CEO Friends of the Supergrid
John Shaw, CIO Mainstream Renewable Power
06 June 2011

Introduction

By 2050 there will be a transition to large-scale Offshore Wind Farms in the North Sea.

The Supergrid will enable efficient distribution of this new energy resource

An Integrated Sea information System is needed to accelerate this transition: ISIS.

To create ISIS, new policies, new standards, greater cooperation and innovative Information and Communication Technologies are needed.

Open Integrated Seabed Information System

- Mainstream Renewable Power
- Offshore Wind in Europe
- Offshore Wind Developers' needs
- Supergrid's needs
- Data Management initiatives
- Integrated Sea Information System
- Next Steps

Open Integrated Seabed Information System

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Vision

Mainstream Renewable Power was founded by Dr. Eddie O'Connor in February 2008.

" Our vision
is of thriving economies and communities
liberated from the restrictions of fossil fuels,
using
renewable energy
as their
mainstream source of power. "

The world is experiencing a **once-off historical transition** to sustainable fuels: Each one of our 195 countries must go through it.

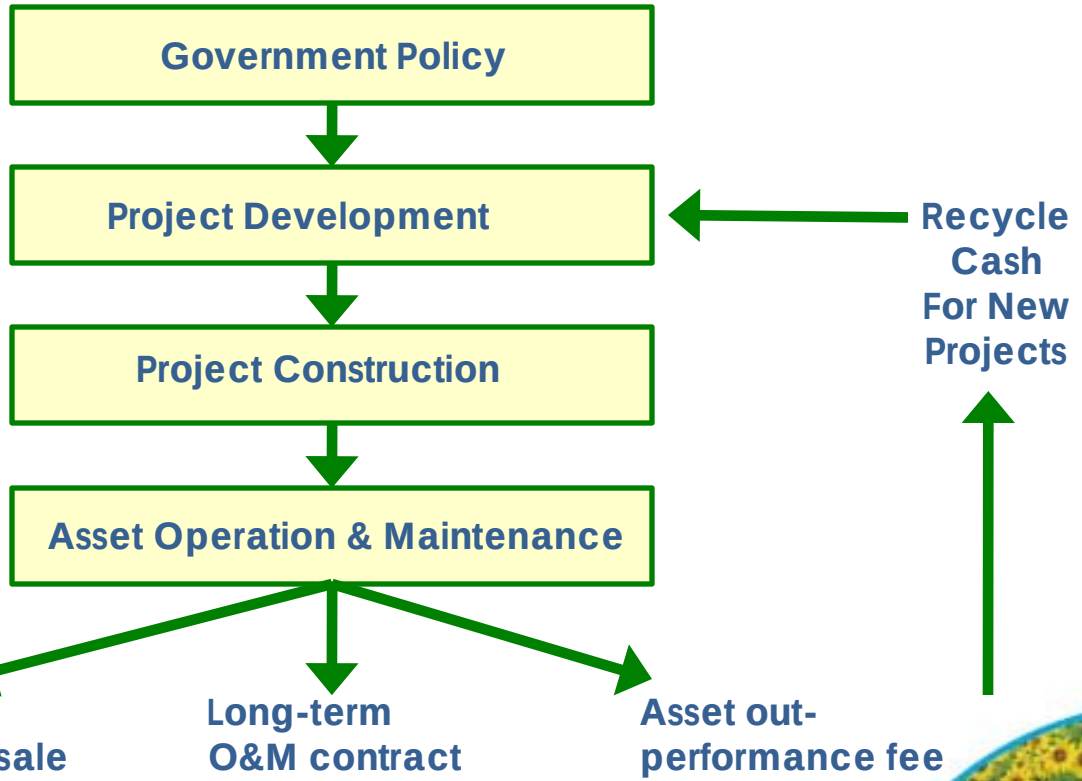
4 fundamental issues drive this transition ;

- **Climate change**
- **Ever-increasing Demand for Energy**
- **Rising Fossil Fuel Prices**
- **Energy Security**

This Vision demands a strong Business Model

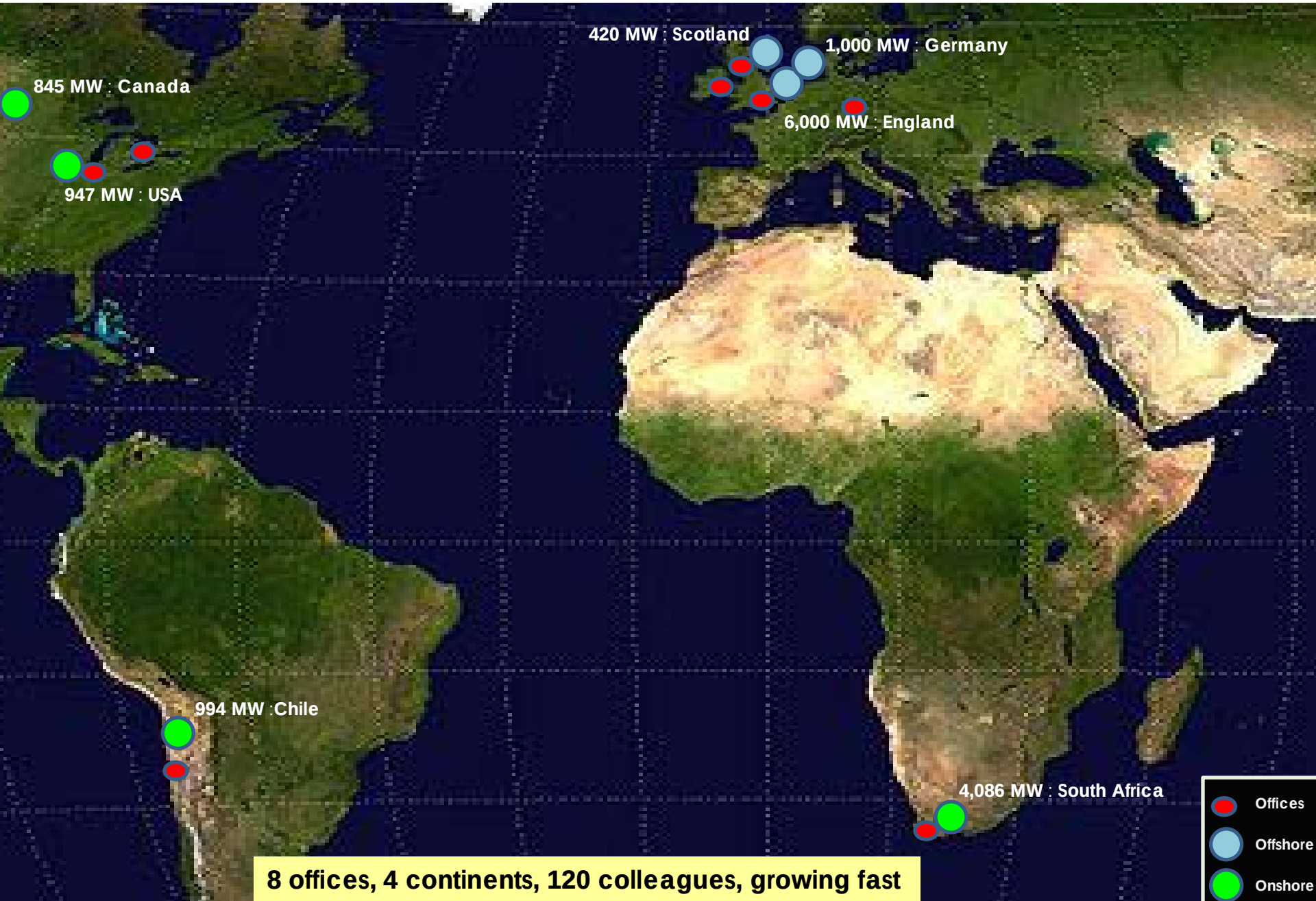
Mainstream's Business Model

- **Sustainability as a business** is what we do at Mainstream : wind & solar.
- **Mainstream's business model spans 4 key areas ;**



A sustainable pipeline of Renewable Energy projects secured

Mainstream's 14,000+ MW Projects' Pipeline



8 offices, 4 continents, 120 colleagues, growing fast

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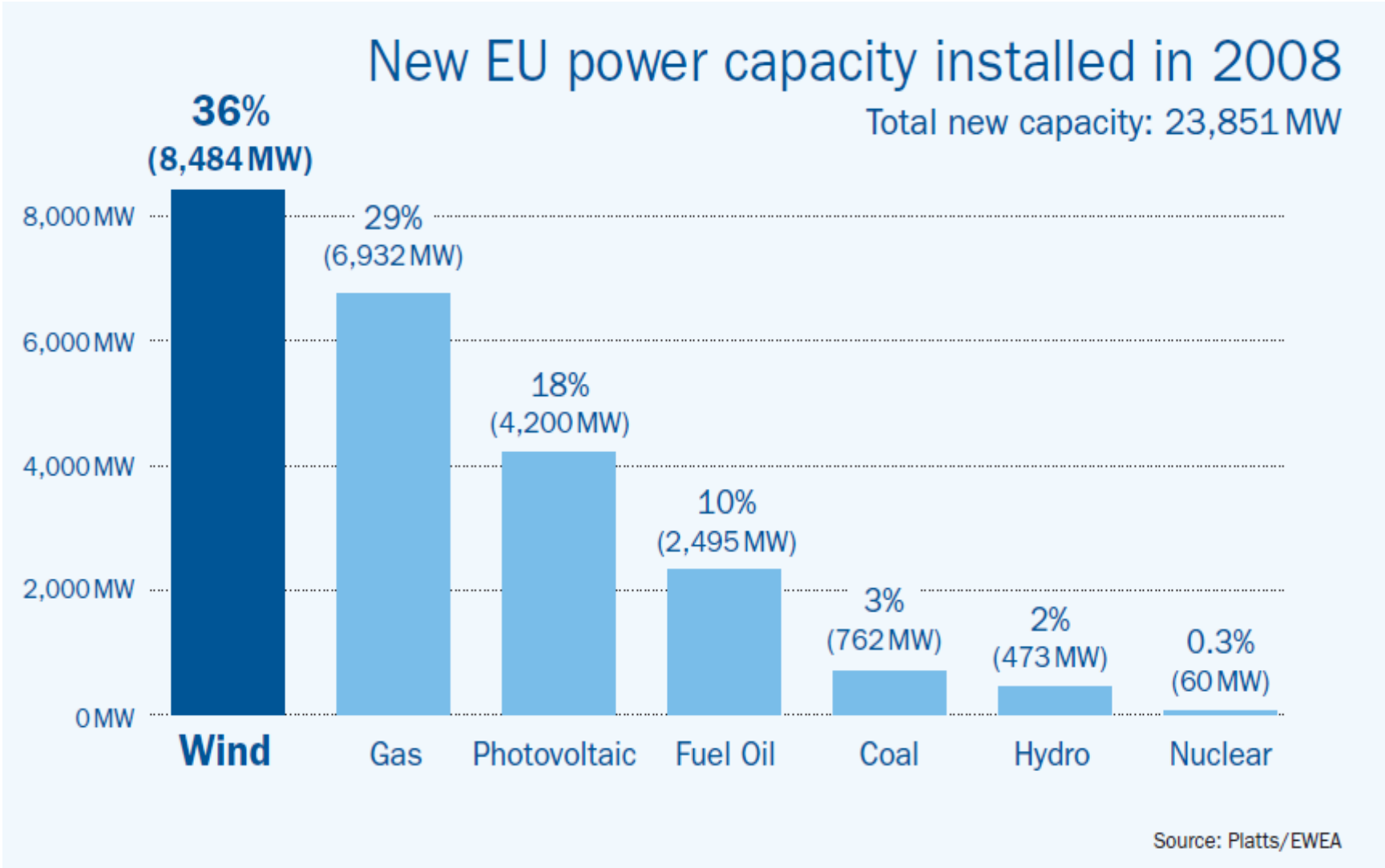
EU Energy Perspective : Current Investment Mix



> 50 % of new Generation Capacity from Wind & PV

EU Energy Perspective : Where is the Wind Resource?

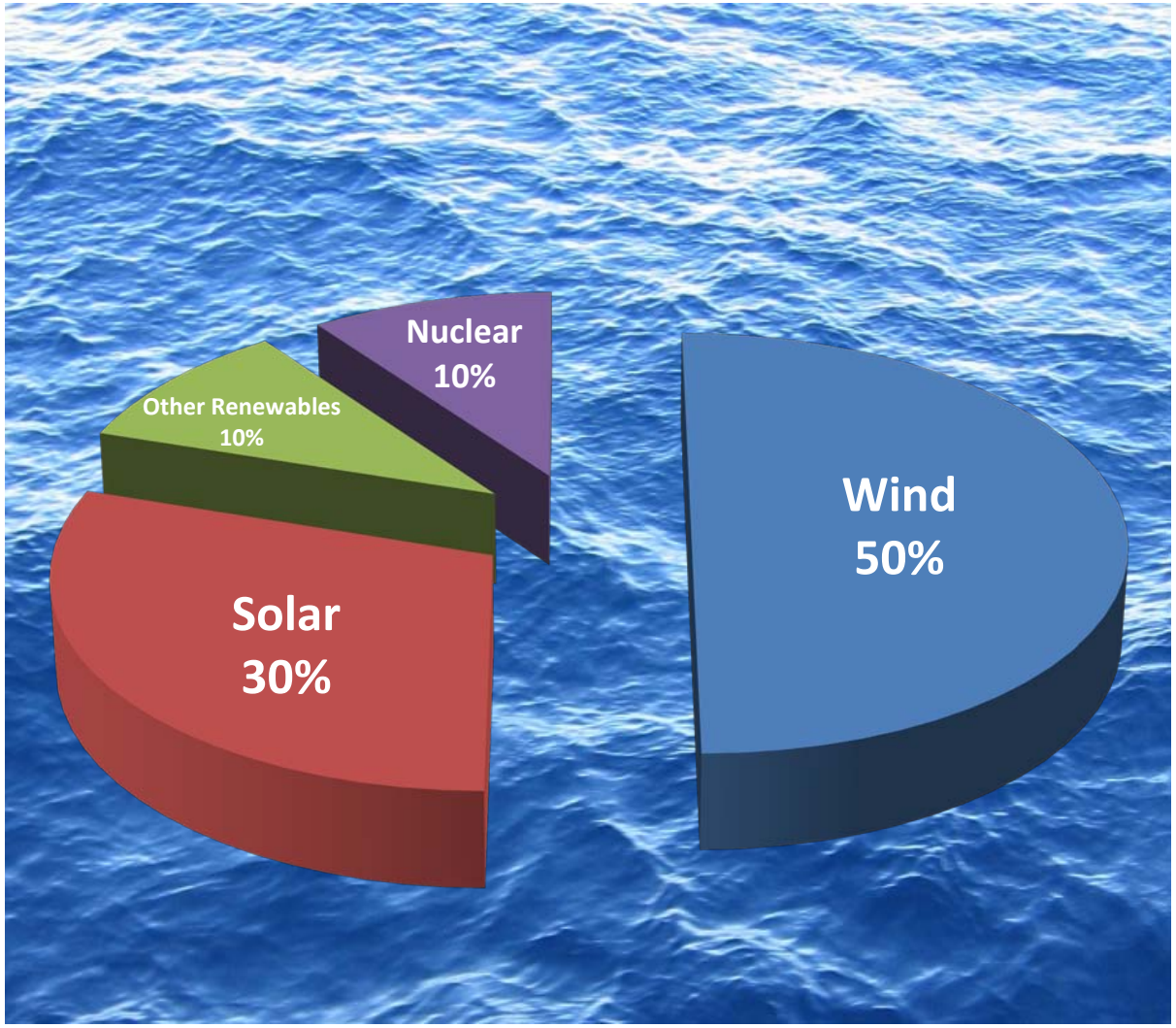
- **1,800,000 MW** of installed Wind Power needed by 2050
  - Based on projected 2050 energy requirements
- **200,000 MW** from Onshore Wind : the limit
  - The limit because Europe is the world's most crowded Continent
- **1,600,000 MW** from Offshore Wind
  - Plenty of space to grow beyond this target
  - Achievable at €3,600,000.00 per MW installed

Equates to :

- **€5.8 Trillion** investment in Offshore Wind Turbines by 2050.
- **€0.6 Trillion** investment in associated Offshore transmission and distribution.

European Offshore Wind is a €6.4 Trillion Investment opportunity

EU Energy Perspective : 2050 Mix



Energy Demand

Offshore Winds farms are needed for Europe to meet Green House Gas Targets

Interconnection across EU member states is needed to enable Offshore Wind

Interconnection, or Supergrid is vital for delivery of any 2050 scenario

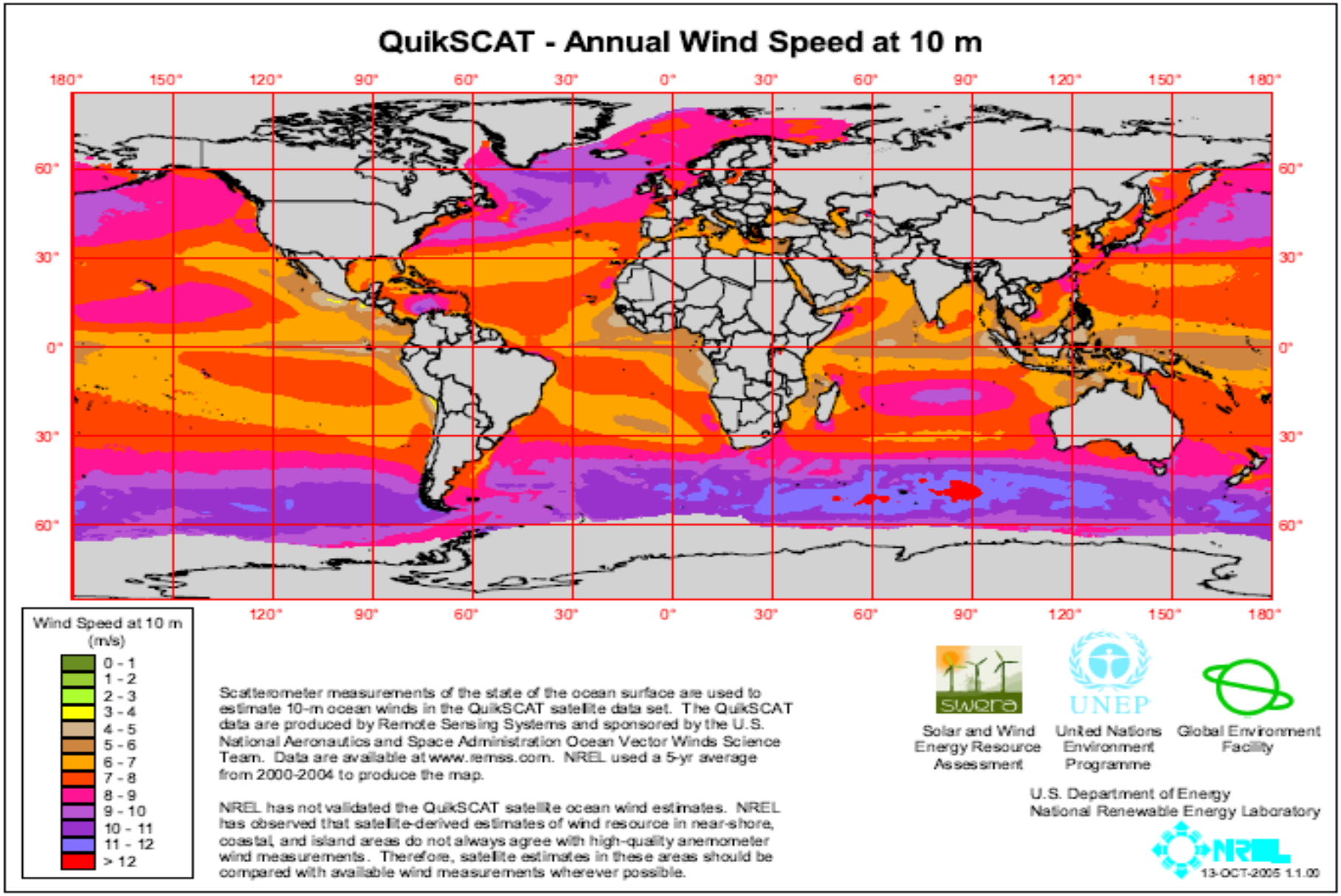
2020 offshore grid connections must be Supergrid-compliant

> 80 % of Generation Capacity will be from Wind & PV

Video : 2050 Challenge

Click Here

Offshore Wind Resource



Offshore Wind in the North Sea represents Europe's best option

Europe's Electricity Demand

Europe's Power Demand

EU27 Demand (2008): **3,200 TWh**

Offshore Wind Power Available

Area considered with 5MW/Km^2	
North Sea:	**35,700,000 MW**
Mediterranean Sea:	**12,500,000 MW**
Total	**48,200,000 MW**
Equates to:	**161,000 TWh**

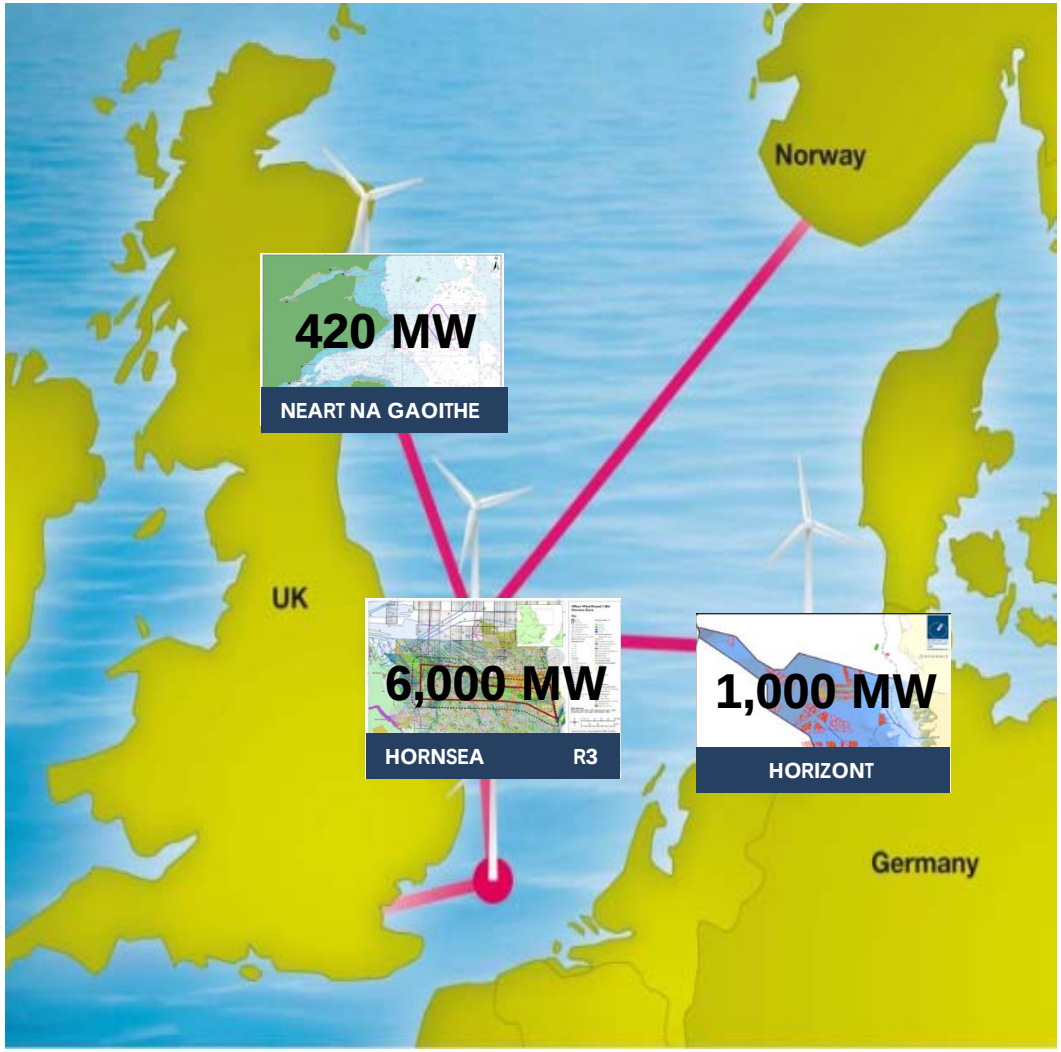
Conclusion :

Demand	**3,200 TWh**
Supply	**161,000 TWh**
Supply v Demand	**x 50**

Mr Brian Hurley, Wind Site Evaluation Ltd.
Offshore Wind Resources in Europe
Marseilles, March 2009

Offshore Wind in the North Sea can meet Europe's need, 50 fold

Mainstream's Projects in the North Sea



Key Features

•**Excellent** wind resource

•**Convenient location** for major energy consumers

•**10 countries** are now focused & organised to developing this resource

•**Mainstream** has 3 projects in the North Sea:

- •Germany
- •Scotland
- •England

• **33,000 MW** of Offshore Wind Round 3 Development licences issued by Crown Estate in UK waters

Offshore Wind Farms in the North Sea will deliver the EU Energy Strategy

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What Offshore Wind Developers Need

- **Mainstream's fundamental belief is that marine data is a Public Good.**
  - It should be collected once and used many times.

- **Key needs ;**

  - **Accessibility and Management:**
    - **Clear policy of ownership**, licensing & access for all publicly funded data collection
    - **Single point of access** to marine data and information
    - **Discourage cost-recovery pricing** from public bodies

  - **Data Standards and Quality control:**
    - **Common standards** across jurisdictions and disciplines
    - **Ensure the above is addressed** in publicly funded data collection contracts

  - **International Coordination:**
    - **Harmonised approach** across the EU in relation to all of the above:
    - **Links** provided and maintained to EU/global databases and initiatives

- **Benefits of improved data management ;**
  - **Measurable reductions in costs** to find, access and retrieve data
  - **Wider and more reliable** data and information upon which to base assessments
  - **Mechanisms to share results** and data with stakeholders

Offshore Wind Energy Developers want to reduce Project Risk

Offshore Business Process

5 % of the € 6.4 Trillion investment will be for ICT
Equates to € 320 Billion ICT investment

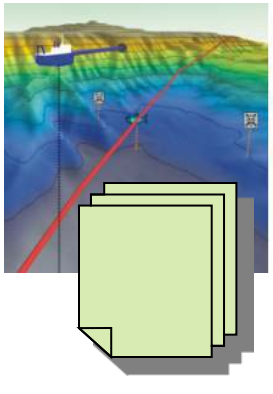
Survey

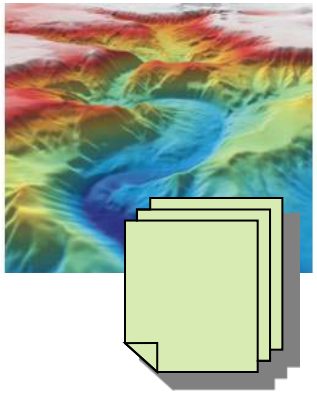
Construct

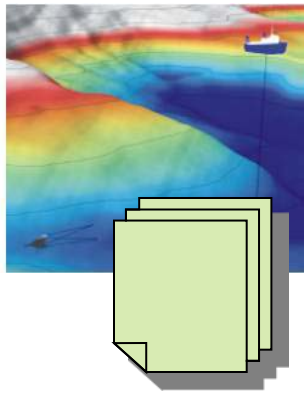
Operate

Business needs to...

Identify & Mitigate Risks
Accelerate Surveying
Accelerate Construction
Connect & Distribute Power







Information needed :

Surveying
Modelling
Turbine Control Systems
Wireless Communication
Power Distribution Management
Project & Document Management
Risk Management

Reducing Risk is all about Data

Open Integrated Seabed Information System

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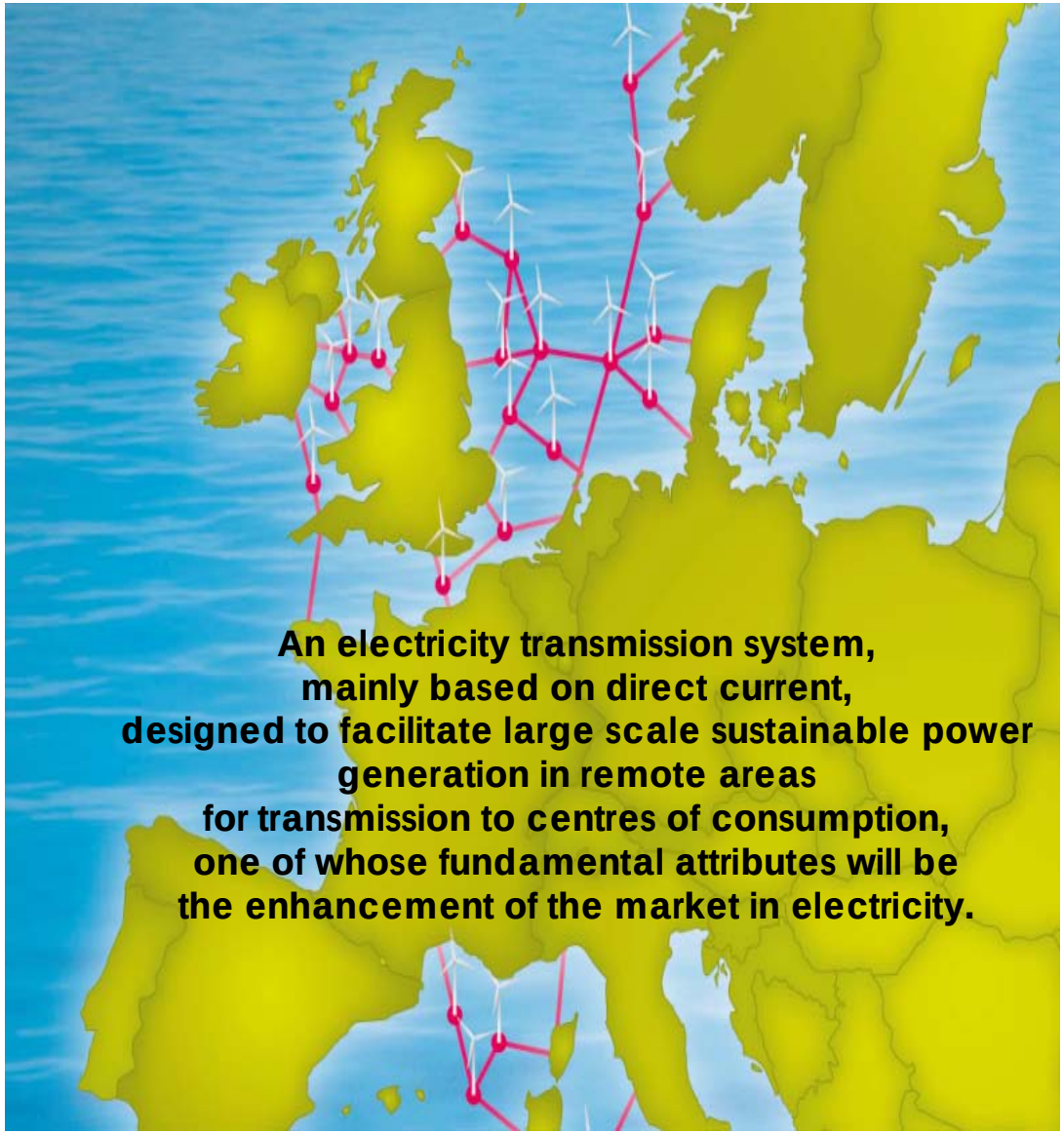
Supergrid



Key Features

- **A new transmission backbone** for Europe's decarbonised power sector
- **Enables distribution of energy** from 1,600,000 MW Offshore Wind Farms
- **A transformational approach** to electricity generation and distribution
- **Captures clean energy generation** and delivers firm renewable power across Europe
- **Goes beyond** existing point-to-point interconnectors
- **Innovative technology needed** to deliver HVDC Supernode technology
- **Requires a strategic partnership** across the Supply Chain
- Cost to build Europe's Supergrid;

€0.6 Trillion Offshore Supergrid
€0.6 Trillion Onshore Supergrid

The wind is always blowing somewhere; Supergrid creates portfolio effect

Supergrid Consortium

The consortium represents companies and organisations with a mutual interest in promoting the policy agenda for a European Supergrid.

CEO Ana Aguado run the Consortium which exists to accelerate the Supergrid via a 5 point strategy:

1. Develop Standards
2. Create Offshore Transmission Operator
3. Establish EU Regulations
4. Create Single Electricity Market
5. Establish legal basis for trading

AREVA

DEME Blue Energy

elia Powering a world in progress

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MAINSTREAM RENEWABLE POWER

HOCHTIEF CONSTRUCTION AG

3E

GE

Nexans

Visser & Smit Marine Contracting

SIEMENS

PRYSMIAN CABLES & SYSTEMS

Smart solutions. Strong relationships.

VATTENFALL

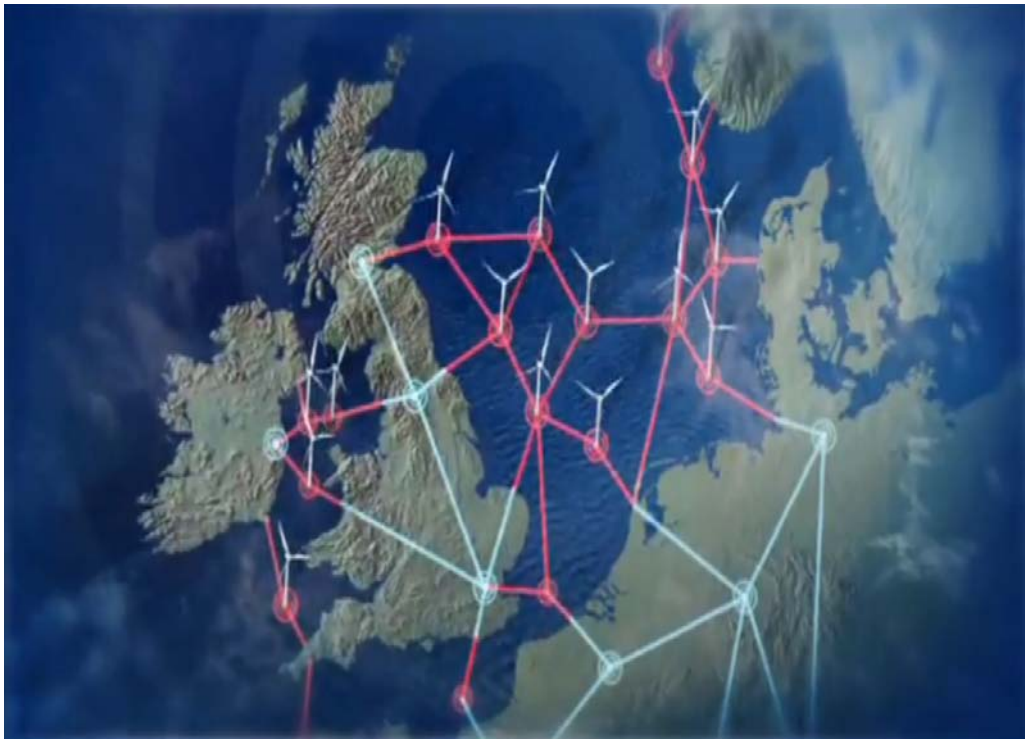
PB PARSONS BRINCKERHOFF

The Consortium has 20 members so far

Video : 2050 Supergrid

Click Here

Europe's Supergrid in 2050



7 Innovation Trajectories are needed;

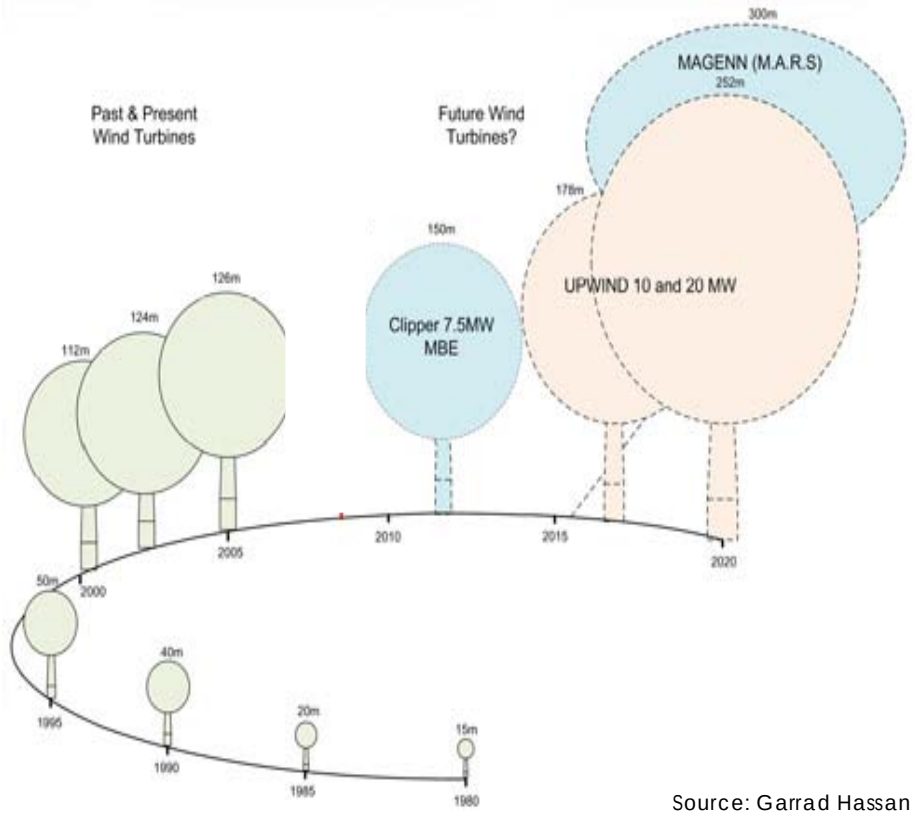
1. Bigger Wind Turbines
2. HVDC Transmission Cables
3. Supernode
4. Next-Generation Civil Engineering
5. Bigger Construction Vessels
6. Bigger Ports
7. Better ICT

Dr Eddie O'Connor, Mainstream Renewable Power
Supergrid Launch
London, March 2010

An inevitable transition to Sustainability with 7 Innovation Trajectories

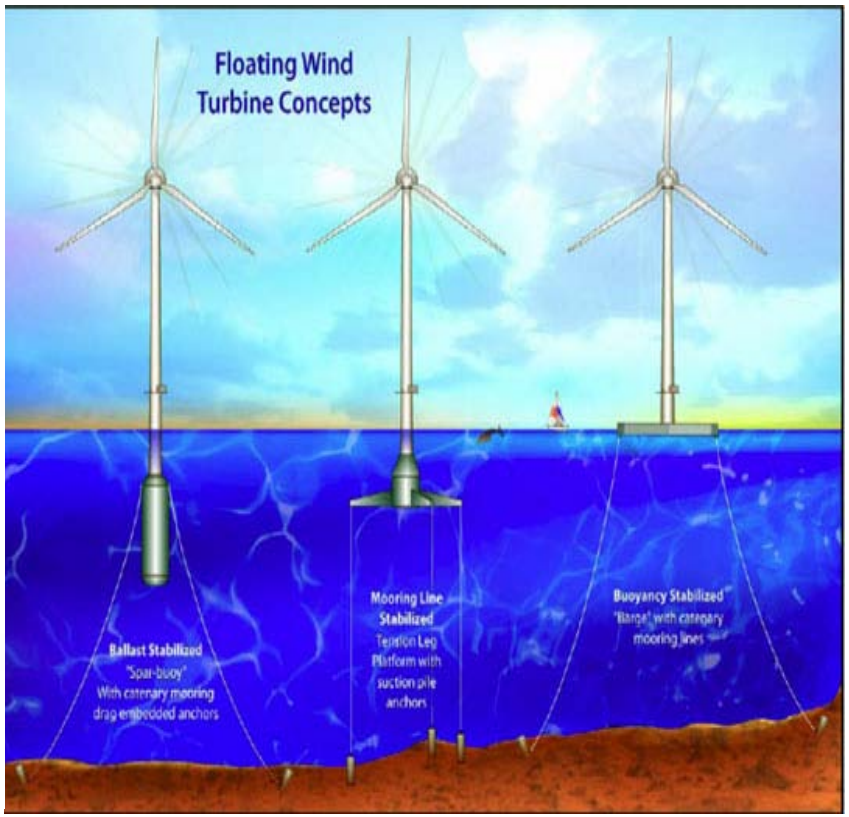
Innovation # 1 : **Bigger Wind Turbines**

Turbines will get bigger : 20 MW



Source: Garrad Hassan

Floating Turbines will be viable

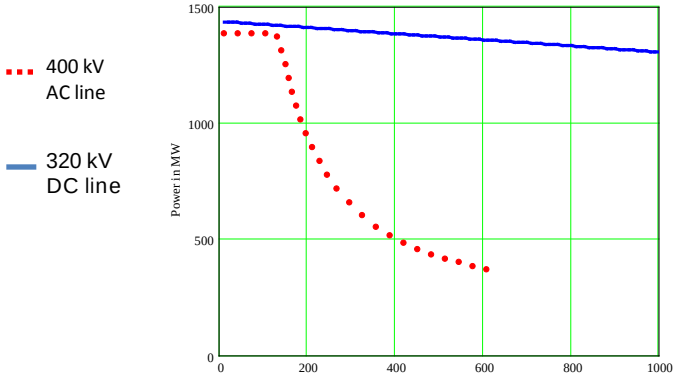


Dr Eddie O'Connor, Mainstream Renewable Power
C & F Offshore Summit
London, April 2009

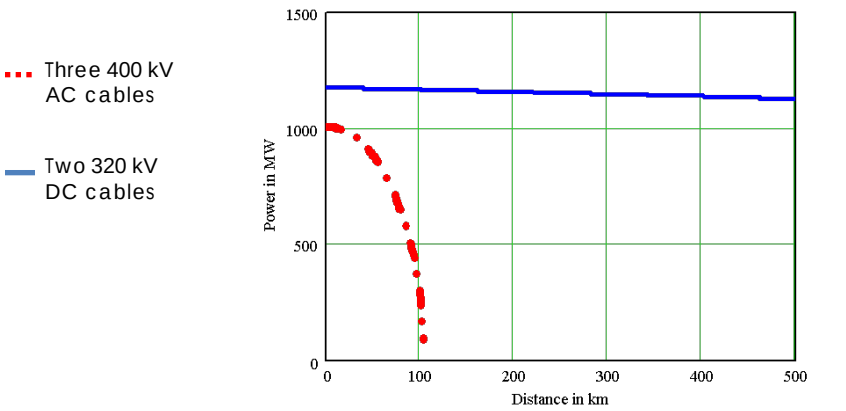
Bigger, better turbines are needed

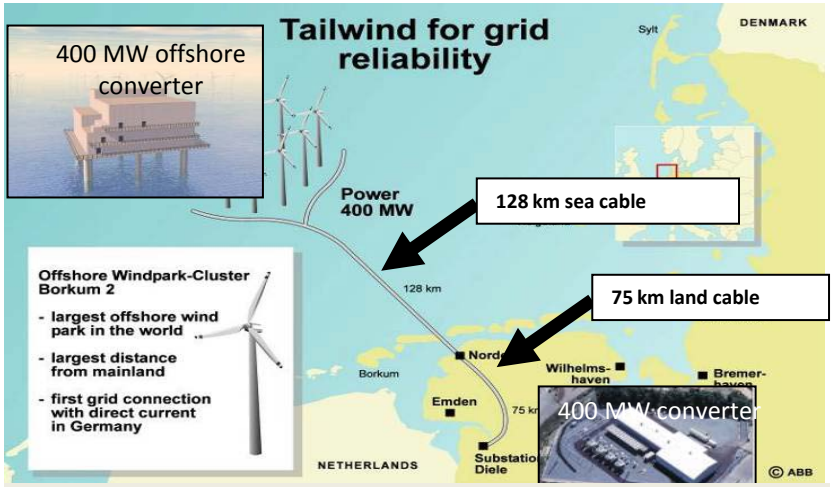
Innovation # 2 : **HVDC Transmission Cables**

Overhead Cables



Sea Cables



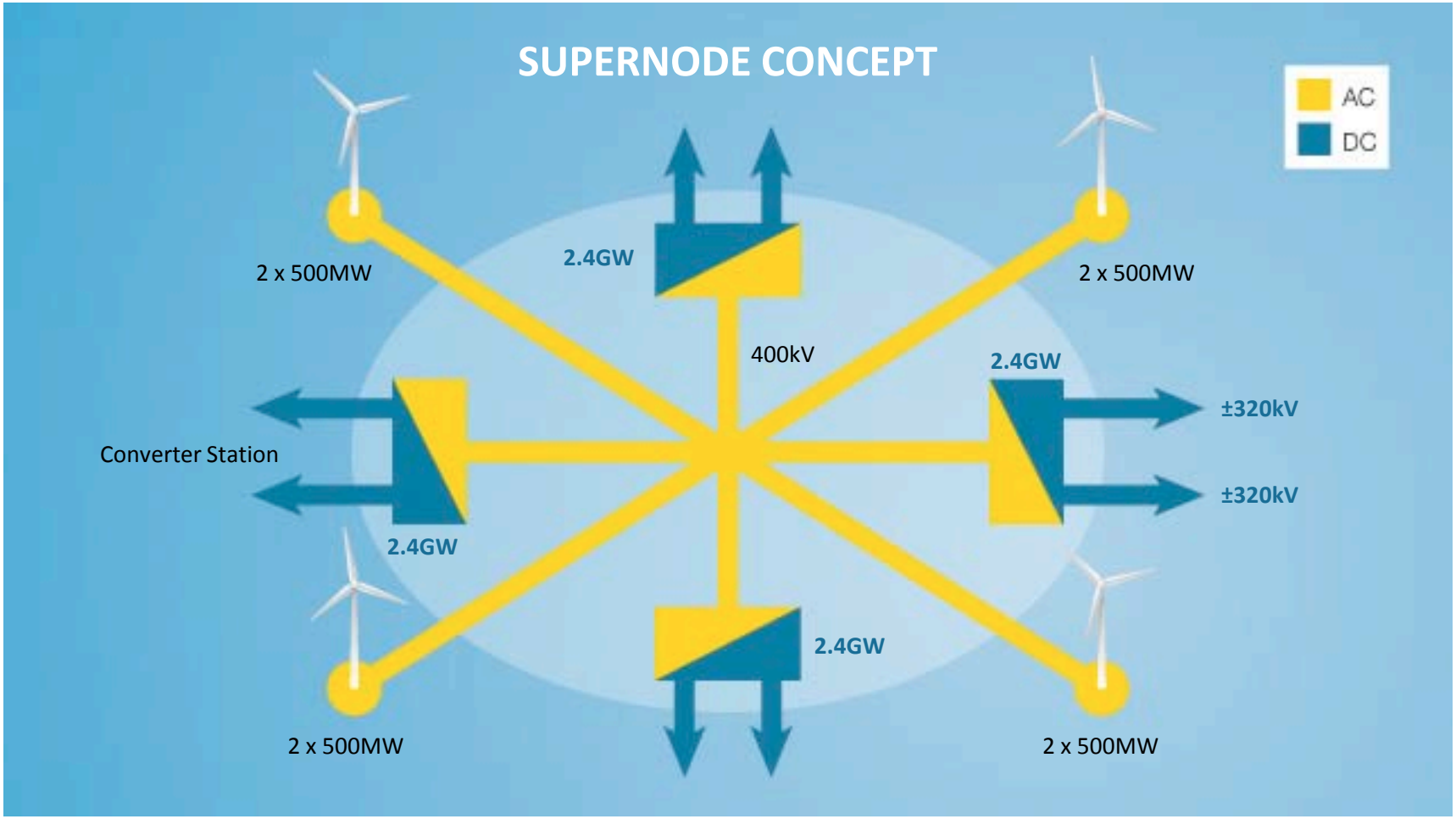


E.ON Netz, Borkum 2, 400 MW HVDC Light

Mr Gunnar Asplund, ABB
HVDC Supergrid - Technology and Costs
Marseilles, March 2009

HVDC uses proven technology

Innovation # 3 : **Supernode**

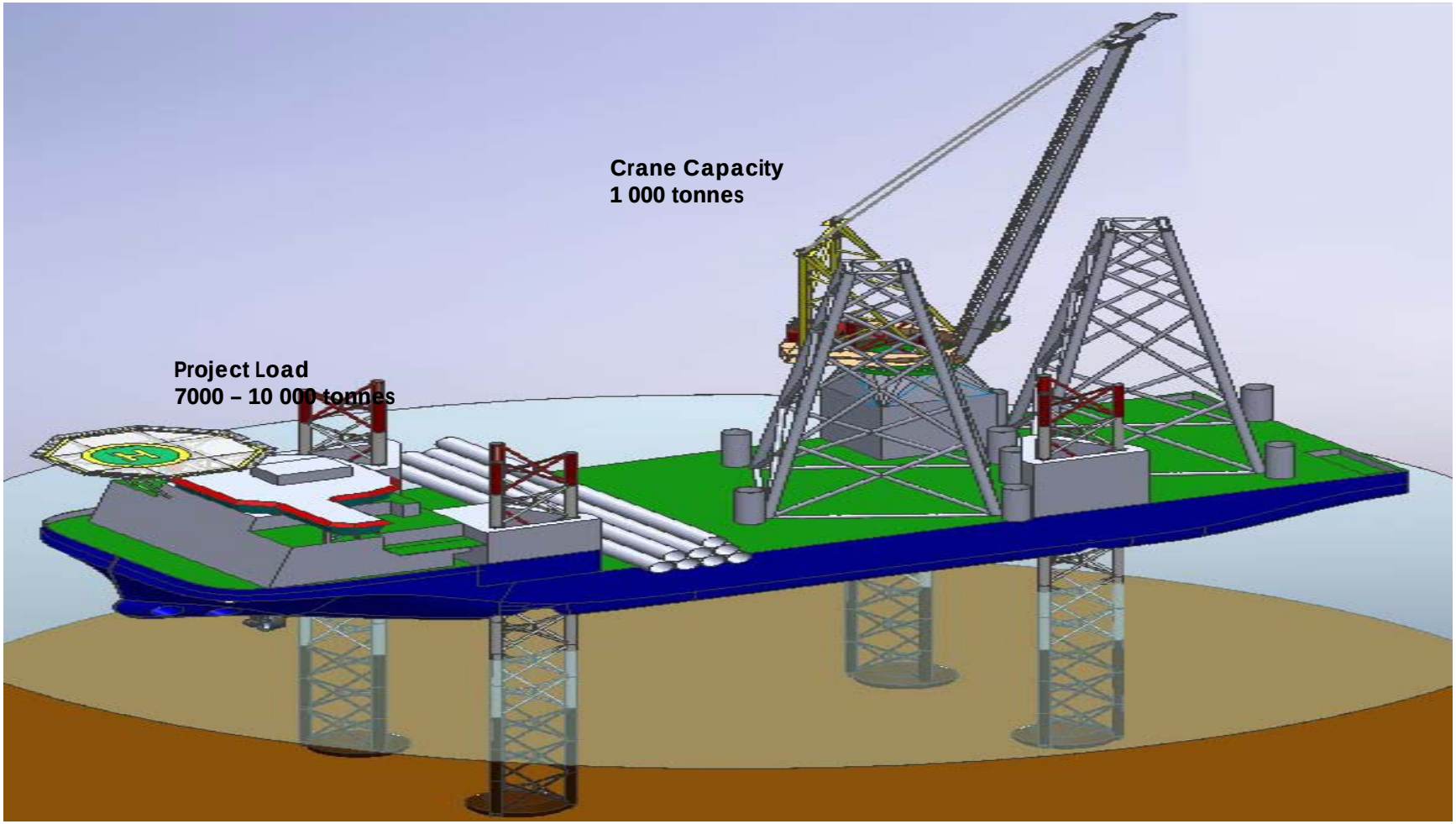


Mr Joe Corbett, Mainstream
Detailed design of the Supernode
Marseilles, March 2009

Supernode is a proven concept

Innovation # 4 : **Next Generation Civil Engineering**

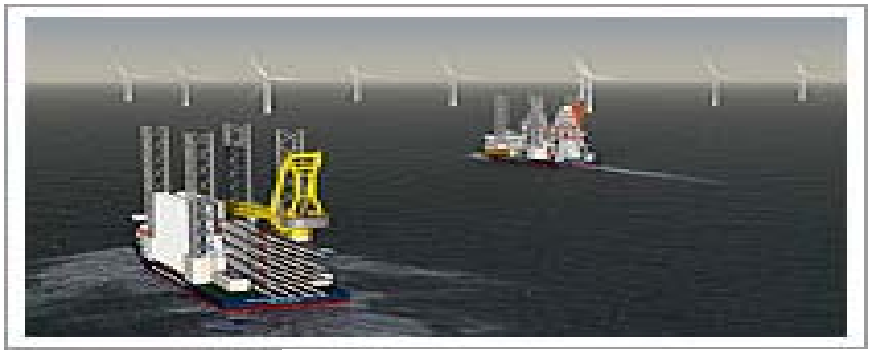
Offshore wind Jack-up



Mr Fenno Leeuwerke, Hochtief Construction
Building at Sea and 3rd Generation of Ships
Marseilles, March 2009

Bigger, stronger Jack-up Technology

Innovation # 5 : **Bigger Construction Vessels**



Mr Fenno Leeuwerke, Hochtief Construction
Building at Sea and 3rd Generation of Ships
Marseilles, March 2009

Bigger Ships for bigger loads

Innovation # 6 : **Bigger Ports & Better Logistics**

Requirements for UK's Offshore Plans;

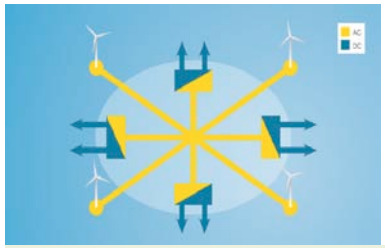
- Develop two completely new ports
- One on either coast of the UK
- More than transport nodes
- Focal point for regional development
- Centres of excellence for R + D
- Training centres for technologists/technicians
- New manufacturing centres

Dr Eddie O'Connor, Mainstream Renewable Power
C & F Offshore Summit
London, April 2009

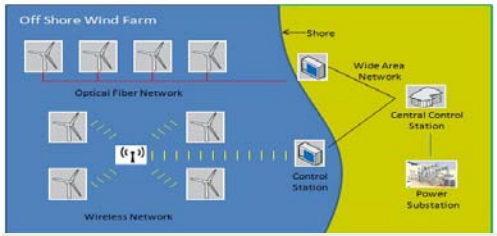
An entirely new approach to Logistics is needed

Innovation # 7 : **Better Information Technology**

Power Distribution Management

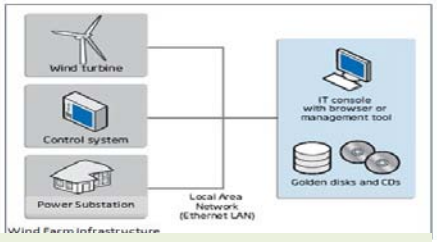


Supernode Power Controls

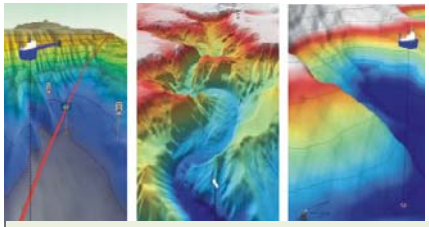


Hi-Speed Wireless Communication

Monitoring & Controlling Risk



Wind Turbine Control Systems



Surveying & Modelling the Sea

John Shaw, Mainstream Renewable Power
ICT Strategy for Offshore Wind

Better ICT will add value throughout the business process

Video : 2050 Forward

Click Here

Better ICT will add value throughout the business process

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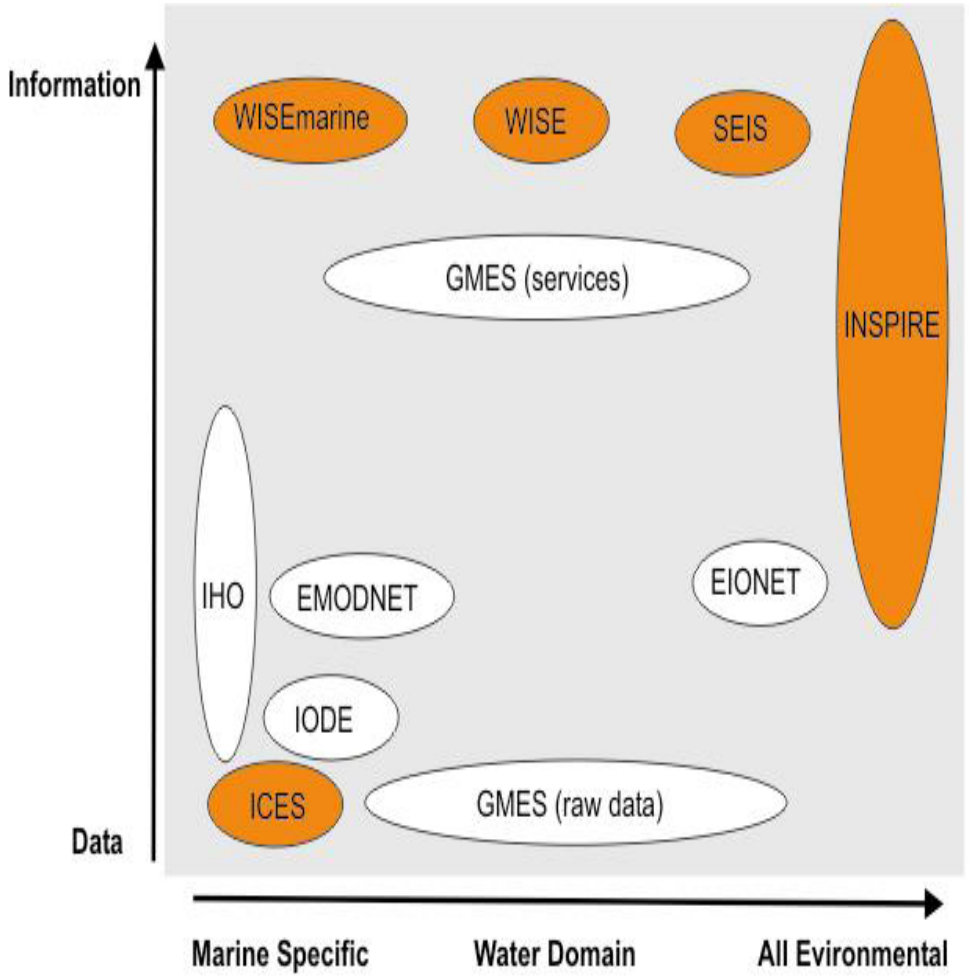
EU & Marine Data Management



Shading = initiatives to manage data to satisfy EC Legislation

- 4 EU Directives in particular impact industry:
  - **Marine Strategy Framework Directive –** *'establish and implement coordinated monitoring programmes for ongoing assessment of the environmental status of [member state] marine waters'*
  - **INSPIRE Directive** – *'adopt measures for the sharing of data sets and services between public authorities for the purpose of public tasks and the Environmental Information Directive'*
  - **Birds and Habitats Directive** – *'establish a network known as Natura 2000 (SPA, SACs)*
  - **Data Collection Framework for Fisheries** – *'collect, manage and provide high quality fisheries data for the purpose of scientific advice, mainly for appropriate fisheries management decisions'*

There are many directives and initiatives underway

Marine Knowledge 2020

Marine Knowledge 2020 :
Marine Data and Observation for Smart and Sustainable Growth

Launched 13 September 2010

Led by Iain Shephard

Key Objectives

This Initiative from the Commission will ensure the following are achieved ;

- ***Data from the EU-supported*** *research programmes are more available for re-use*
- ***Common*** *standards and policies*
- ***Contribute towards*** *an interoperable global marine knowledge system*

Cost

- €110.0 Million spent per year by EU on marine data collection
- € 18.5 Million additional allocation per year for EU's Marine Knowledge 2020 initiative

Offshore Wind Developers need to contribute to Marine Knowledge 2020

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Convert Data into Wisdom

Offshore Data Types

Depth Bathymetry
Wrecks Magnetometer
Seabed Sidescan Sonar
Sub-Strata Boomer
Mapping ESA Satellites

Wind MetMast, Lidar

Foundations Geotechnics

Waves & Currents Oceanography

Flora & Fauna Ecology

Regulatory Reports Consultancy

Risk Prediction & Mitigation

An Integrated Sea Information System (ISIS) is needed : doesn't currently exist

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Identity & Address ISIS Barriers

- **Innovation is inhibited by data licence issues:**
  - **Data licence issue** throughout European waters
  - **Over 400 legal entities** have licensed ownership of data in Britain
  - **Need EU Data Ownership Policy**

- **Innovation is inhibited by regional data strategy variation:**
  - **National data archives** are at different levels of maturity
  - **Low Interoperability** of data and metadata across EU
  - **Need EU standard** for data archives

- **Role for EU Commission:**
  - **Build on existing progress** made by data communities
  - **Provide sustainable funding** for Innovation
  - **Provide framework** for licensing and re-use of data

There is a compelling need for Standard Policy

Conclusion

Offshore Wind will meet Europe's Energy objectives

The Supergrid is the key enabler for Offshore Wind

ISIS will accelerate Offshore Wind Energy Development

ISIS needs a consortium from across Industry, Commission, Academia to define policies, standards and specifications

Further information

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