

Simpler Faster Better ICT Strategy

with

Smart Energy Reference Architecture

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CIO

Mainstream Renewable Power

23 May 2011



Overview

**Sustainability as a Business is what we
do at Mainstream**

**The Smart Energy Reference
Architecture (SERA) delivers a
Sustainable ICT Strategy for
Mainstream**

**The approach taken at Mainstream can
be implemented at other
Companies seeking a simpler, faster,
better ICT Strategy**

Simpler, Faster, Better ICT Strategy with SERA

- A. Mainstream's Business Perspective**
- B. Business Systems' Strategy**
- C. Technology Roadmap & SERA**
- D. Benefits of SERA**



Simpler, Faster, Better ICT Strategy with SERA

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Vision

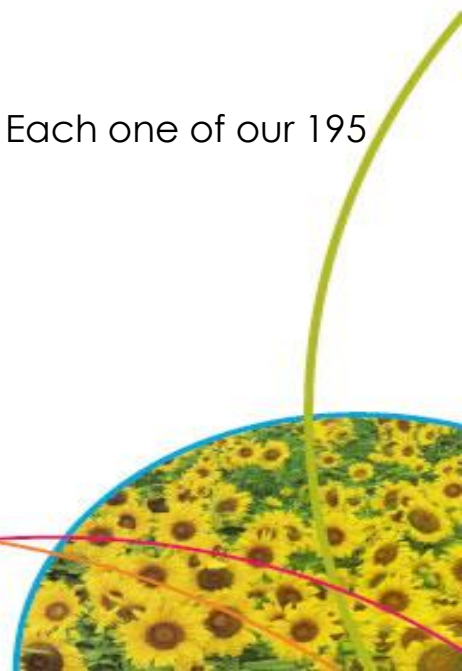
Mainstream Renewable Power was Founded by Dr. Eddie O'Connor in February 2008.

*“ 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.

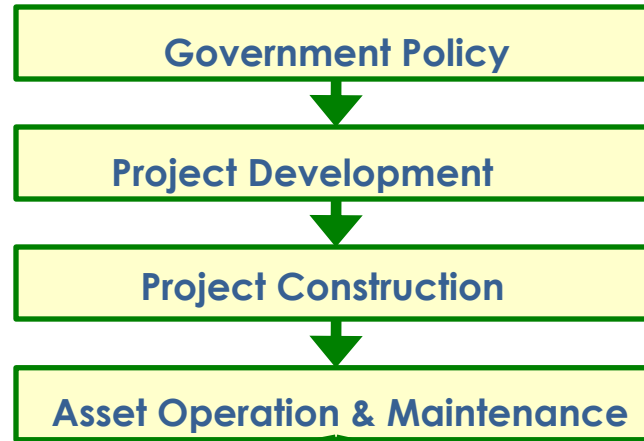
4 fundamental issues drive this transition ;

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



Mainstream's Business Model

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



Recycle
Cash
For New
Projects

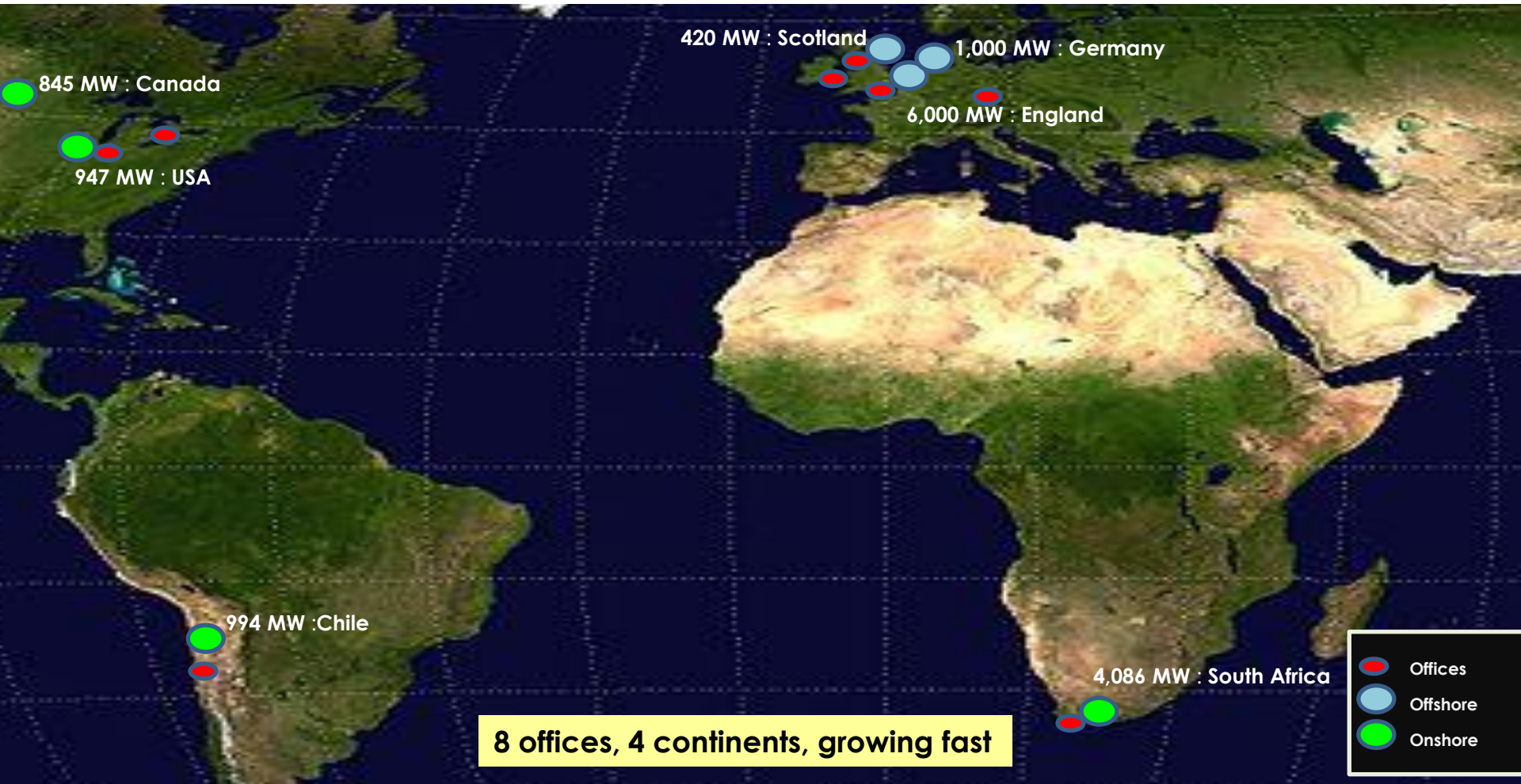
3 Revenue Streams =

Profit
from sale

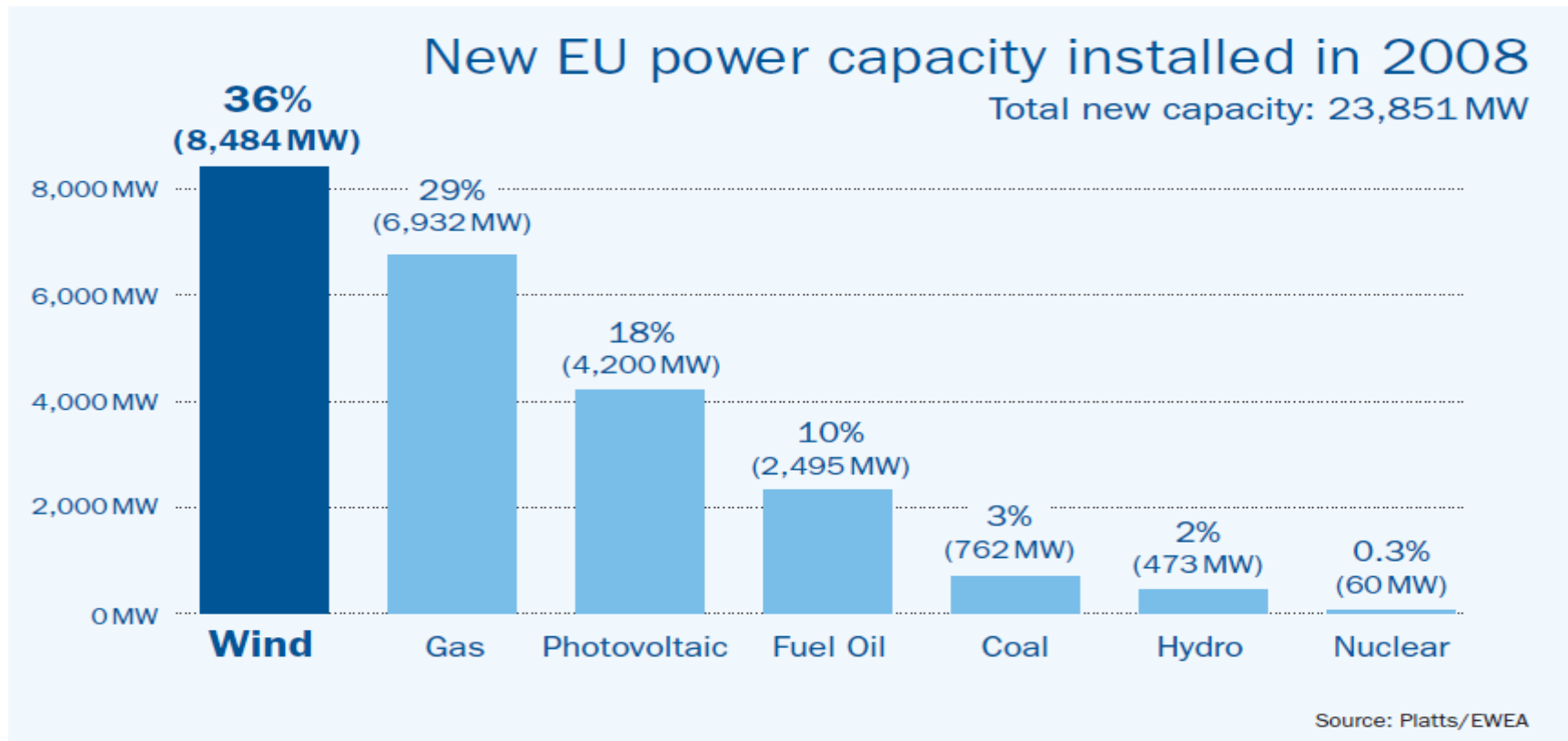
Long-term
O&M contract

Asset out-
performance fee

Mainstream's 14,000+ MW Projects' Pipeline

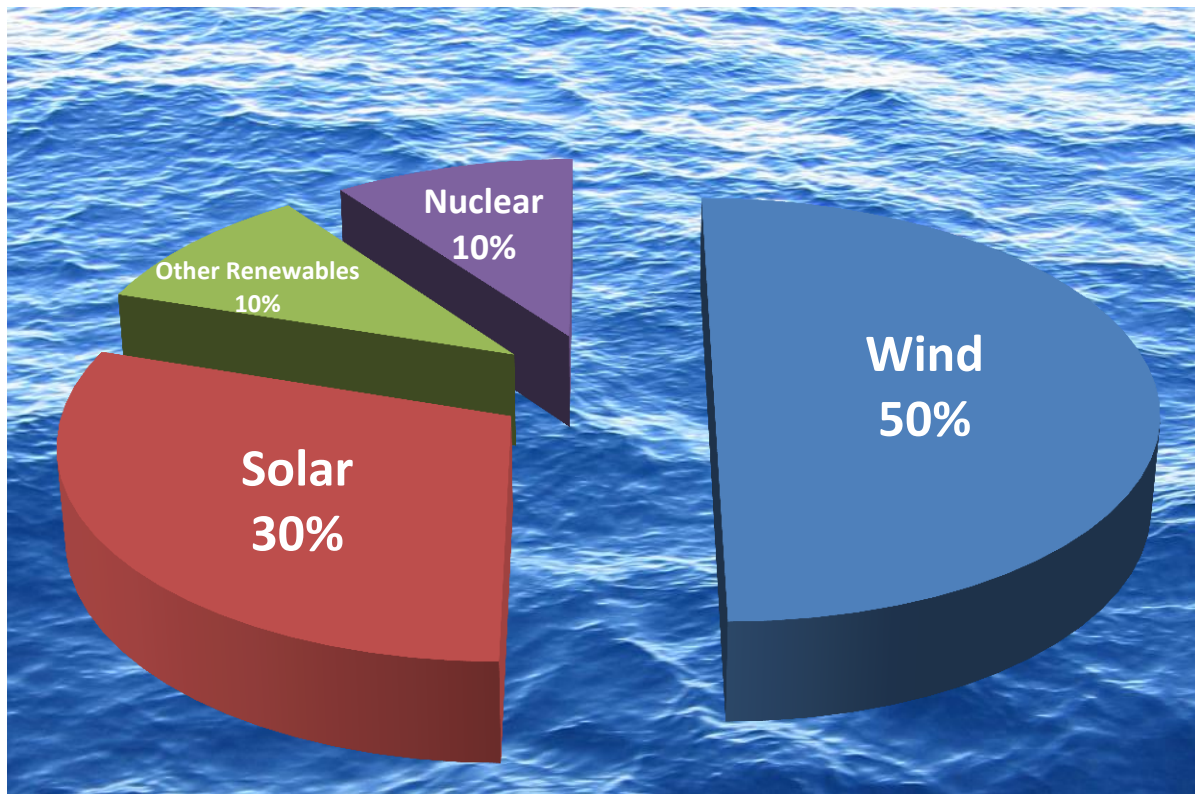


EU Energy Perspective : Current Investment Mix



> 50 % of new Generation Capacity from Wind & PV

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

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
 - Europe is the world's most crowded Continent
- **1,600,000 MW** from Offshore Wind
 - Plenty of space to grow beyond this target

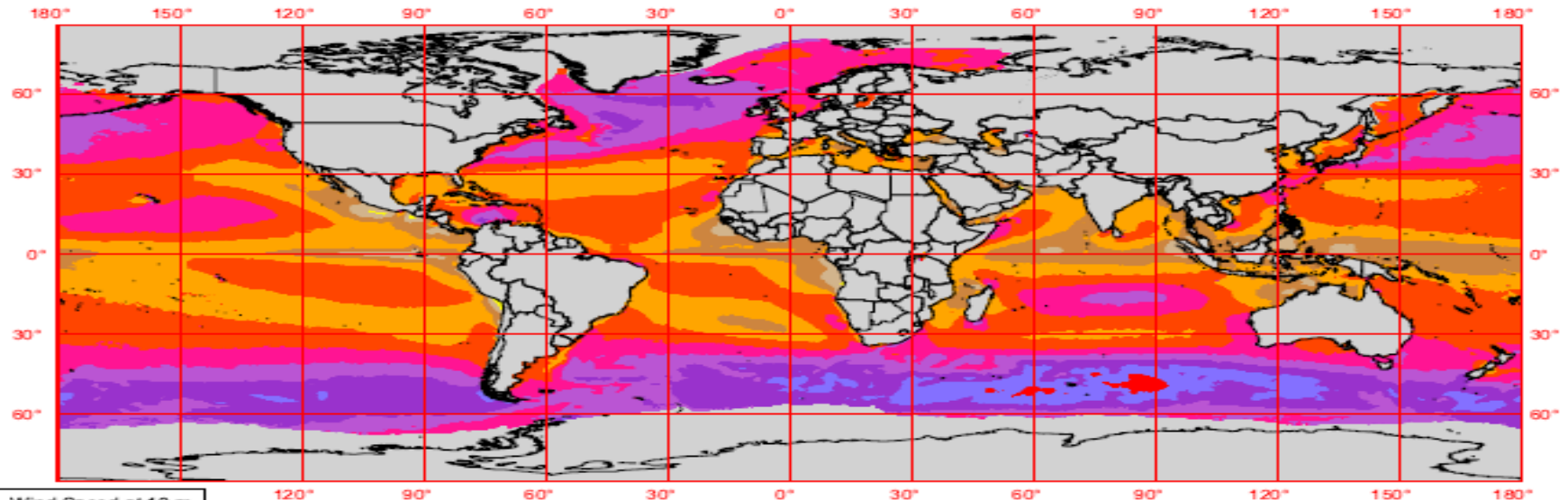
Equates to :

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

European Offshore Wind is a €6.4 Trillion Investment opportunity

Offshore Wind Resource

QuikSCAT - Annual Wind Speed at 10 m



Wind Speed at 10 m
(m/s)



Scatterometer measurements of the state of the ocean surface are used to estimate 10-m winds in the QuikSCAT satellite data set. The QuikSCAT data are produced by Remote Sensing Systems and sponsored by the U.S. National Aeronautics and Space Administration Ocean Vector Winds Science Team. Data are available at www.remss.com. NREL used a 5-yr average from 2000-2004 to produce the map.

NREL has not validated the QuikSCAT satellite ocean wind estimates. NREL has observed that satellite-derived estimates of wind resource in near-shore, coastal, and island areas do not always agree with high-quality anemometer wind measurements. Therefore, satellite estimates in these areas should be compared with available wind measurements wherever possible.



Solar and Wind
Energy Resource
Assessment



United Nations
Environment
Programme



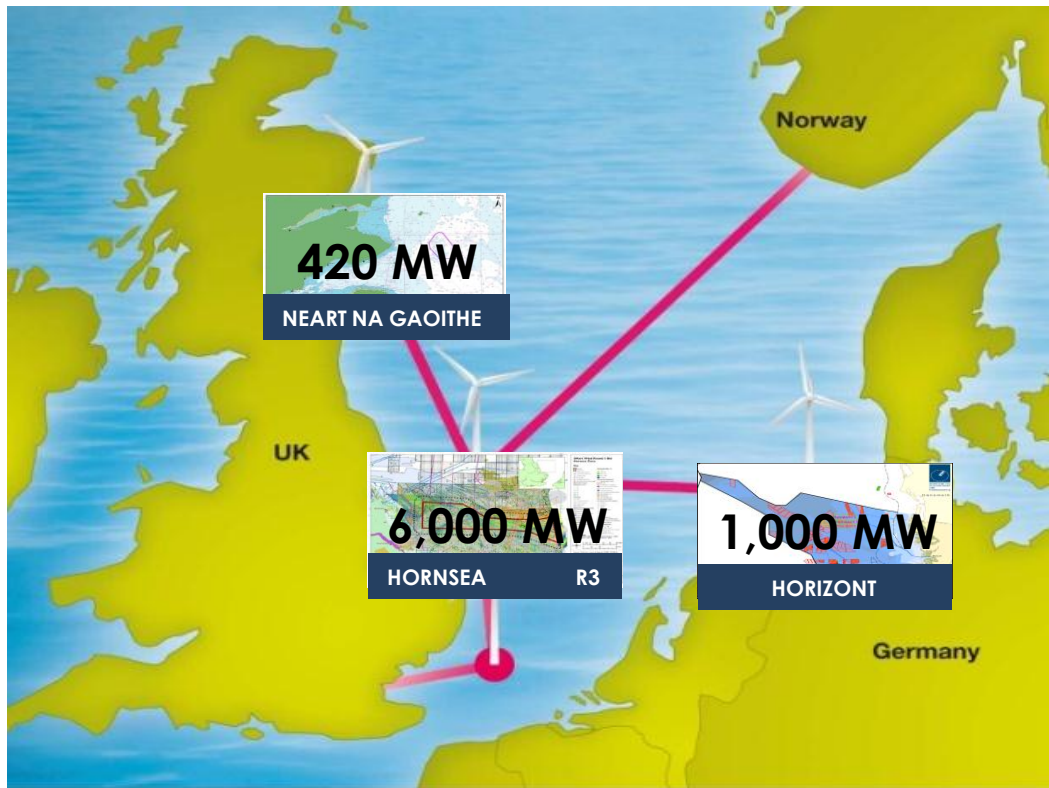
Global Environment
Facility

U.S. Department of Energy
National Renewable Energy Laboratory



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

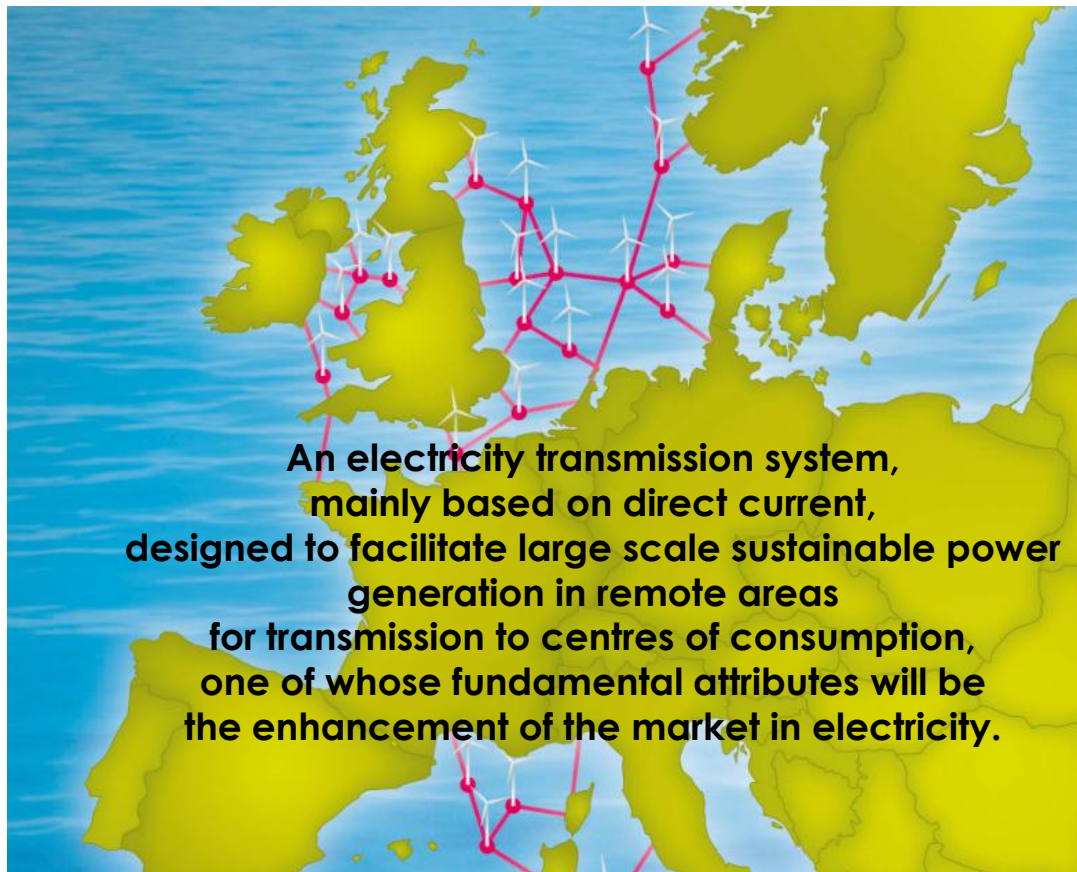
Mainstream's Projects in the North Sea



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's Energy Strategy



**An electricity transmission system,
mainly based on direct current,
designed to facilitate large scale sustainable power
generation in remote areas
for transmission to centres of consumption,
one of whose fundamental attributes will be
the enhancement of the market in electricity.**

Supergrid is....

- **A new transmission backbone** for Europe's decarbonised power sector
- **An Enablers for distribution of energy** from 1,600,000 MW Offshore Wind Farms
- **A transformational approach** to electricity generation and distribution
- **A way to Captures clean energy generation** and delivers firm renewable power across Europe
- **Goes beyond** existing point-to-point interconnectors
- **Driving Innovative technology** to deliver HVDC Supernode technology
- **In need of strategic partnerships** across the Supply Chain
- **Cost to build Europe's Supergrid;**
€0.6 Trillion Offshore Supergrid
€0.6 Trillion Onshore Supergrid

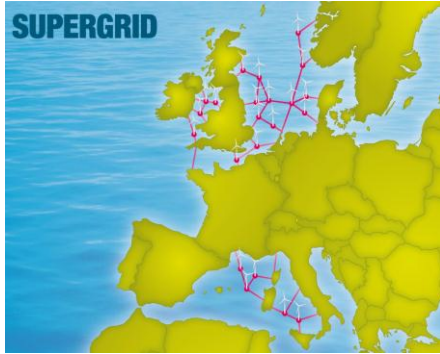
The wind is always blowing somewhere; Supergrid creates portfolio effect

Supergrid Consortium

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

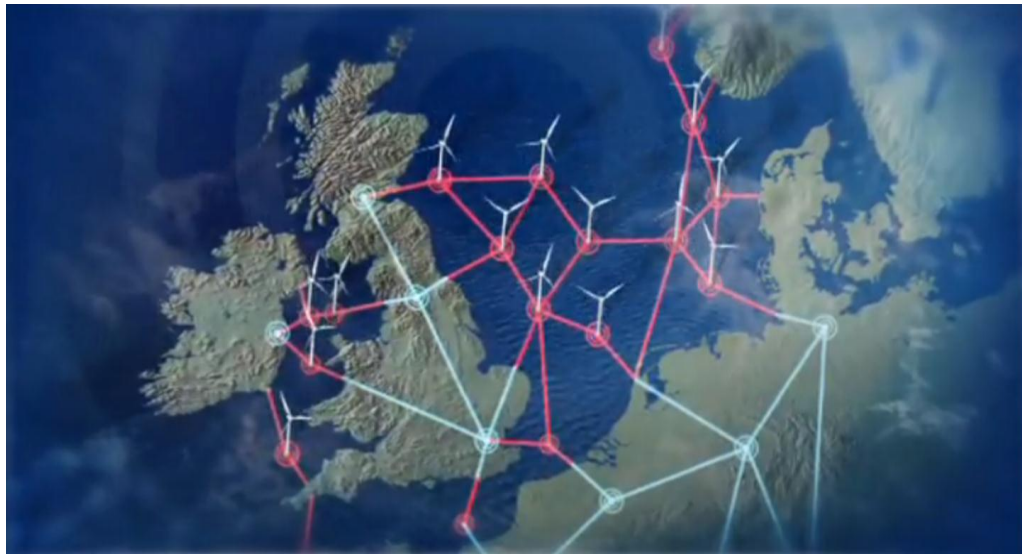
CEO Ana Aguado runs the Consortium which exists to accelerate the Supergrid via a 5 point strategy:

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



The Consortium has 22 members so far


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
- Better ICT

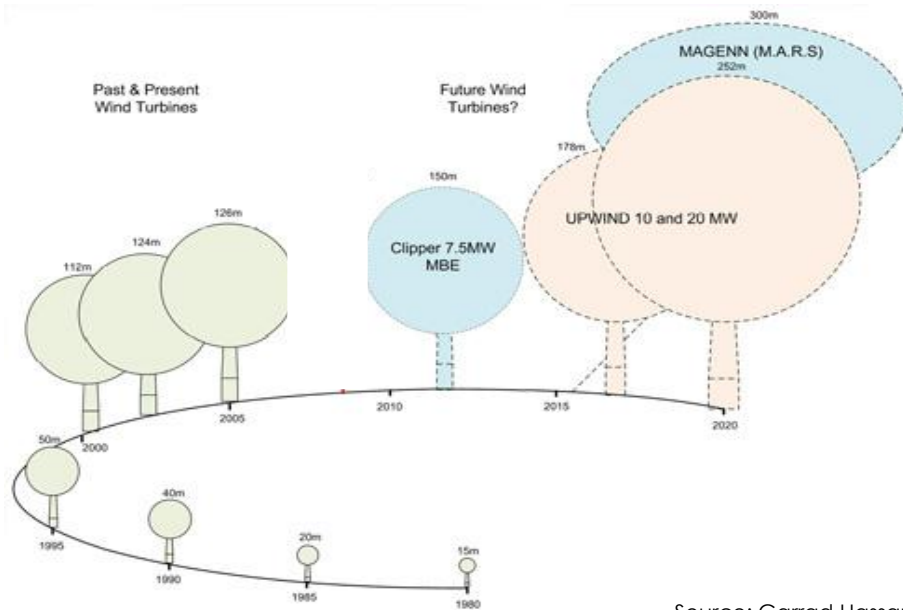
Dr Eddie O'Connor, Mainstream Renewable Power
Supergrid Launch
London, March 2010



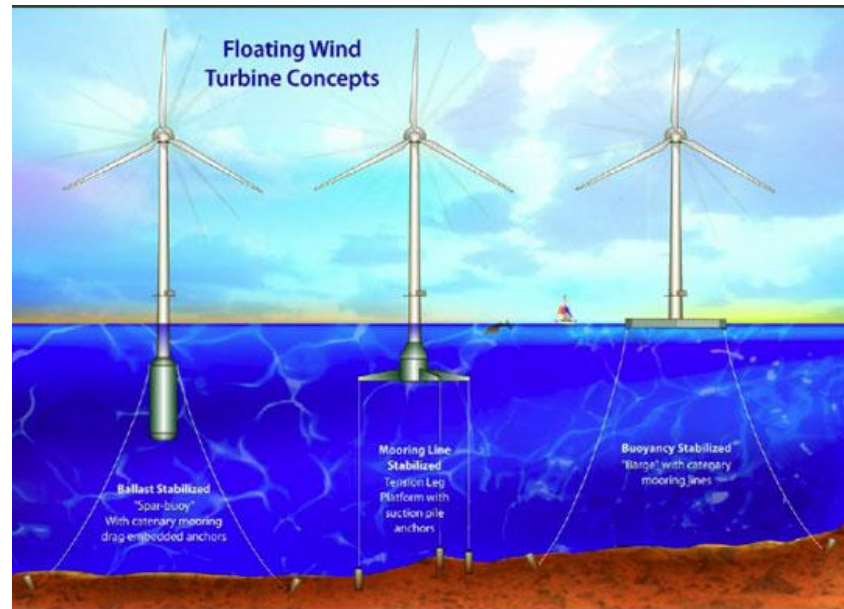
An inevitable transition to Sustainability with 7 Innovation Trajectories

Innovation # 1 : Bigger Wind Turbines

Turbines will get bigger : 20 MW



Floating Turbines will be viable

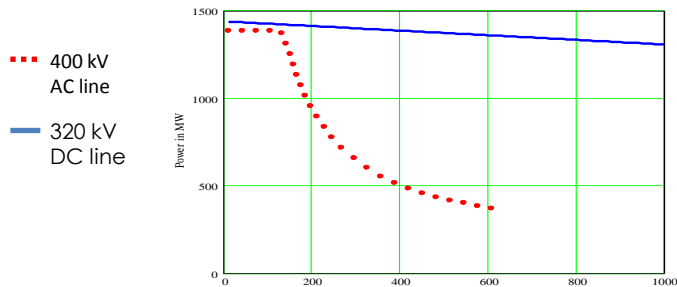


Dr Eddie O'Connor, Mainstream Renewable Power
C & F Offshore Summit
London, April 2009

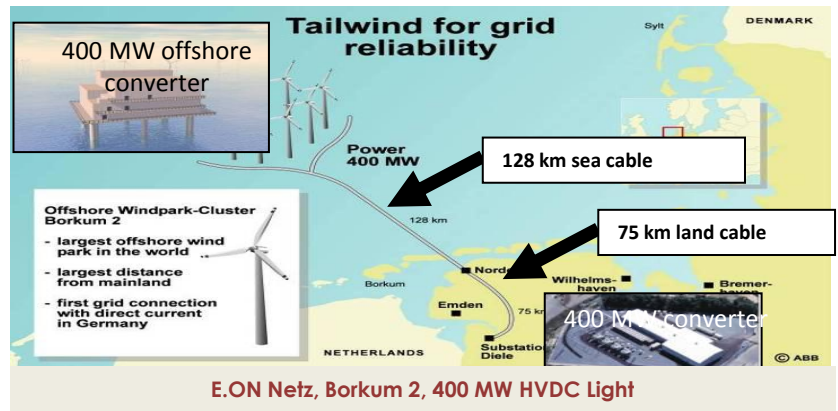
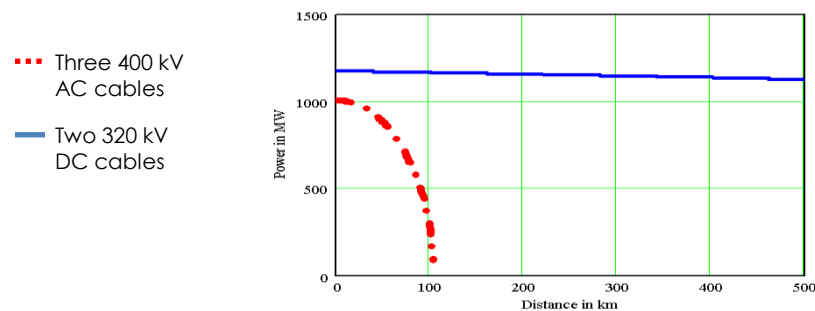
Bigger, better turbines are needed

Innovation # 2 : HVDC Transmission Cables

Overhead Cables



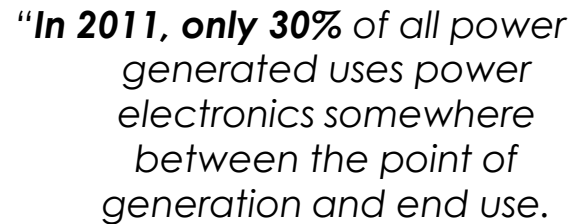
Sea Cables



HVDC uses proven technology

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

SUPERNODE CONCEPT



By 2030, 80% of all electric power will flow through power electronics."

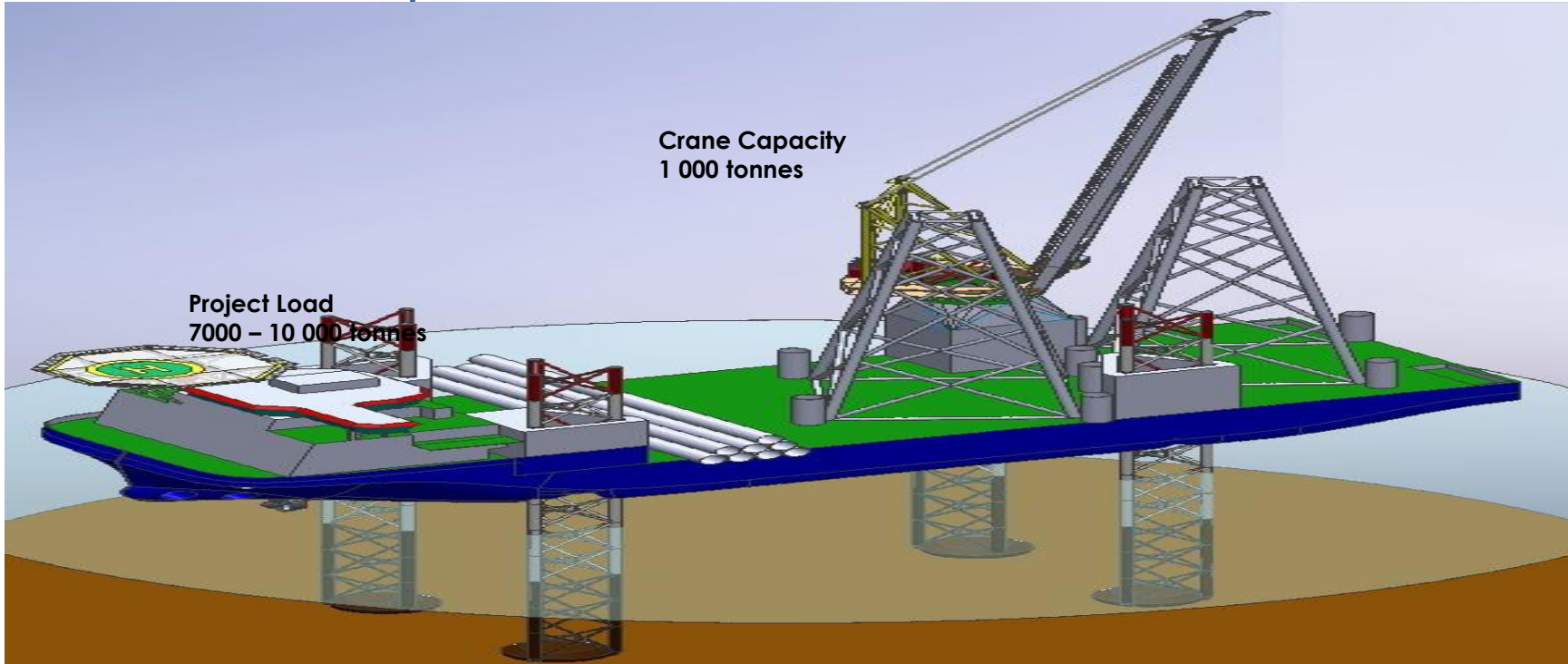
Office of Electric Delivery & Energy Reliability,
US Dept of Energy

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

Supernode is a proven concept

Innovation # 4 : Next Generation Civil Engineering

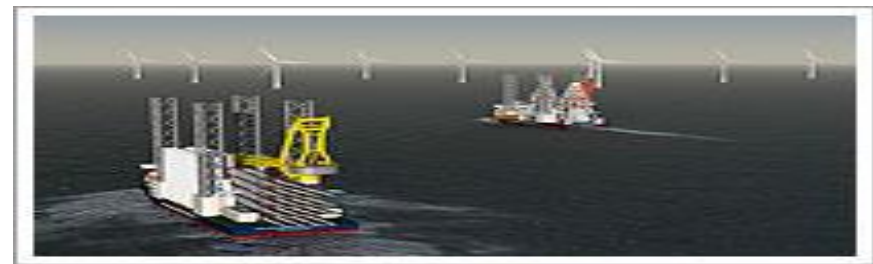
Offshore wind Jack-up



Bigger, stronger Jack-up Technology

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

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

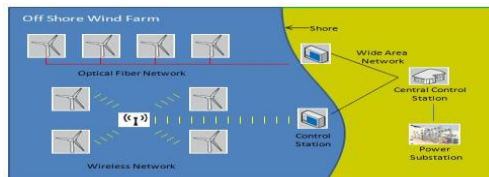
An entirely new approach to Logistics is needed

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

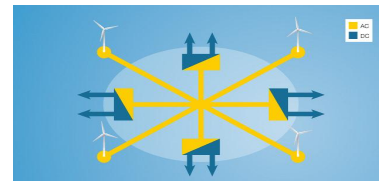
Innovation # 7 : Better Information Technology



Power Distribution Management



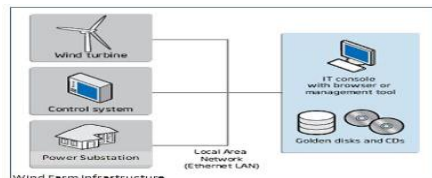
Hi-Speed Wireless Communication



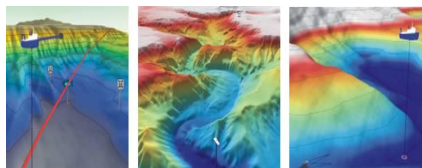
Supernode Power Controls



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

Simpler, Faster, Better ICT Strategy with SERA

A. Mainstream's Business Perspective

B. Business Systems' Strategy

C. Technology Roadmap & SERA

D. Benefits of SERA



Business Context

A company operating exclusively in the **Renewable Energy Sector**

A **New company**, established in early 2008

A company operating **Globally**, offices in 8 countries

A company **growing fast**, a Big Company by 2014

A global, Renewable Energy Start-Up growing fast

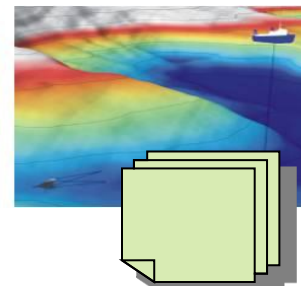
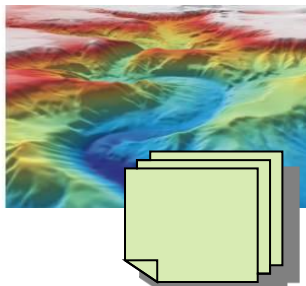
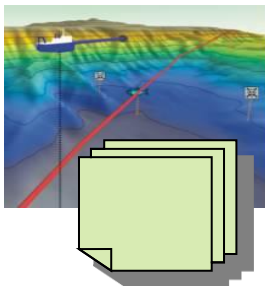
Offshore Business Process

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



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

ICT Objectives :

- Business Systems are Integrated to drive Process Excellence
- Information Services Team are Business Partners delivering Value
- IT enables Sustainable Business Activities
- IT accelerates Sustainable Renewable Energy

Simpler, Faster, Better ICT Strategy with SERA

A. Mainstream's Business Perspective

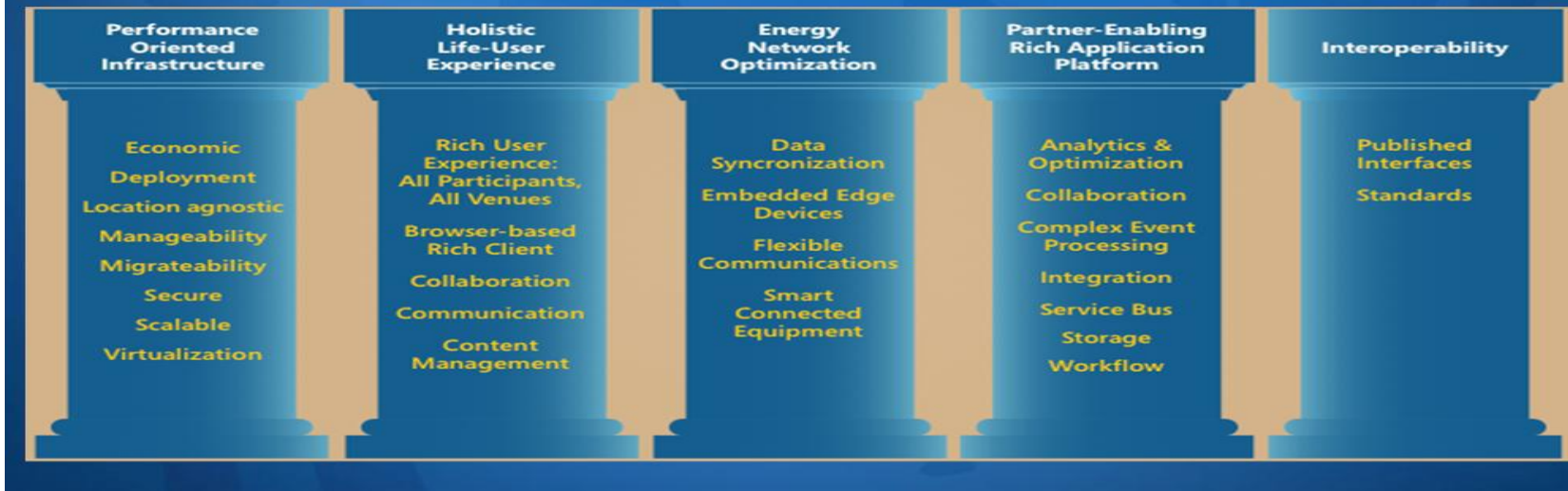
B. Business Systems' Strategy

C. Technology Roadmap & SERA

D. Benefits of SERA



Smart Energy Reference Architecture's Five Pillars



Organization	Application Services				Operations
Portfolio Management Strategic Planning Value Measurement Risk Mgmt Workforce Mgmt Financial Mgmt Governance Asset Management	Information Creation Authoring Import Imaging Approval Streaming Media Transformation	Information Analysis Reporting Aggregation Visualization Drill-down	Planning Products Pricing Lifecycle Category	Generating Demand CRM Promotions Consumer Analytics Brand Marketing	Support Incident Mgmt Problem Mgmt Service/Help Desk Desk Side Assistance
	Information Access Team Site Search Presence Discovery	Managing Enterprise Revenue Budgeting Safety AP AR GL Payroll HR EServices Benefits Training	Developing Products Procurement Quality Supply Chain Cost Manufacturing	Delivering Products Scheduling Inventory Distribution Customer Service	
Engineering Architecture Mgmt Project Mgmt Dev Framework Instrumentation	Infrastructure Services				Monitoring & Control Monitoring Alerting
Delivery Management Service Level Mgmt Change Mgmt Release Mgmt Configuration Mgmt	Access Channels Wireless Kiosk Intranet Extranet Internet VPN	Devices PC PDA Phone	Communication Email Voice Unified Msg. Instant Msg. Broadcasting Conferencing	Coordination Calendaring Notification Routing Tracking	Administration Deployment Patch Mgmt Continuity Mgmt Availability Mgmt Capacity Mgmt
	Data Integration Mapping Exchange Transformation Datawarehouse	Workflow Rules Events	Content Management Indexing Doc Mgmt Archiving Versioning Tagging	Content Distribution File Portal Media Publishing Delivery	
	Security Authroization Authentication Audit Crypto Infra Access Facility Rights Mgmt Intrusion Certificate Identity & Policy		Directory Dir. Store Provisioning Synchronization Meta Directory Locator	Middleware File Message EDI Data Procedure/ORB	
	Network Wired Wireless Voice Internet Firewall Remote Access	Computing Platform Desktop Server Storage Web Mobile Hosting Terminal Print	Data Management Data Store Archival Extract/Load OLAP Replication	Transaction Mgmt App Server State Mgmt Store/forward	

SERA provides a comprehensive Sustainable ICT Roadmap

Implementation Step 1: Business Process

	Generation	Energy Supply (Wholesale/Trading)	Delivery (Trans / Distribution)	Customer Service (Retail)	Shared Services (Corp/Enterprise)
Business Processes	Generation asset management		Delivery (T&D) Asset Lifecycle Management	Customer Lifecycle Management	Supply Chain Management
	Operation Management		Network Operation Management	Revenue Cycle Management*	IT portfolio and asset management
	Fuel Management	Energy Commodity Management	Work Management		Finance / Administration
					Human Resources Management Legal / Regulatory affair Management Enterprise Risk Management
Business Systems	Document Management	SCADA	Development Analysis	Customer Relationship Management	Finance & HR
	Asset Management				Project Management
	Predictive Performance	Load Forecasting		Complex Billing	Business Intelligence
		Demand Response	Field Force Enablement (mobility)		
	Fuel Management	Clearing & Settlement	Field Force Enablement		
	Emissions	Meter Data Management	Outage Management		Enterprise Risk
	Optimisation		Network Design		Supply Chain

































Source: Microsoft Utilities Strategy

8 Business Systems to meet Business Process needs

Step 2 : Business Priorities



Mainstream Business Priorities vs Systems

Business	Document Management System	Finance System & HR	Development Analysis System	Project Management System	Asset Management System	Predictive Performance System	Customer Relationship Management System
1. Develop & construct Robust Pipeline.							
2. Monitor other 'fuel-free' technologies.							
3. Partner with Local Developers.							
4. Leverage Central Expertise.							
5. Offshore position as Early-Stage Partner.							
6. Sell projects to Utilities & Investors.							
7. Recycle cash from Sale of Assets.							
8. Seek liquidity event / IPO for investors.							
Underlying Standard IT technology;							
Management Information always available.	Business Intelligence & Reporting System						
Service Excellence.	Standard PC / Print / Wireless Access / Telephony / Video Conferencing						

8 Business Systems to achieve Business Priorities

Step 3 : Business Systems Vision

Mainstream
Business
Technology

Business Need

Integrated Business Systems

Value

Deal
Making

Cash generation &
Management

Project
Execution

Development
Analysis

Asset
Management

Finance &
HR

Project
Management

Predictive
Performance

Customer
Relationship
Management

Business
Intelligence

Collaboration &
Fast Replication

Efficient Work Flow

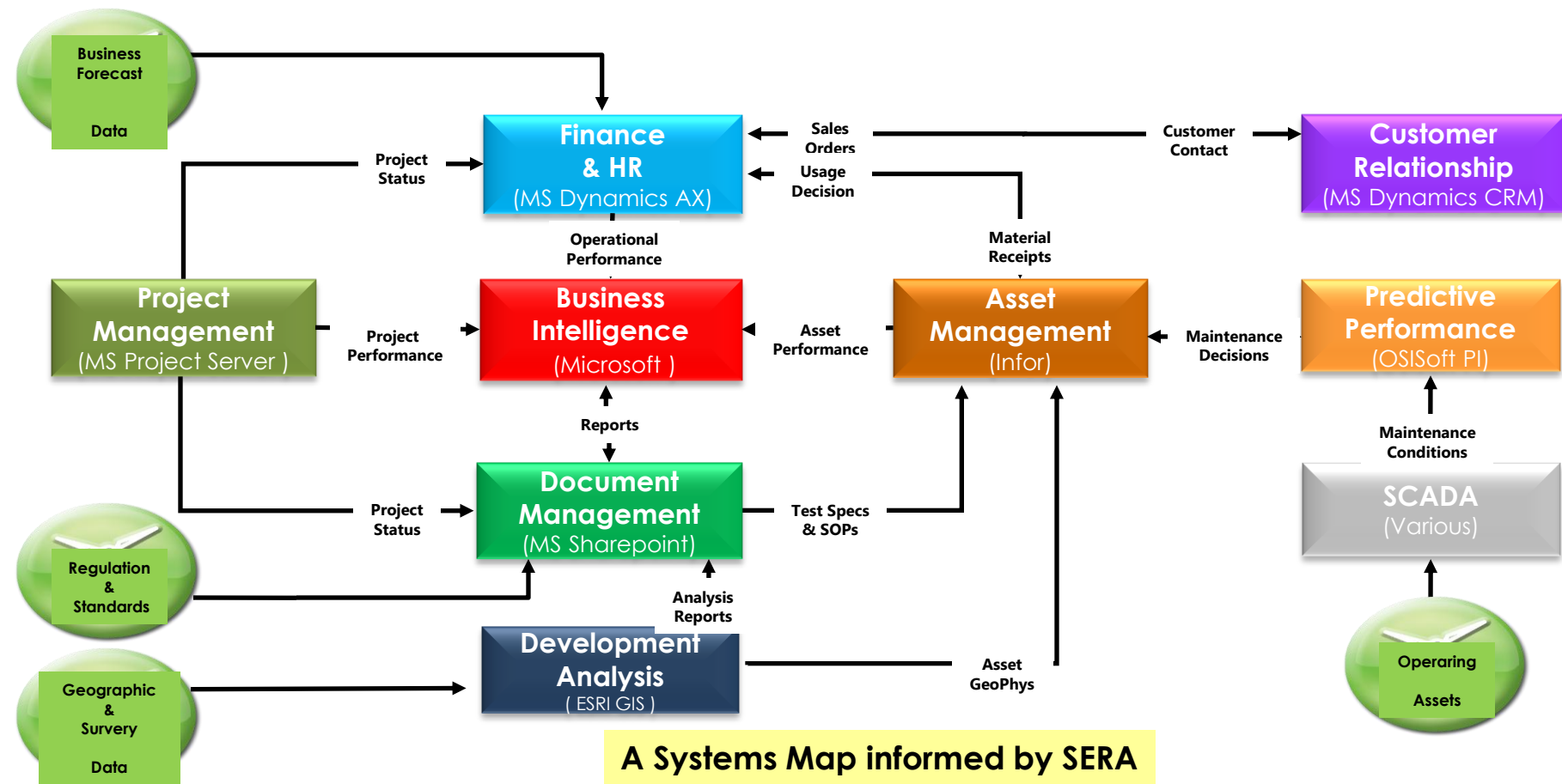
A Single Version of
the Truth

Faster Decision-
Making

Increase Personal
& Team
Productivity

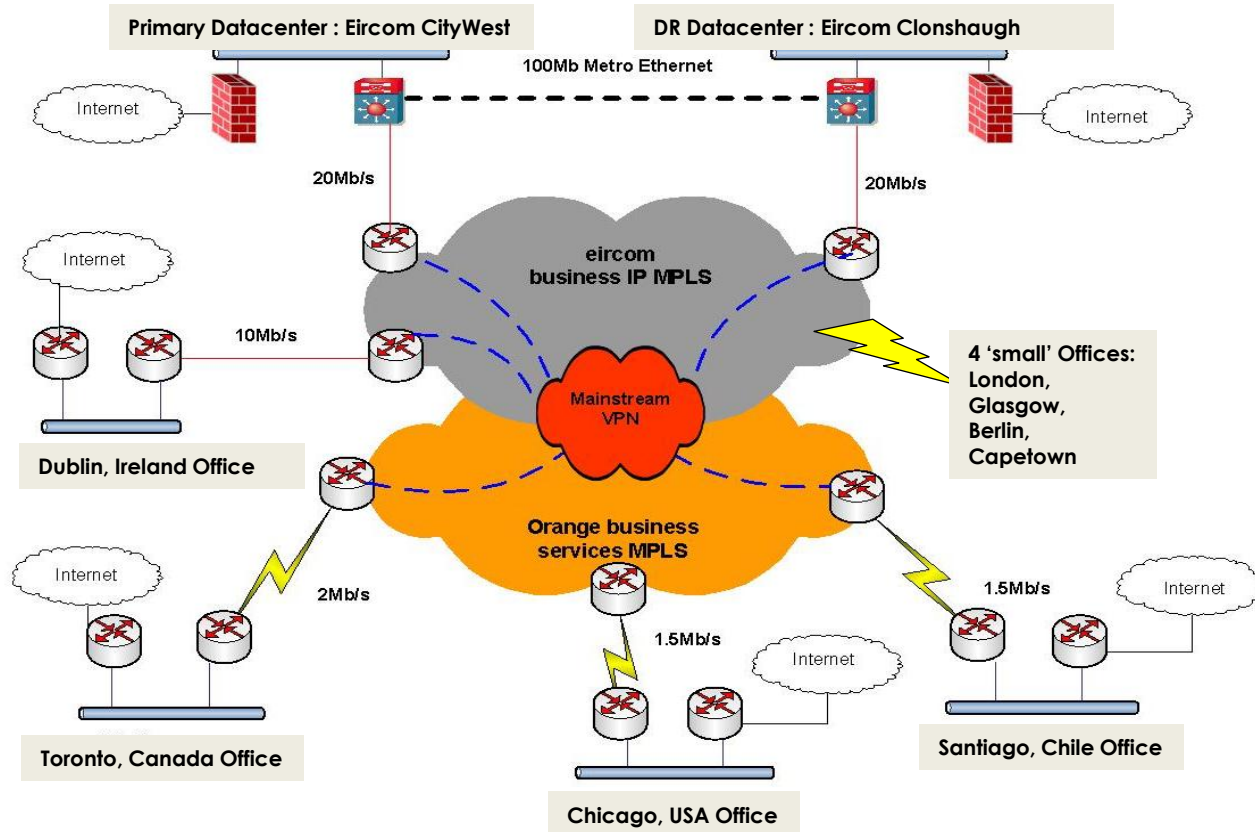
8 Integrated Business Systems to deliver Value

Step 4 : Business Systems Map



Step 5 : ICT Infrastructure

SCHEMATIC



PARTNERS

- **Microsoft : Software**
- **Eircom-Orange : Communications**
- **HP -DSS : Hardware**

STANDARDS

- **Microsoft : 29 Products**
- **HP : Client & Infrastructure h/w**
- **Cisco : data**
- **Nortel : Voice**
- **Polycom : Video**

PRINCIPLES

- **Aligned with SERA**
- **Build for global growth**
- **Build for 24 x 7 availability**
- **Build for Security**
- **Standardise components**
- **Configuration not customisation**
- **Partner with Strategic ICT vendors**
- **Service Level Agreements**

A Private Cloud built for High Availability, Security, Performance

Technology Schedule

IS Support for Mainstream Offices

- 8 Offices
- 120 HP PC's & Laptops, standard devices
- 6 Nortel Phone Systems, standard handsets
- 8 Polycom Video Conference Sets
- 16 HP MFP Print Devices

Single IS Service Desk

7777@mainstreamrp.com

- 320 User Accounts (Mainstream & 3rd Party)
- 1,600 Request tickets per annum
- 5,800 Incident tickets per annum
- 2,500 Infrastructure Incident tickets per annum
- 120 Infrastructure Change tickets per annum

Strong IS Infrastructure

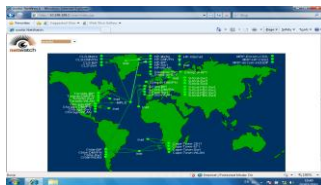
- 3 Database Clusters – SQL Server : HP Proliant
- 68 Servers in Production – : HP Proliant
- 14,000 GB on 2 synchronised SAN devices : HP EVA
- 2 HP LTO Tape Library Devices : HP Devices
- 18 RF & Wireless Access Points : Cisco
- 69 LAN Devices & Switches: Cisco
- 6 sites connected via MPLS WAN circuits
- 4 sites connected via ADSL WAN circuits

Secure IS Facilities

- 2 Datacentres for Hosting (eircom)
- 7 Server rooms – 5 dedicated and 2 x shared
- 9 Facilities with Aircon, UPS Power, Monitoring

Outsourced IS Managed Services

- 24 x 7 monitoring (eircom)
- Escalation Service Management (eircom)
- Applications Support (Microsoft)
- Security , remote access & Firewall (eircom)
- Datacomms Monitoring & break-fix (eircom)
- Voice, Video, Data circuits (eircom)
- Disaster Recovery Hosting (eircom)
- Hardware Monitoring & Break-fix(eircom)
- Data storage and backup (eircom)
- Production Facility Hosting (eircom)



24 x 7 DataComms' Monitoring



24 x 7 ICT Assets' Monitoring

Enterprise Applications

- Finance
- HR
- Document Mgt
- Dataroom Mgt
- Reporting
- eMail & Calendar
- Unified Communications
- Dev. Analysis
- Customer Rel Mgt

- Microsoft Dynamics AX 2009
- Microsoft Dynamics AX 2009
- Microsoft SharePoint 2007
- Microsoft Identity Rights Mgt 2007
- Microsoft Performance point
- Microsoft Exchange 2007
- Microsoft Office Communicator 2010
- ESRI ArcView 3 (Microsoft Partner)
- Microsoft Dynamics CRM 2009

Desktop Software

- Browser
- Email & Calendaring
- Productivity
- Project Management
- Process Modelling
- Remote Access
- PC Operating System
- Anti-Virus

- Microsoft Internet Explorer 7.0
- Microsoft Outlook 2007
- Microsoft Office 2007
- Microsoft Project 2007
- Microsoft Visio 2007
- Microsoft Terminal Services
- Microsoft Windows 7
- Microsoft ForeFront

Infrastructure Management

- Databases
- System Integration
- Server Operating System
- Server Virtualisation
- Service Desk Mgt
- Operations Mgt
- Configuration Mgt
- Security Mgt
- Data Backup Mgt

- Microsoft SQL Server 2008
- Microsoft .NET Framework 3.5
- Microsoft Windows Server 2008
- Microsoft Hyper V 2009
- Microsoft Service Manager 2010
- Microsoft Operations Manager 2007
- Microsoft Configuration Manager 2007
- Microsoft ISA Server 2006
- Microsoft Data Protector v3

Scalable, Standard Technology built on 26 Microsoft Products



Mainstream has invested in 22 Microsoft products to date and Mainstream is in full compliance with **SERA**.

The next 4 Systems planned are **SERA**-compliant, specifically;

- **Microsoft Dynamics CRM** for Customer Relationship Management
- **ESRI GIS Server** for Enterprise GIS
- **OSIsoft PI** for Data Historian
- **Infor Asset Management** for Asset Management

SERA provides a Roadmap for selecting and implementing ICT

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9 Benefits of SERA at Mainstream

- **1 strategic relationship**, avoids 31 disparate vendor relationships
- **Standard Client Experience** at all locations, always
- **Cloud Ready**, Private Cloud now, Microsoft BPOS Roadmap to Public Cloud
- **Interoperability radically simplifies everything** ; upgrades, introducing new products, addressing (rare) support issues
- **Better Software, Cheaper Software, Faster Software**
- **A Clear Technology Roadmap** addressing future needs
- **Aligned with Sustainable ICT** needs
- **Liberates the IS Team** to focus on adding value
- **Mainstream doesn't need a Systems Integrator because Mainstream has integrated systems**

SERA provides a better, simpler, faster approach

Conclusions

**IT-enabled Sustainability is key to our
business success**

**Mainstream has Sustainable ICT
built with SERA**

**SERA provides a simpler, faster,
better roadmap for
Sustainable ICT**

Mainstream : Business Model

<http://www.mainstreamrp.com/>

Mainstream's ICT Strategy, described by Silicon Republic

<http://www.siliconrepublic.com/strategy/item/14728-in-the-mainstream>

Intel & Mainstream : joint White-Paper & Video on Offshore Wind Farms

<http://www.intel.com/embedded/energy/products.htm> (see 'Wind Turbine Availability Excellence')

<http://edc.intel.com/Link.aspx?id=4264>

<http://www.youtube.com/watch?v=oOIWSWujw8s>

Microsoft & Mainstream : Blog on SERA adoption & link to SERA document

<http://blogs.msdn.com/b/mspowerutilities/archive/2010/06/24/sera-succinctly.aspx>

<http://www.microsoft.com/industry/manufacturing/utilities/default.mspx> (see 'Spotlight' Section for details on SERA).

DSS & Mainstream : Partnership in action

<http://www.decision.ie/>

Friends of the Supergrid : driving policy and standards

<http://www.friendsofthesupergrid.eu/>

EU Commission Marine Observation and Data Network Expert Group

<https://webgate.ec.europa.eu/maritimeforum/node/1709>

https://webgate.ec.europa.eu/maritimeforum/system/files/ISIS_Update_10March2011.pdf

Energy Trends : Oil refinery bottleneck report from Richard Branon & from US Military

http://peakoiltaskforce.net/wp-content/uploads/2010/02/final-report-uk-itpoes_report_the-oil-crunch_feb20101.pdf

<http://smallwarsjournal.com/blog/2010/03/joint-operating-environment-20-1/>

Innovation Value Institute

<http://www.ivl.ie/>