



MAINSTREAM
RENEWABLE
POWER

European Supergrid

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Introduction to Mainstream

Target markets

Canada (Onshore)

- Secured pipeline to date: 400 MW

Scotland (Offshore)

- Secured pipeline to date: up to 450 MW

UK (Offshore)

- Secured pipeline to date: 4 GW

Germany (Offshore)

- Secured pipeline to date: 1,000 MW

United States (Onshore)

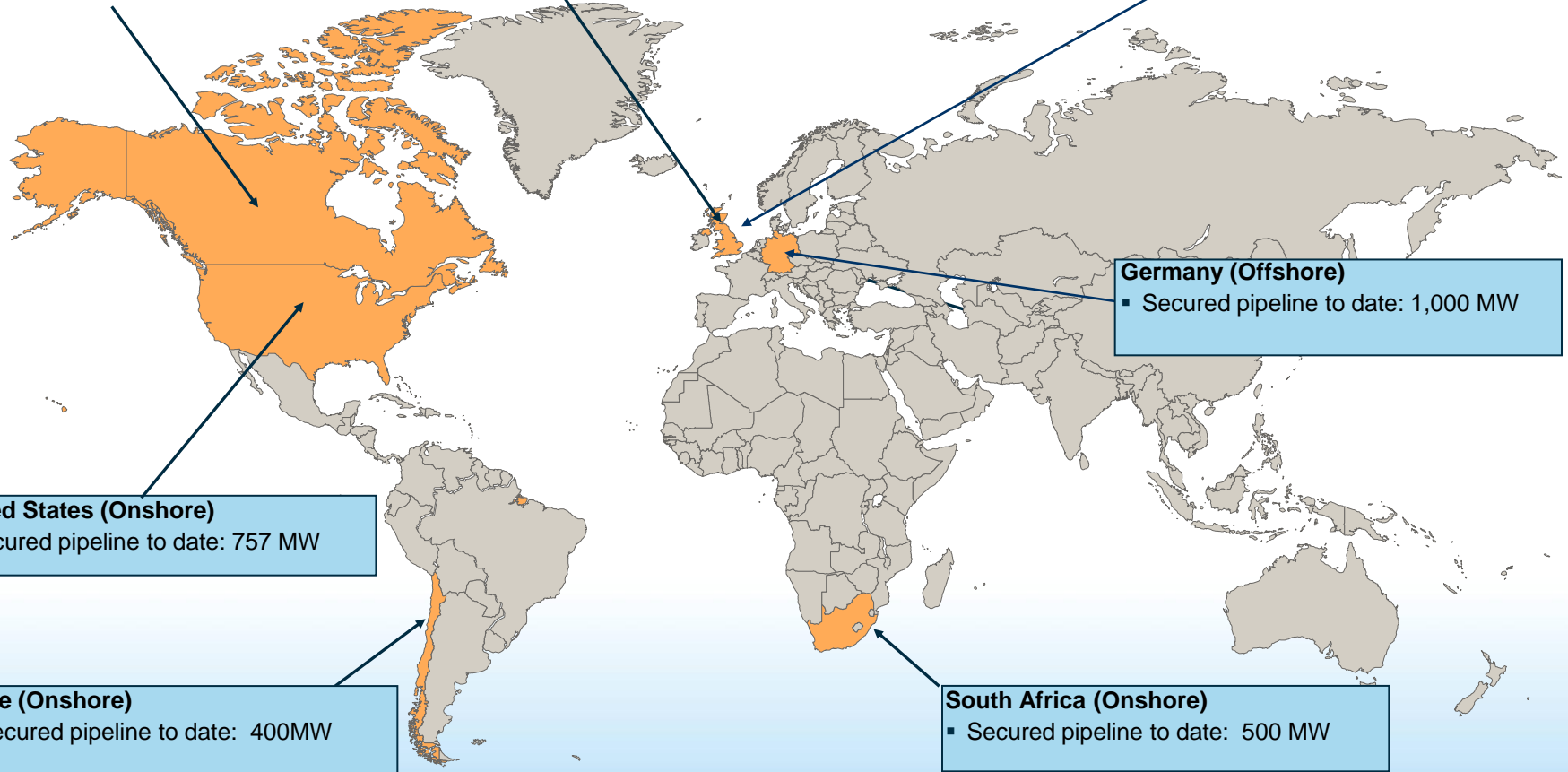
- Secured pipeline to date: 757 MW

Chile (Onshore)

- Secured pipeline to date: 400MW

South Africa (Onshore)

- Secured pipeline to date: 500 MW

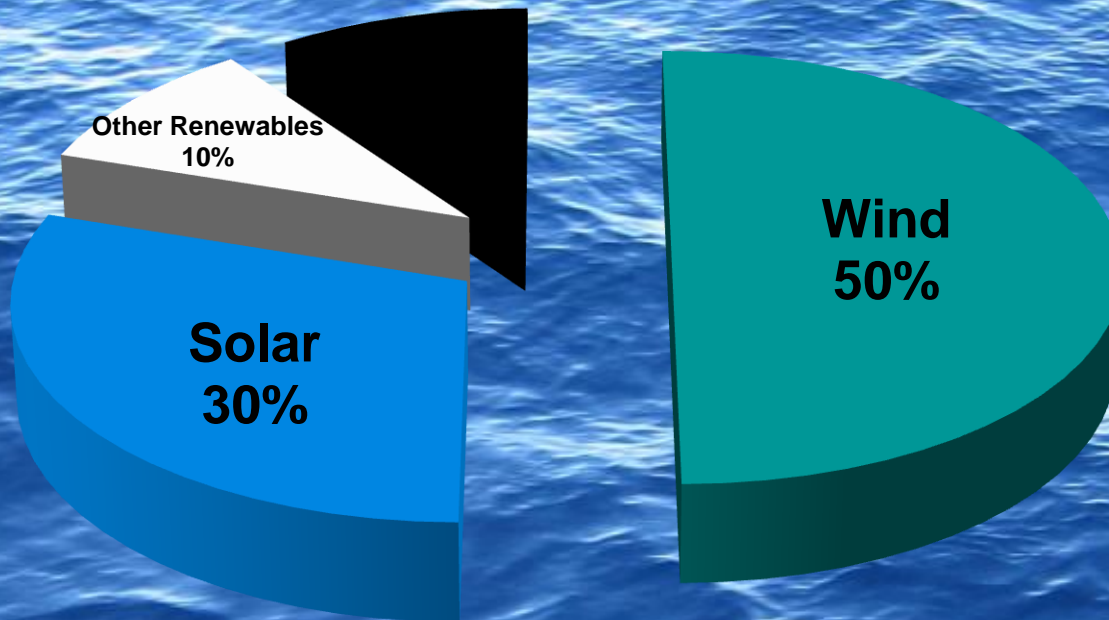


The Supergrid

Drivers

- Single Market
 - Competition
- Energy Security
- Sustainability
- Renewable Energy Targets

Generation Mix - 2050



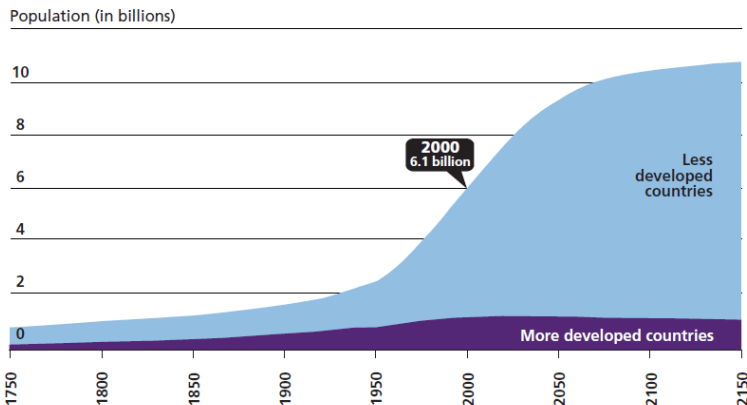
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Growth of Wind Power Generation

Growth Rate	Wind Generation Installed (MW)		
	Onshore	Offshore	Total
2%	250,000	1,000,000	1,250,000
3%	250,000	1,430,000	1,680,000

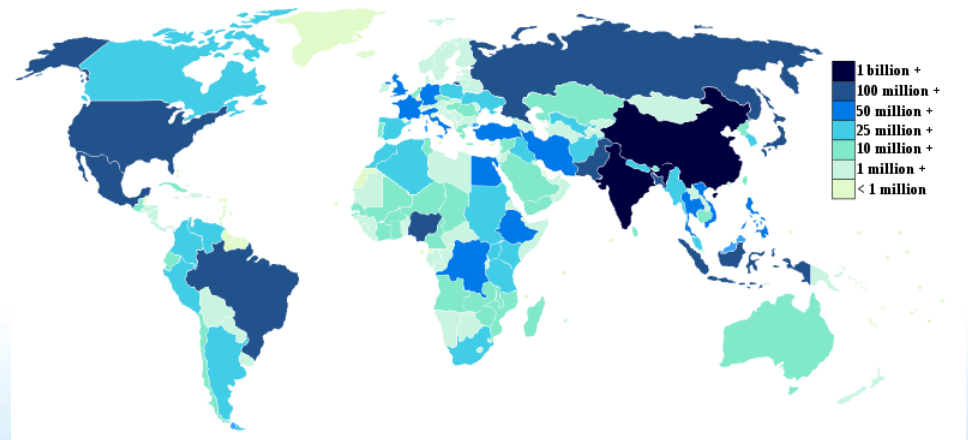
Growth of Population

World population growth, 1750-2150



Source: United Nations, *World Population Prospects, The 1998 Revision* (New York: UN, 1998); and estimates by the Population Reference Bureau.

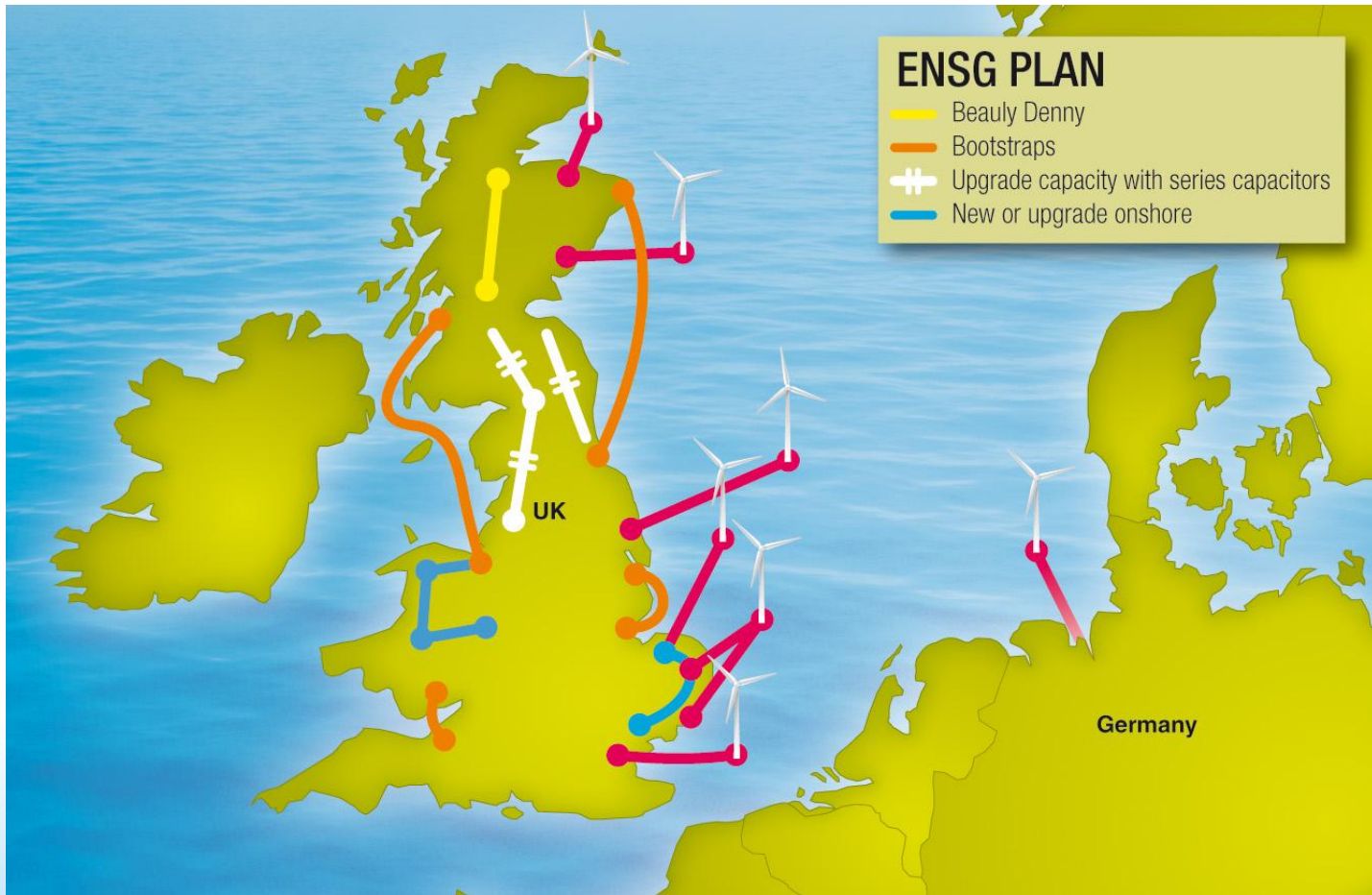
Copyright © 2001 Population Reference Bureau



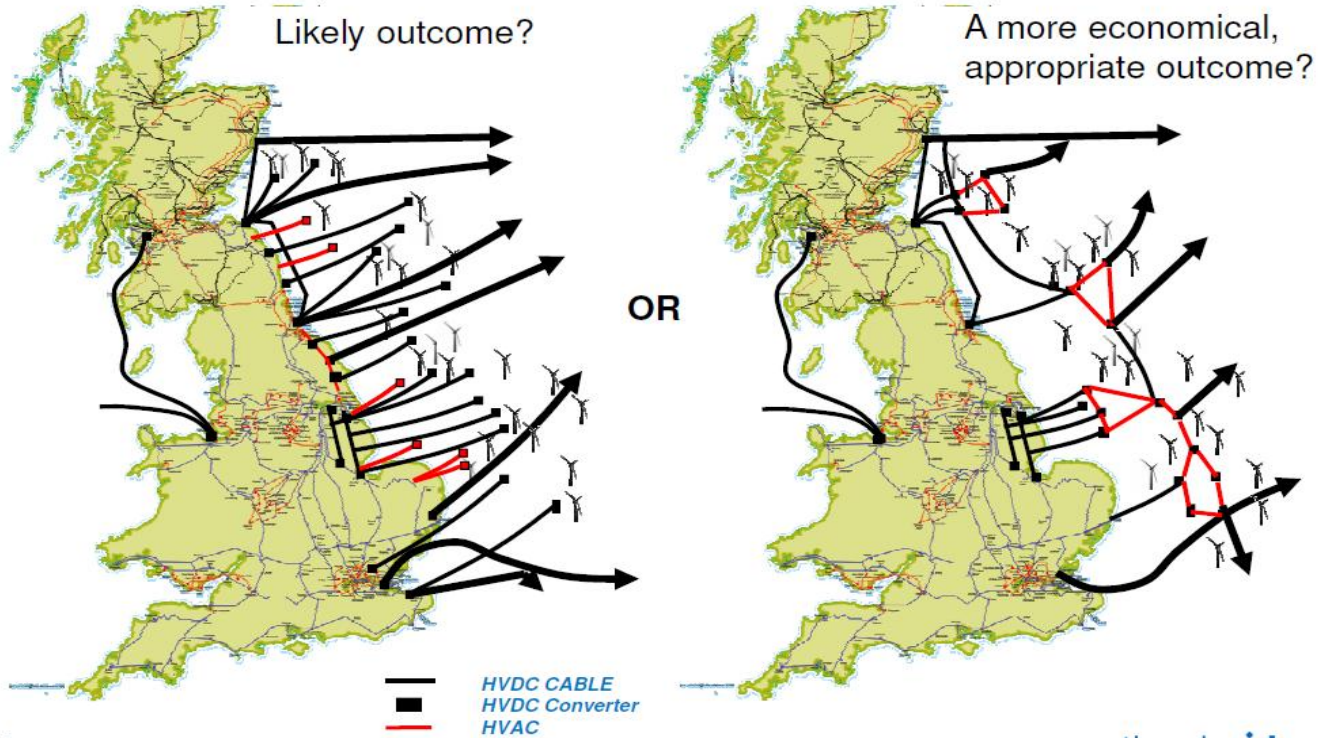
Source: Wikipedia, http://en.wikipedia.org/wiki/File:World_population.svg



Recent Plans



What will the regime deliver?



7

Source: National Grid

nationalgrid
The power of action.



Friends Of The Supergrid

The Friends of the Supergrid:

“is a group of companies and organisations with a mutual interest in promoting the policy agenda for a European Supergrid.”



Visit www.friendsofthesupergrid.eu



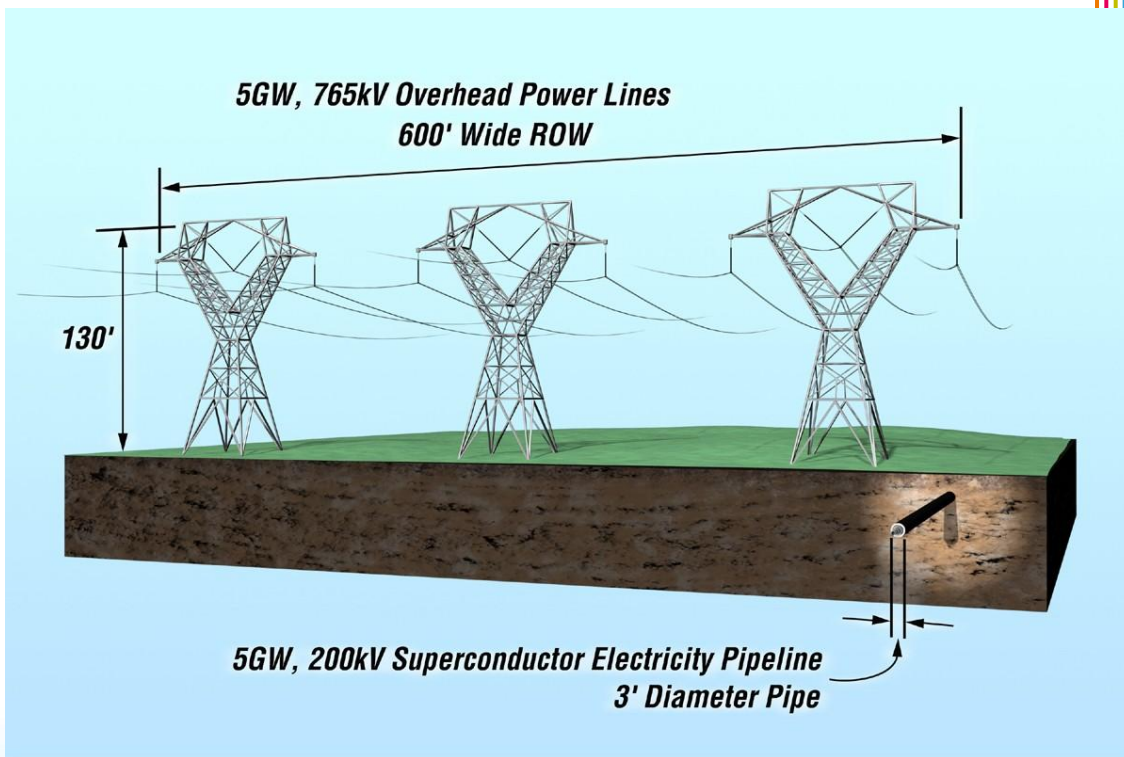
Other Initiatives

- North Seas Countries Offshore Grid Initiative
- Adamowitsch Group
- Super Smart Grid
- ENTSO-E
- ERGEG/CEER

Technology

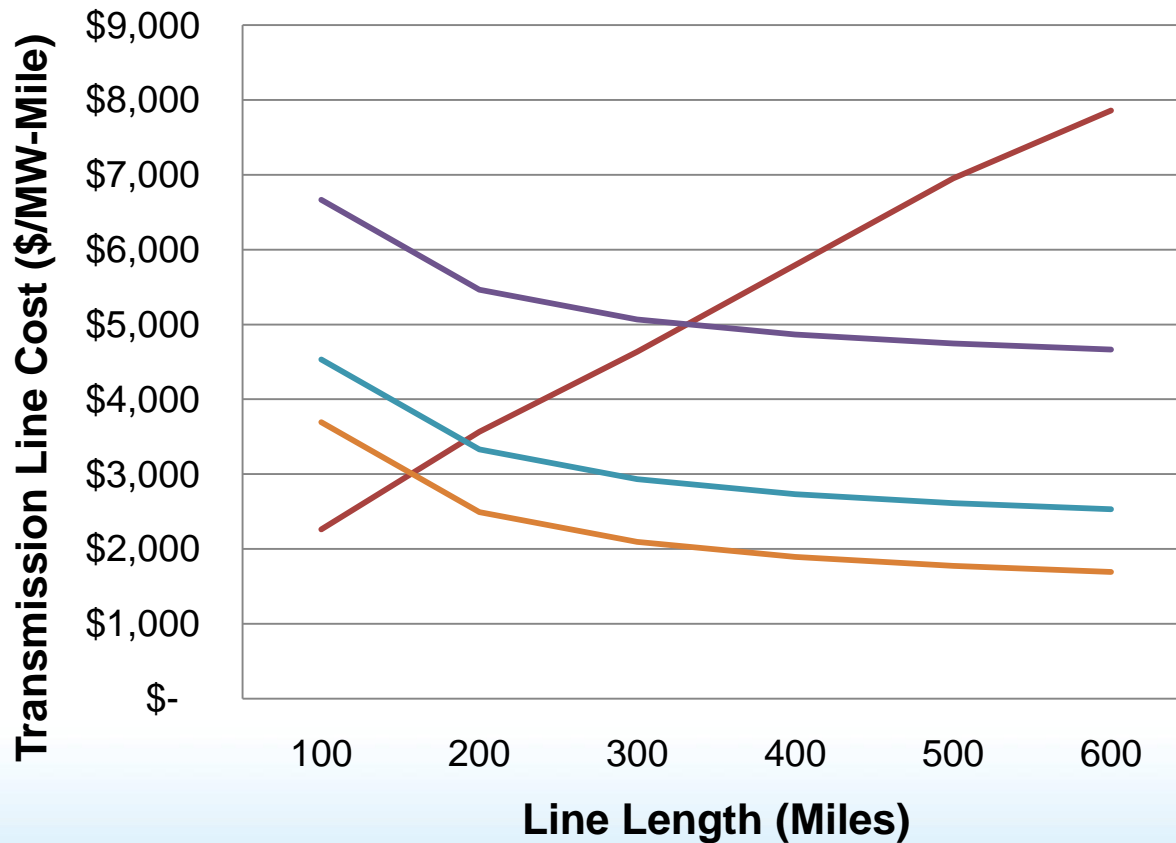
- Bulk Power Transfers over Long Distance between SuperNodes
- HVDC
 - Voltage Source Converter
- Superconducting Pipes
 - Minimum Losses
- Demand Side Management
 - Smart Grid
 - Pricing Response
 - Transport Fleet

Compare 765kV AC with Superconductor Pipe



Source: American Superconductor

Cost per MW-mile of Overhead 765kV AC and Underground Superconductor DC Pipelines



- Overhead 765kV Average
- Underground 2.2GW Pipeline
- Underground 5GW Pipeline
- Underground 10GW Pipeline

NOTES:

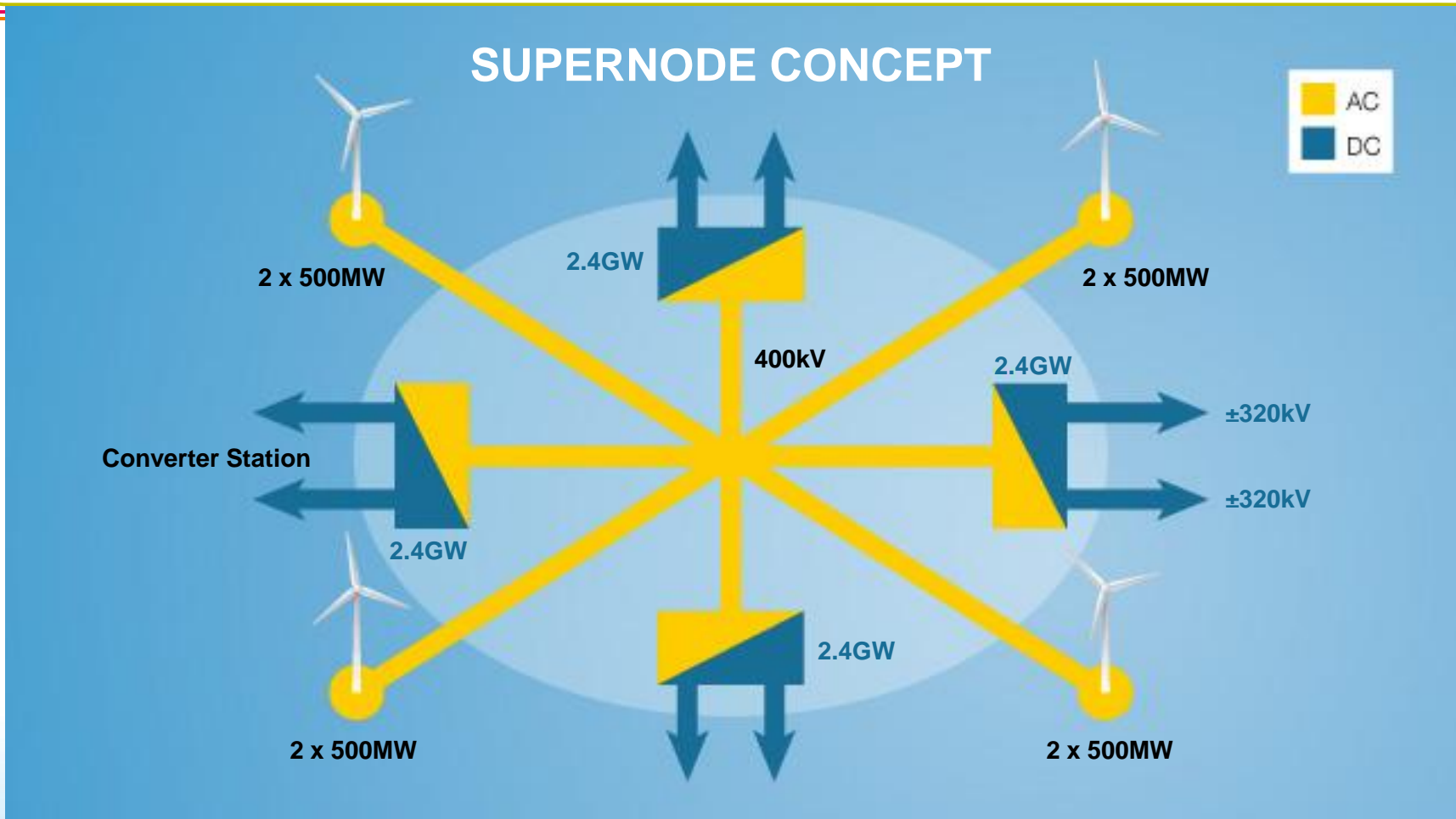
765kV line data based on average cost per mile per 01/20/2010 EWITS study

Superconductor Pipeline costs include HVDC terminal cost and a segregated pole design complete with redundant spare pole cable

Source: American Superconductor



SuperNode Concept

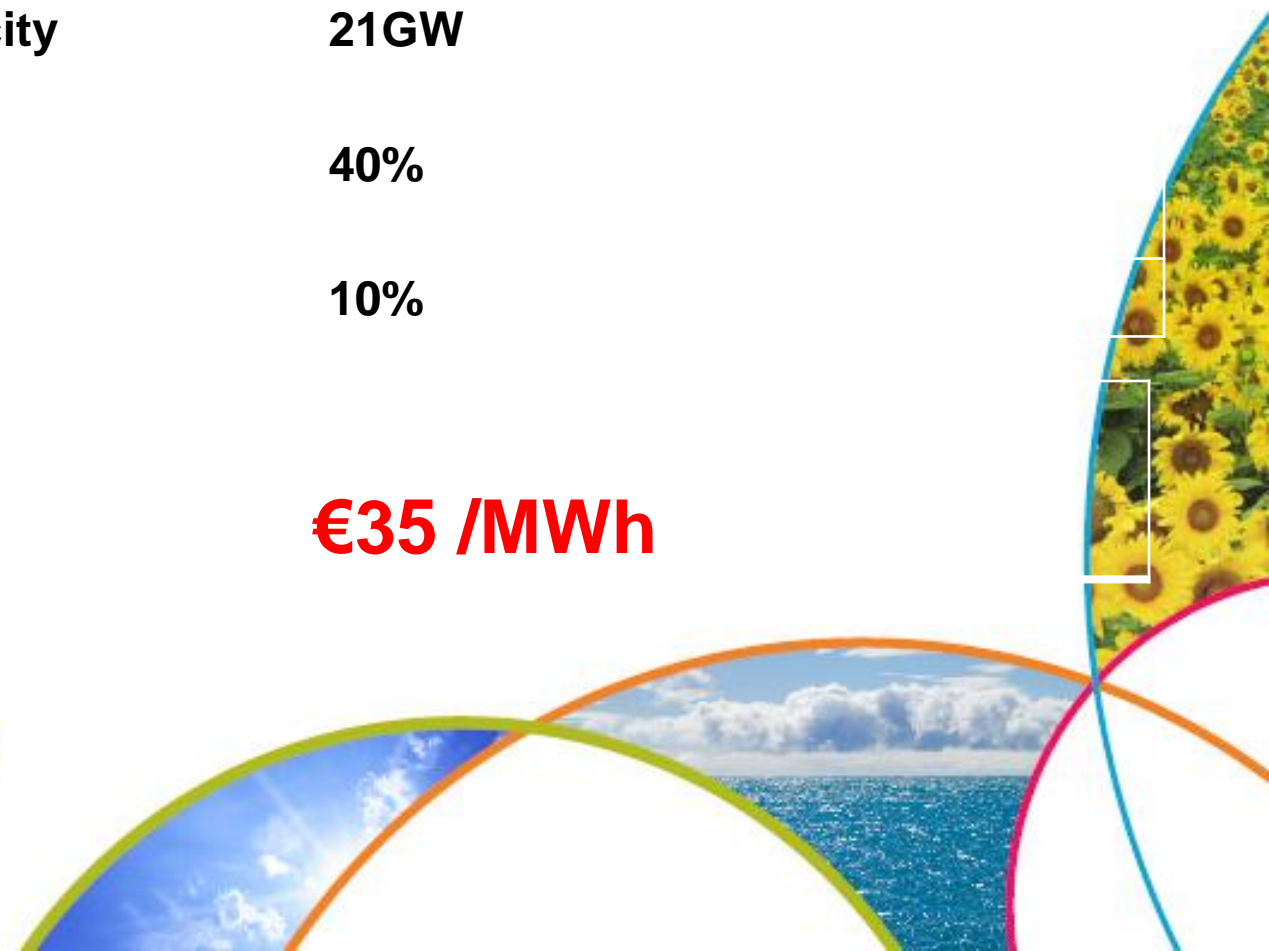


How much will it Cost?

Gearing	70/30
Total Capex	€34bn
Nameplate Wind Capacity	21GW
Wind Capacity Factor	40%
Return on Equity	10%

TUOS

€35 /MWh



Questions

- **Master Plan?**
- **Ownership?**
- **Regulation?**
- **Design?**
- **Operation?**
- **Integration?**
- **Standards?**
- **Incentives?**



What do we Need?

- Converter Development
 - Lower Costs
 - Lower Losses
 - Higher Current
- DC Cables
 - Higher Voltage
- DC Switchgear
- Super-Conducting Pipes
- Control & Protection
 - Multi-terminal HVDC Links
 - Inertia?

Results

- Energy Security
- Single Open Market
- Sustainability
- Reduce CO₂

