

TRANSFORMATIONAL TECHNOLOGY FOR MEASUREMENT & MOTION

GRID TO SMARTGRID: PIPELINE TO NERVOUS SYSTEM?

CORMAC O'PREY

7th Smart Grids & Cleanpower 2016
Cambridge 27-28 June
www.cir-strategy.com/events



Generation, Transmission and Distribution:
“the good old days...”

What’s changed?

So why do we need a “SMARTGrid” then?

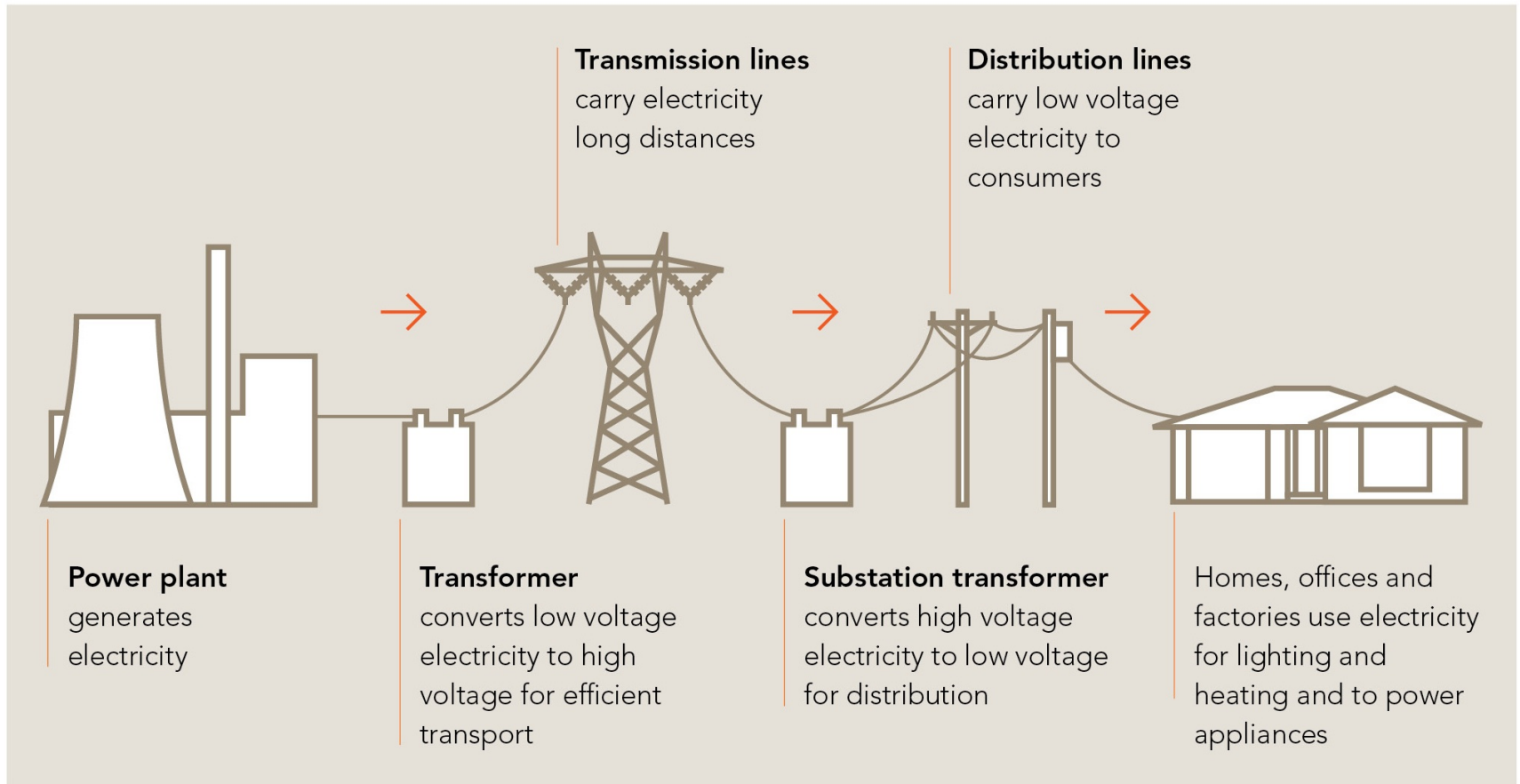
Scaleability: generation, transmission, distribution, storage

So how are we going to make it all work???

Therefore...



“THE GOOD OLD DAYS”



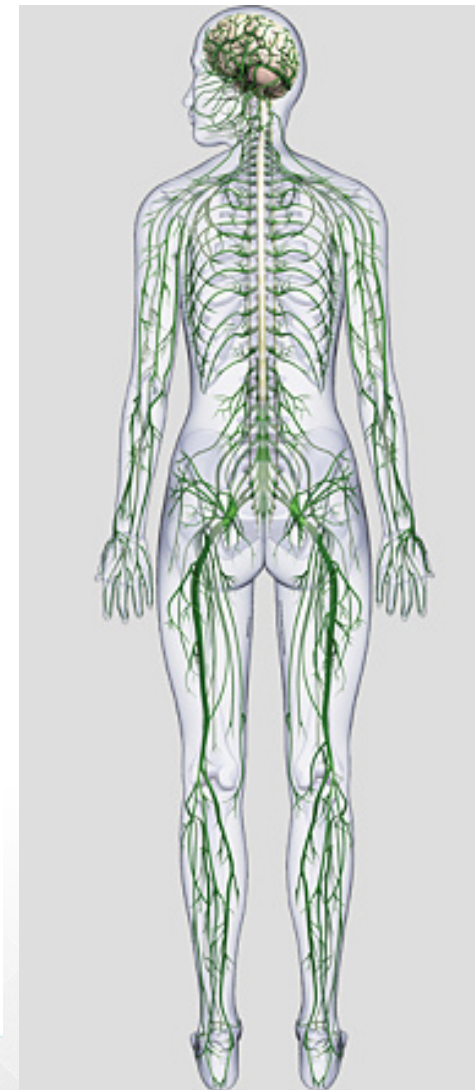
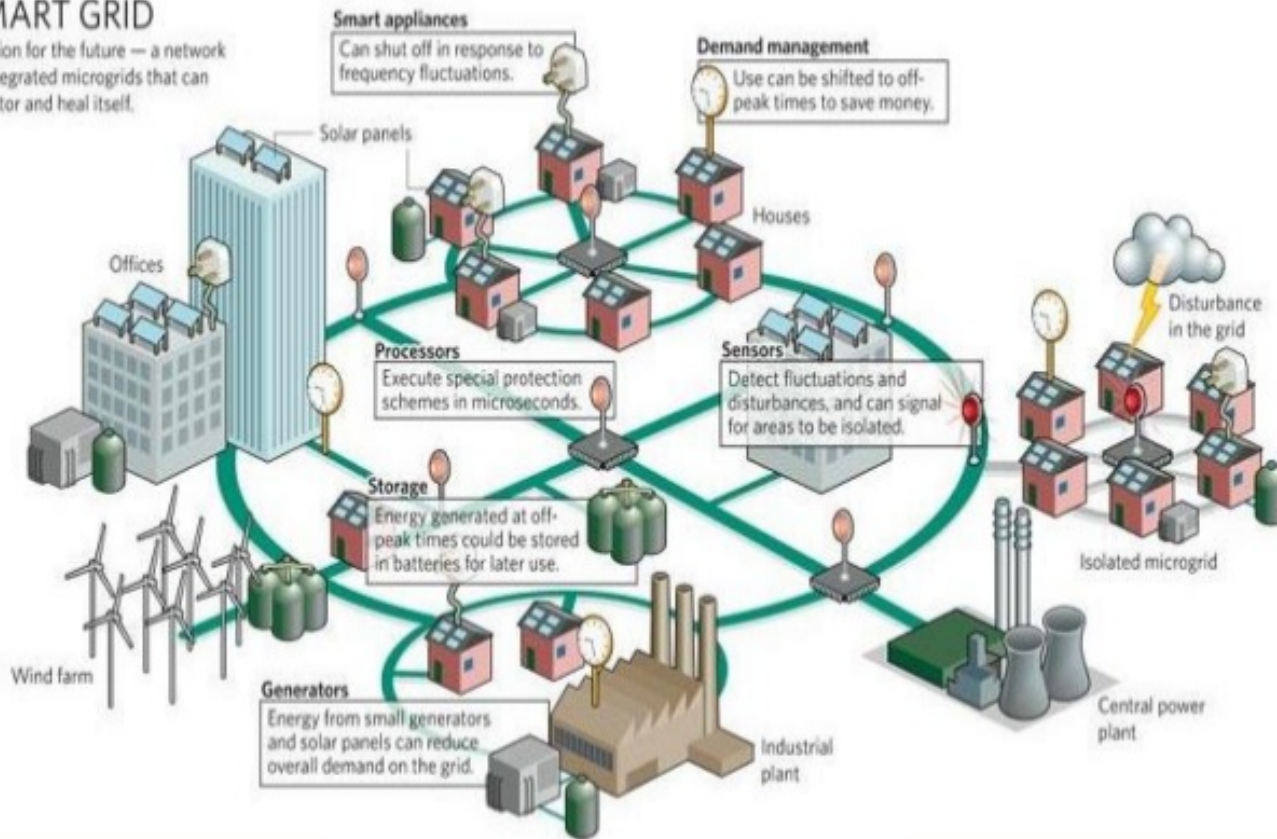
TRANSPORT OF ELECTRICITY



WHAT'S CHANGED?

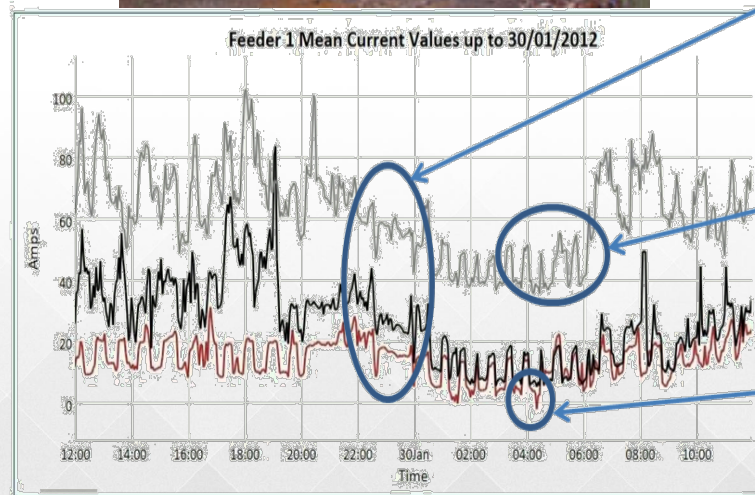
SMART GRID

A vision for the future — a network of integrated microgrids that can monitor and heal itself.





SO WHY DO WE NEED A “SMARTGRID”?



Phase 3 loaded
more than phase 1
and 2 combined

Pulsed energy
profile from
renewables

Negative current
flow – energy
flowing into the
network

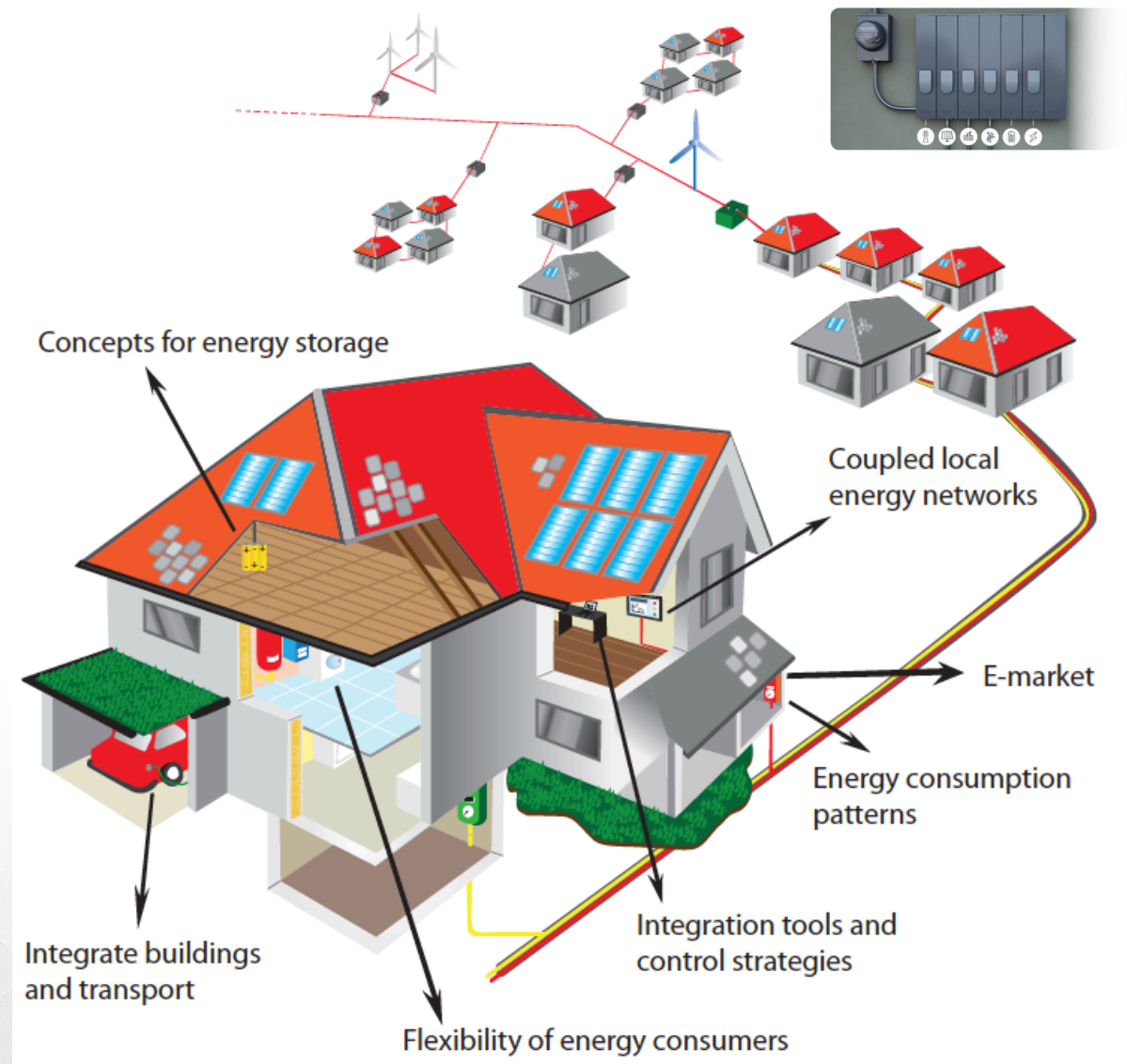


DISTRIBUTED GENERATION, DISTRIBUTION, TRANSMISSION & STORAGE: THE “FRACTAL” GRID



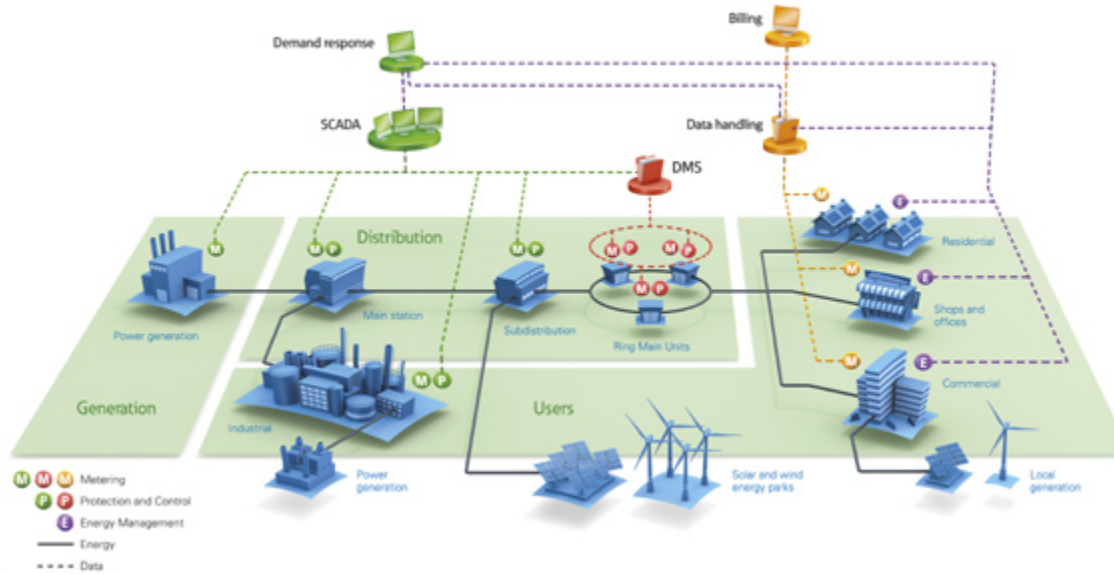


LOCAL





REGIONAL



What to do with all this energy?

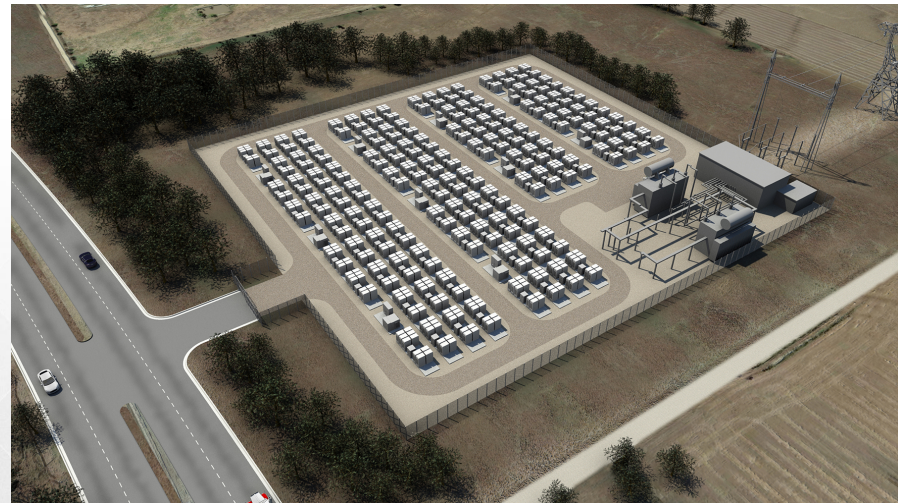
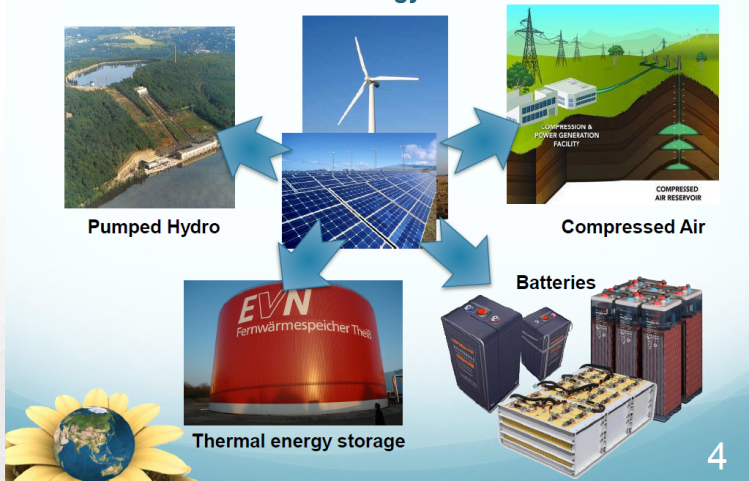


Image courtesy Narada via LinkedIn SlideShare & Tesla



INTERNATIONAL: INTERCONNECTORS

The Economist

“Icelink”

Icelink, a proposed power cable between Iceland and Britain, seems to be getting a deservedly serious hearing. It would be the longest undersea cable in the world, at at least 600 miles (1,000km), costing on current estimates £4 billion. It would take four years to build and would deliver a gigawatt of power.

Jan 20th 2014

(UK solar capacity 2015 ~8 GW: Cornwall Energy)

Map 1.1: Existing and proposed UK interconnectors



Icelandic reservoirs are like natural energy batteries, where Icelandic electricity firms can “store” the energy to the exact period when it is most needed.

TTG-005:

Conversion of 220 kV lines to 380 kV. Already approved.

P25:

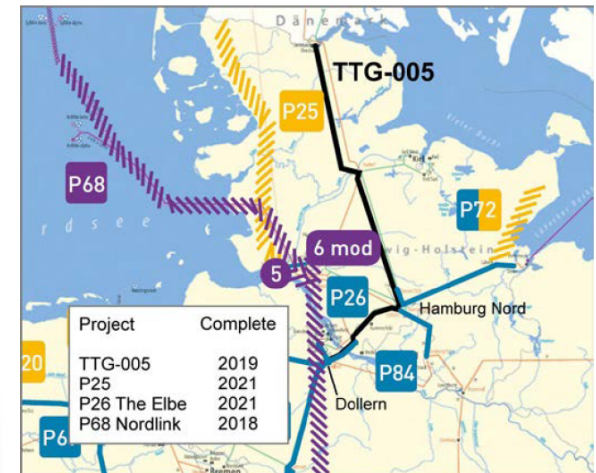
New 380 kV lines from Brunsbüttel to the Danish border, the West coast line.

P26:

New 380 kV line crossing the river Elbe.

P68:

1,400 MW HVDC link to Norway.



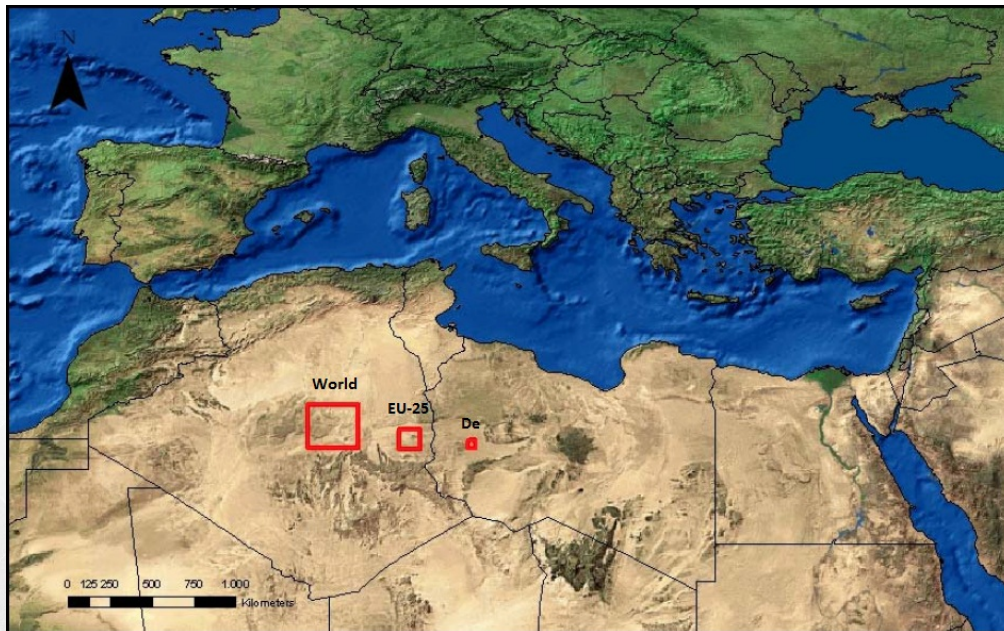
Recently the Danish TSO, Energinet.dk, announced an agreement with TenneT (one of four German TSOs) on upgrading an old 220 kV interconnection between West Denmark and Germany to 380/400 kV. On 8th April 2015, the Danish Energy Association (DE) said that there is plentiful capacity across the border, but that the utilisation is constrained by bottlenecks in the internal German grids. Bloomberg has passed on the story¹.

¹ <http://www.bloomberg.com/news/articles/2015-04-09/as-germans-block-danish-wind-a-new-feud-tests-crisis-weary-eu>

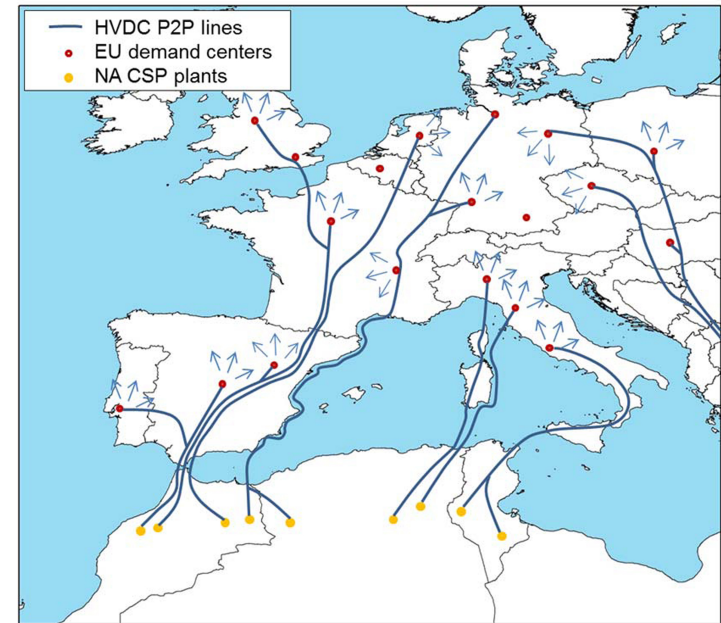


GLOBAL? THE VISION...

“Desertec”



“Supergrid”



MEDGRID

Medgrid, to based in Paris, will carry out feasibility studies during three years for a grid that may start importing electricity to Europe by 2020, it said today in a statement. The 20-shareholder company, created yesterday, is a “major step” toward plans to develop 20 gigawatts of mostly solar renewable energy by 2020 in North African and eastern Mediterranean countries, a quarter of which will be exported to Europe, according to the statement. Medgrid’s mostly European 21 partners include Abengoa SA, Alstom SA, Areva SA, Electricite de France SA, GDF Suez SA, Prysmian, Red Electrica Corp. SA, Siemens AG, Taqa Arabia and Terna SA.

This was 2014. Is this still a viable plan?



THE RESPONSE?





So what does it all mean...?

Now ideas on what SmartGrid is and what it could do are coalescing into a coherent picture, we can proceed with more confidence but...

- ◆ Nothing can or will happen without kit
- ◆ Kit-builders and system adopters are risk-averse in business and technical areas they're unfamiliar with
- ◆ DNOs occupy a key role but are culturally “allergic” to the concept and the perceived risk (with good reason?)
- ◆ It's an engineering problem - Incentives and drivers are needed to make it happen and get engineers working on it
- ◆ The drive for change will need to balance the reticence of adopters to find a way forward but avoiding indigestion

Small but sure steps to understand risk and build confidence



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