The Future of European Energy

2012 Future Energy Scenarios

London, 27 September 2012

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entsoe

Reliable Sustainable Connected

Outline

- **ENTSO-E: role, membership, structure, …**
- **What will it look like in 10 years?**
- **Priorities …**
- **Costs impact**

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ENTSO-E role

41 TSO members from 34 countries

Major responsibilities

- Network codes
- 10 year network plans
- Adequacy Forecasts
- Tools and processes for market integration
- R&D Plan

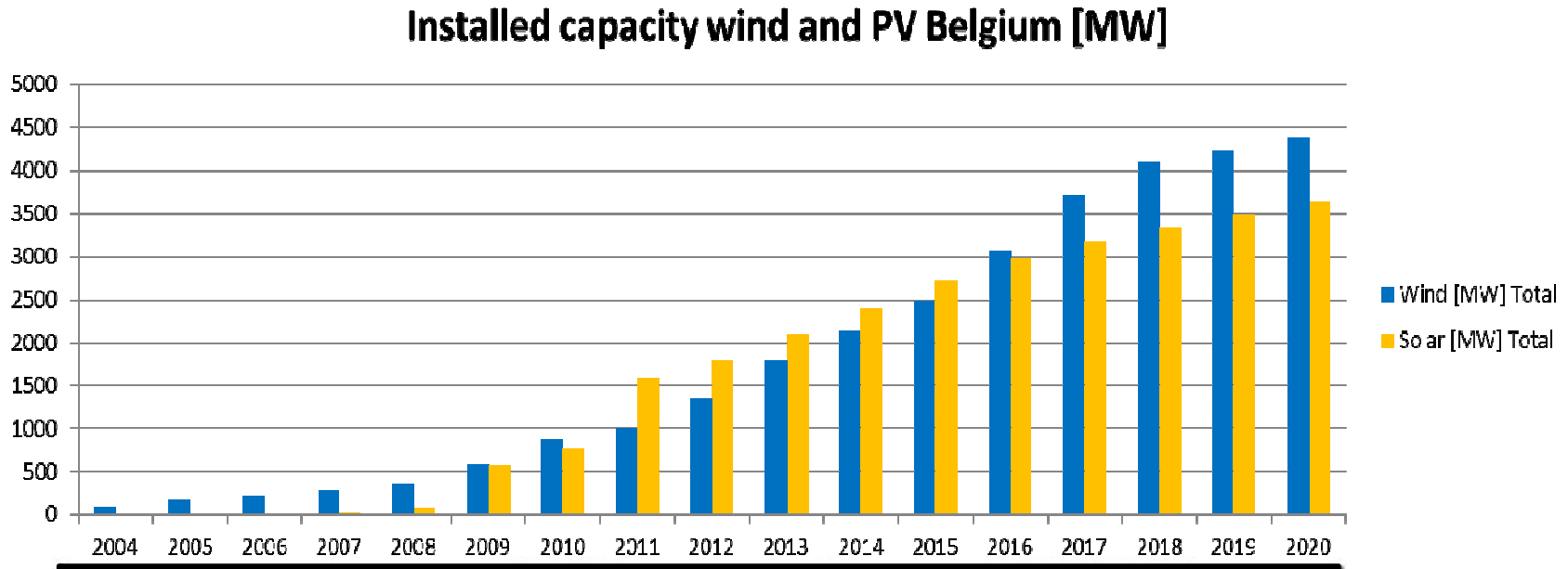
Through its members deliver

infrastructure and **market tools**

Outline

- ENTSO-E: role, membership, structure, …
- **What will it look like in 10 years?**
  - **Hardware**
- Priorities …
- Costs impact

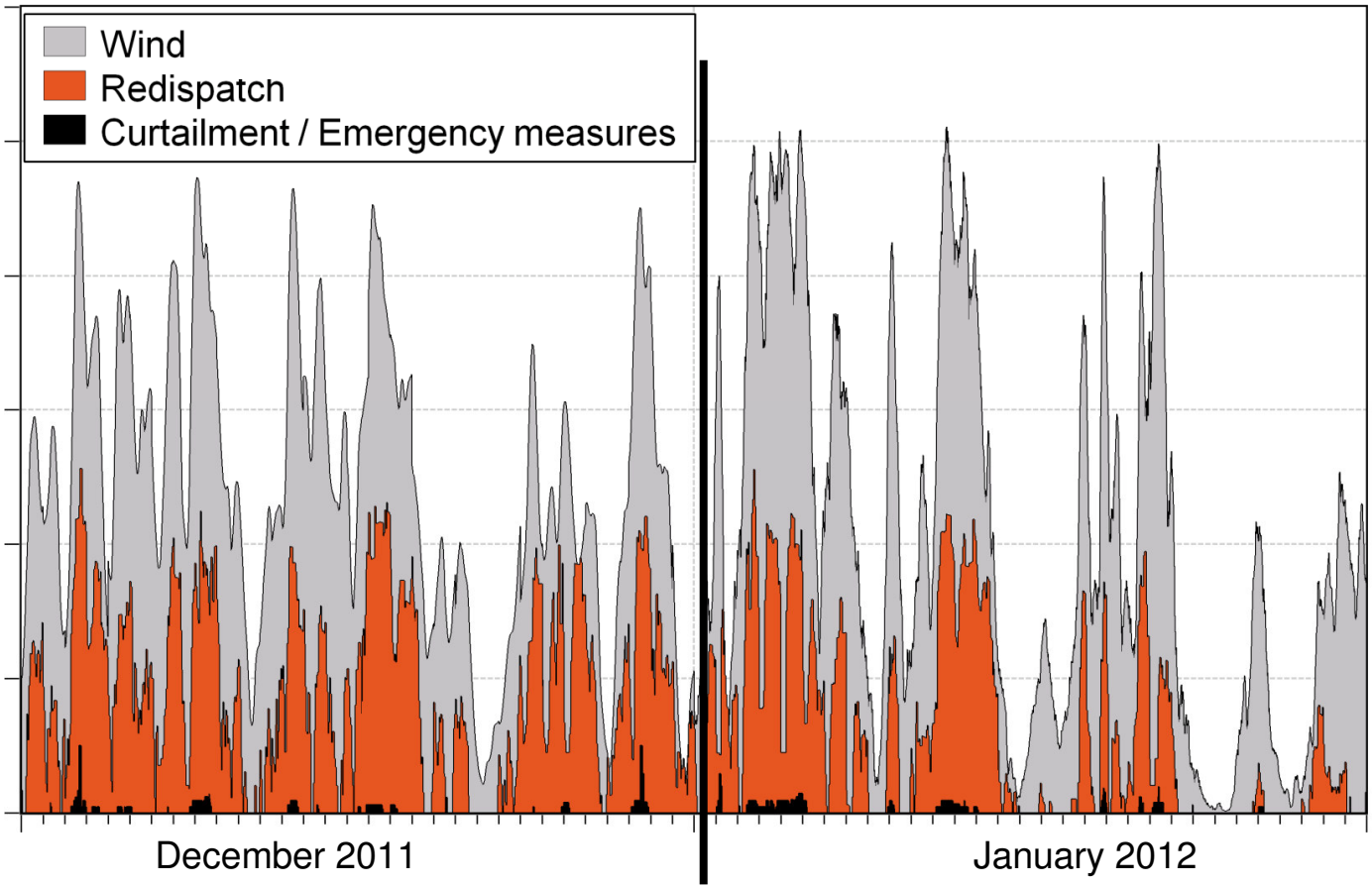
1. RES : the game changer



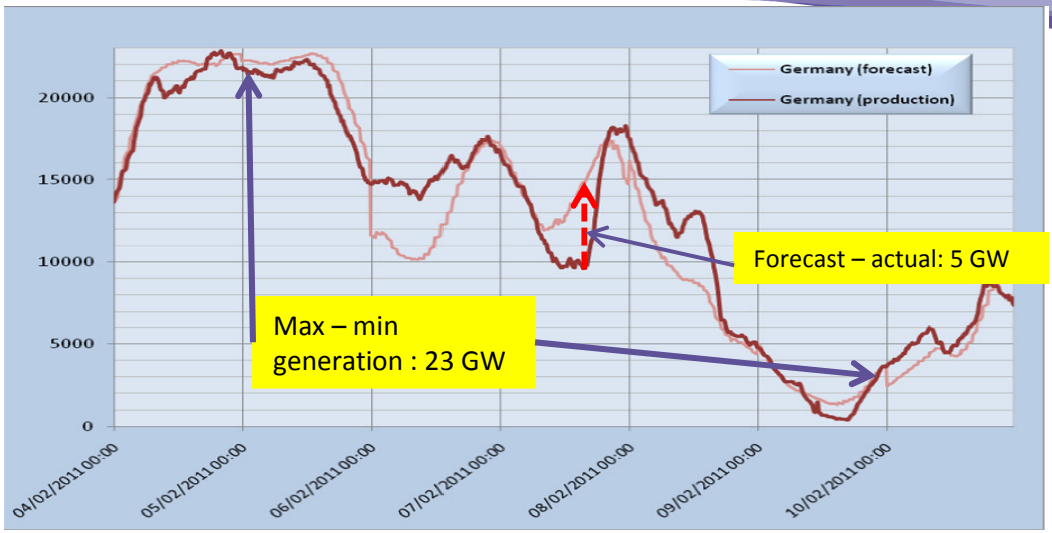
External study	2009 SAR					2020 ENTSO-E				
	BE	DE	FR	NL	UK	BE	DE	FR	NL	UK
Load	13.9	73	92.4	17.5	58.5	(15.9)	(75.1)	(76.4)	(17.9)	(57.4)
Nuclear Power	5.9	20.3	63.3	0.5	10.8	4.1	18.8	66.8	0.5	11.2
CCGT	6.8	17.5	8.3	19.0	27.1	10.3	18.0	7.1	21.8	32.3
RES	1.8	36.7	5.6	3.0	1.4	8.1	107.0	33.4	12.6	27.0
Wind Onshore	0.5	24.9	4.4	2.2	1.4	2.3	36.0	19.0	6.0	9.0
Wind Offshore						2.0	10.0	6.0	5.2	16.4
Other (solar+other)	1.3	11.8	1.2	0.8	0.0	3.8	61.0	8.4	1.4	1.7
Net Gen. Capacity	17.6	134.2	119.2	26.6	73.8	24.1	196.8	147.1	44.1	92.2

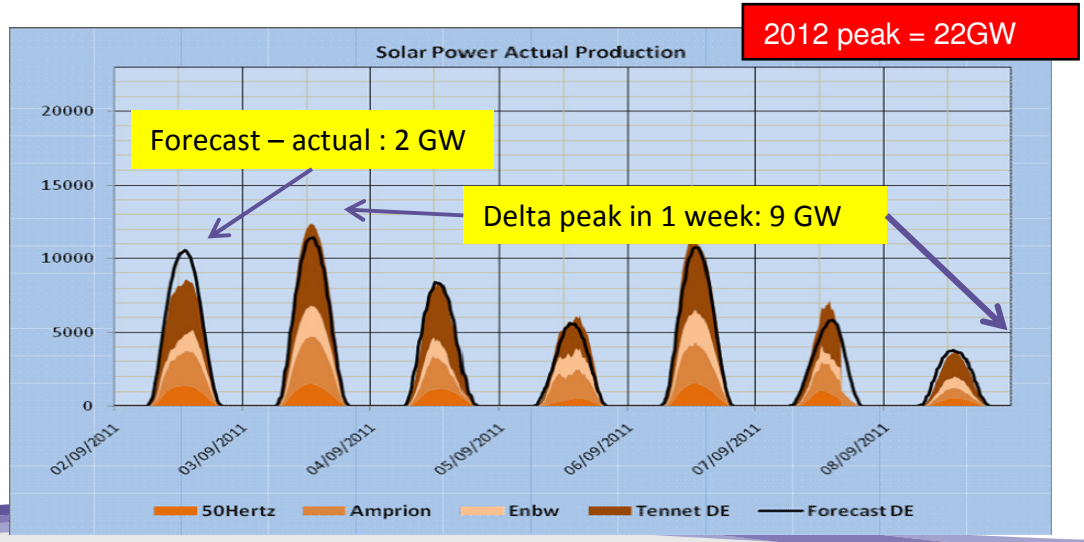
X 4

.. RES = transmission capacity or …



.. RES = flexibility or …





For Germany alone…

around 50% generation= Wind + PV

Flexible CCGT = 2000-3000 h/yr

Reserves R1-R2-R3
due to forecast error= ~ 5 GW

Assuming 400 MW CCGT units with
fast ramping of ~150 MW

approx. 33 CCGT units

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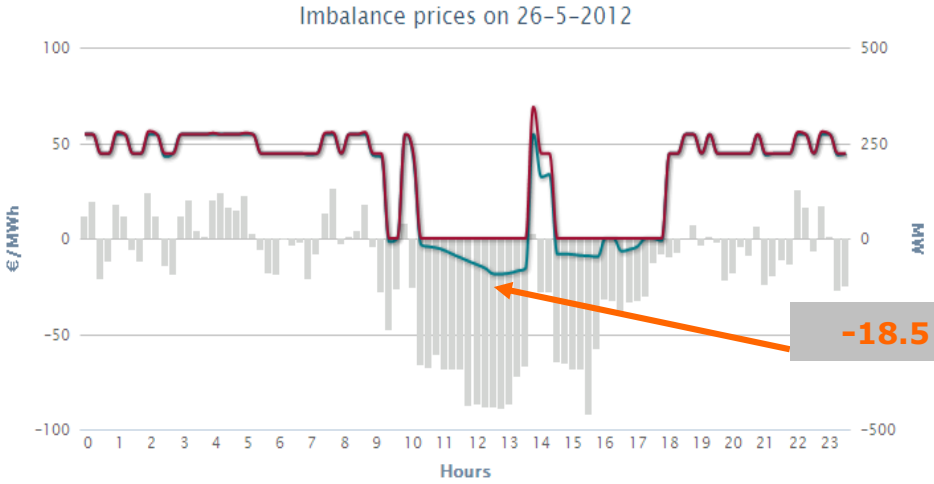
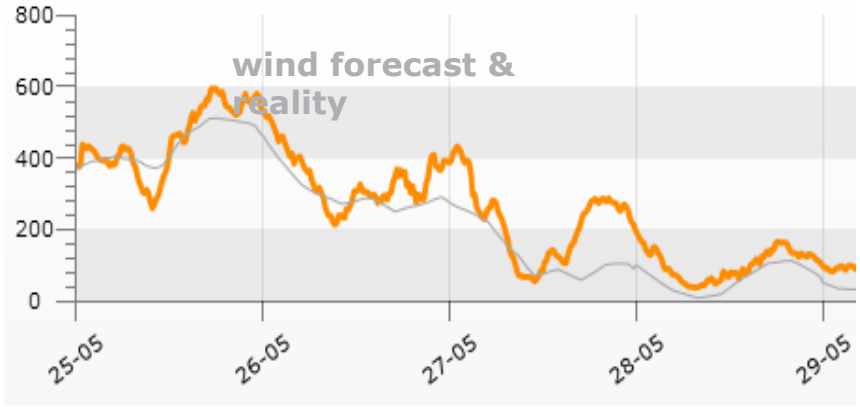
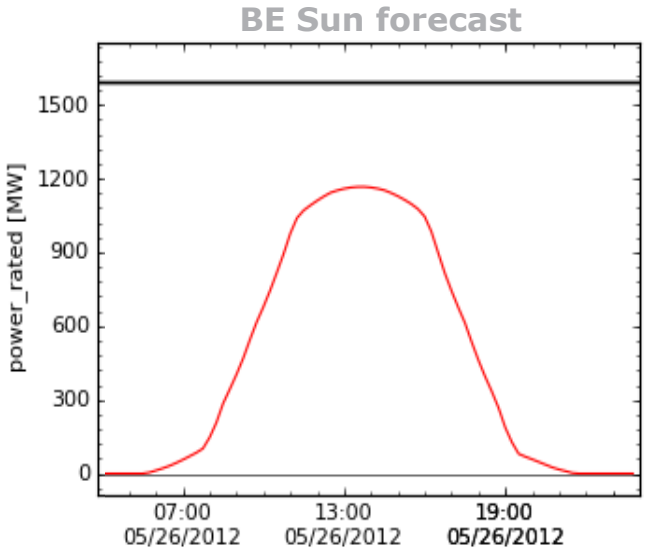
.. RES = highly liquid intraday market or …



Negative prices !

-18.5 EUR/MWh for positive imbalance

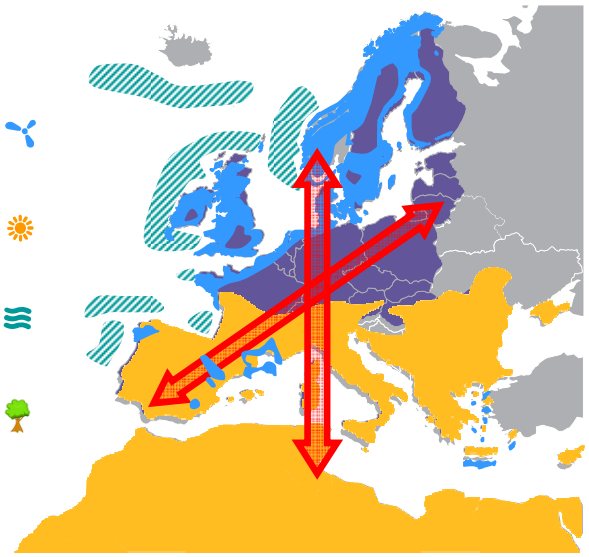


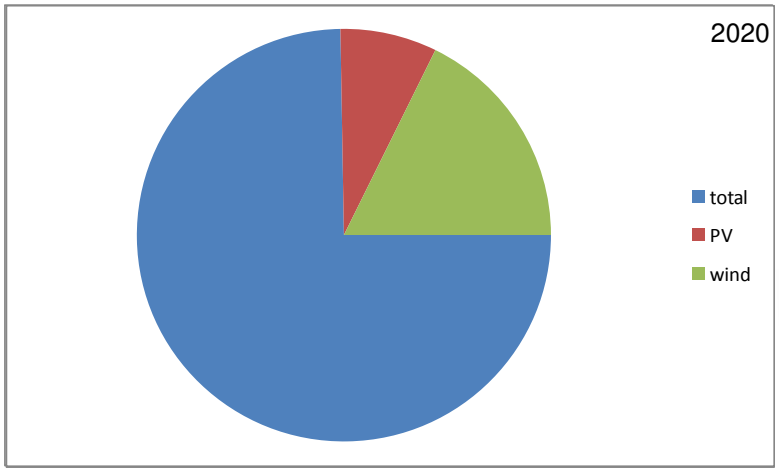


NRV is the difference (for each moment) between the sum of volumes of all upward regulations and the sum of volumes of all downward regulations requested by Elia to maintain the balance of the control area.

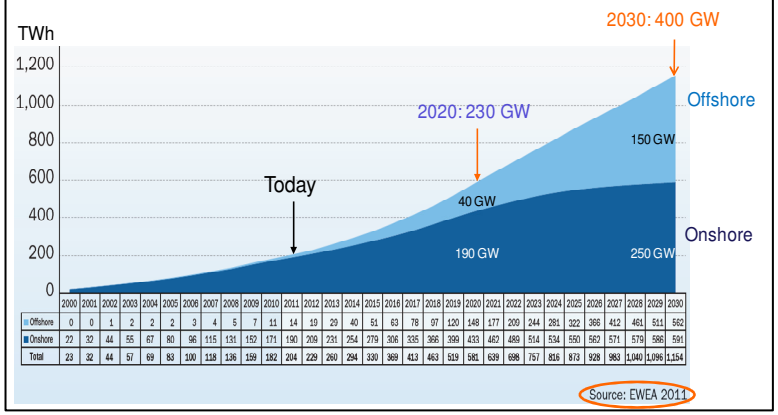
2. A Grid for all kind of Power flows

Huge flows all over Europe





Wind share of demand: 2010 = 5,3% → 2020 = 23% → 2030 = 36%

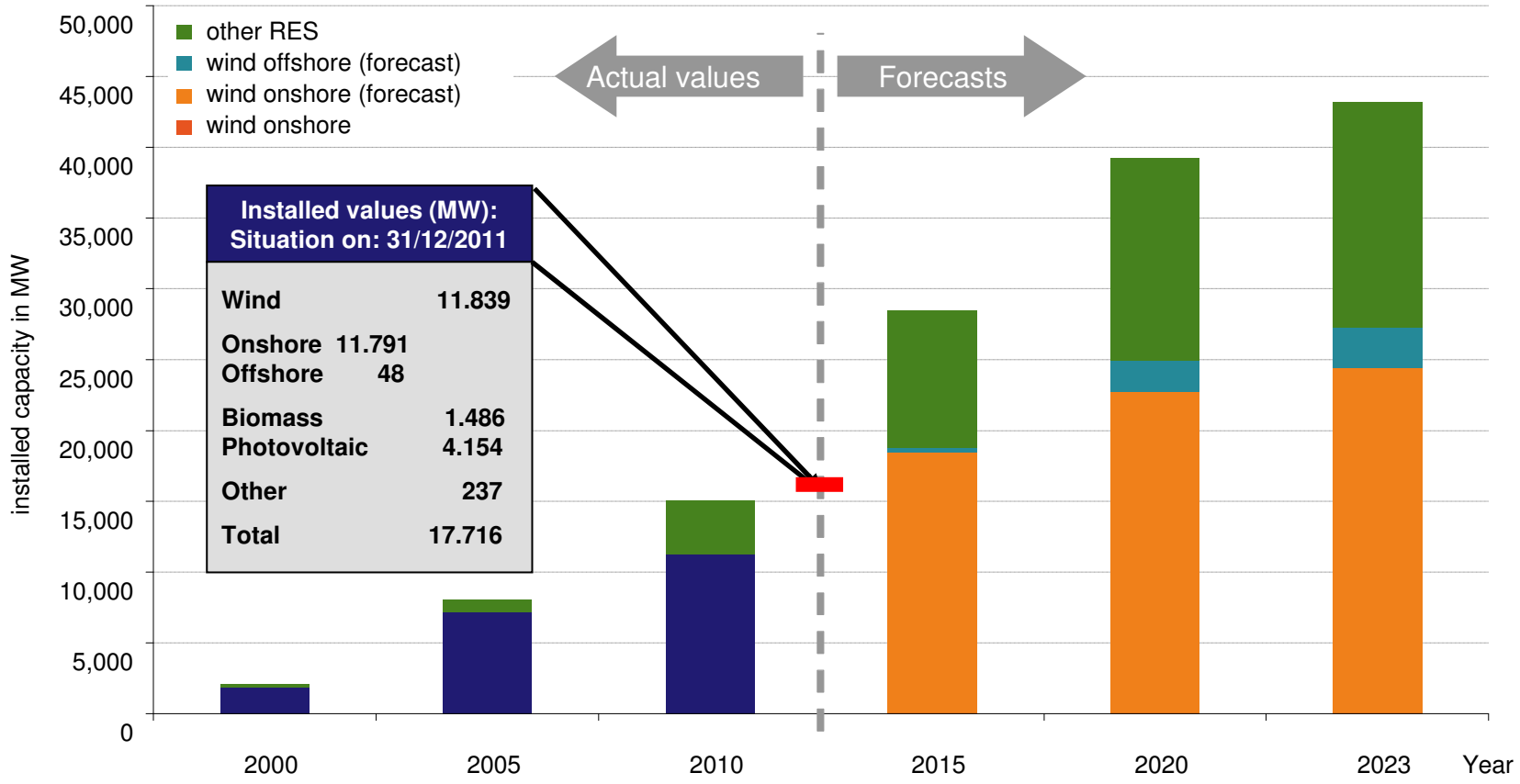


	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Offshore	0	0	1	2	2	2	3	4	5	7	11	14	19	29	40	51	63	78	97	120	148	177	209	244	281	322	366	412	461	511	562
Onshore	22	32	44	55	67	80	96	115	131	152	171	190	209	231	254	279	306	335	366	399	433	462	489	514	534	550	562	571	579	586	591
Total	23	32	44	57	69	83	100	118	136	159	182	204	229	260	294	330	369	413	463	519	581	639	698	757	816	873	928	983	1,040	1,096	1,154

Thousands of small units

.. while more RES is coming on line fast

Example from one German area

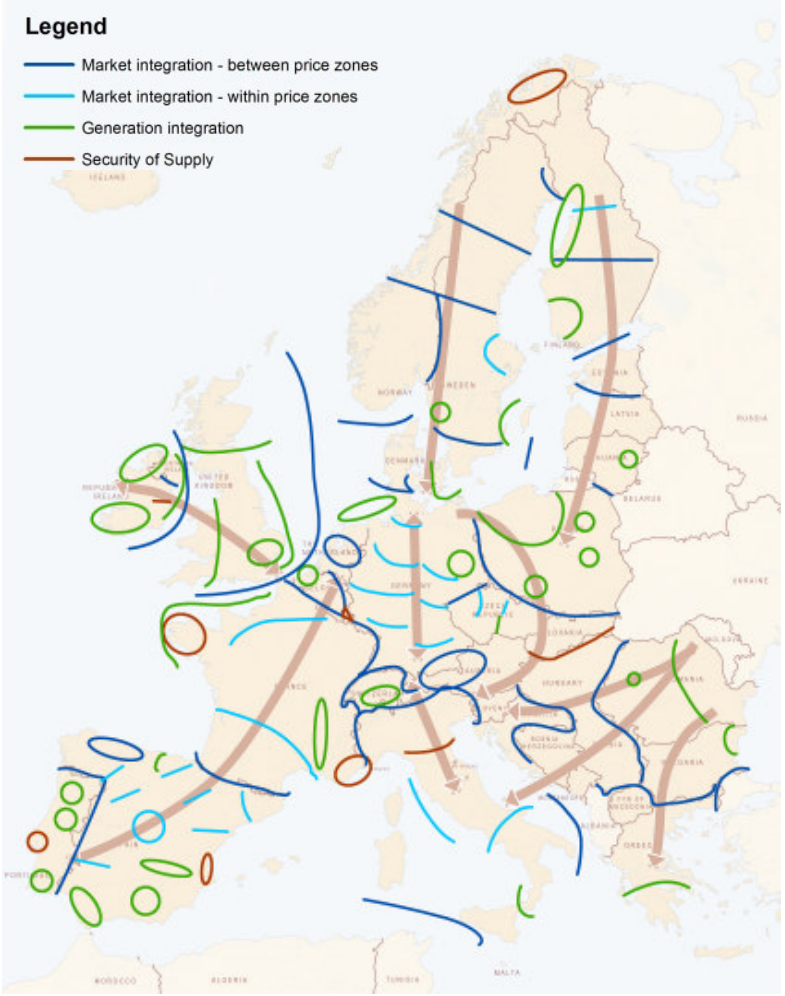


Data from 2000 to 2010 (actual): www.eeg-kwk.net of 13/12/2011
Data from 2015 to 2023 (forecast): EEG forecast 50Hertz Transmission, Situation in 2011

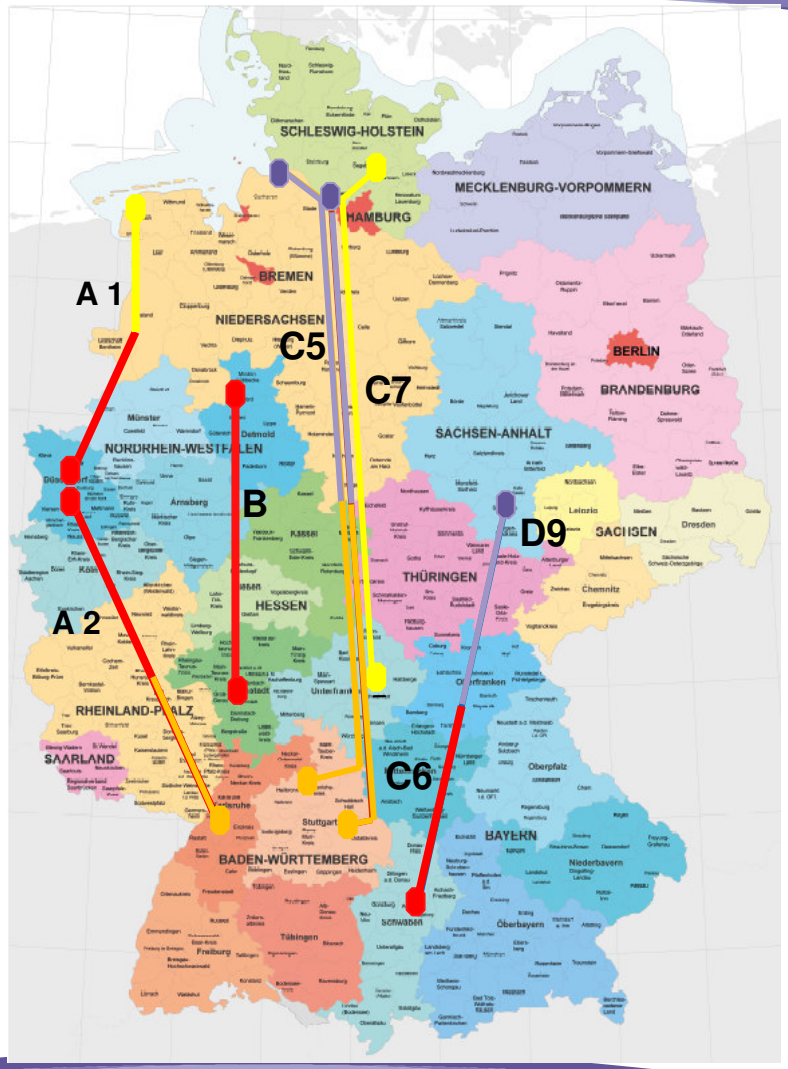
.. Implying more grid capacity … with HVDC corridors

~€104 bn investments, to be compared with
≈ 2% of the bulk power prices and
less than 1% increase of end-users' E-bills

+1.3% per year grid length to match
a major shift in generation mix and
+3% p.a. of generation capacity growth

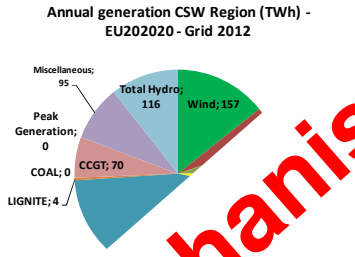


.. implying more grid capacity … with HVDC corridors

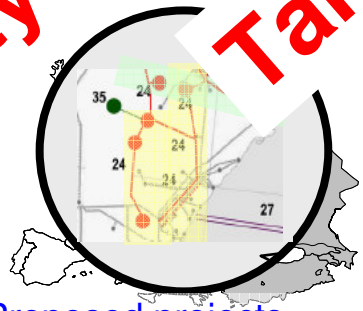


… another game changer …

.. but tomorrow's grid = a moving target ... 2014 ... 2016 ...



Ge… …gas …needs



Proposed projects

…arket studie…

…/20 …2020

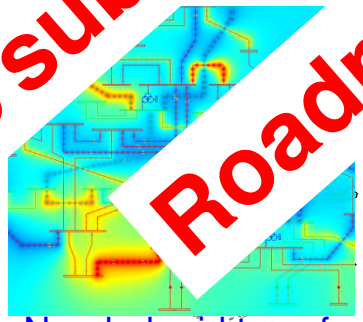
Capacity mechanisms

Tariff issues

RES subsidies

Roadmap 2050

Expecte… flow …



Needed grid transfer capacity increases

Transmission adequacy

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  - **Software**
- Priorities …
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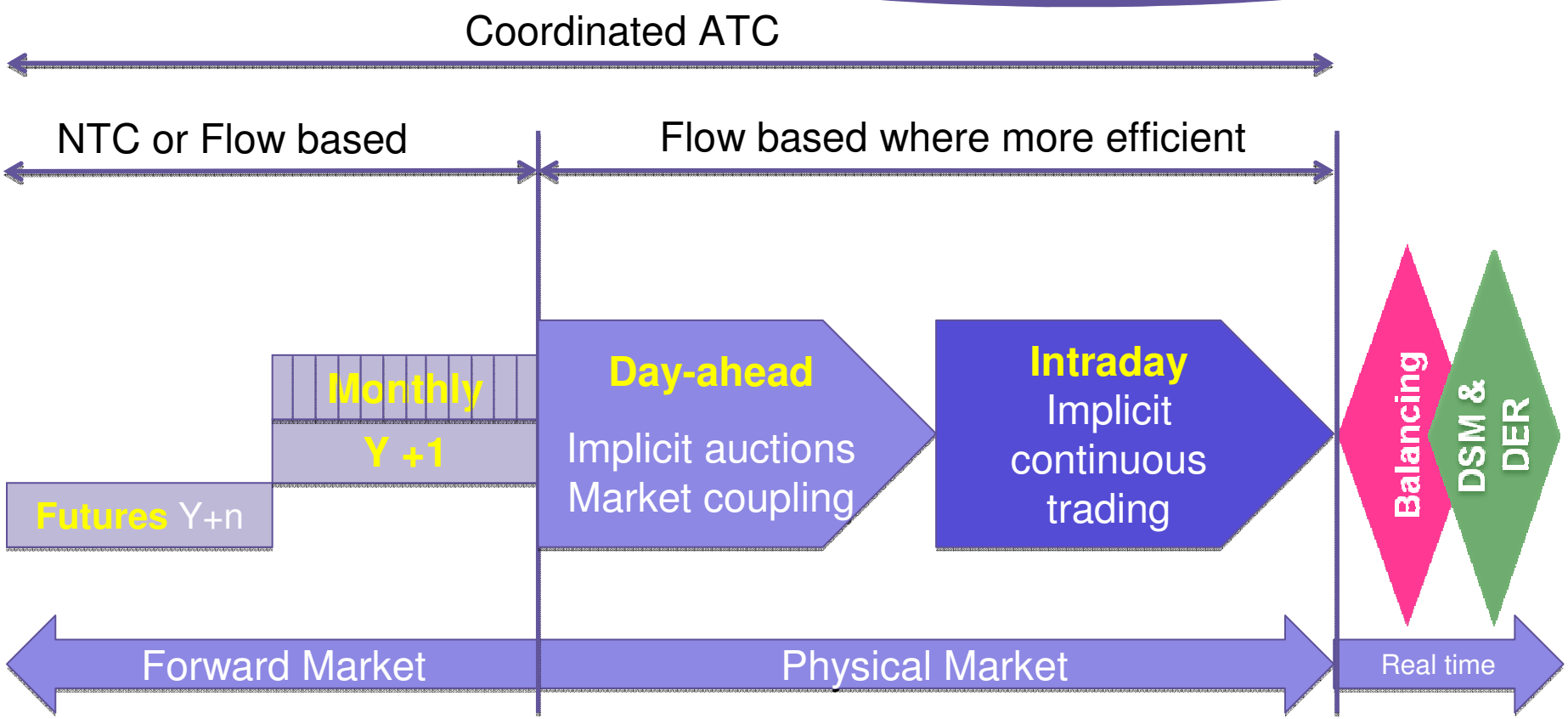
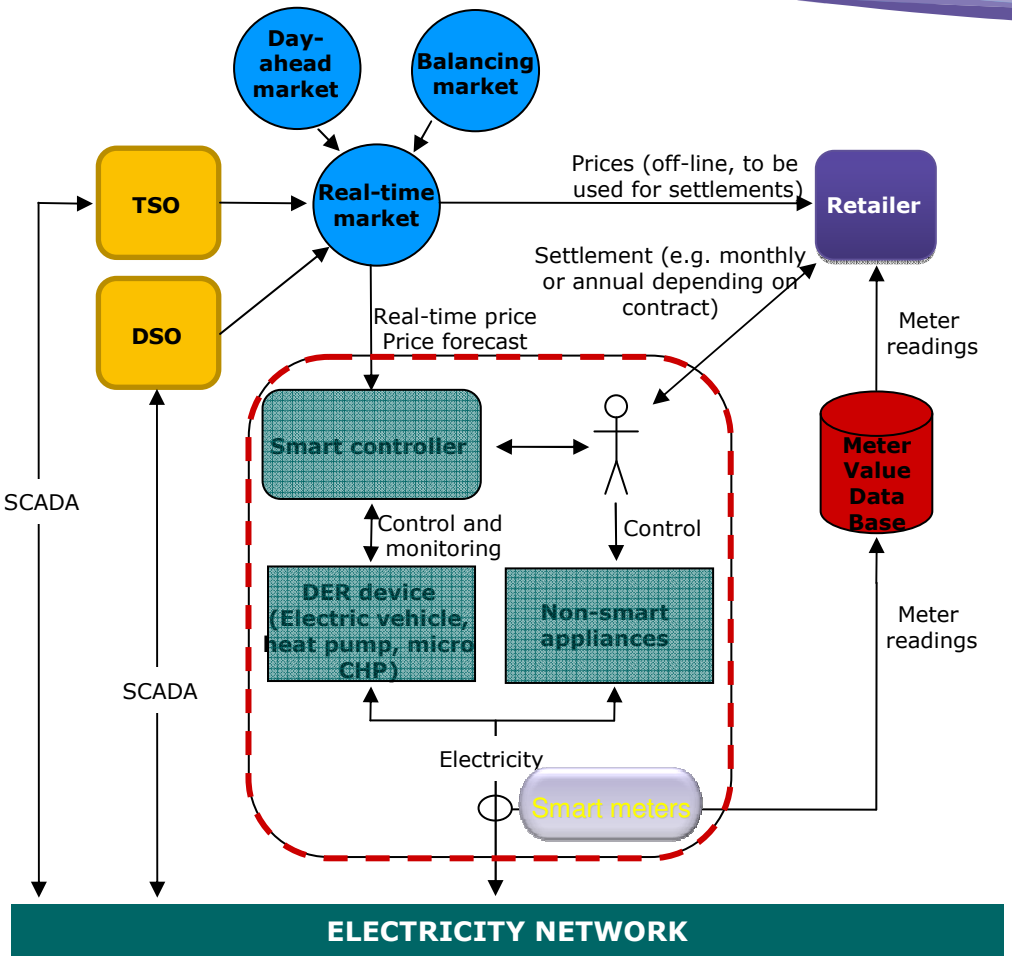
a Common Market Model in .. 2014 !



But ... for the software to work ... a well functioning hardware is a prerequisite !

.. DSM & DER : are only smart meters needed to make it happen?



New market architecture:

- Installation of automatic end-user ”smart controllers” in Distributed Energy Resources
- Smart Meters to manage ”real-time” price signals
- Modern communication /information infrastructure to transmit price signal to market participants/ operational units

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A stable and attractive regulation looking forward !

Conclusions of the European Council
4 February 2011

"It is important to streamline and improve authorisation procedures, while respecting national competences and procedures, for the building of new infrastructure;"

"The bulk of the important financing costs for infrastructure investments will have to be delivered by the market, with costs recovered through tariffs. It is vital to promote a regulatory framework attractive to investment".

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... Impact on TSO costs compared to RES support ?

"The extension of renewables into the system will entail significant costs above lower-cost alternatives for many years.

IHS CERA finds that subsidy costs - supporting the legacy investments made before renewables costs reach cost-competitive levels - could ***peak in 2020–30 at around €45–€60 billion per year****.*

Subsidy supports are not expected to fall below today's levels before 2035 at the earliest and could continue at high levels through to 2050. (…)

Although these costs are necessarily uncertain, it is clear that costs will be significant and likely in this range."

"Sound Energy Policy for Europe", IHS-CERA, July 2011

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