Transizione energetica e decarbonizzazione… e l'idrogeno?

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Convegno "Idrogeno:....il domani è già cominciato?"

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Environmental issues are leading energy strategies/programs

”The United Nation Conference on Environment and Development” of 1992 in Rio has posed the necessity to substitute with alternative energy resources the fossil fuels considered responsible of global warming.

From the 1997 following Kyoto Protocol up to the 2016 Parigi Accord and the last Nov 2017 Conference in Bonn a series of declared of outstanding engagements for decarbonization from many countries/regions

The primary energy consumptions

OIL(33%) ,COAL(28%) and GAS(24%) have together now 85% share compared to 92% in 2005

RES now 10% from 6.8% in 2005: hydro is at 6.6% and wind and PV even with an explosive growth are together at 2.5%

There is no scarsity of fossil fuels the key problem is burning effect of fossil fuels;

Fossil fuels will still have, according to IEA and many other scenarios ,a non negligible role up to 2050 in primary energy consumption

CO 2 EMISSIONS

In 2017 non OCSE 62.5 % of CO2 emissions (AAG 3.4% in 10 years)

OCSE 37.5% with AAG -1%

EU (including UK) CO2 share of 10.4% with -2% AAG

Germany (37% of electricity production with lignite and coal) 2.3% world CO2 share,UK1.2%,Italy 1%,France and Poland 0.9%,Spain 0.8%

Decarbonization is global and it is/will be mainly dependent on non OCSE countries (China has a 27.3 % share of CO2 but US is at 17.5%)

The EU contribution is always more marginal and in 2030 without UK it should be around 6%

The electricity sector with explosive VRES(Variable Renewable Energy Sources)

The electricity sector is the one that has seen in the last 15 years the major changes

-privatizations and new market rules
-explosive development of RES ,mainly wind and solar
-decentralization of production
-pervasive application of ICT at all the levels

	2001		2016	
Coal	38.7%		37.5%	
Oil	7.4%	FF 64.7%	4.0%	FF 65.1%
Gas	18.6%		23.6%	
Nuclear	17.1%		10.5%	
Hydro	16.5%		16.4%	
Biomasses	1.1%	RES 18.2	2.3%	RES 24.4%
Other Renewables	0.6%		5.7%	

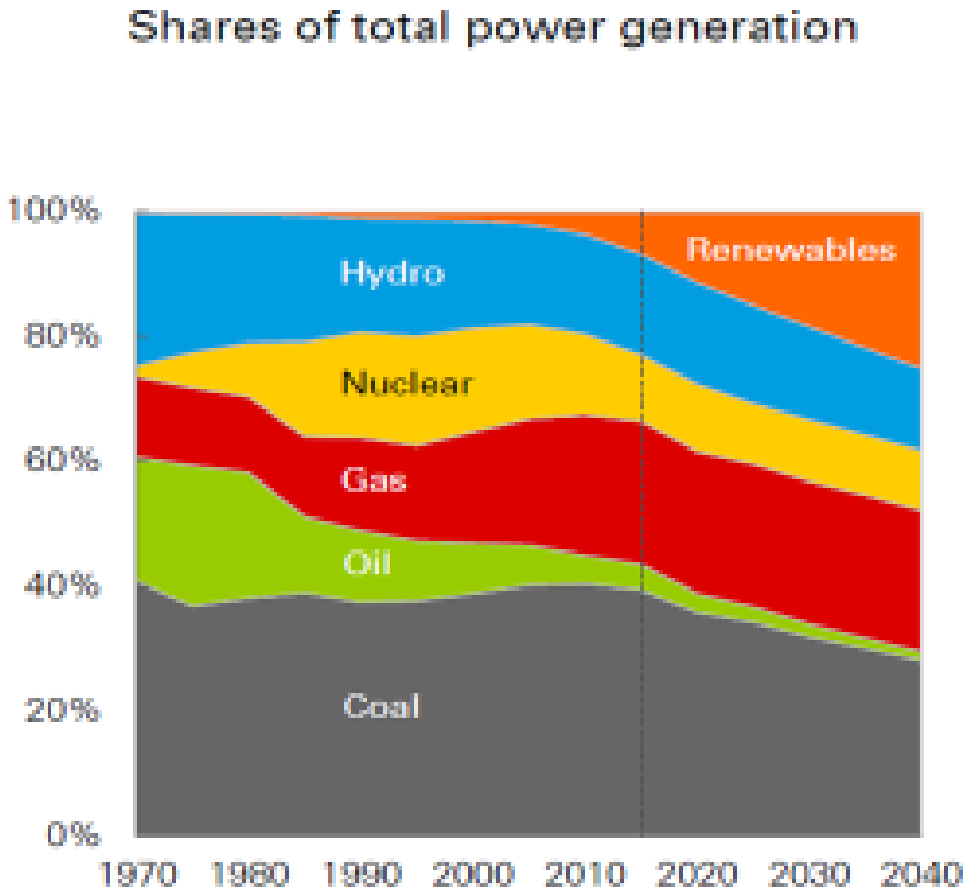
Contribution by the different sources to the 2001 and 2016 global gross electricity production

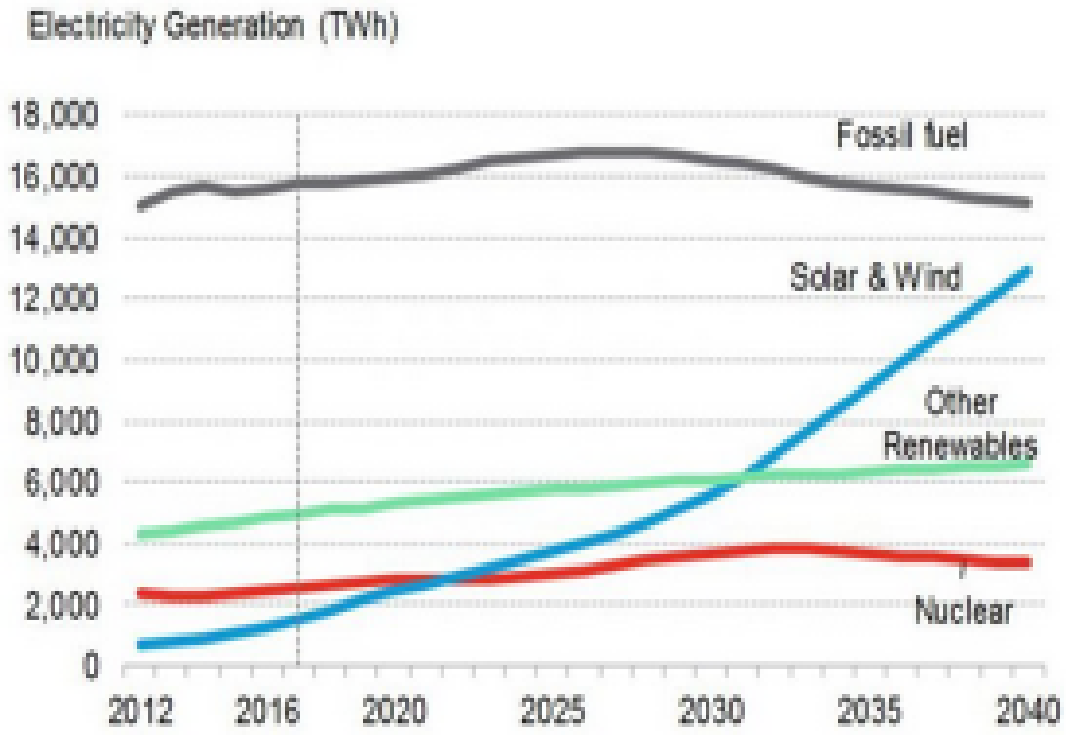
Elaborations from IEA

Projected development of electricity generation up to 2040

-FOR BP IN 2040 FOSSIL SHARE 53% (27% COAL ,24% GAS, 2% OIL) ,RES 38% (13% IDRO AND 25% OTHERS MAINLY PV AND WIND) AND NUCLEAR 9%-COAL STILL THE FIRST PRIMARY SOURCE FOR ELECTRICITY

-FOR BLOOMBERG IN 2040 FOR THE GLOBAL 38000 TWH PRODUCTION, RES SHARE IS 51% (2/3 FROM PV AND WIND) ,FOSSIL AT 40% AND NUCLEAR AT 9%-



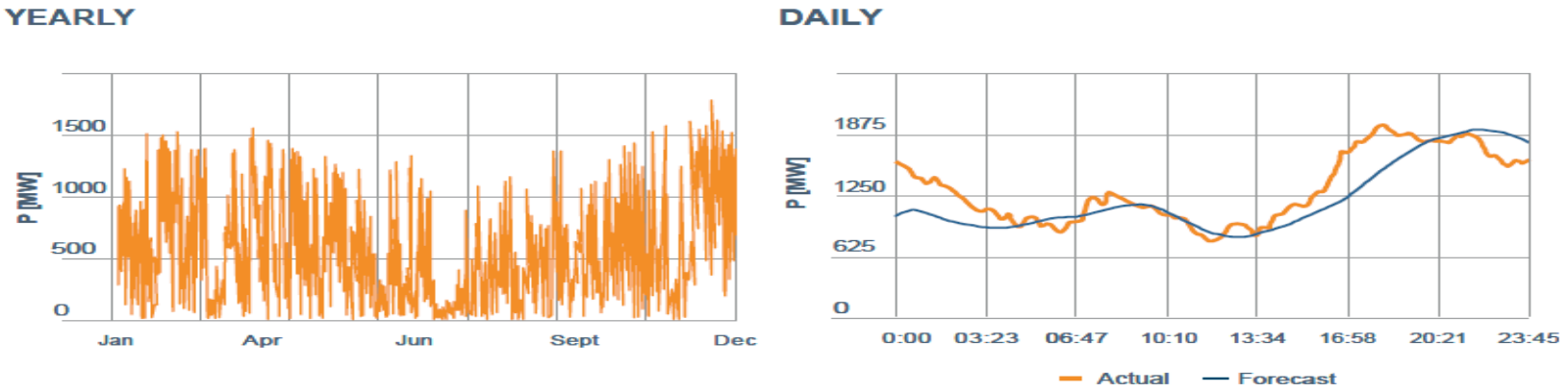


Source: Bloomberg New Energy Finance, New Energy Outlook 2017

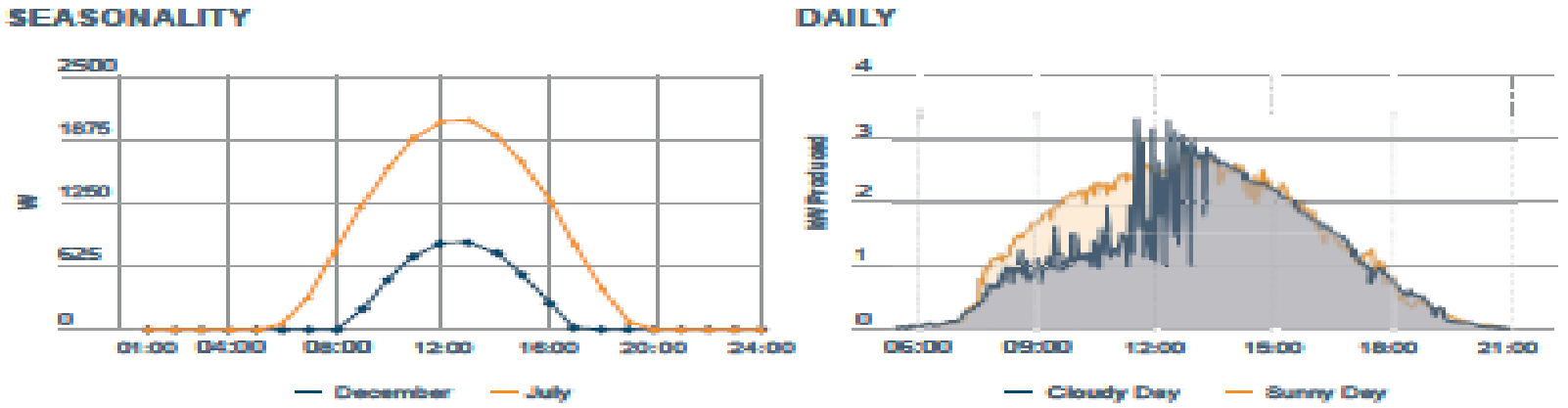
2018 BP Energy Outlook

VARIABLE NATURE OF WIND AND SUN:Ireland great variability of wind and no wind for all the month of July 2013
In Florence PV system in a sunny day of Dember 1/3 of energy than a sunny day of July

YEARLY AND DAILY VARIABILITY IN IRELAND OF GLOBAL WIND FLEET POWER PRODUCTION



SEASONAL AND DAILY VARIATION OF THE POWER GENERATION FOR A SMALL PV PLANT IN CENTRAL ITALY



Variable Renewables Energy Sources (VRES)

A high % of VRES, apart from initial generous incentives reverted on client bills, creates challenges and costs for a smooth integration in the power system:

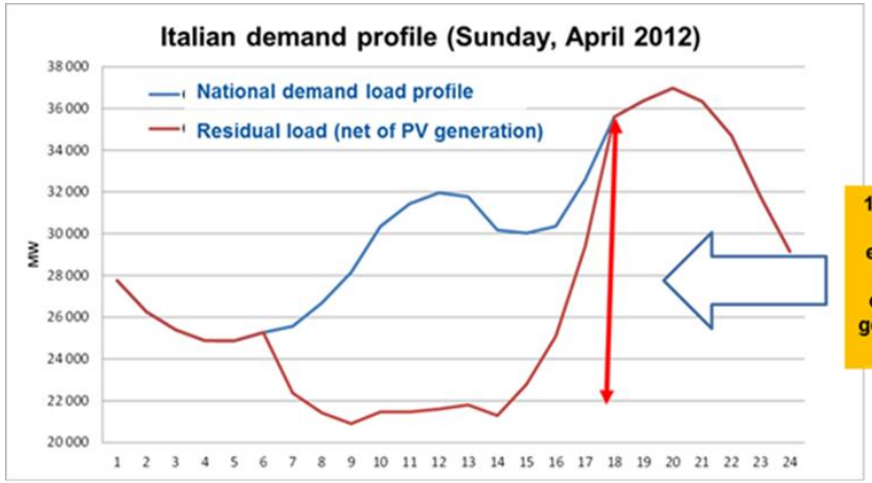
- **-Larger spinning reserve and flexible (steep ramps)**
- **-Investments in T&D systems**
- **-Integration of storage systems**
- **-A capacity market to assure security of supply,**

Etc

According to the EU Grid Operators every € spent in RES requires at least 1 € in the overall power system

HYDROGEN MUST BE ANALYSED IN HOLISTIC APPROACHES NOT CONFINED TO THE ELECTRICAL SYSTEM

RES connections:load following

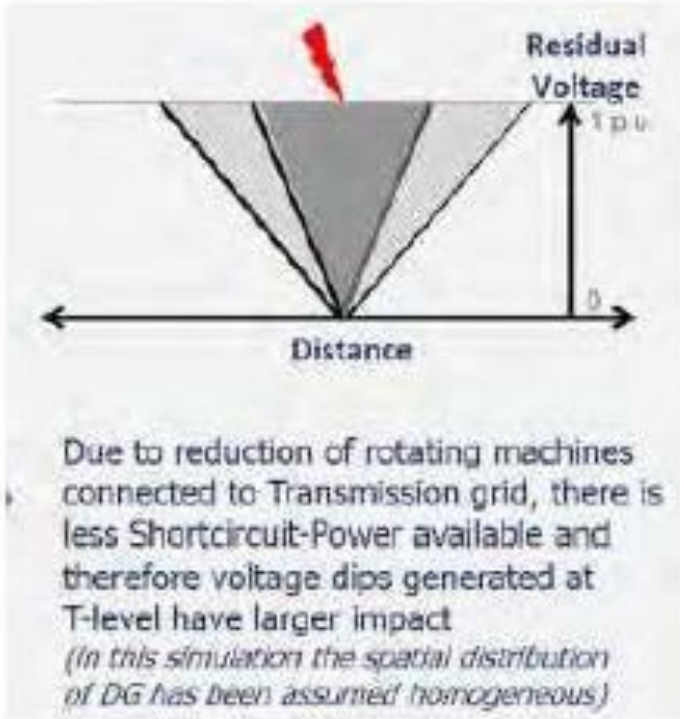


14 GW of load ramp in the evening to be covered by dispatchable generation and import

DEMAND INCREASES AND WIND DECREASES AND VICEVERSA

Different power scale for wind and demand

Figure 18 - Potential impact on system security and quality of supply: voltage dips on T-grid (Source: Terna)



Combination of technology / construction developments, volumes and auctions have driven down CAPEX and OPEX costs of VRES to values in some countries (UAE,S.Arabia, Chile) unimaginable :around 20$/MWh-

Extrapolation of low auction values should be done with caution, as the low prices are based on countries with high wind and solar load factors and low local cost and special financing- In EU the values are now at around 50 €/MWh but in Germany auctions some off shore wind plants have quoted at no surcharge on pool price (now around 30 €/MWh)

So far DSO's and TSO's have been able to manage electric power systems without an impact on reliability even with high % of VRES.

VRES are a pathway for climate change mitigation, but they also reduce dependence on imported fuel, improve air quality, increase energy access and security of supply, promote economic development and job creation

VRES have contributed to the reduction of electricity pool prices even if for some categories of clients this has not been reflected in their bills due to initial strong incentives still valid for around 8 years in Italy and in Germany

Hidden costs or non economic choices in some energy transition projects

The incentives of production cost of VRES reverted to clients amount to hundreds of €/t CO2 avoided in Italy and Germany ……compared to an ETS value of 5-6 €/tCO2 up to 1 year ago---BUT THIS IS PAST HISTORY

The off shore wind in Germany in recent auctions claimed grid parity with no surcharge on pool price(now average 30 €/MWh);but this in the Baltic/North sea at place of production-The cost of connections of 7500 MW from off shore to mainland and for the 3 underground +/- 500 kV DC 250 km systems for specific transmission to the loads in central South Germany is on the shoulders of the TSO's and reverted on the bills of clients: more than 80 €/MWh to be added to the so called grid parity and without all the other additional costs to the system for taking care of variability of RES .

In Italy the domestic distributed generation of 3-6 kW FV micro plants costs 2000-3500 €/kW, AVT included and depends on location ,type of roof etc-Average poor efficiency for exiting houses(orientation ,roof slope)

Now 600,000 domestic prosumers over 30 million domestic clients with consumption 0.44% of Italian global electricity .
With present incentives (tax deduction for 65-50 % of Capex ,reduced charge for system costs and net metering) it is expected in 10 years they will double-

Majority of families in Italy leave in multi apartments houses and the potential number of a micro domestic FV systems is not outstanding-

Italy has a well established and reliable distribution system serving also isolated areas and strongly automated.
The kWh production cost of a mini plant around 400-500 kW close to a secondary substation to aggregate and serve around 100 clients would cost 1/3 of that from a micro domestic system

Is it democratic that a poor lady leaving in the suburbs of Milan contributes to pay all the advantages of Mr Brambilla in his nice villa with swimming pool who is proud to be a prosumer with cost to the country 3 times of what needed?

In the mobility area the ownership of a car is no more considered an asset with car pooling,car renting etc

LET US LOOK AT CHEAPER AND MORE INTERESTING AND SUBSTANTIAL CONTRIBUTIONS TO DECARBONIZATION

A serious and sophisticated holistic approach is needed for an effective and stable energy transition

Energy transition should promote a socio economical development ,respecting the environment and keeping country competitiveness in a global market where sustainable energy costs of industrial, commercial and residential clients are an asset.

A holistic approach(including all the sectors(electricity generation, mobility,energy efficiency) is essential ,taking care and evaluating both positive and negative externalities and role of regulators is essential:

-reduction of emissions
-creation/elimination(eg closure of coal plants) of jobs
-reduction of imported TEP with relevant increased security of supply
-additional government incomes for taxes for increased activities
-additional costs connected to the various investments such as those created by VRES
Etc including hydrogen multi sectorial uses

A quantitative evaluation of externalities (a range for each of them) is essential for final cost /benefit analyses and this should be the initial step.

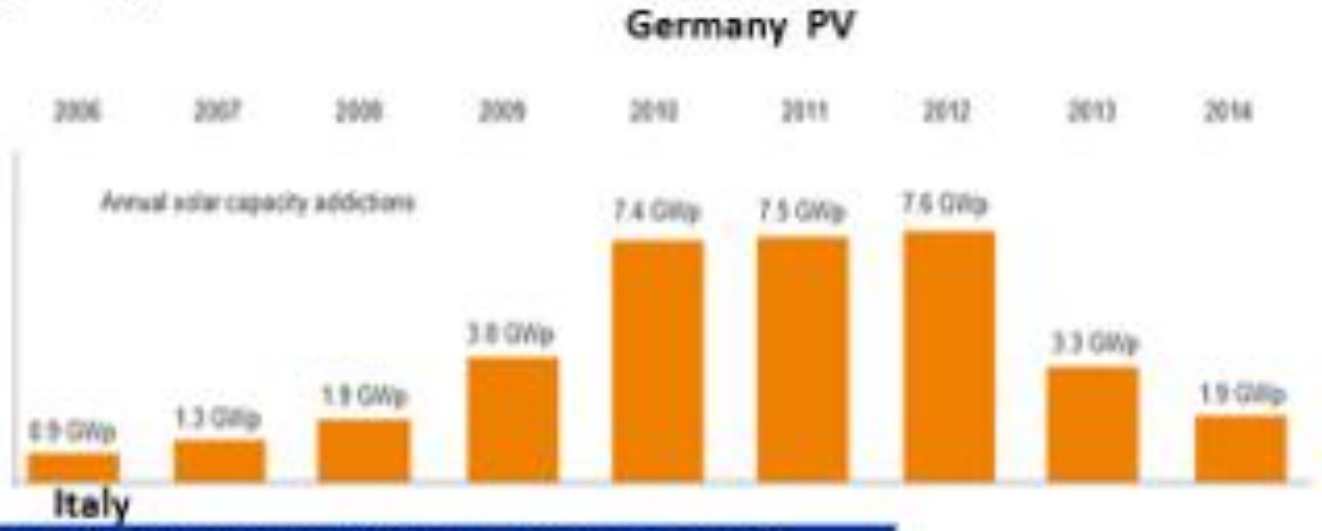
The environmental objectives should be reached with the minimum cost alternatives with appropriate sharing of investments in power generation ,transports and energy efficiency and sophisticated regulation

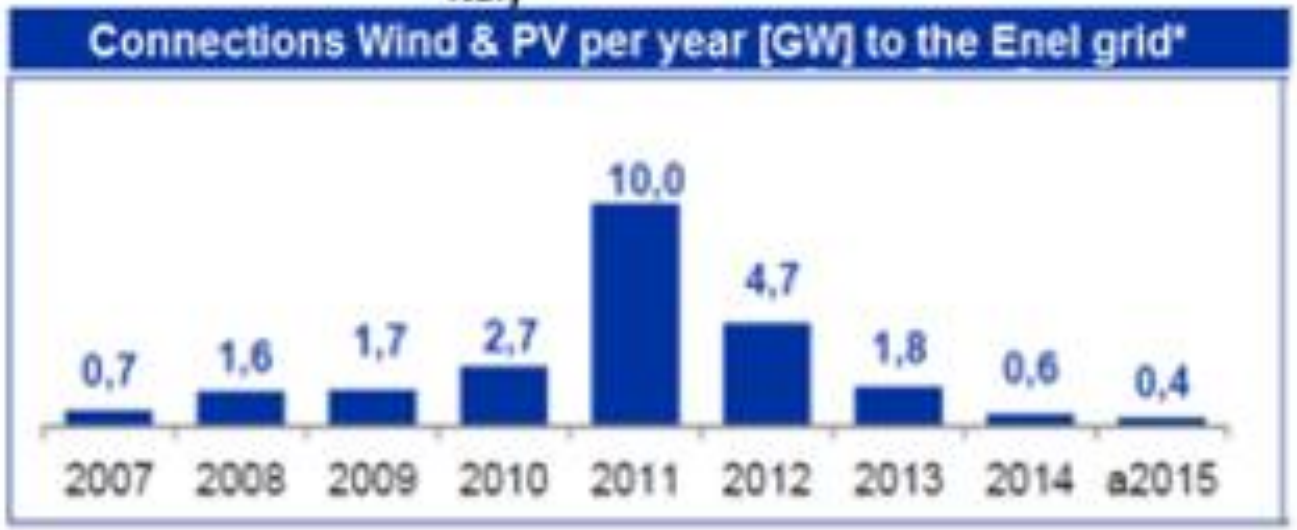
An ideological pushing for a fast energy transition (e.g great expansion of RES and e-vehicles) without detailed analyses on the costs and on who is paying for them, it could lead to bubbles as already seen ;and this killing on the cradle or strongly reduce an effective and stable transition as needed-

A too fast decarbonization may imply in specific countries higher energy costs to final clients, stranded energy infrastructures, stranded primary resources assets, stranded labour forces to be requalified –Final clients must be involved to become conscious of environmental problems and to have their contribution :spread communication and information

BUBBLES AS CREATED BY TOO GENEROUS INCENTIVES FOR WIND AND SOLAR NOT TO BE REPEATED

(Source: WEC RES Integration)





LET US WORK TOGETHER FOR AN EFFECTIVE TRANSITION WITH SERIOUS APPROACHES AND WITH THE CONFORT OF THOUGHT, WITHOUT A PASSVE ACCOMPLISHMENT TO PREVAILING AND FASCINATING IDEOLOGIES THAT HOWEVER HAVE THE MERIT TO PUSH FOR INNOVATION AND INNOVATION INCLUDES HYDROGEN