

INTEGRATION IN NATIONAL POWER SYSTEM (NPS) OF WIND POWER PLANTS

Issues raised by WPP implementation

- Adapting networks
- Technical requirements for wind power groups and wind power plants
- Ensuring adjustment in NPS
- Commercial considerations

Adapting networks

- **Transportation Network (large power plants)**
 - Within limits of network reserves (no other expenditures)
 - Upgrade of network depending on power plants
- **Distribution Network**
 - Small power plants (usually of up to 50 MW installed capacities)
 - Within limitations of reserves
 - Upgrade of network

Adapting networks

Investment Projects for Necessary WPP Networks

Nr.crt.	Descrierea proiectului	Anul PIF	Nec. PIF
1	Racordarea stației el. Medgidia în LEA 400 kV Isaccea(RO) - Varna(BG) si Isaccea(RO) - Dobrudja(BG)	2015	2012
2	LEA 400 kV d.c. Smârdan -Gutinaș	2016	2014
3	LEA 400 kV d.c. Cernavodă - Gura Ialomitei - Stâlp	2020	2016
4	Trecere la 400 kV Stâlp - Teleajea - Brazi	2018	2016
5	LEA 400 kV s.c. Suceava - Gădălin	2021	2018
6	Realizare linii de racord pentru CHEAP Tarnița Lapuștești	2019	2016
7	LEA 400 kV d.c. Medgidia - Constanța	2020	2017
8	LEA 400 kV s.c. Porțile de Fier - Reșița	2016	2012
9	LEA 400 kV România - Serbia	2019	2013
10	LEA 400 kV Reșița - Timișoara - Săcălaz	2022	2016

* Implementation of the entire investment programme would require approximately 500 million Euro.

Technical requirements for Wind Power Groups and for Wind Power Plants

- **Technical norm 51 was developed and adopted**
“Technical conditions for connecting wind power plants to electricity grids of public interest”
- **Includes requirements for wind power groups and wind power plants:**
 - Crossing voltage dips;
 - Frequency – power adjustment;
 - Voltage adjustment;
 - Requirements towards telecommunication equipments;
 - Production forecast.

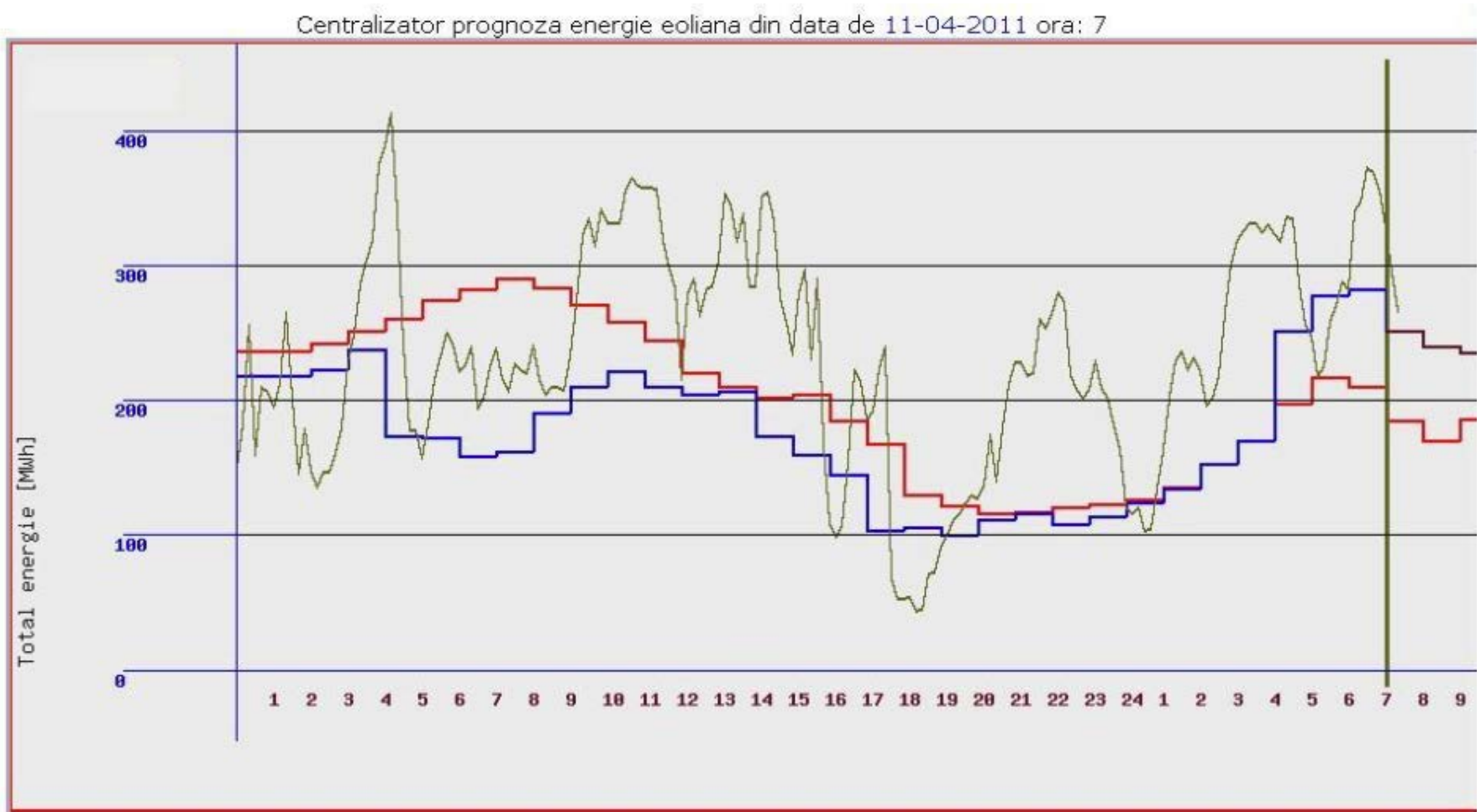
Ensuring adjustment in NPS

- **We aim at a durable implementation**
 - regard it as a priority production;
 - uninterrupted network access (at least 90% of time);
 - reduction limitation under extraordinary circumstances only (force majeure, network breakdown).

Conclusion:

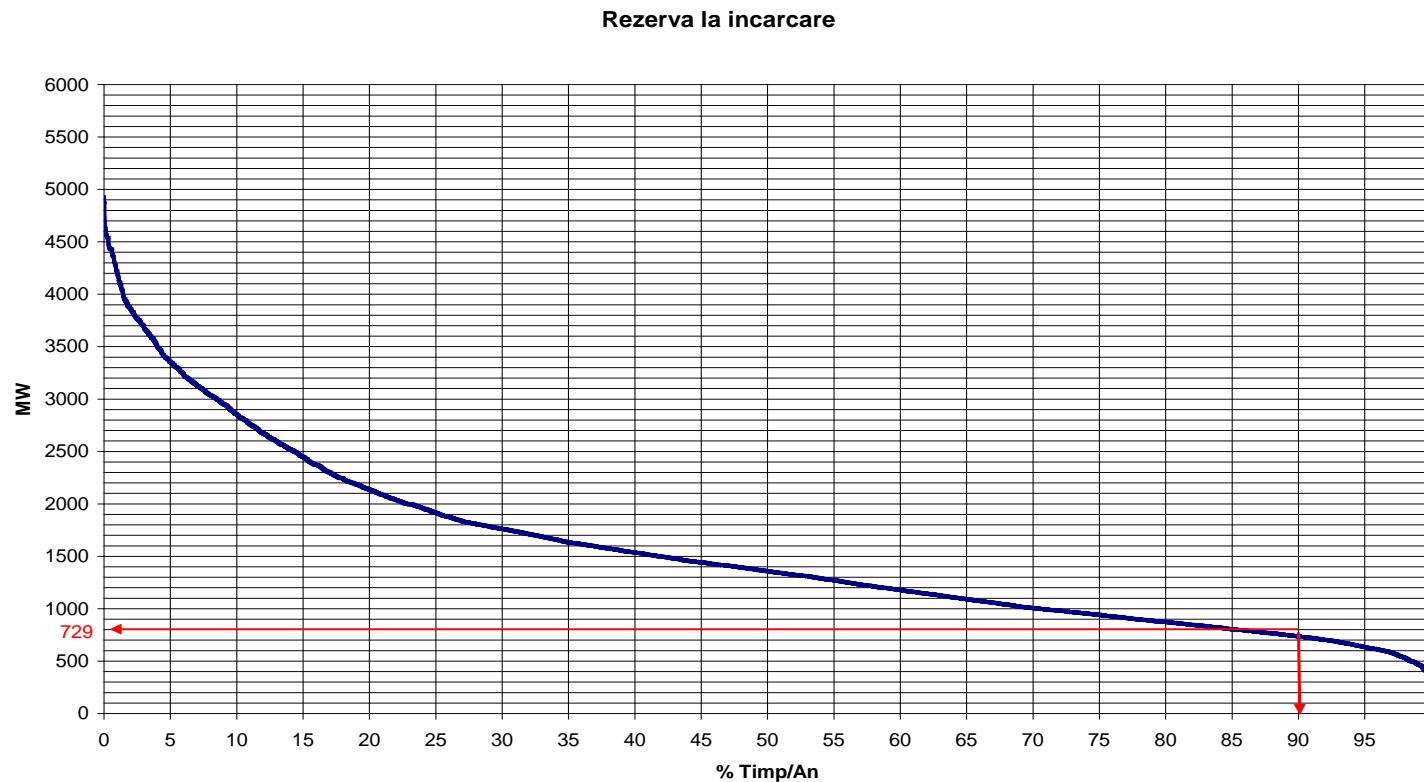
A SUFFICIENT TERTIARY RESERVE IS NEEDED TO COMPENSATE FOR WIND POWER PRODUCTION VARIATIONS

Ensuring adjustment in NPS



Ensuring adjustment in NPS

- Ranked curve of RTR at growth

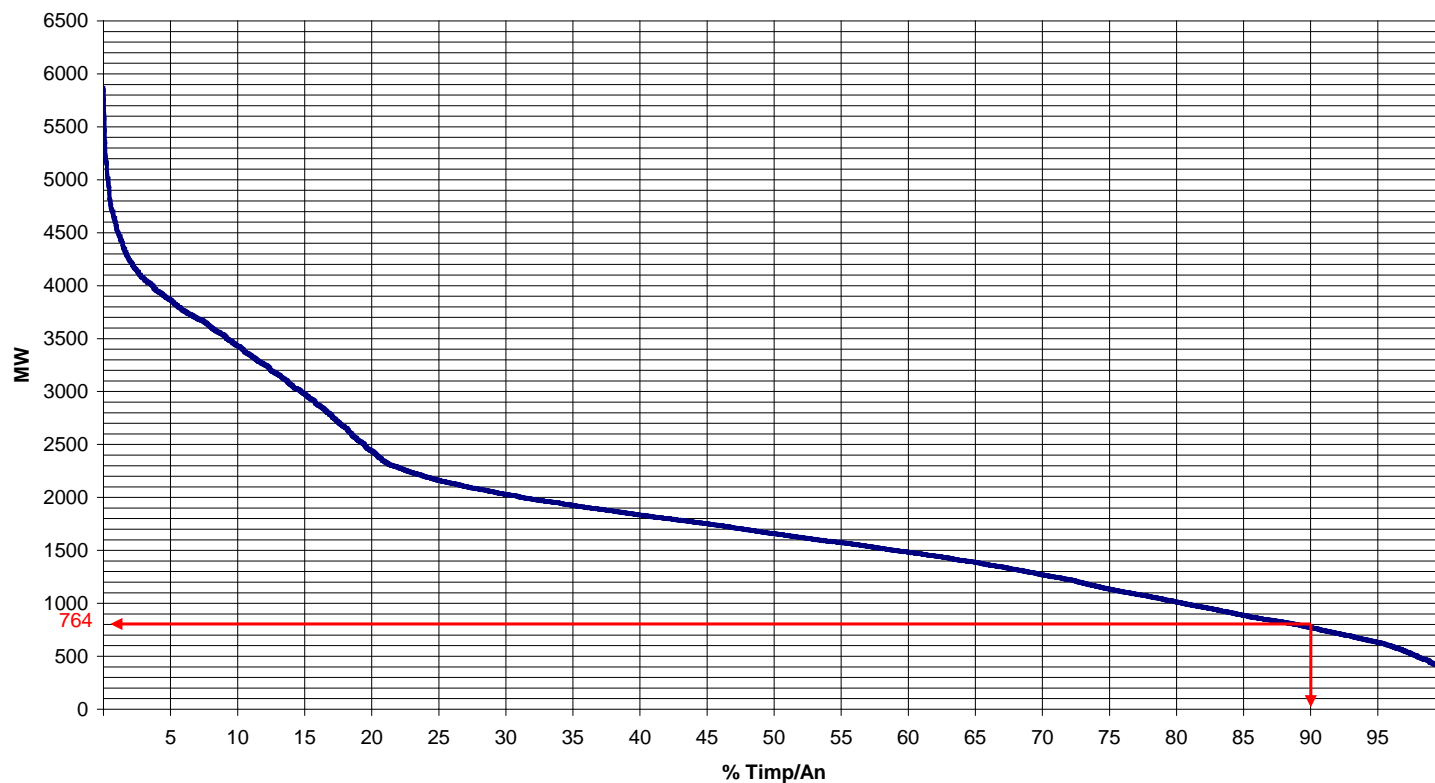


→ $P_{\text{produced}} = (0.25 \div 0.3) P_{\text{installed}} \rightarrow \sim 2\,916 - 2430 \text{ MW installed}$

Ensuring adjustment in NPS

- Ranked curve of RTR at decline

Rezerva la descarcare



→ $P_{\text{produced}} = (0.25 \div 0.3) P_{\text{installed}} \rightarrow \sim 3\,056 - 2\,546 \text{ MW installed}$

Ensuring adjustment in NPS

Situation of WPP Projects in 2011

Nr. Crt.	Compania responsabila cu semnarea contractului / ATR-ului	Putere instalata [MW]	
		Contacte semnate	ATR emise
1	Transelectrica*	3 302	3 788
2	Electrica Muntenia Nord	584	396
3	Electrica Transilvania Nord	0	84
4	Enel Muntenia Sud	0	26
5	Enel Banat	252	274
6	Enel Dobrogea	2 196	129
7	E.ON Moldova	98	354
8	CEZ Distributie	0	50
9	Total SEN	6 431	5 101

•The geographical area where TEN connection projects are located extends practically beyond the geographical areas covered by Electrica Muntenia, Nord, Enel Banat, Enel Dobrogea and E.on Moldova .

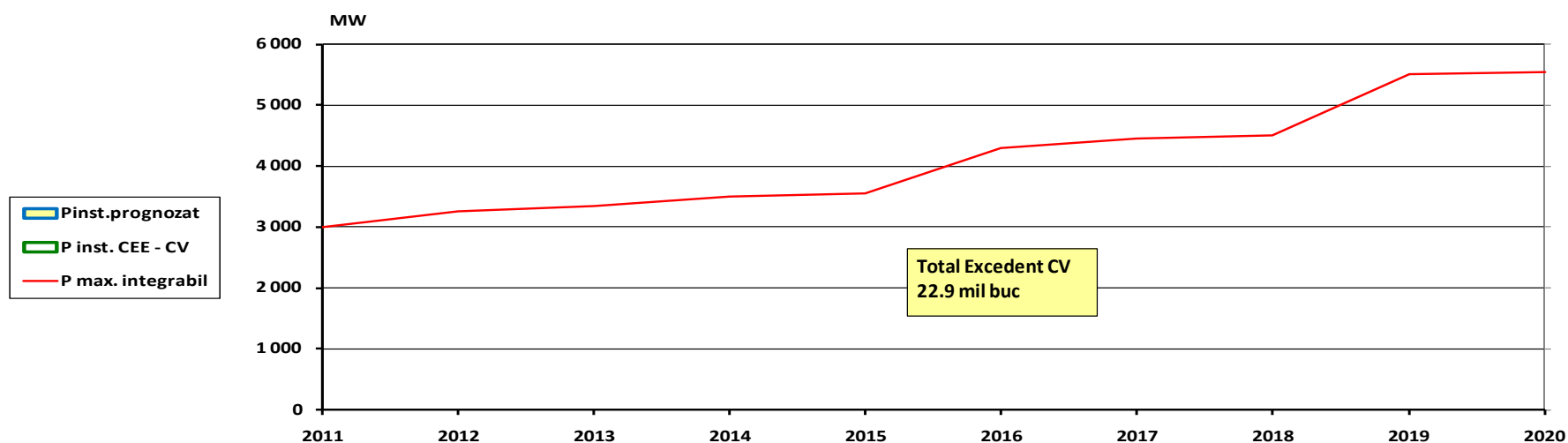
Apart from the amounts preNPSted in the table above, there are solution studies solicitations that amount approximately 15.000 MW of installed power.

Ensuring adjustment in NPS

- **Possibilities of increasing the RTR in NPS and, thus of increasing the durable installed wind power:**
 - installing classical power plants (including nuclear) with wide adjustment bandwidth (40% ÷ 100%);
 - installing gas turbines that can be turned on in maximum 15 minutes;
 - Using hydro power production primarily for adjustments;
 - Implementing pumping/accumulation plants;
 - Consumption incentives;
 - Load curve flattening measures.

Commercial Considerations

Evolution Forecast of Installed WPP Production that can be integrated durably in NPS



Anul	[-]	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Pi CEE - RTR	[MW]	3 000	3 250	3 350	3 500	3 550	4 300	4 450	4 500	5 500	5 550
Evolutia parcului de generatoare**	PIF	-	850 MW OMV Brazi 90 MW CHE	100 MW CHE	140 MW CHE	40 MW CHE	750 MW CTE Braila	130 MW CHE	1 000 MW CHEAP Tarnita	-	-
Pinst. CEE - CV	[MW]	1 123	1 377	1 649	1 812	1 985	2 164	2 353	5 054	5 320	5 594
Pinst.prognozat	[MW]	1 000	1 700	2 400	3 110	3 800	4 300	4 700	5 000	5 010	5 200
Excedent CV	[mil. buc.]	0.0	0.9	2.0	3.4	4.8	5.6	6.2	-	-	-

THANK YOU FOR YOUR ATTENTION!