

Being Selfish for the good of All: Grid Integration



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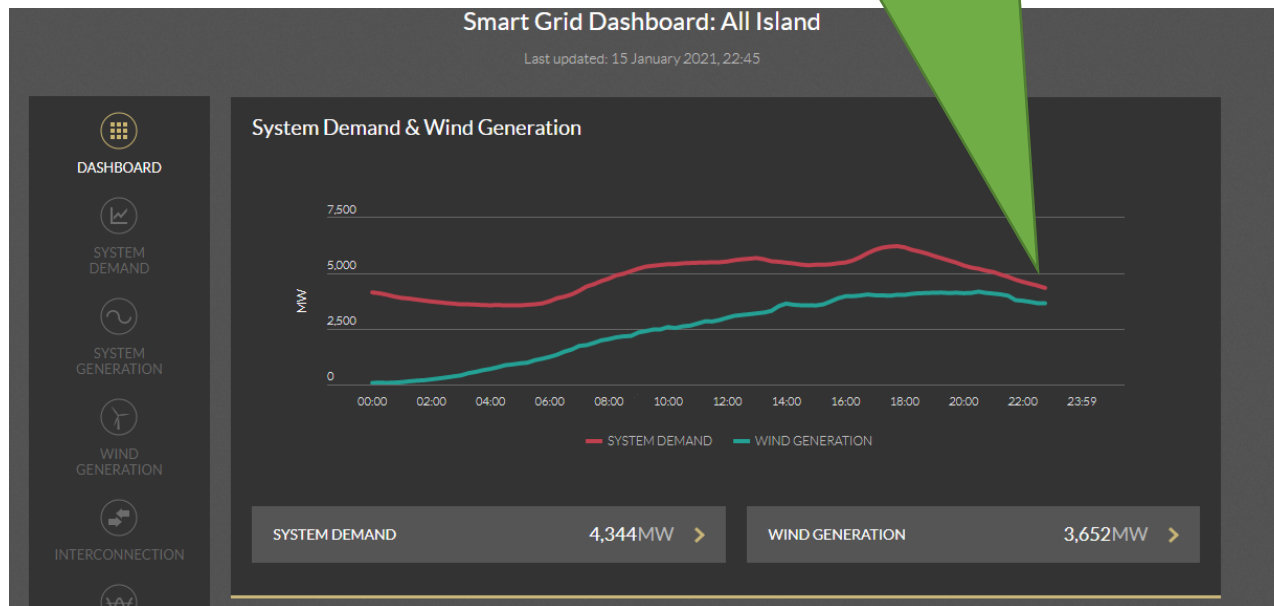
Grid Integration: What's in it for me?

January 26, 2010

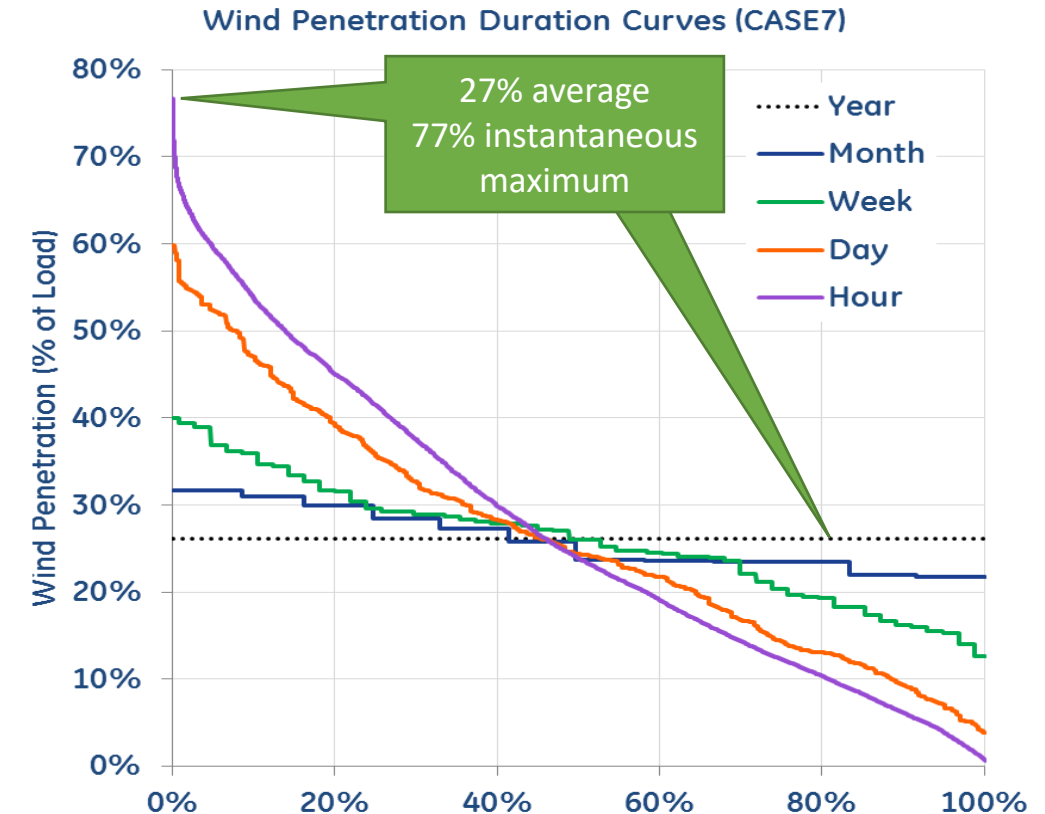


Evolution, Revolution. Today, not mañana

- Think you've got lots of time to get this right?
 - Think again.
- Won't happen here.
 - Think again.
- The future is bright
 - Absolutely!



EirGrid
Friday, January 15, 2021
84% wind (wind/load)
70% SNSP



Source: Miller et al; NSPI Renewable Integration Study
https://www.nspower.ca/docs/default-source/pdf-to-upload/2013coss_ca_dr-14_supplemental_reisfinalreport_redacted.pdf?sfvrsn=8e797640_0

If you want to play with the big kids, do your part

A few obvious points

1. Power system needs to function in order for you to get your product to market
2. There's more to a grid than stuffing in MW and collecting \$

A few sticks

3. Support your end, or get curtailed
4. If you don't provide ERS, somebody else will
5. You won't like it

Challenge traditional thinking

6. "We can't afford this!" : **nonsense** →

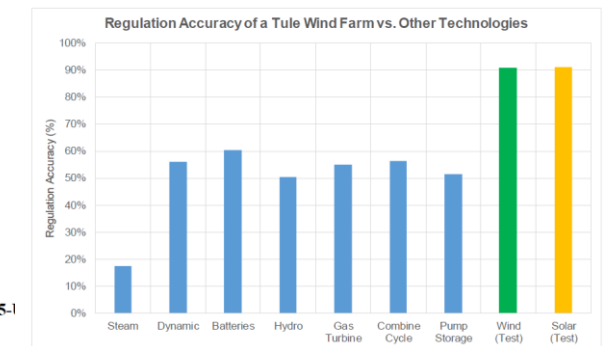
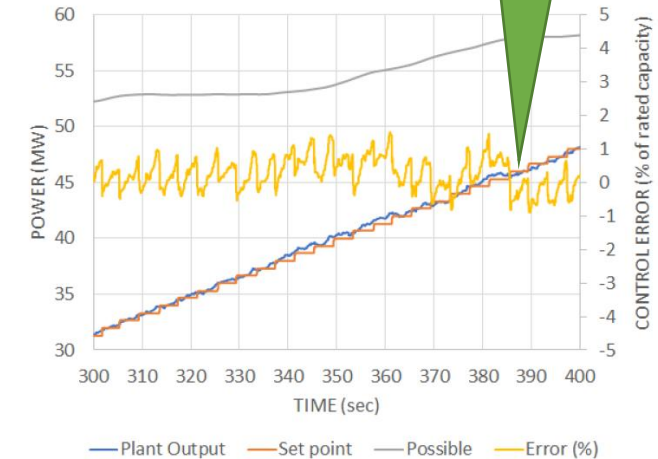
Public Service of New Mexico finds that a solar/battery portfolio provides superior cost effectiveness to a plan that relies heavily on gas generation for replacement of 850 MW San Juan Coal

BEFORE THE NEW MEXICO PUBLIC REGULATION COMMISSION

IN THE MATTER OF PUBLIC SERVICE
COMPANY OF NEW MEXICO'S
CONSOLIDATED APPLICATION FOR
APPROVALS FOR THE ABANDONMENT,
FINANCING, AND RESOURCE REPLACEMENT
FOR SAN JUAN GENERATING STATION
PURSUANT TO THE ENERGY TRANSITION ACT

Case No. 19-00195-1

CAISO
Wind
AGC test



Avangrid Renewables
Tule Wind Farm

Demonstration of Capability to
Provide Essential Grid Services

Play nice, and get paid

A few carrots

Part 1: today. Participate in the markets where you can today.

- Figure it out!
- Use sharp elbows if they won't let you in.

Part 2: tomorrow. Look to integration leaders, they are creating new products

- FFR (fast frequency response)
 - Inertia
 - Grid Formation
- and markets
- active participation by end users
 - differentiated reliability services...



EirGrid DS3 :
Major revamp of system
services. Paid services!

Table 1 below contains a list of the DS3 System Services and a brief description.

Service Name	Abbreviation	Unit of Payment	Short Description
Synchronous Inertial Response	SIR	MWs ^h	(Stored kinetic energy)*(SIR Factor – 15)
Fast Frequency Response	FFR	MWh	MW delivered between 2 and 10 seconds
Primary Operating Reserve	POR	MWh	MW delivered between 5 and 15 seconds
Secondary Operating Reserve	SOR	MWh	MW delivered between 15 to 90 seconds
Tertiary Operating Reserve 1	TOR1	MWh	MW delivered between 90 seconds to 5 minutes
Tertiary Operating Reserve 2	TOR2	MWh	MW delivered between 5 minutes to 20 minutes
Replacement Reserve – Synchronised	RRS	MWh	MW delivered between 20 minutes to 1 hour
Replacement Reserve – Desynchronised	RRD	MWh	MW delivered between 20 minutes to 1 hour
Ramping Margin 1	RM1	MWh	The increased MW output that can be delivered with a good degree of certainty for the given time horizon.
Ramping Margin 3	RM3	MWh	
Ramping Margin 8	RM8	MWh	
Fast Post Fault Active Power Recovery	FPFAPR	MWh	Active power (MW) >90% within 250 ms of voltage >90%
Steady State Reactive Power	SSRP	Mvarh	(Mvar capability)*(% of capacity that Mvar capability is achievable)
Dynamic Reactive Response	DRR	MWh	MVAr capability during large (>30%) voltage dips

Table 1: List of DS3 System Services

Thanks

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