Dispatch Models

SEM Market Integration Project
Information Session
Tuesday 27th November 2012

Background

SEM Committee published a Consultation Paper in January 2012 (SEM 12-004) which set out a number of options for implementing the Target Model in Ireland and Northern Ireland.

The SEM Committee also requested further exploratory work relating to the question of the mechanism of dispatch, its relationship to the emerging Target Model, and in particular to explore the issue of **central dispatch vs. self-dispatch** and the implications for implementation of the Target Model on the island of Ireland.

TSO paper - *Dispatch Model for the All Island Market/ Transmission System, 29 August 2012.*

Purpose of the report

- The TSOs recommend central dispatch is maintained on the island of Ireland however the TSOs can work with self-dispatch and the system can be operated under that model

- The purpose of the report was to highlight the impact of self dispatch and central dispatch

What are we talking about ?

	Who Dispatches?	Basis of Dispatch	Commercial Treatment
1. Centralised TSO scheduling and dispatch	TSOs issue all dispatch instructions.	TSOs schedule and dispatch all units to ensure system security and minimisation of production costs.	Participants are compensated for TSO instructed deviations from the market schedule through the constraint mechanism.
2. Self nomination and TSO dispatch	TSOs issue all dispatch instructions.	TSOs schedule and dispatch all units to ensure system security and minimisation of the cost of deviating from Participants nominated position.	Participants are compensated for TSO instructed deviations from their nominated position.
3. Self nomination and Self dispatch	Participants dispatch themselves with the TSOs only intervening for balancing purposes.	Participants determine their own dispatch position to follow their nomination. The TSOs only intervene to balance the system in short term timescales (typically one hour).	A balancing mechanism compensates participants for balancing actions instructed by the TSOs.

Intervention

- One measure of market success for a self dispatch market is the magnitude of balancing that is required after market gate closure

- Balancing would be driven by the liquidity in the market and the degree of **intervention,** forced deviation from nominations, which would be required by the TSO to ensure system security

- Intervention - interference with the physical firmness of bilateral trading positions

- The degree of intervention required will be largely due to:
  - physical attributes of the system
  - market design
  - engagement of participants.

Intervention

- In a Self dispatch market, with generators providing nominations, the TSO would expect to have to dispatch away from the nominations (intervene) to balance and secure the system for the following reasons -
    - System Services provision (Reserve and Reactive)
    - System constraint management
    - Wind and demand forecast errors
    - Generator availability re-declarations
    - Renewables

System Services Intervention

- Reserve Active power reserves from generators are required in different time frames to control power system dynamics and re-establish a secure system due to a sudden loss in generation.

- Reactive power from generation elements that can produce or absorb MVAr are required depending on

  - system demand
  - transmission system configuration
  - connected generation output
  - interconnector flows
  - transmission reactive device status.

- Generation would have to be dispatched away from a self dispatch schedule to provide these services

Constraints Intervention

- In an ideal world generation would be able to operate at any output at any time and not be subject to any limitation or constraint

- System constraints for generation exist as either inadequate transmission capacity to allow the export of generation from an area, an area requires local generation to support the transmission system or an area requires generation to provide system stability

- Generation would have to be dispatched away from a self dispatch schedule to secure constraints

Renewables Intervention

- Renewable energy will come primarily from wind generation which is variable.

- Without variable generation, balancing a power system is the action of matching conventional generation sources to a predictable demand (and known interconnection flows).

- With increasing amounts of variable generation the role of conventional generation becomes the balancing entity between system demand, interconnector flows and the variable generation. The conventional plant will be subject to much more output ramping movement and cycling on and off to balance with the variable generation and demand.

- Generation would have to be dispatched away from a self dispatch schedule to balance variable generation changes and wind forecast errors

Degree of Intervention

- It was not possible to establish the degree of self dispatch schedule intervention without guessing what a schedule would look like for unknown market conditions in the future or having any historic information. To provide an indication of intervention analysis was carried out using SEM schedules and the actual dispatch information

- The SEM schedule (MSQs) represents a possible schedule that would be arrived at under self-dispatch. The SEM schedule (produced at D+4) contains :
  - Matched generation and demand (as would a self dispatch schedule)
  - No system constraints (as would a self dispatch schedule)
  - No service provision (as would a self dispatch schedule)
  - No wind / demand forecasting errors (self dispatch schedule would - requiring more intervention)

Degree of Intervention

- Two full years of SEM data, calendar year 2010 and 2011, were selected and analysed
- For each Predictable Price Maker Generator (PPMG) and Predictable Price Taker Generator (PPTG) their Market Scheduled Quantity (MSQ) and Dispatch Quantity (DQ) for each 30 min Trading Period (TP) in the year was compared and recorded
- For a TP which had a DQ greater than the MSQ this was recorded as a dispatched up positive value
- For a TP which had a DQ less than the MSQ this was recorded as a dispatched down negative value

Degree of Intervention

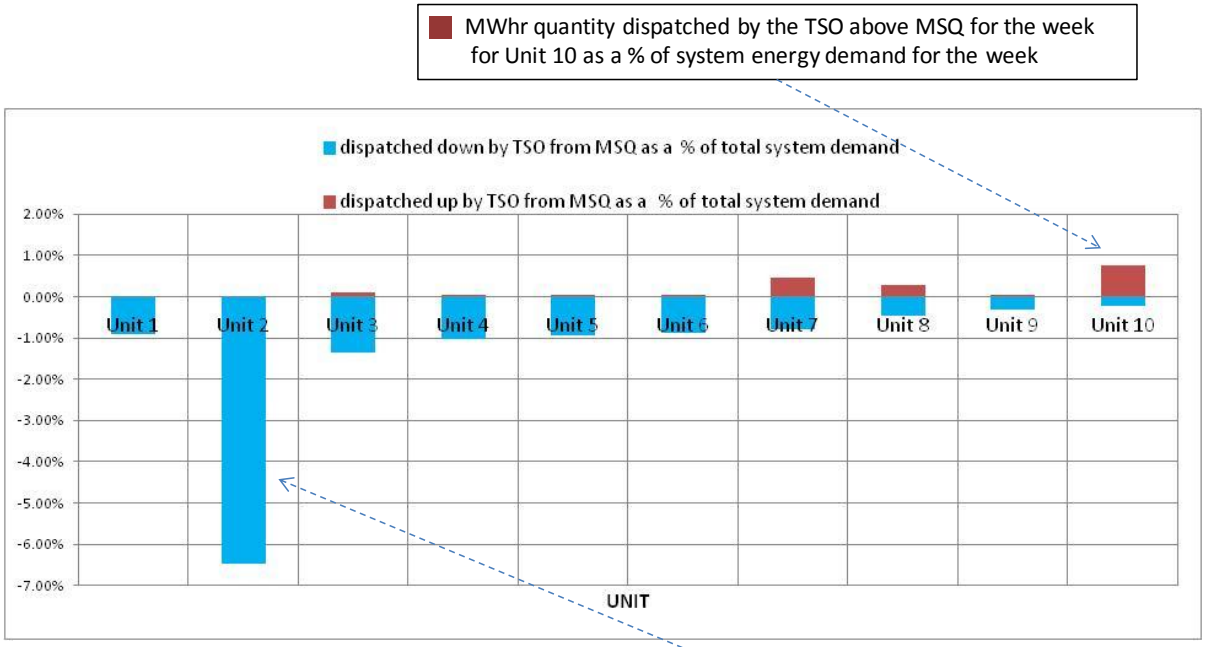
MWhr data 2010				
Market Generation	MSQ		dispatched up	dispatched down
PPMG	26115807		4874453	-5007842
PPTG	3985269		126934	-169985
Total	30101076		5001387	-5177826
	% of MSQ		17%	-17%
2010 demand MWhr				
36211000	% of demand		14%	-14%

TABLE 1a	Total intervention as % of demand	**28%**

MWhr data 2011				
Market Generation	MSQ		dispatched up	dispatched down
PPMG	24088083		5816480	-5696992
PPTG	3629911		28286	-225503
Total	27717994		5844766	-5922495
	% of MSQ		21%	-21%
2011 demand MWhr				
35143000	% of demand		**17%**	**-17%**

TABLE 1b	Total intervention as % of demand	**33%**

Degree of Intervention



GB Comparison

	SEM	BETA
System Size (max demand)	6500	60122
Number of Generators (excluding wind transmission connected)	75	391
Typical Unit size (MW)	400	400
Typical Unit Size as % of maximum demand (%)	6.15%	0.67%
System demand reduction with 0.2 Hz frequency drop (MW)	26	240
System demand reduction with 0.5 Hz frequency drop (MW)	65	601
Wind Generation Operational (MW)	2013	6580
Wind Generation (% max demand)	30.97%	10.94%
Wind Generation forecast error 10 % (MW)	201	658
Wind Generation forecast error 10 % as percentage of maximum demand (%)	3.10%	1.09%
Largest single credible contingency (MW)	450	1320
Largest single credible contingency (% max demand)	6.92%	2.20%
Interconnection (post EW)	1000	4000
Interconnection (% max demand)	15.38%	6.65%

GB Comparison

Category	Year to date total (MWh)	Absolute Value (MWh)	Include in Calc?	Absolute for Calc (GWh)
Energy Imbalance	-2,500,141	2,500,141	Y	2,500
Operating Reserve	4,714,526	4,714,526	Y	4,715
Absolute STOR	64,466	64,466	Y	64
Constraints By Area	5,465,660	5,465,660	Y	5,466
Constraint Margin Replacement	5,074,847	5,074,847	Y	5,075
Footroom	-1,186,921	1,186,921	Y	1,187
Fast Reserve	197,314	197,314	Y	197
Absolute Response	4,334,038	4,334,038	Y	4,334
Unclassified BM	-1,244,153	1,244,153	Y	1,244
BM General	21,680	21,680	Y	22
Transmission Losses	6,154,801	6,154,801	n	-
Total Projected 2011/12 BM Actions (A)	**21,096,117**	**30,958,547**		**24,804**
2011/12 Projected Energy Consumption (B)				**314,400**
BM actions as a percentage of Energy Consumption (A/B)				**8%**

Conclusion

- Central dispatch is recommended by the TSO's for the SEM
- The ROI/NI and GB systems are quite different so comparisons should be made with caution
- The level of intervention required by the SOs in SEM under any market design would significantly effect the ability to realise the self dispatch outturn
- Central dispatch is permitted with the target model
- Central dispatch will be part of the network code on balancing
- Central dispatch is in use widely across the world and in Europe most notably by Poland and Italy, they intend to maintain it while complying with the target model
- Central dispatch can work with different market designs
- The TSO's will ultimately work with and deliver to the preferred market design including the dispatch model