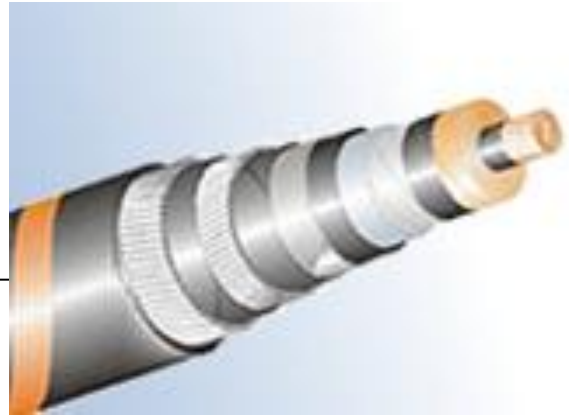
Priority Dispatch in Real Time Operation

Marie Hayden



Presentation

- Reasons for dispatching units with Priority Dispatch

- Changes in approach with SEM-62

Who has Priority Dispatch Today?

Unit Type	MW
Interconnector Trading Units	450
Peat	344
CHP	170
Hydro	217
Windfarms	1,935
TOTAL	3,116MW

Reasons For Dispatching PD Units

- Managing Demand ~ Supply Balance
  - Supply must equal demand at all times
  - All Island Demand Ranges from 2400MW – 7000MW
- Manage System Inertial Stability
  - No more than 50% of Generation can be supplied by Non Synchronous Generation Units
  - All Island Non Synchronous Generation totals 2385MW today
- Constraints
  - Prevent Transmission Lines from breaching Design Limits for Voltage & Current

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Example - Curtailment

- At 4:00am tomorrow system demand will be ≈ 3000MW
- Available Priority Dispatch will make up ≈ 1700MW
- Of this Non-Synchronous PD ≈ 1300MW
  - 50% Rule does not apply
- Constrained on Conventional Generation ≈1350MW
  - There is enough “room” for all Priority Dispatch units
- There should be little or no CURTAILMENT of Priority Dispatch units tonight
- With high levels of wind there may be CONSTRAINTS in parts of the country

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Example - Constraints

- Managing System Constraints
  - Control Centre constantly monitor Contingency Analysis Software in real time
  - Software tells them if any item of plant is at risk of operating outside of its design limits
  - The snapshot on the following slide was taken at 10:00 this morning
  - It indicates a need to constrain generation which feeds into the network North of Cathaleen's Fall

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File Navigate SCADA NETWORK GEN STNET STUDY Related Displays Analyst Displays Help

http://emsweb:63636/habwe

Contingency Violations

Contingency Violations: Summary | Branch | Voltage | Angle | Interface

Monitoring Base Rating Level: EMER

Component Violations: Summary | -- Branch -- | Voltage | Angle | Interface

Values | - Bar -

RTCA REALTIME COMPLETE

UNSOLVED CTG: 2

Alarm New Warn		Type	Volt Class	Pre CTG Value	Postctg Value		Rating
					LN: MVA / XF: MVA / ZBR: MVA	AMP / AMP / AMP	MVA / MVA / MVA
%	100 110 120 130 140 150						
	CTG: PB_2R234 POOLBEG 220KV REACTOR						
	VIOL: INC2PB_1NFDR @INCHICOR	BR	220	215.0	255.5	623	
	CTG: CTH1LGC1 CATHFALL - GOLAGH 'T' 110KV LINE						
	VIOL: CTH1DRM1NFDR @DRUMKEEN	BR	110	73.0	136.0	675	116
	CTG: CTH1DRM1 CATHFALL - DRUMKEEN 110KV LINE						
	VIOL: CTH1LGC1NFDR @CATHFALL	BR	110	-63.7	-133.5	-673	116
	CTG: COR1CTH1 CORACLSY - CATHFALL 110KV LINE						
	VIOL: ACC1COS1NFDR @CARIKONS	BR	110	-92.3	-131.3	-665	120
	CTG: COR1GWE1 CORACLSY - GORTAWEE 110KV LINE						
	VIOL: ACC1COS1NFDR @CARIKONS	BR	110	-92.3	-130.7	-663	120
	CTG: LET1LGC1 LETRKENY - GOLAGH 'T' 110KV LINE						
	VIOL: CTH1DRM1NFDR @DRUMKEEN	BR	110	73.0	124.3	617	116
	CTG: CTH1DRM1 CATHFALL - DRUMKEEN 110KV LINE						
	VIOL: LET1LGC1NFDR @LETRKENY	BR	110	53.3	123.6	615	116

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Contingency Violations

Contingency Violations: Summary | Branch | Voltage | Angle | Interface

Monitoring Base Rating Level: EMER

Component Violations: Summary | -- Branch -- | Voltage | Angle | Interface

Values

Alarm
New
Warn

% 100 110 120

CTG: PB_2R234 POOLBEG 220KV REACTOR
VIOL: INC2PB_1NFDR @INCHICOR

CTG: CTH1LGC1 CATHFALL - GOLAGH 'T' 110KV LINE
VIOL: CTH1DRM1NFDR @DRUMKEEN

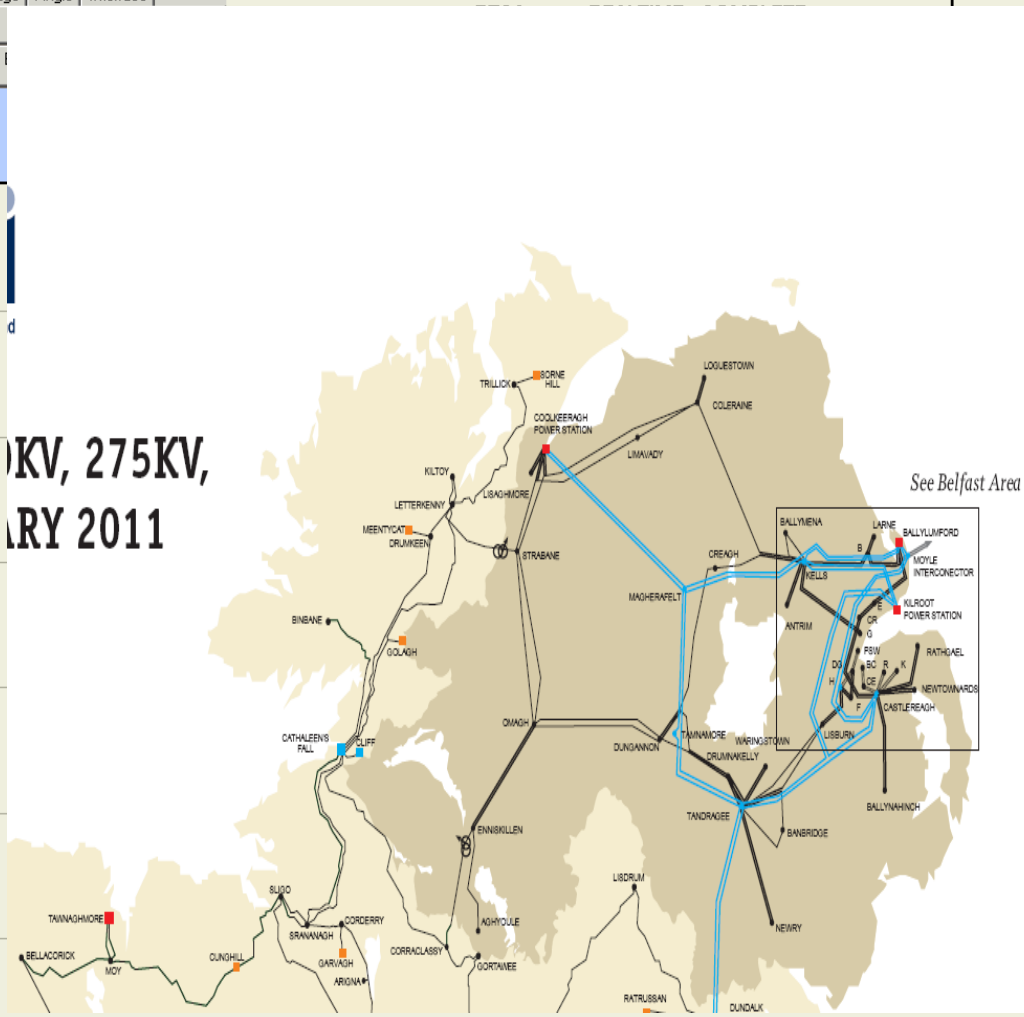
CTG: CTH1DRM1 CATHFALL - DRUMKEEN 110KV LINE
VIOL: CTH1LGC1NFDR @CATHFALL

CTG: COR1CTH1 CORACLSY - CATHFALL 110KV LINE
VIOL: ACC1COS1NFDR @CARIKONS

CTG: COR1GWE1 CORACLSY - GORTAWEE 110KV LINE
VIOL: ACC1COS1NFDR @CARIKONS

CTG: LET1LGC1 LETRKENY - GOLAGH 'T' 110KV LINE
VIOL: CTH1DRM1NFDR @DRUMKEEN

CTG: CTH1DRM1 CATHFALL - DRUMKEEN 110KV LINE
VIOL: LET1LGC1NFDR @LETRKENY



BR 110 53.3 123.6 615 116

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Contingency Violations

Contingency Violations: Summary | Branch | Voltage

Monitoring Base Rating Level: EMER

Component Violations: Summary | -- Branch -- | Voltag

Values

Alarm
New
Warn

% 100 110 120

CTG: PB_2R234 POOLBEG 220KV REACTOR
VIOL: INC2PB_1NFDR @INCHICOR

CTG: CTH1LGC1 CATHFALL - GOLAGH 'T' 110KV LINE
VIOL: CTH1DRM1NFDR @DRUMKEEN

CTG: CTH1DRM1 CATHFALL - DRUMKEEN 110KV LINE
VIOL: CTH1LGC1NFDR @CATHFALL

CTG: COR1CTH1 CORACLSY - CATHFALL 110KV LINE
VIOL: ACC1COS1NFDR @CARIKONS

CTG: COR1GWE1 CORACLSY - GORTAWEE 110KV LINE
VIOL: ACC1COS1NFDR @CARIKONS

CTG: LET1LGC1 LETRKENY - GOLAGH 'T' 110KV LINE
VIOL: CTH1DRM1NFDR @DRUMKEEN

CTG: CTH1DRM1 CATHFALL - DRUMKEEN 110KV LINE
VIOL: LET1LGC1NFDR @LETRKENY

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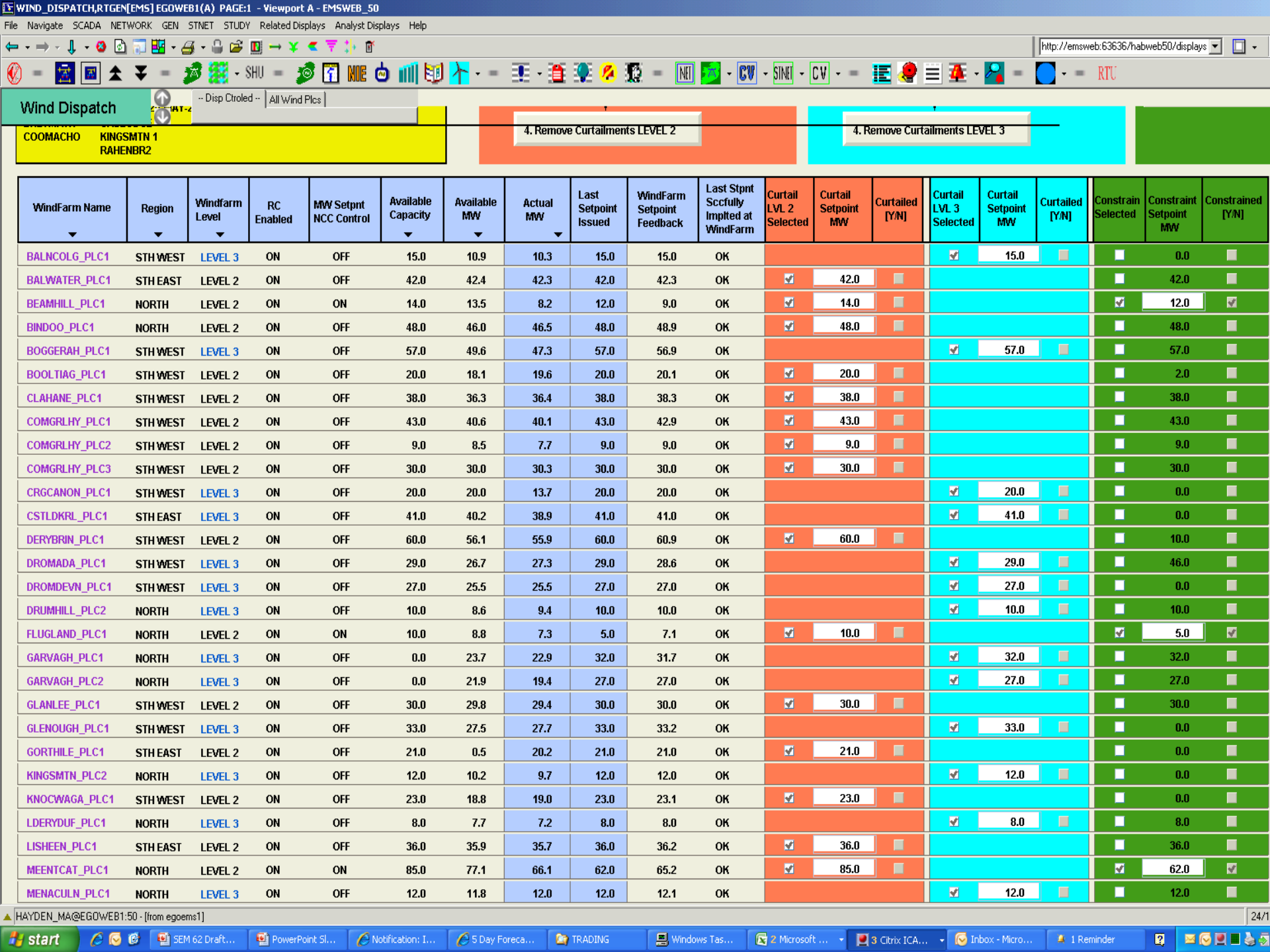
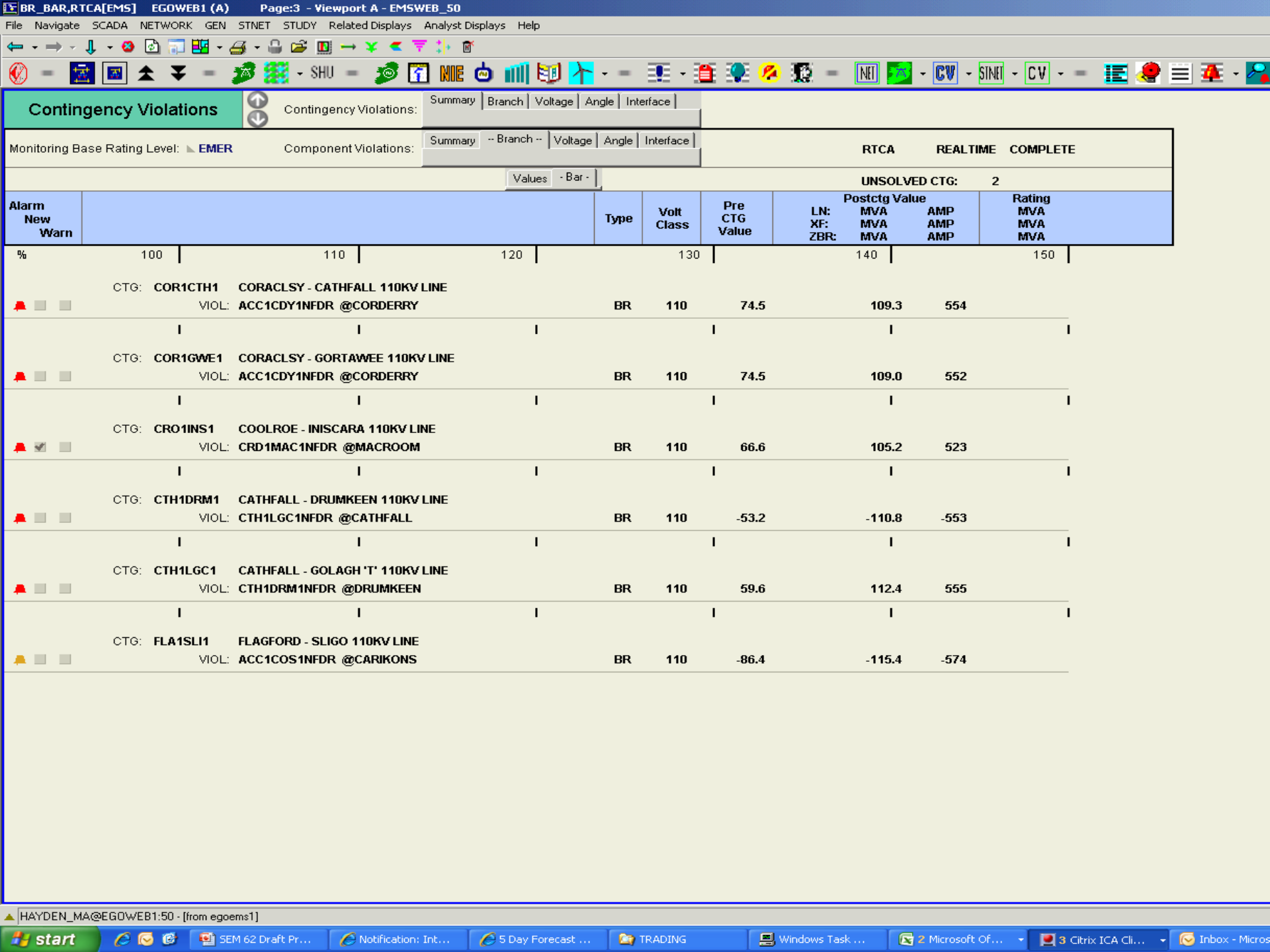
Screens at 11:00

- Control Centre dispatched down wind units which impacted on the constraint
- Manual “Pro-Rata” calculation
- Applied via a dispatch program


WIND_DISPATCH,RTGEN[EMS] EGOWEB1(A) PAGE:1 - Viewport A - EMSWEB_50
File Navigate SCADA NETWORK GEN STNET STUDY Related Displays Analyst Displays Help
http://emsweb:63636/habweb50/displays
Wind Dispatch
-- Disp Ctroled --
All Wind Plcs
COOMACHO KINGSMTN 1
RAHENBR2
4. Remove Curtailments LEVEL 2
4. Remove Curtailments LEVEL 3
WindFarm Name
Region
Windfarm Level
RC Enabled
MW Setpnt NCC Control
Available Capacity
Available MW
Actual MW
Last Setpoint Issued
WindFarm Setpoint Feedback
Last Stpnt Sccfully Implted at WindFarm
Curtail LVL 2 Selected
Curtail Setpoint MW
Curtailed [Y/N]
Curtail LVL 3 Selected
Curtail Setpoint MW
Curtailed [Y/N]
Constrain Selected
Constraint Setpoint MW
Constrained [Y/N]
BALNCOLG_PLC1 STH WEST LEVEL 3 ON OFF 15.0 10.9 10.3 15.0 15.0 OK 15.0 0.0
BALWATER_PLC1 STH EAST LEVEL 2 ON OFF 42.0 42.4 42.3 42.0 42.3 OK 42.0 42.0
BEAMHILL_PLC1 NORTH LEVEL 2 ON ON 14.0 13.5 8.2 12.0 9.0 OK 14.0 12.0
BINDOO_PLC1 NORTH LEVEL 2 ON OFF 48.0 46.0 46.5 48.0 48.9 OK 48.0 48.0
BOGGERAH_PLC1 STH WEST LEVEL 3 ON OFF 57.0 49.6 47.3 57.0 56.9 OK 57.0 57.0
BOOLTIAG_PLC1 STH WEST LEVEL 2 ON OFF 20.0 18.1 19.6 20.0 20.1 OK 20.0 2.0
CLAHANE_PLC1 STH WEST LEVEL 2 ON OFF 38.0 36.3 36.4 38.0 38.3 OK 38.0 38.0
COMGRLHY_PLC1 STH WEST LEVEL 2 ON OFF 43.0 40.6 40.1 43.0 42.9 OK 43.0 43.0
COMGRLHY_PLC2 STH WEST LEVEL 2 ON OFF 9.0 8.5 7.7 9.0 9.0 OK 9.0 9.0
COMGRLHY_PLC3 STH WEST LEVEL 2 ON OFF 30.0 30.0 30.3 30.0 30.0 OK 30.0 30.0
CRGCANON_PLC1 STH WEST LEVEL 3 ON OFF 20.0 20.0 13.7 20.0 20.0 OK 20.0 0.0
CSTLDKRL_PLC1 STH EAST LEVEL 3 ON OFF 41.0 40.2 38.9 41.0 41.0 OK 41.0 0.0
DERYBRIN_PLC1 STH WEST LEVEL 2 ON OFF 60.0 56.1 55.9 60.0 60.9 OK 60.0 10.0
DROMADA_PLC1 STH WEST LEVEL 3 ON OFF 29.0 26.7 27.3 29.0 28.6 OK 29.0 46.0
DROMDEVN_PLC1 STH WEST LEVEL 3 ON OFF 27.0 25.5 25.5 27.0 27.0 OK 27.0 0.0
DRUMHILL_PLC2 NORTH LEVEL 3 ON OFF 10.0 8.6 9.4 10.0 10.0 OK 10.0 10.0
FLUGLAND_PLC1 NORTH LEVEL 2 ON ON 10.0 8.8 7.3 5.0 7.1 OK 10.0 5.0
GARVAGH_PLC1 NORTH LEVEL 3 ON OFF 0.0 23.7 22.9 32.0 31.7 OK 32.0 32.0
GARVAGH_PLC2 NORTH LEVEL 3 ON OFF 0.0 21.9 19.4 27.0 27.0 OK 27.0 27.0
GLANLEE_PLC1 STH WEST LEVEL 2 ON OFF 30.0 29.8 29.4 30.0 30.0 OK 30.0 30.0
GLENOUGH_PLC1 STH WEST LEVEL 3 ON OFF 33.0 27.5 27.7 33.0 33.2 OK 33.0 0.0
GORTHILE_PLC1 STH EAST LEVEL 2 ON OFF 21.0 0.5 20.2 21.0 21.0 OK 21.0 0.0
KINGSMTN_PLC2 NORTH LEVEL 3 ON OFF 12.0 10.2 9.7 12.0 12.0 OK 12.0 0.0
KNOCWAGA_PLC1 STH WEST LEVEL 2 ON OFF 23.0 18.8 19.0 23.0 23.1 OK 23.0 0.0
LDERYDUF_PLC1 NORTH LEVEL 3 ON OFF 8.0 7.7 7.2 8.0 8.0 OK 8.0 8.0
LISHEEN_PLC1 STH EAST LEVEL 2 ON OFF 36.0 35.9 35.7 36.0 36.2 OK 36.0 36.0
MEENTCAT_PLC1 NORTH LEVEL 2 ON ON 85.0 77.1 66.1 62.0 65.2 OK 85.0 62.0
MENACULN_PLC1 NORTH LEVEL 3 ON OFF 12.0 11.8 12.0 12.0 12.1 OK 12.0 12.0
HAYDEN_MA@EGOWEB1:50 - [from egoems1]
24/1
start
SEM 62 Draft...
PowerPoint Sl...
Notification: I...
5 Day Foreca...
TRADING
Windows Tas...
2 Microsoft ...
3 Citrix ICA...
Inbox - Micro...
1 Reminder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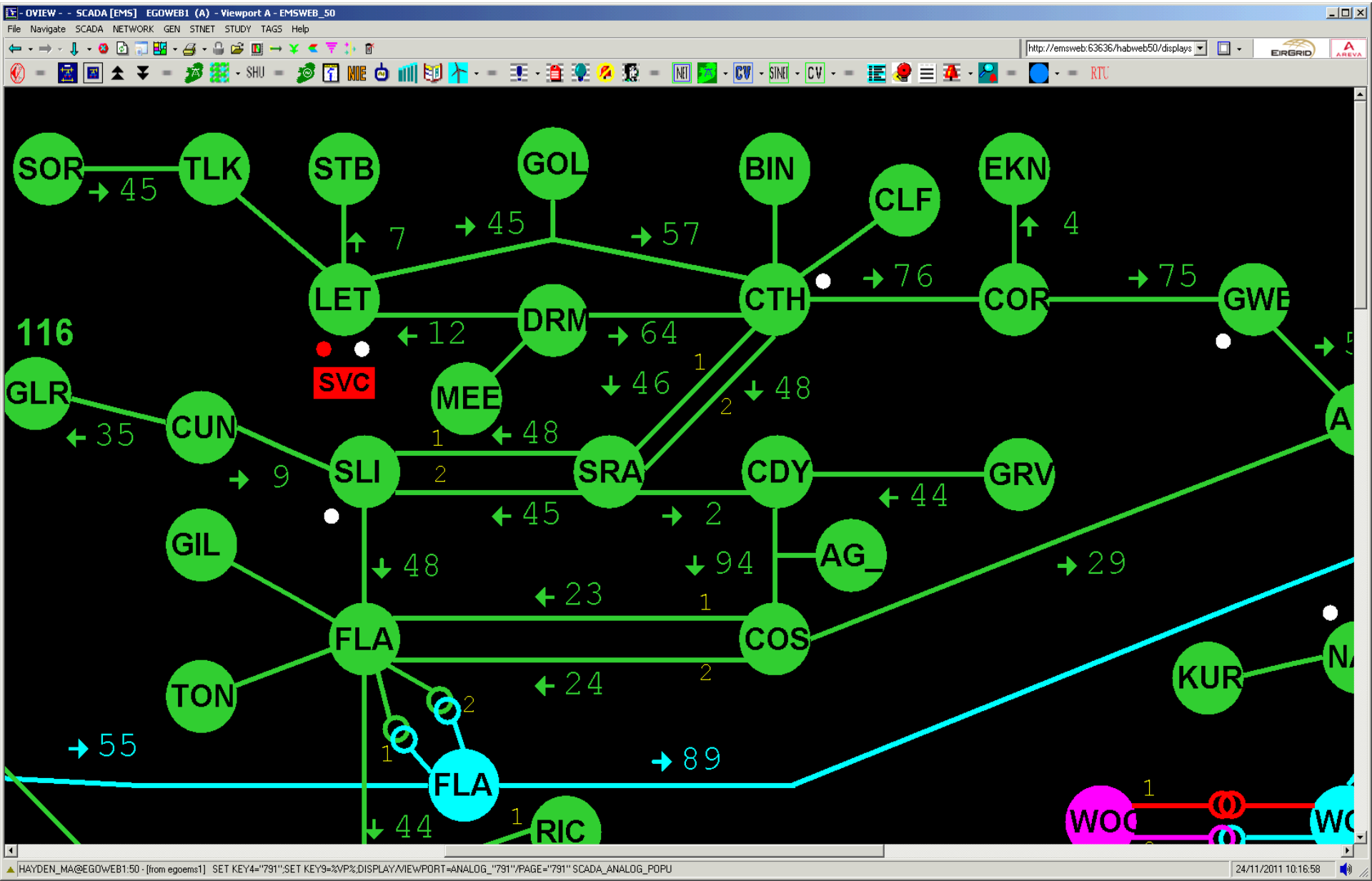
File Navigate SCADA NETWORK GEN STNET STUDY Related Displays Analyst Displays Help
Contingency Violations
Contingency Violations: Summary Branch Voltage Angle Interface
Monitoring Base Rating Level: EMER
Component Violations: Summary -- Branch -- Voltage Angle Interface
RTCA REALTIME COMPLETE
Values - Bar -
UNSOLVED CTG: 2
Alarm New Warn
Type
Volt Class
Pre CTG Value
Postctg Value LN: MVA AMP XF: MVA AMP ZBR: MVA AMP
Rating MVA MVA MVA
% 100 110 120 130 140 150
CTG: COR1CTH1 CORACLSY - CATHFALL 110KV LINE
VIOL: ACC1CDY1NFDR @CORDERRY BR 110 74.5 109.3 554
CTG: COR1GWE1 CORACLSY - GORTAWEE 110KV LINE
VIOL: ACC1CDY1NFDR @CORDERRY BR 110 74.5 109.0 552
CTG: CRO1INS1 COOLROE - INISCARA 110KV LINE
VIOL: CRD1MAC1NFDR @MACROOM BR 110 66.6 105.2 523
CTG: CTH1DRM1 CATHFALL - DRUMKEEN 110KV LINE
VIOL: CTH1LGC1NFDR @CATHFALL BR 110 -53.2 -110.8 -553
CTG: CTH1LGC1 CATHFALL - GOLAGH 'T' 110KV LINE
VIOL: CTH1DRM1NFDR @DRUMKEEN BR 110 59.6 112.4 555
CTG: FLA1SLI1 FLAGFORD - SLIGO 110KV LINE
VIOL: ACC1COS1NFDR @CARIKONS BR 110 -86.4 -115.4 -574
HAYDEN_MA@EGOWEB1:50 - [from egoems1]
start
SEM 62 Draft Pr...
Notification: Int...
5 Day Forecast ...
TRADING
Windows Task ...
2 Microsoft Of...
3 Citrix ICA Cli...
Inbox - Micros

Real Time Power Flow



SEM-011-62 Decision

- Key Messages of the Decision from a Dispatch Perspective:
  - TSOs should only dispatch down Priority Dispatch for system security reasons
  - A specific order is to be utilised when choosing between different types of units with Priority Dispatch
- Order of Priority Dispatch
  - Interconnector via Counter Trading *(NEW)*
  - Peat
  - Hybrid
  - CHP/Biomass/Hydro
  - Windfarms *(New Order)*
  - Interconnector via NTC reduction
  - Hydro (*Flood Risk)*

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Interconnector Flows
Counter Trading

- Flows on Interconnectors are determined by the SEM Market Schedule Day Ahead
- Control Room assess in advance if it is likely that PD units will need to be dispatched down
- Where this seems likely they will attempt to Counter Trade
- Counter Trading on the Interconnector to preserve Priority Dispatch
  - Previously counter trading was only used to manage system security
  - Now TSOs will counter trade before dispatching down priority dispatch units
  - Counter Trading with National Grid is only available on a firm basis 2 hours before real time
  - Power Exchange options being investigated

Interconnector Flows
Net Transfer Capacity Reduction

- EU Directive on Congestion Management states that capacity can only be reduced by a TSO if there is a system security constraint

- Capacity (NTC) Reduction is not allowed if internal re-dispatch resolves the issue

Wind Unit Dispatch

- Order in which wind units are dispatched down
  - Previously Market Classification was used
  - Variable Price Takers (VPTs) were dispatched down before Autonomous
  - Now based solely on controllability
  - All wind units lie in one of three categories

Controllable Wind Units

- Level 1 Units: Should be controllable but are not
  - Have previously passed controllability testing but not working
- Level 2 Units: These units have
  - Working Active Power Dispatch controls
  - Valid Availability Signal
- Level 3 Units: Units not required to be controllable
  - Are exempt e.g. Pre-Gate or Less than 5MW
  - Are still undergoing commissioning
  - TEMPORARY SITUATION
    - Units which were allowed onto the system with controls untested
    - This backlog will be cleared by end of 2012

EirGrid TSO Wind Dispatch Program

- Key Features
  - Allows simultaneous dispatch of selected wind units for Curtailment Purposes
  - Does pro-rata calculations to apportion curtailment on the basis of Availability
  - Differentiates between Level 2 and Level 3 units

WindFarm MW Totals	Actual Exported MW	Available MW	Available Capacity MW	Curtailment Setpoint Target	WindFarm Controller Setpoint Feedback
Curtailment Level 2 WF	57.1	59.7	590.0	590.0	593.7
Curtailment Level 3 WF	26.8	30.8	360.0	419.0	447.7

The following windfarms are not available for Wind Dispatch:
(ref. email from MG to NCC 26-MAY-2011)

BALYMRTN GRSLODGE
COOMACHO KINGSMTN 1
RAHENBR2

LEVEL 2 WF

Auto Select Curtail LVL 2

1. Enter Target for WF LEVEL 2 — -99.0 MW
2. Calculate Curtail Setpnt LEVEL 2
3. Issue Curtail Setpnt LEVEL 2 — LEVEL 2 TARGET 590 MW
4. Remove Curtailments LEVEL 2

LEVEL 3 WF

Auto Select Curtail LVL 3

1. Enter Target for WF LEVEL 3 — -99.0 MW
2. Calculate Curtail Setpnt LEVEL 3
3. Issue Curtail Setpnt LEVEL 3 — LEVEL 3 TARGET 419 MW
4. Remove Curtailments LEVEL 3

1. Select V
2. Issue C
3. Remove

WindFarm Name	Region	Windfarm Level	RC Enabled	MW Setpnt NCC Control	Available Capacity	Available MW	Actual MW	Last Setpoint Issued	WindFarm Setpoint Feedback	Last Stpnt Sccfully Implted at WindFarm	Curtail LVL 2 Selected	Curtail Setpoint MW	Curtailed [Y/N]	Curtail LVL 3 Selected	Curtail Setpoint MW	Curtailed [Y/N]	Constrain Selected	Constraint Setpoint MW
BALNCOLG_PLC1	STH WEST	LEVEL 3	ON	OFF	15.0	0.8	0.7	15.0	15.0	OK				☑	15.0		☐	0.0
BALWATER_PLC1	STH EAST	LEVEL 2	ON	OFF	42.0	0.0	0.8	42.0	42.3	OK	☑	42.0					☐	42.0
BEAMHILL_PLC1	NORTH	LEVEL 2	ON	OFF	14.0	0.0	0.2	14.0	14.0	OK	☑	14.0					☐	14.0
BINDOO_PLC1	NORTH	LEVEL 2	ON	OFF	48.0	0.1	0.0	48.0	48.9	OK	☑	48.0					☐	48.0
BOGGERAH_PLC1	STH WEST	LEVEL 3	ON	OFF	57.0	5.8	5.2	57.0	56.9	OK				☑	57.0		☐	57.0
BOOLTIAG_PLC1	STH WEST	LEVEL 2	ON	OFF	20.0	0.3	0.7	20.0	20.1	OK	☑	20.0					☐	2.0
CLAHANE_PLC1	STH WEST	LEVEL 2	ON	OFF	38.0	1.8	1.8	38.0	38.3	OK	☑	38.0					☐	38.0
COMGRLHY_PLC1	STH WEST	LEVEL 2	ON	OFF	43.0	14.5	14.0	43.0	42.9	OK	☑	43.0					☐	43.0
COMGRLHY_PLC2	STH WEST	LEVEL 2	ON	OFF	9.0	0.8	0.9	9.0	9.0	OK	☑	9.0					☐	9.0
COMGRLHY_PLC3	STH WEST	LEVEL 2	ON	OFF	30.0	13.9	14.0	30.0	30.0	OK	☑	30.0					☐	30.0
CRGCANON_PLC1	STH WEST	LEVEL 3	ON	OFF	20.0	0.7	0.8	20.0	20.0	OK				☑	20.0		☐	0.0
CSTLDKRL_PLC1	STH EAST	LEVEL 3	ON	OFF	41.0	0.4	0.3	41.0	41.0	OK				☑	41.0		☐	0.0
DERYBRIN_PLC1	STH WEST	LEVEL 2	ON	OFF	60.0	13.1	10.3	60.0	60.9	OK	☑	60.0					☐	10.0
DROMADA_PLC1	STH WEST	LEVEL 3	ON	OFF	29.0	0.0	1.9	29.0	28.6	OK				☑	29.0		☐	46.0

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Where Can I Find Out More?

- The TSOs recently published two papers which explain in more detail how SEM 62 is being implemented

QUESTIONS WILL BE TAKEN AFTER NEXT PRESENTATION

THANK YOU FOR LISTENING

EirGrid