Real Time Power System Operations 2012/13

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SONI

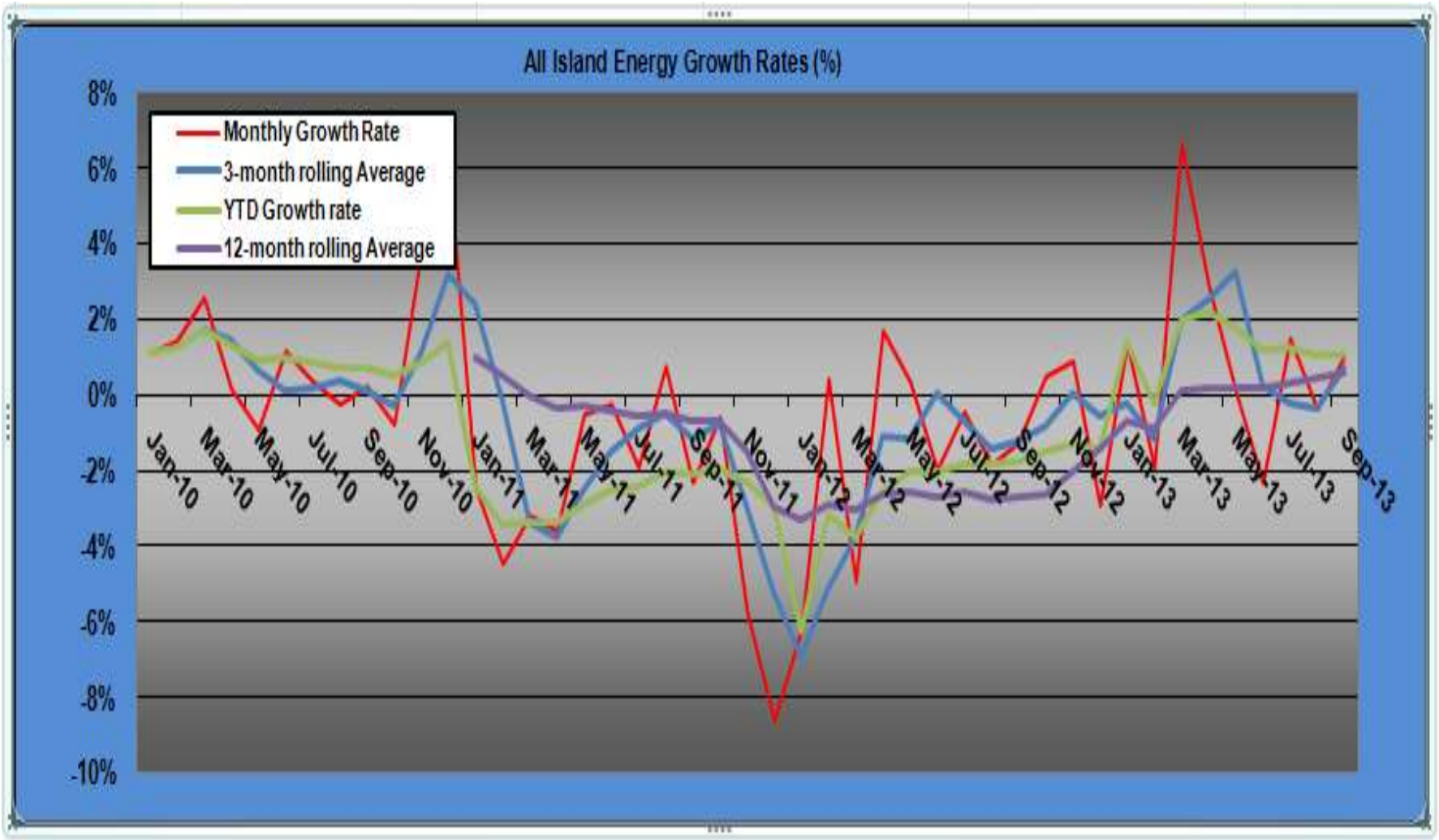
Presentation Structure

- Looking back at the last year
- A day in the life of CHCC - 22 March 2013
- Looking forward to 2014 and new operational challenges

All island data 12/13

INSTALLED CAPACITY (inc wind & Interconnection)	**12272MW - *up by 212*** **12060MW**
PEAK DEMAND @ 17:30 on 10/12/12	**6305MW – *down by 115*** **6420MW**
MIN DEMAND @ 06:00 on 4/8/13	**2217MW – *down by 56*** **2173MW**
DEMAND SUPPLIED YTD	**26991GWhrs - *up by 1532*** **25459GWhrs**
GROWTH RATE **(rolling 12 month average to end of Sept)**	**1.04%** **-2.64%**

All island Growth rates



All island wind data 12/13

INSTALLED CAPACITY	**2288MW - *up by 200*** **2088MW**
CAPACITY FACTOR YTD	**25.9% - *down by 1.7*** **27.6%**
WIND GENERATED YTD - AS % FUEL	**14.8% - *up by 0.5*** **14.3%**
ENERGY REDUCTION YTD	**2.0% - *down by 0.4*** **2.4%**
CONTRIBUTION to PEAK LOAD **@ 17:30 on 10/12/12**	**497MW – *down by 1241*** **1738MW**
MAX WIND TO DATE @ 18:30 on 21/3/13	**1917MW – *up by 79*** **1838MW**

Interconnectors

- Moyle
  - Still operating on 50% rating @ 250MW
  - Currently out to tender for new undersea cables – not expected to be completed until 2017
  - Consideration is being given to operating in a bipolar mode at 500MW but further investigations are required for environmental reasons – with a fair wind this could be achievable for Q4 2014
- EWIC
  - Fully operational and can be considered a success both technically & commercially
  - Has better facilitated SO-SO & Power Exchange counter trading
  - To date a total of 66GWhrs have been traded, 62GWhrs via Statkraft
  - €2.57m income from the trades will reduce constraint costs

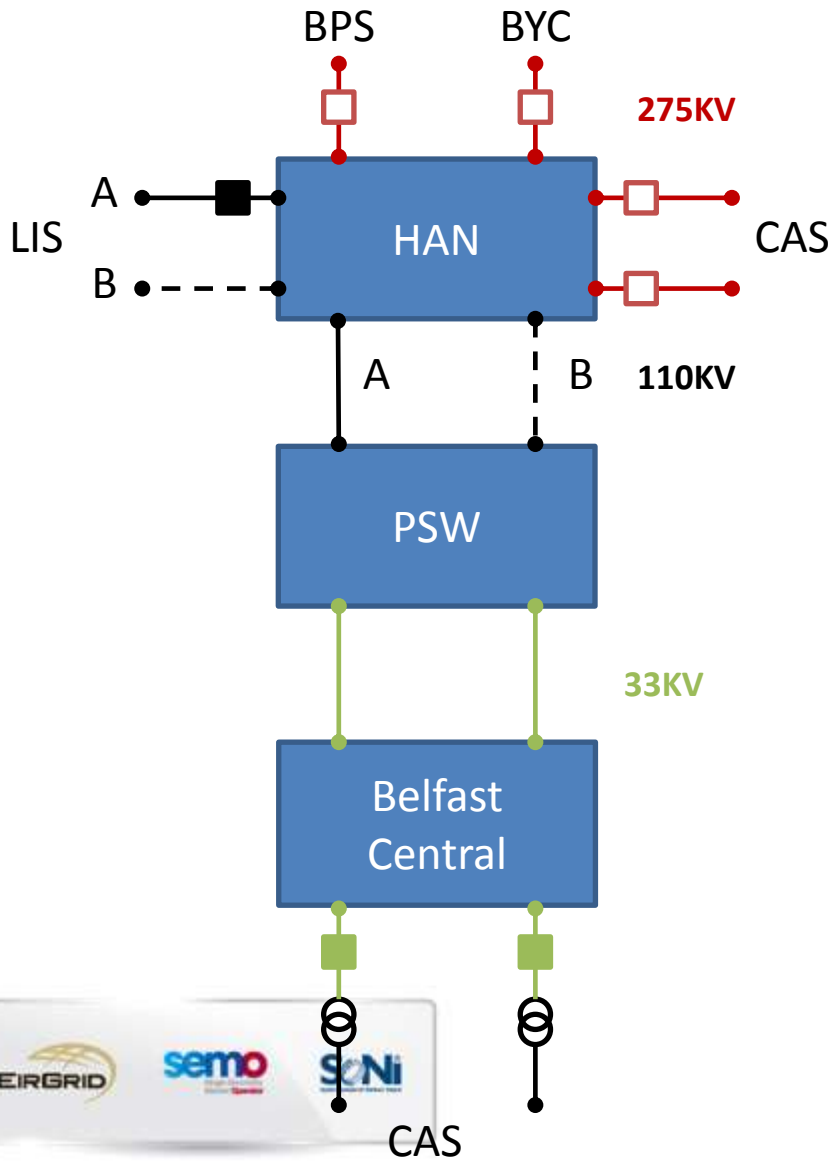
A day in the life - Friday 22 March 2013

Friday 22 March 2013

- 152 Transient Faults & 2 permanent faults on 275kV lines and 110kV lines in 24 hours
- 409 circuit breaker trip operations
- 180,000 customers off supply due to faults on the distribution system – restoration took up to 4 days
- Two incidents, 12 hours apart, on the Txm System in NI resulted in load shedding of Belfast, North & Mid Down

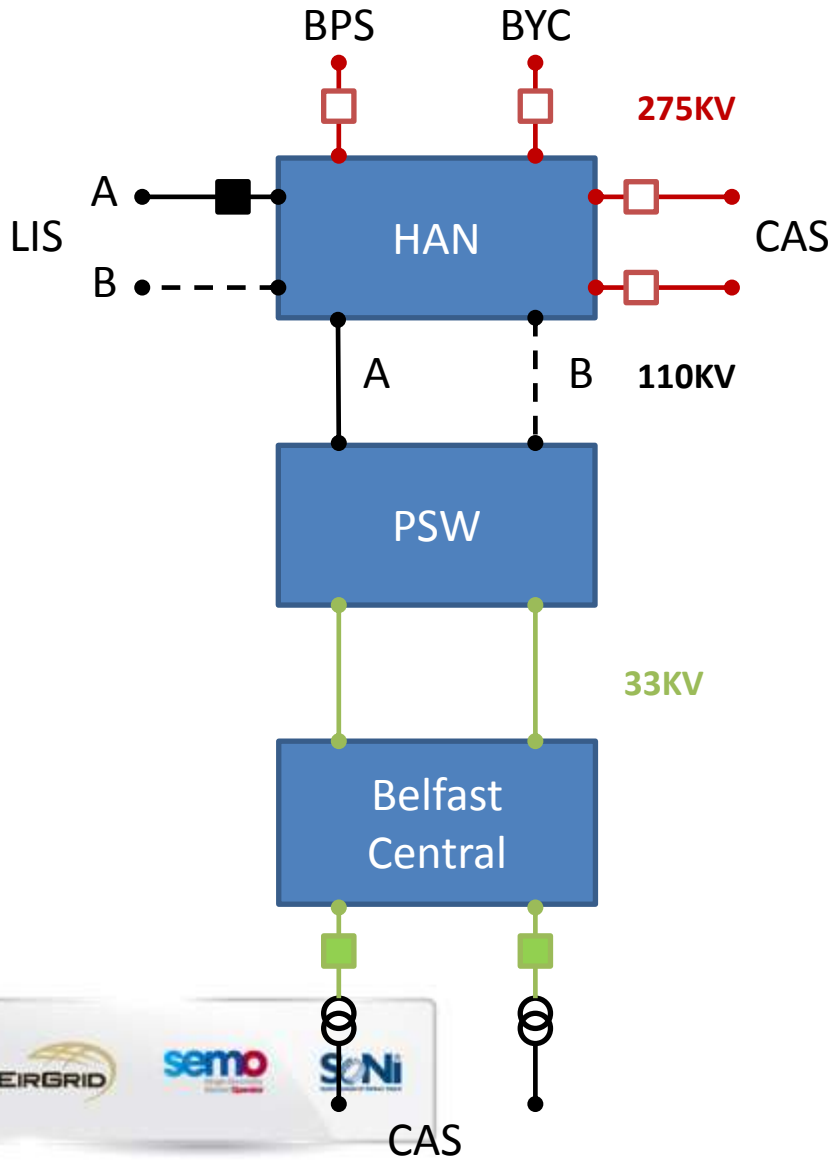
Morning incident.....

Morning of 22 March 2013



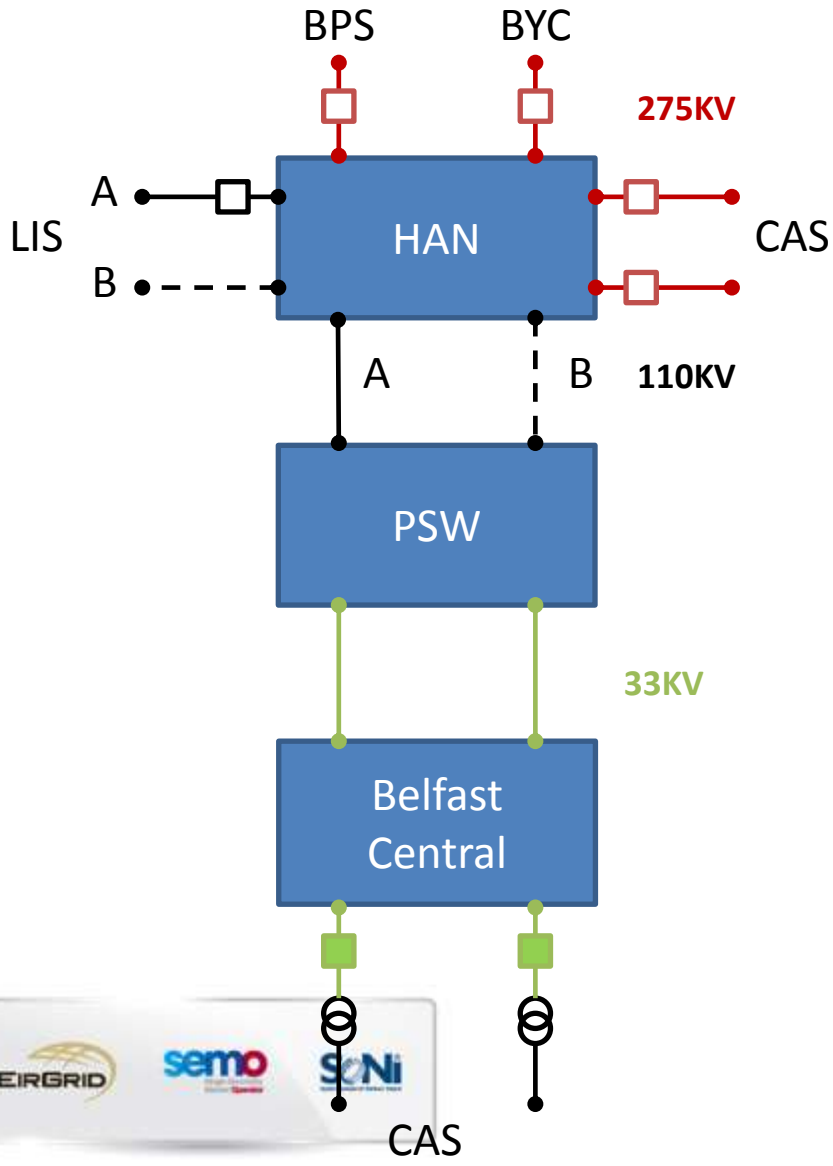
- SCADA lost from Hanahstown at 04:44 RT Ops Manager informed and another Grid Control Eng called out.
- NIE staff requested to attend Hannahstown
- Checking load flows it was deduced that all 275 KV lines had tripped
- Belfast City Centre and North Belfast supplied via Belfast Central and Lisburn A circuit
- Lisburn B and Power Station West B circuits were both out for maintenance

Morning of 22 March 2013



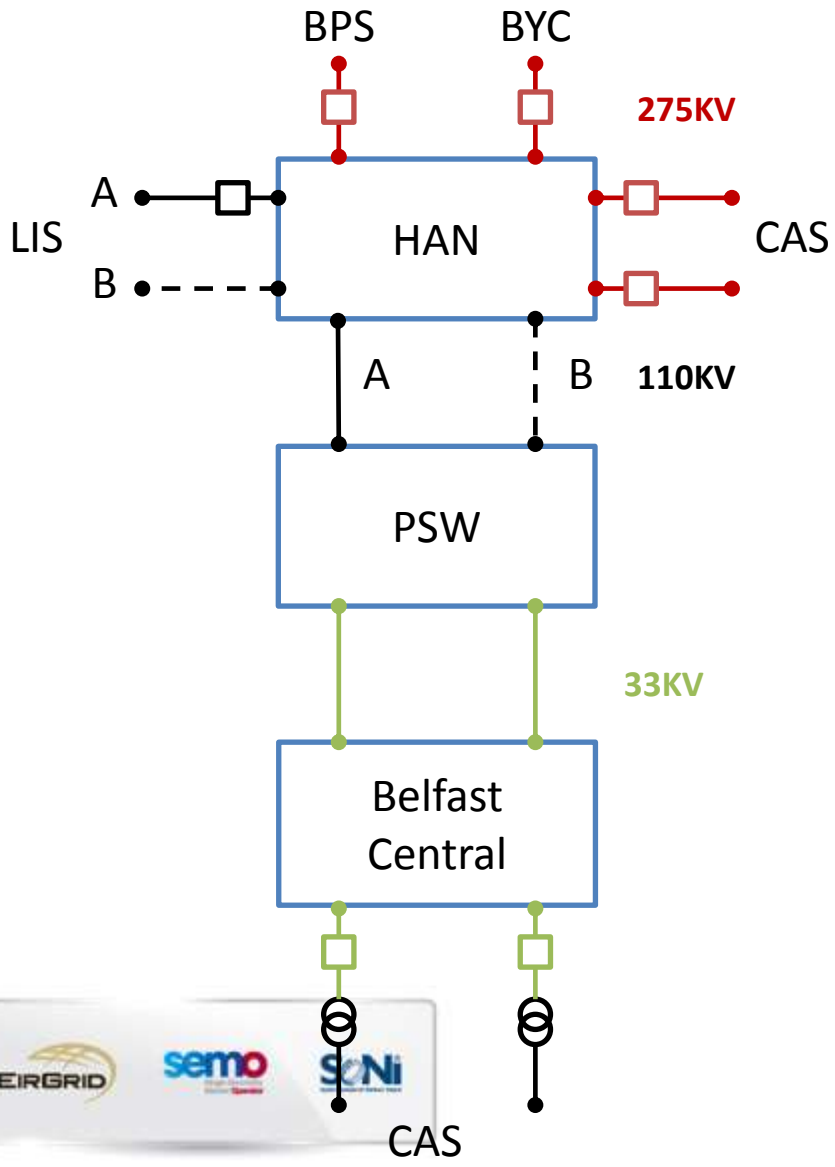
- NIE staff reported to Hannahstown at 07:05hrs
- A substation inspection was carried out and initial switching instructions to facilitate the restoration of the tripped circuits was issued by 07:17

Morning of 22 March 2013



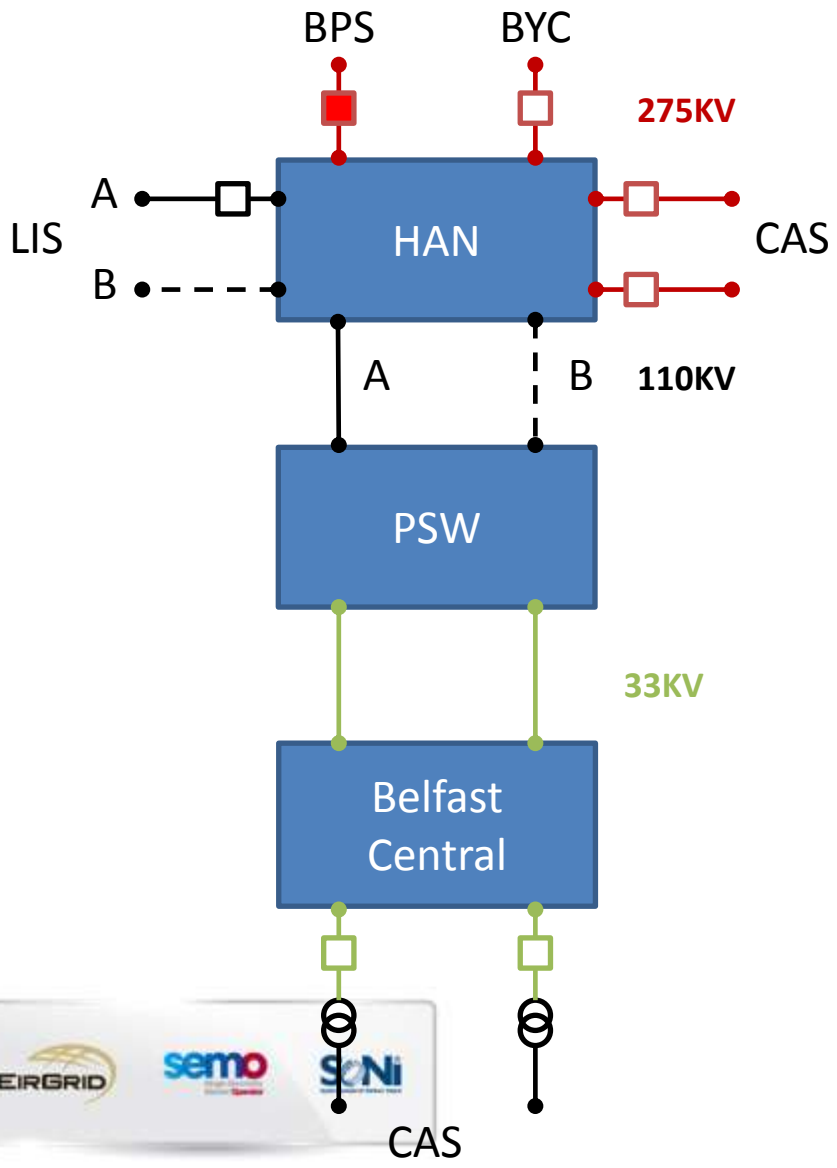
- 07:31 Lisburn A trips on overcurrent protection caused by the morning load lift

Morning of 22 March 2013



- 07:31 the 33kV circuit breakers cascade trip on overload at Belfast Central substation
- Belfast City Centre and North Belfast off supply - frequency rose to 50.16Hz
- 159,000 customers affected

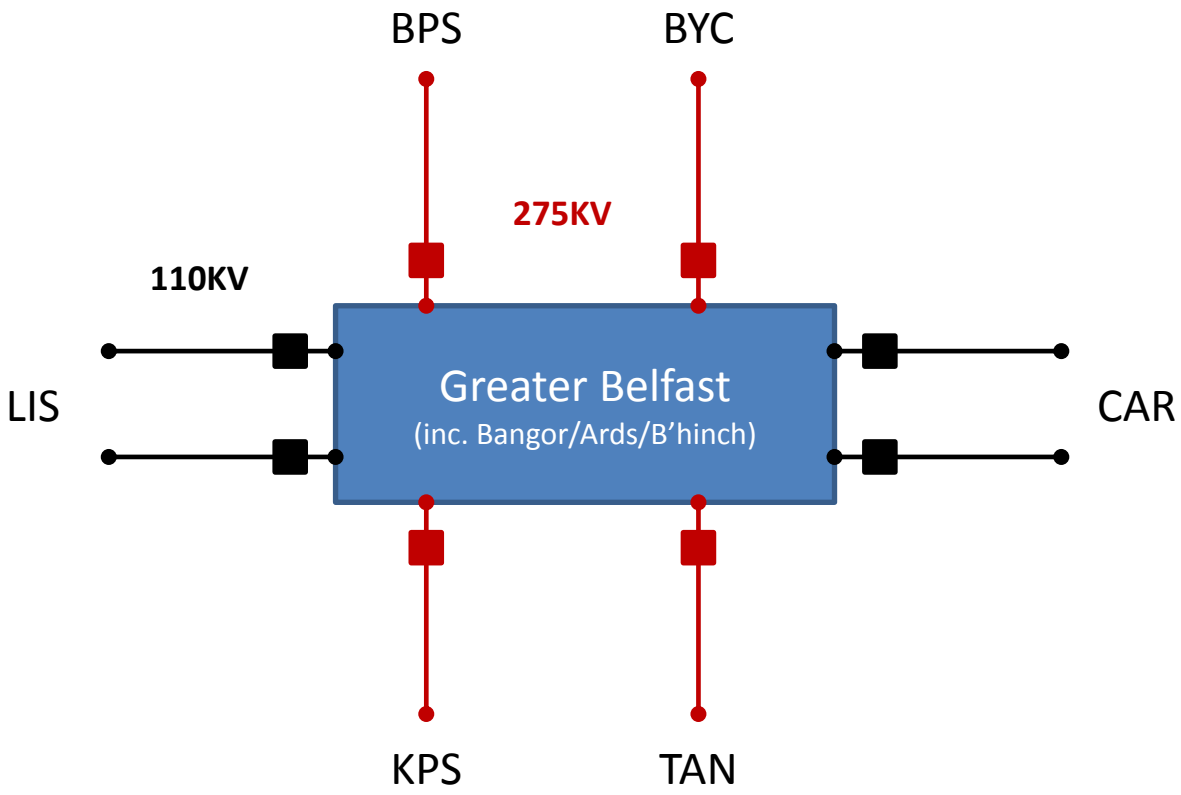
Morning of 22 March 2013



- 07:36 earlier switching instructions were completed and supplies were restored to Hannahstown via the Ballylumford circuit
- System frequency dips to 49.91Hz & restoration aided by Turlough Hill plant in Ireland
- The 33kV breakers in Belfast Central could not be reclosed remotely by the DCC hence a further 10MW of load shedding had to be organised in Belfast with the DCC until 08:56

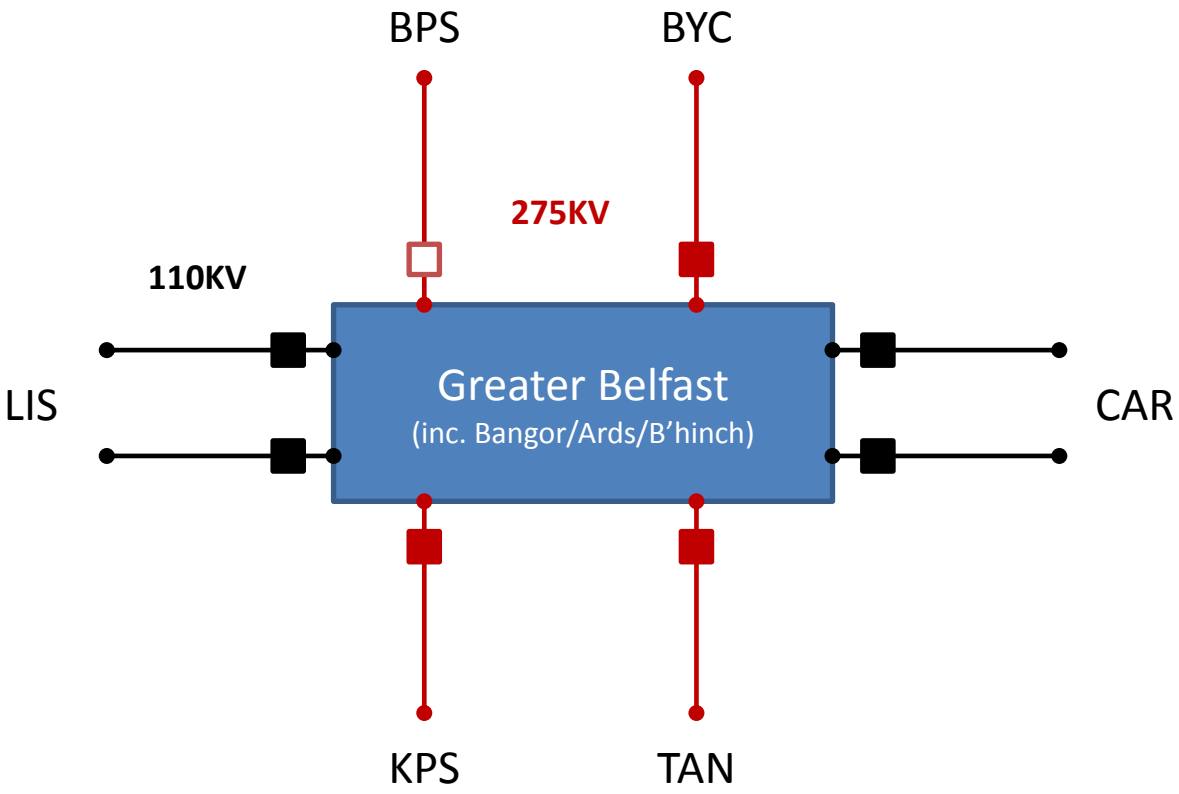
Evening incident.....

Evening of 22 March 2013



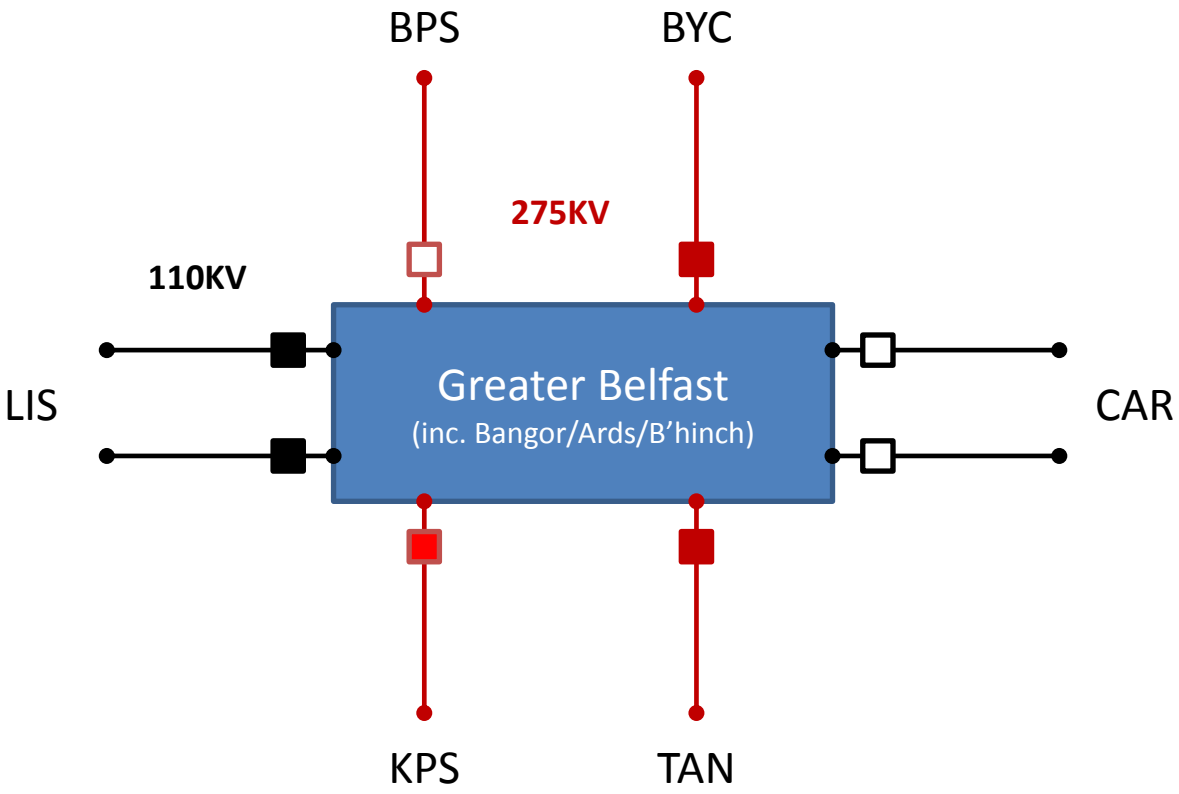
- Belfast is supplied via four 275kV lines; Ballylumford, Ballycronan More, Kilroot , Tandragee; and four 110kV lines; Lisburn A & B, Carnmoney A & B
- The Lisburn & Power Station West B circuits had been restored from outage during the afternoon

Evening of 22 March 2013



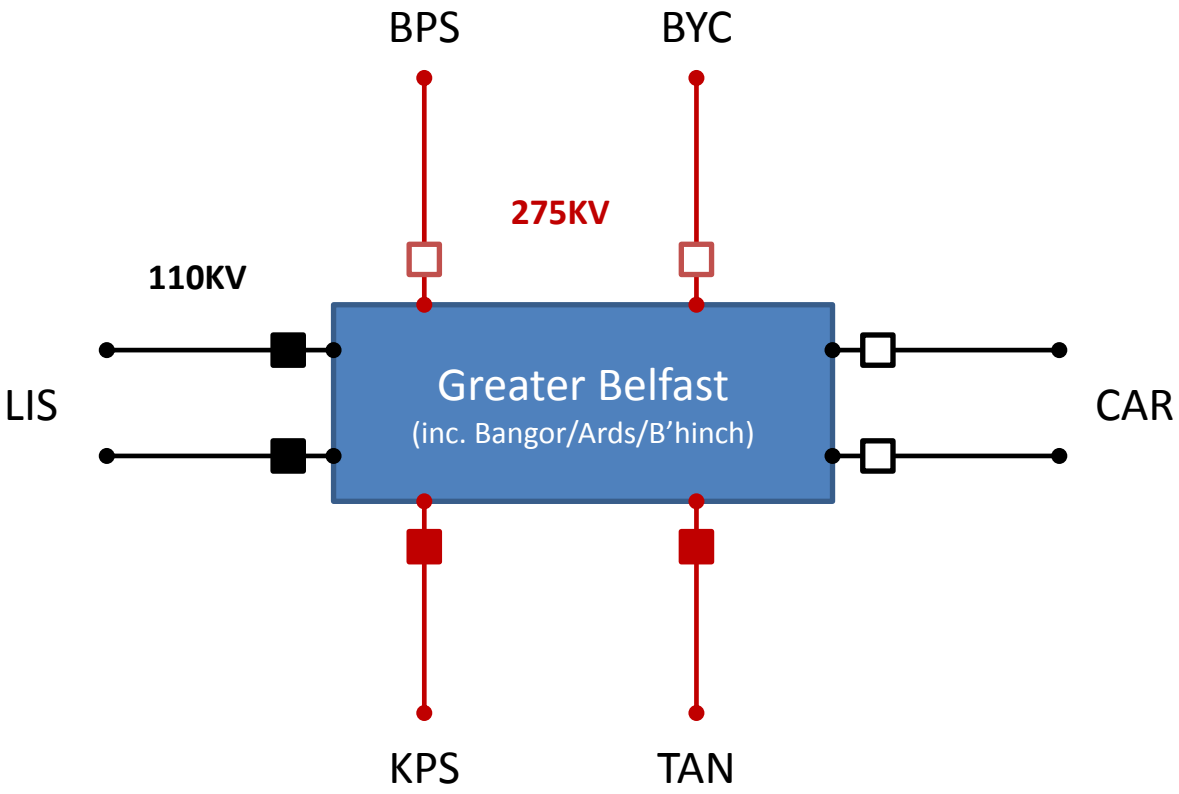
- 18:10 Ballylumford circuit trips along with a section of busbar at Ballylumford 275kV Substation
- Reports of explosion from Power Station staff
- Line is not reclosed
- Later inspection found a broken conductor on the terminal tower at the substation

Evening of 22 March 2013



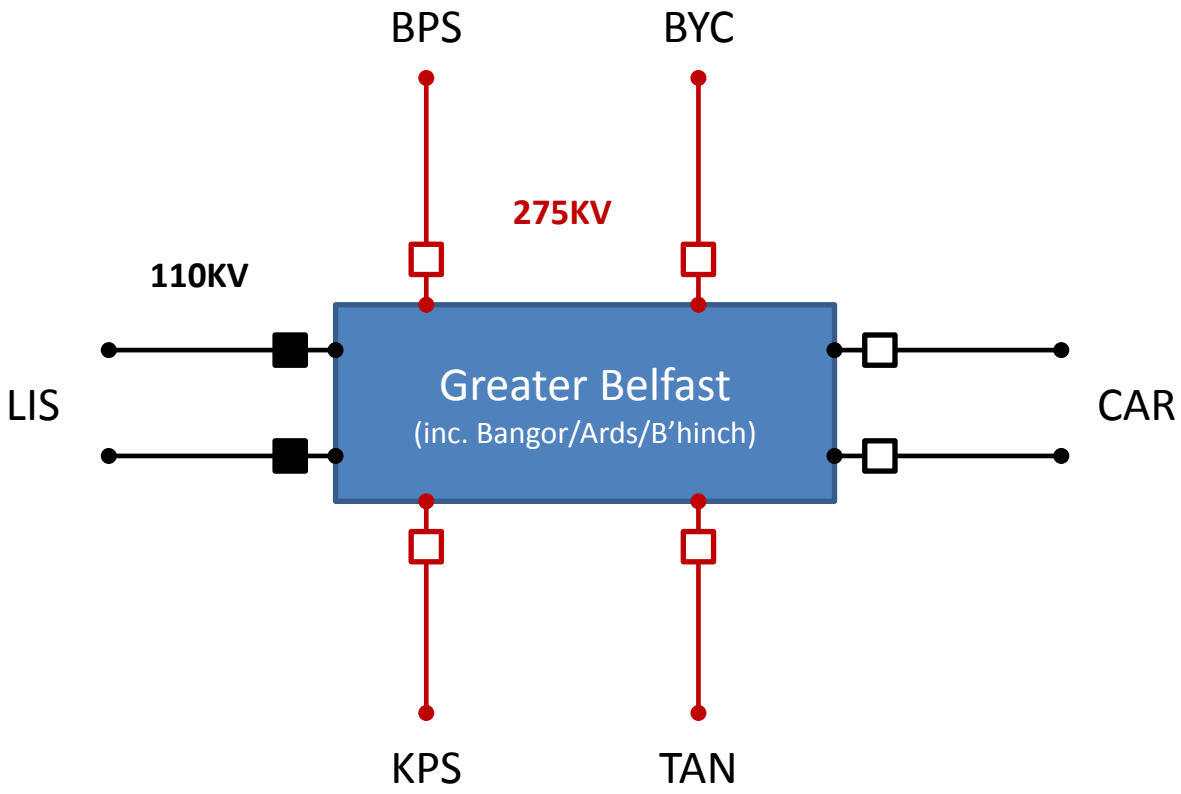
- 18:27 decision taken to open Carnmoney circuits
- These circuits had been tripping and there had been some protection mal-operations in Carnmoney
- This would ensure supplies secured better for Carnmoney and Eden

Evening of 22 March 2013



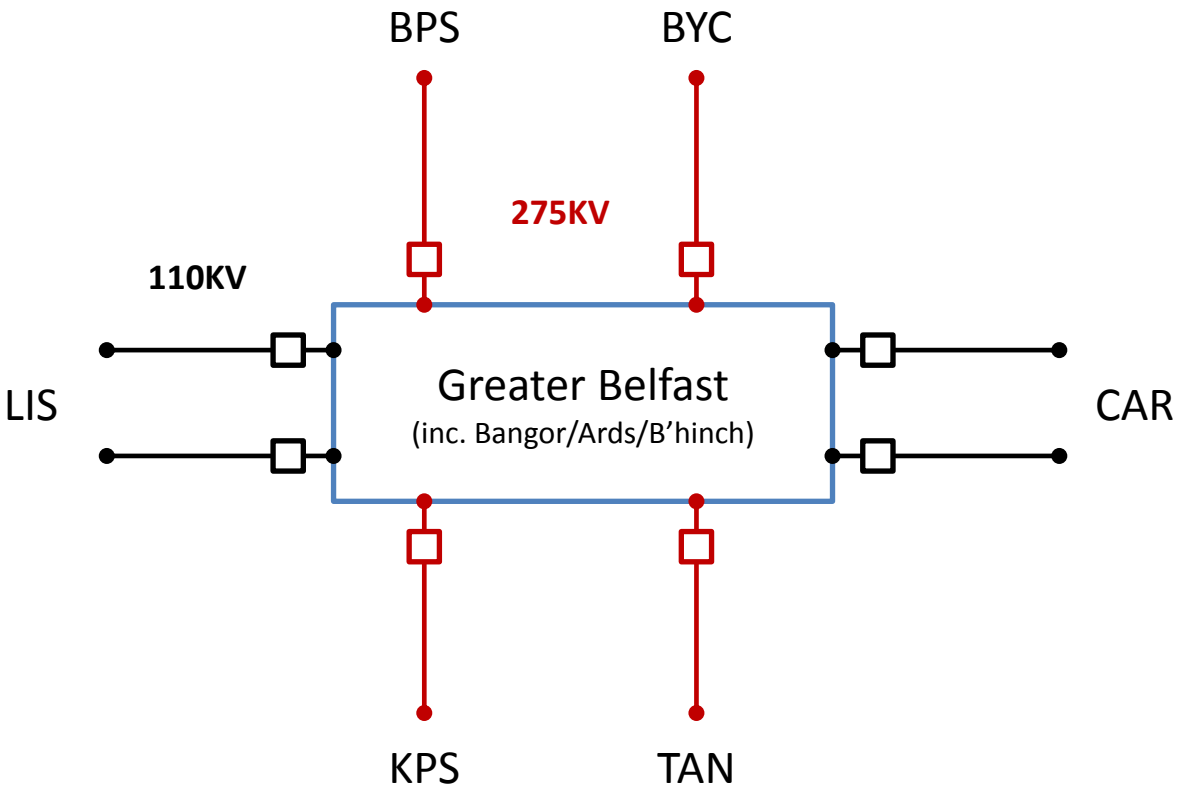
- 19:01 Ballycronan More circuit trips
- The decision was taken not to reclose at this time due to the continual tripping of these circuits
- Over 30 operations had taken place during the day with over 50% of these in previous 2 hours

Evening of 22 March 2013



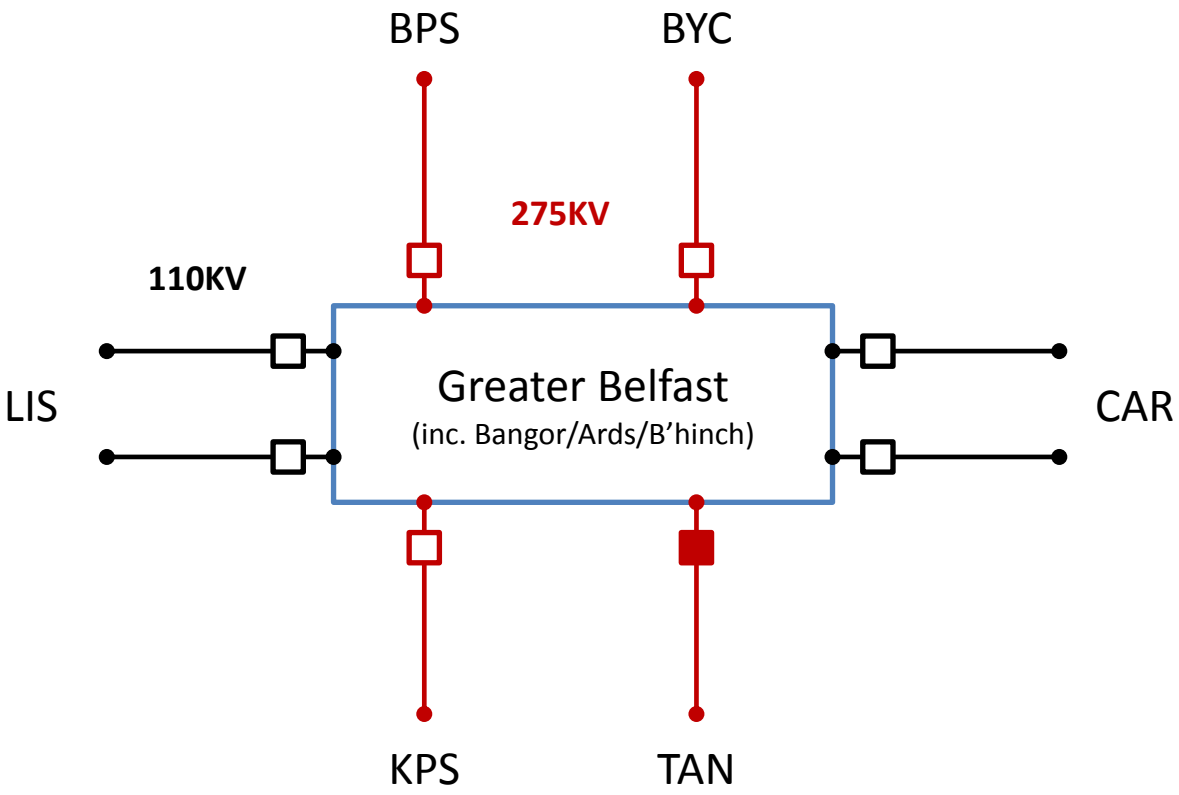
- 19:30 the Kilroot circuit trips closely followed by the Tandragee circuit

Evening of 22 March 2013



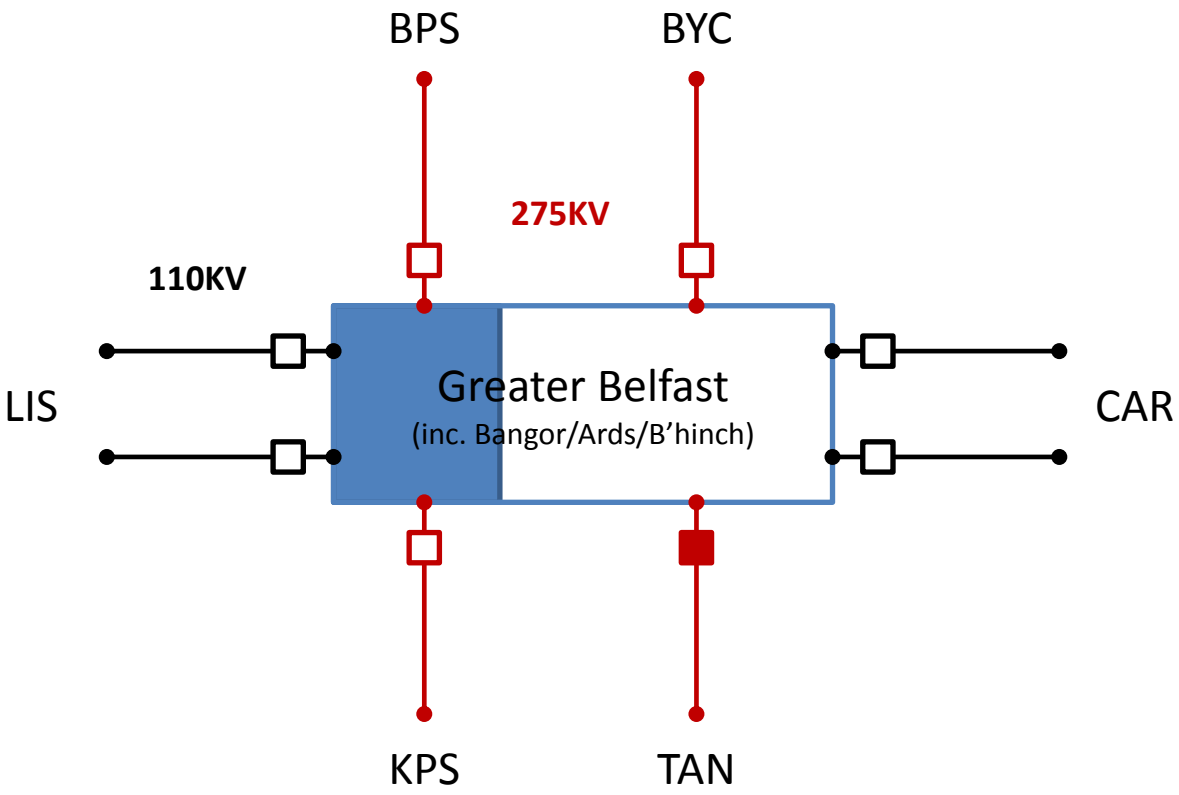
- 19:30 cascade tripping of Lisburn A+B circuits
- Belfast, North and Mid Down off supply affecting 320,589 customers
- Significant frequency disturbance on system - frequency rose to 50.45Hz
- Two generating units tripped in Ireland resulting in the frequency then falling to 49.52Hz
- Frequency restoration by the NCC in Dublin & brought back within normal operating limits by 19:32

Evening of 22 March 2013



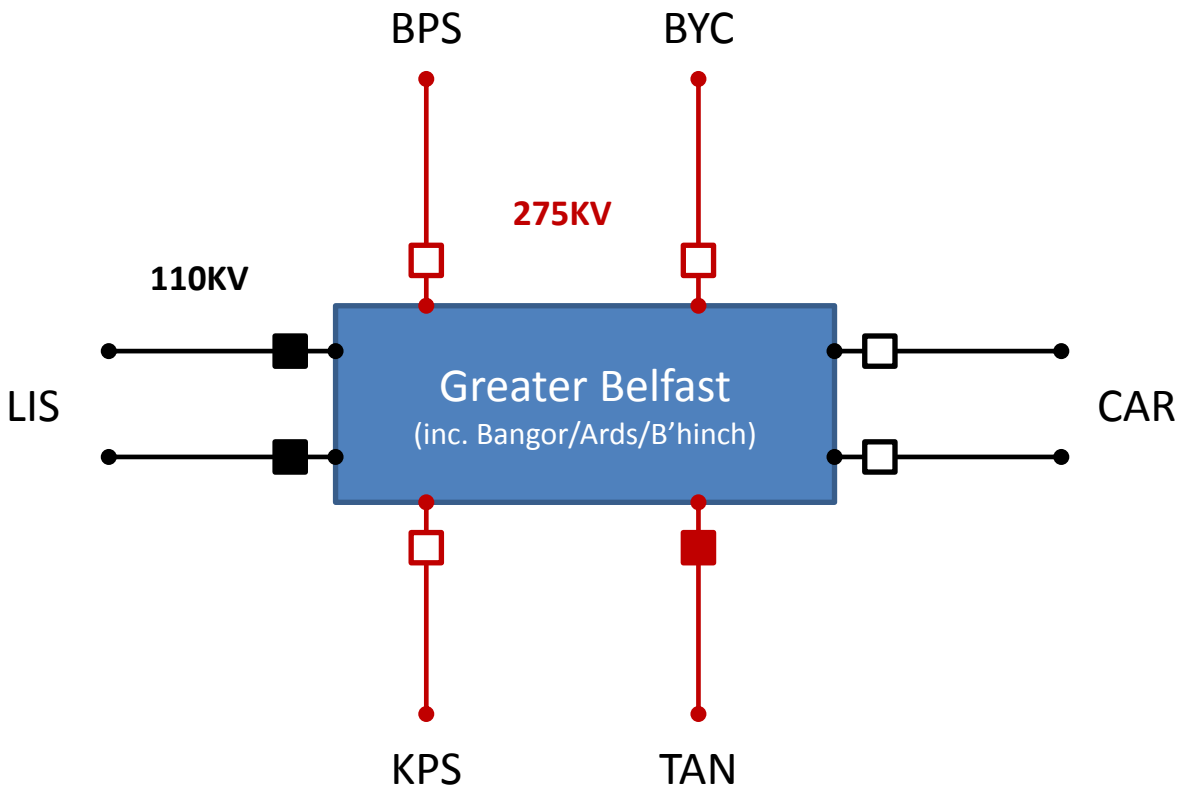
- 19:36:22 busbars cleared of all circuits and Tandragee circuit is reclosed & holds

Evening of 22 March 2013



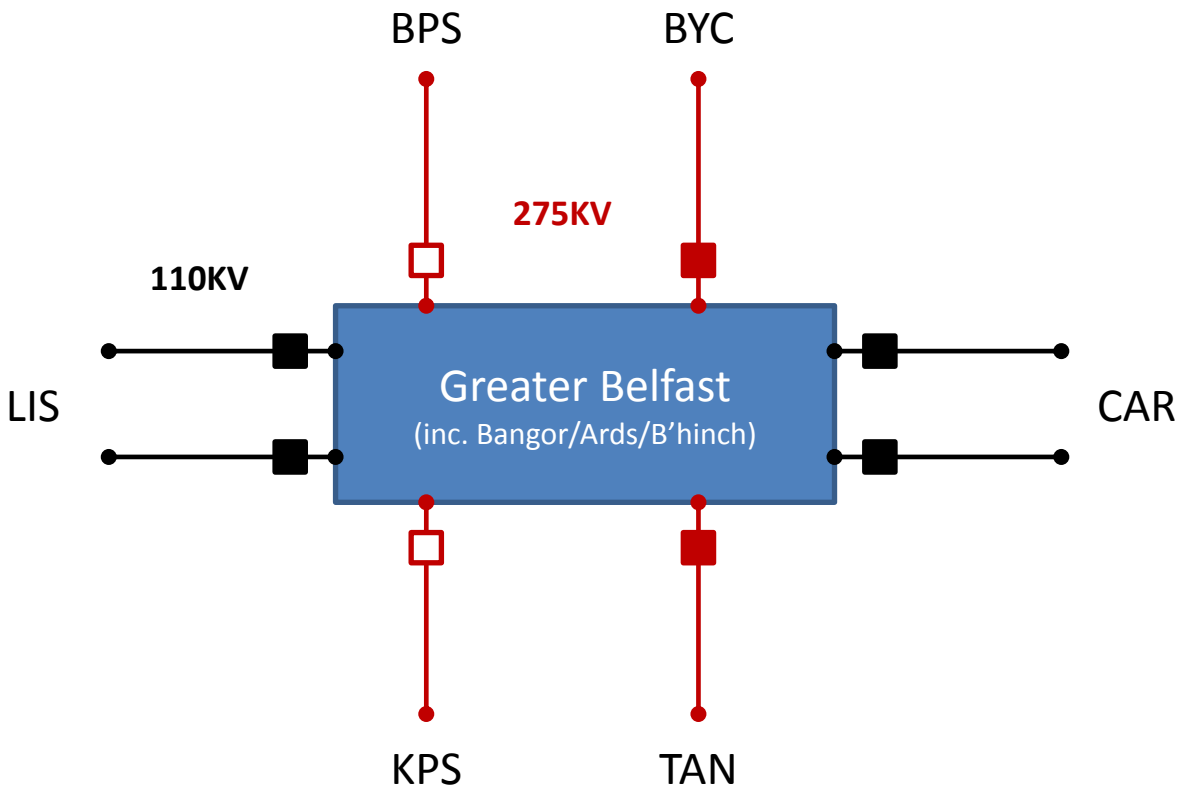
- 19:36:54 restoration started by restoring supplies via Hannahstown into the centre of Belfast

Evening of 22 March 2013



- 19:45:48 restoration completed
- The total elapsed time from loss of supply to full restoration was less than 15 minutes

Finally..... 23 March 2013



- 01:02 Ballycronan More restored and held , Carnmoney circuits also reclosed
- Ballylumford+ Kilroot circuits remained out for repairs but were returned to service during the afternoon

NIE & SONI Joint Investigation of 22/3

- The problem with the RTU at Hannahtown, that caused the loss of SCADA, has been identified and fixed – an input filter has been installed and provision made to facilitate remote manual switch back from bypass mode to UPS mode
- The protection on the transmission circuits indicated that they tripped with both earth and phase to phase faults on the same circuits at different times during the day
- Earth faults suggest wet snow loading whilst phase to phase faults would indicate conductor galloping
- A cure for galloping is to de-spacer but this exacerbates wet snow loading as it allows the conductors to rotate and gather more snow
- NIE investigations through CIGRE have found that wet snow loading on de-spacered conductor may be countered by fitting pendulum weights to the line to prevent rotation & this approach is currently being considered.

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Main challenges for year ahead - 2014

- Internal company re-organisation to faciltate more effective and efficient operation will require more joined up control room operation
- The NCC & CHCC will have one RT Ops Manager and we are currently working towards implementing this change
- Following on from this will be training for both sets of control room staff in order that the system can operated an all island basis when the new EMS goes live in 2016
- The new wind dispatch tool will come on stream at the end of Q1 and this will need setting up and bedding down
- There will be a new trading partner contracted to provide a more flexible and cost effective solution to Power Exchange trading
- Enhanced balancing services trading with NGC has been proposed and consideration is being given to extending control room trading in order to reduce the reserve requirements associated with EWIC when it is the largest single infeed


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