Appendix - Storm Eva

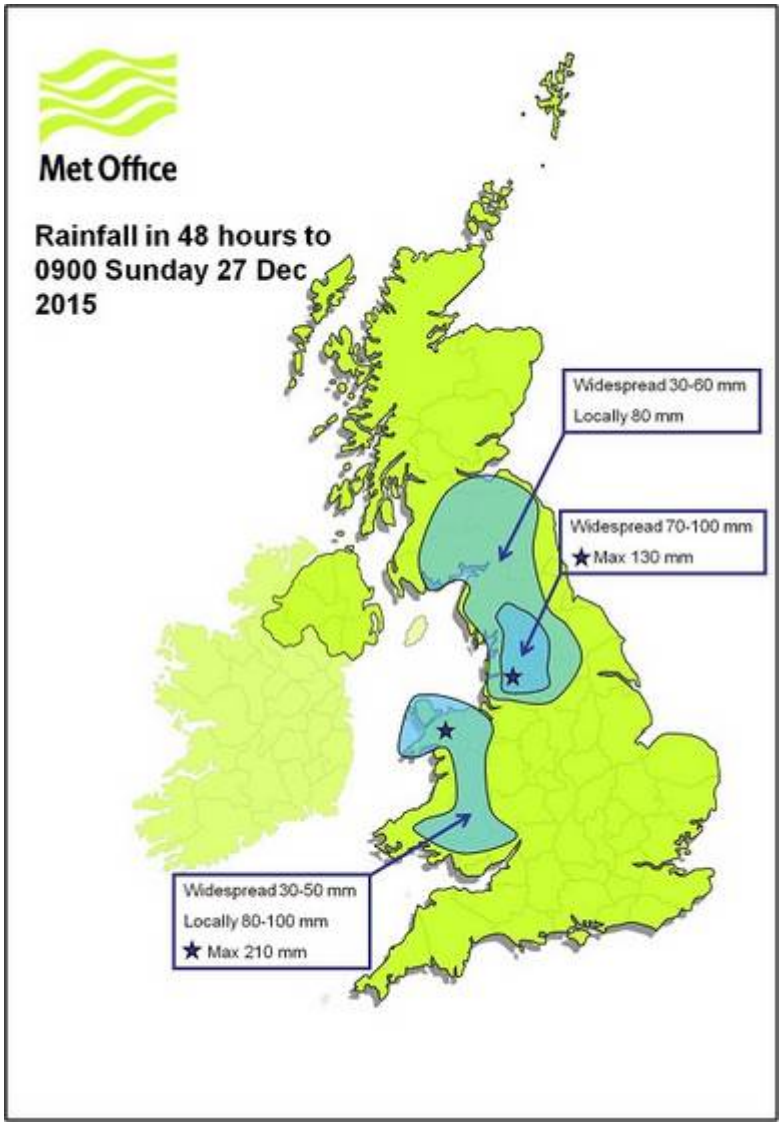
26/27 December 2015



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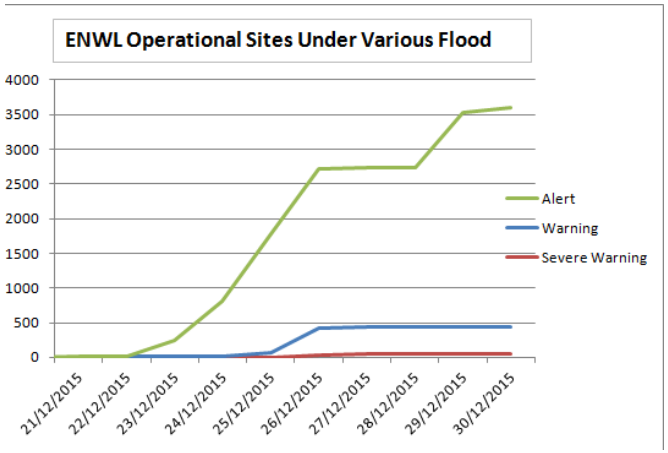
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Storm Eva Rainfall



48hr UK RAINFALL TOTALS 9am 25 DEC – 9am 27 DEC 2015

SITE	AREA	RAINFALL TOTAL (MM)
STONYHURST	LANCASHIRE	100
SHAP	CUMBRIA	86.4
SPADEADAM	CUMBRIA	79.4
PRESTON, MOOR PARK	LANCASHIRE	73.2
MYERSCOUGH	LANCASHIRE	72.4
ROCHDALE	GREATER MANCHESTER	68.2



Rochdale Central Grid



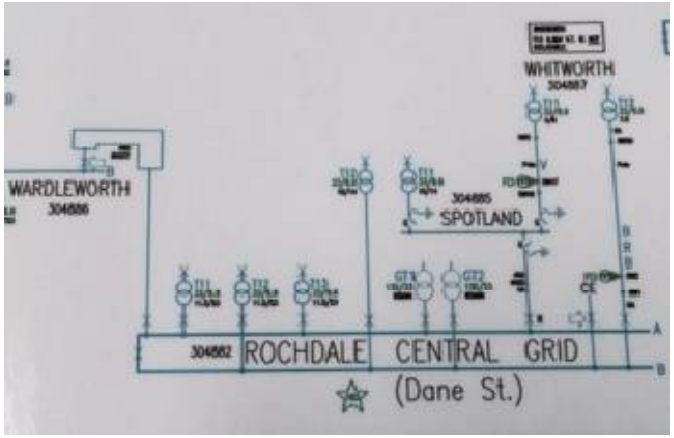
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- River Roch broke its river banks causing widespread flooding
- Rochdale Grid Site flood defences overtopped - Supplies lost to 18,545 customers (10:00 on 26/12). 1,514 customers were diverted from the site prior to the trip.
- Flooded assets – 33/132kV protection panels, 33kV switch rooms, A, B, C, D 11kV switch rooms, batteries, SCADA and auxiliary wiring and control systems
- Within the first hour after trip, we restored 3,673 customers.
- Water levels dropped to allow access to site at 22:00 on 26/12
- 33kV busbars and switchgear were high enough level to remain unaffected by flooding
- Initial supply restoration focussed upon restoration of 33kV network
- Partial 33kV supplies system to Spotland restored 20:54 on 27/12
- 132kV GT2 restored 02:56 29/12

Rochdale Central Grid

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Dane St Primary (Rochdale)







- In same grounds as the grid site
- Floods reached 1.5m high inside the control room of the substation
- 6.6kV switchgear – completely engulfed just below busbar spouts. A and B sections did not have water penetration to busbar or CT chambers, C and D had busbar and CT chamber cable box breaches. 6.6kV protection panels engulfed
- At peak 28/12, 11:12, 25 generators had been connected restoring 31 substations supplying 5,689 customers.

Dumers Lane Primary, Bury

- River Irwell flooded in Bury adjacent to Dumers Lane Primary
- 3,177 customers lost due to substation tripping (13:29, 26/12)
- Engineers on site morning of 27/12 as water level had receded.
- Mild water penetration to circuit protection links (at the bottom of the protection panel) and back-up batteries on site.
- All other critical electrical assets were above the water level and found to be unaffected by the water ingress.
- Pumps inside the switchgear and transformer bays worked and this was clearly evidenced from where the water exited the primary
- No damage to 33kV as much higher.
- 11kV supplies restored 00:10 on 28/12

Loss of Cable Bridges across Irwell - Bury







- Two locations affected by cable bridges each spanning the Irwell and each carrying two HV circuits
- https://www.youtube.com/watch?v=Mb4HPYSSv8U

- **Location 1: Milltown street**
- Milltown Street cable bridge had suffered severe damage, is unstable and needs replacing. It was still carrying one live 11kV and one live 6.6kV circuit when discovered. The 6.6kV was damaged and was replaced with a span of overhead line
- Council owned footbridge bridge – awaiting plan from council but unsure if replacing

- **Location 2: Lomax st**
- Lomax Street was a pedestrian footway which has been completely washed away.
- It was carrying two 6.6kV cables. Both of which have had to be abandoned until cable bridge is reinstated.
- United Utilities strategic sewer works also required and bridge rebuild expected 6-12months time.
- 5 substations still on a radial HV span until the bridge is rebuilt

Common to both events



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Flooded locations (1)

- Four stage process in line with our standing emergency plans:
  1. De-energise flooded areas to safeguard the emergency and rescue services staff from electrocution.
  2. As substation water levels fall, clean LV busbars, maintain switchgear, clean switchgear and transformer cable boxes to remove water contamination.
  3. Enter properties to inspect / replace service terminations. This is undertaken in conjunction with suppliers to enable metering equipment to be changed at the same time. ENWL liaised with all suppliers to ensure a co-ordinated response minimising inconvenience to customers. Where the customer's installation had been flooded, service termination fuses were left isolated to safeguard the property against fire. Inspect and repair / replace street lighting cut-outs.
  4. Re-energise supplies by LV feeder area.

Flooded locations (2)

- Desmond
  - Areas affected included Carlisle, Lancaster, Kendal, Appleby, Grisdale, Glenridding, St Michael on the Wyre, Keswick, Cockermouth, Burniside, Egremont, Eamont Bridge, and Allerdale
  - Some of these areas were flooded to more than two metres by rapidly moving water. In some areas flood water speeds exceeded 30 metres per second
  - About 6,000 flooded properties
  - Worked with Big Six suppliers to establish lead supplier by affected area

- Eva
  - Areas affected include Rochdale, Littleborough, Wigan, Bolton, Salford, Delph, Radcliffe, Leyland, Bacup, Burnley, Walmer Bridge, Rufford, Hutton, Brinscall, Ormskirk, Parbold, Ribchester, Whalley, Croston, Padiham
  - About 3,000 properties flooded, with about 1,000 cut outs water damaged

Response

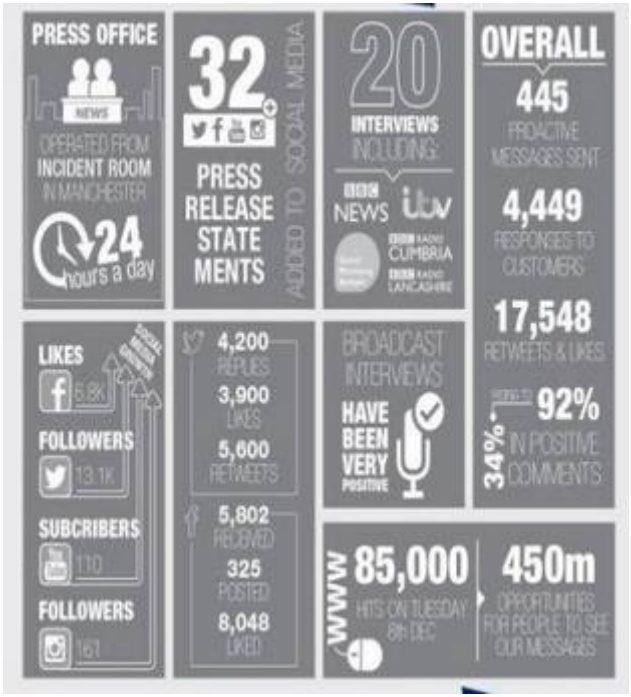
- Customer support and reaction
  - The importance of this was highlighted following the 2013 reviews.
  - Significant improvements have been implemented and Desmond demonstrated their effectiveness.
  - Proactive media and social media approach was highly effective
  - Customers were very satisfied with our response.

- NEWSAC
  - Proven effective again and a plank of the sector's response strategy
  - Response includes generators and repair teams
  - The NEWSAC response enhances the capability of any company
  - Financially efficient.
  - Generators are effective but limited to around 25,000 customers maximum versus 50,000 – 90,000 customers on a typical BSP. Refuelling 75 generators a very significant logistical challenge.
  - Consideration should be given to inclusion of suppliers in NEWSAC to allow more effective replacement of meters

Media communications

- Highly proactive media strategy
- Traditional media management:
- Press releases
  - Desmond – 32
  - Eva – 15
- Media calls answered
  - Desmond – 318
  - Eva – 80
- Interviews
  - Desmond – 20
  - Eva – 10

- 24/7 social media management - Sentiment expressed by customers engaging with us via social media during Storm Desmond was over 75% positive, with only 4% negative comments





Independent Review by Citypress PR

Conclusion

The overall communications response to Storm Desmond by Electricity North West was excellent. The communications team was clearly well-prepared, reacted quickly and calmly, then continued to provide valuable information across a range of channels around the clock until the crisis had passed.

Avoided Damage



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Desmond – Carlisle BSP





- Carlisle BSP was flooded to a depth of 1m, versus 1.05m 1:1000 defences
- Permanent defences reinforced, high volume pumps from Fire Service
- Site inaccessible even with Unimog vehicles
- At one stage lost 2 of 3 GT on site – preparations made for rota shedding
- Several short duration interruptions as network reconfigured

Eva - Tower VA25



- Route of River Irwell changed as a result of flooding
- Tower VA25 located in new course of river
- Tower foundations on land prior to Storm Eva
- If tower had failed, supplies to Bury Grid (64,339 customers) would have been lost

Key observations so far

- Flood investments were effective if not overtopped
- We will investigate what else can be done given new EA forecasts

- Best practice guides improved readiness and response
- Response was excellent with cross industry support

- Customers valued improved support information
- Social media presence very effective
- Pro-active media approach successful

- Resilience forums effective and delivered value