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Major storms

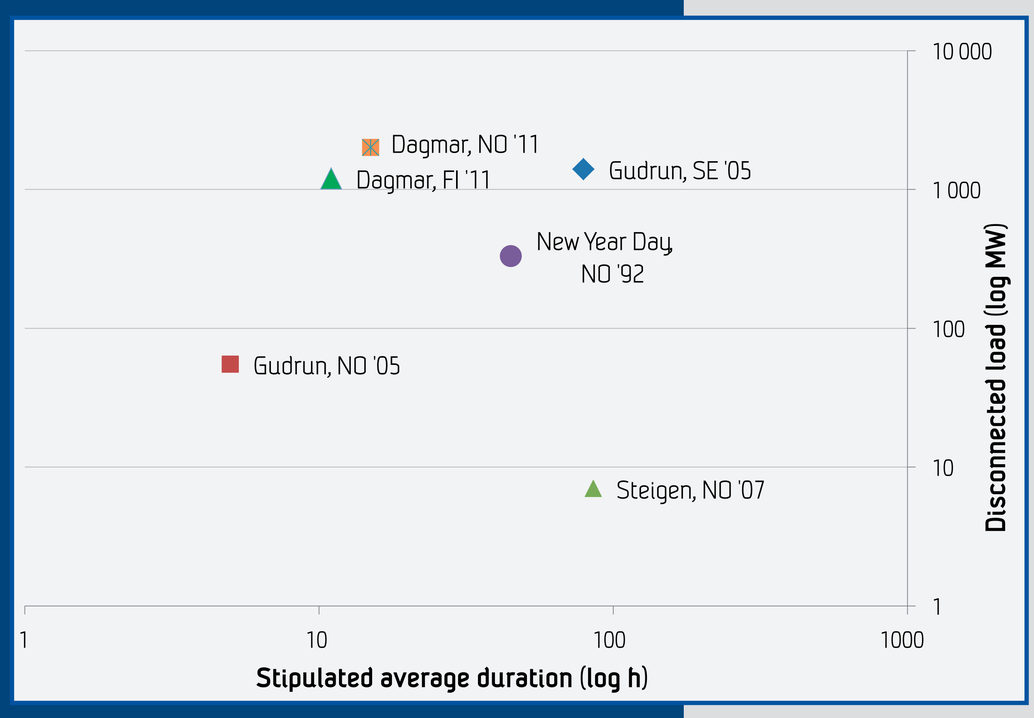
Main causes, consequences and crisis management

Challenge

- Major storms are extraordinary events with high impact and low probability (HILP)
- Extraordinary weather events are expensive experiences
- Learning from major events is important to identify vulnerabilities and improve emergency preparedness
- The paper gives a comparison of the storm Dagmar (2011) in NO, SE and FI

Conclusion

- Dagmar (Dec. 2011) is one of the strongest storms in Nordic countries the last 20 years
- Affected 1.7 million customers and 200 DSOs in Norway, Sweden and Finland
- Resulted in hundreds of MEuro in societal costs
- Examples are given of vulnerability indicators to be used in asset management to prevent HILP events



Extraordinary weather events – consequence diagram

Country	Number of end-users affected (interrupted)	Energy not supplied (MWh)	Stipulated/average interruption duration	Longest interruption duration	Main causes	Customer interruption costs	Compensation for very long interruptions › 12 hrs	Repair costs
Norway	570 000	17 275	15 hours	10 days	Storm, extensive treefall	57 mill. EUR	14 mill. EUR	18 mill EUR
Sweden	530 000	-	18 hours	25 days	Storm, extensive treefall	-	"180 000 customers (all 2011) "	-
Finland	600 000	13 649	11 hours	several weeks	Storm, extensive treefall	446 mill. EUR	47 mill. EUR	30 mill. EUR

Comparison of consequences of the storm Dagmar (2011) in NO, SE, FI

The storm Dagmar - comparison

- Started on Christmas Day 2011, hit North-Western and inner parts in Norway, the middle of Sweden and most of Finland
- Affected DSOs: 76 in Norway, 72 in Sweden, 55 in Finland
- MV accounted for 95 % of interruption duration, longest durations in LV network
- Main causes: Storm and extensive tree-fall damaging power lines
- Incentive-based regulation in NO, SE and FI: Penalty-scheme and direct compensation for interruptions › 12 hours

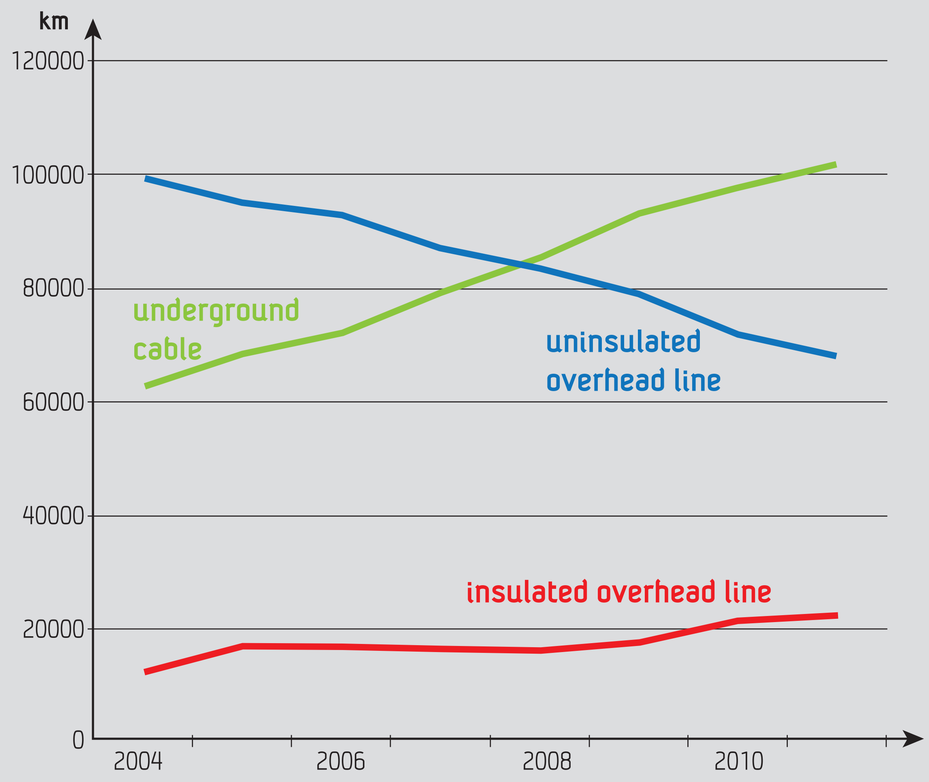
Results and findings

Main challenges

- Power lines' vulnerability to weather-related stress
- Dependencies between power supply, commercial communication systems and transportation
  - Expected to increase with Smart Grids

Coping capacity improved from previous storms

- Quality of supply regulation gradually intensified
- More sectionalizers, automation and remote control
- Cabling, better design criteria and vegetation management
- Early warnings, risk and vulnerability analyses
- Improved emergency preparedness and practicing



The development of km MV cables in Sweden 2004 – 2011.

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