

Security target: LOLE = 3hours *What does it actually mean?*

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Objective and assumptions/1

- **Objective:** assess the system security performance in terms of *average (expected) and “bad extremes” values, with long-term LOLE target of 3h achieved in all cases*
 - *Magnitudes of power and energy shortages*
 - *Frequency of interruptions*
 - *Duration of interruptions*
- **Annual and per event indices are quantified**
 - *Annual – Duration, Energy not served, Frequency of outages*
 - *Per Event - Duration, Power shortage, Energy shortage*

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Objective and assumptions/2

- **System data**
 - Demand model: 1995-2011 demand profiles
 - Generators: size 300-500MW, availability 85%- 90%, MTTR: 50h-100h
 - Systems with no wind and 26GW of wind considered (NASA data for wind profile)
- **Case without and with 1.5 GW or 3GW ‘back-pocket’ reserve considered**
- **Model: *Sequential Monte Carlo simulation – capturing statistics of events with interruptions***

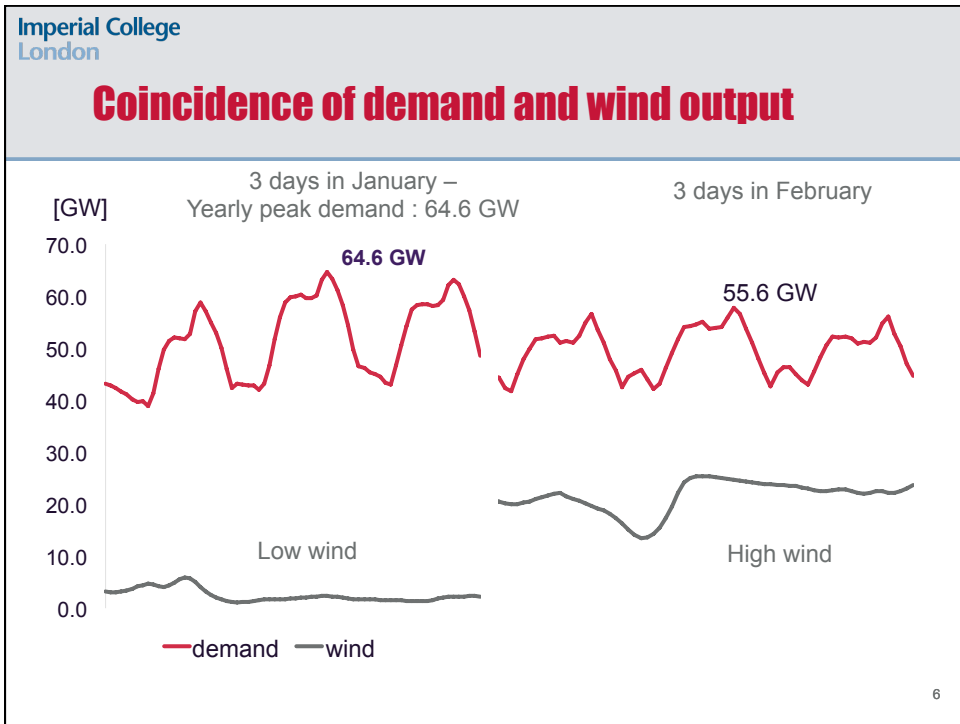
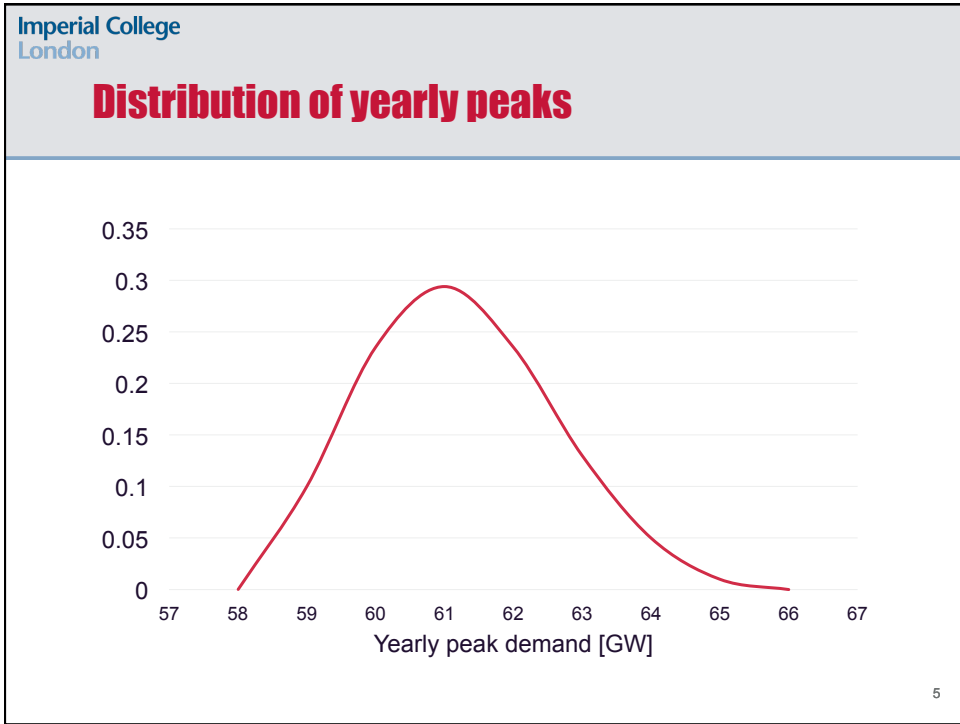
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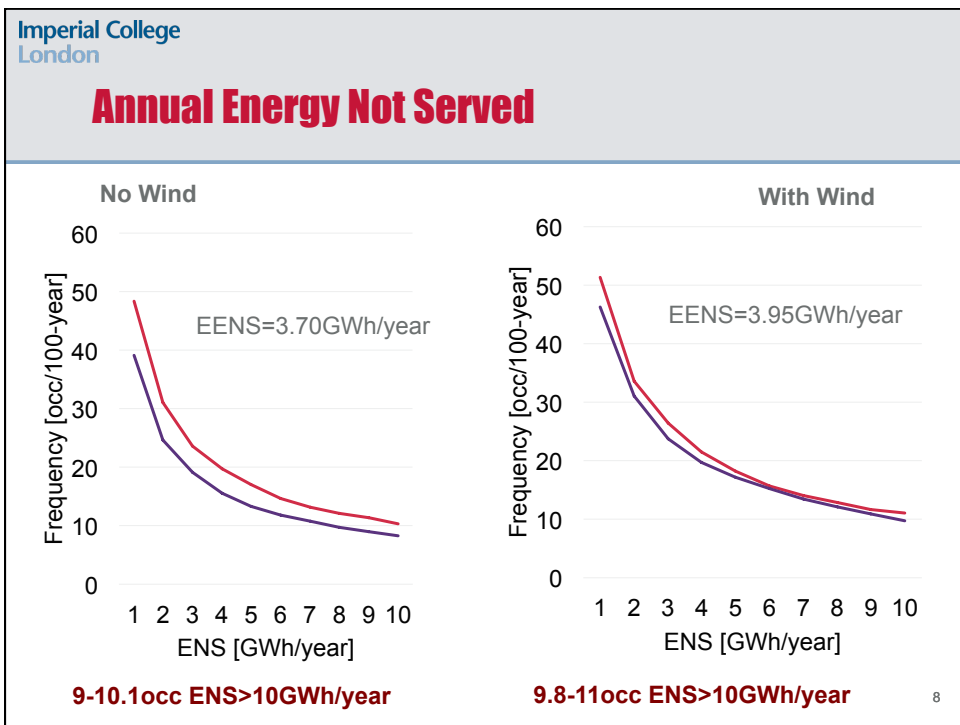
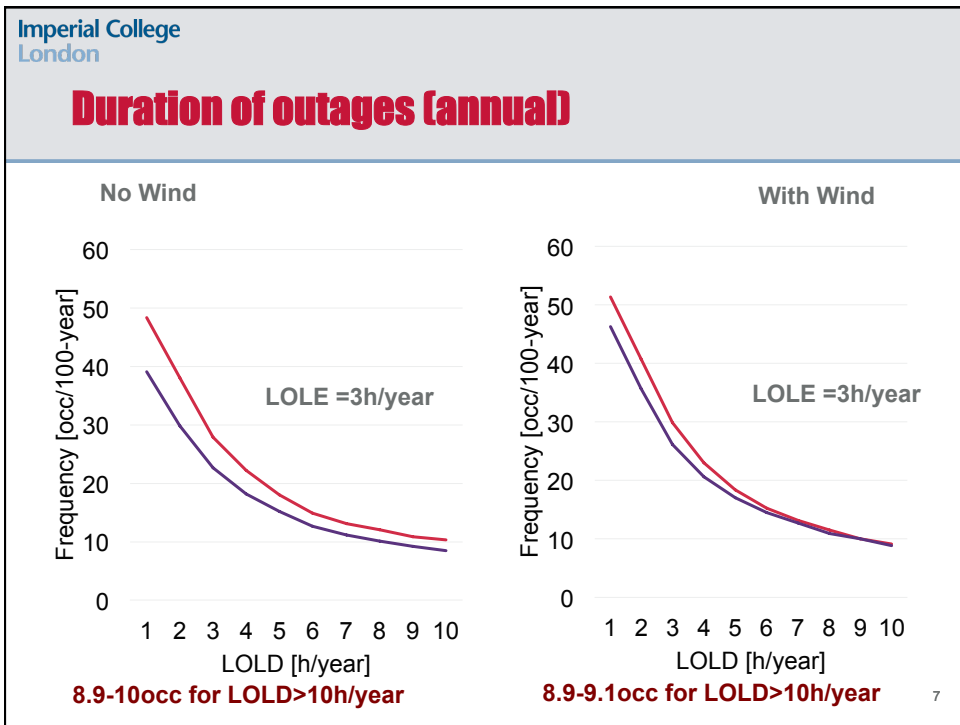
Presentation and interpretation of outputs

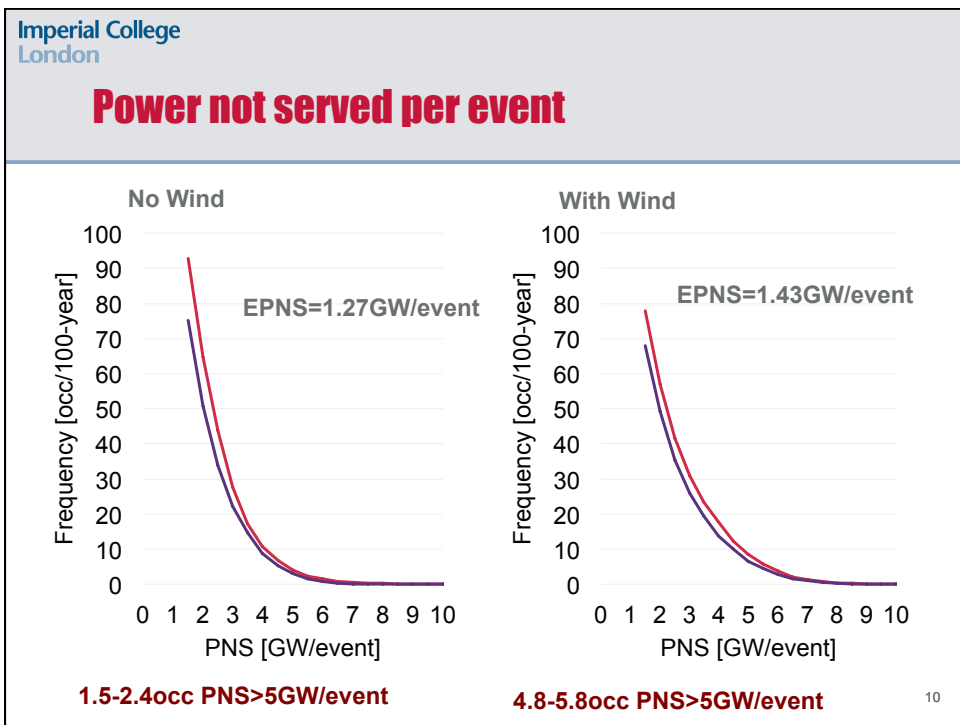
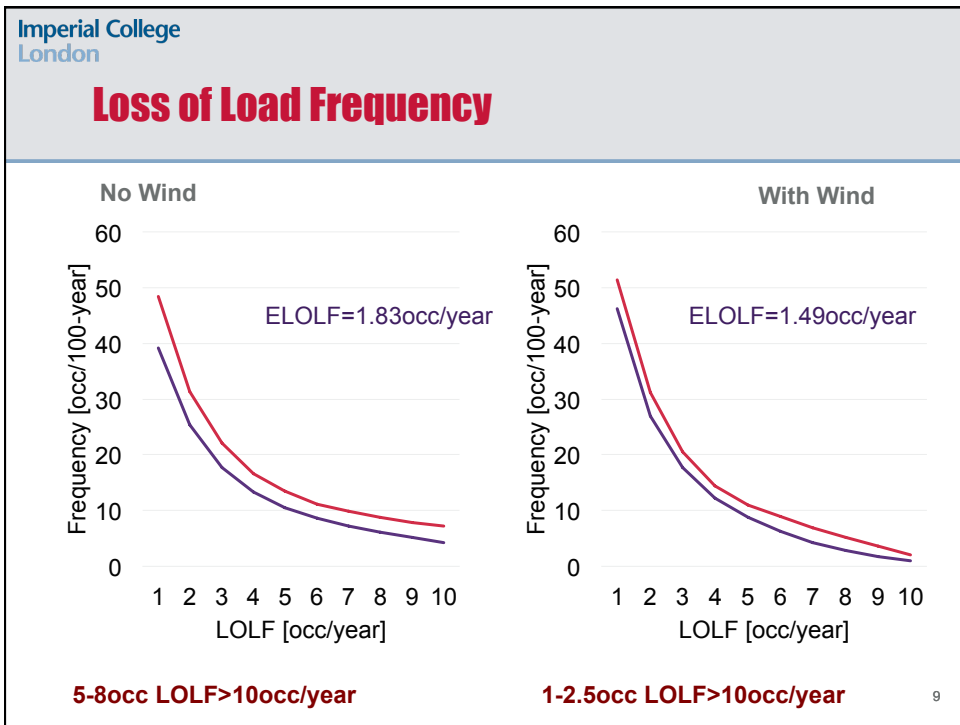
Units presented in each diagram:

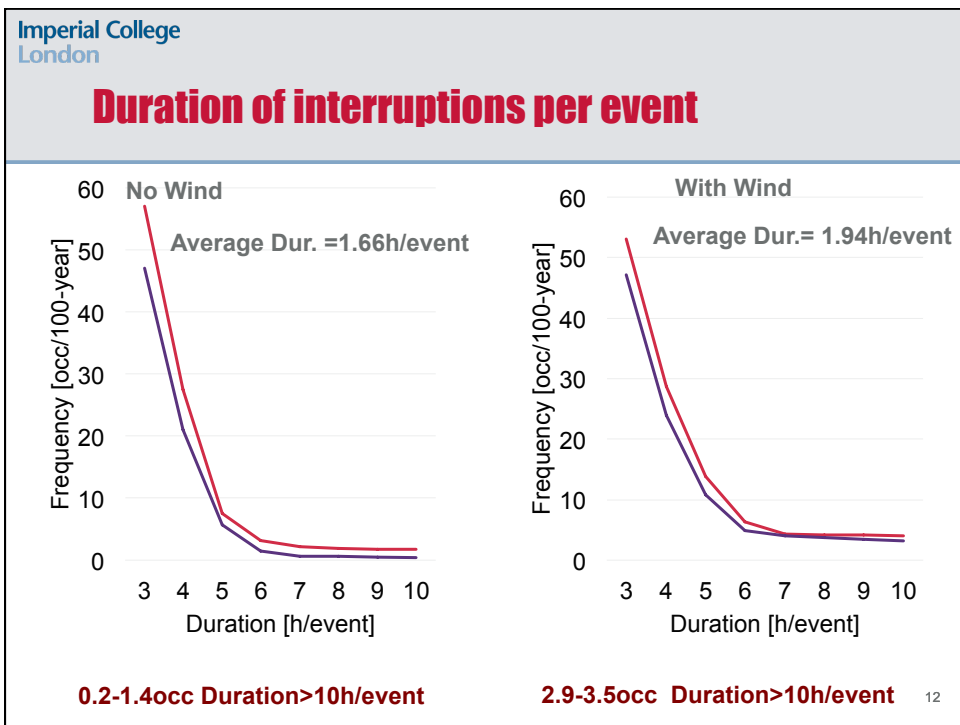
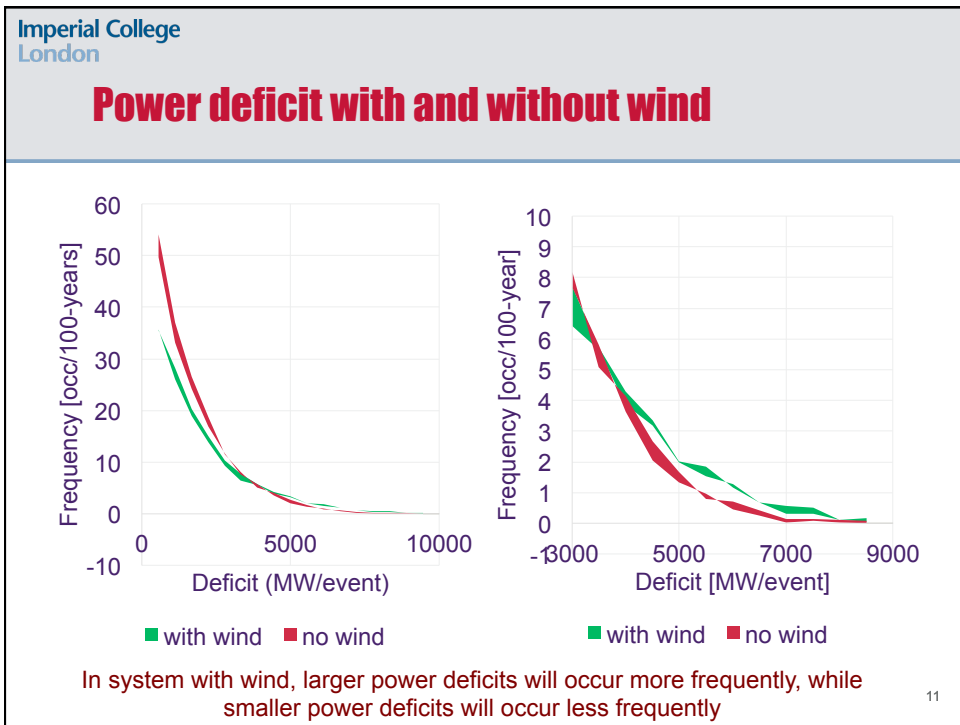
- (1) Expected values
- (2) “*number of occurrences greater than X in 100 years*”(cumulative distributions)
 - Examples of extreme, undesirable events presented
- Expected values of indices (LOLE, Power Shortage, Energy Shortage, Duration of interruptions) are long term averages
- There will be shortages *worse than average*, and this is all expected (and should not necessarily be part of LWR analysis)

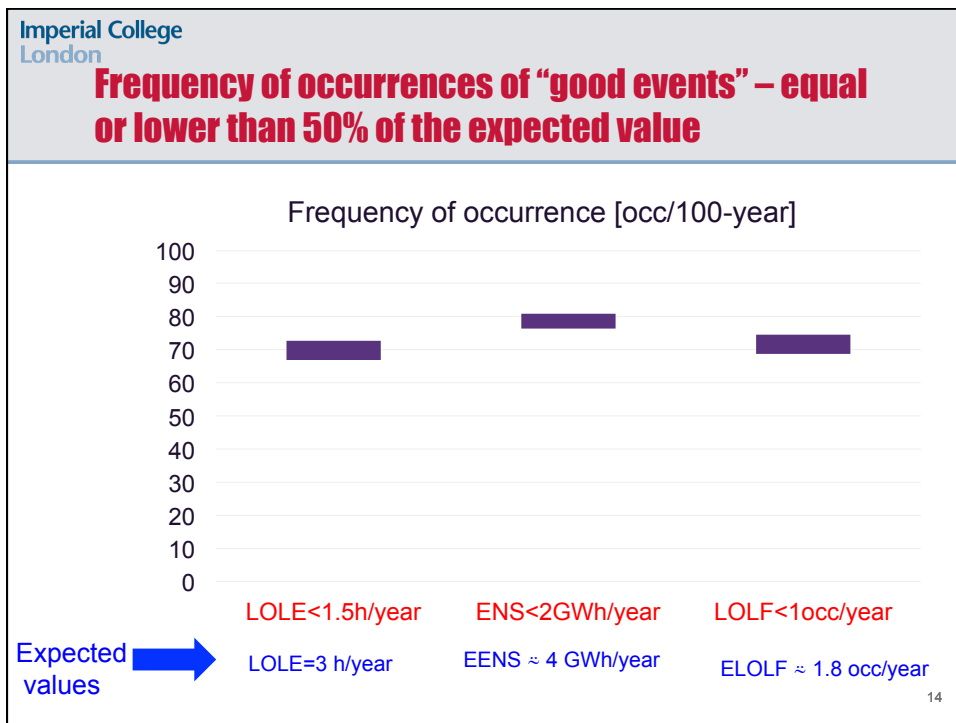
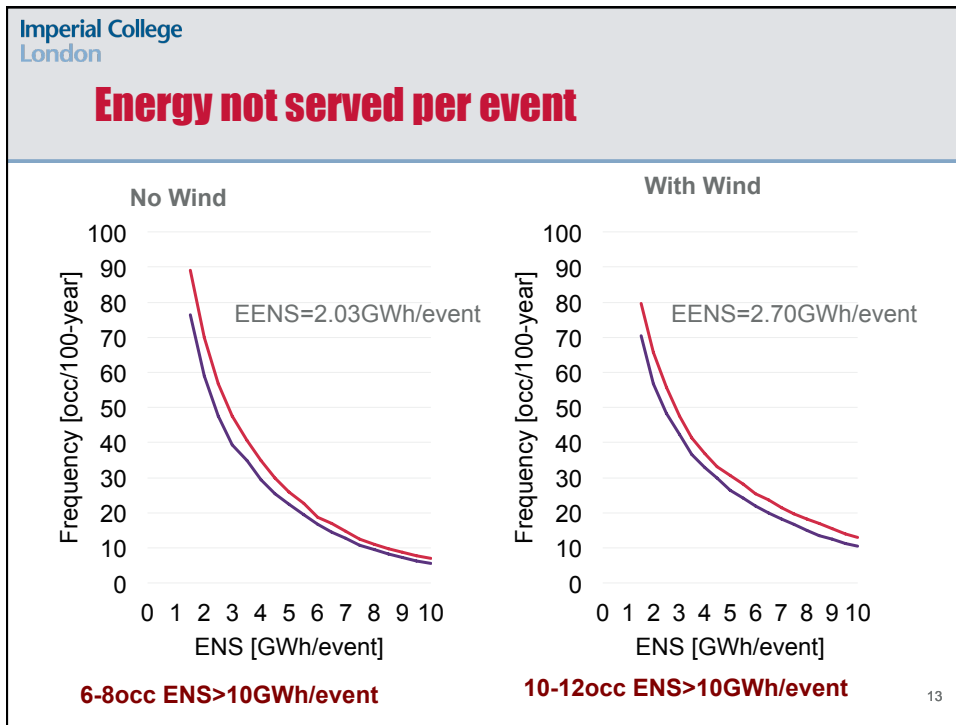
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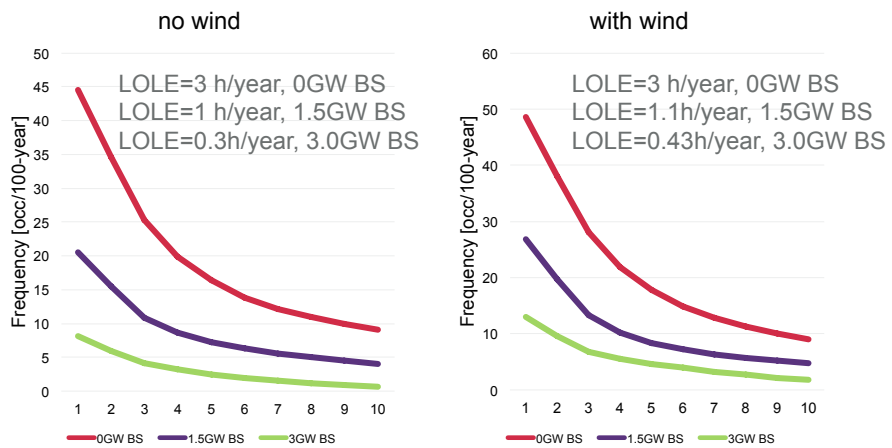




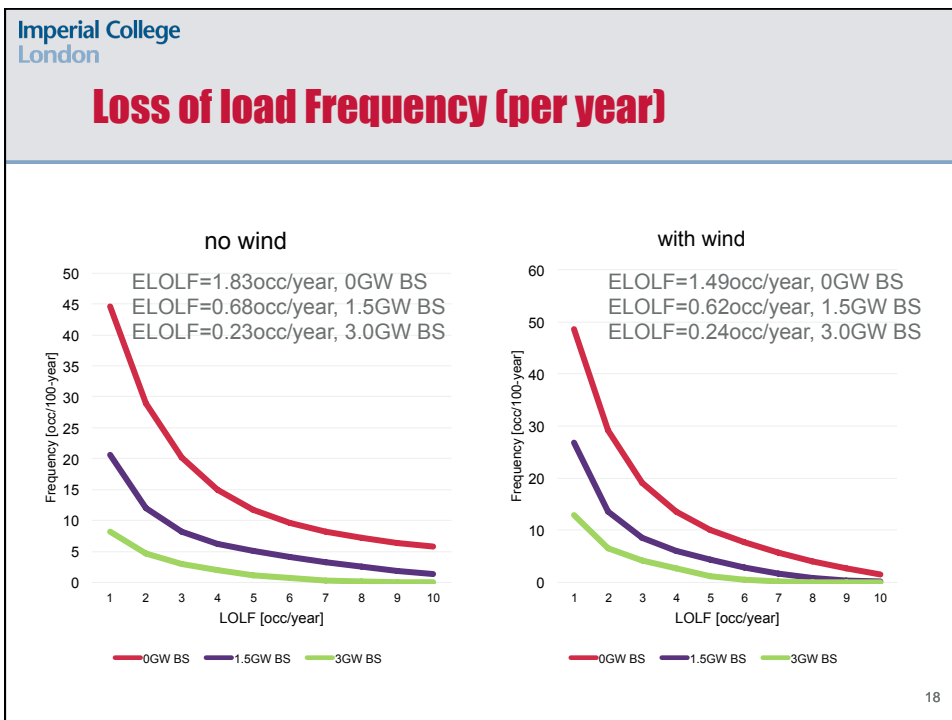
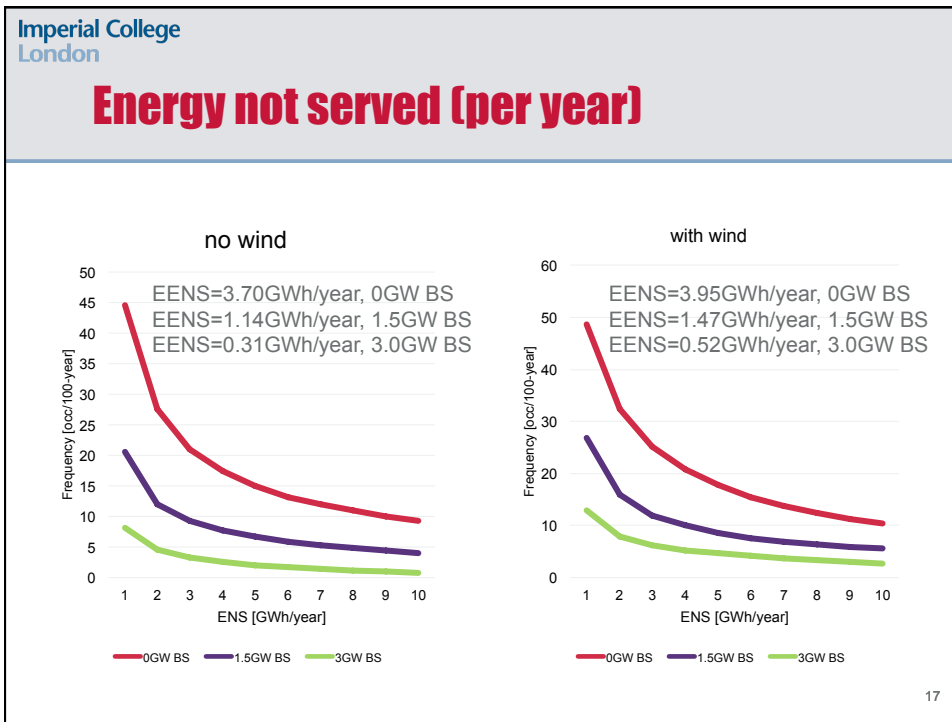
Benefits of “back-pocket” service

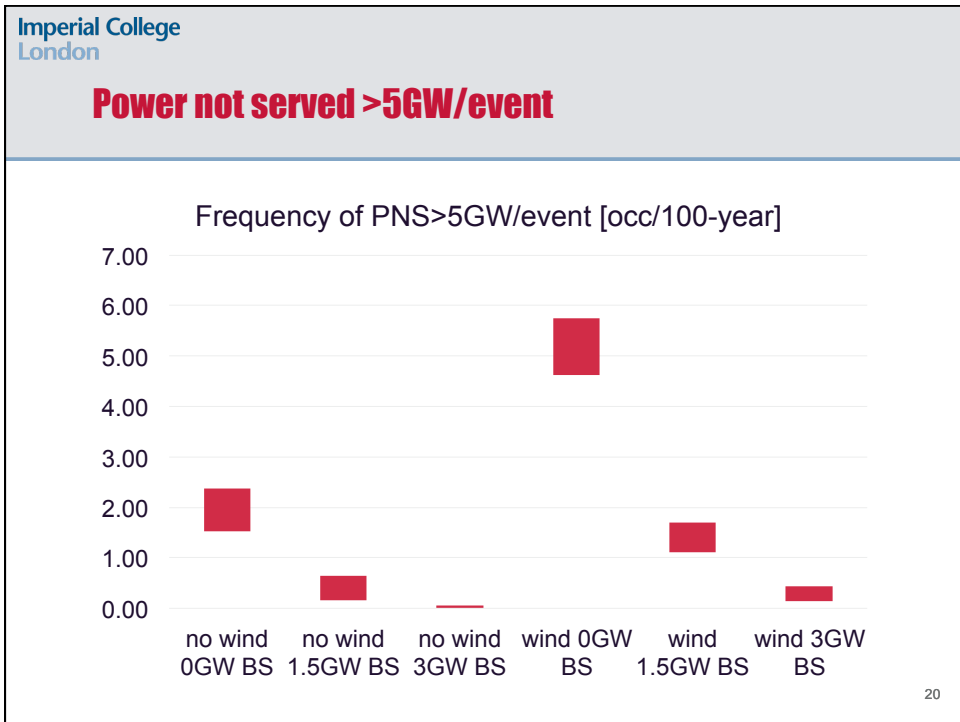
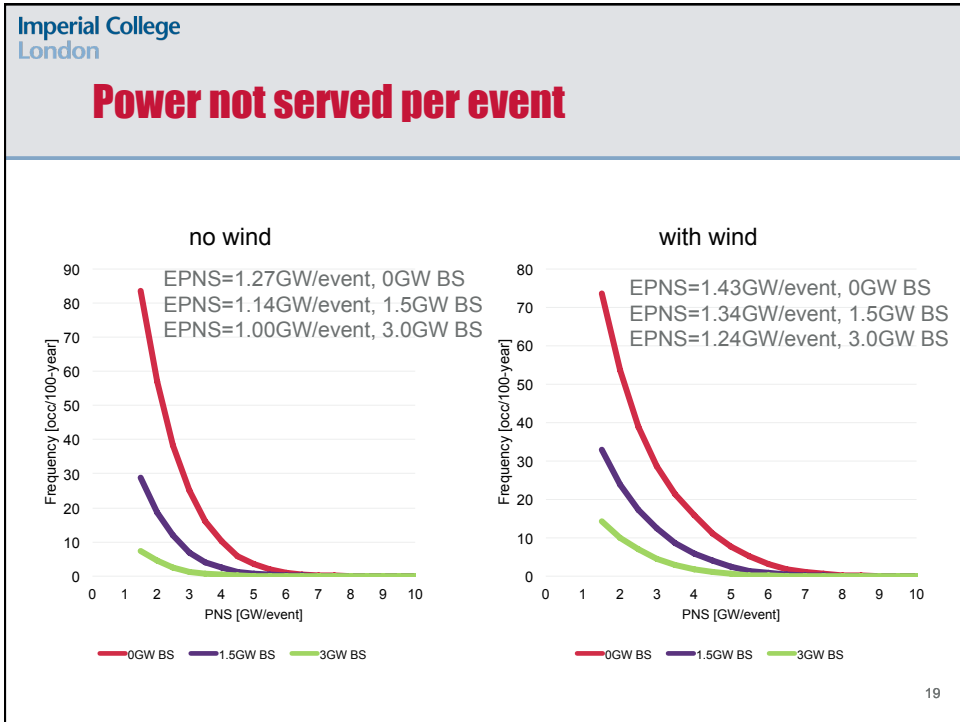
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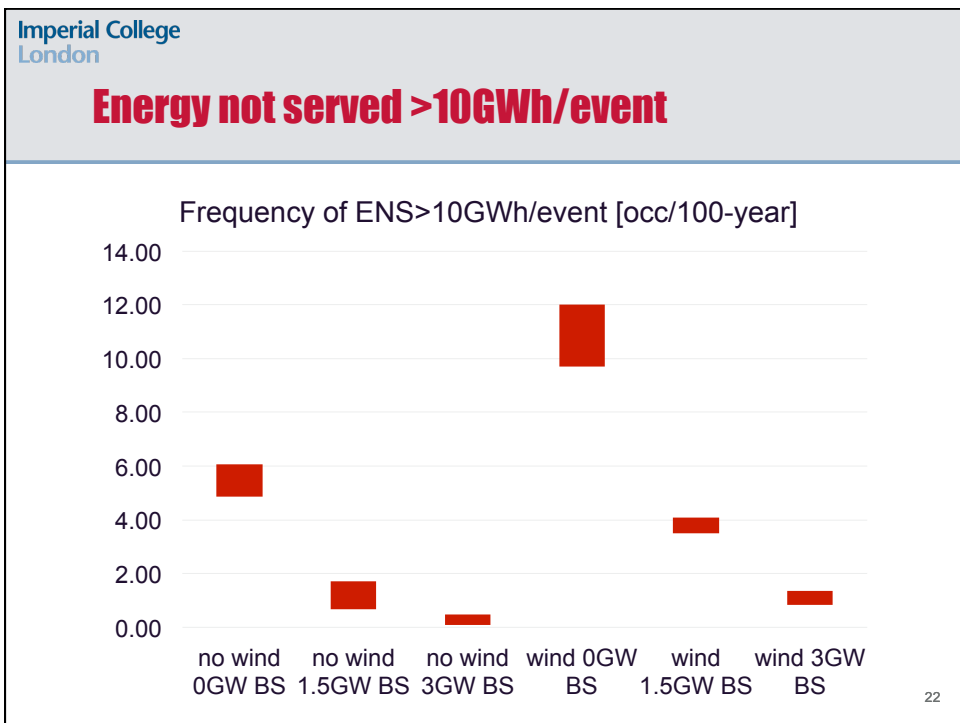
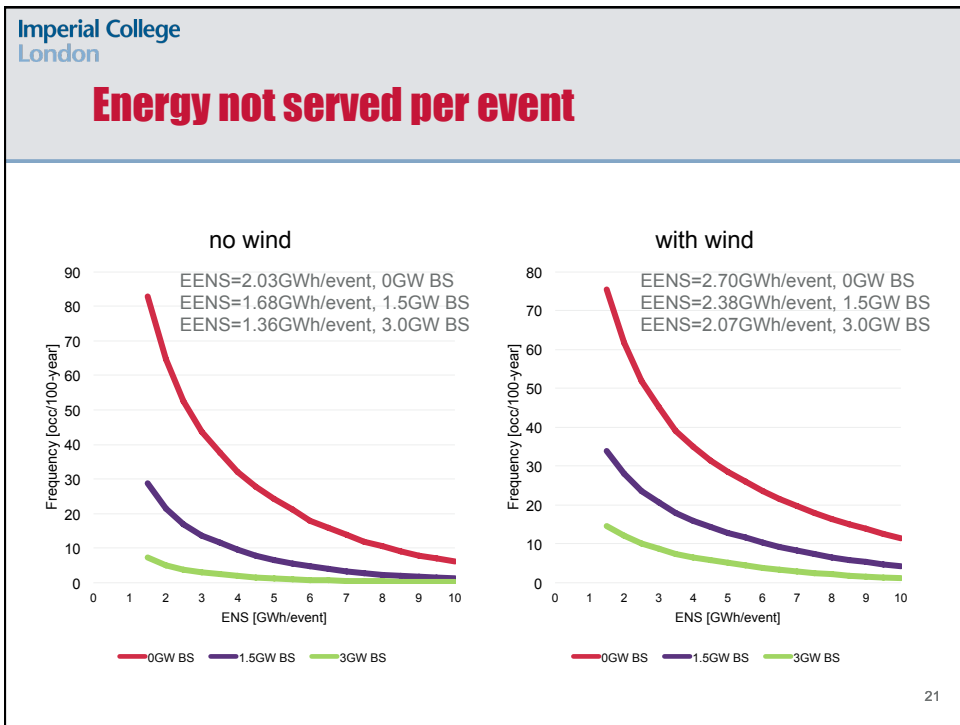
LOLE per year

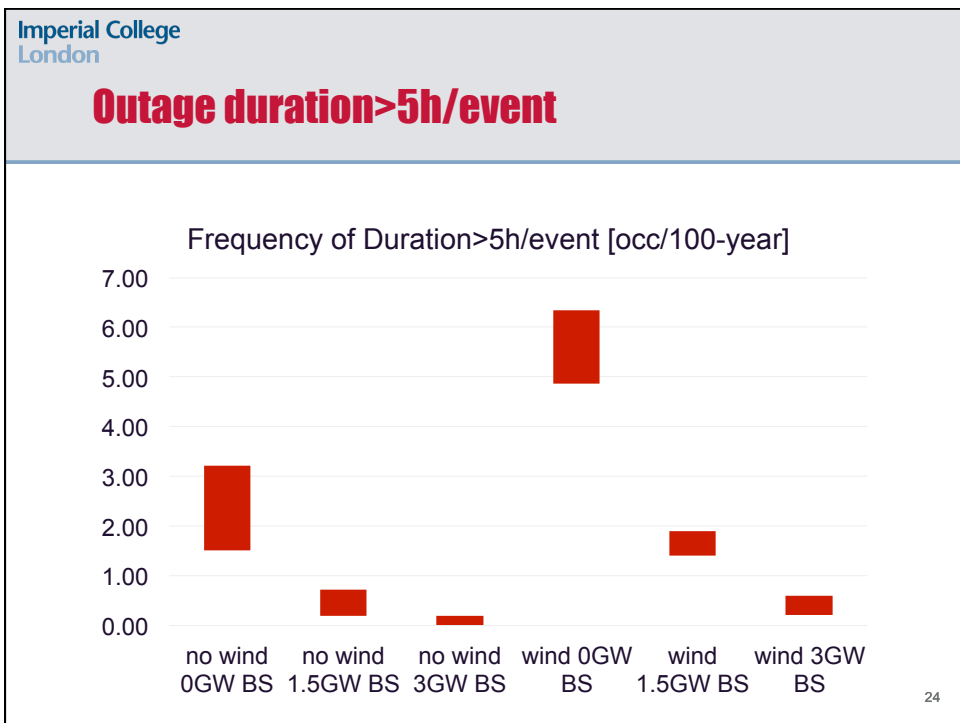
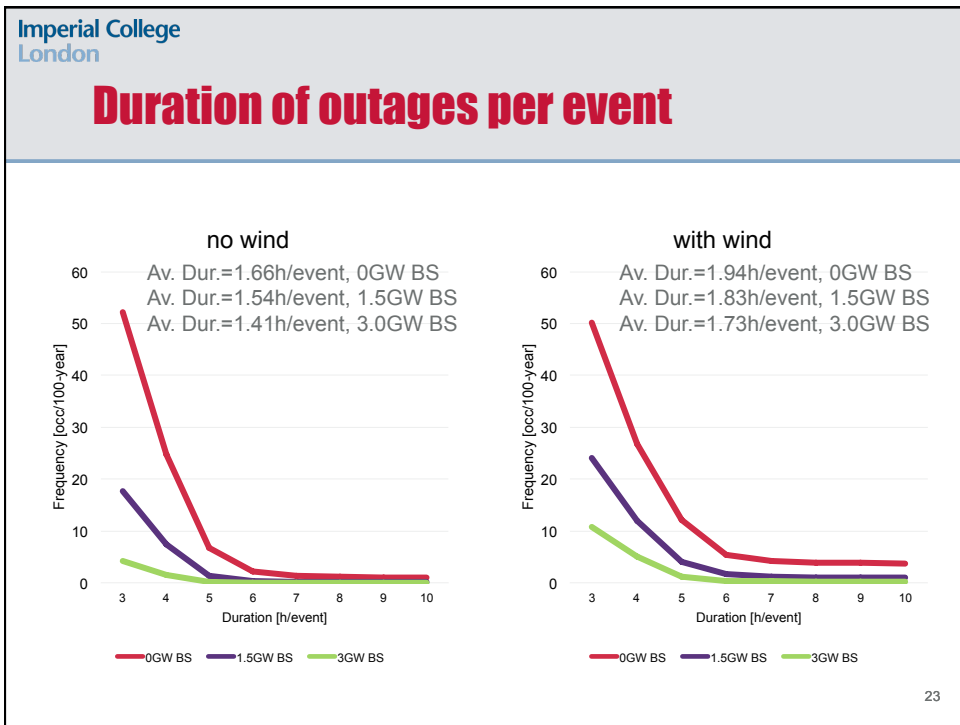


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Interpretation of outputs

- Expected values of indices (LOLE, Power Shortage, Energy Shortage, Duration of interruptions) are long term averages
- There will be shortages worse than average, and this is all expected
- Which events should be included in LWR analysis?