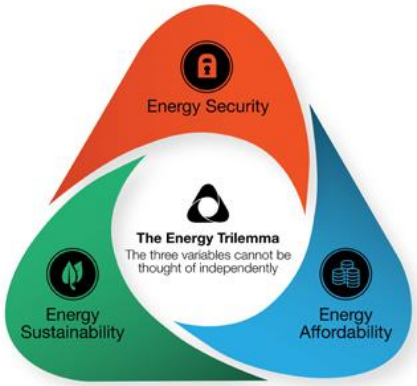
Planning criteria for Future Transmission Networks in the presence of a greater variability of power exchange with distribution systems



http://www.arup.com/low_carbon_energy_the_future_is_now#

Akshay Prajapati
Daniel Clarke
National Grid, UK

https://tallbloke.files.wordpress.com/2013/12/fuel-poverty.jpg

Introduction

Distributed energy is changing how we plan the Distribution interface

Challenges

Changes in generation mix, load characteristics and consumer attitude	**Increasing penetration of Distributed Energy Resources (DER)**	**Maintain quality and security of supply**
Ageing assets and rising costs	**Demand planning criteria and contributions from DER**	**Modifications of planning standards**

Extreme Scenario

Active Network Management

Zero Power Exchange

Oversized Network

DSO ensures perfect balance

Common Practices Of Transmission Network Planning

Cost effective solution

- For various scenarios determine the most cost effective solution

Load flows

- Most important data is represented by load and generation in the HV nodes

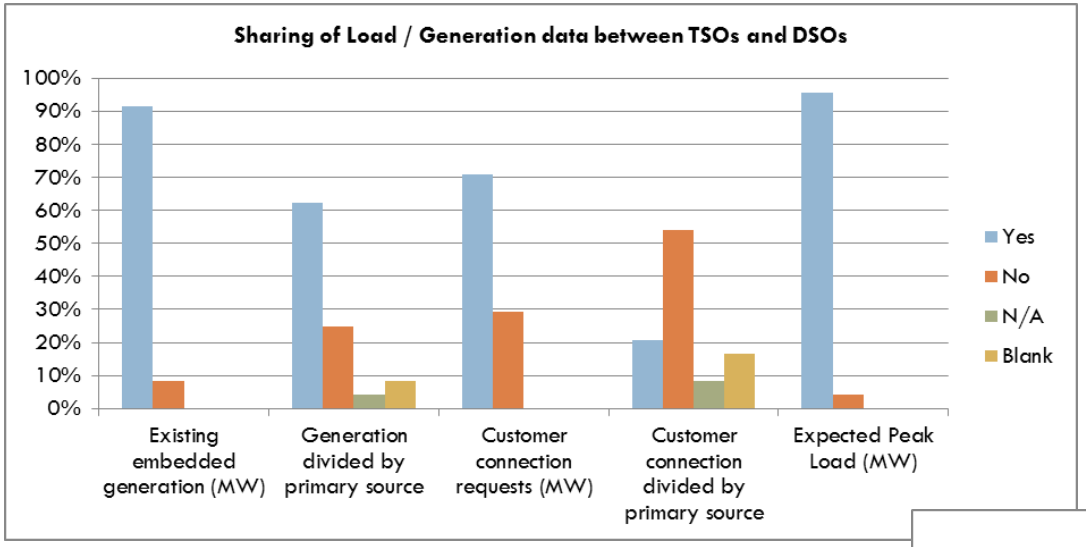
Future scenarios

- Traditionally consider future scenarios to predict trends to determine the optimum time to intervene

Assumptions

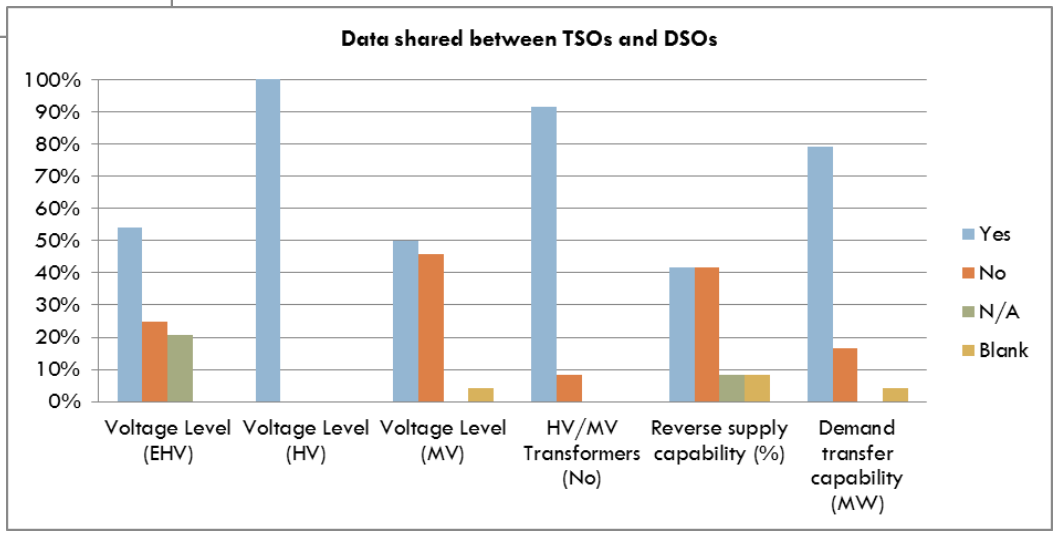
- For a given HV node, the collective behaviour of the network users which are connected to the embedded MV and LV systems is the sum of their unrestricted individual behaviours

Transmission Data

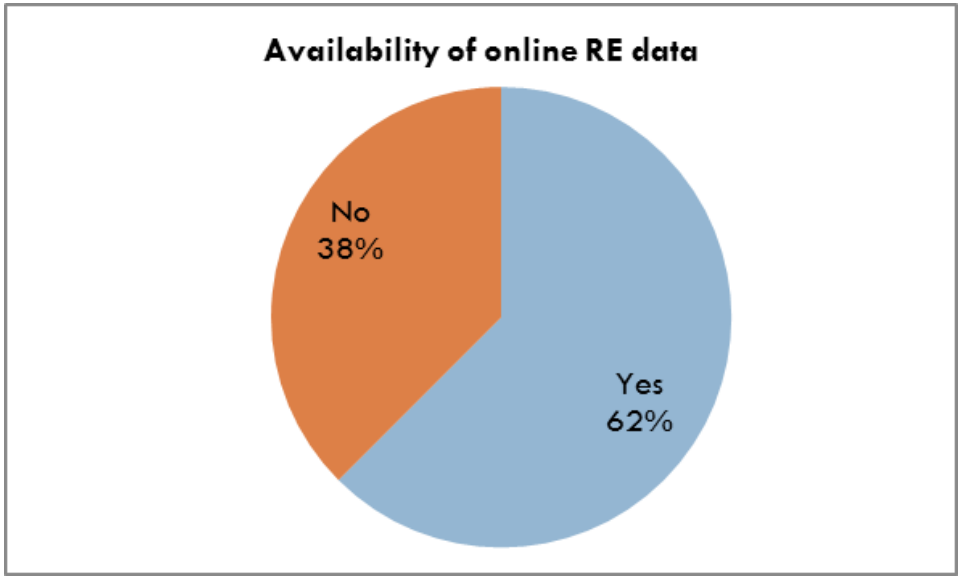


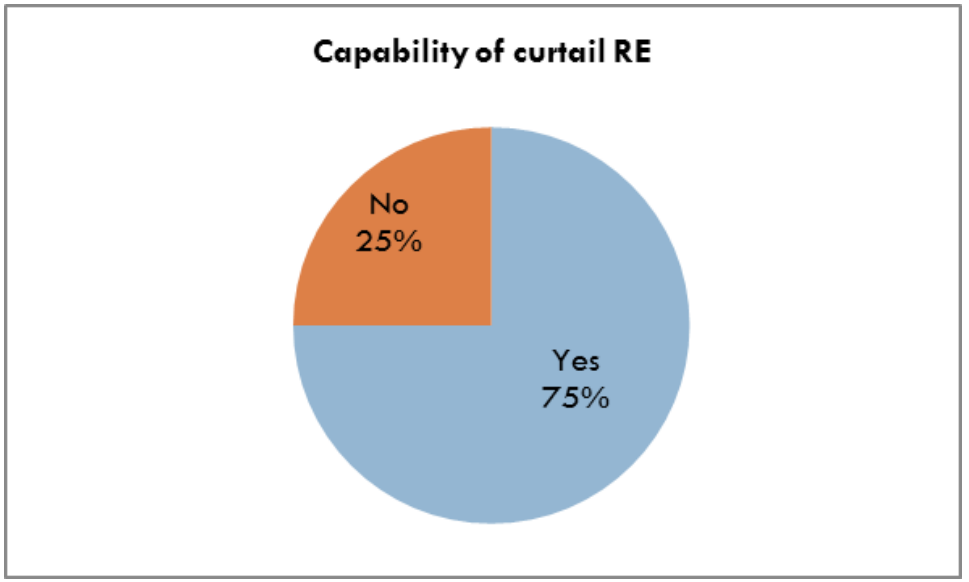
Primary Source data of customer connection uncommonly shared

Less than 50% of TSOs share reverse supply capability



Transmission Planning





Two-thirds of TSO's have a 'live' view of current Renewable Energy

Three-quarters of TSO's have the capability to curtail Renewable generation

Common Practices Of Distribution Network Planning

Similar Network Planning

- For steady state, HV network planning performed by a DSO is similar to TSO planning for the same network

System Priorities

- Planning practices and system priorities are slightly different from the ones highlighted by TSOs

Focus Areas

- Overall priorities for DSO and TSO are different, which inevitably lead to focus in different areas

Distribution Data

Incentives/Penalties taken into account for Investment Planning

End customer (consumer) takes precedence

DSO doesn't curtail renewable generation

Renewable forecasting by DSO isn't common

Renewable generators don't provide forecasts

Case Study – National Grid, UK

Statement of Work process

- Revised the process in March 2015
- Allows bulk submission of Distributed Generators connecting within a GSP

Data exchange

- Detailed data exchange between TSO and DNO
- P, Q and Fault Infeed for each BSP pre and post connection

Benefits

- Greater visibility of DER (>1 MW and <99 MW)
- Improves assessment of impact on transmission network
- Quicker and safer connection

Conclusions

Distributed Generation Mix

- What does this mean for transmission system planning?

Active Network Management

- Economics of providing ANM
- Take into account for investment planning

New Technology

- How can this be used to make investment more efficient?

Regulation

- Can incentives be used on DSO's to better control generation/demand?