Black Start from Distributed Energy Resources

What is Black Start?

Technical Recovery Procedure

Plan to restore power in the event of a national failure of electricity supplies.

High Impact Low Probability

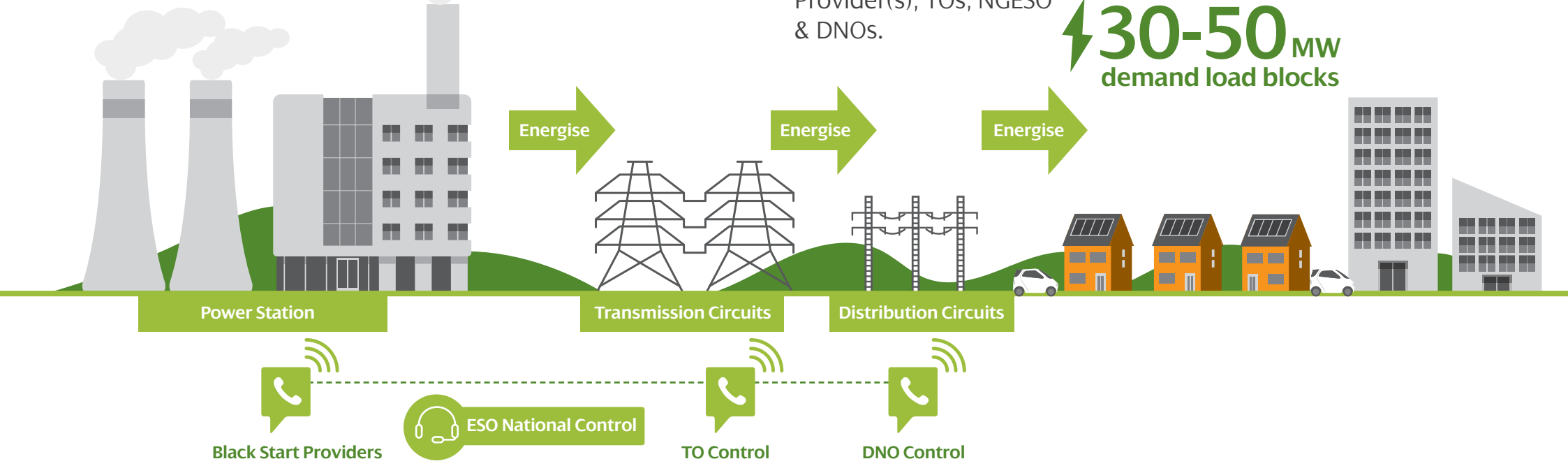
It is a credible risk so must be planned for. It has never happened in the UK but has occurred internationally.

Flexible Plans with Defined Partner Roles

Multiple options within each local joint restoration plan (LJRP).

Partnership between Provider(s), TOs, NGESO & DNOs.

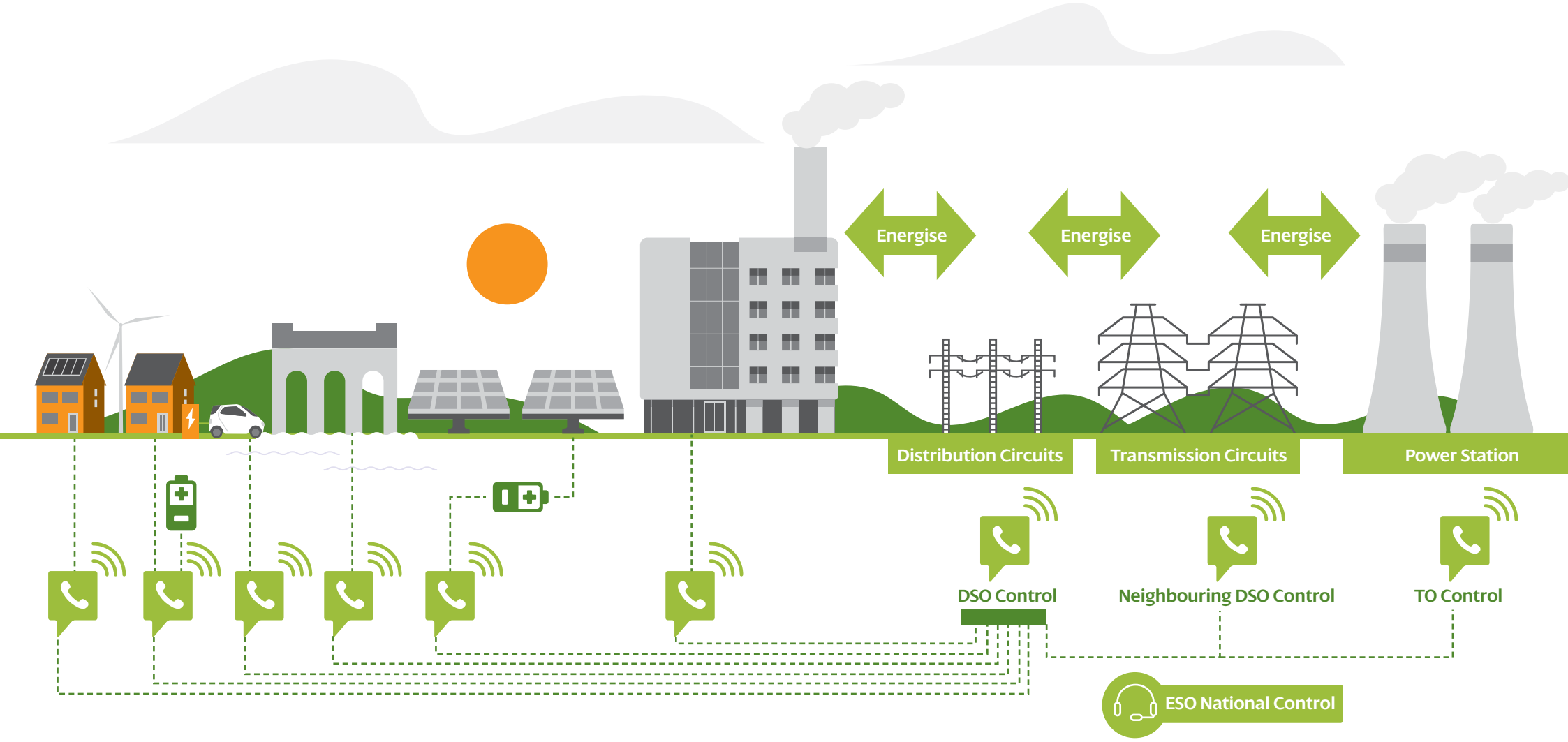
30-50 MW
demand load blocks



Introduction to the Project

Network Innovation Competition

How can we incorporate DERs into Black Start strategy?



NIC Project - Power Engineering & Trials Work Stream

Aim

Provide credible technical solutions for the provisions of Black Start (BS) services from DER

- What is technically feasible and how do we do it?
- Recommendations for adaptations of DER and distribution networks to facilitate BS DER economically and safely.

Approach

- Ten case studies selected (across SPD and SPM) based on a range of DER types, network topologies and potential BS restoration scenarios.

Appendix

Case Study No.	Network Name	Total Generation Capacity (MW)	Anchor (MW)	Additional DER (MW)	Network Topology
1	Galloway Region (SPD - Dumfries)	224	81.2	140.1	Radial – 132/33kV
2	Glenrothes GSP (SPD - Central & Fife)	165.7	112.4	28.5	Radial – 275/33kV
3	Chapelcross GSP (SPD - Dumfries)	136.5	45	78.8	Radial – 132/33kV
4	Dunbar GSP (SPD - Edinburgh)	165.9	41.3	118	Radial – 132/33kV
5	Meadowhead (SPD - Ayrshire)	157.75	32	99.9	Radial – 275/33kV
6	Portobello GSP (SPD - Edinburgh)	29.45	15	0	Radial – 132/33kV
7	Bootle Grid (SPM - Mersey)	53	35	18	Mesh -132/33kV – 2 GT
8	Legacy (SPM - Wales)	157.75	32	99.9	Mesh – 132/33kV – 6 GT
9	Sankey Bridges (SPM - Cheshire)	287	281	3.9	Mesh – 132/33kV
10	Maentwrog (SPM - Wales)	103	39.8	46	Radial – 275/33kV

Key Milestones:

Power Engineering Trials

Team initiated from 1st January

First Report published: 31/07/2019

Organisational & Systems

Team initiated from 1st April

First Report published 08/11/2019

Organisational & Systems

Team initiated from 1st May

First Report published 08/11/2019

Case Study – Technical Challenges

Earthing – When a 33kV network is isolated from the transformer infeeds at a GSP, the 33kV earthing point is typically disconnected (e.g. earthing transformers) leaving an unearthed 33kV network.

Low Fault Levels – Will existing protection at all voltage levels be able to detect faults (on the network and DER)?
Minimum fault level required to ensure wind turbine stability (typically 2-3x wind farm rating)

Temporal nature of demand – Difficult to predict what demand (or generation) may 'appear' when a feeder is closed, e.g. Cold Load Pick Up (CLPU).

Frequency Stability – How can the generation/load balance best be maintained (most DER does not have f control)?

P (MW), Q (MVAr) Pickup – In a low inertia system, how to enable a viable PQ pick up capability to grow a power island while staying within frequency limits.

Reactive Power Capability – The ability for DER to absorb, or the network to be compensated for, the reactive gain when energising the network.

Voltage Control – Where best to monitor, and how to control the voltage (33kV normally controlled by GSP transformers).

Automation – A certain level of automation will be required to initiate, maintain and re-synchronising a power island. Limited human resources available (e.g control engineers).

Others – Transformer inrush currents, resynchronising with the wider network, oscillations, harmonics, zero inertia …

How can you get involved?

NIC Project Contacts

Join our mailing list for updates and invitations:
https://mailchi.mp/db16788e123e/distributedrestoration

(We will send a recording of this webinar and an invitation to join our workshop in May through this list)

Black Start from DER queries box.
distributedresto@nationalgrid.com

We will get the appropriate expert to answer you query from the technical, commercial or organisational work streams

Web page : www.nationalgrideso.com/innovation/projects/restored

NIC Project Contacts

Talk to your account manager if you have an existing contract

For general enquiries please contact:
Commercial.operation@nationalgrid.com

SP ENERGY NETWORKS

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