Use of RTDS at The National HVDC Centre.

16th September 2016

Yash Audichya
Simon Marshall

The National HVDC Centre

Scottish and Southern Energy Power Distribution

The National HVDC Centre

1) **PROMOTioN - PROgress on Meshed HVDC Offshore TransmissiOn Networks - is a new EU funded project to boost the development of meshed HVDC Grids.**

2) **Corpus of Community Research and Development Information Service (CORDIS)**

3) **The European 2020 Energy Strategy.**

PROMOTioN
PROGRESS ON MESHED HVDC OFFSHORE TRANSMISSION NETWORKS

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1) Integration of FPGA based IEDs and DC CB models.
2) Develop DC Grid benchmark RTDS models.
3) Develop DC Grid protection testing algorithms and guidelines.
4) Demonstration of DC Grid Protection using HIL testing.
5) Demonstrate protection interoperability.

PROMOTioN
PROGRESS ON MESHED HVDC OFFSHORE TRANSMISSION NETWORKS

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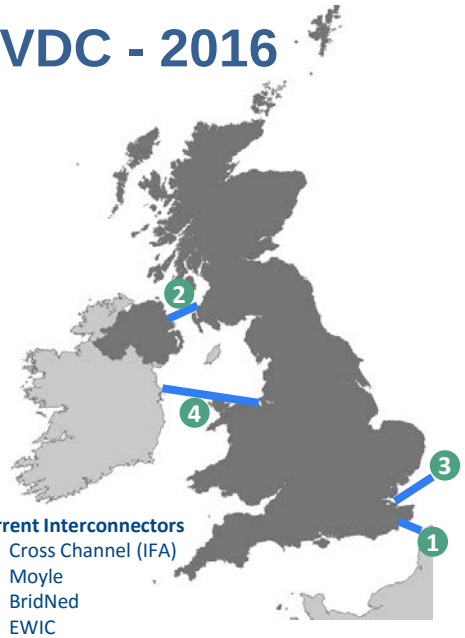
Great Britain's HVDC Challenge

The National HVDC Centre

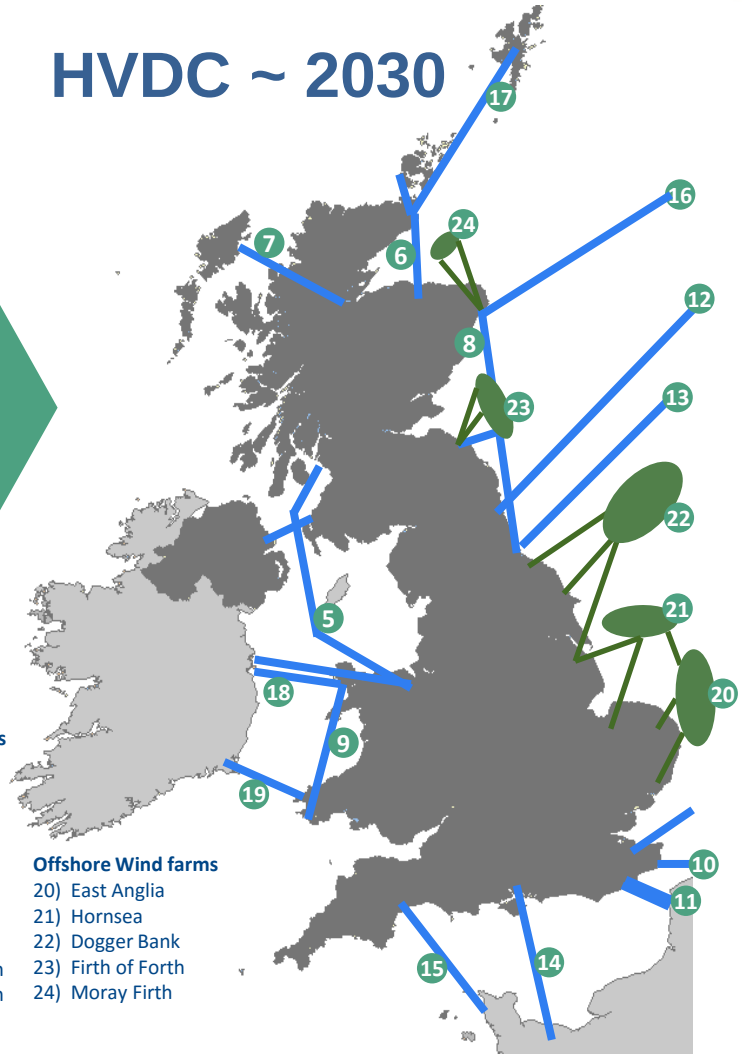
HVDC - 2016



Current Interconnectors

1) Cross Channel (IFA)
2) Moyle
3) BridNed
4) EWIC

HVDC ~ 2030



Embedded HVDC

5) Western Link
6) Caithness - Moray
7) Western Isles
8) Eastern Link
9) Wylfa – Pembroke

New Interconnectors

10) Nemo
11) ElecLink
12) NSN
13) Viking
14) IFA 2
15) FABLink
16) North Connect
17) Shetland
18) Greenwire North
19) Greenwire South

Offshore Wind farms

20) East Anglia
21) Hornsea
22) Dogger Bank
23) Firth of Forth
24) Moray Firth

Based on National Grid's Electricity Ten Year Statement (2013):
http://www2.nationalgrid.com/UK/Industry-information/Future-of-Energy/Electricity-ten-year-statement/Current-statement/

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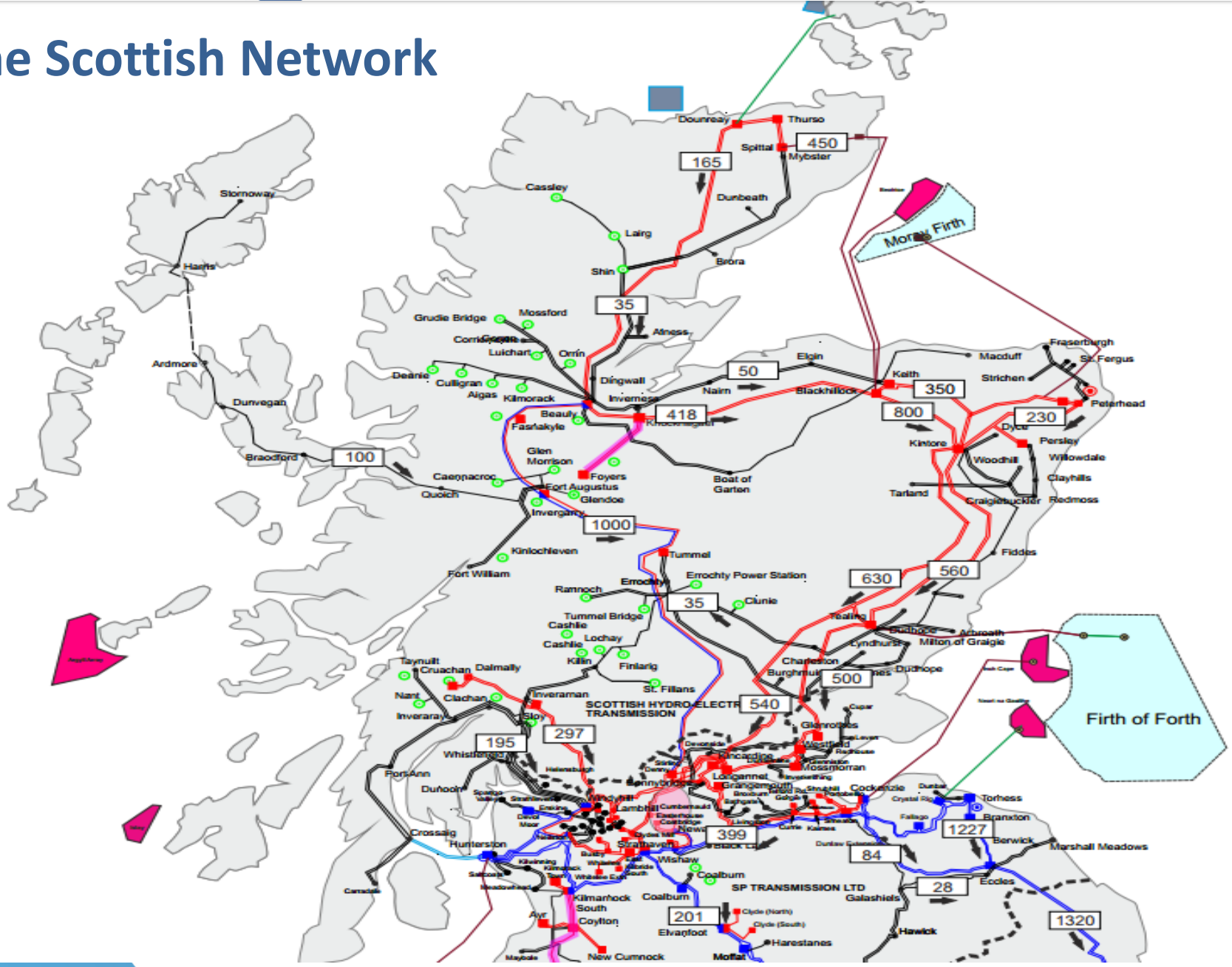
The Scottish Network



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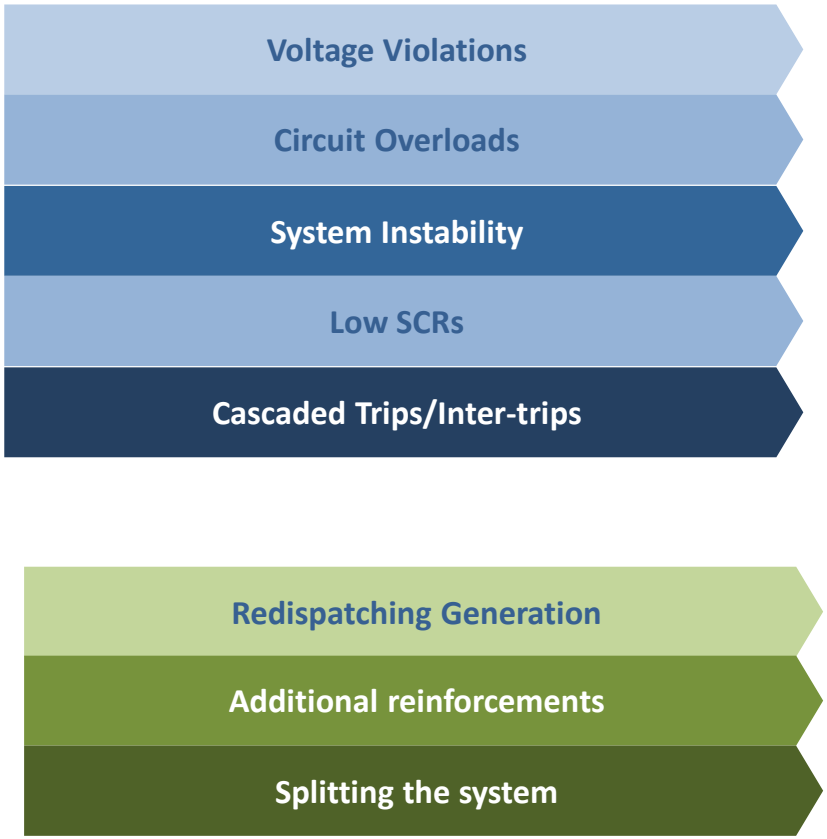
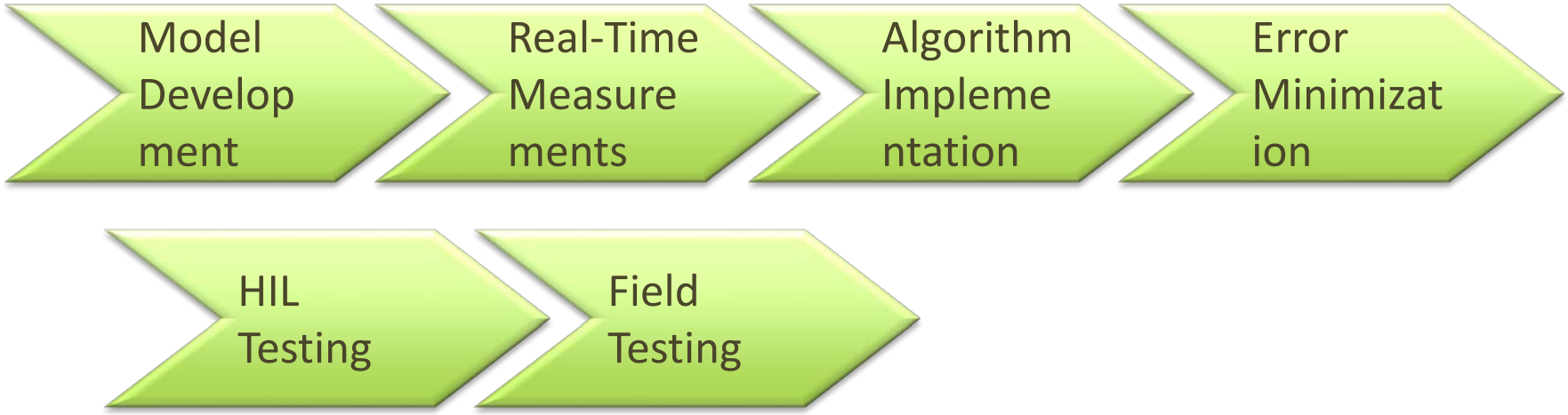
Options


Voltage Violations
Circuit Overloads
System Instability
Low SCRs
Cascaded Trips/Inter-trips
Redispatching Generation
Additional reinforcements
Splitting the system

Design Architecture



Real-Time Simulation

The National HVDC Centre

Caithness-Moray Link

Replicas of HVDC Control Panels

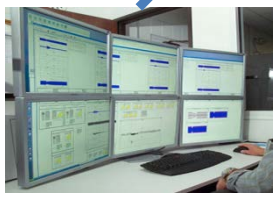
Caithness | Moray | Shetland

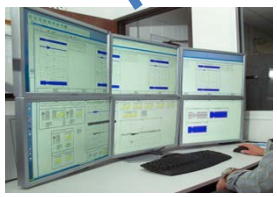
Adaptive Power Controller Cubicles

Future Project Replicas

RTDS Technologies

Real-Time Simulator





Workstations

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CONCLUSIONS

1) More effective utilisation of network assets through realisation of Adaptive Controllers can produce significant cost savings.

2) Co-ordination of power controllers can be realised to increase system stability.

3) The National HVDC Centre's real-time simulation capabilities are utilised to interface Adaptive Controllers, RTDS and HVDC Converter Replica Controls Panels.

4) PROMOTION Project work on DC Grid Benchmark models planned.

5) Future Work planned to test Generalised Power Controllers at The National HVDC Centre.

Overview of the Centre

The National HVDC Centre

The National HVDC Centre provides a world-class facility to support and de-risk the deployment and operation of HVDC transmission solutions on our electricity network.

People

Process

Technology

Building

A new facility to test the operation of HVDC schemes:

- Enabling potential issues to be anticipated and resolved;
- To ensure the integrity and security of the network.

The National HVDC Centre

Opening 29th March 2017

- Real-Time Studies
- Training
- HVDC Support
- Facilities

Scottish and Southern Energy Power Distribution

Making It Real: People

The National HVDC Centre

Our people will be key to the success of the Centre; we have already recruited most of the posts, and are soon to recruit for another 2 roles.

People

Simon Marshall
Centre Manager

Yash Audichya
Technical Director

Paul Neilson
Centre Sponsor

Tarun Sharma
Simulation Engineer

Colin Cameron
ICT Engineer

Recruiting

Senior Simulation Engineer
[RECRUITING]

Simulation Engineer
[RECRUITING]

Vacant Posts *(for future recruitment)*

Simulation Engineer
[VACANT]

Business Development Manager (Scottish Enterprise)
[VACANT]

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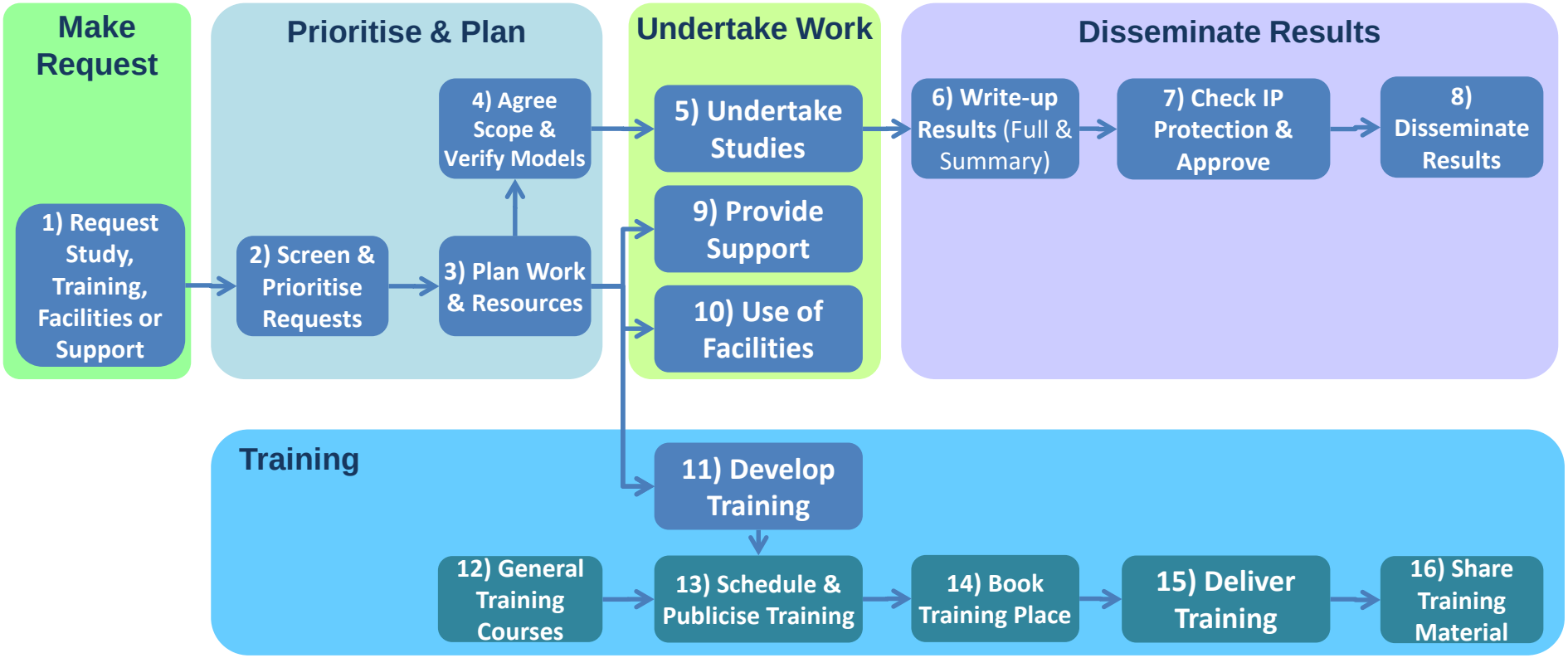
Making It Real: Process

The National HVDC Centre

A transparent process is used to request and prioritise work consistently across all organisations, to ensure fair access to the facility.



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Making It Real: Technology

The National HVDC Centre

Technology underpins the Centre; key components have been purchased and tested.

Infrastructure

RTDS

Replicas

Audio Visual

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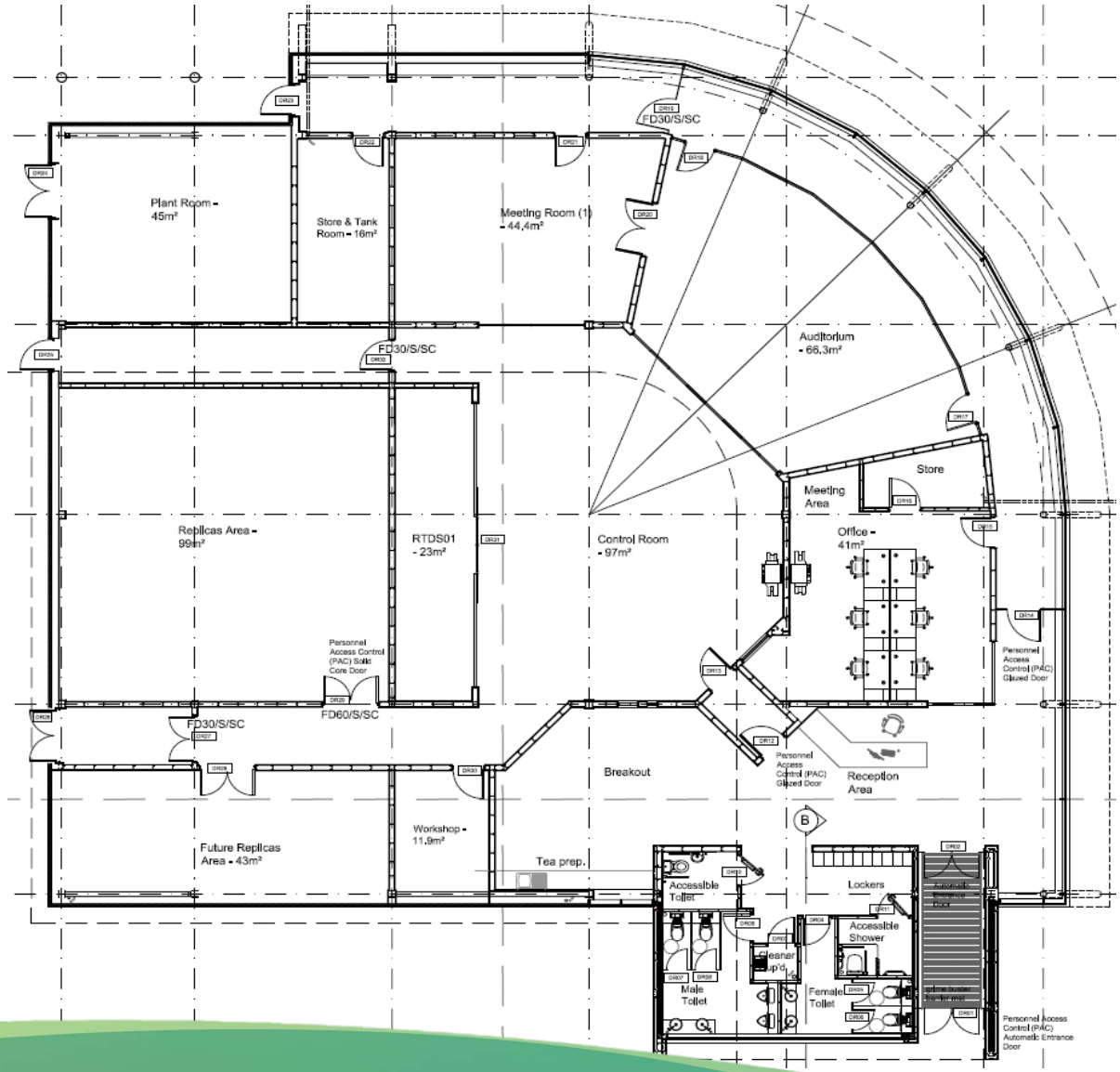
Making It Real: Building Plans

The National HVDC Centre



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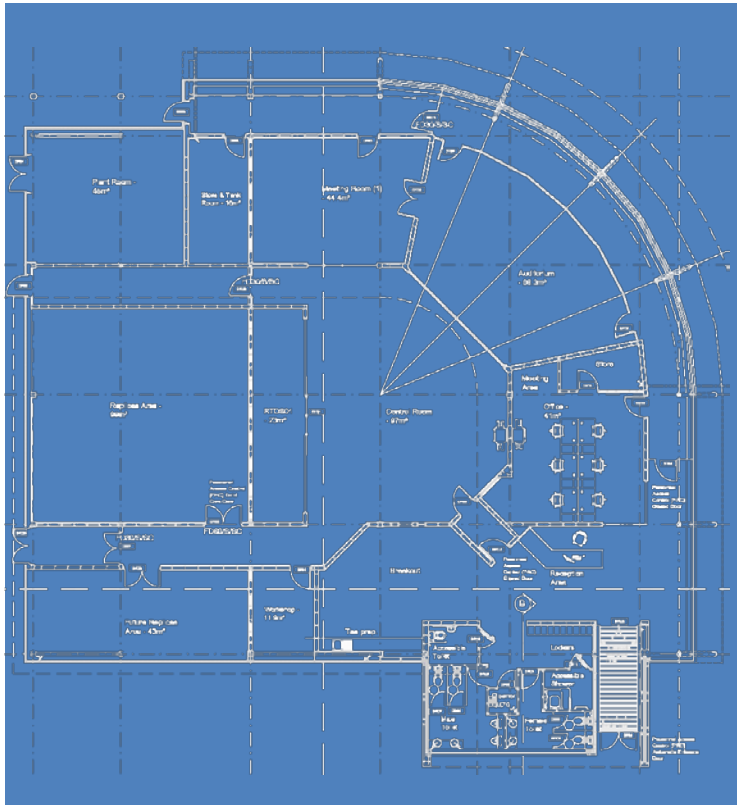
Making It Real: Building

The National HVDC Centre

The building work is progressing to plan.

From Plans....



....to Reality

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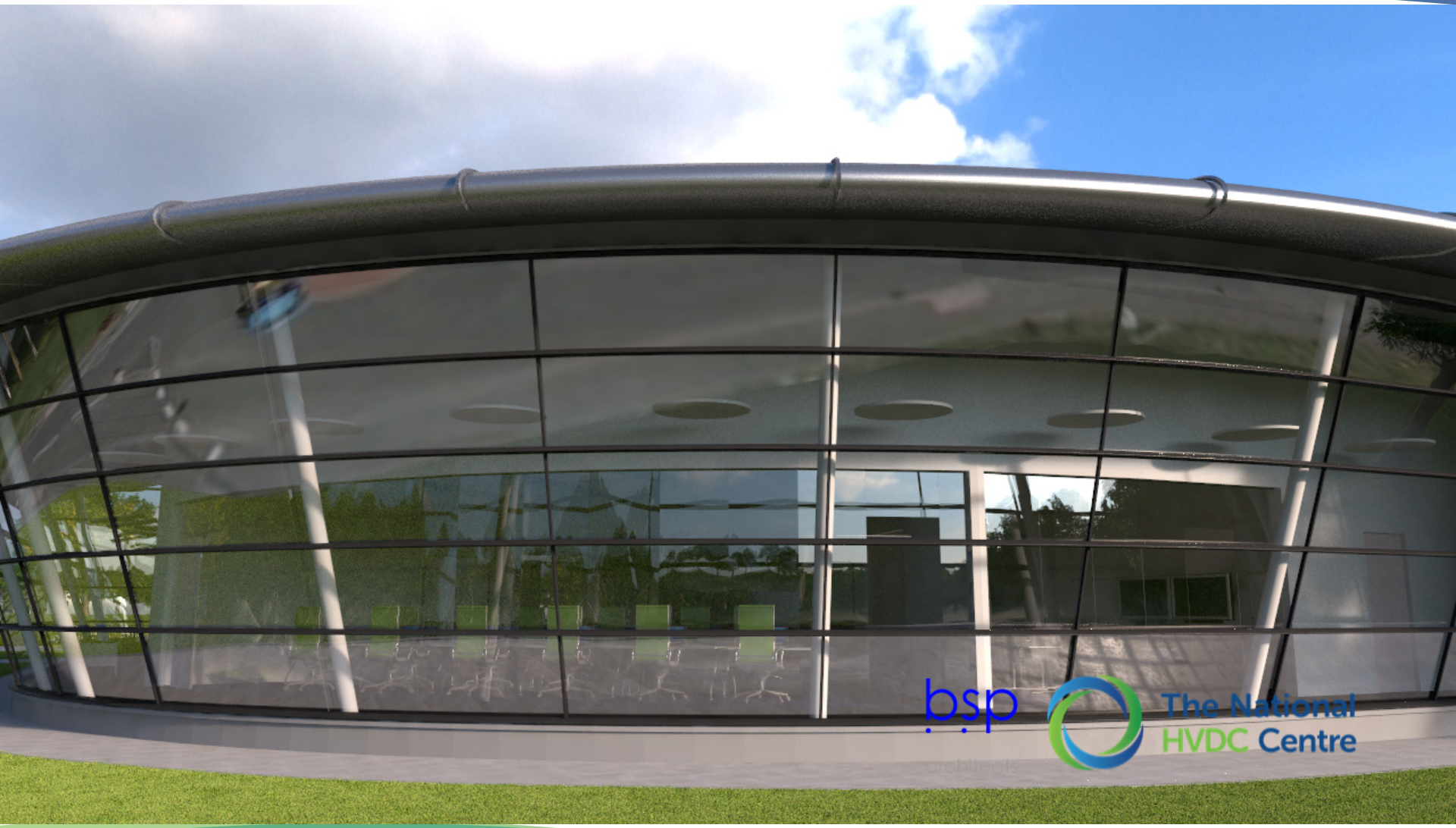
Making It Real: Building Visualisation (1)

The National HVDC Centre



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Making It Real: Building Visualisation (2)

The National HVDC Centre

Scottish and Southern Energy Power Distribution

Making It Real: Building Visualisation (3)

The National HVDC Centre

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Our Services

The National HVDC Centre

The Centre offers a range of HVDC related services.

Real-Time Studies	Undertaking detailed real-time studies on the operation of HVDC (and other power electronics), on GB's transmission network.
Training	A range of HVDC focused training courses will be available, along with bespoke courses developed on request.
Support	Our experts can support and advise on the design, development and operation of HVDC schemes.
Facilities	Use of our state-of-the-art training facilities.

Scottish and Southern Energy Power Distribution

Summary

1) **HVDC Context** – The GB Network faces a number of challenges with the deployment of more HVDC and power electronics on the Network.

2) **Making It Real** – Each component of the new Centre is becoming 'real', and we are on-plan to open the Centre on 29th March 2017.

3) **Our Services** – The Centre offers a range of HVDC related services, which are available to any organisation.

For more information, talk with Yash or Simon or visit our web site:

www.hvdccentre.com

The National HVDC Centre