SPT Connections Summit 2019

WELCOME

- Fire / First Aid
- Breaks
- How to Make Use of the I-Pads

INTRODUCTION

Scott Mathieson
SPT Network Planning & Regulation Director

RIIO T1 PRICE CONTROL – SO FAR, STRONG PROGRESS

- As we are now in our last years of the plan, we are pleased that our strong start has been maintained. We remain on course to complete our ambitious programme of network renewal.

- Our asset replacement related programme is continuing very well - **we have delivered 67% of our total asset renewal outputs**, well ahead of our RIIOT1 plan of 60% for the first six years.

- We are **c75% through our overhead line replacement programme of 800km,** 60km ahead of our plans at this stage.

- Our total spend in **2018/19 was £187.7m, £88m below our original plans**, taking our cumulative investment in the RIIO-T1 price control period to over £1.8bn. We currently **forecast that by the end of the RIIO-T1 period, we will have spent £76m (c3.2%) less than allowance**, through efficient project delivery and changes to forecast allowance and expenditure for generation connections

RIIO T1 PRICE CONTROL – SO FAR, STRONG PROGRESS

- Connections to our network increased and now total **brings the total to 1,500MW, 60% of output target of 2,503MW for the price control period**. Our forecast for the RIIO-T1 period remains at 1,620MW. **For embedded generation, c828MW have connected** since 2013.

- The new connections have been accompanied by a range of reinforcement projects to strengthen the network and facilitate future connections. **Our forecast remains stable at 3,482MVA for the full period**, over three times the original target.

- We continue to work effectively with our stakeholders, and this is driving a wide range of benefits as reflected in our stakeholder engagement performance. **Our average satisfaction score of 8.5/10, a year on year improvement of 0.2, this is significantly better than our benchmark of 7.4.**

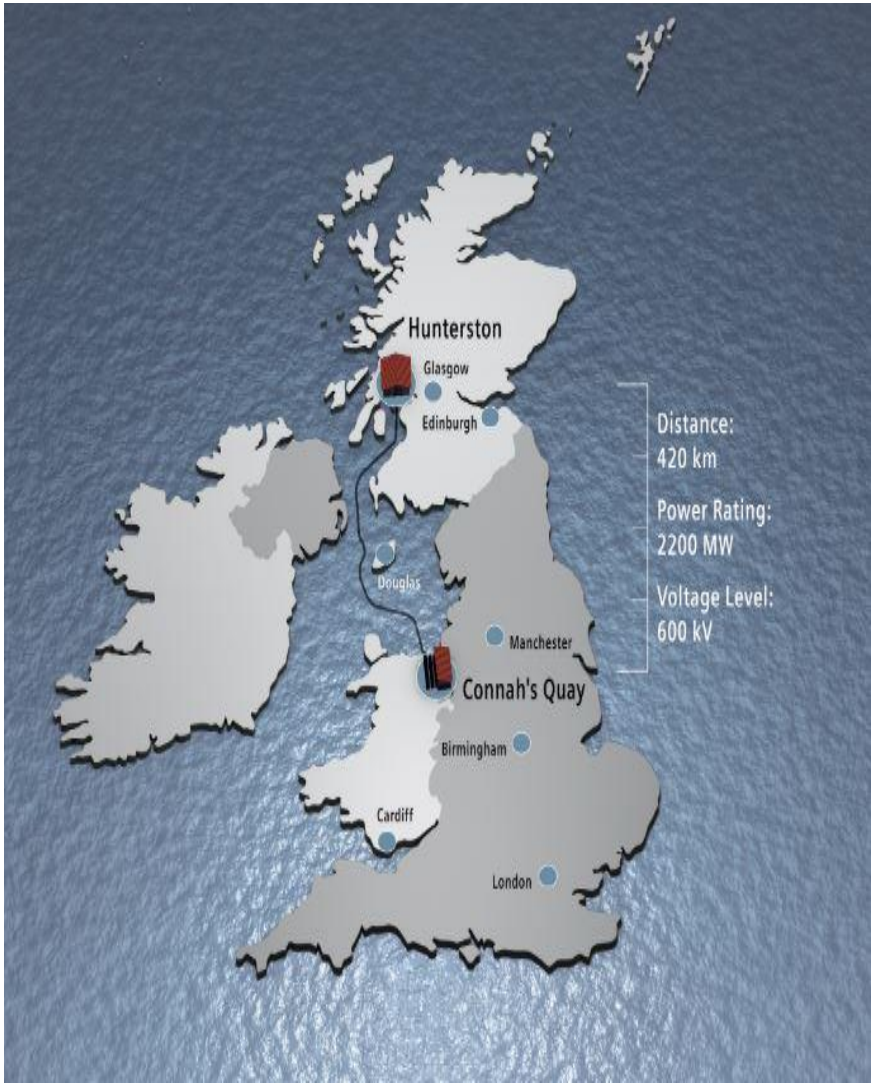
- **Undelivered energy as a result of faults on our networks was 39MWh, a reliability of 99.99%**, well below the benchmark level of 225MWh.

- Our **strong focus on standards of safety continue to be in evidence, with zero incidents** and significant initiatives to promote public safety and continue our collaboration to build the right culture of safety among our contractors.

RIIO T1 PRICE CONTROL – SO FAR, STRONG PROGRESS

The **Western Link HVDC project**, a joint venture with National Grid to increase the interconnection capacity between Scotland and England **was completed in late summer 2017 and taken over in November 2019**. This project supports the transition to a low carbon economy by providing further capacity for renewable energy schemes in Scotland whilst also enhancing the ability to import power into Scotland during periods of low renewable generation.

With the Western HVDC operational, **the power transfer capability between Scotland and England is increased to 6,600MW**, more than doubling the capacity since the start of RIIO-T1.



RIIO T2 PRICE CONTROL – OUR AMBITIONS AND PLANS

- Our RIIO T2 Business Plan sets out how we plan to invest in our network and communities **to facilitate Scotland and Britain's transition to Net Zero by 2045 and 2050 respectively.**

- To achieve our goals, we **plan to invest around c£1.375bn in the RIIO-T2 Price Control** from 2021 to 2026.

- This vital investment will **allow a further 900MW of renewable energy to connect on to our electricity networks** and ensures our infrastructure (such as electricity towers, overhead wires and underground cables) can adapt to meet the changing demands being placed on the system as both the Scottish and UK Governments prepare for the transition to Net Zero.

A sustainable, Net Zero future

We will take the lead to build a healthier, more accessible energy model – one which leaves the carbon economy behind. We will meet carbon targets, customers' low-carbon ambitions, and make a large, proactive contribution towards Net Zero.

Use new alternatives to avoid adding 56% of potential increase in SF_6, reducing the impact by at least **9,700kg**

Facilitate the connection of renewable energy generation **900MW**

Increase efficiency through constant innovation

We will continue to improve our performance through a continual cycle of innovation. With smarter solutions, we can do more with less – deploying new technology, processes and ways to share data. Innovation will help us deliver uninterrupted supply, faster connections, and meet the ambitions of consumers, network users and wider stakeholders.

Innovation has led to a reduction in RIIO-T2 expenditure of **£30m**

Improving efficiency in our plan by **9.5%**

Adapt our world-class, resilient network

This is a critical time for networks. Demand is changing, generation is evolving, and new threats are emerging. We will adapt our world-class network to meet these challenges, including extreme weather, cyber security and black start events – delivering ever-higher performance for consumers, network users and wider stakeholders.

Maintain current level of network reliability **99.9998%**

Longer term monetised risk benefit of **£29.1bn**

Keeping network users and consumers at the heart of our decisions

We will listen and learn even more from our stakeholders. This will allow us to continue to raise our efforts as we work to improve lives, create jobs and protect vulnerable consumers. In everything we do, we aim to do more.

Reducing constraint costs for consumers **£152m p.a.**

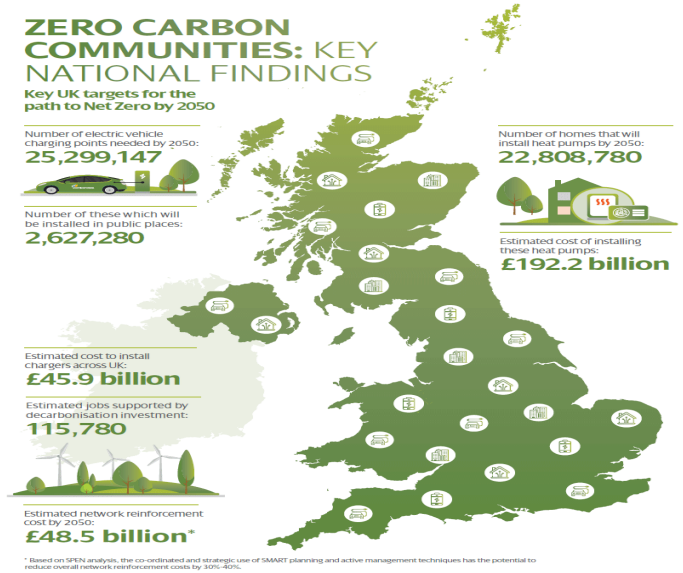
Deliver our plan with minimal financial impact to our consumers – less than £5 per year **£4.43**

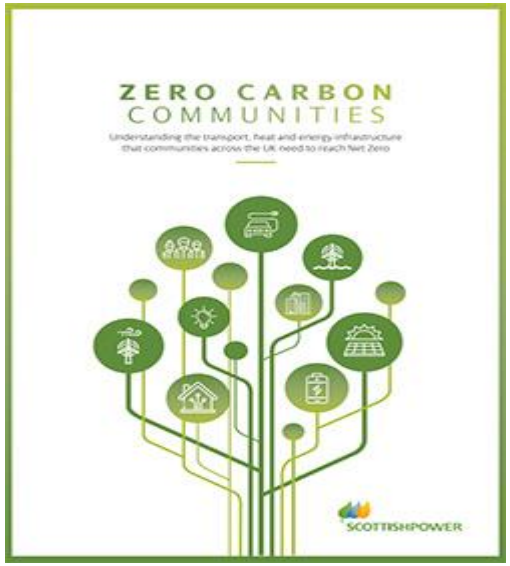
ZERO CARBON COMMUNITIES – HOW WE MEET THE SCALE OF THE CHALLENGE

- In 2019, the UK made a legally binding commitment to a zero-carbon future, legislating a deadline for its contribution to global warming – 2050. In some parts of the country, the net-zero targets are even more ambitious.

- Exactly how to achieve these targets, and the roadmap to get there, is not yet clear. As energy devolution becomes more and more common, the risk to communities is they are left behind in transition. SP Energy Networks committed to work with these communities to help identify what steps they need to take, specific to them, to meet the goals.

- Becoming Net Zero offers Scotland a huge economic opportunity. The road to 2045 will mean many everyday activities will decarbonise and switch to all-electric technologies and it's essential for businesses and communities to start planning now for the transition to a cleaner and greener future."





- Through the Green Economy Fund, SP Energy Networks is investing £20million in Scottish projects that support low-carbon heating, electrification of transport and the education of a renewables workforce for a greener future..

- We're encouraging businesses, local authorities and public bodies in Scotland to follow suit and ramp up their investment in the green economy and join Scotland's race to 'net zero' through innovation and technology.

- We are also committed to helping our local communities and have launched our ambitions in our Zero Carbon Communities Report, launched earlier this year.

SP ENERGY NETWORKS

December 2019

RIIO – T2 Business Plan Summary

Our four strategic goals

A plan built on the views of stakeholders to reflect the changes we are seeing in the energy sector

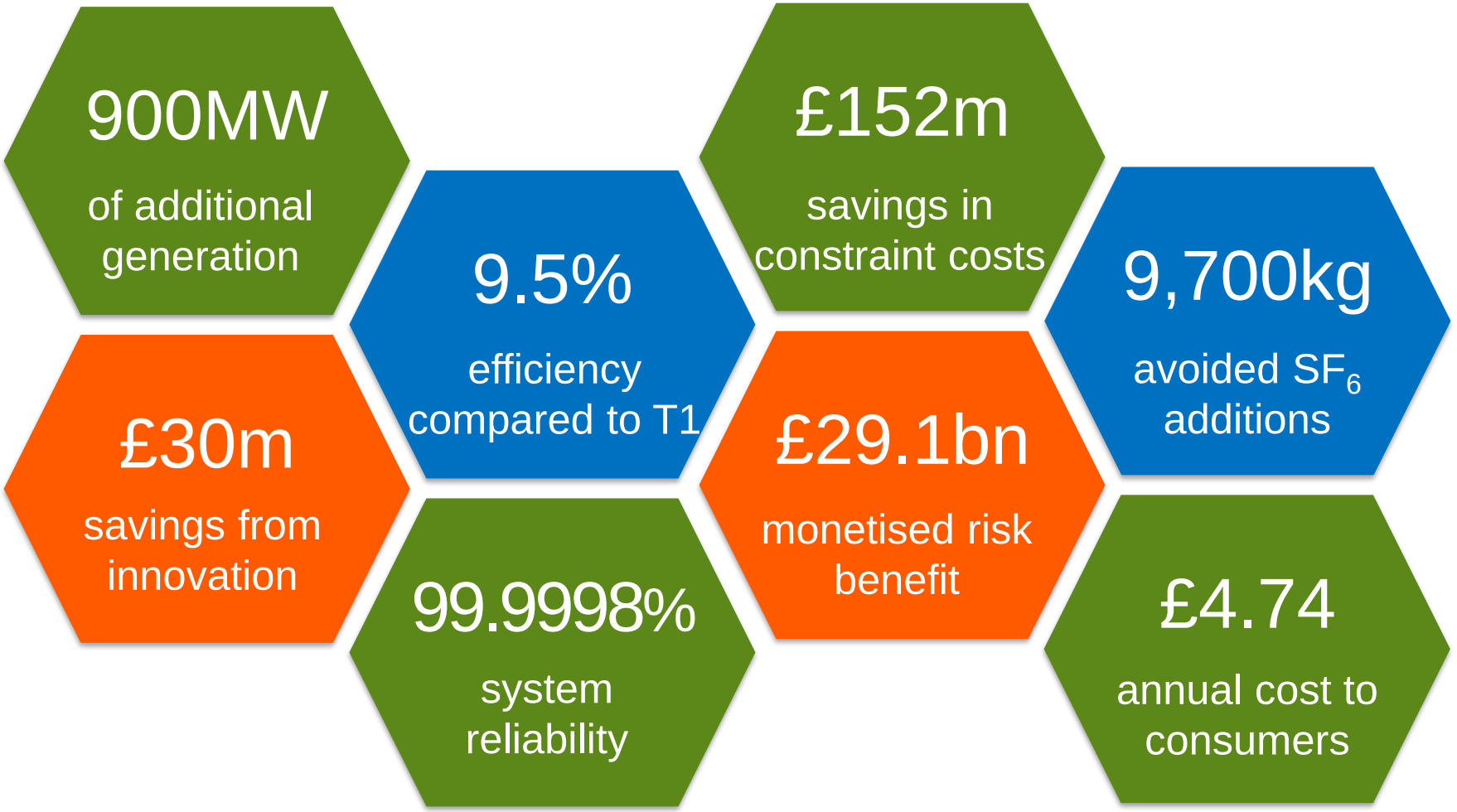
Taking a leading role in delivering a Net Zero future

Increased efficiency by innovating and applying a whole system approach

Resilience and system operability throughout the energy transition

Keeping network users and consumers at the heart of our decisions

Key highlights



A plan to enable Net Zero

£540m of expenditure to accommodate the future changes…
…and flexibility to accommodate whatever else emerges

Connecting 900MW of new generation
High confidence generation projects included in our baseline plan…

…and mechanisms to provide additional funding for further generation

Facilitating the wider changes that the transmission network needs to be prepared for…

…800MW of new embedded generation, 1600MVA of additional boundary capacity, facilitating the demands of at least 158k EVs

Building the foundation for a smarter future with Active network management, Circuit rating management, digital substations…

… and the future flexibility for other solutions that may be required including synchronous compensation

Our output incentives

Commitments and incentives based on the feedback from stakeholders

Fully implement a digitised new connections process

Even greater network reliability for end consumers as result of transmission faults

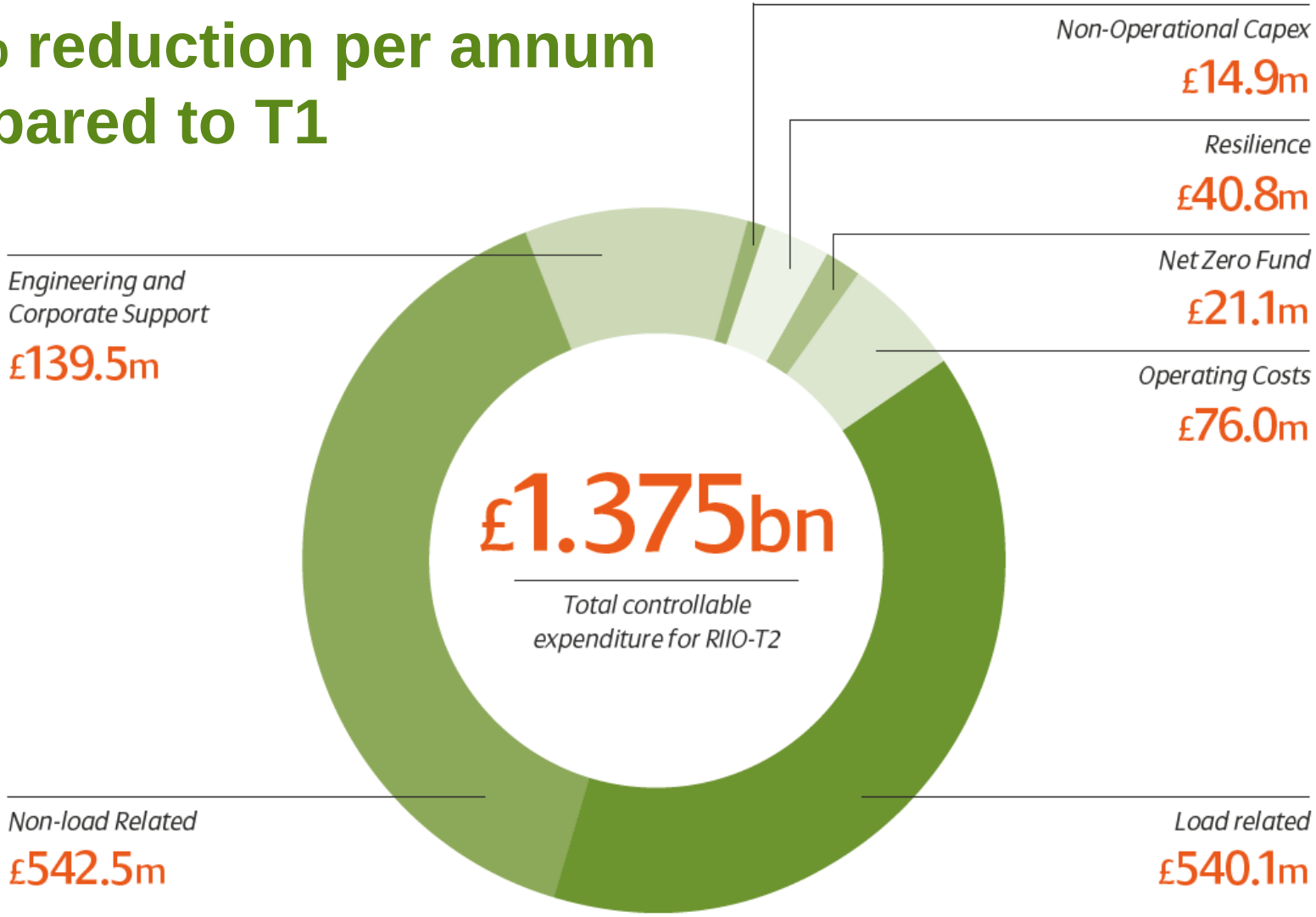
We will be the first TO to be incentivised to improve network availability for generators

A suite of metrics to measure the success of our engagement and services provided

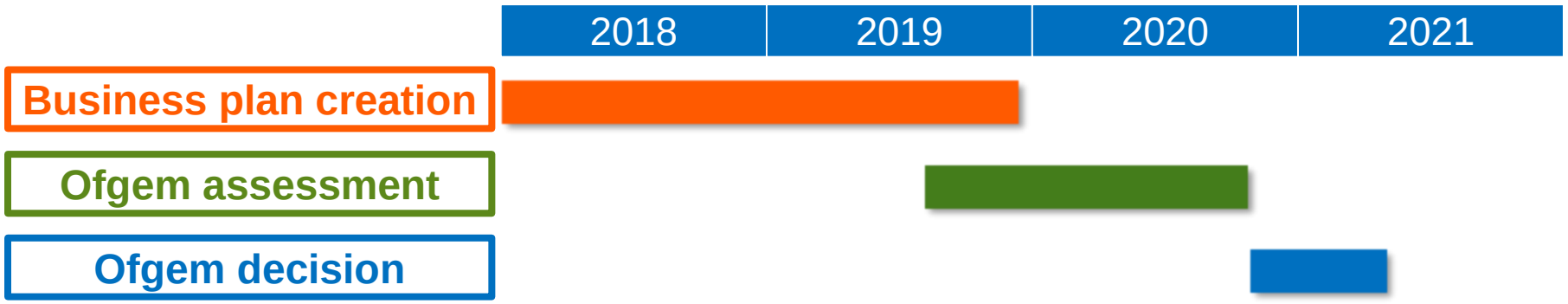
An enduring role for the Independent User Group to challenge our performance and progress against all our incentives and commitments

Planned expenditure

A 4% reduction per annum compared to T1



Next steps



- Plan to be published on Monday, 9th Dec – SPEN website
- Ofgem call for evidence December/January
- Open hearings in March/April 2020
- Ofgem final proposals in December 2020
- Start of RIIO-T2 April 2021

Empowering the Connections Customer

Elevating the Customer Journey

Laura Campbell & Hazel Patterson

5th December 2019

AGENDA

1. Introduction to Project

2. Digital Connections Portal

3. Project Delivery Plan

4. Project Methodology

5. Product vs Project - Future Roadmap

Empowering the Connections Customer | Project

CONNECTION JOURNEY – NOW MANUAL	CONNECTION JOURNEY - FUTURE
• Multiple emails, excel spreadsheets • Volumes are rapidly increasing • Multiple departments interacting with customers at various points • Surveys currently via telephone – online options • Website is not clear	• Pre-Application Information online • Online applications • Automated checks • Communications logged and stored, MOMs, emails etc. • Events / Proactive Notifications. • Calendar / Scheduling requests for meetings.

BENEFITS

- Improve Customer Experience / Customer Feedback
- Digital Transformation
- Agile Methodology Clearer information available to all parties (Design, Costs, Programs, Contracts)
- Streamline customer experience over the project
- History of customer contact. Intelligence. Knowledge retention.

SPT Customer Connections Journey

UK Electricity Network

NGESO (SO)
- Stable and Secure Operation of UK Grid.

TO Licence :
- Maintain / Design / Develop / Deliver: New & Modified connections.
- Coordinated, Economic and Efficient manner.

1. PRE-APPLICATION

- Meeting
- System capacity
- Clock start offers
- Payment

CONTRACT

7 months

2. DEVELOPMENT

- Project team established
- Land & Planning (consents)
- Stakeholder & community
- Design

3.5 years

3. DELIVERY

- Consents & Wayleaves ✓
- Construction
- Commissioning / Compliance
- Operations Engineering
- Outages (OCC)

2 years

4. CONNECTED

- Account closed
- Close out / snagging
- As-built records
- Customer ongoing
- Operations
- Outage Planning (OCC)

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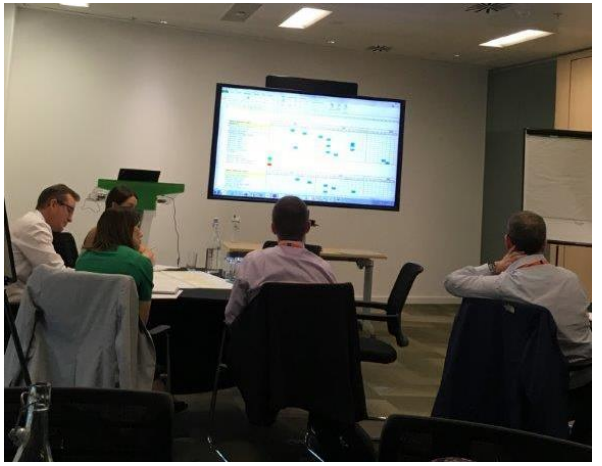
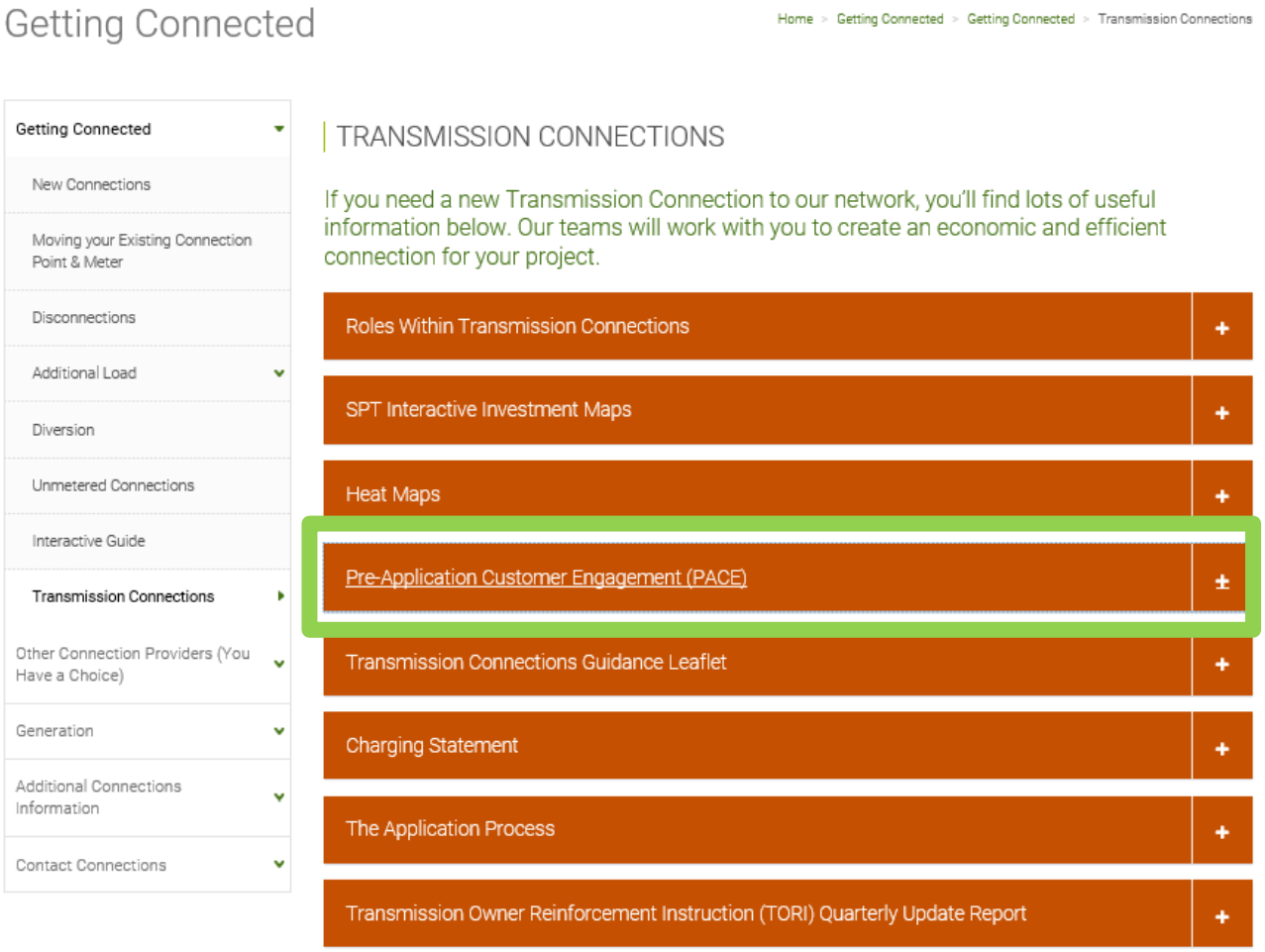
Empowering the Connections Customer | Progress

- ✓ Project Kicked Off: May 2019
- ✓ Sprint Zero: Functional Requirements / Specification (June 2019)
- ✓ Customer Workshop: 9th July 2019
- ✓ Further development of functional requirements (September 2019)
- ✓ Engagement NGESO Seminars (London & Glasgow) Roundtables



New PACE Process

- Acting on feedback from Customer workshop 9th July 2019
- Quality in the first engagement
- (PACE) meetings every Tuesday between 2pm and 4pm
- 10 day review



New PACE Process

Pre-Application Customer Engagement (PACE)

Pre-Application Customer Engagement (PACE)

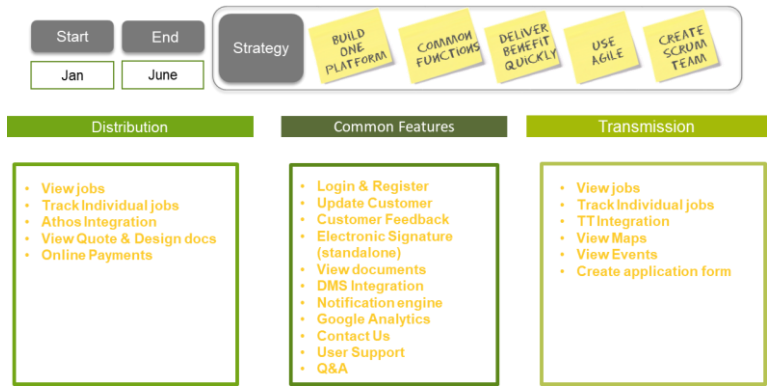
We have streamlined our Pre-Application Customer Engagement process (PACE). Please complete our new PACE request form below to tell us about your project so as we can prepare some information on the type of connection we could offer prior to meeting with you. This can be for a connection directly into our Transmission Network or for embedded projects that require access to our Transmission Network. Once you have completed the PACE request form, please submit to transmissionconnections@spenergynetworks.com. We will then contact you with a time slot for our pre-arranged PACE surgery sessions held on a Tuesday afternoon.

Your meeting with us will take place a minimum of 2 weeks after you submit your PACE request form. You can expect colleagues from our System Design, Project Management and Commercial team to be in attendance along with colleagues from NGET ESO. At this session we aim to give you an overview of the type of connection offer you would likely receive in response to a connection application.

- PACE Pre Application Form

https://www.spenergynetworks.co.uk/pages/transmission_connections.aspx

New connections Portal| Project Delivery Plan



The proposed Scope is based on the User Stories captured during the Sprint Zero.

As this is a collaborative agile delivery, this scope may change during the sprints.

The Product vision does NOT change!

Next Steps

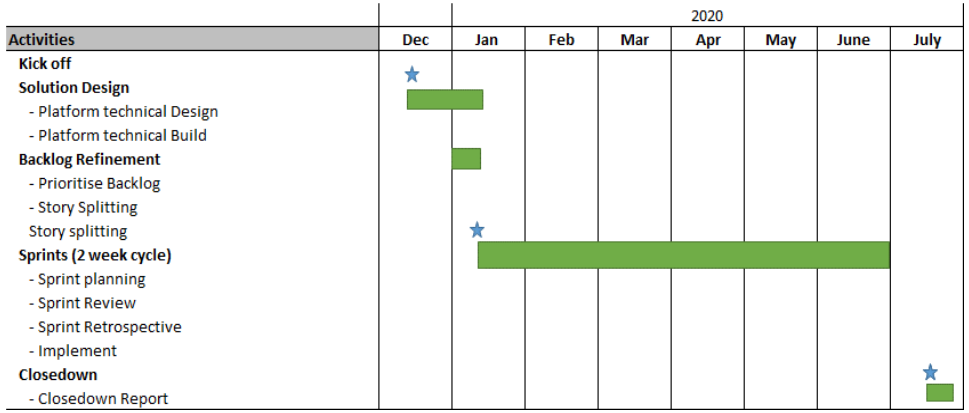
Platform Build – In progress

Technical Design – In Progress

Backlog refinement – 6th January

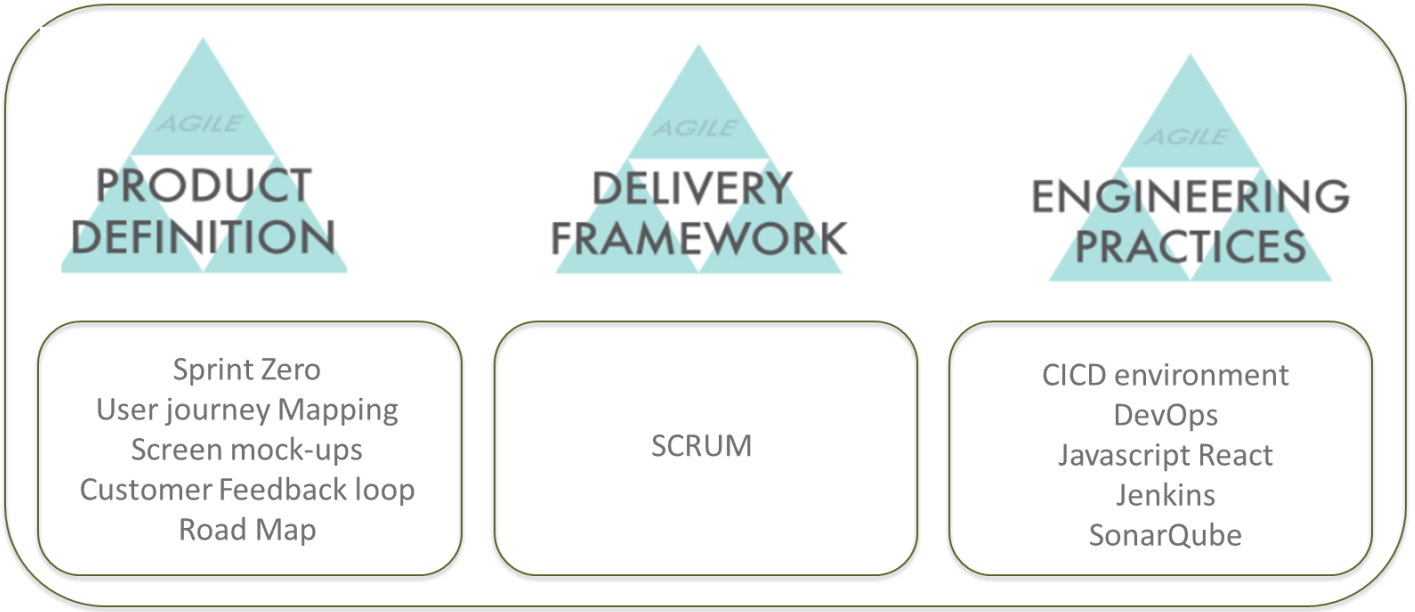
First Sprint – 20th January

Project Duration – January - June



New connections Portal| Agile methodology

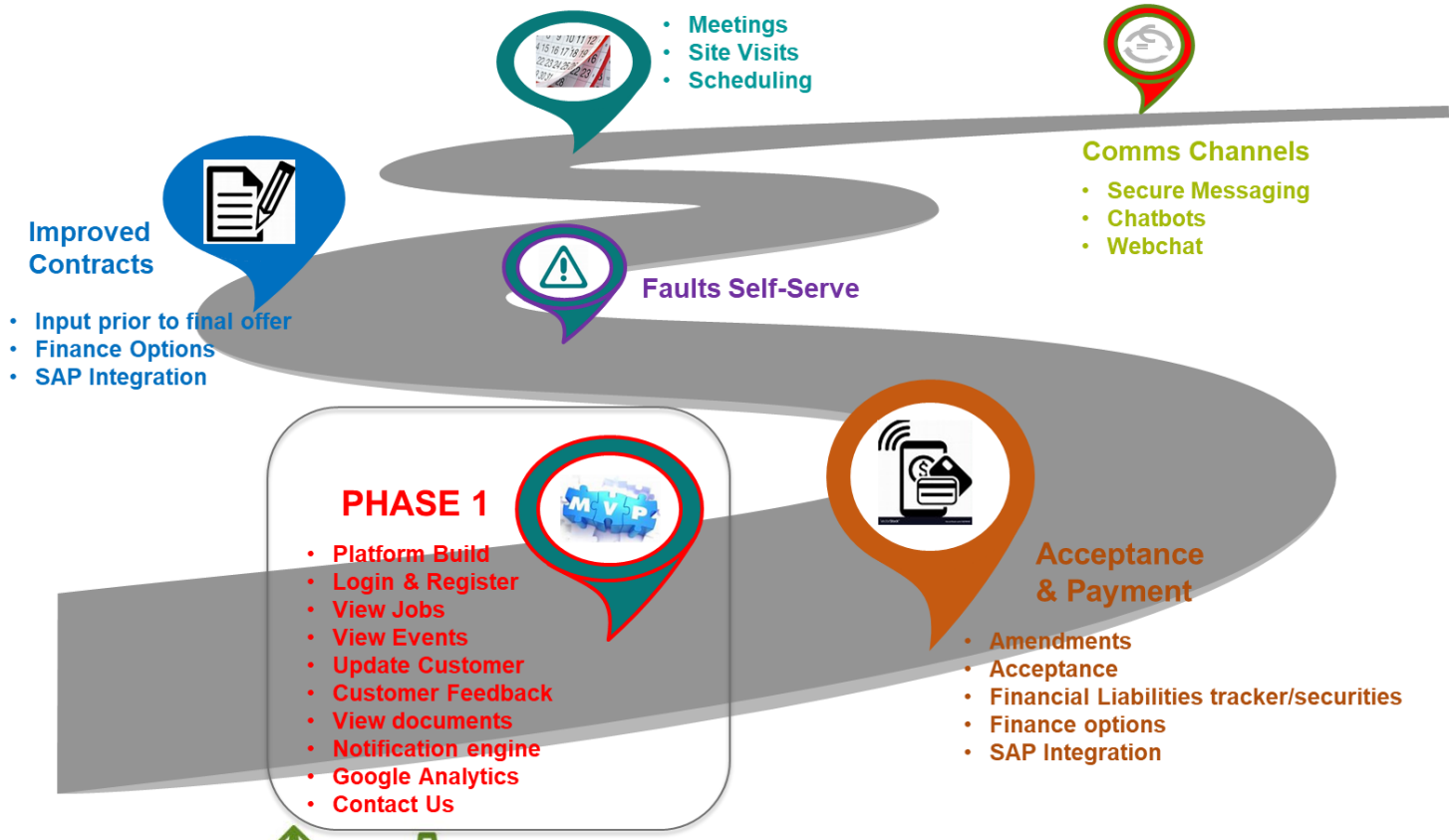
The Agile Triangle is a paradigm, a distinct set of concepts created to communicate the three practice areas of Agile Software Development



The Portal project will showcase the use of the latest technologies and methodologies to ensure a collaborative, iterative and product based approach to achieve success, now and for the future.

New connections Portal| Future Roadmap

Product vs Project – focus on future and not just immediate project!



SP ENERGY NETWORKS

5 December 2019

SPT Activities on Black Start

Colin Foote
Systems Analysis Manager

SPT Activities on Black Start

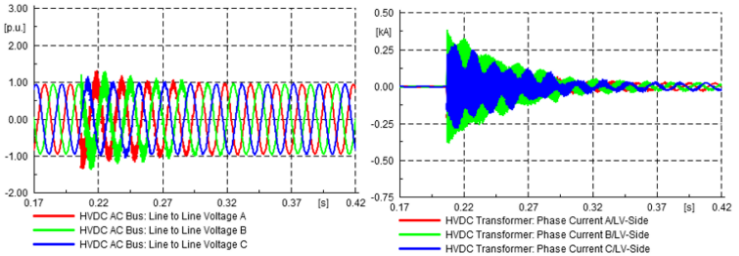
Engagement with Stakeholders and Policy Makers

The Scottish Government

Department for Business, Energy & Industrial Strategy

Analysis and Review of Current Plans

Supporting Trials and Research



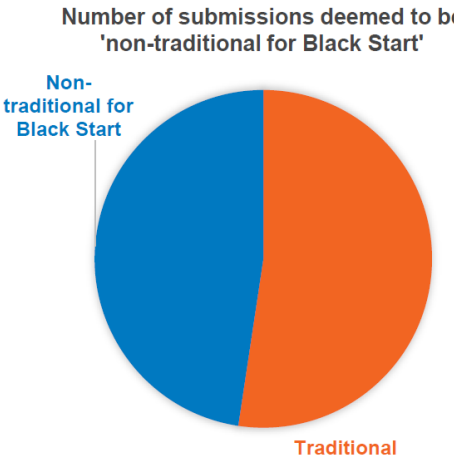
Exploring New Approaches

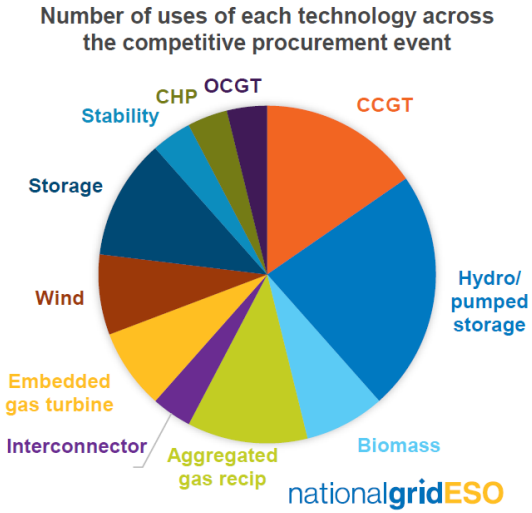
Distributed ReStart

Energy restoration for tomorrow

Engagement with Stakeholders and Policy Makers

- UK Government, Department of Business, Energy and Industrial Strategy (BEIS)
  - Black Start Task Group (BSTG)
  - Black Start Standard
- Scottish Government
  - Scottish Energy Advisory Board (SEAB)
- Ofgem
- SPT Connected Customers
- Wider Industry and Stakeholders





- ESO Black Start tenders
- Consultations
  - EU NCER
- August 9th event
  - Highlighted risks, e.g. control system misbehaviour

Analysis and Review of Current Plans

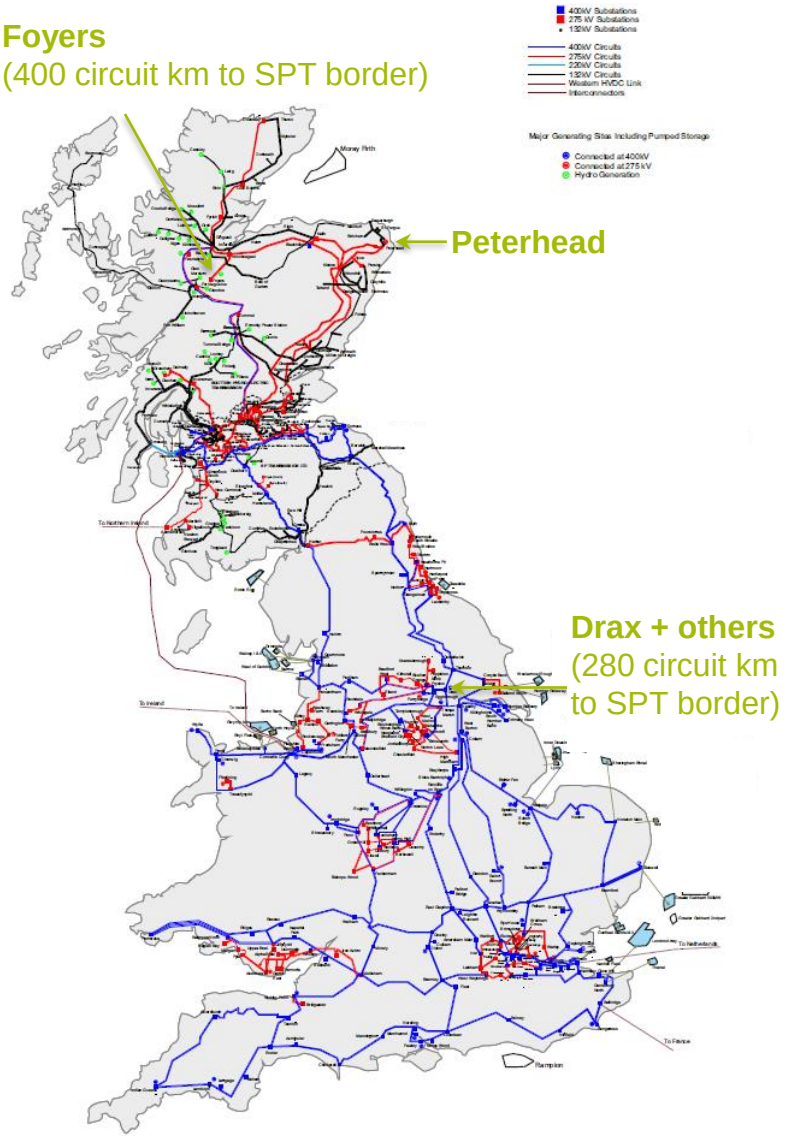
Local Joint Restoration Plan (LJRP)

Scottish Zonal Restoration Strategy

Long distance restoration routes

SPT pushing for further studies and tests:

- Harmonic Resonance Risks
- Dynamic Performance
- Electromagnetic Transients
- Review of Protection

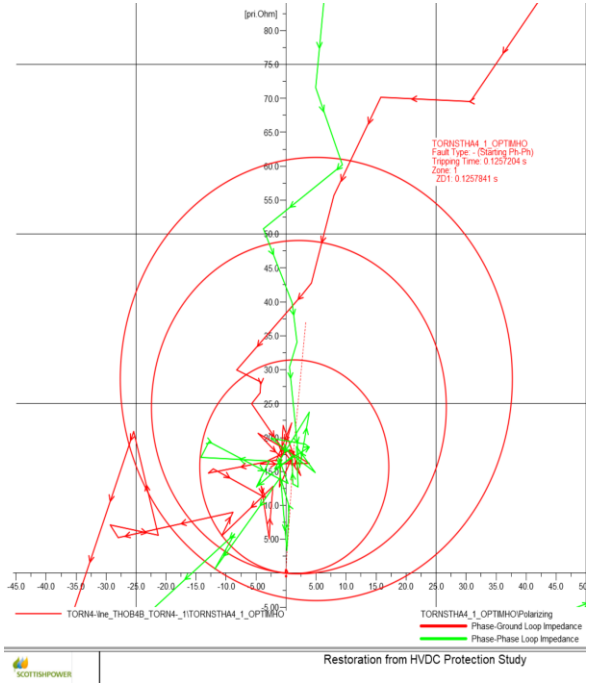


EPRI ELECTRIC POWER RESEARCH INSTITUTE

Black Start from HVDC

The National HVDC Centre

- Voltage Source Converter (VSC)
- Grid Forming vs Grid Following
- Low Short-Circuit Strength
- Detailed Modelling and Testing of Grid Protection



Virtual Synchronous Machine (VSM) trials at Dersalloch

- Network switching to support testing
- Planning for network re-energisation tests

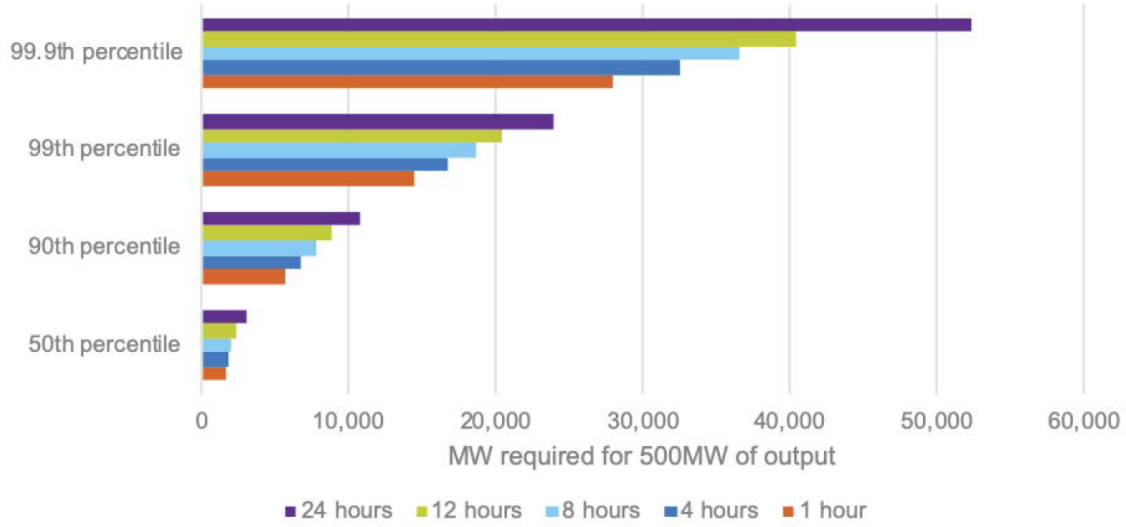
Exploring New Approaches

Distributed Energy Resources (DER) + Distribution System Operator (DSO) = An opportunity to develop a radically different approach to Black Start

- Power Engineering & Trials
- Organisational Systems & Telecoms
- Procurement & Compliance

Distributed ReStart

Energy restoration for tomorrow



Exploring the role of large wind and other technologies in system restoration

Further Information and How to Get Involved

Look out for BEIS and Scottish Government publications and consultations on Black Start and resilience

Input to NGESO and Ofgem consultations on code modifications:

https://www.nationalgrideso.com/codes

Review your own resilience to loss of power and discuss with your suppliers, customers, local government, etc.

Review research publications, for example:

https://www.hvdccentre.com/

https://www.smarternetworks.org/

Distributed ReStart: Review outputs so far and engage with future activities:

www.nationalgrideso.com/innovation/projects/distributed-restart

SP ENERGY NETWORKS

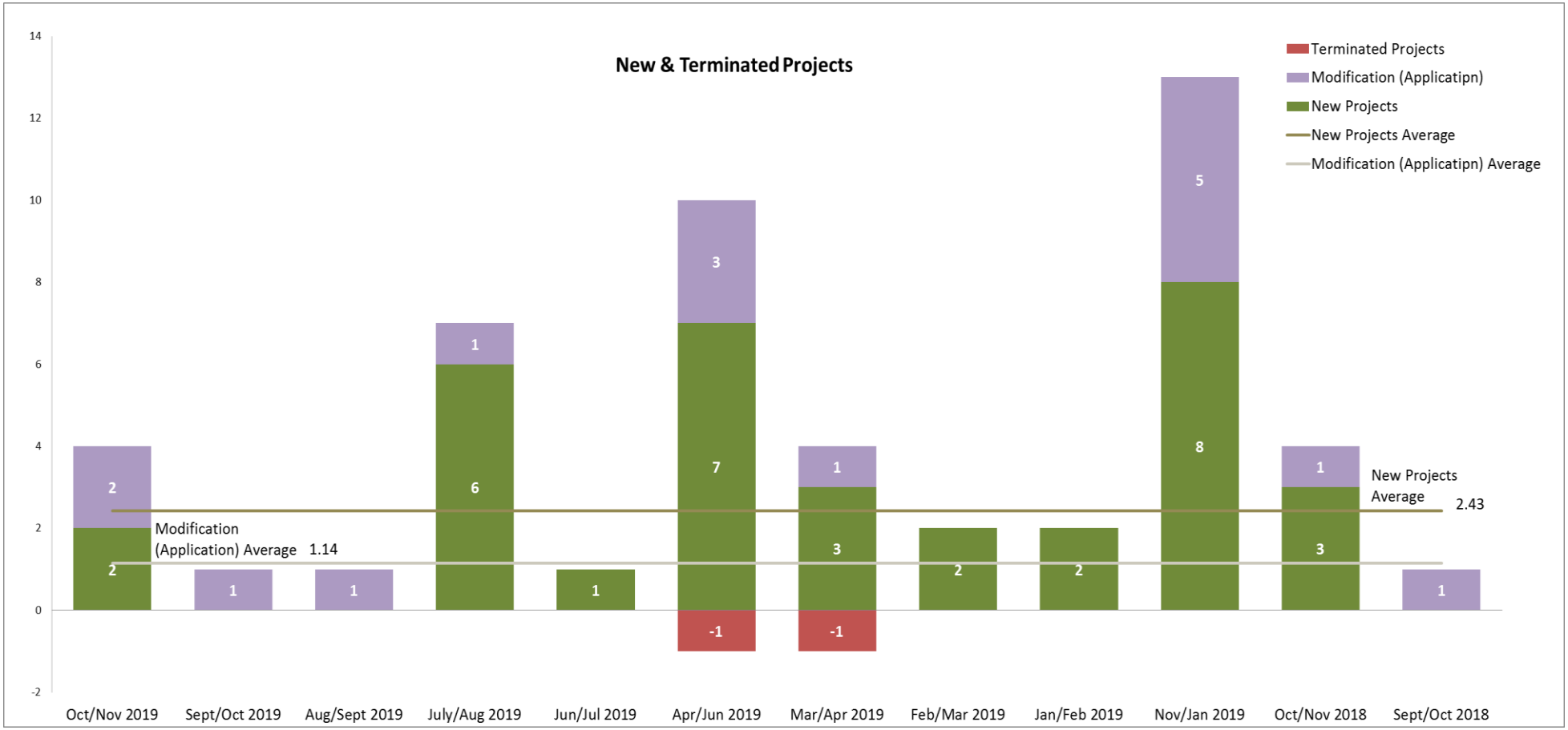
SPT Connections Summit

5th December 2019

SPT Projects Delivery Update

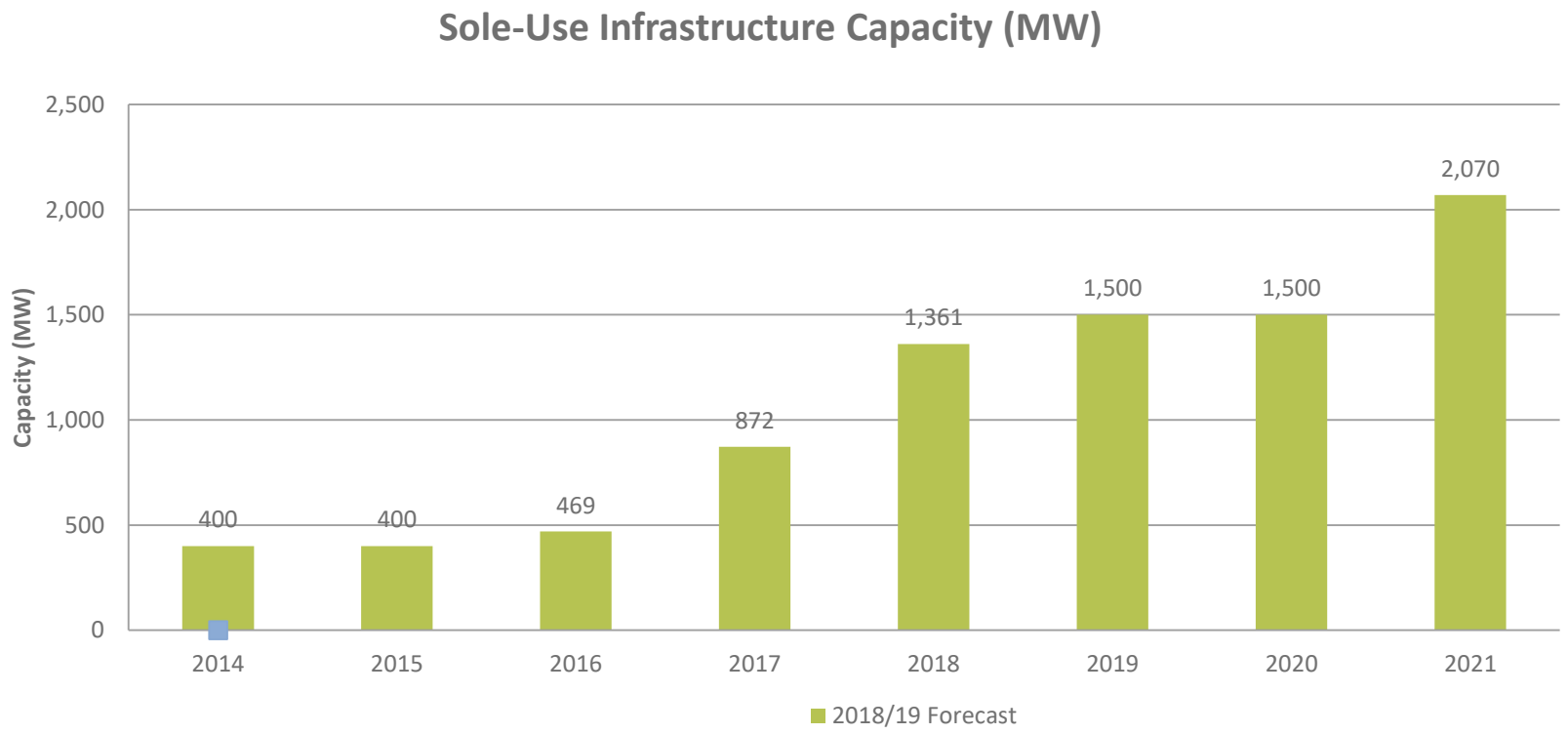
New Customer Connections

- NP&R tracking over 160 customer connection and reinforcement projects with works.
- New projects being generated at run rate of 2.5 projects / month (Nov 19)
- Forecasting 30+ new customer driven projects in 2020



SPT Projects: RIIO-T1 Connections so far...

- We will be ready to connect over 2000MW of renewable generation to the network by 2021
- We have recieved modification applications for an additional 500MW of connections
- The H1 (sole-use infrastructure) has triggered many large scale infrastructure reinforcement Projects



Connection Delivery Challenges

- Programme
- Change
- Developer Interfaces
- Third parties/ stakeholders
- Cost Control
- Landowners
- Network access
- Managing expectations
- Environment (location/climate)
- Health & Safety
- Environmental Impact

How Do We Overcome Challenges ?

“ Collaboration is the process of two or more people or organizations working together to complete a task or achieve a goal ”

- Openness/honesty
- Communication
- Trust
- Respect
- Relationships

SPT Projects: 2019 Highlights – Connection Projects

Coalburn SGT3

- 24 transmission connection windfarm projects in delivery to facilitate over 2700MW new renewable generation.
- Over 20 Load Management Schemes ongoing to maximise capacity of existing infrastructure

SPT Projects: 2019 Highlights

Western Link HVDC - Hunterston Converter Station

SPT Projects: 2019 Highlights - Reinforcements

Kilmarnock South

SPT Projects: 2019 Highlights – Asset Replacement - Substations

Wishaw 275kV Substation

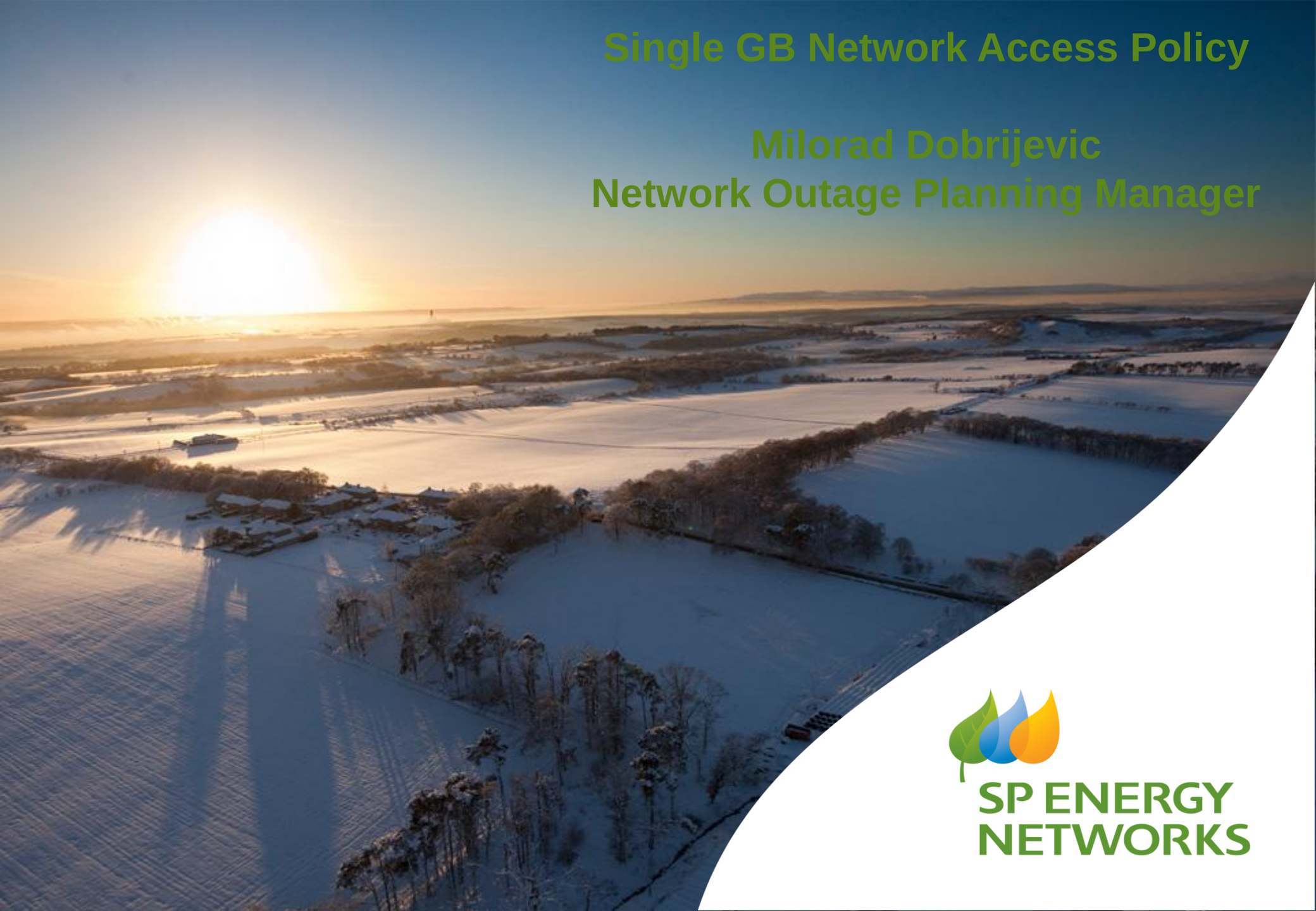
Strathaven 275kV Substation

Currie 275/132kV Substation

SPT Projects: 2019 Highlights – Asset Replacement – Overhead Lines

Blackhill – Glenglass Overhead Line

YW Route through National Park



Single GB Network Access Policy

Milorad Dobrijevic
Network Outage Planning Manager

SP ENERGY NETWORKS

Agenda

1. What is the “Network Access Policy”?

2. What are the key elements of interest within the document?

3. Examples of how the “Network Access Policy” has and will be used!

What is the “Network Access Policy”

- The Network Access Policy is a licence requirement for all Transmission Owners, that requires us to:
    - Co ordinate our planned network outage arrangements taking in to account the long term outcomes for consumers and network users
    - Detail our actions associated with network outages to assist the ESO in minimising network constraints
    - Describe our communication and stakeholder engagement strategy associated with network outages

Network Outage Planning – Baseline Level of Service

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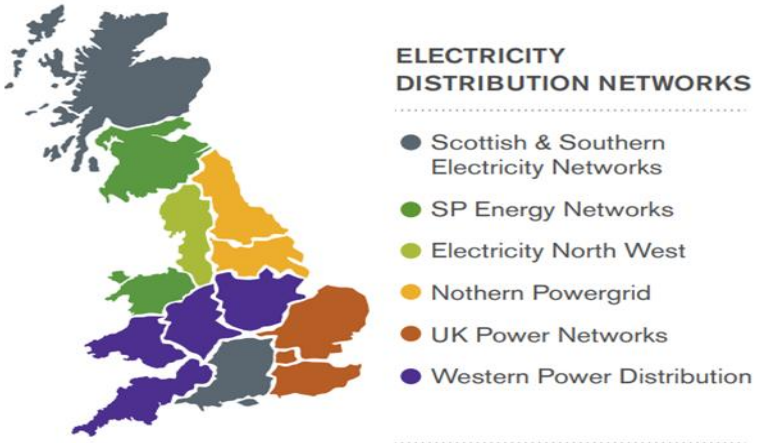
Balfour Beatty Investments

nationalgrid

DUDGEON Offshore Wind Farm Operated by Statoil

sse

Greater Gabbard Offshore Winds Limited



SP Transmission – Operating above the baseline

"The Network Access Policy" is SP Transmission's commitment to work with NGESO and our connected stakeholders to provide an enhanced level of service above the baseline, with respect to

- Assisting NGESO in managing "whole system" operating costs (BSuoS)
- The highest level of stakeholder engagement
- A robust & detailed long-term outage planning framework
- A within year outage planning framework that aims to minimise outage changes

How has the Network Access Policy been used?

1. Internal SPEN outage planning processes updated to reflect the needs of our generation stakeholders
   - Generators and connected parties are now part of the planning process right from the start
   - Minimum of 4 weeks notice for a new planned outage (e.g. defect repair) or earlier if suitable to affected generator due to weather conditions
   - Long term outage planning review to establish if any future outages seriously affects a generators connection

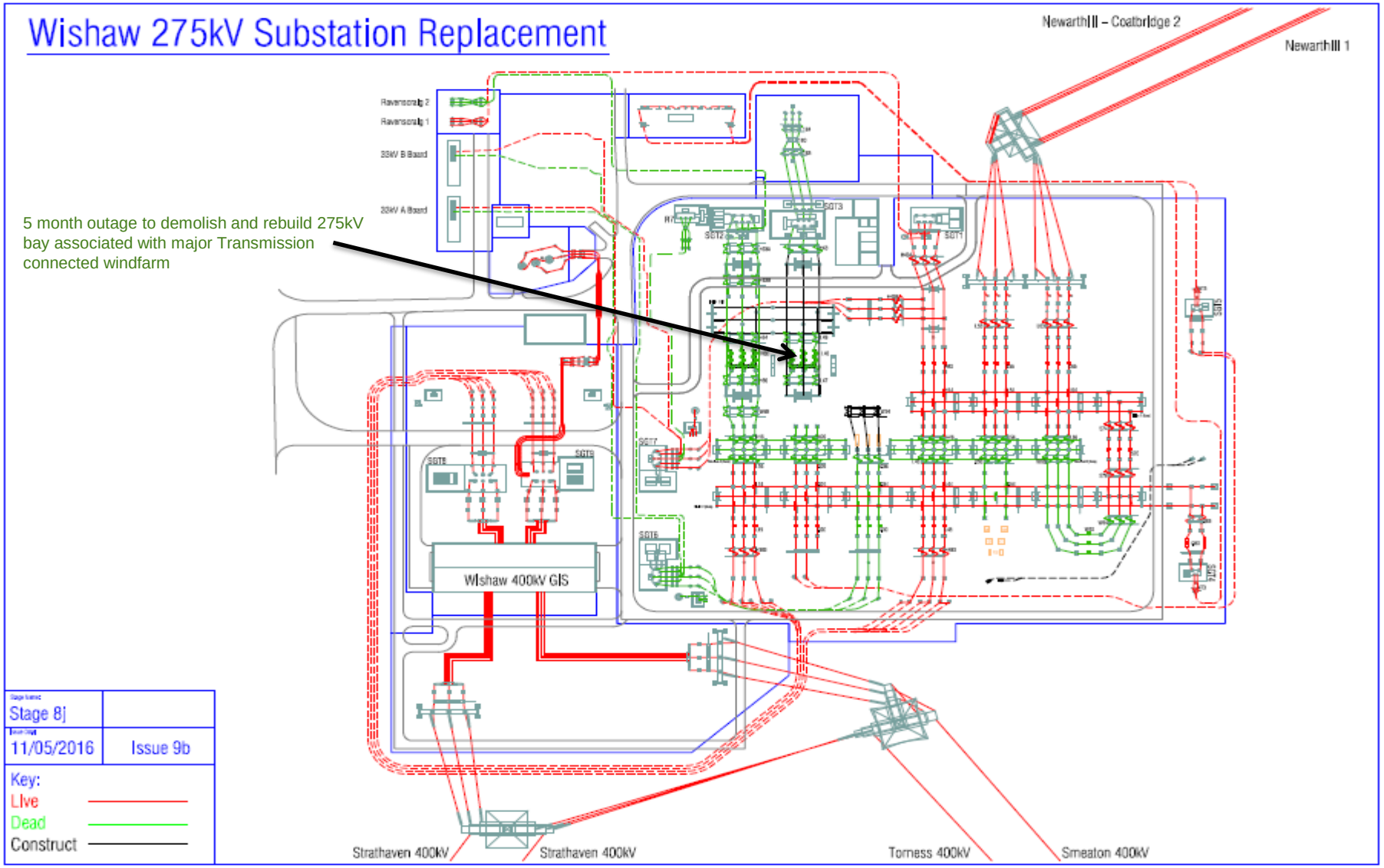
2. Individual 1-1 stakeholder engagement session's offered by SPEN Operational Control Centre to brief stakeholders on within year outage plan and performance to date

3. RIIO-T2 submission takes into account "Whole System Costs"

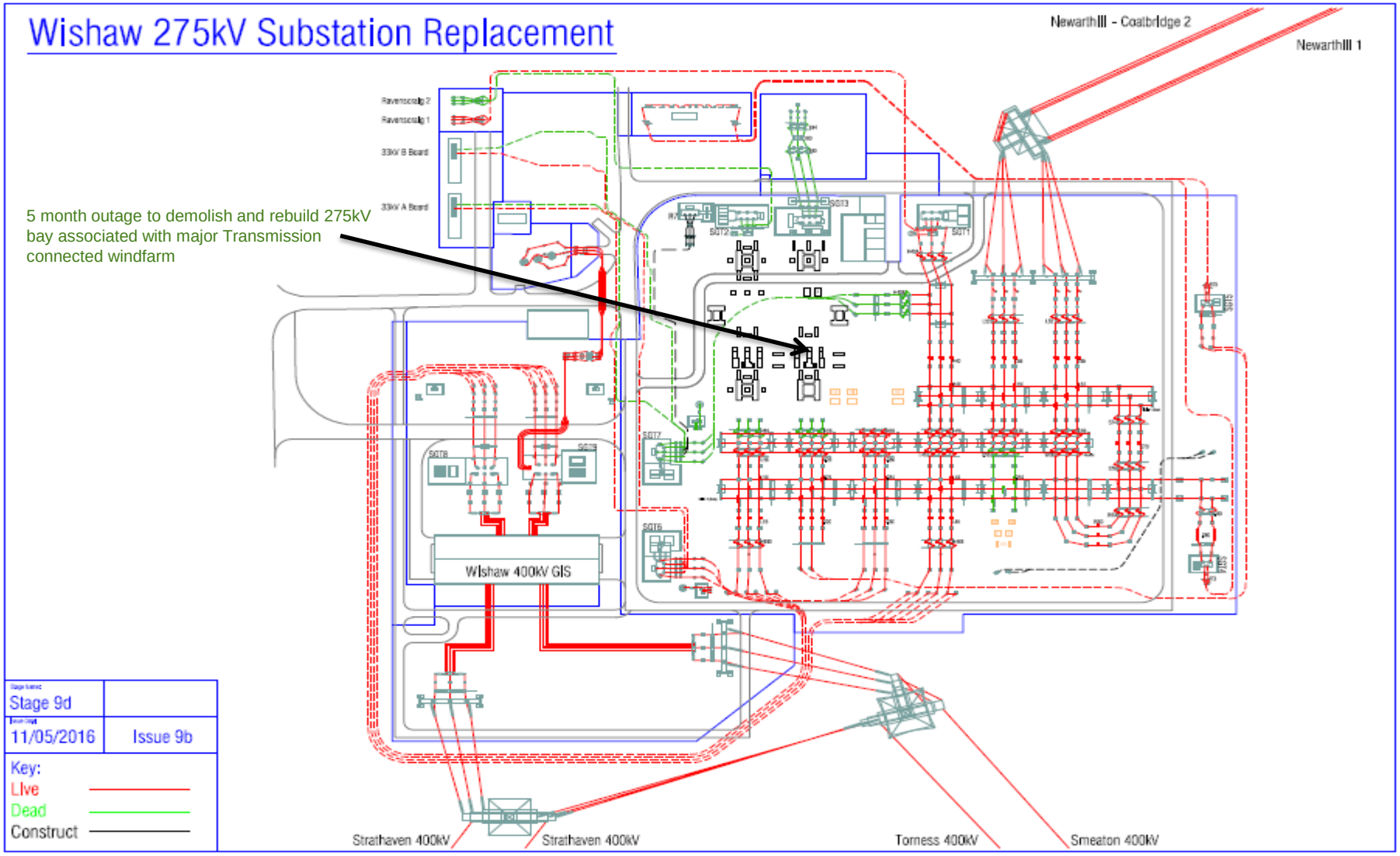
4. RIIO-T2 project plan being reviewed by SPEN Operational Control Centre staff to identify long duration stakeholder impact

Example from RIIO-T1

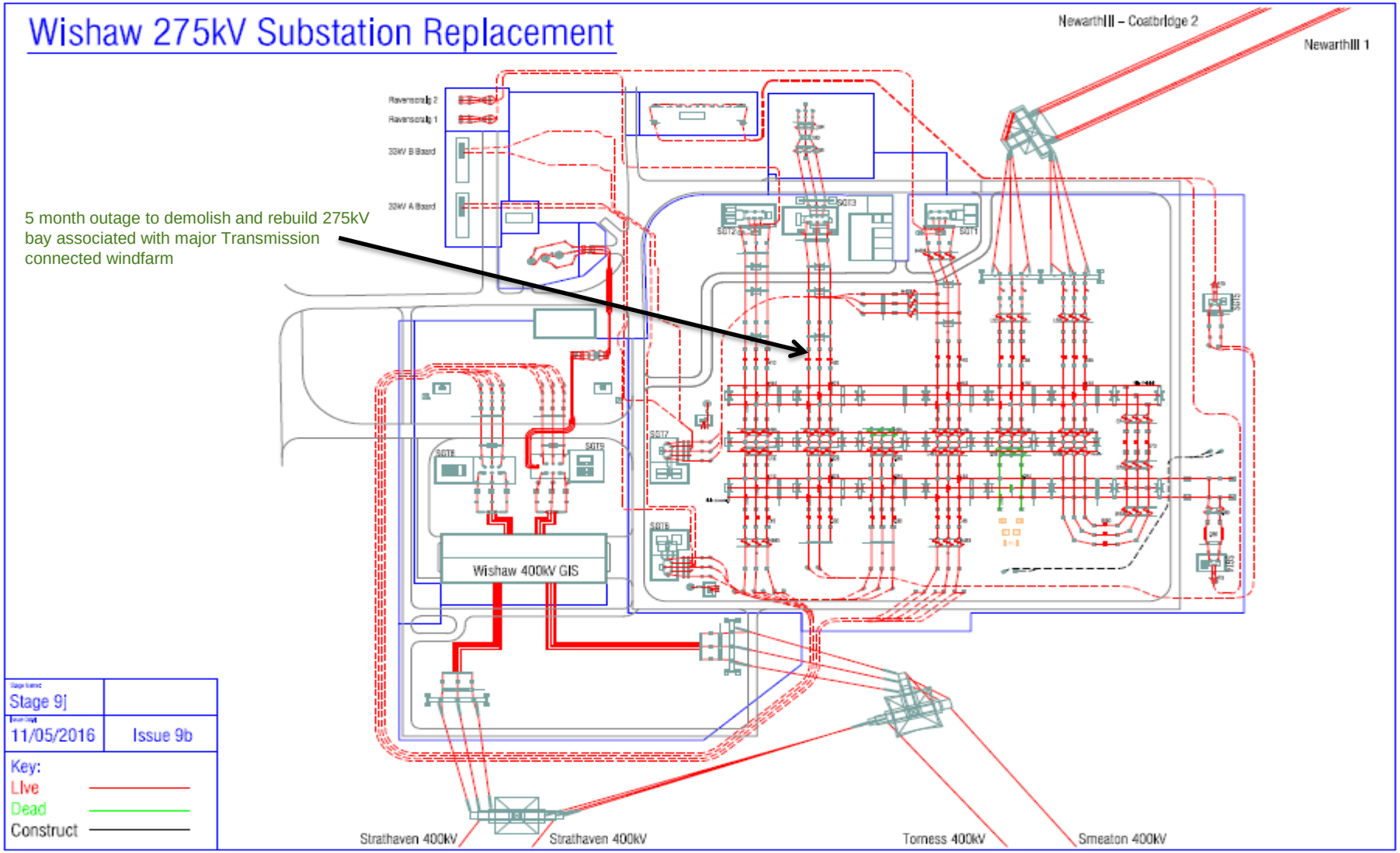
Wishaw 275kV Switchgear Modernisation Project – Original Stage 8 & 9



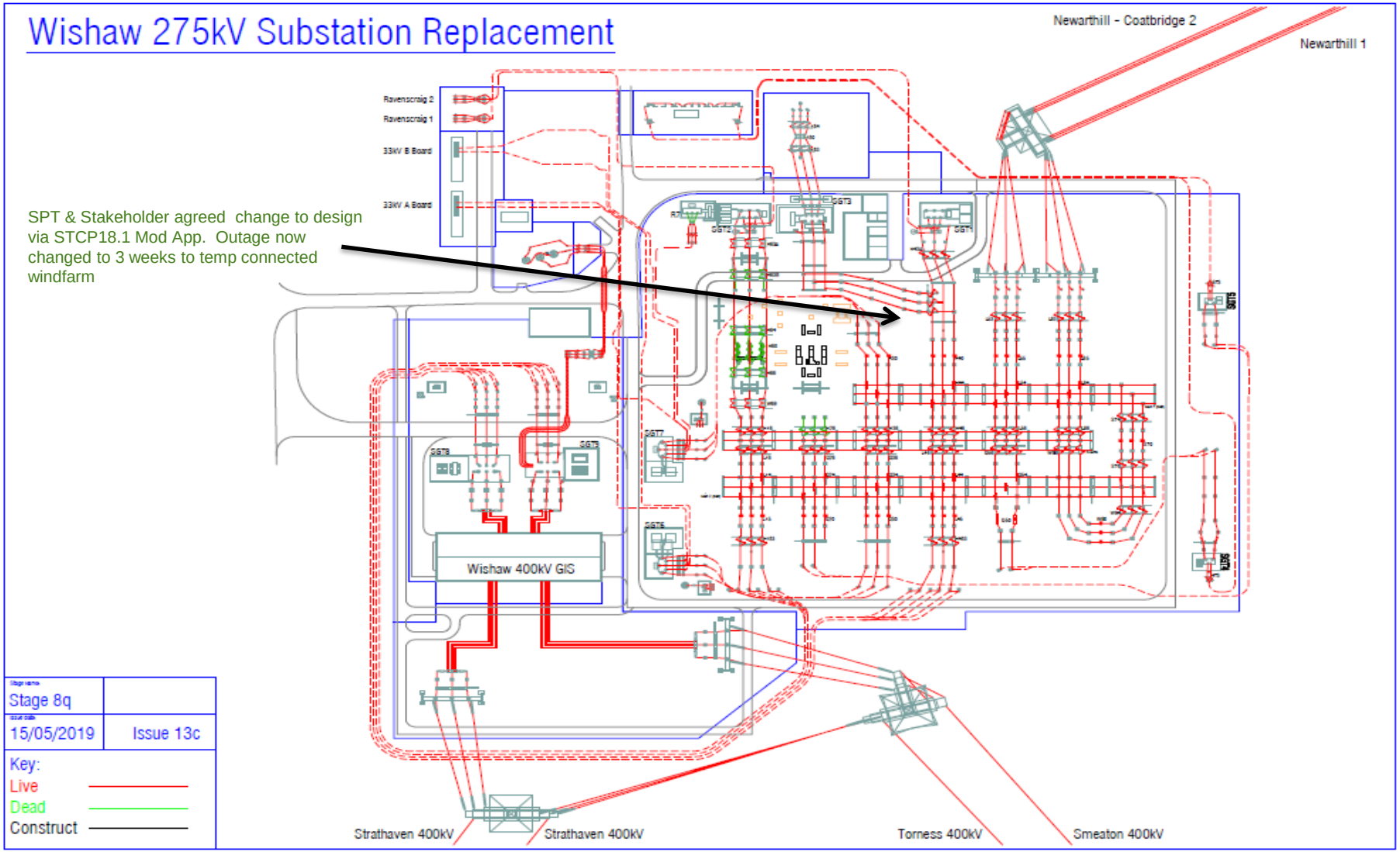
Wishaw 275kV Switchgear Modernisation Project – Original Stage 8 & 9



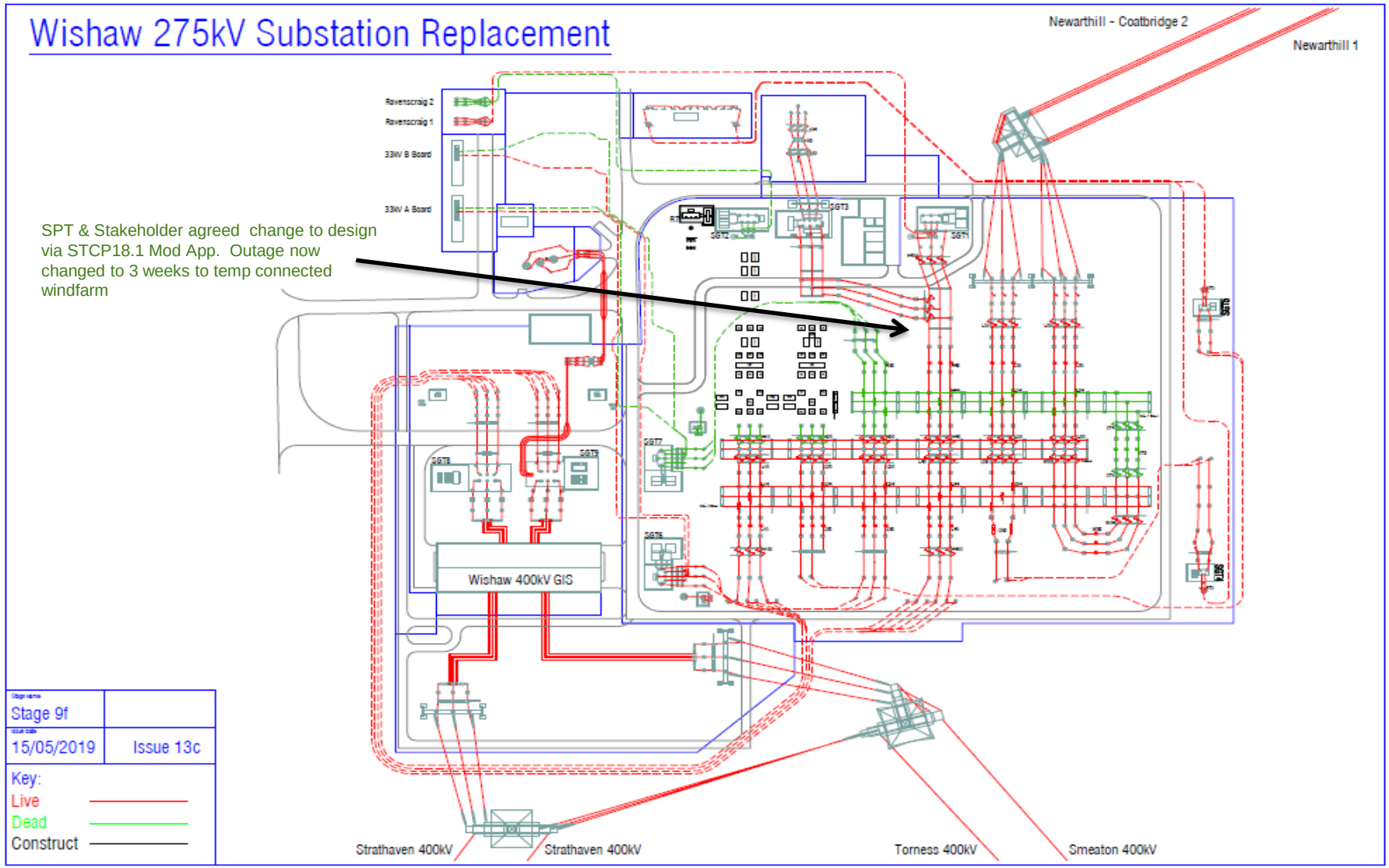
Wishaw 275kV Switchgear Modernisation Project – Original Stage 8 & 9



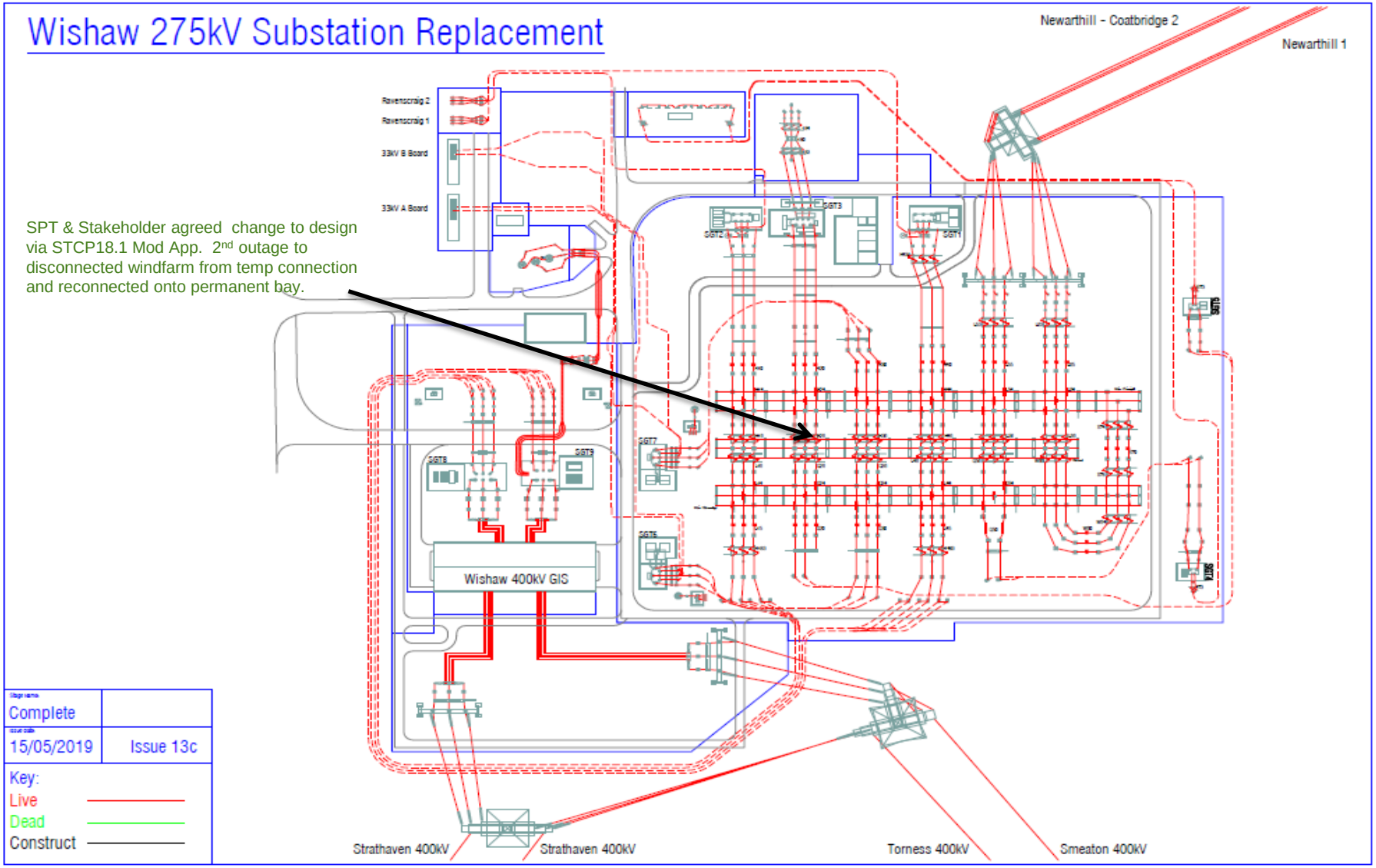
Wishaw 275kV Switchgear Modernisation Project – New Stage 8



Wishaw 275kV Switchgear Modernisation Project – New Stage 8



Wishaw 275kV Switchgear Modernisation Project – New Stage 8



What is the “Network Access Policy”

“This is just one of the many example of how SP Transmission has work with our Stakeholders and NGESO over RIIO-T1 with respect to network outage management and our vision of how we are prepare to work with you all to provide a level of service above the baseline specified in our industry codes”.

ANY QUESTIONS

LUNCH

SP ENERGY NETWORKS

SPT Connections Summit

5th December 2019

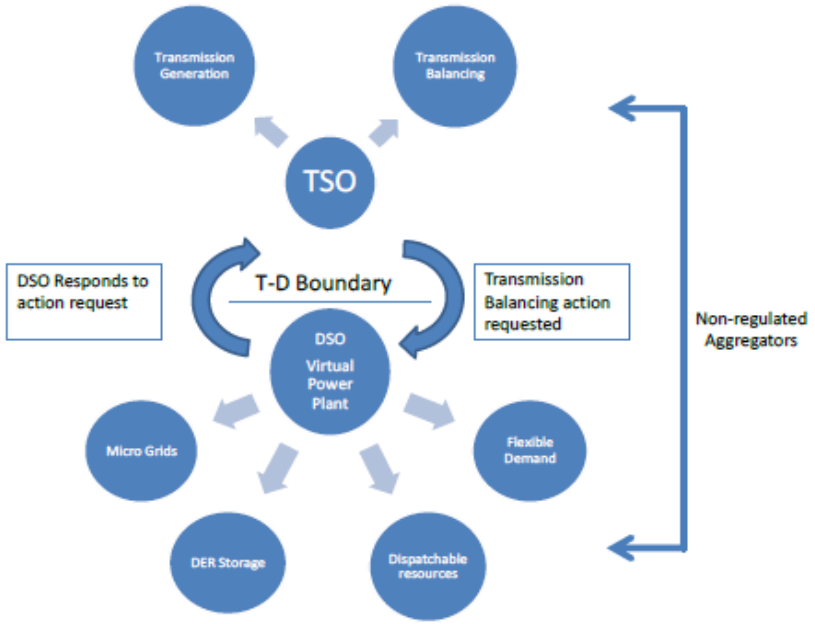
Distribution System Operator (DSO)

Graham Campbell

The Changing Energy Landscape

The way we generate, distribute and use energy is changing

- Decentralisation of energy
- Low carbon economy
- Electrification of heat and transport
- Minimising cost to the consumer



*"A **Distribution System Operator** (DSO) securely operates and develops an **active distribution system** comprising networks, demand, generation and other flexible distributed energy resources (DER). As a neutral facilitator of an **open and accessible market** it will enable competitive access to markets and the optimal use of DER on distribution networks to **deliver security, sustainability and affordability** in the support of **whole system** optimisation. A DSO enables customers to be **both producers and consumers**; enabling customer access to **networks and markets**, customer choice and great customer service"*

SPEN DSO Emerging Strategy

1. Develop a 'flexibility first' approach for all investment activities
Run tender opportunities for flexibility and platform development

2. 'Demonstrate through doing' the value of a DSO to customers
Focus on the delivery of our innovation projects into BAU and DSO implementation

3. Develop 'system operator' capabilities
Develop ESO – DSO commercial framework & demand and generation forecasting

4. Lead the industry in the provision of data for customer use
Embrace and address the recommendations from the 'Energy Data Task Force' report

5. Collaborate with industry to enable 'whole system' benefits
Actively participate in industry forums to make the transition a reality

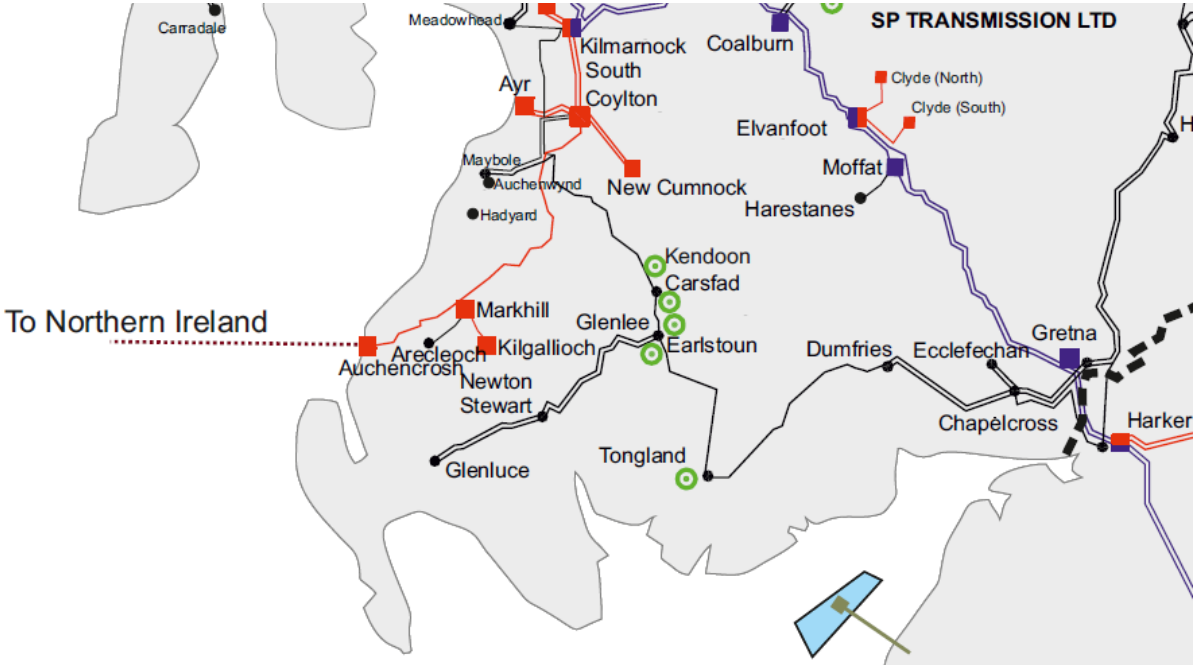
SP ENERGY NETWORKS

Dumfries & Galloway

Active Network Management – A Key Enabler for DSO

Graham Campbell

Centralised Active Network Management Scheme – Dumfries & Galloway



- Successful IRM bid Leveraging ARC learning
- Commission 2020
- Supports transition to DSO
- SPD Wide Centralised ANM

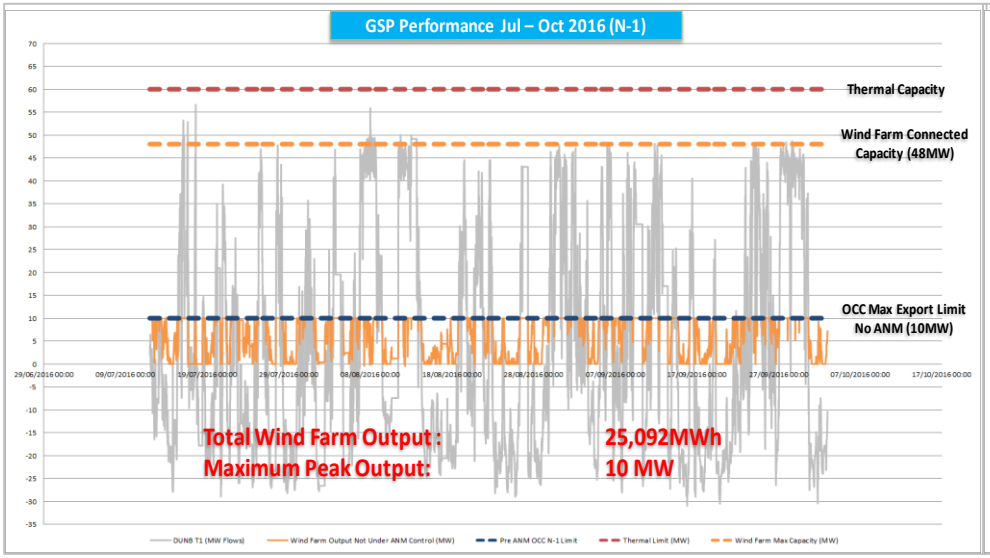
11 GSPs (with the capability to be rolled out across SPD's network area)
Managing up to 300MW of connected and contracted generation

Designed to alleviate transmission constraints using DG and the first to interface with the SO

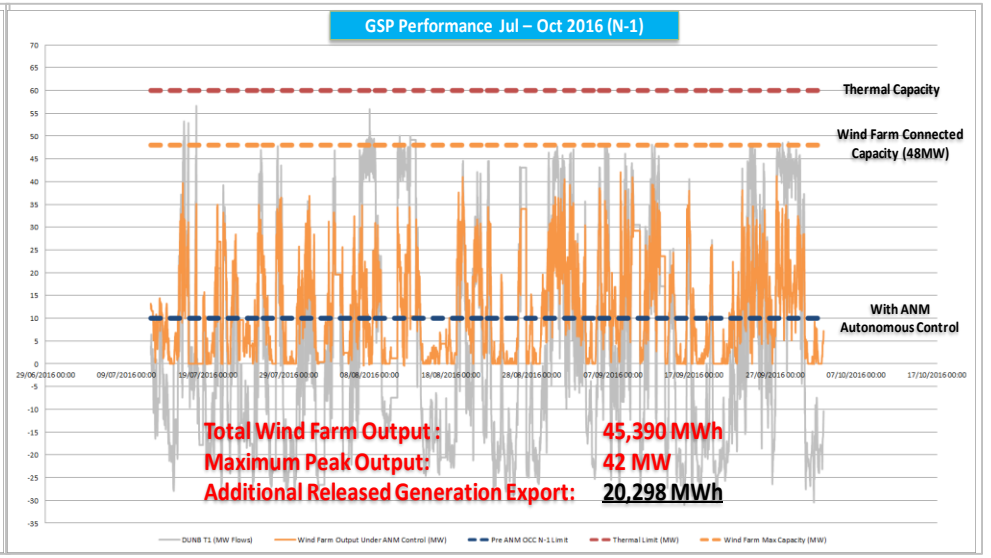
The first multi-GSP ANM scheme of this scale in the UK

ANM Operations

Export Limit

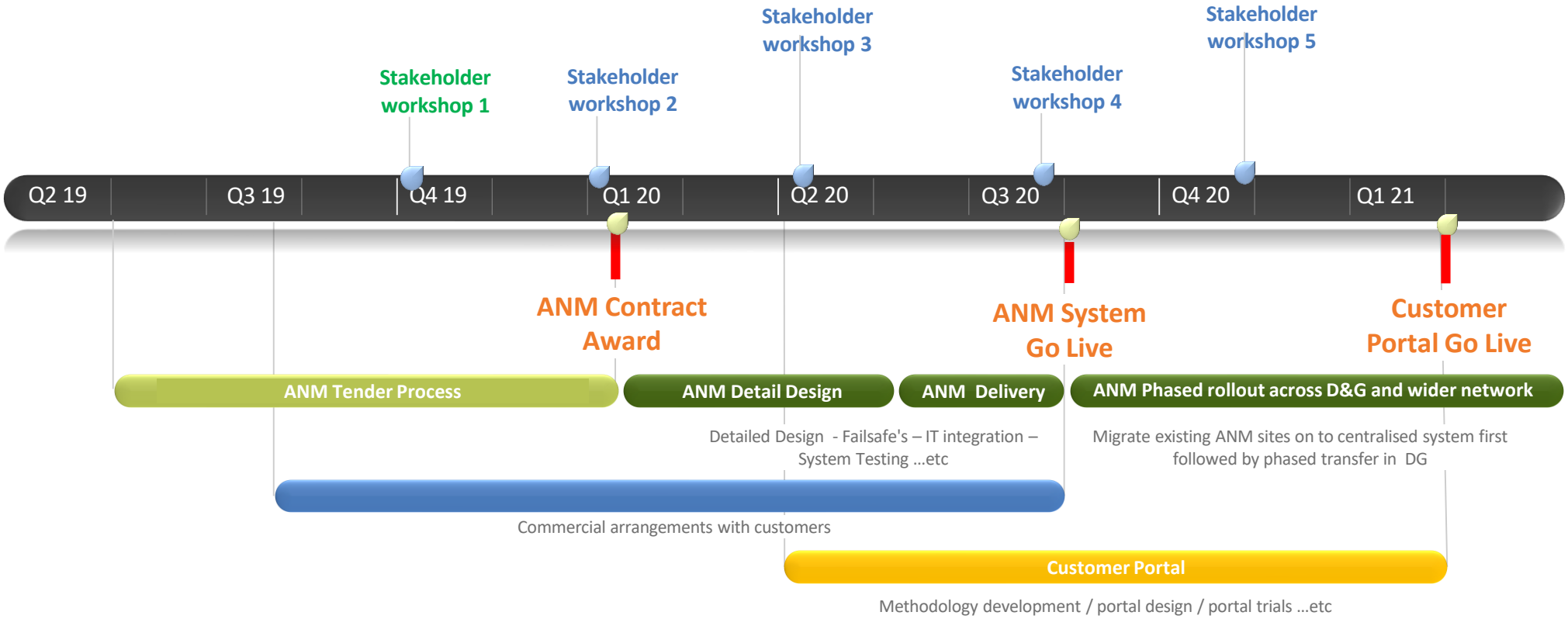


ANM Control



- ANM allows additional generation to export through real time monitoring and control
- Customers are managed through a series of set points which allow time for them to ramp down without the hard trip of LMS
- Enabling ANM will typically cost £50-100k plus any site specific telecoms costs, however, the upside revenues could be significant

Timeline of Dumfries & Galloway Distribution ANM Project



- Transmission GEMS solution to be implemented 2021-23 – providing commercial compensation for Transmission curtailment

- Kendoon – Tongland Reinforcement (KTR) implemented 2023 – build solution mitigating a number of key Transmission network constraints

SP ENERGY NETWORKS

DSO

‘A Day in the Life Of’

Graham Campbell

A ‘DSO’ Day in the life of

‘Domestic Prosumer’

6.00am

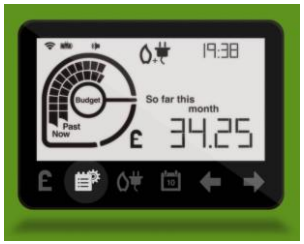
The Morning Routine
Tom jumps in the shower, using hot water heated in yesterday’s strong sunshine and stored in his storage tank overnight. His house is comfortable 20deg, kept cool using his AC unit powered from the storage battery in his garage, charged from the solar panels on his roof yesterday

7.00am

Leaving for Work
Before leaving for work, Tom loads the washing machine and dishwasher and set them both to complete by 5pm. This information is relayed to his ‘Home Smart Hub’ which will schedule both machines to run at the most efficient time, either through price signals or use of his solar panels

7.15am

The EV
Tom gets into his EV ready to go to work and notices it only has 75% charge. That is ok though, more than enough to get him to and from work. Last night Tom set his car to reach a minimum 75% whilst allowing any additional requirements to be used flexibility by the local DSO to facilitate neighbouring EVs set to 100%



1.00pm

‘Smart Home Hub’
Tom’s ‘Smart Home Hub’ receives a signal from the local DSO to use excess electricity on the system due to solar generation. The Hub switches on both the dishwasher and washing machine using power generated locally whilst diverting power from Tom’s solar panels to charge the storage battery, ready to power the AC unit later in the day

5.35pm

Community Energy
Tom arrives home from work and plugs in his EV. Tom doesn’t need hi car tomorrow so allows his ‘Smart Home Hub’ to be flexible with the electricity in his EV and storage battery to participate in any flexibility needs from the DSO through the night. Last week he received £2.50 in credit from doing the same!

‘Community Energy Scheme’

7.00am

Arrives at the Office
Helen arrives at the office and notices how calm it is after such a windy night. She see's that the wholesale price was low overnight and as a result the DSO has charged the community storage battery to over 90%. With it being so calm now, she sees a great opportunity to use this power flexibly to support local constraints

7.30am

Local CHP Scheme
Helen monitors the output of the community Combined Heat and Power (CHP) plant. It is nearing maximum output due to the increased need for both electricity and heat locally now that the wind has gone and the temperature has dropped markedly.

1.00pm

Constraint Management
The local DSO requests access to the community battery later on in the afternoon. There has been a fault locally and the DSO is concerned about peak demand due to the cold weather and lack of wind generation. The Community Energy control system schedules the batter to be available from 4.30pm, to be used a the DSO’s discretion

4.30pm

The Community
The constraints are worse than forecast so the Community Energy control system seeks to access domestic storage and EVs to support local demand through its community members. The DSO offers a healthy price that the Community Scheme can past onto its members. Some ‘Home Smart Hubs’ respond positively, others don’t based on need

6.00pm

‘Run of River’ Hydro
Its been another successful day. The Community Energy control system reports a healthy profit for the day and with ore wind forecast overnight is predicting a full charge in the battery by the morning. Another month of similar success and the community will be able to realise its ambition of installing a ‘run of river’ hydro scheme

‘DSO – Distribution System Operator’

7.30am

Arrive at the Office
Arriving at the office of the DSO, the control team review what happened on the system during the night. Nothing of any concern has been reported by the duty manager. Wind speeds were very high so a large volume of power was generated. The DSO was able to offer services to the ESO using DER assets on the system

9.30am

Network Faults
The wind has dropped and its turned much colder. The morning peak demand was managed using flexibility both in storage and demand. It has cost a little but the net position is good after the services purchased by the ESO through the night. The control system seeks demand flexibility ahead of the afternoon peak following two local faults

12.00pm

ANM System
The ANM system forecasts the weather to turn colder and demand to increase further than expected. The system seeks further flexibility locally to manage demand at peak. It accepts bids from aggregators managing public EV charging and community energy schemes to reduce demand through ‘Smart Home Hubs’. Its going to be tight.

4.25pm

Voltage Support
The DSO system has met its requirements to meet the forecast demand at peak. It receives a request from the ESO for voltage support services through the T / D interface. The local balancing platform accepts bids that do not conflict with other actions. Elsewhere the DSO uses network assets to reduce voltage through active management of transformers

5.52pm

Overnight
Peak demand has been managed with no issues, although it has cost the DSO more than forecast due to additional flexibility procured to support the unplanned faults earlier in the day, albeit offset slightly by the support provided to the ESO. Wind speeds are forecast to increase again overnight so the DSO responds by offering demand support services through DER assets

SP ENERGY NETWORKS

5th December 2019

Competition in Onshore Transmission

Lynne Bryceland

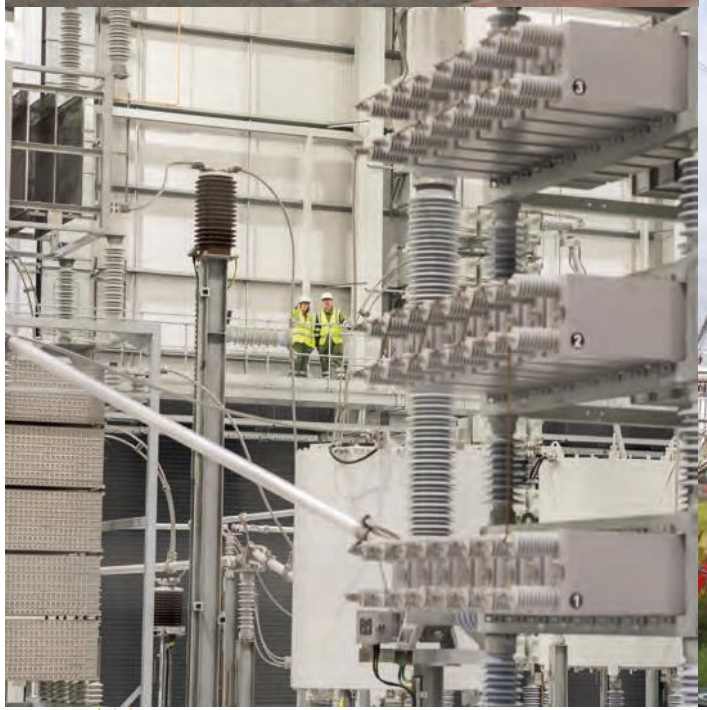
RIIO-2 Competition - Overview

- Ofgem is committed to “Extending Competition in Electricity Transmission”, using market driven forces to deliver consumer benefits.

- In SPT, we already embrace competition with **~ 96%** of all of our regulated transmission construction activities competitively tendered and delivered by the market.

- Ofgem wants to move beyond competition in a natural monopoly, to introduce new delivery models. This is heavily based on the experience of the OFTO regime.

Competition in transmission currently looks like this



Competition in transmission could potentially look like this in the future….

Competition proposals for RIIO-T2

Ofgem is proposing **2 different forms of competition** in RIIO-T2:

Early and **Late** Competition which will introduce new delivery models and players into the design, construction and operation of new transmission assets:

- Why is this of interest to you, our customers?
  - It could have an impact on who designs, builds and operates the transmission asset that will facilitate your connection;
  - New delivery models may be used for the delivery of new transmission assets facilitating your connection;
  - Market driven tendering in the appointment of 3rd parties is likely to feature heavily;
  - SPT may no longer be involved in the delivery of your connection.

RIIO-2 Competition – 'Early' Competition proposals

*"**Early competition**, where a competition is run ahead of the project design process to reveal the best idea to meet a system need, may reveal non-network (and flexibility) solutions".*

- Projects potentially eligible for Early competition:
  - **Value – projects of £50m+**
  - **Contestability of solutions – are there different solutions to a network issue?**

- Ofgem has tasked the ESO with developing an Early Competition Plan which will propose different early competition delivery models.
- ESO exploring **Very Early** – design only (Competition for Ideas) and **Early** - design, build and operate models.

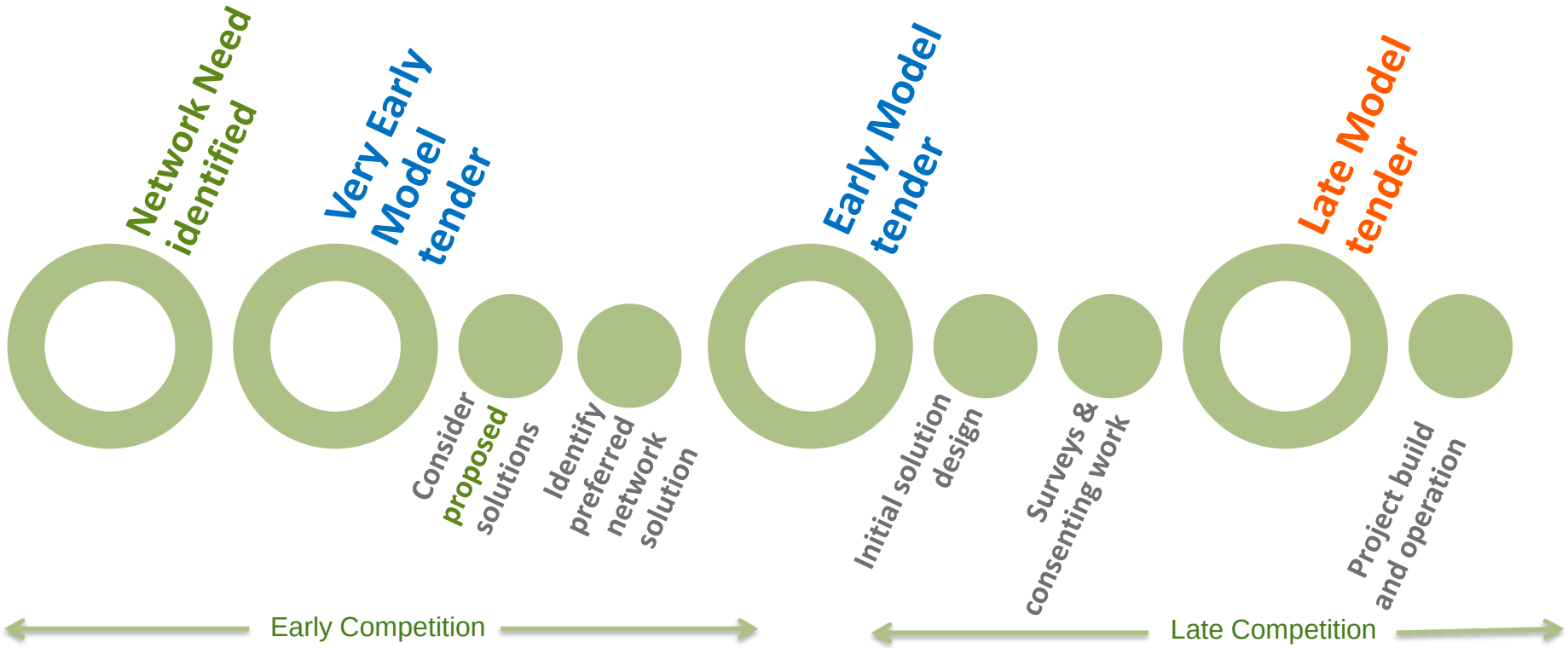
RIIO-T2 – Late Competition Models

- *"**Late competition**, where a competition is run later in a project's lifecycle. Could be after a solution has been identified but ahead of construction and operation, or after construction and ahead of operation".*

- Projects potentially eligible for Late competition
  – new, separable and high value (£100m+).

- **Competition Proxy Model (CPM)** – TO plans, delivers and operates asset, outside of SWW process, at lower WACC.
- **Special Purpose Vehicle (SPV)** – TO tenders for a 3rd party to finance, build and operate asset for 25yrs. TO owns the asset throughout.
- **Competitively Appointed TO (CATO)** – 3rd parties to build, own and operate assets as a licensee *(requires legislative changes)*.

RIIO-T2 – Proposed Competition Process



Some projects could be eligible for both **Early** and **Late** Competition models

Potential impacts of these competition models

- These competition models could facilitate further innovation into the design and delivery of new transmission assets.
- New market players, currently not operating in the electricity transmission sector, may be attracted to this market.
- Heavy reliance on tender exercises and contractual negotiations with 3rd parties could potentially delay necessary network reinforcements and/or lead to cost reopeners.
- The operability of our network could be impacted if third parties own and/or operate segments of the transmission network.

Next Steps – Early and Late Competition models

- Ofgem is to Late Competition models in RIIO-T2 and is leading on their design. We await further details.
- ESO is developing an Early Competition Plan with proposed Early Competition models, to be submitted Feb 2021.
- We will continue to engage with both Ofgem and the ESO as the models are developed.

- In SPT's view, any new Competition delivery model must:
  - **deliver greater consumer benefits than status quo** arrangements;
  - **not delay** the delivery of transmission assets;
  - continue to put our **customers at the heart of network development.**

SPT Connections Summit

5th December 2019

Eastern HVDC Link (TORI-126)

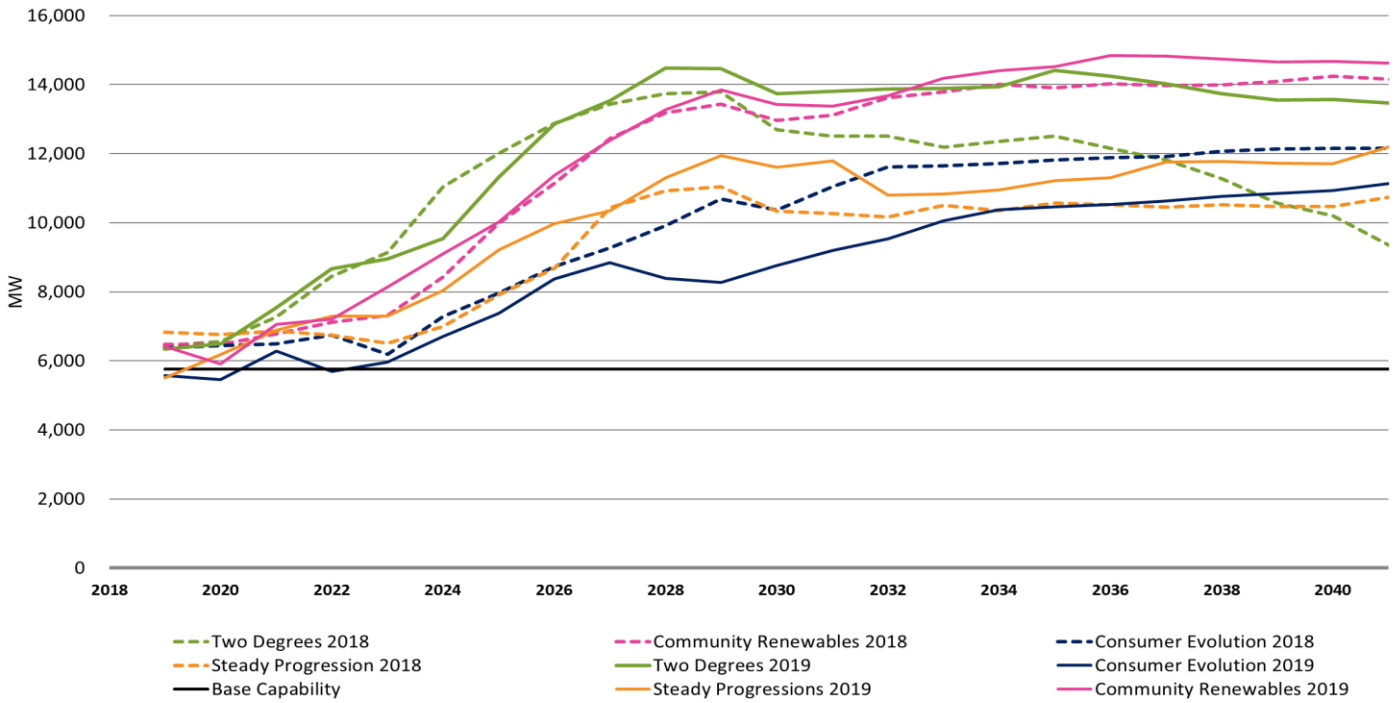
Presenters:
Kirsten McIver (Lead Design Engineer)
Marcos Israeliantz (Senior Project Manager)

1. PROJECT BACKGROUND

System Requirements

- Required System Capabilities are determined in accordance with National Electricity Transmission System Security and Quality of Supply Standard (NETS SQSS)

National planning scenarios

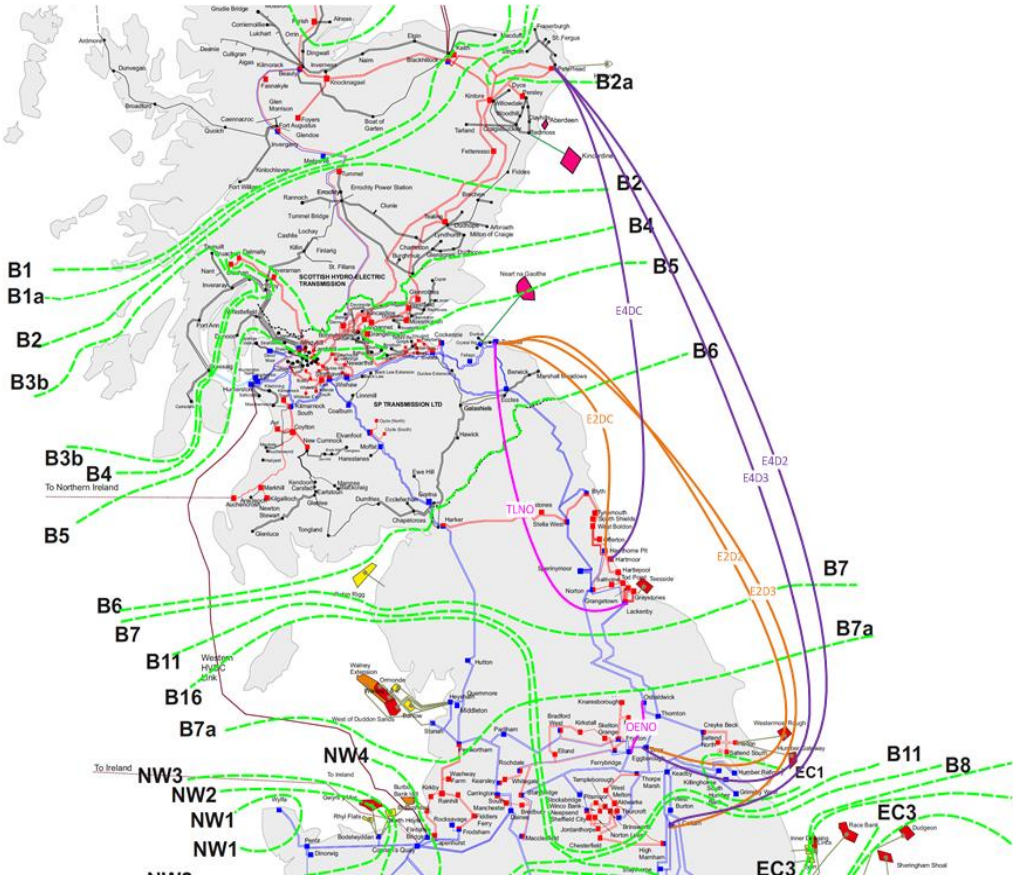


System Requirements

- TOs submit options that aim to meet required transfers to NOA
- Economical assessment of Project CAPEX against the predicted constraint costs based on FES
- Recommendations are made via the NOA report to the TOs on how to invest in the coming year
- Significant generation growth results in recommendation for significant onshore and offshore reinforcement

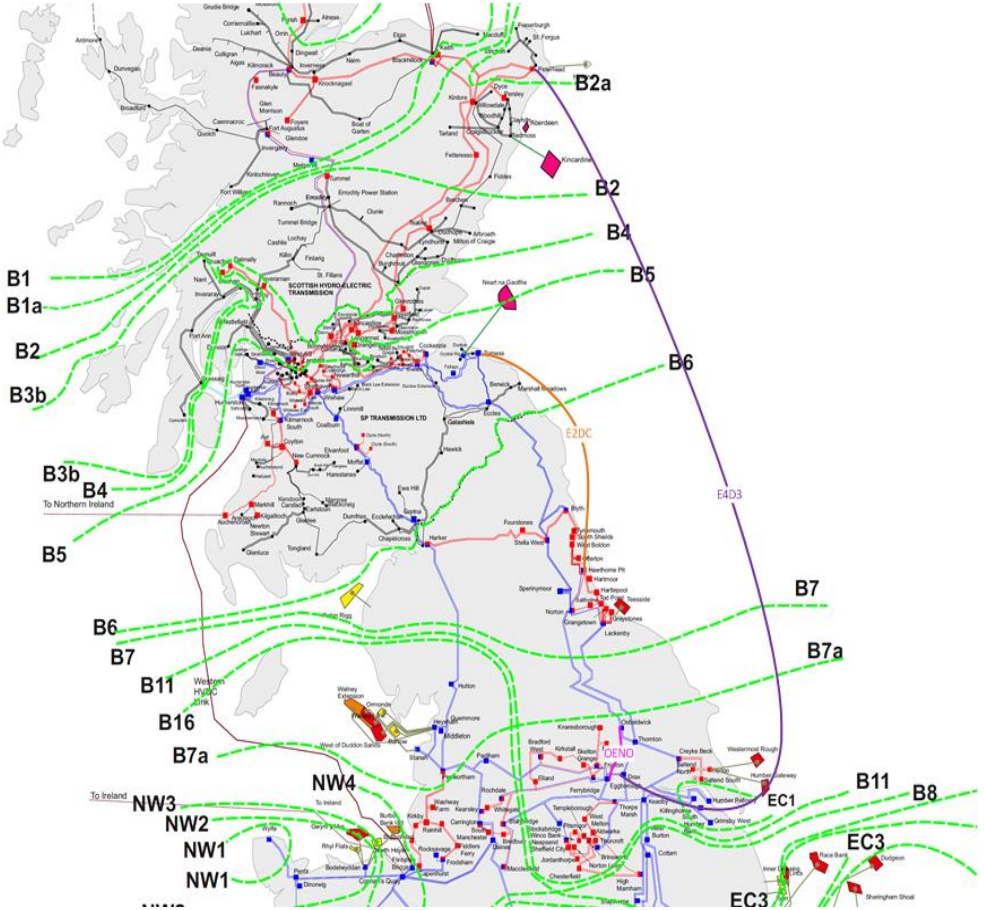
Large Reinforcement Options in NOA4

- Combinations of 2GW Eastern Links have been recommended by the NOA process since NOA1
- Economic assessment both NOA and externally have indicated TWO 2GW subsea HVDC links are required
- Fixed Scottish landing points:
  - Peterhead (SHE Transmission)
  - Torness (SP Transmission)
- Further work to determine southern landing point:
  - Hawthorn Pit
  - Drax
  - Cottam



System Requirements

- Currently working with SHE Transmission and National Grid TO to determine preferred links, and submit Initial Needs Case to Ofgem
- Preferred links currently:
  - Torness to Hawthorn Pit, 2027 delivery
  - Peterhead to Drax, 2029 delivery
- Each link will lead to significant boundary capability increase, allowing greater access to transmission system for renewable generation



2. PRE-CONSTRUCTION UPDATE

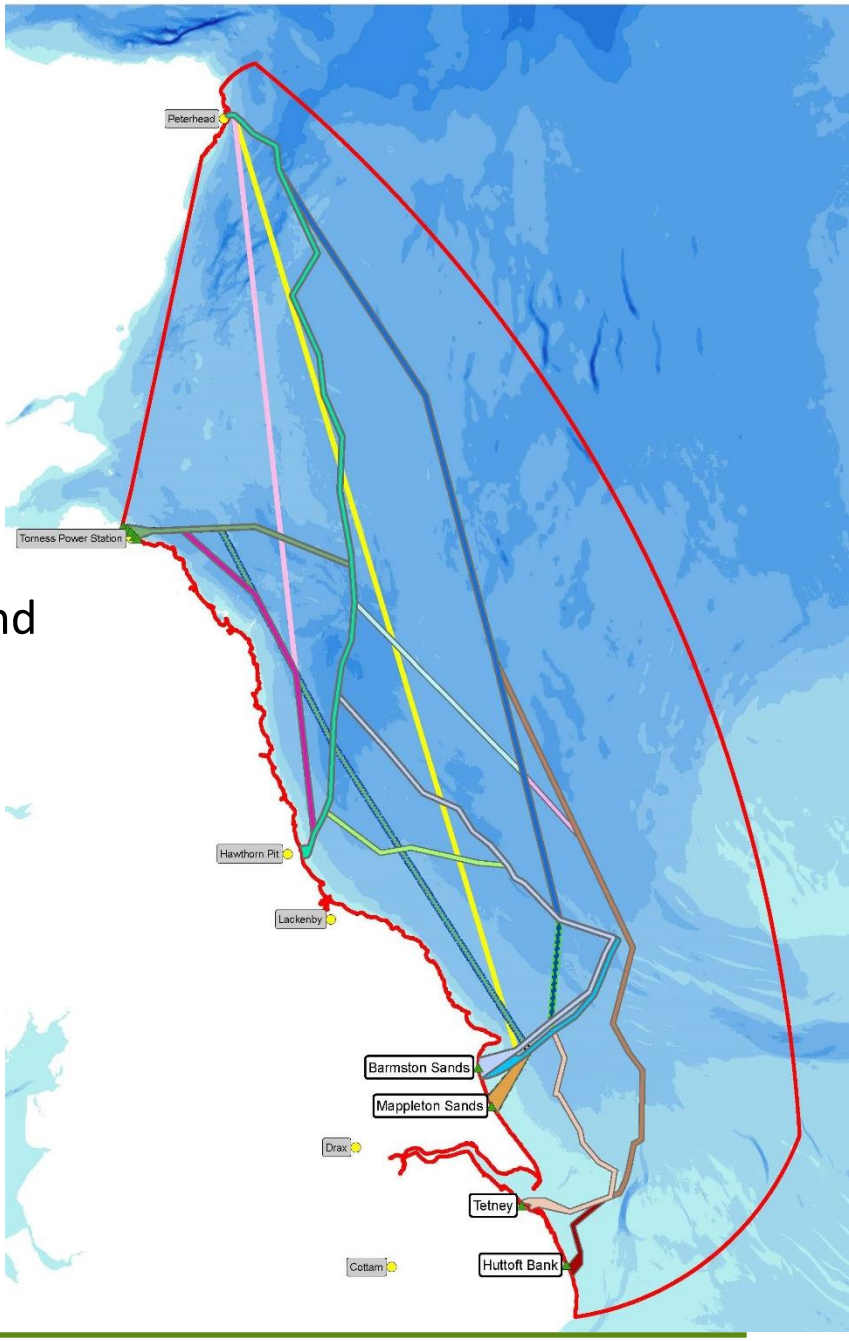
Consents and Environmental

Off-shore Routeing

- Six strategic options identified at Phase 1
- All six routes are being refined further in order to establish preferred routes by Dec 19 / Jan 20
- Initial meetings held with consenting authorities and statutory agencies
- Sea bed survey tender
  - PQQ responses received
  - Tender to be published towards end of Jan 2020
- Working to engage a Fishery Liaison Officer (FLO)

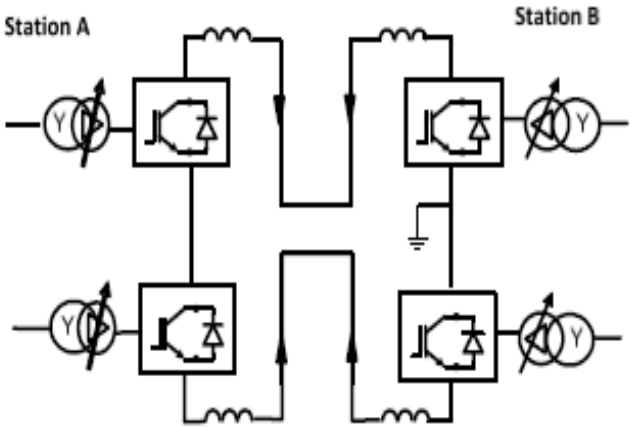
On-shore Routeing

- Progressing routing and studies to identify prefer locations for landing point, converter station and connecting AC sub-station



Technology

- The 3 partner TO's working assumption for CBA purposes is a 2GW, +/-525kV, bipole technology solution
- Engaged with market via a RFI, output of this is being compiled into a technology status report
- Preparing Technology selection report
- Once the above are completed focus will moved into design and the development of technical specifications
- Outcome of NOA5 review could change the above as it may call inclusion of a return cable



Bipolar – No metallic return

Next steps

- Secure permits for sea bed survey
- Tender and complete sea survey
- Identify on shore preferred locations (sub-station and converter station)
- Complete technology exercise
- Submission of Initial Need Case to Ofgem
- Submit off-shore and on-shore planning applications

SP ENERGY NETWORKS

5th December 2019

Transmission Summit

Generation Export Management Update (GEMS)

Diyar Kadar
SPT System Design

Background

Significant amount of contracted generation in south west Scotland and not sufficient transmission capacity.

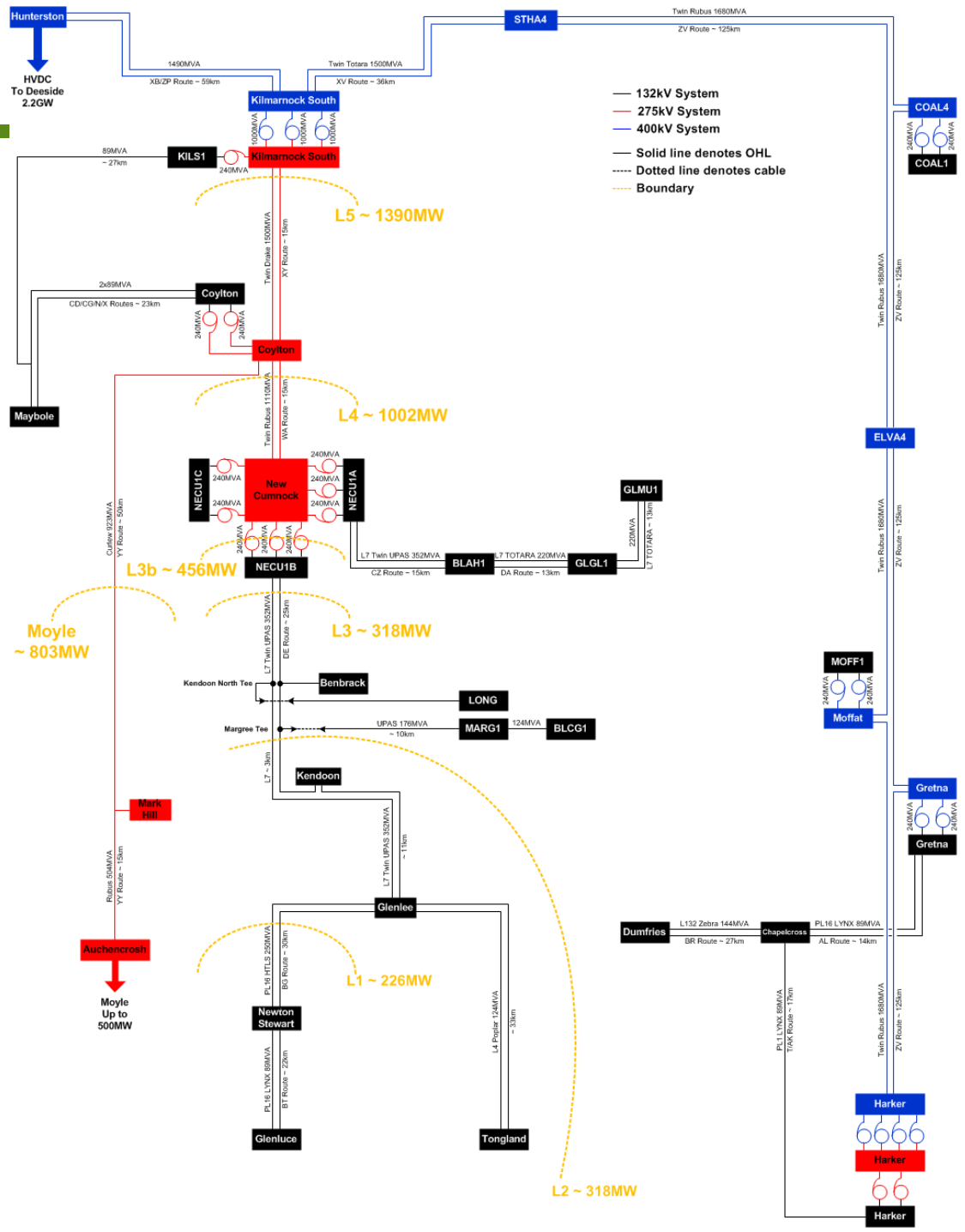
Reinforcements option was submitted to Ofgem as part of Strategic Wider Works in 2016.

This proved to be uneconomical due to the significant capital cost compared to constraining generation

Subsequently derogation from NETS SQSS for boundaries 1 to 5 was submitted by SPT to Ofgem.

Derogation was granted in 2019 to 2026.

Generation output will need to be managed whilst developers remain commercially whole.



Generation Background

	2017 (MW) (when Derogation was submitted)	Now (MW)	Variance
Connected	1107	1272	165
Contracted and consented	735	1807	1072
Contracted but not consented	920	1236	316
Total	2762	4315	1553

No signs of slowing down in onshore developments, in two years the contracted generation has increased by more than 1.5GW.

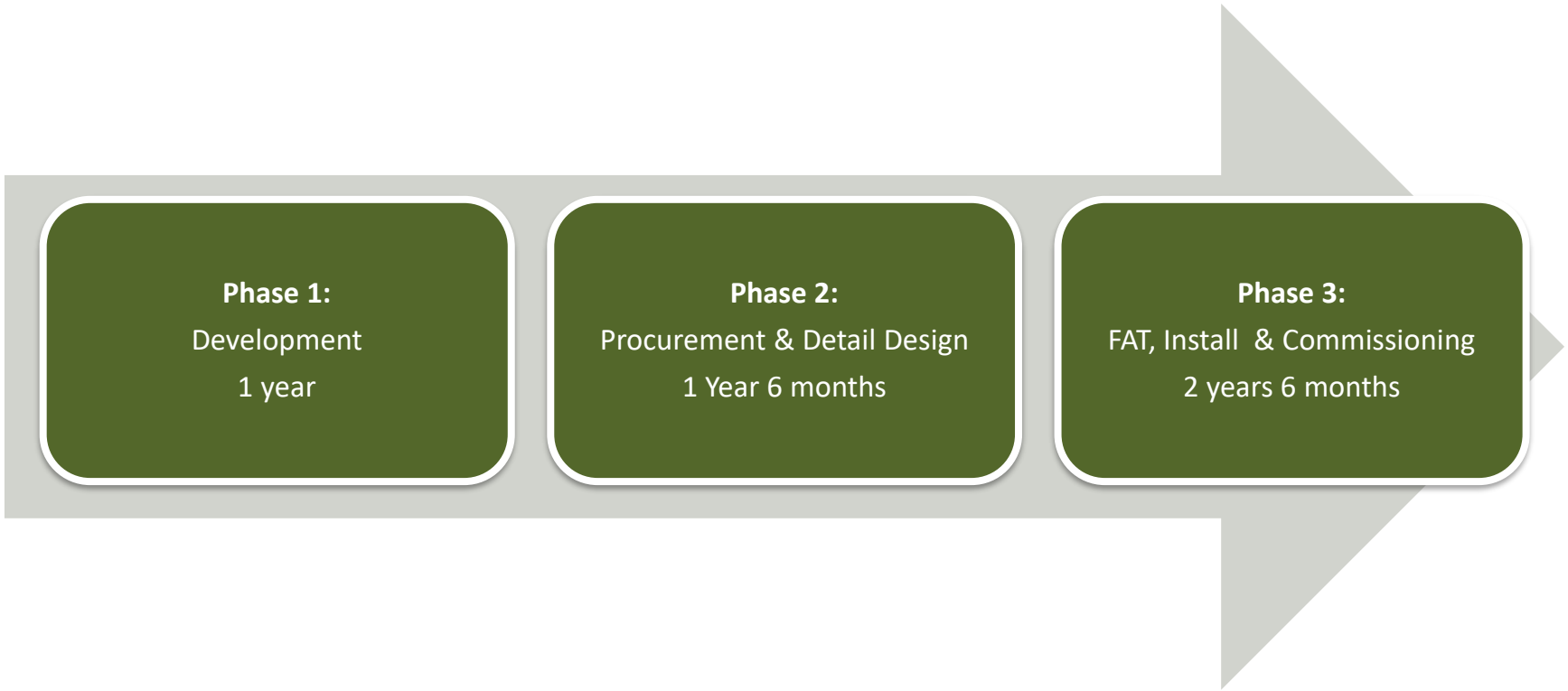
Re-powering offers are being issued, it is fair to assume these will be requesting increased TEC.

Although local constraints already exist on the system and are managed by LMS schemes, GEMs will manage constraints from Q2 2022.

It is anticipated that another 735MW will be added to the system between now and the introduction of GEMS

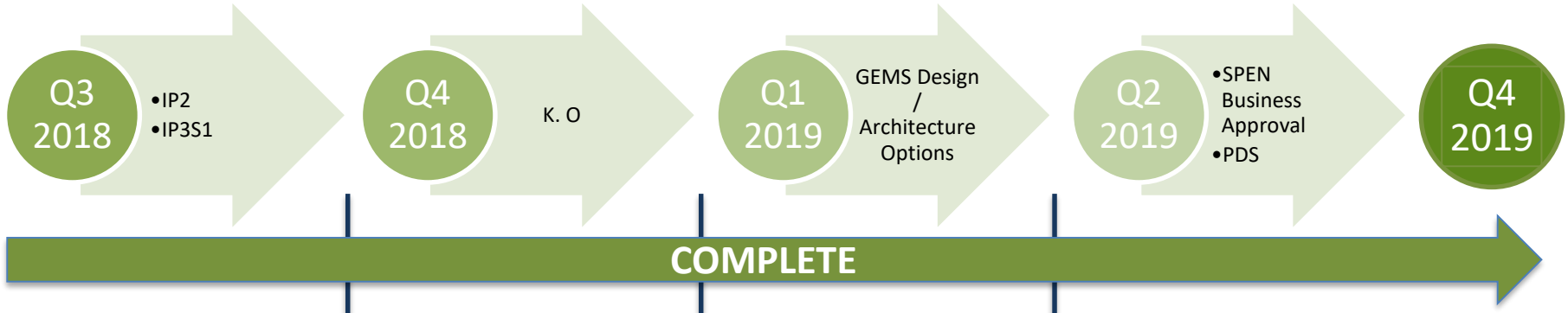
GEMS Timeline

Project Aims: To develop **non-build solutions** to manage the SWS Transmission system to enable future generation connections in collaboration with NGESO. This will be progressed with developers and involve new commercial arrangements.



GEMS Timeline

Phase 1 - Development



- IP2 Technical Approval
- IP3S1 - Initial funding approved for design development
- NGESO Functional Requirements produced

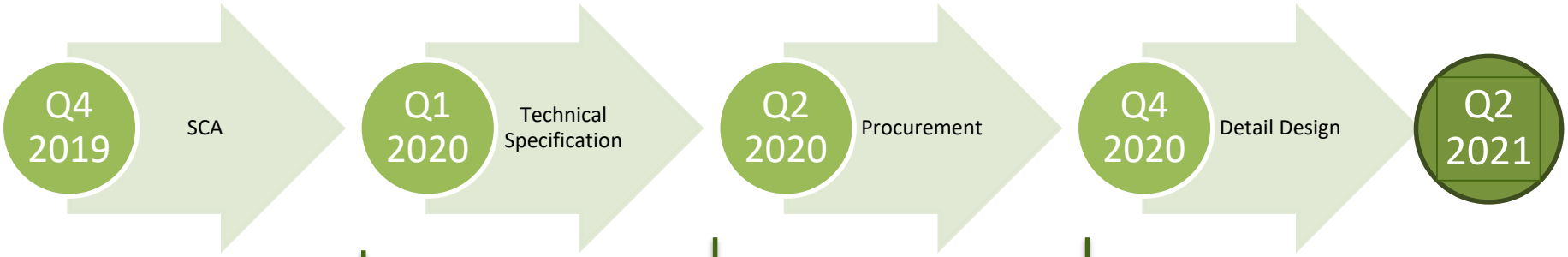
- GSS KOM – 14/11/18
- NGESO KOM – 18/12/18
- GSS NDA in place

- NGESO Workshop 13-14th January 2019
- Interface meeting with SPD & NGESO
- GEMS Architecture options
- Project Programmes aligned
- Project meetings

- SPEN Business Approval
  - Workshop with key SPEN stakeholders
  - Agreement on architecture
- PDS based architecture

GEMS Timeline

Phase 2 – Procurement & Detail Design



- Design Functional Specification
- SCA based on chosen architecture

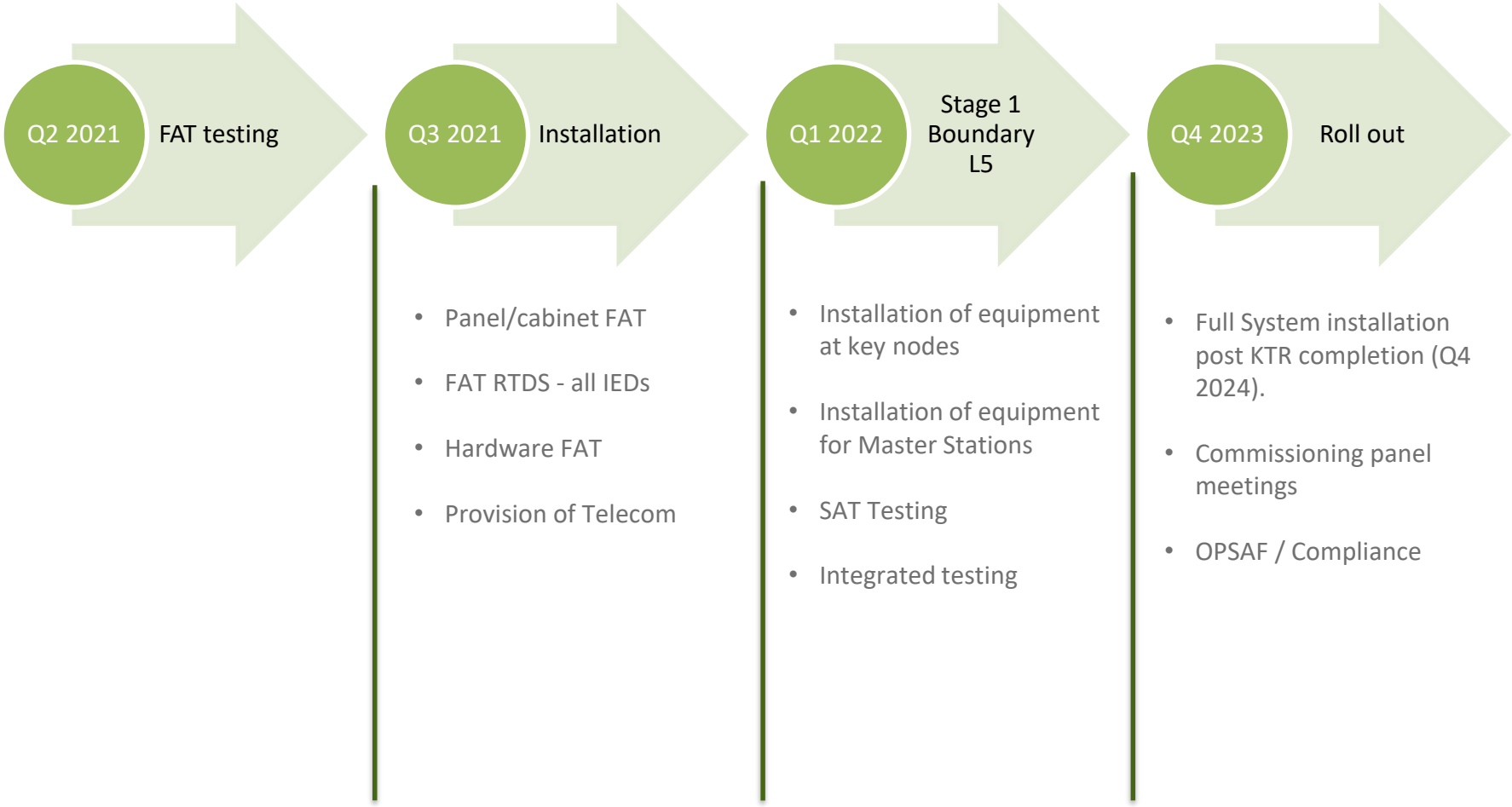
- Technical Specification kick off
- Issuing of Technical Specification

- Preparation of PQQ
- Create & Issue ITT
- Obtain & Review Responses
- Select Supplier
- Contract Agreement
- Supplier On Board

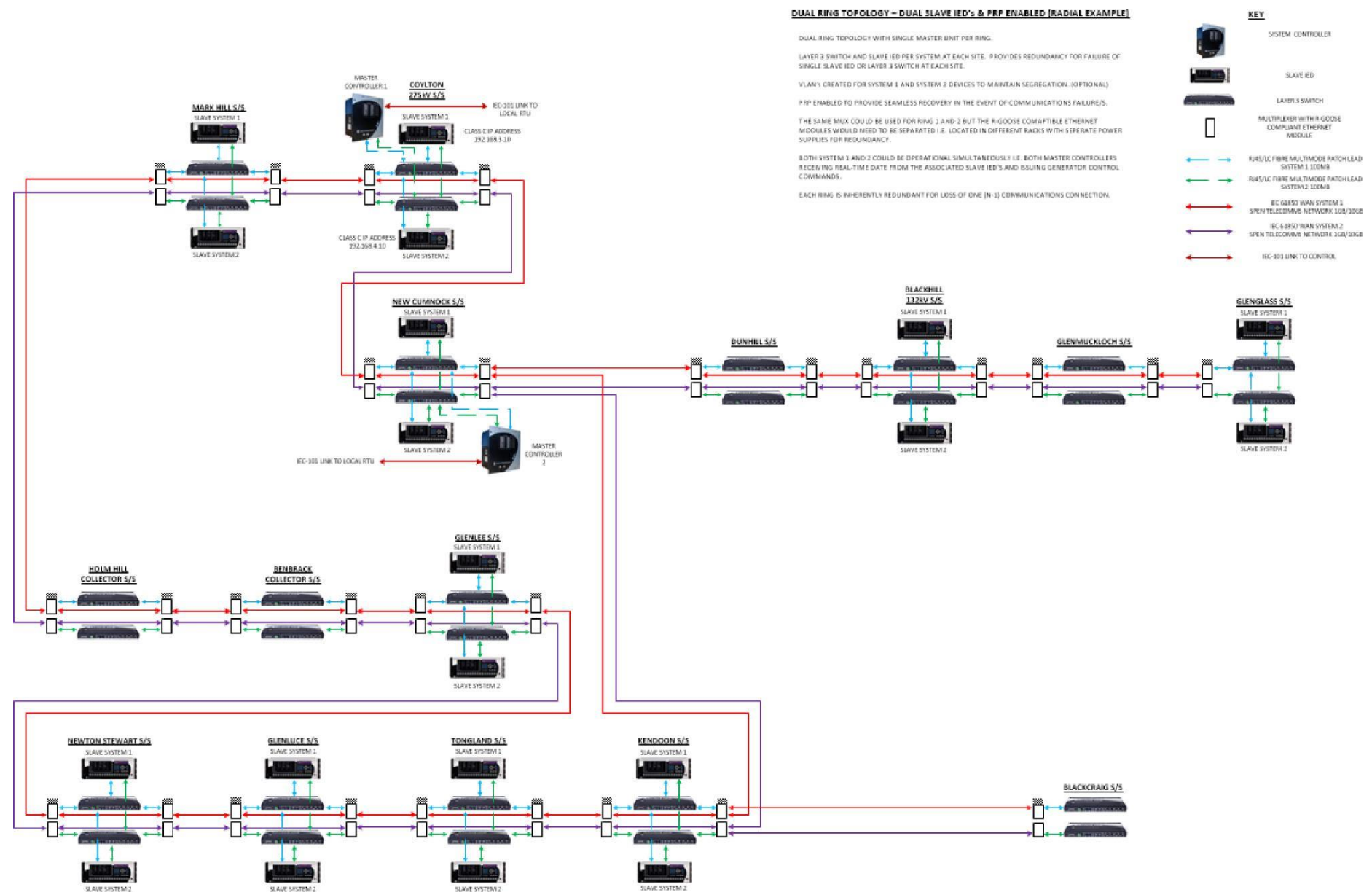
- Definition of hardware requirements
- Definition of software requirements
- Procurement of system level components
- Panel/cabinet manufacturing

GEMS Timeline

Phase 3 – FAT, Installation & Commissioning



Proposed Architecture



Proposed Architecture

The system is required for the control and protection of transmission assets whilst maximising generation output.

The system is required to interface with key users including ESO, SPD and developers.

The system will utilise IEC 61850 technologies which is key for substation digitalisation.

This introduces challenges of cyber security that need to be mitigated.

The technology will provide scalability and configurability that is necessary to allow the control of generation as and when they connect to any node in south west Scotland.

System will be dual redundant to the interface points with users.

System availability will be at least 99.99%.

Going forward

We are working closely with the ESO to ensure the timely delivery of the GEMS system.

We are updating our contracts with the ESO to reflect the requirements of GEMs and visibility and control of impacted generators.

We are continuously assessing further reinforcements and their economic viability.

We need to carryout another strategic review of the area in 2020 to consider our options post 2026.

This might lead to the extension to the derogation beyond 2026.

We need to continue engaging with the users to ensure your needs are met.

The Green Economy Fund

Jillian Violaris

5th December 2019

There’s been substantial press coverage

SP ENERGY NETWORKS

SP ENERGY NETWORKS

We committed to voluntarily contribute up to

£20 million

funding to initiatives that support Scotland's ambitious green energy plans.

WE'VE COMPLETED OUR SECOND ROUND OF FUNDING, POTENTIALLY SUPPORTING 33 GREEN PROJECTS ACROSS THE CENTRAL BELT OF SCOTLAND.

Key priorities of the fund

- **Heat**: Renewable and low carbon innovative solutions.
- **Transport:** Supporting the uptake and infrastructure provision of electric vehicles.
- **Local energy systems:** Local solutions to match generation and demand.
- **Learnings and data** to assess future impact of low carbon economy.
- **Economic and social impact.**

SP ENERGY NETWORKS

Total to date

R1:12
projects supported totalling
£5.6 million

R2:21
projects supported totalling
£10.1 million

R3:3
projects identified totalling
£.4.3 million

£20 million

committed to Scotland's Green Economy

Projects up and running…

South Ayrshire Car Club

Sanctus Media – What's Up APP

Driving the Decarbonisation of Transport

SP ENERGY NETWORKS
ScottishPower Group

20 Large Electric Vehicles, including Refuse Collection vehicles, Minibuses, Single decker's and vans introduced.

e-bike infrastructure/Bikes in Edinburgh, and Central Belt

The development and deployment of two innovative e-Cargo Bike projects

TRANSPORT

Boosting Innovative Heat Projects

SP ENERGY NETWORKS
ScottishPower Group

£4m

Invested in heating, renewables and fuel efficiency projects

CLYDE GATEWAY
Building the Legacy

District Heating Scheme - The largest award to date (£2.1 million) to Clyde Gateway of the first phase of larger scale at Dalmarnock.

WARMWORKS
Scotland

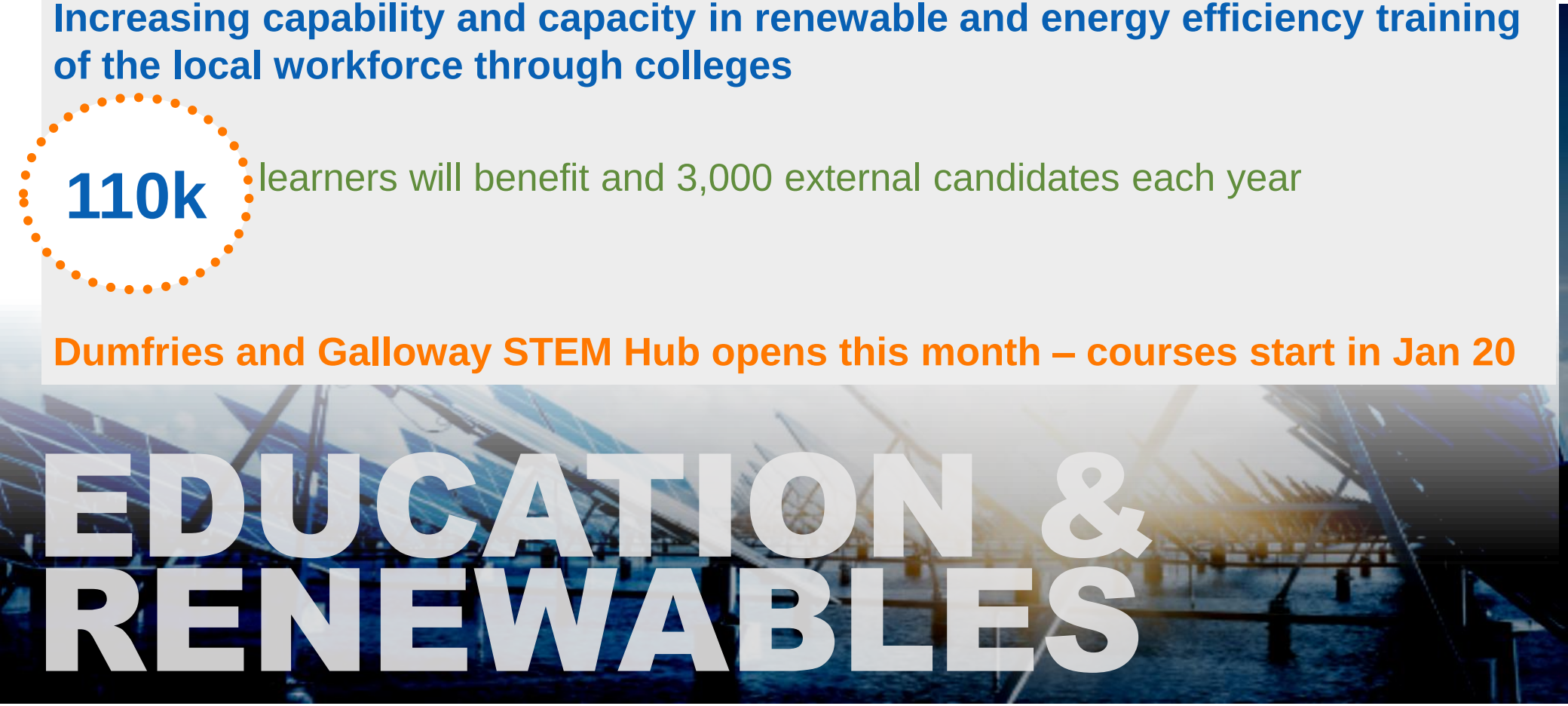
Installation of batteries – by Warmworks Scotland to over 100 off gas social housing stock in Dumfries

SP ENERGY NETWORKS
ScottishPower Group

Increasing capability and capacity in renewable and energy efficiency training of the local workforce through colleges

110k learners will benefit and 3,000 external candidates each year

Dumfries and Galloway STEM Hub opens this month – courses start in Jan 20



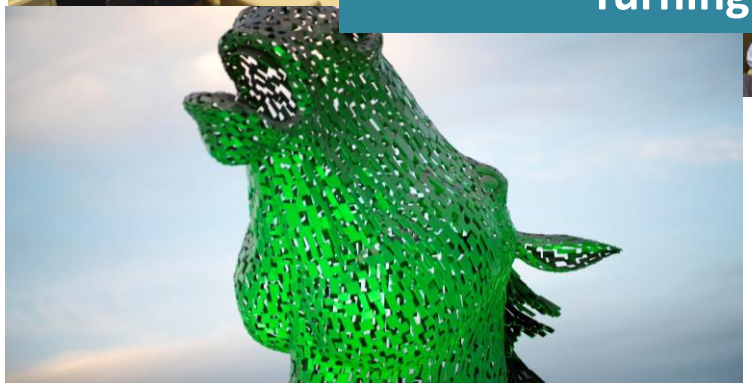
SP ENERGY NETWORKS

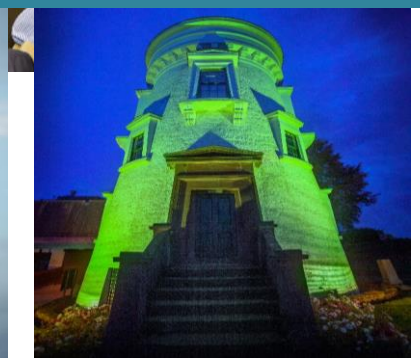
Stimulating the Net-Zero debate in policy, regulation and investment

Our T2 Business Plan sets our plan including

A new Net Zero Fund Proposal

Turning Scotland's Landmarks Go-Green!





And finally fingers crossed

The GEF is nominated for two prestigious awards…

SP ENERGY NETWORKS

THANK YOU

GREEN
ECONOMY
FUND

QUESTIONS & THANK YOU

Gareth Hislop will take questions from the floor.