Powering Wales Renewably - Use Case Definitions

Introduction

The purpose of this document is to provide definitions for the identified Use Cases for the Powering Wales Renewably project as a combined output for Work Package 3 – tasks 3.1, 3.2 and 3.3.

The document sets out to provide a description of each Use Case, definitions of the problems each Use Case looks to resolves, how this may be achieved and how the benefit may be realised by each stakeholder group. User Stories in the form of Personas have also been developed, and are included within an appendix at the end of this document.

Source information has been taken from the output of the workshops held in Work Package 1 and the customer personas information produced within Work Package 2.

The recommendation is to deliver a proof of concept for Use Case 1 within the Alpha phase, then to evolve this as well as deliver the other Use Cases in the Beta phase of the project.

Use Case 1 – Whole Electricity System Foundation

Description

The objective of this use case is to deliver the first common intelligent model of the 'whole' electricity system of Wales, jointly defined with stakeholders from across the electricity system value chain. This will support the delivery of the Welsh Government's decarbonisation plans and accelerate integration of renewables whilst also delivering the first integrated Distribution and Transmission network model for the Virtual Energy System.

Problem Definition

1. Stakeholders lack visibility at a connection level of the full upstream network status (capacity headroom, existing Distributed Energy Resources (DER), constraints, reinforcement planned, and connections queue), at incremental distribution and transmission voltage levels.
2. The planning and delivery of DERs is not an efficient process. It is difficult for Small to Medium Enterprises (SMEs) and investors to identify the locations with high potential for renewables and available capacity headroom that could provide high revenue potential and be connected economically and within an appropriate timeframe.
3. Stakeholders do not have visibility of operational renewable generation curtailment.
4. It is difficult for stakeholders to judge when and where to enter the queue for connections.
5. Local needs and local value for decarbonisation of electricity, heat and transport are not currently being met nor maximised.

Challenges Addressed by the model

Use Case 1 - Whole Electricity System Foundation

	Challenge Addressed	NGET	Welsh Government	ESO	NGED	VES
1	**Visibility** at a connection level **of the full upstream network status** (capacity headroom, existing DER, constraints, reinforcement planned, and connections queue), by incremental Distribution and Transmission voltage levels.	High	High	High	High	High
2	**Accelerate planning and delivery of DERs** through identification of locations with high potential for renewables and available network capacity headroom. Enable SMEs and investors to identify areas of high revenue potential.	High	High	Medium	High	
3	Provide visibility of operational renewable generation curtailment	High	Low	High	Medium	
4	Judging when and where to enter queue for connections	High	Medium	High	Medium	
5	Deliver local needs and maximise local value for decarbonisation of electricity, heat & transport	Low	High	Low	Medium	
6	Additional Challenges	High	Low	Low	Low	

ESO

1. Network status visibility

Welsh Government (and System Stakeholders) – By providing access to published network data in an easy-to-use format, the model will provide greater visibility of the status of the network to inform better decision making and enable Distribution and Transmission coordination opportunities for Wales.

Developers will be able to ascertain which Transmission or Distribution issues are relevant to their prospective sites and if/when mitigation is planned. This will be especially true of Transmission issues as, normally, visibility is only obtained at a much later stage and post connection application.

Access to a definitive set of data can inform policy making and delivery of policies such as Net Zero by attracting renewable generation to Wales and realising decarbonising opportunities.

Development of the model will provide the tools needed to prioritise renewable generation against growth in decarbonised demand and justify reinforcement investment. It will also help provide the "basis for joint representation" [the Welsh Gov, developers and ESO/TO/NO) to Ofgem or Westminster to get things moving (where it isn't within the Welsh Government's devolved powers).

ESO – From a network modelling perspective this would provide much greater visibility of the details of embedded generation within Distribution systems.

The Network Options Assessment (NOA) process would also benefit from accessing such data as it would inform recommendations on which network reinforcement projects should be prioritised for funding.

As part of the Early Competition process, by using a Digital Twin, cited network changes can be captured by Bidders during the tender stage and, after Licence award, the changes on networks can be captured by licensees, therefore improving the efficiency of the design of the network.

NGED & NGET – Benefits include greater coordination between Distribution and Transmission operations for planned or forced outages, such as storms and exceptional events. Greater coordination will lead to less disruption for customers and the potential for reducing costs.

Improved common understanding of network issues.

Greater visibility of where reinforcements are planned will increase informed decision making within developer organisations leading to less speculative connection application submissions.

Virtual Energy System – As one of the first use cases for the Virtual Energy System, the development of an integrated network model of electricity transmission and distribution across Wales will act as an initial proof of concept that can be used to develop integrated network models in other areas or nationally. Lessons learned from the process will inform future development, creating efficiency of design and effective utilisation of resources.

2. Accelerated planning and delivery of Distributed Energy Resources

Welsh Government (and System Stakeholders) – The project aims to build on the increased network visibility by layering in additional data sets (such as geographical and meteorological data, correlated with Long Term Development Statements (LTDS) and current/planned connections data). This will create the capability to link DERs to demand, make identification of areas with potential easier and realise decarbonisation opportunities. This also supports Welsh Government policy of increasing renewable electricity hosting capacity and delivering net benefits to Welsh citizens and communities. Additionally, it will improve opportunities of supply for vulnerable/fuel poor customers and those that experience unreliable supply, ensuring a just energy transition.

ESO – Increased visibility of DERs creates value for the ESO, particularly for balancing and ancillary services and providing visibility of which DERs can be instructed for dispatch.

NGED – Greater visibility of plans for one-off large renewable developments would be of value to the DNOs as these are currently not covered in the Distribution Future Energy Scenarios (DFES). These would normally be picked up by engaging with Local Authorities about their local energy plans.

NGET – Visibility of what DER assets are connected, or planned to be connected and where, will enable protection requirements to be identified, especially with the potential for reverse power flows through transformers that were not designed for this purpose.

Greater visibility of what type of DER is connecting and its intended use will determine what reinforcements are required. Without visibility of this information, it is difficult to advise where it is best to invest.

3. Provide visibility of operational renewable generation curtailment.

Welsh Government (and System Stakeholders) – For the layperson it is difficult to establish where constraints are located on the system. Greater visibility of operational renewable generation curtailment would allow for better forecasting and open up other opportunities such as the use of storage, supporting the drive for decarbonisation.

ESO – Visibility of DNO activation of Active Network Management (ANM) will be invaluable to support application of primacy rules where DNO actions could conflict with ESO actions. Design of services would also be greatly improved with increased visibility of DERs.

Having visibility of assets and impacting factors, including masked load (the aggregate of load routinely hidden by matching local generation that may appear during widespread loss of generation after network or weather events) would also be beneficial for balancing the system.

In the situation where sub-stations are split in two, a scenario can arise where two different constraints are experienced at the same time, e.g., stability and voltage issues. An inter-trip may be required in these situations for instantaneous curtailment. Having visibility of DERs in real-time for constraints and the ability to model them would provide real value. E.g., root cause analysis.

4. Judging where and when to enter the queue for connections.

Welsh Government (and System Stakeholders) – Visibility of planned Transmission and Distribution reinforcement to provide capacity release would lead to improved investment planning decisions being made based on increased confidence in the time and cost of connection to the grid. This, in turn, will help to improve the conversion rate of applications to connection. Additionally, it is likely to reduce the number of connection requests raised that are unlikely to go ahead due to cost or timescale.

ESO – Visibility of planned Transmission and Distribution reinforcement to provide capacity release would provide greater capacity to assist customer applications and enable better facilitation and management of the customer journey for customers connecting to the GB electricity transmission system.

Additionally, it would support coordination of outage availability to accommodate new connections to the grid.

NGED - The capability to identify locations where there's a big discontinuity in the capacity and the demand would be very advantageous. This would increase the ability to provide more affordable and timely connections for all types of customers.

5. Deliver local needs and maximise local value for decarbonisation of electricity, heat and transport.

Welsh Government (and System Stakeholders) - Mapping local / regional / national plans on to the existing Transmission and Distribution networks will support objective evaluation and comparison of options.

It will facilitate coordination and optimal delivery of Local Area Energy Plans (LAEPs) by helping to identify network opportunities and potential solutions.

NGED – It will help provide visibility of Local and Regional plans and the impacts on supply and load which in turn would help determine where reinforcements will be required. This could also benefit the identification of aggregation effects; for example, where multiple energy resources at Distribution level have a combined impact at higher voltage levels or on the Transmission networks, and how this might be reflected up into Transmission and long-term planning.

Use Case 2 – Flexibility Markets and Constraints

Description

The objective of this use case is to deliver a method by which flexibility requirements from Transmission and Distribution network operators and other system actors can be co-ordinated across multiple markets, barriers to participation addressed, liquidity improved, and flexibility rewarded. The project aims to deliver for Wales and its communities a Flexibility Markets interface that optimises network operator requirements across multiple trading platforms and response providers and regional government targets.

Problem Definition

1. There is currently a low volume of renewable hosting capacity in Wales.
2. There is a lack of transparency of the financial and operational benefits of participation of assets with flexibility, impacting market liquidity.
3. There is a lack of understanding of the dependencies between Distribution and Transmission constraints and flexibility requirements.
4. Conflict can occur between National, Regional and Local situations and competing providers.

Challenges Addressed by the model

Use Case 2 - Flexibility Markets & Constraint Coordination

	Challenge Addressed	NGET	Welsh Government	ESO	NGED	VES
1	Increased renewable hosting	High	High	High	Medium	
2	Improve participation and market liquidity	High	High	Medium	High	
3	Coordination/Optimisation of the allocation of flexibility response available between transmission and distribution requirements	Medium-High	Low	High	High	High
4	Operational coordination of use of flexibility at individual sites	Medium	High	Medium High	too early after change to say	

Note: updated following workshop

ESO

1. ***Increased Renewable Hosting***

Welsh Government (and System Stakeholders) – Through maximising network DER hosting capability and coordinating flexibility response from all potential sources, renewable hosting can be increased.

ESO – More renewable generation can be integrated into the system through the use of dispatchable demand and DERs as an alternative to traditional sources of flexibility from fossil fuel

generation." DERs and Customer Energy Resources (CERs) at an aggregated level can be utilised to manage constraints.

NGED – Increased renewable hosting will be critical to using flexibility from DERs and CERs for outage planning and event response, and it will allow for dynamic network management options.

NGET – Delivering the capability to identify the strategic network reinforcements needed, particularly for the integration of electrolysers for the production of hydrogen, would be very beneficial.

2. Improved participation and market liquidity

Welsh Government (and System Stakeholders) – The Powering Wales Renewably (PWR) model could help identify and justify policy/governance initiatives that address barriers to scenarios by showing what an unconstrained network would enable.

The model could also support strategic infrastructure modelling.

NGED – A dynamic flexibility map with locational pricing would help developers make informed decisions and improve participation.

3. Flexibility response coordination/optimisation

Welsh Government (and System Stakeholders) – The digital twin could be used to identify sites for battery use and model the impact battery construction would have on the grid in Wales.

The benefits of co-locating batteries for fast response could also be modelled.

ESO – The visibility of flexibility is important for effective application of primacy rules.

Visibility of what will be generated is also vital for ESO intraday and operational timescales and will improve operational efficiency.

Longer term views of available flexibility will improve scenario modelling.

Another benefit would be the ability to visualise battery output, at what output level (MW), for what duration and whether it creates or assists a constraint, improving operational performance.

NGED – The model can help reduce costs by indicating locations where flexibility services can be used, minimising compensation payments.

Grid performance can be optimised by showing how flexibility interacts with all other load management systems, including inter-trips and ANM.

Visibility of what flexible resources are available could be used to optimise the use of curtailment.

NGET – Flexibility could be used to provide system access outside of the normal outage season.

4. Operational coordination of the use of flexibility at individual sites

Welsh Government (and System Stakeholders) – The model could support the operational use of flexibility by modelling flexibility at the local level.

ESO – The model could provide visibility of the services that have been contracted and in which market they have been contracted.

NGET – Improved planning, operations and conflict avoidance through visibility of Transmission and Distribution flexibility requirements.

5. Visibility of renewable generation curtailment

Welsh Government (and System Stakeholders) – Developers who are able to model their flexibility capacity may be able to get quicker connection dates as they will be more strategically aligned with Welsh Government policy.

Providing visibility of the cost of renewable curtailment would be very useful and could add to the available evidential base used to inform improved policy and planning decisions.

ESO – Visibility of the capability of the DER, what services they provide, when they are available and what markets they are operating in across all timescales would support operational efficiency.

NGED – Curtailment metrics can be combined with meteorological data to inform models for how likely it would be that an asset may be curtailed in the future.

Use Case 3 – Whole Electricity System Connections & Capacity

Description

The objective of this Use Case is to enable electricity system integration through additional connections, increased outputs, and access for flexibility services.

Problem Definition

1. It is unclear what network development options exist for offshore and onshore Transmission and Distribution Networks across time and when looking at windspeed/solar/hydro challenges.
2. There is a lack of understanding of the combined knock-on effects of constraint release on dynamic Transmission and Distribution connection queues and application timing.
3. It is unknown what capacity will be made available at the Transmission and Distribution level through decarbonisation of supply.
4. Lengthy connection times and poor quotation conversion rates.
5. Regional and Local Area Energy Plans lack the information required to comprehensively assess whole electricity system reinforcements vs alternative options.
6. There is a lack of certainty about location and scale of constraints related to outage planning.

Challenges Addressed by the model

Use Case 3 - Whole Electricity System Connections and Capacity

	Challenge Addressed	NGET	Welsh Government	ESO	NGED	VES
1	Identify optimised Transmission and Distribution network development options	Low	High	High	High	High
2	Understand the combined knock on effects of constraint release on dynamic T&D connection queues and application timing	Low	Low	Low	High	
3	Identify capacity release at the T&D level through decarbonisation of supply	Low	Low	Medium	Medium	
4	Reduce connection times and improve quotation conversion rates	Low	High	Medium	Medium	
5	Improve delivery of regional and local area energy plans through better decision taking for whole electricity system reinforcement vs alternative options	High	High	Medium	Medium	
6	Improved outage planning	High	Low	High	Medium	

Note: updated following workshop

ESO

1. Optimised Transmission and Distribution network development options

Welsh Government (and System Stakeholders) – The use of an integrated Transmission and Distribution model could provide an objective, evidential base to support changes to regional and national policy. It could inform interventions by providing an evidential base and by providing the basis of better planning tools and visualisation, improving the planning and consenting processes.

ESO – The use of the model utilising dynamic (real time/near real time) data could increase efficiency by providing transparency and a common view of the network issues between stakeholders.

The model could support planning gap analysis for offshore and onshore Transmission and Distribution to optimise network development options.

NGED – Providing visibility of connection constraints and capacity, combined with what has been accepted to connect but has not yet been connected, will aid others to get connected faster.

Mapping what is in the queue to know what reinforcements have been triggered and when that is happening will inform developer decision making.

Overlaying the Whole System Map with the (Whole) Planning Map would identify constraints and improve connections advice offered to developers. The Whole System Map could also be updated to show what planning permissions are queued.

Identifying areas of saturation of demand and supply would inform decision making for the Welsh Government and customers.

NGET – The model could support the production of delivery assessments which provides more certainty for connections and help reduce connection queue times and improve quotation conversion.

It could also provide clarity on the type of connection (demand/generation).

2. Knock-on effects of constraint release

Welsh Government (and System Stakeholders) – The model could support delivery of a timetable for managing the connection queues that is prioritised for what is needed for decarbonisation.

NGED – The delivery of the model utilising Transmission and Distribution reinforcement plans could enable a 'one touch' approach. This benefits Welsh citizens by minimising disruption (e.g. from road closures) through alignment of work activities across organisations.

Flexibility could be used for the interim, as a tactical tool to support alignment of Transmission and Distribution works.

The model could enable the ability to visualise the whole system with respect to flexibility and constraints rather than only being able to see the maximum drawn within any half-hour period.

Visibility could also be provided of how capacity reduction is released back, whether it is released to the network or whether a party can trade their capacity head room and ramp it down for a period, and potentially get a payment for this.

Connections queue management and constraint management can be interlinked so there is value in being able to merge this data together to inform decision making.

NGET – The model could provide early visibility of proximity outage and local site requirements, which are not normally identified until a site visit takes place. The model could also drive efficiency by providing the best commissioning sequence for outages.

3. Identification of capacity release through decarbonisation of supply

Welsh Government (and System Stakeholders) – Greater visibility of energy costs and capacity will inform commercial decision making; helping to secure investment even while there is a lack of clarity on UK policy about industrial investment in decarbonisation.

The model could provide visibility of capacity that can be released at sites currently using carbon intensive generation that could be replaced with renewable generation.

ESO – The model could identify the areas of the system that would be impacted by replacing carbon based generation with renewable generation. E.g., absorption or injection of reactive power to manage voltage.

The model could enable enhanced coordination of constraint mitigation and whole system opportunities through identification of capacity headroom.

NGED – Using capacity information to deploy flexible intelligent solutions could speed up connections onto the network, e.g., using a time profile on solar generation during daylight hours and the backup is only used at night.

4. Reduce connection times and improve conversion rates

Welsh Government (and System Stakeholders) – Aligning network planning information and planning consent information will provide customers with location data for where best to situate their projects, improving conversion rates and avoiding connection requests being raised that are highly unlikely to be viable.

ESO – Better, more accurate asset information will increase efficiency in processing applications and help with resource management, resulting in reduced connection queue times.

NGED – Greater visibility of network planning and planning consent information will result in less speculative applications being submitted, reducing the workload for network connection teams and result in faster connections.

Visibility of reinforcement timescales will also help with conversion rates.

5. Improved delivery of Regional and Local Area Energy Plans

Welsh Government (and System Stakeholders) – The more information local and regional areas have the better able they will be to make decisions and deliver optimised LAEPs.

Data from the model could provide a trusted basis for dialogues with Welsh local communities.

The model could support coordinated and optimised delivery of LEAPs, connection queues and network development.

NGED – The model can provide visibility of Local and Regional plans and their impact on supply and load.

NGET – Having access to the detail within LAEPs is important for network planning and leads to increased confidence levels for connections.

6. Improved outage planning

Welsh Government (and System Stakeholders) – The model will inform decisions that will help improve the services received by all consumers, but especially those who are vulnerable or in fuel

poverty. The visibility provided by the model will supports decision-taking that enables current issues to be addressed and potential, future issues to be identified and planned for better.

ESO – As the ESO coordinates outages between parties, any improvement to the available data that allows greater coordination could increase efficiency in outage planning and delivery, and ultimately lead to reductions in both outage times and cost to deliver.

NGED - Having knowledge of the whole system would allow flexibility to be procured to avoid outages, reducing the total number.

Procurement of flexibility could avoid an outage at a Distribution level if there's an outage at the Transmission level.

A reduction in the overall impact to customers could be realised if there is an aligned single outage to cover multiple works.

NGET – Improved outage planning through using the model could also help improve resource management of critical resources.

Appendix – Stakeholder User Stories / Personas

In addition to the Use Cases, Stakeholder User Stories in the form of Personas were also developed to describe roles where improvements and/or benefits will be delivered through Powering Wales Renewably.

Each role within the personas is defined by the following attributes:

Department Role

The organisational department and the role considered.

Main Job

Identifies the 2-3 key responsibilities of the role in question that are likely to benefit from Powering Wales Renewably.

Issues

Describes the challenges and issues that this persona faces in delivering each of their responsibilities outlined above and that could be solved or improved through Powering Wales Renewably.

Benefits / Improvements Sought

For each Issue or challenge outlined, this describes the improved outcomes achieved relating to the key responsibilities detailed for this persona.

The personas developed for each the operator partners of the project are provided on the next pages.

Personas - Welsh Government and Other stakeholders

Department Role	Welsh Gov – Policy Targets, Objectives & Strategy	Welsh Gov - Local Energy Plans Local Needs	Welsh Community Groups Local Ownership	Developer / Investor (Inc. Welsh Gov Renewables Dev)
				
Main Job	► Delivery on policies (including Net Zero) ► attracting renewable generation to Wales ► Decarbonisation opportunities ► Housing development location ► Identification of locations ► Delivering a 'just' transition	► Delivery of local policy ► Local Ownership ► Local Needs ► Local Benefits ► Delivery of Local Area Energy Plans	► Engagement with and representation of Welsh citizens	► Investing and developing renewable generation
Issues	► Securing investment ► Lack of clarity on UK energy policy delays investor decisions ► Securing investor confidence ► Attracting investment due connection queues ► Industry processes driving unintended investor behaviours ► Informing policy action ► Lack of visibility of local situations ► Unintended consequences / gaming ► Ministerial post bags (citizen priorities) ► Inability to prioritise renewable generation against growth in decarbonised demand	► Lack of data to optimise delivery of local area energy plans ► Lack of visibility of transmission level issues ► Objective basis that supports local / regional dialogue / engagement	► Assessing environmental impacts of energy infrastructure ► Identifying where oil heating is prevalent and supporting decarbonisation of demand locally ► Community engagement	► Lack of visibility of areas with potential ► Industry processes drive developers to request connections that won't go ahead ► Inability to know where they would be in the connection queue
Benefits / Improvements Sought	► Access to a definitive set of data could help inform policy making (for both Wales and Westminster) ► Inform interventions based on improved evidential base ► Process / Queue reform ► Better planning tools and visualisation ► Improved investment planning ► Improve worst served customers / deliver 'just' transition	► Coordination and optimal delivery of LAEPs, connection queues and network development ► Improved local decision taking ► Improved planning and consenting ► Provide an objective evidential base to support changes to regional and national policy ► Provide trusted basis for dialogue with local communities	► Improve worst served customers / deliver a 'just' transition ► Transparency and a common view of the network issues between stakeholders ► Ability to conduct analysis based on access to accurate, trusted data ► Provide trusted basis for dialogue with local communities	► Easier identification of areas with potential ► Improved decision based on confidence in time and cost to connection ► Justification for investment ahead-of-need in T&D infrastructure through "strategic infrastructure modelling" ► Guidelines/rules for the sharing of commercial information

Personas – NG ED \ National Grid Electricity Distribution

Department Role	Operations Manager Near Real Time	DSO Manager 10 days ahead to day ahead	Connections Manager	Network Development Planning and Regulatory Reporting
				
Main Job	► Managing network running arrangements within limits ► Planned & Forced Outages ► Constraint management ► Safety & Risk Management	► Available capacity & gaps ► Coordinating T&D Flexibility ► Managing Primacy with the ESO ► Coordinated Contracting & Pre-Qualification of Assets ► Carbon footprint reduction	► Fast affordable connections for all types of customers ► Liaison with Local Authorities and customer groups ► Connection Process Digitalisation	► Understanding the scale, timing and long-term development needs ► Options and Modelling of reinforcements and major connection changes ► Drive Innovation and efficiency ► Efficiency & Managing regulatory compliance and reporting
Issues	► Thermal capacity constraints ► Voltage & Reactive Power ► Active networks ► Resource availability ► Storms & exceptional events	► Near Real Time status ► Constraints ► Availability and compliance ► Masked loads and Storage ► Forecasting ► Management & Visibility of Curtailment ► Hoarding Capacity	► Seeing where capacity is / will be and when full ► Introducing Time of day/season and ramped connections ► Queue and reinforcement delivery uncertainty ► Visibility of LV network data and insights internally and externally	► Uncertainty of where, when and scale of changes ► Resource availability ► Supply chain delays ► Aggregation effects ► Scale , location and timing of decarbonization load change
Benefits / Improvements Sought	► Using flexibility / Storage in Outage planning / event response ► Coordination with Transmission operations and outages, including Flexibility	► Mapping connection queue and reinforcements ► Gap between Capacity and demand ► ANM & Flexibility	► See Gap between Capacity and demand ► Track Time of day/season and ramped connections	► Visibility of Local & regional plans and impacts on supply & load ► Coordinated delivery plans ► Regulatory reporting

Personas – NG ESO \ National Grid Electricity System Operator (1 of 2)

Department Role	Customer Connections Manager Non-operational	Operational Planning 2 Year Ahead down to Day Ahead	Early Competition Years ahead
			
Main Job	► Facilitate and manage the journey for customers connecting to the GB electricity transmission system ► Liaise with the wider Electricity System Operator and Transmission and Distribution Network Owners.	► Deliver operational planning and facilitate up to around 18.5k system outages each year against a large number of highly complex competing background challenges including late notice outages, outage cancellations, system faults, weather events, new technology, pathfinders, interconnectors	► Manage the Early Competition process to select bidders to deliver solutions on GB's electricity transmission system ► Encourages new ways of working ► Seeks the best solution at a fair cost for customers
Issues	► Ability to see accurate network capacity to assist customer applications ► Connection queue and network reinforcement delivery to enable customer connections ► Resource management to better support customers with their connections	► Whole system coordination ► Strategic Network Planning ► Data and Digitalisation ► Poor visibility of small embedded generating units that connect to DSO/DNOs	► As part of Early Competition, Power system model(ETYS Model) will be shared with bidders during the initial stage of Tender, bidders build their solution on the given model and do the project estimation. as tender progress (we anticipating it will take more than 1.2 years) there will be change in network. Once Preferred Bidder awarded with licence, during their project development stage also network keep on changes
Benefits / Improvements Sought	► Visibility in near real time of network capacity will give more meaningful data to conversations with prospective connectees ► Visibility of real time progress on transmission reinforcement works to inform contracted customer connections of progress against milestones ► Visibility of upcoming workload (e.g. Customer Connection and Modification applications, etc.) to better manage resourcing requirements	► Visibility of outputs of DERs from longer timescales till real time ► Dispatch of DERs, instructible ► Clarity of which markets DERs participate in ► Compliance with the electricity codes	► Using Digital Twin, cited network changes can be captured by Bidders during the tender stage and after Licence award the changes on network can be captured by licensee. Which will increase the efficiency of the design

Personas – NG ESO \ National Grid Electricity System Operator (2 of 2)

Department Role	Network Modelling	DER Visibility	Whole Electricity System
			
Main Job	► Deliver and maintain power system models (ETYS, GB Master, ...) ► Provide Operational Technical Data within time and quality targets ► Evaluating new and novel offline modelling and simulation tools that we can incorporate into the CSNP and Zero Carbon Operation ► Deliver IT projects on data and modelling capability ► Deliver capability roadmap for Real Time Digital Simulations for Networks ► Lead on Automation and new tool development across networks ► NOA Enhancements tool development (Thermal, probabilistic, voltage and stability)	► Realize DER & CER visibility in terms of tools, people and processes across ESO value chain ► Deliver the enabling regulatory, legal and commercial framework changes	► Meet the expectations of the stakeholders and deliver more, faster with less ► Implementing new systems, processes and tools to meet new responsibilities
Issues	► Poor visibility and no details on the electrical connection location, size, fuel type, operational strategy of embedded generations within DNO networks ► Demand forecast mismatch with real time observations (even at day ahead) ► Voltage dependence P and Q values need to be reviewed for load object types in PowerFactory	► Existing data is unstructured and exists across internal & external silos ► Resources – transformation and data specialists ► Transform whilst managing risk and maintaining current levels of performance	► Legacy integration - the cost of consolidation ► Resource/skills constraints ► Providing seamless (internal and external) access to quality/consistent data ► Lack of understanding of new roles/responsibilities
Benefits / Improvements Sought	► Provide greater visibility of embedded generation details within DNO networks ► Automation of review of voltage dependence P and Q values	► Improve system operability ► Deliver stakeholder expectations and support evolution of zero carbon operations	► Improve agility in delivery ► Consolidation of stakeholder interests ► Improve understanding of new roles/responsibilities

Personas – NG ET \ National Grid Electricity Transmission

Department Role	SIF Lead/Support & Commercial Lead for NGET Deeside Centre for Innovation	Intelligent Substations – Product Manager	Intelligent Substations/Network – Principal Architect	Potential Stakeholder: Future Network Blueprints/Strategic Network Design – Transformation Lead
				
Main Job	► Co-ordination & alignment of NGET innovation projects, NGET internal transformation and NGET partnership for externally-led SIF projects. ► Commercial lead for NGET Innovation Demonstration & Testing facility (Deeside Centre for Innovation)	► Owner & lead for digital twin subset of the 'Intelligent Substations / Network' Transformation program	► Technical Lead for digital twin subset of the 'Intelligent Substations/Network' Transformation program	► Lead for strategic future network design & planning (power system engineering) to enable the decarbonized energy transition in conjunction with robust asset management
Issues	► Applicable use cases for digital twins as a tool should be identified as current use cases may potentially not address the 'root cause' of the challenges ► Challenge regarding the suitability of a digital twin as an enabler for the Welsh Government's renewable targets e.g. are there more suitable strategies/activities to address the Welsh Government's challenges, such as customer connection acceleration programs led by NGESO/NGET	► To be refined within the Alpha phase	► To be refined within the Alpha phase	► To be refined within the Alpha phase
Benefits / Improvements Sought	► A core aim for all digital twins, as opposed to an individual-tailored product for specific use cases. The individual capabilities tailored where required for the given network owners, connected customers etc., such as for regional network operability issues? ► More strategic level of engagement and approach for overall VES program due to strategic implications for major network owners (e.g. cyber & data exchange risk, Transmission Procedure/STCP requirements etc.) ► Powering Wales Renewably should aim to define the 'root cause' of the challenges the Welsh Government have to achieve its renewable energy plans to subsequently evaluate if a digital twin is the appropriate tool to enable the Welsh Government's targets	► To be refined within the Alpha phase	► To be refined within the Alpha phase	► Potential benefit of digital twins: Consistency in long-term forecasting data, e.g. for demand & generation, to enable consistent, strategic decision-making for network design, market analysis etc. for network owners & NGESO ► To be refined within the Alpha phase

End of document.