

**OFGEM LOW CARBON NETWORK FUND
PROJECT PROGRESS REPORT
DECEMBER 2013**

ACCELERATING RENEWABLE CONNECTIONS

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SP ENERGY NETWORKS
ACCELERATING RENEWABLE CONNECTIONS (ARC)
REPORTING PERIOD JUNE 2013 – DECEMBER 2013

1. EXECUTIVE SUMMARY

1.1 PROJECT PROGRESS HIGHLIGHTS

Following on from our previous report in June, the ARC project team has made significant progress delivering the objectives of the Accelerating Renewable Connections (ARC) LCNF project over the course of 2013. A number of the key deliverables to date are highlighted below;

- **Delivery of the First Actively Managed Grid Supply Point at Dunbar Grid Supply Point (GSP)** – SP Distribution have now completed the initial installation of the equipment, supplied through Smarter Grid Solutions, which forms the control infrastructure of the Active Network Management network solution and which we are working towards having operational from March 2014.
- **Positive Engagement with National Grid Electricity Transmission** – Significant progress has been made with NGET with agreement reached on the principle of connecting embedded generation to the distribution network which is connected under an Actively Managed network solution. To put this into context, under existing Business As Usual arrangements, generators are currently sitting behind transmission reinforcements at Dunbar GSP with a forecast cost of £20m and an associated connection date of at least 2020. By enabling the GSP with Active Network Management system control, those connections could take place from March 2014 with network reinforcement costs equating to around £3m.

Around five workshops have been held with both Commercial and Operations departments from both SP Distribution and NGET with the most recent meeting on the 9th December 2013. This was to test the ANM scheme against various Transmission System Operation incidents as developed by Operations staff from SP Distribution, SP Transmission and NGET. The aim was to understand the effect, if any, on the wider transmission network of facilitating embedded connections onto the Distribution network at GSPs where a transmission constraint has been identified.

Further progress will be made in the New Year in order to establish the Commercial Agreements that will govern the relationship between SP Distribution and NGET for those connections managed via an Active Network Management connections solution. The next meeting is scheduled for January 2014.

- **Commercial Agreements** – Based on learning from UKPN and SSE's existing ANM trials, commercial agreements are currently being adopted and refined internally. We are working towards being in the position to issue our first Active Network Management connection offer from Quarter 2 2014. We have already identified three generators who hold planning consent for their embedded generation projects and are actively seeking a connection as part of the Actively Managed Network solution.

1.2 KEY RISKS IDENTIFIED

- **1.2.1 RECRUITMENT RISKS** – To date we have held positive discussion with a number of developers (five in total) who are seeking connection within the trial area under an Actively Managed network solution. All have received a connection offer under Business As Usual arrangements however those offers

are impacted by Transmission constraints and restrict access to the network until 2020 at the earliest.

We have completed curtailment assessments for three generators to date and following a series of meetings, all generators believe that the proposed commercial terms and forecast curtailment of generation are acceptable in order to enable their generation project to progress to construction.

Currently four out of the five developers are in receipt of planning consent for their proposed generation developments.

1.2.2 PROCUREMENT RISKS – Following on from our previous report we remain confident that as a consequence of our robust internal procurement governance arrangements and that of our project partners, we are in a strong position to procure both the services and equipment required to deliver the project outputs and objectives on time and within budget.

1.2.3 INSTALLATION RISKS – The Active Network Management enabling equipment has already commenced initial installation at Dunbar GSP with on-site acceptance testing scheduled to take place over the course of Quarter 1 2014. A design and technical review of the Active Network Management installation at Dunbar GSP and associated connections to the identified embedded generators has highlighted no obvious installation risks. Moving forward as we seek to connect more generation at lower voltage levels a key consideration will be the availability of adequate communications infrastructure to enable the Active Network Management system to calculate and send control data to those generators connected to the scheme. To mitigate this risk we have already commenced discussions with existing communications infrastructure providers to enable a review of options available and what alternative communications technology can be deployed in the absence of hardwired fibre communications infrastructure currently in place for the rollout of Active Network Management enabling technology at Dunbar GSP. Early indications however indicate any perceived risk to be low.

1.3 LEARNING OUTCOMES ACHIEVED

1.3.1 KEY LEARNING OUTCOMES DELIVERED IN THE PERIOD – Learning during the period has predominantly been internal rather than significant learning which we can share with other stakeholders. Our internal stakeholder engagement has been aimed at understanding issues in bringing the project into business as usual.

As a consequence of our detailed dialogue with a number of developers, we are gaining a greater understanding of the generation profiles and generation yield expected from each embedded generator. We are also gaining an understanding of the impact of various generation technologies as those generators that we have spoken with to date regarding connection under the Active Network Management system have included large scale Photovoltaic, Energy from Waste in addition to Wind Farm developers.

This learning to date will form part of our dissemination activity that we expect to commence over the course of 2014.

1.3.2 SP ENERGY NETWORKS APPROACH TO CAPTURING LEARNING – In August 2013 we appointed a dedicated Knowledge Transfer Lead to oversee our activity in both capturing and exporting learning from our ARC project. This appointment is key to the delivery of a number of internal events

promoting the activities of the ARC project team and gaining support for its rollout into firstly a pilot project and thereafter into business as usual operation.

Our approach to capturing learning largely remains the same to that documented in our June 2013 report whereby we continue to document our activity as the project progresses. This ensures that the project learning is adequately understood by firstly the ARC project team and thereafter fully evaluated and challenged where necessary. Secondly we have developed a Stakeholder Engagement map that identifies to which stakeholders learning or process improvements will be relevant before taking the final step to publish and furnish those stakeholders with the appropriate learning tools.

In respect of capturing and disseminating learning, activity has been not limited to the project deliverables themselves but designed to inform and accelerate the transition from a pilot project into business as usual policy. To that end we will deliver a number of models during 2014 that firstly identify key process steps and required activity to make ANM a business as usual reality but more importantly identify who within the existing business will own and operate this process going forward. This will ensure that those owners identified form part of the project team as early as possible to enable a seamless transition into business as usual should ANM prove successful.

With respect to external dissemination activities, we have reviewed the process and techniques used to date by those DNO conducting their own LCNF projects and have given consideration to reviewing the format of external learning events going forward. We consider that going forward an annual event whereby interested stakeholders are invited to a central location and provided with a series of PowerPoint presentation needs refreshing, therefore we are in the process of developing an alternative approach to disseminating learning for events planned in autumn 2014.

1.3.3 THIRD PARTY ACTIVITIES

1.3.3.1 SSE Orkney Visit – September 2013 – This event attended by members of the ARC project team and representatives from our Real-Time Systems department was very successful in highlighting the importance of giving consideration to ANM rollout as business as usual at the commencement of the project as opposed to addressing this issue upon a project's completion. It is through attendance at this event that we have begun to consider which department from the existing business will be responsible for deploying and implementing ANM system under business as usual arrangements and which existing policies are to be amended to accommodate ANM rollout. This will form a key activity as part of our 2014 deliverables.

1.3.3.2 UK Renewables – November 2013 – As part of the promotion of the ARC project, SPD attended this year's UK Renewables conference in Birmingham as an exhibitor, the only UK DNO to do so. This provided the opportunity for members of the ARC project team to interface with a variety of existing and those developers considering a connection within our licenced distribution franchise areas. Our attendance at this event was well received by the generator community and we received positive feedback for our proposed approach under ARC in respect of the LIFO Principles of Access and proposed new network solution to enable embedded generation to connect in the face of transmission constraints.

1.3.3.3 Low Carbon Networks Conference – November 2013 – Our attendance at this year’s conference held in Brighton provided us with the opportunity to showcase and demonstrate the Active Network Management system that has been installed at the Dunbar GSP. Again this received positive feedback from conference delegates as well as presenting SPD with the opportunity to disseminate learning to the wider UK DNO community who attended the conference.

1.3.3.4 2014 Planned Activity – Building on the success of our stakeholder engagement activity during 2013 we have developed a detailed plan for 2014 of which is summarised below;

- 1. Transmission Tech 2014 – February 2014** – Earlier this year we were invited to attend Transmission Tech 2014 that will be hosted in Amsterdam. This invitation was received as a consequence of our activity working alongside NGET to develop a new policy for the connection of embedded generation where transmission constraints exist. At the conference we will promote our activities and objectives of the ARC project, talk about facilitating renewable energy in the face of transmission constraints and review the commercial policies that are required to govern this relationship and new ways of operating going forward.
- 2. ARC Stakeholder Forum – February 2014** – We will host our inaugural stakeholder forum in February where we seek to build on the progress of the project to date and work with stakeholders to develop the principle of offering embedded generation connections on a non-firm connection agreement. This forum will also inform SPD on what developers need from the process in order to accept a connection offer on such terms and what ongoing support once connected may be required.
- 3. ARC Community Workshop – February 2014** – Through our work with Community Energy Scotland and University of Strathclyde we have identified a number of community groups that are in the process of developing their own community owned generation schemes. This workshop will inform of the possibilities for connecting under the Active Network Management system and the work being undertaken to match local flexible demand where a network constraint would otherwise curtail generation from being operated. A key deliverable from this work package however will be development of the commercial arrangements that would govern such connections.
- 4. Attendance at Scottish Renewables Conference – March 2014** – We have secured both an exhibitors stand and speaking slots at next year’s Annual Scottish Renewables Conference. This will provide the opportunity to again reach a wide variety of industry stakeholders to raise further awareness of the ARC project and update on progress to date as well gain the views of interested parties on the development and rollout of the Active Network Management system.
- 5. Royal Highland Show 2014 – June 2014** – We hope to secure an exhibitors stand at next year’s Royal Highland Show. Again we see the opportunity to engage with a variety of stakeholders at this event and promote the aims and objectives of our ARC project. This event predominately attended by those from the rural and agricultural community presents the greatest opportunity to engage with those

developers that are likely to benefit from the rollout of Active Network Management and facilitate the connection of renewable generation.

Evidence from our Connections business to date shows that over the past few years there has been a significant increase in the number of rural businesses seeking to install and operate their own renewable energy projects as part of investment diversity and revised business strategies. With this event attracting an average of 175,000 visitors over four days this represents a great opportunity to engage with a number of those stakeholders.

- 6. Dissemination Events – 2014** – Over the course of 2014 we plan to hold our first ARC dissemination events. We are still working to finalise the format of this activity which may result in a number of events as opposed to the one event that has been the format of most DNOs to date. Further information will be provided once we confirm our position.
- 7. Low Carbon Networks Conference – October 2014** – We will again be in attendance at next year’s conference in Aberdeen. Similar to this year we will seek to ensure that attendees from SP Energy Networks are made up of frontline staff as opposed to members of the Future Networks team as we believe this represents the greatest opportunity to take learning from such events and transfer it into Business As Usual practice and policy.
- 8. UK Renewable Conference – November 2014** – Following the success of attendance at this year’s event we will be seeking to attend next year which is scheduled to be held in Manchester.
- 9. Community Energy Scotland Annual Conference – November 2014** – To promote our work through CES and University Of Strathclyde we will be seeking to attend next year’s Community Energy Scotland Annual conference where again we will be presented with the opportunity to engage with a number of stakeholders at one event.

- 1.3.4 INTERNAL DISSEMINATION** – This year we have undertaken a number of activities to raise awareness of the ARC project and obtain the support and input of the business in the development of the project. In October 2013 we presented the ARC project to a number of internal stakeholders. In addition on 27th November 2013 a series of workshops were held with multiple stakeholders whereby we were able to demonstrate the ANM equipment that has been installed at Dunbar GSP. Furthermore we retained the ANM equipment at our Ochil House Head Office where members of staff were able to interact with the equipment and receive informal demonstrations delivered by the ARC project team.

This approach to date has proved very successful and over the course of 2014 we are committed to increasing the number of awareness sessions within the business and linkage with all the key internal stakeholders to establish a number of ANM operational packs for use by various teams on a day to day basis.

2. PROJECT MANAGER'S REPORT

2.1. PROJECT OVERVIEW

As the first year of the Accelerating Renewable Connections project draws to conclusion, I am delighted to report on the progress that the project team have made. A key highlight this year has been the installation of the Active Network Management enabling system at Dunbar GSP. This marks a significant milestone in the development of the project and following a period of planned on-site testing and network integration, we will have the ability to connect embedded generation under an Active Network Management system from March 2014.

Following the completion of the Dunbar works, our next significant deliverable will be the rollout of Active Network Management enabling technology at Berwick and Galashiels GSPs respectively. This is expected to be completed by June 2014.

Whilst the delivery of the Top-Down enabling technology at the respective GSPs is a key deliverable, the connection of embedded generation under those GSPs cannot take place in the absence of agreement with NGET and an appropriate commercial and governance structure being established. To that end we have embarked on positive engagement over the course of 2013 with NGET engaging both Operations and Commercial departments. Those discussions will continue in the New Year and will be extended to include representatives from SSEPD who are also being prevented from connecting embedded generation as a consequence of transmission constraints within their distribution network franchise area.

Following a visit to the Orkney RPZ in September 2013, hosted by SSE, the learning gained from this event highlighted the importance of considering how ANM will be rolled out under business as usual as early as possible in the project. To that end we have undertaken significant activity reviewing existing network policy and operating procedures to consider any amendments that will be required in order to integrate the Active Network Management system under business as usual activity.

The engagement with the generation community to date has been very positive with a number of developers now in receipt of a Stage 1 high-level curtailment assessment. Furthermore we have gained significant insight into the generation profiles of various embedded generation technologies through our interaction over the course of 2013. This will continue into the New Year and we have our first Stakeholder Forum scheduled for February 2014 that will be attended by developers, financiers and interested industry representatives and local and national government bodies. The purpose of these forums will be to engage on the key aspects of a non-firm generation offering and what each party will require in order to connect under an Active Network Management system.

We have also commenced work on the Community Generation aspect of the project whereby we will seek to demonstrate and develop models for how community owned generation can connect in the face of network constraints. This activity is being taken forward primarily by University of Strathclyde and Community Energy Scotland and our initial activity towards the end of 2013 and early 2014 will be to complete an audit of the potential for flexible demand that could be engaged to absorb the output of local community generation at times of high generation output. In addition we have also invited SSE to become part of this aspect of the project to build upon their experience and learning from the NINES project to date.

2.2. PROGRESS IN THE CURRENT REPORTING PERIOD

Work Package 1 (Empowering Customers)

1.1 Establishing a Stakeholder Forum

Copper Consultancy has been awarded the contract to assist in the facilitation and recording of our Accelerating Renewable Connections stakeholder engagement activities following a robust tender application process attracting four competing vendors. The inaugural stakeholder forum will take place during February 2014 and will be attended by a variety of stakeholder groups that we have engaged with over the first year of the project. This includes developers, financiers, industry and local government representatives. In addition we hope to provide a platform for existing generators who have already connected under an ANM scheme within other DNO groups to impart their experience of owning and operating an embedded generation scheme within a constrained environment as well as new parties who are interested in connecting within the ARC area.

The stakeholder Forum will thereafter meet on a quarterly basis whereby we will work with stakeholders to obtain their views on the implementation of the Active Network Management scheme and assistance in shaping the Active Network Management product that will be offered as part of our business as usual offering when the project transitions from the initial pilot. This forum is a key step in the advancement towards rolling out Active Network Management across our wider distribution networks.

1.2 Publication of a more Frequent Refreshed Network Data and Network Heat Maps with Additional Information on Smart Connection Options

Network heat mapping during the reporting period has recently been refreshed as part of the DG Improvement works. However the ARC project team has commenced initial work on how enhanced network information can be firstly obtained from the network, using new network planning models and application of circuit monitoring currently being trialled through our sister LCNF project Flexible Networks, and thereafter provided to customers that will enable greater empowerment on their behalf to 'optioneer' their connection design at an earlier stage in the project and ahead of formal application.

The purpose of this work package will be to enable the collation and processing of improved 'real-time' network capacity data that can be made available to customers via an on-line tool. This data and the creation of new network modelling techniques being developed through ARC combined with historical network performance data will lead to a new on-line Constraint Analysis Tool that will be a significant enhancement from the existing heat-mapping information currently made available by most DNOs which is based upon primarily network data that is refreshed on a range of time frames from one-year to three-months.

1.3 Viability Studies

Early success to date included the development, by Smarter Grid Solutions, of an initial network planning tool capable of performing high-level 'Stage One' curtailment studies for those seeking to connect under the ANM scheme within the trial area.

The development of this planning tool allows initial viability studies for connection under an Actively Network Managed Zone to be completed by SPEN very quickly and provided to developers with high-level curtailment assessment prior to the submission of a formal application.

A number of potential developers identified as seeing a connection within the ARC trial area have been provided with initial curtailment results. Those assessments were provided based upon two years of network data and modelled against an assumed stacking position governed by the agreed ARC principles of access Last In First Off (LIFO).

Work Package 2 (Connections Design)

2.1 Design Policies

Existing network planning design policy for embedded generation is based upon the principle of unrestricted network access during periods of maximum generation output at times of minimum demand. This requires the design engineer to ensure that any new distributed generation connecting to the system does not adversely impact the existing network, whilst maintaining standards set-out within Electrical Safety, Quality and Continuity Regulations (ESQCR). These standards must be met 365 days of the year. Current embedded generation design policy takes into account all periods of the year when the distribution network is under greatest stress and new connections are measured against such periods. These designs typically provide both the DNO and customer with a connection that is robust and secure, allowing the generator to operate at maximum output all year round. However, as more embedded generation seeks to connect to the network this existing design requirement has led to expensive connection offers.

Within the last reporting period, the ARC team have undertaken a review of current embedded generation design policy in order to identify key stakeholders within the business who are responsible for the creation, modification and authority over current policies. A number of departments have been identified including Network Planning, Systems Analysis, Protection, Real Time Systems, IT, Security, Operational Control, Regulation and Connections.

To enable the rollout of ANM enabling technology, existing policies will require to be reviewed to accommodate the design and connection of embedded generation connecting to the network as part of an Active Network Management scheme. The ARC team have established that the following policies require to be amended which will be developed further over 2014.

1. Change to current planning design policy to permit the integration of ANM – During the current reporting period the ARC team have identified and engaged with key stakeholders within the Network Planning department. Policy change will be required to permit the connection of new generation utilising an Actively Managed connection to curtail generator output against system constraint.

Work has commenced with the Network Planning team to ensure that key learning from the development of the ANM system is reflected through revised network planning strategy and enables the roll-out of ANM into business as usual operation in a seamless manner.

Key internal stakeholders have been identified and engaged through internal demonstration events, attendance at monthly technical system review group meetings and local one-to-one knowledge transfer sessions with senior system design planners.

2. Changes to management of network design models – The Systems Analysis group have been identified as a key stakeholder by the ARC project team and

during the course of the reporting period engagement with several members of the group has taken place.

The ability to perform curtailment assessments against proposed embedded generators is reliant upon having accurate network model data, typically developed using Power Factory within SP Distribution and IPISA+ within SP Manweb.

Network design models are currently managed by the Systems Analysis group, who are responsible for maintaining model accuracy as the network develops and changes due to asset replacement, reinforcement and new connections. As we move forward into customer network trials, it is critical that curtailment assessments are carried out using accurate network models to ensure generators are receiving accurate information.

Following initial engagement during the reporting period, work has commenced on the development of a central network database for embedded generation that will facilitate the deployment of actively managed connections.

3. Policy change over Network Stability Studies - The introduction of an ANM scheme capable of globally tripping generation will require additional stability studies to be carried out to ensure voltage step and frequency is maintained within limits should a global trip event be instructed through the ANM scheme.

The requirement for additional network stability studies has been identified to ensure that as the project moves towards customer trials the technical capabilities to perform this task are established to ensure customer security.

Therefore as ANM is rolled out the establishment of a new policy in respect of Transmission Grid Supply Point control and protocol under an Active Network Management scheme will be required.

4. Changes to protection design will be required to ensure discrimination between current protection design and ANM operation thresholds - During the reporting period the ARC project team have reviewed existing design and operational policy and how this will require to be revised to include provision for the deployment of ANM. Policy changes will result in additional analysis of the protection settings for each new generator connecting to the network regardless of size, under an ANM scheme. Key learning gathered to date includes the requirement to review both distribution and transmission protection settings.

Engagement with stakeholders from both the SP Distribution and SP Transmission business has taken place, which formed part of the internal ANM system demonstration day held at our offices during November 2013.

5. Integration of ANM with Real Time Systems – The ARC project team has engaged with key internal stakeholders from our Real Time Systems department to enable the integration of ANM into current SCADA and information exchange infrastructure.

The ANM system requires direct connection to the local Remote Terminal Units facilitating access to system measurement points, communication with the

Energy Management System (EMS) that will provide communication pathways to 33kV connected generation over existing communications infrastructure currently facilitated through hardwired fibre cable.

Following several GSP substation surveys, the ARC and RTS teams have developed an agreed methodology for the enablement of Dunbar GSP. Requirements have been included within the ANM requirements specification. Details include communication protocol specification, ANM RTU specification and data transfer rate/bandwidths.

6. Publication of new operational protocols for use within the Operational Control Centre – The ARC project team have established that there is a requirement to create new operational policy documentation that will allow the integration of ANM technology within current network control methodologies. Design policy change will detail what ANM information is displayed within the existing EMS SCADA system, as well as detail what control is delegated to control room engineers and outline minimum criteria for ANM alarm signals. Design policy will also outline standard ANM SCADA symbology. During the current reporting period, several meetings and an ANM system demonstration event have been held, allowing stakeholders and engineers from the control room to participate in initial discussion surrounding EMS SCADA integration.
7. Integration of ANM within existing IT Network Infrastructure – Positive engagement has taken place to date to identify and address any IT risks and ensure that IT and network security remains at its highest level following the deployment of Active Network Management. Consideration has been given to future procurement of hardware associated with the rollout of ANM, access to the existing local area network by existing operational staff, firewall barriers and system support.

IT has been identified as a key internal stakeholder for the project at an early stage and is a key enabler for wider Business As Usual rollout. A number of system integration scenarios have been reviewed by IT to address any risks associated with the site integration and any perceived risks will be further mitigated during testing of the new ANM system scheduled for Quarter 1 2014.

8. Creation of an Active Network Management Embedded Generation Connection Policy – Work has commenced on a new commercial agreement that govern the contractual relationship between SP Distribution and generators connected as part of the Active Network Management system. This work includes a review of existing connection agreements being deployed by existing network operators developing similar ANM schemes through the LCN Funding arrangements.

A key stakeholder of this work package is NEG, from whom we require agreement to offer commercial terms to generators that permits the connection of additional generation at Dunbar GSP under an ANM scheme where existing Transmission constraints have been identified.

During these sessions, SPD, SGS and NGET have worked through some of the regulatory issues identified, as well as a review of the technical aspects. At the

start of December, SPD and SGS presented a number of operational scenarios to NGET to demonstrate the capability of the proposed ANM system to manage the exporting GSP constraint. Further meetings will be held in January 2014.

2.2 Network Visibility

A review of four years of historic network data has been collected from existing network monitoring systems. The information extracted has been formatted to represent network load flows during 2010-2013. It includes historic energy transfer at the Dunbar GSP transmission/distribution boundary, as well as detailed data on the historic load flow within the 33kV EHV network and 11kV primary substation demands.

The information extracted from existing network monitoring systems has been used to perform curtailment studies against Case Study 1. The results of these studies are being used within Work Package No. 4 – Customer Network Trails.

Emerging learning from our LCNF Tier 2 Flexible Networks Project has provided the ARC project team with the necessary tools to deploy additional measurement points to verify accuracy of the existing network monitoring information. This has resulted in a number of critical measurement points being identified as requiring further analysis over reliability, accuracy and flexibility. The deployment of such temporary measurement points for validation of current collectors has been identified and will be installed during early part of 2014.

2.3 Planning Tools

The deployment of an actively managed network connection will present new challenges to network planners. ARC is developing the tools required to allow network planners the ability to perform curtailment studies, giving developers information on curtailment events, in line with the ARC Principle of Access LIFO.

Throughout the reporting period, the ARC project team have investigated current network monitoring extraction techniques and through internal stakeholder engagement, have identified a requirement to refine and automate this process.

Current data collection techniques, used by the planning/design department, is currently time consuming and inefficient. Therefore it is proposed to develop an autonomous network planning tool, which will be used to extract high volumes of network data. Internal stakeholder engagement has now commenced over the development of a product performance specification, and resource assigned from within the network planning department to provide design support.

Curtailment analysis is heavily reliant upon the accuracy and availability of network design models. Within the trail area, SPD currently holds network characteristics within Power Factory DigSilent software. Prior to the commencement of ARC, SGS generator curtailment analysis was conducted using scripts designed to interact with TNEI IPSA design Software. However, it has been identified by the ARC team that development of a new script, capable of working with Power Factory DigSilent is required, in order to interact with current SPD network models.

The development of a script capable of such interaction has been developed within the reporting period and is undergoing final tests to refine script stability and performance. The development of a script capable of integrating with current SPD network models is a key enabler to accelerate the ability of SPD to integrate Active Network Management into Business As Usual practices, avoiding duplication of network models in IPSA+ and minimising the requirement for additional training in

alternative design software packages. It is envisaged that ARC will use current SPD DigSilent network models to perform generator curtailment studies, ensuring design accuracy as we progress towards customer networks trials.

Work Package 3 (Network Enablers)

3.1 Design and Evaluation of Enablers

It is too early to comment on this work package at this stage of the project.

3.2 Telecoms Platform for Communicating across the Trail Network

Initial dialogue between SGS and SPD Real Time Systems has established the opportunity to utilise the existing fibre infrastructure for EHV connected generators. ANM set point signals will be dispatched across the existing fibre network to a Remote Terminal Unit (RTU) installed within the DNO's metered circuit breaker, providing a high level of system security, whilst minimising the amount of new infrastructure required. Further development of communication protocols, data transfer rate and bandwidths will be refined as we look to complete site commissioning at Dunbar GSP during the first quarter of 2014.

3.3 ANM Platform for Managing Generators

Good progress has been made during the reporting period, with the production of the following enabling documentation;

1. ANM Requirements Specification
2. Dunbar Design Specification
3. Dunbar Acceptance Test Specification
4. Generator Specific Curtailment Assessments

Factory acceptance testing for the first ANM system took place on 4th November and was installed within Dunbar GSP on the 18th December. Site specific integration and commissioning will commence during Quarter 1 of 2014.

The ANM system installed at Dunbar GSP was sited at our Head Office during late November early December and was used to facilitate an internal stakeholder demonstration event on 27th November. This provided the opportunity to witness the Dunbar GSP ANM system prior to its installation in December. The event was attended by key members of staff from within Network Planning, Design, Protection, Real Time Systems, IT, Automation, Connections and Operational Control. The demonstration consisted of a number of operational scenarios as defined within case study 1 & 3.

Dunbar GSP is the first ANM scheme to be deployed at an already exporting grid supply point and creates the complexity of spanning two existing SCADA systems deployed by SPEN, Eterra for Transmission/EHV and PowerOn for HV. Following on from initial discussions, an agreed standard on what ANM information is displayed and on what system will be further developed during the next reporting periods.

For the 2013 LCNF conference in Brighton, the ARC team provided DNO's, OFGEM, ENA and developers, the opportunity to witness the Factory Accepted ANM System for Dunbar GSP prior to its installation. The three day event was hugely successful in providing a forum for both industry and customer engagement, with members of the ARC team being available throughout the day for questions and system demonstration.

3.4 Substation Environment

Grid Supply Points identified as part of the ARC case study have been surveyed by members of SPD and SGS teams, specifically looking at the deployment and integration of Active Network Management hardware. The survey work was attended by members from Design, Protection, Real Time Systems and several Operational engineers. The survey was also attended by SGS who will be providing the ANM hardware. A number of key aspects were covered including, substation environment, auxiliary power, measurement point wiring, SCADA integration, hardware location and IT/comms links.

An audit of existing SPD assets has identified a list of primary transformers unable or unknown to handle reverse power flow. Transformer tap change capabilities range between zero and partial reverse power flow. During the reporting period a list of sites requiring tap change/AVC modernisation have been established within the first trial area, and it is envisaged that initial survey works regarding modernisation will commence within early 2014.

Work Package 4 (Network Connections Trials)

4.1 Management of Exporting Distribution Networks

Throughout the reporting period, the ARC project has engaged with National Grid over the development of new innovative commercial arrangements to permit the connection of additional embedded generation onto an already exporting GSP. A number of productive meetings have been held with NGET to date, with good progress being made. Discussions have centred around two key work streams, firstly the technical aspect of connecting additional generation at the GSP, and secondly the creation of a new connection agreement between NGET (TSO) - SPD (DNO), and NGET (TSO) - SPT (TO).

On the 9th of December, the ARC team presented scenario studies to National Grid focusing specifically on the technical aspects of enabling Dunbar GSP. The studies were widely received and a number of key technical aspects identified and addressed. Further meetings will continue into 2014, specifically addressing TSO generator visibility through Inter Control Centre Protocol Link, system protection co-ordination and measurement point accuracy.

4.2 Active Management of Generation around Constraints

Creation of new commercial arrangements to permit the connection of additional constrained generation has taken significant steps during the course of the reporting period. Meetings have taken place between SPPS and NGET. This work will continue into the New Year and we hope to be in a position of agreeing a new Commercial Contract and governance arrangements with NGET by Spring of 2014.

4.3 Community Level Connections

Community Energy Scotland and University of Strathclyde have embarked on a number of initiatives that will seek to develop operating and commercial models for the connection of Community Level Connections where network constraints exist. A key aspect of this element of the project will be to understand the opportunity to link community owned generation to local flexible demand. A first step in this process is to understand the availability of flexible demand within the trial area relevant to those known generation schemes that have been identified. This flexible demand audit is currently being undertaken by Community Energy Scotland and will

report its findings by March 2014. In addition, University of Strathclyde have commenced work on the development of network models that could be used to simulate how such connections could be taken forward. Recognising the work of SSE to date and experienced gained from their NINES project, we have invited representatives from SSE to be part of the team taking this work package forward and engagement with the project has already taken place.

Work Package 5 (Project Evaluation)

At this stage of the project no work has commenced on this Work Package.

Work Package 6 (Knowledge Transfer)

To date our activity has been focussed on transferring learning in from other DNOs engaged in Active Network Management rollout. This has enabled us to accelerate the development of our project to a position whereby we have installed the first system during year 1 of the project. 2014 will see us deliver our initial learning derived from our own project that will be disseminated in due course.

6.1 Knowledge Import

Our aim was to start where other LCN funded projects stopped. We have engaged SSE, UKPN and WPD who have relevant learning from LCNF projects, specifically Commercial Agreements, remote maintenance access to ANM equipment, and communication standards amongst other learning.

In November we attended the UK Renewables conference in Birmingham where we made ourselves available to existing and prospective renewable generators and listened to their issues and experience of connecting to the Distribution network. This information has informed our future Stakeholder forum and Community Workshop attendees list.

The outcomes from these events will shape the direction of the deliverables over the project life cycle, linking stakeholder engagement directly to project outcomes.

6.2 Knowledge Export

Our aim is to ensure that the project is taken into business as usual seamlessly, a key project success indicator. Internally we have conducted an Innovation Event directed at business units who will have a future roll in taking this project into business as usual. Externally we have communicated this project at UK Renewables and LCNF conferences to inform others of the project aims and objectives. The key point of interest from other DNOs is progress with NGET on Transmission Distribution boundary discussions. We plan to update other DNOs on this issue specifically with the aim of bringing them into discussions once agreement with NGET is achieved for this project so it can be rolled out across other DNO area where Transmission constraints are affecting the connection of embedded generation.

Demonstrating the actual machinery that will be the first to be installed at the Dunbar grid supply point was achieved at the LCNF conference. This demonstration was a huge success and visitors to the SPEN stand enjoyed the 'hands on' approach. We have extended this to have the ANM machinery within the SPEN offices with 'drop in' demonstrations available for all staff.

6.3 Power Network Demonstration Centre (PNDC) Facility

At this stage in the project it is too early to comment on this work package.

3. BUSINESS CASE UPDATE

The Business Case remains as per our original submission with no events or developments taking place in industry over the first year of the project that would adversely affect the delivery of the ARC project.

4. PROGRESS AGAINST BUDGET

Table 1 below provides a summary of the project budget position in respect of the reporting year 2013. We have received all of the invoices for all work completed and therefore our expenditure from our previous report has significantly increased.

Activity	Budget 2013 £k	Actual 2013 £k	Variance £k	Comments
Labour	1,131.1	219.0	(912.1)	Recruitment delays. Direct Labour costs debited from ARC bank account on a quarterly basis
Equipment	594.4	112.0	(86.1)	Roll-out of ANM technology at Dunbar completed Dec 2013
Contractors	937.7	312.6	(625.1)	All contractors and collaboration partners have invoiced for activity over 2013 however deferment of some activity due to not being required for Dunbar GSP will roll into 2014
IT	464.2	0	(464.2)	Roll-out of ANM technology has not required initial IT spend over reporting period however this will ramp up over course of Q1 2014 as we commission and integrate ANM with existing SP systems
Travel & Expenses	10.0	3.6	(6.4)	Efficiencies realised in respect of travel
Contingency & Others	73.5	9.1	(15.4)	Additional costs incurred attending various conferences throughout 2013 however strong costs focus ensures costs remain within budget. Further costs will be deferred to 2014
Total	3,210.9	656.3	(2,554.6)	

5. BANK ACCOUNT

A copy of the ARC bank statement detailing the transactions of the Project Bank Account to date is attached and included within Appendix A (Confidential Submission)

6. SUCCESSFUL DELIVERY REWARD CRITERIA (SDRC)

- **Criterion (9.1) Project Budget** – We remain on track to deliver the objectives and deliverables of the Accelerating Renewable Connections project within the existing budget provision as set out within our Tier 2 Full Submission documentation.
- **Criterion (9.2) Project Timeline Delivery** – We remain confident that we will deliver the entire project within the Project Timeline as agreed within the Project Direction documentation.
- **Criterion (9.3) Demonstration of alternative solutions as detailed in case study 1** – As already intimated, we have installed the ANM enabling technology at Dunbar GSP and will complete on-site acceptance testing and integration with existing SP Distribution systems during the course of Quarter 1, 2014.

Our successful engagement and communication strategy in the promotion of our activities under the ARC project to date has led to a number of positive interactions with a number of generators seeking to connect under the ANM scheme to date. More importantly the majority of those generators are in receipt of planning consent for the given project. The critical path in order to deliver this aspect of the project will be agreement with NGET on the policy and governance arrangements for connecting embedded generation ahead of or in the absence of transmission reinforcements. However, as described, this work has been progressing positively to date.

- **Criterion (9.4) Demonstration of alternative solutions as detailed in Case Studies 2,3 and 4** – In line with our previous report, we remain confident that we will deliver an Active Network Management system and alternative connection arrangements as detailed in either case studies 2, 3 and 4. This view is supported by the level of engagement and developers seeking to connect within the trial area.
- **Criterion (9.5) Creation of community energy generation scheme & model for community level generation** – Following the appointment of a dedicated resource from within Community Energy Scotland (CES) we have seen a ramp up of activity in respect of delivering a community based generation scheme. The team at CES have completed an initial analysis of possible projects that could be delivered and CES have also began the task of completing an audit of available flexible demand currently in existing within the trial area that could be flexed in order to demonstrate the possibility for local community owned generation to connect behind a known network constraint through the ability to contract directly with a local flexible demand source. CES, in collaboration with Strathclyde will report back on this activity by March 2014.

In addition, CES have identified interested communities who are seeking to deliver their own community generation scheme and we will hold our first Community Workshop, facilitated through Copper Consultancy, during February 2014.

- **Criterion (9.6) Demonstration of top-down Active Network Management** – We have completed site surveys at Berwick and Galashiels GSPs that are scheduled to be ANM enabled by summer 2014. In addition, we have also identified or have been approached by developers interested in connecting to those GSPs as part of the ANM scheme.
- **Criterion (9.7) Detailed publication and dissemination of learning from project** – Following the recruitment of a dedicated Knowledge Transfer Lead in August 2013, we have made significant progress in capturing the learning from our project to date.
- **Criterion (9.8) Improved Generation Experience** – To date we have surveyed a number of existing generation developers to gain their views on the current arrangements for connecting to the distribution networks. With regard to those customers seeking to connect to the distribution network within the trial area but are being prevented as a consequence of transmission constraints, we are seeing that the average time to connect will be at least 5-years from the time of connection application with costs forecast in the order of £20m. For those generators seeking to connect at lower voltage levels, voltage rise remains the main cause of network constraint. Again this is giving rise to costs per MW being significantly higher than would otherwise be expected. This provides a baseline for improving the overall experience for generators seeking to connect to our network.

7. LEARNING OUTCOMES

The emphasis has been learning import as opposed to export during this period. Our aim has been to identify relevant learning to the ARC project, understand that learning, implementing it and ensuring we are benefitting as expected. For example: making ourselves available at the Renewables UK conference to listen to renewable generators which in turn informed our Stakeholder forum and Community workshops attendee list, linking stakeholders directly to project outcomes. The next challenge is to ensure we get a balanced view to ensure the project does not bias a specific set of stakeholders.

8. INTELLECTUAL PROPERTY RIGHT (IPR)

The project is not funding the development of any technology which should create foreground IPR. All partners have accepted the LCNF default IPR arrangements.

9. RISK MANAGEMENT

The project risks table below has been updated with developments and any risks identified as part of the project activity to date. Similar to our last report we consider that the project management approach we have taken has mitigated any perceived risks from materialising.

Risk	WP	Risk Description	P	C	PR	Mitigation	Action
1	WP 1.3	Developers unwilling to trial new commercial and connection arrangements	1	3	3	Targeted Stakeholder Engagement with developers ensuring benefits of ANM are understood	Identify key stakeholders within trial area Hold one-to-one meetings with all developers seeking to connect within the trial area
	WP 1.2	Dynamic network constraints and volume of data leads to IT issues	1	3	3	Ensure network planning tools and data requirements meet the needs of the network planners	Review of existing Network Modelling data and production of up to date network data
2	WP 2.1	The Development of new tools and processes for connection design involves complexity and time/cost risk	2	2	4	SPD has engaged technology partners to develop up to date tools and processes for connections design	Deploy internal IT support and resources where possible and transfer learning from external technology partners into the business
	WP 2.2	Increased visibility of network may have an impact on the available network headroom	2	1	2	Traditional design headroom has been conservative	Utilise learning gained from Flexible Networks project on headroom available

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	WP 2.3	Integrating existing data sources and tools is not successful due to incompatibility	2	1	2	SPD will engage technical experts to conduct integration of data and tools into a single streamlined solution	Expand on previous IFI trials
3	WP 3.2	There are communication issues with telecoms platform meaning that some areas cannot be covered by ANM	3	2	6	SPD will carry out site surveys and specify telecoms that will meet the requirements of the trial area	Use of existing communication technology under Business As Usual
4	WP 4.1	Failure to establish SPD/NGET process and policy	2	2	4	Robust engagement with NGET.	Key deliverable – maintain dialogue with NGET to reach agreement on commercial interface and policy for mgt of GSP constraint
	WP 4.2	Procurement of technology and software tools to facilitate trials could defer project deliverables	1	3	3	Alignment with Business As Usual policy on selection of technology providers	BaU
5	WP 5.2	Network evaluation finds that generation triggers cannot be categorised	1	3	3	Academic partner to carry out analysis and report	Work with key stakeholders
6	WP 6.1	Knowledge Import from other projects	1	1	1	Assignment of dedicated resource to import learning from existing LCNF projects	Appointment of Knowledge Transfer Lead
	WP 6.2	Knowledge Dissemination	1	1	1	Delivery of knowledge sharing events	Identification of key stakeholders Regular engagement with UK DNOs Regular review, update of ARC website Use of various media resource to capture and impart learning
	WP 6.3	PNDC Demonstration of technology	1	2	2	Selected technology does not function as specified	Robust assessment of new technology used to constrain or facilitate embedded generation

10. CONSISTENCY WITH FULL SUBMISSION

We confirm that the project is being undertaken in accordance with the full submission.

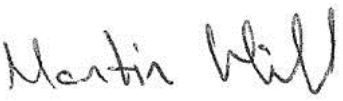
ACCURACY ASSURANCE STATEMENT

Steps taken to ensure this are:-

- Regular update reports from each project team member for their area of responsibility.
- Evidence of work undertaken by the project team is verified by the section manager as part of their day-to-day activities. This includes;
 - Checking and agreeing project plans.
 - Holding regular team project meetings and setting/agreeing actions.
 - Conducting frequent one-to-one meeting and setting/agreeing actions.
 - Confirming project actions are completed.
 - Approving and signing off completed project documents.
 - Approving project expenditure.
- Weekly reports are produced by each section manager of the progress of the work their department is undertaking.
- Director and Senior Management summary reports for the project progress are produced.

Author		Date	18 th December 2013
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Euan Campbell Norris – Senior Project Manager

Signed (1)		Date	18 th December 2013
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Martin Hill – Future Networks Manager