Kent Active System Management
Low Carbon Networks

Project Progress Report December 2015 v1.0
## Contents

1 Contents ........................................................................................................................................ 1  
2 Executive Summary .......................................................................................................................... 3  
3 Project Manager’s report .................................................................................................................. 5  
   2.1 Progress in current reporting period ............................................................................................ 5  
   2.1 Key challenges during this reporting period .............................................................................. 15  
4 Progress against budget ...................................................................................................................... 15  
5 Bank account ..................................................................................................................................... 16  
6 Successful delivery reward criteria (SDRC) .................................................................................... 16  
7 Learning outcomes and knowledge dissemination ........................................................................... 19  
   7.2 Internal communications and knowledge dissemination activities ............................................ 19  
   7.3 External communications and knowledge dissemination activities .......................................... 19  
   7.4 Learning and Dissemination activities in the next reporting period ........................................... 20  
8 Intellectual Property Rights (IPR) ..................................................................................................... 21  
9 Risk management .............................................................................................................................. 22  
10 Other ............................................................................................................................................. 25  
11 Consistency with the full submission ............................................................................................... 25  
12 Accuracy assurance statement ......................................................................................................... 25  
13 Non-Confidential Appendix ............................................................................................................ 26
1 Executive Summary

The Kent Active System Management Low Carbon Networks project (KASM) aims to carry out a range of technical innovation trials to demonstrate more precise operation and planning of the 132kV network in South Eastern Power Networks’ (SPN) East Kent area. The project will support and enable the connection of low carbon generation and the deferral of capital-intensive reinforcement projects associated with generation and will also reduce outages for existing generators.

The project will run for three years, from January 2015 to December 2017, and has been awarded funding of £3.4m by Ofgem, under the Low Carbon Networks Fund (LCNF) scheme. Total funding for the project is £3.9m, with the remaining funding provided by UK Power Networks (£450k) and project partners (£50k).

The main focus during the first year of the project has been mobilisation, detailed design and initiation of the development of the solution. As such, and as seen throughout the report and especially in sections 2 (Project Manager’s report) and 7 (Learning outcomes and knowledge dissemination), learning has been generated and is being disseminated through various channels for use by key stakeholders.

This six-month reporting period (July–December 2015) is the second for the project and at the time of writing, the project’s first Successful Delivery Reward Criterion (SDRC) deliverable (SDRC 9.1 – Development of the strategy for inter-control room communication protocol for the purposes of KASM) is on schedule for delivery at the end of December 2015. This SDRC has seen the completion of the design and installation of the Inter-Control Communication Protocol (ICCP) to transfer data between the National Grid (NG) and UK Power Networks control rooms.

In terms of the remaining components of the KASM project technical solution, which form SDRC 9.2 (Completion of the system integration of Contingency Analysis (CA) software into UK Power Networks systems, excluding a real-time link to National Grid) and SDRC 9.3 (Completion of installation of forecasting modules that will link the DNO control room with other data sources): work is progressing on these although their delivery to the dates in the bid are dependent on the resolution of a small number of technical points relating to a data mapping exercise between the PowerOn and DigSILENT network models. Work is continuing with the software companies behind these systems and we are working hard to resolve the issues. These are expected to be resolved in the New Year, although we will keep Ofgem abreast of any issues that arise surrounding them.

Section 2 provides a summary of the key activities completed during the second reporting period for all three SDRCs.

Risk

A key risk (R013) was highlighted in the previous reporting period, which related to the completion of contractual negotiations with the main project partners and suppliers. This reporting period saw the completion of contractual negotiations with three of these parties; negotiations with the fourth party, our project partner NG, are still ongoing. Whilst bringing a wealth of expertise and skill that has already been beneficial to the project, it has also been a time consuming process to complete. The time taken to complete the three contract discussions and the ongoing negotiations with NG for the remaining agreement has not had any material impact upon the project’s ability to deliver against its key milestones. The project is
focused on agreeing all of the remaining points in the NG contract by the end of 2015. Completion of the contractual negotiations with NG will enable us to procure all of the major items of equipment and services necessary to deliver the project.

A further key risk (R023) has been raised and is being managed in respect of the tight timelines the project is currently working within to deliver SDRC 9.2. The project has faced delays in completing the data mapping design, which will potentially impact the solution testing. To mitigate this, the KASM project team has reviewed the project delivery approach and will be completing activities in parallel. This risk is being monitored on a regular basis to ensure there is no slippage to affect the successful delivery of the SDRC.

Learning and dissemination

The project has been following the learning dissemination strategy outlined in the KASM Knowledge Dissemination Road Map, which we submitted with our June 2015 Project Progress Report. The learning dissemination activities that the project has completed during this reporting period are as follows:

- The project was presented to the ENA R&D working group.
- A high-level presentation has been published on the KASM microsite, inviting stakeholders to provide input on key aspects of the KASM project.
- **WebEx 1 – ICCP Link**: held in November 2015 to present the key technical and commercial challenges relating to the implementation of an ICCP link and capture feedback and considerations from other DNOs.
- **WebEx2 – Contingency Analysis**: held in November 2015 to present the key technical and commercial challenges relating to contingency analysis, data exchanges between DNOs and the TSO, and short term forecasting of load and generation, whilst capturing feedback and considerations from other DNOs.
- A project leaflet was created and distributed at the LCNI conference.

As part of WebEx1 and 2, a number of key points for consideration by the project were raised by other DNOs. These will be described in our SDRC 9.1 report and included: ICCP security, testing and ongoing management; data quality; confidentiality of generator information; and integration of Transmission and Distribution network models into the contingency analysis solution.
2 Project Manager’s report

2.1 Progress in current reporting period

2.1.1 Workstream 1

Workstream 1 is responsible for designing, developing, testing and delivering the Inter-Control Centre Communications Protocol (ICCP) link between the UK Power Networks and NG systems. This link will be used to transfer real-time Supervisory Control and Data Acquisition (SCADA) and metering data between UK Power Networks and NG for the purpose of the Contingency Analysis System (CAS).

The design stage comprised two parts:

1. The Information Technology (IT) hardware and Data Communication infrastructure
2. The data definitions and mapping between NG’s Energy Management System (EMS) and UK Power Networks’ PowerOn Fusion Distribution Management System (DMS)

The IT hardware and Data Communication infrastructure design phase involved the following stakeholders:

- UK Power Networks – IT Architecture, IT Security and IT Communications Teams
- NG – IT Architect, Vodafone (IT Communications)
- GE – ICCP (FEP) application

The scope of this design has taken into consideration future scalability and provides environments for Testing, Pre-Production (Staging area) and Production (Live). As shown in Figure 2 below, the design stage required collaborative working with each stakeholder to design their corresponding deliverable and agree an integrated ICCP solution.

The data definitions and mapping between NG’s EMS and UK Power Networks’ DMS involved design decisions with the following parties:

- UK Power Networks – KASM Technical Design Authority
- NG – KASM Business Team
- GE – PowerOn technical team
The design process to define the real-time data points required by both NG and UK Power Networks involved agreeing a network boundary that covered the KASM area within the SPN network, as shown in Figure 1 below.

![Diagram showing NG network within KASM boundary](image)

**Figure 1:** NG network within KASM boundary

The data points required by NG for modelling UK Power Networks’ network are:

- Switches
- Transformers
- Lines
- Shunts
- Loads
- Series Reactors
- Generators (Embedded)
- Static Var Compensators (SVC)
- Mutual Coupling
Data points required by UK Power Networks to input into the CAS include the following from each substation and/or generator immediately adjacent to the KASM boundary:

- MW
- MVAr
- Current
- Power Factor
- Voltages
- Tap position

Progress to date:

- The end to end high level hardware infrastructure design (see Figure 2) has been reviewed and agreed by all stakeholders. The design has full failover capabilities at both NG and UK Power Networks sites, thus ensuring minimum data loss in the event of failure.
- The low level design defining the communication connectivity has been finalised, enabling components to successfully communicate with corresponding environments within the infrastructure and data security requirements.
- The ICCP FEP servers have been purchased and installed on UK Power Networks sites. The SPN test environment has been fully configured.
- The routers, switches and firewalls have been installed and configured to enable connection between the NG and UK Power Networks (SPN) test environments.
- Using the SPN test environment, initial connectivity tests have been successfully conducted, proving that data can be transferred in both directions.
- The scope of the KASM boundary has been agreed, with flexibility for any changes that may be required as the project matures.
- GE has started to configure the agreed ICCP data points into PowerOn Fusion.
- NG has agreed the data points definitions and are configuring the EMS to send the required real-time data points.
Risks identified:

- At the time of writing this report there are no known risks for Workstream 1.

Assumptions:

- For Workstream 1, the assumption is that the solution will be scalable to incorporate the SPN network on day one but will include spare capacity to increase the number of data points in the future.

Plans for next period:

- Workstream 1 will move into the testing phase of the project. The test strategy will go through the following test cycles:
### Test Type | Env | Objective
--- | --- | ---
Integration Testing | Test | Prove End to End connectivity of the HW infrastructure
Non Functional Test | Pre-Prod | Validate
- Communication resilience
- Network performance
- Security and penetration
- Data volume and sizing
- Application recoverability
- Server failure recoverability

System Integration Test | Test and Pre-Prod | To take real-time data and feed them into EMS and PowerOn system
Go Live | Prod | Cut over to Production plan and acceptance into live
Operational Acceptance Test | Pre-Prod and Prod | Test out operability and support functions
- Validate the change process to ensure that any network changes on either side (NG and/or UK Power Networks) are managed effectively

### 2.1.2 Workstream 2

This workstream is responsible for delivering the IT solution for the CAS to satisfy the business requirements of Real Time mode, Study Mode and Look Ahead mode.

In this workstream, activities related to design, development, testing and delivery into Production of the CAS are being carried out in collaboration with the software supplier Bigwood and the PowerOn Fusion supplier GE. The scope of the CAS involves delivering the following functionalities:

- Single Line Diagram – a graphical representation of the KASM network
- Network Model Builder – where data from PowerOn Fusion and Power Factory is consolidated into the CA model
- Study Mode – creates study case network models using variable scenarios
- Real Time solver – Contingency Analysis function for solving real-time network constraints.
- Look Ahead solver – Contingency Analysis function for solving network constraints for long-term planning.
- PowerOn Extract – a data extract module designed by GE to provide network data from PowerOn Fusion

The workstream had agreed a waterfall methodology comprising the following phases:

- Engagement with partners
- Requirements definitions
- Design definitions
- Development of the solution
- Testing
- Go Live in readiness for trials
During this period the workstream completed the requirements definitions and moved into the design phase. The scope of design was specified in two parts, logical and physical, and the main activities were as follows:

- A data analysis exercise was conducted to gain full understanding of mapping PowerOn Fusion data with Power Factory model data.
- GE developed a mechanism to extract the KASM network model information for the CAS to import into.
- A CIM extract module was developed to enable the Power Factory model data to be loaded into CAS.

In parallel with design, it was decided to start development of some of the standard modules (See ‘Progress to date’ below).

Progress to date:

- The definition of requirements has been completed.

Logical design (activities completed):

- Joint design workshops were held with Bigwood, GE, NG and UK Power Networks to agree the end to end data flows
- Data definitions
- Data mapping
- Application architecture
- Software integration definitions

Physical design (activities completed):

- Application and database server definitions
- Access and security definitions
- Data extract mechanisms and file formats

Software development (activities completed):

- GE PowerOn extract modules for Single Line Diagram and power flow data
- Single Line Diagram module
- Data Bridge to import network model extracts into the CAS

All of the above have been unit and system tested by the suppliers.
Risks identified:

- The data mapping exercise has highlighted that the granularity of data definition in PowerOn Fusion is not the same as in Power Factory. As a consequence, a set of rules had to be defined to successfully map the data between the two models and ensure that an accurate network model is used as an input to CAS. This has proven to be a labour intensive exercise and is not complete. Work is continuing with the software companies behind these systems and we are working hard to resolve the issues. These are expected to be resolved in the New Year, although we will keep Ofgem abreast of any issues that arise surrounding them.

Assumptions:

- None identified.

Plans for next period:

- In the next reporting period the workstream will complete the development of the CAS solution and move into the test phases, as defined below.

<table>
<thead>
<tr>
<th>Test Type</th>
<th>Env</th>
<th>Objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factory Acceptance (FAT)</td>
<td>Supplier side</td>
<td>The suppliers to demonstrate that the solution delivers the agreed functionality as set out in the requirements definition</td>
</tr>
<tr>
<td></td>
<td></td>
<td>This test will be conducted on the supplier environment in US</td>
</tr>
<tr>
<td>Site Acceptance (SAT)</td>
<td>Test</td>
<td>To prove that the FAT passed version of the software functions the same in the UK Power Networks environment</td>
</tr>
<tr>
<td>System Integration (SIT)</td>
<td>Test and then Pre-Prod</td>
<td>Prove end to end connectivity of the CAS with PowerOn and Power Factory to support ‘Control’, ‘Planning’ and ‘Outage Planning’ functionality</td>
</tr>
<tr>
<td>Non Functional (NFT)</td>
<td>Pre-Prod</td>
<td>Validate:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Application performance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Security and penetration</td>
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<tr>
<td></td>
<td></td>
<td>- Data volume and sizing</td>
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<td>- Application recoverability</td>
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<td>- Server failure recoverability</td>
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<tr>
<td>Go Live</td>
<td>Prod</td>
<td>Cut over to Production plan and acceptance into live environment</td>
</tr>
<tr>
<td>Operational Acceptance (OAT)</td>
<td>Pre-Prod and Prod</td>
<td>Test out operability and support functions</td>
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<tr>
<td></td>
<td></td>
<td>Validate the change process to ensure that any network changes on either side (NG and/or UK Power Networks) are managed effectively</td>
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</table>
2.1.3 Workstream 3

This workstream is responsible for developing and testing load and generation forecasting modules that will be used in conjunction with the Look-Ahead mode of the CAS tool.

Since we submitted our June 2015 Project Progress Report, significant progress has been made in designing the architecture of the load and generation forecasting modules. Reviewing the key considerations highlighted in our previous Project Progress Report, the following decisions have been made:

- Forecasting modules will focus on short-term forecasting (<48hrs) as the Met Office has indicated that long-term weather forecasting is not sufficiently reliable.
- Historical and forecast weather data items for the forecasting modules have been agreed with Bigwood and the Met Office. Contracts with the Met Office have been signed. Bigwood now has access to historical and forecast weather data.
- Following detailed discussions with NG, it has been decided that sharing balancing mechanism data will not be necessary for the KASM project. The key reasons for this are:
  
  a) The IPN and MEL data is considered to be confidential and therefore it would be difficult for this to be shared by NG. In order to share this data, UK Power Networks would have to request a change to the Grid Code or gain consent from individual generators.
  
  b) The specific Initial Physical Notification (IPN) and Maximum Export Limit (MEL) data items that we anticipated using do not appear to be a sufficiently accurate forecast of day-ahead outputs from generators.

  To overcome the fact that balancing mechanism data cannot be used as a forecast for transmission connected generation, UK Power Networks will work with Bigwood to use historical outputs from these generators, together with weather data to forecast their future outputs.

- The data formats and transfer mechanisms still need to be agreed for transferring data from NG and the Met Office.

The draft architecture is presented in Appendix 1.

Within the next six months, Workstream 3 will deliver SDRC 9.3 (Completion of installation of forecasting modules that will link the DNO control room with other data sources), which is due in March 2016. The key focus in order to achieve the successful delivery of SDRC 9.3 will be:

- Finalise data items, data formats and transfer mechanisms between NG, the Met Office, UK Power Networks and Bigwood
- Develop testing strategies, test plans and analyse test results
- Develop processes for forecasting new generators, which do not have historical data.
2.1.4 Workstream 4

Workstream 4 is responsible for understanding the value streams and business process impacts of the CAS solution and forecasting modules.

Since we submitted our June 2015 Project Progress Report, the workstream has focused on getting the business process flow documents approved by the business users and producing a draft high level trial strategy document. The trial strategy document will provide details on trial participants, trial durations, trial methodologies and processes for measuring benefits.

Moving into the next reporting period, Workstream 4 will organise workshops to discuss the draft trial strategy with the trial participants. It is expected that this will provide valuable information that will help ensure the users are fully engaged with trials and that expectations from the users can be carefully managed. Following the approval of the trial strategy document, Workstream 4 will produce detailed trial plans and trial design documents which will be specific to each of the use cases (real-time control, outage planning and infrastructure planning). These trial plans and trial design documents will provide a detailed list of scenarios that will need to be tested in order to successfully deliver the criteria listed under SDRC 9.4 (Demonstration of use of real-time CA in the control room) by December 2016 and SDRC 9.5 (Completion of trials and implementation of reliability management, outage management and network capacity management) by December 2017.

2.1.5 Technical Design Authority

In this reporting period, the Technical Design Authority (TDA) focused on network model data and real/historical data exchanges between the existing network modelling tools and the Bigwood CAS. This work included devising a process to update the network switch statuses as they change on the live network, and mapping the model data and components to the CAS. The UK Power Networks and NG models run on the Power Factory simulation software from DigSILENT and PowerOn Fusion supplied by GE.

2.1.5.1 Data model exchange

The TDA carried out structured appraisals of the suitable format for model data exchanges from UK Power Networks models to the Bigwood CAS platforms. Two technologies were evaluated – the PSS/E raw file and the Common Information Model (CIM). Following significant work and due diligence tests involving Bigwood, the CIM methodology was chosen as the preferred solution as it is modularised and proved to be the best fit for design for KASM. The Power System Simulator for Engineering (PSS/E) raw extract methodology would provide a hybrid-type process which is unlikely to be suitable for KASM requirements. Initially, some challenges were encountered in overcoming errors that were reported with the CIM export. These were resolved with support from DigSILENT.

The TDA continues to carry out further work on the CIM process to confirm the full capabilities of other interfacing systems such as the Bigwood CAS tool, with a view to improving the CIM export files. There have been issues with data inconsistencies as observed in the CIM analysis reports – for example, shared/missing Sites, Plant and Equipment Numbering System (SPENS) numbers. The project is focused on correcting the issues and developing a unique numbering system for sites outside SPN.
2.1.5.2 KASM network boundary

The TDA held consultations with relevant stakeholders on settling the appropriate KASM network boundary, on both the distribution and transmission networks, as shown in Figure 1: NG network within KASM boundary)

Initially, it was decided to include only the NG transmission network in and around the SPN licensed area, with the rest of the transmission network reduced to equivalent networks with power injections at KASM boundary nodes. NG confirmed that the calculation/updating of equivalent networks is a manual process. NG will provide the Operating Code No 2 (OC2) and Week 42 models as per the existing arrangements. The OC2 model contains embedded generation and power station data, loads, transmission network and nodal in-feeds and its use is restricted to operational purposes only. Week 42 models contain network equivalent data provided by NG to network operators annually (in week 42), for their fault level assessment processes and long-term planning. At this stage the network equivalents are calculated manually, which would not be ideal for the ‘real-time or near real-time’ requirements for KASM. NG also confirmed that any errors from KASM (the distribution network) will not affect its network or equipment. UK Power Networks would therefore have to manage the accuracy of equivalent network in-feeds in the event of disturbance on the NG network. Because of these envisaged challenges around network equivalents, the project decided to move towards using the full NG model option.

2.1.5.3 Keeping Track of Network Constraints

The TDA also kept in check developments on both the distribution and transmission network in East Kent and compared these against the network constraint drivers on which the KASM project business case is based. The TDA carried out further analysis of distributed generators who are expected to connect the SPN network by the first quarter of 2016 and the network constraints provided in the network study document carried out by Mott MacDonald, which show the drivers of the KASM project were updated. The impact of the emerging transient voltage constraints reported by NG was also incorporated, and the network constraints update also includes the remedial strategies that NG is planning for the transmission network in East Kent.

The TDA was represented in discussions with NG on the Joint Technical Planning Meetings (JTPM), which are quarterly planning meetings held by NG and the respective DNOs. Further analysis was also carried out on the current status of distributed generation connections activities in East Kent. Thermal constraints remain valid for the KASM driver. Recent transient overvoltage observations by NG would further limit the number of additional distributed generators that could potentially be connected using the CAS benefits. At this stage, based on planned distributed generation connections, it is envisaged that the estimated thermal constraint on distributed generators in East Kent will rise from approximately 80MW (originally predicted in 2014) to approximately 150MW by the first quarter of 2016.

With the above in perspective, it is clear that the need for CAS to optimise the use and operation of the distribution/transmission network is growing in significance.
2.1 Key challenges during this reporting period

During this reporting period the project faced three key challenges, as outlined below.

1. Workstream 2: A key challenge for Workstream 2 during this reporting period has been data mapping of PowerOn Fusion and Power Factory model files. The project has explored several options for exporting network models from the PowerOn Fusion and Power Factory model. To ensure the CAS tool is a real-time reflection of the network and can also be used for power flow modelling, it requires data from the PowerOn Fusion and Power Factory model. As stated in the TDA section above, UK Power Networks has explored both CIM and PSS/E exports from the Power Factory model and decided that the CIM models provide Bigwood with the most accurate model of our network. When liaising with GE, the suppliers of PowerOn Fusion, it was decided that the most appropriate export methodology would be for GE to create a bespoke XML export.

2. Workstream 3: The logistics of sharing third party data between NG and UK Power Networks continues to be discussed at length. The specific data items relate to forecast generation data for Central Volume Allocated generators (IPN/MEL), which are connected to the transmission network. In addition, there has been a key challenge in determining whether National Electricity Transmission System Study Network Data Files (OC2) can be shared between UK Power Networks’ operations and planning departments.

3. KASM network boundary: When modelling the NG network, the users need to determine the boundary of the KASM project. Outside the boundary, the initial plan was that the NG network would be modelled as equivalent in-feeds at the boundary nodes. The challenge involved in this exercise is determining the impact of changing the boundary and how the equivalent points can be updated on a real-time basis and longer term basis. Since equivalents are manually calculated by NG at this stage, it is not possible to obtain real-time updates of NG’s equivalent network power injection at the boundary nodes. It has been decided that the full NG network will be used if the project submission to the Grid Code panel is successful in waiving the restriction on OC2 data models, so that these could also be used by infrastructure planners. If this submission is not successful, network equivalents will continue to be calculated manually and updated by exception following significant changes on the NG network.

3. Business case update

The business case remains consistent with our June 2015 Project Progress Report.

4. Progress against budget

This section is provided as a confidential appendix.
5. Bank account

This section is provided as a confidential appendix.

6. Successful delivery reward criteria (SDRC)

<table>
<thead>
<tr>
<th>SDRC</th>
<th>Progress</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.1</td>
<td><strong>Criterion</strong>&lt;br&gt;Development of the strategy for inter-control room communication protocol for the purposes of KASM.</td>
<td>SDRC completed and due for submission on 31 December 2015</td>
</tr>
<tr>
<td></td>
<td><strong>Evidence</strong>&lt;br&gt;• Published report on key technical and commercial challenges relevant to inter-control room link and the KASM project, whether proposed by the KASM team or raised by stakeholders, including other DNOs;&lt;br&gt;• Implementation guidelines for the inter-control room communication link in consultation with National Grid for use by the project.</td>
<td></td>
</tr>
<tr>
<td>9.2</td>
<td><strong>Criterion</strong>&lt;br&gt;Completion of the system integration of CA software into UK Power Networks systems, excluding a real-time link to National Grid.</td>
<td>Progress made so far for this SDRC:&lt;br&gt;- Requirements definitions in progress&lt;br&gt;- Design definitions&lt;br&gt;- Software development ongoing</td>
</tr>
<tr>
<td></td>
<td><strong>Evidence</strong>&lt;br&gt;• Sign-off on set up of CA software;&lt;br&gt;• Sign-off on successful demonstration and testing of CA software; and&lt;br&gt;• Published report on CA software integration that includes the control room IT architecture, lessons learned, engagement with other DNOs, and identified risks.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The data mapping exercise is not yet complete. We expect the issues to be resolved in the New Year, although we will keep Ofgem abreast of any issues that arise.</td>
<td></td>
</tr>
<tr>
<td>SDRC</td>
<td>Progress</td>
<td>Date</td>
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<tr>
<td><strong>9.3</strong></td>
<td><strong>Criterion</strong>&lt;br&gt;Completion of installation of forecasting modules that will link the DNO control room with other data sources.</td>
<td>Significant progress has been made in working towards the completion of SDRC 9.3.</td>
</tr>
<tr>
<td></td>
<td><strong>Evidence</strong>&lt;br&gt;• Sign-off on installation of forecasting modules;&lt;br&gt;• Forecast data, benchmarked for accuracy against historical data;&lt;br&gt;• Published report demonstrating forecasts including each of solar, on-shore wind and off-shore wind;&lt;br&gt;• Forecast error curves plotted at primary substation, 132kV circuit, and GSP levels;&lt;br&gt;• Description of integration architecture with the overall solution;&lt;br&gt;• Published report on data aggregating forecasting modules that includes lessons learned and identified risks.</td>
<td>Key activities that have been completed include:&lt;br&gt;• Agreement of high level architecture&lt;br&gt;• Definition of detailed inputs to solar and wind forecasters&lt;br&gt;• Definition of detailed inputs and load points for demand forecasting&lt;br&gt;This SDRC remains on schedule to be delivered as planned.</td>
</tr>
<tr>
<td><strong>9.4</strong></td>
<td><strong>Criterion</strong>&lt;br&gt;Demonstration of use of real-time CA in the control room.</td>
<td>This SDRC remains on schedule to be delivered as planned. The key progress to date has been in drafting the trials strategy document, which is currently being discussed and refined in conjunction with the users.</td>
</tr>
<tr>
<td></td>
<td><strong>Evidence</strong>&lt;br&gt;• Demonstration of contingency results from live SCADA readings, supplied within 15 minutes of them being collected;&lt;br&gt;• Completion of user survey identifying the most critical forecast time periods perceived by control room users (e.g. next 15 mins; tomorrow; next shift);&lt;br&gt;• Published report with description of the solution, the user interface, and the capabilities.</td>
<td></td>
</tr>
<tr>
<td>SDRC</td>
<td>Progress</td>
<td>Date</td>
</tr>
<tr>
<td>------</td>
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<td>------</td>
</tr>
<tr>
<td>9.5</td>
<td><strong>Criterion</strong>&lt;br&gt;Completion of trials and implementation of reliability management, outage management and network capacity management.</td>
<td>This SDRC remains on schedule to be delivered as planned.</td>
</tr>
</tbody>
</table>

**Evidence**

- Published results from functional trials and the achieved benefits in reduced DG curtailment;
- Published report demonstrating data collection from Grain, Kemsley, Cleve Hill, Canterbury North, Sellindge, Dungeness and Ninfield 400kV network and sensitivity of the CA results to this data;
- List of connection offers that have been linked to reinforcement when assessed using conventional processes, and identification of those that have been revised to remove the reinforcement requirement after being assessed using the trialled methodology; quantification of the released network capacity based on the comparison of the above list;
- Published report on considerations for selecting, designing and installing CA software for each use case.
<table>
<thead>
<tr>
<th>SDRC</th>
<th>Progress</th>
<th>Date</th>
</tr>
</thead>
</table>
| 9.6  | **Criterion**  
Development of business design to incorporate CA as business-as-usual.  
**Evidence**  
- Identification of business areas impacted by the introduction of CA in a Distribution Network Operator.  
- Outline of proposed changes to systems, policies and processes required in the DNO operating model in order to incorporate CA as part the business as usual operation. | Through the initial work undertaken by the project, the current high level processes have been mapped, with stages impacted by the CAS identified.  
This SDRC remains on schedule to be delivered as planned. | December 2017 |

7. Learning outcomes and knowledge dissemination

7.2 Internal communications and knowledge dissemination activities

Since the last reporting period, the main focus of the project has been on design and development. As a consequence, internal communication has mainly been focused on the teams that will directly benefit or be impacted by the implementation of the CAS (e.g. the users and the Real-Time Systems team in UK Power Networks’ Network Operations directorate). This is expected to change as software development progresses and more visuals become available.

7.3 External communications and knowledge dissemination activities

KASM continues to raise the profile of the project through conferences and PR:

<table>
<thead>
<tr>
<th>Conferences and formal dissemination activities</th>
<th>Main Messages/presentation title</th>
<th>Date</th>
</tr>
</thead>
</table>
| ENA R&D working group meeting | High level project description  
Invitation to provide input relating to the following topics:  
- Inter-Control Centre Communications Protocol (ICCP) Link design  
- Real-time data exchanges between DNOs and the TSO (including connected generation data)  
- Generation and Load forecasting | Q2 2015 |
| DG Fora | KASM project listed as a UK Power Networks initiative that will facilitate the connection of additional generation to the distribution network | 15/09/2015 |
### Conferences and formal dissemination activities

<table>
<thead>
<tr>
<th>Conferences and formal dissemination activities</th>
<th>Main Messages/presentation title</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>KASM Website (Presentation)</td>
<td>High level project description</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Invitation to provide input relating to the following topics:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Inter-Control Centre Communications Protocol (ICCP) Link design</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Real-time data exchanges between DNOs and the TSO (including connected generation data)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Generation and load forecasting</td>
<td></td>
</tr>
<tr>
<td>WebEx 1</td>
<td>Inter-Control Centre Communications Protocol (ICCP) Link design and management</td>
<td>04/11/15</td>
</tr>
<tr>
<td>WebEx 2</td>
<td>Data exchanges between DNOs and the TSO (requirements for contingency analysis)/short term forecasting of load and generation</td>
<td>04/11/15</td>
</tr>
<tr>
<td>KASM Tweet</td>
<td>Social media post following the two successful WebEx sessions.</td>
<td>05/11/15</td>
</tr>
<tr>
<td>LCNI Conference</td>
<td>Invitation to provide input relating to the following topics:</td>
<td>24/11/15 - 25/11/15</td>
</tr>
<tr>
<td></td>
<td>• Inter-Control Centre Communications Protocol (ICCP) Link design</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Real-time data exchanges between DNOs and the TSO (including connected generation data)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Generation and load forecasting</td>
<td></td>
</tr>
</tbody>
</table>

### 7.4 Learning and Dissemination activities in the next reporting period

<table>
<thead>
<tr>
<th>Conferences and formal dissemination activities</th>
<th>Main Messages</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>SDRC 9.1 Report</td>
<td>Development of the strategy for inter-control room communication protocol for the purposes of KASM</td>
<td>December 2015</td>
</tr>
<tr>
<td>SDRC 9.2 Report</td>
<td>Completion of the system integration of CA software into UK Power Networks’ systems, excluding a real-time link to NG</td>
<td>March 2016</td>
</tr>
<tr>
<td>SDRC 9.3 Report</td>
<td>Completion of installation of forecasting modules that will link the DNO control room with other data sources.</td>
<td>March 2016</td>
</tr>
<tr>
<td>Public Event</td>
<td>Disseminate learning from SDRCs 9.1, 9.2 and 9.3</td>
<td>Expected Q2 2016</td>
</tr>
<tr>
<td>Project updates (Website, tweets, newsletter, targeted presentation as appropriate)</td>
<td>Update key stakeholders on progress</td>
<td>Q1-Q2 2016</td>
</tr>
</tbody>
</table>
8. Intellectual Property Rights (IPR)

During the current reporting period, the following IPR (foreground or relevant foreground) has been generated (June–November 2015):

<table>
<thead>
<tr>
<th>Workstream</th>
<th>IPR description</th>
<th>IPR Owner</th>
</tr>
</thead>
<tbody>
<tr>
<td>WS1</td>
<td>P.0012.KASM.SDRC 9.1 - Development of the strategy for inter-control room communication protocol for the purposes of KASM</td>
<td>UK Power Networks</td>
</tr>
<tr>
<td>WS5</td>
<td>P.0066.KASM. Webinar Presentation (Oct 2015) WebEx 1</td>
<td>UK Power Networks</td>
</tr>
<tr>
<td>WS5</td>
<td>P.0067.KASM.Webinar Presentation (Oct 2015) WebEx 2</td>
<td>UK Power Networks</td>
</tr>
<tr>
<td>WS5</td>
<td>P.0068.KASM.Website Presentation (Oct 2015)</td>
<td>UK Power Networks</td>
</tr>
<tr>
<td>WS5</td>
<td>P.0069.KASM.LCNI Leaflet</td>
<td>UK Power Networks</td>
</tr>
<tr>
<td>TDA</td>
<td>P.0061.KASM.TDA_FC001 - Infrastructure Planning Process Flow Diagram (incorporating Contingency Analysis) – 11kV busbars</td>
<td>UK Power Networks</td>
</tr>
<tr>
<td>TDA</td>
<td>P.0062.KASM.TDA_FC002 - Outage Planning Process Flow Diagram (incorporating Contingency Analysis) – 11kV busbars</td>
<td>UK Power Networks</td>
</tr>
<tr>
<td>TDA</td>
<td>P.0062.KASM.TDA_FC003 - Control Process Flow Diagram (incorporating Contingency Analysis) – 11kV busbars</td>
<td>UK Power Networks</td>
</tr>
<tr>
<td>TDA</td>
<td>P.0064.KASM.TDA_DC004 - Data Models</td>
<td>UK Power Networks</td>
</tr>
</tbody>
</table>
9. Risk management

The KASM project has established a risk management process, as described in detail in the KASM Project Handbook, which was submitted with our June 2015 Project Progress Report. Please see Appendix 1 for an extract of the risk management process. It allows for the communication and escalation of key risks and issues within the project, and defines where decisions will be made and how these will be communicated back to the workstream where the risk or issue has arisen. Risks are reviewed regularly at a workstream level and fortnightly at a project level by the Project Board. Key project risks are then escalated to the Project Steering Committee for review and approval of the mitigation on a monthly basis.

<table>
<thead>
<tr>
<th>Ref</th>
<th>WS</th>
<th>Risk &amp; Impact Description</th>
<th>BID Mitigation</th>
<th>Mitigation (update)</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>B001</td>
<td>PM</td>
<td>Final funding not awarded and project unable to commence in 2014</td>
<td>Ensure high bid quality, regular reviews, clear differentiation and stakeholder engagement.</td>
<td>The project successfully gained Ofgem funding.</td>
<td>Closed</td>
</tr>
<tr>
<td>B002</td>
<td>PM</td>
<td>Project partner(s) withdraw their support at the start of the project</td>
<td>Regular contact maintained throughout bid preparation and up to project start date. Contracts outline LCNF requirements in advance. Reserve supplier has been nominated.</td>
<td>There has been continual close engagement with all project partners and suppliers throughout the contract finalisation. The project team is working closely with NG to finalise the project’s last contract.</td>
<td>A</td>
</tr>
<tr>
<td>B003</td>
<td>WS1</td>
<td>The software solution fails to perform to specification, leading to system incompatibilities and unsatisfactory trial results</td>
<td>The software solution will be subject to performance testing using benchmarking or simulators under various operating conditions. Software requirements to be defined at design stage and suitable software chosen for the purpose of the trials. UK Power Networks to agree Service Level Agreements (SLAs) for software solution.</td>
<td>Requirements and design phases involve all parties (suppliers and business users) to ensure that the software solutions meet the performance requirements.</td>
<td>G</td>
</tr>
<tr>
<td>Ref BID#</td>
<td>WS</td>
<td>Risk &amp; Impact Description</td>
<td>BID Mitigation</td>
<td>Mitigation (update)</td>
<td>Status</td>
</tr>
<tr>
<td>---------</td>
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<td>----------------</td>
<td>---------------------</td>
<td>--------</td>
</tr>
<tr>
<td>B0004</td>
<td>WS5</td>
<td>There is lost learning during knowledge dissemination and stakeholder engagement activities due to differing interests and learning styles of stakeholders</td>
<td>Identify stakeholders early on. Dissemination workstream is fully engaged with technical workstream at an early stage and lessons learnt are captured from the LCNF projects.</td>
<td>Early engagement with all of the project key stakeholders has taken place and will continue to ensure positive support of the project.</td>
<td>G</td>
</tr>
<tr>
<td>B0005</td>
<td>PM</td>
<td>A lack of available technical and project resources causes a delay to the project</td>
<td>Resource plan completed with UK Power Networks resources. Several other projects closing which will release skilled resource.</td>
<td>The project has recruited all of the required resource as per the project handbook.</td>
<td>Closed</td>
</tr>
<tr>
<td>B0006</td>
<td>PM</td>
<td>The software partner goes out of business before the solution has been delivered</td>
<td>Full financial due diligence undertaken as part of UK Power Networks’ procurement procedure; identify alternative supplier.</td>
<td>Full diligence has been undertaken and an alternative supplier has been selected.</td>
<td>G</td>
</tr>
<tr>
<td>B0007</td>
<td>PM</td>
<td>The software partner goes out of business after the solution has been delivered, resulting in lack of continuity/support</td>
<td>Full financial due diligence undertaken as part of UK Power Networks’ procurement procedure; arrange a software ESCROW and novation of liabilities to OEM.</td>
<td>Full diligence has been undertaken and an alternative supplier has been selected.</td>
<td>G</td>
</tr>
<tr>
<td>B0008</td>
<td>WS4</td>
<td>The trials do not deliver the expected results</td>
<td>Expectations are managed due to thorough planning and frequent reporting. Lessons gathered throughout process.</td>
<td>Initial trial participants have been identified and are being updated accordingly.</td>
<td>G</td>
</tr>
<tr>
<td>B0009</td>
<td>WS2</td>
<td>NG do not deliver data in the timescales required</td>
<td>Proactive engagement and understanding of risks from early stage. Static values and alternative data sources considered, such as balancing mechanism reports.</td>
<td>Historic balancing mechanism data has been purchased and there are no further costs involved.</td>
<td>Closed</td>
</tr>
<tr>
<td>Ref BID#</td>
<td>WS</td>
<td>Risk &amp; Impact Description</td>
<td>BID Mitigation</td>
<td>Mitigation (update)</td>
<td>Status</td>
</tr>
<tr>
<td>---------</td>
<td>----</td>
<td>----------------------------</td>
<td>----------------</td>
<td>---------------------</td>
<td>--------</td>
</tr>
<tr>
<td>B0010</td>
<td>WS2</td>
<td>NG data costs far exceed estimate, resulting in data being too expensive to acquire</td>
<td>Static values and alternative data sources considered, such as balancing mechanism reports.</td>
<td>Historic balancing mechanism data has been purchased and there are no further costs involved.</td>
<td>Closed</td>
</tr>
<tr>
<td>B0011</td>
<td>WS2</td>
<td>Integration of software solution cannot be delivered in time, resulting in delays</td>
<td>Regular progress updates, project planning tools implemented.</td>
<td>Plans have to be agreed and baselined with each supplier.</td>
<td>A</td>
</tr>
<tr>
<td>B0012</td>
<td>WS5</td>
<td>UK Power Networks staff are not actively engaged or in a timely manner, resulting in poor engagement and delays</td>
<td>Ensure early engagement activities and stakeholder events for UK Power Networks staff.</td>
<td>Early engagement with all of the project key stakeholders, including directors and senior managers, has taken place and will continue to ensure positive support for the project.</td>
<td>G</td>
</tr>
<tr>
<td>B0013</td>
<td>WS2</td>
<td>Visualisation of outputs from software tool not in line with operator expectations</td>
<td>Engage with operators early in the process to help inform the design, to mimic existing Distribution Management System. Limited contingency added into timescales to allow re-design if necessary.</td>
<td>Operators already on board and agreeing to the requirements and designs. This risk will be mitigated at User Acceptance Testing.</td>
<td>G</td>
</tr>
<tr>
<td>B0014</td>
<td>PM</td>
<td>Connectees commit to pay for significant SGT upgrades at both Canterbury and Richborough and overhead line upgrades, adding significant capacity to the network and removing the export constraints</td>
<td>Monitor all new connection requests. Support any efforts by distributed generation developers to form group connections or joint connection requests</td>
<td>The project is in close contact with UK Power Networks’ Connections directorate to ensure early awareness of any potential connection requests.</td>
<td>G</td>
</tr>
<tr>
<td>B0015</td>
<td>PM</td>
<td>Exceeding the estimated budget for the project</td>
<td>We have conducted detailed project planning and cost reporting, based on our prior experience in delivering LCNF projects</td>
<td>The project undertakes monthly financial reviews and through the contract negotiations is ensuring value for money within the budget restrictions</td>
<td>G</td>
</tr>
</tbody>
</table>
### Kent Active System Management
#### Project Progress Report December 2015

<table>
<thead>
<tr>
<th>Ref BID#</th>
<th>WS</th>
<th>Risk &amp; Impact Description</th>
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<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>B0016</td>
<td>PM</td>
<td>Exceeding the estimated implementation timeline and underestimating required resources</td>
<td>We have conducted detailed project planning, allowing comfortable implementation margins and a multitude of resources. UK Power Networks has significant experience internally in project management and IT project implementation.</td>
<td>A detailed project plan has been developed and progress and potential risks and issues to project delivery are regularly discussed. Any significant issues will be escalated as per the governance process.</td>
<td>G</td>
</tr>
</tbody>
</table>

### 10. Other

There is no additional information to report.

### 11. Consistency with the full submission

There have been no changes to the project scope since the full submission.

### 12. Accuracy assurance statement

The project implemented a project governance structure as outlined in the project handbook that effectively and efficiently manages the project and all its products. All information produced and held by the project is reviewed and updated when required to ensure quality and accuracy. This report has gone through an internal project review and a further review within UK Power Networks to ensure the accuracy of information.

We hereby confirm that this report represents a true, complete and accurate statement on the progress of the Kent Active System Management Low Carbon Networks project in its second six-month reporting period and an accurate view of our understanding of the activities for the next reporting period.

**Signed** ........................................

**Date** ........................................

Suleman Ali
Director of Strategy & Regulation
UK Power Networks
13. Non-Confidential Appendix

### Short Term Forecasting - Bigwood Forecaster Modules

- **Ensemble Wind Forecaster**
  - Hourly forecasts for the following data items: Humidity, Temperature, Cloud Cover, Radiation, Wind Direction, Wind Speed (UK Met Office)
- **Historical Observations and Historical Forecast Data of Data Items Listed:**
  - One year’s worth of observations (UK Met Office)
- **Holiday List, Daylight Saving Time & Season:**
  - List of generators for forecasting (UKPN Asset Management Database)
- **Historic Data:**
  - One year’s worth of data incl. generation and demand (Historic Data Historian of UKPN PI Historian)
  - Historic CVA Generator Data (MV, FPNs and B/O) (Enappsys)

### Weather Data – 13 Sites

- **Power Injection at Generation Nodes:**
  - Half hourly data. Units: MW, MVar, Amps. Note some generators only measure Amps
- **Load Consumption Nodes:**
  - Half hourly data. Units: MW, MVar, Amps. Not some major consumers only measure Amps
- **Weather Stations:**
  - Thorney Island, Shoreham Airport, Wiggonholt, Wych Cross, Charlwood, Kenley Airfield, Gravesend Broadness, Shoeburyness Landwick, Mansion, Langdon Bay, Frittenten and one additional site expected to be near Hastings (note no observational data will be available).
  - Weather stations will not be at the location of each of the generators, but will provide a strategic spread across the SPN area.
- **Forecasting of New Generation or Load Connections:**
  - Use comparable sites and forecast weather data in order to forecast their imports/exports
- **Forecasting of Gas and Diesel Generators:**
  - Can be very difficult due to the volatility in their outputs. It is proposed that UKPN will contact generators to ask them to submit any forecasts that they have.

**Notes:**
- Weather stations will be at Thorney Island, Shoreham Airport, Wiggonholt, Wych Cross, Charlwood, Kenley Airfield, Gravesend Broadness, Shoeburyness Landwick, Mansion, Langdon Bay, Frittenen and one additional site expected to be near Hastings (note no observational data will be available).
- Weather stations will not be at the location of each of the generators, but will provide a strategic spread across the SPN area.
- Forecasting of new generation or load connections will use comparable sites and forecast weather data in order to forecast their imports/exports.
- Forecasting of gas and diesel generators can be very difficult due to the volatility in their outputs. It is proposed that UKPN will contact generators to ask them to submit any forecasts that they have.