Scottish & Southern Energy

Thames Valley Vision LCNF Proposal

Presented by

General Electric Company

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1. Executive Summary

General Electric Company (GE) believes that the Low Carbon Networks Fund (LCNF) represents an opportunity to transform the whole utility sector, its context and its stakeholders, and can create technology choices that deliver business benefits and outcomes for industry and consumers. Such a comprehensive programme requires collaborative engagement between companies across the electricity value chain that have the technology and domain expertise, and breadth of skills, experience, and resources to implement such a transformational large-scale, multi-year programmes. To achieve the LCNF outcomes, GE will:

- Deliver innovative and integrated deployments of *existing* capabilities to significantly de-risk SSE's project
- Manage and integrate new suppliers and technologies to the SSE's environment with minimum disruption to operations

Through joint working to date, Scottish and Southern Energy (SSE) and GE have combined to define a far reaching project, built around Modelling, Monitoring and Managing concepts which SSE and GE believe will deliver significant benefits against OFGEM's governance criteria and build a strong case towards delivering significant carbon reduction and positive network investment outcomes. GE hopes that this proposal, in support of SSE Tier 2 LCNF submission for its Thames Valley Vision project provides a platform for a low carbon road map and vision for future collaboration.

This proposal is structured to highlight the 3 key concepts around which the project is built, namely:

Concept	Scope
Modelling	The development and implementation of modelling forecasts that may be applied to predict the future load profile on the network created by future low carbon consumers and forecasting the impact of low carbon consumption on the network.
Monitoring	By applying the forecasting data developed under the Modelling concept, identify strategic locations on the network where monitoring equipment will be installed to monitor status and validate the Modelling activities. This will result in monitoring further into the low voltage network than had previously been possible.
Managing	The Monitoring activities will provide information of an accuracy and frequency not currently achievable. This will provide accurate, granular and dynamic information that will enable highly informed decisions to be made concerning network investment (including deferral of investment). Such active management of the network will also allow for optimization of assets and improved management of peak loads by enabling constraint and storage technologies.

This proposal should be read in conjunction with its companion document *GE_SSE_TVV_Workpackage_Response_v1.0a.doc, reference Pxxx-03-05-01 v1.0a.doc* which articulates in more technical detail how each of the project work packages will be technically defined and delivered.

As the project technical leader, GE is working with a number of 3rd parties to provide a series of managed or integrated and end-to-end solutions for SSE. The role of each 3rd party is set out in Section 3 of this proposal, but potentially include Nortech, Sentec, DigSilent, S&C and Honeywell.

The focus of this project is to demonstrate improved network modelling, monitoring and management in response to the accelerating introduction of low carbon technologies by domestic, commercial and industrial customers during DPCR5 and beyond. SSE's core purpose is to provide reliable and sustainable energy to their customers. SSE anticipates that power demands on their distribution network are projected to increase, not the least due to the introduction of low carbon technologies, such as electric vehicles and renewable energy resources. The existing distribution network will impose design and operating constraints on the power demands, of which challenges include the need to account for two-way power flows, forecasting and scheduling of energy resources and electric vehicle charging on the network. Improved monitoring, modelling and control /management of the network will help SSE to determine whether there are more efficient and effective ways to reliably overcome some of these challenges and present an alternative to traditional, or Business as Usual (BaU), network reinforcements.

2. Technical Approach

GE and SSE have worked collaboratively to define the conceptual approach to the SSE LCNF project shown in Figure 1 and Figure 2 below. Working with SSE, GE has engaged with third-party vendors in order to identify best-available, lowest-cost components within the overall solution. GE will, in the main, manage 3rd party relationships and risks to deliver "turnkey" deliverables to SSE. GE and SSE will regularly evaluate changes to the functional solution and consider alternative suppliers throughout the term of the project. Where appropriate, GE will evaluate new technologies and entrants to the market which may improve the technical fitness for purpose of any of the project deliverables and make recommendations to SSE based on its findings.

Detailed work packages which support the conceptual and functional architectures in Figures 1 and 2 are included as appendices. It should be noted that the Work Packages follow an agreed work breakdown structure and deliverables which is agreed for project implementation and which collectively complete the project scope and address the architectures below.

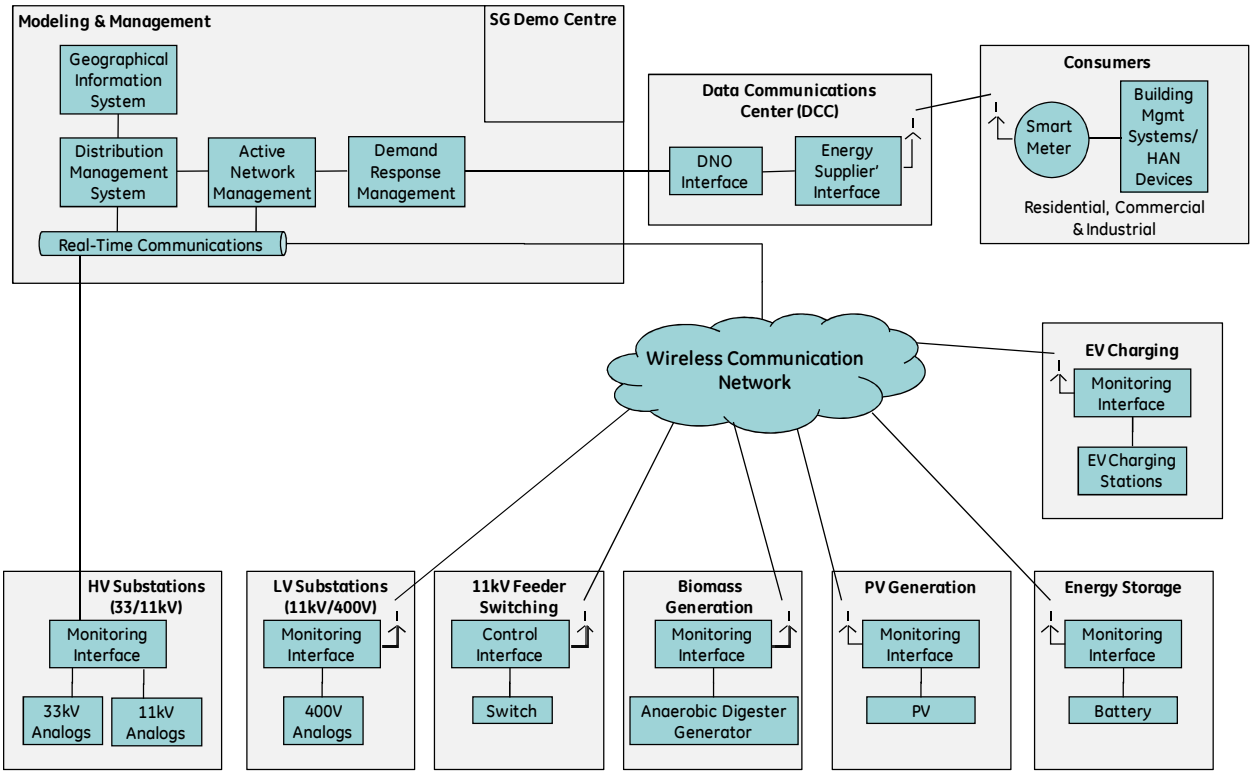

Figure 1: SSE LCNF Conceptual Architecture

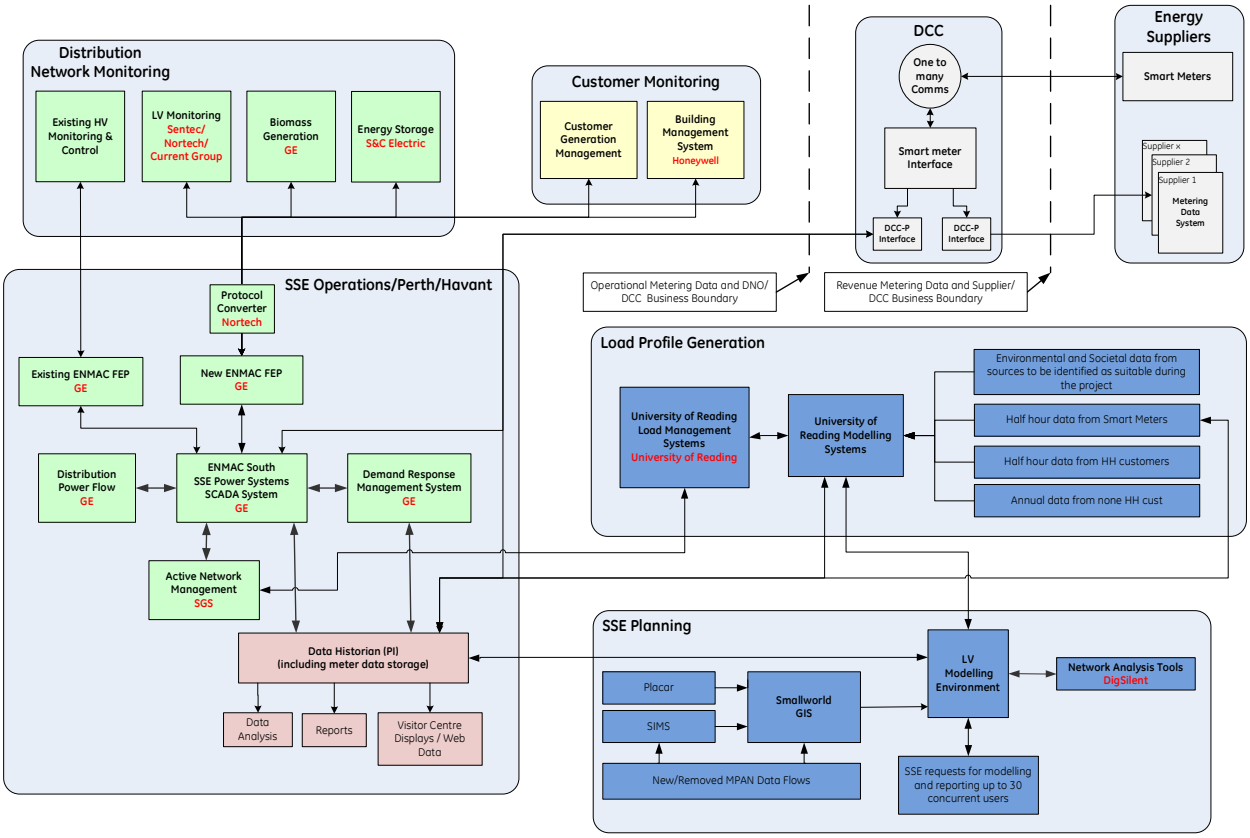

Figure 2: SSE LCNF Functional Overview

The following Sections address the 3 concepts of Modelling, Monitoring and Management.

2.1.1 Monitoring

The monitoring technical and project solution is more comprehensively described in Section 3 of the companion document GE_SSE_TVV_Workpackage_Response_v1.0a.doc, reference Pxxx-03-05-01 v1.0a.doc.

2.1.1.1 Network

Near real-time measurements at HV/LV substations will provide two key solutions. Monitoring will enable SSE to confirm its network modelling while also providing greater overall visibility of LV networks as low carbon technologies are introduced.

GE proposes to work with Sentec (network sensing devices) and Nortech (data acquisition and field communications) and potentially with Current Group (measurement and data acquisition plus Nortech communications) to introduce solutions to extend monitoring of the network down to the LV (400V) busbars. In parallel, GE will provide its own technologies for deployment during the roll out phase to allow for a comparison of available market solutions.

2.1.1.2 EV Charging Points

GE proposes the use of polyphase meters for monitoring of EV charging points, where appropriate.

2.1.2 Modelling

The modelling technical and project solution is more comprehensively described in Section 4A of the companion document GE_SS£_TVV_Workpackakge_Response_v1.0a.doc, reference Pxxx-03-05-01 v1.0a.doc.

GE will work with DigSilent to provide a load forecasting and analysis solution utilizing the existing GIS Smallworld solution used by SSE. The University of Reading and potentially other academic sources alongside the GIS network asset mapping data will provide input to the analysis solution to be used for future demand forecasting on the LV network.

SSE will use this information to identify strategic locations for the installation of monitoring devices to trend current demand and confirm any modelling to better understand the current demand on the existing network.

The solution will assist SSE to determine what action is required on their network, by highlighting areas of the existing network that may need reinforcement and areas where reinforcement can be deferred. The solution will also simulate any proposed network enhancements in line with forecasting to help with the identification of the most suitable network changes to accommodate Low Carbon consumers' technologies.

GE will use the existing DMS system (on completion of the current upgrade activities) and provide a power analysis solution to allow SSE to better understand the introduction of Low Carbon Technologies, such as ground-source and air-source electric heat-pumps and the introduction of electric vehicle charging, and the impact on both HV and LV networks. Monitoring data combined with forecast low carbon Load Profiles will be used to identify the potential impact of these new technologies allowing the right decisions to be made with regards to network reinforcement of the opportunities to defer these activities.

2.1.3 Management

The management technical and project solution is more comprehensively described in Sections 4B and 5 of the companion document GE_SSE_TVV_Workpackage_Response_v1.0a.doc, reference Pxxx-03-05-01 v1.0a.doc.

GE is proposing to use the SSE's existing ENMAC DMS (on completion of the current upgrade activities) to provide the advanced online Distribution Power Flow (DPF) analysis to support network management. GE will integrate Smarter Grid Solutions' (SGS) Active Network Management (ANM) application that will arbitrate, manage and optimize the dispatch of energy resources and demand reduction subject to grid operating constraints and forecasted customer load profiles. GE will work with S&C Electric and SSE to implement enhanced 11kV network automation using S&C's Intelliruptors with IntelliTeam software

2.1.4 Dispatchable Energy Resources

Dispatchable energy resources provide the means to reduce or shift load on the network to more efficiently utilize existing assets. Dispatchable energy resources that will be introduced in this project include:

2.1.4.1 Biomass Generation

GE is proposing to support the introduction of a 1MW GE Jenbacher anaerobic digester (biomass) generator as a low-carbon generation source on the 11kV network within the Bracknell region. It is intended that this generation scheme will be funded by a suitable capital investor (likely to be GE Capital) with revenue support from Feed-In Tariffs etc. This initiative will require identification of suitable site and renewable fuel sources.

2.1.4.2 PV Renewable Generation

GE is proposing to work with SSE on photovoltaic (PV) installations (50-500kW) installations at commercial, industrial and residential consumer sites as a low carbon generation source. This will continue to build on the recently launched initiative, led by GE Capital and Solar Century for solar PV installations at schools and other suitable public sites.

2.1.4.3 Energy Storage

Community level (50-500kW) energy storage units on the 11kV network will store energy by charging for up to 4 hours during low loading periods, or from solar renewable energy sources when constrained by network conditions, and then release the energy during peak loading periods or to minimize or avoid HV or LV network constraints. Energy storage is the responsibility of SSE, however GE will work with SSE as necessary to assist with the modeling, monitoring and management of the energy storage

2.1.5 Dispatchable Demand Reduction

Dispatchable demand reduction provides the capability to reduce consumer demand on the network through price and/or other constraint signalling in order to reduce or shift load on the network to more efficiently utilize existing assets. The ability to actively reduce consumer demand in conjunction with real-time control energy storage and biomass and distributed solar generation will enable the demonstration of active network management to avoid constraints in this project.

Demand response management includes interfacing with commercial and industrial building management systems (BMSs) and residential consumer demand response programs.

GE will implement GE's DRMS (Demand Response Management System), which will aggregate large account and residential account meter data for the purpose of forecasting, measuring and identifying the dispatchable demand response capability.

When suitable smart meter data is available, the DRMS will also aggregate circuit level and substation meter data to allow forecasting of customer load by substation. The available demand reduction will be used by the Active Network Management application to arbitrate and optimize the dispatch of energy resources and demand reduction. GE plans to interface to existing C&I BMSs to enable C&I customers to reduce energy usage through control of the BMS.

2.1.5.1 C&I Building Management System (BMS) Interface

GE plans to Interface to selected C&I BMSs. GE intends to work with Honeywell Business Systems in this activity. Honeywell will augment existing C&I BMSs while GE will deliver network-side solutions to demonstrate BMS dispatch.

2.1.5.2 Customer Metering Interface

It is expected that this project will coincide with the GB-wide deployment of smart meters and selection of the DCC (meter Data Communications Co). SSE has engaged with a number of Energy Suppliers to include smart meters in the TVV project. SSE is separately reviewing the opportunity to engage with a DCC-proxy (i.e. meter data communications and management provider in advance of the establishment of a DECC/OFGEM appointed GB-wide DCC) communications provider to support meters and communications to other field devices, where appropriate. It is envisaged that smart metering will enable the active demand response interface to consumers. GE will work with SSE's energy supplier partners and DCC-proxy to obtain operational data from consumer meters, where available.

2.1.6 IT and Integration

There are two components of IT and Integrations.

1) – Integration requirements defined by SSE in work package 2 – Integrated Operations
2) – Integration of GE solutions (including 3rd Parties solutions identified in this document)

A detailed integration plan will be defined during the design and engineering phases of the project.

3. Proposed GE Scope and Deliverables

For the purpose of calculating its budgetary prices, GE has assumed that the following scope of requirements and deliverables are included. Corresponding budgetary pricing is included in Section 9 of this proposal. As technical lead for the project, the following section outlines GE's scope of works and deliverables. However, this is not exclusively limited to GE products. GE and SSE have collaboratively identified a number of 3rd parties who will play an important role in providing product and service capability under the management of GE:

3.1.1 Monitoring

3.1.1.1 Network

- Three hundred and twenty-five (325) 11kV/400V LV substations with a total of 1790 x 400V feeders – I, W, VA – summation for transformer
- Fifty-five (55) 11kV C&I customer supply points – I, W, V – 4 quadrant (as above except single LV feeder monitoring plus thermal monitoring)
- One hundred (100) 400V C&I customer supply points (>70kVA) (as above except single LV feeder monitoring plus thermal monitoring)
- Ten (10) 11kV/400V transformer top oil temperature monitors + ambient temperature
- Twenty-five (25) 400V cable monitoring points (outside substation) – separate RTU (future)
- Ten (10) 400V cable temperature monitors + ambient ground
- Solar radiation (future)
- Wind speed and direction (future)

3.1.1.2 EV Charging Points

- Ten (10) x EV charging points (via smart meters)

Further details on EV charging points to be determined as appropriate.

3.1.2 Modelling

- Currently SSE is using Smallworld v3. The modelling and planning analytic solution will be executed on a v4 implementation of Smallworld to ensure a future-proof solution
- The Smallworld v4 solution will interact with the existing v3 solution to maintain the integrity of data between the systems based on any changes to either system.
- Upgrading the current v3 Smallworld system to v4 is an option being investigated to negate the need for the parallel running of two GIS solutions and the interaction between the two.
- The Smallworld v4. (Network Modelling environment) will be used to manage the Thames Valley area for asset mapping and analysis. The current Smallworld implementation will continue to be used for map asset management for areas of the SSE region outside the scope of the Thames Valley project.
- DigSilent PowerFactory will be incorporated in the Network Modelling environment. This analysis engine will be used to analyse the GIS information passed to it via an interface from the v4 Smallworld Solution

- The analysis output from the DigSilent engine will be passed back to the v4 Smallworld and presented to the end user
- An initial bulk import of Data to Network Modelling environment from SSEs existing PLACAR and SIMS systems will be performed to populate identified asset and customer connectivity data for the purposes of network analysis
- A Delta Interface from SIMS to Smallworld will be provided to ensure maintenance MPAN/customer connectivity information
- SSE will be required to introduce a Business Process to ensure maintenance of any information initially loaded from the PLACAR system.
- Further analysis of the existing asset data will be performed to identify any gaps in information. It will be the responsibility of SSE to provide any missing information. This will also include data cleansing, initially for the scope of the network of Thames Valley (If the solution is to be expanded to include other areas of the SSE region, further data cleansing will be required
- Load profile information will be supplied to SSE from the University of Reading, The information will be used in combination with the monitoring information from the field and will be used in future forecasting within the Network Modelling Environment
- SSE will supply information based on monitoring and historic data to the University of Reading to allow better Load Profile forecasting.
- SSE intends to consider the replacement of existing LV network planning software tools, including WinDebut. GE will work with SSE to review and create a scope of works describing this opportunity.

3.1.3 Management

- Upgrade of SSE's existing ENMAC DMS version 3 to PowerOn Fusion version 5.
- Introduction of the PowerOn Fusion Distribution Power Flow (DPF) application. This application runs on Linux servers and is integrated with the PowerOn Fusion v5 DMS system
- For redundancy, multiple Linux systems running the DPF application can be introduced with PowerOn Fusion Functionality to manage the usage of a group of more than one DFP servers.
- The DPF solution will be dependent on the capturing of asset data from existing SSE systems imported into the DMS system for use in analysis
- Configuration of the DPF solution is required to ensure the application is configured to execute based on specific SSE requirements
- Testing and implementation of the DPF solution will be carried out in conjunction with SSE for acceptance and implementation with current operational business processes
- Supply of S&C IntelliRupter PulseCloser 11kV switches and controller integration with ENMAC

SGS details to be determined.

3.1.4 Dispatchable Energy Resources

3.1.4.1 Biomass Generation

GE intends to work with the local water company (not yet approached), Bracknell Forest Council, SSE Networks and SSE Generation to develop this initiative.

3.1.4.2 PV Renewable Generation

None, PV generation is the responsibility of SSE, however GE will work with SSE as necessary to assist with the modelling, monitoring and management of the energy storage

3.1.4.3 Energy Storage

None, energy storage is the responsibility of SSE, however GE will work with SSE as necessary to assist with the modelling, monitoring and management of the energy storage

3.1.5 Dispatchable Demand Reduction

3.1.5.1 Demand Response Management System (DRMS)

- GE DRMS software application integrated with ENMAC DMS.
- 30 x C&I customers (via Honeywell BMS interface)
- Integration to 1,000 x residential customers (via proxy-DCC) supplied by SSE

3.1.5.2 C&I Building Managements System (BMS) Interface

- 30 x C&I customers (via Honeywell BMS interface)

3.1.5.3 Customer Metering Interface

None, meters will be supplied and installed by energy suppliers

4. Demand Response Marketing & Outreach Support

As part of its contribution to its relationship with SSE and to support the Learning and Dissemination work package, GE will assist SSE to develop a programme of customer participation, consumer outreach and education. GE's support under this Section 4 will be included as benefit in kind.

4.1 Demand Response and Consumer Behaviour

GE will provide SSE with examples of the design and marketing of outreach and education programs aligned with consumers needs which utilise qualitative consumer interviews, and adaptive and choice-based analysis, to identify specific customer segments with varying benefits sought. GE can also provide SSE with marketing support with a segmentation project to further refine customer segmentation. .

4.2 Programs to Increase Customer Participation

GE will work with SSE on the following customer demand response efforts:

- Leverage social networks to drive consumer engagement:
- Drive further consumer engagement and buy in;
- Improve awareness and how consumers can make a difference;
- Prius-style dashboard visualization to drive awareness and ease of usability;
- Leverage Social Networks and Online Discussion Forums;
- Setup a site to focus on relevant topics for example, vertical search using semantic technologies;
- Social site to promote sharing of best practices;
- Use competitions, motivational techniques and rewards to encourage wide participation and adoption of best practices

4.3 Consumer Education & Outreach

Using prior example templates and existing collateral (such as GE's micro website www.itsyoursmartgrid.com), GE will work with SSE to help create and execute a customized Outreach and Education Plan to educate industrial and residential consumers about smart energy and its long-term benefits and the impact of low carbon technologies on the electricity network in key target markets for SSE. This plan could include leveraging a variety of GE's existing events, tools and resources, as well as creating new ones. GE and SSE will need to agree on the elements of the Outreach and Education Plan, appropriate timing. GE's costs against this activity will be capped at £27,000 (Twenty Seven Thousand Pounds Sterling).

Objectives for an effective communications campaign for SSE would include:

- Driving awareness
- Enhance SSE/consumer
- Converting consumers into advocates

Elements of education and outreach plans could include:

1. Hosting Discussions with Industry Leaders, Policy Makers, Key Influencers

GE has proactively engaged utilities, policy makers, academics, and other thought leaders around the world in various forums, inviting candid dialogues around smarter grid, for example utilizing Executive Summits and Thought Leadership dinners.

2. Community Outreach/Media Events

In conjunction with host city utility executives, strategic technology partners, local politicians and regional thought leaders, engage and educate local media and driven positive brand positioning within relevant communities.

- ***Press conferences*** – host press events announcing city scale projects, innovative alliances, etc.
- ***Media roundtables*** – host media events to proactively tell the LCNF story.
- ***Community Outreach*** - drive positive media/outreach in relevant markets.

3. Brand positioning through inclusion in Corporate Communications

Examples

- GE's recent online Annual Report featured American Electric Power (AEP), one of the largest investor-owned utilities in the USA with the deployment of their GridSmart program in Columbus, Ohio.
- GE worked with Oklahoma Gas & Electric (OG&E) in the USA to create a video featuring their consumer pilot – it was subsequently promoted globally to help educate consumers on how smart grid could impact them in a positive way.
- GE's Ecomagination initiative summarises GE's drive to reducing carbon emissions over the next several years. Please also refer to http://ge.ecomagination.com/smartgrid

4. Educate Communities around the Importance of New Energy

GE would build on the initial success of a collaborative use of GE's Smart Grid Demo centre to extend use of the centre to key community stakeholders. This builds on the success of corporate and political events already completed or scheduled.

Examples

- *Digital Hub*
  SSE could leverage GE's existing ItsYourSmartGrid.com microsite, as well as a specific website for SSE to host interactive sessions with consumers such as blogs, chats and webinars to drive the Smart Energy conversation. SSE's projects could be featured in GE's quarterly newsletter, as well as on www.ItsYourSmartGrid.com, www.ge.com and www.ge-energy.com. In addition, an SSE executive could author a blog on our site. These opportunities would be free of charge.
- *University Outreach*
  GE has focused on driving community outreach with local universities in Boston and Chicago. GE could host one of these events with SSE at the university of their choice to engage and educate college students.

5. Assumed SSE / GE Responsibilities

The following principle roles and responsibilities are agreed between SSE and GE in relation to the project. SSE and GE will agree a detailed scope of roles and responsibilities in support of each work package prior to commencement of works.

Element	SSE Responsibility	GE Responsibility	Notes
Program / Project Management			
Program Management		X	Of Solution supplied by GE
Design / Engineering			
Overall System Design	Lead	Support	
Primary Equipment			
Supply of Primary Equipment		X	
Installation and Verification of Primary Equipment	X		
Commissioning of Primary Equipment	Lead	Supervision of GE solution supplied	
Applications			
Supply of Software		X	Of solution supplied by GE
System Integration		X	Of solution supplied by GE
Management of Third Party Solution Providers		X	Of Third Party Suppliers to GE
Field / SCADA Communications	X		
IT support for Systems Integration	X		
Provision of IT Security Infrastructure	X		
Training			
Solution Training		X	Of solution supplied by GE

6. Preliminary Risk Assessment

The following key risks are identified and summarized below. More detailed risk registered are developed against each work package.

Risk	Impact: (H / M / L)	Mitigation
Schedule uncertainty due to unconfirmed high level technical scope definition (including customization)	M	Detailed scope & program defined early in the design & engineering phase of the project
Deployment of Jenbacher solution	H	Confirmation of funding and third party involvement
Lack of detailed information regarding specific Third Party solutions (SGS; Honeywell)	H	Early establishment of technical and commercial agreements with Third Parties
Availability of Resources from SSE to support Scheduled Deployment	L	Availability of Dedicated Resources agreed during Project Kick Off Meeting
Availability of Appropriate Competencies to support Scheduled Deployment	M	Availability of Dedicated Competencies agreed during Project Kick Off Meeting

7. Draft Project Schedule

The draft schedule is shown in Figure 3 below. The schedule and durations shown in Figure 3 are estimates only.

ID	Task Name
1	**WKP3 - Model**
2	**3.1 - Data Collection/Maintenance**
9	**3.2 - Load Profile Generation**
12	**3.3 - Network Analysis**
19	**3.4 - Network Modeling (output)**
24	**WKP4A - Monitor**
25	**4A.1 - Monitoring Systems**
34	**4A.2 - Determine Monitoring Data**
37	**4A.3 - Determine Monitoring (Stored Locally)**
41	**WKP4B - Manage**
42	**4B.1 - Centralised Management**
48	**4B.2 - Establish Controllable Devices**
52	**4B.3 - Algorithms for LV Management**
54	**WKP5 - Network Energy Storage and Generation**
55	**5.1 - Jenbacher Anaerobic Digestor**
56	**5.2 - Battery Storage**
57	**WKP7 - Demand Response and Control**
58	**7.1 - Identify Dispatchable Demand**
59	**7.2 - Multicast Dispatch Instructions**
60	**WKP08 - Enterprise Demand Response**
61	**8.2 - Building Management Systems**

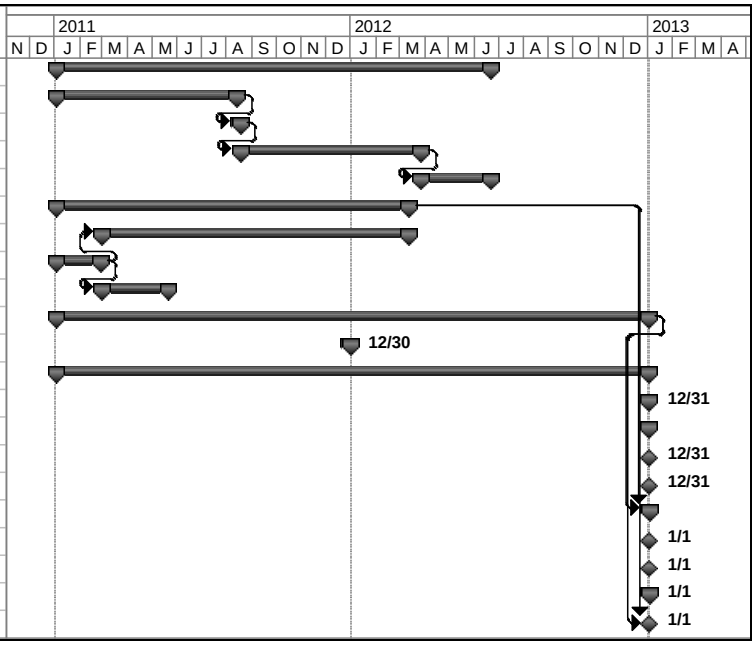

Figure 3: Draft SSE LCNF Schedule

8. Budgetary Pricing

Products	Scope	Notes	Product Price	2011	2012	2013
MONITORING						
Add Load Monitoring to LV Substation 400V Feeders		**325 LV substations with a total of 1790 LV feeders**	**£526,269**	**£263,134**	**£263,134**	**£0**
CTs	5370	Sentec or Current Group	£179,000	£89,500	£89,500	
RTUs	325	Nortech or Current Group	£184,769	£92,384	£92,384	
LV monitoring solution	325	LV Solution	£162,500	£81,250	£81,250	
Add Load Monitoring to 11kV C&I Customer Supply Points		**55 x 11kV customer supply points**	**£64,269**	**£64,269**	**£0**	**£0**
CTs	165	Sentec or Current Group	£5,500	£5,500		
RTUs	55	Nortech or Current Group	£31,269	£31,269		
LV monitoring solution	55	LV Solution	£27,500	£27,500		
Add Load Monitoring to 400V C&I Customer Supply Points		**100 x 400V customer supply points**	**£33,333**	**£33,333**	**£0**	**£0**
3-Phase Meter	100	GE SM300 meter	£33,333	£33,333		
Add Temperature Monitoring to 11kV/400V Transformers		**10 Transformers - top oil + ambient temperature**	**£2,222**	**£2,222**	**£0**	**£0**
Temperature Monitor	20	Temperature monitoring using magnetic mount sensor, 4-20mA input to RTU	£2,222			
Add Load Monitoring to 400V Cable Points		**25 cable monitoring points**	**£29,213**	**£0**	**£29,213**	**£0**
CTs	75	Sentec or Current Group	£2,500		£2,500	
RTUs	25	Nortech or Current Group	£14,213		£14,213	
LV monitoring solution	25	LV Solution	£12,500		£12,500	

Add Temperature Monitoring to 400V Cable Points		**10 cable points - cable + ambient temperature**	**£12,352**	**£12,352**	**£0**	**£0**
Temperature Monitor	30	Temperature monitoring using sensor, 4-20mA input to RTU	£1,667	£1,667		
RTUs	10	Nortech or Current Group	£5,685	£5,685		
LV monitoring solution	10	LV Solution	£5,000	£5,000		
Add Load Monitoring to 400V EV Charging Points		**10 x EV charging points**	**£16,667**	**£0**	**£16,667**	**£0**
PQ Meter	10	GE PQM2 meter	£16,667		£16,667	
Subtotal Monitoring			***£684,324***	***£375,310***	***£309,014***	***£0***
MODELLING						
DigSilent Software License + 2 Years M&S	1		£61,111	£61,111		
Smallworld v4 Software License + 2 Years M&S	1	Additional Smallworld implementation for Bracknell	£61,400	£61,400		
Subtotal Modelling			***£122,511***	***£122,511***	***£0***	***£0***
MANAGEMENT						
ENMAC DPF Application Software License	1	Extend SCADA to LV network.	£50,000	£50,000		
SGS Active Network Management	1	Based on SGS costing - further detail required from SGS	£2,796,842		£2,796,842	
Add Remote Control Switches 11kV Feeders	50	S&C Electric IntelliRupter PulseCloser	£1,385,556		£1,385,556	
Subtotal Management			***£4,232,398***	***£50,000***	***£4,182,398***	***£0***
DISPATCHABLE ENERGY RESOURCES						
Biomass Generation		Future, possible 1MW GE Jenbacher (biomass), includes anaerobic digester	£0			
PV Renewable Energy Interface		To be determined	£0			

LV Energy Storage						
500kWhr at LV Substations		SSE responsibility	£0			
50kWhr at LV Cable points and C&I customers		SSE responsibility	£0			
10kWhr at LV Customer Supply Points		SSE responsibility	£0			
Subtotal Dispatchable Energy Resources			***£0***			
DISPATCAHBLE DEMAND REDUCTION						
DRMS Software License + 2 Years M&S	1	For no more than 10,000 end points.	£200,000	£80,000	£120,000	
C&I Building Management system	3	Honeywell building solution	£296,667	£148,333	£148,333	
Subtotal Dispatchable Demand			***£496,667***	***£228,333***	***£268,333***	
TOTAL			**£5,535,900**	**£776,155**	**£4,759,745**	**£0**

Services			**Product Price**	**2011**	**2012**	**2013**
Program						
Program Management		Program Management over 2 years	£270,884	£135,442	£135,442	
Technical Management		Technical Management over 2 years	£229,210	£114,605	£114,605	
Design and planning		Design and planning required start of project	£196,466	£196,466		
Training		Technical training on software solutions	£39,293		£39,293	
Subtotal Program			***£735,853***	***£446,513***	***£289,340***	***£0***
Monitoring						
Acceptance Test - Interface		Customer acceptance Interface from LV Monitoring solution to DMS	£39,293	£39,293		
CT configuration		Configuration of CT Sensors - not field	£39,293	£19,647	£19,647	

		installation				
Integration and test		integration to DMS	£39,293	£39,293		
Field Support		Ad-hoc support to SSE during field deployment	£39,293	£19,647	£19,647	
Subtotal Monitoring			***£157,172***	***£117,879***	***£39,293***	***£0***
Modelling						
Implementation, Integration and test		implementation of modelling solution based on Smallworld and DigSilent	£1,716,156	£858,078	£858,078	
2 years M&S		M&S for licences	£35,283		£17,642	£17,642
Subtotal Modelling			***£1,751,439***	***£858,078***	***£875,720***	***£17,642***
management						
Implementation, Integration and test		implementation of real time solution based on PowerOn Fusion and power applications including integration SGS	£972,000	£486,000	£486,000	
2 years M&S		M&S licences	£17,280		£8,640	£8,640
Integration test Intelliruptors		integration Intelliruptors with PowerOn Fusion	£29,470		£29,470	
Subtotal Management			***£1,018,750***	***£486,000***	***£524,110***	***£8,640***
Dispatchable Demand reduction						
DRMS Implementation, Integration and test		implementation of DRMS system	£162,000	£162,000		
2 years M&S		M&S licences	£69,120		£34,560	£34,560
Integrate SGS with DRMS		Integration and test	£216,000	£108,000	£108,000	
C&I Building Mgt integration services		Integration and test	£10,800		£10,800	
interface to energy supplier assume DCC		Integration and test	£216,000	£108,000	£108,000	
Subtotal Dispatchable Demand reduction			***£673,920***	***£378,000***	***£261,360***	***£34,560***
TOTALS			**£4,337,134**	**£2,286,470**	**£1,989,823**	**£60,842**

8.1 Pricing Assumptions

Prices are non-binding, indicative and budgetary based on the following assumptions and terms:

- GE's submission is made in support of the umbrella Memorandum of Understanding between GE and SSE dated 21st June 2010.
- Any prices are indicative, subject to change and based on the requirements provided and any other assumptions included in this proposal document.
- Equipment pricing is based on initial estimates. SSE shall be responsible for changes in equipment scope. GE shall provide a quote for additional products or services as required.
- Prices are budgetary estimates only in UK£ (Pounds Sterling) ex-works, and do not include shipping, applicable taxes, permits, licensing fees and travel and subsistence expenses.
- GE Energy Standard Terms and Conditions of Sale (ES104 Rev3), including Software License Addendum would apply.
- Any prices assume that the total implementation schedule would not exceed the schedule included in Section 4 of our proposal.
- Any timescales provided are based on the availability of GE resources at the time of formal agreement.
- The proposal assumes that all necessary third party agreements are in place at execution.
- All pricing is subject to GE approval.

9. GE In-Kind Contribution

GE is investing In Kind contribution in a number of ways as follows:

1. Labour and material contribution to the construction of SSE's ISP and proposals in support of the Tier 2 application process.
2. Provision of office and work facilities
3. Discount against GE products and services
4. Marketing events and collateral

The value of GE's in-kind contribution to SSE as part of the LCNF project is set out below:

	Est. Total Days	In-Kind
Consultancy		**in kind**
Project/Bid Management	72 days	**£100,800**
Senior Engineering Consultancy Services	100 days	**£140,000**
Engineering Consultancy Services	80 days	**£112,000**
Commercial/Sourcing Support	20 days	**£28,000**
Travel & Living Expenses		**£8,000**
Use of Project Room		**£10,000**
Sub Total		**£398,800**
Product		
ENMAC DPF Software License		**£78,000**
Sub Total		**£78,000**
Services		
Program Management		**£240,521**
Monitoring		**£17,464**
Modelling		**£575,972**
management		**£113,194**
Despatchable Demand reduction		**£74,880**
Sub Total		**£1,022,032**
Marketing		
Use of Smart Grid Demo Room for Lessons Learned / Training etc.		**£10,000**
Publicity, Press Releases, Information & Materials		**£10,000**
Learning and Dissemination support		**£27,000**
Sub Total		**£20,000**
GE Total In-Kind Contribution		**£1,518,832**

Appendix 1: WKP03 – Network Modeling/Planning

Included in *GE_SSE_TVV_Workpackage_Response_v1.0a.doc, reference Pxxx-03-05-01 v1.0a.doc,* attached.

Appendix 2: WKP04A – Network Monitoring & Control

Included in *GE_SSE_TVV_Workpackage_Response_v1.0a.doc, reference Pxxx-03-05-01 v1.0a.doc,* attached.

Appendix 3: WKP04B – Network Management

Included in *GE_SSE_TVV_Workpackage_Response_v1.0a.doc, reference Pxxx-03-05-01 v1.0a.doc,* attached.

Appendix 4: WKP05 – Network Energy Storage & Generation

Included in *GE_SSE_TVV_Workpackage_Response_v1.0a.doc, reference Pxxx-03-05-01 v1.0a.doc,* attached.

Appendix 5: WKP07 – Demand Response & Control

Included in *GE_SSE_TVV_Workpackage_Response_v1.0a.doc, reference Pxxx-03-05-01 v1.0a.doc,* attached.

Appendix 6: WKP08 – Enterprise Demand Response

Included in *GE_SSE_TVV_Workpackage_Response_v1.0a.doc, reference Pxxx-03-05-01 v1.0a.doc,* attached.