SP Energy Networks 2015–2023 Business Plan

Updated March 2014

Annex

Innovation Strategy

SP Energy Networks

March 2014

SP ENERGY NETWORKS

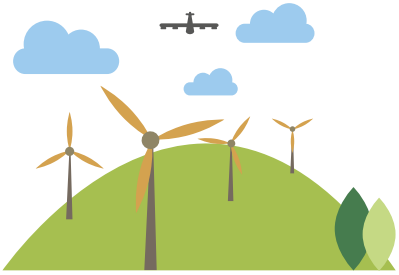
Innovation Strategy

Our approach to using innovation to improve our services and provide long term value for money

Innovation is key to getting more out of the network and delivering value for money for customers. We are part of a global group with a strong innovation heritage recognised as one of the top 4 most innovative European Utilities. We have a strong track record of converting innovation trials into practical applications that bring benefits to customers and making our innovation spend go further by collaborating with others. We recognise the importance of sharing our knowledge on innovation developments to make sure others can benefit from our learning.

Innovation embedded in our plans will deliver more than £70m of customer benefits

In this document:



Document	Chapter / Section
SP Energy Networks Business Plan 2015-2023	Expenditure summary
SP Energy Networks Business Plan 2015-2023 Annexes	Annex C6 – Long Term Strategy – SPEN
SP Energy Networks Business Plan 2015-2023 Annexes	Annex C7 – Smart Meter Strategy – SPEN
SP Energy Networks Business Plan 2015-2023 Annexes	Annex C7 – Smart Grid Strategy – Creating a Network for the Future – SPEN
SP Energy Networks Business Plan 2015-2023 Annexes	Annex C6 – LCT Network Monitoring Strategy – SPEN
SP Energy Networks Business Plan 2015-2023 Annexes	Annex C7 – RIIO-ED1 Review Project – Smarter Grid Solutions

Introduction

The use and generation of electricity in the UK is changing. Our strategy is to help shape the future and so be prepared for the challenges it brings. To deliver our 2023 vision, our network and our organisation need to evolve and adapt.

Our Think Big, Start Small, Scale Fast approach to innovation enables us to be at the forefront of innovative practice and is embodied in our guiding values. This has been the approach we have developed in DPCR5 and successful examples include Real Time Thermal ratings for Overhead lines, Accelerating Renewable Connections (ARC) and Flexible Networks, all of which have started through a carefully focussed trial and are now being scaled up for application in our ED1 plan

At SP Energy Networks, we believe in the power of innovation to enhance all aspects of our business and improve our service for the benefit of our customers. We will deliver innovation to reduce costs to customers and meet their future requirements through:

- *Technology innovation — operating our network more dynamically.*
- *Operational and process innovation — driving efficiency and service benefits.*
- *Commercial Innovation — new contractual arrangements with customers and suppliers.*

We have a strong record of translating innovation trials to practical application. The table on the next page shows the roadmap that our vision will take us on and links the projects to customer benefits.

We will continue to collaborate with other GB network companies to ensure that all customers benefit from customer funded innovation trials.

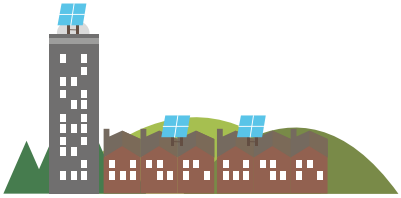
Innovation embedded in our plans will deliver more than £70m of customer benefits.

SP Energy Networks are part of the Iberdrola Group, one of the largest energy companies in the world. The Iberdrola group prides itself on its commitment to innovation.

Across the Iberdrola group in 2013:

- *in excess of €159 million was invested in Research & Development.*
- *over €44 million of the investment was associated with networks.*
- *innovation involves a variety of R&D across distribution and transmission.*
- *investment includes funds leveraged from a variety of sources including European Framework programmes, government funding and stakeholder investment.*

Our Think Big, Start Small, Scale Fast approach enables us to be at the forefront of innovative practice, to maximise value to customers



Our innovation roap map

	Timeframe				Outputs achieved					
	2010-15	2015-2017	2017-2019	2020-23	Safety	Reliability & availability	Environment	Connections	Customer satisfaction	Social obligations
Automation	Automation deployed through trials by SPEN and other DNOs	Substations designed to be automation ready.	Application of automation for managing load flows	Increased automation intelligence for self healing networks	✓	✓			✓	
Demand side response	Demonstration projects currently underway by other DNOs, SPEN demonstration in 2013/14	Further pilot projects at scale to quantify benefits		Development of relevant standards to enable as business as usual		✓	✓		✓	✓
Energy storage	Projects being undertaken by other DNOs	Continue to observe demonstration and adopt learning from others	Demonstration project to build on learning from other DNOs	Build business case and confidence in technology for roll out as the market evolves		✓	✓	✓		
Using smart meters	Simulation project being undertaken in 2013/14	Initial systems constructed to manage data as it becomes available	Application of smart metering data to improve customer service and operation of the network	Advanced application of Smart metering data for improved asset management and demand response		✓		✓	✓	✓
Active network management	SPEN project in the Scottish Borders Other DNO projects being observed	Conclude project and reflect learning into policies, applying where relevant across our practices	Active Network Management contracts become normal practice for generation connections	Linkage of Active Network management with other technologies including dynamic rating as normal practice		✓	✓	✓		
Monitoring and managing fault levels	Development of Fault Level monitoring and Limiters	Deployment of Fault level monitors at various sites. Continued development of fault current limiter technology	Management of fault level through automation and monitoring.	Deployment of fault current limiter as part of business as usual to mitigate reinforcement costs	✓	✓	✓	✓		
Dynamic rating of network in real time	Project with generators in North Wales on 132kV overhead network. Application to cables and Transformers being tested on other projects.	Application of Dynamic rating to mitigate initial reinforcement schemes. Demonstrate alternative means of dynamic rating	Use of Dynamic rating as a standard alternative to replacing highly loaded substations.	Integration of Dynamic rating with other solutions including Active Network Management		✓	✓	✓		

Our strategic approach

Innovation is one of Iberdrola's biggest commitments. Within the group we have a focus on innovation which runs through the company to the highest level. Iberdrola has a corporate Innovation Policy (Appendix 1) which sets out the principles which the business follows. We have an international innovation model which is common across all areas of the company. This allows us to learn and share new developments and best practices with other network businesses including Spain, USA and Mexico.

Based on this policy, we have developed our Innovation Strategy to have the following elements:

1. *Innovation activity will align with our stakeholders' priorities - as gathered through our ongoing stakeholder engagement programme.*
2. *We will promote collaborations and alliances with stakeholders through links that multiply our capacity for innovation - we will look to leverage other sources of funding to minimise the cost to customers.*
3. *We use a 'Think big, start small, scale fast' approach - which allows us to test a concept in a controlled way to avoid unnecessary complexity, cost and risk.*
4. *We won't innovate for the sake of it - only where we believe we can achieve a benefit for customers or the network.*
5. *Our innovation portfolio is balanced to consider short, medium and long term challenges.*
6. *Innovation is about incremental improvements as well as radical changes.*
7. *Innovation can be technical, process or commercial in nature.*
8. *The management of innovation needs flexibility to accommodate change - yet focusses on delivering learning cost effectively.*
9. *Learning can mean success or failure of a project, but we will build on the experiences from either outcome.*

This strategy will underpin all of our activity within the Innovation mechanisms in ED1, and will also align with our Transmission Innovation Strategy. Our innovation plans will help us develop our Smart Grid Strategy. Innovation is vital for developing new solutions and increasing our confidence of existing solutions which are not yet proven.

Informed by our stakeholders

We are acutely aware that the funding we access through the various innovation mechanisms is sourced from our customers. In developing our innovation strategy we have not only ensured that our innovation activity is focussed on areas which customers most value, but also that customers are willing to invest more in these particular areas in the short term, to allow the longer term benefits of innovation to be realised. Our Innovation Strategy uses the priorities identified through our stakeholder engagement process. Of all the areas identified, stakeholder feedback identified six specific priorities:

Specific Priorities

- *#1 Managing an ageing network.*
- *#2 Reducing the number and length of power cuts.*
- *#3 Investing for storm resilience.*
- *#4 Improving customer service during power cuts.*
- *#5 Improving service to poorly served customers.*
- *#6 Preparing the network for low carbon technologies.*

We have aligned our innovation strategy to these areas and will use this as a key feature of the selection process for new projects. We will address these areas within the context of a continued focus on health, safety and the environment. Innovation is not the sole tool for addressing these priorities; however it offers a significant opportunity to identify new approaches to these areas. Through our ongoing stakeholder engagement, these priorities may be updated from time to time based on feedback. This will be reflected into our Innovation Strategy to ensure it remains relevant. Only where we are undertaking a project with a much longer time horizon and the area of benefit is not as clearly defined will we be less able to adapt our project portfolio. For example, R&D on DC networks could offer benefits to a number of different priority areas but this is potentially ED2 before the benefits are realised, we may however think that this is strategically important to pursue due to the benefits for customers.

Our track record

In this section:

Overview

We have a strong commitment to investing in innovation for the future, backed up by a track record of innovative projects and direct applications.

In the first two years of DPCR5 we have invested over £5m through the Innovation Funding Incentive (IFI) and Low Carbon Network Fund (LCNF). This has been leveraged against other funding sources, to generate a total value of research, development and demonstration in the order of £24m. Thanks to this investment, a number of our projects have been developed into solutions that are already being deployed as part of business as usual, while we have other projects that will be in a position to be applied in the ED1 timeframe:

- *The Power Network Demonstration Centre is a world leading facility to help accelerate technology development to a point where it can be deployed on the network. The PNDC provides us with a platform to develop technology faster by creating an environment to test it without the risk to the wider network.*

- *Network automation is being developed in collaboration with various companies to ensure we have robust communication infrastructure as well as system intelligence. This has helped to significantly improve our response to faults and storms.*

- *We have developed active network management solutions to connect renewable generation faster and at lower cost through managing the power flows on the network in real time and providing two-way control of the generation. Through the ARC project we are implementing active network management across a large part of the East of Scotland, an area with over 500MW of DG in the application process.*

We have also been active in other areas of research and development, most notably:

1: We are participating in a Knowledge Transfer Partnership with University of Strathclyde about energy consumption and how this will shape the network in the future. This has been match funded by the Technology Strategy Board.

2: We are a partner in the Step Up (Strategies Towards Energy Performance and Urban Planning) European FP7 funded project. ScottishPower is leading the energy analysis element of the project, creating an energy masterplan for the city of Glasgow. A range of stakeholder information will be used to create this plan, which will:

- *Map the energy consumption across Glasgow,*

- *Highlight key energy users and the role they could play as 'anchors' to planned energy projects,*

- *Highlight potential 'zones' for specific technologies, such as district heating and heat pumps and the impact on the network,*

- *Highlight the potential to link key network upgrades with anticipated development in Glasgow.*

SPEN total	LCNF	IFI	No of Reported Projects	Leveraged funding
2004/05		£223k	12	£1.5m
2005/06		£546k	36	£3.0m
2006/07		£1282k	41	£5.0m
2007/08		£1793k	50	£7.0m
2009/09		£1978k	38	£9.0m
2009/10		£1462k	35	£7.0m
2010/11	£700k	£1621k	27	£8.0m
2011/12	£900k	£1975k	40	£11.0m

The outputs of this analysis will be used to shape local and national policies to promote and facilitate projects that help deliver Glasgow's ambition of achieving a 30% reduction in carbon emissions by 2020.

3: The Scottish Power Active Research Centre (SPARC) is a collaboration with University of Strathclyde that has been running since 2006. In this programme we sponsor research that is relevant to the power sector with particular emphasis on how ScottishPower can improve the network in the short to medium term. The programme has delivered new techniques for cable health monitoring which we are now using on 33kV circuits and software tools for the analysis of alarms which has now been in place for two years, among many other developments. The collaboration also gives us new R&D opportunities and insight into new technologies.

For every £1 of customers' money we spend on R&D, we secure a further £4 from other sources such as project partners or research grants

Innovation Case Studies — Some examples of our technology innovation

Dynamic Thermal Rating

Initiative
Maximising the capacity of our network assets through real time monitoring of their loading. This is now achievable through enhanced visibility, communication systems and data processing.

Through our landmark LCNF Tier 1 project, we have proven the application and limitations of dynamic thermal rating of particular assets on the network. This has improved our confidence in the concept to a position where we will be deploying this in ED1 as part of our reinforcement solution set. Through this solution we believe we can create up to 30% additional capacity on existing overhead lines at a significantly lower cost to constructing a new circuit.

Benefits
- Increased network capacity
- Reduced need for reinforcing the network in certain applications.

Active Network Management

Initiative
The control and dispatch of generation around constraints on the network. This removes the need for extensive upgrades of the network to facilitate generation.

As part of our LCNF Tier 2 ARC project, along with the development of projects by other parties, this is now being considered as a solution for optimising the network, particularly in areas of high distributed generation. This features both commercial innovation in the way that connection agreements are structured, as well as the deployment of novel technology. We believe this may offer savings of more than 20% to the cost of generation connections as well as offering a faster time to connect.

Benefits
- Faster connection of distributed generation.
- Lower cost for the connection of distributed generation.

Technology Innovation

Partial Discharge Mapping

Initiative
Partial discharge is a key indicator of where cables will fail. Mapping of partial discharge enables asset replacement before failure occurs, improving quality of service.

Through our active research centre with the University of Strathclyde, a number of projects are now maturing into solutions which we will be applying in the near future. Notably, research related to partial discharge monitoring of underground cables using protection CTs is now being tested in real applications. The successful testing of this solution could lead to a lower cost solution for identifying cable asset health and allowing for replacement before failure. PD mapping of cable circuits with high occurrences of faults will help to target future investment and increase system reliability.

Benefits
- Asset replacement before failure.
- Reduced number of faults.
- Targeted investment on cables that are in greatest need of replacement.

Fault Level Monitoring

Initiative
The measurement of fault level allows better informed investment in assets that need to be replaced.

As a result of our IFI investment with Outram Research, the fault level monitor which has been developed is now a component of our reinforcement plans as a solution to fully justify and potentially mitigate the need for some fault level asset replacement. The reliable measurement of fault level has never before been possible for such a low cost solution.

Benefits
- Avoided many millions of pounds being spent by deploying a device costing just tens of thousands of pounds.
- Avoided asset replacement before it end of life.
- Being deployed by us and another leading DNO in ED1.

Innovation Case Studies — Some examples of our process innovation

Customer Relationship Management system

Initiative
A state of the art Customer Relationship Management (CRM) system improving our ability to deliver superior customer service now and for the longer term.

We have implemented a new CRM system. This new, multi-channel IT system provides our business with the following capabilities: Consolidated, multi-channel customer contact management for all customer types; Multi-channel work distribution to agents based on near real-time availability; Self-service customer portal /web channel. This builds on our continued improvement in customer service performance and will help us achieve our vision of being an industry leader in delivering excellent customer service.

Benefits
- Improved communication and service for our customers.
- Online self service options for customers.
- Supports ED1 customer service outputs.

Operational Excellence

Initiative
Our Operational Excellence programme allows us to align our process to meet our customers' needs, first time, every time.

Using our operational and Lean Sigma Project Management expertise, we have defined innovative ways to lead and manage our processes, meeting and exceeding customer expectations. We call this Operational Excellence.

We have trained more than 150 of our operational managers in this approach and delivered more than 70 review sessions. Operational Excellence is a key element of our Business change programme and will set us up to successfully and efficiently deliver our outputs in ED1.

Benefits
- Improved focus on customer service and operational management.
- Increased efficiency and reduced costs.

Process Innovation

Mobile work force capability

Initiative
This IT Investment has replaced paper based processes and unnecessary trips to the office by providing our field staff with mobile technology.

This solution embraces mobile technology and connectivity, allowing field workers to operate more effectively, offering higher levels of customer service. Deploying mobile technology has reduced dependency on paper records, improving accuracy. We can upload photographs, confirm locations via GPS and communicate with our field staff in near-real time, improving our efficiency and network data.

In ED1 we will enhance this platform delivering even more improvements for our field staff.

Benefits
- Minimising staff travel and removing manual data transfer.
- Improved network data quality.

Recruitment

Initiative
We are embarking upon an ambitious programme to invest in the recruitment and training of our people, creating our workforce of the future.

We are up-skilling our workforce to undertake two or more trade activities; our training programmes include graduates, engineering apprentices, craft apprentices and adult craft trainees; we will recruit an additional 5 trainers to accommodate our recruitment plans and invest up to £1M in the infrastructure of our training centres; we support colleges in Dumfries and Bangor and recruit our staff from within the rural communities where we work.

Benefits
- Long term resource planning to ensure the deliverability of our plans.
- The creation of careers through our graduate, apprentice and trainee programmes.
- New staff recruited – additional staff to support our commitments.

Innovation Case Studies — Some examples of our commercial innovation

Connection agreements for distributed generation

Initiative
Alternative connection agreements are being offered as part of our Low Carbon Network Funded (LCNF) Accelerating Renewable Connections project.

We are in the process of offering non-firm connection agreements on a business as usual basis rather than by exception, allowing generation to be efficiently managed, rather than firm agreements that can require high cost investment and cause delays to generation being energised.

Benefits
- Increased speed of connection of distributed generation.
- Lowered cost of connections to the network.

Excavation and Cable Laying Contract

Initiative
Replacing our "defined cost" excavation and cable laying contract with a "schedule of rates" contract, we introduced zonal coefficients, reflecting the reduced or increased costs due to rural/urban working, contractor locations and establishment costs and mix of work.

The contract also introduced multiple contractors across our areas, some doing planned-only work and some covering reactive faults. This change to a non-exclusive contract allows contractors to flexibly manage their productivity.

We introduced Quantity Surveyors to assist in controlling fault costs, supported by a major training initiative prior to contract start.

Benefits
- Reduced costs due to improved productivity and commercial management.
- Reduced risk through multiple contractors.
- Improved customer service through greater localisation.

Commercial Innovation

Group Purchasing arrangements

Initiative
Organising our purchasing activities through both our Global Purchasing Group and UK Purchasing means we can purchase equipment and services at competitive rates.

We purchase key strategic assets, such as cables, switchgear, and transformers globally. We are working to create standard specifications across our global networks business.

Locally, we procure a mixture of contractors within our multi-contractor model. Using commercial innovation in both of these approaches, we obtain the best value for money for our stakeholders.

Benefits
- Improved commercial arrangements, bringing new sources of supply to the market.
- Improved flexibility especially in rural areas in emergency/out of hours conditions.
- Reduced our costs
- Improved data quality and customer service.

Introduction of new participants in market

Initiative
We established Iberdrola Engineering and Construction (IEC) as a design and delivery organisation.

IEC programme manage our major projects and we place multiple contracts with our suppliers. This removes multiple contract layers which normally would contain a risk premium. This approach therefore reduces costs.

Benefits
- More effcient management of major projects.
- Reduced costs.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Sharing Knowledge

The new approaches we develop are important to others as well as ourselves. We recognise the importance of sharing our knowledge to make sure that others can benefit from our learning.

We're active participants in the Energy Innovation Centre, a vital platform that helps to connect organisations with DNOs and other utilities with new ideas. Within the Energy Innovation Centre we can talk to SMEs with innovative ideas, collaborate with other DNOs, and work with other organisations such as Gas Distribution Networks.

We have been active in a number of ENA industry working groups to share our learning, engage with a broad group of stakeholders, and keep up to date with industry developments.

We have been engaged with the Smart Grid Forum and participated in a number of the working groups.

The development of the TRANSFORM model through the Smart Grid Forum has been valuable in sharing learning from IFI and LCNF activity to influence the definition of the model outputs. We've also used the TRANSFORM model in the development of our load-related investment plans.

We have co-chaired the Scottish Smart Grid Sector Strategy and Action Plan which was initiated by Scottish Enterprise. This work brought together a number of industry participants including academia, SMEs, trade bodies and existing vendors to discuss how we could work together to maximise the value of a smarter grid. This work outlined the wider role of Smart Grids in the Scottish Economy and was designed to:

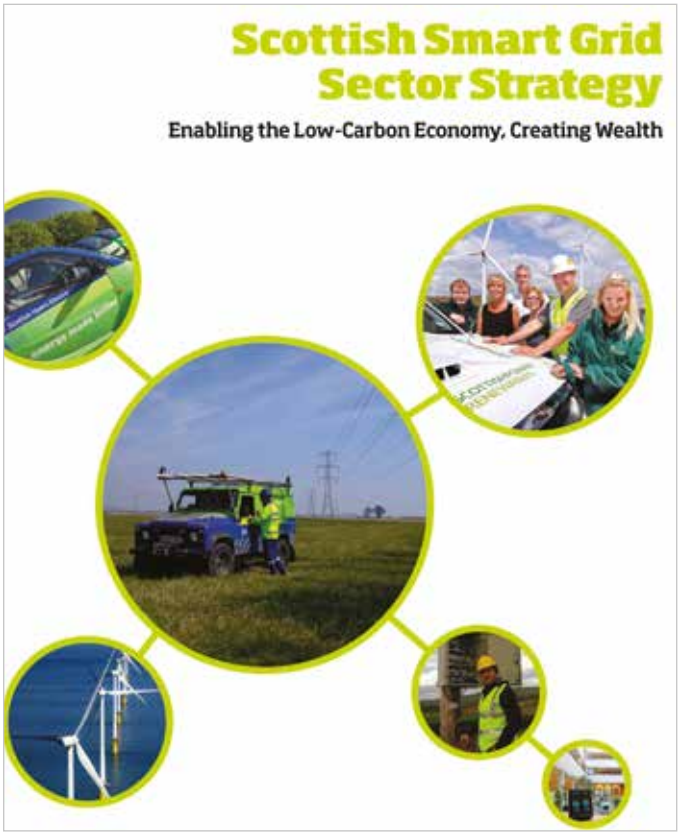
- *highlight the potential benefit to Scotland, network operators and the supply chain of creating a smarter network through job creation,*
- *the benefits which customers would receive from these developments,*
- *engage the wider supply chain by raising awareness of how organisations can be involved in the development of a smarter grid,*
- *discuss how the transferability of these skills can create economic benefit for the country.*

We are a member of Smart Grid GB, which allows us to interact directly with smart grid technology manufacturers on a regular basis and help shape the national benefits of smart grids.

We participated in the Low Carbon Network Fund conference over the past two years to share our learning with other DNOs, suppliers and industry participants. Our learning is now being reflected in the activity of other DNOs who are building on our successes, for example the integration of Fault Level Monitoring with Active Network Management.

Our investments have the wider social benefits of job creation, skill development, and new commercial opportunities. We have seen this in the growth of SMEs working with us on projects.

We integrate our innovation process and development across our network activities so the whole business benefits



Applying existing innovation in ED1

The Innovation Funding Incentive (IFI) and Low Carbon Network Fund (LCNF) were the key innovation funding mechanisms within the DPCR5 period. Throughout DPCR5 we have:

- *Been active within both the IFI and LCNF funding schemes.*
- *Created a Business change team to oversee innovative process improvement and new commercial arrangements. This team use Lean Sigma methods to drive new ways of working and are split between our head office function and within operational depots.*
- *Created a Future Networks team who were responsible for the portfolio of LCNF and IFI projects. We have allowed the Future Networks team the flexibility to explore new opportunities while still being part of our Engineering Department where they work alongside our Design and Asset Management teams who can learn and implement new solutions.*
- *Ensured that learning was shared effectively between network operators and other interested parties.*

Applying this innovation is an important part of our business plan, and innovation developed throughout the DPCR5 period will be applied in ED1. Some of the most significant initiatives that have been built into the business plan are summarised in the table below.

Throughout the RIIO-ED1 period we will continue to engage with customers, and innovation will be one of the elements of this engagement.

Activity	Source of innovation	Benefit
Partial Discharge Mapping	SPEN IFI project	PD Mapping allows us to identify potential 33kV cable faults before they occur, and direct asset replacement.
Fault Level Monitoring	SPEN/WPD LCNF Tier 1 project	We will measure fault levels and actively manage the site rather than using traditional calculation-based evaluation.
Smart Enabled Primary/Secondary Groups	Iberdrola best practice	Our substations will be ready for the future and operable with new equipment.
Active Network Management	Various LCNF projects	We will equip substations for the management of new generation on a non-firm basis, facilitating future connections at lower cost.
HV Statcom	Other DNO LCNF projects	We will apply power electronics to control system voltage and minimise reinforcement.
Dynamic rating	SPEN LCNF	We will maximise the capability of our assets through real time analysis
Online condition monitoring of primary breakers	Iberdrola best practice and technology developments	We will optimise condition monitoring to improve maintenance and replacement
Secondary Sub monitoring	Various project	We will increase network visibility of power flows and emerging issues for improved load indexing.
Soule switch	SPEN best practice	We will replace manual switches with automated switches to improve fault response.
Fault passage indicators	SPEN Fault practice	We will identify faults faster to reduce duration of power cuts.
Generator support	ENW/UKPN/WPD/NPG LCNF projects	We will use commercial arrangements with generators to support the network.

Innovation funding in RIIO-ED1

In this section:

- What are the innovation funding mechanisms
- Proposals for the network innovation allowance
- Consulting with our stakeholders
- Proposals for the network innovation competition
- Proposals for the innovation rollout mechanism

There are various different funding mechanisms within the RIIO-ED1 framework, and we will use them to build on our previous innovation successes.

Our range of innovation projects will be focused around the priorities outlined above, and form a balanced portfolio of short, medium and long-term deliverables. Short term projects will usually offer incremental improvements to existing processes like addressing metal theft. Medium term initiatives will consider less urgent problems, but areas which nevertheless offer opportunities which will take longer to develop such as Electric vehicle charging management.

Our longer term initiatives are likely to have a lower technology readiness level and will consider radical changes to the network that may not materialise until after ED1, but require consideration now to ensure that we can shape their development.

We will work on these projects collaboratively because of the higher uncertainty, and also the wider benefits that may be realised if it is successful.

This approach allows for initiatives at all stages to be pursued, from demonstration activity through to academic research.

What are the innovation funding mechanisms?

A Network Innovation Allowance (NIA)

Designed to fund smaller innovation projects.

A Network Innovation Competition (NIC)

An annual competition to fund selected flagship low carbon and environmental innovation Projects

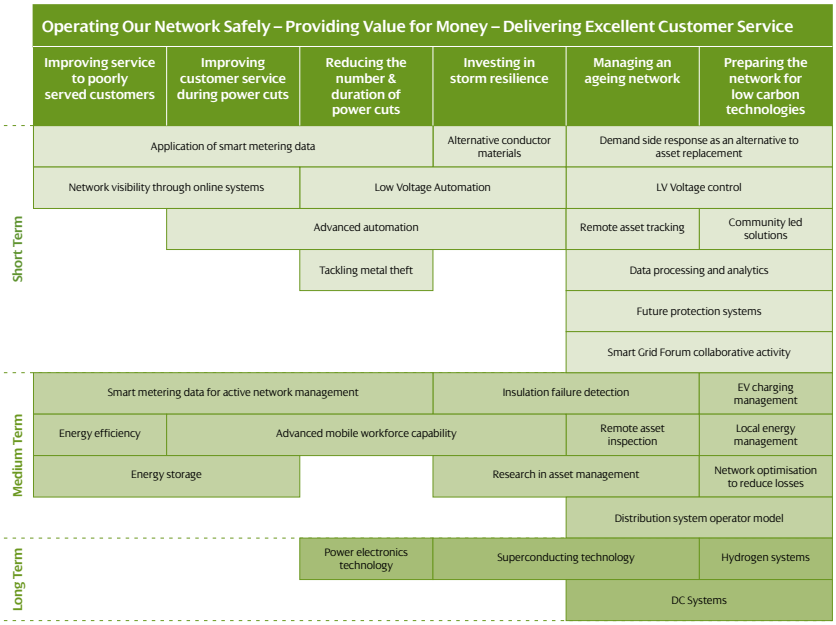
An Innovation Rollout Mechanism (IRM)

Designed to fund the rollout of proven innovations that will contribute to the development of a low carbon energy sector in Great Britain or broader environmental benefits.

Proposals for the Network Innovation Allowance (NIA)

Our existing portfolio includes a broad range of activity, from academic partnerships (such as the Scottish Power Active Research Centre) through to technology demonstration (such as Active Management Network). We will continue to build on this portfolio.

Based on our experience and view of the current industry, we will focus our ED1 innovation activity on a number of topics. We have mapped these topics against our stakeholders' priorities below.



Funding level	Additional cost per customer p.a. (approximate)	Stakeholder Response	Strategy
No funding	£0.00	10%	Not to utilise the NIA
0.5% revenue	50p	36%	Significant emphasis on short term activity, some focus on medium term activity and marginal focus on long term activity
0.75% revenue	75p	33%	Comprehensive focus on short and medium term activity with marginal focus on longer term activity
1% revenue	£1.00	21%	Comprehensive focus across short, medium and long-term horizon.

Consulting with our stakeholders

In mapping our innovation projects onto the priority areas identified with our stakeholders, we took into account the following factors:

- *Many of our innovation initiatives will fulfil more than one priority at a time.*
- *Individual projects will be assessed relative to others in terms of the overall cost, effort, risk and benefit to customers and the network.*
- *The learning from innovation projects will be an important input to the ongoing strategy.*
- *What we learn from our innovation initiatives will have an impact on the overall innovation priorities. Where we have addressed a problem the priority may become less relevant, or if an initiative is unsuccessful that priority may require greater focus.*

We presented our innovation proposal to our stakeholders as part of our engagement programme, and asked for their views on a range of options including:

- *not to utilise the NIA at all (so that stakeholders did have this as an option).*
- *a low cost strategy focused on short term challenges only, equating to approximately 50 pence per customer per annum (0.5% of annual revenue).*
- *maximising amount of funding available to look at a broad spectrum of long, medium and short term challenges, equating to approximately £1 per customer per annum (1% of annual revenue).*
- *a combination of these approaches with greater emphasis on short and medium term challenges and a lesser amount of long term focus, equating to approximately 75 pence per customer (0.75% of annual revenue).*

Innovation was rated the most important with the highest willingness to pay

The proposed strategy was outlined against each option so the benefits and costs of different allowances could be considered. The range of options and responses are summarised below.

Over 50% of stakeholders we asked were in favour of an allowance of at least 0.75% based on our proposed strategy and benefits.

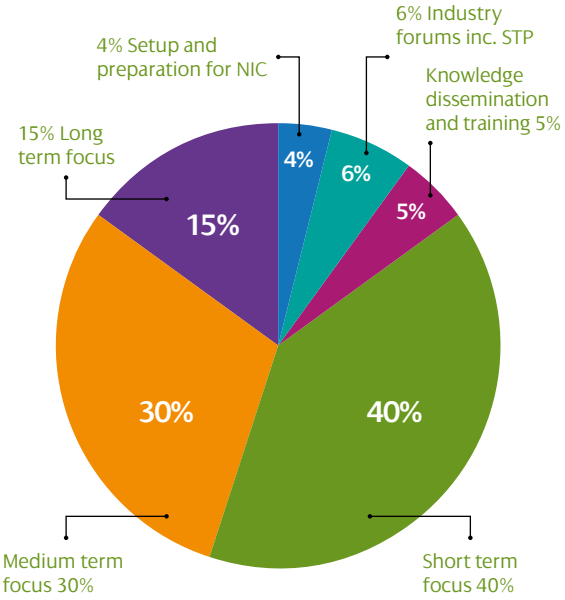
This was further supported by our customer on-the-street survey which included 1100 members of the public. Out of all the areas surveyed, innovation was rated the most important with the highest willingness to pay in both our license areas.

In light of this response, and with consideration of our innovation plans, we propose an innovation allowance for both SPD and SPM of 0.8% of annual revenue. We expect this level of funding to be split as shown in the figure below.

A number of our projects will start in the period leading up to ED1, and continue into the new innovation funding framework. We'll ensure all of these are consistent with our approach for ED1.

Over 50% of stakeholders we asked were in favour of an allowance of at least 0.75% based on our proposed strategy and benefits

Proposed NIA Spend



Proposals for the Network Innovation Competition (NIC)

In the first three years of the LCNF Tier 2 process, we have been awarded two projects. In the ED1 period, we will continue to develop larger scale demonstration projects as part of our ethos of:

"think big, start small, scale fast."

Our projects will be developed within the guidelines of the NIC and also align with our stakeholders views. Particular areas of interest include:

- *Advanced application of Smart Metering data - Smart meters will become available in ED1 and we are committed to maximising the benefits they offer*
- *Demonstrating the DSO concept and the future role of the DNO - our long term strategy is to move to be a DSO and this will require demonstration of some of the components as we go through this journey.*
- *Consumer involvement in the network through DSR and exploring other possible services - the social and economic aspects of DSR are still developing and we believe that the services available need to be explored.*
- *Facilitating the smart city and community - community involvement in the energy market is increasing and we believe that this can offer a benefit to both the network as well as customers.*
- *Loss reduction solutions - new technology is increasing the capacity of our assets but this can increase losses, how can we use this technology to manage losses more effectively as well as capacity?*
- *Energy solutions for vulnerable and off gas grid customers - with a high proportion of off gas grid customers, we need to ensure we can facilitate their transition to new energy solutions with minimal cost and disruption/*
- *Medium Voltage DC systems to improve connectivity - DC technology is offering new opportunities which are not fully understood.*

This is not an extensive list as we expect the priorities to change over the period depending on the success of other projects.

Proposals for Innovation Rollout Mechanism

The Innovation Rollout Mechanism is in the early stages of development, and we will use it as we see appropriate throughout ED1. We regularly review technological developments, both our own and those of other DNOs, and we will evaluate the rollout potential and benefits of these new technologies as necessary.

Outputs from innovation

Our focus for innovation is on real issues that the distribution network will be faced with, informed by stakeholder feedback.

Our innovation activities align with the business plan outputs:

Network reliability

We plan to develop new automation schemes on the Low Voltage network to restore customers faster using embedded intelligence. This will be a key element in reaching our target of reducing fault restoration times by 16%.

Customer satisfaction

We'll apply smart metering data to proactively provide improved information on what is happening on the network, particularly during fault conditions.

Connections

We'll develop demand side response solutions to assist in allowing for faster connection to the network.

Environment

We'll develop alternative conductor and insulation materials to reduce the use of oil in our equipment and the subsequent environmental impact.

Safety

We'll develop new approaches to combating metal theft through alternative detection, such as using technology currently being developed through the Energy Innovation Centre.

Social obligations

We'll provide communities with information from smart meter data and incentives to change their energy consumption behaviour for their own and the network's benefit.

Our innovation and collaboration with other parties will:

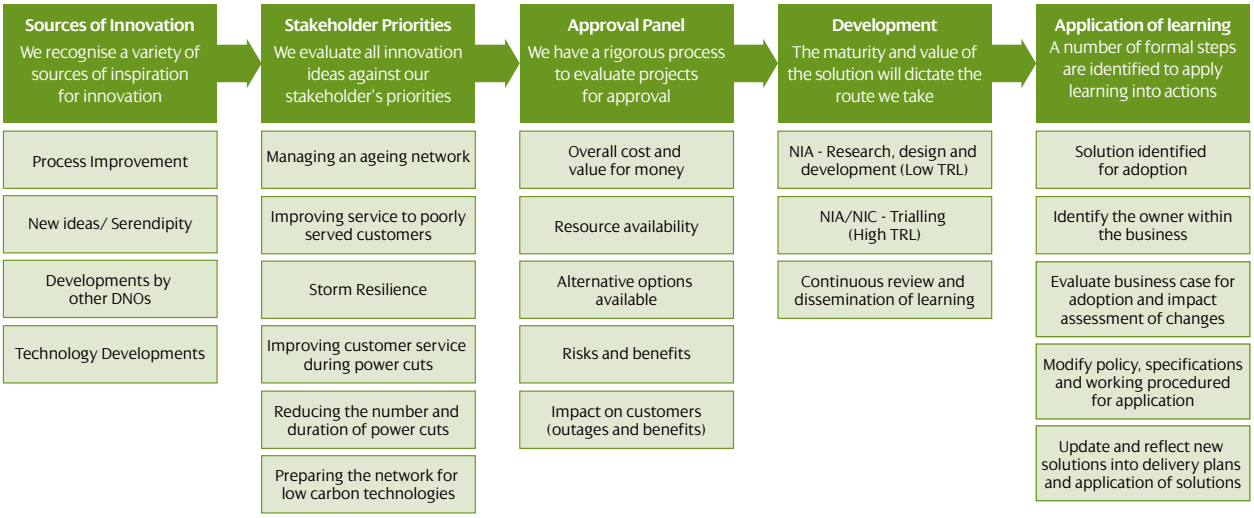
- *help develop the supply chain to understand our future requirements and coordinate suppliers to work together for mutual benefit.*
- *forge stronger links with the academic community.*
- *engage a wider range of community and stakeholder groups.*
- *allow us to understand how other parties can help facilitate the low carbon transition.*
- *share learning to help accelerate the development of new, innovative solutions.*

Innovation is essential for our future, and the detrimental consequences of not innovating would include:

- *Losing our opportunity to reduce the cost of operating the network through the application of new technologies and commercial arrangements. Although a lack of innovation might look like a saving in the short term, it could cost customer more money in the long term.*
- *Hindering the low carbon transition as we adapt to face unprecedented challenges.*
- *Hinder our preparation for the further challenges of ED2, when the uptake of new technology will increase further and place new strains on our network. Without timely investment in alternative solutions the longer-term cost may be higher, as highlighted through the Smart Grid Forum work stream 2 and 3 reports.*
- *Continuing to deploy asset intensive solutions, and failing to be in a position to adopt new technology as it is developing due to a lack of confidence.*

From Inspiration to Solution

SPEN innovation process



Through the development of our innovation strategy, we have discussed our plans and shared knowledge with others.

- *The leading technology company 3M are consistently recognised as one of the most innovative companies in the world. We held a knowledge-sharing event with them to compare our innovation management processes with an organisation outside our sector. This exercise helped us to review our process and the way we think about developing new solutions on the network.*

- *We benchmarked our process with the innovation team in Iberdrola. This helped us to ensure we are at the forefront of innovation management, ensure value for money, and create a more productive environment.*

- *We reviewed our innovation activity with University of Strathclyde to agree our objectives and keep abreast of academic developments.*

The key steps of our innovation process are:

1: Idea generation

Ideas can come from a variety of sources. We have internal initiatives such as 'What's the big idea' that encourage staff from all parts of the business to propose new ideas to our Executive team.

These can include ideas for business improvement as well as innovation. The other areas where we look for new innovative ideas are:

Technology developments

The introduction of new technology by suppliers or academia. This includes working within the competitive marketplace and working collaboratively with others. We have used tools such as the ENA Smarter Networks Portal and Requests for Information from vendors for new ideas to be proposed.

Developments by other network companies and wider industry

This includes the developments by other DNOs as a result of LCNF, IFI and NIA/NIC in the future. A watching brief is be maintained on developments outside the UK, in particular the outcome of FP7 projects and activity within other parts of the Iberdrola group.

Process improvement

Our business change team is working to improve the way that the business operates. We use proven Lean Sigma methods to ensure the customer is at the heart of our procedures.

Serendipity

As with some of the best developments in history, innovation cannot always be planned. Our innovation plans include a degree of flexibility to allow new developments to be pursued if we believe they will provide benefits to customers.

2: Evaluation

We use the priorities of our stakeholders as the main evaluation criteria for new projects. These are the priorities that our stakeholders have told us are where we need to focus, and innovation is no different. We will ensure that all new projects align with at least one of these areas. Operating our network safely, providing value for money and delivering excellent customer service are all implicit requirements in what we do.

3: Approval

Our R&D approvals panel reviews all technology innovation projects before they progress with NIA/NIC funding. This is to ensure that the project aligns with our strategy, offers value for money, and is expected to deliver benefits that will justify the cost and risk. The risks associated with innovation projects can be much broader than conventional projects due to their very nature, such as working with new organisations, unexpected health, safety or environmental risks as well as normal technical issues. We also use the approval process to identify any other activity which has synergies to avoid any duplication, and identify resources from the wider business that may need to be involved. Consideration is also given to any impact on customers (e.g. the requirement for an outage or changes to power quality) to ensure that customers are not disadvantaged in the short term unless the potential benefit outweighs the impact.

Following feedback from our Transmission innovation strategy, we have also reorganised our R&D approvals panel to include a number of external stakeholders such as University of Strathclyde for external verification. External governance will allow further scrutiny of our investments to ensure value for money; however we will balance this against any potential conflicts of interest that external involvement could introduce.

4: Development and delivery

All of our projects are managed inline with the ENA Good Practice Guide for Innovation in Electrical Distribution Networked Systems (G85). A project manager is assigned to each project to ensure effective ownership, and our project managers can either be from the Future Networks team or from another part of the business. All projects are monitored throughout their lifecycle and reported on back through the R&D approvals panel. Should the anticipated benefits not arise through the course of the project, the Approvals Panel have the necessary authority to stop the project. We will consider the technology readiness level of projects and the relative scale to decide whether we will use NIA, NIC or any other funding streams available such as research grants which we can collaborate on.

5: Application of learning

The manager for each project is responsible for directing the learning that comes out of a project to the relevant internal policies for use within our business and across wider industry. The same manager is also responsible for disseminating learning across the business through a variety of channels including our intranet, team briefs, and other internal documentation. We also have a dedicated individual responsible for knowledge transfer. This individual's role is to ensure consistency across our approach and that all channels are effectively used. It is important to disseminate learning where it is both a success and when it does not meet our expectation so that we can learn from our experiences.

An important step in the closure process is evaluation of the business case. Once the full implications of applying the solution are understood, a revised business case is constructed to consider the full cost of roll out, and an impact assessment of any changes. Our impact assessment will consider the impact on customers of making such a change, changes to resources, skills or any other consequential changes that may be required. These are all important considerations as it may be feasible that a new solution appears to be more effective at face value, but has other changes which add to the complexity or quality of service.

Where a significant change to policy or way of working is identified, we create a project charter that outlines the benefits and steps that are required. Each charter is overseen by our business change department to ensure the innovation is implemented into the wider business. We have also found that this may involve other changes such as staff training and developing new working procedures. Finally, these changes are reflected into our annual planning process to ensure that the adoption is reflected within individuals and team objectives.

Learning from others

Our approach does differ when we are adopting the experiences of other DNOs and new solutions which do not require development. As part of our normal operations we operate an innovation tracker which monitors other notable projects being undertaken by other DNOs and parties which is of interest to us. Members of the Future Networks team are accountable for being internal subject specialists such as energy storage, commercial arrangements and dynamic rating. These individuals are responsible for liaising with other parties to gather the relevant information to allow us to replicate the solutions. In this instance, we would move straight to step 5 unless we considered development was required to adopt the solution to a specific situation (e.g. the unique nature of the Manweb network). We treat the

We work with a wide variety of collaborators

experiences of other projects with the same rigour that we would one of the projects we have undertaken internally.

Reviewing our innovation strategy

The environment we work in is constantly changing, and our innovation strategy needs to adapt to this. We will be undertaking an annual review of our innovation strategy through our R&D approval panel and in line with our stakeholder feedback. Because innovation takes time to develop the benefits, we do not expect to update our strategy every year, but will review its content depending on the learning and other developments by our suppliers and other DNOs.

We know that we can't do this alone. We work with a variety of collaborators on our projects, with multiple benefits. Collaboration allows for the sharing of ideas, which in turn allows us to make greater progress, faster. It also allows a sharing of risk so that no one party is carrying all the consequences of a project failing. This in itself is recognised as an important learning point; proving why things don't work can be just as important as proving what does.

Throughout the ED1 period and beyond, we want to ensure good practice and continually review our innovation process.

- *We have worked along with other DNOs as part of the Energy Networks Association R&D group to develop G85 Good Practice Guide to R&D Management.*
- *We will hold a bimonthly review of the progress of all NIC and NIA projects to ensure risks are being managed effectively.*
- *Larger projects are subject to a project charter (administered by the business change team) to ensure that the project is not only delivered but that the proposed benefits from the project are realised. This charter is reviewed at an Executive level.*
- *Our objectives will be subject to a formal internal review on an annual basis to ensure that they are still appropriate.*
- *A continuous review will be undertaken as part of the ongoing stakeholder engagement programme throughout the course of ED1.*

Since 2011, we have run an internal innovation conference and over 150 members of staff from across our company have attended to date. This event showcases a number of our projects, provides an update on what other DNOs are doing, encourages open discussion on the areas we are focussing on, and invites feedback on new areas where staff feel we should be focussing. The conference has included speakers from some of our project partners as well as internal staff. It has proven to be very successful with a lot of positive feedback, and we intend to continue running the conference during the ED1 period and beyond.

Making the most of being part of Iberdrola

Innovation at Iberdrola

SP Energy Networks are part of the Iberdrola Group, one of the largest energy companies in the world. The group prides itself on its commitment to innovation. Across the group:

- *in excess of €159 million was invested in R&D in 2013*
- *over €44 million of the investment was associated with networks.*
- *innovation involves a variety of R&D across distribution and transmission*
- *investment includes funds leveraged from a variety of sources including European Framework programmes, government funding, and stakeholder investment.*

This impressive investment demonstrates Iberdrola's commitment to innovation.

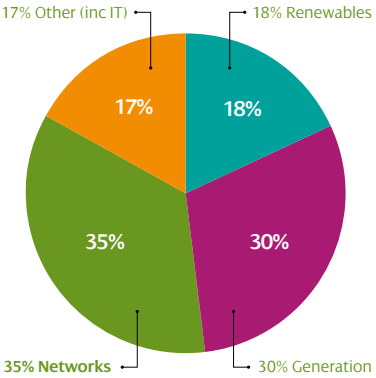
In 2013 Iberdrola was identified as the 4th most innovative utility in Europe by the European Commission.

Source: Iberdrola 2013 Innovation Report

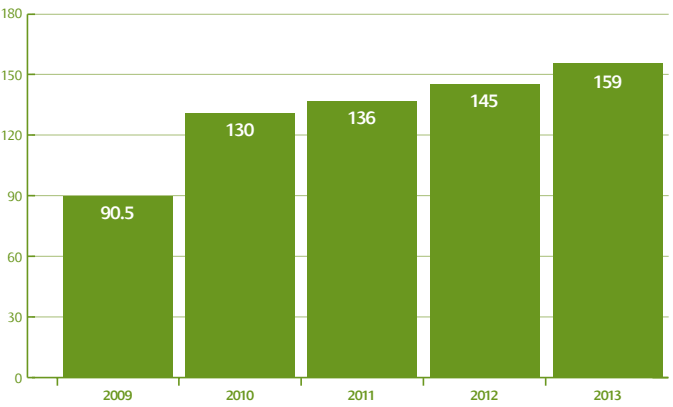
We want to make the most of being part of this highly innovative group. We collaborate extensively with other areas of the Iberdrola group, looking at all elements of networks, led by an international steering group for Smart Grids. To give three examples:

- *In our ED1 business plan the design and deployment of light current technology was informed by experiences of our Iberdrola colleagues in Spain (specifically the substation protocol standardisation to IEC 61850). These experiences have helped to shape our procurement process and equipment specification for this new protocol. This has allowed us to contact a greater variety of suppliers, thereby increasing competition and reducing costs.*

R&D investment in 2012 across Iberdrola



Iberdrola R&D investment (£m)



- *Iberdrola's experience of smart metering in the USA and Spain, and the data this creates, has helped us to plan our IT strategy and refine our requirements for the IT systems we will purchase over the ED1 period. We have shared experiences of work undertaken to date and lessons learned from the use of metering data to derive benefits.*
- *Iberdrola also have a collaborative electric mobility programme in Spain with SEAT to obtain and share data on the actual operating conditions of electric vehicles. Our access to this data will improve our understanding of the impact of this technology on our network and how we design and cater for new electric vehicle charging points.*

Appendix A – Iberdrola Innovation Policy

The Iberdrola Corporate Innovation Policy is detailed below, and can also be found at:
https://www.iberdrola.es/webibd/gc/prod/en/doc/responsabilidad_innovacion.pdf

Innovation Policy

The Board of Directors of IBERDROLA, S.A. (the **"Company"**) directs innovation in the Company and the companies belonging to the group of which the Company is the controlling entity, within the meaning established by law (the **"Group"**), towards an ever more efficient management of available resources and knowledge, while ensuring that the best technologies are efficiently introduced, providing benefits and competitive advantages for shareholders, customers, and employees.

Innovation is a strategic variable that affects all the businesses of the Group and all the activities it carries out.

The Company sees innovation as an open and decentralised process. It is decentralised because it is carried out independently in each business unit, with the support of and coordinated by the Innovation Division. It is open because the Company considers itself to be a technology driver and, as such, its vocation is to involve technology suppliers of the Group, such as universities, technology centres, and equipment manufacturers, in its innovation process.

In addition, the Company believes that the innovation process must be one and the same for all business units, and, with that end in mind, the Innovation Division is responsible for the implementation thereof across the Company.

The Company wants to be a leader in innovation in the energy industry, with its activities in this field pivoting around sustainable development, development of renewable energy, and emerging technology, always complying strictly with the legislation in force and with other commitments of the Group.

The *Innovation Policy* is based on the following basic action principles:

1. **Practise** a "culture of innovation" that pervades the entire organisation and creates motivating work environments that favour and reward the generation of ideas and innovative practices by employees, accepting risk and recognising creative contributions.

2. **Incorporate** innovation into all training within the companies of the Group by means of courses and specific programmes to develop creativity.

3. **Implement** an innovation management system that includes the establishment of annual targets and goals as part of an ongoing improvement process, managing the Company's human and intellectual capital as an effective support for the entire creative and innovative process.

4. **Promote** a system of technological monitoring and prospecting to identify opportunities and challenges for the businesses of the Group and detect the need for innovation in processes or services to allow it to act in advance of technological changes in the market.

5. **Foster** cooperation and alliances with interested parties by means of links that make it possible to multiply the innovative capacity of the Group.

6. **Circulate** internally the knowledge gained so that everyone is familiar with the best practices applicable to their activity in the search for efficiency and effectiveness in all processes of the Group.

7. **Protect** the results of the innovation process, managing intellectual property suitably and ethically.

8. **Disseminate** innovation activities, making the giving back to society of part of the knowledge acquired compatible with the necessary confidentiality regarding the Company's own activities.

9. **Support** innovations that provide added value for users and boost shareholder, customer, and employee satisfaction.

This *Innovation Policy* was initially approved by the Board of Directors on 18 December 2007 and was last amended on 13 December 2011.