PERSPECTIVES ON TRANSFORMING UTILITY BUSINESS MODELS

# Paper 2: Business Models for Innovation

January 2024

## INTRODUCTION

Innovation has always been a byword of the energy sector, and particularly the electricity industry, not only in terms of continuous technological development but also with respect to market mechanisms, commercial instruments, regulatory frameworks, and overall ownership and governance structure. This has led to a continuous evolution of business models for organizations looking to extract the greatest value from their position within the energy sector, whether that be as a regulated monopoly, an energy supplier or merchant generator operating under license, a third-party intermediary such as an aggregator, or as a manufacturer or contracting service provider. Following privatization and deregulation of the electricity industry (which varies in form and levels of maturity across countries), vertical integration has largely given way to business separation, whilst competition has led to the emergence of new entities, including distributed (or embedded) generators, energy storage operators, energy communities, and those with business models operating at the 'grid-edge' or 'behind the meter' (BTM).

Innovation can be pursued in a number of ways: speculatively, business case-driven, regulatory-driven, and market-driven, to meet corporate responsibility commitments and/or to meet policy directives. Particularly since privatization, new innovation funding mechanisms incorporated within regulatory frameworks for the energy sector have been a catalyst for a renewed focus on research and development, and particularly demonstration, for example, in technology terms towards the more advanced end of the TRL spectrum. A significant driver of innovation in the electricity sector has been a major shift from a traditionally supply-side orientated architecture dominated by centrally dispatched large generators to one where distributed energy resources (DERs) and demand-side customer energy resources (CER) are becoming increasingly important to system security, stability, and economic efficiency. Further emerging contexts for innovation in the energy sector are the role of decarbonization of supply and demand as a major contribution to achieving net zero and an increasing need for adaptation of energy infrastructure and climate change resilience.

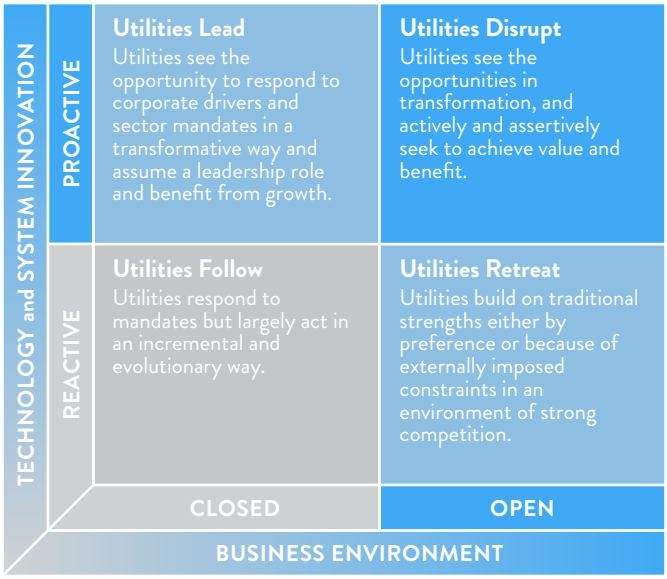
For all the above reasons, stakeholders—including customers, regulators, government, shareholders, and other industry participants—now expect to see innovation embedded as a core activity within an organization's business model. However, an important precursor to successful innovation is that utilities develop business innovation strategies that reflect their business culture, ambition for growth, and appetite for risk in the context of a rapidly evolving energy landscape driven by the security of supply and decarbonization objectives. A further consideration is the role of government and regulators in supporting and incentivizing innovation, the funding models that are applied, and how these should be developed to reflect the changing needs of society, customers, and the environment. Effective innovation life-cycle management is key to utilities aligning their innovation focus with their business objectives, facilitating effective governance of the overall innovation strategy, and embedding new learning throughout the organization. The paper describes how these various elements of a successful innovation model can be brought together to enable utilities to continue to meet their business objectives.

## DEVELOPING AN EFFECTIVE BUSINESS INNOVATION STRATEGY

In a fast moving and increasingly competitive energy sector where business sustainability, let alone business growth, requires organizations to be agile and adaptive to new opportunities and threats, an effective innovation strategy is essential to meeting an organization's corporate objectives and a prerequisite to being able to continuously develop and improve their service offerings to their customers.
In the energy sector, competition in the supply chain for products and services is global, facilitated by international standards such as IEC, CENELC, ISO, etc.) For utilities, even those with a captive customer base due to their monopoly status (such as network operators) regulatory incentives and injection of competition into their core businesses (such as electricity network connections, extensions and upgrades) requires them to continuously seek opportunities to deliver outputs more effectively and cost-efficiently. Horizon scanning (which is the subject of a separate paper) is an essential front-end to the recognition of business threats and opportunities.

However, to be effective, innovation requires coordination and sustained discipline. It has been described as *'the art of enhancing advantage and value creation by making simultaneous—and mutually supportive—changes both to an organization's value proposition to customers and to its underlying operating model.'* [1] At the value proposition level, these changes can address the choice of target segment, product or service offering, and revenue model. At the operating model level, the focus is on how to drive profitability, competitive advantage, and value creation through decisions on how to deliver the value proposition. For energy utilities, business model innovation is also critical to the energy transition required to deliver decarbonization and ultimately net-zero, whilst also ensuring customer affordability and protecting security and reliability of supply.

This paper considers four categories of utility, each of which will have a business-specific perspective on innovation depending on their business culture, and where the utility positions itself in terms of its interest in exploiting technology and process innovation. This will be reflected in the weighting of its innovation project portfolio across a spectrum of low risk/low reward and high risk/higher reward projects. An EPRI report: *Toward Net Zero – The Evolving Utility Business Model and Possible Future Scenarios*[2] suggests that utilities could be differentiated according to where they position themselves on the following matrix.




Technology and system innovation breakthroughs can create new business opportunities that utilities and others are able to exploit.

Conversely, stronger (or more restrictive) regulation, stressed financial markets, energy policy uncertainty and/or weak policy support might see utilities take more of a follow and retreat approach.

Where any given utility sits on the matrix will be determined by their business culture (reactive or proactive) and environment (closed or open).

For any utility, an effective business innovation strategy will be determined by where the utility sits on the above matrix. Taking each of the above four quadrants in turn…

**Utilities Follow** – a utility that is positioned in the bottom-left '**closed-reactive**' quadrant of the above matrix will generally seek to establish an innovation strategy that sustains, rather than grows, its market position or status within the sector. Its focus will be on evolutionary rather than revolutionary opportunities, preferring to adopt a lower risk strategy by following rather than leading the competition or its peers. It will generally look to develop a portfolio of

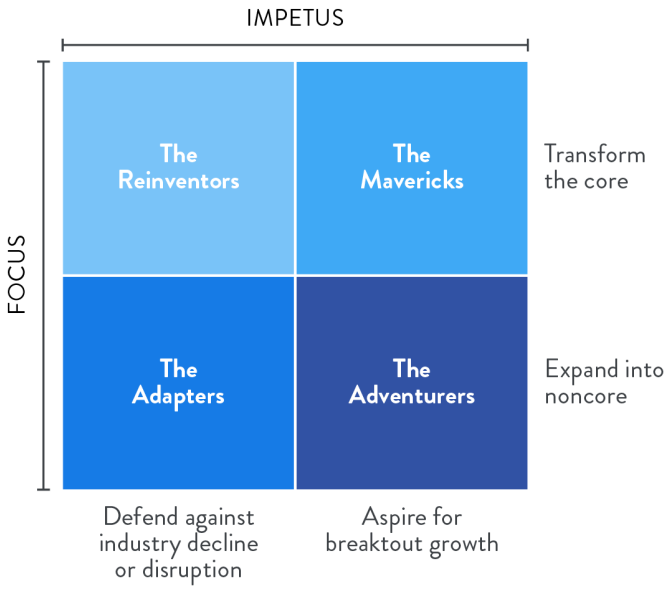
1 Ref. Boston Consulting Group: https://www.bcg.com/capabilities/innovation-strategy-delivery/business-model-innovation

2 https://www.epri.com/research/products/000000003002025745

innovation projects or initiatives which have lower ambition but a higher chance of success.

**Utilities Retreat** – a utility positioned in the bottom-right '**open-reactive**' quadrant will be more open to innovation which leads to business growth opportunities but limited to initiatives and a project portfolio within its 'comfort zone' where the outcomes are more easily adapted to business as usual. It will tend to focus on its core strengths in delivering innovation rather than taking risks with new previously unexplored business models or technologies, or previously unexplored markets.

**Utilities Lead** – a utility positioned in the top-left '**closed-proactive**' quadrant will have a greater appetite for higher risk/higher reward innovation projects which have the potential for transformational business change rather than simply incremental change but continuing to operate and grow within the bounds of its statutory or regulatory limitations. It will seek to explore innovative technologies




Companies hoping to drive growth through business model innovation face several critical questions:

- How broad should the scope of the effort be?
- What is the appropriate level of risk to take?
- Is it a one-time exercise, or does it call for an ongoing capability?

Understanding the four distinct approaches to business model innovation can help executives make effective choices in designing the path to growth.

or business models that are relatively immature, but which might potentially create opportunities for growth or higher returns, provided the company is prepared to manage the risks involved in taking a leading position, for example in developing a technology from (say) TRL6 to TRL9.

**Utilities Disrupt** – a utility positioned in the top-right '**open-proactive**' quadrant will apply innovation in seeking out both established and relatively immature technologies or business models that have the potential for the company to expand its activities into new as well as existing areas of operation. For example, a utility might see an opportunity for a revolutionary change to energy system architecture, or a chance to integrate new technologies into existing architecture. The most open and proactive utilities might consider the option to expand its innovation portfolio into other energy vectors, or even other related sectors.

Applying a similar approach to the four-quadrant model described above, the **Boston Consulting Group** suggests there are four distinct approaches to business model innovation that can help executives make effective choices in designing the path to growth (source: Boston Consulting Group).

**The Reinventor** approach is deployed in light of a fundamental industry challenge, such as commoditization or new regulation, in which a business model is deteriorating slowly, and growth prospects are uncertain. In this situation, the company must reinvent its customer-value proposition and realign its operations to profitably deliver on the new superior offering.

**The Adapter** approach is used when the current core business, even if reinvented, is unlikely to combat fundamental disruption. Adapters explore adjacent businesses or markets, in some cases exiting their core business entirely. Adapters must build an innovation engine to persistently drive experimentation to find a successful 'new core' space with the right business model.

**The Maverick** approach deploys business model innovation to scale up a potentially more successful core business. Mavericks - which can be either startups or insurgent established companies - employ their core advantage to revolutionize their industry and set new standards. This requires an ability to continually evolve the competitive edge or advantage of the business to drive growth.

**The Adventurer** approach aggressively expands the footprint of a business by exploring or venturing into new or adjacent territories. This approach requires an understanding of the company's competitive advantage and placing careful bets on novel applications of that advantage in order to succeed in new markets.

Whilst there is no direct correlation between the above EPRI and BSC quadrants, it might be expected that utilities with business models characterized by '**Utilities Follow**' will tend towards the '**Reinventor**' approach to innovation whilst those with business models characterized by '**Utilities Retreat**' might be more inclined towards the '**Adapter**' approach. Similarly, utilities with business models characterized by '**Utilities Lead**' will tend towards the '**Adventurer**' model whilst those with business models characterized '**Utilities Disrupt**' might be more inclined towards the '**Maverick**' approach.

## SOURCES OF INNOVATION FUNDING AND SUPPORT

Governments and regulators will generally recognize that whilst well designed competitive markets and regulatory incentives towards customer service and cost-efficiency should inspire innovation, regulated utilities will nevertheless tend to focus on incremental, or at best evolutionary innovation. Whilst such low risk/short-term reward innovation is welcome, it nevertheless follows that the exploration of revolutionary technologies and business models with higher risk/longer-term rewards will depend on the availability of external funding support and/or the organization's appetite for risk, for example depending on which of the above four BCG innovation business models the organization's shareholders favour.[3]

Particularly at a time when the energy system faces transformational challenges to meet decarbonization targets and governments commit to legally binding net zero obligations, there is a need for both evolutionary and revolutionary innovation. Whilst funding mechanisms and incentives are helpful to either, the latter also requires a business model which is adaptive to both the growth opportunities and potentially existential threats that major policy interventions can create. In order to provide incentives for a more balanced portfolio of RD&D, there is a need for a range of different innovation funding mechanisms and incentives. The following is a brief, but by no means exhaustive, summary of some of the current more prominent sources of innovation funding and business support relevant to the energy sector in both the USA and UK.

3 Source: EPRI Public Innovation Funds Benchmarking Study - Data Collection Report Q1 2023

## USA

| FUNDING SOURCE | TARGET/METHOD | INNOVATION FOCUS |
|---|---|---|
| Office of Energy Efficiency and Renewable Energy (EERE) | Open, competitive process hosted primarily on the EERE Funding Opportunity Exchange with published Requests for Information and Notices of Intent. | Research and development to lower the cost of clean energy technologies, protect the private sector from financial risk, and ensure an equitable transition to a decarbonized economy. |
| Precourt Institute for Energy (part of the Stanford Doerr School of Sustainability) | Pioneering Projects $450,000 – per project, for 2 years.<br>Seed Grants $100,000–$200,000 per project, for up to 2 years. | Pioneering Projects to tackle urgent and important problems in energy.<br>Seed Grants for new projects and test new/high-risk ideas. |
| Rural Energy for America Program | Loan financing and grant funding to agricultural producers and rural small businesses for renewable energy systems or to make energy efficiency improvements. | Biomass, geothermal, hydropower, hydrogen, small and large-scale wind and solar generation, ocean (tidal, current, thermal) generation. |
| Environmental Protection Agency | $11 million grant funding (announced August 2023) to Address Energy Transitions in Underserved Communities. | Addressing drivers and environmental impacts of energy transitions in underserved and tribal communities. |
| SCI – DoE | $540 million research funding for 54 universities and 11 national laboratories across the USA. | Clean energy transition technologies and low-carbon manufacturing aimed at meeting USA's climate and energy goals. |
| EPRI – Technology Innovation program | Providing thought leadership to illuminate emerging developments and future drivers, risks, and opportunities with a 10–15-year scouting horizon. | Supporting a portfolio of strategic research, early-stage technology development, and field demonstration projects aligned with the energy sector. |

## UK

| FUNDING SOURCE | TARGET/METHOD | INNOVATION FOCUS |
|---|---|---|
| UKRI – Innovate UK | Strategic delivery plan 2022–2025. | UK's national innovation agency supporting business-led innovation in all sectors, technologies and UK regions. |
| UKRI – Engineering and Physical Sciences Research Council (EPSRC) | £400,000 grant (minimum) application open between Oct-Dec 2023 working across domains, Catapults, and Knowledge Transfer Networks. | Strategic infrastructure to improve UK scientific capability and enable cutting-edge research of high priority to EPSRC |
| DESNZ Energy Entrepreneurs Fund | Industrial research, experimental development, or feasibility studies. Capital grants, up to £1m per subcategory up to a maximum project value of £2.5m with match funding by applicant's own resources or external private sector investors. | Supporting the development and demonstration of innovative technologies and/or processes in the areas of energy efficiency, power generation, heat generation, energy storage, reducing greenhouse gas emissions and security of supply. Technology Readiness Level (TRL) 3 up to TRL 8. |
| Ofgem | Allocated funding and innovation competitions (see table showing detailed breakdown below). | Energy systems and networks. |
| Energy Systems Catapult – Whole Systems & Networks platform | Supporting networks with subject matter expertise to make investment decisions using whole systems analysis to understand future energy system challenges. | Accelerating the energy system to net zero. systems engineering, clean tech engineering, whole energy system modelling, business model innovation. |

### USA/EUROPE/ASIA PACIFIC

The following is a summary of some of the larger global sources of innovation funding.[3]

| FUNDING SOURCE | REGION | ADMINISTRATOR | AVAILABLE ANNUAL FUNDING (USD) |
|---|---|---|---|
| Horizon Europe Cluster 5 – Climate, Energy and Mobility | Europe | European Commission | 1,606 |
| Clean Energy Innovation Fund | Asia Pacific | Australia Clean Energy Finance Corporation | 534 |
| Advanced Research Projects Agency | USA | U.S. Department of Energy | 457 |
| New York Green Bank | USA | New York State Energy Research and Development Authority | 435 |
| Electric Program Investment Charge | USA | California Energy Commission | 128 |
| Clean Energy Fund | USA | Connecticut Green Bank | 118 |
| Strategic Innovation Fund | UK | Ofgem/Innovate UK | 108 |

## REGULATORY INCENTIVES FOR INNOVATION

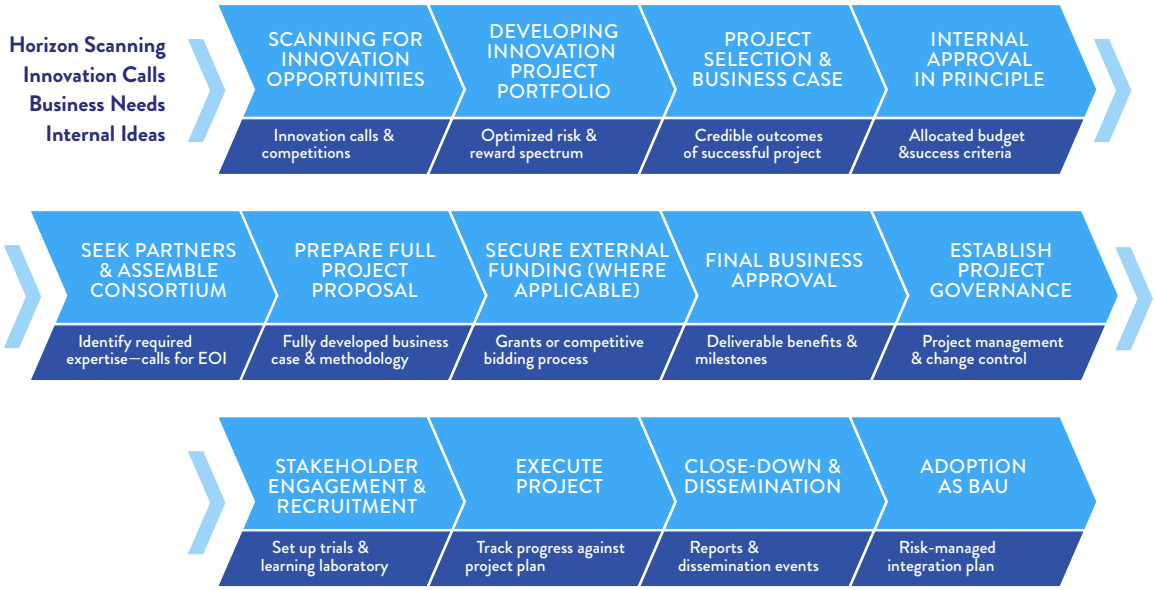
The focus of utility regulation has historically been towards network reliability performance, efficient cost savings, and customer service—due to the primary remit of regulators being that of an economic regulator protecting the interests of existing and future customers, including through promoting competition where practicable (for example generation and supply but increasingly also network investment). However, this limited remit can result in utilities becoming risk-averse, partly because regulatory frameworks have tended not to explicitly differentiate between desirable cost saving efficiencies, and undesirable cost-cutting resulting from short-term business strategies. This can encourage a utility business strategy that seeks to maximize revenues over a given regulatory period but with little consideration of the longer-term impacts. A further consequence is that utilities may be less inclined to invest in innovation where this represents an additional cost burden to the business which is rewarded only over longer timescales. Again, this depends on which of the four characteristic innovation business models the organization aligns with, and the extent to which regulatory funding mechanisms incentivize longer-term strategic innovation (for example in Britain the Strategic Innovation Fund).

This perverse outcome of regulation was observed following privatization of the public electricity network businesses in Great Britain where the original RPI-X regulation introduced in 1990 led to a declining level of RD&D activity. In order to address this, two complementary innovation incentives–the Innovation Funding Mechanism (IFI) and the Registered Power Zone (RPZ) incentive–were introduced by Ofgem as part of the fourth Distribution Price Control Review (DPCR4) which came into effect on 1 April 2005. These funding mechanisms and incentives proved very effective in re-establishing RD&D and innovation as a priority for the electricity (and in the case of IFI subsequently gas) network operators. The original IFI and RPZ incentives have subsequently been displaced by more advanced and/or sophisticated innovation funding incentives and mechanisms including initially a Low Carbon Network Fund followed by a Network Innovation Allowance and Network Innovation Competition, and currently a Strategic Innovation Fund. A chronology of how regulatory innovation funding available to Britain's Transmission and Distribution Network Operators has evolved since 2005 is included in an appendix to this paper.

## INNOVATION DELIVERY LIFECYCLE MANAGEMENT

A critical requirement for a successful innovation and RD&D programme is sound project governance across the whole lifecycle of each individual programme and project – from inception to closure and 'business as usual' adoption. The following diagram illustrates a generic project lifecycle for a typical innovation project – including the competitive bidding stage (where applicable).

Whilst lifecycle management is common to all innovation business models, its importance in ensuring successful delivery of a project portfolio from conception to adoption as BAU cannot be understated.




**Scanning/Scouting** – an innovation project or programme might be triggered by an identified business need, a specific call for innovation, an innovation incentive (an allowance or a competition), an approach by a third-party, or an internally sourced idea or concept. The utility's business model and aspirations (including where they are positioned on the above EPRI four-quadrant matrix) will largely determine the depth and breadth of their scanning focus. A separate paper - Horizon Scanning and Forecasting - explores this in more detail.

**Portfolio Development** – an innovation portfolio which aligns with the company's business strategy will need to strike a balance between high risk/high reward/longer-term benefit—and low risk/low reward/shorter-term benefit projects, depending on the company's level of ambition and overall appetite for trading-off risk and reward. From a technology perspective, the portfolio will typically cover a range of technology readiness levels (TRL) though, again, the balance will be dictated partly by the company's level of ambition and partly by available innovation funding and incentives.

**Project Selection** – the selection of projects to take forward as part of the company's innovation programme will depend on an assessment of their potential value to the business compared to the anticipated cost of the project in terms of required assets and both internal and external resources. In the case of funding competitions, an assessment of the company's strengths relative to likely competitors will need to be made. Projects might take the form of commercial and/or technological innovation, whilst some might be aimed at helping resolve an identified specific challenge. For example, National Grid ESO in Great Britain, as part of its 'Network Options Assessment' process, has initiated a number of 'pathfinder' projects aimed at addressing emerging operational issues with the transmission system as a consequence of the evolving transition from synchronous to inverter-based generation technologies. Current pathfinder projects include pathfinders for System Stability, High Voltage Mitigation, and Constraint Management.

## INTERNAL APPROVAL IN PRINCIPLE

At this stage, authorization is sought to commit human resources and financial expenditure, with an allocated budget based on initial cost-benefit and risk analyses, to further explore and sufficiently develop an innovation programme or project to demonstrate viability against agreed success criteria.

## SEEK PARTNERS AND COLLABORATORS

Following approval in principle, this stage involves assembling prospective project partners (including OEMs, consultancies, academia, peer utilities, etc. as appropriate) through open forums, issuing EOIs and/or RFPs or direct approaches. At this stage commitments in principle would normally be obtained from prospective partners in respect of contributory funding or expertise.

## FULL PROJECT PROPOSAL

At this point a fully costed and benefit-justified business proposal is developed, including the overall methodology for project execution, governance, learning capture and dissemination. It will cover funding arrangements, including contributions from project partners (such as academia) who might have access to external funding not directly accessible to utilities, and (in the case of trials) any necessary customer protection measures.

## SECURE EXTERNAL FUNDING

This stage will apply where the project has been developed in response to an innovation competition and/or where external funding in the form of grants or match funding might be available. Under a competitive bidding process, this stage may involve a significant resource in preparing and presenting the business case and in addressing follow-up questions. In some cases, this stage might involve a change in scope or methodology to secure the required funding. At the conclusion of this stage a decision on external funding will have been received.

## FINAL BUSINESS APPROVAL

By this stage the overall required level of expenditure (gross and net of partner contributions) will have been determined, and hence the viability of the programme or project on a cost-benefit and risk/reward basis. Reward in this context would include the anticipated learning outcomes and their relevance to informing the future strategic direction of the business. In that regard, the value of learning from failure might be equally valuable in the sense that previously unknown boundaries of an innovative technology or business model will have been tested. Final business approval will include commitment to milestones and, especially for larger and/or longer duration projects, interim gate stages might be specified where approval is required to continue with (or amend) the project.

## ESTABLISH PROJECT GOVERNANCE

Having obtained business approval, the necessary project board, project manager, design authority and overall project governance will be put in place with an overall project plan. At this stage, principles of change control will be agreed by the project board to ensure a balance between agility (adaptability to capitalize on interim learning outcomes) and avoidance of scope drift over the duration of the project.

## STAKEHOLDER RECRUITMENT AND ENGAGEMENT

Having assembled the project board and established the overall governance structure, there might be further stakeholders (other than project partners) who are in a position to support the project. At this stage, additional members to the project board (or alternatively an advisory group reporting to the project board) might be sought to provide an external perspective and/or facilitate the execution of the project through levers they are able to deploy (for example local authorities and consumer representative organizations). In the case of trials involving customers (including consumers, generators, energy storage operators, etc.) the recruitment effort will extend to prospective trial participants—including through appropriate incentives and/or risk protection (for example a trial involving dynamic tariffs where customers might be exposed to both higher risks and higher rewards). If not already established, a learning laboratory facility will be commissioned (typically through an academic partner) as a centralized project resource to analyze data and synthesize findings. In the case of a new technology, the engagement of a testing or laboratory demonstration facility might be secured at this stage.

## EXECUTE PROJECT

With everything now in place, including any project direction as a condition of external funding, the project is mobilized, and progress continuously tracked against the project plan (subject to change control and any interim milestone gate stages). Regular internal (and where appropriate external) reporting of progress and outputs, including interim dissemination events where appropriate, will enable stakeholders to apply appropriate governance, and non-participating prospective beneficiaries (for example other utilities) to assimilate learning over the course of the project.[4] For larger projects this stage might extend over several years and hence require rigorous governance to ensure that the project remains on track in terms of scheduled delivery milestones and within budget, and that the original objec-

4 This is particularly relevant where a condition of external funding is that generated foreground IP is openly shared, particularly where external funding is derived from all consumers – for example through use of system charges.

tives of the project are being met and opportunities for additional learning are being captured.

## CLOSE-DOWN AND DISSEMINATION

An essential stage on formal completion of the project is the execution of a learning dissemination plan.[5] This will typically include a suite of reports and dissemination events ensuring that all relevant parties have an opportunity to learn from the project findings. In the case of an externally funded project (including funding secured from an innovation competition) the sharing of foreground intellectual property might be a pre-condition of funding, especially where the funds are secured through utilities' customers (including customers of utilities not participating in the project—as with Ofgem's Network Innovation Competition in Great Britain).

## ADOPTION AS 'BUSINESS AS USUAL'

A key final stage in any innovation project, which requires dedicated effort, is to assimilate the learning from a project and adopt it as 'business as usual'. This might involve a change to a business process and/or the risk-managed integration of a new technology into the existing physical system architecture. The former might even extend to a restructuring of some aspects of the business, whilst the latter might result in a significant change in system design, equipment standards, or procurement schedules. The required transition will need to be risk-managed to ensure continuity of service standards and system performance. In the case of a novel technology, an asset management methodology will be required, and the performance of the technology will need to be monitored to ensure that any unexpected degradation in condition or performance over time is detected. A known potential characteristic of new technology is that of 'infant mortality' whereby unexpected failure modes appear after a short period in service. Early detection of potential failure will prevent functional failure and enable modifications to the technology to be implemented before seriously impacting system performance and customer service.

## CONCLUDING OBSERVATIONS

**Unprecedented scale and pace of change** – the energy sector, and energy utilities in particular, are facing a rate and scale of change unprecedented in recent decades, driven by increasing customer expectations, competitive pressure, security of energy supply imperatives, and particularly climate change, but also by 'enabling' technologies such as those associated with telecommunications and digitalization, and both AI and ML, which can open up new opportunities for dynamic energy markets and energy system operational management.

**Innovation as part of corporate strategy** – where there is a fast moving and increasingly competitive energy sector (such as in the UK and across Europe) business sustainability, let alone business growth, requires organizations to be agile and adaptive to new opportunities and threats. An effective innovation strategy is essential to meeting an organization's corporate objectives and a prerequisite to being able to continuously develop and improve their service offerings to their customers. Stakeholders - including customers, regulators, government, shareholders and other industry participants - now expect to see innovation embedded as a core activity within an organization's business model.

**Evolving energy system architecture** – decarbonization of the energy sector is now at the forefront of strategies for achieving net zero emissions, the implications of which for the electricity sector include electrification of heating and transport, creating a major increase in electricity demand, and the ultimate elimination of unabated fossil-fuelled generation displaced by nuclear, renewables and potentially hydrogen. From a spatial perspective, electricity system architecture is being transformed through decentralization of generation and energy storage, the growth of DER, CER, grid-edge and BTM technologies, and the need for more advanced balancing and ancillary services to maintain system security, and both voltage and frequency stability.

**Alignment of innovation with business ambition** – it follows from all the above that utilities are under increasing pressure to innovate, both in terms of technology and business models, whether that be to meet their ambitions for growth or simply to survive. This paper has demonstrated that utilities' innovation strategies will reflect their level of ambition and appetite for change and/or risk. However, irrespective of where they position themselves on the risk/

5 In practice for a major innovation project executed over a number of years, periodic reporting and dissemination events would typically occur throughout the course of the project.

reward spectrum, utilities will need a continuously evolving innovation strategy to maintain or grow its business.

**Innovation within the business structure** – in recognition of the imperative for a continuously evolving innovation strategy, some utilities have formed dedicated teams to develop and maintain comprehensive innovation strategies and explore opportunities for business development, improved customer service, and technological adaptations to enhance the performance of the physical system architecture. Such teams will typically have a project management office (PMO) overseeing a portfolio of concurrent innovation projects carefully blended and balanced to align with the company's business strategy and ambitions.

**Embedding innovation throughout the business** – a dedicated innovation team must not become an 'ivory tower' department. On the contrary, those responsible for the company's innovation strategy must maintain a close and dynamic relationship with the rest of the business, not only so that learning from innovation is continuously disseminated and embedded, but also to become a 'go-to' part of the business for development of new ideas generated within the mainstream business, or for exploration of innovative solutions to resolve problems they have identified. It follows that dedicated innovation teams should be embedded within the business to ensure that interactions with the wider business are regular, and both effective and iterative in nature. Manged well, this will enable the business strategy to continuously evolve to exploit opportunities realized through innovation.

**Equitable sharing of innovation benefits** – an important outcome of successful innovation is that both customers and company shareholders, and indeed all involved stakeholders are able to share the benefits, including citizens and society generally, particular in respect of environmental benefits. OEMs should also benefit through any shared generated foreground intellectual property. In a fully competitive market, customers will benefit by virtue of improved products or service levels, but in the case of regulated monopolies, it is the role of regulators to ensure that learning from innovation is implemented as business as usual within utilities, reflected in future business plan submissions, and rolled out nationally, particularly where innovation funding has been largely derived from customer contributions, for example through use of system charges. This is an area where regulatory intervention may need to be stronger; for example, in Britain the Totex Incentive Mechanism (TIM) ensures that investment cost savings (both capex and opex) arising from innovation are shared equally between shareholders and customers.[6]

**Developing an innovation culture** – whichever business model or structure a utility adopts, an overriding imperative will be to develop a culture of innovation, and a business governance mechanism with the agility to adapt to opportunity. Successful integration of innovation as a core strength can be a catalyst for innovative thinking throughout the business, particularly if linked to personal or team incentives.

6 50% of the saving is deducted from the company's regulatory baseline expenditure allowance (fully expensed or added to the company's RAB depending on the company's regulatory capitalization rate); the other 50% is deducted from use-of-system charges.

## APPENDIX – THE EVOLUTION OF REGULATORY FUNDING MECHANISMS IN GREAT BRITAIN

| INNOVATION FUNDING MECHANISM | APPLICABLE PERIOD | KEY FEATURES | INNOVATION FOCUS |
|---|---|---|---|
| Innovation Funding Incentive (IFI) | Oct 2004 to Mar 2015 – DNOs<br>Apr 2007 to Mar 2013 – TOs | Capped at 0.5% of turnover – 80% pass-through of incurred costs. | Technical development of networks to deliver value (financial, quality of supply, environmental, safety) to consumers. |
| Registered Power Zone (RPZ) | Oct 2004 to Mar 2011 – DNOs only | Additional invective £1.5 per kW p.a. over DG incentive £3 per kW p.a. (capped at £0.5m p.a.) | Facilitating Distributed Generation through technical innovation. Projects are required to be registered with and approved by Ofgem. |
| Low Carbon Network Fund Tier 1 | Apr 2010 to Mar 2015 – DNOs | £500m total funding available (inc. LCNF Tier2) – min 10% company contribution. | Projects supporting low carbon transition through new technology, and operating and commercial arrangements. |
| Low Carbon Network Fund Tier 2 | Apr 2010 to Mar 2015 - DNOs | Annual competition – up to £64m funding p.a. – plus successful delivery and discretionary reward - min 10% company contribution. | As above – but larger longer-term projects typically involving consortia of collaborative partners. |
| RIIO-1 Network Innovation Allowance (NIA) | Apr 2013 ongoing – TOs Apr 2015 ongoing – DNOs | Specific allowance for each TO and DNO. | Similar to LCNF Tier 1 – funding smaller technical, commercial, or operational projects but not constrained to 'low carbon' innovation. Also, can be used to fund the preparation of submissions to the Network Innovation Competition. |
| RIIO-1 Network Innovation Competition (NIC) | Apr 2013 to Mar 2023 – TOs<br>Apr 2015 to Mar 2023 – DNOs | Annual competition – up to £81m of funding per year. | As NIA but where project funding is subject to an annual competition rather than an allowance. |
| RIIO-2 Strategic Innovation Fund (SIF) | Apr 2021 ongoing – TOs<br>Apr 2023 ongoing – DNOs<br>Apr 2023 ongoing – ESO | Annual competition operated in partnership with Innovate UK – min 10% contribution – anticipated funding £450m by 2026, with option to increase and extend. 3-phases – discovery (£150k project cap), alpha (£500k project cap) and beta (no cap). | Ambitious, innovative projects to help shape the future of energy networks and accelerate the transition to net zero, at lowest cost to consumers – focused on whole system, integration, data and digitalization, heat and zero emission transport. |

## About EPRI

Founded in 1972, EPRI is the world's preeminent independent, non-profit energy research and development organization, with offices around the world. EPRI's trusted experts collaborate with more than 450 companies in 45 countries, driving innovation to ensure the public has clean, safe, reliable, affordable, and equitable access to electricity across the globe. Together, we are shaping the future of energy.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