

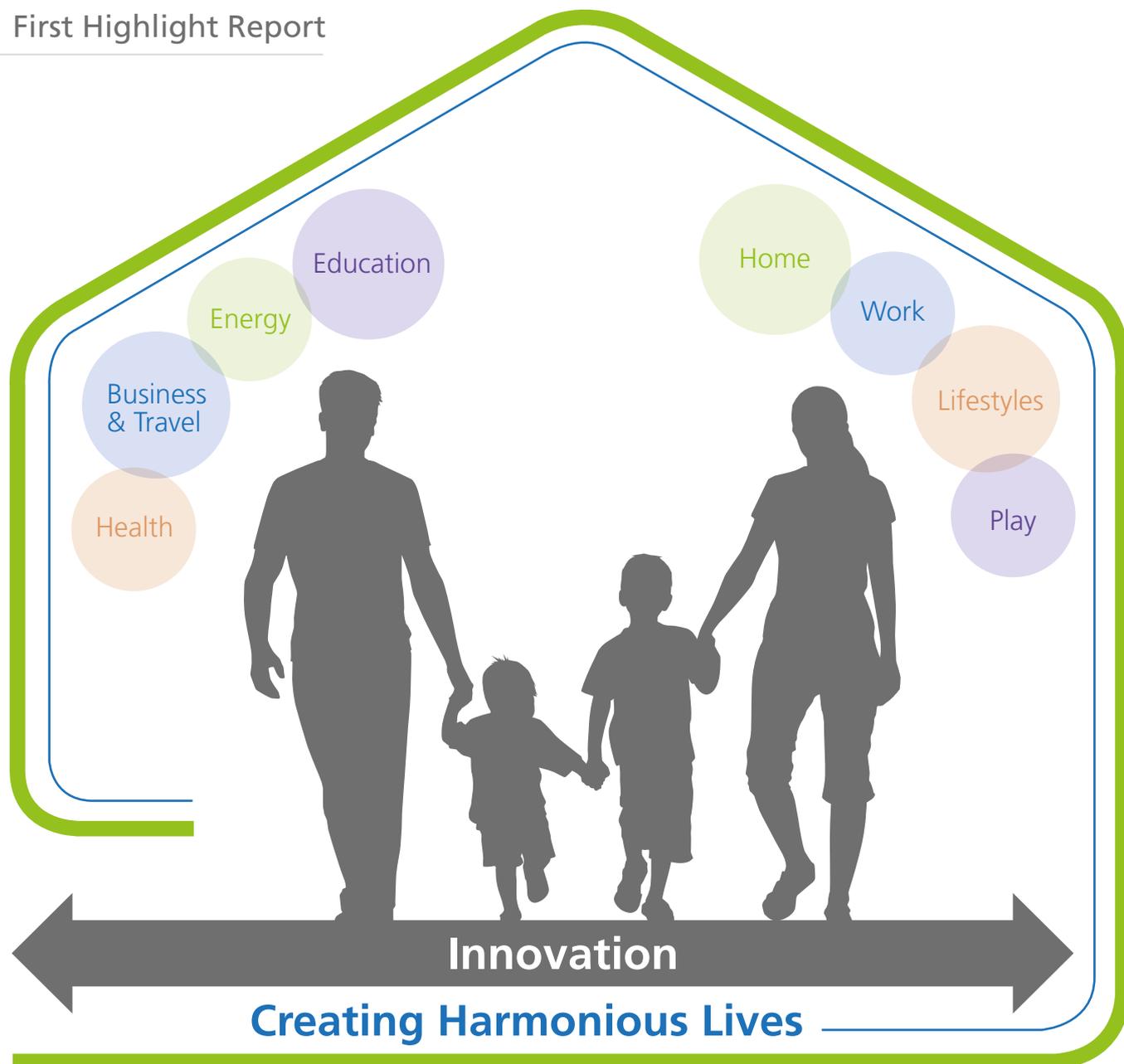
# Smart Living

# Internet of Life



Llywodraeth Cymru  
Welsh Government

First Highlight Report



Understanding Behaviour • Interconnected Resources  
Smart Homes • Smarter Infrastructure  
Resource Intelligent Buildings

Key perspectives provide context and challenge for Smart Living and Wales

Follow-on from inaugural meeting in February 2016

# Smart Living in Wales

## Foreword

The energy world is changing dramatically with much greater focus on local energy use and generation and less on big centralised electricity generation – an enormous paradigm change. This shift is driven by global innovation forces in the world of cleaner energy, consumer power and information and communications technologies, including the internet of things and sensor-related technologies which all have an impact on our lives.

Yet, because these forces are focused on local developments, they provide many opportunities where we in Wales can lead, within the unique Welsh Government driven Well-Being of Future Generations framework. This includes the development of new products, technologies and processes which smarten our use of energy, turn our buildings into powerhouses, create local energy micro grids and demonstrate how low-carbon vehicles and integrated multi vector (power, heat and transport) options can achieve a competitive, comfortable and low-carbon “smart living” future for us all.

The Smart Living Technical Group was established to help Wales keep abreast of perspectives arising on international and domestic platforms from key stakeholders who are active in a myriad of Smart Living areas. Members of the Technical Group cover a mix of private, public, academia and Government interests.

Although the Group does not have executive status, its role is varied and includes providing practical advice and support to help take forward the Smart Living agenda, to help inform its future direction and shape of innovation delivery in this field – with an initial focus on a range of exploratory pilot initiatives in various parts of Wales.

This Highlight report tries both to encompass the deliberations of the inaugural meeting of the group, along with wider considerations which innovative parties around the world are exploring in this truly novel area.

This report will help stimulate further thinking in the Smart Living field and the need to explore the potential read across to wider links to health, education and transport within smart cities/urban and rural area contexts in Wales.



**Lesley Griffiths**  
Cabinet Secretary, Environment and Rural Affairs

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Mae'r ddogfen yma hefyd ar gael yn Gymraeg.  
This document is also available in Welsh.

## Key Report Highlights

### Key points highlighted in this report:

- Consistent energy policy and clarity of purpose is needed from Governments at all levels to help drive development and investments;
- Considerable value can be derived from reorganising and connecting assets and linking investments in the smart space;
- Open data platforms and shared assets should help drive commercial opportunities;
- Technology and digital systems will drive change from smart enablers such as home energy management systems to alignment with integrated information capture and processing drivers of ever-lower cost yet ever-greater capabilities;
- Changes in the smart energy and associated markets are likely to open up opportunities for new and forward thinking organisations;
- Businesses (both as sector stakeholders and product and system users), will increasingly adopt a Smart Living approach to improve their competitiveness, resource efficiency and sustainability credentials;
- Young people will generally support the modernisation and low carbon aspects of the Smart Living agenda and pressure will arise, for a variety of reasons, from increasing numbers of consumers generally;
- Areas such as low carbon vehicles, more effective assisted living and home health diagnostics may drive Smart Living developments faster than anticipated;
- Smart energy homes, and their occupants, could act as an excellent test bed for home-based, smart-health technologies.



## Smart Living

ICT based infrastructure and energy efficient buildings are opening the door to an interconnected and integrated world which is changing, for the better, the way we live, work and play.

Feedback from key stakeholders is Wales should grasp opportunities and proactively influence rather than reactively wait for others and should play a range of differing roles depending on the needs of demonstrator opportunities.

Smart Living Wales is creating an open learning demonstrator platform to encourage key innovation and/or novel projects which will test and inform future smarter activities as well as provide multiple benefits for Wales. Demonstrators are focusing on needs-led and place-based solutions so they are aligned to objectives of all those participating from research through to delivery. See **Appendix B**.

This approach acknowledges the cross-departmental nature of activities, the number of stakeholder interests involved, the scope of Smart Living from smarter users to networks and the matrix of Government policies, funding and access points which illuminate the step changes needed for Wales to be positioned to attract the right type of investment in demonstrators and to test for embedding in mainstream activity.

Key principles for Smart Living include advance learning via demonstrators at scale, adopting a Team Wales 'wellbeing' approach to maximise social, environmental and economic benefits as well as helping find an acceptable balance between the pace of the low carbon transition, affordability and resilience/energy security.

## Technical Group

Membership of the Technical Group is set out at **Appendix A**.

At its inaugural meeting those members of the Group who attended raised a number of perspectives of global reactions to changes in the energy sector as well as an international perception of Wales as highlighted below. The report has been circulated to the wider Group for comment.

### International Community and Energy

The world has similar questions to those in Wales and the UK on how to cope with changing energy demands and capacity pressures arising from the low carbon agenda and the impact it is having on generation, use and local networks. We need to achieve this change as part of the move to a world which is more resource and energy efficient and resilient, with a secure and affordable low carbon energy supply.

As part of this debate, there is recognition of the importance of consistency of energy policy and clarity of purpose needed from Governments at all levels to help drive development and investments.

Expectations are smart energy development will follow the same path as computers with a continual downward drive to smaller equipment/ components and becoming cheaper through commercialisation on a mass scale.

There is a need for a regulatory re-set to match the changes already being seen and are likely to continue to

evolve in the future but there is concern these essential changes have to be fit for purpose in a fast moving world where conservatism has previously reigned supreme.

The level of change being experienced and likely to continue in the future will require associated regulatory and governance changes which facilitate an emerging range of new business models and create new business opportunities.

Similarly there is likely to be a move to build software based apps for the new world which will require access to and use a wide range of integrated data capability as the internet of things evolves and new clever but cheap sensors are developed.

Open data platforms will help facilitate commercial market development and will require organisations to review and develop relevant interesting data sets of value to form part of these platforms. This includes developing common language and open accessibility for commercial developments in order not to inhibit exploitation.

It is acknowledged, technology hardware, with data, will drive significant changes in the energy sector with home-energy management examples such as NEST and HIVE proving to be enablers the same way smart phones have driven changes in the telecom industry.

A range of associated strategic issues include the difficulty in managing the intermittency of generation, climate change and weather conditions, without affecting the viability of

renewables and network resilience. There are a number of strategic challenges which impact on this agenda: the overarching need to decarbonise; the resilience needed to manage the impact of current and future climate change on systems and people; the need to better link energy generation and demand in time and space; and the necessity of developing a regulatory and finance system which incentivises the right developments.

At the overall systems level, rather than expensive major investment in new large scale energy infrastructures supporting historic approaches, the view is enhanced values will be derived from reorganising existing assets and investments in the smart space to maximise resource efficiency and benefits. Notwithstanding simple energy efficiency and energy conservation measures will remain important to cut costs and reduce emissions.

Internationally, in this experimentation phase, the emphasis should be on improving the sharing of knowledge within and between different countries to avoid multiple repeat pilots. This may be complicated by a lack of understanding of what are the most desirable project outcomes, or the most important priorities to be addressed. For Wales to participate in this debate, there is a need to fully understand what Wales hopes to achieve and open a dialogue with others who align with the same aspirations to achieve best practice and outcomes.

Increasingly, as with most other industries, it is expected users will move from being passive to active players. It is anticipated young people will be supportive of the smart agenda and will be first movers in new technology

acceptance and this will be enhanced by pressure arising from users generally seeing the benefits and willing to change. Demonstrations and targeted communication will be important to encourage change-implementation whether in the home, office or factory.

The focus on the balance between local rather than central generation is still a debating point within the UK and Europe in terms of achieving best results but this does raise questions on how to structure central costs levies/ subsidies methodologies which will need to be addressed. There are different approaches being progressed to help optimise and integrate the change from central main generators to multiple generators adopting for example a micro grid approach, with major cities like New York aiming to lead the way.

In many ways, the key driver for rapid implementation may be enlightened local authorities. It was considered important to point out whilst it was good to have some levels of differentiation in approach for development and deployment of Smart Living activity between Wales and the UK or Europe, if the differentiation was significant then this may detract potential innovative organisations, especially if the differences are considered to be more stringent to deploy/demonstrate

## Perspectives on Wales

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The degree of change and an inconsistent view of the future have resulted in organisations building their own view of the world and what it needs. It was suggested Wales should create a shared understanding of what Wales needs and what this view will mean for key stakeholders.

This approach will create the right environment for collaboration, development and delivery.

Wales is encouraged to progress innovative approaches to sharing information, through developing relevant smart case studies, which encourages debate and results in more informed input to Smart Living developments and the wider Smart agenda as well as help inform local planning and project considerations.

It was agreed Wales has excellent grass roots developments but currently fails to successfully communicate and exploit its achievements on the strategic international platform as exemplars. However the Anglesey energy island initiative with its islanded capabilities, is attractive for demonstrators as a showcase for potential multiple demonstrators for piloting smart systems and technology.

There was also potential for adding value to fuel poverty programmes by Smart Living demonstrators enabling successful smart technology, systems and processes to be mainstreamed. This could be supported with strong communication/educational support and focused engagement as part of business as usual energy efficiency schemes.

Implementing the Well Being of Future Generations Act will help position Wales through this strong vision of its future which can be used as a basis for developing an exploitation plan and shared vision with key stakeholders.

## Immediate challenges and opportunities

The Technical Group considered a range of challenges and opportunities which Smart Living Wales should consider over the next five years.

### Challenges

It will be important for Wales to build a market for the future rather than for now. There is a need to avoid the expectation something new will simply evolve from the existing baseline.

There appears to be limited sharing of information and knowledge for successful schemes. Pilot schemes in the domestic and international markets do not appear to be fully exploited, leading to loss of learning opportunities and duplication of innovation.

Without a clear path to market, investments in some smart technology, systems and processes are becoming more difficult for businesses to support, compared to other areas such as cloud computing and internet of things which are moving more quickly.

Wales will need an integrated working philosophy for the demonstrators to be a success. Learning and knowledge will need to be disseminated within and outside Wales working with the UK Knowledge Transfer Network and other communication channels and organisations.

It may be a challenge to capture the right involvement of stakeholders for individual demonstrators and it will be important to target communication appropriately in complex public organisations to ensure messages are focused in the right area.

It is anticipated demonstrators will require new business models, multiple funding streams and supporting regulations but aligning them is likely to be a big exercise and should not be underestimated.

Clearly demonstrators will need to be clear on outcomes otherwise they will not achieve the required final solutions. Too many pilots are being undertaken without translating how success will be commercialised. The “Valley of Death” still exists in smart technology as the future remains uncertain and inconsistency in energy policy has exacerbated the perceived risks.

Appetite can be low for new innovation and risks too high for some organisations and this will need to be balanced within the stakeholder mix of each demonstrator for them to happen. More generally there will be challenges in building the right capacities, utilising multiple disciplines and driving broader opportunities for scaled exploitation potential.

Consumer engagement and behaviour will be important for successful demonstrators and support will be needed to help understand how to identify and engage the less motivated audiences.

### Opportunities

Learning and Data can be exploited to drive improved use of resources to help reduce costs to users. There will be opportunities to broaden knowledge transfer to social/health/education sectors and to demonstrate the socialisation of benefits as part of a strategic cross sector approach.

There is potential to explore advantages and benefits by testing and piloting suitable smart solutions, which if successful, could be integrated in business as usual support schemes to help reduce fuel poverty. There are opportunities in demonstrators to demonstrate whether there is suitable protection in smart developments for vulnerable individuals in our society.

Innovative and novel islanded demonstration systems in Wales which are replicable and scalable will offer commercial benefits.

Wales should try to encourage regulation innovation zones, areas which facilitate new developments and processes will inform the regulatory changes and ensure new business models and possible trading platforms are developed and exploited.

New technologies are emerging and opportunities will arise for piloting these in rural areas such as edges of the current electricity and gas networks.

It will be important demonstrators encourage multiple benefits from single interventions supporting the development of local business supply chains to secure economic benefits. Other benefits will include ensuring relevant intellectual property and asset development are captured and appropriately managed.

There may be potential to incentivise Distributed Network Operators (DNO) as part of a proposed regulatory move to Distributed System Operator (DSO) roles to reflect the changing environment in which they operate. Opportunities may also arise from new entrants in the wider market such as ESCOs supporting delivery of local area energy projects.

## Conclusion and Next Steps

Wales, with its resources, talented stakeholders, spirit of community, achievements and an integrated Government focused on citizen wellbeing and joined-up government, can provide a global exemplar for Smart Living developments.

It was concluded in the first instance that the Technical Group could help Wales to consider how the Well-Being of Future Generations (Wales) Act can inform a collective message on what it needs and how individual stakeholders' visions can incorporate and help deliver these needs for Smart Living and beyond.

Key for communication will be how to develop an innovative open learning platform to share learning between developing demonstrator projects and the wider sector in Wales and beyond.

Clearly important is the need for there to be a Policy and Regulatory context which will create the right environment to drive smart energy investments. This will require Welsh Government working with UK Government and regulators to gain long-term commitments to deliver this.

## Appendix A – Smart Living Technical Group Members

Name	Organisation
Laurence Carpanini	IBM
Roger Hey	Western Power Distribution
Dr James Yu	Scottish Power Energy Networks
Steve Edwards	Wales & West Utilities
Adam Fairman	Dwr Cymru Welsh Water Authority
Derek Stephen	Natural Resources Wales
Jon Maddy	University of South Wales
Nic Speed	British Gas
Gill Kelleher	Swansea University SPECIFIC
Paul Kindlin/Sadie Smith	Flintshire County Council
Michael Jenkins	Bridgend County Borough Council
Professor Phil Jones	Cardiff University
Paul Beasley	Siemens
Professor Nick Jenkins	Cardiff University
Professor Yacine Rezgui	Cardiff University
Douglas Cheung	Hitachi
Chris Bagley	Knowledge Transfer Network
Christian Inglis	Innovate UK
Sophie Howe	Future Generations Commissioner
Graham Ayling	Energy Savings Trust
Andy Sutton	Building Research Establishment (BRE) Wales
Laurent Schmitt/Ray Raychaudhuri	Alstom
Peter R Jones	ABB
Jill Caine	Electricity Storage Network
Lia Murphy	Ofgem
Gareth Harcombe	City of Cardiff Council
Christian Cadwallader	Blaenau Gwent County Borough Council
Tanya Nash	City and County of Swansea
Ben Watts	Engie
Professor Hywel Thomas	Cardiff University
David Williams	Torfaen County Borough Council
Keith Jones	National Trust
Grant Bourhill	Energy Systems Catapult

### Welsh Government Officials

<b>Professor Ron Loveland (Chair)</b>	<b>Energy Advisor for the Welsh Government</b>
Marcia Jones	Jennifer Pride
Jonathan Oates	Eleanor Knight
Helen Donovan	
Usha Ladwa Thomas	

## Appendix B – Initial Smart Living Wales Demonstrators

### Angle DC – MVDC test bed

- MVDC test bed - first in Europe
- Improve network capacity and control
- Create new market in MVDC

### Optimise Virtual Private Wire networks

- Explore different cost structure with Ofgem
- Optimise virtual infrastructure model for Local Authorities

### Create Zero Carbon Zones

- New definition of ZCZ
- New support tool to help development
- Improve quality of life in zones

### Introduce Smart/Low Carbon Urban Maturity programme

- Smart/Low Carbon Urban Development framework
- Mobilise smart urban

### Smart Systems and Heat

- Smart Systems and Heat programme with Energy Systems Catapult
- Smart tools for heat networks

### Exploiting Hydrogen

- Creating hydrogen multi vector infrastructure in Wales
- Added value for heat and transport

### Catalysing a Local Energy Model

- Building resource platforms for new service model for residents and businesses
- Developing resource service models for disadvantaged areas