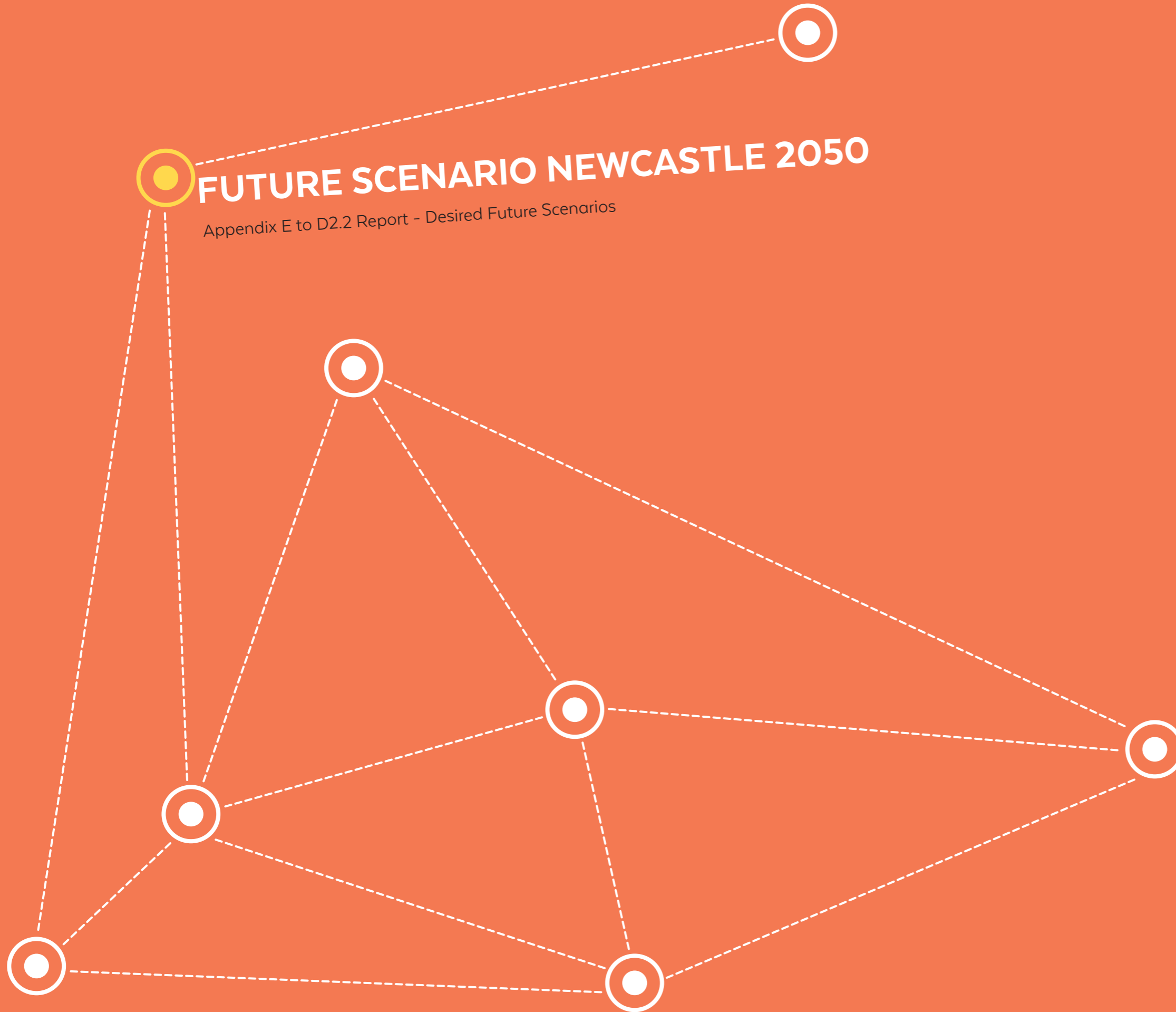




This project received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 649397

FUTURE SCENARIO NEWCASTLE 2050

Appendix E to D2.2 Report - Desired Future Scenarios



15 June 2016

Adrian MCLOUGHLIN & Simon JOHNSON, Newcastle City Council (NCC)
Elke DEN OUDEN & Jan-Jaap RIETJENS & Rianne VALKENBURG, TU/e LightHouse



ROADMAPS
FOR
ENERGY®

This appendix is part of the D2.2 Report - Desired future scenarios - and contains all results of the vision development activities held in the city of Newcastle.



The R4E project received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 649397.

Disclaimer: This report presents the views of the authors, and do not necessarily reflect the official European Commission's view on the subject.

Versions of this report:

- | | |
|---------------|--|
| 25 March 2016 | Concept for internal check in the city (limited distribution) |
| 15 May 2016 | Final version for public distribution |
| 15 June 2016 | Final version for public distribution - with minor corrections |



Contents Appendix E

Desired future scenario Smart Buildings	E 4
The making of the desired future scenario	E 7
Ambition: Smart homes enabling a high quality of life in Newcastle 2050	E 8
Drivers for change for the future of Smart Buildings (domestic) in Newcastle 2050	E 9
Ambition: Smart buildings and infrastructure enable a thriving economy in Newcastle 2050	E 10
Drivers for change for the future of Smart Buildings (non-domestic) in Newcastle 2050	E 11
Contributions	E 13

ENERGY SMART BUILDINGS AND INFRASTRUCTURES ENABLING A HIGH QUALITY OF LIFE AND THRIVING ECONOMY IN NEWCASTLE 2050

In 2050, people in Newcastle enjoy energy-efficient buildings with a high level of comfort. All homes and non-domestic buildings are connected to an effective energy system, to achieve net-zero energy consumption and net-zero emission.

Newcastle has adopted a collective approach to decisions in the infrastructure that enables joint decision-making with stakeholders in the city. Urban planning takes a broad wide-area view to take full advantages of the opportunities extending beyond site or estate boundaries and city limits. Through the open data centre the City Council and its partners are able to implement evidence-based policies and decision-making. Residents are empowered and have the means and the wish to make responsible choices on their own energy usage and investments.

Sustainable buildings

Homes and non-domestic buildings provide high levels of comfort with sustainable energy solutions. They support their users with personalised advice to save energy in line with their lifestyles. Retrofit solutions as well as new innovative buildings ensure that all buildings are sustainable. Buildings are exemplary in their use of innovative and sustainable technologies. High visibility of the solutions supports their adoption as well as a thriving building sector that 'exports' design and consulting services. In this way the standard of the buildings is raised, adding value to existing business models in the local community.

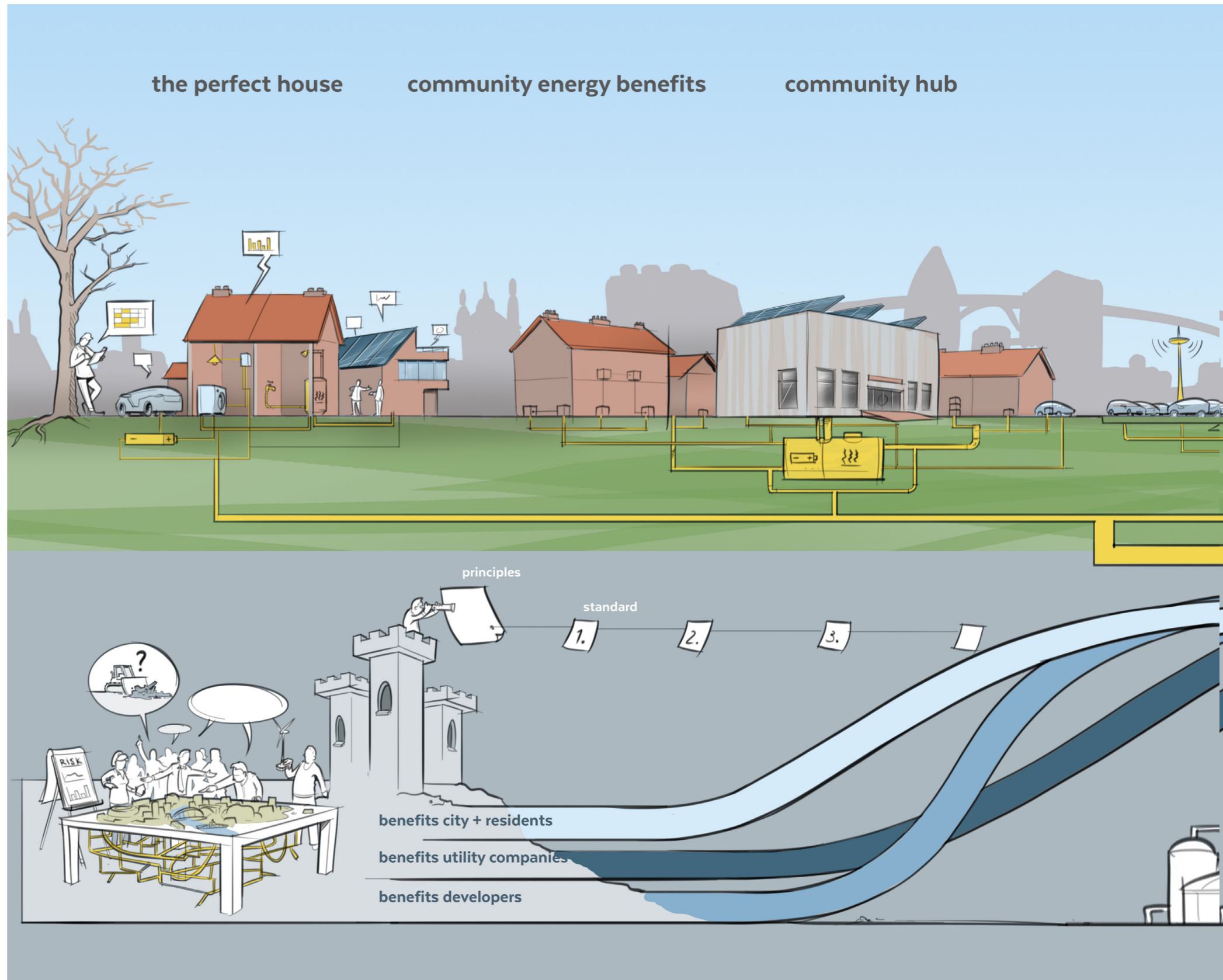
Smart infrastructures

Infrastructure interconnects local grids for different energy sources, such as electricity, temperature control (heating and cooling), water and data, and connect the local grids to regional and national levels. Local grids enable communities to invest in and share sustainable solutions with peers, and support optimal use of renewable energy and the specific features and qualities of separate buildings. All buildings are connected to the grid, receiving and transmitting information to peers or to a wider network with respect for the privacy of the users.

The top layer of the visual represents different type of buildings and sharing options, with an increasing complexity of the solutions. This builds up from a (perfect) house, connected within the neighbourhood, through a community hub around a (public) building, shared use and modular buildings, right up to the future living environment.

At the bottom left the new policy and planning process are shown as a way to manage future-proofing. Elements of the desired future scenario here are the flow of benefits between stakeholders, and city-wide planning (around the table) to align information and decision-making.

At the right of the visual are the underlying infrastructure and personal schemes, which are needed to enable all the other solutions.



Flow of benefits

An integrated planning and development process optimises the flow of benefits for different stakeholders. The value of 'community gain' is considered (not just financial gain) is considered through local integration. A long-term perspective allows business models and decision making to consider state-of-the-art solutions and to avoid the need for renovation. Democratic decision-making enables future retrofitting with participation by residents.

City-wide planning

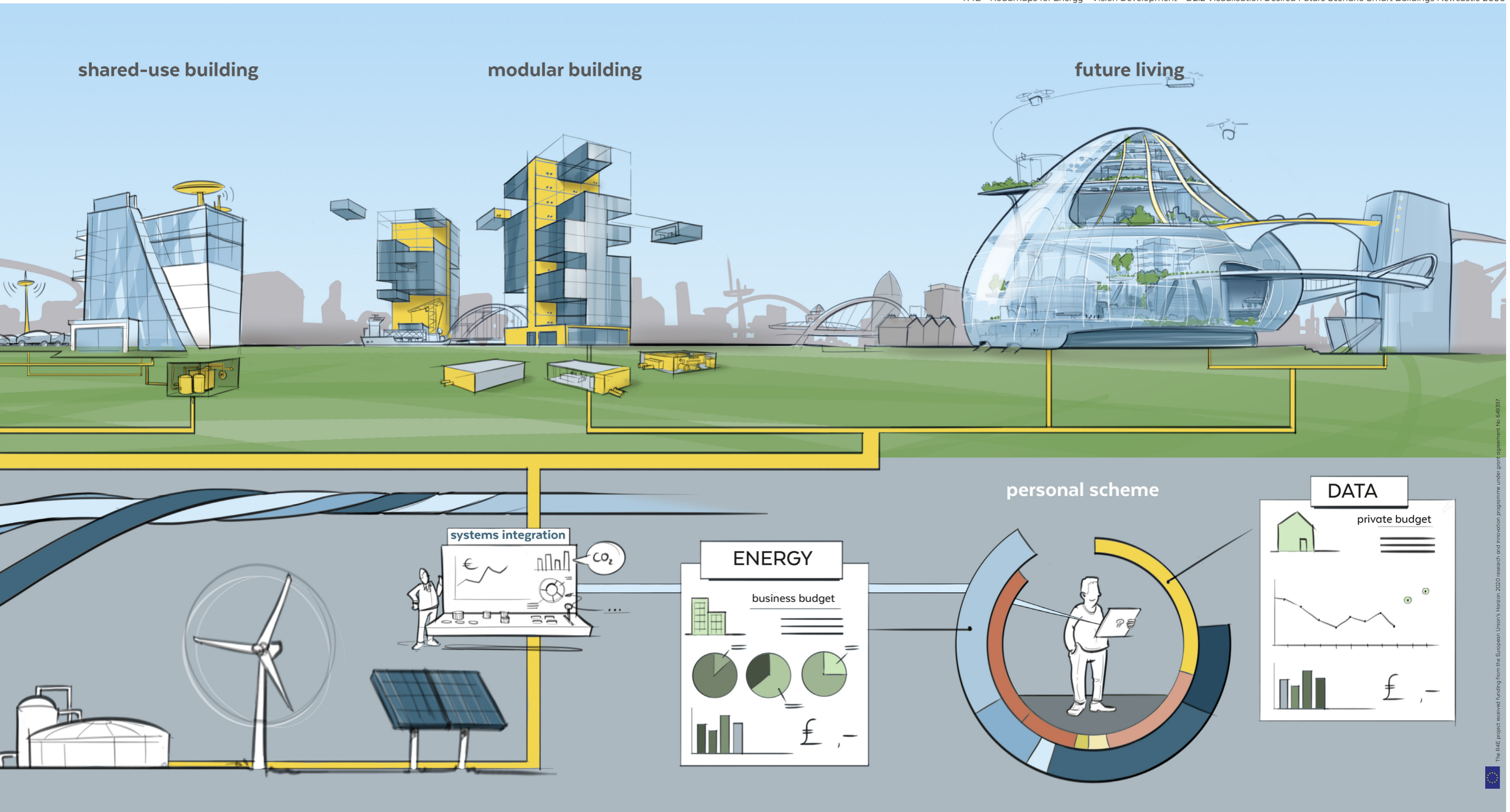
Policy-making and planning in Newcastle are based on a city-wide plan. This fully integrates all assets and their interactions, so the total impact on the surrounding can be considered. A collaborative approach together with all stakeholders drives alignment of information and leads to better decisions. Through regional cooperation, one set of principles provides developers with progressive standards to achieve sustainable projects.

The perfect house

Houses are designed for people. Connectivity with the energy and data net provides valuable services for comfortable living (e.g. tele-care). People can make responsible choices, even from options they did not think of themselves. The smart house manages itself according to set parameters. Simplicity and accessibility are the norm: people have freedom of choice, with full control of their homes and their lives.

Community energy benefits

People living in Newcastle's estates jointly benefit from shared sustainable resources provided through local grid solutions. Residents share energy solutions tailored to their homes (e.g. PV panels on south-facing roofs, or turbines in 'windy gardens', with basement for batteries). The grid provides local interconnectivity promoting community-building and cultural change.



Community hubs

Residents, businesses and public organisations share energy through a two-way interactive local grid. This increases resilience, benefitting from the strengths of the features and investments in other buildings. The benefits of energy investments and production are retained within the community. A smart (virtual) infrastructure allows matching of fluctuations in energy supply and demand of energy.

Shared-use buildings

Smart (wireless) systems enable flexible use of buildings with variable occupancy patterns and users' needs. Office buildings, shopping centres, community buildings and schools can meet varying demands for space by providing the required energy, lighting and heating according to specific user and activity profiles. The building minimises energy consumption by recognising recurring patterns of use.

Modular buildings

Modular buildings offer smart systems, increasing flexibility for reconfiguration of spaces and energy systems (biomass boilers, heat pumps, PV modules). Smart building controls enable internal restructuring. Flexibility de-risks the business case for investors to make the building structures future-proof. Newcastle can exploit its heritage of building large ships and offshore structures to develop core structures that can be clad with modules.

Future living

Citizens' daily living patterns have changed significantly. Buildings suit the activities of future citizens, with flexibility between working, living and leisure activities. Future buildings offer a range of facilities and technologies to encourage social interaction.

Personal energy schemes

Individual energy schemes with personal roaming profiles allow the use of (wireless) energy and data where and when they are needed. These provide access to new services such as telecare or energy donations. The scheme enables localised trading, sharing and lending of resources through peer-to-peer networks. The scheme addresses different lifestyles and provides individual budgets and advice for behaviour based on planned and predicted usage.

Energy infrastructure

The energy infrastructure enables gradual replacement of non-sustainable energy sources by renewable energy in buildings as well as regionally (e.g. wind parks and solar farms). Optimisations are done at the appropriate levels, linking local, regional and national grids. Shared data and knowledge from all stakeholders feed into the city-wide plan and support future-proof decision-making. In 2050, Newcastle is a net-zero emissions city.





Creating the visual of the desired future scenarios

The making of the desired future scenario

The approach

In the Roadmaps for Energy (R4E) project, the partners work together to develop a new energy strategy: their Energy Roadmap. The difference between the regular energy strategies and action plans and these new Energy Roadmaps is the much earlier, better developed involvement of local stakeholders. These include not only those who will benefit from the new strategy, such as the citizens themselves, but also relevant research and industry partners. They offer a much clearer view of the future potential of the city in terms of measures and technologies, as well as of the challenges presented by today's situations in the cities. The aim is to create a shared vision containing the desired, city-specific scenarios and the dedicated roadmaps to be embedded in the context of each city.

The R4E project follows a four step approach:

1. Set the ambitions of the participating cities on sustainable energy and Smart Cities, as well as their choice of three Smart Energy Saving focus areas: 1. Smart Buildings; 2. Smart Mobility; and 3. Smart Urban Spaces.
2. Develop scenarios for the selected focus areas.
3. Create the roadmap. Identify existing and future technologies and other developments – these will enable the desired future scenarios. Plot the opportunities and developments on a timeline, showing the route and milestones towards the desired scenarios. The roadmaps contain common parts for all the partner cities, as well as specific parts for the individual cities.
4. Create a portfolio of new projects and initiatives to achieve the ambitions, visions and roadmaps of the cities. This portfolio shows the shared and individual projects, and includes a cross-city learning plan and a financial plan.

Step Two: Vision development

The aim of Step 2 is to develop visions for the cities in the selected focus areas. A vision is based on a long-term perspective on the world – in this case we are focusing on 2050. Two main activities are taking place in this step: Future Telling research and the development of desired future scenarios.

Future Telling

The first part of the vision development activity is to identify Drivers for Change that influence the future of Smart Cities in general, as well as Smart Buildings, Smart Mobility and Smart Urban Spaces in particular. The Future Telling research method is an approach to create context-related possible future scenarios in a creative, imaginative way. Future Telling research consist of a structured method to map expertise and ideas of thought leaders from the Smart Cities domain. Through interviews and analysis leading to the Drivers for Change for liveable and smart cities in 2050. This research and the 18 Drivers for Change are described in the report Future Telling 2050 D2.1 Report – Drivers for Change.

Developing desired future scenario's

Out of the 18 Drivers for Change for smart and sustainable cities, the cities have chosen the most important Drivers for Change to be included in their further vision development. Together with the Ambitions, which the cities set in Step 1, the desired future scenarios for the focus areas will be developed in city scenario workshops. The ambitions are described in the Ambition Setting D1.1 Report – Specific ambitions of the R4E partner cities.

City scenario workshops

The desired future scenarios for the selected focus areas in the cities are created in a series of workshops held in each of the partner cities. These Scenario Workshops consist of a 3-day programme in each city, and include sessions with policy-makers and stakeholders to develop a rich, contextual scenario for the city. Local stakeholders (companies, citizens, public and private organisations and knowledge institutes) are invited to take part in the workshops through the networks in the cities. The results of the Scenario Workshops are reported in the same format for each of the city, facilitating cross-learning between the cities.

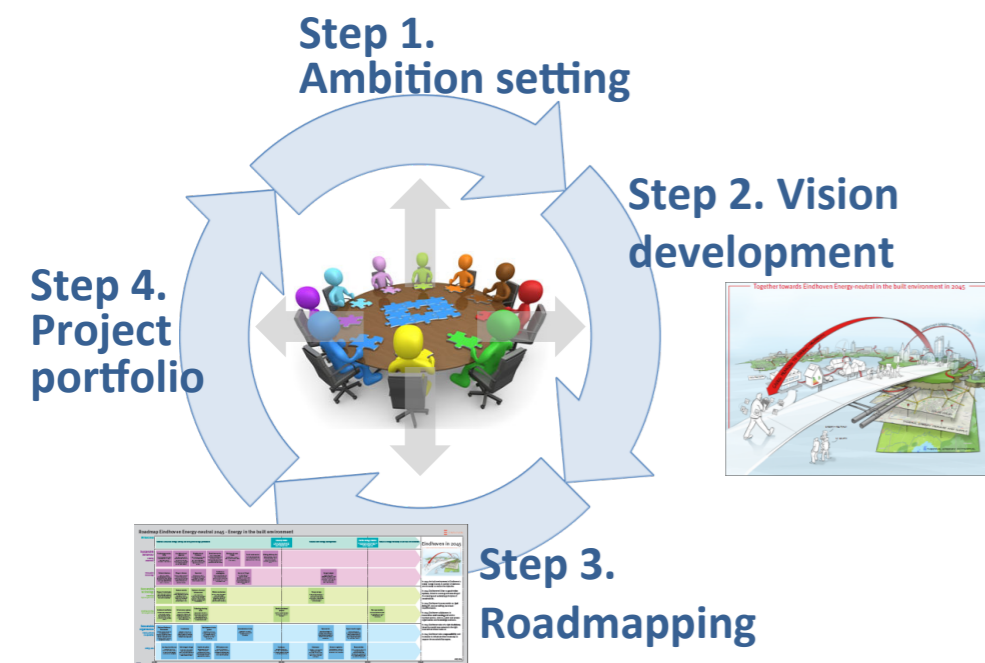
Two sessions are held for each focus area. In the morning session the outline for the vision and the desired future scenario is developed. The main stakeholders work with the set ambition for the focus area and the selected Drivers for Change to understand their impact on the city in 2050. Together, the participants define the main elements of the vision. Then, in the afternoon session a broad spectrum of stakeholders are invited to enrich the desired future scenario with specific additions. Based on the outlined vision they carry out a further in-depth exploration of the main elements of the vision in-depth.

In all the sessions, the participants will interactively build a visualisation of the desired future scenario. See also the pictures of the workshops.

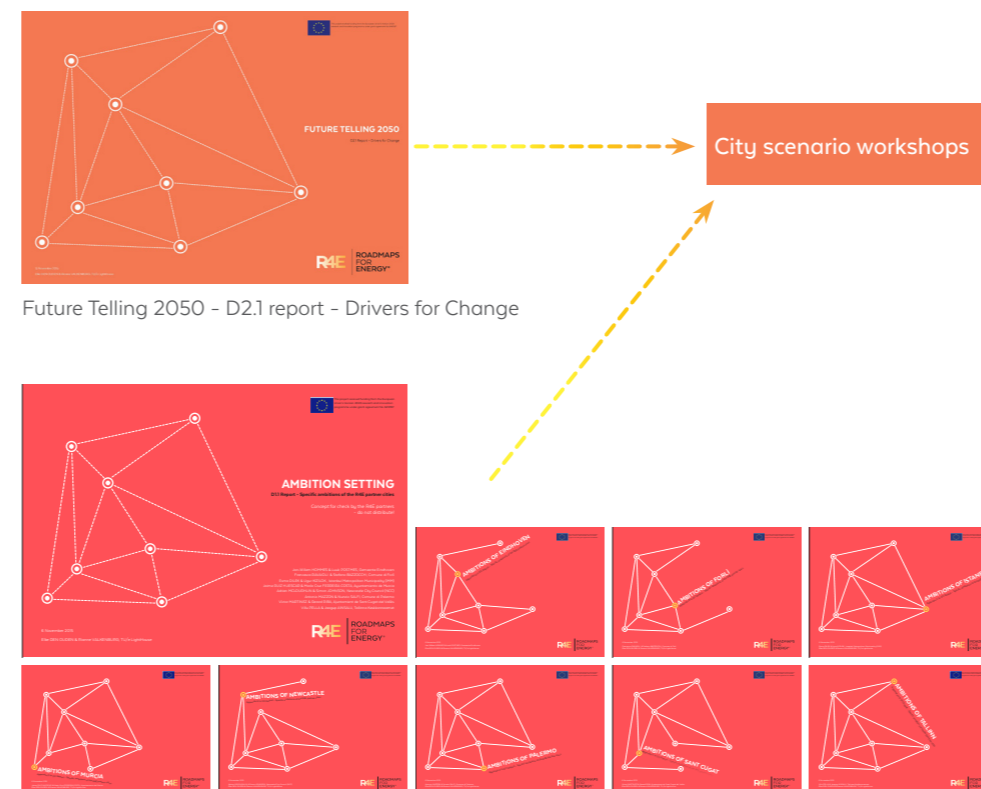
Day 1 - Focus area 1	Day 2 - Focus area 2	Day 3 - Reporting
Outlining the vision <ul style="list-style-type: none"> Exploring the Drivers for Change in relation to the future of the city Selecting the main elements of the vision 	Outlining the vision <ul style="list-style-type: none"> Exploring the Drivers for Change in relation to the future of the city Selecting the main elements of the vision 	Project team working session to prepare the report of the Scenario Workshop
Enriching the desired future scenario <ul style="list-style-type: none"> Exploring the future of the city and the main elements of the vision Enriching the vision with specific additions 	Enriching the desired future scenario <ul style="list-style-type: none"> Exploring the future of the city and the main elements of the vision Enriching the vision with specific additions 	

Program of the ambition workshops

The result of the vision development step is a visualisation of the desired future scenario. The visual is explained in this report and the main elements of the vision are described. The following pages also provide the background of the scenario: the ambition of the focus area, copied from the Ambition Setting D1.1 Report – Specific ambitions of the R4E partner cities and the selected Drivers for Change for each focus area, copied from the Future Telling 2050 D2.1 Report – Drivers for Change.



Four step approach of R4E



Ambition Setting - D1.1 report - Specific ambitions of the R4E partner cities

Ambition: Smart homes enabling a high quality of life in Newcastle 2050

1

Comfortable housing, affordable energy

In 2050, residents of Newcastle value living in the city because of the high quality of life and comfortable housing. Good data management supports an effective energy system, in which all the homes have zero energy usage from the grid. Controllability is achieved by new collaboration and business models for sustainable energy solution. These make energy accessible and affordable for all, in both new and existing housing.

Strategic ambitions

- In 2050 Newcastle domestic buildings have zero energy import from the grid.
- In 2050 the energy system is affordable, accessible, sustainable and fair.
- In 2050 all domestic housing enjoy energy efficient, comfortable and de-carbonised heating. Affordable retrofitting solutions and suitable business models have made it possible for all residents in both existing and newer housing to install such solutions.

2

Empowering residents

In 2050, residents of Newcastle have the means and the wish to make responsible choices in their energy usage. Retrofitting domestic heating systems and adding intelligent controls enables the most efficient, low-carbon options. At the same time it creates jobs in the local economy and helps to tackle fuel poverty. Residents are empowered to control their own energy usage, ensuring affordable, low-carbon heating and enabling healthy, safe energy consumption levels.

Strategic ambitions

- In 2050 the residents of Newcastle have the means and the desire to control their energy environment and make responsible choices.
- In 2050 fuel poverty is zero.
- In 2050 energy consumption in households uses a more diverse range of technologies. Distributed power generation, electrification of heat and connection to district systems are the norm. Other sources of local heat could include geothermal and a wider variety of heat pumps. This more complex, more local energy system offers jobs to the local economy; Many of the traditional jobs in the fossil fuel sector have diversified into the green economy, (e.g. services for offshore wind).

3

City leadership

In 2050, Newcastle City Council is valued for its strong leadership and clear vision. It has created a sustainable society, in which people themselves take responsibility and set the right example. Through the open data centre the City Council and its partners are able to implement evidence-based policies and decision-making. Through consistent, evidence-based programmes, partnerships have created a secure, self-sufficient and low-carbon energy system for the city.

Strategic ambitions

- In 2050 Newcastle City Council considers the local (regional) authority footprint, looking beyond the boundaries of a house, of a property, of a land ownership and creating shared responsibility.
- In 2050 Newcastle is low-carbon energy secure and self-sufficient.
- In 2050 Newcastle City Council benefits from their clear message, strong leadership and leadership by example.

Drivers for change for the future of Smart Buildings (domestic) in Newcastle 2050

Better buildings

In 2050, new buildings combine historical qualities and new technologies, creating maximum comfort and functionality for their users. Historical expertise in building for specific local climates is used to design solutions for new buildings, and for thoughtful upgrading of those already existing. The latest technologies and materials are applied to make buildings self-sufficient or even energy positive, contributing to abundant of renewable energies in cities. Policies aim at improving the quality of neighbourhoods and strengthening the sense of community, and not only at reducing energy consumption.

Technology with a human focus

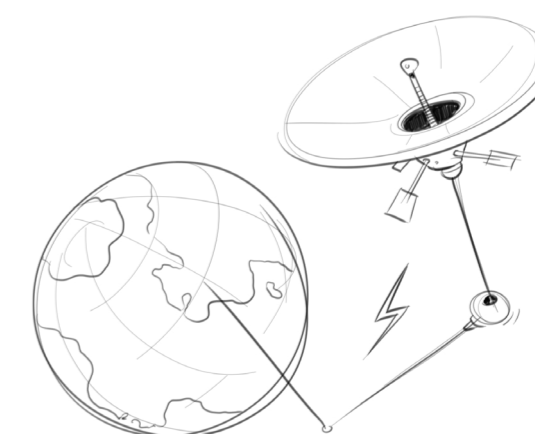
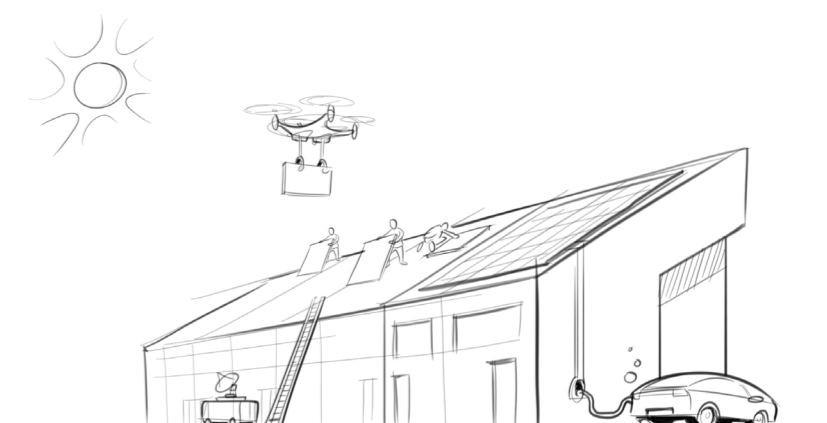
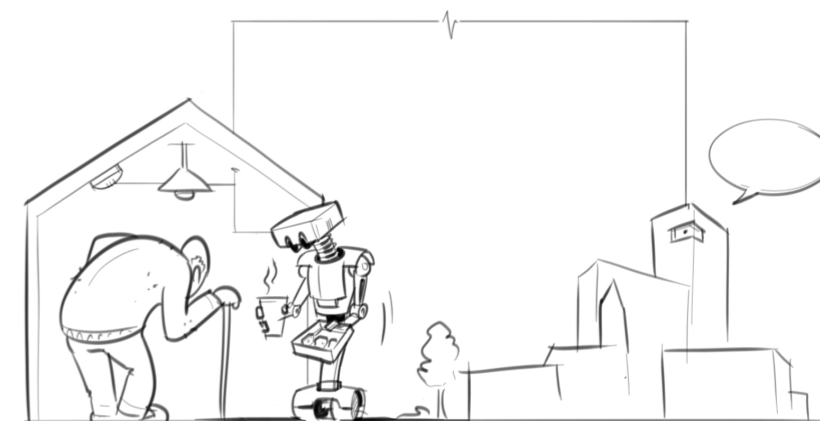
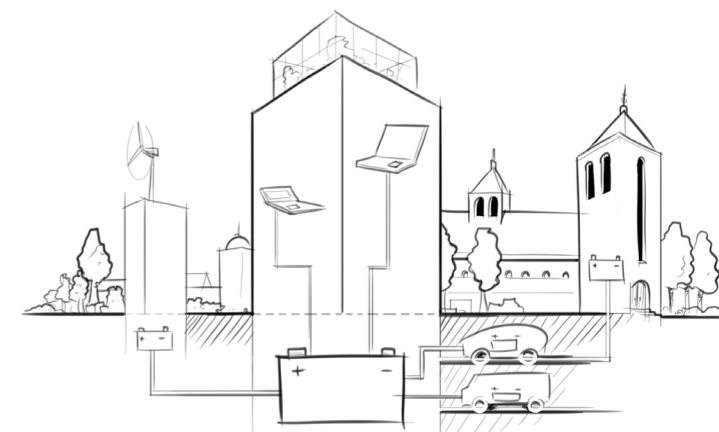
In 2050, we've mastered the challenge of ever more complex, multifunctional systems and the need to make them easier to use. Those systems are user-focused: that means users can understand how the systems work, and how their own behaviour affects sustainability and energy use. Robotics and smart (home care) systems support living at home, helping people to live healthier lives and to stay in their homes longer as they get older. There's a range of available solutions that plug-in directly to the city's open energy platform.

Building business for social living

In 2050, suitable financing structures and revenue models are available, offering solutions that are affordable while also boosting the local economy. Both individuals and small communities act as entrepreneurs. They benefit from good infrastructure and technology options, so they can self manage and at the same time improve their lives and the living environment.

Applying new technologies

In 2050, a range of new technologies are available and affordable. Some of them are already in development, others are still unknown. Cities apply those technologies in new solutions that contribute to the quality of life, and in particular to the creation of smart buildings, smart mobility and smart urban spaces.



Ambition: Smart buildings and infrastructure enable a thriving economy in Newcastle 2050

1

Fit-for-purpose, energy efficient buildings

In 2050, occupants and users of non-domestic buildings in Newcastle enjoy flexible, energy-efficient spaces which they can easily adapt to their own, changing needs. They use on-going retrofit solutions to adapt the buildings to their specific usage and maximise efficiency. Buildings are exemplary in the use of innovative, sustainable technologies. High visibility of the solutions contributes to a thriving building sector that 'exports' design and consulting services. Newcastle City Council shows leadership and informs, supports and cooperates in creating efficient buildings.

Strategic ambitions

- In 2050 all buildings are as efficient as they can be with the newest technologies, despite when they were built. All buildings are flexible adaptable to changing occupancy needs and user requirements. The use of innovative solutions is visible in the city.
- In 2050 the buildings in Newcastle are affordable and fit-for-purpose. Occupants will have the necessary technology to flexibly adapt the spaces to their needs.
- In 2050 Newcastle is a leader in a smart cities approach and an exemplar in sustainable energy efficient buildings. This approach is adopted by all stakeholders. The City Council is a national leader in driving business participation through policy making and by getting things done.

2

Collective approach to infrastructure

In 2050, Newcastle has adopted a collective approach that enables joint decision-making with partners and stakeholders in the city. All buildings are smart - so they both receive and transmit information - and are connected to a physical infrastructure of all kinds of networks (grids, transport, heating, electricity, data etc.). Urban planning takes a broad, wide-area view to take full advantage of opportunities extending beyond site boundaries and city limits.

Strategic ambitions

- In 2050 a collective approach is realised that enables joint decision making as well as a physical infrastructure that connects all buildings. In urban planning a broader view and wider area is considered to link smart buildings into smart grids to reap the opportunities beyond the specific site boundaries
- In 2050 Newcastle City Council has both direct service provision and a strong mix of innovative, collaborative and cooperative models for partnership and participation that supports the smart development of the city.

3

Vibrant economy, happy people

In 2050, Newcastle has a thriving economy based on new industries that attract young people. The smart buildings policy makes the city attractive to investors, resulting in new jobs and new forms of collaboration with stakeholders. Citizens enjoy high-quality facilities, community life and an attractive, green living environment.

Strategic ambitions

- In 2050 Newcastle has a vibrant economy based on new industries (like digital and software) that attract young people.
- In 2050 the city of Newcastle is a catalyst for job creation and industry investments for ethical and environmental developments.
- In 2050 Newcastle is internationally recognised as an innovative area where investments are rewarded through policy. Collaboration between policy and businesses is facilitating continuous investments for a sustainable city.
- In 2050 the outcomes of the smart buildings policy are visible and explicitly of value to all stakeholders, in the sense of health, jobs, cooperation, citizens and community experience. The economy is vibrant, with green jobs, maximising the potential of the city.
- In 2050 Newcastle attracts young people with a growing economy and attractive living environment (facilities, entertainment options, walking and cycling routes). The jobs in the gas/oil industry have been replaced by new jobs in the green economy (such as services for off-shore wind). The new economy in e.g. software and digital industries benefit from Newcastle's heritage as international trading city.

Drivers for change for the future of Smart Buildings (non-domestic) in Newcastle 2050



Flexible 're-purposing'

In 2050, we've adapted to continuous city dynamics. Buildings are part of the constant transformation of urban area. People know that 'things are always changing', so they have an open mind on how buildings and spaces are used. So this can change over time - or even during the day - in line with changing needs and events. As properties become available, they are used for meet the specific need at that time. Individuals and smaller collectives with shared interest have easy access to available properties, sites and services. Historic buildings and cultural heritage are 're-purposed', taking their specific qualities into account.



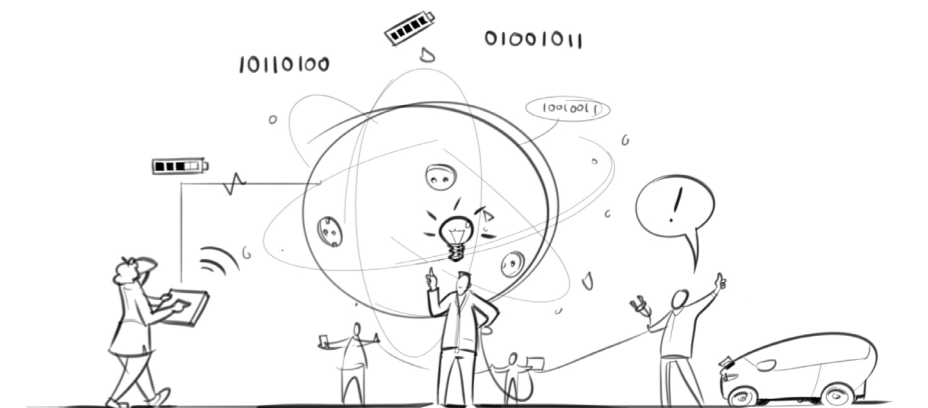
Enabling human development

In 2050, city residents are resilient, and can consciously adapt their behaviour to enable personal development. The middle class have largely disappeared. People have found new ways to live meaningful lives, building on opportunities at all levels - from local to global. They can handle large amounts of information to make personal choices. Smart, human-centric city environments provide inspiring places for lifelong learning.



Democratised energy systems based on open data

In 2050, energy systems are open, bidirectional, multi-purpose platforms on which (renewable) energy and energy management services are open to all. Entrepreneurs have developed business models that provide value for them, for their users and for society at large. Citizens can choose freely from a range of available options. The system ensures privacy and security of users, who are always in control. Ambient energy networks provide connectivity for (wireless) access to data and energy. Increased computing power and artificial intelligence make system resilient: self-organising, self-sustaining and self-learning.



Regenerating resources in a circular economy

In 2050, the circular economy ensures self-sufficiency of cities. Renewable energy is abundant, and this ensures a secure supply of vital resources for life (energy, water, food and clean air), although other resources may still be scarce. Cities have implemented circular systems to regenerate all the resources needed by their populations. These mechanisms are based on small-scale, local solutions, enabled by changed decision-making levels.





Contributions

We would like to thank the participants for their contribution to the scenario workshops

- Graeme Armstrong Newcastle City Council
- Paul Armstrong Newcastle City Council
- Kate Coulthard Newcastle City Council
- Kit England Newcastle City Council
- Chris Goodhand Northern Powergrid
- Kelly Graham Newcastle City Council
- Chris Hogg Northern Gas Networks
- Simon Johnson Newcastle City Council
- Allen Jones Newcastle City Council
- James Lowden Newcastle City Council
- Pdraig Lyons Newcastle University
- Adrian McLoughlin Newcastle City Council
- Sam Neill Newcastle University
- Claire Prospert Newcastle City Council
- Steve Smith Newcastle City Council
- Colin White Newcastle City Council



This project received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 649397

R4E

ROADMAPS
FOR
ENERGY®