

Inspired 3,000 people through our SuperHomes Open Homes

Identified business energy savings totalling 30,000 mWh and £2.9m per year

Developed performance gap insights from 83 social housing dwellings

Managed £2.5m Green Deal Communities project

Advised 3,000 people about energy efficiency at outreach events



Affordable Warmth helped vulnerable householders 1,650

6 Innovate UK projects with a total value of £1.9m

915,000 website users helped to improve their energy use

Reduced building performance risk with our Assured Performance Process



Launched Energy Envoys to 300,000 DofE candidates

The National Energy Foundation is an independent, national charity based in Milton Keynes and has been at the forefront of improving the use of energy in buildings since 1988. We aim to give people, organisations and government the knowledge, support and inspiration they

need to understand and improve the use of energy in buildings.

In delivering our 2015-16 impacts, we invested over £100,000 alongside partner funding in: **supporting the development of policy, strategy and standards** in the UK and internationally; **inspiring and informing**

individuals and companies ranging from householders to energy managers of major corporates; **supporting individual projects** in and with communities; carrying out **research and development** into the many factors that contribute to **improving the use of energy in buildings.**

Better Housing, Better Health



In January, we launched a new service to help those whose health is affected by living in cold or damp homes. Working in partnership with eleven local authorities across Oxfordshire and Buckinghamshire and with funding from the British Gas Energy Trust, **Better Housing, Better Health** provides advice, home energy checks and grants for practical energy efficiency improvements for those living with a cardiovascular disease or respiratory illness.

Cold homes cost the NHS in England £1.36 billion every year in hospital and primary care. In addition, during the winter of 2014-15, there were an estimated 43,900 deaths in England and Wales caused by cold



Alexandra Steeland, Senior Project Officer

weather, the highest number since 1999/00. What's more, the Government's Annual Fuel Poverty Statistics Report estimated that, in 2014, there were 2.38 million households living in fuel poverty in England – up 1.4% on 2013 figures.

Better Housing, Better Health aims to:

- Help prevent avoidable excess winter deaths.
- Reduce fuel poverty.
- Reduce pressure on health services.
- Improve health and wellbeing.

The scheme runs until December 2016 and covers:

- Grants of up to £2,500 for energy efficiency measures.
- Free surveys to identify potential risks to health.
- Support with benefits checks, fuel debt mediation and switching energy tariff or supplier.

To access the service, referrals are made by a health or social care professional. We also offer free training to frontline health and

Helping vulnerable householders to identify energy efficiency improvements

We advised 3,000 people at 80 outreach events and training sessions, and a further 1,650 via our Affordable Warmth helpline. We also secured around £400,000 of external funding for energy efficiency measures installed through ECO and our new Better Housing, Better Health project.



social care staff. Training emphasises the link between cold homes and ill health, shows staff how to identify at-risk patients and explains how to make referrals to the scheme.

Better Housing, Better Health got off to a great start. By early August, 143 referrals had been received and all grants for energy efficiency improvements were allocated by mid-April – less than four months into the project. In recognition of its early success, the British Gas Energy Trust awarded the project an additional £27,600 in July.

Energiesprong

Making net-zero energy housing a reality

In July 2015, we were one of a group of leading social housing providers, construction companies, trade bodies and expert organisations that came together to form **Energiesprong UK** with the intention of creating a 'game-changing' refurbishment sector in the UK, inspired by the Dutch **Energiesprong** approach, and using the social housing sector as the catalyst.

Energiesprong is a Dutch Government-supported approach to delivering attractive whole-house refurbishments guaranteed to achieve ambitious energy improvements. Several manufacturers now offer **Energiesprong** solutions in the Netherlands using customised, off-site manufactured walls and roofs, pre-fitted with windows and doors.

This improved building envelope is



complemented by a services module where renewable energy, grid connection and intelligent management provide heat and power. The envelope and services modules are then delivered to the site to refurbish the existing house, thereby not only insulating the building but providing it with a modern, updated look.

Each refurbishment is completed within a week with no need for the occupants to move out and the cost is covered in the long term by the guaranteed energy savings and reduced maintenance costs. **Energiesprong** retrofits help tackle fuel poverty, and the refurbishment of whole terraces, streets or blocks dramatically improves and regenerates neighbourhoods.

Mirroring the Dutch experience, **Energiesprong UK** aims for:

- **Quality and assured performance** – by ensuring that refurbishment solutions provide guaranteed performance over 20 or 30 years.
- **Affordability** – assured performance, together with mass-customised industrialisation and delivery, reduce costs and allow for the financing of the upfront investment, making it financial viable for both landlords and tenants.
- **Desirability** – low disruption, fast process, improved aesthetics and comfort levels, increase asset value, stimulate neighbourhood renewal and produce a positive social impact.

Boundary Way transformed with DECC-funded external wall insulation

Boundary Way is an estate that lies across the boundary of Watford Borough Council and Three Rivers District Council. Using DECC Green Deal Communities funding and contributions from householders, the two councils concerned and Thrive Homes, we managed the payment of grants for the external wall insulation of 154 homes.

The estate was built in the 1960s and 1970s. Approximately half the estate had already benefited from external wall insulation. Our project aimed to increase energy efficiency, reduce energy bills and improve the appearance and thermal comfort of the properties by rolling out external wall insulation to the remaining properties on the estate, both privately and publicly owned.

What we did included:

- Customer liaison.
- Co-ordinating the production of explanatory leaflets.
- Negotiating with DECC to make payment of top-up grants to residents who had missed out on taking up a Green Deal loan.
- Liaising regularly with both councils and Thrive Homes regarding the administration of the grant.
- Paying the grant to the contractor.
- Providing monthly reports to the project funders.



Sandra Hayes,
Senior Project
Manager

As a result of our project, the Boundary Way estate underwent a dramatic transformation and a lot of the positive comments received from residents related to the aesthetic improvements. Furthermore, residents quickly noticed the reduction in energy use, more rapid increase in internal temperatures, and better heat retention after they turned the heating off. These improvements led to better thermal comfort for residents and improved health and wellbeing.

A high degree of flexibility was required to manage this project, due to changes in Government policy around the Green Deal and ECO. From project inception to delivery, the value of ECO dropped by a quarter and the availability of Green Deal Finance came to an end with no prior notice. The original six-month timescale for sign-ups and installs proved very tight, even in an area where there were plenty of examples of external wall insulation already available for everyone to see.

Helping householders to make energy efficiency improvements to their homes

Working with 14 local authorities across 24 areas, we managed a £2.5 million DECC-funded Green Deal Communities project, which facilitated the installation of solid wall insulation in a mixture of 400 privately owned and rented homes plus 177 energy efficiency measures in fuel poor households across eight districts.

In total, 154 out of a potential 173 homes benefited from external wall insulation. Together with the 118 properties completed in the first phase, the result was a complete regeneration and visual transformation of the estate.



Inspiring individuals and communities

3,000 people took part in the 2015 SuperHomes Open Homes programme by visiting 62 of the 207 accredited SuperHomes, which provided practical advice and inspiration for energy-efficient home improvements. We also supported six community groups to undertake thermal imaging of almost 200 residential properties.



Transition Zero and funding achievements

In April 2016, The European Commission confirmed our application for €3.6 million grant funding to roll out Energiesprong (the innovative Dutch refurbishment process) in a number of European countries, including the UK. We led on this successful multi-national 'Transition Zero' bid, which was made to Horizon 2020 (the largest research and innovation programme of the European Commission). The aim of the project is to kick-start the mass uptake of Energiesprong net-zero energy refurbishments of domestic properties, starting with the social housing sector.



Energy Envoys

DofE volunteers helping to save the planet

In September, we launched our Energy Envoys volunteering opportunity to 300,000 young people as part of the world-famous Duke of Edinburgh's Award (DofE).

The scheme, which is supported and endorsed by the UK's leading professional engineering institutions and the National Union of Students, is a major new environmental volunteering scheme for young people to help schools and communities use energy more wisely, save money and reduce carbon emissions. Young people across the UK who are working towards their Bronze, Silver or Gold DofE now have the opportunity to volunteer as Energy Envoys. Since the Energy Envoys

programme was launched, it has attracted youngsters from all over the UK and from as far afield as Brighton, Angus, Leicestershire and Wigan.

As part of the scheme, Energy Envoys from Ousedale School in Newport Pagnell visited the Mayor of Milton Keynes to help make his home more energy-efficient and reduce his fuel bills. The youngsters interviewed the Mayor and carried out an energy audit, which included an inspection of the lighting, heating system and electrical appliances, as well as a look at how his family uses energy.

The Mayor was presented with some recommendations, in particular to replace



the energy-guzzling halogen downlighters in his kitchen/diner with LED light bulbs, which are far more energy-efficient.

The Ousedale Energy Envoys had a great time advising Milton Keynes' 'first citizen' how he can help save the planet by using energy more wisely, with one commenting: "I will use what I learnt to save energy at home and to tell my friends and family. Volunteering with Energy Envoys has been a memorable experience, which has changed the way I look at the world around us." Since the visit, an electrician has made changes to the former Mayor's lighting system and he's already seeing the benefit in financial savings and lower energy use.



Inspiring the next generation

We launched our Energy Envoys volunteering opportunity to 300,000 young people as part of the world-famous Duke of Edinburgh's Award.

Supporting consumers with free online advice and information

During 2015-16, we helped 915,000 users make decisions on improving energy use in buildings. This was done through 1.1 million visitor sessions on our sites, 1.8 million page views and 60,000 video views. In addition, hundreds of questions from members of the public have been answered by SuperHomers and our new online resource makes these answers freely available. Also during the year, we published 154 YouGen blogs providing inspiration and in some cases detailed information to readers on renewable energy and energy efficiency topics. These were supported by monthly newsletters, each sent to 7,500 subscribers.



Developing sector professionals

People from many backgrounds and with a wide range of skills have volunteered with us over the years, finding the experience enjoyable, enriching and satisfying. Volunteering opens up lots of opportunities for learning, generating ideas and networking, while providing valuable experience in a professional environment.

During the year, we helped develop the careers of 15 volunteers and interns, including UK and international doctoral and post-doctoral interns. Collectively, they spent 5,400 hours with us over a combined 174 weeks, expanding their experience while benefiting our work.

Data is king

when targeting domestic energy efficiency programmes

Suffolk County Council has an ambition to reduce its carbon emissions by 60% by 2025, and recognises that investment in the region's housing stock will be vital to hitting this target. As an essential first step, NEF was appointed to develop a housing stock database to provide a detailed understanding of both the physical characteristics of the region's housing as well as the socio-economic circumstances of its residents - information that is crucial in designing and targeting domestic energy efficiency programmes and campaigns.

With Ordnance Survey AddressBase data and 140,000 EPC records at its core, the Suffolk Housing Stock Database identifies the built characteristics and energy performance of 310,000 properties. This data is cross referenced with Mosaic householder data from Experian to provide detailed insight into not only the stock and its energy efficiency performance and upgrade potential, but also an appreciation of each household's tenure and socio-economic status.

Also included are improvement upgrade packages modelled for all the properties,



Luke Smith,
Principal Energy
Specialist

thereby indicating the potential energy and CO2 savings as well as resident fuel bill savings and required investment estimates. All this is accessed via a user interface that allows all the data to be searched, filtered and reported upon by, for example; town, postcode, ward or region.

The database offers the council comprehensive insight to a level far beyond traditional sample-based stock condition surveys. It also helps tackle fuel poverty, as well as ensure that investment in existing housing is appropriately directed to help meet carbon emission goals.

Wider uses and benefits include:

- Application for, and targeting of, funding to support investment in energy efficiency measures.
- Support for Housing and Public Health

teams to reduce the health effects associated with cold and poor quality housing.

- Identification of vulnerable and fuel poor households, and the potential energy efficiency measures that will benefit them.
- Targeting of other services and behaviour change campaigns – for example; recycling and composting.

Since the handover of the database, Suffolk County Council has successfully used it to secure a grant to help support residents off the gas network, and also as a tool to run mail-out campaigns. The project case study has also been presented widely and we are currently discussing with the government and other councils about scaling the service.

Helping local authorities and registered providers to improve their dwellings

We worked with over 30 local councils and housing providers to identify and implement energy efficiency opportunities.

Assured Performance Process

During the year, we developed a number of tools for building owners and occupiers. In particular, we launched our **Assured Performance Process (APP)** – a whole-system approach that identifies potential energy 'performance gap' risks at each stage from concept through to handover, removes them where possible or ensures that they are mitigated and managed through subsequent stages of delivery.

All too often the actual energy performance of new homes fails to meet their design standards. However much effort planners, developers and building designers put into achieving efficient energy use, occupied homes typically use at least twice as much energy as predicted.

The causes of the energy performance gap occur at every stage of development from concept to hand-over and beyond. Our APP is a process-oriented, risk mitigation approach identifying performance gap 'contributors' and eliminating or reducing

their negative impact on the performance of the completed building at every stage.

APP maps to the RIBA Plan of Work and has five stages of expert, impartial review and assessment:

- Inception and strategy.
- Planning and early design.
- Detailed design.
- Construction.
- Verification and assessment.

The APP process means that energy and low-carbon aspirations in the brief and planning stages translate into executable designs that deliver as they were intended.

It also ensures that the designs are implemented faithfully on site.

Benefits of our Assured Performance Process:

- Lower energy demand and lower carbon emissions from every home.

- More confidence that homes will meet their predicted design standards.
- Improved comfort and satisfaction of residents.
- Certainty of delivering high-quality homes without spending lots of time policing each stage.
- More sustainable buildings without the box-ticking of the old Code for Sustainable Homes.
- Reassurance for stakeholders that action is being taken without firm policy from central government.



Adam Tilford,
Senior Energy
Specialist

ESOS: the proof of the audit is in the saving

If anyone needs convincing of the value of **ESOS**, we have the evidence. We worked with a number of organisations and used half-hourly energy data, utility bills, finance records and mileage claims to identify energy savings totalling **30,000 MWh per year, the equivalent of £2.9 million off fuel and utility bills.**

Notably, we came across a commercial site where they had a combined heat and power plant. Although they were using the power, they were dumping the heat into the atmosphere, only to use lots of energy heating hot water for their industrial washing facility. On top of that, there was no space heating in their centre during winter.

The solution was to re-engineer the systems to produce space heating and deliver low-carbon pre-heating for the industrial washing facility. Together, these two solutions are set to save £40,000 and 1.7 GWh per year.



Thomas Whiffen,
Senior Energy
Specialist

Sharing our expertise

We disseminated our expertise and helped improve building energy knowledge through:

- Presenting at nearly 30 sector conferences and exhibitions across the country.
- Wide coverage of nearly 40 articles, blogs and press releases – both online and in print – the latter reaching a potential readership of over 800,000.

Also, one of our staff sat on the editorial panel for the National Housing Maintenance Forum [Energy Efficiency Guide](#).

Our experience and top insights:

1. There was positive engagement from all the organisations we audited.
2. The ESOS process improved energy-use record keeping.
3. ESOS also improved energy awareness. Improving the visibility of energy consumption helped organisations identify energy-saving opportunities.
4. Major opportunities were identified through behaviour change initiatives in both buildings and transport.
5. Major improvements were achieved through modernising the technology used to monitor and control energy, especially in areas of high demand.
6. There was scope for energy management behaviour to be improved in all the buildings we audited.
7. Likewise, there was room for all organisations to improve the staff support they provided through awareness and training.
8. Lighting upgrades and boiler replacements reduced lighting and heating demand by 25-50%.
9. Fuel card systems made it easier to provide energy consumption data and undertake behaviour-change programmes.
10. The true benefit and power of ESOS will be in the number and value of opportunities that are actually implemented.
11. We continue to work with a number of our clients and have revisited our original audits and worked on strategies for implementing the savings identified.
12. We are now working with forward-thinking clients to prepare for the next ESOS cycle.

Helping businesses to save energy and reduce their fuel bills

Our Technical Team worked with thirteen parent organisations on **ESOS** compliance and identified hundreds of potential energy-saving opportunities.

Informing standards, government policy and regulation

During the year, we drew on our experience and expertise to provide contributions to the development of the sector and policy changes. For example, our Deputy Chief Executive, Ian Byrne, led on a new standard (ISO 50047: Determination of Energy Savings in Organizations) which entered its Final Draft International Standard stage and will provide a standardised and internationally-recognised method for measuring energy savings.

We also acted as an expert witness in the potential mis-selling of a number of PV systems and provided information and advice to the government and official

bodies through responses to: the Bonfield Review; consultation on feed-in tariffs; the Energy and Climate Change Committee inquiry into home energy efficiency and demand reduction; the Hansford inquiry into solid wall insulation (both written and verbal evidence).



Ian Byrne,
Deputy Chief
Executive

PULSE

Improved system for measuring building air permeability

Uncontrolled air leakage in buildings can account for as much as 30% of the total heat loss; an energy penalty that increases even further in premises that are cooled or continuously conditioned. What's more, buildings that are airtight but not adequately ventilated can present risks to the health of both the building structure and the occupants. However, despite its importance, techniques for both measuring and modelling air permeability are inaccurate and unreliable.

As building designers strive to achieve higher energy efficiency in a bid to comply with current and future, more stringent, Building Regulation targets, airtightness has become a major performance issue that cannot be ignored.

Our response was to work alongside The University of Nottingham, Elmhurst Energy,



Luke Smith,
Principal Energy
Specialist

Supporting research, development and innovation

We participated in six Innovate UK-supported projects, with a total value of nearly £1.9 million. In addition, some of our staff undertook monitoring and evaluator roles for Innovate UK projects.

Absolute Air and Gas and others to develop a new and innovative airtightness testing system. The PULSE technique is a compressed, air-based alternative to the blower door fan method, which works by subjecting a building envelope to a known volume change and measuring the pressure response. PULSE is fast, low skill, undistruptive and robust. It's also highly accurate in measuring the airtightness of the building envelope under natural atmospheric conditions. By using low pressure, it offers certain benefits over conventional tests:

- Unobtrusive for occupants as the test is quiet and doesn't disturb household objects.
- Provides a more accurate measurement of fabric infiltration.

- Reduces the time taken to set up and complete a test.
- Carried out using a relatively small, lightweight composite pressure vessel, which is standalone and portable.

PULSE is now commercially available and has the potential to revolutionise the way air-tightness testing is undertaken. Our research shows that this new method will: dramatically improve the accuracy of how air permeability is measured; provide the opportunity for more buildings to be tested; and allow for risks and improvements to be better understood.



REMI – preparing the ground for Energiesprong

The National Energy Foundation is an active partner in REMI (Refurbishment as a Manufacturing Industry), an Innovate UK-supported project, which is investigating the feasibility of a whole-house Energiesprong approach to domestic retrofit in the UK, similar to that already implemented in the Netherlands.

The project is investigating the consequences of various aspects of the UK context – ranging from planning regulations and practice to the UK's use of a feed-in tariff mechanism rather than net energy metering – in order to understand how an Energiesprong approach could be implemented in the UK, stimulating a new, high-volume, industrialised refurbishment sector.

REMI is investigating:

- Regulation, planning and policy constraints, and any changes needed to alleviate them to help establish Energiesprong.

- The development of a financial model to inform the business case for investment, which also includes a total cost of living assessment and various scenarios to test the implications of policy/funding changes.
- Investigation and categorisation of UK housing archetypes and their suitability to Energiesprong solutions.
- The creation of appropriate financing conditions – by encouraging funders to develop financial products and packages to support Energiesprong.
- How to stimulate demand for net-zero-energy refurbishments – for example, by raising awareness among social landlords of their commercial and social value.
- Mobilising potential suppliers of Energiesprong solutions to invest in the concept and develop competitive solutions, learning from best practice in other manufacturing sectors.



- The transformation of the refurbishment market through industry-led innovation.

Outputs from the REMI project include a supply chain workshop (to introduce the nature and scale of the opportunity provided by Energiesprong) and a series of deliverables (reviews, specifications and modelling documents) against agreed work packages.

Finding the gap

Our insights into the 'performance gap' from social housing sector BPE projects

The Building Performance Evaluation (BPE) programme invited competitive submissions from individual companies and other organisations responsible for buildings, to undertake comprehensive performance evaluation studies on buildings post-completion (6-9 months after handover) or in-use (over two heating seasons).

Funded by Innovate UK to a total of £8 million, the programme sought to identify where the 'performance gap' arises, by evaluating and assessing the performance of both domestic and non-domestic buildings against the original design intent.

The programme included over 50 new housing projects.

Some of our staff undertook project monitoring or evaluator roles in the projects, and our Technical Team was commissioned by Innovate UK to undertake an analysis of the data arising from all the



Federico Seguro,
Energy Specialist

registered provider projects, which comprised 83 dwellings. The ultimate objective of the study was to empower registered providers to take a lead and become champions in combating the gap between designed and as-built performance.

Findings from the study identified:

- Key success factors (where things worked well and not so well).
- Practices more likely to result in a significant performance gap.
- The relative impact of specific attributes such as defects and building services on the performance gap.

Gaining recognition

In October, our Chief Executive won the Environment award at the [Women Leaders MK Awards](#) for her leadership of the Foundation's work improving the use of energy in buildings. She was also a finalist in the national First Women Awards.



iAIM A holistic approach to asset information management

In the social housing sector, asset, resident and housing management data are rarely brought together to fully inform investment decision-making.

To overcome this compartmentalised thinking, we are currently working with the Joseph Rowntree Housing Trust and others to develop and implement an integrated approach to asset information management. The iAIM project draws on our expertise of working with data and data analysis models to review current approaches in the sector, and determine the role that [PAS 1192-3](#) and

other asset management standards can play in helping to drive innovation.

By determining the best ways in which to collect, store and process data, we have developed new and innovative means to give social housing providers detailed insights into their properties' performance and their residents' well-being, thereby informing strategic investment decisions. This enables us to determine much more readily: the overall performance; any investment and divestment opportunities; and any risks associated with assets.

Who's who at NEF

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