Drawing Energy:
Exploring perceptions of the invisible
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For Diana

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The Drawing Energy book is part of the larger SuslabNWE study, which saw 11 partners from Germany, the Netherlands, Sweden and the UK come together to understand and investigate energy use.

At the Royal College of Art in the UK, we looked at bringing together two ideals and practices around inclusive design and sustainability. Both often have different starting points and deal with different scales. Inclusive design usually focuses on people’s needs and capabilities at the domestic scale, while sustainability embraces complexity and systems thinking, addressing systemic change. Drawing Energy negotiates a space between the two, bringing together people’s aspirations and perspectives with the context of socio-political mandates and changing infrastructure or technologies.

The study also moves beyond the idea of purely functional research (such as numerically measuring energy use) to depict the less tangible area of how people relate to energy in a visual, literal or metaphorical way – it takes us from data ‘performance’ through to human ‘perception’. The work represented in this book builds on a history of using drawing as a tool for research and as a way to enable people to express their ideas and imagination fully.

We hope you appreciate this publication, whether you see it as a strategy within design research, or simply enjoy it for the rich and varied artwork that represent the public’s views of energy.
Introduction

Project Background

Drawing Energy is a drawing-based research study exploring people’s perceptions of energy, an often intangible concept that is ever-present in our daily lives. It was conducted as part of SusLabNWE, a collaborative European design and engineering project that looked to reduce domestic energy use in north-west Europe. SusLabNWE was supported by Interreg IVB and ran between 2012 and 2015. It was based across the UK, Germany, Sweden and the Netherlands, with a total of 11 different partner institutions as follows:

Technische Universiteit Delft
City Ports Academy
Woonbron
Royal College of Art
Imperial College London
Institute for Sustainability
Wuppertal Institut für Klima, Umwelt, Energie
Hochschule Ruhr-West
InnovationCity Ruhr
Chalmers tekniska högskola
Johanneburg Science Park

About the Royal College of Art

Within the Royal College of Art, SusLabNWE presented an opportunity for collaboration between two departments:

1) The Helen Hamlyn Centre for Design is the Royal College of Art’s largest and longest running research centre and undertakes design research that contributes to improving people’s lives. The Centre employs a range of people-centred design approaches, carrying out ethnographic research and co-creation workshops to ensure that people’s needs and desires are at the centre of any design process. The centre’s main focus is socially inclusive design.

2) SustainRCA is the Royal College of Art’s youngest research centre. Founded in 2010, it addresses social and environmental issues across all areas of art and design and explores the complexity of these challenges in contemporary society. SustainRCA investigates how new connections between businesses, governments and people can lead to lasting change to support and strengthen ecologies in their fullest.
The SusLabNWE project was an opportunity for the Helen Hamlyn Centre for Design and SustainRCA to bring together their distinct philosophies and research approaches to explore the emerging territory of inclusive and environmental design. In the context of this research, this meant understanding the ways in which people use and think about energy in contemporary British society and how energy itself might be represented in new ways in order to help people to engage with it in more personally-relevant and environmentally conscious ways.

About this Book

This book documents a drawing research study conducted by the Royal College of Art as part of the SusLabNWE project. As we will discuss later on (see The Research Process, pg. 16), we found that many people find it difficult to understand the energy they use because it is invisible. We do not explicitly see the warmth our heating creates or the power in our electrical appliances. Instead, we experience the benefits of energy, whilst we do not necessarily know how many kilowatt-hours have been used in the process. Our energy bills come in a numerical format but this does not necessarily help us understand how much energy we have used, its value or the impacts, direct or indirect, of our energy use.

Energy moves stealthily and silently in and around our homes, so to approach this issue head-on, we asked people to draw (or write, if they preferred) what they think energy ‘looks like’. We conducted this study with visitors to the Helen Hamlyn Centre for Design’s Life Examined exhibition at the Royal College of Art in September 2013; with students participating in the UK ArtScience Prize at The Silk Mill, Derby in April 2014; and with visitors to the Victoria and Albert Museum Digital Design Weekend in September 2014.

What emerged was a collection of 180 visualisations of energy from the British public. This book features a selection of the pieces produced by the ArtScience Prize students and visitors to the V&A’s Digital Design Weekend. While we have not been able to feature all the images produced, the text does refer to the collection as a whole and to some images that are not printed, to examine the full spectrum of the work produced.

The book seeks to explore what the drawings reveal about what people think, feel, know and imagine about energy in the UK today. Rather than ask people to focus specifically on energy as a power source, it also looks at the broader conceptualisations that people hold about the subject of energy.
The Energy Context

Much of the UK’s housing was built before the links between energy use and climate change were understood. Much of it was also built when there were very different expectations of thermal comfort.

To put it simply, most families in 1970 lived in homes that would be cold by modern standards in winter – as cool as 12°C on average. There may have been ice on the insides of the windows, and nearly everyone accepted the need to wear thick clothes at home in winter.

The UK Housing Energy Fact File, 2014

The UK’s energy context has clearly changed significantly over recent decades, and our expectation of the conditions we have at home has altered within our lifetimes. This suggests that the energy context is a fluid and changing state, which can be at odds with our housing stock and clothing. It may be informed not just by energy suppliers and markets, but also by the wider cultural context of today.

In the UK, domestic energy use now accounts for almost one third of our total national energy use. In 2013 domestic consumption was 29 per cent of total UK final consumption, compared to 27 per cent in 2000 and 26 per cent in 1990. Households are also responsible for one quarter of the UK’s greenhouse gas emissions (Department for Energy and Climate Change, 2014b, hereafter referred to as DECC).

Domestic energy as a proportion of the total national use is rising, and addressing the ways in which individuals relate to energy, use it at home and understand their interactions with it is becoming an increasingly important part of reducing our total national energy consumption and the associated environmental impact.

The proliferation in digital technology such as computers, tablets and mobile phones over recent years has increased electricity use (The Carbon Brief, 2014), but measures to reduce home energy consumption more broadly are underway, and they are having an effect. The installation of energy efficient appliances (such as fridges, ovens and washing machines) is increasing and is expected to continue as manufacturers improve the efficiency of their products (Department for Environment, Food and Rural Affairs, 2009; DECC, 2014c); and the EU’s Energy Labelling Directive (2010) has meant that the efficiency of such home appliances is clear for all consumers to see. We are also seeing a shift from incandescent to LED light bulbs and improvements in the efficiency of the boilers we install (The Carbon Brief, 2014). Grants have also been offered through the government, energy suppliers and local authorities to improve home insulation (see for example, the Energy Saving Trust, 2014).
With these changes, the actual volume of energy used by UK households has started to fall. When temperature variations are accounted for, we used the lowest amount of energy at home in 2013 since 1985 (DECC, 2014c). This is particularly notable considering the on-going rise in the total population: England and Wales had a population of 48.5 million people in 1981, which had risen to 56 million people by 2011 (Office for National Statistics, 2012).

A key factor that will of course play a role in our home energy use is cost, and the real terms cost of gas doubled in price between 1996 and 2013 (DECC, 2015). Space heating (which is usually from gas) remains the primary use of energy at home – close to 70 per cent of total energy (DECC, 2013). Against this backdrop, it is clear to see how higher costs will affect end use.

The high cost of domestic energy unfortunately also has implications for fuel poverty. In 2012 4.5 million households in the UK (17 per cent of the total) were fuel poor (DECC, 2014a). In 2003 and 2004 there were 2 million fuel-poor households, which increased to 5.5 million in 2009, and has been decreasing again since then (DECC, 2014a). DECC identifies that these changes correlate to household income and changes in the cost of fuel.

Affordable energy is, of course, essential for the wellbeing of the population. Politicians regularly speak of their commitments to reducing fuel costs, and with the decreasing wholesale fuel costs we are experiencing in early 2015, party leaders are championing lower bills for consumers (see for example BBC, 2015a).

While we continue to maintain our dependence on fossil fuels, and as shale gas continues to be explored in the UK (BBC, 2015b) these political pledges come at great environmental cost. In the third quarter of 2014, renewable electricity accounted for 18 per cent of the total electricity generated (DECC, 2014c) and this tension between the need for energy to maintain comfort and wellbeing, and national targets to reduce environmental impact (DECC, 2011), highlights the need for innovative new measures that address today’s energy demands. Furthermore, energy companies still largely create their profit from selling energy, meaning that their business model relies on people using more. Whilst we are seeing a growing number of renewable or community-led energy companies and groups (such as Good Energy or the Community Energy Coalition), at the time of writing the old model is still the dominant one.

As the quote at the beginning of this section suggests, our energy context is situated in time and place. The way we use energy at home is influenced by political context, global markets, national infrastructures, architecture, fashion, product design and technology, amongst other things. The energy context is a multifaceted and complex one, and measures to address the ways in which we use energy should recognise and work with this complexity, not against it.
The Research Process

This section presents the background to the drawing study, framing it within the broader context of the European SusLabNWE project. It explains the research process that led us to the development of Drawing Energy, and details the context and results of the study.

Researching Energy

The Drawing Energy study builds on research methods developed at the Royal College of Art over the last two decades. Our energy research began by conducting a series of ethnographic interviews in 2013 with people – mostly Londoners – in their own homes, to explore their ideas around energy, what it means to them and how it features in their daily life.

While the principal focus of the SusLabNWE project was on energy in the utility sense, the word ‘energy’, with numerous definitions in English (Merriam-Webster, 2015), is a concept that resists easy visualisation and is not synonymous with any singular or distinct visual icon. We therefore decided to expand the frame of reference for our research to encompass fully all the meanings the term holds and explore its significance for our interviewees.

The research process itself was people-centred, with the designers and researchers seeing householders as collaborators and contributors, not just ‘test subjects’ (Gheerawo et al, 2011). This was important: it is beneficial to work with real people as nothing can really replace the value of this process (Warburton, 2003). This moves projects from being perhaps an ego-centric expression of design expertise, to having social relevance and value for the end user.

Projects from the Helen Hamlyn Centre for Design employ a diverse range of design research methods to identify and include people’s needs and perspectives. These include questionnaires, expert consultation, user diaries, interviews, observation in situ, testing with prototypes, and research ‘kits’ requiring a range of responses from photographic to emotive. New design ethnography methods have resulted, such as ‘Design Provocations’ where props, sketches or prototypes are shown to people to provoke response (Eikhaug et al, 2010).

Working closely with small groups of users encourages empathic bonding between designer and user, creating a space where they can both act as equals to address the issue in hand. This can then aid understanding of lifestyle and aspirational factors that are all too often overlooked, moving beyond ergonomic problem solving into an area of creative thinking and user-facilitated innovation (Coleman, 1997).
Describing Energy

From our interviews with householders, we quickly found that people’s personal definitions and associations with energy were in fact much broader than heat or electricity. One participant, Diana (who sadly passed away during the project, and to whom this book is dedicated), described energy as a kind of smoke or fog, and suggested it was like God – all around us, intangible, powerful and ethereal. Another person told us that to describe energy to a child he would say it is ‘a force. Something that creates change, or motion, or action.’ While another person told us that she works hard to save energy at home, not primarily for financial or environmental reasons, but because she believes that valuing resources is part of her religion.

Early on in the research we found that people’s mental models (Johnson-Laird, 1983; Gentner & Stevens, 1983) and notions of energy were very diverse (as confirmed by some other research, e.g. Rupp, 2013). We also consistently found, that the invisibility of energy was a significant attribute for the people we spoke to.

One person said to us:
‘I think I worked out that through gas and electricity every year, the average house gets the equivalent of a bit over three tons of coal delivered completely silently and without any mess. And go back a hundred years ago and everyone would have a really good quantitative understanding of how much energy they used because they had to physically shovel the stuff, So, that made me stop and think.’

This participant was seeking to understand his own energy use by relating it to an equivalent physical mass, but also by comparing his family’s present day experience to a now distant historical context. What this suggests is that the changes in technology and infrastructure that have removed the physical labour and the visual presence of energy from our homes and daily lives, are also a shift that has made it difficult for people to understand or monitor their levels of energy consumption.

Drawing Energy

The initial research interviews revealed that the energy’s invisibility was a defining characteristic, and one that might be closely connected to understanding our own environmental impact through energy use. This was by no means a new finding (e.g. Burgess & Nye, 2008) – and ‘keeping energy use visible’ is central to the thinking behind home energy monitors (Hargreaves et al, 2013) – but it is one that has often been addressed in design through leaping straight to new interface designs (Froehlich et al, 2010) without exploring the issue further in terms of the meanings, social and ecological factors of everyday lived experience (Mazé & Redström, 2008; Strengers, 2011; Hamilton & Hinshelwood, 2014) and the stories around these (Mourik & Rotmann, 2013; Lockton et al, 2014).

To investigate the questions that energy’s invisibility might present, we decided to undertake a drawing study to explore energy in new ways, and to use the drawing process to uncover the associations people make with this immaterial entity.

We developed a visual research method, which social scientists might term a ‘participatory visual method’ (see for example, Gubrium and Harper, 2013; Mitchell, 2011) in which we asked people to respond, through drawing or writing on paper, to the question: ‘What does energy look like?’ As Gray et al. (2010) suggest, ‘[w]ords become more challenging to visualise as they become less literal’, and energy, as a form of dynamism, power, force or activity, might be considered ‘an idea that isn’t anchored to an object in reality’ (Brown, 2014). We reasoned that this method could help us to explore people’s mental models and perceptions of energy.
and of the infrastructures or meanings connected to it. Participatory drawing research has been used before to explore people’s understandings of abstract or invisible concepts, for example Bibace and Walsh (1979) and Nemeroff (1995) explored notions of germs and illness, while Qualter (1995) and Devine-Wright et al (2009, 2010) have explicitly looked at conceptions of electricity generation and the National Grid.

Our study was conducted with visitors to the Helen Hamlyn Centre for Design’s Life Examined exhibition at the Royal College of Art in September 2013 and replicated with students participating in the UK ArtScience Prize at the Silk Mill, Derby in April 2014. A final workshop took place with visitors to the V&A’s Digital Design Weekend in September 2014. These three parts of the study were conducted in the UK, two in London and one in Derby. In each instance the participants spent as long or as little time as they liked creating their drawing.

Where participants chose to do so, we engaged in conversations about the drawings produced, the subject matter, the materials and the act of drawing. We were pleasantly surprised by the enthusiasm people displayed for the study and for the drawing process and their desire to discuss their ideas with us. At the V&A, participants added labels to their drawings telling us something about themselves, and some of these are recorded in the captions alongside the drawings in this book. However, we did not ask people to complete surveys or questionnaires as a part of the study, so our analysis is purely based on our interpretation of the images produced.

As John Berger (1972) observed in Ways of Seeing, ‘[i]mages were first made to conjure up the appearances of something that was absent’ and in time ‘... the specific vision of the image-maker was also recognised as part of the record.’ With this in mind, asking people to draw the invisible offered a very human-centred means of investigating energy and people’s thoughts and ideas about it.
From the three phases of the drawing study emerged a collection of 180 images of 'energy', presenting a diverse, multi-faceted and highly personalised picture of this often intangible and amorphous subject. The drawings also fed into other research conducted on the SuslabNWE project, helping the project team to glean insights into people’s thoughts about energy, and our qualitative methodology complementing some of the more quantitative, data-driven methods on the wider European project.¹

The process of analysing visual research can take many different forms and the subjective and diverse nature of the material can mean that the work defies neat, clear-cut or all-inclusive categorisations and conclusions. Instead, the process of analysing this research has been an exciting one, full of blurred boundaries and interesting overlaps.

It is important to note that this was not a study of people’s drawing skills or observational drawing proficiency (Kozbelt and Seeley, 2007). By asking participants to draw a physical representation of the invisible we were asking them to take part in a conceptual drawing exercise and as such, the study intends to focus on the ideas, thought processes, emotions or experiences that the drawings seek to communicate.

What we found in the material are myriad associations between images, compelling ideas and drawing processes and intriguing uses of colour that illustrate the abstract concept of energy. We developed what Mitchell (2011) would call a ‘conceptual framework’ to allow us to analyse the drawings in a way that is befitting of our method and research subject, and we have therefore analysed the images in two distinct ways.

Firstly, we have looked at the subject matter that is presented in the drawings: the physical objects that people employed to illustrate their personal ideas about energy, the conceptual references or associations that they made (‘household electricity’ as opposed to ‘emotional energy’, for example) and whether their portrayal shows the matter of energy itself (lightning, aura etc.), the effects of it (heat, light), the infrastructure or objects that support it (wires, light bulbs), or something altogether different. We looked at what features heavily and what associations are frequently made, and asked what this says about energy in the public consciousness. Through this process a set of classifications emerged which frames the collection in this book.

Secondly, given the inherent nature of energy, we considered ideas of presence and absence in the drawings. We looked at what is not drawn, examining the images or ideas that might be represented, as well as those conspicuous by their absence.

¹Please visit http://suslabnwe.eu to see the complete range of project activities.
We also thought about the use of colour and of different drawing materials, looking at how people attempted to give form to energy on the page. We asked what the limitations of the research design were and how these might have informed the outcomes, as well as to self-examine and reflect on our own processes and potential bias.

Through this framework we hope to present the drawings on their own terms, in line with the exploratory nature of our research question, and share the enthusiasm and sense of experimentation that our participants showed on the study.

The Subjects We Saw

In studying the drawings we began a process of clustering, or categorising all the pieces in the collection. These were quite fluid groupings at first that offered different lenses through which we could view and think about the material. We looked for relationships and commonality between pieces, recurring themes and shared concerns, but we also considered the divergence or contrast in what the drawings seemed to communicate – those examples that counter one another, or which could exist in a category all of their own. The richness and subjectivity in this body of work means that we felt our groupings were by no means definitive, and in something of a kaleidoscopic way, the categories can shift, reorganise, create new constellations and suggest new ways of thinking about the drawings for each individual viewer. Here are the subjects we propose:

Nature/Culture
Many drawings depict the ‘end points’ of the power we use in everyday life: the light bulbs, plug sockets, batteries or wires that fill British homes today. They are products; part of the energy infrastructure and in a way emblematic of energy in contemporary culture. These images speak of end use, of daily interaction, immediate access and an at-our-fingertips kind of power. Time, convenience, connectivity and the domestic are important considerations in these images as they seem to reference the instantaneous, on-demand moment of connection we have with physical power on a daily basis. Importantly, they also speak of the human scale that the energy system ultimately translates into. Rather than consider the National Grid, or power stations, for example, they present the visible points of contact that people have with the energy system and show how the people behind these drawings experience energy in their immediate environment. A few children’s drawings also show images of food, two in fact show hamburgers, one labelled with the word ‘food’. While this is certainly distinct from the other products discussed above, it similarly relates to the ways in which people gain, come into contact with and benefit from energy sources.

Of all the domestic products, we see light bulbs, most often (15 times) throughout the collection. Studies on energy conservation (see Attari et al., 2010 and Kempton et al., 1985) have identified that people suggest actions such as turning lights out when leaving the room as an effective way to save energy, when it actually saves relatively little compared with heating and air conditioner use. This may be because lighting is often the most visible use of energy at home. We do not see the power running our computers or heating systems in the same way as turning on a light instantly and visibly changes the whole room. Therefore drawings of light bulbs could be representations of the most visible form of energy, and perhaps this recurring presence suggests that people are more aware of the visible ways they use energy than they are the invisible ones.

In the collection, there is a drawing of a Wi-Fi symbol. It is a small pencil drawing, only a few centimetres across, leaving a lot of white space on the page. It was created by a teenage student in the ArtScience Prize study, and it is interesting that it equates a symbol typically associated with the Internet, with energy. No other drawing does this. One shows a computer and mobile phone (this was created by a child), but overall, the Internet and digital technologies rarely appear across the sample. In this second picture we also see a battery,
a light bulb, plug socket and a TV and remote control – everyday electrical items – all seemingly floating in space among lightning bolts, a cloud and rain drops with the sun shining down from above. It is surely one of the most energetic of the drawings of household energy products, suggesting the renewable ways in which they can be powered and the vibrancy of the energy they contain.

So whilst visualising energy through new technologies is not yet commonplace, where it does occur is in the work of children or teenagers. Perhaps if this study were conducted again years into the future we might find that wires or incandescent light bulbs no longer feature. In this sense, the drawings can be seen as being of their moment and representative of contemporary culture and context.

Quite in contrast to images of manufactured products and technologies, there are also many images of nature referencing plant or animal life, the elements and environmental conditions. There are images of the sun and lightning bolts, five drawing of waves, four trees and six flowers, which collectively seem to represent the full range of force and power within the natural world. The sun could be read as the original source of energy, and waves and lightning as powerful forces of nature. In fact, we see lightning bolts 13 times throughout the collection, and (at the time of writing) a lightning bolt is also the first image on Wikipedia’s Energy page (2015), so perhaps this particular aesthetic has been adopted into our collective conscious as a symbol for energy, for example, via its use in battery charging iconography. How might more widespread adoption of electric cars affect this?

Some of these drawings could be representations of strength and danger, of ‘larger than life’ power that can be threatening and overpowering if untamed or unexpected. Lightning, the sun and waves are perhaps the kinds of energy we are enthralled to, or in awe of, and which operate independently and of their own accord (unlike light bulbs and batteries which contain energy in manageable, constant and predictable ways). However, these natural forces are also some of the ways through which we harness energy for our own ends, (Wikipedia’s photo also has a caption noting the number of megajoules in a typical lightning bolt) and in that respect this could suggest the ways in which we dominate, or take advantage of nature and utilise it for our own ends. One lightning bolt drawing is labelled with the word ‘free’ and it thereby presents not just the energy of this natural phenomenon, but perhaps also speculation about how it could be harnessed as an inexpensive resource.

This sets up an interesting duality in our collection of images: in those discussed so far we can start to see a contrast or tension between the wild, which are in many instances (although not all) large-scale and potentially overpowering forms of energy; and the harnessed or the tamed, which is often energy that has been captured to be of service to people. It is also interesting to consider the perspective of the image-maker – the person doing the drawing – how they relate to the forms of energy they have depicted. Some image-makers may have drawn energy as it relates to them and some may have drawn the sources of renewable energy that we capture. In that sense, they have illustrated a starting point in the energy system whilst others may have sought to depict energy in its purest form, entirely beyond the limits of the engineered, human-made energy infrastructure.

As Berger (1960) also wrote: ‘[a] drawing is an autobiographical record of one’s discovery of an event – seen, remembered or imagined.’ So through the act of drawing (perhaps particularly when the subject matter is invisible, as there are no physical cues to respond to or be constrained by) we learn about an individual’s experiences, memory and ideas, in relation to that subject.

We saw many people relate energy to their everyday experiences of it through commonplace commodities and conveniences, through which it has a tangible presence in their home or about their person. But simultaneously, we have seen depictions of energy in the natural world. This section then might also have been called Indoors/Outdoors or Human/Non-human, as it details those things created for human consumption and the domestic space, and those other systems and ecologies completely outside of that, not designed for people at all.

In this more spatialised reading we can see how we bring energy close to us through products and manufacturing – within reach and with safety and reliability – whilst lightning bolts or whirlpools are the kinds of energy that we keep at a safe distance: in systems with which we do not directly interact, but which we view and marvel at from afar.

**Abstraction**

Whilst in the previous section we discussed drawings with a broad range of subject matter, what these images had in common is that they were all representational. However, many of the other drawings in our sample are abstract.

There are images that are very concerned with colour and form, but suggest no explicit connection to, or association with, the objects or entities around us. We see swirls, zigzags, amorphous shapes, lines and blocks of colour across all the sample groups. One image is all bright orange and red, whilst another uses layers of colour to create a wash of deep blues and purple. Perhaps these images seek to visualise the matter of energy itself, to materialise the invisible, rather than to depict those elements or artefacts that either embody energy, or allow us access to it. Or perhaps they directly address the formlessness of energy, the way it is not neatly articulated in a precise and defined shape and cannot be pointed to, but exists intangibly all around us. Through this comparison we can see that the previous
set of images depicted how energy is contained, while these drawings might do exactly the opposite.

But even in this range of abstract images, we see diversity. One drawing from the Life Examined exhibition shows a simple horizontal blue line across the middle of the page, reaching almost to the edges – a single mark on which to focus our attention – while another from the same group of participants, depicts a knotted, frenzied and chaotic mix of lines of different colours and trajectories. Whilst one drawing seems to suggest calmness and clarity, and the other speaks of disorder and confusion, they could both refer to energy’s ubiquity and constancy. So there are parallels to draw, even in this seeming divergence, and it is interesting to consider how similar principles can be expressed in very different visual forms.

Another set of images appropriates symbols to address the behaviours or properties of energy. One drawing shows the mathematical infinity symbol, drawn over and over to emphasise the repetition and another shows what looks like a reading from a cardiograph or seismograph. A third, meanwhile, a flurry of arrows across the page, is annotated with the words ‘it comes and it goes … somewhere’. Flows and pulses are present across the sample groups, and as with the pastel illustrations of equations (E=mc² and an equation for nuclear fusion), we see many ways in which people have invoked the symbolism, the shorthand and the visual language of energy to refer to its characteristics and cultural or personal relevance.

Process Drawings
At the V&A, the third and final strand of our study, we were able to offer the participants a wider variety of materials to work with than we had previously. In the first two studies participants used pens and pencils, but in the third we added chalk pastels and ink and brushes.

Over the two days of the study (in which time the tables became increasingly stained and the materials looked worn and less precious), participants became more experimental with their drawings and freer with the materials. By the end of the first day people began to produce what we could call ‘action drawings’ or works wholly concerned with the process of their making. Several people dripped ink from above the paper; one person used a brush to draw circles then blew the ink across the page – leaving the trace of their energy in the path of the ink. Another three people (who didn’t know each other beforehand) collaborated on a drawing, each making marks in pastel for five seconds, simultaneously. The resulting piece is the evidence of their energy on the paper.

These images are non-representational, but they are records of the energy that has been exerted in their production. They are concerned with the paper, materials and the action of making – the drawing is a three-dimensional object and the result of an energetic process, not a picture plane (Greenberg, 1961).

And Others
There are several other images in the study that don’t fit squarely into the categories above and some that could fit into a category all of their own. Emotional energy, or human energy can be seen in pictures of hearts and maybe in an outline of the image-maker’s hand. One drawing shows brightly coloured rays emitting from (although it could be into) a person’s eyes and mouth. One child drew an archery scene, another, a self-portrait on a scooter, while ‘Energy of a Leader … Inspiration’ takes us away from the idea of a physical power altogether and asks us to think about charisma, vision and will as forms of energy.

Antony Gormley’s Quantum Void (2008-2010) sculpture series and his Energy (2003) etching, also address the body’s relationship to energy and the space it inhabits. We can see therefore how these images of human energy and the energy of the body speak to a longer tradition within fine art that explores this territory.

There is great breadth in the themes addressed by the participants. The drawings do not simply address the issues of the energy infrastructure, or environmental concerns. Instead they show us a much fuller scope of the ways in which people think about energy. The diversity, the contrast, the unexpected and the anomalies all serve to broaden our thinking on this subject, rather than to narrow our definition of it.

What We Do Not See
As well as all the subject matter that the drawings do represent, there are many issues that they do not address, and we would like to briefly consider the significance of some of what has been left out.

Several drawings show energy sources or supplies, but these are nearly all renewable. Alongside the drawings of the sun and waves, we see images of wind turbines on eight occasions, and from the Life Examined exhibition we find a new proposal for harvesting rainwater. Electricity pylons, which are a common feature of the British landscape, and a much longer-standing and more established infrastructure than wind turbines – the first pylon was erected in 1928 (National Grid, 2014) and the first wind turbine in 1991 (Nixon, 2008) – do not feature at all.

The prevalence of renewable energy in the drawings is also intriguing when we consider that it remains a minority energy source across Europe. In the UK, renewable electricity accounted for 18 per cent of the total electricity generated
in the third quarter of 2014, which was an increase of 4.2 per cent on the previous year, but coal and gas accounted for 58.5 per cent of electricity generated (DECC, 2014c). The energy mix in Europe is changing: the UK’s target is for 15 per cent of all energy consumption to be from renewable sources by 2020 (DECC, 2011) and across Europe renewables are forecast to account for 16 per cent of total residential energy use by 2020 (E3M-Lab, 2013). However, our energy supply is still heavily dominated by fossil fuels and this is scarcely represented in the drawings. The emphasis we see on renewables is likely not to be people’s lived experience. Instead, the drawings may look to the future, to imagine what will or could be, rather than intending to show what is at present, or has been in the past.

Nor is the fierce political debate that we often hear – or media coverage of the costs of energy in the UK – depicted in the images. In the winter of 2012/13 all of the UK’s ‘big six’ energy companies increased prices by between six per cent and eleven per cent (Bolton, 2014). In early 2015 we are currently witnessing a fall in the cost of fuel due to reduced wholesale gas and oil prices (2015), but in recent years the cost of domestic heating has become increasingly expensive and it was the subject of much public debate (see for example, Boffey, 2015 and Massy-Beresford, 2014) over the course of the drawing study. Yet these worries or unsettling realities are not represented in the images.

Another interesting omission from the drawings is numbers (and units such as kilowatt hours). When we talk about energy, in terms of what we use and how much it costs, we typically quantify it – even our domestic bills rely on this information. Energy suppliers usually communicate to their customers in measurements – and real-time quantitative feedback for householders is a major plank of UK energy policy (DECC, 2009). But apart from equations, the drawings do not portray numbers, and we therefore see no reference to one of the principal ways in which energy is talked about, or to the idea of quantities at all. This raises questions about how effective or useful quantitative metrics are for people in thinking about energy. Might other modes of communication or explanation be more valuable in engaging people in a dialogue about energy consumption?

There may be many reasons for omitting these realities of energy in day-to-day life. As we have suggested with the drawings of renewables, perhaps by not depicting energy meters and bills, people are considering how they might experience or ‘see’ energy in the future, rather than simply how they do currently. We could look at these drawings as insights and suggestions for how people want to engage with energy – so what would be helpful or thought-provoking kinds of visualisations? And how could we support people in thinking about the political and ecological systems in which they play a part, rather than talk to them purely about the money they owe?

Considerations

In the drawing collection we see some strong themes in people’s visualisations of energy, but it is important that in our interpretation of this we consider some factors in the research that may have informed these outcomes.

The studies in the Life Examined exhibition and the Digital Design Weekend were both held within broader exhibition contexts and the participants were therefore all engaged with cultural events and design. Beyond this, there was no classification of their age ranges, occupations, or backgrounds. The students in the ArtScience Prize were the only group of a particular age range: they were all teenagers (13 to 18 year olds) working on art and design ideas inspired by the theme: ‘Energy of the Future’. All of the participants could be said to have an interest in art or design, and this could have influenced the collection of images.

As the study was conducted in three different phases and locations there were inherent differences in the way each was structured. In the Life Examined: exhibition participants drew on an angled board, at the V&A participants drew on tables, while at the ArtScience Prize many students chose to draw with their paper on their laps.

As we discussed with the V&A study, participants began to use the pastels and inks to create process-drawings, which had not happened in the previous stages. The inks, for instance, allowed new kinds of mark-making, but also the workspace became messy very quickly and traces of earlier participants’ activity began to build up on the table. Drops of ink, lines from felt tip pens and dust from the pastels were there for later participants to see. Completed drawings were also hung on the wall, so participants could see some examples of earlier work. These factors changed the nature of the workspace: they showed what was possible with the materials available and they helped to create a space in which participants could be more confident about being experimental with the drawing they produced. At the Life Examined exhibition participants created their drawings in the midst of new design work on display, and the ArtScience Prize study was held during a workshop day in which students were developing project ideas about energy as part of their programme.

All three strands of the study were conducted in either workshop or exhibition contexts, environments in which participants were encouraged to explore and create, which valued new ideas and even future visions. It is possible therefore, that these conditions encouraged participants to express new ideas for what energy could be, or what they would like or expect to see in future, rather than to illustrate
their experienced realities. This could have happened even though in conducting the study and in introducing participants to it, we ensured that we asked them to respond to the same question: *What does energy look like?*

As we have also discussed, energy is an often fiercely debated political topic, and as the phases of the study were conducted at different times, it is possible that public debate could have informed the participants’ drawings in different ways. We recognise that these conditions would likely have influenced the outcomes of the study, but we hope that the stimulating environments in which it took place served to encourage participants to be confident and ambitious with the images they created.

We also acknowledge that the sample groups who took part in the study are not necessarily representative of British society as a whole, but we see this project as a way of uncovering individual views and ideas about energy that are not normally publicly expressed.

**Reflections**

Considering the collection as a whole, it is noticeable that many of the drawings convey an optimistic, enthusiastic or environmentally conscious tone. Four drawings feature hearts, one of them beating. Several depict the globe, and one, the entire universe. One shows a sun with a smiley face, while another – an entirely written response – includes the statement: ‘Without energy life becomes miserable’. Next to a drawing of a light bulb another reads: ‘Energy is light, an idea, excitement, positivity’ and an illustration of a magician with a wand is annotated with: ‘Energy is magic’. Across all sample groups, we see evidence of a positive approach to the idea of energy, and not one that we could definitively call pessimistic.

What people have drawn in terms of technology at least, leans towards the future rather than towards the historic, but in other ways the results are more divergent. We find that across the sample the definitions of energy are varied. The drawings link to personal history and emotions, but also to infrastructure and systems. They stretch across scales, from the human and engineered, to the natural and untouched; and they are concerned with the political and environmental, the aspirational and the unique, as well as the ubiquitous and the everyday.

Perceptions of energy are, of course, very subjective. But in presenting these varied and sometimes opposing views, we think this study has reflected on some of the enormous complexities in what we often experience as simple daily realities. What has been produced is a diversity of representation, and through the associations and interpretations shown here, we think that this collection of drawings presents an exploration of how the subject of energy is culturally constructed.
Patterns of movement:
energy in circles, waves, zigzags and arrows
Energy by a graphic designer

Energy by an architectural designer
Plant and animal life
A brain,
by an architect

Previous page
Energy as a blaze
of colour

This page
A battery, by a
design engineer

44

45
Below and opposite
Experiments with ink: Painted on and then blown across the page, and a drawing by a retired man who had never used a brush and ink before.
Three people drawing simultaneously, for five seconds.
Ink dripped on the page from above

This page
‘Energy Source’: abstract patterning and graphic lettering
Travelling in all directions
This page
Energy as seen by a fast-food franchise owner and mother of three

Opposite
Swirls by an animator and a graphic designer
Energy by a photography student

‘Energy’ by a designer
The abstract shape of energy, by a twelve-year old

Emotional energy, by an events coordinator
Above
A pastel seascape, created by an artist from Cornwall

Previous page
Energy through the eyes of an eight-year old

Scientific energy, by a writer/theatre director
Previous page
A ten-year old explores both the abstract shapes and physical objects of energy

This page
Lines of energy by an electrical engineer

Below
'And radiating, colourful energy', by a cat lover
Above and opposite
Natural forces, manufactured objects and a drawing of a WiFi symbol: how the next generation see energy
Above
‘50% IRON’

‘Creativity meets science, or at least I hope’
Why does it all not matter?
The Bigger Picture

The Bigger Picture

The drawings clearly show diverse interpretations of energy and most are vastly different from the ways in which energy is regularly communicated by energy companies through the media and the energy infrastructure. As we have seen, none of these drawings show energy meters or bills and none of them use the visual language of these dominant interfaces. Numbers primarily feature in mathematical equations, not in relation to amounts of energy used.

This disparity suggests that the ways in which we think about energy and the ways it is communicated to us are vastly different. What might our energy system look like if it were informed by the images of this study? How dynamic, colourful and relatable could it be? What if our energy meters showed us swirls, waves or drips of colour, textured, layered and changing over time, alongside our different daily activities? What if our bills showed us cups of tea and hours of television, rather than kilowatt hours? Would this help to create a very different relationship with the energy we use at home? Moving beyond the kilowatt hour – perhaps through new ways of representing units – is another possibility that emerged through our research. It is a question that requires further investigation, but if changing the terminology could support people in understanding the subject in new ways, it is surely something worth exploring.

Looking across the collection of images, it seems that the drawings humanise the subject of energy and could go as far as to change the conversation about it. Current public debate often centres on the cost of energy for households, global markets, environmental concerns, or pressures on the National Grid – all of which are of course critical issues to address. But what the drawings add to that conversation is fine-grained detail on the everyday user experience and individual understanding of national and international systems. What’s more, and perhaps most interestingly, the images present the potential of what energy could look like: optimistic ideas of what energy might be in future and the ways in which people could relate to it.

There is great opportunity to reinvent the visual language of energy and the media through which it is communicated. We are increasingly seeing energy displays on phones and tablets, but there are surely other areas to explore: linking appliances, integrating displays into them, expanding on the visual to include other senses (e.g. sound: Lockton et al, 2014), or the form of objects (e.g. Bergström et al, 2013), finding new connections with time and routine (e.g. Broms et al, 2011) or even with architecture itself. As we see through the drawings, this invisible infrastructure can be interpreted, represented and understood in any number of ways, which creates great freedom for designers who choose to engage in this field. The drawings reveal a wealth of new design opportunities that exist in the
energy sector to make images or perceptions of energy more connected to the lived experience of it.

From the in-home interviews we conducted with participants ahead of the drawing study (discussed in The Research Process) a number of valuable insights emerged that also illustrated people’s understanding of energy in interesting ways. We found that even when people use energy in very different ways (and in different quantities), they do not set out to be wasteful. They are trying to cook, keep the house warm, work, or watch TV, among many other things. They are carrying out the routines of daily life and juggling everyday activities and demands. Energy is a peculiar resource not only because of its invisibility but also because it is nearly always used as a means to an end. People do not just want to use energy; they want to do the things that energy enables. Thinking about it like this, it might in fact be counterproductive to ask people to reduce their energy use. Perhaps instead we should be asking ‘what are the new ways in which we can light our homes, stay warm, or prepare our meals?’ Shifting the emphasis and focusing instead on the goals people are trying to achieve as part of everyday practice might be a more constructive, people-centred approach to addressing our energy needs and designing new solutions for them.

Householders are of course not alone in their energy use. The products we use, the design of our homes, gas and electricity supplies and political decisions are all also influencing factors in our energy use and it is important to remember these contingencies. New designs could support not only energy interfaces and the ways people ‘see’ their energy, but creating new business models in conjunction with this could also support people to reduce energy use and drive a shift to the use of cleaner sources of energy. Through our research we have been fortunate to meet many people working in this area who have lots of new ideas to transform the energy system (energy start-up Open Utility, for example, is seeking to challenge the status quo by creating a peer-to-peer energy market that might offer new kinds of interaction and cleaner energy supplies for many households and businesses).

More support is needed for these kinds of ventures. Government and established energy companies need to nurture new initiatives and listen to the needs of individuals to create a sea change in our relationship with energy. Throughout this study we have found great enthusiasm from the public to engage with energy issues. People are excited by the opportunities that the energy system affords. Typically, they do not set out to be wasteful and they do not want to cause environmental damage through their daily activities. The passion and ideas displayed in these drawings suggest there is strong public appetite to transform relationships with energy, but that people should be engaged in exciting, productive and meaningful ways.
Many people took part in our drawing study. We have not been able to publish all their work in this book, however more of the images are published online at http://drawingenergy.rca.ac.uk

We would like to thank every contributor personally. Not everyone who gave us a drawing gave us his or her name. Thank you to all those anonymous participants as well as the 150 people listed here.

UK ArtScience Prize 2014 students

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Some of the drawings in this collection are anonymous, but where we are able, we have credited the artists individually at the end of this book.

Thank you for sharing your thoughts, ideas and images of energy with us.
The Royal College of Art SusLabNWE Team

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