MONASH University

HOUSEHOLD ENERGY GLOSSARY

DECEMBER 2024

Dr Rex Martin
Dr Fareed Kaviani
Dr Kari Dahlgren
Ms Yidan Gao

EMERGING
TECHNOLOGIES
RESEARCH LAB

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Authors
Dr Rex Martin
Dr Fareed Kaviani
Dr Kari Dahlgren
Ms Yidan Gao

Illustrator
Stacy Gougoulis

Editorial Design
Yidan Gao

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We wish to acknowledge the people of the Kulin Nations, on whose land we at Monash work. We pay our respects to their Elders, past, present and emerging.

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Author Affiliations
Dr Rex Martin is a Research Fellow at the ANU Centre for Energy Systems at the Australian National University.

Dr Fareed Kaviani is a Research Fellow in the Emerging Technologies Research Lab at Monash University.

Dr Kari Dahlgren is a Research Fellow in the Emerging Technologies Research Lab at Monash University.

Ms Yidan Gao is an HDR candidate in the Emerging Technologies Research Lab at Monash University.

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MONASH University
EMERGING TECHNOLOGIES RESEARCH LAB

EXECUTIVE SUMMARY

Background

The increasing role of people in the energy transition has led to a number of communication challenges. These include communication challenges within the sector – particularly in how they describe people, and their assumptions about them – which shape their engagements and interventions. Communication challenges also exist between the energy sector and everyday people, who often operate with different understandings of similar terms.

Aims of this Report

- To enhance communication within the Australian energy sector and to bridge the communication gap between the sector and everyday people.
- To facilitate deeper understanding of social dimensions of the energy transition by considering the layers of meaning around contested concepts.

Drawing on insights developed through several years of social science research, we have compiled this Household Energy Glossary focused on 4 key concepts, divided into 2 parts:

Part 1: Communication within the Energy Sector

Focused on miscommunications that often arise from the use of related-yet-distinct terms by different members of the sector.

Consumers
(kənˈsjuːməz) ***n.***

How people are conceptualised in relation to the energy sector.
Related terms: *Customers, Consumers, Prosumers, Users, Households, Communities.*

Concessions
(kənˈseʃ.ənz) ***n.***

How hardship is conceptualised in relation to the energy sector.
Related terms: *Concessions, Energy Hardship, Energy Stress, Energy Poverty, Vulnerability.*

Part 2: Communication Between the Sector and People

Miscommunication also occurs when a single term is used differently by various stakeholders, potentially leading to conflicting interpretations.

Cost
(kɒst) ***n./v.***

How value and related tradeoffs are understood differently between the sector and people.
Related concepts: *Financial Costs, Time Costs, Emotional Costs, Environmental and Health Costs.*

Control
(kənˈtrəʊl) ***n./v.***

How management and responsiveness are understood differently between the sector and people.
Related concepts: *Control over Automation and Energy Management, Control over Comfort, Control of Data.*

Introduction

Rapidly shifting technology, policy, and physical environments are propelling unprecedented changes in the Australian energy sector, transitioning into a decarbonised and decentralised system where residential consumers play an increasingly important role.

However, there are differing understandings of key terms and concepts within what is a diverse sector. These perspectives often reflect fundamental differences regarding how stakeholders frame and understand important issues, such as how to understand people and their role in the energy transition. This can create difficulties in facilitating collaboration and actioning on challenges that require cross-sector cooperation. Similarly, research demonstrates that consumers' understandings of key terms and issues diverge in important ways from those dominant in the sector.

For the energy transition to be successful, and for people to be meaningfully included and have trust in the technologies and initiatives they are being asked to engage with, it is critical that we foster a shared understanding between different sector stakeholders regarding key terms and concepts. This involves better cross-sector communication between diverse stakeholders, but will also require that the sector as a whole better understand and engage with the ways in which households currently think about energy knowledge and systems.

The primary aim of this report is to enhance communication within the Australian energy sector and to bridge the communication gap between the sector and everyday people.

Drawing inspiration from other sectors where a glossary has been developed to promote interdisciplinarity and address miscommunication between diverse stakeholders (Crabtree-Hayes, 2024; Mansour et al., 2022), we achieve this aim by exploring, simplifying, and 'translating' key terms and concepts. We also use illustrations to explore different framings of these key ideas, and to contrast who and what is included or excluded by differing visions of the energy system.

However, this report goes beyond merely mitigating misunderstandings. It also explores how the terminology used within the sector shapes perceptions, approaches, and problem-solving strategies.

For example, labelling people as 'consumers' or 'customers' confines our approach to market-based interactions, while focusing solely on 'costs' as tariffs or prices overlooks other important considerations such as time, energy, and environmental impacts.

This glossary is also a means of highlighting how the language we use can perpetuate misunderstandings about the social realities that are essential components of the energy transition. For the energy sector to successfully engage with the public and navigate the energy transition, it must develop a deeper understanding of these social dimensions.

The way we name and describe concepts influences how we understand the challenges associated with them and envision potential solutions.

The recognition of the impact of terminology is evident in the recent shift in the sector from 'Distributed Energy Resources' (DER) to 'Consumer Energy Resources' (CER), a change led by Energy Consumers Australia. This shift aims to refocus attention on the people who own, use, and influence these technologies. (https://energyconsumersaustralia.com.au/news/death-to-der-why-we-need-to-change-the-language-we-use-for-the-energy-transition)

We agree with this shift, but see it as only a first step. The energy sector is full of terms that suffer from similar misalignments. In this report, we concentrate on four key areas of contested terminology that have emerged throughout our research projects: **Consumers, Concessions, Cost, and Control**.

We have identified these as the core areas where miscommunication and misalignment within and between the energy sector and the public are most pronounced.

The report draws on energy social science research we and others have completed through related research projects over the last 5 years, including:

1) Engaging Households Towards the Future Grid (2019)
2) Digital Energy Futures (DEF) (2020-2023)
   - Review of Industry Trends, visions, and scenarios for the Home (2020)
   - Future Home Life (2021)
   - Demand Management Opportunities (2021)
   - Foresights for Future Living (2022)
   - Scenarios for Future Living (2023)

Relevant Reports

3) Future Home Demand (2023)

Throughout these research projects, we have consistently encountered discrepancies in how everyday people and the energy sector interpret critical terms.

These differences often result in misunderstandings and miscommunication between households and the energy sector, exacerbating the frustration of those trying to navigate the complex and confusing energy landscape.

This has driven us to utilise insights from these projects, alongside research from other energy social scientists, to create this glossary. Our goal is not only to foster better understanding but also to emphasise the power of language and concepts in shaping how issues are framed, and thus which solutions are considered viable.

In previous research, we have identified 4 core areas where miscommunication and misalignment within and between the energy sector and the public are most pronounced. There are often miscommunications within the energy sector and between the energy sector and people. This report examines two key dynamics in the use of terminology, and is separated into 2 parts reflecting these:

1. Within the Energy Sector: Miscommunication often arises from the use of related-yet-distinct terms by different members of the sector.

- **Consumers:** how people are conceptualised in relation to the energy sector
- **Concessions**: how hardship is conceptualised in relation to the energy sector

2. Between the Sector and People: Miscommunication also occurs when a single term is used differently by various stakeholders, potentially leading to conflicting interpretations.

- **Cost**: how value and related tradeoffs are understood differently between the sector and people
- **Control**: how management and responsiveness are understood differently between the sector and people

The remainder of this report will describe in detail the various interpretations and terminologies related to each of these 4 core concepts.

Part 1:
Communication within the Energy Sector

Part 1 of this report describes concepts and terms where miscommunication often arises from the use of related yet distinct terms by different members of the energy sector, focusing on:

Consumers
(kənˈsjuːməz) ***n.***

How **people** are conceptualised in relation to the energy sector

Concessions
(kənˈseʃ.ənz) ***n.***

How **hardship** is conceptualised in relation to the energy sector

Consumers

(kənˈsjuːməz) ***n.***

How **people** are conceptualised in relation to the energy sector

Introduction

People are referred to in a number of different ways in the Australian energy sector. They may be positioned as 'customers' of a business, 'consumers' (or 'prosumers') of electricity and other resources, 'users' of a technology or service, 'householders' when considered as part of a home unit, or as 'members of the community' when underscoring their connectedness to others (Nicholls et al., 2021, pp. 22–23).

These and related terms are sometimes used interchangeably. However, they typically reflect a particular understanding or framing of people that illustrates the diverse disciplinary knowledge and norms represented across the energy sector. As noted in our earlier research (Nicholls et al., 2019), the absence of a centralised and coordinated engagement strategy also reduces the ability for the sector to meaningfully work with the everyday Australians who are playing an increasingly important role in the energy system. For these reasons it is important to understand the meanings of, and differences between, these various ways of referring to people. This section explores common ways in which people are referred to across the Australian energy sector.

Related Terms: Customers, Consumers, Prosumers, Users, Households, Communities

Customers

The term 'customer' describes 'someone who pays the bills [and] consumes' (Norman, 2006, p. 46). The term customer reflects an economic perspective that foregrounds transactional relationships and frames people primarily within acts of economic exchange, such as purchasers of energy or network services.

Emphasis is often placed on customers as individuals, with potentially overlapping but nonetheless personalised preferences and needs (Dahlgren et al., 2020, p. 34).

The word customer is widely used across the sector, particularly in the context of utilities, energy retailers, and other businesses. As evident from a review of industry reports, the customer is also a central concept in future visions of the energy system, where customers' expanding expectations of the energy system are anticipated to drive changes in the services offered, and the infrastructure managed by the sector (Dahlgren et al., 2020, p. 34).

The term customer may inadvertently prioritise economic considerations in relationships or activities which are not inherently transactional (Nicholls et al., 2019). For example, while the cooking of food may require electricity to be purchased, this transaction is only a means to an end (i.e. preparing a meal).

Consumers and Prosumers

In simple terms, 'consumer' refers to someone who purchases and consumes a good or service. In the energy sector a consumer has typically described someone who buys and uses energy (i.e. the bill payer). However, as CER and financial markets both proliferate and grow in complexity, people are increasingly using technologies like energy management systems or platforms enabling electricity trading to optimally manage their energy and participate in the energy market. Thus, a consumer increasingly describes someone not only using resources (like electricity), but also new services in the energy system (Dahlgren et al., 2020, p. 22). With the rise of consumer energy resources such as rooftop solar PV, it is increasingly common to also see reference to 'prosumers' – meaning both producers and consumers of energy. This terminology can be helpful in accounting for some of the changing ways that people act in and upon the energy system.

The terms consumer and prosumer can be helpful in understanding the flow of resources within a system, and reflect common framings in the energy sector such as systems-style thinking, a focus on efficient resource allocation, and issues of price, supply, and demand (Shove & Walker, 2014).

Nonetheless, it has been noted that the language of consumers and prosumers artificially foregrounds the acts of consumption and production, while overlooking the purposes for which energy is consumed, including cooking, heating, and entertainment (Shove & Walker, 2014). Similarly, dynamics that may not include or overtly emphasise resource consumption or economic exchange – such as consuming energy in acts of care, or donating excess electricity to a neighbour – do not fit neatly into the language of consumption (Strengers et al., 2023b).

Users

In general terms the word 'user' refers to someone who uses or operates something. As employed in the energy sector the term user is often applied in the context of the smart and energy technologies increasingly found in people's homes (Strengers et al., 2021).

For example, people engaging with CER, technology platforms like peer-to-peer energy trading, or related energy technologies like energy monitors or mobile apps, could all be considered users. Focusing on the person or parties who directly engage with a product is helpful in identifying target markets or operators, and this language is generally linked with areas of the energy sector involved in developing or marketing technologies (Dahlgren et al., 2020).

One challenge with the terminology of the user is that others who are affected by a product – but do not themselves directly engage with it – may be overlooked by the emphasis placed on users. A common example concerns smart and energy technologies and demand management programs, which literature has found are commonly adopted, maintained and used by men, but nonetheless impact on the lives of other people in a household (Kennedy et al., 2015; Martin, 2022; Strengers et al., 2021, pp. 122, 126).

Households

‘Households’ (or householders) is a term used to describe people in a way that situates them within the context of their everyday lives, their connections with the people (or pets) they reside with, and the home in which they live (Strengers et al., 2021). The term households contrasts with terminology that focuses on individuals, and which emphasises economic considerations (customers) or engagements with technology (users), instead focusing on what people use energy for, rather than how they relate to energy or the energy system.

Using households rather than individuals as the unit of analysis is common among some researchers (particularly social scientists), but also finds currency in community sector reports and other work where people are framed in relational – rather than transactional, or individualistic – terms (Dufty, Johnston, & Consulting, 2023; Energy Consumers Australia, 2023).

Nevertheless, emphasis on the household has also been critiqued for overlooking the heterogeneity that can exist within a household, and for focusing on traditional household compositions (such as nuclear families) that exclude other important forms of living arrangements (such as shared housing, or single person homes) (Nicholls, Strengers, & Tirado, 2017).

Communities

‘Community’ or ‘community members’ are terms that describe people in view of their connections to others (particularly beyond the home), and their embeddedness in place including society and environments.

Community is commonly used in cases where there is a focus on shared and localised infrastructures, such as community-batteries, microgrids or public electric vehicle (EV) chargers, but is also employed in instances where the views of a broader or spatially distributed group are sought, such as residents of a region, members of a cultural or socioeconomic group, or when discussing Australian civil society at large (Dahlgren et al., 2020, pp. 46–47; Nicholls et al., 2019, p. 51; Strengers et al., 2023b).

Community also recognises the embeddedness of people in their environments, and thus often involves greater recognition of concern with the environmental impacts and broader ethical orientations of energy use.

Concessions

(kənˈseʃ.ənz) ***n.***

How **hardship** is conceptualised in relation to the energy sector

Introduction

Energy is an essential service, but when provided through a market system, it can place significant burdens on household finances. There are several ways in which the burden of energy costs on households is understood, including how it relates to other financial stresses. Identifying and understanding these hardships is crucial because it influences the types of interventions and proposals for alleviating this burden.

It also shapes the economic supports that are available and accessible to people, and informs the design of the future electricity system, taking into account, or not, the various vulnerabilities it might create for different households. The concepts of energy concessions, energy hardship, energy stress, energy poverty, and vulnerability are all used within the energy sector by different stakeholders, but they each signal different focuses and require different interventions.

Related Terms: Concessions, Energy Hardship, Energy Stress, Energy Poverty, Vulnerability

Concessions
(kən'seʃ.ənz) ***n.***

Concessions

Households in Australia holding an eligible concession card issued by the government can receive discounted rates on their energy bills. These concessions are used by the government and the energy sector to mitigate energy burdens by providing financial reductions in energy costs. They are designed to support individuals facing vulnerabilities related to energy use.

Concession eligibility often depends on participation in other government assistance programs, with variations across states. All states offer concessions to holders of various concession cards, such as the Pensioner Concession Card, Health Care Card, and Department of Veterans' Affairs (DVA) Gold Card. Many states also provide rebates for households using life support or other medical equipment. The type and level of support differ, with Queensland offering specific rebates for asylum seekers and Victoria providing concessions for those using non-mains energy sources like firewood or bottled gas. Medical Cooling and Heating Concessions are available in Victoria, Tasmania, South Australia, and Queensland, while New South Wales and Queensland offer emergency assistance for those experiencing short-term financial crises.

While these concessions aim to address various reasons households may need financial assistance, many eligible individuals remain unaware of the available energy concessions and rebates. Approximately 62% of concession card holders have not applied for energy concessions on their bills in the past six months, often due to a lack of awareness and knowledge about these programs (Botha & Prakash, 2024). Culturally and linguistically diverse (CALD) households are particularly affected, and frequently excluded from applying for energy concessions due to language barriers and limited energy literacy (Gordon et al., 2024). Moreover, as the following sections illustrate, not all vulnerabilities are accounted for by the various government-run concession programs.

Concessions
(kən'seʃ.ənz) ***n.***

Energy Hardship

Energy hardship is typically defined as the inability to pay one's energy bills. Energy retailers offer hardship programs to support customers who are struggling to meet their energy payments. However, the criteria for hardship and eligibility for these programs are largely determined by the retailers themselves, making it challenging to standardise or recognise energy hardship across the board. Additionally, energy hardship may not always be apparent when a customer is not in significant debt. Many people prioritise paying their energy bills at the expense of other essential needs, such as food or healthcare, often out of fear of disconnection.

As a result, individuals adopt various coping strategies to manage their energy usage and expenses. Some rely on public resources, such as visiting public places to stay warm or cool, while others turn to social connections for assistance. These coping mechanisms illustrate the often-hidden struggles of individuals facing energy hardship, even when their financial distress does not manifest in unpaid bills or significant energy debt (Willand, Torabi, & Horne, 2021, p. 30).

Energy Stress

Energy stress is measured by evaluating the percentage of household income spent on energy. A high proportion of income spent on energy is generally defined as more than 6% of before-housing disposable income or more than 7% of after-housing income (Bryant et al., 2022 p. 4). This metric captures the intersection of low income with high energy bills, addressing not only income-related categories of hardship but also how income aligns with energy needs. It highlights the high energy costs that low-income households are likely to face due to various intersecting challenges.

For example, people living in low-quality housing often encounter significantly higher energy bills. Poor housing quality, typically marked by inadequate insulation, makes it difficult to maintain a comfortable temperature, and the use of appliances to achieve this can become prohibitively expensive.

Moreover, inefficient appliances, which are often older or more affordable upfront, tend to have much higher operating costs. Lower-income households typically have fewer opportunities to replace these appliances with more efficient alternatives, forcing them to continue bearing high energy costs. Public and community housing tenants, in particular, experience some of the highest rates of energy stress (Bryant et al., 2022).

Energy Poverty

Energy poverty refers to the lack of access to adequate, affordable, reliable, and modern energy services (Simcock, 2020a). The term 'energy poverty' first emerged within the field of development studies, initially describing the lack of electricity access in less economically developed countries (Simcock, 2020b). Its scope has since broadened to encompass diverse energy-related challenges faced by the least developed regions to industrialised nations. Two main factors contribute to a lack of access:

1) Affordability: This relates to a household's inability to access sufficient energy due to financial constraints, determined by either the household's income or the price of energy.

2) Infrastructure: The lack of necessary energy infrastructure manifests differently in various global contexts: In the Global South it refers to a lack of widespread electricity infrastructure in society. In the Global North it refers to poor energy infrastructure in homes, including inadequate insulation in walls and roofs, inefficient windows, outdated appliances, and substandard heating and/or cooling systems.

The effects of energy poverty are experienced differently across populations (Samarakoon, 2019). Women, children, lower-income households and marginalised communities are at a heightened risk of experiencing the negative consequences of energy poverty. These groups face increased economic, health, and labour burdens due to inadequate energy access, exacerbating existing social inequalities. As global climate change intensifies, energy poverty may become more widespread, including in developed countries like Australia (Chandrashekeran et al., 2022). Factors such as extreme weather events, rising energy costs, population growth, and technological disparities increase the potential for energy poverty to affect a broader range of communities in the future.

Vulnerability

Energy vulnerability is a broader category that seeks to recognise the complex interplay of factors that make accessing affordable energy difficult for individuals or households. It includes financial challenges captured by the concept of energy stress and certain categories like disability, which may be addressed through concession programs. However, energy vulnerability goes beyond these metrics by acknowledging that many aspects of vulnerability are not fully captured by existing measures. This approach encourages the energy sector to consider the potential intersectionality of different forms of vulnerability, both now and in the future.

For instance, CALD households often face additional challenges, such as language barriers, which make it harder to navigate complex energy systems. Renters may experience vulnerabilities regardless of income level, as they often lack the ability to make energy-efficient upgrades to their homes or are forced to use inefficient appliances. These vulnerabilities are likely to expand during the energy transition, with disadvantaged households potentially missing out on opportunities like solar panels, household batteries, or EVs (Montoya, 2023). Moreover, those experiencing energy vulnerability are more likely to be impacted by fluctuating energy prices. Shifting to more cost-reflective tariffs may present some opportunities for low-income households, but it will also create winners and losers in the process, as emphasised by Nicholls et al. (2017). This makes it critical for the energy sector to closely examine how vulnerabilities may evolve in the future, ensuring that interventions are inclusive and responsive to the changing landscape of energy access and affordability.

Part 2:
Communication Between the Sector and People

Part 2 of this report describes concepts and terms where miscommunication occurs between the energy sector and everyday people, potentially leading to conflicting interpretations when a term is used or understood differently by various stakeholders. We focus on:

Cost
(kɒst) **n./v.**

How **value** and related **tradeoffs** are understood differently between the sector and people

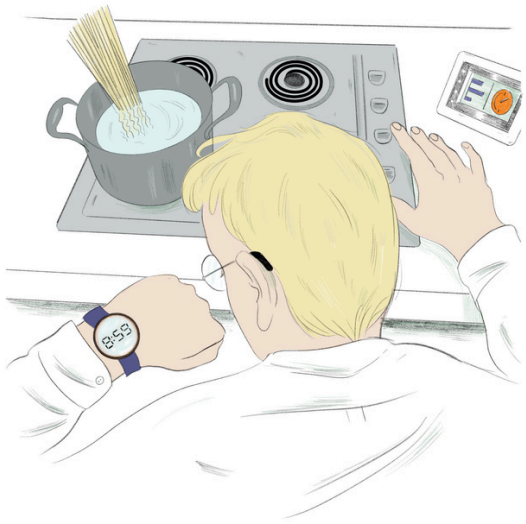
Control
(kənˈtrəʊl) **n./v.**

How **management** and **responsiveness** are understood differently between the sector and people

Cost

(kɒst) **n./v.**

How **value** and related **tradeoffs** are understood differently between the sector and people



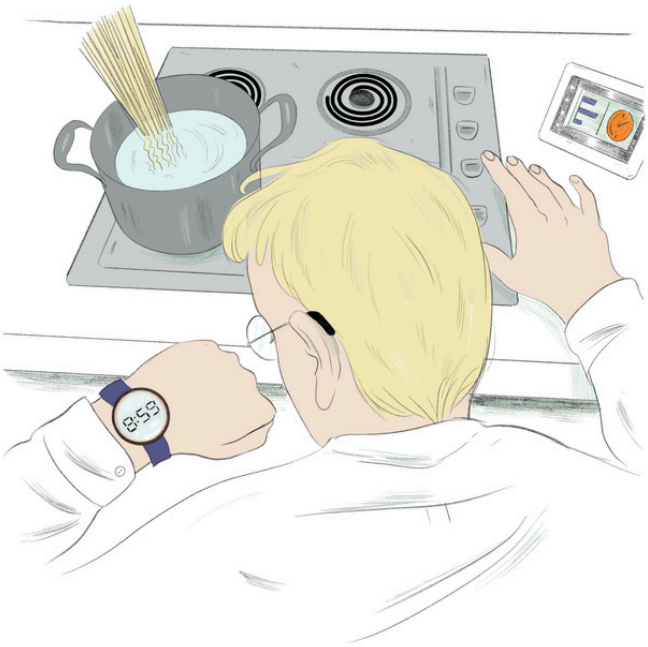
Introduction

Cost is a key concept in the energy sector, and also the focus of significant attention from members of industry, policy makers, and everyday people. Despite the intense interest in cost, it is apparent that different stakeholders use this term to cover different ideas of value and related tradeoffs.

Most commonly, cost refers to financial value or price. Yet it is evident from both empirical and desktop research that aspects of cost beyond the purely economic are also relevant; time costs, emotional labour, environmental costs, and health consequences are all examples of the costs discussed by stakeholders as important. As with the issue of control discussed below, there is a general divide between the ways the energy sector and everyday people see cost.

The energy sector tends to frame cost largely as a financial issue, while others – particularly everyday people – consider cost in broader terms. An exploration of the ways in which cost is used differently not only helps us to avoid miscommunication and the potential for conflicting interpretations, but also enables us to see the diverse priorities of stakeholders in the energy system.

Related Terms: Financial Costs, Time Costs, Emotional Costs, Environmental and Health Costs



Financial cost

The most common framing of cost is in terms of financial value; even so, there are a number of ways through which the energy sector and everyday people understand the financial costs associated with the energy system. Though these framings of cost are connected, they also reflect different meanings and scales at and through which financial costs are considered.

In terms of its engagement with households, the energy sector considers financial cost in two primary ways. First, financial cost describes the cost of building or maintaining some part of the energy network (including generators, poles and wires, maintenance teams etc.). The financial costs involved in creating and running these infrastructures must ultimately be recouped via charges to energy consumers; energy systems therefore (ideally) reflect the anticipated capacity of those they service to pay for them.

Accordingly, the need to be financially self-sustaining shapes not only the design of energy infrastructures, but also represents the second way through which the sector looks at financial cost: financial systems like pricing strategies and tariff structures through which costs are recouped.

In essence, the energy sector charges their customers fees for supplying a service (like a connection fee to the grid or for membership to an energy management program) or for usage (such as a price per kilowatt hour of energy). Additionally, cost is seen as a way of influencing how and when people use energy.

From the energy sector's perspective, cost is a direct incentive that can motivate people or businesses to organise their activities in a way that aligns with the sector's priorities and goals for demand response management. So-called cost reflective pricing, such as time of use or demand tariffs, are both examples of pricing structures that seek to shape the timing and quantity of energy use.

However, households do not always perform cost-benefit analysis regarding energy use, or energy technology adoption. As identified in a previous DEF report, (Pink et al., 2022, p. 61), the energy sector assumes that consumers are likely to respond to price incentives, and that consumers perform cost-benefit analyses about their participation in energy markets and use of energy technologies to maximise their own personal gain. Moreover, while the energy sector recognises that it cannot explain all human behaviour as a response to price signals, energy forecasting struggles to integrate alternate motivations or explainers for human action.

The energy sector's focus on financial cost reflects both its need to be financially viable (building and maintaining systems that consumers can and will pay for), as well as a belief that consumers are primarily economic actors who will act rationally to reduce their costs. In other words, a focus on financial cost within the energy sector can be seen as a reflection of priorities and assumptions regarding efficient resource management and value maximisation by rational economic actors.

For everyday people, financial costs are understood in related-yet-distinct ways. Most people engage with the financial dimensions of energy through things like energy bills, upfront installation costs for new technologies, connection or usage charges, subscription fees, and anticipated long-term savings. Although managing a business and a household are different in important ways, these costs are akin to the way the sector financially frames cost, as they reflect similar values around minimising expenses and maximising value. Importantly, however, for everyday people the financial costs of energy are generally placed in the context of wider costs of living; energy is paid for alongside other utilities, rent or mortgage repayments, and shopping bills. Moreover, these various cost of living expenses exist within a wider set of priorities – outlined below – which reflect broader understandings of cost than those represented by financial framings alone.

Time costs

Time is a valuable resource. For everyday people with broad and often competing demands on their time, any changes to established routines or ways of doing things can create new time costs that shape if and how they engage with the energy system. The idea of time costs also connects with that of convenience, which research demonstrates is a high priority for many people (Shove, 2003). As a first example, there is generally a time cost associated with learning to use new energy technologies. The energy sector tends to assume that energy technologies will be accepted when they become cost-effective (Dahlgren et al., 2020). However, the time and effort associated with researching, installing, learning how to use, and maintaining technologies like solar panels or EVs is not often accounted for; nor is the gendered way in which the management of new digital and energy technologies is often undertaken, and which potentially involves differentiated time costs – and knock-on effects for the way other kinds of housework are undertaken – for different members of a household (Kennedy et al., 2015; Martin, 2022).

The complexity of navigating energy services and changing tariffs is another way in which time costs manifest for energy consumers, because people often find these systems confusing and challenging to engage with (Strengers et al., 2023a, p. 37). Despite significant efforts from the energy sector, there remains a general lack of awareness and responses to energy tariffs (Strengers et al., 2021, p. 121). Relatedly, there can be significant time and effort costs associated with adjusting daily routines around tariffs like time-of-use pricing. As a result, current tariffs can make households feel penalised when they have less capacity to rearrange their daily activities (Strengers et al., 2023a, p. 76). As these examples illustrate, alongside the issue of financial cost, people's time also appears to be a priority. Any efforts to shift people's actions should therefore better account for the time and effort required to engage with the energy sector – particularly in cases where significant change is involved.

Emotional costs

Energy is the driving force of the modern world, and energy systems reflect and bear on many important aspects of everyday life: household finances, the ability to cook a meal, and opportunities to work remotely or to connect with others via the internet, all depend on a well-functioning energy system. Unsurprisingly, then, there is an emotional element to energy and the energy system. The energy sector recognises this to some extent, and in recent years challenges over public perception and trust have led to calls for the sector to reevaluate the way it engages with everyday people (Nicholls et al., 2019, p. 12).

Nonetheless, there remain as yet largely unaccounted for emotional costs for many households when dealing with the energy system. A more obvious example concerns increasing energy costs and the growing complexity of tariff structures, which can be a significant source of anxiety for people – particularly those who are energy vulnerable or from CALD households (Strengers et al., 2021, p. 131; Strengers et al., 2023b, p. 76).

Uncertainty, anxiety and even embarrassment around EV charging is another important emotional cost. Alongside the size of an EV's battery, uncertainty about energy availability and costs can contribute to anxiety. For example, in previous research we found that research participants were willing to charge EVs and batteries during peak hours despite the high tariffs to avoid the potential cost of unpreparedness for unanticipated events, especially in rural areas far from health facilities (Strengers et al., 2023b, p. 47). Navigating developing norms and potential awkwardness around the high costs of charging one's EV when visiting a friend or relative illustrates another way in which the costs involved in managing energy and energy technologies can be emotional (Strengers et al., 2021, p. 40).

Framing energy solely in rational and economic terms overlooks the embeddedness of energy systems in everyday life, and thereby the inherently emotional nature of energy as a provider of security, facilitator of important work, and potential source of anxiety. Recognising and incorporating the emotional elements of energy systems into the energy sector presents an opportunity to engage with the diverse ways in which everyday people feel about energy.

Environmental and health costs

A final non-financial cost to consider involves environmental and health costs. For the energy sector, these costs involve considerations which generally still include a financial component. For example, the environmental costs associated with energy generation may require carbon offsets to be purchased, or investments in local communities to be made. These costs therefore generally represent an incorporation of previously externalised financial costs, such as those to the environment or human health.

Conversely, for households, environmental and health concerns generally reflect values that, although diverse, tend to be deeply held. Moreover, these values are not necessarily drawn on in the way that the sector imagines when envisaging people as rational decision-makers. Rather than a cost-benefit-style evaluation of trade-offs between potentially competing priorities (such as convenience versus environmental consequences), people instead draw on considerations like environmental or health costs more like a navigational heading. As people negotiate complex decisions and situations, these values act as a goal for people to steer towards — even if these values may not be fully realised. For example, even those who value the environment may still take environmentally costly actions; nonetheless, these values guide the overall path of action people take.

In considering environmental and health costs, along with other costs or values, it is important to keep in mind the variety of factors people weigh up when making everyday decisions, such as using an air conditioner or charging an EV. People may balance contrasting environmental considerations. For instance, some may purchase an EV for sustainability reasons, but maintain a fossil fuel car as a backup, or pass down fossil fuel cars to their children (Strengers et al., 2021, p. 39). Environmental costs may also be weighed against personal comfort or convenience, such as by maximising solar energy self-consumption while also recognising that energy still needs to be consumed outside of times when solar generation occurs (Strengers et al., 2021, p. 130). In terms of other environmental costs, many households are also concerned about the environmental impact of manufacturing and disposing of technologies like batteries and solar panels (Strengers et al., 2021, p. 132).

Human health considerations include healthy indoor air and thermal comfort. With more extreme weather under climate change, and the legacy of the COVID-19 pandemic, there is an increased awareness of the health costs associated with maintaining good indoor air quality (Strengers et al., 2021, p. 63, 2023b). While maintaining healthy air may involve increased energy consumption (e.g. due to the use of air purifiers or air conditioning), there is also a growing understanding of the impacts of poor air quality or extreme temperatures on human health.

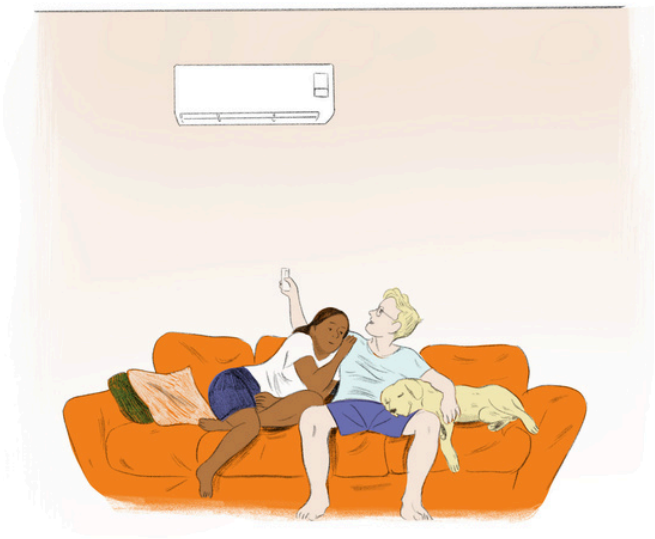
Finally, the move to all-electric homes is a good example of where values may also align, as eliminating gas appliances is often undertaken both for environmental and health reasons (Strengers et al., 2021, p. 127).

In summary, we can see that people also consider the costs to the environment and human health as important in their everyday engagements with the energy system. Recognising the role of cost beyond the financial, and indeed beyond the sole focus on humanity, is important in accounting for the way people think about and use energy.

Control

(kənˈtrəʊl) **n./v.**

How **management** and **responsiveness** are understood differently between the sector and people



Introduction

Control is a central, yet contested, concept in the energy sector. From the sector's perspective, control – either in the form of direct management of CER, or through encouraging people to manage their technologies and energy use in ways deemed desirable by the sector – is seen as fundamental for navigating the complex transition towards a decentralised, renewable energy system. For people, however, control typically involves supporting or enhancing their own decision-making abilities in the context of everyday life.

As more CER and smart technologies enter people's homes, the contested issue of who has control over energy systems, technologies, and data is becoming both increasingly evident and important.

Related Concepts: Control over Automation and Energy Management, Control over Comfort, Control of Data

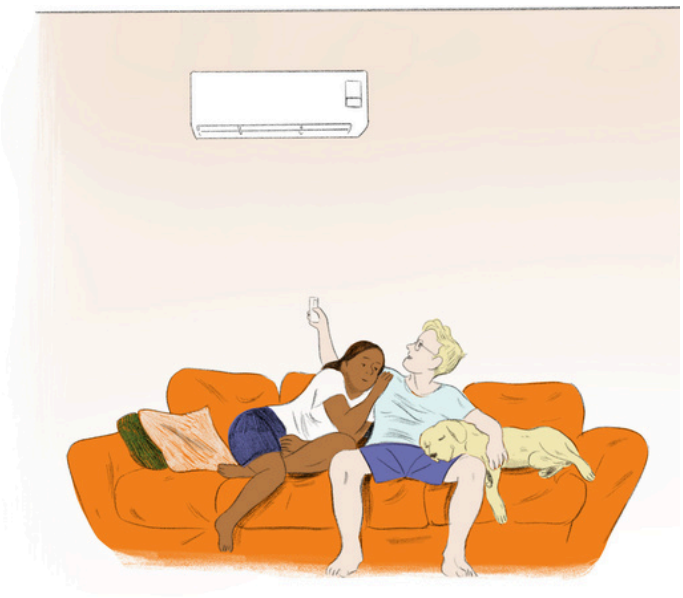
Control
(kən'trəʊl) **n./v.**

Control over automation and energy management

The meaning of control in the context of automation and energy management differs significantly between the energy sector and households. For the energy sector, control reflects a belief in automated technologies and systems that the sector itself is largely able to coordinate. Historically, the sector's capacity to automate and manage energy demand is most evident when considering controlled load hot water heating, which has been widely used in Australia for over half a century to shift a significant portion of household electricity demand to off-peak (overnight) periods (Nicholls et al., 2021, p. 16). Gaining approval from households to manage these technologies is important to the sector, which recognises that people may want to retain some level of control over how things like home batteries or air conditioners are used. However, this level of control would likely be minimised given that full automation and sector control over technologies is perceived as necessary for efficiently integrating consumer energy resources – particularly EVs – into the grid (Dahlgren et al., 2020, p. 36).

In contrast, there is an evident desire among a large proportion of households to retain some degree of oversight over automated technologies and energy management systems. According to the 2021 the Energy Consumer Behaviour Survey (ECBS) survey, 42% of households would prefer to 'set smart appliance timings myself, so I have complete control' and a further 50% would be 'happy for the smart appliance to be automated, but override it if I need to' (Nicholls et al., 2021). Even for those who recognise a role for automated technologies in their home, there remains a clear desire to either set the parameters within which these systems function, or retain the ability to override them at times. For example, although there are increasing possibilities for wireless and automated charging, people continue to prefer personal control over charging (Strengers et al., 2021, p. 37). In the future, people will want to control their technologies themselves, and to tailor these technologies or automated patterns to specific needs.

Rather than prioritising the needs of the grid, people may choose to install and configure automated technologies to meet the needs of multiple members in the home (Pink et al., 2022). For other households, however, the usefulness or value of smart control for home energy management remains unclear, with more complex smart control often viewed as less convenient or unnecessary (Strengers et al., 2021, p. 129).



Control over comfort

Comfort describes the indoor conditions in a home; temperature is generally the prime consideration, but also encompasses related conditions that shape experiences of what it is to be comfortable, including touch, sight, humidity, odour, and the type or quality of heating and cooling (Madsen & Gram-Hanssen, 2017). The energy sector tends to reduce these diverse sensory experiences to a focus on temperature. In this context, controlling comfort centres on the idea of managing the increased energy demand from heating and cooling to deliver savings for both consumers and the energy sector, particularly through automation and remote control (Strengers et al., 2021, p. 75). Control over comfort through strategies like direct load control or demand tariffs are seen by the sector as a way of managing energy consumption by either directly controlling air conditioners, or by encouraging consumers to undertake this management themselves.

However, people tend to think about and use a range of heating and cooling strategies – including those beyond mechanical heating and cooling – which indicate different ways of thinking about and controlling comfort. For example, in contrast to visions of automated air conditioning there is evidence that people may prefer to maintain manual control over heating and cooling because they only intermittently use mechanical air conditioning 'when they need it' (Strengers et al., 2021, p. 10). Similarly, instead of believing the efficiency promises of technology, households often highlight the range of activities, moods and temperature preferences that they consider too complex for automation or algorithms to understand (Strengers et al., 2021, p. 68).

For many people, comfort is also commonly bound up with other priorities and values. These priorities and values may encourage people to take further control of their comfort.

For example, households will prioritise the health and safety of their households when making decisions about how to use and control future air technologies (Pink et al., 2022, p. 114). People also want to be engaged and feel in control of the safety and comfort of their households, so they will need transparency and control over automated systems, such as through an 'override' function, to ensure the care and safety of their households (Pink et al., 2022, pp. 16, 68). This was particularly the case for those with young children, people with health concerns and older people, all of whom may require specific temperature ranges in order to maintain both comfort and health (Strengers et al., 2021, p. 109). For households, controlling comfort is therefore about more than comfort alone.

Beyond health and safety, values like generosity and social responsibility are also important considerations in terms of controlling comfort, which may also lead people to relinquish it. Generosity and a sense of social responsibility regarding others in their community appear to underlie some decisions to cede control of energy and participate in demand management programs. Importantly, these altruistic values seem more likely than financial incentives alone to lead people to agree to relinquish some control of their energy for the common good, such as reducing energy use in peak demand times to ensure power stays on for local hospitals or other vulnerable members of the community (Pink et al., 2022, p. 26).

Control of data

The expansion of smart grids and proliferation of smart technologies means that people are generating increasing amounts of data about their everyday activities and routines. This data may include information generally available in an energy bill, such as total energy generation or consumption, but increasingly also includes more granular, disaggregated data, such as specific appliance use patterns. In addition to practical and ethical considerations around issues of consent and who owns such information, there are important fundamental questions about how people can access and make best use of their own energy data.

For the energy sector, use of energy data can be understood in several ways. Despite these different uses for energy data, however, there is a consistency between these approaches in terms of the industry retaining control and directing the use of data. On the one hand, the sector (but in particular energy networks, retailers, generators and regulatory bodies like Australian Energy Market Operator) requires energy data in order to effectively manage networks. On the other hand, there is also a widespread belief in the energy sector that providing consumers with energy data will help them to better manage their energy consumption.

Consequently, significant sector effort and resources are expended in order to give people access to data regarding energy generation, storage, consumption and price. More generally, there is also a view discussed in technology reports that smart appliances and devices (which generate and use data to improve their functionality) are a means of improving the convenience of everyday routines, such as a smart fridge's integrated digital voice assistant. However, these conveniences are not anticipated to significantly alter the way that people live day-to-day. Instead, the emphasis is typically on simply generating and managing data the sector or other parties can use (Dahlgren et al., 2020, p. 67).

People think about and use data differently to the sector (Martin & Strengers, 2024). Rather than using energy data as the primary means of managing energy use or household routines, people will instead periodically 'check in' with energy data to orient themselves and their activities. For instance, people may check solar generation data in order to decide when to manually undertake tasks like dishwashing or laundry. In this case, automation also needs to be balanced with people's desires to maintain control over some activities (Pink et al., 2022, p. 29).

People also want a level of direct control over charging, especially until they can determine whether a program or automated device can be trusted to do what they want (Nicholls et al., 2021, p. 37). Relatedly, people also use data to tailor automated settings, enabling them to continually adjust technology or systems to evolving needs (Pink et al., 2022, p. 80).

For people, the matter of who has access to data and for what purposes also raises the subject of trust. Energy sector ideas of automation and control of home appliances may not gain widespread acceptance without adequate trust in the business and systems seeking such control – especially in the absence of conversations with trusted sources about any potential benefits for the household, energy system, or environment (Nicholls et al., 2021, p. 51).

Conclusion

Conclusion

The Australian energy sector is undergoing rapid changes towards a decentralised system where everyday people are playing a pivotal role. Communication between the energy sector and people, as well as within the sector about people and their needs and desires, is therefore increasingly critical to deliver on the potential benefits of this transition. This energy glossary aims to bridge communication gaps by clarifying and translating key terms and concepts of relevance to the energy transition.

This household energy glossary highlights the power of language in shaping perceptions and approaches to problem-solving in the sector, with the hope that improved communication and greater understanding will lead to better outcomes for both the energy sector and everyday people.

Drawing on diverse energy social science research, the report identifies 4 areas of contested terminology and concepts – Consumers, Concessions, Costs, and Control – where misalignments and misunderstandings are most pronounced. By exploring these areas, and the multiple levels of terminology and meaning within them, the report advocates for a more inclusive, socially aware energy sector that emphasises the importance of language in framing issues and devising solutions that resonate with both the public and the energy sector.

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