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DIGITAL ENERGY FUTURES

FORESIGHTS FOR FUTURE LIVING:
Executive Summary

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A partnership between:

DIGITAL ENERGY FUTURES

FORESIGHTS FOR FUTURE LIVING

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Views and opinions

The views expressed herein are those of the authors and are not necessarily those of the Australian Government or Australian Research Council, project partners, or Advisory Committee members.

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EXECUTIVE SUMMARY

INTRODUCTION

Digital Energy Futures: Foresights for Future Living presents two key advances in social science-led qualitative foresighting for the energy industry.

New **foresighting concepts**, which use tested theory and research about social and technological futures to revise assumptions about future consumers.

New **foresights** designed to address three key areas of focus at the intersection of energy futures, and emerging automated systems and technologies:

- Electric vehicles and battery charging in local neighbourhoods (near futures, 2027)
- Comfort, care, and safety in the home and the rise of emerging air technologies (near futures, 2025-2030)
- The reconfiguration of routines and load shifting in response to extreme weather (far futures, 2050)

The report is the outcome of the fourth stage of the Digital Energy Futures project. It is based on the findings of 10 design ethnographic futures workshops with 42 people and ethnographic research with 72 households across Victoria and New South Wales, Australia.

The ethnographic research is also supplemented by consumer survey data and several analyses of energy and digital technology industry reports.

EXECUTIVE SUMMARY

INTRODUCTION

Current and future digital transformation, alongside environmental, social and cultural transformations related to climate change and the COVID-19 pandemic, have created a new context for the energy industry which demands updated and future-ready theories, concepts and knowledge.

To understand possible futures realistically and plausibly, the Digital Energy Futures team have undertaken a reframing exercise. Reframing entails adjusting dominant assumptions and models about the relationships between people, technologies and local environments towards a new future-ready framework supported by research evidence.

The reframings presented here, which we call foresighting concepts, are designed to inform scenario planning and residential forecasts in the energy sector. All of the concepts are designed to enable the industry to better incorporate changing trends and everyday life practices into how they plan the energy system.

- We recommend **14 Foresighting Concepts**, each of which reframes dominant assumptions currently held by the energy industry about how people do, or will, interact with energy and technology.

14 FORESIGHTING CONCEPTS

The foresighting concepts build on cumulative findings from the Digital Energy Futures project to reframe existing industry conceptions about people's values, engagements, and practices in (future) energy systems.

The existing industry concepts and the new 'reframing foresighting concepts' are summarised in three tables and six illustrations in the following pages, organised according to:

- People-Led Futures, Reframing Consumer Values
- Collaborative Futures, Reframing Engagements with Energy Systems
- Tailored Futures, Reframing Technology Practices of People

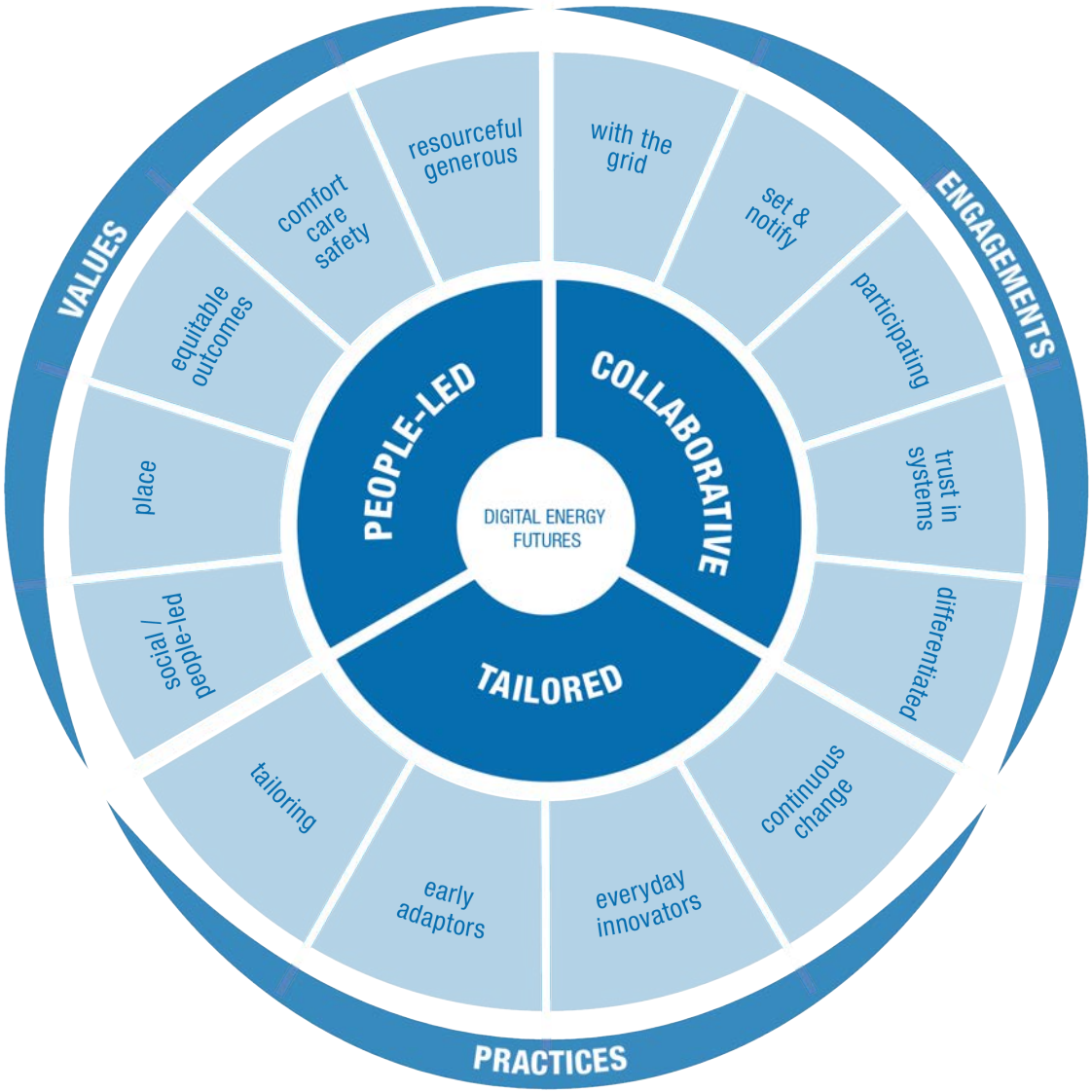
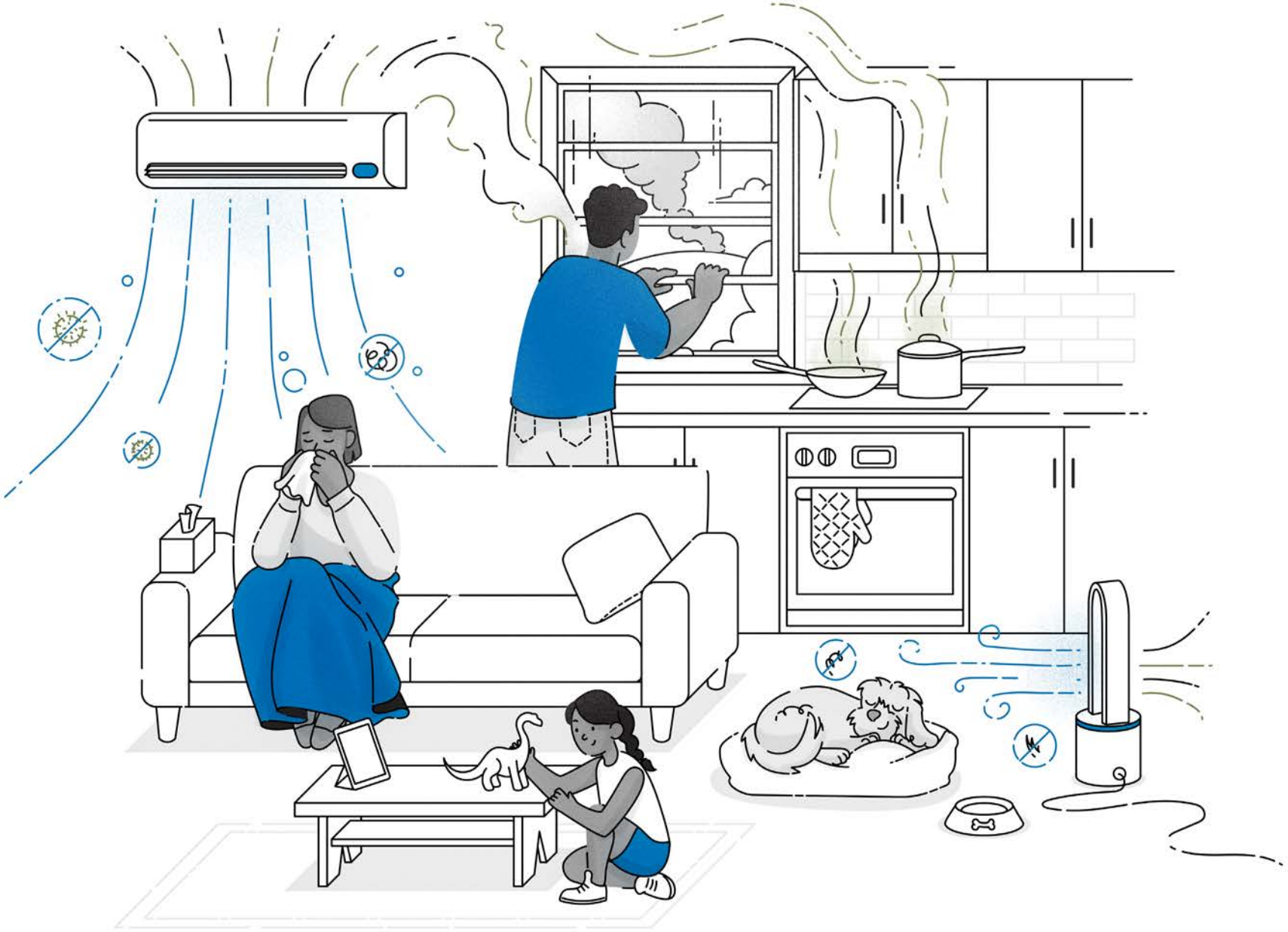


Figure 1 Digital Energy Futures: Reframing foresighting concepts

PEOPLE-LED FUTURES

Reframing Consumer Values

	from	to	
1	TECH-LED FUTURES	**SOCIAL / PEOPLE-LED FUTURES**	understanding the real role that people will play in defining our energy futures
2	ZONES	**PLACE**	acknowledging the role of locality and place in defining how people will use energy
3	UNIVERSAL SMART SOLUTIONS	**LARGE-SCALE EQUITABLE OUTCOMES**	accounting for equity by replacing the focus on equal access to dominant technology solutions with a focus on diverse needs
4	CONSUMING	**COMFORT, CARE AND SAFETY**	accounting for the increasing importance of comfort, care and safety at the core of household lives
5	CALCULATING AND RATIONAL	**RESOURCEFUL AND GENEROUS**	understanding how people's moral values in relation to energy are evolving and that they will be decisive in our energy futures



► FORESIGHTING CONCEPT **4**: **COMFORT, CARE, AND SAFETY**

► FORESIGHTING CONCEPT **5** : **RESOURCEFUL AND GENEROUS**

COLLABORATIVE FUTURES

Reframing Engagements with Energy Systems

6

from OFF THE GRID

to ► **WITH THE GRID**

envisioning a collaborative relationship with the grid evolving, where people will use it as a backup or for sharing energy with others

7

SET AND FORGET

► **SET AND NOTIFY**

providing the transparency and control over automated systems that people will need to ensure the care and safety of their households

8

PROSUMING

► **PARTICIPATING**

people's participation in future energy systems will be driven by their household and community priorities rather than by the market

9

TRUST IN ENERGY COMPANIES

► **TRUST IN TAILORED SYSTEMS**

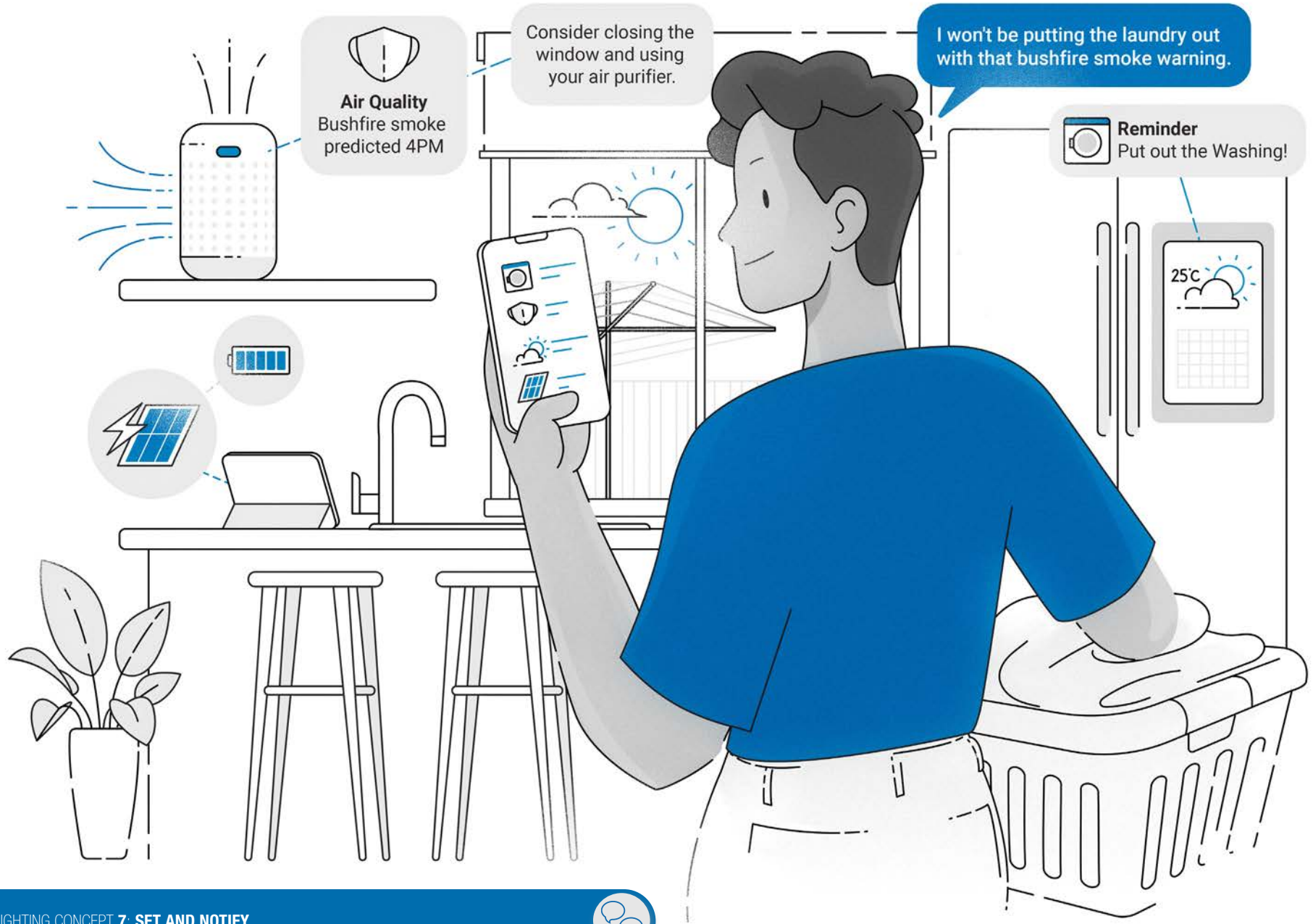
understanding trust as situational and generated in everyday and tailored setups, rather than as transactional and fixed

10

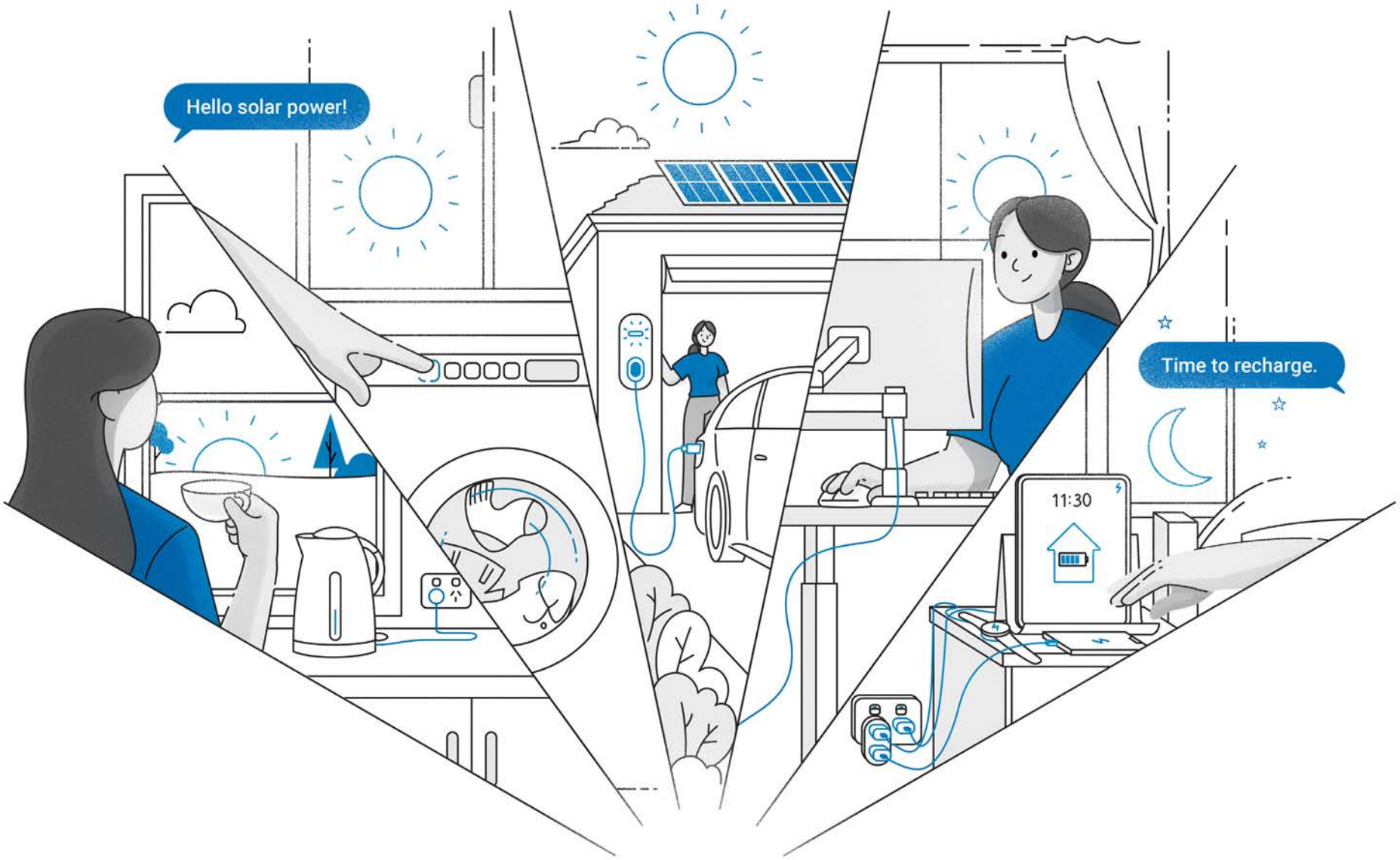
SEGMENTED

► **DIFFERENTIATED**

differentiating between different groups of people through their values, practices and needs, rather than as stable consumer segments composed of single homogenous consumers



► FORESIGHTING CONCEPT **7**: **SET AND NOTIFY**



► FORESIGHTING CONCEPT **8**: **PARTICIPATING**

TAILORED FUTURES

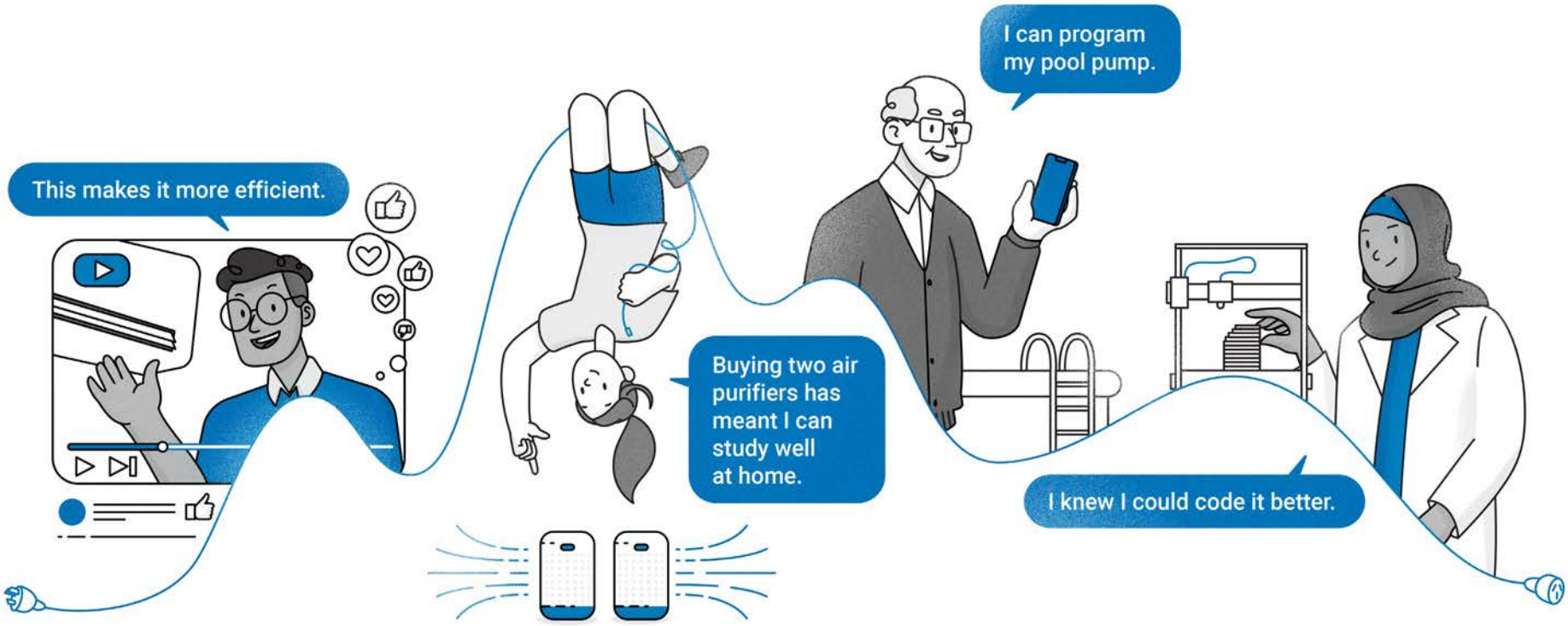
Reframing Technology Practices of People

11 *from* PERSONAL-ISATION → *to* **TAILORING**: attending to how people tailor their preferences in everyday life above defining their preferences through predictive data analytics

12 EARLY ADOPTERS → **EARLY ADAPTERS**: accounting for how the pioneers of new technologies will create energy demand by adapting technology to their own needs

13 PLUG AND PLAY → **EVERYDAY INNOVATORS**: accounting for how the pioneers of new technologies will create energy demand by adapting technology to their own needs

14 BUSINESS AS USUAL → **CONTINUOUS CHANGE**: understanding the complex dynamics of household change as we move into futures and its implications for energy demand



FORESIGHTING CONCEPT **11**: **TAILORING**

FORESIGHTING CONCEPT **13**: **EVERYDAY INNOVATORS**

KEY FORESIGHTS

The *Digital Energy Futures: Foresights for Future Living* report also presents new foresights designed to address three priority areas of focus relating to energy futures and emerging automated systems and technologies.

These areas were identified in collaboration with energy industry partners to represent new trends in technology and society, key challenges in forecasting, and core fields of social science knowledge.

The following pages present foresights in clusters by subject areas:

- future electric vehicle and battery charging
- future air technologies
- future routines and loadshifting

FUTURE ELECTRIC VEHICLE AND BATTERY CHARGING

(near future, 2027)

Charging at home and having a fully charged battery in the morning is likely to be a priority: people predominantly want to charge their future electric cars at home, but may be incentivised to charge elsewhere by cheap top-up charging, schemes for selling back, and other initiatives to avoid wasting 'excess' solar energy during the day.

People will object to EV charging infrastructures that disrupt local life and spaces: people value the aesthetics of their local areas and will prefer charging stations at practical local sites such as health, shopping, or leisure centres, rather than in town centres or other popular sites.

Personal electric car ownership will be more likely in areas where local driving, parking, and charging facilities are easily accessible: everyday use, place, and charging possibilities will be decisive in decisions about owning electric cars, and will vary across urban and rural settings.

Uneven access to charging facilities will lead to new inequalities: existing and unanticipated future inequalities will increase if careful consideration is not given to ensuring accessible EV charging for all, including renters and retirement communities.

Automated charging features which increase convenience will be welcomed by some: people will be open to certain features of automated charging where they increase convenience, especially when they are able to research and make decisions themselves.

Staying in control will be essential for an ageing population: retirees will want to be in control of lives and future routines that combine electric car use with leisure and care for grandchildren.

Future drivers will need to be able to depend on battery services and roadside assistance for electric cars: people will be keen to engage with future services and apps for roadside assistance and to pre-book charging stations.

EVs will be used as one of multiple transport options: people will own and use electric cars in combination with other mobility technologies and services.

Localised working hours and commutes will affect EV time of use and charging, particularly in the regions: local areas with a high proportion of people working in similar industries with early start times provide opportunities to charge personal EVs during early afternoon when rooftop solar is available.

EVs appeal to people for varied reasons and not all are environmentally sustainable: some future electric car owners are primarily concerned with performance, rather than with environmental and energy demand questions.

In the far future (2050) electric cars will become part of increasingly hybridised forms of transport and mobility services: in the future people will navigate their 'ownership' or subscription to diverse electric and automated mobility systems, technologies, and services, in relation to their shifting place-based and household needs.

FUTURE AIR TECHNOLOGIES

(near future, 2025-30)

People's future uses for air technologies will pivot on their knowledge and experience of their local environments: people's relationships to both place and technology are crucial to understanding the ways and extent to which people want to be involved with future air technologies.

Inequalities in home ownership will impact future uses of air technologies: homeowners will invest further in their homes, and are likely to install new air technologies, while renters will be more likely to use portable air purification and filtration systems where they are not already installed.

Future air technologies will be used more than existing air conditioning systems: technologies that combine heating and cooling with filtration and purification will likely be used more than existing air technologies.

Uses of future air technologies will be shaped by the demands of future work and study routines: this may create new peak demand times with intensified use of air technologies in the early evening and new peaks or load smoothing during the day.

People's future priorities will be for the health and safety of their households: people will prioritise the health and safety of their households above their relationships to energy companies when making decisions about when to use future air technologies.

People are acutely aware of privacy and digital safety issues, and will require them to be resolved in the future: privacy is a key concern for many people in the present and is likely to continue to be important in the future.

Participation and communication will be essential for engaging people's use of future air technology in relation to the grid: future systems and services involving effective communication and notification systems, and opportunities to participate that recognise the importance of care and safety, are more likely to be trusted by people in the future.

Most people are not prepared to enable their future air technologies to be run by automated and connected smart home systems: future air technologies are more likely to be used as standalone devices operated independently of other smart home technologies with a mix of automated and manual control.

Air purification technologies heighten people's experience of air impurities and will encourage greater use: the experience of air as impure will be heightened and this will increase air technology use and associated energy demand, most likely at peak times.

Financial incentives alone will not solve energy demand challenges: financial incentives are usually superseded by people's everyday values and priorities.

The availability of new energy data and air monitoring data will lead to new communities of actively engaged citizen scientists and technology enthusiasts: digital data, predictive analytics, and sensor technologies encourage new modes of engagement.

Generosity and social responsibility are key considerations for when people relinquish control over future air technologies: community generosity and social responsibility are more likely to lead people to agree to relinquish control of their energy for the common good than financial incentives alone.

In the future people will want to control their air technologies themselves and to tailor them to specific needs: the needs of multiple people within the home will be prioritised by tailoring technology to fit their needs, rather than the needs of the grid.

In the far future (2050), air technology will be increasingly integral to providing comfort, health, and safety: people will increasingly prioritise installing and using air technologies over natural ventilation, with safety and health integral to how people pursue comfort in their homes.

FUTURE ROUTINES AND LOAD-SHIFTING IN EXTREME WEATHER

(far future, 2050)

More frequent extreme weather is likely to shift the way institutions and households structure their everyday tasks and activities: routines and activities are likely to shift in ways that will help regularly avoid exposure to extreme weather, and which position the home, schools, and workplaces as places of shelter and safety.

Household routines will be structured around expectations of increasingly hybrid and flexible working arrangements: many work tasks will be increasingly conducted working from home online or with digital tools, and jobs that require on-site attendance will shift to hybrid and more flexible modes in the far future.

Schools will balance in-person learning and safety as priorities in the context of extreme weather: schooling will remain largely onsite, with flexible and hybrid-ready delivery modes to respond to extreme weather, transport to schools will become more coordinated and active.

Efficient, climate-controlled and communal workplaces and leisure sites will remain important physical hubs for social interaction: these sites will alleviate social isolation for people working from home and provide heat refuges for older and retired people, and may be a preferred option for people to reduce personal energy consumption and sustainability impacts.

People will become increasingly anxious about social isolation, seeking new ways to connect virtually and in-person: people expect technology innovations will provide new opportunities for social connection in virtual and physical environments during more frequent and extreme weather events, and help to alleviate social anxiety about isolation and disconnection.

Activities will be grouped together into new clusters of routines which could shift household peaks in demand: in response to more frequent extreme weather, people will re-organise their day into new clusters of activities with knock-on effects for household demand and the effectiveness of technology-facilitated sustainability goals.

The morning peak will be spread across a longer period of time: the morning peak will be extended in response to flexible work arrangements, extreme weather events, local environmental conditions, caring responsibilities for people, local environments and animals, and household hobbies

The evening peak will remain relatively constant with some activities occurring later at night due to extreme heat: the 5-9pm period will involve a cluster activity in the home, particularly eating, socialising (virtually or hosting), and spending time on personal devices before bedtime; social and outdoor recreational activities are likely to occur later in the evening on extremely hot days.

Exercising will increasingly happen at home during the day: air conditioned home gyms will become increasingly important for exercising, especially to avoid extreme weather; exercise equipment is likely to become a desired form of charging for small devices, especially when there is decreased availability of solar generation.

More frequent showers will become common, but some of them will be cold in response to hot weather: showering practices will shift in relation to shifts in exercise practices, working from home, and as a way to support bodily cooling and in response to extreme weather conditions.

Caring for animals and pets will shift earlier and later, with additional mid-day care or air-conditioning required: people will continue to prioritise the care of pets and animals within their homes and local environments; extreme weather and hotter temperatures are likely to shift the times of day for feeding and walking to earlier in the morning or later in the evening; air conditioned environments will become increasingly important to provide comfort and care for domesticated animals.

People will 'check in' with energy data to take advantage of solar energy availability for manual tasks: automation will need to be balanced with people's desires to maintain control over manual tasks, and to take advantage of available solar energy generation; energy data will provide an important 'check in' to support these priorities.

People will mostly charge their devices overnight or during the day during the solar peak: people will continue to oversee the charging of more devices and EVs in conjunction with different levels of automation or manual operation; charging is more likely to occur in the evening (overnight) or during the day when solar generation is available and when people are working from home.

Grocery and food deliveries will become increasingly common, and delivered in the late afternoon or early evening: people will increasingly depend on home-based deliveries for groceries and meal services, which are more likely to be delivered in the afternoon or early evening; drones, autonomous vehicles and electrified fleets that are resilient to environmental change and extreme weather will be increasingly responsible for delivering these services.

Laundering will remain a manual activity increasingly carried out during the day when solar power is available: laundry and other household tasks will be increasingly synchronised with available solar power when available; laundry will remain a manual practice, even if other household tasks are automated.

Digital technologies and new services will continue to prioritise pleasure, convenience, and experience over energy savings: alongside innovations in efficiency and sustainability, in the future, households will also incorporate new technologies and services that they think will enhance their quality of life.

NEXT STEPS FOR FORECASTING

The findings and foresights outlined in the report will inform the final stage of the Digital Energy Futures project in developing a qualitative forecasting methodology which places people's lives, values, and practices at the centre of scenario development, and of possible and plausible change.

LEARN MORE ▶ To view the full report, please visit the project website: https://www.monash.edu/__data/assets/pdf_file/0019/3113164/Foresights-for-Future-Living-Nov-22.pdf

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