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How Covid provides an opportunity—and an obligation—to get rentals up to scratch

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A home energy super saver prize from Pure Electric worth up to \$10,000!

Australian residents only



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Technology for a sustainable future

Modular synthesis: all about prefab

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Robyn Deed

Renew magazine editor
(outgoing)

It's been such a pleasure and a privilege to be *Renew* editor these past eight years. It's a little hard to leave, but I'm pleased to be handing over to experienced editor and DIYer Tom Hawking.

Editing *Renew* is a job where you're always learning, sometimes from subject matter experts, but most often from our engaged and data-driven readers, sharing practical, real-life stories of their energy efficiency and renewable energy journeys to help others (including myself). One thing that I've learnt is to never mix up kilowatts and kilowatt-hours; and I've relearnt to never change things just before you go to print (sorry to our proofreader, Stephen!).

Working with the *Renew* community has been a highlight, as has working with the small but highly skilled team at *Renew*. The name most recognisable to many is that of our unbelievably knowledgeable technical editor, Lance Turner, who never seems to find a question he can't answer, or a topic he can't write on.

Special thanks also to our former marketing and comms manager, Katy Daily, whose passion for sustainability forged long-lasting and productive relationships with our members, readers and numerous stakeholders. And a final thank you to all our contributors—*Renew* magazine wouldn't exist without your spreadsheets tracking your energy generation, usage, temperatures and more!!

Hello *Renew*! It's a pleasure to be here, and to have been welcomed so warmly by everyone at both the magazine and the organisation. I come to *Renew* from a long, if somewhat meandering, career in media: I'm a former editor of sadly defunct Melbourne alt-weekly *Inpress*, and I've also lived and worked in the UK, India and the USA. I spent most of the 2010s working in online media at NYC-based online culture publication *Flavorwire*, and I'm delighted to be back in a job where I can produce an actual, physical magazine.

I'm even *more* delighted that that magazine is *Renew*. I have great respect for *Renew*/the ATA and its work, and it's exciting to be taking over a publication with such a rich history, such a strong identity, and such a dedicated readership. Advocating for sustainable living and technologies is as important as it was when *Renew*'s first issue was published in 1980, and it's exciting—if daunting—to take over the magazine at what feels like a key moment for Australia in deciding what our future will look like.

To close, I want to offer many, many thanks to Robyn for making this transition as painless and easy as possible. That she was so generous with her time and her knowledge in handing over this role speaks volumes for her—as a professional and as a person. I wish her all the best and am looking forward to seeing what she does next.



Tom Hawking

Renew magazine editor
(incoming)

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Cover image: Chris Neylon.

A beautiful image of one of our favourite prefabricated houses—designed by Maxa Design and built by CarbonLite—to go with our prefab buyers guide, which starts on page 53. The building is a great example of how aesthetically pleasing prefab design can be! Our sister magazine, *Sanctuary*, also loves the house—they profiled it in issue 48, and you can read the feature at bit.ly/3kvp8MV

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FEATURES

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The big switch (off)



Image: Nature Therapy/Flickr

At face value, the idea of the invisible hand of the (energy) market being able to reach into homes to switch off individuals' rooftop solar systems doesn't sound especially appealing—but there are scenarios in which it's a necessity.

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A new lease on sustainability

We're all fed up to the back teeth with Covid-19—and renters are fed up with living in energy-inefficient properties. Rob McLeod proposes killing two birds with one stone.

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Image: Neil Barrett

Return in light

We return to The Paddock, a Victorian eco-development that gave Renew a chance to test its modelling in a real-world situation. How did we do?

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Image: Mode Homes

Modular synthesis

BUYERS GUIDE

Prefab housing is one of the fastest growing—and most interesting—areas of house design. Our in-depth buyers guide looks at the various methods of prefab construction available, along with the pros and cons of each, and also provides a detailed examination of the Australian prefab marketplace.

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Prefab case studies

CASE STUDIES X 5



Image: Betti & Knut Architecture

There are many ways to prefabricate a building, from reasonably well established systems using insulated panels and factory-built modules to more exotic ideas involving haybales and shipping containers. Here's a look at how some of these have worked out.

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DIY—solar water pumping

Ever wanted a solar water pump that doesn't stall in the morning and doesn't overload itself by midday? So did Rob Landau—and he worked out how to build one!

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Taking in the recycling

In the latest of a regular series on Australia's recycling industry, we look at the world of paper recycling.

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Royal flush

Everything you wanted to know about bidets, but were af— OK, look, let's be honest, you probably didn't want to know, but here we are.

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The Iris House: Affordable by design



Image: Helena Wilson

One woman's quest to build a sustainable prefab home. Co-stars include a Norwegian politician, a cat named Trevor, and 1312 bottles of wine.

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For the common good

A report from the Central Sydney branch, where a recent event took a detailed look at energy efficiency and solar PV for apartment buildings.

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Ditching the fossil burner

Our Andrew Reddaway recently bought himself an electric vehicle. Learn from his experience of "adjusting the mating parts".

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Charging up: EV market update

Also on the EV tip, Bryce Gatton takes a detailed look at the state of the market for BEVs, PEVs, FCEVs and OAVs*.



Image: Rivian

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WIN!

A home energy super saver prize from Pure Electric worth up to \$10,000!

Australian residents only

Learning from the fires (I)

First, the good news: NSW will implement all 76 recommendations of the state-level inquiry into last summer's devastating bushfires. Premier Gladys Berejiklian acknowledged the major role of climate change in the fires, which burned through 5.52 million hectares of land (including 37% of the state's national parks), killed billions of animals and destroyed 2476 homes. Recommendations include requiring landowners to complete hazard-reduction burns, trialling more "military-style" water bombing, investigating indigenous fuel-reduction techniques, and improving mental health support for firefighters. The inquiry's report warned that the extreme conditions leading to last summer's fires will be seen again, and more often.

In Victoria, the bushfires devastated 1.5 million hectares, and 170 rare or threatened species lost more than 50% of their habitat. The state's response is being led by Bushfire Recovery Victoria, a government agency created in the aftermath of the fires, and the report of its independent Fire Season Inquiry was delivered to the Victorian government on 31 July. At the time of writing, it has yet to be tabled in Parliament or otherwise made public. The urgent need for a national response is clear: 35 people died and 21% of Australia's forest cover burned, releasing 434 million tonnes of CO₂. The Royal Commission into National Natural Disaster Arrangements opened in late February and is currently holding public hearings. - *Jodie Lea Martire* naturaldisaster.royalcommission.gov.au

Learning from the fires (II)

Australia isn't the only country learning from the fires: the US state of California has asked Australian firefighters to help battle their latest round of summer wildfires. At the time of writing, 55 Australians were involved in fighting the fires, mostly in high-level coordination roles.

Catastrophic wildfires are becoming a yearly event in California: this time, 5200 km²

of land has burned, seven people have died, and some 170,000 Californians were under evacuation orders at the fires' peak.

As well as our firefighting prowess, Australia's fire-safe building standards are also proving an inspiration (as is our partner magazine, *Sanctuary*): specifically the Bushfire Attack Levels (BAL) system, devised after the Black Saturday fires in 2009, which assesses fire risks in different areas and provides guidance on door/window thickness, site plans, tree clearing, guttering, water tanks and engine-driven pumps.

Unfortunately, California has yet to implement such a uniform system. Their regulations, known as Chapter 7A, are not obligatory, and local governments often waive them in the name of freedom at the request of builders trying to avoid the extra costs of non-combustible cladding and treated wood. Let's hope some Australian building experience helps Californians build back smarter. - *JLM* bit.ly/33mhaid

Not learning from the fires

So what are Australian states doing to proactively fund climate protection? Not a great deal, it seems. The Victorian state government was the first to enshrine its Renewable Energy Target (RET) in law: in October 2019, legislation was passed establishing a 50% RET goal by 2030. However, the combination of Covid-19 and grid connection issues have led to a startling decline in investment in renewable projects. According to a brief prepared by Environment Victoria, the Australian Wind Alliance and Friends of the Earth Melbourne, there are no new renewable projects at all currently scheduled between 2022 and 2025. The brief calls for action in the form of a series of auctions to fund new wind and solar projects. Such an auction was last held in 2017, and reviving the idea would serve both as Covid stimulus and green-energy boost.

In Queensland, meanwhile, the Morrison government has awarded a \$3.6m grant to Shine Energy, a relatively small indigenous-



Bushfires: learning the hard way. Again.

Image: Bert Knottenbeld/Flickr

owned company, to conduct a feasibility study into constructing a new coal-fired power plant at Collinsville, southeast of Townsville. The grant has been controversial, not least because, according to an investigation published in late July by *The Guardian*, the company was invited to apply for the grant two days *after* federal Energy Minister Angus Taylor announced that they would be receiving it.

Labor and Greens senators planned to pass a motion disallowing the grant in late August, by which point Shine had already received its first milestone payment. Shine has also found a novel way to justify running a coal plant: CEO Ashley Dodd recently suggested that his company should be exempt from complying with emissions protocols because the Birriah people, who own the company, are a sovereign nation that is not a signatory to the Paris Climate Agreement. - *JLM* bit.ly/2ZtRWNs

Look, mum, no wires!

New Zealand will be the first country to trial a commercial, long-range power transmission

01



Modular storage

As energy storage systems become more popular for home use, we have seen a steady increase in the number and variety of systems on the market.

A recent addition is the Fimer React 2 from ABB, which is a modular system with storage capacity ranging from 4 to 12 kWh, and rated output power of 3.6 or 5 kW. The battery capacity can be upgraded at any time, so you can start with 4 kWh and add more storage as your budget and/or requirements dictate.

The React 2 uses Samsung lithium-ion cells, so longevity should be excellent, and the in-built hybrid inverter is off-grid capable, providing up to 3 kW of backup power during power blackouts.

As is the case for most systems nowadays, monitoring is done wirelessly using a simple app, so you can keep an eye on what your energy system is doing from anywhere.

The React 2 system is also compatible with ABB's ABB-free@home smart home system, allowing you to make best use of your stored energy.

The React 2 is now available on the SA and Victorian home battery schemes.

Pricing is POA, and the React 2 comes with a 10-year warranty.

Contact:
Fimer, ph: 1800 769 663
fimer.com

02



Protect those batteries

One area often overlooked in DIY extra-low voltage energy projects is low voltage protection for the batteries. Running a battery at too low a voltage can cause it permanent damage—and in mobile systems, where the energy system battery is also the starting battery, you can be left unable to start your vehicle.

The Victron BatteryProtect range of low voltage cut-outs are suitable for 12 and 24 V battery systems (the unit auto-configures for the battery voltage), both lead-acid and lithium based. Loads are run through the BatteryProtect to the battery, and the system will then disconnect those loads if the battery voltage drops too low. It will also disconnect the loads if the battery voltage is excessive, which might happen, for example, because of a voltage regulator failure.

The BatteryProtect is available in 65, 100 and 220A versions. There is also a Bluetooth enabled version and a separate 48 V, 100 A model.

Note that the BatteryProtect is not designed for reverse currents from charging sources, which should bypass the BatteryProtect and be connected directly to the battery.

RRPs start at around \$65 for the BatteryProtect 65 A.

Contact:
Victron Energy, sales@victronenergy.com
victronenergy.com.au/battery_protect

03



Saving birds with no effort

One of the many ways human activity results in bird deaths is through large expanses of glass—windows—which kill up to a billion birds each year just in Northern America. Birds see glass as an open path and fly into it, particularly if there is a visible path to the outside right through the room.

Ornilux is a new anti bird-strike glass from Arnold Glas, which uses a special UV reflective coating applied to parts of the glass in a Mikado pattern. The pattern is almost invisible to humans, but birds can see it just fine. This is demonstrated by the images above; what we see (on the left) is very different to what birds see (on the right).

Paarhammer can now supply this glass as part of the double- or triple-glazed glass units used in their Architectural timber range of range windows and doors, and also the Wood-Alu range.

Ornilux can be combined with low-e glass, so you can still have energy-efficient glass while greatly reducing the danger to birds of all types.

Pricing depends on window size and features, as it does for any windows.

Contact:
Paarhammer, ph: (03) 5368 1999,
mail@paarhammer.com.au
paarhammer.com.au

The big switch (off)

A unique set of circumstances has South Australian owners of rooftop solar panels staring down the prospect of having their grid exports curtailed—a scenario that may well lie in all of our futures.

Andrew Reddaway explains.

In recent months, the organisation that operates Australia's main electricity grid has said that it needs the ability to remotely switch off household solar systems. For many people this is a disturbing prospect since their decision to install solar was partly motivated by a desire to become less beholden to big utilities. No one relishes the idea of Big Brother messing with their personal property, but it's clear that some way to manage rooftop solar generation becomes necessary when the number of panels statewide approaches the point where they can supply an entire state during sunny periods.

Keeping the lights on requires a minute-by-minute balance between supply and demand. The consequences of under-supply are obvious, but a grid-wide oversupply is also a problem as it would cause over-voltage and also raise the grid's frequency above a safe level, potentially causing blackouts. Balancing supply and demand is critical, but it becomes an impossible task if the grid's dominant generator operates without regard to that balance.

South Australia: a vision of the future?

In many parts of Australia, it will be a decade or more before rooftop solar reaches such levels of uptake. The exception is South Australia, where rooftop solar has grown very fast. The state's sunny climate boosts the output of solar systems and increases their up-front subsidy, which scales by expected generation. Uptake of rooftop solar has also been spurred by high retail electricity prices. South Australia has a long, stringy electricity network that is designed to support air conditioner demand during a heatwave. Most of the time, however, demand is low, since

the state has relatively little heavy industry. This "peaky" level of demand translates into an expensive electricity bill, because a portion of consumers' per-unit energy cost is levied to maintain SA's extensive network. Energy costs are also influenced by the increasingly expensive gas that is burned to power the state's remaining fossil-fuel generators when the weather's not suitable for renewables.

The risk of a blackout

SA's high uptake of rooftop solar already poses a risk of blacking out the state's entire grid under some exceptional combinations of conditions, according to the Australian Energy Market Operator (AEMO). Consider a transmission line falling down near Adelaide due to a storm. The cable discharges its electricity into the ground, causing voltage in lines throughout Adelaide to temporarily collapse to a fraction of the normal level, in a manner similar to water pressure dropping when a mains water pipe is ruptured.

In such an event, it'd take a fraction of a

second for automatic switches to activate and disconnect the damaged transmission line and nearby sections of the grid. Years ago, an event like this posed little risk of a state-wide blackout, because electricity was supplied predominantly by centralised generators that could keep operating through the brief period of abnormal voltage.

Unfortunately, many current rooftop solar systems are not so robust and may switch off as soon as they experience a severe voltage drop. If such a drop occurs at a time when Adelaide's solar systems are supplying most of the state's demand (for example, midday on a mild, sunny Sunday) then their sudden, coordinated disconnection could black out the entire state, because other generators won't be able to start up quickly enough to take over the load.

Usually AEMO will recognise such a blackout risk ahead of time and avoid it by running centralised generators in addition to rooftop solar, exporting the surplus electricity to Victoria. However, the interconnector between SA and Victoria is not always operational—it's been out of action six times between 2016 and 2020. At such times SA operates as an electrical island, and AEMO's options are more limited.

The odds are low of all these conditions—a transmission line falling during a sunny time of low demand while disconnected from Victoria—being met simultaneously. However, the potential consequences are so severe that AEMO has determined that it needs a way to cope with this eventuality.

Several possible avenues are discussed over the pages to come.



Without a solution to the blackout risk ... AEMO has said that it will forbid new rooftop solar installations in South Australia.



A new lease on sustainability

"If anything good comes out of this..." is a phrase everyone is sick of hearing—but as Rob McLeod argues, it's imperative that at least one good thing *has* to come out of Covid: getting rental homes up to scratch.

Few people in Australia have been untouched by the effects of the Covid-19 pandemic: effects on our health, financial security, relationships and general wellbeing. However, the pandemic has hit renters particularly hard, amplifying the inequality that has long existed in our housing system.

If you rent in Australia, you were most likely already living on a short lease, offering limited rights over how you live in your home. That situation is now more precarious.

While protections are currently in place for renters who have lost income due to the pandemic, many have good reason to fear what might happen when temporary bans on evictions, rent increases and utility disconnections are lifted. Some renters and landlords have negotiated rent reductions in good faith; many have not, which serves only to reinforce the unequal power dynamics of such relationships.

Most of the focus on renters during the shutdown, both from governments and from the media, has rightly fallen on keeping people in secure housing. But as well as reminding us of the inherent inequalities in the landlord/renter relationship, the pandemic has also been a sharp reminder that millions of existing homes in Australia are simply not up to scratch.

Rental homes are, on average, less energy efficient than owner-occupied homes. This means that many renters are left paying high bills and living in unhealthy homes. Staying at home comes at a high price if your home is cold and damp because your landlord refuses to seal gaps or install insulation.

Making rental homes healthy and resilient in the face of climate change is more important now than ever—and the recovery

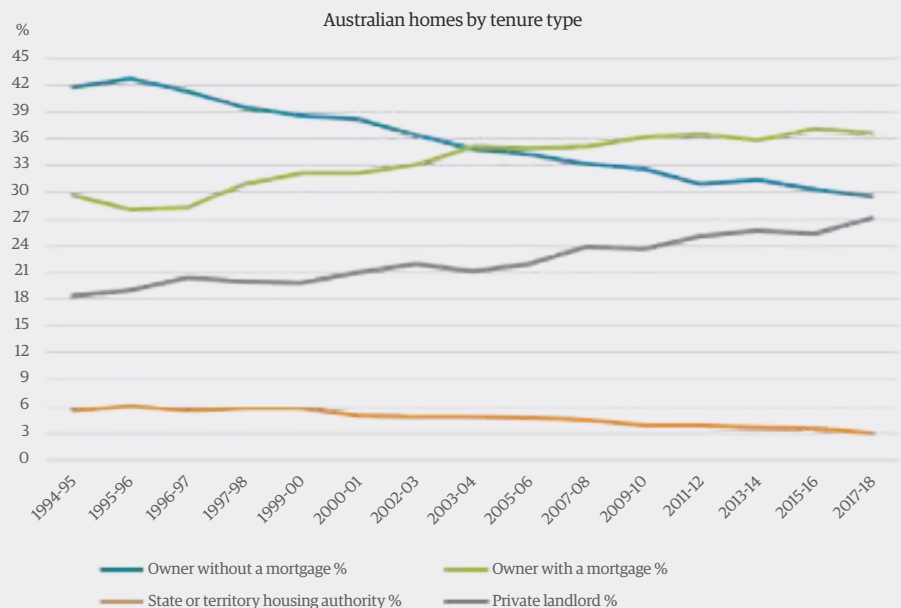


Figure 1: The decline of home ownership in Australia—and the corresponding rise in renting—over the last 25 years.

Source: Australian Bureau of Statistics

from the coronavirus pandemic might be the best chance we ever get to do it.

Renting in Australia

Nearly one in three homes in Australia is rented, and as the chart above demonstrates, that number is rising. As the rate of home ownership declines, the proportion of people renting is increasing steadily—from 26.3% in 2001 to 30.9% in 2016. This trend is not a coincidence: more people are renting as the housing boom has driven the cost of buying a home out of reach.

Tenancy laws and protections haven't kept pace with the growth in renting. The Australian housing system has tended to treat

renting as a temporary arrangement—a step on the way to the Australian dream of owning a home on a quarter-acre block. In 2020, however, people are renting for longer, and a growing number of people are expecting to do so permanently.

This means that more and more people are being put under long-term pressure by the downsides of renting—insecure 12-month leases, unpredictable rent increases, and minimal rights to adapt homes. Rental prices have fallen in many areas during the coronavirus pandemic, but only after rising significantly in real terms over the last 20 years. For renters on higher incomes, these increases may be manageable, but the

return in light



DIY—solar water pumping

Rob Landau describes a solar water pumping system that starts the pump gracefully at sunrise and avoids overdriving it at noon.

In *Soft Technology* 45 and *Renew* 80 there were articles on maximiser kits for driving pumps (or other DC motors) directly from a solar panel array, utilising the array near its maximum power point, avoiding the difficulty of trying to start the pump without supplying it with sufficient power.

In particular, when the outlet pipe is full of water, a large amount of pressure is put back onto the pump. This may stall the pump motor unless it can generate enough torque to move the water. The problem is that, in general, the torque of an electric motor is determined by the current it draws, while the speed at which it turns (i.e. its rpm) is determined by the voltage applied. This means that a high voltage is often not enough to start the pump—it needs high current to develop the required torque.

This led to the development of Renew's maximisers (also called linear current boosters), which increase the current and thus get the motor going at times when it would otherwise stall—typically in the morning when the sun first hits the panel. This approach avoids the use of batteries, the most consumable part of the equipment.

However, maximisers have another problem: when they retire gracefully after startup, the sun may get strong enough around noon to put the full panel voltage on the pump motor, often exceeding the pump's specs and burning out its brushes. A brushless DC pump would be quite useful in these situations, but the only ones we've seen have been expensive compared to brushed motor units. A maximiser with a voltage limiting capability would work, but that adds more complexity. We've adopted a different approach, driven in part by new technology.



The solar pumping system provides water for the house, the veggie garden and chooks on this off-grid 20 ha property on the South Island of New Zealand.

This new technology includes two recent developments: first, batteries that can sustain many more charge-discharge cycles, and second, “battery protectors”. The latter are essentially high current, solid state relays that can automatically disconnect their loads when the battery voltage drops below a programmable set point, and then reconnect when the battery charges to a higher voltage. In other words, they are essentially a low-voltage disconnect (LVD).

The design

The new design inserts a small battery between the panel and the pump. The battery is not being used to store energy; it's there to force the solar panel to operate at the battery voltage, which is kept in a range that keeps

the pump happy. As such, the battery doesn't need to be very large. A charge controller keeps the battery from overcharging, while the LVD prevents it from over-discharging.

For the battery, we use a lithium iron phosphate (LiFePO₄) unit, nominally 12.8V, 7Ah. These are about twice as expensive as lead-acid batteries, but can be cycled five to 10 times as often. They can also be used in any position (see photo p38) and are very lightweight. They have their own internal battery management system that will shut off the battery if the voltage drops below 9V, but we never let it get that low.

The controller is a Morningstar SunSaver 20L, which limits the battery voltage to below 14.4V. The controller also has a load output with an LVD to which the pump could

Taking in the recycling

For many years, Australia simply exported its paper recycling obligations. Those days are over, and we've got a 5.6 million tonne problem on our hands. Jodie Lea Martire opens the blue bin to investigate.

According to the latest National Waste Report, the average Australian generated 229kg of paper and cardboard waste in 2016-17. This makes for 5.6m tonnes of waste, only 60% of which was recycled.

Paper-based packaging is currently recycled at a rate of 49%. In 2018-19, 3.4m tonnes of paper waste was exported, valued at \$235m, but the Council of Australian Governments (COAG) will end the off-shoring of Australian recycling from 2024. We've been left with little choice—China's new (and rather dramatically named) National Sword Policy reduced waste imports severely from February 2018 onward, a move that was followed by other major importing nations like Indonesia and India.

This means we're finally being forced to deal with our own wastepaper. This comes in many forms: newspapers (although the amount of these is falling with increased online news consumption), office and writing paper, cardboard and boxboard (like cereal boxes), and Kraft paper (in paper bags). The cellulose fibres in paper can be recycled an average of seven times, making progressively lower-quality paper products: office paper can make new office paper to start with, but later becomes newsprint, paper towels and corrugated cardboard. Not everything that looks like paper is recyclable—copy paper packaging, baking paper, tissues and paper towels aren't suitable, nor are takeaway coffee cups (see the case study that follows this feature).

How is paper recycled?

The first stage of paper recycling is the collection of paper waste: from bins in offices and universities, commingled domestic

recycling or pre-consumer waste (e.g. offcuts from paper mills). Mixed recyclables are taken to a materials recovery or recycling facility (MRF), where paper is separated from glass, aluminium, plastic, etc. The paper is then sorted into grades (such as newspaper, cardboard and office paper) and each grade is baled separately. Paper can be contaminated if it's wrongly sorted, and/or by paper clips, liquids, pizza grease, or glass slivers from a mixed bin.

Each wastepaper grade then undergoes the recycling process. This starts with the paper being shredded and soaked in large, hot vats to disintegrate the cellulose fibres. The result is called "pulp". This is spun to remove heavy contaminants like staples, then filtered through a series of increasingly fine meshes. This "screening" removes some glue and adhesives (like that on sticky notes).

Once this is done, the pulp moves through a series of processes that are collectively referred to as "laundering". First, the pulp is "washed" to remove ink from it. Sometimes it also undergoes "flotation", which removes both ink and contaminants by injecting soap bubbles into the vat; these bubbles collect impurities and rise to the tank's surface to be skimmed off.

When it's clean, the pulp is beaten and thickened to make the fibres swell. At this point, it's ready to be turned into paper. The papermaking involves refining the pulp into smaller fibres, and bleaching

those fibres with hydrogen peroxide or oxygen to remove dyes and "brighten" the mixture (especially if its destination is office paper). Colours, coatings and additives can also be included now.

After this process is complete, the pulp can basically be used in the same way as virgin wood pulp. (At this point, virgin fibre can also be added to the recycled pulp to add strength or smoothness, although it's not necessary. To make sure you're using post-consumer recycled paper, check the FSC label on your product.)

The pulp is then loaded into a paper machine's head box, diluted until it is 99.5% water, then spread on a large moving screen which drains the water and leaves a long paper sheet or "web". The web is pushed



Case study: Simply Cups

No, you can't put your takeaway coffee cup in the recycling. Sure, it *looks* like it's made of paper—and 90 to 95% of it is—but there's a thin polyethylene coating on the inside to keep your hand dry. That cardboard-plastic combination means that your average takeaway cup can't be recycled in public or domestic yellow bins. There is currently no commercial process for separating the paper from the cardboard, and bioplastic alternatives must be commercially composted (not recycled) to return them to their organic components.

So what are we supposed to do? Australians bin around 1 billion cups a year—and that was before coronavirus made reusable cups “dangerous”! Fortunately, there are companies out there that are trying to address the problem.

One of them is Simply Cups (a project of circular-economy company Closed Loop), which aims to connect coffee drinkers, manufacturers and purchasers of upcycled products. With the support of major companies (including 7-Eleven, Muffin Break, and shopping centre chains like Lendlease), Simply Cups have set up collection points for used cups and lids in most Australian capitals. At the time of writing, the company has over 1000 locations nationwide, and has diverted nearly 14 million cups from landfill.

The bins are emptied regularly, and the cups are then distributed to local manufacturers to make upcycled products. A few examples: plastic manufacturer Newtecpoly uses whole cups to strengthen its recycled-plastic products like roadside curbing and outdoor seating, while Albury start-up Plastic Forest produces mini wheel stops, air-conditioner mounting blocks and garden beds. Recycled cups are also used in the manufacture of the Stay Tray, a reusable drinks holder invented by Melbourne entrepreneur Kate Stewart, which is made from 100% recycled material, while Simply



Behold, a minor miracle: a place to recycle your takeaway coffee cup!

Image: Courtesy of Simply Cups

Cups and 7-Eleven sell the rCUP, a reusable mug made wholly from upcycled takeaway cups.

It is vital that the rescued cups become viable commercial products: recycling only happens when waste is given a second life. According to John Ryan, Closed Loop's head of marketing, Simply Cups had no finalised plans for reusing the cups when it was founded back in 2017. However, Ryan says, “we did know that if we built a system to collect the cups, solutions would come”. Five years later, they're on track to divert 1 million cups a month.

Simply Cups has been able to make an impact because of its understanding of local waste systems, and also because of its connections with major Australian brands and innovative manufacturers who can capitalise on recycled materials. Simply Cups works because, as Ryan says, “it joins the dots to build

a circular economy”.

As that economy grows, so do the possibilities for recycled cups. One “superexciting” future concept is melding rescued cups into asphalt, a process being trialled by Sydney company State Asphalt Services. That company's new road surfacing, which uses coffee cups as a glue replacement, is proving significantly better than the material that it normally uses. (The current material is imported from China or Germany, so producing a local replacement will also save a whole lot of carbon in transport emissions.)

The cup-enhanced surface has shown it is quieter to drive on, more skid resistant and more durable—and uses 80,000 to 90,000 cups per council job. As John Ryan says, “When the roads go live, we've got a solution for every cup in Australia.” - *Jodie Lea Martire*



Royal flush: bring on the bidet

Dave Southgate documents his experiences with ditching the dunny roll and embracing the joys of ... [dramatic pause] the bidet.

Not so long ago, it was almost impossible to find toilet paper on the shelves of most Australian supermarkets. Along with many others, I was amazed that of all the items we need for our everyday lives, Covid panic buyers seemed to have voted toilet paper as number one! There are many, many alternatives for keeping yourself clean. The battle for toilet paper started me thinking seriously about ways to eliminate toilet paper from my life—and if one good thing comes out of the pandemic, it will hopefully be that others are thinking along the same lines.

Why try to eliminate the use of toilet paper?

Many analysts have raised concerns about the environmental impacts of toilet paper. These concerns divide into before- and after-use impacts. The former includes damage associated with forestry, chlorine bleaching, and production/distribution-related CO₂ emissions, while the latter include problems with blocked drains and adverse impacts on sewerage systems.

For some years my family—myself, my wife and two teenagers—has been on a journey to eliminate the direct purchase of fossil fuels for use in our home and our private transport. At the start of 2020 I widened the scope of this project to include the minimisation of our indirect carbon footprint. For the first time, I carried out a detailed carbon footprinting exercise for our household, which demonstrated that we still had a lot of work to do! The exercise coincided with the first wave of Covid panic buying, and toilet paper thus became one of the first targets of my drive to reduce our family's indirect carbon footprint.

My solution came down to replacing

wiping with washing. A lot has been written on this topic, and as far as I can ascertain, the carbon footprint of toilet paper lies somewhere in the range of 1-2g CO₂ per sheet. I estimate that our family's toilet paper carbon footprint over 2019 was around 50kg CO₂, which is approximately the same as the footprint for washing our clothes.

Replacing wiping with washing

I imagine most Australians of northern European descent will find washing, rather than using toilet paper, a somewhat alien idea. However, Australians who originate from—or who have spent time in—most other parts of the world are likely to have had at least some familiarity with people washing their private parts after going to the loo. When I put aside my UK cultural origins and look objectively at the subject, I can readily accept that washing after pooing is going to be cleaner—and more comfortable!—than smearing wastes over sensitive skin using toilet paper.

As far as I am concerned, the Japanese are the number ones for number twos. We had a family holiday to Japan a few years ago and one of the lasting memories is the wonderful—but also somewhat daunting—bidets. When you go to the loo in Japan you are presented with a multitude of options on your bidet. If you don't understand any of the Japanese symbols you just have to press one and feel what happens—warm/cold seat, warm/cold water, strong/gentle jet stream, warm/cold air dry, etc. It's an unforgettable experience for your nether regions. You certainly feel clean.

In terms of water use, many references indicate a bidet uses about 10% of the water that is involved when using toilet paper—

despite the fact that the actual act of washing clearly requires more water than wiping and flushing. This is because the process for making toilet paper is very water hungry.

Our bidet experience

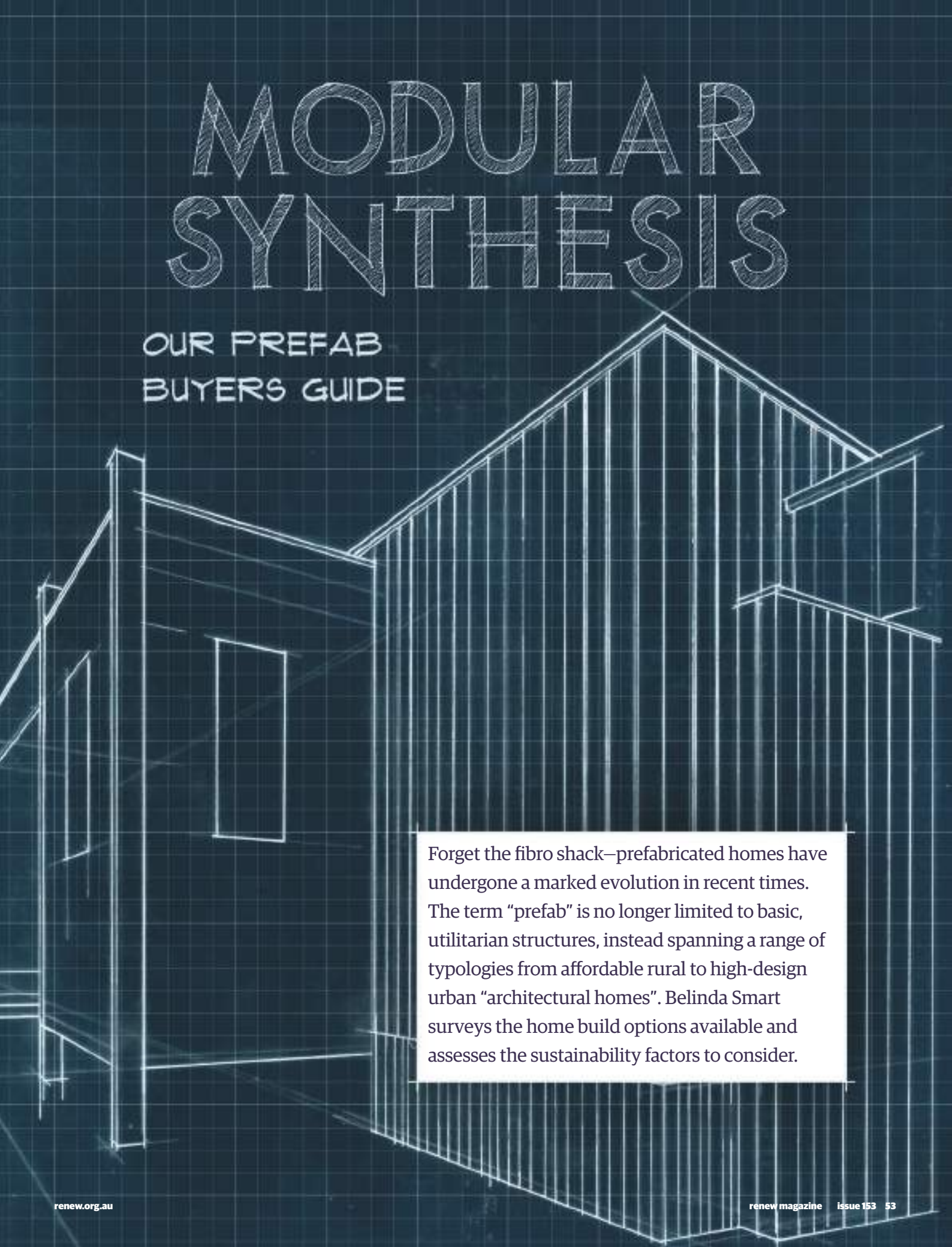
Having decided to move from wiping to washing, I was now in the market for a few test products. I began to Google the options, and was almost overwhelmed by the choice. There were bidets of all shapes and sizes: from simple plastic wash bottles, a bewildering variety of hoses, and handheld pumps, through mechanical toilet seat attachments and more sophisticated toilet seat replacements, right up to the top end Japanese electrical/mechanical options. The prices ranged from about \$10 to into the thousands of dollars.

As a general principle, when buying products I am attracted to simple solutions that have a minimal number of components, use little energy, and are flexible in how and where they can be used. I began by buying one base-level bidet option, along with another mid-range device, in order to see how they compared. Both of my initial purchases were portable handheld bidets, which certainly work: they are versatile in that they can be used in any toilet, and are compact and light. I certainly feel much cleaner after having used one of these.

As far as I am concerned, the crunch question is: how much does using one of these instead of toilet paper reduce one's carbon footprint? The answer will vary from person to person. I have seen some users comment that they no longer need to use toilet paper at all, but for me, using one of these devices does not eliminate the need for

MODULAR SYNTHESIS

OUR PREFAB BUYERS GUIDE



Forget the fibro shack—prefabricated homes have undergone a marked evolution in recent times. The term “prefab” is no longer limited to basic, utilitarian structures, instead spanning a range of typologies from affordable rural to high-design urban “architectural homes”. Belinda Smart surveys the home build options available and assesses the sustainability factors to consider.

Prefab pioneers

Passive House construction in under 15 hours

House prefabricated offsite using cross-laminated timber (CLT); panels craned into position onsite.

David and Kerri-Ann Hellier's brief to Betti & Knut Architecture didn't single out prefab construction for the extension of their Sydney home. Instead it talked about sustainability, running costs and creating an air quality that avoided dust mites and other asthma triggers in their three kids. The couple also wanted a set construction budget and to be able to live in the existing house while the extension was being built. Oh, and the rear of the block was going to be particularly hard to access for building.

"[Architect] Knut [Menden] had worked with cross-laminated timber (CLT) on a larger scale on commercial projects, so he proposed a CLT Passive House as a strong match for our brief," says David. The design was especially suitable as a way of providing decent air quality, given that ventilation systems are a key feature of Passive House. CLT has a similar manufacturing process to plywood, being made from layers of plantation timber that are glued together, but CLT is thicker and more suited to structural use. It's also referred to as a 'mass' timber for its thickness and thermal properties.

While building to Passive House standard could give the family a home with decent air quality, prefabricating it would get the house onsite and constructed much faster. The two-storey extension to the existing 1920s Californian bungalow was prefabricated by KLH in Austria and shipped to Australia as 11m panels, including the staircase and cut-outs for lighting. The extension took just 15 hours to install onsite, as shown in a



Images: Betti & Knut Architecture

Cross-laminated timber (CLT) extension to a Sydney house with difficult site access. The structure was prefabricated offsite and quickly craned into position. The CLT panels come with a finished interior surface. No plaster required!

time lapse video documenting the two days the structure was assembled (see vimeo.com/334861399).

David says this rapid construction time helped reduce crane costs. "Fortunately, we only needed traffic control and crane hire for the two days we were installing the CLT. This

was one significant cost saving," he says.

The complexity of craning the panels onsite illustrates why prefabricating the house saved time and headaches compared to other construction methods. Each panel needed to be craned up and over the house and tree canopy into the backyard, moved

The Iris House: affordable by design

In 2017, Sophia MacRae was a single mother in her late 40s, renting a house, with no savings. But she had a plan—about which she tells Sarah Coles.

In Australia, the fastest-growing category of people experiencing homelessness is women over 55 years of age. This makes it extremely important for single women to be strategic—and it makes staring down late middle age all the more frightening.

In 2016, Sophia MacRae completed a Master of Sustainability and a Master of Planning through the University of Adelaide. Finding that she couldn't land a job, in May 2017, she moved to Victoria for a graduate planning officer role with a local council. At the time, she was broke—or, in fact, worse than broke: "I had less than zero dollars," she recalls. "I had to borrow money to move over."

In January 2018, after securing a loan on the back of her new permanent employment, she bought a cheap block of land for \$55,000 in Camperdown. She says, "I owned my first piece of land—by the skin of my teeth."

Due to Covid social distancing measures, I am interviewing Sophia via Zoom. She is sitting in her new house, which is named the Iris House, after a friend who was assigned by the Planning Institute of Australia to mentor Sophia while she was undertaking a Master of Planning.

The Iris House achieves a 7.7 NatHERS Star rating. The cost of the entire construction came to just \$205,000.

Housing affordability and sustainability

Sophia is outspoken about the definition of "affordable". On the Facebook page detailing the Iris House project (a page entitled "Affordable Sustainable House: Single and Happy") she recalls receiving an email about a Victorian eco-development—one which she describes as "an inspiration", both in its aesthetics and in its sustainability-focused

philosophy. However, despite being described as "affordable", house and land packages started at \$440,000. She wrote eloquently of her disappointment: "Maybe [\$440,000] is [affordable] for couples. It is depressingly far out of reach for single parents, and for women who end up divorced later in life without enough capital to own their own home, ever again."

Sophia says that via her sustainability degree, she learned a lot about the practice of greenwashing, and also about just how slippery the term "sustainable" can be. One essay she studied examined the Brundtland definition of sustainable development, which is named for Norwegian politician Gro Harlem Brundtland, the chair of a 1980s UN commission into sustainable development. In 1987, the Commission released *Our Common Future* (also known as the Brundtland Report), which defined the term "sustainable development" as "that which meets the needs of the present without compromising the ability of future generations to meet their own needs".

Sophia says Brundtland is a definition agreed upon "for the maximum amount of capitalism and consumerism to continue.

It has a growth focus." She believes that policymakers working from a growth-focused definition of sustainability allows greenwashing at a global and federal policy level.

Kit homes

As *Renew* readers can attest, one way to keep housing costs low is to be an owner-builder. But Sophia points out that it is very difficult to work full-time and build your own home simultaneously. She was also physically incapable of some of the tasks involved in building a house. She did, however, know a thing or two about keeping living costs low in order to save: "I don't own a car, so [there are] no running costs [or] capital costs. My son and I knew that I would come home from the shops just with the stuff that's on special."

Sophia decided early on that she would buy a pre-made kit home and then retrofit it to increase the energy efficiency of the building. Buying a kit home costs far less than a custom designed house: according to the Your Home website, "Volume housing typically costs less per square metre than a custom designed and built house. Floor plans vary but they are designed and built



The kitchen, with obsession-inducing cooktop.



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