Orchestrating energy transitions:

From ‘eco-bling’ to tuning the building
Context: Locating the commercial office sector in Australia


25M m² of commercial office stock
4,500 buildings
27 years average age of building
80% more than 10 years old

2015 PCA office market report

Sydney CBD:
• 5M m² of commercial office stock.
• 28% of total CBD office stock in Australia
• 53% top tier
• 16% premium grade

Melbourne CBD:
• 5.7M m² of commercial office stock.
• 32% total CBD office stock in Australia
• 58% top tier
• 15% premium grade
Assembling buildings and urban energy transitions

Buildings as:

- ‘Big things’ as a precarious alliance (Jacobs 2006)
- Performances of ‘holding together’ (Jacobs & Merriman 2011; Kraftl 2010)
- Emergent: degradation and decay offset by stabilizing labours (Edensor 2010)

Urban energy transitions as:

- An assemblage of materials, skills, technologies, regulations and practices (Rutherford 2014; Rutherford & Coutard 2014; McGuirk & Dowling 2020)
- Multi-scalar and multi-temporal (Dowling, McGuirk & Maalsen 2018; Hodson et al. 2013)

- Dominant approach to energy transitions has been governance through ‘big’ things – complex technologies and materials that are capable of producing ‘big’ effects.
- Shifting to an assemblage approach foregrounds the ongoing, everyday socio-technical work of building energy transitions.
Orchestration:
Attending to the rhythms of building upgrade, maintenance and repair

1. Maintenance and repair as:
   • response to decay
   • source of variation, improvisation and innovation
   • economic activity (Graham and Thrift 2007).

2. A focus on the quotidian, largely invisible routine work of maintaining and upgrading buildings (Strebel 2011; Carr et al. 2017; Mattern 2019)

3. Building as lively:
   • Recalcitrant / disobedient materials and technologies (Yaneva 2008; Kraftl 2010; Bennett 2010)

- Routine repair, maintenance, tuning and upgrade practices are largely invisible, yet they hold the building assemblage together.

- A socio-technical approach to energy transitions foregrounds the diverse technologies, knowledges, skills and methods that underpin these practices.
Energy transitions via building fabric technologies and regulation

- Shift to more expansive glass facades
- Cultural inertia around glass facades, despite increased energy consumption
- In response to tighter regulation, owners and designers have turned to new technologies to improve energy performance
- These systems are more materially intensive, complex, costly, difficult to maintain, have a limited lifespan and are difficult to recycle
- Drive for technological solution to an energy problem caused by (largely avoidable) commercial imperatives
The promise of building-scale alternative generation

- Gas-fired generation as an answer to energy performance for commercial buildings
- More than 20 plants installed across Sydney and Melbourne from 2010-2015
- City of Sydney released the Decentralised Energy Master Plan in 2013
- From 2015 growing concern around gas as a non-renewable resource that still produced carbon
- Operational concerns around gas-fired generation, including efficiencies, maintenance and rising gas prices
Energy transitions enacted through data-rich automated building control system

**Siemens Desigo:**

“...a command centre that allows you to optimise your entire building’s performance from one station. Offering superior control, it integrates planned workflows for building automation, power, energy, fire and safety, lighting and security...”

“...a single integrated platform for automatic interactions that is open, efficient, flexible and simple to use. With personalised, actionable information at your fingertips, you can easily optimise your facility’s energy and operational efficiency... It is the future of facility management.”
Yeah look, I think these technologies are great, but we don't have self-driving trains let alone self-driving cars, let alone self-driving buildings. A self-driving car, would be - you'd say immeasurably more complicated than a self-driving building, you'd think. These control systems, they help but the trick is to try and - we think, to try and empower the facilities operators to be more effective and more aware of how to tune a building.

Craig Roussac (Buildings Alive) 2012, Facilities Management trade publication

Energy management consultant, Sydney
They [facilities managers] are the primary people who can do something about it. Aside from the budget setting process which we talked about, which is a capital works planning process, tuning and commissioning of the building is an ongoing activity. We expect people to be doing works continuously: seasonal set points, tuning and controls adjustments.

They may appoint a consultant to do that on their behalf, or they may delegate that to their controls engineers, or they might have the technical competence to do it themselves if they're an - some larger assets have an engineering manager who has those skills, but a smaller asset won't, so they'll probably pay a consultant to do it. Adjusting controls, set points and ongoing optimisation is something that we expect our operations teams to do.

*Major portfolio investor, Sydney*
The biggest gains in big buildings like this that were probably made were to adjust the controls so that the boilers and the chillers weren't on all the time. Just getting the controls right, turn the boilers off in summer. You know, avoid them ever being used. So lock them out in summer, so the controls can't turn them on, even if they wanted to.

So activities like that gave us big jumps in performance. So once you get rid of those gross control errors, then you get to "okay, we've got the best operational strategies, sequencing the chillers in the right sequence", and then you get to “are we using the right technologie”? Through that evolving, changing out, life-cycle process, we're getting the right technologies in place, and you do get to something of a saturation point.

Major portfolio investor, Sydney
Upgrading the building

Every building, everywhere, is being upgraded every day. Whether it's changing a light in the bathroom, whether it's changing a fan in the air conditioning system, there's stuff going on all the time. It's a matter of being able to align that stuff to a performance outcome you want. So if we can align every life-cycle maintenance to deliver both reliability and performance that we want from the service, but also on efficiency, then there's no extra money required. It's all part of our normal maintenance of the building...

Major portfolio investor, Sydney

So this building has never been shut down and upgraded per se. But the chillers have been changed, the boilers have been changed. We're currently changing all the lift motor gear, which will be a significant saving. As tenants come and go, the grid gets upgraded and the lights get changed out. Yeah, piecemeal by piecemeal. So, that's the most efficient, economically, and most practical way to achieve that performance outcome that we want.

Major portfolio investor, Sydney
Conclusions

- The commercial office sector in Sydney and Melbourne has emphasised technological solutions as a way of progressing energy transitions, however in many cases (and for a range of reasons) the promise has fallen short of actual performance.

- New technologies and materials are not sufficient to effect energy transitions on their own. Energy transitions are also delivered through routine repair, maintenance, tuning and upgrade practices that hold the building together.

- This highlights a need for a socio-technical approach to energy transitions that focuses on routine repair, maintenance, tuning and upgrade practices that require diverse technologies, knowledges, skills and methods.

- Requires that stakeholders place less focus on governance of urban energy transitions through ‘big’ things, and more emphasis on orchestrating the assemblage of practices, materials and small-scale interventions that hold the building together.
References


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