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A place-based approach to energy in Victoria: the role for regional energy system planning

Response to the invitation from Infrastructure Victoria to help set the objectives of the 2025 strategy, define the major infrastructure challenges for Victoria, and identify infrastructure options and policies to address them.

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About Arup

Arup is a global collective of designers, consultants and experts dedicated to sustainable development, and to using imagination, technology and rigour to shape a better world.

Arup's work in the built environment leaves a significant legacy to subsequent generations. This power, to design and influence the built environment, carries with it a responsibility to do the best possible job for current and future generations. Since the beginning, Arup's commitment to sustainable development has influenced the way we conduct our business, the way we treat our people and the way we interact with our various communities and society as a whole.

Putting sustainable development at the heart of our work is one of the ways in which Arup exerts a positive influence on the wider world. Shaping a sustainable future – particularly through the urban environment – will be one of the greatest challenges in the 21st century. Arup is rising to the challenge: investing in tools and research, innovating, and creating better solutions for its clients and the wider world.

ARUP

Background

This submission is made by Arup in response to the public consultation by Infrastructure Victoria on the objectives of the 2025 30-year Infrastructure Strategy for Victoria. We welcome the opportunity to provide ideas at this early stage of the process. This submission is made in the context of Victoria's 2035 climate change targets of 65 per cent renewable energy by 2030 and 95 percent by 2035[1]. We see an opportunity to potentially accelerate the rollout of renewable electricity, reduce the cost, and distribute job creation and economic benefits across the economy.

Infrastructure Victoria has set out four key areas that are crucial to the next 30-year strategy:

1. *Doing more with less*
2. *Navigating change and disruption*
3. *Improving social equity through access*
4. *Mitigating and adapting to our changing climate*

Our submission sets out how we think that regional energy system planning approaches are relevant across these four key areas.

Introduction

The Victoria Government has set world-leading targets to achieve net-zero emissions by 2045, and 75-80% reduction in emissions by 2035. This includes a target of **95% renewable energy by 2035.** While work has been done on what this transition looks like at a high level, there is still much work to do to develop viable implementation pathways.

A net-zero energy system requires a paradigm shift. It requires a shift from thinking about 'big' centralised generation and transmission to thinking about renewable energy as a decentralised, dynamic, and complex system – where demand management and distribution are as important as generation and transmission. It requires a shift from thinking about energy as cheap and almost limitless, to valuing energy as a precious resource – so that energy efficiency and conservation are critical. It requires consideration for how energy resources and infrastructure relate to our landscapes and natural resources. It requires explicit consideration of transport energy, which must radically shift from fossil fuels in the next decade. And it provides the opportunity to address energy equity issues.

The scale and pace of this ambitious transition requires agency and decision making to be shared, so that people in communities, businesses, local governments understand the change that is required and their role in that change, and so they are empowered to act.

This submission sets out a proposal for **regional energy system planning** to be included as a key element of the energy transition in Victoria. There is no one part of government currently tasked to plan this transition. Therefore, the holistic view of Infrastructure Victoria – as expressed in the 30-Year Infrastructure Strategy for Victoria – provides a credible and independent vehicle to promote thinking about energy as a place-based system.

[1] https://www.climatechange.vic.gov.au/climate-action-targets

What is regional energy system planning?

Regional energy system planning – sometimes called integrated energy system planning, or local area energy planning[2] – takes whole-systems approach to identifying optimal energy development pathways for a region or community. The process involves using models to explore a range of technologies and scenarios, combined with stakeholder engagement, to identify a cost-effective preferred pathway and a sequence of actions. The result is a masterplan that sets out pathways for the region to achieve net zero energy systems.

A whole-system approach incorporates the interactions between various parts of the energy system, covering energy demand, generation, distribution, storage, and management. The integrated approach enables us to simultaneously consider all uses of energy across heat, cooling, power, transport, and industrial energy.

Models are used to provide a robust, technical evidence-base to inform delivery plans and advance the journey to net zero. Combined with stakeholder engagement, this reveals insights to help decision makers understand the complexities of interconnected energy systems, new technologies, market volatility, regulation, and policy.

We already have energy system planning – why do we need more?

Currently AEMO's Integrated System Plan (ISP) takes the necessary high-level 'bird's-eye view' of the entire National Energy Market and how this can transform to achieve the shift to renewable energy. The Victorian Transmission Investment Framework (VTIF) sets out the framework for Renewable Energy Zones and transmission lines in Victoria. These plans enable an overview of the scale of generation and transmission that is likely to be needed overall.

Other work, such as ARENA's Community Batteries Funding Program, is focusing on how to enable neighbourhood-scale distributed energy resources (DER) markets and storage. This 'worm's eye view' is at too small a scale to understand what is needed to integrate DER into the larger systems.

We need a 'meso' view – somewhere in between – where we can get a reasonably granular view of who uses energy and how they use it, what energy resources are in that place, and how supply and demand can be efficiently integrated. Each region has a different opportunity to achieve net zero. Regional approaches take a 'meso' perspective and allow for place- and community-specific context and aspirations to be incorporated into energy system planning including geography, types of industry, types of buildings, energy infrastructure, energy demand, available resources, economic development aspirations, and urban growth plans.

To determine the appropriate energy mix for a specific area and unlock the broader economic potential of energy plans in terms of job creation and growth, it is crucial to comprehend the unique requirements of that place and actively involve local stakeholders.

The spatially explicit approach enables consideration of transmission and distribution of energy as part of the optimisation analysis. It is at this scale we can develop master planning and system design that 'makes sense' for a particular place.

[2] https://es.catapult.org.uk/tools-and-labs/local-area-energy-planning/

What does it include?

Energy efficiency: Regional energy system planning can prioritize energy efficiency measures, such as promoting energy-efficient technologies, building retrofits, and efficient grid infrastructure. By reducing overall electricity demand through energy efficiency, the need for extensive transmission infrastructure and generation can be minimized, thereby lowering costs.

Demand-side management: Energy demand is no longer a passive endpoint in a chain of energy supply - it is a dynamic, interactive part of an increasingly complex, interdependent, and interactive whole system. Local energy system planning can encourage demand-side management practices, such as time-of-use pricing, smart grid technologies, and energy conservation programs. These initiatives can help shift electricity consumption patterns, optimizing the use of transmission infrastructure and reducing the need for expensive grid upgrades.

Local generation and energy resources: Regional energy system planning can consider the quality of energy resources such as solar, wind, and hydro, and the availability of enabling resources such as land and water. This allows a more granular approach to system optimisation – for example, even lower quality solar and wind resources when combined with a reduced need for transmission might mean some level of local generation is optimal. It will also take into account the Renewable Energy Zones and transmission planning and consider what energy exports are possible, and what imports are be needed.

Microgrids and local storage: Implementing microgrids and local energy storage systems can enhance the reliability and resilience of local energy systems. By integrating renewable energy sources and storage technologies, excess electricity can be stored and utilized locally, reducing the reliance on long-distance transmission and associated costs.

Transport: By including transport in the energy system plan and associated models, decision-makers and the community can gain a clearer understanding of the impact of different transport options. This includes the additional load from electric vehicles or electric buses on the power system, but also the benefits they bring such as reducing the solar ‘duck curve’.

What are the potential benefits?

Regional energy system planning offers a range of benefits, including avoided generation and transmission costs, enhanced energy resilience, economic development, and community engagement.

Avoided generation and transmission costs: By strategically planning and optimizing local energy systems, it may be possible to avoid, reduce or defer costly generation and transmission. Local energy systems often emphasize the use of distributed generation, where electricity is generated closer to the point of consumption. By generating electricity locally, the need for long-distance transmission is reduced, resulting in lower transmission costs. Through optimising flexible demand and load balancing, there is likely to be a reduced need to overbuild renewable generation, transmission, and grid services to cater for peak demand. Less transmission also means lower transmission losses, reducing the need for generation.

System resilience: Regional energy system planning can explicitly consider climate risk and resilience of energy systems as a design objective, which may include the ability to isolate parts of the system during hot days or disasters.

Economic development and job creation: Local energy system planning can stimulate economic development and job creation at the community level. Implementing renewable energy projects, energy efficiency initiatives, and localized energy systems often require local labour and expertise, fostering employment opportunities and attracting investments in the clean energy sector.

Community engagement and empowerment: Local energy system planning encourages community participation and engagement in decision-making processes. It allows residents, businesses, and local organizations to have a say in shaping their energy future, fostering a sense of ownership and empowerment. This can lead to stronger community ties, increased energy awareness, and a more sustainable and resilient society.

It provides a strategic and integrated framework for investment that can be supported by financing instruments and incentives to accelerate deployment of renewable energy.

There is a decade of evidence for these benefits in the UK and Europe, where Arup has supported regional and national governments to guide energy planning and their funding. Key examples to inform the 30-Year Infrastructure Strategy for Victoria include plans developed by Greater Manchester Combined Authority, Greater London, and the Welsh Government.

How does regional energy system planning help with the four key areas?

1. ***Doing more with less*** - *Victoria needs to respond to increasing workforce, supply chain and financial constraints. We can influence productivity in specific infrastructure sectors, better use infrastructure, and help decision makers choose the right infrastructure to activate productivity growth. How should we do this?*

Overall, integrated whole system planning at the 'meso' scale can help achieve better energy efficiency, conservation, and balance between generation and load. Planning for at least some sources of generation to be local can reduce the need to transmit power over long distances. By reducing both the peak and the overall demand, it can reduce the need to overbuild generation and transmission or distribution. Regional energy system planning (and implementation) has the potential to allow reduced generation, less need for transmission, and reduced transmission losses leading to overall lower costs of energy. In terms of productivity, regionally led processes devolve responsibility and encourage more agency and participation from local government, investors, employers, and workers.

2. ***Navigating change and disruption*** - *Victoria's infrastructure planning must adapt to emerging changes and disruptions in technology, population, community preferences and ways of working. What ideas do you have about how Victoria can better plan and use infrastructure in conditions of uncertainty?*

Regional-scale planning can be much closer to the context and situation, responding much more directly to the needs of communities as they navigate the fast-changing world

3. ***Improving social equity through access*** - *Victoria should be a great place for everyone who lives here, no matter where that is. What improvements or changes should be made to make access to infrastructure fairer?*

Regional energy system planning can, and should, allow for explicit consideration of energy equity in the context of the community demographics.

4. ***Mitigating and adapting to our changing climate*** *– Victoria must prioritise adapting infrastructure to climate change and reducing infrastructure-related emissions. How should we do this?*

The primary goal of regional energy system planning is to design cost-effective pathways to net zero emissions for energy (including transport), while achieving other social and economic outcomes. This approach can make a strong contribution to designing energy systems that are resilient to the impacts of climate change. For example, as we face more climate disruption – hot days, fires, floods, and storms – the ability to 'island' community power systems may be important. If done well, the regional-scale planning process contributes to community agency in transitioning to net-zero and adapting to the impacts of climate change.

Resources:

The UK Government is rolling out support for Local Area Energy Planning. Arup has been involved in over a dozen of these plans and has supported the development of the guidelines. https://es.catapult.org.uk/tools-and-labs/local-area-energy-planning/

Information about Arup's experience in place-based energy planning in the UK can be found on our website:

- Local Area Energy Planning: translating net zero goals into actionable steps through whole-system energy modelling - Arup
- Local Area Energy Planning - Arup