



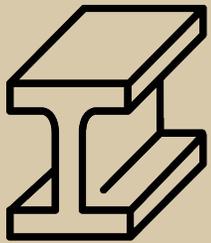
Australian Industry Energy Transitions Initiative

The Australian Industry Energy Transitions Initiative is a platform for Australia's emissions-intensive industry and related businesses to coordinate learning and action on net zero emissions supply chains.

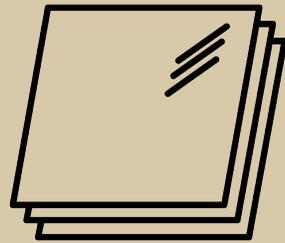
This pioneering initiative convenes Australian industry and business leaders to collectively explore and address the challenges associated with climate change.

Together, we are developing pathways and early action projects and taking action towards achieving net zero emissions supply chains by mid century, in Australia's emissions-intensive industries.

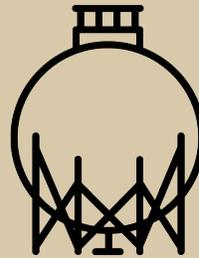
Focusing on five key supply chains



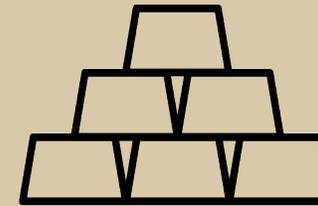
IRON & STEEL



ALUMINIUM



**LIQUIFIED
NATURAL GAS**



OTHER METALS



CHEMICALS

Momentum is building across Australia's economy to decarbonise heavy industry supply chains with an ambition of achieving net zero emissions by 2050.

Australian Industry ETI Partners

The initiative is convened by:



With research support from:



With funding from:



Industry & Business Partners:



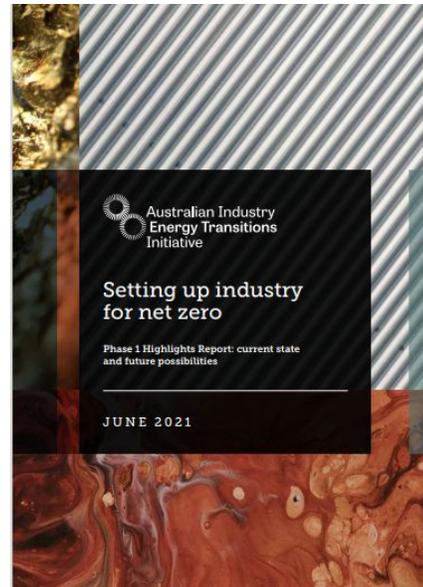
Supported by:



July 2021: *Setting up industry for net zero*

Highlights Report

Key themes and findings from the first phase of the initiative – from partners of enablers and blockers for net zero transition in hard-to-abate sectors.



Technical Report

Robust analysis of the transition to net zero across five supply chains.

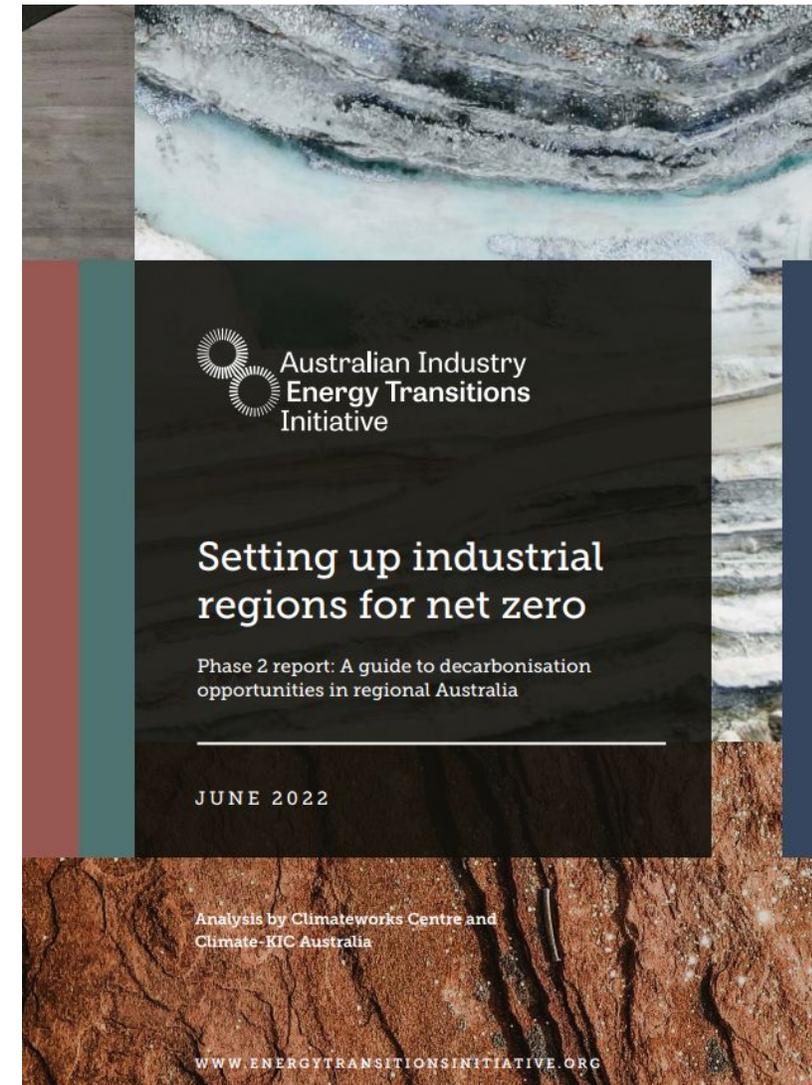
Covers current state of play, promising technologies and their deployment at scale; potential for renewable energy, and validates these findings with industry partners.



June 2022: *Setting up industrial regions for net zero*

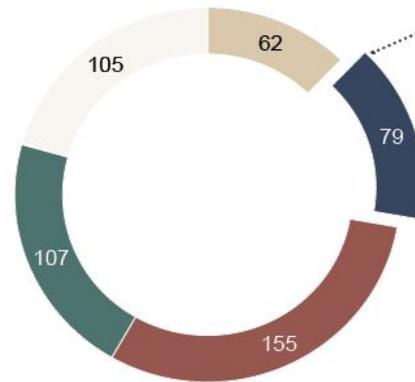
This report:

- Profiles decarbonisation potential of four regions in detail: Pilbara, Kwinana, Hunter and Illawarra, plus high level analysis of potential for Gladstone
- Finds regional Australia offers huge potential to decarbonise across ‘hard to abate’ supply chains

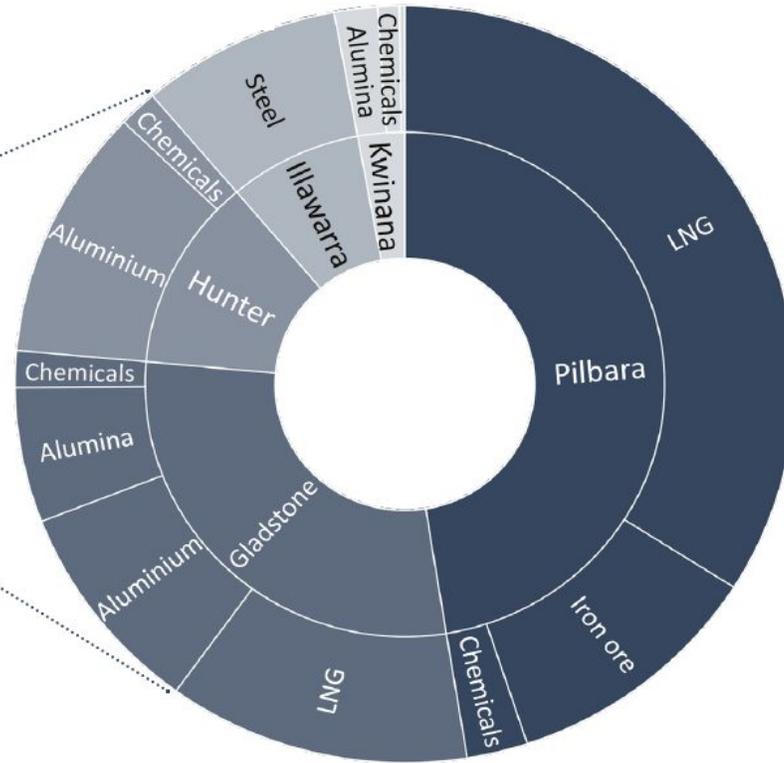


Industrial regions contribute significantly to Australia's economy and are high emitting centres that will need to decarbonise.

Scope 1 and scope 2 emissions across sectors within Australia (MtCO₂e)



- Agriculture and land
- Focus supply chains in the five regions
- The rest of industry
- Transport
- Buildings



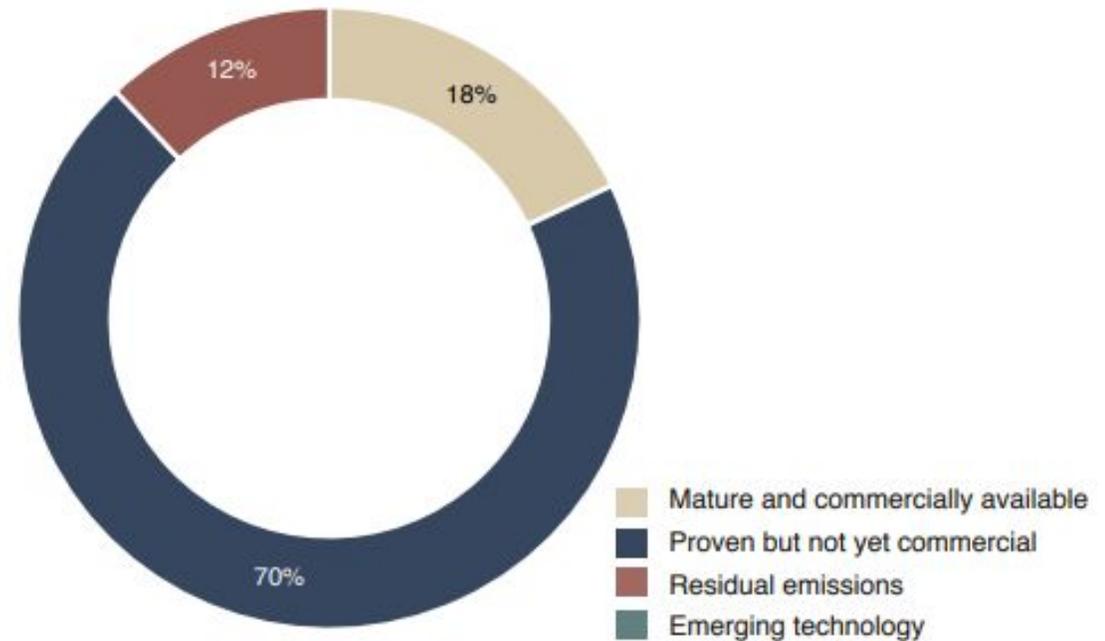
Share of scope 1 and scope 2 emissions across Australian Industry ETI supply chains in the five focus regions

Industrial regions hold substantial opportunities for emissions reductions

70 MtCO₂e of abatement potential identified in Pilbara, Kwinana, Hunter, Illawarra and Gladstone regions, in the supply chains of steel, aluminium, other metals, chemicals and LNG.

This represents an 88% reduction on current emissions: the equivalent of removing all emissions from cars and light commercial vehicles across Australia.

This abatement potential is technologically proven, but commercial barriers to overcome remain.



Decarbonisation opportunities across Australia



212 - 461k
Estimated jobs opportunity



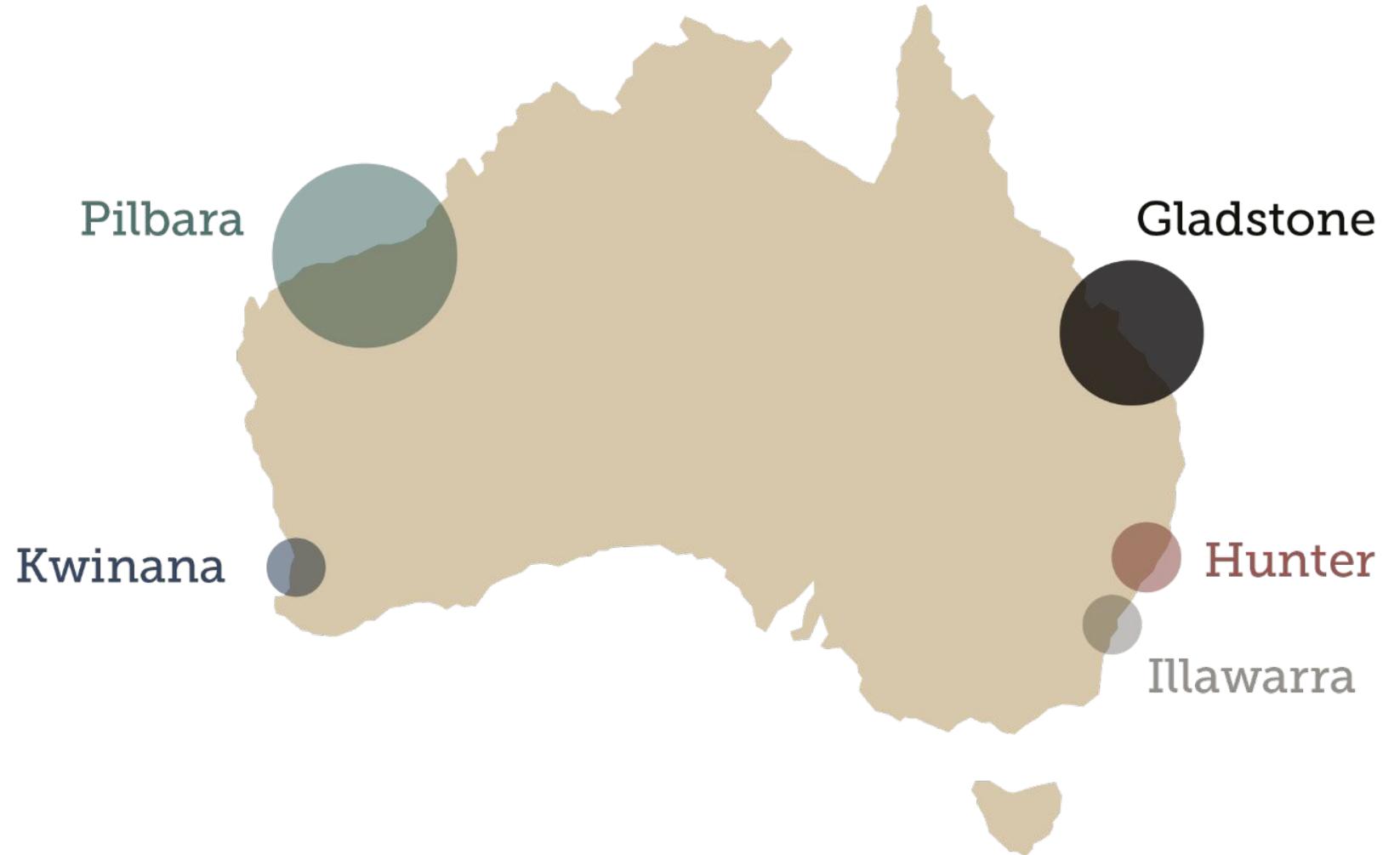
A\$53 to A\$100 billion
Additional investment required



68 - 126 TWh
Additional renewable energy required



70 MtCO₂e
Total abatement potential



Decarbonisation opportunities by region

Pilbara

TOTAL ABATEMENT POTENTIAL:	30.6 MtCO ₂ e
ADDITIONAL RENEWABLE ENERGY REQUIRED:	25.3 to 53.8 TWh
ADDITIONAL INVESTMENT REQUIRED:	A\$17.8 to A\$38.4 billion
ESTIMATED JOBS OPPORTUNITY:	102-243k

Kwinana

TOTAL ABATEMENT POTENTIAL:	2.1 MtCO ₂ e
ADDITIONAL RENEWABLE ENERGY REQUIRED:	4.8 to 9.7 TWh
ADDITIONAL INVESTMENT REQUIRED:	A\$3.9 to A\$7.3 billion
ESTIMATED JOBS OPPORTUNITY:	15- 31k

Gladstone*

TOTAL ABATEMENT POTENTIAL:	21.2 MtCO ₂ e
ADDITIONAL RENEWABLE ENERGY REQUIRED:	14.8 to 37.5 TWh
ADDITIONAL INVESTMENT REQUIRED:	A\$14.2 to A\$33.6 billion
ESTIMATED JOBS OPPORTUNITY:	34-89k

Hunter

TOTAL ABATEMENT POTENTIAL:	9 MtCO ₂ e
ADDITIONAL RENEWABLE ENERGY REQUIRED:	11.2 TWh
ADDITIONAL INVESTMENT REQUIRED:	A\$10.3 billion
ESTIMATED JOBS OPPORTUNITY:	24k

Illawarra

TOTAL ABATEMENT POTENTIAL:	6.6 MtCO ₂ e
ADDITIONAL RENEWABLE ENERGY REQUIRED:	12.1 to 13.7 TWh
ADDITIONAL INVESTMENT REQUIRED:	A\$6.6 to A\$10.7 billion
ESTIMATED JOBS OPPORTUNITY:	37-74k



Bubble size is related to total potential abatement.

*Analysis of the opportunity in Gladstone is presented in appendix, a detailed focus on this region was not undertaken

Kwinana



2.1 MtCO₂e
Total abatement
potential



4.8 to 9.7 TWh
Additional renewable
energy required



A\$3.9 to A\$7.3 billion
Additional investment
required



15,000 - 31,000
Estimated jobs
opportunity

What is needed

- Investment to facilitate the delivery of decarbonised energy into the region, either in the form of electricity or molecules such as ammonia or hydrogen;
- Coordinated planning and development of multi-user infrastructure to facilitate efficient decarbonisation;
- Regulatory changes to facilitate hydrogen and carbon dioxide transmissions and storage;
- Policy development to further stimulate near-term hydrogen demand;
- Building on activities being identified in Kwinana Industry Council's Carbon Reduction Plan.

40 kilometres south of Perth in Western Australia.

Home to alumina refining, ammonia, fertilisers and chemicals productions, nickel refining and other battery mineral processing, as well as cement and a range of supporting industries.

There is significant effort to collaborate around industrial activity and exchanges in the Kwinana strategic industrial area and broader Western Trade Coast.

Due to land constraints, there are limited options for onsite renewable generation.



Potential to build on existing collaboration to develop a thriving ecosystem centred around clean technologies such as green metals, chemicals and hydrogen.

The Pilbara



30.6 MtCO₂e
Total abatement
potential



25.3 to 53.8 TWh
Additional renewable
energy required



A\$17.8 to 38.4 billion
Additional investment
required



102,000 - 243,000
Estimated jobs
opportunity

What is needed

- Leverage the region's huge renewable energy potential to support future industries;
- Large scale development of the North-West Interconnected System, off-grid and stand-alone grids in the region to support large scale electrification of extraction industries;
- Coordinated regional approach to renewable electricity, hydrogen and energy infrastructure to enable effective, large-scale electrification and integrated hydrogen supported by new multi-stakeholder models and ways of working;
- Coordinated industry and government support for new low carbon iron and steel technologies R&D, including post extraction processes for hematite ores for green steel manufacture;
- Industry to work together with original equipment manufacturers to accelerate decarbonisation of haulage and shipping.

Extensive region in northwest WA, equivalent in size to Spain

Responsible for a major portion of the production, value, exports and investments of extraction industries commodities

Annual economic output of A\$88 billion



Low-cost, decarbonised energy systems are needed to enable net zero emissions production and new decarbonised industries such as green iron production at scale.

Hunter



9 MtCO₂e

Total abatement potential



11.2 TWh

Additional renewable energy required



A\$10.3 billion

Additional investment required



24,000

Estimated jobs opportunity

What is needed

- Build on NSW's Electricity Infrastructure Roadmap, taking into consideration new demand from decarbonisation and electrification;
- Leverage momentum from existing policy to join up existing networks, collaborations and research and development efforts and support joint heavy industry;
- Facilitation of market developments to enable scale-up of green products and renewable energy with, for instance, government procurement, mandates, and feed-in tariffs;
- Development of large scale electricity generation and transmissions infrastructure from nearby renewable energy zones.

One of Australia's largest and most diverse regional economies.

Contributes A\$50 billion to NSW Gross State Product (~8 percent) indirectly driving 28 percent of state economic output.

Diversified mix of industry spread across aluminium, steel, chemicals, manufacturing, agriculture, coal mining and energy.



The Hunter has a strong potential for competitive advantage for decarbonised industrial production through existing infrastructure, workforce, manufacturing skills, supply chains, ports, and supportive communities to enable a larger scale transition to net zero industry.

Illawarra



6.6 MtCO₂e
Total abatement potential



12.1 to 13.7 TWh
Additional renewable energy required



A\$6.6 to A\$10.7 billion
Additional investment required



37,000 - 74,000
Estimated jobs opportunity

What is needed

- Coordinated efforts between industry and government on current and future energy need to plan generation and infrastructure such as transmission, storage and grid firming.
- Regional industry stakeholders, agencies and communities need to come together to develop one industry decarbonisation roadmap.
- Market development support for green products.
- Coordinated industry and government support for new low carbon iron and steel technologies research and development and demonstrations, including post extraction processes for hematite ores for green steel manufacture.
- Full decarbonisation will require the development, commercialisation and implementation of new low emissions iron and steelmaking technologies requiring a substantial increase in energy systems to deliver electricity and hydrogen for these processes.

Narrow coastal strip south of Sydney.

Modern industry dominated by steel production.

Has seen significant recent economic diversification with the introduction of advanced manufacturing, ICT and professional services into the economy, as well as the defence sector.



Emissions from steelmaking, the major heavy industry in the Illawarra can be reduced by around 20 percent through mature and commercially available technologies.

Gladstone



21.2 MtCO₂e
Total abatement
potential



14.8 to 37.5 TWh
Additional renewable
energy required



A\$14.3 to A\$33.6 billion
Additional investment
required



34,000 - 89,000
Estimated jobs
opportunity

NOTE Analysis is presented for Gladstone in Queensland given its interest to industry partners, economic contribution, and emissions. This analysis is presented in the appendix of the report as further consultative engagement is required for the development of a detailed focus for this region.

500 km north of Brisbane, spanning 10,489 square kilometres.

Modern industrial region with port access.

Significant economic diversification with industries ranging from tourism, manufacturing, transport, construction, retail, education, health and professional services.



Emissions from alumina refinery, ammonia and ammonium nitrate production and LNG processing in Gladstone can be reduced by around 27 percent through mature and commercially available technologies.

Cross cutting themes central to the effective decarbonisation of industrial regions

The need for large-scale investment and deployment of renewable energy, infrastructure and measures that improve energy system efficiency and flexibility, to ensure affordability and reliability.

The need for enhanced coordination across multiple dimensions of the system.

The need for enhanced collaboration between entities.

The need to act now: setting transformative changes in motion now by laying the groundwork for deployment of mature, not yet commercial and emerging technologies.

Realising the opportunities of decarbonisation requires an **unprecedented transformation** of the energy system **at scale**

Region	Technology abatement potential by region	Energy requirements	Energy capital costs (excluding infrastructure)
Kwinana	2.1 MtCO ₂ e (~92 percent)	4.8 - 9.7 TWh	A\$ 3.9 b - 7.3 b
Pilbara	30.6 MtCO ₂ e (~82 percent)	25.3- 53.8 TWh	A\$ 17.8 b - 38.4 b
Hunter	9.0 MtCO ₂ e (~93 percent)	11.2 TWh	A\$ 10.3 b
Illawarra	6.6 MtCO ₂ e (~100 percent)	12.1 - 13.7 TWh	A\$ 6.6 b - 10.7 b
Gladstone	21.2 MtCO ₂ e (~93 percent)	14.8 - 37.5 TWh	A\$ 14.3 b - 33.6 b
Total	69.5 MtCO₂e (~88 percent)	68.3- 125.9 TWh	A\$ 52.9 b - 100.3 b

These opportunities require an additional 68 - 126 TWh of energy and A\$53 billion to A\$100 billion in investment.

The amount of renewable energy required is equivalent to 26 to 47% of Australia's total electricity generation and 107 to 197% of total current generation from renewable sources.

Recommended actions to unlock the scale of regional decarbonisation

 Government

 Industry

 Communities

 Investors

Target net zero emissions in industrial regions	With net zero emissions targets now set at state and national levels, planning and action to decarbonise industrial regions should be aligned to a regional net zero target in order to guide decision making for the long-term transition.	
Energy system planning for rapid and accelerating transition	Ensure system plans such as the NEM's ISP and the WOSP in Western Australia's SWIS actively plan for an accelerating transition towards firm, zero-emissions electricity and hydrogen networks at the scale needed. Planning should be consistent with 1.5°C warming scenarios, including planning for energy and green metals export scenarios.	
Develop the energy systems of tomorrow, today	Develop Renewable Energy Zones (or equivalent in WA) in proximity to industrial regions at the scale needed for industrial decarbonisation.	
Strategic alignment of supporting mechanisms	Provide long term investment signals strategically aligned to the scale of decarbonisation needed to achieve net zero targets in these regions. Align enabling policies to incentivise and underpin additional, competitively priced, firm and well-planned energy supply.	

Coordination is needed to facilitate system-wide transitions in industrial regions

The importance of decarbonisation in hard to abate sectors in key industrial regions is clear. The transition to net zero requires a regional focus on the integrated transformation of energy systems and industrial processes in a fast changing global context.

This complex system transition challenge will involve simultaneous shifts on multiple fronts, including:



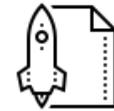
Shifts in workforce skills and capabilities



Technology research



Corporate strategy



Development and deployment



Nurturing new demand and market development



New business models



Finance and investment for new solutions and changes to infrastructure



Changes to regulation and policy

Transition requires coordination across the entire industrial ecosystem.

Recommended actions to unlock the coordination of regional decarbonisation

 Government

 Industry

 Communities

 Investors

<p>Align and coordinate federal and state government policy and programs</p>	<p>Effectiveness of government efforts can be increased by coordinating across multiple levels of government, and by supporting industry's efforts to engage. Missions, tasked with coordinating government efforts on a common goal, are gaining traction globally. A central navigation support service for industry is also needed to enable efficient engagement in government programs</p>	
<p>Regional decarbonisation roadmaps</p>	<p>Co-develop regional decarbonisation roadmaps to align stakeholders on the vision and milestones for the deployment of infrastructure, energy systems and technology solutions. Roadmaps should target the development of new opportunities in potential markets such as hydrogen, green metals and energy export.</p>	   
<p>Coordinate technology development, demonstration and deployment</p>	<p>Stimulate emerging technologies with funds for research and development, pilot and demonstration studies. Support proven but not yet commercial technologies through government procurement, targets, mandates, discounted finance. Accelerate the deployment of proven and commercial technologies through aligned policy, regulation, standards, finance and investment, and enabling infrastructure. Shared learning should be facilitated across technology development efforts</p>	  
<p>Support market development</p>	<p>Build early supply, demand and the enabling infrastructure that allows new markets such as hydrogen and green metals to develop and scale. Levers include: facilitating offtake commitments, guaranteeing the purchase of green products through government procurement, feed-in tariffs, mandates and certification schemes for green products such as green metals and hydrogen.</p>	  

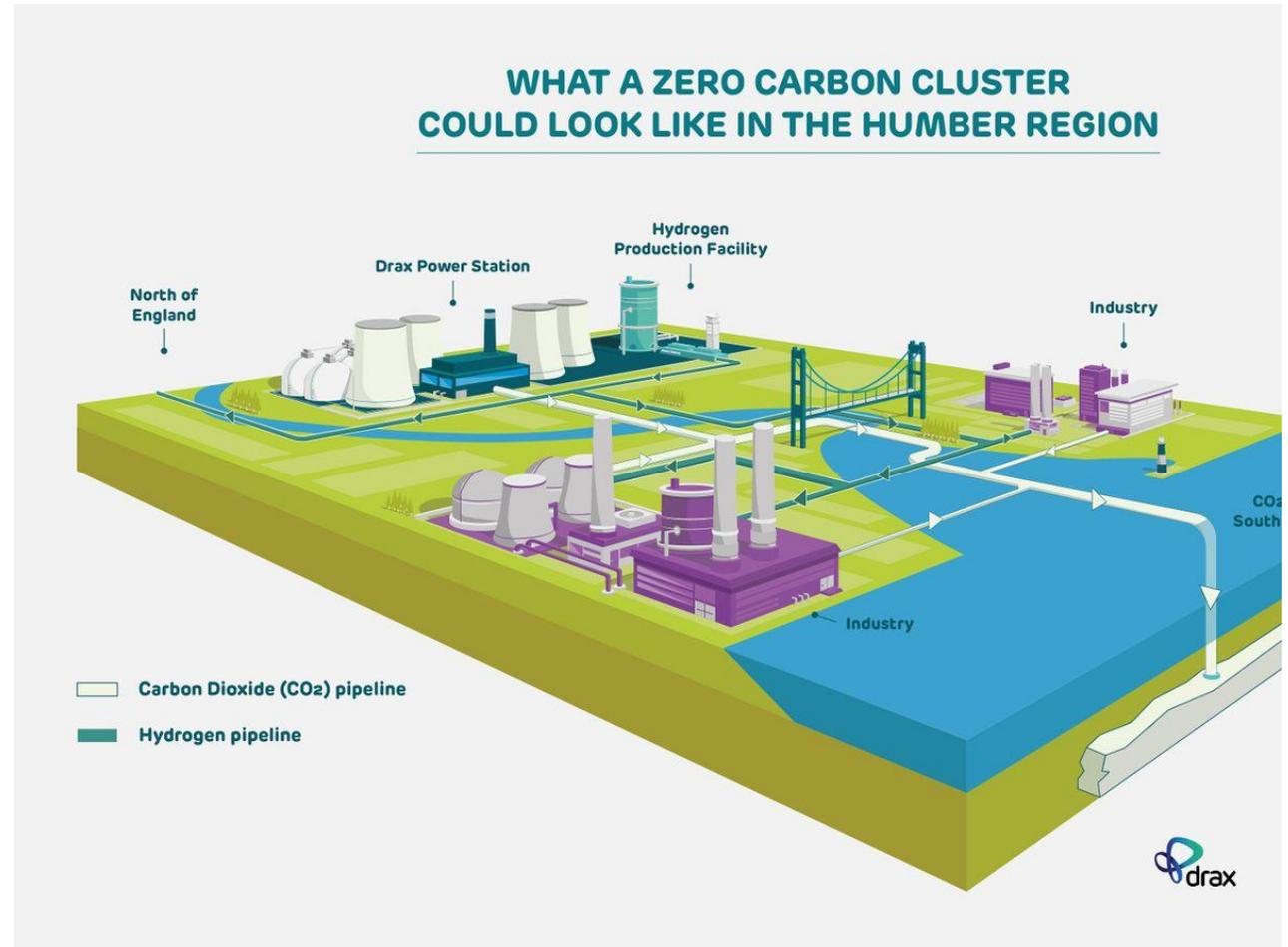
Collaboration to overcome complex system challenges

The scale and complexity of the challenges and opportunities of regional decarbonisation can no longer be addressed by single organisations acting alone.

‘Winning no longer (only) means besting your competitors, but working collectively to achieve lower emissions.’[^]

Internationally, regional clusters focusing on net zero are emerging, demonstrating new models of practice to enable collaboration across industry, government, investors and communities to drive action towards net zero emissions.

[^] Tuff 2021, *Strategies to decarbonize hard-to-abate industries*.
Deloitte Insights



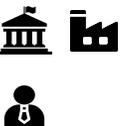
Recommended actions to unlock collaboration

 Government

 Industry

 Communities

 Investors

<p>Collaborate on research, development and demonstration of emerging solutions</p>	<p>Industry partnerships are needed for emerging supply chain solutions and working on common strategic risks and opportunities. Government program funding that requires multiple industry partners can facilitate collaboration on supply and demand solutions and supply chain level initiatives.</p>	
<p>Develop new ways to collaborate</p>	<p>Funding is needed to support and organise ongoing connections to draw in learning and insight on collaboration models into regional efforts in a timely way. Models for collaborations should bring together demand, supply, infrastructure, government funding and/or procurement, and manage shared risk, competitive tensions and intellectual property.</p>	
<p>Collaborate to align policy and regulation to net zero</p>	<p>Better outcomes can be achieved for government and industry if companies work together to inform the policy and regulations needed through forums like public consultations to support decarbonisation. Companies should explore opportunities to work through existing groups and come together in new groups where coordination is not happening or is not sufficient.</p>	
<p>Active engagement in regional leadership and coordination efforts</p>	<p>Regional industry leadership groups and decarbonisation sub-groups should be established, where they don't already exist, to enable active industry involvement in regional decarbonisation solutions. Knowledge exchange between leadership groups domestically and internationally can accelerate learning for the transition.</p>	

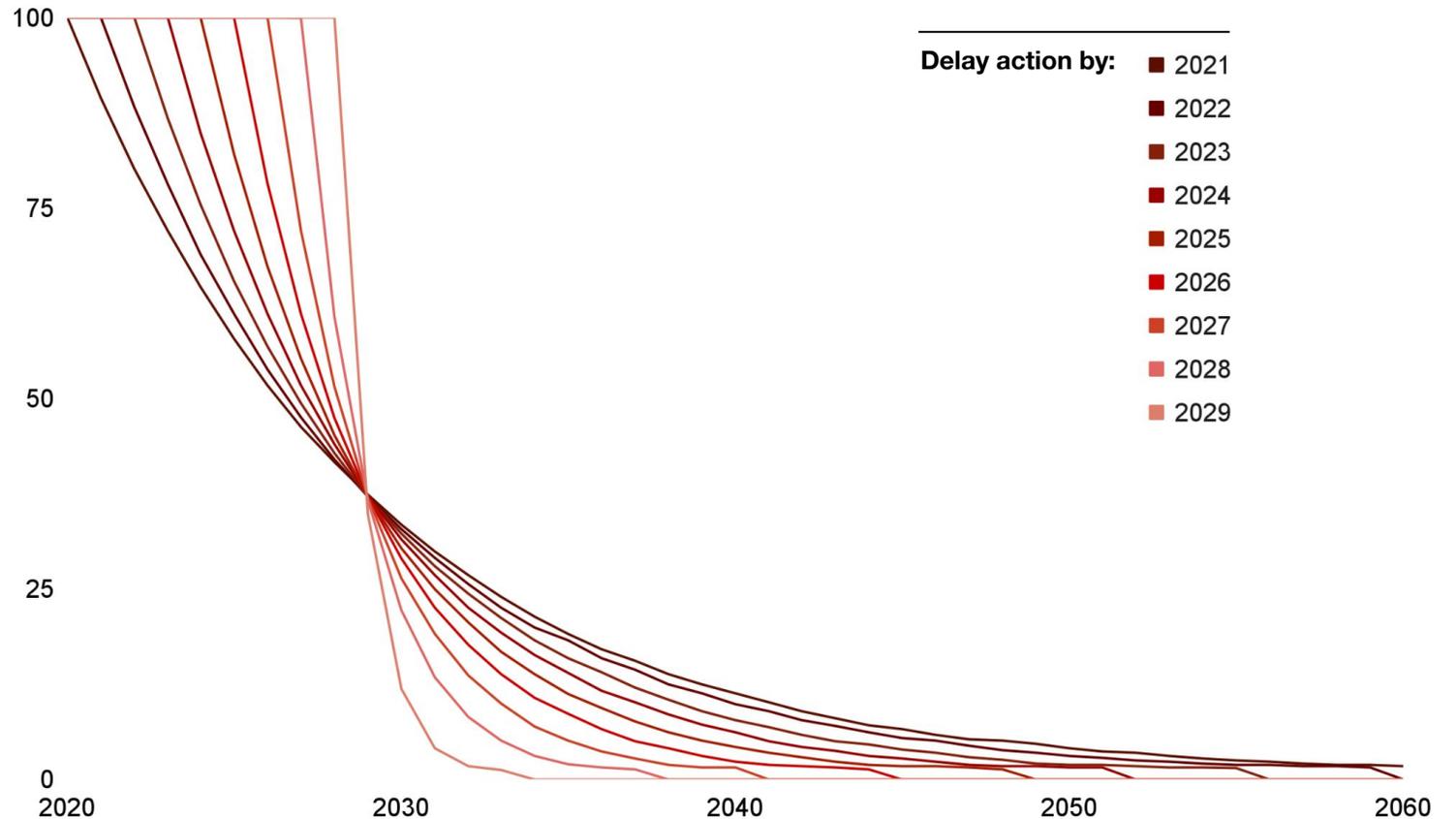
The importance of acting now

Urgent action is needed to avoid the worst risks of climate change and to avoid the need for much steeper emissions reductions in future.

Action now will also enable industries and regions to transition more effectively over coming decades and develop world-leading capabilities that can drive competitiveness in a new economy.

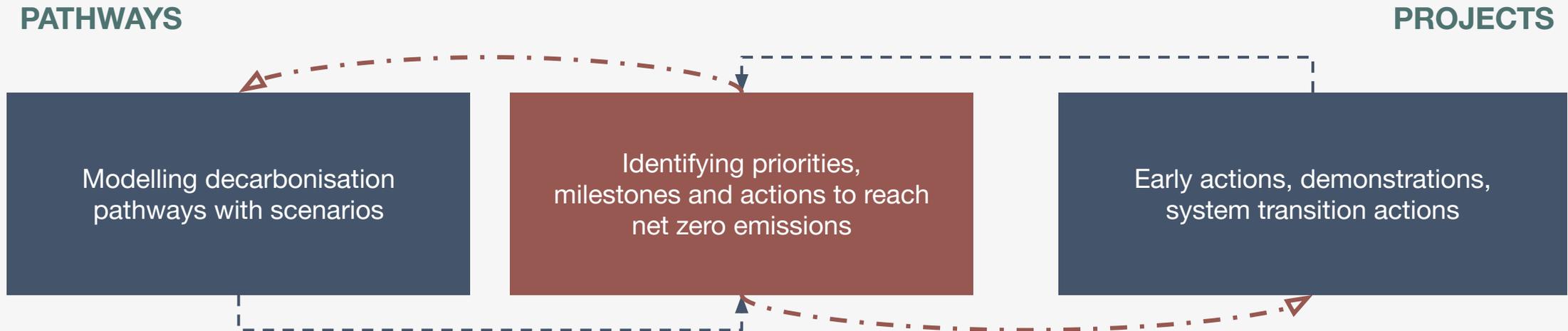
Innovation, investment, and support by governments and industry can accelerate technology development and enable commercial competitiveness sooner than anticipated.

Global carbon budget for 1.5C warming with 67% probability (assume same percentage of emission reductions every year) (2020 index =100)



What's next?

The Australian Industry ETI is next working to identify and target highest opportunity pathways towards net zero emissions and support tangible on the ground action projects.





BloombergNEF

The initiative is co-convened by Climateworks Centre, based at Monash University, and Climate-KIC, with delivery and research support from CSIRO, the Rocky Mountain Institute, the Energy Transitions Commission, and BloombergNEF.

Contact the ETI team @
industry.ETI@climateworkscentre.org