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# Politics and Policy Mixes: The Australian Capital Territory experiment in innovation co-benefits

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## Abstract

Sub-national governments are important actors in mitigating climate change, but often face political constraints. We investigate ability of policy mixes to overcome political constraints while supporting localization of economic benefits and accelerating technological innovation. Examining the case of the Australian Capital Territory (ACT), our findings show that localization of economic benefits policy can successfully overcome political barriers supporting innovation in renewable energy technologies. We discuss the ACT's policy mix as a source of learning for other sub-national governments attempting to balance political and fiscal concerns in supporting renewable energy innovation.

**Keywords:**

policy mix, localization, sustainability transition, innovation

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transdisciplinary research project is a \$10m investment between 2019 and 2023 that aims to help transform the way Australia trades with the world. It comprises five interrelated projects: Renewable Electricity Systems, Hydrogen Fuels, Energy Policy and Governance in the Asia-Pacific, Renewable Refining of Metal Ores, and Indigenous Community Engagement. The Grand Challenge's goals include developing zero-carbon export industries, creating new paradigms in benefit-sharing, and developing technologies, policies and approaches which can be applied in the Asia-Pacific and beyond.

## 1. Introduction

Policy mixes are an important tool in sustainability transitions (Rogge and Reichardt, 2016). Recent work has highlighted the importance of considering policy mixes overall in place of a narrower focus on understanding policy process that lead to development of single policy instruments (Kern and Rogge, 2018). Mixes can contain a range of policy instruments, and can incorporate economic in addition to environmental objectives (Rodrik, 2014). In this paper we examine whether policy mixes designed to meet both economic and environmental objectives can play an important role in overcoming political barriers to sustainability transitions, while simultaneously managing the fiscal costs of supporting local innovation.

An important challenge for governments negotiating transitions to more sustainable societies is political. In the case of climate change, transitions are political because they impose costs on owners of emissions intensive dominant assets (Meadowcroft, 2011). Political barriers mean that while carbon taxes are an effective policy instrument for reducing carbon emissions, implementation has proven challenging for governments and has only rarely been politically stable. In Australia, political disagreement was a key reason for the repeal of a national price on carbon (Rootes, 2014).

A second challenge facing policymakers is fiscal. Subsidies are costly to governments (Hughes and Urpelainen, 2015). For sub-national governments, fiscal constraints may limit ability to subsidize renewable energy technology at a high enough level to encourage uptake (Krause, 2012). Policy mixes can address this challenge to an extent by including economic objectives that reduce fiscal constraints, such as job creation, fostering innovation, supporting exports, or broadening the tax base (Kuntze and Moerenhout, 2013).

We consider the low-carbon policy mix implemented by the Australian Capital Territory (ACT) government as an example of a mix that can manage fiscal costs of supporting low-carbon innovation while simultaneously overcoming political barriers. This policy mix utilizes a reverse auction Feed-in-Tariff (FIT) instrument to meet a 100 per cent equivalent renewable electricity target, with the key feature of including assessment of local benefits when evaluating bids (Buckman et al., 2019). The localization of economic benefits in the evaluation criteria was intended to promote investment in the region (Environment Planning and Sustainable Development Directorate, 2015), but also played an important political role. The ACT case further shows how policy mix design can be improved over time through a process of problem-solving across the policy cycle (Rogge and Reichardt, 2016). Finally, the ACT's policy mix is of particular interest because sub-national governments are increasingly recognised as important in promoting sustainability transitions.

This case study thus contributes to understanding how policy mix design can support low carbon transitions in the energy sector, identified as an important area for research (Rogge et al., 2017). In the next section we describe the lens of policy mixes for sustainable transitions, as applied to understand the emergence of the ACT's localization of economic benefits focus. We then outline the empirical strategy used to gather and analyse data in the paper. In section four we conduct the case study, before discussing the implications of our findings for other actors considering policy mixes to support innovation within political and fiscal constraints.

## 2. Literature review

Policy mixes play an important role in low carbon transitions (Rogge et al., 2017). Multiple policy instruments can be nested inside policy mixes (Rogge and Reichardt, 2016). Individual

instruments vary in design, such as the legal form they take, the actors they target, the degree of stringency, predictability, and flexibility (Rogge and Reichardt, 2016). Instruments used in policy mixes can also evolve, with new instruments being added on top of existing instruments over time, a process defined as layering (Capano, 2019; Howlett and Rayner, 2013). The eventual impact of such changes depends on how well the overall policy mix maintains coherence, consistency, credibility, and comprehensiveness (Howlett and Rayner, 2013; Rogge and Reichardt, 2016).

An increasingly common form of policy mix combines local economy benefits from project development with competitive renewable energy auctions (Hansen et al., 2020; Kuntze and Moerenhout, 2013; REN21, 2019). Matsuo and Schmidt (2019) note that localization policies for renewable energy industries can achieve multiple goals, including promoting learning and capability-building at the local level. Including local benefits within auction instruments can increase political palatability of renewable energy support, but conversely can also increase opposition to these policies (Stokes, 2013). Local benefits policies have been criticized as economically costly, protectionist, and distortionary, (Hufbauer et al., 2013), to the extent that some suggest a plurilateral agreement is required to limit their use (Cimino et al., 2014). Some have argued that localization policies stifle technological innovation by reducing competition (Hufbauer et al., 2013; Kuntze and Moerenhout, 2013). These criticisms are compounded by challenges in assessing whether local economic benefits would have occurred even without these explicit policies (Hufbauer and Schott, 2013; Kuntze and Moerenhout, 2013).

However it may also be possible for LCRs to support local firm development and increase innovation in the medium and long term, which would offset short-term costs of LCRs (Kuntze and Moerenhout, 2013). The design of the LCR is key in achieving this, as only LCRs that foster

learning and innovation in domestic industry will be able to achieve this (Kuntze and Moerenhout, 2013). LCRs embedded in renewable auction instruments vary widely in design, and as such there is significant variation in the effectiveness of these instruments in promoting local industrial development (Hansen et al., 2020).

Debate over the static and dynamic effects of local benefits commonly focuses on their economic costs and benefits. Yet this misses how political objectives interact with economic and environmental policy objectives in the design and implementation of policy mixes supporting sustainability transitions. Green industry policy, for example, makes it possible for political representatives to claim low carbon transitions promote economic growth, even as policies such as Feed-In-Tariffs impose a burden on households or other segments of society through increased electricity costs (Matsuo and Schmidt, 2019).

We show how the deployment of policy mixes solves political problems in the ACT associated with negotiating pathways to low carbon transitions. We pay particular attention to the detailed design of the ACT's localization of economic benefits policy, focusing on design features intended to achieve political objectives, while providing wider localization impacts including technological innovation. In doing so we expand on studies that show political support during the design phase of renewable energy policies is important, and navigating political conflict continues to be important during implementation (Kuntze and Moerenhout, 2013; Stokes, 2013).

### 3. Methodology and data

We adopt the case study method in describing and analysing the development and refinement of the ACT government's policy, reflecting the importance of detailed design on policy instrument performance. We use a purposive case selection strategy, enabling the intensive exploration of a

case in order to understand the process of design and implementation for the policy mix (Gerring, 2004).

Data used in the empirical section is drawn from a mix of interviews and primary documents.

Interviewees were selected based on their role in the design of the policy instrument (Table 1).

Question prompts for interviewees were the same in all interviews, but sub-prompts were varied depending on the role of the individual in the policy process. The four broad prompts were:

Where did the idea for the "economic benefit localization" come from? How were bidders asked to describe their contribution to local economic benefits? What do you consider to be the ACT's unique strengths in gathering investment in renewable energy? If the ACT's localization of economic benefits mechanism (within the reverse auction FIT) serves as a model for other states/cities, what are the lessons and experiences you would share?

Table 1: Interview Subjects

Interviewee	Role	Role in Policy Design	Date and Location of Interview
Hugo Temby	Assistant Director Climate Change and Sustainability Division (CCSD), Environment Planning and Sustainable Development Directorate (ESPDD) 2017-2018 Director CCSD, EPSDD 2018-2020	Administered FIT and REIF, subsequently led Energy Projects section, with oversight of FIT, REIF and battery storage rollout	February and May 2020, Canberra
Scott Bales	Assistant Director CCSD, ESPDD 2018-Present	Administers FIT and REIF	February 2020, Canberra
Jon Sibley	Executive Branch Manager CCSD, EPSDD 2010-2017	Led ACT climate change and energy policy	March 2020, Canberra

Megan Ward	Director CCSD, ESPDD 2015-2017	Developed and implemented FIT and REIF	March 2020, Canberra
Simon Corbell	Minister for Environment and Climate Change 2011-2016	Envisioned and supported rollout of FIT and REIF	June 2020, Canberra

In addition, we utilised primary documents produced by the ACT government, obtained from public sources, and from interview subjects. Primary documents were used to understand the policy development and implementation process, and to contextualise the local benefits requirement of the reverse FIT auction with the broad policy mix. Primary documents were also used for the purposes of triangulation, in order to assess the data quality obtained from interview subjects.

Table 2: Documents Used in Analysis

Title	Type	Organization	Year
Climate Change and Greenhouse Gas Reduction Act 2010	Legislation	Australian Capital Territory	2010
ACT Sustainable Energy Policy: Energy for a sustainable city 2011-2020	Policy strategy	ESPDD (ACT Government: Environment and Sustainable Development)	2011
Electricity Feed-in (Large-scale Renewable Energy Generation) Act 2011	Legislation	Australian Capital Territory	2011
Large-scale Solar Auction Request for Proposals (RFP). Questions and Answers	Auction document	ESPDD	2012
Australian Capital Territory: Wind Auction. Request for Proposals	Request for Proposals	ESPDD (ACT Government: Environment and Sustainable Development)	2014
Large-scale Wind Auction Request for Proposals (RFP). Questions and Answers	Auction document	ESPDD	2014
Wind Auction Review	Auction review	Jacobs	2015
Renewable Energy Industry Development Strategy (REIDS)	Guidance document	ESPDD (ACT Government)	2015

Renewable Energy Local Investment Framework	Guidance document	ESPDD (ACT Government)	2015
Summary of Questions and Answers for Wind Auction II Request for Proposals (RFP)	Auction document	ESPDD (Wind Auction Secretariat)	2015
Outcomes of the ACT's Second Wind Auction	Auction outcomes	ESPDD (ACT Government: Environment and Planning)	2016
Australian Capital Territory: Next Generation Renewables Auction. Request for Proposals	Request for Proposals	ESPDD (ACT Government: Environment and Planning)	2016
Summary of Questions and Answers for Next Generation Renewables Auction Request for Proposals (RFP)	Auction document	ESPDD (Next Generation Renewables Auction Secretariat)	2016
Next Generation Renewables Auction: Local Investment Outcomes	Auction outcomes	ESPDD (ACT Government)	Not dated
Renewable Energy Innovation Fund (REIF): Direct Grants Request for Proposals	Request for Proposals	ESPDD (ACT Government: Environment, Planning, and Sustainable Development)	2019
Australian Capital Territory: Renewables Auction 5. Request for Proposals	Request for Proposals	ESPDD (ACT Government)	2019
Summary of Questions and Answers for Renewables Auction 5	Auction document	ESPDD (Renewables Auction 5 Secretariat)	2020

#### 4. Empirical Section: Emergence of Local Benefits within ACT Feed-In-Tariff

The ACT's FIT is embedded in the ACT's overall policy mix designed to reduce greenhouse gas (GHG) emissions within the territory. It sits alongside the Climate Change and Greenhouse Gas Reduction Act 2010, and is informed by the ACT Sustainable Energy Policy 2011-2020.

The Climate Change and Greenhouse Gas Reduction Act 2010 sets economy-wide targets of reducing emissions to 40 per cent below 1990 levels by 2020, 80% below 1990 by 2050, and zero net greenhouse gas emissions by 2060. Following establishment of these targets, the ACT Environment, Planning, and Sustainable Development Directorate (ESPDD) determined that achieving the 40% reduction by 2020 target required the ACT to transition 90% of its electricity supplies to renewable energy sources (Sibley, 2020a). A series of community consultations and

technical studies informed the focus on the electricity supply sector, the single largest emissions source in the ACT (Corbell, 2020).

The ESPDD developed the ACT Sustainable Energy Policy 2011-2020, which set out 27 measures complementary to the 2010 Greenhouse Act and the renewable energy target (Sibley, 2020a).

The ACT Sustainable Energy Policy 2011-2020 established four outcomes, reflecting the minister's view that renewable energy was an opportunity for the ACT (Sibley, 2020a): 1) reliable and affordable energy, 2) smarter use of energy, 3) cleaner energy, and 4) growth in the clean economy (Environment and Sustainable Development Directorate (ACT), 2011). While no single instrument in the ACT's policy mix was new (Temby, 2020a), the novel design features of the FIT instrument, and the situating of the FIT and other instruments within the overall policy mix designed to support simultaneously sustainability and economic goals was an important experiment in the Australian context, and has informed low carbon transitions in other jurisdictions (Corbell, 2020).

The policy process underlying the development of the instrument mix included consideration of political support for long-term low-carbon transition (Corbell, 2020). In developing the FIT policy instrument, concerns about costs to consumers were addressed by the need for an instrument that ensured FIT-related investment provided benefits through local investment. The political importance of local benefits became more significant as the consumer-funded FIT supported construction of wind power generation outside the ACT. The ACT's role as an innovative leader in policy mix design in the absence of national action was also important in maintaining Australia's renewable energy sector (Corbell, 2020; Sibley, 2020a).

#### 4.1. Policy Mix Design: The ACT's Reverse Auction FIT

The ACT ESPDD examined multiple policy instruments when developing the ACT Sustainable Energy Policy 2011-2020 (Bales, 2020a; Sibley, 2020a; Temby, 2020a). A reverse auction Feed-in-Tariff was selected as lowest cost and least risky (Bales, 2020a; Temby, 2020a). This choice was informed by past and international cases. The ACT government previously released an expression of interest to procure solar generation via a capital grant, but industry feedback was that electricity market volatility meant a mechanism providing long term revenue stability would most likely to produce a competitive price (Bales, 2020a; Corbell, 2020; Sibley, 2020a). The ACT was the first jurisdiction in Australia to introduce a reverse auction FIT, and drew on international experience from the UK and South Africa (Bales, 2020a; Buckman et al., 2019, 2014; Temby, 2020a; Ward, 2020a).

The ACT government passed the Electricity Feed-in (Large-scale Renewable Energy Generation) Act 2011 to establish a reverse auction FIT. The first solar auction round ran in two stages, establishing confidence in the FIT as a low-cost mechanism for procuring renewable generation. The design of the Electricity Feed-in Act 2011 policy instrument was a 'contract-for-difference', specifying that the ACT electricity distributor must pay the holder of the FIT entitlement support payments if the spot price was lower than the FIT, and that the entitlement holder must instead provide payments to the distributor when the spot price was higher. The FIT costs were passed to ACT electricity consumers via the distributor, with distribution defined as a non-contestable segment of the electricity market.

Since costs were passed to consumers, it was important to keep community support as the auctions evolved over time, and wind auctions were run for generation built outside the ACT (Corbell, 2020). The ACT expected cost pass-through to consumer electricity bills to peak at

\$5.50/week in 2020 (ACT Environment Planning and Sustainable Development Directorate, 2020).

Gaining support for the FIT instrument, including from within government, led to the inclusion of the reverse auction mechanism to lower costs, and penalties for non-delivery (Corbell, 2020).

#### 4.2. Design of Local Benefits Instrument

The first auction round for solar in 2012 did not include a localization component, as generation was built within the ACT (Corbell 2020, Temby 2020, Ward 2020). The ACT wanted to open up for wind auction bids, but restricting wind farm construction within ACT boundaries added expense and limited the ability of even local industry to compete on price (Corbell, 2020). Importantly, ensuring local benefits and communicating this to constituents was judged to be critical to the stability of the policy strategy (Corbell, 2020). Given this, there was a need to adapt the FIT instrument's design in a way that created local economic benefits if the generation was constructed outside the ACT or surrounding region.

Adding localization of economic benefits to the bidder evaluation criteria as a design feature brought economic benefits back into the FIT instrument's purview. Politically, the localization of economic benefits was a way to address potential community concerns about economic costs of the FIT (Ward, 2020a). At the same time, a community engagement evaluation criteria was added to the FIT evaluation design; together, these two components were intended to ensure that project development met needs of constituents, thus aimed to maintain political support for the program. While the FIT remains supported by most Canberrans (Sibley, 2020a; Ward, 2020a), there were concerns that this support would dampen if companies and communities receiving economic benefits funded by ACT residents were located well away from the ACT region (Sibley,

2020a; Temby, 2020a; Ward, 2020a). Table 1 summarizes evolution of the economic benefits component over time.

Table 3: Evolution of localization criteria over time

<b>Auction round</b>	<b>Year</b>	<b>Localization of economic benefits</b>	<b>Localization weighting in auction evaluation</b>
Auction 1 (Solar)	2012	No localization of economic benefits	--
Auction 2 (Wind)	2014	Localization of economic benefit goals added	20%
Auction 3 (Wind)	2015	Same as above	20%
Auction 4 ("NextGen", any renewable energy source acknowledged by Secretariat)	2016	Same as above	20%
Auction 5 (any renewable energy source)	2020	Localization now given less weight in assessment, and financial contribution specified separately	7.5% <sup>1</sup>

<sup>1</sup> Financial contribution to ACT renewable energy industry required as an essential eligibility criterion.

Making the ACT a leading hub for renewable energy industry underpinned the local benefits component of the policy mix. The Renewable Energy Local Investment Framework (ACT Government, 2015a) stated "Canberra has a vision of becoming an internationally recognised centre for renewable energy innovation and investment." The ACT wanted to "diversify by creating new businesses and jobs in a host of knowledge and service sectors, while maintaining the public service and defence industry as a solid base for the local economy" (Bales, 2020b); the

2016 census found that 24 per cent of employed people in the ACT worked as public servants or in the defence sector, against 3 per cent of all Australians (ABS, 2016)

In developing the localization of economic benefit criteria, the EPSDD formed a reference group, including representatives from the chief minister's directorate, along with universities, a trades training institute, local businesses, and renewable energy industry representatives (Corbell, 2020; Sibley, 2020a; Temby, 2020a; Ward, 2020a). The lack of heavy industry or manufacturing meant goals were designed to take advantage of the ACT's high skilled labour force, knowledge economy focus, and proximity to government, tertiary institutions and trades training (Corbell, 2020; Sibley, 2020a). The ACT's localization component did not include any requirements to use content manufactured in the ACT or in Australia (ESPDD, 2014).

The economic objectives of the localization component were codified in four criteria (ACT Government, 2015a), which was assigned 20% of the overall assessment in the original scheme, and which have appeared in all four auction rounds:

Deliver enduring benefits to local businesses through the inclusion of regional contractors and labour force;

Build Canberra's capacity as a national tertiary education and trades' skills hub;

Stimulate productive research partnerships that will develop the capacity and global recognition of our tertiary institutions;

Grow the local corporate footprint of national and international businesses.

The design of the localization component sought to bring benefits to the ACT's economy, such as by using local contractors, and drive innovation in renewable energy (see Figure 1).

[Figure 1 here]

### 4.3. Evolution of Policy Instrument and Policy Mix

A key feature of the ACT FIT and localization policy mix was the requirement for ongoing analysis of performance (Bales, 2020a). The Electricity Feed-in (Large-scale Renewable Energy Generation) Act 2011 mandated an evaluation of the outcomes in relation to value for money, and in relation to the competitive process for the FIT capacity release.

Problem-solving was important because the policy instrument had novel features requiring refinement over time. This led to a process of layering to address issues that emerged following implementation (Howlett and Rayner, 2013). By including mandated assessments after each auction round, stakeholders, including cabinet and the broader community, received updates about the costs and benefits of the FIT (Corbell, 2020). Post-auction assessments also institutionalized learning within government about how to structure the framework for the local benefits component (Bales, 2020a; Temby, 2020a; Ward, 2020a).

The mandated learning process led to changes in the design of the local contribution component in the policy mix. In the first wind auction, held in 2014, auction participants defined their local contribution and attached documentary evidence, meaning auction participants produced their own ideas of what they could offer the ACT (Bales, 2020a; Sibley, 2020a; Ward, 2020a). Over time, the ACT EPSDD provided further guidance to in-bound international businesses regarding opportunities (Sibley, 2020a; Temby, 2020a; Ward, 2020a). After the first auction helped the ACT government determine bidder capabilities, subsequent rounds provided additional detail to guide potential bidders (ACT Government, 2015b; Sibley, 2020a; Ward, 2020a).

In 2015, the Renewable Energy Industry Development Strategy (REIDS) was released following the first wind auction, and emphasized the concept of Canberra as a renewable innovation hub supporting an emergent ecosystem (ACT Government, 2015b; Sibley, 2020a). REIDS additionally laid out the concept of supporting small business innovation via a Renewable Energy Innovation Fund (REIF) (ACT Government, 2015b). The goal was to be further informed by industry knowledge, while providing the ACT EPSDD scope to shape localization benefits in line with overarching strategic priorities as identified in REIDS (ACT Government, 2015b; Ward, 2020b). REIF emerged as a complement in this strategy, allowing funding of additional innovation but retaining the focus of industry contributing other co-benefits that could support innovation (Ward, 2020b).

Auction proponents could contribute funds to the REIF as a way to meet their localization of economic benefits criteria. The ACT Minister, under the guidance of an independent board, could then redistribute these funds through REIF application rounds to target energy innovation within the ACT (Bales, 2020a). The REIF thus created a central fund for which innovators could apply. In doing so, the REIF experimented with the idea of expert mediation of auction winners and their local investment expenditure, and is overseen by a board of energy and innovation leaders (Temby, 2020b).

Both REIF and the original localization component within the FIT were designed to support innovation in addition to economic development by building a renewable energy services ecosystem (ACT Government, 2015b). The first round of calls for public REIF applications ran from December 2016 to early 2017 (Temby, 2020c). Within the overall instrument mix, the REIF remained linked to the FIT, with the FIT providing funds.

As of the 2016 call for applications, however, the REIF can be considered as a separate instrument, intended primarily to promote innovation. The REIF also incorporated design features within its eligibility and assessment requirements requiring that projects occur largely within the ACT and be focused on energy innovation. A particular focus was the requirement that new technologies could be commercialized and integrated with the ACT's existing "renewable energy innovation ecosystem" (ACT, 2019). The REIF operates on a shorter timeframe than the FIT, so that the EPSDD can tailor the award process to shifts in the sociotechnical landscape (Bales, 2020a).

In 2020, the localization of economic benefits was adjusted (Bales, 2020a). The four criteria of the localization component now make up 7.5% of assessment rating as a qualitative component, and there is an additional easily assessed quantitative requirement for a financial contribution to REIF for auction eligibility (Bales 2020).

The ACT's evolving FIT instrument design experimented with features intended to head off the cost inflation concerns commonly associated with LCRs (Corbell, 2020; Ward, 2020a). When cash contributions to the energy storage component under the NextGen auction were introduced, for example, the call for proposals stated that "The additional FiT required (per MWh) to meet the Energy Storage Contribution at increasing contribution bands (\$/MW) should be included in the Proponent's submitted Proposal Form" (ACT Government: Environment and Planning, 2016). In the fifth auction round REIF contributions are required at a set level per MW installed from all applicants as an eligibility criteria to participate in the auction, however the call for proposals no longer contains a requirement that the additional FiT required associated with this cash contribution be included in the submitted proposal (ACT Government, 2019). The requirement was removed as part of simplifying the auction process (Bales, 2020b). In the original design the

evaluation process assessed price separately from other criteria, with an eye to procuring generation that met overall goals in the most cost-effective manner possible (Corbell, 2020). The ACT also used an industry advisory panel to assess whether reverse auction bids for windfarms including localization benefits were tracking windfarm construction costs in the Australian and international markets (Corbell, 2020).

There may nevertheless have been some cost pass-through to consumers of funding the REIF via FIT bid lock-in in the electricity price impacts (Sibley, 2020a; Ward, 2020a). There are efforts being made by EPSDD to leverage REIF funding to bring in external money associated with research grants, to maximize value to create a multiplier effect and support a funding source outside ACT ratepayers (Bales, 2020b); the REIF call for proposals weights bids 10% on extent of "new financial or in-kind contributions to Canberra's renewable energy innovation ecosystem" and 10% on the "amount of additional public or private funding leveraged, or likely to be leveraged, by the proposal" (ACT, 2019).

The localization of economic benefits was necessary for the FIT policy's political stability, and the REIF emerged over time as way for the EPSDD to direct innovation investment when proposed industry localization components were judged to be not sufficiently aligned with the EPSDD's wider strategies for the ACT's emergent role as an innovation hub and growing renewables ecosystem. The minister noted that the cost of localization "came back to broader political requirements, which were critical for the health of the policy (Corbell, 2020). If not managed, these political concerns could have destabilized the emissions mitigation policy mix in the long term, dampening the ACT's ability to meet climate mitigation goals.

#### 4.4. Assessing outcomes of the policy mix

The ACT's policy mix sought to meet the environmental goal of reducing emissions, and the economic goal of growing the ACT's economy. Environmental goals were tracked via accounting for renewable generation fed-in to the grid. Assessing local benefits directly related to the policy mix was more complex. The ACT tracked proponent delivery of promised benefits, including staff relocation, engagements, and REIF contributions, but not all benefits were as easily quantifiable (Bales, 2020a).

The ACT Sustainability and Environmental Directorate wrestled with how to set the counterfactual for impact assessment (Bales, 2020a; Sibley, 2020a; Temby, 2020a; Ward, 2020a). The localization of economic benefit criteria was assessed as one of four evaluation criteria, as well as FIT price (Sibley, 2020a). An overall value for money assessment was made based on a trade-off of all factors (Sibley, 2020b). The emphasis on value for money translated to expectations that if proponents did not deliver a promised project, they would pay the equivalent in cash to the REIF (Corbell, 2020; Ward, 2020a).

There is nevertheless an empirical challenge in estimating the performance of the instrument against the counterfactual, to understand how many benefits would have come to the ACT regardless of the policy. Promised benefits to the ACT included relocation of corporate headquarters, hiring of local contractors, partnerships with local universities, and support to trial innovative technologies in the region. Offices locating within the ACT is a high value activity, but putting a precise number on the wider benefits generated over time beyond salaries paid is challenging (Temby, 2020a; Ward, 2020a). One of the auction proponents brought 25 full time equivalent staff to Canberra, and continues to bring more with time, in addition to generating other local economic benefits (Ward, 2020b). Interview data suggest that without the FIT

companies would not have relocated to the ACT, and indeed some companies may even have moved away from the ACT (Corbell, 2020; Ward, 2020a). University partnerships included establishment of new research programs and new training courses being established via local investment (Australian National University, 2020), with initial investments creating additional value in the sector. These benefits associated with the localization policy likely extend benefits far beyond the initial outlay, but the impacts on the local economy become increasingly complex to quantify - for example, where new local energy and tertiary sector employees may bring additional economic benefits to existing local businesses. Innovations developed by international companies based in Canberra also have value impacts far beyond the ACT's borders. This extended value is an intended part of the FIT localization policy's design, and anecdotally appears to have been achieved, but due to the ACT's uniqueness and embeddedness in global value chains, value attributed to the localization policy can't be quantified in isolation.

The ACT's policy mix aimed to spur technological innovation alongside economic growth, and the challenges in assessing whether policies spur innovation are well-known (Pless et al., 2020).

Understanding whether a policy instrument spurs innovation beyond what would have occurred otherwise is a key area for supporting sustainability transitions, because without these assessments it is challenging to know which policy instruments to scale up and which to discontinue when apportioning limited funds (Pless et al., 2020). Continued work is needed to identify the most effective policy instruments, work ideally carried out in a collaboration between researchers and industry or government (Pless et al., 2020). In line with this, the ACT Environment and Sustainability Directorate has sought input from the tertiary sector on how to improve assessment of economic and innovation outcomes from the FIT and REIF (Bales, 2020a; Temby, 2020a).

While benefits to the ACT's overall economy will remain challenging to quantify even with instrument design updates, relatively minor changes to the REIF's design could allow a valuation of supported innovation. Recommendations by Pless et al. (2020) provide examples of how the scheme could be adapted to allow an assessment of outcomes for innovation prompted by REIF. Design of REIF could address the counterfactual by embedding quasi-experiments into the policy design, particularly as relates to the scoring of successful vs. unsuccessful applicants and the sharing of this data with the tertiary sector for analysis (Pless et al., 2020). The REIF could also be considered to have achieved benefits to the ACT if the value of innovation activities (such as via patents filed and added employees) exceeded the cost of the REIF grant provided to these companies.

#### 4.5. Unique features of the ACT

The ACT had several advantages in developing its instrument mix. The ACT is a city and state, and its role as a state gives it jurisdiction to pass legislation regarding electricity supply. The ability to pass legislation setting up the FIT was identified as a key part of the ACT's ability to create this instrument mix (Temby 2020). The ACT also has only a single electricity distributor (Temby, 2020a; Ward, 2020a). Since there is only one electricity distributor in the ACT, it could effectively manage the FIT scheme, including the passing of costs to consumers (Temby, 2020a). Finally, the ACT had timing on its side. The first set of wind auctions, i.e., the first set of auctions including localization of economic benefits, occurred in 2015 and 2016 when there wasn't a lot of competition for projects, which meant that proponents were eager to bid even in the face of heavy localization requirements, and were relatively receptive to relocating office space (Sibley, 2020a; Temby, 2020a; Ward, 2020a). The ACT also benefited from a constituency with generally

strong support for climate action (Corbell, 2020; Temby, 2020a; Ward, 2020a), a strong tertiary and trades sector that underpinned localization of economic benefits goals and follow-through (Sibley, 2020a; Ward, 2020a), and little economic reliance on heavy industry.

## 5. Conclusion and Policy Implications

We examined the ACT's policy mix to support a sustainable transition, with a focus on how local benefits can be used as a method for addressing political and fiscal constraints while supporting technological innovation. We also examined the evolution of the policy mix over time. The ACT case supports the idea that policy mixes can serve to meet both political and innovation support goals, and suggests that some of the common criticisms of localization can be managed through experimentation in policy instrument design over time.

Considering the policy mix overall, rather than policy instruments in isolation, is emerging as a key way to think about designing policy support for the sustainability transition (Rogge et al., 2017; Rogge and Reichardt, 2016). Policy instruments both interact with each other and influence the development of subsequent policy instruments (Edmondson et al., 2019; Rogge and Reichardt, 2016). This is apparent also in the ACT case, where the REIF emerged as an offshoot instrument of the FIT's localization design setting, part of the core policy strategy to support development of a renewable innovation hub. This type of policy mix evolution becomes especially important to consider at the sub-national government level, where actors may be more agile and able to create additional policy instruments more rapidly than the national level. Complexity of sub-national policies and the need for policy mix thinking in this space is well understood (Webb et al., 2018), and the ACT case presented here provides new insights into the forces driving sub-

national policy mixes to evolve over time, both in terms of political constraints and knowledge asymmetry.

The ACT policy mix was both innovative in itself and centred around the need to drive innovation in the energy sector. Our findings highlight the role of iterative improvements in the ACT's instrument design and mix to support economic benefits and technological innovation. Policy processes in the ACT shaped the FIT's design to require localization of benefits as a political necessity, given the FIT's support by consumer electricity payments. This localization design feature was novel, leaving the ACT few other examples to draw on. As a consequence, the FIT instrument and localization design were significantly refined over time, with the REIF eventually emerging as a new instrument to support local innovation.

While localization may be a political necessity, there are concerns that LCR instruments within policy mixes may stifle competition. The ACT case presents an example of use of localization within a policy mix, emerging into two distinct instruments, while centring on spurring innovation rather than strengthening existing manufacturing capacity as is typical for LCRs (Hansen et al., 2020; Kuntze and Moerenhout, 2013). Unlike a typical LCR, the ACT's instrument does not draw thresholds for minimum inclusion of local content (Hufbauer and Schott, 2013; Kuntze and Moerenhout, 2013). Instead it sought to strengthen the knowledge economy within the ACT such as trades and tertiary training, in addition to supporting development of a new industry within the ACT around energy innovation. Thus, instead of insulating local manufacturing firms from competition along the lines criticised in many LCRs (Hufbauer et al., 2013), the ACT's intent was instead to bring additional investment into the locality to strengthen the knowledge economy (ACT Government, 2015a). We consider that the ACT's instrument mix and design provides an example of localization that is less restrictive than a pure LCR, and as such can provide an

example of policy mixes to spur innovation while simultaneously providing political feasibility via localization of benefits.

Sustainability transitions overall are complex, requiring shifts across all sectors of society.

Increasing technological innovation to generate more options for this change is an important part of this transition, even as it remains challenging to evaluate effectiveness of policies at spurring innovation (Pless et al., 2020; Rogge and Reichardt, 2016). Given the criticism of localization instruments as stifling innovation, the ACT case providing an innovation-centric localization instrument provides a novel counterpoint of what a sub-national energy policy mix for innovation can look like. The ACT's localization appears to follow best practice in minimizing restrictions to incoming firms and creating links to technological learning benefits, via the provision of multiple learning-focused paths for proponents to meet localization criteria (Hansen et al., 2020; Kuntze and Moerenhout, 2013).

The importance of policy mix evolution over time is well understood, but methods to evaluate the coherence of this evolution over time are still evolving (Rogge and Reichardt, 2016). Ability for localization instruments to evolve and be refined in a coherent process over time is particularly critical, given that the precise design of a localization instrument determines whether it supports or dampens innovation (Hansen et al., 2020; Kuntze and Moerenhout, 2013; Matsuo and Schmidt, 2019). The iterative experimentation undergone in the ACT's policy mix design over time may represent a way to manage common criticisms of localization mechanisms as stifling innovation. The ACT process first attempted to direct investment during the prompts for proponents (the four criteria regarding local contractors, corporate footprint, supporting tertiary institutions, and initiating research partnerships), then again during the judging of bids, then later in the emergent REIF rounds. The targeting was based on existing local industry strengths in the

knowledge economy. Assessment and iteration mandated within the Electricity Feed-in Act 2011 became important tools in identifying areas for refinement in successive auction designs. Hesitation to include localization within policy mixes may also be tied to criticisms that LCRs inflate costs (Ettmayr and Lloyd, 2017; Johnson, 2013). This cannot be definitively ruled out nor supported in the ACT case. However, interviews show the policy was designed to manage cost inflation by comparison of proposed FIT rates to national and international benchmarks, and by including cost and value for money as a key part of the assessment of auction bids. This provides an initial option for other localities to attempt to manage cost inflation associated with localization. It is also recognized that short-term localization costs may yield medium-term returns via increased innovation, though this has not yet been empirically tested (Kuntze and Moerenhout, 2013). The ACT may provide one such case if more detailed empirical data can be collected by the ACT in future. In particular, if the REIF and the existence of the new knowledge hub and innovation ecosystem in the ACT can be confirmed in future empirical assessments to have increased innovation in the region, any short term costs of including localization in the ACT would likely be offset or overtaken by benefits.

There is an ongoing call for more rigorous research and analysis of localization instrument outcomes (Kuntze and Moerenhout, 2013). As noted in prior literature, attribution of innovation benefits to particular policy instruments requires a more robust identification strategy than can be implemented in the current case due to data limitations (Pless et al., 2020). The uniqueness of the ACT as a region, and the design of the current instruments, also precludes rigorous empirical testing of effectiveness. We make recommendations for future design iterations of the REIF instrument to support measurement of innovation benefits to individual firms, such as by designing a natural experiment utilizing discontinuities (Pless et al., 2020). Globally, there is not

yet a basis for determining "effective" localization assessment, and as in the ACT case much evidence around the success of these instruments remains anecdotal (Hansen et al., 2020). In conclusion, the ACT's localization policy mix may represent a new way for sub-national governments to think about designing localization policies in ways that minimize restrictions to competitiveness. Localization of benefits can enable sub-national governments to make policy instruments more politically palatable by visibly bringing economic alongside environmental benefits (Corbell, 2020; Temby, 2020a). The emergent REIF instrument may represent a promising mechanism to support sustainable technology innovations; as a fund created by cash contributions from industry, it is not as fiscally demanding as more traditional subsidy instruments (Sibley, 2020). Other sub-national governments learning from the ACT's policy mix design for localization of economic benefits will need to contextualize the ACT policy instrument (Peng et al., 2019). More generally, transferability of sustainable policy innovation is a non-trivial issue (Bulkeley, 2006). As in the ACT case, other sub-national governments developing this type of localization policy will need to base their instrument design on a clear understanding of local economic strengths, informed by extensive consultation with industry and community stakeholders. Further, the ACT case demonstrates the importance of building in a learning mechanism; this supports dynamic adjustment of localization components over time to suit changing technological conditions.



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