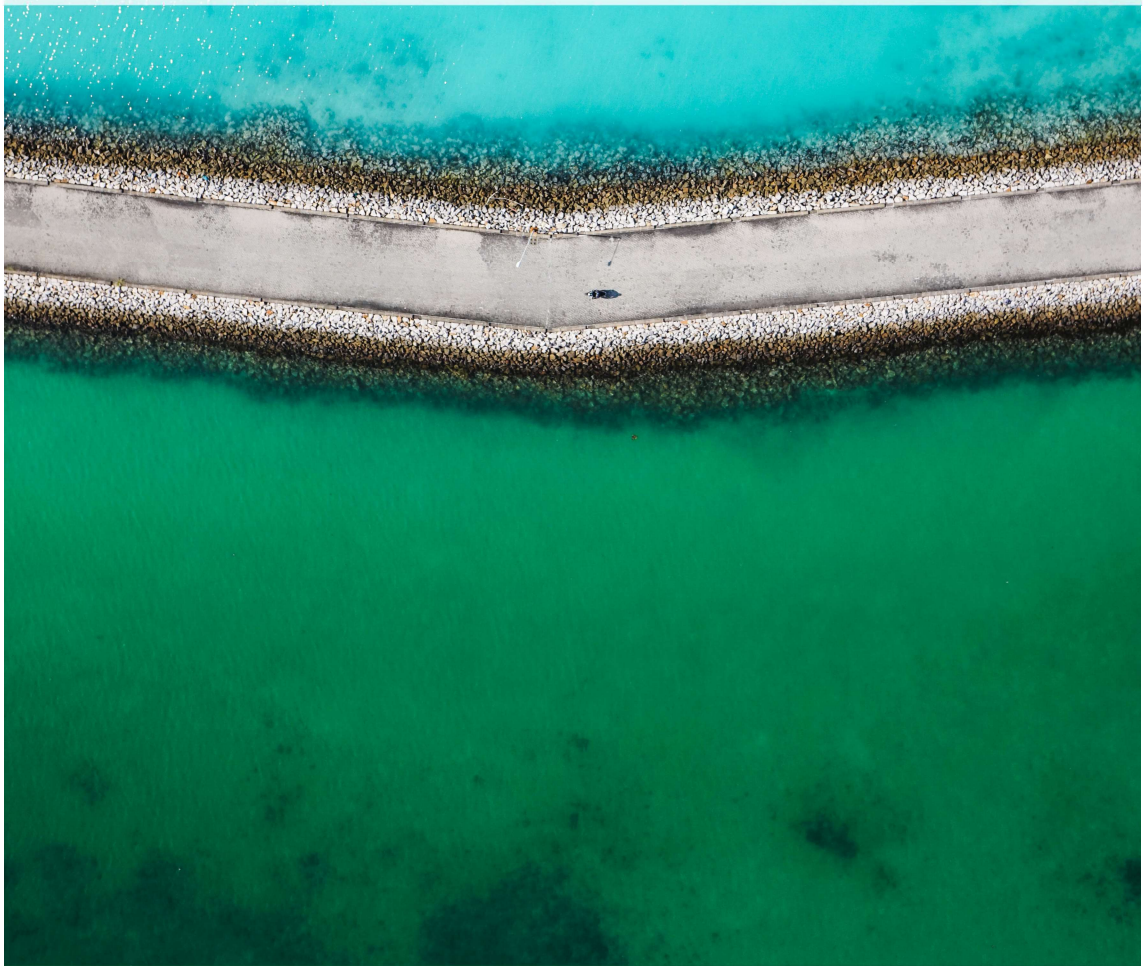
International Carbon Action Partnership

Carbon Leakage and Competitiveness: California's Treatment of Imported Electricity and New Zealand's Synthetic Greenhouse Gas Levy



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Acronyms

BCA	Border carbon adjustment
CAISO	California Independent System Operator
CARB	California Air Resources Board
CBAM	Carbon Border Adjustment Mechanism
CaT	Cap-and-trade
CER	Certified Emission Reduction
EIA	Energy Information Administration
EIM	Energy Imbalance Market
EPA	Environmental Protection Agency
ETS	Emissions trading system/scheme
FERC	Federal Energy Regulatory Commission
FJD	First Jurisdictional Deliverer
GATT	General Agreement on Tariffs and Trade
GHG	Greenhouse gas
GWP	Global warming potential
HFC	Hydrofluorocarbons
ICAP	International Carbon Action Partnership
MRR	Mandatory Greenhouse Gas Reporting Regulation
MWh	Megawatt hour
NZ ETS	New Zealand ETS
NZD	New Zealand Dollar
NZU	New Zealand Unit
PFC	Perfluorocarbons
SF6	Sulphur hexafluoride
SGG	Synthetic greenhouse gas
WCI	Western Climate Initiative
WECC	Western Electricity Coordinating Council
WTO	World Trade Organization

1 Introduction

In a world of unequal carbon prices and levels of climate ambition, jurisdictions with emissions trading systems (ETSs) and other forms of carbon pricing face concerns about economic competitiveness and carbon leakage. While the Paris Agreement has widened participation in global efforts to reduce emissions, it is likely that carbon prices will continue to vary significantly as different jurisdictions move at different speeds to strengthen their domestic climate policies. Especially as carbon prices increase with declining emissions caps and abatement costs rise, so too will interest in measures to address concerns about carbon leakage and competitiveness.

ETSs have addressed risks of carbon leakage by giving allowances to vulnerable industries for free, but this approach may not be suitable for all instances of leakage risk and is incompatible with long-term climate targets of net-zero emissions (Acworth et al., 2020). This may not be a sustainable approach for some jurisdictions and could become increasingly less effective under significantly higher carbon prices. Other ways of addressing leakage and competitiveness risks are therefore likely to continue attracting interest, and these approaches may increasingly focus on cross-border trade.

Two ideas that are gaining traction in policy debates are border carbon adjustments (BCAs) and consumption charges. BCAs apply tariffs or other fiscal measures on imported goods based on their embedded emissions, with the aim of levelling the difference in carbon costs between jurisdictions. They may also include rebates or exemptions for domestic exports to markets without comparable emissions pricing, but this addition may face legal obstacles under the World Trade Organization (WTO) as a prohibited subsidy (Cosbey et al., 2019; Mehling et al., 2019).

Ideally the BCA would provide adequate leakage protections such that free allocation could be discontinued or gradually phased out. Consumption charges would continue free allocation to maintain leakage protections but place an additional cost at the point of consumption for both domestically produced and imported goods to better incentivize downstream abatement through lower-carbon substitutes, more efficient use of materials, and circular economy (Neuhoff et al., 2016). While no jurisdiction has yet implemented a BCA or consumption charges as they are typically conceived, some have implemented measures that resemble both. Their experiences may therefore prove useful to other jurisdictions as they consider border measures.

The International Carbon Acton Partnership (ICAP) held two workshops with member jurisdictions on two such policies in the first quarter of 2021: the first on New Zealand's levy on imported goods containing synthetic greenhouse gases (SGGs) and the second on California's approach to imported electricity. The report that follows draws from those workshops as well as policy documents and academic literature. It provides an overview of both policies and a discussion of how both relate to the design of BCAs and consumption charges, aiming to provide lessons for jurisdictions considering such border measures.

Both the California and New Zealand cases highlight the key challenges in policy design and implementation, including those that are context specific as well as those that may prove harder for other jurisdictions, such as determining the emissions intensity of imported goods or electricity. These challenges will likely grow depending on the scope of the border policy and the broader market context. However, the California and New Zealand cases offer a view to how jurisdictions can navigate

the challenges to continuously improve the effectiveness of border-related measures within their climate policy frameworks.

2 California's treatment of imported electricity

2.1. Background

California's Cap-and-Trade (CaT) Program came into operation in 2012 and covers the state's power, industry, buildings, and transport sectors, totaling around 80% of aggregate GHG emissions. The program's mandate is based on the California Global Warming Solutions Act of 2006, or Assembly Bill (AB) 32. This Act requires the California Air Resources Board (CARB) to reduce statewide greenhouse gas (GHG) emissions, which are defined as including those stemming from electricity generated outside of the state but consumed within the state. This requirement to cover imported electricity was therefore present when California developed its CaT Program, and emissions from imported electricity are included in its cap.[1]

Electricity imports have consistently made up around 30% of California's total electricity supply (Energy Information Administration [EIA], 2021). California is part of the Western Electricity Coordinating Council (WECC) grid, which connects 14 U.S. states, two Canadian provinces, and part of Baja California in Mexico. As the state is part of an interconnected electricity grid, coverage of imported power can also help address carbon leakage that can arise when GHG emissions are not uniformly regulated in a region.

2.2. How California's treatment of imported electricity works

Under the California CaT Program, the party responsible for first placing power onto the electricity grid within California is seen as the importer of electricity and therefore faces reporting and compliance obligations.[2] This first jurisdictional deliverer (FJD) approach was developed as part of the Western Climate Initiative's (WCI) design recommendations[3] to ensure like treatment of importers and in-state generators in a legally and administratively feasible way. Under the Mandatory Greenhouse Gas Reporting Regulation (MRR), California power plants must annually report facility-level emissions. Electricity importers have an obligation to report all delivered electricity in megawatt hours (MWh) by source.

Imported electricity is reported under the MRR as from either a specified or unspecified source. The MRR requires that imports be reported as specified when the importer can claim a specific generation facility as the source of the imported electricity, through either an ownership stake or a written

[1] For more on how California incorporated imported electricity during cap-setting, see California Air Resources Board (CARB) (2010), Staff Report for the 2010 Rulemaking, Appendix E: Setting the Emissions Cap, and CARB (2007), Staff Report: California Greenhouse Gas Emissions Level and 2020 Emissions Limit.

[2] California specifies compliance obligations for electricity importers in its (Regulation for the California Cap on Greenhouse Gas Emissions and Market-Based Compliance Mechanisms, 2018)

[3] WCI was a collaboration between US states and Canadian provinces that released design recommendations for a regional cap-and-trade program in 2008. Under those recommendations, the FJD is either the power generator within the WCI jurisdiction or – in the case imported electricity – the first entity that delivers electricity over which the WCI jurisdiction has regulatory authority. The recommendations state that this approach was designed to address the potential for leakage without disrupting wholesale power markets (Western Climate Initiative (2008).

contract, and when the importer has proof of direct delivery. Specified imports are assigned a specific emissions factor for each facility, which is calculated by CARB based on data from the previous year. This data is collected by the U.S. Environmental Protection Agency (EPA) or the U.S. Energy Information Administration (EIA). For renewable energy, the emissions factor is generally zero.[4] Unspecified imports (those that do not have proof of direct delivery or contract) are assigned a default emissions factor of 0.428 MtCO2e/MWh, which is similar to the emissions factor of a single-cycle natural gas plant and reflects the average emissions rate of resources in the WECC capable of generating additional electricity in response to a marginal increase in demand. This factor was developed through the WCI design process and finalized in 2010. During this design process, policymakers determined that low-emitting sources such as renewables and hydroelectric facilities rarely, if ever, serve as the marginal unit for imports into WCI jurisdictions, as they are generally dispatched first in their market of origin. CARB reviewed this factor as part of its 2018 rulemaking process and found it continued to be in line with average emission rates for marginal generation in the WECC.[5]

A significant challenge of covering imported electricity is preventing resource shuffling, which occurs when electricity importers reallocate the production from out-of-state generators such that low-emission production is imported to California, while higher-emission production is consumed in a state without emissions pricing. In such a hypothetical scenario, the overall emissions of the electricity producers are not reduced, but the electricity importer may avoid or reduce its compliance obligation under California's CaT Program. Given California's placement in the WECC grid, there is a risk of this type of leakage. To counter this risk, California's CaT Program includes a prohibition on resource shuffling, which is explored further in the next section.

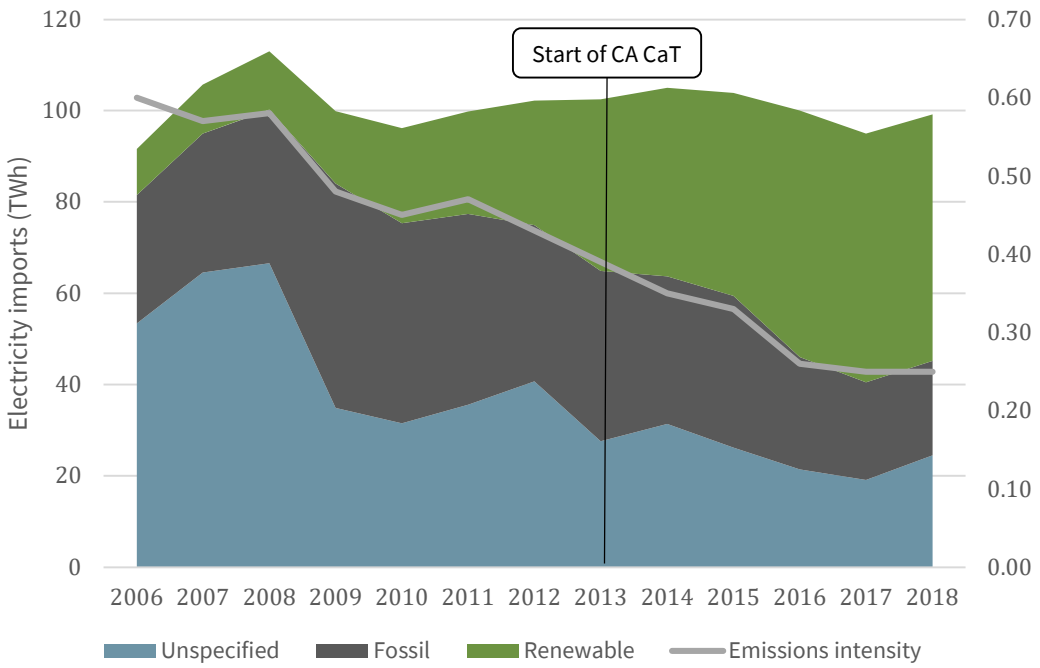
2.3. California's experiences with the policy

The share of unspecified sources in imported electricity has decreased from over half at the beginning of the century to 20-25% in recent years under the policy covering electricity imports (see Figure 1). The increase in specification can partially be explained by the fact that the default emissions factor is higher than that of renewable electricity production, creating an incentive for importers of low-emissions power to specify their source. At the same time, a robust verification process was established for annual reporting under MRR, and California's increasing Renewables Portfolio Standard requirements were established. Since the start of the CaT Program, the share of renewable electricity in imports has increased substantially: from 38% in 2013 to 54% in 2018. CARB has implemented safeguards to ensure that existing long-term power purchasing agreements for power from emissions-intensive sources cannot easily be changed to become unspecified. These safeguards include requirements that electricity importers must report additional information on ownership structure for imports from high-emitting resources and, if no longer reporting imports from a high-emitting resource, importers must report additional information on the new or different resources.

[4] For example, there are compliance obligations for methane and nitrous oxide emissions from the combustion of biomass.

[5] CARB (2018), Cap-and-Trade Final Statement of Reasons, Response E-1.6 (p. 454). https://www.arb.ca.gov/regact/2018/capandtrade18/ct18fsor.pdf

Figure 1: Electricity imports in California by source



Source: CARB GHG Inventory Data (CARB, 2020a)

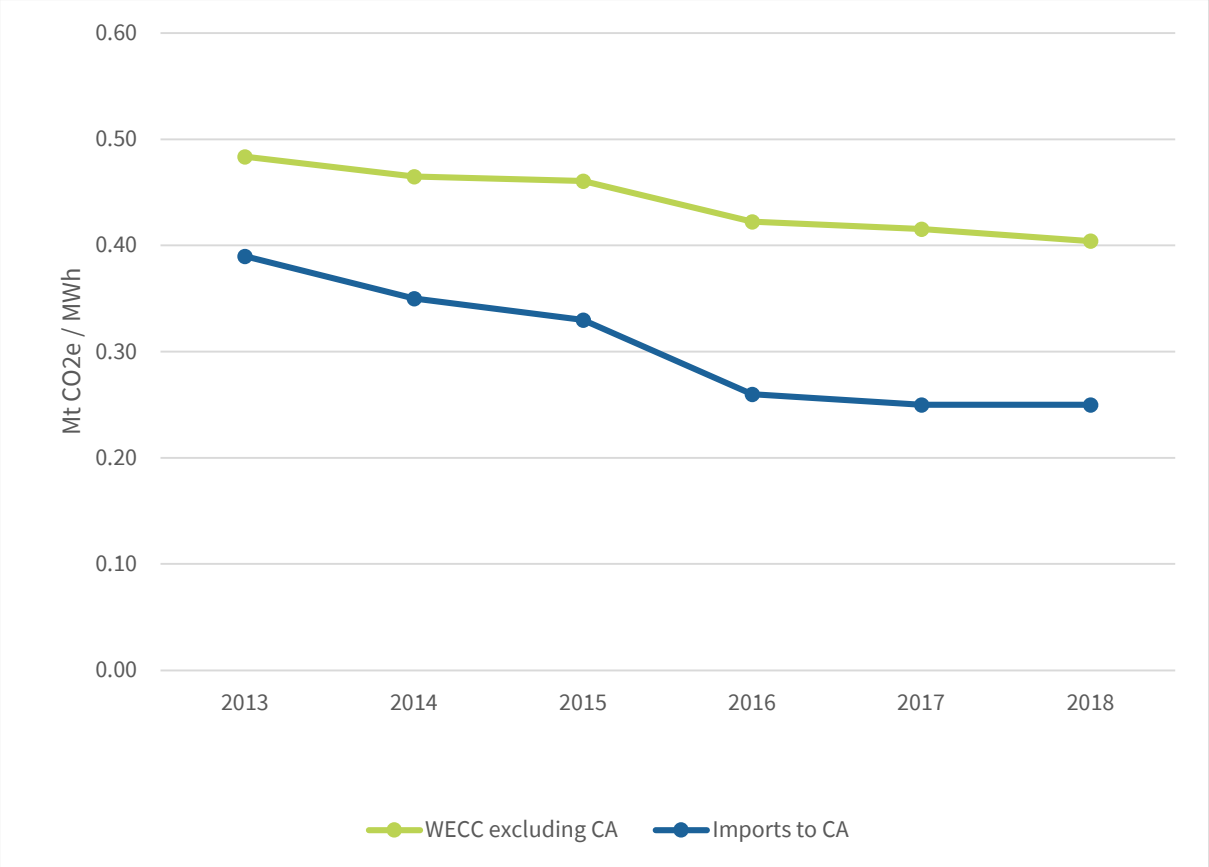
California has also accumulated significant experience with perhaps the biggest challenge of covering imported electricity – resource shuffling. Resource shuffling is a specific type of emissions leakage. The original prohibition, as introduced in 2011, defined resource shuffling as "any plan, scheme, or artifice to receive credit based on emissions reductions that have not occurred, involving the delivery of electricity to the California grid" and required all FJDs to submit written attestations confirming that they did not engage in resource shuffling, under penalty of perjury. Utilities as well as the Federal Energy Regulatory Commission (FERC) raised concerns that the definition was overly broad and raised legal questions in the face of high personal liability (Pauer, 2018). In response, CARB discontinued the attestation requirement and adopted 13 "safe harbor" provisions that fall out of the scope of resource shuffling.[6] These include, for example, electricity deliveries for compliance with the Renewables Portfolio Standard or Emissions Portfolio Standard, as well as electricity deliveries substituting for retired sources or terminated contracts. CARB actively monitors and enforces provisions against resource shuffling.

Critics initially argued that the safe harbor provisions are too generous and could lead to sizeable carbon leakage (see e.g. (Cullenward & Weiskopf, 2013)). However, CARB evaluated the potential for resource shuffling in the electricity sector in 2020 and found no evidence of it occurring (CARB, 2020b). The emissions intensity of electricity production across WECC states excluding California has followed a similar trajectory to that of imports to California (as shown in Figure 2). Additionally, two-thirds of coal plant capacity that previously serviced imports to California has been retired, with the remaining plants

[6] See the Annex for a list of the 13 provisions, which are outlined in the (Regulation for the California Cap on Greenhouse Gas Emissions and Market-Based Compliance Mechanisms, 2018)

scheduled to retire or to switch fuels. The emissions intensity of California's imported electricity has long been below the aggregate intensity across the rest of the WECC, reflecting the requirements of the state's Renewables Portfolio Standard (first established in 2002) and Emissions Performance Standard (established in 2006), in addition to the carbon cost established through the CaT Program.

Figure 2: Emissions intensity of WECC excluding California and California electricity imports



Source: EIA (2021) and California's GHG Inventory (CARB, 2020a)

Another risk of emissions leakage is presented by the Energy Imbalance Market (EIM), a real-time, wholesale electricity market operated by the California Independent System Operator (CAISO), through which market participants across the WECC can buy and sell electricity in fifteen- and five-minute intervals. The EIM makes up a relatively small share of California's electricity imports, but still offers a potential pathway to channel low-emission electricity to California and high-emission electricity to other states.

If generators outside California choose to submit a bid for dispatch to California through the EIM, they submit a "greenhouse gas bid adder" reflective of their compliance costs with the CaT Program. Initially, dispatch to California was biased towards electricity from sources with low or no emissions: the EIM takes the carbon price into account in selecting generators to serve California load, but it would not require these generators to physically increase their output to support the additional California load. This led to an overrepresentation of low-emissions generation, particularly hydropower, in imports to California through the EIM and the potential for higher-emitting sources to "backfill" to serve

the rest of the EIM market. This phenomenon, known as "secondary dispatch", creates a risk of carbon leakage.

After the problem came to light in 2015, CARB implemented a "bridge solution" whereby it estimated the extent of leakage from EIM secondary dispatch associated with EIM transactions and retired state-owned allowances in proportion to account for the leakage (Fowlie & Cullenward, 2018). CAISO then implemented EIM changes that limited the scope of this issue. In a 2018 regulatory change, CARB began reducing allocation to California electric utilities that participate in the EIM market and retiring those allowances to account for the leakage occurring in the EIM. Retiring some allowances that would otherwise be allocated to EIM participants shifts the responsibility for addressing the leakage from the state to the entities in the electricity sector who are benefiting from the EIM. EIM emissions leakage is calculated as the difference between the rate used for obligations on unspecified imports and the source-specific emissions.

2.4. Discussion and lessons on California's treatment of imported electricity

California's approach to covering imported electricity under the CaT Program offers some relevant considerations for jurisdictions pursuing similar policies, such as a BCA. The issue has generated increasing interest in Europe in particular in recent years amid rising imports and greater interconnectivity between EU Member States and third countries outside the EU ETS with little to no carbon pricing, more emissions-intensive electricity sectors, and planned expansions of fossil-fuel generated capacity (Sandbag, 2020). The European Commission included electricity among the sectors in its July 2021 proposal for a BCA, or carbon border adjustment mechanism (CBAM) as it is known in the European context, along with products in the cement, iron and steel, fertilizer, and aluminum sectors (European Commission, 2021). As power is a relatively simple product with fewer downstream implications than many industrial goods (Marcu et al., 2021), other national and sub-national jurisdictions with carbon pricing in place may also take interest in covering imported electricity in the coming years.

California's approach highlights the many challenges with policy design and implementation, the first of which is determining the emissions intensity of electricity generated outside of the jurisdiction. The ability to trace imported electricity to a particular source and its emissions factor will vary by jurisdiction and the nature of their respective electricity markets. Between bilateral transactions (e.g. long-term power purchase agreements) and the EIM wholesale market, 75-80% of California's electricity imports in recent years have come from specified sources that are traceable to a specific generator. For the remaining unspecified source imports, the state has ready access to data on emissions intensity within the wider WECC grid, and thus is assured a strong degree of accuracy in determining a representative default emissions factor that applies to unspecified sources.

Other jurisdictions, particularly where cross-border electricity trade is largely between different nations, may not have the same access to information that has allowed California to mainly rely on resource-specific emissions data for determining compliance obligations. This may be especially true for jurisdictions where cross-border electricity trade is dominated by competitive, real-time wholesale markets, and would require a benchmarking approach. The choice of default values will have implications for the policy's effectiveness against competitiveness and leakage risks as well as WTO compliance and administrative challenges from data collection (Acworth et al., 2020).

For instance, setting individual values for each exporting jurisdiction based on the average carbon intensity of its grid may offer stronger overall protections domestically, but some scholars have suggested this may violate Article I of the WTO's General Agreement on Tariffs and Trade (GATT), the "most favored nation" principle aiming to prevent different treatment of goods based on the country of origin, though such an approach may be allowable as an exemption to the GATT through Article XX on environmental grounds (Cosbey et al., 2012; Mehling et al., 2019). Indeed, country-specific benchmarks may enhance an Article XX exemption on environmental grounds as more effective against leakage risks, since they better reflect a typical exporter's true emissions intensity, but with the added challenge of gathering accurate and reliable data from emitters outside the jurisdiction's boundaries (Cosbey et al., 2019).

The European Commission's CBAM proposal relies on default values as the standard approach to assessing the embedded emissions of imported electricity, with the possibility for an importer to demonstrate actual emissions to reduce their obligations in some circumstances. Conditions under which an importer could use actual verified emissions include cases where a power purchase agreement exists with a third-country installation and the associated emissions were independently verified, instances where the flow of electricity are clearly nominated along the points in the interconnection, and where the third-country installation is directly connected to the EU transmissions system (European Commission, 2021). The Commission kept these circumstances narrow to ensure traceability of the emissions content of the power source and to avoid risks of resource shuffling (ibid).

While the approach to industrial goods relies on actual independently verified emissions of operators in third countries,[7] the European Commission noted the challenge of physical traceability of electron flows within an increasingly interconnected market facilitated through different power exchanges and specific forms of trading (e.g. aggregated bids across member states) (European Commission, 2021). Due to this challenge, the Commission proposed establishing default values for individual countries, groups of countries, or regions within specific countries based on the average emissions factor, a weighted average of the CO_2 intensity of electricity produced by price-setting fossil fuel sources of generation.[8] A transitional phase from 2023-2025 would require reporting of embedded emissions from imported electricity before an operational phase begins in 2026, with the Commission setting default values based on the best available data. A fallback option where a specific default value cannot be determined would be applying an average emissions factor of electricity from fossil fuels in the EU.

The approach to assessing the emissions intensity of imported electricity will also have implications for the risk of resource shuffling. The potential for resource shuffling may be especially strong for the electricity sector compared to industrial materials given large differences in emissions intensity between different types of generation, greater flexibility in trade through wholesale markets, and the relative ease of dispatching different types of generation depending on carbon pricing constraints in different markets (Mehling & Ritz, 2020). In a system using a single benchmark or default values to

[7] The CBAM proposal allows for the use of default values for industrial goods where actual emissions cannot be adequately determined.

[8] In European electricity markets and others around the world, prices are often set by fossil-fuel based sources of generation, which serve as the unit in the merit order dispatched to meet marginal demand after sources with lower marginal costs such as renewables have already been dispatched. As the Commission's impact assessment for the CBAM notes, export capacity is only available when domestic demand is satisfied, so EU demand that results in importing electricity is met with fossil fuel plants at the end of the merit order (European Commission (2021).

determine emissions intensity of imported electricity, especially one with more generous assumptions relative to the exporting jurisdiction's actual intensity, the incentive to engage in resource shuffling is likely lower, but this provides lower abatement incentives for the exporting jurisdiction and weaker protections for the importing jurisdiction.

Resource shuffling is challenging both to precisely define in a legal and regulatory context and to prevent through enforcement. However, California has developed experience on both fronts, as CARB actively monitors and enforces its prohibition against resource shuffling and compliance with its safe-harbor provisions.

3 New Zealand's levy on imported SGGs

3.1. Background

SGGs are human-made GHGs that have a global warming potential of hundreds or thousands of times that of CO_2. Despite their high global warming potential, SGGs are not commonly covered by a carbon price. New Zealand is one of eight jurisdictions with an ETS that covers SGGs, specifically hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulphur hexafluoride (SF_6).

SF_6 is used and emitted in the transmission and distribution of electricity. PFCs are mostly emitted during aluminum production. HFCs, on the other hand, were widely introduced as substitutes for ozone depleting gases and are commonly used in consumer products like refrigeration and air conditioning units (Schwarz et al., 2013). The emission of HFCs contained in these products mostly occurs because of leakage during maintenance, because of wear, or at the end of a product's lifetime.

Participation in the New Zealand ETS (NZ ETS) is mandated for companies that manufacture HFCs or PFCs in bulk in New Zealand, import HFCs or PFCs in bulk, or use SF_6 (with holdings above a set threshold) when operating electrical equipment. There are currently no producers of bulk HFCs or PFCs in New Zealand, but 27 entities import the gases in bulk and are therefore covered by the NZ ETS. As with most other sectors in the NZ ETS, coverage is upstream. The expectation is that ETS costs are passed through to manufacturers of goods containing SGGs, such as refrigeration and air conditioning units, and ultimately reflected in the prices of those products for consumers. New Zealand has four major manufacturers of refrigeration and air conditioning equipment that largely serve export markets within the Asia-Pacific region.

There is no emission cost incorporated in the landed price of the same products when they are imported from abroad. To put an emission cost on HFCs imported in products, when bulk imports were brought into the NZ ETS (from 1 January 2013) New Zealand also introduced a levy on imported goods containing SGGs. Decreasing the price gap can also protect domestic producers against a loss of competitiveness. At the same time, the levy intends to reduce the emissions of SGGs. Since SGGs are emitted during products' lifecycles, the emissions of imported products would occur within New Zealand and be part of the country's inventory. The levy discourages the import of products containing SGGs and incentivizes the import of goods with a lower global warming potential, creating a market for emissions avoidance.

3.2. How New Zealand's SGG levy works

The SGG levy applies in principle to importers of goods and motor vehicles containing HFCs and PFCs. In practice, only HFCs are covered, mostly those contained in refrigeration and air conditioning units. Approximately 220 types of goods and eight types of vehicles are covered, with no threshold for minimal SGG content. These goods are defined using the New Zealand Customs Service Working Tariff Document, which is based on the international Harmonized Commodity Description and Coding System Nomenclature, commonly referred to as the HS. An updated list of covered goods is specified in Schedule 1 and 2 of the Climate Change (Synthetic Greenhouse Gas Levies) Regulations 2013 (SR 2013/46).

The Environmental Protection Authority is officially responsible for the administration and compliance of the SGG levy but does not have the operational responsibility. For motor vehicles, the levy is applied when the vehicle is first registered for on-road use, i.e. when it receives its license plate. This part of the levy is administered by the New Zealand Transport Agency. The levy on other SGG-containing goods is applied at the point of import and is administered by the New Zealand Customs Service. Practically, this means that the levy on vehicles is paid directly by the consumer, whereas the levy on other goods is paid by the importer.

The levy rate is set each year and differs per product. In 2021, the levy rates ranged between NZD 21.96 (USD 14.24) and NZD 146.43 (USD 94.96) for vehicles, and between NZD 1.83 (USD 1.19) and NZD 187.26 (USD 121.44) for other goods. The levy rate is determined by:

$$Levy = GWP * SGG\ content * carbon\ price$$

GWP is the global warming potential, specified per class of products and indicated in Schedule 1 and 2 of the regulations. The SGG content is either a default value per item or the actual quantity determined to be contained in the product. A default value is used for commonly imported products for which it would not be practicable for importers to report individual SGG content, such as domestic fridges or freezers that come in large shipments. For products that have a significant variability in SGG content, the actual quantity of SGGs contained in the products is used. For such products with significant variability, information on SGG content is typically easily obtained, often directly from information on the product. The carbon price for the purpose of the levy is determined annually, as the weighted average of weekly spot prices of valuation units used for compliance. Valuation units in the past have included both allowances (New Zealand Units, or NZUs) as well as international offsets (Certified Emission Reductions, or CERs) until 2015. The levy price in 2021 is NZD 25.60 (USD 16.60). The levy price in 2022 is set to increase substantially to NZD 36.50 (USD 26.14), reflecting dramatic allowance price increases in the NZ ETS during 2021.

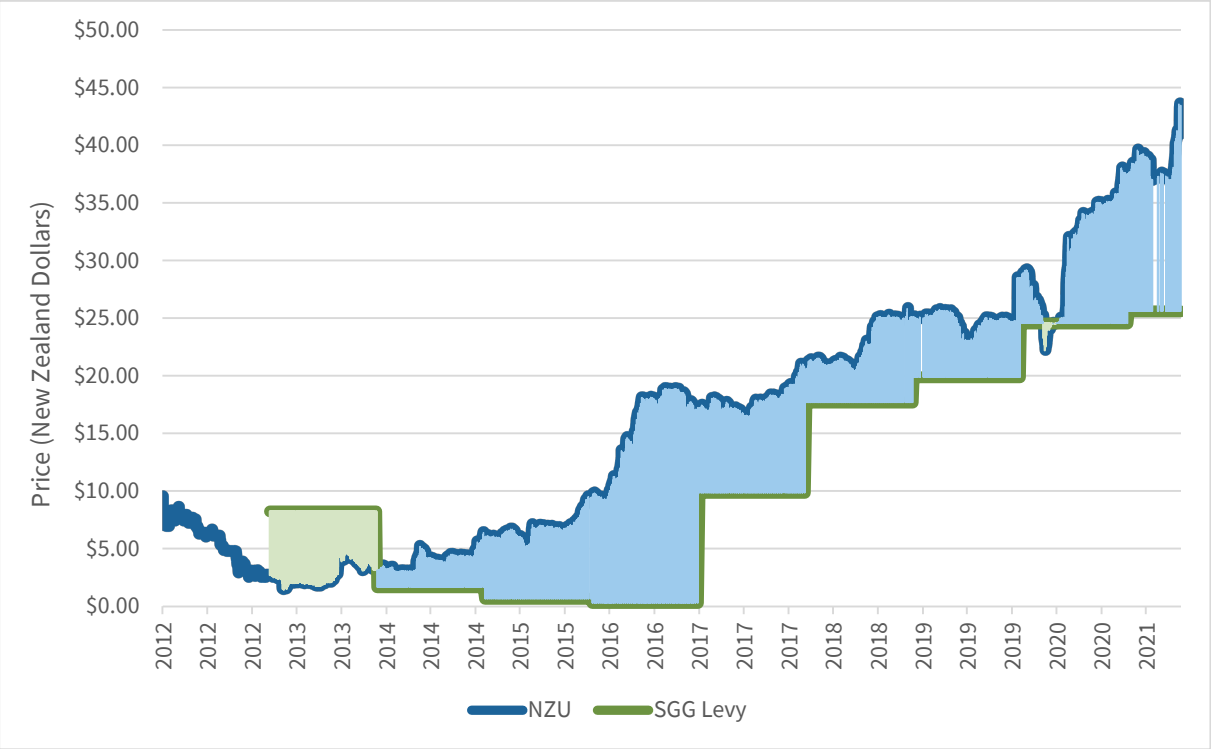
Importers and producers of bulk SGGs, who participate in the NZ ETS, do not receive any free allocation of allowances, as their activities are not considered to be trade exposed. However, the ETS does have a mechanism for companies that export or destroy SGGs to account for them and receive NZUs. When SGGs are exported or destroyed, they are no longer emitted within New Zealand's jurisdiction and covered by New Zealand's GHG inventory. These exporters – there are currently no companies in New Zealand that destroy SGGs, with most bulk exports destroyed at a facility in Australia – are eligible to receive one NZU for each ton of CO_2e exported, provided that they meet the threshold of exporting at least one ton of CO_2e. This is unrelated to the ETS free allocation process but is classed as a removal activity, similar to exporting liquid carbon dioxide or liquid petroleum gas (LPG). This system of rebates

was chosen over a system of exemptions because of the challenge of accounting for goods bound for export within convoluted supply chains. There is no entitlement to NZUs for goods that are in New Zealand for less than 180 days and for certain excluded goods, such as household goods, medical goods, aircrafts, and ships (unless the total removal exceeds 100 tons in the year), as well as goods containing HFCs solely because they were used in manufacturing the good (such as in insulation foam).

Conceptually the three elements of the policy are expected to work together to ensure that, over time, all emissions of HFCs in New Zealand will incur a cost at least approximately equal to the ETS price at the time they are imported. The upstream ETS obligation on imports, and the levy, put a cost on HFCs equal to their total potential emissions if they were all released into the atmosphere at some point. Removal credits account for the proportion that are not emitted by allocating NZUs equivalent to HFCs that are exported or destroyed.

3.3. New Zealand's experiences with the policy

Figure 3: Price per tCO2e under the NZ ETS and SGG Levy



Note: the calculation of the SGG levy carbon price until 2016 included the prices of CERs as well as the price of NZUs. Prices are current through the second quarter of 2021. Sources include ICAP Allowance Price Explorer and Climate Change (Synthetic Greenhouse Gas Levies) Regulations 2013 (SR 2013/46).

The use of the average carbon price over the previous year, in combination with the steadily increasing price of NZUs since 2013, has led to a significant lag in the carbon price used to determine the SGG levy. Barring the first year of the levy and a brief period in early 2020, the price of one NZU has consistently been higher than the price charged for a ton of CO_2e contained in an import covered by the levy, as shown in Figure 3. This price difference could partially explain importers' preference for a levy over an ETS.

The combination of the levy and the crediting of SGG exports can lead to price inequities and possible opportunities to game the system. For an importer subject to the levy, the discrepancy between the levy and the increasing prices of NZUs provides an arbitrage opportunity for companies to profit off re-exporting covered goods after storing them in the country for 180 days, though officials have not uncovered any such cases. The export of SGGs has increased significantly since the implementation of the levy. However, this was accompanied by a sharp decline in bulk SGG imports, which tend to fluctuate significantly, and relatively stable import numbers for products containing SGGs.

Implementation of the SGG levy has further shed light on the complications inherent in border-related measures for specific industries based on how goods enter and exit a jurisdiction. Before the policy change discussed below, when, for example, refrigerated shipping containers were imported to New Zealand and serviced within the country, the owner paid the costs of the NZ ETS that were passed on from domestic firms servicing the vessels, which entails the use of bulk SGGs. These shipping containers are not eligible for removal units if they are re-exported within 180 days under the policy of granting NZUs for exported SGGs as a removal activity, so cannot recover the cost in this way. An additional problem was that, if a container was in New Zealand for more than 180 days, in principle its owner could have claimed removal credits for all the HFCs in the container – whether added in New Zealand or not – on exporting it.

The levy in combination with the ETS and the 180-day window before awarding NZUs for removals in effect discouraged owners of refrigerated shipping containers from having their vessels serviced in New Zealand, which prompted complaints from the domestic service industry. This led New Zealand officials to amend the ETS to exempt bulk imports of SGG used to service refrigerated shipping containers, as well as to exclude the shipping containers from the levy on import and make them ineligible for NZUs upon re-export in most cases.

While customs officials conduct periodic audits, ensuring compliance can be a challenge. The system relies on importers correctly identifying their goods from among a list of over 200 products in the levy schedule, some of which have similar wording but different cost implications based on their SGG content and GWP. This can lead to misinterpretation and misreporting as well as intentional acts of non-compliance. Since the levy application is public record, in the past competing firms have uncovered misreporting by other importers and informed customs officials. The New Zealand Ministry for the Environment has identified potential for non-compliance as an ongoing challenge and has encouraged customs officials to perform more frequent audits and reviews. The list of covered goods itself requires continuous updating as new SGG blends and products enter the market and as international customs codes change, with an anticipated expansion to over 300 goods in the years ahead.

The implementation of the SGG levy in New Zealand in 2013 was not met with WTO complaints or pushback from trading partners. The primary purpose of the levy is to put a consistent price on all SGG emissions within New Zealand, regardless of how the SGGs were brought into the country. It is applied to the same products that would incur a (passed through) cost from the NZ ETS, and the price of the levy has almost always been lower than the NZ ETS cost. Additionally, most domestically produced products containing SGGs are exported, so there is little competition between manufacturers and importers on the domestic market. New Zealand also intended to design the rebate on exports in such a way as not to convey a net benefit to exporters as a subsidy.

An alternative way to price imported products containing SGGs would have been to incorporate them into the NZ ETS, similar to how bulk importers are mandatory participants. Proposals to do this were included in the 2008 legislation that established the ETS. The main reason to opt for a levy instead was the excessive administrative costs that were expected from incorporating the large number of importers with a relatively small quantity of emissions each into the NZ ETS. Introducing a threshold for participation was considered but expected to be too liable to distortions and gaming. The importers, when consulted, also indicated they preferred a levy over ETS participation, in part because of its relative simplicity and consistency with existing business practices.

3.4. Discussion and lessons on New Zealand's SGG levy

New Zealand's SGG levy has some elements in common with consumption charges for industrial goods as conceived in the European context and offers some relevant considerations, particularly on application to imported goods. Under a system of consumption charges paired with free allocation, an equivalent charge is applied on like imported goods that are subject to the charge when produced domestically. As with New Zealand's SGG levy, consumption charges on imported industrial goods would require a standardized system that likely relies to a significant degree on default values of GHG content. In the case of industrial goods, default values could be based on the benchmarks used for free allocation for the respective product, which would approximate the level of pricing that is otherwise muted through free allocation upstream at the level of production.

However, a standardized approach to GHG content of imported carbon-intensive goods subject to consumption charges would face additional challenges relative to the SGG levy. To avoid shifting leakage concerns to firms that use the covered materials downstream, the consumption charges would need to be extended farther down the value chain to other finished and semi-finished products that contain significant amounts of the covered material (Ismer et al., 2016). In the European context, this could be restricted to around 1,000 product categories accounting for around 85% of emissions from imported industrial goods by using a threshold of liability as a share of product price exceeding 1% (Pauliuk et al., 2016). But this implies a significantly larger scope than the SGG levy and additionally requires determining assumptions on the amount of a covered good that a product contains in the absence of such data from importers.

The New Zealand experience also demonstrates the potential for a lag between levy prices that importers face and ETS prices that domestic producers face. New Zealand importers expressed a need for predictable levy rates published with significant lead time to avoid market disruptions, which resulted in a methodology that relies on a weighted average of weekly spot prices of ETS units over the previous year, whereas domestic manufacturers face cost pass-through from more recent ETS prices upstream. A system of consumption charges may similarly need to set rates in advance, possibly based on a weighted average of allowance prices over the preceding year. Manufacturers using domestically produced goods and those using imported goods would face the same consumption charge, avoiding any lag in this case. However, there would still be a lag between the consumption charge and current allowance prices that producers of the covered materials face at the margin for emissions that exceed the benchmark, and depending on the degree of ETS cost pass-through and allowance price trends there is potential for higher costs downstream for domestic manufacturers.

The treatment of exports would likely be different under consumption charges for industrial goods. For one, the rationale for classifying many industrial goods as a removal activity that generates credits is

not clear. A system of duty-suspension arrangements for industrial products is a more likely avenue for ensuring export competitiveness, whereby liability for the consumption charge is relieved upon export as long as the good is held under duty-suspension along each step of the value chain (Ismer et al., 2016). As this system only allows for relief from the consumption charge and not the creation of an asset or instrument with financial value, there would be no concerns about arbitrage opportunities (e.g. importing a good and re-exporting to exploit price differentials).

Lastly, the New Zealand case sheds light on the complexity of border-related measures, the degree of coordination across different agencies they require, and the significant potential for unanticipated impacts that may require adjustments to the scheme. In addition to policy direction at the ministerial level, the SGG levy requires the work of the Environmental Protection Authority on administration and compliance as well as officials from the New Zealand Customs Service and the New Zealand Transport Agency, who are also critical in ensuring compliance. Trade-related policies are likely to encounter unforeseen complications, including disruptions in local economic activity that may require adjustments to the policy. This was the case with, for instance, refrigerated shipping containers that were temporarily in New Zealand to be serviced, which resulted in a revision that exempts them from the SGG levy.

The EU CBAM would similarly require a significant degree of coordination between customs authorities enacting border procedures for the covered imports and other regulators designated as “competent authorities” to carry out compliance obligations by each Member State, which may often be the same, largely environmental authorities administering the EU ETS.

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5 Annex

Below are the 13 practices that CARB explicitly defines as not constituting resource shuffling according to the California CaT Regulation, which was most recently updated in 2018 (CARB, 2018). They are known informally as “safe harbor” practices.

1. Electricity deliveries that are caused by the procurement of electricity eligible to be counted towards and purchased for Renewable Portfolio Standard (RPS) compliance in California.
2. Electricity deliveries made for the purpose of compliance with state or federal laws and regulations, including the Emission Performance Standard (EPS) rules established by the California Energy Commission (CEC) and the California Public Utility Commission (CPUC) pursuant to Public Utilities Code section 8340 et. seq.
3. Electricity deliveries made for the purpose of compliance with requirements related to maintaining reliable grid operations, such as North American Electric Reliability Corporation (NERC) Reliability Standards and Reliability Coordinator directives, including the provision of electricity between balancing authorities or load-serving entities when required to alleviate emergency grid conditions.
4. Electricity deliveries made for the purpose of compliance with either a judicially approved settlement of litigation or a settlement of a transaction dispute pursuant to the dispute resolution terms and conditions of a contract for reasons other than reducing GHG compliance obligations.
5. Electricity deliveries that substitute for power previously supplied by a specified source that has been retired.
6. Electricity deliveries that substitute for deliveries that have been discontinued because of termination of a contract or divestiture of resources for reasons other than reducing a GHG compliance obligation.
7. Electricity deliveries that are necessitated by early termination of a contract for, or full or partial divestiture of, resources subject to the EPS rules.
8. Electricity deliveries that are necessitated by expiration of a contract.
9. Electricity deliveries pursuant to contracts for short-term delivery of electricity with terms of no more than 12 months, for either specified or unspecified power, linked to the selling off of power from, or assigning of a contract for, electricity subject to the EPS rules from a power plant that does not meet the EPS with which a California Electrical Distribution Utility has a contract, or in which a California Electrical Distribution Utility has an ownership share, and based on economic decisions including congestion costs but excluding implicit and explicit GHG costs. In evaluating these short-term deliveries of electricity, ARB will consider the levels of past sales and purchases from similar resources of electricity, among other factors, to judge whether the activity is resource shuffling.
10. Short-term transactions and contracts for delivery of electricity with terms of no more than 12 months, or resulting from an economic bid or self-schedule that clears the CAISO day-ahead or real-time market, for either specified or unspecified power, based on economic decisions including implicit and explicit GHG costs and congestion costs, unless such activity is linked to

the selling off of power from, or assigning of a contract for, electricity subject to the EPS rules from a power plant that does not meet the EPS with which a California Electricity Distribution Utility has a contract, or in which a California Electricity Distribution Utility has an ownership share, that is not covered under paragraphs 11., 12., or 13. below.

11. Electricity deliveries that are necessitated by operational emergencies or transmission or distribution constraints, including constraints caused by the inability to obtain or retain transmission rights, transmission curtailments or outages, or emergencies.

12. Electricity deliveries that are necessitated because a First Deliverer has more than enough electricity to meet demand as a result of the First Deliverer being required to take electricity from specific generating units, including requirements due to electricity contracts with "must-take" or "must-run" provisions.

13. Deliveries of electricity that are required to make up for transmission losses associated with electricity deliveries in California.