



**Asia-Pacific
Economic Cooperation**

Advancing Free Trade
for Asia-Pacific **Prosperity**

Scoping Study on New and Emerging Environmental Goods

APEC Market Access Group

December 2021



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Executive Summary

Building on APEC's legacy

APEC has a long history of leadership promoting trade and investment in environmental goods (EGs). In 2012, APEC economies agreed to reduce applied tariff rates to five percent or less on a list of 54 EGs– the APEC Environmental Goods List (EGL). This non-binding commitment has been successfully advanced. It is, to date, the most internationally accepted 'list' of EGs.

In June of this year APEC Ministers Responsible for Trade affirmed their readiness to build on the successful legacy of the 2012 EGL, noting that since this time, new environmentally friendly goods, technologies and innovations have emerged that are not covered by the original list.

Environmental goods and trade

Since the initial list was created there have been significant developments in the regional landscape for trade in EGs. Over the past 10 years, government policy to support EGs has grown, technology has advanced, and trade in these goods has expanded. Trade has become increasingly integrated through regional and global value chains, supported by the development of new agreements and frameworks for liberalisation.

There is growing support among APEC economies for reducing barriers to trade as part of a wider strategy to address climate change and support sustainable development goals, and to consider updating the list with new goods in advancement of these goals.

Emerging environmental goods – moving towards updating APEC EGL

As an initial step and basis for discussion, APEC members can consider an approach to expanding the EGL that is focused on new and emerging renewable energy, products and technologies that contribute to emissions reduction and mitigation. It should account for whole of value chains and be capable of being expanded, updated, and built on over time.

Illustrative EGs likely to fall within these parameters include not only complex new technologies like fuel-cell electric vehicles, but also raw materials such as critical minerals, products of renewable energy such as green hydrogen, and simple manufactures such as gas tanks.

The trade landscape for new environmental goods – trade, tariffs and non-tariff measures

Trade in these new EGs is potentially substantial. Annual trade in products on the 2012 EGL already amounts to as much as USD 500 billion globally, with more than half of this trade taking place in the APEC region. Trade in newly identified EGs offered for consideration in this paper could amount to more than half this value again, representing a growing source of trade across many APEC economies.

Applied tariffs on new EGs are already generally low at around 5% on average across APEC economies. Some of these have been liberalised further as a result of

Asia Pacific FTAs. However, bound rates remain high. Some EGs are subject to higher multilateral and preferential applied rates in some APEC economies.

Non-tariff measures (NTMs) - in the form of technical regulations, pre-shipment inspection formalities, licensing and quantity controls, price control measures, and export related measures - are more difficult to identify, but also impact on trade. Emerging EGs involve new industries for which regulation is evolving, warranting further work examining NTMs and their impact across EG supply chains.

Benefits for APEC

Reducing tariff and non-tariff barriers on new EGs would have a direct and compounding positive impact on the competitiveness of new EGs in the APEC region.

Lower barriers would reduce costs and spur demand along the supply chain, helping to incentivise production, manufacturing, and trade in EGs, creating opportunities for exports and assisting economies in meeting their own climate change goals.

More open supply chains for EGs can encourage the development of new industries – not just for final products but also up and down the value chain, including raw material supply, component manufacturing, product assembly, and waste recycling. This network effect can enable the participation of developing member economies in these industries of the future.

As with the initial APEC-54 list, APEC can set the standard for multilateral liberalisation of new EGs. APEC's success as an incubator for new initiatives make it the ideal forum to continue to pioneer meaningful trade liberalisation and support regulatory approaches that are relevant to shared and current policy objectives.

Furthermore, as economies across the world seek out various ways to drive economic recovery post pandemic and mitigate climate change, APEC can demonstrate to the world the value of open trade in enabling sustainable economic growth.

Next steps

There are several steps APEC economies may consider taking to increase trade in new EGs and realise the potential benefits. Data collection and analysis on new EGs should be improved to permit more accurate calculation of trade flows and allow for transparent and targeted tariff cuts. FTA liberalisation outcomes and disciplines could be considered as a baseline for future reduction of tariffs and non-tariff barriers.

More work can also be advanced on NTMs and their impact across supply chains. As EG technologies develop, trade expands and regulation evolves, more NTMs may emerge in future. Knowledge sharing and dissemination on EG regulation among government, business and civil society should be encouraged, particularly as EG markets further develop.

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Introduction

This study was commissioned to provide new research to inform and enrich future discussions in APEC on EGs. In June of this year APEC Ministers Responsible for Trade agreed on the importance of promoting economic policies and growth that contribute to tackling climate change and other serious environmental challenges aligned with global efforts. They affirmed their readiness to build on the successful legacy of the APEC EGL endorsed in 2012, noting that since this time, new environmentally friendly goods, technologies and innovations have emerged that are not covered by the original list.¹

The study seeks to:

- Outline the current state of play of trade in EGs both in APEC and within the broader plurilateral and multilateral conversations on trade and the environment;
- Identify new and emerging EGs that support global sustainability goals that were not captured in the original EGL, focusing on climate change mitigating technologies that contribute to emissions reduction;
- Assess the current landscape for trade in these new and emerging EGs, focusing on the APEC region;
- Provide suggestions on how APEC might usefully support increased trade in these goods, and the potential impact of these actions.

The study includes four sections:

Part I. Environmental goods and trade – 10 years on – outlines the existing trade frameworks for EGs in APEC and multilateral fora, assesses new developments since the APEC EGL was endorsed, and reviews emerging bilateral, regional and multilateral trade frameworks and initiatives for EGs.

Part II. Emerging environmental goods – updating the APEC EGL– identifies 21 ‘new’ EGs not currently on the APEC EGL that contribute to climate change mitigation for possible inclusion on an updated list and proposes an approach for APEC to consider in an updated list including selection criteria.

Part III. The trade landscape for environmental goods – estimates the size and growth of trade in new EGs, assesses average levels of tariff protection across APEC in these goods, and reviews the nature and incidence of non-tariff measures (NTMs) potentially impacting on trade.

Part IV. Benefits and next steps – outlines the potential benefits for APEC from more open trade in new EGs and the potential next steps APEC might consider to achieve this.

The findings are without prejudice to the positions of APEC economies and ongoing negotiations on EGs in other fora such as the WTO. Newly identified goods do not represent a complete, nor an APEC ‘updated list’ of EGs.

¹ https://www.apec.org/Meeting-Papers/Sectoral-Ministerial-Meetings/Trade/2021_MRT

The outcomes are intended to contribute to the body of research work and to discussions within the APEC space for economies to proactively consider and refine their own positions in this evolving area. The research may also support and provide impetus to ongoing plurilateral and multilateral discussions in the WTO without prejudicing the position of any individual economy.

I. Environmental goods and trade - 10 years on

Existing trade frameworks for environmental goods

APEC has a long history of leadership on promoting trade and investment in EGs. APEC economies recognised more than 10 years ago that trade liberalisation in EGs supports trade, green growth, and sustainable recovery. Lower tariffs improve access to crucial environmental technologies, creating new trade opportunities while promoting clean, efficient energy use and lower carbon emissions in the region.”²

APEC has been the global leader in advancing institutional frameworks to support this goal. APEC economies agreed in 2012 to reduce the applied tariff rates on a list of 54 EGs to 5% or less by the end of 2015. This non-binding commitment has successfully advanced- there are now 19 APEC member economies who are fully compliant with the APEC EGL.³

The 2012 APEC list comprises 54 products at the Harmonized Standard (HS) six-digit level including solar panels, wind turbines, bamboo flooring, as well as environmental monitoring, analysis, and assessment equipment.

The 2012 list, and pledge to implement it was and remains significant, as the first - and as yet only - time a group of major trading partners have agreed to a set of environmental products on which they will apply tariff reductions. It is widely considered to have helped create a basic understanding of the sector and its importance to the region’s future growth objectives and provided impetus to the plurilateral Environmental Goods Agreement (EGA) negotiations in the World Trade Organization (WTO).

Multilateral efforts to build on the APEC list among WTO members⁴ have been ongoing, but to date unable to reach a consensus. Concurrent work in the OECD has produced a broader list of EGs, which unlike the APEC and WTO lists, was not intended for targeted tariff reductions.

As such, there is currently no generally agreed definition of ‘environmental goods’⁵ the APEC list serves as the most internationally accepted ‘list’ of goods that can be considered such.

Environmental Goods Lists

WTO - Plurilateral negotiations on an agreement to cut tariffs on EGs were launched in the WTO in 2014 among a group of WTO members. The agreement aims to build on the APEC list. Over 18

² https://www.apec.org/Press/News-Releases/2016/0128_EG.aspx

³ https://www.apec.org/Press/News-Releases/2021/0311_MAG

⁴ Participating WTO Members include Australia; Canada; China PRC; Costa Rica; European Union (including United Kingdom); Hong Kong, China; Iceland; Israel; Japan; Korea; New Zealand; Norway; Singapore; Switzerland; Liechtenstein; Chinese Taipei; Turkey; United States. See https://www.wto.org/english/tratop_e/envir_e/ega_e.htm.

⁵ Balineau, Gaëlle, and Jaime De Melo. 2011. “Stalemate at the Negotiations on Environmental Goods and Services at the Doha Round.” *FERDI, Working Paper; WP 28.2011*. (Page 2).

Tran, HTT, and Kaliappa Kalirajan. 2018. “Is Environmental Goods Trade Beneficial for the Environmental Performance of the Concerned Countries?”

https://ccep.crawford.anu.edu.au/sites/default/files/publication/ccep_crawford_anu_edu_au/2018-07/tran_htt_and_kalirajan_k_2018_is_environmental_goods_trade_beneficial_for_the_environmental_performance_of_the_concerned_countries_ccep_working_paper_1808.pdf.

WTO members are participating, largely representing major traders in EGs– across APEC this includes China; Japan; Korea and the United States, as well as Hong Kong China; Australia; New Zealand; Canada; Chinese Taipei and Singapore.

Progress on the agreement however has been slow - despite 18 rounds of negotiations, members have not been able to reach consensus on a list of EGs, and there have not been any new negotiations since 2016. The WTO list is much broader than the APEC list and contains goods from various points of view of environmental protection. While several economies have expressed their support for continuing work on the EGA, no timetable has been set for a return to negotiations. (See 'Multilateral approaches').

OECD - Concurrent to the APEC and WTO frameworks, the OECD first developed a list of EGs in 1999. In contrast to the other initiatives, this was the result of an exercise intended to illustrate, primarily for analytical purposes, the scope of the “environment industry”, rather than to identify products targeted for tariff reductions. It flowed directly from joint OECD and Eurostat work on a manual for statisticians to assist them in measuring their environmental industries. The OECD list is broader than both the WTO and APEC lists as both a result of the analytical approach to identifying goods, and because adding products to the list had no policy consequences.⁶

Sources: https://www.wto.org/english/news_e/archive_e/ega_arc_e.htm;
<https://www.oecd.org/environment/envtrade/35837840.pdf>

New developments

Since the APEC, WTO and OECD lists were created there have been significant developments in the global and regional landscape affecting trade in EGs. Over the last ten years government policy to support EGs has grown, technology has advanced, and trade in EGs has expanded. Trade has become increasingly integrated through regional and global value chains, supported by the development of new agreements and frameworks for liberalisation.

Moreover, the COVID-19 pandemic has demonstrated the need to diversify and strengthen the resilience and sustainability of global supply chains to ensure stability of trade in the face of global challenges, such as pandemics, climate risks and impacts, and wider economic and trade risks presented by environmental degradation, biodiversity loss and natural disasters.⁷

Climate change policy

Policies for climate change adaptation and mitigation have taken on increasing importance for APEC economies in the last ten years, including the use of trade policy to support decarbonisation. The last decade has seen greater demand and growth in EGs and greater impetus to reduce prices and incentivise the production and export of EGs.

Government regulations and policies on clean energy - including environmental laws, voluntary schemes, co-operative mechanisms and improved enforcement methods – are driving demand for EGs, including through private sector participation.⁸ For example, commitments to the development of hydrogen fuel cell vehicles and building of hydrogen fuel stations for recharging the vehicles are expected to drive

⁶ As Steenblik notes, moreover, the OECD's larger list was created deductively: starting from general categories based on the classifications in the environment industry manual, it added specific examples in order to produce an estimate of average tariffs on a previously undefined class of goods.

See <https://www.oecd.org/environment/envtrade/35837840.pdf>

⁷<https://docs.wto.org/dol2fe/Pages/SS/directdoc.aspx?filename=q:/WT/CTE/W249.pdf&Open=True>

⁸ https://www.unescap.org/sites/default/files/S4-Trade_in_envgoods.pdf

the hydrogen compressor market. See box below illustrating APEC economies' government policies on climate change impacting EGs.

Government policies on climate change impacting EGs

Japan has recently announced that it will achieve carbon neutrality by 2050. Japan's greenhouse gas emission reduction target was also raised to 46% by FY2030, versus FY2013 levels, from the previous 26% target. Japan has adopted a new strategic roadmap for hydrogen making the development of hydrogen technology one of its centrepieces and is working toward decreasing the cost of decarbonised hydrogen production tenfold by 2050. It is thus very likely that its R&D budget will continue to rise, as it has since 2011. The hydrogen economy is also a centrepiece of Japan's 2020 Olympic Games.

Korea's 160 trillion won (\$144 billion) New Deal economic strategy announced last year is focused on developing a greener economy and included the target of putting 200,000 hydrogen vehicles on the road and setting up 450 charging facilities by 2025.

Australia adopted a *National Hydrogen Strategy* in 2019 and in 2020 released its first annual Low Emissions Technology Statement as part of its Technology Investment Roadmap. The first annual Statement Identified five priority technologies and accompanying stretch goals, they related to: clean hydrogen, energy storage, carbon capture and storage, low emissions steel and aluminium, and soil carbon measurement. The statement also identified "emerging and enabling technologies", and "watching brief technologies". The latter categories include technologies expected to be developed overseas and imported to Australia as required, as well as technologies domestically produced.

China, the world's largest automobile market, will begin requiring at least 10 percent of new car sales be fully electric or plug-in hybrid starting in 2019. To help encourage adoption, the Chinese government offers generous subsidies that averaged \$15,000 per vehicle in 2016.

Indonesia's current President, Joko Widodo, introduced a low carbon emission vehicle (LCEV) policy in his first term. The policy outlined concrete actions in Presidential Regulation 55/2019 on the Acceleration Program for Battery Based Electric Vehicles for Road Transport. The focus of the regulation is to advance Indonesia's transformation from internal combustion-based engines directly to electric vehicles powered by batteries.

Sources: See references.

Reduction of tariffs on EGs forms part of the climate change mitigation and adaptation discussion. Many experts concede that this is an important piece of the needed mitigation measures to combat climate change.⁹

Technological innovation

Government policy has been accompanied by advances in technology and product innovation, driven by the increasing need to use resources more efficiently, involving the application of technologies with lower carbon footprint.¹⁰ There have been important technical advances in the energy sector, a major driver of GHG emissions. In addition, the cost of solar and wind technologies has fallen dramatically, opening the possibility of economic down-stream industries (such as green hydrogen). See box below.

Growth in EGs for clean energy

⁹[https://www.uschina.org/sites/default/files/Value%20of%20the%20Environmental%20Goods%20Agreement%20on%20China%20\(English\).pdf](https://www.uschina.org/sites/default/files/Value%20of%20the%20Environmental%20Goods%20Agreement%20on%20China%20(English).pdf)

¹⁰ <https://www.apec.org/Publications/2012/04/A-Snapshot-of-Current-Trade-Trends-in-Potential-Environmental-Goods-and-Services>

Hydrogen compressors - The hydrogen compressor market is expected to register a CAGR of more than 3.5% during the forecast period, reaching a value of around USD 1.88 billion by 2026, up from USD 1.51 billion in 2019. Factors such as the increasing demand for hydrogen from end-user industries and the development of hydrogen pipeline infrastructure are expected to drive the market demand over the forecast period. Asia-Pacific is expected to be the promising market for fuel cells in the coming years, on account of the favourable government policies in economies such as China, Japan, Korea, and India. China is one of the largest and fastest-growing hydrogen compressor markets in the world.

Lithium batteries - Forecast growth in EVs will be a significant source of demand as governments adopt policies that encourage the move from Internal Combustion Vehicles (ICEs). Other initiatives are also fuelling demand by raising the costs of traditional energy distribution and constraining the development of non-renewable resource supplies. Deutsche Bank expects global battery consumption to increase five-fold in the next 10 years, placing pressure on battery supply chain and lithium markets. Frost & Sullivan forecast that for the period 2017 to 2023, demand for lithium-ion batteries for EVs will increase by 32.4 per cent, grid and energy storage by 21 per cent and consumer electronic applications by 8.1 per cent.

Sources: See references.

The EG sector is still evolving – government regulation and technological innovation can be expected to drive new products, industries, and technology. For example, significant growth in the automotive sector's demand for batteries will increase demand for a (lithium-ion) recycling industry, requiring products from raw materials to component and equipment production.¹¹ It is reported that about 50% of total EGs to be used within 2030 are yet to be created.¹²

Expanding trade

As government policy to support EGs has grown, and technology has advanced, trade in EGs has expanded. Prior to the APEC EG list, international trade in EGs was already growing rapidly.¹³ Seven years on, in 2019, global trade in EGs across the 54 goods on the APEC List (APEC-54) amounted to as much as USD515.4 billion.¹⁴ APEC economies accounted for more than half (58%) of this total (302.8 billion).

Indications are that non-OECD economies in the Asia Pacific region are increasingly expanding their share of global EG exports. OECD members accounted for 80.6% of EGs exports in 2003, falling to 66.9% in 2016. Since 2012, China has become a dominant player of international trade in EGs. In 2003, China's share in the total EGs exports from outside the OECD area was less than half, at just over 40%. Thirteen years later in 2016, the bulk of these exports originated from China, at nearly 60% share.¹⁵

¹¹ <https://www.energy-storage.news/news/every-step-of-lithium-battery-value-chain-will-have-an-interest-in-recyclin>

¹² https://ccep.crawford.anu.edu.au/sites/default/files/publication/ccep_crawford_anu_edu_au/2018-07/tran_and_kalirajan_k_2018_apecs_exports_of_environmental_goods_an_exploratory_analysis_of_performance_ccep_working_paper_1806_july_2018.pdf

¹³ The OECD estimates that between 2003 and 2016, international trade in environmentally-related goods (EGs) more than doubled, and increased its share in global trade from 7.2% to 8.1%.

[https://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=COM/TAD/ENV/JWPTE\(2018\)2/FINAL&docLanguage=En](https://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=COM/TAD/ENV/JWPTE(2018)2/FINAL&docLanguage=En)

¹⁴ Based on trade flows in 6-digit HS codes applicable to EGs. Flows may include goods not classified as EGs. See Part III.

¹⁵ According to OECD data covering 248 'environmentally related goods' based on the Combined List of Environmental Goods (CLEG).

Integrated supply chains

Value chains for EGs have become increasingly integrated over the last ten years with greater participation of emerging economies. Final EGs require multiple inputs which can be sourced, assembled, and traded across multiple locations before being sold to consumers. See box below.

The lithium EV battery manufacturing supply chain

The lithium EV battery manufacturing supply chain has three main parts: cell manufacturing, module manufacturing, and pack assembly. These three stages can be conducted in the same place or broken up into two or (theoretically) three locations. This follows the supply and processing of raw material inputs - in addition to lithium, lithium-ion batteries tend to contain aluminium, cobalt, graphite, manganese, and nickel.

For example, LG Chem batteries are used in vehicles sold in the United States. LG Chem assembles packs in Michigan and South Korea for Ford, General Motors, and Chrysler using Korean or U.S.-made cells, depending on the model. AESC has assembled cells, modules, and packs for the Nissan Leaf and NV200 in Tennessee and Sunderland, England. Samsung SDI produces cells and assembles packs for BMW and Volkswagen at a plant in Hungary. Those packs are then installed in vehicles in Germany. Bosch assembles batteries in Michigan for Fiats produced in Mexico.

Source: See references.

Because goods cross borders multiple times, tariffs compound along the value chain. Therefore, the benefits of tariff reductions - even modest ones - also compound each time inputs cross borders, benefiting the value-add component at each point in the supply chain. This is increasingly important for economies that participate upstream in the value chain, and not just for final manufacturers and exporters of EGs.

Emerging trade frameworks

Greater integration of trade supply chains in EGs has been facilitated by the emergence of bilateral and regional trade agreements. They are impacting on cross border trade flows through tariff reduction commitments, rules of origin arrangements and disciplines to promote trade in EGs and address barriers.

Trade disciplines on EGs are yet to be agreed at the multilateral level. Plurilateral negotiations in the WTO on liberalisation of EGs that commenced in 2014 came to an end in 2016. The Trade and Environmental Sustainability Structured Discussions were launched in November 2020, with some interest from members in addressing EGs in future discussions.

Alongside this, work is progressing in other multilateral forums examining the interaction between EGs - such as hydrogen – trade rules, barriers, and agreements, as well as international standards governing EGs.

Some economies, including those outside of APEC, are also moving forward with separate trade policy initiatives to support decarbonisation, principally the EU. Given

[https://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=COM/TAD/ENV/JWPTE\(2018\)2/FINAL&docLanguage=En](https://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=COM/TAD/ENV/JWPTE(2018)2/FINAL&docLanguage=En)

the integrated nature of supply chains involved, these policies will likely have a bearing on EG trade of APEC economies.

Bilateral and regional FTAs

Some recent agreements involving APEC economies provide for tariff reduction commitments for EGs (see Chapter III). They also set out disciplines to promote trade in EGs and address potential barriers. Many encourage the development of plurilateral cooperative projects on EGs to address trade related environmental challenges.

Provisions on EGs exist in the CPTPP, the USMCA and Vietnam's bilateral FTA with the EU to 'facilitate' and 'promote' trade and investment in EGs and services.¹⁶

CPTPP and USMCA also establish mechanisms to address potential barriers to trade in EGs identified by the parties and encourage bilateral and plurilateral cooperation projects to address future trade related environmental challenges. The New Zealand/China FTA has a similar cooperation provision.¹⁷

These provisions reflect positive consensus among economies involved of the benefits of reducing barriers to EGs and facilitating trade and investment in clean technologies. As CPTPP notes 'the Parties recognise the importance of trade and investment in EGs and services as a means of improving environmental and economic performance and addressing global environmental challenges'.¹⁸

WTO initiatives

Negotiations on an agreement to reduce barriers to EGs in the WTO have failed to progress since 2016, reflective of difficulties across the WTO in general, rather than due to EGs per se.

Signs of renewed engagement have occurred earlier this year when delegates from the group of WTO members were involved in new "structured discussions on trade and environmental sustainability". The discussions are aimed at exploring emerging trade and environment policy issues.¹⁹

The first plenary meeting of the Trade and Environmental Sustainability Structured Discussions (TESSD) was held on 5 March 2021. Many Members broadly supported starting discussions in TESSD to consider, along with a number of other trade topics, conversations on liberalising trade in EGs, though there remain differing views on the possible scope of work on EGs and the way forward, including whether to prioritise a negotiating agenda or give more focus to exploratory work instead.²⁰

¹⁶ USMCA Article 24.24, CPTPP Article 20.18, EVFTA Article 13.10

¹⁷ See Article 7 Bilateral cooperation

¹⁸ CPTPP Article 20.18

¹⁹ The initiative was launched in November 2020 during the WTO's Trade and Environment Week, where 53 WTO members said they planned "to collaborate, prioritise and advance discussions on trade and environmental sustainability," naming, among other factors, the pressing challenge of climate change and the lessons learned from the COVID-19 pandemic.

<https://docs.wto.org/dol2fe/Pages/SS/directdoc.aspx?filename=q:WT/CTE/W249.pdf&Open=True>

²⁰ <https://sdg.iisd.org/commentary/policy-briefs/trade-and-environment-structured-discussions-among-wto-member-group-get-underway/>

A key issue, recognised by members, is the need to enlarge the group of participants, especially from developing economies, in EG discussions to reach critical mass.

Work on EGs in the WTO TESSD

Submissions circulated by several WTO members ahead of the March TESSD meeting indicate that EGs could become a track for the group's work.

According to the WTO, several members noted that TESSD work could use as a reference and build upon existing relevant work, including the EGA; the APEC EGL; the Agreement on Climate Change, Trade and Sustainability (ACCTS); regional trade agreements; and domestic initiatives.

Several proposals were made on the way forward on EGs and services, including to: conduct a stock-taking exercise to improve understanding of progress made and remaining challenges; define common goals and a coherent narrative on the benefits of trade liberalisation of EGs and services; and explore the possibility of defining negotiating parameters with a view to starting negotiations after MC12.

Source: See references

Other multilateral forums

In other multilateral forums, work is being undertaken by the International Partnership for Hydrogen and Fuel Cells in the Economy ([IPHE](#)) related to hydrogen as a commodity. The IPHE is considering hydrogen trade rules, investigating and assessing relevant existing hydrogen and carrier trade rules, agreements, and potential barriers across IPHE members to support large-scale future international trade of hydrogen and carriers. It is also developing a common methodology for determining the greenhouse gas emissions associated with the different hydrogen production pathways. The initiative is designed to form the basis of an international standard by the International Organization for Standardization (ISO).

Increasingly, steps are also being taken internationally towards harmonisation of global regulations for electric vehicles, with a view to improving safety, environmental performance, and trade. In 2014, the Electric Vehicles and Environment Working Group of the United Nations Economic Commission for Europe proposed a global Electric Vehicle Regulatory Reference Guide.²¹ While the submission represents a European initiative; the working group is led by representatives from the US, China, Japan and Canada. WP29, the UNECE World Forum for Harmonization of Vehicle Regulations, has also published Global Technical Regulations covering safety for electric²² (2018) and hydrogen²³ (2013) vehicles.

Other trade measures

Alongside efforts to reduce barriers to trade and align international standards, other economies are pressing ahead with unilateral trade measures designed to address climate and sustainability challenges. The EU for example is moving forward with a carbon border adjustment mechanism (CBAM) as part of a broader European Green

²¹ <https://unece.org/electric-vehicle-regulatory-reference-guide>

²² <http://www.unece.org/fileadmin/DAM/trans/main/wp29/wp29wgs/wp29gen/wp29registry/ECE-TRANS-180a20e.pdf>

²³ <http://www.unece.org/fileadmin/DAM/trans/main/wp29/wp29wgs/wp29gen/wp29registry/ECE-TRANS-180a13e.pdf>

Deal, aimed at greening the bloc's economy. It has also recently developed disciplines governing investment in renewable energy generation. Canada is exploring the possibility of carbon border adjustments and is discussing this with domestic and international stakeholders.²⁴

These measures are likely to have a bearing on trade in APEC moving forward, given the prominent role of Europe in global EG trade and the increasing integration of EG supply chains.

They also give weight to the need for an APEC-driven approach to trade and climate change that is reflective of the core interests of its members.

Asia-Pacific perspectives

Across APEC, there appears to be broad support for reducing barriers to EGs as part of a wider strategy to address climate change. This includes possible consideration of an expanded APEC list of EGs to target more goods for tariff cuts, as well as resuming EGA negotiations in the WTO. Greater consensus however is needed on the scope of possible additional EGs that could be considered for inclusion, as well as the benefits for developing APEC members.

New Zealand, this year's APEC host, supports an expanded APEC EGL and commitment to ongoing reviews to update the list over time. New Zealand has noted that an updated APEC list along with other plurilateral climate and trade initiatives, can support environmental work at the WTO, including renewing negotiations on an EG Agreement. New Zealand has advocated for APEC trade ministers to work on updating the list during the June ministerial, with a view to achieving clarify on an expanded list at the end of the year.²⁵

Australia also supports liberalisation of trade in EGs as an effective way to ensure access to technology, and the means to deal with emissions reduction.²⁶ Australia, along with Korea and Singapore, has called for resuming negotiations on EGs and addressing environmental services in the WTO.²⁷

United States lawmakers and the administration have expressed interest in the expansion of clean energy exports. President Biden has made climate change a centrepiece of his administration's agenda. USTR Tai recently affirmed the US' intention to "pursue a trade agenda that supports the Biden Administration's comprehensive vision of reducing greenhouse gas emissions and achieving net-zero global emissions by 2050, or before, by fostering US innovation and production of climate-related technology and promoting resilient renewable energy supply chains."²⁸

²⁴ <https://budget.gc.ca/fes-eea/2020/report-rapport/FES-EEA-eng.pdf>

²⁵ New Zealand's deputy trade secretary, Vangelis Vitalis said during a [Washington International Trade Association webinar](#) in April 2021 that the APEC trade ministers will work on updating the list during their June ministerial. New Zealand could then announce the expanded list at the end of the year. He added that he expects ministers to "commit to regular reviews" of the list.

<https://insidetrade.com/daily-news/new-zealand-trade-official-apec-expand-environmental-goods-list>

²⁶ <https://www.trademinister.gov.au/minister/dan-tehan/transcript/interview-kieran-gilbert-sky-news-1>

²⁷ <https://sdg.iisd.org/commentary/policy-briefs/trade-and-environment-structured-discussions-among-wto-member-group-get-underway/>

²⁸ https://subscriber.politicopro.com/f/Tai_QFR.pdf?&id=00000177-ef4b-d594-a77f-ff5b70010000

President Biden's Climate Finance Plan includes commitments to boost funding for exports of environmentally beneficial goods. The Export-Import Bank will be tasked to identify ways to significantly increase, as per its mandate, support for environmentally beneficial, renewable energy, energy efficiency, and energy storage exports from the United States, in recognition that 'exports of low-carbon and climate-resilience technologies and related services can be a catalyst for economic and job growth at home.'²⁹

Alongside this, the US has been urged by both Republican and Democrat Senators to relaunch EGA negotiations in the WTO to remove tariffs on clean energy exports, create jobs and reduce global emissions.³⁰

China was a participant in the WTO EGA talks. Early on, China advocated a position that developed economies remove all their tariffs (except in some limited cases) while developing economies be given staging periods with an undefined number of years for phaseouts. China proposed the concepts of a 'Common list' - for all Members to reduce or eliminate tariff and non-tariff barriers, with priority given to 'products of export interest of developing and least-developed Members in order to enhance the export capacity building on EGs in real terms' - as well as a 'Development List' - that included 'products selected by developing and least-developed Members from the common list for exemption or a lower level of reduction commitment.' The WTO talks faltered in 2016 before negotiations could be further advanced.³¹ Since this time, China has become a large producer and consumer of environmental technologies.³²

Japan has advocated not only removing tariff barriers to trade as part of the WTO EGA negotiations but also expanding this work to include rule making 'related to regulatory issues to facilitate transactions from production to consumption, and prevent arbitrary trade obstacles from being introduced in the future.' This includes 'discussing concrete ways towards (1) elimination of tariffs on goods that contribute to emission reduction; and (2) rule-making to promote dissemination of such products and technologies simultaneously'.

Japan notes that 'goods subject to tariff elimination should be products using technologies which directly contribute to the reduction of greenhouse gas emissions towards realisation of global carbon neutrality.' Japan has also suggested that discussions on rule-making on regulatory issues be undertaken in conjunction with

²⁹ <https://www.whitehouse.gov/wp-content/uploads/2021/04/U.S.-International-Climate-Finance-Plan-4.22.21-Updated-Spacing.pdf>

³⁰ See <https://delbene.house.gov/news/documentsingle.aspx?DocumentID=2779>
https://insidetrade.com/sites/insidetrade.com/files/documents/2021/apr/wto2021_0189.pdf

³¹ TN/TE/W/42, 6 July 2004, Statement by China on Environmental Goods at the Committee On Trade and Environment Special Session (Ctess) Meeting of 22 June 2004 accessed at <https://docs.wto.org/dol2fe/Pages/SS/directdoc.aspx?filename=Q:/TN/TE/W42.pdf&Open=True>

³² According to China's Ministry of Ecology and Environment, the overall environmental technologies market in China (including goods and services) is estimated to be valued at \$77.27 billion in 2019.
<https://www.privacyshield.gov/article?id=China-Environmental-Technology>

tariff liberalisation, 'so as to promote research and development, strengthen supply chains, facilitate diffusion, and enhance transparency of domestic measures.'³³

ASEAN economies have started to move towards a new sustainable development paradigm that would facilitate increasing poverty reduction along with environmental protection. Thus, there has been an increasing awareness of climate change, and environment protection activities.³⁴ APEC ASEAN economies are yet to participate in WTO talks for the EGA but have been successful in implementing tariff reductions for APEC EGs, most recently Indonesia. Continuing APEC's efforts in this area present opportunities to strengthen regional production and export capabilities in EGs for developing economies.

³³ <https://web.wtocommerce.org.tw/DownFile.aspx?pid=353860&fileNo=0>

³⁴ https://ccep.crawford.anu.edu.au/sites/default/files/publication/ccep_crawford_anu_edu_au/2018-07/tran_htt_and_kalirajan_k.2018_apecs_exports_of_environmental_goods_an_exploratory_analysis_of_performance_ccep_working_paper_1806_july_2018.pdf

II. Emerging environmental goods - updating the APEC EGL

Approach

Recent developments since the initial list was agreed provide impetus to update it to better reflect changes in the policy and trade environment. APEC Ministers Responsible for Trade recently recognised this. They affirmed their intention to take concrete steps to build on the legacy of its success and to ‘consider instructing officials on further potential work to update the list’.³⁵

Renewable energy focus

The evident policy focus of APEC economies toward clean energy warrants an initial focus on renewable energy technologies that contribute to emissions reduction and mitigation. A broader scope of EGs for possible inclusion could be undertaken subsequently as agreed among economies.

Whole of value chain

It is evident from the developments over the last ten years, that a whole of value chain approach needs to be adopted when considering new EGs for inclusion on an updated list. Comparative advantage at different points in the value chain needs to be accounted for if all APEC economies are to benefit. As such, proposed new EGs for inclusion include not only complex new technologies like fuel-cell electric vehicles, but also raw materials such as critical minerals, products of renewable energy such as green hydrogen, and simple manufactures such as gas tanks.

Non-exhaustive

Attempts to create an initial list are not intended to be exhaustive, nor cover all EGs. As evident from the experience of the last decade, there is still no generally agreed definition of EGs.³⁶ As the OECD notes, it is not possible to exclusively or exhaustively identify EGs and services.³⁷ Furthermore, as technological improvements continue to be made and new information about environmental costs and benefits emerge, lists will need periodic updating. The impossibility of a defining a perfect list, should not, however, be a reason not to create and update the best possible and practical list.

Selection criteria

A necessary precondition to an updated list is an informed discussion of the conceptual issues that arise in the definition of EGs for inclusion in lists for prioritised liberalisation. Previous work, including OECD research on developing

³⁵ https://www.apec.org/Meeting-Papers/Sectoral-Ministerial-Meetings/Trade/2021_MRT

³⁶ Balineau, Gaëlle, and Jaime De Melo. 2011. “Stalemate at the Negotiations on Environmental Goods and Services at the Doha Round.” *FERDI, Working Paper; WP 28.2011*.

Tran, HTT, and Kaliappa Kalirajan. 2018. “Is Environmental Goods Trade Beneficial for the Environmental Performance of the Concerned Countries?” https://ccep.crawford.anu.edu.au/sites/default/files/publication/ccep_crawford_anu.edu.au/2018-07/tran_htt_and_kalirajan_k_2018_is_environmental_goods_trade_beneficial_for_the_environmental_performance_of_the_concerned_countries_ccep_working_paper_1808.pdf.

³⁷ Sinclair-Desgagné, Bernard. 1999. “The Environmental Goods and Services Industry: Manual for Data Collection and Analysis.” *OECD*. <https://doi.org/10.1561/101.00000012>

methodologies for analysis of common definition and classification of the environment industry;³⁸ the EU's sustainable investment taxonomy;³⁹ and WTO proposals for EGs⁴⁰ can be drawn on to inform this.

From a conceptual perspective, both inclusion criteria and exclusion criteria can be considered:

- Goods for Environmental Management (GEM) and Environmentally Preferable Products (EPPs) are two broad categories for inclusion criteria.
- Process and production methods (PPMs) need to be considered in identifying goods for inclusion on a green list.
- Exclusion criteria concerns goods with multiple end-uses and goods with both harmful and beneficial environmental impacts.
- Competitiveness and WTO legality should also be considered.

Inclusion Criteria

The New Zealand non-paper provides a useful starting point for inclusion criteria, noting that EGs need to “show an identifiable environmental end use and/or benefit aimed at:

- supporting APEC members' goals for low emission, climate resilient and more circular economies;
- reducing water, soil, marine and oceans, and air pollution;
- improving waste and wastewater management; or
- protecting and conserving biodiversity.”⁴¹

The “**environmental end use**” component of the non-paper's definition is similar to one of the broad categories of the OECD's proposed EGs: Goods for Environmental Management (GEM). The OECD defines GEM as “products [and services] that reduce environmental risk and minimise pollution and resource use”.⁴² Water purifying machinery is an example of such a product on the current APEC list.

The “**environmental benefit**” component of their definition is similar to the OECD's “Environmentally Preferable Products” (EPPs). EPPs can be identified when there exists a close, less environmentally friendly substitute with a similar use or purpose. Solar water heaters are an example of a EPP on the current APEC list. Challenges can arise in defining EPPs when a product is less harmful than some technologies, but more harmful than others. An example from the current APEC list is gas turbines for which not all economies have specified an “ex out”⁴³ for turbines burning natural gas.

³⁸ Sinclair-Desgagné, Bernard. 1999. “The Environmental Goods and Services Industry: Manual for Data Collection and Analysis.” *OECD*. <https://doi.org/10.1561/101.00000012>.

³⁹ In particular the Technical annex to the TEG final report on the EU taxonomy, see

https://ec.europa.eu/info/files/200309-sustainable-finance-teg-final-report-taxonomy-annexes_en.

⁴⁰ Balineau, G., & De Melo, J. (2011). Stalemate at the Negotiations on Environmental Goods and Services at the Doha Round. FERDI, Working Paper; WP 28.2011.

⁴¹ APEC Committee on Trade and Investment, Non-Paper on Environmental Goods, Submitted by New Zealand (18 February 2021)

⁴² *Supra* note 2, page 9. A specific catalogue of the GDM see page 12-13.

⁴³ It refers to defining a subset of products to be covered under a 6-digit HS subheading.

Exclusion criteria

While an environmental end use or benefit is a useful starting point for inclusion criteria, it is not clear that *all* goods that satisfy this criterion should be preferentially liberalised. There are two main issues that may prevent certain goods from being appropriate for preferential liberalisation, despite having an identifiable environmental end use and/or benefit.

The first potential exclusion criterion relates to goods which have multiple end uses – only some of which are environmentally beneficial. For example, certain turbines classifications contain turbines that can be used to burn both conventional fossil fuels and new low-emissions fuels. This dual use problem may be reduced through specifying 8-digit rather than 6-digit HS code, or by specifying an “ex-out” that can identify environmental beneficial end-use(s). In some cases, however, a particular product or component may have both beneficial and harmful uses. In this case the parties will need to weigh the net environmental benefit to be expected from its preferential liberalisation. Inclusive negotiations among members will be needed to facilitate consistency and fairness of listed goods. Specific criteria could also be developed if agreed among members.

The second concern relates to goods which have both harmful and beneficial impacts. The EU’s sustainable investment taxonomy established a negative inclusion criterion of ‘no significant harm’.⁴⁴ This criterion means that EGs must not only directly contribute to achievement of one goal, but also do no significant harm to the achievement of other goals. Excluding goods based on harmful side-effects could prove controversial, as almost all goods have some negative environmental impact. An approach may be to require substantial measures to minimise or eliminate the harmful impacts. For example, in the case of wind turbines, the innovation of eagle sensitive turbines can limit harm.

The role of process and production methods

A further issue for consideration in identifying new EGs is the importance given to process and production methods (PPMs).

PPMs may be instrumental in defining EPPs. While some products may be preferential because of their low environmental costs when in use, many important distinctions occur during production. Bamboo flooring panels on the current EGL are an example of a product whose environmental superiority stems almost entirely from differences in environmental impact during production, rather than during use. Notably, PPMs in the form of low greenhouse emissions during production are central to the definition of potential EPPs such as green hydrogen, green ammonia, green steel, and green aluminium.

Currently, many EPPs and their less environmentally friendly counterparts share the same HS code. Over time it may be appropriate to create new HS codes which differentiate EPPs on the basis of PPMs. In the meantime, “ex-outs” may be necessary for differentiation.

⁴⁴ For instance, see the JRC report: Technical assessment of nuclear energy with respect to the ‘do no significant harm’ criteria of Regulation (EU) 2020/852 (‘Taxonomy Regulation’), https://ec.europa.eu/info/file/210329-jrc-report-nuclear-energy-assessment_en.

If considered in defining inclusion criteria, PPMs will also need to be considered in the exclusion criteria. Consideration of PPMs as exclusion criteria could prove problematic if a 'do no harm' approach is used. There is no product in the world that has no negative environmental consequences associated with its production. Indeed, many key technologies for the energy transition have significant environmental costs associated with their current production. Lithium provides a case in point: while it is essential for electric vehicles and energy storage technologies, its production process is water intensive and prone to high pollution rates. Many first-generation biofuels have also proven controversial due to their questionable life-cycle emissions benefits and negative impacts on soil and biodiversity.

Competitiveness and WTO legality

Compliance with WTO rules is a necessary precondition when considering parameters to guide selection of EGs. For example, the role of EPPs under WTO rules for like products is less clear than GEMs.

Additionally, EPPs may raise competitiveness concerns among APEC economies with differing levels of development. For example, water efficient washing machines may be appropriate to preferentially liberalise in a water-scarce, high-income economies like Australia, but not in a water-abundant, middle- or low-income economy. This does not necessarily warrant the inclusion of "somewhat preferred" or "transition" products such as natural gas turbines, "clean" thermal coal plants or hybrid vehicles. Neither does it preclude liberalisation of such goods through other means (eg; unilaterally or in trade agreements) where they are important for a specific sustainable development pathway.

Proposed EGs

Presented below is a proposed list of 21 illustrative EGs (the New-21) that satisfy the selection criteria described earlier. The list focuses on goods for renewable energy generation, transport, storage, trade and use. Falling within this broad category are products whose environmental benefit is relatively uncontroversial (if appropriate ex-outs are included); and for which there has been a substantive change in technology readiness and economic viability since the 2012 EGL. In particular, changes in economic readiness of the proposed technologies have been driven by significant decreases in the cost of solar photovoltaic and wind technologies over the last 15 years. As noted earlier, the list below is not exhaustive; rather it may serve as a base for further discussion among APEC members.

The proposed goods can be classified into three categories:

- renewable energy sources/carriers;
- energy storage and integration;
- transport and other end use.

See table below. Products are listed, categorised and described in non-technical terms.⁴⁵ An "ex-out" column is used in the table below to differentiate between products that may not be EGs. The justification for inclusion of each good is presented in the remarks column.

⁴⁵ Note some identified EGs have no exclusive HS commodity code at the 6-digit level - some HS commodity codes include goods which may not be EGs. See Annex 2 for a list of applicable HS codes.

Additional potential products have already been identified by some APEC economies for further consideration, and are included in a separate table.

A consolidated list of EGs for possible consideration -both proposed 'New 21' goods and additional goods as suggested by some APEC economies - is included at Annex 5.

Proposed 'new' EGs- the New-21

Product	Product Description	EX-OUT / ADDITIONAL Product Specification	REMARKS / ENVIRONMENTAL BENEFIT
RENEWABLE ENERGY SOURCES/CARRIERS			
Solar energy			
Photovoltaic system controller	A solar PV charge controller is an important part for a PV power system that charges batteries. The purpose of the controller is to ensure that the batteries are properly fed and therefore safe for long-term use – it prevents the battery from overcharging or over discharging. Controllers are used in both wind energy and PV systems. Small power systems that have wind and solar energy use hybrid controllers. Larger systems have their own controllers.		Controllers enable the integration of solar PV cells with battery storage. Storage is essential as electricity systems move toward 100% renewable energy in order to ensure supply and demand are matched at all times of day and night.
Wind energy			
Towers and lattice masts for wind turbines	Towers and masts form part of the infrastructure needed for wind turbines - they are the support structures which give them the suitable height to capture wind. Towers for large wind turbines may be either tubular steel towers, lattice towers, or concrete towers. Guyed tubular towers are used for small wind turbines. Lattice towers are manufactured using welded steel profiles.		Infrastructure needed for wind turbines. Wind turbines are essential in renewable energy based electricity generation, often being complementary to solar generation and in many locations the cheapest form of renewable energy generation.
Hydrogen			
Hydrogen	Hydrogen can be produced as a gas or liquid or made part of other materials. It can be used to power fuel cells, to store electricity, or as a raw material in industrial processes. Hydrogen energy can be stored as a gas. When converted to a liquid it can be transported on trucks and in ships.	Possible ex-out may include hydrogen produced from fossil fuels	Hydrogen produced from renewable source can provide reduce the emissions and facilitate the transition to low emission economy. I can be used for seasonal storage of renewable energy, to power fuel cell vehicles, to decarbonise industrial processes such as steel making and to generate high-temperature heat.
Electrolyser system, Machines and apparatus for electroplating, electrolysis or electrophoresis	An electrolyser is a system that uses electricity to break water into hydrogen and oxygen (electrolysis). Through electrolysis, the electrolyser system creates hydrogen gas. The oxygen that's left over is released into the atmosphere or can be captured or stored to supply other industrial processes.	Possible ex-out may include electrolyser using electricity from grid that produces emissions	Electrolysers are currently the only commercial way to convert renewable energy into hydrogen (see benefits above). Hydrogen formed by electrolysis using electricity from fossil fuels, however, has high greenhouse emissions and is more polluting than directly burning the fossil fuels for energy.
Hydrogen Compressor	A hydrogen compressor is a device that is used in a hydrogen gas generation unit to increase the pressure of hydrogen by reducing its volume resulting in compressed hydrogen or liquid hydrogen.	Possible ex-out may include compressing hydrogen produced from fossil fuel	Hydrogen has a low volumetric energy density at atmospheric pressure. To be commercially transported it requires compression, liquefaction,

			conversion to ammonia or a liquid organic hydrogen carrier.
Hydrogen Gas Compressor - Diaphragm	A hydrogen recycle diaphragm compressor is a reciprocating compressor that reciprocates in a cylinder to compress and transport gas. It is a part for a hydrogen compressor.		Part for the hydrogen compressor (see above).
Steel containers for compressed or liquefied gas	Containers form part of the hydrogen value chain. Compressed hydrogen must be stored in specially designed tanks capable of withstanding the storage pressures. These tanks are usually made of steel.	Possible ex-out may include storing hydrogen produced from fossil fuel	Part of hydrogen value chain, used for storage at site of production, transport, or distribution.
Aluminium containers for compressed or liquefied gas.	Containers for compressed hydrogen may be made of carbon fibre lined with aluminium, steel, or specific polymers when weight is a consideration.	Possible ex-out may include storing hydrogen produced from fossil fuel	Part of hydrogen value chain, used for storage at site of production, transport, or distribution.
Ammonia			
Ammonia, anhydrous or in aqueous solution	Ammonia is an input for fertilizers. It can be used to transport hydrogen and as a fuel itself, both for co-firing in coal power stations and as a shipping fuel.	Possible ex-out may include ammonia produced from fossil fuels	Ammonia is the foundation for fertilizers. If produced from renewables, it can have considerable environmental benefits. Also, one of the best ways to transport hydrogen and can be used as a green fuel itself, both for co-firing in thermal power stations (coal fired boiler and internal combustion engines such as gas turbine) and as a shipping fuel of the future.
ENERGY STORAGE AND INTEGRATION			
Cells and accumulators			
Primary cells and primary batteries, electric	A cell is the basic functional unit of a battery, which consists of a compilation of electrodes with active materials, electrolyte, containers, connections and usually separators. A primary cell or battery is one that can only be discharged once and cannot be recharged afterwards. These cells can store renewable electricity.		Can store renewable electricity and reduce the need for power generation from fossil fuels by enabling renewable energy generated at times of excess to be used when demand exceeds generation.
Lithium cells and batteries (excl. spent)	A lithium-ion battery is a rechargeable battery used in portable electronics and EVs. Electrochemical cells power the battery – they consist of three major parts: a cathode and an anode separated physically but connected electrically by an electrolyte. Lithium-nickel-manganese-cobalt oxide is the most common composition for lithium ion batteries used in EVs, but lithium-nickel-cobalt-aluminium oxide is also used.		Can store renewable electricity and reduce the need for power generation from fossil fuels. Lithium-ion batteries are currently the dominant battery used in electric vehicles. Li-ion batteries are also used in a range of non-EGs; hence it may be appropriate to add an ex-out to limit to those batteries specifically designed to support renewable energy use.
Electric accumulators, lead-acid	Lead acid batteries are the most commonly used type of rechargeable battery in photovoltaic		Energy storage device use to enable higher proportion of

	systems, used as a storage device. The main components/parts of a lead/acid accumulator include a metallic Pb alloyed with Sb and/or Ca; an electrolyte; and plastic materials to form separator and case.		renewable energy in electricity systems.
Nickel-iron electric accumulators	Nickel-iron electric accumulators are storage/rechargeable batteries with nickel oxide cathode and an iron anode with an electrolyte of potassium hydroxide. The active materials are held in nickel-plated steel tubes or perforated pockets. They can be used as an energy storage device		Energy storage device use to enable higher proportion of renewable energy in electricity systems.
Other accumulators	Other accumulators include secondary rechargeable batteries, used as energy storage devices.		Energy storage device
Cell recycling			
Waste and scrap of primary cells, primary batteries and electric accumulators	Spent primary cells, spent primary batteries and spent electric accumulators		Recycling of waste and scrap of primary cells, batteries and electric accumulators can help to conserve mineral resources, including metals that are non-renewable finite resources.
TRANSPORT AND OTHER END USE			
Electric vehicles			
Vehicles; with only electric motor for propulsion	Battery Electric Vehicles (EVs) are vehicles running on electric motor with zero tailpipe emissions. This includes battery electric vehicles and (hydrogen) and fuel cell electric vehicles for road and rail, surface and underwater vessels.		Vehicles running on electric motor with zero tailpipe emissions. This includes battery electric vehicles and (hydrogen) fuel cell electric vehicles.
Public transport vehicles (carries 10 or more persons, including driver), with only electric motor for propulsion	Vehicles for public transport, running on electric motor with zero tailpipe emissions, as above.		Vehicle running on electric motor with zero tailpipe emissions
Hydrogen internal combustion engine vehicles			
Hydrogen internal combustion engines - Spark-ignition reciprocating or rotary internal combustion piston engines	Vehicles running on hydrogen with zero tailpipe emissions. In the case of hydrogen combustion, liquid or gaseous hydrogen is burned in a modified gas-turbine engine to generate thrust. This process is identical to traditional internal combustion, except hydrogen replaces its fossil fuel counterpart. Fuel Cell Vehicles are zero-emission vehicles – they produce no tailpipe pollution except water vapor.		Vehicle running on hydrogen with zero tailpipe emissions
Parts suitable for use solely or principally with hydrogen engines above	Parts for Hydrogen internal combustion engines		Parts for Hydrogen internal combustion engines
Hydrogen fuel cell vehicles			

Fuel cells	A fuel cell is a device that generates electricity through an electrochemical reaction, not combustion. In a fuel cell, hydrogen and oxygen are combined to generate electricity, heat, and water.		There are no emissions associated with electricity generation with fuel cells
Fuel cells – parts	A fuel cell is composed of several parts - an anode, cathode, and an electrolyte membrane. A typical fuel cell works by passing hydrogen through the anode of a fuel cell and oxygen through the cathode. At the anode site, a catalyst splits the hydrogen molecules into electrons and protons. The protons pass through the porous electrolyte membrane, while the electrons are forced through a circuit, generating an electric current and excess heat. At the cathode, the protons, electrons, and oxygen combine to produce water molecules.		Parts for Fuel cells

Sources: see references.

An additional group of goods that APEC members may wish to consider for inclusion in an expanded EGL in coming years is those related to carbon capture storage and utilisation, as well as transport and other end use. Some examples of such goods and their description are provided below, along with other goods fitting within the original scope of the paper which have been identified through feedback from some APEC economies.

Other potential new EGs for consideration

Product	Description
Renewable Energy Sources/Carriers	
Parts of electrolytic cell (frame for racking, electrode)	Parts of electrolytic cell that electrolyses water to purify hydrogen
Hydrogen dispenser	Hydrogen fuelling dispenser is the product that measures hydrogen gas accurately to fuel it to the fuel cell vehicle.
Other steam-generating boilers (steam-generating boilers)	An ammonia fuelled steam generating boiler is a device that generates steam by heating water. It can be used, for instance, to generate electric power with a steam turbine.
Ammonia burner for combustion process	An ammonia burner is a device that heats an object by burning ammonia or a mixture of ammonia and other fuels, and is used in an industrial furnace, a gas turbine, and so on. Control of pollutants is necessary to minimise the impact to the environment.
Ammonia fuelled gas turbine	An ammonia fuelled gas turbine is a device that converts the heat energy generated by the combustion of ammonia into kinetic energy using rotating blades, and is mainly used for power generation. Control of pollutants is necessary to minimize the impact to the environment.
Ammonia compressor (liquid and gas)	An ammonia compressor is a device used to increase the pressure of ammonia in ammonia utilization and liquefaction equipment. There are three types of compressors: gas-to-gas, gas-to-liquid, and liquid-to-liquid.
Ammonia storage tank (liquid)	Ammonia storage tanks are used to store large quantities of ammonia in liquid form, at low temperatures and atmospheric pressure or atmospheric temperature and high pressure. Cryogenic tanks usually have a double shell structure for heat insulation.
Ammonia vaporizer	An ammonia vaporizer is a device that vaporizes ammonia in a liquid state by applying heat from outside. The heat source can be air, water, steam, waste heat of combustion, or a combination of these.

Ammonia cracker	An ammonia cracker is a device that uses heat and a catalyst to decompose ammonia to obtain a mixture of hydrogen and nitrogen. Purification device also can be used to obtain pure hydrogen.
Lithium-ion accumulators	Can store renewable electricity and reduce the need for power generation from fossil fuels. Lithium-ion batteries are currently the dominant battery used in electric vehicles.
Nickel metal hydride accumulators	Energy storage device used to enable higher proportion of renewable energy in electricity systems.
Parts of accumulators	Parts of accumulators
Hydraulic turbines and water wheels (a power not exceeding 1,000 k)	Water turbines and turbine equipment for power generation are for generating electricity by utilising hydraulic power (a power not exceeding 1,000 k)
Hydraulic turbines and water wheels (a power exceeding 1,000 kW but not exceeding 10,000 kW)	Water turbines and turbine equipment for power generation are for generating electricity by utilising hydraulic power (a power exceeding 1,000 kW but not exceeding 10,000 kW)
Hydraulic turbines, water wheels (a power exceeding 10,000 kW)	Water turbines and turbine equipment for power generation are for generating electricity by utilising hydraulic power (a power exceeding 10,000 kW)
Parts of Hydraulic turbines, water wheels	Parts of water turbines and turbine equipment for power generation are for generating electricity using hydraulic power
Transport and other end use	
Heat pump	A heat pump is a facility that collects heat from a low-temperature heat source and sends it to a high-temperature heat source with little energy.
Plug-in Hybrid Electric Vehicle	Plug-in Hybrid Electric Vehicles (PHEVs) are vehicles running with both an electric motor and an internal combustion engine capable of being charged by plugging into an external source of electric power. PHEVs can be used in an area with insufficient charging infrastructure utilizing internal combustion engines.
Other components for electric battery vehicles	Most battery EV infrastructure is comprised of generic components that are part of general electricity infrastructure or included in the category for Energy Storage and Integration. Charging connectors and adaptors are two of the only components whose use is restricted to charging EVs.
Carbon Capture and Storage	
Carbon dioxide Scrubber	Machinery; for filtering or purifying gases, other than intake air filters for internal combustion engines
Demister	The demister is a separation accelerator that makes the separation and recovery of impurities contained in liquids or gases more effective.
MEA solvent	Primary amine for CO ₂ capture with chemical absorption technology
MDEA solvent	amine for MDEA based chemical absorption technology for CO ₂ capture
CO₂ Membrane	Part for CO ₂ capture based on cryogenic and Membrane technology
CO₂ Absorber Tower	Part for the CO ₂ Capture unit
Amine Stripper Tower	Part for the CO ₂ Capture unit
CO₂ Compressor	Part for the CO ₂ Compression and Dehydration unit
CO₂ Dehydration unit	Part for the CO ₂ Compression and Dehydration unit
CO₂ pump	Part for the CO ₂ Compression and Dehydration unit

III. The trade landscape for environmental goods

APEC trade in environmental goods

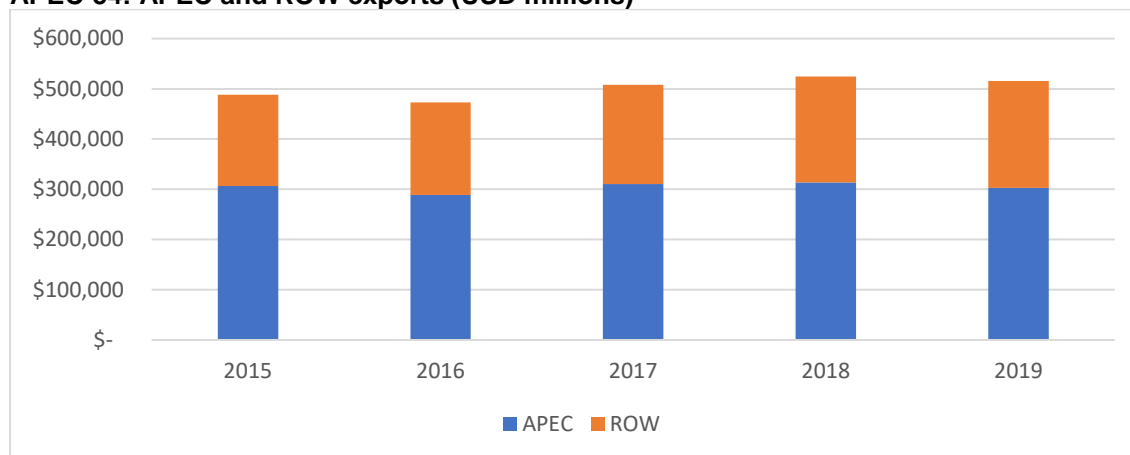
Trade in APEC’s original list of EGs (the APEC-54) is significant – amounting annually to as much as USD 500 billion globally- with more than half of this trade taking place in the APEC region. Trade in newly identified EGs (the New-21) could be potentially more than half this value again, and a growing source of trade across many APEC economies.

APEC-54

In 2019, global trade in EGs across the 54 goods on the APEC-54 List amounted to as much as USD515.4 billion.⁴⁶ APEC economies accounted for more than half (58%) of this total (302.8 billion).

Globally, this trade in EGs has grown 6% since 2015. While exports have been relatively steady across APEC, export growth in some APEC economies has been far greater. For example, Viet Nam’s exports have grown by 380%, Australia’s by 74%, Brunei (40%), and Russia (28%) followed by Canada (17%), Malaysia (16%), Mexico (15%) and Hong Kong, China (14%).

APEC-54: APEC and ROW exports (USD millions)



Source: UN Comtrade

New-21

Trade in the New-21 is currently difficult to measure with precision, as some of these goods do not have specific HS codes at the 6-digit level, and share codes with other (non-EG) products, thus potentially overstating the true value of traded EGs.⁴⁷

Notwithstanding this challenge, available trade data indicate that global trade across the relevant HS codes for the New-21 amounted to as much as USD260 billion in

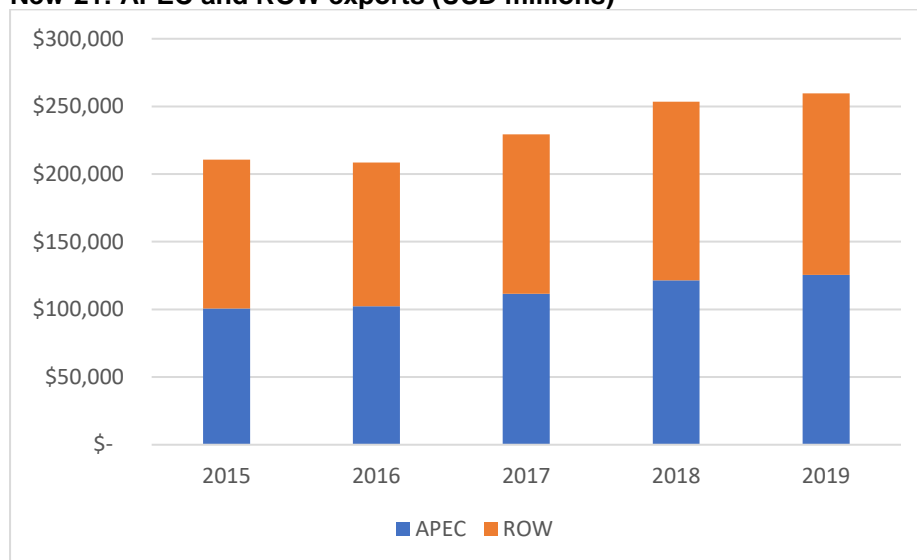
⁴⁶ Based on trade flows in 6-digit HS codes applicable to EGs. Flows may include goods not classified as EGs.

⁴⁷ A more detailed analysis at 8 or 10-digit level may help isolate growth in EGs within 6 digit codes, however, specific codes at this level generally do not yet exist for new EGs. They are also not harmonised internationally beyond the 6-digit level, making collation of like for like data across economies very difficult.

2019 – more than half the value of the trade in the APEC-54.⁴⁸ APEC economies accounted for USD126 billion (almost half) of this total.

Although not all of this trade can be attributed to the New-21, the size of the trade flows is substantial and growing. They have increased globally by 23% since 2015- and even more so across APEC where it expanded by 25% between 2015 and 2019.

New-21: APEC and ROW exports (USD millions)



Source: UN Comtrade

Most APEC economies have experienced significant growth in exports over the last five years –the Philippines’ exports have increased by 212% since 2015 and Vietnam’s by over 160%, followed by Indonesia (53%), Peru (46%), Korea (46%) the US (37%), Thailand (33%) and China (25%). Exports of Mexico, New Zealand and Japan also experienced considerable growth.

Tariff settings for the New-21 EGs

Applied tariffs on the New-21 EGs are already generally low at around 5% on average across APEC economies. Some of these have been liberalised further as a result of Asia Pacific FTAs. However, bound rates remain high. Certain new EGs are still subject to higher multilateral and preferential tariffs in some APEC economies.

Bound and applied tariffs

A review of applicable 6-digit tariff codes⁴⁹ across the New-21 reveals MFN tariff rates (2019 or most recent year reported) are already generally low across APEC economies, with average applied duties of around 5%. Bound rates are significantly higher.

By broad category, applied rates are highest for transport and other end use (6.2%) followed by energy storage and integration (4.5%) and lowest for renewable energy

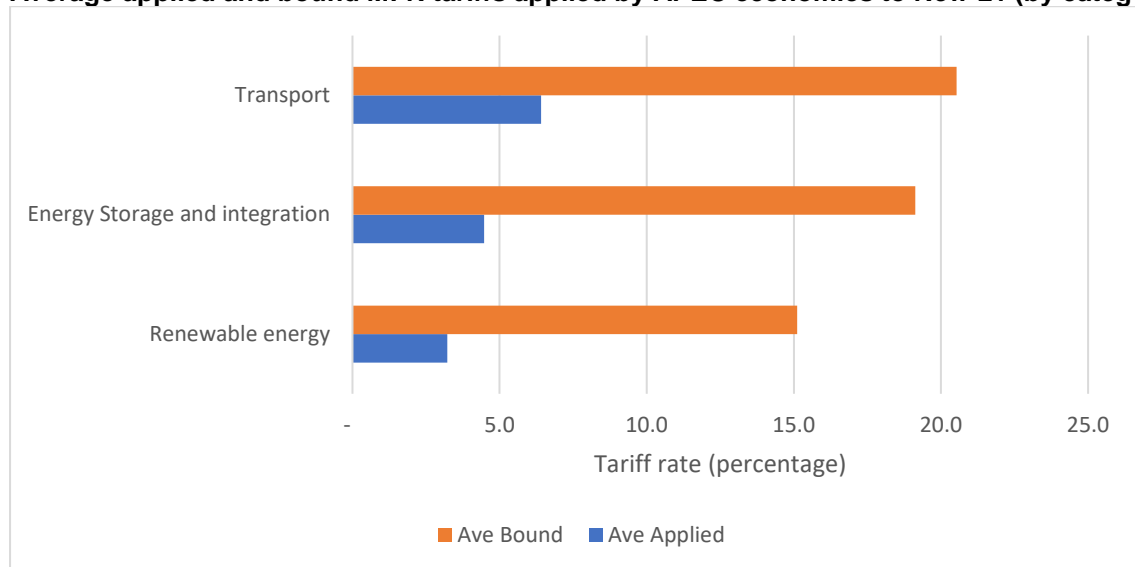
⁴⁸ Note this total may overstate trade in EGs as HS codes analysed at 6-digit level include other goods in addition to the identified APEC-21 goods.

⁴⁹ Most new EG’s identified do not have specific tariff codes at HS 6-digit level and are therefore subject to tariff rates that encompass a broader range of products. For example, hydrogen fuel cell vehicles, engines and parts fall under the same tariff code as other vehicles (except electric vehicles) . Other new EGs have specific tariff codes that are relatively new - such as electric vehicles – that are not yet bound in WTO or reflected in FTAs. See Annex 1 Methodology.

(3.1%). Across product sub-categories, electric vehicles have the highest average applied rates (13.7%). Average rates are lowest for hydrogen and ammonia (3% and 1.5% respectively). By new EG, the highest applied rates are in place for electric passenger vehicles (15.2%) and electric public transport vehicles (12.2%).

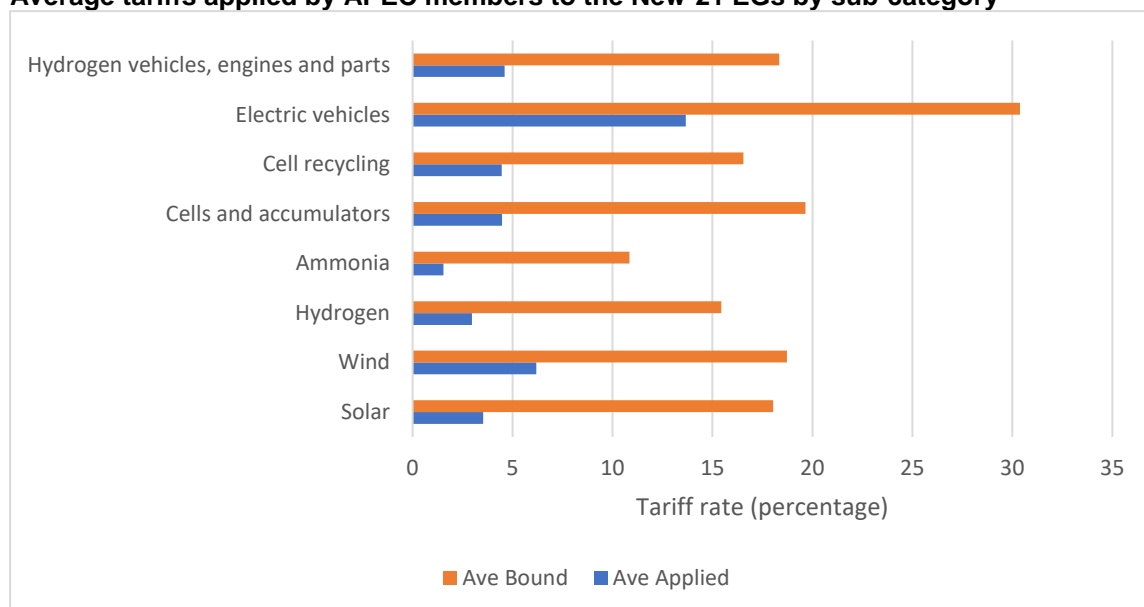
The charts below illustrate the average applied and bound tariff rates by EG category and sub-category. Details on rates by EG are at Annex 3.

Average applied and bound MFN tariffs applied by APEC economies to New-21 (by category)



Source: WTO

Average tariffs applied by APEC members to the New-21 EGs by sub-category⁵⁰



Source: WTO

⁵⁰ The category 'Hydrogen vehicles, engines and parts' includes both hydrogen internal combustion engines and parts, as well as hydrogen fuel cells and parts.

Liberalisation in FTAs

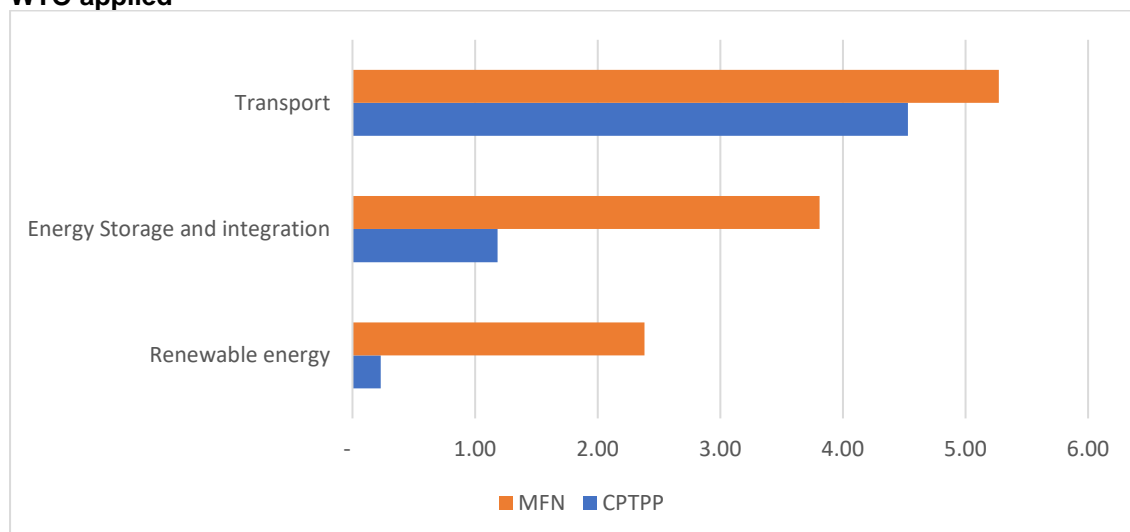
Tariffs on the New-21 EGs have been further reduced by APEC economies as a result of FTAs. All three parties to the United States Mexico Canada Agreement (USMCA) have committed to zero tariff rates on all the New-21 EGs.⁵¹ The Comprehensive and Progressive Trans-Pacific Partnership (CPTPP) includes significant liberalisation of almost all of the New-21. Tariffs will also be liberalised by APEC economies under the Regional Comprehensive Economic Partnership (RCEP)⁵², though to a lesser degree. See table below.

CPTPP

The CPTPP – involving APEC economies of Australia, Brunei, Canada, Chile, Japan, Malaysia, Mexico, New Zealand, Peru, Singapore and Viet Nam - includes liberalisation commitments that apply to all of the New-21 EGs.⁵³

As indicated in the charts below, average tariffs applied⁵⁴ to the New-21 by APEC signatories to CPTPP are low, and lower than MFN applied rates - less than 5% for transport products, less than 1.5% for energy storage and integration, and less than 0.5% for renewable energy. By sub-category, relatively higher rates apply to fuel cell vehicles, cells and accumulators and cells for recycling. Tariffs for hydrogen and ammonia are zero, while solar system controllers attract just 0.26%.⁵⁵

Average tariffs applied by APEC members to the New-21 under CPTPP commitments (yr3), WTO applied



Source: CPTPP, WTO tariff database⁵⁶

⁵¹ Mexico's zero-tariff commitments on electric vehicles are included in tariff codes that pre-date the updated HS subheading codes for electric vehicles (HS2018-8703.10.01).

⁵² RCEP is expected to enter into force in 2022. At time of writing it had been ratified by Japan, Singapore, Thailand and China.

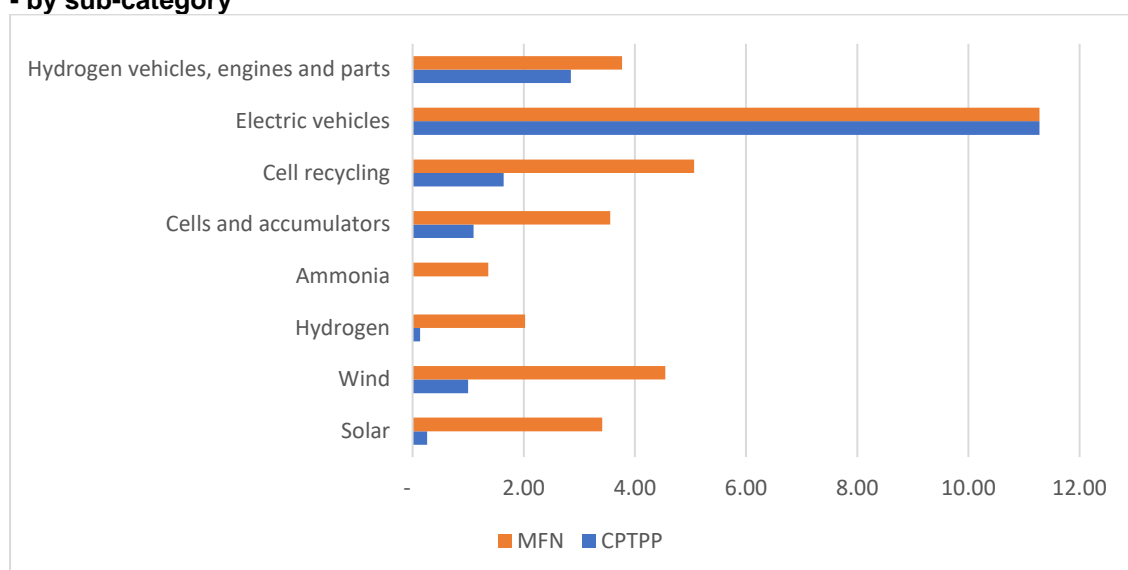
⁵³ As of August 2021, Malaysia, Brunei and Chile had not ratified the agreement.

⁵⁴ Tariff commitments under CPTPP follow a liberalisation schedule that is unique to each member. Year 3 commitments are cited in this report as an indication of liberalisation under the agreement to date. Year 4 commitments are currently in force for Australia, Canada, Japan, Mexico, New Zealand and Singapore. Peru ratified the agreement in August 2021. Remaining signatories are yet to ratify and apply tariff concessions under the agreement.

⁵⁵ Note the MFN applied rates included in CPTPP charts do not match the MFN rate included in the APEC-wide chart. This is because they reflect an average of the tariffs applied by the 11 APEC members that are also CPTPP parties, whereas the APEC-wide charts reflect averages across all 21 APEC member economies.

⁵⁶ As per note above.

Average tariffs applied by APEC members to the New-21 under year 3 of CPTPP commitments - by sub-category⁵⁷



Source: CPTPP, WTO tariff database⁵⁸

Of the new EGs, the highest applied rates are on electric passenger vehicles and electric public transport vehicles (15.6% and 12.7% respectively). These rates reflect WTO MFN rates that are applied to broader HS categories that include passenger and public transport vehicles more generally - not just electric vehicles. Electric vehicles have a specific HS code, but this was not included in CPTPP tariff reduction schedules.

Most CPTPP rates are also subject to further scheduled tariff reductions over time. See Annex 3 for a full list of current average CPTPP tariffs on all of the New-21 EGs.

RCEP

Liberalisation commitments for the New-21 EGs made by APEC parties to RCEP in the first year of its operation are generally not as deep as those made in CPTPP; however, the agreement has delivered some significant tariff reductions. By broad category, average preferential rates in RCEP for identified renewable energy EGs are 2.2%, while EGs under the energy storage and integration category attract an average tariff of 3.8%. Both averages are well below the MFN rates applied by APEC RCEP members.

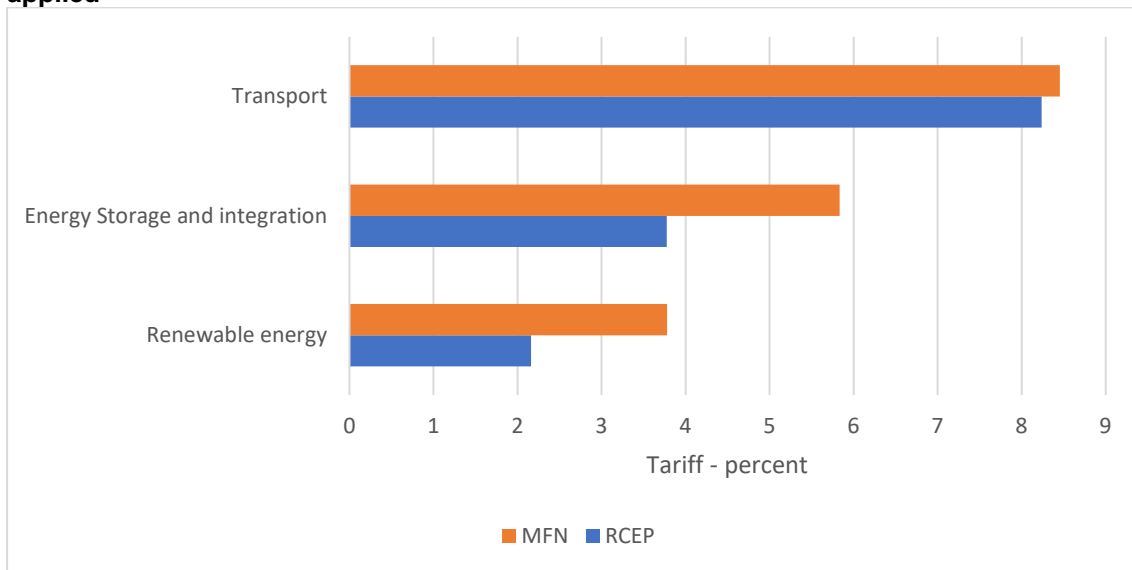
Average tariffs applied by APEC RCEP members on transport EGs are slightly lower than equivalent MFN rates (8.2% and 8.5% respectively). This low differential reflects both low levels of preferential liberalisation in the FTA, as well as subsequent lowering of MFN applied rates since RCEP commitments were negotiated.⁵⁹

⁵⁷ The category 'Hydrogen vehicles, engines and parts' includes both hydrogen internal combustion engines and parts, as well as hydrogen fuel cells and parts.

⁵⁸ As per note above.

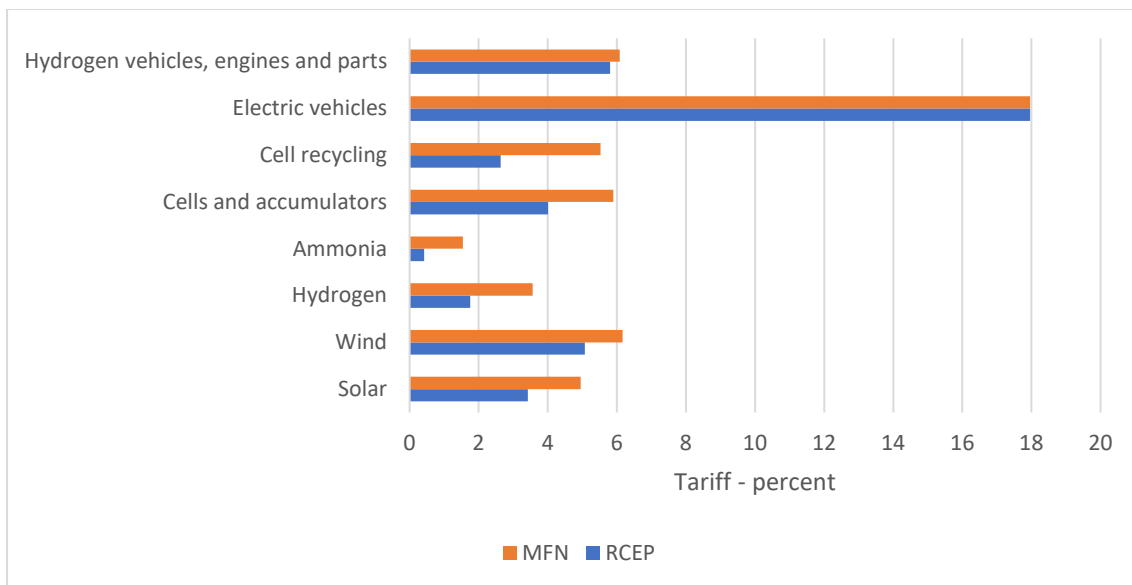
⁵⁹ Some APEC parties to RCEP excluded some new EGs (mostly electric and hydrogen vehicles and parts) from commitments under RCEP, therefore maintaining MFN settings for these goods. MFN applied rates on some of these goods have fallen from HS2012 rates upon which RCEP commitments are based to current HS2017 settings.

Average tariffs applied by APEC members to New-21 under RCEP commitments (yr1), WTO applied



Source: RCEP, WTO tariff database⁶⁰

Average tariffs applied by APEC members to the New-21 EGs under year 1 of RCEP commitments - by sub-category⁶¹



Source: RCEP, WTO tariff database⁶²

Tariff peaks in RCEP commitments for the New-21 EGs are on electric private and public transport vehicles (20% and 15.7% respectively) and hydrogen engines (7.5%). As per CPTPP, the 6-digit HS code for electric vehicles is not included in

⁶⁰ Note the MFN applied rates included in RCEP charts do not match the MFN rate included in the APEC-wide chart. This is because they reflect an average of the tariffs applied by the 12 APEC members that are also RCEP parties, whereas the APEC-wide charts reflect averages across all 21 APEC member economies.

⁶¹ The category 'Hydrogen vehicles, engines and parts' includes both hydrogen internal combustion engines and parts, as well as hydrogen fuel cells and parts.

⁶² As per note above.

RCEP schedules, so these vehicles attract the same tariffs as their fossil-fuel-powered counterparts.

Note as in CPTPP, many tariff rates in RCEP are scheduled for further, phased in reductions over time. See Annex 3 for a full list of average (year 1) RCEP tariffs on all the New-21 EGs.

USMCA

The USMCA is the most ambitious multiparty agreement with respect to the New-21 EGs. All three parties have committed to offering their counterparties zero tariff rates on all of the New-21 EGs. However, exporters in the three jurisdictions do face barriers in the form of non-tariff measures (NTMs) that are presented in the following section.

Non-tariff measures impacting on new EGs

Non-tariff measures (NTMs) can impact negatively on access to EGs and potentially reduce the benefits of a low tariff environment.

NTMs are inherently more complex to identify and address than tariffs as they relate to domestic regulatory measures involving various public policy objectives such as health, safety, and the environment. For new and emerging EGs this is even more so, largely because they involve new industries for which specific regulation is not yet fully developed. Most are impacted by regulations that apply to a wider range of products that do not distinguish EGs from 'normal' goods.

There has been little work to date examining NTMs applied to new EGs, nor their impact across supply chains. It is an area warranting further work and consideration.

NTMs impacting on EGs

Most of the New-21 EGs identified form part of the electric vehicle manufacturing or hydrogen value chain, or both, either as final traded goods or inputs into manufacturing and production.

Key New-21 EGs include:

- Lithium batteries and primary cells
- Electric accumulators
- Electric vehicles (EVs)
- Hydrogen
- Ammonia
- Hydrogen compressors/parts
- Steel and aluminium containers

An indicative analysis reveals several types of NTMs as impacting on APEC trade in these goods.⁶³ They include technical barriers to trade (TBTs); pre-shipment inspection formalities; licensing and quantity controls; price control measures; and export related measures.

⁶³ This analysis is based on relevant tariff codes for selected EGs. It is not an exhaustive inventory of measures but intended to provide an overview of the types and incidence of NTMs impacting on selected EGs for consideration by APEC economies. The methodology used to identify and assess NTMs is set out in Annex 1.

These NTMs do not necessarily discriminate against foreign suppliers but can create impediments to trade where regulations and permit requirements are unclear, not suited for new or environmental purposes, or are inconsistent across sectors and economies. They are more problematic where they deviate from international standards or are more trade restrictive than necessary.

The scope of NTMs identified is set out in the table below:⁶⁴

Categories and types of NTMs impacting on the New-21 EGs⁶⁵

Category of NTM	Type of NTM
Technical Barriers to Trade (TBTs)	Product quality, safety, or performance requirements Labelling and packaging requirements Import authorisation/licensing related to TBTs Production or post-production requirements - TBT regulations on transport and storage, other Conformity assessment related to TBTs - Product registration/ approval, testing, certification, traceability, other requirements
Pre shipment inspection and other formalities	Pre-shipment inspection Import monitoring, surveillance, and automatic licensing measures
Non automatic licensing, quotas, prohibitions and bans, other quantity control measures	Non -automatic import licensing procedures not SPS or TBT measures Tariff rate quotas included in FTAs (non-WTO bound)- - economy allocation
Price control measures including additional taxes and charges	Additional taxes and charges levied in connection with services provided by the government – customs inspection, processing and servicing fees Internal taxes and charges levied on imports - consumption taxes - Excise taxes, taxes and charges for sensitive product categories
Export related measures	Export price control measures, including additional taxes, charges Measures on re export Export formalities and measures nes Export measures related to SPS and TBT - production and post-production requirements to export, labelling, marketing, packaging, conformity assessments, inspection requirements Export licenses, export quotas, export prohibitions and other restrictions (excl SPS and TBT) - licensing, permits, registration, other

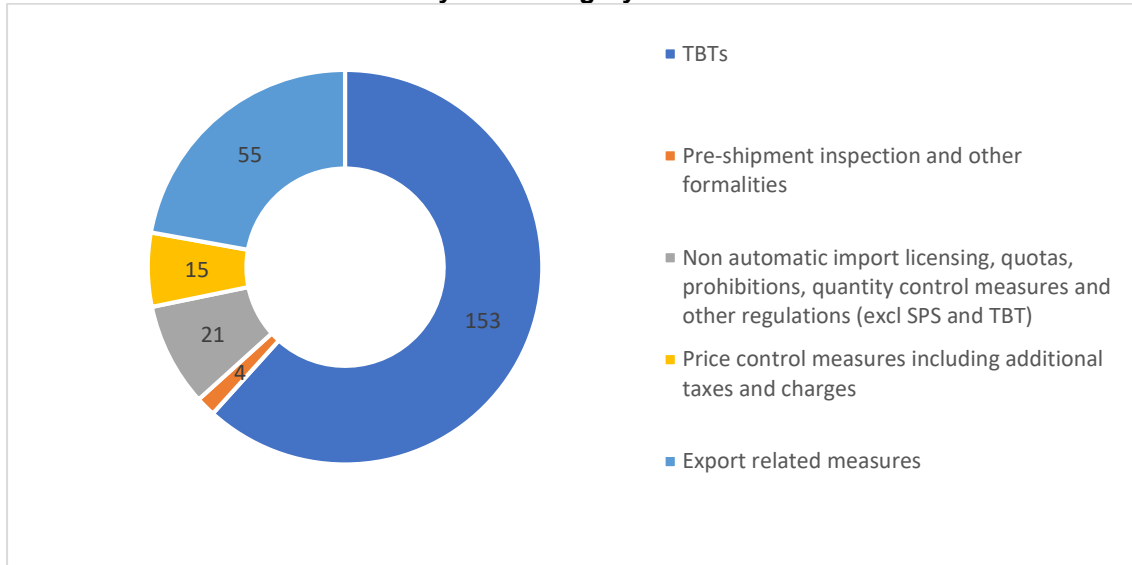
Source: https://unctad.org/system/files/official-document/ditctab2019d5_en.pdf

Of all the NTMs identified⁶⁶ as applying to the selected New-21 EGs, TBT measures are the most prevalent, comprising over 61% of all measures. Export-related measures (22%), licensing, quotas and quantity control measures (8%), and price control measures (6%) also potentially impact significantly on New-21 EGs.

⁶⁴ Other measures typically classified as NTMs (such as sanitary and phytosanitary measures, government procurement, subsidies, intellectual property, distribution, finance measures, and post sales service) were excluded from the scope of NTMs for the purposes of this study (See Annex ** Methodology).

⁶⁵ Adopted from the UNCTAD international classification of NTMs. See https://unctad.org/system/files/official-document/ditctab2019d5_en.pdf

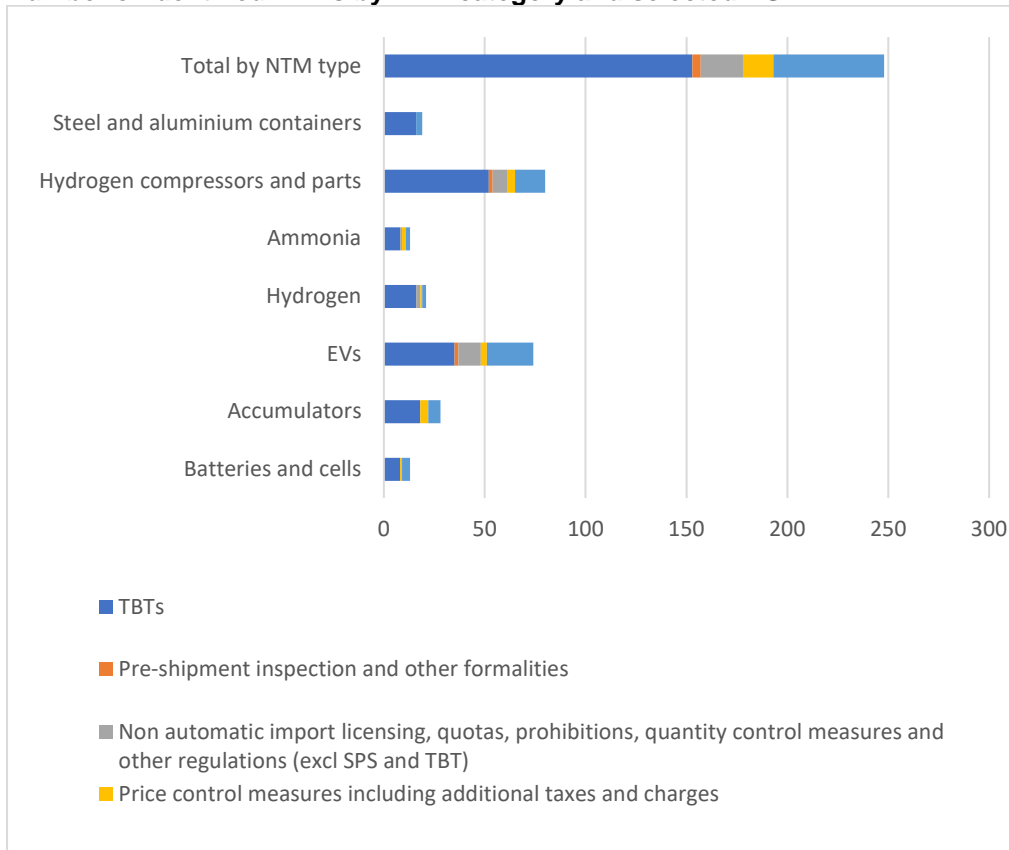
Total number of identified NTMs by NTM category



Source: UNCTAD TRAINS database

As indicated in the table below, the new EGs most impacted are compressors and parts, electric vehicles and electric accumulators. All new EGs are most impacted by TBT measures and least by pre-shipment inspection and formalities. The type of measures affecting the EGs vary by good. A summary of the types of measures impacting on each new EG is set out at Annex 4.

Number of identified NTMs by NTM category and selected EG



Source: UNCTAD TRAINS database

As EG technologies develop, trade expands and regulation evolves, more NTMs may emerge in future. Examples of recently proposed or implemented measures that could prospectively impact on trade in the New-21 EGs are illustrated below.

Examples of emerging NTMs

Measure	Description
Standards for cells and batteries in electric vehicles	Safety requirements and test methods for cells and batteries for electric vehicles sold (including lithium-ion batteries, nickel-hydrogen batteries, and other rechargeable energy storage devices for electric vehicles), specifying recycling and utilisation, coding, traceability information management requirements for enterprises, not fully aligned with international standards and requirements as set out by the UNECE World Forum for the Harmonisation of Vehicle Regulations (WP29) in particular the UN Global Technical Regulation No. 20 (GTR 20) on 'Electric Vehicle Safety (EVS)'.
Import ban on cell recycling and waste	An import ban on the import of electronic waste (e-waste) including electric and electronic scraps, excluding scraps from an electric generator. Prior to the ban, there were no restrictions on importing e-waste.
Supply chain due diligence and sustainability requirements for EV batteries and waste	Whole of life cycle regulation of batteries, including for use in electric vehicles, focusing on: (i) ethical sourcing of raw materials; (ii) measuring the carbon footprint of battery manufacturing; (iii) facilitating reuse, repurposing and recycling; and (iv) management of toxic substances in battery production. This encompasses sustainability, safety, labelling and information requirements as well as supply chain due diligence policies for the sourcing of cobalt, natural graphite, lithium and nickel, and chemical compounds for the manufacturing of the active materials of batteries used in EVs sold on the market.
Local content requirements for inputs	Mandated use of locally manufactured batteries as a condition for local manufacture of electric vehicles.
Export restrictions on raw materials	Export restrictions on critical minerals such as cobalt, used in the manufacture of cells and batteries or other critical minerals used in parts across the supply chain for EGs.
Trade remedy actions on solar cells	Safeguard, anti-dumping and/or countervailing duty actions on EGs such as solar cells and parts.
Restrictive ROO in FTAs	EVs need to meet multiple origin requirements to qualify for preferential tariff treatment, including requisite regional value content, originating core parts, originating steel and aluminium content and high wage labour value content.

Sources: see references

Approaches to NTMs and EGs

Avoiding trade restrictive measures in the regulation of EGs is an important element in approaches to facilitate trade in EGs, build resilient supply chains and encourage technologies that contribute to emissions reduction. New and emerging EGs raise several issues for consideration:

Lack of specific regulation. New EGs involve new industries with new and emerging technologies for which specific regulation is not yet fully developed (e.g., regulation on hydrogen compressors is not distinct from regulation of other gas compressors). Most products by their nature are captured by broader regulations impacting on a wide range of products (e.g.: electrical products and safety), and/or regulations that do not distinguish EGs from 'normal' goods (e.g.: 'green' hydrogen from 'blue' or 'grey' hydrogen).

The importance of a whole of value chain approach

Achieving environmental outcomes through less restrictive regulatory approaches requires adopting a whole of value chain approach. New EGs are not only final goods but also critical inputs into value chains involved in the development of technology, production, manufacture, and sale of EGs. Regulation along the supply chain impacts on trade in these products. For example: the EV value chain encompasses regulation of source minerals (such as lithium), cells, batteries, and vehicle manufacturing. It involves production, manufacture, transportation, storage, assembly, distribution, and sale.

Linkages with services, investment, and intellectual property

New EGs are closely linked with services, both in terms of their delivery (e.g.: transport and distribution), functionality (e.g.: access to electricity grids and infrastructure) and viability (e.g.: market rules in gas and electricity markets). They are also impacted by regulations on foreign investment, with supply chains increasingly functioning across multiple jurisdictions (e.g.: joint-venture requirements for foreign firms to manufacture in another economy). Intellectual property is a factor given reliance on new and developing technologies. This suggests the need for adoption of a wholistic approach to the consideration of regulatory measures impacting on trade.

The impact of industry policy, domestic support, and government procurement policies

There are numerous and growing policies and support measures designed to encourage development of EG technologies, goods and industries that have or are in the process of being implemented by governments globally and across APEC. These measures have the potential to impact on trade (both positively and negatively – for example subsidies provided to local EV manufacturers or consumers that purchase local EVs may incentive local industries, but at the expense of other competitive global suppliers). The role of government support measures in efforts to reduce barriers to EGs should be carefully examined. It was not considered as part of this analysis.

The role of trade remedy measures

A further measure not considered as part of this analysis but impacting on trade in some new EGs is trade remedy actions - anti-dumping, countervailing and safeguard measures. While such measures may be legitimate under WTO rules and FTAs, they have the potential to undermine the benefit of tariff reductions under recent liberalising FTAs. This applies to final EGs (such as solar cells, as well as critical inputs (such as cobalt). Disciplines to prevent misuse may form part of the broader discussion on NTMs.

Consistency in standards across economies

Sharing knowledge and recognising standards for equipment, safety and certifying emissions from different sources is important in helping to reduce non-tariff barriers. E.g.: production of hydrogen engines can be impacted by unclear, incomplete, or

counterproductive industrial emissions or safety regulations.⁶⁷ Due regard should be given to international standards in the development of EGs to ensure they do not create unnecessary trade barriers. For example, parallel work in the United Nations World Forum for Harmonization of Vehicle Regulations (WP29) could be considered in the development of international standards for in-vehicle batteries.⁶⁸ The International Partnership for Hydrogen and Fuel Cells in the Economy ([IPHE](#)) is developing a common methodology for determining the greenhouse gas emissions associated with different hydrogen production pathways. The initiative is designed to form the basis of an international standard by the International Organization for Standardization (ISO).

Options for recognition of equivalence of standards and certification systems across economies could also be explored. For example, certification systems will be crucial for the effective operation of low-emissions hydrogen markets. Incompatible certification systems between exporting and importing economies could create technical barriers to trade, reducing the efficiency and interoperability of global markets.⁶⁹

Emerging disciplines in FTAs

Recent FTAs - CPTPP, RCEP and USMCA - build on WTO obligations for NTMs, providing for more detailed disciplines on TBTs, import licensing and export control measures for trade among the parties. They all establish consultation and cooperation mechanisms to deal with NTMs, some to specifically address potential NTMs for EGs. Although the scope of obligations differs among the agreements, they are generally 'WTO plus' in their regulation of NTMs impacting on trade. They can inform greater consensus across APEC on disciplines to address NTMs for new EGs.

Examples of 'WTO plus' provisions in CPTPP, RCEP and USMCA across relevant categories of NTMs are illustrated in the box below.

WTO-plus NTM disciplines in recent FTAs

TBT – more detailed provisions to encourage transparency in development and dissemination of standards and testing. Recognition of a broad range of measures to support alignment of international standards and greater regulatory alignment.

E.g.: Each USMCA party must conduct an appropriate assessment of major technical regulations it proposes to adopt, including evaluation of alternative measures, periodically review technical regulations for increasing alignment with international standards, and consider any less trade-restrictive approaches.

Import licensing – obligations to improve the transparency of import licensing procedures, including notification, publication, and consultation.

⁶⁷ <https://www.iea.org/reports/the-future-of-hydrogen>

⁶⁸ See <https://unece.org/transport/vehicle-regulations>

⁶⁹ White et al, *Towards emissions certification systems for international trade in hydrogen: The policy challenge of defining boundaries for emissions accounting*, Energy 215 (2021) 119139

E.g.: CPTPP parties must notify requirements and modifications of their import licensing procedures within 60 days and provide sufficient information to other parties on eligibility, terms, conditions etc. They must respond within 60 days to a 'reasonable' enquiry from another Party on licensing rules and procedures regarding applications for an import license.

Pre-shipment inspection –specific provisions on pre-shipment inspection and pre arrival processing, affirming WTO obligations. Each RCEP Party is encouraged not to introduce or apply new requirements regarding the use of pre shipment inspections.

Export measures –provisions to ensure transparency in export licensing procedures, prohibitions on export duties, taxes, or other charges (subject to WTO rules and some exceptions).

E.g.: CPTPP mandates publication of export licensing procedures and establishment of contact points for information. RCEP requires parties to inform other parties of export prohibition or restrictions and provide parties that may be seriously affected with an opportunity for consultation. USMCA includes similarly detailed provisions.

Institutional mechanisms – cooperation and consultation mechanisms to address potential NTMs for EGs, and general NTMs, and to further information exchange and dialogue on NTMs among the parties.

E.g.: The Committee on Environment established in the CPTPP is tasked with considering issues related to trade in EGs and services, including those identified as potential NTMs to that trade. USMCA includes a similar provision.

Sources: See references

IV. Benefits and next steps

Benefits for APEC

Reducing tariff and non-tariff barriers on the New-21 EGs would have a direct and compounding positive impact on the competitiveness of these EGs in the APEC region. It would spur demand and contribute to sales of inputs at every step of the GVCs that produce these goods, helping APEC economies to both improve environmental outcomes and creating opportunities for their exports.

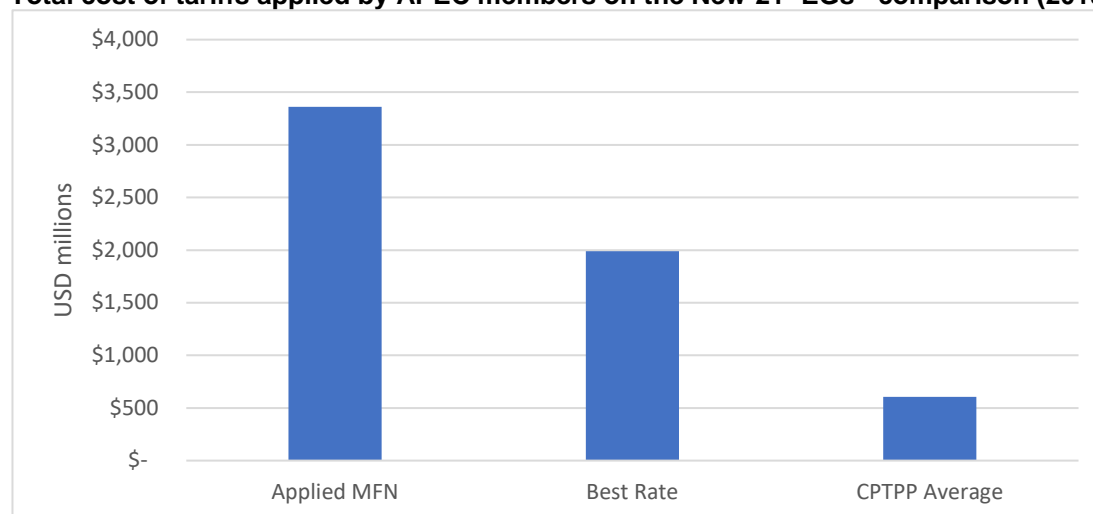
Modest cuts for major trade gains

Tariffs on the New-21 EGs across the APEC membership are on average already relatively low. However, tariffs are still an impediment to trade, and to the uptake of these environmentally beneficial products. If tariffs were further reduced, trade could expand.

Tariff cuts for trade gains

Based on 2019 trade data, when all APEC members apply their respective WTO (applied) MFN rates, total tariff costs for purchases of the New-21 EGs total USD3.4 billion. If each APEC member that is party to a regional trade agreement were to multilateralise their 'best' tariff commitments - e.g. if Australia were to offer its CPTPP tariffs on the New-21 EGs to all WTO trading partners - then this total tariff cost would be reduced to less than USD2 billion. If the average commitments made by APEC signatories to the CPTPP were taken as a baseline - with all APEC members committing to at least match these average tariff rates - then total tariff costs could be reduced by 82% to USD606 million per year. See the chart below.

Total cost of tariffs applied by APEC members on the New-21 -EGs - comparison (2019)



Source: Article Three based on RCEP, WTO, CPTPP rate

APEC economies, as major traders in these new technologies, can significantly reduce the tariff imposts on trade in these goods, leading to more competitive value chains, increased export earnings and improved environmental outcomes.

Develop efficient and transparent regulation

Non-tariff measures can impact negatively on access to EGs, impede trade, limit their development, and potentially reduce the benefits of a low tariff environment.

In advancing common approaches to address NTMs along supply chains, APEC economies can contribute to the development of efficient, transparent, and best practice regulation in these new and emerging industries. Avoiding trade restrictive regulatory measures can help build resilient supply chains and encourage technologies that contribute to emissions reduction.

Contribute to climate change goals

Lower tariff and regulatory barriers would reduce costs along the supply chain for EGs, helping to incentivise production, manufacturing, and trade in EGs, and assist economies in meeting their own climate change goals. It is consistent with other policies and measures governments are adopting or considering, to reduce emissions and move toward lower carbon activities. It reflects APEC's longstanding approach of ensuring that trade and environmental policies are mutually supportive.

Build the industries of the future

More open supply chains for EGs can encourage the development of new industries – not just for final products but also up and down the value chain, including raw material supply, component manufacturing, product assembly, and waste recycling. Access to cheaper inputs for EGs, combined with transparent and non-trade distorting regulation, could facilitate FDI across APEC economies in both EG manufacturing and technologies, supporting the development of already increasingly integrated value chains. This network effect can enable the participation of developing member economies in these industries of the future.

Investment in batteries and EVs in Indonesia

The Indonesian Government's policies to encourage the development of an EV battery sector has stimulated interest and commitments from a number of producers led by Korea's LG Chemicals, and including China's Contemporary Amperex Technology (CATL). There is also interest from Korea's Samsung SDI, China's BYD Auto and Farasis Energy as well as Japan's Panasonic.

In EV battery-powered motorcycles, there are even prospects of Indonesian developed and owned makers emerging. Local start-up producers, like Gesits (Garansindo Electric Scooter ITS), add new prospects for independent component makers, both Indonesian and foreign, to forge new partnerships that may not be accessible to established commercial arrangements between the traditional producers.

In addition, significant preparatory investments in connecting and enabling infrastructure to support EV and battery production are being undertaken in Central Java, especially to the west of Semarang City, as well as in the Rebana development zone located in the north eastern regions of West Java.

Source: Kevin Evans and Eugene Sebastian, Electric vehicles: Powering Indonesia's next industrial growth, Australia Indonesia Centre, June 2021 <https://australiaindonesia.com/aic/electric-vehicles-powering-indonesias-next-industrial-growth/>

Set the global standard

As with the initial APEC-54 list, APEC can set the standard for multilateral liberalisation of new EGs. APEC's success as an incubator for new initiatives make it the ideal forum to continue to pioneer meaningful trade liberalisation and regulatory approaches that are relevant to shared and current policy objectives, including addressing climate change. APEC has committed to advancing trade and

environment issues at the WTO⁷⁰ - like the APEC-54 list, an updated list could make a valuable contribution to progress in this area.

Lead green and sustainable recovery through open trade

As economies across the world seek out various ways to drive economic recovery post pandemic and mitigate climate change, APEC can demonstrate to the world the value of open trade in enabling sustainable economic growth. This is consistent with APEC's support for a 'free, fair, predictable, non-discriminatory, transparent, and open trade and investment environment'.⁷¹ It can contribute to APEC's vision for 'an open, dynamic, resilient and peaceful Asia-Pacific community by 2040'.⁷²

Next steps

There are several steps APEC economies may consider to support increased trade in new EGs and realise the potential benefits.

Improve data collection and analysis

New EGs need to be identifiable (preferably at the 6-digit harmonised) HS code level if they are to be accurately identified and targeted for tariff reductions (i.e.: hydrogen powered engines and vehicles) across economies. As previously noted, while some economies differentiate some EGs at the 8 or 10-digit level, many of the New-21 EGs currently share 6-digit HS codes with non EG goods, making it difficult to differentiate them from broader types of goods. (The exception is electric vehicles, for which specific 6-digit HS codes apply).

Specific HS codes for all new EGs would permit more accurate calculation of trade flows and allow for transparent and targeted tariff cuts. Differentiated HS codes would also help to ensure EGs are not treated as 'like products' to non EG goods, thereby reducing potential conflicts with WTO rules arising from better tariff treatment.

Commitments in current FTAs should be updated to reflect HS changes, and such changes incorporated in tariff cutting instruments going forward.

Build on FTA liberalisation

Most APEC economies have already reduced, or are in the process of reducing, their tariffs on new EGs as a result of recent FTAs. These commitments could potentially serve as a baseline for future tariff reductions in an updated EGL. Applied multilaterally, the liberalising impact would be expanded. APEC members could also explore wider adoption of WTO-plus disciplines for NTMs that are included in recent FTAs.

Advance work on NTMs

There has been little work to date examining NTMs applied to new EGs, nor their impact across supply chains. As EG technologies develop, trade expands and regulation evolves, more NTMs may emerge in future. Improved understanding of

⁷⁰ https://www.apec.org/Meeting-Papers/Sectoral-Ministerial-Meetings/Trade/2021_MRT

⁷¹ https://www.apec.org/Meeting-Papers/Sectoral-Ministerial-Meetings/Trade/2021_MRT

⁷² https://www.apec.org/Meeting-Papers/Sectoral-Ministerial-Meetings/Trade/2021_MRT

the incidence, nature, and impact of NTMs on EGs is an area warranting further work and consideration.

Share and disseminate knowledge on EG regulation

As EG markets grow and tariffs to EG trade are dismantled, it may be desirable for governments to consider pre-emptively ensuring that future domestic regulations and policies involving EGs are not designed in a manner that is discriminatory or trade restrictive. Given the complex supply chains and 'new' technologies involved there is a strong case for knowledge sharing among government, business, and civil society within APEC. APEC Ministers Responsible for Trade recently affirmed their support for APEC efforts to discuss the impact of NTMs on trade in EGs.⁷³

⁷³ https://www.apec.org/Meeting-Papers/Sectoral-Ministerial-Meetings/Trade/2021_MRT

V. Annexes

Annex 1 - Scope and methodology

Trade analysis

Indication of the size and growth of trade in the study represents best possible estimates based on currently available data.

Estimates of trade are based on value in USD of applicable tariff codes drawn from the UN Comtrade database for the year 2015-2019 as reported by APEC economies, at 6-digit level only.

Most New-21 EG's identified do not have specific tariff codes at HS 6-digit level and are therefore subject to tariff rates that encompass a broader range of products.

Totals may therefore overstate trade in the New-21 EGs as HS codes analysed at 6-digit level include other goods in addition to the identified APEC-21. A more detailed analysis at 8 or 10-digit level may help isolate growth in EGs within 6-digit codes, however, specific codes at this level generally do not yet exist for new EGs. They are also not harmonised internationally beyond the 6-digit level, making collation of like for like data across economies very difficult.

Tariff analysis

Tariff rates applied by APEC economies to the New-21 EGs were identified using the same 6-digit classification described above (see codes set out at Annex 2), and by reviewing the WTO Tariff Database (for WTO bound and applied rates) and the official tariff schedules of RCEP, CPTPP and USMCA member economies.

HS 2017 classification was used. Codes subsequently created for electric vehicles – specifically HS 870380; 870240 –were used where specified, including for WTO and USMCA rates.

Average tariff rates were calculated to provide an indication of levels of protection across APEC/globally. It was not the intention of the study to identify tariff levels by individual APEC economy.

All averages included reflect unweighted averages of tariffs at the 6-digit HS code level.

- For the WTO applied and bound rates, the averages cover all 21 APEC economies.
- For the FTAs (RCEP, CPTPP, and USMCA), the averages cover participating APEC economies. The charts reflect both the average preferential rate committed to under the agreement by APEC signatories to the agreement; and an average of the WTO MFN tariffs applied by those APEC members of the agreement. For example, in the CPTPP section, the "Ave MFN" rate reflects an average of the WTO MFN rates applied by Australia, Brunei,

Canada, Chile, Japan, Malaysia, Mexico, New Zealand, Peru, Singapore and Vietnam (but not other APEC members, such as China, US and Thailand).

Some of the commitments of single economies at the 6-digit level included differing tariff rates at the 8- or 10-digit level. In these cases, an unweighted average was calculated for each product at the 6-digit level for each economy, which was then used as a preferential average rate for that particular product at the APEC-wide average level. For example, New Zealand's CPTPP commitments on HS841480 (pumps and compressors) were further broken down into:

- 841480.01 - 0%
- 841480.11 - 0%
- 841480.19 - 2.8%
- 841480.29 - 0%
- Average of these tariff rates = $(0+0+2.8+0)/4 = 0.7\%$
- New Zealand's average CPTPP tariff rate on HS841480 was calculated to be 0.7%, which was then combined with average rates from all other APEC CPTPP signatories to arrive at an APEC average CPTPP tariff rate of 0.47% for HS841480.

In some instances, in the RCEP schedules, some APEC members elected not to make commitments on certain New-21 EGs. Where this occurred, the WTO MFN rate applied by those APEC members was used for the purposes of calculating average tariffs.

As noted in the report, no commitments have been made on electric vehicles (EVs) by parties to RCEP and CPTPP under the HS 6-digit codes for electric vehicles (870240 and 870380). Each participating economy's WTO MFN commitments on these two HS categories have been reflected in the CPTPP and RCEP tariff charts in this report. Under USMCA, both the US and Canada have made specific commitments on these new EV codes while Mexico's commitments for these products are covered by HS 2018 – 8703.10.01.

Assessment of NTMs

The assessment of NTMs was deliberately refined to meet the time and data constraints of the study. It presents indicative results as part of preliminary work which may be built on by APEC economies at a later date.

Representative EGs from the 21 new EGs identified were selected for analysis. As most of the New-21 EGs form a key part of either the electric vehicle manufacturing or hydrogen value chain, or both, those most relevant to these areas were selected. They also represent goods applicable across all product categories - renewable energy, transport and energy storage and integration categories of EGs.

Representative new EGs selected for analysis and their applicable tariff codes are as follows:

Selected EGs

New EG	HS code (2017)
Lithium batteries and primary cells	850650; 850680
Electric accumulators	850720; 850740; 850780
EVs	870380; 870240
Hydrogen gas	280410
Ammonia	281410; 281420
Hydrogen compressors/parts	841480; 841490
Steel and aluminium containers	731100; 761300

The analysis adopted the UNCTAD taxonomy of NTMs as set out in the UNCTAD 2019 International Classification of Non-Tariff Measures as accessed at https://unctad.org/system/files/official-document/ditctab2019d5_en.pdf

Several measures included in the UNCTAD taxonomy were excluded from the scope as they were considered less relevant to the particular products concerned, the key objectives of the study and its intended coverage. Notably, subsidies were not covered, mainly because they are generally not dealt with in tariff cutting agreements. Measures related to services, such as distribution and post sales services, were also not covered, nor were finance measures and SPS measures.

The types and categories of NTMs adopting the UNCTAD classification that were assessed are set out in the table below.

Coverage of NTMs for EGs

NTM category	NTM type	Description	Measures
Technical measures on imports	TBTs	Measures relating to product characteristics such as technical specifications and quality requirements; related processes and production methods; and measures such as labelling and packaging in relation to environmental protection, consumer safety and domestic security.	<p>Authorisation requirements for importing certain products, or for importers</p> <p>Tolerance limits for residues of or contamination by certain substances, restricted use of certain substances</p> <p>Labelling, marking and packaging requirements</p> <p>Production or post-production requirements</p> <p>Product identity requirements, quality, safety or performance requirements</p> <p>Conformity assessment requirements: product registration/approval; testing, certification, inspection, traceability</p>
	Pre shipment inspection and other formalities	Compulsory quality, quantity and price control of goods prior to shipment from the exporting economy, conducted by an independent inspecting agency mandated by the authorities of the importing economy.	<p>Pre shipment inspection</p> <p>Prior consignment requirements</p> <p>Requirement to pass through specified port of customs</p> <p>Import monitoring, surveillance</p> <p>Automatic licensing measures</p>
Non-technical measures on imports	Contingent trade protection measures	Measures implemented to counteract the adverse effects of imports in the market of the importing economy.	Anti-dumping, countervailing and safeguard investigations, measures and undertakings
	Non automatic licensing, quotas, prohibitions and bans, other quantity control measures	Measures generally aimed at restraining the quantity of goods that be imported.	<p>Licensing linked with local production or environmental protection</p> <p>Quotas, import bans, tariff rate quotas</p>
	Price control measures including additional taxes and charges	Measures implemented to control or affect the prices of imported goods. Includes measures designed to support the domestic prices of certain products when the import prices of these goods are lower, to establish the domestic prices of certain products because of price fluctuation in domestic markets or price instability in a foreign market and to increase or preserve tax revenue.	<p>Administrative measures affecting customs value</p> <p>Minimum import prices</p> <p>Variable charges and levies</p> <p>Customs surcharges</p> <p>Additional surcharges and levies</p>

			Internal taxes and charges levied on imports (excise, consumption taxes)
	Measures affecting competition	Measures that grant exclusive or special preferences or privileges to one or more limited group of economic operators. They are mainly monopolistic measures, such as State trading, sole importing agencies or compulsory domestic insurance or transport.	Requirement for state-trading enterprises for importing, other selective import channels Compulsory use of domestic services
	Trade-related investment measures	Measures that restrict investment by requiring local content or requesting that investment be related to export in order to balance imports.	Local content requirements Mandatory technology transfers
	Rules of origin	Measures that restrict the origin of products or its inputs.	Origin criteria Proof of origin requirements
Export controls	Export prohibitions and taxes	Measures applied by the government of the exporting economy on exported goods.	Authorisation or permit requirements to export: export registration requirements; production and post-production requirements to export Export formalities: requirements to pass through specified port of customs for exports; export monitoring and surveillance requirements Export licences, export quotas, export prohibition and other restrictions Export price-control measures: additional taxes and charges; measures to control the prices of exported products; export taxes and duties State-trading enterprises, for exporting; other selective export channels

The analysis of the above NTMs was based on data drawn from the UNCTAD TRAINS database (see <https://trainsonline.unctad.org/detailedSearch>) for each of the representative NTMs based on their applicable 6 digit tariff code. Note the results include not only measures specific to the selected 6-digit codes for the New-21 EGs but also broader measures that may affect other products. For this reason, there may be duplication of measures across representative products.

Data was also not available for all APEC economies. Results reflect outcomes for 17 APEC economies included in the database, absent Australia, Chinese Taipei, Vietnam, and Russia. Measures may therefore be understated.

Results indicate measures impacting on regions of ASEAN, Pacific, East Asia, North America, Latin America, and the world. Measures impacting specifically on the EU, Caribbean, South Asia, and Africa were excluded as less representative of the APEC region.

The analysis was further limited to measures implemented over the last 5 years – it does not account for pre-existing NTMs which may still be in operation, thereby also potentially understating the extent of applicable measures.

To supplement this analysis, a qualitative desk review of emerging and current NTMs more specifically related to the New-21 EGs was conducted. Measures noted were de-identified by place of origin for the purpose of illustrating representative examples of the type and scope of NTMs for possible consideration in future.

Annex 2 – Tariff codes for the NEW-21 EGs

CAT	SUB CAT	PRODUCT	HS 6 DIGIT 2017	HS DESCRIPTION
Renewable energy	Solar	Photovoltaic system controller	853710	Boards, panels, consoles, desks and other bases; for electric control or the distribution of electricity, (other than switching apparatus of heading no. 8517), for a voltage not exceeding 1000 volts)
Renewable energy	Wind	Towers and masts for wind turbines	730820	Iron or steel; structures and parts thereof, towers and lattice masts
Renewable energy	Hydrogen	Hydrogen	280410	Hydrogen
Renewable energy	Hydrogen	Electrolyser system	854330	Electrical machines and apparatus; for electroplating, electrolysis or electrophoresis
Renewable energy	Hydrogen	Hydrogen Compressor	841480	Pumps and compressors; for air, vacuum or gas, n.e.c. in heading no. 8414
Renewable energy	Hydrogen	Hydrogen Gas Compressor - Diaphragm	841490	Pumps and compressors; parts, of air or vacuum pumps, air or other gas compressors and fans, ventilating or recycling hoods incorporating a fan
Renewable energy	Hydrogen	Steel containers for compressed or liquefied gas	731100	Containers for compressed or liquefied gas, of iron or steel
Renewable energy	Hydrogen	Aluminium containers for compressed or liquefied gas	761300	Aluminium; containers for compressed or liquefied gas

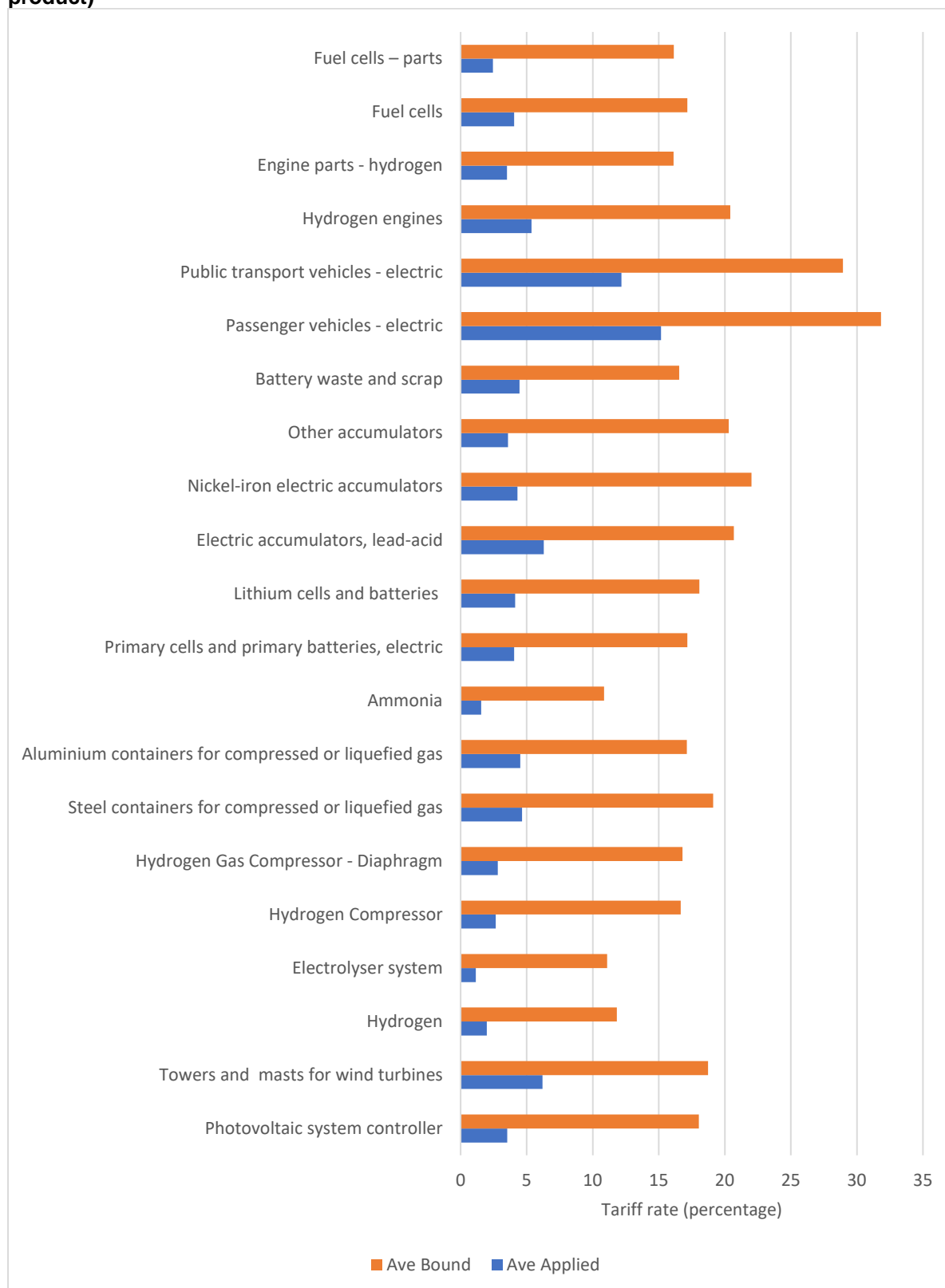
CAT	SUB CAT	PRODUCT	HS 6 DIGIT 2017	HS DESCRIPTION
Renewable energy	Ammonia	Ammonia	281410 & 281420	Ammonia; anhydrous & Ammonia; in aqueous solution (average of 2 lines)
Energy Storage and integration	Cells and accumulators	Primary cells and primary batteries, electric	850680	Cells and batteries; primary, (other than manganese dioxide, mercuric oxide, silver oxide, lithium or air-zinc)
Energy Storage and integration	Cells and accumulators	Lithium cells and batteries	850650	Cells and batteries; primary, lithium
Energy Storage and integration	Cells and accumulators	Electric accumulators, lead-acid	850720	Electric accumulators; lead-acid, (other than for starting piston engines), including separators, whether or not rectangular (including square)
Energy Storage and integration	Cells and accumulators	Nickel-iron electric accumulators	850740	Electric accumulators; nickel-iron, including separators, whether or not rectangular (including square)
Energy Storage and integration	Cells and accumulators	Other accumulators	850780	Electric accumulators; other than lead-acid, nickel-cadmium, nickel-iron, nickel-metal hydride and lithium-ion, including separators, whether or not rectangular (including square)
Energy Storage and integration	Cell recycling	Battery waste and scrap	854810	Waste and scrap of primary cells, primary batteries and electric accumulators; spent primary cells, spent primary batteries and spent electric accumulators
Transport and other end use	Electric battery vehicles	Passenger vehicles - electric	870380	Vehicles; with only electric motor for propulsion
Transport and other end use	Electric battery vehicles	Public transport vehicles - electric	870240	Vehicles; public transport type (carries 10 or more persons, including driver), with only electric motor for propulsion, new or used

CAT	SUB CAT	PRODUCT	HS 6 DIGIT 2017	HS DESCRIPTION
Transport and other end use	Hydrogen internal combustion engine vehicle	Hydrogen engines	840731	840731 - Engines; reciprocating piston engines, of a kind used for the propulsion of vehicles of chapter 87, of a cylinder capacity not exceeding 50cc
Transport and other end use	Hydrogen internal combustion engine vehicle	Hydrogen engines	840732	840732 - Engines; reciprocating piston engines, of a kind used for the propulsion of vehicles of chapter 87, of a cylinder capacity exceeding 50cc but not exceeding 250cc
Transport and other end use	Hydrogen internal combustion engine vehicle	Hydrogen engines	840733	Engines; reciprocating piston engines, of a kind used for the propulsion of vehicles of chapter 87, of a cylinder capacity exceeding 250cc but not exceeding 1000cc
Transport and other end use	Hydrogen internal combustion engine vehicle	Hydrogen engines	840734	Engines; reciprocating piston engines, of a kind used for the propulsion of vehicles of chapter 87, of a cylinder capacity exceeding 1000cc
Transport and other end use	Hydrogen internal combustion engine vehicle	Hydrogen engines	840790	Engines; rotary internal combustion piston engines, for other than aircraft or marine propulsion
Transport and other end use	Hydrogen internal combustion engine vehicle	Engine parts - hydrogen	840991 & 840999	Engines; parts, suitable for use solely or principally with spark-ignition internal combustion piston engines (for other than aircraft) & Engines; parts for internal combustion piston engines (excluding spark-ignition) (ave of two lines)
Transport and other end use	Hydrogen fuel cell vehicles	Fuel cells	850680	Cells and batteries; primary, (other than manganese dioxide, mercuric oxide, silver oxide, lithium or air-zinc)

CAT	SUB CAT	PRODUCT	HS 6 DIGIT 2017	HS DESCRIPTION
Transport and other end use	Hydrogen fuel cell vehicles	Fuel cells – parts	850690	Cells and batteries; primary, parts thereof

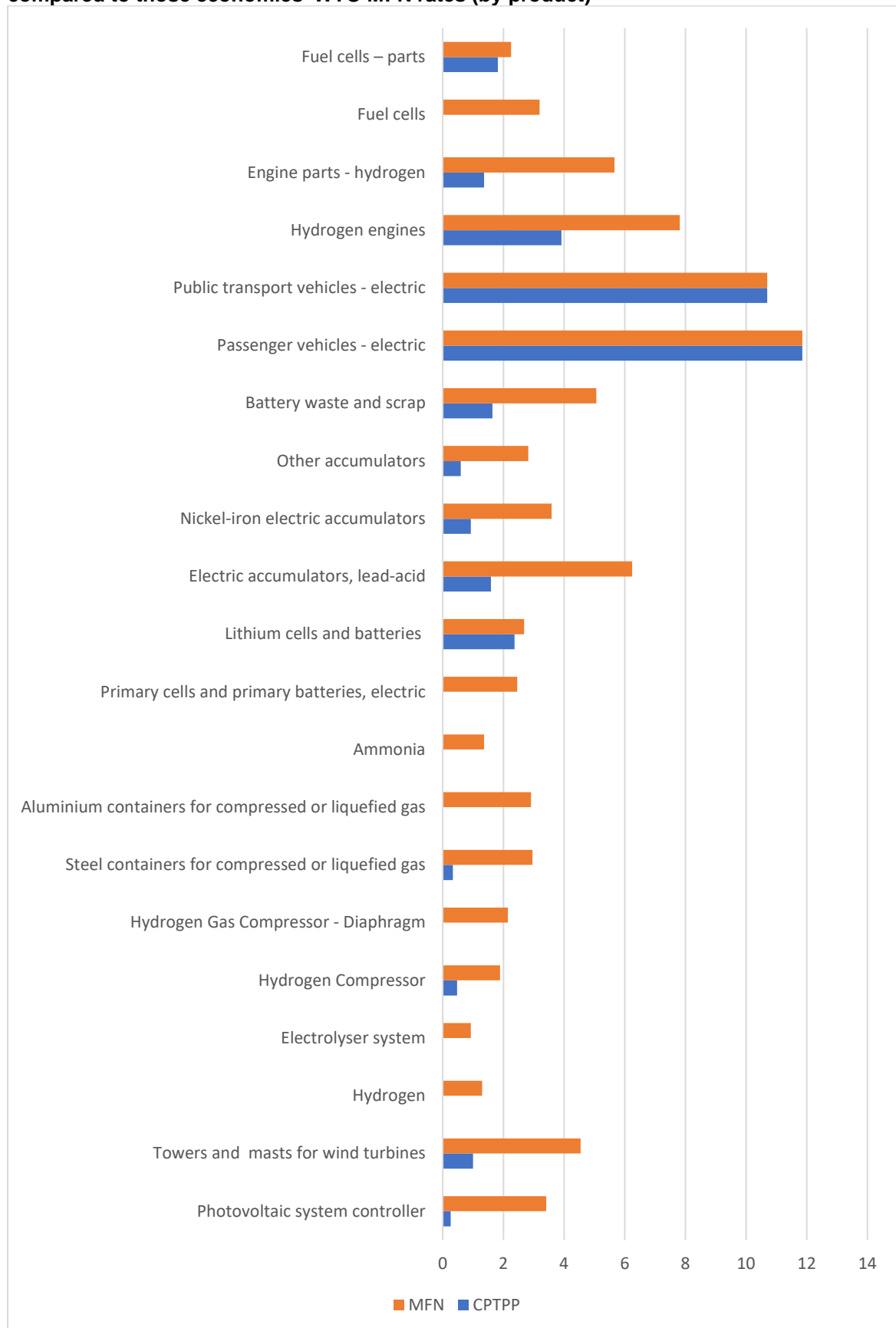
Annex 3 - Average tariffs on the New-21 -EGs across APEC economies

Average applied and bound MFN tariffs applied by APEC economies to the New-21 EGs (by product)



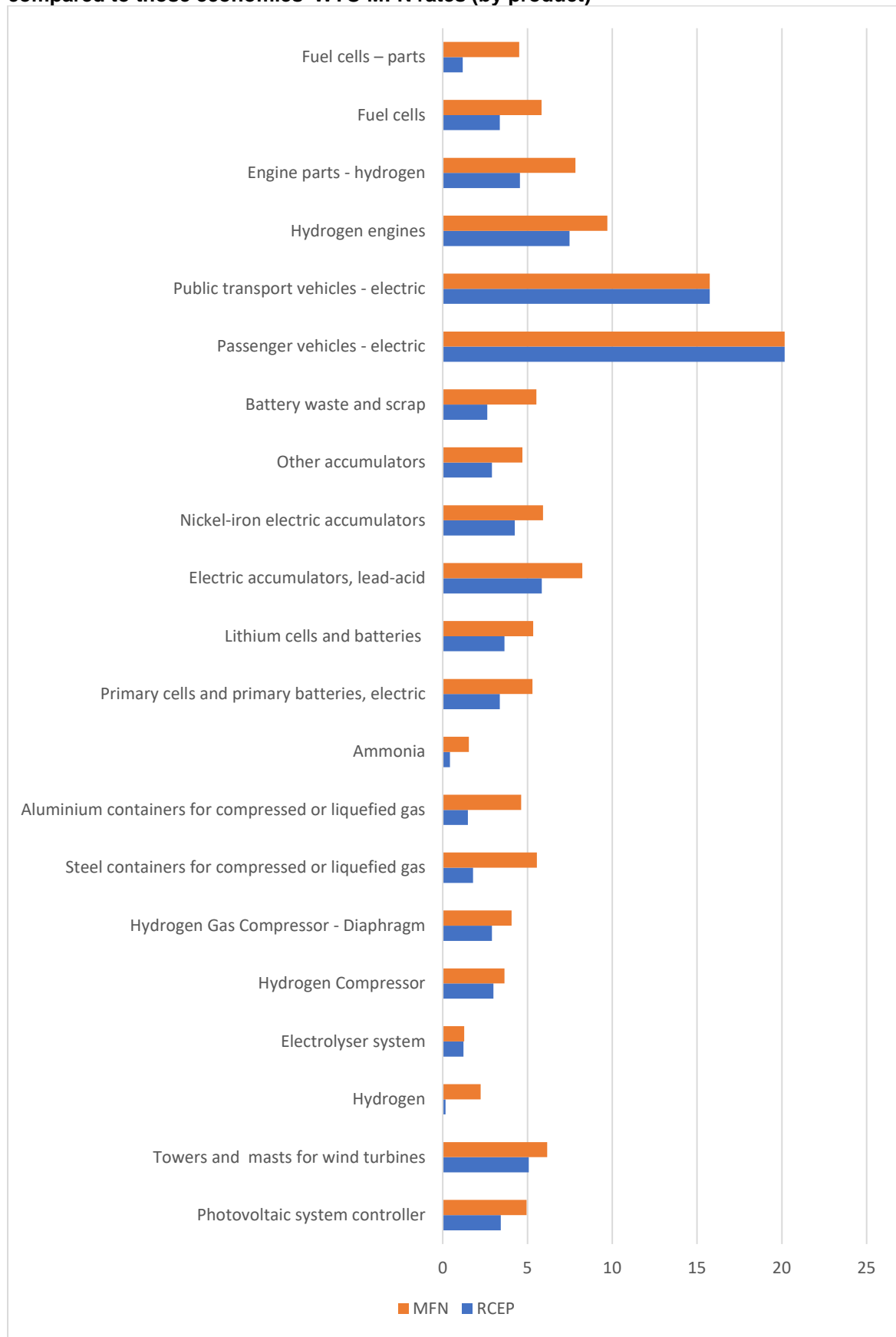
Source: WTO, FTAs

Average tariff commitments made for the New-21 EGs by APEC signatories to CPTPP, compared to those economies' WTO MFN rates (by product)



Source: WTO, FTAs

Average tariff commitments made for the New-21 EGs by APEC signatories to RCEP, compared to those economies' WTO MFN rates (by product)



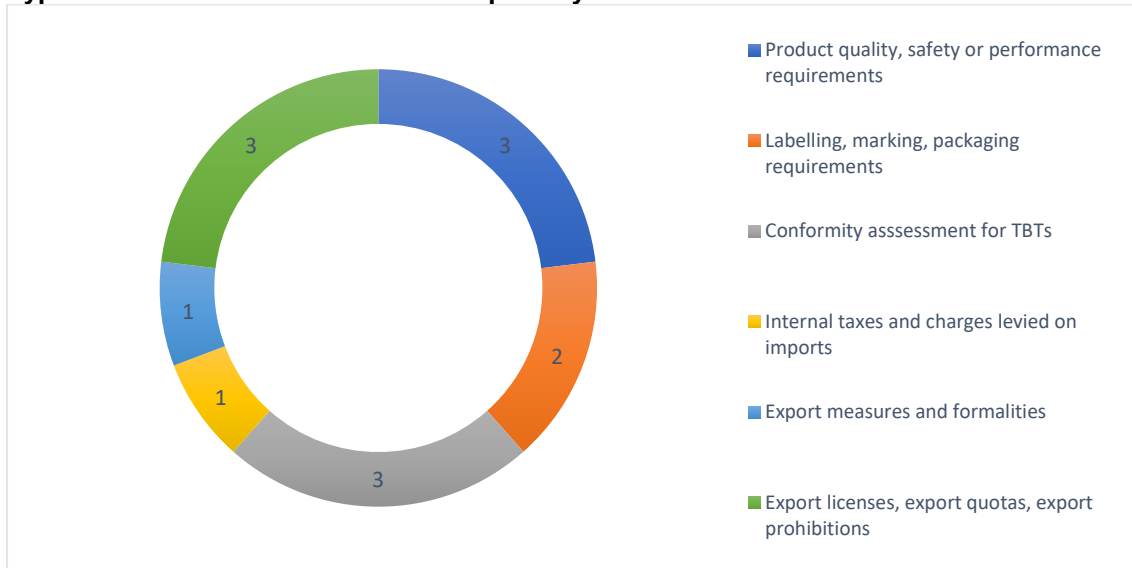
Source: WTO, FTAs

Annex 4 - NTMs impacting on selected EGs by type of measure

The non-tariff measures impacting on the New-21 -EGs vary. A summary of the types of measures for selected new-EGs is set out below.

Lithium batteries and primary cells are impacted by a range of NTM measures including product quality, safety and performance requirements, export licenses and prohibitions, conformity assessment measures and labelling and packaging requirements.

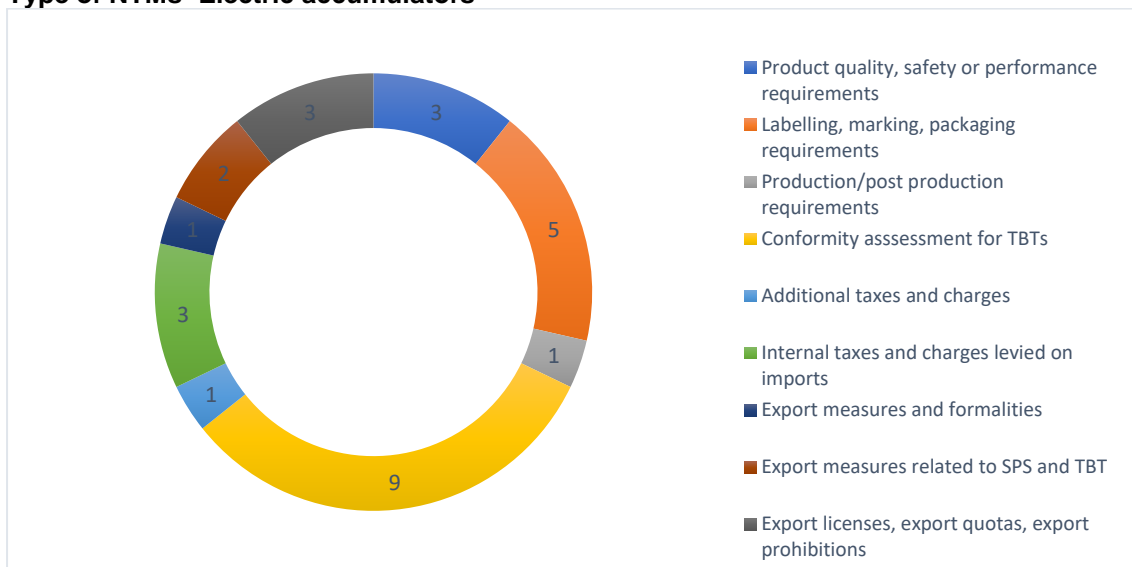
Type of NTMs – Lithium batteries and primary cells



Source: UNCTAD TRAINS database

Electric accumulators are most impacted by conformity assessment measures and labelling, marking, and packaging requirements, but also face numerous other types of NTMs.

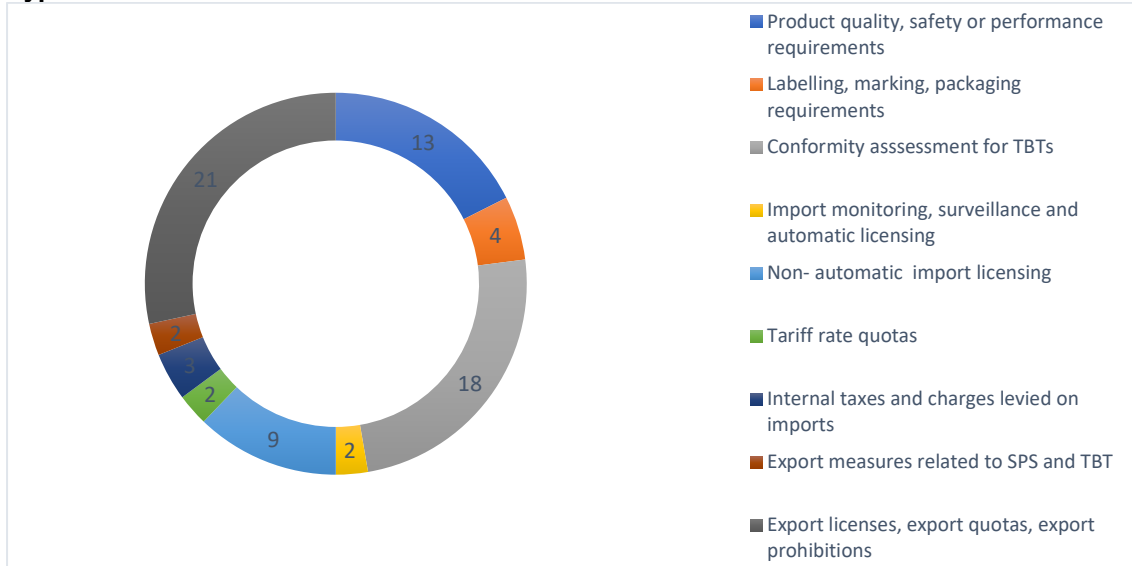
Type of NTMs- Electric accumulators



Source: UNCTAD TRAINS database

Electric vehicles are potentially affected by a greater range and number of NTMs than most other EGs assessed (except compressors and parts – see below). This includes predominantly export licences and quotas, conformity assessment measures and product quality, safety, and performance requirements.

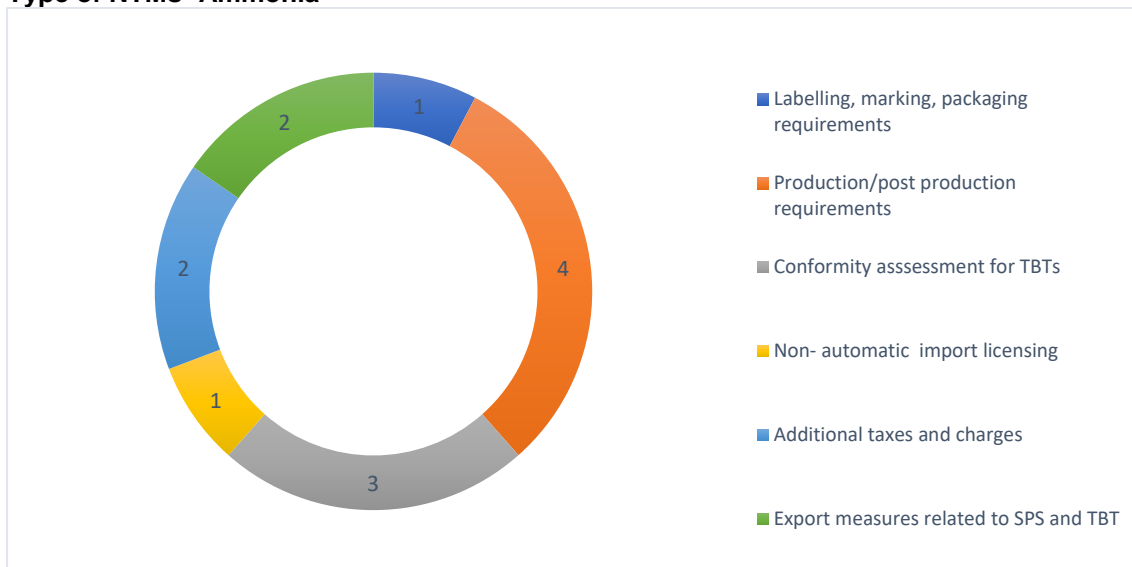
Type of NTMs- EVs



Source: UNCTAD TRAINS database

Ammonia, in contrast faces far fewer NTMs, mainly production and post-production requirements as well as conformity assessment measures.

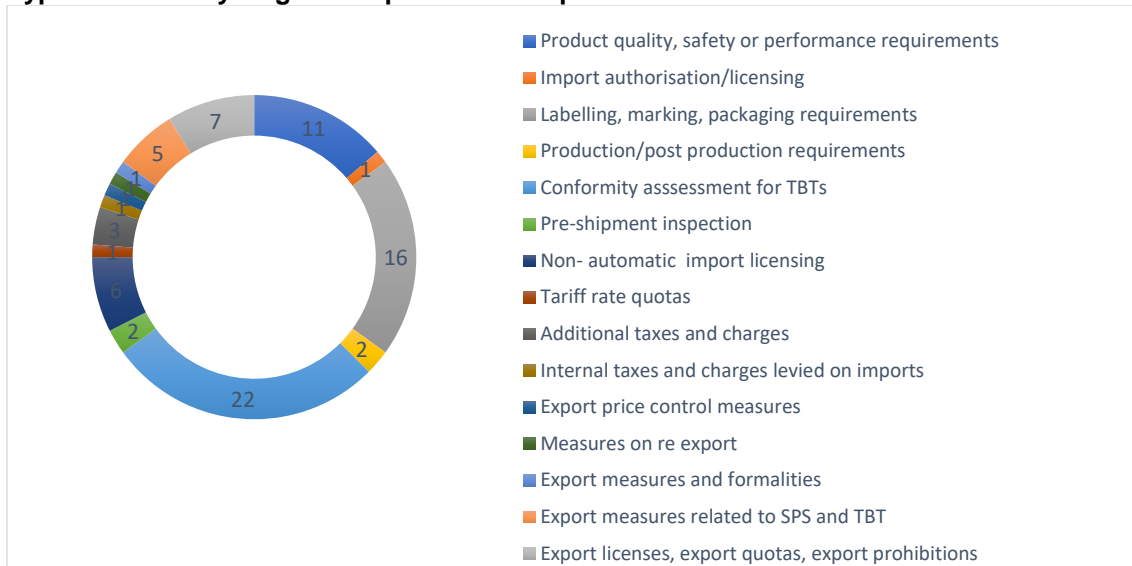
Type of NTMs- Ammonia



Source: UNCTAD TRAINS database

Compressors and parts are impacted by the widest range and largest number of measures. These include mainly product quality, safety, and performance requirements, labelling and packaging requirements, and conformity assessment measures.

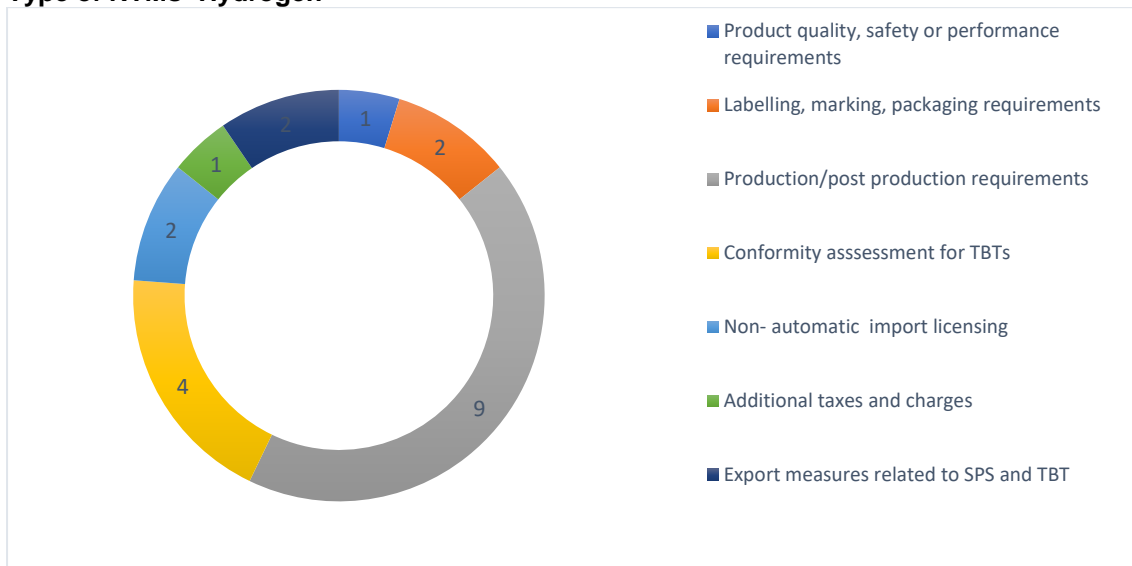
Type of NTMs- Hydrogen compressors and parts



Source: UNCTAD TRAINS database

Hydrogen exports must comply mainly with production and post-production requirements, as well as conformity assessment measures for TBTs.

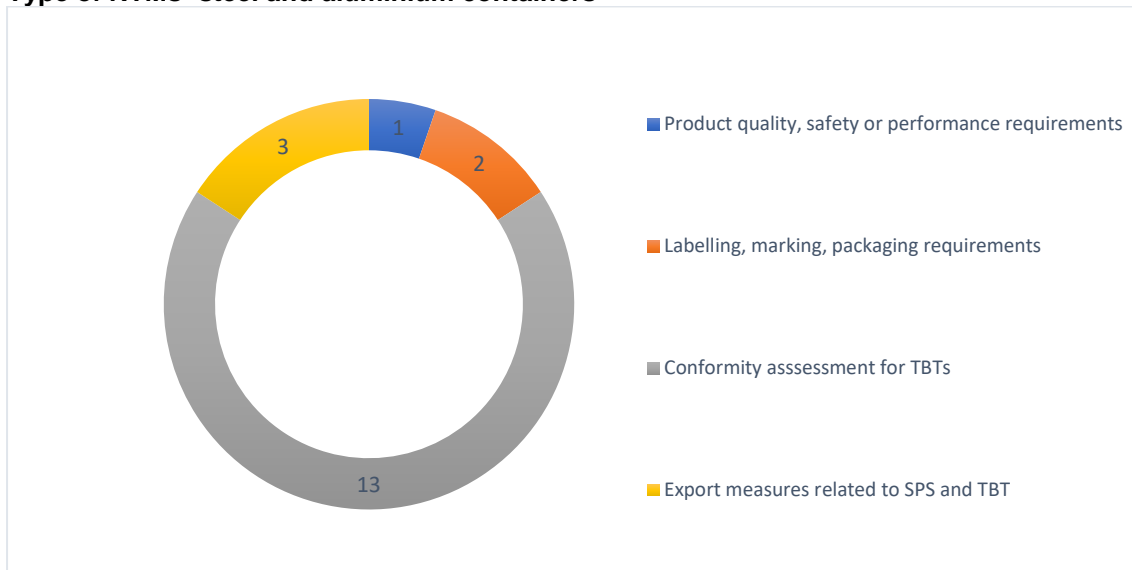
Type of NTMs- Hydrogen



Source: UNCTAD TRAINS database

Steel and aluminium containers predominantly face conformity assessment measures as well as export measures related to SPS and TBT controls.

Type of NTMs- steel and aluminium containers



Source: UNCTAD TRAINS database

Annex 5 – Consolidated list of EGs for possible consideration in an expanded list

(The list below includes both proposed ‘New-21’ goods from this report and additional goods as suggested by some APEC economies).⁷⁴

Product	Product Description	EX-OUT / ADDITIONAL Product Specification	REMARKS / ENVIRONMENTAL BENEFIT
RENEWABLE ENERGY SOURCES/CARRIERS			
Solar energy			
Photovoltaic system controller	A solar PV charge controller is an important part for a PV power system that charges batteries. The purpose of the controller is to ensure that the batteries are properly fed and therefore safe for long-term use – it prevents the battery from overcharging or over discharging. Controllers are used in both wind energy and PV systems. Small power systems that have wind and solar energy use hybrid controllers. Larger systems have their own controllers.		Controllers enable the integration of solar PV cells with battery storage. Storage is essential as electricity systems move toward 100% renewable energy in order to ensure supply and demand are matched at all times of day and night.
Wind energy			
Towers and lattice masts for wind turbines	Towers and masts form part of the infrastructure needed for wind turbines - they are the support structures which give them the suitable height to capture wind. Towers for large wind turbines may be either tubular steel towers, lattice towers, or concrete towers. Guyed tubular towers are used for small wind turbines. Lattice towers are manufactured using welded steel profiles.		Infrastructure needed for wind turbines. Wind turbines are essential in renewable energy based electricity generation, often being complementary to solar generation and in many locations the cheapest form of renewable energy generation.
Hydro			
Hydraulic turbines and water wheels (a power not exceeding 1,000 k)	Water turbines and turbine equipment for power generation are for generating electricity by utilising hydraulic power (a power not exceeding 1,000 k)		Water turbines and equipment are used for generating renewable electricity from hydraulic power
Hydraulic turbines and water wheels (a power exceeding 1,000 kW but not exceeding 10,000 kW)	Water turbines and turbine equipment for power generation are for generating electricity by utilising hydraulic power (a power exceeding 1,000 kW but not exceeding 10,000 kW)		Water turbines and equipment are used for generating renewable electricity from hydraulic power
Hydraulic turbines, water wheels (a power exceeding 10,000 kW)	Water turbines and turbine equipment for power generation are for generating electricity by utilising hydraulic power (a power exceeding 10,000 kW)		Water turbines and equipment are used for generating renewable electricity from hydraulic power
Parts of Hydraulic turbines, water wheels	Parts of water turbines and turbine equipment for power generation are for generating electricity using hydraulic power		Part of hydraulic turbines for generating renewable electricity from hydraulic power

⁷⁴ This consolidated list does not reflect all member economy views. A possible expanded list of EGs will be subject to APEC member consensus.

Hydrogen			
Hydrogen	Hydrogen can be produced as a gas or liquid or made part of other materials. It can be used to power fuel cells, to store electricity, or as a raw material in industrial processes. Hydrogen energy can be stored as a gas. When converted to a liquid it can be transported on trucks and in ships.	Possible ex-out may include hydrogen produced from fossil fuels	Hydrogen produced from renewable source can provide reduce the emissions and facilitate the transition to low emission economy. I can be used for seasonal storage of renewable energy, to power fuel cell vehicles, to decarbonise industrial processes such as steel making and to generate high-temperature heat.
Electrolyser system, Machines and apparatus for electroplating, electrolysis or electrophoresis	An electrolyser is a system that uses electricity to break water into hydrogen and oxygen (electrolysis). Through electrolysis, the electrolyser system creates hydrogen gas. The oxygen that's left over is released into the atmosphere or can be captured or stored to supply other industrial processes.	Possible ex-out may include electrolyser using electricity from grid that produces emissions	Electrolysers are currently the only commercial way to convert renewable energy into hydrogen (see benefits above). Hydrogen formed by electrolysis using electricity from fossil fuels, however, has high greenhouse emissions and is more polluting than directly burning the fossil fuels for energy.
Parts of electrolytic cell (frame for racking, electrode)	Parts of electrolytic cell that electrolyses water to purify hydrogen		Parts of electrolytic cell needed to convert renewable energy into hydrogen.
Hydrogen Compressor	A hydrogen compressor is a device that is used in a hydrogen gas generation unit to increase the pressure of hydrogen by reducing its volume resulting in compressed hydrogen or liquid hydrogen.	Possible ex-out may include compressing hydrogen produced from fossil fuel	Hydrogen has a low volumetric energy density at atmospheric pressure. To be commercially transported it requires compression, liquefaction, conversion to ammonia or a liquid organic hydrogen carrier.
Hydrogen Gas Compressor - Diaphragm	A hydrogen recycle diaphragm compressor is a reciprocating compressor that reciprocates in a cylinder to compress and transport gas. It is a part for a hydrogen compressor.		Part for the hydrogen compressor (see above).
Steel containers for compressed or liquefied gas	Containers form part of the hydrogen value chain. Compressed hydrogen must be stored in specially designed tanks capable of withstanding the storage pressures. These tanks are usually made of steel.	Possible ex-out may include storing hydrogen produced from fossil fuel	Part of hydrogen value chain, used for storage at site of production, transport, or distribution.
Aluminium containers for compressed or liquefied gas.	Containers for compressed hydrogen may be made of carbon fibre lined with aluminium, steel, or specific polymers when weight is a consideration.	Possible ex-out may include storing hydrogen produced from fossil fuel	Part of hydrogen value chain, used for storage at site of production, transport, or distribution.
Hydrogen dispenser	Hydrogen fuelling dispenser is the product that measures hydrogen gas accurately to fuel it to the fuel cell vehicle.		Part of hydrogen value chain that measures hydrogen gas and fuel it to the fuel cell vehicle.
Ammonia			
Ammonia, anhydrous or in aqueous solution	Ammonia is an input for fertilizers. It can be used to transport hydrogen and as a fuel itself, both for co-firing in coal power stations and as a shipping fuel.	Possible ex-out may include ammonia produced from fossil fuels	Ammonia is the foundation for fertilizers. If produced from renewables, it can have considerable environmental benefits. Also, one of the best

			ways to transport hydrogen and can be used as a green fuel itself, both for co-firing in thermal power stations and as a shipping fuel of the future.
Other steam-generating boilers (steam-generating boilers)	An ammonia fuelled steam generating boiler is a device that generates steam by heating water. It can be used to generate electric power with a steam turbine.		The boiler can run on renewable ammonia to generate steam.
Ammonia burner for combustion process	An ammonia burner is a device that heats an object by burning ammonia or a mixture of ammonia and other fuels, and is used in an industrial furnace, a gas turbine, and so on. Control of pollutants is necessary to minimise the impact to the environment.		
Ammonia fuelled gas turbine	An ammonia fuelled gas turbine is a device that converts the heat energy generated by the combustion of ammonia into kinetic energy using rotating blades, and is mainly used for power generation. Control of pollutants is necessary to minimize the impact to the environment.		
Ammonia compressor (liquid and gas)	An ammonia compressor is a device used to increase the pressure of ammonia in ammonia utilization and liquefaction equipment. There are three types of compressors: gas-to-gas, gas-to-liquid, and liquid-to-liquid. Proper material has to be used to avoid corrosion problem.		
Ammonia storage tank (liquid)	Ammonia storage tanks are used to store large quantities of ammonia in liquid form, at low temperatures and atmospheric pressure or atmospheric temperature and high pressure. Cryogenic tanks usually have a double shell structure for heat insulation. Proper material has to be used to avoid corrosion problem.		
Ammonia vaporizer	An ammonia vaporizer is a device that vaporizes ammonia in a liquid state by applying heat from outside. The heat source can be air, water, steam, waste heat of combustion, or a combination of these.		
Ammonia cracker	An ammonia cracker is a device that uses heat and a catalyst to decompose ammonia to obtain a mixture of hydrogen and nitrogen. Purification device also can be used to obtain pure hydrogen.		
ENERGY STORAGE AND INTEGRATION			
Cells and accumulators			
Primary cells and primary batteries, electric	A cell is the basic functional unit of a battery, which consists of a compilation of electrodes with active materials, electrolyte, containers, connections and usually separators.		Can store renewable electricity and reduce the need for power generation from fossil fuels by enabling renewable energy

	A primary cell or battery is one that can only be discharged once and cannot be recharged afterwards. These cells can store renewable electricity.		generated at times of excess to be used when demand exceeds generation.
Lithium cells and batteries (excl. spent)	A lithium-ion battery is a rechargeable battery used in portable electronics and EVs. Electrochemical cells power the battery – they consist of three major parts: a cathode and an anode separated physically but connected electrically by an electrolyte. Lithium-nickel-manganese-cobalt oxide is the most common composition for lithium ion batteries used in EVs, but lithium-nickel-cobalt-aluminium oxide is also used.		Can store renewable electricity and reduce the need for power generation from fossil fuels. Lithium-ion batteries are currently the dominant battery used in electric vehicles. Li-ion batteries are also used in a range of non-EGs; hence it may be appropriate to add an ex-out to limit to those batteries specifically designed to support renewable energy use.
Electric accumulators, lead-acid	Lead acid batteries are the most commonly used type of rechargeable battery in photovoltaic systems, used as a storage device. The main components/parts of a lead/acid accumulator include a metallic Pb alloyed with Sb and/or Ca; an electrolyte; and plastic materials to form separator and case.		Energy storage device use to enable higher proportion of renewable energy in electricity systems.
Nickel-iron electric accumulators	Nickel-iron electric accumulators are storage/rechargeable batteries with nickel oxide cathode and an iron anode with an electrolyte of potassium hydroxide. The active materials are held in nickel-plated steel tubes or perforated pockets. They can be used as an energy storage device		Energy storage device use to enable higher proportion of renewable energy in electricity systems.
Nickel metal hydride accumulators	Nickel metal hydride accumulators are secondary batteries that use a nickel oxide for the positive electrode, hydrogen or a hydrogen compound for the negative electrode, and an alkaline solution for the electrolyte.		Energy storage device use to enable higher proportion of renewable energy in electricity systems.
Lithium-ion accumulators	Lithium-ion accumulators are batteries that use lithium metal oxide for the positive electrode, and that have a higher energy density than other storage batteries, making them compact and lightweight.		Can store renewable electricity and reduce the need for power generation from fossil fuels. Lithium-ion batteries are currently the dominant battery used in electric vehicles.
Other accumulators	Other accumulators include secondary rechargeable batteries, used as energy storage devices.		Energy storage device
Parts of accumulators	Parts of accumulators		Parts of accumulators needed for energy storage
Cell recycling			
Waste and scrap of primary cells, primary batteries and electric accumulators	Spent primary cells, spent primary batteries and spent electric accumulators		Recycling of waste and scrap of primary cells, batteries and electric accumulators can help to conserve mineral resources, including metals that are non-renewable finite resources.
TRANSPORT AND OTHER END USE			

Heat pump	A heat pump is a facility that collects heat from a low-temperature heat source and sends it to a high-temperature heat source with little energy.		
Electric vehicles			
Vehicles; with only electric motor for propulsion	Battery Electric vehicles (EVs) are vehicles running on electric motor with zero tailpipe emissions. This includes battery electric vehicles and (hydrogen) and fuel cell electric vehicles for road and rail, surface and underwater vessels.		Vehicles running on electric motor with zero tailpipe emissions. This includes battery electric vehicles and (hydrogen) fuel cell electric vehicles.
Plug-in Hybrid Electric Vehicle	Plug -in Hybrid Electric Vehicles (PHEVs) are vehicles running with both an electric motor and an internal combustion engine, capable of being charged by plugging in to an external source of electric power. PHEVs can be used in an area with insufficient charging infrastructure utilizing internal combustion engines.	As a transition good, preferential liberalisation should be reviewed by 2030 to ensure continued compliance with EG selection criteria.	PHEVs can significantly lower the emissions from short-distance travel in the urban area. By overcoming range anxiety they can increase uptake and help achieve scale economies for charging infrastructure, increasing the uptake of EVs. They offer efficient use of supply-constrained battery materials.
Public transport vehicles (carries 10 or more persons, including driver), with only electric motor for propulsion	Vehicles for public transport, running on electric motor with zero tailpipe emissions, as above.		Vehicle running on electric motor with zero tailpipe emissions
Other components for electric battery vehicles	Most battery EV infrastructure is comprised of generic components that are part of general electricity infrastructure or included in the category for Energy Storage and Integration. Charging connectors and adaptors are two of the only components whose use is restricted to charging EVs.		Charging connectors and adaptors are key elements of charging stations to support the adoption of EVs.
Hydrogen internal combustion engine vehicles			
Hydrogen internal combustion engines - Spark-ignition reciprocating or rotary internal combustion piston engines	Vehicles running on hydrogen with zero tailpipe emissions. In the case of hydrogen combustion, liquid or gaseous hydrogen is burned in a modified gas-turbine engine to generate thrust. This process is identical to traditional internal combustion, except hydrogen replaces its fossil fuel counterpart. Fuel Cell Vehicles are zero-emission vehicles – they produce no tailpipe pollution except water vapor.		Vehicle running on hydrogen with zero tailpipe emissions
Parts suitable for use solely or principally with hydrogen engines above	Parts for Hydrogen internal combustion engines		Parts for Hydrogen internal combustion engines
Hydrogen fuel cell vehicles			
Fuel cells	A fuel cell is a device that generates electricity through an electrochemical reaction, not combustion. In a fuel		There are no emissions associated with electricity generation with fuel cells

	cell, hydrogen and oxygen are combined to generate electricity, heat, and water.		
Fuel cells – parts	A fuel cell is composed of several parts - an anode, cathode, and an electrolyte membrane. A typical fuel cell works by passing hydrogen through the anode of a fuel cell and oxygen through the cathode.		Parts for Fuel cells
Carbon Capture and Storage			
Carbon dioxide Scrubber	Machinery; for filtering or purifying gases, other than intake air filters for internal combustion engines		Can be used for carbon capture
Demister	The demister is a separation accelerator that makes the separation and recovery of impurities contained in liquids or gases more effective.		Can be used for carbon capture
MEA solvent	Primary amine for CO ₂ capture with chemical absorption technology		Primary amine for carbon capture
MDEA solvent	amine for MDEA based chemical absorption technology for CO ₂ capture		amine used for chemical absorption technology for carbon capture
CO₂ Membrane	Part for CO ₂ capture based on cryogenic and Membrane technology		Part for carbon capture process
CO₂ Absorber Tower	Part for the CO ₂ Capture unit		Part for the CO ₂ Capture unit
Amine Stripper Tower	Part for the CO ₂ Capture unit		Part for the CO ₂ Capture unit
CO₂ Compressor	Part for the CO ₂ Compression and Dehydration unit		Part for the CO ₂ Compression and Dehydration unit
CO₂ Dehydration unit	Part for the CO ₂ Compression and Dehydration unit		Part for the CO ₂ Compression and Dehydration unit
CO₂ pump	Part for the CO ₂ Compression and Dehydration unit		Part for the CO ₂ Compression and Dehydration unit

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CPTPP Article 2.13: Transparency in Export Licensing Procedures

RCEP Article 2.17: General Elimination of Quantitative Restrictions

USMCA Article 2.11 Import and export restrictions; Article 2.14: Transparency in Export Licensing Procedures; Article 2.15: Export Duties, Taxes, or Other Charges

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