APEC POLICY GUIDANCE TO DEVELOP AND IMPLEMENT CLEAN AND LOW-CARBON HYDROGEN POLICY FRAMEWORKS IN THE ASIA-PACIFIC

1. Introduction

Clean and low-carbon hydrogen is being recognized as one of the key energy vectors that contributes to efforts to clean energy transition and climate change mitigation. Clean and low-carbon hydrogen clearly stands out as a prominent tool to decarbonize a range of economic activities.

The APEC Region is at the forefront of the hydrogen industry's expansion, customizing strategies, roadmaps, and regulations to fit the specific requirements of each economy. Economies are promoting clean and low-carbon hydrogen and its derivatives such as ammonia, e-fuels and e-methane, as a cross-cutting energy vector through new policies, supporting the deployment of multiple projects in the region. Therefore, APEC assumes a leading role in the hydrogen industry's growth due to high consumer/producer concentration and numerous projects planned in the region.

However, the clean and low-carbon hydrogen industry is still in its early stages. Therefore, it will require specific industrial policies. Also, coordination among regulators, standards bodies, and industries in further developing a common approach and understanding towards clean and low-carbon hydrogen will be critical.

There is a growing global interest in expanding clean and low-carbon hydrogen's role in the energy transition. We note that the current policy framework does not sufficiently facilitate support for the adoption of clean and low-carbon hydrogen in most APEC economies. Moreover, in many

cases public investments in both production and end uses have been insufficient and fragmented.

In this line, APEC supports the development and implementation of clean and low-carbon hydrogen frameworks, and its derivatives in the Asia-Pacific through this APEC Policy Guidance (the Policy Guidance) that provides orientation on key areas and actions to facilitate knowledge, technological and policy exchanges among member economies, while supporting innovative, inclusive and sustainable growth. It builds on previous APEC´s work and initiatives related to the development of clean and low-carbon hydrogen.

The overarching objective of the Policy Guidance is to support the commitment "to adopt renewable energy and other environmentally sound technologies, as part of sustainable energy transitions that reduce our dependence on fossil fuels"[1], while working together to support energy resilience, access, and security in the region, in consistency with the APEC Putrajaya Vision 2040 and the Aotearoa Plan of Action.

2. The Policy Guidance

APEC economies have recognized the importance of clean and low-carbon hydrogen, including its derivatives, in reducing greenhouse gas emissions, decarbonizing economic activities and propelling energy transitions across sectors, in particular in hard-to-abate sectors.

For APEC economies, "hydrogen has become a key alternative energy vector to decarbonize various sectors such as transportation, chemicals, power, etc. While the transition to clean hydrogen is underway, it is not yet competitive enough to be scaled up and is facing many challenges such as

[1] 2021 APEC Leaders Declaration

cost reduction, transport and storage option availability, and safety concerns”[2].

In this context, APEC economies acknowledge that it is a timely opportunity to address the development of clean and low-carbon hydrogen, including its derivatives, in the Asia-Pacific region in a concerted manner, concomitant to the work that is being carried out in other cross regional and global bodies and as a contribution to achieve a meaningful and practical energy transition.

This Policy Guidance is a living document that will advise APEC working groups on potential areas of cooperation to further promote the coherent development of a clean and low-carbon hydrogen ecosystem in the region.

3. Key areas

Acknowledging the variety of economic and social circumstances across APEC economies while recognizing the cross-cutting nature of clean and low-carbon hydrogen in supporting energy transition, APEC economies will concentrate, but not limit, their work on the following key areas, in line with different domestic circumstances:

3.1 Standards and certification

- Definitions
- Interoperability
- Emissions accounting
- Safety

[2] Assessing Existing and Planned Hydrogen Infrastructure to Facilitate Widespread hydrogen Use in the APEC Region-Final Report, page 8. Energy Working Group. October 2023.

3.2 Value Chain

- Sustainable market growth
- Supply chains
- Infrastructure

3.3 Research and innovation

- Capacity building
- Skills development
- Technology development, deployment and voluntary transfer on mutually agreed terms

3.4 Finance and investment

- Financing schemes
- De-risking environments
- Collaboration with international institutions
- Clean and low-carbon projects related to hydrogen and its derivatives

3.5. Public and social awareness

- Engagement with relevant stakeholders
- Access to and use of natural resources (land, water)
- Affordability of clean and low-carbon hydrogen and its derivatives

4. Starting points

For the purpose of implementing the Policy Guidance, the following starting points should be taken into account:

4.1 Focus of the Policy Guidance

The Policy Guidance will be focused in promoting clean and low-carbon hydrogen based on the carbon intensity and lifecycle emissions.

4.2 Alignment with APEC´s energy targets

In everything that is pertinent, the implementation of the policy guidance will support the achievement of the APEC energy goals for doubling renewable energy from 2010 levels by 2030 and reducing energy intensity 45 percent from 2005 levels by 2035.

4.3 Coherence

The promotion of coherence and cooperation of regulatory approaches affecting the development of clean and low-carbon hydrogen will be supported, in order to promote mutual understanding and strengthen cooperation in approaches to regulation, including international and technical standards, while respecting each economy’s choice of policies which are consistent with domestic circumstances and legal obligations.

4.4 Inclusiveness

The Policy Guidance will support as necessary APEC´s work of integrating all sectors of society and relevant stakeholders in all our efforts to achieve a clean, sustainable, affordable, inclusive and just energy transition and a quality economic growth. Local environmental impacts, including energy and water supply, and social factors like job creation, and community involvement should be considered.

4.5 Strategic actions

Each economy should encourage the design of plans outlining the integration of hydrogen into the energy mix and should be based on the

optimal use of its resources and without affecting its energy security, for instance with policies and measures for production capacity, infrastructure, and market integration. These plans should include intermediate and long-term policies and measures for reducing carbon emissions, increasing energy security, and fostering economic growth. Promoting clean and low-carbon hydrogen derivatives and funding related projects is also important to increase hydrogen demand.

APEC economies will respectively work with relevant stakeholders to identify and prioritize hydrogen projects based on their own policies and priorities that can be implemented in the short term in the industry while emphasizing the importance of public-private partnerships in driving innovation and investment in the hydrogen sector.

A dedicated platform to facilitate collaboration between APEC governments, industry stakeholders, research institutions, and financial entities to accelerate the development of clean and low-carbon hydrogen will be created, in collaboration with the Asia Pacific Energy Research Centre (APERC), the APEC Sustainable Energy Center (APSEC), and the Energy Working Group´s expert bodies, to promote contributions and collaborative efforts through research, technology development, deployment and voluntary transfer on mutually agreed terms, and strategic initiatives that can enhance the development and implementation of clean and low-carbon hydrogen projects in the Asia-Pacific region, taking into account the key areas outlined by this policy guidance.

4.6 Cross fora and cross regional collaboration

The implementation of the Policy Guidance will promote APEC´s cross fora collaboration, with the Energy Working Group as the main APEC body to harmonize this collaboration in order to avoid duplication or

unnecessary overlaps. Similarly, the Energy Working Group will be in charge to coordinate collaboration with other regional and global organizations that are also working in the development of clean and low-carbon hydrogen.

5. Implementation

The implementation of the policy guidance will build on previous and ongoing work and progress achieved so far in different regions and organizations. It will add to the implementation of international and cross-regional commitments that are consistent to the objectives of this instrument.

The Energy Working Group will have the overall responsibility for monitoring and evaluating progress on the implementation and development of this Policy Guidance, including the above-mentioned Key Areas, in close collaboration with relevant fora and sub fora. The Energy Working Group will report periodically to APEC Energy Ministers and to Senior Officials within the Steering Committee on ECOTECH and to APEC Energy Ministers on progress and seek further guidance, given the evolving nature of the clean and low-carbon hydrogen ecosystem.

The Expert Group on Clean Fossil Fuel Energy (EGCFE) together with the Expert Group on New and Renewable Energy Technologies (EGNRET) will have the responsibility for the implementation of the Policy Guidance at the technical level and based on the key areas and elements already identified in this framework. For this purpose, both expert groups will decide on the best way to operationalize the implementation and follow up of this Policy Guidance.

APEC 發展暨落實亞太地區潔淨及低碳氫能政策框架之政策指引

1. 前言

潔淨及低碳氫能係經認可為推動潔淨能源轉型和減緩氣候變遷工作的關鍵能源之一，並脫穎而出成為實現一系列經濟活動去碳的重要選項。

APEC 區域處於氫能產業擴展的前哨站，經濟體依據其各自需求制定相關策略、路線圖和法規，透過新政策支持區域多項計畫的部署，推動潔淨低碳氫能及其衍生物作為跨領域能源，如氨（ammonia）、電力衍生燃料（e-fuels）和電力衍生甲烷（e-methane）。因此，APEC 氫能產業得以在區域消費者/生產者的高度集中和眾多計畫茁壯中，擔任領導者的角色。

然而，潔淨及低碳氫能產業發展仍處於早期階段，因此其需要具體的產業政策。同時，監管機構、標準機構和產業之間的協調，進一步對潔淨及低碳氫能發展出一個共同方法和理解，亦至關重要。

全球對擴大潔淨及低碳氫能在能源轉型中角色的興趣日益增長。我們注意到，大多數 APEC 經濟體未能充分支持將潔淨及低碳氫能納入其現有政策框架。此外，在許多情況下，對生產和最終用途的公共投資也顯得不足且零散。

準此，APEC 透過本「APEC 政策指引」，（以下簡稱「政策指引」），支持亞太地區潔淨及低碳氫能及其衍生物框架之發展與落實，為重點領域和行動提供指引，以促進會員體之間的知識、技術和政策交流，同時支持創新、包容和永續成長。該政策指引係建立在 APEC 先前有關潔淨及低碳氫能發展的相關工作和倡議之上。

本政策指引整體目標係支持「採用再生能源和其他環保技術，作為永續能源轉型的一部分，以減少對化石燃料依賴」[3]的承諾，並支持

[3] 2021 年 APEC 領袖宣言（2021 APEC Leaders Declaration）。

區域能源韌性、途徑及安全，與「太子城願景 2040 （APEC Putrajaya Vision 2040）」和「奧特亞羅瓦行動計畫」（Aotearoa Plan of Action）一致。

2. 政策指引

APEC 經濟體認知到潔淨及低碳氫能（包括其衍生物）在減少溫室氣體排放，實現經濟活動去碳，以及推動跨部門（特別是難以減排的部門）能源轉型中的重要性。

對於 APEC 經濟體來說，「氫能已成為實現運輸、化學工業及發電等不同部門去碳的重要替代能源選項。儘管潔淨氫能轉型刻正進行中，然其競爭力尚不足以大規模推廣，並面臨諸多挑戰，如降低成本、運輸和儲存選項的可行性以及安全問題。」[4]

在此背景下， APEC 經濟體認識到，這是一個亞太區域潔淨及低碳氫能（包括其衍生物）及時協調發展的機會，與其他跨區域及全球性機構執行中的工作一致，並可為實現切實可行的能源轉型作出貢獻。

本政策指引係一份與時俱進的活文件，其將為 APEC 工作小組就潛在合作領域提供建議，以進一步促進區域潔淨及低碳氫能生態系統的協調發展。

3. 重點領域

鑒於 APEC 經濟體各自經濟和社會情勢，同時認識到潔淨及低碳氫能在支持能源轉型中的跨領域特性，APEC 經濟體將集中（但不限於）在以下重點領域工作，並可視各自內部情況進行調整。

3.1 標準與認證

- 定義

[4] APEC 計畫「評估現有與已計畫的氫能基礎建設以促進 APEC 區域氫能廣泛使用（Assessing Existing and Planned Hydrogen Infrastructure to Facilitate Widespread hydrogen Use in the APEC Region project）」結案報告，第 8 頁，能源工作組（Energy Working Group），2023 年 10 月。

- 互通性
- 排放計算
- 安全性

3.2 價值鏈

- 永續市場成長
- 供應鏈
- 基礎建設

3.3 研究與創新

- 能力建構
- 技能發展
- 技術開發、部署，及根據共同商定條件進行的自願性技術移轉

3.4 金融與投資

- 融資方案
- 去風險環境
- 國際機構合作
- 氫能及其衍生物相關潔淨及低碳氫能計畫

3.5 大眾和社會意識

- 與相關利害關係人互動
- 獲取和使用自然資源（土地、水）
- 潔淨及低碳氫能及其衍生物的可負擔性

4. 指引要點

為落實本政策指引，應將下列要點納入考量：

4.1 重點

本政策指引之重點在於促進基於碳密度和生命週期排之潔淨及低碳氫能。

4.2 與 APEC 能源目標一致

在所有相關方面，政策指引之落實支持實現 APEC 能源目標，即 2030 年再生能源佔比較 2010 年水準增加一倍，以及 2035 年能源強度從 2005 年的水準降低 45%。

4.3 一致性

為促進相互理解和強化法規途徑合作，包括國際和技術標準，同時尊重與個別經濟體內部情勢與法律義務相符之政策選擇，將支持促進影響潔淨及低碳氫發展規範途徑的一致性與合作。

4.4 包容性

本政策指引將在必要時全力支持 APEC 整合社會各部門和相關利害關係人的工作，以實現潔淨、永續、可負擔、包容和公正的能源轉型及高品質經濟成長。此外，應將地方環境影響，包括能源和水資源供給，以及社會因素如創造就業機會和社區參與，納入考量。

4.5 策略行動

各經濟體應鼓勵制定將氫能納入能源組合的計畫，並應基於其資源最佳利用，且不影響其能源安全，例如制定生產量能、基礎建設和市場整合的政策和措施。這些計劃應包括中期和長期的政策和措施，以減少碳排放、提高能源安全並促進經濟成長。推廣潔淨及低碳氫能衍生物和資助相關計畫對增加氫能需求亦是相當重要的。

APEC 經濟體將各自與相關利害關係人合作，依據各自政策和優先事項確定和優先考慮可在短期內落實的產業氫能計畫，並強調公私夥伴關係在推動氫能部門創新與投資方面的重要性。

為加速潔淨及低碳氫能之發展，應建立一個專門的平台，以促進 APEC 政府們、產業利害關係人、研究機構和金融機構之間的合作。該平台將與亞太能源研究中心（Asia Pacific Energy Research Centre, APERC）、亞太永續能源中心（APEC Sustainable Energy Center, APSEC）以及能源工作組的專家小組合作，並考量本政策指引提及之重點領域，透過研究、技術開發、部署、根據共同商定條件進行的自願性技術移轉，及提升亞太區域潔淨及低碳氫能計畫發展和落實的戰略倡議，促進貢獻與合作努力。

4.6 跨論壇與跨區域合作

本政策指引之落實將促進 APEC 跨論壇合作，其中能源工作組（Energy Working Group）將作為主要的 APEC 機構協調相關合作，以避免重複或不必要之重疊。同樣地，能源工作組也將負責協調與其他正在發展潔淨及低碳氫能的區域和全球性組織之合作。

5. 執行

本政策指引之執行將建立在不同區域和組織過往已達成和進行中的工作與進展之上，其將有助於與本文件目標一致的國際及跨區域性承諾之履行。

能源工作組將全面負責監督和評估該政策指引之落實及發展情況，包括上述重點領域，並與相關論壇及子論壇密切合作。能源工作組將定期向 APEC 能源部長們及經濟暨技術合作指導委員會（Steering Committee on ECOTECH）的資深官員們報告進展，並根據潔淨及低碳氫能生態系統的發展需求，尋求進一步指示。

潔淨化石燃料專家小組（Expert Group on Clean Fossil Fuel Energy, EGCFE）偕同新及再生能源技術專家小組（Expert Group on New and Renewable Energy Technologies, EGNRET）將依據本框架確認之重點領域和要點，負責在技術層面上落實該政策指引。為此，兩個專家小組將決定執行該政策指引之最佳方式並追蹤其後續發展。