

Asia-Pacific



| Pakistan: NEECA and ADB collaborate for renewable hydrogen deployment study

By [Rob Cockerill](#) on Jan 12, 2021 | [Translate](#) ▼

[NEWS](#)

Hydrogen holds hope for many nations as they seek to implement the Paris Agreement and its decarbonisation targets. Pakistan has recognised the potential also. There are several properties that make hydrogen an excellent energy vector and its deployment is complimentary to an energy mix that is high in renewables.

Generation of electrical power from renewable sources such as wind, solar and hydro schemes is subject to weather patterns, daily sunlight profiles and seasonal rainfall. However, the demand pattern for electricity consumption follows different daily and annual cycles. Hydrogen can be combined synergistically with these renewable power sources to bridge the gaps between supply and demand.

Hydrogen is a clean burning fuel with zero carbon dioxide emissions. When it is produced from renewable power it can contribute both to improvements in ambient air quality and a reduction in greenhouse gas (GHG) emissions. When used on power generation plants to substitute coal, oil or natural gas there is the opportunity to decarbonise electricity generation and re-life existing assets.

For heating, cooking and CNG mobility applications, hydrogen can be ad-mixed into the existing natural gas distribution pipelines to reduce pollutant gas emissions from these applications. With a transition to fuel cell vehicles, hydrogen for transportation applications on urban trains, heavy trucks and buses can reduce pollution in Pakistan's major cities such as Karachi and Lahore, each of which is home to more than 10 million people.

With abundant potential for wind, solar and hydroelectric power generation, Pakistan can also look forward to 'energy-autonomy' through the conversion of renewables to green hydrogen on electrolyzers. Perhaps Pakistan can transition from being a net energy importer to becoming an exporter of green hydrogen or derivatives such as ammonia or methanol.

With all these potential benefits, hydrogen is getting much attention from the power and energy departments within the Government of Pakistan's administration.



Pre-feasibility study with NEECA and ADB

The vision of the Asian Development Bank (ADB) is *a prosperous, inclusive, resilient, and sustainable APAC region*.

Its work focuses on *economic and social development while sustaining efforts to eradicate extreme poverty* in the region. Beyond these aspirations, ADB also recognises the UN Sustainable Development Goals (SDGs).

Hydrogen deployment in Pakistan’s energy mix directly impacts SDG 7 (‘Affordable and clean energy’) and SDG 13 (‘Climate action’).

There are three significant hydrogen projects that are being sponsored by ADB at present. Firstly, the creation of the ADB hydrogen energy handbook. It will characterise the potential role for hydrogen within the APAC region. Relevant technologies, products, business models, challenges and risks will be explained.

DOHMEYER
CRYOGENIC • FREEZING • PRECISION

“...it became clear that Pakistan has an ideal mix of renewable power potential and an established infrastructure to be a pilot country within the region for a pre-feasibility study into the deployment of renewable hydrogen”

A study into the establishment of a hydrogen trading market is also underway. This will consider the need for a hydrogen trading hub, viable pricing mechanisms and potential. Lastly, ADB is engaged with Pakistan’s National Energy Efficiency and Conservation Authority (NEECA) to conduct a pre-feasibility study into the deployment of renewable hydrogen energy in Pakistan.

Dr. Sardar Mohazzam, the Managing Director of NEECA, explains the background to the study, “In recent months, ADB organised several meetings to enable the member nations of ADB in the APAC region to share thoughts on hydrogen deployment and learn from the experience of member nations outside of the APAC region.”

“Through those discussions it became clear that Pakistan has an ideal mix of renewable power potential and an established infrastructure to be a pilot country within the region for a pre-feasibility study into the deployment of renewable hydrogen. We also have the social and economic motivation to transition our energy mix and we have the engagement of many government stakeholders to execute the study and work on its recommendations. These factors led to the decision to undertake this study in Pakistan as a beacon for the APAC region.”

Dr. Mohazzam continues to say that, “support for the study has been coordinated by the Sustainable Development and Climate Change Energy Sector Group at ADB.”



Mandaluyong City Metro Manila Philippines, Asian Development Bank, ADB

ADB supports public and private sector investments in the APAC region with advice and financial backing. “The initial pre-feasibility phase of this project will advise NEECA on the most beneficial deployment options for renewable hydrogen,” Dr. Mohazzam adds. “In later stages, we hope that some of the proposals will flow through to pilot projects and full-scale implementation over the next decade. Perhaps ADB and other institutions will help some of the proposals to become reality with the appropriate financial support.”

National priorities and infrastructure call for local deployment focus

At the outset of the collaboration between NEECA and ADB, terms of reference were drafted. They confirmed three energy-related priorities for the renewable hydrogen deployment pre-feasibility study and laid out additional benefits.

The top three energy-related priorities for hydrogen deployment in Pakistan are:

- National energy autonomy – ‘home-grown’ energy, based on renewables
- Continuous power and energy security though seasonal supply and demand fluctuations
- Clean and affordable energy, in line with UN SDG 7

Additional desirable benefits include:

- Support the Paris Agreement and the Government of Pakistan’s vision to achieve carbon neutrality
- Provide pollution-free energy
- Enable an export revenue stream based on clean energy
- Leverage existing energy infrastructure such as the existing electrical power generation and distribution network and the natural gas pipeline infrastructure.

To investigate how hydrogen can contribute to these goals, ADB enlisted the support of Stephen B. Harrison as an international hydrogen energy consultant. Additional local experts were also appointed to support the project with their experience of energy systems, regulations, and financial structures in Pakistan. Their local presence also enables

networking with relevant stakeholders in Pakistan to prepare the ground for project implementation.

Regular readers of **gasworld** might be familiar with Harrison's work in industrial gases and hydrogen through numerous articles that he has written for our magazine and his thought leadership contributions as a member of the **gasworld** Editorial Advisory Board.

"I must admit that towards the end of 2020 I was suffering from hydrogen strategy fatigue," says Harrison. "We saw the emergence of EU, German and Bavarian hydrogen strategies within the space of one month. Many other countries also published their national papers on the topic. Whether they were labelled hydrogen roadmaps, strategies, or policies – the intent was the same. I began to wonder if we really needed so many papers at a national or regional level."

"Then, in October I was engaged by ADB to work on the Pakistan renewable hydrogen deployment pre-feasibility study. Within the first few days of working on the project, understanding the needs of the stakeholders, and researching the existing situation in Pakistan, it became 100% clear to me that, yes, we absolutely do need local and national hydrogen strategies."

"Hydrogen is simply hydrogen – it does the same things in Pakistan as it does in Germany, yes that is clear. And it can support a decarbonised future, yes, also clear," he explains. "But, even if the long-term vision is the same and the physical properties of hydrogen are universal, each nation is starting from a different place, has specific priorities and local resources. I am convinced that we must take a local view of hydrogen deployment."



Hydroelectric power is abundantly available in Pakistan

Turning priorities and potential into projects

The geography and geology in Pakistan are unique. The same can be said for every nation. In the north of the country, mountainous regions adjacent to the Himalaya have deep rocky valleys which are ideal for hydro-electric power generation. In the south, there is a long coastline with a shallow continental shelf which is ideal for offshore wind power generation.

In parts of the desert in the west of the country, the sunshine profile has the potential for large-scale, low-cost solar projects – like those announced in Saudi Arabian and Australian desert regions. These attributes govern the potential for renewable power generation.

In the north east of Pakistan there is a large underground salt formation that could potentially be used to create large caverns for long-term storage of vast quantities of hydrogen. Salt formations like this exist in the North Sea and the south east and south west of the US – but they are not common. The costs of using hydrogen as a long-term energy storage medium in this way are much less than other technologies such as batteries. There is the potential to use hydrogen energy storage in salt caverns to smooth the seasonal imbalances between power generation and demand.

Throughout Pakistan there is an established natural gas distribution pipeline network that has been built to transport locally produced natural gas from the wells to demand centres. It is also used to move imported LNG around the country.

This mixture of national energy priorities, natural resources and established infrastructure is the foundation upon which Pakistan's renewable hydrogen deployment pre-feasibility study will be based.
