What do potential partner countries think about P2X?

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Overview of the Bilateral Energy Partnership Program

- **Commissioned by**: German Federal Ministry for Economic Affairs and Energy (BMWi)
- **Lead executing agency**: Energy ministries in participating partner countries
- **Energy Partnerships implemented by GIZ**:
  - Algeria (since 2015)
  - Brazil (since 2017)
  - Chile (since 2019)
  - China (since 2007)
  - India (since 2006)
  - Jordan (since 2019)
  - Mexico (since 2016)
  - Morocco (since 2012)
  - South Africa (since 2013)
  - Tunisia (since 2012)

  **Energy Dialogues**:
  - Iran (since 2017)
Fields of activity and inputs

- **Intergovernmental dialogue** on energy policy with partner countries, including contributions from multilateral actors
- **Advice** on policy for the global energy transition
- **Cooperation** with the private sector, academia and civil society actors
- Facilitating **mutual knowledge transfer** on current energy policy issues
- **Communication and knowledge management** in relation to the energy transition
Informal survey among EP secretariats in selected countries in September 2019

Survey questions

1. How is P2X perceived and discussed politically and technologically in the country?
2. Does a P2X strategy already exist (in particular concerning P2G and P2L) in the country?
3. Is P2X actively supported by the government or is it driven by the private sector?
4. Does the country already consider sustainability criteria (land and water use, environmental impacts...)?
5. Does the country focus on the local market or does it already consider exports?
6. Are first P2X projects implemented in the country?
7. How strong is the company landscape in this field in the country?
8. What support can be offered by Germany to develop a P2X market in the country?
How is P2X perceived and discussed politically and technologically in the country?

- **Tunisia**: P2X is not a subject of discussion in Tunisia yet.
- **Brazil**: P2X has been widely discussed during the 2000s but nowadays it isn’t.
- **Algeria**: P2X is currently not being discussed on a political level, but partners are showing interest in the topic raised by the Energy Partnership.
- **India**: In the Integrated Energy Policy emphasis is put on utilizing natural gas for electricity production, but natural gas cannot commercially compete with domestic coal.
- **China**: The “Action Plan for RE-Integration 2018-2020” considers P2X as one solution and promotes exploring different approaches of P2X.
- **Chile**: For the government, P2X, is key to reaching carbon neutrality.
- **Morocco**: A roadmap is currently developed by the newly established P2X Committee.
- **South Africa**: Huge potential for a “hydrogen economy” due to South Africa’s vast Platinum Group Metal reserves (70% of world reserves).

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For the government, P2X, is key to reaching carbon neutrality.
Does a P2X strategy already exist (in particular concerning P2G and P2L) in the country?

- **India**
  - Ministry of New and Renewable Energy (MNRE) operates the "Chemical Sources of Energy Program" with the aim of developing hydrogen technology "Made in India".

- **China**
  - There is a technological roadmap for FCV, a white paper and a blue paper on hydrogen but not Power-to-hydrogen in particular.

- **South Africa**
  - South Africa produces 30% of its fuel by Coal to Liquid

- **Morocco**
  - A roadmap should be presented in the course of next year.

- **Chile**
  - A strategy is being developed.

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No.

No, but…

Yes…
Is P2X actively supported by the government or is it driven by the private sector?

- Algeria: One private company (Linde Gas) is exploring the technology at small scale.
- China: P2X (heating, cooling, hydrogen) is supported by the government and driven by SOEs and big private companies.
- India: The Ministry of Petroleum and Natural Gas sees itself as responsible for hydrogen as fuel. High overall interest by companies from the oil, gas and coal sectors visible.
- Chile: P2X is promoted by the private sector and the government is supporting this development.
- Morocco: It is in particular supported by the science and research sector.
- South Africa: Yes, Department of Science and Innovation runs a Hydrogen South Africa R&D programme since 2008.
- Tunisia: Government and private sector seem interested, but none of them actively drive the development.

- None
- Private sector
- Both
- Government/Science
<table>
<thead>
<tr>
<th>Country</th>
<th>Sustainability Criteria Consideration</th>
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<tbody>
<tr>
<td>Tunisia</td>
<td>For RE yes, it can be assumed that these factors would play a role for P2X development as well.</td>
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<tr>
<td>Algeria</td>
<td>Sustainability criteria are generally being considered for all kinds of infrastructure projects, so it is not a concern.</td>
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<tr>
<td>Brazil</td>
<td>No.</td>
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<tr>
<td>China</td>
<td>Water shortage in most regions with high curtailment of RE limits the development of PtH₂.</td>
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<tr>
<td>India</td>
<td>Yes in all power projects excluding the solar and wind</td>
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<tr>
<td>Morocco</td>
<td>No.</td>
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<tr>
<td>Chile</td>
<td>Yes, but the coal lobby requests to talk about P2X rather than green P2X.</td>
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<tr>
<td>South Africa</td>
<td>Water use plays an important role in the Integrated Resource Plan (power plant development plan).</td>
</tr>
<tr>
<td>Tunisia</td>
<td>It is intended that all the electrical energy for P2X will be of renewable origin (+ land use &amp; water regulations)</td>
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Does the country focus on the local market or does it already consider exports?

**Algeria**
- Hydrogen production in the private sector currently focuses on satisfying local demand.

**India**
- Limited resources of natural gas reserves are currently being used for fertilizer production etc. and hence exports of gas cannot happen.

**China**
- China has gas shortage and P2G should contribute to the independence of gas import. So far, no consideration of exports.

**Tunisia**
- In the first discussions, both options were considered.

**Morocco**
- The aim is first to serve the local market. However, Morocco had always ambitions to export energy derivatives to Europe.

**South Africa**
- Japan and Europe have been identified as potential markets. The current synthetic fuel from CtL is mainly used on the local market.

**Chile**
- The short and medium term goals are for national use. In the long term, the objective is to export „renewable energy“ (e.g. to California, Japan and Germany).

**Local market/no exports**

**Both**

**Exports**
Are first P2X projects implemented in the country?

Tunisia: None

Brazil: Pilot project in state of São Paulo using hydrogen fuel cell bus for public transportation

Algeria: Linde Gas is implementing hydrolysis processes, however they are not using power from a renewable resource

India: Over 25 GW of gas fired capacity installed for supplying cleaner power runs far below capacity contributing just about 5 percent to India's total power generation.

South Africa: There are a number of small scale electrolyzers active to produce hydrogen in off-grid applications. Green synthetic fuels not yet.

Morocco: A second pilot project with the means of BMU/GIZ should be implemented in the mid-term.

Chile: There are several projects in the pipeline – the largest one comprises the generation of 350,000 tons of green ammonia.

China: Yes, several pilot projects on wind power to hydrogen and fuel cell, power to heat and cooling.
How strong is the company landscape in this field in the country?

- **South Africa**: There are strong mining companies providing Platinum Group Metals (for electrolyzers and fuel cells). First start-ups and HySA spin-offs are created. German companies are very interested in the market.

- **China**: According to official statistics 139 listed companies in China are currently active in the field of hydrogen.

- **Chile**: There are several important companies related to P2X.

- **India**: CFCT-ARCI, CSIR-Network Labs, NMRL, VSSC, BHEL are involved in development of PEMFC technology in India.

- **Algeria**: There are several companies that are producing hydrogen for their own processes on a small scale, and not from green electricity but from gas (hydrolysis/transformation).

- **Brazil**: The country will depend on external technology, know-how and capacity building.

- **Morocco**: The country will depend on the technology, know-how and capacity building.

- **Tunisia**: Most of the research and initiatives were abandoned.

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Not strong

Strong
What support can be offered by Germany to develop a P2X market in the country?

First: Providing information on P2X technology and potential

Algeria
The initiation of a discussion with government officials on the perspectives of P2X and its benefits for the energy sector and the economy is recommended.

Tunisia
First: Providing information on P2X technology and potential

Brazil
Bringing back the discussion with data and applications – especially in a scenario with renewable intermittent generation.

Morocco
German products along the value chain, capacity building, up-scaling projects.

South Africa
The EP developed a concept for a support organisation following the NOW-example in Germany. Further support would be needed to put pilot projects on the ground.

China
German products and technologies along the value chain, capacity building, up-scaling projects.

Chile
Products related to generation, transport, storage and distribution. Chemical transformation to several products. Scale up, regulations, technical training.

Dialogue/information

Capacity building/Products
For more information please contact

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