## LOW CARBON HYDROGEN

# BUSINESS MODEL & BANKABILITY FACTORS

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SOCIETE GENERALE Corporate & Investment Banking BUILDING TEAM SPIRIT TOGETHER

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## HYDROGEN – BUSINESS MODEL

Low Carbon Hydrogen has the potential to become one of the prime energy sources for the future. As most new markets with need for development, some key challenges will need to be addressed:

#### MARKET

- Circularity of supply and demand how do you build the first plants if there is not yet a market and how does the market develop if there is no production
  - Existing "grey" H2 replacement is the first natural step
  - Support from regulators and governments through policies and goals

#### COST

- Green and Blue Hydrogen are currently up to 4x more expensive than gray hydrogen, a mechanism will have to be implemented to fill the cost gap
  - Support similar to the feed-in tariffs and tax equity that benefited renewable electric generation
  - Consumer subsidy (Asian markets) to cover the difference between delivered H2 price and the fossil fuel product it is replacing
  - Other markets are also looking at an end use subsidy, hydrogen obligation, certificate or other means to subsidise the industry

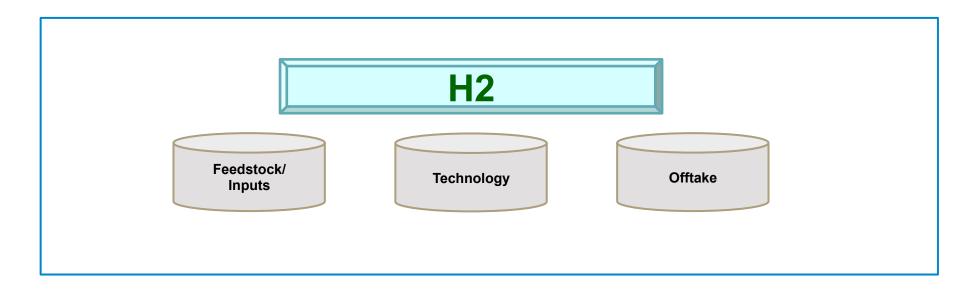
#### CAPITAL

• Private sector financing will be needed for the development of the hydrogen market. The financing will most likely be in the form of Project Financing, which will benefit from a structure, or appropriate credit enhancement in order to raise the required capital



## **BANKABILITY FACTORS**

There are three pillars that will anchor the bankability of Low Carbon Hydrogen



## FEEDSTOCK AND INPUT

- Availability of water
- Access to renewable energy significant expansion of the renewable energy generation will be required for the development of H2 Projects
  - The intermittent nature of the electric renewable generation also has an effect on production and costs. Additional factors such as storage may increase the efficiency of the production and enhance its pricing competitiveness



## **BANKABILITY FACTORS**

## TECHNOLOGY

- Despite the technology (electrolyzers) has existed for some time, as projects scale up there will be added scrutiny into:
  - Credit quality of the technology suppliers supports on warranties and O&M
  - EPC arrangements and performance support
  - Track record of operations and maintenance reserve requirements

#### OFFTAKE

- · Capital raised for the Projects will determined by the terms of the offtake agreements
  - Price Initial projects will likely require capacity payments that will provide cash flow regardless of production or sales, in order to raise capital for the project
  - Tenors shorter tenors will limit the debt capacity of the Projects
- Offatkers are likely to be corporate entities (as opposed to utilities) bringing different challenges to the debt providers in terms of credit quality
- Location contracts to provide product FOB as the best (cheapest) areas to produce hydrogen are not always aligned with the largest potential markets. Shipping hydrogen is technically more difficult than LNG and expensive.



## **GOVERNMENT'S INVOLVEMENT**

- Governments will play a key role in the development of the Low Carbon Hydrogen market:
  - Provision of economic incentives to enhance the economic competitiveness of the Projects CO2 incentives, government directives, etc
  - Clear and appropriate standards and regulations for transportation and markets
  - Provisions of grants, guarantees and/or multilateral funding to support the initial projects

Past experience has taught us that appropriate government policies, incentives and support have driven new technologies (as renewable generation) to significant growth resulting in lower costs and significant expansion



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