

Air Products Syngas for Today

A world-leading industrial gases company
Possessing advanced, mature and complete gasification technologies

Innovating for a Better Future

Jerry Kassman

October 28, 2020



Forward-looking statements

This presentation contains “forward-looking statements” within the safe harbor provisions of the Private Securities Litigation Reform Act of 1995, including statements about earnings guidance, business outlook and investment opportunities. These forward-looking statements are based on management’s expectations and assumptions as of the date of this presentation and are not guarantees of future performance. While forward-looking statements are made in good faith and based on assumptions, expectations and projections that management believes are reasonable based on currently available information, actual performance and financial results may differ materially from projections and estimates expressed in the forward-looking statements because of many factors, including, those disclosed in our earnings release for the fourth quarter of fiscal 2019 as well as in our filings with the Securities and Exchange Commission. Except as required by law, the Company disclaims any obligation or undertaking to update or revise any forward-looking statements contained herein to reflect any change in the assumptions, beliefs, or expectations or any change in events, conditions, or circumstances upon which any such forward-looking statements are based.

Air Products profile

- A world leading industrial gases company
- The world's leading supplier of liquefied natural gas process technology and equipment
- One of the leading gasification companies, owning advanced & mature dry feed and slurry gasification technologies, building & operating large scale gasification plants



US\$8.9
billion in sales

~17,000
employees

50+
countries

~\$50B
market cap

7+
decades in business

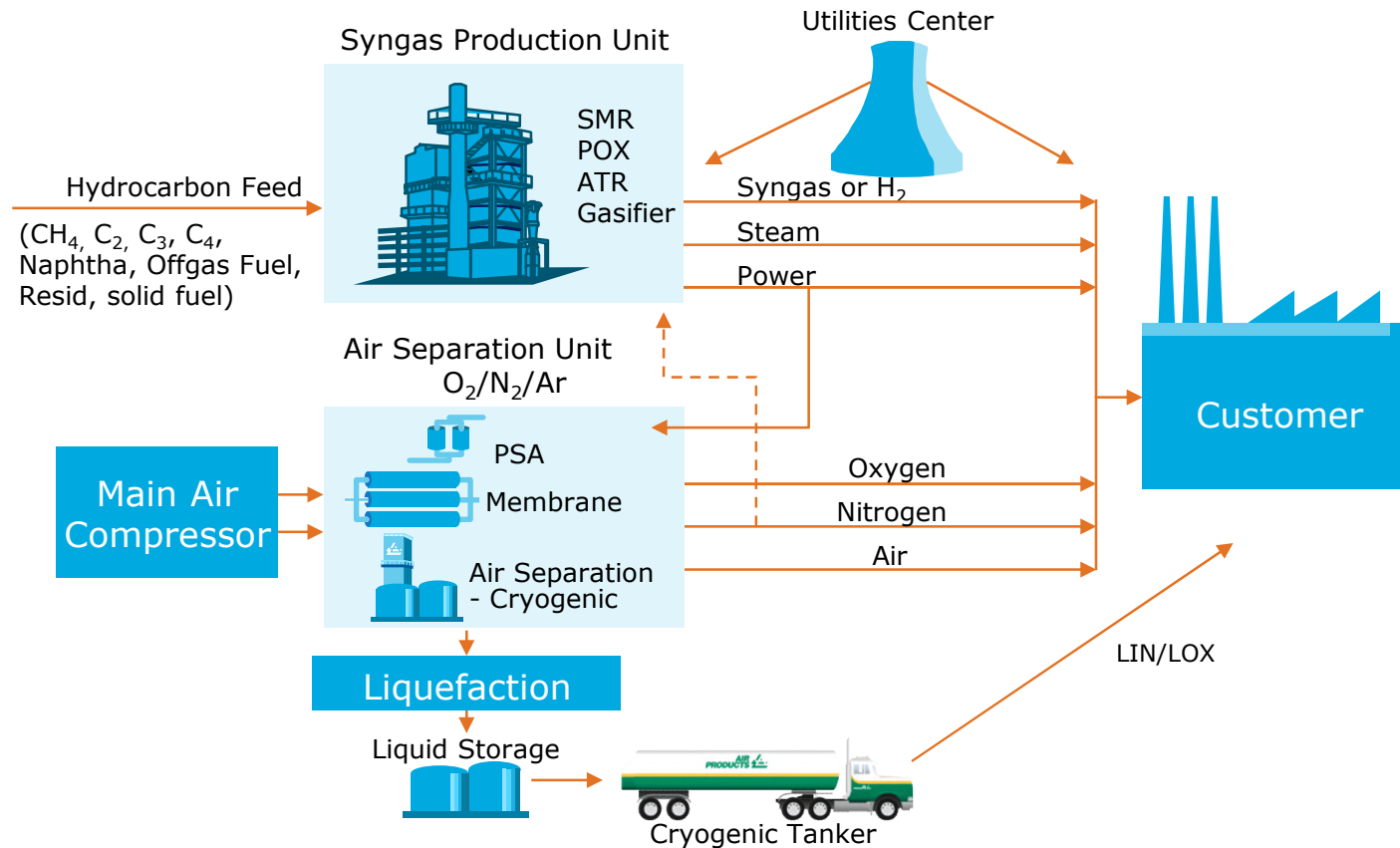
170,000+
customers

1,800
miles of industrial
gas pipeline

750+
production
facilities

30+
industries
served

Air Products Industrial Gases – Integrated Supply Systems Tailored to Customer's Needs



What is Sale of Gas / Outsourcing

- Air Products pioneered the concept of Building, Owning and Operating and maintaining industrial gas plants several decades ago
- This is often referred to as “Build, Own & Operate” or “Sale of Gas” or “on-site supply” of gases
- Under this model of gas supply, the customer outsources the supply of these gases to Air Products, enabling the customer to focus on its core strengths
- The alternative is the “make” case where the customer builds its own facility, sometimes termed “Sale of Equipment”, with all the associated risks

What is Sale of Gas / Outsourcing

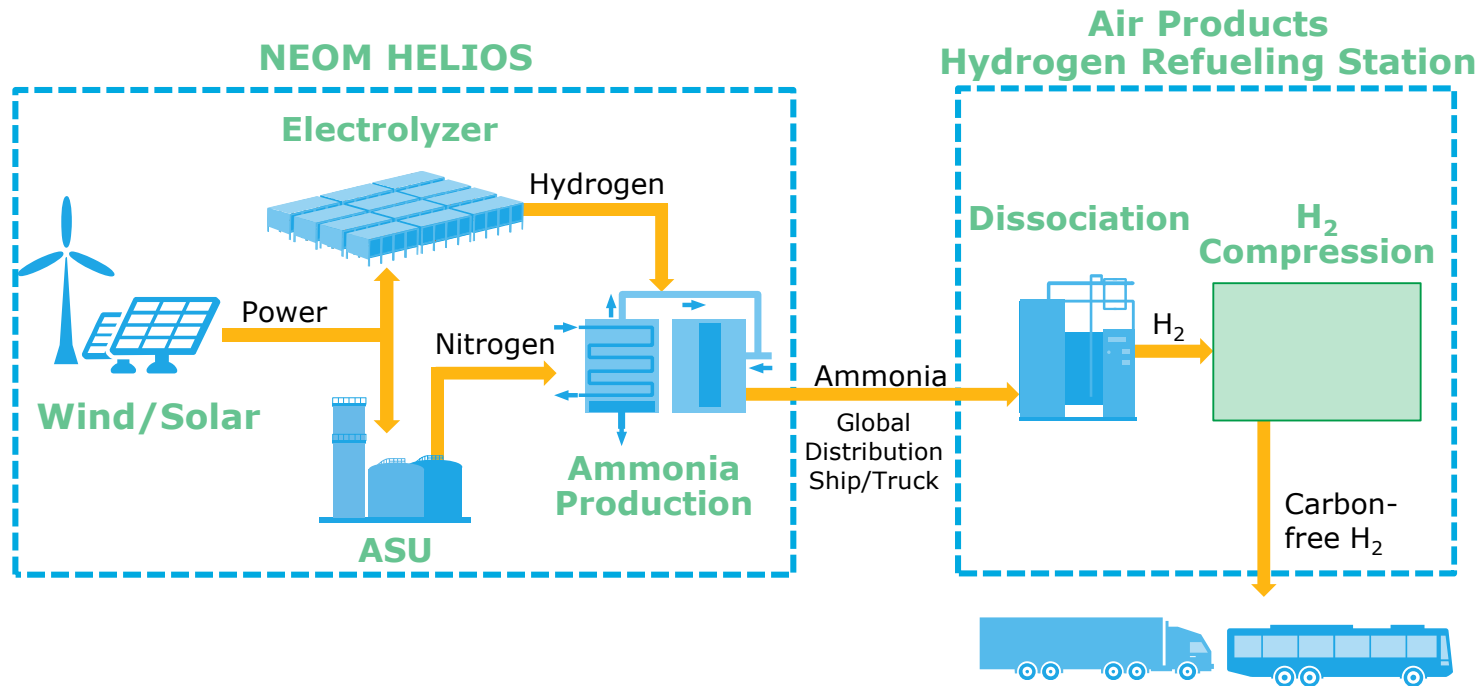
- Under the Sale of Equipment model, the customer produces its own industrial gases. They buy a design license, pay other parties to build the plant & then operate and maintain the plant themselves
- Under the Sale of Gas case, the customer buys hydrogen from the gas supplier, the supplier;
 - Provides capital to design & build the hydrogen plant and then owns and operates the facility and supplies gas by pipeline over a long term contract
 - Takes full responsibility for all operating and maintenance activities and risks
 - Provides guaranteed on-stream (reliability & availability) and process efficiency levels
 - May supply multiple customers from a single plant

Benefits of Outsourcing Hydrogen

- Greater supply reliability – allows you to produce more
 - Greater availability (% on-stream) & reliability (trips/year)
- Avoid Major Outages
 - Minimise risk of unexpected extended outages (up to 4 months) & avoid cost of repairs
- Improved H₂ plant efficiency
 - Reduce the feedstock consumption
- Reduced Unit Cost
 - Focus on the long term overall cost of hydrogen
 - Capital Financing by Air Products may access lower cost of capital
- Improved Focus
 - Allows customer to focus on their production operations
 - Air Products increased focus on improvement opportunities

HELIOS is carbon-free hydrogen

produced and delivered with proven, world-class technology.



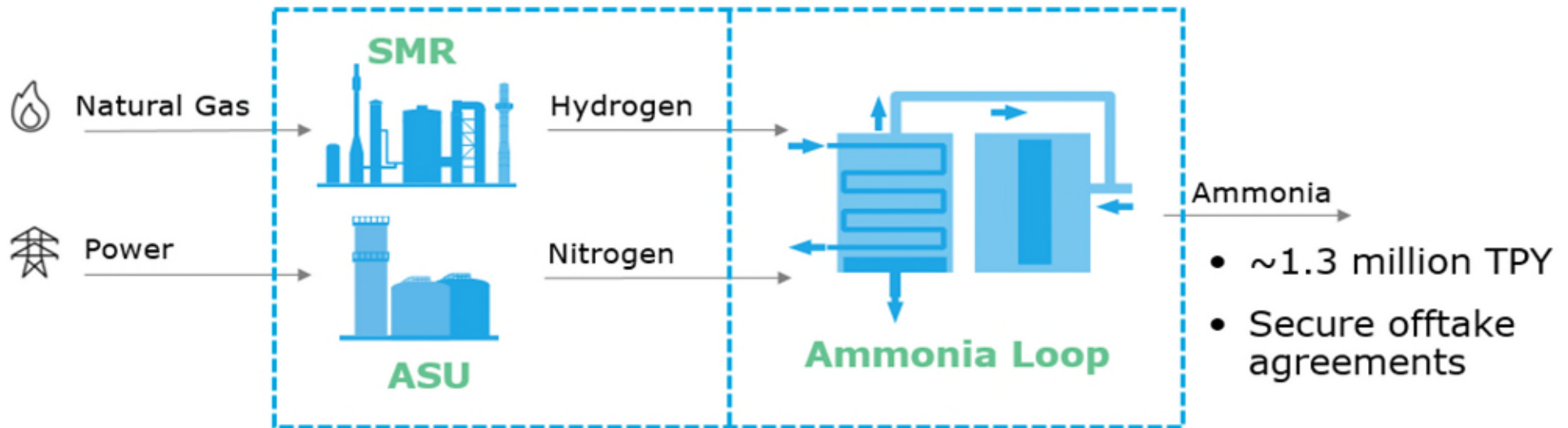
PBF hydrogen asset acquisition



- Consistent with strategy
 - Asset acquisition, capital deployment, onsite business, hydrogen, refining market, expanding strong customer relationship
- Agreement
 - APD to acquire 5 hydrogen plants (~300MMSCFD) for \$580 million
 - APD to supply hydrogen under long-term onsite agreements to three, high quality PBF refineries in California and Delaware
- Financial returns better than capital deployment commitments
- Timing
 - Deal announced: March 30 2020
 - FTC approval: April 10 2020
 - Transaction closed: April 17 2020

Gulf Coast Ammonia (GCA) Project

Texas City, Texas



Air Products

- Build, Own, Operate
- ~\$0.5 billion invest

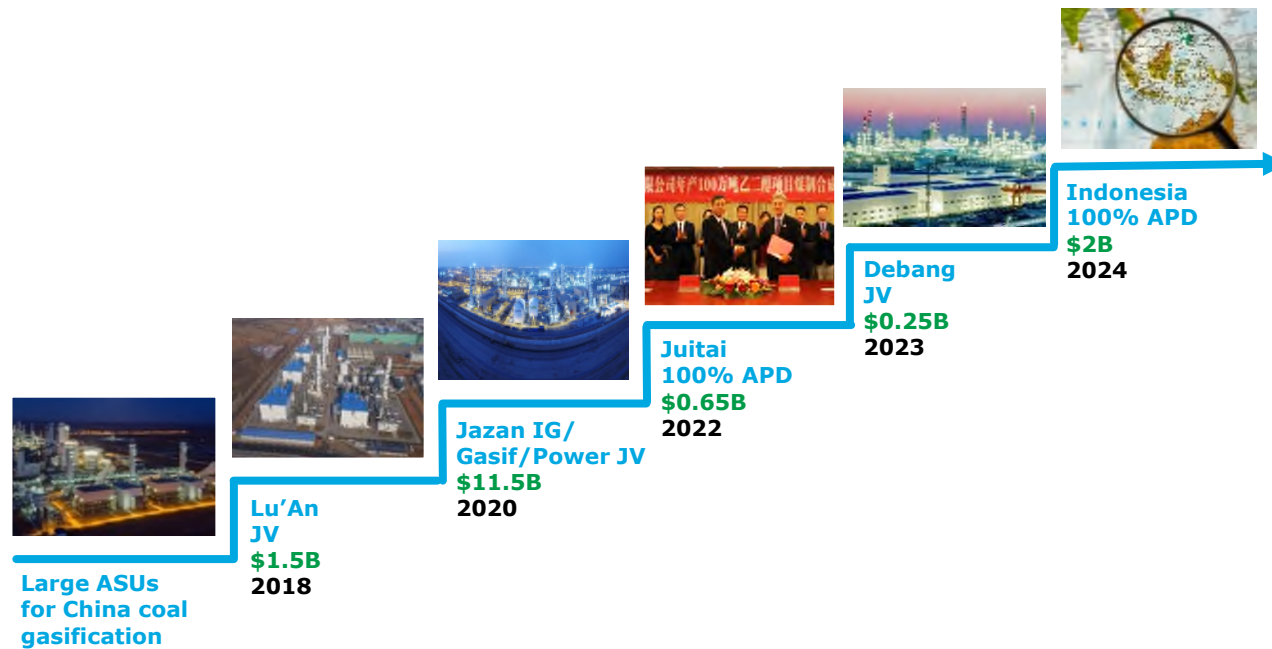
GCA

- Partners
 - Starwood
 - Mabanaft
- ~\$0.6 billion invest

Only major product flows shown

Executing our gasification strategy

Energy, environmental, emerging markets



GE Gasification Technology



Shell Gasification Technology



Haldor Topsoe Alliance
Ammonia, Methanol, DME

Project capital represents 100%, not APD share
Project dates represent actual or expected onstream

Lu'An Clean Energy Company

Changzhi, Shanxi Province, China



•**Scope:** Long-term supply of syngas from coal gasification. Air Products process includes:

- Four 3,000 ton-per-day (tpd) Air Products dry-feed gasifiers with syngas coolers, the largest single dry-feed gasifiers at the time of being put into operation
- Syngas clean-up system
- Four air separation units (ASU) producing >16,000 tpd of oxygen and nitrogen

•**Customer End Products:** 1 mmpta coal to liquid—one of China's landmark clean energy demonstration projects

•**Ownership:** Joint venture (JV) between Air Products (60%) and Lu'An (40%)

•**Cost:** \$1.3 billion

•**Contract:** Customer pays fixed monthly fee and provides coal

•**Status:** Onstream

•**Other:**

– The gasifiers, which represent the largest pulverized coal gasifiers adopting AP dry feed technology (former Shell) have been delivering outstanding performance in feedstock input, gases output, carbon conversion rate and operational efficiency.

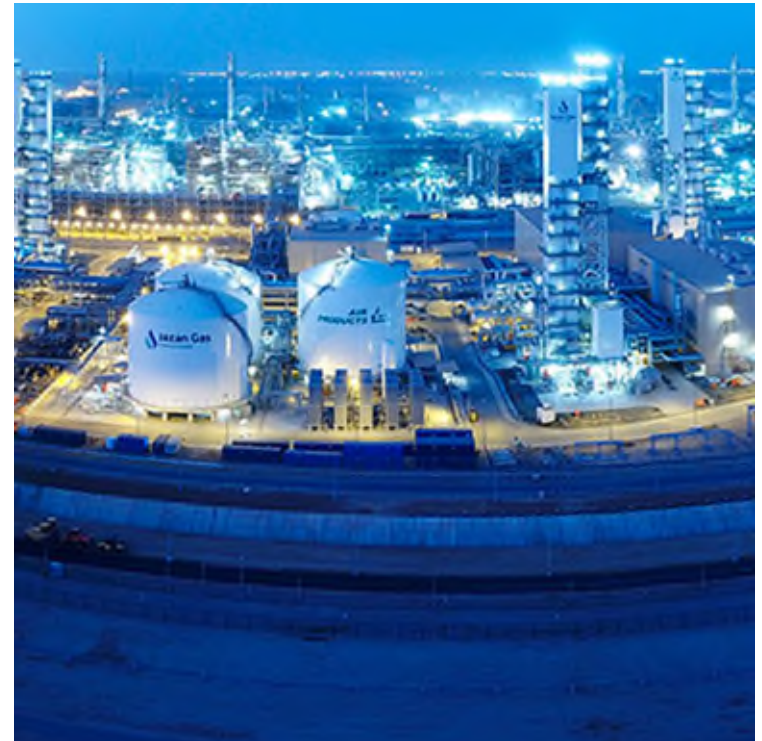
– Gasifiers ramped up quickly in plant loading rate with a consecutive running record of 212 days for a single gasifier realized within one year since start-up, nearly 95% of plant availability rate was achieved in 2019.

– Carbon conversion rate of >99% was delivered in 2019 for high ash anthracite as feed

Saudi Aramco

Jazan Economic City, Saudi Arabia

- **Scope:** Long-term supply of hydrogen, nitrogen, steam and electricity from gasification of vacuum residue. Air Products process includes:
 - ~3.8 GW IGCC
 - Six ASUs producing >75,000 tpd of oxygen and nitrogen
 - Utilities
- **Customer End Products:** Refined oil products
- **Ownership:** JV between Air Products (46%), ACWA Power (25%), Saudi Aramco (20%) and Air Products Qudra, a majority-owned JV with Qudra Energy (9%)
- **Cost:** ~\$11.5 billion
- **Contract:** Customer pays fixed monthly fee and provides vacuum residue
- **Status:** Financial closing expected fourth quarter of calendar year 2020



Jiutai New Material Co. Ltd

Hohhot, China



- Scope:** Long-term supply of about 500,000 nm³/hour of syngas. Air Products process includes:
 - Two 2,000 tpd Air Products dry-feed gasifiers, converting lignite into syngas efficiently
 - Two ~100,000 nm³/hour ASUs
 - Syngas purification and processing
 - Associated infrastructure and utilities
- Customer End Products:** 1 mmtpa MEG—the largest single plant of its size
- Ownership:** Air Products (100%)
- Cost:** \$650 million
- Contract:** Customer pays fixed monthly fee
- Status:** Onstream expected 2022

Debang Group

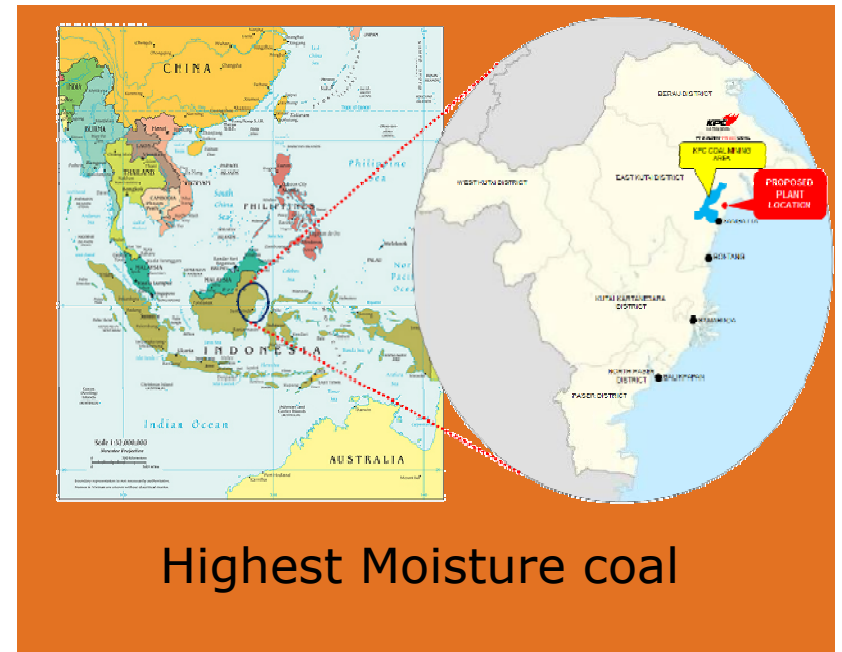
Xuwei National Petrochemical Park, Lianyungang City, Jiangsu Province, China

- Scope:** Long-term supply of about 500,000 nm³/hour of syngas. Air Products process includes:
 - Two 750 tpd slurry gasifiers
 - Purification units
 - ASUs
- Customer End Products:** 350,000 tons per year (tpy) of chemicals
- Ownership:** JV between Air Products (80%) and Debang Group (20%)
- Cost:** ~\$250 million
- Contract:** Customer pays fixed monthly fee
- Status:** Onstream expected 2023



PT Bakrie Capital Indonesia and PT Ithaca Resources Bengalon, East Kalimantan, Indonesia

- Scope:** Long-term supply of nearly 2 million tpy of methanol. Air Products process includes:
 - Air separation
 - Air Products' proprietary Syngas Solutions™ dry-feed gasifier (6 million TPY of coal)
 - Syngas clean-up
 - Methanol plant
 - Utility island
- Customer End Products:** Nearly 2 million tpy of methanol
- Ownership:** Expect 100% Air Products
- Cost:** ~\$2 billion
- Contract:** Customer pays fixed monthly fee
- Status:** Onstream expected 2024



Highest Moisture coal

License startups

- Mingshengda project: working on commissioning and startup service now, the first train started up successfully on July 16, 2020.
- Shenhua CTC: Initial startup is scheduled in November. Per train capacity of 220,000 ncm/hr.
- Weihua Project: Started LBI service in late September; startup 2021
- Fuhua Tianchen: Will start LBI service in middle November; startup 2021



Summary

- Air Products is very active in developing syngas opportunities around the world
- Feedstocks run the gambit from electrolysis to coal
- Our primary focus is sale of gas, but we do license our gasification technologies
- We are always looking for new opportunities and want to hear about yours
- Learn more at <https://www.airproducts.com/>

Thank you
tell me more