Use of Natural Gas for Ammonia Production in Israel

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Presentation Highlights

- Global Market
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  - Trade
  - Cost Benchmarks
- Israeli Market
  - Local demand
  - Logistics
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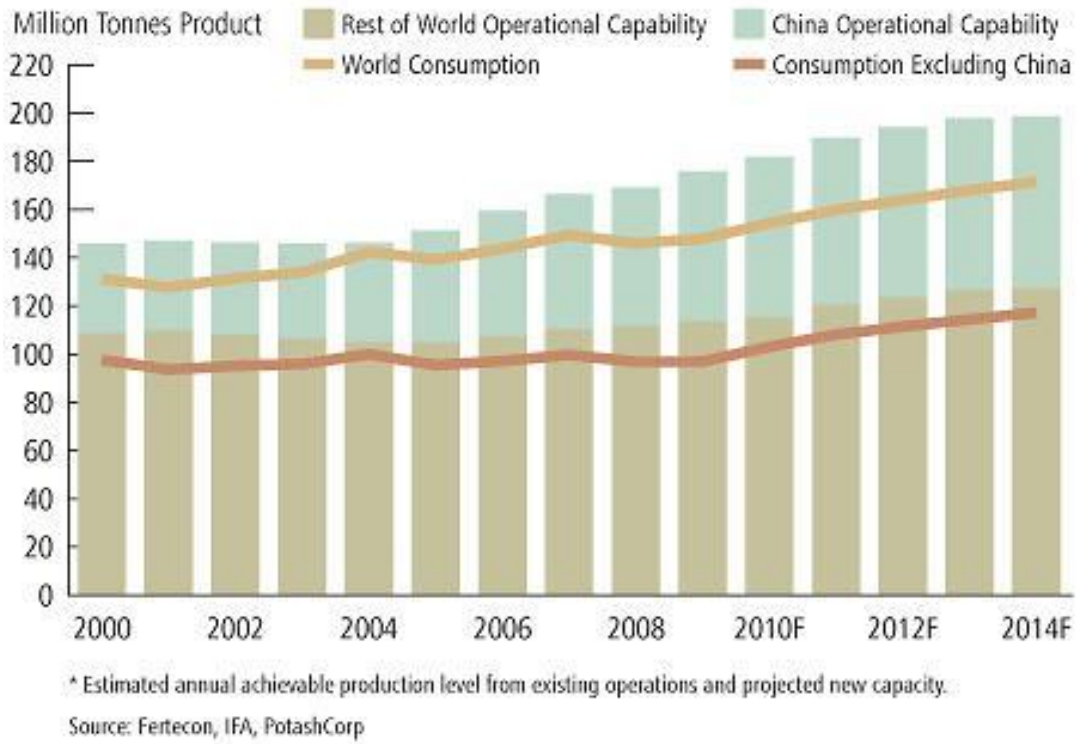
  - General Parameters
  - Linde Ammonia Concept (LAC)
  - Summary of Advantages of Linde Engineering Niche Technology for Ammonia Production
  - Modern Integrated Industrial Site Concept
  - Views of Existing Linde Engineering Ammona Plants of Different Capacities
  - Ammonia Production in Israel from NG: Economical and General Considerations

Global Ammonia Market

Production



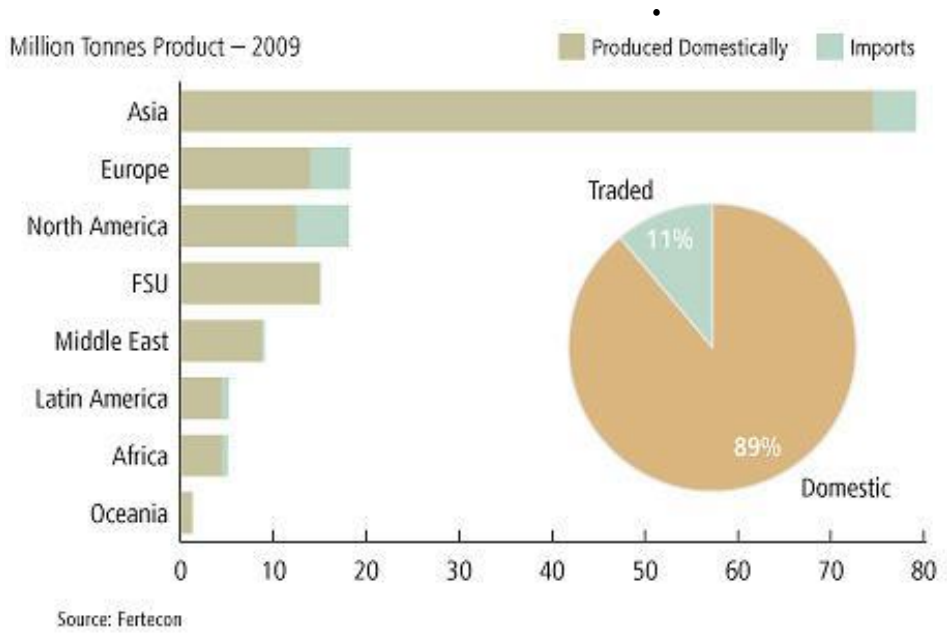
* Estimated annual achievable production level from existing operations and projected new capacity.

Source: Fertecon, IFA, PotashCorp

- China accounts for the largest share of projected new capacity.
- Due to rising domestic energy costs and expected closures of inefficient capacity it is unlikely to significantly increase its ammonia exports.

Global Ammonia Market

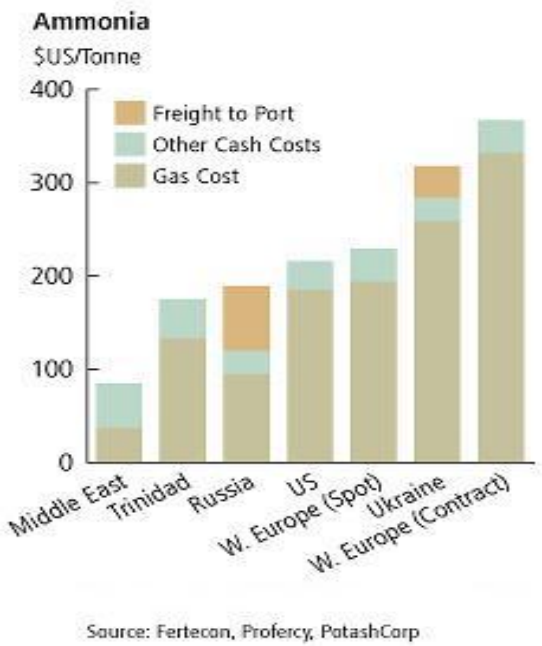
Trade



- Most ammonia is consumed in its domestic market as it is expensive and difficult to transport.
- North America is the largest importer with 35-40 % of world trade.
- Europe, a higher-cost producer, accounts for about 25 %
- The former Soviet Union, Latin America, the Middle East and North Africa are the primary exporting regions due to their lower-cost gas positions and limited domestic consumption.

Global Ammonia Market

Cost Benchmarks



Source: Fertecon, Profercy, PotashCorp

- Access to lower-cost natural gas and proximity to markets are critical to success in the ammonia traditional business oriented toward urea production.
- High-cost producers in Western Europe and Ukraine currently set the floor for nitrogen prices.
- Israel is considered as a niche market.

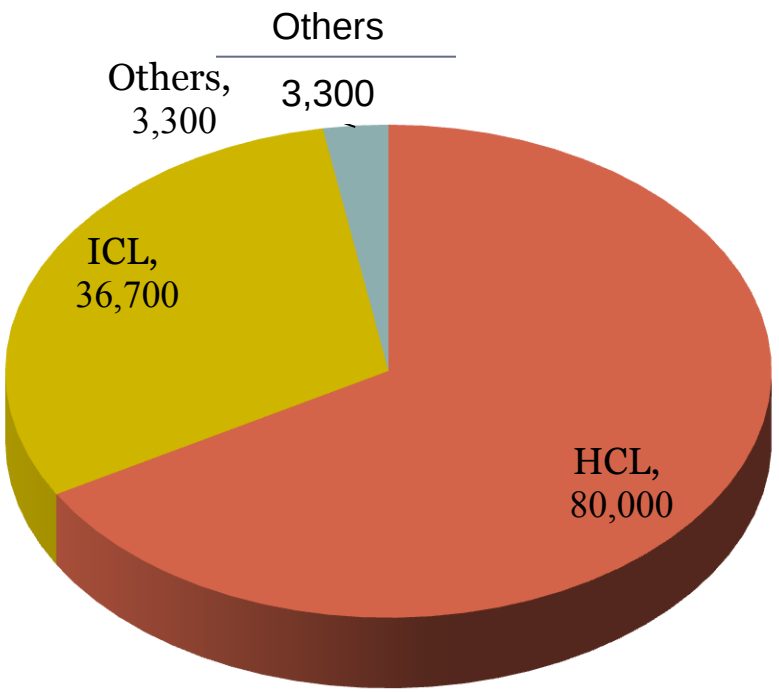
The Israeli Market

Local Demand

Ammonia has been declared by MOI a "national strategic raw material".

Used for fertilizers, food refrigeration, DeNOx, explosives, yeast, pharmaceuticals.

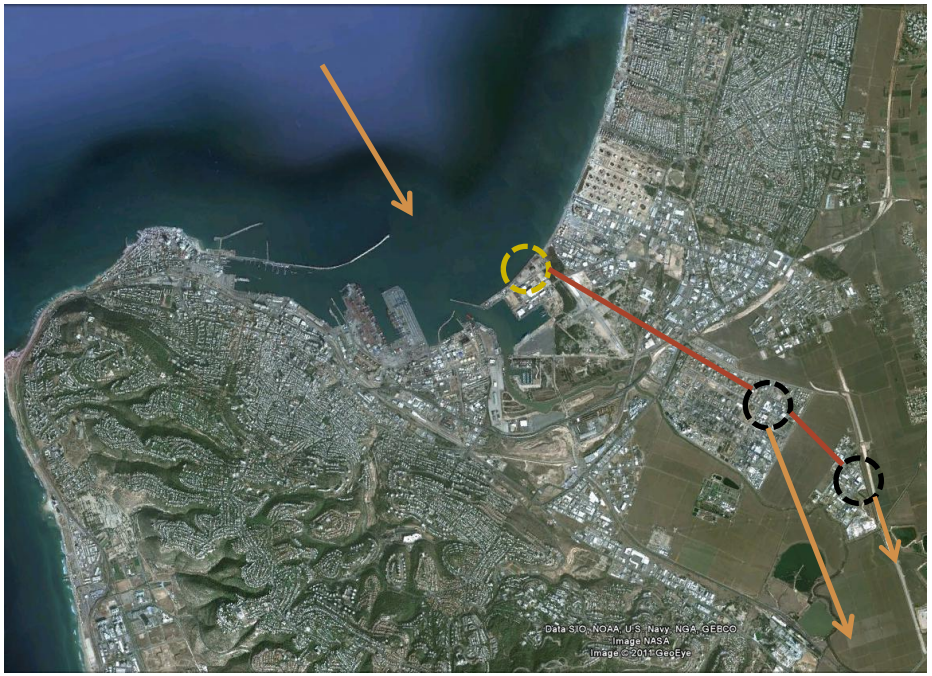
Yearly Consumption MT/year



The Israeli Market

Logistics

- 12 shipments per year from the black sea - 10,000 each
- Storage tank in Haifa Bay – 12,000 MT
- 5.5 km pipeline from the storage tank to HCL North (120,000 MT/year)
- Pipeline from HCL North to Deshanim (40,000 MT/year)
- Other Local Logistics including HCL South by Road Trucks



The Project

General Parameters

- Capacity Basic Project
  - 480 MTPD - 160,000 MT/year Ammonia
  - NG Consumption: 0.16 BCM/year
- Relevant economically viable and proven technology suppliers for niche markets:
  - Linde Engineering
- Project Location
  - Mishor Rotem
- Estimated Project Timetable
  - Project Development: 0.5 years
  - Project Execution: 2.0 years
  - Project Operating Life: 25 years

A combination of proven technologies

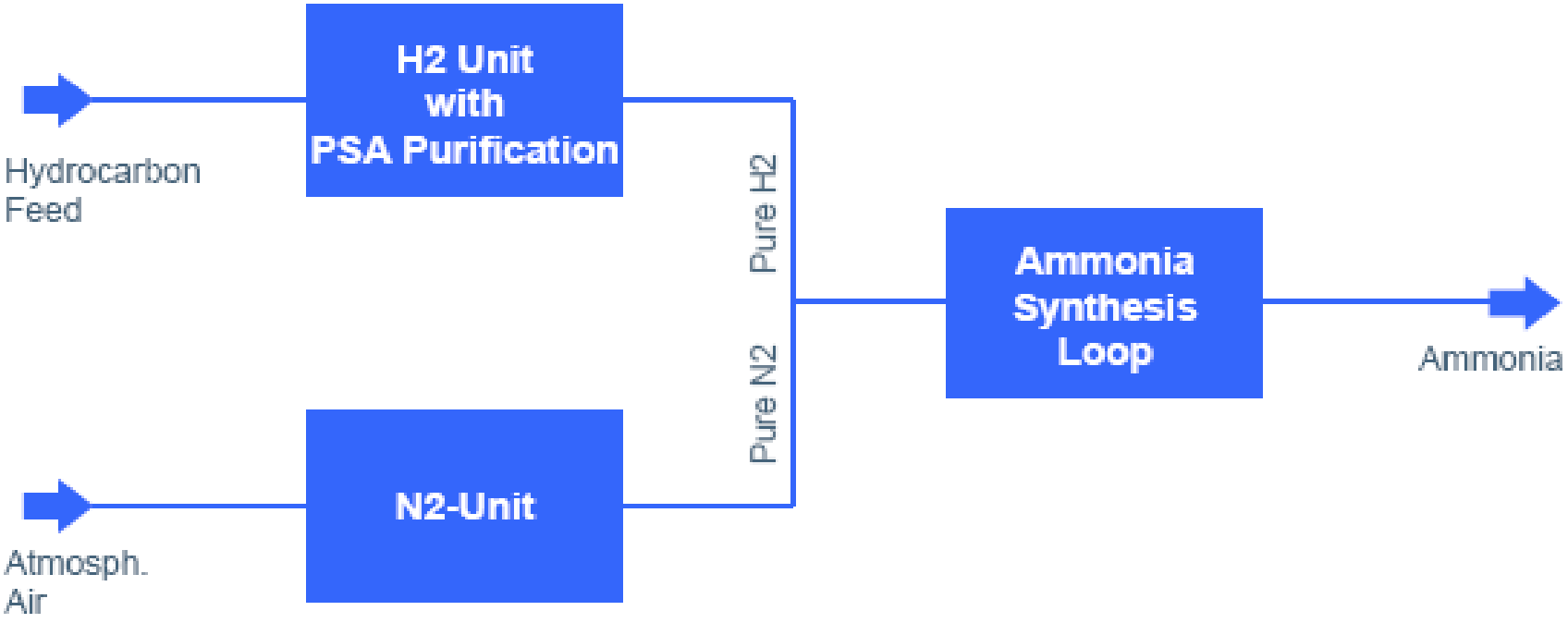
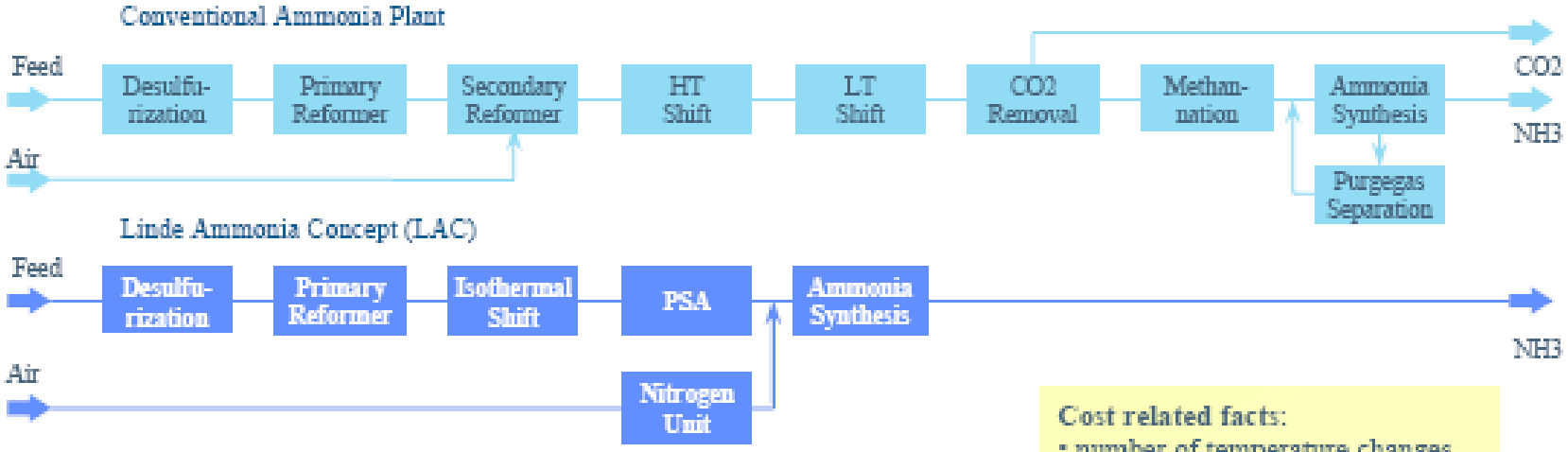
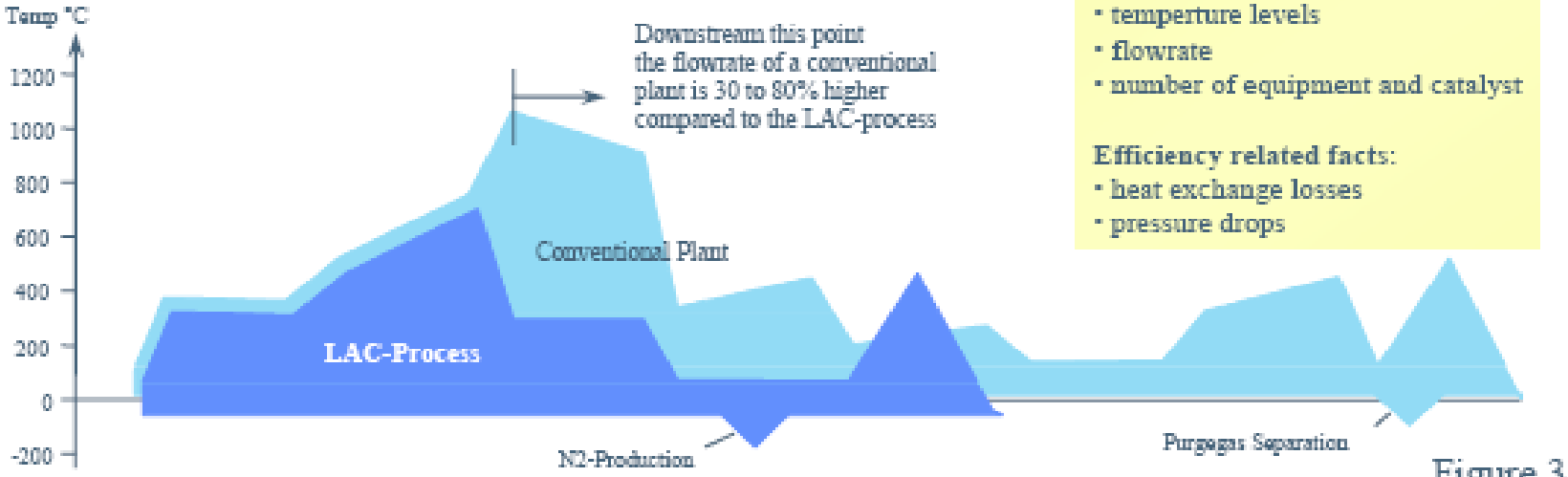


Figure 1

Linde Ammonia Concept (LAC)
Comparison of LAC process with conventional scheme





Cost related facts:
- number of temperature changes
- temperture levels
- flowrate
- number of equipment and catalyst

Efficiency related facts:
- heat exchange losses
- pressure drops

Figure 3

Linde Ammonia Concept (LAC)
Possible valuable By-Products

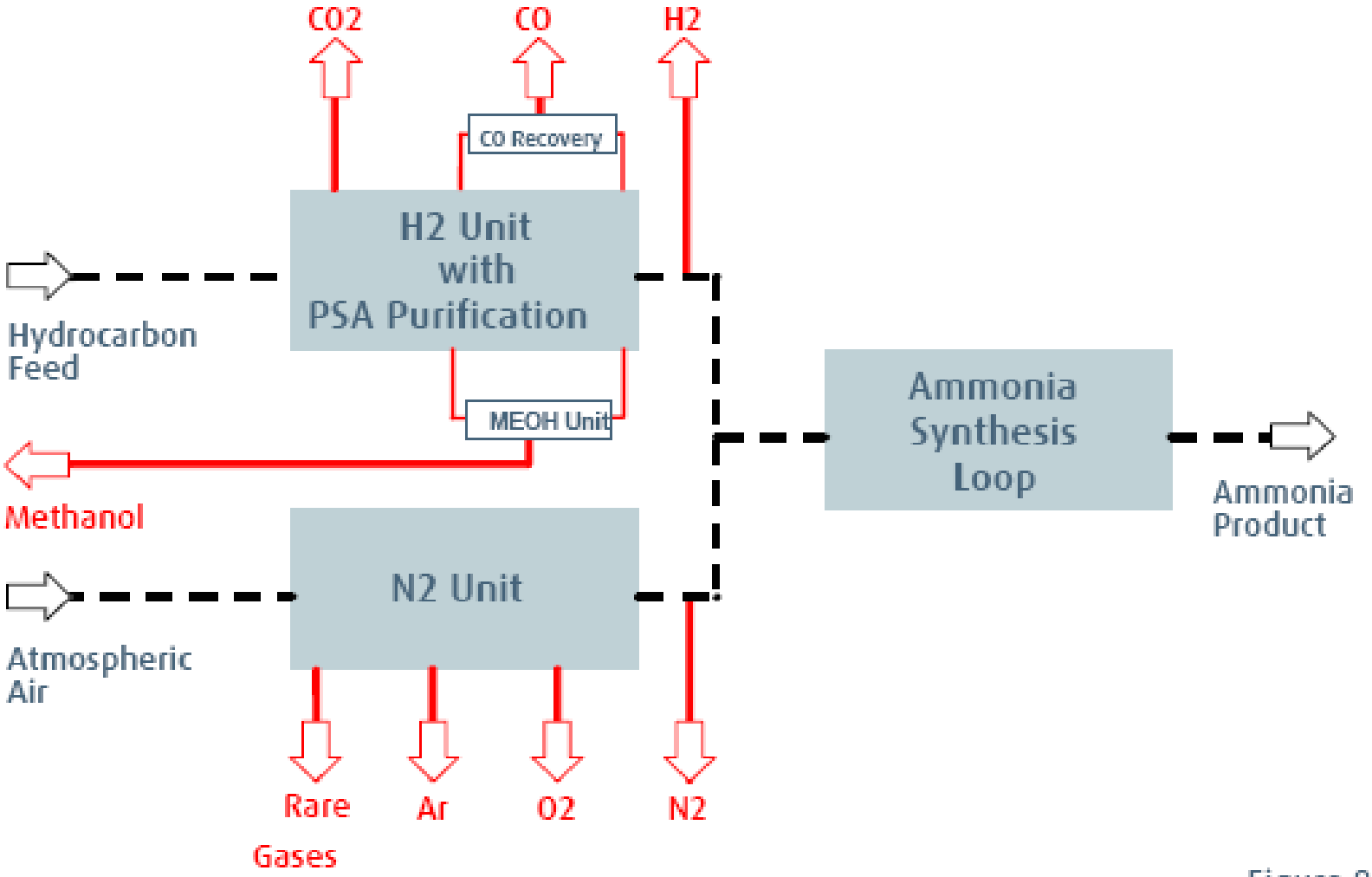


Figure 8

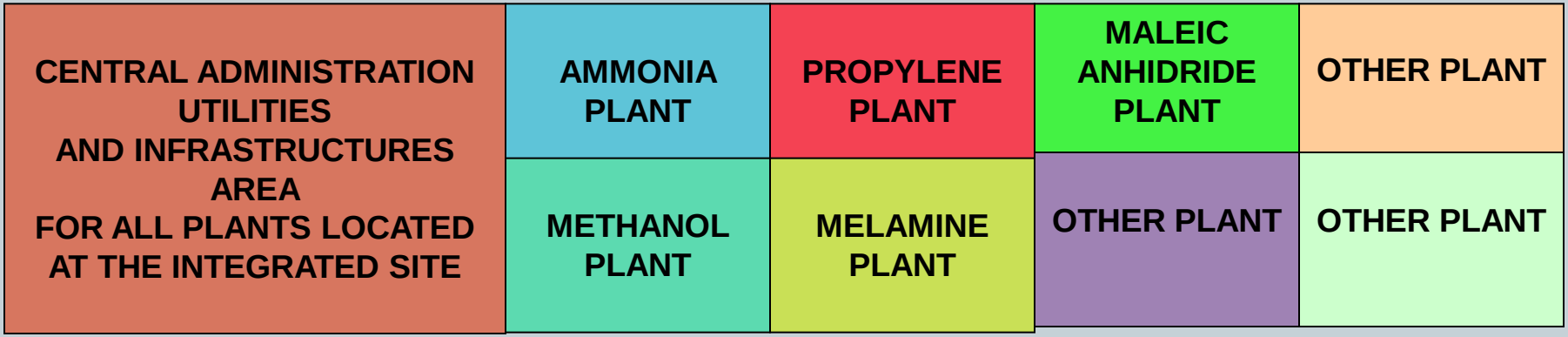
Summary of Advantages of Linde Engineering Niche Technology for Ammonia Production versus Conventional Technologies

- Elimination of three catalytic process steps, reducing the total catalyst volume to approx. 50% of that in a conventional plant, reduced number of equipment items.
- Recovery of CO2 through an additional washing unit, allowing adjustment of CO2 quantity to the demand.
- Reduced start up and shut down time resulting in important savings in feedstock consumption.
- Savings in investment costs (15 to 20%), construction time, site area, maintenance and spare parts costs as well as catalyst replacement costs.
- Valuable by-products may be produced.
- Tailored for Israeli Market needs economically proven available technology
  (14 plants in operation worldwide) for niche Ammonia markets not sensible to world commodities (Urea) market fluctuations.
- A relatively low investment required to economically manufacture in development area a strategic product for the Israeli local necessities.

World Modern Industrial Chemical / Petrochemical Integrated Sites Concept

Governments promote and support projects oriented toward national benefit:

- Minimize environmental impact
- Optimize investments
- Minimize need of Governmental grants for development.



Linde Ammonia Concept
Moura, Australia - 230 mtpd NH3

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Linde Ammonia Concept (LAC)
Phosphate Hill, Australia - 600 mtpd NH3

Linde Ammonia Concept (LAC)
Phosphate Hill, Australia - 600 mtpd NH3

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Ammonia Production In Israel From NG: Economical and General Considerations

- NG Price: 5.5 -6.0 $ per 1MM BTU
- Plant Capacity: 160 ktpa (480 tpd)
- Capex: 160 - 180 MM $
- Opex: 40 - 42 MM $ per year
- ROI: 2.5 – 3.5 years
- Operational Production Cost versus actual local Ammonia Market Price: ~ 30% - 35%
- Additional National benefit – Saving of foreign currency for importing Ammonia
- Enhancing foreign world leaders as Linde Group active commitment and participation in the Israeli industry
- Supply by local facility of a recognized nationally important strategic material, drastic improvement of safety and security nationwide.

THANK YOU