



UNITED NATIONS  
INDUSTRIAL DEVELOPMENT ORGANIZATION



Ministry of Trade & Industry  
وزارة التجارة والصناعة



EGYPT

GEIPP

GLOBAL ECO-INDUSTRIAL PARKS PROGRAMME



Schweizerische Eidgenossenschaft  
Confédération suisse  
Confederazione Svizzera  
Confederaziun svizra

Swiss Confederation

Federal Department of Economic Affairs,  
Education and Research EAER  
State Secretariat for Economic Affairs SECO



# MODULE 4: GH<sub>2</sub> APPLICATIONS AND ECONOMICS

Development of Roadmap for Green Hydrogen Ecosystem in the SCZone (Sokhna). Training

# Hydrogen production



## Uses of green hydrogen:

- Self-consumption for industry
- Introduce it in the natural gas network (blended gas up to 20% H2)
- Export H2



## Water supply

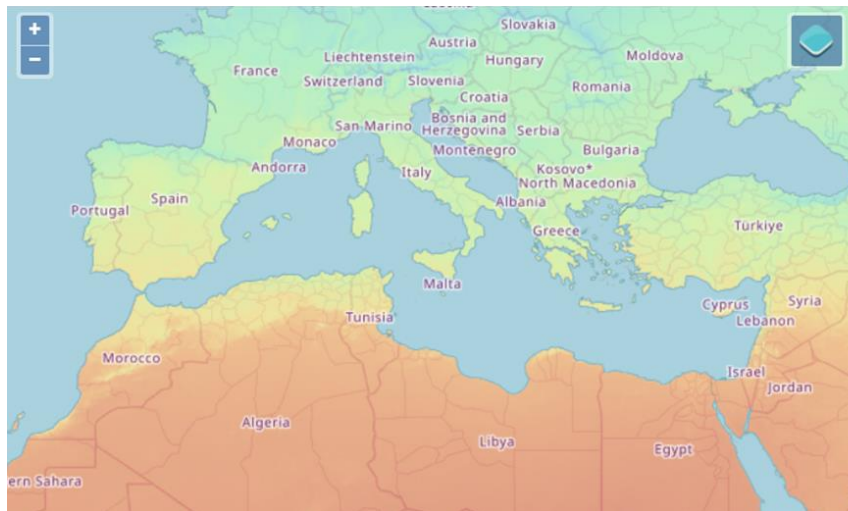
- Local water network
- Sewage treatment (it may need a purification process)
- Sea water desalination plant



## Power

- Local power grid (it may need some kind of green hydrogen certification)
- Renewable energy production plants (such as solar or wind power)

# Syzing of a real case in the SCZone





# Why hydrogen? Why now?

Egypt and in particular the SCZone has a very good solar resource. The radiation of this territory makes it very profitable to install photovoltaic modules for hydrogen generation. Two cases will be considered for a 100 MW FV plant and 50 MW alkaline electrolyzer

CASE 1  
Isolated system

CASE 2  
Grid connected

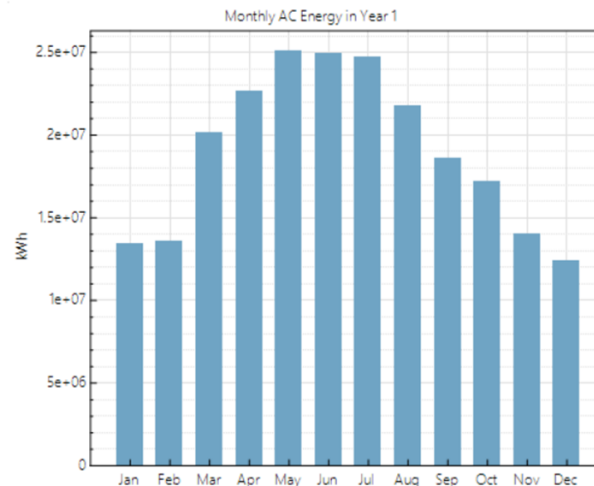
# Renewable installation

100 MW

2,283 equivalent hours

LCOE 42.9 €/MWh

CAPEX 70 M€



Metric	Value
Annual AC energy in Year 1	228,266,048 kWh
DC capacity factor in Year 1	26.1%
Energy yield in Year 1	2,283 kWh/kW
Performance ratio in Year 1	0.81
LCOE Levelized cost of energy	4.29 €/kWh

# Case 1 isolated system

50 MW alkaline electrolyzer

3,532 equivalent hours

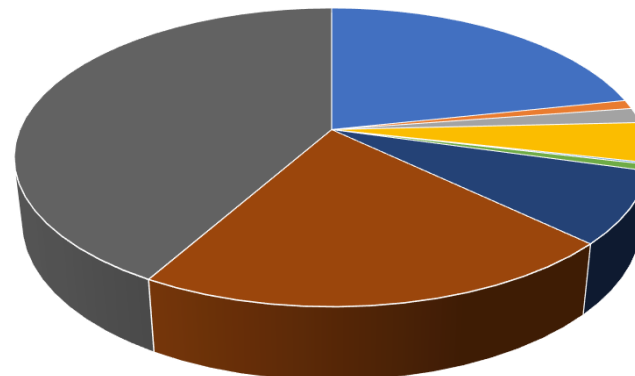
3,417.95 t/y

LCOH 5.82 €/kg

Electricity selling price 16 €/MWh

LCOH 5.6 €/kg (selling electricity)

CAPEX



- Electrolyzer
- Power line
- Purification
- Civil work
- Land use
- Compressor
- Storage
- Engineering
- Renewable installation

## Case2 Grid connected

50 MW alkaline electrolyzer

Purchase price of the grid 27 €/MWh

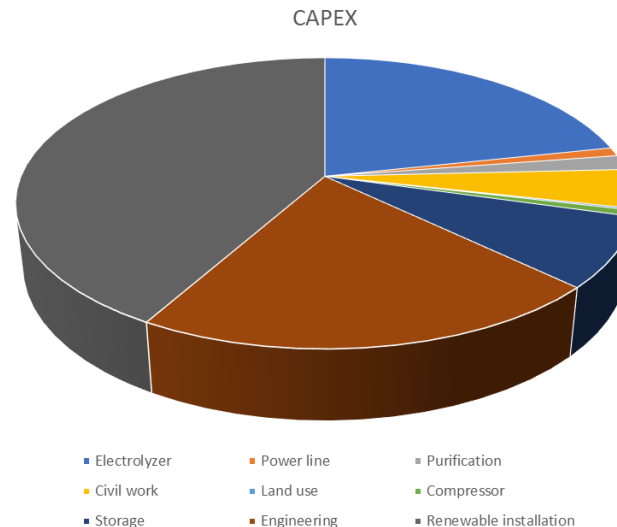
Electricity selling price 16 €/MWh

6,000 minimum equivalent hours (Electrolyser operating minimum 25 MW)

5,926 t/y

LCOH 3.98 €/kg

LCOH 3.85 €/kg (selling electricity)



# Hydrogen export to Europe

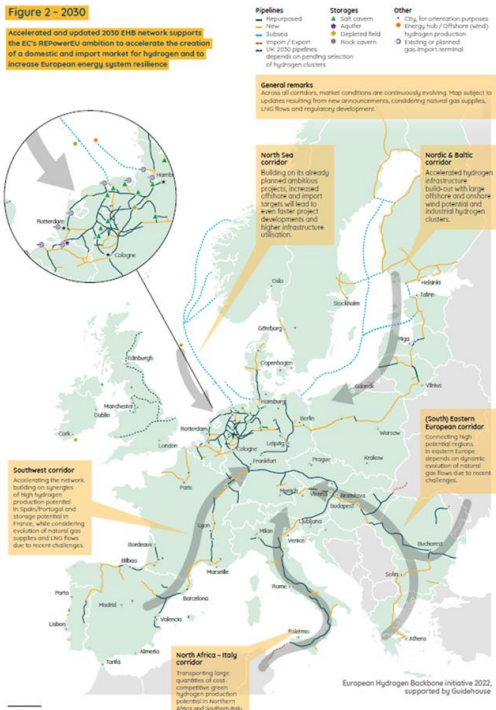




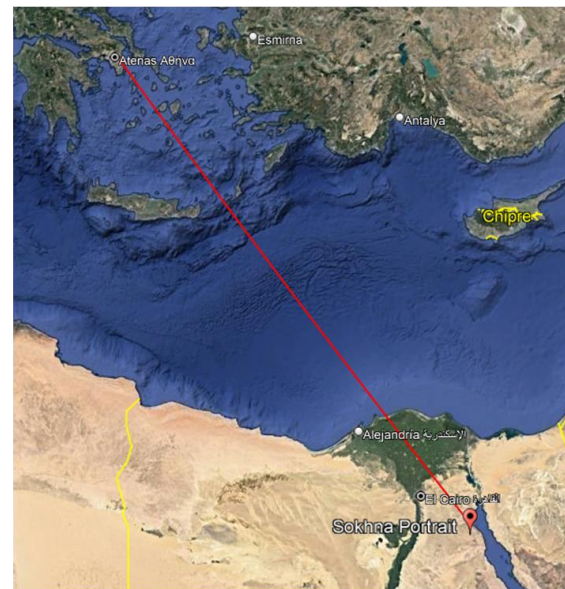
# Sokhna Portrait- Athens

Figure 2 – 2030

Accelerated and updated 2030 EHS network supports the EC's REPowerEU ambition to accelerate the creation of a domestic and import market for hydrogen and to increase European energy system resilience



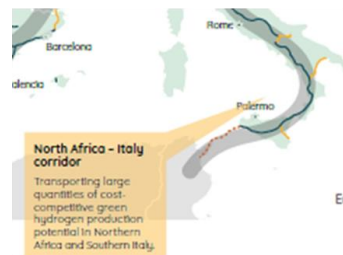
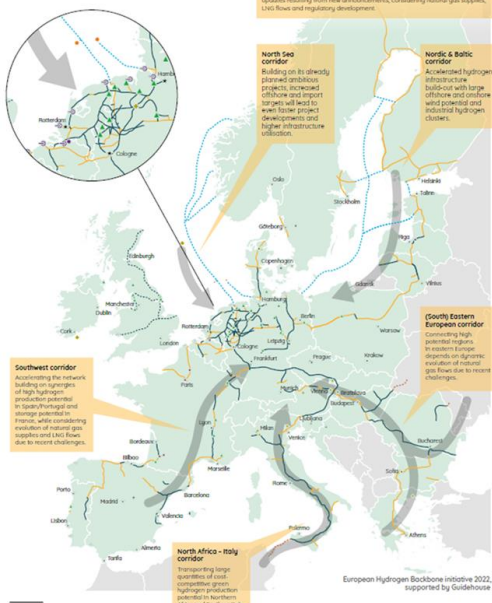
1200 km by boat



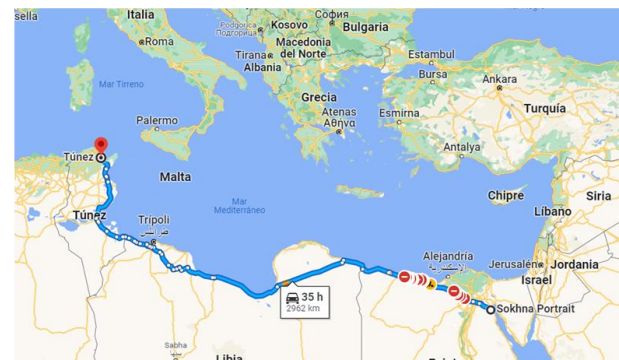
# Sokhna Portrait- Tunisia - Palermo

Figure 2 - 2030

Accelerated and updated 2030 ENE network supports the EC's REPowerEU ambition to accelerate the creation of a domestic and import market for hydrogen and to increase European energy system resilience



3000 km by truck

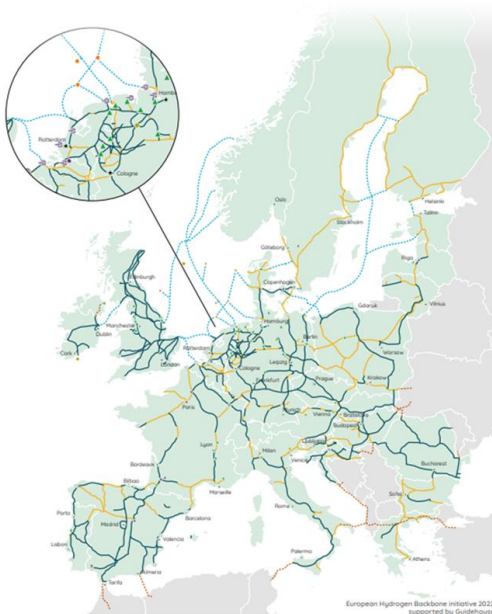


# Sokhna Portrait- Istanbul

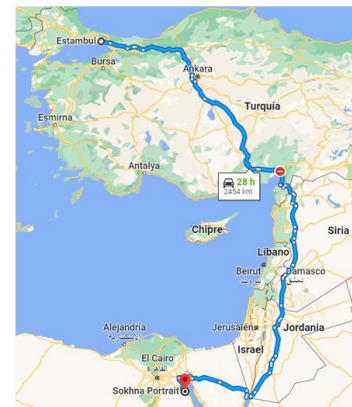
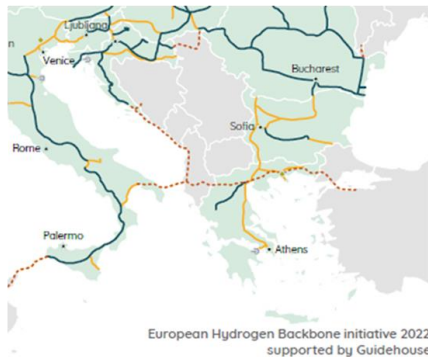
Figure 3 – 2040

Mature infrastructure stretching towards all directions by 2040

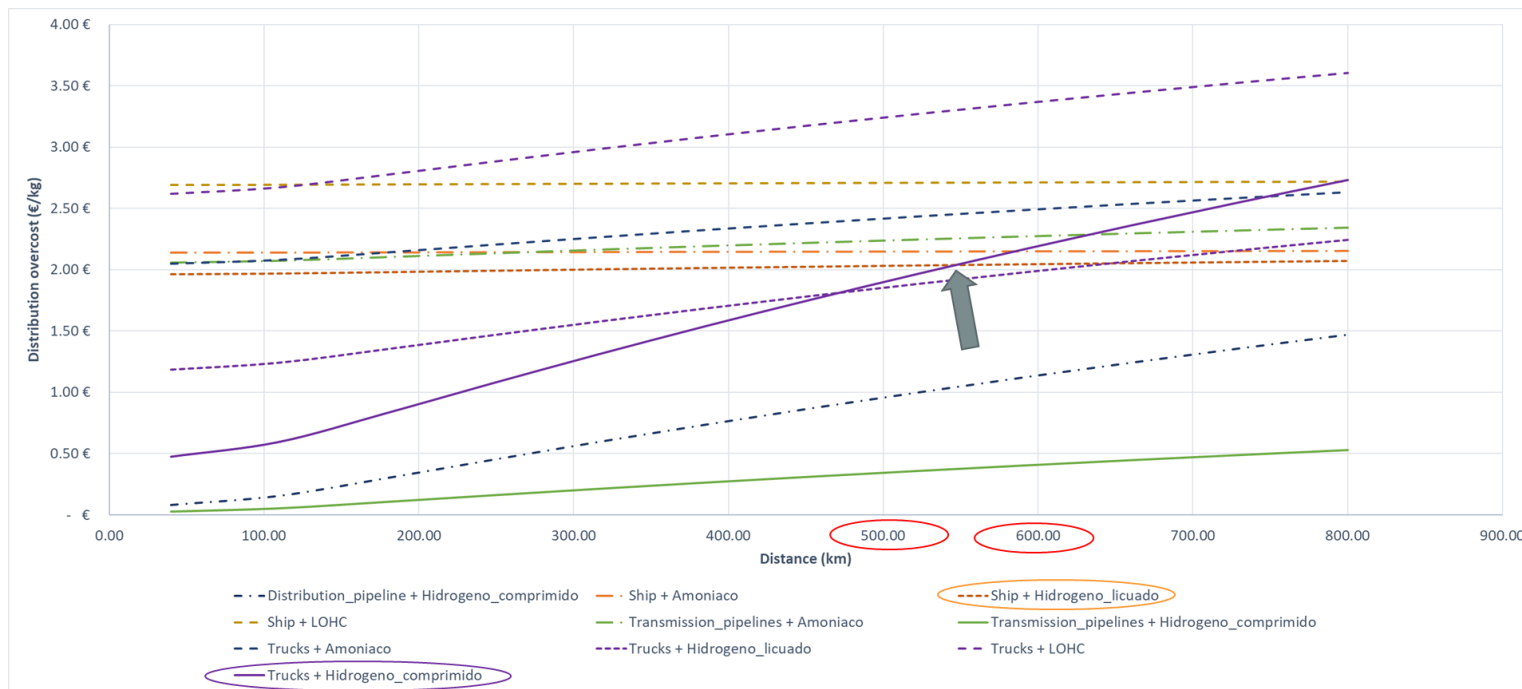
**Pipelines**  
 — Repurposed  
 — New  
 - - Subsea  
 - - Import/Export  
**Storages**  
 ● Sub-cover  
 ● Receptor  
 ● Deployed field  
 ● Rock cavern  
**Other**  
 ● City, for administration purposes  
 ● Energy hub/ offshore center  
 ● Hydrogen production  
 ● Existing or planned  
 ● gas import terminal



2500 km by truck

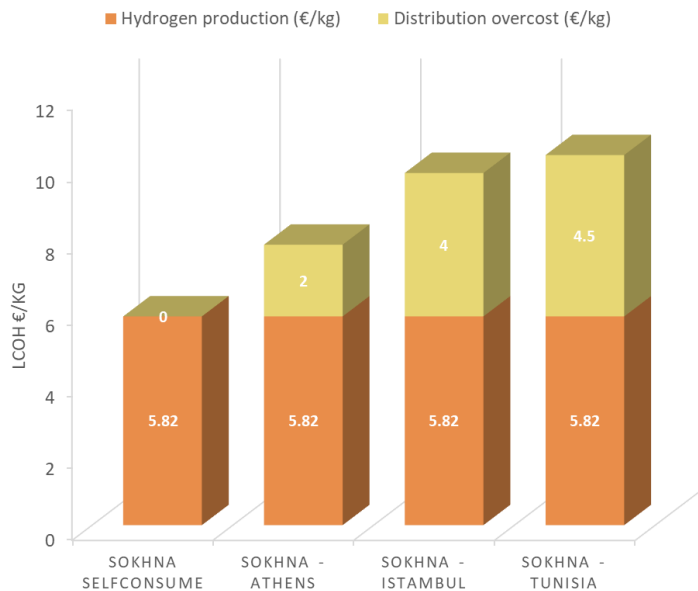


# Distribution overcost

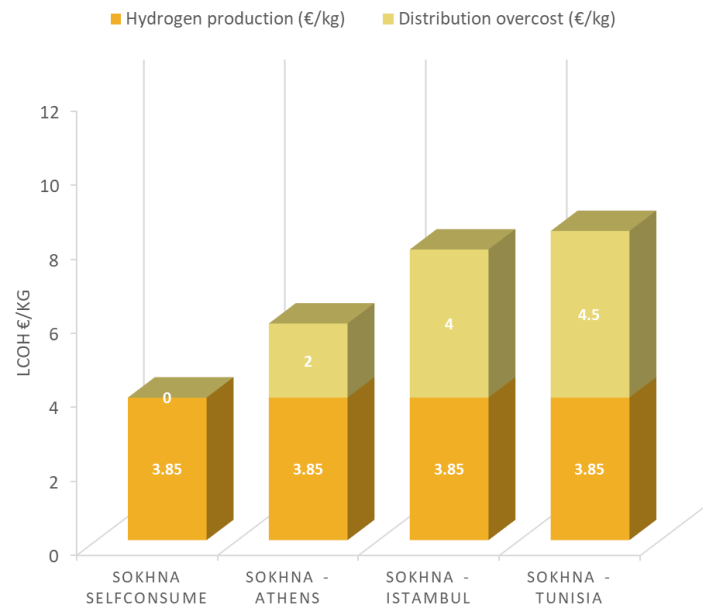


# LCOH

## ISOLATED SYSTEM

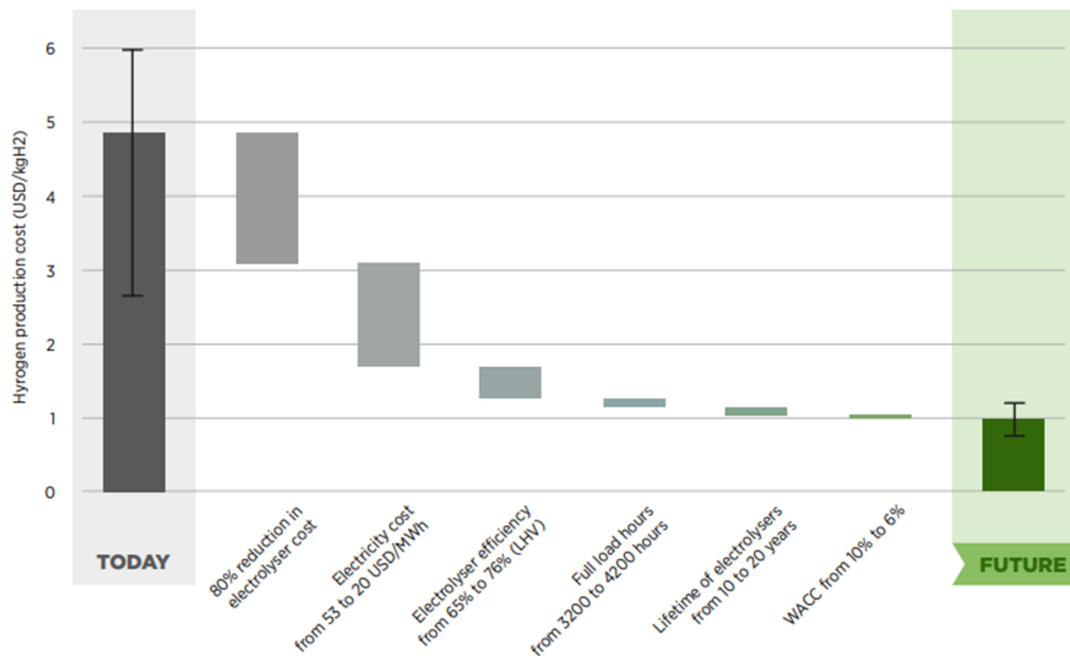


## PV + GRID SYSTEM





# LCOH



# Self- consumption



**12** Industrial Sectors

- 01 ROLLING STOCK
- 02 AUTOMOTIVE
- 03 ELEC. CARS BATTERIES
- 04 CAR TIRES
- 05 CASTING & FOUNDRY
- 06 BUILDING MATERIALS
- 07 CHEMICAL & PETROCHEMICALS
- 08 TEXTILES & APPAREL
- 09 PHARMACEUTICALS & MEDICAL DEVICES
- 10 ACTIVE PHARMA INGREDIENT (API)
- 11 SOLAR P.V. SYSTEMS
- 12 AGRI-BUSINESS & FOOD PROCESSING

**03** Service Sectors

- 01 BUNKERING
- 02 LOGISTICS
- 03 DATA CENTERS



# Self-consumption

## SOKHNA INTEGRATED ZONE

*"One of the largest industrial and port complexes globally is ready to host new projects."*

Integrated zone with an area of 210 Km supporting light, medium and heavy manufacturing activities, as well as commercial and business activities, integrated with a hub port (SOKHNA port) and logistic area.

### Facts:

- 12 industrial developers
- more than 240 projects
- Over 30k direct and indirect job opportunities

### Industries:

- Refinery, Energy Components
- Chemicals & Petrochemicals
- Construction & Building Materials
- Heavy Industries
- Textiles & Ready-made Garments
- Home Appliances & Electronics
- Automobile Assembly & Parts
- Food Processing
- Pharmaceuticals
- Logistics activities & Courier services
- SME Cluster Park Development



# Self-consumption

## EAST PORTSAID INTEGRATED ZONE

EAST PORTSAID is an integrated port / logistics / industrial zones to serve Mediterranean, North & West Africa, Europe, North America and MENA region. The benchmark of EPS is light and medium industries, commercial and business activities with the capacity to generate over 80,000 jobs.

East Port-Said (EPS) industrial zone is on a total area of 63 KM<sup>2</sup> designated to receive various manufacturing activities and a wide range of industrial clusters :

- Automotive Assembly, Feed industry and Rolling stock ←
- Textiles & Ready-made Garments
- Home Appliances & Electronics
- Construction & Building Materials
- Engineering Equipment & Machinery
- Electric Power Industry ←
- ICT / Hardware ←
- Pharmaceuticals ←
- Food Processing ←
- SME Cluster Park Development
- Logistics HUB & Services ←

- ① Sea Water Desalination Plant (New EPS City) 150,000 M3/day.
- ② A Wastewater Treatment plant (capacity of 100,000 M3/day).
- ③ Sewage Lifting Stations / 4 X 500 Ltr/S.
- ④ Electricity Substation (125\*2 MVA),
- ⑤ Electricity Substation under construction (175\*2 MVA) +
- ⑥ 3 Electricity networking Projects
- ⑦ Fiber Optics Cables
- ⑧ Natural Gas is available ←

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