

Long term analysis of the electricity sector in Algeria: an energy dilemma nexus

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ICAE - 2020

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Context

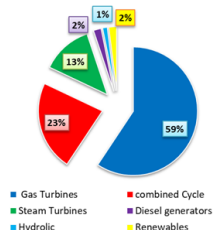
- The Algerian economic development model mainly based on the exploitation of exhaustible natural resources.
- Algeria's strategy relies mainly on optimizing export revenues from oil and NG at the expense of using natural gas to meet national demand.
- 97% of domestic power plants uses natural gas to generate electricity.
- A major Energy Dilemma
- The need to implement forward-looking policies that may ease the transition.

Focus of the study

- Achieve a new energy model paradigm featuring less natural gas, and alternative forward-looking policies and strategies
- Establish different demand scenarios up to 2070 that will drive the TIMES-ELEC-ALGERIA model
- A prospective analysis will be achieved enabling to explore different trajectories.
 - ① Enhance the role of renewable resources in the energy mix
 - ② The contribution of shale gas in Algeria's energy mix.

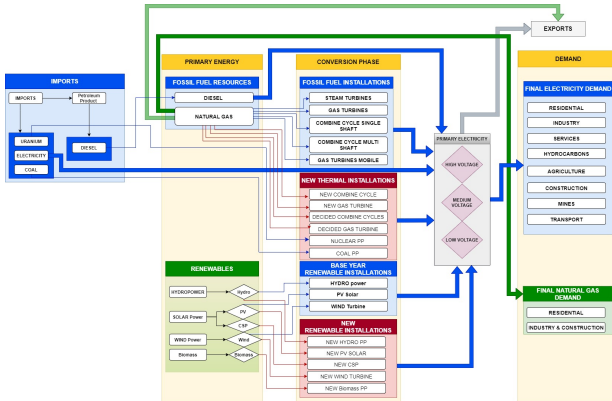
Generalities

- 1 In 2016, Installed Capacity reached 19 GW.
- 2 Power generation increased in the last decade and reached 66TWh.
- 3 Total Electricity consumption was 55 TWh.
- 4 NG accounts for about 55% of total primary energy
- 5 Algeria's marketed gas production reached 93.3 bcm
- 6 Natural gas demand reached 41.3 Mm3 in 2017
- 7 Natural gas exports (including LNG and LPG)reached about 65.8 bcm in 2017



Methodology

- We will use a TIMES (The Integrated MARKAL-EFOM System)
- Three alternative demand scenarios were explored (S0, S1 and S2)



Reference power system in Algeria

Data and preliminary analyses

We develop long-run, scenario-based forecasts based on possible future evolutions of the growth rates of relevant economic and demographic drivers.

The electricity consumption data (MW) and NG data (Mm3), available on a yearly basis (1998-2018)

Electricity Sectors	Natural Gas Sectors
Residential (RES)	Public Distribution (PD)
Agriculture (AGR)	Power Plants (PP)
Hydrocarbons (HDR)	Industrial Clients(IC)
Construction (BTP)	
Mining (MIN)	
Industry (IND)	
Transport (TRAN)	
Services (SVR)	

Assumptions Scenarios

1- GDP Scenarios

GDP AAGR %	2018-2035	2035-2070
S0 trend SC	1.3 %	1.4 %
S1 resilient SC	2.8 %	2.6 %
S2 ambitious SC	3.5 %	3.7 %

2- Population Scenarios

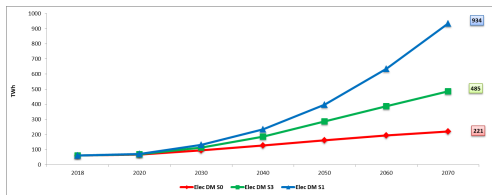
Electricity demand in the residential sector in Algeria is very sensitive to the expansion of housing stock, as well as to the growth of the population.

AAGR %	2018-2035	2035-2070	HOR by 2070
S0 trend SC	1.1 %	0.3 %	3.5
S1 resilient SC	1.3 %	0.7 %	3.0
S2 ambitious SC	1.6 %	1.1 %	2.2

Electricity Demand Scenarios

Construction of the future trajectories of electricity and gas demand

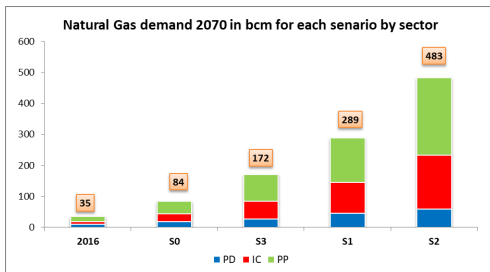
- In the trend scenario the electricity will reach 220TWh
- by scenario the structure of the electricity demand changes, more contribution of the industry and services sectors
- in the resilient scenario 50 % comes from the residential sector in 2070.



AAGR %	2018-2035	2036-2070
S0 trend SC	3.5 %	2.0 %
S1 resilient SC	5.0 %	3.5 %
S2 ambitious SC	6.0 %	4.9 %

Natural Gas Demand Scenarios

- Total Natural gas consumption is expected to reach 84-289 billion cubic meters by 2070
- In 2016, the share of PD clients was around 30%, yet it decreases to reach a share of 12% in the ambitious scenario



Natural Gas demand scenarios 2018-2070

Supply System

A long run prospective analysis was performed of the power and gas system in Algeria.

we explored two alternative scenarios, that were compared in terms

Electricity generation and Gas supply

- Cost Efficient Renewable Scenario "CERN"
- Fossil Fuel Scenario "FF"

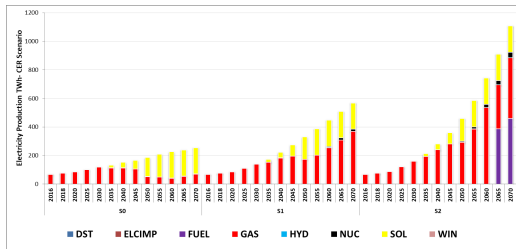
Considered Hypothesis:

- ① Shale gas is available after 2030
- ② Upper bound on new Shale Gas capacities
- ③ A Limit on the deployment of future Solar (150GW max) and Nuclear (from 2040, 1GW/5years) technologies

Electricity Production 1/2

1- Cost Efficient Renewable Scenario

- Natural gas remains the predominant technology
- A significant penetration of renewable technologies, mainly solar emerges by 2035
- In S2 Fuel plants are proposed as a solution
- renewable contribution varies between 46 %, 21% and 11% in 2070 in the scenarios S0, S1 and S2, respectively.

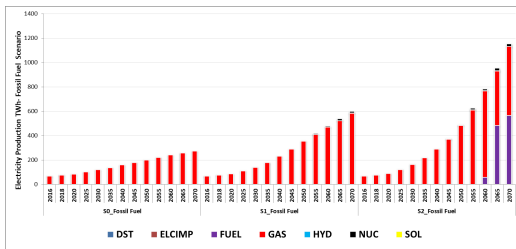


Electricity generation by technology CERN scenario at 2070

Electricity Production 2/2

2- Fossil Fuel Scenario

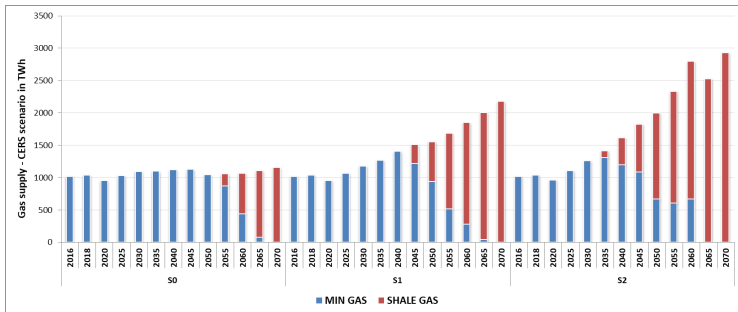
- High levels of fossil fuel were found in the three alternative scenarios
- in S2 some new fuel plants starting from 2060
- a limited contribution of 2% of new Hydro plants was observed from 2020



Electricity generation by technology Fossil Fuel scenario

Gas Supply

- to ensure the required generation in each scenario, the system gradually expands the use of shale gas.
- A smooth transition from natural gas to shale gas in each scenario



Gas supply in the cost efficient renewables

Conclusion

- The results confirm our concerns regarding the Energy dilemma.
- The results highlight the challenge of diversification for a leading export country and the need for strategic anticipation and planning.

Thank You for your attention

Questions?
More Information?

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