# Algerian Energy Planning According to the INPRO Methodology

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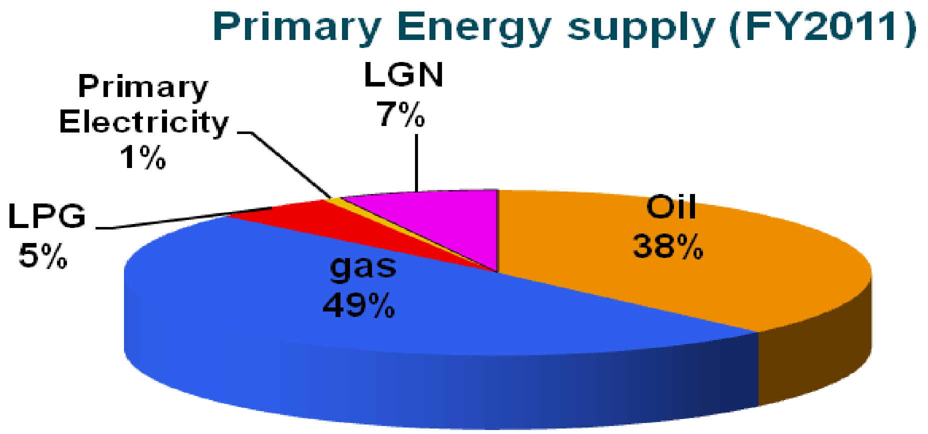
# Algerian Energy Sector

# Algerian Energy Situation

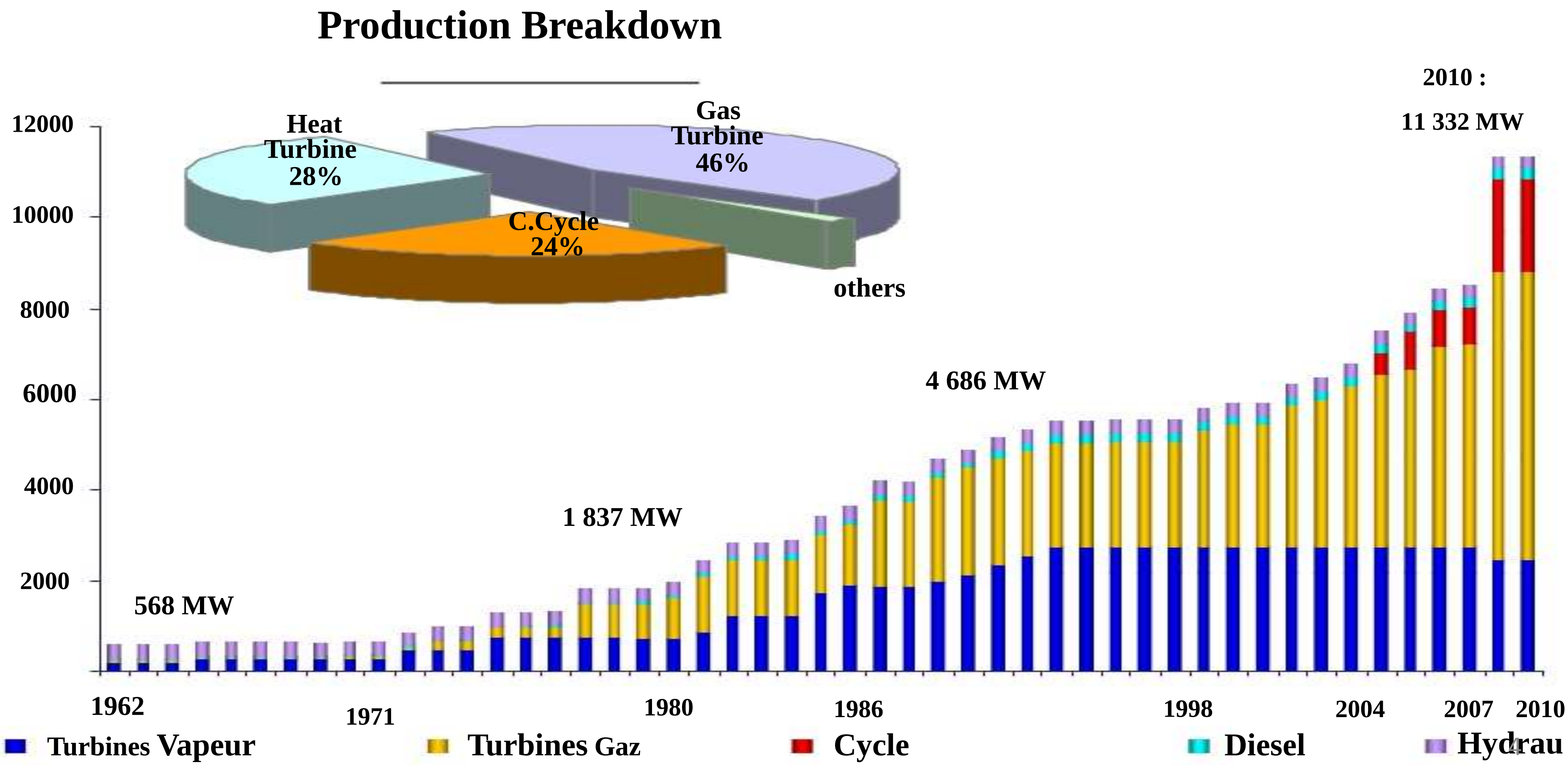
**Algeria is 100% energy self-sufficient country.**



# Energy Generation Capacity

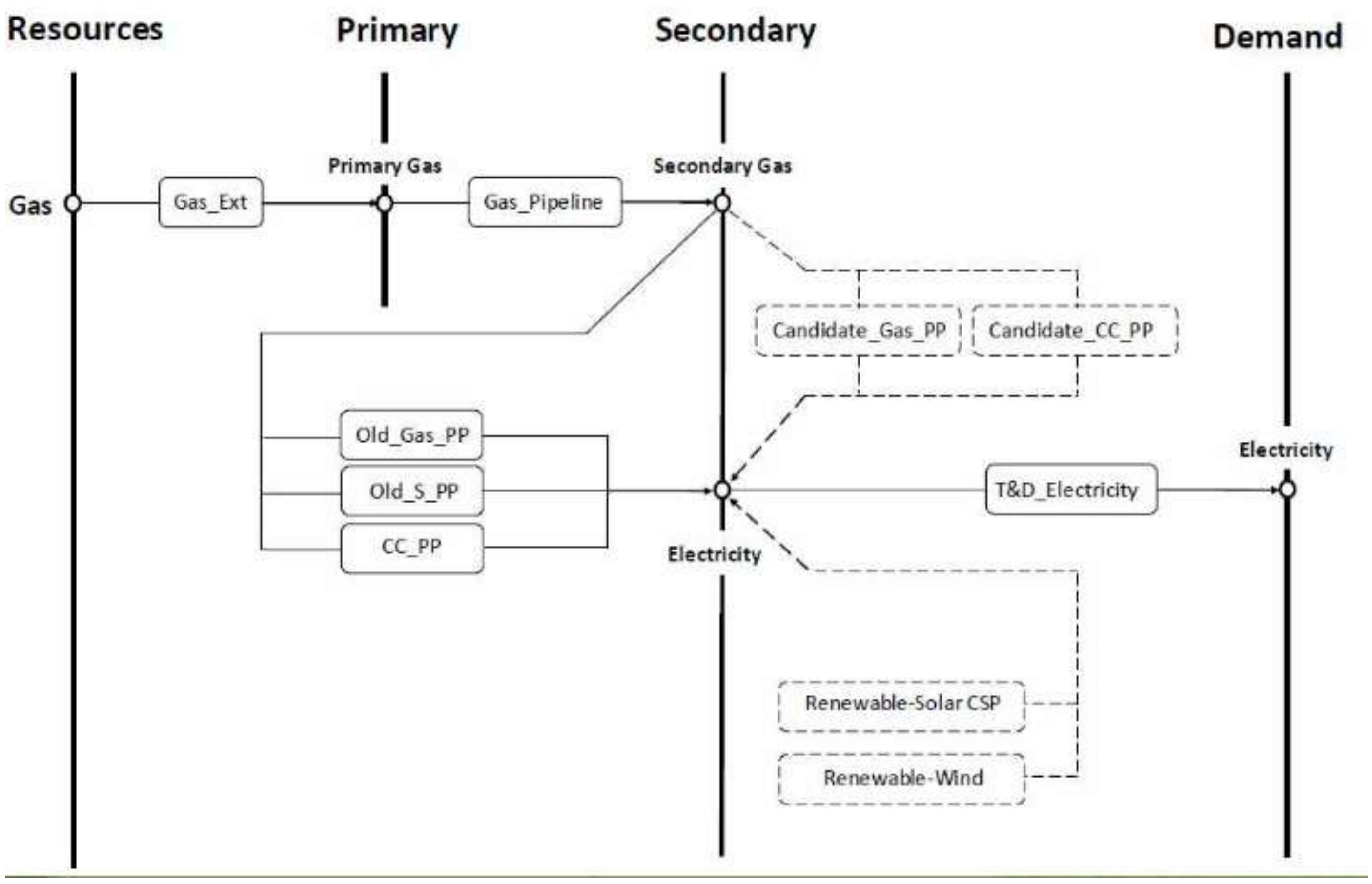
**The total generation capacity has reached 11,300 MW in 2010**

**Combined Cycle was introduced in 2005**



# Energy planning using MESSAGE

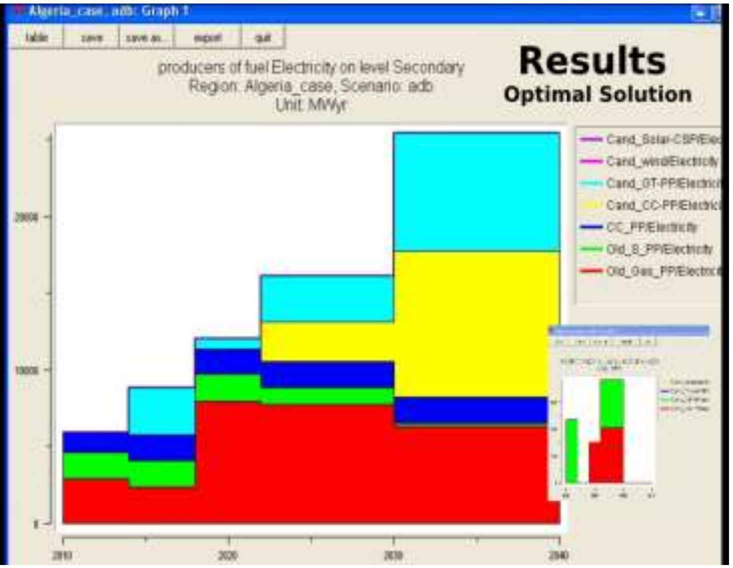
- Energy chain modeling

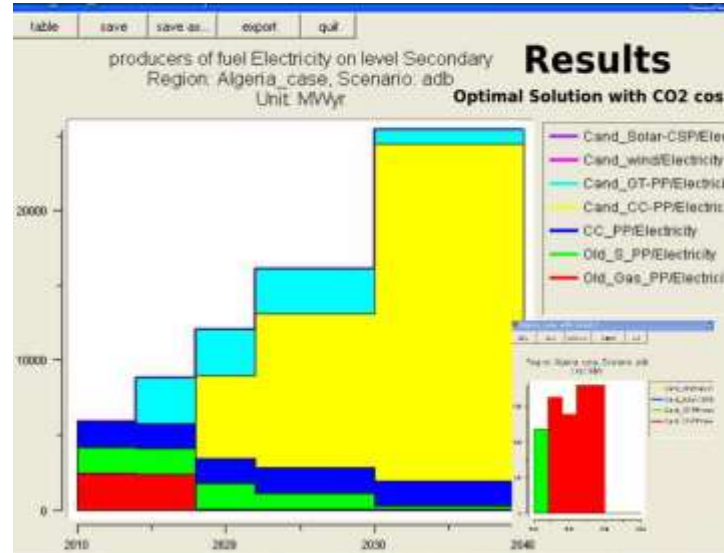


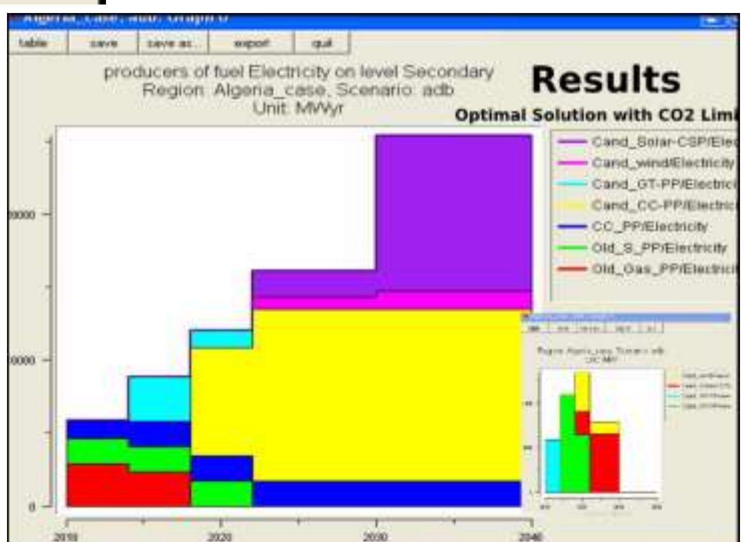
# Energy planning using MESSAGE

- Energy planning scenarios
  - Scenario 1: Base case
  - Scenario 2: Considering the penalty on $CO_2$ emission
  - Scenario3: Considering $CO_2$ emission limit

# Energy planning using MESSAGE



# Optimal Solution: Scenario 1

| | Gas P-P (MWyr) | | | Combined Cycle (MWyr) | | | Steam P-P | Renewables (MWyr) | | | Total | CO2 emmissions |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Old | New | Total | Old | New | Total | (MWyr) | Solar CSP | Wind | Total | (MWyr) | Mton/yr |
| **2010** | 2870 | 0 | **2870** | 1284 | 0 | **1284** | **1728** | 0 | 0 | **0** | **5882** | **64** |
| **2014** | 2345 | 3051 | **5396** | 1700 | 0 | **1700** | **1728** | 0 | 0 | **0** | **8824** | **96** |
| **2018** | 7945 | 651 | **8596** | 1700 | 0 | **1700** | **1728** | 0 | 0 | **0** | **12024** | **138** |
| **2022** | 7709 | 3051 | **10759** | 1700 | 2580 | **4280** | **1088** | 0 | 0 | **0** | **16127** | **175** |
| **2030** | 6272 | 7746 | **14018** | 1700 | 9549 | **11249** | **205** | 0 | 0 | **0** | **25472** | **253** |

# Optimal Solution: Scenario 2

| | Gas P-P (MWyr) | | | Combined Cycle (MWyr) | | | Steam P-P | Renewables (MWyr) | | | Total | CO2 emmissions |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Old | New | Total | Old | New | Total | (MWyr) | Solar CSP | Wind | Total | (MWyr) | Mton/yr |
| **2010** | 2454 | 0 | **2454** | 1700 | 0 | **1700** | **1728** | 0 | 0 | **0** | **5882** | **62** |
| **2014** | 2345 | 3051 | **5396** | 1700 | 0 | **1700** | **1728** | 0 | 0 | **0** | **8824** | **96** |
| **2018** | 4 | 3051 | **3055** | 1700 | 5541 | **7241** | **1728** | 0 | 0 | **0** | **12024** | **108** |
| **2022** | 37 | 3051 | **3087** | 1700 | 10252 | **11952** | **1088** | 0 | 0 | **0** | **16127** | **136** |
| **2030** | 34 | 1044 | **1078** | 1700 | 22489 | **24189** | **205** | 0 | 0 | **0** | **25472** | **194** |

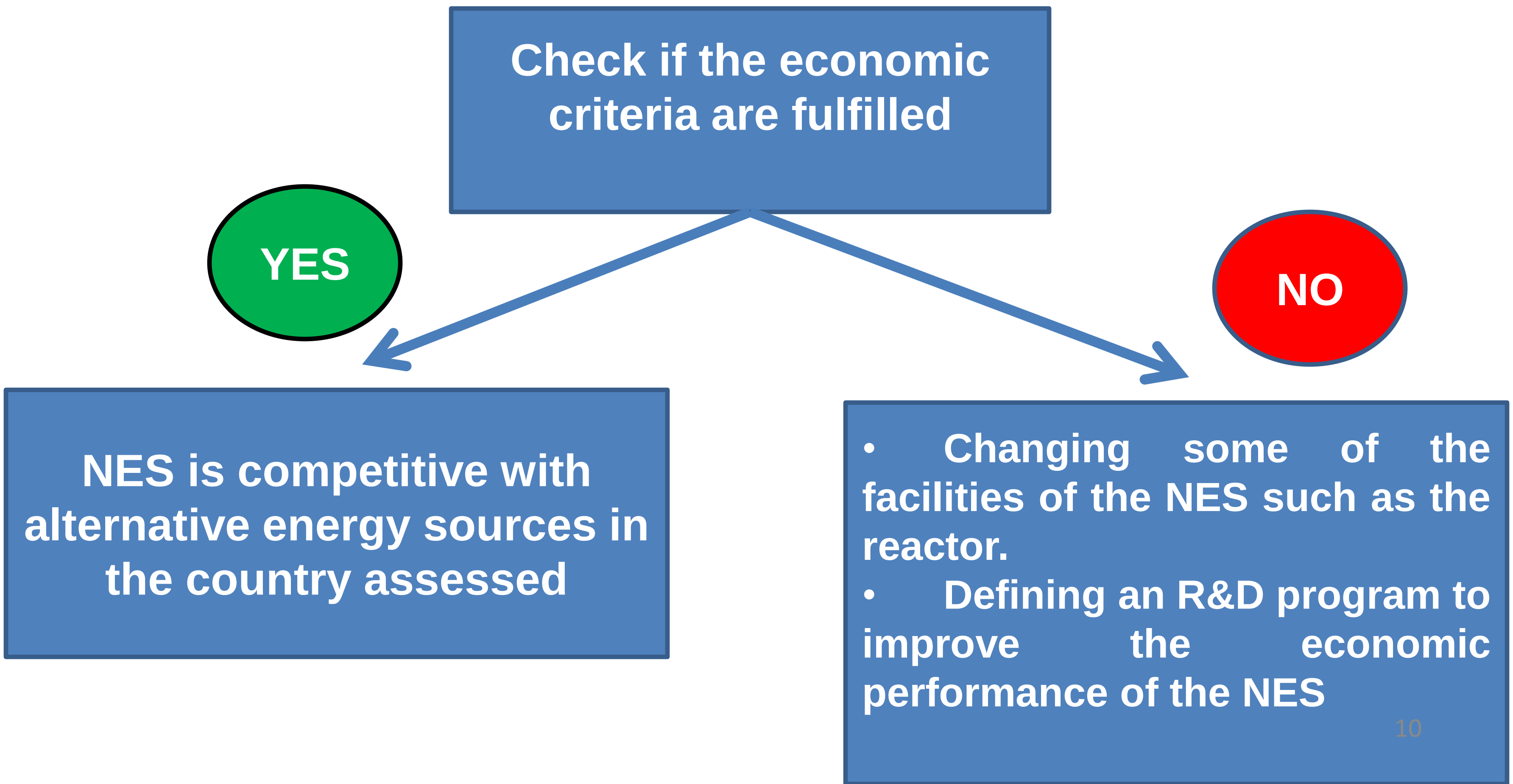
# Optimal Solution: Scenario 3

| | Gas P-P (MWyr) | | | Combined Cycle (MWyr) | | | Steam P-P | Renewables (MWyr) | | | Total | CO2 emmissions |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Old | New | Total | Old | New | Total | (MWyr) | Solar CSP | Wind | Total | (MWyr) | Mton/yr |
| **2010** | 2870 | 0 | **2870** | 1284 | 0 | **1284** | 1728 | 0 | 0 | **0** | **5882** | **64** |
| **2014** | 2345 | 3051 | **5396** | 1700 | 0 | **1700** | 1728 | 0 | 0 | **0** | **8824** | **96** |
| **2018** | 0 | 1170 | **1170** | 1700 | 7425 | **9125** | 1728 | 0 | 0 | **0** | **12024** | **100** |
| **2022** | 0 | 0 | **0** | 1700 | 11814 | **13514** | 0 | 1816 | 798 | **2614** | **16127** | **100** |
| **2030** | 0 | 0 | **0** | 1700 | 11814 | **13514** | 0 | 10699 | 1260 | **11958** | **25472** | **100** |

# Overview of INPRO Economics Methodology

# Overview of INPRO Economics Methodology

**Before the energy planning…**



# Overview of INPRO Economics Methodology

**After the energy planning…**

INPRO assessment results provide additional information through a study of the sensitivity of important economic parameters and added transparency of the economic results.

# Overview of INPRO Economics Methodology

One basic principle

Energy and related products and services from NES shall be affordable and available.

# Overview of INPRO Economics Methodology

- User Requirements

| User Requirements | Criterion |
|---|---|
| Cost of NES should be competitive | $C_N \leq k*C_A$ |
| Ability to finance all stages of NES | Attractiveness of investment |
| | Investment limit |
| Investment risk | Maturity of design |
| | Construction schedule |
| | Uncertainty of economic input parameters |
| | Political environment |
| Flexibility | Flexibility to different market |

# THANK YOU FOR YOUR ATTENTION