Manaar
Energy Consulting & Project Management
إستشارة و إدارة مشاريع الطاقة

# Feedstock Challenges and Market Implications for Middle East Petrochemical Producers

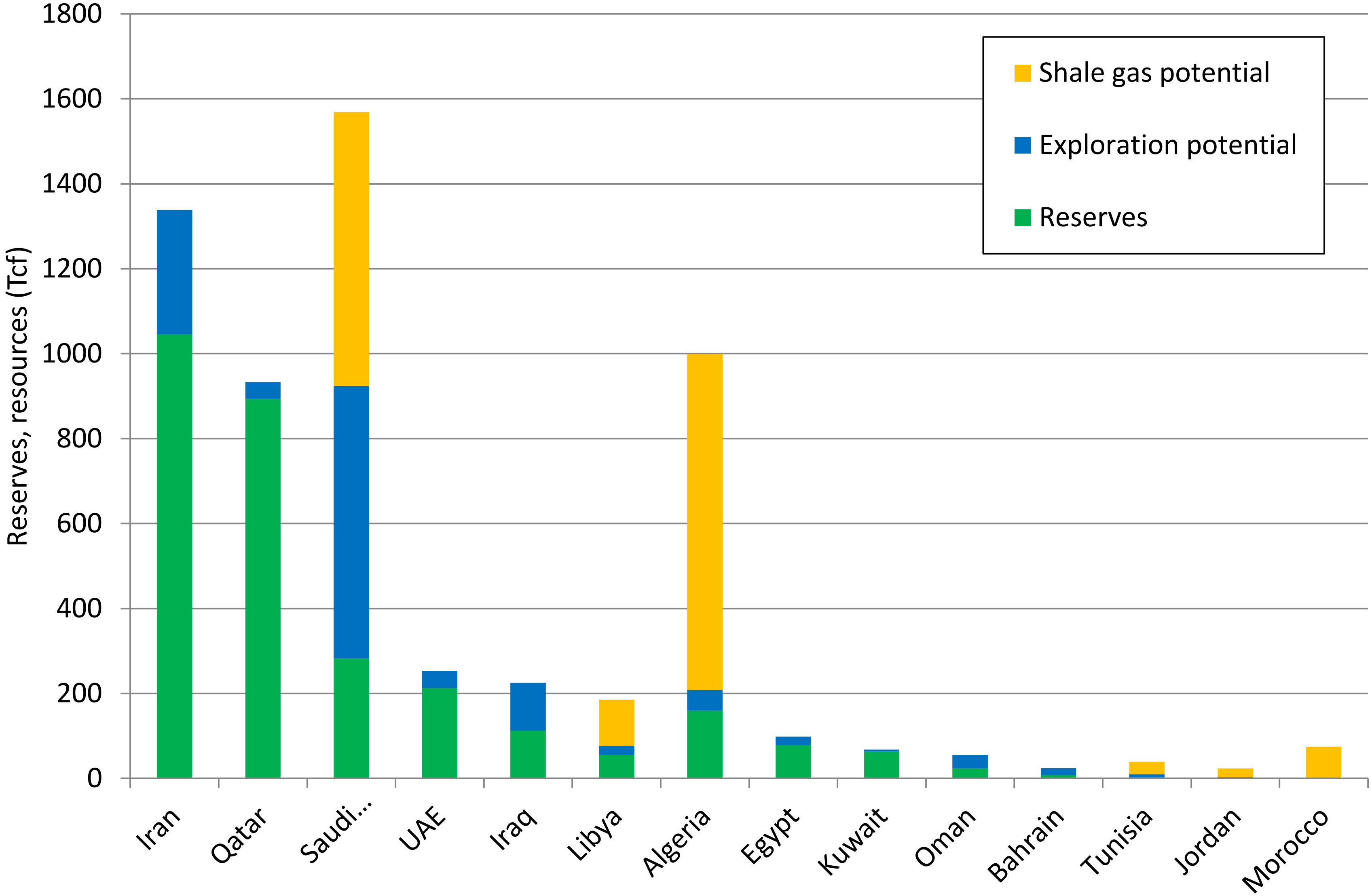
# Agenda

1. **Current MENA gas situation**
2. Country examples (Saudi Arabia, Kuwait, UAE)
3. Implications for petrochemicals
4. Conclusions

# MENA gas challenges

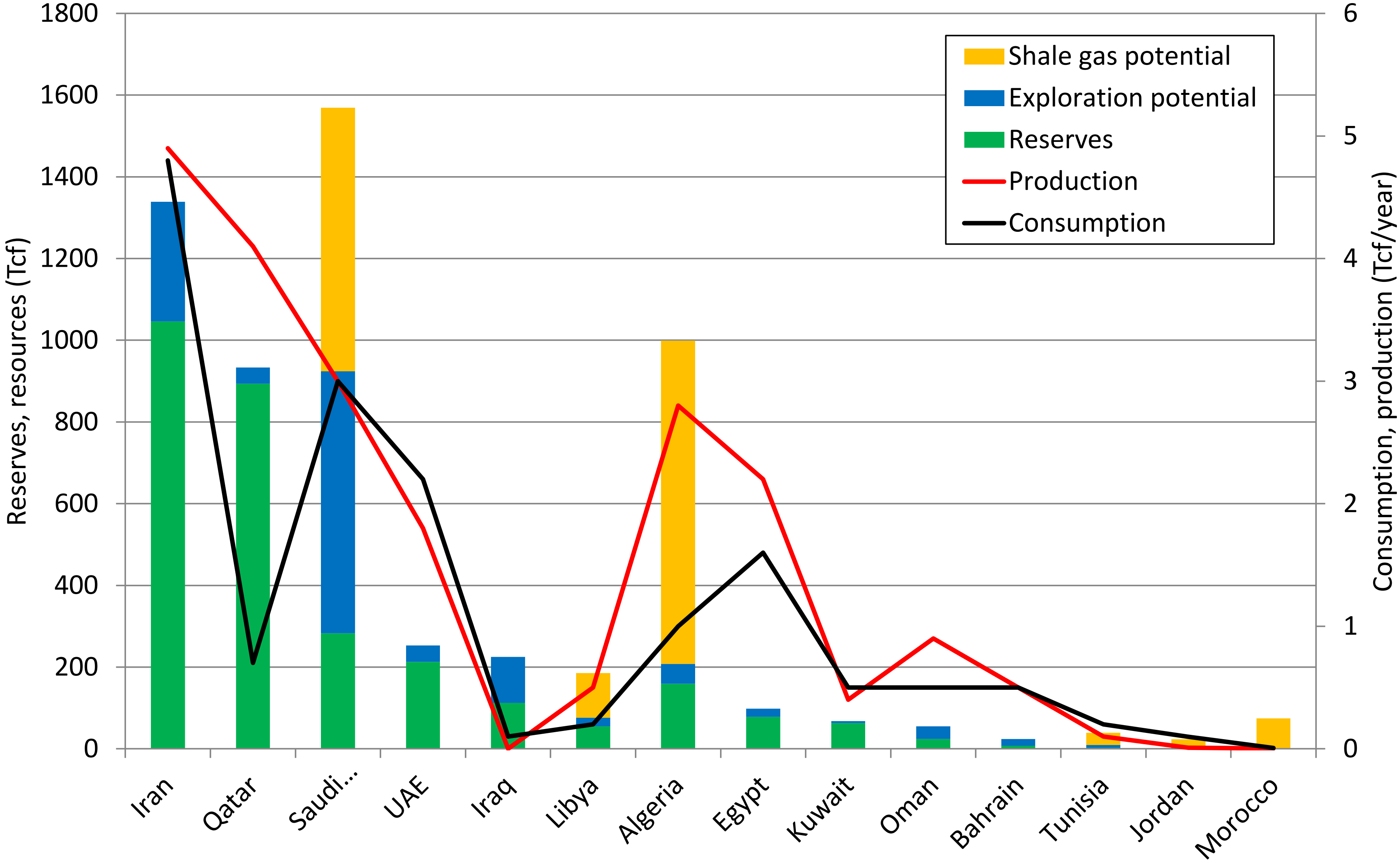
- Explosive growth of demand
  - Economic and population growth
  - Air-conditioning
  - Petrochemicals, LNG, aluminium
  - Mature oil fields requiring EOR
- Very uneven reserves distribution
- Limited development of intra-regional gas trade
- MENA cross-border gas trade had limited success (AGP, Dolphin based on low gas prices)
- Maintaining LNG exports with long-term contracts (Qatar, Oman, UAE)
- Expansion plans: New industrial cities, expansion of existing plants and transportation systems (Saudi Arabia, Oman, UAE)
- Lower reliance on oil revenues for exports (mainly Saudi Arabia)
- Complex and expensive sour gas reserves (UAE)

# MENA gas: The haves and have-nots



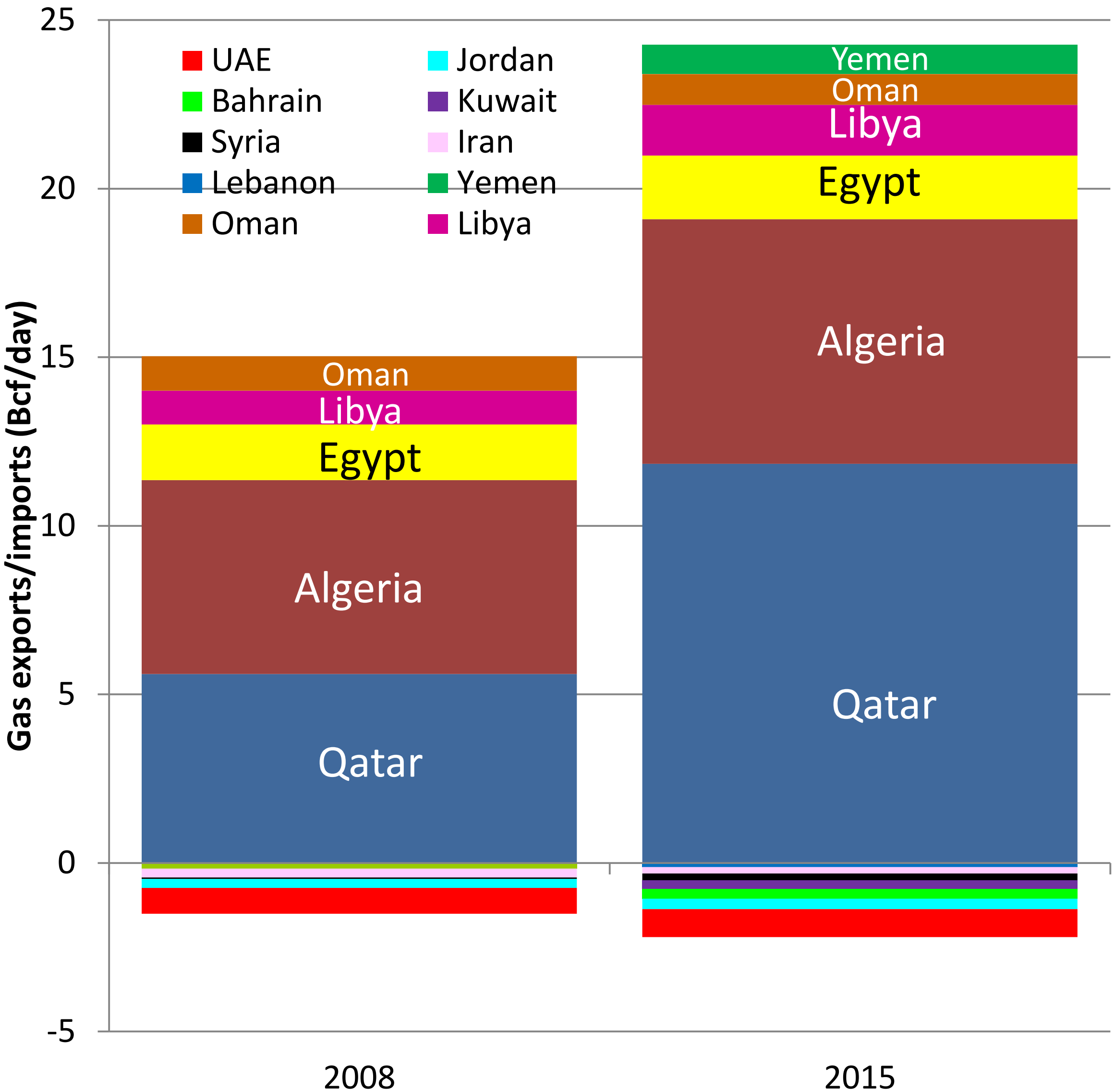

*Sources: BP, USGS, EIA, Petrenel, Baker Hughes, Manaar research*

# MENA gas: The haves and have-nots




*Sources: BP, USGS, EIA, Petrenel, Baker Hughes, Manaar research*

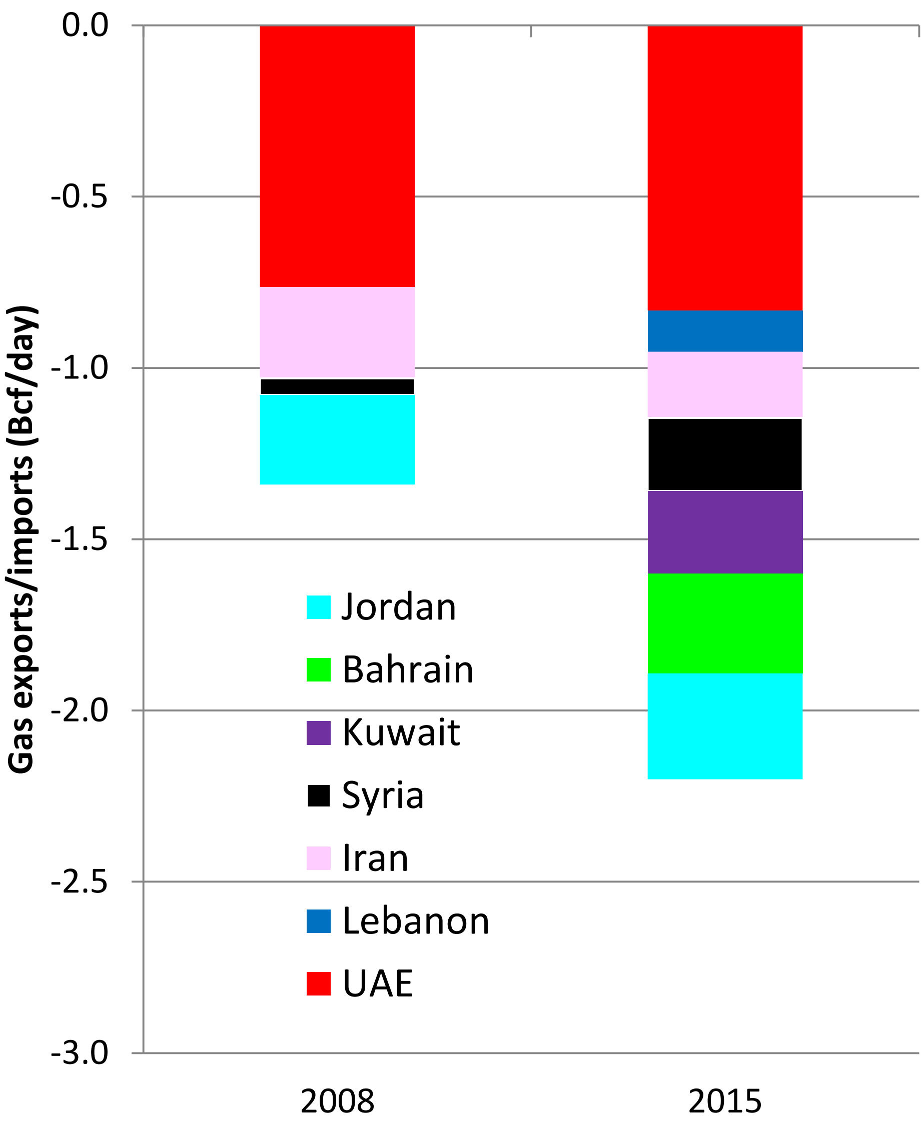
# Some growth in MENA gas exports to 2015; little thereafter




- On current trends:
  - MENA gas export growth is virtually all driven by Qatar & Algeria
  - Neither will grow much after 2015
  - Oman exports declining
  - New importers appearing (Kuwait, Bahrain, Fujairah)
- Possible export growth from Israel, Iraq, (Libya and Iran?)
- More gas production (including unconventionals) a necessity for regional and global markets

*Source: Fattouh & Stern*

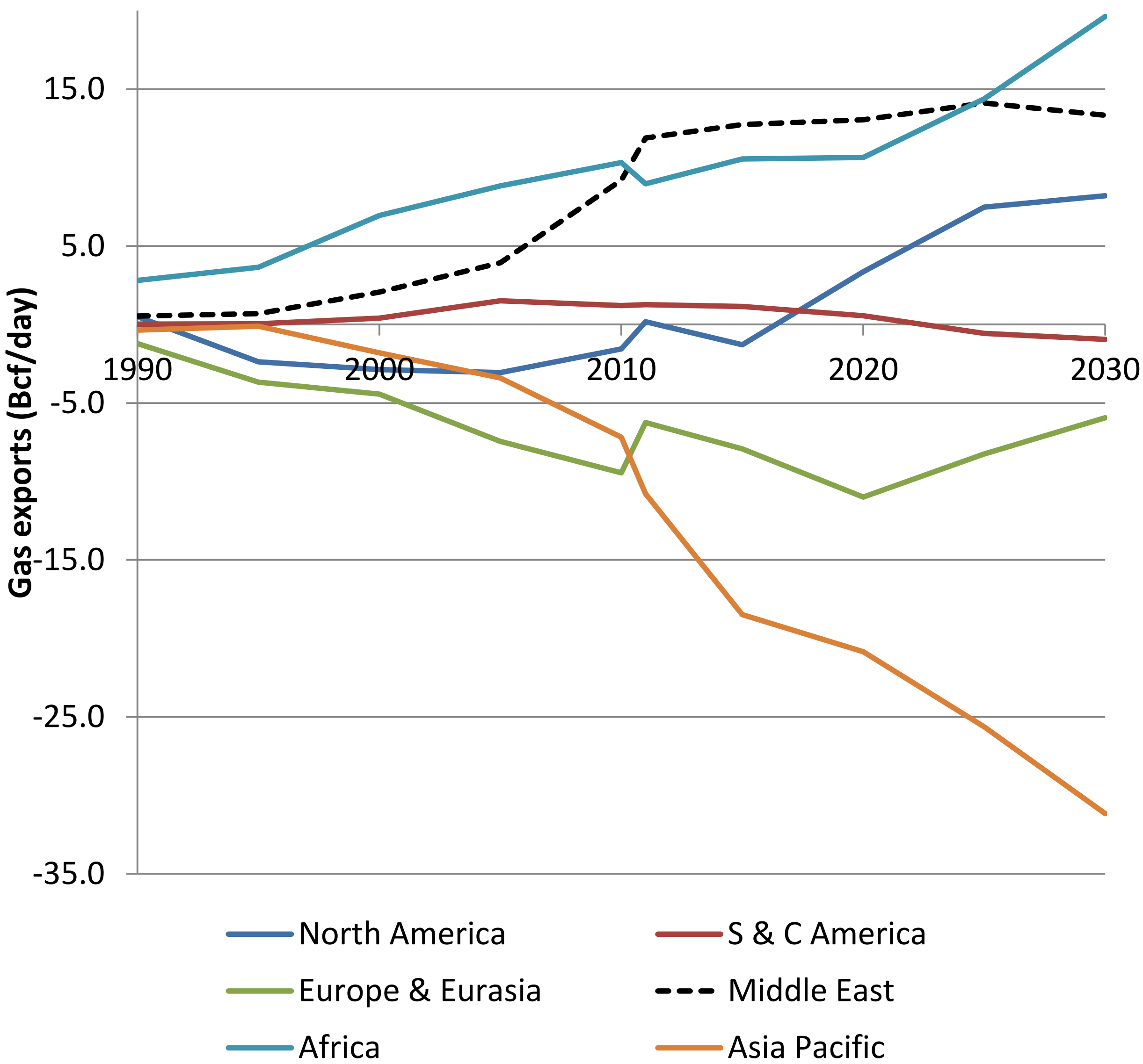
# Imports growing, including LNG




*Source: Fattouh & Stern,eds. (2010)*

- Despite its large gas reserves, the UAE is increasingly a net gas importer
- New MENA gas/LNG importers emerging
  - Dubai and Kuwait in 2010
  - Abu Dhabi/Fujairah (2015)
  - Bahrain (2015?)
  - Lebanon?

# Long-term global gas export balance




- Middle East and Africa are the two major exporting regions
- Asia is the major importing region
- Russia supplies Europe
- Big change is the emergence of North American gas exports after 2015
- However, total Middle East gas exports do not grow much

# Implications of soaring MENA gas demand

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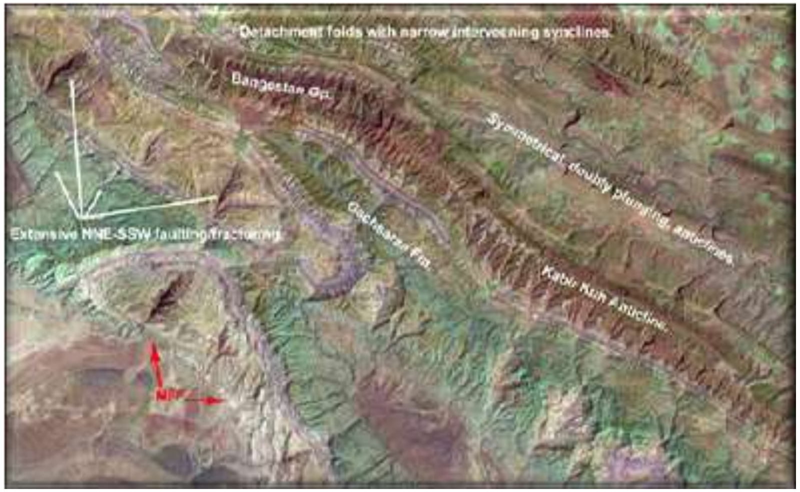
• Need for improved efficiency and end to gas flaring

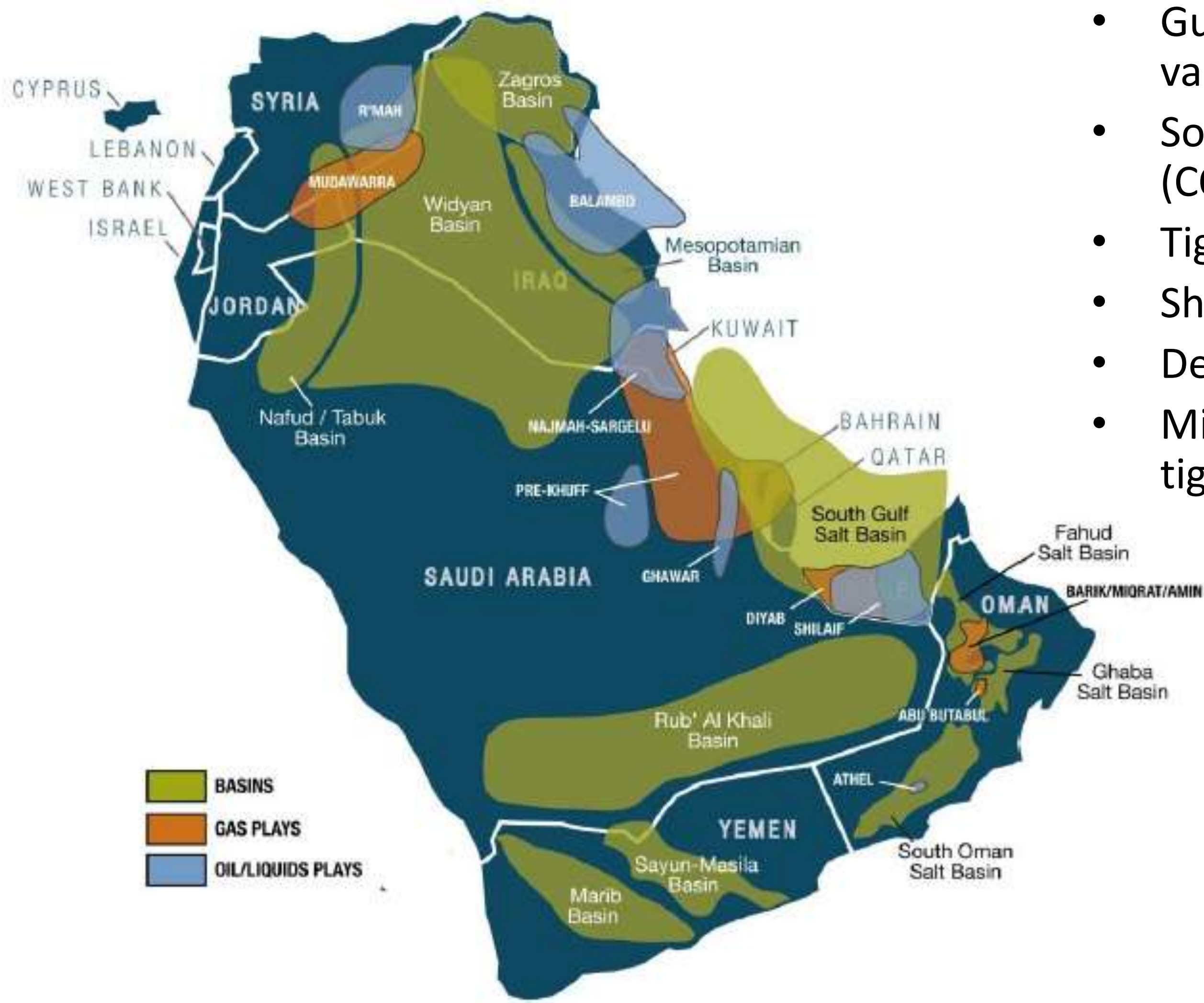
• Challenges to gas-based industrialisation & job creation




• Need for new gas exploration & development

• Power cuts and economic damage

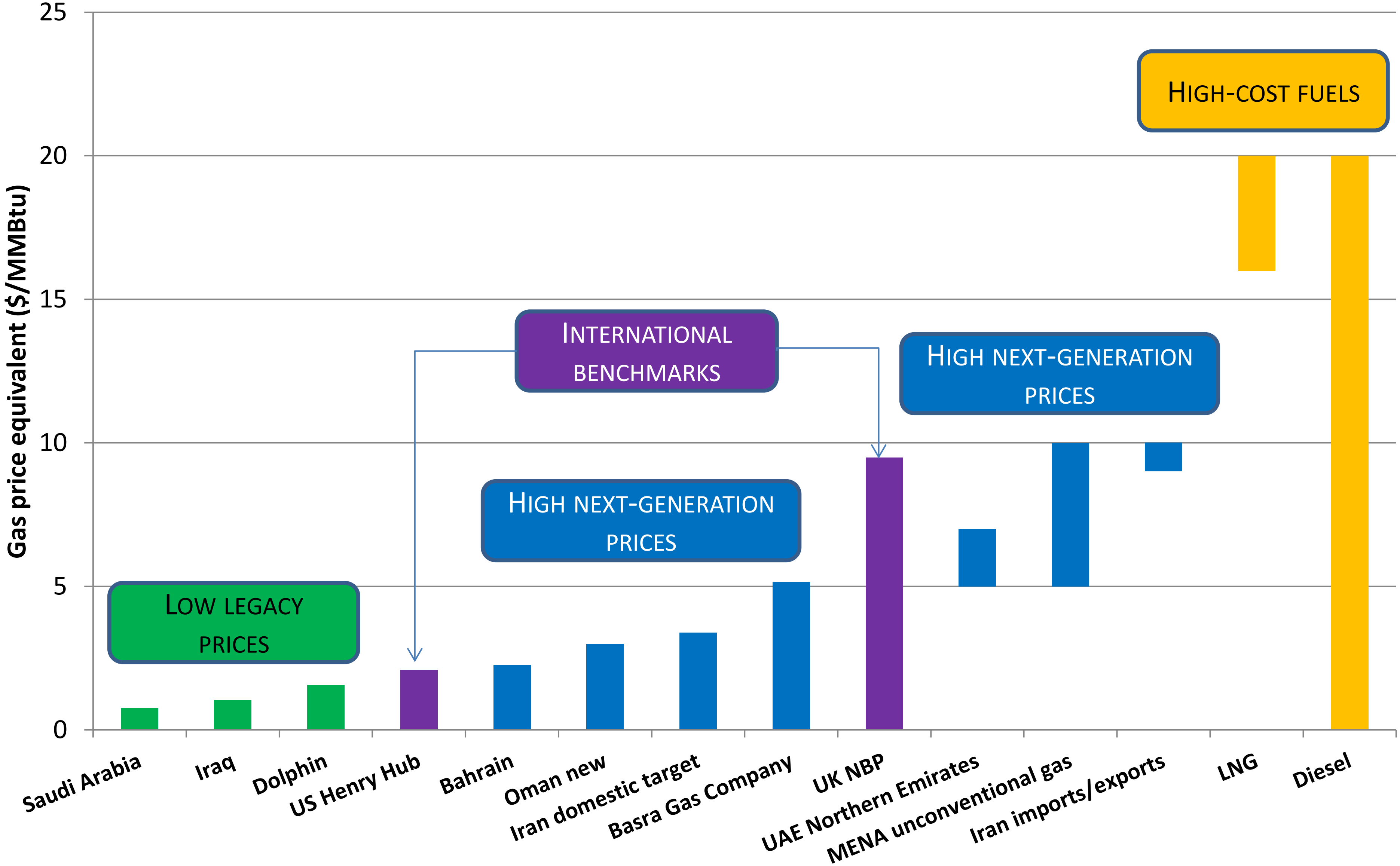
# Numerous different Gulf unconventional gas plays




- Gulf unconventional plays varied, potentially large
- Sour and contaminated gas ($CO_2$, $H_2S$, nitrogen)
- Tight gas (sands & carbonates)
- Shale gas, condensate and oil
- Deep and ultra-deep
- Mixed resources (e.g. deep, tight and sour)

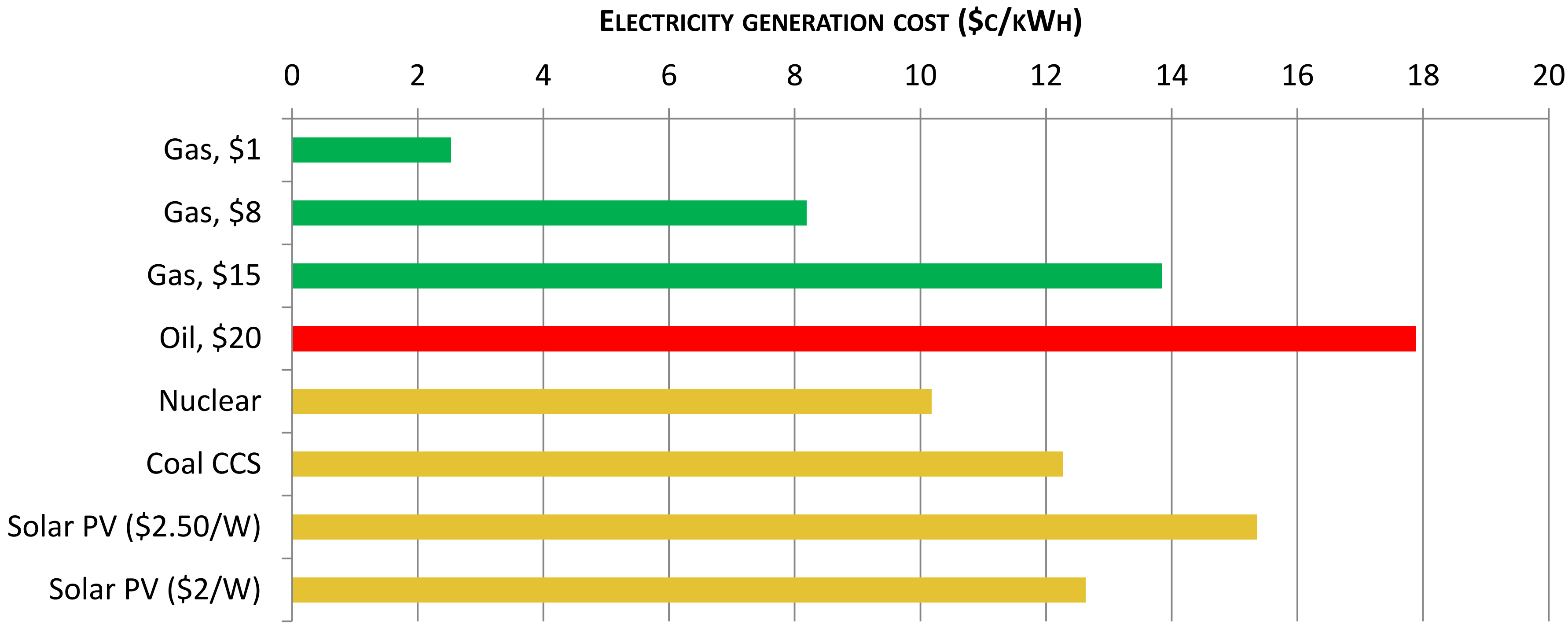
*Source: PacWest; Manaar research*

# Gas pricing reform slowly materialising




*Source: Manaar research*

# Cost of alternative energy

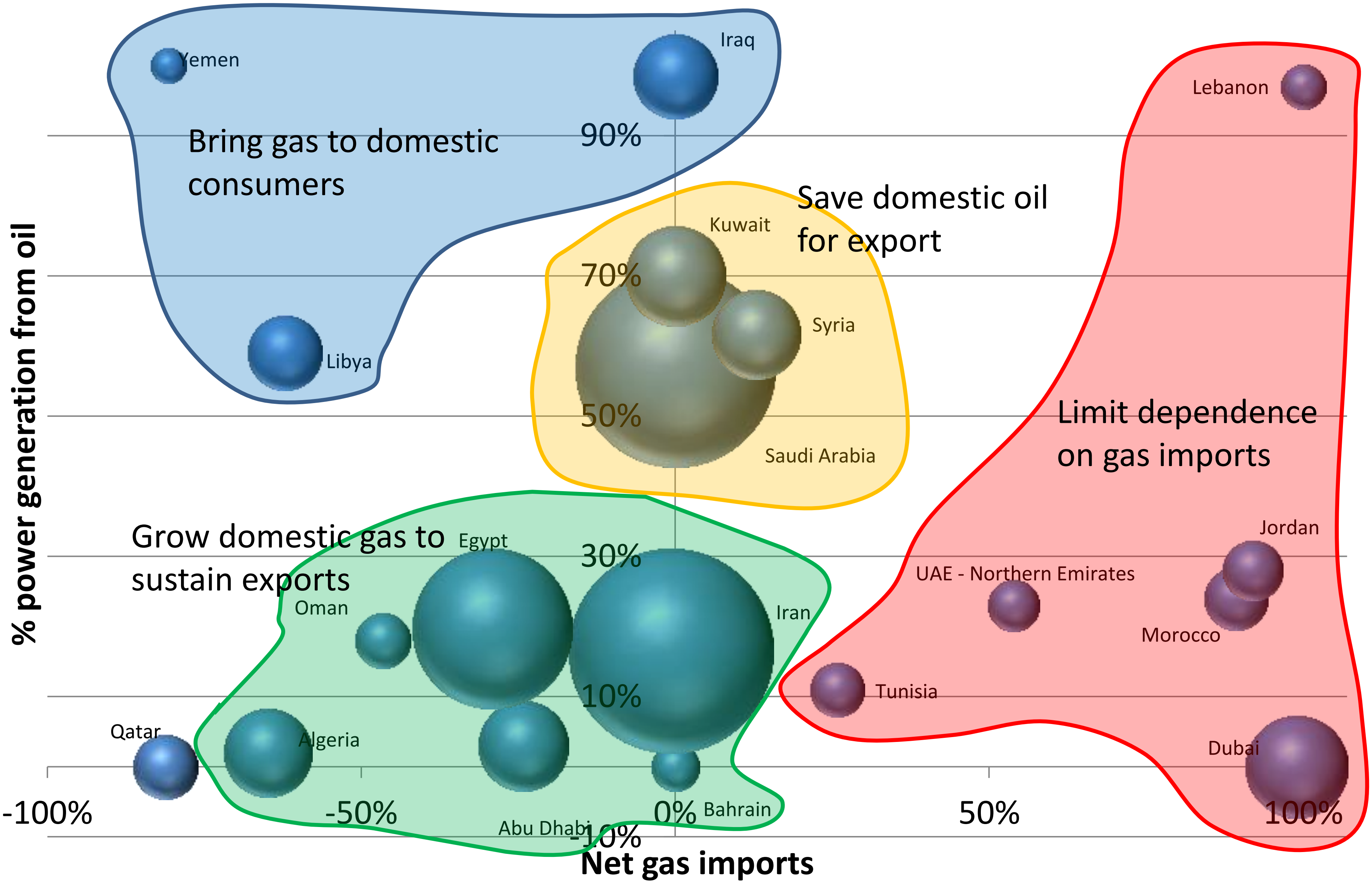



- Alternative generation (solar, nuclear, coal CCS) is cheaper than LNG or oil
- However, high-cost domestic gas (e.g. unconventional) at ~$8/MMBtu is still competitive against alternatives



*Source: Manaar research*

# Gas policy motivations vary by country (bubble size indicates market size)



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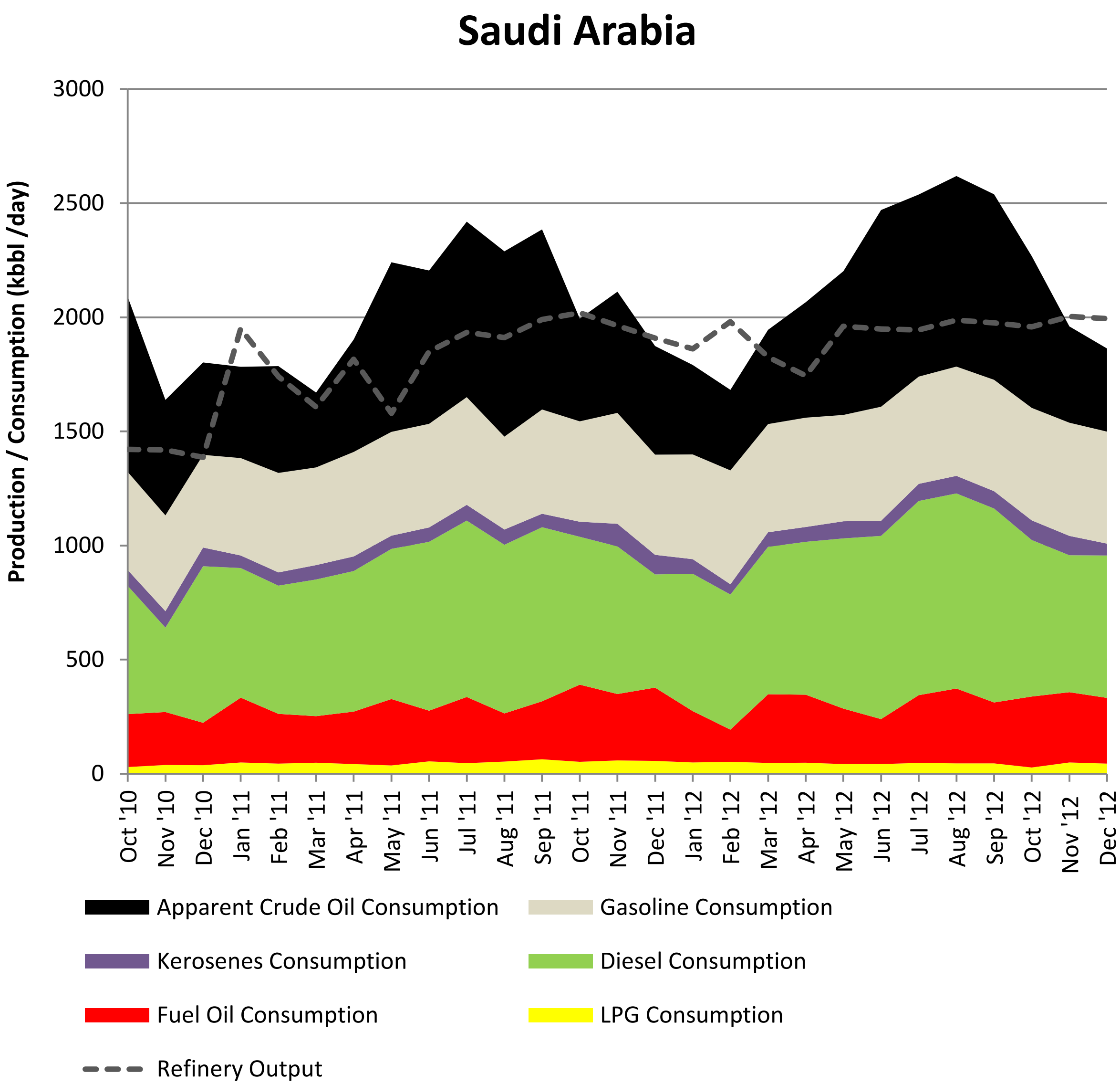
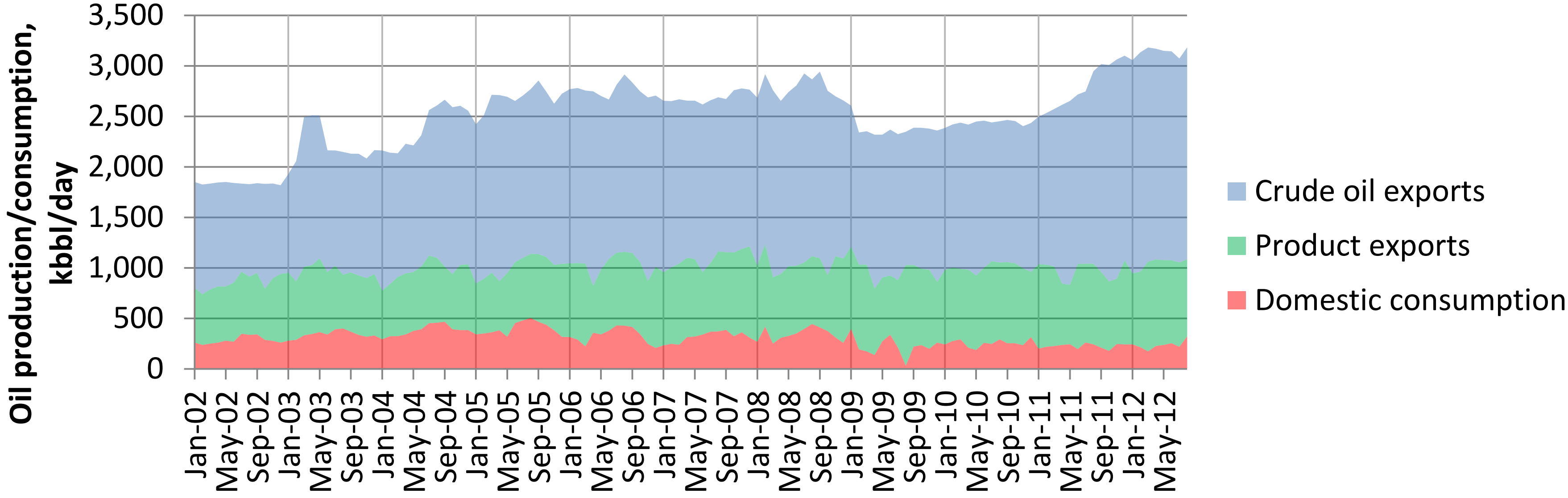
# Saudi Arabia Gas Issues




- High, seasonal demand for direct crude burn for power generation
- Fuel shortages this summer
- Delays to Wasit gas development
- Unconventional gas exploration beginning
- Refining mismatch – too much fuel oil, not enough diesel & gasoline
- Major refining expansions, but primarily for domestic use

*Source: JODI; Manaar research*

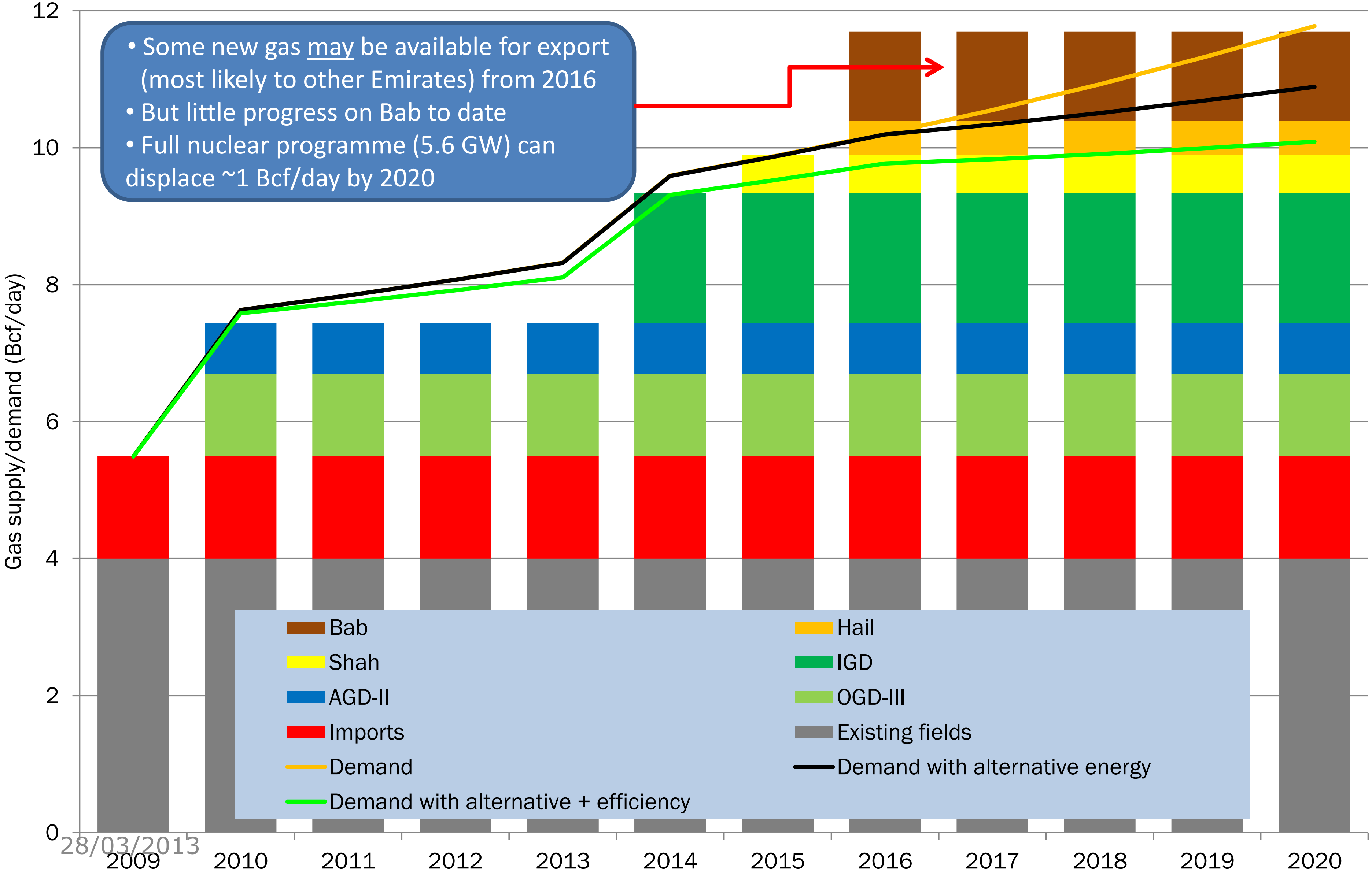
# Kuwait: challenges on gas



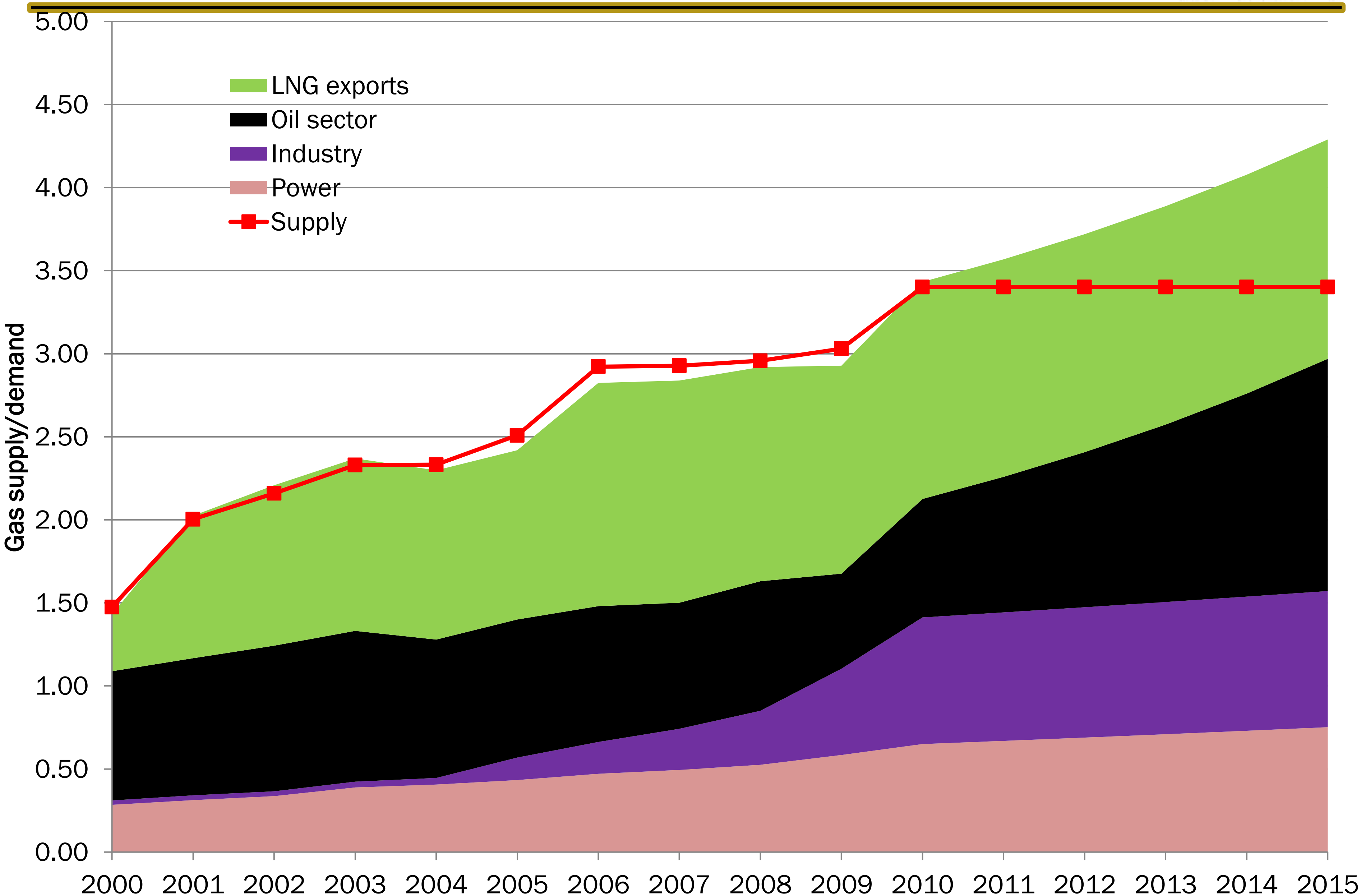

- The Middle East's first LNG importer
- LNG imports have cut domestic oil consumption (fuel oil) significantly
- However, progress on Jurassic gas/condensate (tight, sour, deep) limited by technical & political problems

*Source: JODI; Manaar research*

# Abu Dhabi: gas supply squeezed to 2016



# Oman: needs unconventional gas to maintain LNG exports



# Iraq's petrochemical progress likely to be slow

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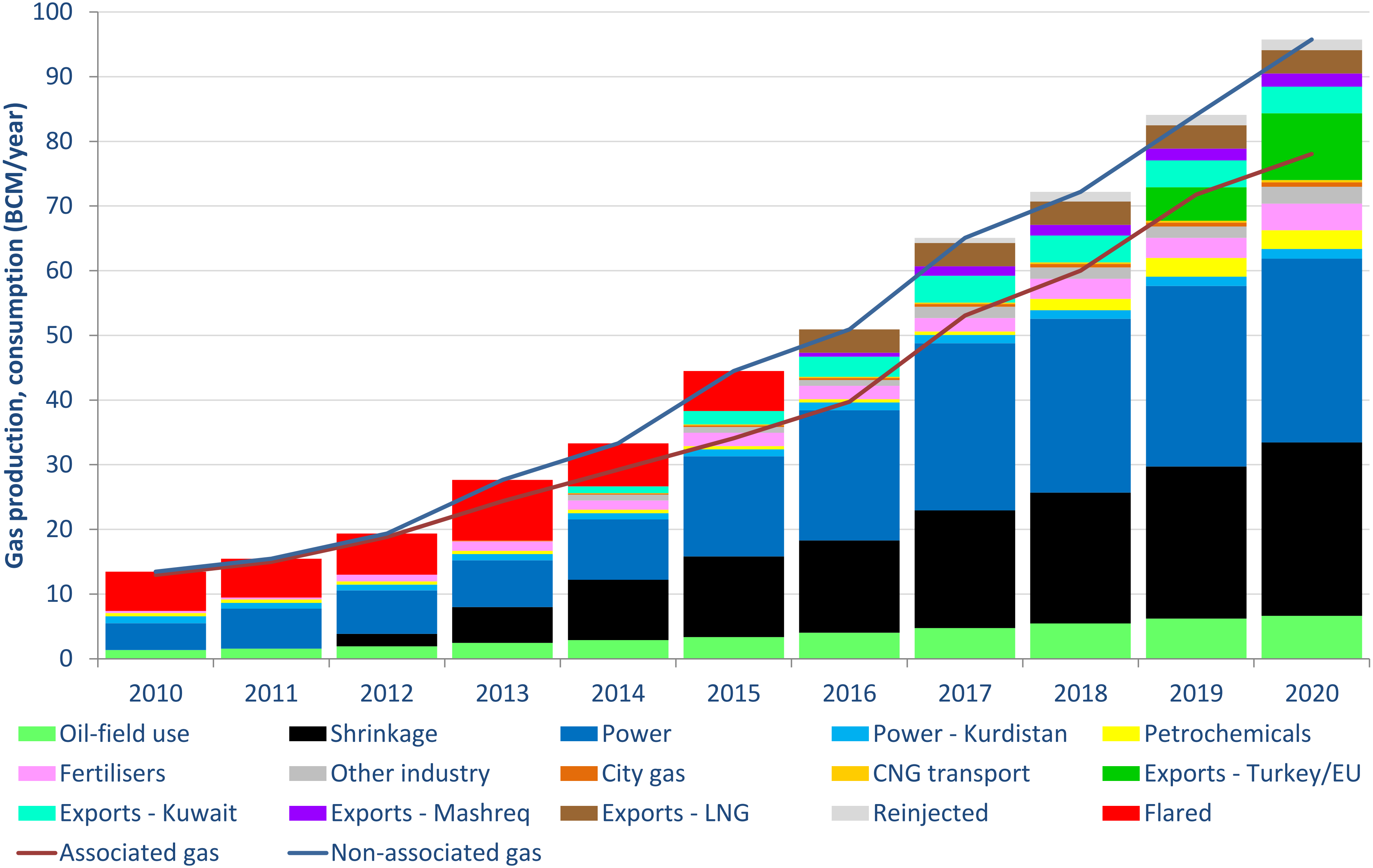

# New regional competitors could emerge

| Tcf | Discovered to date | 2010 gas demand |
|---|---|---|
| Israel | 26 | 0.2 |
| Palestine | 1.4 | 0 |
| Cyprus | 5-8 | 0.1 |
| Lebanon | 0 | 0.1 |
| Syria | 8.5 | 0.6 |
| Jordan | 0.2 | 0.1 |
| Egypt | 77 | 1.9 |

- Gas demand assumes conversion of all oil-fired power to natural gas
- USGS estimates 122 Tcf (3544 BCM) recoverable gas and 1.7 billion bbl oil from the Levant Basin
  - Conservative as pre-dates Leviathan and Aphrodite discoveries
- **Resource potential easily sufficient for significant exports and petrochemical/industrial use**

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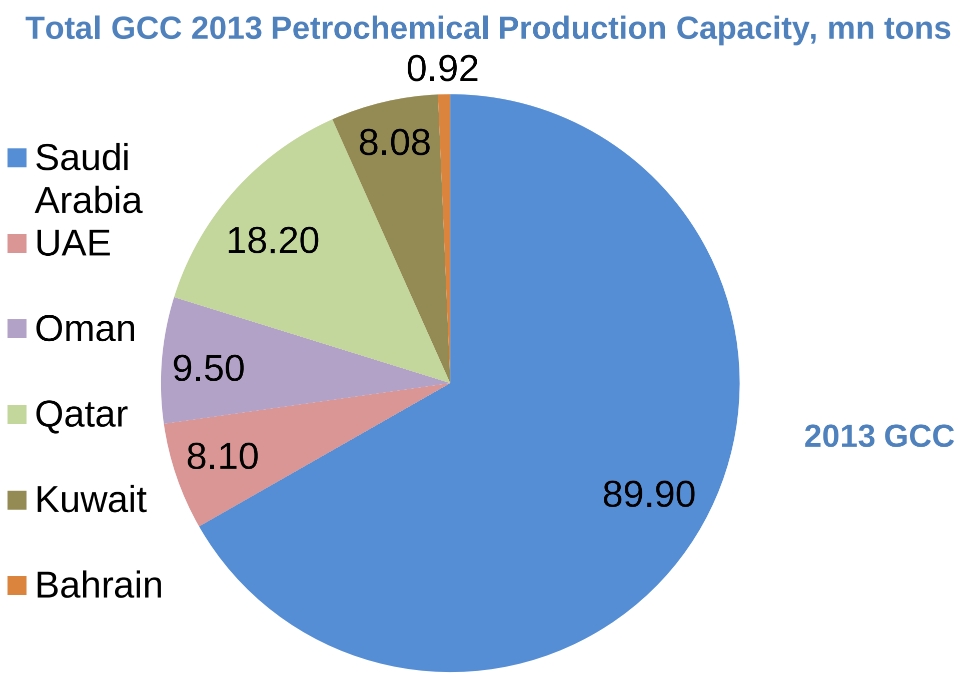
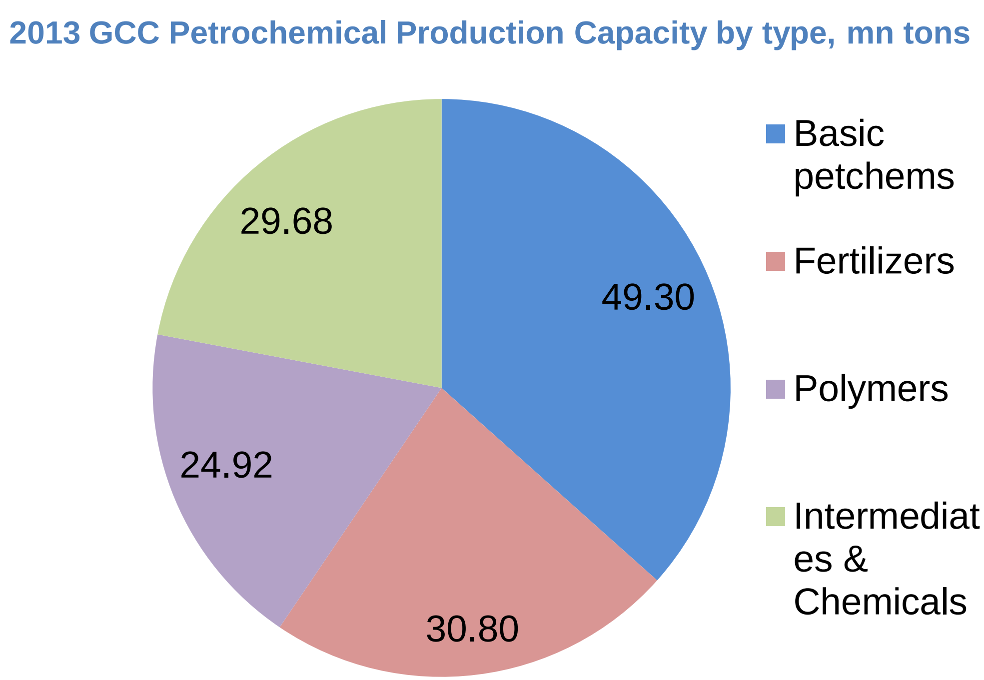
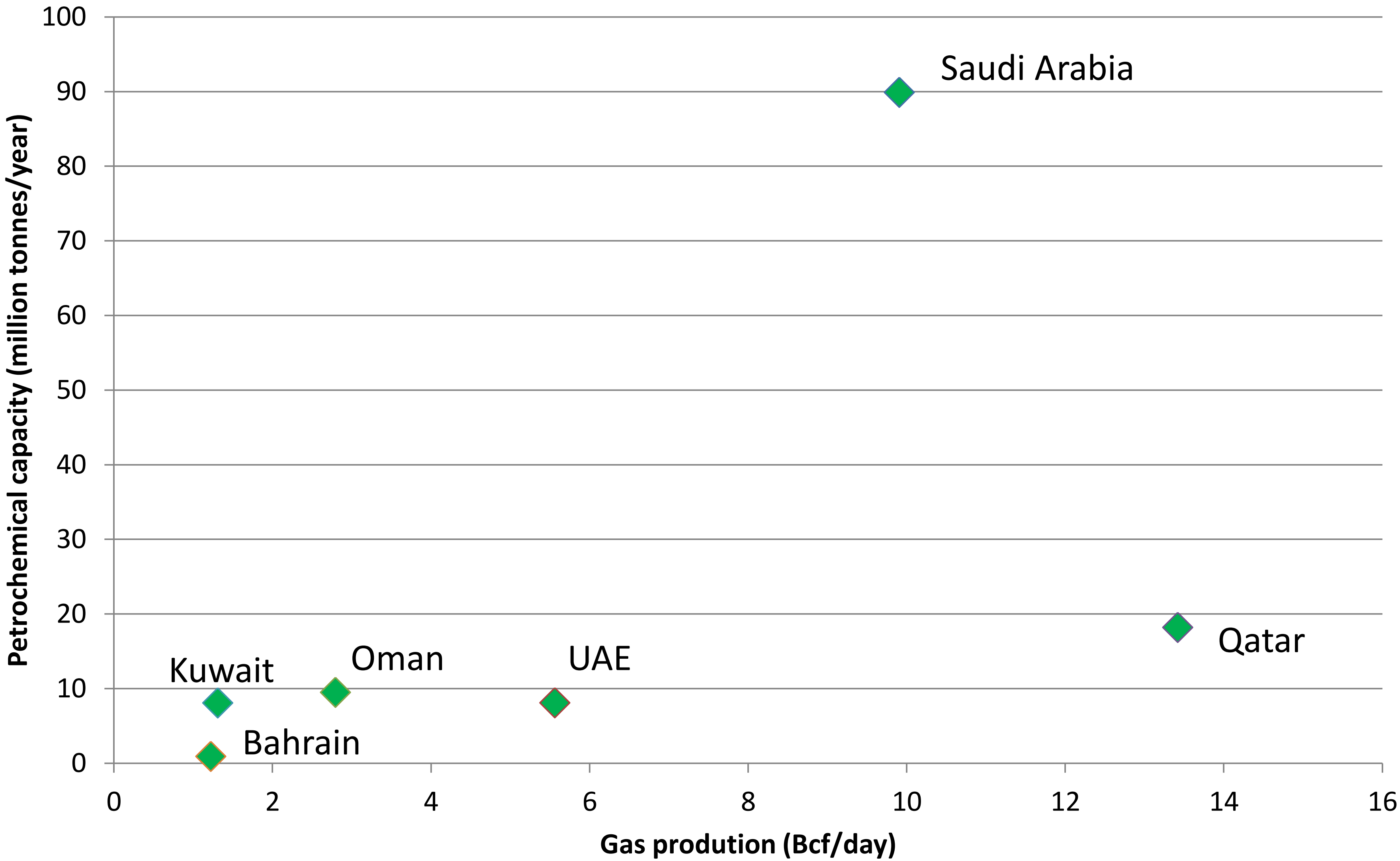
# Petrochemical capacity by country & type

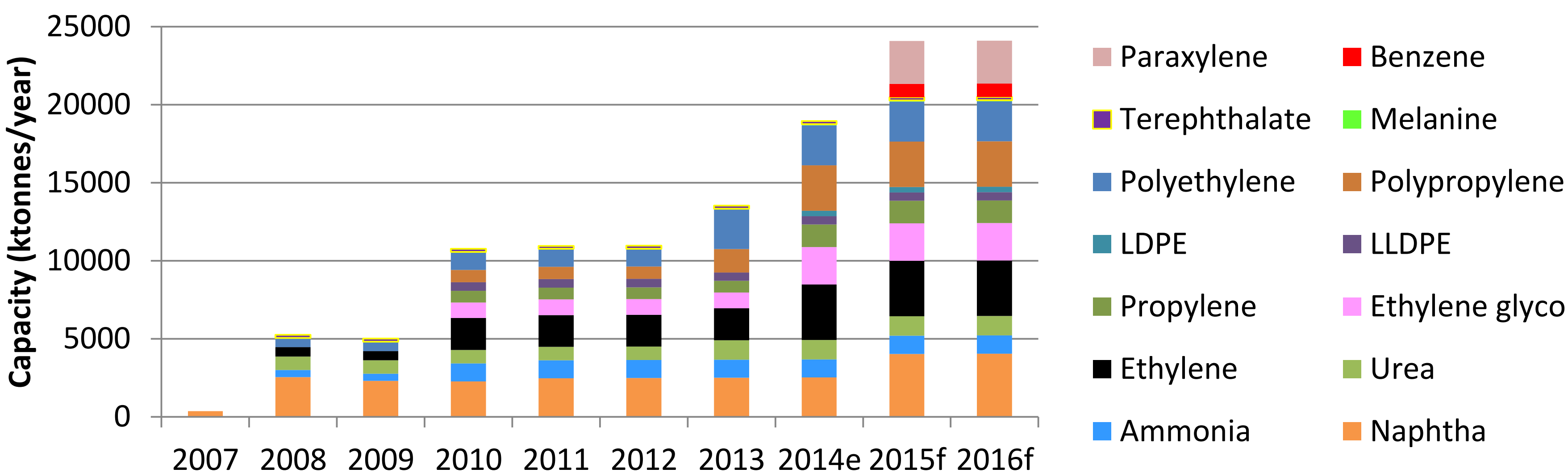


# Petrochemical capacity a function of gas endowment; national strategy



# Example at one site: Ruwais




| Project database (extract) | | | | |
|---|---|---|---|---|
| **Project** | **Product** | **Feedstock** | **Capacity (ktpa)** | **Status** |
| Borouge I | Ethylene | Ethane | 600 | Online |
| Borouge II | Ethylene | Ethane | 1450 | Online |
| Borouge III | Ethylene | Ethane | 1500 | Planned |
| Fertil I | Ammonia | Naphtha | 470 | Online |
| Fertil II | Ammonia | Naphtha | 695 | Planned |

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# Uncertainties

- Balance of MENA's light crudes and NGLs vs heavy crudes
- Role of alternative energy – especially nuclear – in displacing oil & gas in power sector
- Pace of new MENA gas developments (including unconventional) and intra-regional gas trade
- Progress in reforming gas pricing; new pricing policies
- New regional markets for gas
  - Gasification of new areas (Iraq, Levant, etc)
  - Shipping (ECAs), ground transport
- Response to challenge of unconventional gas and US petrochemical revival

# Contact Details

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