

THE ECONOMIC, POLITICAL AND STRATEGIC RATIONALE FOR THE UAE'S NUCLEAR AND RENEWABLE ENERGY VENTURES

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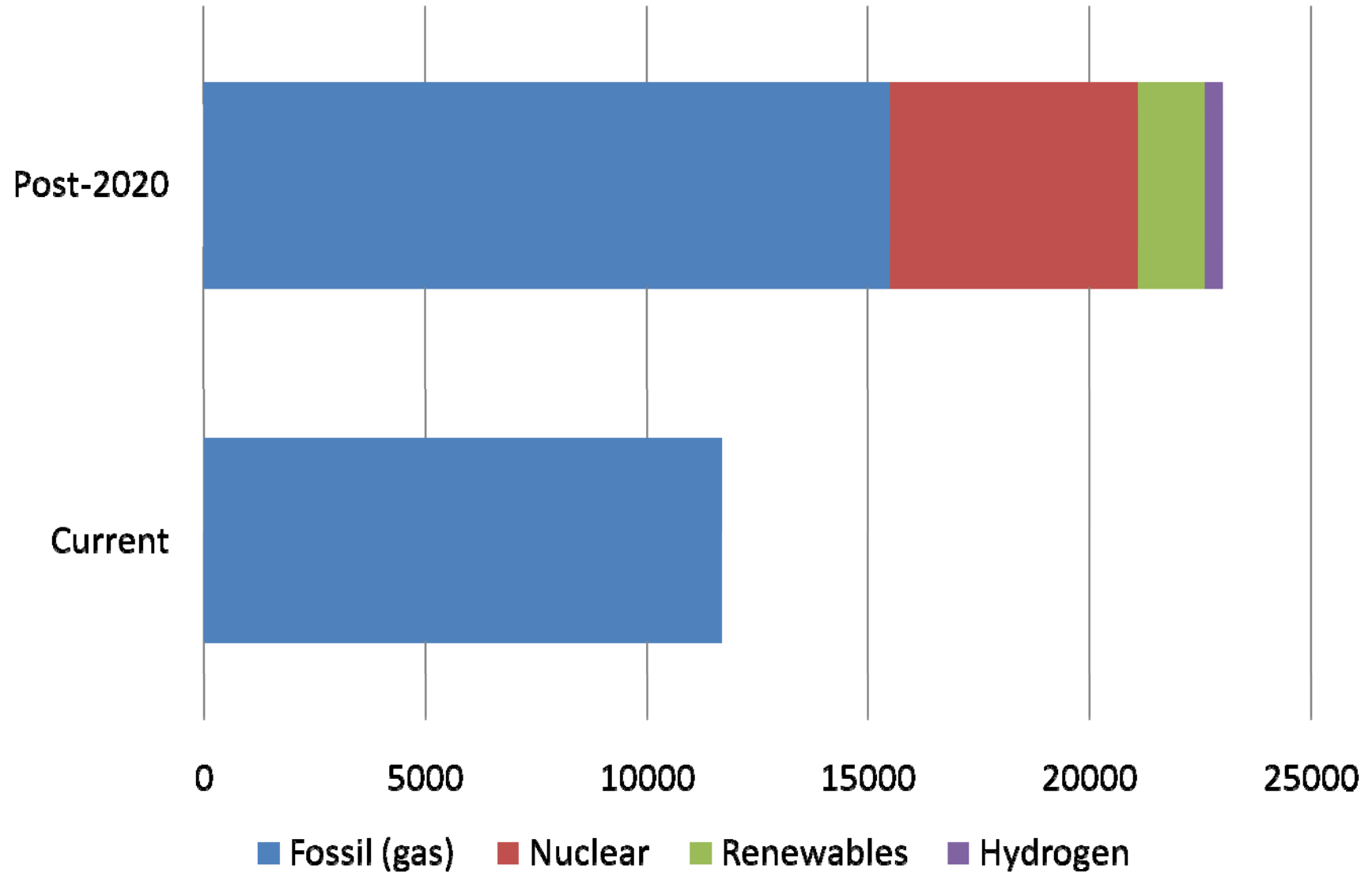
Abu Dhabi's clean energy target

- 7% renewables by 2020
- Overall 30% low-carbon electricity generation

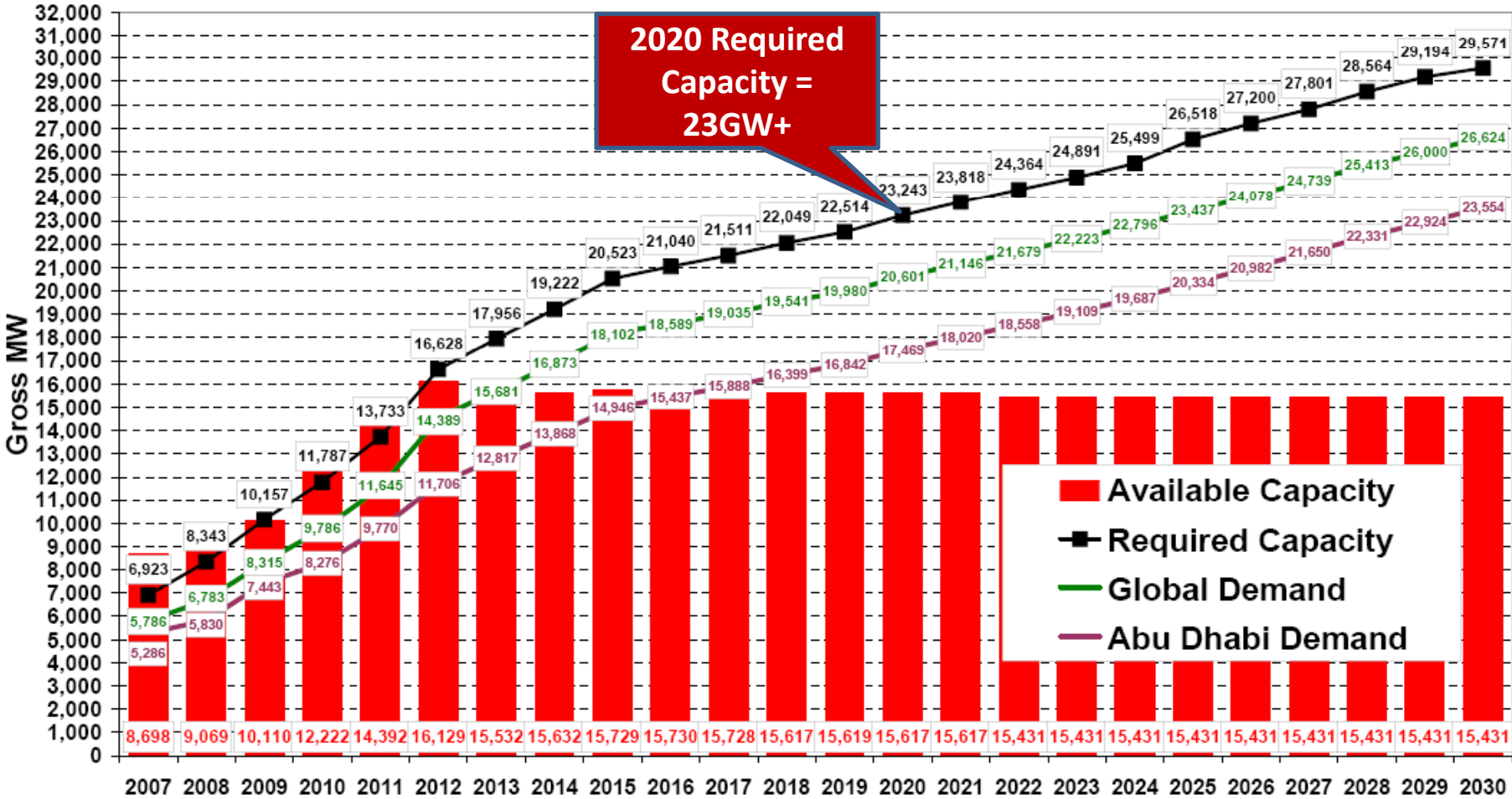
HOW THAT PLAYS OUT:

- Current generation capacity is near 12GW
- Need **23GW** by 2020
- That means **1.5GW** of renewables (=7%)
- Mostly solar
- And **5.3GW** of clean “alternative” energy (=23%)
- Mostly nuclear and maybe some hydrogen

Abu Dhabi generation mix (MW)



Electricity Capacity v Peak Demand Base Global Demand Forecast



SOURCE: ADWEC

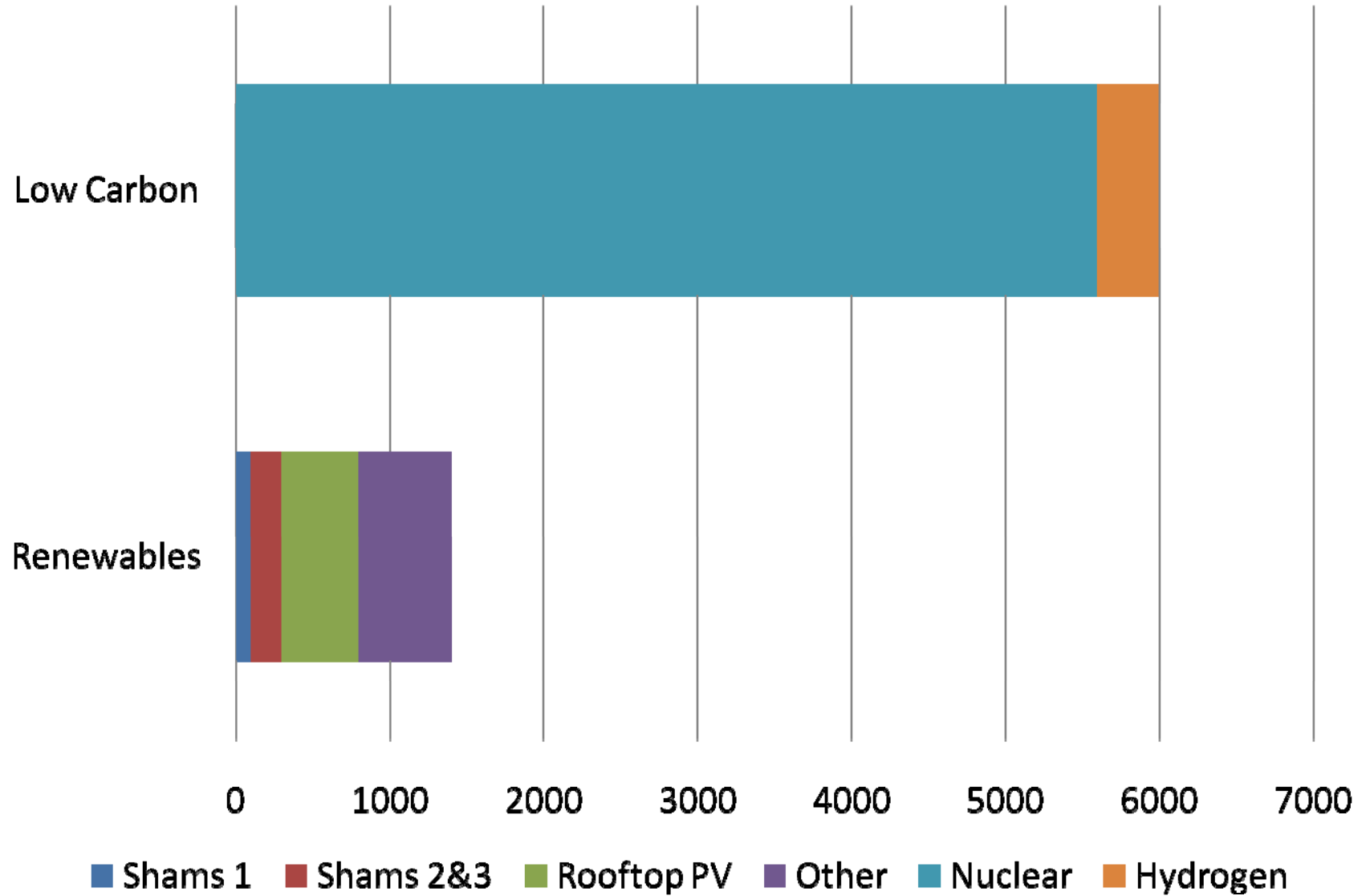
Getting there: Nuclear and Hydrogen

- Nuclear plans announced in 2008
- \$20.4 bn Korean-led BOT bid accepted in 2009
- Four 1.4GW reactors, for a **total of 5.6GW** – slightly more than required
- All four stations online by 2020?
- \$2bn Hydrogen JV with BP – on hold
- 400MW electricity and carbon injection CCS for enhanced oil recovery

Getting there: Renewables

- Mostly solar: combination of CSP and PV
- Funded under overall \$15bn clean energy investment
- Masdar offers a clue: 60% PV and 26% CSP
- \$600m/100MW “Shams” CSP contract awarded in June
- Talk of a 1.5GW “PV park” and 500MW of distributed generation via rooftop PV
- Geothermal drilling underway

Clean Energy in Abu Dhabi (post 2020-MW)



Issues and constraints

- Subsidies are exacerbating consumption
- Pressing need for energy policy reform
- The UAE holds the world's:
 - No. 1 per capita ecological footprint
 - No. 2 per capita carbon footprint
 - No. 2 per capita electricity consumption
- Domestic politics and economics favors more fossil fuel generation

Conditions favoring BOTH nuclear and renewables

- Urgent need: Demand for electricity is outstripping supply
- Desire to meet demand without demonizing itself as the globe's worst polluter
- Alt energy frees up hydrocarbons for export
- Plenty of money
- Investment preference for capital-intensive domestic projects
- SWF foreign investment track record is mixed

Conditions favoring nuclear

- No difficulty making initial investment worth 2/3 of plant's lifetime cost
- No ROI for 10 years? No problem.
- Ideal vehicle to transfer today's wealth to future generations
- Authoritarian government/Weak civil society
- Good baseload source of power and water

Conditions favoring renewables

- Geography: AT LEAST 2,000 kWh per m²/yr
- Production curve peak parallels demand peak
- Synergies with nuclear

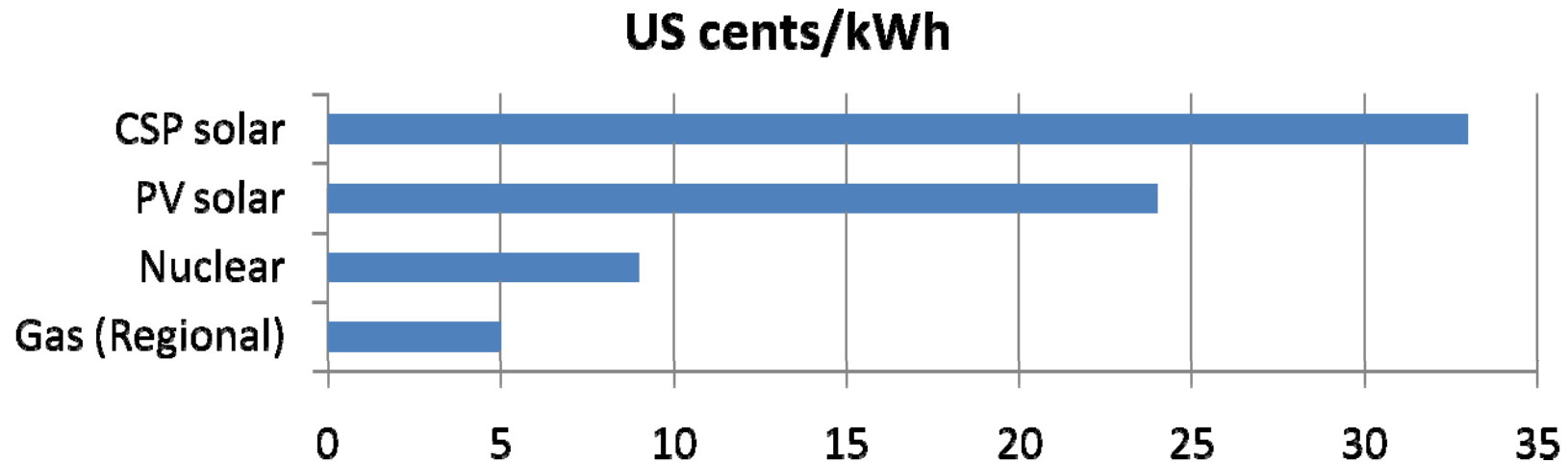
BUT:

- Degraded output from heat, dust and humidity
- CSP needs water
- Wind energy not viable

The rest of the story

- Rentier state “ruling bargain” is behind the subsidies fueling demand
- AND is blocking best reform tool: tariff hikes
- Risk of social conflict behind extreme reluctance to raise tariffs
- California: Tariff hikes=lower consumption on some appliances

Uncompetitive on cost



- Cheaper in per kWh terms to keep burning hydrocarbons
- Nuclear competitive with gas if Abu Dhabi's gas cost rises -- substantially

Political rationale

- Enhanced international prestige for rulers
- Increased legitimacy at home
- Evidence of success:
 - IRENA hosting
 - Global media's warm reception for Masdar
- Using fossil fuels would reverse this process:
More carbon = less prestige

Nuclear strengthens the state

- Increased centralization; more state security
- More surveillance and secrecy; less dissent
- “Permanent protection” for “perpetually endangered” and “indispensable” industry
- Emerging signs:
 - Critical Infrastructure Protection Authority
 - Police vetting for *all* gov’t jobs and promotions

Strategic rationale

- Nuclear increases West's stake in regime survival
- Tightened security relations with US, UK, France, etc.
- Preconditions for political stability and state vigilance
- Valuable example to Iran and others
- Regime insurance policy: Substitutes for questionable defense abilities

Leverage for reform?

- Strengthened regime may have political space for sensitive energy policy reform
- Runs counter with social contract with nationals
- Cost-reflective tariffs can be phased in, with proper message
- Potential for structural government change
- Potential challenge to rentier literature

Conclusion

- Abu Dhabi's investments make sense, but not on a competitive commercial basis
- Increases in generation capacity and prestige
- Synergies with investment preferences
- Strengthen the state?
- New source of security?

- YOUR THOUGHTS