Renewable Energy Market Analysis
The GCC Region

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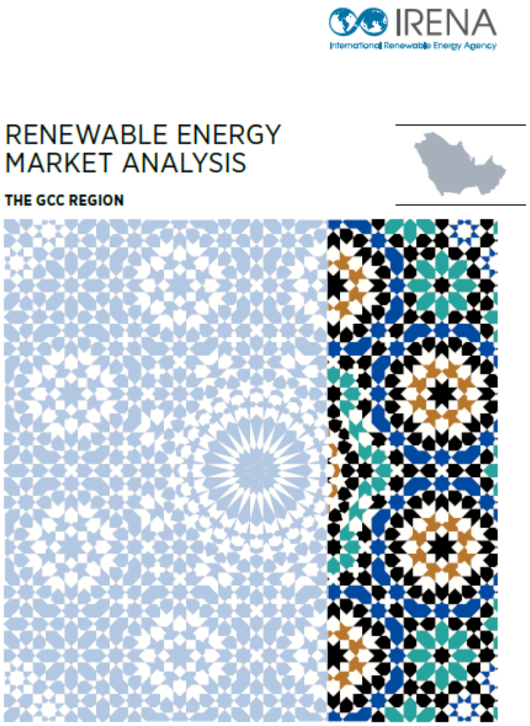
Chatham House
January 26, 2016



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Economic growth

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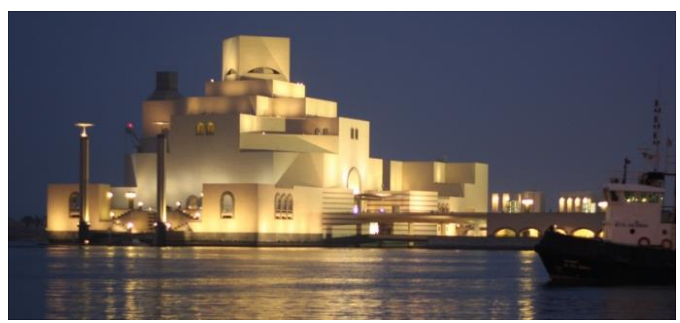

Growing energy demand in the GCC

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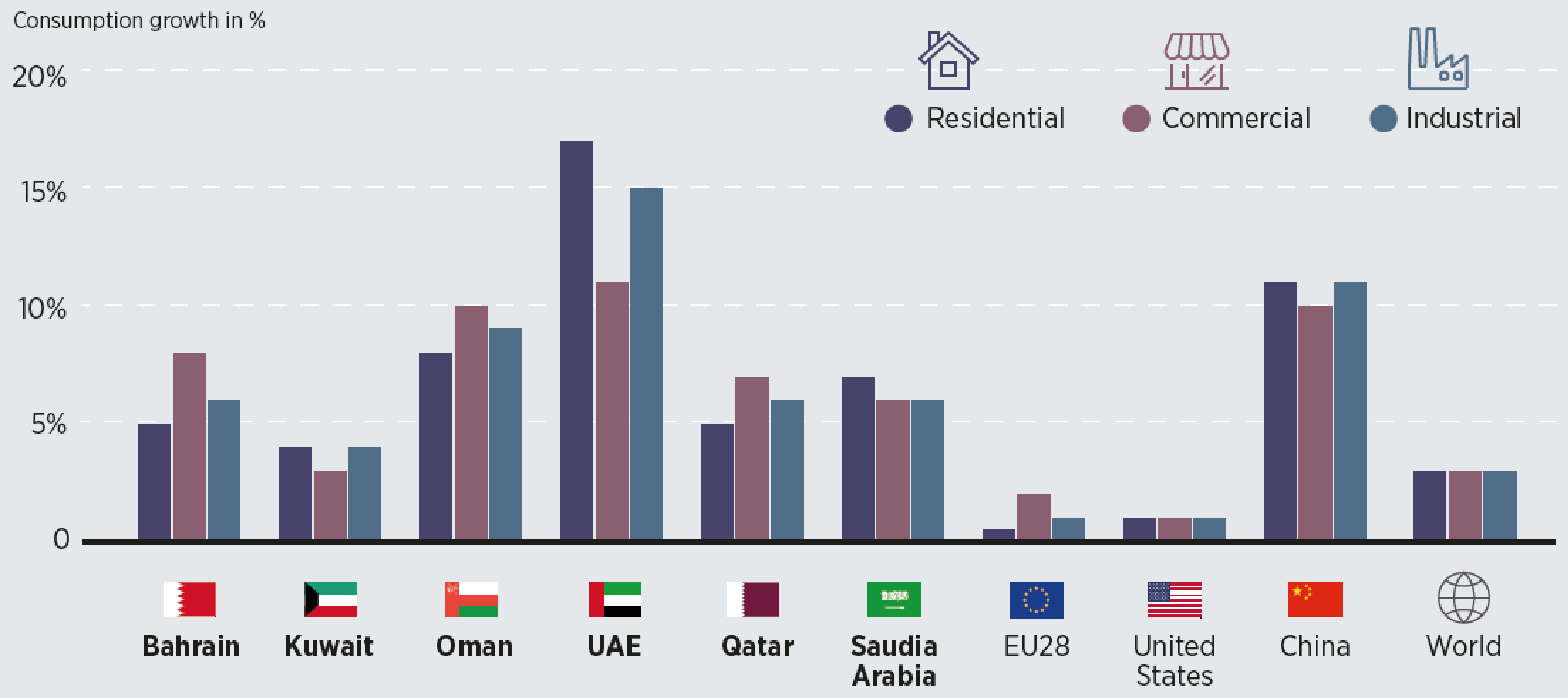
Rising Populations

Harsh climate (Cooling and Desalination)

Industrialization (steel, aluminum & petrochemical)

Young and fast growing infrastructure

Annual electricity consumption growth (2003-2013)



Source: Based on (IEA, 2015)

Rationale for RE diversification

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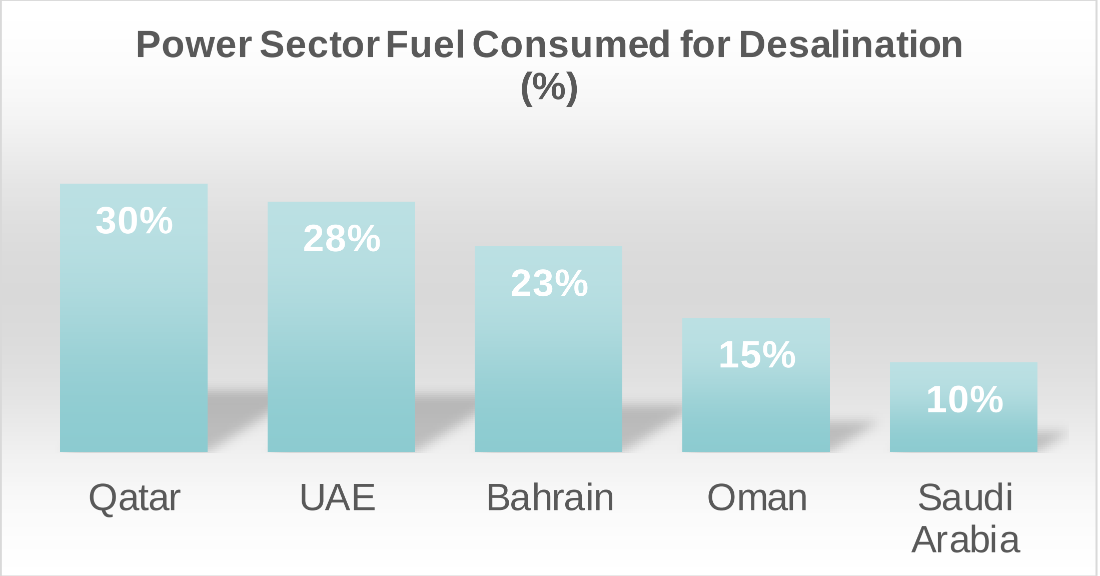
- Resource constraints – Gas and Oil
- Forgone earnings from fossil fuels exports
- Pressure on government budgets
- Interlinkages between resources
- High per capita carbon footprints

Subsidy costs in GCC countries

9% – 28%
of government revenue

	tCO_2 per Capita
GCC	19
United States	17
European Union	7
China	5
World	4



Source: IRENA based on Lahn, Stevens and Preston, 2013

Rationale for RE diversification

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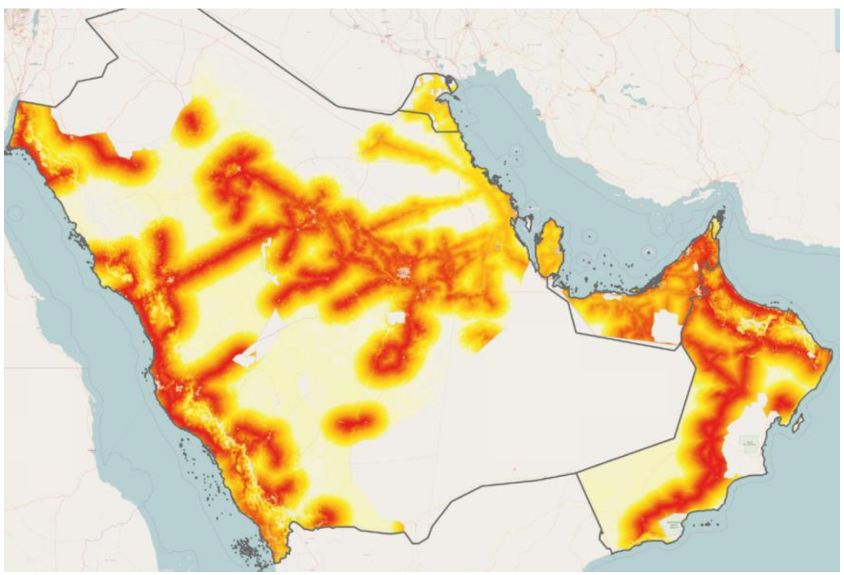
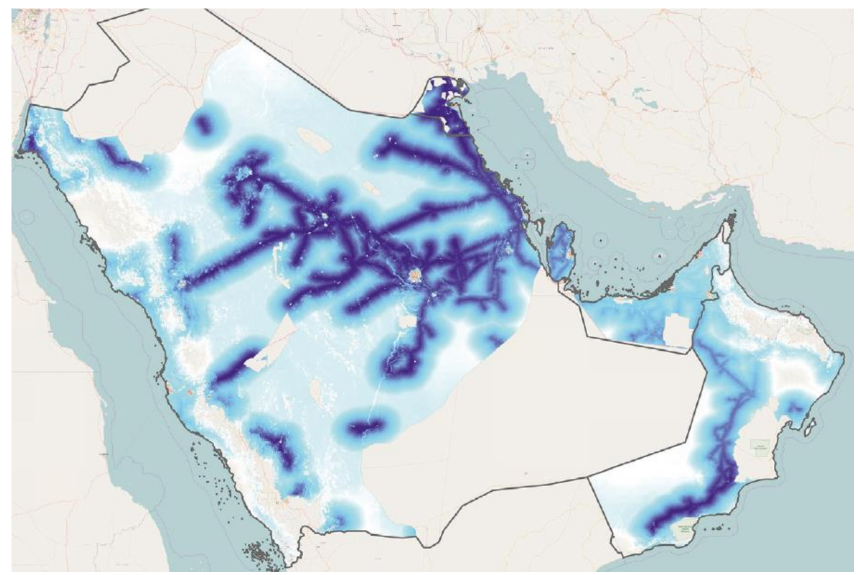
The renewable energy potential

60% area has good suitability for PV
Developing just 1% yields **~ 470 GW**

56% area has good suitability for wind
Developing just 1% yields **~ 60 GW**





Source: (IRENA, 2016) http://irena.masdar.ac.ae/?map=2146

Plans for RE and EE in the GCC

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2020: **5%** of generation
2030: **15%** of generation
CSP 5.7 GW, PV 4.6 GW, Wind 0.7 GW

↑ **5%** generation efficiency
↓ **10%** energy cons. in buildings

2022: **9.5GW**
2040: **54GW** 41GW Solar, 9GW Wind, 3GW W2E**, 1GW Geo.

2020: Energy intensity = G7
2021: 14% ↓ peak demand, 8% ↓ electricity consumption

2015: ↓ **5%** in average gas cons. per kWh of generation

2020: **5%** of capacity

2030: **20%** of capacity (1800MW)

2017: ↓ **20%** in per capita elecricity cons. and ↓ **35%** in per capita water cons. over 2011

2021: **24%** clean energy
2020: *(Abu Dhabi)* **7%** of capacity
2030: *(Dubai)* **5GW** solar PV

2030: *(Dubai)* ↓ power cons. by **30%** vs business as usual

Source: IRENA, 2015

Seeds of enthusiasm for renewables

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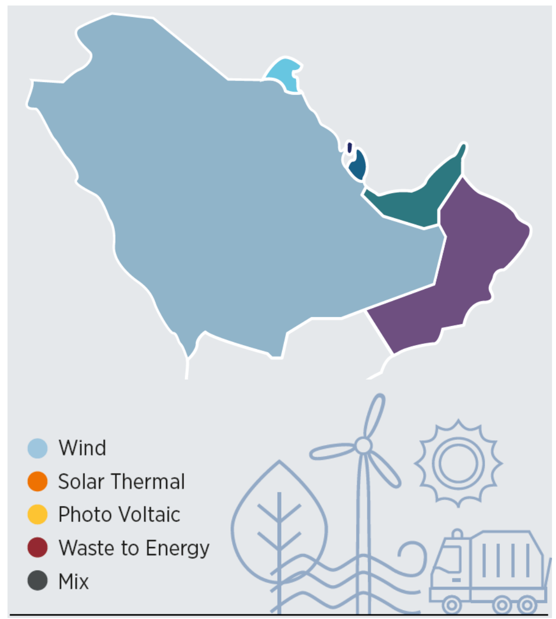
Kuwait

MEW/KISR–Shagaya Wind turbine 10MW	bidder selected
MEW/KISR–Shagaya Solar Thermal 50 MW	bidder selected
MEW/KISR–Shagaya PV 10 MW	bidder selected
Al-Abdaliyah ISCC project 60 MW	planned

Saudi Arabia

KAUST rooftop PV panels 2MW	Completed
KAPSARC PV Phase 1 - 3.5 MW	Completed
KAPSARC PV Phase 2 - 1.8 MW	Completed
Princess Nora University solar water heating 17MW	Completed
ARAMCO, 300 MW capacity off-grid	Planned
Saudi Aramco North Park PV Project 10.5 MW	Completed
SEC – Duba ISCC Power plant phase 1 CSP 50 MW	Planned
Waad Al-Shamal ISCC Project 50 MW	Planned
Al-Aflaj Solar PV Park 50 MW	Planned
KACST Al Khafji PV desal Plant 10 MW	Planned
K.A.CARE, Royal Commission for Jubail and Yanbu 50 MW PV	Planned
K.A.CARE, 500 MW PV plants around the kingdom	Planned
K.A.CARE, King Salman Green Initiative, Madinah	Planned
K.A.CARE/SWCC, Solar & Wind Desalination in north and south	Planned



Qatar

KAHRAMAA–Solar Power Plant 230 MW	Announned
Mesaieed waste to energy plant 40MW	Completed
Al Duhail Solar PV Park 10 MW	Announced

United Arab Emirates

Sir Bani Yas Wind Energy plant 30 MW	Planned
Solar power plant, Utico, RAK 40MW	Planned
Waste to Energy, TAQA 100MW	Bids invited
Masdar City solar PV park ADFEC 10MW	Completed
Shams 1 CSP plant 100MW	Completed
Mohammed bin Rashid Al Maktoum 1 - 13 MW	Completed
Mohammed bin Rashid Al Maktoum 2 - 200 MW	Financial Closure
Mohammed bin Rashid Al Maktoum 3 - 800 MW	Bids invited
Waste to energy, Bee'ah 83 MW	Planned
Noor 1 Solar PV plant 350MW	Bids invited

Oman

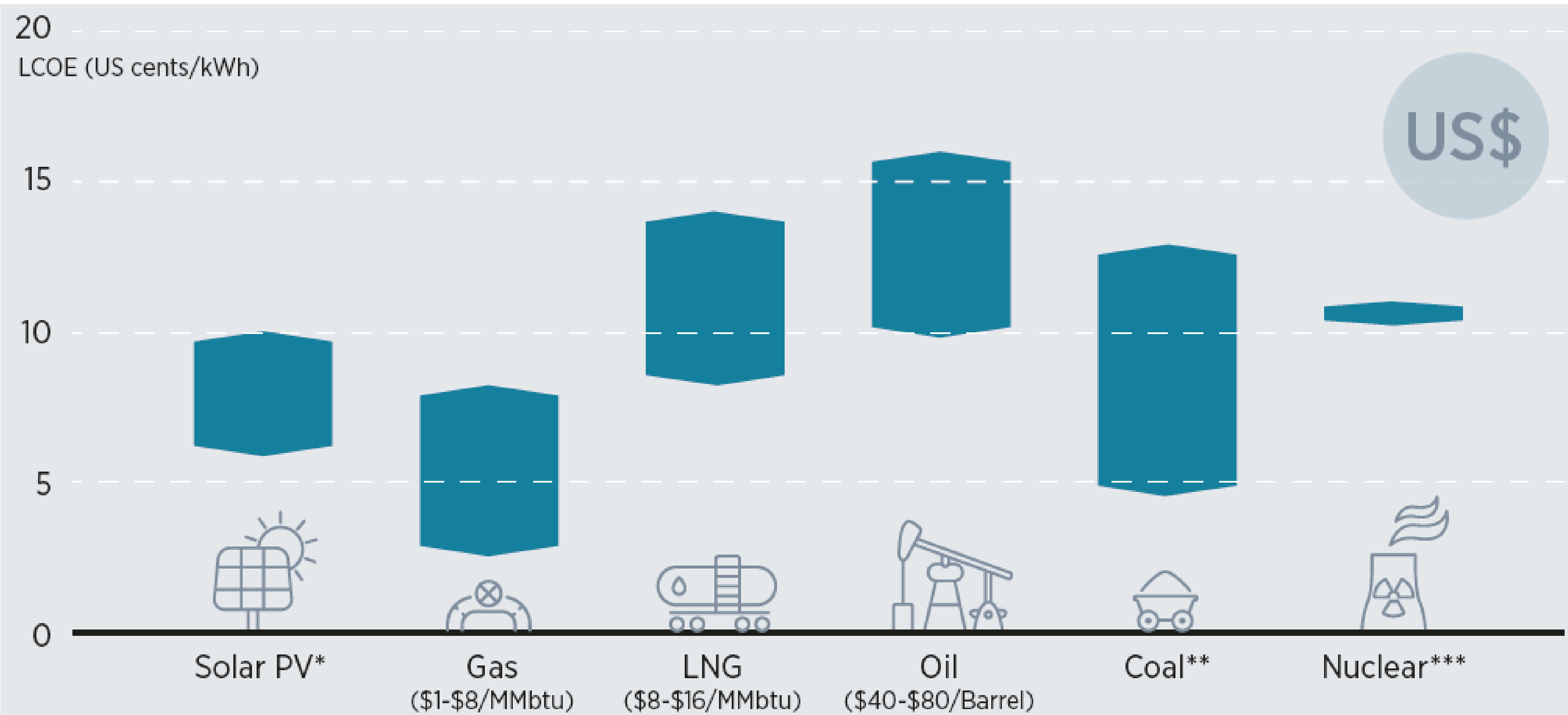
Solar thermal EOR plant 1 GW	Planned
Solar thermal EOR plant 7MW	Completed
Dhofar Wind farm 50 MW	Planned

Bahrain

Waste to Energy Plant 25MW	Planned
BAPCO Bahrain PV Plant 5 MW	Completed
Petra Solar-Manama Solar PV Park 5 MW	Completed

Rising competitiveness in GCC

Large and medium scale



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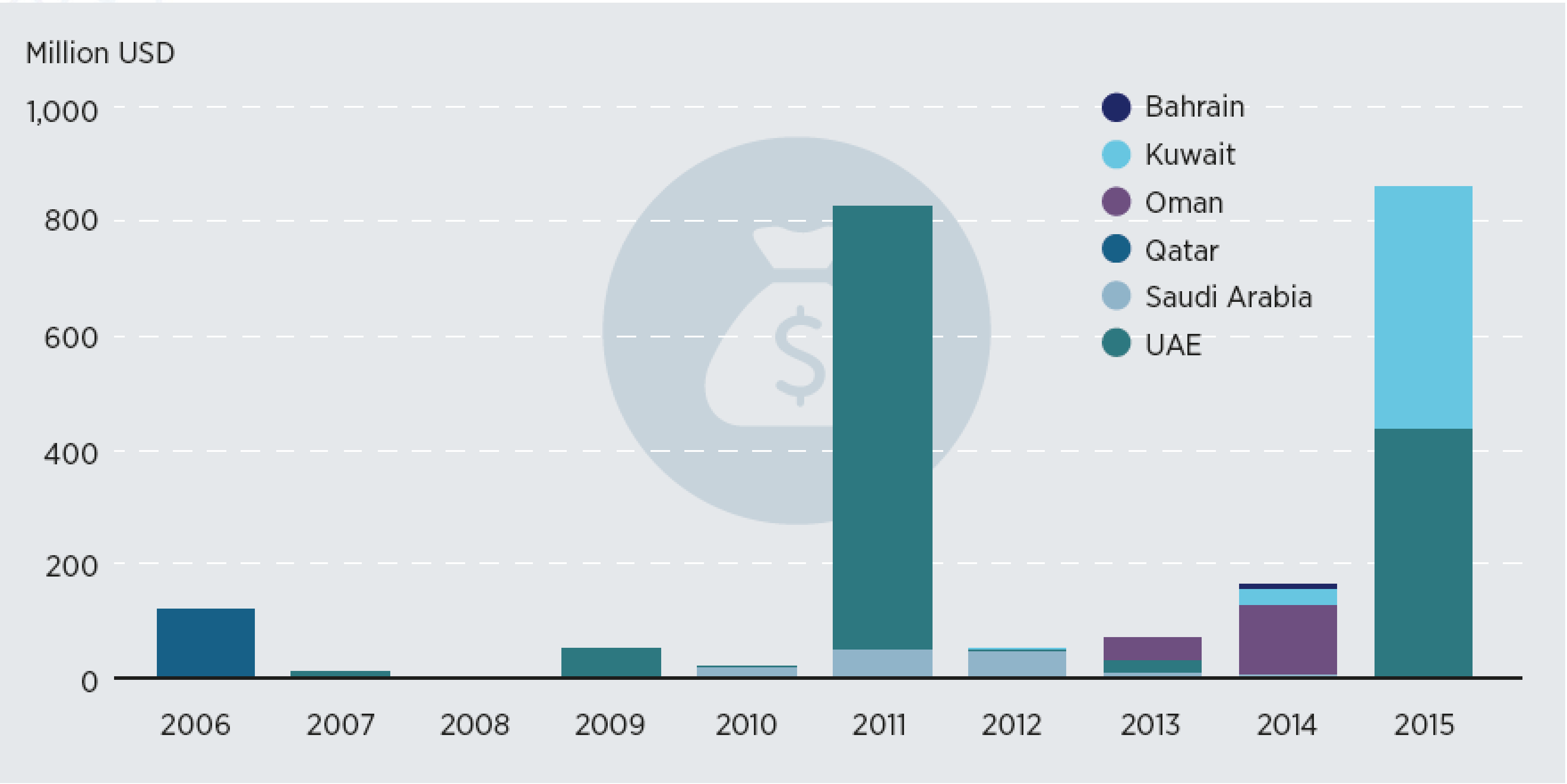
Renewable energy investments in GCC



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Development of value chain in GCC

Medium and Large Scale

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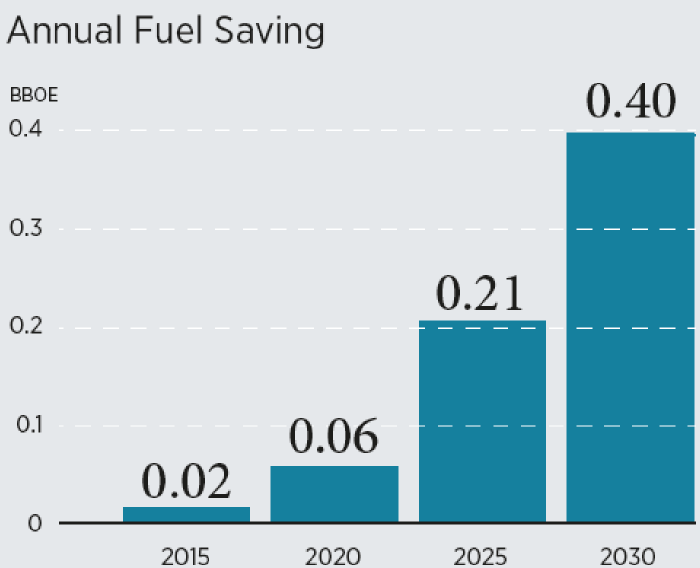
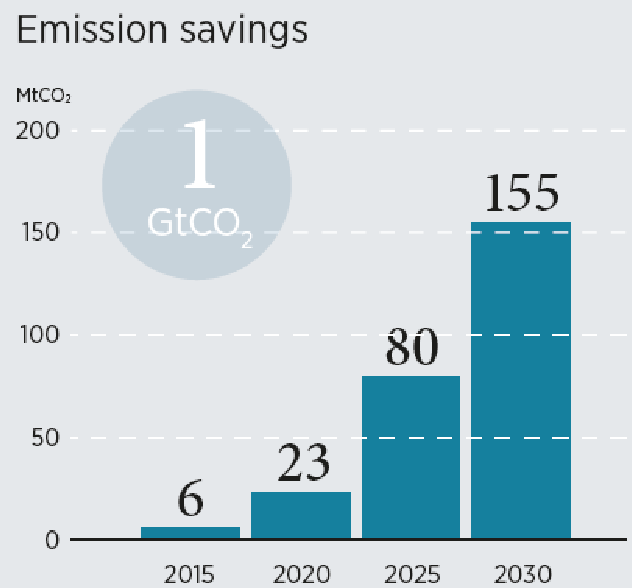
Stakeholders	Role in the value chain	Renewable Energy Projects across the region: DEWA 13MW	DEWA 200MW	SHAMS I 100MW	OURZA-ZATTE I**
Equipment Provider(s)	• Manufacturing • Assembly • Distribution	• First Solar • ABB	• First Solar	• Abengoa Solar • First Solar • Schott Solar • Flabeg	• Flabeg • SENER
Developer and/or EPC*	• Project planning • Construction • Operation and maintenance	• First Solar	• ACWA Power • TSK	• Total • Masdar • Teyma • Abengoa Solar	• ACWA Power • SENER • Acciona • TSK • Aries
Utility(ies)	Support functions: • Decision making • System planning • Grid connection	• DEWA • DSCE	• DSCE	• Masdar • ADWEC	• MASEN
Financier(s)	Support function: • Financial services	• DEWA	• First Gulf Bank • Samba • NCB	• NBAD • KfW • BNP Paribas • Societe Generale • SMBC • MUFG	• KfW • EIB • Afdb • World Bank • AFD

Conclusion

Renewable energy development brings multiple benefits

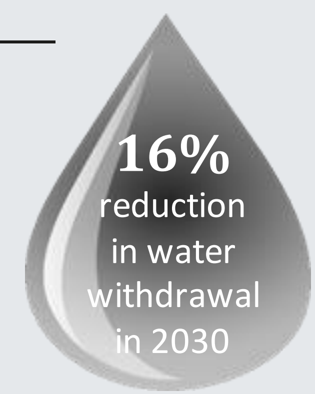




2.5 billion BBOE Cumulative Fuel Savings

55-87 billion USD Discounted* Fuel Savings

207,000 Jobs in 2030



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Thank you!