

Nuclear Exports to Riyadh: Risky Business

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Four Questions

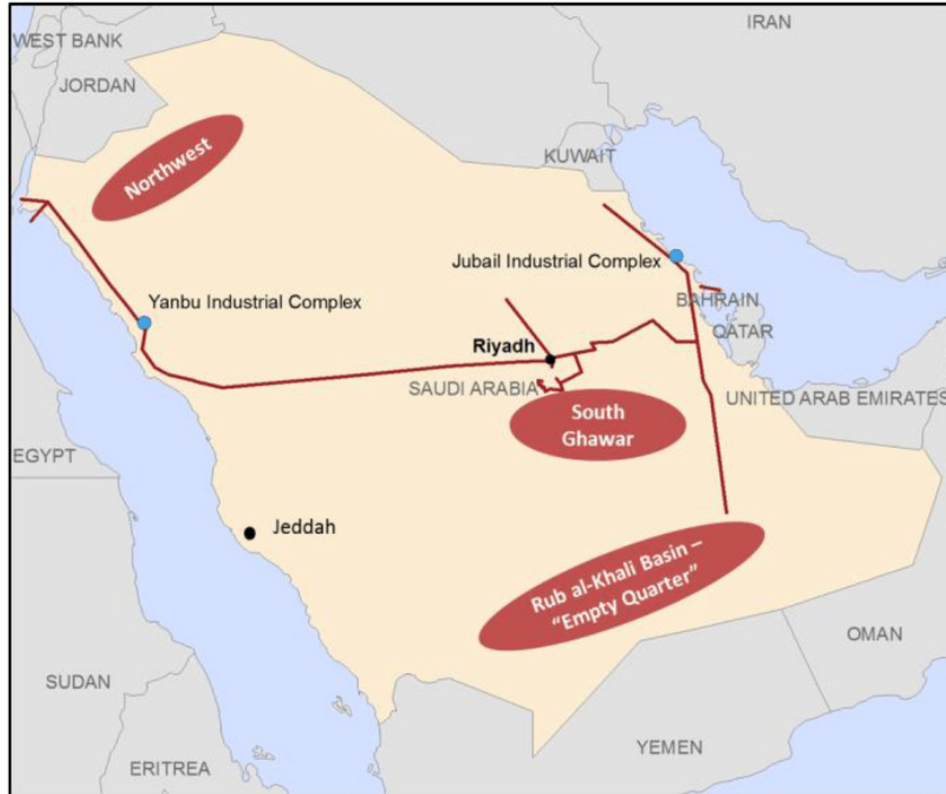
- I. Do the Saudis need nuclear power or enrichment or reprocessing?
- II. Should we trust the Saudis not to use nuclear technologies to make bombs?
- III. Doesn't the US lack leverage since the Saudis can always buy a French, Russian or Chinese reactor if they don't buy American? Won't US-Saudi nuclear cooperation strengthen our security ties?
- IV. Are the proliferation implications of the Saudis proceeding with their nuclear program readily manageable?

One Answer to All Four Questions

▶ **No**

I. Do the Saudis Need Nuclear Power or Enrichment or Reprocessing?

Saudi Arabia Is Awash in Natural Gas



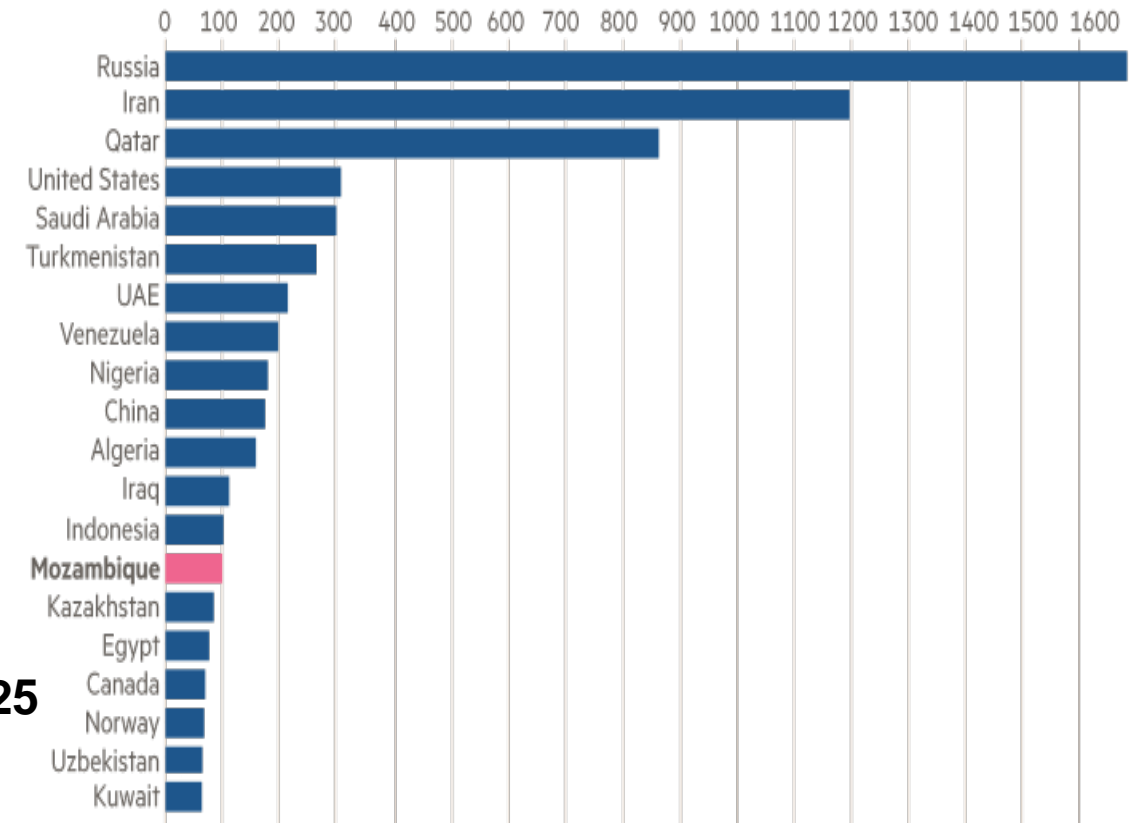
Saudi gas pipeline infrastructure relative to shale gas regions

Saudis are spending \$334 billion on shale gas by 2025

World's top natural gas reserves

Proved reserves of natural gas, 2016

Cubic feet (tn)



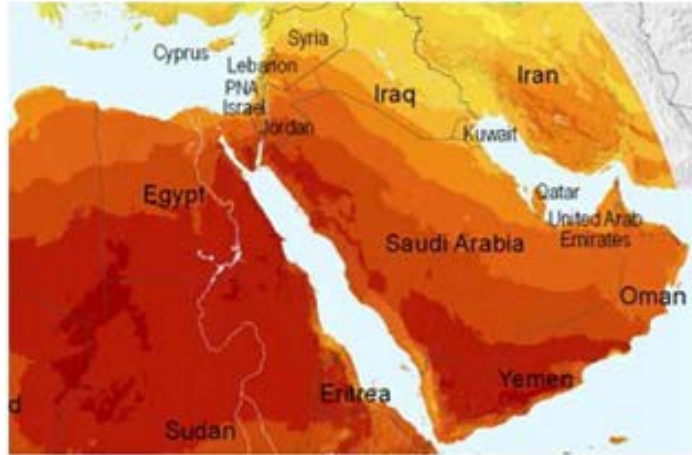
Source: U.S. Energy Information Administration

© FT

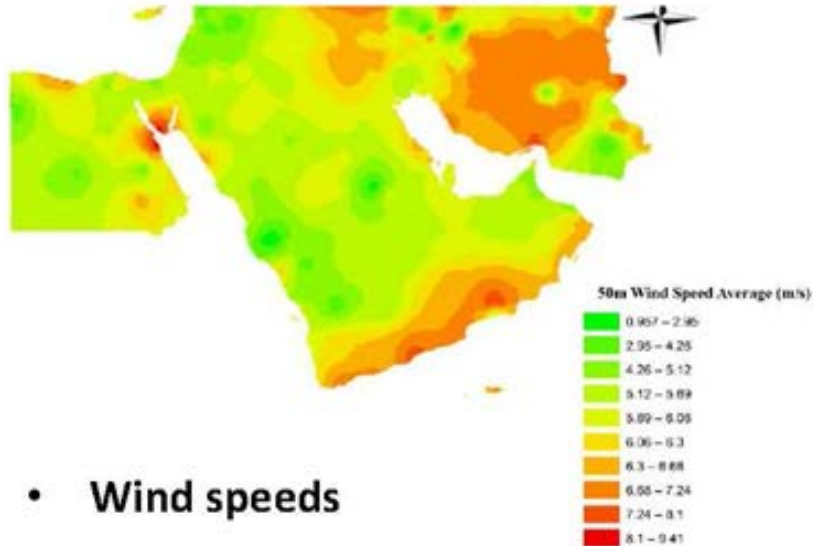
NET Power: Zero Emission Gas-fired Electricity at 4.4 cents/kwh



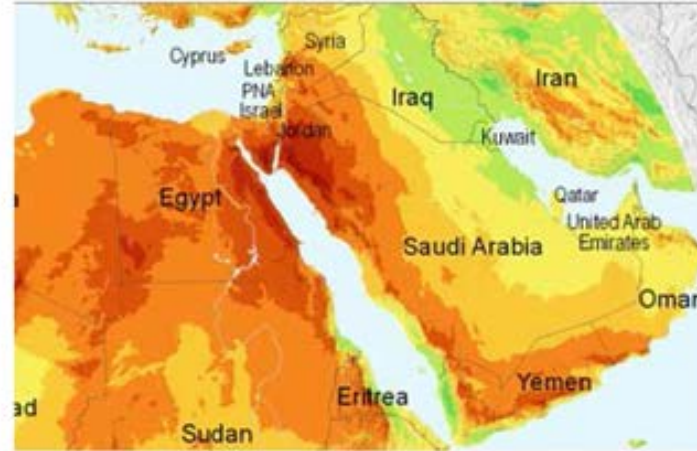
Saudi Arabia: Rich in Renewable Energy Potential



- **Total solar radiation (PV)**

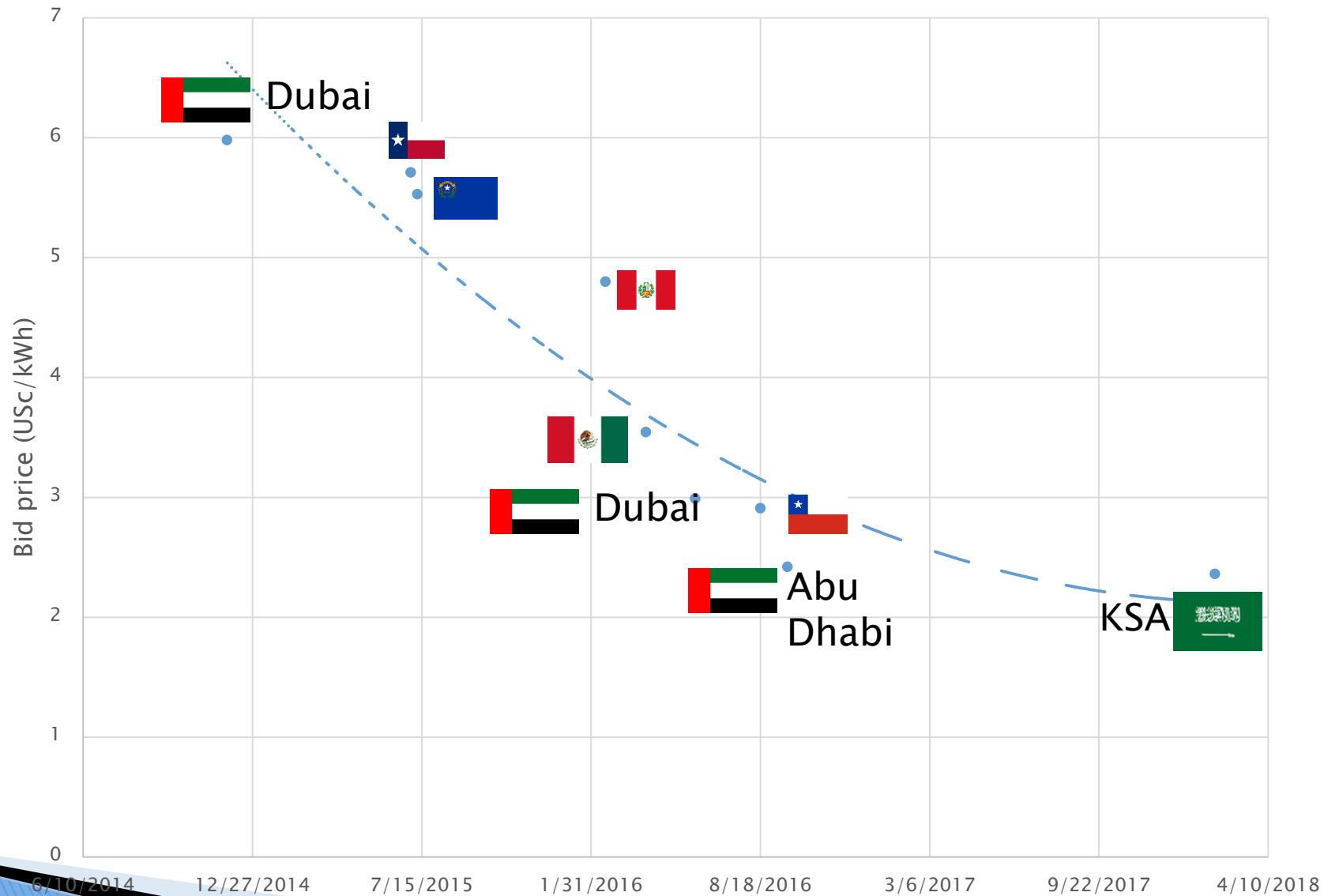


- **Wind speeds**



- **Direct solar radiation (CSP)**
- GCC focuses on Solar PV because it is cheaper
- Advantage of CSP is its thermal storage
- Possibility of PV power with storage

Dramatic Falls in Solar PV Power Bids



Latest contract for Saudi solar PV awarded at 2.4 cents/kwh

Concentrated Solar Power at 7.3 cents/kwh Is Well Below Nuclear at 11 cents/kwh

Falling Prices for CSP Plants with Molten Salt

The prices for electricity from concentrated solar power (CSP) plants with molten salt energy storage have dropped by more than half since SolarReserve started developing its Crescent Dunes plant in 2009. Some recent bids to build new plants show the price trajectory.

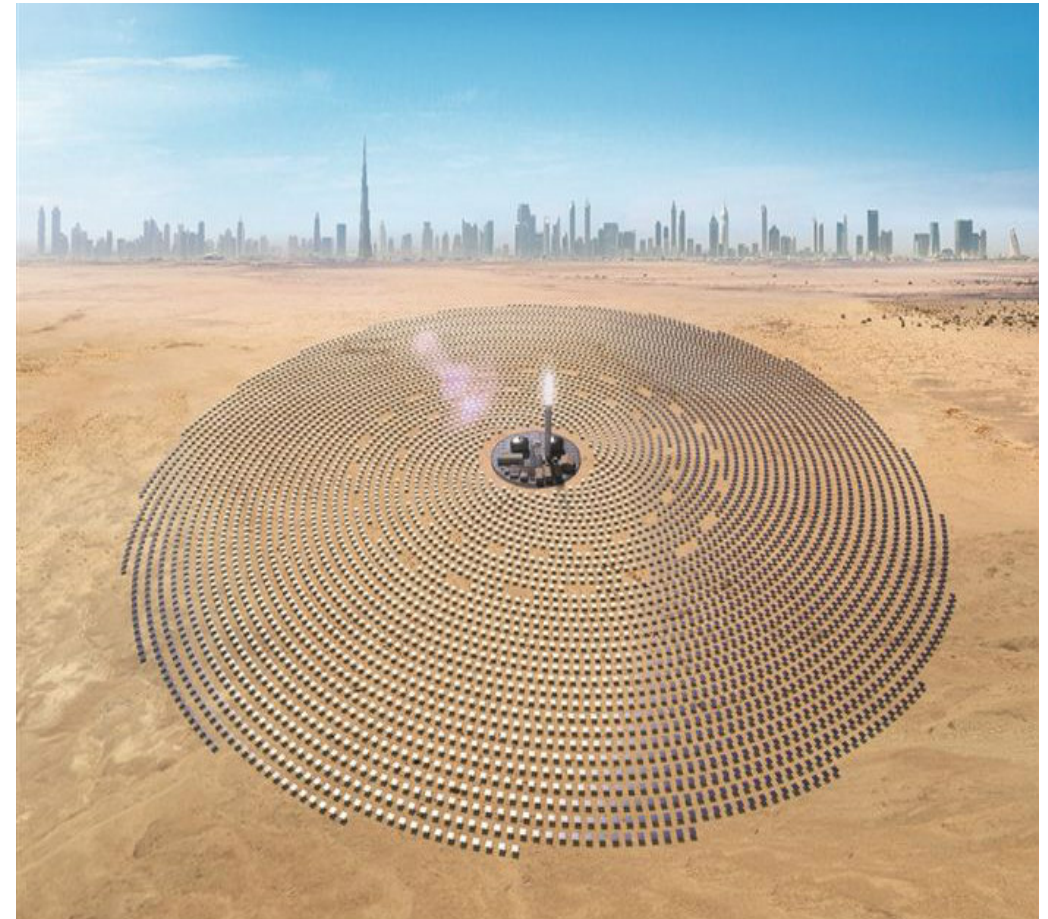
inside
climate
news

CSP MOLTEN SALT TOWER PROJECTS

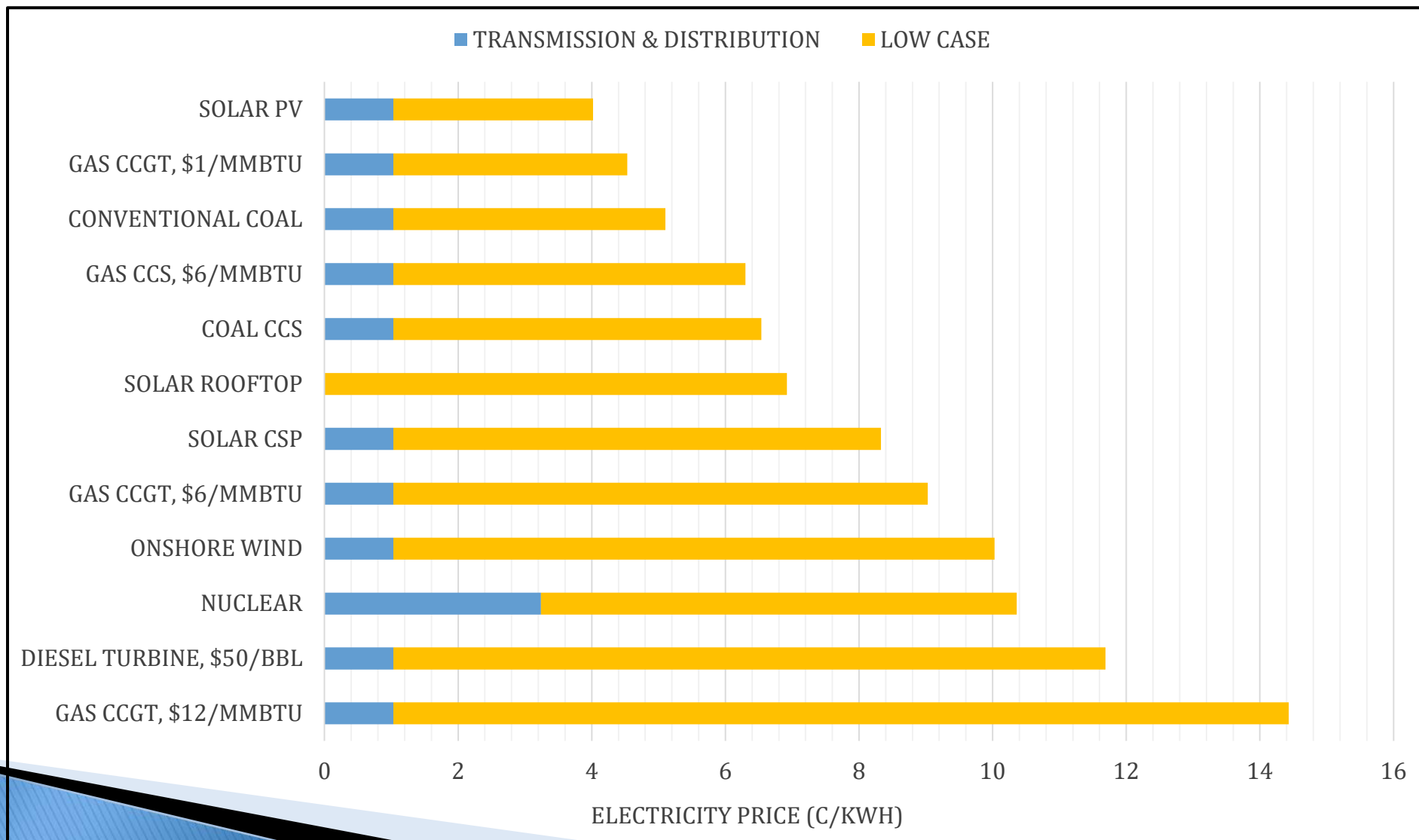
PROJECT/LOCATION	DEVELOPER(S)	CAPACITY/ STATUS	POWER PRICE	DATE PRICED
Crescent Dunes <i>Tonopah, Nevada</i>	SolarReserve	110 MW (operating)	13.5¢/ kWh	2009
Noor III <i>Ouarzazate, Morocco</i>	ACWA Power, Sener	150 MW (under construction)	15¢/ kWh	2014
Redstone <i>Postmasburg, South Africa</i>	SolarReserve, ACWA Power	100 MW (preferred bidder)	12.4¢/ kWh	2015
MBR Solar Park Phase 4 <i>Dubai, UAE</i>	ACWA Power, Shanghai Electric	100 MW* (construction to begin 2018)	7.3¢/ kWh	2017
Aurora <i>Port Augusta, South Australia</i>	SolarReserve	150 MW (construction to begin 2018)	6¢/ kWh	2017
Copiapo <i>Copiapo, Chile</i>	SolarReserve	260 MW (pending bid)	<5¢/ kWh	2017

Power price is based on the power purchase agreement (PPA) signed by the developer for power from the project; it may not reflect other sources of project income such as the sale of environmental credits or excess power.

*PPA for this project covers a mix of trough and CSP tower facilities.



S. Arabia's Most Economical Option Is Not Nuclear

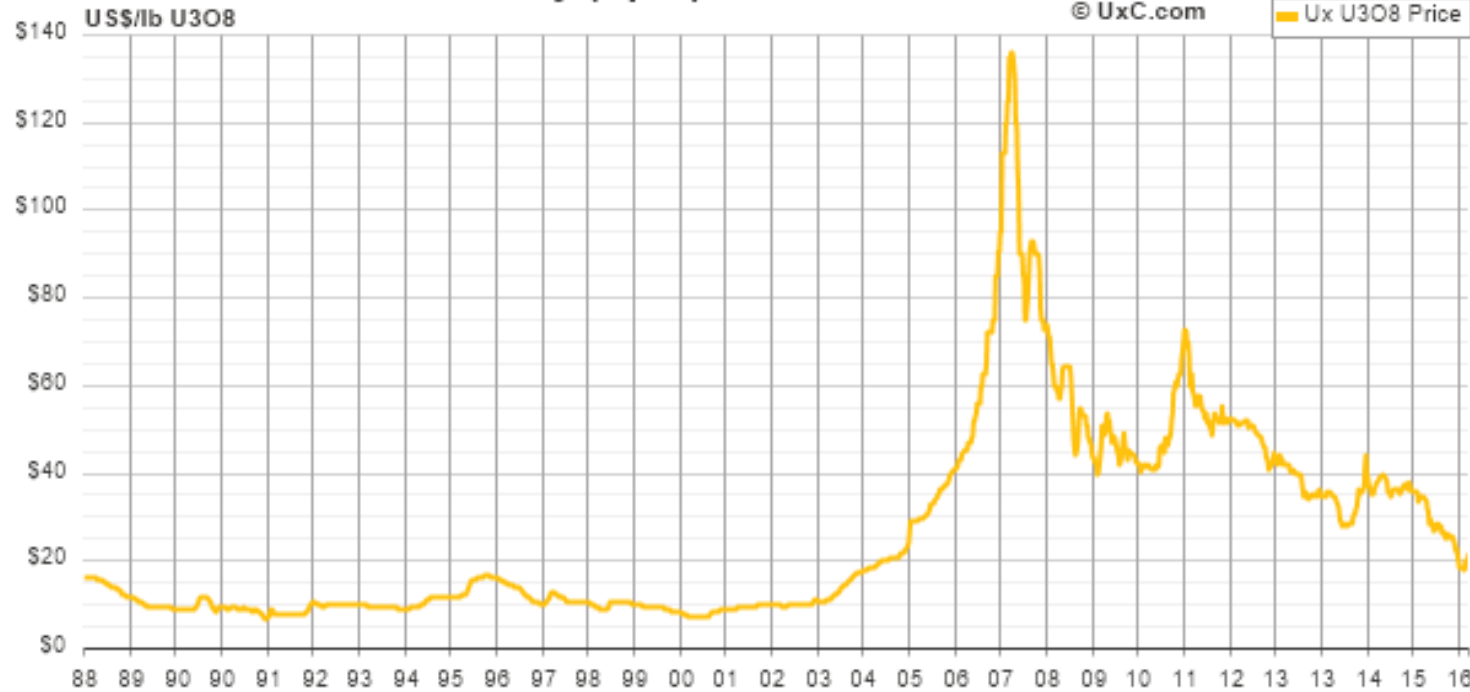


Source: Qamar research

Uranium: Plentiful and Cheap

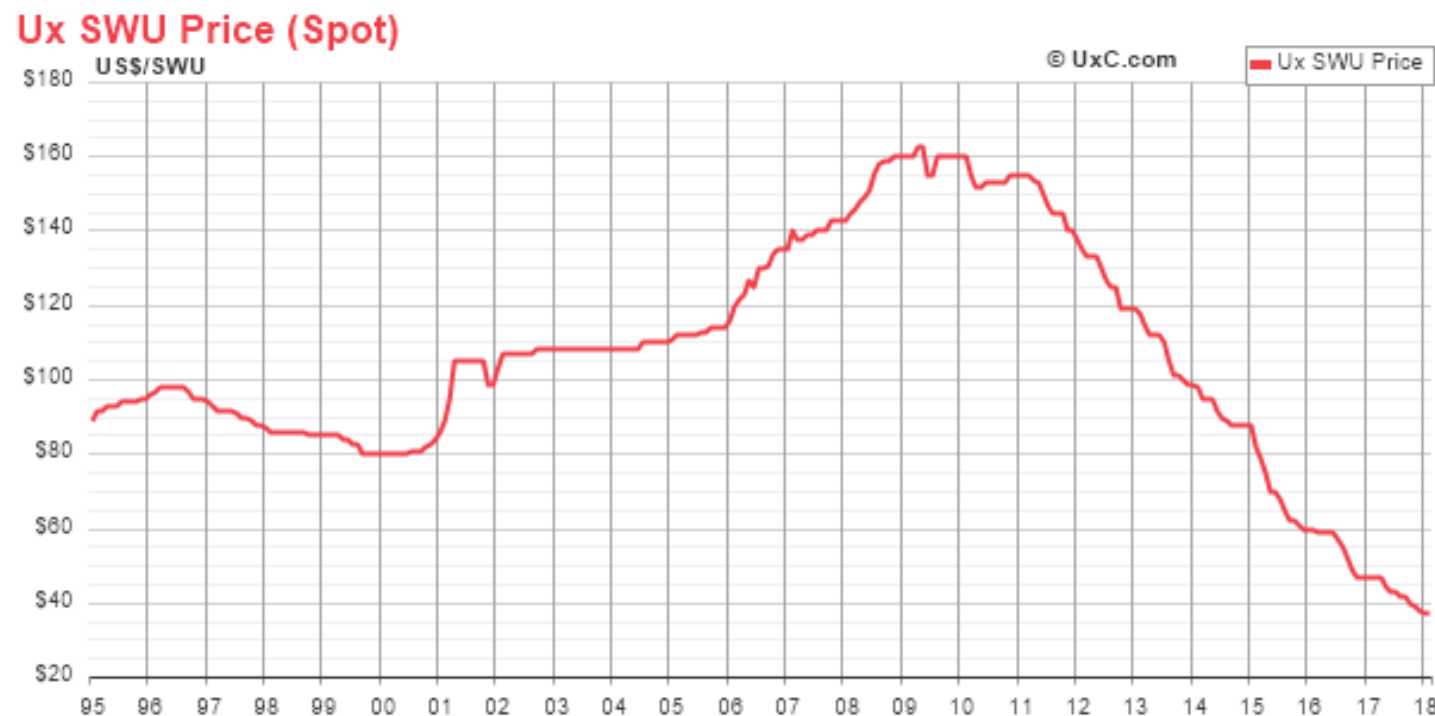
Ux U3O8 Price - Full History

Ux U3O8 Price® - Full History (Spot)



April 2019
spot price
is just
below \$25
per lb. of
U3O8

Enrichment Services: Also Abundant & Cheap



II. Should We Trust the Saudis Not to Use Nuclear Technologies to Make Bombs?

Riyadh Reserves the Right to Build a Bomb



“Saudi Arabia does not want to acquire any nuclear bomb, but without a doubt **if Iran developed a nuclear bomb, we will follow suit as soon as possible.**”

– *Crown Prince
Mohammed bin Salman,
March 18, 2018*

The Saudis Have Previously Hidden Nuclear-Capable Missiles and Factories



CSS-2 (DF-3A) missiles at Saudi military parade



DF-21 missile



Saudi ballistic missile factory near Al-Watah

Riyadh's IAEA Safeguards Agreement Allows Nuclear Construction Without Prior Notice



Information Circular

INFCIRC/746

Date: 16 February 2009

General Distribution

Original: English, Arabic

Agreement between the Kingdom of Saudi
Arabia and the International Atomic Energy
Agency for the Application of Safeguards in
Connection with the Treaty on the
Non-Proliferation of Nuclear Weapons

Riyadh's Lying Is Now Normal



- ▶ “My understanding is he entered and he got out after a few minutes or one hour. I'm not sure. We are investigating this through the foreign ministry to see exactly what happened at that time.”
– *Mohammed bin Salman, October 5*
- ▶ “The crime was really painful to all Saudis and I believe it is painful to every human in the world . . . It is a heinous crime that cannot be justified.”
– *Mohammed bin Salman, October 24*
- ▶ “In Saudi Arabia our leadership is a red line. The custodian of the two holy mosques [King Salman] and the Crown Prince [Mohammed bin Salman] are a red line . . . They represent every Saudi citizen and every Saudi citizen represents them. And we will not tolerate any discussion of anything that is disparaging towards our monarch or our crown prince.”
– *Foreign Minister Adel al-Jubeir, November 21*



III. Doesn't the US Lack Leverage Since the Saudis Can Always Buy a French, Russian or Chinese Reactor if They Don't Buy American?

Won't US-Saudi Nuclear Cooperation Strengthen Our Security Ties?

America's Leverage Over Saudi Arabia Never Was Nuclear

- ▶ Westinghouse isn't American-owned
- ▶ The Saudis have always been more interested in the Korean APR-1400



KEPCO APR 1400, Tried, Roughly on Schedule and Budget, Construction Crew in Region



Korean SMART Reactor: A Sleeper that Doesn't Require a 123 Agreement

SMART (System-integrated Modular Advanced Reactor). Saudi Arabia's King Abdullah City for Atomic & Renewable Energy (KA-Care) signed a memorandum of understanding (MoU) with ROK in November 2016 to develop the technology in the kingdom.

According to a source at KA-Care, *Saudi Arabia owns a percentage of the intellectual property (IP) rights for the technology, and is already moving ahead with plans to begin to develop the first two SMART reactors, which will have a capacity of about 100MW each, within the next four years.*



Source: Middle East Business Intelligence, January 22, 2018

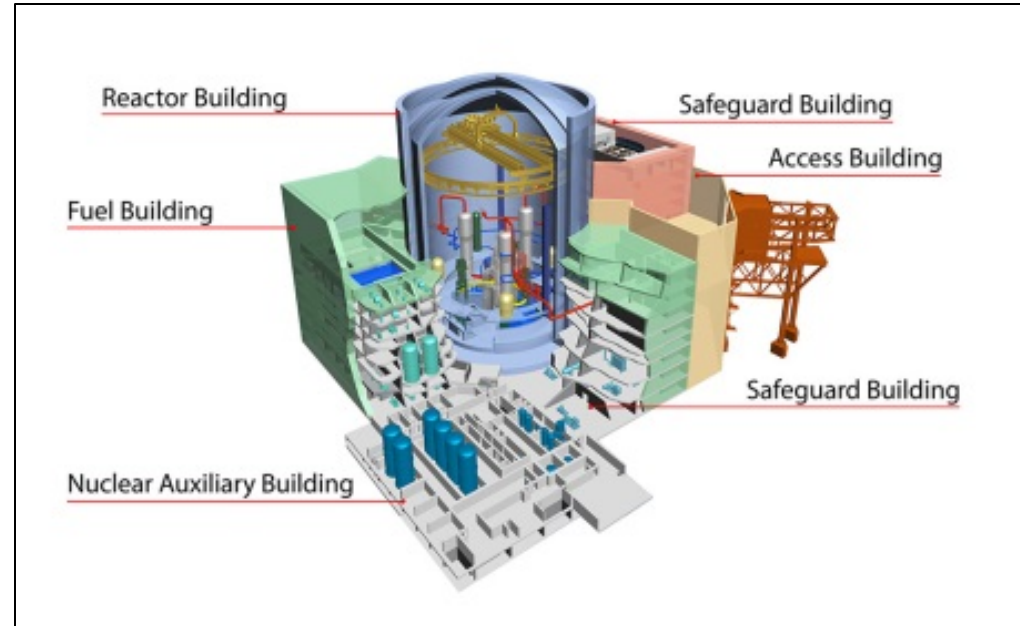
<https://www.meed.com/exclusive-saudi-arabia-shortlists-two-sites-first-nuclear-power-project/>

South Korea – Saudi Arabia 2011 Nuclear Cooperative Agreement Allows Enrichment

ARTICLE 8 Enrichment and Reprocessing

2. Equipment or technology transferred pursuant to this Agreement and equipment based on such technology *shall not be used for the production of uranium enriched to twenty (20) percent or more in the isotope U-235, unless the Parties otherwise agree.*

CAP 1400, HPR 1000: Not Quite Ready



VVER 1200: 1st Safety Test Late 2016, Bounced Reactor off the Grid



Non-Nuclear Leverage: We Have It

- ▶ Seoul may or may not need a 123 for the APR 1400 or the SMART reactor. Either case, Washington has their number
- ▶ Senator Jack Reed (D. Ranking SASC) got things right when he noted March 22, 2018 that:

“I think the proliferation dangers are so great that we should be able to wield all the influence we have, which goes way beyond this one transaction, to insist upon the same standards that we applied to the Emirates”



Trump Agrees



“I love the king, King Salman, but I said,
‘King we’re protecting you. You might not
be there for two weeks without us.’”

- October 3, 2018

The Mathematics of Nuclear Deterrence in the Middle East

1 Iranian nuclear weapons option or nuclear weapon + 1 Saudi nuclear weapons option or nuclear weapon

= 0?

= 2?

OR

= >2?

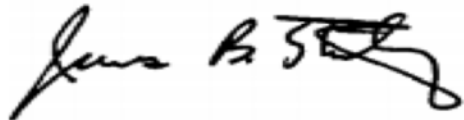
IV. Are the Proliferation Implications of the Saudis Proceeding With Their Nuclear Program Readily Manageable?

The US-UAE Deal Calls for Terms “No Less Favorable”

Equal Terms and Condition for Cooperation

The Government of the United States of America confirms that the fields of cooperation, terms and conditions accorded by the United States of America to the United Arab Emirates for cooperation in the peaceful uses of nuclear energy shall be no less favorable in scope and effect than those which may be accorded, from time to time, to any other non-nuclear weapon State in the Middle East in a peaceful nuclear cooperation agreement. If this is, at any time, not the case, at the request of the Government of the United Arab Emirates the Government of the United States of America will provide full details of the improved terms agreed with another non-nuclear-weapon State in the Middle East, to the extent consistent with its national legislation and regulations and any relevant agreements with such other non-nuclear weapon State, and if requested by the Government of the United Arab Emirates, will consult with the Government of the United Arab Emirates regarding the possibility of amending this Agreement so that the position described above is restored.

FOR THE GOVERNMENT OF
THE UNITED STATES OF
AMERICA:



FOR THE GOVERNMENT OF
THE UNITED ARAB
EMIRATES:



So Too Does the US - Egyptian Deal

EQUAL TERMS AND CONDITIONS FOR COOPERATION

The Government of the United States confirms that fields of cooperation, terms and conditions accorded by the United States to the Arab Republic of Egypt for cooperation in the peaceful uses of nuclear energy **shall be no less favorable in scope and effect than those which may be accorded by the United States to any other non-nuclear weapon state in the Middle East** in a peaceful nuclear cooperation agreement.

Pending Middle Eastern 123 Agreements

- ▶ Egypt, expires 2021
- ▶ Morocco, expires 2021
- ▶ Turkey, expires 2023
- ▶ Jordan?

What About Israel?

The last time the United States made an exception from its nonproliferation policies and legal requirements not to promise to transfer controlled nuclear commodities to another close friend, India, Israel quietly petitioned for equal treatment.

See, Glen Kessler, “Israel Submits Nuclear Trade Plan,” *The Washington Post*, September 30, 2007, available from <http://www.washingtonpost.com/wp-dyn/content/article/2007/09/29/AR2007092901530.html>

Trump Wants a Better Deal with Iran



“I hope to be able to make a deal with [Iran]: a good deal, a fair deal, a good deal for them, better for them, better for them.” – May 10, 2018

We Have Been Here Before

GUESS WHO'S BUILDING NUCLEAR POWER PLANTS.



The Shah of Iran is sitting on top of one of the largest reservoirs of oil in the world.

Yet he's building two nuclear plants and planning two more to provide electricity for his country.

He knows the oil is running out — and time with it.

But he wouldn't build the plants now if he doubted their safety. He'd wait. As many Americans want to do.

The Shah knows that nuclear energy is not only economical, it has enjoyed a remarkable 30-year safety record. A record that was good enough for the citizens of Plymouth, Massachusetts, too. They've approved their second nuclear plant by a vote of almost 4 to 1. Which shows you don't have to go as far as Iran for an endorsement of nuclear power.

NUCLEAR ENERGY. TODAY'S ANSWER.

BOSTON EDISON - EASTERN UTILITIES ASSOCIATES - NEW ENGLAND POWER COMPANY
PUBLIC SERVICE COMPANY OF NEW HAMPSHIRE - NEW ENGLAND GAS AND ELECTRIC COMPANIES



And Then There's the RoK and E. Asia

- Even “anti-nuclear South Korean President Moon wants a nuclear submarine program — i.e., likely to enrich US-origin materials
- How might Washington resist Seoul's request if it allows Riyadh to enrich and recycle?
- How might South Korea's neighbors “react” to Washington green lighting ROK enrichment?



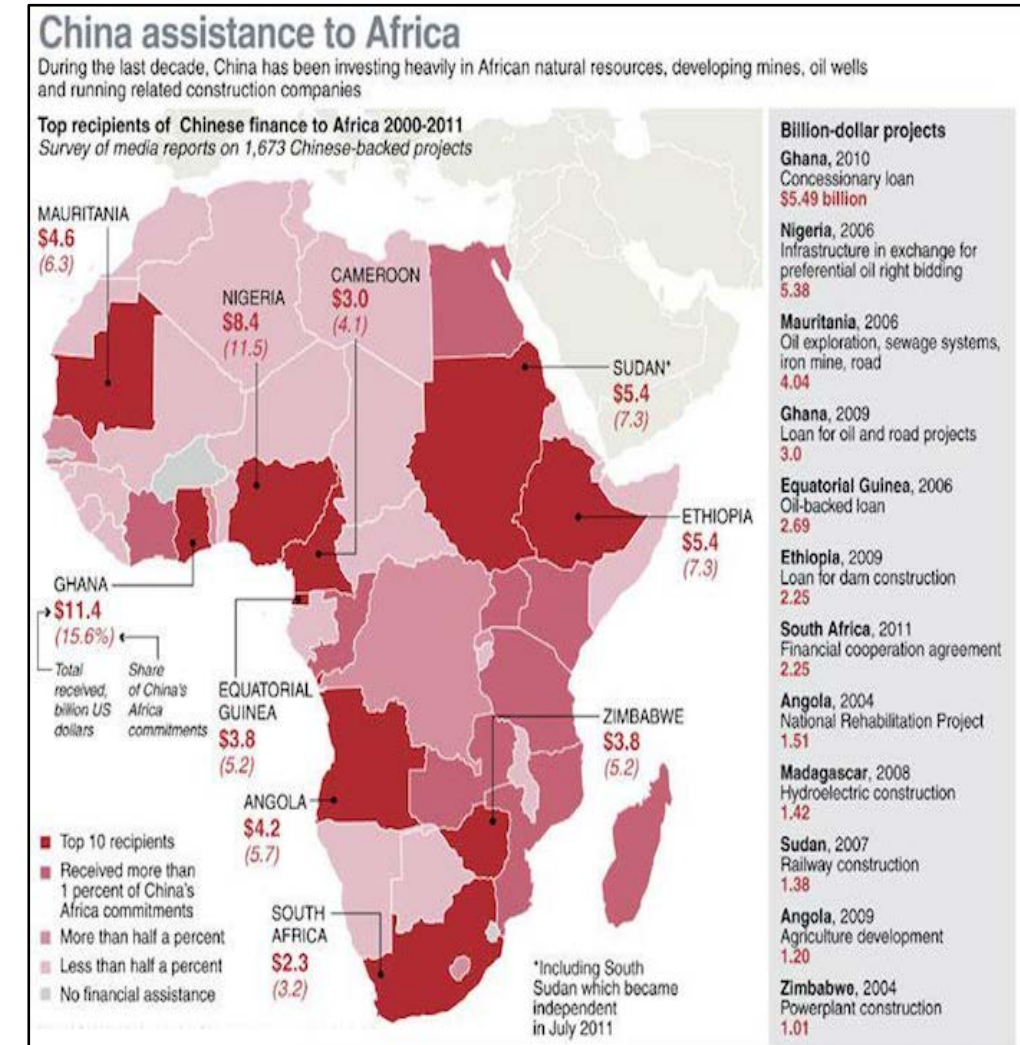
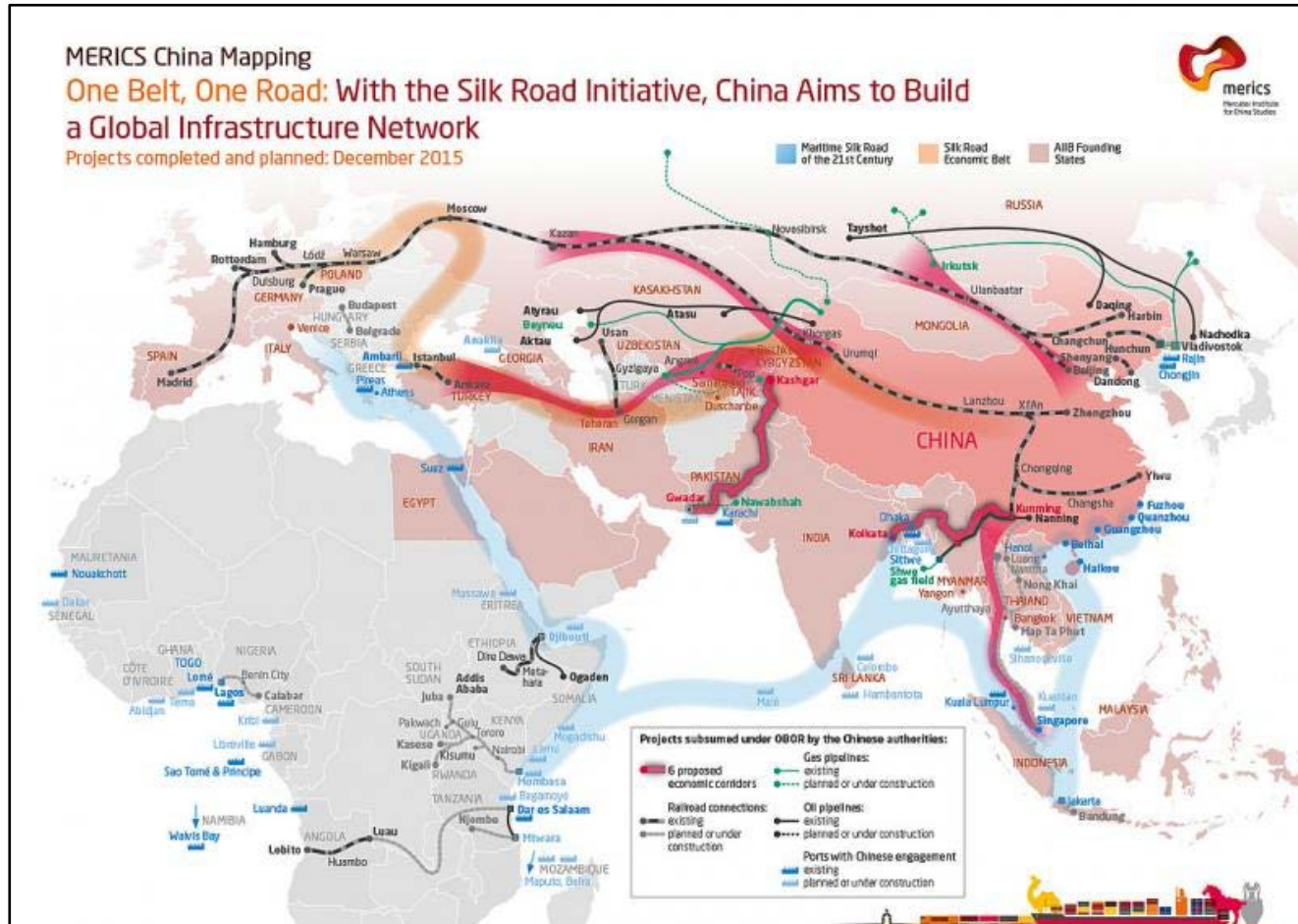
What Should We Do?



Additional Slides

The US Should Pursue Non-nuclear Strategic Energy Competition

China's Serious, Nonnuclear Energy Geopolitics



Source: IB Times

The US Should Compete Here Too

Title V of the Nuclear Nonproliferation Act of 1978 requires the US Government to:

“endeavor to cooperate with other nations, international institutions, and private organizations in establishing programs to assist in the development of non-nuclear energy resources, to cooperate with both developing and industrialized nations in protecting the international environment from contamination arising from both nuclear and non-nuclear energy activities, and **shall seek to cooperate with and aid developing countries in meeting their energy needs through the development of such resources and the application of non-nuclear technologies consistent with the economic factors, the material resources of those countries, and environmental protection.** The United States shall additionally seek to encourage other industrialized nations and groups of nations to make commitments for similar cooperation and aid to developing countries.”

Would the Saudis Really Want to Do Business With Moscow?

SOUTH AFRICAN COURT RULES AGAINST \$76 BILLION RUSSIAN NUCLEAR PLAN IN BLOW FOR PRESIDENT ZUMA

BY **CONOR GAFFEY** ON 4/26/17 AT 7:51 AM



Model of the planned Akkuyu Nuclear Power Plant in Turkey

We've Done This Before

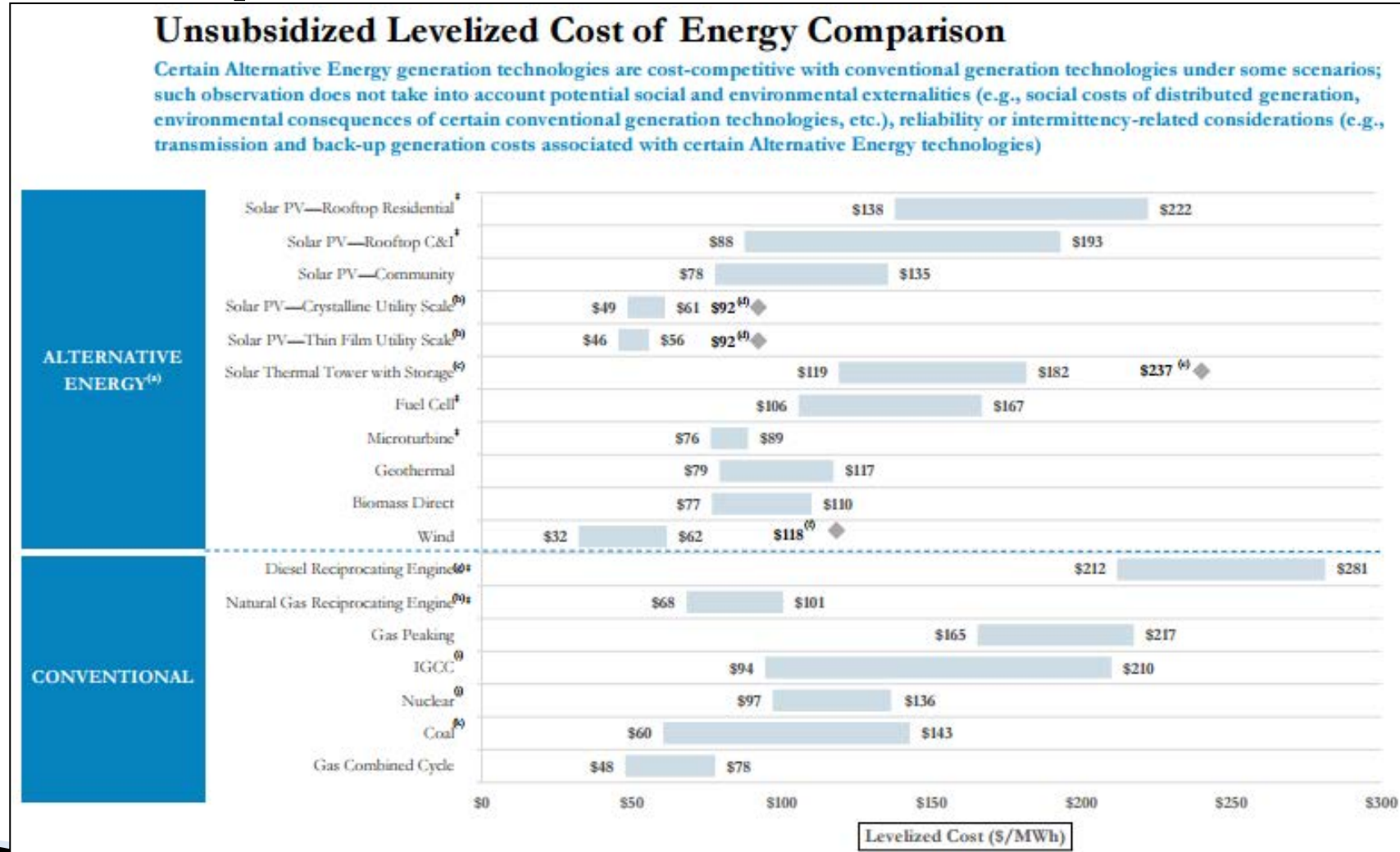


**Isn't a 123 Agreement With Riyadh Needed if
US Nuclear Technology or a Reactor With US
Technological Content is Built There?**

Only the Export of One Kind of American Nuclear Technological Content Requires a 123

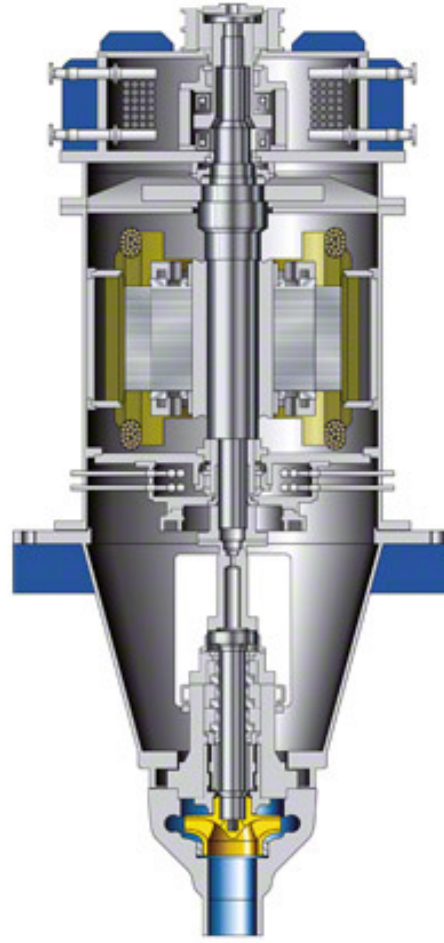
- ▶ Balance of plant (tangible nonnuclear items) — **no**
- ▶ Intangible nuclear know-how (DoE Part 810 Authority) — **no**
- ▶ Tangible American nuclear components on the NRC 110 Nuclear Trigger List (Items especially significant from a nuclear explosive standpoint) — **yes**

Solar PV is More Than Cost Competitive

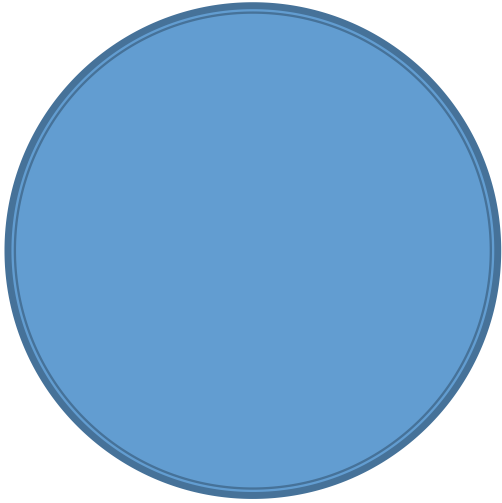


Source: Lazard “Levelized Cost of Energy Analysis – Version 10.0”

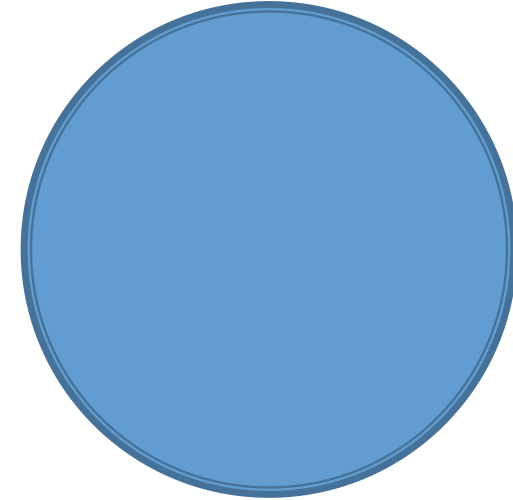
But KSB Also Makes Coolant Pumps for KEPCO APR 1400 Reactors



Westinghouse: American in Name Only



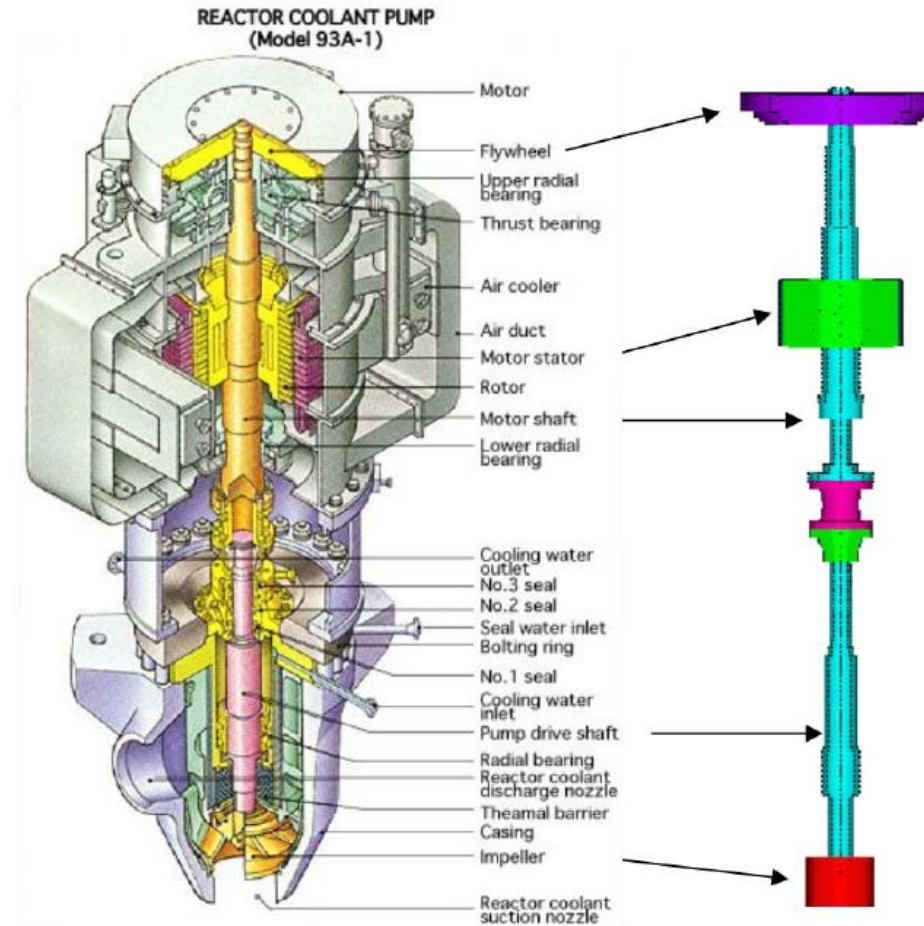
Today: 100% **Japanese** Owned



Later this year: 100%
Canadian Owned

Westinghouse no longer builds reactors abroad and makes no major components in US; it designs reactors and makes smaller components

Westinghouse Brands Curtiss-Wright Coolant Pumps for APR 1400



Kingdom's SMART Option Suggests How Important the Gold Standard Is to Secure

- ▶ If the Kingdom wants a bomb, the SMART reactor is large enough to
 - Serve as a procurement cover for a covert enrichment program
 - Serve as a justification for an overt enrichment program
 - Server as a plutonium production plant for either abrupt or incremental military diversions
- ▶ The best diplomatic way to head this off is to push for the Gold Standard whether the Kingdom buys American or not