Proposal for National Renewable Energy Plan for Saudi Arabia

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ECRA

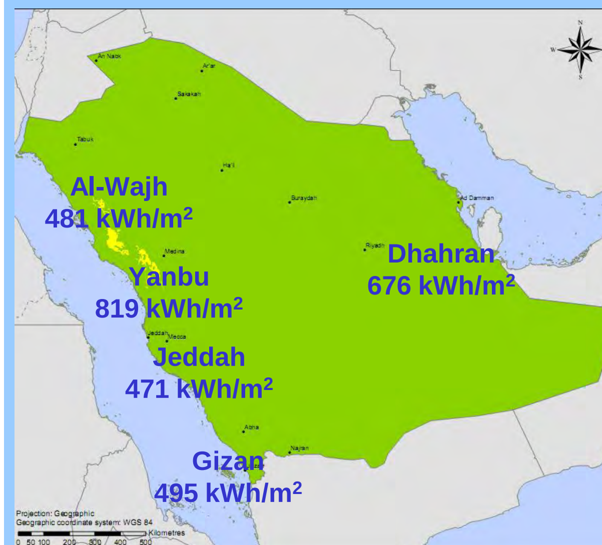
Plan of presentation

- Introduction
- Benefits and potential of renewables
- Proposal for incentivizing renewables
- Institutional responsibilities
- Next steps

Conventional focus has been on solar and wind development in Saudi Arabia

- Saudi Arabia has approximately 2,200 thermal kWh of solar radiation (sunshine) per square meter, twice the average radiation in Europe
- In particular substantial solar-thermal potential, using mirrors to reflect sunlight for heating fluids and generating steam, which is then piped to run the generator
- Two major joint solar energy projects in Saudi Arabia, SOLERAS and HYSOLAR, in partnership with the US and Germany respectively
- Two windy regions exist in Saudi Arabia along the Arabian Gulf and the Red Sea coastal areas (Yanbu windiest region)
- The mean annual wind energy density lies between 250 and 500 kWh/m^2 on the Red Sea coastal sites and drops to about 50 kWh/m^2 in inland areas

Average wind energy density



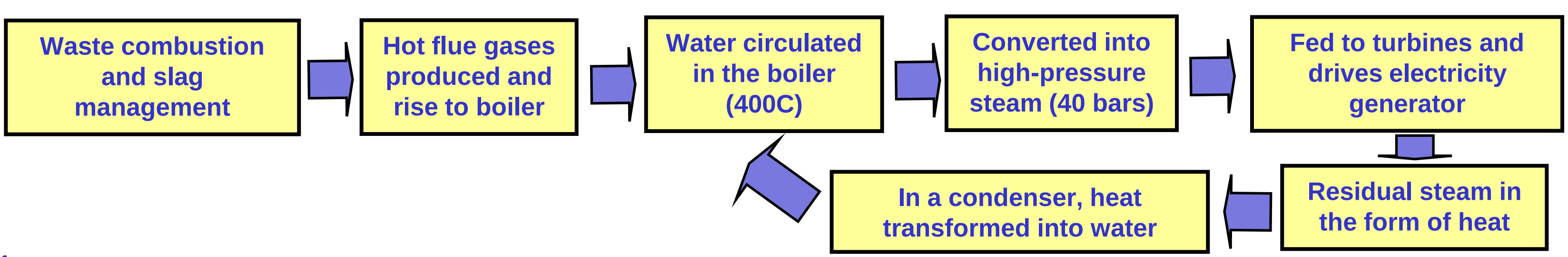
Source: 'Prospects of Wind Farm Development in Saudi Arabia' – King Fahd University of Petroleum & Natural Resources, November 2003

Industrial and agricultural processes can also create some renewable potential

- **Waste to Energy - Waste heat from industrial processes (e.g. steel mills, petrochemical processing, pulp and paper mills) can be recovered to provide energy for generation**
- **Landfill gas – biodegradable waste in municipal landfills can be decomposed to produce methane, and then used as fuel for power generation**
- **Municipal solid waste – incinerators can burn solid waste from municipal landfills to generate heat and electricity; there are about 431 Waste to Energy plants in Europe and 89 in the US**
- **Biomass - agricultural waste (e.g. grains, weed, sawdust, etc.) and animal waste could be used as feedstock for boilers/heated steam can be used to generate electricity**

Saudi Arabia's agricultural produce may offer a potential for biomass energy:

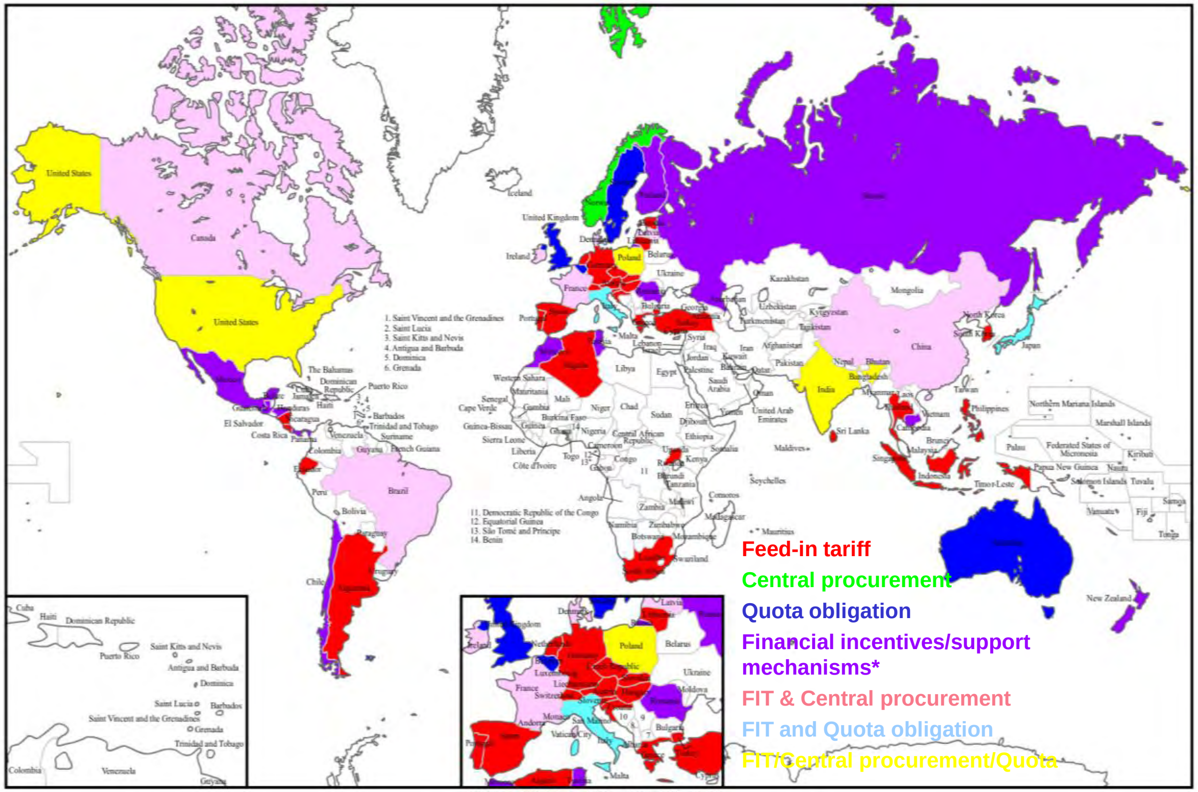
- **Saudi Arabia produces, in order of importance, wheat, barley, tomatoes, melons, dates, and citrus fruits; the main livestock are mutton and chickens**
- **Various crop/vegetable production (2.5 million tons in 2004) and animal waste could be used as feedstock to generate electricity**
- **However wheat production gradually being reduced, requiring reliance on other sources for biomass**



Key messages

- Saudi Arabia has significant renewable energy potential, and not only in solar and wind energy
- There are four main approaches to incentivizing renewable energy:
  - *Feed in tariffs* set a standard price per kWh for qualifying renewables; they are effective at guaranteeing a revenue stream to generators, but if not set at the right price can distort incentives
  - *Central procurement* involves an agency providing renewable energy contracts through competitive bidding; such an agency must be strong, but the process can lead to greater control over capacity and timing
  - *Quota systems* determine the quantity of renewable energy to be procured, and allow the market to set the price; they are effective if a trading infrastructure is in place
  - *Financial incentives and support mechanisms* make use of existing systems and are administratively easy, but are often insufficient
- In Saudi Arabia, feed in tariffs and central procurement are most relevant

Various alternatives are deployed worldwide to promote renewable energy



**This classification only applies to jurisdictions that solely rely on financial incentives/support mechanisms. Virtually all jurisdictions employ financial incentives/support mechanisms along with one or more of the other three mechanisms (FIT, central procurement, and quota obligation).*

Note: Finland recently implemented a FIT system but the chart does not show this because financial incentives/support mechanisms remain most prominent in Finland.

- **At least 64 countries have renewable energy support policies**
- **Support policies were first deployed in the late 1970s in Denmark and the US**
- **As of year-end 2008, renewable capacity was 280,000 MW, mostly wind and small hydro**
- **Four main mechanisms are feed in tariffs, central procurement, quota systems and financial incentives/support mechanisms**

These mechanisms aim to overcome fundamental barriers to entry by renewables by targeting different aspects

- Projects more expensive than alternative ways of generating power; chief barrier to development of renewables
- Certain renewable technologies may be less proven, and unknown risk to financiers (particularly in current credit environment)
- Zoning and building codes may inadvertently discriminate against renewables, particularly small-scale
- Problems in dealing with multiple levels of government in seeking approvals
- Growing opposition to siting renewable facilities in close proximity to residential areas

Aspects targeted by different approaches

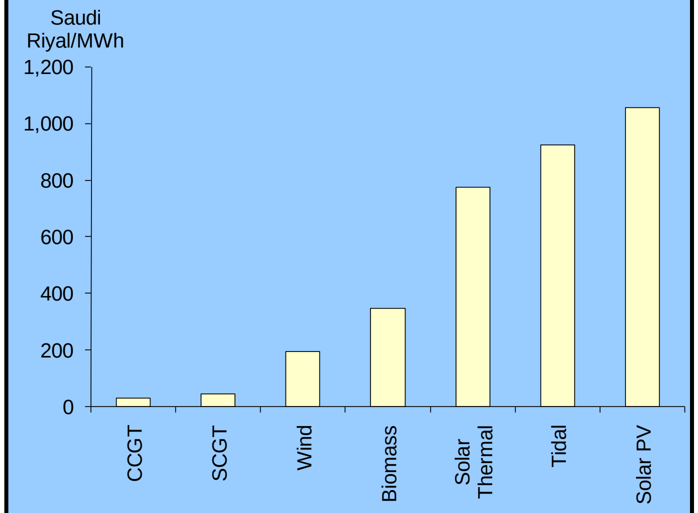
- Feed in tariffs set price (and may differentiate between technologies and sizes of facilities)
- Central procurement sets an installed capacity target (in MW)
- Quota system has explicit renewable generation target (in MWh)
- Financial incentives implicitly target the return on equity to project developers

There are also Saudi specific challenges in incentivizing renewables

- **Unclear commitment to renewable energy**
- **Uncertainty to developers on who is lead contract authority or how to obtain contract from creditworthy counterparty**
- **Uncertainty regarding evolution of industry; developers need to know how activities fit in with structure and that entity contracted with will still exist**
- **Extent of renewables resource base undefined; developers will gravitate to jurisdictions with most available information**
- **Permitting and business set up process not well understood by developers**
- **Low cost of primary fuels**

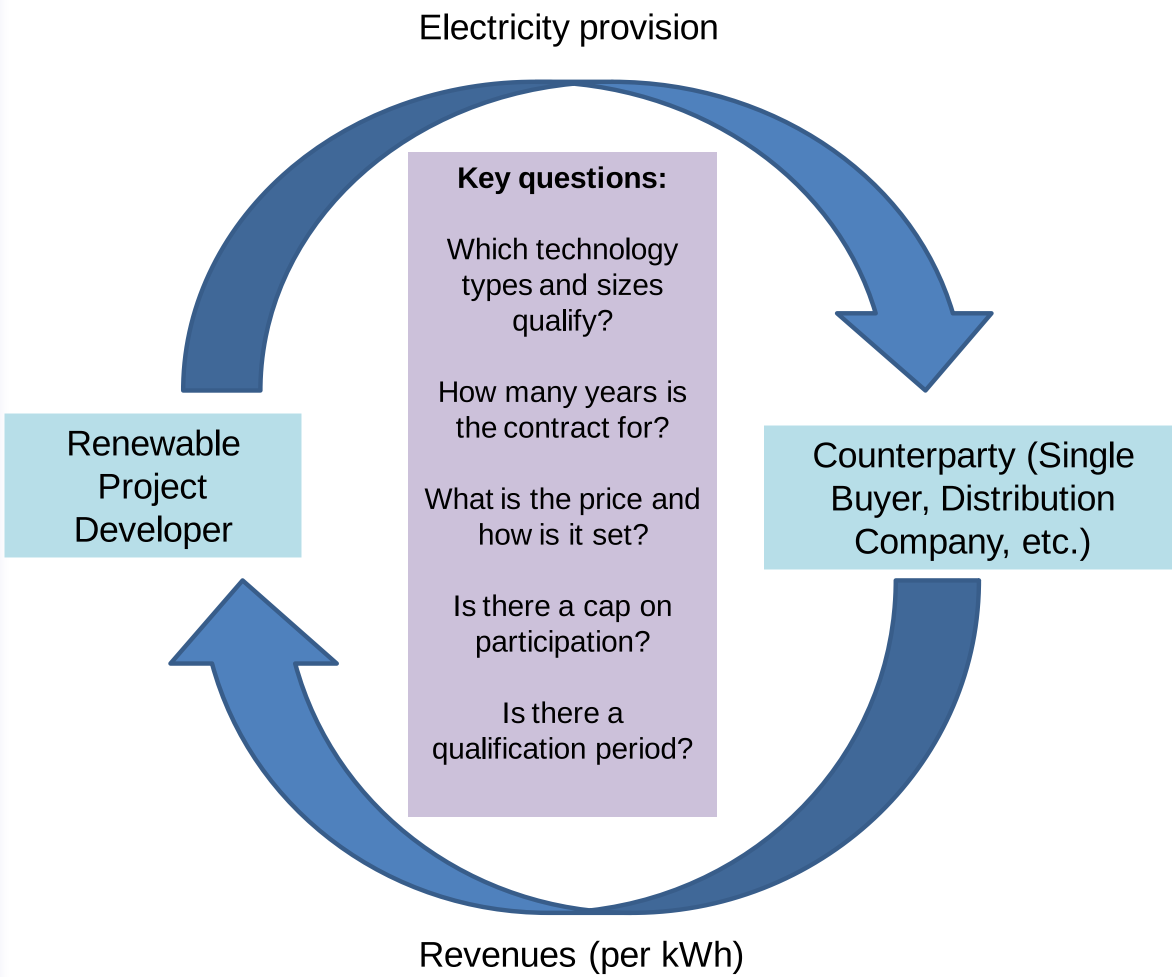
Primary fuel costs

Indicative levelized cost of renewables against gas-fired entrants in KSA



- **Low and subsidized cost of primary fuels accentuates cost advantage of gas-fired power stations against renewables in Saudi Arabia**

Feed in tariffs provide renewable energy developers with a predictable revenue stream

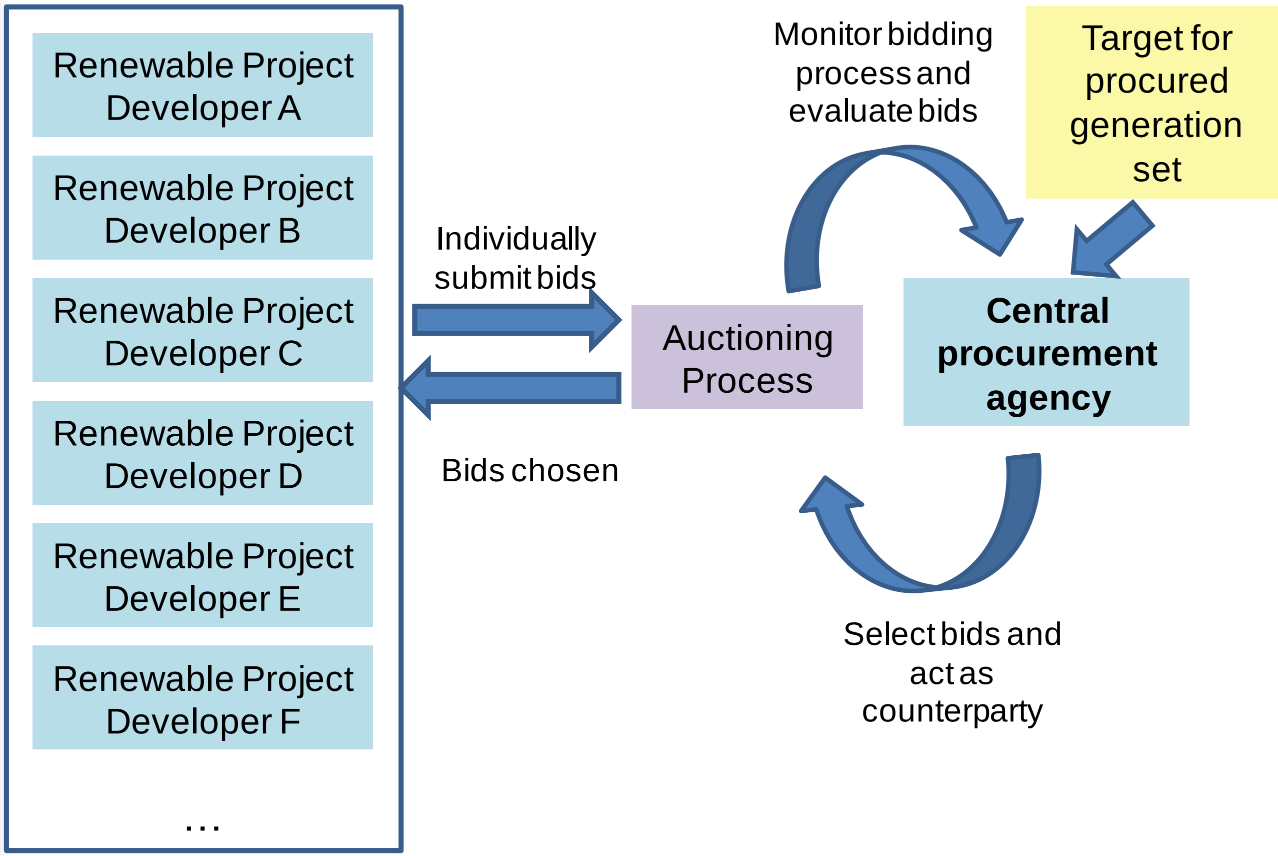


- An FIT sets a standard price per kWh for all qualifying resources
- May vary depending on technology type, size or location
- May be received for lifetime of project or set period of time
- Can be reduced on annual basis
- May be enshrined in contract or paid through clearinghouse
- Some prices determined through competitive process, others based on all-in-levelized cost estimates

FITs are predictable, transparent and flexible, but the price needs to be set right

Pros	Cons
▪ Instrumental in accelerating renewable energy development: provides a predictable revenue stream for generators ▪ Transparent mechanism ▪ Flexible (easy to change price levels for future facilities) ▪ Administratively straight forward	▪ Can lead to higher electricity prices and/or financial deficits by utilities (e.g. in Germany prices risen 4% per annum since 1990) ▪ If price set too high, can incentivize inefficient entry ▪ If price set too low, can attract insufficient capacity ▪ Can lead to geographical concentration of resources

Central procurement can benefit from a strong central agency and a specified target capacity



- **Involve central agency (such as Single Buyer or government itself) providing renewable energy contracts through competitive bidding process**
- **Agency sets explicit renewable energy target (in MW) and issues requests for proposals (RFPs)**
- **Often maximum price per unit specified and limits placed on capacity by one participant**

May be different targets for different technologies and sizes or alternatively all technologies may compete on equal footing

Central procurement provides greater control over capacity and timing, but requires a strong agency to manage process

Pros

- Provides control over amount of renewable capacity deployed and timing
- Can incentivize low cost resources
- Provides revenue stability to generators due to long-term contracts
- No need for any agency to second guess price level

Cons

- More administratively complex than FITs; requires entities which are competent enough to undertake competitive auctioning process, determine selection criteria, evaluate bids, devise standardized or individualized contracts, etc. or rely on consultants/experts
- Lag between procurement and generation

Quota systems allow the market to set the price for renewables and involve tradable instruments

- **Determine quantity (MWh) of renewable energy to be procured, and allow market to set price**
- **Targets often set by government; quota placed mainly on load serving entities for proportion of energy purchased from renewables; penalties imposed for failing to meet quota**
- **Often combined with marketable/ tradable instruments, with transparent price**
- **Tradable instruments represent environmental attributes of power produced from renewables and can be bought or sold by market participants, often separately from underlying energy**

Set targeted quantity, determine entity to be targeted (e.g. 10% of all electricity sales for distribution companies must be purchased from renewable resources)

Determine eligibility criteria for renewables under program and whether different "classes" of renewables

Determine penalty level to be applied to entities which do not meet target

Establish tradable instrument which sets price per MWh to renewable power generators. Set terms of trading of instrument, including across jurisdictions

Establish monitoring, evaluation and verification structure to support program

Quota system can achieve given renewable quantity at lowest cost, but needs clear, consistent policy and trading infrastructure

Pros

- Can ensure specified quantity of renewable generation is achieved at the lowest cost
- No need for agencies to second guess the price level

Cons

- Need stable and well communicated government policy about eligible technologies, who is mandated to meet targets, etc.
- Generators are not guaranteed revenue stream
- Needs developed trading infrastructure
- Can be administratively complex

Financial incentives also can promote renewable development by targeting a company's ROE

- Financial incentives can influence a renewable energy developer's future free cash flows through targeting their return on equity (ROE)
- Financial incentives can be directed both at renewable energy developers and the manufacturers of renewable energy products:
- Examples of financial incentives targeting
  - Investment subsidies
  - Grant
  - Low interest loans
  - Tax credits
  - Lower or zero tax rates (value-added tax, excluding dividends from renewable energy investments from income tax, etc.)

Financial support mechanisms in Spain

- Alongside the FIT, Spain uses a variety of financial support mechanisms, including subsidies, tax deductions and low interest loans
- Investment ***subsidies*** cover 36.4% of installation costs for renewable energy heating and cooling technologies
- The 2001 Law on Fiscal, Administrative and Social Measures provided ***corporate tax deductions*** of 10% for investments in non-wind based renewable energy
- The Renewable Energy Plan 2000-10 established a financing mechanism to provide ***low interest loans*** covering up to 70% of an investment to help renewable energy developers

Other support mechanisms exist, such as R&D, resource mapping, and institutions to expedite permitting

- ***Government funded research*** to disseminate information on renewable energy to interested parties can be effective support mechanism; can include resource mapping showing potential of different renewable technologies
- Supporting institutions to expedite or ***streamline permitting process*** for proposed projects are also widely used
- Some jurisdictions provide infrastructure ***support in connecting to the grid*** or in ***expanding transmission lines*** to accommodate renewable projects in development of prospective projects
- ***Net metering***, which allows consumers to build small renewable energy systems at homes and businesses and sell unused energy back at the wholesale electricity price also used to incentivize development

Wind mapping and net metering in Ontario

- In Ontario, the ***Wind Resource Atlas Program*** has aimed to help large and small wind developers identify favorable locations for wind development and widely publishes such information
- The ***net metering program*** allows small producers of renewable energy (who produce mainly for own consumption) to connect their output to the grid and receive credits towards their energy costs. The value of generated renewable electricity is calculated at the same price as what a consumer would pay for a kWh of energy
- In 2009 Green Energy Act proposal to create a ***Renewable Energy Facilitation Office*** to share information with developers on permitting process

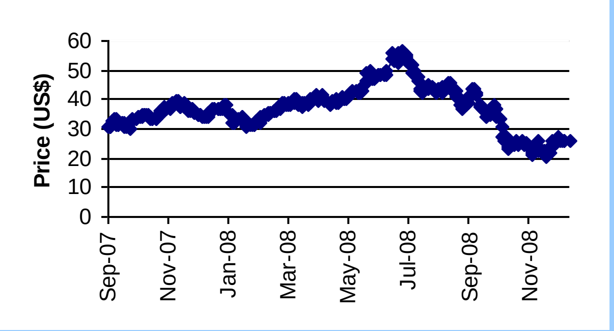
The CDM mechanism has been used in China to promote renewable energy

- The Clean Development Mechanism (CDM) is a component of the Kyoto Protocol that allows industrialized countries to offset carbon emission reductions by buying certified credits from non-industrialized signatories; credits under CDN known as Certified Emission Reduction Credits (CERs)
- As of April 2008, 18% of all CDM projects were in China, the leading country
- 27% of these projects involved renewable energy, and were mainly hydro based
- Aligning national renewable energy regulations with CDM policies could increase ability to earn future credits

Qualification for CDM projects

- To qualify for earning CERs, project needs to be in "non-annex 1" country, which is party to the Kyoto Protocol
- Also need for a Designated Operational Entity (DOE)/ Designated National Authority (DNA), which is independent legal entity accredited and designated by CDM Executive Board to validate proposed CDM projects and verify and certify emission reductions
- Saudi Arabia eligible to participate in CDM; Egypt, Jordan, Israel, Qatar and UAE all have DNAs and host or are registering a CDM project

CER Prices (Sep 2007 – Dec 2008)



Source: Bloomberg

Financial incentives and support mechanisms are administratively straight forward, but if politicized can create uncertainty and often insufficient

Pros

- Financial incentives make use of existing mechanisms (e.g. tax and benefit system)
- Administratively straight forward

Cons

- If constantly changed, due to political factors, can create uncertainty to project developers (e.g. sunset period of PTC)
- Often insufficient on own; need one of preceding tools to incentivize renewables further

Plan of presentation

- Introduction
- **Benefits and potential of renewables**
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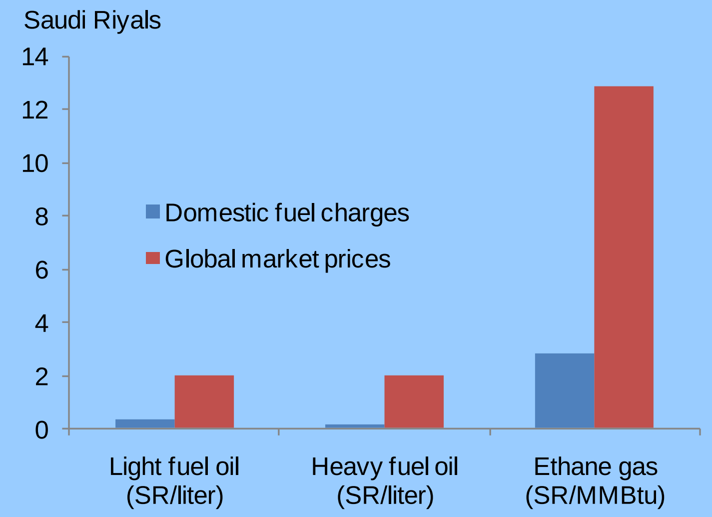
Renewable energy can provide Saudi Arabia with significant benefits

- ✓ Helps diversification of fuel and technology sources
- ✓ Can reduce growth of Saudi emissions (NO_x, SO_x and CO_2), effluents and water usage
- ✓ Reduces opportunity costs of subsidized fuel inputs
- ✓ Provides alternative means of serving remote areas
- ✓ Can foster creation of a domestic market for renewable energy products
- ✓ Introduces new players into wholesale market, enhancing innovation and potentially competition
- ✓ Can be more scaleable than conventional technologies

Subsidized fuel inputs

- Natural gas and petroleum products sold to power producers at rates considerably below market prices
- A reduction in use of subsidized fuels for future capacity could potentially increase export revenues, even if renewable energy itself is subsidized

Domestic fuel charges for power facilities relative to current global market prices



Source: Bloomberg, proprietary contracts

Renewable energy plan is needed to incentivize developers to build; it also signals efforts are being taken by KSA to reduce greenhouse gases

- A plan is needed to provide potential investors with clear understanding of *how they will get paid, how much, who will make the payment*, and have confidence in commitment of authorities to renewables
- If properly designed, a plan can ensure that renewable projects will be developed in a cost-efficient fashion
- As increasing pressure on countries to reduce greenhouse gas emissions, can show steps are being taken by Saudi Arabia

The Copenhagen Conference

- Successor agreement to Kyoto being sought to reduce greenhouse gas emissions
- 65 Heads of States have thus far committed to attending the conference, scheduled to end on December 18th
- Agreement on a global target for the reduction of greenhouse gas emissions and timeline to achieve target are key objectives of conference
- Will require commitment from developed countries to reduce their CO_2 emissions, while developing countries contribute to a “collective solution” through sharing of technologies, research and development
- Any agreement on global climate regime should not restrain economic growth or distort competition

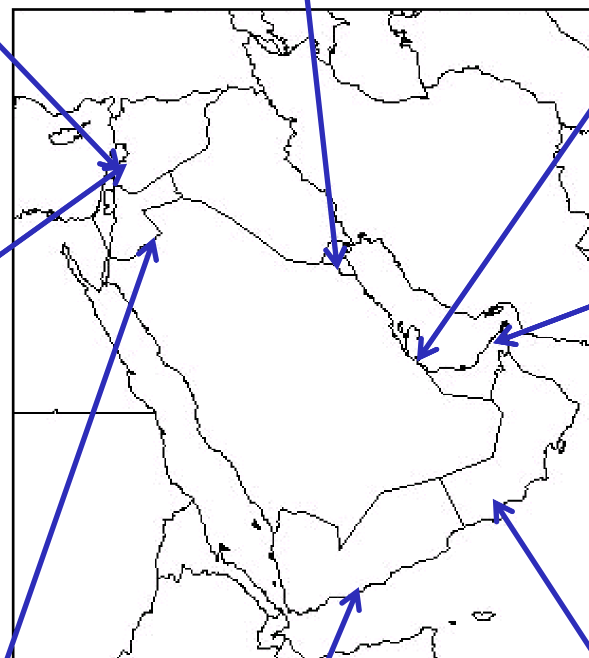
Developing a renewable energy plan is consistent with developments in neighboring countries

Lebanon
- Developing *project for solar-powered desalination plant*
- Significant installed hydro
- Increasing installations of solar water heaters

Syria
- Completed wind farm feasibility study
- Establishing *National Center for Energy Studies and Research* to develop a National Renewable Energy Plan
- Significant amount of installed hydro, biomass and solar water heaters

Jordan
- Developed energy sector strategy with a *goal of 5% of renewables by 2015*
- Established a *National Energy Research Center*
- Established a solar energy industry: stand-alone PV, PV pumping systems, R&D and training
- Two operating wind farms

Kuwait
- *Goal of 5%* of total electricity from renewable energy by *2020*
- Call for $150 million for R&D



Yemen
- Significant *PV* applications for both urban and domestic use
- Established solar water heater industry

Qatar
- Investing $20 million for Renewable Energy Center
- Set up a *$403 million clean energy fund* with the UK
- Building solar complex of 3,500 MW by 2013

UAE
- Established carbon-neutral, zero waste city and launched $250 million company to develop new renewable energy sector (*Masdar Initiative)*
- Considerable use of solar energy: parking meters, water heating, cooling, and 500 MW plant
- Opened solar-cell production line

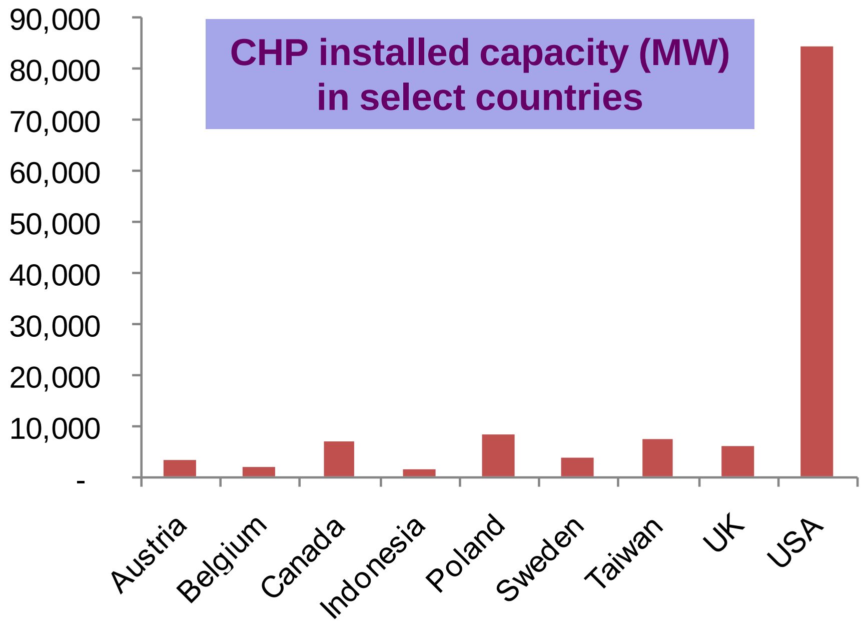
Oman
- Study proposing a National Renewable Energy Plan published in 2008; *evaluating proposed pilot schemes*
- Significant use of *solar water heating* systems
- PV used for power in remote areas
- Significant R&D

But future potential from other renewable resources should not be ignored

- ***Wind*** - best potential lies along Arabian Gulf and Red Sea coast
- ***Waste to energy*** – incineration with energy recovery most potential using urban solid waste; 0.3-1.1 GW of installed capacity estimated to be technically feasible
- ***Geothermal*** – there are 10 hot springs with varying deep temperatures of 50 to 120ºC
- ***Other innovative technologies***, such as hydrokinetic energy and waste heat recovery exist
- ***CHP*** – using the heat for cooling purposes via absorption cycles; efficiency rate as as high as 80-90% compared to 47-60% for CCGTs

Wind energy and speeds in KSA

- From available data, mean annual wind energy between 250 and 500 kWh/m^2 on Red Sea, dropping to 50 kWh/m^2 inland
- Annual average wind speeds of 3.2 to 5.3 miles per second
- Available data does not appear comprehensive



There are Saudi-specific challenges in promoting renewables

- Low cost/subsidization of primary fuels
- Uncertainty on who is lead contract authority or how to obtain contract from creditworthy counterparty may discourage investors
- Uncertainty regarding evolution of industry; developers need to know how activities fit in with structure and that entity contracted with will still exist
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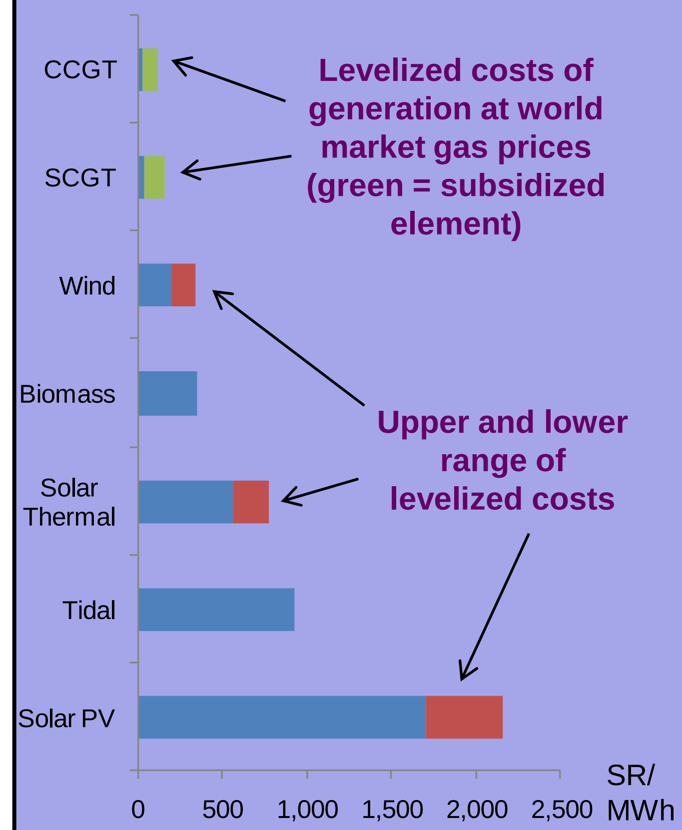
Indicative levelized cost of renewables against gas fired entrants in Saudi Arabia



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FITs, central procurement and supporting policies are most applicable to Saudi Arabia

Feed in tariffs	Clearly identify counterparty to developers, flexible, provides stable revenue flows to generators, not administratively complicated
Central procurement	If structured would identify counterparty, provides stable revenue flows to generators, may require assistance to manage procurement rounds, can incentivize low cost generation
Quota systems	Requires trading infrastructure in place and load serving entities, neither of which currently exist
Incentives and support mechanisms	As taxes are low already, tax incentives less effective mechanism; support policies (including resource mapping and agency to expedite permitting) important, but not primary instrument

Mechanisms to promote renewable energy should encourage the lowest cost resources, be transparent, and be tailored to the jurisdiction

- Instrument should attempt to incentivize the *lowest cost, most efficient resources*, rather than encourage a "gold rush" from inefficient entry
- Mechanism should be *transparent*, flexible and administratively straightforward
- Option chosen should be *tailored* to the specific institutional capacity and market structure of the *jurisdiction*
- Ideally if a price is being set for renewables, a device for "*revealing" the price* should be formulated rather than agencies having to second guess
- Instrument should consider *geographical distribution* of projects and grid impact

Procurement arrangements base eligibility on environmental attributes

- Eligibility standards based on environmental attributes rather than technologies
- Initially a size limitation would be imposed, as administering multiple small contracts administratively burdensome for REPD
- Initial procurement arrangements designed with anticipation of seeking contracts up to 2,000 to 4,000 MW by September 2011
- Also requirement projects be connected to transmission voltage level, as projects at distribution voltage may cause additional cost incurrence (except in remote areas)
- Requirements can be revised in future rounds, including possibility of energy efficiency projects

Suggested initial qualifying resources

- ***Minimum size:*** greater than 10MW
- ***Emissions:*** zero emissions, except for qualifying biomass fuels and waste to energy facilities
- ***Online date:*** project must be operating no later than three years from date of award
- ***Biomass:*** any biomass fuels must be procured within KSA and emission and effluent levels should be consistent with KSA regulations
- ***Waste to energy:*** waste should be delivered from radius no greater than 100 km from facility (if delivery is solely by road), and emissions and effluent levels should be consistent with KSA standards

Contracts would be for 20 years or more, with selection based on a scoring mechanism

- Bids would be submitted for contract terms of 20 years; could be submitted for longer terms if results in lower levelized cost
- Request for EOIs would include draft standard contract template for comment by potential developers; comments used by REPD to refine template
- On award of contract, negotiations will be related to specifics of contract addendums/exhibits and project development milestones, not contract itself
- Drafts of addendums/exhibits to contract would be part of RFP submission

Proposed selection criteria

- Levelized cost
- Technological diversity
- Geographical diversity
- Impact on grid
- Impact on reliability
- Likelihood of reaching completion (including both technical and financial considerations)

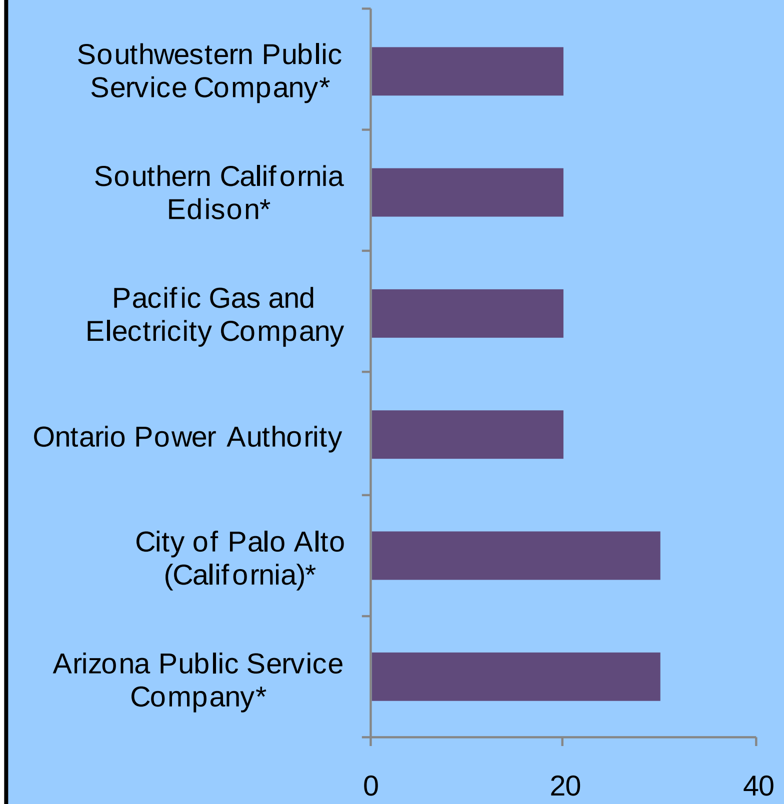
↓

Each category would be allocated certain number of points, reflecting REPD's weightings; proposal would be scored by multiple evaluators; average score would determine selection

20 year contract terms are consistent with central procurement processes in other jurisdictions and PWPA lengths

- 20 year length is consistent with recent procurements in other jurisdictions, including in Arizona, California, and Ontario, as shown in accompanying box
- Also consistent with recent length of power and water purchase agreements (PWPAs) for Independent Water and Power Producers (IWPPs), including:
  - 20 year PWPA for Shoaiba 3 project in KSA
  - 25 year PWPA for Hidd project in Bahrain

Lengths of recent central procurements (in years)



*Source: applicable entities' websites; * consistutes maximum*

A separate category could be created to promote renewables in off-grid locations

- To promote the use of renewables in remote areas, we propose that projects are evaluated in a separate procurement process, with clearly defined installed capacity targets for off-grid renewable promotion
- Such a procurement process would also have to balance factors already mentioned, including levelized cost and likelihood of reaching completion

General challenges in developing off-grid electricification projects

- Often poorer customers are based in off-grid areas; willingness to pay may be lower than the marginal cost of providing service
- Off-grid projects may use technology options that are new or unfamiliar in local communities; require access to "spare parts" for maintenance purposes, and may require training within community
- Need to ensure least cost options are pursued in these off-grid areas

Saudi Arabia's existing grid system

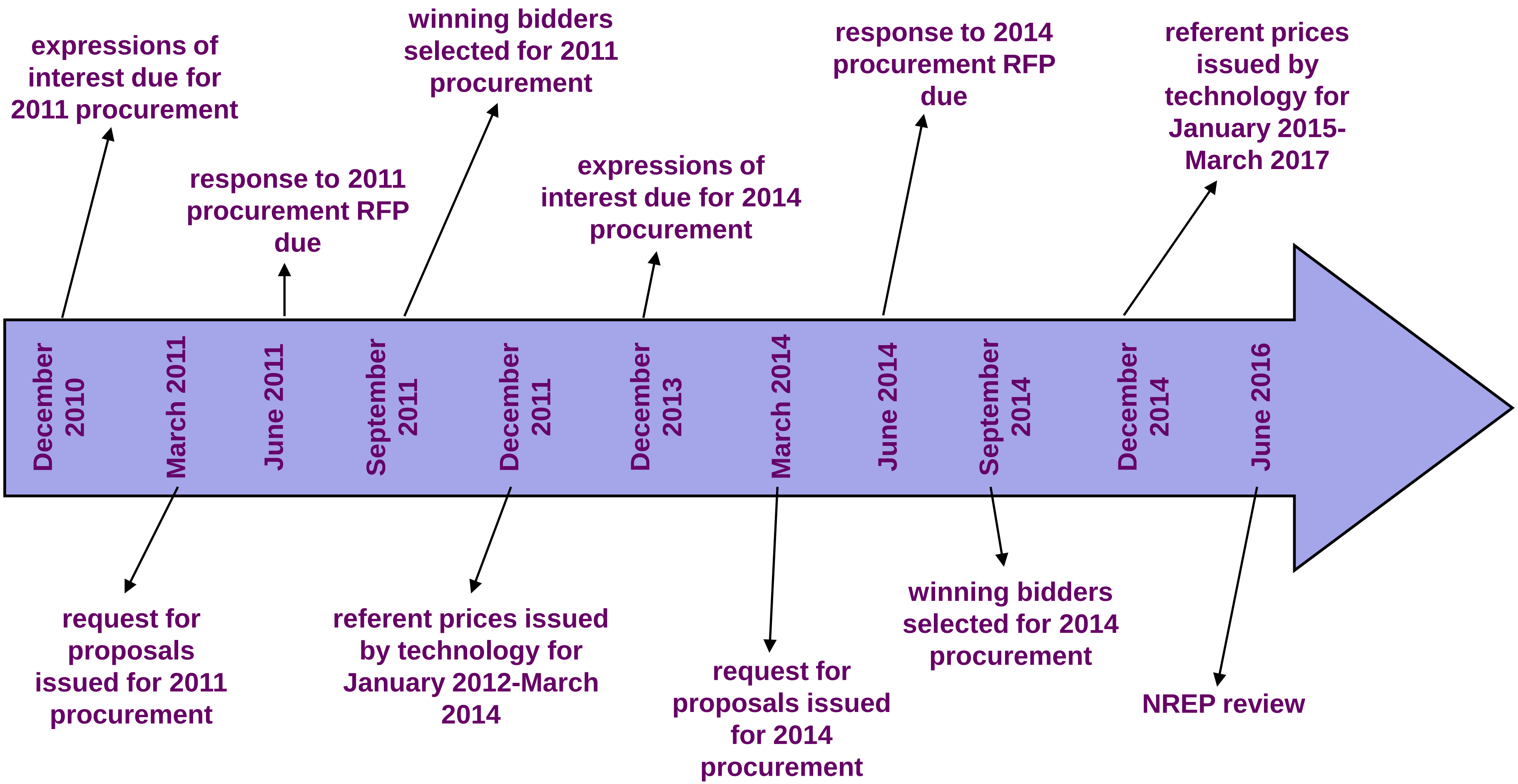
An initial Renewable Resource Inventory would occur prior to the first procurement round

- Need for Renewable Resource Inventory to assess economic and technical feasibility of renewable projects in Saudi Arabia
- Based on generic projects across multiple technologies at appropriate scale (at minimum covering solar, wind, municipal waste and geothermal)
- Would identify most promising regions and approximate technologically feasible amounts of capacity at current technology
- Also provide guidance on how land and other inputs can be obtained in most promising regions
- Should be on fast-track basis, completed by mid-2010 in conjunction with REAC

Importance of continually updating resource mapping for potential investors

- Need for Saudi Arabia to assure *up-to-date data* about renewable energy resources is publicly available and accessible
- Program would *build upon initial Renewable Resource Inventory*, including regular updates and consideration of new technologies and improvements to old ones
- Work of National Renewable Energy Laboratory (*NREL*) in the US is one example
- Maintenance of Renewable Resource Inventory would be appropriate role for SREO in conjunction with REAC and Presidency of Meteorology and the Environment (PME)

Competitive procurements would occur on a repeated cycle and have three distinct periods



In 2017 the same cycle will be repeated, dependent upon results of NREP review

Referent pricing would be used to serve as a form of FIT in between procurement rounds

- Envision procurement rounds held triennially
- Results of 2011 procurement used to inform prices for procurements in-between 2011 and 2014 rounds; new entity REPD would use results to establish referent prices for each technology (expressed in Riyals per MWh in each year)
- Qualified bidders would execute standard contract at referent price
- Prior to 2014 procurement, REPD would commission study determining whether any adjustments should be made (e.g. on size threshold, connection to distribution level voltage, inclusion of energy efficiency projects, etc.)

Indicative timeline for each procurement round

Submission of EOI
End of March

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Notification EOI accepted
End of June

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Submit project application
End of September

↓

Sign contract
End of December

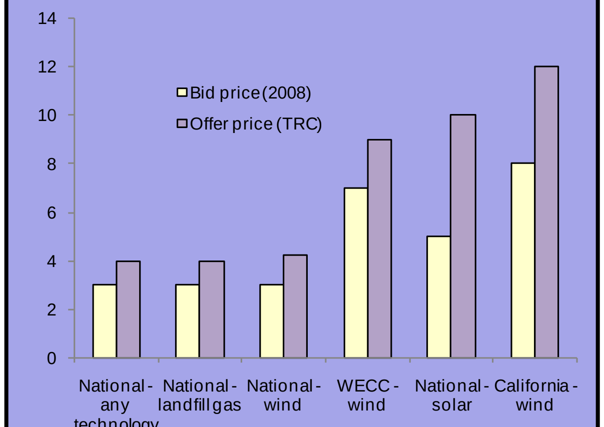
The shortfall would primarily be covered through conventional tariffs and the Balancing Fund

- The two key methods for recovering the costs of renewable energy procurement will be:
  - Selling the energy from the contracts, compensated at a rate equivalent to conventional generation under the tariff
  - Charging remaining shortfall to the government as part of the Balancing Fund (designed to stabilize rates)
- In future, green certificates could also be marketed by REPD to buyers wishing to establish environmental credentials:
  - Initially envision system as being purely voluntary through quarterly auctions; platform could be used later for transition to private procurement or trading of environmental attributes
  - Voluntary green certificates produced non-zero values in other jurisdictions; even small payment will help offset added costs of renewables procurement

Voluntary REC pricing in US

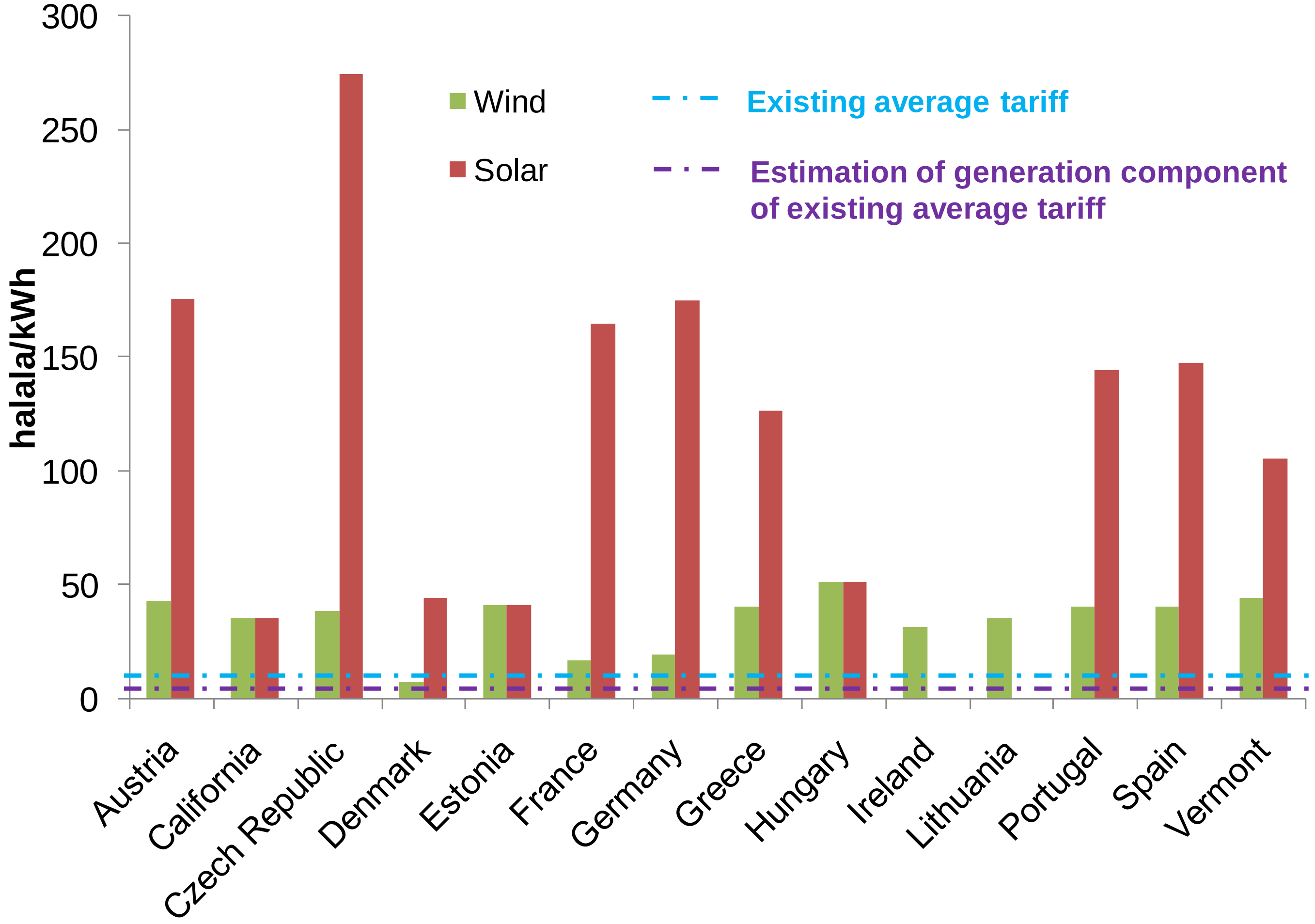
- Voluntary certificated programs in the US, otherwise known as "non-compliance" renewable energy certificates (RECs) have value

Selected "green e" tradable renewable certificate prices in the US for 2008 ($/MWh)



Source: Evolution Markets

FIT in other jurisdictions show extent of cost differential from existing Saudi tariffs



Source: OPA FIT price schedule as at September 30th, 2009; Reinhard Hass et al (2008) and EREC, "RES National Policy Reviews," European Renewable Energy Council, April 2008; exchange rate to SR uses 2008 average
Note: In disaggregating the generation component from the total tariff, the revenue requirement allocation from LEI's tariff model to ECRA over the 2007-09 period is used

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There are three key implementing bodies to be established within existing or soon to be created institutions

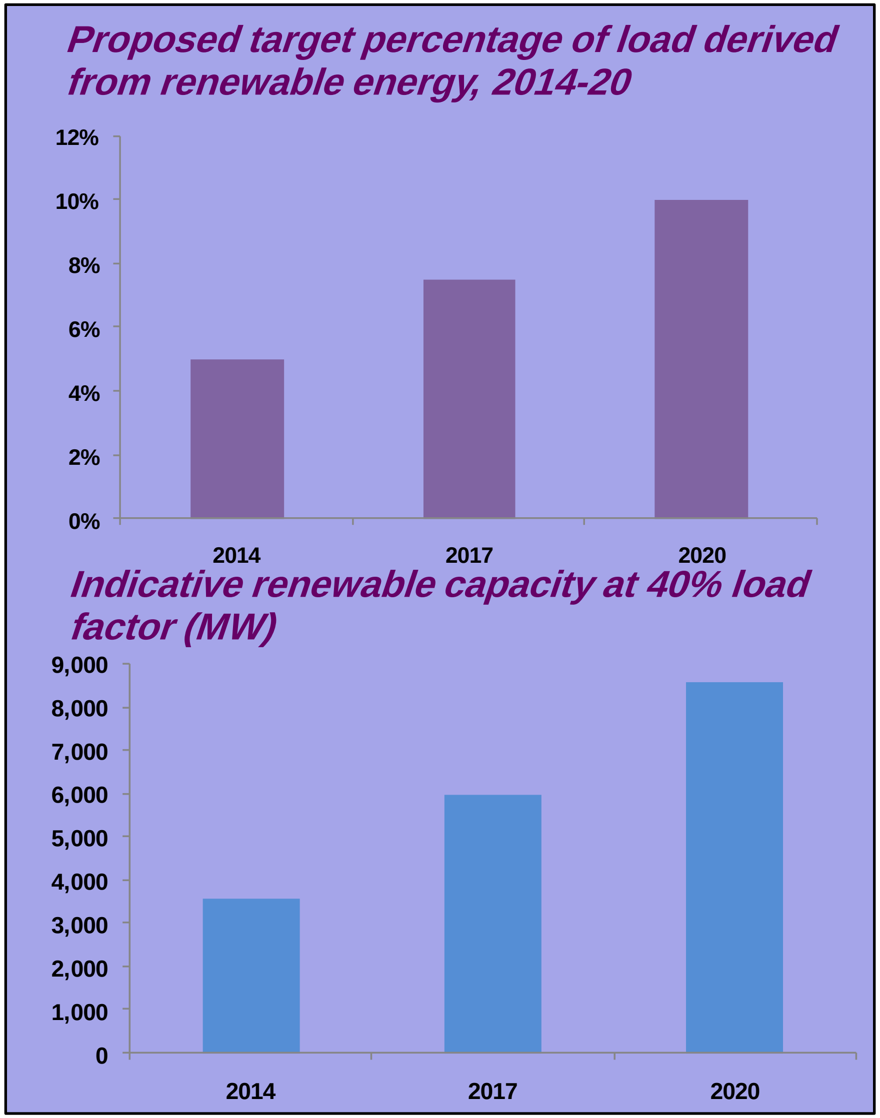
Ministry of Water and Electricity (MoWE)	Saudi Power Procurement Company (SPPC)	King Abdullah City for Science and Technology (KACST)
Saudi Renewable Energy Office (SREO)	Renewable Energy Procurement Division (REPD)	Renewable Energy Academic Council (REAC)

Implementation bodies, within existing or soon to be created institutions, need to be established

- Creating implementation bodies within existing organizations or soon to be created institutions will:
  - minimize extent new entities need to be chartered;
  - allow the use of existing oversight mechanisms; and
  - potentially keep costs lower, as less need for new boards or more expensive bureaucracy
- Propose a Saudi Renewable Energy Office (SREO) in the Ministry of Water and Electricity to play key role in defining renewable targets, and working with project developers to assist permitting and overall development process
- Renewable Energy Procurement Division (REPD) in Saudi Power Procurement Company (SPPC) to act as counterparty to renewable energy contracts, and develop and run procurement process
- Another implementation body is Renewable Energy Academic Council (REAC), which it may be beneficial for King Abdullah City of Science and Technology (KACST) to host

SREO would set a target percentage of generation from renewables, initially 10% by 2020

- Target amount of renewable energy would be set by SREO in consultation with its parent ministry and ECRA
- Proposed target level takes into account technical feasibility, project gestation periods, costs and impact on reliability
- 10% target by 2020 corresponds to around 8,500 MW level over last 10 years; has been achieved in several countries, including Spain (10,563 MW) and Germany (19,304 MW).



SREO would create an ombudsman/liaison office to provide "single window" permitting

Problems with permitting for renewable energy project developers across the world

Need to ***shepherd multiple permit applications*** through diverse agencies at different levels of government

Deadlines for consideration of permits ***may not be consistent*** with financing or construction schedules

At times, ***requirements*** from different agencies ***may be contradictory***

Challenges can be exacerbated if foreign developer ***unfamiliar*** with ***local procedures***

SREO liaison office

- As part of SREO, a liaison Office would be devoted to working with renewable energy project developers
- Would particularly assist developers through permitting process (what permits needed, how filled out, and likely timing for decisions); can provide for all permits being applied for simultaneously
- Key role to play in inter-Ministerial coordination
- As part of duties, would develop a "how to" guide for renewable project developers, which will include focus on market rules and mechanisms, permitting and environmental standards

Renewable ombudsman offices are used in other jurisdictions, including Canada and Australia

Renewable Energy Facilitation Office in Ontario, Canada

- In Ontario, the Renewable Energy Facilitation Office (REFO) was established under 2009 Green Energy Act
- REFO is located within the Ministry of Energy and Infrastructure
- Aims to provide single window access point for information on renewable energy project requirements
- Provides information on regulatory approvals and permits, incentives under the Ontario FIT program, and how to bring a renewable energy project to life
- Opportunity for renewable energy developers to set up with REFO a "coordinated orientation meeting" to discuss and clarify project requirements

The Office of Clean Energy in Queensland, Australia

- Established in October 2008, as part of the Department of Employment, Economic Development and Innovation in the Queensland government
- The Office of Clean Energy aims to be a "one stop shop" assisting potential developers by helping "to fast track eligible clean energy projects"
- Role includes removing regulatory barriers to renewable energy industry development
- Part of role is also identifying, mapping and sourcing potential renewable energy locations around the state

Developers will still require a license, and be responsible for output risk and interconnection costs

- Renewable energy providers will not be exempt from existing ECRA rules, regulations and procedures; generation license still required
- Proposed contracts assumed to be entirely output based, and not include capacity payments
- Ultimately producer is still responsible both for estimating amount technically feasible to generate, and assuring projects maintained and operated to achieve that amount
- Interconnection responsibilities consistent with existing IPP programs
- Priority dispatch to grid

Selected steps required to receive generation or cogen license from ECRA

- Need to ensure:
  - *compliance with general KSA laws*;
  - preparation of written policy on compliance with *environmental* laws;
  - promotion of health and safety measures;
  - any third parties are competent in performing duties;
  - meet *industrial security* regulations; and
  - resource generation and stored fuel are placed at disposal of Ministry in emergency conditions
- Provide *relevant information to ECRA* for monitoring purposes
- Establish *separate accounting system* for generation activities
- Guarantee *no cross subsidization*
- Ensure access to and acquisition of *land rights*
- Ensure compliance with transmission, distribution and market codes

Plan of presentation

- Introduction
- Benefits and potential of renewables
- Proposal for incentivizing renewables
- Institutional responsibilities
- Next steps

Next steps are for a COM decision, creation of implementation bodies and gearing up for initial procurement

Step 1	Step 2	Step 3	Step 4	Step 5
Council of Ministers decision on adoption of determined renewable energy plan, supported by regulations	Creation of Renewables Working Group and begin Initial Renewables Resource Inventory	Establish implementation bodies – SREO, REPD and REAC, and Renewables Interconnection Planning and Oversight Group	Focus begins on initial procurement round and requirements including: ▪ amount to be procured; ▪ determining exact weightings and scoring mechanism; and ▪ development of the standard contract template	Consider new building codes and standards, training schemes and ways to incentivize solar water heating

A Renewables Working Group and Interconnection Planning and Oversight Group would be created

- A Renewable Working Group would be responsible for coordinating the initiation phase of the NREP:
  - Would initially consist of representatives from ECRA, Ministry of Water and Electricity and Ministry of Finance
  - Would meet monthly until Implementation Bodies have been established
  - Once established, ECRA, and heads of each Implementation Body would sit on the Group
  - During meetings, each member will provide monthly report on progress in establishing the Bodies
- A Renewables Interconnection Planning and Oversight Group would also be created to plan and monitor the impact on the transmission grid:
  - Developers will need accurate estimates of transmission interconnection costs
  - Need to also identify which grid strengthening projects necessary to accommodate significant renewable energy in particular regions
  - Also need to assure interconnections and grid strengthening occurs in timely fashion once need identified
  - Will consist of members form REPD, ECRA and STC

New building codes and standards and training in renewables would complement the NREP

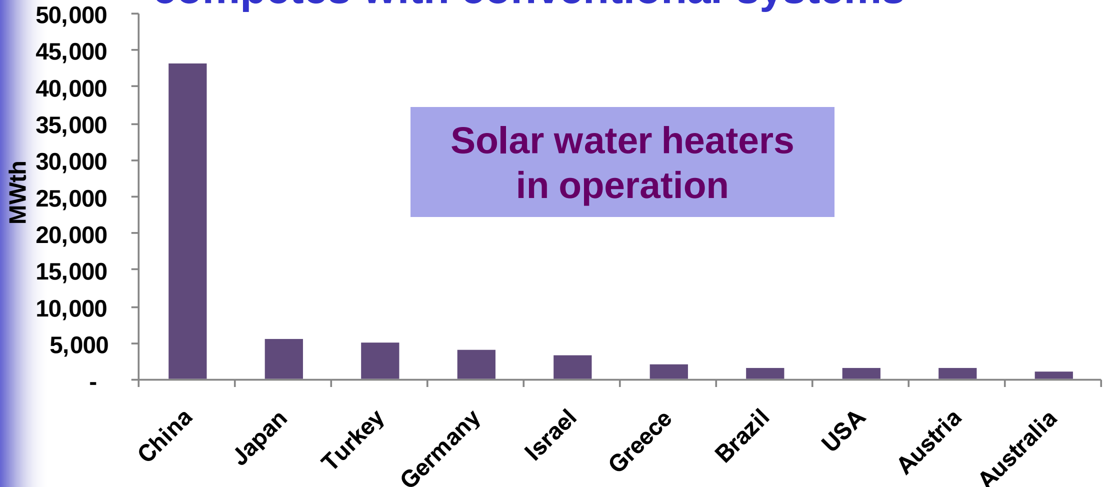
- Building codes and standards should be considered:
  - Assure existing codes do not unnecessarily prevent installation of renewable energy facilities
  - Determine extent to which codes for new buildings can encourage energy efficiency
- Players such as REAC and Ministry of Labor and Social Affairs may focus on creating training programs in renewable energy field for skilled workers:
  - New jobs unlikely to occur immediately
  - Programs should focus on technical skills; recognizing that many technologies not labor intensive once installed
  - Energy efficiency programs (particularly building retrofits) may generate more employment

Building standards

- Throughout the world, various standards are being developed *to rate buildings on their sustainability*, often including: site selection, water use, energy consumption, materials used, indoor environmental quality, and innovation and design process
- Often projects can be *rated in stages*: in design, on completion, and after the building is occupied
- Known standards include:
  - The *Green Star* system of the Australian Green Building Council;
  - The US Leadership in Environmental Design (*LEED*) ratings;
  - The British Research Establishment Environmental Assessment Method (*BREEAM*); and
  - The recently unveiled *Pearl* Design System ratings by the Abu Dhabi Urban Planning Council (Estidama initiative)

Incentivizing solar water heating may be another pillar of Saudi Arabia's renewable plan

- Solar water heaters can be used to heat water for variety of residential, commercial and industrial uses, including space heating and cooling
- In Spain, standards introduced where 60 percent of hot water demand must be met by solar water heating in all new and/or renovated buildings
- Many countries, including Greece, Japan, China and Turkey have succeeded in making solar water heaters standard technology that competes with conventional systems



Source: World Energy Council, May 2007

Solar water heating in Turkey

- Significant potential for future growth in solar generally:
  - Technically feasible solar potential in Turkey is estimated at 88 million tons of oil equivalent per year
  - 40 percent of this is considered economically usable, ¾ths of which is suitable for thermal use, and ¼th for electricity production
- The Turkish solar water heating market is the third largest in the world and has increased by 15% per annum from 2001 onwards, reaching over 5,000 MWth
- Turkish manufacturing capacity for solar water heaters was 1 million m^2 per year in 2008
- A solar water heating system costs approximately €200-300/m^2 in Turkey

Source: MDPI (Sensors) Feb 2008

Thank You