FDI ATTRACTION AND CREATING LOCAL DEMAND

Review of Economic Growth Potential
Final Report

December 29, 2009
This publication was produced for review by the United States Agency for International Development. It was prepared by Josh Timberlake and Richard Longstaff, Deloitte Consulting LLP.
FDI ATTRACTION AND CREATING LOCAL DEMAND

REVIEW OF ECONOMIC GROWTH POTENTIAL

Final Report

USAID JORDAN ECONOMIC DEVELOPMENT PROGRAM
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DELOITTE CONSULTING LLP
USAID/JORDAN
USAID/ OFFICE OF ECONOMIC GROWTH (EG)
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DELOITTE CONSULTING LLP.
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DISCLAIMER:
The author’s views expressed in this publication do not necessarily reflect the views of the United States Agency for International Development or the United States Government.
TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXECUTIVE SUMMARY</td>
<td>IV</td>
</tr>
<tr>
<td>PRESENTATION TO USAID (DECEMBER 17)</td>
<td>1</td>
</tr>
</tbody>
</table>
EXECUTIVE SUMMARY

- Jordan faces energy and water scarcity challenges which are among the most acute in the world.
- Addressing these energy and water challenges will help Jordan progress toward key strategic and economic objectives, including:
  - Decreasing dependence on foreign energy sources;
  - Generating jobs and investment.
- SABEQ has created a preliminary Year 4 work plan with a stated objective to:
  - Support creation of a Clean Tech and Water Entrepreneurship cluster in Jordan, through identification of executable opportunities, capacity building to meet local, regional, and global needs, and by inducing increased activity in these fields from local and international players.
- The first task (included herein) is to review the sector’s potential as a driver of economic growth. From this review, SABEQ will refine the preliminary work-plan activities into a focused, cohesive set of tasks to stimulate economic growth.

The principal deliverable from this preliminary two-week assessment was a PowerPoint document presented to USAID. The “USAID Presentation for December 17” document has been included in handout format as the body of this report, and attached electronically.
EWE / Clean Tech

Review of Economic Growth Potential

Contents

- Background and Approach
- Regulatory / Policy Considerations
- Foreign Direct Investment Attraction
- Recommendations and work plan Activities
Background / Scope of Work

- Jordan faces energy and water scarcity challenges which are among the most acute in the world.
- Addressing these energy and water challenges will help Jordan progress toward key strategic and economic objectives, including:
  - Decreasing dependence on foreign energy sources
  - Generating jobs and investment
- SABEQ has created a preliminary Year 4 work plan with a stated objective to:
  - Support creation of a Clean Tech and Water Entrepreneurship cluster in Jordan, through identification of executable opportunities, capacity building to meet local, regional, and global needs, and by inducing increased activity in these fields from local and international players.
- The first task (included herein) is to review the sector’s potential as a driver of economic growth.
  - From this review, SABEQ will refine the preliminary work-plan activities into a focused, cohesive set of tasks to stimulate economic growth.

Overview of current work-plan

- The current work plan consists of four primary categories.
- Based on our review, we suggest a “Regulatory / Policy” category be added as a high priority to address during Year 4.

<table>
<thead>
<tr>
<th>Work plan Category</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. FDI Attraction</td>
<td>• Existing work plan does not include specific initiatives</td>
</tr>
<tr>
<td></td>
<td>• This analysis suggests prioritized focal areas (within clean-tech sector) and activities to promote new jobs and investment</td>
</tr>
<tr>
<td>2. Capacity Building toward Green Collar Jobs</td>
<td>• Considered enabling activities to support FDI attraction</td>
</tr>
<tr>
<td></td>
<td>• Several specific work plan tasks have already been developed and appear to be progressing</td>
</tr>
<tr>
<td>3. Create Local Demand for Clean Tech Implementation</td>
<td>• Additional suggestions to support these activities are included in the recommendations section</td>
</tr>
<tr>
<td>4. Create Awareness about Clean Tech / EWE</td>
<td>• Not included in original work plan</td>
</tr>
<tr>
<td>5. Regulatory / Policy</td>
<td>• Essential to supporting renewable energy generation, and important to aiding FDI Attraction and other work plan initiatives</td>
</tr>
</tbody>
</table>
Approach

- This initial assessment included reviewing several background reports, and conducting interviews with stakeholders from a wide range of public and private sector entities.

<table>
<thead>
<tr>
<th>Name</th>
<th>Entity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ross Hagen</td>
<td>USAID</td>
</tr>
<tr>
<td>Rami Al Qusus</td>
<td>King Hussein Bin Talaat Development Area</td>
</tr>
<tr>
<td>Muawiyah Fayyit</td>
<td>Ministry of Energy (Alternative Energy, Energy Efficiency Dept.)</td>
</tr>
<tr>
<td>Dr. Naseer</td>
<td>Jordan Investment Board</td>
</tr>
<tr>
<td>Karim Knaar</td>
<td>EDAMA, Knaar Group</td>
</tr>
<tr>
<td>Hisham Al-Rawashdeh</td>
<td>National Training &amp; Employment Project</td>
</tr>
<tr>
<td>Dr. Maen Nsour</td>
<td>Jordan Investment Board</td>
</tr>
<tr>
<td>Karim Kawar</td>
<td>Jordan Investment Board</td>
</tr>
<tr>
<td>Eng. Amer Al-Majali</td>
<td>Jordan Industrial Estates Corporation</td>
</tr>
<tr>
<td>Jose Ceron</td>
<td>Economic Development Zones Commission (advisor)</td>
</tr>
<tr>
<td>Dr. Ahmed Al-Ghandoor</td>
<td>Philadelphia Solar, Nu Energo, Hashemite University</td>
</tr>
<tr>
<td>Dr. Khalid Al-Hashash</td>
<td>Royal Scientific Society</td>
</tr>
<tr>
<td>Mr. Ennis Rimawi</td>
<td>Millennium Energy (investor), Catalyst Private Equity</td>
</tr>
<tr>
<td>Mr. Anupam Govil</td>
<td>Global Equations</td>
</tr>
<tr>
<td>Mr. Hisham Al-Rawashdeh</td>
<td>National Training &amp; Employment Project</td>
</tr>
<tr>
<td>Mr. Naseer Oweis</td>
<td>Global Equations</td>
</tr>
<tr>
<td>Various (initiative leads and other stakeholders)</td>
<td>SABEQ</td>
</tr>
</tbody>
</table>

1 Principal contact – most meetings included additional attendees.

Spectrum of Activities (large-scale generation project)

- Jordan stands to capture much of the economic benefit related to Planning, Implementation, and Operations of large-scale solar or wind generation projects occurring in the country.
- However, until Jordan can develop a renewables manufacturing base, technology-specific capital equipment will be sourced from abroad.

Planning
- Technical/feasibility studies
- Development Support
- Engineering Design
- Interconnection Studies
- Environmental review
- Site Identification & permitting
- Legal advisory
- Financial advisory

Manufacturing
- Includes all dedicated renewables equipment (of foreign or domestic origin) e.g.
  - Wind: turbines, towers, generators, gearboxes, etc.
  - Solar PV: cells, modules, panels, mounting systems, inverters, etc.
  - Solar CSP: mirrors, receivers, pumps, etc.

Construction / Installation
- Includes on-site project costs e.g.
  - Line extension (to grid)
  - Site preparation
  - Foundation labor / materials
  - Installation
  - Grid connectivity
  - Testing

Operations
- Ongoing maintenance and operating costs e.g.
  - Repair
  - Maintenance
  - Testing and monitoring
  - Operations
Value share across the Activity Spectrum depends on technology used and scale. For utility-scale wind installations typical lifetime project spend is:

Over next 5 years:
- Capturing some of Planning segment value: **Probable**
- Capturing some of Manufacturing segment value: **Possible**
- Capturing most of Construction & Operations segments’ value: **Probable**.
- Capturing any significant value requires supportive regulation and policy.
Regulatory / Policy Considerations

Jordan’s Energy Challenge

Energy Sector

Jordan’s currently has no indigenous sources of energy. In order to achieve security of supply the government developed the Energy Master Plan 2007-2020.

- Enhancing renewable energy projects.
- Implementing intensive energy efficiency programs.
- Utilizing oil shale to generate electricity and produce oil.
- Generating electricity from nuclear energy.
- Developing local sources of Natural Gas.

The dependency on imported oil will be reduced by:
**Policy stimulates demand**

- 2007 Energy Strategy predicted doubling of energy demand by 2020
- 60% of new energy from domestic sources (Shale, Nuclear, Renewables)
- 20% of new energy from renewables

To date:
- Energy Law remains a work in progress
- Draft provisions for renewable energy are vague; fail to provide clear, long-term incentives for development
- Tender process adopted for large renewable sites; nothing has yet closed

**Common Renewables Policy Options**

- **Tendering**
  - Large scale renewable sites packaged and offered to bidders
  - Bidder accepting lowest sales price /kWh wins development mandate
  - Advantages: Market based, simple
  - Disadvantages: Episodic, higher risk

- **Feed in Tariff (FIT)**
  - Guaranteed offtake agreement, providing some form of price premium
  - Advantages: Simple, transparent, effective
  - Disadvantages: Direct cost

- **Green Credits**
  - Domestic thermal operators buy “Green Certificates” from renewables operators
  - Certificate requirements and quotas set by government
  - Advantages: Provides second funding stream
  - Disadvantages: Complex, higher risk

- **Tax Incentives**
  - Reduced taxes on equipment, construction and operations
  - Generally used as an additional, rather than an enabling, incentive
Feed-in Tariffs

- Feed-in tariffs are generally considered the most effective means to stimulate renewable energy generation.
- A recent study by SEMI\(^1\) cited several best practices in global feed-in tariffs:
  - Purchase and interconnection requirements – guaranteed offtake agreements to increase investor security
  - Fixed price payments – provide greater certainty than “premium payments” which fluctuate with market prices. Separate prices should be set for wholesale and retail production
  - Long-term payments – 10-20 year agreements are common
  - Predictable declines – time-based declines are more transparent/predictable than those based on capacity or sporadic regulatory reviews
- Currently no FIT policy in Jordan
  - Lack of FIT policy is significant impediment to GoJ’s ability to meet its own renewables goals
  - Al-Qamsha wind farm negotiations have stalled over supply tariff issues
  - Makeup of incoming government may be unique opportunity to promote FIT-related issues

\(^{1}\) Semiconductor Equipment and Materials International (SEMI)

Fit not addressed in Energy Strategy or pending Energy Law

- Limited understanding of how FITs work or how they can help policy goals
  - Risk adjusted tariffs
  - Balance of payments
- However, GoJ continues to invest directly in conventional energy and does not seem to view this as a market distortion:
  - Phase III Samra Station gas-fired expansion: 200MW (effective 170MW), cost appx $200m.
  - Ten year cost/MW produced = $0.013,
  - Ongoing imported fossil fuel costs
- Providing similar levels of support to Renewables could have dramatic results:
  - Current pricing ‘gap’ at Al-Qamsha is $0.04/kWh.
  - Use this as base for 10 year declining FIT model. Apply against 5 MoE wind portfolio sites
  - Ten year cost/MW produced = $ 0.019
  - No import or fossil fuel costs
Recent Feed-in Tariff Case Study – Ontario, Canada

- Ontario, Canada passed a new FIT in May, 2009
- Pays up to 10x the retail electric rate for certain installations
- In addition to substantial increases in planned small and large-scale generation, the FIT has attracted considerable manufacturing investment
  - Canadian Solar announced plans to establish a 200MW module manufacturing facility in Ontario, investing a planned C$24M and creating an estimated ~500 jobs
  - Opsun Panels announced construction of a 50MW Solar Panel production line in Ontario
  - Sustainable Energy Technologies Ltd. announced that it will base the North American manufacturing of its “SUNERGY” line of inverters in Ontario
  - SMA Solar Technology AG announced a contract assembly / distribution agreement with Pure energies for its Sunny Boy line of inverters

1 Ontario’s FIT contains “domestic content” requirements which encourage local production
FDI Attraction

Clean Tech Overview?

- Definitions of “Clean Tech” vary, but the term is generally considered to encompass technologies which:
  - Harness renewable materials and energy
  - Reduce use of natural resources through enhanced efficiency
  - Reduce or eliminate pollution and waste

- Among these technologies wind and solar have been primary drivers of FDI and job creation -- with globally distributed value chains -- and are examined further herein as potential drivers for Jordan’s economic growth
- Other clean technologies which may offer potential for Jordan to attract FDI (energy efficiency, water conservation) are addressed in the recommendations section
Wind Value Chain Overview

- Raw Material Suppliers
  - Vale
  - Rio Tinto
  - BHP Billiton
  - JSP Industries

- Raw Material Manufacturers
  - Suez
  - ArcelorMittal
  - Holcim (concrete)

- Component Manufacturers
  - Wind Turbine Manufacturers
    - Gamesa
    - Siemens
    - Vestas
  - Rotor Blades
    - Gamesa
    - Mitsubishi
    - ABB
    - LM
    - Nacelles
    - Echetsa
  - Gearboxes
    - Gamesa
    - GE
    - Gamesa
    - Siemens
  - Generators
    - ABB
    - Siemens
    - Gamesa
    - Gamesa
  - Towers
    - Gamesa
    - GE
    - Siemens
    - Gamesa
  - Controllers
    - Gamesa
    - Gamesa
    - Siemens
    - Siemens

- Wind Turbine Manufacturers
  - Gamesa
  - Siemens
  - Vestas

- Installation and Integration
  - Gamesa
  - Siemens
  - Vestas
  - Offshore wind installation

- Transmission & Distribution
  - Gamesa
  - Siemens
  - Vestas

- Local transmission and distribution companies

Wind Capacity Installations

- The vast majority of global installed wind capacity continues to occur in Europe, N. America, and Asia

ANNUAL INSTALLED CAPACITY BY REGION 2005-2008

- USAID Jordan Economic Development Program (SABEQ)
Wind – Implications for Jordan

- Vertical integration is common among wind energy manufacturers; 5-6 companies dominate the value chain.
- Manufacturers of wind turbines and other large components increasingly produce as close to installation sites as possible to minimize logistics costs/challenges of shipping oversized, overweight components.
  - Majority of recent global investment in wind energy (manufacturing and installed capacity) has occurred in the “wind corridors” of the U.S. and China.
- The Middle East in general, and Jordan in particular, has comparatively low wind resource potential relative to other global regions.
- As a result, Jordan is unlikely to attract significant foreign direct investment among wind component manufacturers.
  - Jordan should not neglect the wind industry as a possible source of foreign direct investment in manufacturing, but prioritizing investment attraction efforts toward select components of the solar value chain is a more viable strategy.
  - Depending on regional/domestic success in attracting wind generation projects, Jordan may have a niche opportunity as regional service center for the wind industry.

Solar Overview

<table>
<thead>
<tr>
<th>Description</th>
<th>Energy Conversion</th>
<th>Conversion Type</th>
<th>Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Photovoltaic</td>
<td>Electricity</td>
<td>Direct</td>
<td>6 – 21%</td>
</tr>
<tr>
<td>Concentrated Solar Power</td>
<td>Electricity</td>
<td>Indirect (through heat)</td>
<td>20 – 40%</td>
</tr>
<tr>
<td>Solar Heating</td>
<td>Heat</td>
<td>Direct</td>
<td>70 – 90%</td>
</tr>
<tr>
<td>Solar Lighting</td>
<td>No conversion</td>
<td>None</td>
<td>Maximum efficiency</td>
</tr>
</tbody>
</table>

While other technologies are emerging, PV accounts for the vast majority of jobs and investment in solar, and is the focus of the following value chain assessment.
Solar (PV) Value Chain Overview

**The PV Value Chain**

- **Silicon/Raw Materials**
  - Wacker
  - REC Silicon
  - Elkem Solar
  - DOW Hemlock
  - SiSilicon Technologies
  - Taiyang

- **Ingots/Wafers**
  - REC
  - Solarworld
  - LG Solar
  - Suntech
  - Kyocera
  - Sharp
  - JM Solar

- **Cells or Thin Film**
  - QCells
  - Sharp
  - Suntech
  - Solarworld
  - SunPower
  - Kyocera
  - Evergreen
  - Akeena Solar

- **Modules**
  - REC Solar inverters
  - SMA Solar
  - DUPLU
  - Dupont
  - Sharp
  - SunPower
  - Ovonic

- **Support Product Manufacturers**
  - REC Solar
  - SolarWorld
  - LDK Solar
  - Glory Silicon
  - ReneSola
  - TKX Corp.
  - Kyocera
  - M. Setek
  - Tianwei Yingli
  - Jinglong

- **Wholesalers/Distributors**
  - REFU
  - Schott Solar
  - Dupont
  - Smid
  - Futura Industries
  - Torpedo Specialty Wire, Inc

- **Installers/Integrators**
  - Numerous

- **End Users**
  - Residential
  - Commercial users (e.g., Walmart, Prologis)
  - Utility (e.g., Duke, AEP, ComEd)
  - Industrial users
  - Retail (e.g., JCPenney

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Solar Manufacturing Case Study #1

- Leading German based producer of crystalline silicon solar cells
- Conducted global search for new production facility (wafers, cells)
- Middle East was key part of search area
  - Field investigations conducted in Dubai, Abu Dhabi, Oman
- Other finalists in N. America and Southeast Asia
- Project deployed in Southeast Asia
Case Study #1 – Project Specifications

**Site Requirements/Building Construction**
- 18 ha site (minimum) based on German site planning standards (0.8 ratio bldg to land), which allows for wafer expansion
- Plug and play site with all utilities keyed to construction timeline commencing January 2008
- 18 ha site, design to accommodate 1,000 m² of hazardous chemical storage
- Total footprint per module of 21,000 m²
  - Production area: 15,000 m²
  - Hazardous chemical storage: 1,000 m²
  - Warehouse/storage: 5,000 m²
  - Separate building for each component above
- Approx. 25 m³ building height (permitting must allow for 25m height)
- Parking, test fabs, office and other structures

**Utilities**
- Electric: Demand (year): 86,560 MWh
  - Power Factor: #
  - Connection: 110/220v
  - Other: Dedicated substation; middle to high voltage circular supply; redundant feeding
- Natural Gas: Not currently required
- Water: 150 m³ p.h.
- Wastewater: 100% of water usage

**Technical gases and chemicals:** several

**Other: **
- 18 ha site (minimum) based on German site planning standards (0.8 ratio bldg to land), which allows for wafer expansion
- Plug and play site with all utilities keyed to construction timeline commencing January 2008
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- Approx. 25 m³ building height (permitting must allow for 25m height)
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**Transportation – Accessibility**
- Good express highway access (maximum 10-20 minutes from a 4-lane expressway)
- Prefer within 2 hours driving of an international commercial airport with direct service to main international destinations such as New York, Singapore, Frankfurt and Paris
- Very good air cargo shipments from local airport (prefer within 2 hours of international air cargo hub)

**Work Force and Talent Characteristics**

<table>
<thead>
<tr>
<th>Work Force</th>
<th>Talent</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Operators</strong></td>
<td><strong>Workers</strong></td>
</tr>
<tr>
<td>Cell</td>
<td>Wafers*</td>
</tr>
<tr>
<td>Shift dependent*</td>
<td>364</td>
</tr>
<tr>
<td>Shift independent</td>
<td>57</td>
</tr>
<tr>
<td>Shift leader</td>
<td>5</td>
</tr>
<tr>
<td>Team leader</td>
<td>5</td>
</tr>
<tr>
<td>Engineer</td>
<td>30</td>
</tr>
<tr>
<td>Executive Engineer</td>
<td>3</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>463</strong></td>
</tr>
</tbody>
</table>

- Operators: Mix of experienced, technically-trained and entry level: Electrical, chemical and mechanical
- Engineers: electrical, process, chemical and mechanical
- Good computer, math, and communication skills required
- * currently not included in technical specifications below
- ** for cell fab, with Wafertrimming. Full automation requires 24 people less.

**Project Timing**
- Initial Negotiation: November-December 2007
- Option on real estate, complete negotiations: January 2008
- Design, contracting: Vendor Selection, bid
- Commercial Construction: January 2009
- Commercial Operations: Cell Module 1: January 2009

**Case Study #1 – Implications for Jordan**

- Jordan barely missed the initial screening cutoff based on Economist Intelligence Unit political stability risk rating
- However, had Jordan passed the initial screen, it would have had difficulty competing based on:
  - Availability of a ready-to-go site meeting extensive infrastructure requirements
  - Availability of technically-trained operators
  - Globally-competitive incentives targeted for solar companies
  - Comparatively high electric costs
- Jordan is generally not on the radar for this type of globally-competitive, infrastructure-intensive project
- Further upstream projects (e.g. polysilicon processing plants) consume even more utilities, and usually focus on locations with hydroelectric, geothermal, or heavily subsidized power
  - Within the Middle East, activity has been limited primarily to Saudi, Qatar
Solar Manufacturing Case Study #2

- Leading global producer of solar inverters
- Conducted search for first production facility in North America
- Search focused on United States due to strong current (and projected future) market demand
- However, Ontario Canada’s new Feed-in tariff was also a key consideration
  - Company deployed in Denver, CO, but determining how to best serve Canada (due to FIT) has become a high priority
- Company is already considering expansion into other global regions

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### Case Study #2 – Project Specifications

<table>
<thead>
<tr>
<th>Project Timing</th>
<th>HR Requirements*</th>
<th>Facility Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>- June 2009 – identify candidate locations (including brief field investigations)</td>
<td>- ~150 full-time employees at full operations in Year 1 (2011)</td>
<td>- 220,000 – 250,000 sf manufacturing and warehouse space</td>
</tr>
<tr>
<td>- July 2009 – detailed field-validation of short-list locations</td>
<td>- 70% Operators (primarily temps)</td>
<td>- 20,000 – 30,000 sf office space</td>
</tr>
<tr>
<td>- July 2009 – preferred location finalists known</td>
<td>- ~10% Technicians / Team Leads</td>
<td>- Existing building strongly preferred due to aggressive project timeframe</td>
</tr>
<tr>
<td>- August/September 2009 – finalize negotiations (depending on # of finalists)</td>
<td>- ~10% Management / Admin</td>
<td>- Shovel-ready sites will be considered in areas meeting all other requirements</td>
</tr>
<tr>
<td>- January 2010 – commence operations</td>
<td>- Up to 700 employees may be required during peak production periods by Year 4-5</td>
<td>- Expansion potential for additional 80,000 – 200,000 sf (on-site, or preferably within ~5 miles)</td>
</tr>
<tr>
<td>- May / June 2010 – reach full operations</td>
<td>- Location should have the ability to support long-term headcount comparable to current Niestetal operations (~1,200+ employees)</td>
<td>- Standard floor-loading capacity; e.g. 6” (15 cm) reinforced concrete, or greater</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Access / Logistics Requirements</th>
<th>Utility Requirements</th>
<th>Capital Investment*</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Within maximum 4-5 days of primary customer base (closer proximity preferred)</td>
<td>- 4,000,000 kW/year average usage</td>
<td>- ~$US 14M (~10M EUR) investment over initial 5 years, excluding real estate costs</td>
</tr>
<tr>
<td>- Within maximum 3-4 days of primary suppliers (closer proximity preferred)</td>
<td>- ~13.5 kV is sufficient</td>
<td>- ~$US 12.5M (~9M EUR) machinery &amp; equipment</td>
</tr>
<tr>
<td>- Within maximum 40 minutes (20 minutes preferred) a logistics hub and established 3rd party logistics providers</td>
<td>- Dual-feed electric service preferred, but not required</td>
<td>- ~$US 1.5M (~1.2M EUR) software, telecom, and other infrastructure</td>
</tr>
<tr>
<td>- Reasonable proximity to an airport with commercial and cargo service</td>
<td>- Robust telecommunications infrastructure/lit services from 2 providers</td>
<td>- SMA intends to lease the facility unless particularly favorable purchase conditions</td>
</tr>
<tr>
<td>- Highway access near the facility, with strong inter-state connectivity for shipping product nationally</td>
<td>- Basic service requirements for water, wastewater, and gas (only required for heating/cooling purposes)</td>
<td></td>
</tr>
</tbody>
</table>
Case Study #2 – Implications for Jordan

- Many of Jordan’s industrial parks can meet the basic infrastructure needs of this project
- Had the project been Middle-East focused, Jordan would have been challenged to meet key client preferences including:
  - Providing an existing manufacturing building
  - Demonstrating significant solar industry presence
  - Demonstrating customized government support for solar companies
  - Providing a favorable real estate opportunity in Amman
- Despite the above challenges, Jordan is more likely to be targeted for – and competitive in – this type of project for downstream components of the solar value chain…. but must develop a focused investment promotion effort to be successful

Jordan’s likely entry point into PV value chain

- Jordan is unlikely to attract much interest from the upstream, utility-intensive components of the solar value chain
- Greater potential to attract solar-related foreign direct investment in the PV sector lies primarily in downstream activities, including:
  - Production of modules, inverters, mounting systems, etc.
  - Engineering, testing, installation, maintenance, and other support services
- Additional applications of solar power (e.g. water heating) also offer economic growth / energy conservation opportunities, and are addressed in the recommendations section
Recommendations

Regulatory Actions

- Provide Energy Policy advisory services to MoE, in particular developing tariff, risk-based planning and energy market analysis assistance
- Assist MoE to finalize Al-Qamsha wind farm tender
- Advise on redrafting of Energy LAw
- Use Al-Qamsha tariff agreement as basis to develop comprehensive FIT policy for Jordan
- Implement FIT policy through revised Energy Law
- Assist MoE to finalize remaining wind farm tender commitments
- Use FIT policy to promote open, non-tender process for additional wind and solar sites
FDI Attraction Actions

- Identify / confirm focal areas within broader clean-tech sector, recommended to include:
  - Downstream elements of the solar PV value chain (modules, inverters, mounting systems, etc.)
  - Solar water heating systems (build on existing success / momentum in manufacturing and system integration)
  - Regional service / support centers for solar, wind or other clean technologies
  - Energy efficiency / water conservation technologies (specific technologies and value-chain components to be determined based on the incentives scheme adopted for green building codes)
- Develop and articulate Jordan’s value proposition for clean-tech investment.
- Identify Jordan’s competitive challenges (segment by controllable vs. non-controllable)
- Benchmark industry-specific incentives for clean-tech manufacturers or service providers in competing countries (regional, global)
- Establish external messaging (brochures, website, etc.) targeted to clean-tech companies
- Generate a Jordan presence at industry conferences and events (regional and global)
- Identify targets for outreach programs (by sector, technology, company)
- Investigate opportunities to develop a showcase manufacturing park in greater Amman which caters to clean-tech companies
- Nurture clean tech education, training, incubation, and collaborative research programs (many of which are planned or in progress already)
- Leverage learnings from ongoing outreach campaign developed by SABEQ BPO thread

Sequencing of Actions (Illustrative)

<table>
<thead>
<tr>
<th>Category</th>
<th>Short-Term (0-6 months)</th>
<th>Long-Term (6-24 months)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Policy</td>
<td>• Offer Tariff Advisory, MoE</td>
<td>• Use Al-Qamsha tariff agreement as basis to develop comprehensive FIT policy for Jordan</td>
</tr>
<tr>
<td></td>
<td>• Assist MoE to finalize Al-Qamsha wind farm tender</td>
<td>• Implement FIT policy through revised Energy Law</td>
</tr>
<tr>
<td></td>
<td>• Advise on redrafting of Energy Law</td>
<td>• Use Al-Qamsha tariff agreement as basis to develop comprehensive FIT policy for Jordan</td>
</tr>
<tr>
<td>FDI Attraction</td>
<td>• Identify / confirm focal areas within broad clean-tech sector</td>
<td>• Develop external messaging materials to promote clean tech investment</td>
</tr>
<tr>
<td></td>
<td>• Develop / articulate Jordan’s value proposition for targeted investments</td>
<td>• Establish presence at industry conferences, trade shows, etc.</td>
</tr>
<tr>
<td></td>
<td>• Highlight competitive strengths</td>
<td>• Identify targets for outreach (sector, origin country, specific company, etc.)</td>
</tr>
<tr>
<td></td>
<td>• Understand challenges, and develop mitigation strategies for “controllable” factors</td>
<td>• Initiate targeted outreach program</td>
</tr>
<tr>
<td></td>
<td>• Benchmark leading regional / global clean-tech investment policies</td>
<td>• E-mail communications</td>
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<tr>
<td></td>
<td>• Propose a suite of targeted incentives for clean-tech investment</td>
<td>• Visit prospective regional / global investors</td>
</tr>
<tr>
<td></td>
<td>• Explore opportunities for a “showcase” clean-tech park within Amman</td>
<td>• Hosting of prospective investors within Jordan</td>
</tr>
<tr>
<td>Energy Efficiency*</td>
<td>• Develop standardized building codes</td>
<td>• Influence passage of recommended scale of clean-tech incentives</td>
</tr>
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<td></td>
<td>• Develop guidelines and incentive scheme for energy conservation</td>
<td>• Leverage program initiatives to require adoption of green building codes in public sector</td>
</tr>
<tr>
<td></td>
<td>• Develop online tools to educate private sector developers on economics of solar water heating and other conservation measures</td>
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</tr>
</tbody>
</table>

1 Specific initiatives detailed in Green Building Code report submitted to USAID in September, 2009
## Targeted Results

<table>
<thead>
<tr>
<th>Measure</th>
<th>Current Goal (by 2010)</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jobs Created</td>
<td>2,750</td>
<td>• Attracting large-scale generation projects (wind, CSP, PV) offer the best possibility to approach the job creation target – rule of thumb is 250 constr. / 20 opx, jobs per 100 MW installed.</td>
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<td></td>
<td></td>
<td>• Other job creation mechanisms will supplement those produced from generation program.</td>
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<tr>
<td>New FDI Generated</td>
<td>$US 100M</td>
<td>• Can be achieved through closing any of the proposed large-scale wind or solar (CSP or PV) generation projects – but will require government support.</td>
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<td>• Highly unlikely to meet this threshold through FDI attraction in the clean-tech manufacturing or service sector (proposed action items will take time to implement).</td>
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<tr>
<td>New clean tech firms established</td>
<td>6</td>
<td>• Realistic objective through combination of FDI, local business incubation programs, and entrepreneurship, and policy initiatives (adoption of green building codes, etc.).</td>
</tr>
<tr>
<td>Increase in Jordan’s EWE productivity</td>
<td>5%</td>
<td>• Will likely require adoption / implementation of several conservation measures, including:</td>
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<tr>
<td></td>
<td></td>
<td>▪ New water tariff structure to encourage conservation (proposed to take effect starting late 2009 or early 2010)</td>
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<td></td>
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<td>▪ Green building codes.</td>
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</table>