DOE OFFICE OF INDIAN ENERGY

The Five-Step Development Process

Step 4: Project Implementation
Presentation Agenda

• Step 4: Project Implementation
  – Pre-construction
  – Contract execution
  – Interconnection
  – Project construction
  – Commissioning

• Project Example
4 Implementation

1 Potential
2 Options
3 Refinement
4 Implementation: Financing and Construction
5 Operations & Maintenance
Step 4: Implementation

**Purpose:** Contract and begin physical construction of project

**Tasks:**
- Finalize pre-construction activities including project agreements—financial, contractual, and interconnection
- Realize construction and equipment installation
- Realize interconnection
- Realize project commissioning leading to facility/community project operation

**Output:** Completed project (operation)
Implementation Activities

• Pre-construction
  — Financial closing (if applicable)
  — Project kickoff
  — Design and construction documents, plans/schedules, submittals

• Contract execution
  — Contract oversight/quality control
  — Change control

• Interconnection
  — Application review and approval process
  — Final building inspection
  — Paperwork submittal to utility

• Project Construction
  — Contract oversight/quality control
  — Change control

• Commissioning
  — Testing and verification
  — Interconnection verification (utility)
  — Utility permission to operate
Pre-construction: Financial Closing

The process of completing all project-related financial transactions, finalizing and closing the project financial accounts, disposing of project assets, and releasing the work site.

A few key steps:

• Establish and communicate final date for all financial transactions and account closings well before closing
• Verify all items from the statement of work have been completed before disbursing final payments
• Collect all financial records and verify that all financial obligations have been satisfied
• Close all financial accounts
• Transfer or dispose of assets according to the acquisition plan.
Pre-construction: Project Kickoff and Design and Construction Documents

• Kickoff meeting
• Checklists for schedules and each activity based on contract and project documents
• Utility interconnection process and agreement
• Design (often in stages) and design approvals
• Other possible plans:
  – Utility
  – Construction
  – Management
  – Quality control
  – Commissioning
  – Environmental protection
  – Security
Contract Execution

• Verify contract documentation
• Obtain contract approvals
• Book the contract
• Transfer project responsibility to project manager
Interconnection

- Installing a renewable energy project requires multiple approval and process steps, including local permitting jurisdiction, installer, and utility.

- Four distinct steps:
  1. Utility interconnection application review and approval process
  2. Construction
  3. Final building inspection and paperwork submittal to utility
  4. Utility permission to operate

- Usually takes approximately 15–20 days for residential and/or small commercial projects.

- Typically, one must obtain a building permit from the local jurisdiction and sign an interconnection agreement with the local utility.

Process for PV Building Permitting and Interconnection Example

Interconnection cont.

• Utilities prefer installers to submit an application for interconnection early on in project development before construction.

• Some utilities are allowing systems that are 30 kW or less to be fast-tracked without any pre-construction utility application reviews or approvals.

• Smaller systems pose fewer risks of adverse system impacts.

• Different utilities have different thresholds (i.e., system sizes) for modeling and mitigation.
Project Construction

• The system has received building approval from the local permitting authority housing jurisdiction, but has not yet received final authorization for interconnection or permission to operate

• Project developer orders equipment and begins construction or installation

• Construction manager coordinates work of various trades

• Close coordination with tenants if site or building is occupied

• Frequent communication between all parties to minimize possible issues
Commissioning

- To receive final interconnection authorization from a utility, the installer must first submit verification of passed final building inspection
- Project interconnected according to utility interconnection agreement and utility process
- Plan may be standardized by developer and technology and may be refined according to individual system design
- Witnessing and/or third party independent commissioning may be stipulated
- Commissioning
  - Physical inspection
  - Component Testing
  - Whole system performance testing
Commissioning cont.

• Once the building inspections and commissioning process are complete, all required paperwork is submitted to the utility (e.g., relay settings, as-built drawings, etc.)

• Upon approval of all paperwork, the utility will likely install a net meter (for net-metered systems) and finally issue a permission to operate letter.

• After permission is granted, the installer is allowed to energize the system.
Commissioning Process Example

- **Planning**
  - Determine objectives and strategies
  - Assemble project team
  - Compile and review documentation

- **Investigation**
  - Conduct site assessment
  - Develop functional test and monitoring plans
  - Analyze test results
  - Compile master list of deficiencies and recommend improvements

- **Implementation**
  - Implement accepted recommendations
  - Make repairs and improvements
  - Retest and remonitor
  - Fine-tune

- **Hand-off and Integration**
  - Present final documentation of commissioning effort
## Project Risk: Community- and Facility-Scale

<table>
<thead>
<tr>
<th>Phases</th>
<th>Risks</th>
<th>Risk Assessment Post Step 4</th>
<th>✓</th>
</tr>
</thead>
<tbody>
<tr>
<td>Development</td>
<td>• Poor or no renewable energy resource assessment</td>
<td>Low; site picked</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>• Not identifying or unrealistic estimation of all possible costs</td>
<td>Low; detailed model</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>• Incorrect estimation of long-term “community” energy use</td>
<td>Low; detailed model</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>• Utility rules and ability to offset use with centralized production</td>
<td>Low; final projection</td>
<td>✓</td>
</tr>
<tr>
<td>Site</td>
<td>• Structural (e.g. rooftop solar, wind loading, soil conditions)</td>
<td>None; addressed</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>• Installation safety (e.g., wind tower, hazard)</td>
<td>None; addressed</td>
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</tr>
<tr>
<td></td>
<td>• Site control for safety/security purposes</td>
<td>Low; site secure</td>
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</tr>
<tr>
<td>Permitting</td>
<td>• Tribe-adopted codes and permitting requirements</td>
<td>Low; complete</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>• Utility interconnection requirements</td>
<td>None; complete</td>
<td>✓</td>
</tr>
<tr>
<td>Finance</td>
<td>• Capital availability</td>
<td>None; finalized</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>• Incentive availability risk</td>
<td>None; finalized</td>
<td>✓</td>
</tr>
<tr>
<td>Construction/</td>
<td>• EPC difficulties</td>
<td>None; contracted</td>
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<tr>
<td>Completion</td>
<td>• Cost overruns</td>
<td>None; construction complete</td>
<td>✓</td>
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<tr>
<td>Operating</td>
<td>• Output shortfall from expected</td>
<td>Assumed low, mitigable or allocatable</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Technology O&amp;M</td>
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</table>

*NOTE: Underlining signifies that the risk assessment outcome changes during the step at hand.
Adapted from Holland & Hart, RE Project Development & Finance & Infocast, Advanced RE Project Finance & Analysis