Course Outline

What we will cover...

- About the DOE Office of Indian Energy Education Initiative

- Commercial-Scale Process: Hypothetical Example
  - Project development and financing concepts
  - Project development and financing process and decision points
  - Commercial project as an investment
  - How to pay for commercial project

- Additional Information and Resources
Introduction

The U.S. Department of Energy (DOE) Office of Indian Energy Policy and Programs is responsible for assisting Tribes with energy planning and development, infrastructure, energy costs, and electrification of Indian lands and homes.

As part of this commitment and on behalf of DOE, the Office of Indian Energy is leading education and capacity building efforts in Indian Country.
Training Program Objective and Approach

A specially designed curriculum was created to give tribal leaders and professionals background information in renewable energy development to:

- Present foundational information on strategic energy planning, grid basics, and renewable energy technologies
- Break down the components of the project development process on the facility, commercial, and community scale
- Explain how the various financing structures can be practical for projects on tribal lands.
Course Audiences

Tribal Leaders
• Primary decision makers
• Understand terminology
• Understand key decision points and factors influencing them

Staff/Project Management
• May be self-managing project or managing consultants
• Communicate at key points with decision makers
• Require in-depth knowledge of process
How This Advanced/In-Depth Course Fits

**Essentials**
Basic process, decisions, and concepts for project development  
**Audience:** All involved in project

**Facility**
Comprehensive, in-depth process pathways for project development and financing by project scale  
**Audience:** Decision makers and project and contract managers

**Community**
Comprehensive, in-depth process pathways for project development and financing by project scale  
**Audience:** Decision makers and project and contract managers

**Advanced/In-Depth**
Detailed, academic information for deep understanding of concepts  
**Audience:** Project and contract managers

**Commercial**
Comprehensive, in-depth process pathways for project development and financing by project scale  
**Audience:** Decision makers and project and contract managers
Terminology in These Courses

Why Is It Important?
• Provides common language for internal discussion
• Assists in interaction with external organizations
• Increases credibility in project development

What Does It Include?
• Common terms and language for project development
• Acronyms for and roles of:
  – Federal agencies
  – Common federal and state policies

Your resource for reference: DOE-IE Course Terminology Guide
Key Concepts

• Risk and Uncertainty
• Levelized Cost of Energy (LCOE)
• Tax-Equity Partnership
• Roles of the Tribe
• The Project Team

In-depth information on each key concept available in Advanced Courses
About the Speaker

Karlynn Cory

• Senior Analyst at the National Renewable Energy Laboratory (NREL)

• Creator of the Renewable Energy Project Finance Analysis team at NREL that identifies, analyzes, and communicates project financing innovations

• Nationally recognized tax and incentive policy expert with more than 17 years of experience on renewable policies and markets
Agenda

• Project development and financing concepts for a commercial-scale project

• Project development and financing process and decision points for a commercial-scale project

• Commercial project as an investment

• How to pay for a commercial project
PROJECT DEVELOPMENT AND FINANCING CONCEPTS: COMMERCIAL SCALE
Terminology: Project Scale

Facility
Definition: single building system
Primary purpose: offset building energy use

Community
Definition: multiple buildings, campus
Primary purpose: offset community energy costs, energy self-sufficiency

Commercial
Definition: stand-alone project
Primary purpose: sale of power generation, financial benefits

Photo credits: (top to bottom):
NC Solar Center, NREL 09373; Orange County Convention Center, NREL 18077; Tucson Electric Power, NREL 13327
Why Elect to Do a Commercial-Scale Project?

• Available, Tribe-controlled, appropriate location
  – May/may not be Tribe-owned

• Tribe has significant capital in-hand

• Tribe has identified a potential off-taker that will buy the power and renewable energy credits (RECs)

• Tribe wants to get into renewable project development *for more than one project* (higher risk/higher return)

• Job development (construction and maintenance)

• Diversify energy supply with local, renewable sources
So Why Seek a Tax-Equity Finance Partner?

- Tax incentives (MACRS and either PTC or ITC) can represent up to half the project value or reduce project’s capital costs by ~50%.

- Tax incentives can help to achieve a competitive price of power.

- Many projects also require state-level incentives to be economic.
# Project Scale Decision Factors

<table>
<thead>
<tr>
<th></th>
<th>Facility</th>
<th>Community</th>
<th>Commercial</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Definition</strong></td>
<td>Project serves one tribal facility/building</td>
<td>Project serves more than one tribal facility/building</td>
<td>Project power is sold to a third-party off-taker</td>
</tr>
<tr>
<td><strong>Value Proposition</strong></td>
<td>Save $$, reduce electricity cost, energy independence</td>
<td>Save $$, reduce electricity cost, energy independence</td>
<td>Sale of power at competitive market terms whereby Tribe benefits</td>
</tr>
<tr>
<td><strong>Tribe’s Success Measurement</strong></td>
<td>Cost avoidance</td>
<td>Cost avoidance</td>
<td>Revenue</td>
</tr>
<tr>
<td><strong>LCOE Comparison</strong></td>
<td>Retail electricity price</td>
<td>Retail electricity price</td>
<td>Wholesale electricity price</td>
</tr>
<tr>
<td><strong>Key Decision Point</strong></td>
<td>Savings/security of supply</td>
<td>Savings/security of supply</td>
<td>Revenue streams</td>
</tr>
</tbody>
</table>
The Competitive Power Business

**Role:** Independent power producer (IPP)/non-utility generator (NUG)

**Commercial-scale:** Long-term, revenue-generating facility on tribal land that sells power to one or more utilities

**Rewards: Typical Goals**
- Generate revenue for Tribe
- Job creation (construction, O&M)
- Available, Tribe-controlled location  
  – May/may not be Tribe-owned
- Found interested party to off-take/purchase power
- Have enough capital for a large-scale project
- Environmental sustainability
- Self-sufficiency, pride

**Challenges**
- Capital intense
- Development risk and time
- Involves external players
- Combination of market forces

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A commercial project is dependent upon market forces. The project needs to be competitive with non-tribal projects and/or provide a clear differentiator.

Key Concepts Throughout Steps

• Risk and Uncertainty
• LCOE
• Tax-Equity Partnership
• Roles of the Tribe
• The Project Team

In-depth information on each key concept available in Advanced Courses
PROJECT DEVELOPMENT AND FINANCING: PROCESS AND DECISION POINTS FOR COMMERCIAL SCALE
1 Potential

2 Options

3 Refinement

4 Implementation

5 Operations & Maintenance
Step 1: Site, Scale, Resource and Market Potential

**Purpose:** Determine whether basic elements for a successful project are in place

**Tasks:**
- Identify possible **sites** for project locations
- Confirm renewable energy **resource**
- Review Tribal facility electric cost data, regulations, and transmission and interconnection requirements
- Evaluate potential **markets and paths** for renewable sales; identify potential partners/ **off-takers** to sell the project’s power
- Assemble or communicate with the right team, those in positions or with knowledge to facilitate, approve, champion the project

**Analyze risks:** financing, permitting, construction costs

**Analyze utility rules:** interconnection and transmission
### Step 1: Project Potential Example

#### Potential
- **Framework:** NREL BEPTCTM
- **Information sourced from:** Thomas, Pilar; “Briefing the Senate Natural Resources Committee and Senate Indian Affairs Committee,” May 18, 2012. And 2011 retail and wholesale rates: Energy Information Administration

#### Options
- **Facility:** California
  - Solar for peak demand!
  - Solid San Diego market

#### Refinement
- **Community:** Minnesota
  - Large facility (e.g., casino) or many small buildings

#### Implementation
- **Commercial:** Arizona
  - Resource size vs. market size
  - Low cost/kWh Wholesale: 3.54¢/kWh (if BTM, retail Ind, Com: 6.6¢-9.5¢/kWh)

<table>
<thead>
<tr>
<th>Baseline</th>
<th>Facility: California</th>
<th>Community: Minnesota</th>
<th>Commercial: Arizona</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Baseline</strong></td>
<td>Solar for peak demand! Solid San Diego market</td>
<td>Large facility (e.g., casino) or many small buildings</td>
<td>Resource size vs. market size</td>
</tr>
<tr>
<td><strong>Economics</strong></td>
<td>High cost/kWh Time of use Com, Res: ~16¢/kWh</td>
<td>Mid cost/kWh Retail Ind., Com, Res: 6.5¢–11.0¢/kWh (Wholesale: 3.75¢/kWh)</td>
<td>Low cost/kWh Wholesale: 3.54¢/kWh (if BTM, retail Ind, Com: 6.6¢-9.5¢/kWh)</td>
</tr>
<tr>
<td><strong>Policy</strong></td>
<td>RPS: 33% (2020 GAP) Net metering (1 MW) Feed-in tariff: 1–3 MW CA Solar Initiative</td>
<td>RPS: 25% by 2025 No transmission needed (Net metering &lt;40 kW)</td>
<td>Gap meeting 15% RPS Net metering (no limit; only if selling behind the meter [BTM])</td>
</tr>
<tr>
<td><strong>Technology</strong></td>
<td>Solar resource rich; solar dominates Southern CA</td>
<td>Wind resource rich; not nearly as much solar</td>
<td>Solar (photovoltaic [PV] or concentrating PV) strong, commercial</td>
</tr>
<tr>
<td><strong>Consensus</strong></td>
<td>Given facts, should Tribe pursue?</td>
<td>Given facts, should Tribe pursue?</td>
<td>Given facts, should Tribe pursue?</td>
</tr>
</tbody>
</table>
Step 1: Site and Project Potential Buyer

Identify and begin discussions with potential power purchasers in Arizona:

- Navopache Electric Cooperative (NEC)
- Salt River Project (SRP)
- Arizona Public Service (APS)
- Tucson Electric Power
- Navajo Tribal Utility Authority (NTUA)
Step 1: Resource

Potential

Options

Refinement

Implementation

Operations & Maintenance

7–8 kWh/m²/day is excellent!

6–7 kWh/m²/day is good!

http://www.nrel.gov/gis/mapstore/
Step 1: Off-take, Production, Savings

Project – 21.5 MW PV plant in southern Arizona or 20 MW CSP in southwest Arizona

Off-taker – A utility, most likely (competing with 3.54¢/kWh wholesale rate)

Production and Cost:

- Use NREL’s System Advisor Model (SAM) for production and cost estimates depending on whether third-party owned or Tribe-owned:
  - PV: 37.7 million kWh/yr; third party: 2 ¢/kWh   Tribe: ~5 ¢/kWh
  - CSP: 59.2 million kWh/yr; third party: 14.2 ¢/kWh   Tribe: 20.7 ¢/kWh
- Based on lower cost and better access to capital/lower risk, choose PV over CSP
Step 1: Hypothetical Commercial Example – Outputs

- **Technology** – solar PV, at this scale and location
- **Project scale** – commercial/utility-scale (21.5 MW)
- **Resource and market context** – gap meeting RPS in Arizona
- **Production potential** – 37.7 million kWh/yr
- **Preliminary sites options** – Tribe’s land, federal land, or I act as developer on another’s land
- **Team** – assume tribal leaders are in favor, support, and champion the project and are preparing to do more projects in the future
- **Tribal role options** – own or partner with tax-equity investor
## Commercial-Scale Project Risks – Post Step 1

<table>
<thead>
<tr>
<th>Phase</th>
<th>Risks</th>
<th>Risk Assessment Post Step 1</th>
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</thead>
<tbody>
<tr>
<td><strong>Development</strong></td>
<td>• Poor or no renewable energy resource assessment</td>
<td>Screened good sites</td>
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<tr>
<td></td>
<td>• Not identifying all possible costs</td>
<td>Reduced</td>
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<td></td>
<td>• Community push-back and competing land use</td>
<td>Reduced</td>
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<td><strong>Site</strong></td>
<td>• Site access and right of way</td>
<td>Unchanged; Critical to have site control and community support</td>
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<td>• Not in my backyard (NIMBY)/build absolutely nothing anywhere (BANANA)</td>
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<td>• Transmission constraints/siting new transmission</td>
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<td><strong>Permitting</strong></td>
<td>• Tribe-adopted codes and permitting requirements</td>
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<td></td>
<td>• Utility interconnection requirements</td>
<td>Reduced</td>
</tr>
<tr>
<td></td>
<td>• Interconnection may require new transmission, possible NEPA</td>
<td>High risk, reduced</td>
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<tr>
<td><strong>Finance</strong></td>
<td>• Capital availability</td>
<td>High risk, unchanged</td>
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<td></td>
<td>• Incentive availability risk</td>
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<tr>
<td></td>
<td>• Credit-worthy purchaser of generated energy</td>
<td>Unchanged</td>
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<tr>
<td><strong>Construction/Completion</strong></td>
<td>• Engineering, procurement, and construction (EPC) difficulties</td>
<td>Assumed low, mitigable, or allocatable</td>
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<td></td>
<td>• Cost overruns</td>
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<td></td>
<td>• Schedule</td>
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<tr>
<td><strong>Operating</strong></td>
<td>• Output shortfall from expected</td>
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<td></td>
<td>• Technology O&amp;M</td>
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<td></td>
<td>• Maintaining transmission access and possible curtailment</td>
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Sources: Adapted from Holland & Hart, RE Project Development & Finance & Infocast, Advanced RE Project Finance & Analysis

NOTE: Underlining signifies that the risk assessment outcome changes during the step at hand.
Step 2: Project Ownership and Regulatory Options

**Purpose:** Determine ownership structure and determine permitting considerations

**Tasks:**
- Identify final resource and project location
- Understand ownership structure/tribal role and risk allocations
- Narrow financing options
  - Clarify tax-equity structure
- Initiate EPC procurement process
- Understand and plan for permitting, interconnection (and transmission)

**Resources:**
Step 2: Ownership Structure Options

- Direct ownership

- Third-party power purchase agreement (PPA)
  - Containing a traditional land lease/royalty structure

- Equity investment partnering
  - Partnership flip
  - Sale leaseback
  - Inverted lease/lease pass-through

Key Question: What viable ownership structure options are attractive to the community?
Step 2: Paying for Project

Three Major Costs to Develop a Project:

1. Feasibility – this is the potential analysis
2. Preconstruction – permitting, environmental, site control (lease agreement)
3. Construction – engineering, procurement of equipment, and actual construction of plant

Project Capital Contributions for Each Project Development Step

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<td>Tax equity</td>
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<td>Debt</td>
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<td>Vendor financing</td>
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<tr>
<td>Title</td>
<td>Role</td>
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<tr>
<td>Project Company</td>
<td>Legal entity that owns the project, also called special purpose entity</td>
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<tr>
<td>Resource/Landowner</td>
<td>Legal and/or beneficial owner of land and natural resources</td>
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<tr>
<td>Sponsor/Developer</td>
<td>Organizes all of the other parties and typically controls project development and makes an equity investment in the company or other entity that owns the project</td>
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</tr>
<tr>
<td>EPC Contractor</td>
<td>Construction contractor provides design, engineering, and construction of the project</td>
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</tr>
<tr>
<td>Operator</td>
<td>Provides the day-to-day O&amp;M of the project</td>
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<tr>
<td>Feedstock Supplier</td>
<td>Provides the supply of feedstock (i.e., energy, raw materials) to the project (e.g., for a power plant, the feedstock supplier will supply fuel)</td>
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</tr>
<tr>
<td>Product Off-taker</td>
<td>Generally enters into a long-term agreement with the project company for the purchase of all the energy</td>
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<td></td>
</tr>
<tr>
<td>Lender</td>
<td>A single financial institution or a group of financial institutions that provides a loan to the project company to develop and construct the project and that takes a security interest in all of the project assets</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Tribal Host</td>
<td>Primary sovereign of project site</td>
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</tr>
</tbody>
</table>
Key Concept: Tribal Role Options

- Tribe
  - Project Operator/O&M
  - Equity Investor/Generation Equipment Owner
  - Lender/Debt Provider
  - Renewable Resource/Land Owner/Land Lessor*
  - Off-taker (Power Purchaser/User)

* Also called Tribal Host
# Key Concept: Tribal Role Options

<table>
<thead>
<tr>
<th>Role</th>
<th>Opportunity</th>
<th>Constraints</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Resource/Land Owner</strong></td>
<td>Land rent/royalty, taxes. Low risk, known reward, consistent (small) income.</td>
<td>Limited project control. Must provide site access.</td>
<td>Limited upside potential, limited risk</td>
</tr>
<tr>
<td><strong>Off-taker/Energy User</strong></td>
<td>Only pay if project becomes operational; security.</td>
<td>Only available to Tribes that own utility providers.</td>
<td>Still requires utility interconnection agreement. Med risk.</td>
</tr>
</tbody>
</table>
| **Project Operator/O&M** | Control and self-determination of project; potential for profits (and losses) is minimal | • Investors require experience  
• Only consider as a new business (act as operator for multiple projects in a portfolio) | • High risk, complex  
• Tribes may be best served by outsourcing |
| **Lender/Debt Provider** | Help finance a project (e.g., cash or New Market Tax Credit (NMTC), or Qualified Energy Conservation Bonds (QECBs)) with lower risk | • Requires ready capital  
• May be cost-prohibitive to document-and manage a single debt transaction (multiple more cost-effective) | • Med-risk, more complex  
• Requires lending knowledge  
• Option for Tribes with limited lands, lots of $ |
| **Equity Investor/Gen. Owner** | Provide cash, NMTC or QECB for project development. | Higher risk than debt lending. Requires ready capital, or unique source of capital that provides market advantage (like NMTC). | • High risk, more complex  
• Competes with other investments  
• Option for Tribes with limited lands, lots of $ |
| **Project Developer** | Self-determination of project; potential for profits (and losses) is highest. Tribes with cash on hand don’t need investors, but could still consider engaging tax equity partners. | • Investors require experience  
• Only consider as a new business (act as developer for multiple projects in a diverse portfolio)  
• Tribes investing money may not want this high risk/return investment | • High risk, complex  
• Tribes may be best served by outsourcing  
• A project pipeline/portfolio mitigates some risks |
Key Concept: Tax-Equity Partnership – Federal Tax Incentives

Internal Revenue Code

• Production Tax Credit (PTC); payment based on kWh produced
  – 10-year, 2.3¢/kWh for wind, geothermal, and closed-loop biomass technologies
  – “Start construction” before 1/1/2014

• Investment Tax Credit (ITC); payment based on % of up-front cost
  – One-time 30% or 10% tax credit (depending on technology) of eligible tax basis
  – “Placed in service” before 1/1/2017

Geothermal eligible for PTC and ITC; can only take one of them

• Cost recovery of plant through depreciation deductions
  – Often called “accelerated depreciation”
  – Officially called Modified Accelerated Cost Recovery System (MACRS)

Need to pay taxes and have enough of the right kind of tax liability to use federal tax incentives
March 8, 2013 IRS Private Letter Ruling – 111532-11

• An Indian tribal government is not considered a “governmental unit” or “tax-exempt organization” for purposes of renewable energy tax subsidies

• This presumably could permit tribal governments to enter into any one of the three tax-equity financing structures *without* jeopardizing access and use of federal tax incentives (*potentially BIG change*)

• Yet to be executed in the market; perhaps only applicable to the Tribe that applied; it would be wise to seek legal counsel


Key Concept: Tax-Equity Partnerships

• Tribe can benefit from tax-equity incentives without being taxable

• Tribes can partner with third-party tax investors and/or developers to gain this incentive/advantage
  – Recent IRS PLR supports tribal partnerships with third-party tax equity
  – Even with IRS ruling, the Tribe needs capital to build a large renewable project

• Tax incentives (MACRS and either PTC or ITC) can represent up to half the project value, or reduce project’s capital costs by ~50%

• Tribe benefits by offering a more competitive price for energy and RECs from the project to a utility
Financial Capital Sources

• Financing structure is highly dependent on capital used for a given project:
  – **Tribal capital**: Tribal investment ($$$) to purchase project equipment
  – **Tribe-private sector capital sharing**: Tribe contributes some resources ($) and partners with third-party capital to leverage tax equity ($$)
  – **Non-Tribe capital**: Developer equity, tax equity, bank debt. Tribe participates in other ways.

• Responsibility to generate capital, collect revenues, and monitor returns will vary according to project structure

• If all framework elements are fully developed and meet market conditions, the project is ready to attract capital
Step 2: Hypothetical Commercial Example – Outputs

- Finalize resource type – AZ 21.5 MW AZ solar; collect bankable data
- Determine tribal role – owns land; some capital; will hire developer
- Off-take - Utility is willing to buy the power and RECs
- Initial financing options identified, want to consider role for tax-equity investment partner
- Procurement process initiated – RFP written for the EPC
- Permit needs and process – understand for all jurisdictions (city, county, AZ permits understood)
- Utility interconnection, transmission – process initiated
# Commercial-Scale Project Risks – Post Step 2

<table>
<thead>
<tr>
<th></th>
<th>Risks</th>
<th>Risk Assessment Post Step 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Development</strong></td>
<td>• Poor or no renewable energy resource assessment</td>
<td>Finalized resource</td>
</tr>
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<td>• Not identifying all possible costs</td>
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<td><strong>Finance</strong></td>
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<td><strong>Construction/ Completion</strong></td>
<td>• EPC difficulties</td>
<td>Low; allocate to EPC or developer</td>
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<td><strong>Operating</strong></td>
<td>• Output shortfall from expected</td>
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NOTE: Underlining signifies that the risk assessment outcome changes during the step at hand.
3
Refinement

1 Potential
2 Options
4 Implementation
5 Operations & Maintenance
Step 3: Project Refinement

**Purpose:** Validate decisions and finalize project structure

**Tasks:**
- Finalize ownership structure and project team identification
- Finalize permitting (including environmental reviews), interconnection
- Finalize technology, financing, and development costs

**Outputs:**
- Proposed financing/commitments and organization structure
- Detailed economic models
- Vendors selected
- Completed environmental reviews and finalized permits
- Off-take and interconnection agreement
- Transmission finalized, if necessary
### Step 3: Project Refinement: Outstanding Risks

<table>
<thead>
<tr>
<th>Site</th>
<th>Resource</th>
<th>Off-Take</th>
<th>Permits</th>
<th>Technology</th>
<th>Team</th>
<th>Capital</th>
</tr>
</thead>
<tbody>
<tr>
<td>Securing site: No site, no project</td>
<td>Engineering assessment (input)</td>
<td>Power purchases: off-take contract – (revenue)</td>
<td>Anything that can stop a project if not in place...</td>
<td>Engineered system (output)</td>
<td>Professional, experienced, diverse</td>
<td>Financing structure</td>
</tr>
</tbody>
</table>

- Site control
- Size and shape
- Location to load and T&D
- Long-term control
- Financial control
- Clear title
- Lease terms
- Collateral concerns
- Environmental concerns
- Access
- O&M access
- Upgradable

- Volume/Frequency
- Variability
- Characteristics (power/speed)
- 24-hour profile
- Monthly, seasonal, and annual variability
- Weather dependence
- Data history
- Std. deviation
- Technology suitability

- Credit of counterparty
- Length of contract
- Terms and conditions
- Reps and warranties
- Assignment
- Curtailment
- Interconnection
- Performance
- Enforcement
- Take or pay
- Pricing and terms

- Permitting/entitlements
- Land disturbance
- Environmental and cultural impacts
- Resource assessments
- Wildlife impacts
- Habitat
- NEPA, EIS
- Utility interconnection
- Other utility or PUC approvals
- Lease and/or ROW approvals

- Engineering design plans
- Construction plans
- Not generic solar panel and inverter
- Engineered resource/conversion technology/balance of system designs
- Specifications
- Bid set

- Business management
- Technical expertise
- Legal expertise
- Financial expertise (including tax)
- Transmission interconnection expertise
- Construction/contract management
- Operations
- Power marketing/sales

- Development equity
- Project equity
- Nonrecourse project debt
- Mezzanine or bridge facility
- Tax equity
- Grants, rebates, other incentives
- Environmental attribute sales contracts (RECs)
- Bond finance

Framework: NREL SROPPTTCTM
## Step 3: Project Refinement: Risks Addressed

<table>
<thead>
<tr>
<th>Site</th>
<th>Resource</th>
<th>Off-Take</th>
<th>Permits</th>
<th>Technology</th>
<th>Team</th>
<th>Capital</th>
</tr>
</thead>
<tbody>
<tr>
<td>Securing site: No site, no project</td>
<td>Engineering assessment (input)</td>
<td>Power purchases: off-take contract – (revenue)</td>
<td>Anything that can stop a project if not in place...</td>
<td>Engineered system (output)</td>
<td>Professional, experienced, diverse</td>
<td>Financing structure</td>
</tr>
<tr>
<td>Site secured (likely tribal) for commercial-scale solar PV project: 200 acres with/near transmission access</td>
<td>Solar resource data: favorably evaluated</td>
<td>Electric utility off-taker: identified and contracted</td>
<td>Necessary permits and interconnect, agreement: secured</td>
<td>System design: prepared to bid to secure EPC contractor</td>
<td>Team: identified and engaged</td>
<td>Determine finance structure: based on Tribe/third-party capital and ability to mitigate risks</td>
</tr>
</tbody>
</table>

NREL’s System Advisor Model (SAM) is a free computer program that calculates a renewable energy system’s hourly energy output over a single year and calculates the cost of energy for a renewable energy project over the life of the project.

- Solar, wind, geothermal, and other renewable and fossil technologies available
- These calculations are done using detailed performance models, a detailed cash flow finance model, and a library of reasonable default values for each technology and target market
Step 3: AZ Solar PV System Cost Example

Q3/Q4 2012
Total Cost/Watt: $2.46/Wdc
System Capacity: 21.5 MW

AZ Solar LCOE:
~10¢/kWh – 12¢/kWh

Total System Cost: $94 Million

2011 Total Cost/Watt: $4.38
System Capacity: 21.5 MW

Total System Cost: $49.2 Million
### Step 3: Capital to Pay for the Project

<table>
<thead>
<tr>
<th>Process Stage</th>
<th>Activity</th>
<th>Primary Capital</th>
<th>Secondary Capital</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Potential</td>
<td>Feasibility studies</td>
<td>Developer equity</td>
<td>None</td>
</tr>
<tr>
<td>2. Design</td>
<td>Permitting, environmental, site control</td>
<td>Developer equity</td>
<td>None</td>
</tr>
<tr>
<td>3. Refinement</td>
<td>Engineering, buy equipment</td>
<td>Developer equity</td>
<td>Debt Vendor financing</td>
</tr>
<tr>
<td>4. Implementation</td>
<td>Construction</td>
<td>Construction debt (OR tax equity)</td>
<td>Developer equity (OR construction debt)</td>
</tr>
<tr>
<td>5. Operations &amp; Maintenance (O&amp;M)</td>
<td>Completed</td>
<td>Developer equity</td>
<td>Reserve fund term debt (tax equity)</td>
</tr>
</tbody>
</table>
# Financing Structures and Tribal Implications

<table>
<thead>
<tr>
<th></th>
<th>Direct Ownership</th>
<th>Partnership Flip</th>
<th>Sale Leaseback</th>
<th>Inverted Lease/Lease Pass-Through</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Financing</strong></td>
<td>User self-fineses system and consumes power on-site</td>
<td>Investor can provide up to 99% financing. Debt can also be part of capital stack.</td>
<td>Investor provides 100% financing. Debt can also be part of capital stack, commonly at developer level.</td>
<td>Investor provides partial financing. Debt is a common part of capital stack.</td>
</tr>
<tr>
<td><strong>Up-front Tribal Capital Req.</strong></td>
<td>$$$$$</td>
<td>$</td>
<td>$, potentially $0</td>
<td>$$–$$$$</td>
</tr>
<tr>
<td><strong>Ownership</strong></td>
<td>User-owned</td>
<td>Co-ownership by developer and investor</td>
<td>Developer has option to purchase assets at lease term</td>
<td>Assets revert to developer at the lease term</td>
</tr>
<tr>
<td><strong>Tax Credit</strong></td>
<td>NA</td>
<td>PTC or ITC, and MACRS</td>
<td>ITC and MACRS</td>
<td>ITC and MACRS</td>
</tr>
<tr>
<td><strong>Investor Preference</strong></td>
<td>Certain firms have preferences for/familiarity with particular structures and/or technologies. Project specifics may also dictate financial structure selected.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Single Finance

A completed project is a business with commercial activity.

Parent Company: Taxable Corporation

- 5% Potential
- 10% Design
- 25% Refinement
- 60% Implementation

Project Company

Project Development Stages – % Resource Inputs, Time/$
Third-Party Financed Power Purchase Agreement: Where Electricity is Sold to a Utility

The Tribe is the host in this structure. The utility agrees to buy electricity generated by the renewable energy system.

**Benefits:**
1. No/low up-front costs
2. No O&M
3. Save on electricity costs

**Tax attributes:** Modified Accelerated Cost Recovery System (MACRS) and either Investment Tax Credit (ITC) or Production Tax Credit (PTC)

**Corporations**
- Project Company/Pass-Through Entity
- Tax Equity
- Potential Tribal Role

**Utility:**
- Purchase $ Purchase Output
- Site Access
- Lends $ to the Project or Debt Capital
- Potential $ Payments

**Tribe:**
- Host

**Lender/Capital Provider**
- $ Principal and Interest

**Tax-Equity Investor**
- Equity Investment $
Capital Structure with Tax Equity

Potential Capital Financing Sources
- Tax Equity
- Debt
- Cash Equity
- Other

Tax-Equity Investment Structures
- Partnership Flip
- Sale Leaseback
- Inverted Lease
**Advantages:**

- Tax equity provides most of the capital up front
- Easier way for Tribe/developer to own the project in the long run (than other advanced financing structures)
- Generally familiar structure for wind and solar industry, so many tax-equity investors have experience

**Challenges:**

- Limited distribution payments to Tribe/developer until later in project (e.g., year 6-7 for solar; year 10-11 for wind)
- Still requires up-front capital contribution from Tribe
- Developer must consult tax equity on major decisions
Capital Structure with Tax Equity

Potential Options Refinement Implementation Operations & Maintenance

Project Company

Potential Capital Financing Sources

Tax Equity Debt Cash Equity Other

Tax-Equity Investment Structures

Partnership Flip Sale Leaseback Inverted Lease

Corporations Project Company/Pass-Through Entity Tax Equity
Sale Leaseback Structure

1) Developer sells project to tax-equity investor. Developer receives: sale proceeds and cash from PPA (less lease payments and O&M). Must purchase asset from tax equity at end of lease.

2) Tax equity leases project to developer. Tax equity receives: ITC, MACRS, and lease payments.

Sale leaseback can provide 100% financing from tax-equity investor. Tax equity receives full ITC and MACRS.
Advantages:

- Tax equity can provide 100% of the capital up front
- Developer gets large cash distribution upon sale of project
- Familiar and utilized structure among solar community

Challenges:

- Most costly for Tribe/developer to acquire long-term ownership of project (large cash infusion ~ year 7)
- Tribe/developer operates the project
- Requires largest equity contribution from tax-equity investor (could limit investment)
- Limited participation to developer/Tribe until buyout of project (~ year 7)
- Not possible for PTC-based project (e.g., wind)
Capital Structure with Tax Equity

Potential Options Refinement Implementation Operations & Maintenance

Potential Capital Financing Sources

Tax Equity Debt Cash Equity Other

Tax-Equity Investment Structures

Partnership Flip Sale Leaseback Inverted Lease
Inverted Lease/Lease Pass-Through Structure

1) Tax-equity investor buys project, then sells project to developer. Tax equity receives: sale proceeds, ITC pass-through, cash from PPA (less lease payments, O&M).

2) Developer leases project to tax equity. Developer receives: lease payments; retains MACRS (unless Tribe is developer; then it is lost). Developer owns asset in full at expiration of lease.

In the inverted lease, ITC is passed through to the tax-equity investor, allowing developer to retain ownership and some tax benefits (MACRS). IRS PLR seems to indicate Tribe may be developer; legal opinion required.
Advantages:

• Tribe/developer maintains controlling interest and ownership in project
• Cash flows to Tribe/developer from beginning
• Limits risk to tax-equity investor, possibly increasing availability of investment
• The developer owns the project after the expiration of the lease term

Challenges:

• Most complicated of all three tax-equity structures
• Developer must contribute significantly to up-front capital investment
• Not possible for PTC-based project (e.g., wind)
• Limited upside for tax-equity investor
Step 3: Hypothetical Commercial Example – Outputs

- Financing structure and Tribe organization – inverted lease
- Detailed economic models – modeled in SAM
- EPC vendors selected – sign contract
- Completed environmental reviews and finalized permits, as required by third-party investors
- Off-take agreement – PPA signed
- Utility interconnection and transmission – working with utility to complete
# Commercial-Scale Project Risks – Post Step 3

<table>
<thead>
<tr>
<th>Risks</th>
<th>Risk Assessment Post Step 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Development</strong></td>
<td></td>
</tr>
<tr>
<td>• Poor or no renewable energy resource assessment</td>
<td>Low; site picked</td>
</tr>
<tr>
<td>• Not identifying all possible costs</td>
<td>Low; detailed model</td>
</tr>
<tr>
<td>• Unrealistic estimation of all costs</td>
<td>Low; detailed model</td>
</tr>
<tr>
<td>• Community push-back and competing land use</td>
<td>None; addressed</td>
</tr>
<tr>
<td><strong>Site</strong></td>
<td></td>
</tr>
<tr>
<td>• Site access and right of way</td>
<td>Low; site secure</td>
</tr>
<tr>
<td>• Not in my backyard (NIMBY)/build absolutely nothing anywhere (BANANA)</td>
<td>None; opposition addressed</td>
</tr>
<tr>
<td>• Transmission constraints/siting new transmission</td>
<td>Low; process started</td>
</tr>
<tr>
<td><strong>Permitting</strong></td>
<td></td>
</tr>
<tr>
<td>• Tribe-adopted codes and permitting requirements</td>
<td>Low; complete</td>
</tr>
<tr>
<td>• Utility interconnection requirements</td>
<td>Low; complete</td>
</tr>
<tr>
<td>• Interconnection may require new transmission, possible NEPA</td>
<td>Low; identified</td>
</tr>
<tr>
<td><strong>Finance</strong></td>
<td></td>
</tr>
<tr>
<td>• Capital availability</td>
<td>Low; PPA complete</td>
</tr>
<tr>
<td>• Incentive availability risk</td>
<td>Low; risk on developer</td>
</tr>
<tr>
<td>• Credit-worthy purchaser of generated energy</td>
<td>Low; PPA complete</td>
</tr>
<tr>
<td><strong>Construction/Completion</strong></td>
<td></td>
</tr>
<tr>
<td>• EPC difficulties</td>
<td>Low; allocate to EPC or developer</td>
</tr>
<tr>
<td>• Cost overruns</td>
<td></td>
</tr>
<tr>
<td>• Schedule</td>
<td></td>
</tr>
<tr>
<td><strong>Operating</strong></td>
<td></td>
</tr>
<tr>
<td>• Output shortfall from expected</td>
<td>Assumed low, mitigable, or allocatable</td>
</tr>
<tr>
<td>• Technology O&amp;M</td>
<td></td>
</tr>
<tr>
<td>• Maintaining transmission access and possible curtailment</td>
<td></td>
</tr>
</tbody>
</table>
4 Implementation

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

Purpose: Contract for, realize physical construction of project

Tasks:
- Finalize project agreements
- Finalize vendor contracting process
- Finalize preconstruction tasks
- Realize construction and equipment installation
- Realize interconnection
- Realize project commissioning leading to commercial operations

Output: Completed project (commercial operation)
Step 4: Project Implementation Example

Check:
• Ensure permitting is complete
• Ensure on-site activities will not interfere with construction and vice versa
• Communicate and plan with the vendor/contractor

Interconnection:
• Sometimes contracted and completed by system owner in cooperation with utility
• Sometimes involves host
• Often coordinated by contractor/system owner

Construction/commissioning: diligence of each party as appropriate to its assumption of risk as:
• PPA energy seller (or purchaser) – least diligence for tribal entity – economic due diligence needed
• Energy system seller (or purchaser/owner) – technical diligence and capability for tribal entity
Step 4: Hypothetical Commercial Example – Outputs

 ✓ Completed and operating project
 ✓ New ownership organization completed (if needed)

Commercial Operating Date (COD) Success

• Project generating electricity
• Project developed within budget

Photo by Dennis Schroeder, NREL 21512
## Commercial-Scale Project Risks – Post Step 4

<table>
<thead>
<tr>
<th>Risks</th>
<th>Development</th>
<th>Site</th>
<th>Permitting</th>
<th>Finance</th>
<th>Construction/Completion</th>
<th>Operating</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Poor or no renewable energy resource assessment</td>
<td>• Site access and right of way</td>
<td>• Tribe-adopted codes and permitting requirements</td>
<td>• Capital availability</td>
<td>• EPC difficulties</td>
<td></td>
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<tr>
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<td>• Cost overruns</td>
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<td>• Credit-worthy purchaser of generated energy</td>
<td>• Schedule</td>
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<tr>
<td></td>
<td>• Community push-back and competing land use</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Risk Assessment Post Step 4</td>
<td>Low; site picked</td>
<td>None; site secure</td>
<td>Low; complete</td>
<td>None; finalized</td>
<td>None; contracted</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Low; detailed model</td>
<td>None; opposition addressed</td>
<td>Low; complete</td>
<td>None; finalized</td>
<td>None; construction complete</td>
<td></td>
</tr>
</tbody>
</table>

### Sources
Adapted from Holland & Hart, RE Project Development & Finance & Infocast, Advanced RE Project Finance & Analysis

**NOTE:** Underlining signifies that the risk assessment outcome changes during the step at hand.
Project Development Process

1. Potential
2. Options
3. Refinement
4. Implementation
5. Operations & Maintenance
Step 5: Operations & Maintenance

Purpose: Conduct or ensure ongoing O&M, including repair and replacement (R&R)*

O&M Costs:
- Equipment maintenance and upkeep
- Gearbox/inverter replacement
- Insurance
- Labor and staffing
- Extended warranty agreements

If leasing, lessor often manages maintenance

If PPA, vendor typically manages maintenance

* Esp. if owner – role of highest O&M risk

Photo from Florida Solar Energy Center, NREL 14728
In our hypothetical case, the tribal community elected the inverted lease with a tax-equity investor.

- Tribe may elect to have responsibility for O&M (or can subcontract to the equipment manufacturer or other vendor)
- Tribe revenues will be at risk if O&M is not conducted; impacts project cash flows
- Investment partners will be concerned as well – revenues for all parties in the partnership are impacted by system performance
Step 5: Hypothetical Commercial Example – Outputs

- Ensure responsible party carries out O&M/R&R*
- Measuring and tracking success
- Correlation with business plan and strategic energy plan
- Revenue management
- Contract compliance
- Reporting of generation

* Esp. if owner

Photo from Henry Price, NREL 14952
<table>
<thead>
<tr>
<th>Phase</th>
<th>Risks</th>
<th>Risk Assessment Post Step 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Development</td>
<td>• Poor or no renewable energy resource assessment</td>
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<tr>
<td>Finance</td>
<td>• Capital availability</td>
<td>None; finalized</td>
</tr>
<tr>
<td></td>
<td>• Incentive availability risk</td>
<td>None; finalized</td>
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<tr>
<td></td>
<td>• Credit-worthy purchaser of generated energy</td>
<td>None; finalized</td>
</tr>
<tr>
<td>Construction/</td>
<td>• Engineering, procurement, and construction (EPC) difficulties</td>
<td>None; contracted</td>
</tr>
<tr>
<td>Completion</td>
<td>• Cost overruns</td>
<td>None; construction complete</td>
</tr>
<tr>
<td></td>
<td>• Schedule</td>
<td></td>
</tr>
<tr>
<td>Operating</td>
<td>• Output shortfall from expected</td>
<td>Being managed by appropriate party</td>
</tr>
<tr>
<td></td>
<td>• Technology O&amp;M</td>
<td></td>
</tr>
<tr>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

Sources: Adapted from Holland & Hart, RE Project Development & Finance & Infocast, Advanced RE Project Finance & Analysis

NOTE: Underlining signifies that the risk assessment outcome changes during the step at hand.
Step 1: Gather all relevant data in order to make first pass at potential project, understand tribal role options

Step 2: Estimate value to Tribe, consider ownership approach, begin to identify off-takers, partners, vendors, begin planning permitting and site use

Step 3: Finalize economic assumptions and tribal roles, finalize permitting, interconnection, transmission and off-take agreements, and determine financial partnerships, ownership structure

Step 4: Finalize agreements (including vendor contracting); financial close and construction; project commissioning, begin operation

  Celebrate!

Step 5: Maintenance plan implementation (conduct or ensure ongoing O&M, R&R)
Not Quite Done!

- Check back in with planning document – update as necessary
- Identify next potential project from plan
Wrap-Up: Project Development Process
Key Concepts Review

- Risk and Uncertainty
- LCOE
- Tax-Equity Partnership
- Roles of the Tribe
- The Project Team

In-depth information on each key concept available in Advanced Courses
These courses were designed in coordination with Tracey LeBeau and Pilar Thomas of the DOE Office of Indian Energy by a team including Dan Beckley, Karlynn Cory, Elizabeth Doris, Travis Lowder, Paul Schwabe, and Bob Springer of the National Renewable Energy Laboratory; Joe Cruz and Matt Ferguson of Cohn Reznick; Paul Dearhouse of the Dearhouse Group; and Carolyn Stewart of Red Mountain Energy Partners.

Questions, comments: indianenergy@hq.doe.gov
For more information: www.energy.gov/indianenergy
Additional courses: www.нтерlearning.org

THANK YOU
INFORMATION ON THE CURRICULUM PROGRAM AND OFFERINGS
Curriculum Structure and Offerings

Foundational Courses
Provide an overview of foundational information on renewable energy technologies, strategic energy planning, and grid basics

Leadership and Professional Courses
Cover the components of the project development process and existing project financing structures
# Foundational Courses

## Energy Basics
- Assessing Energy Needs and Resources
- Electricity Grid Basics
- Strategic Energy Planning

## Renewable Energy Technology Options
- Biomass
- Building Heat & Hot Water
- Geothermal
- Hydroelectric
- Solar
- Wind

All courses are presented as 40-minute webinars online at: [www.nterlearning.org](http://www.nterlearning.org)
### Essentials

**Project Development and Financing Essentials**
- Key concepts
- Process overview
- Decision points

### Advanced/In-Depth

#### Project Development
- **Concepts**
  - Risk and uncertainty
  - Tribal project roles
  - Policies and renewable energy (federal & state)
- **Process**
  - Project scale decision factors
  - Understanding the energy market
  - Project team
  - Procurement

#### Project Finance
- **Concepts**
  - LCOE
  - Business structures
  - Tax-equity partnerships
- **Process and Structures**
  - Direct ownership
  - Flip
  - Leaseback
  - Inverted lease

#### Project Scale
- Facility
- Community
- Commercial