DOE OFFICE OF INDIAN ENERGY

Renewable Energy Project Development and Financing: Facility Scale

Detailed Hypothetical Example of How to Use Renewable Power in Your Small to Medium-Sized Tribal Facilities

U.S. DEPARTMENT OF ENERGY | Office of Indian Energy

Course Outline

What we will cover…

- About the DOE Office of Indian Energy Education Initiative

- Facility-Scale Process: Hypothetical Example
  - Project development and financing **concepts**
  - Project development and financing **process and decision points**
  - Facility-scale project as an **investment (or commitment to an alternative utility payment)**
  - **How to pay** for facility-scale project (or the renewable energy from it)

- 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

Advanced/In-Depth

Detailed, academic information for deep understanding of concepts
Audience: Project and contract managers

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

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

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

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

About the Speaker

Tom Harris

- Project Leader in the Project Development and Finance Group at the National Renewable Energy Laboratory
- Supporting municipal, state, federal, and international clients in all aspects of energy portfolio and project development
- Utility distribution engineering, enterprise consulting, and law background

Agenda

- Project development and financing *concepts* for a **facility-scale** project
- Project development and financing *process and decision points* for a **facility-scale** project
- Facility-scale project as an *investment* (or alternative to utility payments)
- *How to pay* for a facility-scale project (or the renewable energy from it)

PROJECT DEVELOPMENT AND FINANCING CONCEPTS: FACILITY SCALE

Terminology: Project Scale

Facility

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

Community

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

Commercial

Definition: stand-alone project
Primary purpose: revenue generation, financial self-sufficiency

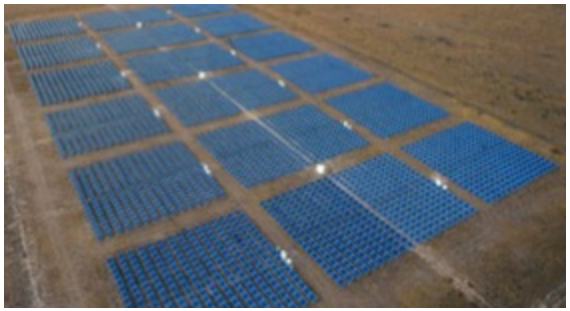


Photo credits: (top to bottom): NC Solar Center, NREL 09373; Orange County Convention Center, NREL 18077; Tucson Electric Power, NREL 13327

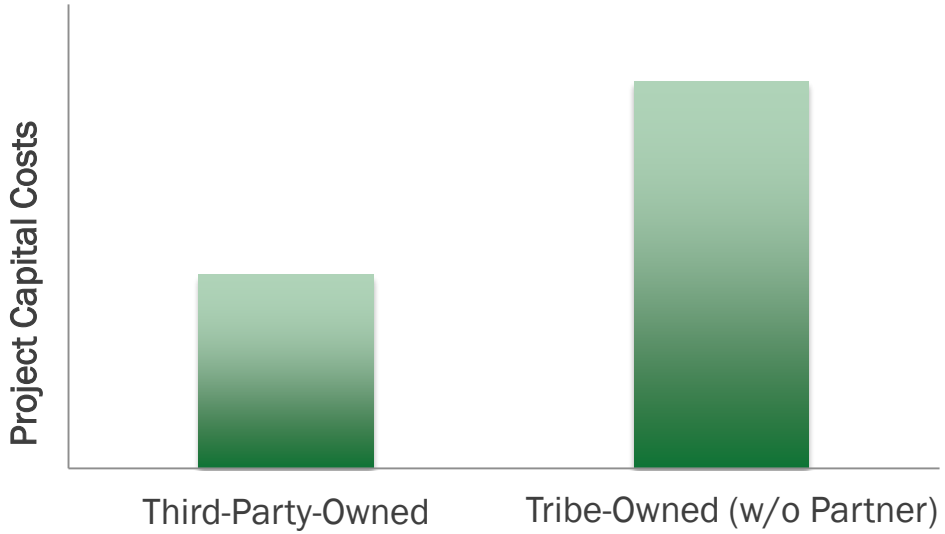
Why Elect to Do a Facility-Scale Project?

- Available, Tribe-controlled, *appropriate* location
  - May/may not be Tribe-owned
- Balance of factors not supportive of community or commercial scale
- Lower capital investment/lower overall risk (than a larger-scale facility)
- Gain experience with renewables before doing a larger-scale project
- Increase self-sufficiency, offset utility electricity costs/lower power bills
- Provide visual impact and green image
- Minimize environmental impact
- Diversify energy supply with local, renewable sources

Photo by Joe Ryan, NREL 19717

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

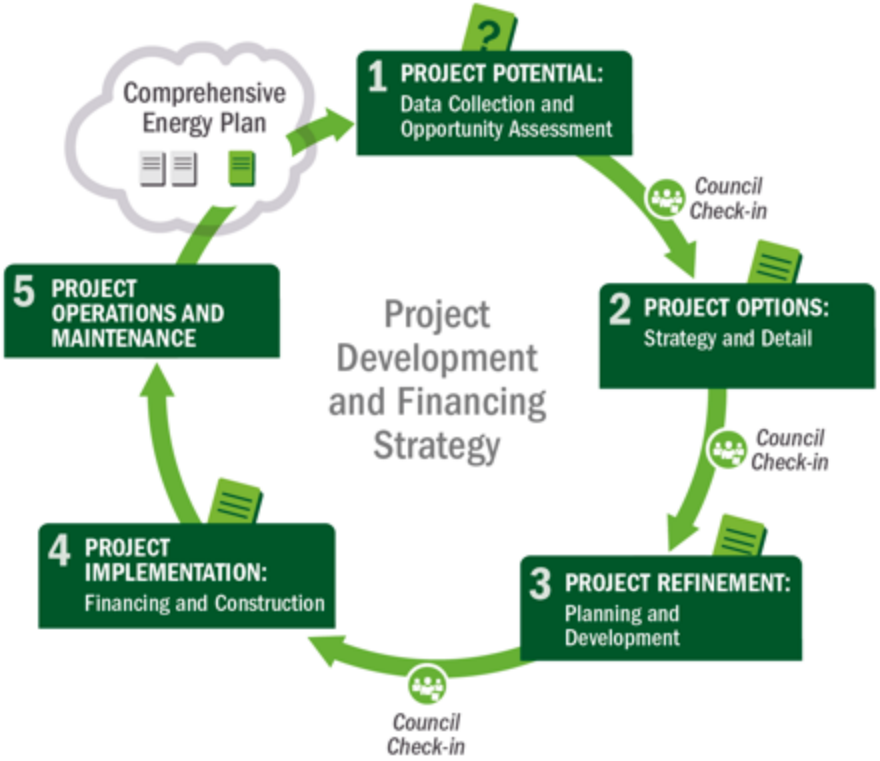
	Facility	Community	Commercial
Definition	Project serves one tribal facility/building	Project serves more than one tribal facility/building	Project power is sold to a third-party off-taker
Value Proposition	Save $$, reduce electricity cost, be more environmentally responsible	Save $$, reduce electricity cost, energy independence	Sale of power at competitive market terms whereby Tribe benefits
Tribe's Success Measurement	Cost avoidance	Cost avoidance	Revenue
LCOE Comparison	Retail electricity price	Retail electricity price	Wholesale electricity price
Key Decision Point	Savings/security of supply	Savings/security of supply	Revenue streams

Key Concepts

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

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

PROJECT DEVELOPMENT AND FINANCING: PROCESS AND DECISION POINTS FOR FACILITY SCALE


Comprehensive Energy Plan
1 PROJECT POTENTIAL: Data Collection and Opportunity Assessment
Council Check-in
2 PROJECT OPTIONS: Strategy and Detail
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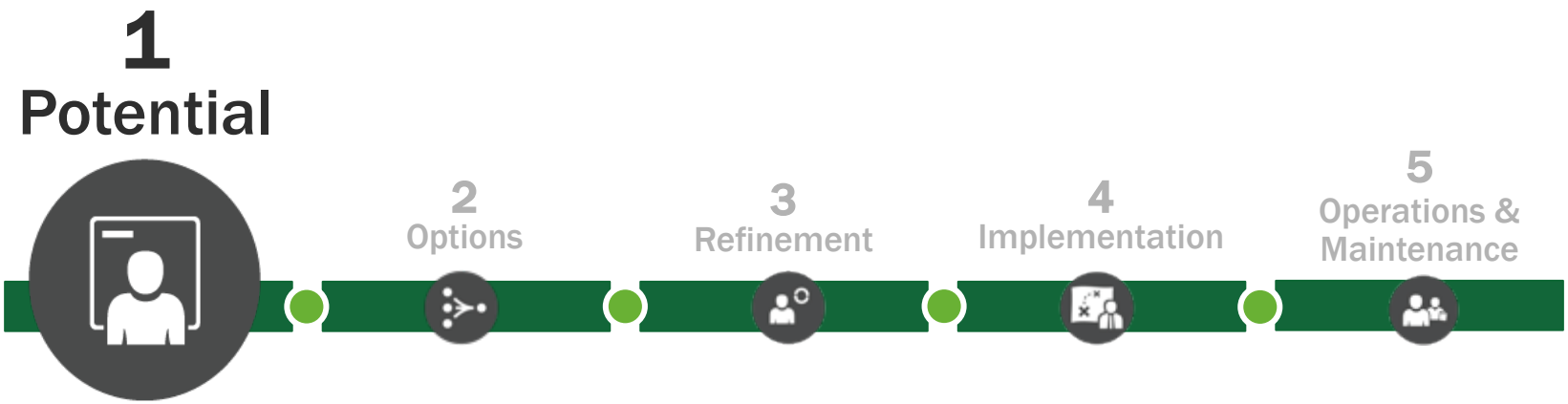
Project Development and Financing Strategy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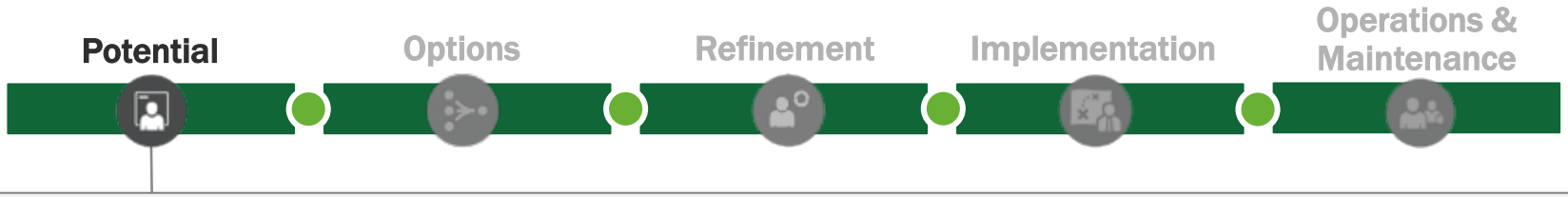
Step 1: Site, Scale, Resource and Market Potential



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

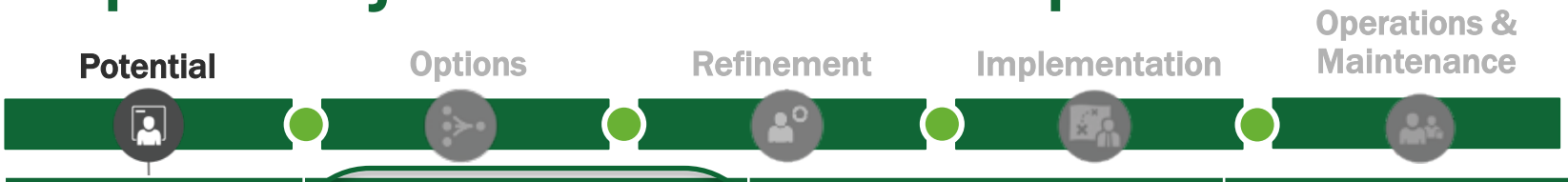
Tasks:

- Identify possible **site(s)** for project locations
- Confirm renewable energy **resource**
- Review tribal facility electric cost data, regulations for **permitting**, and interconnection requirements
- 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, net metering, feed-in tariff (FIT)

Step 1: Project Potential Example

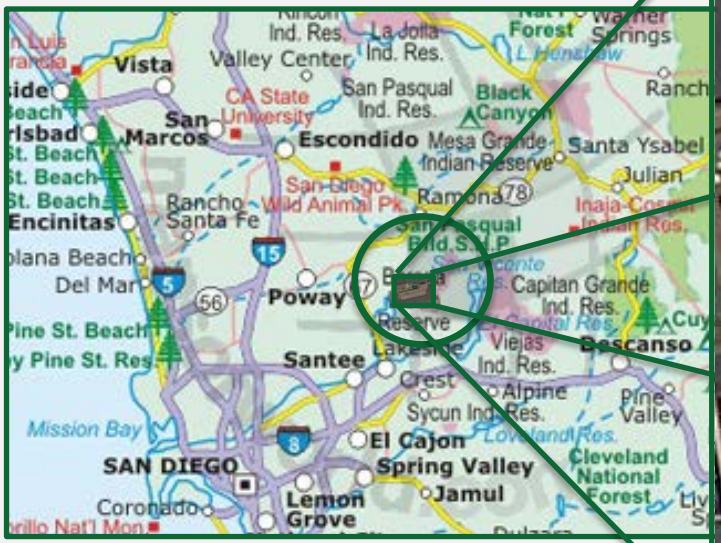


	Facility: California	Community: Minnesota	Commercial: Arizona
Baseline	Solar for peak demand! Solid San Diego market	Large facility (e.g., casino) or many small buildings	Resource size vs. market size
Economics	High cost/kWh Time of use Com, Res: ~16¢	Mid cost/kWh Retail Ind., Com, Res: 6.5¢–11.0¢ *(Wholesale: 3.75¢)*	Low cost/kWh Wholesale: 3.54¢ *(if BTM, Retail Ind, Com: 6.6¢–9.5¢)*
Policy	RPS: 33% (2020 GAP) Net metering (1 MW) FIT 1.5 MW – >3 MW California Solar Initiative	RPS: 25% by 2025 No transmission needed *(Net metering <40 kW)*	Gap meeting 15% RPS *Net metering (no limit; only if selling behind the meter [BTM])*
Technology	Solar resource rich; solar dominates Southern CA	Wind resource rich; not nearly as much solar	Solar (photovoltaic [PV] or concentrating PV) strong, commercial
Consensus	Given facts, should Tribe pursue?	Given facts, should Tribe pursue?	Given facts, should Tribe pursue?

Framework: NREL BEPTC™
Information sourced from Thomas, Pilar; "Briefing the Senate Natural Resources Committee and Senate Indian Affairs Committee," May 18, 2012. 2011 retail and wholesale rates: Energy Information Administration

Step 1: Site

Potential | Options | Refinement | Implementation | Operations & Maintenance

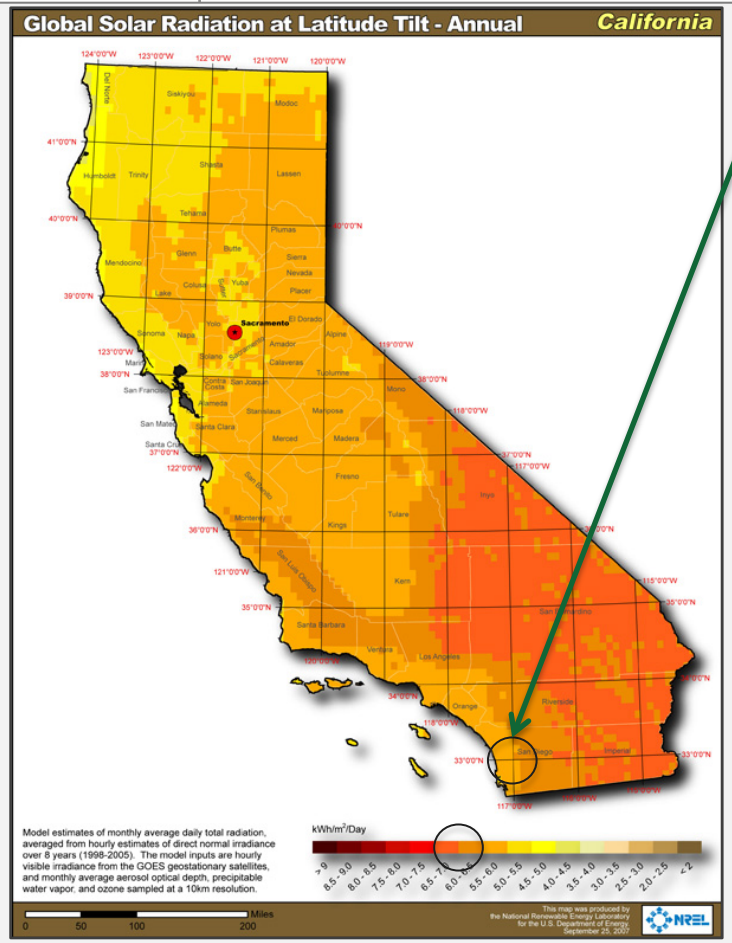


http://www.mapsofworld.com/usa/county-maps/california/san-diego-county-map.html#

https://maps.google.com/maps?f=q&source=s_q&hl=en&geocode=&authuser=0&q=Barona+Cultural+Center+%26+Museum,+Barona+Road,+Lakeside,+CA&aq=0&oq=barona+cultural&vps=4&sll=32.941896,-116.855156&sspn=0.000851,0.001705&vpsrc=6&t=h&gl=us&ie=UTF8&hq=Barona+Cultural+Center+%26+Museum,+Barona+Road,+Lakeside,+CA&hnear=&radius=15000

Step 1: Resource, Off-take, Production, Savings

Potential | Options | Refinement | Implementation | Operations & Maintenance



6–7 kWh/m²/day – good!

Off-taker:

Hybrid when instantaneous facility electric load

- > production: facility is off-taker
- < production: utility is off-taker by virtue of net metering or FIT

Production:

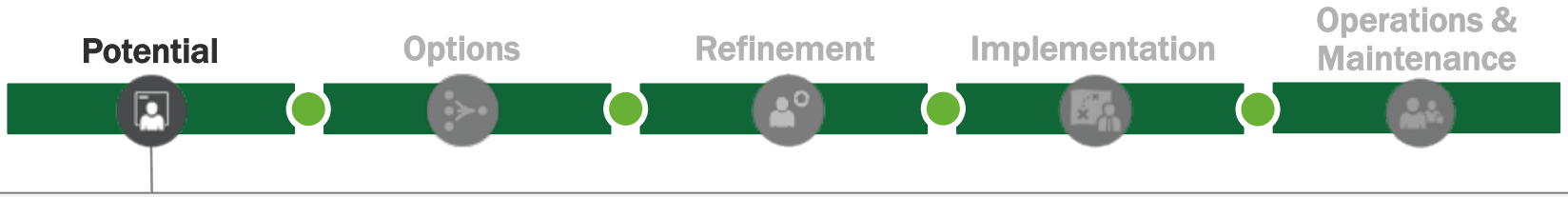
- Utilize NREL's online tool PVWATTS® for production estimate: 15,394 kWh/yr

Savings:

- Assume power purchase agreement (PPA) of $0.12/kWh and retail average cost during production of $0.16/kWh
- $616/year

http://apps1.eere.energy.gov/states/images/maps/map_large_pv_CA.jpg

Step 1: Hypothetical Facility-Scale Example – Outputs



- ✓ **Technology** – PV at this scale
- ✓ **Project scale** – 10 kW DC
- ✓ **Resource and market context** – excellent
- ✓ **Savings/production potential** – ~$616/~15,394 kWh/yr
- ✓ **Preliminary sites options** – cultural museum, small facility
- ✓ **Team** – assume leaders and facility administrators are in favor, support, champion the project
- ✓ **Tribal role options** – own or host and purchase renewable energy (PPA)

Facility-Scale Project Risk – Post Step 1

	Risks	Risk Assessment Post Step 1
Development	Loss/waste of development resources	Low but rising; "calculated"
Site	Improper orientation or project affected by shade	Reduced
	Inadequate foundation or structural integrity	Assumed low
	Site control challenges for safety/security purposes	Assumed low
Permitting	Tribe-adopted codes and permitting challenges	Reduced
	Utility interconnection challenges	Reduced
Finance	Capital constraints	Assumed low
	Incentive unavailability or insufficiency	Reduced
Construction/ Completion	Engineering, procurement, and construction difficulties	Assumed low, mitigable, or allocatable
	Cost overruns	Assumed low, mitigable, or allocatable
	Schedule overruns	Assumed low, mitigable, or allocatable
Operating	Output shortfall from expected	Assumed low, mitigable, or allocatable
	Operations & maintenance (O&M) issues	Assumed low, mitigable, or allocatable

NOTE: Underlining signifies that the risk assessment outcome changes during the step at hand.

Sources: Adapted from Holland & Hart, RE Project Development & Finance & Infocast, Advanced RE Project Finance & Analysis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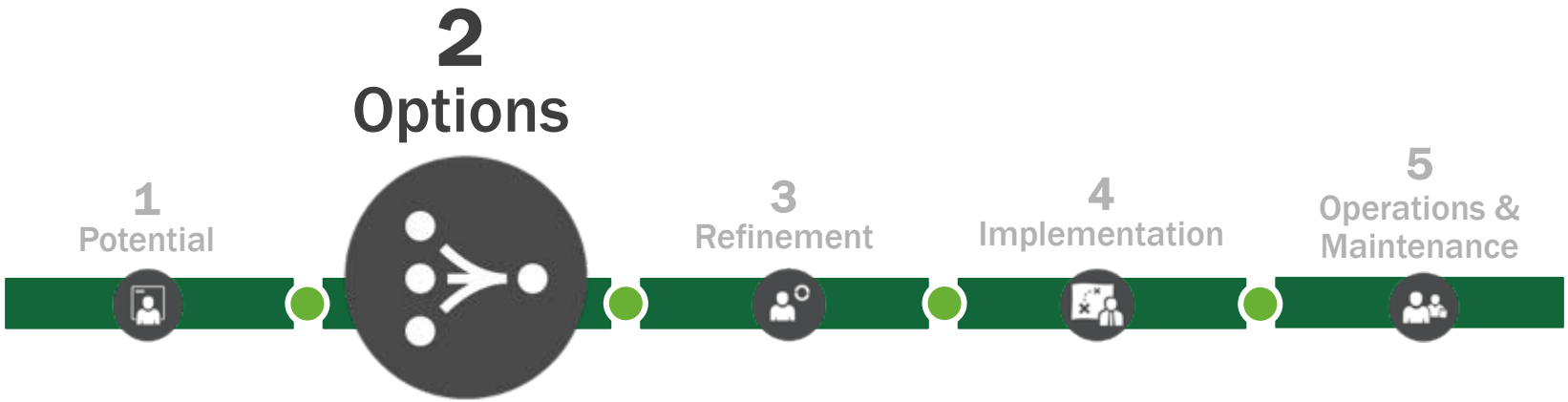
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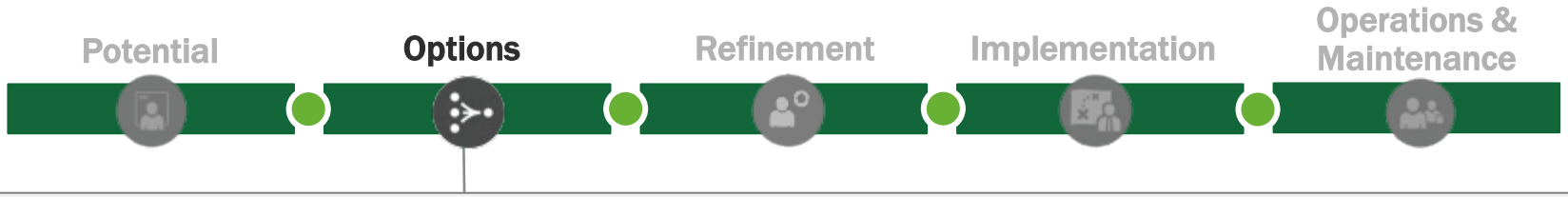
Step 2: Project Ownership Options and Permitting



Purpose: Decide ownership structure and determine permitting considerations

Tasks:

- Understand ownership structures and usual risk allocations inherent
- Consider what ownership approach best corresponds to tribal entity goals and situation
- Understand and plan for permitting and site use considerations
- Begin investigation of interconnection agreements and utility requirements

Key question: What viable ownership structure options are attractive to the facility?

Key Concept: Project Role Definitions

Title	Role
Resource/Land Owner	Owner or long-term lessor of project site
Generation Equipment Owner	Legal owner of generation equipment
Sponsor/Developer	Organizes all of the other parties and typically controls and makes an equity investment in the company or other entity that owns the project
Engineering Procurement and Construction Contractor (EPC)	Construction contractor provides design, engineering, and construction of the project
Financier	Entity that provides any loan to the EPC or owner to construct the project and may take a security interest in the project assets
Operator	Provider of the day-to-day O&M of the project
Product Off-taker	Entity that usually has a long-term contract to purchase the energy (and sometimes the renewable attributes) produced by the project

Key Concept: Tribal Role Options

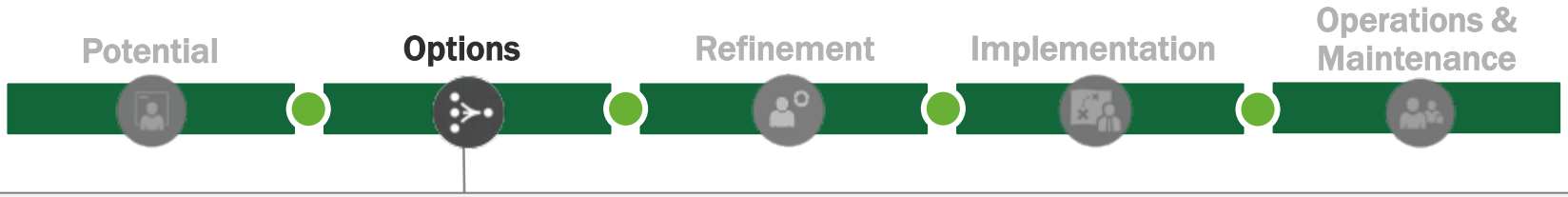
* Also called Tribal Host

Key Concept: Tribal Role Options

Role	Opportunity	Constraints	Comments
Resource/ Land Owner*	Utilization of otherwise unused area such as rooftop/small land parcel	Commits land or area to predetermined use for period of years. Must provide site access.	Limited risk associated with potential opportunity cost
Off-taker/ Energy User	Typically present energy cost savings and future price risk mitigation	Possible opportunity cost if utility prices fall in future	A role typically shared with utility somewhat. Historical price trends support the opportunity—low risk.
Financier	Potential for lower-cost financing	• Requires ready capital • For more sophisticated financing arrangements likely require bundling of multiple facility-scale projects	• Med. risk, more complex • May require lending knowledge • Option for Tribes with limited lands, lots of $
Sponsor/ Developer	Self-determination of project; potential for profits (and losses) is moderate. Tribes with $ don't need investors.	• Investors require experience • Only consider as a new business (do multiple projects for diverse portfolio)	• High risk, complex • Tribes may be best served by outsourcing
Generation Equipment Owner	Potential for profits (and losses) is moderate. Tribes with $ don't need investors.	• Only consider as a new business (do multiple projects for diverse portfolio) • Tribes investing money may not want this high risk/return investment • Tribe may not realize federal tax benefits as direct owner	• A project pipeline/portfolio mitigates some risks
Operator	Control and self-determination of project's potential for profits (and losses) is minimal	• Investors require experience • Only consider as a new business (multiple projects in a portfolio)	• Tribes may be best served by outsourcing

* Also called Tribal Host

Step 2: Permitting and Interconnection



Permitting

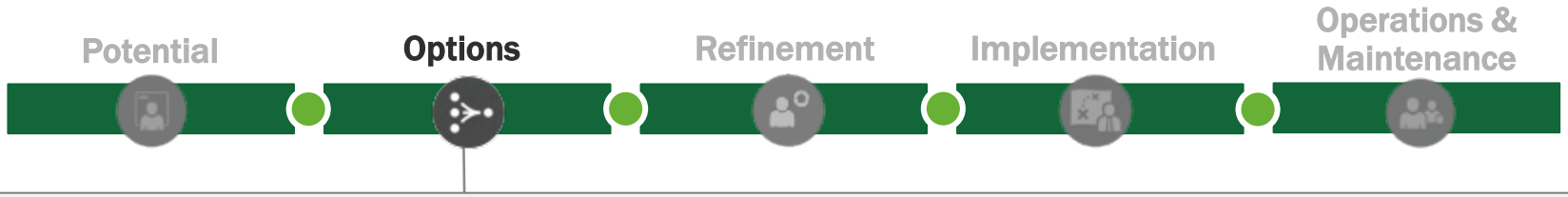
- Ensure tribal experts familiar with permitting are on the team
- Discuss/document and factor permitting actions and timeline into the evolving project plan
- Plan/schedule such that permitting is complete or eminent before contracting

Interconnection

- Inspect utility interconnection agreement and process early involving key tribal stakeholders
- Consider need for system impact or interconnection study
- Third party owner often handles interconnection process and agreement

Key questions: What will be involved in permitting and getting the project interconnected and operational?

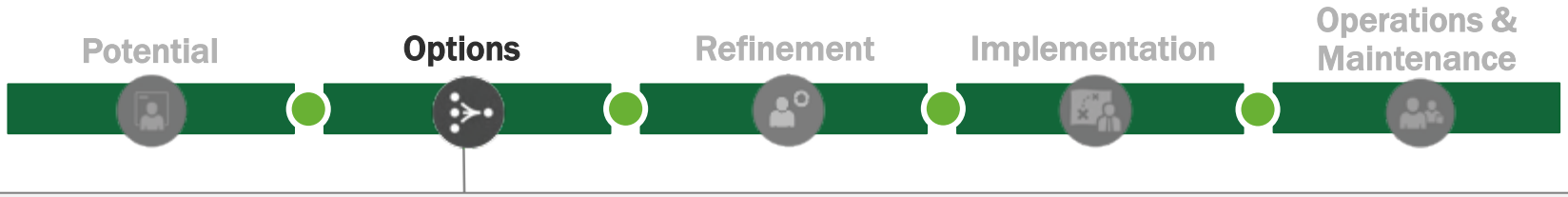
Step 2: Ownership Structure Options



- Direct ownership
- Third-party owned; PPA

Key question: What viable ownership structure options are attractive to the facility?

Step 2: Hypothetical Facility-Scale Example – Outputs



- ✓ **Permit needs and process –** local and tribal experts manage permitting requirements
- ✓ **Interconnection –** tribal decision-makers investigate utility processes and agreements and begin consideration
- ✓ **Finance options and costs –** private third-party financing secured through developer/owner
- ✓ **Tribal role options –** host and purchase renewable energy (PPA)

Facility-Scale Project Risk – Post Step 2

	Risks	Risk Assessment Post Step 2
Development	Loss/waste of development resources	Still low but rising; "calculated;" more assurance of success
Site	Improper orientation or project affected by shade	Reduced
	Inadequate foundation or structural integrity	Assumed low; developer to assess
	Site control challenges for safety/security purposes	Assumed low
Permitting	Tribe-adopted codes and permitting challenges	Further reduced; now well informed (team-critical)
	Utility interconnection challenges	Reduced
Finance	Capital constraints	Assumed low; PPA elected
	Incentives unavailability or insufficiency	Low; allocate to developer to facilitate
Construction/ Completion	Engineering, procurement, and construction difficulties	Low; allocate to EPC/developer
	Cost overruns	Low; allocate to EPC/developer
	Schedule overruns	Low; allocate to EPC/developer
Operating	Output shortfall from expected	Low; allocate to owner
	Technology O&M failure	Low; allocate to owner or O&M contractor

NOTE: Underlining signifies that the risk assessment outcome changes during the step at hand.

Sources: Adapted from Holland & Hart, RE Project Development & Finance & Infocast, Advanced RE Project Finance & Analysis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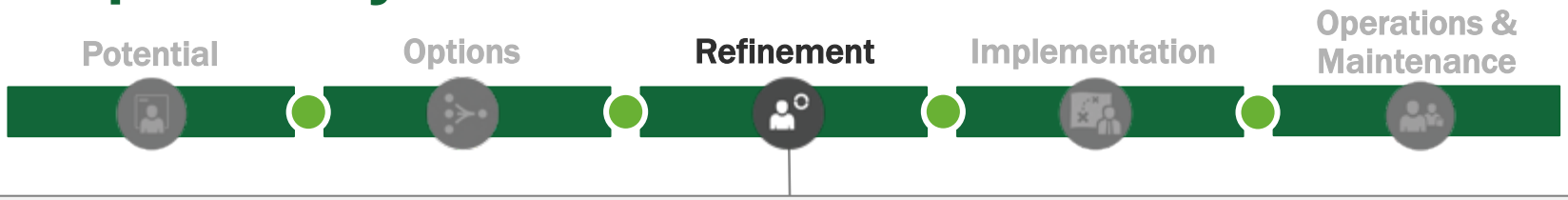
Step 3: Project Refinement



Purpose: Validate decisions, complete permitting

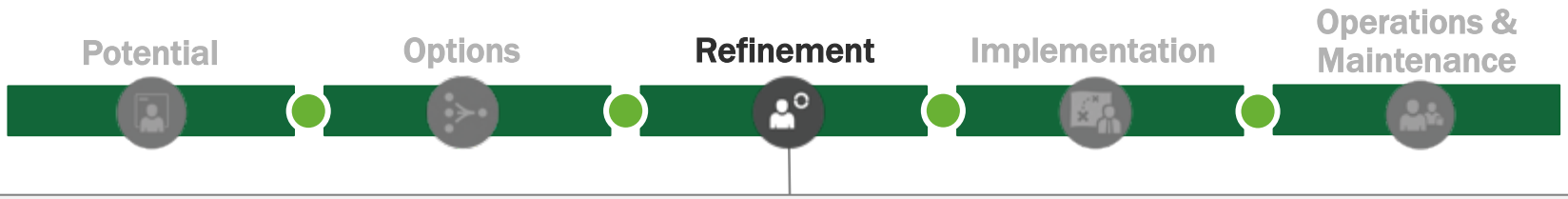
Tasks:

- Confirm that ownership structure decision was valid
- Finalize permitting (including environmental reviews)

Outputs:

- Confirm cost savings or goals to be met
- Vendors selected
- Completed environmental reviews and finalized permits

Step 3: Project Refinement – Outstanding Risks



Site	Resource	Off-take	Permits	Technology	Team	Capital
Securing site: No site, no project	Engineering assessment (input)	Power purchases: off-take contract – (revenue)	Anything that can stop a project if not in place…	Engineered system (output)	Professional, experienced, diverse	Financing structure
• Site control • Size and shape • Location to load and T&D • Long-term control • Financial control • Clear title • Lease terms • Collateral concerns • Environmental • Access • O&M access • Upgradable	• Volume/ Frequency • Variability • Charac-teristics (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 inter-connection • 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 • Environ-mental attribute sales contracts (RECs) • Bond finance

Simple LCOE Tools: Geo, Wind, PV, Digester

Available at: http://financere.nrel.gov/finance/content/CREST-model

Cost of Renewable Energy Spreadsheet Tool (CREST) Model:

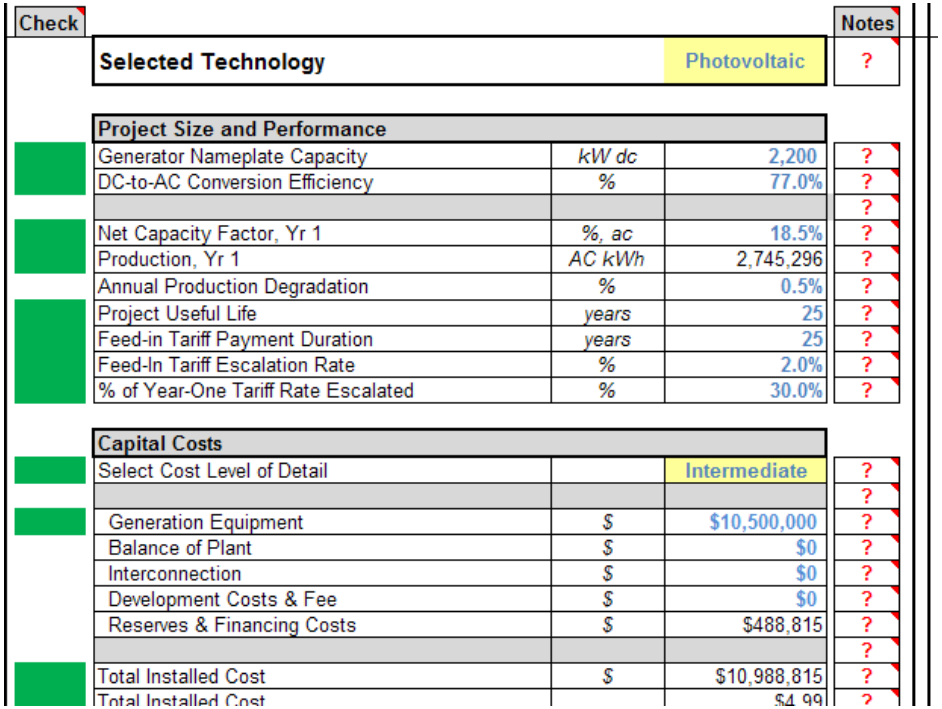
- Designed to give public utility commissions (PUCs) and others a tool and methodology to quickly evaluate LCOE
- Can handle simple or complex level of inputs (user's choice)
- Simple to operate—no macros
- Outreach and interaction tool:
  - PUCs
  - Utilities
  - Other stakeholders
- Solar, geothermal, wind, and anaerobic digester

White Paper:

Describes each term in LCOE and weighs choices for analysis methodology

Renewable Energy Cost Modeling: A Toolkit for Establishing Cost-Based Incentives in the United States

http://www.nrel.gov/docs/fy11osti/51093.pdf



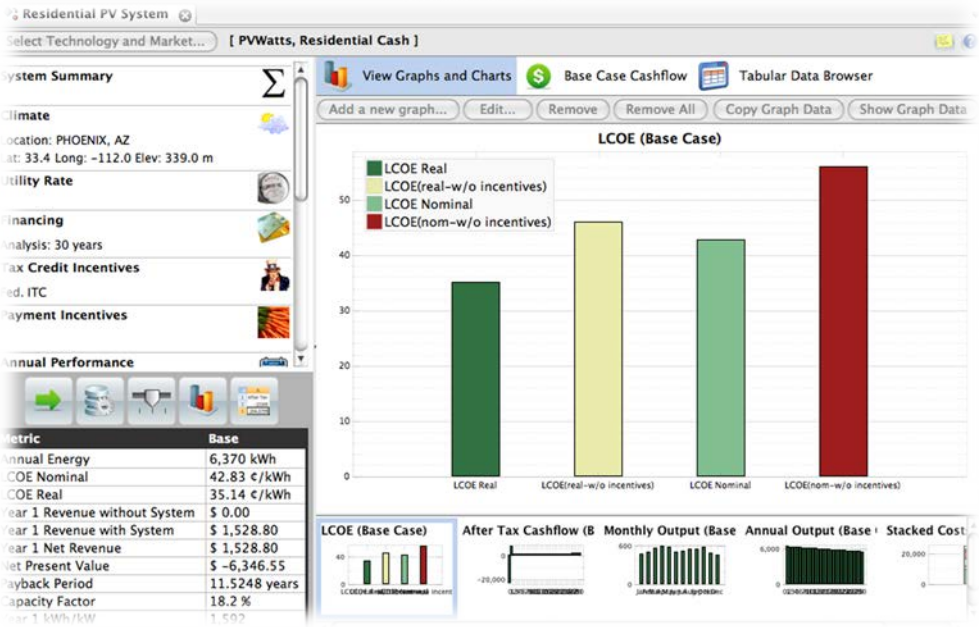
Check				Notes
	Selected Technology		Photovoltaic	?
	Project Size and Performance			
	Generator Nameplate Capacity	*kW dc*	2,200	?
	DC-to-AC Conversion Efficiency	%	77.0%	?
				?
	Net Capacity Factor, Yr 1	*%, ac*	18.5%	?
	Production, Yr 1	*AC kWh*	2,745,296	?
	Annual Production Degradation	%	0.5%	?
	Project Useful Life	*years*	25	?
	Feed-in Tariff Payment Duration	*years*	25	?
	Feed-In Tariff Escalation Rate	%	2.0%	?
	% of Year-One Tariff Rate Escalated	%	30.0%	?
	Capital Costs			
	Select Cost Level of Detail		Intermediate	?
				?
	Generation Equipment	$	$10,500,000	?
	Balance of Plant	$	$0	?
	Interconnection	$	$0	?
	Development Costs & Fee	$	$0	?
	Reserves & Financing Costs	$	$488,815	?
				?
	Total Installed Cost	$	$10,988,815	?
	Total Installed Cost		$4.99	?

Advanced Tool: NREL's System Advisor Model

Available at: https://www.nrel.gov/analysis/sam/

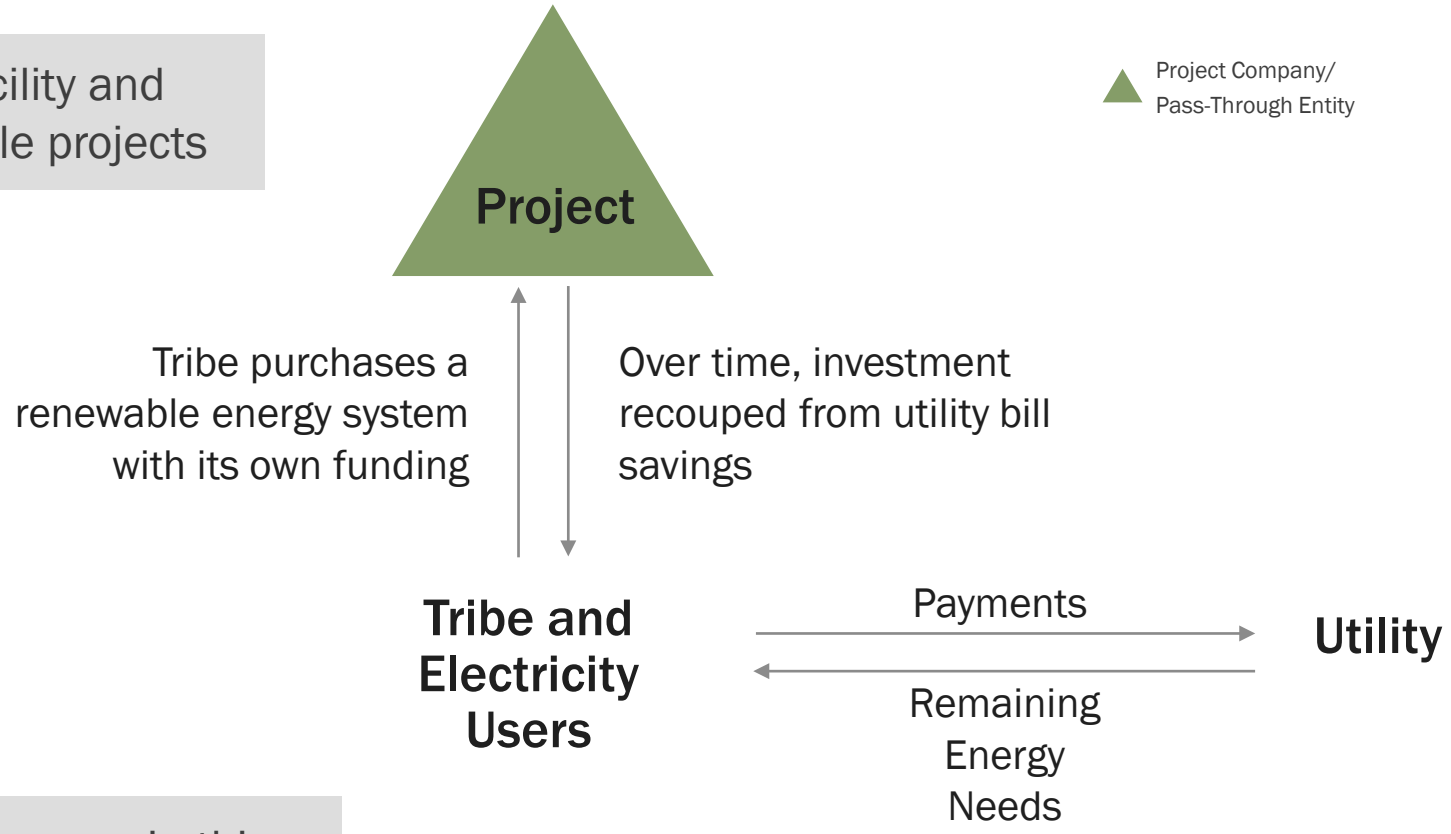
NREL's System Advisor Model (SAM) is a free computer program that **calculates a renewable energy system's hourly energy output** over a single year and **calculates the cost of energy** for a renewable energy project over the life of the project.

- 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



Direct Ownership Structure

Primarily for facility and community-scale projects



The Tribe is the owner in this structure and self-generates its electricity

Ownership Options – Direct Ownership

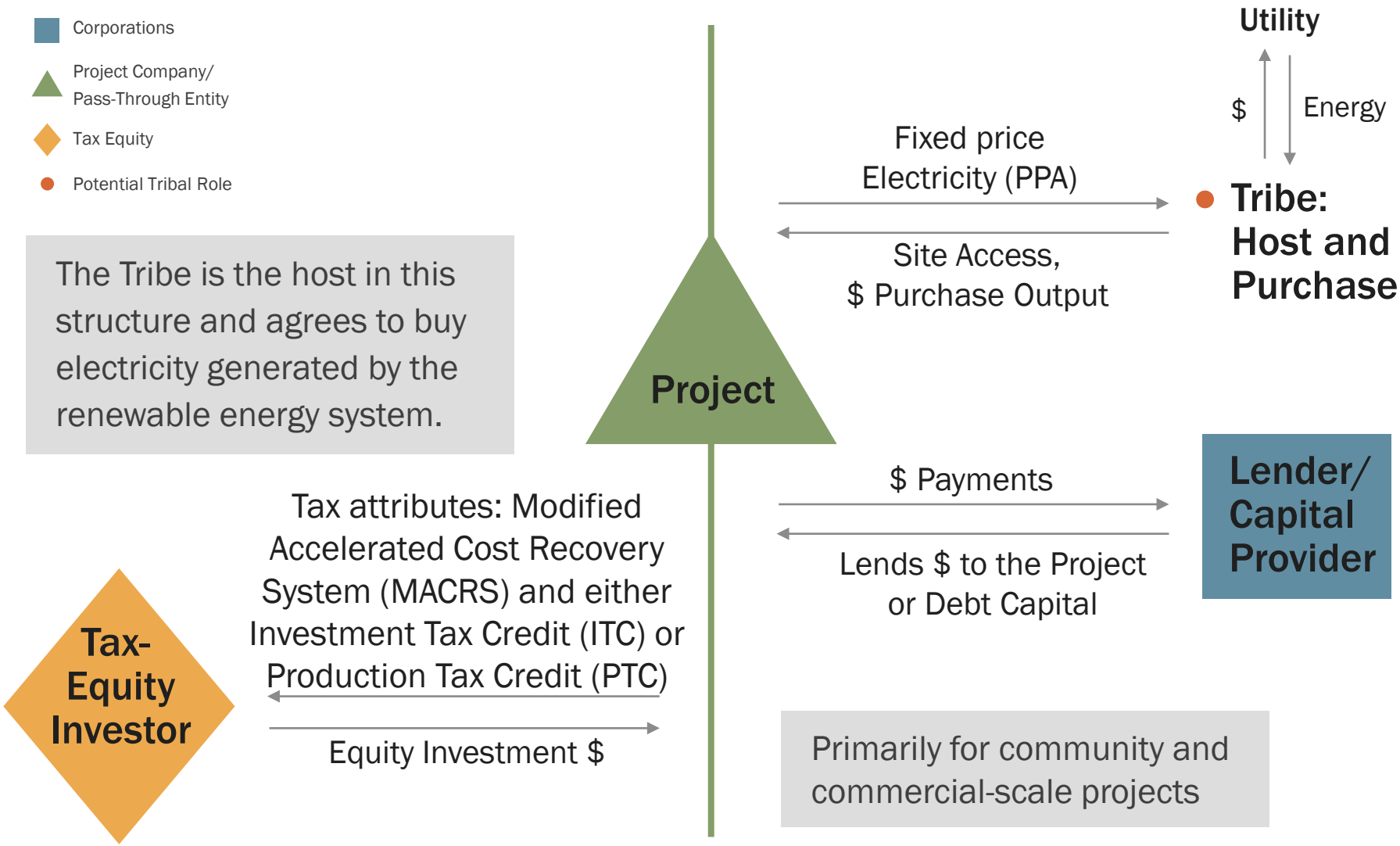
Advantages

- Maximum reduction in electricity bills
- Lower finance costs (or none depending on source)
- Full control over a project: design, operations, and risks
- Own renewable energy credits (RECs) and can choose to retain or monetize
- Might be only option for small projects

Challenges

- Need the resources to pay for the project
- Don't fully benefit from available tax incentives given tax-exempt status
- Responsibilities of ownership (operations & maintenance)

Tax-Equity Partnerships and Third-Party PPAs



Tax-Equity Partnerships and Third-Party PPAs

Advantages

- No/low up-front outlay of capital
- Ability for tax-exempt entity to benefit from savings derived from tax-based incentives
- Fixed electricity price for 15–25 years
- No operating and maintenance responsibilities
- Path to ownership if desired

Challenges

- The process of negotiating a PPA *can be* (but isn't necessarily) lengthy and costly
- Need to be able to enter into longer-term contracts (10–25 yrs)
- Still pay for 100% of electricity
- Don't own the green attributes (RECs) unless they are purchased
- Need to allow and manage site access

Step 3: Project Refinement – Ownership Approach and Vendor Selection

Market research and tools permit comparison of alternatives:

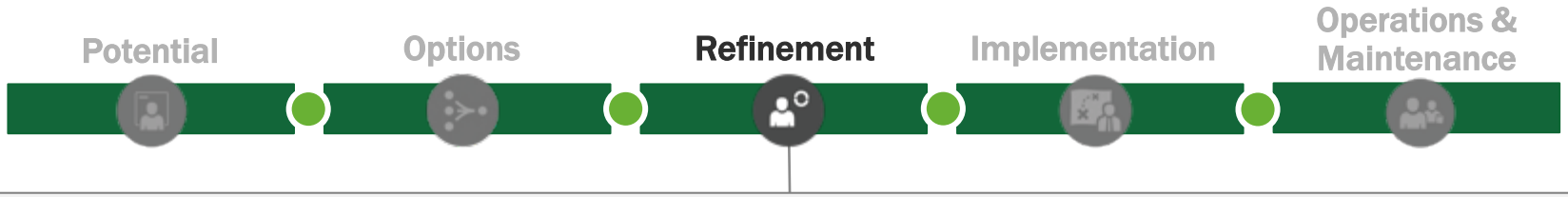
- Evaluate baseline, ongoing utility costs with escalation and variation
- Evaluate PPA price and expected production and subtract expected production as utility savings going forward
- Consider direct ownership
  - Only if:
    - Cash or financing available
    - Project is desired use of funds
    - Risks and responsibilities are appropriate—even if best economic case, do you want the risks and responsibilities?
  - Factors
    - Outlay
    - O&M, repair and replacement (R&R), insurance
    - Cost of money
    - System degradation
    - Utility savings from expected production
- Metrics for comparison
  - LCOE
  - Net present value
  - Savings-to-investment ratio

The market research performed at this stage (could be informal, depending on tribal rules) will usually provide sufficient information for selection of a developer/vendor.

Step 3: Project Refinement – Permitting

- Bureau of Indian Affairs (BIA) approval required for leases and rights-of-way on tribal lands
- Federal environmental (National Environmental Policy Act [NEPA]) and other statutory review (environmental assessment [EA], environmental impact assessment [EIA], categorical exclusions [CatX]) may be required, so assess implicated sacred sites such as:
  - Burial grounds
  - Native plant harvesting areas
  - Ceremonial locations.
- Consult with Tribe on unique or archaeological resources or culturally relevant features on a proposed site
- Utilize attorneys, local staff, and tribal contacts knowledgeable in complexities of leasing, permitting, and project siting on tribal lands
- Understand scheduling implications of all of the above

Step 3: Hypothetical Facility-Scale Example – Outputs



- ✓ **Decision confirmation on ownership structure** – third-party owned PPA
- ✓ **Economic models/market research** – PPA is economical
- ✓ **Vendor(s) selected** – SD Solar*
- ✓ **Finalized permits** – selected rooftop was not sensitive and required no special permitting⁺
- ✓ **Interconnection** – negotiating with utility or contractor will manage

*Hypothetical contractor
⁺ No implication intended as to actual permitting that would be required for project on rooftop of tribal facility

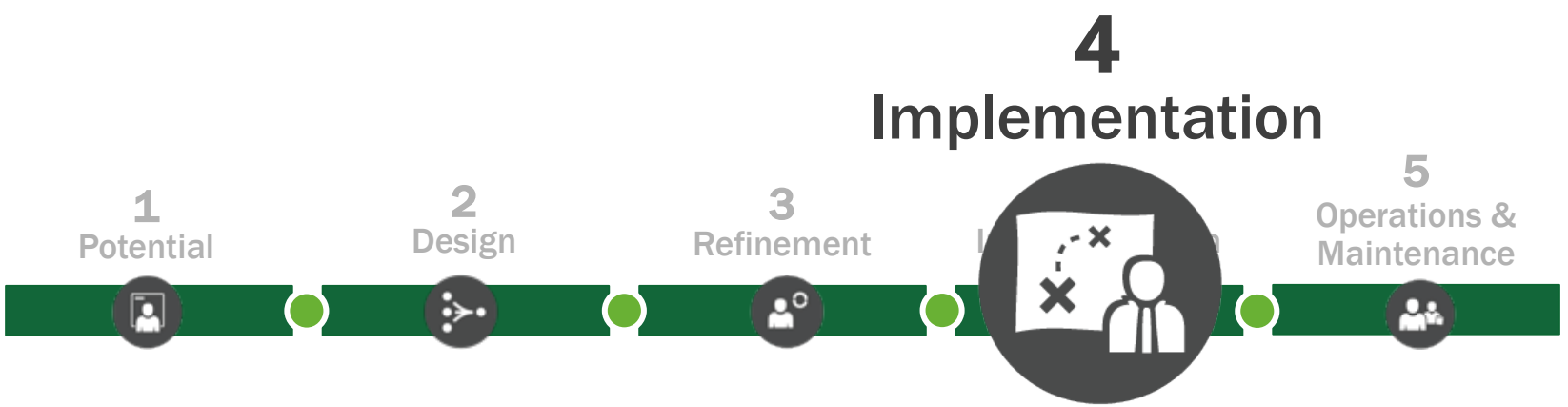
Facility-Scale Project Risk – Post Step 3

	Risks	Risk Assessment Post Step 3
Development	Loss/waste of development resources	Medium; now with more assurance of success
Site	Improper orientation or project affected by shade	Low; some may be assumed by host
	Inadequate foundation or structural integrity	Assumed low; developer to assess
	Site control for challenges for safety/security purposes	Assumed low
Permitting	Tribe-adopted codes and permitting challenges	Low; permitting completed
	Utility interconnection challenges	Reduced
Finance	Capital constraints	Low; PPA elected and confirmed
	Incentive unavailability or insufficiency	Low; allocate to developer to facilitate
Construction/ Completion	Engineering, procurement, and construction difficulties	Low; allocate to EPC or developer
	Cost overruns	Low; allocate to EPC or developer
	Schedule overruns	Low; allocate to EPC or developer
Operating	Output shortfall from expected	Low; allocate to owner
	Technology O&M failure	Low; allocate to owner or O&M contractor

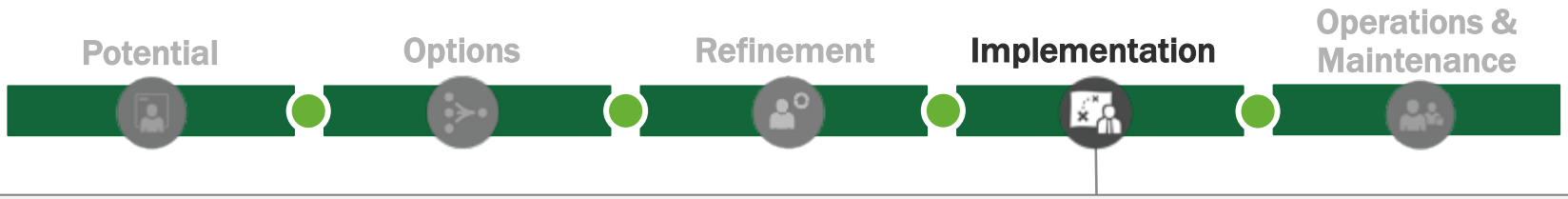
NOTE: Underlining signifies that the risk assessment outcome changes during the step at hand.

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


Comprehensive Energy Plan
1 PROJECT POTENTIAL: Data Collection and Opportunity Assessment
Council Check-in
2 PROJECT OPTIONS: Strategy and Detail
Council Check-in
3 PROJECT REFINEMENT: Planning and Development
Council Check-in
4 PROJECT IMPLEMENTATION: Financing and Construction
5 PROJECT OPERATIONS AND MAINTENANCE
Project Development and Financing Strategy


4
Implementation
1
Potential
2
Design
3
Refinement
5
Operations & Maintenance

Step 4: Implementation



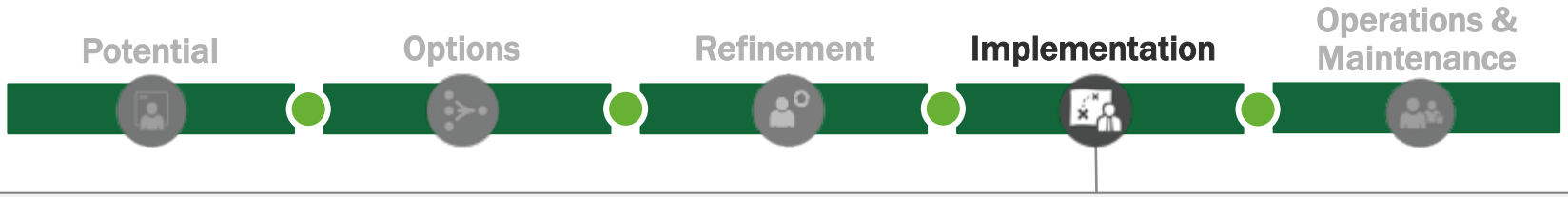
Purpose: Contract for, realize physical construction of project

Tasks:

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

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

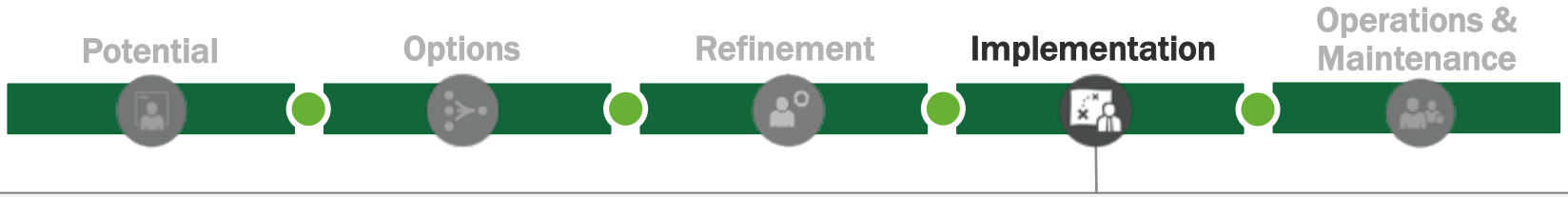
Interconnection:

- 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 Facility Scale Example – Outputs



✓ Completed and operating project

Project Implementation Success

- Project generating electricity
- Facility utilizing generated electricity

Photo by Dennis Schroeder, NREL 21512

Facility-Scale Project Risk – Post Step 4

	Risks	Risk Assessment Post Step 4
Development	Loss/waste of development resources	Medium; now with more assurance of success
Site	Improper orientation or project affected by shade	Low; some may be assumed by host
	Inadequate foundation or structural integrity	Low; developer assessed
	Site control for challenges for safety/security purposes	Low; some assumed by host
Permitting	Tribe-adopted codes and permitting challenges	Low; permitting completed
	Utility interconnection challenges	None
Finance	Capital constraints	None; project constructed/commissioned
	Incentive unavailability or insufficiency	Low to none; allocated to developer
Construction/ Completion	Engineering, procurement, and construction difficulties	None; EPC complete
	Cost overruns	None; construction complete
	Schedule overruns	None; construction complete
Operating	Output shortfall from expected	Low; allocated to owner
	Technology O&M failure	Low; allocated to owner or O&M contractor

NOTE: Underlining signifies that the risk assessment outcome changes during the step at hand.

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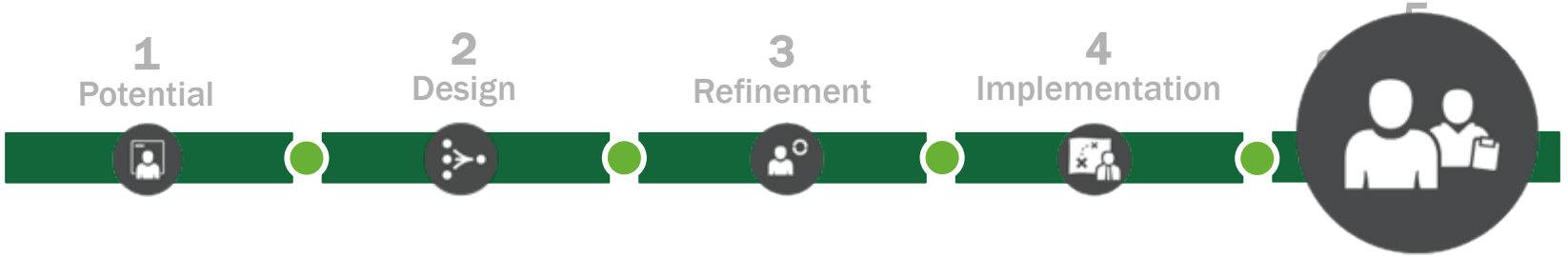
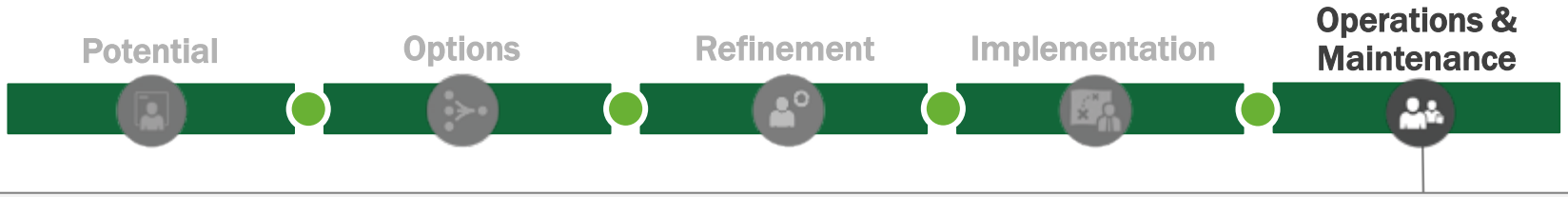
Project Development and Financing Strategy


5
Operations & Maintenance
1
Potential
2
Design
3
Refinement
4
Implementation

Step 5: Operations & Maintenance



Purpose: Conduct or ensure ongoing O&M/R&R*

O&M Costs:

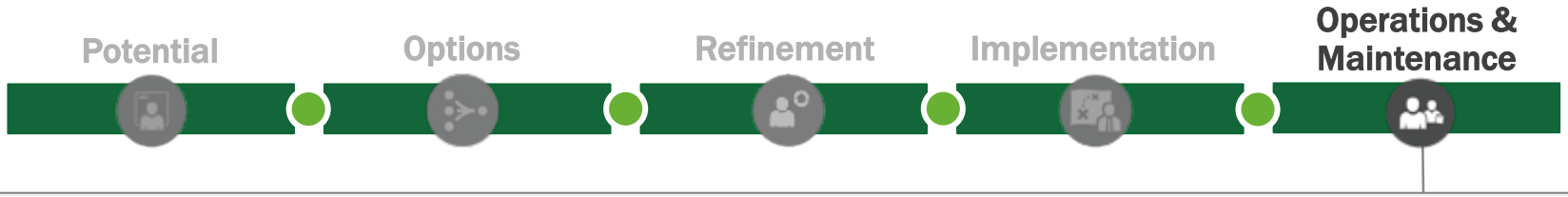
- Equipment maintenance and upkeep
- Inverter replacement
- Insurance
- Labor and staffing
- Extended warranty agreements

If PPA, vendor typically manages maintenance

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

Photo from Henry Price, NREL 14952

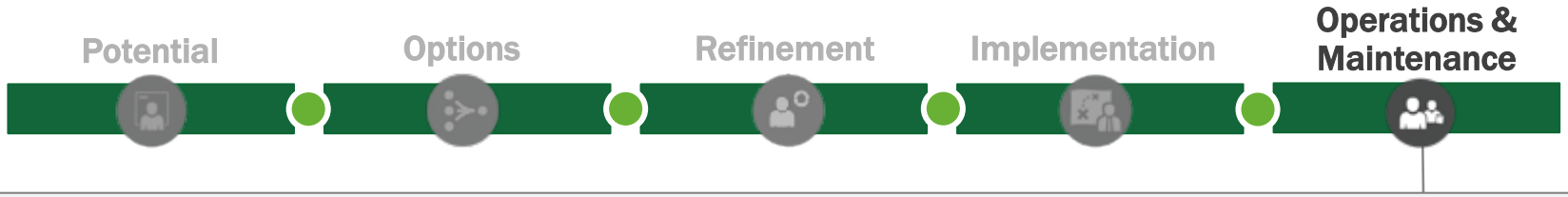
Step 5: O&M Example



In our hypothetical case, the museum and cultural center elected the PPA third-party ownership model.

- Museum has no responsibility for O&M
- If O&M is not conducted and the system doesn't produce, the museum still only pays for delivered energy
- The vendor is incented to keep the system in good working order so that it continues to receive revenues

Step 5: Outputs



- Ensure that responsible party carries out O&M/R&R*
- Measuring and tracking success
- Correlation with business plan and comprehensive energy plan
- Reporting

* Esp. if owner

Photo from Henry Price, NREL 14952

Facility-Scale Project Risk – Post Step 5

	Risks	Risk Assessment Post Step 5
Development	Loss/waste of development resources	Medium; now with more assurance of success
Site	Improper orientation or project affected by shade	Low; some assumed by host
	Inadequate foundation or structural integrity	Low; developer assessed
	Site control for challenges for safety/security purposes	Low; some assumed by host
Permitting	Tribe-adopted codes and permitting challenges	Low; permitting completed
	Utility interconnection challenges	None
Finance	Capital constraints	None; project constructed/commissioned
	Incentive unavailability or insufficiency	Low to none/allocated to developer
Construction/ Completion	Engineering, procurement, and construction difficulties	None; EPC complete
	Cost overruns	None; construction complete
	Schedule overruns	None; construction complete
Operating	Output shortfall from expected	Being managed by appropriate party
	Technology O&M failure	Being managed by appropriate party

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.

Summary of Actions by Step

Step 1: Gather all relevant data in order to make first pass at potential project, understand tribal role options

Step 2: Consider ownership approach, begin to identify vendors, begin planning interconnection and permitting in consideration of site use

Step 3: Finalize permitting, choose vendor(s), and confirm economic and ownership structure decision, negotiate interconnection if needed

Step 4: Finalize agreements (incl. vendor contracting), installation, interconnection, commissioning, begin operation

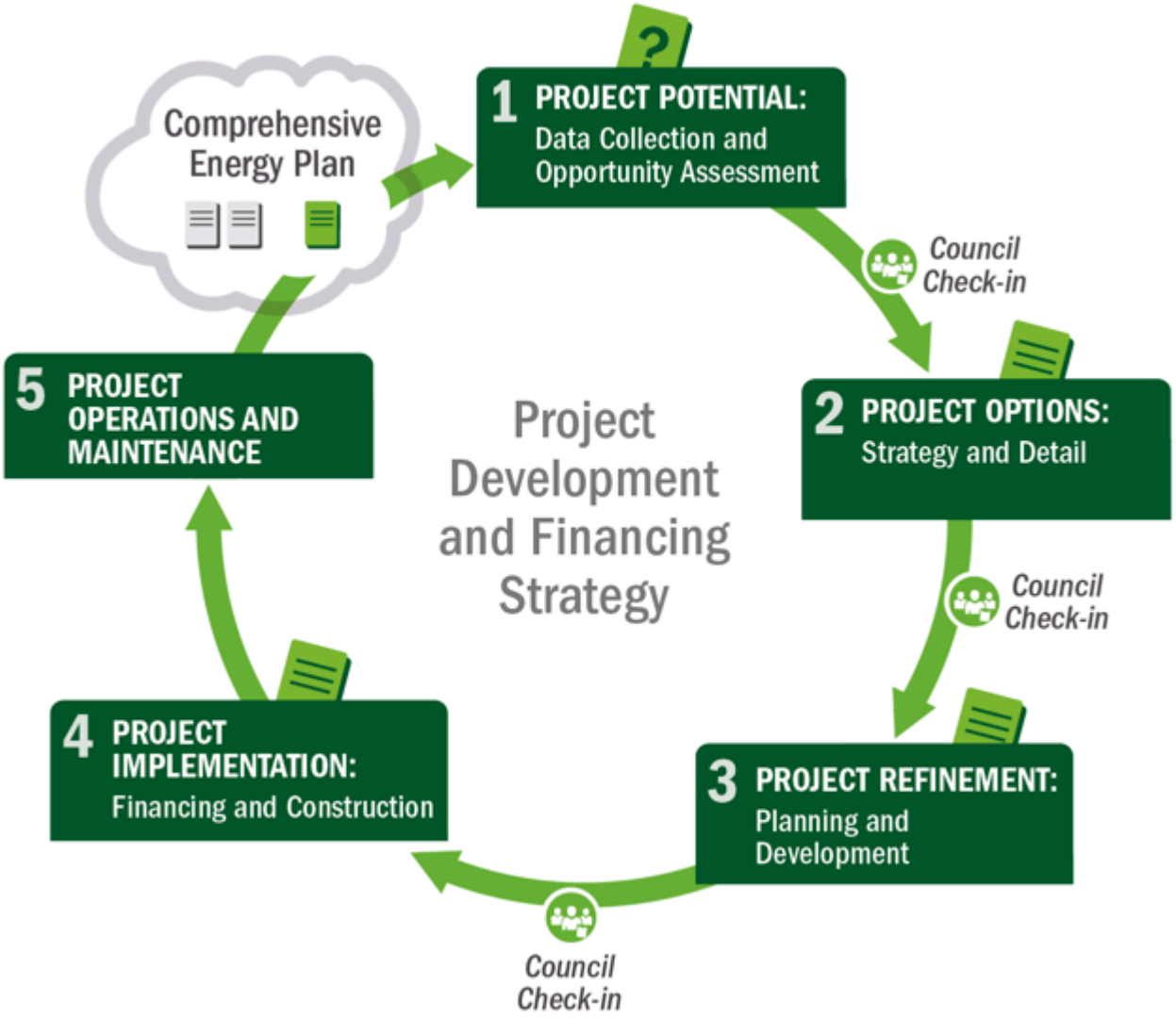
Celebrate!

Step 5: 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

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

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, Stacy Buchanan, Karlynn Cory, Jason Coughlin, Elizabeth Doris, Mike Elchinger, Sara Farrar-Nagy, Bill Gillies, Tom Harris, Travis Lowder, Anirudh Paduru, Paul Schwabe, Bob Springer, Blaise Stoltenberg, and Rachel Sullivan of the National Renewable Energy Laboratory; Joe Cruz and Matt Ferguson of Cohn Reznick; Paul Dearhouse of Dearhouse Consulting 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.nterlearning.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

Leadership and Professional Courses

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