Step 1: Identifying Project Potential

Commercial Scale Workshop
Tribal Role Options

- 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
1 Potential

2 Options

3 Refinement

4 Implementation

5 Operations & Maintenance
Agenda

- Market and Offtakers
- Initial Site Considerations
- Resource
- Permitting & Regulation
- Project Savings and Production Potential
MARKET & OFFTAKERS
Commercial-Scale Considerations

• Need an off-taker to buy your electricity
  – A utility
  – A large commercial, industrial, or government agency (e.g., military base)

• Utility motivated by RPS compliance

• Nonutilities motivated for a number of reasons, including: cost savings, sustainability goals, and energy hedging
The Electricity Grid

It is not enough to identify a market for the electricity. Can you get the electricity to market?

- Existing transmission lines?
- Capacity on those lines?

---

**Diagram:**

- **Generation:** 13,200 volts
- **Transmission:** 345,000 volts
- **Subtransmission:** 69,000 volts
- **Distribution:** 13,200 volts

**Legend:**

- **Generating Station**
- **Transmission Substation**
- **Transmission Lines**
- **Transmission Substation**
- **Industrial Customer**
- **Distribution Substation**
- **Commercial/Residential Customers**

**Notes:**

- United States transmission grid
- Source: FASMA
Identifying a Market: Western States’ RPS Policies

<table>
<thead>
<tr>
<th>State</th>
<th>RPS</th>
</tr>
</thead>
<tbody>
<tr>
<td>AZ</td>
<td>15% by 2025</td>
</tr>
<tr>
<td>CA</td>
<td>33% by 2020</td>
</tr>
<tr>
<td>CO</td>
<td>30% by 2020 (IOUs) 10% by 2020 (co-ops/munis)*</td>
</tr>
<tr>
<td>MT</td>
<td>15% by 2015</td>
</tr>
<tr>
<td>NM</td>
<td>20% by 2020 (IOUs) 10% by 2020 (co-ops)</td>
</tr>
<tr>
<td>NV</td>
<td>25% by 2025*</td>
</tr>
<tr>
<td>OR</td>
<td>25% by 2025 (large utilities)* 5%-10% by 2025 (small utilities)</td>
</tr>
<tr>
<td>WA</td>
<td>15% by 2020*</td>
</tr>
<tr>
<td>UT</td>
<td>GOAL: 20% by 2025</td>
</tr>
</tbody>
</table>

- Renewable portfolio standard
- Minimum solar or customer-sited requirement
- Extra credit for solar or customer-sited renewables

Source: www.dsireusa.org
California

- Projected to need an additional 400–13,000 MW installed by 2020 to meet RPS obligations
- No major projected transmission expansion in California

### Electricity Sales

<table>
<thead>
<tr>
<th>Total</th>
<th>% US Res</th>
<th>% US Comm</th>
<th>% US Ind</th>
<th>% Total US</th>
</tr>
</thead>
<tbody>
<tr>
<td>19,000 GWh</td>
<td>6.2%</td>
<td>8.8%</td>
<td>4.3%</td>
<td>6.6%</td>
</tr>
</tbody>
</table>

### State TECHNICAL Potential (GW)

<table>
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<tr>
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<tbody>
<tr>
<td>61</td>
<td>4,111</td>
<td>2,726</td>
<td>1,052</td>
<td>4</td>
<td>16.7</td>
</tr>
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</table>

### Tribal RESOURCE Potential (GW)

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<tbody>
<tr>
<td>ND</td>
<td>13.8</td>
<td>10.6</td>
<td>0.68</td>
<td>.127</td>
<td>9</td>
</tr>
</tbody>
</table>

### Avg Elec. Prices (c/kWh)

<table>
<thead>
<tr>
<th>Policy</th>
<th>Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>12.96</td>
<td>3.00</td>
</tr>
</tbody>
</table>

### Major Utilities

Los Angeles Department of Water & Power
Pacific Gas & Electric Co.
San Diego Gas & Electric Co.
Southern California Edison Co.
Oregon

- RPS obligations began in 2011
- Projected to have 340–1,700 MW in excess of RPS obligations in 2020
- Large projected transmission expansion across the state

<table>
<thead>
<tr>
<th>Electricity Sales</th>
<th>Total</th>
<th>% US Res</th>
<th>% US Comm</th>
<th>% US Ind</th>
<th>% Total US</th>
</tr>
</thead>
<tbody>
<tr>
<td>4,000 GWh</td>
<td>1.7%</td>
<td>1.3%</td>
<td>1.2%</td>
<td>1.4%</td>
<td></td>
</tr>
</tbody>
</table>

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<tbody>
<tr>
<td>5</td>
<td>1,898</td>
<td>1,017</td>
<td>252</td>
<td>2</td>
<td>2.4</td>
<td></td>
</tr>
</tbody>
</table>

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</tr>
</thead>
<tbody>
<tr>
<td>ND</td>
<td>26.4</td>
<td>7.8</td>
<td>1.12</td>
<td>.0001</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

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<thead>
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<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>8.32</td>
<td>3.00</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Policy</th>
<th>Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>RPS</td>
<td>25% (large utilities), 10% (small), 5% (smallest) by 2025</td>
</tr>
<tr>
<td>Interconnection</td>
<td>No limit</td>
</tr>
<tr>
<td>Net Metering</td>
<td>2 MW</td>
</tr>
</tbody>
</table>

% Consumers Served by Type of Utility in OR

Major Utilities: None
Key Contract: Power Purchase Agreement (PPA)

- A long term, financeable commitment to buy project output
- Generally addresses energy and attributes (like RECs)
- Allows developer to monetize tax or other policies
- Finding a power purchaser/off-taker is key for securing capital
Summary: Understanding Electricity Markets

• Who Is Your Market?
  – On-site
  – Utility/utilities
  – Nearby federal agencies (especially Department of Defense)
  – Large commercial or industrial off-taker

• Getting Power to the Market
  – Proximity to transmission
  – Current capacity of existing transmission
  – New transmission being planned
  – Required transmission studies take time; start early

• Contracts Needed to Put It All Together
  – Signed power purchase agreement (PPA) with creditworthy buyer
  – Signed interconnection agreement
  – Signed transmission agreement
Summary: Understanding Market Potential

- Free tool for understanding local current energy needs/costs: State & Local Energy Data (SLED Tool) [www.eere.energy.gov/sled](http://www.eere.energy.gov/sled)
  - Lists utility names
  - Shows available rates
  - Electricity demand by sector
  - Consumption trends
  - Renewable energy resource maps

- Think through growth and energy need scenarios (e.g., building a new recreation center will increase load)

Sled Demonstration
[https://www.youtube.com/watch?v=VAzAGlX1zag&list=UU7EGgnYFEIOaAa47ZBpninw](https://www.youtube.com/watch?v=VAzAGlX1zag&list=UU7EGgnYFEIOaAa47ZBpninw)
Permits

Purpose:
Understanding necessary regulatory requirements for the project particularly if seeks to inter-connect and/or deliver off reservation.

Considerations:
• Interconnection
• Environmental (National Environmental Protection Agency (NEPA): Environmental Assessment (EA) or Environmental Impact Statement (EIS)
• Cultural
• Federal, Tribal, and/or State Use Permits
Policy: Regulatory Bodies for the Electricity Grid

- Federal Energy Regulatory Commission (FERC)
- North American Electric Reliability Corporation (NERC)
  - Regional Reliability Councils
- Utility commissions and districts regulate privately and publicly owned electricity providers
  - Utilities Commission
  - Utility Regulatory Commission
  - Public Utilities Commission
  - Public Service Commission (may be civil service oversight body rather than utility regulator)
  - Public Utility District (Tribal, state, or government owned utility, consumer owned and operated, small investor owned)
  - Publicly owned utilities include cooperative and municipal utilities
  - Cooperative utilities are owned by the customers they serve (farmers and rural communities)
Considerations for Permitting, Regulations, and Laws


- Two types of **individually owned land**: (1) trust land and (2) restricted fee land
- Three types of **tribally owned land**: (1) trust land, (2) restricted fee land, (3) fee land purchased by Tribes
- Consider whether the project will fall under as a government function for the Tribe or a profit-making enterprise?

B. Consult with a lawyer early in the renewable energy development process to verify business model and eligibility of the project for federal incentives.

C. What local tribal laws might apply for this renewable energy project? Projects are more likely to get external investment (if necessary) if there is evidence that tribal leadership is committed to the project. See [http://www1.eere.energy.gov/tribalenergy/guide/legal_issues.html](http://www1.eere.energy.gov/tribalenergy/guide/legal_issues.html).
## Permitting and Regulating

### Outside Tribal Boundaries

- In general, if located on private, non-tribal land, or state properties; local and state land-use policies do apply.
- If located on tribal-owned fee land outside of reservation boundaries, then subject to state and local land-use, permitting jurisdiction.

### Inside Tribal Boundaries

- In general, state and local land-use laws do not apply.
- In addition, the extent to which federal rules and regulations apply depends on the type of project, its location, and size.
- Tribal law, regulations, and policies will apply.
- Tribes may “self-regulate” under federal law including TERA’s and Hearth Act.
## Determine What Type of Permitting is Necessary

<table>
<thead>
<tr>
<th>Key Types of Permitting at Tribal Community &amp; Facility Level</th>
<th>Always</th>
<th>Sometimes</th>
<th>Rarely</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interconnection agreement</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Environmental permitting</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Transmission permitting</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Off-take agreement</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local and State permitting</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Federal permitting</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Local Tribal permitting</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Environmental Regulations to Consider – NEPA

National Environmental Policy Act (NEPA)

- All federal agencies must assess environmental impact of proposed actions
- Federal funding may trigger assessment for tribal projects (federal nexus, e.g. federal grants, BIA initiated/approved projects)
- Each federal agency may have their own particular NEPA procedure – need to check with appropriate agency
- Timeline: Approximately 1 to 3 years depending on project size and complexity (unlikely for community scale)
- Recommendations:
  - Draft the EIS concurrently with other applicable federal statutes and regulations
  - If necessary, work with NEPA experts to determine and prepare required analysis

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**NEPA Decision Making Process**

1. **Is BIA funding or approval necessary to implement the action?**
   - Yes → **Will the action effect the human environment?**
     - Yes → **Is the action exempt from NEPA?**
       - No → **NEPA Documentation Required**
       - Yes → **NEPA Document Not Required**
     - No → **NEPA Document Not Required**
   - No → **NEPA Document Not Required**

### NEPA cont.

Three types in order of complexity and time:

<table>
<thead>
<tr>
<th>Types</th>
<th>Complexity</th>
<th>Timeline</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Categorical exclusions (CX)</strong>— Categories of actions that federal agencies have determined do not have a significant effect on the quality of the environment and neither an environmental assessment (EA) nor an environmental impact statement (EIS) is required.</td>
<td>Does not require any public reviews, hearings, and unless any ‘extraordinary circumstances’ exist, an EA or an EIS is not required.</td>
<td>The Categorical Exclusion Exception Review (CEER) conducted by the BIA is an internal two step process and mainly involves a simple check-box form.</td>
</tr>
<tr>
<td><strong>Environmental assessment (EA)</strong>— The document that provides sufficient analysis for determining whether a proposed action may or will have a significant impact on the quality of the environment and therefore require the preparation of an EIS.</td>
<td>Usually requires a 30 day public commenting period and may also require a 14-30 day scoping period upfront.</td>
<td>Generally allow 6-9 months for this process before issuing either a FONSI or proceed with an EIS.</td>
</tr>
<tr>
<td><strong>Environmental impact statement (EIS)</strong>— If an action is expected to have significant impacts, or if the analysis in the EA identifies significant impacts, then an EIS will be prepared.</td>
<td>Requires more rigorous and expanded review including public involvement, public meetings and hearings.</td>
<td>Generally should allow 18 to 24 months for completing this process.</td>
</tr>
</tbody>
</table>

Environmental Regulations to Consider – Other

Clean Air Act (CAA)
- Purpose is to protect the nation’s air and public health.
- Mandates identification of both mobile and stationary pollutants and the sources—gives authority to U.S. Environmental Protection Agency (EPA) for listing such pollutants.
- Establishes a process for the states and applying the National Ambient Air Quality Standards (NAAQS).

Clean Water Act (CWA)
- Goals are to make the nation’s water fishable and swimmable by 1983 and eliminate the discharge of pollutants into navigable waters by 1985.
- Gives authority to the EPA to regulate National Ambient Water Quality Standards (and effluent limitations applied to all point sources of pollution).
- Paved the way for nationally uniform technology-based standards imposed on individual sources through a permit system (NPDES permit; National Pollutant Discharge Elimination).

Endangered Species Act (ESA)
- The purpose is to protect plants and animals that are listed by the federal government as “endangered” or “threatened”.
- Enforced by the U.S. Fish and Wildlife Service (FWS—see Secretary of the Interior) and the National Marine Fisheries Services (NMFS—See’s Secretary of Commerce).
INITIAL SITE CONSIDERATIONS
## Site Due Diligence

<table>
<thead>
<tr>
<th>Consideration</th>
<th>Applicability</th>
<th>Resources</th>
</tr>
</thead>
</table>
| Wetlands/ Waterways | • Are there wetlands, water bodies, washes, arroyos, drainage considerations, or floodplain on site? | [http://www.fws.gov/wetlands/Data/Mapper.html](http://www.fws.gov/wetlands/Data/Mapper.html)  
[https://msc.fema.gov/portal/search](https://msc.fema.gov/portal/search) |
| Soils               | • Soil conditions impact structural design and site feasibility.  
• Caliche or bedrock may require costly drilling.  
• Sandy soils may require deeper post embedment to meet wind and snow loading requirements.  
| Wildlife/habitat/flora | • Check for critical habitat, riparian areas, and endangered species of flora or fauna that may be impacted. | [http://ecos.fws.gov/crithab/fl ex/crithabMapper.jsp?](http://ecos.fws.gov/crithab/fl ex/crithabMapper.jsp?) |
| Driveway/access     | • Is a new driveway required? If so, is access available?  
(Limited access highways may not allow a driveway.)  
• Can equipment and materials be safely delivered to the site with no obstructions such as overhead utilities, trees, or vehicle weight limits? | Check local, state, or federal department of transportation or equivalent |
### Site Due Diligence (cont.)

<table>
<thead>
<tr>
<th>Consideration</th>
<th>Applicability</th>
<th>Resources</th>
</tr>
</thead>
</table>
| **Easements/Encumbrances/Rights-of-way** | • Are there easements or rights-of-ways for pipelines, utilities, or rail roads that will be crossed or impacted?  
• Are there plans for road expansions or improvements, new pipelines, or future utility rights-of-ways at any time during the life of the project?  
Check with land management authorities, transportation plans, USGS maps |                                                                                                  |                                                                                                                                                           |
| **Cultural resources**                 | • Are there known cultural resources on or near the site? If not, are further studies required?  
Tribal Historic Preservation Office  
[http://nrhp.focus.nps.gov/natreg/docs/Download.html](http://nrhp.focus.nps.gov/natreg/docs/Download.html)  
(Google Earth layer)                                                                 |                                                                                                  |                                                                                                                                                           |
| **Land use and building permits**      | • Building permit requirements  
• Land use/zoning permits – Is the facility allowed as a primary or accessory use? Is a special or conditional use permit or re-zoning required?  
• Rights-of-way permits, including interconnection line, driveway, drainage  
Local tribal government                                                                 |                                                                                                  |                                                                                                                                                           |
| **Storm water**                        | • Is the site one acre or more? If so, a construction storm water permit and mitigation measures are required.  
• Are measures such as retention ponds or swales required for erosion and sediment control or storm water mitigation during and after construction?  
Initial Site Considerations

- Suitable Land Type
- Town
- River
- Road
Initial Site Considerations – Urban Centers
Initial Site Considerations - Rivers

Suitable Land Type
Initial Site Considerations - Roads
Initial Site Considerations – Suitable Area
Initial Site Considerations – 1% Slope
Initial Site Considerations – 5% Slope
Initial Site Considerations – 20% Slope
Solar PV Energy Resource Mapping

Potential Photovoltaic Generation from Tribal Lands
Utility Scale (Urban and Rural)

Annual Generation
(Thousand MWh)
- 0.1 - 1,000
- 1,000 - 5,000
- 5,000 - 10,000
- 10,000 - 50,000
- 50,000 - 2,850,000

Total Potential
9,275 Million MWh/yr

Estimates of technical potential do not account for locations of sacred sites, transmission access, or other factors that will significantly impact development potential.

These estimates show the annual utility scale photovoltaic generation for tribal lands. The estimates are derived from annual resource data representing a 1-axis tracking collector facing the equator with 0 degree tilt. Areas with slope >3%, parks, landmarks, federal protected lands, forested areas, wetlands and impervious surfaces are excluded. Remaining areas are further filtered to eliminate areas <0.016 sq. km in size in urban areas, <1 sq. km in rural areas. Regional capacity factors used to estimate generation were calculated from the National Solar Radiation Database Typical Meteorological Year 3 (TMY3) dataset.

U.S. DEPARTMENT OF ENERGY
Office of Indian Energy
NREL
April 28, 2011
Wind Energy Resource Mapping

Potential Wind Capacity from Tribal Lands
Wind at 80 m, Gross Capacity Factor >= 30%

Installed Capacity
MW
- 0.1 - 1,000
- 1,000 - 5,000
- 5,000 - 10,000
- 10,000 - 50,000
- 50,000 - 56,000

Total Potential
370,200 MW

Estimates of technical potential do not account for locations of sacred sites, transmission access, or other factors that will significantly impact development potential.

These estimates show the potential wind capacity from tribal lands with a gross capacity factor (without losses) of 30% and greater at 80-m height above ground. Energy generation will vary based on local resource intensity and patterns.

AWS TrueWind, LLC developed the wind resource data for windNavigator® (http://navigator.awstruewind.com) with a spatial resolution of 200 m. NREL produced the estimates of windy land area and windy energy potential, filtering the estimates to exclude areas unlikely to be developed such as wilderness areas, parks, urban areas, and water features. Additional information is available from the Wind Powering America website (www.windpoweringamerica.gov).
Project Description
The PVWatts application is an interactive map-based interface to rapidly utilize the PVWatts calculator. The PVWatts calculator is a basic solar modeling tool developed at NREL to allow non-experts to quickly obtain performance estimates for grid-connected PV systems.

Project Impact
This project is focused on providing the general public with a basic solar performance modeling tool and is one of the most heavily visited pages on the NREL website. Users can get an estimate of expected monthly and annual solar resource values for any location in the United States.

Users
Generally solar installers, but really anyone is able to use this to get a first cut of the potential output. Many national subsidy providers use PVWatts to determine the amount of subsidy a homeowner can receive.

Data Analysis and Visualization Group
Project Lead: Dan Getman
Dan.getman@nrel.gov

http://maps.nrel.gov/pvwatts
The Solar Prospector

Project Description
The Solar Prospector is a Web-based Geographic Information System (GIS) tool designed to assist industry professionals in the siting of utility-scale solar plants. The tool employs various GIS datasets to help identify areas that may have a high potential for solar plant development. Additionally, the Solar Prospector forms a platform to disseminate all solar related geospatial data to the larger industry and analysis community.

Project Impact
This project provides the location of solar resources, land ownership, and general infrastructure in an easy to use map format. Users can quickly download hourly solar resource data for specific locations and perform temporal analyses for any location in the United States and North Mexico.

Users
- Originally developed for CSP and expanded to PV; the CSP project development industry is a heavy user of the tool
- DOE/Lab analysts
- PV developers interested in information from the federal government

Citing Utility-Scale CSP

Data Analysis and Visualization Group
Project Lead: Ted Quinby
ted.quinby@nrel.gov

http://maps.nrel.gov/prospector
Renewable Resource Characterization & Technical Potential

**Layer Stacking**

- Regional (or cell based) Capacity Factor
- Resource
- Water Features
- Urban Areas
- Wetlands
- Contiguous Area
- Slope
- Federally Protected Lands
- Area of Critical Environmental Concern
- Region

**Available Land**

Regional Generation (MWh) = \( \sum \text{available land (km}^2) \times \text{power density (MW/km}^2) \times \text{capacity factor (%) \times 8760 (hours/year)} \)

**Land-Use Constraints**

- Topographic/Area Constraints

**Habitat/Protected Land Constraints**

- Habitat/Protected Land Constraints

**PV Utility (Urban) Technical Potential - U.S. Counties**

- Photovoltaic (PV) Utility – Urban & Rural
- PV Rooftop
- Concentrating Solar Power (CSP)
- Onshore Wind
- Offshore Wind
- Biopower – Gaseous and Solid Biomass
- Geothermal
- Hydropower

*See Technical Potential Worksheet for data sources, descriptions, and details*
NREL Tools Links

Map Apps at NREL  http://maps.nrel.gov
MapSearch  http://www.nrel.gov/gis/mapsearch/
REAtlas  http://maps.nrel.gov/reatlas
IMBY  http://mercator.nrel.gov/imby
SAM  http://sam.nrel.gov
HyDRA  http://maps.nrel.gov/hydra
RE_Atlas  http://maps.nrel.gov/re_atlas
OpenPV  http://openpv.nrel.gov/gallery
PVDAQ  http://maps.nrel.gov/pvdaq
LCOE Calculator  http://www.nrel.gov/analysis/tech_lcoe.html
GeoREServ API  http://rpm.nrel.gov/docs/georeserv/
REEDS  http://www.nrel.gov/analysis/reeds/
PV JEDI  http://www.nrel.gov/analysis/jedi/
OpenEI  http://openei.org
Smartgrid.gov  http://smartgrid.gov
PROJECT SAVINGS AND PRODUCTION POTENTIAL
Advanced Tool: NREL’s System Advisor Model

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

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
General Modeling Workflow

System

Weather Data + System Specs = Electricity Production

Economics

Financing Options + Utility Rates & Incentives + Cost Data

Results of Annual, Monthly, and Hourly Output
Levelized Cost of Energy (LCOE), Net Present Value (NPV), Payback, Revenue, Capacity Factor
Technologies in SAM

Photovoltaics
Concentrating PV
Solar Water Heating
Geothermal
Parabolic Trough
Power Tower
Linear Fresnel
Dish-Stirling
Small Wind
Utility-Scale Wind
Biomass Power
Conventional
## Commercial-Scale Project Risks – Post Step 1

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

*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.*
Small Group Exercise

• Evaluate pre-identified 10 sites on a map for potential development (considering what you just learned)