Developing Utility-Scale Renewable Electricity

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Preface: What is Utility-Scale?

For purposes of this presentation, utility-scale refers to projects that are multi-megawatt (e.g., 50 MW), grid-connected, and selling power to third parties.

THIS ...

Utility-Scale Solar PV Project at the Moapa River Indian Reservation, Clark County Nevada

NOT THIS ...

Commercial-Scale Solar PV Project at the Indian Pueblo Cultural Center, Albuquerque, New Mexico
Source: Sandia National Laboratories
Forecast Electricity Generating Changes to 2050

Source: U.S. Energy Information Administration, Annual Energy Outlook 2021
Forecast Electricity Generating Changes to 2050

Source: U.S. Energy Information Administration, Annual Energy Outlook 2021
Why Renewable Energy?

Multiple factors are driving the growth of renewable energy:

- Favorable tax policy
- Declining prices
- Energy storage
- Renewable mandates
- Corporate investment
- Community interest
- Coal fleet retirements
Market Drivers

Macroeconomics
- Population
- Economic Growth
- Deep Electrification

Finance/Incentives
- Tax Credits
- Tax Deductions
- Opportunity Zones
- Direct Payments
- Capital Availability

Policy
- PURPA
- Deregulation
- RPS/CES/REC
- Taxation
- Stranded Asset Recovery
- Environmental Perception

Off-take/Procurements
- Utility
- Corporate
- Rural Energy
- Municipality
- Community
- Merchant

Retirements
- Environmental Regulations
- Economic Obsolescence
- Physical Obsolescence

New Capacity Options
- Levelized Cost of Energy
- Anticipated Obsolescence
- Installed Costs
- O&M Costs

Source: Settle et al, NREL, September 2019
Why
Tribal
Energy?

Alignment of Renewable Energy with Tribal Goals:

- Sustainable Use of Resources
- Income Base Expansion
- Construction Jobs
- Operations Jobs
- Capacity Building
- Infrastructure Upgrades
- Other Community Benefits

Purpose is Foundational to Success
Note: Oklahoma tribal land in the Tribal Energy Atlas refers to Oklahoma Tribal Statistical Areas. Most of these lands are not fully under tribal control and therefore were not included in the critical planning study at this time.

Source: Tribal Energy Atlas, Utility-Scale Wind on Tribal Lands, October 2019

Technical exclusions:
- Slopes > 5%
- Minimum Contiguous Area of 1 km$^2$
- Incompatible Land Use
- Protected Areas

Wind Potential on Tribal Land

Technical exclusions:
- Slopes > 20%
- Incompatible Land Use
- Protected Areas


Utility-Scale Wind (within tribes) (Megawatt Hour (MWh))

Note: Oklahoma tribal land in the Tribal Energy Atlas refers to Oklahoma Tribal Statistical Areas. Most of these lands are not fully under tribal control and therefore were not included in the critical planning study at this time.

Source: Tribal Energy Atlas, Utility-Scale Wind on Tribal Lands, October 2019
Transmission on Tribal Land

This study used a refined high voltage dataset from ABB Energy Velocity Suite using the following ranges for substations and transmission lines:

- 34.5 – 120 kV
- 130 – 287 kV
- >=300 kV

Source: Tribal Energy Atlas, Utility-Scale Wind on Tribal Lands, October 2019
Community Benefits of Renewable Energy Development

Economic Opportunity

Renewable energy development creates multiple economic benefits to communities, including:
- Job creation (construction & permanent)
- Indirect impacts (employee spending at local businesses)

Workforce Development

- Developers can agree to prioritize local, qualified labor for construction.
- Operations and maintenance work can often be carried out by locals.

Land Lease Payments

- Land leases are a significant revenue stream for the life of the project.

Community Funds

- Community funds are typically provided by the project developer and administered by an independent authority.
- Such funds may support energy efficiency, fire departments, schools, reduced electricity rates for low-income residents, etc.¹

Property Taxes, Infrastructure Upgrades

- Depending on local and county tax rates, RE development can also provide additional public funding.
- Delivery of machinery and equipment to the site can entail upgrades to public roads covered by the developer

Example of Community Benefits – Perrin Ranch Wind

WORKFORCE/ECONOMIC
  Development Consultants
  Construction, Direct and Subcontract Suppliers
  Operators

EDUCATION
  NAU Partnership, Curriculum, Training

DONATIONS
  Multiple Local Organizations

ONGOING BENEFITS
  Firehouse, EMT Training, Equipment
  Tax Payments to School District
  Road Rebuilding
  Chambers of Commerce
  Landowner Payments

Williams News, Photo/Bob Freson
An Approach to Maximizing Community Benefits

CAUTION: If the project is not competitive, there are no community benefits.

Competitive RFQ/RFP Process

DEVELOPMENT
- De-risk the project site and establish development value
- Compete the development offering through formal RFQ/RFP process

CONSTRUCTION
- Secure Tribal jobs
- Engage Tribal businesses

OPERATION
- Secure Tribal jobs
- Engage Tribal businesses
- Provide education and job training
- Long-term land lease and reinvestment
- Consider profits interest/equity stake and reinvestment

POST-PPA
- Evaluate takeover options
- Salvage, repower, transfer to tribal utility
Development Risk

The risk and required return for renewable energy financing are not constant over the life of the project.

Project Roles

More Capital Intensive
- Owner/Operator
- Equity Investor
- Lender

Less Capital Intensive
- Off-taker
- Land Owner
- O&M subcontractor
<table>
<thead>
<tr>
<th>Role</th>
<th>Opportunity</th>
<th>Constraints</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resource/Landowner</td>
<td>Land rent/royalty, taxes. Low risk, known reward, consistent income.</td>
<td>Limited project control. Must provide site access.</td>
<td>Limited upside potential, limited risk</td>
</tr>
<tr>
<td>Off-Taker/Energy User</td>
<td>Tribe purchases and uses all power on-site. Electricity price security/hedge value.</td>
<td>Limited investment, economic development for on-site projects</td>
<td>Must have demand to use power; still requires utility interconnection agreement (if on the grid). Limited/Med risk.</td>
</tr>
<tr>
<td>Project Operator/O&amp;M</td>
<td>Greater involvement; Job/skills development opportunity. Modest source of revenue</td>
<td>Investors require experience May not be very labor intensive Might not be practical for a single project</td>
<td>Depending on technology, can be complex. Risk profile higher given O&amp;M responsibilities.</td>
</tr>
<tr>
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</table>
| Lender/Debt Provider        | Participate financially in project with lower risk. Interest income.         | 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 experience  
Option for Tribes with limited lands, available $                                                               |
| Equity Investor             | Invest cash into project development. Profit opportunity. Less capital required than commercial scale. | Higher risk than debt lending. Requires ready capital, or unique source of capital that provides market advantage (like NMTC). Implications for tax credits                                          | High risk, more complex  
Competes with other investments  
Option for Tribes with limited lands, available $                                                              |
| Project Developer and Owner | Self-determination of project; potential for profits (and losses) is highest. Tribes with its own resource may not need investors. | Capital intensive and complex  
Tribes investing money may not want this high risk/return investment  
Might forfeit tax benefits                                                                                         | High risk  
Likely Tribe has gained experience over time in other roles  
A project portfolio mitigates some risks                                                                         |

**Tribal Roles**
Development Plan outlines the entitlement pathway, transmission/interconnection studies, and potential power purchasers.

Development Agreement is the contract with a well-qualified developer to fully develop the project, including the land lease agreement and other benefits.
Four Pillars of Success

- Resource
- Site Control
- Buyer
- Transmission

Photo Credit: Edward Settle, NREL – Kayenta Solar II, Navajo Tribal Utility Authority
Four Pillars of Success

**Resource** – A chosen project location must have a **strong natural resource**. Whether solar, wind or other, the strength of the resource directly relates to the performance of the project.

**Site Control** – The developer and the financier(s) will not expend much development capital without **effective ownership or control of the project site**.

**Buyer** – The capital necessary to build and operate a project usually requires a long-term contract with a buyer for the product (electricity). This is often referred to as the off-take agreement or **power purchase agreement**. Buyers may include utilities, cooperatives, municipalities, or corporations.

**Transmission** – If there is a resource on an approved project site and a buyer for the power, the ability to **interconnect** and transmit power between the project and the buyer is required.
Utility Scale Solar PV – Four Pillars and Assumptions

CAUTION: Figures are subject to change at any moment.

LAND
- 6 to 8 acres per megawatt
- $300 to $600 (or more) per acre rent, fixed 25-year plus
- Site control, access, and entitlements – including linear corridors

RESOURCE
- Verified sunny

BUYER
- Need a long-term (20 year plus) power purchase agreement
- Recent Price: $24.99 per MWh, 20 years – $23.76 per MWh, 25 years

DELIVERY
- Adequate transmission between site and buyer
- Ability to interconnect

Hypothetical 100 MW:
- Capital Cost: Around $1,000,000 per MW
- Construction Labor: 150 to 250 workers, 6 to 9 months
- Operating Labor: 2 to 3 FTEs
- Incentives: 26% Investment Tax Credit, Accelerated Depreciation
- Tax/Fee Structure: Competitive
Thank you