IBERDROLA RENEWABLES

Siting and Development Issues

Presentation to
Bureau of Land Management

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Who is Iberdrola Renewables?

- World's largest renewable energy owner and operator
- 9,000 MW of renewable energy worldwide
- About 3,000 MW are in the U.S.
- Owned by Iberdrola S.A., leading private electric utilities worldwide, headquartered in Bilbao, Spain

- BLM portfolio acquired through our purchase of Pacific Solar Investments, 2008

How does IBR do business?

- Find land
- Secure development rights
- Obtain environmental permits
- Transmission & interconnection
- Design and construction
- Sell output
- Own and operate

We are technology neutral.

Solar Technologies: Two Categories

- Photovoltaic (PV)
  - Collects sun's light
  - Uses silicon as a semi-conductor, no emissions, noise or pollution
  - Both direct and diffuse sunlight
- Concentrated Solar
  - Collects sun's heat
  - Generates steam, runs a conventional stream turbine
  - Direct sunlight, clear blue sky conditions

Early Site Selection

- Solar Resource
- Available Land and Size
  - number of landowners
- Topography
  - needs may vary by technology
- Infrastructure
  - transmission/interconnection location
  - voltage

Initial Due Diligence

- BLM Special Designation
  - RMPs
- Cultural Records Searches
- T&E Species
  - Records
  - Site Search
- Hydrology and Surface Water
- Soils and Geology, Faults

Measuring the Solar Resource

- Concentrated Solar
  - Direct Normal (Clear Blue Sky)
    - Limited areas
- Photovoltaic
  - Global Solar Radiation
    - Includes diffuse sunlight
    - Can still generate when cloud passes
- Different Measurement Technologies

Direct Normal

Measured by a *Pyrheliometer* on a sun-following tracker

Global Horizontal

Measured by a *Pyranometer* with a horizontal sensor

Diffuse

Measured by a shaded *Pyranometer* under a tracking ball

Global, Direct, and Diffuse in a Single Instrument

Measured by a *Rotating Shadowband Radiometer*

LiCor Pyranometer Sensor

Courtesy of NREL

Water

- Parabolic Trough
  - 200 MW: 2000-2500 acre-feet/year (wet cooled)
  - Less than most existing agricultural operations
  - Test well drilling
  - Dry cooled options
- Photovoltaic
  - Construction water
  - Limited water for mirror washing

Other Needs

- *Access*
- *Gas lines*
- *Labor force*
  - *monitoring and construction*

Summary

- Many technologies
- Each has very different siting needs
- Siting requirements may evolve, assuming that
  - Panel and plant costs will come down
  - Technologies/engineering will adapt
  - Panel efficiencies will rise, affecting
    - Locational decisions (lower DNI or GSR)
    - Acreage needs

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Thank You

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