Brookfield Asset Management Introduction
Brookfield Renewable Power Introduction
Pumped Storage Profile
Brookfield Pumped Storage Projects
Conclusion
Brookfield Asset Management

A global asset management company

- Brookfield Asset Management is an asset management company focused on property, power and infrastructure assets
- Approximately US$95 billion of assets owned and under management
- Approximately 10,000 employees in the Americas, Europe and Australia

- 120 million sq. ft. office and retail space
- 162 renewable power plants
- 2.5 million acres of timberlands
- 11,000 km of transmission lines
Brookfield Renewable Power

➤ Brookfield Renewable Power is a leading producer and developer of renewable energy focused on hydroelectric and wind technologies
➤ Over US$13 billion of assets owned and under management
➤ Over 3,500 MW of hydro capacity

➤ 3 countries: United States, Canada and Brazil
➤ 9 markets
➤ 63 river systems
Accelerate growth in renewable power market through acquisition and development

- Projected $5 - $10 billion dollars in spending on new generation projects over the next ten years
- Over 6,700 MW of growth in existing pipeline, 35% from Pumped Storage

**Brookfield Strengths**

- Strong financial position
- Synergies with other Brookfield Asset Management companies – property & transmission
- Owners, Developers, & Long Term Operators of generation assets
- Employees – solid engineering, operating, and marketing & trading expertise
- Over 100 years of power generating experience
Pump Storage Profile
Why Pumped Storage?

- Wide range of ancillary product offerings well suited to complement intermittent generation such as wind, available on demand
- Load Following ability
- Ability to store Renewable energy for use during peak hours
- No environmental emissions
- Mature, dependable technology
- Service life of 50 years – longer than gas alternatives
Pump Storage Profile

- **Pumped Storage Considerations**
  - Limited in generation – usually hours, as determined by upper reservoir size
  - Larger in scale, scope, & complexity than alternatives
  - Long build time coupled with more complex licensing dynamics
  - Full advantages not widely understood in the market
  - Limited developers can fully execute - project scope, schedule, and cost complexities will require experienced developers with financial strength
Pump Storage Profile

**Components of a successful project**

- **Site Selection**
  - Sites with high head, natural reservoir formations where possible, and minimized distance between upper & lower reservoir (Low L/H ratio)
  - Water availability – for evaporation makeup and initial fill for closed loop systems
  - Low recreational / civic use of land
  - Proximity to un-congested transmission resources
  - Favorable geotechnical conditions – low possibility of reservoir seepage, underground construction of penstocks, powerhouse placement, etc.

- **Market**
  - Regional environmental concerns need to favor this “clean” alternative over other options
  - Regions whose need for regulatory and ancillary products has increased substantially as a result of significant renewable integrations – wind, solar, etc.

- **Cost**
  - Driven mainly by site selection, must be competitive with alternatives

- **Developer Selection**
  - Project size & complexity requires a developer and operator with solid expertise, substantial resources, and financial strength
  - Experience needed with permitting & licensing, plant operations, and the ancillary markets
Brookfield Pumped Storage Projects
Mulqueeney Ranch

- Located in California
- 280 MW
- Preliminary Permit granted 10/2007
- Closed Loop system – will not reside on any existing waterways
- Water source identified
- Within one mile of transmission corridor
- Preliminary site control established
- Located in a market where the value of capacity is still evolving
Brookfield Pumped Storage Projects

Banks Lake

- Located in Washington
- 1,040 MW
- Preliminary Permit process underway
- Utilizes an existing lake for lower reservoir – irrigation source with low recreational activity
- Within 5 miles of transmission corridor
- Increased wind generation driving market demand for ancillary services
**Brookfield Pumped Storage Projects**

**Duffey Lake**

- Located in Washington
- 1,150 MW
- Preliminary Permit process underway
- Utilizes existing lakes for both reservoirs – both on Brookfield Asset Management property
- Within 5 miles of transmission corridor
- Increased wind generation driving market demand for ancillary services
Brookfield Pumped Storage Projects

**Lorella**

- Located in Oregon
- 1,000 MW
- Preliminary Permit process underway
- Closed Loop system – will not reside on any existing waterways
- Water resource identified
- Within 5 miles of transmission corridor
- Increased wind generation driving market demand for ancillary services
Pumped Storage offers clean, renewable Capacity, Ancillary, and Generation services

It has proven advantages over alternatives to complement intermittent generation feeding the grid

Development, construction and operation of a Pumped Storage project will require an experienced organization with technical, transmission, licensing/permitting, construction, operational & marketing expertise, along with a strong balance sheet. Absent this, access to the financial marketplace will be unlikely if not impossible.
Thank You