Emerging Trends in Clean Energy Finance

Ray Wood, Global Head of Power, Bank of America Merrill Lynch
October 13, 2015
Over one billion people do not have sufficient access to electricity

## Factors Encouraging Transition to Clean Energy

<table>
<thead>
<tr>
<th>Security of Energy Supply</th>
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<tr>
<td>Environmental Stewardship</td>
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<td>Cost Competitiveness</td>
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<td>Individual Preference for Clean Power</td>
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<td>Utility and Distributed-Scale Applications</td>
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Several Challenges Remain

- Numerous approaches taken across the world
- Finding opportunities when incentives are removed
- Recognizing and overcoming the challenge of change to the existing utility model

**Energy Demand**
- Low demand growth in developed markets where capital is available,
- High demand growth where capital is not

**Government Policy**
- Lowering the levelized cost
- Increased competition in low commodity price environment
- Applying disruptive technologies (batteries, smart grids, fuel cells)

**Technology Innovation**
- Expanding financial tools to meet market demand for renewable investment
- De-risking emerging market infrastructure investment

**Capital Investment**

2014 saw a new high of $254bn+ in Global Renewable Power Investment

Innovation and Scale Efficiencies have Driven Down Costs

Wind: $/MW turbine prices have stabilized as developers opt for higher-priced, longer-rotor diameter turbines, while the price per MWh continues to decline on better turbine performance.

Solar: Continued declines in capex assumptions. $1.57/W all-in capex is now possible in most of the world, although tariffs have temporarily slowed module costs decline.

Levelised Cost of Energy (“LCOE”) for Renewables continues to decline driven by technology improvements, competitive equipment supply dynamics and lower financing costs.

Leading a Steady Increase of Renewable Generation’s Contribution to the Electricity Mix

Renewable Generation (% of Global Electricity Consumption)

Renewable Generation (% of US Electricity Consumption)

Wind and Solar Technology Innovation Should Continue

Residential Solar Average Cost per Watt, 2014-17 ($)

Onshore Wind LCOE, 2014-17 ($ / MWh)

- Solar system costs could decline 40% in the next 2-3 years based on forecasts
- Increasing Capacity Factors driven by improving turbine and gearbox technology will support a further decline

Notes: Onshore Wind - 50% Capacity Factor based on linear relationship with 40% Capacity Factor
Accelerating the Transition to Renewable Power Generation

Annual New Build Generation (GW)

Renewables
Nuclear
Fossil Fuels

Global Generation Capacity (GW)


Renewable Generation will Capture a Significant Majority of Future Generation Additions

225% Increase

Disruptive Technologies Support This Evolution: Smarter Grid Networks

Connecting the Policy & Technology Elements of the Power Chain

- Central Generation
- Utilities
- Regulators
- Transmission Networks
- Individuals
- Businesses
- Distributed Generation
- Smart Meters

Global Smart Grid Spending, 2012-20e ($mm)

- Rest of Asia
- Japan
- China
- EMEA
- North and South America

Source: BNEF Potential Cost Reductions in EV lithium-ion Battery Packs, Sept 2015.
Disruptive Technologies Support This Evolution: Batteries

Cost of Lithium Ion Technology
$/kw-hour of capacity

Global Production Capacity
GWh per year

Source: BNEF Potential Cost Reductions in EV lithium-ion Battery Packs, Sept 2015, 2H2014 Battery Cost Update.
Note: The battery pack price line forecast in chart is projected cost based on the learning curve of EV lithium-ion batteries based on Bloomberg New Energy Finance.

(1) Brattle Group, “The Value of Distributed Electricity Storage in Texas” November 2014
Battery Cost Declines are Driven by Significant Improvements in Component Costs

Observed 2015 Battery Cost by Components
$/kw-hour of capacity

<table>
<thead>
<tr>
<th>Component</th>
<th>2020E</th>
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<tbody>
<tr>
<td>Cell</td>
<td>$200</td>
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<tr>
<td>Pack Costs</td>
<td>$120</td>
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<tr>
<td>Fixed Expenses</td>
<td>$28</td>
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<tr>
<td>Warranty &amp; Profit Margin</td>
<td>$52</td>
</tr>
<tr>
<td>Total</td>
<td>$400</td>
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</table>

| Improved Technology           | (30%)   |
| Cost of Compounds             | (-)     |
| Global production scale       | (70%)   |
| efficiency                    | (+)     |
| Depreciation cost of capital  | (35%)   |
| investment                    | (-)     |
| Lower profit margin & warranty| (80%)   |
| per unit                      | (+)     |
| Total                         | (45%)   |

Source: BNEF Potential Cost Reductions in EV lithium-ion Battery Packs, Sept 2015. $ in 2015$
Creating a New Model for Utility Operations

**Traditional Utility Model**

- Generation by Coal/Oil/Gas/Nuclear/Hydro
- Large central units
- One Way Grid
- Limited demand flexibility
- Limited retail price transparency

**Utilities in the Future**

- Growing Renewable Mix w/ Thermal Support
- Increasing mix of smaller capacity units
- Smart Two-way Grid
- Increasing demand response capabilities
- Real-time prices

Graphic Credit to Hawaiian Electric Industries
Energy infrastructure requires an environment that enables long-term investment built on stability

An enabling investment environment is characterised by: peace and stability, the rule of law, good governance with accountability and transparency, the absence of corruption, adequate infrastructure, an educated workforce, clear property rights and enforceable contracts.

UN Estimates that $650bn/year of additional capital needs to be invested to meet its Energy Goals

1. Universal access to modern energy technology (today: 85%)

2. 30% of world’s energy supply from renewables (today: 18%)

3. Doubling rate of annual energy efficiency gains (today: 1.3%)

Source: IRENA REMap 2014; World Bank, IEA GTF 2015
The Equity Market Opportunity Remains Large Compared to Traditional Energy Companies

Global Market Capitalization of Renewable & Efficiency-Driven Public Companies Compared to the Oil & Gas Industry ($bn)

- Public Renewable Energy/Efficiency Companies: $414
- Exxon Mobil: $310
- Global Oil & Gas: $4,650

The Global Market Cap of the Renewable Energy/Energy Efficiency Sector is only 30% Larger than ExxonMobil

Source: Factset and BNEF as of September 17, 2015.
Public Equity Valuations Demonstrate Volatile Market Psychology

Solar Index Returns (10-yr Return)

Viewed as a growth-oriented sector, Renewable Energy Stocks are sensitive to investor sentiment regarding economic growth outlook, commodity markets, and changes in capital market inflows/outflows.

Source: NYSE Bloomberg Global Solar Energy Index as of 10/07/15
Incentives to Support Renewables can take Many Forms

<table>
<thead>
<tr>
<th>Country Name</th>
<th>Regulatory Policies &amp; Targets</th>
<th>Fiscal Incentives</th>
<th>Public Financing</th>
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<tr>
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<td>Renewable Energy Targets</td>
<td>Feed-In Tariff/premium Payment</td>
<td>Electric Utility quota obligation/RPS</td>
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<td>United States</td>
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Source: Global Status Report, REN21 2013
The Experience of the EU Shows the Importance of this Stability Even in OECD Countries

- The EU has seen a drop in clean energy investment from a peak of $114bn in 2011 to $53bn in 2014

Retroactive policy changes across the EU

Clean energy investment in selective countries ($bn)
Capital Can Come from Many Sources

Private Sources

- Institutional & Retail Investors
- Banks
- Utilities
- Private Equity
- Venture Capital
- Insurance Companies
- Other Strategics
- Pension Funds
- Sovereign Wealth Funds
- Multi National Develop. Banks
Finance has Many Roles to Play in Delivering This Capital to Meet Investment Needs

Financial Institutions are Critical to the Development of Renewable Generation
IPO Markets Follow this Volatility

Renewable Energy Initial Public Offerings ($ mm)

- Developer / YieldCo
- EPC / Installer / Financier
- Manufacturer

Note: Excludes European Utility spin-outs of renewable segments.
The YieldCo Model Emerges

- Public YieldCos have created a new investment class
- A YieldCo is a dividend growth oriented vehicle created to hold and acquire assets with a predictable revenue stream and long-term tax shields to fund a regular and increasing dividend to public shareholders
- Following a robust initial reaction to the model, in the Summer of 2015 these companies have been impacted by macro conditions that have investors taking a more risk-off investment stance including:
  - Relatively limited public float of their shares
  - Continued deterioration in commodity markets
  - Concern over emerging market slow down for those with non-OECD exposure
  - Share price reaction in a future rising interest rate environment

Number of YieldCos Increasing

Source: BofAML GCIB.
YieldCo’s Raised Over $9bn Since 2013, but Market Volatility has Created a Pause

Equity Issued by Public YieldCos ($mm)

- Pattern
- Nextera Energy Partners
- 8point3 Energy Partners
- TerraPower
- Abengoa Yield
- saelaveld

Source: BofAML GCIB.
Note: Includes initial public offerings, follow-on equity offerings and equity-linked convertibles.
Green Bonds Allowing a Wide Range of Companies to Support Renewable Investments

Source: BNEF, BofAML GCIB.
The Green Bond Market has Matured into a Significant Source of Funding

Issuance has Grown to ~$40BN/yr

Securitizing Distributed Solar Lease Payments

Renewable Loan Securitizations

- Securitizing cash flow streams is a tested method of lowering the cost of capital for projects too small to attract debt capital market investment on their own.
- Aggregation of energy projects lease payments improves investability by achieving sufficient scale.
- Supports distributed generation growth through lowering cost of capital.

Examples

<table>
<thead>
<tr>
<th>Date</th>
<th>Amount ($mm)</th>
<th>Yield</th>
<th>Rating</th>
</tr>
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<tbody>
<tr>
<td>11/13/13</td>
<td>$54.4</td>
<td>4.8%</td>
<td>BBB+</td>
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<tr>
<td>4/3/14</td>
<td>$70.2</td>
<td>4.6%</td>
<td>BBB+</td>
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<tr>
<td>7/25/14</td>
<td>$201.5</td>
<td>4.3%</td>
<td>BBB+</td>
</tr>
<tr>
<td>7/1/15</td>
<td>$111.0</td>
<td>4.5%</td>
<td>A</td>
</tr>
<tr>
<td>8/7/15</td>
<td>$123.5</td>
<td>4.4%</td>
<td>BBB</td>
</tr>
<tr>
<td>9/25/15</td>
<td>$100.0</td>
<td>TBD</td>
<td>BBB</td>
</tr>
</tbody>
</table>

Source: BofAML GCIB, Company Press Releases.
(1) PPA Price per kWh with respect to lease agreements are calculated by dividing the sum of the first year's fixed monthly payments by the estimated first year production.
(2) Weighted Average Annual Customer Agreement Price per kWh. Fee Escalator calculation excludes fully prepaid contracts.
(3) Aggregate Discounted Solar Asset Balance.
Financially Warehousing Assets for Future Purchase

Development Warehouses

- Construction finance is a well-established mechanism for infrastructure investment
- Banks & Other Investors provide developers flexibility by creating warehouse financing facilities
- Streamlines financing process and allows for more efficient development

Examples

<table>
<thead>
<tr>
<th>Date</th>
<th>Total Size ($mm)</th>
<th>Use of Proceeds</th>
<th>Equity Partner(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/24/14</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1/9/15</td>
<td>$250</td>
<td>Finance Residential &amp; Commercial Installations</td>
<td></td>
</tr>
<tr>
<td>5/4/15</td>
<td>$200</td>
<td>Funding for MyPower Customer Loan Program</td>
<td></td>
</tr>
<tr>
<td>5/6/15</td>
<td>$500</td>
<td>Paydown Term Loan &amp; Finance New Projects</td>
<td></td>
</tr>
<tr>
<td>6/26/15</td>
<td>$1,516</td>
<td>Acquire First Wind Projects After COD</td>
<td>First Reserve</td>
</tr>
<tr>
<td>8/17/15</td>
<td>$525</td>
<td>Atlantic Power Acquisition</td>
<td>John Hancock, Macquarie</td>
</tr>
<tr>
<td></td>
<td>$1,000</td>
<td>U.S. Invenergy Assets</td>
<td>West Street Infrastructure Partners(1)</td>
</tr>
</tbody>
</table>

Source: BofAML GCIB, Company Press Releases.
(1) An infrastructure investment fund.
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