GLOBAL TRENDS IN CLEAN ENERGY
(ABRIDGED VERSION)

NORTH CAROLINA SUSTAINABLE ENERGY ASSOCIATION:
MAKING ENERGY WORK

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OCTOBER 2012
GLOBAL NEW INVESTMENT IN CLEAN ENERGY
2004–11 ($BN)

Note: Includes corporate and government R&D, and small distributed capacity. Adjusted for re-invested equity. Does not include proceeds from acquisition transactions.

Source: Bloomberg New Energy Finance
PV MODULE PRICES, 1976–2012
($/W)

PV MODULE PRICES HAVE FALLEN 75% SINCE 2008

Source: Paul Maycock, Bloomberg New Energy Finance, FSLR filings

Notes: Inflation adjustment using US PPI, R2 of c-Si regression = 0.94, R2 of FSLR regression = 0.98; data since 2007 based on Bloomberg New Energy Finance Solar Spot Market Price Index
EUROPE – FINANCIAL CRISIS
The graph shows the performance of the NEX Clean Energy Index (versus benchmarks) from 2011 to 2012 YTD. The index is compared to the S&P 500 and NASDAQ benchmarks.

Note: Values as of 22 August 2012; NASDAQ and S&P 500 rebased to 100 on 01 Jan 2011.

Source: Bloomberg New Energy Finance
CALIFORNIA PV MODULE SUPPLIERS BY PERCENTAGE OF TOTAL MW, COUNTRY, AND QUARTER, Q2 2009 – Q2 2012


Source: Bloomberg New Energy Finance, California Solar Initiative
LEVELISED COST OF ENERGY Q4 2012 ($/MWH)

Note: Carbon forecasts from the Bloomberg New Energy Finance European Carbon Model with an average price to 2030 of $38/mt. Coal and natural gas prices from the US EIA and BNEF. Percentage change represents change from Q3 2012.

Source: Bloomberg New Energy Finance
RESIDENTIAL PV PRICE PARITY

Note: LCOE based on 6% weighted average cost of capital, 0.7%/year module degradation, 1% capex as O&M annually.

Source: Eurostat, grid operators, Bloomberg New Energy Finance
TOTAL NEW CLEAN ENERGY FINANCIAL INVESTMENT, 2010–11 ($BN)

<table>
<thead>
<tr>
<th>Country</th>
<th>2010</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>China</td>
<td>45.0</td>
<td>48.1</td>
</tr>
<tr>
<td>US</td>
<td>33.7</td>
<td></td>
</tr>
<tr>
<td>Germany</td>
<td>32.1</td>
<td>30.6</td>
</tr>
<tr>
<td>Italy</td>
<td>20.2</td>
<td>28.0</td>
</tr>
<tr>
<td>Japan</td>
<td>7.0</td>
<td>10.2</td>
</tr>
<tr>
<td>UK</td>
<td>7.0</td>
<td>9.4</td>
</tr>
<tr>
<td>Brazil</td>
<td>6.9</td>
<td>8.6</td>
</tr>
<tr>
<td>Spain</td>
<td>6.9</td>
<td>8.6</td>
</tr>
<tr>
<td>India</td>
<td>6.6</td>
<td>8.0</td>
</tr>
<tr>
<td>Canada</td>
<td>5.3</td>
<td>5.5</td>
</tr>
</tbody>
</table>

Note: Includes small distributed capacity and adjustments for re-invested equity. Does not include corporate and government R&D or proceeds from acquisition transactions. Source: Bloomberg New Energy Finance.
HISTORICAL AND PROJECTED CUMULATIVE US PV CAPACITY INSTALLED (GW)

CAGR = 20%

CAPITAL REQUIREMENTS = $62BN

Source: Bloomberg New Energy Finance
EVOLUTION IN US SOLAR PROJECT FINANCING

**Today**

- Development
- Construction
- Commission / Operation

**DEBT**
- INSURANCE COMPANIES
- BANKS

**EQUITY**
- VENTURE CAPITAL (VC)
- DEVELOPMENT PRIVATE EQUITY
- INFRASTRUCTURE PRIVATE EQUITY
- SMALL/MED DEVELOPERS
- LARGE DEVELOPERS / UTILITIES

**TAX EQUITY**
- BANKS (AND OTHER SELECTED PLAYERS)

**Costs of Capital**
- >20% cost of equity (unlevered)
- ~15% cost of equity (levered)
- ~7-9% tax equity yield (after-tax, unlevered), ~14-18% (levered)
- ~6-7% cost of debt

**Tomorrow**

- Development
- Construction
- Commission
- Spin-out of operating assets

**INFRASTRUCTURE DEBT FUNDS**
- Bonds / ABS / ‘Crowdfunding’
- INSURANCE COMPANIES

**DEBT**
- PENSION FUNDS
- MUTUAL FUNDS
- RETAIL INVESTORS
- HEDGE FUNDS
- MLPs / ‘SREITs’ / ‘YieldCos’

**EQUITY**
- DEVELOPMENT PRIVATE EQUITY
- INFRASTRUCTURE PRIVATE EQUITY
- SMALL/MED DEVELOPERS
- LARGE DEVELOPERS / UTILITIES

**TAX EQUITY**
- B Kathryn
- NON-FINANCIAL CORPORATES

**Costs of Capital**
- >20% cost of equity (unlevered)
- 9-13% cost of equity (levered)
- ~7% tax equity yield (after-tax, unlevered), ~11% (levered)
- ~6% cost of debt (capital markets debt financing)
- ~6% cost of equity (unlevered)
- <6% cost of debt
THIRD-PARTY TAX EQUITY PROVIDERS FOR US RENEWABLES

Pre-financial crisis

J.P. Morgan
NEW YORK LIFE
GE
Wells Fargo
Morgan Stanley
Bank of America
MetLife
Citi
AIG
John Hancock
Wachovia
LEHMAN BROTHERS
FORTIS

Post-financial crisis

J.P. Morgan
MetLife
Wells Fargo
Union Bank
CREDIT SUISSE

Today

J.P. Morgan
WELLS FARGO
CITI
US Bancorp
CREDIT SUISSE
Bank of America
MetLife
Morgan Stanley
Union Bank
Rabobank
PNC
Northern Trust
STATE STREET
Sumitomo
BNP PARIBAS
ING

Source: Bloomberg New Energy Finance, US PREF
SOUTHERN COMPANY’S PARTICIPATION

- Second-largest utility in the US
- Service area covers four Deep South states, no RPS
- Opponent of renewables legislation at federal level

- Acquired ~100MW of PV assets since March 2010, via JVs with Ted Turner
- Georgia Power (Southern subsidiary) filed initiative to conduct largest voluntary solar solicitation in the US

- Trend 1: Solar will become a cost-competitive option
- Trend 2: RPS policies will decline in importance
- Trend 3: Utilities will eye solar for defensive reasons
- Trend 4: Utilities (low WACC) will become asset owners
- Trend 5: Utilities will become a source of tax equity

30MW Cimarron I solar project (northern New Mexico)

Source: Bloomberg New Energy Finance, Solar Daily, Southern Company
REAL ESTATE INTERFACES AND TRANSITIONS

Source: Bloomberg New Energy Finance

Points of potential friction when implementing energy efficiency

Seniority concerns / Loan restrictions

Split incentives

Income valuation credibility gap

Capital priorities/ perverse incentives

Tenant comfort vs. energy management

DEVELOPER

LENDER 1

Loan (construction)

Sale

OCCUPANT 1A

OCCUPANT 1B

OCCUPANT 1C

OCCUPANT 1D

OCCUPANT 1E

MANAGER 1

LENDER 2

Loan (acquisition financing)

Leases

OCCUPANT 1A

OCCUPANT 1B

OCCUPANT 1C

OCCUPANT 1D

OCCUPANT 1E

MANAGER 2

LENDER 3

Loan (refinance)

Sale

LENDER 4

Loan (acquisition financing)

Sale

Owner 1

Owner 2

MANAGEMENT AGREEMENT

Management services

Leases

Leases

Leases
BLOOMBERG NEW ENERGY FINANCE GAS PRICE FORECASTS VS. NYMEX STRIP ($/MMBTU)

Source: Bloomberg New Energy Finance
LED LIGHTING VALUE CHAIN

Source: Bloomberg New Energy Finance
JAPAN ELECTRICITY MARKET: 2012 SUMMER SUPPLY-DEMAND FORECAST FOR WESTERN REGION (MW)

Source: National Policy Unit, Government of Japan

Note: The value in parentheses shows the excess/gap as a percentage of supply. The demand forecast does not take into account demand response programmes.

Kansai gap
-4,450 (-17.5%)

Chubu excess
1,370 (4.9%)

Hokuriku excess
200 (3.5%)

Chugoku excess
530 (4.3%)

Shikoku excess
20 (0.3%)

Kyushu gap
-360 (-2.3%)

West gap
-2,690 (-2.9%)

Source: National Policy Unit, Government of Japan
SNAPSHOT OF JAPANESE POLICYMAKER’S MIND

BEMS aggregator  Bilateral offsets  Biofuel  Biomass&Waste  Cap and trade
Carbon tax  Charging infrastructure  Cost of electricity  Debundling
Demand response  Distributed capacities  Energy blueprint
Energy efficient appliances  Energy mix  EV/PHV  Feed-in tariffs
Geothermal  Hatoyama initiative  Home battery  Kyoto
Non-traditional players
Nuclear
Quake resistance  Regulatory body  Regulatory easing  Residential FC  Safety
Site Rehabilitation  Small hydro  Small/micro generations  Smart community
Smart meter deployment  Solar PV  Tepco
Wind
Transmission lines  Vertically-integrated utilities
Source: Bloomberg New Energy Finance
ROMNEY ON COAL

“If [Obama] was elected president, the cost of energy would skyrocket… We have 250 years of coal. Why in the heck wouldn't we use it?”

Source: Herald Star Online, Bloomberg New Energy Finance
LEVELISED COST OF ENERGY COMPARISON: COAL VS. COMBINED CYCLE GAS ($/MWH)

Note: ‘Cheapest coal’ assumes $1.50/MMBtu delivered fuel costs and capex of $2,500/kW; ‘Average coal’ assumes $2.50/MMBtu and $2,750/kW; ‘Expensive coal’ assumes $3/MMBtu and $3,000/kW. ‘$4 gas’ assumes capex of $800/kW; ‘$6 gas’ assumes $900/kW, ‘$8 gas’ assumes $1,000/kW. All prices in real 2012 dollars.

Source: Bloomberg New Energy Finance
OBAMA ON WIND

“Today we have nearly 500 facilities in 43 states employing tens of thousands of American workers…If [wind manufacturers] are not confident that the industry’s going to be moving at a fast clip and they start reducing orders here, that affects you…”

SUPPLY AND DEMAND BALANCE FOR US TURBINE PRODUCTION CAPACITY, 2006-14E (GW)

Note: Lines show demand corresponding to Bloomberg New Energy Finance projections for wind build under different scenarios for PTC extension.

Source: Bloomberg New Energy Finance
MIDWEST DROUGHT MONITOR

August 2002

Moderate drought
Abnormally dry

July 2012

Moderate drought
Extreme drought
Exceptional drought

Source: University of Nebraska (Lincoln), Mark Svoboda, National Drought Mitigation Centre (http://droughtmonitor.unl.edu)

Note: Shading reflects level of drought severity (brown is more severe, yellow less severe)
US CORN PRICE ($ PER BUSHEL)

2008 commodities boom
(not a drought)

2011 drought

2012 drought

Source: Bloomberg New Energy Finance
## COMPREHENSIVE GLOBAL COVERAGE – CLEAN ENERGY AND CARBON MARKETS

### INSIGHT
- Research Notes
- Analyst Reactions
- Quarterly Outlooks
- Conference Calls
- Sector-Specific Data

### RENEWABLE ENERGY
- Wind
- Solar
- Geothermal
- Bioenergy
- Hydro & marine
- Renewable energy credits

### CARBON MARKETS
- North America
- EU-ETS
- Global / Kyoto
- Australia

### ENERGY SMART TECHNOLOGIES
- Energy efficiency
- Digital energy (smart grid)
- Power storage
- Advanced transportation

### ENERGY SMART TECHNOLOGIES
- Power (European)
- Gas
- Carbon Capture & Storage
- Nuclear
- Water

### Cross-sector research (eg, policy analyses, levelised cost of energy updates, regional market outlooks)

### INDUSTRY INTELLIGENCE
Organisations, projects and deal database, daily news per region

### NEWS & BRIEFING
Daily news & monthly briefing

### EVENTS & CONSULTING
- BNEF Summit
- Food for Thought events
- Leadership Forum events
- Applied research
- Data mining
- White papers
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MARKETS
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Carbon Markets
Energy Smart Technologies
Renewable Energy Certificates
Carbon Capture & Storage
Power
Water
Nuclear

SERVICES
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Industry Intelligence: data & analytics
News & Briefing: daily, weekly & monthly
Applied Research: custom research & data mining
Knowledge Services: Summit, Leadership Forums, Executive Briefings & workshops

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