



German American Renewable Energy Outlook 2011

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Roland Berger
Strategy Consultants



AHK

German American
Chambers of Commerce
Deutsch-Amerikanische
Handelskammern

Management Summary

- **Optimism is growing.** Over 50% of respondents expect greater than 10% annual revenue growth over the next five years
- **Growth will create jobs.** Over 40% of respondents expect to grow their headcount by greater than 10% per year over the next five years
- **Natural gas is seen as the most likely replacement for base load coal by 2020.** Followed by solar PV and onshore wind, the leading renewable energy sources in our survey
- **Federal policy would be welcomed by renewables industry.** A long-term, consistent federal energy policy was viewed by over 65% of respondents as "Important" or "Very Important"
- **Optimism is tempered by a lack of belief in RPS targets.** Only 30% of respondents believe that 50% of the US states with Renewable Portfolio Standard (RPS) goals will reach these goals by 2020

Management Summary

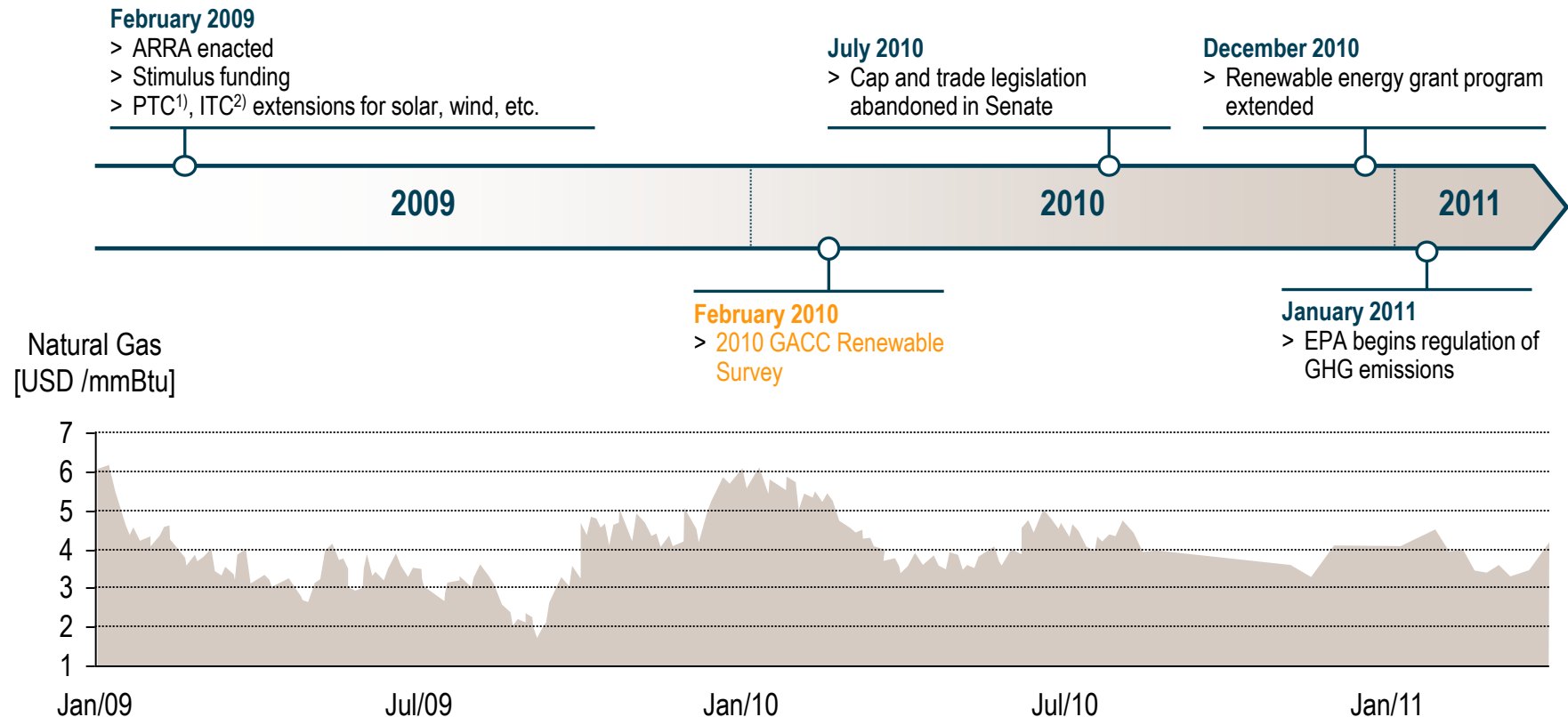
- **The US is second globally in installed wind capacity.** The US has over 40 GW of installed capacity as of the end of 2010, lagging China slightly, but far ahead of all other countries. Germany is third with 28 GW.
- **The US lags in solar PV but fast growth was seen in 2010.** The US currently ranks 4th in installed solar and is far behind global leader Germany. A fast annual growth rate of over 100% led to an increase from 1.2 GW in 2009 to 2.1 GW of installed capacity in 2010.
- **California, Ohio and Pennsylvania show best growth potential.** High renewable targets combined with large electricity markets and positive government support create large demand for renewable energy sources.
- **Solar PV adoption is being supported by many US states.** California and New Jersey are the current national leaders with supportive policies such as net metering programs and solar-specific RPS requirements

Introductory remarks

- In the spring of 2011, the **German American Chambers of Commerce** (GACCs – AHK USA) in cooperation with **Roland Berger Strategy Consultants**, for the second year in a row, conducted a survey evaluating the outlook of the renewable energy sector within the United States
- The survey target group included managers and key decision-makers from a number of companies operating in the green sector – both US-based as well as American subsidiaries of German companies
- The survey queried the respondents' business outlook and thoughts on power generation, drivers affecting growth of renewables, and upcoming challenges for the industry

A number of events affecting renewables in the US have transpired since the last survey

Timeline of major renewables-related events

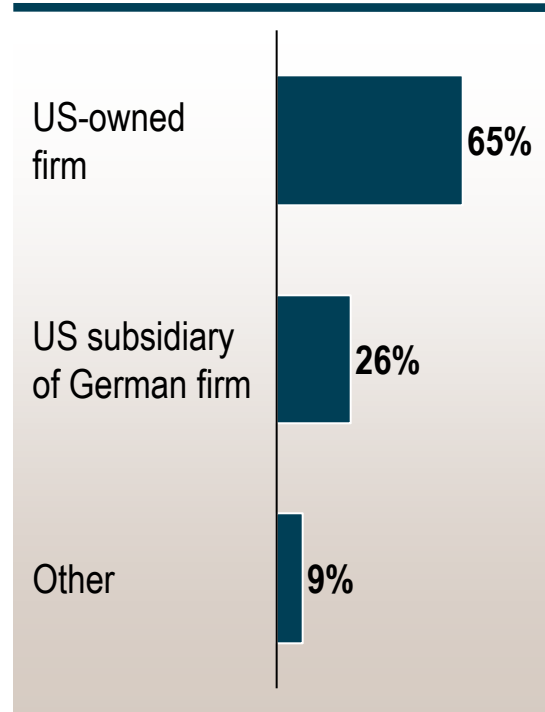


1) Production tax credit 2) Investment tax credit
Source: EIA, press releases

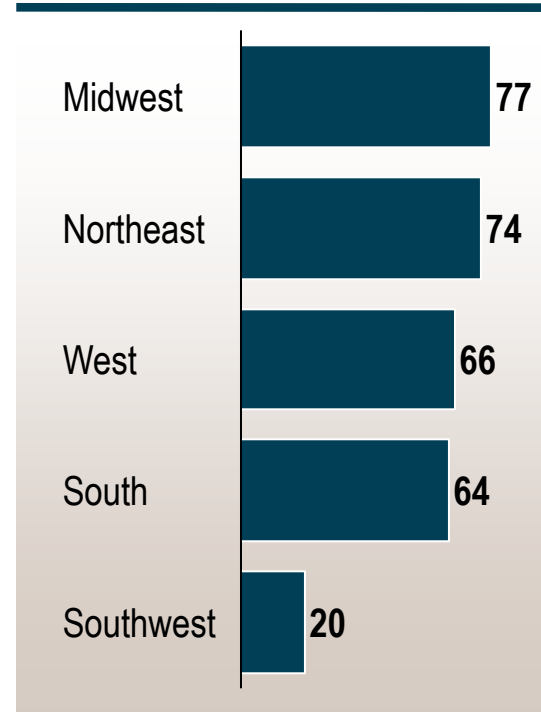
The 2011 survey covered a broad spectrum of companies, but is dominated by relatively small businesses

Key characteristics of survey sample

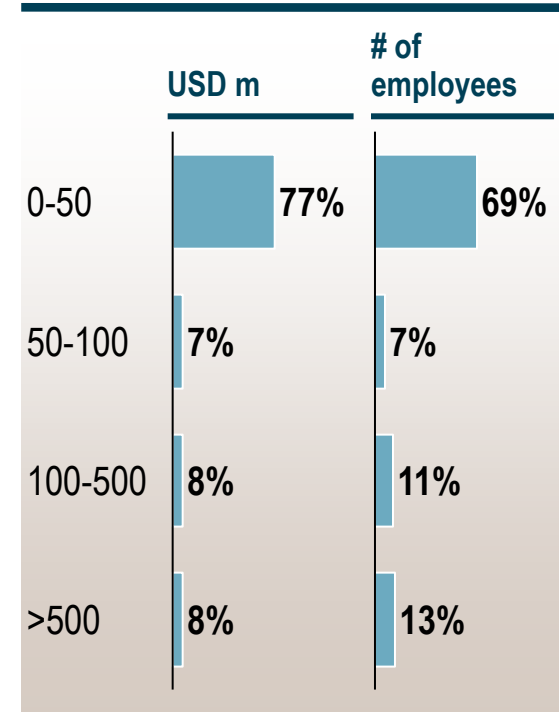
RESPONDENT TYPES¹⁾



US REGIONS OF COMPANIES²⁾



COMPANY SIZE¹⁾

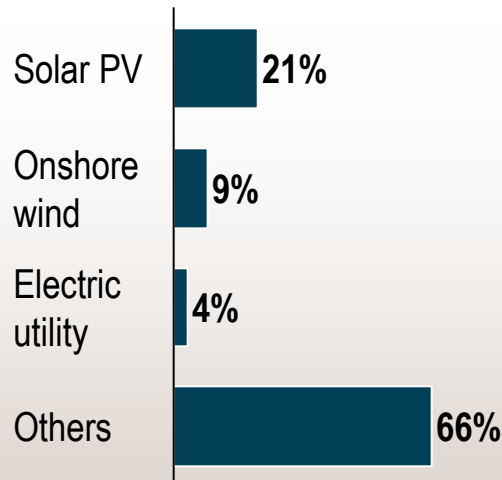


1) Out of survey pool of those who responded 2) Out of a base of 144 respondents

Each of the key renewables sectors and activities is represented – Solar PV companies had the largest representation

Key characteristics of survey sample

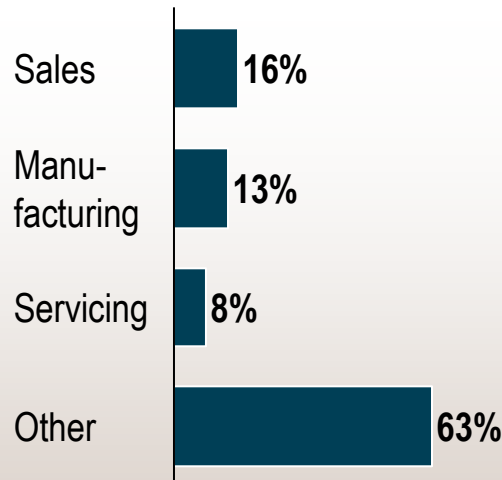
BUSINESS SECTOR¹⁾



Examples of others:

- > Energy efficiency
- > Biomass
- > Construction/real estate

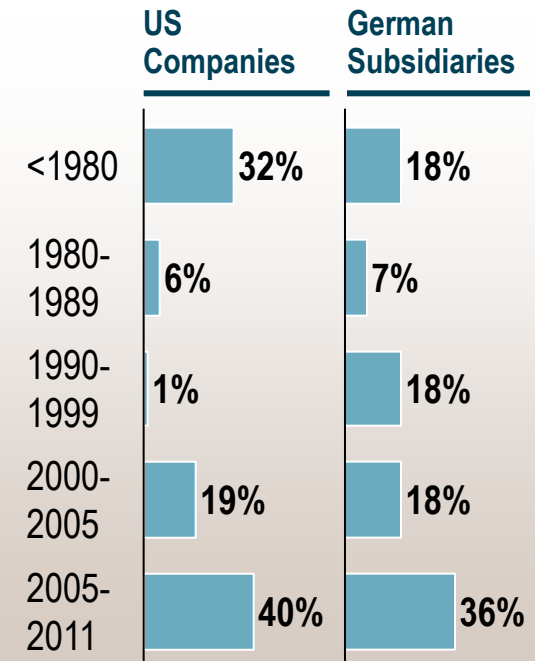
KEY US ACTIVITIES¹⁾



Examples of others:

- > Energy production – renewable
- > Servicing
- > Research/education

ENTRY IN US MARKET¹⁾



1) Out of survey pool of those who answered

The outlook for the renewables sector in the US looks very positive and government has an opportunity to support its growth

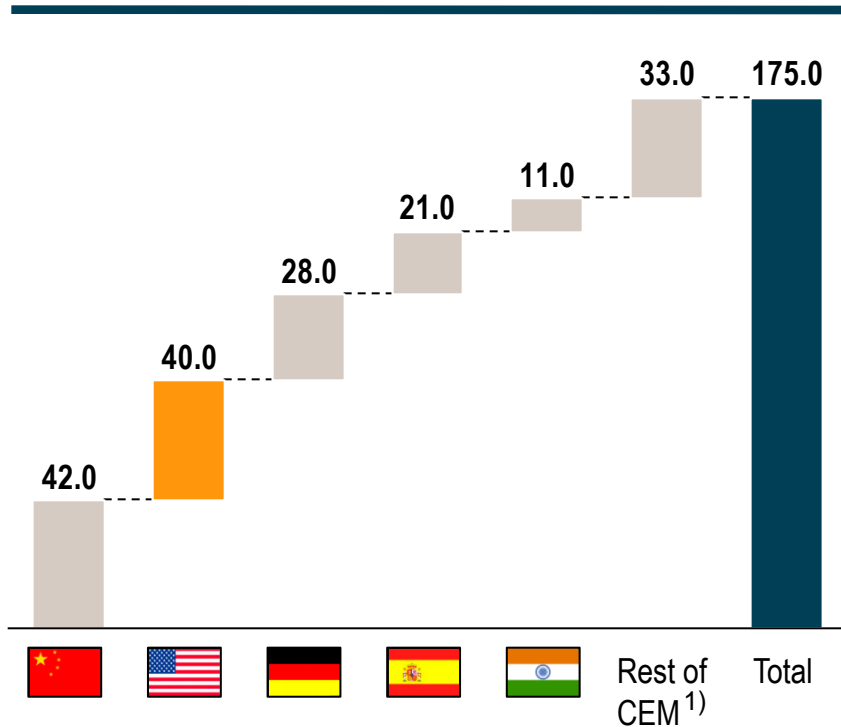
Executive Summary

- I STATE OF THE BUSINESS** Firms are expecting above-average revenue growth in the near term, and even greater in the long-term, driving plans for increased hiring
- II FUTURE ENERGY MIX** The makeup of the US energy generation mix will undergo significant change – both in the short term and long term
- III ENABLERS** Government has an opportunity to stimulate renewables demand through more cohesive and encouraging policies and incentive programs
- IV CHALLENGES** Credit and funding limitations as well as dependence on overall economic conditions are identified as key potential challenges to the increased adoption of renewables

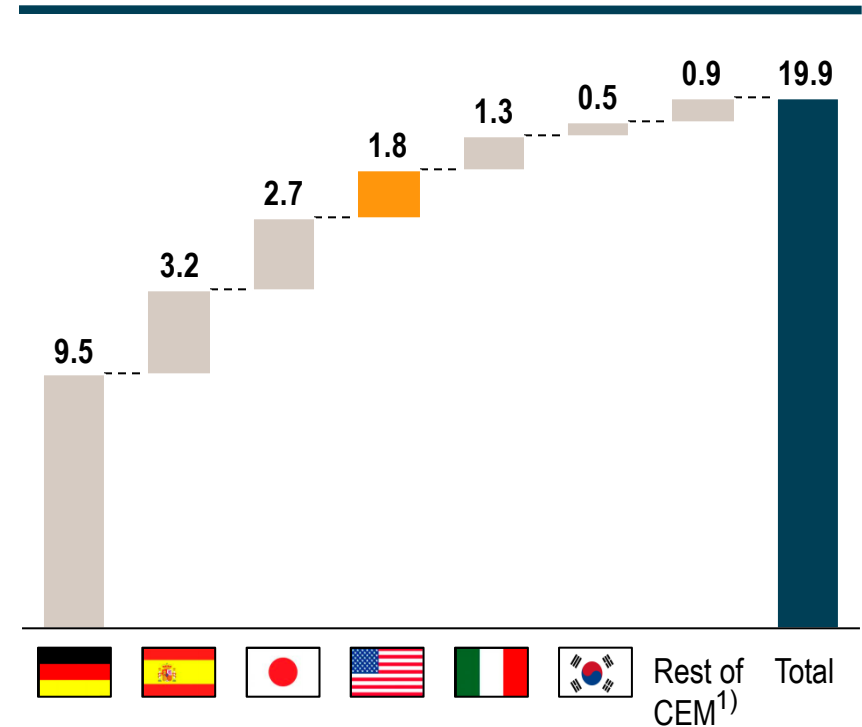
On a global scale, the US has remained a leader in wind power but lags in solar PV capacity

Major renewables capacity of select countries

WIND CAPACITY (2010) [GW]



SOLAR PV CAPACITY (2009) [GW]



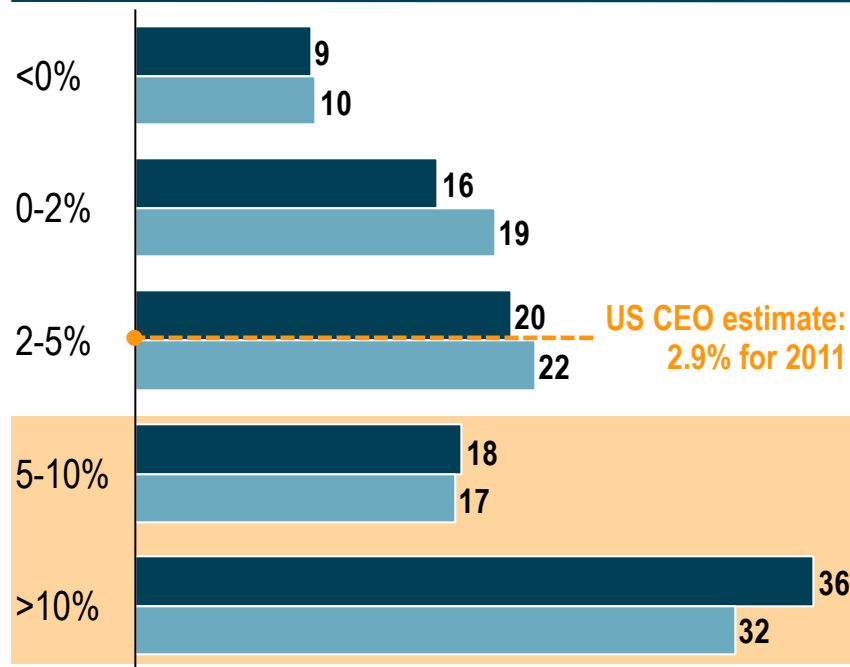
Notes: 1) Clean Energy Ministerial

Source: Global Wind Energy Council, China Electricity Council, 2010, country submissions

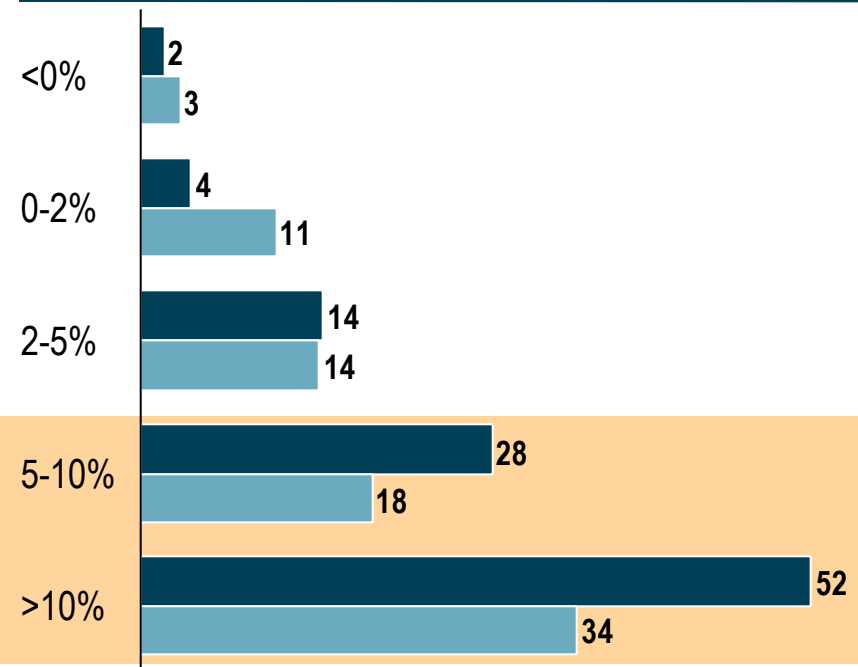
Firms are considerably more optimistic in their revenue outlook relative to last year in both the near-term and long-term

Annual revenue outlook (% increase)

1-YR TIMEFRAME [% share of participants]¹⁾



5-YR TIMEFRAME [% share of participants]¹⁾



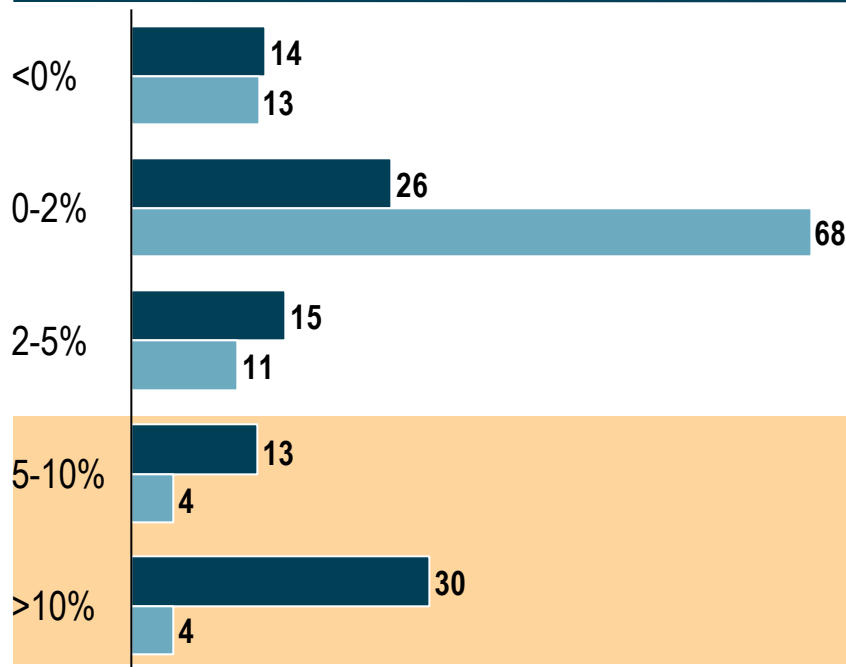
2011 Survey 2010 Survey Focus area

1) Out of survey pool of those who answered

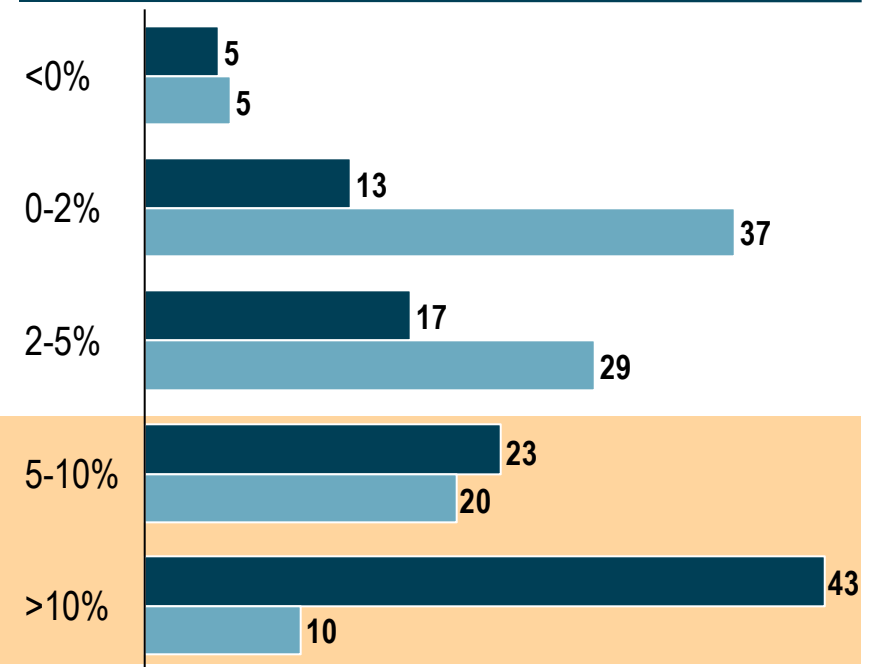
Consequently, there is a significant improvement in firms' expectations to increase their workforce

Annual headcount outlook (% increase)

1-YR TIMEFRAME [% share of participants]¹⁾



5-YR TIMEFRAME [% share of participants]¹⁾



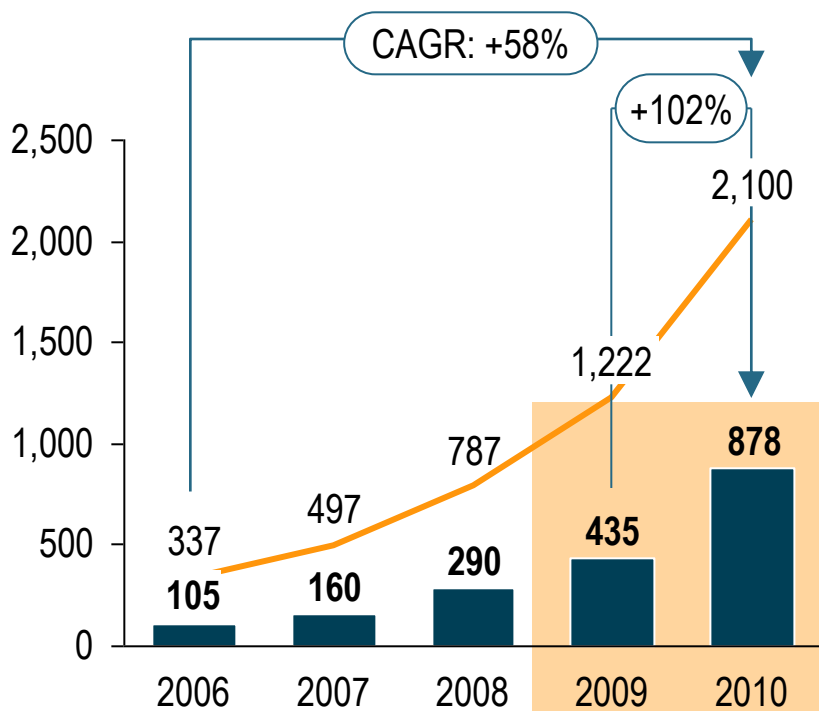
2011 Survey 2010 Survey Focus area

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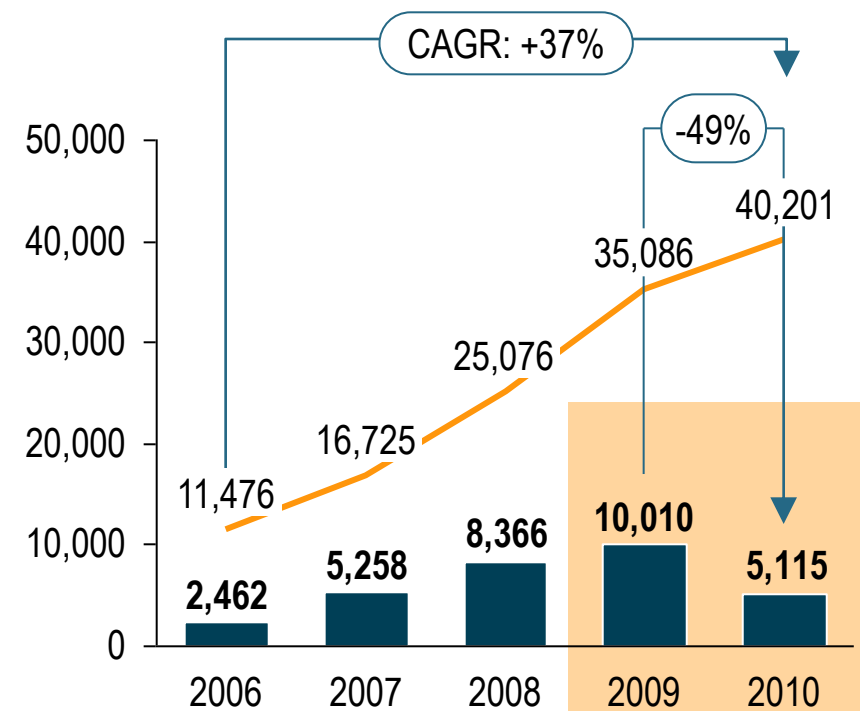
Wind power, although constituting over 40 GW of US generating capacity, has seen slower growth compared to solar PV

Major renewables sector capacity growth in the US (2006-2010)

SOLAR PV CAPACITY [MW]



WIND CAPACITY [MW]

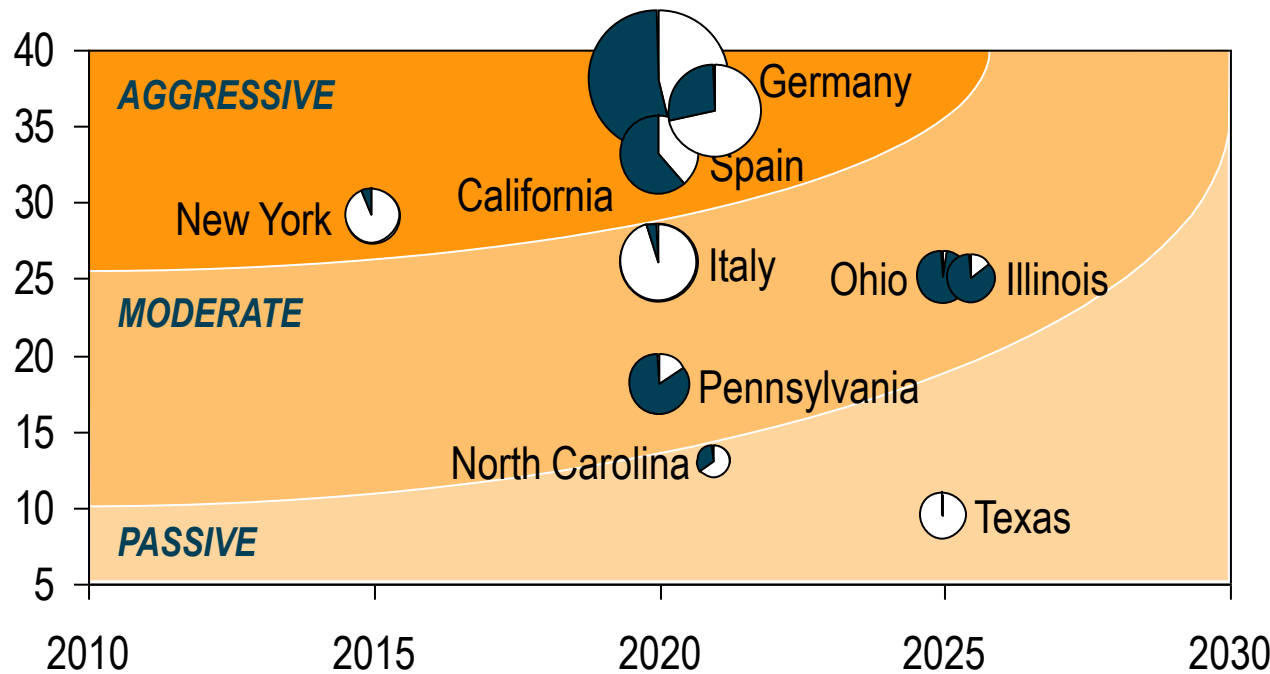


■ Annual installation [MW] — Cumulative installation [MW] ■ Focus area

Looking forward, the renewables targets and market opportunity for renewables differ broadly across various markets

Renewable electricity generation targets for select markets¹⁾

Renewables % goal²⁾



- > The major European markets are generally more aggressive in their renewables targets and have generally progressed to achieve them at a quicker pace than comparable US states
- > Significant opportunity in the US exists in Ohio, Pennsylvania, and California



OVERALL BUBBLE SIZE INDICATES TOTAL RENEWABLES GENERATION NEEDED
PROPORTION IN BLUE INDICATES REMAINING RENEWABLE ENERGY NEEDED TO TARGET

Target Year

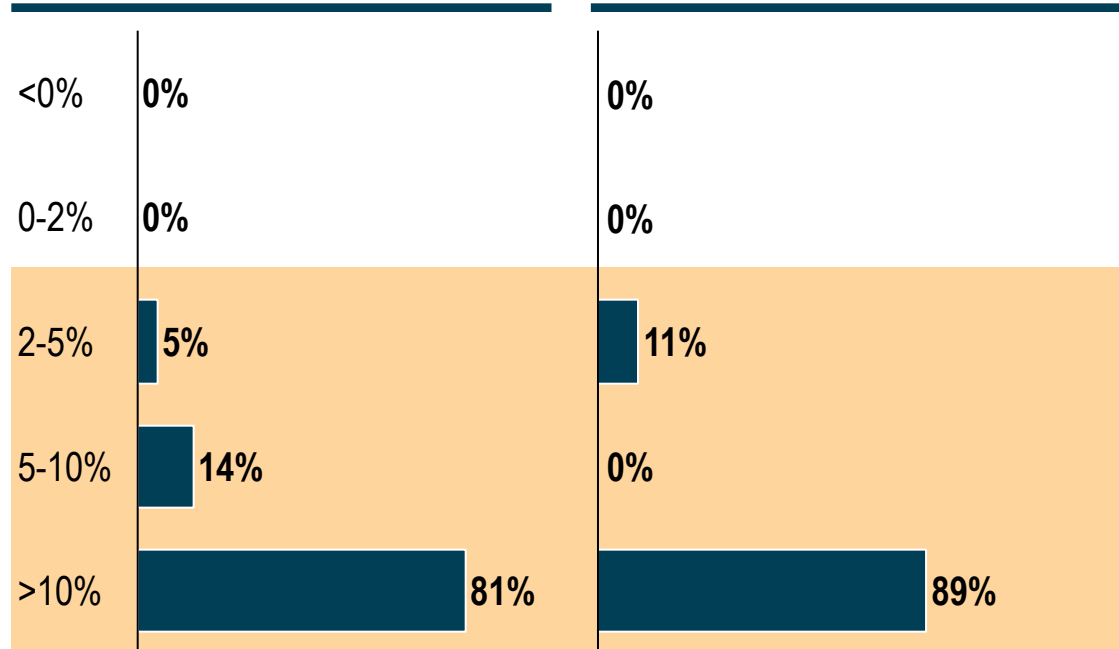
Notes: 1) Largest US states with RPS shown 2) Based on electricity supply (not capacity)
Source: EIA, DSIRE, EU National Renewable Energy Action Plans, Roland Berger analysis

Companies in two key Green segments have particularly high expectations for five year revenue growth

Expected revenue growth per year for the US (5 years)¹⁾

SOLAR PV

ONSHORE WIND



Focus area

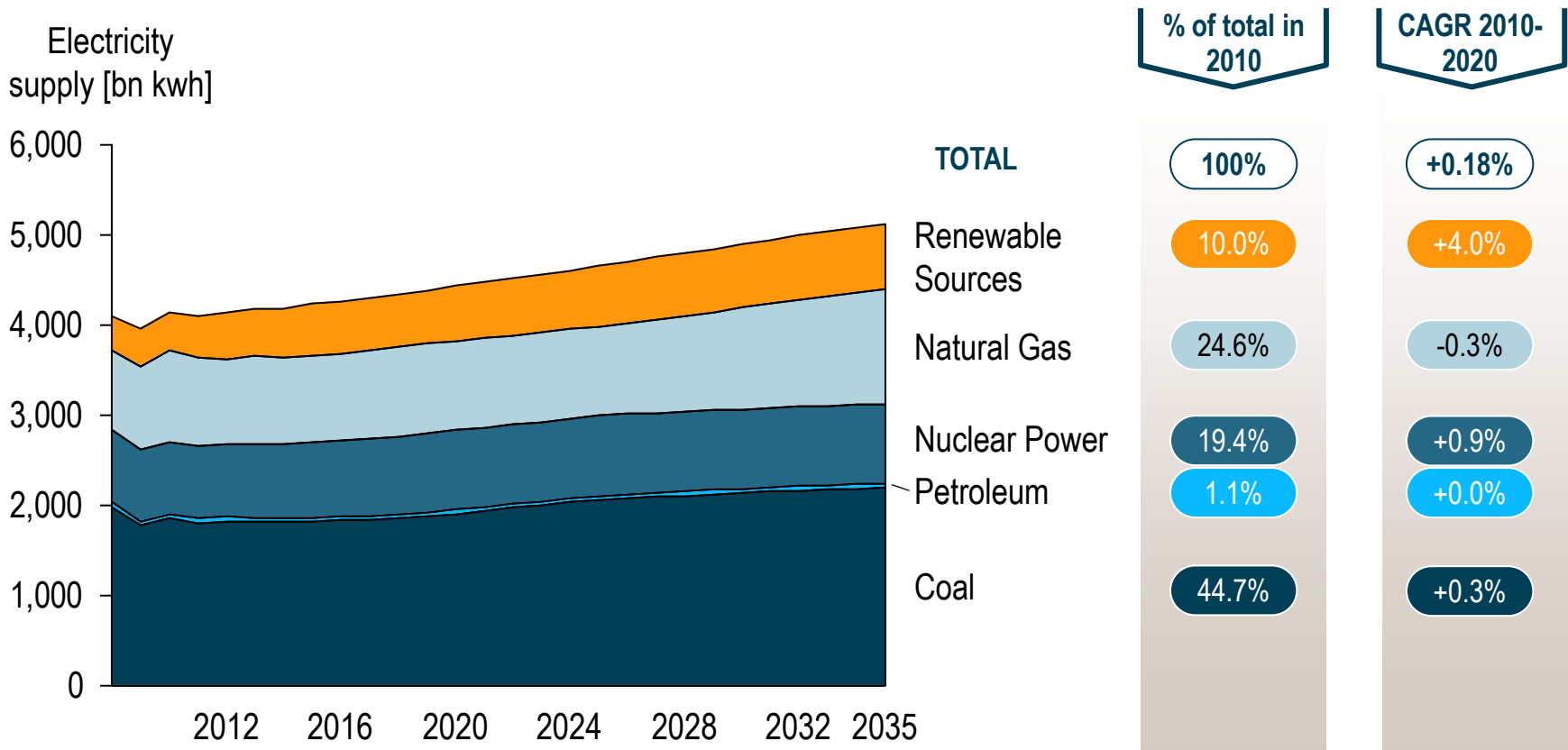
1) Out of survey pool of those who answered

Source: GACC Renewables Outlook Survey 2011, Roland Berger analysis

- > Solar PV and onshore wind sectors are the most optimistic going forward in terms of revenue growth
- > Solar PV expectations are high likely due to **CONTINUED GOVERNMENT SUPPORT** and lower technology and production costs
- > The wind sector remains optimistic, driven by federal tax credits and substantial **PRIVATE SECTOR INVESTMENT**

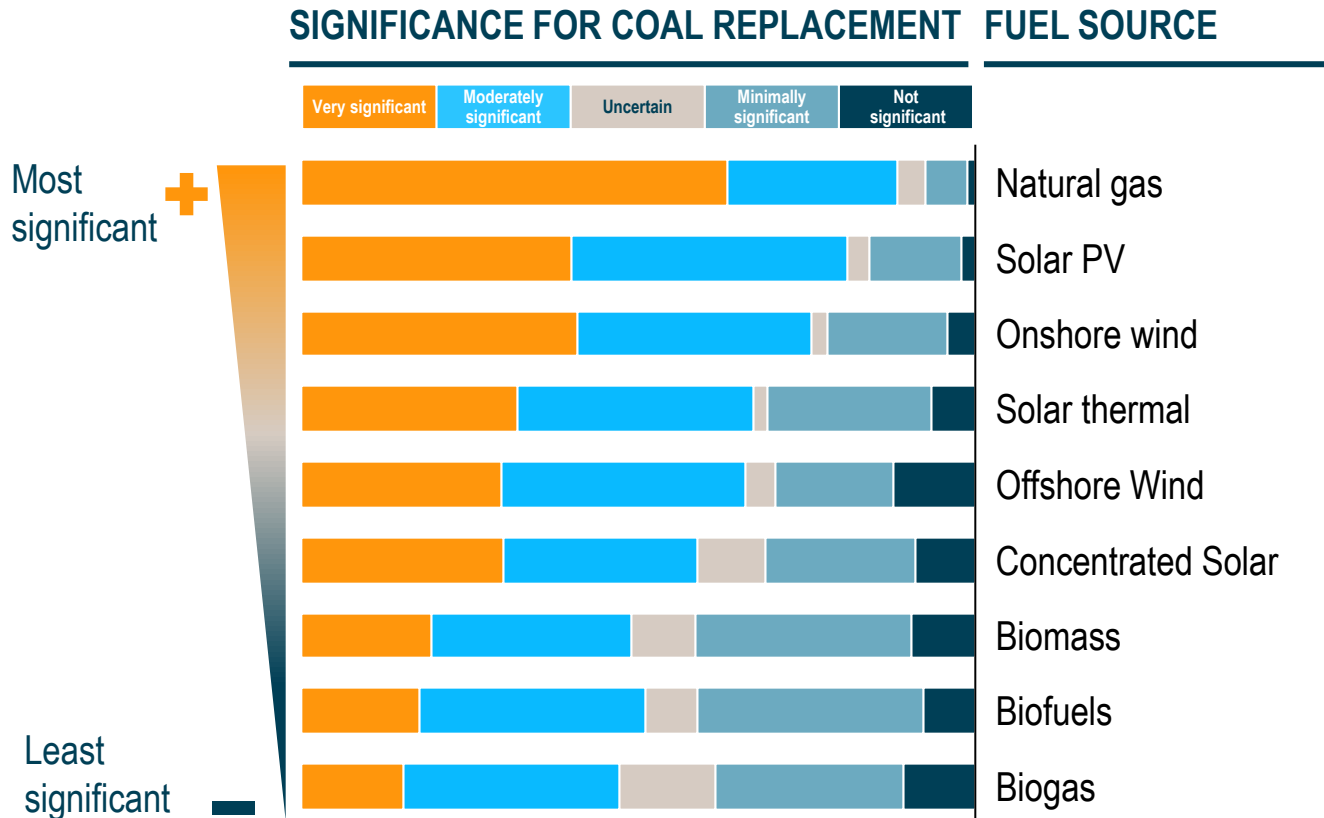
Renewable energy growth is to lead shift from carbon-based energy sources according to a baseline scenario

Forecast of US electricity generation by fuel, present-2035



Expectations are that natural gas followed by solar PV and onshore wind installations will replace coal sources

Suitability for base load coal replacement by 2020



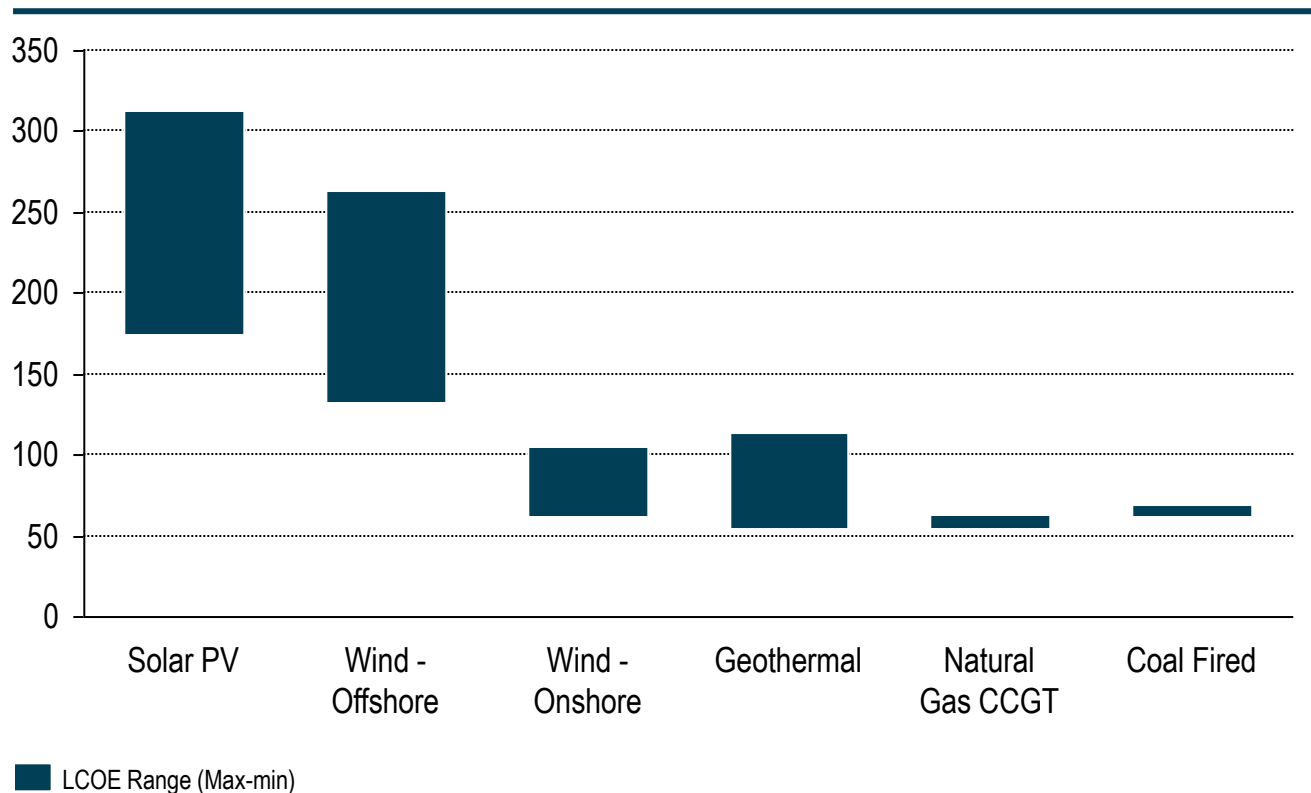
> Natural gas, driven by abundant supplies, low prices, versatility as a power plant fuel, and relatively low emissions is expected to dominate coal replacement for base load requirements

1) Out of survey pool of those who answered

Currently, PV and wind energy sources have a considerably higher cost basis compared to conventional sources

Cost-competitiveness of various energy generation sources

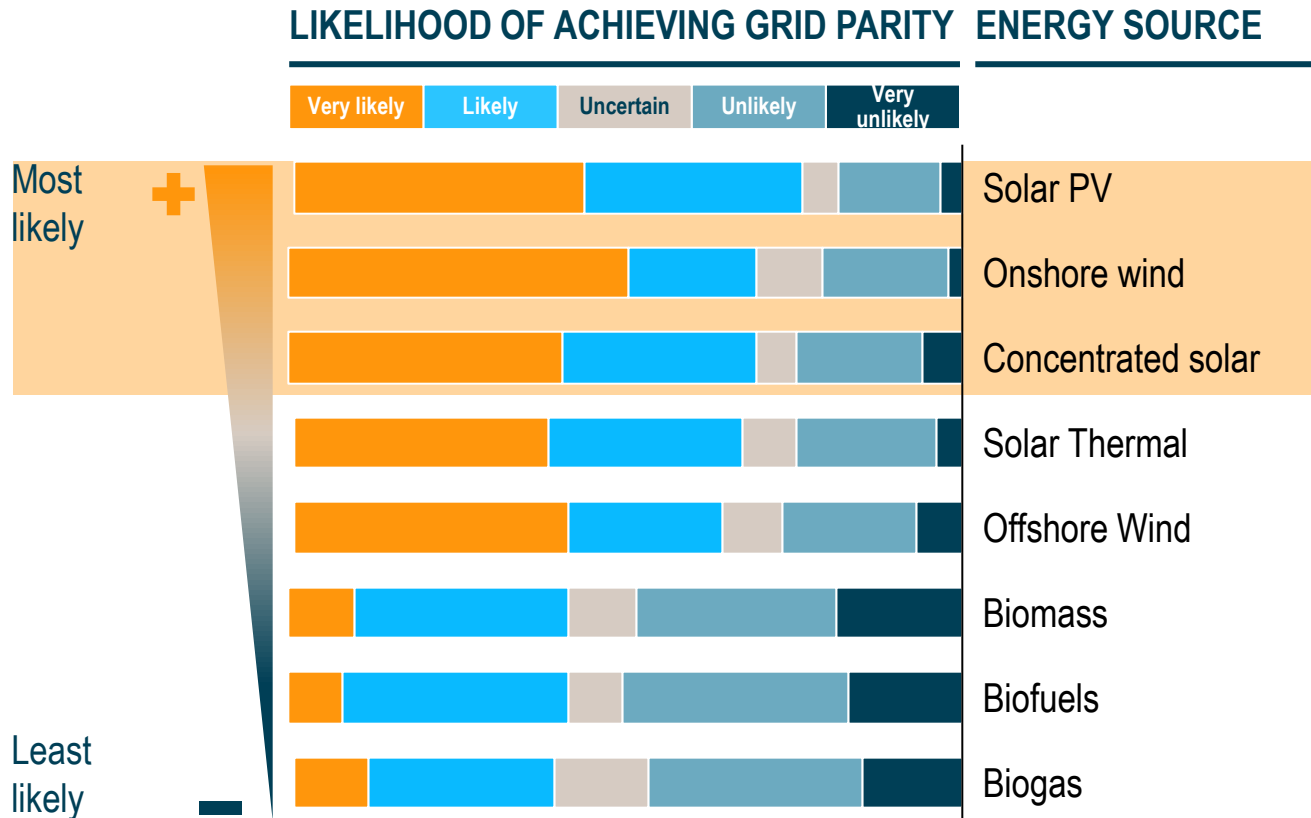
LEVELIZED COST OF ENERGY, Q4 2010 [USD/mWh]



- > Solar PV costs are roughly 3X more costly currently than primary base load energy sources
- > Geothermal and on-shore wind are the most cost competitive 'newer' generation sources
- > Actual costs are very specific to source location, weather conditions, etc.

However, there is an expectation that in future solar PV will be the most cost-competitive source followed by onshore wind

Likelihood of reaching grid parity by 2020, by energy source¹⁾

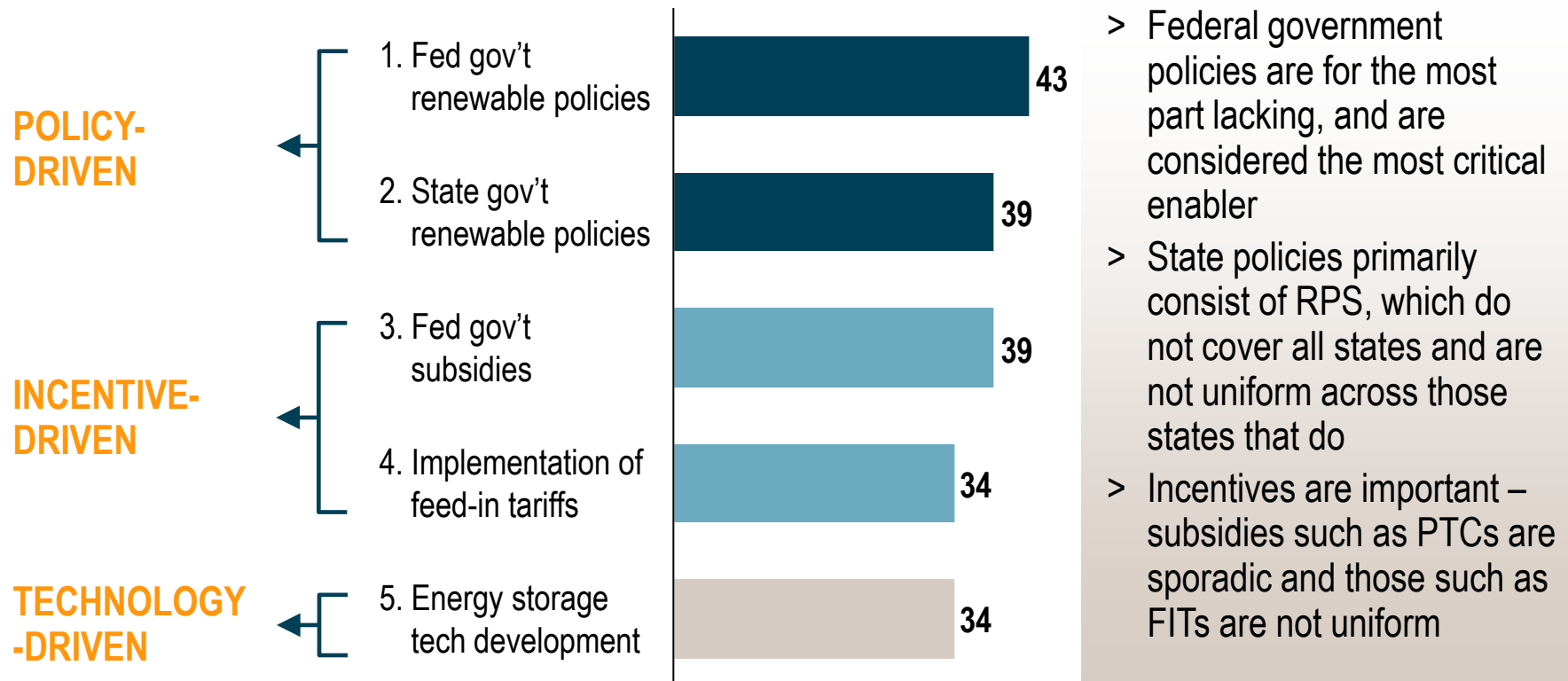


- > Solar PV is seen as having the most promise in terms of cost reduction – recent announcements of costs closer to USD 1/W²) affirm this sentiment
- > The 'bio' sources are not thought to be as cost-competitive over the next 10 years compared to other energy sources

1) Out of survey pool of those who answered 2) MiaSole CIGS technology
 Source: Economist, GACC Renewables Outlook Survey 2011, Roland Berger analysis

Policy and incentive-driven initiatives are considered to be top enablers for the continued adoption of renewables going forward

Top five enablers for further renewables adoption (% of respondents)



Interestingly, the top enabling factors are different for the two principal renewable energy sectors

Top three enablers for further renewables adoption, by sector

SOLAR PV SECTOR

- 1 State government renewables policies
- 2 Implementation of feed-in tariffs (FITs)
- 3 Federal government renewables policies

ONSHORE WIND SECTOR

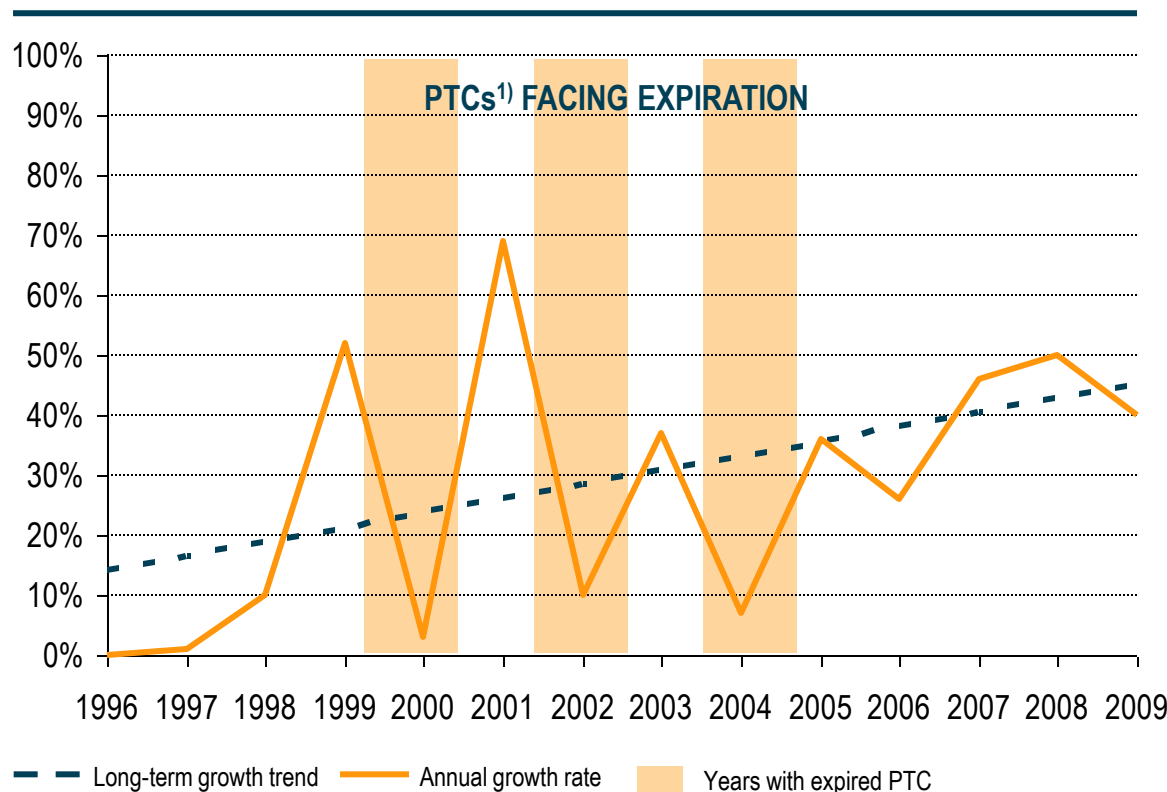
- 1 Federal government renewables policies
- 2 Federal government subsidies
- 3 Energy storage technological development

- > The solar sector is much more dependent on state renewables policies, which in some cases stipulate solar share of generation within the RPS, as well as the **PROLIFERATION OF STATE-ADMINISTERED FITs**
- > Due to greater manufacturing costs and **INTERMITTENCY OF POWER GENERATION**, the wind sector considers federal government policies such as PTCs and energy storage as more important enablers

Capacity growth of wind power in the US is particularly dependent on implementation of federal production tax credits (PTCs)

Wind power growth trend

GROWTH OF US WIND POWER CAPACITY

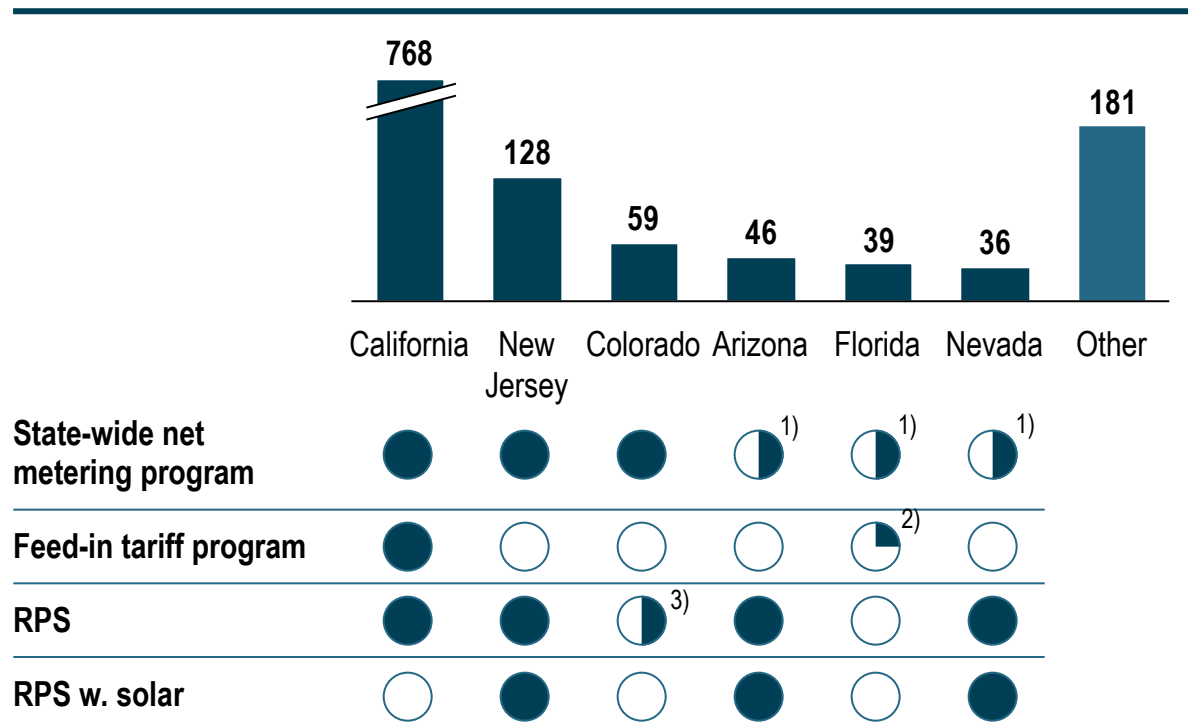


- > Wind capacity in the US has generally been trending upwards over the last ten years
- > Capacity growth is highly sensitive to the enactment of production tax credits (PTCs), which faced expiration in 2000, 2002, and 2004 resulting in planning uncertainty in the industry and markedly lower growth rates in those years

As well, solar growth has been particularly robust in a number of select states due principally to state-specific initiatives

Solar PV comparison across select states

CUMULATIVE SOLAR PV INSTALLATION, 2009 (MW_{DC})



- > The RPS acts as a strong, overall driver for increased deployment of renewables in general, and especially solar
- > Measures that encourage 'grassroots' adoption of renewables at the residential level, such as net metering and feed-in tariff programs, seem to be highly effective in promoting deployment of solar PV

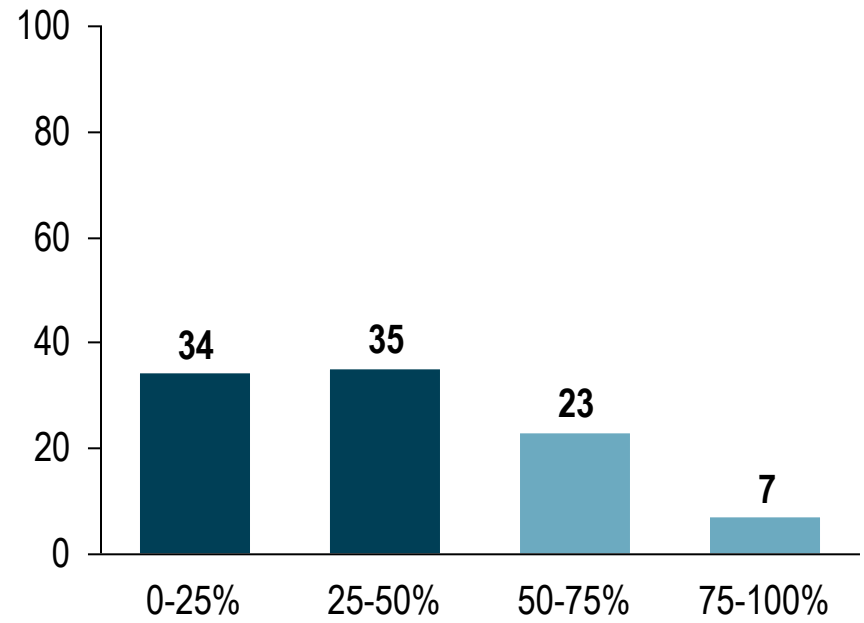
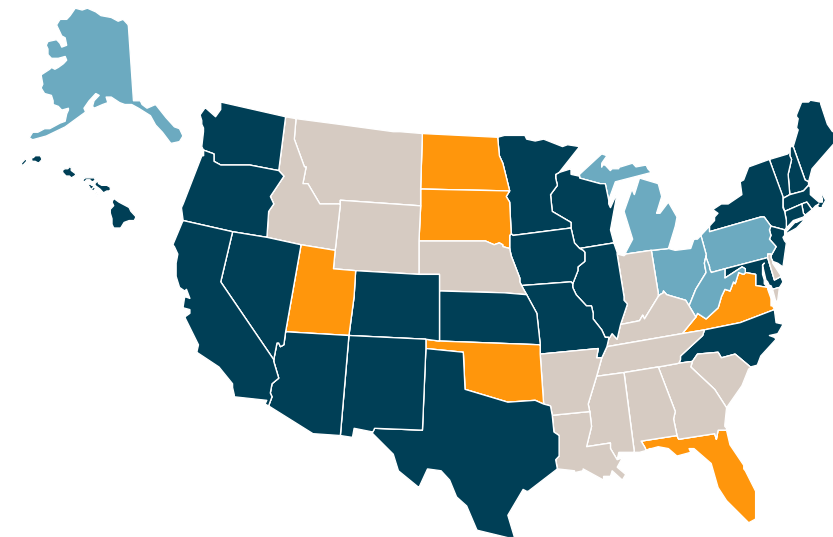
Notes: 1) Statewide only for certain utility types 2) In some municipalities 3) Renewable portfolio goal
 Source: DSIRE, IREC, Pew Center for Global Climate Change, Roland Berger analysis

The renewable portfolio standards have been adopted by most states, but skepticism remains as to how realistic the targets are

State renewable portfolio standards

RENEWABLE PORTFOLIO STANDARDS

% OF STATES THAT WILL MEET RPS GOAL¹⁾



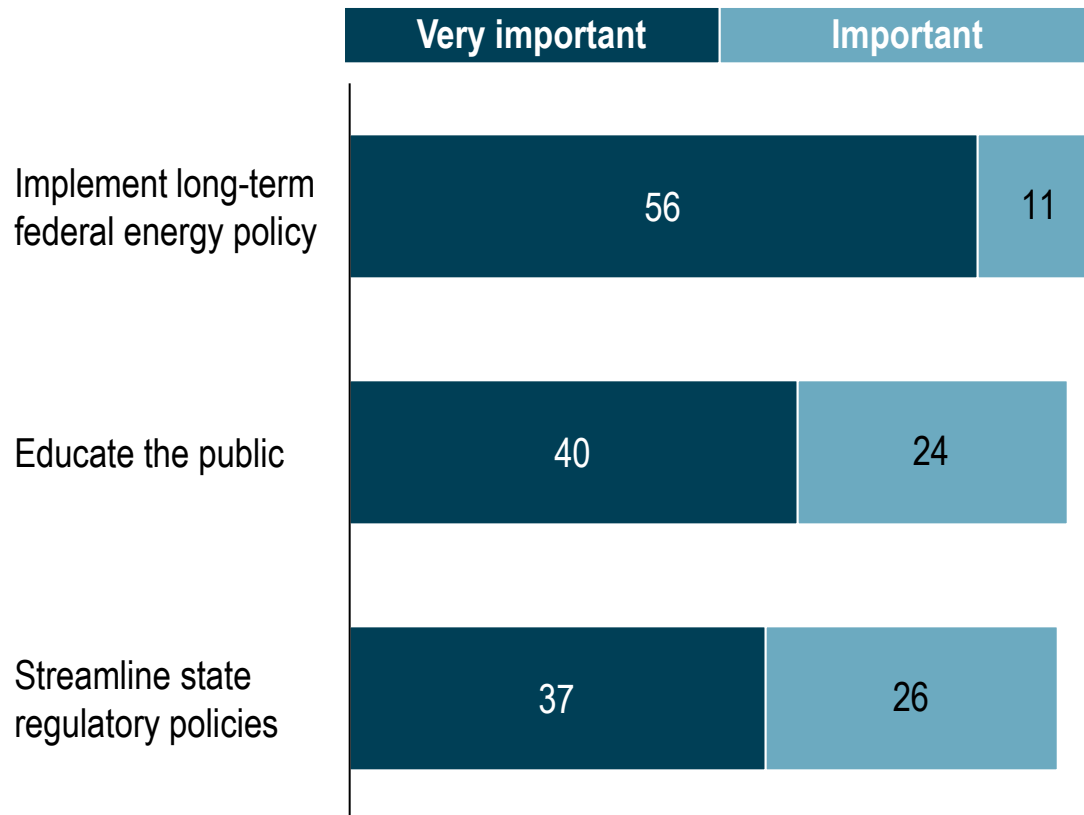
- Renewable Portfolio Standard
- Alternative Energy Portfolio Standard
- Renewable or Alternative Energy Goal

1) Out of survey pool of those who answered



Policy action but also raising awareness with the public are considered top government actions that can fuel renewables

Top government actions to encourage renewables growth



- > Policy improvements, both at the federal level and with the goal of achieving uniformity across different states, dominate the desired actions to be spearheaded by government and agencies
- > The business sector indicates that the public may not be fully aware of the benefits and importance of renewable energy, and some action on the part of the government is needed

Poor economic conditions and credit limitations remain prime challenges for most companies in the renewables sector

Challenges facing the renewables sector¹⁾

US-OWNED FIRMS		US-SUBSIDIARIES OF GERMAN FIRMS	
1 (1)	Poor economy	1 (3)	Federal government policies
2 (2)	Credit and funding limitations	2 (4)	Inconsistent standards
3 (N/A)	State government policies	3 (1)	Poor economy

- > Despite improved economic conditions, they along with credit/funding limitations remain at the forefront of challenges for the sector
- > However, both of these threats are less critical for subsidiaries of German firms, possibly owing to stronger economic environment and funding conditions in Germany

1) 2010 ranking shown in shaded parentheses
 Source: AWEA

In conclusion...

- Renewable energy, lead by solar PV and wind, has progressed substantially in the US and abroad in the last decade
- The outlook for the industry is increasingly very positive in the long-term, with expectations of revenue growth and job creation clearly exceeding those for the general economy
- Optimism is accounted for by governments striving to achieve portfolio targets, continually decreasing costs of generation, and hope for more supportive government policy
- A federal energy policy and better coordination among states remain at the forefront of initiatives needed to help promote renewables



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Strategy Consultants

Founded in 1967, Roland Berger is one of the world's leading strategy consultancies. With 39 offices in 27 countries, the company has successful operations in all major international markets. Annually, it generates about USD 900 million in revenues with 2,000 employees. The strategy consultancy is an independent partnership exclusively owned by about 180 Partners.

Participating organizations



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