



PERSPECTIVES FROM ENERGY STORAGE PROFESSIONALS

THE RISE & FUTURE OF ENERGY STORAGE



MORTENSON IS PLEASED TO SHARE PERSPECTIVES ON ENERGY STORAGE AND THE FUTURE OF THE ENERGY INDUSTRY

To understand and share perspectives about the future of energy storage and the broader energy industry, we surveyed 165 professionals at this spring's Energy Storage Association Annual Conference and Expo. Survey participants included energy storage manufacturers and developers, utilities, independent power producers, and other energy professionals.

While there are a number of significant challenges ahead, we learned that there is strong optimism surrounding energy storage and the tremendous benefits it can bring to our nation's energy infrastructure.

Now is the time for industry players to step up and define the business models and applications that will enable energy storage to thrive.

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THE FUTURE OF ENERGY STORAGE

PERSPECTIVES FROM STORAGE AND UTILITY PROFESSIONALS*

CHALLENGES

- 1 COSTS**
- 2 VIABLE BUSINESS MODELS**
- 3 REGULATIONS AND RATES**

POTENTIAL

89% of all professionals believe **IN A DECADE THE ELECTRIC INDUSTRY WILL LOOK AND OPERATE DIFFERENTLY**

98% of manufacturers, developers and IPPs believe **ENERGY STORAGE WILL ULTIMATELY FLOURISH AND BE A GAME-CHANGER**

PREDICTIONS

The majority believe **DISTRIBUTED GENERATION AND RENEWABLES ARE THE FUTURE** of the industry

Most predict **BATTERIES AND CAPACITORS WILL BE THE MOST UTILIZED STORAGE** technology in 5-7 years

60% BELIEVE LITHIUM ION BATTERIES WILL DOMINATE

COMMERCIAL VIABILITY

Nearly all believe growth of **ELECTRICITY STORAGE WILL REQUIRE MODERATE OR SUBSTANTIAL REGULATORY CHANGES.**



All Professionals



Manufacturers, Developers, IPPs



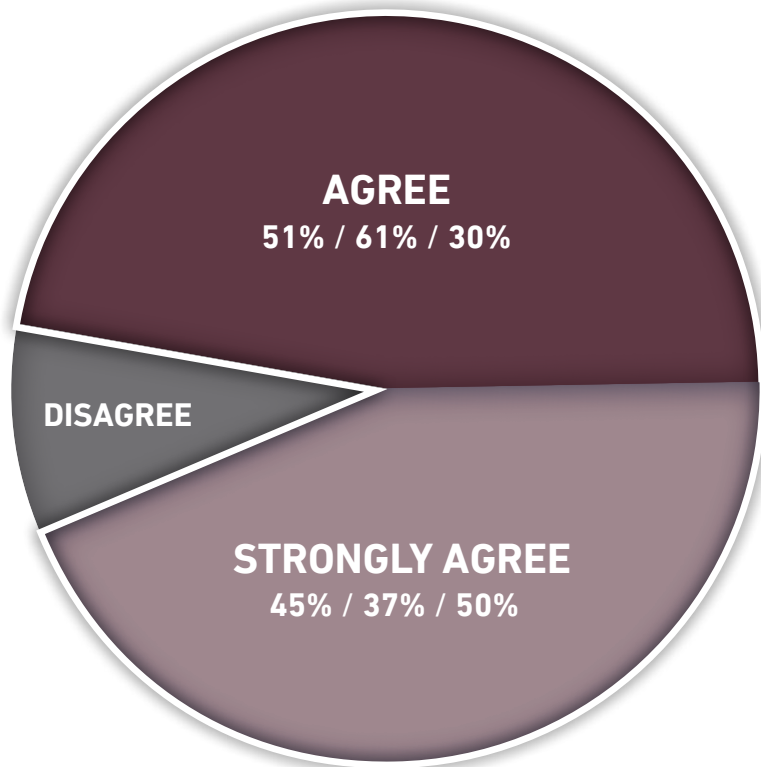
Utilities

*Survey of 165 professionals at the 2016 Energy Storage Association Annual Conference and Expo.

TRANSFORMED INDUSTRY

ENERGY STORAGE WILL FLOURISH AND HELP TRANSFORM THE INDUSTRY

Energy storage will ultimately flourish and be a game changer.



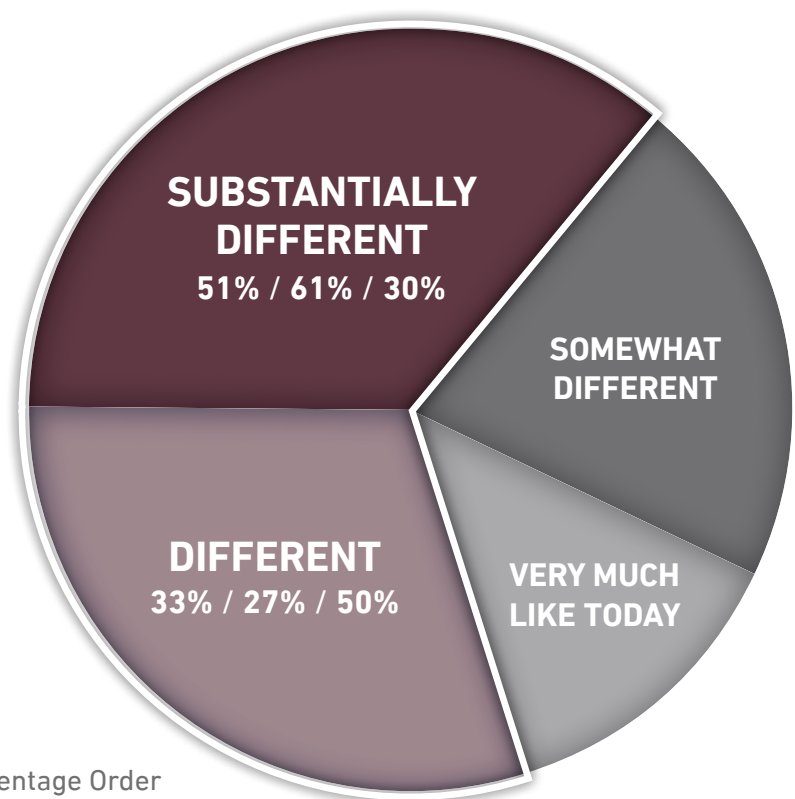
Percentage Order

1 | All Professionals

2 | Manufacturers, Developers, IPPs

3 | Utilities

A decade from now, the look and operation of the electricity industry will be:



Percentage Order

1 | All Professionals

2 | Manufacturers, Developers, IPPs

3 | Utilities

DISTRIBUTED GENERATION

DISTRIBUTED GENERATION AND RENEWABLES ARE THE FUTURE OF THE INDUSTRY

How will the electricity industry be most different 10 years from now?

All Professionals



Manufacturers, Developers, IPPs



Utilities



- More Distributed Generation
- More Renewables
- More Storage
- Different Role for Utilities
- More Competition and Choice
- Other Answers

**MANY ALSO FORESEE
INCREASED COMPETITION
AND AN ALTERED ROLE
FOR UTILITIES**

SELECT COMMENTS:

- “ There will be a substantial increase in renewable penetration, with associated storage providing system stability. ”
- “ There will be far more distributed generation and energy storage. ”
- “ We will see an increase in distributed generation. 75% of generation will come from independent sources. ”
- “ The future will be far more competitive and transactive than today. There will be a significant rise in parties that can buy and sell electricity. ”
- “ Utilities will move to a Distribution System Operator business model. ”

WINNERS AND LOSERS



SIGNIFICANT CONSOLIDATION IS EXPECTED OVER THE NEXT 5–7 YEARS IN BOTH ENERGY STORAGE PLAYERS AND TECHNOLOGIES

How many years until we see a meaningful consolidation of energy storage players and developers?



6.6 YEARS

Manufacturers, Developers, IPPs

6.7 YEARS

All Professionals

7.5 YEARS

Utilities

How many years until we see a small number of primary storage technologies (2–4) that dominate the industry?



5 YEARS

Utilities

7.3 YEARS

All Professionals

7.6 YEARS

Manufacturers, Developers, IPPs

FUTURE TECHNOLOGIES

BATTERIES WILL BE THE MOST UTILIZED TECHNOLOGY 5–7 YEARS FROM NOW

Which category of technology will be most utilized 5–7 years from now?

All Professionals



Manufacturers, Developers, IPPs



Utilities



☒ Batteries

☒ Electrical (super-capacitors, superconducting magnetic etc.)

☐ Mechanical (pumped storage, compressed air, etc.)

☐ All Others

ANTICIPATE PROMISE
IN SUPERCAPACITORS/
SUPERCONDUCTING
MATERIALS

SELECT COMMENTS:

“ I think Lithium Ion will take over the world. There are just too many advantages to this chemistry. ”

“ We will see advanced Lithium Ion technologies with higher energy densities. ”

“ I envision remotely monitored battery systems that ensure constant energy. ”

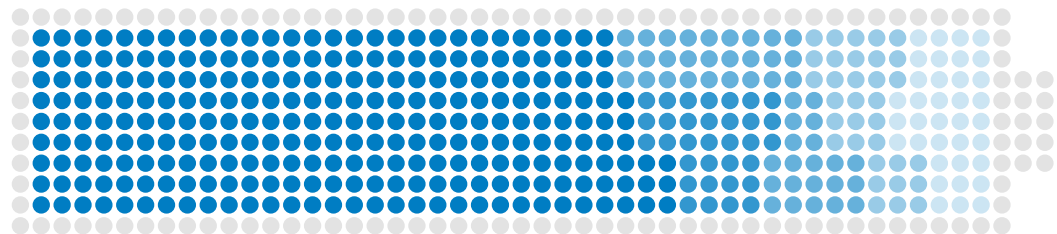
“ I wouldn't count out high density, ultra capacitors. ”

LITHIUM ION BATTERY TECHNOLOGY HAS THE MOST PERCEIVED POTENTIAL

Which technology will dominate within batteries?

- ☒ Lithium Ion
- ☐ Sodium Sulfur
- ☐ Flow
- ☐ Vanadium-based
- ☐ All others

WHEN ASKED SEPARATELY, **FLOW BATTERIES** WERE MENTIONED MOST AS HAVING THE GREATEST “YET TO BE COMMERCIALIZED” PROMISE



64%

Utilities

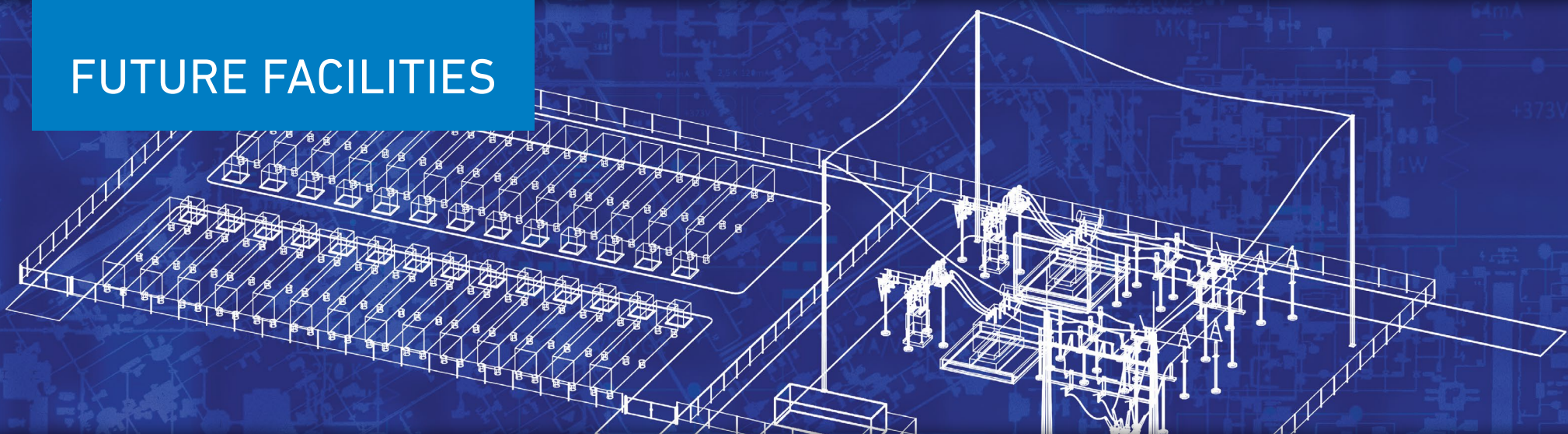
65%

Manufacturers, Developers, IPPs

68%

All Professionals

FUTURE FACILITIES



STORAGE HOLDS MEANINGFUL POTENTIAL IN “BEHIND THE METER” END-USER APPLICATIONS AND WE WILL SEE FACILITIES AND CAMPUSES WITH THEIR OWN STORAGE AND GENERATION ASSETS WITHIN THE NEXT 5–7 YEARS

How many years until it is common to see commercial/institutional facilities with their own generating and storage capabilities?



6.5 YEARS

Utilities

7.4 YEARS

All Professionals

7.9 YEARS

Manufacturers, Developers, IPPs

How many years until it is common to see communities/campuses with generating and storage assets that provide energy across their facilities?



5.5 YEARS

Utilities

7 YEARS

All Professionals

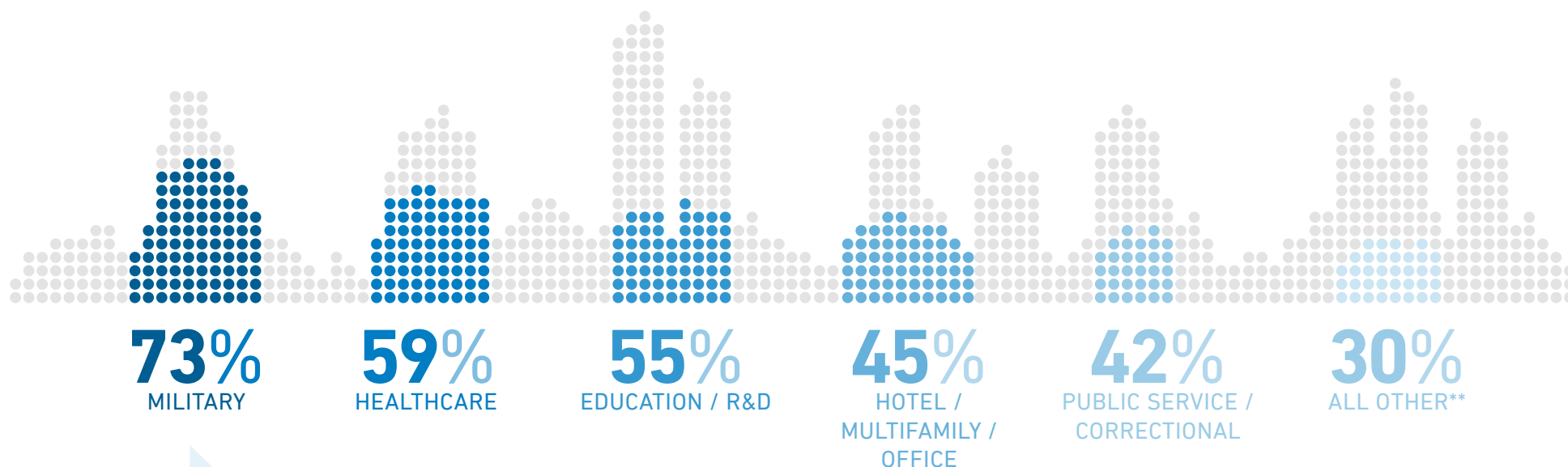
7.2 YEARS

Manufacturers, Developers, IPPs

FUTURE FACILITIES

HEALTHCARE, EDUCATION, MILITARY, EDUCATION, AND R&D FACILITIES ARE **VERY SUITABLE FOR ENERGY STORAGE**

Which facilities/campuses are most suitable to energy storage?



ALTHOUGH THERE IS ACTIVE MILITARY INTEREST IN THE RESILIENCY OF MICROGRIDS (INCLUDING ENERGY STORAGE), THE MILITARY IS DEPENDENT ON THIRD PARTY FINANCED SOLUTIONS. **DOING BUSINESS WITH THE FEDERAL GOVERNMENT IS VERY COMPLEX, AND THAT LIMITS THE VIABILITY OF THIS SEGMENT.**

(% of respondents indicating very suitable*)

*Responses were similar across participant groups.

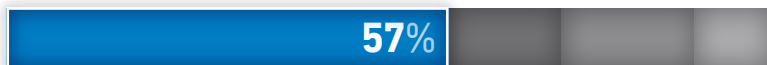
**Includes segments such as Retail, Cultural, Sports, and Warehouse

FUTURE APPLICATIONS

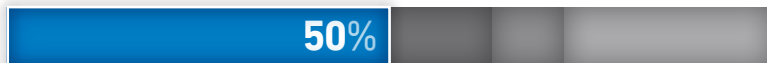
ENERGY STORAGE WILL SEE ITS GREATEST ADVANCEMENT WHEN PAIRED WITH RENEWABLE ENERGY GENERATION

Where will energy storage achieve its greatest proliferation over the next 5–7 years?

All Professionals



Manufacturers, Developers, IPPs



Utilities



- ☒ In Applications that Integrate Renewables
- ☐ In Other Applications (Grid Support, Ancillary, etc.)
- ☐ In Distributed/End-user Applications
- ☐ Within Utilities/At the Utility Scale Level

MANY UTILITIES ALSO BELIEVE PROLIFERATION WILL OCCUR IN ANCILLARY APPLICATIONS

ENERGY GENERATION FROM RENEWABLES WILL CONTINUE TO GROW AT BOTH THE UTILITY AND DISTRIBUTED LEVELS

Which will see the greatest increase in installed generating capacity over the next 5–7 years?

All Professionals



Manufacturers, Developers, IPPs



Utilities



- ☒ Utility Scale Solar
- ☒ Distributed Solar
- ☐ Wind

MOST UTILITIES EXPECT GROWTH AT THE DISTRIBUTED LEVEL

FUTURE GEOGRAPHIES

BY FAR, CALIFORNIA IS SEEN AS THE STATE THAT WILL BE MOST SUPPORTIVE OF ELECTRICITY STORAGE.

What state will most support electricity storage development over the next 5–7 years?
(% of total participant responses*)

57%
CALIFORNIA

11%
ALL OTHER

13%
NEW YORK

11%
TEXAS

NEW YORK WAS ALSO MENTIONED AS A SUPPORTER

LATE 2016: MASSACHUSETTS LAUNCHES NEW ENERGY STORAGE INITIATIVE

TEXAS WAS ALSO MENTIONED AS A SUPPORTER

* Responses were similar across participant groups.

SIGNIFICANT CHALLENGES

STORAGE COSTS MUST COME DOWN, VIABLE BUSINESS MODELS MUST BE DEVELOPED AND THE REGULATORY ENVIRONMENT MUST CHANGE TO **FAIRLY REWARD STORAGE**

What is the biggest challenge the storage industry must overcome to expand and be successful?

All Professionals



Manufacturers, Developers, IPPs



Utilities



- Reduce Storage Costs
- Establish Viable Business Models
- Get Regulations and Rates Right
- Improve Performance and Reliability
- Overcome Interests of Other Players
- Other Answers

MORE UTILITIES BELIEVE THAT **PERFORMANCE AND RELIABILITY MUST IMPROVE**

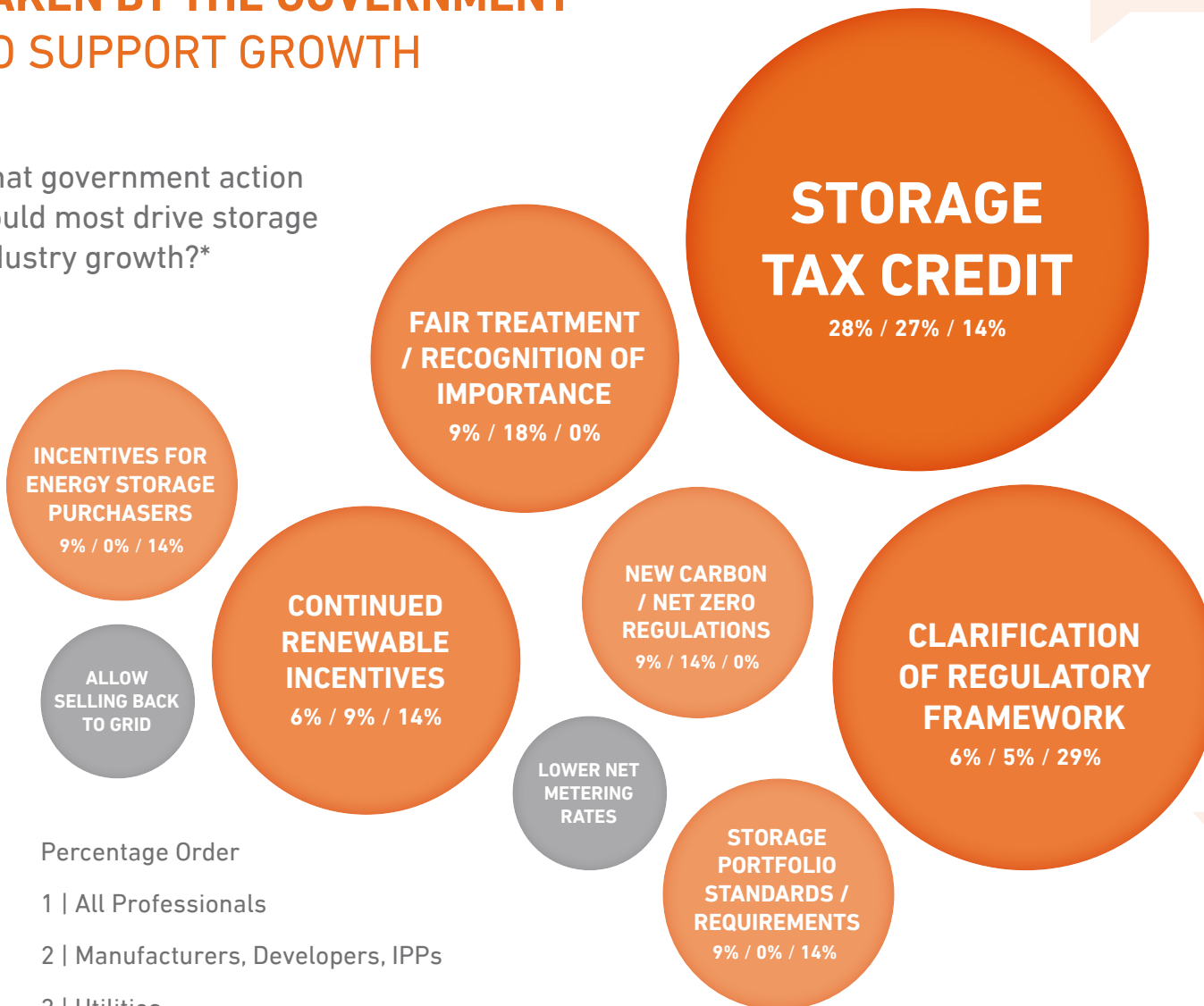
SELECT COMMENTS:

- “ We need cost reductions across the board, including batteries, integration, installation and O&M. ”
- “ Strong deployment growth will not be feasible without reducing costs. ”
- “ We must find business models that ensure long-term revenue sources for the services provided by storage. ”
- “ We need codified and commercially vetted solutions that provide a predictable value outcome. ”
- “ Regulation and rate designs must change to monetize the true value of storage. ”
- “ The energy storage industry must establish a proven performance track record for long duration output. ”

NECESSARY GOVERNMENT ACTIONS

MANY ACTIONS COULD BE TAKEN BY THE GOVERNMENT TO SUPPORT GROWTH

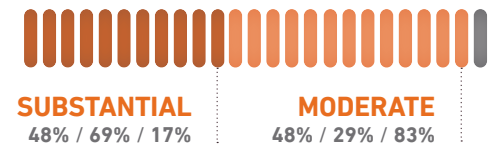
What government action would most drive storage industry growth?*



MANUFACTURERS AND DEVELOPERS WANT A TAX CREDIT

SUBSTANTIAL REGULATORY CHANGES ARE NEEDED FOR GROWTH

What degree of regulatory changes are needed to better accommodate the growth of electricity storage?



UTILITIES SEE MOST VALUE IN CLEANING UP THE REGULATORY FRAMEWORK

*Respondents provided sentence responses, which we categorized into the areas shown above.

NECESSARY GOVERNMENT ACTIONS



SELECT COMMENTS:

- “ We need a change in tax treatment for standalone storage projects that provides something like the solar and wind tax credits. ”
- “ Utilities such as mine need clarification from Public Utility Commissions regarding procurement, accounting and multi-use frameworks. ”
- “ Governments need to acknowledge the variety of services that storage can provide. ”
- “ We need a reduction in net metering rates and larger time-of-use spreads. ”
- “ There should be tax rebates for utilities and other entities that purchase storage. ”
- “ The regulatory structure today does not reward storage for the value it brings to the system. This has to change. ”

HOW FAST IS FAST?

SOLID GROWTH IS ANTICIPATED IN STORAGE DEPLOYMENTS

2015 energy storage deployments were 223 MW. How large will deployments be in 2020?

UTILITIES ARE NOT AS BULLISH
AND MAY BE MORE CAUTIOUS
AND INCREMENTAL

650%

1,672 MW

All Professionals

582%

1,521 MW

Manufacturers,
Developers, IPPs

200%

670 MW

Utilities

CLOSING THOUGHTS



OPPORTUNITY

Professionals in this study believe in the potential of energy storage. Significant hurdles must be overcome, but most believe the electricity industry will look and operate differently a decade from now, and that energy storage will play a meaningful role in the transition.

CHALLENGE

The immediate challenge for the storage industry is how to establish economically viable technical solutions and business models that generate the returns needed for energy storage to flourish and proliferate.

REQUIREMENTS

Achieving commercial viability will require hard work, innovative thinking, and risk taking. This study, however, suggests significant advancements can be made if we work hard to tackle our challenges and leverage all available opportunities.

THANK YOU!

**WE SINCERELY THANK THE ENERGY
PROFESSIONALS WHO PARTICIPATED IN THIS STUDY.**

Your input is tremendously valued and greatly appreciated. Our aim at Mortenson is to be in lockstep with customers and partners, resulting in a service experience that's second to none.

**MORTENSON IS A NATIONAL LEADER IN RENEWABLE
AND ENERGY INFRASTRUCTURE PROJECTS,**

with more than 20 years of experience. We know what's coming next in the energy industry because we've been at the front end of industry change before. We are committed to finding new innovations and new ways to deliver projects that enhance the success of our energy partners. And we're ready to push the envelope and break some conventions to help take energy storage to a new level.

**WE WELCOME THE OPPORTUNITY TO SHARE
MORE WITH YOU ABOUT OUR EXPERTISE,
KNOWLEDGE AND UNIQUE CAPABILITIES
TO PROVIDE WORLD-CLASS SERVICE.**

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