The Next Five Years in Energy Storage According to 500 Energy Professionals

Live attendee poll results from Greentech Media's 2017 Energy Storage Summit Crowdsourced Insights Panel

Daniel Finn-Foley
Senior Analyst, Energy Storage
finn-foley@gtmresearch.com

January, 2018

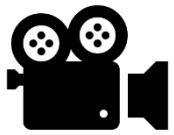
gtmresearch
is now Wood Mackenzie

What this Research Note Is

On December 12, 2017, Greentech Media's Energy Storage Summit kicked off, and it was my pleasure to moderate one of the tone-setting panels, *Crowdsourced Market Insights: Role of Energy Storage in Creating the Grid of the Future.* This panel employed a unique structure where our experts on stage were asked to interpret and weigh in as attendees answered live polling questions on the top themes in the market.

The results were insightful and, in some cases, surprising, with optimism mixed with skepticism in equal doses as the industry took stock of a market that was roiled with activity in 2017. It occurred to me on stage as we received hundreds of votes on our live polls that most researchers would be overjoyed to get this level of engagement from such a diverse and senior audience, and I was determined to dig a layer deeper, examining how the perspective of the audience intersected with the views of our expert panelists and the analysts here at GTM Research.

The results, with additional context from our research, are presented here. Thank you again to everyone who participated and to our panelists. For those who were unable to attend in person I encourage you to follow along with the panel recording, click the video icon on each slide to jump to that discussion in the recording, and keep this conversation going at our next events!



Kelly Speakes-Backman
CEO, Energy Storage Association (ESA)

Craig R. Horne
Vice President Business Development, Energy Storage, RES

Vibhu Kaushik
Director of Grid Technology & Modernization, Southern California Edison

Daniel Finn-Foley
Senior Analyst, Energy Storage, GTM Research

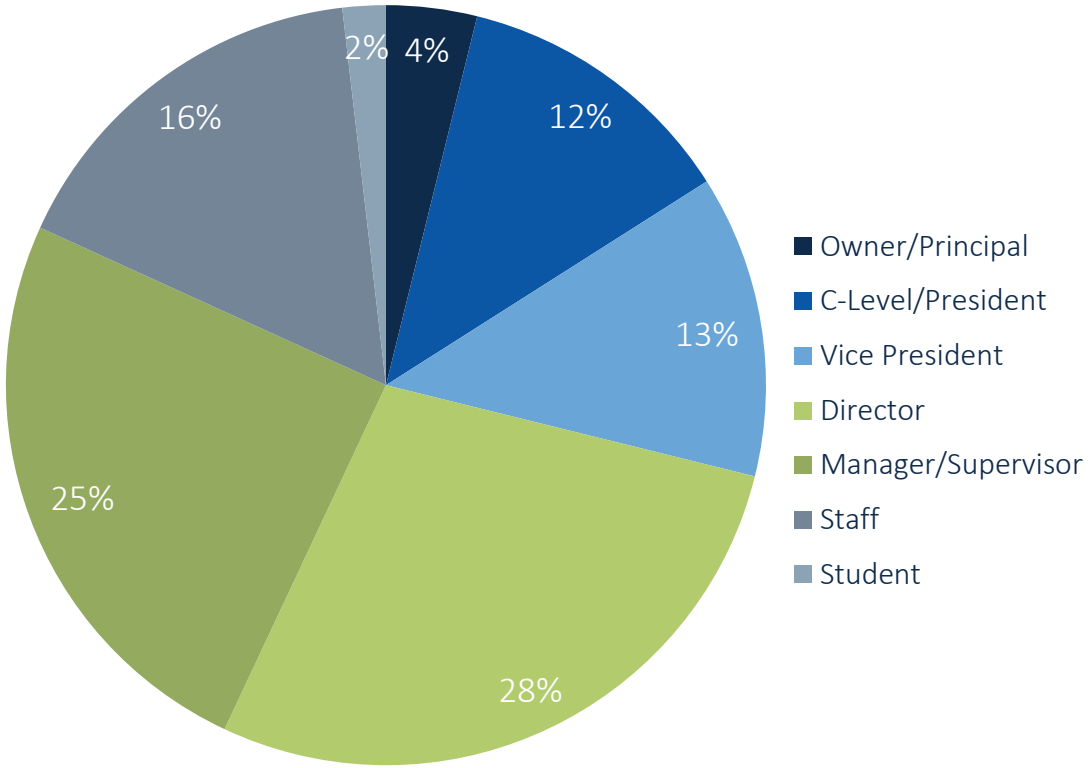
GTM Perspective – Four Key Takeaways from the Crowdsourced Insights Panel

It was a real pleasure to moderate this panel, interacting with our attendees and setting the tone for discussions to come while letting our experts interpret some of the surprises – who would have thought we'd be talking about bacteria? Looking back I highlighted four key takeaways that emerged from the poll results and panel discussion as critical for 2018 and beyond:

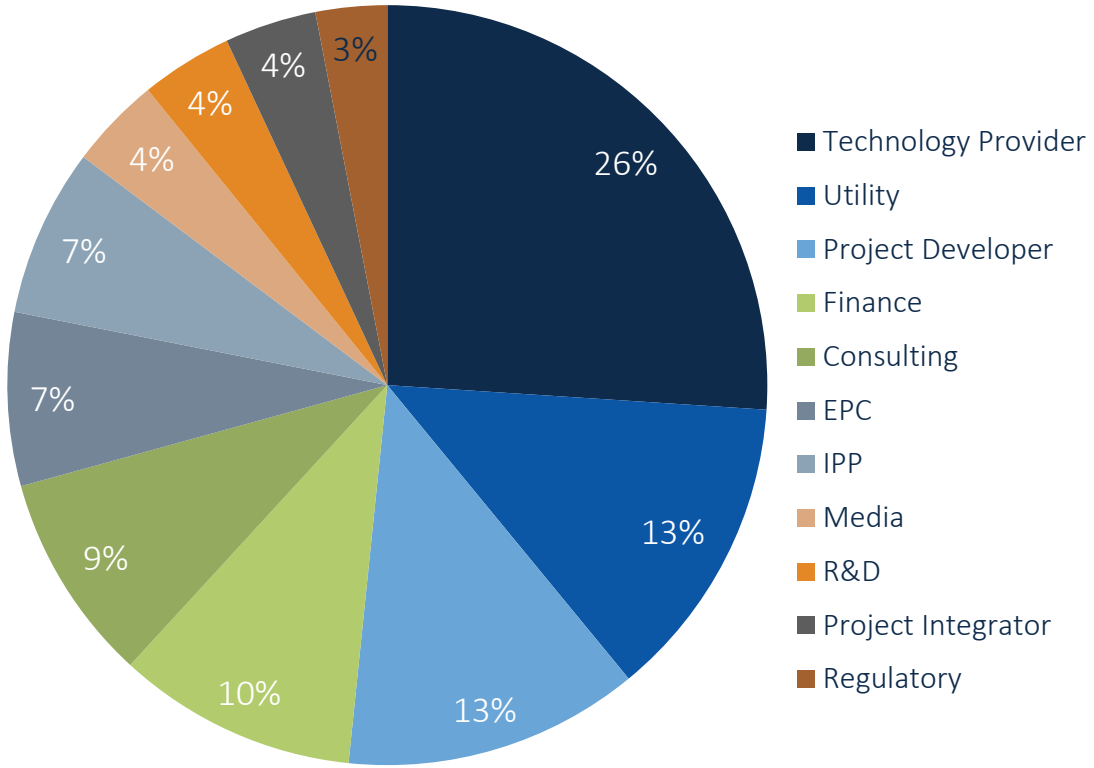
Broad optimism on the potential for storage to disrupt the grid	I was surprised by the results of the final question of the panel, asking what the 2022 keynote would be, believing the majority would go with the story of growth. Instead attendees gravitated to **transformation** and how energy storage is and will change how power is delivered. To me this shows an impressive maturity in the market. Our attendees don't care about the bottom line as much as they do about results and embracing change, the bottom line flows naturally from that.
Storage will replace gas peakers, but the timeline is up in the air	In only the few short weeks since the event we have seen the near certain termination of the Puente gas plant in SCE, with storage poised to potentially fill the IOU's local capacity requirements instead. Have we seen the end of gas for peaking plants, or could it be another 5, 10, 20 years? Attendees see it happening further in the future but I'm not convinced, this sea change could happen **sooner than the majority expect**. Watch California closely in 2018…
Waning patience for behind-the-meter's promised breakout, including disagreement with GTM's current forecast	GTM forecasts behind-the-meter deployments will overtake front-of-the-meter in the next five years, but only one in five attendees agree, and two fifths say it will **never happen.** This is a theme I heard many times in conversations at the event, and the arguments behind it are compelling. Could FTM deployments grow faster than everyone thinks? Could utilities muscle in on BTM's turf, eager to own assets themselves?
Tremendous faith in renewable integration, particularly solar	Solar being an exciting area was easy to expect, but perhaps not just how popular it was. A year ago solar developers said they would be including storage in all of their proposals within a few years. At the time it seemed overly optimistic, but from what we heard this marriage is really founded on true love and **solar-plus-storage may soon become standard**. In the next two years it may become impossible to keep these lovebird technologies apart, and I doubt investors will want to.

Energy Storage Summit 2017 Provided a Senior and Diverse Industry Perspective

Energy Storage Summit 2017 Attendee Organization Level



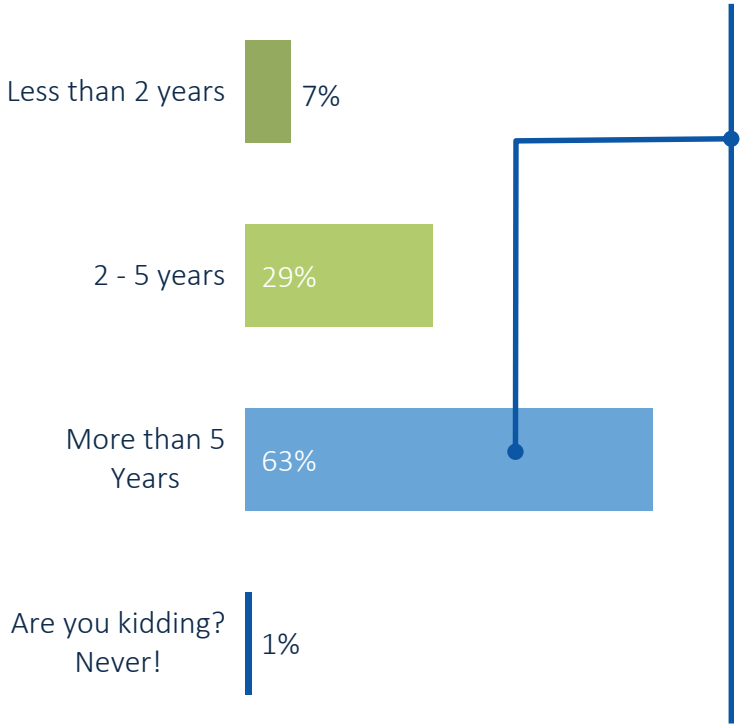
Energy Storage Summit 2017 Attendee Industry Breakdown



Greentech Media's 2017 Energy Storage Summit provided a senior and diverse cross section of the industry, with 56% of attendees at the director level or higher representing the full value chain for energy storage, making it a truly unique opportunity to tap into the market's broad knowledge base.

The Crowd and GTM Research Agree Storage Will Displace NG Peakers (Eventually!)

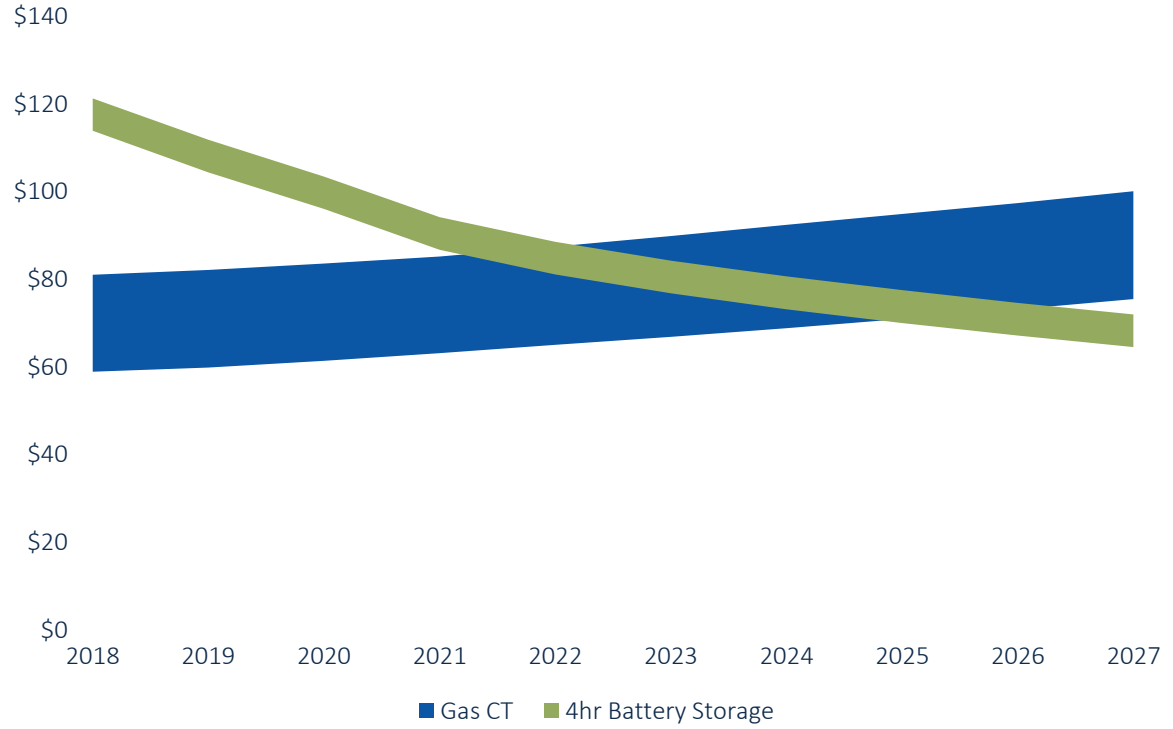
Question 1: How long until we see more energy storage systems than gas peakers approved for meeting peak load needs?



Only 1% of attendees feel that natural gas plants will always out-compete storage, a perspective that may have been shaped by Shayle Kann's earlier presentation indicating that 4-hour storage begins to compete with peaker plants within four years, and always wins financially within ten years. The majority of attendees foresee energy storage dominance outside of a five-year time frame.

Source: Greentech Media's Energy Storage Summit, Audience Participation Poll

Base Case Levelized Cost of Energy – Peaking Gas Combustion Turbine vs. 4hr Li-ion Battery Storage ($/MWh)

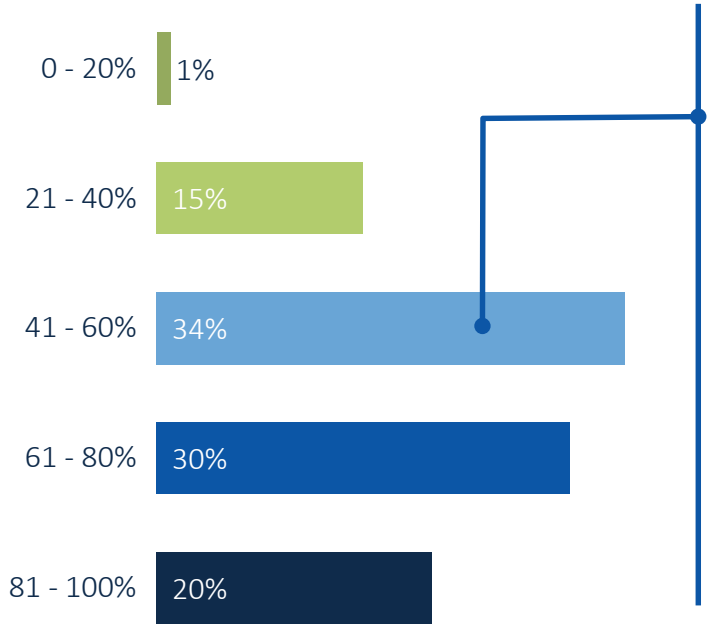


Source: Shayle Kann & Stephen Lacey Live Interchange Podcast – State of Storage, Energy Storage Summit 2017

"In California, I don't know when we will build our next natural gas plant – maybe we are there already."
-Vibhu Kaushik, Director of Grid Technology & Modernization , Southern California Edison

Broad Optimism Among the Industry on Utility Engagement, and Data Backs it Up

Question 2: How many utilities will include storage in long-term resource plans by 2022?

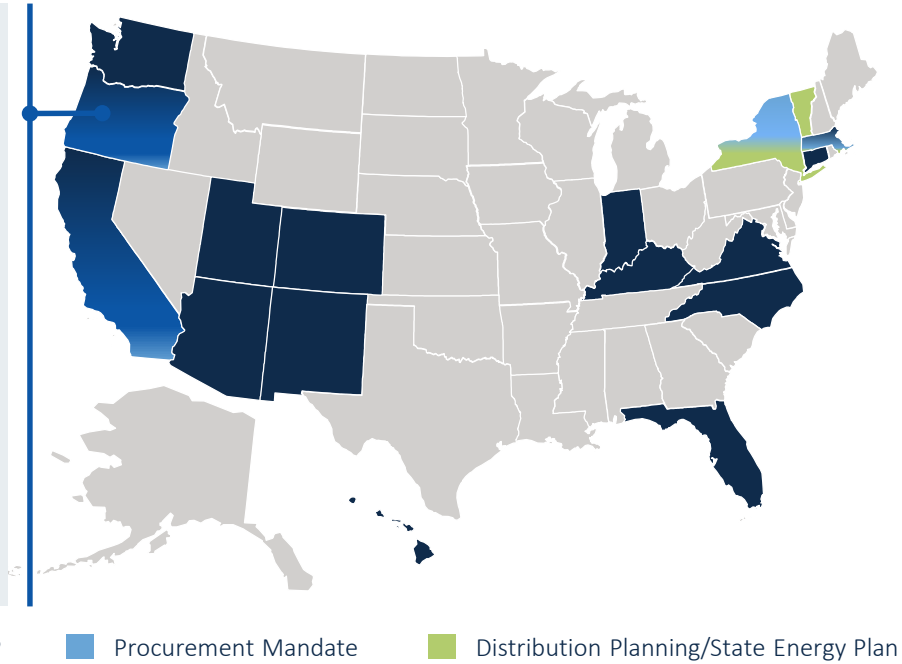


More than 4 out of 5 attendees believe 41% or more of utilities will be including energy storage in their IRPs within five years - and their optimism seems justified. GTM Research's tracking shows the trend is not just emerging, energy storage is becoming the norm in utility planning.

Source: Greentech Media's Energy Storage Summit, Audience Participation Poll

States With Utilities Including Storage in Resource Planning or Rate Cases

Oregon is a sign of the times for utilities – Portland General Electric recently announced RFPs for up to 39 MW, the upper limit of the state's energy storage mandate. When was the last time we saw a utility out-pace legislatures?

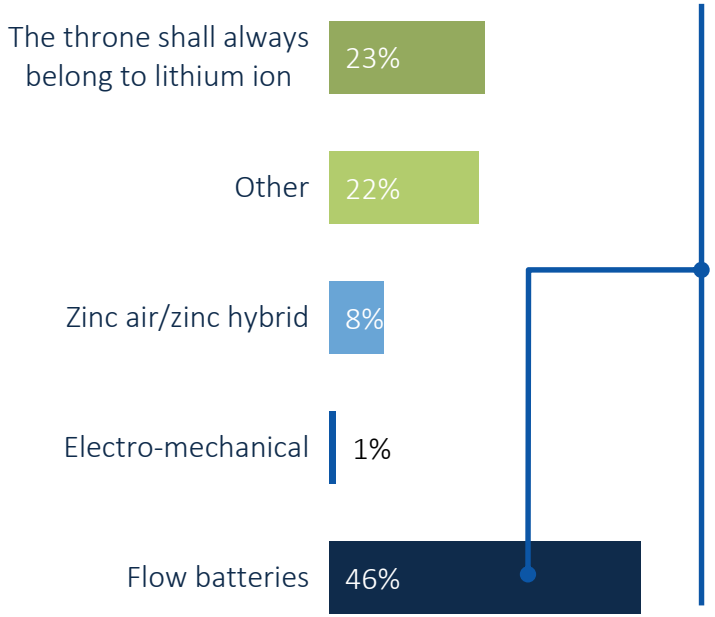


Source: GTM Research/ESA U.S. Energy Storage Monitor

"Within the next several years there will be more hard data... that's how I think we get to 60-100%."
-Craig R. Horne, Vice President Business Development, Energy Storage, RES

Lithium-Ion is the Undisputed King – Who Will Emerge as its Challenger?

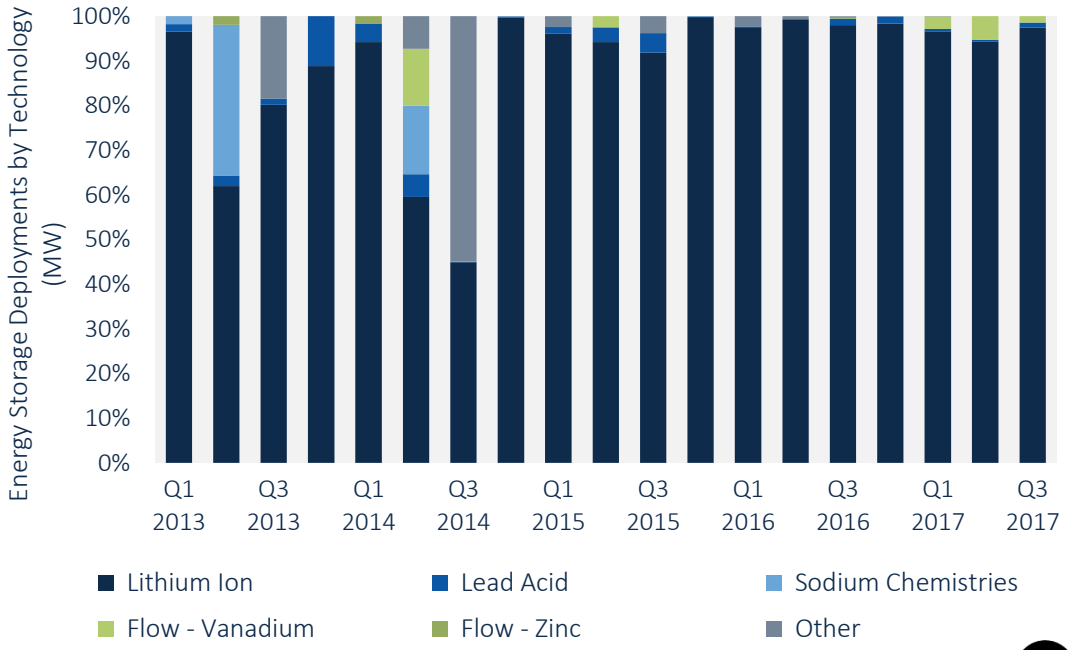
Question 3: What technology has the best chance of supplanting lithium-ion as the dominant utility-scale advanced storage technology?



Flow batteries draw the most optimism, with nearly half of attendees citing them as the most exciting technology for utility-scale applications. As system durations continue to grow flow battery manufacturers are increasingly bullish on their pricing, claiming the high ground for 6-hour or longer duration and even eyeing the coveted 4-hour mark.

Source: Greentech Media's Energy Storage Summit, Audience Participation Poll

Quarterly Energy Storage Deployment Share by Technology (MW %)

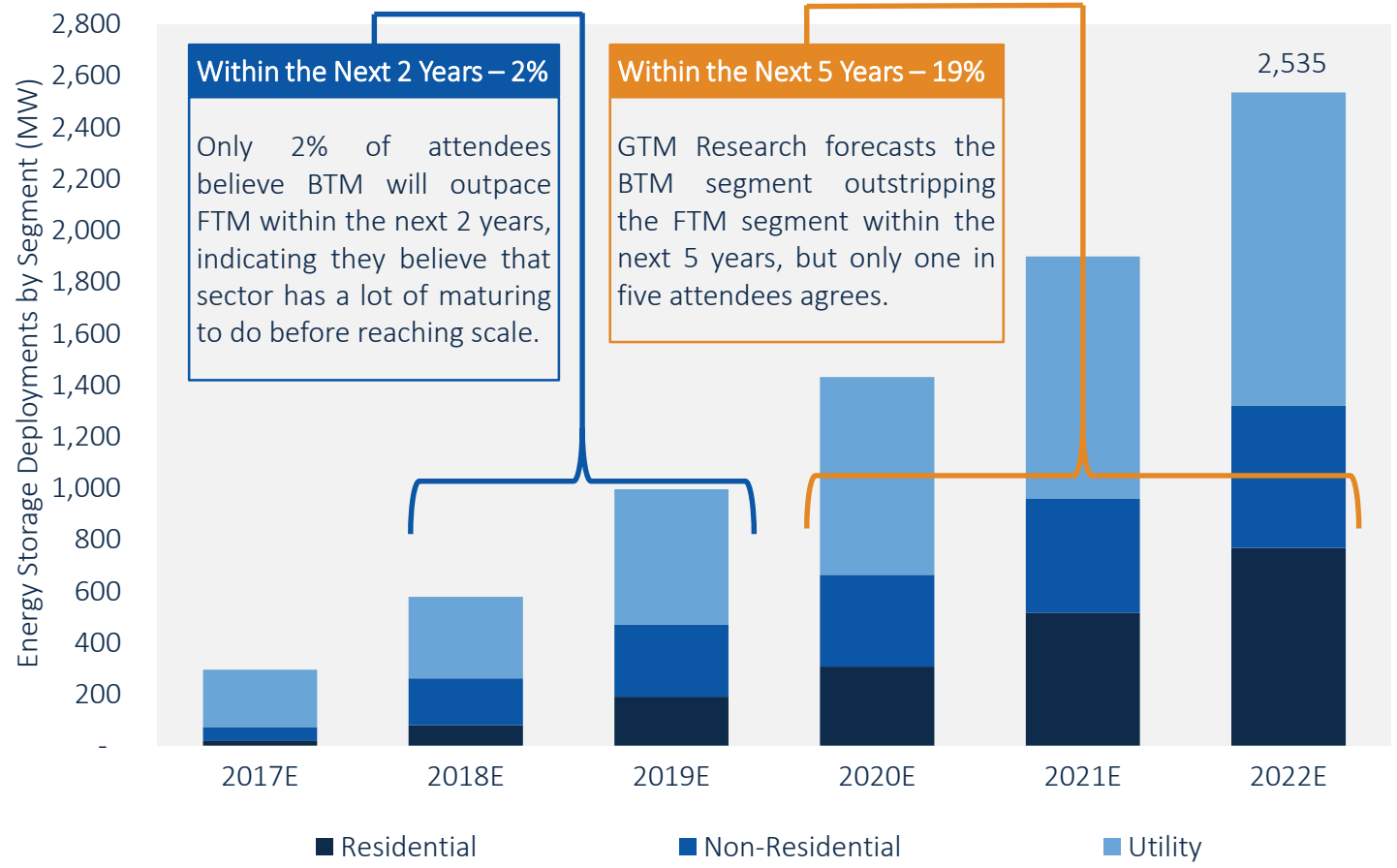


Source: GTM Research/ESA U.S. Energy Storage Monitor

- We asked the audience what they meant by "other", and heard liquid air, hydrogen, and even bacteria suggested as alternative energy storage technologies.
- Notably nearly one in four attendees believe that lithium-ion will remain the dominant technology indefinitely, and it is hard to argue this point as GTM Research's tracking recently marked lithium-ion's twelfth straight quarter with overwhelming market share in the U.S.
- The next big question to ask next year is, assuming this will happen, when will it happen? Flow batteries are increasingly obtaining insurance and warranty packages backing up their extended lifetime claims, could 2018 be the an investor bets big on a 30-year lifetime and a long-duration flow solution?

Is the Market Losing Patience for Behind-the-Meter Energy Storage's Promised Breakout?

Question 4: When Will Behind-the-Meter MW Deployments Outstrip Front of the Meter? GTM Research's Forecast and Attendee Poll Results.



Within the Next 2 Years – 2%

Only 2% of attendees believe BTM will outpace FTM within the next 2 years, indicating they believe that sector has a lot of maturing to do before reaching scale.

Within the Next 5 Years – 19%

GTM Research forecasts the BTM segment outstripping the FTM segment within the next 5 years, but only one in five attendees agrees.

Within the Next 10 Years – 23%

Optimism for the BTM space grows when you get to 10 years out, with nearly one in four attendees believing the BTM space will be the majority of deployments by 2027.

Within the Next 20 Years – 16%

16% believe it will be within the next 20 years, indicating they either feel the FTM space is poised for even more significant growth, or the BTM space has been overhyped.

- 40% of attendees said the BTM space will never overtake the FTM space in terms of raw deployments, making it the most popular answer and making this one of the more surprising results given the general hype the BTM space is given in the market.
- So why the long runway? Our panelists weighed in - Vibhu Kaushik indicated that the mechanisms that may drive energy storage, such as demand charges, are always evolving. Craig R. Horne believes the sheer number of utility-scale deployments will be difficult to outstrip. Kelly Speakes-Backman was more on the optimistic side, believing it could be 10 years, but highly dependent on how good the industry is on the advocacy level.
- The industry response seems to make it clear, however, that utilities, in one form or another, will be pushing back on true behind-the-meter applications.

Source: GTM Research, Greentech Media's Energy Storage Summit, Audience Participation Poll

Views are Split on how an Energy Storage Project Differentiates Itself

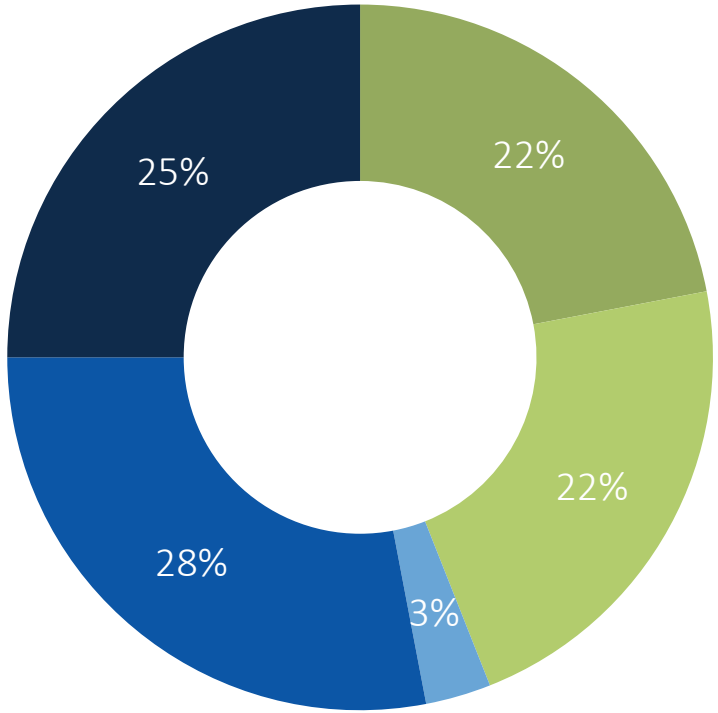
Question 5: What is the most effective way an energy storage project can differentiate itself from its competitors?

Price - just save me money! – 25%

- Raw dollars and cents continues to be the primary way energy storage can stand apart, both from other sources of "generation" and from other proposed energy storage projects.
- 1 out of 4 attendees don't see this changing, citing price as the driving force for differentiation.

Performance / economic guarantees – 28%

- The most popular answer for differentiation, and partially a subset of the price category, guarantees represent a critical way to not only differentiate, but ease investor or customer anxiety about developing a (still relatively) new technology.



Source: Greentech Media's Energy Storage Summit, Audience Participation Poll

Advanced Software and Controls – 22%

- After the spate of software acquisitions in 2016 and 2017 it's clear that controls can be a major differentiator, driving business cases and extended project lifetimes, and many turnkey providers see their software as the keystone providing value to end users.

Business Model / Value Stacking – 22%

- "Value stacking" was almost a dirty word at the event, but innovative business models are still a tremendous opportunity for energy storage, as a large number of attendees voted for it.

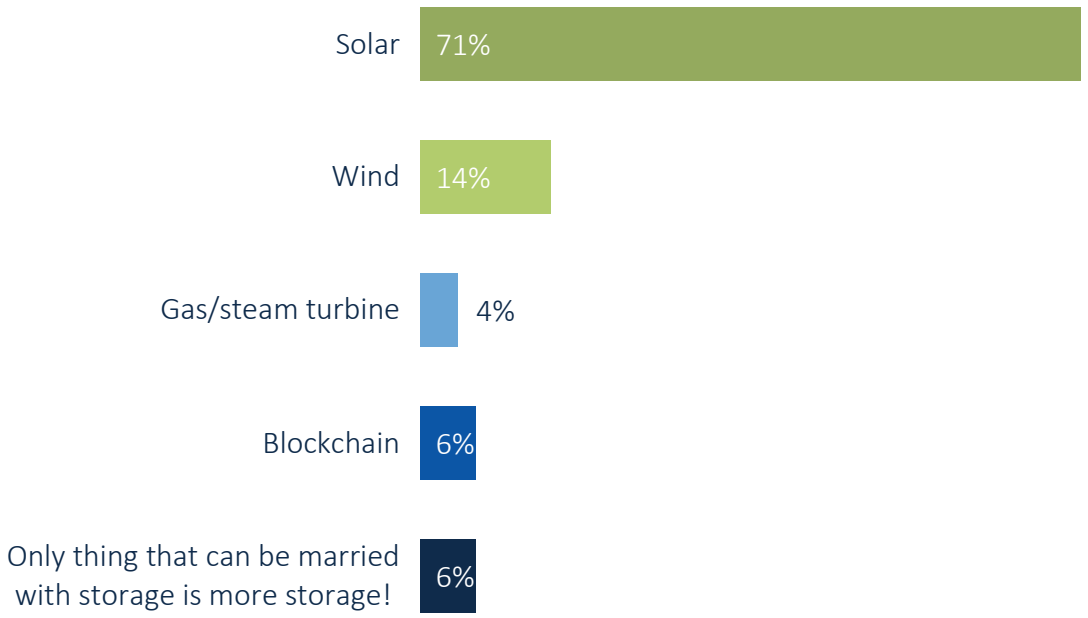
Technology – 3%

- Technology was the least popular response, indicating that at the end of the day storage is energy in and energy out, and the technology used to accomplish this is not as important as the results.

"Price, warranties, controls… those are more enablers to building a successful business case."
-Vibhu Kaushik, Director of Grid Technology & Modernization , Southern California Edison

In the Most Definitive Result, Solar Emerges as Storage's One True Love

Question 6: _____ plus storage is a match made in grid heaven:



Source: GTM Research, Greentech Media's Energy Storage Summit, Audience Participation Poll

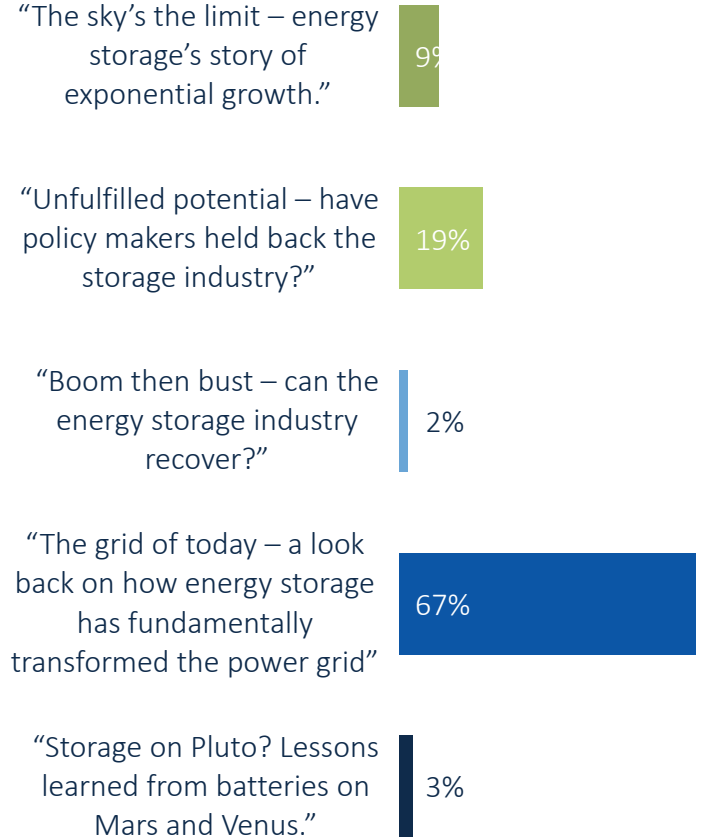
GTM Research's analysis agrees – it's Solar-plus-storage's time to shine

- According to GTM Research's latest analysis, coming out this quarter, a residential solar-pluis-storage system installed today in SDG&E, PG&E, or SCE's service territory in California can break even within seven years even without the self generation incentive program (SGIP).
- Utility-scale solar-plus-storage PPAs are reaching record lows as costs drop, and recent analysis has examined just how low costs will have to go to sustain these rock-bottom LCOEs.
- Wind-plus-storage still has to prove itself, as two case studies GTM Research and MAKE collaborated on showed that the economics for arbitrage and wind-charged ancillary services simply don't add up yet. Even with the ITC a wind-charged system would reach an IRR of only 5.2% due to low clearing prices and the phasing out of the tax credit.

"Solar-plus storage… In 2016 it might be once a quarter we'd get an inquiry, to now, it's once a week."
-Craig R. Horne, Vice President Business Development, Energy Storage, RES

Eyes Forward – Five Years from Now Attendees Will be Discussing a Grid Disrupted

Question 7: What will the keynote presentation be at Energy Storage Summit 2022?



Suggested 2022 Keynote Possibilities from the GTM Storage Family:

"Untapped Potential - How the Grid can Better Manage the GWs of Deployed, Underutilized Storage"
MJ Shiao, Head of Americas Research, GTM Research

"EVs Obfuscate the Need for Stationary Storage. Can the Industry Survive?"
Ravi Manghani, Director, Energy Storage

"Power play – how Utilities Elbowed Out the Competition in a Nascent Market."
Daniel Finn-Foley, Senior Analyst, Energy Storage

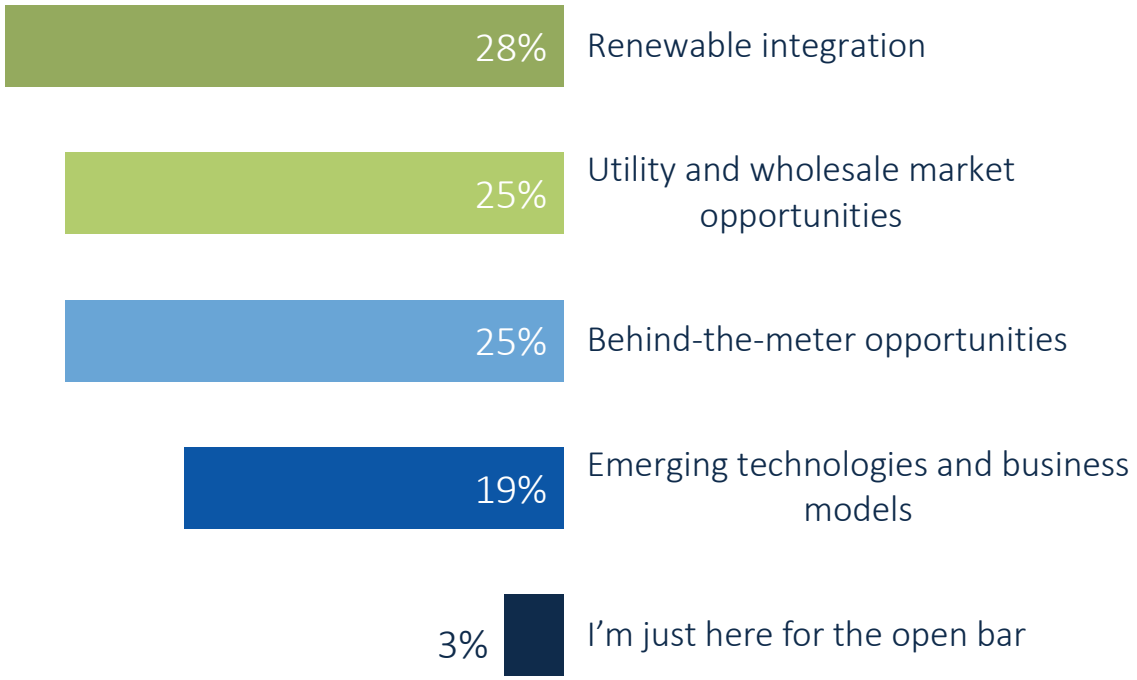
"Virtual Power Plants: Here, There, and (Almost) Everywhere!"
Brett Simon, Analyst, Energy Storage

"Embracing the New Era of Price Stability, Where do we go from here?"
Mitalee Gupta, Analyst, Energy Storage

Source: GTM Research, Greentech Media's Energy Storage Summit, Audience Participation Poll

More Applications, More Growth, More to Discuss, and More to Read

Question 8: What topic are you most excited to discuss at Energy Storage Summit?



What topic are you excited about? Make sure to read our latest research:


U.S. Wind + Storage – The Business Case, December 2017


Energy Storage in Integrated Resource Plans – GTM Research/ESA U.S. Energy Storage Monitor


U.S. Residential Battery Storage Playbook, September 2017


The Rise of the Electric Car: How Will it Impact Oil, Power and Metals? Learn More.


You'll just have to come to our next event!

Source: Greentech Media's Energy Storage Summit, Audience Participation Poll

"I'm excited about all of the above… we believe in all of these applications."

-Kelly Speakes-Backman, CEO, Energy Storage Association (ESA)

Speaking of our Next Event…

If you're looking for the next batch of crowd-sourced (and expert-sourced) insights, or just the next open bar, look no further than our next events – add these warm weather destinations to your calendar and this January cold snap suddenly won't feel so bad. See you there!

solar summit mexico 2018

Mexico City, Mexico
February 13 - 14

solar summit 2018

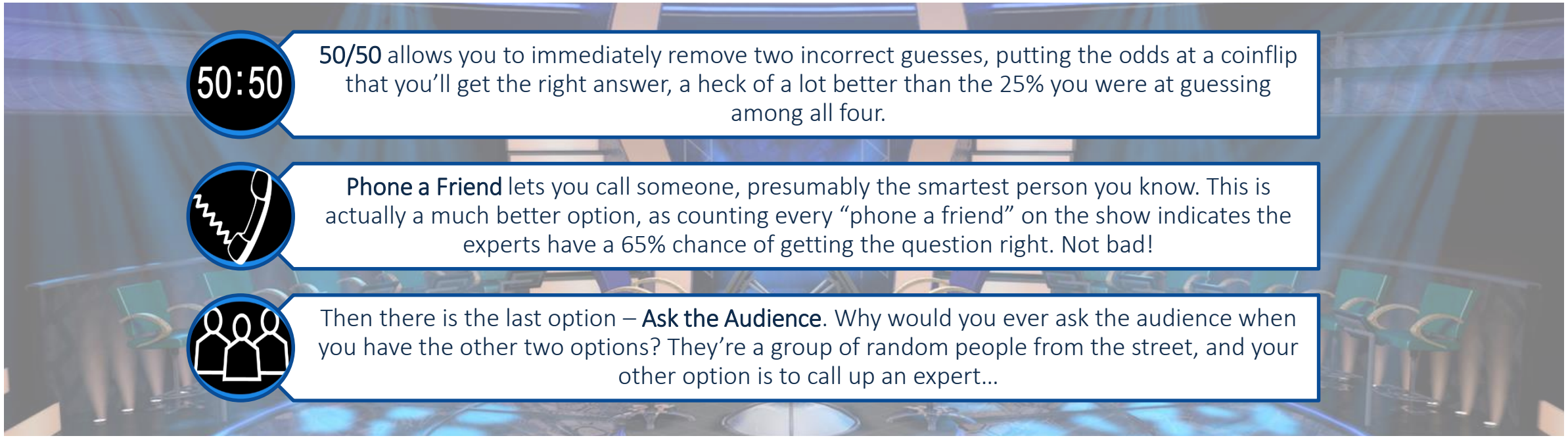
San Diego, CA
May 1 - 2

grid edge innovation summit 2018

San Francisco, CA
June 20 - 21

Crowd-Sourcing Insights – Why We Asked the Audience at our 2017 Storage Event

Imagine yourself sitting in the "hot seat" on *Who Wants to be a Millionaire*, under the lights, the music thrumming menacingly, a crowd of onlookers silently judging your every move, when you're faced with a question that has absolutely stumped you. This is where the trivia show's "lifelines" kick in, giving you a chance to up your odds of a correct answer. But which do you pick?



Well it turns out you should ask the humble audience, because through the show's run they have a stunning **91% success rate**.

The wisdom of the crowd can mean far more than the wisdom of an expert, just as distributed energy resources can be greater than the sum of their parts. With this in mind this year's Energy Storage Summit included a Crowdsourced Market Insights Panel, where the experts poll the crowd and interpret the results as they come in in real time. The audience's responses from this year's event are presented here, with additional context courtesy of GTM Research.

Interested in other GTM Research products and services? Please visit www.gtmresearch.com or contact sales@greentechmedia.com

January 2018

gtmresearch
is now Wood Mackenzie