



Emerging Technologies Survey: Results – 2021 Update

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Change from
Oct 2020 survey

+4

+10

+2

In what area of PJM’s business do you feel exploration and adoption of emerging technologies could be most transformational?

	Number (#)	Percentage
Transmission system operations	62	30%
Competitive markets	45	22%
Long-term transmission planning	54	26%
Costs associated with transmission upgrades	12	6%
Other (please specify):	31	15%

RESPONSES

Comments

- + *Renewable integration*
- The PJM ETF should be technology-neutral and allow for the exploration of a range of technologies not limited to one business area
- Holistic long-term transmission planning and modeling
- PMUs, batteries, dynamic line ratings and other technologies could be impactful for planning, markets and operations
- Generation and changes to energy dispatch and capacity market design

Out of the following technologies, please rank your level of interest in the technology.

	1		2		3		4		5		6		7		Weighted Avg.	
	#	%	#	%	#	%	#	%	#	%	#	%	#	%		
RESPONSES	Dynamic line rating technology	3	3%	2	2%	12	12%	11	11%	15	15%	26	26%	30	30%	2.67 +
	Distributed energy resources technologies	25	26%	40	41%	1	1%	19	20%	1	1%	0	0%	11	11%	5.26 +
	Topology optimization	0	0%	42	43%	0	0%	43	44%	2	2%	10	10%	0	0%	4.64 -
	Hydrogen (“Power to Gas”)	0	0%	12	12%	18	19%	0	0%	48	49%	16	16%	3	3%	3.52 +
	Energy storage as a transmission solution	69	71%	1	1%	18	19%	0	0%	0	0%	0	0%	9	9%	6.06 +
	Blockchain	0	0%	0	0%	1	1%	0	0%	9	9%	41	42%	46	47%	1.65 -
	Flexible Alternating Current Transmissions Systems (FACTS)	0	0%	0	0%	47	48%	24	25%	22	23%	4	4%	0	0%	4.18 +

+ / - indicates change in direction from last survey

What technologies are not listed that you would like to see on the list?

Technologies

- + *DERMS pilots (PJM, EDCs, existing DERs)*
- + *New storage technologies*
- + *Distributed computing and/or other advanced computational methods to increase day-ahead and FTR model solve times*
- Small modular reactors/modular nuclear generation
- Maintenance inspection automation/optimization tools
- Preemptive system detection technology (Asset Health-type systems)
- ELMP
- Automated fault analysis tools
- Improved hardware/software to solve market engines (e.g., DAM, FTR) quicker
- Advanced Fuel cells
- software to perform all planning studies (load flow, stability & short circuit)
- EMS changes to handle capacity predominated by renewables
- Smart devices (e.g., smart wires)
- Line coatings and other transmission technologies
- Linear state estimation for Transmission Operations
- Relay and automation technology that enhance system resiliency

Would you like to see PJM engage in more, less, or the same amount of Advanced Technology Pilots and why?

Comments

- + *The number of pilots doesn't really matter. It's more of "are you getting something meaningful and transparent". Quality is better than Quantity.*
- + *It would be helpful if PJM provided a venue for more emerging technologies to get exposure that typically would not get attention from the market.*
- + *There is a lot going on at the federal level. These fed programs directly or indirectly may influence the implementation of any Advanced Technologies - the result: re-investigation into the Adv technology following the implementation of the fed programs.*
- + *Pilot programs take a large amount of PJM staff and member resources. Pilots are not guaranteed to yield positive results. PJM should engage in very promising pilot programs but generally leave innovation to other entities when PJM's early participation is not critical to success.*

	Number (#)	Percentage
More	43	51% +
Less	0	0%
Same Amount	42	49%

What are the most important considerations for your company regarding the PJM Advanced Technology Pilot process?

Comments

- + *There should be tests/conditions for a topic to be studied (don't do a pilot just to do a pilot)*
- Flexibility. Asset owners should have the opportunity to explore transmission system technologies with PJM that the asset owner believes offer safety, reliability or cost benefits to their customers and/or the PJM system. An asset owner should be under no obligation to explore or adopt a technology that may not offer safety, reliability or cost benefits. Additionally, the pilot process should not seek to rack up a high number of pilots or force their success – that's dangerous, wastes resources, and could potentially jeopardize the integrity of the grid.
- Clear and flexible guidelines/rules for Advanced Technology Pilot process and market participation/development. Efficient and quick review process. Respect confidential and security attributes of pilots.

	Number (#)	Percentage
Transparency	48	27% -
Ensuring each pilot is successful	29	16%
Amount of pilots	13	7% +
PJM resources devoted to pilots	32	18%
Other (please specify):	57	32%

- A successful project does not necessarily mean it is implemented. The ability for developing a better understanding of how the technology performs and whether the project has potential for future implementation, modifications that may be needed and shortcomings of the technology should be the goal.
- We believe that pilots are beneficial, but that PJM should not be overly dedicated to them.
- There should be tests/conditions.

Regarding the following challenges for implementing a new technology, rank which is most important to you?

	1		2		3		4		Weighted Avg.
	#	%	#	%	#	%	#	%	
RESPONSES	Inclusivity – ensuring that the benefits and implementation challenges are identified and considered when comparing with a traditional technology								
	2	2%	13	15%	47	55%	23	27%	1.93 +
	Reliability – ensuring that the technology is sufficiently reliable and controllable, as compared to traditional equipment or software								
	43	52%	19	23%	20	24%	1	1%	3.25 -
Transparency of entry – ensuring that stakeholders receive timely notification of the first-time use of a new technology in PJM									
19	22%	1	1%	18	21%	47	55%	1.91 +	
Security – ensuring that new technology does not pose unnecessary additional cyber or physical security risk to PJM or the broader electric system.									
19	23%	50	60%	0	0%	14	17%	2.89 -	

What type of content or discussions are you most looking forward to at the Emerging Technologies Forum? (Rank)

		1		2		3		4		Weighted Avg.	
		#	%	#	%	#	%	#	%		
RESPONSES	Discussion of active Advanced Technology Pilots	12	14%	46	55%	24	29%	1	1%	2.83	+
	Education about the technical details of emerging technologies	23	28%	9	11%	23	28%	28	34%	2.33	-
	Discussing implementation of technology within PJM	31	37%	10	12%	24	29%	18	22%	2.65	-
	Presentations from non-PJM staff about emerging technologies and issues (e.g., vendors, technologists, research organizations)	17	20%	18	22%	12	14%	36	43%	2.19	+

- In what topic area(s) is your organization using big data analytics and machine learning?
 - + *Asset analysis – effective age of critical equipment*
 - + *Severe weather impact on outages and restoration*
 - + *Impact of DER on load*

In what topic area(s) should PJM pursue applying big data analytics and machine learning technology?

- + *Decarbonization impacts (x3)*
- + *Climate change impacts*
- + *Policy change impacts*
- + *Voting and stakeholder engagement*
- + *Interconnection queue statistics to identify high probability resources and proactive transmission builds to accommodate those interconnections*
- + *DER management & operational coordination.*
- + *Weather and operational data to improve renewables production forecasting and load forecasting*
- + *Leveraging historic weather, EMS and pricing data to better model the actual transmission system in its economic models*
- + *What sort of sensitivities can provide better insight into needed economic enhancements not identified through base case assumptions?*

**Some movement, but
no significant shift in
survey data**

**Good additional
comments and
feedback for PJM to
consider**

**Responses will
contribute to ETF
roadmap updates**

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