

STATE OF WASHINGTON DISTRIBUTED ENERGY RESOURCES PLANNING

CURRENT UTILITY CAPABILITIES WORKSHOP, NOVEMBER 20, 2017



STUDY OBJECTIVES

- The UTC has been tasked with submitting a report to the Legislature on Distributed Energy Resource Planning
- The Legislature requested that the report include an inventory of current utility distribution planning practices and capabilities in Washington State
- The questionnaire was designed to collect factual information to report back
- The survey includes transmission and distribution planning and wide array of distributed energy resources – distributed solar, distributed generation, energy efficiency, demand response, electric vehicles, and battery storage

The survey isn't intended to imply that utilities should be doing one thing or another – it's designed to help us inform the Legislature about how distribution system investment decisions are being made right now











KEY TOPIC AREAS

- Utility responses about transmission and distribution (T&D) system
- Capital project planning
- Forecasting
- T&D marginal costs and locational value
- Distributed energy resource valuation



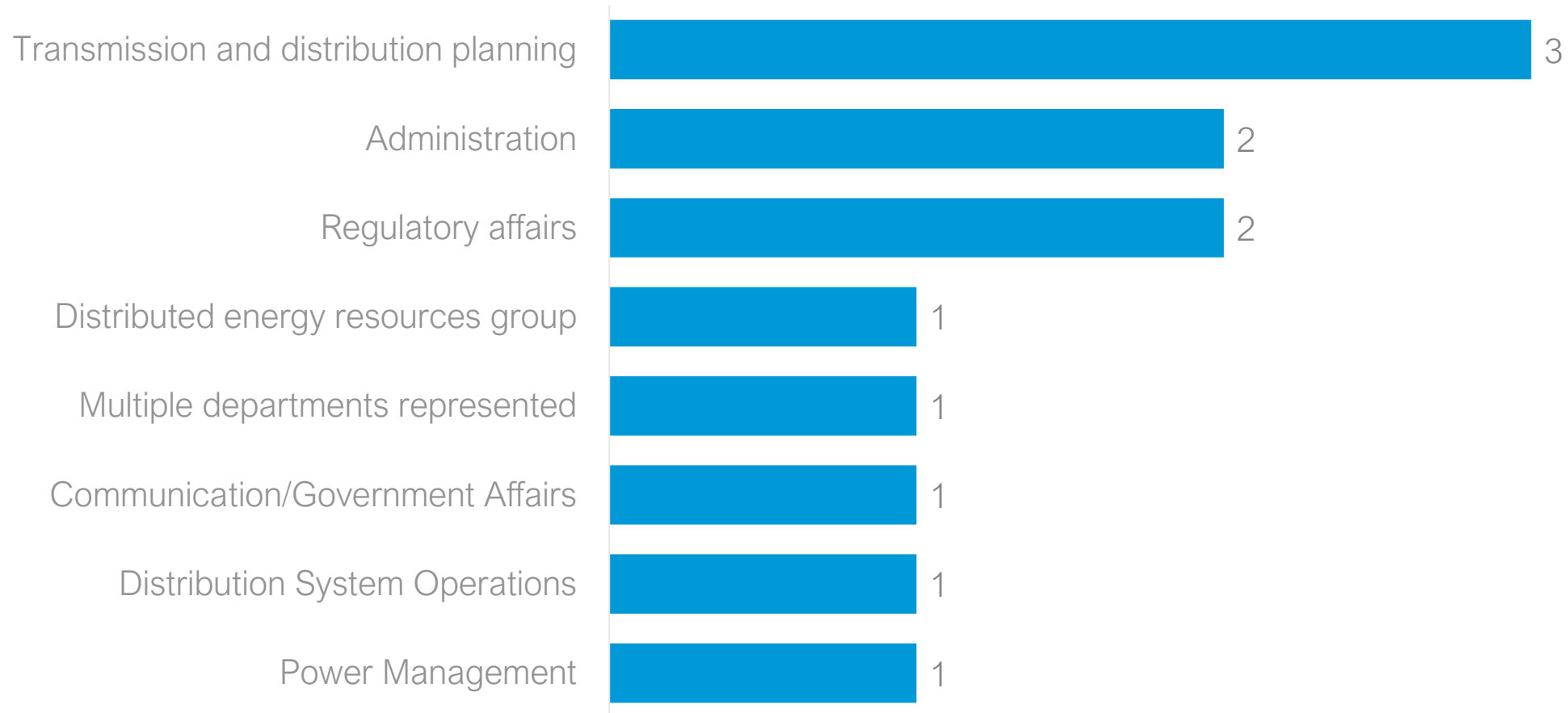
UTILITY AND RESPONDENT CHARACTERISTICS

A TOTAL OF 12 COMPANIES COMPLETED THE SURVEY, INCLUDING THE STATE'S SEVEN LARGEST UTILITIES

Completed Surveys	Number of Customers		Size Category
Puget Sound Energy	1,103,611		Large
Seattle City Light	422,809		Large
Snohomish PUD	337,063		Large
Avista	246,435		Large
Clark PUD	195,142		Large
Tacoma	174,558		Large
PacifiCorp	128,983		Large
Chelan PUD	49,058		Small
Tanner Electric Cooperative	4,704		Small
Parkland Light & Water	4,555		Small
Kittitas PUD	4,304		Small
Ohop Mutual Light Company	4,258		Small



THE RESPONSES WERE PROVIDED BY A MIX OF INDIVIDUALS IN DIFFERENT ROLES

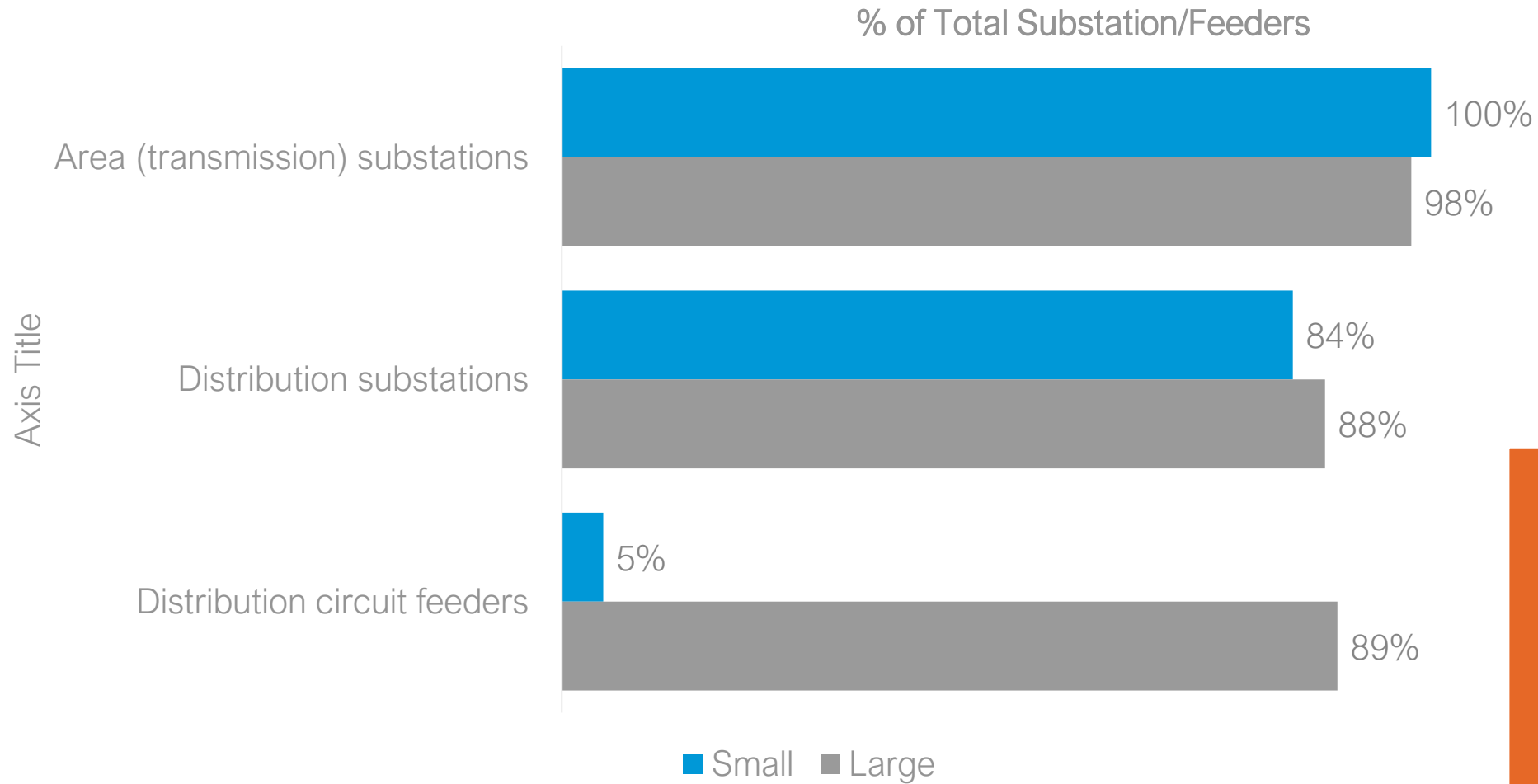


COMBINED, THE RESPONDENTS DELIVER POWER TO APPROXIMATELY 80% OF WASHINGTON ELECTRIC CUSTOMERS

Metric	Small (n=5)	Large (n=7)
Total territory square miles	5,513	41,868
Total number of area substations (transmission substations)	7	166
Total number of distribution substations	44	642
Total number of distribution circuit feeders	168	2,488
Total miles of transmission lines	329	6,891
Total miles of distribution lines	3,217	58,693



MOST LARGER UTILITIES HAVE HOURLY DATA FOR SUBSTATIONS AND CIRCUIT FEEDERS

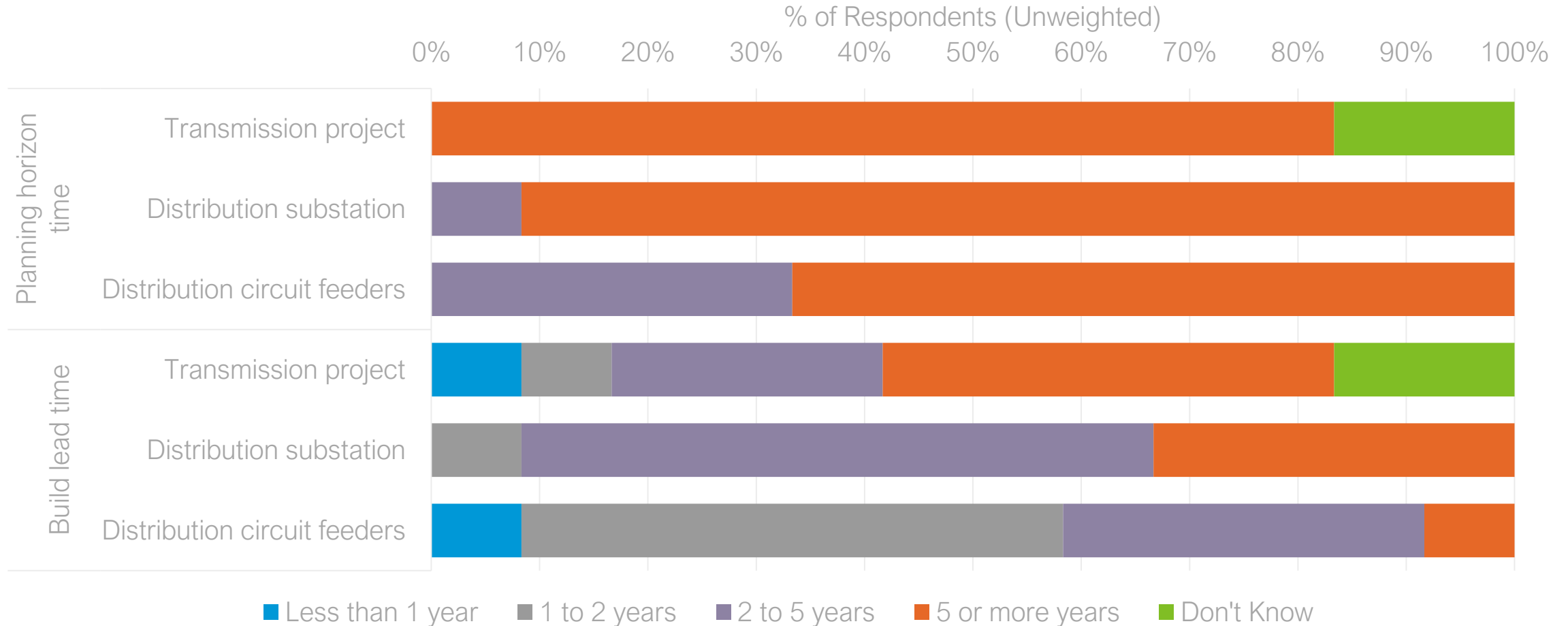


Only one small utility had area substations

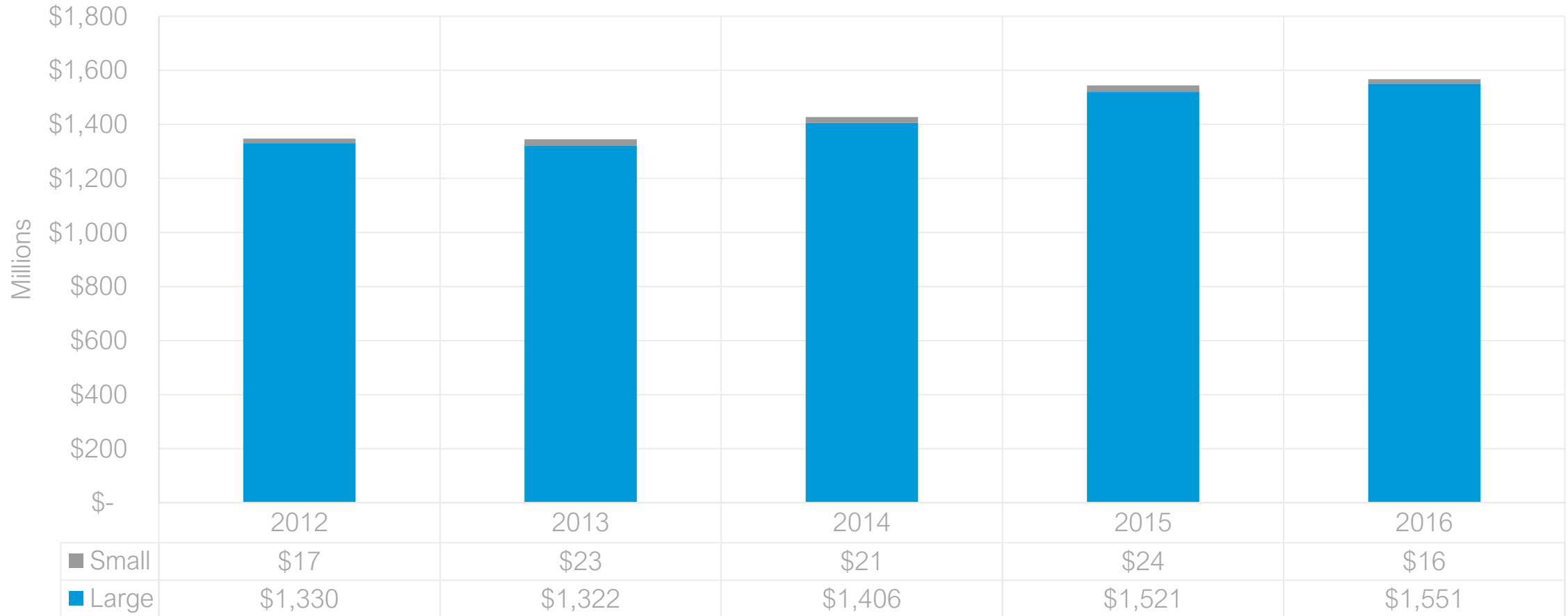


CAPITAL PROJECT PLANNING

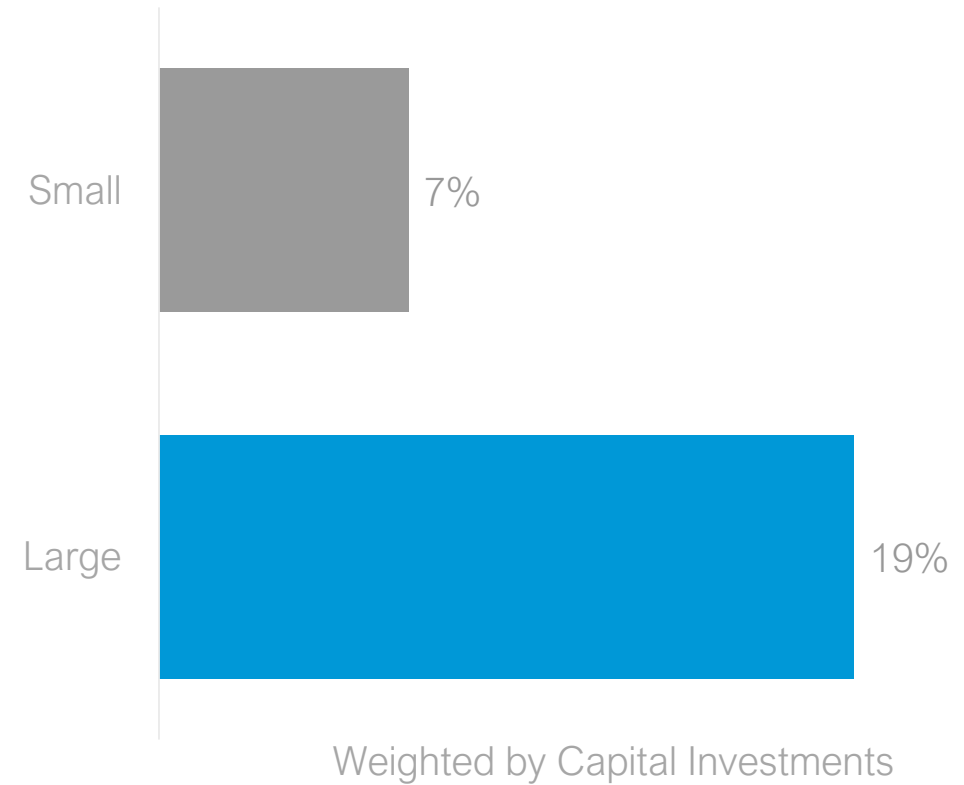
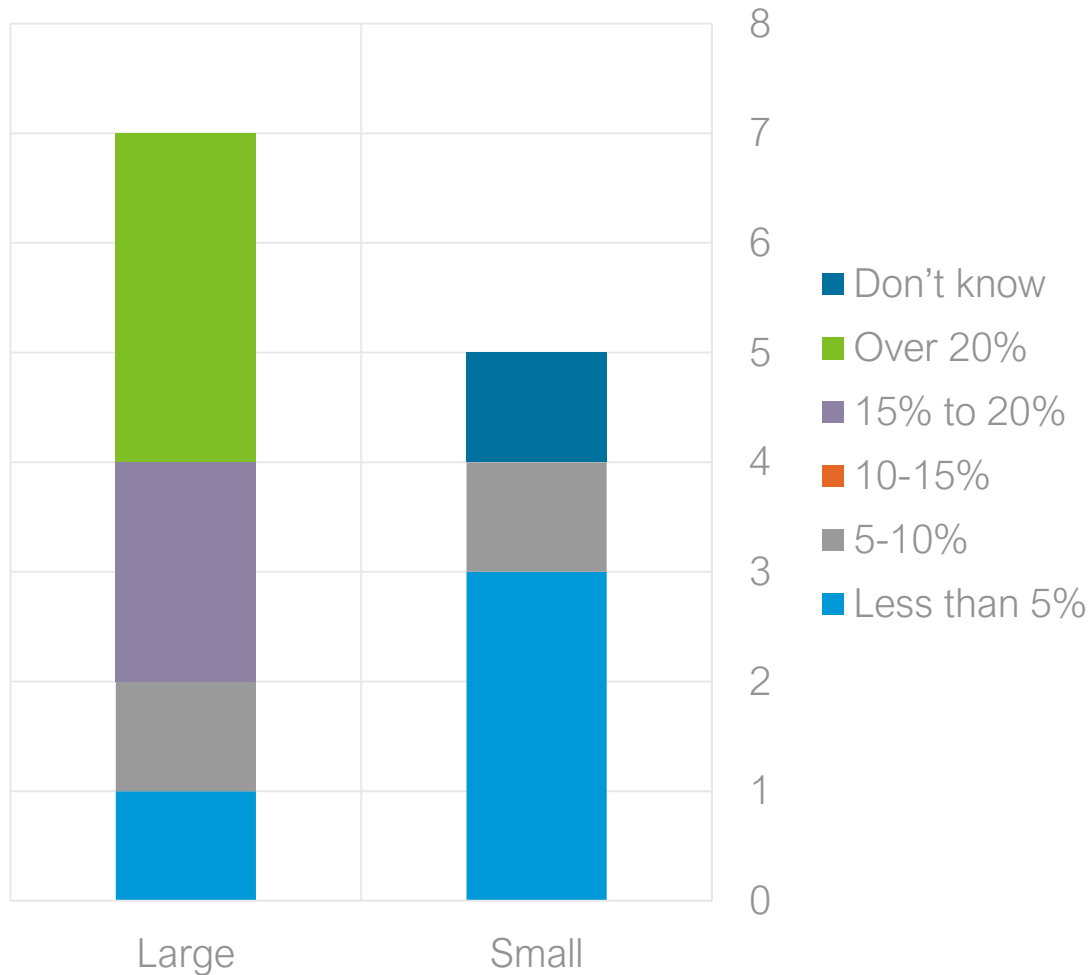
TRANSMISSION AND DISTRIBUTION SUBSTATIONS HAVE LONGER PLANNING HORIZONS AND BUILD TIMES



HISTORICAL T&D CAPITAL EXPENDITURES BY RESPONDENTS WERE BETWEEN \$1.35 AND \$1.57 BILLION PER YEAR

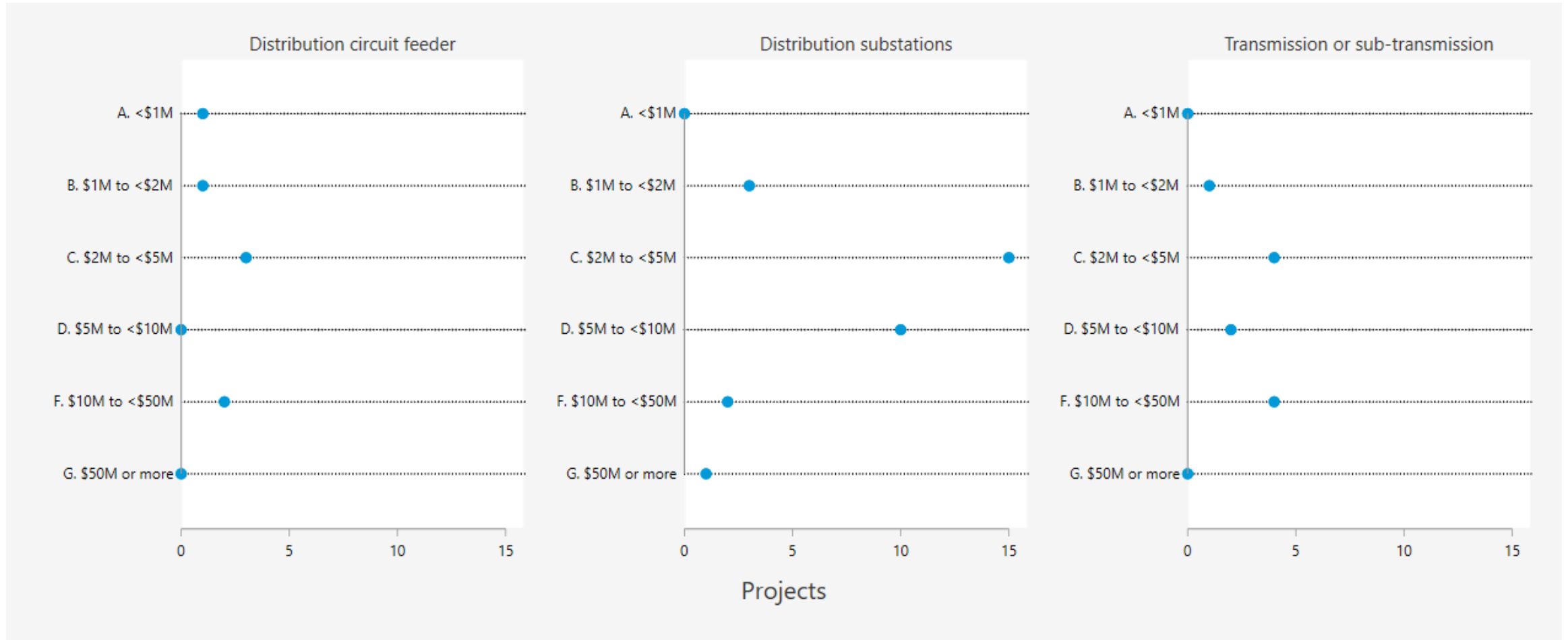


ROUGHLY 19% OF HISTORICAL EXPENDITURES WERE DUE TO SYSTEM EXPANSION (LOAD GROWTH) – APPROXIMATELY \$280M/YEAR

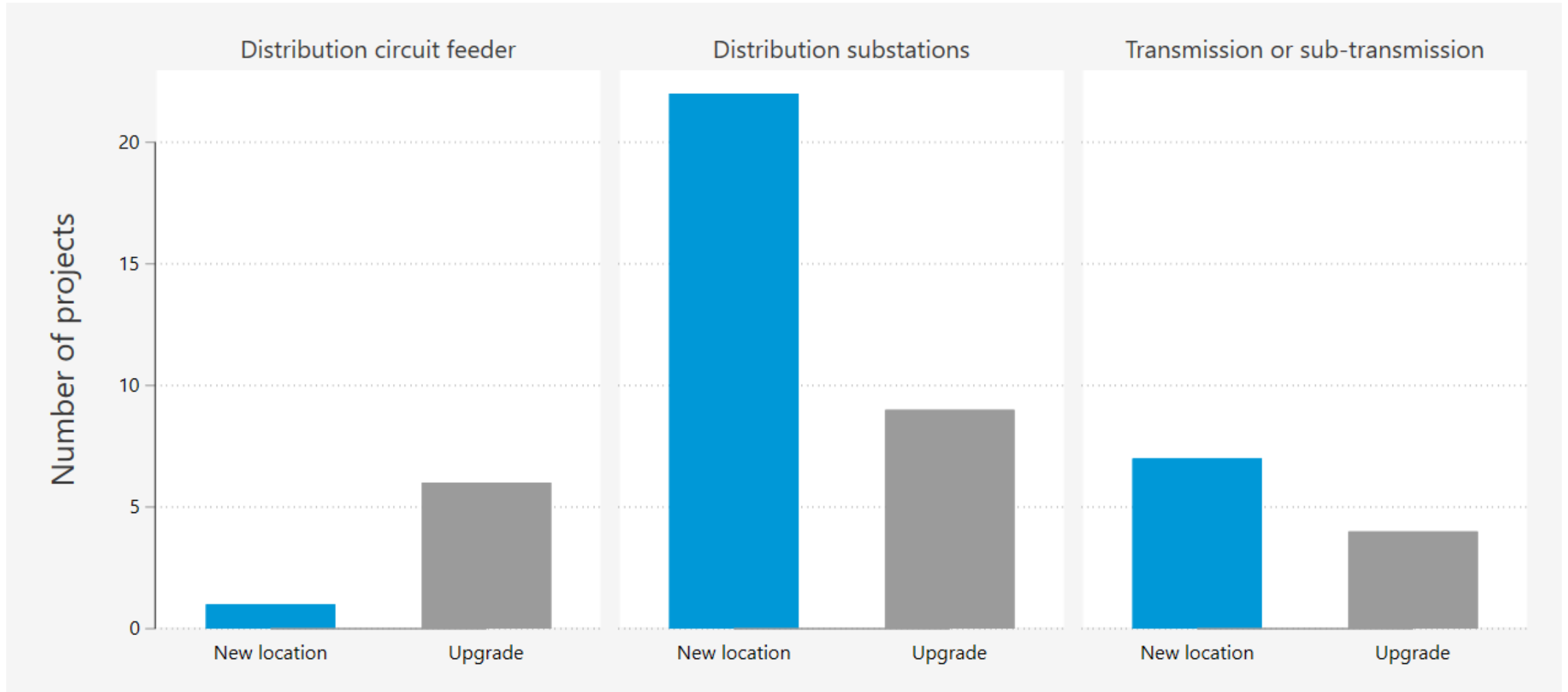


The over 20% category was capped at 20%

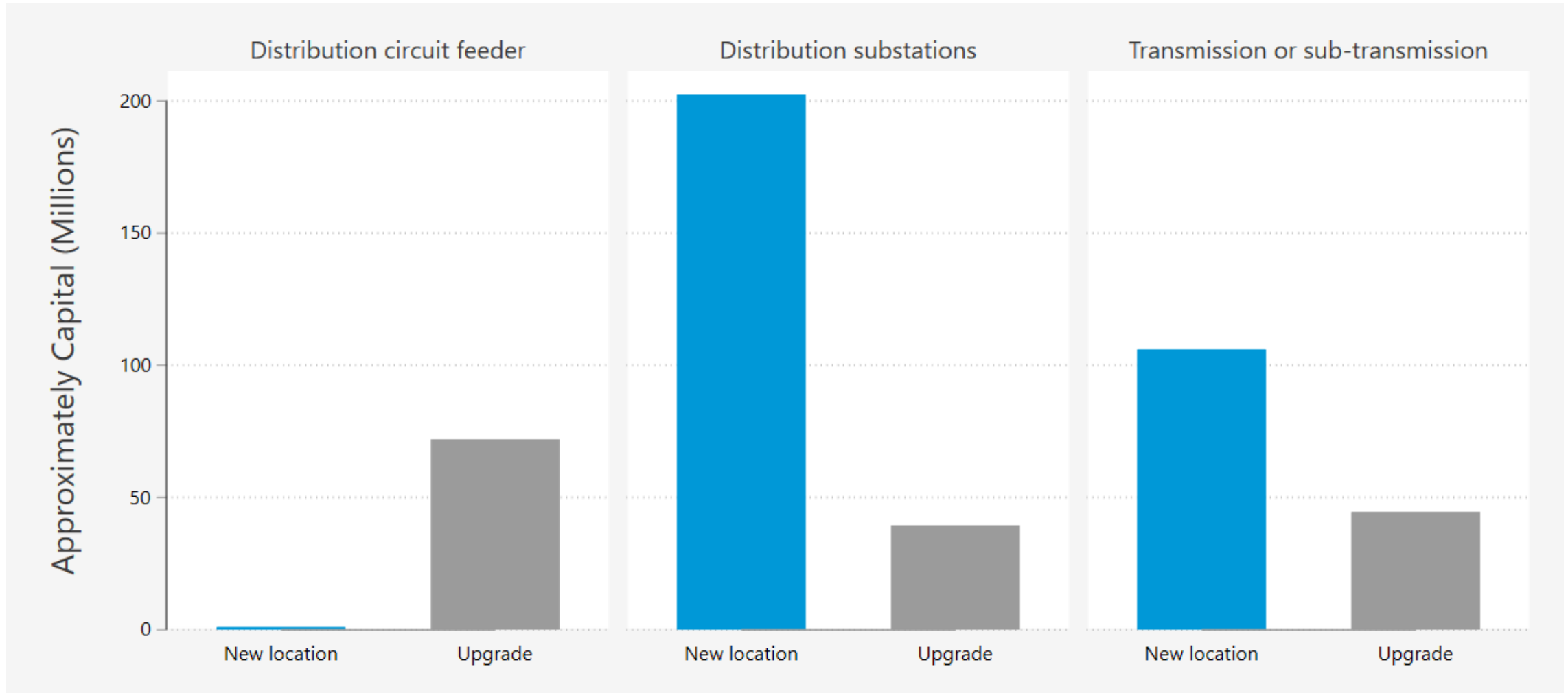
WHILE NOT EVERYBODY PROVIDED DETAIL, RESPONDENTS IDENTIFIED 49 PLANNED PROJECTS VALUED AT \$460M IN CAPITAL INVESTMENTS



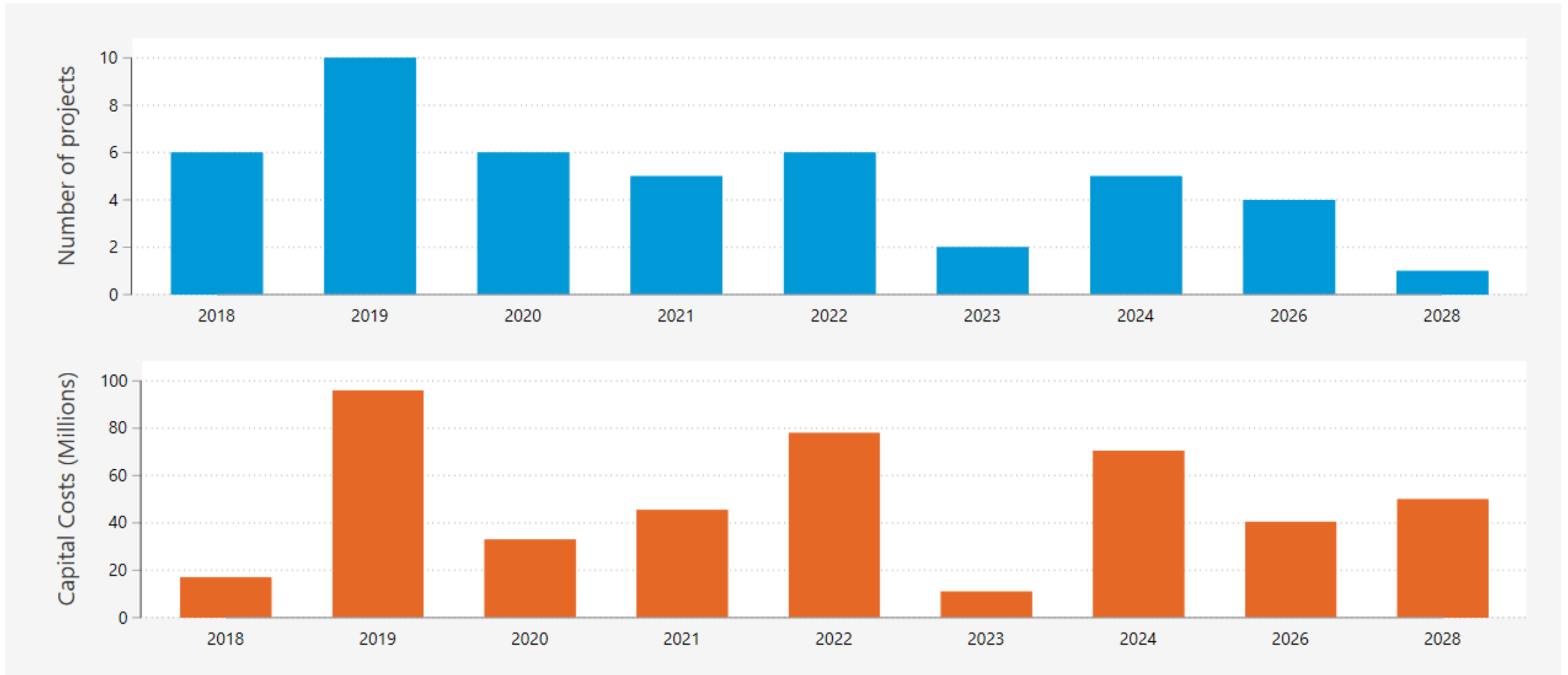
MOST PLANNED SUBSTATION PROJECTS ARE FOR NEW LOCATIONS, WHILE MOST CIRCUIT FEEDER PROJECTS ARE UPGRADES



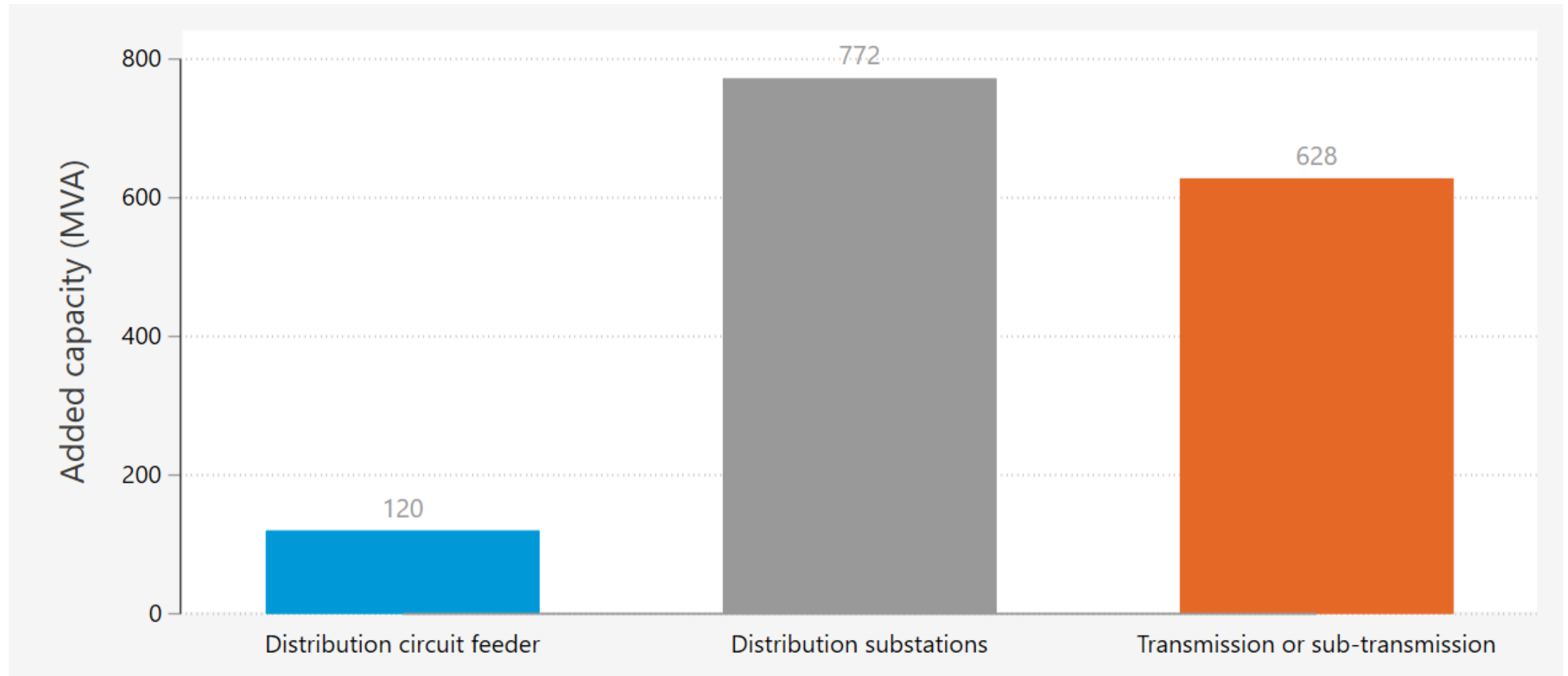
MOST EXPENDITURES FOR PLANNED GROWTH-RELATED PROJECTS ARE ALSO FOR NEW LOCATIONS



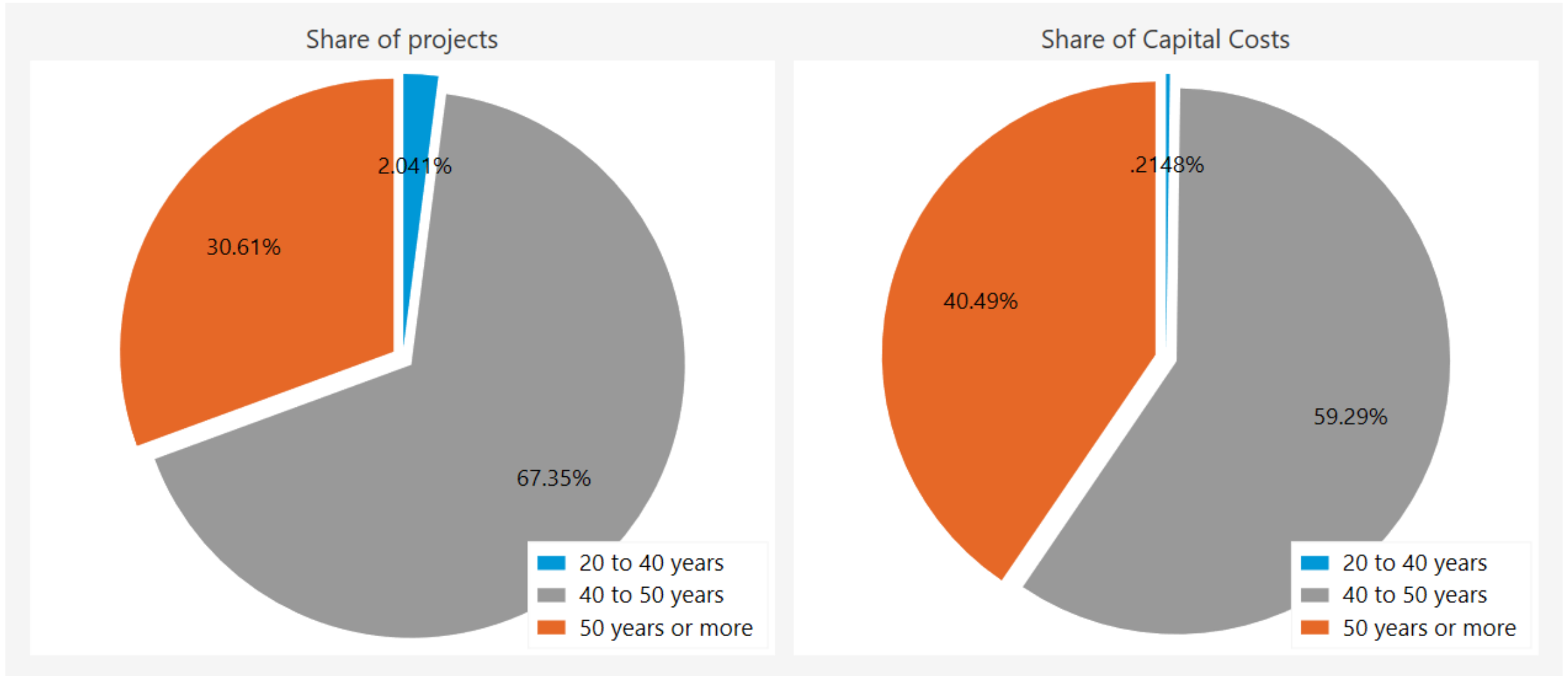
THE NUMBER AND COST OF PROJECTED T&D GROWTH-RELATED PROJECTS VARIES BY YEAR



IN TOTAL, THE PROJECTS IDENTIFIED ADD OVER 1,520 MVA OF CAPACITY

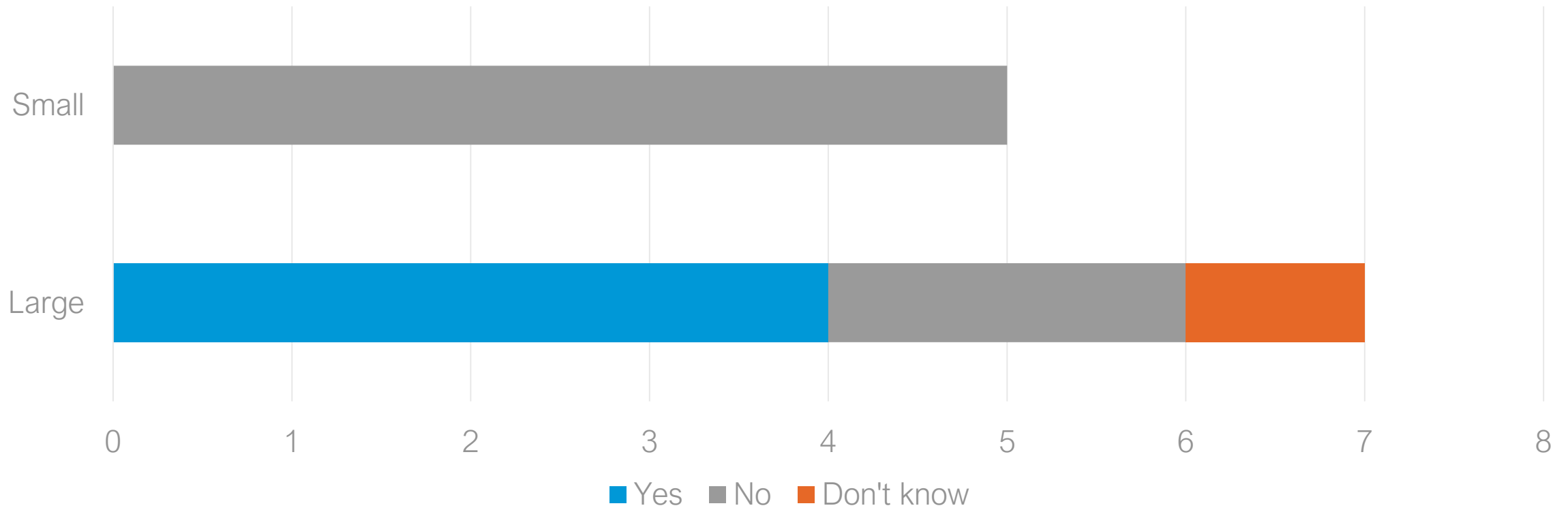


NEARLY ALL PROJECTS HAVE A USEFUL LIFE IN EXCESS OF 40 YEARS



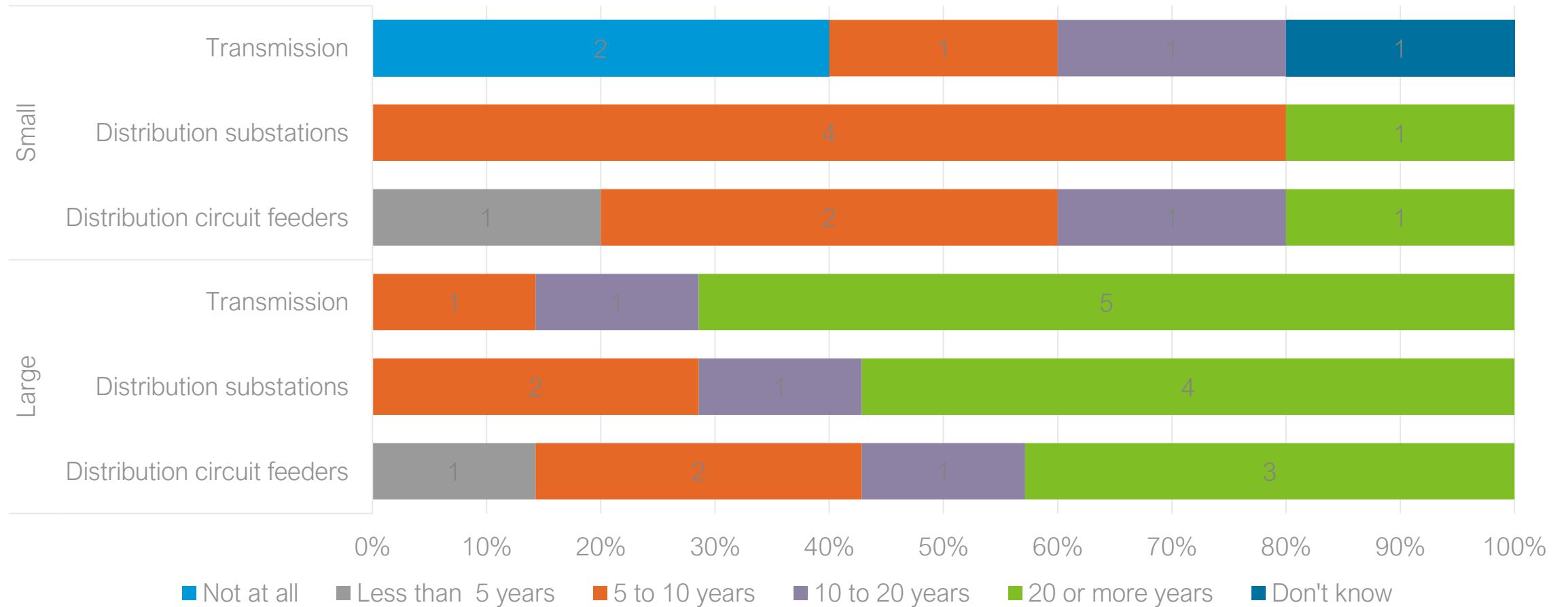
AMONG LARGER UTILITIES, 4 OUT OF 7 HAVE A PROCESS FOR EVALUATING NON-WIRES OPTIONS

Does your utility have a process for evaluating non-wires alternatives alongside traditional transmission and distribution infrastructure options?

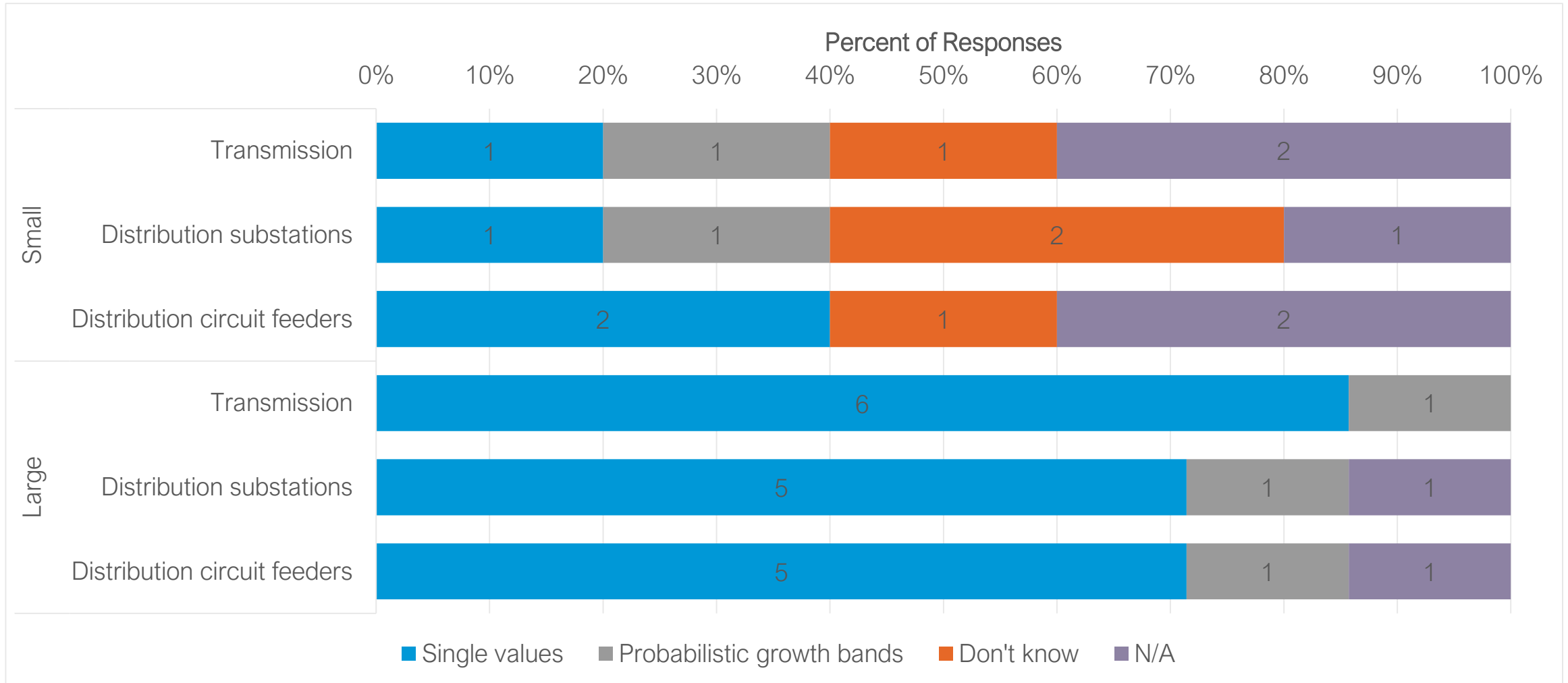


LOAD AND DISTRIBUTED ENERGY RESOURCE FORECASTING (T&D)

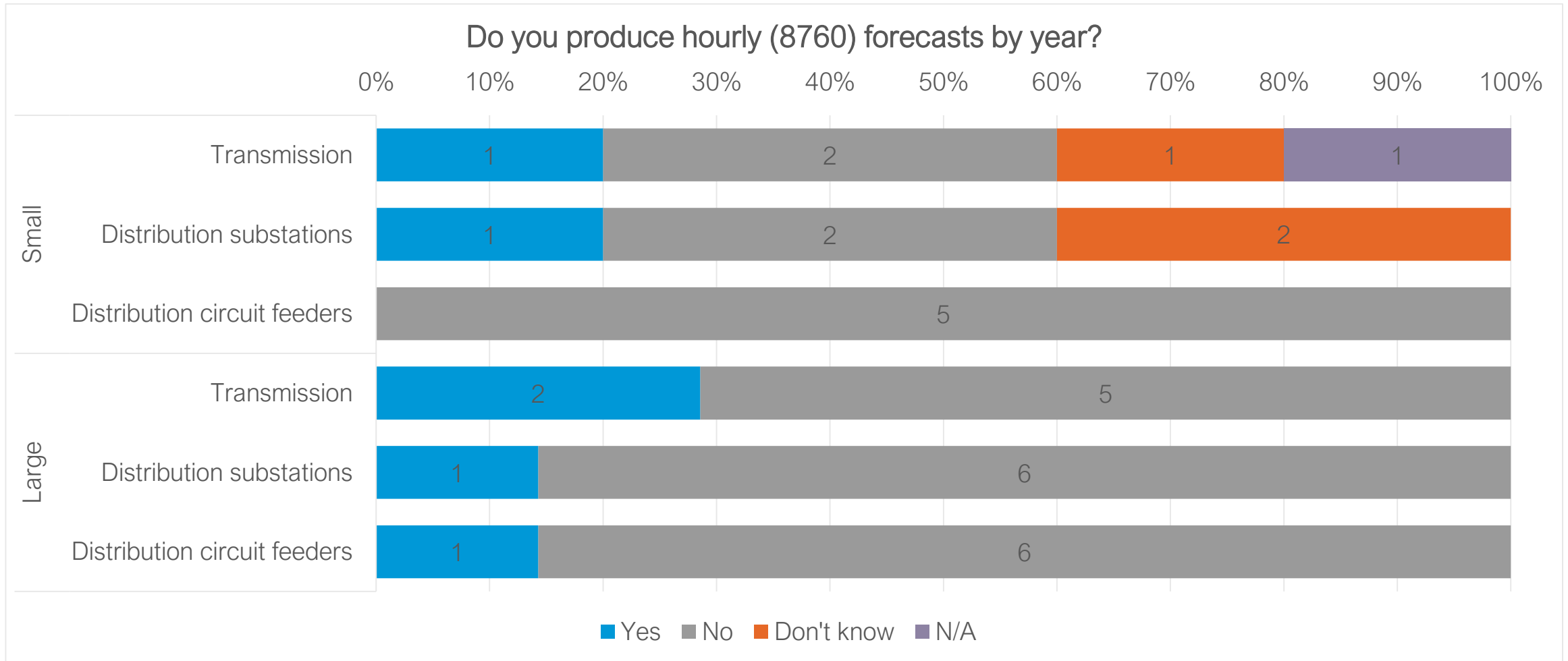
MOST UTILITIES FORECAST T&D LOADS MORE THAN 5 YEARS OUT



THE PREDOMINANT PRACTICE IS TO FORECAST POINT ESTIMATES (VERSUS FORECASTS THAT REFLECT UNCERTAINTY)



MOST T&D LOAD FORECASTS ARE NOT ON AN HOURLY BASIS (8760)



COORDINATION BETWEEN T&D AND SYSTEMWIDE FORECASTS VARIES ACROSS UTILITIES

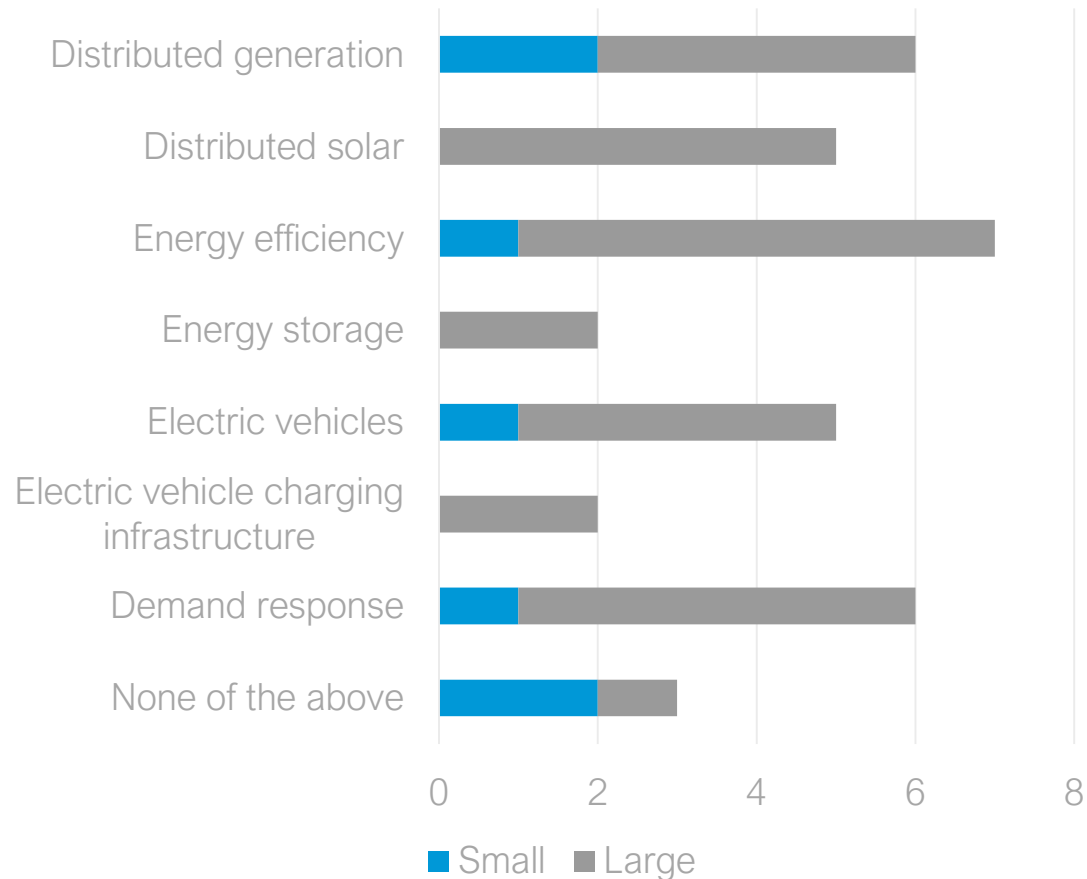
Does your utility coordinate company-wide peak forecasts with distribution peak forecasts?

The system peak and distribution forecasts are independent of each other and are not currently coordinated.	2	
System forecasts are the starting point for distribution peak forecasts (top-down).	3	
Distribution peaks are aggregated to the system peak forecast (bottom-up).	2	
We only forecast distribution peaks on as needed basis.	1	
Don't know	1	
Other	3	

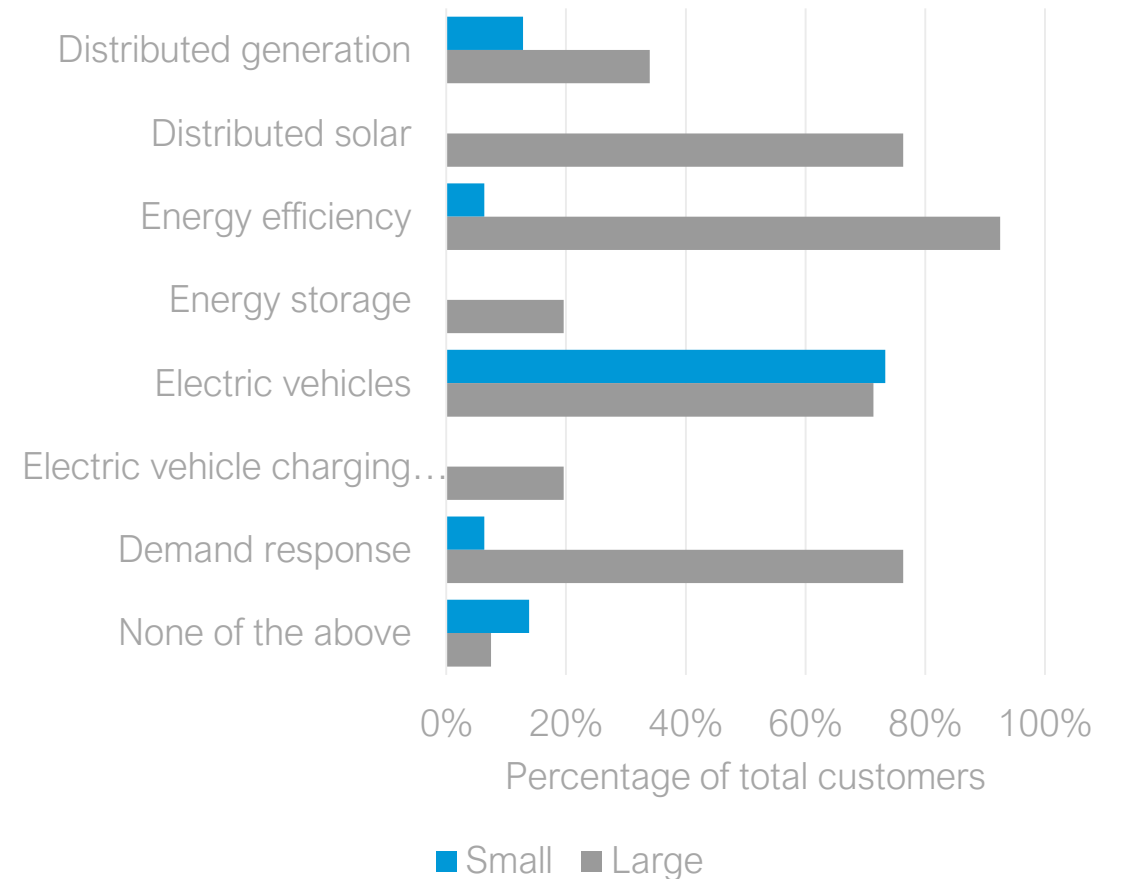
- "It is a bottom up forecast restrained by corporate's energy forecast."
- "Differing results would be expected from a company-wide forecast to a distribution forecast due to many factors."
- "At a "company-wide" level the load is flat, but when observed at a component level there was considerable change."
- "We use both top-down and bottom-up for various kinds of distribution studies"

MOST LARGE UTILITIES ARE PRODUCING FORECASTS FOR DISTRIBUTED ENERGY RESOURCES

Do you produce forecasts for...



Do you produce forecasts for.... (weighted)



SEVERAL UTILITIES FORECAST DISTRIBUTED RESOURCES AND INCORPORATE THEM INTO PLANNING (% OF RESPONSES)

DER Type	Do you produce forecasts for...?	Is the forecast hourly?	Is the forecast probabilistic?	Does the forecast have locational granularity?	Is the forecast incorporated into system planning?	Is the forecast incorporated into T&D planning?
Distributed generation	50%	8%	0%	0%	33%	17%
Distributed solar	42%	8%	0%	0%	33%	17%
Energy efficiency	58%	33%	0%	8%	58%	33%
Energy storage	17%	0%	0%	0%	17%	8%
Electric vehicles	42%	8%	8%	8%	17%	8%
EV charging infrastructure	17%	8%	8%	8%	17%	8%
Demand response	50%	8%	0%	8%	33%	17%

- Hourly, probabilistic, and location specific forecasts are uncommon
- Limited forecasting of battery storage and electric vehicle infrastructure
- Results are more likely to be incorporated into system planning than T&D planning

N = 12



BECAUSE LARGER UTILITIES ARE MORE LIKELY TO FORECAST DISTRIBUTED RESOURCES, A SUBSTANTIAL SHARE OF WASHINGTON CUSTOMERS ARE INCLUDED (% OF ELECTRIC CUSTOMERS)

DER Type	Do you produce forecasts for...?	Is the forecast hourly?	Is the forecast probabilistic?	Does the forecast have locational granularity?	Is the forecast incorporated into system planning?	Is the forecast incorporated into T&D planning?
Distributed generation	33%	5%	0%	0%	33%	16%
Distributed solar	74%	5%	0%	0%	33%	16%
Energy efficiency	90%	62%	0%	41%	90%	57%
Energy storage	19%	0%	0%	0%	19%	7%
Electric vehicles	71%	7%	7%	7%	19%	7%
EV charging infrastructure	19%	7%	7%	7%	19%	7%
Demand response	75%	7%	0%	7%	65%	48%

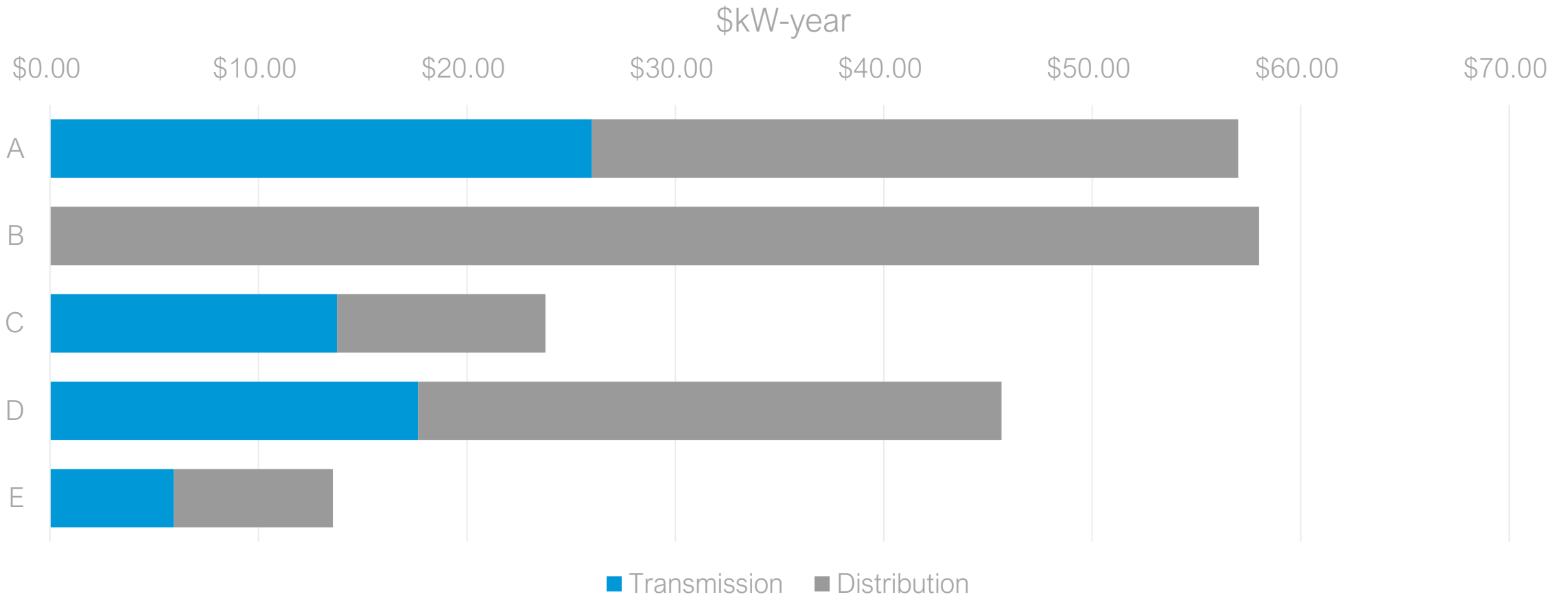
- Hourly, probabilistic, and location specific forecasts are still uncommon
- Limited forecasting of battery storage and electric vehicle infrastructure
- Results are still more likely to be incorporated into system planning than T&D planning



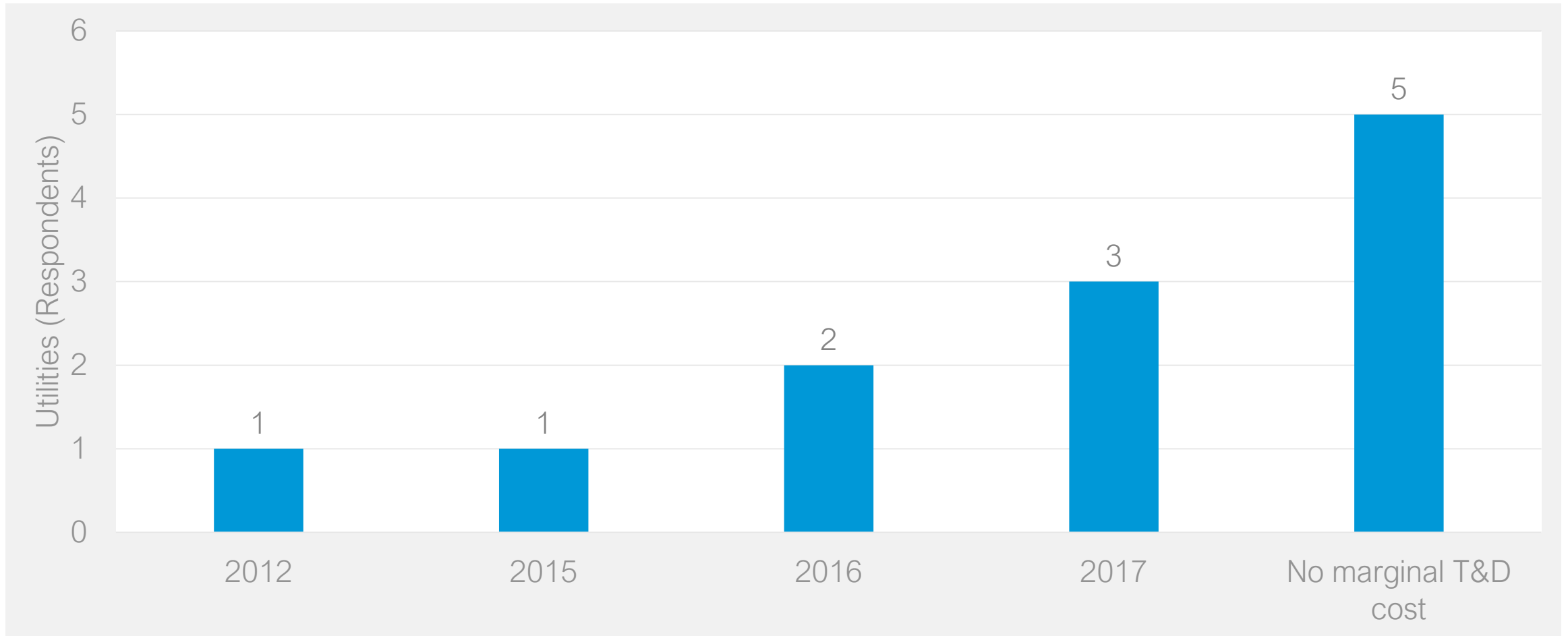


T&D MARGINAL COSTS AND LOCATIONAL VALUE

ESTIMATES OF TRANSMISSION AND DISTRIBUTION MARGINAL COSTS (\$/KW-YEAR) VARY AND WERE PROVIDED ONLY BY LARGER UTILITIES

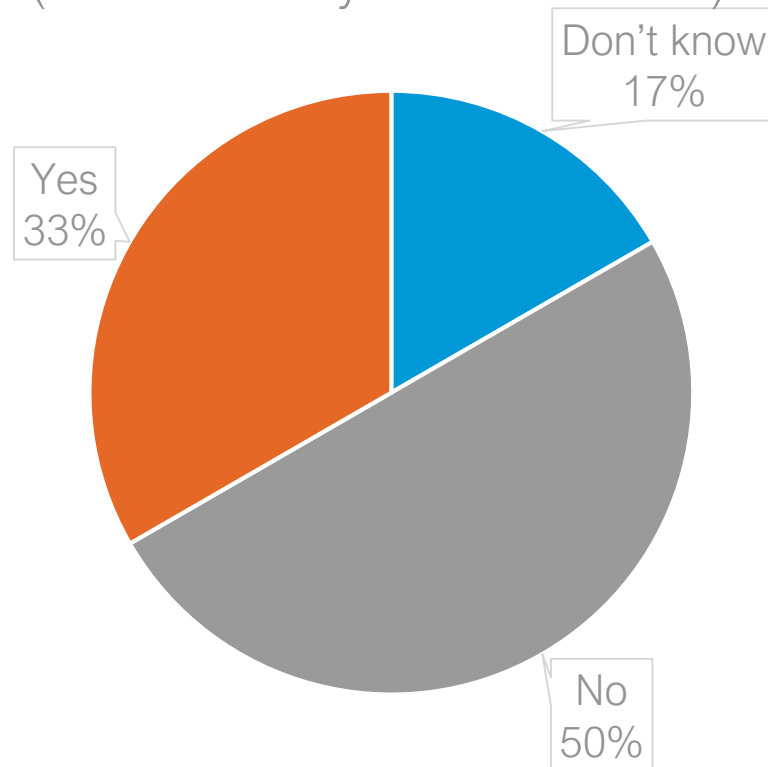


THE ESTIMATES ARE BASED ON RELATIVELY RECENT STUDIES



FOUR LARGER UTILITIES HAVE CALCULATED AVOIDED T&D COSTS FOR A SPECIFIC T&D PROJECT

Has your utility calculated avoided T&D costs for specific projects or areas (versus on a system wide basis)?



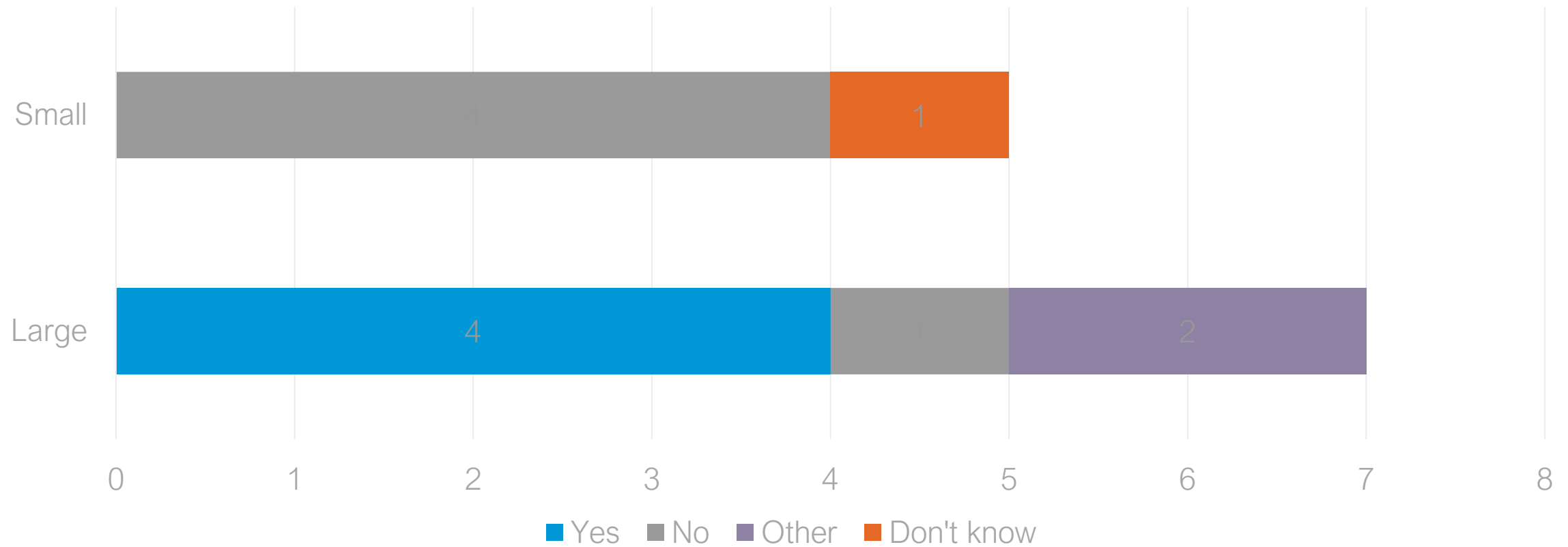
- None of the smaller utilities have done so
- 4 out of 7 larger utilities have calculated avoided costs for a specific T&D project
























DISTRIBUTED ENERGY RESOURCE VALUATION

4 OUT OF 7 LARGER UTILITIES ALREADY CONSIDER DISTRIBUTED RESOURCES IN THEIR T&D PLANNING

Does your utility consider DER alternatives in its T&D planning?



THERE ARE A NUMBER OF DER PROJECTS CURRENTLY UNDERWAY

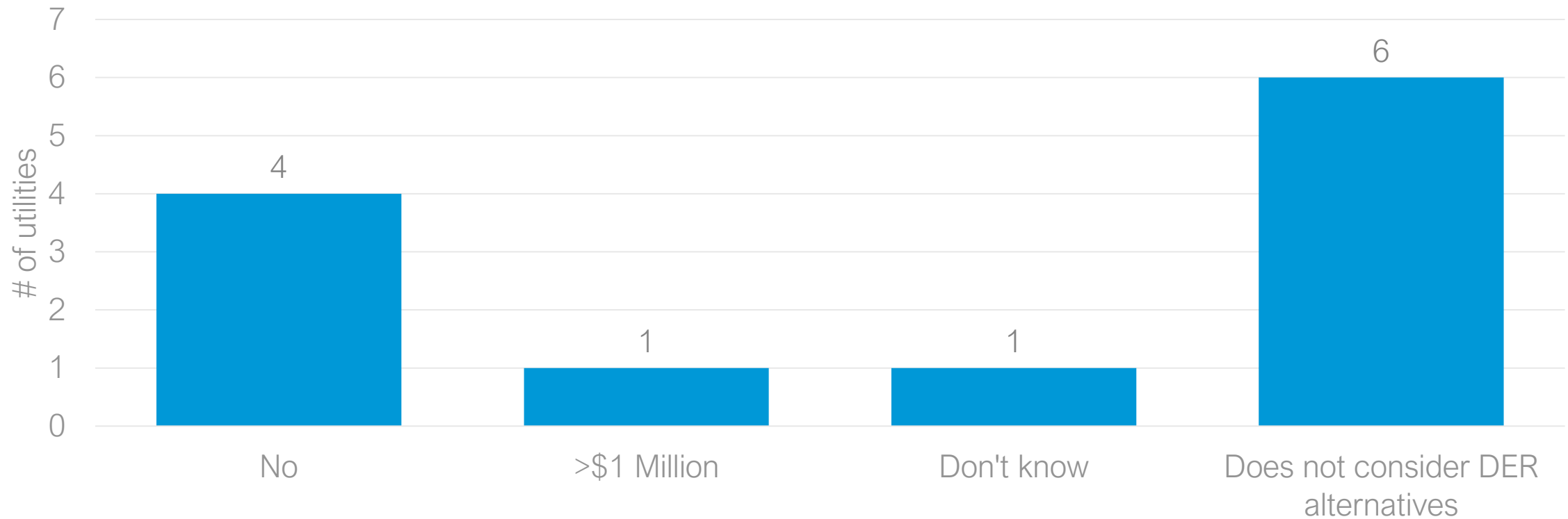
	We have considered this		We have pilot projects in progress or complete		We have planned projects	
Distributed generation	3		2		0	
Distributed solar	3		2		2	
Energy efficiency	3		4		1	
Energy storage	4		2		0	
Electric vehicles	2		2		1	
Electric vehicle charging infrastructure	3		2		1	
Demand response	3		3		1	

- Several of the larger utilities have considered DERs and/or have projects underway
- None of the smaller utilities have DER pilots or programs underway

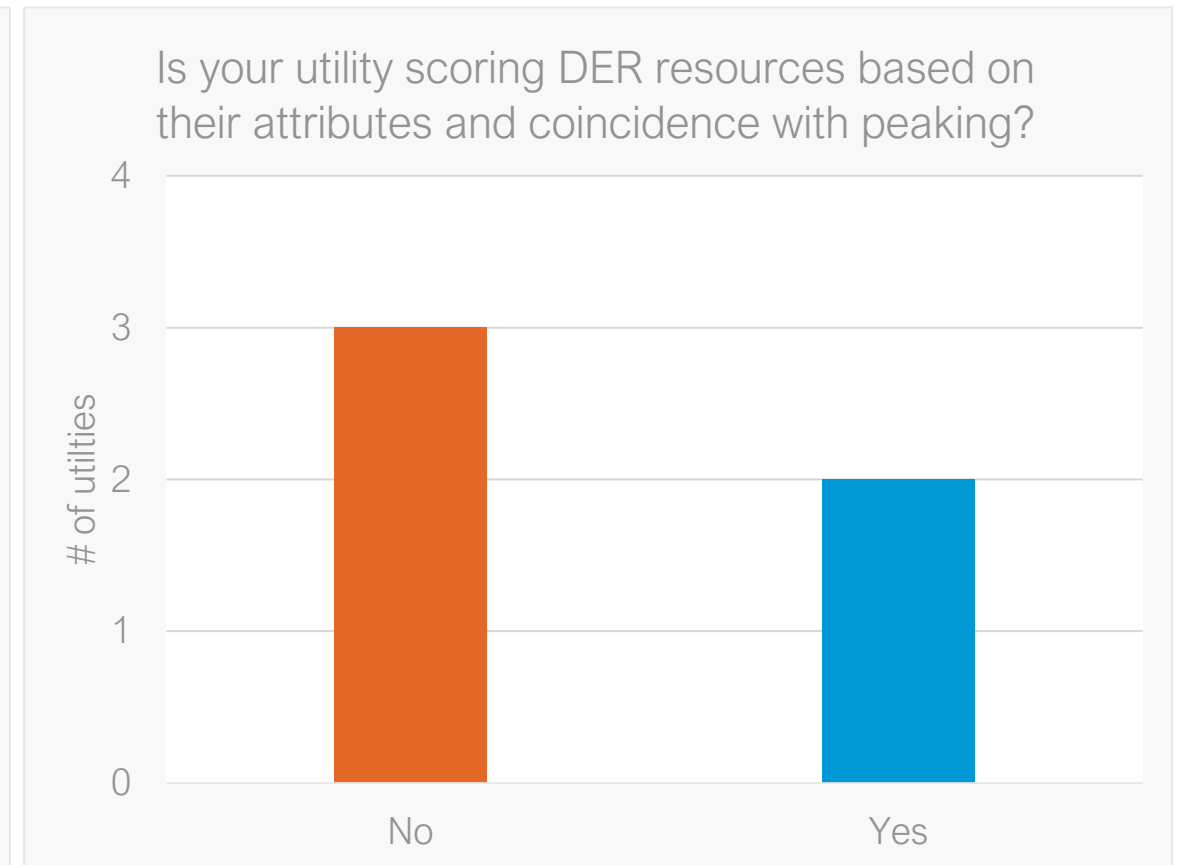
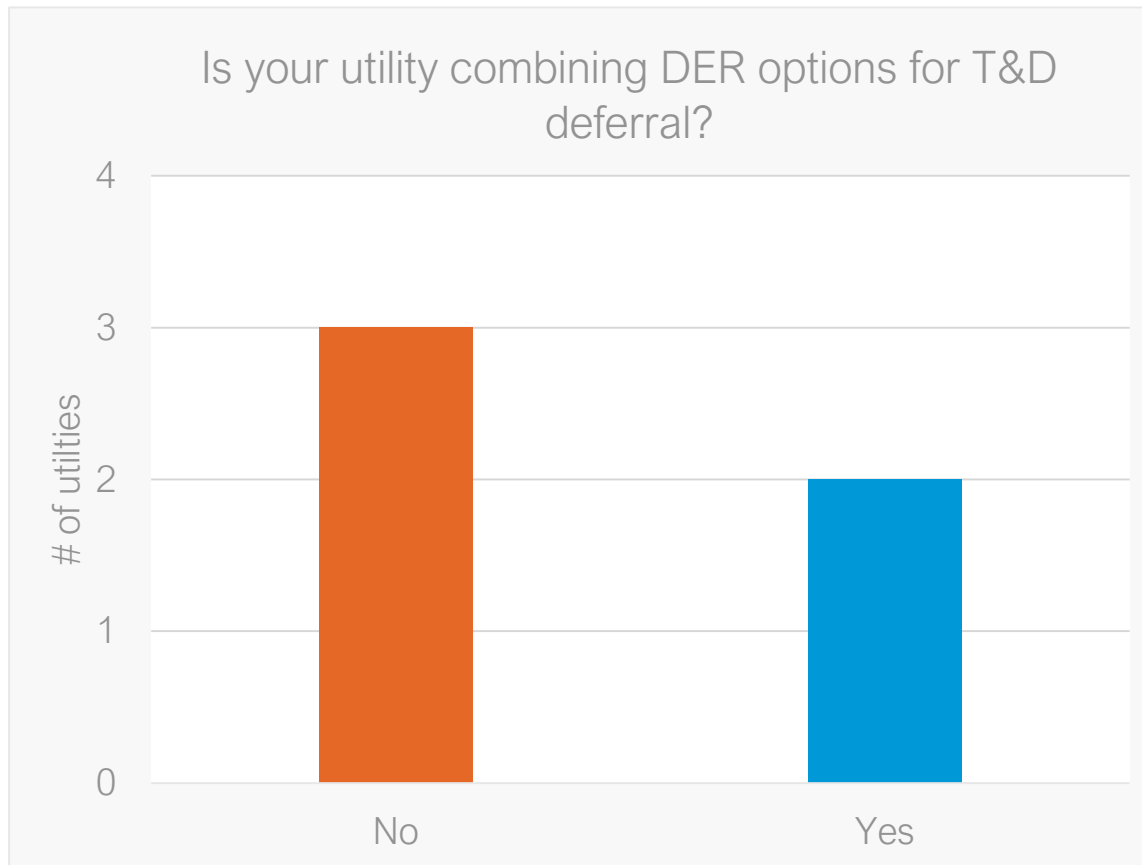


ONLY ONE UTILITY HAS IDENTIFIED A PROJECT COST LEVEL THAT TRIGGERS AN ASSESSMENT OF NON WIRE ALTERNATIVES

Is there an infrastructure investment level that triggers assessment of DER alternatives?



SCORING DISTRIBUTED RESOURCES BASED ON THEIR ATTRIBUTES AND COINCIDENCE WITH PEAKING IS AN UNCOMMON PRACTICE



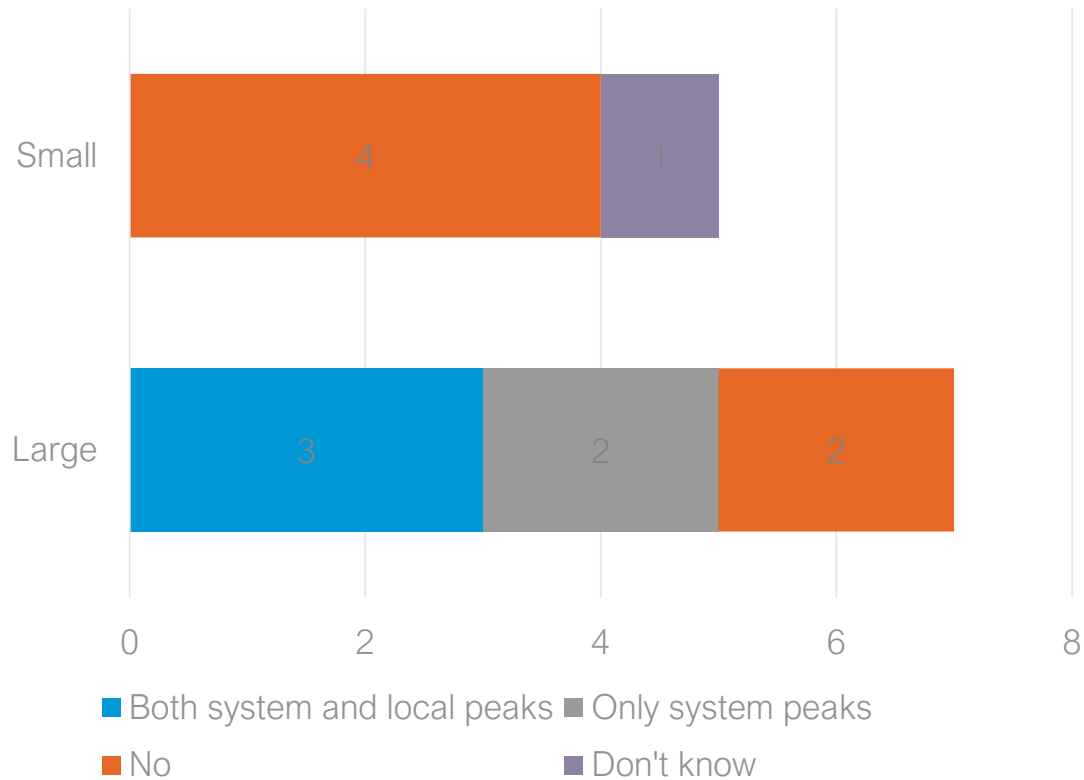
THE BENEFITS INCLUDED VARIES BY TYPE OF DISTRIBUTED ENERGY RESOURCE (N = 5)

	Distributed generation	Distributed solar	Energy efficiency	Energy storage	Electric vehicles	Electric vehicle charging infrastructure	Demand response
Avoided Energy Costs	████████	████████	██████████	████████	████████	██████	██████████
Avoided generation capacity	████████	████████	██████████	██████████	████████	██████	██████████
Avoided transmission capacity (system-wide value)	██████	██████	██████████	██████	██████	███	██████████
Avoided distribution capacity (system-wide value)	██████	██████	██████████	██████████	██████	███	██████████
Avoided transmission capacity (location specific value)	███	███	███	███	███	███	███
Avoided distribution capacity (location specific value)	███	██████	██████	██████	███	███	███
Frequency and load following services				██████			███
Contingency reserves	████████	████████	██████	██████████	███	███	██████████
Distribution ancillary services (e.g. voltage regulation)	███	███	███	██████████	███	███	███
Reliability benefits/costs	███	███	███	██████	███	███	███
Avoided emissions	████████	████████	██████████	██████	██████	██████████	██████████
Avoided line losses	██████████	██████████	██████████	██████████	██████	██████	██████████
Avoided renewable portfolio standard compliance costs	████████	████████	██████████	██████	██████████	██████	██████████
Nonutility impacts	██████	██████	██████	██████████	██████	██████	██████

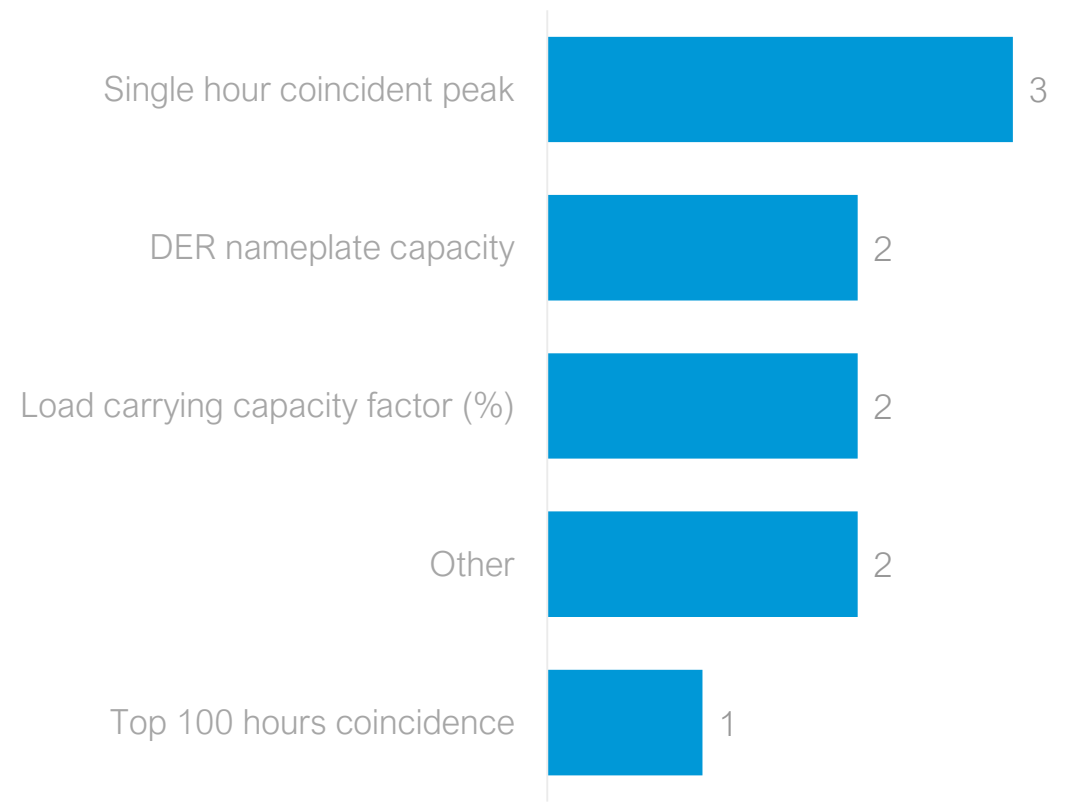


UTILITY PRACTICES FOR CALCULATING COINCIDENT PEAK AND CAPACITY VALUE ARE DIVERSE

Does your utility calculate the DER value coincident with system and local peaks?

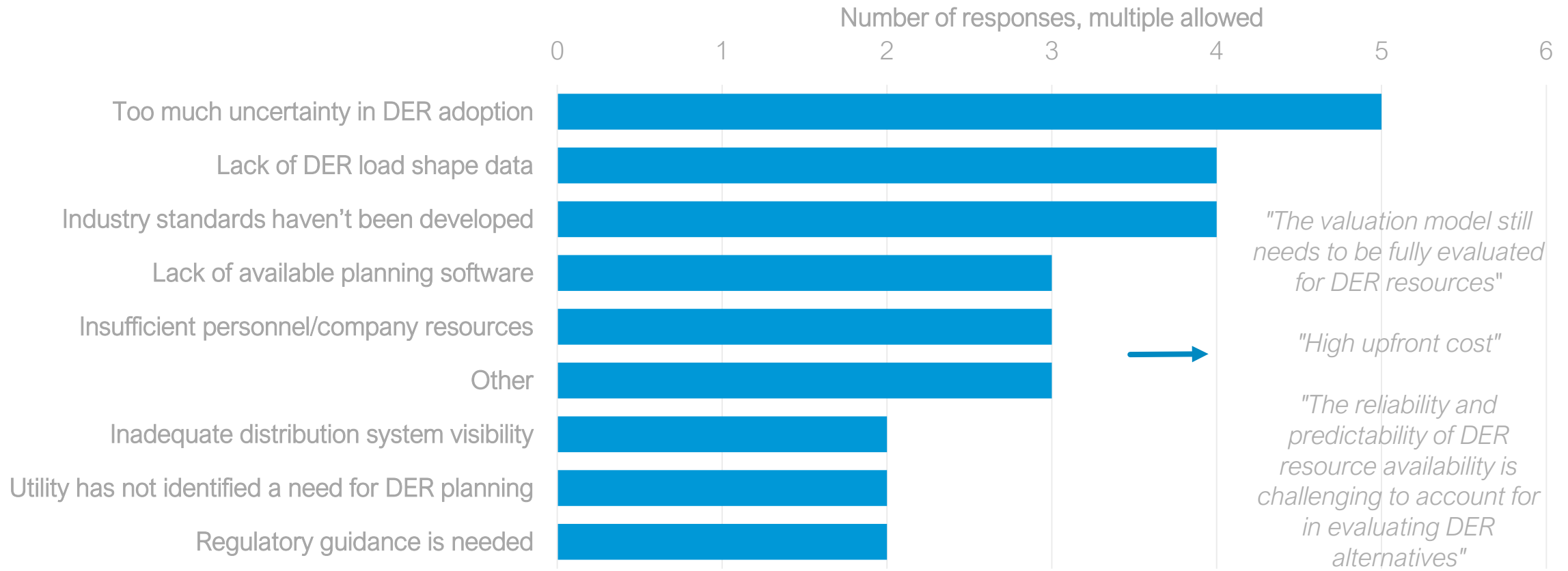


Which metric(s) does your utility use for quantifying the capacity value of a DER?



RESPONDENTS IDENTIFIED A NUMBER OF BARRIERS TO INTEGRATION OF DERs INTO PLANNING

What are the primary barriers to incorporating DERs into planning?



QUESTIONS?



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