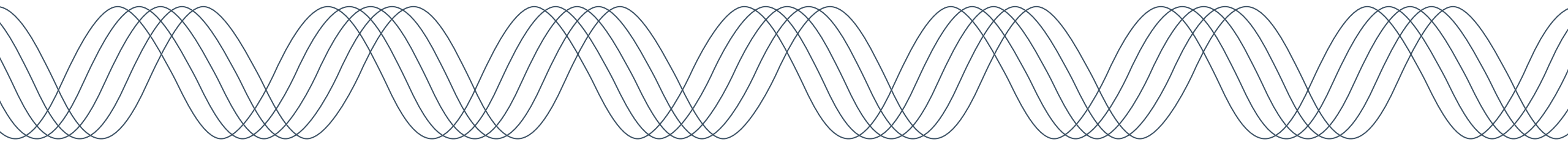




PGE Request for Information (RFI) 2024 Key Insights

December 2024



Background on PGE's 2024 Long Lead-Time RFI

- **PGE conducted the RFI pursuant to Order 24-096** (LC 80, PGE 2023 CEP/IRP):

"PGE file a proposal to develop a long lead-time resource RFI via a stakeholder process in LC 80, facilitate a workshop on the RFI findings, and allow sufficient time for stakeholder review of its RFI before proposing its next steps."

- **Objectives:**

- Build market intelligence on where future projects may be available, focused on projects beyond 2029
- Support better understanding of how to prepare the grid for future resource additions
- Increase understanding of key development criteria for long lead-time resource additions

- **Timeline:**



Conclusions and Key Insights

- **RFI identified energy and capacity projects with intent to deliver by 2030 in significant excess of PGE near-term resource needs**
 - 19 GW of generation and hybrid projects with COD 2029-2030
 - 2.4 GW of short-duration storage
- **RFI results emphasized Oregon, but with varying levels of project development status - transmission, permitting, and interconnection remain real risks**
 - Relative to responses generally, Oregon projects are at any earlier development phase, with lower reported achievement of site control and interconnection submission
 - 2030 COD may be unlikely for 3.6GW of Oregon project capacity (generation, storage, hybrid) that has not submitted an interconnection request as of summer 2024.
- **Relatively lower response from out-of-state may suggest risk in their ability to deliver to PGE**
 - RFI participation rate is small relative to total regional potential and project activity
 - Projects further afield may have transmission-related feasibility risk with respect to PGE
 - Regional trunk transmission access to Portland area would likely increase response
- **Low response rate from less mature technology types (i.e., geothermal, nuclear, offshore wind, long duration storage) underscores challenges of incorporation into planning and competitive acquisition**
 - Long-duration storage may be the most viable, but still appears to be commercially unavailable in the near term

Next Steps

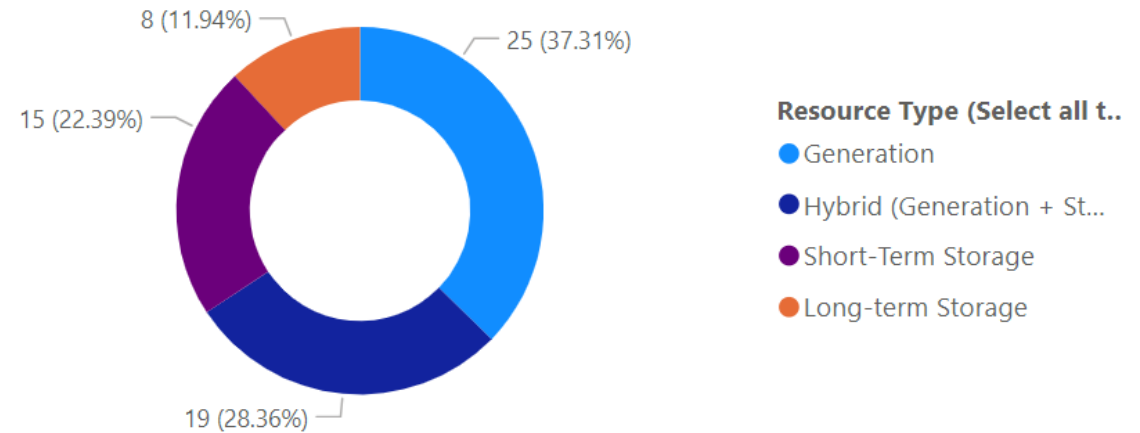
PGE expects to use RFI findings to inform:

1. Resource and transmission planning iteration, including 2023 IRP/CEP Update (March 2025)
2. Design of subsequent PGE RFPs
3. Continuing consideration of alternative acquisition approaches
4. Future RFIs

Key Resource Types

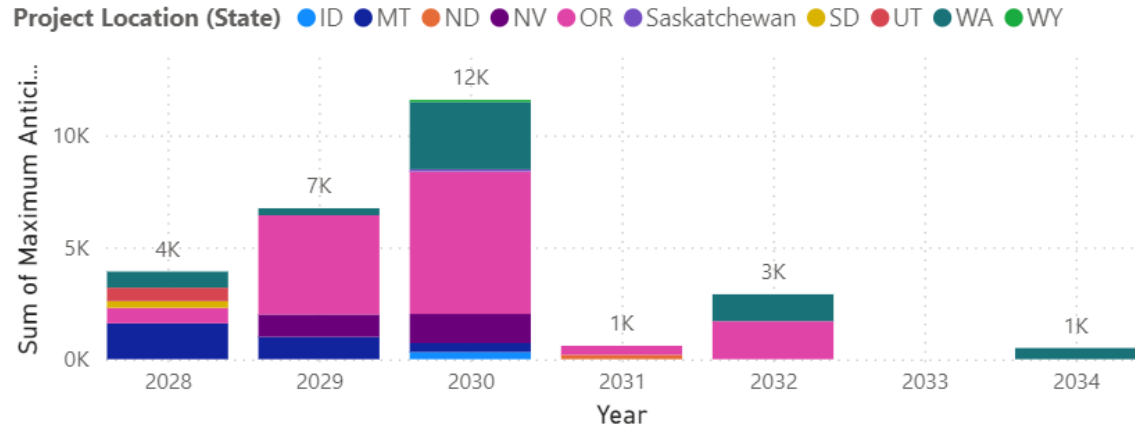
- A total of 67 projects from 27 counterparties were submitted to PGE's RFI with a COD of 2028-outward
 - Many hybrid projects (over 25%)
 - Storage projects comprised some 23 projects, including short-term (4-8hr) batteries and longer-term projects
 - Nearly 40% of projects are energy generation-only, including wind and solar projects

Resource Type (count of reported projects)

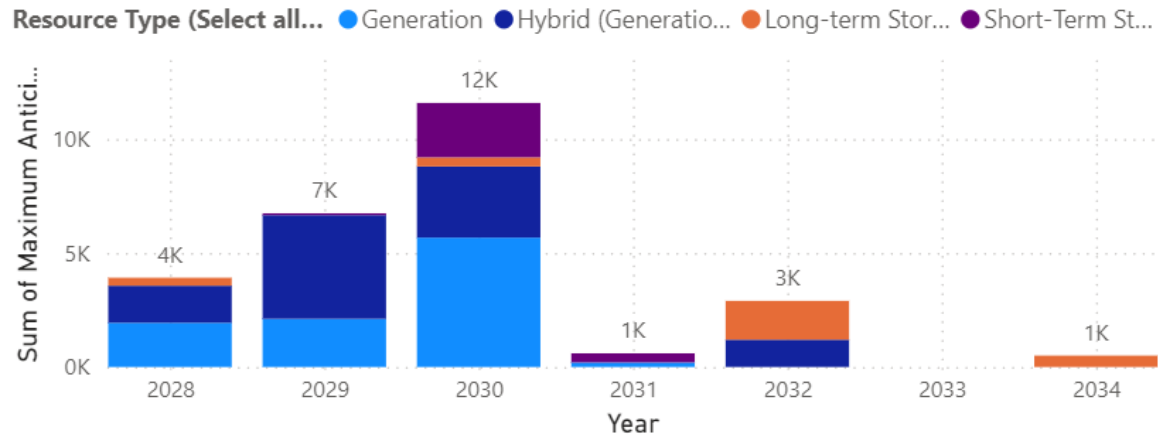


RFI project timeline

Project launch date (nameplate MW, by state)



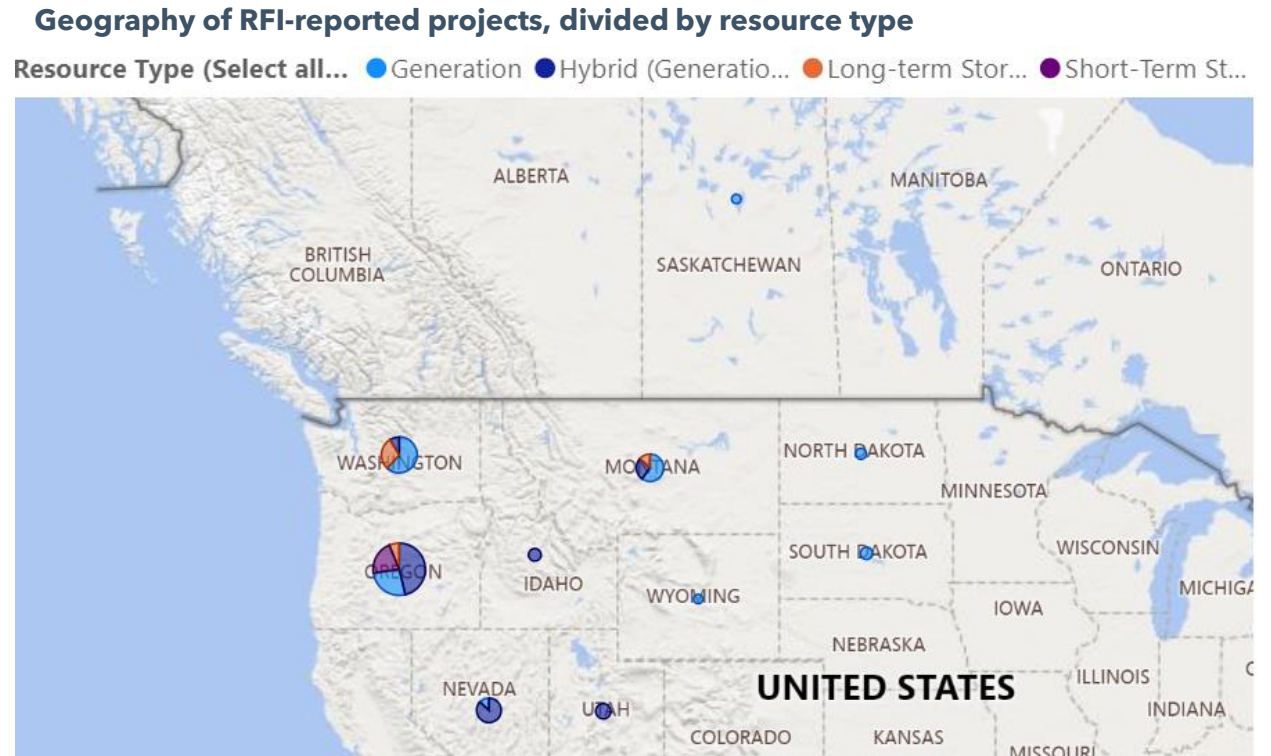
Project launch date (nameplate MW, by resource type)



- Largest number of projects coming online in 2029-2030
 - Includes total potential projects with nameplate of 19GW
 - Represents majority of hybrid + generation projects included in the RFI
 - 7GW (out of 9.9 GW) of generation
 - 7.7GW (out of 10 GW) of hybrid resources
 - Represents nearly all short-duration storage included in the RFI
- Long-duration storage is the primary resource type with longer term delivery (2032, 2034) but this project timeline remains far-out
- This timeline reflects the need to appropriately mitigate risk through more flexible procurement and a discrete focus on improving interconnection, transmission, and permitting constraints.

Geographies of RFI-reported projects

- Majority of RFI-reporting projects in Pacific Northwest (PNW) – Oregon (**39 projects**), Washington (**10 projects**) – reflects ongoing potential for smaller renewable projects locally
 - 6 GW in potential Oregon hybrid projects
 - Washington-situated assets include most long-duration storage
- Another 5 GW of resources in Montana (Southern Power Pool North), Nevada (Desert Southwest) -- **11 projects aggregate**
 - SPP North majority generation (wind)
 - DSW majority hybrid (solar generation + capacity)
- Smaller hybrid + generation plays in SPP North (Montana, Wyoming, North Dakota, South Dakota), primarily wind (**7 total projects elsewhere**)



Feasibility of RFI-reported projects

Feasibility assessed based on site control, permitting status, and interconnection/transmission request status. If COD pre-2030, but no substantive progress in the following areas, project may be considered low-feasibility.

Site Control

29 of the projects are fully secured, while another 19 have a majority of their site secured

- This is critical from land rights perspective, especially for solar

Permitting

Majority of projects answered that they are not yet permitted by FERC

- Most projects are likely not subject to FERC requirements

Interconnection

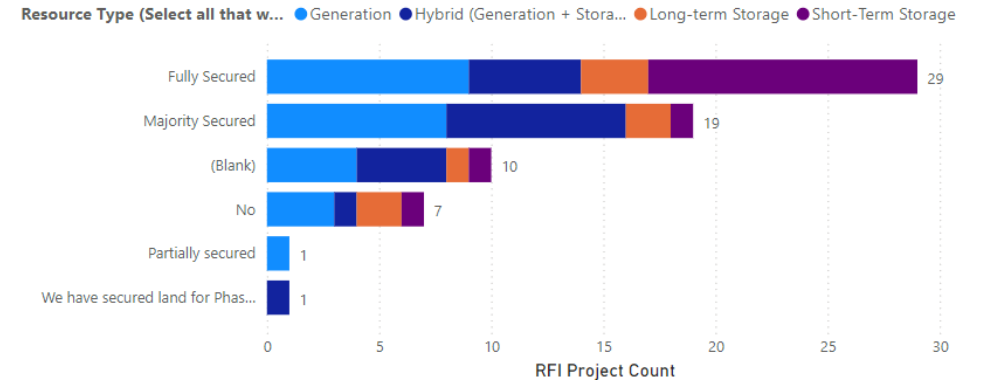
31 of the projects have submitted interconnection requests (at various stages of progress)

- Projects with a COD prior to 2030 should have an interconnection request submitted by 2024

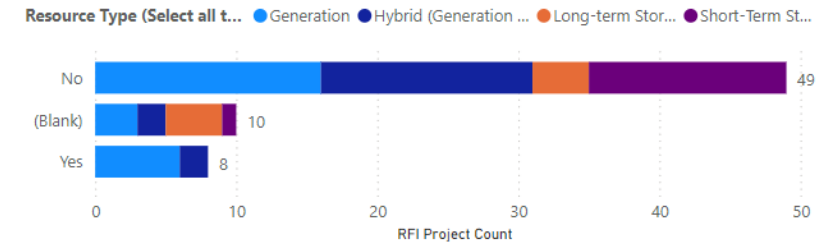
Transmission

Majority of projects have not submitted TSR to PGE

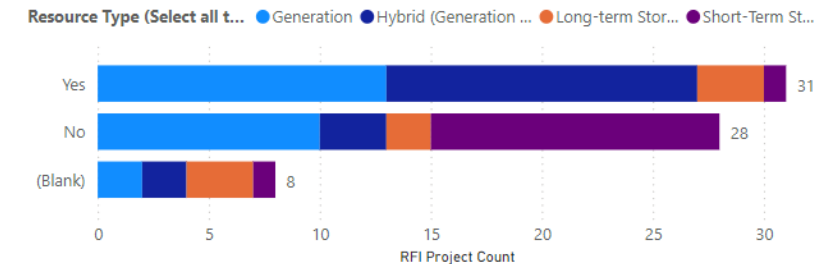
Degree of Site Control?



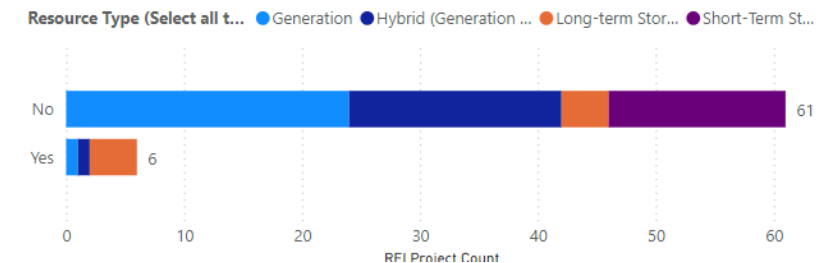
TSR to PGE Submitted?



Interconnection Request Submitted?



FERC Licensing Obtained?



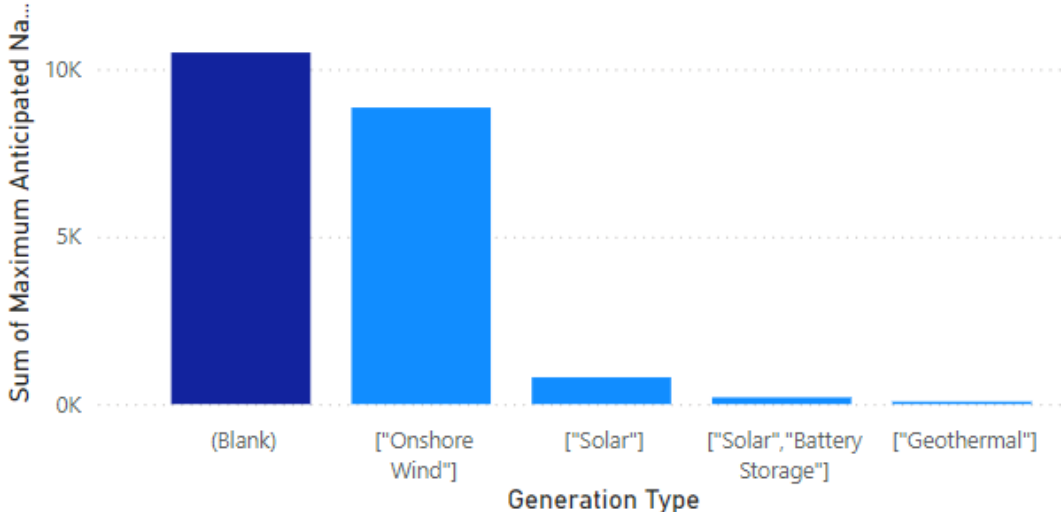
Generation technologies

- Largest utilized technology in the RFI is onshore wind (8.8GW), standalone solar another 800MW
 - Offshore wind developers chose not to participate due to regulatory concerns
 - 2024 Oregon offshore block auction delayed
- Few small-scale (50 MW or less) geothermal projects reported in RFI
 - Likely that other projects did not participate
- No nuclear contribution, but potential projects exist in WA and elsewhere in WECC market
- Most hybrid projects did not submit generation technology data but suggest another 10.5GW of potential availability
 - However, review suggests that hybrid projects in DSW will have solar generation component; MW will have wind component
 - PNW: 52% of hybrid
 - DSW: 26% of hybrid
 - MW: 22% of hybrid

Generation Type	Resource Type (Select all that would apply)	Sum of Maximum Anticipated Nameplate Generation Capacity (MW).1
	Hybrid (Generation + Storage Capacity)	10495
["Geothermal"]	Generation	75
["Onshore Wind"]	Generation	8852
["Solar", "Battery Storage"]	Generation	200
["Solar"]	Generation	800
Total		26239

Generation Types

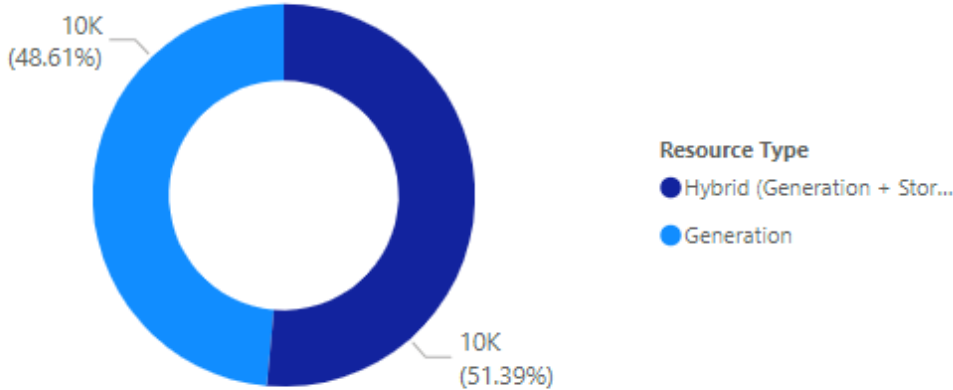
Resource Type (Select al... ● Generation ● Hybrid (Generation + Storage Capacity)



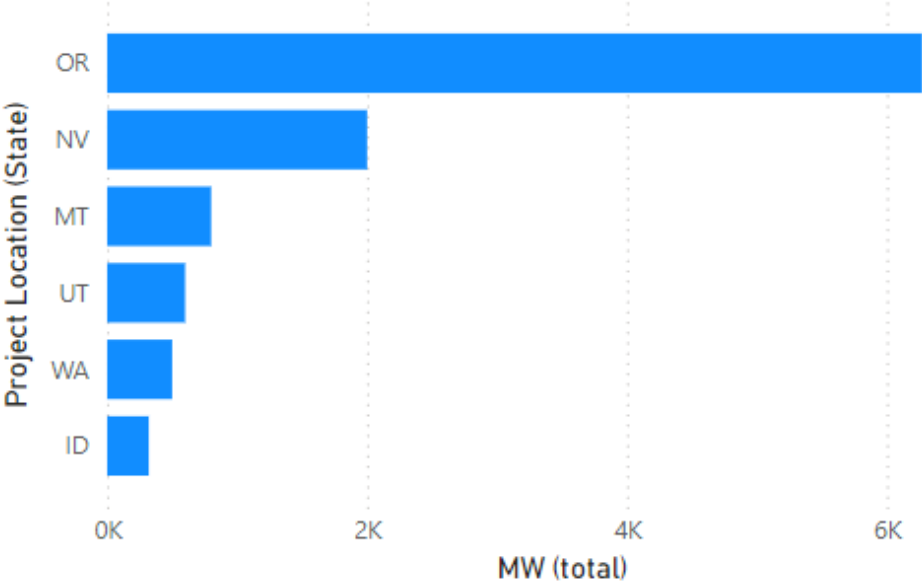
Hybrid Projects a significant portion of generation after 2028

- Hybrid projects incorporate both a generation component and (almost always) short-term storage
 - Particularly prevalent among daily-variance non-emitting projects as battery allows generated power to be dispatched at peak demand periods
 - Limited by battery duration (majority 4 hours)
- Majority of hybrid projects are in OR, but NV projects also significant as applied to solar resources (offer 4 hour offset of generated power)
- Additional advantage to resources in eastward time zone

Hybrid projects comprise >50% of new generating RFI projects



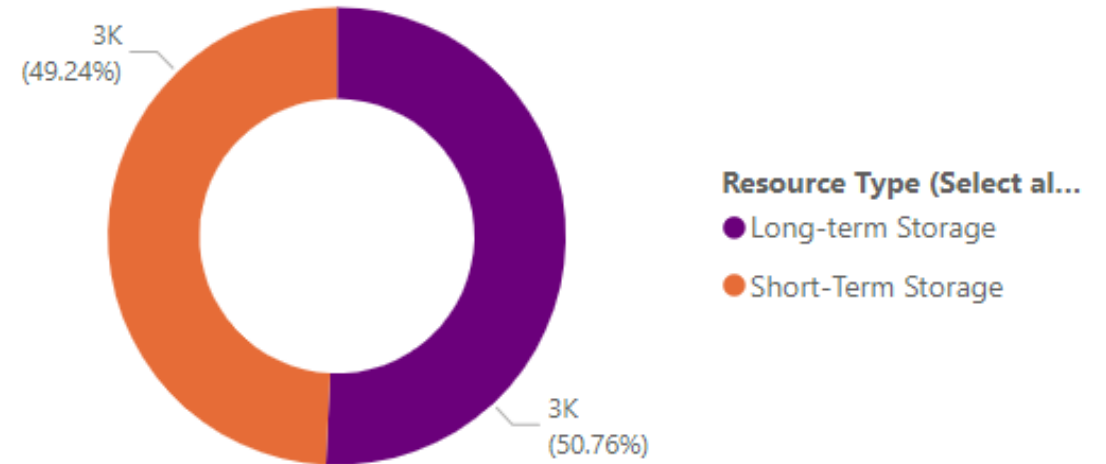
Location and nameplate MW of RFI's hybrid projects



Capacity projects

- Short-term duration storage comprises 3 GW of capacity, comprised of 4-8 hour batteries
 - Vast majority of battery technology available currently is geared towards 4 hour battery requirements
 - Large portion of the battery storage units are in OR, although other storage + hybrid to be found further afield
- Long-term duration storage (8 hours plus) includes multiple potential technologies with the ability to discharge energy over a longer duration than Li-ion batteries
 - RFI project contributors did not include specifics on technology
 - Most long-term storage is coming online in 2032; entities have not submitted much information

Breakdown of Long-term vs. Short-term Storage among RFI projects (excluding hybrid)



Conclusions and Key Insights

Capacity and Hybrid Resources prevalent; some new technologies emerging; RFI reveals continued significant development in OR/WA as well as further afield

- **Project count:** 67
- **Geography:** Pacific Northwest, Mountain West, Desert Southwest
- **Proposed COD:** 2028-2034
- **Resource types:** Non-emitting generation, short-duration storage, long-duration storage, and hybrid (generation + storage) projects
- **Key takeaways and next steps:**
 - RFI projects could be sufficient to meet the 2023 IRP identified 2030 energy and capacity needs
 - None of the participants have been awarded long-term firm transmission
 - Expanded transmission pathways are needed to ensure future delivery
 - Many projects are still in the interconnection queue
 - Continue to look at ways to accelerate interconnection study process
 - Post-2030 projects need clear market signals that their generation is necessary