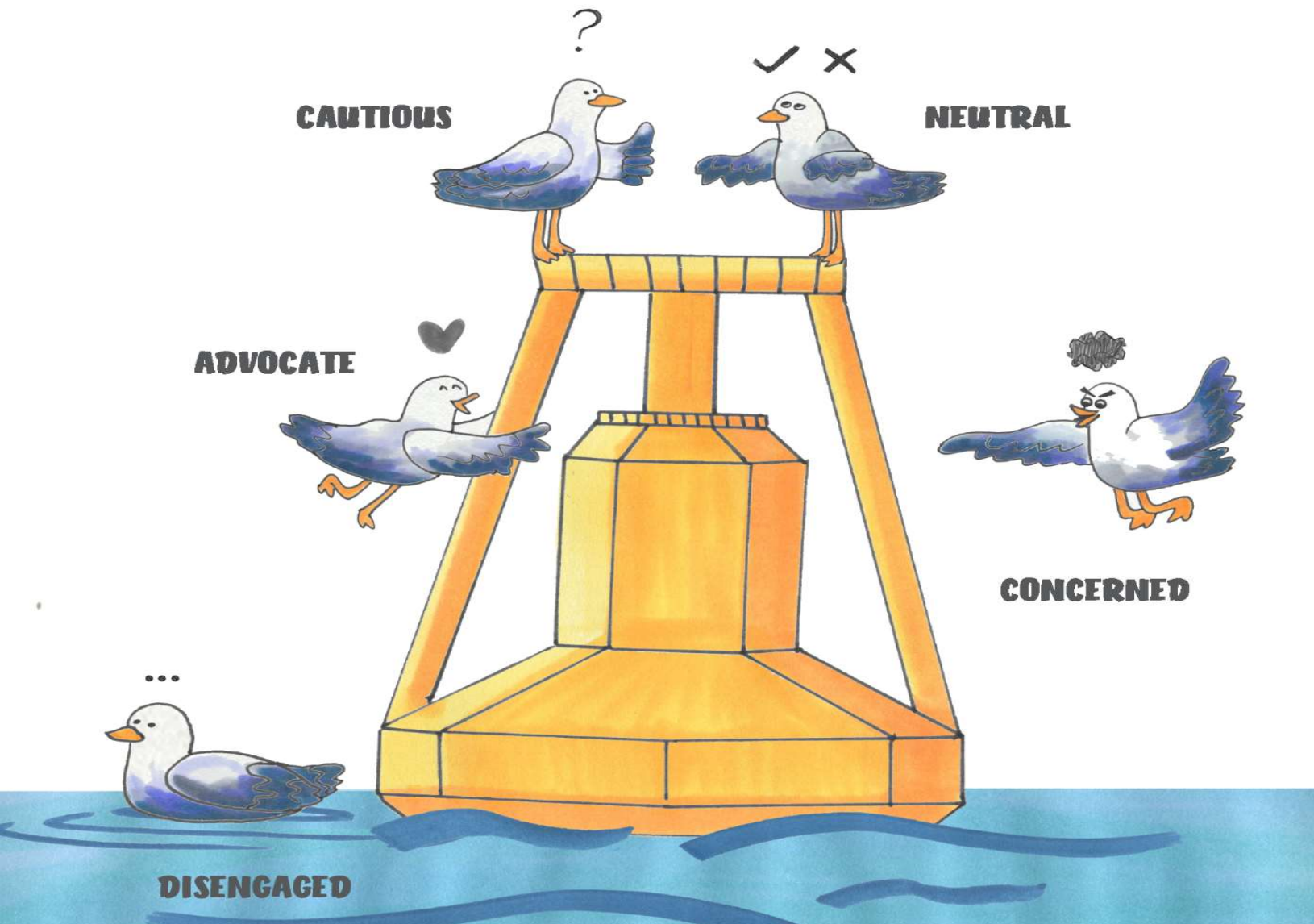


# West Coast Perceptions of Wave Energy: A Second Survey of California, Oregon, and Washington Residents

October 2024



# Executive Summary

## ***Background and Methods***

The West Coast of North America has high potential for wave energy development. Recent estimates from the National Renewable Energy Laboratory suggest it could generate up to 40% of the combined annual electricity consumption of California, Oregon, and Washington<sup>1</sup>. The PacWave South test site, located seven miles off the coast of Newport, Oregon, is expected to begin grid-connected testing of wave energy converters in 2025, which will provide valuable information that can contribute to the commercial development of the technology in the coming years.

The Pacific Marine Energy Center, with funding from the U.S. Department of Energy Water Power Technologies Office, is conducting research to better understand public views on this emerging technology on the West Coast. Our effort builds upon a previous survey conducted during the summer of 2020 of West Coast states and British Columbia, which found, despite low familiarity, positive public perceptions of wave energy.

To assess how views may have changed in the past four years, we developed and conducted a survey of California, Oregon, and Washington residents (N=2999), administered online via Qualtrics, matched on age, gender, and education to general population quotas for the three states. Respondents were asked how much they had heard or read about wave energy; their views of commonly cited risks and benefits; and their overall attitude toward wave energy development.

## ***Key Findings***

A majority of respondents (57%) had never heard or read anything about wave energy. Despite this limited familiarity, they held positive views about potential wave energy development (56% supportive of development off their state's coast). Support for

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<sup>1</sup> Kilcher, L., García Medina, G., & Yang, Z. (2023). A scalable wave resource assessment methodology: Application to U.S. waters. *Renewable Energy*, 217, 119094. <https://doi.org/10.1016/j.renene.2023.119094>



development was higher among respondents with stronger self-reported familiarity, more liberal respondents, and male respondents.

When asked about preferences for energy resource mix in the distant future, respondents indicated strong support for the use of wave energy, with only solar and onshore wind receiving stronger support. Wave energy was also viewed slightly more favorably than offshore wind, another form of ocean renewable energy, and much more favorably than hydro, nuclear, and natural gas.

Respondents generally agreed with statements about potential benefits of wave energy, with strongest agreement for reductions in carbon emissions (64%), economic opportunities (59%), local employment (57%), and grid reliability (53%). Disagreement about benefits was low, with “don’t know” and neutral responses representing the next most common answer for five out of the six statements. We found lower levels of agreement with statements of potential concerns. Risks to commercial fishing (42% agreement), marine life (41%), and ocean recreation (38%) being the most prevalent concerns.

Finally, we used measures of familiarity, stance on development, and perceptions of benefits and concerns to identify five distinct clusters of respondents, representing the main perspectives on wave energy development among our respondents. Based on the most common responses in each cluster, we labeled these perspectives: Cautious (34% of respondents), Disengaged (24%), Advocate (19%), Neutral (14%), and Concerned (8%). We then used quantitative analysis to understand characteristics that distinguish clusters from each other, finding that views towards other renewable energies, perceptions of siting process, coastal place attachment, and political ideology influence how respondents align with the five perspectives.



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# Authors and Acknowledgement

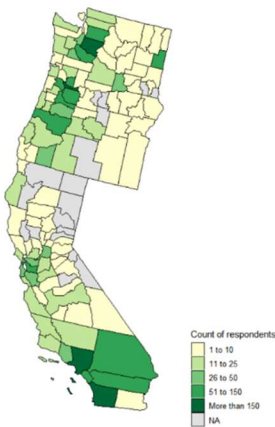
## West Coast Perceptions of Wave Energy: A Second Survey of California, Oregon, and Washington Residents

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Interview Dates: September-November, 2023. Interviews: 2,999 adults (18+)

Respondents by County  
West Coast States



Comparison survey demographics to census quotas			
	Sample	Quota	Diff.
<b>Age</b>			
<b>18 to 24</b>	10%	11%	-1%
<b>25 to 34</b>	18%	19%	-1%
<b>35 to 44</b>	19%	18%	1%
<b>45 to 64</b>	32%	32%	0%
<b>65+</b>	21%	20%	1%
<b>Gender</b>			
<b>Male</b>	51%	50%	1%
<b>Female (and Other)</b>	49%	50%	-1%
<b>Bachelor's Degree or higher</b>			
	33%	34%	-1%

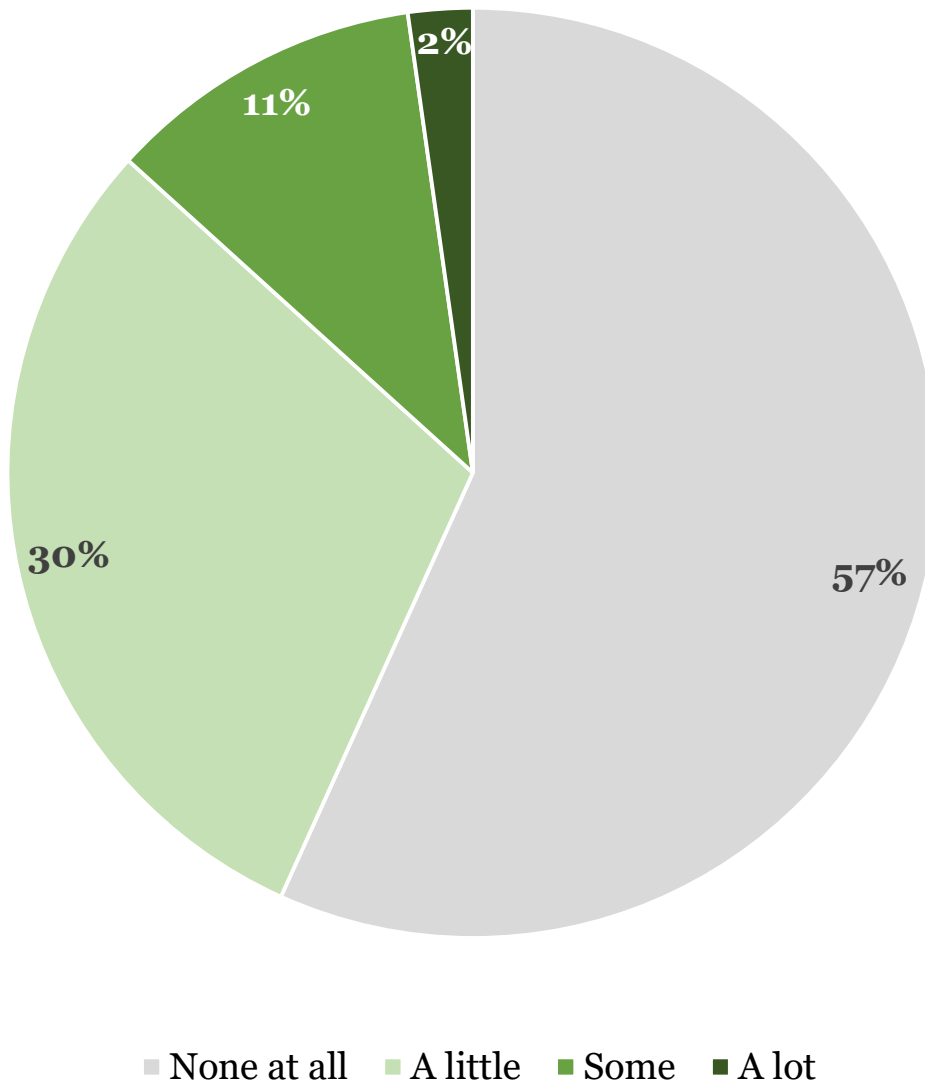
Funding for this research was provided by the U.S. Department of Energy’s Office of Energy Efficiency and Renewable Energy (EERE) under the Water Power Technologies Office (WPTO) Award Number DE-EE0009969.



## Familiarity with Wave Energy

A majority (57%) of respondents reported no familiarity with wave energy, with another 30% reporting “A little”. A small minority of respondents reported “Some” (11%) or “A lot” (2%) of familiarity with wave energy.

### How much have you heard or read about wave energy?

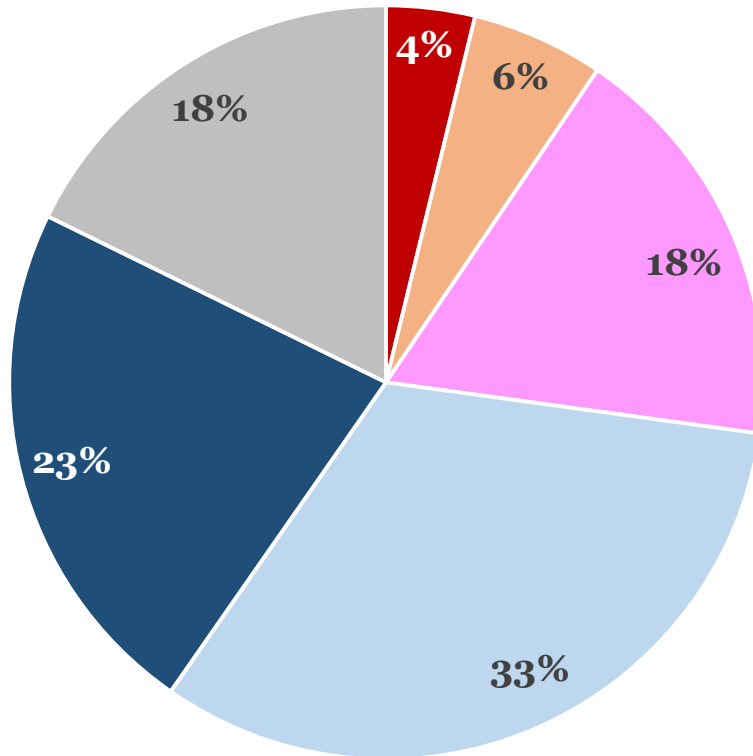


## Attitudes to Development

### *Stance on Development in State*

A majority of respondents (56%) expressed some level of support for development of wave energy of their state's coast, while only 10% expressed some level of opposition. The remaining respondents reported neutral opinions (18%) or that they lacked enough information to form a stance (18%).

### **Do you support or oppose leasing ocean space to energy companies to pursue wave energy development off your state's coast?**



- Strongly oppose
- Somewhat oppose
- Neither support nor oppose
- Somewhat support
- Strongly support
- Don't know, need more information

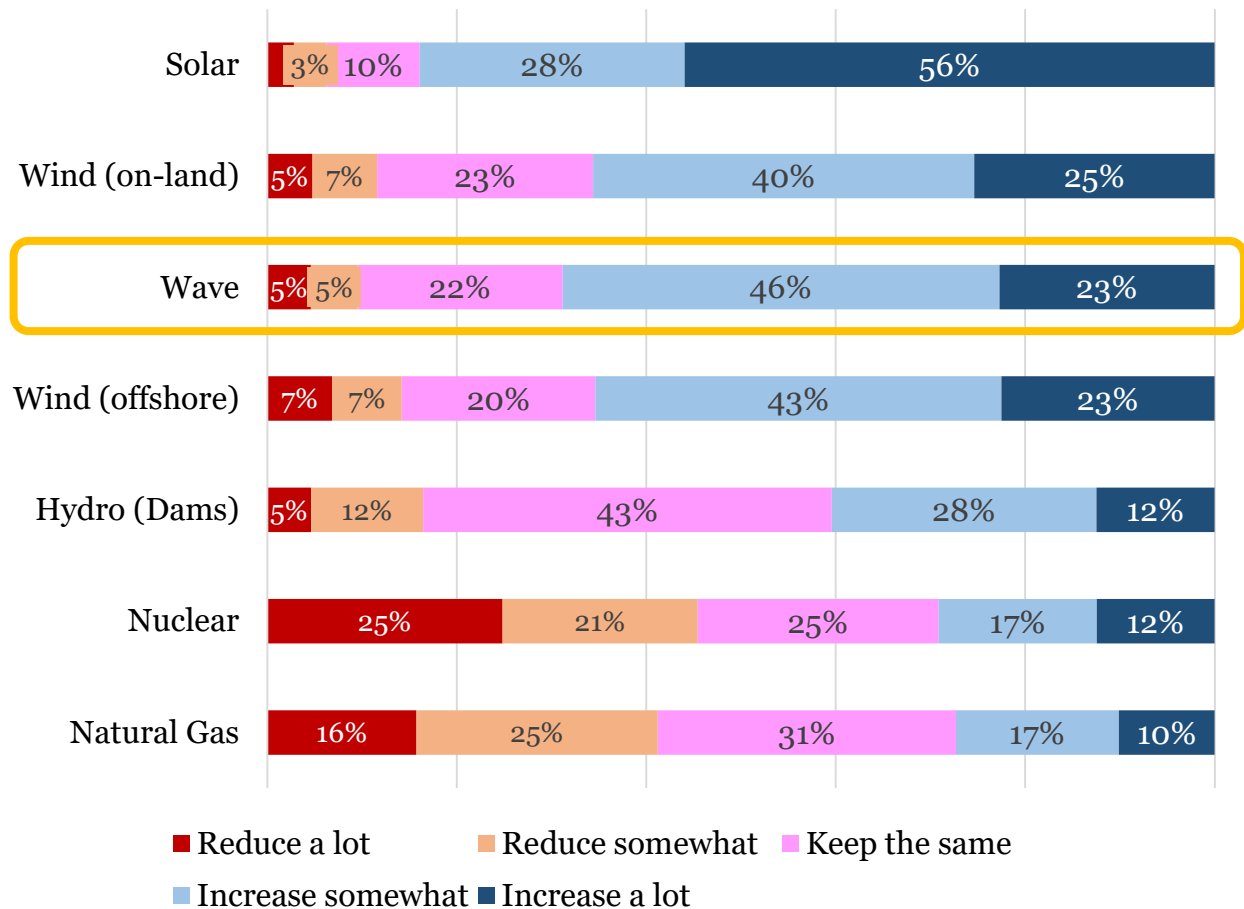


## Support for 2050 Development at National Scale

In addition to stance on development in state, we asked respondents about their preferences around the future energy mix. For each of the seven energy sources, respondents were asked whether they would like to see the source increase, reduce, or remain the same by 2050.

Overall, respondents rated wave energy favorably, on par with wind energy (both on-land and offshore), though solar was the most favored, with a majority (56%) of respondents seeking to increase its use a lot. Natural gas (the only fossil fuel source presented to respondents) was the least favored source, though a plurality of respondents wanted to maintain current levels of its use.

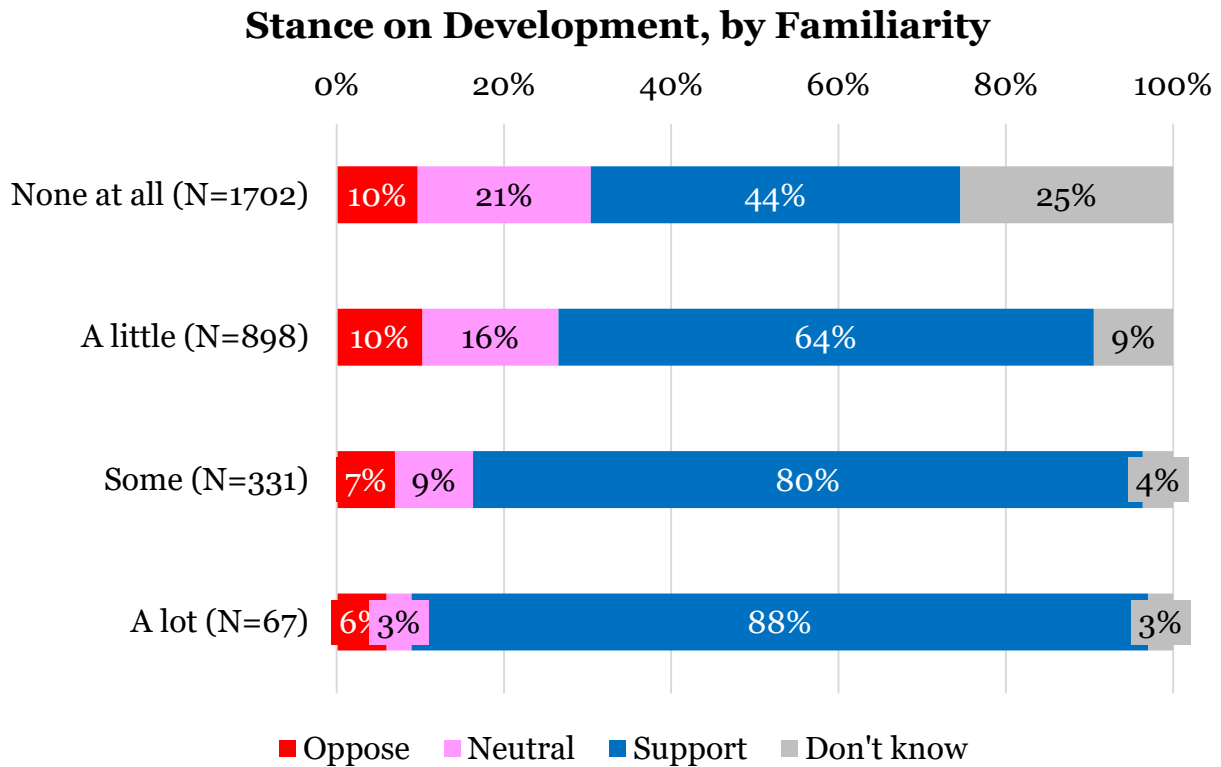
**For each power source listed below, indicate whether you feel the U.S. should reduce or increase its use to meet the country's electric power needs by 2050.**





## Stance by Familiarity

Respondents with no self-reported familiarity with wave energy had the highest proportion of “Don’t know” responses (25%), and fewer than half of these respondents supported development (44%). For all other levels of familiarity, most respondents supported hypothetical development of wave energy on their state’s coast, with those most familiar having strongest support (88%). Respondents with “Some” familiarity also had strong support but were evenly split between somewhat and strong support for development.



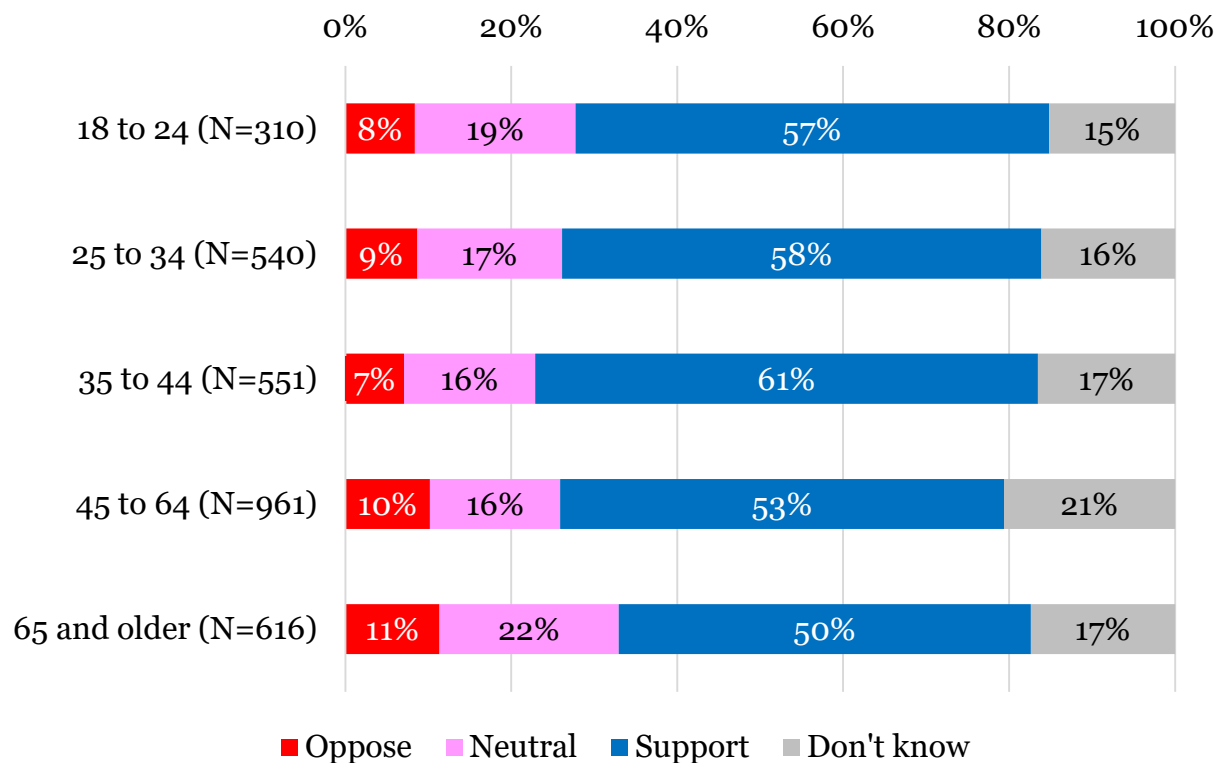
## Attitudes to Wave Energy by Select Demographics

We examined relationships between respondent stance on development of wave energy in their state across various demographic characteristics and political ideology.

### Age

Support for wave energy development was fairly consistent across all age groups, with a slightly stronger support in respondents ages 35 to 44 (61%), with lower support from older age cohorts – though support remained the majority response.

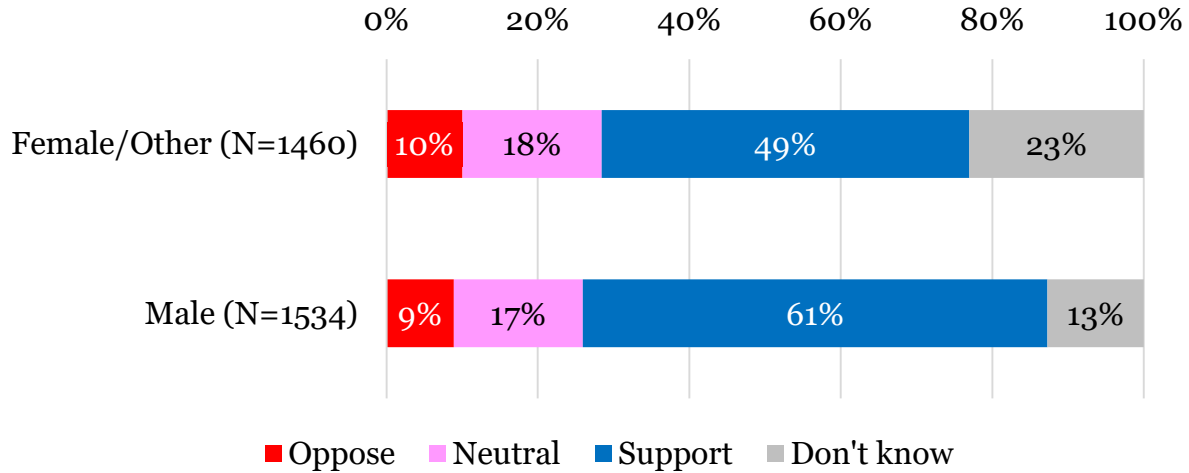
### Stance on Development, by Age Bracket



## Gender

Male respondents were more supportive of wave energy development than female/other respondents (61% vs 49%), while female/other respondents instead had a higher proportion responding “Don’t know” (23% vs 13%).

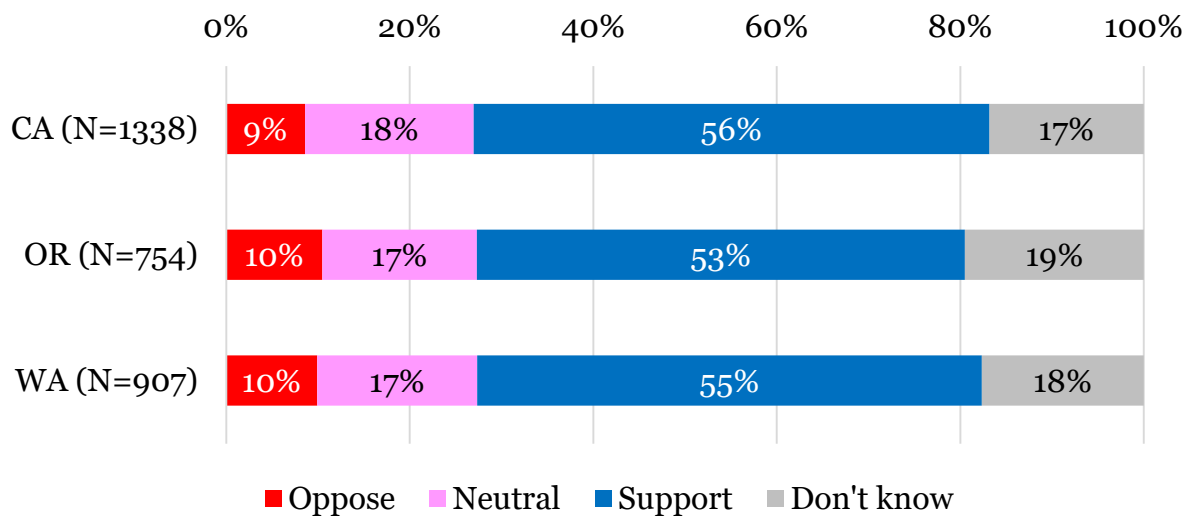
### Stance on Development, by Gender



## State

Respondents across the three states had fairly consistent stances on development.

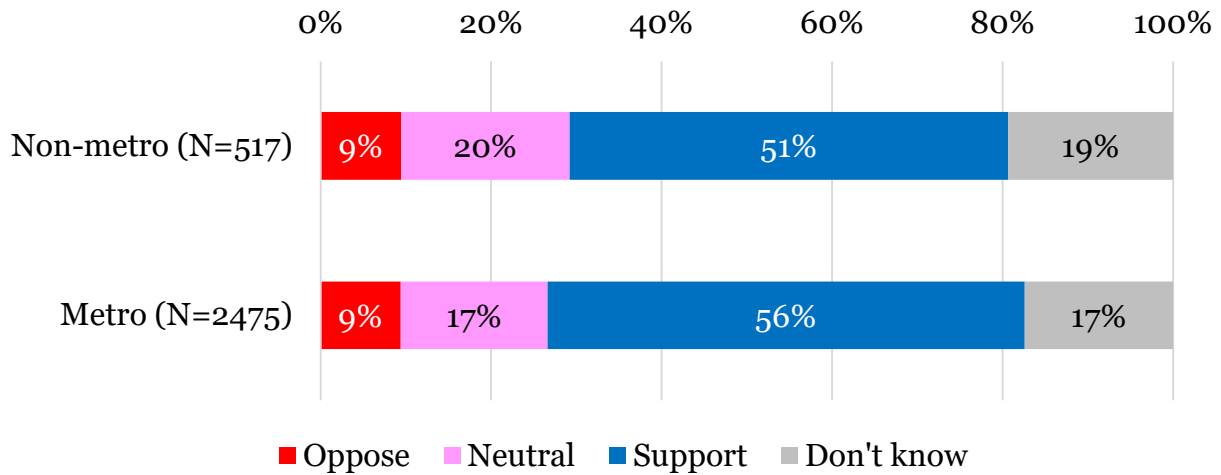
### Stance on Development, by State



### Metro/Non-metro

Respondents in metro areas<sup>2</sup> were slightly more supportive of wave energy.

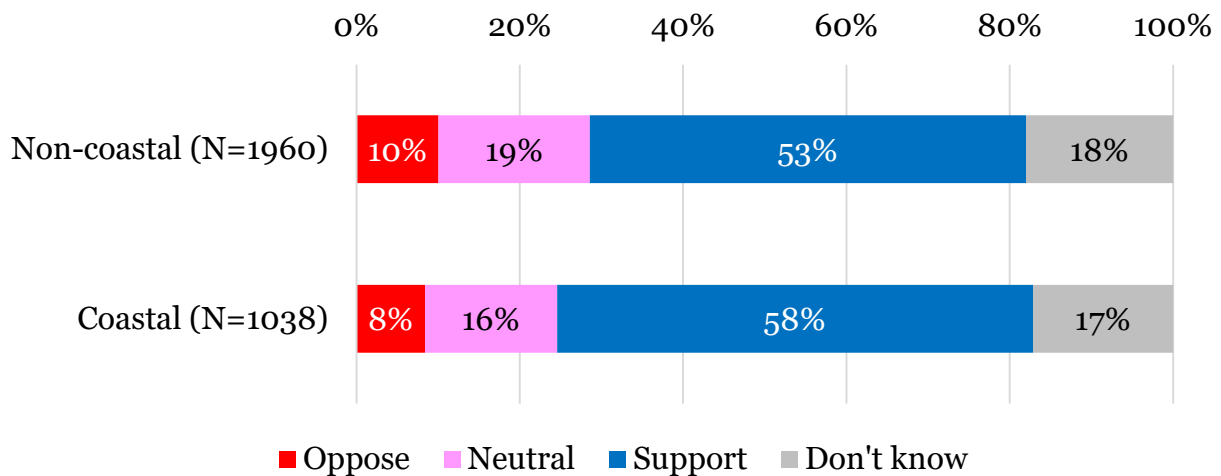
#### Stance on Development, by Metro/Non-metro



### Coastal

Coastal respondents (those reporting being in a zip code within 5km of a coastline) were slightly more supportive of development (58%) than non-coastal respondents.

#### Stance on Development, by Coastal

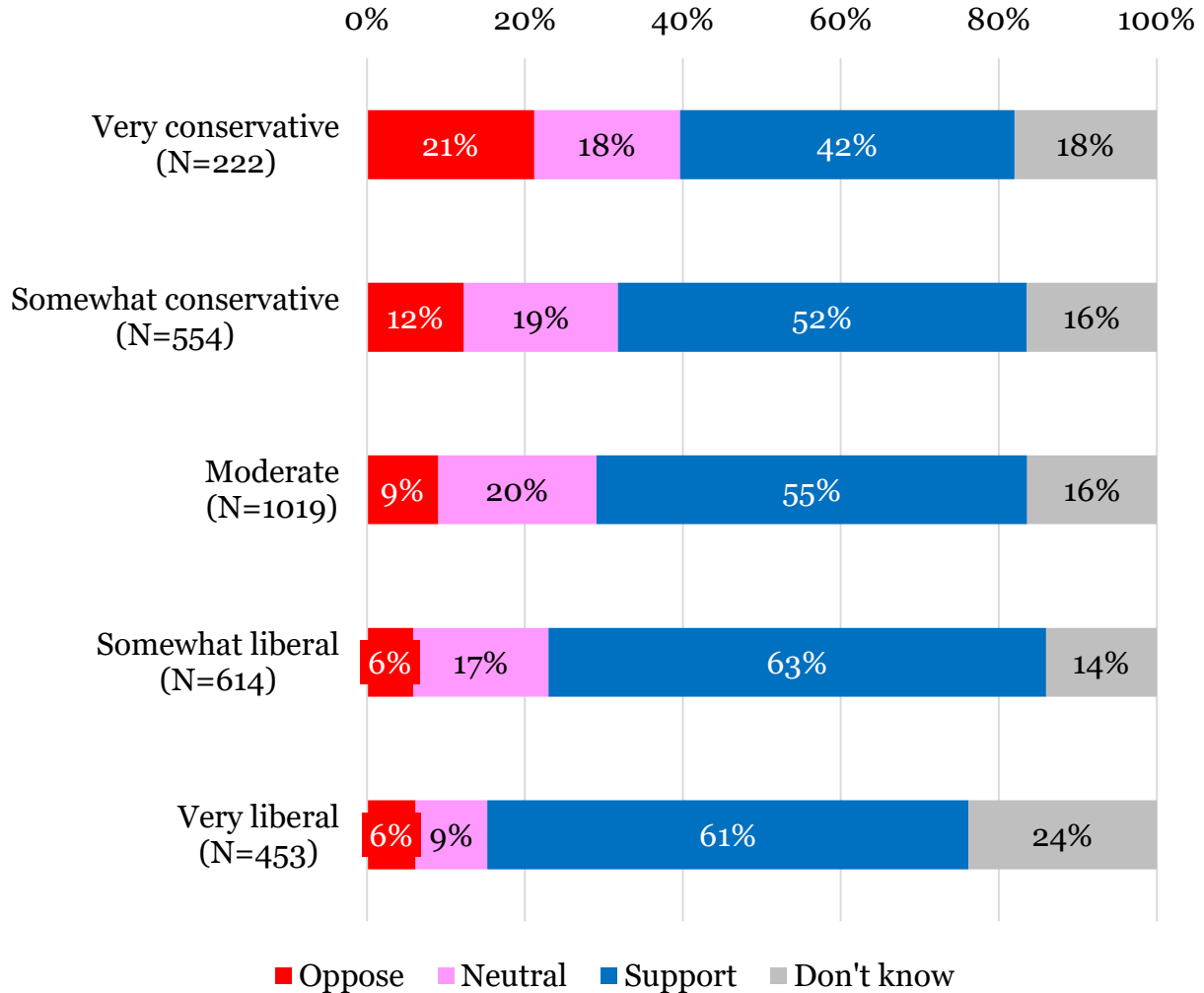


<sup>2</sup> Metro is classified by the USDA Rural Urban Commuting Area code "Metropolitan area core: primary flow within an urbanized area"

*Political Ideology*

Conservative respondents expressed more opposition to wave energy development (21%), while somewhat liberal ones had the highest support (63%). Very liberal respondents had the highest proportion needing more information (24%).

**Stance on Development, by Political Ideology**



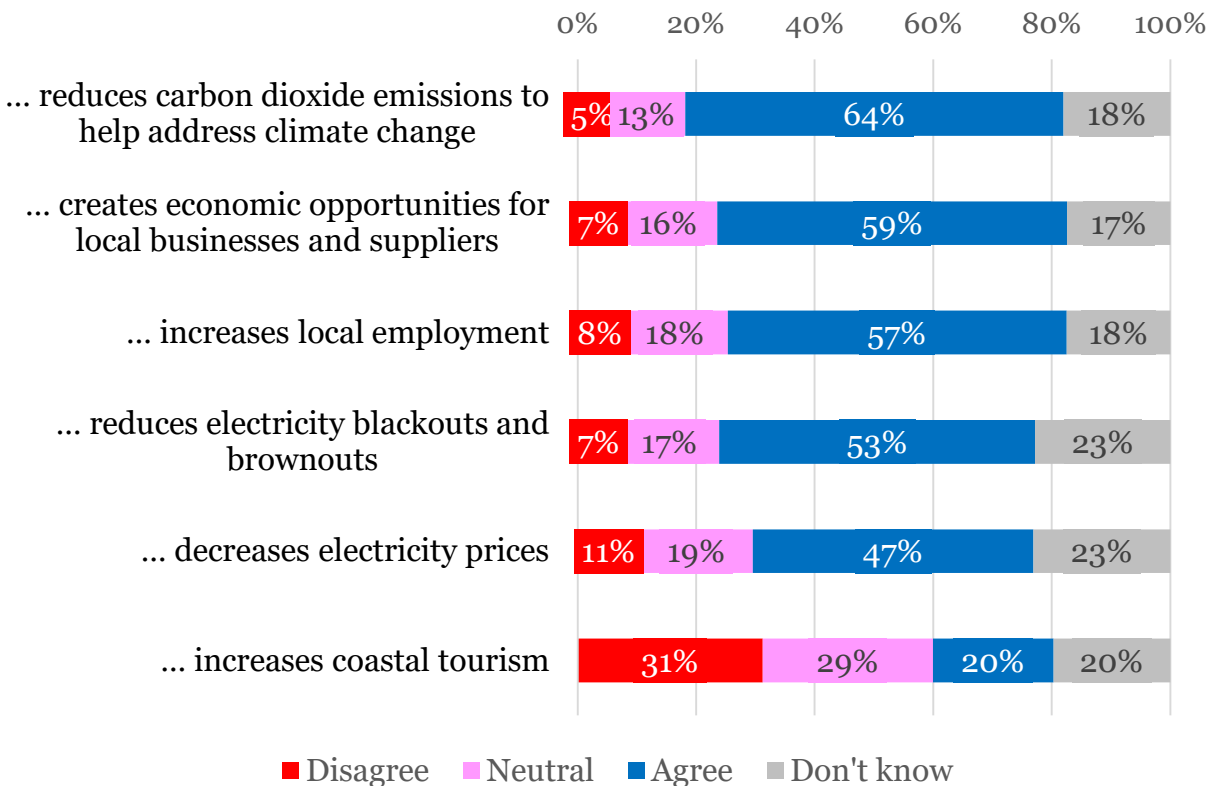
## Perceptions of Benefits and Concerns

Respondents were presented with 11 statements about potential benefits (6 statements) and concerns (5 statements) related to wave energy development.

### *Perceived Benefits*

We found strongest agreement with the notion that wave energy could reduce carbon dioxide emissions to help address climate change (64% agreement), with statements regarding economic benefits – economic opportunities (59%) and local employment (57%) – just behind. Respondents were skeptical that wave energy could increase coastal tourism, with 31% disagreeing, 29% neutral, and 20% don't know. Benefits to electricity reliability (23%) and prices (23%) had the highest proportion of respondents selecting the don't know option.

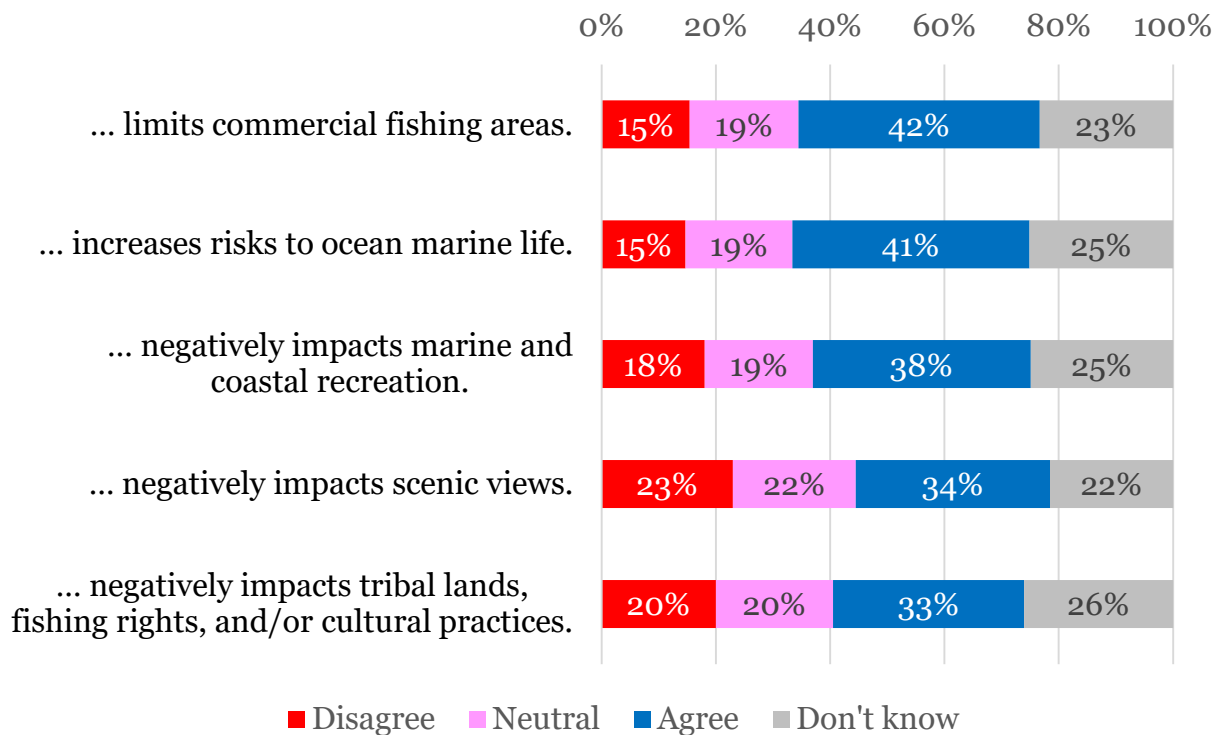
### Perceived Benefits: Wave energy...



## Perceived Concerns

Overall, a higher proportion of respondents answered with the don't know option for concerns compared to benefits, with respondents most unsure about impacts to tribes (26%), ocean marine life (25%), and recreation (25%). No statement about concerns had majority agreement or disagreement, though agreement was more than double disagreement for concerns about ocean marine life (41%), commercial fishing (42%), and recreation (38%).

### Perceived Concerns: Wave energy...

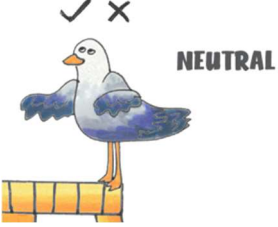



## Wave Energy Perspective Clusters

Finally, we clustered respondents based on their responses to the questions above.

Cluster Label	Sample %	Wave energy perspective	Characteristics
<p><b>CAUTIOUS</b></p> 	34%	<ul style="list-style-type: none"> <li>Moderately familiar</li> <li>Somewhat support development both in state and nationally</li> <li>Somewhat agree with benefits</li> <li>Somewhat agree with concerns</li> </ul>	<ul style="list-style-type: none"> <li>Higher income, male</li> <li>Believe in human-caused climate change</li> <li>Somewhat support other renewables</li> <li>Somewhat trust energy developers</li> <li>Believe siting process somewhat fair</li> </ul>
<p>...</p>  <p><b>DISENGAGED</b></p>	24%	<ul style="list-style-type: none"> <li>Least familiar</li> <li>Don't know about stance on development in state, benefits, and concerns</li> <li>Slightly support future national scale wave energy development</li> </ul>	<ul style="list-style-type: none"> <li>Lower income, more female</li> <li>Mild support for other renewables</li> <li>Low coastal place attachment</li> <li>Less trusting of energy developers</li> <li>Unfamiliar with siting process</li> </ul>
<p><b>ADVOCATE</b></p> 	19%	<ul style="list-style-type: none"> <li>Most familiar</li> <li>Strongly support development in state and nationally</li> <li>Strong agreement with benefits</li> <li>Somewhat disagree with concerns</li> </ul>	<ul style="list-style-type: none"> <li>Very male</li> <li>Strongly support other renewables</li> <li>High trust in energy developers</li> <li>Believe siting process very fair</li> </ul>



Cluster Label	Sample %	Wave energy perspective	Characteristics
 <p><b>NEUTRAL</b></p>	14%	<ul style="list-style-type: none"> <li>Moderately familiar</li> <li>Neither agree or disagree with development in state</li> <li>Slight support for wave energy development nationally</li> <li>Neither agree or disagree with all statements of benefits and concerns</li> </ul>	<ul style="list-style-type: none"> <li>Politically moderate</li> <li>Not that supportive of other renewables</li> <li>Low coastal place attachment</li> <li>Somewhat trust energy developers</li> <li>Believe siting process a little fair</li> </ul>
 <p><b>CONCERNED</b></p>	8%	<ul style="list-style-type: none"> <li>Second-most familiar</li> <li>Strongly oppose development in state and nationally</li> <li>Mixed agreement and disagreement with benefits</li> <li>Strong agreement with concerns</li> </ul>	<ul style="list-style-type: none"> <li>More conservative than liberal</li> <li>High coastal place attachment</li> <li>Opposed to other renewables</li> <li>Believe siting process unfair</li> </ul>

While a slight majority of respondents indicate either outright or cautious support for wave energy (19% Advocate, 34% Cautious), more than a third of respondents do not have formed opinions, including a large segment that are Disengaged (24%) altogether. While the clusters are not intended to be generalized to full population of West Coast states, they indicate that the overall favorable view towards wave energy development could be subject to change as the general public becomes more familiar with the technology and understands the actual impacts – both positive and negative.