

**WEST COAST PERCEPTIONS OF WAVE ENERGY:
A SURVEY OF CALIFORNIA, OREGON, WASHINGTON,
AND BRITISH COLUMBIA RESIDENTS**

SEPTEMBER 2020



EXECUTIVE SUMMARY

BACKGROUND

- North America’s West Coast represents some of the highest global potentials for wave energy output. A recent NREL report¹ identified the Oregon, Northern California, and Washington coasts as regions best suited for long term wave energy development in the United States.
- The Pacific Marine Energy Center (PMEC) has established two wave energy testing facilities in Oregon over the past decade: PacWave North, a non-grid connected test facility, and PacWave South, a grid-connected, open-ocean test facility.
- Past surveys on public perceptions of wave energy reveal low levels of awareness about the emerging sector. Particularly salient topics include understanding views on its cost and reliability, potential impact on local economies, and risks to existing uses and ecosystems.

RESEARCH METHOD

- Working with YouGov, we developed and conducted a survey of a sample of residents (N=2000) in California, Oregon, Washington and British Columbia matched on gender, age, race, and education to the general population. Respondents were asked how much they had heard or read about wave energy; what first came to mind when they heard the term; their views of commonly cited risks and benefits; and their overall attitude toward wave energy development.

KEY FINDINGS

- Over half of our respondents had never heard or read about wave energy, and the most common “top of mind” associations indicated little or no knowledge about it. Oregon respondents indicated the highest levels of familiarity.
- Despite limited familiarity, the results suggest mainly positive attitudes toward wave energy with little variation by state of residence or proximity to the coast.
- Attitudes varied by gender, race, education and political ideology. In general, respondents who were male, white, college educated and politically liberal held more positive attitudes. Female respondents, in particular, wanted more information.
- Respondents expressed more agreement with statements about the benefits of wave energy development (e.g., for renewable energy, energy independence, economy/jobs, etc.) than its risks (e.g., to marine life, fishing, recreation, etc.). Risks to marine life, fishing and recreation were of more concern to those who reported visiting the coast at least once a month. Liberal respondents indicated higher levels of agreement with wave energy benefits and lower levels of agreement with its risks.
- Compared to other energy sources, respondents strongly preferred increasing the use of renewable energy sources like solar, wind and wave energy, as opposed to more traditional energy sources like hydro, geothermal, natural gas, nuclear, and coal.



Table of Contents

ACKNOWLEDGEMENT AND AUTHORS	4
FAMILIARITY AND TOP OF MIND ASSOCIATIONS AND WITH WAVE ENERGY.....	5
1. Most respondents have heard little or nothing about wave energy.	5
2. Top of mind associations reflect a lot of unfamiliarity with wave energy, though positive associations outnumber negative associations.	6
3. Oregonians reported the highest level of familiarity with wave energy and had a significantly lower proportion of “don’t know” top of mind associations.	7
ATTITUDES TOWARDS WAVE ENERGY	8
4. Most respondents have a positive attitude to wave energy.	8
5. Familiarity with wave energy does not guarantee positive attitudes.	9
6. Men had more positive attitudes toward wave energy; women wanted more information.	10
7. White respondents had more positive attitudes toward wave energy.	11
8. Respondents with a college degree had more positive attitudes toward wave energy.	12
9. Politically liberal respondents had more positive attitudes toward wave energy than moderate and conservative respondents.	13
PERCEIVED RISKS AND BENEFITS OF WAVE ENERGY	14
10. Respondents largely agreed with statements about the benefits of wave energy development.	14
11. Respondents were mostly neutral about risks, expressing the most concern about impacts to coastal beauty and marine life.	15
12. Across various demographics, perceived benefits are mostly stable, but perceived risks vary. .	16
13. Respondents that visit the coast more frequently perceived higher levels of coastal-specific risks.	17
ELECTRIC POWER PREFERENCES BY SOURCE.....	18
14. Respondents favor increasing the use of wave energy to meet electric power needs, similar to other renewable sources like solar and wind.	18
15. Liberal respondents more strongly prefer increased use of wave energy than moderate and conservative respondents, but the difference is not as large as other renewables.	19

ACKNOWLEDGEMENT AND AUTHORS

West Coast Perceptions of Wave Energy

Hilary Boudet¹, Diane Brandt¹, Greg Stelmach¹, Shawn Hazboun²

Cite as: “Boudet, H. S., D. Brandt, G. Stelmach and S. Hazboun (2020). *West Coast Perceptions of Wave Energy*. Pacific Marine Energy Center.

<https://ir.library.oregonstate.edu/concern/technical_reports/pr76f9588>.”

Interview dates: June 15, 2020 – June 23, 2020. Interviews: 2,000 adults (18+).

The study was funded by the Pacific Marine Energy Center. We would like to thank the students in Oregon State University’s PPOL 524 Spring 2020 course for their help in developing the survey, specifically the survey methods research team of Shahinur Bashar, Diana Crespo, John Garrett, Ava Gentilcore, Bianca Llamas, and Fatuma Mohamed. We also received helpful comments and support from faculty members in Oregon State University’s School of Public Policy – Flaxen Conway, Brent Steel and Ana Spalding – as well as faculty and staff at the Pacific Marine Energy Center – Bryson Robertson and Brenda Langley.

¹ Oregon State University

² The Evergreen State College



FAMILIARITY AND TOP OF MIND ASSOCIATIONS AND WITH WAVE ENERGY

1. Most respondents have heard little or nothing about wave energy.

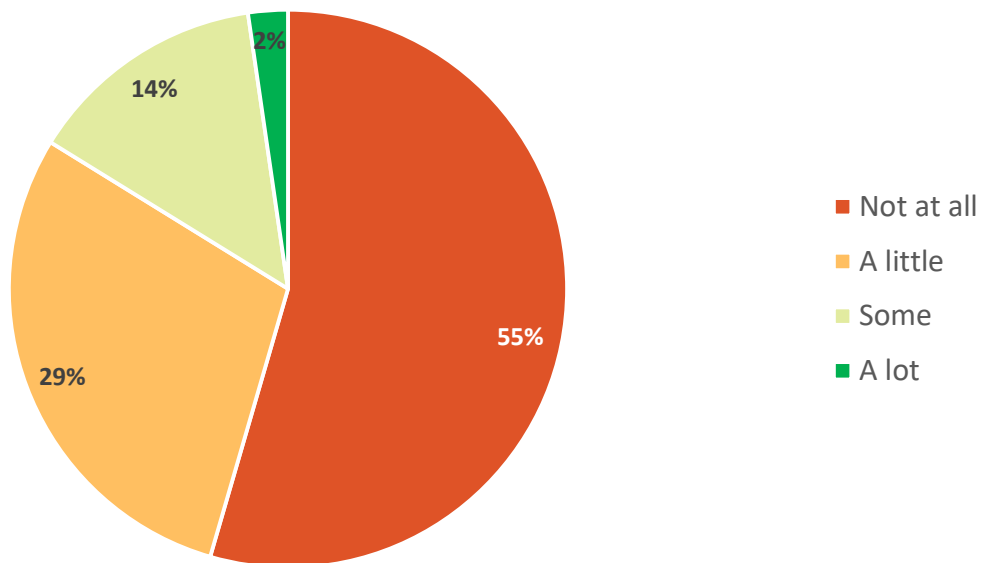
Fifty-five percent of respondents have heard or read nothing at all about wave energy.

Twenty-nine percent have heard “a little.”

Fourteen percent have heard or read “some.”

Only two percent have heard or read “a lot.”

How much have you heard or read about wave energy?



2. Top of mind associations reflect a lot of unfamiliarity with wave energy, though positive associations outnumber negative associations.

Respondents were asked to write in the first thing to come to mind when they think of “wave energy.” The most common response (46%) was “don’t know” or other unrelated or nonspecific statements. These responses included everything from basic “I don’t know” answers to unrelated comments such as “Wi-Fi” or “5G,” as well as simple answers that were too general to indicate understanding of wave energy, such as “ocean” or “power.”

The next most common response was a knowledge-based description of the concept of wave energy (30%). These responses made explicit connections between oceans or bodies of water and energy production, such as “energy from the ocean.” Another 11 percent of respondents made references to the ocean and tides, though without connecting it to energy or electricity production.

Eleven percent of respondents expressed positive affects towards wave energy. Such responses used adjectives such as “green,” “clean,” or “sustainable,” or expressed a desire for increased levels of power generation from wave energy.

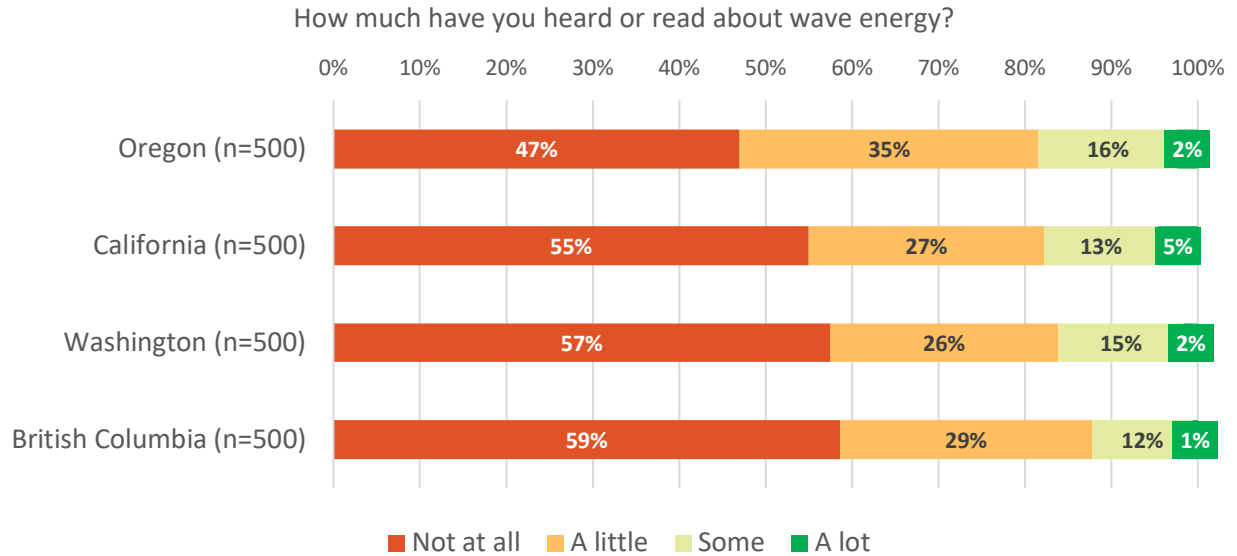
Few respondents (3%) mentioned negative aspects or concerns about wave energy. Examples included general concerns about wave energy like “inconsistent” or “nonsense”; economic concerns like “expensive”; environmental concerns like “destroys fish habitat”; and aesthetic concerns like “ugly wave equipment spoiling coastline.”

Finally, a small proportion of respondents (1%) mentioned specific locations, in the United States and Canada (both domestic and foreign), which often had a connection with wave energy facilities such as “Bay of Fundy.”

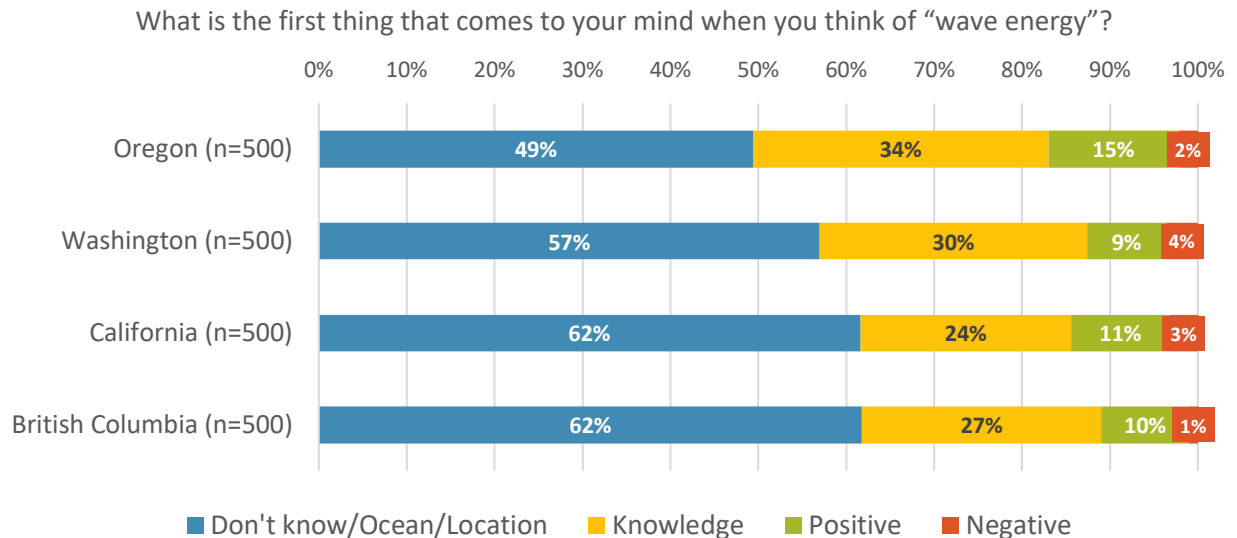
What is the first thing that comes to your mind when you think of “wave energy”?	
Don’t know or irrelevant/non-specific statements	46%
Knowledge-based descriptions (e.g. energy from the ocean, buoys/turbines)	30%
References to ocean (ocean waves, tides)	11%
Positive affect (clean, green, renewable, sustainable)	11%
Negative affect and concerns (environmental, economic, aesthetic)	3%
Locations (Bay of Fundy, specific wave energy project locations)	1%
N = 2000	
Total percentages exceed 100% because categories were not mutually exclusive	

3. Oregonians reported the highest level of familiarity with wave energy and had a significantly lower proportion of “don’t know” top of mind associations.

Oregon respondents showed the highest level of familiarity with wave energy, with 53% indicating they had heard or read “a little,” “some,” or “a lot” about it. California respondents indicated the next highest level of familiarity (45%), followed by Washington (43%) and British Columbia (41%).



Oregon respondents wrote in the smallest percent of “don’t know” top of mind associations and the largest percent indicating knowledge about wave energy (34%) and “positive” affect (15%).



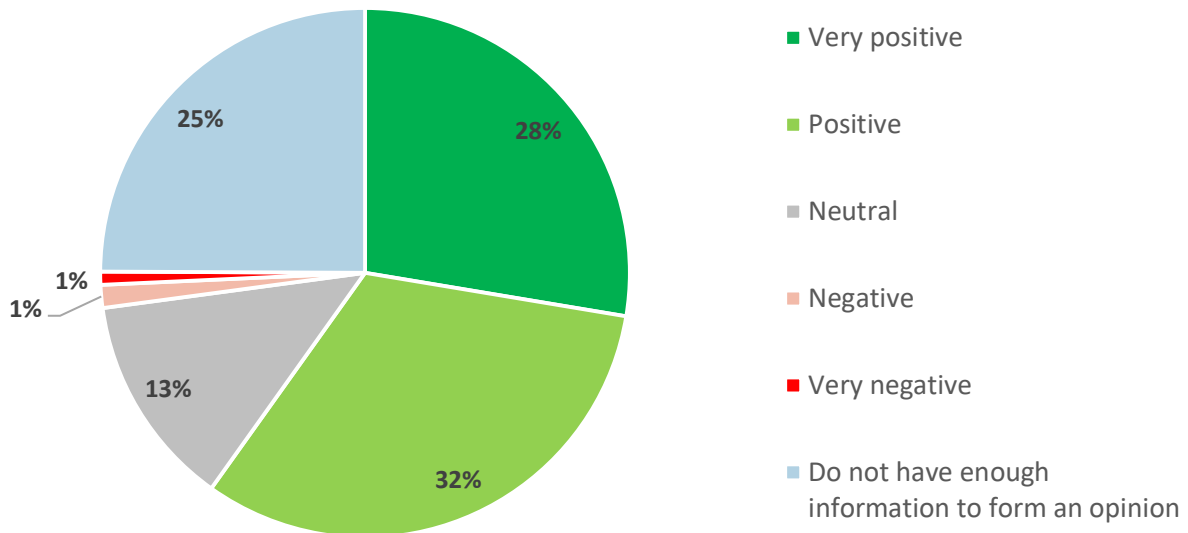
ATTITUDES TOWARDS WAVE ENERGY

4. Most respondents have a positive attitude to wave energy.

Most respondents (60%) indicated they had a “very positive” or “positive” attitude toward the development of wave energy off the coast of their state or province, with very few holding a “very negative” (1%) or “negative” (1%) attitude.

The remaining respondents were either “neutral” (13%) or indicated they “do not have enough information to form an opinion” (25%).

What is your general attitude toward the development of wave energy off of the [California/Oregon/Washington/British Columbia] Coast?

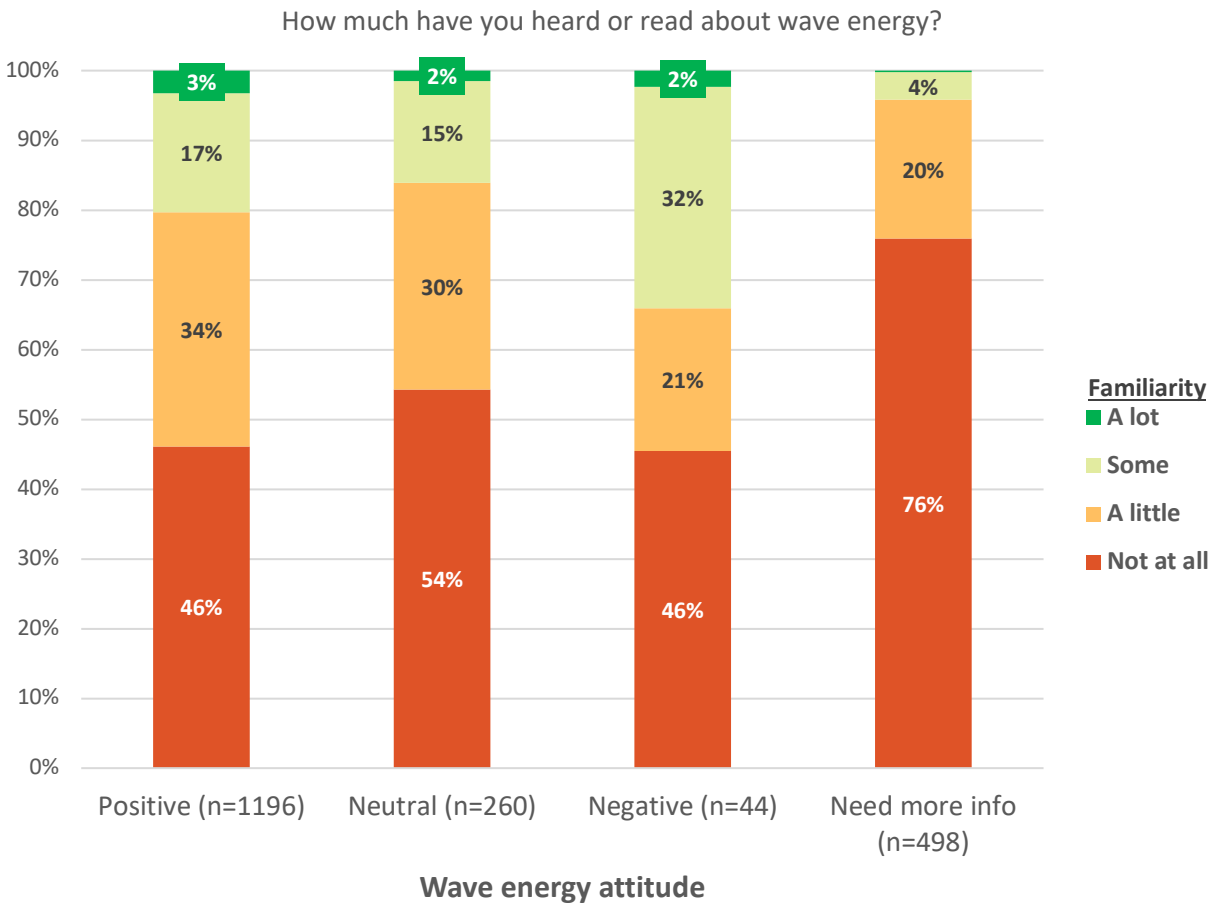


5. Familiarity with wave energy does not guarantee positive attitudes.

Among those who reported a “very negative” or “negative” attitude to wave energy development, 46% reported no familiarity with wave energy, 21% “a little,” 32% “some,” and 2% “a lot.”

Similarly, among those who reported a “very positive” or “positive” attitude, 46% reported no familiarity, 34% “a little”, 17% “some,” and 2% “a lot.”

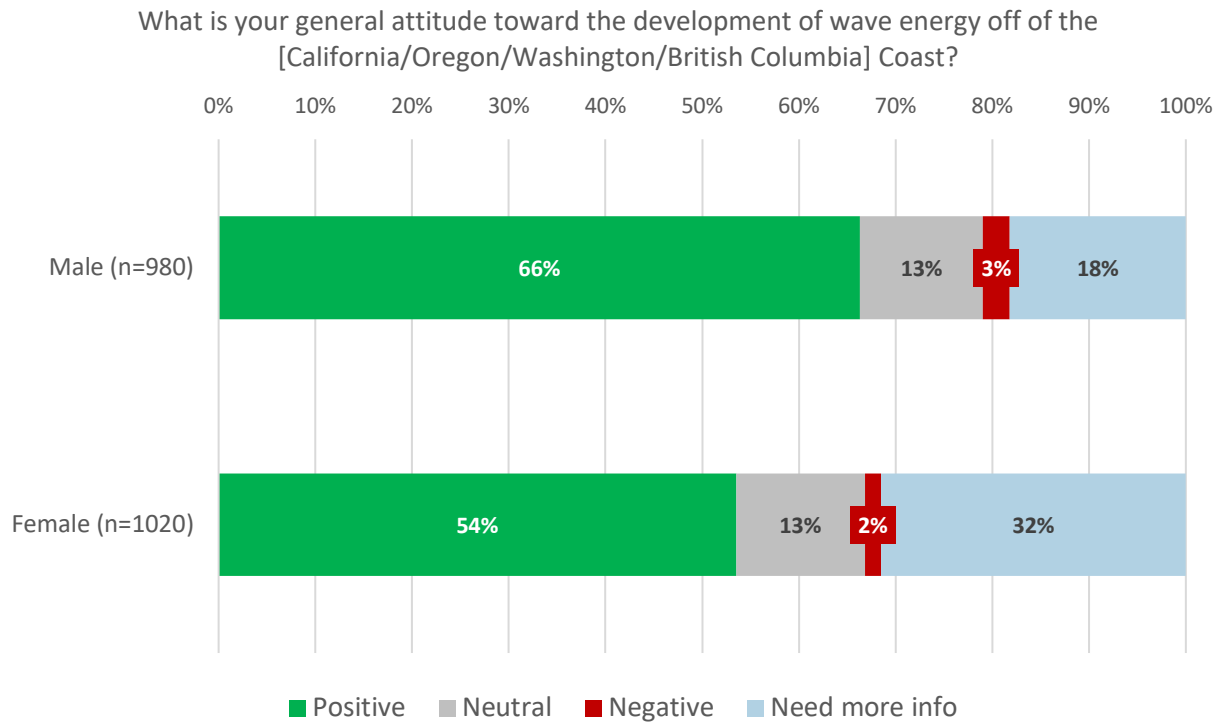
Of those reporting a neutral attitude, over half reported no familiarity (54%), 30% “a little,” 15% “some,” and 2% “a lot.” Of those who “needed more information to form an opinion”, 76% had no familiarity, 20% “a little,” 4% “some,” and less than 1% “a lot.”



6. Men had more positive attitudes toward wave energy; women wanted more information.

Males (66%) expressed more "positive" attitudes towards wave energy development than females (54%). Females were more likely to indicate that they needed more information to form an opinion (32%) than males (18%).

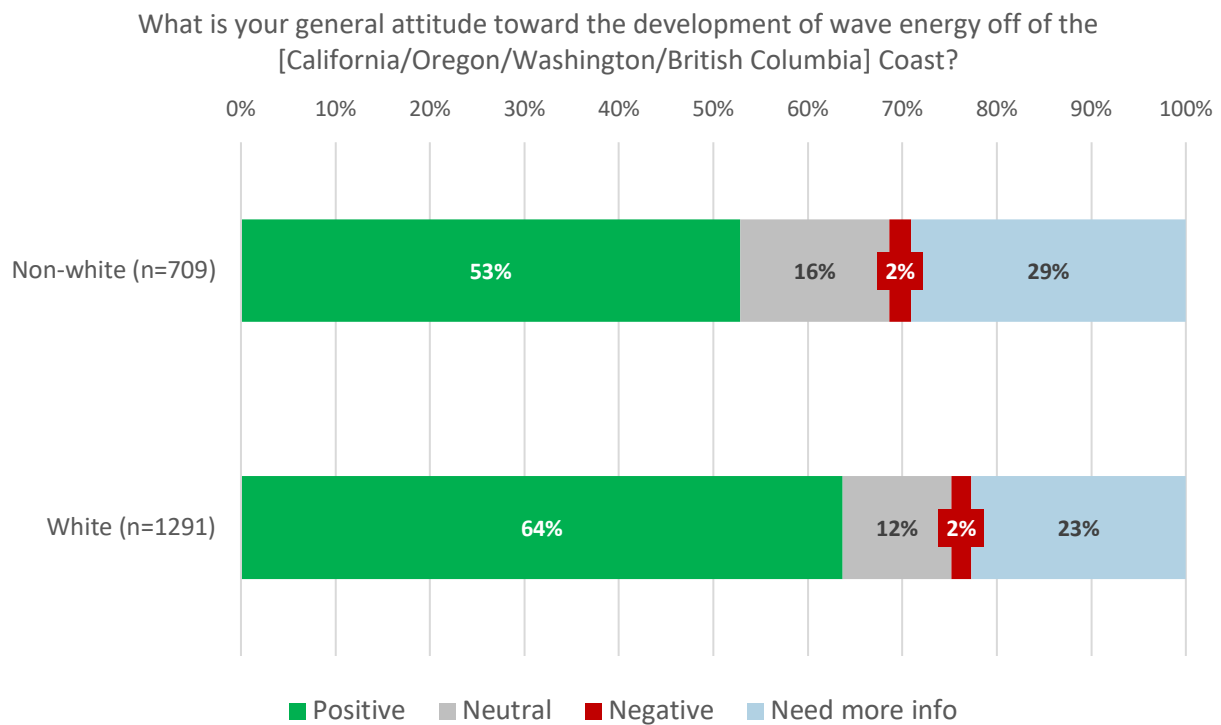
The percentage of male and female respondents expressing "neutral" or "negative" attitudes were similar for both genders.



7. White respondents had more positive attitudes toward wave energy.

While most non-white and white respondents indicated a “positive” attitude towards wave energy development, a larger majority of white respondents (64%) indicated positive attitudes than non-whites (53%).

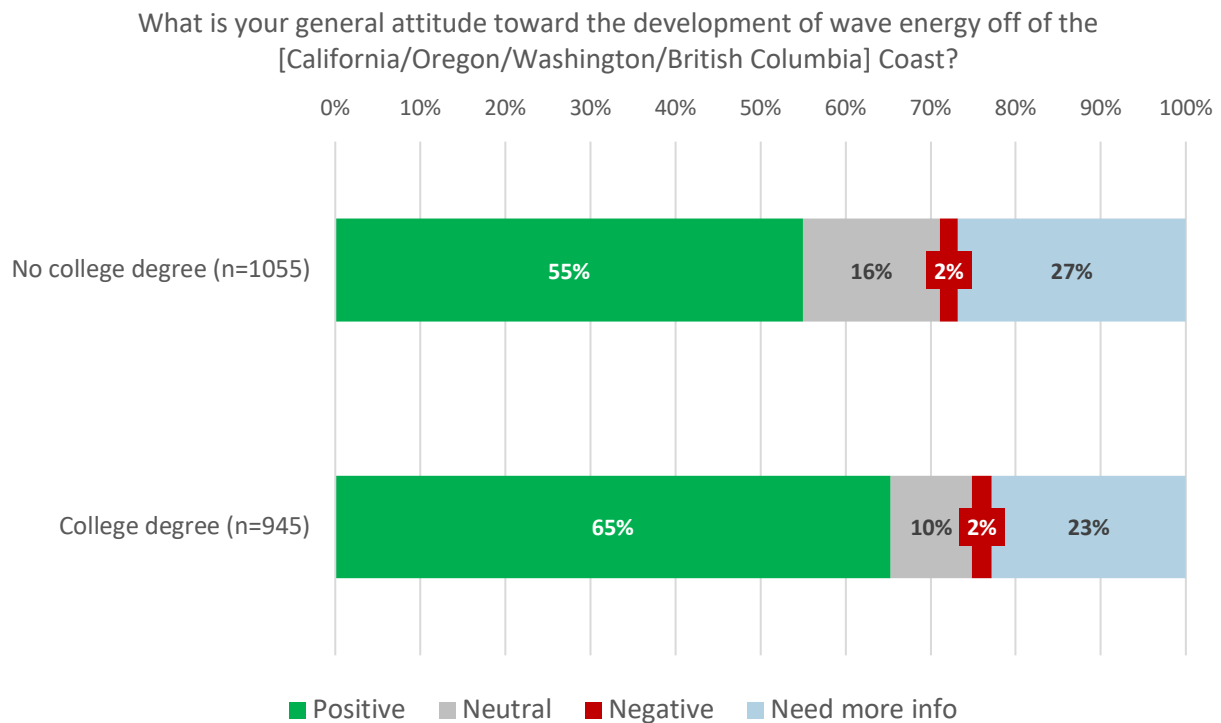
The percentage of white and non-white respondents expressing “neutral” or “negative” attitudes were similar.



8. Respondents with a college degree had more positive attitudes toward wave energy.

While most respondents with and without a college degree indicated “positive” attitudes towards wave energy development, those with a college degree (65%) were more positive than those without a college degree (55%).

The next largest response for both respondent groups was “need more information” (27% of those without a college degree, 23% with a college degree), followed by “neutral” (16% without a college degree, 10% with college degree), and “negative” (2% without a college degree, 2% with college degree).

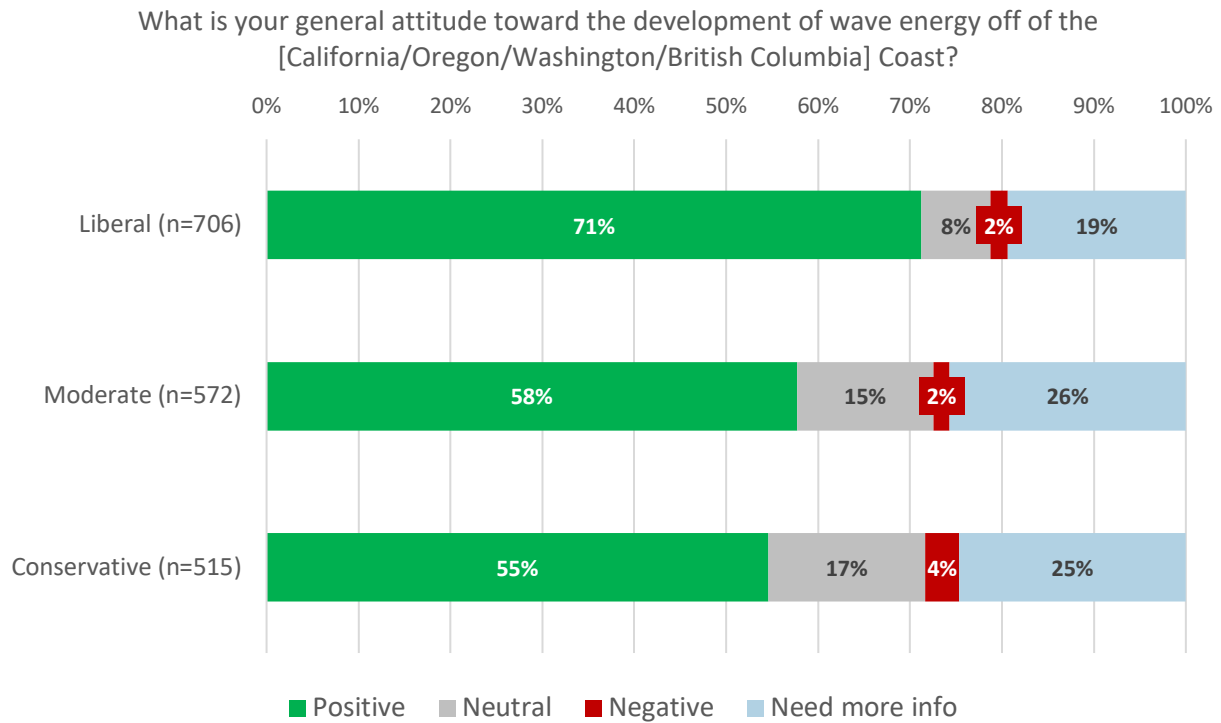


9. Politically liberal respondents had more positive attitudes toward wave energy than moderate and conservative respondents.

A higher proportion of liberal respondents (71%) had “positive” attitudes towards wave energy development than moderate (58%) or conservative (55%) respondents.

The next largest response was “need more information” (19% of liberals, 26% of moderates, and 25% of conservatives). “Neutral” followed with 8% of liberals, 15% of moderates, and 17% of conservatives.

The smallest response was “negative” with 2% of liberals, 2% of moderates, and 4% of conservatives.



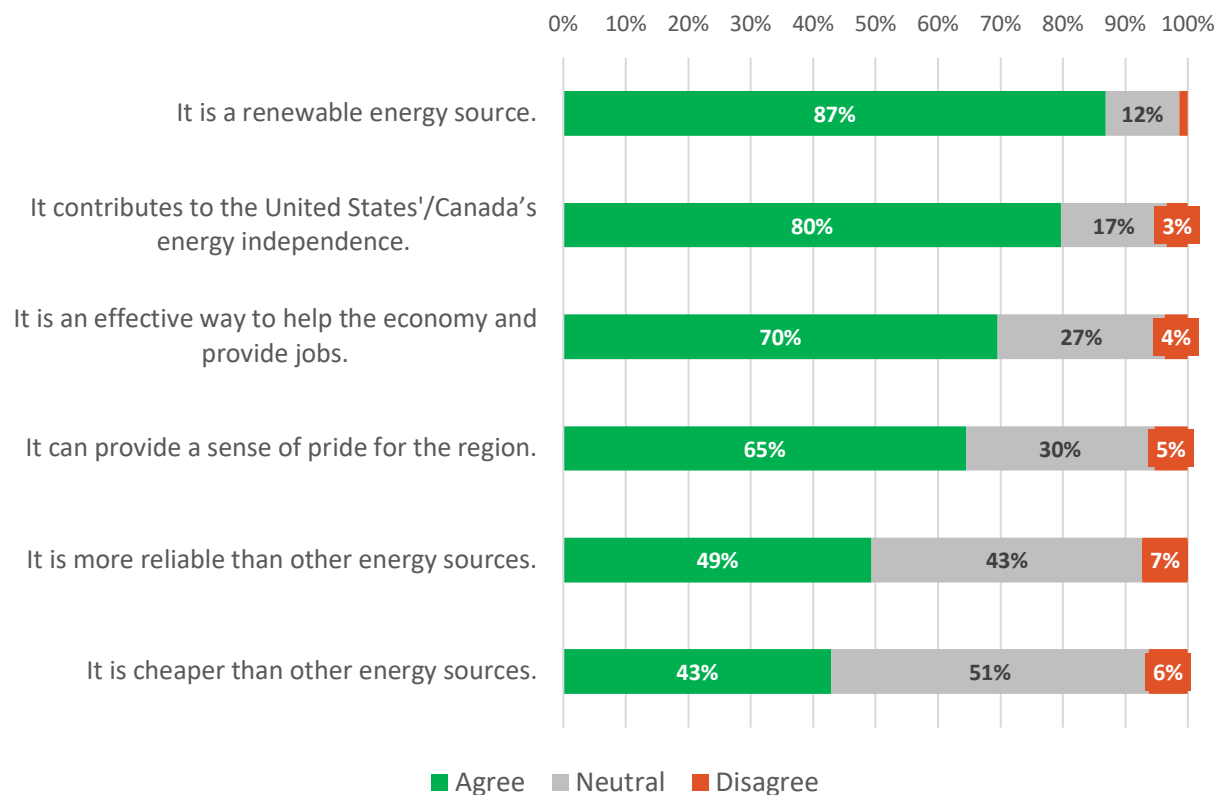
PERCEIVED RISKS AND BENEFITS OF WAVE ENERGY

10. Respondents largely agreed with statements about the benefits of wave energy development.

Respondents were asked the extent to which they agreed with six statements about the potential benefits of wave energy development.

Respondents agreed the most that wave energy is a renewable energy source (87%) and that it contributes to the United States'/Canada's energy independence (80%). Majorities also agreed that it is an effective way to help the economy and provide jobs (70%) and that it can provide a sense of pride for the region (65%). Agreement dipped below 50 percent and neutral responses increased for statements about wave energy's reliability compared to other energy sources and its cost.

How strongly do you agree or disagree with the following statements about the potential **benefits** of the development of wave energy off of the [California/Oregon/Washington/British Columbia] Coast?



The six benefit questions can be averaged into a single index of perceived benefits, ranging from 1 "Strongly disagree" to 5 "Strongly agree." Overall, the mean score on this index is 3.91, indicating that the average respondent somewhat agrees with these statements about wave energy's benefits.

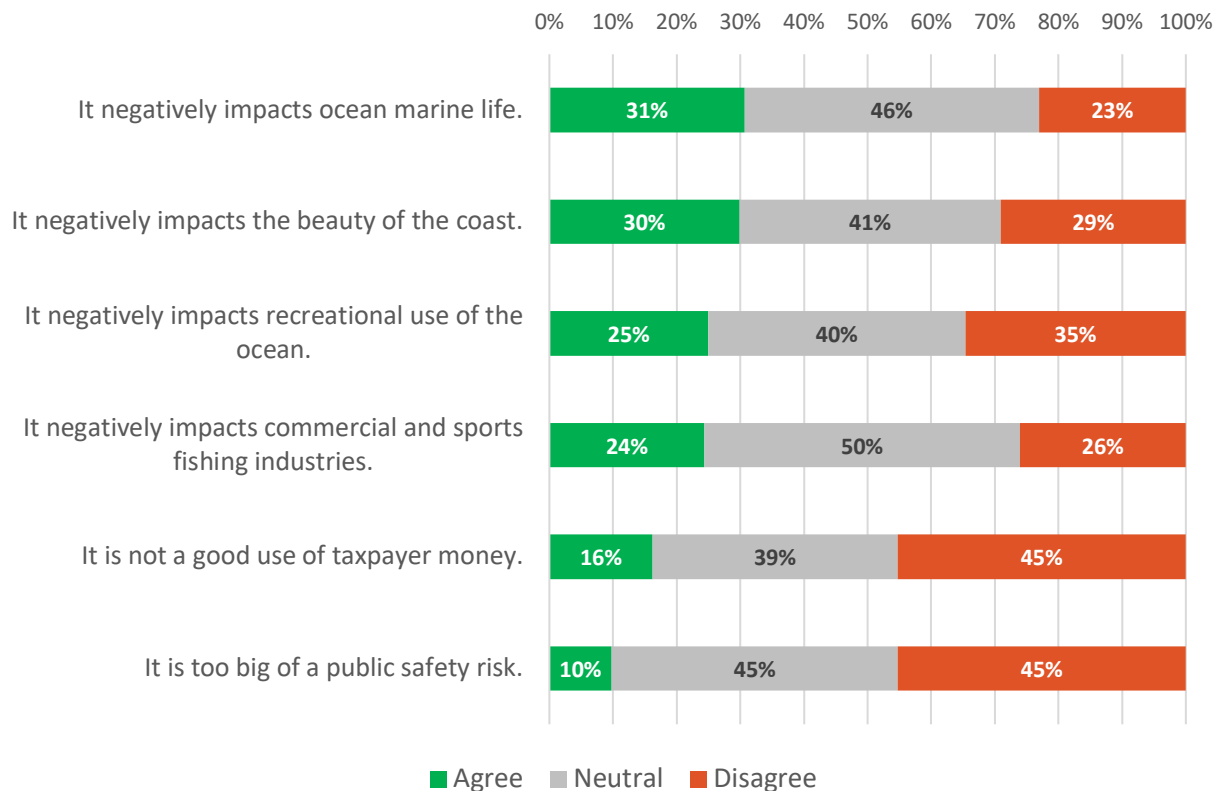
11. Respondents were mostly neutral about risks, expressing the most concern about impacts to coastal beauty and marine life.

A similar set of six questions gauged respondents’ views on the perceived risks of wave energy development. The modal response to most of these risks was “neutral,” though more respondents disagreed that it is not a good use of taxpayer money.

At the same time, 30% and 31% of respondents agreed that wave energy development negatively impacts the beauty of the coast and ocean marine life, respectively. Twenty-five percent agreed it negatively impacts recreational use of the ocean, and 24% of respondents agreed that wave energy negatively impacts commercial and sports fishing industries.

The lowest concerns about the risks of wave energy were related to public safety risk (10% agreement) and it not being a good use of taxpayer money (16% agreement). These two risks also registered the highest disagreement levels at 45 percent each.

How strongly do you agree or disagree with the following statements about the potential **risks** of the development of wave energy off of the [California/Oregon/Washington/British Columbia] Coast?



The six risk questions can be averaged into a single index of perceived risks, ranging from 1 “Strongly disagree” to 5 “Strongly agree.” Overall, the mean score on this index is 2.82, indicating that the average respondent is between neutral and somewhat disagree with these statements about wave energy’s risks.

12. Across various demographics, perceived benefits are mostly stable, but perceived risks vary.

A respondent’s agreement with the benefits of wave energy development did not vary greatly based on state of residence (mean range 3.84-3.94), gender (mean range 3.88 to 3.93), race/ethnicity (mean range 3.89-3.92), or education level (mean range 3.88 to 3.94). However, the perception of risks of wave energy development varied between states, with Oregon at the lowest perceived risk (mean=2.67) of the four. Gender also showed a larger gap between perceptions of risk, with female respondents (mean=2.90) having higher risk perceptions than males (mean=2.73). Non-white respondents also had higher risk perceptions (mean=2.96) than white respondents (mean= 2.74). Respondents with a college degree showed lower risk perceptions (mean=2.76) than those with no college degree (mean=2.87).

Respondents with a “negative” attitude towards wave energy development “somewhat disagreed” (mean=2.82) with the benefits of wave energy and “somewhat agreed” (mean=4.08) with the risks. Conversely, respondents with a “positive” attitude towards wave energy development “somewhat agreed” (mean=4.17) with the benefits of wave energy and “somewhat disagreed” (mean=2.56) with the risks. Respondents with “neutral” attitudes and those who needed more information had similar means closer to “neutral” for both benefits and risks.

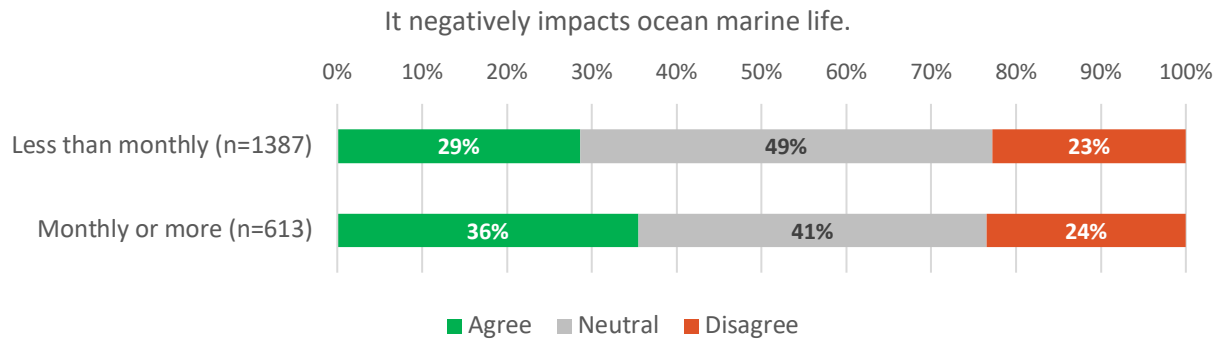
Respondents that self-assessed their place on a political ideology spectrum as “liberal” had stronger agreement with the benefits of wave energy (mean=4.03) than “moderates” (mean=3.89) and “conservatives” (mean=3.82). Conversely, “conservatives” had the highest level of agreement with the risks of wave energy, although it was still less than neutral, at a mean of 2.95, with “moderates” (mean – 2.85) and “liberals” (mean=2.68) indicating lower levels of agreement regarding potential risks.

How strongly do you agree or disagree with the potential benefits and risks of wave energy? (1=Strongly disagree, 5=Strongly agree)					
	Benefits		Risks		
	Benefits	Risks	Benefits	Risks	
State			Education		
California (n=500)	3.94	2.88	No college degree (n=1055)	3.88	2.87
Oregon (n=500)	3.92	2.67	College degree (n=945)	3.94	2.76
Washington (n=500)	3.84	2.86	Political ideology		
British Columbia (n=500)	3.93	2.85	Liberal (n=706)	4.03	2.68
Gender			Moderate (n=572)	3.89	2.85
Male (n=980)	3.93	2.73	Conservative (n=515)	3.82	2.95
Female (n=1020)	3.88	2.90	Wave energy attitude		
Race/ethnicity			Positive (n=1196)	4.17	2.56
Non-white (n=709)	3.89	2.96	Neutral (n=260)	3.55	3.17
White (n=1291)	3.92	2.74	Negative (n=44)	2.82	4.08
			Need more info. (n=498)	3.56	3.13

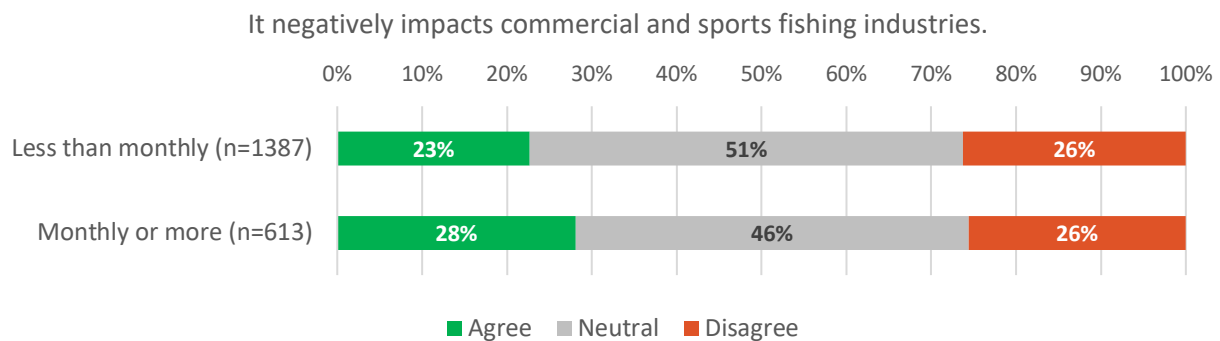
Highlighted cells indicate statistically significant differences, compared to cells of different colors within each category.

13. Respondents that visit the coast more frequently perceived higher levels of coastal-specific risks.

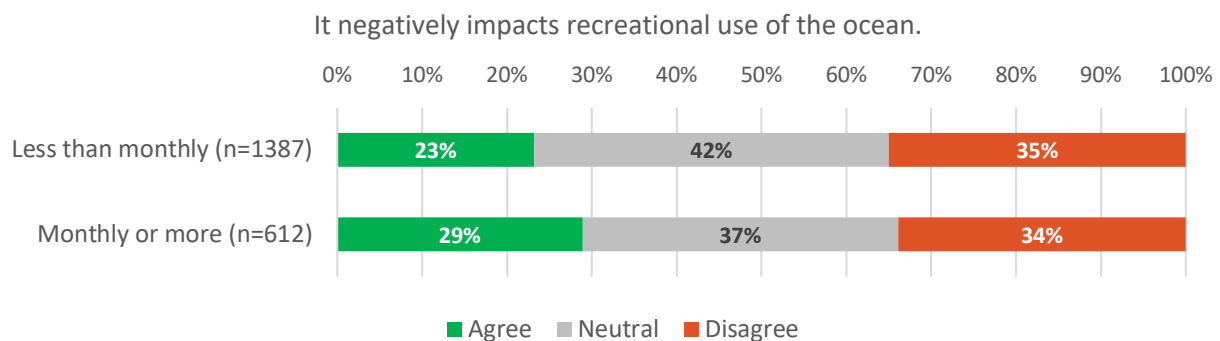
Thirty-six percent of respondents that reported visiting the coast monthly or more agreed that wave energy negatively impacts ocean marine life, compared to 29% of respondents that visit the coast less frequently.



Twenty-eight percent of respondents that reported visiting the coast monthly or more agreed that wave energy negatively impacts commercial and sports fishing industries, compared to 23% of respondents that visit the coast less frequently.



Twenty-nine percent of respondents that reported visiting the coast monthly or more agreed that wave energy negatively impacts recreational use of the ocean, compared to 23% of respondents that visit the coast less frequently.



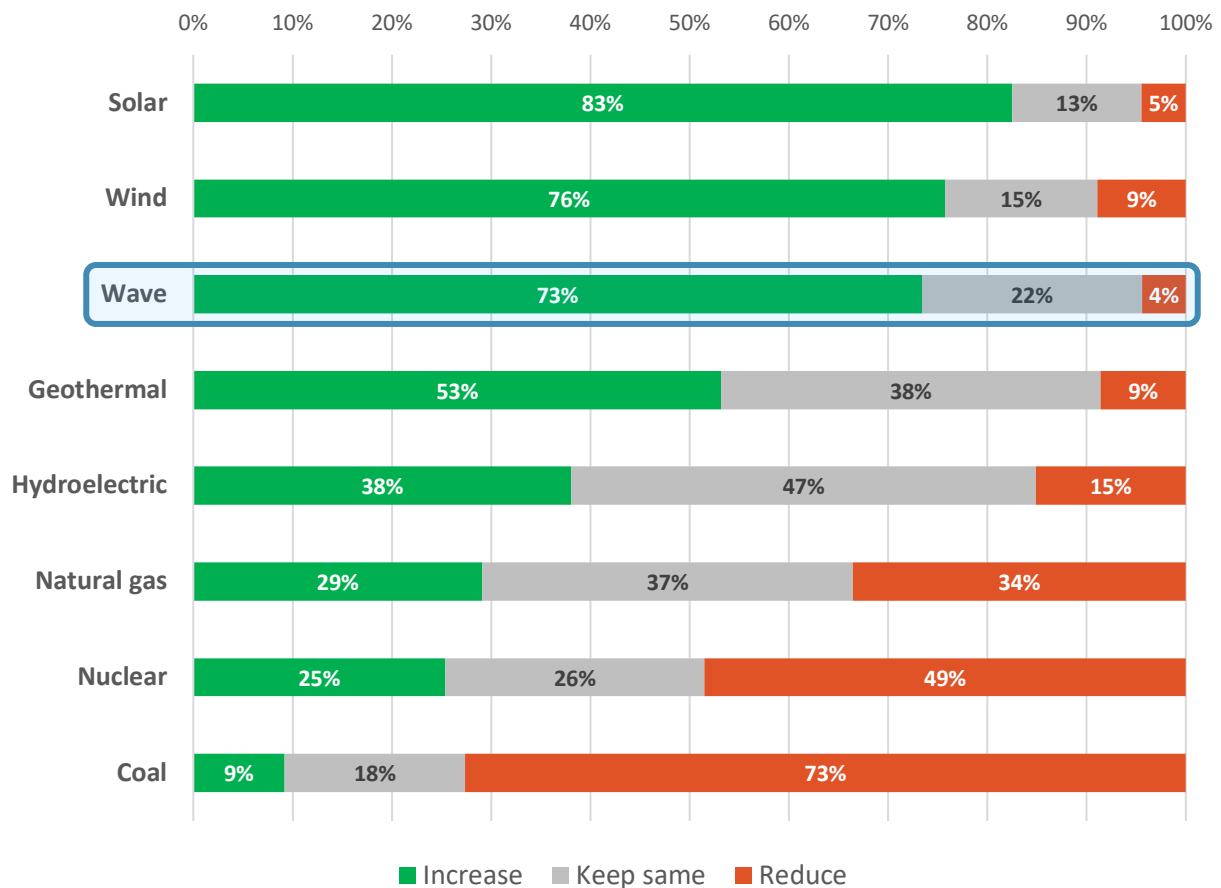
ELECTRIC POWER PREFERENCES BY SOURCE

14. Respondents favor increasing the use of wave energy to meet electric power needs, similar to other renewable sources like solar and wind.

Seventy-three percent of respondents indicated support for increasing the use of wave energy to meet national electricity needs over the next 25 years.

Another 22% indicated a desire to keep the same level of wave energy, and 4% preferred to reduce the amount of electricity from wave energy, the lowest response for reduction among the eight energy sources listed.

For each power source listed below, indicate whether you feel [the United States/Canada] should reduce or increase its use to meet the country's electric power needs over the next 25 years.



15. Liberal respondents more strongly prefer increased use of wave energy than moderate and conservative respondents, but the difference is not as large as other renewables.

Respondents across all political ideologies indicated, on average, that they preferred to somewhat increase the use of wave energy to meet electricity needs over the next 25 years.

Liberal respondents were most in favor of increasing wave energy, following a similar trend exhibited in other renewable energy source like solar and wind.

Conservative respondents indicated preferences for a mix of both renewable and traditional energy sources, with coal energy being the only source with a mean below keeping the same level. Among conservatives, wave energy (3.8) was the second most favored energy source, behind only solar.

For each power source listed below, indicate whether you feel [the United States/Canada] should reduce or increase its use to meet the country's electric power needs over the next 25 years.

