

Welcome to the Webinar

Webinar Instructions and Disclaimer



- **Welcome to the NETL RWFI Hydrogen 101 Series on Community Engagement**
- **Slides and Recording will be prepared and sent out as well as uploaded to the NETL.DOE.GOV/RWFI website some time after the webinar**
- **All attendants will be placed on mute**
- **Please use the chat function for questions during the workforce panel at the end of the webinar, we will try to get to as many as possible.**

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NETL RWFI Hydrogen 101 Webinar: Building Effective Community Engagement in Hydrogen Hubs



This is our first webinar of the **NETL RWFI Hydrogen 101 Series** entitled Building Effective Community Engagement Strategies

We will delve into the findings of the Energy Futures Initiatives (EFI) Factbook/Report: "Building Stronger Community Engagement in Hydrogen Hubs." The factbook presents insights garnered from a comprehensive survey of nearly 5,000 individuals hailing from disadvantaged, tribal, labor, and environmental justice communities. Madeline Schomburg Director of Research at EFI will be presenting the findings of the report as well as providing a regional lens to the results.

Today's Agenda

- NETL RWFI and the Hydrogen Hub Webinar Series – Anthony Armaly, RWFI Lead
- Building Stronger Community Engagement in Hydrogen Hubs- Madeline Schomburg, Director of Research, EFI
- Workforce Roundtable Discussion



NETL Regional Workforce Initiative (NETL RWFI)



A Focus on Appalachia and the future of Energy and Advanced Manufacturing Regional Workforce Readiness and Economic Development

NETL RWFI- Measuring Our Impact - People First

Key Metrics are Levels of Engagement and Outreach



800+

individual
stakeholders

400+

institutions and
organizations
represented

2000+

registrants to the
NETL RWFI Webinar
Series

300+

subscribed to the
NETL RWFI e-Note
Monthly Newsletter

**Catalyzed over 2M in energy/advanced manufacturing
workforce & economic development funding**

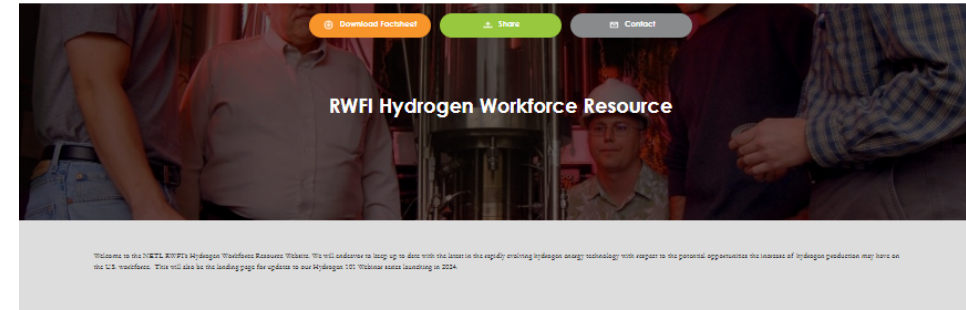


NETL Regional Workforce Initiative Updates

Supporting Regional Economic and Workforce Development opportunities.



- **NETL RWFI, DOE IEDO Industrial Sustainability, Energy Efficiency and Decarbonization (ISEED) Workforce Collaborative (FY24 to FY26)**- Working with NREL and ORNL to help establish an Industrial Efficiency Workforce Collaborative for DOE IEDO. Will endeavor to engage the PA, OH, WV and greater Appalachia through our efforts in this program.
- **DOE TCF- MSI Connect Program with Brookhaven National Lab (FY 2023-24) Appx 30K**- Awarded a TCF to improve MSI engagement with labs (BNL, LLNL, SNL, PPPL, SLAC). NETL will host 6 students from MSI universities to work on Carbon Management IP commercialization
- **NETL RWFI Hydrogen and Methane Mitigation Workforce Activities:** NETL RWFI launched a H2 Workforce website for regional stakeholders as well as a Methane Mitigation Workforce website. NETL RWFI will launch similar workforce resources for carbon mitigation technologies and serve as a web portal for regional stakeholders to learn more about skills, reports, analysis and funding available for workforce activities.



About the NETL RWFI:

The NETL Regional Workforce Center (RWFC) is a platform for assessment, meaningful, virtual domain engagement, collaboration and partnerships with key workforce, education and economic development stakeholders who are central to the deployment of U.S. DOE and NETL Energy and Advanced Manufacturing technologies, research instruments and capabilities by analyzing those research instruments into enabling economic development and workforce job opportunities for the Appalachian region and the Nation.

Hydrogen 101 Webinar Series Information

- **Hydrogen Energy Basics (Date TBD):** This webinar will provide a fundamental understanding of hydrogen technology and begin to start the discussion around emissions and different hydrogen technologies; may have correspond to the skills and education needed with transportation up and down the supply chain to other energy technologies.

Hydrogen Workforce Online Resources

- **Hydrogen and Fuel Cells Career Map:** Find your career in Hydrogen with the Hydrogen and Fuel Cells Career Map
- **U.S. National Clean Hydrogen Strategy and Roadmap:** The U.S. National Clean Hydrogen Strategy and Roadmap explores opportunities for clean hydrogen to contribute to national decarbonization goals across multiple sectors of the economy; it provides a snapshot of hydrogen production, transport, storage, and use in the United States today, and presents a strategy framework for attaining hydrogen production and use of clean hydrogen, containing resources for 2025, 2040, and 2050.
- **U.S. DOE Hydrogen Roadmap:** The U.S. Department of Energy's (DOE's) Energy Earthshots Initiative aims to accelerate breakthroughs of mass abundant, affordable, and reliable clean energy solutions within the decade. Advancing the Energy Earthshots will help America realize the toughest remaining barriers to addressing the climate crisis, and meet quality needs the Biden-Harris Administration's goal of net-zero carbon emissions by 2050 while ensuring good-paying union jobs and growing the economy.
- **Hydrogen for All:** Find easy-to-understand information about hydrogen (H₂) and fuel cell technologies that increase your H₂IQ by sharing out our fact sheets and other introductory resources.
- **Hydrogen Skills Assessment National Labor & Workforce Strategy:** [View the report](#)

Funding Opportunities

- **Hydrogen Workforce Funding Opportunities:** Find information about open funding opportunity announcements (FOAs) and FOA pre-award notices from the DOE Hydrogen Program's participating offices.

Upcoming Events

- **NETL Hydrogen 101 Webinar on Building a Thriving Community Engagement in Hydrogen Hubs:** June 04, 2024 11am-12pm (ET)

NETL Hydrogen in the News

- [NETL Hydrogen Inlet Reactor Reaches Near-Ambient](#)
- [NETL, Other National Labs Explore Innovative Pathways To Produce Carbon-Negative Hydrogen](#)
- [NETL, Partners Pilot Clean Steam Technologies for Hydrogen Leak Detection](#)
- [NETL, as Part of DOE's SHASTA, Begins Study On Hydrogen Storage Potential in Existing Underground Gas Facilities](#)

[More Hydrogen News](#)

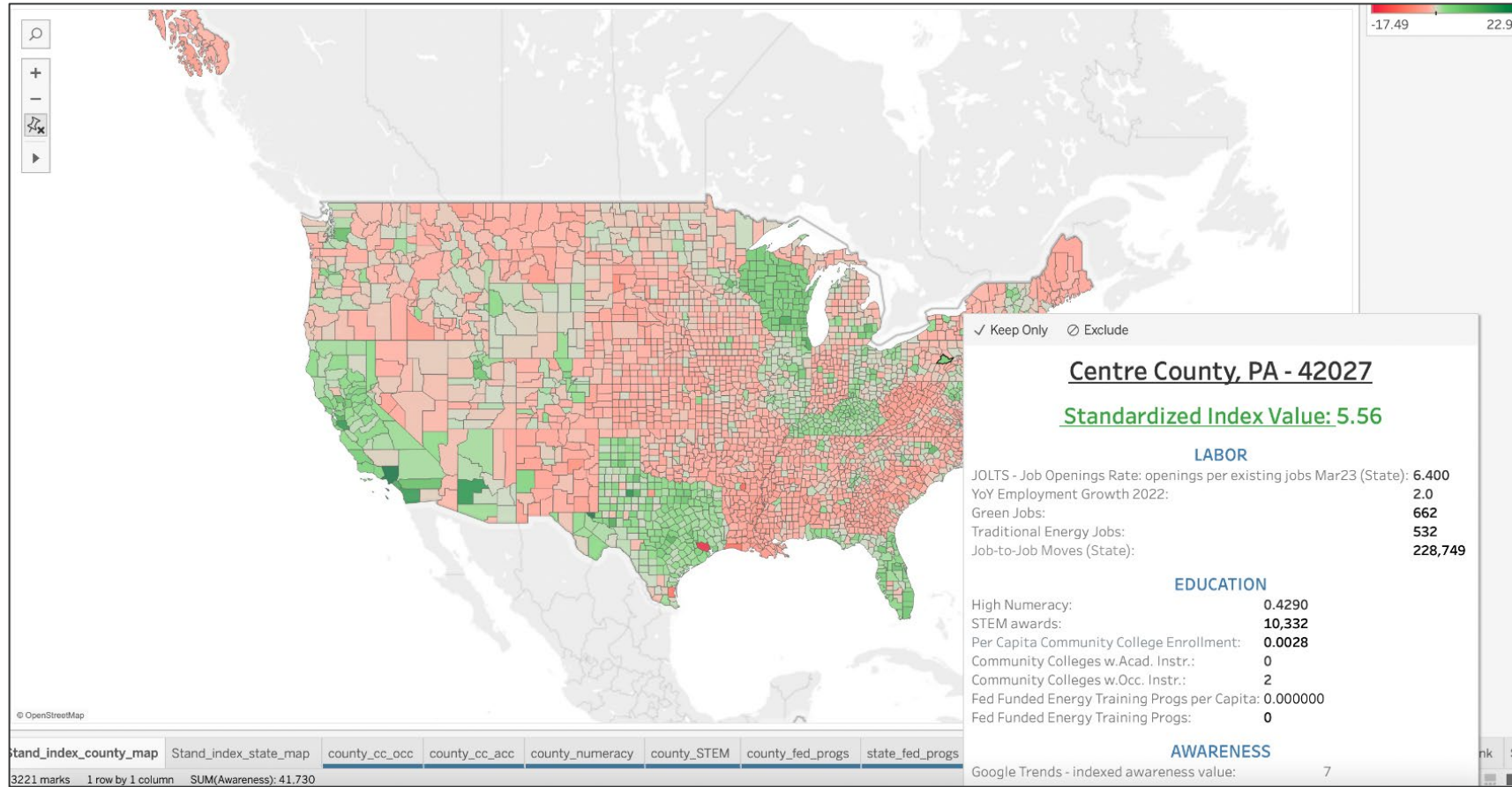
Hydrogen Workforce: Data Driven analysis, Engagement, Tracking Community Sentiment and Awareness, and investigating Workforce Readiness



- **Community Stakeholder Engagement and Regional/National Workforce Activities: Aggregation/Integration/Communication/Deployment (NETL RWFI)**
 - Regional and national outreach (Leverage RWFI network)
 - **Hydrogen 101 Series (Hydrogen tech basics/workforce impacts/research impacts and roadmaps)**
 - Hydrogen focus group (Education and Workforce) (best practice sharing—catalyzing follow-on funding, stakeholder awareness)
 - Workforce Readiness and Workforce Awareness Regional and National Index
 - Skills Taxonomy and Skills Matching
 - Regional Hydrogen workforce playbooks (Australia Hydrogen Workforce Industry Roadmap Strategic Plan, Victoria Hub Hydrogen Workforce DOE roadmap)/dashboard hosting
 - **Answer the what, when, and where of Hydrogen Workforce**
- **Dashboard Tracker of Workforce Impacts**
 - Impacts and analysis integration and tracking through an online/real time dashboard
 - Potential future work with integration with LLM for occupation discovery and worker outreach/education on hydrogen skills/current occupation and skills match
 - ChatGPT Virtual guidance counselor feature
 - Dynamic real time reporting on national hydrogen strategy goals progress

Skills Mapping and Jobs and Skills Projection for U.S. Hydrogen Industries (Julius Education)

Current Green Workforce Readiness Dashboard



- They have integrated 25+ relevant data sets to evaluate county-level readiness for green workforce development.
- Data spans educational indicators, labor market conditions, and analysis of awareness of jobs and career pathways.
- This work could be localized and contextualized to the opportunities and challenges in building the requisite Hydrogen workforce.

Example of a Potential Hydrogen Skills Taxonomy: Opportunity to Provide Deep Skills Analysis and Enable Skill Transferability



Hydrogen Plant Machinery Operator Skills Model (Example)

Rich Skill (tied to role)	Generic Skill
Monitor equipment for safety and performance	equipment monitoring
Operate valves and pumps to control the flow of hydrogen	valve/pump operation
Adjust machinery to maintain the desired pressure and temperature	machinery adjustment
Troubleshoot and repair any malfunctions or breakdowns	troubleshoot
Inspect and maintain equipment to ensure compliance with safety regulations	equipment inspection
Perform routine maintenance to keep machinery in optimal condition	maintenance technician
Monitor hydrogen levels and adjust as needed	hydrogen monitoring
Load and unload materials for processing	material handling
Follow established safety protocols	safety protocols
Document all work performed and test results	documentation testing
Observe safety precautions when handling hazardous materials	safety handling
Coordinate with other personnel to ensure efficient operation	coordinating
Analyze data and make adjustments to ensure optimal performance	data analysis
Operate computer systems to monitor and control machinery	computer systems operations
Respond to alarms and take corrective action	alarm response
Prepare reports to document operations and maintenance activities	report preparation
Perform tests on samples to measure hydrogen levels	testing hydrogen
Follow instructions from supervisors to ensure proper operation	following instructions
Train other personnel in the operation of hydrogen plant machinery	training others
Adjust settings on machinery to optimize performance	machine tuning
Identify and report any defects or malfunctions	troubleshoot
Monitor and adjust hydrogen levels as required	hydrogen monitoring
Assemble, install and maintain machinery	machinery maintenance
Calibrate instruments to ensure accuracy	calibration
Troubleshoot and repair any issues with machinery	machinery repair
Maintain records of hydrogen production and consumption	hydrogen tracking
Perform quality checks on products and materials	quality control
Follow safety guidelines when handling hazardous materials	safety handling
Analyze data to identify trends and potential problems	data analysis

- Having a skills taxonomy and ontology provides a critical enabler of a whole host of workforce use cases to support recruiting, employee retention, workforce and academic program development, and upskilling.
- It also helps match potential employees to the right job, clarifies skills “delta” between where a job seeker or employee is today and the job they aspire to, illuminates skill transferability between jobs with similar skills, and helps educators develop more employer aligned programs, among many other benefits.
- They use AI tools to automate the development and maintenance of a Hydrogen Skills Taxonomy.

Skills Mapping and Jobs and Skills Projection for U.S. Hydrogen Industries (Workforce roadmaps)

HYDROGEN SKILLS MAP

Planning & Design <ul style="list-style-type: none"> Hydrogen System and Facility Design* <ul style="list-style-type: none"> Engineers - Systems/Integration, Robotics, Automation (Higher Ed.) Draftspeople (VET) Industrial designers (Higher Ed.) Design of Integrated Systems and Facilities <ul style="list-style-type: none"> Engineers - Systems/Integration, Robotics, Automation (Higher Ed.) Industrial designers (Higher Ed.) Draftspeople (VET) Hydrogen Pipeline, Storage and Transport Facility Design <ul style="list-style-type: none"> Engineers - Mechanical, Electrical, Chemical, Automation (Higher Ed.) Draftspeople (VET) Industrial designers (Higher Ed.) Planning, Approvals and Compliance processes <ul style="list-style-type: none"> Planners (Paraprof./Higher Ed.) Regulatory Officers (Paraprof./Higher Ed.) Project Managers and Consultants (Paraprof./Higher Ed.) Water Treatment <ul style="list-style-type: none"> Establishing and Operating facilities to purify water for hydrogen production* <ul style="list-style-type: none"> Plumbers and engineering trades, including for pumps (VET) Instrumentation & Electrical Technicians (VET/Paraprof.) Process Operators (VET/Paraprof.) Specialists in treatment, testing, and compliance of water quality (VET/Paraprof.) Engineers - Process, Chemical, Civil, Mechanical (Higher Ed.) 	Construction & Installation <ul style="list-style-type: none"> Electrolyser Installation and Commissioning* <ul style="list-style-type: none"> Project Managers (Paraprof.) Electrolyser Technicians* (VET/Paraprof.) Instrumentation & Electrical Technicians (VET/Paraprof.) Engineering Trades (VET) Mechanical Fitters (VET) Pipeline Construction, Commissioning & Testing <ul style="list-style-type: none"> Pipeline Technicians (VET/Paraprof.) Project Managers (Paraprof.) Engineering Trades (VET) Surveyors (Higher Ed.) Installation of Stationary Fuel Cells* - Industrial/Commercial Scale <ul style="list-style-type: none"> Project Managers (Paraprof.) Fuel Cell Technicians* (VET/Paraprof.) Engineering Trades (VET) Installation of Stationary Fuel Cells* - Industrial/Commercial Scale <ul style="list-style-type: none"> Project Managers (Paraprof.) Instrumentation & Electrical Technicians (VET) Engineering Trades, including for pressure vessels, etc. (VET) All above <ul style="list-style-type: none"> Equipment Certifiers (VET) 	Operations & Maintenance <ul style="list-style-type: none"> Hydrogen Production Process Operation* <ul style="list-style-type: none"> Specialist Hydrogen Process Operators* (VET/Paraprof./Higher Ed.) Engineers - Electrical, Gas, Chemical (Higher Ed.) Quality and Safety Managers (Higher Ed.) Mechanical Fitters (VET) Electrolyser Maintenance* <ul style="list-style-type: none"> Electrolyser Technicians* (VET/Paraprof.) Instrumentation & Electrical Technicians, including SCADA (VET/Paraprof.) Pipeline and Hydrogen Storage Facilities Operations and Maintenance <ul style="list-style-type: none"> Pipeline Technicians (VET/Paraprof.) Specialist Hydrogen Process Operators, including SCADA (VET)* Safety Managers (VET/Higher Ed.) Engineering Support (Paraprof./Higher Ed.) Hydrogen Compression, Liquefaction and Conversion using multiple carriers - for domestic use* <ul style="list-style-type: none"> Specialist Hydrogen Process Operators* (VET/Paraprof./Higher Ed.) Mechanical Fitters (VET) Stationary Fuel Cell Maintenance* <ul style="list-style-type: none"> Fuel Cell Technicians* (VET/Paraprof.) Dangerous Goods Transport <ul style="list-style-type: none"> Drivers (OTI) Vehicle Inspectors (OTI) Hazardous Areas <ul style="list-style-type: none"> Electricians (VET) Inspectors (Paraprof.) Safety Managers (VET/Paraprof.) 	Transport <ul style="list-style-type: none"> Hydrogen Refuelling/ Dispensing* - Fleet & Retail <ul style="list-style-type: none"> Service Station Workers (OTI) Installation of Refuellers <ul style="list-style-type: none"> Hydrogen Dispenser Technicians* (VET/Paraprof.) Gas Fitters (VET) Fuel Cell Electric Vehicle (FCEV) Maintenance* <ul style="list-style-type: none"> Automotive Trades & Technicians (VET) Future Transport Applications - Rail, Maritime, Aerospace* <ul style="list-style-type: none"> ITBO Export <ul style="list-style-type: none"> Hydrogen Compression, Liquefaction and Conversion using multiple carriers - for export* <ul style="list-style-type: none"> Specialist Hydrogen Process Operators* (VET/Paraprof./Higher Ed.) Ship loading for Hydrogen Export* <ul style="list-style-type: none"> Specialist Hydrogen Process Operators* (VET/Paraprof./Higher Ed.) 	Energy <ul style="list-style-type: none"> Injecting Hydrogen into Gas Networks* <ul style="list-style-type: none"> Pipeline Technicians (Paraprof.) Hydrogen Combustion Turbine Design & Operation* <ul style="list-style-type: none"> Engineers - Mechanical, Electrical (Higher Ed.) Power Plant Operators (VET) Residential Hydrogen System Design* <ul style="list-style-type: none"> Plumbers (VET) Electricians (VET) Residential Stationary Fuel Cell Installation and Maintenance* <ul style="list-style-type: none"> Plumbers (VET) Electricians (VET) Hydrogen Combustion Appliance Installation & Maintenance* <ul style="list-style-type: none"> Plumbers (VET) Electricians (VET) Gas Fitters (VET)
Whole Sector <ul style="list-style-type: none"> Hydrogen Emergency Response* <ul style="list-style-type: none"> On-site emergency teams* (VET) First Responders (VET/Higher Ed./ Specialist training) 	Hydrogen Familiarisation and Safety* <ul style="list-style-type: none"> All Roles (VET/OTI) 	Trainers and Teachers <ul style="list-style-type: none"> For all roles (VET/Paraprof./Higher Ed.) 		

NEW SKILLS OR OCCUPATIONS: Most others will build on existing capabilities.
 SKILLS AND TRAINING PATHWAYS: Vocational Education and Training (VET); On the job training (OTI); Higher Education - Bachelor/Postgraduate (Higher Ed.); Paraprofessional - Advanced diploma or Associate degree (Paraprof.)
 *This Hydrogen Skills Map has been developed and tested with industry stakeholders across Queensland.
 However, we know there may be many other skills and occupations not shown. Here, Hydrogen is a high employment opportunity for Queensland.

Australia Hydrogen Workforce Industry Roadmap
 Victorian Hydrogen Workforce Report/Roadmap

Future jobs and skills trajectory

Combining the analysis and modelling of the future green hydrogen economy, the emergence of jobs being impacted by green hydrogen-related changes over the coming decades is predicted in the figure below.

As the industry rapidly evolves, these predictions are subjected to change. The introduction of new technologies, implementation of new regulations and adoption of hydrogen to scale is expected to result in jobs needing to be filled earlier than anticipated.

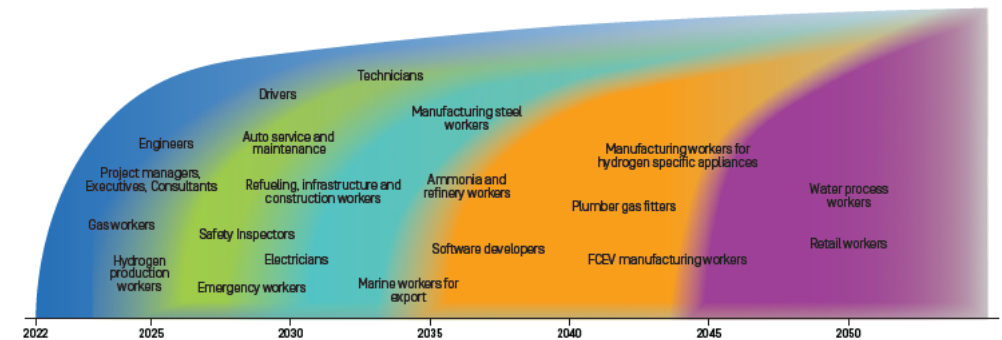


Figure 12. Predicted emerging jobs in various industries driven by green hydrogen

Contact Information

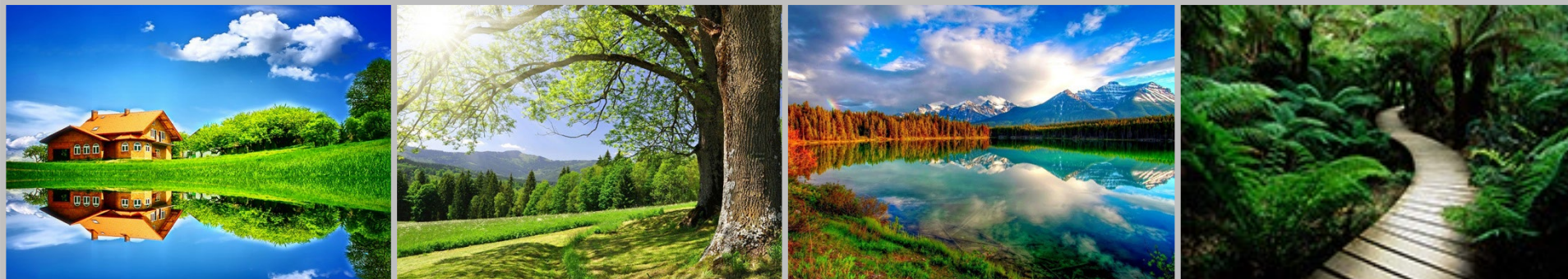


For More Information, Contact Anthony Armaly

anthony.armaly@netl.doe.gov

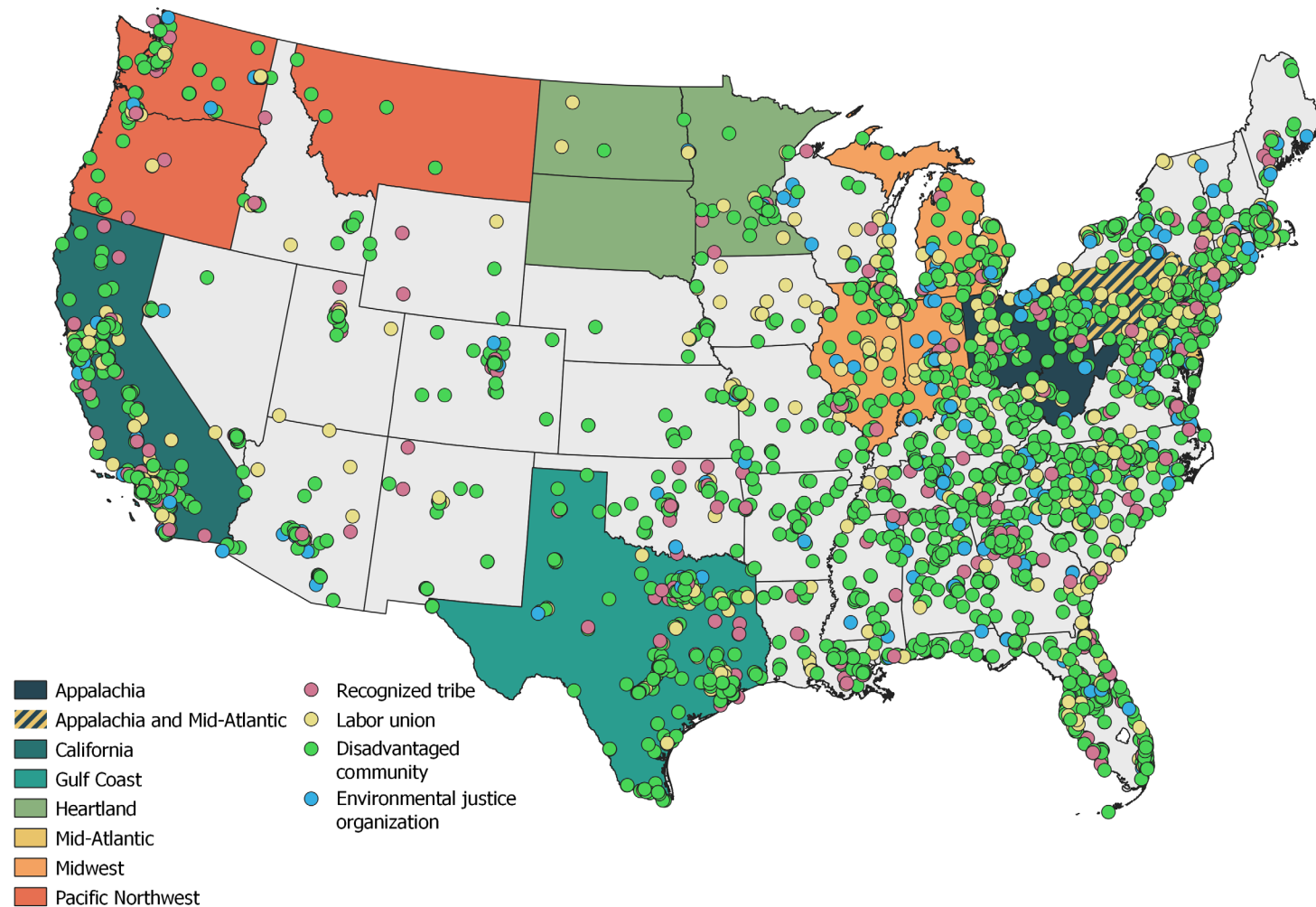
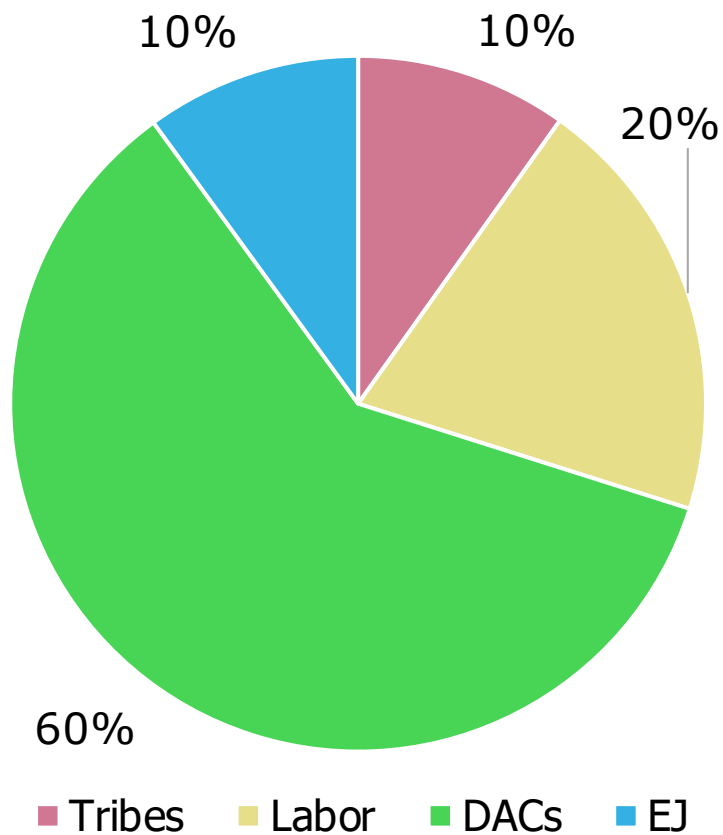
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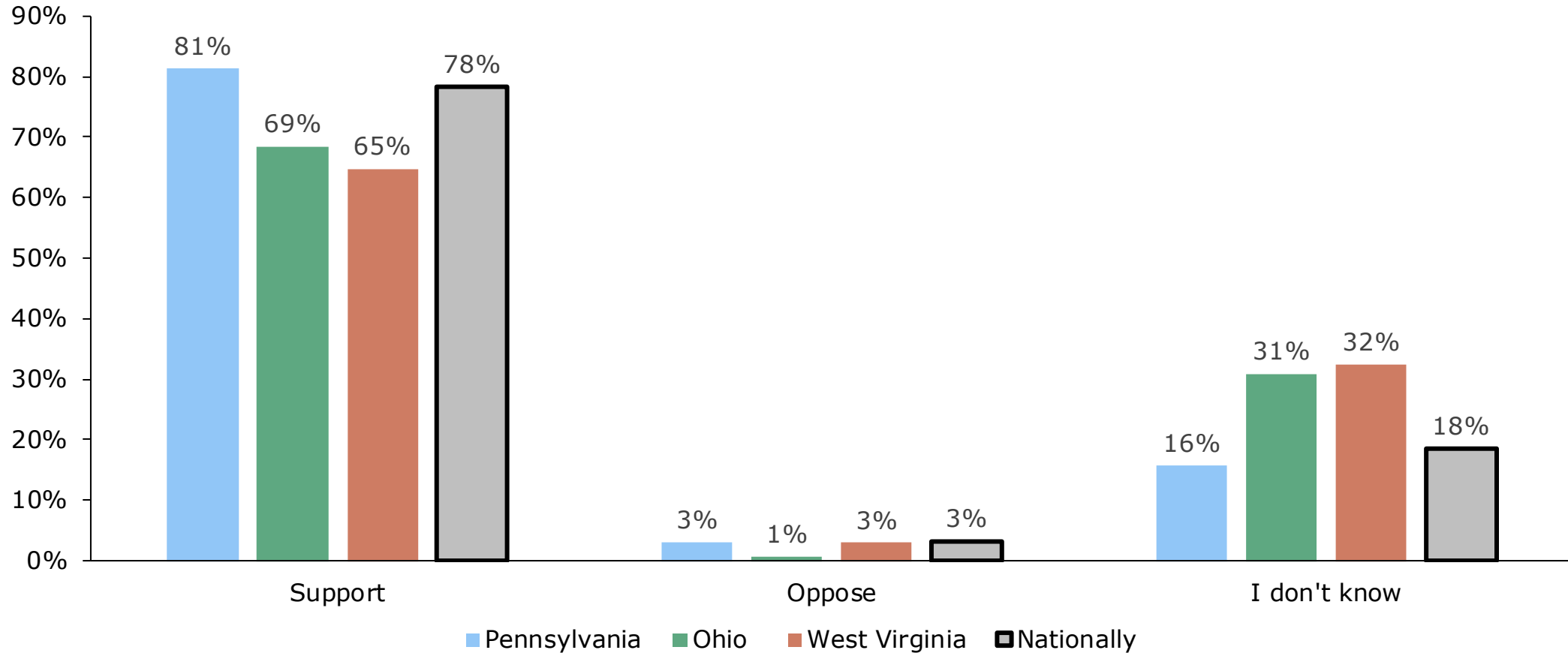


Community Perspectives on Hydrogen Hubs: Regional Findings from EFIF's National Surveys

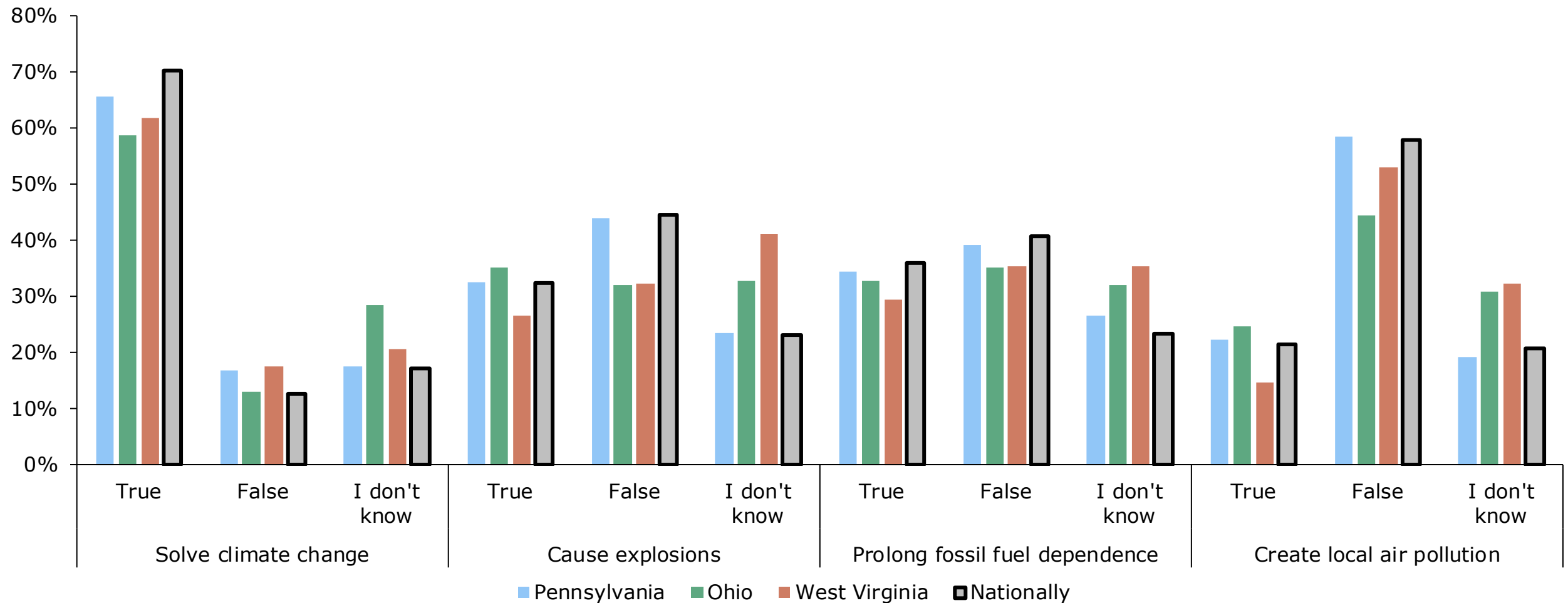
~5,000 survey respondents cover a range of communities and geographies.



West Virginians and Ohioans reported lower levels of support than the national average.



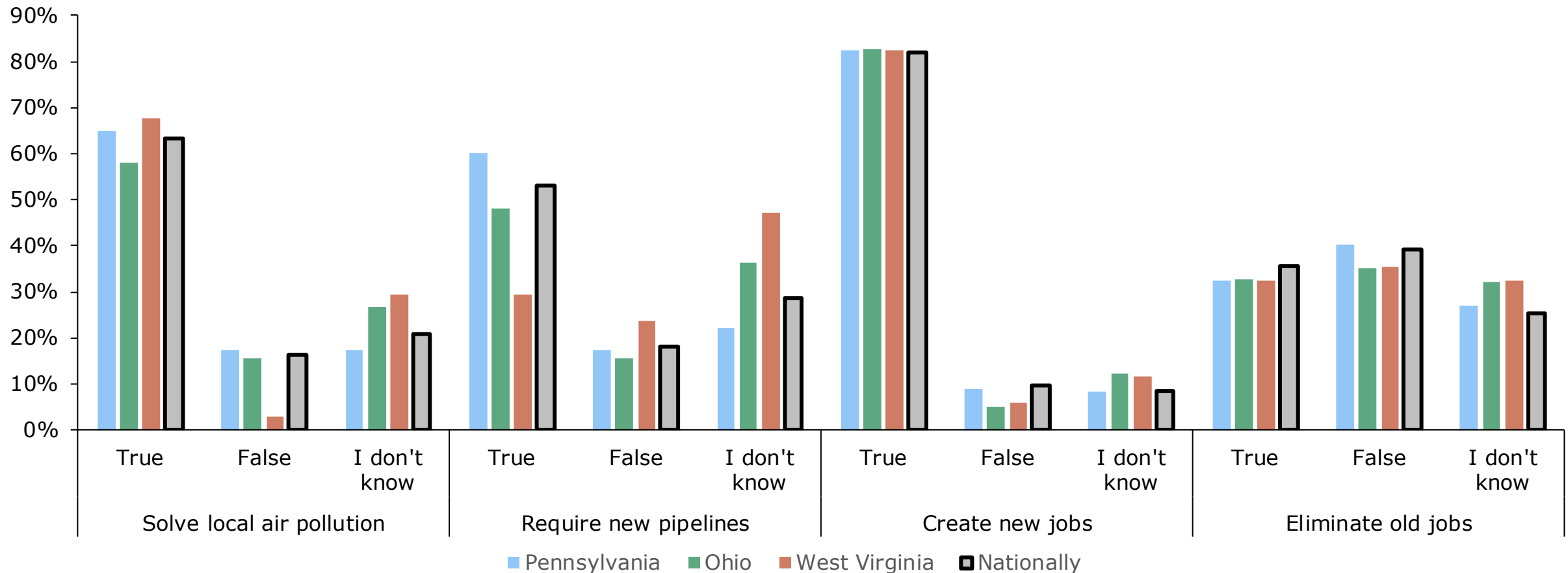
West Virginians and Ohioans were more likely to be unsure if hydrogen would solve climate change, cause explosions, prolong fossil fuels, and create pollution.



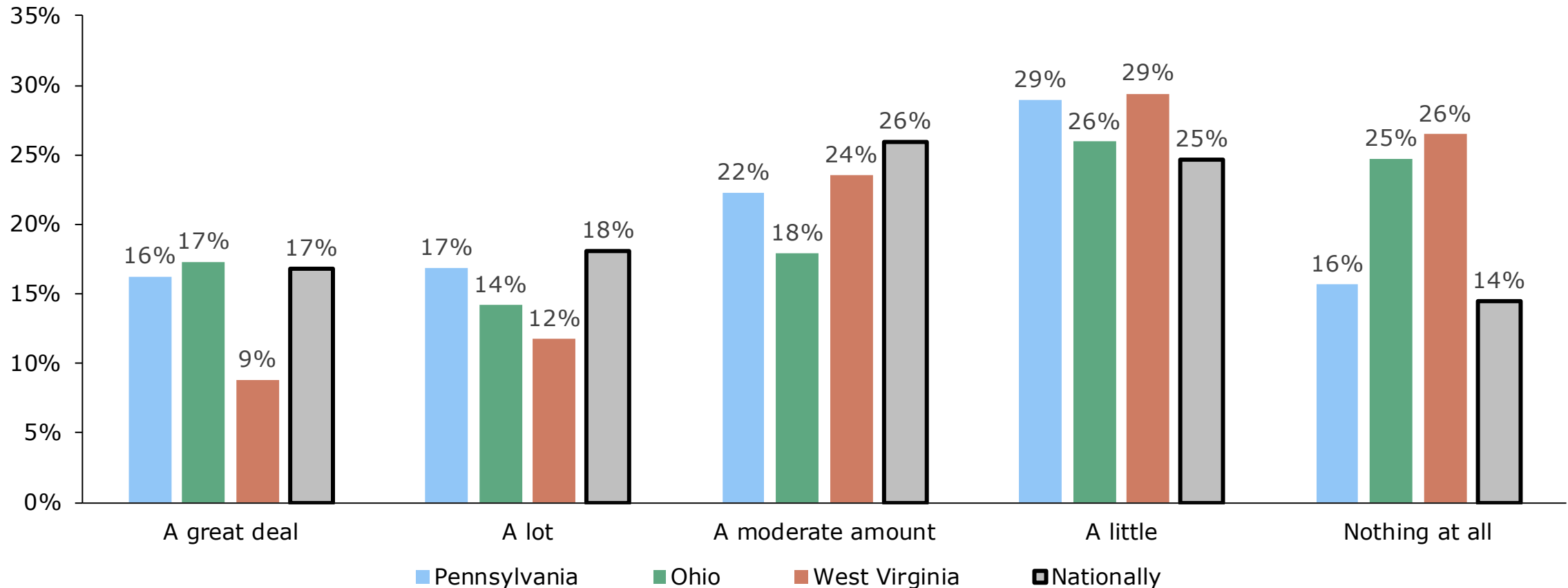
West Virginia and Ohio respondents were more unsure of whether hydrogen would require new pipelines, solve local air pollution, create new jobs, and eliminate old jobs.



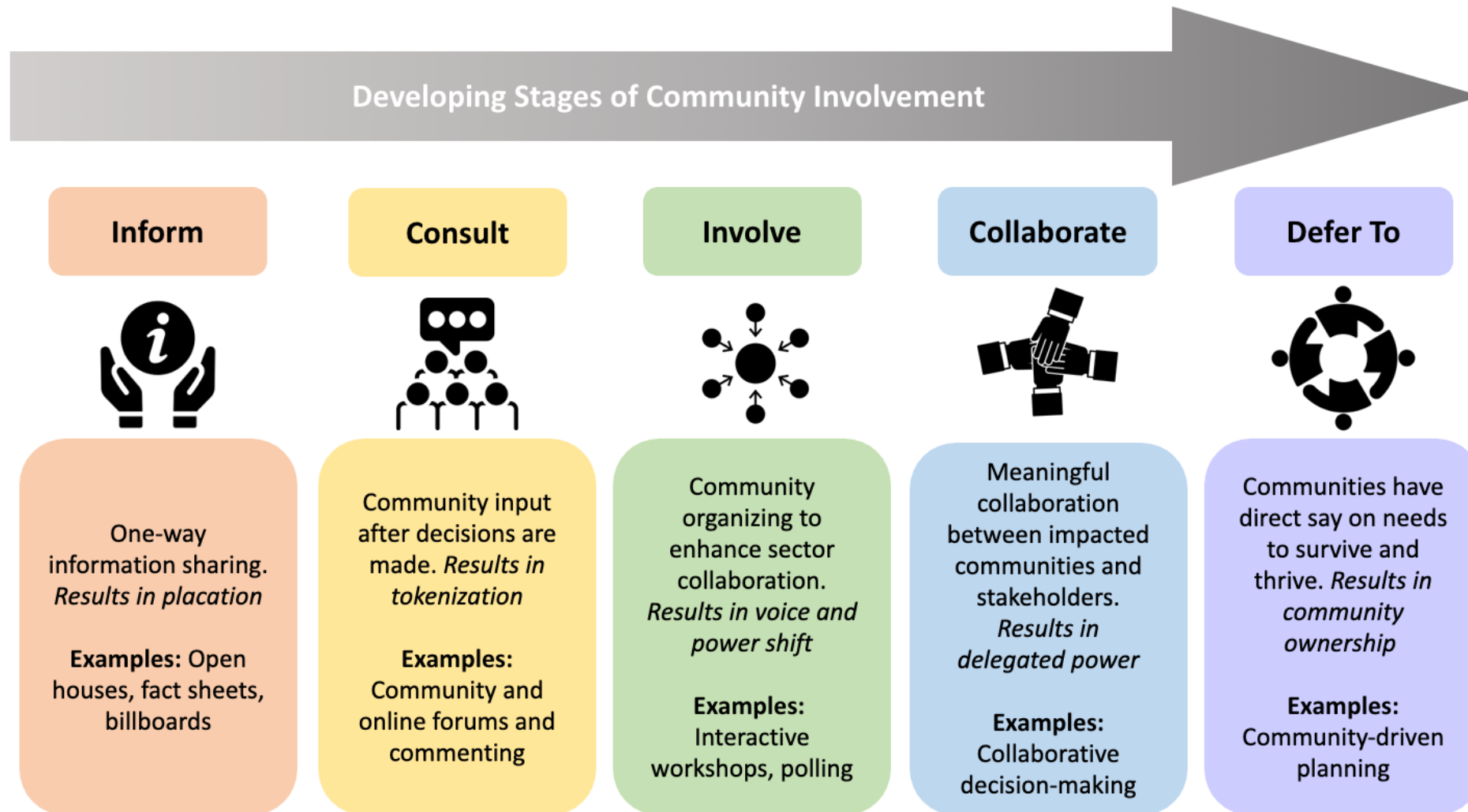
In general, do you think the following statements about hydrogen energy are true or false?



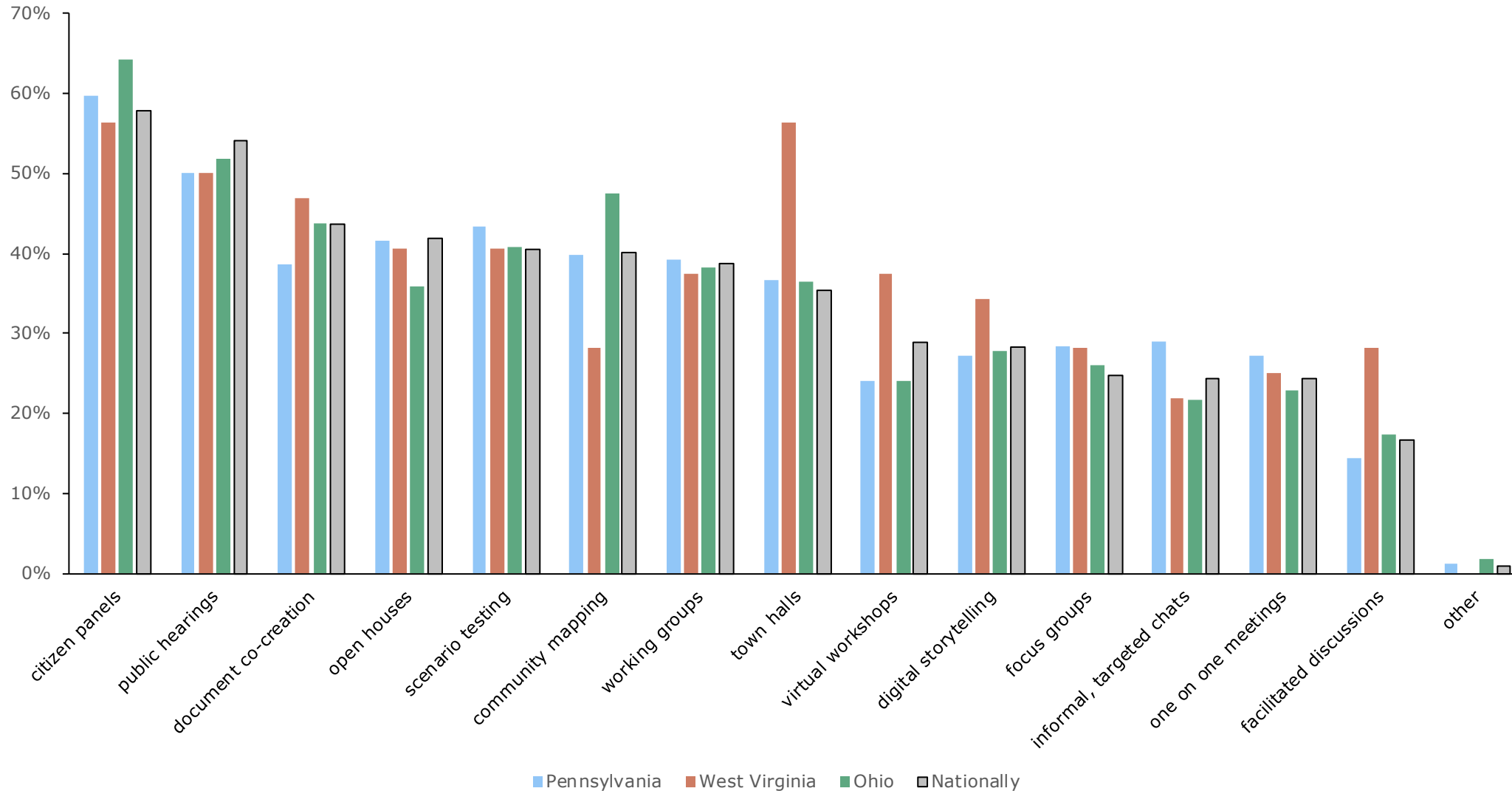
West Virginians reported knowing less about hydrogen than Pennsylvanians or Ohioans.



Community engagement methods fall along a spectrum, depending on the level of input from communities.



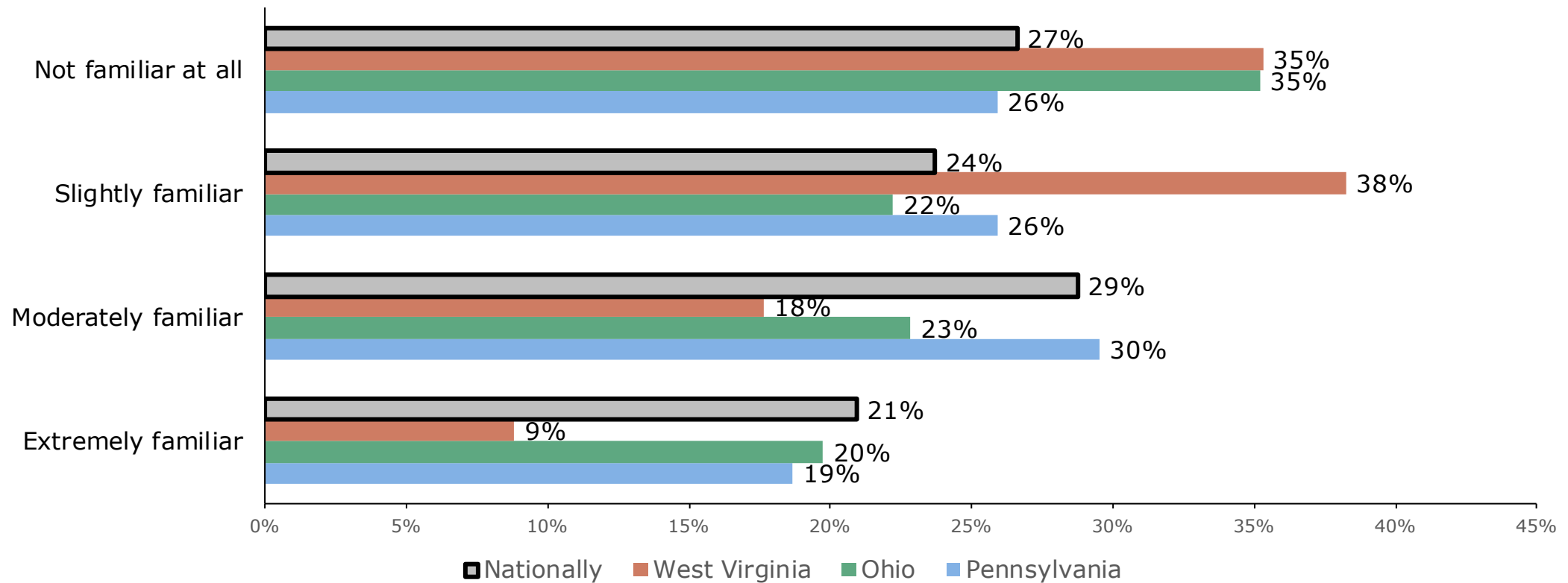
Preferred engagement methods vary by state.



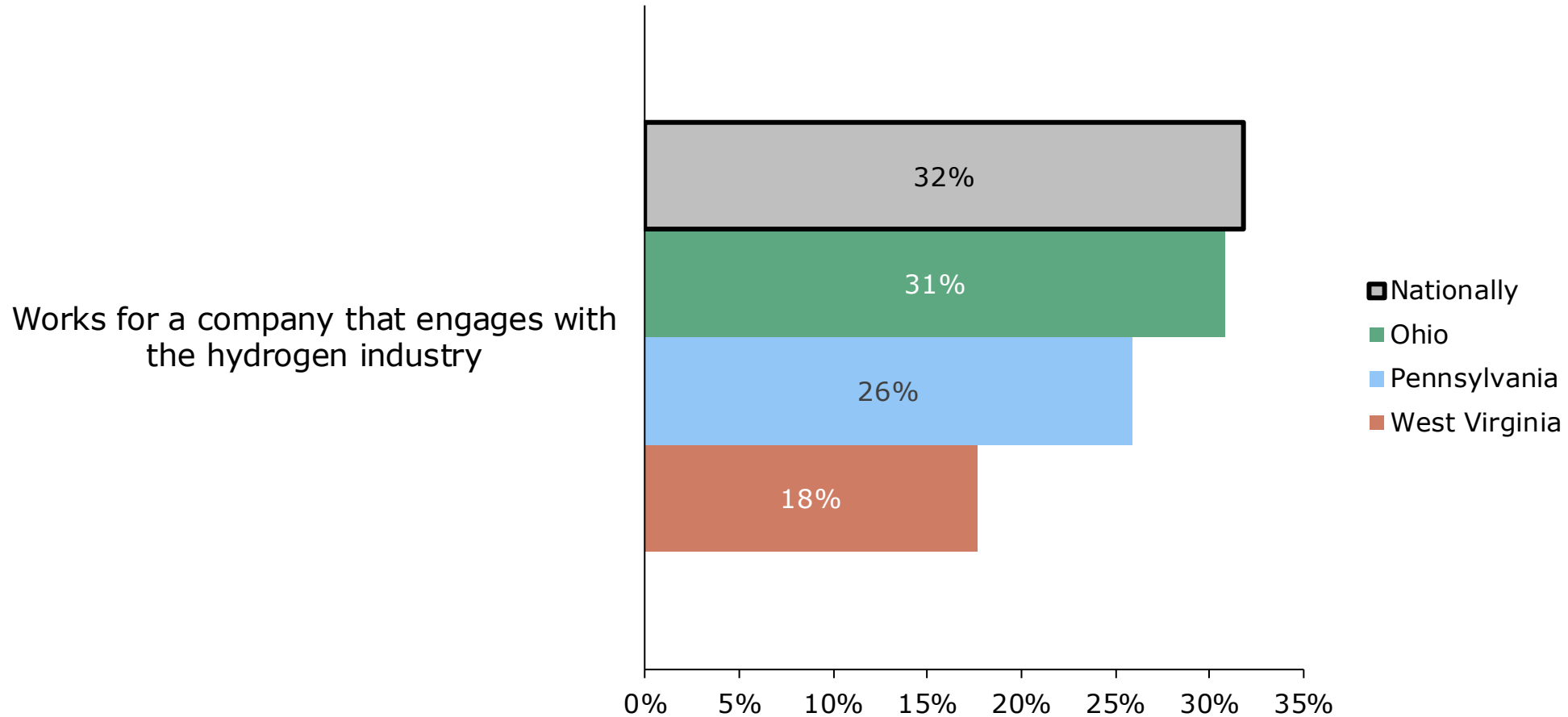
Scenario testing joins the top 3 for PA; community mapping for OH; and town halls were top choice for WV.

West Virginians knew the least about CBPs, while Pennsylvanians were most closely aligned with the national average.

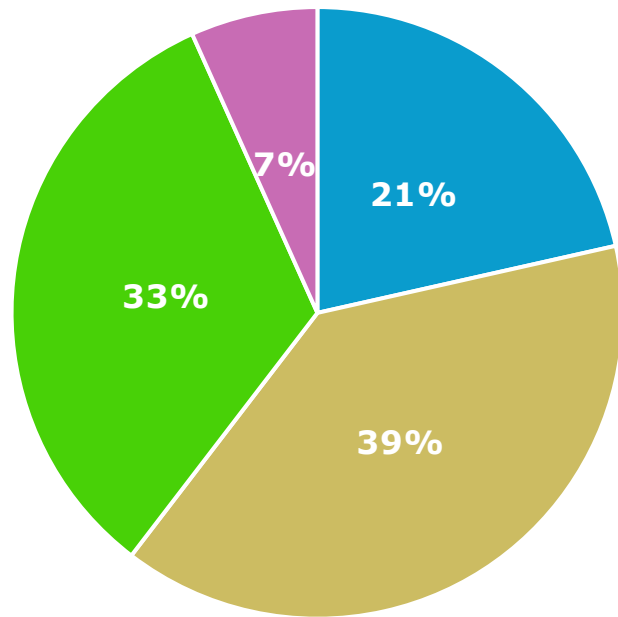
How familiar are you with the concept of a Community Benefits Plan (CBP)?



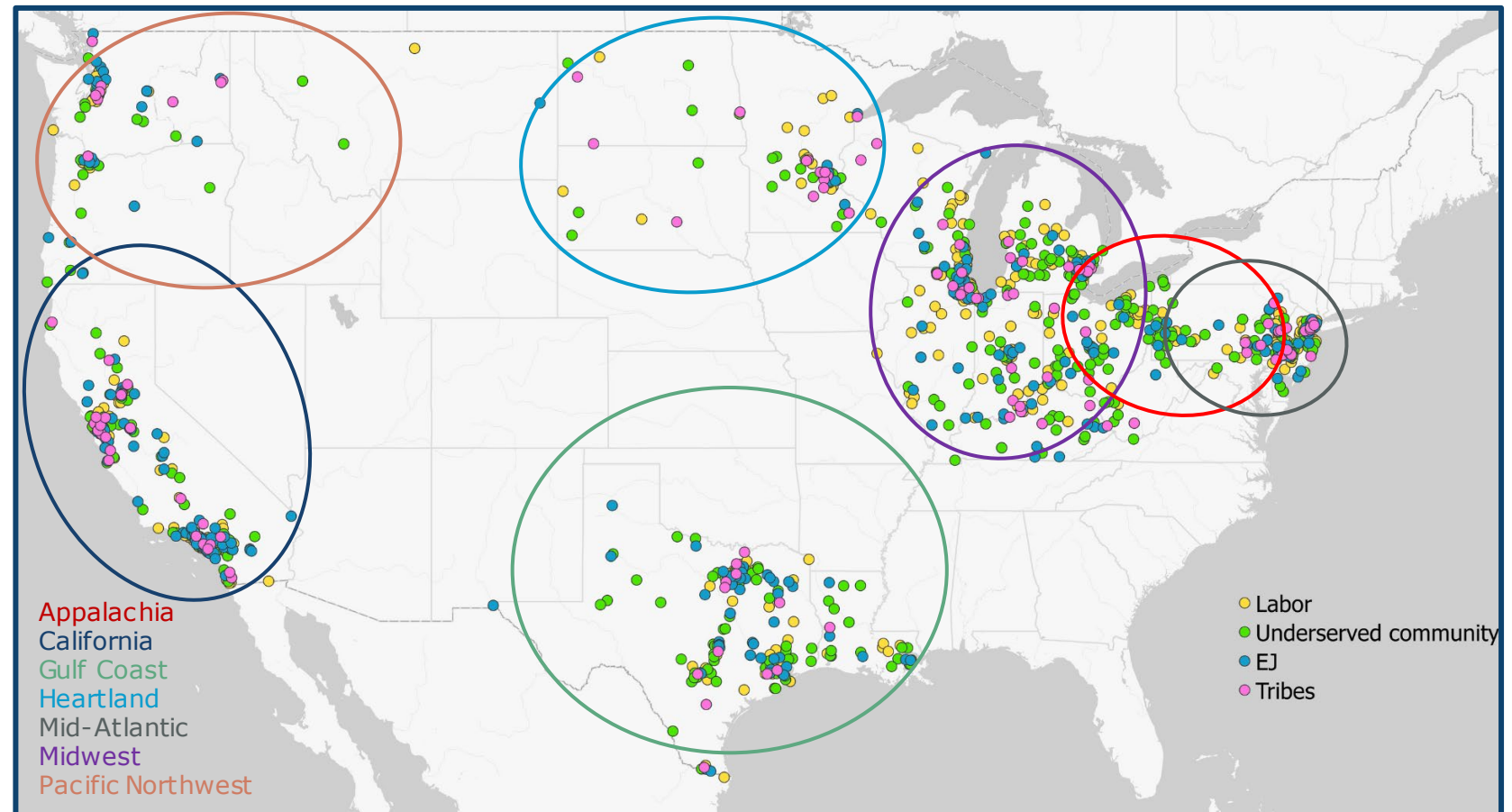
Respondents from West Virginia and Pennsylvania reported lower levels of employment in hydrogen-adjacent industries.



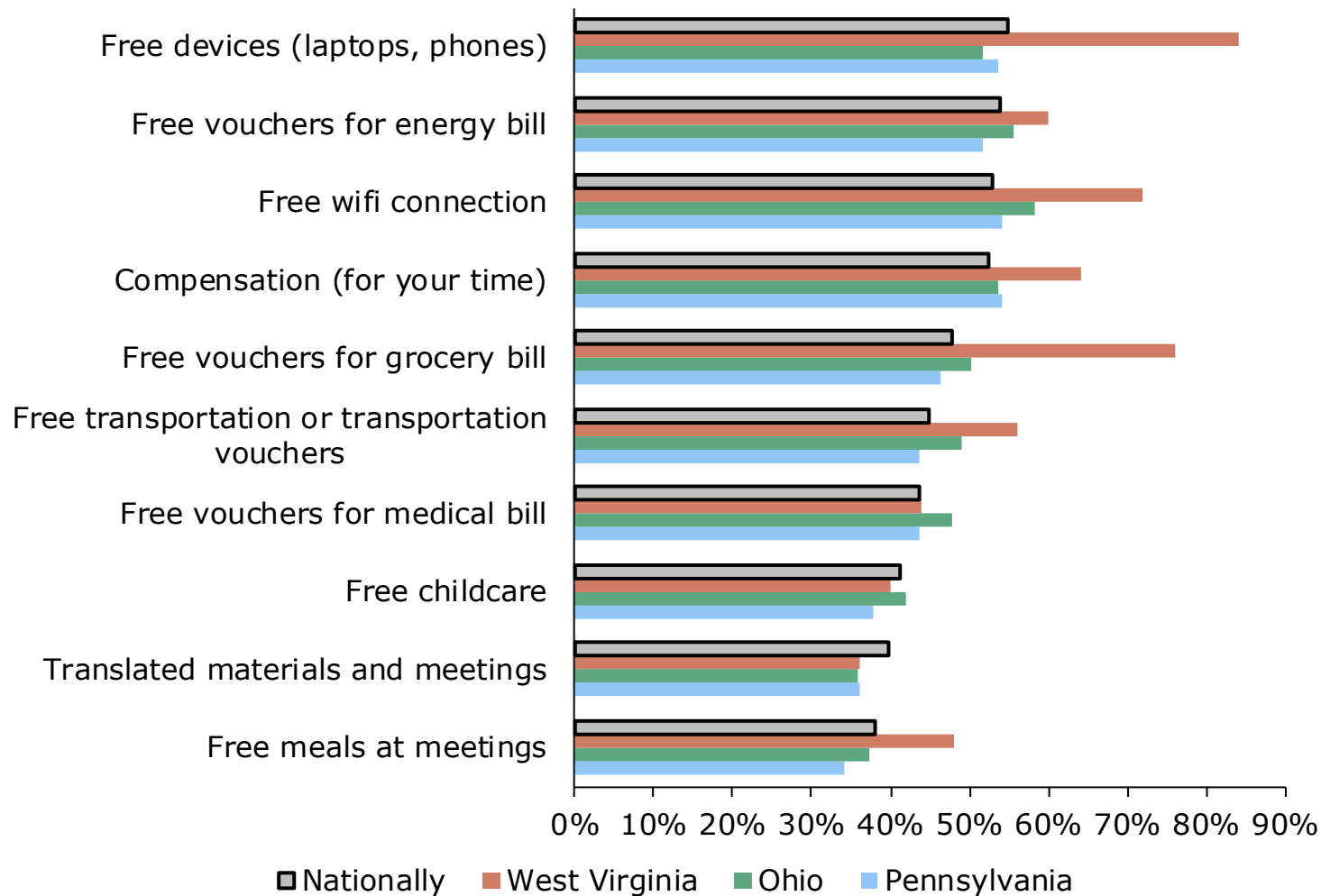
~3000 survey respondents covering a range of communities and geographies.



- Environmental justice organization
- Labor group
- Underserved community
- Recognized Tribe



Pennsylvanians, West Virginians, and Ohians have unique needs for engagement.

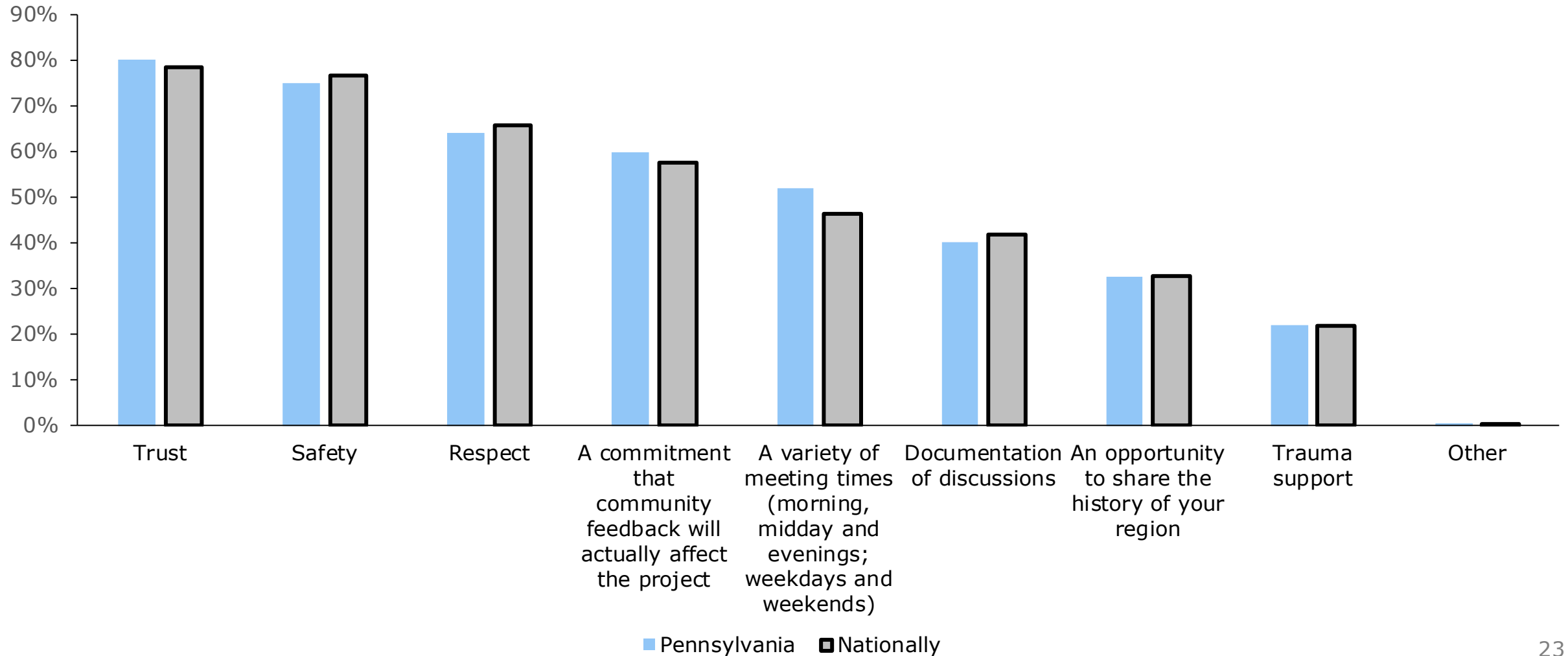


Pennsylvanians say free wifi connection and compensation will help them engage.

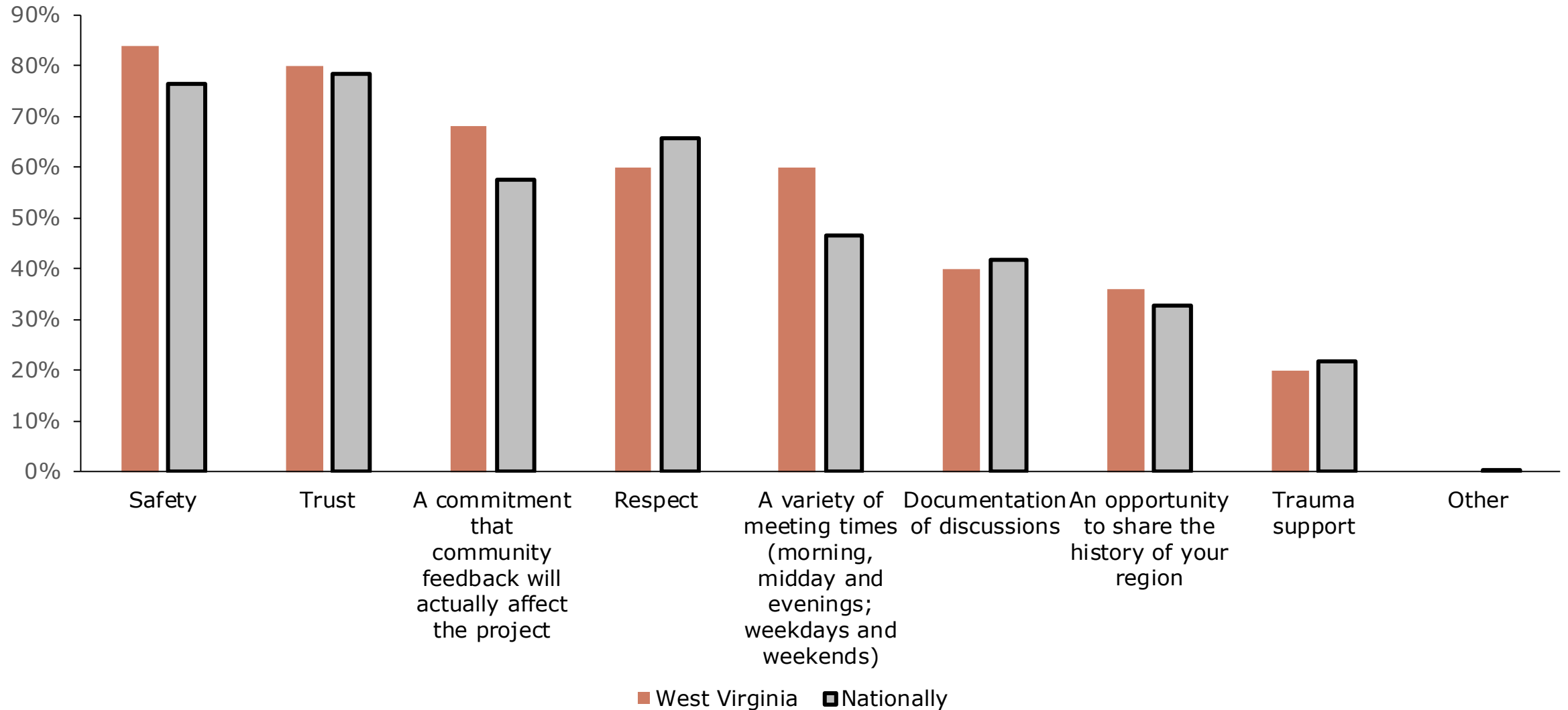
West Virginians say free devices and grocery vouchers will help them engage.

Ohioans say free wifi connection and energy bill vouchers will help them engage.

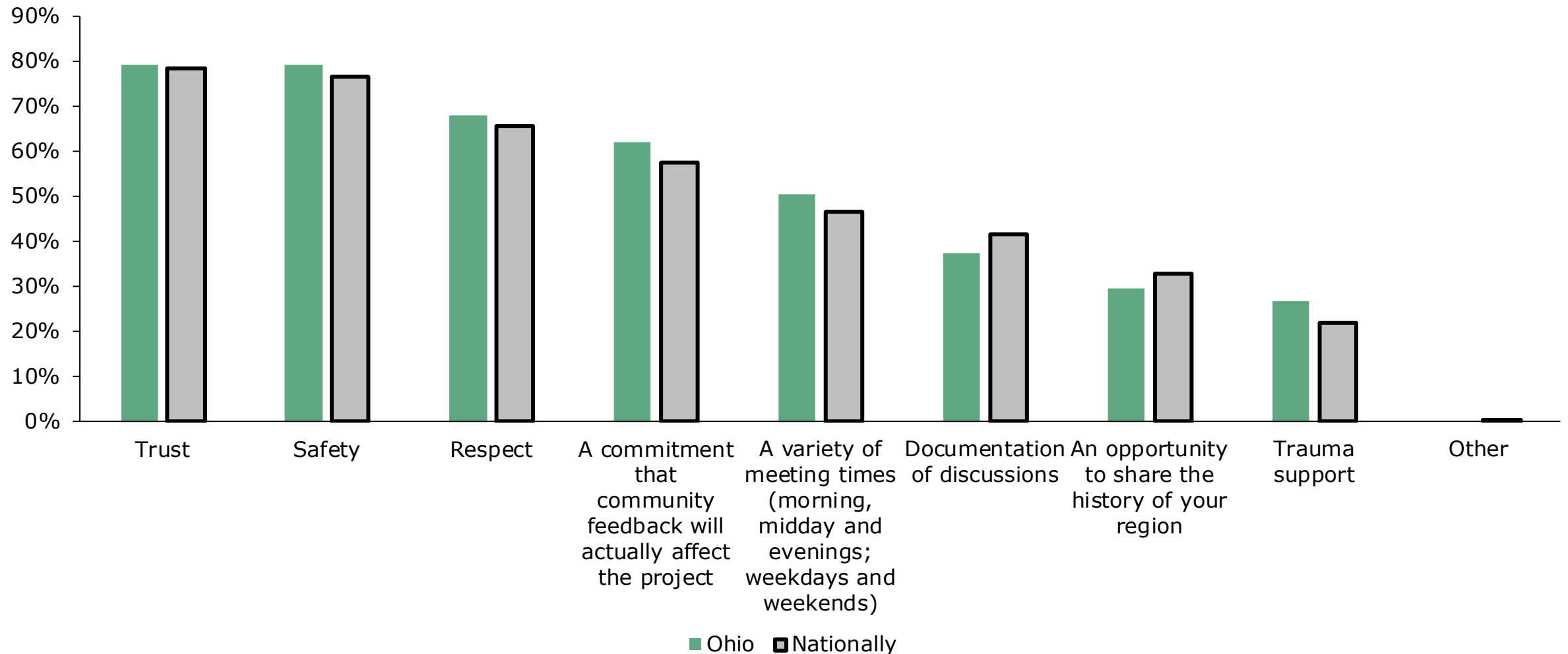
Pennsylvanians say trust and safety will help them engage, consistent with the nation writ large.



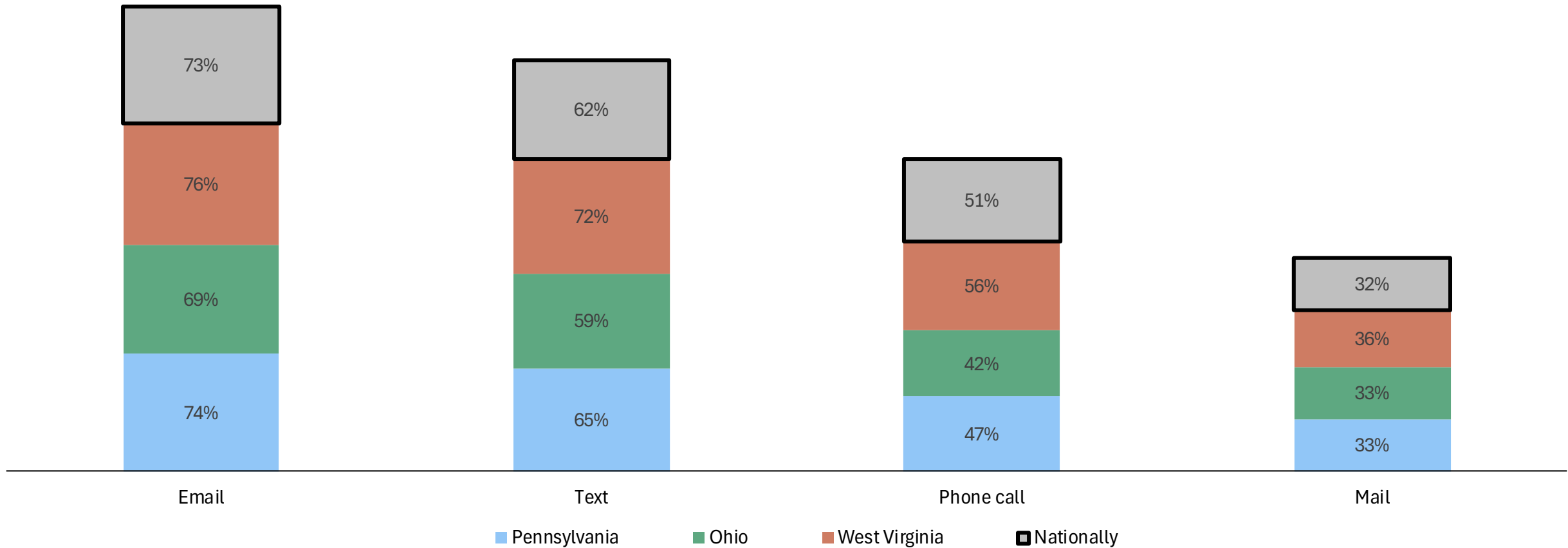
West Virginians agree on the importance of trust and safety for engagement.



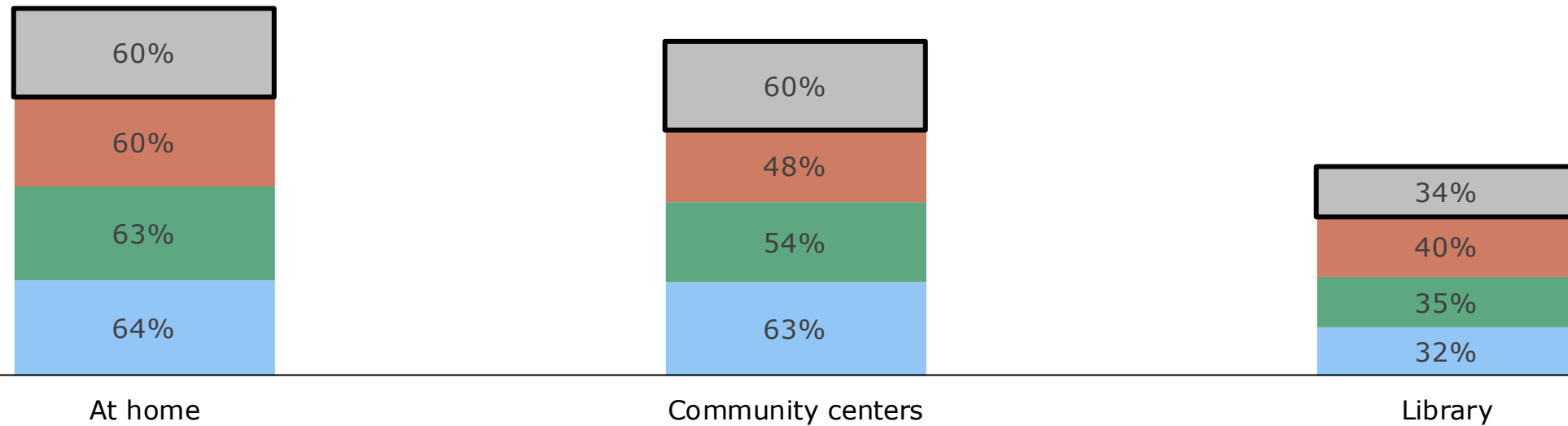
Ohioans say trust and safety will help them engage, consistent with the national average.



Consistent with the national average, email and text are the preferred ways to be reached.

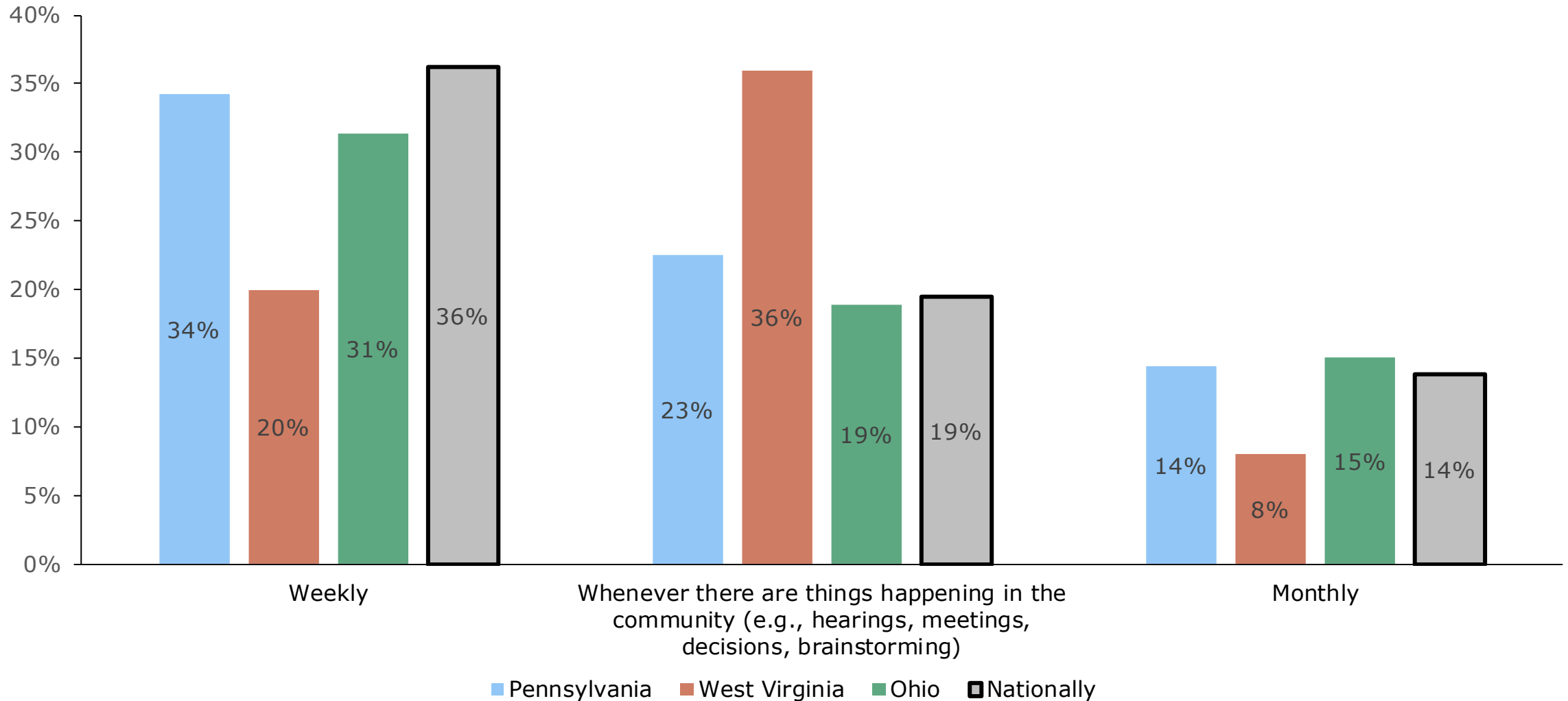


Respondents prefer to be reached at home and in community centers.

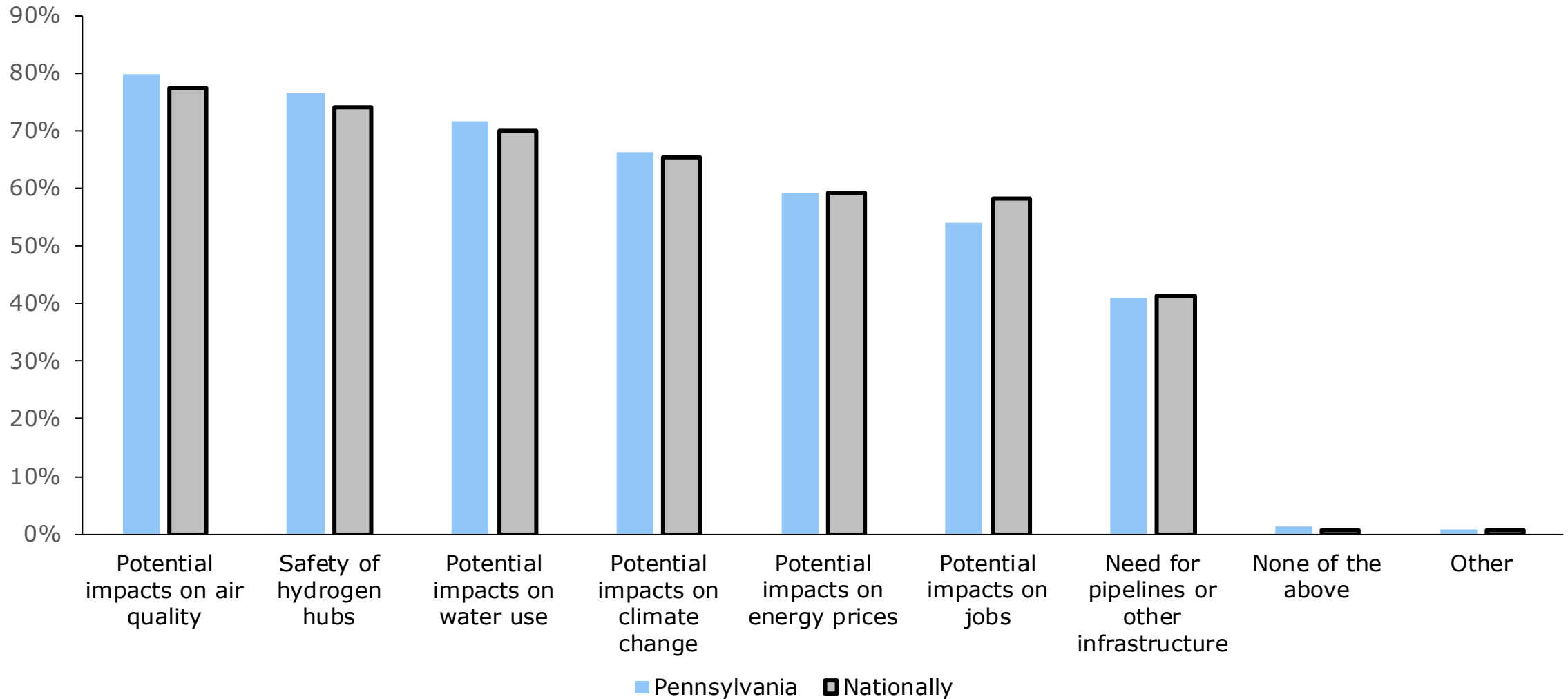


■ Pennsylvania ■ Ohio ■ West Virginia ■ Nationally

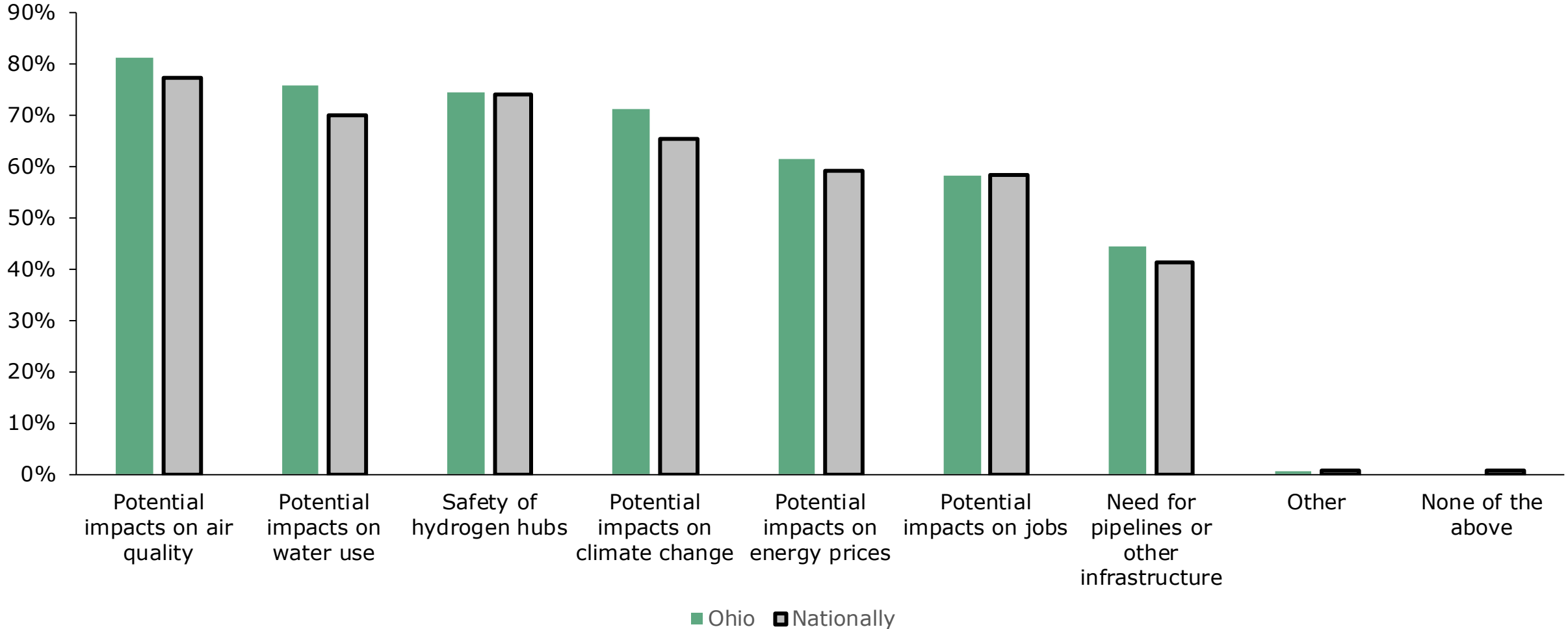
Respondents in West Virginia are more inclined to want updates when things are happening in the community.



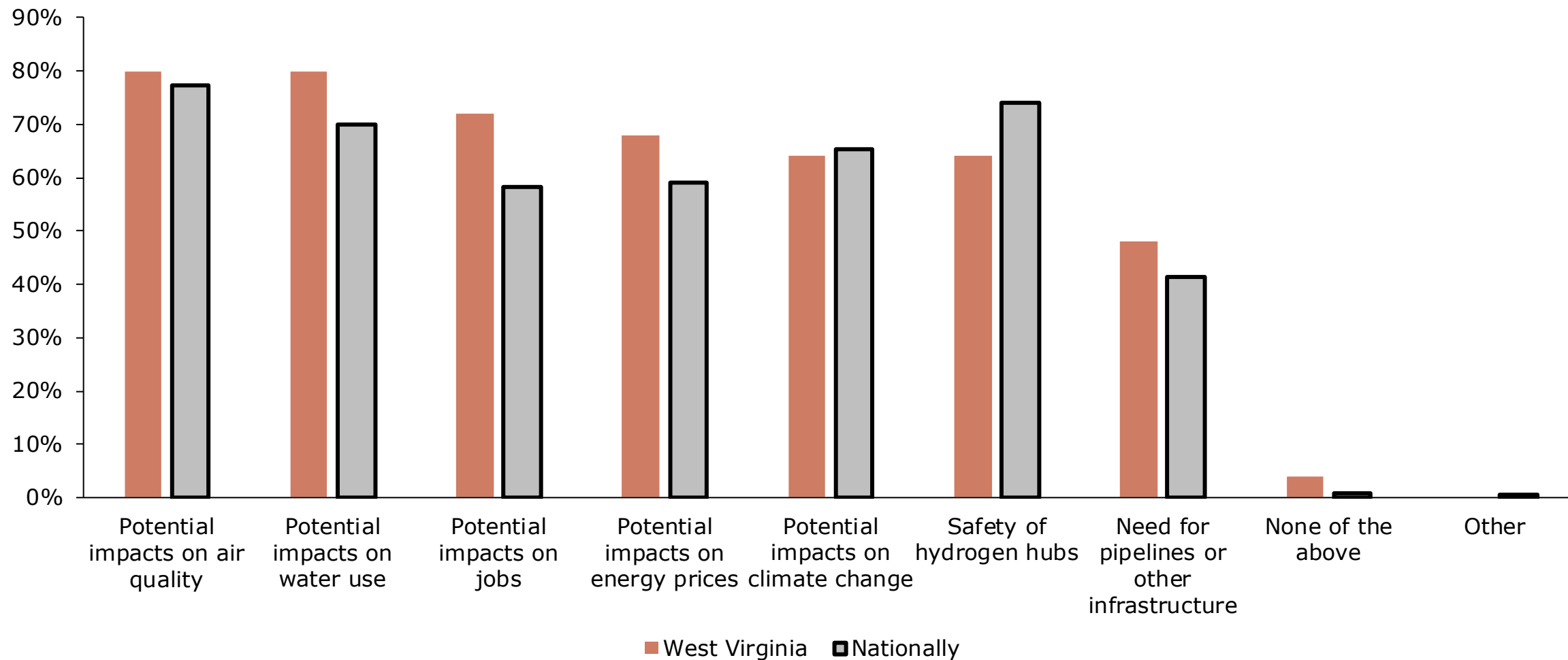
Pennsylvanians' research preferences are aligned with the national average.



Ohioans' research preferences are aligned with the national average, with a slight preference for information about impacts on water use.

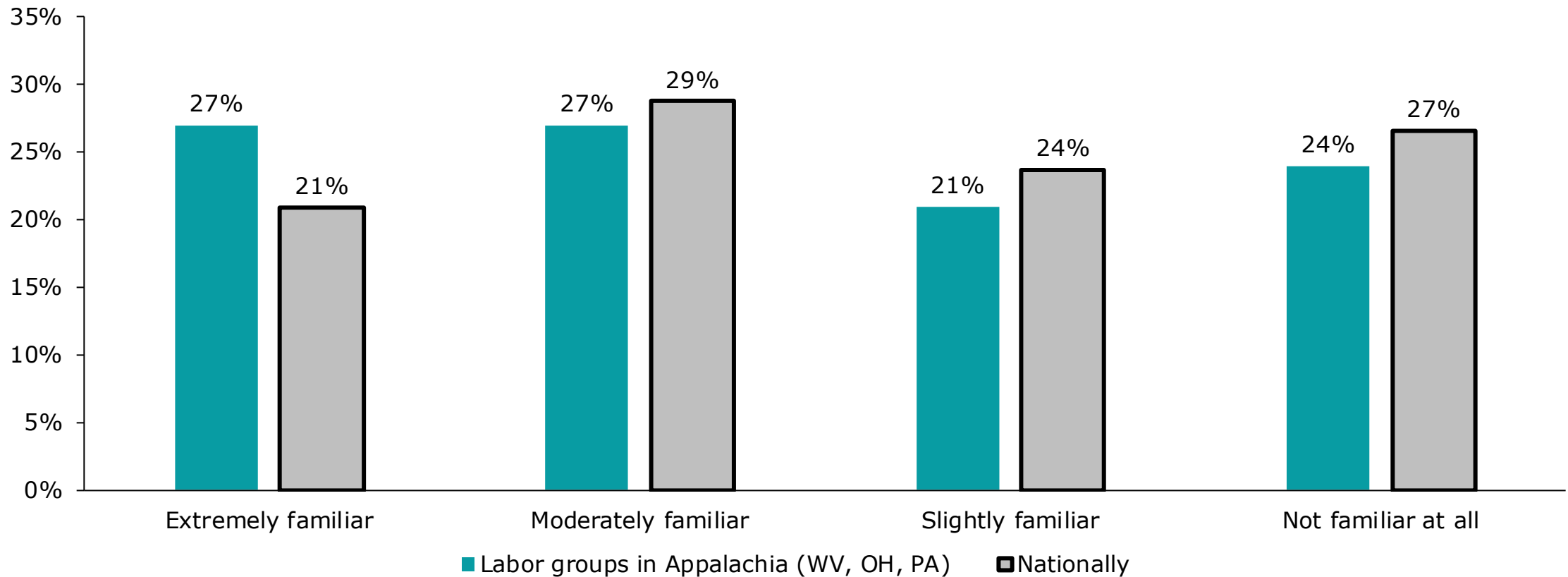


West Virginians are less concerned about safety, and more concerned about air quality, water use, and jobs.



Respondents from labor groups in Appalachia reported being 'extremely familiar' with CBPs, above the national average.

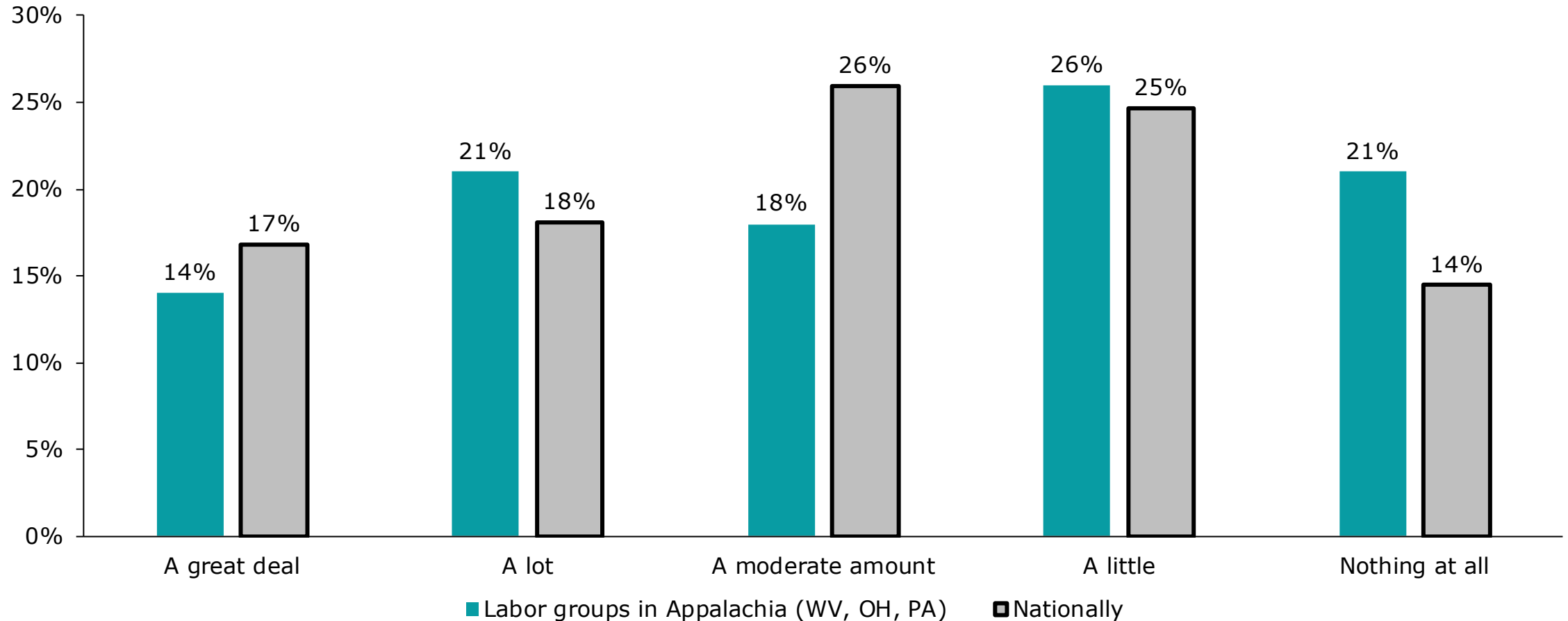
How familiar are you with the concept of a Community Benefits Plan (CBP)?



*'Nationally' refers to the national average, which includes respondents from disadvantaged communities, EJ organizations, Tribal Nations, and labor groups.

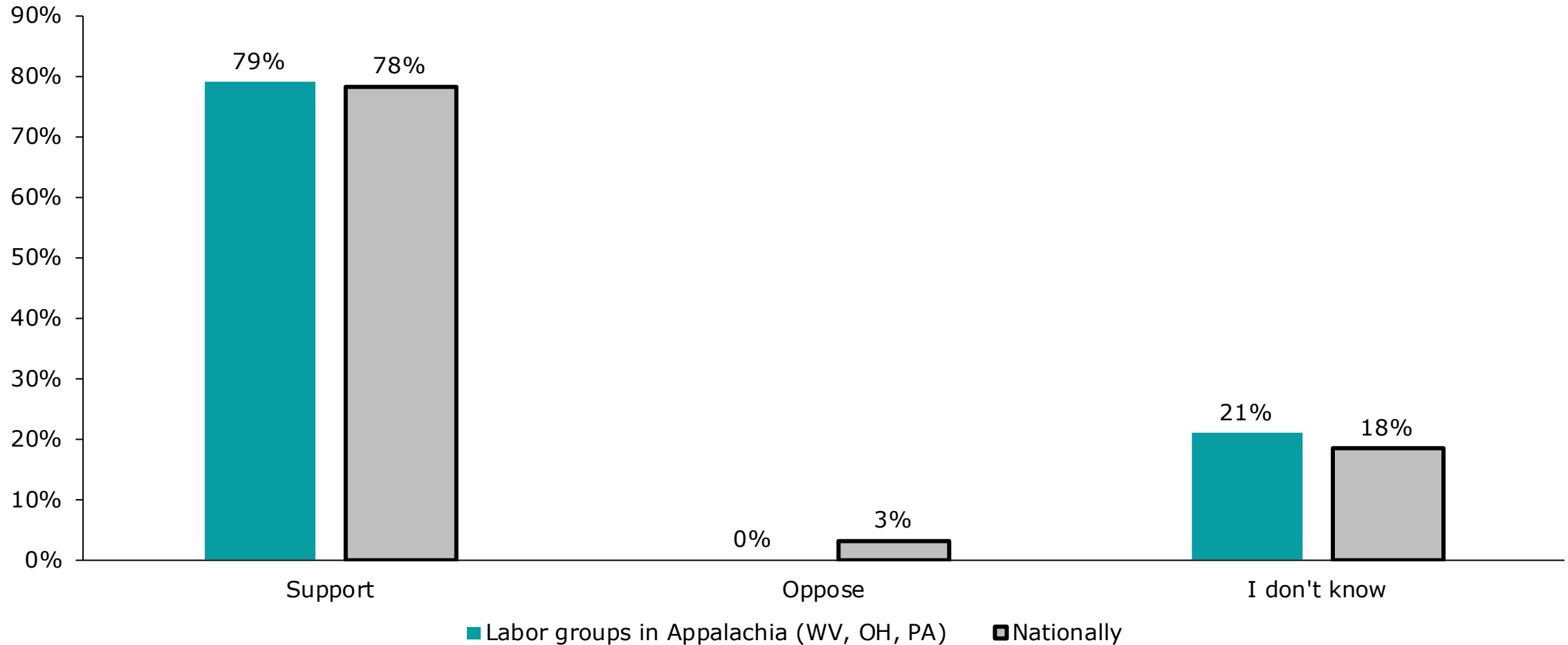
Respondents from labor groups in Appalachia were generally less familiar with hydrogen compared to the national average.

How much do you know about hydrogen energy?



*'Nationally' refers to the national average, which includes respondents from disadvantaged communities, EJ organizations, Tribal Nations, and labor groups.

Respondents from labor groups in Appalachia generally support hydrogen, consistent with the national average.



*'Nationally' refers to the national average, which includes respondents from disadvantaged communities, EJ organizations, Tribal Nations, and labor groups.

Other findings from labor groups in Appalachia (WV, OH, PA)



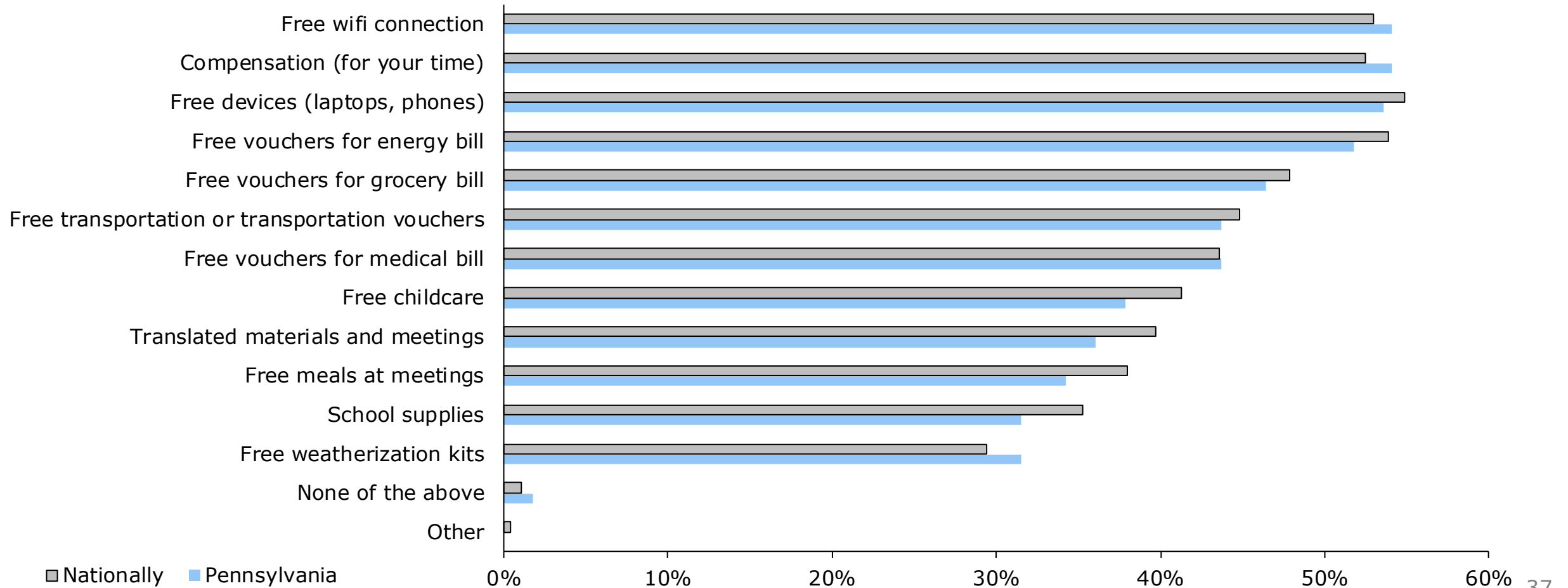
- Citizen panels were the most preferred engagement method, at 61%, followed by public hearings at 51%.
- 85% of respondents from labor groups in Appalachia said a binding agreement would make them more likely to support hydrogen hubs, and 86% said binding agreements would make them more likely to consider it a fair process.
- 85% of respondents from labor groups in Appalachia believe hydrogen can bring new jobs, as compared to 82% nationally. 45% said it would not eliminate old jobs, as compared to 39% nationally.
- 59% of respondents believe hydrogen can solve climate change. 68% believe it can solve local air pollution problems.

Other findings from labor groups in Appalachia (WV, OH, PA)

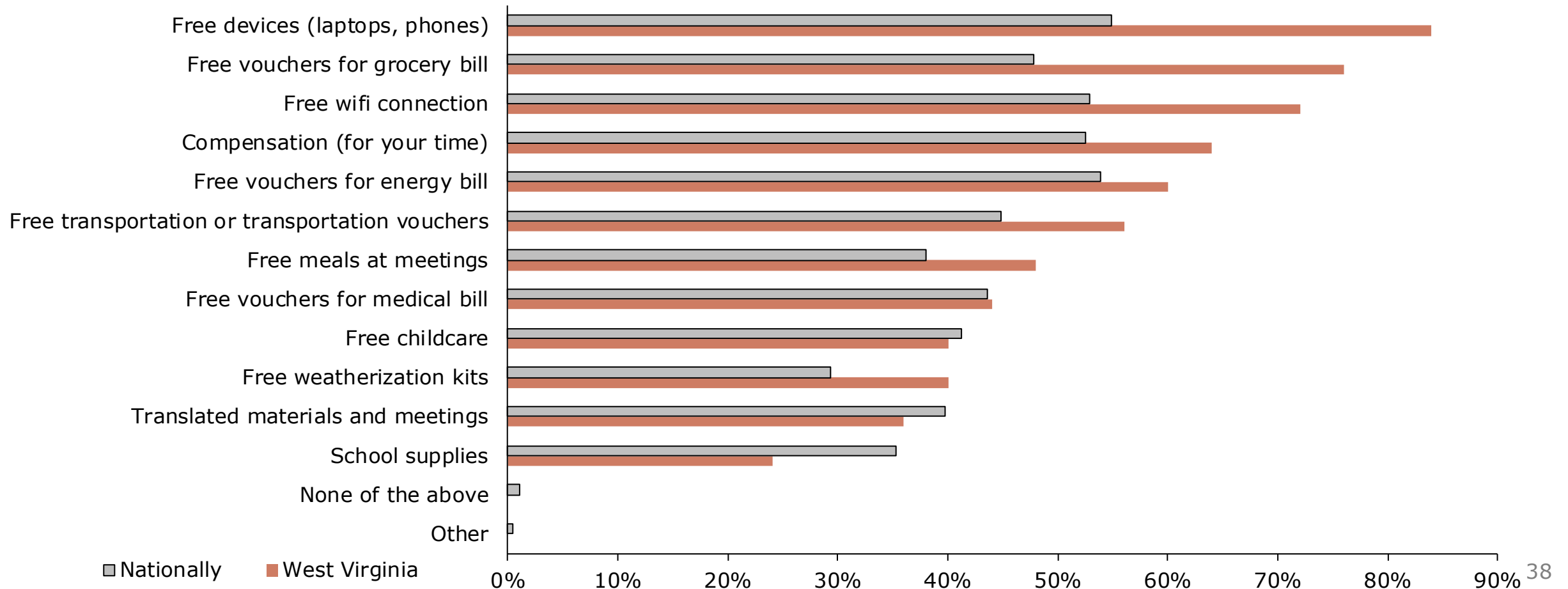


- Free wifi (50%) and free vouchers for energy bills (53%) were the top need for labor groups from Appalachia to engage.
- Trust (76%) and safety (79%) were also cited as the top needs to engage, consistent with the national average.
- Labor groups from Appalachia want to know more about the potential impacts on air quality (77%) and the safety of hydrogen hubs (70%).
- Labor groups from Appalachia want to be reached via email (76%) and text (61%).
 - They want to be reached at home (63%) and at community centers (55%).
 - They want to be reached when there are things happening in the community (20%) and weekly (30%).
 - These are consistent with the national average.

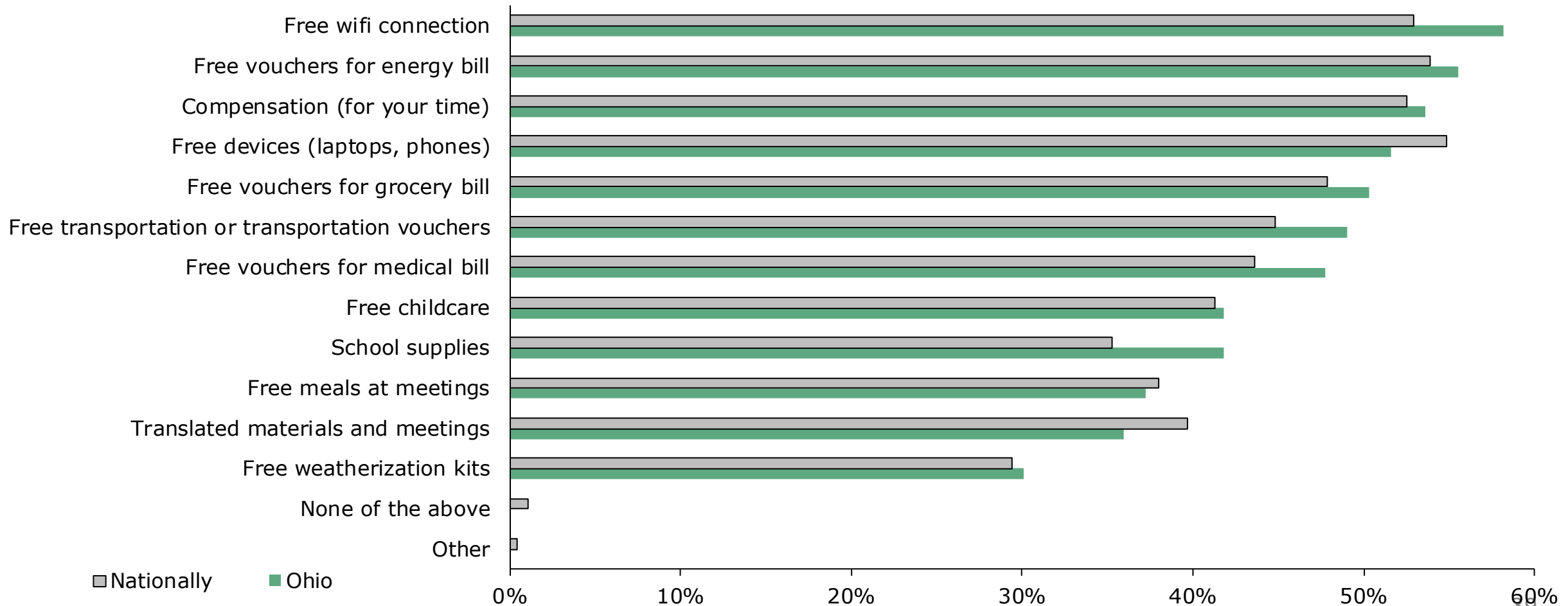
Pennsylvanians say free wifi connection and compensation will help them engage.



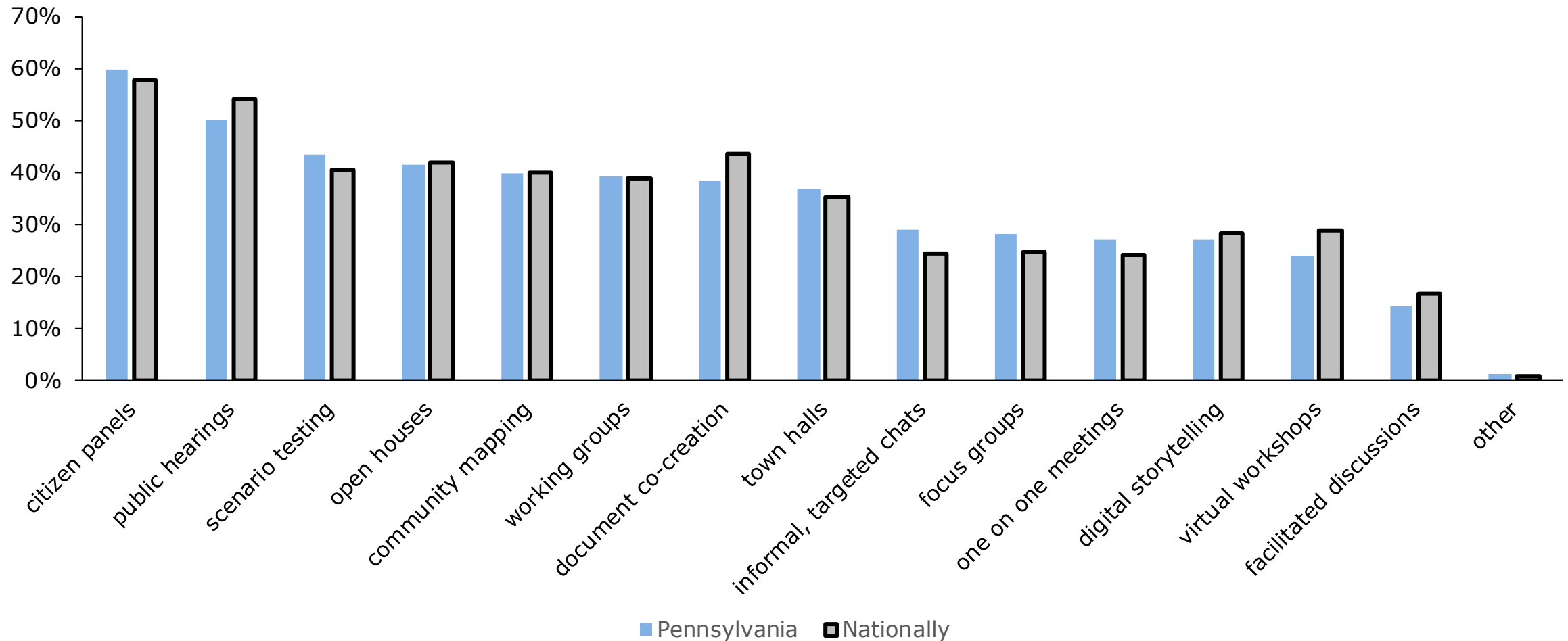
West Virginians say free devices and grocery vouchers will help them engage.



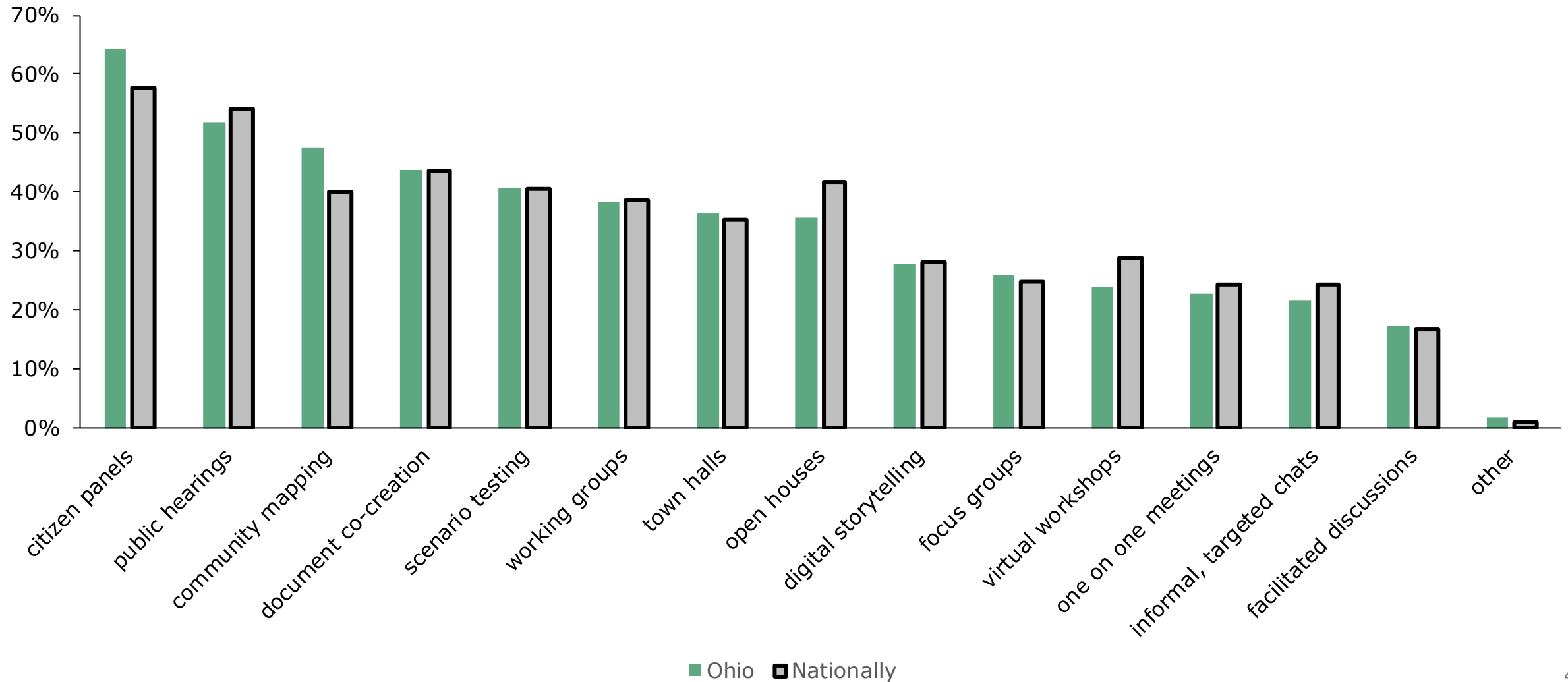
Ohioans say free wifi connection and energy bill vouchers will help them engage.



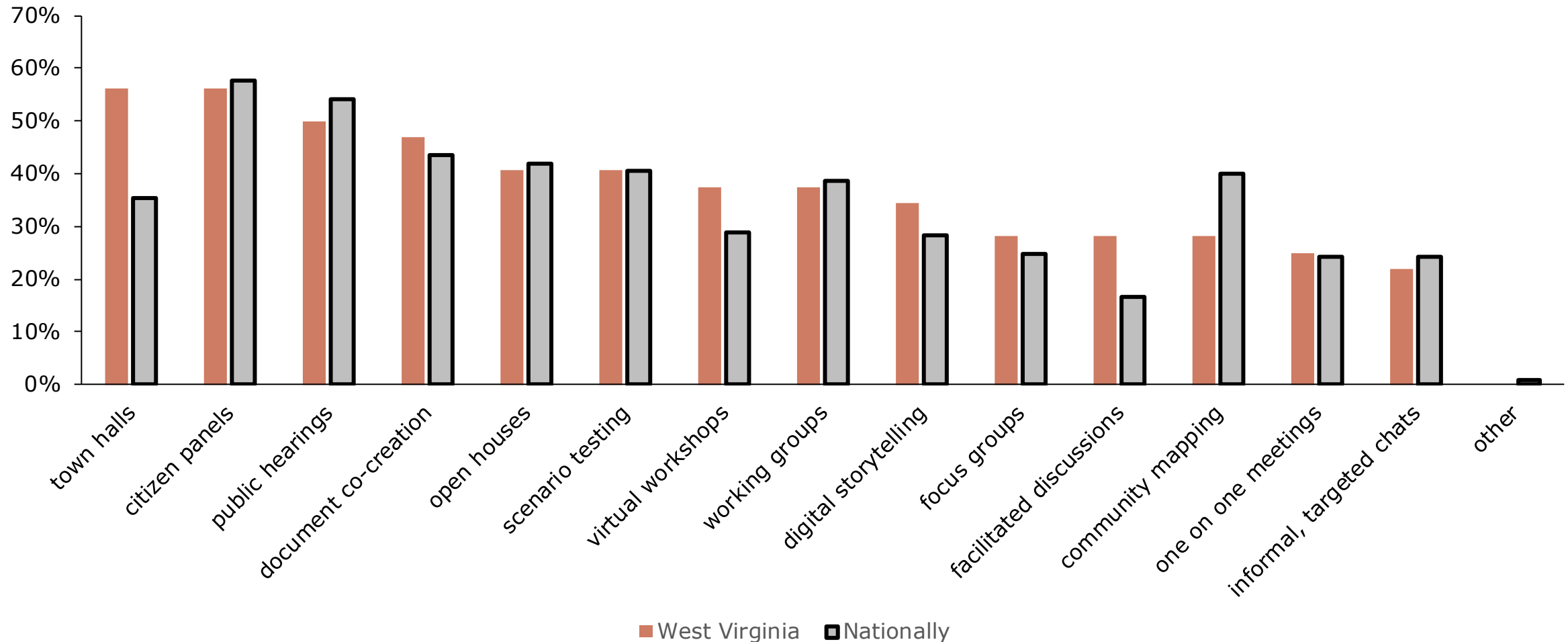
Pennsylvania's top engagement methods are generally consistent with the national average, though scenario testing joins the top 3 methods for the state.



Ohio's top engagement methods are generally consistent with the national average, though community mapping joins the top 3 methods for the state.



West Virginia respondents reported town halls as their top engagement method.



Thank you for your participation



Today's Take Away's

- In-depth analysis of community attitudes towards hydrogen hubs and engagement strategies.
- Revelation of preferred modes of engagement between communities and hydrogen developers.
- Regional Analysis and Insights

Agenda

- NETL RWFI and the Hydrogen Hub Webinar Series – Anthony Armaly, RWFI Lead
- Building Stronger Community Engagement in Hydrogen Hubs- Madeline Schomburg, Director of Research, EFI
- **Workforce Roundtable Discussion**

To learn more and to keep up to date on other events

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