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</table>
California Energy Commission
Business Meeting
March 17, 2021
10:00 a.m.
Pledge of Allegiance
Keep California Healthy

- Wash
- Clean
- Cover
- 6 Feet

covid19.ca.gov
Sign up to get notified when it's your turn to get the COVID-19 vaccine.
Remote Compliance

Business Meeting held remotely, consistent with Executive Orders N-25-20 and N-29-20 and the recommendations from California Department of Public Health to encourage physical distancing to slow spread of COVID-19.

For remote participation instructions visit CEC’s Business Meetings webpage:
https://www.energy.ca.gov/proceedings/business-meetings

If Zoom’s toll-free phone numbers don’t work:
• Dial: (669) 900-6833
• Meeting ID: 938-6923-0237

If Zoom shuts down, Business Meeting will continue via Verizon.
• Dial: (888) 823-5065
• Passcode: business meeting
Public Comment Instructions

• Pursuant to California Code of Regulations Title 20 §1104(e), any person may make oral comment on any agenda item.

• Comments may be limited:
  • to 3 minutes or less
  • 1 representative per organization

• Any person wishing to comment on information items or reports (non-voting items) shall reserve their comment for the general public comment portion of the meeting agenda.

To comment, dial (888) 823-5065.
Passcode: business meeting

1) Tell Operator: name, organization and item number.
2) Tell Operator if you represent:
   • federal or state legislature;
   • tribal nation or California tribal government;
   • state agency; or
   • county/city government.
3) Spell your first and last name.
4) Do not use speaker phone when talking.
5) Mute Zoom while calling to comment.
Item 1a. – g.: Consent Calendar

a. MIDWAY SUNSET COGENERATION PROJECT (85-AFC-03C) Contact: Mary Dyas.
b. SOUTHERN CALIFORNIA PUBLIC POWER AUTHORITY (21-EPS-01) Contact: Michael Nyberg.
c. SOUTHERN CALIFORNIA PUBLIC POWER AUTHORITY (21-EPS-01) Contact: Michael Nyberg.
d. RCAM TECHNOLOGIES, INC. Contact: Rizaldo Aldas.
e. RCAM TECHNOLOGIES, INC. Contact: Rizaldo Aldas.
f. THE INTERNATIONAL COUNCIL ON CLEAN TRANSPORTATION INC. Contact: Sharon Purewal.
g. CENTER FOR HYDROGEN SAFETY. Contact: Sebastian Serrato.
Item 2: SB 100 Joint Agency Report

March 17, 2021 Business Meeting
Senate Bill 100

Officially titled “The 100 Percent Clean Energy Act of 2018,” Senate Bill 100 (SB 100, De León):

1. Sets a 2045 goal of powering all retail electricity sold in California and state agency electricity needs with renewable and zero-carbon resources.

2. Updates the state’s Renewables Portfolio Standard to ensure that by 2030 at least 60 percent of California’s electricity is renewable.

3. Requires the CEC, CPUC, and CARB to use programs under existing laws to achieve 100 percent clean electricity and issue a joint policy report on SB 100 by 2021 and every four years thereafter.
California’s 2018 Greenhouse Gas Emissions

- 24% Industrial
- 9% Electricity (In-State)
- 6% Electricity (Imports)
- 8% Agriculture
- 5% Commercial
- 7% Residential
- 41% Transportation

Source: California Air Resources Board
Benefits of 100% Clean Energy

Improves Public Health

The phaseout of fossil fuel-generated electricity is expected to reduce criteria air pollution and related deaths and illnesses.

Advances Energy Equity

Disadvantaged communities—low-income neighborhoods that have historically suffered poor health, dirty air and other burdens—will reap the highest health benefits from clean electricity.

Restores and Creates Clean Energy Jobs

SB 100-driven growth will restore thousands of clean energy jobs lost during the pandemic and create thousands of new high-quality clean energy jobs.
The 2021 SB 100 Joint Agency Report

The 2021 report is a first step to evaluate the challenges and opportunities in implementing SB 100.

It includes an initial assessment of the additional energy resources and the resource building rates needed to achieve 100 percent clean electricity, along with the associated costs.

The estimates in this report will change over time as additional factors, such as system reliability, land use, energy equity, and workforce needs, are more closely examined.
A diverse array of interests informed this report through a year-long series of public workshops and comment opportunities. Participants included:

- Community leaders
- Energy experts with utilities, technology companies and trade groups
- University researchers
- Environmental groups
- Environmental justice organizations

The joint agencies also consulted with:

- The California Balancing Authorities
- The Disadvantaged Communities Advisory Group
Renewable/Zero-Carbon Technologies Modeled:

Solar, photovoltaic and thermal (existing only)

Wind, onshore and offshore

Geothermal

Bioenergy

Fuels cells

Hydroelectric, existing large and small operations only

Nuclear, existing power plants only
## California
### Clean Electricity Resources

**Projected to increase annual costs 6% above a 60% RPS baseline**

<table>
<thead>
<tr>
<th>Resource</th>
<th>Existing Resources</th>
<th>Projected New Resources</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>2019*</td>
<td>2030**</td>
</tr>
<tr>
<td>Solar (Utility-Scale)</td>
<td>12.5 GW</td>
<td>16.9 GW</td>
</tr>
<tr>
<td>Solar (Customer)</td>
<td>8.0 GW</td>
<td>12.5 GW</td>
</tr>
<tr>
<td>Storage (Battery)</td>
<td>0.2 GW</td>
<td>9.5 GW</td>
</tr>
<tr>
<td>Storage (Long Duration)</td>
<td>3.7 GW</td>
<td>0.9 GW</td>
</tr>
<tr>
<td>Wind (Onshore)</td>
<td>6.0 GW</td>
<td>8.2 GW</td>
</tr>
<tr>
<td>Wind (Offshore)</td>
<td>0 GW</td>
<td>0 GW</td>
</tr>
<tr>
<td>Geothermal</td>
<td>2.7 GW</td>
<td>0 GW</td>
</tr>
<tr>
<td>Biomass</td>
<td>1.3 GW</td>
<td>0 GW</td>
</tr>
<tr>
<td>Hydrogen Fuel Cells</td>
<td>0 GW</td>
<td>0 GW</td>
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<tr>
<td>Hydro (Large)</td>
<td>12.3 GW</td>
<td>N/A†</td>
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<tr>
<td>Hydro (Small)</td>
<td>1.8 GW</td>
<td>N/A†</td>
</tr>
<tr>
<td>Nuclear</td>
<td>2.4 GW</td>
<td>N/A†</td>
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</tbody>
</table>

* Includes in-state

** Includes in-state and out of state capacity

† New hydro and nuclear resources were not candidate technologies for this round of modeling and could not be selected

---

Achieving 100% Clean Electricity in California
To Achieve Clean Energy

Development Needs To Rapidly Accelerate

3X
Solar and wind build rates need to nearly triple*

8X
Battery build rates need to increase by nearly eightfold**

*Based on 10-year average  **Based on 2020
Additional Scenarios: Preliminary Findings

Study Scenarios
The agencies also explored scenarios outside their interpretation of SB 100 to inform broader state planning efforts

High Demand Flexibility:
Increased flexibility may lower overall resource needs and systems costs

No-Combustion:
Reduces criteria air pollution but results in higher costs

Zero-Carbon Firm Resources:
Commercialization of emerging technologies or cost decreases in existing firm resources may lower overall system costs

Accelerated Timeline:
These targets may be achievable but may increase overall costs
This initial analysis suggests SB 100 is technically achievable through multiple pathways.

Construction of clean electricity generation and storage facilities must be sustained at record-setting rates.

Diversity in energy resources and technologies lowers overall costs.

Retaining some natural gas power capacity may minimize costs while ensuring uninterrupted power supply during the transition to 100 percent clean energy.

Increased energy storage and advancements in zero-carbon technologies can reduce natural gas capacity needs.

Further analysis is needed.
Recommendations for Further Analysis

1. Verify that scenario results satisfy the state’s grid reliability requirements.

2. Continue to evaluate the potential effects of emerging resources, such as offshore wind, long-duration energy storage, green hydrogen technologies, and demand flexibility.

3. Assess environmental, social, and economic costs and benefits of the additional clean electricity generation capacity and storage needed to implement SB 100.

4. Hold annual workshops to support alignment among the joint agencies and continuity between SB 100 reports.
Thank You

The 2021 SB 100 Joint Agency Report and Summary Document can be found at:

https://www.energy.ca.gov/sb100

March 17, 2021 Business Meeting

Joseph Sit, Utilities Engineer
Energy Research and Development Division, Energy Systems Research Office
Benefits of Long Duration Storage to Californians

- Technology benefit over Li-Ion
  - Longer lifecycle
  - No thermal runaway
  - No electronic waste

- Use of excess renewable generation

- Cleaner, cost effective grid resilience
Technology Innovations

- Scalable and rapid implementation
- Seasonal storage
Overview of Antelope Valley Water Storage Agreement

• Funding:
  $6.4M (CEC) + $3.2M (match)

• Technology:
  • Aquifer Pumped Hydro
    o 10-hour minimum energy capability (20 hours possible)
    o Minimum rating of 200 kilowatts

• Purpose:
  Supply power to critical facilities in low-income community
Staff Recommendation

• Adopt CEQA findings
• Approve grant agreement
Item 4: The Regents of the University of California, on behalf of the San Diego Campus
March 17, 2021 Business Meeting

Kevin Mori, Mechanical Engineer
Research and Development, Energy Efficiency Research Office
**Benefits to Californians**

**Lightwave System** uses optical rotor switch and light signaling.

- Double energy efficiency for data processing.
- Reduced energy requirements for cooling from reduced heat production.
- Increased internet speeds.

Test setup for a proof-of-concept data center optical switch.  
Photo Credit: UC San Diego News Center
Lightwave Energy Efficient Datacenters (LEED)

Novel Lightwave Technology

• Uses optical rotor switch to direct server traffic.
• Testbed will be installed and simulated through real world workloads.
• Technology and coding will be adjusted for scalability.
Federal Grant Background

**Phase 1:** Developed architecture and optical switch.

**Phase 2:** Test technology with real-world workloads.

<table>
<thead>
<tr>
<th></th>
<th>Phase 1</th>
<th>Phase 2</th>
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<tbody>
<tr>
<td><strong>Start Date</strong></td>
<td>June 2018</td>
<td>April 2021</td>
</tr>
<tr>
<td><strong>End Date</strong></td>
<td>Jan. 2020</td>
<td>Mar. 2024</td>
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<tr>
<td><strong>ARPA-E Funding</strong></td>
<td>$ 3,800,000</td>
<td>$ 5,000,000</td>
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<tr>
<td><strong>CEC Funding</strong></td>
<td>$ 475,000</td>
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For more information on the current status of the project: [https://ucsdnews.ucsd.edu/pressrelease/lightening-the-data-center-energy-load](https://ucsdnews.ucsd.edu/pressrelease/lightening-the-data-center-energy-load)
Staff Recommendation

• Approve agreement
• Adopt staff’s determination that project is exempt from CEQA
Item 5: Bringing Rapid Innovation Development to Green Energy (BRIDGE) 2020 (GFO-20-301)

March 17, 2021 Business Meeting

Michael Ferreira
Energy Deployment & Market Facilitation Office
Energy Research & Development Division
CEC’s Entrepreneurial Ecosystem
Packetized Energy Technologies, Inc.
EPIC Funding: $2,000,000

Increasing Access to Smart and Affordable Energy for Customers and Resource Adequacy for California Grid

- Grid flexibility software platform
- Cloud-based management of customer electric appliances
- Deploy 7,000 smart devices providing 4 MW of flexible capacity
Pilot Demo of Ultra Low Cost, Long-Duration Energy Storage Coupled to Solar Power

- Carbon-oxygen chemistry utilizes earth abundant materials
- Long duration storage < $20/kWh
- 100 kW, 10 MWh demonstration system coupled to solar

Figure 1. Comparison of Noon Energy’s new battery technology with other electrochemical energy storage technologies based on energy efficiency and cost of storage media.

- Energy-generating windows with transparent solar cells
- Made of inexpensive, abundant raw materials
- Integrate into existing window manufacturing process
Hybrid Lithium-Metal Batteries for Low-Cost and Long-Range Electric Vehicles

• "Anode-free" hybrid lithium-metal cells for higher energy density

• EV batteries at <$100/kWh

• Optimized electrolyte for fast charging
South8 Technologies, Inc.
EPIC Funding: $1,010,227

Advanced Li-ion Chemistry for Safer and Greener Electric Vehicle and Energy Storage Systems

• Non-hazardous liquefied gas electrolyte chemistry
• Operational temp: -60 to +60 °C
• Demonstrate energy density, fire safety and recyclability
Increasing the Thermal Range and Efficiency of Affordable User-Installable Room Heat Pumps

- No tools or professionals needed for installation
- Plugs into 120V outlet
- Energy savings of 33% for cooling, 70% for heating
Skyven Technologies, Inc.
EPIC Funding: $1,100,500

Transforming Techno-Economics of Decarbonization in California’s Bespoke Industrial Sector with Scalable Front-End Engineering AI

• Decarbonization pathways for unique operations
• 10x reduction in front-end engineering costs
• Pilot test using data from two CA industrial facilities
Machine Learning Enhanced Acoustic Inspection to Improve Battery Manufacturing

- Battery inspection using ultrasound and data analytics
- Increase battery cell yield by 5%
- Demonstrate techno-economic value on battery pilot line
Staff Recommendation

• Approve projects
• Approve staff's findings that projects are exempt from CEQA
Item 6: Hydrogen Fuel Cell Demonstrations in Rail and Marine Applications at Ports (H2RAM) (GFO-20-604)
March 17, 2021 Business Meeting

Peter Chen, Mechanical Engineer
Energy Research and Development Division
Energy Generation Research Office
Impacts of Locomotives and Harbor Craft

Diesel Particulate Matter Emissions at California Ports

Source: Port Emissions Inventories
Benefits to Californians

• Reduce emissions from locomotives and harbor craft

• Realize economies of scale for renewable hydrogen

• Inform future regulations and deployment strategies
Sierra Northern Hydrogen Locomotive Project

• Demonstrate hydrogen switcher locomotive at Port of West Sacramento
• Zero emission alternative for freight rail
• Validate performance and analyze scalability
HyZET: Design and Feasibility Study of Fuel Cell-Powered Commercial Harbor Craft

- Feasibility study for hydrogen tugboat
- Design for implementation at Port of Los Angeles
- Evaluate liquid hydrogen fuel systems
Golden Gate Zero Emission Marine, Inc.

Small Fast Multi-Use Hydrogen Fuel Cell Harbor Craft

- Demonstrate hydrogen multi-use vessel at Port of San Francisco and Port of Long Beach
- Compact marine fuel cell powertrain
- Mobile refueling system to leverage existing stations
Staff Recommendation

• Approve grant agreements
• Adopt staff’s determination that projects are exempt from CEQA
Item 7: Cerritos Community College District

March 17, 2021

Larry Rillera, Air Pollution Specialist
Fuels and Transportation Division, Transportation Policy and Analysis Office
Benefits to California

• Zero-emission vehicle career pathway for high school students
• Develop potential workers for local ZEV supply chain companies
• Enhance zero-emission automotive/truck skills
Overview

- Augment existing agreement to add $1.5 million
- Extend by 24-months
- Revise Training Plan
- Increase high schools with ZEV auto and truck programs
- Support CEC School Bus Replacement Program participation
$2 Million Total Funding

- 28 High Schools Funded
- 19 High Schools Reporting...
- 1,800 Students/Year Enrolled in Auto Courses with New EV Curriculum
- 36 Faculty (High School and Community College) Trained to Date

Results!
Staff Recommendation

• Approve ask to:
  • Augment agreement by $1,500,000
  • Extend agreement by 24 months
REMOVED - Item 8: California Air Resources Board

March 17, 2021 Business Meeting

Pulled from Business Meeting.
Item 9: Agreement with CALSTART for a MD/HD Infrastructure Block Grant Project (ARV-20-006)

March 17, 2021 Business Meeting

Matthew Kozuch, Associate Energy Specialist
Fuels and Transportation Division, Freight & Transit Unit
Benefits to California

Enables:

• accessible electric charging and hydrogen refueling options
• progress converting all MD/HD vehicles to ZE
• targeted emission reductions and health benefits
Project Overview

CALSTART will:

• develop MD/HD ZEV infrastructure incentive projects
• create internal controls and procedures
• design user-friendly website
• implement equity strategy
Complimenting Vehicles

CEC MD/HD ZEV Infrastructure Block Grant
Staff Recommendation

Approve

• Agreement for $50M block grant with CALSTART

Adopt

• Determination that action is exempt from CEQA
Item 10: GFO-19-603 EV Ready Communities Phase II- Implementation

March 17, 2021 Business Meeting

Sharon Purewal, Associate Energy Specialist
Advanced Vehicle Infrastructure Office, Fuels and Transportation Division
Benefits to California

- **Improve** access to electric vehicle charging infrastructure
- **Reduce** barriers to zero emission transportation
- **Increase** mobility options in disadvantaged communities
- **Support** green job creation
Goal: Increase electric vehicle charging station installations to support 75,000 zero emission vehicles by 2025
Goal: Deploy electric vehicle charging stations, leverage local funding opportunities, and create workforce development programs.
Staff Recommendation

Approve:

- City of Sacramento for $1,825,418
- Contra Costa Transportation Authority for $2,467,067
Item 11: 2021 Integrated Energy Policy Report Natural Gas Demand And Rate Forecasting Forms and Instructions

March 17, 2021 Business Meeting

Jason Orta, Lead Hydraulic Modeler
Energy Assessments Division, Supply Analysis Office
Benefits to California

• Increase knowledge of gas system
• Improve quality of forecasting
• Continue collaboration with gas utilities
Natural Gas Forms and Instructions

- Developed in consultation with gas utilities
- Leverages existing work
Information Requested on Forms

- Sectoral demand forecasts out to 2035
- Forecasting inputs and assumptions
- Impact of electrification, RNG/H₂, etc.
- Rate forecasts
- Supporting data
Recommendation And Next Steps

• Adopt Natural Gas Forms and Instructions
• Continue collaboration with gas utilities and stakeholders
• Apply knowledge to future CEC work
Item 12: Order Instituting Informational Proceeding

March 17, 2021 Business Meeting

Heather Raitt, Assistant Executive Director, Policy Development
Benefits to Californians

• Authority to collect information needed for developing 2021 IEPR
  • Hearings and workshops
  • Data requests

• Information is foundational to good policy development
2021 IEPR Scope

Topics:

• Energy reliability over next 5 years
• Natural gas outlook and assessments
• Building decarbonization and energy efficiency
• Energy demand
Staff Recommendations

• Approve request for Order Instituting Informational Proceeding for 2021 IEPR
Item 13: 2020 IEPR Update, Volume I and Volume III

March 17, 2021 Business Meeting

Heather Raitt, Assistant Executive Director, Policy Development
Quentin Gee, Lead Author for Volume I, Fuels and Transportation Division
Nick Fugate, Lead Author for Volume III, Energy Assessments Division
Benefits to Californians

Volume I:
Blue Skies, Clean Transportation

Volume III:
California Energy Demand Forecast Update
Public Engagement

• Opportunities for public comment

• Remote access workshops
  • 9 on transportation
  • 2 on energy demand
Disproportionate Transportation Impacts

Percent of Residents Living in High Diesel PM Exposure Communities, by Race

- Black: 36%
- Asian American: 29%
- Latino: 27%
- Other: 22%
- White: 15%
- Native American: 15%
Additional Disproportionate Impacts

Percent of Residents Exposed to High Diesel PM by Census Tract Median Household Income

Lower-Income Communities

- <20k: 57%
- 20k-40k: 40%
- 40k-60k: 26%
- 60k-80k: 19%
- 80k-100k: 18%
- 100k-120k: 19%
- 120k-140k: 19%
- 140k-160k: 18%
- >160k: 16%
Californians are Opting for Larger Vehicles

Average Greenhouse Gas Emissions from Driving per Mile, Lighter and Heavier 2020 BEVs vs ICEs

- Lighter (3000-3500) Vehicle Curb Weight (lbs)
  - Emissions per Mile Driven: 340 g CO2e/mi
  - Emissions Increase: +115 g CO2e/mi
- Heavier (4500-5000) Vehicle Curb Weight (lbs)
  - Emissions per Mile Driven: 455 g CO2e/mi
  - Emissions Increase: +27 g CO2e/mi

Internal Combustion vs Battery Electric

Vehicle Curb Weight (lbs)
Decline and Return of VMT

Southern CA Association of Governments Region VMT
January to August 2020

% Change from 2019 Reference Week

-50% -40% -30% -20% -10% 0% 10%
1/11 2/8 3/7 4/4 5/2 5/30 6/27 7/25 8/22

SCAG Region
County Hi/Low Range
The Three Revolutions

Electrification, Automation, and Shared Mobility Services

Future Mobility: “Blue Skies” or “Dirty Skies”?

- Cars are all electric
- Energy mix is clean
- Increased capacity
- Better livability
- Integration with public transit
- Everybody shares intelligent vehicles

- Increased congestion
- Vehicles use fossil fuels
- Increased travel demand
- More car-dependence of society
- Reduced role of transit
- Robocars increase congestion and VMT

The future will largely be shaped by the policies that are developed today...
California is a PEV Leader, but EU and China May Catch up Soon

Light-Duty PEV Sales as a Percentage of Total Sales in Large Economic Regions, 2017-2019

- China: 2.0% (2017), 5.1% (2019)
- Europe: 2.0% (2017), 3.8% (2019)
- North America: 1.2% (2017), 1.9% (2019)
- California: 4.5% (2017), 7.7% (2019)
Price Parity is on the Horizon

Bloomberg New Energy Finance PEV Battery Pack Prices, Historical and Projected

PEV Battery Pack Cost ($/kWh)


Estimated Point of PEV Price Parity with Internal Combustion Vehicles ($100 per kWh)
CA Needs More Chargers

Significant Charger Needs for 2025 and 2030

67k Currently Installed

121k Additional Planned Through 2025 (188k Total)

62k Gap for 2025 (Goal of 250k)

780k Gap for 5 Million PEVs (968k Total)

1.3M Gap for 8 Million PEVs (1.5M Total)
Align Charging with Renewables

Modeled Time of Use Charging Load Curves Suggest Need to Improve Alignment with Renewables
ZEVs Can Contribute to Energy Resiliency
Ambitious Global Fuel Cell Targets
Blue Skies, Clean Transportation
Benefits to California

Accounts for:
- Economic and demographic growth
- Climate change impacts
- Extreme weather events
- Distributed resource adoption
- Transportation electrification
Overview

• Update to 2019 IEPR demand forecast
  • Captures near-term economic downturn and recovery
  • Refreshes PV, battery storage, and ZEV projections

• Includes wide variety of scenarios
  • 3 baseline demand cases
  • 6 additional achievable efficiency scenarios
  • Peak demand variants to account for extreme weather events
Exploratory Transportation Scenarios

• **Scenario 1:** Charging MD-HD zero-emission vehicles to meet South Coast Air Basin ozone standards

• **Scenario 2:** Shifting EV charging to reduce GHG emissions

• **Scenario 3:** Increased telework up to five days a week
Staff Recommendation

Adopt 2020 IEPR Update:

• Volume I: Blue Skies, Clean Transportation
• Volume III: California Energy Demand Forecast Update

Thank you!
Item 17: Public Advisor's Report

March 17th, 2021 Business Meeting

Noemí O. Gallardo
Public Advisor's Office
IDEA Initiative

• Task Force meeting 3/24/21
  • Discuss allyship
  • Review staff recommendations
• Uplift employee-led activities:
  • Employee Resource/Affinity Groups
  • Celebrations
Business Meetings Survey: Participation & Engagement

• 78 participants

• Available at CEC Business Meetings webpage:
  https://www.energy.ca.gov/proceedings/business-meetings
Attendance

1. HOW MANY CEC BUSINESS MEETINGS HAVE YOU ATTENDED FROM JANUARY 2020 THROUGH TODAY?

- Not sure, 1%
- All of them, 0%
- 8 or more, 14%
- 5 to 7, 12%
- This is my first, 37%
- 2 to 4, 36%

Most are rather new or infrequent participants.
Most attend for work but also feel passionate and see impacts.
Preferences to Join

Most prefer Zoom, but want multiple ways to join.
Ease to Participate

Most find it very easy to participate but there's room to improve.
Takeaways

- Continue enabling various ways to join, including Zoom.
- Determine additional ways for public to access meeting material.
- Share additional ways attendees can participate in CEC efforts.