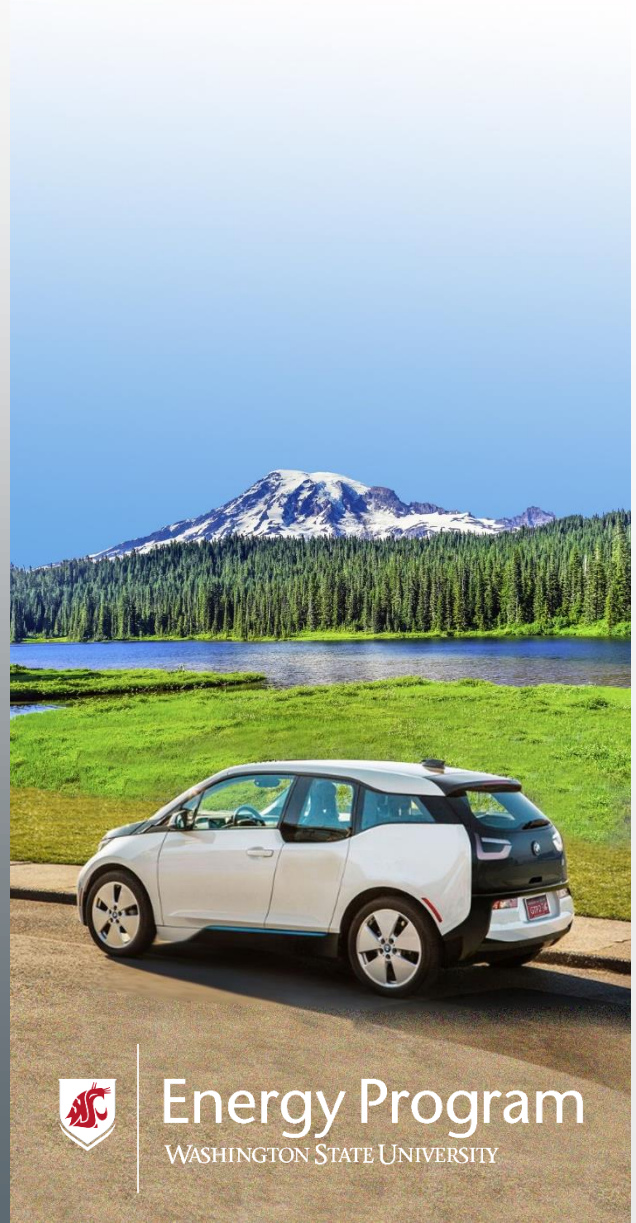


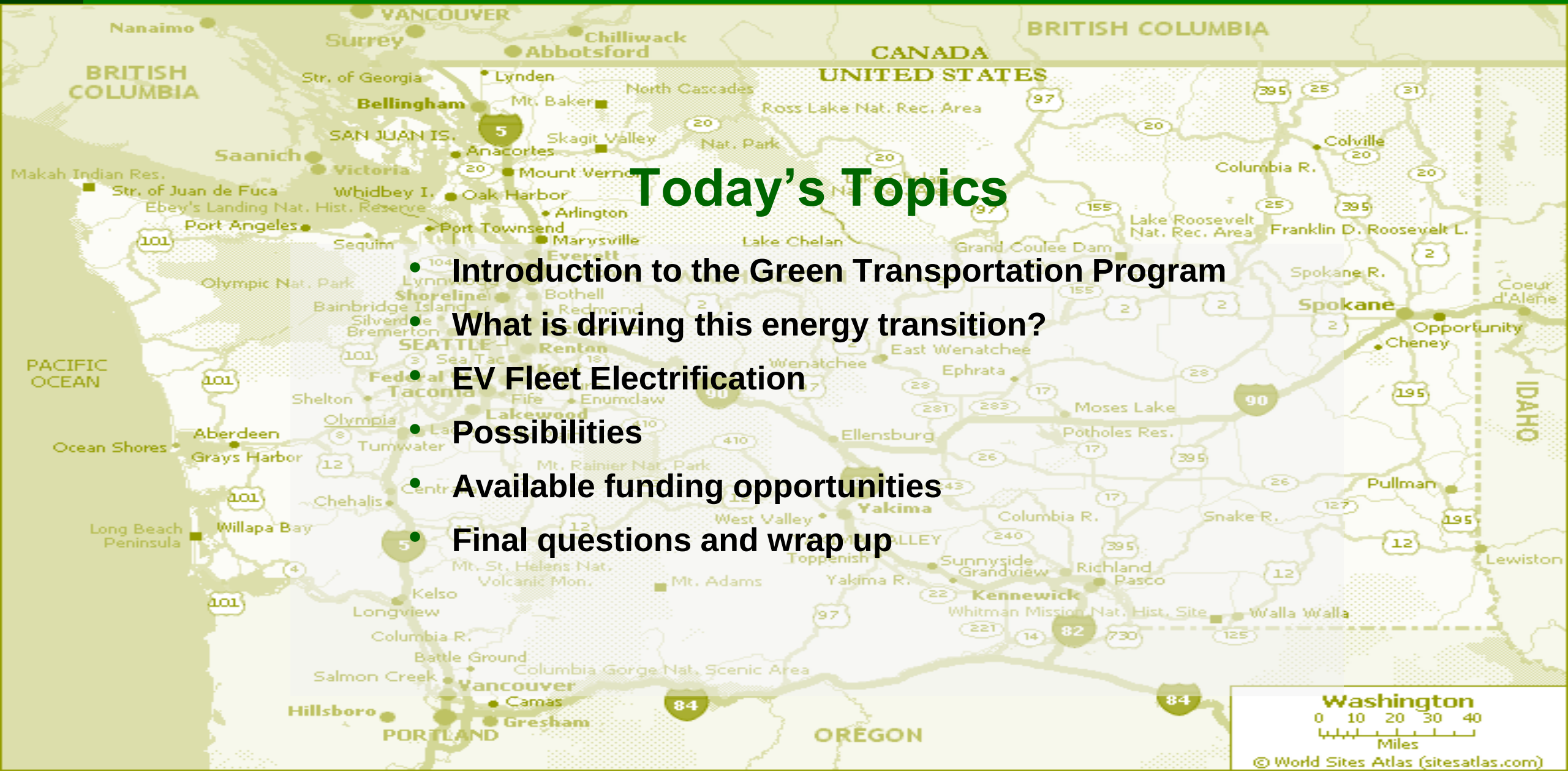
Washington
Green Transportation Program
Moving forward with Washington's public fleets

Electrifying Pupil Transportation: Successful Transition Planning

Jim Jensen
Washington Association for Pupil Transportation
June 2024

Today's Topics

- Introduction to the Green Transportation Program
- What is driving this energy transition?
- EV Fleet Electrification
- Possibilities
- Available funding opportunities
- Final questions and wrap up



Green Transportation Program

Legislative directive to the WSU Energy Program

(HB 2042–Advancing Green Transportation)

Mission: establish and administer a technical assistance and education program for public agencies on the use of alternative fuels and vehicles.

QR Code to ESB Hub

Subscribe for news and announcements

www.energy.wsu.edu/GreenTransportationProgram

Request information via email

greentransportation@energy.wsu.edu

GTP Delivers “Next Step” Assistance

- ✓ Education: website, studies, resources, publications, and more
- ✓ **Alt Fuel-Vehicle Technical Assistance Group (AFV-TAG)**
- ✓ Webinars: BEVs and infrastructure, renewable hydrogen series
- ✓ Events: infrastructure field trips and ride-and-drives
- ✓ Coordination: EV Council, WSDOT, Commerce, Ecology, JTC
- ✓ Technical assistance, all public fleets: cities, counties, tribes, transit agencies, school districts, ports, public utilities (800+)
  - Presentations to teams and decision-makers
  - Research – answering questions about vehicles and charging
  - Analysis – vehicle TCO comparisons, infrastructure needs
  - Grant writing support
  - Introductions and connections (utilities, vendors, consultants, etc.)


Energy Program
Washington State University

WSU Energy Program

Mission
To advance environmental and economic well-being by providing unmatched energy services, products, education and information based on world-class research.

About Us
Our staff of energy engineers, energy specialists, technical experts and software developers work out of Olympia, Washington. The WSU Energy Program is a self-supported department within the WSU College of Agricultural, Human and Natural Resource Sciences.

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Report to the Legislature
October 2021 Update

Washington
Green Transportation Program
Moving forward with Washington's public fleets

Washington consumers and fleets are increasingly using alternative fuels and modes to move people and goods that conserve energy, increase efficiency, and use clean and renewable alternative fuels. Examples include clean electricity, biofuels and renewable fuels. The transition from fossil fuels – gasoline and diesel – is well underway. This is especially true for public fleets. These changes are often captured under the label 'green transportation.'

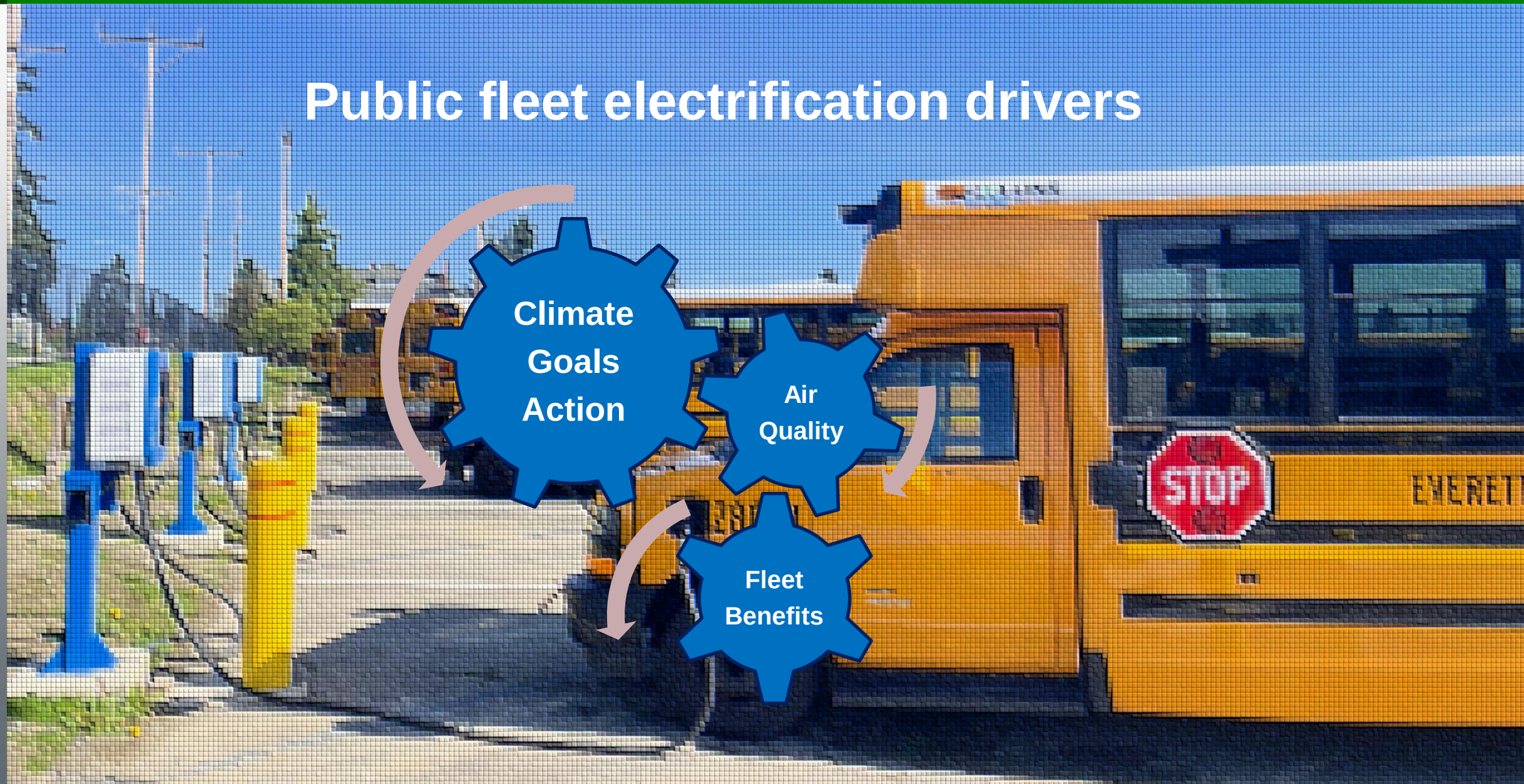
The Washington State Legislature delivers green transportation through several strategies

The Washington State Legislature has fostered the acceleration of the adoption of green transportation in both the public and private sectors of the state through broad and successful strategies, including providing many grants and vehicle incentives to support green transportation for consumers and at all levels of government.

In 2019, the Washington State Legislature passed legislation directing the **Washington State University (WSU) Energy Program** to establish and administer a technical assistance and education program for public agencies on the use of alternative fuels and vehicles. The legislation said that education and assistance may be provided to public agencies including cities, counties, transit agencies, school districts, colleges and universities, utilities and PUDs, tribes, ports, and other state political subdivisions.

The WSU Energy Program was well-positioned to administer such an effort, and that same year it established the **Green Transportation Program (GTP)** to provide unbiased, up-to-date education and technical assistance to support the transition of public fleets to cleaner fuels.

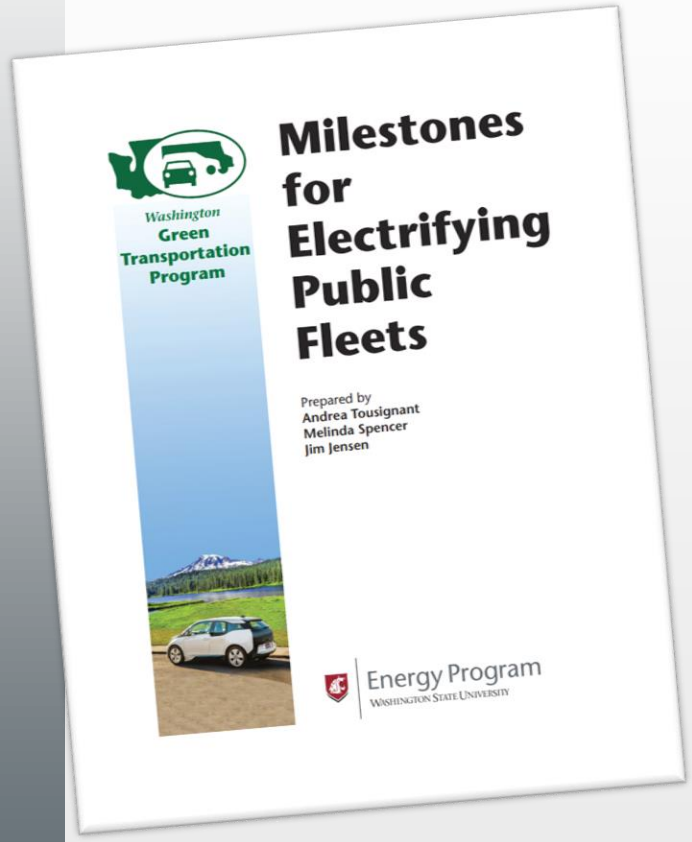
Public fleet electrification drivers



Legislature passes HB 1368 to electrify school buses

- Expands Ecology's Zero-Emission School Bus Grant Program, prioritizing grants to districts serving overburdened and disadvantaged communities and for the oldest buses first
- Requires new buses to be zero-emission after a determination that the Total Cost of Ownership is lower than diesel
- Establishes exemptions
- Requires OSPI do a survey of districts this year

A typical fleet EV transition



Take the next step!

Internal Planning & Assessment

Coordinate with External Partners

Action & Funding Phase

1. Assemble your team and set goals
2. Identify EV candidates
3. Calculate electric loads
4. Facility planning and capacity assessment
5. Engage utility
6. Engage vendors and contractors
7. Finalize plans
8. Procurement
9. Installation
10. Implementation

1. Assemble your team and set goals

Which of these is available and most critical:

- Transportation supervisors/fleet manager
- Facility managers
- Electrician
- Energy/sustainability managers (RCMs)
- Planners
- Drivers (union)
- Finance and procurement
- Parking enforcement or public safety
- Decision-makers–superintendent, board rep

2. Identify EV candidates for school buses

Type C Models		Capacity	
Bus Name	Bus Manufacturer	Range (miles)	Battery Capacity (kWh)
Vision Electric	Bluebird	130	155
Electric CE Series	IC Bus	135-200	210-315
Jouley	Proterra/Thomasbuilt Buses	138	226
LionC	Lion Electric Co	155	126-168

Considerations for choosing the right vehicles for the first ones:

- Routes
- Daily miles
- Established dealer relationship
- Compatible with charging

Routes & Schedules
When is the vehicle on the road?
When to charge it?
How far does it go?
How much charge does it need?
Does it come back to campus by the end of the day?
Will it be charged overnight?

Example Type C Electric School Bus

	Blue Bird	Lion	Thomas	IC Bus/Navistar	BYD
MODEL	BLUE BIRD VISION	LIONC	SAF-T-LINER C2 JOULEY	IC CE SERIES ELECTRIC BUS/ PB10E	TYPE C
Price range	$326,810–$365,000[a]	$338,253–$422,302[b]	$335,287–$437,000[c]	$347,870–$364,123[d]	Not available
Length (L)/width (W)/height (H)	L: Max 477" W: 96" H: 123"	L: 473" W: 96–102" H: 122"	L: 396" W: 96" H: 144"	L: 303.9"/474.9" W: 96" H: 123"	L: 435"/462" W: 102" H: 132.9"
Passenger capacity	77	77	81	29–72	78
Charger connector	L2: J1772 DCFC: CCS1	L2: J1772 DCFC: CCS1	DCFC: CCS1	L2: J1772 DCFC: CCS1	L2: J1772 DCFC: CCS1
Capable of bidirectional charging	Yes	Yes	Optional	Yes	Optional
Battery size (kWh)	155	126/168	226	210/315	255.5
Range (miles)	120	100/125	138	135/210	155
Battery thermal management	Liquid cooled	Liquid cooled	Set to maintain 70°F battery temp	Set to maintain 70°F battery temp	Water cooling
Recharge time	L2 (19.2 kW): 8 hours DCFC (60 kW): 3 hours	L2 (19.2 kW): 6.5–11 hours DCFC: (24 kW) 5–9 hours or (50 kW) 2.5–4.25 hours	DCFC: (25 kW) 8.25 hours or (60 kW) 3.4 hours	L2 (19.2 kW): 8 hours DCFC (60 kW): 3 hours	L2 (20 kW max): 12.5–13 hours DCFC (150 kW): 1.5–2 hours

Elements of electric bus

Source: WRI Electric School Bus Market Report, June 2022. Newest version available here https://electricschoolbusinitiative.org/all-about-types-electric-school-buses

3. Calculate electric loads

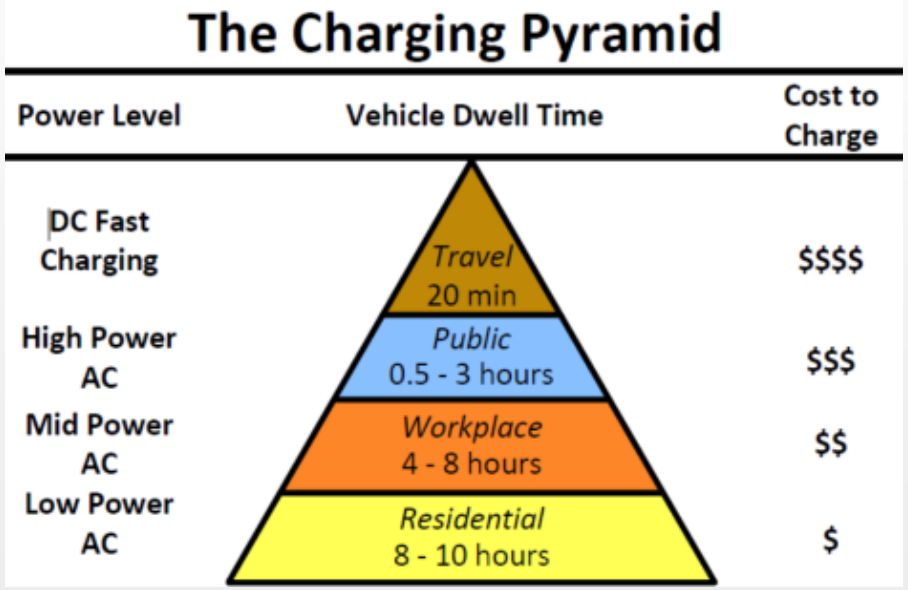
Vehicle Name	Range (miles)	Battery Capacity (kWh)	L2 (ACkW)	L3 (DCkW)	Days on road/month	Miles per day	Hours on Road	kWh/mile	kWh used	Time to charge AC	Time to charge DC 60kW	Demand Charge $/kW	Electricity Charge $/kWh
IC Bus Type C	200	210	19.2	60	20 (M-F)	80	4	1.05	133.6	6.96	2.23	10	0.12

Monthly kWh	Monthly Demand Cost low power	Monthly Demand Cost High power	Monthly Bill L2 Charging	Monthly Bill DCFC
2672	**192**	**600**	**512.64**	**920.64**

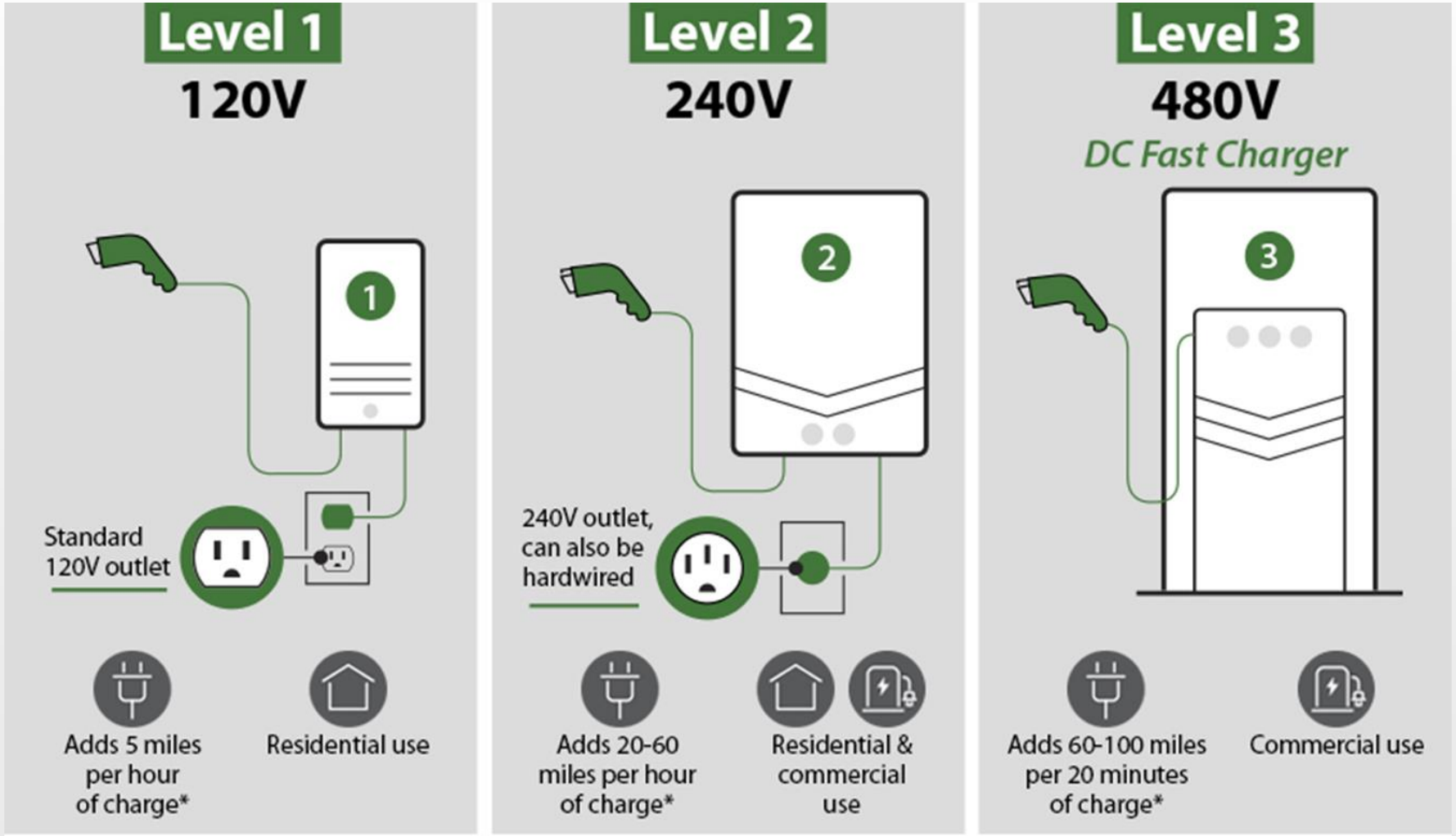
3. Calculate electric loads

Charging Level	Power Output Charging Session	Small EV (40 kWh battery)	Medium EV (65 kWh battery)	Large EV (90 kWh battery)
Level 1	2.3 kW	11h 36m	18h 50m	26h 05m
Level 2	7.4 kW	3h 36m	5h 51m	8h 06m
Level 2	11 kW	2h 25m	3h 56m	5h 27m
Level 2	22 kW	1h 08m	1h 45m	2h 27m
DCFC	50 kW	32 min	52 min	1h 12m
DCFC	100 kW	16 min	26 min	36 min
DCFC	150 kW	-	17 min	24 min
DCFC	240 kW	-	11 min	15 min
DCFC	300 kW	-	8 min	11 min

Source: EVBox



4. Facility planning & capacity assessment



4. Facility planning & capacity assessment

Cost element	Study	Level 2	DCFC			
			50 kW	150 kW	350 kW	800 kW
Equipment cost	ICCT (2019)	$3,127	$28,401	$75,000	$140,000	
	NREL (2020)	$3,500	$38,000	$90,000		
	RMI (2020)	$2,500 - $4,900	$20,000 - $35,800	$75,600 - $100,000	$128,000 - $150,000	
	EDF & GNA (2021)			$136,540		$481,299
Installation cost	ICCT (2019)	$2,837 - $4,148	$17,692 - $45,506	$18,577 - $47,781	$25,654 - $65,984	
	NREL (2020)	$2,500	$20,000	$60,000		
	RMI (2020)	$7,000	$62,700	$75,500	$138,200	
	EDF & GNA (2021)			$35,000		$175,000

Image Credit - ICF

4. Facility planning & capacity assessment

This an opportunity to plan for or think about Public, Fleet and Workplace charging

- Discuss campus characteristics
- Discuss building characteristics
- Allowable public safety parking more than 4 hours

Hardware

L2 or DCFC

At Headquarters or on-route

What vehicle battery size

Network

Telematics/GPS data

Capture mileage/fleet data

Scale it – capture on the EVSE (charger)

Or need reporting software/network for electricity used/re-fueling

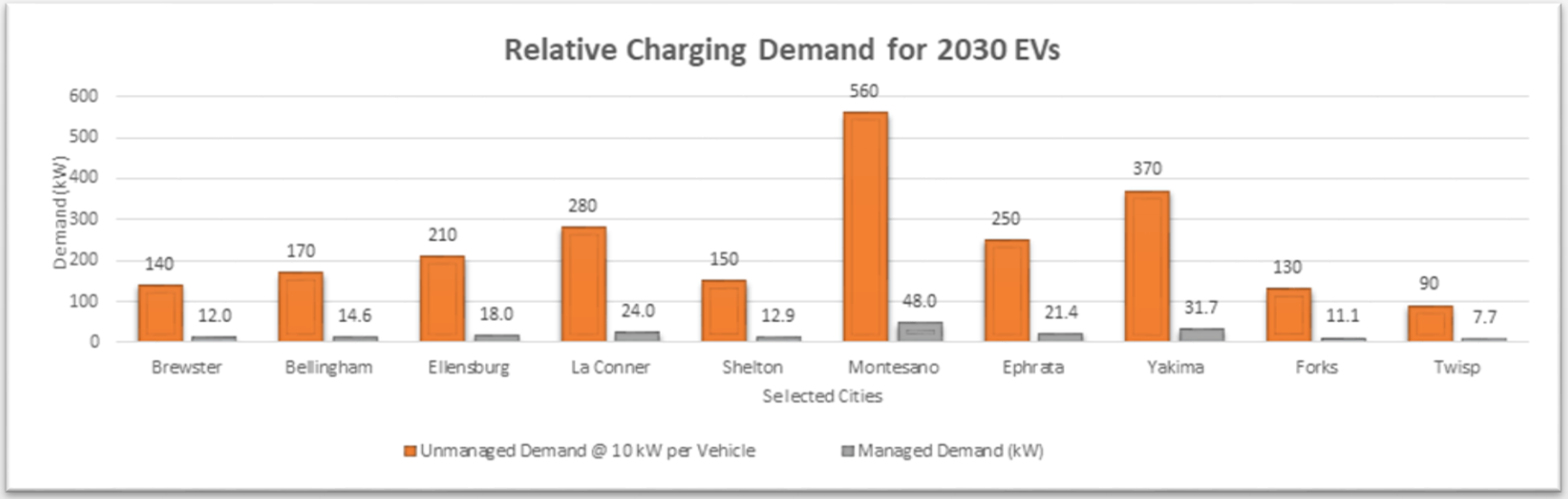
Dual-port wall-mount unit attached to a building column. Shows L2 J1772 plug. Dept. of Commerce, Olympia
(Photo: WSU)

Single dual-port charging unit positioned to serve multiple vehicle parking spots.
(Photo: Dept. of Ecology)

Single pedestal EVSE serving three spaces including an ADA-compliant space. WSDOT, Shoreline
(Photo: WSU)

Consider Charging Hardware and Network Options

- **Specifications**
- **Vehicle to charger ratios**
- **Non-network vs network charging**
- **Plan load management strategies**



Assumptions: 1:1 V:P ratio, 10kW/EVSE, 14-hour charge window

5. Engage utility

- Contact the utility with preliminary plans
- They may offer an EV specialist who can address your technical questions
- They may confirm electrical usage on site, and excess capacity available
- Offer tools data, and incentives

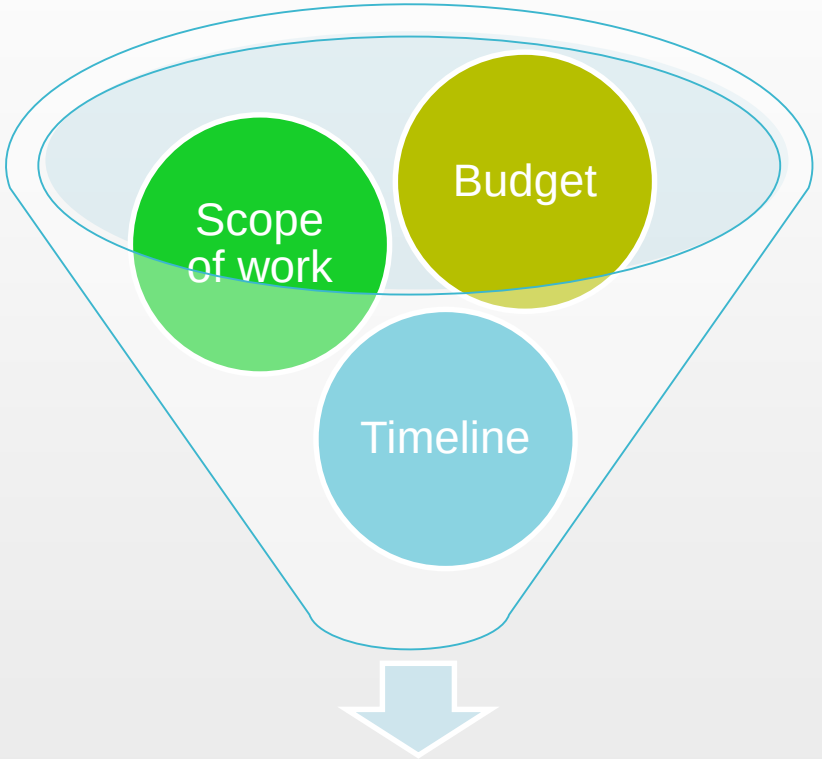
Action & Fund
Phase

6. Engage vendors & contractors

- Combine electrical planning with construction
- Check if any upgrades have to happen off property (e.g. transformers)
- Connect with EVSE contractors to understand the equipment and if there are any specifications to know! (e.g. charger chord length, power factor)

Daimler Electric Island

7. Finalize plans



Ready for grant applications

Ready for contracting

8. Procurement

- Invest in energy conservation and efficiency
- Make EVs the default choice
- Use a robust total cost of ownership (TCO) model
- Consider incorporating a Social Cost of Carbon figure in the TCO comparison
- Address the budget dilemmas with EVs (capital vs O&M totals)
- Choose drop-in renewable fuels or alt fuels when electric doesn't compute
- Take advantage of the IRS rules for elective and direct pay incentives

STATE CONTRACT https://apps.des.wa.gov/CARS/ContractVehicleMenu.aspx

SOURCEWELL - https://driveevfleets.org/electric-vehicles/?fuel-type=battery-electric

8. Procurement

We are expecting roughly $40 million in Washington State funding to be available in the next 18 months!

WA Department of Ecology

WA Department of Commerce

9. Installation

- Have planning and procurement documents ready to go
- Check compliance with building codes
- Make sure to have electrical and building permits

Lion Electric Bus

10. Implementation

- CELEBRATE!
- Have a ribbon cutting
- Train drivers
- Track driving habits that increase or decrease efficiency
- Plan ahead for cold conditions

- Start or keep planning for the next phase

Montgomery County Public School Bus Fleet

WSU Energy Program

Green Transportation Program

Electrifying Student Transportation

Washington's school districts are facing a game-changing opportunity to add electric school buses (ESBs) to their fleets. The Green Transportation Program (GTP) offers resources and guidance to help districts decide if this is the right time to pursue available funding.

Why electrify?

Health and environmental benefits of replacing diesel-fueled school buses with ESBs are clear. Diesel exhaust, a known carcinogen, is linked to serious physical health issues and cognitive development impacts. Students from low-income families are disproportionately exposed to the dangers of diesel exhaust pollution. Electrifying school bus fleets can help address these health and environmental concerns, especially in overburdened communities. Studies on health impacts from fossil-fueled buses are included in Webcasts and Case Studies.

Get funding

We provide details about funding opportunities and incentives to support ESB and charging equipment purchases in Funding Opportunities.

Questions? GTP can help!

We invite school districts to contact us at greentransportation@energy.wsu.edu to discuss projects and challenges specific to your district. In our flyer Successful Deployment of Electric School Buses, we describe the types of questions we can answer for you, including:

- Calculating charging needs and determining where to install EV charging stations.
- Which bus routes to electrify first.
- ESB models that could work well for your district.
- Working with your electric utility to assess electrical capacity and install charging equipment.

Text/HTML

Green Transportation Program Home

Clean Fuel Programs

Alt Fuel-Vehicles Technical Assistance Group

EV Charging Resources

Funding Opportunities

Electrifying Student Transportation

The Green Transportation Program delivers "Next Step" Assistance

Search

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Email Requests

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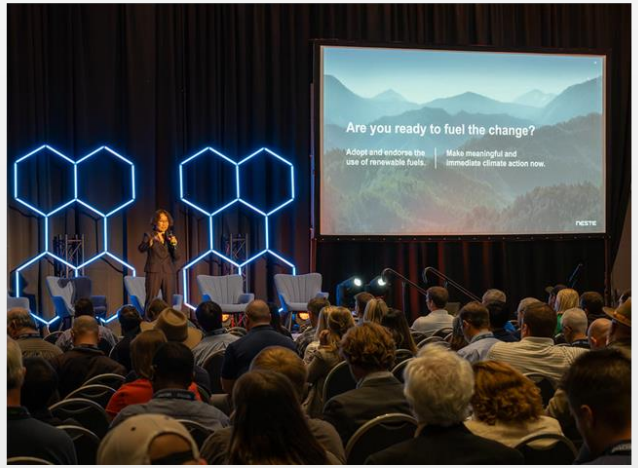
This Year With RE+

Green Transportation Summit & Expo 2024



August 20-22, Tacoma Convention Center

Use our discount code: 24CP-WSU, 30% off

Thank You

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