



# Idling Reduction Technologies

August 21, 2012

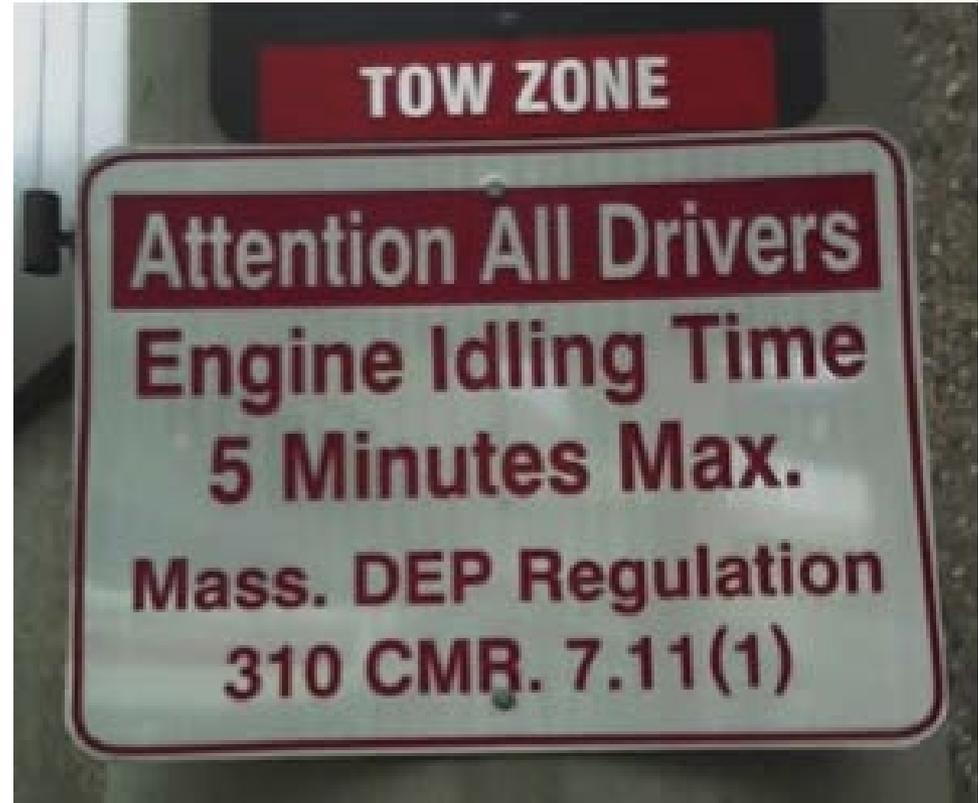
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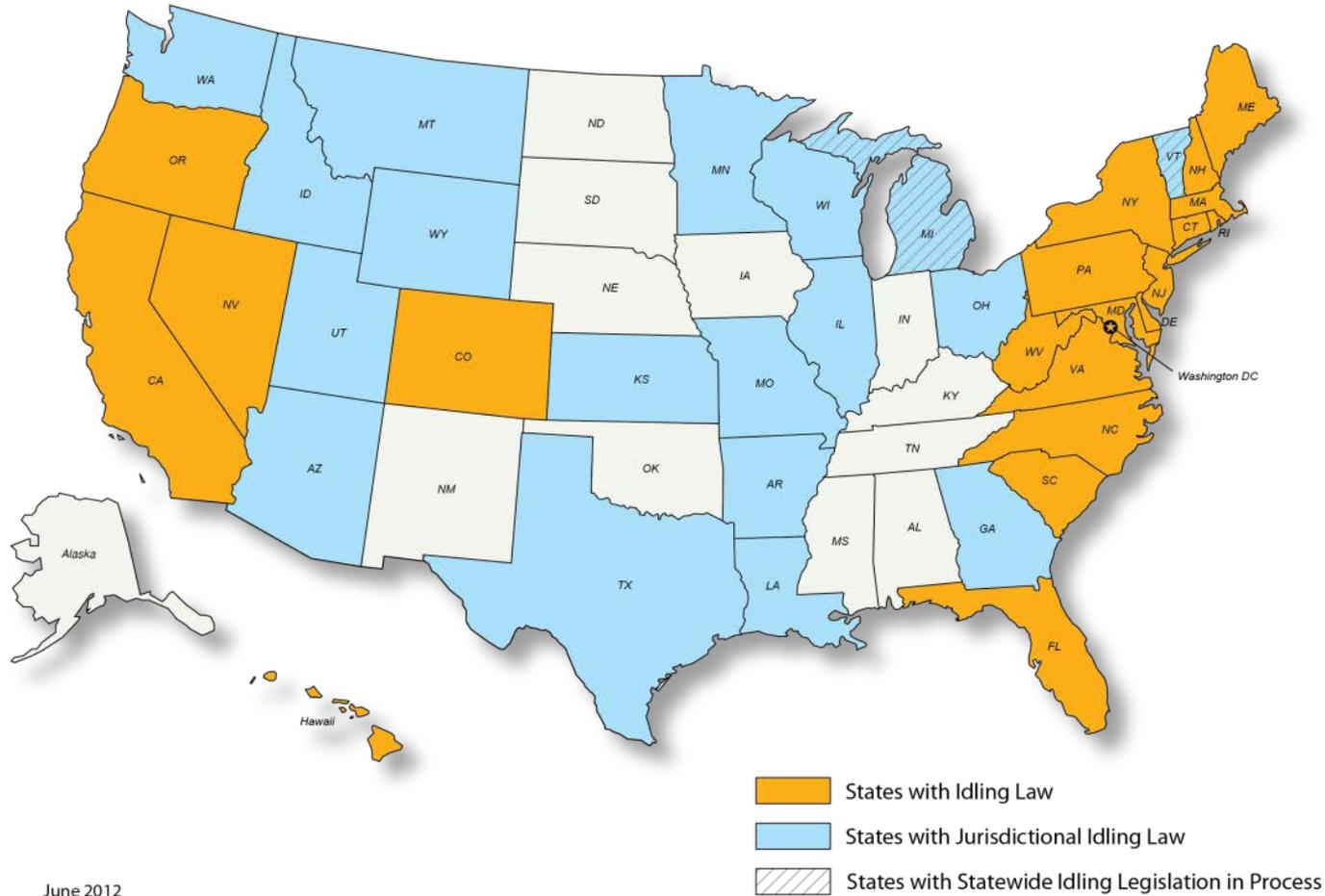
- **The cost of fuel (for which the vehicle owner gets *0 mpg*)**
  - Idling wastes about 6 billion gallons of fuel per year; about half of that is from trucks idling overnight and during the workday
- **Increased petroleum consumption and reliance on nonrenewable resources**
- **Engine wear**
  - Increased maintenance costs



- **Air pollution**
  - Harmful emissions, including greenhouse gases and those that cause smog
  - Potentially costly regulatory consequences
- **Noise**
- **Idling is *illegal* in some states and municipalities**



## States with Idling Regulations



June 2012

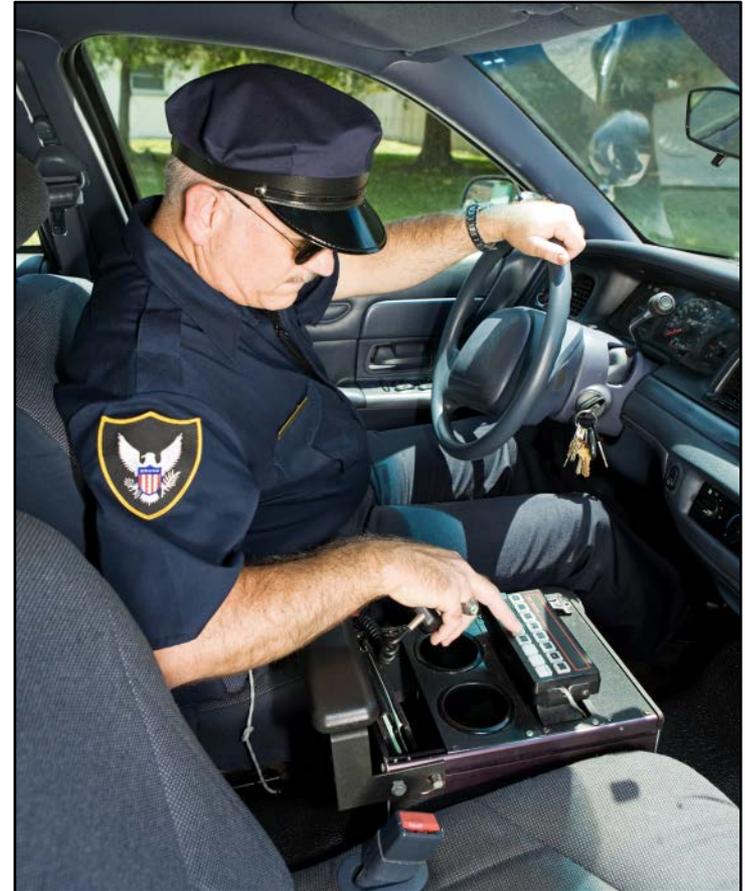
# Idling Restrictions in Wisconsin



Jurisdiction	Vehicle Type	Restriction	Exemptions
City of Madison	Large trucks on State Street	15 min. limit between 40°F and 80°F	Maintenance, construction, public utility vehicles
City of Madison	Bus >8000 lb.	15 min. if road abuts residences and 40°F-80°F	
City of Milwaukee	Vehicles outside public schools	Engines must be turned off	

## Power for Auxiliaries

- For driver and passenger safety and comfort
- To provide power for warning lights and communications equipment
- To maintain proper temperature for sensitive equipment and goods



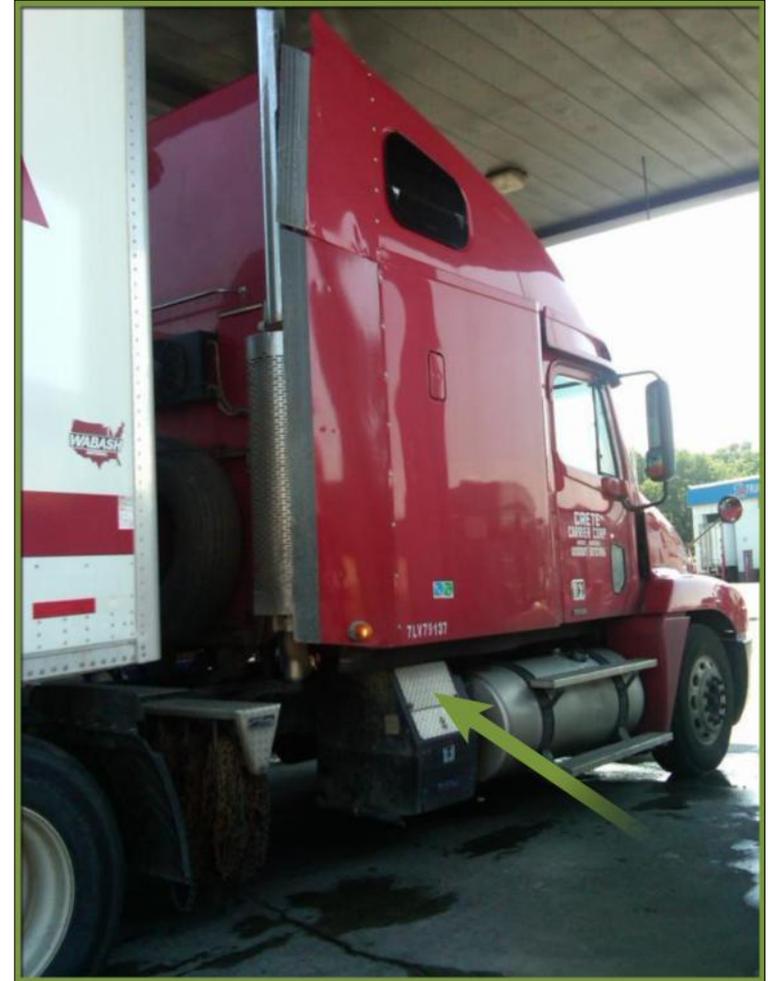
# Simple measures can reduce energy demand

- Reduce heat transfer with insulation
- Reduce solar load with shades
- Recover waste heat from coolant
- Reduce peak with load management
- Can be retrofit or OEM option



## On-Board Options

- Auxiliary power units (APUs)
- Automatic engine stop-start controls
- *For heat (and/or engine warming) only*
  - Fuel-fired heaters
  - Coolant heaters
  - Waste-heat recovery systems
  - Engine block heaters (to preheat engine only)
- *For cooling only*
  - Thermal storage cooling systems
  - Battery-electric air conditioners



- Automatic start-stop senses sleeper temperature
  - Turns engine on when too warm or cold
  - Minimal savings in extreme weather
  - May disturb sleep
  - Adds to engine wear, emissions
  - Cost for factory option or retrofit \$1,200+ for truck
- Cylinder deactivation limits combustion to part of engine
  - Enables small reduction of fuel use and emissions
  - Not commercial

- Supply HVAC, electricity, and charge battery
- Auxiliary power unit (APU) or gen set
  - Diesel-fueled engine and generator
  - Some models can be plugged in
  - Fuel cell in development
- Inverter/charger with batteries
  - Heat pump system now available
- Cost is ~\$8,500+ for truck



## A Weighty Issue

Some idling solutions can add a lot of weight to a vehicle. Some, but not all, states provide a 400-pound weight exemption for these devices.



# Status of weight exemption



- The Energy Policy Act of 2005 allowed for, **but does not mandate**, a national 400-pound exemption for the additional weight of IR devices on heavy-duty vehicles.
- The new transportation bill, MAP-21 (Moving Ahead for Progress - 21), would raise the exemption to 550 pounds
- Each State can adopt this exemption without any penalty related to withholding of highway trust fund monies.
- Wisconsin recognizes the current exemption

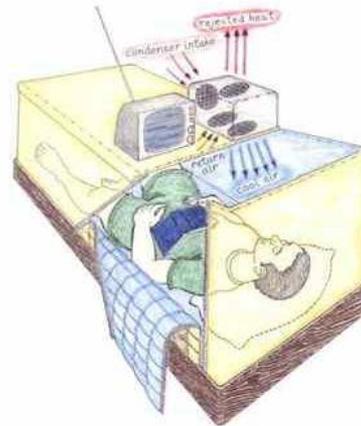
State Recognition of the 400-Pound Auxiliary Power Unit Exemption to GVW Limit: 23 CFR 658.17(n)

Alabama	<i>District of Columbia</i>	Kansas	Mississippi*	New York	South Carolina	West Virginia
Alaska	Florida	<i>Kentucky</i>	Missouri	<i>North Carolina</i>	South Dakota*	Wisconsin
Arizona	Georgia	Louisiana*	Montana*	North Dakota	<i>Tennessee</i>	Wyoming*
Arkansas*	<i>Hawaii</i>	Maine	Nebraska	Ohio*	Texas	
<i>California</i>	Idaho*	Maryland	Nevada*	Oklahoma	Utah*	
Colorado	Illinois	<b>Massachusetts*</b>	New Hampshire	Oregon	Vermont*	
Connecticut	Indiana	Michigan*	New Jersey*	Pennsylvania	Virginia	
Delaware	Iowa*	Minnesota	New Mexico	<i>Rhode Island</i>	Washington	

States in **black** allow the 400-lb weight exemption (asterisk means that the allowance is granted by enforcement policy rather than by state law); states in *gray* do not permit the exemption; and states in **brown** have legislation in process.

# Heaters and air conditioners are available

- Small, inexpensive, diesel-fueled heaters are efficient
  - For sleeper and engine
  - Used in Europe, on trucks, buses, boats
- Waste heat recirculation is inexpensive
- Most air conditioners rely on batteries
  - One system uses evaporative cooling
  - Thermal storage also available
  - May just cool bed



## Off-board Options (Electrification)

- Single-system
  - Hookup, via a window adaptor, provides heating, cooling, and amenities such as TV (no on-board equipment required)
- Dual-system (shore power)
  - Power connection allows driver to plug in to power on-board equipment, such as heater, A/C, computer, and appliances such as microwaves



Find TSE sites for heavy-duty trucks at [www.afdc.energy.gov/afdc/progs/tse\\_listings.php](http://www.afdc.energy.gov/afdc/progs/tse_listings.php)

**There are none in Wisconsin, but there is one dual-system location in Gurnee, IL.**

# Dual system TSE\* supplies electrical services

- On-board electric HVAC required
  - Cost up to \$2,500
- Parking space costs up to \$6,000
- Plug-in pedestal like campground
- Use costs \$1.00/h
- Standardized plugs desirable
  - 120V and/or 240V AC
- Payback projected <2 years for trucker
- Can plug in reefer at some locations
- Chicken and egg problem

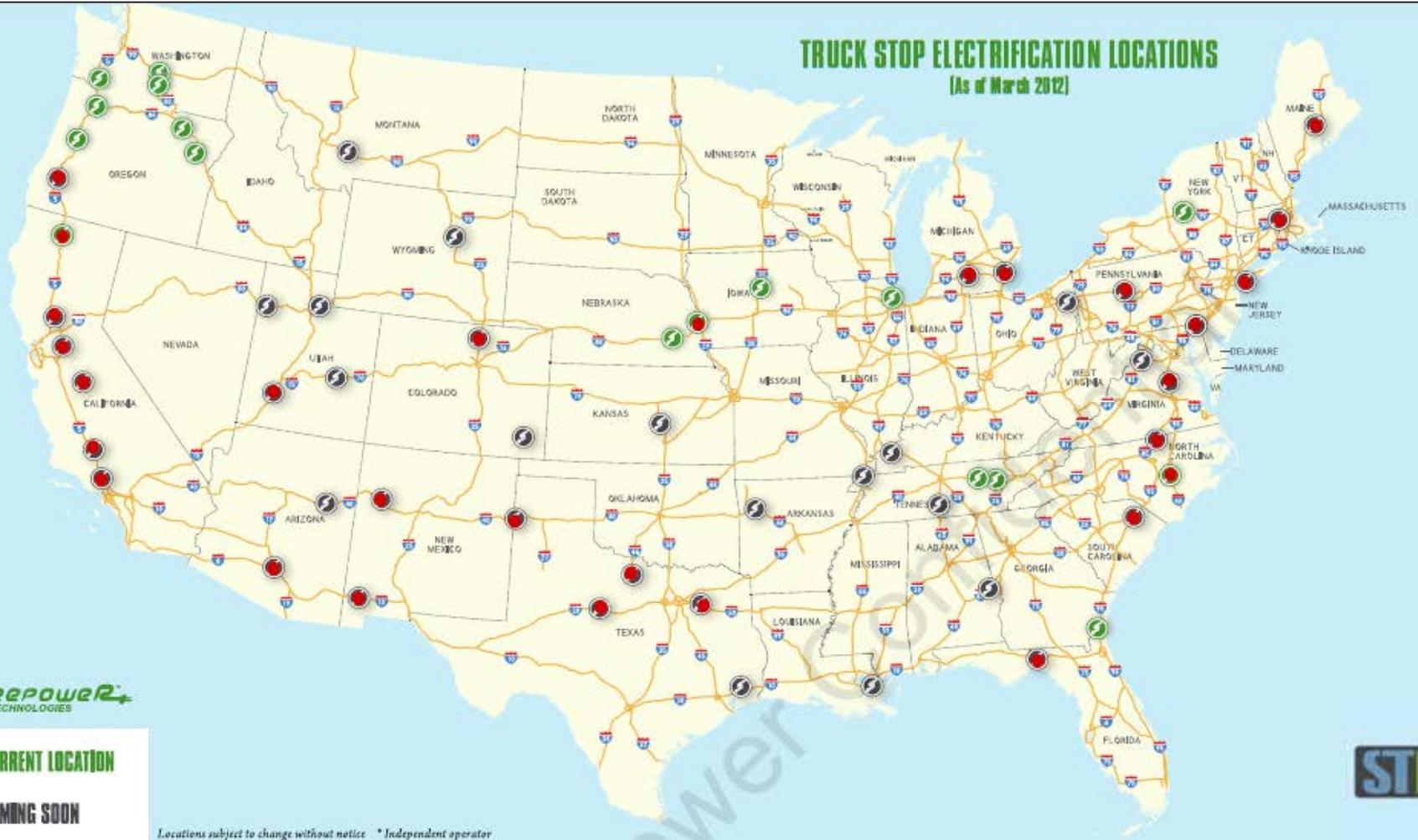


\*TSE= truck stop electrification,  
also called  
EPS= electrified parking space



# Dual System Locations

## TRUCK STOP ELECTRIFICATION LOCATIONS (As of March 2012)



SHOREPOWER<sup>2</sup>  
TECHNOLOGIES

 CURRENT LOCATION

 COMING SOON

 480 V e-TRU (refer) connection

Locations subject to change without notice \* Independent operator

STEP 

# Single system electrified parking spaces require no investment by truck owner

- User satisfaction high
  - No investment by truck owner
  - Costs less than fuel for idling
- Truck stop gets part of revenues
- System owner could sell emission credits
- About 100 locations available nationwide
- Several purveyors offer similar service
- Available for ambulances now



# Largest Single System Purveyor's Sites



# Technologies have pros and cons



System	Services	Advantages	Disadvantages
Idling	All	No investment	High emissions, noise, fuel use
Automatic start-stop	All, intermittently	Low cost	Noisy, minimal benefit in winter
APU or similar device	All	<b>Anywhere, anytime</b>	High cost and weight
Truck stop electrification	All	No <b>local</b> emissions, pay-per-view, quiet	<b>Requires equipped location</b> , cost
Heater	Heating	Low cost and weight	Not full service
Air conditioner	Cooling	Low cost	Not full service, energy storage may be heavy

EPA has determined that devices among the product lines of the following companies save fuel and reduce emissions when compared to idling the main engine for Class 8 trucks:

- **Electrified parking spaces:** CabAire, Craufurd, EnviroDock, IdleAire, Philips and Temro, Shorepower™, Xantrex
- **Auxiliary Power Units and Generator Sets (APU/GS):** ACEMCO, Airworks, Big Rig, Carrier Transicold, Diamond, Dunamis, Hodyon, Kohler, Life Force, Mantis, McMillan, Midwest, Navistar, Parks, Pony Pack, Power Technology Southeast, RigMaster, Star Class, Thermo King, TRIDAKO, Volvo, Willis
- **Fuel-operated heaters:** Automotive Climate Control, Espar, Teleflex, Volvo, Webasto
- **Battery air-conditioners:** All Around Contracting, AuraGen, Bergstrom, Cool Moves, DC Power, Diamond, Dometic, Driver Comfort, Energy Xtreme, Freightliner, Glacier Bay, Hammond, Idle Free, Indel, NAS, Navistar, Paddock Solar, Peterbilt, Safer, Sobo, Sun Power, Thermo King, Volvo
- **Thermal storage systems:** Autotherm, Webasto



## Driver Education, Policy Implementation, and/or Schedule Adjustments

- Vehicle/fleet telematics (to monitor driver behavior, including idling time) can support education and policy.

## Devices and Technologies

- Idle limiters (engine shutdown timers)
- Automatic engine stop-start controls with battery-charge monitor
- Air and coolant heaters
  - Air heaters operate with a flame and blower
  - Coolant heaters circulate warmed coolant from the engine to the cabin; can provide heat for several hours
- Small fans (blow heat out of a hot vehicle)



## *Devices and Technologies (cont.)*

- **Hybrid Drivetrain**
  - Solves “creep” idling problem
- **Auxiliary Power**
  - Auxiliary battery/power cells
- **Electrified Parking Spaces**
  - Technology is emerging for some medium-duty vehicles such as ambulances



## Power Take-Off (PTO)

- *Power take-off* refers to a device that diverts power from a vehicle engine to power another device (e.g., hydraulic lift on a bucket truck).
- PTO powers nonpropulsion functions on work trucks.



# Hybridization can reduce idling as well



Type of Hybrid	Hybrid Drivetrain	Hybrid PTO	Companies	Comments
Hydraulic	X		Eaton	Eliminates creep idle
Battery Plug-In	X	X	Odyne	Li-ion battery, eliminates creep idle
Battery		X	Vanner	Monitors battery when using PTO



Hybrid digger derrick with turret-mounted winch

A green banner with a white border. On the left side, there is a graphic of a road with several vehicles (a car, a truck, and a bus) and arrows pointing right, symbolizing traffic flow. The text 'National Idling Reduction Network News' is written in white, bold, sans-serif font across the center of the banner.

## National Idling Reduction Network News

### **A free monthly, electronic newsletter that provides:**

- Information about current funding opportunities and recent awards
- News about changes in ordinances, laws, regulations, and enforcement
- Alerts about upcoming meetings, events, and other resources of interest
- Links to idling cost calculators and other idling reduction resources

[www.eere.energy.gov/vehiclesandfuels/resources/fcvt\\_national\\_idling.html](http://www.eere.energy.gov/vehiclesandfuels/resources/fcvt_national_idling.html)

## Argonne National Laboratory's Idling Reduction Page

[www.transportation.anl.gov/engines/idling.html](http://www.transportation.anl.gov/engines/idling.html)

## Alternative Fuels & Advanced Vehicles Data Center (AFDC) Idling Reduction Page

[http://www.afdc.energy.gov/conserve/idle\\_reduction\\_basics.html](http://www.afdc.energy.gov/conserve/idle_reduction_basics.html)

## Clean Cities

[www.cleancities.energy.gov](http://www.cleancities.energy.gov)

## Clean Cities Coordinator Contact Information

[www.afdc.energy.gov/cleancities/progs/coordinators.php](http://www.afdc.energy.gov/cleancities/progs/coordinators.php)

## National Idling Reduction Network News

[www.eere.energy.gov/vehiclesandfuels/resources/fcvt\\_national\\_idling.html](http://www.eere.energy.gov/vehiclesandfuels/resources/fcvt_national_idling.html)

## SmartWay Verified Technologies

<http://www.epa.gov/smartway/technology/index.htm>



### IDLING IS EXPENSIVE >>>

up to a gallon of fuel per hour in most vehicles

### IDLING POLLUTES >>>

a gallon of fuel creates about 20 lbs. of greenhouse gases

### IDLING THREATENS HEALTH >>>

breathing vehicle emissions increases risk of respiratory illness



DRAFT poster from IdleBox

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