State of Oregon
Department of Environmental Quality Memorandum

Date: Jan. 8, 2021

To: Environmental Quality Commission

From: Richard Whitman, Director

Subject: Item L: Addressing Diesel Engine Emissions in Oregon (Informational)
Jan. 21-22, 2021, EQC meeting

Purpose

This is the second of two informational briefings for the commission on diesel engine emissions reduction. DEQ staff will describe the environmental and public health impacts of diesel engine exhaust, characterize the diesel engines emissions in Oregon, describe existing programs and policies that address diesel engine emissions and prepare the commission for relevant rulemakings and other actions planned in the next several years.

The commission will also hear from outside experts on challenges and opportunities in further reducing diesel engine emissions. Guest speakers will include:

- Amy Schlusser, Green Energy Institute
- David Breen, Port of Portland
- Dennis McLerran, Cascadia Law Group

Introduction

Diesel engines offer fuel economy, power and durability. For these reasons, diesel engines power most non-road equipment as used in the construction, agricultural, marine and locomotive sectors, including approximately 80 percent of all freight moved in the U.S. While the operational advantages of diesel are clear, diesel engines emit large amounts of nitrogen oxides, particulate matter and other toxic air pollutants.

In 2007, the Oregon Legislature directed the Environmental Quality Commission in statute to "establish a goal to reduce excess lifetime risk of cancer due to exposure to diesel engine emissions to no more than one case per million individuals by 2017" (ORS 468A.793). The state did not meet that goal, renewing conversations in the legislature and the community about the health effects associated with diesel engine exhaust and options for reducing emissions.

In July 2020, DEQ staff briefed the commission on the environmental and public health risks associated with diesel engine exhaust, the major sources of diesel emissions in Oregon and the ambient levels of diesel particulate matter found across the state.

Key takeaways from that briefing include:

- Diesel engine exhaust contributes to a wide-variety of health and environmental problems
- The major sources of diesel emissions in Oregon are medium-duty and heavy-duty trucks, and non-road equipment such as construction and agricultural machinery
- While newer engines are cleaner-burning, Oregon has a substantial fleet of older, high-emitting equipment still in use
- The use of diesel engines is ubiquitous across the state; however,
- Some communities experience much higher levels of diesel pollution than others

This informational item focuses on policy and programmatic approaches to reduce diesel engine emissions. The report includes:

1. A summary of the state's and this commission's legal authorities to regulate diesel engine exhaust and emissions
2. An inventory of existing programs and regulations that address diesel engine exhaust and emissions
3. A review of new and emerging initiatives designed to reduce diesel engine exhaust and emissions

Throughout the report, and synthesized in this report's conclusions section, DEQ has identified challenges and opportunities to further reducing emissions.

State and EQC authorities

Below is DEQ's understanding of key concepts, constraints and authorities related to regulating mobile sources of diesel pollution. This is not a comprehensive review of all legal authorities, and is not legal advice. This summary focuses on authorities related to the federal Clean Air Act and Oregon Revised Statutes Chapter 468A, Air Quality Laws. It is not inclusive of all sources of diesel emissions; instead, it focuses on key sectors discussed at the July 2020 commission meeting, namely medium- and heavy-duty vehicles and construction equipment.

There are three key definitions when evaluating mobile source legal authorities:

1. **Emission standard:** An emissions standard is any regulation that restricts engine emission levels, including setting an emission level that may not be exceeded, requiring use of a particular pollution control device, or requiring particular design features to decrease emissions.
2. **On-road versus non-road:** On-road generally refers to motor vehicles, meaning vehicles designed to travel over the highway and road, such as trucks and cars. Non-road sources are those not primarily designed to travel over highways and roads, such as locomotives, marine vessels, and agricultural, construction and logging equipment. Distinguishing on-road and non-road sources is important as the authorities provided to states under the federal Clean Air Act differ based on that distinction.
3. **New versus in-use:** The Clean Air Act also treats the regulation of new vehicles and vehicle engines differently than the regulation of in-use (i.e. used) vehicles and engines.

Figure 1 – Legal authorities summary table

	On-road ("motor vehicles")	**Non-road**
New engine standards	Oregon is preempted under Section 209 of the Clean Air Act (42 USC § 7543) from establishing emission standards for new on-road engines (motor vehicles) – except when adopting standards identical to those adopted by the state of California, under CAA Section 177 (42 USC § 7507). ORS 468A.380 authorizes EQC to establish motor vehicle emissions standards.	Oregon is preempted under Section 209 of the Clean Air Act from establishing standards for new locomotive engines and for new non-road engines used in farm or construction equipment that are under 175 horsepower. For all other new non-road engines, Oregon is preempted under Section 209 of the CAA from establishing emission standards for new non-road engines, except when adopting standards identical to those adopted by the state of California. ORS 468A.025(3) authorizes EQC to establish emissions standards for

		all sources of air contaminant emissions, including non-road engines, except that ORS 468A.020(1)(b) prohibits EQC from regulating equipment used in agricultural operations.
In-use engine standards	Oregon may adopt emission standards for in-use on-road engines. The CAA does not preempt such standards. ORS 468A.380 authorizes EQC to establish motor vehicle emissions standards	Oregon is preempted under Section 209 of the federal CAA from establishing emission standards for in-use non-road engines, except when adopting standards identical to those adopted by the state of California. ORS 468A.025(3) authorizes EQC to establish emissions standards for all sources of air contaminant emissions, including non-road engines, except that ORS 468A.020(1)(b) prohibits the EQC from regulating equipment used in agricultural operations.

Authorities to regulate on-road sources

Section 209(a) of the federal Clean Air Act (42 USC § 7543) prohibits states or local or regional governments from establishing emission standards for new motor vehicles. However, there is an important exception: Section 177 (42 USC § 7507) allows states to adopt new motor vehicle emissions standards that are identical to standards adopted by the state of California, if California has received a waiver from the U.S. Environmental Protection Agency to promulgate its standards. This is an authority that over a dozen states, Oregon included, have exercised.

Additionally, ORS 468A.380 provides authority to the Environmental Quality Commission to establish motor vehicle emissions standards. It is under this authority, and consistent with the federal Clean Air Act, that Oregon has adopted motor vehicle emissions standards for new vehicles, such as adoption of California's Low- and Zero-Emissions Vehicle regulations.

The federal Clean Air Act does not prohibit states from establishing emissions standards for in-use motor vehicles (i.e. on-road). Any standard a state establishes for in-use motor vehicles cannot be more stringent than the current new vehicle standards as that would in effect be a standard on new engines. Further, the new engine standards established by the U.S. EPA or the California Air Resources Board are applicable for the "useful life" of the engine. That is typically five years/50,000 miles, 10 years/100,000 miles or as otherwise described in the standard. In effect, this means Oregon cannot establish a standard for an in-use vehicle that is more stringent than the motor vehicles' initial emission standard and that would apply during its useful life.

Again, Oregon has exercised its authority to establish standards for in-use motor vehicles. Examples specific to diesel-powered motor vehicles include:

- The Vehicle Inspection Program: ORS 468A.360 authorizes EQC to establish emissions standards and ORS 468A.365 authorizes a program for inspecting and certifying compliance with emissions standards.
- Engine phase-out deadlines: In 2019, the Oregon Legislature established a schedule by which older diesel trucks cannot be registered in Clackamas, Multnomah and Washington counties because of their higher emissions.

Authorities to regulate non-road sources

The federal Clean Air Act prohibits all states from adopting emissions standards for new locomotive engines and for new non-road engines with less than 175 horsepower that are used in construction or farm equipment. The state of California has the authority, when granted a waiver by EPA, to adopt emissions standards for all other non-road engines. In those instances, other states can opt to adopt standards identical to those adopted by California, when California has received a waiver for such standards from EPA.

For on-road in-use engines, states are also prohibited under the federal Clean Air Act from establishing emissions standards for in-use non-road engines. Again, the California waiver exception exists. Section 209(e) of the Clean Air Act provides the state of California the authority to seek a waiver and develop emissions standards for any non-road engines, including in-use engines, not exclusively under EPA's authority (i.e. new locomotives, and new non-road engines smaller than 175 horsepower used for farm and construction equipment). This means that California may adopt emissions standards for in-

use non-road engines, and California has done so. Other states have the authority to adopt in-use regulations, but only if they are identical to those adopted in California. To date, no state has adopted California's in-use non-road engine regulations.

The preemption in Section 209 of the Clean Air Act applies only to engine emission standards, and not to other types of regulations on the use of engines. These other types of allowed regulation can include things like fleet standards, idling restrictions and carpool lane restrictions. Any such proposed regulations must ensure that they are not regulating the engines, but are instead regulating only their use.

Authority to regulate indirect sources

Under ORS 468A.025 and the statutory definition of "air contamination source" in ORS 468A.005, and as also recognized under Section 110(a)(5) of the Clean Air Act, EQC may regulate indirect sources of emissions. As defined in the Clean Air Act, an indirect source means "a facility, building, structure, installation, real property, road, or highway which attracts, or may attract, mobile sources of pollution." The distinguishing factors between regulating indirect sources of emissions and establishing emissions standards on mobile sources include:

- An indirect source review or regulatory program must evaluate or measure emissions at the site-level, and not be a regulation that effectively imposes engine emission standards on the individual mobile sources traveling to, from or operating at the site.
- Any emissions reductions required under an indirect source regulatory program must be site-based and not specific to particular vehicles or engines.

In the 1970s and 80s, EQC adopted OAR Chapter 340, Division 253, which established statewide indirect source regulation focused on the construction of new parking facilities, shopping malls, multi-family housing developments, commercial property developments and other road projects. The program was an integral element of the state's strategy to attain compliance with the federal carbon monoxide ambient standard. The program has since been limited to focus on the construction of new large parking facilities in the Portland-metro and Rogue Valley areas.

Existing programs and policies

Research and evaluation

A core element of the agency's diesel emissions reduction work is conducting research and data analysis to evaluate and inform diesel emissions reduction strategies. Recent research and evaluation efforts include community-scale air toxics monitoring, inventory of non-road diesel engines in Oregon and emissions modeling work, all detailed below.

Community-scale air toxics monitoring: Improving Diesel Particulate Matter Exposure Assessment for Vulnerable Populations

In 2017, DEQ along with Portland State University, applied for and were awarded EPA's Community-Scale Air Toxics monitoring grant in 2017. The project includes three phases:

- Develop monitoring "signatures" from different diesel engine emission sources, including: locomotives, marine ships, construction sites and distribution centers;
- Using those signatures and monitoring in Portland's Jade District and Cully neighborhood, identify the source of diesel particulate matter impacting the two communities; and
- Engage with advocates and community leaders to disseminate and interpret the results to impacted communities.

Researchers from PSU and Reed College have completed characterizing emissions and monitoring emissions in the communities. Researchers are now focused on analyzing the monitoring data to determine which sources of diesel particulate matter are impacting the Jade and Cully communities. Community engagement activities are scheduled to begin in early 2021, though will be modified if in-person gatherings continue to be restricted due to COVID-19 safety requirements.

Non-road Inventory

In 2017, the Oregon Legislature appropriated funding to DEQ for a statewide survey of non-road diesel engines greater than 25 horsepower. The purpose of the project was to better estimate non-road diesel equipment emissions and to identify sectors or equipment types where incentive funding, including grants, would have the greatest impact on reducing exposure.

The report indicates that statewide non-road diesel fuel consumption is significantly less than predicted from the standard inventory – it is 61% of expected, based on other available input data used to create study predictions.

This indicates that, in general, non-road equipment is not used as much as previously predicted. However, because the study also showed that equipment is typically older than previously predicted, the ultimate emissions results for criteria pollutants are comparable at the statewide level. Even though the equipment is operating for fewer hours than originally assumed, it emits more pollutants per gallon of fuel consumed because of its age. Based on this information, Oregon should encourage the accelerated turnover of this equipment to dramatically reduce diesel emissions coming from this sector.

The data also showed that the sectors using these older engines varied strongly by county and area. For example, the agricultural sector was a larger source in rural less-populated counties, while construction was the largest source in the state's urban centers. Strategies for reducing these emissions and their subsequent exposure risk may need to reflect these geographic differences. .

Emissions inventory and dispersion modeling

The National Emissions Inventory is a comprehensive and detailed estimate of air emissions of criteria pollutants, criteria precursors, and hazardous air pollutants, including diesel particulate matter, from all human-made and natural sources of air pollution. The NEI is released every three years based primarily upon data provided by state, local, and tribal air agencies for sources in their jurisdictions and supplemented by data developed by the EPA. While this is not a DEQ-led effort, the results are critical to inform the sources and their relative contribution to diesel engine emissions.

DEQ uses dispersion modeling to estimate the ambient concentrations of particular pollutants found in the air at a certain place and time. Dispersion modeling uses air quality monitoring, emissions inventory, meteorological, and other data to model concentrations of air pollutants in the air across a defined geography. Dispersion modeling is widely used by regulators, researchers and regulated entities to evaluate air quality. It is the only way of characterizing concentrations of pollutants at a fine scale across a community or geography.

The most comprehensive dispersion model is the National Air Toxics Assessment. NATA is EPA's review of air toxics in the United States. DEQ uses NATA to evaluate levels of diesel pollution and the associated health risks throughout the state.

Incentive programs

DEQ operates a variety of incentive programs for the retrofit, repower and replacement of diesel engines in Oregon.

Federal Diesel Emissions Reduction Act

Since passage of the Federal Diesel Emissions Reduction Act in 2005, EPA has funded diesel emissions reductions projects either through competitive grants (70 percent of funding) or through state allocations (30 percent of funding), with additional matching incentive funds. The focus of DERA grants in Oregon has been on vehicle and equipment replacement, funding advanced exhaust control retrofits or replacing older diesel engines with newer, cleaner-burning engines. Between 2008 and 2018, a total of $14.6 million was spent on DERA projects within Oregon to treat more than 800 diesel engines.

In recent years, Oregon has focused its DERA state allocation resources on retrofitting or replacing older school buses, funding approximately $480,000 per year for these projects. School buses do not represent the largest source of diesel emissions in Oregon communities; however, the emissions that are produced by older school buses impact children, a vulnerable population under federal and state definition, and the buses are driven in mostly residential areas. In addition, these funds assist school districts with meeting the retrofit and replacement requirements in ORS 468A.796. DEQ plans to integrate non-road equipment projects in current and future rounds of state allocation funding to assist construction contractors with meeting local and state clean diesel contracting standards that will go into effect in 2022.

Federal Congestion Mitigation and Air Quality funds

Oregon DEQ receives $500,000 per biennium of federal Congestion Mitigation and Air Quality funds to reduce harmful diesel emissions from older more polluting vehicles and equipment. DEQ has used these CMAQ funds used to pay for the installation of diesel exhaust control retrofit devices on older school buses in the David Douglas School District in the Portland area. Based on guidance from the Oregon Department of Transportation, future projects must generate a net emissions reduction from a transportation project and must be consistent with a long-range transportation plans.

DEQ has approximately $2.6M in unexpended CMAQ funds available for diesel emission reduction work during the upcoming biennium. These funds must be spent pursuant to guidance from the Federal Highway Administration and ODOT. Past projects have focused on exhaust control retrofits and future

projects could include similar equipment purchases that measurably reduce emissions. Future projects will likely focus on decommissioning older diesel engines and supporting the transition to newer, cleaner technologies.

VW School Bus Program

As required by Senate Bill 1008 (2017), Oregon DEQ continues to retrofit, repower, and replace at least 450 school buses with a portion of the $73 million available from a court settlement agreement with Volkswagen for its national emissions cheating violations. This initial allocation to the State of Oregon, based on registration share of VW diesel vehicles by state, must be spent in 10 years, or a deadline of Oct. 2nd, 2027. The court settlement agreement establishes the types of projects allowed, and the amounts of funding available for different projects, by equipment model year, type, and owner.

To date, DEQ has funded upgrades for 262 buses, which results in reductions of 28 tons of nitrogen oxides (NOx) and 2.4 tons of fine particulate matter (PM 2.5). While most school districts have chosen to purchase new, lower-emission diesel school buses with this funding, some are prioritizing exhaust control retrofit technology and alternative fuel vehicles.

Policies and Rules

The foundational research described above informs key policies and rules for the regulation of diesel emissions in Oregon. With the exception of restrictions on idling, all of the rules described in this subsection are implemented or enforced by DEQ.

Vehicle Inspection Program

VIP has established standards for testing passenger, included those powered by diesel engines. Newer vehicles are tested using on-board diagnostic system. This includes downloading computerized vehicle OBD information, observing trouble codes and observing the malfunction indicator lights located on vehicle dashboards. Passenger vehicles from 1997 and earlier are tested using the basic tailpipe test program method.

ORS 468A.385 gives EQC statutory authority to establish and maintain procedures and programs for determining whether motor vehicles meet the minimum requirements necessary to secure a certificate of compliance in accordance with ORS 815.310 (Proof of compliance with requirements). The vehicles regulated by the Vehicle Inspection Program include any motor

vehicle that is not exempt from the requirement to be equipped with a pollution control system listed in ORS 815.300 and ORS 801.026.

Diesel vehicles 8,501 to 14,000 pounds, which are typically heavier-duty trucks and equipment, are not exempt from VIP testing; however, they currently do not require an emissions test in VIP-regulated parts of the state. DEQ intends to evaluate the feasibility of testing diesel trucks, 8,501 and up to 14,000 pounds using OBD technology for vehicles model year 2013 and newer. This action may require modifications to testing stations, establishment of fees for this class of vehicles and additional staff.

Clean Fuels Program

The Clean Fuels Program is designed to decrease the amount of greenhouse gases created during the production, processing, transportation, and consumption of fuel used in Oregon. Cleaner fuels have lower carbon emissions, or carbon intensity, which help improve air quality and public health. DEQ began implementing the Clean Fuels Program in 2016, and it initially required an average carbon intensity of fuels in Oregon to be 10 percent below 2015 levels by 2025. Governor Brown's Executive Order 20-04, issued in March 2020, directs EQC and DEQ to reduce the average carbon intensity of fuels by 20 percent below 2015 levels by 2030, and 25 percent below 2015 levels by 2035. In addition to these pollution reductions, the program:

- Provides incentives to create demand for cleaner fuels in the marketplace
- Encourages the use of cleaner fuels such as electricity, ethanol, biodiesel and renewable diesel

Since 2019, the program has reduced approximately four million tons of greenhouse gas emissions and displaced the use of over 900 million gallons of gasoline and diesel.

The transition to cleaner fuels can also reduce tailpipe emissions such as diesel particulate matter. Most lower-carbon options, including biodiesel, renewable diesel and liquefied and compressed natural gas, reduce particulate matter and NOx emissions when used, and electric vehicles produce zero tailpipe emissions.

Stationary Source Regulations

EPA has established federal regulations for many reciprocating internal combustion engines, such as 40 CFR part 60 subpart IIII the New Source Performance Standards for compression-ignition engines. These standards limit the allowable emissions of criteria and hazardous pollutants from diesel generators and other large stationary installations of spark and compression ignition engines. DEQ has the authority to implement the federal standards for any source required to obtain an air permit, either under the ACDP or Title V programs. In addition to the federal standards, DEQ's Cleaner Air Oregon program evaluates risk associated with emissions from diesel generators. The program has issued permits for new facilities that include large installations of diesel-powered generators and is in the process of reviewing emissions from existing sources.

Idling restrictions

Oregon has restrictions on commercial vehicle idling in statute. The law prohibits idling in excess of five minutes within any 60-minute period. The law makes exceptions for certain vehicle types and for certain activities, including but not limited to: maintenance activities, for up to 30 minutes while trucks are loading/unloading, and for cab heating and cooling when the outside temperature is below 50 degrees Fahrenheit or above 75 degrees Fahrenheit. Oregon's idling laws are part of the motor vehicle code, enforced by state and local police officers, and violation of the law is a Class C traffic violation. ORS 825.615 preempts local governments from establishing their own restrictions on commercial vehicle idling.

New and emerging initiatives

In addition to the established efforts described above, DEQ staff are engaged in many new and emerging initiatives focused on reducing diesel engine emissions. These efforts fall into one, or more, of three strategic approaches:

1. Replace and retire the oldest diesel engines
2. Adopt new and cleaner technologies
3. Support owners and operators to transition fleets

Replace and retire the oldest diesel engines

Because of national standards developed by the EPA, new diesel engines burn much cleaner, emitting over 90 percent fewer particulate and NOx emissions than pre-2007 models. However, diesel engines are incredibly durable, and can remain in operation for decades when maintained. Many of these strategies are contingent on rule adoption by the Environmental Quality Commission.

Medium- and heavy-duty truck phaseout or retrofit program

House Bill 2007 (2019) includes phased-in prohibitions on registering and titling older on-road diesel engines in Clackamas, Multnomah and Washington counties. By 2029, all medium-duty trucks must be model year 2010 or newer, all publicly-owned heavy-duty vehicles are model year 2010 or newer and all privately owned heavy-duty trucks be model year 2007 or newer to be legally titled in these counties.

The legislation allows a vehicle to be registered or titled after the phase-out deadlines if it is equipped with EQC-approved retrofit technology. Diesel retrofit technologies are aftermarket components installed on a vehicle. These components are designed to reduce emissions in existing diesel engines. The availability, effectiveness, and cost of retrofit technologies vary by application. DEQ staff are conducted a rulemaking now to identify allowable retrofit technologies and the process for truck owners to demonstrate compliance. DEQ expects to bring proposed rules for commission consideration in mid-2021.

DEQ requested state funding in 2019 to support this legislatively-directed work. The Oregon Legislature approved partial funding; however, additional staff and funding for information technology upgrades are needed to ensure the retrofit program is fully implemented.

Clean diesel construction standards for major public works projects

ORS 279C.537 sets standards for the use of diesel engines used on certain public improvement contracts in the Portland region and allows for state contracting agencies to create their own standards after considering minimum standards established by DEQ. These minimum standards, currently under development and expected in January 2021, are expected to reduce diesel emissions associated with publicly funded infrastructure projects in the areas of the state that have the highest levels of estimated diesel particulate matter exposure, the largest population and the highest concentration of infrastructure projects. State contracting agencies will need to have standards in place for contracts advertised or solicited after Jan. 1, 2022.

Voluntary emissions labeling program

This new program, described in ORS 468A.813, would allow owners or operators of construction equipment powered by non-road diesel engines to participate in a voluntary program to help them easily demonstrate the emissions profile of their equipment. A label would communicate certain information about engine tier level to officials involved in ensuring compliance

with clean contracting standards and to the public who value having the lowest polluting equipment used on projects in their neighborhoods.
Funding for this work was reduced during the legislature's special session in August, delaying progress until the next biennium.

Backup diesel generator General Permit update
DEQ's General Permit (AQGP-018) for electrical power generation from combustion is set to expire in 2021. The current permit incorporates some of the federal requirements discussed above, but excludes permitting requirements for engines that are used solely for emergency response, such as the loss of grid power. DEQ is evaluating ways to update this general permit in ways that fully explain applicable requirements and require additional cost-effective emission reduction strategies.

Adopt newer and cleaner technologies
In addition to retiring the oldest diesel engines, the state must study and pursue strategies that lead to greater adoption of newer and cleaner technologies. While these strategies primarily reduce harmful tailpipe emissions, many also reduce greenhouse gas emissions. Failure to adopt these emerging technologies may lock the next generation of trucks and equipment into higher-emitting technologies and a reliance on fossil fuels.

Medium/Heavy-Duty Zero Emissions Vehicle Memorandum of Understanding
In July 2020, Oregon signed onto a multi-state Medium- and Heavy-Duty ZEV MOU with 14 other signatory states and Washington D.C. The MOU commits states to work together to advance and accelerate the market for electric medium- and heavy-duty vehicles, with a goal of 100 percent of all new medium- and heavy-duty vehicle sales be zero emission vehicles by 2050 with an interim target of 30 percent zero-emission vehicle sales by 2030. The MOU includes the development and implementation of a ZEV action plan for trucks and buses, and will seek ways to accelerate the deployment of these zero emission vehicles to benefit disadvantaged communities. This plan will be complete in 2021.

The MOU comes at an important transition point for the industry as investment in zero emission vehicle technology for the medium- and heavy duty sector continues to ramp up. Medium- and heavy-duty vehicles are also an acknowledged, but unaddressed, environmental justice problem that directly and disproportionately harms communities located near freight corridors, ports and distribution centers.

Advanced Clean Truck rulemaking

California recently adopted the Advanced Clean Trucks Rule, which will result in greenhouse gas and tailpipe emissions reductions in the on-road medium- and heavy- duty vehicle sectors. The rule requires medium- and heavy-duty vehicle manufacturers to sell ZEVs as a certain percentage of sales, beginning with the 2024 vehicle model year.

Oregon has adopted California's light-duty ZEV requirements, but not those for medium-duty or heavy-duty vehicles. DEQ is developing a rulemaking for EQC consideration by the end of 2021, which would require 2025 model year vehicles and beyond to conform to the standards. This rule action would further Oregon's progress to meeting its greenhouse gas emission reduction goals, shift the medium- and heavy-duty market away from fossil fuel use, and electrify Oregon's vehicle fleet for all on-road classes of vehicles.

Low-NOx emissions standards rulemaking

The California Air Resources Board recently adopted new Heavy Duty emissions standards for on-road engines for NOx and PM. This rule has been referred to as the heavy-duty omnibus regulation and it has several components including but not limited to:

- New, lower emissions limits for NOx and PM, and new optional lower NOx standard
- New, low load cycle standard which addresses emissions associated with low or idle speeds when emissions temperatures are not high enough to ensure proper catalyst operation
- New criteria for demonstration of engine and after-treatment system durability over the full useful life

Adopting these rules by reference under authority of the Clean Air Act (Section 177) would mean that all new medium- and heavy-duty vehicles sold in Oregon would need to meet these new standards. This does not affect vehicles that are already on the road. DEQ is preparing a rulemaking and intends to bring proposed rules to the commission by the end of 2021.

Truck Alternative Fuels Study

This study will identify the fueling and infrastructure needs for medium- and heavy-duty trucks to be powered by electricity, hydrogen, renewable natural gas, or other lower carbon biofuels, and potential approaches state agencies can

take to enable a transition to alternative fuels. DEQ will lead this work, with support from the Oregon Department of Transportation. The goal of the effort is to provide technical support, not to regulate or mandate specific fuels or technology.

Anticipated outcomes include an Oregon-specific fleet profile as well as informed scenarios to increase alternative fuel usage. The study will identify opportunities to develop policies that overlap local, regional, state and federal regulations and funding opportunities in order to maximize alternative fuel adoption, reduction of greenhouse gases and other tailpipe emissions, and address disproportionate impacts to environmental justice communities. The study will also identify barriers for conversion to alternative fuels, and specifically those that disproportionately harm disadvantaged businesses enterprises.

Expanding the Clean Fuels Program and the health and social impacts of the Clean Fuels Program

The Clean Fuels Program will be conducting two studies to analyze ways Oregon's fuels market could meet the expanded targets in Executive Order 20-04 and then to quantify the health and social impacts that might arise from those scenarios. The results of these studies will inform policy and investment strategies needed to achieve deep and long-term reductions in greenhouse gas emissions from the transportation sector. They will also inform opportunities to focus tailpipe emissions co-benefits in communities disproportionately harmed by diesel pollution.

Support owners and operators to transition fleets

Strategies to retrofit, repower and replace engines sooner than they otherwise would be retired can be expensive. Retrofit technologies, which are the most cost-effective approach to reducing emissions and only work in certain applications, can range between $8,000 and $20,000. Repowering or replacing whole trucks or pieces of equipment is of course far more expensive, but may be the only feasible approach in some circumstances. DEQ views providing financial incentives, including grants, loans and tax credits, as one important element of a comprehensive strategy to reduce emissions.

Volkswagen grant program

House Bill 2007 (2019) directs EQC to develop rules and direct DEQ to operate a program for disbursing Oregon's remaining share of the Volkswagen settlement agreement. HB 2007 also sets preference criteria for awarding grant

funding and authorizes EQC to establish additional preferences by rule. This direction allows DEQ to prioritize and select projects that meets multiple policy goals by establishing additional award criteria, including prioritizing investments in communities disproportionately harmed by diesel pollution. DEQ will bring proposed rules to the commission for consideration at its January 2021 meeting.

Joint Legislative Task Force On Supporting Businesses in Reducing Diesel Emissions

Since fall 2019, DEQ has provided support to a legislative task force studying revenue options to support diesel engine retrofit, repower and replacement projects. The task force includes legislators, truck and equipment owners, environmental advocates, health experts and local governments. States that have made significant progress in reducing emissions, such as California, Texas and Washington, all have state-specific funding mechanisms and grant programs. The existing incentive programs available in Oregon are important but not sufficient to address the need for the tens of thousands of older trucks and pieces of equipment in use across the state.

DEQ sees incentives as an important element of a comprehensive diesel emissions reduction strategy, but does not have the authority to create new revenue sources. Because of this, the agency is engaging actively in legislative work to identify an Oregon-specific revenue stream.

Conclusions: Challenges and opportunities

Reducing diesel engine emissions remains a priority of the Air Quality Division. Focusing on diesel engines is an effective multi-pollutant strategy. In addition to the harmful health effects of diesel particulate matter, diesel engines are major sources of smog-forming pollution and a significant source of greenhouse gas emissions. Moving forward, DEQ sees various challenges and opportunities in the state's work to reduce diesel emissions.

Challenges

As discussed above, the main challenges of regulating emissions from diesel engines are related to legal constraints, the availability of agency resources and the fundamental costs of treating or replacing old engines.

Legal constraints

The federal Clean Air Act constrains policy options available to states. This is especially true in relation to non-road engines, such as locomotives and machinery used in agriculture, construction and logging. As the recently

conducted non-road inventory concluded, Oregon's fleet of non-road equipment is much older than previously thought. Unfortunately, there are few regulatory tools available to reduce non-road emissions and those that are available would require additional agency resources to develop and implement. While there is flexibility provided in certain parts of the federal Clean Air Act the Oregon Legislature has recently provided specific mandates and direction to DEQ in Senate Bill 1008 (2017) and House Bill 2007 (2019).

Agency funding and resources

Until recently, DEQ had just one position available to focus on addressing diesel emissions and much of that FTE is devoted to administering the federal DERA program. New mandates from the Oregon Legislature came with authorization to hire two new positions, a third of what the agency needs to implement the bill. Additionally, the funding for one of the two positions was reduced by the legislature during the August special session. DEQ does not currently have sufficient staffing to implement legislatively-mandated programs, develop or implement additional strategies.

Cost to treat older engines

As discussed, diesel engines are ubiquitous. This is in part due to their reliability and durability, traits that also lead to older high-emitting engines staying in use for decades. According to ODOT data, approximately 44 percent, or 25,000, of heavy-duty trucks registered in Oregon are pre-2007. This does not include the tens of thousands of trucks registered out of state that route into or through Oregon, nor does it include medium-duty trucks that often operate shorter intra-city routes. Additionally, the non-road inventory identified that approximately half of the engines used in agriculture, construction and logging equipment are Tier 2 or older (i.e. generally speaking 20 years or older). The cost to retrofit or replace these engines, whether the state bears that cost through incentives or the engine owners, is significant. One retrofit can cost between $8,000 and $20,000, while the cost to replace a single truck or piece of equipment can and often does exceed $150,000.

Opportunities

While the challenges are substantial, DEQ has identified principles, policies and actions that represent significant opportunity for meaningful reductions in emissions from diesel engines in Oregon.

Environmental Justice

Applying an Environmental Justice lens to the diesel program can help to focus benefits in communities historically, currently and disproportionately harmed by diesel pollution. DEQ has begun to incorporate explicit analyses of environmental justice impacts in our work and expects to do more, particularly in our efforts to implement the Statewide Transportation Strategy. Some key examples underway include:

- DEQ intends to propose that projects funded with Volkswagen grant dollars receive preference when they can demonstrate that they will reduce emissions in communities disproportionately exposed to diesel pollution.
- The Alternative Fuels Study and Clean Fuels Tailpipe Co-benefits Study will both seek to characterize environmental justice impacts and identify strategies to focus benefits in disproportionately impacted communities.

Advances in technology

Manufacturers are adopting rapid advances in alternative technologies and fuels. Nearly every major truck manufacturer has committed to, or is, developing alternative-energy models, including hydrogen fuel cell, hybrid and fully electric models. Biofuels are being produced with ever-lower carbon footprints and renewable diesel is leading to wider-spread adoption of biofuels in the medium- and heavy-duty fleets. This rapidly changing landscape and variety of new technologies presents many opportunities to lower greenhouse gas and tailpipe emissions across a number of use-cases, including inner-city delivery, long-haul freight, transit busses and refuse trucks.

Reducing greenhouse gas and tailpipe emissions

DEQ sees major opportunity in the synergies between strategies designed to reduce greenhouse gas emissions and those designed to reduce harmful tailpipe pollution. In addition to the pollutants discussed above, diesel engines are a major source of black carbon – a potent climate-forcing agent. Any effort to reduce diesel particulate matter has immediate and powerful climate co-benefits. Many complementary efforts already underway at DEQ. Some key examples include:

- The Clean Fuels Program is also creating incentives to transition heavy-duty diesel trucks and busses to alternative fuel technologies, including natural gas and electric.

- DEQ's partnership with 14 other states to develop a medium- and heavy-duty ZEV action plan will chart a course towards electrification, eliminating tailpipe emissions.
- The proposed Advanced Clean Truck rules DEQ will bring to EQC next year could lead to greater adoption of electric vehicle technology in the medium and heavy-duty arena, as they did when EQC adopted ZEV standards for light-duty vehicles.
- DEQ's proposed rules for the Volkswagen Grant Program will offer higher reimbursement rates and preferences to projects that replace older diesel engines with alternative fuel technologies.

New and emerging studies

This staff report described several key studies underway or beginning soon at DEQ. We believe these technical analyses and the associated stakeholder involvement will inform our understanding of new and additional opportunities to reduce diesel engine emissions. Specifically, what strategies does Oregon need to undertake to lead to greater adoption of lower-carbon and zero-emission technologies in the medium and heavy-duty truck sectors.

Legislative efforts to identify revenue

The legislature's interest and dedication to identifying long-term revenue sources for clean diesel incentives is encouraging. DEQ will continue to monitor and support the work of the Joint Legislative Task Force and engage in any effort during the 2021 session to establish long-term funding for clean diesel incentives. A state-specific revenue source presents a major opportunity and will Oregon to design incentive program based on our unique needs.

EQC involvement and next steps

DEQ will bring rulemaking proposals and action items for diesel-related activities over the next year, as presented throughout this document. DEQ will also provide updates on diesel engine emissions, and related work in Air Quality and other agency programs, through the director's report or other updates to the commission.

Supporting materials and links

1. The Concerns About Diesel Engine Exhaust (DEQ) available at: https://www.oregon.gov/deq/FilterDocs/DieselEffectsReport.pdf
2. Diesel Engine Emissions in Oregon Staff Report, July 2020 EQC Meeting. Available at: https://www.oregon.gov/deq/EQCdocs/07162020_F_Diesel.pdf

3. Oregon Nonroad Diesel Engine Emissions Inventory Study, available at: https://www.oregon.gov/deq/aq/programs/Pages/Non-Road-Diesel-Emission-Inventory.aspx
4. Multi-state Medium- and Heavy-Duty Zero Emission Vehicle Memorandum of Understanding, available at: https://www.nescaum.org/documents/multistate-truck-zev-governors-mou-20200714.pdf/

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