



CHP
TECHNICAL ASSISTANCE
PARTNERSHIPS

Alaska Remote Area Waivers from EPA's Tier 4 Diesel Engine Emissions Standards

Policy Description

Over 180 isolated communities in rural Alaska depend on diesel for electricity generation and heat, and there are many combined heat and power (CHP) systems combining these services to increase efficiency. These communities' islanded energy systems are located in the most severe arctic environments in the United States, with the villages entirely dependent upon local diesel to generate electricity and heat (as well as water and sewer service, when available) in critical public infrastructure such as schools, post offices, health clinics, and community buildings. The energy systems are typically operated by community residents employed by utilities or power cooperatives, and most operators are part-time staff. With an average population of 310 residents, the villages are scattered over an area twice the size of the state of Texas and are often located in parts of the state without road access. These communities, and the CHP systems that serve them, are likely to be disproportionately affected by changing diesel engine emissions regulations. Changes in emissions after-treatment requirements can have impacts on replacement costs for generating equipment (including CHP system components) and maintenance requirements and expenses.

In 2009, the U.S. Environmental Protection Agency (EPA) published a proposed rule that would require advanced exhaust emissions control equipment and annual source testing for pre-2007 model year stationary reciprocating internal combustion engines, including rural diesel-fueled power plants and agricultural applications. For engines manufactured after 2006, increasingly stringent New Source Performance Standards (NSPS) were to be imposed in stages. Compliance dates and allowable Tier 2 through Tier 4 emissions rates depend on engine size. A timeline for phasing in the new NSPS non-road emissions standards is shown in the table to the right. The table also indicates the maximum allowable oxides of nitrogen (NOx), hydrocarbon (HC), carbon monoxide (CO), and particulate matter (PM) emissions (in grams per kilowatt-hour) over time.

Quick Facts

LOCATION: Alaska
MARKET SECTOR: Electricity Production
Program/Policy Type: Emissions After-Treatment Requirement Waiver
Geography: Rural Alaska
Program Start: 2010, expanded in 2019

bkW	2006*	2007	2008	2009	2010	2011	2012	2013	2014	2015
< 8	7.5 8.0, 80		7.5 8.0, 40		7.5 8.0, 60					
≥8 < 19	7.5 6.6, 80		7.5 6.6, 40							
≥19 < 37	7.5 5.5, 60		7.5 5.5, 30					4.7 5.5, 03		
≥37 < 56 Option 1	7.5 5.0, 40		4.7 5.0, 30					4.7 5.0, 03		
≥37 < 56 Option 2	7.5 5.0, 40		4.7 5.0, 40				4.7 5.0, 03			
≥56 < 75	7.5 5.0, 40		4.7 5.0, 40				3.4, 19 5.0, 02			4.0, 19 5.0, 02
≥75 < 130	6.6 5.0, 30	4.0 5.0, 30					3.4, 19 5.0, 02			4.0, 19 5.0, 02
≥130 < 225	4.0 3.5, 20					2.0, 19 3.5, 02			4.0, 19 3.5, 02	
≥225 < 450	4.0 3.5, 20					2.0, 19 3.5, 02			4.0, 19 3.5, 02	
≥450 ≤ 560	4.0 3.5, 20					2.0, 19 3.5, 02			4.0, 19 3.5, 02	
>560 Non Genset	6.4 3.5, 20					3.5, 40 3.5, 10				3.5, 19 3.5, 04
>560 ≤ 900 Genset	6.4 3.5, 20					3.5, 40 3.5, 10				6.7, 19 3.5, 03
>900 Genset	6.4 3.5, 20					6.7, 40 3.5, 10				6.7, 19 3.5, 03

NOx, HC or $\frac{NOx+HC}{CO, PM}$ g/kW-hr
 ● Tier 2 ● Tier 3 ● Tier 4 Interim ● Tier 4 Final
*EPA Nonroad Regulations commenced with Tier 1 in January 1996

Early Alaska Policy Development

Recognizing that the costs to comply with these regulations were prohibitive and would impose hardships on rural Alaskan communities, the EPA provided specific relief for them in 2010 and 2011 final rulemakings. For “remote areas of Alaska,” the EPA does not require advanced after-treatment NOx emissions control equipment, such as selective catalytic reduction (SCR) technology. Most SCR systems require urea, which is difficult to transport, store, and use; and maintaining the control devices in remote areas with extreme cold also presents challenges. NOx is not considered a health threat in rural Alaska, either as a criteria pollutant or as an ozone precursor. The EPA allowed additional exceptions: operators of pre-2014 model year engines are exempt from ultra-low sulfur diesel fuel requirements, and owners and operators of stationary engines in remote areas of Alaska are allowed to use engines certified to marine engine standards (such engines have increased emissions but offer higher jacket water heat recovery). Such engines enable CHP retrofits to existing power plants. Additionally, the rules allow blending used lubricating oil with diesel fuel (up to 1.75% of total fuel) when the sulfur content of the used lubricating oil is less than 200 ppm. This latter provision eliminates some back-haul costs for used oil.

The pollutant of primary health concern in rural Alaska is PM, which originates from diesel engines, road dust, wildfires, woodstoves, and open burning of refuse. Accordingly, in their rulemakings, the EPA required the inclusion of diesel particulate filters in all model year 2014 or later compression ignition engines that are not Tier 4 certified. Rural Alaska was originally defined as areas not accessible by the Federal-aid highway system (FAHS). The FAHS includes the marine highway system with regular roll-in/roll-off ferry service. In 2013, the EPA revised its definition of remote areas of Alaska to include communities that meet the following criteria: 1) they are connected to FAHS only by the Alaska Marine Highway System or are not connected to the small transmission grid, 2) at least 10% of the power generated goes to residential sector use, and 3) the generator is less than 12 MW in capacity or is used exclusively for backup power for renewable energy.

Particulate Emissions Policy Modifications



Alaska state highway system, showing areas of rural Alaska

SOURCE: ALASKA PUBLIC LANDS INFORMATION CENTERS

Operators of diesel engines in rural Alaska that have diesel particulate filters report decreases in engine reliability and fuel efficiency, and both maintenance requirements and maintenance costs increase. After-market diesel particulate filter systems are considered expensive and unreliable. Alaskan villages that seek to replace older compression ignition engines have sought out model year 2013 or older engines to avoid particulate emissions control devices. This practice has served as a barrier to purchasing new, cleaner-burning, more fuel-efficient diesel engines. Accordingly, the *Alaska Remote Generator Reliability and Protection Act* of 2019 requires 2014 and later model year stationary diesel generator engines used in remote areas of Alaska to meet Tier 3 particulate emission standards.

The Alaska congressional delegation efforts resulted in access to cleaner, more reliable and efficient diesel engine generators that are available with a manufacturer’s warranty for rural Alaska villages.

For More Information

U.S. DOE NORTHWEST CHP TECHNICAL ASSISTANCE PARTNERSHIP (CHP TAP)
www.nwchptap.org

ALASKA ENERGY AUTHORITY
<http://www.akenergyauthority.org/>

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