



TRU Advisory: 12-22

Compliance Requirements for Model Year 2008 and Newer TRU Engines Rated at Less Than 25 Horsepower

Who is this advisory for?

This advisory is for owners of transport refrigeration units (TRU) that are equipped with diesel engines that are rated at less than 25 horsepower (<25 hp). Diesel engines in the <25 hp category are used in all TRUs mounted on straight trucks (sometimes called bobtail trucks) and some trailer TRUs.

Why is this advisory needed?

The purpose of this advisory is to inform owners of model year (MY) 2008 and newer diesel-fueled TRU engines that are rated at <25 hp of the compliance steps they need to take to meet the California Air Resources Board's (ARB or Board) TRU Airborne Toxic Control Measure's¹ (ATCM or Regulation) Ultra-Low-Emission TRU (ULETRU) in-use performance standard.

Do MY 2008 and later diesel-fueled engines in the <25 hp category meet ULETRU?

No. Effective January 1, 2008, MY 2008 and later diesel-fueled TRU engines that are rated at <25 hp were required to meet federal and California Tier 4 emissions standards for new engines. U.S. Environmental Protection Agency (U.S. EPA) and ARB have the same Tier 4 emissions standards for new engines. However, the Tier 4 standards for <25 hp engine categories do **NOT** meet ARB's TRU Regulation's ULETRU in-use performance standard because the ULETRU standard is more stringent.

MY 2008 and newer TRU engines must meet the TRU Regulation's ULETRU in-use standard by December 31st of the seventh year after the engine model year. Table 1 shows the ULETRU compliance dates for all MY 2008 and newer TRU engines.

Table 1

TRU Engine MY	ULETRU Compliance Date
2008	December 31, 2015
2009 and newer	December 31 st of the 7 th year after the engine model year

For example, MY 2013 <25 hp engines would need to meet ULETRU by the end of 2020.

¹ Title 13 California Code of Regulations (13 CCR), sections 2477.1 through 2477.21.

Exception

An exception is allowed if the TRU manufacture year is only one year different from the engine model year.² For example, a TRU that was manufactured in 2009, that is equipped with a model year 2008 engine could use 2009 to determine that ULETRU compliance is required by the end of 2016. If the difference between the engine model year and the TRU manufacture year is greater than one year, the engine model year must be used to determine ULETRU compliance dates (see Table 1).

Background

TRUs are refrigeration systems powered by integral diesel internal combustion engines designed to control the environment of temperature-sensitive products that are transported in trucks, trailers, shipping containers, and railcars. The emissions from these units are a source of unhealthy air pollutants including particulate matter, toxic air contaminants, nitrogen oxides, carbon monoxide, and hydrocarbons, and pose a potential threat to both public health and the environment. These units often congregate in large numbers at California distribution centers, grocery stores, and other facilities where they run for extended periods of time to ensure their perishable contents remain cold or frozen. These distribution and loading facilities are often in close proximity to schools, hospitals, and residential neighborhoods. In 2004, the TRU Regulation was adopted by the Board to reduce diesel particulate matter emissions from TRUs and TRU generator set engines. The TRU Regulation is designed to accelerate the cleanup of existing (in-use) TRUs and TRU generator sets through retrofit with verified diesel emission control strategies (VDECS), engine repowers, use of Alternative Technologies, or unit replacements. The TRU Regulation's in-use standards are phased in and will reduce diesel particulate matter (PM) emissions from in-use TRU and TRU generator set engines that operate in California. The Board adopted amendments to the TRU Regulation on November 18, 2010,³ and October 21, 2011.⁴

Additional Q&A:

1. How do I comply if I own or operate MY 2008 and later TRUs with <25 hp engines?

Owners of TRUs equipped with MY 2008 and later engines in the <25 hp categories will still have other compliance options to choose from in 2015 and later. Examples are listed below:

- A. Retrofit with a Level 3 VDECS,⁵ such as a diesel particulate filter (DPF) that reduces diesel particulate matter by at least 85 percent.
- B. Use hybrid electric or electric standby in a way that qualifies it as an Alternative Technology compliance option that meets ULETRU.⁶

² Allowed under 13CCR, section 2477.5(b)(6).

³ ARB's Regulatory Activity webpage for the 2010 rulemaking is at:
<http://www.arb.ca.gov/regact/2010/tru2010/tru2010.htm>

⁴ ARB's Regulatory Activity webpage for the 2011 rulemaking is at:
<http://www.arb.ca.gov/regact/2011/tru2011/tru2011.htm>

⁵ The VDECS compliance option is listed at 13 CCR section 2477.5(a)(1).

⁶ Alternative Technology compliance options are listed at 13 CCR section 2477.5(a)(3). The qualification criteria that must be met for hybrid electric or electric standby are listed in 13 CCR, section 2477.5(a)(3)(A).

- C. Use hybrid cryogenic temperature control in a way that qualifies it as an Alternative Technology compliance option that meets ULETRU.⁷
- D. Replace a noncompliant TRU with a new TRU.

These compliance options are discussed in more detail, below.

2. Is engine repower still a compliance option for MY 2008 and later engines?

No. Compliance options for <25 hp MY 2008 and later engines do not include engine repower (i.e. engine replacement). This is because replacement engines must be cleaner than the engine being replaced.⁸ If a TRU was manufactured in 2008 and the engine is MY 2008, ULETRU compliance would be required in 2015. A MY 2015 replacement engine would be no cleaner than the MY 2008 engine that would be replaced because both model years 2008 and 2015 must meet the same Tier 4 emissions standard. And as described above, Tier 4 for <25 hp engines does not meet the TRU ATCM's ULETRU in-use performance standard. Again, replacing a MY 2008 or later engine with a MY 2015 and later engine is **NOT** a compliance option.

3. Are there other compliance strategies that could be used because they make the TRU exempt from the TRU Regulation?

Yes. Refrigeration systems that do not use a diesel engine are generally exempt from the TRU Regulation. Some of these are listed below.

- A. Repower with exempt, non-diesel engines (e.g. engines fueled with gasoline, propane (LPG), or compressed natural gas (CNG)).⁹
- B. Replace noncompliant TRU-equipped vans with temperature control systems that are exempt from the TRU ATCM's requirements.¹⁰

These compliance options are discussed in more detail, below.

4. What do I need to know to use the compliance options listed above?

Before an owner commits to a compliance option, they should do some research. Some basic information is provided below, along with links to where more detailed information may be available.

A. Retrofit with a Level 3 VDECS (meets ULETRU):

Level 3 VDECS (e.g. DPF) meet the ULETRU in-use performance standard. Huss¹¹ is currently the only VDECS manufacturer that has verified a Level 3 VDECS for <25 hp engines. Huss' MK 35 and MK 50 active DPF reduces particulate matter emissions by at least 85 percent. This VDECS retrofit option may be limited for some straight truck TRUs because the Huss DPF won't fit inside the TRU housing. Since the MK 35 and 50 DPFs are actively regenerated, they can be mounted in other locations, such as on the truck's frame rails (under the van). VDECS mounting on the truck frame rail

⁷ Alternative Technology compliance options are listed at 13 CCR section 2477.5(a)(3). The qualification criteria that must be met for hybrid cryogenic temperature control are listed in 13 CCR section 2477.5(a)(3)(B).

⁸ 13CCR, section 2477.5(i) requires replacement TRU engines to be cleaner than the engine being replaced.

⁹ This exemption is listed under 13 CCR 2477.3(c).

¹⁰ These exemptions are listed under 13 CCR 2477.3(c).

¹¹ Huss' website is at: http://www.hussgroup.com/huss-umwelt/us/products/dpf_tru.php

is feasible and has been demonstrated and approved. No limitations on frame rail mounting are known at this time.

Other diesel emissions control strategy (DECS) manufacturers are looking to gain verification of Level 3 DECS for <25 hp engines. Engine families and TRU models that may be retrofitted will be listed as an attachment to the verification Executive Order when approval is granted.

You can look up the most current VDECS that have been verified for your TRU's engine family at ARB's Verification Procedure Website. First look through the Currently Verified list, looking at the "Applicability" column at: <http://www.arb.ca.gov/diesel/verdev/vt/cvt.htm>. Also, use ARB's Verification Database to see what is currently available by entering information about your engine to get a list of VDECS.

The DECS Installation and Maintenance website provides general information and lists of installers that may be helpful to owners: <http://www.arb.ca.gov/msprog/decsinstall/decsinstall.htm>

B. Use Hybrid Electric/Electric Standby (E/S):

E/S-equipped TRUs are equipped with an integral diesel-fueled internal combustion engine and an electric-powered motor so that the refrigeration system may be driven by the integral electric motor when plugged into shore power. Historically, most <25 hp straight truck TRUs are equipped with E/S. E/S may qualify as an Alternative Technology¹² that meets ULETRU if the diesel engine operation is eliminated at all nonretail delivery and pick-up points (e.g. distribution centers and cold storage facilities) and limited to no more than 30 minutes at retail delivery points (e.g. grocery and convenience stores, restaurants, lounges, cafeterias, etc.). To qualify as an Alternative Technology, electric power plugs are required at distribution centers and may be required at retail delivery points if engine operations exceed 30 minutes.¹³ The TRU ATCM requires that after a compliance deadline, recordkeeping is required to demonstrate that E/S is used in a way that qualifies as a compliance option. Manual recordkeeping is allowed in the beginning, but automated electronic tracking and recordkeeping systems, as defined,¹⁴ are phased in after that. The first half of an owner's units that are complying with E/S must convert to electronic tracking systems by December 31, 2012, and the remainder of an owner's units that are complying with E/S must convert by December 31, 2013.

C. Use Hybrid Cryogenic Temperature Control:

Hybrid cryogenic temperature control systems use cryogenic temperature control systems in conjunction with a conventional TRU. Like E/S (immediately above), they may qualify as an Alternative Technology¹⁵ that meets ULETRU if the diesel engine operation is eliminated at all nonretail delivery and pick-up points (e.g. distribution centers and cold storage facilities) and limited to no more than 30 minutes at retail delivery points (e.g. grocery and convenience stores, restaurants,

¹² Alternative Technology suppliers are listed at: http://www.arb.ca.gov/diesel/tru/documents/control_option_matrix.pdf

¹³ Qualification criteria for hybrid electric and E/S are listed under 13 CCR, section 2477.5(a)(3).

¹⁴ Electronic tracking systems are defined at 13CCR, section 2477.4(a)(36). Recordkeeping requirements for hybrid electric and E/S are listed at 13 CCR, section 2477.5(d)(3).

¹⁵ Alternative Technology suppliers are listed at: http://www.arb.ca.gov/diesel/tru/documents/control_option_matrix.pdf

lounges, cafeterias, etc.).¹⁶ As with E/S, recordkeeping is required, starting off with manual recordkeeping and phasing over to automated electronic tracking and recordkeeping systems.¹⁷

D. Replace the Entire TRU with a New TRU:

Replacing the old TRU with a new TRU is an option that has the advantage of stepping up to a more efficient refrigeration system and engine, and results in operating cost savings due to reduced fuel use and reduced maintenance and repair costs. Since the engine in the new unit would meet Tier 4, which does not meet ULETRU, compliance would then be required by December 31st of the seventh year after the engine model year or unit manufacture year (see Table 1, above, and the exception described after Table 1). Going a step further, an owner could replace the entire refrigerated van and TRU, which then has the additional advantage of more efficient van insulation and door seals. In this case, there would be additional operating cost savings due to reduced fuel use and reduced vehicle maintenance and repair costs.

E. Repower with Exempt Non-Diesel Engine:¹⁸

Repowering with certified engines that use non-diesel fuels would make the TRU exempt from all of the TRU ATCM requirements. Several engine repowers have been completed using gasoline-fueled engines. Converting diesel engines to spark-ignited liquid propane (LPG) injected engines also makes the TRU exempt. The cost of these conversions is similar to the cost of a diesel engine repower.

F. Replace the TRU with exempt Non-Diesel-Powered Refrigeration/Temperature Control Options:¹⁹

There are other non-diesel options for new reefer trucks, such as cold plate technology. These systems' on-board refrigeration systems are plugged into grid power when parked to chill the eutectic salt-fill plates. Vehicle engine or vehicle transmission power take-off generators may be used to provide electric power to the on-board refrigeration systems when they are travelling on the road to extend their range.

Another exempt option is pure cryogenic temperature control systems that use liquid nitrogen or carbon dioxide. These systems have been demonstrated in California and are currently available on the market.

5. If the Tier 4 new engine standard for <25 hp engines is the cleanest emissions standard for the <25 hp category engines, why does this standard not meet the TRU Regulation's ULETRU in-use performance standard?

The U.S. EPA and ARB Tier 4 emissions standard for particulate matter for <25 hp categories is 0.30 grams per horsepower-hour (g/hp-hr). ARB's ULETRU in-use performance standard for 25 hp and greater (≥ 25 hp) engines, which are used in trailer TRUs and TRU generator sets, is an engine certified to meet 0.02 g/hp-hr or a Level 3 VDECS. A comparison of the Tier 4 standard for <25 hp engines to ULETRU for ≥ 25 hp engines shows the Tier 4 standard for <25 hp engines is 15 times

¹⁶ Qualification criteria for hybrid cryogenic temperature control systems are listed under 13CCR, section 2477.5(a)(3)(B).

¹⁷ Electronic tracking systems are defined at 13CCR, section 2477.4(a)(36). Recordkeeping requirements for hybrid cryogenic temperature control systems are listed at 13 CCR, section 2477.5(d)(4).

¹⁸ Exempt technology suppliers are listed at: http://www.arb.ca.gov/diesel/tru/documents/control_option_matrix.pdf

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dirty. Lack of proper maintenance can also lead to increased emissions. Anecdotal information from TRU manufacturers, dealers, repair shops, and owners indicates that emissions-related maintenance is not performed unless there is a performance problem. Therefore, staff believes that emissions from TRU engines may be significantly greater than the emissions standard after the warranty period expires.

Until the new engine standards are adopted to be more stringent for <25 hp engines, in-use TRU engines rated at <25 hp will need to be cleaned up at the end of seven years to adequately protect the public health.

6. Why are there not more Level 3 VDECS available for <25 hp TRU engines?

The current market for VDECS for <25 hp TRU engines is small, but may change in the future. As the <25 hp TRU population grows, the VDECS market will also grow. We believe that VDECS manufacturers may be more interested in developing additional emission reduction technologies for <25 hp TRUs in the future.

For more information

To obtain a copy of the regulation or other related compliance assistance documents, visit the TRU website at <http://www.arb.ca.gov/diesel/tru/tru.htm>. Additional questions may be addressed by calling the toll-free TRU Help Line at 888-878-2826 (888-TRU-ATCM). If you need this document in an alternative format or another language, please call 888-878-2826 or email arber@arb.ca.gov. TTY/TDD/Speech users may dial 711 for a California Relay Service.

Si necesita este documento en un formato alternativo u otro idioma por favor llame al 1-888-878-2826 o contáctenos por correo electrónico a arber@arb.ca.gov. Para Servicios de Relevos de California (CRS) o para el uso de teléfonos TTY, marquen al 711.