



TRU Advisory: 13-18

Compliance with TRU Regulation by Repowering with New or Rebuilt Replacement Engines

The purpose of this advisory is to explain the Transport Refrigeration Unit (TRU) Regulation's requirements related to repowering with new or rebuilt replacement engines to comply with the regulation's in-use performance standards.

Who is this advisory for?

This advisory applies to TRU owners, who are responsible for compliance with the TRU Regulation's¹ in-use performance standards.² TRU original equipment manufacturers (OEM) and engine rebuilders have requirements for providing supplemental labels and registration information documents for the replacement engines they supply.³ TRU dealers and repair shops have requirements related to registration information documents if they sell and/or install new or rebuilt replacement engines.⁴

What are the requirements for TRU owners?

Existing state and federal laws allow an engine manufacturer to produce new replacement engines that do not meet the most current emissions standards if the manufacturer determines that no engine manufacturer has certified an engine to the current tier standards with the appropriate physical and performance characteristics to repower the equipment.⁵ In other words, a replacement engine must be the cleanest engine that will physically fit and perform in the equipment, but if a current-tier engine will not fit or perform, a prior-tier engine may be used.

The TRU Regulation currently allows TRU owners to comply with the TRU Regulation's in-use standards by repowering a TRU with a new, certified replacement engine that is the cleanest engine that will fit and perform in the TRU. Also, the replacement engine must be cleaner than the engine being replaced. The compliance date for the replacement engine is seven years from the model year (or effective model year if engine meets a prior-tier standard) of the replacement engine. In some cases, the replacement engine may not actually meet an in-use performance standard, but still qualifies as a compliance option. For example, a new Tier 2 engine does not meet the Low-Emission TRU (LETRU) or Ultra-Low-Emission TRU (ULETRU) in-use standards, but still qualifies as a compliance option if the compliance date for the replacement engine is in the future. The TRU owner needs to be aware that unless a replacement engine meets the ULETRU in-use performance standard, the replacement engine will need to be retrofitted with a Level 3 Verified Diesel Emissions Control Strategy (VDECS), replaced again with a cleaner engine, or otherwise brought into compliance with the ULETRU in-use standard by December 31st of the seventh year after the replacement engine's model year or effective model year.

¹ The entire TRU Regulation is at title 13 California Code of Regulations (13 CCR), sections 2477.1 through 2477.21.

² In-Use performance standards are at 13 CCR, section 2477.5.

³ OEM requirements for new and rebuilt replacement engines are at 13 CCR, section 2477.13(c)

⁴ TRU dealer and repair shop requirements for replacement engines are at 13 CCR, sections 2477.14 and 2477.15, respectively.

⁵ Replacement engines must comply with the requirements of Title 40, Code of Federal Regulations sections 89.1003 and 1068.240 and title 13 California Code of Regulations section 2423(j).

New Replacement Engine Requirements

The TRU Regulation requires a new replacement engine to meet more stringent emissions standards than the TRU's original engine and it must comply with the TRU ATCM's in-use standards based on the new replacement engine's model year or effective model year. New current-tier replacement engines must use the engine model year as shown on the engine emissions label to determine the applicable in-use standard and compliance deadline. New prior-tier replacement engines must use the engine's effective model year to determine the applicable in-use standard and compliance deadline. Further discussion about emissions labels for current-tier and prior-tier replacement engines is provided below.

Rebuilt Replacement Engine Requirements

Rebuilt replacement engines must meet a more stringent emissions standard tier than the TRU's original engine, and must additionally be rebuilt in compliance with federal and state engine rebuilding requirements for off-road compression ignition engines.⁶ Current tier rebuilt replacement engines use the year in which the rebuild is completed as the engine model year to determine in-use requirements and associated compliance dates. Prior-tier rebuilt replacement engines use the engines' effective model years to determine in-use requirements and associated compliance dates. Further discussion about emissions labels for current-tier and prior-tier replacement engines is provided below.

Effective Model Year⁷

If a replacement engine was manufactured to meet a tier of the off-road emissions standards that was in effect at the time the engine was manufactured (i.e. current-tier), the model year of the replacement engine is used to determine in-use standard compliance deadlines. However, if the replacement engine was manufactured to meet a prior tier of the off-road emissions standards that was no longer in effect at the time of manufacture, the replacement engine's *effective model year* must be used to determine in-use performance standard compliance deadlines. The effective model year is the last year that the prior-tier off-road emissions standard was in effect. Table 1 shows the years that the off-road engine emissions standard tiers were in effect for the horsepower categories of engines used in TRUs and the effective model years for prior-tier replacement engines.

**Table 1: Effective Model Year
for Prior-Tier Off-Road Replacement Engines**

Off-Road Engine Emissions Standard Tier	Tier Standard Effective Years	Effective Model Year for Prior-Tier Replacement Engines
Tier 1, ≥ 25 to < 50 hp	1999-2003	2003
Tier 1, < 25 hp	2000-2004	2004
Tier 2, ≥ 25 to < 50 hp	2004-2007	2007
Tier 2, < 25 hp	2005-2007	2007
Tier 4i, ≥ 25 to < 50 hp	2008-2012	2012
Tier 4, < 25 hp	2008+	Not Applicable

Notes: There is no Tier 3 for the horsepower categories used in TRUs. Tier 4i means "Interim Tier 4."

TRU owners need to be aware that using a prior-tier replacement engine as a compliance option will result in a shorter operational life, because in-use compliance is still required seven years after the effective model year of a prior-tier replacement engine. For example, if a trailer TRU has an MY 2007

⁶ 40 CFR sections 89.130 and 1068.120, 13 CCR sections 2423(l) and 13 CRC section 2477.16. See TRU Advisory 13-27 for a more detailed explanation of these requirements.

⁷ Effective model year was defined in the 2010 TRU ATCM amendments in 13, CCR 2477.4

original engine that must comply by December 31, 2014, and the owner chooses to repower the TRU with a Tier 4i replacement engine, the effective model year of the replacement engine is 2012, and compliance with ULETRU in-use standard would then be required by December 31, 2019 (seven years after the effective model year). In this example, the operational life of the replacement engine would only be about five years (late 2014 to December 31, 2019).

Engine replacements that meet LETRU

Engine replacements that meet LETRU may qualify for extensions to the compliance deadline for meeting the subsequent, more stringent ULETRU standard.⁸ Repowering with a replacement engine must either meet the LETRU in-use performance standard for the horsepower category or result in at least 50 percent reduction in PM emissions to qualify as meeting LETRU. Not all engine replacements do that. For example, for all TRU engine horsepower categories, if an original engine met Tier 1 and was replaced by an engine that meets Tier 2, the Tier 2 PM emissions limit would not be met and the emissions reductions would be less than 50 Percent, so LETRU would not be met. However, if a Tier 1 TRU engine in the 25 to 50 horsepower category is replaced by a Tier 4i engine, the Tier 4i PM limit is 0.22 g/hp-hr, which meets LETRU for that horsepower category and the emissions reduction would be 63 percent, so LETRU is met. Table 2 shows various cases of engine replacements, the PM emissions standards met by the original and replacement engines, the LETRU standards, the resulting PM emissions reduction, and LETRU determination.

**Table 2
Replacement Engine Emissions Reduction Cases for Meeting LETRU**

Horsepower Category	Emissions Standard Tier Met by Original Engine PM (g/hp-hr)	Emissions Standard Tier Met by Replacement Engine PM (g/hp-hr)	LETRU Engine Certification Required (g/hp-hr)	PM Emissions Reduction	Is LETRU Met?
<11	Tier 1 0.75	Tier 2 0.60	0.30	20%	No
<11	Tier 1 0.75	Tier 4 0.30	0.30	60%	Yes
<11	Tier 2 0.60	Tier 4 0.30	0.30	50%	Yes
≥11 to <25	Tier 1 0.60	Tier 2 0.60	0.30	0%	No
≥11 to <25	Tier 2 0.60	Tier 4 0.30	0.30	50%	Yes
≤25 to <50	Tier 1 0.60	Tier 2 0.45	0.22	25%	No
≤25 to <50	Tier 1 0.60r	Tier 4i 0.22	0.22	63%	Yes
≤25 to <50	Tier 2 0.45	Tier 4i 0.22	0.22	51%	Yes

⁸ ULETRU compliance extensions for early or on-time compliance with LETRU are explained in TRU Advisory 08-12.

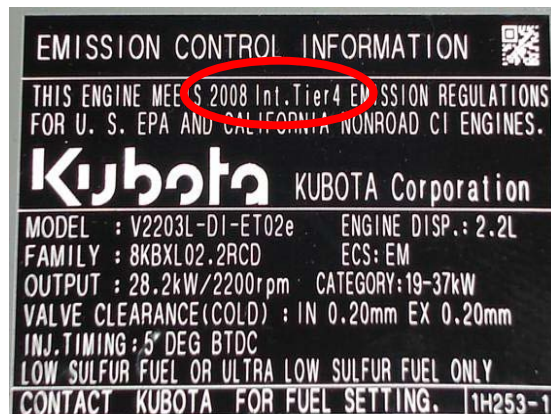
Engine replacements that meet ULETRU

At the time of publication, there were no known new or rebuilt replacement engines that meet ULETRU. The owner would need to look into other compliance options.

How can I tell what emissions standard tier was met by my original and replacement engines?

Current-Tier New Engine Labels

Emissions labels for new engines that were manufactured when the emissions standard tier was in effect include the model year in a statement that declares compliance with U.S. EPA and California regulations. Some emissions labels also include the tier standard met. An example of a current-tier engine emissions compliance statement is: "THIS ENGINE MEETS 2008 INT. TIER 4 EMISSION REGULATIONS FOR U.S. EPA AND CALIFORNIA NONROAD ENGINES." The picture to the right shows an emissions label that was used when Interim Tier 4 (Tier 4i) was currently in effect.



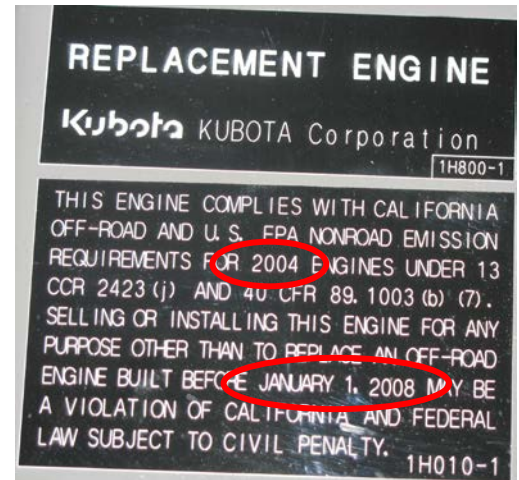
Other current-tier emissions labels just indicate the model year of the engine and require the reader to look up the tier standard met. An example of such a current-tier engine emissions compliance statement is: "THIS ENGINE COMPLIES WITH U.S.EPA AND CALIFORNIA REGULATIONS FOR 2009 M.Y. NONROAD AND STATIONARY/OFF-ROAD DIESEL ENGINES." The picture to the right shows an example of such an emissions label. The power rating of the engine in this picture shows 11.3 kW, which is 15.2 horsepower (note that 1 kW equals 1.341 hp). Table 1, above, indicates the years that each tier standard was in effect. By examination of Table 1, a less than 25 horsepower, model year 2009 engine was required to meet Tier 4.



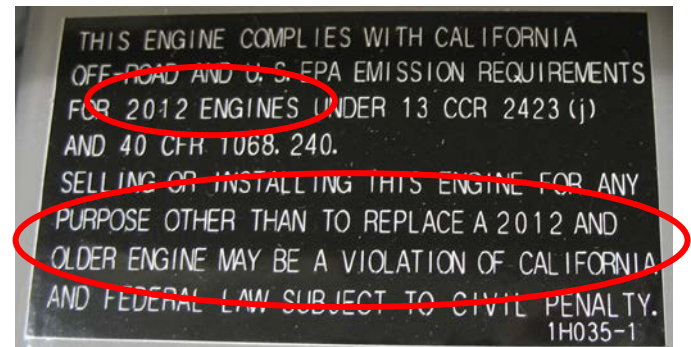
Prior-Tier Replacement Engines

Unfortunately, replacement engines that were manufactured to meet an emissions tier that was no longer in effect at the time of manufacture have emissions labels that must be interpreted using key pieces of information included on the emissions label compliance statement to determine the tier standard met. The first compliance statement on *most* of these prior-tier engine emissions labels includes the first year of the emissions tier that was met. The second sentence is a warning that includes the first day of the next tier emissions standard.

For example, a prior-tier replacement engine emissions label for an engine meeting Tier 2 reads as follows: “THIS ENGINE COMPLIES WITH CALIFORNIA OFF-ROAD AND U.S. EPA NONROAD EMISSION REQUIREMENTS FOR 2004 ENGINES UNDER 13 CCR 2423(j) AND 40 CFR 89.1003(b)(7). SELLING OR INSTALLING THIS ENGINE FOR ANY PURPOSE OTHER THAN TO REPLACE AN OFF-ROAD ENGINE BUILT BEFORE JANUARY 1, 2008 MAY BE A VIOLATION OF CALIFORNIA AND FEDERAL LAW SUBJECT TO CIVIL PENALTY.” The first sentence refers to the year 2004. Referring to Table 1, above, 2004 is the first year that Tier 2 was in effect and January 1, 2008 is the first day that Tier 4i was in effect, so the label is indicating this replacement engine meets Tier 2.



Another example of an emissions label for a prior-tier replacement engine is shown to the right and reads as follows: “THIS ENGINE COMPLIES WITH CALIFORNIA OFF-ROAD AND U.S. EPA EMISSIONS REQUIREMENTS FOR 2012 ENGINES UNDER 13 CCR 2423(j) AND 40 CFR 1068.240. SELLING OR INSTALLING THIS ENGINE FOR ANY PURPOSE OTHER THAN TO REPLACE A 2012 AND OLDER ENGINE MAY BE A VIOLATION OF CALIFORNIA AND FEDERAL LAW SUBJECT TO CIVIL PENALTY.” The key indicator in this case are the phrases “COMPLIES WITH . . . EMISSIONS REQUIREMENTS FOR 2012 ENGINES” and “2012 AND OLDER.” Referring to Table 1, above, 2012 is the *last* year that Tier 4i was in effect, so the label is indicating this replacement engine meets Tier 4i.



If you need help interpreting emissions label compliance statements to determine the Tier standard met by an engine, please call the TRU Help Line at 1-888-878-2826.

What are the requirements for TRU OEMs and engine rebuilders that supply replacement engines?⁹

As the pictures above show, the engine emissions labels on new replacement engines generally do not contain sufficient information for owners of TRUs and TRU gen sets to register their units in ARBER. The TRU Regulation now requires TRU OEMs and engine rebuilders to provide all of the following:

1. Supplemental engine emissions labels must be provided with each new or rebuilt replacement engine they supply that list all engine information needed to register the equipment in ARBER (if the engine manufacturer’s emissions control label does not provide this information);
2. A written disclosure must be provided with each prior-tier engine supplied to interested buyers prior to sale disclosing that the engine was manufactured to meet less stringent emissions standards, and stating the effective model year of the prior-tier replacement engine and the ULETRU compliance deadline; and

⁹ 13 CCR sections 2477.13 and 2477.16, respectively

3. A registration information document must be provided with each new and rebuilt engine that must be passed on to the end user. The registration information document must include all the engine information needed to register the equipment in ARBER and must be consistent with the information that is on the engine emissions label and supplemental engine label. As an alternative to providing a registration information document, a TRU OEM may provide a web-based on-line look-up system for registration information, if approved by ARB.

What are the requirements for TRU dealers and repair shops?¹⁰

The TRU Regulation now requires dealers and repair shops to pass the registration information documents (which are now supplied with new and rebuilt replacement engines) to the end-user. As described in the section above, the registration information document is usually supplied by the TRU original equipment manufacturer or the engine rebuilder. If a registration information document is not included with a replacement engine because it came from some other supply channel, the dealer or repair shop must provide a registration information document. If the replacement engine is supplied by a TRU OEM, but without a registration information document, the dealer or repair shop must print-out this document from the OEM's on-line look-up system. If the replacement engine is a prior-tier engine, the dealer must notify a potential purchaser of the written disclosure provided by the OEM prior to sale, and must pass the OEM's written disclosure to the ultimate purchaser at point of sale.

How do I update my ARBER registration to show compliance by engine replacement?

The TRU Regulation requires owners to update their registration information within 30 days of any changes to the information they submitted. Penalties can result from failure to update ARBER registrations. The following steps are used to update ARBER:

1. Log into ARBER with your user I.D. and password at:
<https://arber.arb.ca.gov>
2. Select "TRU/ TRU Genset Registrations"
3. From the list of TRU Identification Numbers (IDN) for units you have registered, select the IDN for the unit that needs registration information changed.
4. Scroll down through the registration categories and click on the "Update" button to update information that has changed. For an engine replacement, be sure to update the "Engine Information", "Compliance Information", and "Installer Information" sections.
5. Be sure to click on the "Submit" button to save your changes.
6. Review the information on the "Certification TRU Registration Information" page. Near the bottom, you must click to certify under penalty of perjury that all of the information you have entered is true and correct. Then click again on the "Submit" button.
7. Print out your Certification Page for your records.

Please call the TRU Help Line at 1-888-878-2826 during regular business hours if you need assistance. You may ask questions or request a call-back by email: arber@arb.ca.gov.

¹⁰ 13 CCR section 2477.14 and 2477.15

Can I retrofit a rebuilt engine with a Verified Diesel Emissions Control Strategy (VDECS), such as a diesel particulate filter?

No. When a VDECS manufacturer applies for verification of a diesel emissions control strategy (DECS), they are required to propose a list of engines that are compatible with their DECS. They must provide data and engineering arguments to demonstrate their DECS can reliably reduce emissions and control exhaust backpressure on these engines. If successful, ARB approves the verification and issues an Executive Order (EO) that includes terms and conditions that must be met by each engine that is retrofit with the VDECS. An attachment to the EO lists the engine families that can be considered for retrofit with the VDECS. Before retrofit can occur on any engine listed on the EO attachment, a pre-installation compatibility (PIC) assessment must be performed to show the engine actually meets all of the terms and conditions required by the EO. The PIC assessment ensures the condition of the actual engine is compatible with the VDECS. So far, no VDECS manufacturer has tested their DECS with rebuilt engines, so no rebuilt engines are listed on any VDECS EO attachments.

When does the repower compliance option expire?

Transport refrigeration unit (TRU) owners need to be aware that the engine replacement compliance option expires for model year (MY) 2008 and newer in-use TRU engines.

Repowering a TRU ceases to qualify as a compliance option when the replacement engine is no cleaner than the engine being replaced. Title 13 California Code Regulations (13 CCR), section 2477.5(i) stipulates that a replacement engine shall meet a more stringent emissions standard than the engine being replaced. To evaluate if this limitation applies to their TRUs, TRU owners need to determine what emission standard tier is met by the in-use engine being replaced and compare that to the tier standard that is met by the cleanest replacement engine that will fit and perform in the TRU.

Examples follow:

1. Trailer TRUs or TRU generator sets equipped with MY 2008 through 2012 Tier 4i in-use engines rated at 25-50 hp: The only replacement engine that will fit and perform is another Tier 4i replacement engine, which does not result in a cleaner replacement engine. Therefore, the repower compliance option for MY 2008 to MY 2012 25-50 hp trailer TRU and TRU gen set engines fails to qualify in 2015.
2. TRUs equipped with MY 2008 and newer Tier 4 in-use engines rated at less than 25 hp: The only replacement engine that will fit and perform is another Tier 4 less than 25 hp replacement engine, which does not result in a cleaner replacement engine. Therefore, the repower compliance option for MY 2008 and newer less than 25 hp TRU engines fails to qualify in 2015.

Please be aware of possible cases where TRUs manufactured in 2008 could still use the replacement engine compliance option if they are equipped with Tier 2 engines:

Case 1: During the first quarter of 2008, TRU manufacturers may have installed MY 2007 engines that were manufactured in the last few months of 2007, which met Tier 2 emission standards. This lag is allowed for normal production, shipping, and inventory practices.

Case 2: TRU OEMs may have installed “flexibility engines” into TRUs manufactured during the remainder of 2008 and possibly 2009 for a limited number of engines. Flexibility engines that were installed in TRUs manufactured in 2008 and 2009 have an effective model year of 2007 and met Tier 2 emission standards. Flexibility engines have emissions labels that include the following text: “SELLING OR INSTALLING THIS ENGINE FOR ANY PURPOSE OTHER THAN FOR THE

EQUIPMENT FLEXIBILITY PROVISIONS OF 40 CFR 1039.625 MAY BE A VIOLATION OF FEDERAL LAW SUBJECT TO CIVIL PENALTY.”

In-use engines that met Tier 2 can be replaced by replacement engines that meet the cleaner Tier 4i emission standards to qualify as a compliance option under 13 CCR section 2477.5(i).

It should also be noted that the engine replacement compliance option is not very attractive for TRUs manufactured in 2008 that are equipped with MY 2007 engines or flexibility engines that have an effective model year of 2007 that must comply by the end of 2015. Those replacement engines' effective model year is 2012, so the ULETRU compliance deadline would be December 31, 2019, which only results in about four years of compliance before the ULETRU in-use performance standard has to be met. For example, if a trailer TRU that was manufactured in 2008 is equipped with an MY 2007 original engine, the compliance date is December 31, 2015 (based on the unit manufacture year). If the owner chooses to repower the TRU with a Tier 4i replacement engine, the effective model year of the replacement engine is 2012 (the last year that Tier 4i was in effect), and compliance with ULETRU in-use standard would then be required by December 31, 2019 (seven years after the effective model year). In this example, the operational life of the replacement engine would only be about four years (late 2015 to the end of 2019).

What compliance options remain? Retrofitting with a Level 3 Verified Diesel Emissions Strategy (VDECS) may be something to consider because Level 3 VDECS meet the TRU Regulation's ULETRU In-Use Performance Standard. Another option is to replace the unit with a new unit.

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, 2010,¹¹ and October 21, 2011.¹²

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

¹¹ ARB's Regulatory Activity webpage for the 2010 rulemaking is at: <http://www.arb.ca.gov/regact/2010/tru2010/tru2010.htm>

¹² ARB's Regulatory Activity webpage for the 2011 rulemaking is at: <http://www.arb.ca.gov/regact/2011/tru2011/tru2011.htm>

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 Relev
de California (CRS) o para el uso de teléfonos TTY, marquen al 711.