

STATE OF CONNECTICUT  
CONNECTICUT SITING COUNCIL

IN RE: :  
: :  
WATERTOWN SOLAR ONE, LLC AND VCP, : PETITION NO. 1417  
LLC D/B/A VEROGY PETITION FOR A :  
DECLARATORY RULING, PURSUANT TO :  
CONNECTICUT GENERAL STATUTES §4-176 :  
AND §16-50K, FOR THE PROPOSED :  
CONSTRUCTION, MAINTENANCE AND :  
OPERATION OF A 1.975-MEGAWATT-AC :  
SOLAR PHOTOVOLTAIC ELECTRIC :  
GENERATING FACILITY LOCATED AT 669 :  
PLATT ROAD, WATERTOWN, :  
CONNECTICUT, AND ASSOCIATED :  
ELECTRICAL CONNECTION : OCTOBER 22, 2020

RESPONSES OF WATERTOWN SOLAR ONE, LLC  
AND VCP, LLC D/B/A VEROGY TO  
CONNECTICUT SITING COUNCIL INTERROGATORIES - SET TWO

On October 15, 2020, the Connecticut Siting Council (“Council”) issued Interrogatories, Set Two to Watertown Solar One, LLC and VCP, LLC d/b/a Verogy (“Verogy” or “Petitioner”), relating to Petition No. 1417. Verogy offers the following responses.

**Project Development**

Question No. 1

Describe any further communications that Watertown Solar One, LLC and VCP, LLC d/b/a Verogy (Petitioner) had with neighbors beyond what is noted in the Petition.

Response

Since the filing of the Petition on July 6<sup>th</sup>, 2020, the Petitioner, has been in contact with four abutting property owners. The Petitioner received emails and/or telephone calls from the owners of property of 664 Platt Road, Michael Stankus and Mary Spillane; 100 Hinman Road, Alicia and Peter Maddox; 636 Platt Road, Mark and Marcia Worenko; and 279 Hinman Road,

Renee Hodge. On June 28, 2020, the Petitioner was contacted by Michael Stankus, the owner of property at 664 Platt Road. Mr. Stankus had questions regarding the property and property ownership for those portions of the property being used for the proposed solar facility. Mr. Stankus also had questions regarding the visibility of the proposed project from Platt Road. The Petitioner responded to Mr. Stankus' questions.

On July 15, 2020, the Petitioner was contacted by Peter Maddox, the owner of property at 100 Hinman Road. Mr. Maddox mentioned that he works for a large site-work contractor and was interested in performing the land preparation work for the project. The Petitioner had further discussion with Mr. Maddox regarding that scope of work.

On July 23, 2020, the Petitioner responded to questions from Marcia Worenko on the proposed solar facility, its location and proximity to her property at 636 Platt Road. Ms. Worenko also expressed concerns for recent activity undertaken by Eversource within its transmission line right of way that extends across Platt Road and through her parcel. Ms. Worenk mentioned that she might reach out to the Council with additional questions.

On July 7, 2020, the Petitioner responded to questions and comments from Renee Hodge, the owner of property at 279 Hinman Road. On July 13, 2020, the Petitioner sent Ms. Hodge an electronic copy of Petition No. 1417 and prepared a Site Vicinity Map to help Ms. Hodge understand where the project would be located and how far the development was from her home. A copy of the Site Vicinity Map sent to Ms. Hodge is provided in Attachment 1 of these responses. As indicated on the Site Vicinity Map, the Hodge residence is located approximately 2,750 feet to the northwest of the proposed solar facility's fence line.

Question No. 2

Describe the views of the proposed project from the 279 Hinman Road, Watertown property (Hodge Property).

Response

As shown on the Viewshed Analysis Map (Petition, Exhibit G - Appendix G), no visibility of the proposed project is predicted from the 279 Hinman Road property, which is located approximately 2,750 feet (approximately one-half mile) from the proposed fence line for the facility. Visibility to the northwest of the Project Area in the direction of 279 Hinman Road is obscured by nearly 0.5 mile of intervening woodlands. It should be noted that an Eversource electrical transmission line is located approximately 700 feet northwest of the Project Area and runs between the residence at 279 Hinman Road and the Project Area. (See Attachment 1).

Question No. 3

How would existing power line frequency magnetic field levels at the nearest property line of the Hodge Property be affected by the operation of the proposed solar facility?

Response

The existing power line frequency magnetic field levels at the nearest property line of the Hodge Property will be unaffected by the operation of the proposed Watertown solar facility. The proposed solar facility will convert direct current electricity generated by the solar panels to three phase 60-Hz alternating current power that will be fed into the Eversource distribution service along Pratt Road. This conversion involves sequential processing of the direct current through an inverter that produces low-voltage three-phase power, which is stepped up to distribution voltage (13.8 kV) through a transformer. The two main sources of electric and

magnetic fields within a solar facility are the inverters and transformer<sup>1</sup>. Based on the distance (~300 feet) from the limits of the proposed facility to the existing high voltage transmission lines to the northwest, the electromagnetic field (“EMF”) from the inverters and transformers would not appreciably change the EMF levels outside the limits of the proposed facility<sup>2</sup>.

#### Question No. 4

Referencing pages 32 and 33 of Environmental Assessment of the Petition, what would the projected noise level resulting from the proposed facility be at the nearest property line of the Hodge Property?

#### Response

The Hodge residence is located approximately 2,750 feet from the project fence, as depicted on the attached Proposed Solar Facility Site Vicinity Map (Attachment 1). The projected noise level resulting from the proposed facility at that distance would be approximately -0.3 dBA. As such, the noise level at the nearest property line of the Hodge Property would be indecipherable to the human ear.

Decibels are not an absolute measure of sound energy; they are actually a comparison with a reference level. This is similar to the Celsius scale, which sets 0 as the freezing point of water. What this means is that this scale measures temperature in *reference* to the freezing point of water. In the same manner, 0 dB is the threshold of human hearing, i.e., the softest sound the human ear can hear (without artificial help). Expressing sound levels in the context of human hearing, 0 dB means that the sound is right at the threshold of human hearing ability. A positive

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<sup>1</sup> R. A. Tell, H. C. Hooper, G. G. Sias, G. Mezei, P. Hung & R. Kavet (2015) Electromagnetic Fields Associated with Commercial Solar Photovoltaic Electric Power Generating Facilities, *Journal of Occupational and Environmental Hygiene*, 12:11, 795-803, DOI: 10.1080/15459624.2015.1047021, <https://doi.org/10.1080/15459624.2015.1047021> at 795.

<sup>2</sup> Tell et al., 2015 at 801.

dB value means that the sound is a few times louder than the threshold, while a negative dB value means that the sound is a few times softer than that threshold.

Question No. 5

Would the proposed erosion and sediment control plans be submitted to the Department of Energy and Environmental Protection to be considered as part of the Petitioner's application for a stormwater permit for this project?

Response

Yes, the proposed erosion and sediment control plans were submitted to CT DEEP as a part of the Petitioner's application for a stormwater permit in July of 2020.

Question No. 6

Could earth movement as the ground stabilizes (post-construction) result in broken electrical conduits/cables and result in fire risk? Explain. Would the project comply with the National Fire Protection Association Section 11.12.3?

Response

Post-construction ground stabilization will not result in any damage to conduits/cables or fire risk. The electrical trench is backfilled and compacted to 95% compaction per ASTM D1557 standard. (See electrical trench detail, Petition, Appendix A, Sheet DN-1.) The Project will comply with the National Fire Protection Association Section 11.12.3.

Question No. 7

How would the proposed facility affect natural flows of nearby watercourses?

Response

There will be no effect on natural flows of nearby watercourses as a result of project development. The nearest watercourse is Lewis Atwood Brook, approximately 440 feet to the

east of the facility fence and approximately 85 feet south of the underground interconnection line. Stormwater will be managed as required by DEEP; the project has been designed to meet all DEEP requirements.

Question No. 8

How would traffic be impacted and managed, both during construction and during operation of the proposed facility? How often would maintenance visits be performed, and how many vehicles would be required for a typical maintenance visit?

Response

As noted in the Petition, during construction, heavy equipment will be required to access the Project Area during normal working hours as needed. Traffic will likely increase during the construction period only. Once construction is complete and the facility is operating, minimal traffic is anticipated. For standard operations and maintenance visits, one to two light-duty vehicles will visit the Project Area on a monthly recurring basis, on average.

Question No. 9

Would the proposed transformer have any insulating fluid, or would it be a “dry” transformer? If it would contain insulating fluid, what containment measures would be employed to minimize the risk of soil contamination due to a leak?

Response

The proposed transformer would have insulating fluid. The fluid that is utilized in the step-up transformers is called Envirotemp FR3 fluid. This is a dielectric fluid that helps increase the lifespan of the transformer and can improve fire safety. The fluid is used to protect the insulation paper in the transformer and is more effective and sustainable than normal mineral oil. The FR3 fluid is classified as “readily biodegradable” per the OECD 301 standard. This

standard requirement to pass as “readily biodegradable” is six 28-day long tests that are run on the fluid. In these six tests, there must be 70% removal of Dissolved Organic Carbon (DOC) and 60% Theoretical Carbon dioxide (ThCO<sub>2</sub>) production for respirometry methods. These levels of removal must be met within a 10-day window of the 28-day test to be considered “readily biodegradable”. The 10-day window starts when there is 10% DOC or ThCO<sub>2</sub> removal reached and must be completed before the 28-day study ends. Please see the specification sheet attached Attachment 2.

The transformer unit itself will provide primary containment for the Envirotemp FR3 transformer fluid. Due to the “readily biodegradable” nature of the fluids that would be used, the transformers do not maintain secondary containment measures. As described in the attached specifications, the Envirotemp FR3 fluid is non-toxic and non-hazardous to soils and water.

#### Question No. 10

Would the proposed facility present any risk of arc flash? What design safety features would protect against arc flash?

#### Response

Yes, there is a risk of arc flash. However, precautions to prevent arc flash during design, installation and operations and maintenance are always taken. For instance, separating conductors that have different voltage and correctly labeling them is a large part of properly planning against arc flashes. The inverter technology being used at the Watertown project has arc fault detection that de-energizes the facility when an arc is detected. Another safety feature used to prevent arc flashes is the use of fused combiner boxes. The AC equipment on the Watertown project is designed so that none of the AC equipment will need maintenance while the facility is energized. All equipment will maintain appropriate arc flash safety labeling and all

O&M professionals that will visit the site will be trained to prevent against arc flashes, including wearing applicable PPE.

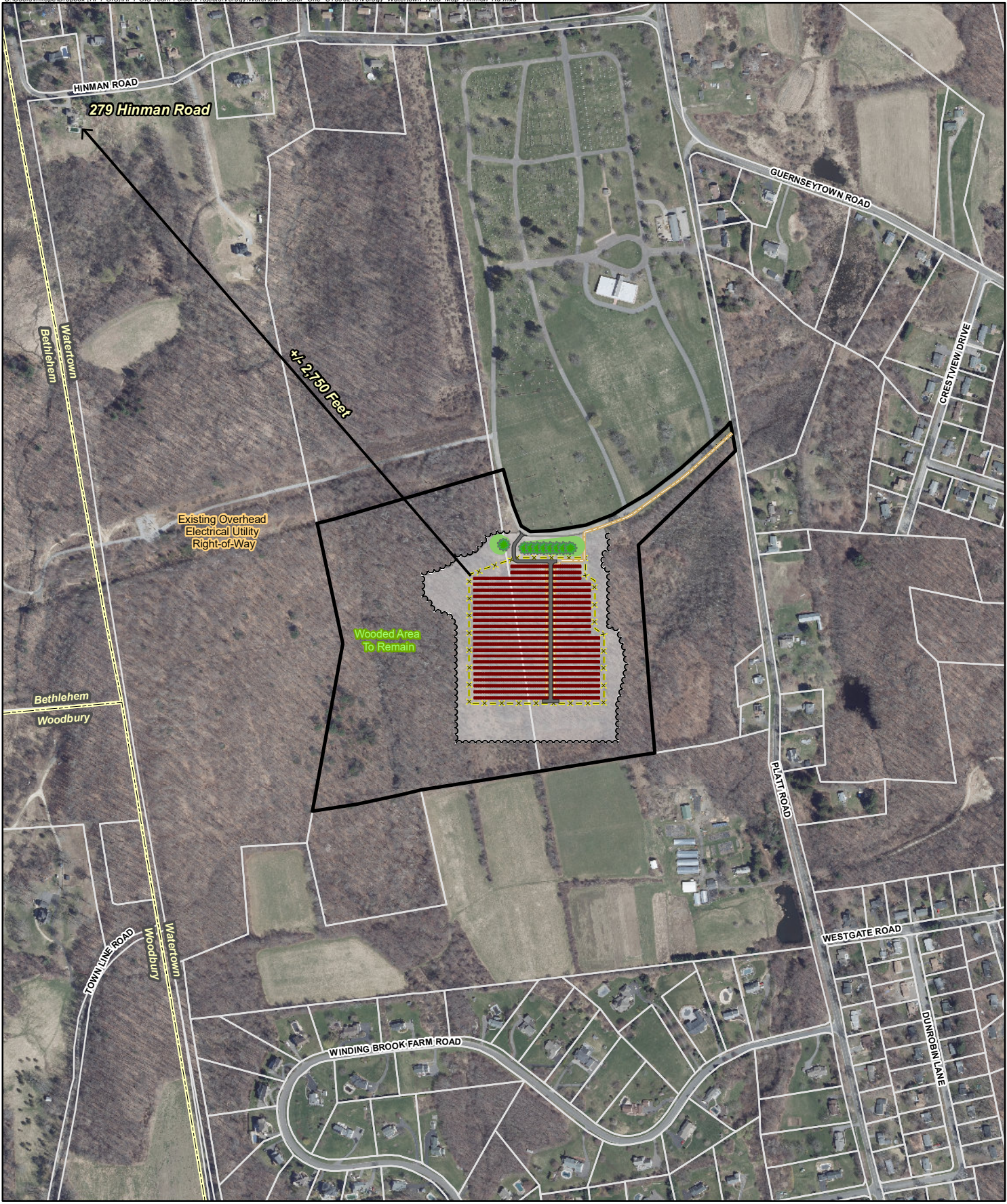
Question No. 11

In the Petitioner's experience, do inverter failures result in the majority of solar photovoltaic generation outages or unavailability? If so, explain and if not identify other factors that may cause such outage or unavailability.

Response

Inverter failures are certainly one factor that may cause a generation outage or unavailability. Other factors that contribute to unavailability are utility distribution grid outages from storms, and grounding due to lightning strikes. Unavailability is difficult to predict, however the 24/7 monitoring system that will be in place at the Watertown project will alert the Petitioner of an outage, or if the system is unavailable as soon as that event occurs. In these instances, the Petitioner would diagnose and address the problem as quickly as possible to assure that the facility is available to generate power as soon as possible.





- Legend**
- Site
  - Approx. Parcel Boundary
  - Municipal Boundary
  - Limit Of Disturbance
  - Solar Modules
  - Gravel Access Road
  - Grass Berm
  - Treeline (Clearing Limit)
  - Perimeter Fence
  - Interconnection Path
  - Landscape Screening (Evergreens)

**Proposed Solar Facility Site Vicinity Map**

Proposed Solar Facility - Watertown Solar One  
 669 Platt Road  
 Watertown, Connecticut

**Map Notes:**  
 Base Map Source: CTECO 2019 Aerial Photograph  
 Map Scale: 1 inch = 600 feet  
 Map Date: July 2020



**Watertown Solar One, LLC**



# Envirotemp<sup>TM</sup> FR3<sup>TM</sup> fluid Formulated for performance.



**Envirotemp™ FR3™ fluid.**  
**Trusted worldwide**  
**a million times over.** .....





With over one million installations across six continents and validated in over 250 tests, Cargill's Envirotemp™ FR3™ natural ester fluid is trusted by our customers to deliver cost-effective solutions that help improve transformer performance reliably and safely.

Our team of dielectric experts is active in the standards community globally and has extensive knowledge of not only dielectric fluid properties but also fluid performance in

application. And they have transformer design experience, too. This means our customers adopting FR3 natural ester technology have comprehensive dielectric fluids support from initial planning stages through best practices implementation and beyond.

Backed by Cargill's global supply chain network, our customers can rely on us to deliver the best solution for their application - when they need it, anywhere in the world.

### With FR3 fluid, our customers can:

- Gain cost efficiencies either on initial cost or total cost of ownership without sacrificing reliability.
- Extend transformer insulation and asset life.
- Optimize load capacity.
- Significantly improve fire safety.
- Enhance their environmental footprint and sustainable supply chain initiatives.

# Improve performance with life extension and loading flexibility.

## Protect insulation life to extend asset life.

Insulation paper is one of the primary factors that determines the life of a transformer. FR3™ fluid's unique chemistry absorbs free water and essentially wicks it away from the insulation paper. FR3 fluid has 10 times the water saturation level of mineral oil. This results in extending the insulation life 5-8 times longer than mineral oil.



Insulation aging study comparing thermally upgraded paper using FR3 fluid vs. mineral oil.

- Save significantly on replacement costs by extending the asset life with FR3 fluid.
- Reduce the risk of failure to improve reliability of the transformer.
- Reduce processing maintenance costs, since FR3 fluid does not sludge like mineral oil.

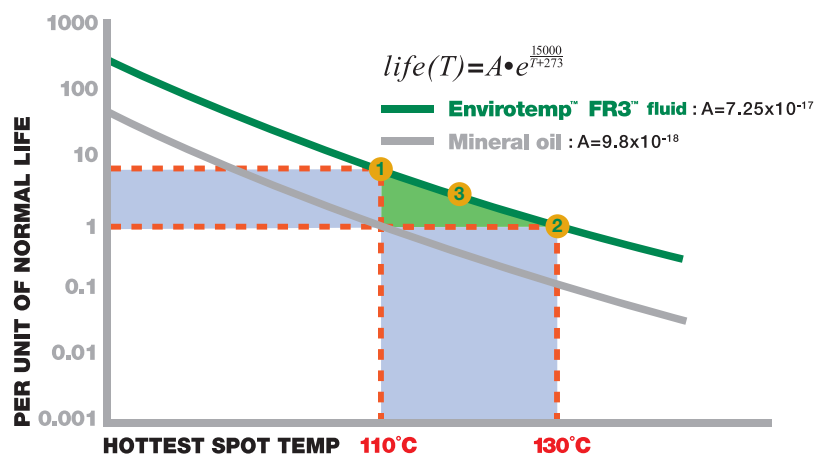
With FR3™ fluid’s unique capabilities to extend insulation life and increase load capacity, organizations now have the flexibility to optimize their transformer fleet loading profiles in order to gain cost savings without sacrificing reliability.

### Leverage higher thermal capability with FR3 fluid.

Historically, standards were written to accommodate a 95°C or 110°C hot spot for cellulose and Thermally Upgraded Kraft (TUK), respectively. However, published high temperature insulation system standards - IEC (60076-14) and IEEE (C157.154) – accommodate a 15°C or 20°C increase in hot spot without sacrificing the life or reliability of the transformer, when immersed in natural ester fluid.

| Paper | Dielectric Fluid | Thermal Class | Hot spot | IEEE AWR | IEC AWR |
|-------|------------------|---------------|----------|----------|---------|
| TUK   | Mineral Oil      | 120           | 110°C    | 65°C     | 75K     |
| TUK   | Natural Ester    | 140           | 130°C    | 85°C     | 95K     |

TUK life curves



- OPTION 1:** Extend asset life at current 110° hotspot.
- OPTION 2:** Increase load capability up to 20% with 130°C hotspot.
- OPTION 3:** Incrementally extend asset life and increase load capability with 120°C hotspot.

IEC 60076-14 Part 14: Liquid-immersed power transformers using high-temperature insulation materials. Edition 1.0 September 2013.

IEEE C57.154 Standard for the Design, Testing, and Application of Liquid-Immersed Distribution, Power, and Regulating Transformers Using High-Temperature Insulation Systems and Operating at Elevated Temperature. Published October 30, 2012.

# Improve fire safety.

# Add more sustainability to your sustainable supply chain.



## Reduce costs while increasing fire safety.

FR3™ fluid has the highest fire point of any dielectric fluid (360°C compared to 160°C for mineral oil) making it the ideal choice for densely populated areas where transformers are positioned indoors, underground or in close proximity to buildings and other equipment. FR3 fluid is a K-class, less flammable fluid as certified by Underwriters Laboratory and approved by FM Global.

- Reduce clearance to buildings which saves precious real estate, particularly in space-constrained areas.
- Retrofill older transformers with FR3 fluid instead of replacing or moving them to help comply with current fire code regulations.
- For power transformers, potentially eliminate the need for expensive fire walls and deluge systems (and their ongoing maintenance costs).



## “Being green” also benefits your bottom line.

FR3 fluid not only has best-in-class environmental properties, but with its enhanced thermal capabilities enabling smaller transformer designs, your supply chain just got a whole lot more sustainable.

- Smaller, more efficient transformer designs:
  1. Use less fluid and construction materials.
  2. Are typically lighter which could make installations easier for work crews and could reduce transportation costs.

## Envirotemp™ FR3™ fluid properties: standard acceptance values and typical values

| PROPERTY                                 | Standard test methods                    |                 | ASTM D6871/IEEE C57.147                     | IEC 62770                                      | Envirotemp FR3 fluid        |                |
|--|--|-----------------|---|--|-----------------------------|----------------|
|  | ASTM                                     | ISO/IEC         | As-received new fluid property requirements | Unused new fluid property requirements         | TYPICAL                     |                |
| <b>Physical</b>                          |  |                 |   |  |                             |                |
| Color                                    | D1500                                    | ISO 2211        | ≤1.0  | –  | 0.5                         |                |
| Flash Point PMCC (°C)                    | D93                                      | ISO 2719        | –   | ≥250   | 255                         |                |
| Flash Point COC (°C)                     | D92                                      | ISO 2592        | ≥275  | –  | 320-330                     |                |
| Fire Point (°C)                          | D92                                      | ISO 2592        | ≥300  | >300   | 350-360                     |                |
| Pour Point (°C)                          | D97                                      | ISO 3016        | <-10  | ≤-10   | -18 - -23                   |                |
| Density at 20°C (g/cm <sup>3</sup> )     | –  | ISO 3675        | –   | ≤1.0   | 0.92                        |                |
| Relative Density (Specific Gravity) 15°C | D1298                                    | –               | ≤0.96                                       | –  | 0.92                        |                |
| Viscosity (mm <sup>2</sup> /sec)         |  |                 |   |  |                             |                |
|  | 100°C                                    | D445            | ISO 3104                                    | ≤15  | ≤15                         | 7.7 - 8.3      |
|  | 40°C                                     |                 |   | ≤50  | ≤50                         | 32 - 34        |
|  | 0°C                                      |                 |   | ≤500   | –                           | 190            |
| Visual Examination                       | D1524                                    | IEC 62770 4.2.1 | bright and clear                            | clear, free from sediment and suspended matter | clear, light green          |                |
| Biodegradation                           | OECD 301                                 |                 | readily biodegradable                       | readily biodegradable                          | readily biodegradable       |                |
| <b>Electrical</b>                        |  |                 |   |  |                             |                |
| Dielectric Breakdown (kV)                | D877                                     | –               | ≥30   | –  | 47                          |                |
| Dielectric Breakdown (kV)                |  |                 |   |  |                             |                |
|  | 1mm gap                                  | D1816           | –   | –  | 28                          |                |
|  | 2mm gap                                  | D1816           | –   | –  | 48-75                       |                |
|  | 2.5mm gap                                | –               | IEC 60156                                   | –  | 73                          |                |
| Gassing Tendency (mm/min)                | D2300                                    | –               | ≤0  | –  | -79                         |                |
| Dissipation Factor                       |  |                 |   |  |                             |                |
|  | 25°C (%)                                 | D924            | –   | –  | 0.010 - 0.15                |                |
|  | 90°C (tan δ)                             | –               | IEC 60247                                   | –  | 0.02                        |                |
|  | 100°C (%)                                | D924            | –   | –  | 0.41 - 3.85                 |                |
| <b>Chemical</b>                          |  |                 |   |  |                             |                |
| Corrosive Sulfur                         | D1275                                    | IEC 62697       | non-corrosive                               | non-corrosive                                  | non-corrosive               |                |
| Water Content (mg/kg)                    | D1533                                    | IEC 60814       | ≤200  | ≤200   | 4 - 50                      |                |
| Acid Number (mg KOH/g)                   | D974                                     | IEC 62021.3     | ≤0.06                                       | ≤0.06  | 0.013 - 0.042               |                |
| PCB Content (mg/kg)                      | D4059                                    | IEC 61619       | not detectable                              | free from PCBs                                 | not detectable              |                |
| Total Additives                          | –  | IEC 60666       | –   | Max weight fraction 5%                         | <2%                         |                |
| Oxidation Stability (48 hrs, 120°C)      | –  | IEC 61125C      | –   | –  | –                           |                |
|  | Total Acidity (mg KOH/g)                 | –               | IEC 62621.3                                 | –  | ≤0.6                        | 0.1            |
|  | Viscosity at 40°C (mm <sup>2</sup> /sec) | –               | ISO 3104                                    | –  | ≤ 30% increase over initial | 17.1% increase |
|  | Dissipation Factor at 90°C (tan δ)       | –               | IEC 60247                                   | –  | ≤ 0.5                       | 0.1            |

**NOTE: Specifications should be written referencing only the defined ASTM or IEC industry standard acceptance values and test methods. The listed 'typical' values are average values summarized from a significant number of data points over many years; they are not to be identified as acceptance values.**

ASTM D6871 Standard Specification for Natural (Vegetable Oil) Ester Fluids Used in Electrical Apparatus.

IEC 62770: Fluids for electrotechnical applications – Unused natural esters liquids for transformers and similar electrical equipment.

A transformer filled with FR3™ fluid complies with the transformer temperature operating range requirements defined in IEEE C57.12.00 and IEC 60076-1.

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- Made from a renewable source with global, reliable supply.
- Carbon neutral (according to BEES 4.0 lifecycle analysis).
- Non-toxic and non-hazardous in soil and water.
- Readily Biodegradable per OECD 301.
- Contains no petroleum, halogens, silicones or sulfurs.
- Recyclable.





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