

PUBLIC UTILITIES COMMISSION

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March 14, 2018

**SUBJECT: General Order (GO) 167 Audit of Topaz Solar Farm
Audit Number GO167-1025**

Dear Mr. Hood:

The Electric Safety and Reliability Branch (ESRB) of the California Public Utilities Commission (CPUC) has completed and enclosed the audit report for the 2017 Topaz Solar Farm (Topaz) audit that was conducted from October 23 through 26, 2017.

On September 15, 2017, ESRB notified Topaz of the audit and requested pertinent documents that include Operation, Maintenance, and Logbook Standards, Emergency Response Procedures, and other Topaz manuals, procedures, and maintenance records as listed in the Appendix of the Audit Report. Prior to the start of the audit, ESRB reviewed the submitted documents and made additional follow up data requests.

During the audit, ESRB also conducted field inspection of the facilities and equipment, reviewed additional pertinent documents and records, and interviewed plant personnel. After the audit, ESRB made several follow up data requests and reviewed the submitted documents. As a result of these activities, ESRB evaluated the plant's compliance with GO 167 requirements and identified violations requiring corrective actions listed in Section II of the audit report.

Please provide a written response within 30 days of your receipt of this letter, indicating the corrective actions and preventive measures taken and/or planned to address the violations and observations noted in the report to ensure compliance with GO 167 requirements. The response should include a Corrective Action Plan (CAP) for all findings listed in Section II with a description and completion date of each remedial action and preventive measure completed within 30 days. For any outstanding items not completed within 30 days, please provide the projected completion dates of the actions that Topaz plans to finish within 90 days to achieve full compliance with General Order 167. The response should also include preventive measures that Topaz plans to implement in order to prevent a reoccurrence of the violations listed. If you believe the Audit Report contains factual or other errors, you may discuss those in your response.

Please submit your response electronically to Chris Lee (chris.lee@cpuc.ca.gov). After ESRB reviews your response, the audit team may set up a meeting with you for further discussions.

Please note that although Topaz has been given 30 days to respond, Topaz has a continuing obligation to comply with all applicable requirements of General Order 167. The 30-day period does not alter this continuing duty.

If you wish to make a claim of confidentiality covering any of the information in the audit report, please submit a confidentiality request pursuant to Section 15.4 of General Order 167, using the heading "General Order 167 Confidentiality Claim." Please send the request to Anand Durvasula (Anand.Durvasula@cpuc.ca.gov) of our Legal Division, with a copy to Chris Lee and me.

Thank you for your courtesy and cooperation throughout the audit process. Please contact Chris Lee at (415) 703-1323 for further questions or additional information.

Sincerely,



Banu Acimis
Program and Project Supervisor
Electric Safety and Reliability Branch

Attachment:
2017 Audit Report of Topaz Solar Farm

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2017 Audit of *Topaz Solar Farm*

March 2018

STAFF REPORT

**PREPARED BY: ELECTRIC SAFETY AND RELIABILITY BRANCH
SAFETY AND ENFORCEMENT DIVISION**



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I. Introduction

This is the 2017 Audit Report of the Topaz Solar Farm (“Topaz” or “the Plant”) prepared by the California Public Utilities Commission’s (“CPUC’s” or “Commission’s”) Electric Safety and Reliability Branch (ESRB). ESRB audited the Plant for compliance with Commission General Order (GO) 167, which includes Operation, Maintenance, and Logbook Standards for power plants. GO 167 requires generating asset owners to operate and maintain their power plants in a safe and reliable manner. Electricity is vital to the State’s economic well-being and the safety of its residents. Therefore, ESRB enforces GO 167 and conducts compliance audits to ensure electric generation safety and reliability for the State.

On September 15, 2017, ESRB notified Topaz of the audit and requested pertinent documents that include operation procedures such as lock-out tag-out, confined space entry, and emergency response procedures, as well as maintenance records. ESRB’s initial data request is included in the Appendix. Prior to the start of the onsite audit, ESRB reviewed the submitted documents and requested additional follow-up data. ESRB conducted the onsite audit from October 23 through 26, 2017 during which it observed plant operations, inspected facility and equipment, reviewed additional data, and interviewed plant staff. During and after the onsite audit, ESRB requested and reviewed more data. From these activities, ESRB evaluated whether the Plant 1) complies with GO 167 requirements, and 2) could improve its programs, procedures, and policies to enhance safety and reliability.

ESRB identifies 14 findings in Section II, which represent potential violations of Operation and Maintenance Standards. These deficiencies can adversely affect reliable operation and present safety hazards to plant staff. ESRB also notes two observations and recommendations in Section III.

II. Findings Requiring Corrective Action

Finding 1 – Topaz fails to address SCADA¹ issues that may hinder reliable plant operations.²

Topaz fails to address and resolve Supervisory Control and Data Acquisition (SCADA) issues that may affect reliable plant operations. Topaz uses the control software called [Wonderware](#) that serves as the Human-machine Interface (HMI³) and supervisory control of its power blocks. While Topaz is remotely-operated from Tempe, Arizona, the Plant does have a complete redundant control room onsite. ESRB toured the control room and received a demonstration

¹ SCADA is a system of software and hardware that allows a plant to remotely operate and control equipment. It also enables a plant to acquire and store key operating data of the equipment, particularly to analyze their performance.

² GO 167 Operation Standard (OS) 4 - Problem Resolution and Continuing Improvement, OS 8 - Plant Status and Configuration

³ HMI is the graphical display that interfaces between the human operator and the equipment/machine being operated and controlled. Through the HMI, an operator can see schematics of the system on computer screens and can operate remotely-controlled equipment, e.g. open or close switches, turn on or off motors/pumps, and modulate valves, etc.

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from an operator, see Figure 1. ESRB noticed several software issues in the HMI that may impact plant operations. In particular, ESRB saw the HMI showed a graphical display of an opened circuit breaker while in fact the breaker was closed at the time according to the operator. ESRB also observed an indicator on the HMI flashing on and off intermittently. The operator explained that the flashing alert indicates a loss of communication from the inverter, though it's attributed to a glitch in the software rather than an actual loss of communication. ESRB inquired about these glitches and discovered that the Plant has known, but failed to repair, at least a dozen of these so-called SCADA issues. Some of these include nuisance alarms that may be caused by improper setpoints. Though Topaz is two years into commercial operations, it has yet to resolve these issues. The issues that ESRB noticed in particular can cause an operator error and may hinder reliable operations. Topaz must evaluate and take proper corrective actions to correct these SCADA issues.



Figure 1: Topaz's SCADA operator control room.

Finding 2 – The Plant's contractor management program is inadequate.⁴

Topaz lacks an adequate contractor management program. The Plant's current program to manage contractors consists of only a simple flow chart.⁵ While the chart explains that Topaz assesses risks thoroughly when evaluating a contractor for projects over \$2 million, the chart lacks sufficient detailed information on how Topaz actually prequalifies, selects, and oversees contractors to ensure worker safety and work performance. Topaz states that it is currently

⁴ GO 167 Maintenance Standard (MS) 1 - Safety, OS 1 - Safety, and OS 7 - Operations Procedures and Documents

⁵ Topaz's Risk Assessment (Prequalification) Process Flow Diagram, FS.462018, Version 0, Last Updated: April 11, 2016

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formalizing a program. However, the program is still in draft form.⁶ Further, ESRB reviewed a list of prequalified contractors and found at least one contractor (Electricraft) with a high Experience Modification Rate (EMR) subjecting it to additional review per the Plant's impending program.⁷ A high EMR means a company has a higher-than-industry-average number of worker injuries and compensation claims. It indicates a company may be unsafe. Even so, ESRB found no evidence that shows the Plant performed a secondary review, which further illustrates the need for a robust contractor management program.

Topaz must adopt a robust contractor management program to ensure the proper oversight, qualification, and safety of contractors.

Finding 3 – The Plant fails to manage vegetation to minimize fire risks.⁸

Topaz fails to manage vegetation to minimize fire risks. During the onsite visit, ESRB observed overgrown vegetation of at least several feet tall, some of which encroaches onto the solar panels, see Figure 2. This is contrary to the Plant's vegetation management goals to “*manage fuel load to minimize risk of fire*” and to “*manage vegetation height to maintain optimum function of solar PV arrays*”.⁹ Topaz is subject to environmental restrictions and maintains at least eight inches average height and at least 500 pounds per acre residual dry matter to promote a natural habitat for the San Joaquin Kit Fox, an endangered species.^{10, 11} Further, Topaz is restricted from using motorized trimming and/or mowing onsite to protect wildlife except along roadsides, fence lines, and other obstructed areas.¹² The Plant primarily uses sheep and cattle grazing as a mean to vegetation management. However, as evidenced by the overgrown and dry vegetation in some areas, this method proves ineffective in mitigating potential fire risks. The Plant is situated in the Carrizo Plain, an area of arid climates where low humidity and strong winds, combined with dry grass, make it highly susceptible to wildfires. Additionally, the Plant has had a history of fires in and around the solar panels. Since commercial operations in February 2015, Topaz has had 12 fires.¹³ In four occasions, an avian shorted an overhead conductor on a riser pole. The bird was electrocuted, caught fire, and fell to the ground, where it ignited dry vegetation and started a fire. In eight separate occasions, a rodent chewed on an underground cable, which shorted a circuit and caused a ground fault resulting in a fire. So fires have occurred and do occur at Topaz necessitating prudent and effective means of managing

⁶ Topaz's Subcontractor Management Program document, Revision 0

⁷ Electricraft had an EMR of greater than 1.0 in 2010, 2011, 2014 and 2015.

⁸ OS 1 - Safety, OS 4 - Problem Resolution and Continuing Improvement

⁹ Topaz Solar Farm Vegetation Management Plan [Revision February 8, 2012], Section 1.5 Topaz Vegetation Management Goals, at p. 8.

¹⁰ Topaz Solar Farm Vegetation Management Plan [Revision February 8, 2012], Section 3.5 Grazing Intensity and Management, at p. 39.

¹¹ U.S. Fish and Wildlife Service's Biological Opinion dated July 22, 2011, at p. 15, “*The ground under and between the solar arrays will be vegetated with a dominant cover of grasses and herbs to promote a more natural habitat that supports kit fox prey. Vegetation height will be controlled by pulse grazing or other means not hazardous to kit fox. A managed grazing regime will be implemented to maintain vegetation height suitable for kit fox use and their prey*”.

¹² Topaz Solar Farm Vegetation Management Plan [Revision February 8, 2012], Section 1.7 Protection of San Joaquin Kit Fox and Nesting Birds and Their Habitat, at p. 9.

¹³ Topaz fire incidents with causes and corrective actions.

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vegetation to reduce fire risks. Topaz must evaluate and implement effective alternatives to better manage vegetation to minimize fire risks.



Figure 2: ESRB observed overgrown vegetation of at least several feet tall, some of which encroaches onto the solar panels.

Finding 4 – The Plant fails to complete work on inverter fault detection and isolation to prevent grass fires.¹⁴

Topaz experienced 12 grass fires since July 2015: two in 2015, seven in 2016, and three in 2017. The majority were incipient fires that were contained by plant staff with fire extinguishers before CalFIRE arrived.

Topaz identified that the fires were caused by avian contact with overhead lines and ground faults resulting from rodents chewing on low voltage circuits. The Plant also identified solutions to address each of the causes. For example, the Plant installed customized “green jackets” on overhead conductors to prevent avian contact in February 2016, see Figure 3. The Plant also implemented automatic ground fault detection and isolation in one type of inverter in late 2016 (Topaz uses two types of inverters onsite). Both solutions proved effective and the number of fires was significantly reduced from 2016. And Topaz has not had any further fires from the enhanced inverters in 2017. However, Topaz has failed to implement automatic fault isolation on **all** inverters. The Plant must complete installation of this protection scheme on all inverters to reduce fire risks.

¹⁴ MS 1 - Safety, OS 1 - Safety, and OS 20 - Preparedness for On-Site and Off-Site Emergencies

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Further, as part of its overall fire mitigation, Topaz must coordinate with the local fire department at the next emergency drill to address how to best to alert its neighbors who are in close proximity of the Plant in the event of a fire emergency. Topaz must critique its drill and incorporate any lessons-learned in its Emergency Action Plan.

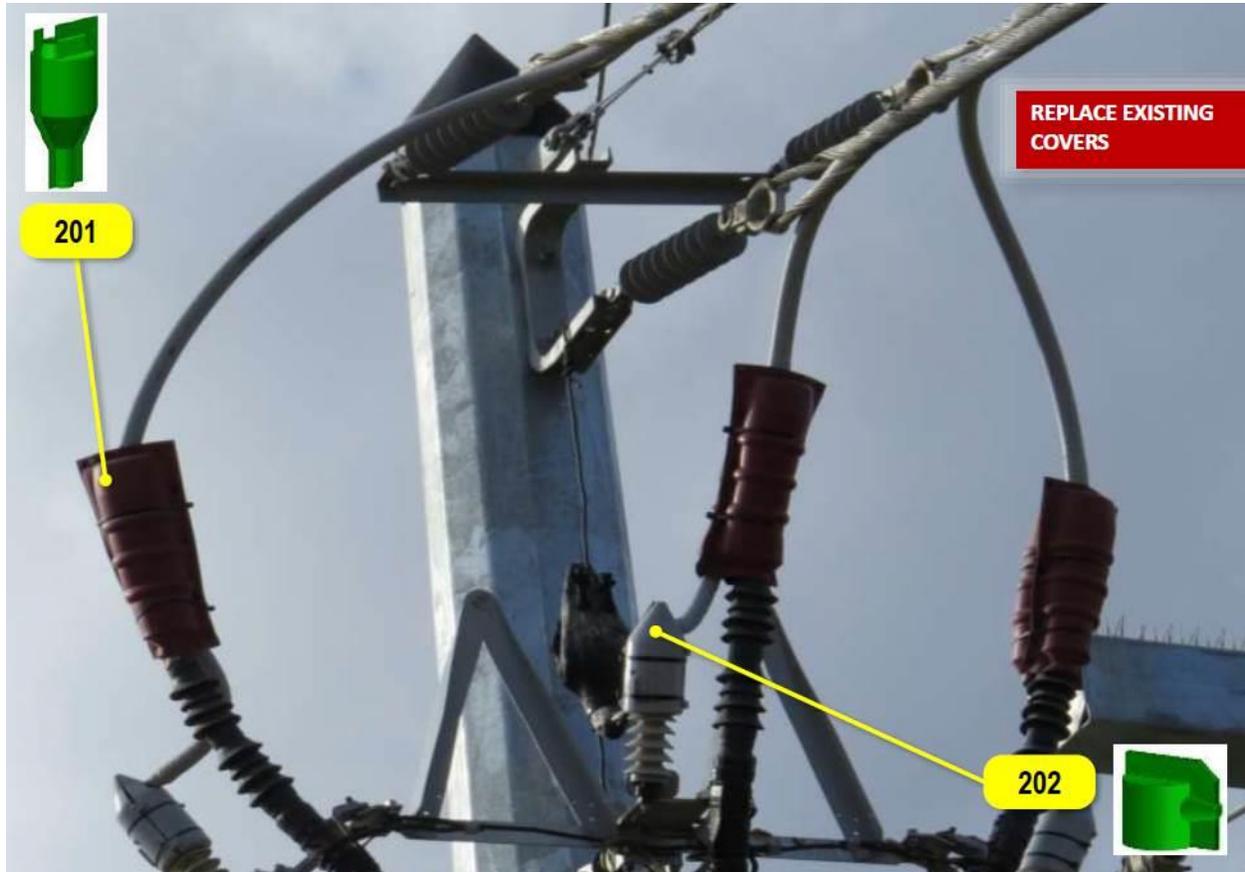


Figure 3: The Plant contracted with [Cantega Technologies](#) to install custom-designed "green jackets" shown as 201 and 202 to prevent avian contact with energized overhead conductors.

Finding 5 – The Plant fails to maintain warning labels on combiner boxes and confined spaces.¹⁵

In Block 5, ESRB observed faded, partially-peeled, or otherwise illegible warning labels. For example, on some combiner boxes, the arc flash warning labels as required by National Fire Protection Agency (NFPA) 70E¹⁶ have either partially or completely peeled-off, rendering them unreadable and ineffective, see Figure 4.

¹⁵ MS 1 - Safety

¹⁶ NFPA 70E is the standard for electrical safety in the workplace. Article 130.5(D) and 130.7(E)(1) [2015 version] sets the standard for arc flash labeling and best practices for maintaining such labels.

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Figure 4: Partially-peeled and faded arc flash warning labels on a combiner box.

Topaz must inspect warning labels on combiner boxes throughout the plant and replace them as necessary. Arc flash labels should withstand their usage environment. If necessary, the Plant should consider applying an over-laminate to protect the printed surface from exposure to sunlight and other elements.

ESRB also observed faded confined space labels throughout the plant, see Figure 5. While Topaz's confined spaces are classified as "non-permit" spaces, they, nevertheless, have limited or restricted access and may otherwise present a safety hazard to workers.

Topaz must inspect warning labels on confined spaces throughout the plant and re-stencil them as necessary. The Plant should consider installing Occupational Safety and Health Administration (OSHA)-compliant signs that are more visible and resistant to wear, see Figure 6.



Figure 5: Faded confined space label adjacent a medium voltage transformer.



Figure 6: An OSHA-compliant warning sign for non-permit confined spaces.

Finding 6 – The Plant lacks evacuation maps at power blocks having alternate muster points.¹⁷

The Plant designates four muster points for workers to gather in an emergency evacuation. The main muster point is located in front of the O&M building in a gravel area east of the parking lot. Due to the size of the facility,¹⁸ the Plant also designates three other alternate muster points: one each in Blocks 5, 12, and 19/20, see Figure 7. ESRB inspected Block 5 and noted that it lacks an evacuation map. ESRB did not check Block 12 and 19/20, but those may lack evacuation maps as well.

¹⁷ OS 1 - Safety, OS 4 - Problem Resolution and Continuing Improvement, and OS 20 - Preparedness for On-Site and Off-Site Emergencies

¹⁸ During the safety orientation, the maintenance manager stated the Plant encompasses approximately 7 ½ square miles of land.

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In the event of an emergency, contractors and visitors who are unfamiliar with the site may get disoriented easily. A clear and visible map that shows where you are on the map in relation to where you need to go will inform and direct workers to the proper assembly point, and may mean the difference between life and death. The lack of a map also conflicts with Topaz’s EAP, which requires staff to “*be trained in order to familiarize themselves of the locations of emergency assembly areas and the pre-determined routes in which to reach them.*”¹⁹ Topaz must affix an evacuation map on the entrance gate of each block having an alternate muster point.

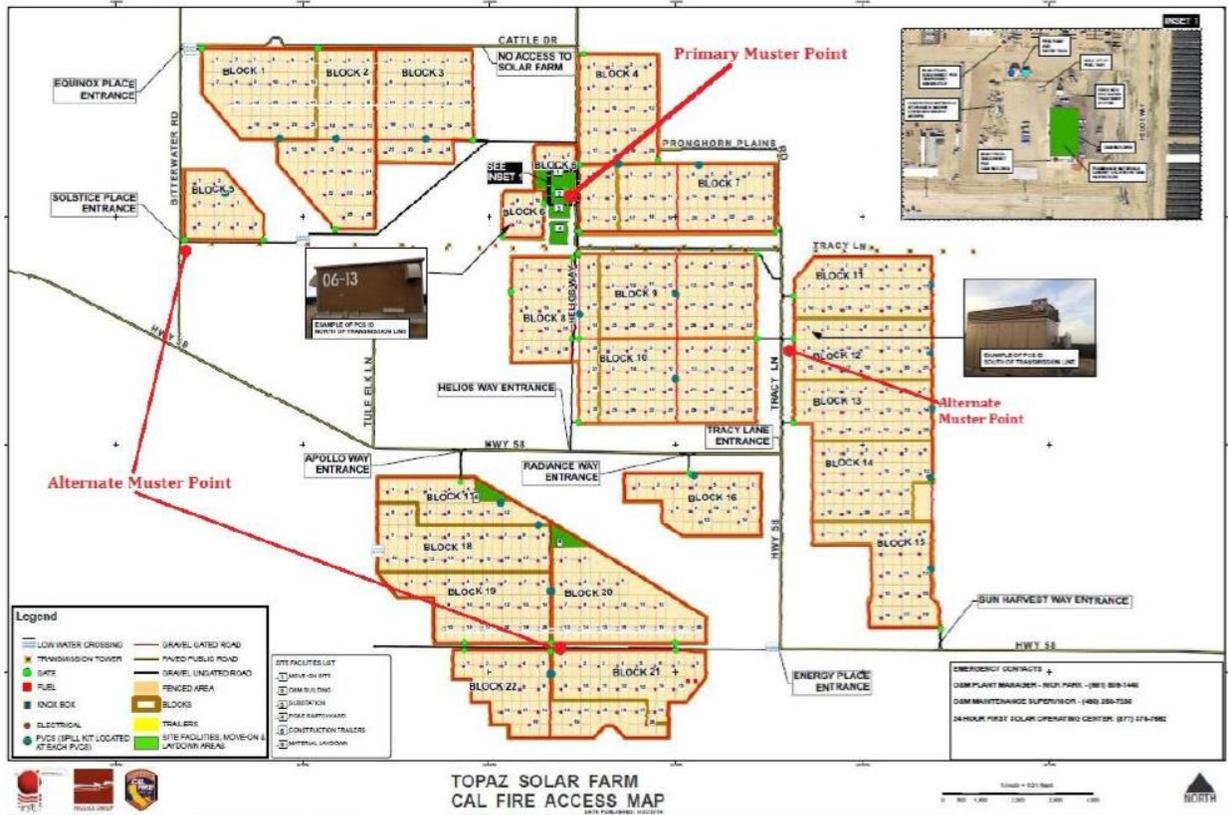


Figure 7: Map of Topaz Solar Farm showing each of the four muster points in ‘red’ dots.

Finding 7 – The Plant fails to post evacuation maps at each exit door at the O&M building.²⁰

The O&M building consists of four exits by which workers can evacuate the building in an emergency. However, the Plant fails to post an evacuation map at each of those exits. The lack of a directional map at each exit door can confuse workers, and can delay and compromise safe and orderly evacuation. ESRB noted at least one exit (south) without an evacuation map. Further, Topaz must make the following improvements to its evacuation map:

¹⁹ Topaz Solar Farms Emergency Action Plan Rev. 3 dated September 2017, Section 2.1 (at p. 2) – Pre-Planning

²⁰ OS 1 - Safety, OS 4 - Problem Resolution and Continuing Improvement, and OS 20 - Preparedness for On-Site and Off-Site Emergencies

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- a) In addition to showing fire extinguishers, Topaz must show the location of its Automated External Defibrillators (“AED”) on the map. This would facilitate a speedier response in the event of a medical emergency.
- b) Topaz must revise its map to indicate where you’re on the map in relation to where you need to go. This is typically done with a ‘star’ and ‘you’re here’ marker. Doing so will help orient a worker when he/she uses the map.
- c) Topaz must include and identify the main muster point on the map. This will help direct workers to where they need to go and promote a quicker response.
- d) Finally, Topaz must post an evacuation map at both exits of the conference room in the O&M building.

Finding 8 – The Plant lacks hazmat placards in designated areas.²¹

The Plant lacks hazmat placards in at least two areas.

First, the Plant lacks a placard at the hazardous waste accumulation site. The Plant designates a storage shed where it stores and accumulates broken and/or defective solar panels containing the hazardous chemical *cadmium telluride*²², see Figures 8 and 9. The Safety Data Sheet (“SDS”)²³ indicates that the chemical causes harmful health effects if inhaled, swallowed, or if it contacts the eyes or skin. The Plant stores and accumulates the chemical-laden panels in the shed until they are shipped out by a hazardous waste transporter. While the shed is marked as hazardous waste storage, it lacks the proper NFPA 704²⁴ placard identifying the chemical’s hazard, see Figure 10. NFPA 704 is a widely-used standardized system for identifying materials hazards for emergency response. It provides a crucial alert to workers and first responders in an emergency situation should the material be involved in a leak, spill or fire.

Second, the Plant lacks a placard at the fuel storage tank. The Plant stores gasoline onsite in an aboveground storage tank which it uses to fuel its company trucks since the plant is remotely located from any commercial gas stations. Gasoline is highly flammable and causes harmful health effects if inhaled or swallowed, or if it contacts the eyes or skin.

The Plant must install a hazmat placard at both locations. Not only does the placard provide a crucial alert to emergency response personnel, but it also allows the Plant to easily identify and assess its hazards when it plans for an emergency response.

²¹ OS 1 - Safety, and OS 4 - Problem Resolution and Continuing Improvement

²² Cadmium telluride (CdTe) is a stable crystalline compound of cadmium (Cd) and telluride (Te). It is mainly used as a semiconducting material to make thin film solar cells.

²³ The SDS provides information regarding the properties of a chemical or material, the physical, health, and environmental hazards, protective measures and safety precautions for handling, storing, and transporting the material.

²⁴ NFPA 704 is a widely-used standardized system for identifying materials hazards for emergency response. It identifies a material’s health, flammability, and chemical reactivity hazards.

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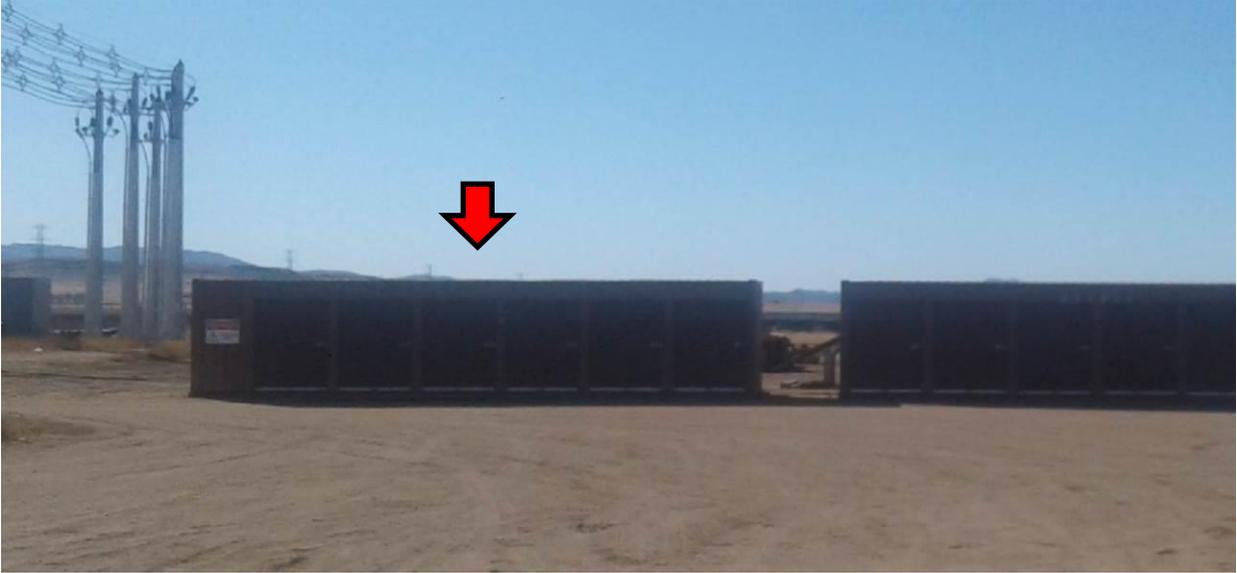


Figure 8: The Plant stores and accumulates broken and/or defective solar panels that contain cadmium telluride in the pictured storage shed.

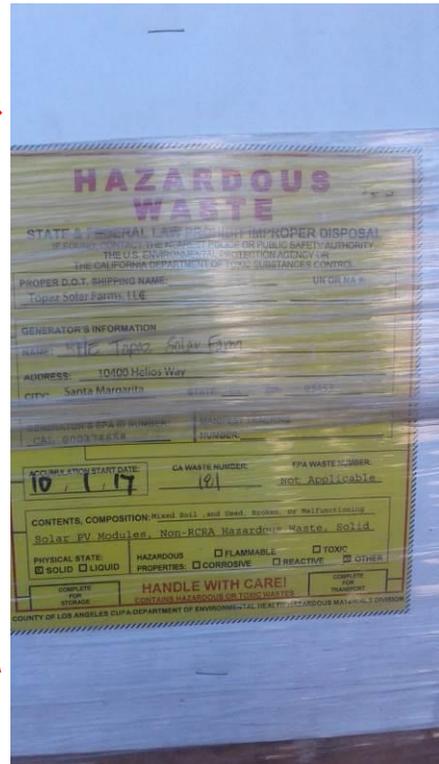


Figure 9: Inside the storage shed, defective panels are stored in boxes.



Figure 10: A typical NFPA 704 hazmat placard.

Finding 9 – The Plant’s work planning document conflicts with actual practice.²⁵

The Planning and Scheduling Standards, FS.TPZ1.514002, page 17 states:

*“The Site Management will be held accountable to ensure that Preventative Maintenance (which are contractual requirements) are performed as specified in the SOP within the time period that has been indicated in the **Annual Maintenance Plan.**”*

However, in reality, Topaz uses a document called **Annual Maintenance Schedule (AMS)** to schedule PM work orders. And this schedule is the actual documentation that specifies the frequency at which PM tasks are to be performed. Therefore, Topaz must revise its Planning and Scheduling Standards to refer to this schedule instead to prevent worker’s confusion.

Further, ESRB noticed that the AMS’ schedule for whip current measurement conflicts with the Plant’s actual practice. Per AMS, Topaz is to perform whip current measurement on Blocks 19 to 21 in July. However, the Plant’s record showed that in July 2016, Topaz performed the task on Blocks 1 to 10 instead²⁶, see Figure 11. Similarly, the Plant should have performed whip current measurement on Block 22 in August, but instead, performed the task on Blocks 16 to 22, see Figure 12. Topaz must adhere to its Annual Maintenance Schedule, or otherwise, revise its schedule to reflect actual practice so as to prevent workers’ confusion and to avoid omitting crucial maintenance.

²⁵ OS 7 - Operations Procedures and Documents

²⁶ Data request item #37, Completed Work Orders.xls

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Completed Work Orders Between 10/01/2016 and 09/20/2017

NA00048398	7/30/2016 11:52:24 PM	TPZ1 - BLK 1 Whip Current Measurement	Perform MP817100.1 DC Health Inspection FS Task 1	TPZ1PM-00X-00
NA00048400	7/30/2016 11:53:18 PM	TPZ1 - BLK 2 Whip Current Measurement	Perform MP817100.1 DC Health Inspection FS Task 1 11/2/16 inspections completed earlier in the year---TR	TPZ1PM-00X-00
NA00048402	7/30/2016 11:54:18 PM	TPZ1 - BLK 3 Whip Current Measurement	Perform MP817100.1 DC Health Inspection FS Task 1 11/2/16 inspections completed earlier in the year---TR	TPZ1PM-00X-00
NA00048404	7/30/2016 11:55:16 PM	TPZ1 BLK 4 Whip Current Measurement	Perform MP817100.1 DC Health Inspection FS Task 1	TPZ1PM-00X-00
NA00048406	7/30/2016 11:56:13 PM	TPZ1 BLK 5 Whip Current Measurement	Perform MP817100.1 DC Health Inspection FS Task 1	TPZ1PM-00X-00
NA00048408	7/30/2016 11:56:58 PM	TPZ1 BLK 6 Whip Current Measurement	Perform MP817100.1 DC Health Inspection FS Task 1	TPZ1PM-00X-00
NA00048410	7/30/2016 11:58:07 PM	TPZ1 - BLK 7 Whip Current Measurement	Perform MP817100.1 DC Health Inspection FS Task 1 11/05/16 - already been completed at the beginning of the year. FM3	TPZ1PM-00X-00
NA00048412	7/30/2016 11:59:26 PM	TPZ1 - BLK 8 Whip Current Measurement	Perform MP817100.1 DC Health Inspection FS Task 1 11/05/16 - Already been completed at the beginning of the year. FM3	TPZ1PM-00X-00
NA00048414	7/31/2016 12:00:32 AM	TPZ1 - BLK 9 Whip Current Measurement	Perform MP817100.1 DC Health Inspection FS Task 1 11/5/16 Work Completed prior in the year---TR	TPZ1PM-00X-00
NA00048416	7/31/2016 12:01:44 AM	TPZ1 - BLK 10 Whip Current Measurement	Perform MP817100.1 DC Health Inspection FS Task 1 11-5-16 I believe short description should read block 15 whip current measurements, but work was completed prior in the year---TR	TPZ1PM-00X-00

Figure 11: Record shows Topaz conducted whip current measurement on Blocks 1 to 10 in July 2016.



Completed Work Orders Between 10/01/2016 and 09/20/2017

NA00050129	8/27/2016 11:58:08 PM	TPZ1 BLK 09 Whip Current Measurement	Perform MP817100.1 DC Health Inspection FS Task 1	TPZ1PM-00X-00
NA00050131	8/27/2016 11:59:38 PM	TPZ1 - Whip Current Measurement	Perform MP817100.1 DC Health Inspection FS Task 1 Task was completed earlier in the year---TR	TPZ1PM-00X-00
NA00050133	8/28/2016 12:01:09 AM	TPZ1 - Whip Current Measurement	Perform MP817100.1 DC Health Inspection FS Task 1	TPZ1PM-00X-00
NA00050135	8/28/2016 12:02:25 AM	TPZ1 - Whip Current Measurement	Perform MP817100.1 DC Health Inspection FS Task 1 10/25/16 work done prior in the year--TR	TPZ1PM-00X-00
NA00050137	8/28/2016 12:04:06 AM	TPZ1 BLK 16 Whip Current Measurement	Perform MP817100.1 DC Health Inspection FS Task 1	TPZ1PM-00X-00
NA00050139	8/28/2016 12:05:50 AM	TPZ1 BLK 17 Whip Current Measurement	Perform MP817100.1 DC Health Inspection FS Task 1	TPZ1PM-00X-00
NA00050141	8/28/2016 12:07:20 AM	TPZ1 BLK 18 Whip Current Measurement	Perform MP817100.1 DC Health Inspection FS Task 1	TPZ1PM-00X-00
NA00050143	8/28/2016 12:08:33 AM	TPZ1 BLK 19 Whip Current Measurement	Perform MP817100.1 DC Health Inspection FS Task 1 6/5/17 Completed Whip checks in array 19-1. -- TF 6/25/17 Completed Whip checks in arrays 19-02 through 19-08. -- MMM 7/31/17 Completed whip checks in arrays 9 through 20. -- TF	TPZ1PM-00X-00
NA00050145	8/28/2016 12:09:45 AM	TPZ1 BLK 20 Whip Current Measurement	Perform MP817100.1 DC Health Inspection FS Task 1	TPZ1PM-00X-00
NA00050147	8/28/2016 12:11:12 AM	TPZ1 BLK 21 Whip Current Measurement	Perform MP817100.1 DC Health Inspection FS Task 1	TPZ1PM-00X-00
NA00050149	8/28/2016 12:12:23 AM	TPZ1 BLK 22 Whip Current Measurement	Perform MP817100.1 DC Health Inspection FS Task 1	TPZ1PM-00X-00

Figure 12: Record shows Topaz conducted whip current measurement on Blocks 16 to 22 in August 2016.

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Finding 10 – The Plant fails to check engine coolant and oil levels on a weekly basis.²⁷

Section 12.11 Vehicle Inspection Instructions of the Plant’s Operations and Maintenance (O&M) Health and Safety Plan (HASP), Revision 4.0, Revision Date: 9/19/17 states in part:

“..D. Check engine coolant and oil levels at least weekly...”

ESRB reviewed the Plant’s monthly Vehicle Inspection Sheets from October 2016 to October 2017 and noted that the Plant did not check the engine coolant and oil levels at least weekly on the following vehicles:

1. Ranger 1
2. Ranger 2
3. 6L1
4. 5L1
5. 4K1
6. Sportsmen

Topaz must follow its O&M and HASP procedures to ensure that vehicle inspections are done properly.

Finding 11 – The Plant fails to follow-up on a contractor’s recommendation.²⁸

The Plant contracts with SDMyers to perform oil sampling and analysis for its generator step-up (GSU) transformers. In January 2017, SDMyers analyzed Unit 1’s transformer oil and recommended resampling to further evaluate the oil’s moisture content (SDMyers report, TC# 9113, page 2). During ESRB’s onsite audit, the Plant had not yet resampled the oil per the recommendation. Topaz must resample and reanalyze the oil to ensure that the oil continues to have proper cooling and insulating properties.

Finding 12 – The Plant uses 3-way Communication and Peer Checking in Lockout Tagout (LOTO) Procedures instead of Independent Verification.²⁹

The Plant does not consistently use independent verification in its LOTO procedure. Independent verification by a second authorized employee is a common practice at electric generation facilities. The Plant’s procedure, instead, calls for a 3-way Communication and Peer Checking process between the authorized employee performing the LOTO and the FSOC (First Solar Operations Center) in Mesa, AZ, to confirm that each action in the LOTO is completed. In particular, the Plant’s LOTO form requires a signature from a “tagging authority” who authorizes the LOTO after reviewing the sequence of isolation points, as separate from the “Person Writing

²⁷ MS 8 - Maintenance Procedures and Documentation

²⁸ OS 7 - Operations Procedures and Documents

²⁹ MS 1 - Safety, OS 1 - Safety

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LOTO”. However, this Peer Checking is only administrative in nature and does not provide assurance that an isolation point is indeed physically locked as it should be. Exceptions occurred when contractors performed work and also signed on the LOTO permit as authorized employees participating in the LOTO. In these cases, the contracted employee(s) also verified the steps of the LOTO before work occurred, thus providing a second authorized employee providing independent verification.

To assure proper LOTO is performed, Topaz must, in addition to using Peer Checking and 3-way Communication: 1) use independent verification by a second authorized employee or contractor (“Person Checking LOTO”), or 2) ensure that the “Tagging Authority” is a different Authorized Employee than the “Person Writing the LOTO”, and the “Tagging Authority” physically verifies the LOTO isolation points before authorizing LOTO issuance and LOTO release.

Finding 13 – The Plant lacks a Continuing Training Program.³⁰

The Plant provided training records for safety and skills-based training for its staff, from 2013-2017. While several of the safety training courses require re-training periodically, the skills-based, or functional training curriculum consists of one-time training and on-the-job training, as part of the initial Operator Technicians Qualification Training. Even though many of the skills-based or functional based training are available electronically to plant staff, there is not a structured curriculum of recommended coursework in a continuous training program for the functional based courses.

Topaz must develop a curriculum of on-going Field Technician Continuing Training for its workers.³¹

Finding 14 – The Plant’s CPUC Reporting Procedures required updates.³²

During the audit, ESRB requested the incident reporting procedure for safety-related incidents to the CPUC. The Plant provided a snapshot of the plant’s GO 167 reporting procedures from the First Solar internal website. The description of required safety reporting under Section 10.4 did not include some of the reporting criteria: property damage of \$50,000 or more and an incident resulting in significant negative media coverage. The Plant must update the procedure to include this information and provide ESRB with an updated version of the safety related incident reporting procedure.

³⁰ MS 6 - Training Support, OS 6 - Training Support

³¹ FS.540020 Technician Training Program Description

³² MS 8 - Maintenance Procedures and Documentation

III. Observations and Recommendations

Observation 1 – The Plant’s spill kits lack identification and labeling.³³

Topaz maintains a spill kit next to its switchgears in each power block. The kit is part of the Plant’s spill prevention control program. It contains absorbent socks that worker can use to absorb and contain a spill should a transformer tank³⁴ rupture and leak oil, see Figure 13. ESRB observed minor deficiencies with the spill kit and provides several recommendations for improvement.

First, the spill kit lacks identification and labeling. An untrained worker would not be able to tell what the container or its contents are for. Therefore, Topaz should label all spill kits as such and identify their contents on the exterior so workers can easily identify what is available to them in the event of a spill. Proper identification and labeling will significantly improve Topaz’s spill readiness.

Second, the medium voltage transformer uses a vegetable oil derivative, FR-3³⁵, to cool and insulate its windings. Per the SDS, prolonged or repeated skin contact with the oil may cause drying, cracking, or irritation to the skin. And direct contact with the eyes may cause temporary irritation. Therefore, in addition to stocking absorbent socks in the kit, ESRB recommends that Topaz include items such as nitrile gloves and eye goggles that provide workers more protection when they perform spill cleanups.

Third, ESRB recommends that Topaz include a laminated SDS and an instruction sheet as part of the kit. Having the proper information for workers to stay safe during a spill is crucial. The SDS will provide workers with safety information regarding the handling of the oil. Additionally, an instruction sheet will remind workers of the crucial steps that they need to take to contain, cleanup, and report the spill.

Finally, regarding periodic inspection of the spill kits, ESRB recommends that Topaz seal the kit with a plastic tie or tape. This is a common practice at other power plants to facilitate the inspection by avoiding the unnecessary task of opening each kit to examine its contents and assess the need to restock nonperishables. The rationale is that if a kit is sealed, its contents have not been used.

³³ OS 1 - Safety, and OS 4 - Problem Resolution and Continuing Improvement

³⁴ The nameplate on the medium voltage transformer shows it uses 627 gallons of oil to insulate and cool its internal windings.

³⁵ FR-3 is a dielectric [insulating] coolant derived from renewable vegetable oil. It provides improved fire safety, transformer life, and environmental benefits that are superior to mineral oil and other dielectric coolants (<https://www.cargill.com/bioindustrial/envirotemp/fr3>).

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Figure 13: The nameplate on the medium voltage transformer shows it uses 627 gallons of insulating oil.

Observation 2 – The Plant lacks a written procedure for use of company vehicles.³⁶

The Plant could not produce records to demonstrate that there is a written procedure in place for using company vehicles, including vehicle check-in/checkout and lockbox procedures.

³⁶ MS 1 - Safety, MS 6 - Training Support, and OS 12 - Operations Conduct

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Appendix – CPUC-Requested Documents

Category	Reference #	CPUC-Requested Documents
Safety	1	Orientation Program for Visitors and Contractors**
	2	Evacuation Procedure
	3	Evacuation Map and Plant Layout
	4	Evacuation Drill Report & Critique (last 3 years)
	5	Hazmat Handling Procedure
	6	SDS for All Hazardous Chemicals
	7	Injury & Illness Prevention Plan (IIPP) (last 3 years)
	8	OSHA Form 300 (Injury Log) in last 4 years
	9	OSHA Form 301 (Incident Report) in last 4 years
	10	List of all CPUC Reportable Incidents (last 5 years)
	11	Root Cause Analysis of all Reportable Incidents (if any)
	12	Fire Sprinklers Test Report (last 3 years)
	13	Insurance Report / Loss Prevention / Risk Survey (last 3 years)
	14	Lockout / Tagout Procedure (last 3 revisions, if applicable)
	15	Arc Flash Analysis
	16	Confined Space Entry Procedure
	17	Plant Physical Security and Cyber Security Procedures and Records
	Training	18
19		Conduct of Training Procedures
20		List of Training Programs and Descriptions
21		Onboarding Procedure and Records
22		Safety Training Records*
23		Skill-related Training Records*
24		Certifications for Welders, Forklift & Crane Operators*
25		Hazmat Training and Record*
Contractor	26	2017 List of site-specific Qualified Contractors
	27	Contractor Selection/Qualification/Procurement/Monitoring Procedure
	28	Contractor Safety Data Sheets
	29	Contractor Safety Program Procedure and Training Records
Regulatory	30	Water Permit (if applicable)
	31	Spill Prevention Control and Countermeasures Plan (SPCC)
	32	Spill Prevention and Response Plan (SPRP)
	33	Storm Water Pollution Prevention Plan (SWPPP)
	34	CalARP Risk Management Plan (RMP)
O&M	35	Daily Round Sheets / Checklists
	36	List of Open/Backlogged Work Orders*
	37	List of Closed/Retired Work Orders (last 4 quarters)*

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	38	Work Order Management Procedure (last 3 revisions, if applicable)
	39	Computerized Maintenance Management System (CMMS) (Demonstration Onsite)**
	40	Conduct of CMMS
	41	All Root Cause Analyses (if any)
	42	Conduct of Maintenance Procedures
	43	Site Operating Plan/Procedures
	44	SCADA System (Demonstration Onsite)**
	45	Maintenance and Inspection Records for Solar Inverters
	46	Maintenance and Inspection Records for Solar Trackers
	47	Maintenance and Inspection Records for Solar Arrays/Collectors/Solar Field
	48	Maintenance and Inspection Records for Mounting System
	49	Maintenance and Inspection Records for Electrical System
	50	Maintenance and Inspection Records for Switchgear/breaker/relays
	51	Maintenance and Inspection Records for Main Transformer(s)
	52	Maintenance and Inspection Records for Switchyard & Transmission Equipment
	53	Maintenance and Inspection Records for other equipment
Document	54	P&IDs (if applicable)**
	55	Vendor Manuals for Major Equipment**
	56	Solar Farm Equipment Design Data
	57	Procedure Compliance Policy
Spare Parts	58	Spare Parts Inventory List
	59	Shelf-life Assessment Report
Management	60	Employee Performance Review Procedures and Verifications
	61	Organizational Chart
	62	Job Titles and Job Descriptions (of Plant Staff)
Instrumentation	63	Instrument Calibration Procedures and Records
Test Equipment	64	Measuring & Testing Equipment List
	65	Test Equipment Calibration Procedures and Records
Internal Audit	66	Internal Audit Procedures and Reports

* Provide data in a searchable format such as a searchable PDF, Word Document, Excel Spreadsheet, etc.

** These items may be provided on-site by the first day of the audit