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5 Year Electronic Maintenance Planning & Implementation Luncheon

April 10,2025 | Lake Chalet | Oakland, CA


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PANELISTS:

Toby Ludwick, Chief Engineer | CBRE 2100 Powell
Laurie Berberich, Senior Real Estate Manager | CBRE 2100 Powell
Amanda Bava, Assistant Real Estate Manager | CBRE 2100 Powell
Hanif Madyun, Property Manager | Lincoln Property Co BART HQ
Jesus Castillo, Chief Engineer | ABM BART HQ
Youran Kim, Senior Customer Relationship Manager RE | PG&E

5 Year Electrical Maintenance Planning & Implementation

Why should we shut down for maintenance?

- Code and Insurance Requirements
- Property Management Company Engineering Standards
- Increased Efficiency and Reliability
- Avoid costly and untimely breakdowns and disruptions to critical business activities

That's a scary thought, right?

What is the code for Electrical Maintenance?

Current California Electrical Code is based on the **NFPA 70, 2020** with amendments and additions.

NFPA 70B is the standard for Electrical Equipment Maintenance.

Where do we find guidance for code compliance?

EATON-WHITE PAPER-NFPA 70B

-A helpful resource for summarizing the new standard, understanding what is currently required and how to administer an effective Electrical Maintenance Plan.

https://www.eaton.com/content/dam/eaton/services/eess/eess-documents/eaton-nfpa-70b-white-paper-wp027024Xen.pdf

Understanding 2023 NFPA 70B:

Standard for electrical equipment maintenance

How to administer safer, more reliable and efficient electrical preventive maintenance programs

II. Understanding 5 new requirements of NFPA 70B

For decades, the NFPA 70B, Recommended Practice for Electrical Equipment Maintenance, served to provide guidance to electrical maintenance managers on how to develop and implement an electrical maintenance program (EMP). It provides a framework to safeguard people, equipment and processes from electrical system failures.

The 2023 version of NFPA 70B, now a standard, shifts from recommendations to mandatory language surrounding the implementation of electrical maintenance programs. Earlier versions of NFPA 70B provide for what electrical maintenance practices "should" be, whereas the new version provides for what they "shall" be. Changes were made to incorporate the electrical equipment physical condition, criticality and operating environment when determining the frequency of maintenance. The failure of improperly maintained equipment could impact personnel or environmental safety.

What’s new in the current standard?

- As of 2023 the NFPA 70B shifted from a “Recommended Practice” to a “Standard”

- Contains mandatory language for developing and implementing an EMP (Electrical Maintenance Program)

I. Overview

In 2023, the National Fire Protection Association (NFPA) 70B will shift from a “Recommended Practice” to a “Standard” containing mandatory language for the development, implementation and operation of an electrical maintenance program Electrical Maintenance Program (EMP).

We believe this change will provide practical safeguards, helping protect people and support more reliable electrical systems. It closely aligns with NFPA 70E Standard for Electrical Safety in the Workplace, which indicates that even if equipment is installed properly, it may not be safe to work on unless it is “properly maintained” per the manufacturer’s instructions or industry consensus standards.

The new standard will impact electrical infrastructure installed in industrial plants, institutional and commercial buildings, and large multifamily residential complexes. Unlike the state-adopted National Electric Code (NEC), NFPA 70B is not a code or directly mandated by law. However, much like NFPA 70E, NFPA 70B is considered the minimum consensus requirements for safe electrical work practices and the Occupational Safety and Health Administration (OSHA) can utilize the standard to issue citations.

How often is maintenance required in NFPA 70B?

Can we still call it a 5-year shutdown?

The answer, unfortunately is no, not really.

In NFPA70B 2023, Maintenance Intervals are now a primary focus based on equipment condition assessments.

Chapter 9 provides mandatory scopes of work and maintenance intervals broken out by product type.

These maintenance intervals do not supersede manufacturer's guidelines, but provide guidance in the absence of information from the manufacturer.

1. Maintenance intervals are now a primary focus

Chapter 9 of NFPA 70B now provides mandatory scopes of work and maintenance intervals broken out by product type and based on an equipment condition assessment. These requirements can be referenced in Table 9.2.2, which is in alphabetical order and provides the corresponding reference chapter for maintenance procedures specifics.

It is important to note these maintenance intervals do not supersede manufacturer's guidelines; they provide guidance only in the absence of information from the manufacturer.

How do we determine maintenance intervals?

TABLE 9.2.2

-Defines Maintenance Intervals based on Equipment Condition Assessments

-The condition of equipment (1, 2 or 3) plays a large part in determining how often maintenance is required

-The better the condition, the less frequent maintenance is required

Following NFPA70B, you can develop a comprehensive Electrical Maintenance Plan based on the equipment you have, it's age and condition

It is our recommendation that when determining the condition of the equipment, it is important to also consider the reliability/criticality the equipment has on your entire power system.

Product	Scope of Work	Condition 1	Condition 2	Condition 3
All equipment	Infrared thermography	12 months	12 months	6 months
Battery ESSs	Visual inspection	60 months	36 months	12 months
	Cleaning	60 months	36 months	12 months
	Lubrication		Reserved	
	Mechanical servicing		Reserved	
	Electrical testing	60 months	36 months	12 months
Busways	Visual inspection	60 months	60 months	12 months
	Cleaning	60 months	36 months	12 months
	Lubrication	60 months	36 months	12 months
	Mechanical servicing	60 months	36 months	12 months
	Electrical testing	60 months	36 months	12 months
	Special	60 months	36 months	12 months
Cable trays	Visual inspection	12 months	12 months	6 months
	Cleaning	60 months	36 months	12 months
	Lubrication	60 months	36 months	12 months
	Mechanical servicing	60 months	36 months	12 months
	Electrical testing	60 months	36 months	12 months
Electric vehicle power transfer systems	Visual inspection	60 months	36 months	12 months
	Mechanical inspection	60 months	36 months	12 months
	Electrical testing	60 months	36 months	12 months
Electronic equipment			Reserved	
Fuses	Visual inspection	60 months	36 months	12 months

What should be included in a comprehensive Electrical Maintenance Plan (EMP)?

Best Practices include:

Annual Infrared Scans

Annual Automatic Transfer Switch Service

Monthly Generator Testing, Transfer and Load Tests, Annual and 3-year Diesel Engine Service

Injection testing of large breakers

Ground Fault Testing and Main Switchgear Service

Bus duct riser and disconnect service

Transformer servicing

Accurate and up to date Arc Flash Study and Panel Hazard Labelling

Always follow Electrical Safety Requirements of NFPA 70E Generally, this includes no work on energized equipment outside of testing and inspection and the proper use of Personal Protective Equipment (PPE) when work is required on energized equipment, following Hazard Risk Categories defined in the Arc Flash Study

KEY: Current Due Past Due

Annual Testing and Servicing			
Infrared Inspection of the Electrical System	X		
Emergency Lighting Inverter System	n/a		
Automatic Transfer Switches		X	
KVAR Management Cabinets	n/a		
Fire Pump ATS	n/a		
2-Year Testing and Servicing			
Primary Injection Testing of the Generator		X	
Primary Injection Testing of the Emergency Feeder Breakers		X	
3-Year Testing and Servicing			
Main Switchboards		X	
Distribution Boards		X	
Inspection and Service of Bus Riser and Disconnect		X	
Main Switch Service	n/a		
Ground Fault Testing and Recertification		X	
Secondary Injection Testing of Breakers Trip Unit		X	
Motor Control Center		X	
5-Year Testing and Servicing			
Primary Injection Testing of Main Breakers	X		
Breaker Panels		X	
Transformers		X	
Arc Flash Study Review	X		

How do we develop our Scope of Work?

Review the most recent annual infrared report from a trusted provider, use the report's recommendations as a starting point for developing your scope of work.

Your scope should include all the elements needed for a robust EMP.

Keep in mind service intervals for Main switchgear, GFI breakers, ATS switches, bus ducts and other critical equipment, focusing on when they were last serviced and when they are due to be serviced again.

Shutting down the facility to perform maintenance is a lot of work and affects everyone in the facility, so ***try to capture as many maintenance items as you can to take advantage of the down time.***

This is an ideal time to complete recommended repairs from your Infrared Inspection Report.

There may be other critical equipment that you can use this opportunity to service; for example, plumbing, condenser pumps, process piping, cooling towers, etc. ***get pricing and work it in!***

Welcome ***Laurie Grant Berberich**, RPA –Senior Real Estate Manager*, 2100 Powell St.

Budgeting your scope of work

Once your scope is defined and concise, it's time to price it out and develop a budget.

Start to budget 12-18 months in advance. As you submit your budgets for the upcoming year(s) get budgetary pricing proposal from at least two preferred and trusted service vendors.

You'll need to play the role of a Project Manager: communicate your scope to bidders, create bid sheets, coordinate job walks, compare competing bids, clarify proposals, include contingencies and ultimately determine the funding amount you'll need.

This is where leveraging the power of your team will pay off, a joint effort of Property Management and Engineering, and diligent communication with ownership will set the stage for a successful project.

Get buy-in and approval from Ownership

Be ready to give compelling reasons to ownership to complete a shutdown, including code requirements, as they can be expensive and disruptive to tenant operations.

If your maintenance recommendation is deferred by ownership, keep written records to show you've done your due diligence.

Ultimately, the building owner makes the decisions about where their money is spent and holds the responsibility for their decisions. But it should not be assumed they are aware of what is required, especially when requirements have changed. Play the roll of an adviser and communicate your knowledge.

Hopefully your owner will agree that being code-compliant and proactive about maintenance is worth the investment. Keep in mind these costs should come out of R&M budgets and costs passed back to tenants through Operating Expenses.

Communicate with Owners, Shareholders and Leadership

Consult with your Director of Engineering and Property Management leadership. Their requirements should align with current code and industry standards, but they may have their own standards and forms that need to be filled out and approved, and may also provide valuable guidance in planning your shutdown.

Meet with your ownership representatives to align your goals, **talk to your tenants early in the process** to understand their needs.

Start the process of speaking with your utility provider (in our case, PG&E) so you can incorporate their costs and requirements into your plan. You may need to make some assumptions about PG&E costs to plug into your budget until you can apply for and get pricing to shutdown and re-energize your facility from their Service Planning Dept.

Coordinate with PG&E to price their services for shutdown and re-energization.

Youran Kim

Senior Customer Relationship Manager
High Tech/Real Estate | Business Energy Solutions

We meet periodically throughout the year to compare objectives and discuss opportunities.

We told her about our plans to complete a shutdown 16 months in advance and asked for her recommendations.

Youran provided valuable information and insight into planning our Electrical Maintenance Shutdown.

Do you have a point of contact with PG&E?

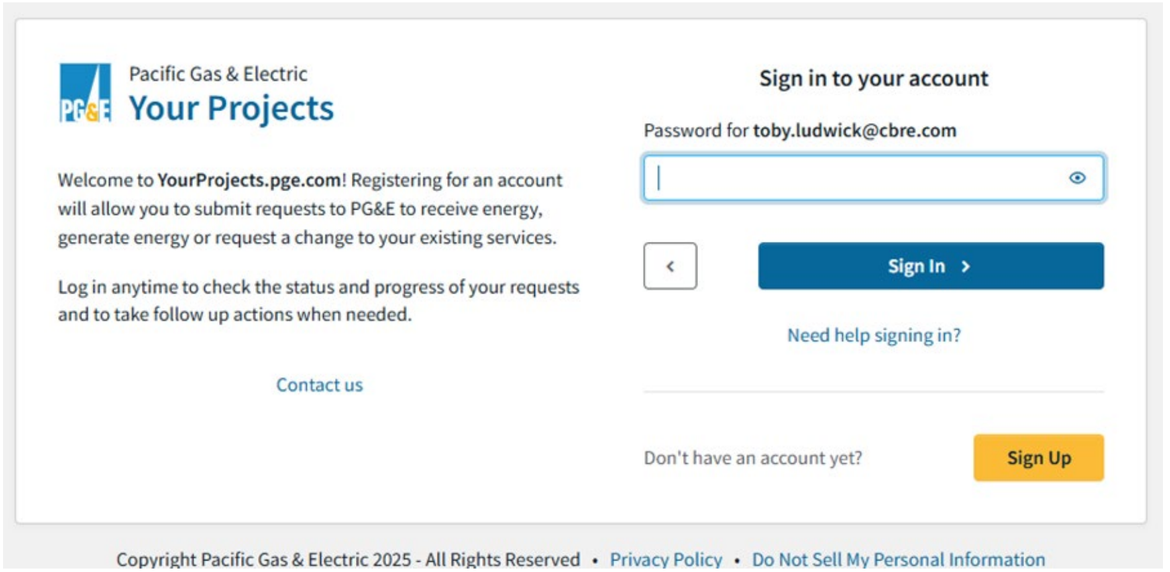
Coordinate with PG&E to plan and price their services for shutdown

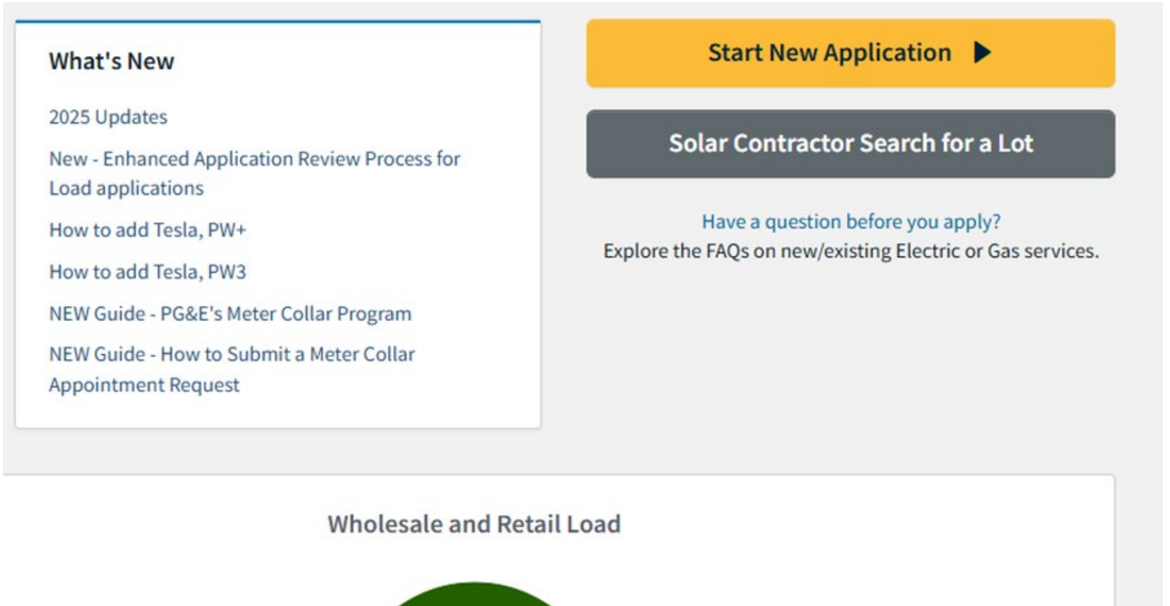
Youran directed us to set up a **PG&E 'Your Projects' account** and fill out an application for our electrical maintenance shutdown and provided the following URL.

https://yourprojects-pge.com/

She also provided two PDF user guides to walk us through the process. **Your Projects Guide** and **Your Projects Login User Guide**

After setting up an account we filled out a PG&E service disconnect application through the 'Your Projects' Portal, if we needed help, Youran said we could call the **Building Renovation Service Center** for assistance and follow up with the application at **1-877-743-7782**.





Coordinate with PG&E to plan and price their services for shutdown

Once our application was submitted in **Your Projects**, we were assigned a **PG&E Service and Planning Representative** to guide us through the process.

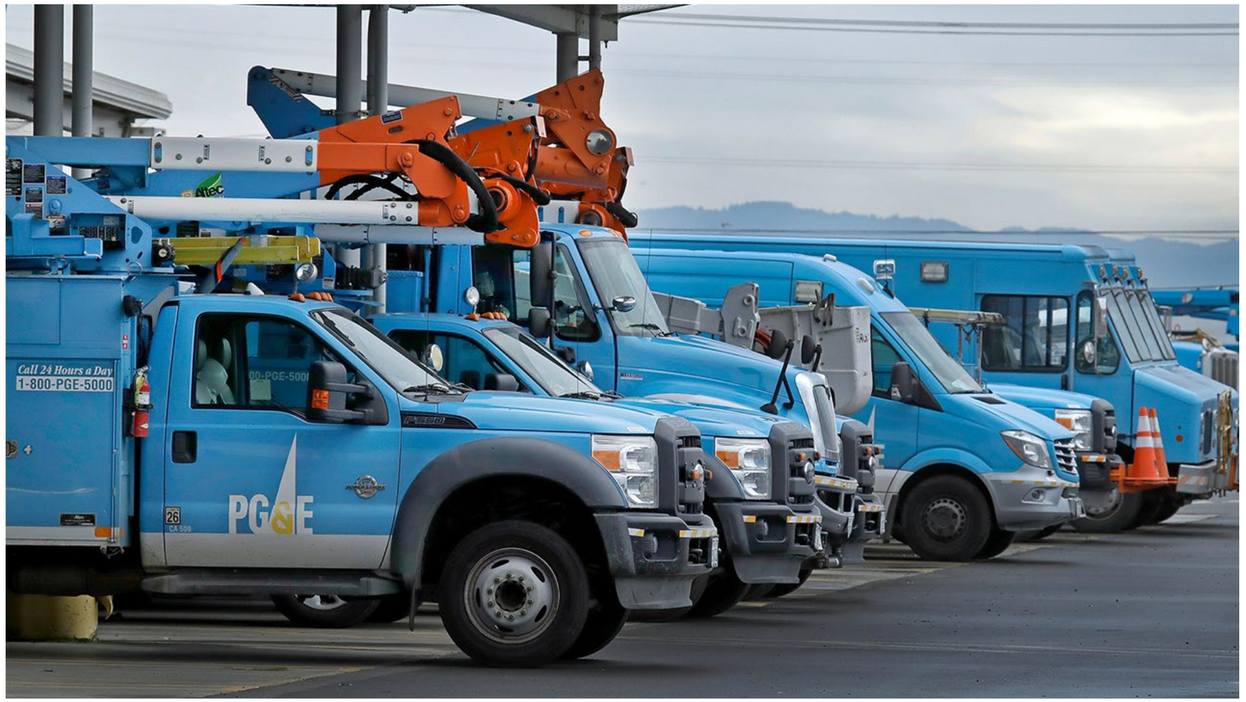
They asked us:

When would you like the disconnect/reconnect to happen, during the week or on weekend?

Is the request during normal business hours (7:00-3:30 M-F)?

We found that shutdown requests on weekends have to go through estimating and overtime approval. For these requests the customer cost is determined by the complexity of the disconnect/reconnect service and the labor needed to safely complete it.

You can likely save money by shutting down on a weekday, but many facilities like ours require services outside of normal business hours.



Coordinate with PG&E to plan and price their services for shutdown

Once we received pricing for our overtime service disconnect/reconnect request, we promptly added the cost to our project budget, got approvals and signed the agreement with PG&E.

We then worked with our accounting department to cut a check and make sure it was received by PG&E.

Once payment was received, we could lock in our Maintenance Shutdown date.

Tenant Notifications and Communications

Should start as soon as a date is confirmed, ***remember, you cannot lock in a date with PG&E until your invoice is paid.***

Initial tenant notification should be at least a month in advance, ideally 2-3 months, potentially longer depending on the type of facility.

Standard office buildings are not too complicated but shutdowns at lab, R&D, data center and manufacturing facilities may take longer to plan.

Communications should repeat with more frequency as the date approaches, making sure all tenants have acknowledged the scheduled date. Do not rely on email completely unless you know your tenants are reading and acknowledging them.

Reaching out personally or on the phone may be necessary, especially to important and sensitive tenants. Periodic meetings with key tenants help to open lines of communication, clear up confusion and align goals.

Apparently, a lot of people don't have time to read their emails!

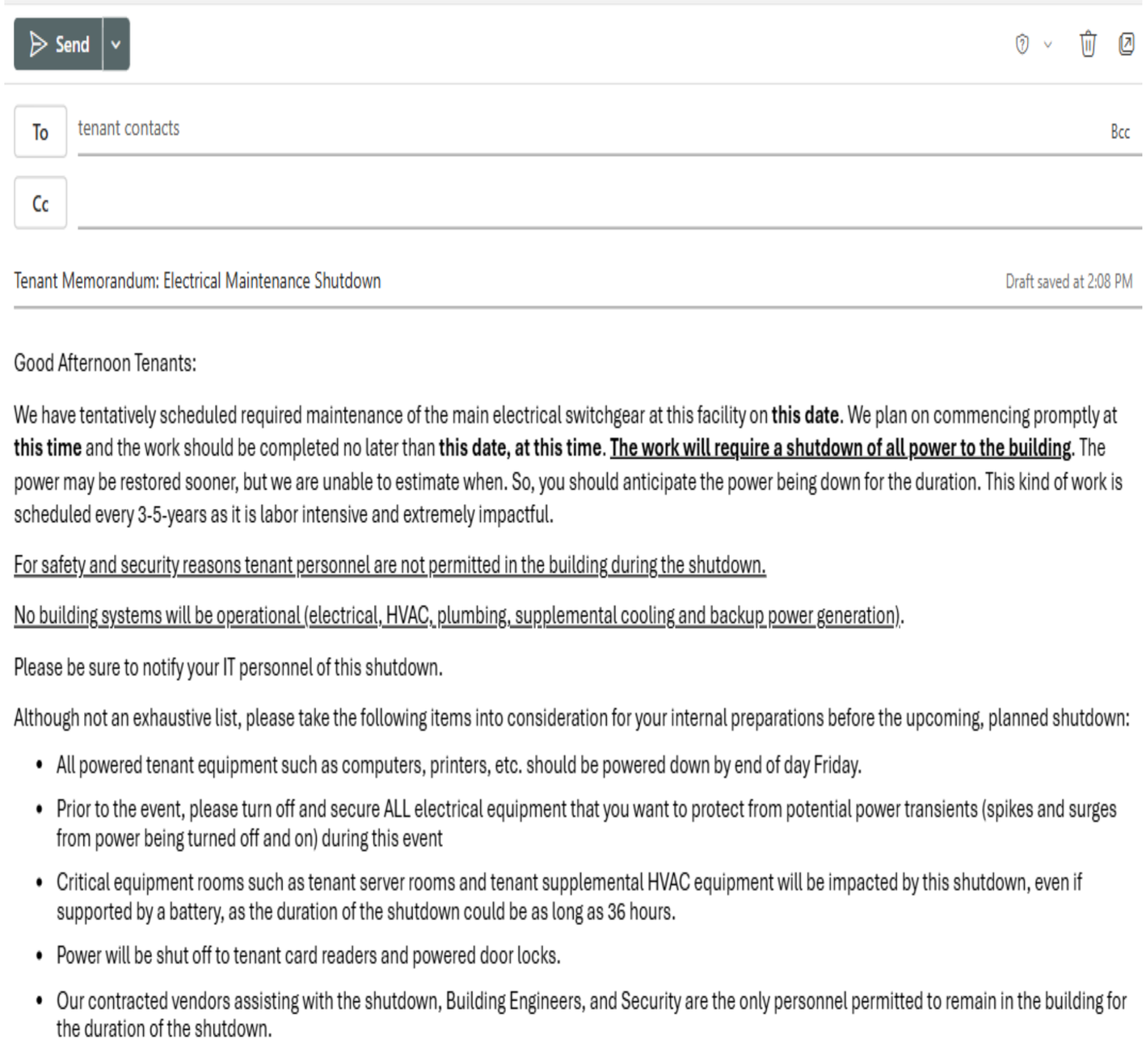
Cover all your bases with a well-written tenant notification email

Your Email should:

- Be professional, concise and well-organized
- Educate the tenant on what is taking place
- Include the specific date and time when the facility must be vacated and powered-down
- Set reasonable expectations
- Provide examples of what the tenant may need to do to prepare

Your Email should not:

- Over-promise or commit to things that may not be possible
- Allow decided-upon plans to be put up for debate
- Include specific time when power will be restored, things may happen that would delay even the best plan



Send

To: tenant contacts

Bcc

Cc

Tenant Memorandum: Electrical Maintenance Shutdown

Draft saved at 2:08 PM

Good Afternoon Tenants:

We have tentatively scheduled required maintenance of the main electrical switchgear at this facility on **this date**. We plan on commencing promptly at **this time** and the work should be completed no later than **this date, at this time**. **The work will require a shutdown of all power to the building**. The power may be restored sooner, but we are unable to estimate when. So, you should anticipate the power being down for the duration. This kind of work is scheduled every 3-5-years as it is labor intensive and extremely impactful.

For safety and security reasons tenant personnel are not permitted in the building during the shutdown.

No building systems will be operational (electrical, HVAC, plumbing, supplemental cooling and backup power generation).

Please be sure to notify your IT personnel of this shutdown.

Although not an exhaustive list, please take the following items into consideration for your internal preparations before the upcoming, planned shutdown:

- All powered tenant equipment such as computers, printers, etc. should be powered down by end of day Friday.
- Prior to the event, please turn off and secure ALL electrical equipment that you want to protect from potential power transients (spikes and surges from power being turned off and on) during this event
- Critical equipment rooms such as tenant server rooms and tenant supplemental HVAC equipment will be impacted by this shutdown, even if supported by a battery, as the duration of the shutdown could be as long as 36 hours.
- Power will be shut off to tenant card readers and powered door locks.
- Our contracted vendors assisting with the shutdown, Building Engineers, and Security are the only personnel permitted to remain in the building for the duration of the shutdown.

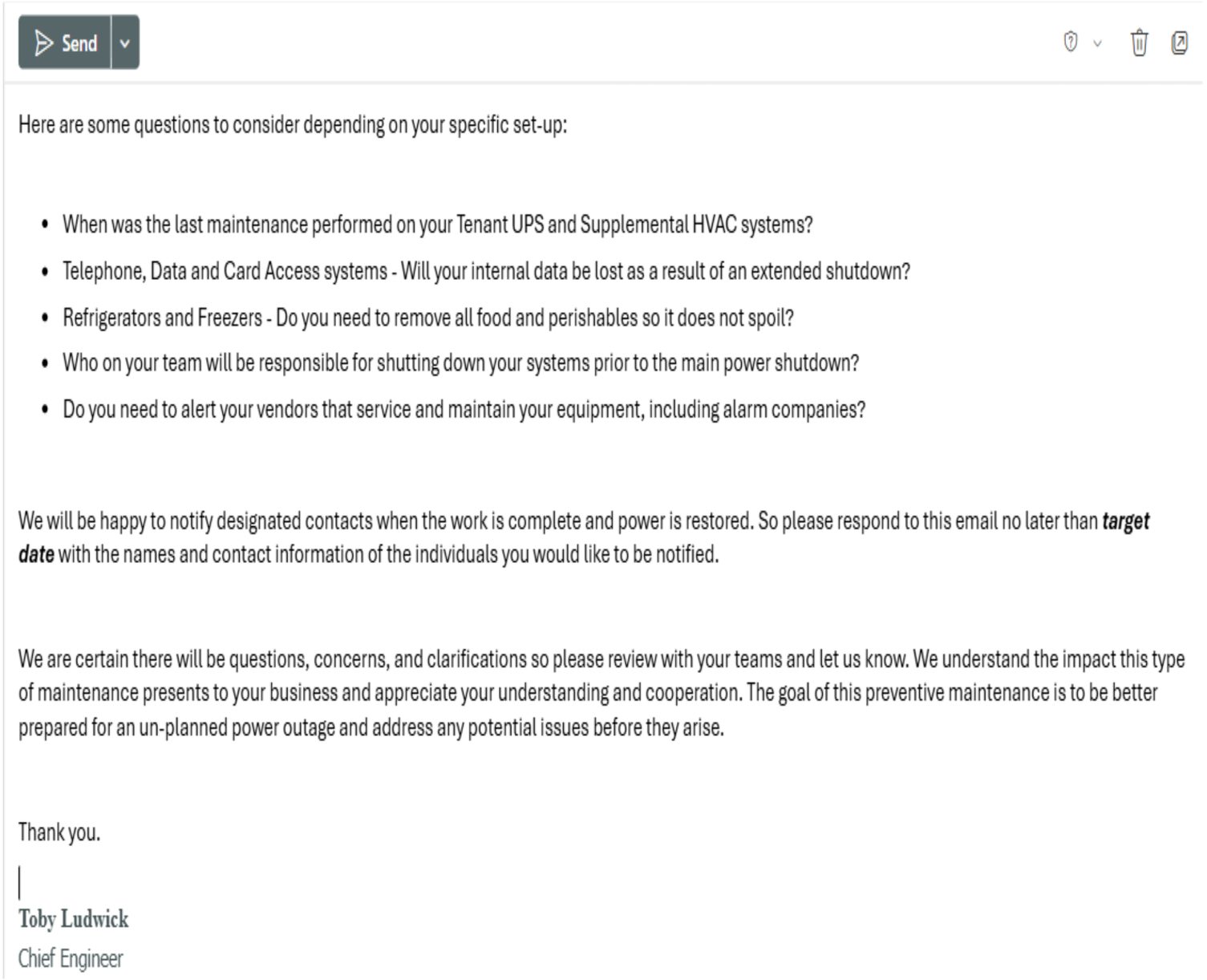
Cover all your bases with a well-written tenant notification email

Your Email should:

- Establish a line of communication to answer tenant's questions
- Provide insight on tenant vs. management responsibilities
- Ask for contact information for key tenant employees and department leads such as IT, Facilities, Operations and Office Managers
- Define the tenant/management relationship as a partnership

Your Email should not:

- Downplay the importance of completing necessary maintenance tasks
- Leave the tenant feeling unsupported and their needs un-considered
- Trivialize the impact on tenant operations, as it definitely is significant



Put yourself in your tenant's shoes

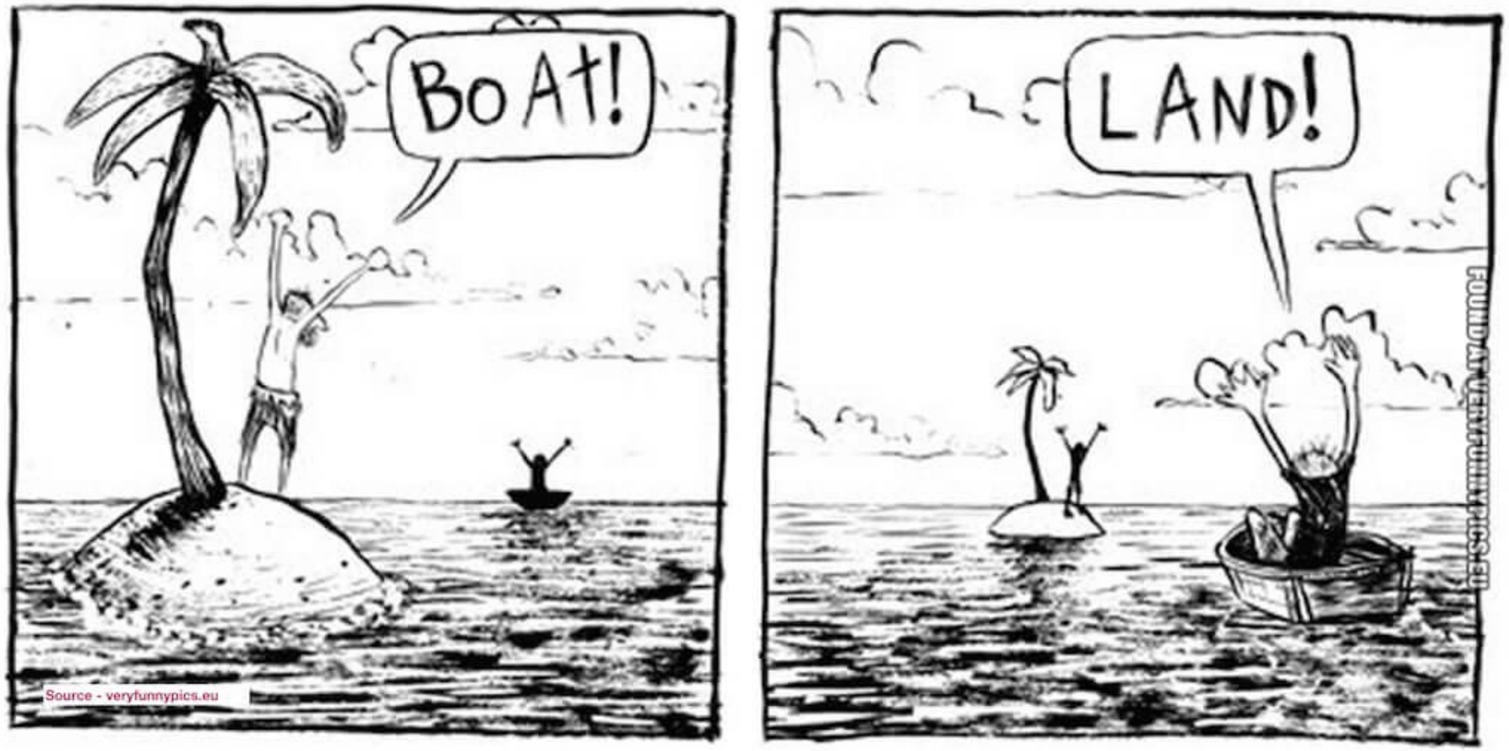
Consider *their* perspective:

Notifications should help the tenant understand what they need to do to prepare their systems and equipment for being successfully shut off and restarted without damage, even simple things like cleaning out their fridge so food doesn't spoil.

Some tenants may store goods that need to be in temperature-controlled environments, and may need to arrange for dry ice or supplemental cooling systems to keep stored stock from spoiling.

In labs, clean rooms, manufacturing and life science facilities the planning may get complicated and need to be closely coordinated to allow for critical operations to be redundant and maintained for continuity.

What's important to *them*?



Internal Planning and Team Preparations

Make lists!

Writing down your thoughts, plans and concerns will help you work through the details, and details are important!

Share a draft scope of work early on with your team.

Be sure to save the shutdown date with your engineering team well in advance, they play a vital role in the execution of the shutdown.

Gather names, phone numbers and emails for important project contacts.

Have team meetings to keep the facility team up to date and engaged, assign roles, disperse the plan!

Internal Planning and Team Preparations

Additional security officers may be needed, coordinate staff availability and associated costs in advance.

Make sure you have backups of critical systems, badge reader/access control, life safety and BMS data. Have a plan for a soft shutdown and controlled restart of these systems as they will not benefit from hard shutdowns, power spikes and high in-rush current.

Engage your service providers, riser managers, IT professionals, BMS/EMS vendors and security team.

Ask if they need to backup their databases and if they have recommended procedures for shutting down and restarting their equipment.

Welcome ***Hanif Madyun*** *-Property Manager,* Lincoln Property Company & ***Jesus Castillo –****Chief Engineer,* **ABM**

BART Headquarters

Background:

- Class-a
- 244k Square feet
- Acquired 2019, occupied 2021
- Avg occupancy ~800

Lincoln

Unique Challenges (Property Management):

- BART SECURITY:
  - DOJ BACKGROUND CHECKs ARE required for access
- District works: Prevailing wage requirement
- COMMUNICATIONS:
  - BUILDING ACCOUNCEMENTS
  - PRE-EVENT/POST-EVENT COMMS

Lincoln

BART

Unique Challenges (Engineering):

- IT prep:
  - It had to power down equipment the night before
- Call center relocation:
  - Overnight department moved to bpd headquarters
- Personal appliances:
  - Preventative measure to avoid water damage

Lincoln

Advantages:

- Buy-in from ownership
- Accessible management to approve change orders
- Relatively UNRESTRICTED access
  (compared to multi-tenant building)

Internal Planning – Engineering Team Preparations

Have critical spare parts on hand!

Don’t paint yourself into a corner, if you ask an engineer, chances are they have a horror story of a main breaker not resetting, not having a spare and not being able to restore power on time as a result.

These situations can be very stressful if you’re not prepared. Many spare parts are specialized and not readily available off the shelf, especially on a weekend.

Take inventory of critical items including fuses, and breakers, get pricing and approval for big ticket items, and stock up on the things you might need.

Remember your company may not allow refurbished breakers, so plan accordingly.

Develop and Distribute a Specific Method of Procedure

Your engineer along with selected maintenance contractors will need to develop and agree upon a **Method of Procedure (MOP) or Specific Method of Procedure (SMOP).**

This will define the scope, outline the sequence of activities, assign responsibilities and document a written plan.

A backout plan should also be included. If unexpected trouble arises for safety reasons or other unanticipated developments, work may need to stop. Think about what the team may need to do in the unfortunate event that something brings your project to a halt.

Share your plan, review it with the project team, get input and buy-in, leave time to incorporate changes and make sure all parties are in agreement.

Prepare your SMOP and Gather important contact information

We use a proprietary SMOP form that we can't share, but we've developed a Task List and Schedule document that we've used and updated for several shutdowns.

This information ultimately gets plugged into our SMOP.

It allows us to compile the necessary project specifics to make sure we don't miss any important details in planning and implementing our shutdown.

The first page compiles contact information for all the key contributors on the day of the shutdown, so no time is wasted looking for contact info. Remember, the power will be out, computers and Wi-Fi networks will be shut down.

Electrical Maintenance Shut Down – Task List and Schedule

Project Contacts:

Chief Engineer XXX-XXX-XXXX

Engineer 1 XXX-XXX-XXXX

Engineer 2 XXX-XXX-XXXX

Electrical Maintenance Contractor Lead XXX-XXX-XXXX

PG&E Service Planning: New Business Representative XXX-XXX-XXXX
PG&E Planned Outage Coordinator XXX-XXX-XXXX

PG&E Service Rep - XXX-XXX-XXXX

Generator Service Contractor 24 Hour Emergency Line XXX-XXX-XXXX

Diesel Fuel Provider – XXX-XXX-XXXX

Fire Department non-emergency XXX-XXX-XXXX

Outline the overall scope, allow all contributors to see the big picture

We use a checklist format to follow along as the work progresses and make sure no important items are missed.

SCOPE OF WORK:

- ☐ Ground Fault Testing of all Breakers over 300A
- ☐ Service, Clean & Torque Main Switchboards. Ductor All Breakers and Megger Bussing
- ☐ Service, Clean & Torque Distribution Panels
- ☐ Ground Fault Testing of Generator Breakers
- ☐ Inspect and Verify Torque on Bus Risers & Service Disconnects
- ☐ Inspect & Clean Electrical Panels
- ☐ Service and Test Transformers, greater than or equal to 30kVA
- ☐ Test and Service Automatic Transfer Switches per NFPA-110
- ☐ Inspect & Clean Motor Control Centers
- ☐ Infrared Inspection Repairs
- ☐ Drain Down Cooling Tower (in-house) and replace condenser water piping and associated Victaulic couplings (contracted)

NOTE: Normal Building Power will be OFF for the Duration of the Maintenance and Service Activities. Emergency Power Will be Available Unless It Presents an Unsafe Condition for Any of the Personnel Working on the Project ie: during the ATS and Emergency Power Buss maintenance.

***Note we included a plumbing scope of work to take advantage of the down time for our 24/7 condenser loop.**

Create a checklist of items to complete leading up to your shutdown

Assign tasks to team members, be clear and concise!

Preparation for Maintenance:

- ☐ Notify Tenants that they or their contractors will have to secure and turn off their equipment prior to shut down for maintenance and testing.
- ☐ Notify Tenants of the electrical shutdown for emergency system maintenance and testing and elevators will be out of service
- ☐ Notify neighboring buildings of “maintenance” activity and potential impacts i.e. generator exhaust emissions (Property Management)
- ☐ Coordinate shut down timing with Tenants. BUILDING POWER OFF starting at 5:00AM (Saturday). PG&E OFF Starting by 8:00AM ON (Saturday). PG&E on Starting by 4:00PM (Saturday). BUILDING POWER ON BY 8PM on (Saturday).
- ☐ Some Passenger elevators OFF at 6:00AM ON (Saturday). All Passenger and Freight elevators OFF at 12:00PM on (Saturday). Passenger and freight elevators available at 8:00PM (Saturday).
- ☐ Coordinate shut down with PG&E. (Chief)
- ☐ Obtain PG&E Service Representative Weekend Cell Phone Number (Chief)
- ☐ Obtain PG&E Foreman Weekend Cell Phone Number (Chief)
- ☐ Tenant delivery of dry ice (1 day before) to keep their freezers cold for shutdown
- ☐ Tenant delivery and installation of new UPS batteries for their server racks

Prepare your equipment and supplies for optimal execution

Make sure your equipment is primed and ready to perform properly as your shutdown date approaches, make sure you have all the necessary supplies, including batteries and portable lighting

Generator System Equipment Preparation:

- ☐ Annual load bank testing of the emergency generator prior to testing recommended
- ☐ Test ATS switches prior to building maintenance and testing to insure correct operation
- ☐ Verify Elevator will transfer from main normal source power to generator power. Verify elevator control system will restart properly after being de-energized
- ☐ Maintain appropriate fuel on hand for emergency generator – identify resupply vendor
- ☐ Fill up main Emergency Generator diesel tank
- ☐ Verify Generator fuel transfer pumps and level switches function properly

Building System Equipment:

- ☐ Inspect and replace any out-of-date batteries in fire panel sub cabinets
- ☐ Verify appropriate fuses are in stock
- ☐ Check trouble lights, flashlights and extension cords
- ☐ Obtain portable lighting and verify operation
- ☐ Obtain repair parts for infrared scan action items
- ☐ Verify the fire suppression system reservoir is full (Chief)
- ☐ Top off Generator oil, water and day tank levels
- ☐ Check and charge spare batteries for the radios
- ☐ Verify radio repeater is on emergency power
- ☐ BMS – make back up disk to all programs
- ☐ Coordinate with Elevator Company to insure proper operation during maintenance activity. Make sure that on call information and telephone numbers are available

Finalize your plans with input and buy-in from the team

Schedule de-brief meetings with key team members in the last few days leading up to shutdown. This is your opportunity to talk through and finalize plans and make sure everyone is on the same page.

Building System Equipment:

- ☐ 3 days prior to shut down, Call with Electrical Maintenance vendor to review logistics and schedule for shutdown. Do they need to stage any test equipment onsite prior to shut down? Obtain contact information for team so all members can be reached, discuss contingency plans should any key team members not be able to show up on day of shutdown. Confirm their estimated arrival time on morning of shutdown.
- ☐ 2 days prior to shut down, Engineering, Security and Property Management Briefing
- ☐ Notify Fire Department prior to electrical shutdown – ACFD Non-Emergency XXX-XXX-XXXX (Chief)
- ☐ Notify Police Dept. prior to electrical shutdown – EPD Non-Emergency XXX-XXX-XXXX
- ☐ Call PG&E Foreman to confirm onsite start time
- ☐ 1 Day before shutdown Set up sign-in log for tenants at lobby security desk to track who is inside building starting 6:00PM

DON'T FORGET TO PLAN FOR FOOD AND DRINKS FOR THE PROJECT TEAM!

****There will not be time or power available to prepare meals and we don't want the team to leave site during shutdown. It may be a long day (our last was over 16 hours!), so breakfast, lunch and dinner may be needed.***

Prepare and follow a detailed script for the day of the shutdown

Clearly delineate team member responsibilities,

starting with the Engineering team arriving early to get the facility ready for shutdown.

Emphasize safety throughout the entire project! Get a good night's rest!

Day of Shutdown:

UTILIZE REQUIRED PPE!

5:00AM Arrival of Building Engineering Team and Plumbers

- ☐ Tenants or their contractors to secure their equipment and exit premises prior to shutdown (By 5:00AM)

Engineering Team:

Chief:

- ☐ Building's Fire Life Safety Panel placed on Test (Chief)
- ☐ Notify ACFD of Electrical Shutdown (Chief)
- ☐ All-Call Announcements made by PA System that power will soon be shut down and elevators taken out of service, instructing all occupants to exit building who are not supporting shutdown work effort (Chief)

"May I Have your attention please; may I have your attention please. Power to the building will soon be shutdown. The elevators, lighting and restrooms will not be operational during this time. Please exit the building now while it is safe to do so." (repeat)

- ☐ **Engineering/Security** to ensure all building occupants (tenants) have exited except staff and vendors supporting shutdown work effort
- ☐ **Security** to monitor building entry points, instructing anyone trying to enter that the building is closed for maintenance

Prepare and follow a detailed script for the day of the shutdown

Engineering Team methodically shuts down base-building equipment, taking care not to shutdown items that are needed, like elevators and emergency lighting.

5:15AM Engineering:

Engineer 1:

- ☐ Provide access to Penthouse for Plumber, check out key and badge set
- ☐ Verify all HVAC equipment is shut down on BMS, then shutdown BMS Computer and unplug
- ☐ On Distribution Panel in Penthouse OPEN Breakers Chiller 1 & 2, Boiler 1 & 2, HWP 1 & 2, RPA, RPB, CT1, SF2, SF4, RF2, RF4 & MCCPH
- ☐ Panel TMCC PH Place HOA Switches in OFF and OPEN Disconnects
- ☐ Panel EPH Penthouse OPEN Breakers SPF1 & 2, SF 1 & 3, RF1 &3, (**DO NOT** OPEN Breakers TEPH, FREIGHT ELEV & HIGHRISE ELEV ELHR)
- ☐ Start draining cooling tower piping, Plumber can use new power receptacle at chiller room refrigerant monitor to operate their electric hoist and charge batteries for tools, fed by BLDG Generator

Engineer 2:

- ☐ North and South Garage Gates to be raised to allow access for vendors supporting shutdown
- ☐ Shut Down and Lockout TENANT Generator, (BUILDING Generator stays ON)
- ☐ Check BUILDING Generator to verify appropriate Fuel, Oil and Coolant Levels, visual inspection of components to verify no deficiencies are evident
- ☐ Verify Engineer 1 has made his way down from the penthouse. Recall All Elevators to Ground Floor, leave parked with doors open

6:30 to 7:00AM Electrical Maintenance Crew arrives on site, coordinate parking and provide access, they setup and stage their equipment in preparation for maintenance scope.

Hold an all-hands safety meeting before transferring to E-power

Once all team has arrived, gather everyone for a Pre-job Safety Meeting. Make sure safety is prioritized, including Lockout/Tagout, testing for dead, PPE, stop work authority and backout plan.

7:30AM Safety Meeting

- ☐ **Gather entire shutdown team** at PG&E Service Transformers at South Side of BLDG for **Pre-Job Safety Meeting/De-Brief** will include representatives and personnel working on site to include **Engineering & Security Team, Electrical Maintenance and Plumbing Crews,** discuss verifying all panels are de-energized before starting work, lockout/tagout, use of radio to notify team of any issues that arise or changes to the plan. Appropriate PPE is available and utilized for switching large loads.
- ☐ If a failure occurs **ALL WORK STOPS;** Engineering / Electrical Maintenance Contractor calls for afterhours emergency response as applicable, order a standby emergency generator and/or necessary materials and set up for operation to provide emergency power to affected facilities in the event of a critical failure
- ☐ **GO / NO-GO** for commencement of work

7:45AM Engineering Team and Electrical Maintenance Contractor command BLDG. Emergency Generator to start from ATS Switch with full transfer to generator power, Tenant Generator remains OFF

- ☐ BUILDING Emergency Power Generator Starts
- ☐ Verify ATS Transfer and that emergency power is available
- ☐ Engineering Team checks BUILDING Emergency Generator, log readings and continues to do so hourly for duration of generator run
- ☐ Electrical Maintenance Contractor and Engineering Team sheds load on Building by opening Breakers that power Main Switchgear Panels MSBA and MSBB

Time to shut it down and get started!

Once your Pre-job Safety Meeting is complete, coordinate with PG&E to shutdown the main feeds to the facility. All team members should stand clear while transformer cabinets are opened and de-energized.

8:00AM PG&E shuts down utility power

- ☐ **PG&E** Trouble man to Shut Down Power to Building. Lockout & Verify Absence of Voltage
- ☐ **Engineering (Chief)** obtains PG&E Trouble man Phone Number to coordinate re-energization timing
- ☐ **Electrical Maintenance Contractor** tests to verify power to equipment is de-energized, installs personal grounds line side of main breaker
- ☐ **Electrical Maintenance Contractor** tests to verify power to equipment is de-energized, Main Switchgear Panels MSBB & MSBA and verify utility and generator power to equipment is de-energized TENANT ATS
- ☐ **DO NOT OPEN EMERGENCY POWER BUSS DISCONNECTS!**

8:30AM

Engineering Team:

- ☐ Put Freight Elevator into service, Release from Fire Mode (Chief)

Engineering Continually Monitor Emergency Generator, Log Readings

Engineering provides access for contractors to various areas of building requiring maintenance

Implement the maintenance scope – normal power system first, then emergency system

Stick to the script and you can't miss!

8:30AM Electrical Maintenance Contractor begins maintenance testing scope on NORMAL POWER and TENANT EMERGENCY POWER INFRASTRUCTURE ONLY, BLDG. EMERGENCY GENERATOR WILL BE IN USE, TENANT GENERATOR WILL BE SHUT-OFF and ISOLATED

- ☐ Ground Fault Testing of Breakers ≥300amp.
- ☐ Service, Clean & Torque Main Switchboards MSBA & MSBB. Ductor All Breakers and Megger Bussing
- ☐ Service, Clean & Torque Distribution Panels
- ☐ Ground Fault Testing of Square D Type NEL Generator Breakers
- ☐ Inspect and Verify Torque on Bus Risers & Twenty-Seven Service Disconnects
- ☐ Inspect & Clean Ninety-Nine Panels
- ☐ Service and Test Transformers ≥30kVA
- ☐ Test and Service 1200amp GE Zenith ATS's per NFPA-110
- ☐ Inspect & Clean MCC's (TMCC-PH & MCC-PH)
- ☐ Replace Customer-Provided Shunt Trip unit for Panel XX
- ☐ Infrared Inspection Repairs

Electrical Maintenance Contractor Tests Breakers:

- ☐ Circuit Breaker 1600A Buss Riser
- ☐ Circuit Breaker TDP 1200A
- ☐ Circuit Breaker Tenant Generator 1200A

Electrical Maintenance Contractor Switchgear Inspection, testing and maintenance:

- ☐ MSBA 4000A
- ☐ MSBB 3000A

Verify scope is complete, then commence the re-energization plan!

Be methodical, focus on safety, leave no tools or material inside panels.

Electrical Maintenance Contractor Verifies all main switches are in appropriate state to be re-energized, leaves bus disconnects in the open position so they are de-energized when power is restored, they will be closed and re-energized one-by-one later to avoid power spikes and surges.

Engineering:

- ☐ Verify all work is completed for testing, maintenance and repair of all equipment. Contractors have successfully completed their respective scopes of work on above-noted equipment, panels are closed, tools removed and work areas cleared.
- ☐ Contact PG&E Trouble man to request power to Building be Restored

PG&E Trouble man Restores power to building at Service Transformers

Electrical Maintenance and Engineering Team:

- ☐ ***Don appropriate PPE for operating electrical switches: Arc Flash Coveralls, Double-Insulated Gloves, Shroud, Face Shield etc..***
- ☐ Verify Power to Main Switchgear has successfully been restored
- ☐ Close/Energize Main Switchgear
- ☐ Verify BUILDING ATS is in Utility Power Mode, Re-enable BUILDING Generator, Perform Transfer Test, to verify ATS is operating properly
- ☐ Verify TENANT ATS is in Utility Power Mode, Re-enable TENANT Generator, Perform Transfer Test to verify ATS is operating properly
- ☐ Close Buss Taps
- ☐ Close Elevator Breakers
- ☐ Put Freight Elevator back into service
- ☐ Close/Energize Normal & TH Buss Riser Duct Disconnects

Be prepared for PG&E to restore power, all stand clear!

Restore Building Systems power, verify proper operation

Power up the gear, test it out. Hold all-hands post-work safety meeting

Engineering:

- ☐ Release all Elevators, verify normal operation (E3)
- ☐ Re-energize Domestic Water Pumps, verify operation (E3)
- ☐ Panel DP Penthouse CLOSE Breakers Chiller 1 & 2, Boiler 1 & 2, HWP 1 & 2, CT1 (E2)
- ☐ Panel EPH Penthouse CLOSE Breakers SPF1 & 2, SF 1 & 3, RF1 &3 (E2)
- ☐ Panel TMCC PH CLOSE Disconnects for ACWP1, 2, 3 &4 and CT2 and Place HOA Switches in AUTO
- ☐ Plug-In and turn on BMS Computer (E2)
- ☐ Notify Management Team that power has been restored, send out notifications to pre-determined list of tenant contacts (E1)
- ☐ Check Condenser System pumps and Heat Exchanger (E2)
- ☐ Check Elevator Machine Room AC units, verify they are operating properly (E3)
- ☐ Verify Boilers and Chillers are online and available for startup on Monday morning (E2)
- ☐ Verify BMS is online, Startup Fans to put load on system, return all equipment to auto (E2)
- ☐ Check BUILDING and TENANT Generators to verify appropriate Fuel, Oil and Coolant Levels, visual inspection of components to verify no deficiencies are evident, both units are in auto mode (E3)
- ☐ Check all Elevators E3) Check Fire Alarm Panel, clear all troubles and put back online (E1)

Engineering/Maintenance Contractor Post Safety Meeting (NOTE: This is to capture near misses and/or findings, can be published via email later).

- ☐ Once this meeting is complete Maintenance Contractor can be released from the job site.
- ☐ Garage Gates to be put back into normal operation (E3)

Send out tenant notifications. Time to wrap it up!

Restore Building Systems, final checks, time to go home

Final system checks of security equipment and lighting

Security and Engineering:

- ☐ Check and reset badge reader system as needed
- ☐ Verify Building Entry Doors are locking and unlocking with badges
- ☐ Open and Secure lobby fire doors on floors: 1, 2, 4, 6, 7, 8, 9, 10, 11, 12, 13
- ☐ Check Camera System, verify all cameras are on line
- ☐ Assist Tenants with access and troubleshooting of Server Room cooling equipment as needed
- ☐ Check parking garage entry and exit gates
- ☐ Verify Garage Lighting is operational
- ☐ Check Exterior Lighting, did astronomical timeclock bring it on?

It's been a long day, work is done, head home to family and rest!

That's it until next time, THANK YOU!

Questions?

Go ahead and shoot!

Thanks for joining us.

Many thanks to Metro Services Group, the presenters and BOMA Oakland East Bay!