MODE 0 AND MODE 1
ELECTRICAL WORK
RESTART AT PSC -
MAKEUP SESSION

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CURRENT STATUS

What can we do, what is still on hold

- Non-hazardous Electrical Work
  - $< 50\text{VAC}$ or $\geq 50$ volts AC and $\leq 5$ mA
  - $< 100\text{VDC}$ or $\geq 100$ VDC and $\leq 40$mA
  - No stored Energy in Excess of Table 2 in LMS-POL-69

- Restart of Hazardous Electrical Work
  - Equipment or wiring is already in the electrically safe work condition (Mode 0)
  - Placing equipment or wiring into the electrically safe work condition including Zero Voltage Verification (Mode 1)

<table>
<thead>
<tr>
<th>Mode</th>
<th>Description of Work</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Equipment or wiring is already in the electrically safe work condition</td>
</tr>
<tr>
<td>1</td>
<td>The task of placing the equipment or wiring into the electrically safe work condition including zero voltage verification</td>
</tr>
<tr>
<td>2</td>
<td>Performing only testing, measuring, troubleshooting, and/or calibration while energized (Includes visual inspection of energized enclosures)</td>
</tr>
<tr>
<td>3</td>
<td>Energized work and any task beyond mere testing, measuring, troubleshooting, and/or calibration; includes any manipulative work and any use of tools beyond that of a tester</td>
</tr>
</tbody>
</table>
RESTARTING MODE 0 AND MODE 1 WORK

- Compensatory actions are required, this is at a Laboratory level
  - QEW employees were reviewed by each division with a critical eye
    - Some upgraded
    - Some eliminated
      - Current list available on APS Electrical Safety Web page
  - Work Approval required - Covered by a procedure, technical note, or WCD
  - PSC Pre-Job briefing REQUIRED
  - Mode 1 checklist completed in ADDITION to pre-job
  - Trained independent Qualified Electrical Worker Observer present for all Mode 1 work
  - Work Authorization from the line REQUIRED prior to start
WORK APPROVAL

Group Leaders and Schedulers must

- Examine proposed work
  - Covered by a procedure, technical note (in ICMS), or WCD
    - That work is scoped as described
    - That hazards and controls are fully identified
    - That proper PPE is called out
    - That equipment needed is described
    - Level of QEW is proper for tasks

- Review the approval dates of the work document (must be < 3 yrs.)
  - IF complex LOTO is involved review the procedure being used in conjunction with the review above if separate procedure(s) are used
PRE-JOB BRIEFING

Same as restart of operations

- PSC Pre-Job briefing form is completed on APS web page
  - Mode 1 work MUST have indication that the ANL-1202, *Mode 1 Electrical Work Job Briefing* has been completed by checking the box
  - Name of the QEW Observer entered (field has been added)
    - Observer will complete ANL-1205 prior to and during Mode 1 work
  - In approved field enter name of the person who AUTHORIZED the work
    - For work supporting the APS Upgrade there may be two names
# Mode 1 Electrical Work Job Briefing

**Follow ISM principles:** Define the scope of the work; Analyze the hazards; Develop and implement controls; Perform work within the controls; Feedback and improvement

- [ ] Extended duration from ______ to ______
- [ ] One-time use only

### Follow ISM Principles

- **Defining the Scope of the Work:**
  - Define the scope of the work.

- **Analyzing the Hazards:**
  - Analyze the hazards.

- **Developing and Implementing Controls:**
  - Develop and implement controls.

- **Performing Work within the Controls:**
  - Perform work within the controls.

### Feedback and Improvement

- **Extened duration from**
- **One-time use only**

### Division

- Building:
- Room/Area:

### Person in Charge:

- Job supervisor/responsible engineer:
- Date start:
- Expiration date:

### Description of work (Scope) to be done:

- Description of circuit/equipment:

### Electrically Safe Work Condition (NFPA-70E 2015, 120.1, 130.2, ESH 9.1)

- Reference all applicable drawings, diagrams, identification tags, etc.
- Field verify the possible energy sources
- Determine all possible sources of electrical supply to the equipment including stored energy (capacitors, inductors, etc.)
- Simple LOTO: isolation device ID:
- Complex LOTO: isolation device ID:

### Results of Shock Hazard Analysis (NFPA-70E 2015 130.4, LMS-PROC-321)

- Maximum voltage:
- Glove voltage rating:
- Insulated tools and equipment required

### Results of Arc Flash Hazard Analysis (NFPA-70E 2015 130.5, LMS-PROC-287)

- Incident energy:
- Arc flash boundary:
- Working distance:

### Additional PPE

- Arc flash PPE category:
- Required additional PPE (list if required):

### Qualified Electrical Workers

- Qualified electrical workers level:
- (must be trained per ESH 9.1.6, qualified, and have full knowledge of equipment)

### Capacitor Training

- Capacitor training required as determined by JHQ

### Line Manager

- Line manager must determine if the work is to be completed by skill of the worker or by procedure.

### Skill or Procedure

- Procedure required: Procedure no:

### Approvals

- Hazard analysis performed by:
- ESH Coordinator:
- Electrical SME:
- Line Supervisor/Group Leader/ Foreman:
- Dept. Mgr or Line Mgr (For QEW Level 2 & 3):

### Person in Charge (PIC)

- Person in charge (PIC) deliver the job briefing: must include the scope of work, hazard analysis and required controls.

### Authorized Workers

- Authorized Workers who have attended required job briefing by the person-in-charge:

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OBTAIN AUTHORIZATION

You may now proceed

- This is given once you have an approved process, procedure, work control document, technical note or work tool
- Line management, or designee, provides
  - Work direction
  - Work authorization
- Workers need to know
  - Limits of authorization (what scope is authorized)
  - Expectations to pause or stop work if
    - Scope creep begins
    - Hazards are different (can be a different location changes them)
    - Controls are ineffective or unworkable
    - Unclear of limitations of authorization, work direction or approved process
Observer MUST be from a different work group
<table>
<thead>
<tr>
<th>Level of Qualified Electrical Worker</th>
<th>Job Briefing and Documentation Requirements</th>
<th>Mode of work (0, 1) Note 1.</th>
<th>Review (R)/Approval (A) Required</th>
<th>Independent Observer (Additional Qualified Person) Requirements for Field Observations (Y/N). Note 2.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Level 1 QEW</strong></td>
<td></td>
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<tr>
<td>• 60 Hz AC:</td>
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<tr>
<td>• &lt; 230 volts; transformer &lt; 125 kVA (or no arc flash hazard)</td>
<td>• Verbal Job Briefing including scope of the work and review of LO/TO (No written documentation required)</td>
<td>Mode 0</td>
<td>• QEW 1 or 2 (R)</td>
<td>• NO, Not Required</td>
</tr>
<tr>
<td>• DC and Batteries:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• ≥ 100 volts and available short circuit current ≤ 500 amps</td>
<td>• ANL Mode 1 Electrical Work Job Briefing Form</td>
<td>Mode 1</td>
<td>• ESH Coordinator (R)</td>
<td>• YES (Worker and independent observer)</td>
</tr>
<tr>
<td>• Capacitors:</td>
<td></td>
<td></td>
<td></td>
<td>Complete Electrical Safety Field Observation Checklist</td>
</tr>
<tr>
<td>• ≤ 400 volts and &lt; 10,000 J</td>
<td>• Procedure for all complex LO/TO</td>
<td></td>
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<tr>
<td>• Sub-RF and RF:</td>
<td></td>
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<tr>
<td>• ≤ 250 volts and ≤ 500 amps</td>
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<td></td>
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<tr>
<td><strong>Level 2 QEW</strong></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>• 60 Hz AC:</td>
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<td></td>
</tr>
<tr>
<td>• ≤ 600 volts</td>
<td>• Verbal Job Briefing including scope of the work and review of LO/TO (No written documentation required)</td>
<td>Mode 0</td>
<td>• QEW 2 (R)</td>
<td>• NO, Not Required</td>
</tr>
<tr>
<td>• &gt; 600 volts that is of facility (not utility) type</td>
<td>• ANL Mode 1 Electrical Work Job Briefing Form</td>
<td>Mode 1</td>
<td>• ESH Coordinator (R)</td>
<td>• YES (Two-person and independent observer)</td>
</tr>
<tr>
<td>• DC and Batteries: Any</td>
<td>• Procedure for all complex LO/TO</td>
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</table>
- **Mode 0** – Equipment or wiring has already been placed in the electrically safe work condition.

- **Mode 1** – The work is to place the equipment or wiring in the de-energized electrically safe work condition including zero voltage verification (ZVV).
  - Note 1: Cord and plug equipment may be placed in the electrically safe work condition (Mode 0) by unplugging and controlling the sole plug so it cannot be plugged in, as long as there is no stored hazardous energy inside the unit and the cord and plug is the only source of hazardous energy to the unit. **THIS DOES NOT REQUIRE AN ANL Mode 1 Electrical Work Job Briefing Form.**
  - Note 2: The Independent Observer must have completed Electrical Safety Observer training and should be a QEW outside of the group that planned the work. If this is not feasible, the line manager must approve the observer. The observer must be qualified to the appropriate level per LMS-POL-69 and is an addition to the number of workers required by the applicable LMS Procedure for the work.
  - Note 3: When two persons are required review the applicable LMS Procedure to determine if the person is required to be a safety watch or an additional person. Electrical LMS Policies and Procedures are listed below for reference.
    - Argonne **ESH-9.1**, *Electrical Safety Program – General Electrical Safety*
    - Argonne **ESH-9.2**, *Electrical Safety Program – Electrical Worker Safety*
    - Argonne **ESH-9.3**, *Electrical Safety Program – Electrical Systems and Equipment*
    - Argonne **ESH-7.1**, *Lockout/Tagout Program*
    - Argonne **LMS-PROC-185**, *Simple Lockout/Tagout*
    - Argonne **LMS-PROC-208**, *Determining Work Controls for Electrical Work on Batteries*
    - Argonne **LMS-PROC-230**, *Determining Work Controls for Electrical Work on 60 Hz AC*
    - Argonne **LMS-PROC-248**, *Determining Work Controls for Electrical Work on DC*
    - Argonne **LMS-PROC-249**, *Determining Work Controls for Electrical Work on Capacitors*
    - Argonne **LMS-PROC-250**, *Determining Work Controls for Electrical Work on AC Other Than 60 Hz*
    - Argonne **LMS-PROC-253**, *Testing, Procuring, and Using Voltage-Rated Gloves*
    - Argonne **LMS-PROC-287**, *Performing an Electrical Arc Flash Risk Assessment*
    - Argonne **LMS-PROC-294**, *Performing Electrical Work Involving Shared Neutrals*
    - Argonne **LMS-PROC-321**, *Performing an Electrical Shock Risk Assessment*
QUESTIONS

Contact your supervisor or ESH Coordinator

- There are other resources available to us
  - Electrical SME’s
  - Electrical Safety Committee members
  - Authority Having Jurisdiction (Mike Edelen)
  - Infrastructure Services staff

- If you aren’t sure DON’T proceed, this is not an option, it is an EXPECTATION
  - Pause work
  - Ask for direction
  - Call for assistance