

SWITCHGEAR REPLACEMENT: OVERVIEW & LESSONS LEARNED



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PRESENTATION OVERVIEW

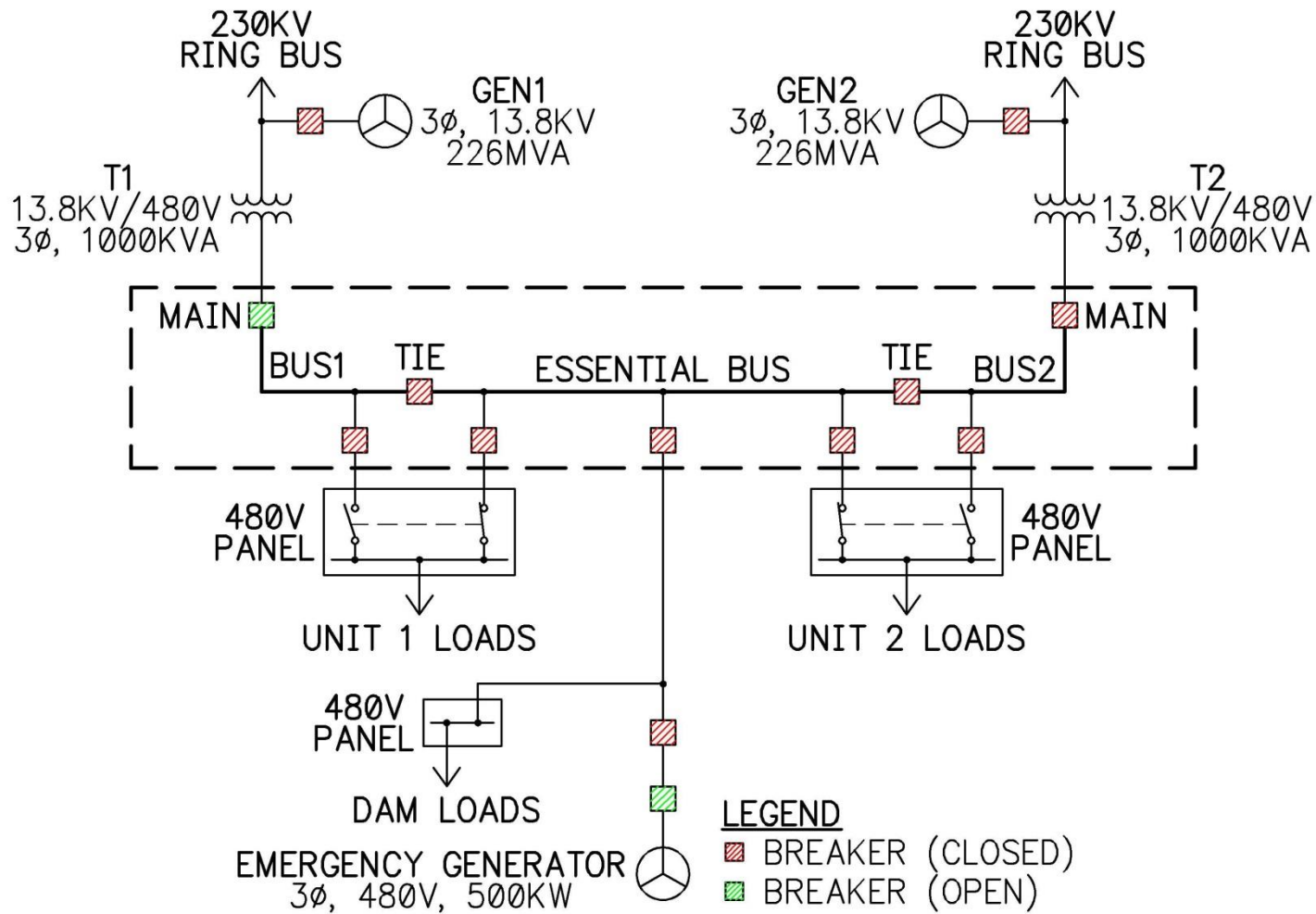
- **Project scope**
- **Overview of project activities**
- **Highlights and lessons learned**

PROJECT SCOPE

- Replace station service switchgear
- Replace station service control switchboards
- Protective relay switchboard



SWITCHGEAR REPLACEMENT: OVERVIEW



NORMAL CONFIGURATION

SWITCHGEAR REPLACEMENT: OVERVIEW

Start
Design
(Jan
2012)

START DESIGN (JAN 2012)

- Key Design Areas
 - Cable inspection
 - Location and core drill
 - Breaker control scheme
 - Protective relay scheme
 - Anchoring

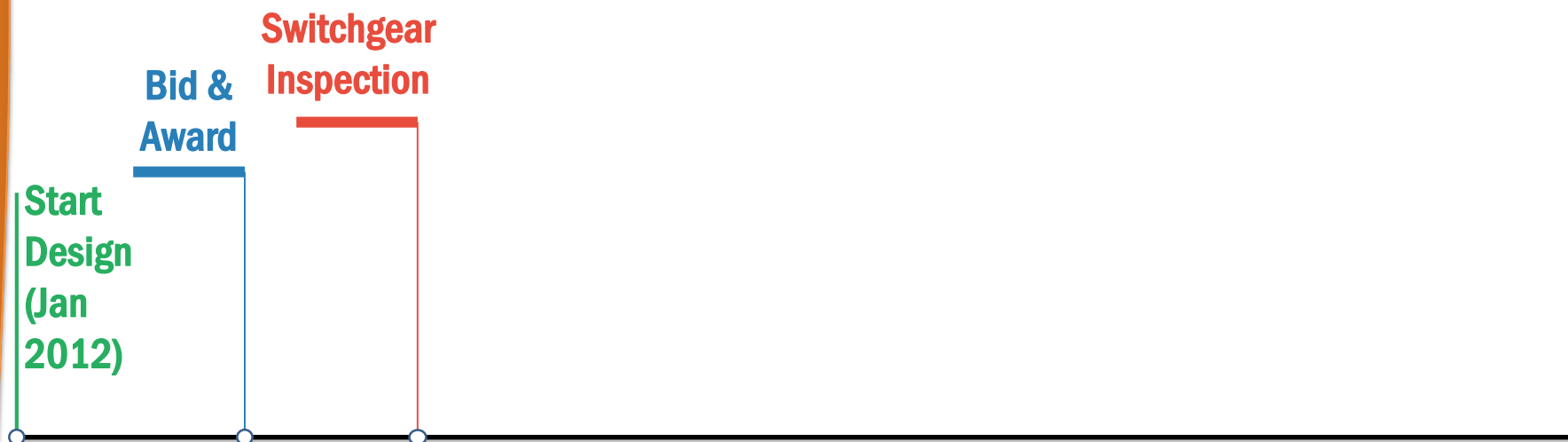
SWITCHGEAR REPLACEMENT: OVERVIEW



BID & AWARD

- Two attempts to secure vendor
- Awarded to a manufacturer using GE breakers

SWITCHGEAR REPLACEMENT: OVERVIEW



SWITCHGEAR INSPECTION

- Site inspection revealed insulator cracks, bus connection hardware issues, and workmanship issues
- Manufacturer replaced insulators on-site
- Re-inspection revealed new cracked insulators

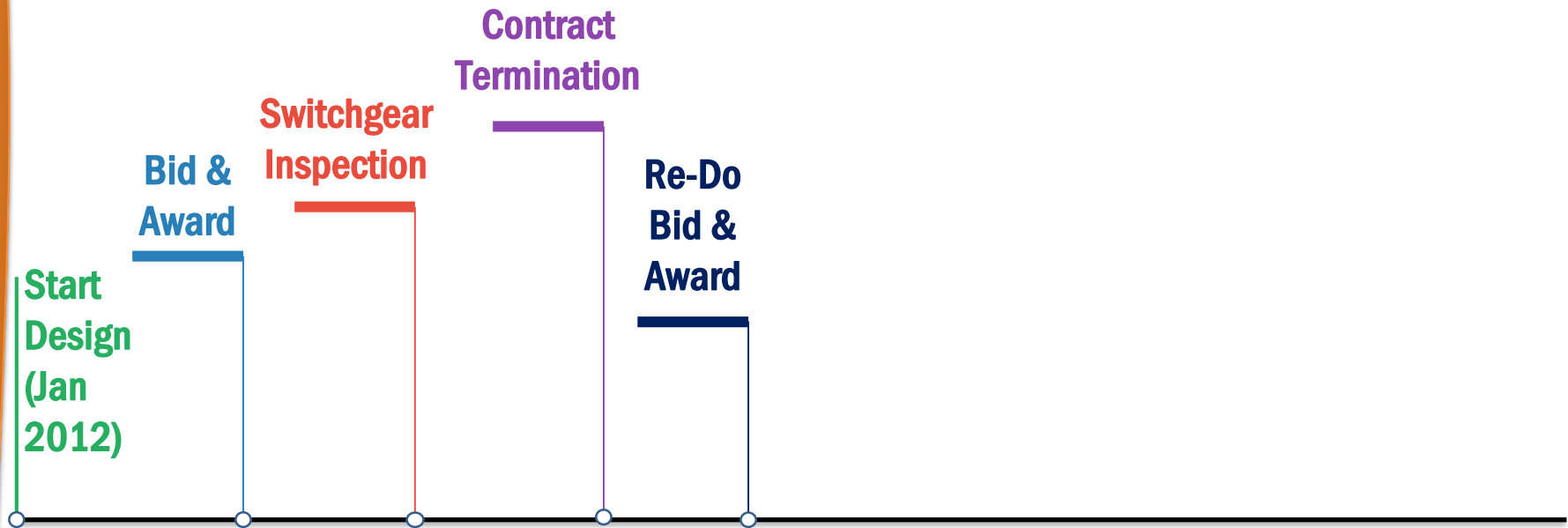
SWITCHGEAR REPLACEMENT: OVERVIEW



CONTRACT TERMINATION

- Initiated insulator testing on-site
- Documented and sent report to manufacturer
- Negotiated with manufacturer to terminate contract
- End result was a full refund

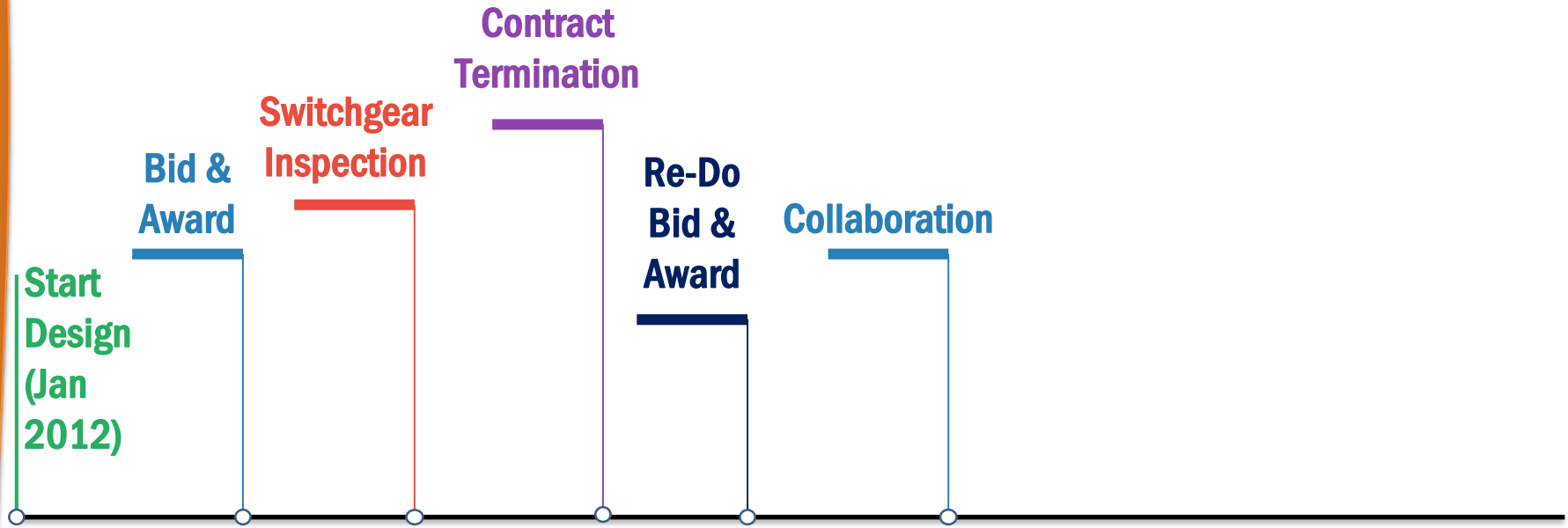
SWITCHGEAR REPLACEMENT: OVERVIEW



RE-DO BID & AWARD

- Rewrote specification
- Vetted design with potential manufacturer

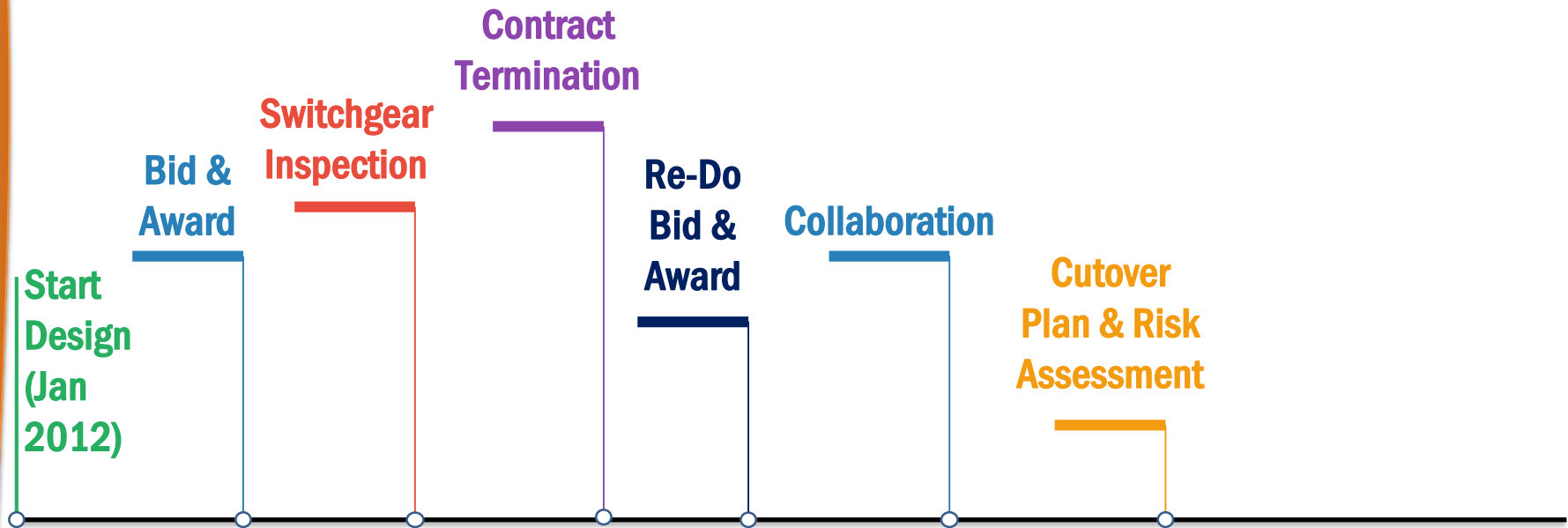
SWITCHGEAR REPLACEMENT: OVERVIEW



COLLABORATION

- Manufacturer visits Tacoma Power
- Tacoma Power visits factory

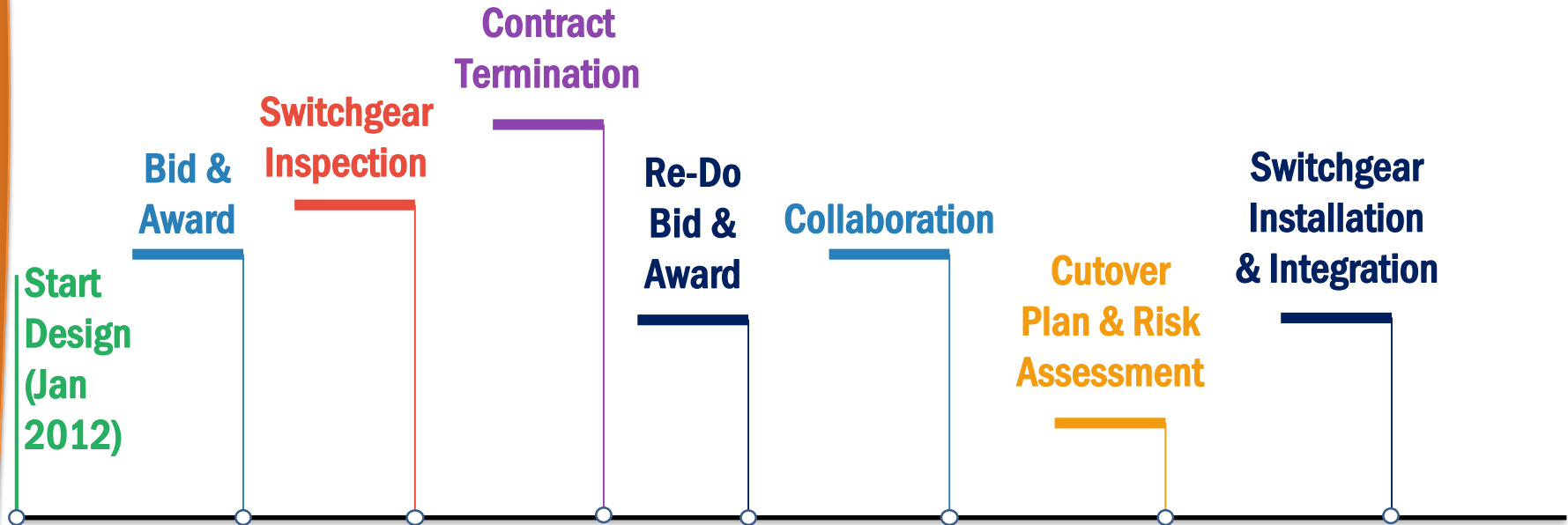
SWITCHGEAR REPLACEMENT: OVERVIEW



CUTOVER PLAN & RISK ASSESSMENT

- Multiple meetings with stakeholders
- Developed detailed cutover strategy
- Evaluated and addressed risks
- Created cable/ splice location plan
- Communication

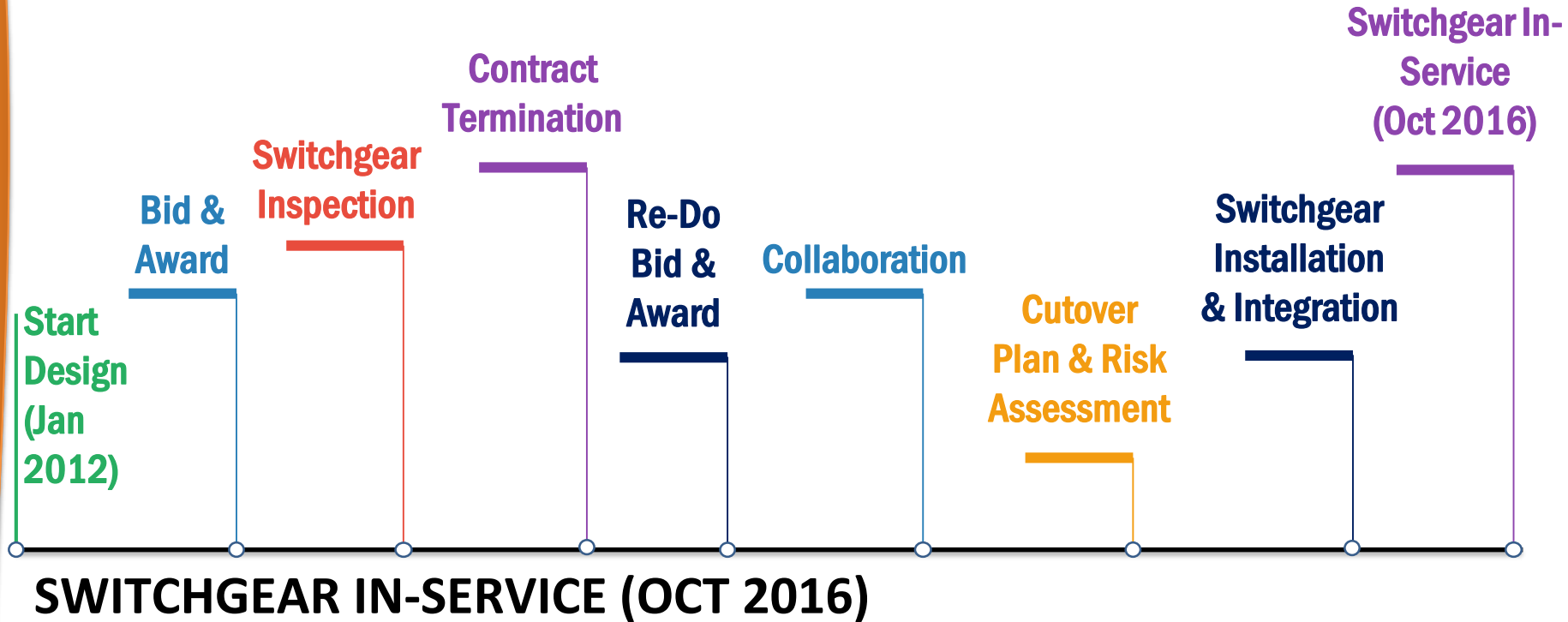
SWITCHGEAR REPLACEMENT: OVERVIEW



SWITCHGEAR INSTALLATION & INTEGRATION

- Cowlitz River Project (TP) labor performed all construction activities
- Manufacturer's technician performed Site Acceptance Testing
- Tacoma Power led commissioning of breaker control logic
- Resolved issues
- Protective relay schemes commissioned

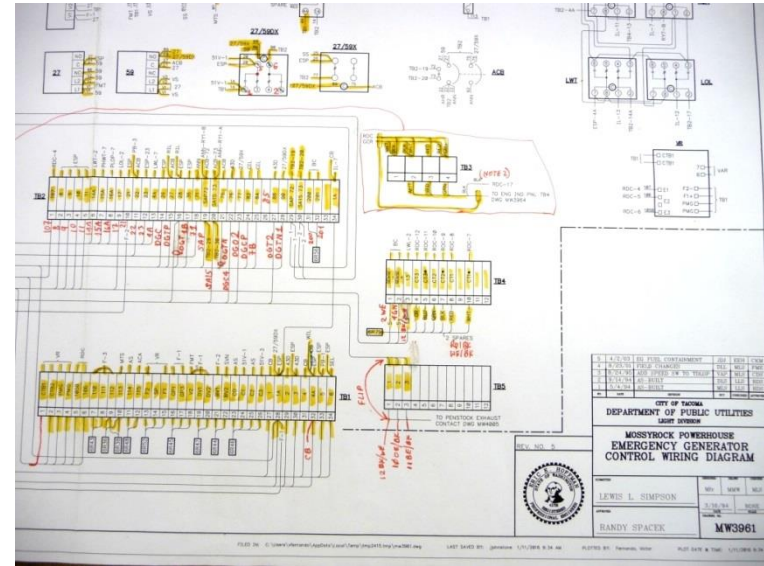
SWITCHGEAR REPLACEMENT: OVERVIEW



HIGHLIGHTS AND LESSONS LEARNED

DESIGN

- Walkdown equipment and as-built drawings
- Review original equipment documents
- Review equipment anchoring requirements
- Engage experts



HIGHLIGHTS AND LESSONS LEARNED

BID & AWARD

- Understand the implications of procurement options
- Communicate what's important to you
- Include hold points for detailed drawing review
- Include measurable performance requirements
- Evaluate need for performance bond
- Realistic schedule

HIGHLIGHTS AND LESSONS LEARNED

SWITCHGEAR INSPECTION AND TESTING

- Plan a thorough Factory Acceptance Test (FAT)
- Recommend sending design engineer and plant electrician to FAT
- Perform thorough site inspection
- Identify who provides commissioning test equipment
- Request field service technicians resumes

HIGHLIGHTS AND LESSONS LEARNED

CONTRACT TERMINATION

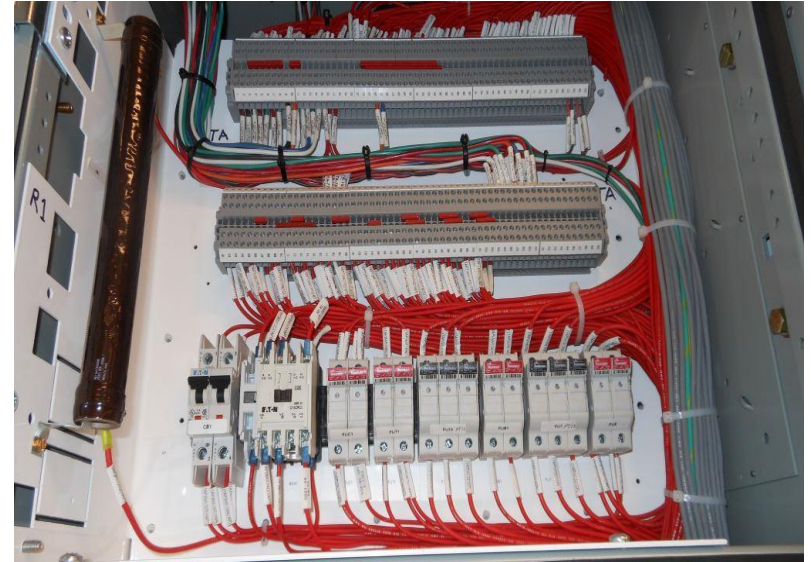
- Document and escalate issues promptly
- Initiate and perform tests, then document in report
- Keep stakeholders informed
- Use the T&Cs, contract, PO



HIGHLIGHTS AND LESSONS LEARNED

COLLABORATION

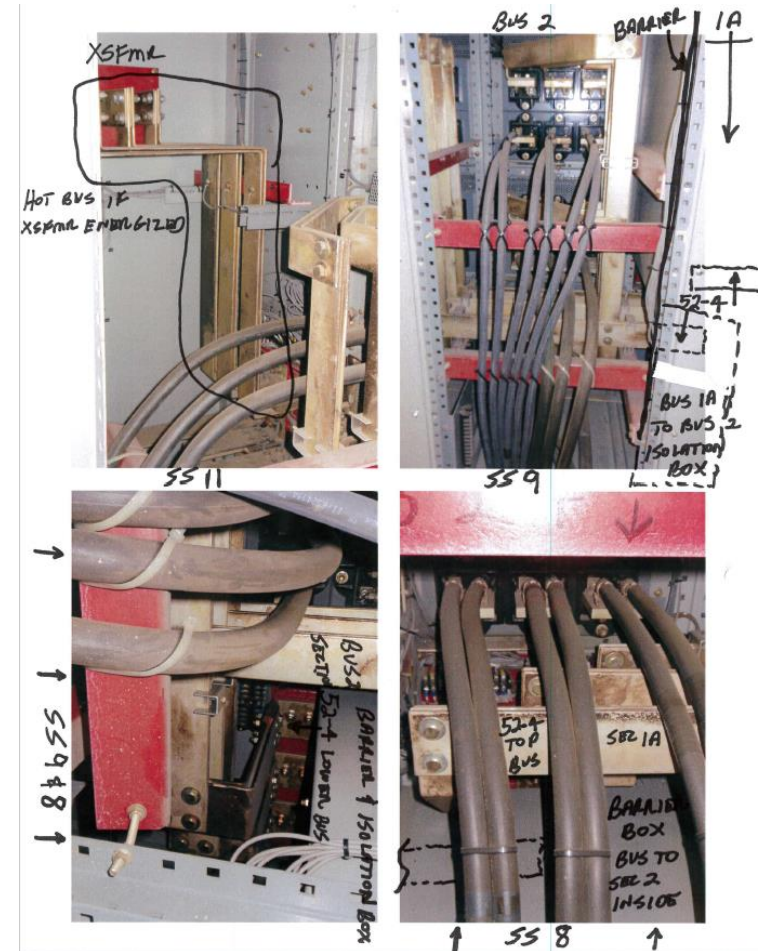
- Meet with the vendor to review design
- Visit the manufacturing facility to resolve issues
- Include craft persons in discussions



HIGHLIGHTS AND LESSONS LEARNED

CUTOVER PLAN AND RISK ASSESSMENT

- Start early to develop cutover plan
- Think through the details
- Review loads and the impact to facility during cutover
- Leverage existing contracts
- Get buy-in from stakeholders



HIGHLIGHTS AND LESSONS LEARNED

SWITCHGEAR INSTALLATION

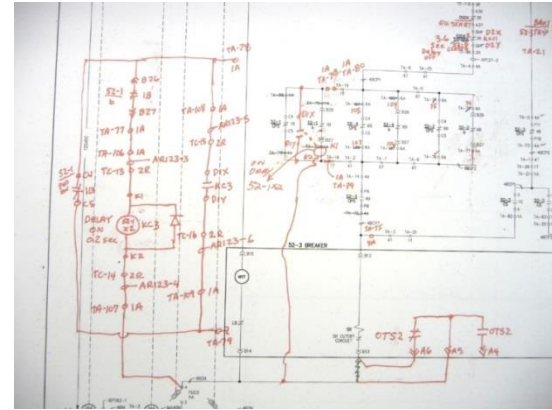
- Tools and materials



HIGHLIGHTS AND LESSONS LEARNED

SWITCHGEAR INTEGRATION

- Identify roles & responsibilities within the team
- Purchase spare parts with the switchgear
- Review test results before factory field personnel leaves site
- Collaborate with plant staff
- Perform thorough testing
- Isolate protective relay outputs to avoid false trips



QUESTIONS?

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THANK YOU!

MOSSYROCK DAM

