# Annex XVI – Hidden and Untapped Hydropower Opportunities

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# Task 2 – Case Studies

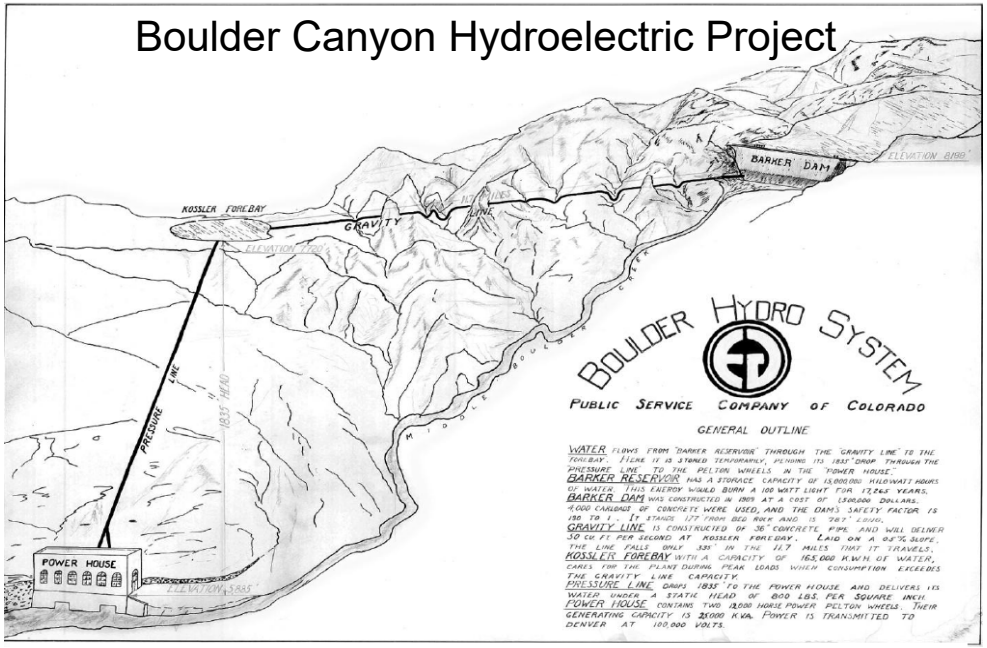
Upgrades/Retrofits to Existing Hydropower in the US

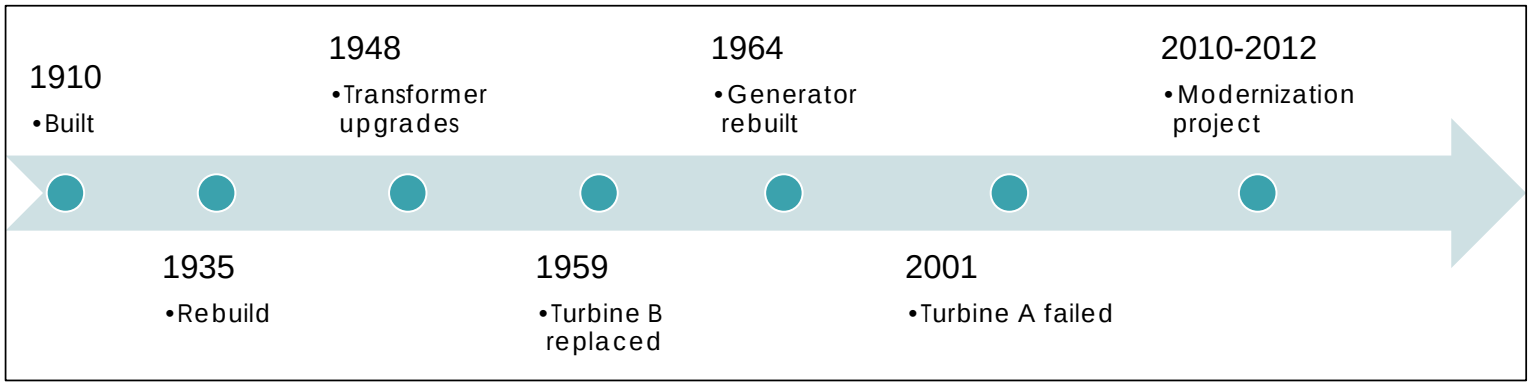
# Untapped Hydropower at powered facilities in the US

- Opportunities to increase generation in response to changing water availability at existing hydropower facilities
  - Boulder Canyon project in Boulder, Colorado (2012)
- Opportunities to increase generation in response to relicensing of existing hydropower facilities
  - Slab Creek project in Sacramento, California (2020)

# Boulder Canyon Project

- At time of construction, water supply was solely for hydropower
  - Widely recognized as notable project because of construction difficulty and technological challenges (high pressure system), used unique engineering features that changed penstock construction
- From 1950-present, most water was converted to municipal water supply. By 2001, there was not enough water to support the single 10 MW unit
- Modernization project = replace with 5 MW unit



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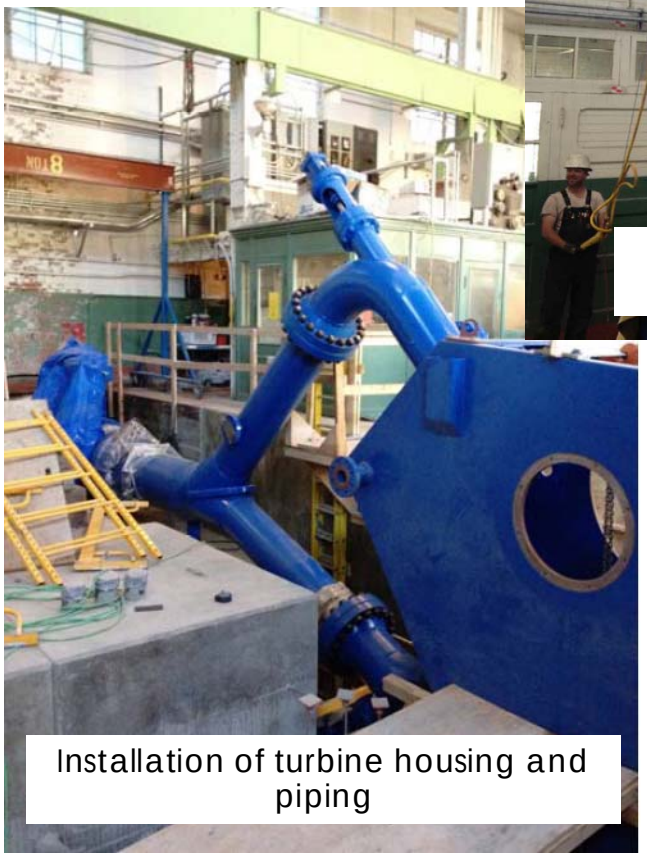
# Boulder Canyon Project

- Previous generation using the single 10MW turbine was 8500 MWh
- Smaller but more efficient turbine averages 11-12,000 MWh (30% increase in generation)
- Total project cost = 5.15 million USD
- Technical challenges:
  - high pressure water supply,
  - age of equipment,
  - and operations associated with its incorporation into a municipal water supply system

# Boulder Canyon Project

Removal of turbine B
(10 MW unit A remains but is inoperable)



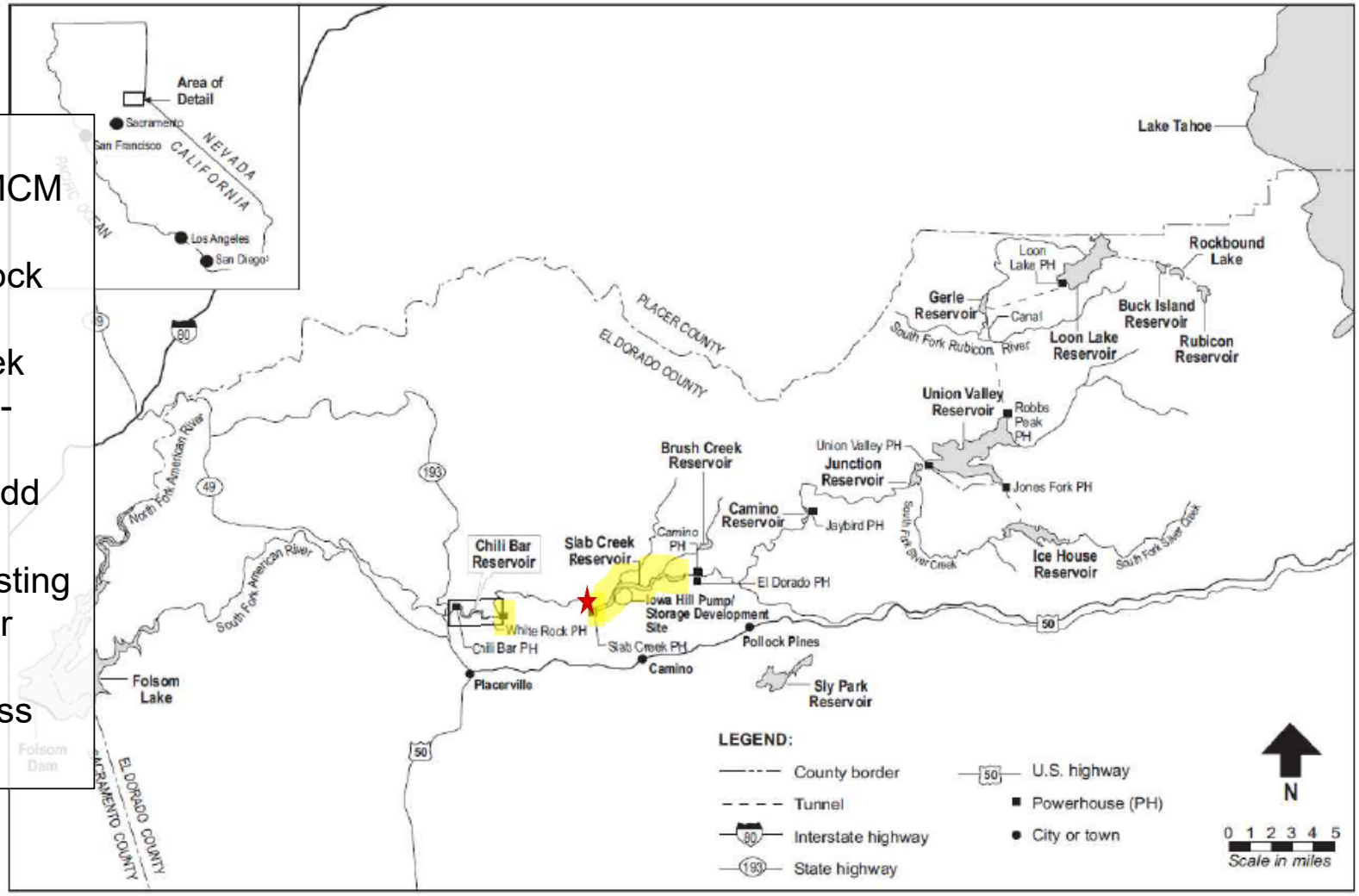
Installation of turbine housing and piping

Installation of new 5MW turbine runner

**Sources:**
Technical Report:
https://www.osti.gov/servlets/purl/1072022
Consulting firm (AECOM) project page:
https://aecom.com/projects/boulder-canyon-hydroelectric-modernization/

# Slab Creek Dam

- Construction: 1967
- Reservoir Size: 20.5 MCM
- Existing facilities:
  - 224 MW White Rock Powerhouse
  - 450 kW Slab Creek powerhouse for in-stream flow
- General approach to add power: add a 5 MW powerhouse at the existing dam to generate power from minimum flows released into the bypass reach



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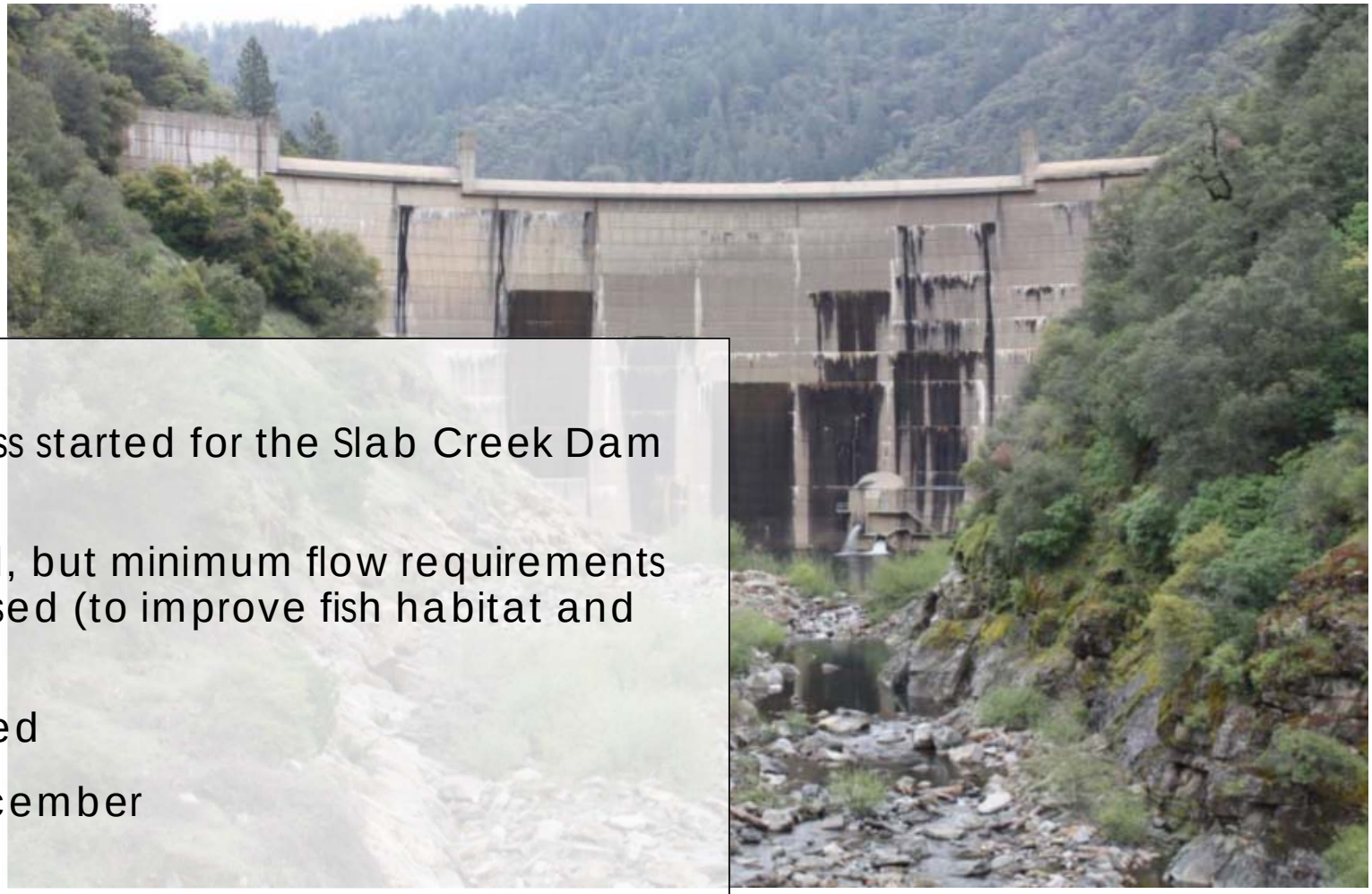
# Slab Creek Dam



**Project timeline:**

- 2005 - Relicensing process started for the Slab Creek Dam project
- 2014 - License was issued, but minimum flow requirements were significantly increased (to improve fish habitat and recreation downstream).
- 2017 - Construction started
- 2020 - Completed in December

# Slab Creek Dam

# Slab Creek Dam

- Original license required 1 cms release at existing powerhouse, but new license requires minimum flows between 1.8—11.8 cms
- Challenges specific to the project:
  - Use of the existing tunnel required that it be dewatered
  - Cofferdam instability
  - Use of existing transmission infrastructure not straightforward
    - 12 kV pole line hardening
  - COVID and remote consultation with manufacturers
    - Estimated 30% more effort to support remote/virtual commissioning vs. in person.

# Slab Creek Dam

**Sources:** https://www.hydroreview.com/hydro-industry-news/hydro-review-a-novel-approach-to-new-small-hydro-constructing-south-fork-powerhouse/, written by Bill Collins, P.E. (principal mechanical engineer with Sacramento Municipal Utility District)

# Extensions to other projects

- Range of hydrologic conditions/shifts in water management are important to consider.
- Relicensing may present many opportunities
  - Changing environmental mitigation strategies may present similar opportunities elsewhere
- Existing powered dams in deeply incised canyons pose a particular construction/access challenge
- Plugging into existing transmission infrastructure can be an additional challenge to consider at existing powered facilities