Ryan Schnitzler

Director, Dam and Hydro
Lower Colorado River Authority

Ryan is responsible for directing field operations and maintenance of six Highland Lakes dams and 13 hydroelectric generators. Ryan has worked in Dam and Hydro for 23 years through various roles and holds a Bachelor of Science in business administration from the University of Phoenix.

Summer Season GSU Transformer Preparations

Weather Emergency Preparedness

Ryan Schnitzler
Director, Dam and Hydro

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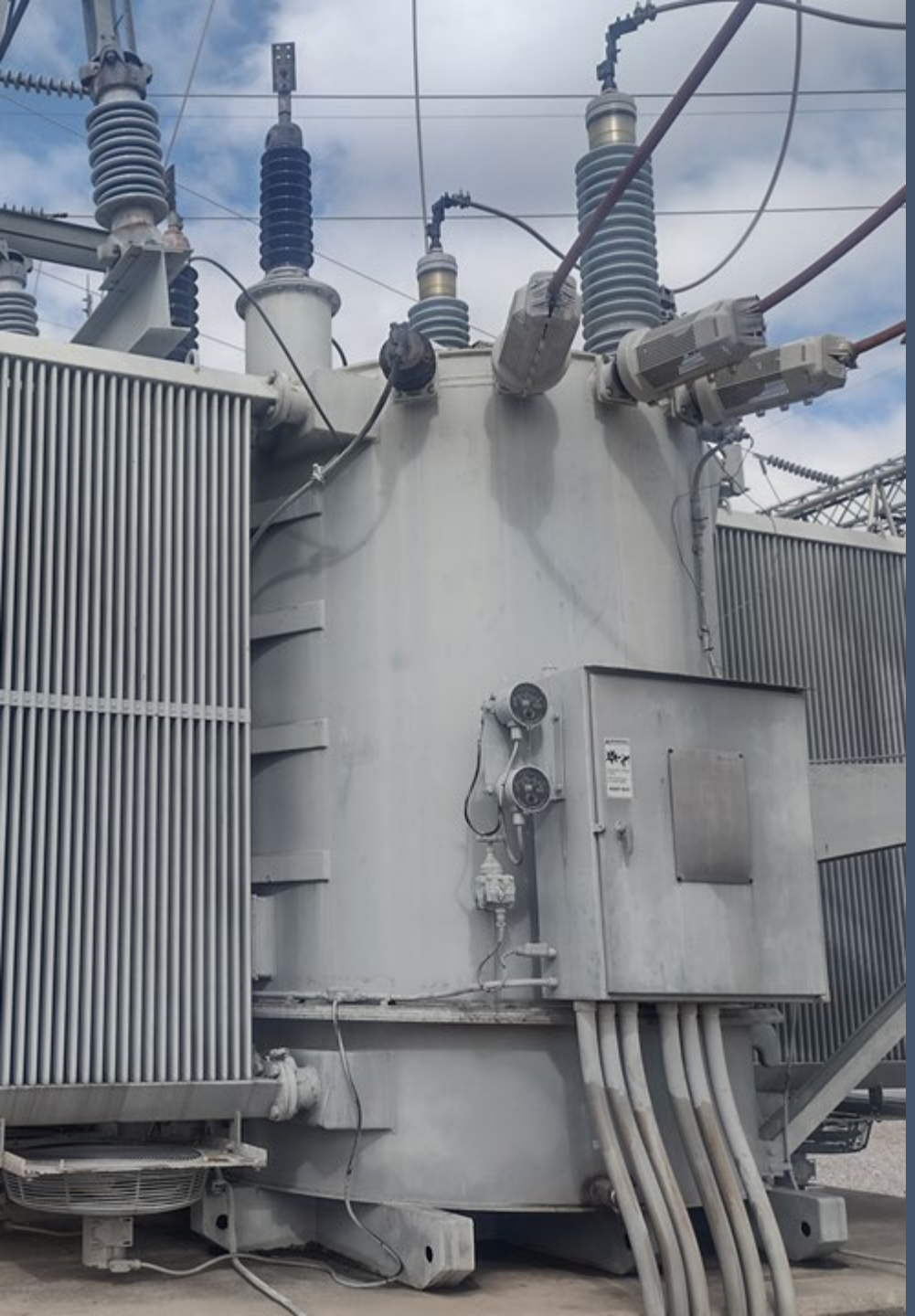


Purpose

- Provide reasonable assurance that the generator step-up transformer will operate reliably through the summer season

Routine Maintenance

- **Substation and switchyard maintenance**
  - LCRA Transmission maintenance rounds performed monthly, year-round
  - Data and inspection points captured in computerized maintenance management system

Routine Maintenance
(Continued)

- **Dissolved gas analysis**
  - Manual samples taken quarterly
  - Continuous monitoring on major GSUs
  - Samples reviewed by Transmission and/or Generation Engineering
- **SF6 breaker gas pressure monitoring**
- **Connections and switches monitored with infrared technology**

Calisto DGA

Hydrogen (H2) ppm	4.00	Ethylene (C2H4) ppm	2.20
Methane (CH4) ppm	8.40	Ethane (C2H6) ppm	2.00
Acetylene (C2H2)	0.20	Carbon monoxide (CO) ppm	152.00
TDCG%	0.02	Carbon dioxide (CO2) ppm	855.00

DGA Tools

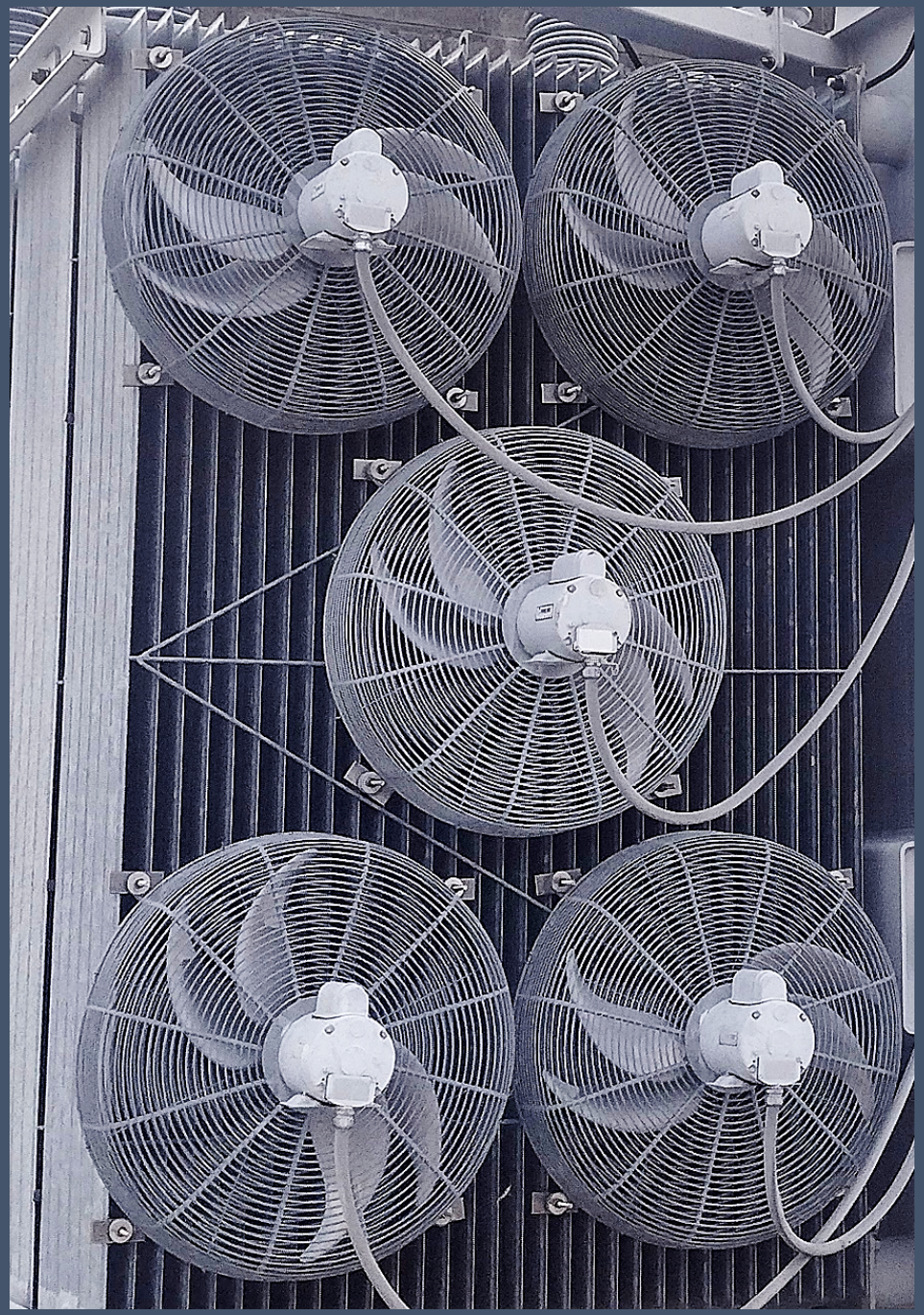
TDCG (Calc) ppm	168.80	Key Gas Method TCG% (Calc)	0.73

DGA Graph

C2H2/C2H4 (Calc)	0.09	%CH4 (Calc)	77.78
CH4/H2 (Calc)	2.10	%C2H4 (Calc)	20.37
C2H4/C2H6 (Calc)	0.00	%C2H2 (Calc)	1.85
IEC Ratio Method		Duval Triangle Method	

Summer Scope

- **Maintenance and preparations**
  - GSU inspections
    - Cooling radiator cleanliness
    - Winding temperatures
    - Cooling/insulating oil temperature
    - IR inspection of components
    - Dissolved gas analysis monthly



Summer Scope
(Continued)

- GSU cooling fan verification
  - Operate cooling fans
  - Verify operating temperature with IR
  - Procedure to address as-found and as-left
- GSU cooling pump verification

Substation/Switchyard Safety

- **Personal protective equipment**
  - Provide employees with adequate level of PPE for substation safety and as required for enclosure access and weather-specific situations

Substation/Switchyard Safety (Continued)

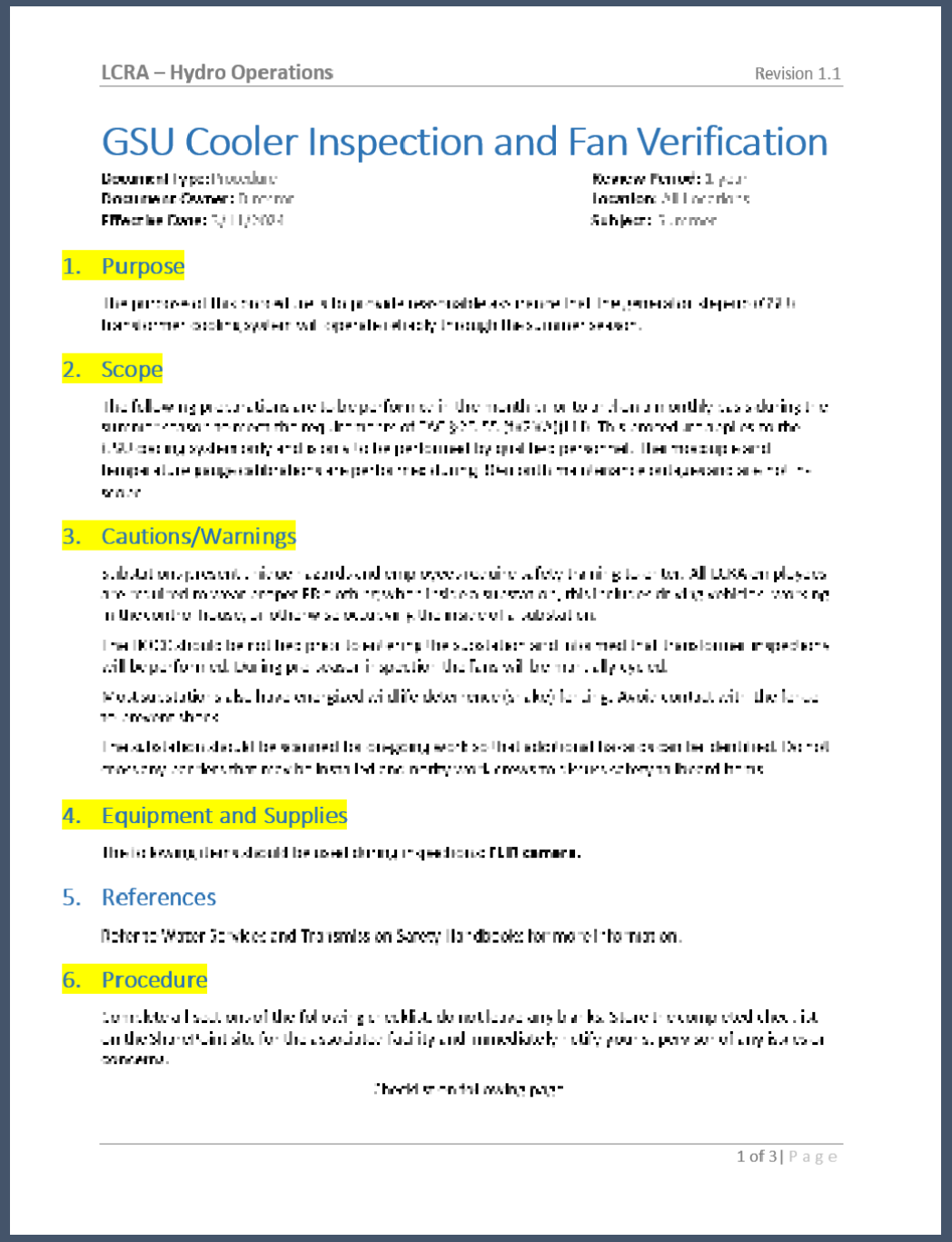
- **Substation/switchyard awareness training (in person)**
  - Identify electrical hazards
  - Define requirements for entering substation
  - Describe purpose and function of major equipment and components
  - Define minimum approach distances

Tools and Equipment

- **Thermal imaging or infrared thermometer**
  - Thermal imaging camera
    - Preferred method due to wide area coverage
    - Easy identification of anomalies
    - Multispectral imaging enhances images for easy identification
    - Can provide snapshots for comparison

Tools and Equipment (Continued)

- **Thermal imaging or infrared thermometer (continued)**
  - Infrared thermometer
    - Provides point of interest temperature readings
    - Lower cost
- **Binoculars**
  - Enhanced visibility for bushings



LCRA – Hydro Operations Revision 1.1

GSU Cooler Inspection and Fan Verification

1. Purpose

2. Scope

3. Cautions/Warnings

4. Equipment and Supplies

5. References

Reference Water Services and Transmission Survey Handbooks for more information.

6. Procedure

1 of 3 | Page

Written Procedure

- **Procedural elements**
  - Purpose, scope, cautions and warnings, equipment and supplies, required training, and specific procedural steps
- **Reporting requirements**
  - Provide instruction on what to do if an anomaly or issue is discovered

Training

- **Training topics**
  - Include safety elements and procedural requirements
- **Initial training in person**
- **Recurring training video preseason**
  - Include visuals for substation equipment and components
  - Include visuals and examples of tools and equipment used during inspections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