

Chris Dedeurwaerder, P.Eng., P.E.

EDUCATION

1998 - University of Alberta, Edmonton, Electrical Engineering Co-op, B.Sc.

PROFESSIONAL AFFILIATIONS

- Member of IEEE, ISA, APEGBC, APEGA, APEGS, APEGM and PEO
- Registered Professional Engineer in the States of Arizona, Colorado, Wyoming, Missouri, West Virginia, Pennsylvania, Ohio, Iowa, Minnesota, Texas, North Dakota, Nebraska, Nevada, Michigan, Kentucky, Louisiana, Illinois, Indiana, California, Utah, Arkansas, Alabama, Washington, New Mexico, Tennessee and Provinces of Alberta, British Columbia, Saskatchewan, Manitoba, New Brunswick and Ontario
- TUV certified Functional Safety Engineer, ID: 1582/09
- TUV certified Functional Safety Expert, ID: 152/10
- Technical Committee Chair for the 2016/2018/2020/2022/2024/2026 IEEE Electrical Safety, Technical and Maintenance Projects Workshop
- Authored and presented a technical presentation for the IEEE Electrical Safety, Technical and Mega-Projects workshop in 2005, 2014, 2022, 2024 and 2026
- Co-authored and published a technical paper for the IEEE Petroleum and Chemical Industry Conference in 2000

EXPERIENCE AND CAPABILITIES

Extensive, first-hand experience with operations, maintenance, technical support, design, construction, and commissioning activities for petrochemical facilities, oil and gas facilities, power generation and pipelines in the electrical, instrumentation, controls and functional process safety disciplines as an Owner's Engineer.

Significant experience with utility interconnections on behalf of the end user, including new load connections, modifications to existing connections, additions of gas fired generation and renewable (solar and wind) connections.

My strong leadership skills include the ability to prioritize, plan, lead, organize and control teams in a cross-functional organization.

I have provided a strong commitment to behavioral based safety programs to ensure incident and injury free work conditions, while coordinating work and interfacing with many stakeholders in multiple locations and disciplines for a successful project completion.

CAPTUS GENERATION

138kV and 240kV Substation Design and Interconnection - Datacenter

EMIRATES GLOBAL ALUMINUM - (ERM)

Utility Interconnection Guidance
Oklahoma PCO/SPP for Aluminum Smelter

EDP RENEWABLES (ERM)

IESO System Impact Assessment (SIA)
Applications for BESS

DEEP SKY CLIMATE (JUNO)

240kV Substation FEED and Design

VERMILION ENERGY

Mica Station Electrification (Owner's Engineer)

VARME ENERGY

Waste to Energy Station (Owner's Engineer)

IESO (JUNO)

Indigenous Energy Support Program
(Independent Evaluator)

HYDROGEN CANADA CORPORATION

Ammonia Facility Pre-FEED including a
240kV Substation Pre-FEED

XTO PIPELINE (CONNECT)

James Ranch Compressor Station (New Mexico)

AIR PRODUCTS (CONNECT)

MV Distribution, Cogen and E-house
Coordination for the Edmonton Net Zero
Hydrogen Energy Complex (ENZHEC)

TORCH ENERGY (ERM)

160MW Solar and BESS Generation, with 345kV
transmission line connection
Independent Engineer Review (Arizona)

CARBON UPCYCLING (CONNECT)

Carbon Slag Processing Facility FEED for Ash
Grove Cement Plant in Mississauga

DUNMORE SOLAR INC. – (METSCO)

216 MW Solar Power Station FEED (Owner's
Engineer)

EDF RENEWABLE ENERGY – (METSCO)

247 MW Wind Power Cypress 1 & 2 (Owner's
Engineer Authentication)

EXHIBITION PLACE – (METSCO)

TWX 13.8kV Substation Relocation

SURF LAKES – (DJA)

Surf Park Feasibility Study and Guidance

**CANADA-KUWAIT PETROCHEMICAL
CORPORATION (CKPC)**

Petrochemical Facility FEED, including 40MW
motor and VFD
240kV Substation FEED

PEMBINA PIPELINE CORP

138kV Substation Expansion
Legacy DCS Upgrade FEED and Implementation
Heartland Ethane Facility FEED
Sustainable Aviation Fuel FEED
Low Carbon Complex Feasibility
Redwater 138kV Substation Addition FEED
Heartland 138kV Substation FEED
Flare Gas Utilization Project FEED
Redwater RFS3 De-Eth FEED
Ammonia Facility Pre-FEED
Kaybob Reciprocating Cogen Units
5kV Switchgear/MCC Replacement
Solar Generation FEED
Duvernay Cogeneration FEED
Brine Pond 6 FEED/Detailed Design
Butane Splitter FEED
RFS4 FEED/Detailed Design
Siemens DCS Upgrade Detailed Design Empress
Frac and Rail Expansion
Younger Substation & Switchgear Upgrade
Younger 15kV VFD and Motor Upgrade
Prince Rupert Propane Export Terminal
Empress Cogeneration Detailed Design
Redwater Cogeneration Facility
138KV Scoria Substation
25kV Infrastructure
RFSII/ RFS3 Fractionation Plant
Multiple Cavern Storage Projects
Brine Pond 5 Detailed Design

UNOGAS KC8- (EQUINOX)
Carbon Capture Facility in Alabama

ARCHAEA RENEWABLES – (EQUINOX)
Renewable Gas Facilities in Zion IL, Forest Lawn
MI, Sycamore Ridge IN

BTG MIDSTREAM – (JUNO)
34 MW Reciprocating Engine/Generator Peaking
Station FEED

TERIC POWER – (JUNO)
16MW Battery Energy Storage System for Irrican
Hydro Facility

OBSIDIAN ENERGY (GRD)
MV MCC Upgrade

**MCGREGOR PARK HYDROGEN FACILITY
– (CATCH)**
Hydrogen Facility in Ohio
Area Classification Studies
Electrical Design and Authentication

VOLTAGRID CNG FACILITY – (CATCH)
Compressed Natural Gas Facility in Arizona
Area Classification Studies
Electrical Design and Authentication

COLAS RAIL – (BBA)
Light Rail Transit Functional Safety Evaluation
and SCADA system for Passenger Rail Cars

NWT POWER CORPORATION – (JUNO)
Talton Hydro Generation Station – Electrical
Equipment Evaluation

**SHELL RECHARGE SOLUTIONS (CATCH
ENGINEERING)**
Electric Vehicle Charging Station Design (Ohio,
Texas, Missouri)

INEOS OLIGOMERS
13.8kV Auto Transfer Upgrade

PLAINS MIDSTREAM
Merox Addition
Josephburg Pump Station

TREMCO PAINTS (MAC)
Process Safety Guidance for Control System
Upgrade (Texas)

LEPRINO FOODS - (GRD)
Coordination and Arc Flash Studies -New Mexico

**WESTERN MIDSTREAM - TEXAS &
WYOMING – (GRD)**
Sabre Compressor Station Additions
Avalon 1, Avalon 4 Central Gas Facility
HiLight HIPPS System
Block 2 Compressor Station Additions
SWD Pump Skid Additions

ANADARKO - COLORADO – (GRD)
Design and calculations of medium voltage
switchgear single line diagrams, control
circuits, cable sizing, cable schedules,
grounding and HAC for the following
compressor stations:
St Vrain, Dougan Phase IV, Tri Town Phase IV,
Mead Phase III/IV, Powars, Dacono, COSF
Product Cooling, Coal Ridge, Johnstown and
Frederick Compressor Station

LARICINA ENERGY LTD
Salewski 10.7 SAGD FEED
Germain SAGD Project
Germain Communications Tower
Electrical Specifications

TECK RESOURCES - BC – (GRD)
Line Creek MCC and Ehouse Upgrade FEED
Green Hills MV VFD Upgrade FEED

ACCESS PIPELINE
Jackfish 1 Expansion
MEG LACT Expansion
Viscosity Control Optimization
Expansion Power System Analysis
LLB VFD Upgrade
Jackfish 2 Commissioning
MEG2B LACT Expansion
SL/LLB Pumpstations, including 138kV
substations
Jackfish 3 and Pipeline Expansion

BRUCE NUCLEAR POWER

Generator AVR Upgrade
Excitation System Upgrade

NUTRIEN AMMONIA FACILITIES

SIL Verification Studies
SRS Documents and SIL Design

NOVA CHEMICALS

Joffre 2000 Utilities and Infrastructure
Expansion including Cogeneration
138kV Substation and Transmission
E1 Cooling Tower Medium Voltage Relay
Upgrade
PE1 15 kV Substation Expansion
PE1 Catalyst Metering Upgrade
MI Main Substation Relay Upgrade
Protective Relay Application Guidelines
Critical Motor Ride Through Capability Study
ETAP Reference Model

NOVA CHEMICALS - PIPELINE

Joffre and Didsbury Pump Station Smoke, F&G
Detector Upgrade
BV-8 and BV-2500 PLC Upgrade
BV Sites UPS & Rotophase Upgrade
Didsbury Pump Station Upgrade
Brightview PS MOV & MCC Upgrade
Joffre Site Flow Computer Upgrade

EQUITRANS (W. VIRGINIA) – (EQUINOX)

Skin Creek Pump Station

PETRO-CANADA

Hanlan Robb Gas Plant 5 kV Coordination and
Arc Flash Study

RED DEER HOSPITAL

25 kV Switchgear Upgrade

ATCO ELECTRIC

25 kV Overhead Distribution Upgrade

SHAW CONFERENCE CENTRE

15 kV Switchgear Upgrade

CANEXUS, ENCANA, SUNCOR, HUSKY, NOVA CHEMICALS, SPECTRA ENERGY

Functional Process Safety Lifecycle Guidance

CELANESE

Refrigeration system electrical and PLC control
system design

RESPONSIBILITIES

- Owner's Engineer
- Lead Electrical Engineer for Projects in charge of technical design, execution, construction support and commissioning
- Interface management with operations, maintenance, IT, SCADA, facility, external engineering, automation integrators, senior management and others as required;
- Technical support to operations and maintenance
- FEED (Front End Engineering and Design)
- Project management and controls (capital and maintenance projects)
- Functional Safety Advisor
- Stewardship of MOC (Management of Change) for brownfield and greenfield facilities;
- Specifications
- Conceptual Studies
- Scoping Studies
- Schedules / Cost Estimates
- Detailed Design Review & Guidance
- Construction & Commissioning Support
- Project Management

EXPERTISE

UTILITY INTERCONNECTIONS

AESO & AUC REGULATORY PROCESS

BC HYDRO REGULATORY PROCESS

ISO REGULATORY PROCESS

PSO/SPP REGULATORY PROCESS

- Completed transmission interconnection applications for the following:

- New load connections
- Additions to existing loads
- Applications for gas fired generation, solar and wind

- Familiar with BCHydro, Altalink, Atco and Hydro One utility processes

- Operating Agreements/Supply Contracts/PPA's/vPPA's

- Technical review of electrical grid studies to understand capacity and upgrade needs including feasibility, system impact and facilities studies.

- A deep understanding of the Independent System Operator (ISO) regulatory process, including:

- Stage 0 through 6;
- Schedule Constraints;
- System Constraints;
- Documentation for each stage;
- Tariff rules;

- Reliability and Compliance Requirements

- WECC/NERC/CIP /

Requirements;

- BC Hydro/AESO Independent Engineer Review and Sign-off

LEGAL – TECHNICAL EXPERT

CATCH ENGINEERING

Insurance technical expert wrt functional process safety

KGC CONSULTING

Houle vs. BC Hydro Arbitration

ALBERTA UTILITIES COMMISSION

Technical Expert – Confidential Project

MCLEAN & ARMSTRONG

Technical Expert – Confidential Project

ELECTRICAL APPARATUS

- HV 240kV, 138kV and 69kV

 Switchgear/Substations, including switches, breakers, CT's/PT's, metering, grounding and protection/control;

- MV Switchgear up to 25 kV

 including GIS indoor Switchgear, MCCs, Fused disconnects, vacuum contactors, vacuum circuit breakers, and air magnetic breakers;

- LV switchgear including switchgear, MCCs, power circuit breakers, and PDCs (Power Distribution Centers);

- VFD's up to 15kV;

- Load interrupter switches, power fuses, segregated phase and isolated phase bus duct;

- Transformers up to 240 MVA, 240kV, including 138kV, 69kV, 25kV;

ROTATING MACHINES

- Induction motors up to 50,000 HP, 11 kV

- Synchronous motors up to 24,000 HP, 13.8 kV

FUNCTIONAL PROCESS SAFETY

- Functional Safety lifecycle guidance and leadership

- SIL Determination and Verification studies

- HAZOP, HAZID, SILD, SILV, LOPA

 procedures and standards;

- Project Management and technical

 expertise for various clients;

- SIS implementation in facilities;

- Course instruction for SIS systems;

EMERGENCY AND UPS POWER SYSTEMS

- Inverters, battery chargers, static transfer switches;

- Emergency diesel generators up to 2.5 MW;

BATTERY ENERGY STORAGE SYSTEMS

- Tesla Mega-Packs

DC SYSTEMS

- DC distribution systems- Switchgear DC battery bank sizing;

GENERATION

- GE LM6000 45MW Aeroderivative GTG, including:
- FEED, detailed engineering, construction support, commissioning and startup
- Responsible for electrical and controls design, including substation interconnection, GTG, Balance of Plant;
- FEED on multiple Aero-derivative machines;
- Siemens SGen Industrial Generators FEED
- Joffre Cogen, including 501F gas turbine with HRSG
- Extensive experience with AESO for cogeneration applications
- Generator and protection relay upgrade at hydro stations
- Hydro station electrical equipment upgrade evaluation
- Excitation system evaluations, engineering, trouble-shooting and upgrades
- Major generator maintenance including re-wedging of rotor and stator at a thermal generation station
- Upgrade of slip ring excitation system

OVERHEAD DISTRIBUTION

- 3 phase 240kV, 138kV overhead transmission design;
- Three phase and single phase 25kV 14.4/8kV overhead distribution design;
- Fiber and OPGW systems with transmission lines;
- System planning including system reviews, evaluations and future loading;
- Construction design standards;
- Fusing coordination and protection;
- Rural subdivision design including both overhead and underground cabling;
- Overhead to underground power line road crossing design.

ELECTRICAL PROTECTION

- Protection and Control schemes for all electrical apparatus;
- Lightning (surge) protection including insulation coordination;
- Schweitzer, Multilin, Basler, and Areva protection relay applications including settings files, IRIG-B, Ethernet, RS-485, and RS-232 communications.
- Restricted earth fault, differential (transformer, bus and generator)
- Automatic Voltage Regulators
- Generator Excitation system

POWER MANAGEMENT SYSTEMS

- PMS for industrial generation and load sites;
- GE MultiLiin and SEL systems;
- architecture and I/O list development, design, testing and commissioning;

INSTRUMENTATION AND CONTROL

- Control narratives;
- Shutdown keys;
- Pipeline Pump Control;
- PLC's (Allen-Bradley & Modicon);
- DCS (Honeywell, DeltaV, Siemens);
- Closed loop PID control;
- Fire, gas vibration, density, pressure, temperature, level and flow instrumentation;
- Modbus, ControlNet, Profibus and Ethernet communications;
- Control valves and MOV's;
- Fire detections and protection systems;
- Catalyst metering;
- Control systems electrical design, and P&ID development;
- Pump and Compressor Control;
- SCADA Telecommunications;
- RTU's;
- Leak Detection Systems;

MEASUREMENT

- Custody transfer flow computers;
- Omni, Accuload and ROC;
- Flow meters;
- Truck/Rail Loading/Unloading;
- Measurement Canada requirements;

ELECTRIC HEAT TRACE

- EHT Distribution Skids
- SR and MI trace design
- Tank EHT design

MISCELLANEOUS

- Front End Engineering Design
- Technical specifications;
- Performance specifications;
- Cost estimates;
- Schedules;
- Tender documents;
- Bid evaluations;
- Contract strategies and execution;
- CWPs (Constructions Work Packages);
- FAT, construction procedures;
- CSA/API hazardous area classifications

PROJECT MANAGEMENT

- Leadership of design and owners' team including:
- Scope definition;
- Schedule creation for design, construction and commissioning;
- Cost control;
- Management of multiple simultaneous projects;
- A proven ability to plan, lead, prioritize, organize and manage work and teams in a cross-functional organization;
- Experience leading teams, coordinating work and interfacing with many stakeholders in multiple locations and disciplines
- Risk reviews of schedules and cost estimates, critical path determination

COMMISSIONING

- Commissioning Management including:

- Detailed execution plans;
- Integrated schedules;
- Consolidated budgets;
- OEM FAT's
- E-house FAT's;
- Procedures;
- Vendor scopes and coordination;
- RASCI charts;
- Integration of various disparate groups for successful completion;
- Daily update meetings;
- Reporting;
- RFI's;

- Electrical Equipment including:

- 138kV substation equipment such as breakers, disconnects, transformers, relays, measurement, control;
- 25kV GIS switchgear
- 5kV and 600V switchgear
- up to 15kV VFD's such as Siemens, Toshiba and Yaskawa;
- All voltages of transformers and cabling;
- Motors up to 50,000 horsepower;
- Electrical Protection relays;
- UPS and batteries;

- Controls including:

- DCS including DeltaV, ABB, Honeywell and Siemens;
- PLC's including Modicon and Rockwell;
- Shutdown Key testing;
- Control narrative testing;
- Alarm and trip setpoints testing;
- Communications systems;

- Communications Systems including:

- RS-485/232
- Modbus TCP/IP;
- Ethernet IP;
- ProfiNet;
- ControlNet and DeviceNet;
- Radio Communications Systems;
- SCADA and Leak Detection Systems
- RTU's, SCADAPack;

- Mechanical Equipment including:

- Piping;
- Pumps, including centrifugal and reciprocating;
- Compressors, including reciprocating and screw compressors;
- Turbines including gas and steam;
- Auxiliary systems including lubrication, vibration and temperature monitoring;
- Control strategies for pumps, compressors and turbines;
- Industrial Heaters, Boilers and fuel gas trains including B149 certification;

- Instrumentation including:

- Pressure, temperature, flow transmitters;
- Densitometers and viscometers;
- Level transmitters
- gas and oxygen detection;
- Flow computers;
- Mercaptan injection;
- Rail loading and unloading;
- Truck loading and unloading;
- Rail management systems;

- Power Generation including:

- Aero-derivative gas turbine generators;
- Stability, AESO and WECC testing;
- generator response testing;
- excitation systems;
- control system integration;

- Safety Instrumented Systems (SIS) including:

- 61511 compliant configuration, testing, field verifications and documentation