Canadian Prairies Group
http://www.cpgce.org

NEWSLETTER

of Chartered Engineers

Summer 2014

Liaison
Nigel Shrive

Liaison
Alastair Milne

Liaison
Ray Marsh

Liaison
John Charrett

Associate Institution

Liaison
Alan Rhodes

IN THIS NEWSLETTER

Chairman's Notes **Summer 2014**

Dear members

Hello everyone- I hope everyone enjoyed our wonderful warm, okay hot summer. After what we went through last winter, I am not going to complain at all .

As those of you who were present in such a large number on February 1 at our AGM will recall, we now have a change in our Executive committee. I have the task of being the chair following the giant footsteps of Nigel Shrive. as you may recall, the CPGCE was in grave danger of folding up its tent when Nigel took over its helm and steered it from the choppy waters the calm seas the group is now sailing in . we all are greatly indebted to Nigel's

leadership in bringing back the CPGCE to such a vibrant organization, a record number of people willing to join and serve on the Committee.

Peter Gibby was elected as Vice Chair , Rick Marshall as Secretary and Bob Enever agreed to continue as Treasurer, together with the continuing Committee members: Adrian Dumbrava , Arun Kumar, Bob Sparrow, Colin Pollard, Maina Waiguru, Mia Jovic, Teddy Arevalo and Tom Martin. We welcomed the new members who stepped forward, namely Bob Salt, David Dean, Dilruk Gunsekera, and Mario Micallef.

Unfortunately some continuing members then decided to retire from the committee due to their individual commitments. So our appreciation for all their work on the committee, we thank Colin (for ably serving as our indefatigable Secretary for 7 years), Arun our web master , Teddy(for his work on the last Newsletter), and Maina (for his work on the membership database).

I also have to thank all who have made every attempt to attend our technical presentations, despite the cold winter.

At the AGM , we were enthralled by Dan Hladuik's wonderful presentation on "Planetary Robotic Explorers" , which was enjoyed by everyone

If you have any suggestions for the technical programme contact the Technical Meeting Coordinators identified on the back page. Please monitor :-

http://www.cpgce.org/technical2014.htm

for updates to our Technical Program.

We are making plans our next AGM which is scheduled for Saturday January 24th 2015 . If you have any suggestions for a speaker please contact organizer Mario Micallef or any of the committee members.

We have experienced some technical difficulties with our website and the committee is working on launching a new webpage. Our technical guru , our secretary Rick Marshall is ably leading this project having successfully set up our Linked in account if you are on Linked In , please join the CPGCE group. Once the website is set up , Rick is going to set up Facebook and Twitter accounts so that we are current in social media.

The scholarship Fund is also being revised and we will present the changes on our website.

So it's been an exciting time with some very engaging discussions continuing in the Committee , which is a sign of everyone wishing to improve the organization. Of course the Committee can only do so much as the support of the membership at large is critical to our existence. We will welcome suggestions /feedback/ constructive criticism and increase the visibility of the CPGCE.

Mohammed Jaffer

2014 FALL TECHNICAL PROGRAMME

All Technical Presentations are held at the Danish Canadian Club, 727, 11th Ave. S.W., Calgary, AB at 7:00pm on the specified date.

Wednesday, Sept. 10, 2014

Engineering Innovations in Brain Imaging

Dr. Bruce Pike – Professor of Radiology & Clinical Neurosciences, University of Calgary

Engineering innovations during the past 30 years have created unprecedented windows onto the living human brain and have revolutionized medical care and neuroscience research. In this presentation, Bruce will review many of the great medical imaging milestones during this period, discuss their impact on basic and clinical neuroscience, and muse about future directions

Wednesday, Oct. 8, 2014

Gas Hydrates and the Influence of Climate Change

Dr. Jocelyn Grozic – Associate Professor, University of Calgary and
Dr. Jeffrey Priest – Canadian Research Chair, Geomechanics of Gas Hydrates, University of Calgary"

The Arctic is experiencing dramatic rises in temperature that are likely to accelerate over the next few decades. This may lead to melting of ice-like methane hydrate locked with the pore space of sediments along the continental margin in the Arctic. Release of methane gas, a potent greenhouse gas, from hydrates may exacerbate Arctic warming. In addition, melting hydrate may significantly reduce the strength of the host sediment leading to slope instability. Dr Jocelyn Grozic and Dr Jeffrey Priest will introduce gas hydrate, the role of hydrate morphology on observed behavior of gas hydrate-bearing sediments, and explore what influence the change in climate of the Arctic may have on hydrate stability and the implications for the future.

Wednesday November 12, 2014

Design and Construction of the Glacier Skywalk

Dr Simon Brown P.Eng., Principal , Read Jones Christofferson Ltd.

When Brewster Travel Canada requested Expressions of Interest for the Glacier Skywalk, "visceral and gob-smacked" were terms they used to describe their vision. This was achieved by maximizing the inherent exposure "fear factor"

offered by the site. A glass floored walkway was developed using an innovative self-anchored eccentric cable suspension system. Simon will discuss the challenges associated with the design, construction, and environmental considerations of this one-of-kind project.

PRESENTATION MADE TO THE CPGCE ON MARCH 12TH, 2014

The Benefits of Direct Pipe

Presentation Abstract

Presenter: Wayne King, P.Eng. – President & CEO

Company: Innovative Pipeline Crossings Inc.

Innovative Pipeline Crossings (IPC) has brought the German-based directional drilling technique Direct Pipe, to the Western Canadian Market. IPC is a Calgary based, drilling contractor focused on providing safe, environmentally conscious solutions for trenchless pipeline crossings under rivers, roads and railways. With two AVN drilling heads (36" and 48"), Direct Pipe thrusters the company focuses on larger diameter pipeline projects.

Direct Pipe combines the advantages of the established Micro-tunneling method and Horizontal Directional Drilling (HDD) technology. A string of prefab pipes are pulled in with one continuous step.

The Direct Pipe method allows the trenchless jacking of a pipe in one step with concurrent excavation of the drill hole.

Similar to Pipe Jacking, the excavation of the soil is carried out with a Herrenknecht machine. The navigable machine pumps the excavated material via a slurry circuit above ground. The pipe is pushed forward by the Herrenknecht thruster. The pipe transmits the thrust force, required for drilling, to the cutter- head

IPC's presentation also explored the history of Direct Pipe on an international level, including discussion surrounding several European project successes. IPC identified the unique benefits of this directional drilling technology that include themes surrounding risk mitigation, lower environmental impact, less drilling waste, and potential project efficiencies. IPC also compared the Direct Pipe technology to the commonly used Horizontal Directional Drilling (HDD) method, contrasting the differences and which projects are suitable for Direct Pipe.

The presentation showcased how Direct Pipe can be a tool for 6 project cases including:

1. An aid tool for HDD pipe pull-in
2. Recovery tool for stuck or damaged pipelines
3. Insertion of a pipe into an existing tunnel or borehole
4. The Pipe Express method
5. The Direct Pipe
6. IPC's patented Easy Pipe method

The presentation concluded with a case study showcasing how IPC employed the Direct Pipe method for the first time in Calgary to lay a 180m long steel casing for power and telecommunication cables beneath North East Stoney Trail.

The presentation outlined the project delivery and some of the challenges encountered on the project including: extreme weather, fluids management, soil conditions and power needs.

Note:- the following is a summary of the presentation

Wednesday, April 9, 2014

Ensuring Safe Railway Shipments

Dr. Chris Bunce
GM of Environment, CP rail

CP Rail Network

CP's Vision is to be the safest most fluid railway in North America

Canadian Pacific Network

Track Miles 14,400 2013 Total Revenues $6.1 billion
Employees 15,000 2013 Net Income $1.13 Billion
Annual Carloads 2.7 million
Gross Ton Miles(GTM) 268 billion

Train Accidents (defined by US Federal Railroad Administration) the frequency is trending down for all rail companies, Canadian railways and |CP specifically consistently lead the industry.

60% of the train accidents are in yards. 40% on the mainline. The leading causes on the mainline are mechanical or track failure.

LAC- MEGANTIC EVENTS AND POTENTIAL FACTORS
July 5, 2013

- 11.25 pm MMA train engineer parks the train carrying 72 loads of crude oil at Nantes, QC for crew change , retiring to a nearby motel.
- single crew member
- hand brake application
- unattended train
- 11.30 pm Nantes resident calls 911 after seeing one of the parked locomotives on fire
- 11.42 pm 12 firefighters arrive on scene
- 12.12 am Fire is extinguished
- 12.23am to 12.15 am Two MMA employees arrive , firefighters leave soon after
- notes :- locomotive access, locomotive shutdown, communication.
- 1.15 am first explosion in Lac- Megantic is reported, followed by at least two others.
- 1.15 am to 4.00 am - Explosions continue and firefighters respond to surrounding areas as well.

Following the Lac-Megantic accident , regulatory activity accelerated significantly in Canada and the US

Canada	US
Dangerous Goods Safety	Hazardous Material Safety
Flammable liquids testing & classification	Improved tank car standards
Commodity information to Communities	Improve ER response capability & training
Requirements for Emergency Response Assistance plans (ERAP)	Special handling requirements
Speed restrictions ,route planning and analysis for Oil and Ethanol unit trains	Flammable liquid testing & limitations for reclassification of some crude types
Additional incident reporting requirements	Route planning and analysis
Additional spill response requirements in BC	Speed restrictions in high consequence areas
GENERAL	GENERAL
Securement & attendance Rules	Securement & attendance Rules
Fatigue Management Working Group	Crew Size
SMS Regulations	Fatigue Management
Grade crossing regulations	
Access Control regulations	
Wayside Detector Working Group	
Train Control Working Group	

TANK CAR STANDARDS POST LAC - MEGANTIC

Both FRA and TC have undertaken to enhance safety and securement of Hazmat rail transportation by:

- Adoption of CPC 1232 tank car standards in Canada.
- PHMSA issued Advanced notice of proposed Rule making for DOT 111tank car
- top fitting protection , reclosing pressure relief valves, 1/2" head shield , thicker and higher quality steel.
- FRA/PHMSA is considering additional measures for Crude and Ethanol rail transportation. these include:-
- Thicker jackets
- Full height head shields
- High capacity relief devices
- Thermal Blanket to improve fire rating of cars exposed to pool fires.
- Improvements to reduce the potential bottom outlet valve to open.
- retrofitting of existing pre-CPC1232 DOT111 cars

CTC111A-DOT111 TANK CARS

- 310,000 tank cars (pressure and non pressure) in the fleet, of which 240, 000 (77%) are DOT 111 tank cars.
- All DOT 111 tank operating today meet both current federal and AAR -North American Tank Car Committee standards and continue to operate safely.
- Non-pressure tank cars designed to carry hazardous and non hazardous materials including crude oil and ethanol.
- the tank car standard was upgraded in 2011,the new car standard is commonly referred to as the "Petition Car" of "CPC 1232":
  -Half head shield and increased shell thickness
  -rollover Protection for Top/Bottom fittings
- Nearly 25% of the Tank cars used to move crude today meet the Petition Car standard.
- DOT PHMSA Advanced Notice of Proposed Rule Making (ANPRM) issue to assess performance of the Petition Car standard and the older tank fleet.

Beginning on October 1, 2011, the new AAR standard for DOT-111 tank cars requires tank heads and shells to be constructed of thicker steel. The new specification also requires that heads and shells be constructed of normalised steel and in all cases $\frac{1}{2}$-inch (12.7 mm) thick half head shields must be provided. The AAR has also mandated a more robust housing or rollover skid for protection of top fittings. The new standards only apply to newly manufactured cars; there is no requirement to retrofit, repurpose, or retire existing DOT-111A cars built to the older design. The NTSB has called that design "inadequate," noting the older cars are "subject to damage and catastrophic loss of hazardous materials."

CP Safety Management System

- based on a "plan, do ,check, act" model of continuous improvement.
- Incorporates the international OHASAS 18001 SMS Standard.
- Ensures we meet or exceed all of the standards prescribed by federal regulations.
- Top -down/ Bottom up commitment to safe operations by all levels of the organization.
- Ongoing monitoring and evaluation is used to identify initiatives to improve safety.

CP passed its most recent ACC Responsible Care Audit in Oct 2012

Initiatives to Improve Safety

- $0.8 to $1.1 B annually capital investment in infrastructure ,technology and equipment
- Leveraging technology and monitoring systems to more effectively monitor and maintain infrastructure & equipment.
- Procedures and systems to support safe train handling.
- Equipment Health Monitoring Systems

Safety and Environmental Procedures in place for new and existing locations

- Product transfer between truck and rail car
- To identify and mitigate safety and environmental risks
- Sites assessed before setting up operations
- Procedures and training are in place to ensure that operations meet or exceed regulatory requirements.
- Periodic audits are conducted by CP or a third party in order to ensure compliance with transfer procedures.

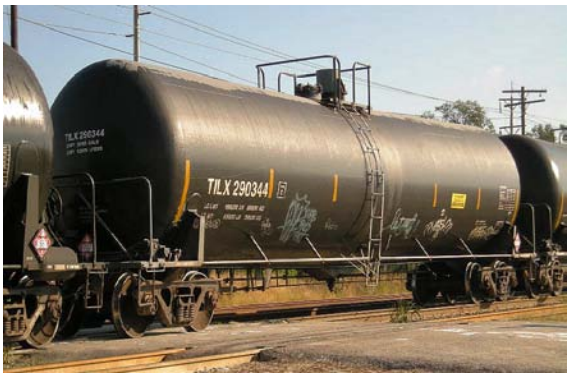
CP will receive the Railway Association of Canada Award for its risk assessment process for new Trans-load Operations.

EMERGENCY PREPAREDNES & RESPONSE

- CP works pro-actively with Emergency Responders and communities to prevent , prepare for , and recover from incidents.
- In partnership with CANUTEC, the chemical industry and our shippers.
- CP promotes community awareness and emergency response capacity through Trans*CAER*® by running and participating in training and events.

In the unlikely event of an incident , CP has:

- Emergency response Plans based on CSA Z731-03 "Emergency Preparedness and Response " standards.
- Established a 24/7 network of resources ,equipment contractors and experts to reduce response time ,limit impacts, and remediate impacted sites.



photographer: Harvey Henkelmann

DOT 111A Tank Car

ROLES AND RESPONSIBILITIES

Transportation Parties	Requirements /Responsibilities
Tank Car Owners	Tank car maintenance. Re-qualification of the tank car per regulatory requirements.
Shippers/Billers	Correct classification of the product. Appropriate container selection(tank car) and maintenance issues(i.e. corrosion). Correctly billing the cars with all the required regulatory information.
Loader/Unloader	Proper securement prior to offering them for transportation. Inspection of cars post loading. No Non -Accident Releases en-route. Not overloaded.
Carriers	Initial inspection at lifting terminal . Mechanical inspections en-route. Safe transit.

Impact of the of the 2013 Southwest Alberta Floods on CP

The rail bridge in Bonnybrook dropped more than 0.6 metres in 90 minutes following a 'structural failure,' according to the Calgary Emergency Management Agency. Led to morning traffic chaos.

Wednesday, May 14, 2014

HVDC Engineering

Alberta Electric System Operator(AESO)

Presentation on the Western Alberta High Voltage DC Transmission System

Steve Height P.Eng.

About the AESO

- Not for Profit corporation established by the 2003 Electric Utilities Act as the "Independent System Operator"
- Operates in the Public Interest
- May not own or hold an interest in any transmission facility, electric distribution system or generating unit.
- No government funding

The AESO's Core Functions:-

System Operations-

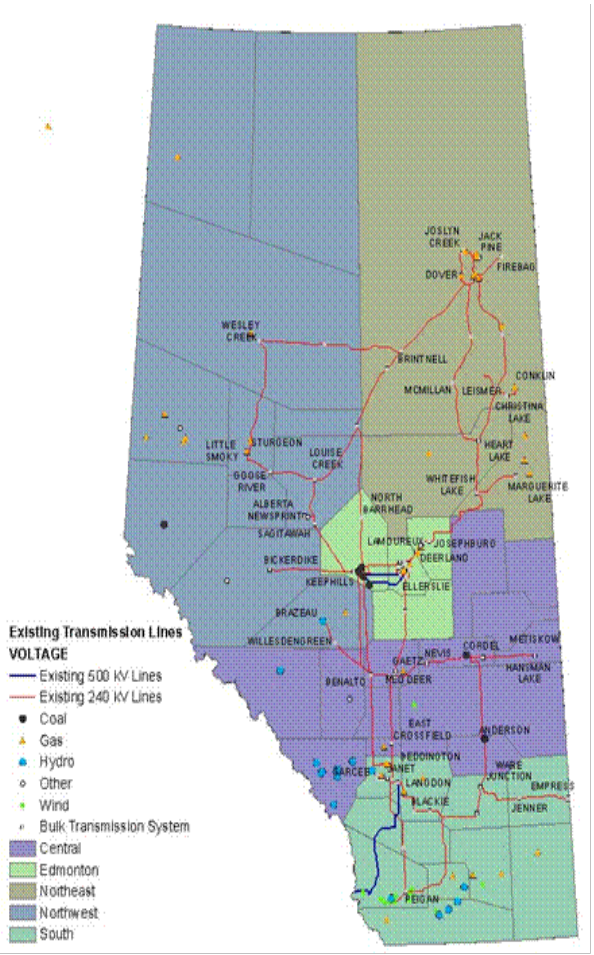
Direct the reliable 24/7 operation of Alberta's power grid.

Transmission System Development-
Provide continued reliability and facilitate the competitive market and investment in new supply.

Market services-
develop and operate Alberta's real time wholesale energy market to facilitate fair ,efficient and open competition.

Transmission System Access-
Provide access for both electricity generators and large industrial consumers.

Alberta's Power System - a snap shot



26000 km of transmission lines
Over 235 generating units
Approximately 500 substations
15,852 MW installed capacity
11,139 MW peak demand
80% load factor in 2013
176 market participants
3 interties:-
500 kV to B.C. (Path 1)
Back-to-back DC converter to Saskatchewan (Path 2)
Merchant line to Montana Path (83)

ALBERTA'S GENERATION SOURCES

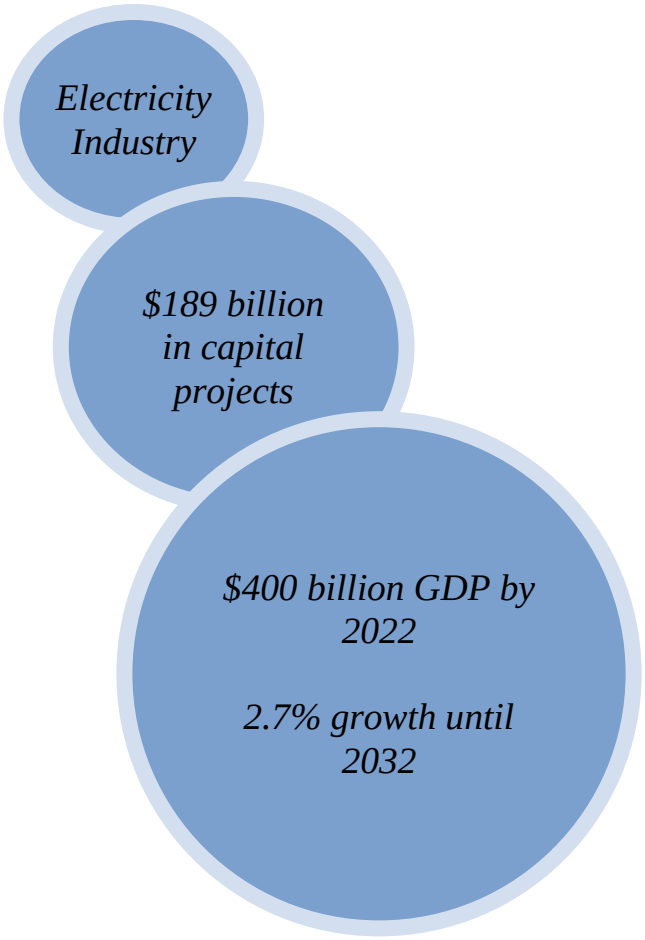
6,271 MW COAL

6,830 MW GAS

894 MW HYDRO

1,857 MW WIND(1434MW) AND OTHER RENEWABLES(423MW)

TOTAL INSTALLED CAPACITY : 15,852MW



*"Electricity is the facilitator of economic development in Alberta***"**

(2008 Provincial Energy Strategy)

Enables: $hundreds of billions in oil sands projects /10 years

Enables: GDP growth from $300 to $400 billion/10 years

High Voltage Direct Current and Alberta's Power System

DC Transmission is older than AC
Milestones:-

- The first commercial electric power transmission (developed by Thomas Edison in the late 19th century) used direct current.
- During the initial years of electricity distribution ,Edison's direct current was the standard for the United States.

- Supporting Technologies/Applications DC Generators ...Dc Motors... Batteries...
- DC Transmission faced limitations because at that time (Voltage cannot be raised easily ,which is needed to avoid large current carrying conductors)...No DC/DC Transformer.
- Early 1920's It was recognised that DC transmission could overcome the AC transmission limitations.
- late 1920's : the mercury arc rectifier emerged as a potential AC/DC/AC converter technology for transmission. - 1954: The Mercury Arc Valve Technology was used in a commercial transmission project (Gotland, Sweden)- 1971:Nelson River, Manitoba ,HVDC are the largest mercury arc rectifiers ever built.,
- At the same time: A new technology ,the silicon semi-conductor thyristor, began to emerge as a viable technology for the valves of HVDC systems.- 1972 ; the first project incorporated thyristors was the Eel River Project in New Brunswick.
- As a result of the advancement of AC/DC conversion technology, DC transmission made a comeback and is spreading!!!

- Very Limited Group of Facilities: -

- Around 140 HVDC systems worldwide
- Of these around 40 are back to back systems
- only 3 manufacturers have historically provided HVDC systems , namely :
  Siemens
  Alstom
  ABB

In contrast there are 434 nuclear reactors

NORTH/SOUTH PROJECTS SUMMARY

Two 1000 MW 500KV HVDC Lines
500 kV Bi-Pole Structures with neutral Conductor
+/- Stage -1 ; operated as mono-pole (1000 MW rating) . ISD Dec 2014

West Corridor HVDC (WATL)
from Genesee to Langdon
Approximately 350 KM
ISD DEC 2014

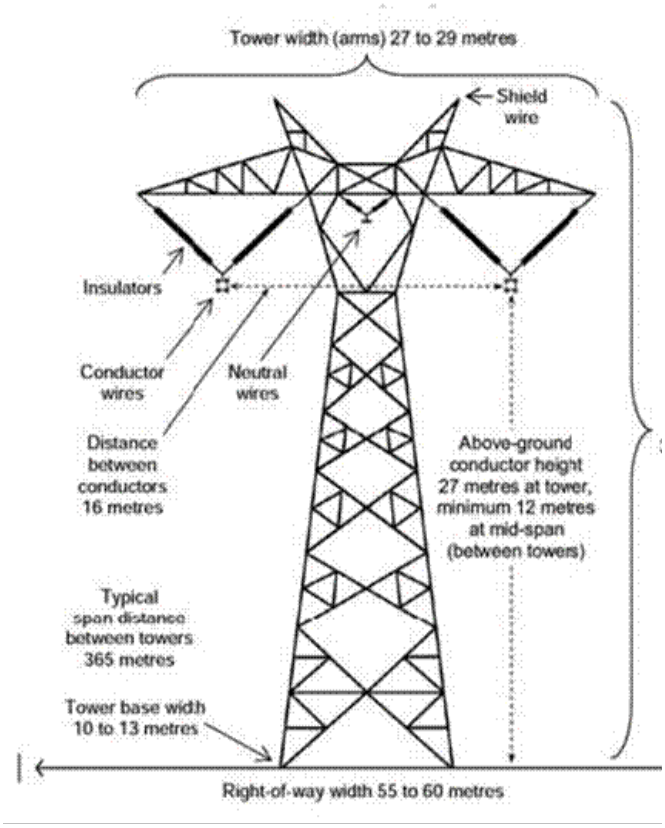
East Corridor HVDC (EATL)
from heartland to Cassils/WB
Approximately 500KM
ISD, April 2015

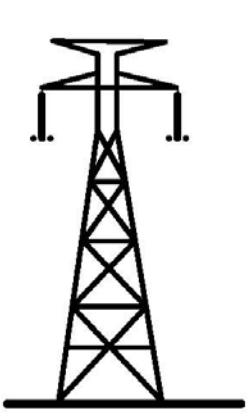
500KV HVDC Transmission Line

Typical Tower Outline

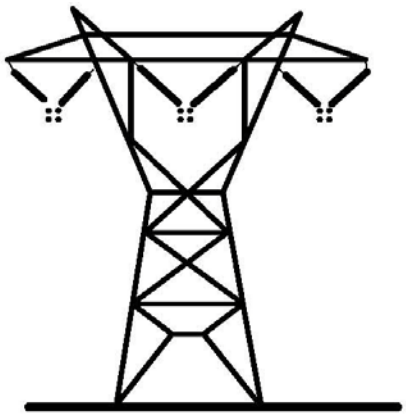
- Optimized to 2000 MW max capacity of 4000 MW
- BI-pole with neutral return
- Overhead shield wires :OPGW
- Stage 1 -monopole -1000 MW
- Stage 2 -Bi-pole -capacity to be determined through future planning
- Conductor : 4-1590 MCM ASCR per pole

26,000 km of transmission lines
Over 235 generating units
11,139 MW peak demand
15,852 MW installed capacity
More than 200 active projects;
includes both system and customer connections

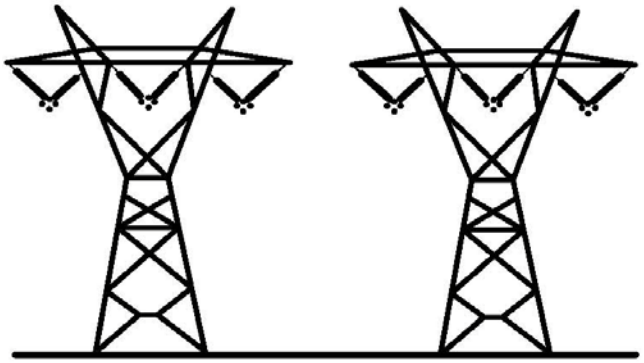




±500 kV DC
ROW = 61m



765 kV AC
ROW = 88m

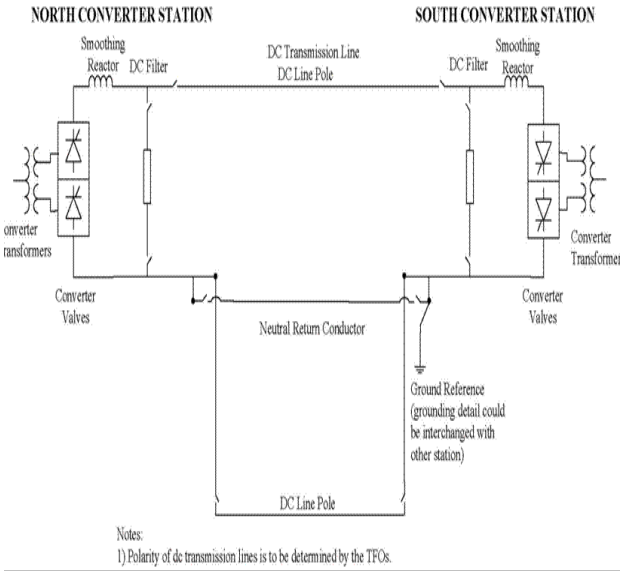


2 x 500 kV AC
ROW = 100m

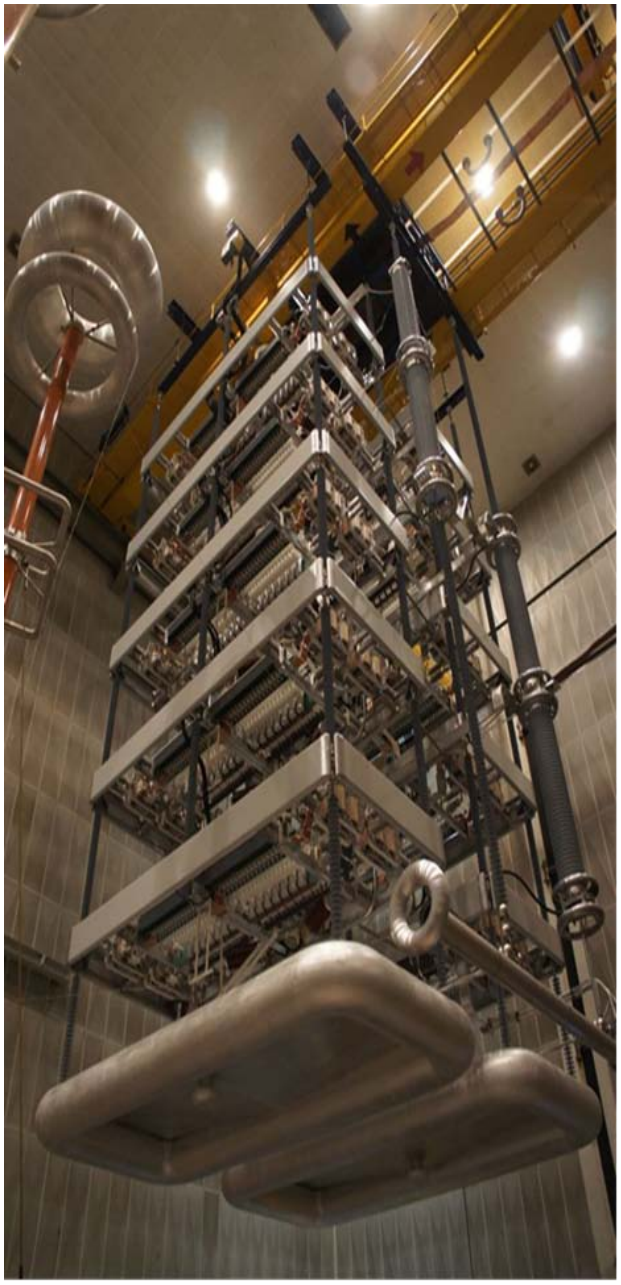
The ROW (right of way)width required for the DC Line is less than for the AC equivalents.

The above transmission lines are all for 2000 MW of capacity capability.

100m right of way may not meet Alberta standards, and may require more right of way width.



AC HARMONIC FILTERS



THYRISTOR VALVE STACK

DC Filter Capacitor Banks

Power System Operations

One Golden Rule

-Supply = Demand
- Speed of the system is measured in Hz (60 Hz - cycles per second)

No such thing as a Buffer
- i.e. no line pack
Solves cycle per cycle -every 60th of a second
-Speed (frequency) is critical

Very Tight Tolerance
- A generator is operating at 60Hz is good for 50+ years
- A generator is operating at 55Hz is good for minutes

HVDC operation is different than AC system operation.
- AC Operations
  - Flows are natural
  - Divide up on line impedance

-HVDC
  - Is dialed in and set by the operator.
  - So flow is determined and forced

Overall Operational Questions:-
  - How far can you push HVDC till the system breaks?
  - Where should you set HVDC economically?
  - How does HVDC affect areas and interchange?
  - What else may limit HVDC?
  - Can the system {existing) take HVDC testing?
  - When do you use HVDC when restoring the system?

Develop the HVDC Operating Philosophy :-
  - Maintain System Reliability
  - Relieve transmission congestion
  - Optimally minimise system losses

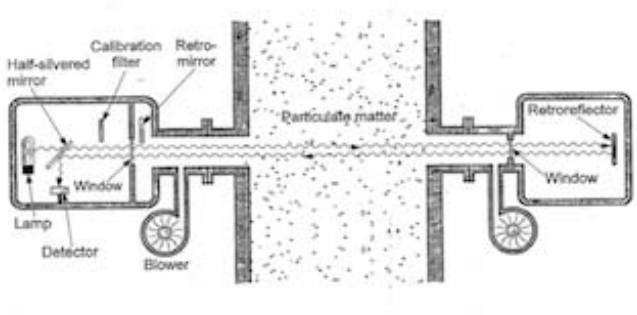
Wednesday June 11, 2014

Continuous Emissions Monitoring Systems (CEMS)

Kurt Hansen P.Eng, President of Green Inc.

Kurt gave a presentation on the code requirements for CEMS introduced over the last two decades. The Alberta Government has put in place under the AB 1998 CEMS Code and AB 2012 Continuous Emissions Monitoring requirements for all facilities where emission monitoring is a condition of the Environmental Protection and Enhancement Act (EPEA) approval. Over and above regulatory requirements for reporting SO_2, NO_x and CO_x, mass rates and sulphur recovery efficiency the data uses are for reporting emission inventory, corporate environmental performance and a data source for regional air modeling. The monitoring requirements apply in the main to power and large natural gas treatment plants.

To monitor plant's gas emissions it is necessary to sample and test the just prior to it



ejection into the atmosphere, which entails measuring the gas stream towards the top of the stack. There are two basic methodologies, in situ and extraction. The in situ is a more intuitive and uses a an optical probe inserted in the stack. The disadvantage of this approach is the probe stack is located tens of metres from ther ground which makes it difficult to maintain in the Alberta climate.

The alternative is an extractive system where a sample probe is installed at the requisite point and the gas extracted with a dilutent gas and this continuous sample is monitored at ground level with a purpose built analyser sysytem. There is a higher cost associated with this option but it is easier to maintain and will have a higher availability.

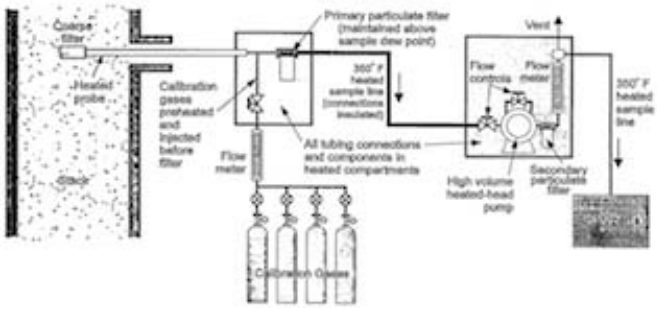
Besides the location of CEMS “single point/path” probe the gas sample must be a representative and a velovity velocity measurement is required. The measurement needs to verified for concentration and velocity stratification across the stack. A parallel sample point will be required for performance teating.

The provincial requirement is for 24/7 monitoring system and to ensure this objective is achieved it is necessary to to have regular scheduled mainetance and tesing of the monitoring sustem. Auto calibrations routines need to be built into the design. If the system does go down the regulations allow for equiavlent data from before and after the down time to used to provide as an average. Strategies for temporary system failures and maintenance down time need to be developed and implemented.

A Quality Assurance Plan (QAP) is a code requirement for a CEMS system and it must cover the following

- Installation design and specifications
- CEMS data collection and management
- Data validation
- Maintenance Plan
- System reliability and Plan B options for system downtimes
- Reporting formats

The presentation concluded with the following observations. CEMS is mandatory requirement for any plant in Alberta that has significant gas emissions. A rigorous CEMS-specific QAP is a must for all CEMS installations and serious attention needs to be applied to the Plant CEMS maintenance, data acquisition and



handling system(DAHS). The provincial regulator will not have patience with reported data reflecting an inadequate QAP and/or DAHS.

The provincial regulator’s credence is what gets measured gets managed.

The following members were proposed and duly elected to the executive committee at the Annual General Meeting held on February 1, 2014.

Executive Officers

Mohamed Jaffer E Chairman
Peter Gibby M Vice Chairman
Nigel Shrive Ci Past Chairman
Rick Marshall M Secretary
Bob Enever E Treasurer

Executive Members

To be determined _ Web/Technical
Tom Martin Ci Deputy Treasurer
Adrian Dumbrava Ch Scholarship Award1
Bob Sparrow Ch Scholarship Award2
To be Determined _ Newsletter
To be determined _ Memberships
Bob Salt M Technical
Mia Jovic E Technical
Mario Micallef Ci Technical
Dilruk Gunsekekera E Technical
David Dean E Technical
Abbreviations:
M= IMechE; Ci= ICE:Ch=:IChemE: S=IStructE:
E= IET: Mar= IMarineE

Sponsoring Institution Liaison Members

Alan Rhodes IChemE
John Charrett IStructE
Nigel Shrive ICE
Ray Marsh IET