Considerations in the Design, Construction and Interconnection of Cogeneration Facilities

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Abstract:

- With the gradual retirement of coal fired generation in Alberta, gas fired generation and renewables are growing. In 2016 and for the first time in Alberta, installed capacity of gas fired generation exceeded coal fire ones. A significant part of the existing and planned gas fire generation in Alberta is configured and proposed as cogeneration with high efficiency. The February 2017 IEEE/SAS, PES/IAS Joint Chapter will discuss topics and considerations associated with cogeneration such as selection of configurations, critical aspects of design, construction commissioning and operation of cogenerating facilities connections to the Alberta Interconnected System and experience and lesson learned.
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- That presentation will be done by multiple presenters and will be organized as follows:
  - Introduction and definitions and overall review
  - Process aspects of cogeneration
  - Electrical engineering considerations for cogeneration
  - Interconnection to the Alberta Interconnected Electrical System (AIES)
  - Experience with existing cogeneration facilities
  - Wrap up and conclusions

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References (Books)

- Cogeneration--combined heat and power (CHP): thermodynamics and economics, (Horlock)
- Handbook for Cogeneration and Combined Cycle Power Plant, (Boyce)
- Small-Scale Cogeneration Handbook, (Kolanowski)
- Conversion of Coal-Fired Power Plants to Cogeneration and Combined-Cycle Bartnik & Buryn)
- IET Digital Library: Cogeneration and District Energy Systems, (Rosen& Koohi-Fayegh)
- Cogeneration Design Guide /90392 (Paperback – ASHRAE)
- Cogeneration Design Guide (Orlando)
- Cogeneration & Small Power Production Manual, (Spiewak & Weiss)

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INTRODUCTION

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Definitions:

- Cogeneration: is the process of jointly generating two useful forms of energy (most common: electricity and heat)., especially the utilization of the steam left over from electricity generation to produce heat.
- Combine Cycle Generation: A high efficiency cycle, which include both gas turbine generator, heat recovery steam generator and electrical stream generator.
- Combined cycle cogenerations: a combination of combined cycle generation and cogeneration as described above.

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Definitions (for future reference):

- Trigeneration or combined cooling, heat and power (CCHP) refers to the simultaneous generation of electricity and useful heating and cooling from the combustion of a fuel or a solar heat collector cycle generation.
- Topping cycle plants primarily produce electricity from a steam turbine. The exhausted steam is then condensed and the low temperature heat released from this condensation is utilized for district heating, water desalination or other purposes
- Bottoming cycle plants produce high temperature heat for industrial processes, then a waste heat recovery boiler feeds an electrical plant.

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