

# NorthernLights

## High Voltage Direct Current Transmission (HVDC)



### Providing low-cost, environmentally attractive access to markets

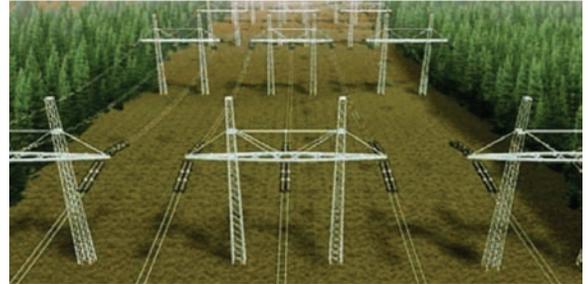
NorthernLights will facilitate the development of low-cost, environmentally attractive generation resources in Alberta and in Montana, Wyoming and other U.S. states.

Clean, fossil fuel and renewable resources in these regions will not be developed without long distance transmission line access to suitably large markets such as those in the Pacific Northwest and the U.S. Southwest.

The use of High Voltage Direct Current (HVDC) transmission line technology is an economically and environmentally attractive way to provide such access.

#### Among its strengths, HVDC:

- is the most cost effective way of moving large quantities of electricity over long distances (500 miles or more) because the lines cost less and have lower energy losses;
- is a proven technology in the western U.S.; two such lines have been reliably serving the southern California market for decades;
- is widely used elsewhere in the world;
- uses smaller transmission structures and narrower transmission rights-of-way than alternating current (AC) transmission of comparable capacity
- will not produce troublesome electro-magnetic fields (EMF); and
- can complement existing AC systems, improving reliability and security of electricity supply.



AC Transmission corridor with 3 500 kV lines for a total capacity of 3,000 – 4,000 MW



DC Corridor with one 500 kV bi-pole line for a total capacity of 3,000 MW



**TransCanada**  
*In business to deliver*

## NorthernLights – High Voltage Direct Current Transmission (HVDC)

### Comparing AC to DC

- AC lines transport alternating current, which is the common form of electricity produced from power plants and used in our homes, businesses and offices. It alternates 60 times per second while DC voltage remains constant like a flash light battery.
- AC transmission was chosen as the standard by utilities because it is the most cost effective for shorter distances and to supply energy to local distribution utilities and customers. DC is chosen for high voltages over long distances with few intermediate customers along the route
- DC transmission lines require a narrow right-of-way for the same capacity and have fewer line losses than AC transmission lines.

### Who is TransCanada

TransCanada is a leader in the responsible development and reliable operation of North American energy infrastructure. Our network of approximately 25,600 miles of pipeline transports the majority of Western Canada's natural gas production to key Canadian and U.S. markets. A growing independent power producer, TransCanada owns, or has interests in, approximately 6,700 megawatts of power generation in Canada and the United States.

### TransCanada and NorthernLights

- TransCanada has been working on the NorthernLights projects for more than four years. Through that period, extensive technical, economic, and routing studies have confirmed the viability of the NorthernLights concept. Independent studies by regional planning entities have also confirmed the significant benefits of such infrastructure development.
- TransCanada is a major North American corporation in excellent financial health with some US\$21 billion in assets and strong cash flow.
- TransCanada has more than five decades of experience in the long distance delivery of energy, and is North America's largest transporter of natural gas by volume. The company's forte is developing large, long-term infrastructure projects.

### For more information about TransCanada and NorthernLights, visit

[www.transcanada.com/northernlights](http://www.transcanada.com/northernlights)

or contact

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Western Canada and the Western U.S. have huge potential to supply growing electricity markets in the Pacific Northwest and the U.S. Southwest with environmentally attractive, stable-priced electricity. Meanwhile, the Western Electricity Coordinating Council (WECC) estimates the demand for power in the region will grow by over 30,000 megawatts (MW) by 2014.

TransCanada's NorthernLights projects propose to connect these sources of low cost and renewable supply to growing markets via long distance, High Voltage Direct Current (HVDC) transmission lines. Each line is estimated to cost US\$1.2 – 1.8 billion and will maximize the use of existing and emerging energy infrastructure corridors and rights-of-way where practical.

HVDC is the most cost effective way of moving large quantities of electricity over long distances (500 miles or more) because the lines have lower energy losses i.e. energy lost over the length of the line as a result of resistance in the wire and are less costly to build per mile than an equivalent AC line designed to transmit the same amount of energy.