

# Cascade Renewable Transmission Project

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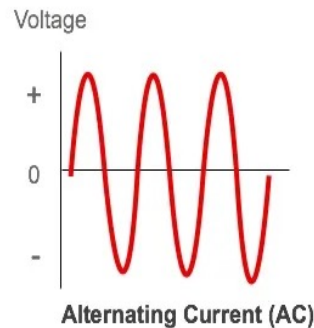
NW Energy Coalition Webinar  
July 2022

Chris Benson  
PowerBridge

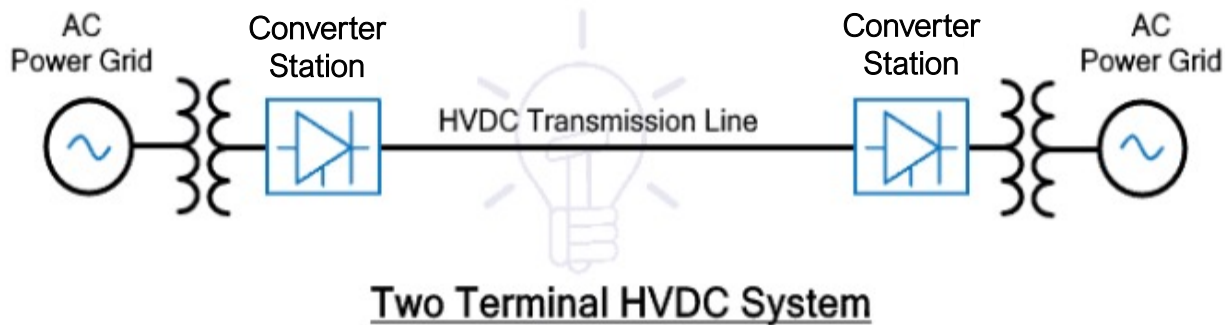
Corey Kupersmith  
Sun2o Partners

# What is HVDC?

HVDC = High Voltage Direct Current



- AC power from the Grid is converted (rectified) at an HVDC converter station near generation
- DC power is transmitted over long distances directly to another HVDC substation near the load center
- DC power at that station is inverted back to AC power and is sent back into the Grid



# Why HVDC?



- Controllability of power flow / reactive power
- Low losses over long distances
- Long underwater routes can be used (>50 miles)
- Newer HVDC converter stations provide massive voltage support to surrounding AC Grid at each HVDC substation
- No wildfire risk in submarine/underground cable applications
- No visual impacts along cable route
- High reliability
- Connect asynchronous AC networks
- Black Start capable

# HVDC Submarine Projects

Project	Country	Miles	Rating	Voltage	Online Date
ElecLink	UK-France	32	1000 MW	320 kV	2022
North Sea Link	Norway-UK	453	1400 MW	525 kV	2021
NordLink	Germany-Norway	387	1400 MW	500 kV	2020
Nemo	UK-Belgium	87	1000 MW	400 kV	2019
BorWin3	Germany	99	900 MW	320 kV	2019
BorWin2	Germany	120	800 MW	300 kV	2014
<b>Hudson*</b>	<b>NJ/NY, US</b>	<b>7</b>	<b>660 MW</b>	<b>345 kV</b>	<b>2013</b>
TransBay	San Francisco, US	53	400 MW	200 kV	2010
<b>Neptune*</b>	<b>NJ/NY, US</b>	<b>67</b>	<b>660 MW</b>	<b>500 kV</b>	<b>2007</b>
BassLink	Australia	230	500 MW	400 kV	2005
Cross Sound	CT/NY, US	25	330 MW	150 kV	2003

*Note:* There are many more HVAC aboveground and submarine cables worldwide, notably for offshore wind. One particular advantage of HVDC is the ability to transmit large quantities of energy over long distances underwater.

*\* Projects developed and operated by PowerBridge*

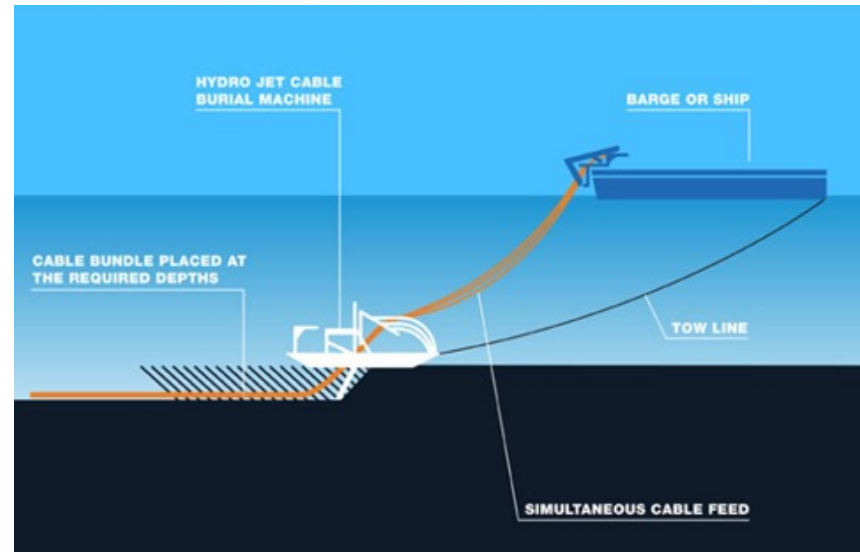
Over 150 HVDC projects in operation worldwide including the Pacific DC Intertie, which, while an aboveground line, originates in The Dalles, OR

# HVDC Submarine Cable



The main power cable is less than 6 inches in diameter; two cables are bundled with a fiber optic cable for burial in the riverbed.

The “jet plow” is towed by a barge or ship. Water jets in the plow blade create an 18-inch-wide trench by fluidizing the sediment while the cable is simultaneously laid into the trench, and the sediment settles back down over the cable.



# NEPTUNE

## Project Description

- 65-Mile-Long, 660-MW HVDC cable linking PJM electricity market with Long Island Power Authority (“LIPA”)
- 51 miles of cable buried undersea, 14 miles underground; two converter stations
- Completed June 2007 – under budget and ahead of schedule
- \$650M total cost, financed in the private capital markets, with investment grade rating
- Financing based on a 20-year Firm Transmission Capacity Agreement with LIPA
- Learn more by visiting project website [www.powerbridge.us](http://www.powerbridge.us)

## Route & DC Converter Station



# CRTP Route Summary



## Western Interconnection (Harborton)

- Converter Station with direct connection to PGE's Harborton Substation outside Portland
- Deliver renewable energy located east of the Cascades into Portland and up the I-5 corridor to Seattle

## Overview

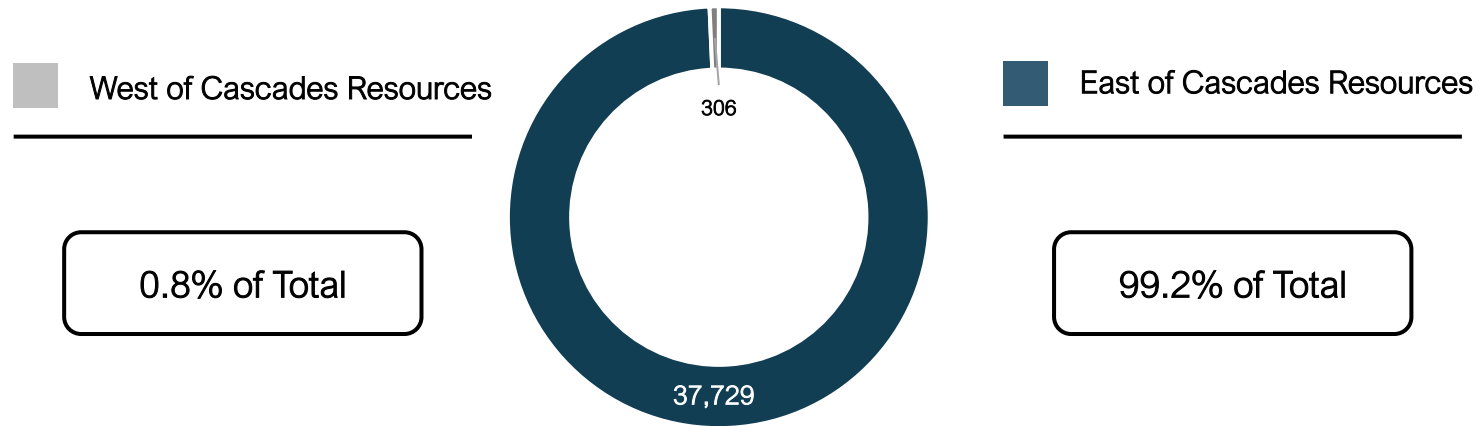
- 1,100 MW line rating
- VSC HVDC System
- ~100 Miles underwater and underground
- Bridge the Cascade Mountains while minimizing environmental impact

## Eastern Interconnection (Big Eddy)

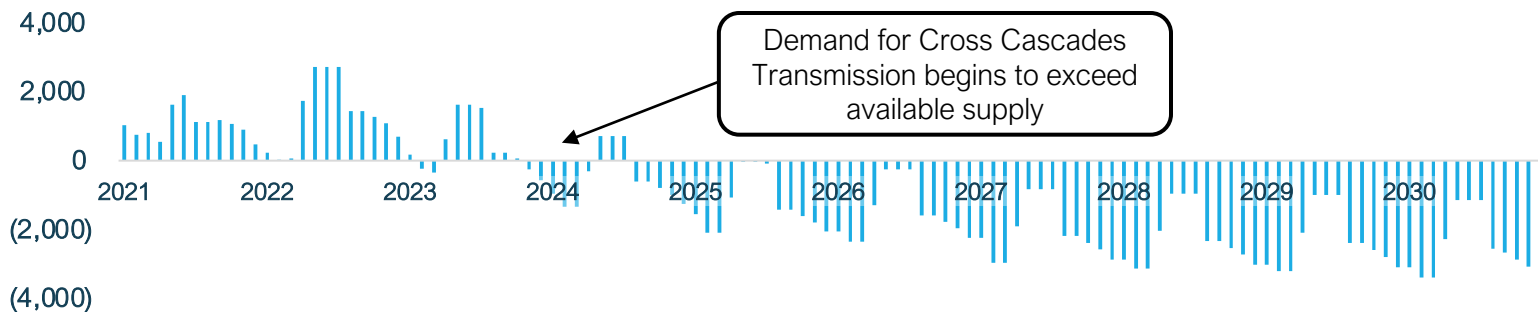
- Converter Station with direct connection to BPA's Big Eddy Substation outside The Dalles
- Source abundant renewable energy in the heart of BPA's transmission network

# Cross Cascades Constraint

## BPA Renewable Interconnection Queue Analysis (MW)



## BPA ATC Less Pending Queue on Cross Cascades South (MW)



New Transmission is needed to deliver east of Cascades renewables to west of Cascades load centers

Source: BPA ATC Less Pending Queue as of 12/21/2021, BPA Active Generator Interconnection Queue as of 12/21/2021. Includes interconnection requests Received, In Study, and Completed Study. Does not include Withdrawn or Energized projects or any proposed stand alone Battery Energy Storage projects.



# Conclusion

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- The Cascade Renewable Transmission Project is now in the permitting stage, planned for completion in Q4 2027
- For further information about the Project, please visit <http://www.cascaderenewable.com>
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