

HIGH VOLTAGE DIRECT CURRENT (HVDC) TRANSMISSION SUPER HIGHWAY BENEFITS TO THE PLAINS AND SOUTHEAST

Assessing two proposed HVDC transmission projects seeking to solve high energy demands in the South.

By Simon Mahan

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THE SOUTH IS THE NEW FRONTIER for the wind industry. As the rest of the country struggles with a lack of electricity demand growth, the South is expected to continue its robust growth demand in addition to retiring up to 30 gigawatts of coal-fired power plant capacity (Brattle Group 2012). In addition to developing in-region onshore and offshore wind energy resources, importing wind energy from the plains will be an important way to serve load in the South. Two large-scale high voltage direct current (HVDC) projects have been proposed to connect the Plains' strong wind resource to the South's strong energy demand.

PROJECT DESCRIPTIONS

Plains & Eastern Clean Line

Developer: Clean Line Energy Inc.

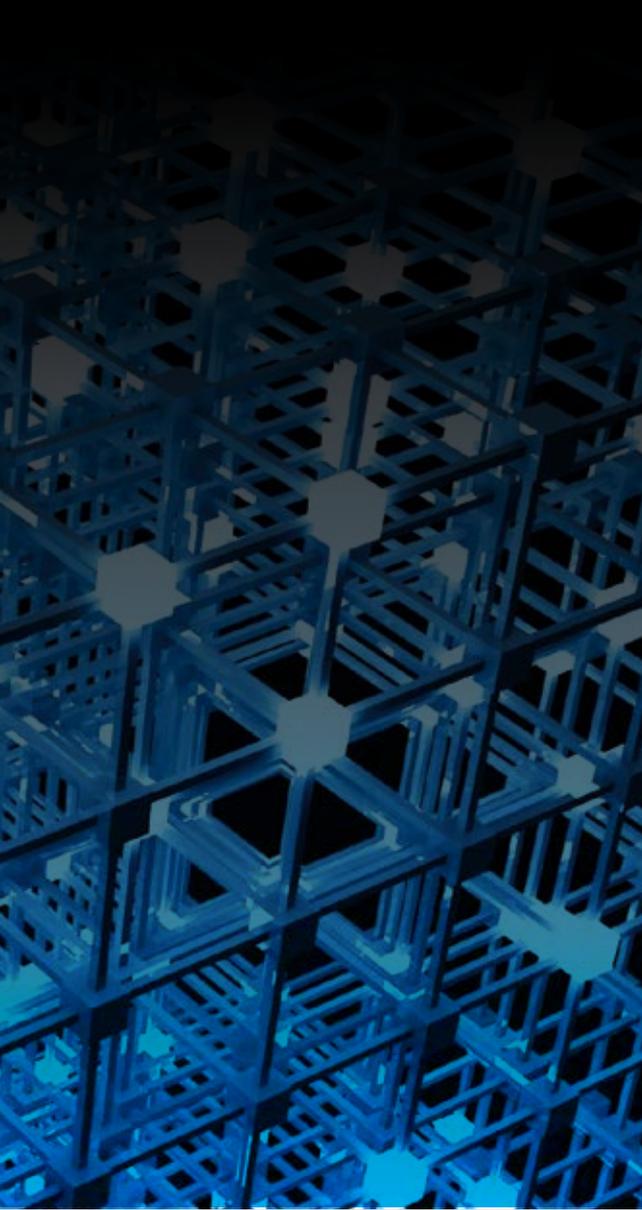
HQ: Houston, Texas

Project Length: 700 to 800 miles

Capacity: 7,000 megawatts (in two phases)

Estimated cost: \$2 Billion

The Plains & Eastern Clean Line is an HVDC project designed to connect up to 7 gigawatts of wind energy from the plains to Tennessee and the South beyond. Project developer Clean Line Energy estimates the 50% capacity factor wind



energy resource from the Plains could be sold into the Tennessee Valley Authority system for approximately \$55-\$60 per megawatt hour. General Cable (an Arkansas-based transmission cable manufacturer) and Pelco Structural (an Oklahoma-based tubular steel manufacturer) are preferred suppliers for construction materials. The company estimates approximately 5,000 construction jobs and 500 permanent jobs will be created by the Plains & Eastern project and associated wind farms while the South will benefit from low-cost, highly available wind resources. This project is currently under National Environmental Policy Act review through

the Department of Energy Section 1222 authority. Clean Line Energy is also developing three additional HVDC transmission projects connecting the Plains to other regions as well.

Southern Cross

Developer: Pattern Energy

HQ: San Francisco, CA

Project Length: 400 miles

Capacity: 3,000 megawatts

Estimated cost: \$1 Billion

The Southern Cross is an HVDC project designed to connect up to 3 gigawatts of wind energy from Texas to northern Mississippi, and from there into other parts of the South. Potential off-taker utilities may include Entergy, Southern Company, TVA or another southern utility. Project developer Pattern Energy has received a ruling from the Federal Energy Regulatory Commission allowing the Texas system operator (ERCOT) to remain independent while connecting the Southern Cross to the rest of the South. This ruling was vital for ERCOT participation.

WHY HVDC?

Constructing new HVDC transmission is not a new concept. Several HVDC transmission lines already operate in the United States and abroad. However, constructing HVDC infrastructure intended to move large quantities of high-quality wind energy from the plains to large demand loads in the Southeast has never been done. HVDC transmission provides benefits over alternating current (AC) transmission including lower cost, reduced line losses and a reduced footprint despite large-scale power transmission.

In order to access high-quality wind energy resources in the Plains states, transmission is required. Some wind farm developers have found existing transmission routes (AC) to deliver power to Alabama Power, Southwestern Electric Power Company and the Tennessee Valley Authority; however, without additional transmission capabilities, expanded use of existing infrastructure will be limited. Additionally, some wind farm operators must utilize available transmission through multiple regional transmission organizations which increases the cost and complexity of delivering power to the South.

WHAT ARE THE CHALLENGES?

Like any other billion-dollar project, HVDC transmission projects face their own challenges. Collecting anchor tenants, conducting interconnection studies and agreements, selecting component manufacturers and construction crews, managing environmental review and project routing are some of the steps in the development process.

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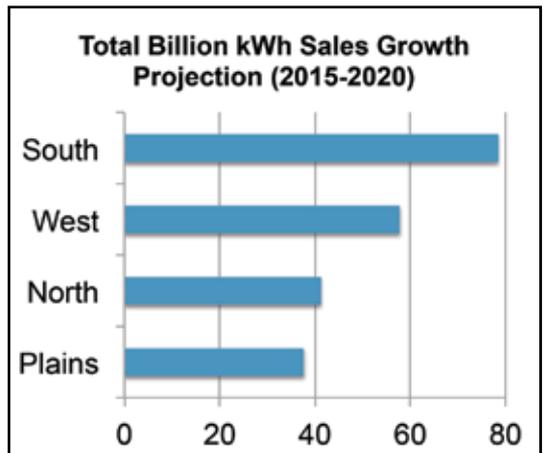
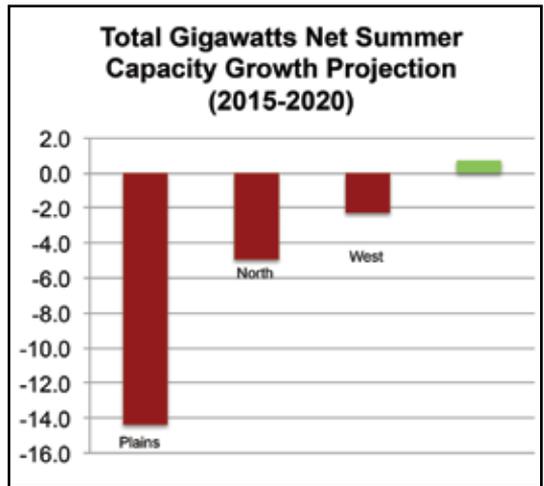


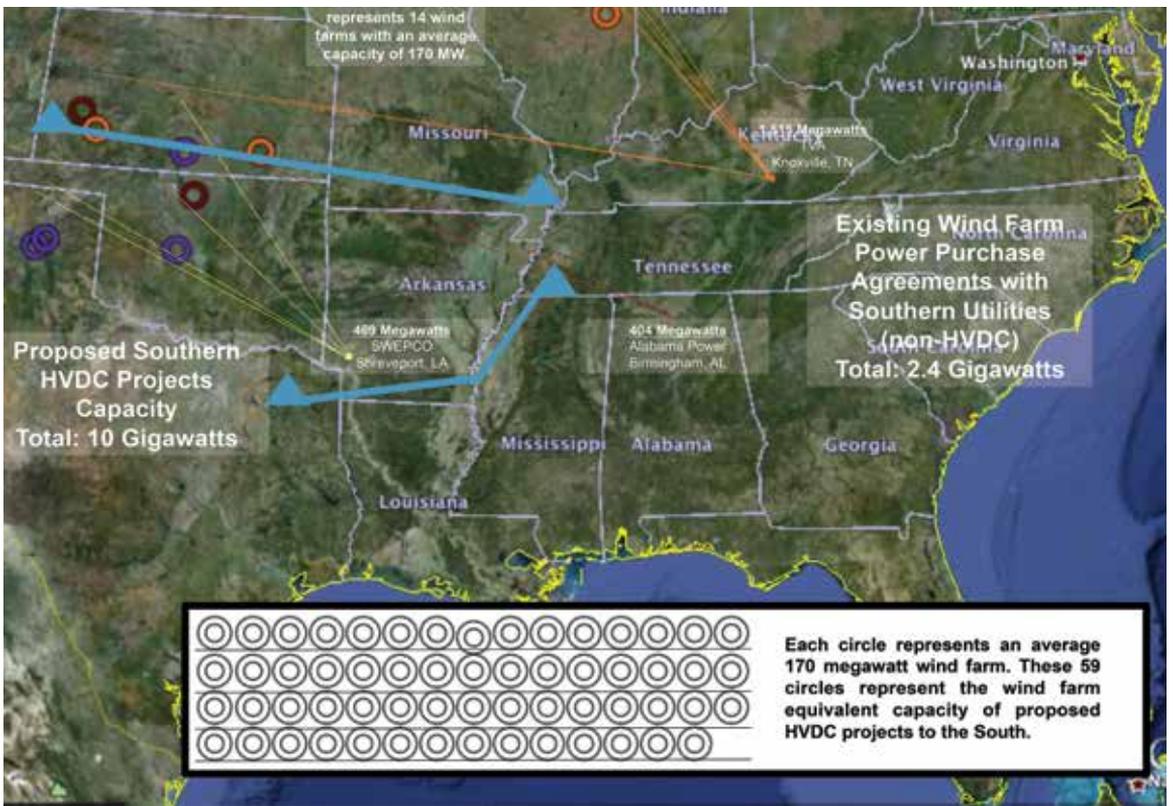
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| BATON ROUGE, LOUISIANA | LAKE CHARLES, LOUISIANA |
| BEAUMONT, TEXAS | HOUSTON, TEXAS |

However, perhaps the most important factor to ensure a streamlined process is stakeholder engagement. Local, state and federally elected officials must be informed on how these projects will benefit their communities, even if the projects' benefits are spread across several states. Presenting facts in a clear, timely and easily accessible way to local stakeholders encourages better siting practices and community relations. These relationships are extremely important to develop trust and prevent unnecessary ill-will or potential opposition.

WHERE'S THE DEMAND?

Between 2015 and 2020, the Energy Information Administration estimates that the South will be the only region with an increase in net summer generation capacity. The South's electrical demand is estimated to grow by an extra 78,000,000 megawatt hours – 36% more demand growth than the West, and more demand growth than the Plains and East, combined. (EIA Annual Energy Outlook 2013, early release.





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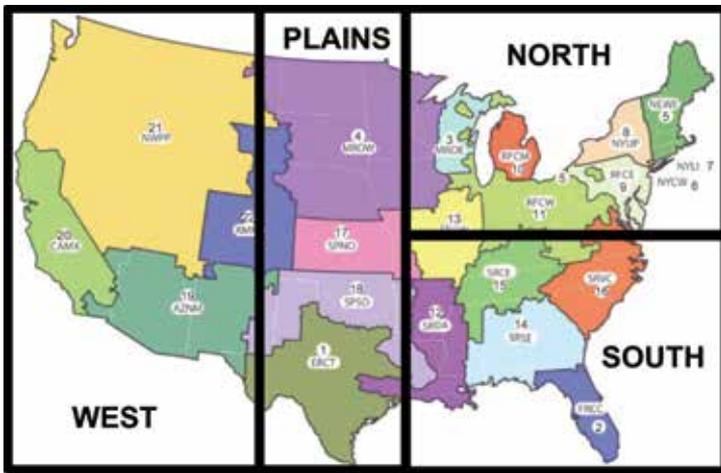
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WHERE'S THE SUPPLY?

In a National Renewable Energy Lab analysis, Southern wind energy resources at 100 meters could achieve at least 30% capacity factors. In the South, NREL estimates some 128 gigawatts of total wind energy potential may exist onshore. However, this amount only represents

approximately 1% of the country's total resource. The rest of the country also has substantially higher estimated wind resources – perhaps reaching past 50% capacity factor. (NREL 2011). ↙

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