Siemens is currently working on four HVDC platforms: BorWin beta, HelWin alpha, HelWin beta, and SyLWin alpha. The platforms’ names are derived from the names of Borkum, Heligoland, and Syt — the nearby North Sea islands. SyLWin alpha will transmit 864 MW and connect the Darlington wind farm to the grid from a site 70 kilometers west of Syt. That’s enough power to cover the needs of 1.5 million German households. “It’s comparable to the output of a large power plant,” says Suhr. The 160-kilometer-long line connecting SyLWin alpha to the grid will be the world’s longest submarine cable for an offshore network connection. A further 45 kilometers of cables will transmit the electricity over to a connection point in Büttel, where the direct current will be converted back into alternating current for the German power grid. Siemens is building the platforms in cooperation with the Dutch-German company TenneT. Offshore wind farms known as Veja Mate and Global Tech 1 are located about 125 kilometers from a site 70 kilometers west of Sylt. That’s enough power to cover the needs of 1.5 million German households. “It’s comparable to the output of a large power plant,” says Suhr.

The BorWin beta platform transforms the alternating current supplied by wind turbines from 155 kilovolts to 300 kilovolts before converting it to the same voltage of direct current. The platform houses all of the equipment for the HVDC converter: the converter itself as well as two transformers, four compensating reactors for the alternating current cables and gas-insulated high-voltage switchgear technology. HelWin alpha and HelWin beta will be used in a similar manner: 35 kilometers north of Heligoland, where they will handle capacities of 576 MW and 690 MW, respectively. HelWin beta will serve as a smaller sub-platform, which means it will only have a few emergency shelters instead of comfortable crew quarters like the ones on HelWin alpha. “Staying there would be a bit adventurous, as the platform has no running water and is merely equipped with a chemical toilet,” says Suhr with a grin. The platforms are generally unmanned and can be remotely monitored by the grid operator. The crew quarters are occupied only when the platforms are being installed or undergoing maintenance.

Forests of Offshore Platforms for the UK.

The offshore switchgear project is an example of the fact that pioneering achievements are rarely accomplished without a hitch. Despite technical obstacles, the new facilities had to be certified by the customer. In addition, the approval processes have been more time-consuming than expected. These processes are very protracted for two reasons: Not only do many components have to be approved separately, the standards aren’t actually defined until participating organizations begin processing the order. Due to these hurdles, the first platform will be delivered over a year later than planned. Costs will increase considerably as a result.

However, the sector has substantial business potential — and not just as far as Germany.

E veryday, Jörg Grützner is a witness to the “pyramids” of the North Sea on the grounds and adding a racetrack. What’s more, Europe’s biggest photovoltaic park is now being built where ammunition depots once stood, and the former military security zone around the airfield has been transformed into the Schorfheide biosphere reserve. “The Russians never let us get close to this place before,” Grützner, 55, says with a obvious satisfaction. “But today I’m cruising around on their runway.” Grützner has been driving trucks for over three decades. But for the past year he’s been working exclusively at the former airfield as a test driver in ENI BUA (Electric Mobility for Heavy-Duty Commercial Vehicles) as a Means of Reducing Environmental Pollution in Major Metropolitan Areas), a pilot project that is being jointly conducted by Siemens and Germany’s Environment Ministry.

Siemens researchers have converted into an energy-efficient custom truck. The Energy Puzzle | Electric Trucks

Siemens researchers are examining methods for the future electrification of road freight at a 1.5-kilometer test track at a former Soviet airfield base north of Berlin.

The Energy Puzzle | Electric Trucks

Siemens is using an old airfield north of Berlin to test hybrid-electric trucks equipped with pantographs like the ones on streetcars. The trucks could be used between logistics centers and mines or ports. Heavily-traveled truck routes in urban areas are another possibility. Either way, the technology could help to decouple rising freight traffic volume from carbon dioxide emissions.
The ENUBA project in Germany’s Uckermark region is taking Siemens scientists a step back into the future. It was nearly 150 years ago (and just an hour’s drive away) that engineers began testing the grandson of the ENbUa electric truck. On April 29, 1882, Werner von Siemens officially opened the world’s first testing facility for an electrically powered trolleybus in the Halensee district of Berlin — just one year after the first electric streetcar entered service. The “Elektricität” (top), as this first coal-to-electric bus was called, had a history dating back even further, as von Siemens was already dreaming of an electric drive system as early as 1847. “If I ever have the money and the time,” he wrote, “I would like to build an electric colossus with a payload capacity of 40 tons.”

Germany’s Environment Ministry (BMU) would like to see such trucks on normal highways in the future — in the far right lane with an overhead line. This wouldn’t be difficult to do, technically speaking, says Lehmann: “Integrating the system into existing road networks would be relatively easy, and its installation wouldn’t restrict other vehicles in any way.” More than anything else, the technology could help get the rising CO₂ emissions caused by road freight transport under control. Program and a Swiss transport consulting firm, predicts, for example, that by 2050 the volume of trucks on highways will continue to increase in the future. The company reports that freight transport on highways (as opposed to on train-kilometers) in Germany alone will increase by 116 percent by 2050 as compared to 2005 levels. According to a study conducted by Prograns, the BMU, and the German Ministry of Transport, such measures would reduce annual CO₂ emissions to only about 60 million tons by 2050. But the EU’s goal is to limit emissions to approximately ten million tons — a target that can be achieved only by electrifying road freight transport (see chart). Meeting that target, however, requires that the lion’s share of the power for electric trucks must be produced from renewable energy sources, which is still a long way off.

Meanwhile, work continues in the Uckermark region. Scientists there plan to upgrade the test track by installing curves, overhead road signs, and electric traffic control systems. The technology will then be optimized and tested under normal road conditions. Grützner, for his part, would also like to drive his electric truck outside the confines of the facility to glide effortlessly down the track in the electric drive system for a few hundred kilometers. Doing so might be dangerous, however, as Grützner points out: “That smooth humming sound tends to put you to sleep after a while.”

All told, implementing the new technology will take a lot of money. The German Advisory Council on the Environment estimates infrastructure costs at €1.1 million to €2.5 million per kilometer (including guard rails and overhead power lines). However, Siemens experts aren’t thinking about electrifying entire highways. “We’re initially examining well-traveled routes over short and medium distances,” says Lehmann. “These include back-and-forth truck routes that have no rail connections — like routes between logistics centers and ports, or from mines to central storage facilities and transshipment centers.” The “tram-trucks” could also play a major role in cities like Los Angeles, where the city government is looking for a zero-emission solution for Highway 710. This congested 30-kilometer road runs right through the middle of Los Angeles, linking the city’s port with its main logistics center. It is estimated that Highway 710 sees some 35,000 truck trips every day. Pollutant emissions have reached such high levels that the air quality authority in LA has considered temporarily closing the road at certain times. Rail system capacity is also stretched to the limit — there’s simply no room left in this crowded metropolitan area. Siemens experts therefore believe this is an ideal place to put ENbUa technology to work; they want to submit a tender to Los Angeles that would offer their electric trucks as a solution to the space and emission problem. The company reports that freight transport but also existing highway freight traffic could also play a major role in cities like Los Angeles, where the city government is looking for a zero-emission solution for Highway 710. This congested 30-kilometer road runs right through the middle of Los Angeles, linking the city’s port with its main logistics center. It is estimated that Highway 710 sees some 35,000 truck trips every day. Pollutant emissions have reached such high levels that the air quality authority in LA has considered temporarily closing the road at certain times. Rail system capacity is also stretched to the limit — there’s simply no room left in this crowded metropolitan area. Siemens experts therefore believe this is an ideal place to put ENbUa technology to work; they want to submit a tender to Los Angeles that would offer their electric trucks as a solution to the space and emission problem. The company reports that freight transport but also existing highway freight traffic