



SUSTAINABLE ENERGY

FINANCING GERMANY'S ENERGY TRANSITION

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Germany's attempt to rely on renewable sources of energy for 80 percent of its electricity demand by 2050 is one of the most ambitious economic ventures in the nation's history. It requires the utility industry, which has relied heavily on conventional energy in the past, to undergo a fundamental change. In addition, the investment costs involved in this project are enormous. Our projections show that it remains uncertain whether there will be sufficient financing to meet the investment needs of both Germany's transmission network and its conventional power generation. As a result, it is important for the government and regulatory bodies to adopt countermeasures – otherwise the energy transition may fail.

According to Oliver Wyman's calculations, the investments required to realize Germany's energy transition may come to as much as \$469 billion by 2033. Out of this amount, up to \$282 billion will be needed as soon as 2023. Renewable power generation will be the largest cost item followed by investments in expanding transmission and distribution networks (including the introduction of

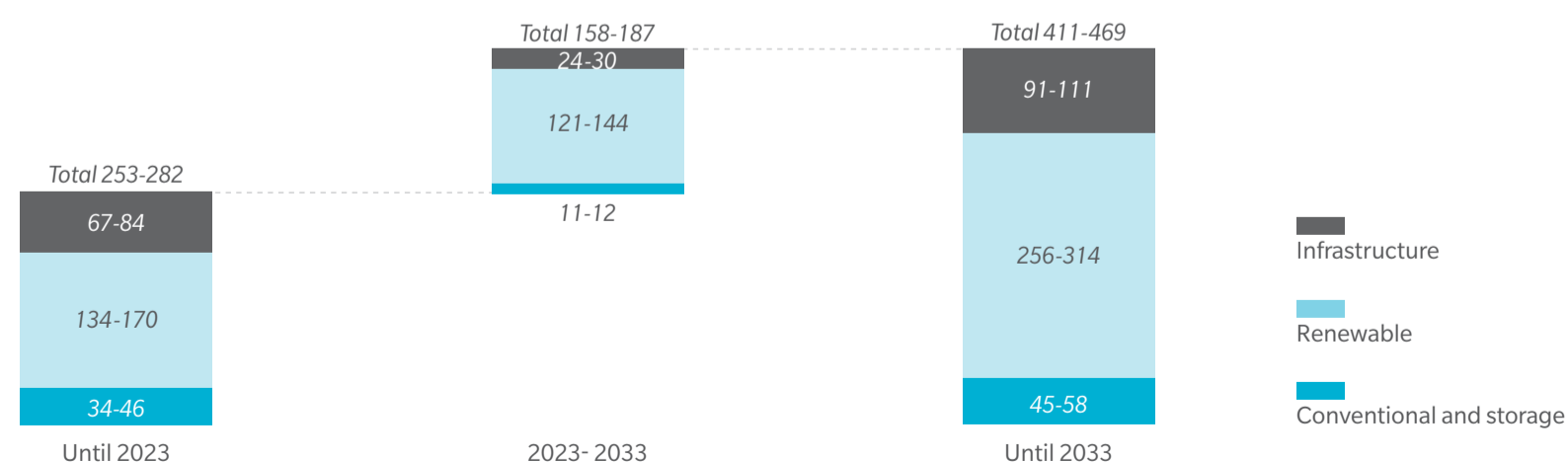
smart meters), which will likely require \$111 billion. Conventional power generation and storage will need investments on the order of \$58 billion. Both are necessary to secure energy supply in Germany, given the uncertainty of the availability of renewable power sources. (See Exhibit 1.)

At the same time, because of the stagnating energy business in Germany, the earnings base for utilities is fundamentally shifting from centralized to decentralized activities. This significantly limits the freedom of traditional players to make investments. Consequently, if current conditions and goals remain the same, the utilities' market share in power generation capacity will probably decline by one-third, to less than 50 percent by 2033. New players, such as private individuals, banks and private equity investors, will enter the energy market as competitors. Even with these additional players, it won't be possible to cover the investments needed for the energy transition in all areas. There will be considerable gaps in the financing of the transmission network, conventional generation and storage, as well as offshore wind, until 2023.

EXHIBIT 1: INVESTMENTS REQUIRED FOR GERMANY'S ENERGY TRANSITION

RANGES FOR INFRASTRUCTURE, RENEWABLE POWER AND CONVENTIONAL POWER AND STORAGE, REFLECTING MULTIPLE SCENARIOS MODELED BY OLIVER WYMAN

ESTIMATED COSTS BY INVESTMENT AREA IN BILLIONS OF DOLLARS



Source: Network development plan 2013, 2nd draft, DENA distribution network study, Fraunhofer study "Electricity production costs of renewable energies" (2012), Oliver Wyman analysis.

\$469 billion

Oliver Wyman's estimate for how much investment is needed by 2033 for renewable sources of energy to meet most of Germany's electricity demand by 2050

When we examine the risk-return profile of individual sectors, most of the areas in which investments are needed for the power transition should see returns of between 4.5 to 6.5 percent, with low to medium risk. Conventional generation and storage, as well as offshore wind farms, are an exception. The latter have the potential to generate above-average returns of up to 10 percent.

HIGHER RISKS

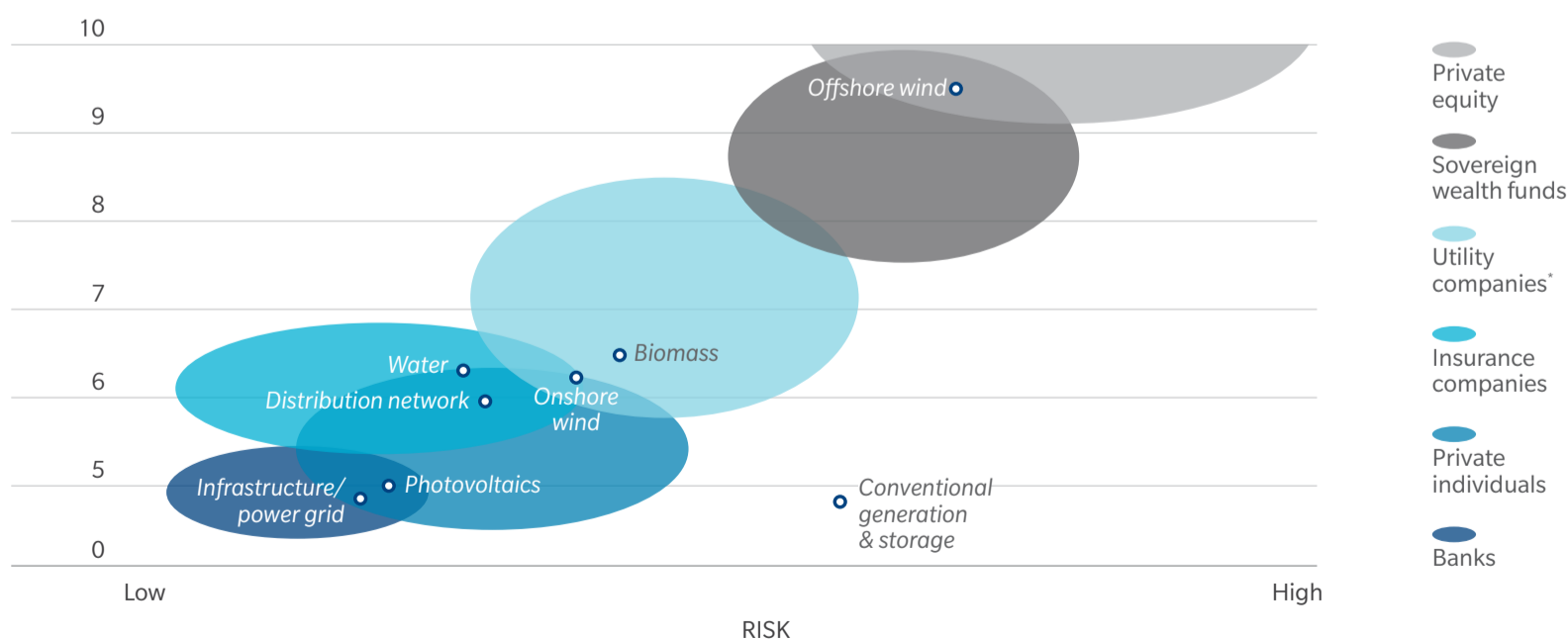
Nevertheless, at the same time, offshore wind and conventional energy generation and storage also bear the highest risk for

investors. The situation of conventional generation and storage has deteriorated significantly in recent years. In the past, the risks were moderate and returns were high. In recent years, however, profits have shrunk considerably because of falling wholesale prices. At the same time, economic and political risks have become greater.

A comparison of the risk-return profile of the various investment areas with the willingness of investor groups to take risks reveals that investments in conventional generation and storage are currently not attractive to any market players. Only traditional

EXHIBIT 2: LIKELY CORE INVESTORS FOR EACH TECHNOLOGY BASED ON THEIR RISK PROFILES

ACTUAL VS. REQUIRED RETURN (WACC) IN PERCENT



Source: Oliver Wyman analysis.

* Mean of the risk-return profile, investments in higher risk (offshore wind) as well as lower returns (distribution network) are common.

utility companies are still investing in the sector today.

However, those investment decisions were made at a time when the market environment was entirely different, and most of the decisions cannot be reversed. Nevertheless, numerous utilities have since broadened their portfolios and are extremely active in almost all areas of the energy market today. (See Exhibit 2.)

FINANCING GAPS

If one compares the investments needs for expansion and how much investment is expected, it comes as no surprise that the largest financing gaps are in the area

of conventional generation and storage. By 2023, the gap between the amount of investment required and the amount of investment expected for conventional generation and storage will reach \$22.4 billion – and \$10 billion by 2033. By contrast, transmission networks and offshore wind farms will suffer from financing gaps of only between \$3.7 billion and \$15 billion respectively through 2023.

The persistent financing deficit for conventional generation and storage is all the more worrisome because, alongside the network, conventional power plants are key to ensuring an adequate power supply in Germany. (See Exhibit 3.)

EXHIBIT 3: LIKELY CORE INVESTORS FOR EACH TECHNOLOGY BASED ON THEIR RISK PROFILES

EMERGING FINANCING GAPS

US\$BILLION



Source: Oliver Wyman analysis.

Some politicians already recognize this problem. That's why there has been substantial discussion around the possibility of incentives for utility companies to provide power plant capacities that currently do not generate profit in the regular market but are needed to assure the future stability of the network. The German government has also decided to reduce the targets for offshore wind farms, which will help close the financing gap.

However, no appropriate solutions have yet to be identified for closing the significant financing gaps for conventional generation and storage. As a result, the whole energy transition has been put into question. For it is not investments in renewable energies that are at issue, but rather conventional power generation investments.

RESOLUTE ACTION

Germany's transition to a more sustainable energy system can only succeed if all of the energy market's supporting pillars are stable. These include a reliable transmission network, renewable power generation and conventional generation and storage. If significant financing gaps in the conventional segment remain, then one of the pillars for success will crumble and the sustainability

of Germany's power supply will be in doubt. Resolute action is critical.

Discussions about how to address the challenges in conventional power generation have so far primarily focused on capacity markets. But these proposals fall short of the mark. Instead, a wider range of approaches is needed to find an ideal social, political, legal and economic solution with as little intervention in the market as possible. Changing market rules by extending the allowed price range and allowing for extreme price peaks may be important first steps in the right direction.

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