Switzerland electric grid

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Leads McKinsey"s Global Energy Perspective and advises energy and industrial companies on strategy and digital to navigate the energy transition, drive growth, improve performance, and build operational excellence

Leads our industrial sector in Switzerland and helps companies develop winning strategies, effectively manage and integrate M& A, design effective operating and organizational models, and create value through sustainability

May 13, 2021Industry forecasts show that the Swiss energy system is expected to face a growing energy-supply gap in the decades to come. Given the dynamics of the country"s energy-producing industries, utilities and power providers will likely need to increase imports from other countries, such as France. While this may be easy in theory--Switzerland acts as a major hub of power flows--it will not be easy in practice. All matter of hurdles, from evolving regulations to changing energy sources, must first be overcome.

Switzerland currently relies on hydro and nuclear power to meet the bulk of its energy demand. However, it"s unlikely that a reduction in expected energy consumption and a buildup of domestic renewables would suffice to fill the energy-supply gap, which could potentially begin as early as 2030. The gap could be further widened by an accelerated decarbonization agenda, which would see higher shares of electric vehicles (EVs) on the road and increased production of hydrogen by electrolysis. Additional challenges include the growth of renewables, a higher share of intermittent electricity, a limitation on imports, and a potential peak demand-supply gap.

On January 27, 2021, the Federal Council adopted Switzerland"s long-term climate strategy 20501, an energy act made up of ten strategic principles to guide the country"s climate policy in the years to come2. The act focuses on the energy sector and outlines four potential pathways for Switzerland to meet its increasing power-supply needs while achieving net-zero carbon emissions by 2050 and maintaining high energy security3.

The following article outlines four potential pathways that could enable Switzerland to meet its increasing power-supply needs by focusing on the role of the electric grid, factoring in the economic and regulatory

feasibility and the time required for implementation.

The Swiss power sector--as well as the broader European energy system--features a relatively stable equilibrium, with loads having been mostly flat for the past ten years. While the energy production mix in Europe is slowly changing from fossil-fuel plants to renewable-power plants, the electricity mix in Switzerland has been nearly carbon-free for decades. In fact, more than 60 percent of Switzerland"s annual energy generation stems from hydropower, with the remaining share of the mix mostly generated by nuclear.

That said, the Swiss energy system is expected to change rapidly in the years to come. The country plans to phase out its remaining nuclear capacity by 2044. Further, Switzerland is a central European hub for power transmission and therefore highly interconnected with the electric grid. In 2019, the country imported, exported, and transitioned around 40 TWh of electricity, with up to 60 percent of total produced power exported in the summer and the same share imported in the winter4.

This high level of interconnection makes Switzerland dependent on power-market developments and regulations on a European level. On this point, the expected power-market evolution is likely to result in an increasing gap between supply and demand; electricity demand could increase by up to 30 percent by 2050 (46 percent if power demand for green hydrogen is included).

With the potential for increased reliance on hydropower somewhat limited, and the construction of nuclear power plants prohibited since 2016, it"s likely that additional capacity won"t close this gap--at least not in a trivial way. When the Swiss electorate voted in favor of Energy Strategy 2050, the correct approach to balancing supply and demand had not yet been determined5. Finding this correct approach is complicated by the ambitious Swiss decarbonization targets; the Swiss Federal Council targets net-zero emissions by 20506. While solar and wind can potentially help resolve this issue, imports are increasingly likely to play a key role.