



Resisting Time's Ravages

The triumphal advance of electricity began more than a century ago. Electric railroads and electric motors changed lives, and the first power plants were built in order to satisfy the public's growing need for electricity. Some of these technologies are still being used today. Five examples tell an impressive story of the strength of technology and the durability of innovation.

In the early 20th century, traveling from the harbor city of Palma to the mountainous regions of Majorca was a difficult undertaking. Travelers had to ride in carriages and carts along narrow roads up and down mountains and across the Coll de Sóller pass. Along the way, they had to rest several times in order to recover from the stresses and strains of the trip. Nonetheless, this was the only way to bring goods from Palma to Sóller.

Things did not change until 1907, when construction began on a rail connection between Palma and Sóller. Regular service began in 1912 and was supplemented 18 months later with an electric streetcar line to Port de Sóller, five kilometers further on. The streetcar line had its own power plant in the Sóller train station, where a combustion engine with an output of 48 kilowatts (kW)

powered a dynamo made by the German electrotechnical company Siemens-Schuckert. Suddenly, the little town began to benefit from visitors and from goods such as fresh fish transported in a small refrigerated car.

Another big step, which eliminated the irritating smoke in tunnels, was the electrification of the train line in 1929. For this purpose, the train line's operator, Ferrocarril de Sóller, bought four bidirectional locomotives, each one weighing 33 tons and with a power output of 265 kW. They too were produced by Siemens-Schuckert.

About 85 years later, the same trains, numbered 1 to 4, are still climbing hundreds of meters above sea level every day along the 27-kilometer route between Palma and Sóller. Railroad experts notice the unusually narrow tracks, which are only 914 mm wide

(a normal track is 1,435 mm wide). Passengers enjoy not only the refined interior of the wood-paneled cars but also the view from the old-fashioned sliding windows. The trains travel past olive groves and orange plantations, through a total of 13 tunnels, and across several bridges.

Saving a Landmark. Another treasure has not resisted time's ravages quite as successfully. In the High Tatra Mountains of Slovakia, a tram called the Comet transported mail, goods, and tourists to mountain spas starting in 1912. The trip was grueling. Along the 36-kilometer route the train gained about 700 meters in altitude, sometimes at external temperatures of minus 30° C. The Comet's electric locomotive was built in Budapest in 1912. A Siemens-Schuckert factory in

Bratlava supplied electric motors, each of which had a power output of 40 kW, and all the electric equipment. From the start, the train was renowned for its reliability. However, in the 1980s it was sent into semi-retirement and then brought out only occasionally for anniversaries and other special occasions.

Just before the train's 100th anniversary, a lightning strike damaged the electric motor and a high-voltage cable. It looked as though the railroad yard in Poprad would be the train's final destination. However, a group of rescuers turned up to save this local hallmark. It consisted of the railroad veterans' club of Poprad as well as Siemens, the restoration project's main sponsor. After repairs had been made, the engine once again ran smoothly. The tram was put back on track in August 2013, and today it can transport about 1,000 passengers a day. The Comet received its name in the winter of 1923, when it was equipped with a snowplow. At high speeds, the tram pulled a long tail of snow behind it. The name "Comet" was born, and it has become firmly established since then.

1916 and World War II, after which Tsingtao passed into Chinese hands in 1945. Eventually, however, it was time for the gleaming black Siemens electric motor of 1903 to begin its well-deserved retirement. It has been resting in the Tsingtao Museum since 1995. But it now has a satisfactory successor: Since 2010, an automatic process control system (BRAUMAT) from Siemens has ensured that Tsingtao beer is still served all over the world.

Supplying Power to an Entire Country. No electric motor can function without a power source. That's why the need for electrical power plants increased worldwide around 1900. In many places this ushered in the era of hydroelectric power plants. One of these places was the Ardnacrusha power plant in Ireland, which entered service in 1929. At 86 MW, it delivered 90 percent of Ireland's total power output. Today its power output remains the same, but it represents only two percent of Ireland's total.

The Siemens-Schuckert company was the general contractor and supplier of the elec-

In the Alpine foothills of Bavaria nature has created the perfect conditions for generating clean electricity — and storing it. Walchensee, or Lake Walchen, lies 800 meters above sea level; Kochelsee, or Lake Kochel, is located 200 meters further down. At the turn of the 19th century, demand for electric power increased in Bavaria. In response, Oskar von Miller, a construction engineer and the founder of the Deutsches Museum in Munich, forged ahead with the construction of the Walchensee power plant. The principle behind this plant is simple: A total of six pipes were laid between the two natural lakes. The water coming from Lake Walchen rushes downward through the pipes for 200 meters and onto the eight turbines of the power plant. Connected to the turbine shafts are eight generators that produce electricity. The water subsequently flows further down into Lake Kochel.

The turbines started rotating in 1924, and they are still turning today. The eight generators, two of which were manufactured by Siemens-Schuckert, have faithfully served the



Reliable Brewery. Far from the High Tatras, there's another senior that is held in high esteem. One of China's first breweries began operating in 1903 in the harbor city of Tsingtao. At the Germania brewery, German and British settlers far from their homelands brewed their favorite drink. From the start, the fermentation process was assisted by the oldest electric machine from Siemens that is still operational today: an electric motor manufactured in Germany in 1896.

Almost a century later, Germania Pils has become Tsingtao beer, and the brewery is today one of the largest in China. The antique Siemens motor resisted the ravages of aging for a long time. It did its job faithfully, needing no repairs whatsoever, until 1995. Without suffering any damage, it survived the takeover of the brewery by the Japanese in

trical systems for Ardnacrusha. The construction of the power plant, which began in 1925, turned out to be a mammoth undertaking. Ireland's construction industry was not yet highly developed, so almost all of the skilled workers and materials came from Germany. This included 30,000 tons of construction machinery and equipment.

Ireland's humid climate and the site's poor soil stability created additional problems for the builders. The crucial parts of the power plant went into operation in October 1929, and from that point on the country received electricity via a 3,400-kilometer-long cable system. Some of the plant's original components are still in operation today. They include excitation dynamos, which have merely been rewound, slip ring motors, the original bearings, and the rectifiers.

power plant ever since the start. In the 1960s they were merely rewound and relaminated.

Today the plant generates about 300 gigawatt-hours a year — a relatively small part of Germany's power supply. It provides about 80,000 households with electricity. However, the operators have little leeway in terms of power generation. They can either let exactly as much water flow through the pipes as has flowed into Lake Walchen, in which case the water level remains constant, or they can dam up the water overnight and open the pipe when electricity demand reaches a given point. Within a few minutes, the system will then run at full capacity. This option balances out periods of peak demand and is thus part of Germany's energy transition strategy. In spite of its age, the power plant is still as modern as ever. ■ Nicole Efllein