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THE ELECTRIC RAILWAY

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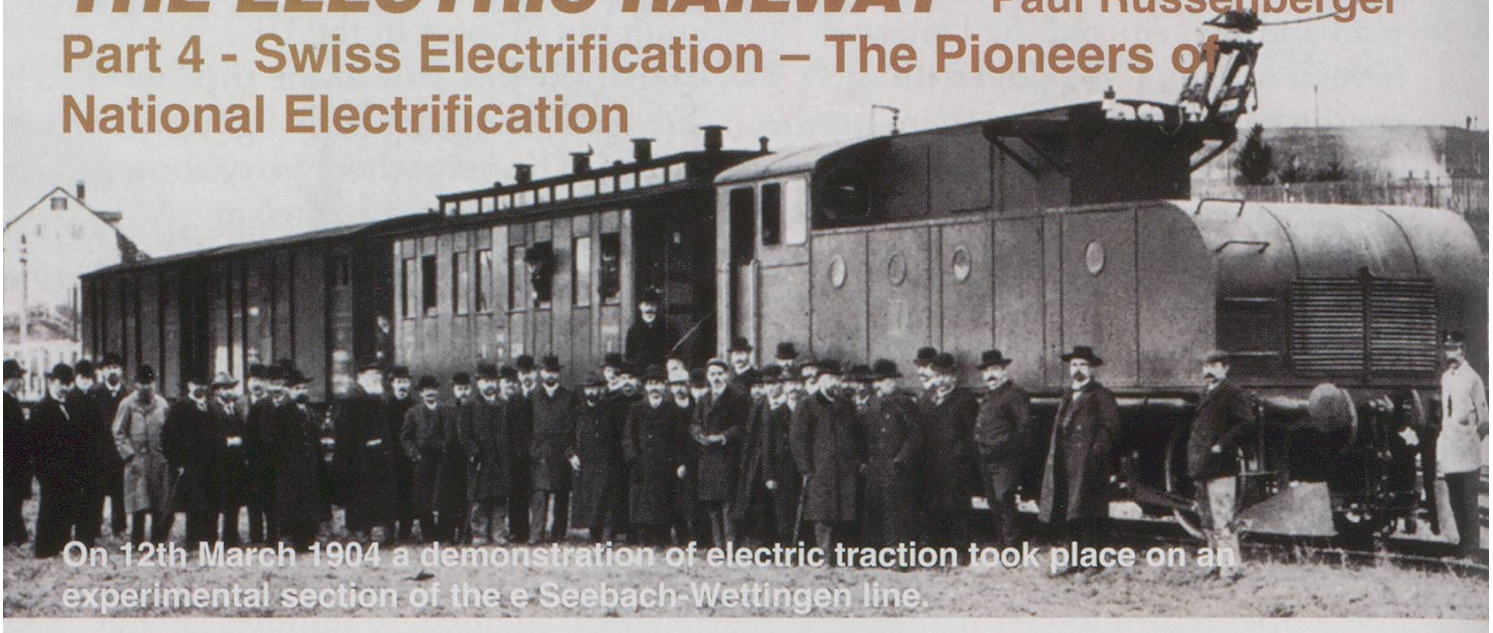
Part 4 - Swiss Electrification – The Pioneers of National Electrification



On 12th March 1904 a demonstration of electric traction took place on an experimental section of the e Seebach-Wettingen line.

Major changes in the railway industry on the scale of national electrification are rarely, and should never be, the result of an instant decision, but a development subject to scrutiny and review. With true Swiss caution, the decision to carry out a major conversion of the railways was not taken lightly and had to gain the continued support of the Government and the railway directorate. This article seeks to outline the processes undertaken to put the national electrification in place, while honouring those pioneering visionaries who solved the technical problems and drove the project forward.

About 1890 Emil Huber-Stockar of the Oerlikon Engineering Works showed that main line railway electrification was technically possible. He also concluded that the use of high voltage, single-phase, alternating current was the only realistic system for a country such as Switzerland. Direct current would require an extensive supply network, while a three-phase system would lead to physical difficulties at junctions, because it needed complicated overhead wiring. Huber's aim to experiment by electrifying a section of railway, led to Oerlikon submitting a request to electrify the Seebach to Wettingen line. This concession was granted in May 1902, possibly assisted by a paper on electric traction given by Huber on 27th February that year to the Zürich Society of Engineers and Architects.

The electrification took place in stages with trials starting between Seebach and Affoltern in 16th January 1905. It was extended to Regensdorf the following year and was completed to Wettingen on 1st December 1907. By 1909 experimental work was complete. Oerlikon had paid for the work in its entirety and offered it for sale. The SBB could not afford to purchase the equipment which was dismantled, electric working ceasing on 3rd July 1909. Although it had disappeared, the experiment had demonstrated the feasibility of high voltage ac electrification, especially as another engineer from Oerlikon, Hans Behn Eschenburg, had used it to develop the single-phase ac motor.

Meanwhile, an October 1902 meeting of the Swiss Association of Electrical Engineers in Montreux, Edouard Tissot suggested a Commission to "Study the Electrification of Railways", be set up. This Commission began its work in 1903 under the direction of Professor Walter Wyssling, who had supported Huber's early work and had submitted his own report to the Federal Department of Commerce in 1901. In March 1904 Huber-Stockar delivered another paper in Zürich recommending the electrification of the Gotthard route from Erstfeld to Bellinzona.

The Commission produced four reports. The first examined the energy requirement for electric operation and was issued in October 1906. Two more reports appeared in 1908; the first setting standards to be used, and the second recommending a frequency of 16 2/3 cycles per second for ac electrification. The findings of the Commission were submitted to the SBB in May 1910 and

formally presented by Professor Wyssling at the 8th International Railway Congress in Bern in 1910. The report recommended overhead line electrification at 15,000 volts ac, at a frequency of approximately 15 cycles. The German and Austrian delegates gave their support.

While the Commission had been at work, in 1908 the BLS decided to electrify the Spiez to Frutigen section at 15,000 volts, 15 cycles, to gain experience before opening the line through to Brig. Electric operation began in May 1911. The previous year part of the Seetal line had been electrified at 5,500 volts, 25 cycles and the Rhätischebahn decided to electrify Bever – St.Moritz/ Pontresina at 11,000 volts, 16 2/3 cycles.

Severe increases in traffic on the Gotthard line forced the SBB to consider either electrification or the development of more powerful steam locomotives. A further report was submitted in May 1912 and on 1st October that year an Electrification Committee was set up under Huber-Stockar as the Chairman, effectively making him Chief Electrical Engineer of the SBB. Just over a year later, on 25 November 1913 the SBB Board authorised CHF38.5m for the Erstfeld – Bellinzona electrification. Detailed planning was completed in July 1914 but the whole scheme was brought to an abrupt halt by the outbreak of the First World War and Huber-Stockar being called up for military service.

In 1915 the issue of the choice of system to be used arose again. The matter turned on whether the use of low-frequency ac was economically sound, as it required the railways to generate the electricity in their own power stations. This led to a meeting in the Hall of the Grand Council in Bern on 14th December that year between two Swiss Associations – that of Electrical Engineers and that of the Development of Water Power. Professor Wyssling pointed out that a convention adopting single-phase electrification at 15,000 volts, 16 2/3 cycles had been signed in 1912 between Bavaria, Prussia and Baden, while Austria, Norway and Sweden had adopted the same systems. Huber-Stockar was keen that the issue should be resolved and suggested that further discussion would merely delay the project and might be interpreted as revealing indecision. On 16th February 1916, the Board of the SBB accepted a recommendation that the Erstfeld – Bellinzona electrification should go ahead using the 15,000 volts 16 2/3 cycle system. In practice they had little choice. The BLS had been operating the system successfully for nearly 5 years, demonstrating that it was thoroughly practical. It was simpler than the three-phase system installed by Brown, Boveri, at its own expense, in the Simplon Tunnel. The Commission formed in 1903 held its final meeting at Brig on 8th July 1916. No national plan existed, but the electrification of the Swiss Federal Railways was now under way.

Throughout 1916 to 1918 coal became scarcer and the cost rose by 650%. Train services were reduced. By 1918, Sunday services were all but suspended. Huber-Stockar had begun to press for more electrification in 1917 and on 30th August 1918 the SBB Board agreed to electrify all principal lines in three 10-year stages. The Council of States gave its approval in December that year.

In May 1923 the SBB Board decided to accelerate the programme, so that lines intended to be electrified by 1933 were, in fact, converted by 1928 at an annual rate of 100 route-km. Huber-Stockar retired in 1925, remaining as a consultant, to be replaced by H. Eggenberger. He can be truly regarded as the father of the electrification of the Swiss railways.

Huber-Stockar's absence as a driving force was compensated by the appointment of Anton Schrafl in 1922 by the Federal Council as SBB Head of Works. He became SBB President in 1926 until his retirement in 1938. Coal prices had fallen. There was pressure to divert national finance to the canalisation of the Rhine from Basel to the Bodensee. Schrafl had experienced the effectiveness of the Gotthard electrification while working on the Luzern Division and pressed hard to keep the programme in place. World trade was going into recession. Since 75% of the cost of electrification went in staff wages, this kept the capital invested in the Swiss economy and strengthened Schrafl's arguments.

Both Huber-Stockar and Wyssling lived to see the greater part of the Swiss Federal Railways electrified. This series of articles must now turn to describe the actual electrification and describe the locomotives used.