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Catalyst for Transition: The Anschluss, Kaprun, and a Dual Energy Transition, 1938–1955

Austria's Hohe Tauern mountain range is special in many ways. The Tauern form the continuation of the main crest of the Alps as it passes from the western provinces of Austria. Comprising an area of some 6,000 square kilometers, the range is home to Austria's two highest mountains, the Grossglockner (3,797 meters) and the slightly smaller Grossvenediger (3,674 meters). The former represents the center of the Hohe Tauern National Park, the largest nature reserve in the Alps. Since 1935, the Grossglockner and the PasterzeKeesglacier, one of the largest glaciers in the eastern Alps, have been accessible to motorists via the Grossglockner High-Alpine Road. This spectacular drive winds through the Tauern, crossing the main crest at an altitude of 2,505 meters. The Hohe Tauern has also had a long tradition of tourism, with the classical spas of Mayrhofen and Badgastein in the northern part of the range attracting visitors to the Alps since the nineteenth century. The Tauern are well known in the geological community for the famous "window" that exposes the basement rocks of this part of the Alps at surface level.

The Hohe Tauern also occupy an extremely important position in both the Austrian and central European electricity supply. Since the 1950s, the range has been home to a series of high-altitude dams that store the summer floods of Alpine waterways for use during the winter, when Alpine streams dwindle considerably. The energy development of the Hohe Tauern has transformed the mountains into a source of auxiliary power for Austria's remaining hydropower plants, and the presence of these strategic reserves has been key in the creation of an electricity supply largely dependent on otherwise seasonal flows of water power. The sheer size of the Tauern dams has allowed them to assume a similar role in the Central European electricity supply as well. The Tauern energy has also been rich with symbolic significance for the postwar Austrian republic. In particular, the completion of the first large-scale hydroproject in the Tauern in the mid-1950s, the *Tauernwerke* Glockner-Kaprun, was hailed by many Austrians as an example of their postwar republic's political and economic recovery. Thanks to its four monumental concrete dams and shimmering blue reservoirs, Kaprun—as Austrians often refer to the facility in reference to the Tauern valley where the dams are located—holds a mythical status in Austrian society not unlike the dams of the Tennessee Valley Authority in the US.

Kaprun, however, was not a singularly Austrian achievement. Historians have demolished the “myth” of Kaprun by emphasizing that the project was launched and considerable progress was achieved during the National Socialist period, in part due to heavy use of forced laborers. Moreover, when a portion of Kaprun’s generators came online, they fed electricity into the same grid that supplied power to Auschwitz. After the war, the second Austrian republic capitalized on the considerable work and investment performed during the *Anschluss*-period (and took advantage of new avenues of finance in the form of the Marshall Plan fund) and completed the Kaprun project. It has remained a cornerstone of the Austrian electricity supply ever since.

This essay approaches these developments from a slightly different angle. It considers how the Kaprun project launched by Germany drove two critical but neglected energy transitions (understood here as any change in the components of an energy system; see Smil 2010) in postwar Austria. In the most general sense, the Kaprun project represented a continuation of the hydroelectric energy transition that had been underway in west-central Europe—and Austria—since the 1890s. With several hundred megawatts in capacity, Kaprun would be one of the larger hydroplants in Europe. But energy experts also argued that projects like Kaprun would have an impact that went beyond the number of kilowatt hours they produced annually. High-altitude reservoirs, the argument went, would make all hydropower more economical and thus usher in a new era of hydropower exploitation. In the postwar period, the Austrian state picked up where the National Socialists had left off in pushing for the completion of the Kaprun dams. Thanks in no small part to the reserve power of the Hohe Tauern dams, the transition to hydroelectricity, which makes up over half of Austria’s electricity supply, has made greater inroads in Austria than almost anywhere else on the globe.

Kaprun also embodied another, less obvious type of transition. In the Kaprun facility we can see an important shift in the purported source of hydropower. Up until the idea for Kaprun first emerged in the 1920s, when Europeans spoke of developing hydropower, they usually portrayed it as the harnessing of the energy of a specific watercourse. Along with the improvement of hydraulic technology came the use of energy from larger rivers such as the Rhine. In the Alps, hydraulic engineers began harnessing the power of waterfalls at the end of the nineteenth century and subsequently moved on to larger streams. At the turn of the twentieth century, high-lying lakes emerged as a uniquely montane source of hydropower. As the history of the Kaprun project shows, hydropower

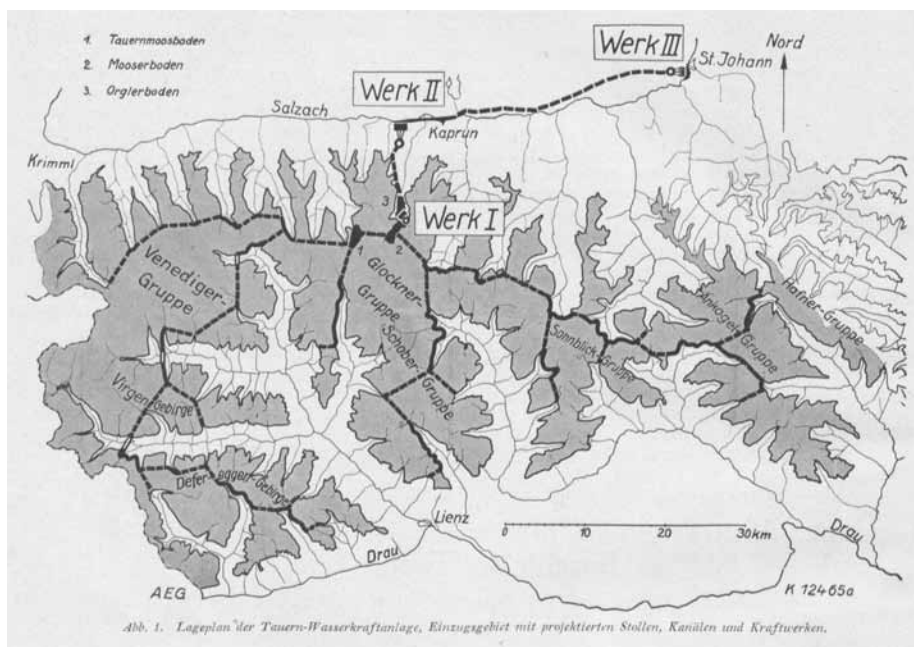
projects in the Alps eventually came to focus on activating the power of entire mountain ranges. From the very beginning, discussions of damming the Kaprun valley occurred in the context of exploiting the power of the whole Hohe Tauern range. Kaprun therefore marked a different way of harnessing water power, predicated upon the creation of a new type of hydropower landscape. As it happened, the transition owed much to the energy politics of Austria's northern neighbor.

Finally, a word about those politics. In a volume that explores the energy dimensions of the historical relationship between European imperial powers and their former colonies, an essay about Germany's impact on the postwar Austrian energy supply might seem misplaced. Although Austria is not often thought of as a former colony of Germany, several historians of the period have argued that the relationship did indeed resemble a colonial one in certain respects. Indeed, the historian of Austria's electricity supply from 1938–1945 concludes that by paving the way for an organized Austrian supply in the postwar period, German influence achieved something positive despite its “imperialistic economic conceptions” (Koller 1985, 206). In the case of the Kaprun, the Nazi leadership did indeed hold the power to harness the Tauern water power as it wished. Nevertheless, if the story here falls short of truly being one between former imperial power and colony, I hope that it might provide a fruitful basis for comparison.

Discovering the Tauern Power

German interest in the energy of the Hohe Tauern was not a product of the Anschluss era. In fact, over a decade before German annexation of Austria, the imperial gaze of several German electrical utilities “discovered” the water power of the Hohe Tauern and hoped to siphon off a fair portion of this energy to bolster their economic prospects. In the mid-1920s, Württembergische Elektrizitätswerke AG (WEAG), a smaller state utility company in the southern German province of Württemberg, developed a project to tap the energy of the Hohe Tauern with a series of dams in multiple valleys including the Kaprun. The WEAG plan called for concentrating a significant portion of the water draining off of the northern slope of the Tauern range in reservoirs located in two separate valleys. It recommended diverting water to these two valleys by piercing watersheds, crossing Austrian provincial borders, and covering considerable distance if necessary. Soon thereafter, the giant German General Electric Company (AEG)

Figure 1:
Map of the AEG
"Tauern Hydropower
Facility," 1929. Source:
"Projekt einer Verwertung
der Wasserkräfte
im Bereich der
Tauernkette," *Deutsche
Wasserwirtschaft* 24,
no. 2 (1929): 22.



also publicized its own plans for an even more ambitious “super” Tauern project (see Figure 1). Instead of constructing dams in multiple Tauern valleys, the AEG project envisioned centralizing as much Tauern water as possible in one single valley: Kaprun. Of all the Tauern valleys, Kaprun was the steepest, and therefore the most ideal for generating water power. To get the water to Kaprun, AEG foresaw building a network of high-altitude canals totaling 1,200 kilometers in length (*Hangkanäle*, see Figure 2). While AEG’s designs boasted greater dimensions, both companies promised that their Tauern projects would generate enough electricity to satisfy all Austrian demands, and leave plenty of electricity left over for export to Germany.

For the time period, both Tauern plans represented something revolutionary. Up until that point, hydraulic engineers generally focused on developing the hydropower of singular waterways. The idea of concentrating the water of entire mountain ranges in high-altitude reservoirs (a practice that would become common in the Alps after the Second World War) was relatively new (Bätzing 2003). Rerouting water from valleys throughout a mountain range, moreover, promised to rob some areas of their water,

with significant ecological and agricultural consequences.

While many of the technological components of these new Tauern projects—dams, diversions, tunnels—had been tried elsewhere, undertakings of this kind in the unforgiving high Alps were relatively scarce. In particular, many engineers viewed the slope canals that formed the centerpiece of the AEG plan as an

untested technique at best, and lunacy at worst. The planners at AEG defended their plan's dimensions, arguing that the Tauern power was so unique and lucrative that anything less than a gigantic project would be an unforgivable waste of precious natural resources (*Raubbau*).

Both of these bold plans must be understood in the context of the German electricity supply of the mid-1920s. At the time there was an urgency to develop Alpine water power (or white coal, as it was often called) on a grand scale. Demand for electricity was robust after the immediate aftermath of the First World War, and German utilities anticipated a continuation of this trend. To meet this expected growth in demand many German utilities were on the lookout for cheap new sources of electricity, and the water-rich Austrian Alps emerged as one of the most accessible sources of bulk hydropower. Advocates for incorporating more Austrian white coal into the German electricity supply also argued that it would bolster the national economy by freeing up German coal for more strategic uses.

At the same time, a consensus was also emerging that harnessing this energy economically required taking advantage of the mountain environment to store water behind large, high-altitude dams. Such reservoirs, proponents argued, would create auxiliary hydropower reserves that could counter hydroelectricity's greatest flaw: its seasonal fluctuations. Feeding stored hydropower into electricity grids would make existing

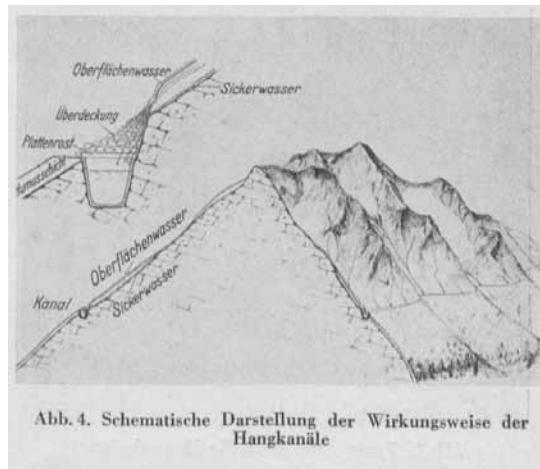


Figure 2: Schematic depiction of the function of the slope canals. Source: "Das Tauernwerk," *Deutsche Wasserwirtschaft* 26, no. 1 (10 January 1931): 3.

hydroplants more efficient, and allow the development of marginally economic hydropower in the future. In short, a majority of electricity supply experts viewed storage works like Kaprun as the key to completing a transition to white coal in central Europe.

Although the AEG super project initially won the favor of the provincial governor of Salzburg, where the Kaprun dams were to be constructed, the utility did not manage to make much headway. By 1930, the worsening economic crisis diminished AEG's interest in the costly project. Ultimately, the ascent of National Socialism in Germany poisoned political relations with Austria and made AEG activity there impossible. But the push for an energy transition in the Hohe Tauern did not disappear for long.

Nazi Germany Sets the Hydropower Transition in Stone

Nazi Germany initiated the decisive steps towards realizing an energy transition in the Hohe Tauern. In March 1938, German forces invaded and occupied Austria. Soon thereafter, Austria was incorporated into the greater German empire as a province called the *Ostmark* (Eastern March). With the Anschluss completed, the Nazi state made a priority of developing the hydropower of the Hohe Tauern. Though Nazi energy planners remained unsure which Tauern project would get the nod, they nevertheless resolved that whatever the ultimate decision, the first dams would be erected in the Kaprun valley. No less a personage than Hermann Göring took an interest in the Tauern project, and the field marshal wielded the spade at the project's groundbreaking ceremony in May 1938. To finance the expensive undertaking, the Nazi government created the Alpen-Elektrowerke (AEW), a Reich-owned corporation charged with developing much of Austria's white coal. In the fall of 1938, AEW's engineers drew up detailed project designs, opting for a decentralized development of the Tauern power, similar to the original WEAG plan (see Fig. 3). The following spring, one of the Nazi Germany's energy czars confirmed AEW's choice in the face of a renewed campaign for a super Kaprun project. By employing forced labor, the AEW managed to bring part of the Kaprun plant online before the war's end, but the high dams remained to be built. Nevertheless, the decisions made during the Anschluss period set a decentralized development of the Tauern power in the future more or less in stone.

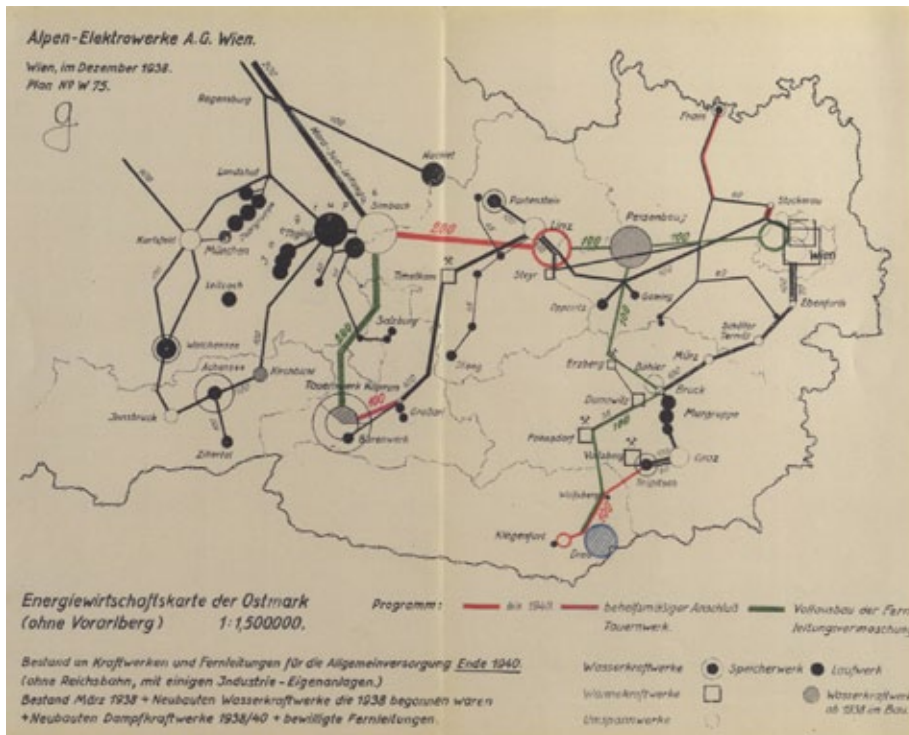


Figure 3: AEW Energy supply map of the "Ostmark", December 1938. The map shows that the Kaprun power was to be fed into a north-south high-voltage transmission line to eastern Germany. Source: Salzburger Landesarchiv

Nazi Germany's drive to further the hydroelectric transition in the Tauern region stemmed from the belief that this best served the needs of an economy gearing up for war. German state economists believed that Tauern dams possessed enormous significance for the future German electricity supply and viewed their construction as a necessary component of a four year plan for Austria. Developing the Tauern energy would enable the substitution of hydroelectricity for coal in the German electricity supply. Conserving coal was deemed crucial, as the energy source could power a range of strategic uses. Most importantly, coal was indispensable in the production of the synthetic fuels so desperately required by the German war economy. Burning coal to generate electricity wasted much of the thermal and mineral value of the fossil fuel. The more Austrian hydropower that could be made available in the German electricity supply, the more that coal would be available for strategic purposes. It was this value that made the harnessing of Austrian white coal the most important concern for the German energy establishment in the months before the invasion of Poland.

Given the National Socialist penchant for technological gigantism, it is somewhat ironic that the Kaprun project begun during the National Socialist period represented the first step in what was viewed at the time as the more moderate plan to develop the power of an entire mountain range. The main proponents of decentralization were the AEW engineers who finalized the project plans. They found the super Tauern project to be technologically and economically unfeasible. AEW's head engineer also favored the decentralized project because he believed it could be completed in the foreseeable future. Nevertheless, AEW found itself compelled to defend their decentralized project against a renewed battle for the "super" variant.

Ultimately, a National Socialist energy czar appointed by Göring put paid to the "super" project. His concerns about the defense implications of concentrating all of the Tauern power in one valley, and the agricultural consequences of diverting so much water there, led him to opt for decentralization. This decision, taken in the spring of 1939, had irrevocable consequences for the postwar Austrian energy supply. For the different projects required vastly different dimensions and measurements for key components of the project. Once generators, turbines, and penstocks, for instance, had been ordered to fit the decentralized scheme, a return to the "super" variant could only be accomplished at considerable extra time and cost. In opting for a decentralized development of the Tauern power in the interests of national security, Nazi Germany set a dual energy transition for postwar Austria in stone.

Suggested Readings

For an excellent synthesis of historical scholarship on Kaprun, see Georg Rigele, "Das Tauernkraftwerk Glockner-Kaprun—Neue Forschungsergebnisse und offene Fragen," *Blätter für Technikgeschichte* 59 (1997): 55–94. On forced labor see Margit Reiter, "Das Tauernkraftwerk Kaprun," in *NS-Zwangsarbeit in der Elektrizitätswirtschaft der "Ostmark", 1938-1945*, ed. Oliver Rathkolb and Florian Freund (Vienna: Böhlau, 2002), 127–98. Helmut Maier estimates 400 deaths among the nearly 4,000 forced laborers at Kaprun. See "Systems Connected: IG Auschwitz, Kaprun, and the Building of European Power Grids up to 1945," in *Networking Europe: Transnational Infrastructures and the Shaping of Europe, 1850-2000*, ed. Erik van der Vleuten and Arne Kaijser (Sagamore Beach, MA: Science History Publications, 2006), 129–58.

For a more detailed analysis of the Marshall Plan's impact on Kaprun see Georg Rigele, "Der Marshall-Plan und Österreichs Alpen-Wasserkräfte: Kaprun," in *"80 Dollar": 50 Jahre ERP-Fonds und Marshall-Plan in Österreich, 1948–1998*, eds. Günter Bischof and Dieter Stiefel, 183–216. Vienna: Ueberreuter, 1999.

Norbert Schausberger places the Anschluss in a historiographic tradition that interprets German foreign policy since the First World War as an attempt to secure world power status. See *Der Griff nach Österreich: Der "Anschluß,"* (Vienna: Jugend und Volk, 1988).

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