
Ideas, Individuals and Institutions: Notion and Practices of a European Electricity System

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Based upon extensive multi-archival research, this article traces the long lineage of the notion of European electricity network. Since the 1930s engineers and policy makers conceived of a geographical conception for rationalising and optimising electricity supply: a European one. This article purports that three vectors undergirded threads of continuity: institutional, intellectual and physical (technological networks). These vectors, and the actors involved in them, created strong path dependencies that kept the idea of a European system firmly on the agenda. Today's international electricity market of the European Union should be seen as an extension of this legacy.

Just weeks before the start of the Second World War in Europe, an official from the League of Nations' Secretariat wrote to the director of its Organisation for Communications and Transit (OCT). This body aimed to improve the means of cross-border transport and communication, for example via standardisation of road and traffic signs.¹ In her letter, the secretary referred to extensive files containing information on the state of Europe's electrification, based on correspondence with member state governments and associations of energy producers. The OCT had collected this documentation from 1930 onwards to study the possibilities of creating a European electricity system, but it never found the time to turn this into a more synthetic report. 'I thought it useful to register these documents', the secretary wrote, 'in order to more easily track them if the need arises'.² At that point in time the

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¹ See Frank Schipper, Vincent Lagendijk and Irene Anastasiadou, 'New Connections for an Old Continent: Rail, Road and Electricity in the League of Nations' Organisation for Communications and Transit', in Alexander Badenoch and Andreas Fickers, eds., *Europe Materializing? Transnational Infrastructures and the Project of Europe* (Houndsmills: Palgrave Macmillan, 2010), 113–43.

² Étude de Mr. van Dissel, 9 Aug. 1939, Transport et transit de l'énergie électrique en Europe, section 9^E, 38833, 1777, League of Nations Archive.

work of the OCT came to a grinding halt, as the threat of war loomed large and the League was effectively falling apart.

The secretary turned out to be right, as the need for revisiting the same issues actually arose after 1945. Following in the footsteps of the League, several organisations again collected data on electricity networks in Europe. These organisations made plans for the post-war period, and once more studied the possibilities of a European electricity network. By 1945 the role of electric power had become even more prominent. Whereas electricity was only a relative newcomer to the activities of the League's OCT, it was now seen as vital for Europe's reconstruction. During the interwar and wartime years, electricity increasingly became the lifeblood of industries and households, while governments came to see it as a strategic commodity, too.

As the League became defunct new international organisations stepped in. These included the United Nations Economic Commission for Europe (UNECE), set up in 1947; the Organisation for European Economic Cooperation (OEEC), created in 1948; and the more informal and technical Union for the Coordination of the Production and Transport of Electricity (UCPTE), established in 1951. Like the OCT these organisations focused on Europe and made infrastructural improvements a vital part of their plans for Europe's economic growth. While the data collected by the OCT remained in the drawer, the guiding principles remained the same. What these new organisations shared with the League was a particular geographical conception for rationalising and optimising electricity supply: a European scale. The internal electricity market of today's European Union (EU) is as an extension of this legacy.

Since its inception in the late 1920s the notion of a European electricity system remained continuously on the agenda. This notion was supported by national representatives within the League, and later by the UNECE, the OEEC and non-governmental organisations that liaised with them, like the UCPTE. Thus, a strong consensus came about on how electricity systems should be developed in Europe. In addition, the idea of a European system did not merely emerge during the interwar years to reappear in post-war Europe; it was also a goal pursued by National Socialist policy-makers and engineers *during* the Second World War.

This continuous focus on creating a European network requires further analysis and explanation. This article seeks to provide a better understanding of the transfer processes from interwar to post-war Europe, by exploring the intellectual (dis)continuities in the field of electricity policy between 1914 and the creation of the European Economic Community (EEC) in 1957. It argues that three types of vectors undergirded the different threads of continuity: institutional, intellectual and physical (networks). The institutions involved all worked within a European space, while emphasising key technological systems. For electricity, such a focus only emerged during the interwar period and thus later than for transport and telecommunications. The electro-technical community consisting of electricity producers, electrical engineers and manufacturers of electrical equipment played a key role in cultivating discussions about the European idea. Against the background of a widely shared belief in rationalisation through interconnection, they thus shaped the intellectual agenda in this field. In fact, the electricity industry was a 'breeding ground of the new faith

in technical, scientific and politico-economic planning that emerged after 1900'.³ Electricity networks, finally, require vast investments. They are inert, that is hard to move or redirect without considerable sacrifice. These three vectors and the actors involved in them created strong path dependencies that converged to keep the idea of a European system on the agenda until the present day.

Exploring these continuities based on fresh research in national and international organisation archives, the article first describes the situation before and shortly after the First World War. It goes on to trace and analyse the genesis of the European network idea and its evolution until the 1950s, with an outlook to electricity integration in the European Communities (EC) during the 1980s. The conclusion also draws parallels with other articles in this special issue which focus on technology cooperation and integration.

Setting a European Agenda

Since the dawn of the twentieth century electricity has made a triumphant march through Western society and beyond. Initially a curiosity at world exhibitions, carnivals and in expensive hotels, it gradually grew into the handmaiden of modern society. Improvements in transmission technologies allowed for the transportation of electricity from one place to another with little loss of efficiency, increasing the scale of local electricity networks and ensuring their continued growth. Starting out locally, the possibility of transporting electricity over longer distances enabled the use of relatively isolated sites of hydropower and coal fields. Many internationally oriented electrical engineers favoured cooperation across borders in order to improve the efficiency of power stations and strengthen the reliability of their service. The idea of increasing the size and scale of electricity systems thus was an inherent part of the electrical engineering philosophy from the beginning.⁴

Extending networks required standardisation. This was largely an international affair, pioneered by the International Electro-Technical Commission (IEC), created in 1906. One key technological standard was to have power plants and networks operate at a frequency of 50 Hz, which became the preferred standard of Swiss and Germany manufacturers around 1900 – though many other frequencies persisted at least until the 1950s.⁵ Further exchange of ideas and standards was facilitated by other international professional organisations that sprang up between the wars. They include the Conférence Internationale des Grands Réseaux de Transport d'Énergie Électriques à Très Haute Tension, from 1921; the World Power Conference (WPC),

³ Wolfgang Schivelbusch, *Disenchanted Night: The Industrialization of Light in the Nineteenth Century* (Berkeley: University of California Press, 1995), 75.

⁴ Georg Klingenberg, *Bau grosser Elektrizitätswerke* (Berlin: Verlag Julius Springer, 1924); Norbert Gilson, *Konzepte von Elektrizitätsversorgung und Elektrizitätswirtschaft: Die Entstehung eines neuen Fachgebietes der Technikwissenschaften zwischen 1880 und 1945* (Stuttgart: Verlag für Geschichte der Naturwissenschaften und der Technik, 1994).

⁵ Gerhard Neidhöfer, '50-Hz Frequency', *IEEE Power and Energy Magazine*, 9, 4 (2011), 66, 73.

formed in 1924; and the Union Internationale des Producteurs et Distributeurs d'Énergie Électrique (UNIPÉDE), created in 1925.

In addition, as power plants and transmission networks required large investments, the electrical industry, electricity utilities and financial institutions forged very close relations. Manufacturers of electrical equipment joined forces with banks to form multinational holding companies to raise the capital needed to build larger power plants and high voltage transmission lines.⁶ Engineers and their associations successfully sought to influence policy making, too, to improve the investment climate and promote international connections that would further rationalise existing systems.

Before the First World War little international regulation existed for international electricity flows, and governments largely refrained from interfering in the sector. This left the initiative to private actors. Once the commercial prospects of electric light were recognised by the 1870s, electricity systems as well as electric traction systems were initially exploited by private companies. Municipal and provincial governments played a limited role as co-owners and regulators of early local utilities.⁷ The influence of public authorities increased substantially after the First World War and continued to transform the electricity sector ever more after the Second World War. National authorities stepped in to direct the geographical expansion of electricity networks but also to curb the negative effects of the near-monopoly position of private utilities. Moreover, starting with Switzerland in 1916 many European governments passed laws governing electricity exports.⁸ Thus, the new role of national government also checked the potential growth of international flows.

These new restrictions after 1918 displeased several internationally-oriented engineers and policy makers. This came to the fore at the 1926 World Power Conference in Basel, which devoted one session to the importance of international connections. Without exception, all papers in the session argued for a *laissez-faire* regime for international electricity transmission. This included prominent French engineer Etienne Génissieu, who gave an overview of existing interconnections between Switzerland and France. For him, increasing the connections between countries was not dependent on technological factors but on political will.⁹ Génissieu was supported by Robert Haas, the director of the Rheinfelden power plant in Germany, who objected to the recent legislation hampering the exchange of

⁶ Alfred D. Chandler, *Scale and Scope: The Dynamics of Industrial Capitalism* (Cambridge: Belknap Press, 1990), 464; William Hausman, Mira Wilkins and Peter Hertner, *Global Electrification: Multinational Enterprise and International Finance in the History of Light and Power* (Cambridge: Cambridge University Press, 2008), 52–3.

⁷ Robert Millward, *Private and Public Enterprise in Europe: Energy, Telecommunications and Transport, 1830–1990* (Cambridge: Cambridge University Press, 2005), 28; Hausman, Wilkins and Hertner, *Global*, 10–13, 23.

⁸ David Gugerli, *Redeströme: Zur Elektrifizierung der Schweiz, 1880–1914* (Zurich: Chronos Verlag, 1996), 287; United Nations Economic Commission for Europe, *Transfers of Electric Power Across European Frontiers: Study by the Electric Power Section* (Geneva: United Nations, 1952), 62–7.

⁹ Etienne Génissieu, 'Échanges d'énergie entre pays,' in *Transactions of the World Power Conference, Basle sectional meeting*, vol. 1 (Basle: E. Birkhäuser & Cie., 1926), 1001 & 1015.

electricity.¹⁰ The session was concluded by Jean Landry, a professor in electrical engineering at Lausanne and leading figure in the electrification of French-speaking Switzerland. Landry argued that international connections ‘can never have any but a useful and beneficial effect from all point of view’.¹¹ Those benefits largely revolved around rationalisation and efficiency. Connecting networks enabled taking advantage of seasonal surpluses of hydroelectricity and mutual assistance in case of short-term shortages. Hence, the first arguments for transcending national borders were related to technical rationalisation objectives.

The combination of increased state intervention and of the efficiency rationale was as much a feature of the electricity sector as it was of debates in other sectors after 1918. During the war democratically unaccountable government agencies had controlled mobilisation, leading to the emergence of corporatist managed economies and societies marked by close collaboration amongst state institutions, industry and labour. This went hand in hand with increased state intervention in the production, distribution and allocation of economic resources.¹² Engineers played a key role in these government agencies and administrations. Their emphasis on rationality, efficiency and scientific methods became as central to their administrative thinking as it was in Jean Monnet’s experience of Allied cooperation discussed by Wolfram Kaiser in his article in this special issue. The rise to power of electrical engineers and their ideology is best exemplified by Louis Loucheur (1872–1931). He was an engineer-entrepreneur and co-founder of Société Giros et Loucheur, an engineering firm specialising in constructing electricity and electric rail networks. During the First World War he first served as under-secretary of state for munitions and later as minister of armaments. After the war Loucheur became minister of reconstruction. He strongly emphasised mass production and stressed the importance of raw materials and energy, in particular coal and hydroelectric power.¹³ In the mid-1920s he also played a key role in the preparation of the League of Nations’ 1927 World Economic Conference.

‘Europe’ played no role in these early discussions about international rationalisation. The League’s OCT started out with an attempt to codify international electricity transmission but failed to get sufficient ratifications. At this time the League lacked sufficient expertise in electricity affairs, and thus the responsible committee

¹⁰ Robert Haas, ‘Austausch elektrischer Energie zwischen verschiedenen Ländern’, in *Transactions of the World Power Conference, Basle sectional meeting 1926*, vol.1 (Basle: E. Birkhäuser & Cie., 1926), pp.987–99.

¹¹ Jean Landry, ‘Exchange of Electrical Energy Between Countries: General Report on Section B’, in *Transactions of the World Power Conference, Basle Sectional Meeting*, vol. 1 (Basle: E. Birkhäuser & Cie., 1926), 1117; 1. ‘Le professeur Jean Landry’, *Revue technique suisse des mensurations et améliorations foncières*, 7, 38 (1940), 151–2.

¹² Philip Morgan, ‘The First World War and the Challenge to Democracy in Europe’, in Menno Spiering and Michael Wintle, eds., *Ideas of Europe since 1914: The Legacy of the First World War* (New York: Palgrave, 2002), 69–70.

¹³ Stephen D. Carls, *Louis Loucheur and the Shaping of Modern France, 1916–1931* (Baton Rouge: Louisiana State University Press, 1993), 3–4, 129 and 172–3.

could only draw up conventions in ‘very general and elastic terms’.¹⁴ Still, many engineers regarded the League’s intention to create a legislative framework for building more electricity connections between nations as a useful step towards a more liberal electricity exchange regime in Western Europe. The role of the League marks the start of the involvement of intergovernmental organisations in governing international electricity flows.¹⁵

In the late 1920s a broad variety of actors called for closer European cooperation, aiming to overcome the political and economic cleavages on the continent. Supporters of such cooperation came together in Count Richard Coudenhove-Kalergi’s Paneuropa Movement launched in Vienna in 1924. Several journals such as *l’Européen* and *l’Europe nouvelle* also came out in favour of greater European cooperation.¹⁶ Electrical engineers who supported this movement included Loucheur, UNIPEDE president Marcel Ulrich and Dannie Heineman, chairman of the Brussels-based multinational holding company SOFINA. The political debates about European unification provided a new impetus for the pleas of engineers for internationalisation and led to a number of European network plans. Arguably the best-known scheme was Oskar Oliven’s (1870–1939), the Director-General of the Gesellschaft für Elektrische Unternehmungen in Berlin. At the 1930 World Power Conference in Berlin, Oliven presented a scheme for a European high-voltage network of approximately 9,750 kilometres, connecting main sites of electricity generation with industrial and urban centres. Oliven expected that ‘political motives’ would pose the main barrier to his plan of a fully integrated system. He therefore regarded expanding interconnections between emerging national systems as ‘a very good interim solution’.¹⁷ This gradual approach received wide support and seems to suggest that for these engineers the rationalisation of networks was more important than the political motives related to European technological integration. From then onwards ‘Europe’ was commonly accepted as the geographical scale of rationalisation.¹⁸ The exact spatial scope varied, however; some included the Soviet Union and the British isles, whereas others did not.¹⁹

¹⁴ LoN, Report of the Sub-Committee for Hydro-electric questions: Advisory and Technical Committee for Communications and Transit, Minutes of the 4th session, LoN document C.486M.202.1923.VIII (Geneva: LoN, 1929), 9.

¹⁵ For a more thorough discussion of the role of the League, see Vincent Legendijk, *Electrifying Europe: The Power of Europe in the Construction of Electricity Networks* (Amsterdam: Aksant, 2008), 61ff.

¹⁶ Anita Ziegerhofer, *Botschafter Europas: Richard Nikolaus Coudenhove-Kalergi und die Paneuropa-Bewegung in den zwanziger und dreißiger Jahren* (Böhlau Verlag Wien, 2004); Etienne Deschamps, ‘“L’Européen” (1929–1940): A Cultural Review at the Heart of the Debate on European Identity’, *European Review of History*, 9, 1 (2002), 85–95.

¹⁷ Oskar Oliven, ‘Europas Großkraftlinien: Vorschlag eines europäischen Höchstspannungsnetzes’, *Zeitschrift des Vereines Deutscher Ingenieure*, 74, 25 (1930), 875–9.

¹⁸ ‘Session spéciale de la Conférence Mondiale de l’Énergie, Stockholm 1933,’ n.d., section 9E, box R-4286, League of Nations Archive.

¹⁹ Other plans included Ernst Schönholzer, ‘Ein elektrowirtschaftliches Programm für Europa’, *Schweizerische Technische Zeitschrift* 23 (1930), 385–97, which included Great Britain its network proposal, while the plan of French engineer Georges Viel did not. See his ‘Étude d’un réseau à 400.000 volts’, *Revue générale de l’électricité* November (1930), 729–44.

Such ideas to create a European system subsequently diffused into the work of the League. The League not only developed an interest in (electricity) infrastructure through the OCT, it also became ever more focused on European affairs. The specificity of some of the political and technical issues often related to the impact of the First World War, and the predominantly European composition of the League made a regional approach more logical and legitimate. Despite US President Woodrow Wilson's initially global ambitions, the League was a deeply Eurocentric organisation from the start – a result mainly of the influence of the European Great Powers, especially the United Kingdom, combined with the absence of the United States and Soviet Union (except for 1934–1939).²⁰

The European focus was strengthened further by the initiative of Aristide Briand, the French foreign minister. In September 1929 he proposed exploring ways to forge a 'United States of Europe' to the League's Assembly.²¹ This led to the creation of the Commission for Enquiry on European Union (CEEU), the main vehicle within the League for European collaboration.²² Subsequently the Belgian government appealed to the CEEU, asking it to study electricity transmission in a European framework. It argued that such a study could 'already look forward to the time when these exchanges can no longer be limited to two neighbouring countries, but when they will have to extend the whole continent . . . covered by an immense network of power distribution'.²³ Such a grid could also contribute to 'peace', the Belgian government argued, by constructing a physical bond between people that created new (energy) interdependencies between countries. Through the Briand and Belgian proposals, the quest for a European electricity system became part of the agenda of international organisations including the International Labour Organisation discussed by Lorenzo Mechi in his article in this special issue.²⁴

The by now institutionalised quest for such a European electricity system was strongly backed by the European electricity industry. The electro-technical community saw a European grid as a way to increase efficiency but also as a business opportunity. Dannie Heineman gave lectures outlining his views on a united economic Europe and played a key role in setting up and financing the

²⁰ See, for example, Mark Mazower, *Governing the World: The History of an Idea* (New York: Penguin Press, 2012), 128–36; Zara Steiner, *The Lights That Failed: European International History 1919–1933* (Oxford: Oxford University Press, 2005), 349.

²¹ LoN, Verbatim Record of the 10th Ordinary Session of the Assembly of the League of Nations, 6th Plenary Meeting, LoN document A.10.1929 (Geneva: LoN, 1929), 5.

²² One of few studies on the CEEU is Antoine Fleury, 'Une évaluation des travaux de la Commission d'Étude pour l'Union Européenne 1930–1937', in Sylvian Schirmann, eds., *Organisations internationales et architectures européennes 1929–1939. Actes du colloque de Metz 31 mai – 1er juin 2001. En hommage à Raymond Poidevin* (Metz: Centre de Recherche Histoire et Civilisation de l'Université de Metz, 2003), 35–53.

²³ League of Nations, 'Proposals Put Forward by the Belgian Government for the Agenda of the Commission of Enquiry for European Union', LoN document C.E.U.E/3 (Geneva: LoN, 1930), 1.

²⁴ Vincent Lagendijk, "'To Consolidate Peace'? The International Electro-Technical Community and the Grid for the United States of Europe', *Journal of Contemporary History*, 47, 2 (2012), 402–26.

Belgian national committee of the Paneuropa Movement.²⁵ SOFINA was also the majority owner of Oliven's company. During the early 1930s Marcel Ulrich reported on the progress regarding a European electricity grid in *L'Européen*.²⁶ Industry representatives also explicitly expressed their interest in League affairs and offered their services to the organisation, particularly to support the efforts to build a European power network.²⁷ These connections highlight the intertwining of the European movement, the engineering world and societal actors integrating diverging interests.

The coalescing of the European and electricity agendas demonstrates two important shifts within the realm of international organisations during the course of the early 1930s. For one, the League focused explicitly and increasingly on European affairs. Briand's speech, though yielding few tangible results, appeared to provide an opening for new forms of closer European cooperation within the League. Especially after 1932 the regional 'European option' became increasingly more dominant.²⁸ Moreover, the League became an important hub for expert groups, which included industrialists, engineers, scientists and economists.²⁹ While international observers during the 1930s increasingly saw the League as a failure regarding its more overtly political ambitions, plans to reform the organisation hinged on conceptions of what it should be about. Crucially, the work of its more technical bodies active in fields such as financial and economic affairs, health and infrastructures received praise from contemporaries and bore more concrete outcomes.³⁰ Reform proposals like the influential 1939 Bruce Report aimed to place the expert driven technical work at the core of a new League of Nations. The underlying technocratic internationalism – an allegedly non-political and scientific approach to addressing common problems – was regarded as an alternative to more traditional diplomatic methods.³¹

²⁵ See, for example, Dannie Heineman, 'Skizze eines neuen Europa: Vortrag gehalten in der Mitgliederversammlung des Vereins der Freunde und Förderer der Universität Köln im Hansasaal des Rathauses am 28. November 1930' (Gilde-Verlag, 1931). Geneviève Duchenne, *Esquisses d'une Europe nouvelle: L'europhisme dans la Belgique de l'entre-deux-guerres (1919–1939)* (Peter Lang, 2008), 245–57.

²⁶ See Marcel Ulrich, 'Un projet de réseau européen. Le transport de l'énergie électrique', *L'Européen*, 25 (1932); 'Le réseau électrique européen: Un projet grandiose', *L'Européen* 201 (1933); 'Le réseau électrique européen', *L'Européen*, 202 (1933).

²⁷ See, for example, Dunlop to Haas, 16 July 1931, and R.A. Schmidt to Haas, 7 Dec. 1932, section 9e, 11978, 1668, box R-2572, League of Nations Archive.

²⁸ Eric Bussière, 'L'Organisation économique de la SDN et la naissance du régionalisme économique', *Relations internationales*, 75 (1993), 301.

²⁹ Patricia Clavin and Kiran Klaus Patel, 'The Role of International Organisations in Europeanisation: The Case of the League of Nations and the European Economic Community', in Martin Conway and Kiran Klaus Patel, eds., *Europeanization in the Twentieth Century: Historical Approaches* (Basingstoke: Palgrave MacMillan, 2010), 110; Patricia Clavin, *Securing the World Economy: The Reinvention of the League of Nations, 1920–1946* (Oxford: Oxford University Press, 2013); Schipper, Lagendijk, and Anastasiadou, 'New Connections'.

³⁰ See, for example, H.R.G. Greaves, *The League Committees and World Order: A Study of the Permanent Expert Committees of the League of Nations as an Instrument of International Government* (London: Oxford University Press, 1931); R. Haas, 'World Transit and Communications', in *Problems of Peace: Lectures Delivered at the Geneva Institute of International Relations* (London, 1927), 212–20.

³¹ See Schot and Lagendijk, 'Technocratic'; Waqar H. Zaidi, 'Technology and the Reconstruction of International Relations: Liberal Internationalists Proposals for the Internationalisation of Aviation and

From European Grid to European *Grossraumwirtschaft*

The League proposal for a European electricity system died with the war, as did the League itself. But during the Second World War the notion of a European electricity system remained on the agenda on the side of the Allies and the Axis powers. The period of National Socialist German domination and occupation in fact proved a fertile ground for the construction of a European system.³² While the underlying ideological inspiration was considerably different from the interwar pro-European movement, Nazi electricity plans also aimed at creating a Europe-wide system.

The National Socialist quest for a European network was motivated by a drive for greater efficiency and more energy resources, but also by security interests. After 1933 Nazi energy plans continued to appeal to a ‘technocratic impulse’ and drew on people ‘with economic and technological expertise’.³³ Moreover, Bavarian engineer Oskar von Miller had already set in motion the move towards integrating regional networks prior to the Nazis’ rise to power. He argued for a larger role of the nation state and a nationally integrated network.³⁴ The backbone of this new system was to be the network of the Rheinisch-Westfälische Elektrizitätswerks Aktiengesellschaft (RWE), which already extended from the Ruhr into the Voralberg in Austria, and which had several interconnections to the Swiss grid as well. The RWE was experimenting with 400 kV technology in the 1930s, allowing for longer distance transport of electricity with lower efficiency loss, thus opening up cooperation on an ever larger geographical scale.³⁵

The National Socialists acted upon von Miller’s suggestions shortly after they came to power. First, the state assumed a stronger role in restructuring the sector with the energy economy law (*Energiewirtschaftsgesetz*), privileging the larger electricity companies to build new plants and transmission lines.³⁶ Second, in around 1937 Siegfried Heesemann, advisor to Hermann Göring’s ministry of economic

the International Control of Atomic Energy in Britain, USA and France, 1920–1950’, Ph.D thesis, University of London, Imperial College, 2008.

³² Bernhard Stier, ‘Expansion, réforme de structure et interconnexion européenne: Développement et difficultés de l’électricité sous le nazisme, 1939–1945’, in Denis Varashin, ed., *Les entreprises du secteur de l’énergie sous l’Occupation* (Arras: Artois Presses Université, 2006), 269–90.

³³ Maier, ‘The Economics’, 76–8.

³⁴ Wilhelm Füssl, *Oskar von Miller 1855–1934: Eine Biographie* (Munich: C.H.Beck, 2005), 195–6; Bernhard Stier, *Staat und Strom: Die politische Steuerung des Elektrizitätssystems in Deutschland 1890–1950* (Mannheim: Verlag Regionalkultur, 1999), 443.

³⁵ Georg Boll, *Entstehung und Entwicklung des Verbundbetriebs in der deutschen Elektrizitätswirtschaft bis zum europäischen Verbund. Ein Rückblick zum 20-jährigen Beziehen der Deutschen Verbundgesellschaft e.V.* (Frankfurt am Main: Verlags- und Wirtschaftsgesellschaft der Elektrizitätswerke d. Elektrizitätswerke mbH., 1969), 44; Helmut Maier, ‘Systems Connected: IG Auschwitz, Kaprun, and the Building of European Power Grids up to 1945’, in Erik van der Vleuten and Arne Kaijser, eds., *Networking Europe: Transnational Infrastructures and the Shaping of Europe, 1850–2000*, (Sagamore Beach: Science History Publications, 2006), 135.

³⁶ Stier, *Strom und Staat*, 443; Adam Tooze, *The Wages of Destruction: The Making and Breaking of the Nazi Economy* (New York: Penguin, 2008), 111–2.

affairs (*Reichswirtschaftsministerium*), suggested that a large-scale interconnected system (*Grossverbundnetz*) should be developed. Such a system would cater for the energy needs of the aluminium and other metal industries and facilitate the production of the synthetic rubber Buna.³⁷ As a part of his national scheme Heesemann also foresaw links with neighbouring countries along the lines of a European grid advocated by Oliven, who actually fled Germany after anti-Semitic laws forced him to resign.³⁸ Similarly, Just Dillgardt (1889–1960), who was placed in charge of the Reich's energy sector by Göring in 1939, based his investments into the electricity system on Heesemann's conception.³⁹

More left-leaning Nazi engineers such as Gottfried Feder and Franz Lawaczeck questioned the strong economic position of joint stock companies like RWE and argued against a centralised system. They saw decentralised electricity generation as a way to decrease transport costs and to create jobs in more remote regions. But breaking up industrial conglomerates like RWE went against the grain of the Nazi leadership. Ties between the National Socialists and parts of German industry were quite strong. RWE chairman Albert Vögler became a 'non-party member' of the Nazi Party in the Reichstag and sat on Hitler's economic advisory council as well. Dillgardt, in charge of the Reich's energy affairs, was a Nazi Party career politician with a seat on the board of RWE.⁴⁰

Germany's increased energy demands, combined with the occupation of large parts of Europe in 1940, provided incentives to think again about an electricity system on a European scale. The Minister of Armaments Fritz Todt (1891–1942) also came to see the benefits of an interconnected European system.⁴¹ After the occupation of Norway the Nazi planners revived older ideas of importing hydroelectricity from the north. Austria was particularly strongly integrated into the Reich's European grid. The Austrian network virtually merged with the German grid after the so-called Anschluss in 1938, and new power plants came under construction on the rivers Drau, Enns and Donau, as well as in the Voralberg.⁴² By 1941 Nazi planners discussed new connections from annexed Austria to neighbouring states, and the Reichswerke Hermann Göring started to negotiate the construction of hydroelectric

³⁷ Helmut Maier, *Erwin Marx (1893–1980), Ingenieurwissenschaftler in Braunschweig, und die Forschung und Entwicklung auf dem Gebiet der elektrischen Energieübertragung auf weite Entfernungen zwischen 1918 und 1950* (Stuttgart: Verlag für Geschichte der Naturwissenschaften und der Technik, 1993), 276.

³⁸ Boll, *Entstehung und Entwicklung*, 78. On Oliven, see Vincent Lagendijk, 'Biography 1: An Electrifying Legacy: The Long Life of the Oliven Plan', in Alexander Badenoch and Andres Fickers, eds., *Materializing Europe: Transnational Infrastructures and the Project of Europe* (Houndsmills: Palgrave Macmillan, 2010), 44–6.

³⁹ Maier, *Erwin Marx*, 276–7.

⁴⁰ Maier, *Systems Connected*, 138; Edith Raim, *Justiz zwischen Diktatur und Demokratie: Wiederaufbau und Ahndung von NS-Verbrechen in Westdeutschland 1945–1949* (Munich: Oldenbourg Verlag, 2013), 992.

⁴¹ Stier, *Strom und Staat*, 482–3.

⁴² Florian Freund, 'Elektrizitätswirtschaft in Österreich und der Krieg', in Oliver Rathkolb and Florian Freund, eds., *NS-Zwangsarbeit in der Elektrizitätswirtschaft der 'Ostmark' 1938–1945: Ennskraftwerke – Kaprun – Draukraftwerke – Ybbs-Persenbeug – Ernsthofen* (Vienna: Böhlau Verlag, 2002), 3.

plants in Bulgaria, Slovakia and Croatia.⁴³ The Third Reich also reinforced its links with neutral Switzerland during the war.⁴⁴ Ambitious plans to strengthen the ties between Germany, Belgium and the Netherlands were not implemented except for a connection between the dispatch centre in Brauweiler near Cologne with the Netherlands and Belgium. This connection proved to be an important node after the war.⁴⁵

The modus operandi of constructing these new interconnections and power plants differed. On the one hand, the National Socialists relied on collaboration and exploitation. Austria was a case in point. A special company was founded, the Alpelektrowerke AG, to plan and oversee the construction of new power plants. Building the hydroelectric complex of Kaprun was in the hands of Hermann Grengg, a hydraulic engineer from Graz and early Nazi Party and SA member, relying on forced labour for the physical work.⁴⁶ Network extensions with France, the Netherlands and Switzerland were conducted in a more business-like fashion and were left in the hands of non-party member engineers and companies like RWE.

Thus, the electricity system became geographically more European during the early years of the war, although many Nazi plans were never realised. The inertia of this new physical reality also left a material legacy for post-war planning. After the war, moreover, many experts remained in positions of power and influence. Heesemann, co-architect of the German interconnected system, retained a high-ranking position at the German ministry of economics and represented his government at the International Atomic Energy Agency in the 1950s and at the UNECE on matters of electricity. He was also chair of the Committee on Classic Energy (as opposed to nuclear energy) set up following the meeting of the foreign ministers of the European Coal and Steel Community (ECSC) in Messina in early June 1955.⁴⁷ Having been dismissed by the American military occupiers, Grengg was reinstated as a professor in hydraulic engineering in Austria, and even became rector of the University of Graz in 1954.⁴⁸ Many electrical engineers in Germany's neighbouring countries came to play

⁴³ 'Niederschrift über die Sitzung des Fachausschusses I (Wasserkraftplanung) am 27. und 28.1.1942 in Berlin, Pariser Platz 5a', Collection Wasserwirtschaftsstelle für das untere Donau-gebiet, 1940-1942, Box 134, Austrian State Archives.

⁴⁴ Jean-Daniel Kleisl, *Électricité suisse et Troisième Reich* (Lausanne: Chonos/Éditions Payot, 2001), 49 and 71-3.

⁴⁵ Louis de Heem, 'Expérience acquise dans le fonctionnement interconnecté du réseau belge avec les réseaux des pays voisins', in *Report to UNIPEDE Congres: Comité d'études des interconnexions internationales*, IV.1 (Rome: UNIPEDE, 1952), 2-3; G.P.J. Verbong, L. van Empelen, and A.N. Hesselmann, 'De ontwikkeling van het Nederlandse koppelnet tijdens de Tweede Wereldoorlog', *NEHA-Jaarboek*, 12 (1998), 277-309, 304-5.

⁴⁶ Margit Reiter, 'Das Tauernkraftwerk Kaprun', in Rathkolb and Freund, eds., *NS-Zwangsarbeit in der Elektrizitätswirtschaft der 'Ostmark' 1938-1945*, 130-40.

⁴⁷ Comité Intergouvernemental créé par la Conference de Messine, Brussels, 26.7.1955 MAE 94 f/55, doc nr. 54. Liste des membres du comité intergouvernemental créé par la conference de Messine, CM3 - Comité Intergouvernemental: listes des membres du comité directeur et des membres de commissions ou sous-commissions instituées dans le cadre du comité intergouvernemental, Archives of the European Council, Brussels.

⁴⁸ Oskar Vas, 'Hermann Grengg: 70 Jahre,' *Österreichische Ingenieurs-Zeitschrift*, 4 (1961), 61-2.

a prominent role after 1945, too, although they made few references to the wartime years.

Institutionalising European Cooperation

During the war the Allies favoured keeping the electricity system largely intact. Less than 1 per cent of aerial attacks were aimed at German electrical installations.⁴⁹ The future of the new wartime network extensions between Germany and the Netherlands, Belgium and Switzerland was discussed in Swiss Laufenburg in June 1945. They were put to use to cover basic electricity needs as much as possible.⁵⁰ In several instances the Marshall Plan supported the completion of power plants started under National Socialist rule or occupation – such as the vast hydroelectric complex at Kaprun.⁵¹

Post-war plans largely replicated similar geographical foci of both interwar and wartime electricity proposals. While the institutional set-up of post-war international organisations became more technical and European compared to the interwar League, the electro-technical sector retained its evolving European agenda. Whereas the political and ideological inspiration changed, the aim to construct an interconnected European electricity system to improve efficiency and security of supplies remained constant. The post-war manifestation of former League ideals, the United Nations organisation, comprised so-called ‘functional organisations’. They included the UN Economic and Social Council, which the Bruce Report had already suggested – an institution with several regional organisations including the UNECE with its focus on Europe.⁵²

The expert-driven technical approach remained strong after the war, too. The influential post-1945 generation of electrical engineers only just bridged the interwar and post-war years. While mostly being educated at a time when the European system idea was becoming nested in different milieus and institutions, many key members had already worked during the late 1930s, and some had played a role in the efforts of Nazi Germany, directly or as collaborators.

This was the case, for example, for Dutch engineer Gerard J. Th. Bakker. He had been the director of the The Hague electricity company since 1914 and was named director-general of the Dutch electricity supply in 1939. One of his first initiatives was to prepare a national interconnection programme as a strategic move in the tense European political climate. Following the prevailing technical rationale, an interconnected system would allow for a more efficient use of existing capacity,

⁴⁹ United States Strategic Bombing Survey, *The United States Strategic Bombing Survey: Over-All Report (European War)* (Washington, D.C.: Government Printing Office, 1945), 83–5.

⁵⁰ Report of a Meeting held on 22 June 1945 in Laufenburg, Folder: Allgemeines 1930–1951, File 83: Ausfuhrbewilligungen (81, 81.1, 82), 8 E 8190 (A) -/3 - Amt für Energiewirtschaft 1930–1969, Schweizerisches Bundesarchiv, Bern, Switzerland.

⁵¹ Lagendijk, *Electrifying Europe*, 116–7.

⁵² Victor-Yves Ghébali, ‘Aux origines de l’Ecosoc: L’évolution des commissions et organisations techniques de la Société des Nations’, *Annuaire français de droit international* (1972), 469–511.

and, in case of war, allocating electricity from one part of the country to another. Under German occupation after 1940 Bakker's main task remained integration, but of a different nature. While continuing as director-general, Bakker had to negotiate a Dutch interconnection as part of the expanding German system. During the war he was acting president of the WPC. After 1945 he served as the chair of UNIPED's 1949 Study Committee on International Interconnections. He was also the Dutch representative on the UNECE's Electricity Committee during the 1940s and 1950s.⁵³

Other influential members of this generation included the Swiss René Hochreutiner (1908–1991) and the two Frenchmen Pierre Ailleret (1900–1996) and Charles Crescent (1890–1963). All three were founding members of UCPTE and had experiences akin to Bakker's. Ailleret started his career within the French ministry of public works and taught at the *École des Ponts et Chaussées* after 1938, where he educated a new generation of engineers to be employed by *Électricité de France*, of which he was one of the founders in 1946.⁵⁴ During the first post-war years he was the French representative on the Public Utilities Committee of the Allied Kommandatura of Berlin. Crescent became head engineer of the *École des Ponts et Chaussées* in 1928 and was promoted to inspector-general nine years later. He worked towards abolishing restrictions on electricity exchanges and held functions in several international organisations like the UCPTE and UNECE. Hochreutiner, Bakker and Crescent met again at the UNECE's Electricity Committee in 1947, alongside Hintermayer.

Generally speaking, these men all operated large national electricity systems *prior* to the war and continued to run them *during* the war as well as afterwards. The post-war political leadership did not regard their wartime role as problematic, and they were able to attain key positions in the electricity sector. Their positions after the war reflect a clear shift towards a much greater role of the state in the electricity sector and international cooperation. Apart from sitting committees of professional associations, men like Crescent represented their countries at the UNECE, the OEEC and later at the UCPTE. They became technical experts in the service of the state, as governments further increased their grip on the electricity systems at the expense of private holding companies. After 1945 most governments in Western Europe aimed to suppress market forces in most infrastructure sectors. In addition to their roles as regulators, national governments increasingly came to own infrastructure systems and ran them as public services in order to ensure equal access to electricity. This seriously eroded the role of foreign companies.⁵⁵

Within this new post-1945 setting experts operating the networks now institutionalised cooperation amongst Western European state-owned electricity grids. A key episode was the 1949 Marshall Plan-sponsored technical aid mission. This project brought twenty-five electrical engineers from Western Europe to the United States in order to study dispatch centres, control rooms and power plants.

⁵³ Verbong, Empelen, and Hesselmanns, 'De Ontwikkeling', 283, 301–7.

⁵⁴ André Merlin, 'In Memory of Pierre Ailleret', *Power Engineering Review, IEEE*, 16, 12 (1996), 31.

⁵⁵ Millward, *Private*, 96; Hausman, Wilkins, and Hertner, *Global*, 234–5.

Chaired by Hochreutiner, the mission recommended extending the number of international connections and improving international coordination. Subsequent discussions within the OEEC led to a consensus that Western European electricity resources should be pooled, but the regional and national structures of individual utilities should be maintained.⁵⁶ Shortly after the US trip, the OEEC endorsed the idea of a Western European power pool in March 1950. Fourteen months later representatives of utilities from eight countries (Austria, Belgium, Germany, France, Italy, Luxembourg, the Netherlands and Switzerland) founded the UCPTE on a basis of voluntary cooperation.

While the electrical engineers from the technical aid mission became well-acquainted with each other, many staff members of the new European functional organisations already knew each other, for example from cooperating in the so-called E-organisations that operated in the transition from war to peace, as well as in the Berlin military government.⁵⁷ In terms of staffing the new post-war organisations, the continuities reached back at least to the war years. As in the case of the postal sector discussed by Leonard Laborie in his article in this special issue, experts largely remained silent about their cooperation under German occupation.

Cooperation was confined to Western Europe, however, for economic as well as strategic reasons, particularly after the start of the Korean War in 1950. Governments actively discouraged electricity cooperation with Eastern Europe for political reasons.⁵⁸ 'Europe' effectively became reduced to those countries not under Soviet tutelage. This development marked a clear break with interwar debates, when Central and Eastern Europe was still considered an integral part of the planned European system. Moreover, opinions differed on how such a European system should be attained. In this respect both the UNECE and the OEEC were ambitious in planning an extensive expansion of transmission lines and power plants and considered international ownership of electricity facilities. American officials within the OEEC proposed an 'International Programme' consisting of internationally financed and owned plants in 1947. The electricity generated in those plants would be shared amongst participating countries.⁵⁹ UNECE officials floated a similar proposal for a 'European Power Board' that would have ownership and control over transmission lines.⁶⁰

⁵⁶ 'Council recommendation concerning the working of the international power pool', 26 Mar. 1950; and *Ibid.*, document EL(50)22, 'Draft agreement between the countries of Western Europe for the joint operation of electric power resources', 20 May 1950, document EL(50)16, file 1156.1, fonds OEEC, Historical Archives of the European Union.

⁵⁷ Cornelius W. DeForest to Cisler, 29 Sept. 1948, Box 1, Map: Electricity 1948, Office of the director, subject files, 1948–1952. Administration – Commodities. Entry # 986, Industry division (1948–1951), RG 469 – Records of US Foreign Assistance Agencies, 1948–1961. Office of the Special Representative in Europe (1948–1953), National Archives and Records Administration, College Park, United States.

⁵⁸ See, for example, Vincent Lagendijk, 'The Structure of Power: The UNECE and East–West Electricity Connections, 1947–1975', *Comparativ: Zeitschrift für Globalgeschichte und Vergleichende Gesellschaftsforschung*, 24, 1 (2014), 50–65.

⁵⁹ CEEC, *Committee of European Economic Co-Operation. Volume II: Technical reports* (London: His Majesty's Stationary Office, 1947), 132

⁶⁰ European Power Board, General: Draft note, 13 Dec. 1947, registry fonds GX, file 19/13/1, box 3175, United Nations Office Geneva Archives.

But like during the interwar period electrical engineers opted for a more gradual approach. Through their key positions as experts and national representatives, they were able to oppose these proposals in the OEEC and UNECE electricity committees, instead advocating international cooperation on the basis of bilateral agreements.⁶¹ This gave UCPTTE members a large measure of flexibility in pursuing different agendas and policy aims on the national and sub-national level. Leading engineers like Hochreutiner proposed new forms of international cooperation over already existing networks to achieve efficiency and to only construct the highest priority new lines.⁶² The main challenge was technical: in order to be able to exchange electricity amongst utilities and countries, networks should operate at the prevalent frequency of 50 Hz under similar technical parameters. European cooperation was seen as key but not at the expense of national control. This setting left little space for a more supranational organisation.

Pursuing their technocratic internationalist agenda, the post-1945 generation of engineers prioritised liberalising international electricity exchanges. This item had featured prominently on interwar Europeanist agendas of the electricity industry. The UCPTTE took the lead in this effort, lobbying both the OEEC and UNECE to act. As result, the OEEC and UNECE electricity committees convinced European governments to simplify their regulations in order to facilitate exchanges in successive steps.⁶³ Within Western Europe electricity flows were no longer restricted, and the network operations united within UCPTTE could now continue to optimise electricity supply on a European scale. With most legislative barriers out of the way, the UCPTTE turned its attention to the physical aspects of the network. The backbone of the network was the synchronisation at 50 Hz, now becoming the uniform standard in all European countries, Central and Eastern European countries included.⁶⁴ The synchronous interconnection of the French, Western German and Swiss networks in 1957 was a stepping stone for the further expansion of cooperation amongst Western European utilities across borders.

The creation of a Western European electricity system was thus well under way in the 1950s. In the process the UCPTTE became responsible for ensuring a balance between a stable and rational international system and the efficient operation of national systems. The UCPTTE system proved to be very robust building on 'mutual trust' and 'technical solidarity' amongst experts.⁶⁵ They operated a

⁶¹ 'Note of meeting held in the Executive Secretary's office on December 19th, 1947 to discuss the proposal that the Power Committee be asked to consider the formation of a European Power Board', registry fonds GX, file 19/13/1, box 3175, United Nations Office Geneva Archives.

⁶² René Hochreutiner, 'L'Interconnexion au service des échanges d'énergie en Europe occidentale (report no. 9)', in *Compte rendu des travaux du huitième congrès international tenu à Bruxelles en septembre 1949, Rapports des Comités d'Études IV à IX*, vol. 2 (Paris: Imprimerie Chaix, 1949), 6–7.

⁶³ Letter of Myrdal sent to European ministers of foreign affairs and relevant international organisations, 30 Oct. 1951, registry fonds GX, file 19/6/1/4-3815, United Nations Office Geneva Archives; and Notes of Réunion du Comité Restreint, 3 Oct. 1955, UCPTTE Archive.

⁶⁴ Neidhöfer, '50-Hz Frequency', 78–9.

⁶⁵ UCPTTE, 'Cooperation in the Interconnected Power System of the UCPTTE – Technical Reasons for Coordination, in *Half-Yearly Report*, vol. II – Summer (Brussels: UCPTTE, 1993), 40.

system of interconnections with extensive common safety regulations, each national network operating as an integrated part of the European network. While cross-border electricity flows remained relatively marginal compared to national flows, they could be essential to address seasonal or short-term shortages. In line with technocratic internationalist ideas, UCPTTE members had access and influence at the domestic level, where they enjoyed the mandate to negotiate international flows and connections, as well as at the international level, where they sat on electricity committees in Paris and Geneva. Thus, the construction and operation of this European system was largely a technocratic affair.

In its self-representation the UCPTTE fused both Europeanist and technical elements. It regarded itself as a harbinger of European cooperation, and as part of a liberal and open trade regime for electricity. On the eve of its twentieth anniversary, in 1971, UCPTTE President Pietro Facconi emphasised the organisation's 'historic importance for its remarkable contribution to the ideal of a "United Europe"'.⁶⁶ This proclaimed unity was mostly technological, however, while energy sovereignty remained firmly in nationally organised utilities – all of which enjoyed the mandate of their respective governments to strike international deals.

This also explains why for the longest time the EEC's role remained marginal in this field. In 1957 – the year of the signing of the EEC Treaty – Hochreutiner explained that the 'creation of supranational organisations would only bring out more difficulties for electricity exchange in Western Europe'.⁶⁷ From this perspective it is not surprising that the UCPTTE kept a distance to 'core Europe' integration in the ECSC and the EEC, portraying itself as an alternative forum for European unification. To engineers like Hochreutiner supranationality implied breaking up the existing system of national representation, effectively taking power out of the hands of national companies – and hence potentially disempowering the engineers. The technical cooperation within the UCPTTE went beyond EEC membership, with Austria and Switzerland playing pivotal roles.

As early as the 1950s the High Authority, and later the European Commission, tried to intervene in the energy sector. However, it concluded that the barriers to implementing market principles in network-bound systems such as electricity and gas were too high.⁶⁸ Subsequent energy crises led the European Commission to formulate several proposals for a European Community (EC) energy policy, but they bore few tangible results until the 1980s. Western European governments preferred to keep the strategically and economically vital energy policy firmly in their own hands and did not yield to centralising tendencies. This played into the hands of the UCPTTE.

The European Commission's most notable accomplishment in the electricity sector was probably the 1973 Low Voltage Directive, setting standards for the free trade

⁶⁶ Pietro Facconi, preface to *UCPTTE 1951–1971: 20 ans d'activité* (Rome: UCPTTE, 1971).

⁶⁷ Lecture by René Hochreutiner, 'Gemeinsamer Markt und europäische Freihandelszone', 4 June 1957, 82 Verband export, Werke 1934–1959, 8190 (A) 1981/1, 37, Schweizerische Bundesarchiv Bern.

⁶⁸ Comité Intergouvernemental créé par la Conférence de Messine, 'Rapport des Chefs de Délégation aux Ministres des Affaires Etrangères', document Mae 120 f/56 (corrigé) (Brussels: Secrétariat, 1956), 126–.

of electronic appliances with a voltage rating between 50 and 1,000 V. This built upon on the standardisation efforts of a non-EC body, the European Committee for Electrotechnical Standardisation (CENELEC).⁶⁹ However, this directive only covered the standardisation of electrical appliances and did not affect electricity systems. Thus, at least until the 1980s the EC continued to be marginal in the electricity sector. Established actors like the UCPTTE and CENELEC continued to dominate international policy making and technological limitations hampered the EC's free trade principles.⁷⁰ In this respect the electricity sector to some extent resembled the integration patterns in the many other sectors. Here, too, the European Communities were 'fragile latecomers in a closely networked region'.⁷¹

Conclusion

Today we plug our appliances into wall sockets that connect us to the rest of the European continent. Since the days of the League a tense and multifarious process of network integration has led to an interconnected electricity system on a European scale. In many ways this process can be labelled Europeanisation, as it has entailed 'a variety of political, social, economic and cultural processes that promote (or modify) a sustainable strengthening of intra-European connections and similarities through acts of emulation, exchange and entanglement and that have been experienced and labelled as "European" in the course of history'.⁷²

There is no direct line from the first interwar plans for a European grid to the contemporary state of electricity interconnectedness. Although the electricity industry has clearly undergone a process of Europeanisation, this was a 'complex, multidirectional and open process of intra-European entanglement'. Building European infrastructures has been a contested process that also met with opposition.⁷³ The emerging system evolved continuously, with the geographical scale of European cooperation first contracting in the post-war period and ultimately expanding. While most Scandinavian countries (with the exception of the continental part of Denmark) are still not part of the synchronised system, it has come to include Central and Eastern Europe. This electrical eastward expansion in fact preceded the EU's 2004 enlargement to include ten new member states. Despite this increase in scale, the process was slow and uneven.

⁶⁹ Wolfram Kaiser and Johan Schot, *Writing the Rules for Europe: Experts, Cartels, and International Organizations* (Basingstoke: Palgrave Macmillan, 2014), 277; CENELEC and Rudolf Winckler, *Electrotechnical Standardization in Europe: A Tool for the Internal Market* (Brussels: CENELEC, 1994).

⁷⁰ See Vincent Legendijk, "'An Experience Forgotten Today": Examining Two Rounds of European Electricity Liberalization', *History and Technology*, 27, 3 (2011), 291–310.

⁷¹ Kiran Klaus Patel, 'Provincialising European Union: Co-Operation and Integration in Europe in a Historical Perspective', *Contemporary European History*, 22, 4 (2013), 653.

⁷² Ulrike von Hirschhausen and Kiran Klaus Patel, 'Europeanization in History: An Introduction', in Martin Conway and Kiran Klaus Patel, eds., *Europeanization in the Twentieth Century: Historical Approaches* (Basingstoke: Palgrave, 2010), 2.

⁷³ Erik van der Vleuten et al., 'Europe's System Builders: The Contested Shaping of Transnational Road, Electricity and Rail Networks', *Contemporary European History*, 16, 3 (2007), 327–8.

After launching the idea of a European system, the institutional dynamics worked in favour of its creation. The League became increasingly more focused on Europe and dominated by technical experts. Along with pro-European politicians, they viewed technical cooperation as a potential way out of the League's political impasse, leading to recommendations that influenced the post-war institutional machinery. These continuities are reflected in the operational mode of the OEEC and the UNECE. Engineers connected themselves to these new forms of international organisation. Prior to the European 'turn', they had argued for a more open regime of electricity connections and flows. Connecting networks, also across borders, matched seamlessly with the engineering rationale of making the electricity system more efficient and robust. 'Europe' seemed to be the ideal geographical scale for optimising the system.

The Second World War did not mark a break. Instead, it actually acted as a stimulus for building the network. The fear of war first spurred national governments to better integrate their domestic grids. The subsequent Nazi dominance over large parts of the European continent stimulated a further process of technical integration. Though supporting different ideological aims, the geographical scale and the engineering logics at work remained quite constant. The three vectors of ideas, technology and institutions paved the way for more institutionalised European cooperation in the post-war era. Still, nothing was fixed, as competing solutions were discussed within the electricity committees of the UNECE and OEEC. Eventually Western European countries committed themselves to far-reaching forms of technical cooperation, while not surrendering their energy sovereignty. At least well into the 1980s the EC with its more overtly political objectives remained a mere sideshow, while other organisations facilitated European cooperation in the electricity sector.

In some important respects the electricity sector was clearly similar to postal and transport services discussed by Leonard Laborie and Christian Henrich-Franke in their articles in this special issue. Thus, electricity experts spoke out against using the EEC Treaty as a framework for the sector's integration and instead continued to rely upon their own expert-led organisation. In that sense the UCPTE's liberal electricity regime, which preceded the creation of the EEC, established a form of path dependency. The sector only left this path in the mid-1980s. The momentum created by the Single European Act, which gave the European Commission more powers to realise an internal energy market by 1992, was technologically buttressed by new ICT-based possibilities that allowed the application of market principles to electricity systems. As a consequence, privatisation as well as separating electricity transportation and production activities altered the European institutional electricity landscape. The technological legacy – the by now well-integrated European system – remained a key part of this landscape, as did the notion of an efficient system on a European scale – but now this was a form of efficiency dictated by market principles.⁷⁴

⁷⁴ Lars Thue, 'Connections, Criticality, and Complexity', in Per Högselius et al., eds., *The Making of Europe's Critical Infrastructure* (Basingstoke: Palgrave Macmillan, 2013), 229–32; Lagendijk, "An Experience", 301–2.

As in the transport sector, the EC found itself overshadowed by well-established other actors. There are some marked differences compared to the postal services, however. Whereas letters and packages can be transported in different ways, electricity has no alternative network structures. This, then, makes the electricity grid more inert and fixed, also over a longer time. At the same time, the limits of 'European' electricity were never clear cut. Although the European character of the scale was fixed, what constituted 'Europe' was not. The geography of the 'political Europe' hardly matched the 'technological zone', or zones.⁷⁵ Although the UCPTTE system expanded over time, it never corresponded with the EC or EU due to the conspicuous presence of some countries like Switzerland and the absence of others like Finland and Sweden.

This leads on to the final question about the key driving factor. Does the emergence of a European grid and organisation reflect a quest for European cooperation, or engineering ideas of rationalisation? The engineering logics do not necessarily stop at Europe's border, wherever those may be. The vision of the so-called Global Electricity Network Initiative, a US-based non-profit organisation, is even of a scale beyond Europe, propagating a global electricity network. While adhering to lofty ideals of decreasing pollution and reducing hunger and poverty, the initiative has striking similarities with earlier plans for a European system. One key component of the initiative's legitimisation is a wish for a more rational use of resources and efficient organisation of electricity supply. Former UCPTTE President Albert Michel wrote in 1997 that 'synchronous interconnection has no technical limits'.⁷⁶ In other words, electricity integration can be conceived of on a wider than merely European geographical scale, so that the history of the European system may turn out only to have been a historical intermezzo.

⁷⁵ Frank Schipper and Johan Schot, 'Infrastructural Europeanism, or the Project of Building Europe on Infrastructures: An Introduction', *History and Technology*, 27, 3 (2011), 250. The use of 'technological zones' is inspired by Andrew Barry. See his *Political Machines: Governing a Technological Society* (London: Athlone Press, 2001).

⁷⁶ Michel Albert, 'Enlarged Interconnection between the East and the UCPTTE', *Perspectives in Energy*, 4 (1997), 7.