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RTE: FINANCING ELECTRICITY TRANSMISSION INVESTMENTS IN A REGULATED ENVIRONMENT

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It was the end of 2013, a year after his appointment as the finance director of Réseau de Transport d'Électricité (RTE), and Olivier Lavoine was reviewing his company's investment program. Compared to previous years, the plan was more ambitious, which Lavoine saw as an opportunity for growth. At the same time, he was aware of the regulatory risks that came with these large investments.

Lavoine described the specificities of financial planning in his business: "In our industry, the investment risk is essentially regulatory risk because we depend on [the] CRE [Commission de Régulation de l'Energie, the national regulatory authority in France] for the approval of our investments, and for the review of the prices we charge our grid users for the transport services we provide."

In that context, Lavoine needed to develop a financial planning model that would help RTE decide whether to make the planned investment and how to prepare for possible regulatory uncertainties.

RTE: THE FRENCH POWER GRID OPERATOR

The European electricity network was then managed by 41 transmission system operators (TSOs) and more than 2,300 distribution system operators (DSO). The TSOs managed the electricity network from generation plants to regional or local DSOs; the DSOs delivered the electricity to the connected customers. The voltages at which these electricity networks operated were standardized in Europe, ranging from 400,000 volts for the international electricity highways to 230 volts in domestic houses. The border between transmission and distribution existed somewhere in the range of voltages, but it was not standardized, determined by regulation rather than physics.

RTE played the role of a TSO in the French energy value chain, established as a result of restructuring the electricity sector in Europe. The company was founded in 2000 as an independent function attached to the former vertically integrated Électricité de France (EDF). With the formation of RTE, EDF was then limited to activity only in power generation and supply segments of the value chain. RTE's main role was to maintain, operate, and expand the transmission network in a spirit of fairness and equality for all transmission system stakeholders. In 2006, RTE became a limited company as a subsidiary of what had become the EDF Group. This further reinforced the independence of RTE from EDF.

RTE was the largest TSO in Europe, with 100,000 kilometres of lines carrying between 63,000 and 400,000 volts; 250,000 towers; 2,518 power stations; and 46 cross-border lines. RTE had a turnover of €4,529 million[1] in 2012 and a workforce of 8,400.

The company was essentially an asset manager and provided services to facilitate the wholesale electricity market. It was the only electricity TSO in France and the only company that managed international exchanges of electricity between France and neighbouring countries. The French electricity network was interconnected with Great Britain, Belgium, Germany, Italy, Switzerland, and Spain (see Exhibit 1).

THE INDUSTRY IN FLUX

Before the 1990s, the European electricity sector was characterized as a top-down system: large power generators (hydroelectric, nuclear, coal, and natural gas) produced electricity, and transmission lines then took that power to load centres, from where it was distributed to consumers over grids. The system was like a waterfall, with electricity flowing in just one direction, from high to low voltages.

The whole value chain was managed by vertically integrated utilities. Later, the electricity transport services (transmission and distribution) were unbundled from the electricity production and supply activities, and wholesale and retail markets were introduced all over Europe. As a result, competition was introduced in the production and supply of electricity; however, electricity networks were considered natural monopolies that needed regulating.

Prior to changing the regulatory regime to revenue cap, most European TSOs, including RTE, were regulated with a cost-plus (cost+) regime. Under cost+, the regulator checked the company's cost accounting and approved the recovery of the company's costs to the extent that they were reasonable. In the revenue cap regime, the cap was periodically revised by the national regulatory authority, fixing the revenue stream for a number of years. To increase profits in that period, the company needed to cut costs; thus, revenue cap was one of the regimes known as incentive regulation.[2] Periodic review allowed the regulator to transfer a portion of the efficiency gains back to consumers and set an updated revenue cap for the next regulatory period.

Revenue caps were typically restricted, applying to operating expenditures that the companies at least partly controlled. There were also "other costs" that the companies could charge as pass-through fees,[3] such as costs related to public service obligations.

Capital expenditures were treated differently among European Union member states. Belgium and France, for instance, excluded investment costs from a TSO's revenue cap and instead remunerated the investment costs with a cost+ or cost pass-through mechanism. This meant that the process to approve investments was separate from the process to set the revenue cap.

[1] € = EUR = euro; all currency amounts are in € unless otherwise specified; €1 = US$1.32 on December 31, 2012.
[2] In effect, every regulatory regime provided companies with incentives; the incentives just varied with the regime.
[3] Pass-through charges referred to costs incurred by the company that the regulator directly added to the total revenue (i.e., the regulated asset base) that the company could collect from consumers through electricity transmission tariffs.

Once investments were approved by the regulator, the investment entered the company's regulated asset base (RAB). The RAB was then remunerated with a regulated weighted average cost of capital (WACC) that allowed the TSOs to pay back the interest on outstanding debt and provide a return on equity to its shareholders. In Germany and the Netherlands, however, both the operating expenses and the capital expenditures were included in the revenue cap; the value of old assets could be revised in the periodic review of the revenue cap. This approach was called the total expenditures approach, and it provided stronger incentives for the TSO to keep costs under control, but, at the same time, the approach also increased the TSO's investment risk (see Exhibit 2).

In addition to the changes in the sector's structure and in the regulatory environment, there was a growing need for cross-border investments. More market integration was required, and renewable energy sources came on stream in locations where electricity was easier and cheaper to produce. It was difficult to predict whether these changes would increase the global or local production of electricity, or both. Households and businesses were beginning to produce their own electricity with windmills and solar panels, but it was unknown how far decentralization of energy production would progress. It was possible that the system would become, in fact, more centralized with large solar installations in North Africa and more wind farms on the North Sea coast. Experience and history indicated that evolution would likely be a mixture of the two trends, but how the trends would balance, when it would happen, and what the outcome would be were unknown. This led to debate and uncertainties about where investments were needed most in electricity networks—in high-voltage transmission networks (the motorways of electricity transport), local (and lower voltage) distribution networks, or both?

INVESTMENT PLAN UNDER REGULATORY RISK

The European Commission had estimated that approximately €200 billion needed to be invested in electricity and gas infrastructure to achieve its 2020 energy and climate objectives. Because investments in electricity networks (lines, cables, and energy storage) had been inadequate, renewable energy was likely to be lost in some places and, therefore, wasted because production would exceed consumption, and the excess could not be stored. In other places, production was insufficient, and expensive backup production would be needed. To address these needs, the European Network of Transmission System Operators (ENTSO-E), an association of the TSOs in Europe, published its *10-Year Network Development Plan* (*TYNDP*) to promote investment in the European power transmission network.[4]

In 2013, the European Union adopted an energy infrastructure package, which included regulatory measures to support investments in electricity networks.[5] Under this package, projects with a significant cross-border impact were labelled as "projects of common interest" and granted preferential regulatory treatment when granting permits, allocating costs, and providing TSOs with incentives. The first list of projects of common interest was adopted in 2013. It included several of RTE's projects, which, together, would increase France's import capacity from 5–10 per cent to 15–30 per cent of the installed generation capacity. Each of these projects represented several hundred million euros, such as a 64.5-kilometre high-voltage underground connection between France and Spain with an estimated cost of €700 million.

Also, in 2013, Lavoine finished negotiating the revenue cap (the Tarif d'Utilisation des Réseaux Publics d'Électricité, or TURPE charge) with the regulator for the next three-year regulatory period. There was a

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[4] European Network of Transmission System Operators for Electricity, *10-Year Network Development Plan 2012*, accessed August 29, 2018, www.entsoe.eu/fileadmin/user_upload/_library/SDC/TYNDP/2012/TYNDP_2012_report.pdf.
[5] *Regulation (EU) No 347/2013 of the European Parliament and of the Council of 17 April 2013*, accessed August 30, 2018, https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2013:115:0039:0075:EN:PDF.

risk, however, that the regulator might follow Germany and the Netherlands and implement the total expenditures approach in France in the next regulatory period. Lavoine was also concerned that if the investment program he proposed to the regulator increased prices more than an average of 2 per cent per year, the regulator might change the regulatory regime from the current revenue cap regime to a price cap.

Given the risks, Lavoine decided to evaluate two regulatory scenarios: (a) the current revenue cap regime and (b) the risks associated with a price cap regime, if it were introduced, and compare them to the old regulatory regime (i.e., cost-plus) (see Exhibit 3).

Lavoine began with the company's financials from 2013, when the company was still regulated by a cost+ regime and achieving a 7 per cent return on equity (€4,800 million in equity was costing the company €336 million) (see Exhibit 4). Lavoine also worked with a linear asset depreciation that assumed the depreciation costs in 2013 corresponded to an average asset lifetime of 26.7 years. The averaged lifetime adjusted for the typical situation with TSOs with assets, such as cables and overhead lines, with a lifetime of up to 40 years, and assets that had a much shorter lifetime, such as information technology (IT) equipment.

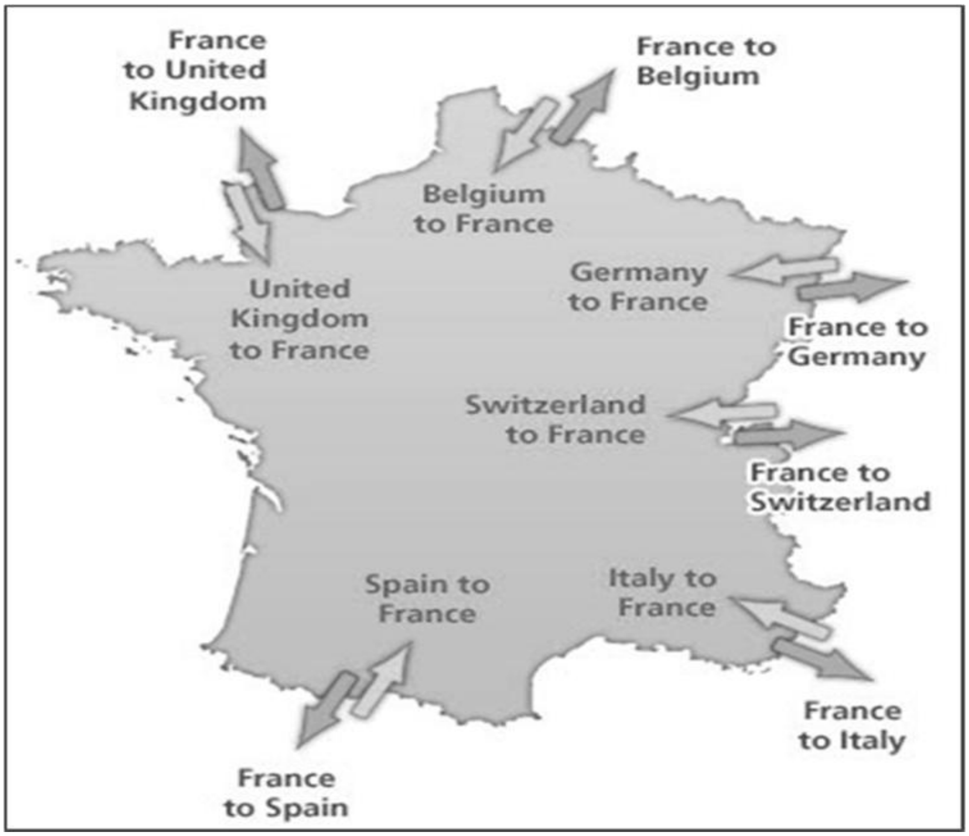
For each regulatory regime, Lavoine evaluated the outcome with and without RTE's 10-year investment plan, which was included in the *TYNDP*. For the situation without the investment plan (i.e., business as usual), Lavoine assumed that the expected evolution of the RAB was the net effect of new investments (i.e., RAB growth), corrected for the depreciation of new assets plus the ongoing depreciation of existing assets (€450 million per year). For new investments, Lavoine assumed a depreciation rate of 2.5 per cent, indicating that the assets had a lifetime of about 40 years. If there was an additional need for financing, it was to be shared between debt (60 per cent) and equity (40 per cent). In addition, all equity in 2013 was shared capital, meaning that there were no reserves (see Exhibit 5).

For the situation with the investment plan, Lavoine included capital expenditures as well as operating expenditures because additional transmission lines implied additional maintenance and the electricity lost during transmission that needed to be compensated by the TSO in France, as in most European countries (see Exhibit 6).

THE CHALLENGE

With the information he had gathered, the company's financial figures, and the assumptions he had made, Lavoine needed to develop a financial planning model that could analyze the impact of the proposed investment program under different regulatory regimes and assumptions. Should RTE invest in the *TYNDP* investment program, and, if so, under what conditions would the investment be attractive to RTE's equity investors? Please use the Student Spreadsheet that accompanies this case (Ivey product no. 7B19N002).

EXHIBIT 1: CONNECTIONS BETWEEN RTE'S NETWORK AND NEIGHBOURING COUNTRIES



Source: Company files.

EXHIBIT 2: TYPES OF REGULATORY REGIMES

Except for the very first decades of electric power systems, the network operation—and for a long time, the entire vertically integrated utility company—had been subject to regulation on the grounds of its inherent features of a natural monopoly. The main tools for regulating the activities and remuneration of power grid companies were as follows:

Cost-Plus Regulation

With cost-of-service or rate-of-return regulation, also widely called cost-plus regulation, the network operator was allowed a certain level of remuneration that recovered the main expenses—primarily capital expenditures and operating expenditures—and paid an excess return. The regulator thereby incentivized the network operator to declare its costs, but the grid company was not rewarded for optimizing its internal processes to achieve the prescribed level of service. This situation motivated the development of incentive- or performance-based regulation schemes.

Price Cap Regulation

Price cap regulation fixed the prescribed level of service and ensured a degree of incentive by setting fixed upper boundaries on the prices to be charged for the service. Price caps set the desired output and gave the network operator the freedom to determine what input was needed to achieve the desired targets. Thus, the network operator could benefit by optimizing its internal processes. The disadvantage to this type of regulation was that an information asymmetry persisted between the regulator and network operator; the regulator was not provided with any information about the network operator's cost function.

Revenue Cap Regulation

Revenue cap regulation also prescribed the level of service and incentivized the network operator to control costs, but by setting an upper limit to the revenue that the network operator could earn, rather than the price the network operator could charge.

Output Regulation

Instead of merely focusing on incentivizing transmission system operators to improve the efficiency of using inputs, performance-based regulation could also be designed with certain incentives that focused on the operator's output in terms of quantity and quality of service delivered.

Yardstick Competition

Finally, the regulator could choose to base remuneration of the distribution company on the costs declared by other companies with similar activities. The company's performance would be benchmarked against an average cost-of-service in the sector. With this incentive for cost efficiency in place, the yardstick value should, in theory, decrease over time, ensuring a dynamic convergence of costs closer to the efficiency optimum.

Source: Ignacio J. Pérez-Arriaga, chap. 4 in *Regulation of the Power Sector* (London, UK: Springer, 2013).

EXHIBIT 3: ASSUMPTIONS FOR THE CURRENT REGULATORY REGIME (PRICE CAP) AND RISK

Cost-plus	7% return on equity
Price cap (current regime)	5% weighted average cost of capital €2,491 million operating expenses cap, 2014 1.2% operating expense cap increase/year
Regulatory risk	€8.9/MWh price cap, 2014 2% price cap increase/year

Note: € = EUR = euro; MWh = megawatt hour.
Source: Created by the case authors, loosely based on actual numbers from the company.

EXHIBIT 4: FINANCIAL RESULTS IN 2013, ASSUMING COST-PLUS REGIME

Regulated asset base	€12,000 million
Equity	€4,800 million
Debt	€7,200 million
Operating expenditures	€2,466 million
Depreciation	€450 million
Cost of equity	€336 million
Cost of debt	€324 million
Other costs	€454 million
Consumption	460 TWh (460,000,000 MWh)
Price	€8.76/MWh
Return on equity	7%

Note: € = EUR = euro; TWh = terawatt hours; MWh = megawatt hours.
Source: Created by the case authors, loosely based on actual numbers from the company.

EXHIBIT 5: BUSINESS AS USUAL SCENARIO, 2014–2023

RAB growth (replacement investments)	€1,500 million/year
Equity (financing new investments)	40.0%
Debt (financing new investments)	60.0%
Interest rate	4.5%
Dividend payout ratio	70.0%
Operating expenses growth	1.0%
Depreciation for new investments	2.5%
Other costs growth	0
Consumption growth	1.0%

Note: RAB = regulated asset base; € = EUR = euro.
Source: Created by the case authors, loosely based on actual numbers from the company.

EXHIBIT 6: INVESTMENT PROGRAM (*TYNDP*), 2014–2023

Year	Capital Expenditures	Operating Expenses
2014	€1,400 million	€75 million
2015	€1,400 million	€75 million
2016	€1,400 million	€75 million
2017	€1,400 million	€75 million
2018	€1,400 million	€75 million
2019	€1,400 million	€75 million
2020	€1,400 million	€75 million
2021	€1,400 million	€75 million
2022	€1,400 million	€75 million
2023	€1,400 million	€75 million
Depreciation	2.5%	

Note: € = EUR = euro; *TYNDP = 10-Year Network Development Plan*.
Source: Created by the case authors, loosely based on actual numbers from the company.