Transmission Expansion in Argentina 5: The Regional Electricity Forum of Buenos Aires Province

Stephen C. Littlechild and Eduardo A. Ponzano

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Abstract

This paper supplements analyses of Argentine transmission expansions at the federal level by looking at experience in Buenos Aires province. A Regional Electricity Forum of distribution companies has drawn up and begun to implement a ten-year transmission expansion plan. Contrary to previous fears, getting agreement between the members on investment and cost sharing has not been unduly problematic. More challenging was getting approval of the provincial government on funding. Deferring tariff reductions and using the revenues for investment facilitated the process, and now some innovative financing arrangements are underway. Again contrary to some previous suggestions, the controversial Area of Influence method was extended rather than replaced. This overcame concerns about free-riding. Progress and investment have been severely curtailed by the economic crisis in 2001 and subsequent federal government policy. The arrangements nonetheless appear to be working well, and to be conducive to more efficient transmission expansion. This confirms that it is practicable and advantageous to allow users rather than the transmission company or the regulator to propose and determine transmission investment, even in a meshed rather than radial system. An appropriate regulatory framework is needed to approve that part of the total budget to paid by distribution business consumers, but this does not require the regulator to lead or monitor the detail of the process.

Key words: Argentina, electricity, transmission, regulation.

JEL classification: L33, L51, L94, L98.

[a] Judge Business School, Trumpington Street, Cambridge CB2 1AG, UK. Email address: sclittlechild@tanworth.mercianet.co.uk.

[*] Corresponding author.

[b] Comercializadora de Energía SA Calle 55 # 680 piso 1[o] La Plata (1900) República Argentina. Email address: eponzano@comesa.com.ar.

1. Introduction

As part of its electricity reform program in the early 1990s, Argentina introduced the so-called Public Contest method. Decisions to initiate and approve major transmission expansions were not to be made by the concessionaires that operated these transmission systems. Nor were they to be made by the national and provincial regulatory bodies, which were given only limited powers to prevent or modify these decisions. Instead, they were made the responsibility of users of the various transmission systems: generators, distribution companies and large consumers.

Although Argentine electricity reform is in general praised, the Public Contest method for transmission expansion has been viewed sceptically and indeed criticised.[1] Among the concerns are the Area of Influence method used to identify users, allocate costs and determine their votes. The concern is that this method reflects usage of the system rather than economic benefits, hence can distort, complicate or delay investment decisions. Other concerns are that this method would be inapplicable or not as successful if applied to a meshed transmission system as in a radial one; that transactions costs including lack of information could preclude cooperation and efficient investment planning, especially where many parties are involved; that any centrally prescribed method of determining votes and cost allocation could fail to reflect local conditions; that distribution companies did not play as supportive a role as generation companies did, and perhaps could not be expected to do so given the difficulties associated with regulation of their costs and prices; and that the combination of this regulation and the Public Contest method would lead to inadequate or excessive investment in the transmission network relative to the distribution network.

Recent research has challenged these perceptions.[2] It has been counter-argued that the main instance of alleged delay (the Fourth Line) was in fact an uneconomic investment; that the process has generally been characterised by active and effective cooperation between users; that the Area of Influence method does not seem to have been a problem in practice; and that actions of the distribution companies, rather than indicating a deficiency in the Public Contest method, have been constrained by the stance of some provincial government regulators.

The above research has focused on transmission expansion arrangements at the federal level in Argentina as a whole. The present paper is a study of transmission expansion arrangements in Buenos Aires province. This is of interest for a number of reasons.

- First, whereas previous studies have concentrated on the national transmission system, where generators are the main users or beneficiaries, regional sub-transmission systems are more geared to distribution (here, three main distribution companies and some 200 municipal distributors, mostly cooperatives of users). In

[1] E.g. Abdala (1994, 2007a,b), Abdala and Chambouleyron (1999), Abdala and Spiller (2000), Chisari et al (2001), Gómez-Ibáñez (2003), NERA (1998), Newbery (1999), Woolf (2003), as summarised in Littlechild and Skerk (2007b).

[2] E.g. Galetovic and Inostroza (2007), Littlechild and Skerk (2004a,b; 2007a,b,c,d).

fact, the Area of Influence method identifies only users connected to the system at 132kV and above, but in this province many distributors are connected below that voltage level (often embedded in the grid of another distribution company) and are therefore not identified by that method.

- Second, whereas the generators and major consumers operate in a competitive market unconstrained by regulation, the distribution companies are constrained by price controls set by the provincial regulator, so that regulation plays a more critical role in this application of the Public Contest method.
- Third, whereas it has been argued that the Area of Influence method would only work for radial networks like the national transmission system, the sub-transmission networks are more highly meshed.

Some advocates of greater decentralisation in network decision-making participated in the early discussions about transmission expansion arrangements in Buenos Aires province. Abdala and Spiller (2000) refer to the arrangements there as illustrating a more decentralized approach. The present study provides an opportunity to assess the conjectured reasons for adopting a decentralised approach and how effectively it is working.

A combination of appraisals at the federal and provincial levels thus seems helpful in order to assess the applicability of user-determined network expansion policies in other countries and other infrastructure sectors.

2. The electricity industry before reform

Before the electricity sector was reformed, the federal government owned three electricity companies in Argentina, responsible for extra high voltage (EHV) transmission (mainly 500 kV) and high voltage (HV) transmission (mainly 132kV), as well as most generation and the distribution of electricity in many parts of the country including Greater Buenos Aires. Most of the 23 provincial governments had their own electricity distribution company, in some cases also engaging in generation and in most cases operating some high voltage (132kV) transmission lines. Several hundred cooperatives throughout the country, in some cases partially owned by municipalities or large users, carried out some local distribution.

The electricity companies negotiated their tariffs with the corresponding jurisdictional authority (national, provincial or municipal government). Their investments were financed from the net revenues of the businesses themselves and by soft loans or subsidies from the government, especially for expansions in rural areas.

A Federal Electricity Council had been formed in 1960, comprising representatives of provincial governments and the Secretariat of Energy. It coordinated and administered various specific project funds created to develop the sector.[3] The funds were primarily

[3] The Electricity Regulation Act (Law 24065) provided for a surcharge, sometimes called a ‘stamp’, of up to $3/MWh on purchases by large users and distribution companies. Article 70 of that Law provided that 60 per cent of these surcharge revenues would be distributed to provinces that adhered to the federal scheme

used for expansions and developments at 132 kV or lower, including low voltage grids, isolated generation in small towns, rural electrification and small hydroelectric power plants. Some 3893 km of 132 kV transmission lines were approved and built from 1978 to 1991.[4]

3. Restructuring, privatisation and reform at the federal level

At the federal level, electricity reform in Argentina largely followed the British model, though it went further in some respects (and also reflected previous reform experience in Chile). There was considerable structural and ownership separation of generation, transmission and distribution, particularly of the three large companies owned by the federal state. Most of the components were then privatised separately. A not-for-profit Wholesale Electricity Market Managing Corporation called CAMMESA was created as the independent system operator. A National Electricity Regulatory Agency called ENRE was also set up.[5]

The federal transmission systems were restructured into one EHV transmission grid (mainly 500 kV) named Transener, and four HV regional sub-transmission grids (mainly 132 kV), namely Transnea, Transnoa, Distrocuyo and Transcomahue plus the separate grid Transpa in Patagonia. Transener was privatised in 1993, and bought by a consortium including National Grid Company of the UK (which sold its stake in 2004). As explained shortly, an additional HV regional sub-transmission grid Transba in Buenos Aires province was created later when the provincial utility there was unbundled. Arrangements for the provincial electricity companies and the many municipal and local cooperatives varied considerably: some provinces followed the national policy, albeit with a time lag, while others resisted. For the most part, provincial governments retained responsibility for regulating the distribution companies in their provinces.

4. The electricity industry in Buenos Aires province

Figure 1 shows Transener's EHV transmission network and the locations of the five sub-transmission companies plus Transpa.

The City of Buenos Aires (population 2.8m in 2001 census) has been the Federal District since 1880 and is no longer part of Buenos Aires province. The province of Buenos Aires (capital city La Plata) is the largest, most populated and often said to be the most prosperous province in Argentina. Its area is 303,000 sq km - about the same size as Italy but less densely populated. It has a population of 13.8m, of which 9.3m live in the 19 municipalities and neighbouring areas known as Greater Buenos Aires. The Federal District and Greater Buenos Aires (total population 12.1m) thus contain one third of the 36m population of Argentina. The federally-owned distribution company Servicios

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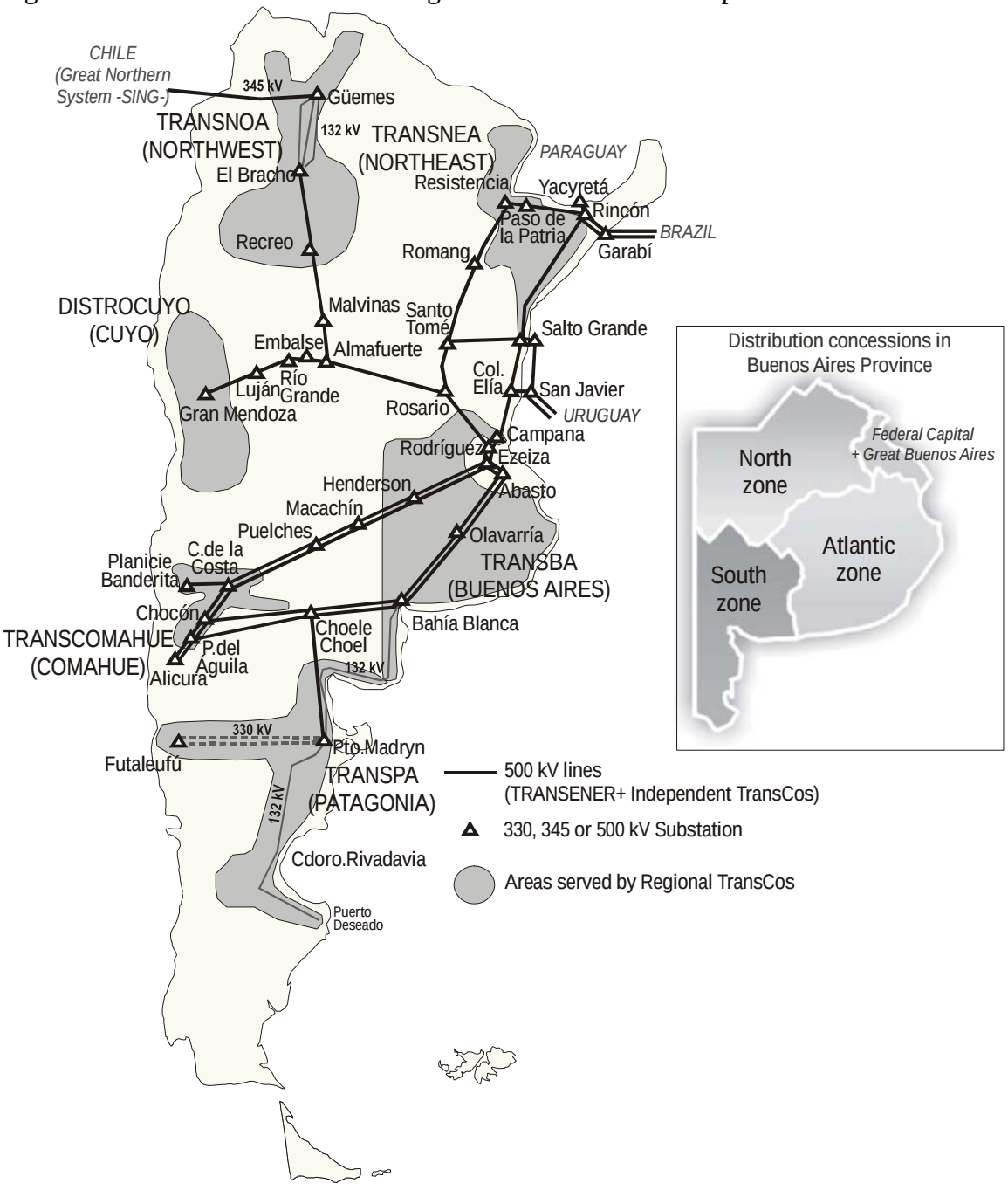
for distribution tariffs, in order to subsidise customers. The remaining 40 per cent of the revenues would be directed to another Fund for electricity development in the country's interior, including rural electrification. Littlechild and Skerk (2007a,d)

[4] Analysis by Mercados Energéticos. Investments are detailed by province at www.cfee.gov.ar.

[5] Bastos and Abdala (1996), Littlechild and Skerk 2004a, Pollitt 2004.

Eléctricos del Gran Buenos Aires (SEGBA), responsible for electricity distribution in the Federal District and Greater Buenos Aires, was sold as three separate companies: Edenor and Edesur (north and south Buenos Aires) and Edelap (City of La Plata and neighbouring areas). [6] They account for 43 per cent of total electricity demand in Argentina.

Figure 1 Transmission networks in Argentina and Buenos Aires province



[6] Their shares of demand in the electricity wholesale market are Edenor (20.7%), Edesur (19.0%) and Edelap (3.2%), together totalling 42.9% of market demand. CAMMESA Annual Report 2002.

Source: Transener and Transba and Mercados Energéticos

This paper deals with the remainder of Buenos Aires province (that is, excluding Greater Buenos Aires and not including the Federal Capital), which has a population of 4.5 million. It has about 1.4 million electricity consumers with a total demand of about 9500 GWh/year, and is the largest electricity region in Argentina, accounting for 13.3 per cent of total electricity demand.[7] The province has three main regions: the North, South and Atlantic Zones, as shown in the inset in Figure 1.

Before the electricity reform, most of the activities related to electricity in Buenos Aires province were carried out by the provincial Department of Energy – the Dirección de Energía de Buenos Aires (DEBA). This included electricity generation, transmission, distribution and supply, together with regulation and more general government responsibilities in the sector. On 1 August 1990, as the first step in a reform process, it was decided to separate operation from regulation. A new provincial electricity company was formed in Buenos Aires province, called Empresa Social de Energia de Buenos Aires Sociedad Anónima (ESEBA SA). It was a vertically integrated company comprising those components of DEBA associated with generation (total 1100 MW), high voltage transmission (more than 5,000 km of transmission lines) and distribution (800,000 customers, 7200 GWh/year). It supplied about two thirds of the province's consumers. Over 200 municipal distributors (mostly cooperatives of users) supplied the rest of the consumers in the province. The distribution lines operated by municipal distributors were mostly at 33 kV and 13.2 kV.

After the creation of ESEBA, the remainder of DEBA became the Ente Provincial Regulador de Electricidad (EPRE). This continued as the entity responsible for energy matters within the provincial government, including regulation and other responsibilities.

5. Restructuring, privatisation and reform in Buenos Aires province

In line with the continuing electricity sector reform process, and in response to internal financial pressures, Buenos Aires province took further steps in following federal guidelines at the provincial level.[8] In 1993 the provincial government reorganised ESEBA for accounting purposes into a high voltage sub-transmission division, a distribution division and a generating division. In 1996 the provincial government formally unbundled ESEBA into a separate sub-transmission company (Transba), further divided the distribution division into three successor provincial distribution companies (EDEN, EDES and EDEA, in the North, South and Atlantic Zones, respectively), and divided the generating division into two successor companies (Central Piedra Buena and

[7] The remaining six electricity regions of Argentina, some of which contain two or more provinces, range in size from Litoral (13.1% of national demand) down to Comahue (4.1%). CAMMESA Annual Report 2002.

[8] During this period the financial accounts of Buenos Aires province were in deficit and the province was under considerable pressure to deal with this. In addition, substantial investment would be needed to update and expand the ageing electricity network in the province, which provincial revenues were unable to fund. Privatisation thus offered a means of financing and modernising the sector.

Centrales de la Costa Atlantica). In April 1997 the three distribution companies - called provincial distributors - were privatised[9] for a total of $969m.[10]

In 1997, part of the provincial government functions of EPRE, including tariff calculations, were split off into a separate electricity regulatory body OCEBA.[11] In 1999 the remaining government responsibilities of EPRE were reconstituted as the Provincial Energy Directorate or Dirección Provincial de Energía (DPE). [12]

The regional sub-transmission company Transba had some 5000 km of lines, mainly at 132kV (see Figure 2). In terms of line length it is the largest sub-transmission system in Argentina.[13] After some discussion and change of plan (see below), it was privatised by international bid in August 1997. The purchaser was the now-privatised federal EHV transmission company Transener, which owns 90 per cent of Transba, with employees owning the remaining 10 per cent. During ESEBA's privatization process Transba

[9] EDEN and EDES were purchased by the US company AES, and EDEA by Inversora Eléctrica de Buenos Aires (which is jointly owned by Buenos Aires Energy Company 55% and United Utilities International 45%). The shares of national wholesale market demand accounted for by these companies are EDEN 6.4%, EDEA 3.9% and EDES 2.9%, total 13.3%. CAMMESA Annual Report 2002.

[10] The $ symbol is used for both the Argentine peso and the US dollar. Until January 2002 the Argentine peso had parity with the US dollar. At the time of the economic crisis the peso fell to less than one third of the US dollar. At the time of writing (August 2007) the rate is 3.2 pesos (AR$3.2) to 1 US dollar (USD). In practice it is common to use a standardised exchange rate of AR$3 to USD. To minimise confusion, costs and revenues in this paper are typically given in Argentine pesos.

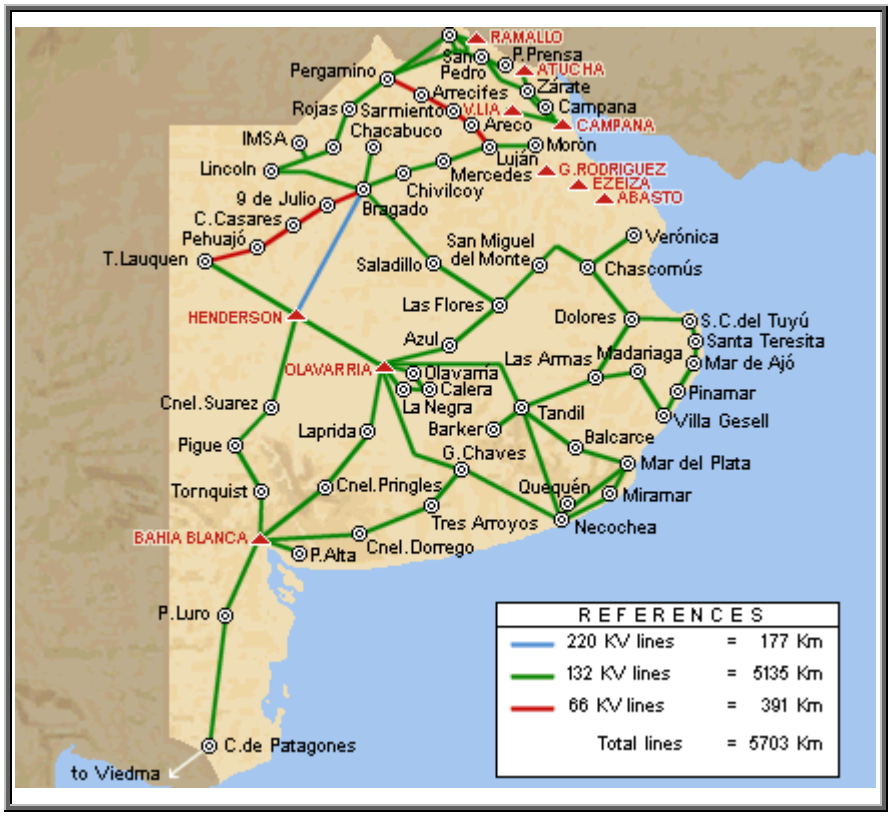
[11] In 1993 that part of DEBA excluding ESEBA became EPRE, responsible for regulation and other government functions, and operating within the Ministry of Public Works & Services. In 1997 a new provincial regulatory body was created called Organismo de Control de Energía Eléctrica de la Provincia de Buenos Aires (OCEBA). This had a similar regulatory role in Buenos Aires province to that of ENRE in the federal jurisdiction, focusing mainly on provincial and municipal distribution concessions and related tariff reviews. OCEBA's responsibilities include tariff calculations, controlling activities under provincial jurisdiction, and dispute resolution.

[12] EPRE remained in place in 1997 and in 1999 was reconstituted as DPE, which now reports to the Ministry of Infrastructure, Housing and Public Services in Buenos Aires province. DPE (and formerly EPRE) has the responsibility known as 'autoridad de aplicacion'. In Argentina (and most of Latin America and Spain), this generally includes making rules for a given sector within the framework set by a law and the related decrees issued by the head of the executive branch (the president at federal level, the governors at provincial level). These laws and decrees usually contain provisions that allow their implementation. DPE's role is related to technical and administrative aspects. Among DPE activities are: 1) management of issues like rural electrification and use of renewable energy, 2) acting as the public sector counterpart of private organisations such as FREBA, in this case approving the transmission expansion plan, 3) compiling statistics, 4) issuing technical authorisations to build new facilities within the province, i.e. lines, substations, etc. and ruling on such matters, and 5) authorising rights of way for new lines. From a legal perspective, the Ministry of Infrastructure, Housing and Public Services is responsible for regulation. The DPE is specifically responsible for advice on energy matters. OCEBA monitors and controls compliance with all the rules and regulations that impact on the functioning of the electricity sector in the province.

[13] "TRANSBA S.A. is the concessionaire of the Electric Power Transmission System in the Province of Buenos Aires. The Company is also in charge of the operation and maintenance of the 132 kV grid in this Province, with the exception of the facilities placed within EDENOR S.A., EDESUR S.A., and EDELAP S.A. jurisdictions. Besides, TRANSBA S.A. operates and maintains not only the 500 kV Olavarría, Bahía Blanca and Campana Substations as TRANSENER S.A.'s Independent Transporter (TIBA), but also some 66 kV facilities." Transba website. For maps of Transener's 500 kV EHV system, see Littlechild and Skerk (2004a,b, 2007a,b,c,d).

became subject to federal jurisdiction, and was henceforth subject to federal regulation via ENRE. This included the federal arrangements for transmission expansion.

Figure 2 Map of Transba sub-transmission system



Source: Transba website

6. Arrangements for transmission expansion

The federal regulatory framework put in place two sets of arrangements for the regulation of transmission systems: one for existing transmission systems and another for the expansion of those systems. Existing transmission systems (now including Transba as well as Transener) were subject to a price cap for a period of years, intended to encourage greater efficiency in operation and maintenance. These price caps were to be revised at periodic intervals by the federal regulatory agency ENRE. Although resetting Transener's price control was not without difficulties, the method seems to have worked well, at least until the time of the macroeconomic crisis.[14]

The regulations specified various methods for approving and carrying out expansions to existing transmission systems, and further methods were added over time.[15] Briefly, expansions intended for one or a few users could be carried out by Contract between

[14] Gómez-Ibáñez (2003), Pollitt (2007), Littlechild and Skerk (2007d).
[15] For further details see Abdala (1994), Chisari et al (2001), Littlechild and Skerk (2007a,c,d).

Parties, that is, by agreement between the transmission operator or an independent transmission company, and the users who agreed to pay for the expansion. The transmission operator could identify and carry out Minor Expansions, defined as costing less than $2m for Transener, $1.5m for Transba. (The allocation of Minor Expansion costs would normally be agreed with the users or, if necessary, determined by CAMMESA at the request of ENRE.) There were separate arrangements for investments for Private Use.

Major expansions to transmission systems, potentially affecting many parties, were to be carried out by the Public Contest mechanism. The potential users or 'beneficiaries' had to propose and approve expansions: existing transmission and sub-transmission operators were not allowed to propose expansions.[16] The system operator CAMMESA identified the 'beneficiaries' using the Area of Influence method, which estimated the changes in flows on the system that would result from implementing the expansion in question. The identified beneficiaries would vote on any proposed expansion. If at least 30 per cent of beneficiaries supported the expansion, and less than 30 per cent of beneficiaries opposed it, the expansion could proceed. The regulator ENRE was required to check that this expansion passed the Golden Rule of reducing the sum of investment, operation and outage costs in the system as a whole. (In practice no approved expansions have failed this Golden Rule test.) The expansion would then be put out to tender under a Construction, Operation and Maintenance contract. The bidder offering the lowest annual fee over a specified amortisation period (maximum 15 years) would win the tender. The concessionaire of the existing transmission system was allowed to bid if it wished to do so.

Before reform, transmission had been characterised by excessive investment and operating costs. The aim of the new arrangements was to ensure that transmission expansions took place if, and only if, there was a sound economic basis for doing so. This was to be judged by users, who would have to pay for the expansions, rather than by the transmission concessionaire or the regulator.

It was envisaged that generation companies and distribution companies would each have an important role to play in expanding transmission systems. Generators would have an incentive to ensure that they could transmit their power to the market, otherwise they would lose revenue. Distribution companies would have an incentive to ensure that they could import sufficient power into their systems and maintain the quality of supply, otherwise they would face penalties and in extreme cases the loss of the concession. Both types of entity would have an incentive to propose, support and pay for expansions necessary to provide sufficient transmission capacity, and to design and schedule such expansions in the most economic way.

[16] In 1998, federal Resolution SE 208/1998 for the first time enabled the concessionaire of an existing transmission system to initiate a Public Contest process for certain limited expansions, mainly related to existing sub-stations. Such expansions were still subject to the approval of the beneficiaries. This Resolution also allowed the Secretary of Energy to propose security of supply expansions, and the scope for these was extended by later Resolutions. (Littlechild and Skerk 2007c)

In the event, generation companies did propose Public Contest expansions, often to overcome or reduce transmission constraints. But there was concern that an allegedly much-needed expansion (the Fourth Line) was opposed and delayed by other generators. There was also concern that distribution companies opposed a similarly needed Public Contest expansion to improve quality of supply (transformer capacity in Bariloche). This led to criticism of the Public Contest method, to suggestions that users could not in practice work together, and in particular to debate as to whether distribution companies could or would play the role envisaged for them in proposing and supporting quality of supply expansions.

Subsequent research has shown that these concerns are largely unfounded.[17] All the methods of transmission expansion were used increasingly, at least until the economic crisis. The Fourth Line was unprofitable when first proposed, and the users subsequently worked well together to design an acceptable proposal. In the Bariloche case, the relevant provincial regulators had indicated their disapproval of the proposed expansion.[18] Many Public Contest expansions were proposed and supported, attracted competitive bids and reduced the cost of expansions. Typically, they led to more efficient use of existing capacity rather than to the building of new lines.

With some modifications, these arrangements continue to obtain. However, since the economic crisis at the end of 2001, and particularly after the pesification and freezing of tariffs in early 2002, they account for less investment in transmission. Instead, the federal government and Federal Electricity Council have assumed an increasing role in directing and financing transmission investment.

7. Regulation of distribution companies in Buenos Aires province

The role of provincial distribution companies and provincial regulators was of some importance in the success or otherwise of the federal scheme for transmission regulation. It was likely to be particularly critical with respect to expansions of sub-transmission systems, where distribution companies play a greater role. Experience in Buenos Aires province sheds light on the issues involved and how this province addressed the problems involved.

When Buenos Aires province privatised its distribution companies, it put in place a mechanism (as did some other provinces) whereby these companies are held responsible for non-supplied energy due to failures of the transmission systems (as well as those due to failures of generation and of their own distribution systems). [19] This was intended to provide an incentive for the distribution companies to propose and support relevant transmission expansions under the Public Contest method. However, difficulties arose over the financing of such expansions.

[17] Littlechild and Skerk (2007b,d,e), Galetovic and Inostroza (2007)
[18] Littlechild and Skerk (2007d).
[19] In addition, in Buenos Aires province, any penalties paid by Transener and Transba for non-supplied energy have to be passed through to end-users by the distribution companies: the distribution companies do not retain these penalty payments to assist in financing transmission investment.

The original intention of Buenos Aires province was to retain its sub-transmission system Transba in provincial ownership. The province would continue to plan and determine the investment programme, which would be financed by a uniform surcharge or 'stamp' for use of the transmission system. This would be paid to Transba by the distribution companies and contained in their allowed tariffs. The stamp was expected to be around $1.50/MWh, which if applied to the whole demand in the province would yield sufficient to finance an initial transmission expansion budget of about $200m, which would cover the transmission needs of the province over a ten-year period.

Potential investors in the provincial distribution companies then expressed concern about the continued provincial ownership of transmission because it would leave the supply conditions of the distribution companies (and hence their liabilities to penalties) dependent on public sector investment. Following negotiations, it was decided to include transmission in the privatisation process. This put Transba's system, including the rules for expansion, under federal regulation. The uniform 'transmission stamp' was thereby ruled out as a means of funding transmission expansion. The transmission price control could cover only the cost of maintaining the existing system. It would now be for the privatised distribution companies to propose and pay for expansions of Transba (as well as Transener) under the Public Contest or other methods specified in federal regulation.

This was an aspect of the Public Contest method that had not featured highly in discussions at the federal level. It was expected that generators would be the main proponents and funders of expansions in the EHV transmission system.[20] In Buenos Aires province, and several other relatively populated provinces, the situation was different insofar as distribution companies were expected to be among the main beneficiaries and hence proponents of transmission expansions to maintain quality of supply.

There was then discussion whether the $1.50/MWh transmission stamp should be included in the tariffs of the distribution companies to enable them to carry out this role. But there was a concern that this could enable the distribution companies to vote for transmission expansions instead of investing their own revenues in their own distribution systems. This could bias the system from a technical perspective, increase the cost to customers, and unduly benefit the distribution company shareholders. To try to prevent this, the distribution companies might be required to seek the approval of the provincial regulatory body on each transmission expansion proposal. But this could mean a heavy burden of regulatory analysis and decision-making, there was no previous experience of such regulation or regulatory expertise available, and the consequent regulatory uncertainty would increase the difficulty of privatisation. The provincial government concluded that it was not appropriate to include the transmission stamp in the distribution company tariffs.

[20] In fact, the location of the Area of Influence reference node in Buenos Aires province meant that the distribution companies in Greater Buenos Aires did not get a vote or pay directly. This led to concerns about that method. cf Chisari et al. (2001), Chisari and Romero (2007)

The price controls on the provincial distribution companies in Buenos Aires province thus made allowance for new investment in distribution, and for covering the charges of the existing transmission systems as they applied at the date of privatisation, but not (explicitly) for any further investment in transmission. These distribution companies then argued that they were not allowed the margin for new transmission investment (that is, the 'transmission stamp') that was envisaged at the time of privatisation. They said that the allowed margin between their distribution revenues and costs (the value added in distribution, or VAD) was not sufficient to cover investment in transmission as well as in distribution, so they could not afford to provide the necessary funds. This was a problem that needed to be addressed.

8. The need for transmission investment and the initial challenges

In 1998 there were reliability problems in particular areas of the Province, for example in supplying the Atlantic coast in the middle of summer. [21] There was a risk that inadequate transmission capacity in Buenos Aires Province would constitute a critical bottleneck. It became apparent that it was necessary to expand the capacity of the regional transmission (and distribution) networks in the Province so as to remove any bottlenecks in the system.

This posed three initial challenges.

- First, it was necessary to develop a new approach to determining transmission expansion, consistent with privatisation and the national regulatory framework, to replace the pre-privatisation approach based on central planning.[22] In view of the meshed nature of the provincial transmission system, it was necessary to coordinate the various possible expansions that different parties might propose, in order to obtain the most efficient outcome for the province as a whole. It was also necessary to agree a Transmission Expansion Plan that would be implemented automatically, thereby reducing the regulatory burden and regulatory uncertainty.
- Second, it was necessary to raise the funding for this investment. Given the price control situation just described, this meant persuading the provincial government as regulator of the distribution companies that it should allow these companies to raise additional funds for transmission investment and that customers should pay the costs involved via the distribution tariffs.
- Third, it was necessary to convince the government that the money thus raised would be well spent, and on transmission projects rather than on other uses.

The next few sections describe in turn how these three challenges were tackled, via the FREBA Forum, the Aggregate Tariff, and the FITBA Trust. We then move on to additional tasks that subsequently became apparent.

[21] There was also a well-publicised failure of supply in 1999 by the company Edesur serving the city of Buenos Aires, when it was installing new distribution capacity. This was unrelated to the transmission issues discussed herein but nonetheless focused attention on quality of supply issues.

[22] Before privatisation of ESEBA, technical staff within ESEBA had planned the transmission network, placing high value on security and quality of supply and lower value on economy, and assuming that the provincial Treasury would pay for any transmission or distribution expansion that could not be met out of the tariff revenues. One of the aims of privatisation was to avoid the need for such Treasury support.

9. FREBA: The Regional Electricity Forum of Buenos Aires

As the importance of the above three challenges became increasingly clear, in December 1999 the three provincial distribution companies (EDEN, EDES and EDEA) and 11 of the largest municipal distributors (cooperatives) in the province formed themselves into the Regional Electricity Forum of Buenos Aires (Foro Regional Eléctrico de la Provincia de Buenos Aires, or FREBA). The transmission companies Transener and Transba were made advisory members. Over time other cooperatives joined the project, and FREBA now has 174 members. These members are responsible for supplying some 95 per cent of demand in Buenos Aires province (excluding Greater Buenos Aires).[23]

Among the objectives of FREBA are

- to coordinate and select investment projects so as to improve and expand the distribution and transmission networks in the Province
- to work with the relevant authorities in the development of proposed laws, rules, tariffs, the presentation of information and other related activities
- to provide advice and information to its members and associates
- to establish contacts with similar entities within and outside the country, for the purpose of interchanging information and services beneficial to the electrical sector of the Province.

The main decision-making authority of FREBA, which approves or rejects proposed network investment projects to be funded by the organisation, is the general Assembly. Voting in the Assembly is proportional to the size of the company in terms of MWh demand. A Board of Directors of 7 members, elected annually by the Assembly, oversees the work of FREBA. These 7 members are appointed in proportion to the sizes of the member companies: 2 from EDEN, 1 from EDES, 2 from EDEA and 2 from the municipal distributors (cooperatives).

The Board of Directors appoints a Technical Committee composed of 7 suitably qualified professionals and experts in the regulation and economic evaluation of electricity projects, plus an External Technical Advisor if required. (In practice the External Technical Advisor has not proved necessary to date.) Members of the Board and Committee all act on an unpaid basis (that is, they are remunerated by their companies rather than by FREBA). The functions of the Technical Committee are to

- select the investment projects in accordance with a specified mechanism;
- verify that the proposed projects meet the technical requirements of national and provincial legislation;

[23] 25 large users but only 5 generating stations (total capacity 755 MW) are directly connected to Transba's network. (Two additional generating stations with total capacity 970 MW are directly connected to Transener's EHV network.) The province imports most of its electricity and hence depends on good transmission networks. The directly-connected generators and large users are not precluded from membership of FREBA, but to date none have become members. In almost all cases that might be put to a vote under the Public Contest method, the FREBA distribution companies have sufficient majority to carry their proposals.

- circulate among the members of FREBA the characteristics of the proposed projects and the opinions of Transba and Transener as Advisory Members (so as to facilitate the formation of coalitions among the Associate members of FREBA for the purpose of competitive selection among these projects); and
- discuss and express opinions on any objections or claims for compensation that members of FREBA might present before the voting and final approval of the projects.

A particular benefit of FREBA has been the development of better relations and better trust and understanding between the members, including advisory members Transener and Transba, and a willingness to work together to solve common problems. This was actually envisaged in the design of the technical committee and of FREBA itself.

10. Design and approval of the transmission expansion plan

No medium or long-term transmission plan was publicly available before the sector reform policy began. Federal regulation then obliged each transmission company to present to Cammesa in November of each year a Reference Guide with suggested expansions required (in its view) to maintain quality of service over the next eight years. However, the transmission company had no power to implement these expansions. The purpose of the Reference Guide was to provide transparent public information for the benefit of the relevant decision-makers.

Transba's first Reference Guide was produced in November 1997. In December 1999 FREBA began to work on its first integrated transmission plan for the Province. It took account of the Reference Guide and was assisted by engineers from Transener and Transba among others.[24] In general FREBA's recommendations did not differ significantly from those of the transmission companies. However, there was some difference of emphasis: where alternative solutions to a problem were available the transmission company tended to prefer the one that yielded higher revenues or greater convenience for that company whereas FREBA looked for the overall least cost solution. This is illustrated below with some actual examples. Nonetheless, as a result of working together, FREBA and Transba generally resolved their differences, and from December 2000 onwards Transba's (eight year) Reference Guide and FREBA's (ten year) Transmission Expansion Plan were fully consistent. The same was true for those aspects of Transener's Reference Guide relating to Buenos Aires province.

The distribution companies took the view that they had better information about the likely growth of demand, and therefore should determine what measures should be taken to deal with this. In their view, once FREBA had approved the Plan and the Provincial Government (Ministry of Infrastructure) had declared it financeable out of the Aggregate Tariff (see next section), the distribution companies could adjust the timing of an

[24] E.g. Transba's "Study of short and medium term expansion alternatives for the Buenos Aires Trunk [Regional] Transmission System, considering the grid structural problems under N & N-1 conditions" (for FREBA), 2000, listed at http://www.transba.com.ar/en/index.htm.

expansion in the light of demand growth. They feared that a transmission company would be less sensitive to such variations in demand growth.

By December 2000 FREBA had put together a Transmission Expansion Plan. In principle, the Plan began in 2000/01 and terminated in 2010/11, so it was envisaged that it would meet the transmission investment needs of the province for ten years, including the necessary financing. The Plan comprised the following elements:

- new works to meet the "N" condition, including the construction of 810 km of 132 kV line, 1100 MVA transformers and 125 MVAr compensators;
- new works to meet the "N-1" condition, including 800 km of 132 kV line and 370 km of 500 kV line, 1680 MVA transformers and 330 MVAr compensators;
- repowering of 65 MVA transformers to meet the "N" condition;
- repowering of 800 MVA transformers to meet the "N-1" condition. [25]

At that time, the estimated cost of the Plan was some 225m pesos in total.

11. Funding for transmission investments

In order to fund the selected transmission investment projects, FREBA's original idea was that an initial list of projects would be selected, and there would be two sources of contributions. First, each distribution company would make a mandatory contribution to cover part of the cost of this list, pro rata to its own share of total demand (in MWh) in the province.[26] This would serve to indicate the commitment of the distribution companies to the process, and also provide an initial 'critical mass' of funds. Second, there would be funds collected from a special tariff component charged to end customers (later called the Aggregate Tariff).[27]

Both these sources of funds would be put into fiduciary accounts, one for each distribution company, usable only through a trust fund and under the management of FREBA. The funds in each company's fiduciary account would be used only towards transmission investments serving the customers of that company. A distribution company could make an additional voluntary contribution from its own resources if it wished to ensure that a particular project went forward where the funds in its own fiduciary account would not otherwise be sufficient to cover that project.

FREBA originally proposed to the provincial government that at most 90 per cent of investment costs should be covered by the special tariff charged to end users, so that the distribution companies themselves would have to contribute at least 10 per cent of the

[25] The N condition means that the required standards of service are met with all the lines in the network in service. The N-1 condition means that these standards are met with all but one of the lines in service. (Hence the N-1 condition is more onerous than the N condition.)

[26] See also Abdala and Spiller (2000), para 3.1.2. This initial mandatory contribution would not be allocated to any particular project unless so decided voluntarily by its contributing member in the Assembly, at the time of selecting and approving projects.

[27] The term 'pass-through funds' is also used for this component. However, it is important to emphasise that this was not the same concept as in UK and other utility regulation, where specified costs such as energy purchases are automatically passed-through to customers as incurred on the basis that they are outside the control of the utility. This distinction is discussed further below.

cost of transmission investment from their own revenues in the form of the mandatory contribution. This was to provide an additional incentive on the distribution companies to select worthwhile projects and to ensure that the projects were constructed and operated economically and efficiently. It would also help to reassure the provincial government that the special tariff funds would be well spent, and that the scheme would be consistent with the responsibilities established at the time of privatisation.

As explained in section 7 above, distribution companies complained that the distribution price controls made no provision for the special tariff component charged to end-users to finance transmission expansions. The distribution companies and cooperatives therefore proposed to the provincial government that instead of the end-user tariff reductions scheduled to take effect in February 2001 and 2002, the tariffs should be held constant and the resulting increments in revenue should be put into a fund for transmission investment. The provincial government accepted this idea in December 2000, per Provincial Decree 4052. The revenue contribution is known as the Aggregate Tariff.[28] This seems to have been recognition by the provincial government of the merit of the distribution companies' argument.

In the event, the 10 per cent mandatory contribution from the distribution companies did not materialise. The main reason was that the pesification and freezing of distribution tariffs at the beginning of 2002, at a time of rising costs of certain inputs, made it impracticable for the distribution companies to contribute from their own funds in the way previously envisaged.[29] Also, the revenues from the Aggregate Tariff were sufficient to generate sufficient critical mass to initiate the system.

In principle there still remains the possibility of an additional voluntary contribution from a particular distribution company. This would be a means of implementing an investment of interest to that company if other companies preferred to use the available funds in a different way, or if its Aggregate Tariff revenue does not provide sufficient funds to pay for it. In practice, however, there has not been a need for "voluntary contributions" as such. There has been consensus among the companies as to how to use the funds. Where a distribution company's Aggregate Tariff revenue has been insufficient to pay for an agreed project, in some cases the company has advanced funding from its own resources, and then begun to recover this over time from the Aggregate Tariff revenues. In other

[28] In practice, only the tariffs to small and medium-sized users were amended in this way because of a tax asymmetry between national and provincial systems. The province took the view that increasing the tariffs of the large commercial and industrial users would provide undue incentive for these users to leave the tariff market and enter the competitive wholesale market, which the province wished to avoid. (Distribution companies acting as transmission providers to large users that had decided to buy in the wholesale market became subject to federal rather than provincial regulation.) Nevertheless, when a transmission expansion is envisaged in the area in which a large user is situated, the distributor supplying that area negotiates with the large user to pay a part of the cost. Sometimes this is successful, sometimes not.

[29] Tariffs were frozen at the previous level in pesos rather than at the new dollar equivalent level, even though much of the borrowings and some of the ongoing costs were denominated in dollars or linked to dollar-related prices. (Actually, freezing of distribution tariffs was a decision of each province under the umbrella of the national emergency law. Consequently, each province retained the right to set distribution tariffs independently of national policy on this matter. In the event, Buenos Aires province followed the federal government in this matter.)

cases the company has borrowed from other companies against the security of future Aggregate Tariff revenues (see below).

12. FITBA: Financial trust for investments in Buenos Aires province

To ensure that the funds from the Aggregate Tariff are indeed used for transmission investments, and not used for other purposes by companies or the government, FREBA created a Financial Trust for Investments in Transmission in the province of Buenos Aires (Fondo Fiduciario para Inversiones de Transporte de la Provincia de Buenos Aires, or FITBA). The members are the three provincial distribution companies EDEA, EDEN and EDES, plus 167 municipal distribution companies (cooperatives). (FREBA is encouraging its remaining 4 members to join FITBA.) Funding presently comes from the provincial and municipal distribution companies (typically via the Aggregate Tariff). Potentially, in future, there could be funding by external investors in the Financial Trust.

The organisation of FITBA is tailored to the characteristics of the members, the details of their concession contracts, the contributions of each distribution company to FITBA and the estimated amounts of the investments in question, and the coordination needed to select and approve projects. FITBA ensures that the available funds are held without incurring risk and spent only on approved investments.

The main use of the funds of FITBA is to pay the costs of constructing projects approved by FREBA and eligible for financing out of the Aggregate Tariff. To that end, the financing has to be approved by the DPE on behalf of the provincial government.[30]

The provincial government needed to assure itself that the funds would be well spent. However, beyond approving the concept (and hence the amount) of the Aggregate Tariff, it did not seek to influence the extent, allocation or timing of the investments. The FREBA/FITBA scheme has thus provided a degree of information, coordination and security about future transmission investment and funding that is not equally true of the federal approach[31] or of the approaches of some other provincial governments.

13. The next tasks and the economic crisis

[30] Provincial government approval is needed in order to use the Aggregate Tariff resources for transmission expansion. Resolution MOSP 120/2002 (and more recently Resolution MIVySP 316/2004 and related Resolutions) approved the overall transmission plan. There is a procedure for modifying this plan in order to allow further expansions. After receiving government approval for the general plan, the distribution companies request trust fund resources from FREBA for each particular project therein. After verifying that the request is in order, FREBA instructs the fiduciary agent (BAPRO Mandatos y Negocios) to make available funds in favour of those distributors and simultaneously communicates its decision to the Province.

[31] The federal government, which determines the availability of federal funds, and the Federal Council have increasingly decided where and when new 500 kV lines should be built. Littlechild and Skerk (2007c).

By December 2000 the three initial challenges had been met. FREBA presented its Transmission Expansion Plan to the Provincial Government. By Decree 4052/2000, the Buenos Aires Provincial Government approved the concept of the Aggregate Tariff to fund transmission expansions. [32] This enabled the companies to begin collecting the Aggregate Tariff as from February 2001, albeit at a negligible level until May 2001.[33] In the same Decree the Government also approved the concept of organisations such as FREBA and FITBA. FREBA was subsequently recognised as a non-profit association in April 2001.[34]

Three more tasks needed to be accomplished before the transmission investment program could begin.

- First, the privatised distribution companies required a commitment from the provincial government to support the proposed Transmission Expansion Plan. They were concerned that the government might otherwise insist on different expansions.
- Second, it was necessary to establish a clear default criterion for allocating the costs of transmission expansion between the three large provincial distribution companies identified by the federal Area of Influence method, and the more than 200 smaller municipal distributors (mainly cooperatives) in the province that were connected at lower voltages.
- Third, it was necessary to negotiate and sign a Financial Trust contract with a chosen financial institution that would administer the FITBA funds in accordance with FITBA rules. Its tasks would include receiving the Aggregate Tariff revenues, investing them until required, and releasing them as and when it was appropriate to do so.

FREBA began to address itself to these issues during 2001. However, economic conditions became increasingly difficult. For example, constructors were no longer willing or able to extend credit and accept the financing risk of a project. The financing arrangement embodied in federal transmission regulation was the mechanism of the annual fee or canon by which payments to the constructor would not start to be made until the expansion entered into service and would then be spread over a specified period of up to 15 years. This was no longer viable. Constructors now needed to be paid in advance and during construction, with the final payment upon commissioning the project. Unless other financing could be found, this meant that FREBA could no longer embark

[32] A decree is an official rule made by the executive power and signed by the provincial governor, which implies endorsement by other ministers. It is not a law but has higher status than a decision of an individual minister. Recently, Provincial Law 13173 of March 2004 modified some aspects of the original provincial electricity regulatory framework set up by Provincial Law 11769 of January 1996. In particular, it incorporated into this framework the modifications of decree 4052/2000, which now have force of law.

[33] To avoid migration of large consumers that were eligible to migrate to the wholesale market and buy direct from generators, the Aggregate Tariff was applied only to residential and commercial consumers. The rate was initially 0.001 peso/kWh for six categories of such consumers, rising in May 2001 to between 0.003 and 0.010 pesos/kWh for 14 categories of consumers.

[34] That is, the Provincial Board of Juridical Entities of Buenos Aires Province granted FREBA recognition as a non-profit Civil Association. (The Board is the organisation that checks the legality and registration of associations that seek to be recognised as members.)

upon projects immediately and pay for them over time as Aggregate Tariff revenues were collected. Instead, it would need to defer the start of each project until sufficient Aggregate Tariff revenues had accumulated to cover its total cost.

At the end of 2001 came the full macro-economic crisis. In January 2002 the peso was devalued from parity with the US dollar to more than three pesos to the dollar. Tariffs were frozen in peso terms.

This had a further adverse impact on FREBA and transmission investment. Devaluation meant that costs increased (depending on the proportions payable in dollars and pesos). Prospective income from the Aggregate Tariff was no longer in balance with the higher cost of the Transmission Plan. (Indeed, even without the crisis it would only have been in balance if the scope of the Aggregate Tariff had been extended to include contributions from users that did not presently contribute, and from distribution companies themselves.) Moreover, the freezing of tariffs despite considerable cost increases after the crisis meant that distribution companies were no longer able to consider making contributions from their own funds.

Nonetheless FREBA pushed ahead. On 14 March 2002 Resolution 120 announced that FREBA's Transmission Expansion Plan was eligible for financing out of the Aggregate Tariff. [35] This provided the needed reassurance to the distribution companies about the commitment of the Provincial Government to the Plan.

In May 2002, in response to a request by FREBA, Resolution 228 recognised the need to complement the Area of Influence method by a further method that would require the municipal distributors embedded in the provincial distribution networks to take their share of responsibility for the costs of transmission expansions that benefited them. It instructed the DPE to elaborate the method in detail. Over the next four months the DPE, assisted by FREBA, developed the Aportantes method (explained in the following section) which was approved in August and became effective when it was published in September 2002. [36]

The signing of the financial trust took considerable time. It took about a year after the crisis to design and implement the fiduciary aspects of the scheme, including the specification of procedures and transparency requirements and the choice of banks, and to get provincial government approval. On 7 January 2003 a Financial Trust contract was

[35] Such a resolution, issued by the Ministry of Infrastructure, Housing and Public Services (MIVySP), is the way in which OCEBA and DPE conventionally make public their decisions.

[36] Resolutions MIVSP 228 of 20 May 2002 and MIVSP 82 of 12 August 2002. See Metodología para calcular el aporte do los beneficiados en ampliaciones de sistemas eléctricos de transporte, EPRE (no date). La llave de la energia en nuestra provincia de Buenos Aires, Metodología de calculo de los aportes de los beneficiados en ampliaciones de sistemas eléctricos de transporte, de acuerdo de los resoluciones MIVSP 228/2002, MIVSP 82/2002, DPE, September 2002. [Translation: Method for calculating the contribution of beneficiaries in expansions of electrical transmission systems in Buenos Aires province. The key to the development of energy infrastructure in our province of Buenos Aires, in accordance with the specified resolutions.]

signed with one of the business units of the Buenos Aires provincial state bank (BAPRO Mandatos y Negocios).

The economic crisis seems likely to have delayed the achievement of the outstanding three tasks. On the other hand, one should not underestimate the time needed to deal with the novelty of the project (nothing of this kind had been attempted in the country before) and the multiplicity of public and private entities involved.

14. The allocation of transmission expansion costs within the province

To implement federal regulation of transmission expansions when the Public Contest mechanism is used, the system operator CAMMESA uses the Area of Influence method to identify beneficiaries and allocate costs between them.[37] This means that beneficiaries are limited to those market participants directly linked to the transmission and sub-transmission networks. This typically includes generators, distribution companies and some large users.

However, the Area of Influence method does not extend beyond the 132 kV network. Therefore, it fails to identify as beneficiaries those municipal distributors (mainly cooperatives) embedded in the 66kV, 33 kV and 13.2 kV networks of the distribution companies and of other cooperatives. The demand of these municipal distributors is counted as part of the demand of the relevant distribution company, and the votes and cost allocations of the latter are calculated accordingly. No votes or costs are allocated to these municipal distributors.

In Buenos Aires province, a good number of the 200 or so municipal distributors are embedded in the provincial distribution systems of EDEN, EDES and EDEA. The three provincial distribution companies were concerned about free-riding by these embedded municipal distributors: they wanted a default method for allocating the relevant parts of the transmission expansion costs to them.[38] In addition, some method was necessary for taking account of the views and needs of these municipal distributors.

This was a provincial rather than federal matter. The appropriate provincial arrangements would therefore complement rather than replace the federal provisions.[39] The privatised

[37] It is open to the beneficiaries to agree to modify the sharing proportions determined by the Public Contest method. However, in practice this has not yet been found necessary.

[38] For example, EDEN, one of the three provincial distribution companies, had earlier financed a new substation that also benefited smaller cooperatives, but was not able to get any contributions from the cooperatives.

[39] Thus, federal and provincial arrangements continued in parallel. For example, beneficiaries in Buenos Aires province that were directly connected to the transmission networks approved several major transmission expansions in Transener's system under the Public Contest method, such as transformers at Ramallo 500/220kV and Campana 500/132kV. (Littlechild and Skerk 2007d Appendix) There was no need for involvement by FREBA in these cases. Another expansion in Buenos Aires province under the Public Contest method, which did not involve FREBA, was a new configuration of circuit breakers at Ezeiza substation in Greater Buenos Aires. The beneficiaries were the ex-federal distribution companies Edenor and Edesur, who were not part of FREBA. The scope of FREBA's transmission plan is all those

distribution companies were keen that the specific provincial cost allocation method should itself be consistent with the Area of Influence method rather than compete with it. To deal with this issue, the provincial government passed a "Resolución de Aportantes" (Resolution about Contributors) in May 2002, requiring the DPE to prepare an appropriate method. This reflected an initiative of FREBA, which itself proposed the fundamentals of the Aportantes method, and the need for it as a default or fall-back method in the event of failure of the parties to agree on cost allocation.

To implement the Aportantes method, DPE starts with the cost allocations for each bar of the 132 kV system as calculated by CAMMESA using the federal Area of Influence method. It then assigns shares of these responsibilities for expansions to the municipal distributors connected to the 33 kV and 13.2 kV networks. The Aportantes method reflects the benefits that the expansion generates for each such municipal distributor. It does this using a 'metaformula' incorporating many aspects of each power facility connected to the network, including capacity, energy, quality (tension level, wave length i.e. harmonic and flicker, capacity factor), reliability, environmental quality, unit cost per capacity and unit cost per energy.

The formula looks complicated. However, the principal determinant seems to be the peak load of each market participant. And since the Transba network is radial below the 132 kV level, in practice the method is applied by calculating peak usage of each user at the node where an expansion is developed.

The DPE is responsible for determining the contributions under the Aportantes method. In principle this calculation is revised each three or six months, to reflect the actual usage at any time, rather than the usage at the time of agreeing the expansion. As with the federal Area of Influence method, this means that future users do not 'free ride' on the decisions of present users. It also minimises the risk to cooperatives of their demand not growing at the expected rate.[40]

As with the federal Area of Influence method, the Aportantes method is used when the market participants identified by the method do not agree an alternative basis for sharing the fee. The intention of FREBA is to use the method in case voluntary agreement fails. However, it has already been used to allocate EDEA's share of the annual fee for the Olavarría-Barker 132 kV line between the municipal distributors in its area. It seems likely that, in practice, the Aportantes method will be used unless the parties find it unacceptable. It undoubtedly works better than having the regulator as an arbiter of last resort, since a regulatory decision would be more uncertain and open to challenge.

15. Implementation of the transmission expansion plan

transmission expansions where at least one FREBA member is identified as a beneficiary by the federal method using the Area of Influence methodology.

[40] Users in aggregate still have to meet the cost of the monthly charge. The same is true of the Area of Influence method, in both cases with a few months lag.

The first major transmission project was the 139 km 132 kV line from Olavarría to Barker with associated works at a cost of about 10m pesos. The provincial distribution company EDEA initiated this expansion under the Public Contest method in 1999. [41] FREBA accepted it as an integral part of the Transmission Expansion Plan drawn up in December 2000, so the project was eventually eligible for financing under the Aggregate Tariff. This line has been in service since spring 2001, improving the quality of service in the Mar del Plata and Atlantic Coast area.

For reasons given above, particularly associated with the economic crisis, the implementation of other expansion projects was delayed until 2003. By December 2003 45m pesos had been raised through the Aggregate Tariff, approximately 15m pesos in each of the first three years. But as a result of inflation, the Transmission Plan was now estimated to cost 626m pesos compared to the original estimate of 225m pesos. By December 2004 the fund had grown to 67m pesos, and future income was expected to be about 20 or 30m pesos per year, depending on the growth of electricity demand and the evolution of the Aggregate Tariff. As of March 2006 FREBA had accumulated 98.5m pesos and invested about 35m pesos.[42] Its expected future income was still about 20m pesos per year, but the estimated cost of the Transmission Plan had now grown to 835m pesos.[43]

At this point FREBA drew up a Priority Plan for 180m pesos, comprising the most important part of the total Transmission Expansion Plan. Having already invested 35m pesos and having nearly 65m pesos in hand, it sought finance for an additional 100m pesos. To that end it explored the possibility of bank loans secured against the future cash flow from the Aggregate Tariff. It began to negotiate with builders to delay cash payments in exchange for security against future cash flows. (Since 2001, the main problem with transmission expansions is 'who finances' rather than 'who pays'.) FREBA also made representations to the Provincial Government concerning the level of the Aggregate Tariff.

[41] The Olavarría – Barker line was proposed under the Public Contest method in 1999, with payment specified over a 15 year period. A public hearing was held on 10 February 2000. There was 100% support from the 12 beneficiaries, although EDEA accounted for 92.43% of the votes. The expansion was accepted 8 March 2000, put out to tender in August 2000, and went into operation 18 October 2001. The initial tender specified a maximum fee of 1.4m pesos/year over 15 years. But after the expansion was first proposed, financing conditions became more difficult, and by 2000 no constructor was willing to extend credit for 15 years. The winning (and only) bid was from the company Cobra, for 2.2m pesos/year over 7 years. ENRE approved this variation in the time period, declaring that the equivalent value of this bid over 15 years was lower than the specified maximum fee. (Littlechild and Skerk 2007d)

[42] This 35m pesos spent includes the Olavarría – Barker line, four new transformers, three new substations, cold reserve payments to generation on the Atlantic Coast, and several minor expansions.

[43] FREBA made a small revision to the Transmission Plan in 2004 in response to an issue raised by the provincial regulator DPE. The Transmission Plan has also been revised and updated from time to time, mainly to accommodate the actual evolution of demand in each area insofar as this deviated from initial estimates. Resolutions 316/2004 (May 2004), 57/2005 (14 Feb 2005), 624/2005 (18 October 2005) and 571/2006 (2 October 2006) approved revised Plans. The Plan includes the projects that have been completed or are underway as well as those yet to be implemented.

16. Resetting distribution tariffs

The tariffs for the provincial distribution companies had been fixed at the time of privatisation for an initial period of ten years, from 1997 to 2007. They provided for a reduction in distribution tariffs over the five-year period to 2002. As explained, FREBA was able to persuade the provincial government that partially cancelling this reduction would provide an appropriate fund for transmission expansions. The resulting Aggregate Tariff was approved in December 2000 with effect from February 2001. This deferred the potentially more complex decision about how in principle a distribution tariff should provide for the appropriate extent and timing of funding for transmission expansion, and what the appropriate magnitudes would be for the companies in question. This issue would arise in the context of the distribution tariff review, originally scheduled to determine revised tariffs for the period 2007 – 2012.

In the event, tariffs were pesified and frozen from February 2002, with indefinite duration.[44] Discussions continued on the appropriate way to provide adequate funding for transmission investments. Certain limited changes were made, in response to these and other considerations, but did not go to the heart of this issue.

For example, Provincial Law 13173 of 16 March 2004 changed Article 42a of Provincial Law 11769 to allow the cost of transmission and its expansion to be included in setting the distribution tariff. At the same time the Law imposed a new obligation (article 42b) on the regulator to maintain the tariff as low as possible compatible with the required quality of service. This reflected political resistance to an increase in tariffs. The Law also clarified and established the rights of the provincial government in the electricity distribution sector and imposed additional obligations on the distribution companies.[45]

In August 2005 the provincial government decided to end the tariff freeze. In February 2006 it changed the basis of the Aggregate Tariff from a fixed amount to a percentage of total allowed revenue. The percentage was set to raise the same Aggregate Tariff revenue as in January 2006. This meant that when allowed tariffs are adjusted, the value of the Aggregate Tariff would be adjusted correspondingly.

[44] The 2002 Emergency Law made reference to renegotiating the contracts of the privatised utilities. The Provincial Government avoided discussion of renegotiation, preferring instead the concept of adjustment (unilaterally proposed by itself, which the utility could accept or not). In practice, neither concept has been taken forward to date.

[45] The provisions include: article 39 recognising the customer's right to electricity service at just and reasonable tariffs; article 65(i) establishing the concept of minimum and vital supply (a minimum consumption associated with the right to energy of all inhabitants of the province of Buenos Aires, that is not subject to cut-off by the distribution company in the event of non-payment); provision for monitoring quality of service in real time and in advance (the regulator can ask distribution companies for their expansion plans) rather than just penalties in arrears if the quality of service obligation is not met; an obligation on distribution companies to provide more systematic and uniform accounts, reflecting a concern that they might be responding to the economic crisis by delaying investment in order to recover revenues; and constraints on financing conditions especially for distribution companies, to limit the amount of their debt so as to avoid financial problems.

The provincial government recognised that if the Aggregate Tariff remained frozen in the face of the increased cost of construction and the lack of financing, then many of the needed projects would not materialise. In order to carry forward the projects in the Priority Plan, Decree 1652 provided for a 165 per cent increase in the Aggregate Tariff as from October 2006. This represented an increase of only one or two pesos per month for most smaller consumers but increased the Aggregate Tariff revenue to about 70m pesos per year compared to the previous 20m pesos. As of June 2007 FREBA had collected 156m pesos and had invested almost 75m pesos. This was double the 35m pesos invested in March 2006.

The scheduled distribution tariff review got underway (albeit slowly) in January 2007, when the government set targets for end user tariffs over the next few years. The review applies to the three provincial distribution companies and thereby to the municipal distributors and cooperatives in the province, whose tariffs are capped by those of the provincial distributor in whose zone they are located.

The review raises fundamental questions about the financing of transmission investment. For example, if the provincial government (or its regulatory bodies DPE and OCEBA) is to specify a levy or 'stamp' on distribution charges as originally envisaged, in order to fund transmission expansion, how is it to decide on the level of this stamp? Present thinking is that the level should reflect the cost and timing of a program of approved works. This would be allowed for in setting each distribution price control. As long as the 'postage stamp' concept applies, this contribution will be proportional to the MWh demand on each distribution system. An arrangement like the Aggregate Tariff might therefore continue to be applied as hitherto.

Recent experience has shown that the government has been disposed to adjust the Aggregate Tariff so as to enable a particular work or group of works to go ahead, as with the October 2006 increase to facilitate the Priority Plan. There is no aim to reintroduce the controversial role of regulation – in appraising and approving particular transmission investment projects on an ad hoc basis - that the initial reform attempted to avoid. Rather, in light of the FITBA arrangements, it is envisaged that the regulator should simply approve the Transmission Plan designed and proposed by FREBA. The October 2006 tariff increase was not to substitute the regulator's view for FREBA's, but to remedy a situation where the original arrangements no longer yielded sufficient revenue to take forward the originally approved Transmission Plan.

The provincial government has also explored whether certain particularly large transmission projects proposed by FREBA, that have so far not been started because of lack of funds, could be provided with additional economic assistance or financing from the provincial state or by helping FREBA to obtain aid from multilateral organisations. The government's ability to take forward both sets of projects was been delayed by the October 2007 elections but the next section describes how these developments are proceeding.

17. The situation today

The first priority project at EHV level that has been held up for some time pending the receipt of additional funds is a 500 kV line from Abasto (near Buenos Aires) to Mar del Plata with associated works costing 320 m pesos. This is the 350 km line mentioned in the first Federal Transmission Plan (June 2000) "to solve the historical problems of the Mar del Plata city supply", but shortly thereafter (November 2000) deleted from the Federal Plan. Buenos Aires province was perceived as less in need of federal support than the other provinces. (Littlechild and Skerk 2007c) For the moment, there is little prospect of this line going ahead. Accordingly, FREBA is financing 26MW of generation to cover the summer demand peaks on the Atlantic coast, assisted by an increase in the Aggregate Tariff in that area.[46] There are also several other distributed generation projects in this region.[47]

The other priority project hitherto held back is a 500/132 kV substation transformer near to the town called 25 de Mayo, a 70 km 132 kV line from 25 de Mayo to Chivilcoy, and a new 500/132kV 300 MVA transformer at Bahía Blanca, costing 90m pesos in total. This project is likely to be realised thanks to a loan that the province has secured from the multilateral organisation CAF.[48] This loan is envisaged to cover the substation transformer at 25 de Mayo and the 132kV line. Because it presently has access to better loan conditions than the private companies whose revenues are regulated, the provincial government rather than FREBA has borrowed the money and has to put the expansion out to tender. The government will collect the money from the Aggregate Tariff in order to repay CAF. It is hoped that an increase in the Aggregate Tariff will support the FREBA members' 53% share of the new transformer at Bahía Blanca, with large users (non FREBA members) identified by the Area of Influence method paying the remaining 47%.

FREBA has recently coordinated its Transmission Plan with the projects proposed by the Federal Council. [49] FREBA's immediate action plan is to speed up the approval

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[46] This 26MW comprises 18 small internal combustion engines commissioned by various parties, namely EDEA (10 units), a municipal distribution company (2 units), two cooperatives (2 units) and a generation company on the coast (4 units). Existing FREBA funds are being used to expedite the process, but these funds will be recovered by an increase in end-user tariffs of 0.0075 pesos/kWh for distributors in the Atlantic area as from September 2007. This represents about a 5% increase in charges to customers. Resolution MIVySP 508/2007. http://www.diarioelcronista.com/Regionales/nota_seccion.php?id=35903. Once the cost has been recovered from customers the provincial state will take ownership of the generating units.

[47] ENARSA, a new state-owned company created by the federal government, is planning to install 15MW of new generation in EDEA's Atlantic Coast area plus 40 MW of new generation at the Junín and Pehuajó nodes of EDEN's Northern area. These plants are small internal combustion engines that burn diesel oil and that can be installed relatively quickly. In addition, ENARSA plans to connect a new barge-mounted plant of around 100MW at some point on the Atlantic Coast.

[48] The Andean Development Corporation (Corporacion Andina de Fomento, or CAF, at www.caf.com).

[49] More precisely, the Federal Council incorporated FREBA's proposal into its Federal Transmission Plan II, which is basically a list (rather than a plan) of 132kV expansions in all provinces, replicating the concept of its 500kV Federal Transmission Plan. http://www.cfee.gov.ar/planfederal2.htm To date, this Plan II has not yet attracted Federal funding.

processes for projects before ENRE and the DPE[50]; to advance the technical appraisal of as many projects as possible; to develop the conditions that will make it possible for third parties to participate in the financing of FREBA's Work Plan (which may require regulatory changes at federal and provincial level); to establish a regime of penalties for those members of FITBA who do not comply with their obligations; and to establish a regime whereby those who are not members of FITBA nonetheless comply with the fiduciary obligations (to ensure that the funds of the Aggregate Tariff are actually used to finance the intended transmission projects).

FREBA's longer-term objectives are to secure that all its 174 members participate in the financial trust FITBA (as of the date of writing only 4 members of FREBA are not members of FITBA); to integrate the Aggregate Tariff revenues of all its members into the FITBA trust fund (as opposed to any other fiduciary fund); to seek additional third-party funding (from public funds, multilateral organisations and/or banks); and to reassess the Work Plan to make the total cost compatible with FITBA's stable longer-term revenue. (The Priority Plan of 2006 and the increased Aggregate Tariff revenue from October 2006 onwards are seen as transient measures in response to the distortions of devaluation and the tariff freeze.)

18. The record of transmission investment

What has been the overall impact of the FREBA/FITBA scheme on transmission investment in Buenos Aires province? Did expansion in Buenos Aires province take place to a greater or lesser extent than in other regional sub-transmission systems? Or to a greater or lesser extent after the reform compared to before it? Or was there some change in the nature rather than the quantity of the investment?

It is by no means straightforward to answer these questions because there are several different types and sources of transmission funding, various different types of transmission investment project, many factors influencing the extent of investment, and no single source of data. And, importantly, the FREBA/FITBA arrangements that formally came into effect in 2003 were not fully operative in the first few years. Nevertheless, let us examine the data on the Transba website, and that CAMMESA and ENRE provide in their latest (2004) Annual Reports.

Transba's website (apparently not updated since 2002), lists 38 extensions made within Transba's jurisdiction and commissioned between 1998 and 2002. Of these, 26 were Minor expansions, 8 were based on Contract between Parties (i.e. by agreement), 3 were made by individual parties, and one by the Public Contest method (namely, the Olavarría-Barker 132kV line).[51]

[50] Although the provincial government does not need to approve each project once the general Work Plan has been approved, it has to enforce provincial regulations on environmental issues, and there is still a need to comply with the federal procedures under which Transener and Transba are regulated.

[51] Of the 8 expansions by Contract between Parties, 2 list 1 party, 2 list 2 parties, 2 list 3 parties, 1 lists "cooperatives" and 1 lists "cooperatives and large users". http://www.transba.com.ar/en/index.htm

Table 1 shows CAMMESA's record of the additions to transmission lines and transformer capacity in the five regional sub-transmission systems of the main Argentine electricity network. It distinguishes between Transba in Buenos Aires province and (in aggregate) the other four sub-transmission systems. To present a clearer pattern, the data are grouped in pairs of years from 1992-93 to 2003-04.

Table 1 Sub-transmission capacity expansions 1993 to 2004

Transco	Capacity in 1992	1993-1994	1995-1996	1997-1998	1999-2000	2001-2002	2003-2004
Transmission lines km							
Total excl Tba	4946	516	222	183	282	346	194
Transba	4820	125	161	430	167	273	11
Total	9766	641	383	613	449	619	205
Transba %	49.4%	19.5%	42.0%	70.1%	37.2%	44.1%	5.4%
Ave km/yr		320.5	191.5	306.5	224.5	309.5	102.5
Transformer capacity MVA							
Total excl Tba	2786	215	164	345	244	362	164
Transba	3278	320	190	35	440	100	30
Total	6064	535	354	380	684	462	194
Transba %	54.1%	59.8%	53.7%	9.2%	64.3%	21.6%	15.5%
Ave MVA/yr		267.5	177.0	190.0	342.0	231.0	97.0

Source CAMMESA Annual Report 2004

In very round terms, over the twelve years 1993 to 2002 the total length of sub-transmission lines increased by some 200 to 300 km a year, then fell to about 100km per year in 2003-04. Similarly, the total extent of transformer capacity increased by about 200 to 300 MVA per year, then fell to about 100 MVA in 2003-04. These reductions presumably reflect the after-effect of the macroeconomic crisis.

Transba in Buenos Aires province accounted for 49% of the lines in 1992, and 43% of the lines built from then until 2002. Yet during the subsequent two years it accounted for only 5% of the lines built. Similarly, Transba accounted for 54% of the transformer capacity in 1992, and 45% of the transformer capacity added from then until 2002. Yet in the subsequent two years it accounted for only 15.5% of new transformer capacity.

There were marked variations from one period to another (and from one sub-transmission company to another.[52] Nevertheless, expansion in Buenos Aires province was at a similar level to the national picture, and comparable to the other regional systems, at least until 2002. But in the last two years 2003 - 2004, expansion there fell significantly with respect to both transmission lines and transformer capacity. This was not just relative to

[52] There was also very great variance between the other four regional sub-transmission systems. For example, the increase in line length over the decade 1992-2002 varied from zero in Cuyo region and 8.7% in Comahue to 35.2% in NEA (North East) and 57.7% in NOA (North West). The corresponding increases in transformer capacity were 16.8%, 24.8%, 75.8% and 77.9% respectively. Source: CAMMESA Annual Report 2002.

previous investment in the province, which was true for all the systems following the crisis; rather, according to these CAMMESA data, investment in Buenos Aires province fell sharply relative to investment in other systems.

Now consider the data provided by ENRE covering the same period. Table 2 presents this in the same format as Table 1. It shows the number of transmission expansion projects and the total value of transmission investment in the same regional sub-transmission systems.

Table 2 Sub-transmission projects and expenditures 1994 to 2004

Transco	1994	1995-1996	1997-1998	1999-2000	2001-2002	2003-2004
Number of projects						
Total excl Tba	0	8	18	22	34	16
Transba	0	0	7	20	14	8
Total	0	8	25	42	48	24
Transba %		0%	28.0%	47.6%	29.2%	33.3%
Average no. projects/yr	0	4	12.5	21	24	12
Expenditure $2001m						
Total excl Tba	0	1212	36,434	34,321	42,957	5,930
Transba	0	0	2,980	24,055	17,704	1,518
Total	0	1212	39,414	58,376	60,661	7,448
Transba %		0%	7.6%	41.2%	29.2%	20.4%
Ave expend/yr	0	$606m	$19,707m	$29,188m	$30,331m	$3,724m

Source ENRE Annual Report 2004

With respect to the sector as a whole, the picture is not dissimilar to Table 1 although it shows more active growth. The number of transmission projects steadily increased from 0 in 1994 to 24 per year by 2002. Then it halved. The total value of these projects increased to $30,000 m per year over the same period. Then it fell to one tenth of that level. As with Table 1, this presumably reflects the impact of the crisis.

What is different from Table 1, however, is that Transba market participants did not take forward any fewer projects in 2003-2004, as a proportion of the total, than they did in previous years. In fact they took forward slightly more (33% compared to 27% overall in previous years). And the value of these projects was only slightly down as a proportion of the total: 20% compared to 28% in aggregate over the previous eight years. In other words, contrary to the CAMMESA data in Table 1, these ENRE data do not suggest that investment in transmission in Buenos Aires province fell sharply relative to investment in other systems.

Reconciling these two sets of official data is beyond the scope of this paper. What can be said, however, is that there does not seem to have been an increase in transmission investment in Buenos Aires province in the two years 2003-2004, and if anything there

may have been a decrease. However, it is too soon to judge whether this measures the effect of the FREBA/FITBA scheme. Of the almost 75m pesos that FREBA has invested up to July 2007, only 10.5 m pesos were invested during 2003-04. The scheme had only just begun and the effect of the crisis was still felt. It is possible that transmission investment would have been even less in the absence of the FREBA/FITBA scheme, both in 2003-2004 and prospectively thereafter.

19. Further discussion of the transmission investment record

The actual pattern of investment in each transmission system reflects many factors including different rates of investment in the past and different rates of economic development. In addition, underlying conditions were changing: the vigorous expansion of transmission in the state-owned period had come to an end by the late 1980s, and is unlikely to have been matched thereafter, even if there had been no changes in ownership or regulation. There were changes in ownership in Buenos Aires province, as well as in transmission regulation. We have explained above that the funds available for transmission expansion in Buenos Aires province were essentially determined by decisions of the provincial government (notably with respect to the Aggregate Tariff) rather than by the distribution companies themselves. And we do not yet have data for the subsequent years. So it would be premature to conclude that the FREBA/FITBA arrangements would necessarily be associated with reduced transmission expenditure.

However, a reduction in transmission expenditure compared to what would otherwise have taken place would by no means necessarily be a criticism or weakness of such arrangements. Indeed, as the Cammesa Annual Reports show, the new transmission arrangements at the federal level led to a significant reduction in the building of 500kV transmission lines (with a corresponding increase in expenditure on transmission control systems). This seems to have been a more economic outcome, and it was a merit of the federal arrangements to have brought it about.[53]

The Transba website, albeit not up-to-date, indicates that not all transmission and sub-transmission investment depends on the Public Contest method. Over the ten-year period 1992-2002, this method accounted for some 2160 km of the 2477 km investment in Transener's 500 kV transmission system, but for only 329 km of the 2705 km investment in the regional companies' 132 kV sub-transmission systems. Similarly, the Public Contest method seems to have accounted for only 300 MVA of the 2250 MVA investment in transformer capacity on Transener's system, and for none of the 2415 MVA investment in the regional systems.[54] Much transmission and especially sub-transmission investment thus derives from sources of funding other than the Public Contest method.

[53] Littlechild and Skerk (2007b,d)

[54] ENRE Annual Report 2002, Littlechild and Skerk (2004b, 2007d). Note that the investment in Transener's 500 kV transmission system under the Public Contest method includes two lines proposed by and for government-owned generating stations.

The precise nature of these other sources is unclear. Certainly there are other methods of expansion under the federal procedure, including Contract between Parties, Minor Expansions and Private Use. As noted earlier, these have been relatively numerous albeit smaller in individual magnitude. And in later years yet other methods of expansion have been added to the repertoire, primarily with a view to their use by government.

In addition, the Federal Electricity Council referred to earlier was still responsible for disposing of revenues derived from a surcharge on electricity sales. This seems to have had a continuing and significant effect on transmission investment in some of the provinces. During the period 1992 to 2001 the Federal Council approved and built 1441 km of 132 kV lines, of which 707 km were expansions in regional sub-transmission systems and 734 km were expansions in distribution networks.[55] However, very little of the Federal Council investment was in the Buenos Aires sub-transmission system.[56] The Mar del Plata line was explicitly deleted from the Federal Transmission Plan. The Federal Council concentrated its expansions in less affluent provinces and in rural and low voltage systems.

In sum, for several reasons it is difficult to evaluate the impact of the FREBA/FITBA transmission expansion arrangements in Buenos Aires province at an aggregate level: the arrangements have been in effect for a relatively short time; all investment has been severely impacted by the economic crisis; many factors, both past and present, influence transmission investment; and the Public Contest method is only one of several ways of financing transmission investment.

Is it plausible that the FREBA/FITBA arrangements would reduce the level of investment in transmission to an unreasonable level? The evidence suggests not: its extensive Transmission Expansion Plan was drawn up in consultation with transmission companies and Transba's Reference Guide was later made consistent with it.

Do the CAMMESA data suggesting a lower level of transmission investment in 2003-2004 disprove this claim? It would be premature to conclude that. Quite apart from the inconsistency with ENRE data, the actual investment reflects the serious limitations imposed by the crisis and the funding available through the Aggregrate Tariff, which was less than would have been implied by FREBA's Plan.

Alternatively, was FREBA's Transmission Expansion Plan perhaps too generous? Would the approach have led to excessive transmission investment under normal conditions and in the absence of the tariff freeze? Does the province's ability to survive with considerably less investment than was planned indicate that the Plan was over-engineered and that the incentives to efficient investment in the FREBA/FITBA scheme are now poor? The counter-argument to this is that the Transmission Expansion Plan was based on maintaining quality and security of service, including building in a margin for delays

[55] Analysis by Mercados Energéticos of Federal Electricity Council data at www.cree.gov.ar.
[56] In the period 1991-97 the Federal Electricity Council financed a 24 km 132kV line between Papel Prensa and Bardero with a new substation at Bardero. Another expansion of a 40 km 132kV line between Monte and Lobos with a new substation at Lobos was approved in 1998 but not built.

on particular projects, with sufficient lead times and allowing for indivisibilities in expanding capacity. In the absence of a comparable programme of investment, quality would gradually decline, at first almost imperceptibly and then more noticeably.

In the event, quality and security do not seem to have declined, indeed they seem to have improved initially. [57] However, the limited extent of transmission investment in subsequent years has reduced these quality and security margins and the system is no longer compliant with the N and N-1 conditions.[58] The FREBA plan would have provided the appropriate degree of security that does not at present obtain. From this perspective the Plan was not over-engineered and would have provided the appropriate degree of quality and security at least cost.

20. The different interests of operators and users

The arrangements in Buenos Aires province have both required and enabled users to look more carefully at the need for and nature of transmission investments. Because the users of transmission systems have different interests and priorities from the concessionaires of those systems, and from governments and regulatory bodies, these arrangements have impacted upon decisions about expansion, and in such a way as to yield more economic investments than would otherwise occur. Section 10 above noted that the transmission companies tended to prefer the solution that yielded higher revenues or greater convenience for that company whereas FREBA looked for the overall least cost solution. We now illustrate this by examining three related issues that faced the relevant decision-makers Transener, the distribution companies, the federal government and the Buenos Aires provincial government (via the DPE).

20.1 Henderson 500/220kV transformer

Henderson substation in Transener's 500kV transmission system contains a 500/220kV transformer feeding a 220 kV line from Henderson to Bragado and a 500/132 kV transformer feeding a 132kV system in the concession area of the provincial distribution company EDEN. In 1998, Transener proposed to install a second 500/220 kV transformer at Henderson substation in order to meet a prospective increase in load associated with an expanding steel factory in Bragado. EDEN and neighbouring cooperatives objected. It is unclear how far they considered that the expansion was premature, how far they were influenced by the lack of allowance for transmission expansion in their own price controls, and how far Transener proposed an expansion at an existing substation simply because the relevant regulation (Resolution SE 208/1998) did not allow it to propose the

[57] The operating performance of the five regional sub-transmission systems in aggregate improved from an average of 3.4 faults/100km/year in the three years 1999-2001 to an average of 2.2 faults/100km/year in 2002-2004. Transba had 3% fewer faults than the average in the first period and 15% fewer faults than average in the second period. Cammesa Annual Report 2004, p. 59.

[58] See the statements of Transener and Transba (most recently in a presentation at MIVySP on 19 July 2007) showing that most of their lines and transformers are either at the limit of their capacity or actually overloaded. In consequence it is ever more difficult to retire facilities for preventive or corrective maintenance without compromising quality of service standards.

building of a new one. At any rate, Transener withdrew its proposal in the light of the objection and did not press the matter to a public hearing.

Subsequently, under the Transmission Upgrade scheme for security of supply projects announced in Resolution 1/2003, Transener again proposed the second 500/220kV transformer at Henderson, at a projected cost of 15m pesos. The Secretary of Energy accepted it.[59] Under the terms of this scheme, 30 per cent of the costs of the expansion were placed on the users as beneficiaries (regardless of their views), with the other 70 per cent of the costs being spread across the system as a whole in proportion to peak demand. This decision impacted on some of FREBA's members. Because the project was not in FREBA's Transmission Plan that had been declared financeable from the Aggregate Tariff, FREBA took steps to secure an increase in the tariff in the affected area in the north of the province to cover the 30 per cent share of the cost. The government also decided to use certain congestion revenues (the Salex Funds) to help finance these expansions.[60] The Henderson transformer is now in service.

This case suggests that the transmission operator, who does not have to pay for an expansion, tends to look more favourably on building in advance of demand than the users who do have to pay for it. The federal government (in the post-crisis years when policy was less oriented to users) later imposed the same transmission expansion that the beneficiaries had rejected, to be paid for by users in general.

20.2 Reinforcing Transba network

In order to meet increasing demand in EDEN's area, two alternative schemes were put forward. The DPE proposed to build a new substation in Bragado, which would have necessitated double circuit 500 kV lines from there to the 500 kV transmission system (total length 2 x 60 = 120 km of 500 kV line). FREBA, in contrast, proposed the installation of a new substation (with a 500/132 kV transformer) at the town of 25 de Mayo, under the path of the existing 500 kV system, plus a 70 km 132kV line between 25 de Mayo and the town of Chivilcoy. FREBA pointed out that to build the new substation near to the 500 kV system would be less expensive and would also allow improved supply conditions in other areas of the province as well as Bragado. After some discussion, the DPE, which no longer had the role of planning the electricity network, accepted the recommendations of FREBA, as did Transener and Transba. This case suggests that FREBA brought about a different and more economic expansion than the Provincial Energy Directorate would have done.

[59] Resolution SE 106/2003, 28 February 2003: "Instalación de un segundo transformador en Henderson, de 300 MVA 500/220/13.2 kV. La pérdida del actual transformador determina la existencia de una Energía no suministrada de largo plazo superior al 30% de la demanda durante 10 días. El abastecimiento de gran parte de la zona centro de la Pcia. de Bs. As. depende del mismo. $15.0m" [translation: 'Installation of a second transformer at Henderson, of 300 MVA 500/220/13.2 kV. The loss of the existing transformer would mean lost energy in excess of 30% of demand for a period of 10 days. The supply of a great part of the central zone of Buenos Aires province depends on this transformer. 15m pesos.'] It is an interesting question whether the Henderson transformer is properly regarded as a security of supply project when it was originally proposed to meet a prospective increase in load.

[60] Littlechild and Skerk (2004b fn 35 p. 17 and pp. 47-9, 2007c)

20.3 Linking the two networks

A third issue was how to link the proposed 500/132 kV transformer at 25 de Mayo to the existing EHV network. The transformer would be located beneath the two existing 500kV lines between Henderson and Ezeiza. Transener preferred to link it to both lines, even though this would be more expensive, in order to increase operating flexibility and stability of the system. [61] FREBA proposed to link it to just one of these two lines, arguing that this would be more economic and still consistent with the relevant operating rules and stability limits. In the event, it was agreed that the transformer would initially be linked to one line; later, a second (twin) transformer would be linked to the second line.

This case again suggests a difference in emphasis. The transmission operator, who does not have to pay the bill, tends to look more favorably on an expansion that minimizes operating problems and makes the system more stable. Transmission users, who do have to pay the bill, prefer a more economic solution compatible with the relevant regulations, even though this may not be so convenient for the operator.

20.4 Implications

These three examples illustrate the differences in perspective between the two sets of industry parties (transmission concessionnaires and users) and the two relevant governments (federal and provincial), and the possible impacts of the decision mechanism on investment decisions. They shed light on the effect of different institutional arrangements for proposing and approving transmission investment. Transferring the decision-making power to the users, rather than leaving it with the transmission operator or the provincial or federal government (the so-called regulated Transco approach), does make a difference. In general it seems likely to have influenced the pattern of investment in the direction of more economic expansions rather than those more convenient to the transmission operator or more politically appealing to the government. And drawing up their explicit Transmission Expansion Plan enables market participants better to defend a least-cost solution against alternative proposals geared to solving political problems.

21. Expectations and Experience

How does experience in Buenos Aires province compare with the concerns and expectations of its founders?

21.1 Process of decision-making

[61] Transener argued that opening only one of the 500kV circuits would unbalance load flows on these two major lines, which would mean problems for transmission system operation because of difficulties in calibrating protection devices. Transener therefore preferred to open both the 500 kV circuits at the same point.

It was expected that there might be strong differences of view and conflicts of interest among the market participants. In particular, it was feared that there might be problems in determining and agreeing the appropriate pattern of investment, particularly with a meshed network and in the presence of externalities. To that end, FREBA's constitution specifies in some detail the formal mechanisms for accepting or disapproving projects (circulating project details so as to facilitate the formation of coalitions for competitive selection of projects, with provision for objections and claims for compensation, etc).

In practice, however, it has not yet been necessary to invoke these procedures since there has been a high degree of consensus among the members. Externalities were resolved by determining the most appropriate program of investments to maximise benefits for the province as a whole. The feared problems associated with failure to reveal preferences did not emerge. Concerns about free-riding were addressed by the Aportantes Method. The parties achieved a broad consensus, and unanimously approved the ten year Transmission Investment Plan. There was no need to choose the projects so that each company received an equal or proportionate share. The shares of funding determined by the Area of Influence and Aportantes methods were acceptable to all the parties.

The real problem that the members actually faced was obtaining funds to expand the transmission system and, later, financing the construction. It was not the difficulty of reaching agreement as to how to use what funds were available.

21.2 Area of Influence and Aportantes methods

Some have suggested that the federal Area of Influence method is unsatisfactory because it determines votes and cost allocations on the basis of physical flows rather than economic benefits. The concern was that this would lead to inefficient patterns of investment. Others argued for a more decentralised approach in order to attain greater flexibility in allocating the costs of investment between the beneficiaries.

A further concern was that, even if the Area of Influence method worked in Transener's 500 kV transmission network, this was still a largely radial network, and the method was unlikely to be appropriate in a more meshed network such as Transba's sub-transmission network. In such a network there was likely to be a greater difference between the cost allocation determined by the Area of Influence method and the benefit that each market participant would derive from an expansion.

Again, this was not a major problem in practice. In the event, it was not the specific and inflexible provisions in the Area of Influence method that impelled market participants in Buenos Aires province to introduce their own Aportantes method. And although some distribution companies complained about the fairness of the Area of Influence method, this was not their main concern.

The Area of Influence method is in fact still used to allocate costs between the provincial users, even though it is open to FREBA to allocate costs as it may decide. The driver for

action was not the inappropriate allocations of the Area of Influence method (which have concerned some commentators) but the limited scope of them. The concern was that the Area of Influence method did not make provision for the onward allocation of transmission expansion charges from distribution companies to the cooperatives embedded within them. The parties therefore proposed the Aportantes method to extend, rather than replace, the Area of Influence method.

A referee comments that the Aportantes method does not look as if it has good cost minimisation properties. But this is not its function. It is not designed and intended as a means of selecting least cost expansion programmes. The FREBA process for coordinating and selecting investment projects is the vehicle for securing cost minimisation. The role of the Aportantes method is to determine a fair and accepted way of allocating the resulting costs, in the absence of any other agreement between the parties.

21.3 Funding

It was initially envisaged that the majority of the funding for transmission expansions would come from a specific allowance in the distribution price controls. But distribution companies would also contribute some of their own funds (about 10 per cent) pro rata to the MWh demand on their own systems. This would provide an incentive to efficient selection and monitoring of investment, and indicate the commitment of the companies.

In the event, the transmission expansion allowance was removed from the price controls before privatisation. From the companies' perspective this meant that the provincial regulatory framework no longer made adequate provision for customers to pay the costs of justified transmission expansions. The distribution companies were unwilling to support any transmission investment, on the grounds that the provincial regulation made no allowance for the costs of this.

Eventually, agreement was reached on transmission funding via the Aggregate Tariff. This was the crucial factor in enabling agreement and progress. Distribution companies have not had to fund the investments directly out of their own pockets. The question of what contribution was appropriate from each company or each set of customers has been removed from the debate.

There is no suggestion that this adversely affected commitment or efficiency. If there had been less availability of Aggregate Tariff funds, it is possible that voluntary contributions might have emerged, especially if the penalties for supply failures had been higher.[62] The efficiency incentives might then have been stronger. This might in turn have produced more conflicts between participants. But these are necessarily conjectures.

[62] It has been suggested that the provincial regulator did not enforce standards and impose penalties on the distribution companies as severely as was originally envisaged. On the other hand, this may have been recognition that the companies did not have as much revenue to make transmission investments as was originally envisaged.

21.4 Tendering and finance

All this investment takes place within the context of the federal regulatory framework for transmission. Projects are put to Public Contest or a Contract between Parties is agreed beforehand. For a large project involving many members, the preference is to use the Public Contest method. For a small project involving only one or a few members, an agreed Contract between Parties often suffices. In the latter case, too, it is usual to put the construction, operation and maintenance out to tender, looking for competition between constructors and/or providers in order to get the best possible price and to avoid conflicts of interest.

There is already some learning from experience in this respect. Experience suggests that civil works can usually be done more cheaply by the cooperative in the area of the expansion but that transformers and other works benefit from being put out to tender. The custom is now to partition the expansion work and put the non-civil works out to tender. The distribution companies also learn from the experience of other members of FREBA, including by comparing offers.

The arrangements allow greater flexibility with respect to financing than might initially appear. It is possible to establish loans between trust accounts, so that a company needing to fund an immediate investment can borrow from the account of another with funds available, at a mutually acceptable rate. Three such loans have already been made.[63]

21.5 Decentralized decision-making

Abdala and Spiller (2000) have argued that decentralised systems of decision-making in common-pool networks can be more effective than a centralised system, and have cited the FREBA/FITBA arrangements in Buenos Aires Province as an example of this. How far does subsequent experience bear this out?

Those authors argue that decision-making in a common-pool network such as electricity is problematic. Centralised solutions have the advantage of lower transactions costs and direct control of activities characterised by externalities, free-riding and property rights problems. But information asymmetries – specifically lack of knowledge of the preferences of the parties - mean that the chosen solution may not be the most efficient. A decentralised decision mechanism may be preferable, and may avoid politicization, although problems of free riding and transactions costs may remain. In transmission regulation specifically, it is difficult for a centralised agent to assess the preferences of agents. There are problems with leaving transmission investment decisions to the incumbent monopolist, or opening the market to competition, or creating transmission rights. A decentralised mechanism may be preferable if it can promote self-revelation of preferences among grid users and overcome various problems of transactions costs, the tyranny of the status quo, inefficient outcomes and free riding.

[63] The Cooperatives of Colon and 9 de Julio have lent $0.7m and $0.78m, respectively, to the Cooperative of Lujan, and the Cooperative of Pergamino has lent $1m to the Cooperative of Chacabuco.

Those authors suggest that the FREBA/FITBA arrangements in Buenos Aires province, which at that time were in course of formulation, were triggered by two major regulatory flaws: federal procedures for transmission investment that relied on an administrative rule for cost allocation based on power flows rather than user preferences, and an 'incoherent' provincial level regulation for pass-through of transmission investment costs to end-user tariffs. They describe at some length the project selection procedure within FREBA, the consultation and compensation devices and the provisions for revelation of preferences. They identify free riding by smaller players as a potential problem area.

It is not clear that the FREBA/FITBA arrangements were prompted by regulatory flaws associated with a centralised administrative rule. Rather, these arrangements aimed to provide a method for determining transmission investments and a means of financing them. As explained above, the criticised federal rule for cost allocation was in fact accepted and extended rather than rejected or replaced. This was to overcome the concern that the smaller municipal distribution companies and cooperatives embedded in the provincial distribution systems would free-ride on the provincial distribution companies identified as payers by the federal rule. The 'incoherent' provincial regulation, which made inadequate provision for funding transmission investment, was indeed a serious problem. Progress depended on making adequate provision for funding via the Aggregate Tariff. In practice, the detail of the project selection procedures within FREBA, the consultation and compensation devices and the provisions for revelation of preferences have not been critical factors. Indeed, there seems to have been general agreement within FREBA about which projects to select.

In sum, the actual working of the decentralised FREBA/FITBA arrangements in Buenos Aires province differed in some respects from the early conjectures. But so far the arrangements do indeed seem to be successful, and the outcome to date seems more efficient and more reflective of the preferences of the users than the projects that would otherwise have been selected by the transmission companies themselves or by a regulator. We now examine this final point in more detail.

22. A comparison with the regulated Transco approach

Some might question the approach in Buenos Aires province. The constitution and voting scheme of the Regional Electricity Forum seem to be quite elaborate. The work needed to prepare, discuss and update a Transmission Plan and persuade the provincial regulator of its merits must be quite extensive. Funding was initially a problem, the FITBA trust arrangements impose additional obligations, and the Aportantes cost allocation method seems to be quite complex. Is all this worthwhile? Is it in fact significantly different from the conventional 'regulated Transco' approach? Is it less costly or more cost-effective? Would it not be simpler for the regulator simply to consult on a proposed expansion plan put forward by the Transco?

Experience to date suggests that the arrangements in Buenos Aires province have led to a different and preferable process compared to the regulated Transco approach. In both

processes, it is necessary to prepare and consult on a transmission plan. FREBA seems to have looked further ahead (ten years as opposed to five years in the typical regulated Transco approach and eight years specified in Transba's Reference Guide) and to have carried out a more comprehensive analysis (integrating distribution networks more thoroughly into the transmission analysis than a Transco would normally do). It seems unlikely that, in aggregate, the preparation and consultation could have been significantly less onerous or costly in a comparably thorough regulated Transco process. The process has led to better relations, trust and understanding between the members than had previously been the case. This is equally true with respect to the transmission companies too, where FREBA has involved Transener and Transba as Advisory Members. Such outcomes are also reported in other countries where negotiated settlements and constructive engagement approaches have replaced conventional regulation.[64]

Not only the process has been different and preferable, so has the outcome. There is limited experience to date, but this paper suggests several issues where the process has led to transmission investments different from those of a regulated Transco. Even if the same options are consulted upon in the light of expert technical advice, it does make a difference which party takes the final decision. The outcome of the process in Buenos Aires has been a transmission investment program more closely attuned to the needs of users than to the needs of transmission companies, regulators and politicians.

Allocating costs via the Area of Influence and Aportantes methods has not been problematic in practice. Experience also suggests that the distribution companies have acted in a responsible and coordinated way with respect to the interaction between transmission and distribution investments and the sharing of costs.[65]

Are the distribution companies a good proxy for the interests of end-user customers in designing transmission programs? Some have worried that if the distribution companies had to pay for the costs of transmission expansions out of their own pockets, there would be less transmission investment than customers really wanted. Others have worried that if the costs of transmission expansions could simply be passed through to end-user customers, this would induce distribution companies to make excessive investments in the transmission system relative to the distribution network, and at the expense of customers.

The more policy-relevant question is whether the distribution companies constrained by the actual regulatory framework in Buenos Aires province are a better proxy for customers than would be the regulator or the Transco constrained by the conventional regulated Transco framework. The fears just mentioned might be valid if the associated regulatory arrangements actually applied in Buenos Aires province. But they do not.

[64] Doucet and Littlechild (2006, 2007)

[65] For example, a particular transmission investment on the Atlantic Coast of the province removed the need for a distribution investment. It was agreed within FREBA that the distribution company (the cooperative of Pinamar) would contribute the avoided cost of the distribution network expansion, and the remaining cost of the expansion (a new 132 kV substation) would be paid for out of FITBA funds.

As regards the first worry, the requirement that distribution companies pay for transmission investment out of their own pockets was initially envisaged to constitute some 10 per cent of the required total transmission budget. In the event, even that small element proved infeasible. The distribution companies therefore had to negotiate with the regulator for a special allowance for transmission investment over a ten year period. Once that allowance (the Aggregate Tariff) was agreed, there was no reason for the distribution companies not to authorise its spending. Moreover, given their liability for penalty payments in the event of failures on the transmission system, it was in the interests of the distribution companies to secure needed transmission investment and to get the most effective allocation of investment for the total funds available. In fact, they have been assiduous in trying to secure additional transmission funding since the economic crisis rendered the initial budget inadequate.

The second worry, that the distribution companies are incentivised to spend excessively on transmission, rings somewhat hollow in light of the severe funding limitations since the crisis. Putting that aside, the distribution companies do not in fact have a pass-through arrangement in the conventional sense (e.g. of fuel cost adjustments). Rather, the regulator earmarks a specified allowance for a period of time. In deciding the amount of that allowance, the provincial regulator has been every bit as conscious of the impact on customers as a conventional Transco regulator would be. Moreover, the distribution companies have been conscious that, insofar as they secure additional funding for transmission investment, the consequent increase in end-user prices may reduce the economic and political willingness to allow additional investment in the distribution networks, on which they can hope to earn a reasonable return.

The users rather than the regulator or the Transco thus make the running in terms of designing the size and content of the transmission investment program. But a key regulatory input is to set a total allowance for transmission investment over a specified period of time. In this respect the process is not so different from the conventional regulated Transco process.

There is one further significant difference from the regulated Transco model. Under conventional price cap regulation, the regulator identifies an efficient transmission investment program and incorporates an allowance for the cost of this in setting the price cap. In some cases, there is limited monitoring of the way in which that allowance was spent, or not spent. In the limit, it is open to companies simply to return part of the associated revenues to their shareholders as long as they continued to meet the prescribed quality of service standards. This has been a problem to which conventional regulators have increasingly had to respond, with increasingly complex monitoring and incentive schemes. In contrast, the FREBA/FITBA arrangements provide an explicit assurance that the earmarked revenues will be spent on the approved transmission investments (revised as necessary in the light of evolving needs on the system). In this respect, the Buenos Aires arrangements were ahead of the conventional regulated Transco approach. They are also simpler, and make better use of the knowledge and incentives of the distribution companies to monitor the investment program and revise it as necessary.

23. Conclusions

The Public Contest method in Argentina transferred decision-making on transmission expansion from the transmission companies and the regulator to the users of the transmission systems, particularly the generators and distribution companies. This method has been much debated. Early evaluations were critical, but focused almost entirely on one particular expansion (the Fourth Line). More recent evaluations (including the papers in this Symposium) have been much more positive.

Previous analysis has been limited to the operation of the Public Contest method at the federal level. The present paper has examined how the method has been applied in the province of Buenos Aires, where some different issues are raised. These include the viability of the approach when large numbers of distribution companies and cooperatives are involved, the applicability of the Area of Influence method for determining cost allocations and votes in a meshed rather than radial transmission system, the danger of distribution companies providing inadequate or excessive transmission investment, and the problems of provincial regulation.

The paper shows that nearly 200 distribution companies of different types and sizes have cooperated with each other, and with the transmission companies and the provincial regulator, to develop and begin to implement a ten-year transmission expansion plan at national and regional level. The process and outcome seem to be more thoroughly prepared, and more closely geared to the needs of users, than would otherwise have been the case.

Concerns about inadequate or excessive transmission investment reflect assumptions about the funding and incentive mechanism that do not in fact apply. The provincial regulator has determined an allowance in the distribution tariff (initially, in lieu of a scheduled tariff reduction) to cover transmission investment. These funds are being invested fully, conscientiously and efficiently, without conflicts between the parties. There are better incentives to apply and monitor this funding than in the conventional regulated Transco model.

Some expected that it would be necessary and desirable to modify or replace the controversial Area of Influence method, not least to deal with the more highly meshed sub-transmission network. This was not found necessary. In fact, that method was extended - to allocate votes and costs to the smaller municipal distributors and cooperatives embedded in the larger distribution networks - rather than replaced.

The approach in Buenos Aires province was still in its early days when it was hit by the economic crisis and subsequent federal government policy constraining funding. It is a testament to the approach that it has survived. In 2003-2004 there may have been less investment in transmission than previously, but it is too soon to judge whether this is typical. It remains to be seen how the deferred distribution tariff review will deal with the tradeoff between total investment in transmission expansion, which influences quality of

supply, and the implications for tariffs to customers. But the provincial government has demonstrated its willingness to allow tariff increases to fund transmission investments, and to explore alternative financing arrangements. The scheme has yet to be faced with significant conflicts between participants. But to the extent that the approach has been able to operate, it seems to be working well.

Experience in Buenos Aires province to date thus extends and reinforces experience at the federal level. It shows that it is feasible for provincial and municipal distribution companies including cooperatives to design, agree, implement and monitor an efficient program of investment and expansion in national and regional transmission and sub-transmission systems. This paper has argued that this approach is preferable to the conventional regulated Transco approach, particularly in terms of responsiveness to the needs of users, more economic investment, and monitoring of the chosen investment program. Importantly, it makes significantly less demands on the regulatory body, though there is still a role for regulatory input.

There seems no reason why the limitations of the conventional approach or the strengths of the approach studied here are particularly characteristic of Argentina. Providing adequate but not excessive regulation is a challenge internationally. There would therefore seem scope to apply these ideas to both developing and developed countries elsewhere in the world.

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