

Transmission expansion in Argentina 4: A review of performance

Stephen C. Littlechild^{a,*}, Carlos J. Skerk^b

^a *Judge Business School, Trumpington Street, Cambridge CB2 1AG, UK*

^b *Mercados Energéticos, Buenos Aires, Argentina*

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Abstract

In 1992 Argentina's electricity reform provided an innovative approach to transmission expansion. In particular, major expansions were determined by the Public Contest method – that is, by votes of transmission users rather than by the transmission company or the regulatory body – and then put out to competitive tender. This paper reviews the overall performance of that policy. There was substantial new transmission investment, especially in control systems and transformers rather than extra-high-voltage lines: an achievement of the policy lies in making better use of the existing transmission system. The number and value of Public Contest transmission expansion projects were steadily growing over time until Argentina's economic crisis, particularly at sub-transmission level. Transactions costs were not a problem in the Public Contest method: the median number of voters was 5, and the process was generally characterised by harmony between participants rather than by discord. Distribution companies supported rather than obstructed the process, though there was scope to improve the provincial regulatory framework. There was effective competition to build and operate the expansions, with a median of 3 bids for each and the incumbent winning less than one fifth. Such competition roughly halved the cost of new lines. This contrasts with lines built under the present Federal Transmission Plan at two and a half times the previous cost.

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* Corresponding author.

E-mail addresses: scittlechild@tanworth.mercianet.co.uk (S.C. Littlechild), cskerk@me-consultores.com (C.J. Skerk).

1. Introduction

As part of its 1992 reform and privatisation policy, Argentina adopted an innovative approach to transmission regulation. Existing transmission systems were regulated with a conventional incentive price cap. Transmission expansions were regulated separately and differently. Four methods were specified, of which the most important and controversial was the Public Contest method. Users rather than transmission companies or the regulatory body made decisions on major transmission expansions. Accepted proposals were then put out to competitive tender.

Other papers have examined the origins, development and application of transmission policy in Argentina.¹ This paper seeks evaluate the extent and performance of the policy overall. It examines a number of aspects of transmission expansion performance, including

- the impact of privatisation and regulation of existing transmission systems
- the number and nature of extra-high-voltage (EHV) lines built in the decade 1992 to 2002 (before the economic crisis in Argentina) compared with the programme under the previous state-owned regime
- the types of investment in the national EHV system and the regional sub-transmission systems
- the pattern of transmission investment over time
- the extent of Public Contest versus other methods of expansion
- the nature of the Public Contest process and the number and extent of agreement among voters
- the extent and effectiveness of competition for Public Contest tenders, and
- the effect of competition on transmission construction and operating cost.

The Appendix section lists all the Public Contest expansions that have been proposed to date.

2. Regulation of existing transmission systems

Argentina provided for the existing transmission systems to be regulated according to a now-conventional RI-X incentive price cap arrangement. It provided for expansions to those systems to be owned and regulated quite separately. The focus of this paper is on the performance of these arrangements for regulating transmission expansions. It is worth noting, however, that these have not impacted adversely on the efficiency of existing systems. On the contrary, efficiency and quality of service improved.

This has been well documented for the 500 kV national Extra High Voltage system owned and operated by Transener. For example, operation and maintenance costs reduced to one third of the pre-privatisation rate and to half of the actual 1992 costs. The number of faults per 100 km of line reduced from about 1.5 in 1992 and 1994 to an average of 0.55 from 1995 to 2002.² Transmission forced outages fell from 1000 h in 1992 to 900 in 1993, 650 in 1994 and 300 in 1995.³ Average recovery time when a tower line collapsed reduced from about 1½ days during 1981–1992 to

¹ Littlechild and Skerk (2004a,b, 2008-this issue-a,b,c,d) and references therein, Littlechild and Ponzano (2008-this issue) and other papers in this Symposium.

² Transener (2003), Sanz (2004).

³ Estache and Pardina (2003), Table 1.

about ½ day during 1993–2003.⁴ In the Transener transmission system the rate of own failures per year fell from 1.48 in July 1994 to 0.57 in 2002, well below the limit of 2.50 set in the concession contract.⁵

Privatisation plus separate ownership and regulation of existing and new transmission systems thus seem to have facilitated improved efficiency and quality of service.

3. Expansion of EHV 500 kV transmission lines 1992 to 2002

At the time of electricity reform, Argentina created several separate transmission companies: an extra-high-voltage (EHV, mainly 500 kV) national system called Transener, and six high voltage (HV, mainly 132 kV) regional sub-transmission systems. Although the transmission policy applies to all types of investment in all the transmission networks, attention has hitherto focused on new lines in the EHV network. Table 1 shows the EHV transmission lines installed from 1992 to 2002. Notation # indicates the number of a Public Contest method expansion in the Appendix.

Overall, nearly 3000 km of new 500 kV lines were built over the ten years following privatisation and reform, an average of about 300 km per year. The longest line that went ahead after privatisation (the 1292 km Fourth Line) was a particularly large and important investment.⁶ The length and character of lines built under the new transmission expansion arrangements was thus substantial.

How does this performance compare with the previous record? More 500 kV transmission lines were built before privatisation — some 6870 km from 1974 to 1987. The rate of building was also faster then — nearly 400 km to 500 km per year, depending on the precise period taken.⁷ But that was when the transmission system was first being formed into a national interconnected system, as a matter of public policy.

Note, however, that Table 1 is not an indication of the impact either of privatisation or of the Public Contest method. Three of the longer lines listed in Table 1 (# 1, 2, totaling 267+506+80=853 km) were planned before privatisation. They were financed by the federal government as part of the development of the Yacyretá hydro plant at Rincón, which is jointly owned by the governments of Argentina and Paraguay. They were initiated by the government before the Public Contest arrangements were in place.⁸ A further two lines (135 km each) link the same inter-government plant with Garabí in Brazil.

The InterAndes line (409 km) is separate from the interconnected system, and was financed by a Chilean generating company supplying energy to mining companies in the north of Chile. A further nine lines, the shortest not more than 6 km long (total 136 km), simply connect particular generating plants with the high-voltage grid. This leaves the 1292 km Fourth Line as the only EHV 500 kV line built fully under the Public Contest method and involving numerous private (non-government) parties located within the national transmission system.

Is the building of only one major 500 kV line a sign of the inadequacy of the expansion arrangements? Should more 500 kV lines have been built, whether under the Public Contest

⁴ Transener (2003).

⁵ Pollitt (2008-this issue) p. 16 citing Transener Annual Report 2002, p.21.

⁶ See Littlechild and Skerk (2004a, 2008-this issue-b), Galetovic and Inostroza (2008-this issue).

⁷ Construction totalled 6870 km from 1974 to 1987, an average of 491 km/year over 14 years, or 382 km/year if the period is extended to 1991. See Table 1 in Littlechild and Skerk (2004a).

⁸ In both cases, ENRE was not yet in operation at the time at which a public hearing would have been called, so there were no public hearings in these cases. Nevertheless, the government put the construction of both expansions out to tender, and after the line was operative the beneficiaries paid the fee according to the area of influence method.

Table 1
Construction of 500 kV transmission lines in Argentina 1992–2002^a

Year	Operator	Project	Length (km)
1993	Transener	Piedra del Águila grid interconnection	6
1994	Transener	Piedra del Águila grid interconnection	6
1994	EBY	Yacyretá–Rincón (3 × 3.6 km) grid intercon. #1	11
1994	Yacylec	Rincón–Resistencia #1	267
1994	L L Lata	Loma la Lata–Planicie Banderita grid intercon.	37
1996	Litsa	Rincón–Salto Grande #2	506
1996	Litsa	Rincón–San Isidro #2	80
1997	P P Leufú	P P Leufú–P Águila grid interconnection	18
1999	Transener	P Águila–Abasto (Fourth line) #7	1292
1999	Transener	A Cajón–Chocón grid interconnection	52
1999	InterAndes	Cobos–Atacama (Chile) 345 kV	409
2000	Endesa	Rincón–Garabí (Brazil)	135
2000	AES	Power plant grid grid interconnection	6
2002	Endesa	Rincón–Garabí 2nd circuit	135
Total			2960

^a Source: Mercados Energéticos. CAMMESA Annual Report 2002 gives a similar total length of line over the same period, but with different timings: 1993 251 km, 1994 279 km, 1996 592 km, 1999 52 km, 2000 1303 km, total 2477 km. It is possible to reconcile the data to a large extent by assuming that some projects are entered a year or two earlier or later in one or other data set. If about 246 km from CAMMESA’s 1993 total corresponds to pre-1987 investment (see Littlechild and Skerk 2004a, footnote to Table 3), there remains unexplained about 25 km from CAMMESA’s 1996 total. The 1999 Rincón – Garabí lines (2 × 135 km) are not included in CAMMESA’s figures because they are considered “international transmission” and consequently are not part of the 500 kV national grid.

method or otherwise? The evidence suggests not. The rate of transmission building before the 1992 reform was excessive from an economic perspective.⁹ The Fourth Line itself is now revealed to have been uneconomic. Even though the present government has subsequently developed and begun to implement an extensive National Transmission Plan, with over 4750 km of 500 kV lines, there is no reason to believe that these or any other 500 kV lines would have been economic to build.¹⁰ In the state of excess capacity obtaining in the period after 1992, an achievement of the post-privatisation policy was precisely to avoid the building of unnecessary lines. The priority was to make better use of existing lines. The next sections explore how the Public Contest method encouraged a more economic approach to transmission expansion.

4. Types of investment in transmission systems

Apart from EHV lines, what other types of expansion were made in the transmission system? Table 2 sets out the summary by regulatory body ENRE of the transmission expansion projects completed during 1994 to 2002. It shows that during this period a total of 186 new transmission projects were put into effect, with a total value of \$837.3 m.¹¹ Where information is available, some details of the investments are noted in the table.

⁹ Littlechild and Skerk (2004a, 2008-this issue-a).

¹⁰ Littlechild and Skerk (2004b, 2008-this issue-b,c), and also below.

¹¹ During the period 1992 to end 2001, the Argentine peso (symbol \$) had parity with the US dollar. In early 2002 there was a substantial devaluation. Nowadays it is conventional to express values in US dollars at an assumed exchange rate of 3 pesos to the US dollar, with adjustments made according to the daily exchange rate obtaining at the time of settlement. Unless noted otherwise, the post-2001 \$ values used in this paper refer to US dollars or equivalent.

Table 2
Transmission expansion projects completed during 1994 to 2002

		Number	Value \$m
<i>Transener EHV transmission system (500 kV)</i>			
Comahue–Buenos Aires (4th line) 1292 km 1999	PC#7	1	250
Rincón (Yacyretá) – Salto Grande 506 km 1996	PC#2	1	135
Rincón (Yacyretá) – Resistencia 267 km 1994	PC#1	1	70
Henderson–Puelches capacitores 1996	PC#4	1	24
Paso de la Patria–Sta Catalina 132 kV link ^a		1	c20
Macachin substation (500/132 kV)		1	c20
Next three projects (average \$13 m)		3	38
Agua del Cajón–Chocón 52 km 1999			
Ramallo (power plant interconnection) 2000			
Recreo capacitores 2000	PC#9		
Remaining 40 projects (average \$2 m)		40	83
Total		49	640
<i>Six regional sub-transmission systems (mainly 132 kV)</i>			
Three largest projects Transba (average \$8 m)		3	23
Three largest projects Transnoa (average \$6 m)		3	17
Next three largest projects Transnoa (average \$4 m)		3	12
Next three largest projects Transba (average \$3 m)		3	9
Next three largest projects Transnoa (average \$2)		3	7
Remaining projects (average \$1m)		122	129
Total		137	197
Overall Total		186	837

Source: ENRE Annual Report 2002 ch. 3pp. 49–55.

Some cost figures have been deduced from the text of ENRE 2002 Report and from other data. PC denotes a Public Contest expansion. # indicates the number of the Public Contest expansion in the Appendix to the present paper. ENRE's list may not be entirely complete and the classification of a few expansions is debatable. Later tables in this paper use data to 2004 from ENRE Annual Report 2004, which contains slightly different cost figures (rebased to constant US\$ 2001). However, this table to 2002 suffices to indicate the nature of investment during the period when the reform policy was effective, before the economic crisis in early 2002.

^a It is not clear why this 132 kV line is listed as in Transener's 500 kV system.

About a quarter of these transmission projects (49/186) were within Transener's jurisdiction, and related primarily to the 500 kV EHV system. However, they accounted for just over three quarters (\$640 m/\$837 m) of the total value of investments. The Fourth Line and two other long lines (listed as costing \$250 m, \$135 m and \$70 m respectively, total \$455 m) accounted for 71% (\$455 m/\$640 m) of the EHV investment. The next six projects in size ranged from \$24 m to about \$10 m. The remaining 40 EHV (500 kV) projects cost \$83 m in aggregate, an average of just over \$2 m each.

The other three quarters of the total number of projects (137), accounting for just under a quarter of the total value (\$197 m), were carried out within the areas of the six regional sub-transmission companies operating primarily at 132 kV. The projects were evidently smaller than in the 500 kV system, the largest being about \$10 m. The largest 15 projects from the two most active systems accounted for \$68 m of the total value, an average of \$4.5 m each. The remaining 122 projects therefore averaged about \$1 m each.

Apart from the three major 500 kV lines, other investments in the EHV system totalled \$185 m during this period. There was also nearly \$200 m of investment in the regional sub-transmission

Table 3
Transmission expansion projects over time, by type of system

Year	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	Total
<i>Number of projects</i>												
Transener	2	9	5	5	5	6	5	9	3	2	6	57
Regional Cos	0	5	4	8	18	26	20	36	20	4	20	161
Total	2	14	9	13	23	32	25	45	23	6	26	218
<i>Value of projects \$m 2001</i>												
4 largest projects ^a	74	0	158	0	0	247	0	0	0	0	0	479
Other projects	5	15	4	10	23	23	34	40	6	8	6	174
Transener	79	15	162	10	23	270	34	40	6	8	6	653
Regional Cos	0	0	3	12	29	48	24	63	15	1	6	197
Total	79	15	165	22	52	318	58	103	21	9	12	853

Source: ENRE Annual Report 2004.

^a The 4 largest projects are #1, 2, 4, 7.

networks. In other words, there was nearly \$400 m of transmission investment, on nearly 200 projects, other than in the eye-catching major lines in the EHV system.

In particular, there was substantial investment in better control systems, to expand the existing capacity more economically than by building new transmission lines. To illustrate the change in emphasis on investment, over the period 1993 to 2003 the increase in system demand was over 50%. During that same period the length of transmission lines increased by 20%, and the capacity of main transformers by 21%, compensators by 27% and substations by 37%. But series capacitors increased by 176%. As a result, transmission capacity limits increased by 105%, more than sufficient to meet the increase in demand.¹² Investments in capacitors under the Public Contest method were generally economic, in contrast to the investment in the Fourth Line and the transmission lines in earlier periods (Littlechild and Skerk 2008-this issue-d).

5. Investment over time

Table 3 shows ENRE's record of the number of transmission expansion projects commissioned (i.e. becoming operational) in each year from 1994 to 2004 and their value in constant \$m 2001. Over the whole period there were 218 projects, with a total value of \$853 m. In broad terms, Transener's EHV system accounted for one quarter of the expansions by number, and three quarters by value. The four largest projects accounted for over half the total value of the expansions.

There were about eight years of experience (1994–2001) of the post-reform arrangements under relatively normal conditions. To abstract from the variations from one year to the next, Table 4 shows more clearly the trend over time by taking three-year moving totals. It also sets

¹² Transener (2003). Sanz (2004) has slightly different calculations for 1992–2002 but the same overall conclusion. Transmission capacity increased in the same proportion as did demand, namely 60%. Half the increase reflected new investment in 500 kV lines (an increase of 30%) while the other half was consequent on the introduction of supplementary control devices in the main corridors. As a result of the greater efficiency of control, the ratio of kilometres of EHV lines to load decreased by 25% (put another way, the average load factor increased by about a third). This made better use of existing facilities and reduced charges to generators and other users.

Table 4
Transmission expansion projects: 3 year moving totals

3 years ending	1996	1997	1998	1999	2000	2001	2002	2003	2004
<i>Number of projects</i>									
Transener ^a	13	17	13	15	15	19	17	14	11
Regional Cos	9	17	30	52	64	82	76	60	44
<i>Total value of projects \$m 2001</i>									
Transener ^a	24	29	37	56	80	97	81	54	20
Regional Cos	3	15	44	89	101	135	102	79	22

Source: Table 3.

^a Excluding four largest projects.

aside the four exceptionally costly expansions (in the years 1994, 1996 and 1999). The pattern during this period as shown by the moving averages may be summarised as follows:

- for Transener's EHV system, the number of expansion projects (excluding the four largest expansions) increased slightly over time while the total value of those projects increased steadily and had roughly doubled by 1999–2001;
- for the regional sub-transmission systems, the number of expansion projects steadily increased to the extent of nine-fold by 1999–2001, while the total value increased 34-fold over the same period.

There were no significant trends in the average value per project over time, except that the regional company projects were lower in average value at the beginning of the period than they were later on.

Both the number and value of the transmission expansion projects dropped sharply in 2002, after the economic crisis at the very beginning of that year, and again in 2003.¹³ In total, the number of projects in 2003 was one eighth of what it was in 2001, and the value was one eleventh. For both systems the average value per project (as well as the number and of projects) also fell in these years.

In 2004 there was a marked increase in the number of expansion projects and, at the regional level only, in the corresponding aggregate value of these projects. As will now be seen, however, this increase reflected a different method of expansion and different decision-makers.

6. Analysis of expansions by method used

At the time of privatisation and reform, three methods were put in place for expansion of the transmission systems for public use. The Public Contest method, which requires a vote of users followed by competitive tender, is the best-known and most innovative. In addition, there was provision for expansion by Contract between Parties (agreement between one or a few users and the transmission company) and for Minor expansions. There was also provision for expansion for Private Use, under Article 31 of the Market Regulations. Some changes were made to the

¹³ The freezing of electricity tariffs in February 2002, following the crisis and devaluation of the peso in January 2002, essentially precluded many normal regulatory processes. Since then, the private sector has generally seen new investment as risky.

Regulations over time. For example, Resolution 208 in 1998 enabled transmission companies to propose expansions, including to maintain quality at substations, although users still had to approve and pay for such expansions under the Public Contest method. In a departure from the original approach, Resolution 1 in 2003 allowed the Secretary of Energy (rather than users) to authorise Upgrade Expansions, payable by transmission users on a prescribed basis, and Resolution 821 in 2006 increased the scope and extent of such expansions.¹⁴

Table 5 shows ENRE's record of the number and value of transmission projects commissioned under each method in each year over the decade from 1994 to 2004. Once again it is helpful to separate the period before the crisis (1994–2001) from the period since then (2002–2004). During the first period there were 163 expansions with a total value of \$809 m. During the second period there were 55 expansions with a total value of \$42 m.

During the period before the crisis (1994–2001), only 10% by number of the expansion projects (16/163) were taken forward under the Public Contest method, but they accounted for two thirds (66.5%, or 538/809) of the projects by value. 25% were taken forward by Contract between Parties, accounting for 24% by value. 61% were Minor expansions, accounting for 8% by value. Only 4% were private expansions (under Article 31), accounting for only 1.5% by value.¹⁵

As already noted, the four largest Public Contest expansions were exceptionally large (ranging from \$25 m to \$247 m, and the two earliest of these were not full Public Contest expansions). Setting these aside, the average sizes of expansions during this period were Public Contest \$4.8 m, Contract between Parties \$4.9 m, Private expansions (Article 31) \$1.7 m, and Minor expansions \$0.6 m. Thus, apart from the four largest projects, the 12 remaining Public Contest projects had the same average size as the 40 projects by Contract between Parties.

Minor expansions were defined as those under \$2 m for Transener's network, \$1.5 m for Transba and \$1 m for the other sub-transmission systems. On average Minor expansions were one eighth the size of the other projects. Each Minor expansion was typically for the benefit of only one or two users. It was the responsibility of the transmission concessionaire to propose such expansions. In the absence of agreement by the beneficiaries ENRE was empowered to authorise the investment and determine responsibility for payment. ENRE reports that of the 100 Minor expansions during this period, only 5 were not agreed between the parties, accounting for only 4% of the value of these expansions.

Putting this into the larger context, this means that all but 5 of the 163 transmission expansions in the whole period from 1994 to 2001, accounting for all but \$3 m out of the \$809 m total value, were voluntarily agreed by the transmission users. There was no need for any determination or compulsion by the electricity regulator.

After the crisis, the picture changed radically in terms of the number and composition of expansions. There were no Public Contest or Private expansions in 2002, 2003 or 2004. Nor, by 2004, were there any expansions by Agreement between Parties. The number of Minor expansions dwindled from 31 to 3.

In that last year 2004, there were 23 projects under Resolution 1, each valued at an average of only \$0.4 m, but accounting for over 80% of the expansion projects by number and by value. Recall that these projects were ordered by the Secretary of Energy, not decided upon by the users themselves.

ENRE figures are not yet available for later years, and we do not have data on the expansions by Contract between Parties, Minor Expansions and Article 31. However, we can make some

¹⁴ Littlechild and Skerk (2008-this issue-c) sections 5.2 and 9.3.

¹⁵ It is not clear that ENRE's figures include all the Article 31 expansions — for example, the 202 km 220 kV line from Tucumán to the Australian-owned goldmine in the Andes. Littlechild and Skerk (2004a) p. 27.

Table 5
Evolution of projects over time, by method of expansion

Year	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	Total
<i>Number of projects</i>												
Public Contest	1	0	2	0	1	2 ^a	2	8 ^a	0	0	0	16
Contract b/Parties	0	1	2	7	6	11	8	5	5	1	0	46
Minor Projects	0	12	3	5	16	19	14	31	18	5	3	126
Private Article 31	1	1	2	1	0	0	1	1	0	0	0	7
Upgrade Res1/2003	–	–	–	–	–	–	–	–	–	–	23	23
Total	2	14	9	13	23	32	25	45	23	6	26	218
<i>Value of projects (\$m 2001)</i>												
PC-4 largest	74	0	158	0	0	247	0	0	0	0	0	479
PC–other	0	0	0	0	2	1 ^a	16	41 ^a	0	0	0	59
Contract b/Parties	0	0	3	16	43	61	32	41	16	8	0	220
Minor Projects	0	14	3	5	7	8	8	19	5	2	2	72
Private Article 31	5	2	1	1	0	0	1	3	0	0	0	12
Upgrade Res1/2003	–	–	–	–	–	–	–	–	–	–	10	10
Total	79	15	165	22	52	318	58	103	21	9	12	853

Source: ENRE 2004 Annual Report (totals may not add precisely due to rounding).

^a These figures include some provincial government projects assimilated into the Public Contest method (see below).

approximate calculations as to the number and value of Public Contest expansions, most of which had been delayed by the crisis. In 2005 another five Public Contest expansions were in place (#12, 15a,b, 18, 26a) value about \$25 m. By mid-2007 another nine were either in operation (# 20a,b, 23) or under construction (# 19, 24, 27, 30, 31, 33), total value about \$41 m. Another six were being prepared for tender (#26b, 29, 32, 34, 35 36), total value about \$84 m. By this date also, the number of Upgrade and other expansions authorised by the Secretary of Energy under Resolution 1/2003 and similar resolutions had increased to 65, worth nearly \$100 m. Meanwhile, and most important, the Secretary of Energy and Federal Council were directing a massive program of constructing 4750 km of EHV transmission lines, largely financed by ‘transmission stamps’ and increasingly out of the Federal Budget, at a cost of nearly \$2 bn.¹⁶

7. The Public Contest process

The Public Contest process requires users to propose transmission expansions, then to vote on them and pay for them using an allocation of costs and votes determined by the system operator

¹⁶ AR\$5.7 bn=US\$1.9 bn. See Littlechild and Skerk (2008-this issue-c) for developments in policy and the following website for the latest statement on the Federal Transmission Plan <http://www.presidencia.gov.ar/Articulo.aspx?cdArticulo=3060>.

CAMMESA under the so-called Area of Influence method. As Pollitt (2008-this issue) remarks, this approach proved controversial. Especially in light of the rejection of the initial proposal to build the Fourth Line, some commentators argue that the voting system was faulty (Chisari et al. 2001-this issue, Chisari and Romero 2008-this issue). We and others have argued that it largely avoided uneconomic expansions and reduced the cost of economic expansions (Littlechild and Skerk 2008-this issue-b, Galetovic and Inostroza 2008-this issue).

What does the record show about the attitude to Public Contest expansions? The ENRE Annual Report records some two dozen Public Contest expansions. But the Fourth Line was initially rejected. What about other Public Contest proposals? Has rejection been the exception or the norm?

The Appendix to this paper lists the 36 Public Contest proposals that have been made to date, some of which have two components or variants making a total of 40 proposed expansions. The list is slightly different from that of ENRE discussed above.¹⁷ Table 6 summarises the reception that Public Contest proposals have received from the users as voters. In total, 35 of the 40 proposals have been accepted (some after a delay during the economic crisis). Four of these 35 were subsequently converted to other methods of expansion. All but 11 of the remaining 31 projects are in operation now and these 11 projects are either under construction or being put out to tender. Users rejected only five projects out of 40. Of these, one (the Fourth Line) was successfully resubmitted and three have since proceeded on a different basis.

A rejection rate of 12.5% (5/40) does not sound problematic. But do the reasons for rejecting these five proposed transmission expansions suggest any significant or systematic difficulty with the process? The reasons for rejection were as follows.¹⁸

- The first Fourth Line proposal (#3) seems to have been premature given the size of the project: voters had not adequately discussed it, there was uncertainty about the Salex Funds, it did not realistically offer net benefits to the majority of beneficiaries, and the proposed COM fee by an associate company of the major proponent was later found to be considerably in excess of the winning competitive tender. A revised Fourth Line proposal (#7) based on fuller discussions between the beneficiaries passed almost unanimously.
- The Arroyito–Chocón Oeste line (#5) was primarily to connect one generator to the system. This generator later had it built by Agreement between Parties.
- The Mendoza–San Juan line (#17) was proposed in two alternative variants (#17/1, 17/2) by a local distribution company. Other users were not convinced of the need for it. The provincial regulators involved pointed out that the federal government was proposing to support a 500 k line between the same points. The provincial government later modified its position. The line

¹⁷ We show the whole of the value of the projects initiated by the government (#1, 2), which were intended to follow Public Contest procedures, whereas ENRE shows only part. (Thus, our value for the first project (#1) is \$205 m whereas ENRE seems to include only the \$ 74 m value of the later part of that expansion, presumably on the basis that the main part of that expansion (the Rincon–Resistencia line) was in operation before 1994.) We exclude some provincial projects that ENRE has assimilated into the Public Contest method although they were not intended as such. (These are 4 expansions in Corrientes province that were commissioned in 2001, associated with the 132 kV La Cruz–Santo Tome interconnection. The other 4 Public Contest methods in 2001 had a value about \$30 m (see Appendix), so the value of the 4 Corrientes expansions was about \$41 m–\$30 m=\$11 m in total. These expansions were developed by the state-owned utility under provincial regulation, starting in about 1990. There seems to have been a similar assimilation in 1999, of one expansion value about \$1 m.) A minor difference is that we take the value of each project as the NPV at 12% of the annual payments (canon) of the winning bid.

¹⁸ Littlechild and Skerk (2004b, 2008-this issue-c).

Table 6
Public Contest proposals to August 2007

	No. of projects	Estimated value US \$m
Accepted proposals		
– Initiated by federal government (#1, 2)	2	\$511.2
– Fourth Line (2nd proposal) (#7)	1	\$256.0
– Other expansions commissioned by 2004 (#4, 6, 9, 10, 8, 11a, 11b, 16)	8	\$70.9
– Commissioned 2005 (#26a ^a , 12, 15a, 15b, 18)	6	\$24.9
– Commissioned 2006	0	
– Commissioned in 2007 (#20a, 20b, 23)	3	\$19.8
– Under construction September 2007 (#19, 24, 27, 30, 31, 33)	6	\$21.1
– Tender in preparation September 2007 (#26b, 29, 32, 34, 35, 36)	6	\$84.2
– Converted to Contract between Parties (#14, 22, 28)	3	\$41.1
– Converted to Res 1/2003 (#13)	1	\$4.9
Total accepted proposals	35	\$1034.1
Rejected proposals ^b		
– Resubmitted successfully (Fourth Line #3)	1	\$429.3
– Converted to Contract between Parties (#5)	1	\$3.0
– Objections by provincial regulator	3	
– Proceeded with federal support (#17)		\$17.5
– Converted to Res 1/2003 (#21)		\$6.6
– Subsequently abandoned (#25)		\$1.8
Total Rejected proposals	5	\$458.2
Total	40	\$1492.3

Source: Appendix.

^a Our understanding is that #26a was in fact operational in December 2004 though ENRE does not list it.

^b Where the value of rejected proposals is not available we estimate this using a cost of 60 k US\$/km for 132 kV lines (per line #5) and 100 k US\$/km for 220 kV lines (per line #17).

eventually proceeded with a combination of support from the Federal Transmission Fund (70%) and the provincial distribution company via pass-through funding (30%).¹⁹

– The Alicurá/Bariloche transformer (#21) was proposed by a transmission company rather than by users. The main provincial regulatory body said that the scale of the investment was uneconomic and that the cost could not be passed through to the distribution company customers. The transformer was subsequently provided by decision of the Secretary of Energy under Resolution 1/2003.

– The Anchoris transformer (#25) was proposed by the transmission company in 1998. There was some delay at the request of the provincial regulator, which later (2005) said that it would not allow the distribution company, as the only beneficiary, to pass through the cost to users. The company said that it was not a priority investment.

¹⁹ This line was the first stage of the Mining Line, which the Federal Council had identified in 1998. It was identified as financeable in December 1999. Open Season was authorised in 2000, when it was said that the first and second stages of the Mining Line would qualify for an allocation of Financial Transmission Rights and that 70% of the Federal Transmission Fund would support this investment. In 2001 Bastos derogated the Federal Transmission Plan and suspended the Federal Transmission Fund. In 2003 the government relaunched the Federal Transmission Plan and again declared Open Season on the first stage of the Mining Line. In June 2004 the provincial regulator announced that it would allow the distribution company to pass 30 per cent of the costs of the line through to end-users, with the Federal Fund contributing the other 70% Littlechild and Skerk (2008-this issue-c).

In all five cases there were plausible reasons for the beneficiaries to object to the proposal as it was put forward. There was perhaps a question about the stance of some provincial regulators, who had not yet fully come to terms with the new regulatory and ownership framework of the industry. But these cases do not suggest any failure of the Public Contest method on the grounds of capricious, ill-informed or otherwise unreasonable behaviour by the beneficiaries as voters.

It is sometimes suggested that distribution companies had no incentive to support expansions. It has been suggested that they proved reluctant to support expansions that would benefit customers rather than generators, or that would improve quality of supply. The figures on voting do not support this. For example, Resolution 208/1998 enabled transmission companies as well as users to propose expansions at substations, which could be either to expand capacity or to improve quality of service. The main beneficiaries are likely to have been distribution companies. Transmission companies proposed 12 expansions under this Resolution, covering 14 investments.²⁰ Distribution companies rejected only two of these investments, involving (as just mentioned) transformers at Bariloche (#21) relating to quality of service and at Anchoris (#25) relating to capacity. In both cases the relevant provincial government indicated that the investment was unnecessary and that the distribution companies would not be allowed to pass the cost through to end-user customers. Of the 12 accepted investments under this Resolution, 10 were passed by 100% vote and the other two (#23, 27) by about 93% of the votes. In fact the only objector in each of these last two cases was a large consumer rather than a distribution company. This does not suggest that distribution companies were obstructive, or that their participation was inconsistent with the Public Contest method. In fact they seem to have been supportive.²¹

8. The voting process: voters and transactions costs

It has been conjectured that the transactions costs associated with the number and/or diversity of voters impaired the effectiveness of the Public Contest method, or could render it ineffective in other contexts. The voting patterns on the Public Contest proposals can shed light on this. [Table 7](#) shows the number of beneficiaries (voters) for each proposal and how they voted. Including the two alternatives for proposal #17, there were 41 votes in all. The number of beneficiaries (voters) varied from 1 to 65. The median number of beneficiaries was only 5. This does not seem so large a number as to generate insuperable transactions costs.

The two earliest cases had 65 and 44 voters. This size did not make them problematic since one particular voter (the government-owned Yaceretá generating station) accounted for 71% and 86.5% of the votes, respectively. These levels were above the 70% level needed to carry a proposal, so there was no need to canvass the views of the other voters.²²

Nine proposals had between 10 and 20 voters. When the Fourth Line was first proposed (#3) with 15 voters, it was indeed rejected. But the voters worked on the project together, and when it was again proposed 18 months later (#7) with 17 voters, it passed with less than 10% opposition.

²⁰ Proposals #15a,b, 18, 20a,b, 21, 23, 24, 25, 27, 30, 31, 33, 36 in Appendix.

²¹ Littlechild and Skerk (2008-this issue-d) examine the situation of distribution companies more closely, and look in particular at the rejected proposal concerning quality of service in Bariloche. This does not suggest any qualification to the conclusion just stated.

²² At this time the rules of procedure were not fully developed and specified, but the State as owner of the Yacyretá generating station chose to treat these expansions under the public contest method. This generating station of course paid a corresponding share of the costs of these expansions. A formal vote was not held in a few later cases #3, 5, 17/1 and 17/2, where the dissenting beneficiaries made their views formally known to ENRE before the Public Hearing. After CAMMESA had confirmed their % votes ENRE issued a resolution ending the process.

The Campana transformer (# 23) had 10 voters, but was opposed by only 1 of these, accounting for under 7% of the votes. The other six proposals with over 10 voters passed with no opposition. In other words, the proposals with relatively large numbers of voters posed no problem with respect to transactions costs.²³

Table 8 summarises the outcome of the 40 proposals (41 votes). 31 passed with 100% support or no opposition or no need for a vote. 3 passed with only minimal opposition (only 1 or 2 opponents, each accounting for about 5% of the vote). One expansion passed despite some opposition.²⁴

Were numbers of voters and/or transactions costs a reason for the 6 rejected expansions? The first 4th Line proposal (#3) has already been discussed: there were 15 (later 17) parties but they subsequently worked together to develop an acceptable proposal (#7) proposed by almost all of them. The two transformers (#21, 25) proposed by transmission companies have also been mentioned: there were only two voters in the first case and one in the second. A proposed new line (#5) involved 5 voters, but it was primarily to connect a particular generator to the system, and this generator later had it built by Agreement between Parties. The remaining two proposals (#17/1, 17/2) were alternative lines proposed by a provincial distribution company where 2 or 3 voters out of 5 or 6 were not convinced of the need for such a line, and the provincial regulators involved pointed out that the federal government was proposing to support a 500 k line between the same points.

This record does not suggest that transactions costs associated with number of voters were a problem with the Public Contest method. On the contrary, the number of voters was generally quite manageable (median 5) and the picture is one of considerable harmony between market participants rather than one of discord and failure to reach agreement. The evidence in fact suggests that widely varying numbers of voters have been able to design, propose and support a variety of major transmission expansions.

9. Number of competitors for transmission expansions

The Public Contest method required approved projects to be put out to competitive tender. Have there been sufficient competitors to construct, operate and maintain such transmission expansions?

Of the 35 expansions that have been approved under the Public Contest method, one (#13) was changed to Resolution 2003 before being put out to tender, one (#35) is partially complete, and the tenders for five of the latest expansions are still in course of preparation. Table 9 gives details of the bidding for the 29 expansions where tenders have so far taken place.

²³ The Regional Electricity Forum of Buenos Aires Province (FREBA) was active in planning the recent expansion #36 in conjunction with the transmission company. Excluding the two exceptional earliest proposals (#1,2), this expansion has the largest number of beneficiaries (20), of which 9 are FREBA members (distribution companies) accounting for about 53% of the votes, and the remaining 11 are large customers directly connected to the transmission network. FREBA was also active in promoting #32, with 13 beneficiaries, the highest value expansion since the Fourth Line. For discussion of FREBA see Littlechild and Skerk (2008-this issue-d).

²⁴ In this case (#29), the main beneficiary (with 52.8% of the votes) was a hydro plant in Comahue, owned by three provincial governments (Buenos Aires, Rio Negro and La Pampa), which required a new 132 kV line of length 75 km in order to avoid some transmission constraints. The second beneficiary (20.7% of the votes) was the distribution company of Rio Negro province, which was thereby able to reduce its dependence on a local embedded generator, and which authorised the pass-through of the associated expansion cost to consumers. The remaining 26.5% of the votes belonged to four oil field companies and the state-owned distribution company of neighbouring Neuquen province, which did not have an ownership share in the generating station. These five voters opposed the expansion because it did not significantly improve their supply conditions even though they had to pay a share of it.

Table 7
Number of beneficiaries and voting patterns on Public Contest proposals

#	Proposed expansion	Number of beneficiaries	Number of supporters	Number of abstentions	Number of opponents	% Positive votes	% Abstaining votes	% Negative votes	Largest beneficiary
1	Yacyretá–R-R line	44	1	–	–	71.00%	–	–	71.00%
2	Rincón–SG line	65	1	–	–	86.50%	–	–	86.50%
3	4 th line	15	–	–	3	–	–	34.18%	
4	HP capacitors	13	9	4	0	92.27%	7.73%	0.00%	
5	Arroyito–CO line	5	–	–	3	–	–	38.27%	
6	Chocón transfmr	7	5	2	0	92.27%	7.73%	0.00%	
7	4th line	17	8	7	2	82.14%	8.37%	9.49%	
8	SG transformer	3	1	2	0	73.75%	26.25%	0.00%	73.75%
9	Recreo capacitors	10	4	6	0	88.96%	11.04%	0.00%	
10	Recreo transformer	5	4	1	0	90.03%	9.97%	0.00%	
11 a	Recreo–SM line	5	5	0	0	100.00%	0.00%	0.00%	
11 b	Recreo–Frías line	5	5	0	0	100.00%	0.00%	0.00%	
12	Resistencia substn	2	2	0	0	100.00%	0.00%	0.00%	
13	Cañada H substn	1	1	0	0	100.00%	0.00%	0.00%	
14	EBracho–LB line	7	7	0	0	100.00%	0.00%	0.00%	91.28%
15 a	Capiz transformer	1	1	0	0	100.00%	0.00%	0.00%	
15 b	C de P transformer	4	4	0	0	100.00%	0.00%	0.00%	
16	Olavarría–B line	12	12	0	0	100.00%	0.00%	0.00%	92.43%
17/1	Mendoza–SJ line	5	–	–	2	–	–	44.99%	
17/2	Ditto alternative	6	–	–	3	–	–	47.13%	
18	Ezeiza substation	2	2	0	0	100.00%	0.00%	0.00%	
19	Güemes–LM line	3	1	2	0	73.84%	26.16%	0.00%	
20 a	Ramallo transfmr	8	8	0	0	100.00%	0.00%	0.00%	
20 b	Rosario transfmr	1	1	0	0	100.00%	0.00%	0.00%	
21	Alicurá transfmr	2	0	0	2	0.00%	0.00%	100.00%	
22	LPalmas substn	3	3	0	0	100.00%	0.00%	0.00%	

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Table 7 (continued)

#	Proposed expansion	Number of beneficiaries	Number of supporters	Number of abstentions	Number of opponents	% Positive votes	% Abstaining votes	% Negative votes	Largest beneficiary
23	Campana transfr	10	9	0	1	93.07%	0.00%	6.93%	
24	Montecaser transfr	2	2	0	0	100.00%	0.00%	0.00%	
25	Anchoris transfr	1	0	0	1	0.00%	0.00%	100.00%	
26 a	CC&O capacitors	14	14	0	0	100.00%	0.00%	0.00%	
26 b	3 rd line reactors	14	14	0	0	100.00%	0.00%	0.00%	
27	Almafuerte transfr	3	1	1	1	92.40%	3.20%	4.40%	
28	LLL–El T line	6	4	2	0	98.90%	1.10%	0.00%	
29	CPiedra–LN line	7	2	0	5	73.50%	0.00%	26.50%	52.80%
30	Cipolleti transfr	1	1	0	0	100.00%	0.00%	0.00%	
31	Santo Tomé transfr	2	2	0	0	100.00%	0.00%	0.00%	77.00%
32	25 Mayo substn	13	13	0	0	100.00%	0.00%	0.00%	49.90%
33	S.Nicolás breakers	2	2	0	0	100.00%	0.00%	0.00%	
34	25 M-Chivilc line	9	9	0	0	100.00%	0.00%	0.00%	78.30%
35	A.Cabral substn	1	1	0	0	100.00%	0.00%	0.00%	
36	B.Blanca transfr	20	20	0	0	100.00%	0.00%	0.00%	32.00%

Source: ENRE (further details found in Appendix).

For six of the earlier expansions, where procedures and reporting were still evolving, the number of bidders was not revealed. An additional five expansions were approved and had maximum fees set before the crisis but were tendered under quite different conditions after the crisis, and in consequence ran into difficulties. Two of these expansions (#14, 22) were subsequently changed to Contract between Parties, in the other three cases (#19, 23, 24) there was

Table 8
Outcome of Public Contest proposals

Passed with 100% support	22
Passed with no opposition	7
Passed with no need for vote	2
Passed with minimal opposition	3
Passed with significant opposition	1
Rejected	6
Total	41

Table 9
Bidding data for Public Contest expansions

#	Proposed expansion	Winning bidder	Incumbent (I) or entrant (E)	Estimated value NPV at 12% \$	Number of bidders	Initial bid, maximum fee or maximum price \$	Winning bid \$
1	Yacyretá–R-R line	Yacylec	E	\$205.0 m	Bids not available		
2	Rincón–SG line	LITSA	E	\$175.1 m+\$131.1 m	Bids not available		
4	HP capacitors	Transener	I	\$23.7 m	Bids not available	Initial Bid \$3.5 m/month	\$2.1 m/month
6	Chocón transfmr	ABB	E	\$2.6 m	Bids not available	\$2.6 m/year	\$2.0 m/year
7	4 th line	Transener	I	\$256.0 m	4 consortia, 14 bids**	\$43.7 m/year	\$24.5 m/year
8	SG transformer	Cobra	E	\$7.7 m	Bids not available	\$2.2 m/year	\$1.8 m/year
9	Recreo capacitors	Cobra	E	\$12.2 m	2 bids (1 rejected)	\$1.7 m/year	\$1.5 m/year
10	Recreo transformer	Cobra	E	\$5.2 m	Bids not available	\$3.0 m/year	\$2.9 m/year
11a	Recreo–SM line	Cobra	E	\$6.9 m	3 bids	\$1.6 m/year	\$1.1 m/year
11b	Recreo–Frias line	Cobra	E	\$4.6 m	3 bids	\$1.2 m/year	\$0.8 m/year
12	Resistencia substn	Transnea	I	\$2.4 m	2 bids	\$1.5 m/year	\$1.3 m/year
14	EB–LB line	–	–	–	0 bids	\$4.1 m/year	–
15a	Capiz transformer	Distrocuyo	I	\$1.3 m	2 bids (1 rejected)	\$1.3 m	\$1.3 m
15b	C de P transformer	Distrocuyo	I	\$2.7 m	2 bids (1 rejected)	\$2.7 m	\$2.7 m
16	Olavarría–B line	Cobra	E	\$10.6 m	1 bid	\$1.4 m/year(15 years)	\$2.2 m/year (7 years)
18	Ezeiza substation	Transener	I	\$4.5 m	3 bids	\$6.6 m	\$4.5 m
19	Güemes–LM line	Electro-ingenieria	E	\$3.2 m	1 bid 1 alternative	\$3.2 m	\$3.8 m, \$4. 3 m agreed \$3.2 m
20a	Ramallo transfmr	Faraday and others	E	\$9.6 m	One transformer module: 3 bids One substation expansion works module: 2 bids: Eight installation works and other devices: 3,2,2,2,3,2,1,2 bids	\$9.7 m	\$2.7 m+\$4.8 m+\$0.8 m+\$0.3 m+\$0.1 m+\$0.1 m+\$0.2 m+\$0.2 m+\$0.02 m+\$0.3 m Total=\$9.7 m
20b	Rosario transfmr	Siemens & others	E	\$6.3 m	One transformer module: 2 bids One substation expansion works module: 4 bids: Seven installation works and other devices: 4,3,3,2,3,2,3 bids	\$6.4 m	\$2.3 m+\$2.9 m+\$1.14 m (\$0.5 m, \$0.1 m, \$0.03 m, \$0.2 m, \$0.1 m, \$0.01 m, \$0.2 m) Total=\$6.3 m

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Table 9 (continued)

#	Proposed expansion	Winning bidder	Incumbent (I) or entrant (E)	Estimated value NPV at 12% \$	Number of bidders	Initial bid, maximum fee or maximum price \$	Winning bid \$
22	Las Palmas substn	Transba (1st tender) CAM (2nd tender)	I–E	\$3.3 m	1 bid then 1 bid	\$0.492 m/year 15 years (1st tender) \$0.496 m/year 15 years (2nd tender)	\$0.490 m/year (1st) \$0.493 m/year (2nd)
23	Campana transfmr	Faraday/Siemens	E	\$4.0 m	Two modules: 4, 2 bids	\$4.5 m	Total \$3.7 m renegotiated to \$4 m due to crisis
24	Montecaser transfmr	Distrocuyo	I	\$1.9 m	1 bid	\$1.9 m	\$1.9 m
26a	CC&O capacitors	ABB/Transener	I/E	\$14.0 m	2 bids (1 rejected)	\$14.0 m	\$14.0 m
27	Almafuerte transfmr	Faraday/ABB/Electro-ingenieria	E	\$7.3 m	Three modules: 3, 2, 3 bids	\$7.3 m	\$2.0 m+\$1.9 m+\$2.6 m=\$6.5 m
28	LLL–El T line	ALUSA VA-Tech	E	\$22.0 m	7 bids (1 rejected)	\$22.0 m	Prices not revealed (conversion to CBP)
30	Cipolletti transfmr	Czerweny/other	E	\$0.7 m	One transformer module: 3 bids Six installation works and other devices: 3,2,2,1,1,1 bids	\$0.7 m	\$0.7 m+\$0.1 m
31	Santo Tomé transfmr	Faraday/other	E	\$7.5 m	One transformer module: 2 bids Eight installation works and other devices: 3,1,1,3,3,2,2,3 bids	\$7.5 m	\$7.0 m+\$0.4 m
33	S.Nicolás breakers	ABB	E	\$0.7 m	3 bids	\$0.7 m	\$0.6 m
35	A.Cabral substn	Faraday/other	E	\$30.3 (total)	One transformer module: 1 bid Seven installation works and other devices: 2,2,2,3,3,3,0 bids	Module A \$4.1 m Modules B1 to B7 \$5.0 m Module C \$21.1 m Total \$30.3 m	\$9.1 (A, B1 to B7) (to retender B7 and tender C)

(**) Two consortia (*Transener* and *Líneas de Transmisión del Comahue*) presented more than one bid reflecting alternative specifications: *Atalaya Energy* \$39.5.; *Compañía Transportadora de Electricidad del Comahue* \$38.0; *Transener* \$26.0, \$24.5, \$24.8; *Líneas de Transmisión del Comahue* \$27.8, \$27.2, \$27.0, \$27.1, \$26.5, \$26.3, \$25.7, \$25.0, \$24.9. All \$m/year for 15 years.

Note: The Appendix shows that in a few cases one bid was rejected, typically for technical reasons (e.g. does not meet prescribed specification).

Source: ENRE.

Table 10
Numbers of bidders for Public Contest expansion modules

Number of bidders	Number of cases
0	1
1	8
2	23
3	22
4	3
7	1
Total bid situations	58

Source: Table 9.

some renegotiation of the price.^{25,26} Of the remaining 18 expansions, 12 were tendered as a single entity and the remaining 6 were tendered in a total of 46 modules. This makes a total of 58 bid situations.

Table 10 summarises the frequency distribution of number of bidders. The number of bidders per case ranged from 0 to 7, with a mean of 2.4 bids. In over three quarters of the cases there were 2 or 3 bids, approximately equally. It is evident that a range of competitive bidders emerged and participated in most of the tenders.

Where there were no bidders, or only one, this seems more plausibly to reflect special circumstances rather than monopoly power or a lack of interest by competitors. For example, in an ongoing case (#35) where there was no bid for a transformer and only one bid for another module, the tender had been delayed through the crisis pending a provincial government request for federal support and there was then some ambiguity as to whether the expansion was tendered under federal or provincial rules. Of the other 7 cases with only 1 bid, 6 of these were for very low value modules (in the range \$20,000 to \$70,000 in # 20a, 30, 31). In the remaining case (#16), the bidder did not secure a higher price than the maximum specified price.²⁷ This record does not suggest that single bidders were able to hold the users to ransom.

Is there any relationship between the value of the contract and the number of bidders? The Fourth Line (#7), which attracted four bidders, was exceptional in value (at about \$256 m). The second most valuable project for which bidding details are available (#28 at \$22 m) also attracted a particularly large number of bidders (7). Otherwise, however, the median number of bidders seems independent of the size of project.²⁸

²⁵ For the Güemes–Las Maderas line (#19), the incumbent distribution company proposed the expansion in 2000 and lodged an initial bid of \$1.2 m/year for 5 years by Siemens and Cobra consortium. There were no other bidders and the contract was awarded. But with the advent of the crisis the parties agreed to rescind the contract. When the proposal was relaunched in 2004, the maximum fee was set at \$3.2 m (NPV of \$1.2 m/year/5 years at 14.5%). Electroingeniería made two bids with different specifications, at \$3.6 m and \$4.0 m. After discussion, the bidder agreed to reduce the price of the first bid to \$3.2 m.

²⁶ For the Montecaseros transformer (#24), a maximum fee of \$1.4 m had been specified six years earlier, before the crisis, but it was then agreed to reset this at \$1.9 m. This was the price bid by the only bidder.

²⁷ The Olavarría–Barker line (#16) had a maximum fee of \$1.4 m/year over 15 years. The only bid was \$2.2 m/year over 7 years. Applying a procedure specified in the terms of the tender, ENRE declared that the equivalent value of this bid over 15 years was lower than the specified maximum fee. One may calculate that the net present value of the actual bid is less than that of the maximum fee at a discount rate of up to about 10%.

²⁸ For example, the median number of bidders is 2 for each of the following size ranges of project: \$5–20 m, \$1–4.9 m, \$0.1–0.9 m and \$0.01–0.9 m.

10. The effectiveness of competition

Were these bidders effective? Competition got off to a striking start when the first two expansions (#1, 2) put out to competitive tender – the substantial EHV lines associated with Yacyretá generating station and totalling some 869 km (including connections) – were won by new entrants. This was quite unexpected, especially by the incumbent transmission company Transener. It stimulated active response, as reflected in the closely-run contest to build the Fourth Line described below. But what about the subsequent and lower value expansions?

One measure of effectiveness might be whether the winning bid price was below the maximum fee specified by the beneficiaries. In the case of the Fourth Line the beneficiaries set this benchmark fee based on calculations of the cost likely to be incurred by an efficient entrant, and the winning bid was very much lower. We can make this comparison for 20 expansions.²⁹ In 15 cases, three quarters of the total, the winning bid was indeed below the maximum specified fee. In 4 cases it was equal to the maximum fee and in one case it was slightly above but accepted after discussion.

Another measure of effectiveness is whether the incumbent transmission company won the tender. Of the 29 expansions listed in [Table 9](#), excluding those two (#14, 22) that were subsequently changed to Contract between Parties, the incumbent has won only seven, about a quarter.³⁰ In one additional case (#26a) the incumbent Transener partnered an independent bidder ABB in the winning tender. In all but one of these eight cases where the incumbent was the winning bid (or part thereof), there were multiple bidders, so the incumbents were evidently pressed.³¹ Independent contractors won 19 tenders outright, some three quarters of the total. Entrants have won all the later cases that have been tendered in modular form. Nor were the winners limited to one or two companies: at least eleven different independent contractors have won tenders.³²

In addition to the competitive tender for Public Contest expansions, there was competition for expansions by Contract between Parties and Article 31. [Table 1](#) above shows that Transener was responsible for the Piedra del Aguila connections which had been arranged while both entities were in the public sector, and won the bidding for the Fourth Line. But it was chosen for only one connection out of the other 11 EHV lines, accounting for only about 3% of the remaining line length (52 km/1656 km).

The Fourth Line was the most dramatic example of competitive bidding. There were four bidders including the incumbent Transener (see [Appendix](#)). Between them they submitted a total of 13 bids. Transener offered two alternatives to its basic offer and its main competitor offered seven alternatives. This reflected a desire to bid as keenly as possible, including by the use of new technologies that had not yet been applied in Argentina. Although the possibilities of these new technologies were discussed between the generators and constructors, the tender documents were not entirely clear on this point and the bidders preferred to include more than one option in order

²⁹ These are the 29 expansions in [Table 9](#) excluding the two first expansions (#1, 2) where a maximum fee was not specified, the five expansions where the crisis caused obvious difficulty (#14, 19, 22, 23, 24), one expansion that was changed to Contract between Parties before the tenders were opened (#28) and one tender that is yet incomplete (#35).

³⁰ The seven cases where the incumbent won the tender outright were the Fourth Line (#7), the Henderson/Puelches capacitors (#4), the expansion of a substation on Transnea's system (#12), two transformers on Distrocuayo's system (#15a,b), new breakers at Ezeiza on Transener's EHV system (#18), and another new transformer on Distrocuayo's system (#24).

³¹ The exception (# 24) was mentioned in footnote [30] above, where the maximum fee was set before the crisis and later reset. In three other cases (#15a,b, 26a) there were two bids of which one was rejected for technical reasons. We understand that there was at least one additional offer for #4 that did not meet the time schedule requested in the terms of reference, and was rejected on that account.

³² These successful contractors include Yacylec, LITSA, Cobra, Electroingeniería, Faraday, Siemens, ABB, Lago Electromecánica, Artech-Ait, ALUSA VA Tech and Tadeo Czerweny. In some cases, such as #20a,b where there were very small modules for the installation works, the incumbent did not tender.

avoid any risk of rejection. In the event the Public Contest voters (primarily generators) accepted the lowest fee bid, from Transener, which involved an innovative Cross Rope technology. The value of this bid was \$24.521 m, which fractionally beat the lowest rival bid of \$24.999 m.

The users increasingly designed the tenders in more sophisticated ways to maximise competition, and to enable bidders to focus on those areas where they would be most effective. For example:

- The tender for Campana transformer (#23) in August 2004 was divided into two modules: the transformer itself (4 bids), and the installation of the transformer plus minor expansions in the substation (2 bids). Faraday won provision of the transformer whereas Siemens, which had bid for both, won only the installation.
- The tender for Almafuerde transformer (#27) in July 2004 was divided into three modules: provision of the transformer (3 bids), equipment for measuring and manoeuvre such as metering and circuit breakers (2 bids), and expansion of the substation (3 bids). There were five different bidders in total, and the three contracts went to three different bidders (Faraday, ABB and Electroingeniería).
- The tenders for transformers at Rosario and Ramallo (#20a,b) in March 2005 were each divided into one module for the transformers themselves (3 and 2 bids, both won by Faraday), one module for substation expansion works (4 and 2 bids, won by Siemens and Electroingeniería), and seven or eight modules respectively for several installation works and provision of minor devices (total 20 bids for Rosario modules, won by Siemens (3), Lago Electromecánica, Artech-Ait (2), and ABB, and 15 bids for Ramallo modules, won by ABB (2), Artech-Ait (2), Lago Electromecánica (2), and VA Tech (2)). A similar multi-module approach was taken with other recent expansions (#30, 31, 35).

11. Impact on the cost of new lines

If competition to provide transmission expansions is a reality, what effects has it had? The faster introduction of innovative technology has just been mentioned. Has competition also secured reductions over time in the cost of building and operating new lines? This would be a further measure of effectiveness.

A commonly cited statistic is that the first three 500 kV lines, successively of length about 300 km, 500 km and 1300 km, were all secured for nearly the same fee — about \$2 m per month or \$24 m per year.³³ Taken at face value, a quadrupling in line length for the same price implies that costs fell to a quarter of their previous level. That would indeed be amazing. However, this would be an inaccurate deduction because other equipment and some exceptional costs were involved as well. It is therefore worth refining the calculation.³⁴

Before privatisation, for planning purposes the companies AyE and Hidronor would use a budget estimate of about \$230,000 (\$230 k) per km or more. In practice construction costs always exceeded this figure.

The first major line to be built and put out to tender after privatisation was the 267 km Rincón–Resistencia line for Yacyretá power station (#1). This was originally estimated to cost \$228 k/km, consistent with previous experience. The winning bid by Yacylec was \$2.4 m per month over 15 years, implying total investment of about \$205 m. However, this included the three short 3.6 km lines connecting the plant with the local substation, and the cost of building the substation at Rincón,

³³ e.g. Woolf (2003a) p. 266, Woolf (2003b). It began to be said in Argentina that a new transmission line costs \$24 m whatever the length.

³⁴ The following notes reflect calculations made earlier by R Sanz.

and there were exceptional costs because the line had to cross the 3 km wide Parana river near Resistencia. Table 2 above (based on the ENRE annual report) puts the cost of the line itself at \$70 m excluding exceptional costs. This implies an average cost of \$262 k/km, greater than the usual estimates before privatisation. There are at least three possible explanations for this: the ‘client’ was the Yacyretá station jointly owned by the governments of Argentina and Paraguay, for whom lowest cost may not have been the highest priority; bidding took place during the privatisation process (it was completed in 1994) so Transener was not able to bid; and there was limited competition for the tender.

The second major line was the 506 km Rincón–Salte Grande line in 1996, also for Yacyretá power station. The winning bid was a monthly fee of \$1.8 m over 10 years, present value about \$131 m. Table 2 (per ENRE) puts the total cost at \$135 m. In this case the ENRE figure seems to comprise about \$49 m for a substation and other works and about \$86 m for the line. Dividing the latter by the length 506 km implies an average cost of \$170 k/km. This is a significant reduction on the cost of the previous line, and reflects stronger competition. It was not thought that the incumbent Transener could lose this contract, but the winning bidder was the construction company Litsa, which thereby became the second independent transmission company in Argentina.

The third major project was the 1292 km Fourth Line, approved in 1997. The winning tender was a monthly fee of \$2 m over 15 years. However, this was after reducing the total cost by \$80 m from the Salex Fund. Table 2 (per ENRE) puts the total cost at \$250 m before application of the Salex Fund. Here too there was a substation and other works estimated to cost about \$82 m with the line costing about \$168 m. Dividing the latter by the 1292 km length implies a cost of about \$130 k/km. The price reduction reflected an active concern by buyers (mainly generators) to minimise their costs, and fierce competitive bidding by construction companies in which Transener was keen not to cede its leading position (see also Galetovic and Inostroza, 2008–this issue).

To summarise, transmission line construction costs seem to have been in the range \$230 k/km to \$262 k/km in the period up to 1994, and then fell to \$170 k/km in 1996 and to about \$130 k/km in 1997. Thus, construction cost did not fall to one quarter of its previous level. A more accurate conclusion is that, under the impact of private ownership and competition, the cost of building 500 kV transmission lines roughly halved. This is still a very significant cost reduction.

12. A comparison with construction costs today

It is instructive to compare these figures with the estimated cost of constructing the new lines in the latest Federal Transmission Plan, which are being determined by the federal government. In March 2006 the government estimated that the total cost of building 4752 km of 500 kV lines would be \$1898 m.³⁵ This is an average cost of \$400 k/km.

There is some variation in the costs of the different lines in the Federal Plan. The 1220 km NOA-NEA line, which also involves the construction of substations and other works, has a total cost of \$641 m, an average cost of \$525 k/km.³⁶ Those future lines mentioned in the March 2006 press release, excluding the NOA-NEA line, have relatively few additional works and show a total cost of \$698 m for 1982 km, an average cost of \$352 k/km. One may calculate that the

³⁵ AR\$5696 m or \$US1898 m at US\$3 to AR\$1. The figures are for total cost including the contributions from federal and provincial governments and any private investors (<http://www.presidencia.gov.ar/Articulo.aspx?cdArticulo=3060>).

³⁶ The details of the cost are not available in the press release. The IADB loan that financed this line covered a variety of other works. On its website the cost of the project itself is given as \$518.2 m, to which may be added a proportionate share of overheads ($\$18.3 \text{ m} + \33.9 m) $\times 71.5\% = \$24.3 \text{ m}$, making a total of \$555.5 m, which implies a lower cost of \$455 k/km (<http://www.iadb.org/IDBdocs.cfm?docnum=755456> (Table 1)).

remaining 1550 km of lines in the Federal Plan cost \$559 m, at an average cost of \$361 k/km. The weighted average cost of the relatively straightforward lines is \$356 k/km.

In making comparisons with earlier costs, some allowance needs to be made for inflation following devaluation. For transmission lines and associated works, this might be about 5% overall.³⁷ So for a line with relatively few additional works, the equivalent construction cost of the Fourth Line today would be about $\$130 \text{ k} \times 1.05 = \136.5 k/km .

The cost of building a line that included several substations and other works, such as the NOA-NEA line, would be higher. We are advised that this cost might be of the order of \$200 k/km today if put out to competitive tender.³⁸ Some confirmation of that figure is provided in a recent (2006) tender by the Brazilian regulatory authority ANEEL. This was an expansion of 308 km with associated substations, comparable to the NOA-NEA expansion in Argentina. The winning bid from Cobra, which also operates in Argentina, works out at \$197 k/km.³⁹

To summarise, the present Federal Transmission Plan envisages paying about \$356 k/km for relatively straightforward 500 kV transmission lines that would have cost about \$136.5 k/km based on the last results of Public Contest tenders. It envisages paying about \$525 k/km for a line that would involve several substations and other works, which should cost about \$200 k/km based on competitive tenders elsewhere. In both cases, the present cost is about two and a half times what the cost would have been under the previous arrangements involving competitive tender.⁴⁰

13. Summary and conclusions

In privatising its electricity sector in 1992, Argentina adopted innovative arrangements with respect to transmission regulation. Under the Public Contest method, transmission users, rather than the transmission company or regulatory body, had to propose, vote for and pay for major expansions. The policy proved controversial, not least because a major expansion (the Fourth Line) was delayed. Commentators have variously suggested that the policy be modified, supplemented or replaced.

The aim of the policy was to improve efficiency with respect to what was built and the cost of building it, not to increase the number and length of EHV lines built. In the circumstances of the 1990s, after excessive expansion in previous decades, this primarily meant better use of existing networks. Although there was substantial new transmission investment of various types, an

³⁷ R Sanz at Mercados Energéticos suggests that, as a first approximation, one might assume that capital costs increased by 40% and labour costs decreased by 30%, and that these components might be weighted about equally.

³⁸ Source: R Sanz, Mercados Energéticos.

³⁹ The expansion comprises three 500 kV lines of 137 km, 118 km and 53 km, three new substations and a significant expansion of an existing substation, which also includes a transformation from 500 to 400 kV (Diagrama Unifilar Simplificado–Lote B). The reference annual fee included in the general conditions of the tender was R\$ 56.1 m (Brazilian Reais). There were nine tenders from national and international constructors, including from some Spanish companies also present in Argentina, such as Cobra and Abengoa. The tenders ranged from R\$ 42.9 m down to the winning bid of R\$ 23.4 m from Cobra. Assuming a Capital Recovery Factor of 0.18 (equivalent to recovery over 10 years at 12% discount rate) and an exchange rate of 2.18 R\$/US \$ (the average for 2006, which was stable during the year), the cost per km implicit in the winning bid was: $\text{R\$ } 23.43 \text{ m} / 0.18 / 2.18 \text{ R\$/\$ } / 308 \text{ km} = \text{US\$}197 \text{ k/km}$. See the tenders at http://www.aneel.gov.br/arquivos/Excel/Resultado_Licitacao_Transmissao_INTERNET_Jan_2007.xls; the conditions for the 2006 tenders at: http://www.aneel.gov.br/aplicacoes/editais_transmissao/documentos_editais.cfm?IdProgramaEdital=55; and Annex 6B to Leilão 005/2006, which describes the cited 500 kV expansion at page 6 (numbered “VOL. III–Fl. 80 de 515”): http://www.aneel.gov.br/aplicacoes/editais_transmissao/documentos/Anexo%20Técnico%206B_Lote%20B_Jaguara_Estreito_Ribeirão Preto_PoçosCaldas-005_2006.pdf.

⁴⁰ Law 25551 passed on 28 November 2001 (just days before the crisis) and confirmed complemented by Decree 1600 of 28 August 2002 (after the crisis) obliged public contracts to “Compre Trabajo Argentino” (“Buy Argentine work”). There are few Argentine suppliers of many transmission components, and increases in the prices of such components, particularly towers and transformers, may account for much of the increase in the cost of the federally-contracted transmission expansions.

important feature was an increased investment in system control. This doubled transmission capacity limits with only a 20% increase in transmission lines.

Until the economic crisis, transmission expansion arrangements generally worked well. From 1994 to 2001, the number and value of transmission expansions steadily increased, especially in the sub-transmission systems, and \$806 m out of \$809 m new investments were voluntarily agreed between transmission users.

The negotiations between market participants were in general not problematic. There was an initial disagreement on the Fourth Line, not surprising in view of its size and uneconomic nature. But after the first (split) vote, the generators that voted against the initial proposal worked actively with the proponents to develop a proposal that all could support, and this joint effort succeeded. There was substantial agreement amongst market participants on most other transmission expansion proposals. Four fifths of Public Contest proposals were accepted rather than rejected, and rejections were for valid reasons.

Market participants included a variety of types and sizes of generation plants, distribution companies and large users. The numbers of voters varied from 1 to 65 but this was not a problem. In the two cases where there were more than 20 voters the largest voter had more than the 70% of votes necessary to carry the proposal forward. This was not a typical situation: the median number of voters was 5. Transactions costs were not a problem.

There were adequate numbers of bidders for the expansions, ranging from 1 to 7 with median 3. In the few (3) cases of only one bidder there was no evidence of ability to exploit that position. Competition was effective: in over two thirds of the cases the winning bid was below the specified maximum, the incumbent won less than one fifth of the tenders, and at least nine independent competitors emerged and won tenders. Competition brought down by about half the costs of building and operating new lines. In contrast, costs under the present Federal Transmission Plan have increased to two and a half times the level under the Public Contest approach.

In a few cases the opposition of provincial governments and regulators created difficulties. This problem is not attributable to the Public Contest expansion method itself, but to the differences in stance between federal and provincial governments in Argentina at that time. These differences would have caused difficulties for any method, and indeed in the past led to inefficient over-expansion in Argentina. But provinces were responding to the situation, and experience in Buenos Aires province shows how these difficulties could be overcome (Littlechild and Ponzano, 2008-this issue).

Some have argued for national transmission planning and a more active role for regulation. In the years before the 1992 reform in Argentina, such an approach was characterised by severe inefficiencies and over-expansion. In the years since the economic crisis in 2002 the reversion to a similar approach has already had a similar effect.

The evidence presented in this paper about experience in the period 1994 to 2001 suggests that Argentina's transmission expansion methods not only worked, they worked well, in terms of achieving the intended aim of improving efficiency. In particular, the Public Contest method deserves to be studied and considered for adoption in other countries and sectors where improved efficiency is an important aim.

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Appendix A
Proposed Public Contest expansions in Argentina

#	Expansion	Winning bidder	Estimated total investment at 12%	Sale × funds allowed	Amorti-sation period [years]	Process timing	Number of bids and values	Observations/current status
1	Yacretá–Rincón –Resistencia 500 kV line 3 × 3.6+267 k	Yacylec	\$205.0 m	No	15	PH: not held Contract signed 15/12/1992 InOp: September 1994	Bids not available	Accepted
2	Rincón–Salto Grande+Rincón San Isidro 500 kV line 506+85 km	LITSA	\$175.1 m+ \$131.1 m	No	10	PH: not held Contract signed 7/11/1994 InOp: September 1996	Bids not available	Accepted Public tender called by Federal Government.
3	Piedra del Águila– Abasto(“4th Line”) 500 kV line 1291 km	–	[\$429.3 m]	[\$117 m ?]	15	Prop: 1994 PubH: 17/2/1995 Rej: 28/3/1995 Prop: 1994 PubH: 16/2/1995 Acpt: 2/3/1995 Tend: 4/7/1995 InOp: September 1996 Prop: 1995 Rej: 13/2/1996	Initial bid (Tenesa) \$54.6 m/year × 3 years, \$61.4 m/year × 12 years Initial bid \$3.5 m/month Winning bid: \$2.1 m/month	Rejected Res ENRE 49/1995 ENRE File ID:668/94 2nd attempt (#6) in 1996 Accepted Res ENRE 40/1995
4	Henderson & Puelches capacitors 500 kV	Transener	\$23.7 m	No	1	Prop: 1994 PubH: 16/2/1995 Acpt: 2/3/1995 Tend: 4/7/1995 InOp: September 1996 Prop: 1995 Rej: 13/2/1996	Initial bid \$3.5 m/month Winning bid: \$2.1 m/month Bids not available	Accepted Res ENRE 40/1995 ENRE File ID:809/94
5	Arroyito–Chocón Oeste132 kV line 50 km	–	[\$3.0 m]	–	–	Prop: 1995 Rej: 13/2/1996	–	Rejected Res ENRE 74/1996 ENRE File ID:1084/95 Constructed later Contract between Parties Accepted Res ENRE 82/1997 ENRE File ID:1153/95
6	Chocón transformer 500/132 kV150 MVA	ABB	\$2.6 m	\$0.7 m	1	Prop: 1996 PubH: 19/12/1996 Acpt: 28/1/1997 Tend: 2/9/1997 InOp: 1998	Max Fee \$2.6 m/year Winning bid: \$2.0 m/year Bids not available	Accepted Res ENRE 613/1996 ENRE File ID:2167/96
7	Piedra del Águila– Abasto(“4th Line”) 500 kV line 1291 km	Transener	\$256.0 m	\$127.8 m	15	Prop: 1996 PubH: 25/9/1996 Acpt: 24/10/1996 Tend: 27/10/1997 InOp: December 1999	Max Fee: \$43.7 m/year Winning bid:\$24.5 m/year 4 consortia / 14 bids(**)	Accepted Res ENRE 296/1999 ENRE File ID:3280/97
8	Salto Grande transformer500/132 kV 150 MVA	Cobra	\$7.7 m	No	6	Prop: 1997 PubH: 14/1/1999 Acpt: 24/2/1999 Tend: 11/11/1999 InOp: April 2001	Max Fee: \$2.2 m/year Winning bid: .8 m/year Bids not available	Accepted Res ENRE 1472/1998 ENRE File ID:4190/97
9	Recreocapacitors 500 kV	Cobra	\$12.2 m	\$6.8 m	5	Prop: 1997 PubH: 30/7/98 Acpt: 23/9/1998 Tend: March 1999 InOp: October 2000	Max Fee: \$1.7 m/year Winning bid: \$1.5 m/year 2 bids (1 rejected)	Accepted Res ENRE 1472/1998 ENRE File ID:4190/97

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Appendix A (continued)

#	Expansion	Winning bidder	Estimated total investment at 12%	Sale × funds allowed	Amortisation period [years]	Process timing	Number of bids and values	Observations/current status
10	Recreo transformer 500/132 kV 150 MVA	Cobra	\$5.2 m	\$3.6 m	2	Prop: 1997 PubH: 10/9/98 Acpt: 30/9/1998 Tend: March 1999 InOp: June 2000	Max Fee: \$3.0 m/year Winning bid: \$2.9 m/year Bids not available	Accepted Res ENRE 1490/1998 ENRE File ID:4478/97
11a	Recreo–San Martín 132 kV line 115 km	Cobra	\$6.9 m	No	10	Prop: 1998 PubH: 22/12/1998 Acpt: 27/1/1999 Tend: 13/12/1999 InOp: May 2001	Max Fee: \$1.6 m/year Winning bid: \$1.1 m/year 3 bids	Accepted Res ENRE 120/1999 ENRE File ID:5113/98
11b	Recreo–Frias 132 kV line 75 km	Cobra	\$4.6 m	No	10		Max. Fee:\$1.2 m/year Winning bid: \$0.8 m 3 bids	
12	Resistencia substation expansion (132 kV)	Transnea	\$2.4 m	No	2	Prop: 1998 PubH: 8/9/2000 Acpt: 27/9/2000 Tend: December 2000 InOp: 2005	Max Fee: \$1.5 m/year Winning bid: \$1.3 m/year 2 bids	Accepted Res ENRE 544/2000 ENRE File ID:5870/98 Delayed for renegotiation
13	Cañada Honda substation 132/33/13.2 kV 30 MVA	Distrocuyo, under Res 1/2003	\$5.0 m	No	10	Prop: 2000 (Initially proposed in 1998 as minor expansion) PubH 17/7/01 Acpt: 25/7/2001 Susp: 13/11/2002 Under construction in 2007	Max Fee: \$0.8 m/year	Accepted Res ENRE 416/2001 Suspended by ENRE (pesification)Res ENRE 523/2002 ENRE File ID:5893/98 Changed to Resolution 1/2003, built by incumbent
14	El Bracho–La Banda 132 kV line 70 km + Santiago Oeste new substation	–	[\$15.8 m]	No	7	Prop: 1998 PubH 14/12/1999 Acpt: 5/7/2000 Tend: March 2002 (called July 2001)	Max Fee: \$4.1 m/year × 7 years No bids due to crisis	Accepted Res ENRE 393/2000 Tender without bids Changed to Contract between Parties 30 March 2005 Res ENRE 134/2005 ENRE File ID: 5910/98
15a	Capiz transformer 132/66/13.2 kV 20MVA	Distrocuyo	\$1.3 m	No	8	Prop: 1999 PubH 21/1/2000 Acpt: 13/6/2000 Tender: 13/12/2000 InOp: 2005	Max Price: \$1.3 m 2 bids (1 rejected)	Initiated by Transco (SE208/98) Accepted Res ENRE 329/2000 Delayed by crisis – contract renegotiated ENRE File ID:6775/99
15b	Cruz de Piedra transformer 132/66/13.2 kV 60MVA	Distrocuyo	\$2.7 m	No	8		Max Price: \$2.7 m 2 bids (1 rejected)	
16	Olavarría–Barker 132 kV line 139 km	Cobra	\$10.6 m	No	7	Prop: 1999 PubH: 10/2/2000 Acpt: 8/3/2000 Tend: August 2000 InOp: 18/10/2001	Max Fee: \$1.4 m/year × 15 years Winning bid: \$2.2 m/year × 7 years 1 bid	Accepted Res ENRE 130/2000 ENRE File ID:6935/99 and 7310/99

17	Mendoza–San Juan 220 kV line 175 km Variants 17/1, 17/2	–	[\$17.5 m]	–	–	Prop: 1999	–	Res ENRE 191/2000 (Preliminary Project) ENRE File ID:6967/99
18	Ezeiza substation breakers	Transener	\$4.5 m	No	2	Rej: 29/3/2000 Prop: 2000 PubH: 18/12/01 Acpt: 22/1/2003 Tend: 23/1/2004 InOp: 2005	Max Price: \$6.6 m Winning bid: \$4.5 m 3 bids	Constructed later via Federal Plan Initiated by Transco (SE208/98) Accepted Res ENRE 60/2003 ENRE File ID:7804/00
19	Güemes–Las Maderas132 kV line 2×7 km+89 km	Siemens & Cobra (rescinded) Electro- ingenieria	\$3.2 m	No	5	Prop: 2000 PubH 11/1/01 Acpt: 3/5/2001 Tend: Aug 2001 Tend: 18/10/2004 InOp: under construction Sept 2007	Initial bid: \$3.2 m Initial winning fee: 2 m/year×5 years Revised max price: \$3.2 m 1 bid 1 alternative \$3.8 m, \$4.3 m agreed \$3.2 m	Accepted Res ENRE 261/2001 and 230/2004 Delayed due to crisis 2nd Tender announced 8/7/04 Awarded 24/11/2004 Res ENRE 647/2004 ENRE File ID:8562/00
20a	Ramallo transformer 500/220 kV	Faraday	\$9.6 m	\$6.1 m	1.5	Prop: 2000 PubH 22/6/01 and 3/12/02 Acpt: 1/10/2003 Tend: 29/3/2005 InOp: Sept 2007	Max. price: \$9.7 m 10 modules 3,3,2,2,2,3,2,1,2,2 bids \$2.7 m, \$0.8 m, \$0.3 m, \$0.1 m, \$0.1 m, \$0.2 m, \$0.2 m, \$0.02 m, \$0.3 m, \$4.8 m, total \$9.6 m Max price \$6.4 m Max. price: \$6.4 m 9 modules 2,4,3,3,2,3,2,3,4 bids \$2.3 m, \$0.5 m, \$0.1 m, \$0.03 m, \$0.2 m, \$0.1 m, \$0.01 m, \$0.2 m, \$2.9 m total \$6.3 m	Initiated by Transco (SE208/98) Accepted Res ENRE 495/2003 (approved after several modifications)
20b	Rosario transformer 500/132 kV	Siemens	\$6.4 m	\$4.4 m	1.8			Tender announced 5/8/2004 Awarded 21/7/2005 Res ENRE 480/2005 ENRE File ID:8534/00 and 10158/01
21	Alicurá (Bariloche) transformer 500/132 kV 100 MVA	–	[\$6.6 m]	No	5	Prop: Aug 2000 PubH Sep 01 Rej: 14/9/2001	–	Initiated by Transco (SE208/98) Rejected Res ENRE 501/2001 ENRE File ID:8695/00 Subsequent Upgrade Expansion 2003 by Secretary of Energy \$9 m Accepted Res ENRE 62/2001
22	Las Palmas substation132/33 kV	–	[\$3.3 m]	No	15	Prop: 1998 PubH 14/ 12/1999 Acpt: 5/7/ 2000 Tend: October 2001 (1st), December 2006 (2nd)	Max Fee: \$0.5 m/year x 15 years 1st tender: 1 bid 2nd tender: 1 bid	Accepted Res ENRE 393/2000 1st tender announced 28/8/2001, process cancelled due to economic crisis 2nd tender announced 12/10/2006, process cancelled when bid price exceeded maximum price Changed to Contract between Parties 5 July 2007 Res ENRE 463/2007 ENRE File ID: 5910/98

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Appendix A (continued)

#	Expansion	Winning bidder	Estimated total investment at 12%	Sale × funds allowed	Amortisation period [years]	Process timing	Number of bids and values	Observations/current status
23	Campana transformer 500/132 kV 300 MVA	Faraday/Siemens	\$4.0 m	\$3.2 m	Initially 5 years (2001), then 2 years (2003)	Prop: 2000 PubH: 7/8/01 and 7/9/01 Aept: 16/10/2003 Tender: 2004 InOp: 2007	Max. price: \$4.5 m Tender in 2 modules 4, 2 bids Total \$3.7 m renegotiated to \$4 m due to crisis	Initiated by Transco (SE208/98) Accepted Res ENRE 550/2003 (approved after several modifications) Tender announced 19/8/2004 Tender awarded 11/8/2005 Res ENRE 516/2005 ENRE File ID:9068/00
24	Montecaseros transformer 132/66/13.2 kV 30 MVA	Distrocuyo	\$1.9 m	No	1 revised to 4	Prop: Feb 01 Susp: 31/1/2002 PubH: 25/8/2005 Award: 17/5/2007	Max. fee: \$1.4 m/year × 1 year Subsequent Max price: \$1.9 m 1 bidder \$1.9 m	Initiated by Transco (SE208/98) Suspended at Provincial Regulator request before Public Hearing Res ENRE 47/2002 Resumed 2005 Awarded 17 May 2007 Res ENRE 312/2007 ENRE File ID:9895/01 Under construction
25	Anchoris transformer 132/66/13.2 kV 30 MVA	–	[\$1.9 m]	No	1	Prop: Feb 01 Susp: 31/1/2002 PubH: 25/8/2005	Max. fee: \$1.9 m/year	Initiated by Transco (SE208/98) Suspended at Provincial Regulator request before Public Hearing Res ENRE 48/2002 Resumed 2005 Rejected 20/12/2006 Res ENRE 1115/2006 ENRE File ID:9972/01
26a	Choele Choel & Olavarria capacitors 500 kV	ABB/Transener	\$14.0 m	\$14.0 m	0 (cash)	Prop: 2001 PubH: 11/10/2002 Acpt: 13/11/2002 Tend: 18/6/2003 InOp: Dec 2004	Max. Price: \$14.0 m Winning bid: \$14.0 m 2 bids (1 rejected)	Accepted Res ENRE 518/2002 ENRE File ID:10330/01
26b	Comahue–Buenos Aires 3rd line reactors 500 kV	–	[\$1.5 m]	\$1.5 m	[0] (cash)	Prop:2001/2006 (***) PubH: 14/06/2007 Aept: 05/07/2007	Max. price: \$1.5 m Tender in preparation	Accepted Res ENRE 464/2007 ENRE File ID:10330/01 Considered as necessary to ensure proper function of 26a
27	Almafuerte transformer 500/132 kV 300 MVA	Faraday/ABB/ Electro-ingenieria	\$6.5 m	\$5.1 m	0.8	Prop: Oct 02 PubH: 30/10/03 Acpt: 4/12/2003 Tend: 16/12/2004 InOp: end 2007	Max. price: \$7.3 m 3 modules 3,2,3 bids \$2.0 m, \$1.9 m, \$2.6 m total \$6.5 m	Initiated by the Transco (SE208/98) Accepted Res ENRE 616/2003 Tender announced 16/7/2004 Awarded 28/12/2004 Res ENRE 743/2004 ENRE File ID:12019/02
28	Loma La Lata–El Trapial 132 kV line 2x140 km	ALUSA VA-Tech	[\$22.0 m]	No	10	Prop: 2003 PubH: 16/04/2004 Aept: 3/6/2004 Tend: 12/10/2004 InOp: Sept 2007	Max. price: \$22.0 m 7 bids (1 rejected) Bid envelopes not opened	Accepted Res ENRE 323/2004 Tender announced 19/8/2004 Changed to Contract between Parties 5 May 2005 Res ENRE 205/2005 ENRE File ID:15055/03
29	Casa de Piedra–Loma Negra 132 kV line 75 km	–	[\$4.0 m]	No	11	Prop: 2004 PubH: 7/4/2005 Acpt: 30/5/2005	Initial bid (Transcomahue — incumbent) \$0.7 m/year × 11 years Tender in preparation	Accepted Res ENRE 411/2005 Tender announced 14/9/2006, delayed due to discussions between provincial governments on initial bid. Res ENRE 154/2007 ENRE File ID:15289/04

30	Cipolletti transformer 132/33/13.2 kV30 MVA	Tadeo Czerweny (module 1)/ other (modules 2 to 7)	\$0.8 m	No	Paid during construction	Prop: 2004 PubH: 16/06/2005 Acpt: 3/8/2005 Tend: December 2006 Under construction	Max. price: \$0.7 m 7 modules 3,3,2,2,1,1,1 bids \$0.7 m, \$0.01 m \$0.01 m, \$0.01 m, \$0.02 m, \$0.03 m, \$0.01 m, total \$0.8 m Awarded after discussions on total price (higher than max. price).	Initiated by the Transco (SE208/98) Accepted Res ENRE 485/2005 Tender announced 28/9/2006 Awarded 8/2/2007 Res ENRE 110/2007 ENRE File ID:16243/04
31	Santo Tomé transformer 500/132 kV300 MVA	Faraday/ABB/ other (modules B1 to 7)	\$7.4 m	No	Paid during construction	Prop: 2004 PubH: 27/12/2004 Acpt: 30/3/2005 Tend: 7/11/2005 Under construction	Max. price: \$7.5 m 9 modules 2,3,1,1,3,3,2,2,3 bids \$3.0 m, \$0.7 m \$0.3 m, \$0.1 m, \$0.3 m, \$0.1 m, \$0.2 m, \$0.2 m, \$2.6 m, total \$7.4 m	Initiated by the Transco (SE208/98) Accepted Res ENRE 132/2005 Tender announced 7/7/2005 Awarded 21/12/2005 Res ENRE 935/2005 ENRE File ID:16890/04
32	25 de Mayo 500/132 kV substation	–	[\$33.0 m]	No	–	Prop: 2005 PubH: 16/11/2006 Acpt: 11/10/2007	Max. price: \$33.0 m Tender in preparation	Accepted Res ENRE 674/2007 ENRE File ID:17025/05
33	San Nicolás substation breakers132 kV	ABB	\$0.6 m	\$0.5 m	Paid during construction	Prop: 2005 PubH: 28/3/2006 Acpt: 1/6/2006 Tend: February 2007 Under construction	Max. price: \$0.7 m 3 bids: \$0.575 m, \$0.583 m, \$0.639 m	Initiated by the Transco (SE208/98) Accepted Res ENRE 458/2006 Tender announced 14/12/2006 Awarded 3/5/2007 ENRE File ID:17731/05
34	25 de Mayo–Chivilcoy 132 kV line70km	–	[\$4.8 m]	No	–	Prop: 2005 PubH: 16/11/2006 Acpt: 11/10/2007	Max. price: \$4.8 m Tender in preparation	Accepted Res ENRE 675/2007 ENRE File ID:18283/05
35	Arroyo Cabral 500/132 kV substation	Faraday/other (modules B1 to 7)	[\$30.3 m+]	No	2	Prop: 2006 (relaunched as PC) PubH: 29/11/1995 Acpt: 19/12/1995 Tend: 12/10/2004	Max. price: \$9.1 m Module A \$4.1 m Modules B1 to B7 \$5.0 m Module C \$21.1 m 1,2,2,2,3,3,3,0, bids for modules A & B \$4.1 m, \$2.4 m, \$0.9 m, \$0.3 m, \$0.9 m, \$0.4 m, \$0.2 m, \$-, total \$9.1 m Retender for B7 and tender for C in progress	Accepted as CBP Res ENRE 196/1995 Delayed due to lack of financing Changed to Public Contest Res ENRE 344/2006 ENRE File ID:397/1994
36	Bahía Blanca transformer 500/132 kV 300 MVA	–	[\$10.6 m]	No	–	Prop: 2007 PubH: 12/09/2007 Accepted (not yet published)	Max. price: \$10.6 m Tender in preparation (and negotiations with province on tariff)	Initiated by the Transco (SE208/98) ENRE File ID:23852/07

(*) Monthly fee is taken as the Maximum Canon for those expansions that were rejected or suspended, and taken from the public tender process for accepted expansions. It is calculated after any Salex contribution to initial costs but before any Salex contribution to the ongoing fee.

(**) Two consortia (*Transener* and *Líneas de Transmisión del Comahue*) presented more than one bid reflecting alternative specifications: *Atalaya Energy* \$39.5; *Compañía Transportadora de Electricidad del Comahue* \$38.0; *Transener* \$26.0, \$24.5, \$24.8; *Líneas de Transmisión del Comahue* \$27.8, \$27.2, \$27.0, \$27.1, \$26.5, \$26.3, \$25.7, \$25.0, \$24.9. All \$ m/year for 15 years.

Abbreviations on process timing: Prop: Proposed; PubH: Public Hearing; Acpt: Accepted; Rej: Rejected; Susp: Suspended; Tend: Tender bids presented and usually technical proposals opened; InOp: In operation.

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