

**AN ECONOMIC ANALYSIS OF COMPETITIVE PROCUREMENT PROCESS
DESIGN OPTIONS FOR NPAC SERVICES***

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by

William P. Rogerson**

* Prepared for Telcordia Technologies, Inc.

** Professor of Economics, Northwestern University, FCC Chief Economist, 1998-99.

Email: wrogerson@northwestern.edu

Tel.: (847) 491-8484

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EXECUTIVE SUMMARY

Introduction

At the FCC's direction and under its supervision, the North American Numbering Council ("NANC") and an industry group, North American Portability Management, LLC ("NAPM"), are currently designing, and will be conducting, a procurement for Number Portability Administration Center ("NPAC") services to take effect when the current contracts expire in June 2015. This procurement has the potential to be particularly significant, because it is the first explicit recompetition of these contracts since 1997. Carriers and consumers will likely be paying nearly \$500 million annually to procure these services by 2015. Moreover, absent a major change in consumer behavior, it is likely that e.164 telephone numbers will remain a critical communications addressing system for many years or even decades. This procurement thus has the potential to influence the structure of these markets even beyond the procurement period. This study uses economic analysis to explore approaches to objective-driven procurement design, including advantages and disadvantages of each approach. Objectives that need to be considered include minimizing overall costs at the initial award, during the contract period, including change orders, and in future procurements, as well as promoting continued innovation and quality service delivery.

Although a single firm, NeuStar, is currently the sole NPAC services provider in the United States, the NPAC is not operated as a single, unified nationwide database. Instead, the country is divided into seven regions largely corresponding to the original seven regions served by the Regional Bell Operating Companies as they stood in 1996 (the "NPAC regions.") Each region has a separate database of all telephone numbers within that region that have been transferred between different providers.

The fact that there are seven different regional databases and that telephone numbers are not allowed to be transferred between databases means that it would be relatively straightforward to use different NPAC services providers in different regions of the country, so long as each NPAC region was assigned in its entirety to a single regional provider. The main purpose of this study is to provide an economic analysis of how the upcoming NPAC service procurement could be organized to potentially allow for multiple regional providers and the economic costs and benefits of doing so.

Three Basic Design Issues

Three basic design issues will need to be addressed regardless of the approach that is taken towards potentially allowing for multiple competitors. First, as the FCC itself has already concluded, the provider(s) of NPAC services and the terms under which these services are provided for the period beginning after the current contracts expire should be determined by a full and open competition where proposals from multiple potential providers are received and evaluated, rather than through a private negotiation that further extends the incumbent's term. Second, the procurement should be designed to be very transparent; that is, clear and complete information should be provided on the desired features and performance characteristics of the system and precisely how the procurement agency will evaluate and compare different proposals with different features, characteristics, and prices. Transparency is especially necessary to level the playing field between the incumbent and potential entrants, maximize the number of bidders, and thereby ensure that competition produces the greatest possible benefits. Third, the contracts awarded under the procurement should be approximately five years in duration in order to allow potential entrants a reasonable opportunity to recover the substantial start-up costs required to create a functioning NPAC services system and transition customers onto it.

Benefits of Having Multiple Regional Providers

There are four significant systemic benefits that telephone companies and the rate-paying public would experience from a system where there were at least two different regional providers as opposed to a single national provider. First, providers can be benchmarked against one another for purposes of evaluating performance or pricing change orders. Second, more and better innovation is likely to occur when there are multiple different providers that can potentially provide different perspectives and ideas. Third, having multiple providers allows for back-up capability in the event that one firm turns out to have either technical or financial difficulties that prevent it from performing properly. Finally, creating multiple providers in the current procurement provides more competition for future NPAC procurements and also for other future related procurements. In any procurement decision, these advantages would have to be weighed against any benefits from a single provider.

Two Simple Procurement Designs That Predetermine the Number of Providers

For simplicity, this study focuses on analyzing a hypothetical procurement where the seven existing regions are consolidated into two regions, for purposes of running the procurement. The two simplest possible procurement designs predetermine the number of final providers. Under the “sole source design,” firms only submit bids for serving the entire country and the procurement agency chooses the best bid. Under the “multiple source design,” firms submit separate bids to serve each of the two regions and the procurement agency chooses the best pair of bids subject to the constraint that a different provider be chosen in each region.

There are two different potential advantages to choosing the multiple source design over the sole source design. First, the multiple source design by definition results in multiple providers and thus creates the four benefits of having multiple providers described above.

Second, the multiple source design may create more competition than a sole source design. As is true for the procurement of any complex one-of-kind system, potential competitors to the incumbent must incur significant costs merely to create a proposal and compete. This creates the danger that potential competitors will simply not enter the competition if they perceive that the incumbent has too large an advantage. This entry-detering effect will obviously be greatly reduced if the procurement guarantees that at least two different regional providers will be chosen.

The potential advantage to choosing the sole source design over the multiple source design is that there may be some economies of scale/scope to producing NPAC services. That is, the cost of a single provider serving two regions may be somewhat lower than the sum of the costs of two different providers each serving one of the regions. To the extent that there are economies of scale/scope, the sole source design could result in a lower procurement award price than the multiple source design, holding all other factors equal.

The choice between these two procurement designs depends on assessing the relative significance of these competing factors. Prices at award under the multiple source design will tend to be higher to the extent that economies of scale/scope are foregone but lower to the extent that this design results in more competition. Planners should not discount the potential magnitude of the price-reducing effects of increased competition. For example, in defense procurement, it has been found that dual sourcing generally lowers prices by 20%, even though dual sourcing sacrifices some economies of scale. Furthermore, even if it was predicted that dual sourcing would result in higher award prices than sole sourcing on the current procurement, dual sourcing would still be the best choice if the benefits of lower post-award pricing on the current procurement (*i.e.*, change order pricing), lower pricing on future procurements, and the non-price

benefits (*e.g.*, increased innovation and system back-up) of having multiple providers are significant enough.

Flexible Procurement Designs that Do Not Predetermine the Number of Providers

A “flexible procurement design” allows firms to submit bids to serve each region as well as the entire country and allows the procurement agency to choose the best alternative after seeing firms’ bids. There are two natural variants of a flexible design depending upon whether so-called “package bidding” is allowed or not. If package bidding is allowed, firms in a two region procurement submit three bids, one for serving each region and one for serving the package of both regions. If package bidding is not allowed, firms only submit a bid for each region and the bid for serving the package is required to be equal to the sum of the two regional bids. In the latter case, the procurement agency could select the best combination of bids, regardless of whether they were from the same or different providers.

A significant potential advantage of these flexible designs over designs predetermining the number of providers is that they essentially allow the procurement agency to make a better-informed decision when it chooses between a single provider system and a multiple provider system. This is because the procurement agency is able to actually see what the differential cost is between procuring the best possible single provider system and the best possible multiple provider system based on firms’ actual bids. Thus, if there is considerable uncertainty about the likely magnitude of economies of scale/scope, flexible procurement designs offer the advantage that this uncertainty can be resolved before the procurement agency chooses between a multiple provider and single provider system.

If a flexible procurement design is used, it must also be decided whether or not to allow package bidding. The main potential advantage of allowing package bidding is that firms may

be willing to bid more aggressively on the package of both regions than on either region alone to the extent that there are economies of scale/scope. This potential informational advantage, however, can also compromise other information that might be gained from the bids. One significant potential problem with allowing package bidding is that the incumbent may attempt to “game” the system by submitting very high bids on each region and only submitting a serious bid on the country as a whole – a strategy that can be particularly successful if the procuring authority is predisposed to award at least one of the regions to the incumbent (for example, because of fear of transitional disruption or change). If package bidding is not allowed, the incumbent will be unable to follow such a strategy because the only way to attempt to win the country as a whole would be to submit low bids on each region.

Conclusion

This study describes four alternative simple procurement designs for NPAC services that allow different approaches to determining how and whether to allow for the possibility of different multiple regional providers. While no simple definitive conclusions are possible, it is possible to describe the factors that should be considered when choosing between these alternatives. Some of the main factors that need to be considered are as follows. It is clear that there are significant advantages to carriers and their customers from having multiple regional providers of NPAC services. These include increased transparency regarding service provision and pricing, the ability to benchmark both performance and future change orders, more and better innovation due to a diversity of suppliers, added back-up capability, and extra competition for future NPAC procurements and related procurements. Furthermore, using a multiple source design will create more competition by encouraging more firms to compete against the incumbent. However, if economies of scale/scope are large enough it is possible that the cost savings from using a sole source design might be larger than the benefits from using the multiple source design. To address this concern, the procurement agency might use a flexible procurement design so it can learn about the magnitude of the potential cost savings from using a single provider before making its decision on the number of providers to use. In this case, the procurement agency will need to decide whether or not to allow package bidding. To the extent that the procurement agency wishes to be presented with a serious option of using the incumbent in one region but using a different provider in the other region, it may be necessary to disallow package bidding.

I. INTRODUCTION

The FCC requires that telephone providers implement database number portability to allow telephone customers to keep the same telephone number when they switch service providers. To implement database number portability, the FCC appoints number portability administrator(s), *i.e.*, providers of Number Portability Administration Center (NPAC) services which, in the initial selections in the late 1990s, were awarded through competitive bidding hosted by industry consortia subject to review by the NANC¹ and the FCC. The United States is divided into seven regions largely corresponding to the original seven regions served by the Regional Bell Operating Companies as they stood in 1996 (the “NPAC regions”). A separate database is maintained for each region of all telephone numbers within that region that have been transferred to different providers. A single firm - NeuStar - has provided NPAC services in all seven regions since 1997 under contracts scheduled to expire on June 30, 2015. The FCC and bodies that report to it are currently engaged in designing the procurement that will determine the NPAC services provider(s) and the terms under which NPAC services are provided for the period after the current contracts expire.

Although a single firm is currently the NPAC services provider in all seven U.S. regions, the fact that there are seven different regional databases and that telephone numbers are not allowed to be transferred between databases means that it would be relatively straightforward to use different NPAC services providers in different regions of the country, so long as each NPAC region was assigned in its entirety to a single regional provider. The main purpose of this study is to provide an economic analysis of how the upcoming NPAC service procurement should be

¹The NANC is a federal advisory committee composed of both industry and consumer representatives that oversees and manages telephone numbering issues for the FCC.

organized to potentially allow for multiple regional providers, and the economic costs and benefits of doing so.

The study is organized as follows. Section II provides background information. Section III offers analysis and conclusions on three more basic design issues. Section IV describes four significant benefits that would flow to telephone providers and their customers from having different multiple regional providers of NPAC services. The remaining sections describe and evaluate alternative procurement designs. Section V begins by explaining why attention is restricted to designs that allow for at most two regional providers. Section VI considers the choice between two simple procurement designs where the number of providers is predetermined. Section VII considers flexible procurement designs that allow the procurement agency to choose the number of providers after observing firms' bids. Finally, section VIII draws a brief conclusion.

II. BACKGROUND

A. History of NPAC Services Procurement in the United States.

A brief history of how the provision of NPAC services has evolved is as follows.² Even

²For further details see the four FCC orders that have been issued on local number portability. See (i) *First Report and Order and Further Notice of Proposed Rulemaking, In the Matter of Telephone Number Portability*, CC Docket No. 95-116, July 2, 1996 (“*First LNP Order*”); (ii) *Second Report and Order, In the Matter of Telephone Number Portability*, CC Docket No. 95-116, August 18, 1997 (“*Second LNP Order*”); (iii) *Order and Request for Comment, In the Matter of Petition of Telcordia Technologies, Inc. To Reform or Strike Amendment 70, to Institute Competitive Bidding for Number Portability Administration and to End the NAPM LLC’s Interim Role in Number Portability Administration Contract Management and Telephone Number Portability*, WC Docket No. 09-109 and CC Docket 96-116, March 8, 2011 (“*First LNP Procurement Order*”); and (iv) *Order, In the Matter of Petition of Telcordia Technologies, Inc. To Reform or Strike Amendment 70, to Institute Competitive Bidding for Number Portability Administration and to End the NAPM LLC’s Interim Role in Number Portability Administration Contract Management and Telephone Number Portability*, WC Docket No. 09-109 and CC Docket 96-116, March 8, 2011 (“*Second LNP Procurement Order*”).

prior to the passage of the 1996 Act, the FCC had initiated a rulemaking procedure to examine number portability. In the wake of the passage of the 1996 Act, through various means, seven non-profit LLCs were formed, largely corresponding to the seven RBOC regions and comprised of telephone companies operating in those regions. The LLCs issued RFPs and independent competitions were held for each region. In the end, two different firms split the contracts, with NeuStar's predecessor, Lockheed Martin Information Systems, and Perot Systems each winning some of the competitions, and with only one winner being selected in each region. The original awards were for a term of five years. The FCC reviewed the selections and appointed each of the winning firms as the number portability administrator for the regions awarded.

Thus, when the FCC first named the number portability administrators in August 1997, it appeared that a system had been set in place in which there were two different regional providers of NPAC services and under which periodic competitions would be held to determine the provider for each region. However, subsequent events have resulted in a different outcome. First, almost immediately after the awards were made, it became apparent that one of the two providers - Perot Systems - would be unable to begin operations on time. As a result, all of the LLCs that had chosen Perot systems switched to the other immediately available vendor Lockheed Martin Information Systems. Subsequently, the seven different LLCs – now dealing with a common vendor – also merged into a single LLC called North American Portability Management LLC (NAPM), although the contracts for each region remained separate. Second, the initial contracts have never been explicitly recompeted.³ Rather, NAPM has negotiated a series of contract extensions and renewals with NeuStar without conducting any explicit

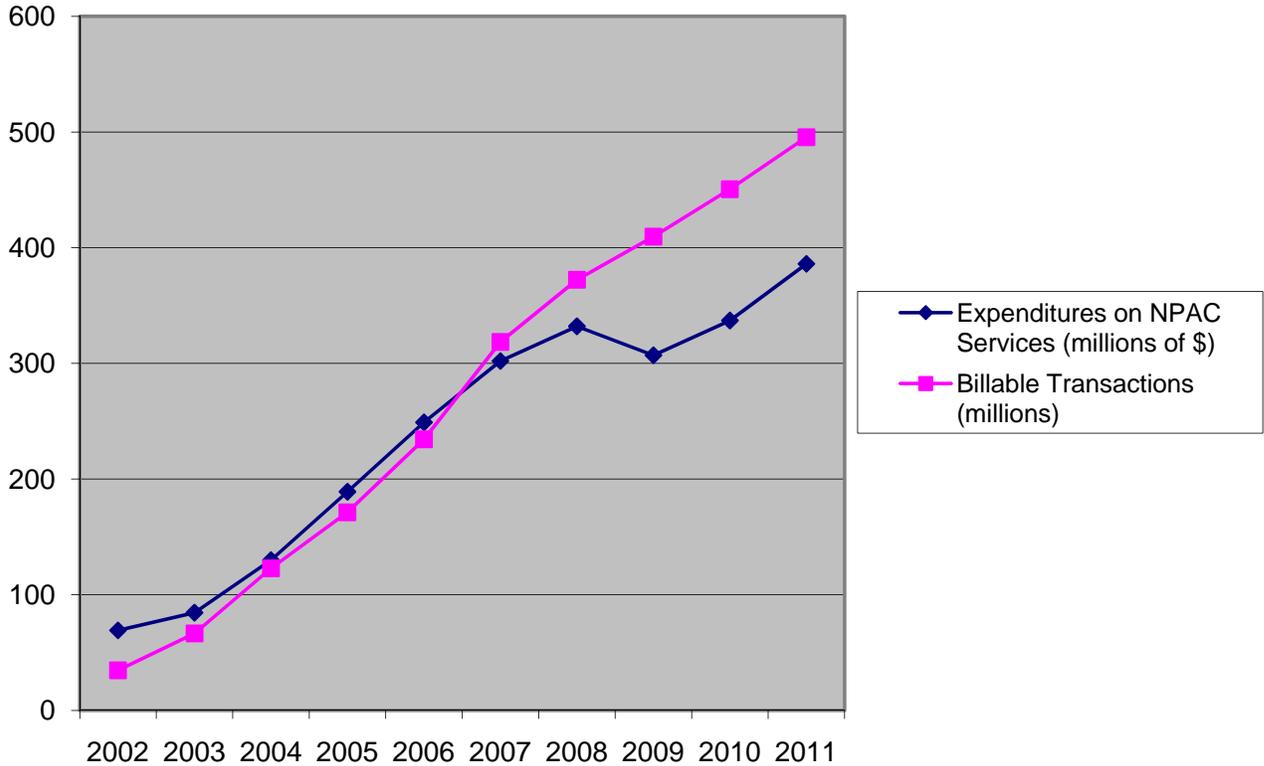
³That is, another full and open competition, in which multiple firms submit proposals in response to a Request for Proposals and a winning proposal is selected from among these, has never been held.

competitions. The current contract with NeuStar is now set to expire on June 30, 2015. Under the active supervision of the FCC, the NANC and NAPM are currently in the process of determining how to design the procurement that will determine the provider(s) of NPAC services after June 2015 and the terms under which these services will be provided.

Table 1, included in an appendix to this study, provides data on the annual number of billable transactions⁴ handled by the NPAC services system, the total annual expenditures on NPAC services and the expenditures per billable transaction. Figure 1 illustrates the data on the annual number of billable transactions and the total annual expenditures on NPAC services.

⁴A billable transaction is essentially an entry or change of entry in the database that records telephone numbers that have been transferred from one carrier to another.

Figure 1
Total NPAC Expenditures and Billable Transactions by Year



Note that both the annual number of transactions and the total annual cost have risen dramatically over time.

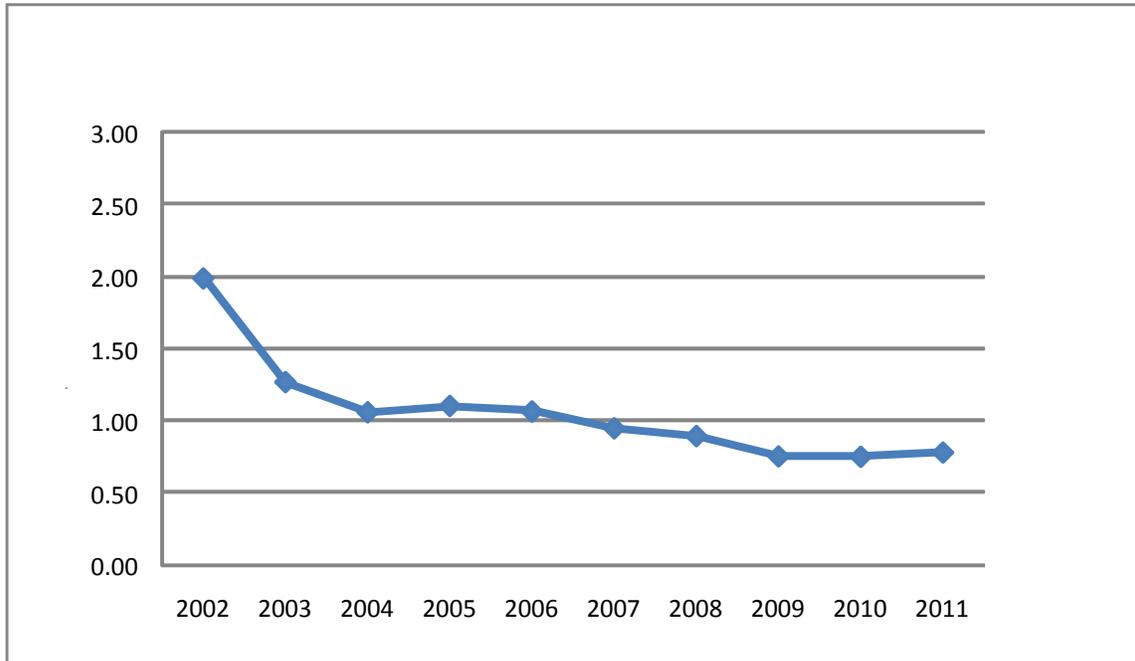
The increase in transactions has occurred for a number of different reasons. First, number portability for wireless carriers was not introduced until late 2003 for the top 100 markets and mid-2004 for most of the remaining markets. Second, the extent to which landline customers have a competitive wireline alternative that provides its own switching has increased over time. Third, most recently, the FCC has extended the number-portability requirement to IP

Enabled service providers.⁵ Fourth, over time new uses have been found for the NPAC services system and this has dramatically increased usage of the system. For example, the NPAC services system is now used to allow assignment of telephone numbers to carriers in blocks of 1,000 numbers instead of in blocks of 100,000 numbers. In addition, as a result of mergers and reorganizations, individual carriers now use the NPAC services system to implement internal routing (network consolidation) and billing system changes.

Figure 2 illustrates the data on expenditures per billable transaction from Table 1.

⁵*In the Matter of Telephone Number Requirements for IP-Enabled Services Providers; Local Number Portability Porting Interval and Validation Requirements; IP-Enabled Services; Telephone Number Portability; CTIA Petitions for Declaratory Ruling on Wireline-Wireless Porting Issues; Final Regulatory Flexibility Analysis; and Numbering Resource Optimization. Report and Order, Declaratory Ruling, Order on Remand, and Notice of Proposed Rulemaking, WC Docket Nos., 07-243, 07-244 and 04-36, CC Docket No. 95-116, November 8, 2007.*

Figure 2
NPAC Expenditures Per Billable Transaction by Year (in \$)



Notice that expenditures per billable transaction have drifted somewhat downward over time, but not nearly as rapidly as transaction volumes have increased, particularly after 2004. The decline in per transaction expenditures in and of itself cannot and should not be interpreted as providing any assurance at all that prices are being set at or anywhere near the competitive level. To the extent that there are economies of scale associated with transactions volumes, it may well be that procurement costs should have dropped much more dramatically than they have actually dropped.

B. NPAC-Like Services Procurement in Other Countries⁶

Almost all developed countries require some form of number portability, at least between

⁶There is very little publicly available information on the manner in which NPAC services are procured in other countries. Unless otherwise indicated, the information in this section has been provided by Telcordia.

mobile operators, and these services are generally procured from a company other than the telephone companies themselves through some sort of competitive procurement process in which bids or proposals are solicited from multiple providers.⁷ The duration of the awards is usually approximately five years to allow providers time to recover their start-up costs. At the end of the contract, contract extensions with the existing provider based on negotiations only with that provider and competitive reprocurments are both common. Competitive reprocurments are more common when there is dissatisfaction with the existing provider(s), a long amount of time has passed since the last competitive procurement, or extensive changes in the NPAC-like system or services have occurred or are scheduled to occur in the near future.

Worldwide, there are seven large providers of NPAC-like services that each provide these services in at least three countries and that frequently compete in international NPAC-like services procurements. Table 2, included in an Appendix to this study, provides a list of these companies and the countries in which they provide services.

Most countries use a single service provider and conduct procurements designed to select a single provider. The two exceptions are Spain and India. In Spain, there are two service providers - one for fixed line portability and one for mobile portability. Each provider keeps a separate database of ported numbers dedicated to wireless numbers in one case and to wireline numbers for the other. The two providers in Spain were chosen in independent procurements conducted at different points in time. In contrast, India divides itself into two roughly equal-sized regions and has a different NPAC services provider in each region. The providers for both regions were chosen in a single competitive procurement in 2009 where firms were invited to

⁷Some countries have limited the competition to national companies. However, most larger countries open the competition up to international providers.

submit proposals for each region and it was announced ahead of time that the same provider would not be chosen for both regions.⁸ Notably, India is a large market that was deemed by Indian authorities to be capable of sustaining multiple providers.

III. THREE BASIC DESIGN ISSUES

Three basic design issues will need to be addressed regardless of the approach that is taken towards potentially allowing for multiple competitors.

First, as the FCC itself has already concluded,⁹ the provider(s) of NPAC services and the terms under which these services are provided for the period beginning after the current contracts expire should be determined by a full and open competition where proposals from multiple potential providers are received and evaluated, rather than through a private negotiation that further extends the incumbent's term. By 2015, when the current contract with NeuStar is set to expire, nearly 20 years will have passed since a full and open competition determined an appropriate price for NPAC services. As described above in Section II.A, the nature and extent of the services provided have changed dramatically during this period. Thus, knowing that prices were competitively set 20 years ago provides essentially no assurance that prices are being

⁸See Telecom Regulatory Authority of India, *Consultation Paper on Determination of Port Transaction Charge, Dipping Charge and Porting Charge for Mobile Number Portability*, July 22, 2009 (available at http://www.trai.gov.in/ConsultationPapers_list_division.asp?j=9&select=) for a general description of the history of this procurement. See Government of India, Ministry of Communications & Information Technology, Department of Telecommunications, *Tender Document for Mobile Number Portability (MNP) Service, Tender No. 20-201/2008-AS-I, Part - I&II*, (available at http://www.dot.gov.in/tender/MNP/MNP-TENDER_DOCUMENT_Final-25.11.2008.doc) for a more detailed description of the actual rules used to conduct the procurement.

⁹See *First LNP Procurement Order* at footnote 14 which states “The Commission or Bureau will select the LNPA(s) through a competitive bidding process.”

set at competitive levels today. As noted above, the fact that the cost per transaction has fallen modestly over time should not be interpreted as providing any assurance that prices are being set at a competitive level today. To the extent that there are economies of scale associated with transaction volumes, it may be that procurement costs should have fallen much more dramatically than they have actually fallen.

Second, the procurement should be designed to be very transparent in the sense that clear and complete information should be provided on (i) the desired features and performance characteristics of the system to be procured; (ii) the most important issues that the proposal must specifically address; and, (iii) precisely how the procurement agency will evaluate and compare different proposals with different features, characteristics, and prices.

While it is of course simply common sense that a procurement agency should communicate its preferences to sellers in order to maximize the possibility that sellers will make proposals that fulfill these preferences, there is a more subtle effect at play here as well. In the absence of additional information, the incumbent is likely to be much better informed about the preferences of the procurement agency and the key issues that need to be addressed in any proposal than potential entrants are likely to be. Here, where the incumbent has been in place for a period of nearly fifteen years, this informational advantage may be pronounced. Thus, transparency is necessary to level the playing field between the incumbent and potential entrants and thereby attempt to ensure that competition produces the maximum possible benefits. Note that in addition to allowing potential competitors to compete more effectively with the incumbent once they enter the competition, increased transparency is also likely to increase the number of potential competitors that are willing to enter the competition in the first place. As is true for the procurement of any complex one-of-kind system, potential competitors to the

incumbent must incur significant costs merely to create a proposal and compete. This creates the danger that potential competitors simply will not enter the competition if they perceive that the incumbent has too large an advantage. Given the long duration of the current contract, potential bidders may be skeptical of the extent to which the U.S. is willing to embrace NPAC competition. Commitment to a transparent procurement process sends a strong signal to potential bidders that the U.S. is open to competition and potentially changing NPAC vendors.

Third, the contracts awarded under the procurement should be of long enough duration to allow potential entrants a reasonable opportunity to recover the substantial start-up costs required to create a functioning NPAC services system. Experience from NPAC services procurements conducted in other countries suggests that an award period of approximately five years is sufficient to accomplish this.

IV. THE BENEFITS OF MULTIPLE REGIONAL PROVIDERS

There are four significant potential benefits that telephone companies and their customers would experience from a system where there were at least two different regional providers as opposed to a single national provider.¹⁰ Both the FCC and the NANC have previously acknowledged the existence of these sorts of benefits.¹¹

¹⁰Note that there are no significant corresponding benefits flowing from a single provider system. One possible such benefit is that the transactions costs of dealing with NPAC services provider(s) could conceivably be smaller if there was a single provider. However, this can be largely dealt with by requiring providers to use a standardized interface to deal with customers.

¹¹“The NANC identified two advantages that would result from the selection of two database administrators. First, the NANC notes that if one administrator could not or would not perform its obligations under its master contract, or declines to renew this contract, there would be another administrator with the experience and expertise required to provide these services quickly and with minimal disruption to the industry. Second, the NANC observes that having multiple database administrators permits competition in both the initial and future competitive

A. Benchmarking Performance and Change Orders

In NPAC services procurements, relatively long contracts lasting approximately five years must be offered to provide potential competitors with some assurance that they will be able to recover the relatively substantial start-up cost involved with creating the software and purchasing the hardware necessary to create a functioning data center. The length of these contracts and the fact that circumstances will change and new, unanticipated problems and issues will arise over time, create two related problems that cannot be dealt with when NPAC services contracts are awarded to a single provider, but can be more effectively addressed when these contracts are awarded to multiple regional providers.

The first problem is that, as circumstances change over time and new issues and situations arise, it becomes very difficult for a procurement agency to directly determine if a provider is making its best efforts to solve problems, address issues as they arise, and generally maintain quality at as high a level as possible. This problem would be dramatically reduced if the procurement agency were able to directly compare the performance of different providers doing essentially identical sorts of jobs in different regions of the country. This is, of course, precisely what contracting with multiple different regional providers of NPAC services allows. This means that the procurement agency will be able to create better incentives for providers to devote their best efforts to solving problems and maintaining and improving the quality of their

bidding and selection processes, which should enable carriers to obtain more favorable terms and conditions than if only one database administrator had been selected. The NANC concludes that the selection of two database administrators is consistent with the Commission's directive that the NANC recommend the most cost-effective number portability methods. . . . [W]e agree, for the reasons given by the NANC, that there are clear advantages to having at least two experienced number portability database administrators that can compete and substitute for each other, thereby promoting cost-effectiveness and reliability in the provision of Number Portability Administration Center services." *See Second LNP Order* at paragraphs 36 and 38.

service if there are multiple providers.

Similarly, because circumstances and conditions change, it is generally the case that significant changes will likely be made to an NPAC services contract over its lifetime. The cost of these changes must be negotiated. If the procurement agency faces a single national provider, it only has one source of information. However, if the procurement agency has multiple regional providers, it will be negotiating the same types of changes with multiple different providers. This will allow it to compare both the cost estimates that different providers submit to it as well as the explanations that they offer for these cost estimates. This is likely to give it considerably more insight into the true cost of a change order. This means that the procurement agency will be able to price change orders more fairly and to obtain better information about what changes are most desirable to implement when it has multiple providers. As described in more detail in Section II.A, there have been very significant changes that have occurred over the past fifteen years. These include expansion of the NPAC services system to include wireless providers, to permit thousands block number assignment, and to permit intra-carrier network consolidation and billing system changes. Change orders have been a regular occurrence since the NPAC was created. Thus there is a great need for better control over and insight into the cost of change orders.

B. More and Better Innovation

One task that requires best efforts is innovation. Therefore the above point on benchmarking applies to innovation. Namely, having multiple regional providers may create better incentives for providers to devote their best efforts to innovation and thus result in more and better innovations. However, there is an additional and simpler reason why having multiple

regional providers for NPAC services is likely to lead to more and better innovations. Namely, even if providers are making their best efforts to innovate, multiple providers are likely to come up with more innovations than a single provider simply because there will be a larger diversity of ideas created by multiple providers than by a single provider.

C. Back-up Capability

Multiple providers would allow for back-up capability in the event that one firm turned out to have either technical or financial difficulties that prevented it from performing adequately. As such, a multiple vendor structure can reduce the risk that could be associated with introducing competition among NPAC vendors, as the procuring agency is necessarily relying on a single vendor, whether the incumbent or an entrant. This is because a firm already operating in some regions of country could much more quickly and effectively take over operations in a different area of the country than could a firm with no operations in the country at all. As discussed above in Section II.A, the choice of multiple regional providers allowed for precisely this sort of back-up capability to be exercised in the initial implementation of NPAC services. Namely, the fact that Lockheed Martin Information Systems and Perot Systems were both chosen as regional providers meant that regions which had chosen Perot Systems could easily switch to Lockheed Martin Information Systems when Perot Systems experienced difficulties, without causing substantial delays.

The primary risk of technical failure likely occurs when a new entrant is initially developing its system. Once a provider is set up and operating successfully, it seems less likely that it would suffer a major technical problem. Thus the risk of technical failure is likely higher for a new entrant than the incumbent. This means that there is a sense in which having multiple

different regional providers will level the playing field to some extent between the incumbent and potential entrants and thus make the entire procurement more competitive. That is because there will be a back-up capability in place in case the new entrant has problems.

It is also worth noting that, especially in the current financial climate, inability to perform due to financial failure is another risk that needs to be considered. Once again, to the extent that multiple competitors provide a back-up capability for one another, they provide extra protection against this risk.

D. More Competition for Future NPAC Procurements and Related Procurements

Incumbency in one region likely provides some advantages for competing in future NPAC procurements for other regions. For example, an incumbent likely has extra information that transfers across regions. As another example, an incumbent in one region may have lower costs of providing service in an additional region than a non-incumbent to the extent that there are economies of scale/scope. This means that choosing more providers in the current NPAC services procurement will increase the amount of competition that exists in future NPAC procurements.

As a related point, the provision of data centers for NPAC services is very closely related to and somewhat overlapping with the provision of data centers to provide routing information for IP-based phone calls. ENUM is an international standard for mapping a single, specified traditional telephone number to a variety of numbers and IP addresses corresponding to various devices and applications. It thus transforms one telephone number into a universal identifier across voice, fax, mobile, email, SMS, and other IP services. Currently, two forms of ENUM exist: public ENUM and private (also called carrier) ENUM. Public ENUM is a voluntary, end-

user provisioned system with privacy concerns. Carrier ENUM permits carriers to exchange subscriber information privately and securely to facilitate routing. Carrier ENUM providers offer a database permitting carriers to correlate a telephone number to a carrier domain and thus to send content of any type, not just voice traffic, from one carrier to another. ENUM providers provision their databases from multiple sources, including carrier databases, LERG, MNC, SPID and other routing databases, as well as the NPAC and other country-specific number portability databases. Currently, multiple providers, including the current NPAC Administrator, provide competitive carrier ENUM services to carriers.

An initial investment in NPAC data centers and carrier connections can be leveraged – and, in fact, is being leveraged – for provisioning ENUM routing data. The magnitude of any operational synergies is not well established. If the magnitude is small, then NPAC procurement decisions are likely to have little impact on overall competition to provide carrier ENUM services. If operating an NPAC, however, conveys substantial operational advantages, then a decision regarding the number of NPAC service providers could well affect the structure of the market for carrier ENUM services.

V. THE NUMBER OF REGIONS

The remainder of this study will turn to describing alternate procurement mechanisms and discussing their relative advantages and disadvantages. One preliminary issue that needs to be addressed is the number of regions to use in any procurement that potentially permits multiple regional providers. Because a substantial share of the benefits of having multiple providers are likely to be created by having two different providers and because a procurement design becomes progressively more complicated and unwieldy as the number of regions increases, this study focuses, for purposes of simplicity, on alternative procurement designs that allow at most two different regional providers. Additional providers could be selected just as easily, in which case the procurement process likely would reveal additional benefits in transparency, information forcing, benchmarking, competition and pricing, but lead to reduced economies of scope/scale for potential providers and additional administrative burdens for the procurement administrators and, potentially, carriers. Use of a model involving two providers illustrates the potential benefits of multiple regional providers and permits readers to consider how those benefits and costs would change if additional regional providers were added. A two-provider model would be implemented by consolidating for procurement purposes the original seven NPAC regions into two roughly equal-sized regions. Note that the seven databases would still remain separate just as they are now with the current single provider.

VI. TWO SIMPLE PROCUREMENT DESIGNS THAT PREDETERMINE THE NUMBER OF PROVIDERS

Begin by considering the choice between two simple procurement designs where the number of providers is predetermined. Under the “sole source design,” firms only submit

proposals for serving the entire country and the procurement agency chooses the best value proposal.¹² Under the “multiple source design,” firms submit separate proposals to serve each of the two regions and the procurement agency chooses the best pair of proposals subject to the constraint that a different provider be chosen in each region.

There are two different potential advantages to choosing the multiple source design over the sole source design. First, the multiple source design obviously results in multiple providers and thus creates the four benefits of having multiple providers described above in Section IV. Second, the multiple source design may create more competition than a sole source design. As is true for the procurement of any complex one-of-kind system, potential competitors to the incumbent must incur significant costs merely to create a proposal and compete. This creates the danger that potential competitors simply will not enter the competition if they perceive that the incumbent has too large an advantage. This entry-detering effect will obviously be greatly reduced if the procurement guarantees that at least two different regional providers will be chosen. It should not be overlooked that this is the first explicit recompetition since 1997. Given the long duration of the current contract, potential bidders may be skeptical of the extent to which the U.S. is willing to embrace NPAC competition. Committing to multiple vendors sends a strong signal to potential bidders that the U.S. is open to competition and changing NPAC vendors.

The potential advantage to choosing the sole source design over the multiple source design is that there may be some economies of scale/scope to producing NPAC services. That is,

¹²Note that the best value proposal is not necessarily the lowest priced proposal. As usual, the procurement agency is allowed to take non-price factors into account related to the quality of each proposal and chooses the over-all best proposal taking both quality and price into account.

the cost of a single provider serving two regions could be somewhat lower than the sum of the costs of two different providers each serving one of the regions. To the extent that there are economies of scale/scope, the sole source design could result in a lower procurement award price than the multiple source design, holding all other factors equal.¹³

The choice between these two procurement designs depends on assessing the relative significance of these competing factors. Prices under the multiple source design will tend to be higher to the extent that economies of scale/scope are foregone but lower to the extent that this design results in more competition. Planners should not discount the potential magnitude of the price-reducing effects of increased competition. For example, in defense procurement it has been found that dual sourcing generally lowers prices by 20%, even though dual sourcing sacrifices some economies of scale.¹⁴ Furthermore, even if it was predicted that dual sourcing would result in higher award prices than sole sourcing on the immediate procurement, dual sourcing would still be the best choice if the benefits of lower post-award pricing on the current procurement (i.e., change order pricing), lower pricing on future procurements, and the non-price benefits of having multiple providers were significant enough.

¹³Note that having multiple providers should not create large coordination problems that could further increase costs. This is because each of the seven databases for each of the seven NPAC regions is separate and telephone numbers are not allowed to be transferred across databases. Therefore, so long as the two regions served by the two providers are created by aggregating the NPAC regions, there will not be any need for the providers to transfer telephone numbers between one another or to jointly manage any database.

¹⁴See Thomas P. Lyon (2006), "Does Dual Sourcing Lower Procurement Costs?" *The Journal of Industrial Economics*, LIV(2) which reports that "dual sourcing appears to produce procurement savings on the order of 20% for those missiles to which the policy is applied" at 248 and concludes that "dual sourcing as used in practice reduces procurement costs significantly, apparently spurring efforts at cost control that outweigh any lost economies of scale or learning that result from splitting production across two suppliers" at 225.

VII. FLEXIBLE PROCUREMENT DESIGNS THAT DO NOT PREDETERMINE THE NUMBER OF PROVIDERS

A. Description of the Designs

A “flexible procurement design” allows firms to submit bids to serve each region as well as the entire country and allows the procurement agency to choose the best alternative after seeing firms’ bids. There are two natural variants of a flexible design depending upon whether so-called “package bidding” is allowed or not. If package bidding is allowed, firms submit three bids, one for serving each region and one for serving the package of both regions. If package bidding is not allowed, firms only submit a bid for each region and the bid for serving the package is required to be equal to the sum of the two regional bids. In the latter case, the procurement agency could select the best combination of bids, regardless of whether they were from the same or different providers.

After the procurement agency sees the bids, it then must determine which proposal(s) to accept. It is useful to view the procurement agency as making this decision in two stages. In the first stage, the procurement agency chooses the best single provider solution and the best multiple provider solution. Neither of these decisions requires new techniques or approaches. These are standard procurement decisions where the procurement agency can consider both price and non-price aspects to choose the best proposal. However, as noted above, it is critical that the procurement agency be transparent about what its scoring methods for technical and cost sections as well as for best value determination will be.

At the second stage, the procurement agency has to choose between the best single provider solution and the best multiple provider solution. There are two factors that the procurement agency needs to consider when it makes its second stage decision. The first factor

is the benefits of a multiple provider system over a single provider system as discussed in Section IV. These benefits can really be thought of as a sort of quality difference between the two proposals. Therefore the value of these benefits needs to be taken into account just as the benefits from any other quality difference in the proposal scoring design. The second factor is the prices that are bid. If there are economies of scale/scope, it is possible that the price of the best single provider solution will be less than the price of the best multiple provider solution. At the second stage, the procurement agency should choose the best proposal by comparing the benefits of having multiple providers to the price advantage of having a single provider.¹⁵

B. The Potential Advantage of Flexible Designs

A significant potential advantage of these flexible designs over designs predetermining the number of providers is that they essentially allow the procurement agency to make a better-informed decision when it chooses between a single provider system and a multiple provider system. This is because the procurement agency is able to actually see what the differential cost is between procuring the best possible single provider system and the best possible multiple provider system based on firms' actual bids. Thus, if there is considerable uncertainty about the likely magnitude of economies of scale/scope, flexible procurement designs offer the advantage that this uncertainty can be resolved before the procurement agency chooses between a multiple provider and single provider system.

C. The Effects of Allowing Package Bidding

¹⁵There may also be other sorts of quality difference between the two proposals. For example one proposal may be riskier than the other. These other aspects of quality should also of course be taken into account.

If a procurement agency decides to use a flexible procurement design, it will need to choose between allowing and not allowing package bidding. Both auction designs have been extensively studied and compared in the economics literature.¹⁶ In general, there are circumstances in which either auction type might out-perform the other and the literature does not provide any unambiguous ranking of them.

The main potential advantage of allowing package bidding is that firms may be willing to bid more aggressively on the package of both regions than on either region alone to the extent that there are economies of scale/scope. This potential informational advantage from package bidding, however, may undermine the quality of information presented by the bids for each region alone. A potentially significant problem with allowing package bidding arises from the fact that there is already an incumbent in place. If package bidding is allowed, there may be a risk that the incumbent will “game” the system by not making serious bids on each region. This strategy is more likely to be successful if the procurement agency views it as necessary that the incumbent win at least one region – which could result, for example, from a fear of a complete transition to entirely new service providers or from concern over transition costs. If the incumbent increases its regional bids to try to enhance its likelihood of winning the entire country, the procurement agency will then have to choose between bringing on two entirely new

¹⁶See, for example, Charles River Associates (1997), *Report 1B: Package Bidding for Spectrum Licenses*, (available at http://wireless.fcc.gov/auctions/conferences/combin2000/releases/cr_2.pdf); Peter Crampton (2002) “Spectrum Auctions,” in *Handbook of Telecommunications Economics*, Martin Cave, Sumit Majumdar, and Ingo Vogelsang (eds), Amsterdam: Elsevier Science B.B., Chapter 14, 605-639; Paul Milgrom (1999), “Combination Bidding in Spectrum Auctions,” in *Competition, Regulation and Convergence: Current Trends in Telecommunications Research*, Sharon Gillett and Ingo Vogelsang (eds), Mahwah, New Jersey: Lawrence Erlbaum Associates, Publishers, pp 19-26.

providers, or remaining with the current incumbent as the single national provider. In particular, it would not have the option of keeping the incumbent in one region and bringing a new provider on in one region. Therefore, to the extent that the procurement agency wishes to be presented with a serious option of using the incumbent in one region but using a different provider in the other region, it may be necessary to disallow package bidding. In this case, the incumbent would be forced to bid seriously on each region, because this would be the only way it could attempt to win the entire country.

VIII. CONCLUSION

This study describes four alternative simple procurement designs for NPAC services that allow different approaches to determining how and whether to allow for the possibility of different multiple regional providers. While no simple unconditional rankings are possible, it is possible to describe the factors that should be considered when choosing between these alternatives. Some of the main factors that need to be considered are as follows. It is clear that there are significant advantages to telephone carriers and their customers from having multiple regional providers of NPAC services. These include increased transparency regarding service provision and pricing, ability to benchmark both performance and future change orders, more and better innovation due to a diversity of suppliers, added back-up capability, and extra competition for future NPAC procurements and related procurements. Furthermore, conducting a multiple source procurement will likely create more competition by encouraging more firms to compete against the incumbent. However, if economies of scale/scope are large enough, it is possible that the cost savings from using a sole source design might be larger than the benefits from using the multiple source design. To address this concern the procurement agency might use a flexible procurement design, so it can learn about the magnitude of the potential cost savings from using a single provider before making its decision on the number of providers to use. In this case, the procurement agency will need to decide whether or not to allow package bidding. To the extent that the procurement agency wishes to be presented with a serious option of using the incumbent in one region but using a different provider in the other region, it may be necessary to disallow package bidding.

DATA APPENDIX

TABLE 1
EXPENDITURES ON NPAC SERVICES AND BILLABLE TRANSACTIONS

Year	NPAC Expenditures (millions of \$)	Number of Billable Transactions (millions)	Expenditures per Billable Transaction (\$ per transaction)
2002	69.2 ^a	34.7 ^d	1.99
2003	84.5 ^a	66.6 ^d	1.27
2004	130 ^a	122.8 ^d	.94
2005	189 ^b	171.2 ^d	1.10
2006	249 ^b	234.4 ^d	.94
2007	302 ^b	318.5 ^e	.95
2008	332 ^b	372.3 ^e	.89
2009	307 ^b	409.5 ^f	.75
2010	337 ^b	450.5 ^f	.75
2011	386 ^c	495.5 ^f	.78

Notes:

1. Data are estimates provided by Telcordia based on calculations using data from publicly available documents.
2. Sources of data are as follows:

^a Data is from NeuStar Initial Public Offering Prospectus June 28, 2005,
<http://www.sec.gov/Archives/edgar/data/1265888/000104746905018344/a2160362z424b4.htm>

^b Data is from NeuStar annual 10K filing, see:
<http://www.sec.gov/Archives/edgar/data/1265888/000095013306001512/w17665e10vk.htm>
<http://www.sec.gov/Archives/edgar/data/1265888/000095013307000891/w27475e10vk.htm>
<http://www.sec.gov/Archives/edgar/data/1265888/000095013308000870/w47692e10vk.htm>
<http://www.sec.gov/Archives/edgar/data/1265888/000095013309000545/w72883e10vk.htm>
<http://www.sec.gov/Archives/edgar/data/1265888/000095012310018171/w77295e10vk.htm>
<http://www.sec.gov/Archives/edgar/data/1265888/000095012311018814/w81496e10vk.htm>

^c Data is calculated based on the fixed price and the 6.5% annual price escalation reported in the NeuStar 2010 annual 10K filing, see:
<http://www.sec.gov/Archives/edgar/data/1265888/000095012311018814/w81496e10vk.htm>

^d Data is based on the ex-Parte filing of Verizon Communications RM-11299 filed January 18, 2007.

^e Data is based on the annual 10K filing of NeuStar, see:
<http://www.sec.gov/Archives/edgar/data/1265888/000095013308000870/w47692e10vk.htm>
<http://www.sec.gov/Archives/edgar/data/1265888/000095013309000545/w72883e10vk.htm>

^f Data is calculated based on 10% annual transaction growth, provided by Telcordia as a reasonable proxy for actual transaction volumes over the last 3 years based on its knowledge.

TABLE 2
MAJOR NPAC SERVICES PROVIDERS
AND THE COUNTRIES THEY SERVE
(Number of countries served by each provider in parentheses.)

- 1. Telcordia (13)**
Chile, Egypt, Greece, India, Lithuania, Malaysia, Mexico, Pakistan, Saudi Arabia, South Africa, Thailand, Turkey, UAE.
- 2. Porting XS (8)**
Cayman Islands, Ghana, Guernsey, Isle of Man, Jersey, Kenya, Netherlands, Panama.
- 3. Systor (6)**
Bahrain, Ecuador, Luxembourg, Norway, Portugal, Qatar.
- 4. El Corte Ingles (4)**
Colombia, Dominican Republic, Peru, Spain.
- 5. NeuStar (4)**
Brazil, Canada, Taiwan, USA.
- 6. Syniverse (4)**
Finland, Hong Kong, India, Singapore.
- 7. Hewlett Packard (3)**
Czech Republic, Hungary, New Zealand.

Notes:

1. Data provided by Telcordia based on information available in press releases from vendors, from service providers/operators in the countries listed and from regulators in these countries.