

Expert Report of
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I. Qualifications and Questions to be Addressed

A. Janusz A. Ordover

1. My name is Janusz A. Ordover. I am Professor of Economics Emeritus and former Director of the Masters in Economics Program at New York University, where I have taught since 1973. During 1991-1992, I served as Deputy Assistant Attorney General for Economics at the Antitrust Division of the United States Department of Justice. As the chief economist for the Antitrust Division, I was responsible for formulating and implementing the economic aspects of antitrust policy and enforcement of the United States, including co-drafting the 1992 U.S. Department of Justice and Federal Trade Commission *Horizontal Merger Guidelines*. I also had ultimate responsibility for all of the economic analyses conducted by the Department of Justice in connection with its antitrust investigations and litigation, including economic analyses of collusion and other anticompetitive industry practices. I have written and consulted in the telecommunications sector and other network industries in the US, Australia, New Zealand, and in the EU on behalf of private parties as well as regulators. In February 2011, I was the recipient of Global Competition Review's Economist of the Year award. In April 2015, I was awarded the 2015 Who's Who Legal Competition Economist Award, which is awarded to one economist each year and is the organization's top economist award. A copy of my curriculum vitae is attached as Exhibit 1.

B. Allan L. Shampine

2. My name is Allan L. Shampine. I am an Executive Vice-President of Compass Lexecon, an economic consulting firm. I received a B.S. in Economics and Systems Analysis *summa cum laude* from Southern Methodist University in 1991, an M.A. in Economics from the University of Chicago in 1993, and a Ph.D. in Economics from the University of Chicago in 1996. I have been with Compass Lexecon (previously Lexecon) since 1996. I specialize in

applied microeconomic analysis and have done extensive analysis of network industries, including telecommunications and payment systems. I am the editor of the book *Down to the Wire: Studies in the Diffusion and Regulation of Telecommunications Technologies*, and I have published a variety of articles on the economics of telecommunications and network industries and on antitrust issues. I am an editor of the American Bar Association journal *Antitrust Source*. I have previously provided economic testimony on telecommunications and other issues for the United States Federal Communications Commission, International Trade Commission, state public utility commissions, Federal Maritime Commission, district court, Patent and Trademark Office, European Commission, Korean Fair Trade Commission, Chinese National Development & Reform Commission, Info-Communications Development Authority of Singapore, and the Australian Competition & Consumer Commission (“ACCC”). A copy of my curriculum vitae is provided as Exhibit 2.

C. Questions to be Addressed

3. We have previously been asked by counsel for nbn (formerly known as NBN Co Limited and referred to in our prior report as “NBN Co”) to provide our advice on whether certain aspects of nbn’s 2012 proposed Special Access Undertaking (“SAU”) would provide appropriate incentives for, and constraints on, nbn over the term of the SAU. In particular, we were asked to provide our expert opinion on whether, in the context of a vertically separated, wholesale-only network provider such as nbn, the proposed SAU was likely to lead to efficient investment, an efficient level of costs, and efficient and not anti-competitive pricing. We concluded that the 2012 proposed SAU provided for commonly observed, reasonable and effective methods of achieving the goals set forth by the Australian Government. In particular, we concluded that the SAU provides correct incentives for durable sunk investment, such as the billions of dollars required to build the National Broadband Network. The specified and

regulated NBN Offers provide assurance to potential customers that encourages take-up and investment, and the modular nature of the SAU allows adaptation to changing circumstances expected in a dynamic industry such as telecommunications.¹

4. We have now been briefed in respect of the changing circumstances that have led nbn to lodge a variation to the SAU. The key changes concern the addition of new technologies into the nbn technology mix:

- Greenfield areas and areas where fiber to the premises (“FTTP”) is already under construction, or has been constructed, will receive FTTP services (as originally planned). However, nbn will determine which technologies are utilized on an area by area basis so as to minimize peak funding, optimize economic returns and enhance the Company’s viability.²
- The additional networks supporting the optimized multi-technology mix (“MTM”) will include acquired elements (as distinct from constructed, although significant construction will be required to produce the final nbn networks even where some acquired elements are used as inputs) from two fixed incumbent operators – Telstra’s copper sub-loop network and hybrid fiber / coaxial cable (“HFC”) network, and Optus’s HFC network – and will see nbn’s service offerings expanded to these additional networks (*e.g.*, nbn may provide service in

1. We understand that there are some differences in the details from the SAU lodged on December 18, 2012 and the varied (*i.e.*, modified) SAU (provided by nbn on November 18, 2013 and subsequently accepted by the ACCC), but that the areas of the SAU on which our opinions are focused are substantively the same as the proposed version that we evaluated.

2. Statement of Expectations, April 8, 2014, p. 2 (“NBN Co will determine which technologies are utilised on an area-by-area basis so as to minimise peak funding, optimise economic returns and enhance the Company's viability.”).

some areas by upgrading existing HFC networks). nbn will integrate such acquired and existing networks into the rollout where it is feasible and economically beneficial, and provide for wholesale-only, open access operation of these.

5. Specifically, we have been asked by counsel for nbn to provide our advice on whether or how the Government's transition of nbn from a predominantly FTTP model (along with some fixed wireless and satellite services) to a mixture of technologies (the "optimized multi-technology mix" or "MTM" in the new Statement of Expectations, which will add Fiber-to-the-Node/Basement or "FTTN/B" and HFC technologies) would impact our original expert views. Our views are limited to the changes to the SAU arising from the MTM and, when referring to the MTM in this report, we are referring to the additional technologies (namely, FTTN, FTTB and HFC) that will be used by nbn to provide wholesale services. We are not referring to the application of the SAU to the existing technologies (*i.e.*, FTTP, wireless or satellite) which are already covered by the SAU and to which our previous report applies.

6. The key questions put to us by counsel are:

- Whether the incentives to be efficient in nbn's investment in and use of the nbn network are equally applicable to variations made to the SAU to implement the MTM, in respect of:
 - Operating and capital expenditures;
 - The pricing and services to encourage take-up of services and to drive increased usage over time; and
 - The maintenance of (or increase in) an appropriate level of quality in the supply of wholesale services to access seekers over the nbn network.

- Whether the term of the SAU is appropriate when applied to the variations made to the SAU to implement the MTM.
- Whether the modular structure and revenue constraints on nbn (*e.g.*, the long-term revenue constraint methodology, or “LTRCM”) automatically calibrate for proposed MTM changes and are applicable, credible and a reasonable means of encouraging investment in respect of such changes.
- Whether the efficiency of pricing outcomes can be expected for services provided over the additional/replacement networks given that the current intention is to extend the existing pricing mechanisms and principles to apply to new MTM-based wholesale products.
- Whether the inclusion of capital expenditure within the Regulatory Asset Base (“RAB”) and operating expenditure in the Annual Building Block Revenue Requirement (“ABBRR”) in respect of the Amended Agreements with Telstra and Optus in accordance with the existing processes in the SAU (which are automatically included in the RAB and ABBRR) are appropriate and need not be subject to separate capital expenditure prudence conditions, particularly in light of the fact that the Amended Agreements have been implemented on a value neutral basis.
- More generally, whether:
 - The capital expenditure prudence conditions already in the SAU are reasonable as a means of ensuring nbn does not deviate from efficient levels of investment during the network rollout in the context of the investment required as part of MTM;

- The incentives for effective engagement between nbn and its customers in relation to non-price terms of supply of its services will be applicable in the MTM context; and
- The incentives for efficient product development and withdrawal will be applicable in the MTM context.

7. This report proceeds as follows. We begin with a description of the background of nbn and its regulatory treatment, noting instances where that treatment is proposed to change. We then summarize our opinions. Finally, we revisit the questions, analyses and conclusions from our initial report and explain in more detail how, if at all, those conclusions differ in light of the proposed changes. To be clear, in this report we do not repeat all of our prior discussions, nor all our citations of the economic literature – the detailed bases for the conclusions in our prior report are provided in that report and not repeated here.

D. Acknowledgement

8. With respect to this report, we have read, understood and complied with the “*Practice Note CM 7: Expert Witnesses in Proceedings in the Federal Court of Australia*” supplied to us by counsel for nbn – Webb Henderson. We agree to comply with the terms of the Practice Note. Our opinions are based wholly or substantially on the specialized knowledge described above and in our curriculum vitae in Exhibits 1 and 2.

II. Background

9. Our opinions are based upon our specialized knowledge as economists, our prior report and the materials cited therein, the economics literature as cited in the bodies of the reports, and certain materials provided to us by Webb Henderson. A complete list of materials relied upon is provided in Exhibit 3. In addition to materials listed in our prior report, the materials provided to us by Webb Henderson are:

- nbn Special Access Undertaking, December 18, 2012, varied on November 18, 2013
- ACCC Assessment of Telstra’s revised Migration Plan, Final Decision, June 2015
- Statement of Expectations, April 8, 2014 (“Revised Statement of Expectations”)
- nbn, NBN Multi-Technology Deployment Principles, November 13, 2014
- nbn Wholesale Broadband Agreement – Service Levels Schedule, January 30, 2015
- nbn, HFC: Consultation Outcomes and Final Product Construct, May 2015
- Telecommunications Regulatory and Structural Reform, December 2014
- NBN non-commercial services funding options, Consultation Paper, April 1, 2015
- Background facts provided by counsel as set forth in our prior report and in the remainder of this section.³

10. We assume that the reader is generally familiar with nbn (the company), the SAU, the nbn network and the regulatory framework. However, we highlight a few facts that are of particular importance to our analysis.

11. nbn had originally been directed by the Australian Government to connect between 90 and 93 percent of Australian premises using FTTP technology, initially supporting downlink speeds of up to 100 Mbps. The remaining 7 to 10 percent of Australian premises were to be connected through a combination of wireless and satellite technology with downlink speeds of at least 12 Mbps (*i.e.*, a technology mix of FTTP, wireless and satellite was contemplated).

3. As in our prior report, we have not been asked to opine on the specifics of the methodologies, such as the precise calculation of the Regulatory Asset Base or the price levels of the NBN Offers, but rather on the economics of the overall approach and whether our opinions still apply in light of the contemplated changes.

nbn has now been directed to consider whether and how existing infrastructure can be leveraged to deliver on a revised set of download speed (and proportionate uplink speed) objectives (*i.e.*, 25 Mbps to all premises and at least 50 Mbps to 90 percent of fixed line premises as quickly as possible). In particular, nbn has revised its commercial arrangements with two of Australia's largest telecommunications companies (Telstra and Optus) to transfer ownership of a substantial part of their legacy networks (*i.e.*, copper sub-loops and HFC networks) in addition to (consistent with the previous arrangements) ceasing to provide many legacy services over those networks within an 18 month period after the nbn network is ready for service in a particular area. This will facilitate migration of retail and wholesale customers for voice and broadband services to the nbn network (with the plan originally being for Optus and Telstra to retire those networks, but with the networks now being transferred to nbn with the option to use parts of those networks in nbn's new networks).⁴ The use of existing network elements in the construction of nbn's new networks raises new issues with respect to migration that we understand have recently been addressed by the ACCC.⁵ However, the 18 month transition period remains the same. Although the arrangements between nbn, Telstra and Optus will change, we understand that the Amended Agreements have been implemented on a value neutral basis.

12. The SAU has a term of roughly 27 years and utilizes an incentive-based modular approach which proposes different terms and conditions to apply for different periods. The SAU includes a commitment by nbn to supply certain offers ("NBN Offers") from when they are introduced, unless withdrawn in accordance with the product withdrawal provisions in the SAU.

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4. We understand that Telstra's hybrid fiber network will still be used to provide Pay TV services. In order to acquire nbn network broadband services, end users will have to be connected to a retail service provider who has acquired an nbn wholesale product.
 5. See ACCC Assessment of Telstra's revised Migration Plan, Final Decision, June 2015.

Those NBN Offers and Other Charges are regulated through, among other things, specification of initial Maximum Regulated Prices in the SAU and a price increase limit of roughly CPI – 1.5% per annum.⁶

13. nbn is a wholesale-only broadband service provider, prohibited by legislation from supplying services over the nbn network to persons other than a carrier or service provider, and from owning or controlling a retail carriage service provider.⁷ nbn is also subject to stringent non-discrimination obligations.

14. nbn is subject to an LTRCM which is consistent with the “Building Block” revenue methodologies used by the ACCC and other regulators. As part of the LTRCM, an Initial Cost Recovery Account (“ICRA”) is established that is a separate regulatory account which comprises nbn’s unrecovered costs that are rolled forward each year and to which a return on capital is applied to the balance each year.⁸ By using the ICRA mechanism, nbn’s initial

6. More specifically, the individual price increase limit is specified as $(1 + \text{CPI}) \times (1 - 1.5\%) - 1$, but is referred to for simplicity in the remainder of the report as CPI – 1.5%. SAU, p. 196, §2.B.2.3.a. As specified in the SAU, the effect of the individual price increase limit is that real prices (with some limited exceptions concerning time or time and materials based charges) must decline by 1.5% or more per year, subject to nbn not having to decrease its nominal prices. That is, if CPI is below 1.5%, nbn is not required to decrease its nominal prices. There are also some NBN Offers in respect of which the Maximum Regulated Price is fixed in nominal terms until 30 June 2017, and the ACCC has the ability to determine different charges through several mechanisms (*e.g.*, a revenue neutral price rebalance or a resetting of new prices within 24 months of introduction). The ACCC is also able to review efforts to withdraw a product.

7. nbn is, in limited circumstances, permitted to also supply directly to utilities.

8. SAU, Schedule 1E. The primary components of the LTRCM are the Regulatory Asset Base (“RAB”) that represents nbn’s actual prudently incurred capital expenditure which is rolled forward each year of the initial regulatory period by adding new investments and deducting depreciation and disposals; an Annual Building Block Revenue Requirement (“ABBRR”), or regulatory revenue, which is calculated at the end of each year of the initial regulatory period and which represents a level of revenue that will allow nbn to earn a return on its RAB and cover its depreciation, actual prudently incurred operating expenditure, net taxation expenses and the cost of financing capex projects that are still in

under-recovery of its costs is capitalized and essentially forms part of the overall capital base that nbn can earn a return on over time.

15. During the Initial Regulatory Period, the SAU includes an approach to prudent expenditure which is based on the requirement that expenditures must satisfy certain conditions, such as that these are consistent with nbn’s Network Design Rules, specified Permitted Variations to those rules or, for expenditures on new network changes, that these have been endorsed by nbn’s customer base (with a role for the ACCC in the event of a dispute).⁹ The SAU also requires nbn to follow appropriate procurement processes in incurring expenditure. A conventional utility regulation approach, which provides incentives for efficient expenditure, is to be used in the Subsequent Regulatory Period, based on the provision of regular forecasts to the ACCC which, in turn, are to be assessed by the regulator as part of the overall reasonableness of the replacement modules lodged as variations to the SAU.¹⁰

III. Summary of Opinions

16. In our initial report, we noted there is rarely a single “best” approach to attaining various regulatory objectives, such as ensuring short-term and long-term economic efficiency, while satisfying a potentially wide range of other public policy constraints that may be relevant.¹¹ We concluded that the measures in the SAU were reasonable¹² and appropriate to the

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progress; and a rate of return, or cost of capital, that is calculated by reference to a risk free rate (*i.e.*, the 10 Year Australian Government bond rate, updated annually) plus 3.5 percentage points.

9. SAU, Schedule 1.D.

10. SAU, Schedule 2.C.

11. See the discussion at paragraph 21 of our initial report.

12. We understand that “reasonable” is also a legal term under the legislation. We are not lawyers and do not use the term in that legal sense.

concerns identified.¹³ The new structure with the MTM – where some parts of the legacy networks are transferred to nbn rather than retired, and nbn is directed to utilize existing infrastructure to achieve the specified expectations in a cost efficient manner – does not alter our conclusions. The SAU can and does adequately deal with the relevant concerns.

17. Importantly, because nbn is a wholesale-only entity prohibited from offering retail services, many of the most vexing concerns that often arise in designing and policing a regulatory scheme for a vertically integrated access provider do not apply. A vertically integrated access provider which also provides retail services may have an incentive and ability to discriminate in favor of its own retail services. However, structural separation of the sort implemented in Australia which led to the creation of nbn should ensure that all customers have equal access to the network, and nbn has no incentive to favor one over another. This was true with the original SAU and is also true with the MTM. As we explain in the body of this report, nbn has appropriate incentives to ensure its customers are successful, as that will increase demand for nbn’s own services and the concomitant revenue flow.

18. Our initial opinions, as we noted at the time, were based on the overall economics of the approaches detailed in the proposed SAU, and not on the specific details.¹⁴ We review each of our opinions below in detail, but in broad terms, we perceive no changes that would impact our opinions. At the time we prepared our prior report, nbn had multiple options for

13. See paragraph 21 of our initial report. Although we note that the CPI – 1.5% individual price increase limits may require modification at some point if real prices fall to the point at which they interfere with nbn’s ability to receive a return on its investments. More generally, we assume that the reporting mechanisms required of nbn will produce useful, high quality information, reducing any concerns about asymmetric information between nbn and the regulator, and we do not discuss issues of “regulatory capture”.

14. See paragraph 26 of our initial report.

building out its network, including FTTP, wireless and satellite. The proposed build-out would have substantial cost, and reasonable mechanisms were therefore contemplated to ensure efficient incentives for investment and to regulate the price and quality of the service offerings. Now, the construction options would be somewhat different, but the cost is still substantial, and the same mechanisms to ensure efficient incentives for investment will equally apply to the MTM.

19. To be clear, the MTM will result in physical networks that are different than would occur without the MTM. More specifically, nbn is required to meet certain expectations as to product speeds and offerings. However, without the MTM, nbn was further constrained by being required to construct FTTP in the majority of areas, with some wireless and satellite.¹⁵ The Revised Statement of Expectations sets forth expectations as to product speeds and offerings, but allows for the possibility that those requirements can be met through upgrading existing infrastructure – a less costly alternative than Greenfield construction of FTTP.¹⁶ The MTM and SAU can be expected to meet the policy goal of achieving the product speed and offering expectations in a cost efficient manner.¹⁷ That is, nbn’s incentives will be to minimize

15. It has always been contemplated that different technologies might have somewhat different product offerings (*e.g.*, satellite and wireless offerings were never contemplated to include higher speed tiers that would be available under FTTP).

16. The impact on consumers of the construction process may be different, but it is not clearly larger or smaller. Some consumers might lose service during an upgrade of an existing network that might not lose service with an overbuild (*i.e.*, construction of a brand new network that is running at the same time as the legacy network). On the other hand, the construction process involved with an upgrade may be less disruptive to consumers overall than constructing entirely new infrastructure in every area and then retiring the old infrastructure.

17. Given the constraints on construction possibilities. The relaxation of some of those constraints by providing more construction options – including the possibility of using existing infrastructure rather than simply discarding it – allows for reduced costs.

costs and transition time while investing in a prudent and efficient manner and meeting the service expectations imposed upon it.

20. The primary concern that might arise from transferring the legacy networks to nbn's control is that nbn might then have incentives to slow the construction of and transition to the nbn network. In fact, that is not a concern here. First, the 18 month migration window remains unchanged. Second, even within that timeframe, nbn will have incentives to transition customers from the legacy networks as quickly as possible. This is because, while Telstra will continue to provide legacy network wholesale and retail services, the only revenue that nbn will accrue from Telstra from operation of the legacy networks will be "value neutral." We understand that this means Telstra's profits will be unaffected and nbn will be compensated only for the direct costs of operating and maintaining the network.¹⁸ Indeed, there will be an opportunity cost to nbn of having customers remain on the legacy network that was not present before, as nbn will have to expend funds because it will be required to operate and maintain the legacy networks. Thus, nbn will have incentives to transfer customers from the legacy network as expeditiously as possible, even more so than without the MTM.

21. The ability to use existing infrastructure as part of the construction of the nbn network rather than simply retiring such infrastructure – effectively throwing away potentially billions of dollars of sunk investments – will clearly allow for more efficient construction of networks that meet the expectations set forth for the nbn network. Those networks will not be the same as without the MTM (*i.e.*, they will include large elements of HFC and FTTN/B rather than being predominantly FTTP), but the upgrading of existing infrastructure is an economically

18. We understand the same framework applies to Optus.

reasonable policy that makes efficient use of available assets.¹⁹ Given nbn's operation as a wholesale-only entity (as required by law) and the other regulatory structures we discussed in our prior report, and below, the MTM does not raise any new concerns with respect to pricing, discrimination against or between customers, or investment. Rather, under the SAU and the MTM, nbn will have incentives to meet the policy goals it is presented with – to use existing infrastructure in an efficient manner while providing services that meet the specified expectations.

IV. Economic Issues of Concern

22. In this section we review major topics that we explored in our initial report. We explain the opinions we reached initially, and then explain how those opinions apply to the MTM.

19. As a general matter, it is economically efficient to use existing infrastructure until the expected demand justifies upgrading or replacing it (*e.g.*, when the net benefit of extending the use of the old network exceeds the new benefit of speeding up the investment, taking into account that there is some benefit in waiting simply due to uncertainty about the course of the future – see, for example, Avinash Dixit & Robert Pindyck, *Investment Under Uncertainty*, Princeton University Press, 2004). There can be differing expectations as to future demand and costs, leading to different decisions in practice. Furthermore, private incentives may differ from public incentives, such as when an upgrade may produce social benefits that the network operator does not directly profit from. As we discuss in more detail in the body of our report, the choice of whether to meet the given speed and product goals with, say, an upgraded HFC network rather than an FTTP network is a policy decision grounded in, among other things, implicit expectations as to future demand, the course of technological development, the cost of capital, and the presence of externalities. Such a decision is also implicitly based on expectations as to the course of future upgrades (*e.g.*, an FTTP network is likely to cost substantially more in the short-term, but may, or may not, require less expense for upgrades in the future, depending upon how demand and technology develop). We take the policy decision to achieve the expected speed and product goals using the lower cost options of FTTN/B and HFC as given.

A. Incentives for Investment

23. We begin by examining the question of incentives for investment in the network infrastructure. The Australian Government has stated that its central objective in this case is “completing the National Broadband Network (‘NBN’) and ensuring all Australians have access to very fast broadband as soon as possible, at affordable prices, and at least cost to taxpayers.”²⁰ The initial roll-out of the National Broadband Network was anticipated to cost tens of billions of dollars.²¹ While the use of the multi-technology nbn network is expected to lower this cost, it is still expected to be a substantial investment by any measure and one which for the most part will be sunk.²² Firms make such investments in anticipation of earning profits, *i.e.*, at least a risk-adjusted normal rate of return on the investments. If the risk-adjusted, expected profits on an investment are insufficient, then the firm will not make the investment or will scale back on its investment plans. In the regulatory context, sunk aspects of the investment create a concern that after a firm has made an investment, the regulator may “expropriate” that investment by materially reducing (or even eliminating) the allowable return.²³ Fears of such expropriation have significantly reduced infrastructure investments in many countries.²⁴

20. Revised Statement of Expectations, at 1. Of course, there can be some tensions between these goals, as speed can add to cost. The MTM, for example, reflects a change in the relative priorities of some goals.

21. In Australian dollars. nbn Corporate Plan 2012-2015, at 10, 71. Original Statement of Expectations, at 11 and 12.

22. Revised Statement of Expectations, at 1.

23. Mark Armstrong & David Sappington, "Recent Developments in the Theory of Regulation," in *Handbook of Industrial Organization*, M. Armstrong and R. Porter (eds), 2007, at 1631-1632.

24. See, for example, Paul Levine, John Stern and Francesc Trillas, "Utility price regulation and time inconsistency: comparisons with monetary policy" *Oxford Economic Papers* 2005, 57, at 449; and B. Levy and P. Spiller (eds) (1996) *Regulations, Institutions and Commitment*, Cambridge University Press, Cambridge, at 2. At the same time, a legal monopolist subject to regulatory oversight is to a significant extent protected from the

24. As we explained in our prior report, the usual solution to such concerns is a credible commitment to not expropriate firms' investments.²⁵ While we did not opine on the individual components of the LTRCM formulae in the SAU,²⁶ based on our knowledge and experience, we concluded that the general approach of using a credible long-term commitment to a rate of return acceptable to the investors is commonly used and is a reasonable and effective means of encouraging durable sunk investment. Thus, the SAU is likely to engender investments in the National Broadband Network sufficient to obtain the specified network scope.

25. The addition of more options for build-out does not change any of our opinions. While the total cost of build-out is likely to be somewhat lower as a result of the MTM,²⁷ the cost will be very large, the potential concerns about risk and expropriation will equally apply to the MTM, and the regulatory mechanisms adopted in the SAU to engender efficient investment will be reasonable and effective. If anything, the reduction in total cost will provide further assurance that nbn will be able to obtain sufficient investment to construct the nbn network.

B. Impact on Efficiency and Quality

26. We discussed in our prior report whether and how the SAU would affect incentives to control costs and maintain quality. We addressed these incentives together because

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- rigors of market competition which should reduce the risk from investment. Such reduction in risk can, all else being equal, encourage investment.
25. See paragraphs 25 and 26 of our initial report.
26. Although we did note that rate of return regulation is an effective means of encouraging investment for a broad class of rate base rules. We discuss the economic literature in more detail in our previous report.
27. Specifically, we understand that the Amended Agreements have been implemented on a value neutral basis. However, the original plan was simply to retire the legacy networks. nbn will now have the option of using at least some pieces of those legacy networks as inputs into the construction of the National Broadband Network, rather than having to undertake more extensive network construction.

they are often closely related. In particular, strong incentives to control costs may also create incentives to reduce quality.²⁸ Indeed, a recognized issue with price caps is that quality may suffer as a result.

27. As we explained, rate of return regulation, with its low-powered incentives, is very effective at providing incentives for durable sunk investment, but has limited ability to encourage cost reductions. At the same time, rate of return regulation does not typically raise concerns about under-provision of quality. To the contrary, one concern with rate of return regulation is the possibility of “gold plating.” On the other hand, high-powered incentive schemes, such as price-caps, can discourage provision of quality. The SAU contains elements of both rate of return regulation and price caps, providing mechanisms to address both potential “gold plating” and potential under-provision of quality. With respect to the former, to encourage efficient development and operation of the network, the SAU includes a process for determining whether investments and expenses are “prudent.” These requirements are explicit in the Initial Regulatory Period and implicit in the Subsequent Regulatory Period through the ACCC’s approval of forecast spending through the Replacement Module Application process.²⁹ Such measures are a common and reasonable means of addressing potential overinvestment and can lead to more efficient investment than could have been achieved by the rate of return regulation alone. Specified *ex ante* criteria for prudence also help protect against the use of *ex post* reviews as another means of expropriation.

28. In the Subsequent Regulatory Period, the LTRCM functions as a revenue cap based on forecast demand and costs (although that cap will not be binding until after nbn

28. See paragraphs 27 to 33 of our initial report.

29. The requirements to be found “prudent” are spelled out (primarily) in §§1.D.4 and 1.D.6 and 2.C of the SAU.

recovers its initial investment), but nbn will bear at least some of the risk and rewards of demand and cost variations. Thus, if nbn can reduce costs more than forecast, it will reap the rewards, as with a price cap. This approach will provide similar incentives to price caps for reducing costs (we discuss incentives related to quality below). The SAU thus provides an appropriate mix of incentives to achieve an efficient level of costs associated with the construction and operation of the network and common and reasonable safeguards against overinvestment.

29. The SAU also includes a set of price caps for the NBN Offers. Price caps are effective at providing incentives for firms to minimize costs. However, unlike rate of return regulation, they also raise concerns about quality, as cost reductions may reduce quality below the level consistent with the objectives of the regulator. We explained in our prior report that if the price caps are not binding, then they are unlikely to raise concerns about reduced quality. Even if the price caps are binding, the ACCC retains the ability to step in should nbn's quality commitments made in contractual agreements be deemed inadequate. The SAU and the overall contractual and regulatory framework is thus conducive to the maintenance of an appropriate level of quality in the supply of wholesale service to access seekers over the nbn network.

30. Our prior opinions did not hinge upon the precise options available to nbn for building its network. The same regulatory structure will apply with the proposed changes, and the same appropriate incentives to achieve an efficient level of costs will apply to the MTM. The same quality assurances will still be in place. The availability of a lower cost construction option does not, by itself, weaken those assurances. To the contrary, the fact that the network to provide those service offerings may be constructed at a somewhat lower cost is an additional benefit in that fewer resources are needed to achieve the goal, and some ongoing benefit can be derived from prior investments rather than simply retiring the fruits of those investments.

C. Pricing

31. In our prior report, we discussed the efficiency and incentives related to nbn's pricing starting from the premise that uniform national wholesale pricing and price caps were required. That is, we took the cross subsidies inherent in such a system as a given. We understand that uniform national wholesale pricing is no longer part of the Government's Statement of Expectations, although it is the Government's expectation that nbn will maintain a wholesale price cap approach under which nbn's wholesale prices will not be increased in either urban or regional areas above the current levels approved by the ACCC in the SAU to provide nbn with scope to reduce prices in some areas where this is necessary for nbn to respond to competition.³⁰ Those parts of our prior report discussing uniform national wholesale pricing are thus no longer relevant, but the remaining discussion, and, in particular, the discussion concerning how the SAU impacts incentives for pricing and investment, is relevant.

32. We explained in our prior report that there is some tension between the desire to induce investment in areas where the market has not resulted in such investment and the desire to maintain low prices and limit the returns earned by nbn. The rate of return regulation specifies the allowed margin (over the 10 year government bond rate) for the Initial Regulatory Period, and that margin does not change with the MTM. nbn's pricing flexibility is limited by the price caps, but, as we explained in our prior report, nbn has incentives to price in such a way as to encourage take-up of its services. Encouraging take-up initially can yield great dividends down the road. Similarly, pricing too high initially could stunt industry development and cost nbn significant profits in later years. That is, nbn has incentives under the SAU – incentives that do

30. Telecommunications Regulatory and Structural Reform, December 2014, §2.4.

not change with the MTM – to price in such a way as to ensure the growth of downstream services, provided, of course, that it receives some upside from such pro-growth policies, which the SAU allows for.

33. The NBN Offers, which cannot be withdrawn without the oversight of the ACCC, also serve an important function by providing assurance about potential costs to customers of nbn, including assurance that nbn will not attempt to take advantage of customers by raising prices after the customers make investments, and by reducing uncertainty as to what prices will be available. This certainty stimulates downstream incentives for investment and take-up of nbn's services. There will be additional NBN Offers under the MTM, but they will serve the same function of providing assurance about costs to customers of nbn's wholesale services.

34. Because nbn is not a vertically integrated access provider and thus does not compete in downstream markets, it does not have incentives to discriminate in an anticompetitive manner against its downstream customers. In addition, nbn is subject to explicit non-discrimination obligations. Overall, nbn has incentives to price in a manner which encourages the development of downstream markets. Nothing in the proposed changes to the SAU and the transition to MTM will undermine those incentives.

D. Introduction and Withdrawal of Products

35. As we discussed in our prior report, nbn generally has incentives to offer its customers products its customers wish to purchase. As a vertically separated wholesale supplier, nbn has no incentive to withhold desired products to advantage its own (nonexistent) retail operations. That is, nbn still has incentives to offer new products, while consumers are protected by the ACCC's ability to intervene on proposed withdrawal of products, and by the requirement that, once introduced, prices for the new products also decline at specified rates over time in real terms.

36. One potential change in incentives for the introduction of new products from the proposed MTM changes is that it is possible that some new products might be less costly to introduce on particular types of network (*e.g.*, the cost to introduce a new product on an FTTP network might be different than on an upgraded HFC network). That is, the proposed changes will allow nbn to provide the NBN Offers at a lower total cost than if it were required to eliminate all of the existing networks and replace them with fiber-to-the-premises, but the total potential bandwidth, for example, of a network using HFC for the final connection to the consumer premises may be lower than if the final connection were fiber. Potential future service offerings that require more capacity than the HFC connection could provide might be less likely to be introduced at a given date because the incremental cost of providing them would be greater (*i.e.*, a further network upgrade might be necessary to provide the service).³¹ To be clear, the regulatory structure discussed above is appropriate and effective given specified policy goals. The incremental cost of providing some new service offerings may be different if the underlying network is different, but, given the structure of the network, nbn will still have appropriate incentives to introduce new services at appropriate prices. It is a policy question as to whether the Government wishes to attempt to “future-proof” the nbn network by requiring more extensive deployment of FTTP (paying now in anticipation of future need), or to lower construction costs, likely by billions of dollars, by meeting the specified expectations for the nbn network now while waiting to see how demand develops before making further investments.³²

One risk of attempting to “future-proof” a network is that technology may end up developing in

31. The effects of prior investments on deployment of new generations of technology can be complex. For example, older networks may sometimes “leap-frog” generations of technology.

32. We also note that the Revised Statement of Expectations provides that “NBN Co will ensure upgrade paths are available as required.”

different directions, ultimately stranding the investment. For example, Sprint (a telecommunications company in the United States) had deployed a 4G wireless network based on WiMAX, but is in the process of shutting that network down and deploying an LTE based 4G network instead.³³ Given the Government's mandate to provide specified services in the most efficient and lowest-cost manner available, the SAU provides appropriate and reasonable incentives to ensure that result.

E. Non-Price Terms

37. Vertically integrated firms which supply both access and retail services may have an incentive to disadvantage access customers (*e.g.*, raise rivals' costs). When prices are regulated, firms may attempt to disadvantage rivals through non-price terms. Here, however, nbn is not permitted to offer retail services. Such vertical separation is one means of aligning the incentives of the access provider and its customers and inducing higher levels of service quality.³⁴ That is, all of nbn's revenues will derive from wholesale services. Since nbn's rate of return will be regulated, nbn can increase total profits by increasing its volume of sales. Accommodating customers with respect to non-price terms can increase sales by increasing quality (and reducing quality-adjusted prices). Furthermore, to the extent that accommodating non-price terms will increase nbn's operating expenses, nbn will have the opportunity to recover those costs under the LTRCM and so is likely to accommodate such requests from customers as long as these expenditures are considered to be prudent. Thus, under the SAU, nbn has incentives for effective engagement with its customers on the issue of the non-price terms of its

33. See Sprint frequently asked questions about the WiMAX network shutdown, available at <https://community.sprint.com/baw/community/sprintblogs/announcements/blog/2015/04/29/faqs-about-the-wimax-network-shutdown>.

34. David Sappington, "Regulating Service Quality: A Survey," *Journal of Regulatory Economics*, (2005) 27(2) at 145.

services. Non-price terms are also subject to regulatory oversight by the ACCC, providing further protection for consumers. Nothing in the proposed changes impacts our opinions with respect to the regulation of non-price terms under the SAU. The same protections will apply to the MTM, and the addition of some new network construction options will not impact the incentives concerning non-price terms for NBN Offers.³⁵

F. Timing and Structure of the SAU

38. The structure of the SAU must balance the need to provide certainty for investing significant capital in long-lived infrastructure with the fact that telecommunications is a dynamic and rapidly changing industry, making it difficult to specify contractual and other terms far in advance. The SAU provides for the former by setting in place a framework assuring that nbn will have the opportunity to recover its investment, along with a reasonable rate of return, over a lengthy period. It is appropriate for the SAU to specify a longer period during which explicit regulation is in place in relation to the recovery of nbn's initial investment. By the same token, once the investment has been earned back, the ICRA will have served its purpose and it is appropriate to switch the regulatory regime to a "building block" approach in which the revenue cap specified by the ABBRR becomes binding.

39. The same uncertainty referred to above raises concerns about specifying detailed terms far in advance. The modular structure of the SAU addresses this risk by providing

35. Our initial opinions applied also to future offerings, whose precise service characteristics are, by definition, unknown. Even if a change in the physical network resulted in changes in the types of future service offerings that might be made available, the existing regulatory framework should still provide appropriate incentives and protections with regards to non-price terms and conditions. That is, our opinions in this regard are not contingent upon any particular underlying physical network. They applied equally to wireless and satellite offerings as to FTTP in our initial report, and apply to FTTN/B and HFC here.

significant detail for the Initial Regulatory Period and then setting out key principles to be implemented in a series of three to five year regulatory cycles for the remaining years (the “Subsequent Regulatory Period”). Together, these mechanisms are reasonable and appropriate methods for providing flexibility needed for addressing industry changes and concerns that may arise while still providing adequate assurance to investors as to their likely potential returns. They are reasonable and appropriate in respect of the proposed changes to encompass additional technologies, as part of the MTM.

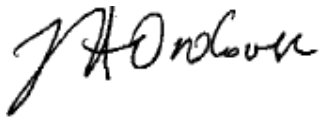
G. Other Issues

40. We have also been asked to consider whether the inclusion of capital expenditure within the RAB and operating expenditure in the ABBRR in respect of the Amended Agreements in accordance with the existing processes in the SAU (which do not subject the inclusion of such expenditure to direct regulatory scrutiny) are appropriate and need not be subject to separate capital expenditure prudence conditions, particularly in light of the fact that the Amended Agreements have been implemented on a value neutral basis. We believe that they are. The change is that rather than shutting down all of the existing networks, some use may be made of certain components of those networks, subject to the Government’s stated objectives discussed earlier for nbn to provide various services of specified quality (*e.g.*, the NBN Offers). The addition of new construction options should allow nbn to meet the specified network expectations at a lower total cost, and the treatment of the expenditure for the acquisition of the existing networks is appropriate.

V. DECLARATION

41. We declare that we have made all the inquiries that we believe are desirable and appropriate and that no matters of significance that we regard as relevant have, to our knowledge, been withheld from the ACCC or the Court.

Janusz Ordoover



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March 24, 2016

Allan Shampine



.....

March 24, 2016

Exhibit 1: Curriculum Vitae of Janusz Ordover

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EDUCATION

- 1968-1973 Columbia University, New York, New York
Graduate Department of Economics and European Institute of the School of International Affairs
Doctoral Dissertation: Three Essays on Economic Theory (May 1973). Ph.D. 1973.
- 1967-1968 McGill University, Montreal, Canada
Departments of Economics and Political Science
- 1963-1966 Warsaw University, Warsaw, Poland
Department of Political Economy. B.A. (equiv.), 1966.

HONORS

- 2016 “2016 Competition Economist of the Year” voted by Who’s Who Legal
- 2015 “2015 Competition Economist Individual Expert of the Year” voted by Who’s Who Legal
- 2011 “The Economist of the Year 2010” voted by the Global Competition Review
- 1973 Columbia University: Highest distinction for the doctoral dissertation
- 1971-1972 Columbia University: Honorary President's Fellow
- 1969-1971 Columbia University: President's Fellow
- 1967-1968 McGill University: Honors Student
- 1964, 1965 Warsaw University: Award for Academic Achievement, Department of Political Economy
- Who's Who in the World
Who's Who in America
Who's Who in the East

PROFESSIONAL EXPERIENCE

June 1982 - 2015 Professor of Economics
Department of Economics, New York University, New York, New York

Sept. 1996 - Aug. 2001 Director of Masters in Economics Program
Department of Economics, New York University, New York, New York

Summer 1996-2000 Lecturer
International Program on Privatization and Reform
Institute for International Development, Harvard University, Cambridge, Massachusetts

Aug. 1991 - Oct. 1992 Deputy Assistant Attorney General for Economics
Antitrust Division
United States Department of Justice, Washington, D.C.

Sept. 1989 - July 1990 Visiting Professor of Economics
School of Management, Yale University, New Haven, Connecticut

Lecturer in Law
Yale Law School

Mar. 1984 - June 1988 Visiting Professor of Economics
Universita Commerciale "Luigi Bocconi," Milan, Italy

June 1982 - Feb. 1985 Director of Graduate Studies
Department of Economics, New York University

Sept. 1982 - June 1986 Adjunct Professor of Law (part-time)
Columbia University Law School, New York, New York

Feb. 1982 - June 1982 Acting Director of Graduate Studies
Department of Economics, New York University

June 1978 - June 1982 Associate Professor of Economics
Department of Economics, New York University

Sept. 1979 - May 1990 Lecturer in Economics and Antitrust
New York University Law School

Sept. 1977 - June 1978 Member, Technical Staff
Bell Laboratories, Holmdel, New Jersey

Associate Professor of Economics
Columbia University

Visiting Research Scholar
Center for Law and Economics, University of Miami, Miami, Florida

Sept. 1973 - Aug. 1977 Assistant Professor of Economics
New York University

Summer 1976 Fellow, Legal Institute for Economists,
Center for Law and Economics, University of Miami

Summer 1976 Visiting Researcher Bell Laboratories, Holmdel, New Jersey

OTHER PROFESSIONAL ACTIVITIES

2011 Organizer
Session on the 2010 Agencies Horizontal Merger Guidelines, 2011 Spring Meetings, Antitrust Section,
American Bar Association, Washington DC

2010 – present Member
ABA Section of Antitrust Law, Economics Task Force

2006 - present Special Consultant
Compass Lexecon (formerly Compass)/FTI Company, Washington, D.C.

2003 - 2006 Director
Competition Policy Associates, Inc. (“Compass”), Washington, D.C.

1997 – 1999 Consultant
Inter-American Development Bank, Washington, D.C.

1997 – 2009 Board of Editors
Antitrust Report

1995 – 2001 Consultant
The World Bank, Washington, D.C.

1998 – 2004 Senior Consultant
Applied Economic Solutions, Inc., San Francisco, California

1995 - 2000 Senior Affiliate
Cornerstone Research, Inc., Palo Alto, California

Various Testimony at Hearings of the Federal Trade Commission

1994 - 1996 Senior Affiliate
Law and Economics Consulting Group, Emeryville, California

1994 - 2000 Senior Affiliate
Consultants in Industry Economics, LLC, Princeton, New Jersey

1993 - 1994 Director
Consultants in Industry Economics, Inc., Princeton, New Jersey

1992 - 1993 Vice-Chair (*pro tempore*)
Economics Committee, American Bar Association, Chicago, Illinois

1990 - 1991 Senior Consultant
1992 - 1995 Organization for Economic Cooperation and Development, Paris, France

1991 Member
Ad hoc Working Group on Bulgaria's Draft Antitrust Law
The Central and East European Law Initiative

American Bar Association

1990 - 1991 Advisor
Polish Ministry of Finance and Anti-Monopoly Office
Warsaw, Poland

1990 - 1991 Member
Special Committee on Antitrust
Section of Antitrust Law, American Bar Association

1990 - 1991 Director and Senior Advisor
Putnam, Hayes & Bartlett, Inc., Washington, D.C.

1990 - 1996 Member
Predatory Pricing Monograph Task Force
Section of Antitrust Law, American Bar Association

1989 Hearings on Competitive Issues in the Cable TV Industry
Subcommittee on Monopolies and Business Rights of the Senate Judiciary Committee
Washington, D.C.

1989 Member
EEC Merger Control Task Force, American Bar Association

1988 - present Associate Member
American Bar Association

1987 - 1989 Adjunct Member
Antitrust and Trade Regulation Committee, The Association of the Bar of the City of New York

1984 Speaker, “Industrial and Intellectual Property: The Antitrust Interface”
National Institutes, American Bar Association, Philadelphia, Pennsylvania

1983 - 1990 Director
Consultants in Industry Economics, Inc.

1982 Member
Organizing Committee
Tenth Annual Telecommunications Policy Research Conference, Annapolis, Maryland

1981 Member
Section 7 Clayton Act Committee, Project on Revising Merger Guidelines
American Bar Association

1980 Organizer
Invited Session on Law and Economics
American Economic Association Meetings, Denver, Colorado

1978 - 1979 Member
Department of Commerce Technical Advisory Board
Scientific and Technical Information Economics and Pricing Subgroup

1978 – present Referee for numerous scholarly journals, publishers, and the National Science Foundation

MEMBERSHIPS IN PROFESSIONAL SOCIETIES

American Economic Association
American Bar Association

PUBLICATIONS

A. Journal Articles

- “Exclusionary Discounts,” with Greg Shaffer, *International J. of Industrial Org.*, vol. 31, 569-86, September 2013
- “Coordinated Effects in Merger Analysis: An Introduction,” *Columbia Bus. Law Review*, No. 2, 2007, 411-36.
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- “Archimedean Leveraging and the GE/Honeywell Transaction,” with R. J. Reynolds, *Antitrust Law Journal*, vol. 70, no. 1, 2002, 171-98.
- “Entrepreneurship, Access Policy and Economic Development: Lessons from Industrial Organizations,” with M. A. Dutz and R. D. Willig, *European Economic Review*, vol. 4, no. 4-6, May 2000.
- “Parity Pricing and its Critics: Necessary Condition for Efficiency in Provision of Bottleneck Services to Competitors,” with W. J. Baumol and R. D. Willig, *Yale Journal on Regulation*, vol. 14, Winter 1997, 146-63.
- “Competition and Trade Law and the Case for a Modest Linkage,” with E. Fox, *World Competition, Law and Economics Review*, vol. 19, December 1995, 5-34.
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“Costly Litigation and the Tort Law: Single Activity Accidents,” *Journal of Legal Studies*, June 1978, 243-261.

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B. Books and Monographs

Proceedings of the Tenth Annual Telecommunications Policy Research Conference, editor with O. Gandy and P. Espinosa, ABLEX Publishers, 1983.

Obstacles to Trade and Competition, with L. Goldberg, OECD, Paris, 1993.

Predatory Pricing, with William Green, *et al.*, American Bar Association, Section of Antitrust Law, Monograph 22, 1996.

C. Book Chapters

“Coordinated Effects: Evolution of Practice and Theory,” with J. Jayaratne, chap. 21, in R.D. Blair and D.D. Sokol (eds.), *The Oxford Handbook of International Antitrust Economics*, Oxford U.P., 2015, 509-28.

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“Transition to a Market Economy: Some Industrial Organization Issues,” with M. Iwanek, Chap. 7 in H. Kierzkowski, *et al.* (eds.), *Stabilization and Structural Adjustment in Poland*, Routledge, 1993, 133-170.

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“The Department of Justice 1988 Guidelines for International Operations: An Economic Assessment,” with A.O. Sykes, in B. Hawk (ed.), *European/American Antitrust and Trade Laws*, Matthew Bender, 1989, 4.1-4.18.

“Predation, Monopolization, and Antitrust,” with G. Saloner, in R. Schmalensee and R.D. Willig (eds.), *Handbook of Industrial Organization*, vol. 1, North Holland, 1989, 538-596.

“Supervision Technology, Firm Structure, and Employees' Welfare,” in *Prices, Competition and Equilibrium*, M. Peston and R.E. Quandt (eds.), Philip Allan Publishers, Ltd., 1986, 142-163.

“Perspectives on Mergers and World Competition,” with R.D. Willig, in *Antitrust and Regulation*, R. Grieson (ed.), Lexington Books, 1986, 201-218.

“Transnational Antitrust and Economics,” in *Antitrust and Trade Policies in International Trade*, B. Hawk (ed.), Matthew Bender, 1985, 233-248.

“Pricing of Interexchange Access: Some Thoughts on the Third Report and Order in FCC Docket No. 78-72,” in *Proceedings of the Eleventh Annual Telecommunications Policy Research Conference*, Vincent Mosco (ed.), ABLEX Publishers, 1984, 145-161.

“Non-Price Anticompetitive Behavior by Dominant Firms Toward the Producers of Complementary Products,” with A.O. Sykes and R.D. Willig, in *Antitrust and Regulation: Essays in Memory of John McGowan*, F. Fisher (ed.), MIT Press, 1985, 315-330.

“Local Telephone Pricing in a Competitive Environment,” with R.D. Willig, in *Regulating New Telecommunication Networks*, E. Noam (ed.), Harcourt Brace Jovanovich, 1983, 267-289.

“An Economic Definition of Predatory Product Innovation,” with R.D. Willig, in *Strategy, Predation and Antitrust Analysis*, S. Salop (ed.), Federal Trade Commission, 1981, 301-396.

“Marginal Cost,” in *Encyclopedia of Economics*, D. Greenwald (ed.), McGraw-Hill, 2nd ed. 1994, 627-630.

“Understanding Economic Justice: Some Recent Development in Pure and Applied Welfare Economics,” in *Economic Perspectives*, M. Ballabon (ed.) Harwood Academic Publishers, vol. 1, 1979, 51-72.

“Problems of Political Equilibrium in the Soviet Proposals for a European Security Conference,” in *Columbia Essays in International Affairs*, Andrew W. Cordier (ed.) Columbia University Press, New York, 1971, 1951-197

D. Other Publications

“Intellectual Ventures v. Capital One: Can Antitrust Law and Economics Get Us Past the Trolls?” with Michelle Miller, *Competition Policy International*, vol. 1, No. 2, Winter 2015, available at <https://www.competitionpolicyinternational.com/intellectual-ventures-v-capital-one-can-antitrust-law-and-economics-get-us-past-the-trolls/>

“Implementing the FRAND Commitment,” with Allan Shampine, *Antitrust Source*, October 2014, available at http://www.americanbar.org/content/dam/aba/publishing/antitrust_source/oct14_full_source.authcheckdam.pdf

“Economics and Competition Policy: A Two-sided Market?” with Jith Jayaratne, *Antitrust Magazine*, vol. 27, No. 1, Fall 2012, pp. 78-80.

“Editorial: Thinking about coordinated effects,” with Jith Jayaratne, *Concurrences 3-2012*, September 2012.

“The 2010 Horizontal Merger Guidelines: A Static Compass in a Dynamic World,” with Jay Ezrielev, *Antitrust Source*, October 2010, available at www.antitrustsource.com.

“The Economics of Price Discrimination,” with Doug Fontaine and Greg Shaffer, in *The Economics of the Internet, The Vodafone Policy Paper Series*, No. 11, April 11, 2010, 27-51.

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“Economic Analysis in Antitrust Class Certification: *Hydrogen Peroxide*,” with Paul Godek, *Antitrust Magazine*, vol. 24, No. 1, Fall 2009, pp. 62-65.

“Comments on Evans & Schmalensee’s ‘The Industrial Organization of Markets with Two-Sided Platforms.’” *Competition Policy International*, vol. 3(1), Spring 2007, 181-90.

“Safer Than A Known Way? A Critique of the FTC’s Report on Competition and Patent Law and Policy,” with I. Simmons and D. A. Applebaum, *Antitrust Magazine*, Spring 2004, 39-43.

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“The Role of Efficiencies in Merger Assessment: The 1997 Guidelines,” *Antitrust Report*, September 1997, 10-17.

“Bingaman’s Antitrust Era,” *Regulation*, vol. 20, No. 2, Spring 1997, 21-26.

“Competition Policy for High-Technology Industries,” *International Business Lawyer*, vol. 24, No. 10, November 1996, 479-82.

“Internationalizing Competition Law to Limit Parochial State and Private Action: Moving Towards the Vision of World Welfare,” with E.M. Fox, *International Business Lawyer*, vol. 24, No. 10, November 1996, 458-62.

“Economists’ View: The Department of Justice Draft for the Licensing and Acquisition of Intellectual Property,” *Antitrust*, vol. 9, No. 2, Spring 1995, 29-36.

“Competition Policy During Transformation to a Centrally Planned Economy: A Comment,” with R.W. Pittman, in B. Hawk (ed.), *1992 Fordham Corporate Law Institute*, 533-38.

“Poland: The First 1,000 Days and Beyond,” *Economic Times*, vol. 3, no. 9, October 1992, 6-7.

“Interview: Janusz A. Ordo: A Merger of Standards? The 1992 Merger Guidelines,” *Antitrust*, vol. 6, no. 3, Summer 1992, 12-16.

“Interview: U.S. Justice Department’s New Chief Economist: Janusz A. Ordo,” *International Merger Law*, no. 14, October 1991.

“Poland: Economy in Transition,” *Business Economics*, vol. 26, no. 1, January 1991, 25-30.

“Economic Analysis of Section 337: Protectionism versus Protection of Intellectual Property,” with R.D. Willig, in *Technology, Trade and World Competition*, JEIDA Conference Proceedings, Washington, D.C., 1990, 199-232.

“Eastern Europe Needs Antitrust Now,” with E. Fox, *New York Law Journal*, November 23, 1990, 1-4.

“Understanding Econometric Methods of Market Definition,” with D. Wall, *Antitrust*, vol. 3, no. 3, Summer 1989, 20-25.

“Proving Entry Barriers: A Practical Guide to Economics of Entry,” with D. Wall, *Antitrust*, vol. 2, no. 2, Winter 1988, 12-17.

“Proving Predation After Monfort and Matsushita: What the New ‘New Learning’ has to Offer,” with D. Wall, *Antitrust*, vol. 1, no. 3, Summer 1987, 5-11.

“The Costs of the Tort System,” with A. Schotter, Economic Policy Paper No. PP-42, New York University, March 1986. Reprinted in *Congressional Record*, U.S. Government Printing Office, Washington, D.C., 1987.

“An Economic Definition of Predation: Pricing and Product Innovation,” with R.D. Willig, Report for the Federal Trade Commission, October 1982, 131 pp.

“Market Power and Market Definition,” with R.D. Willig, Memorandum for ABA Section 7 Clayton Act Committee, Project on Revising the Merger Guidelines, May 1981.

“Herfindahl Concentration Index,” with R.D. Willig, Memorandum for ABA Section 7 Clayton Act Committee, Project on Revising the Merger Guidelines, March 1981.

“Public Interest Pricing of Scientific and Technical Information,” Report for the Department of Commerce Technical Advisory Board, September 1979.

“Economics of Property Rights as Applied to Computer Software and Databases,” with Y.M. Braunstein, D.M. Fischer, W.J. Baumol, prepared for the National Commission on New Technological Uses of Copyrighted Works, June 1977, 140 pp. Reprinted in part in *Technology and Copyright*, R.H. Dreyfuss (ed.), Lemond Publications, 1978.

Book review of O. Morgenstern and G.L. Thompson, *Economic Theory of Expanding and Contracting Economies*, reviewed in *Southern Economic Journal*, September 1978.

“Manual of Pricing and Cost Determination for Organizations Engaged in Dissemination of Knowledge,” with W.J. Baumol, Y.M. Braunstein, D.M. Fischer, prepared for the Division of Science Information, NSF April 1977, 150 pp.

UNPUBLISHED PAPERS

“Activating *Actavis* with a More Complete Model,” with Michael G. Baumann, John P. Bigelow, Barry C. Harris, Kevin M. Murphy, Robert D. Willig, and Matthew B. Wright, Revised version forthcoming in *Antitrust*, January 28, 2014

“Exclusionary Discounts,” with Greg Shaffer, August 2006.

“Regulation of Credit Card Interchange Fees and Incentives for Network Investments,” with Y. Wang, Competition Policy Associates WP, Washington D.C. September 2005.

“Economics, Antitrust and the Motion Picture Industry,” C.V. Starr Center Policy Paper, July 1983.

“On Bargaining, Settling, and Litigating: A Problem in Multiperiod Games With Imperfect Information,” with A. Rubinstein, C.V. Starr Working Paper, December 1982.

“Supervision and Social Welfare: An Expository Example,” C.V. Starr Center Working Paper, January 1982.

“Should We Take Rights Seriously: Economic Analysis of the Family Education Rights Act,” with M. Manove, November 1977.

“An Echo or a Choice: Product Variety Under Monopolistic Competition,” with A. Weiss; presented at the Bell Laboratories Conference on Market Structures, February 1977.

GRANTS RECEIVED

Regulation and Policy Analysis Program, National Science Foundation, Collaborative Research on Antitrust Policy, Principal Investigator, July 15, 1985 - December 31, 1986.

Regulation of Economic Activity Program, National Science Foundation, Microeconomic Analysis of Antitrust Policy, Principal Investigator, April 1, 1983 - March 31, 1984.

Economics Division of the National Science Foundation, "Political Economy of Taxation," Principal Investigator, Summer 1982.

Sloan Workshop in Applied Microeconomics (coordinator), with W.J. Baumol (Principal Coordinator), September 1977 - August 1982.

Economics Division of the National Science Foundation, "Collaborative Research on the Theory of Optimal Taxation and Tax Reform," July 1979 to September 1980, with E.S. Phelps.

Division of Science Information of the National Science Foundation for Research on "Scale Economies and Public Goods Properties of Information," W.J. Baumol, Y.M. Braunstein, M.I. Nadiri, Fall 1974 to Fall 1977.

National Science Foundation Institutional Grant to New York University for Research on Taxation and Distribution of Income, Summer 1974.

Exhibit 2: Curriculum Vitae of Allan Shampine

ALLAN SHAMPINE

February 2016

Executive Vice President
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EDUCATION

- Ph.D. UNIVERSITY OF CHICAGO: Economics, 1996
(Full scholarship from the University)
(Thesis: *An Evaluation of Technology Diffusion Models and Their Implications*)
(Field specializations: urban economics, agricultural economics)
- M.A. UNIVERSITY OF CHICAGO: Economics, 1993
(Full scholarship from the University)
- B.S. SOUTHERN METHODIST UNIVERSITY: Economics and Systems Analysis,
Mathematics Minor, 1991
(Full scholarship from the University)
(Summa Cum Laude, Honors, Departmental Distinction)

PROFESSIONAL EXPERIENCE

Compass Lexecon (formerly Lexecon), Chicago, Illinois: (1996 – date)

Editor for *The Antitrust Source*, American Bar Association (2011 – Present)

PUBLICATIONS

BOOKS

Down to the Wire: Studies in the Diffusion and Regulation of Telecommunications

Technologies, (Editor) Nova Science Press (2003).

(Contributors include Debra Aron, Johannes Bauer, Peter Bernstein, David Burnstein, Robert Crandall, Nicholas Economides, Wayne Fu, Shane Greenstein, Charles Jackson, Junghyun Kim, Donald Kridel, Mercedes Lizardo, Paul Rappoport, Pablo Spiller, Lester Taylor and Steven Wildman)

ARTICLES

- “Economics of Patents and Standardization: Network Effects, Hold-Up, Hold-Out, Stacking,” with Timothy Simcoe, forthcoming in *The Cambridge Handbook of Technical Standardization Law*
- “Patent Litigation, Standard Setting Organizations, Antitrust and FRAND” with Dennis Carlton, *22 Texas Intellectual Property Law Journal* 3 (2014).
- “Implementing the FRAND Commitment” with Janusz Ordover, *Antitrust Source*, American Bar Association, October 2014.
- “Identifying Benchmarks for Applying Non-Discrimination in FRAND” with Dennis Carlton, *CPI Antitrust Chronicle*, August 2014.
- Review of “Strategic Patent Acquisitions” (by Fiona Scott Morton & Carl Shapiro), *Antitrust Source*, American Bar Association, October 2013.
- “An Economic Interpretation of FRAND” with Dennis Carlton, *9 Journal of Competition Law and Economics* 3, 2013.
- “The Role of Behavioral Economics in Antitrust Analysis,” *27 Antitrust* 2, American Bar Association, Spring 2013.
- “Testing Interchange Fee Models Using the Australian Experience,” proceedings of the Bank of Canada Economics of Payments VI conference, May 24, 2012.
- Review of “Why (Ever) Define Markets? An Answer to Professor Kaplow,” (by Gregory Werden), *Antitrust Source*, American Bar Association, April 2012.
- Review of “An Empirical Study of the Effects of *Ex Ante* Licensing Disclosure Policies on the Development of Voluntary Technical Standards,” (by Jorge Contreras), *Antitrust Source*, American Bar Association, February 2012.
- “Price Indexes, Hedonic Analysis and Patent Damages,” *5 Journal of Intellectual Property Law & Practice* 2 (2010).
- “Credit Cards in Context: Framing the Discussion” and “Assessing the Social Effects of the Use of Credit Cards” in The Law and Economics of Interchange Fees and Credit Card Markets, International Center for Law & Economics, December 8-9, 2009.
- “Reasonable royalties and the sale of patent rights,” *4 Journal of Intellectual Property Law & Practice* 8 (2009).
- “The Evaluation of Social Welfare for Payment Methods,” *2009 Oxford Business & Economics Conference Proceedings*, June 2009.
- “Another Look at Payment Instrument Economics,” *6 Review of Network Economics* 4 (2007).
- “The Telecom Boom and Bust: Their Losses, Our Gain?” with Hal Sider, *Milken Institute*

Review (October 2007).

“Boom and Bust in Network Industries: Rising from the Ashes,” with Hal Sider, *International Journal of Business & Economics, Proceedings* (2006).

“The Economics of Interchange Fees,” with Alan Frankel, *73 Antitrust Law Journal* 3 (2006).

“Handicapping Countries in the Race to Digital Switching,” *5 Review of Network Economics* 2 (2006).

“The Evolution of Telecommunications Switching in the Central Office,” in Down to the Wire: Studies in the Diffusion and Regulation of Telecommunications Technologies, Nova Science Press (2003).

“The Welfare Implications of Advertising and Extension Under Uncertainty,” with George Tolley, *Technological Forecasting & Social Change* 70 (2003).

“Determinants of the Diffusion of U.S. Digital Telecommunications,” *Journal of Evolutionary Economics* 11 (2001).

“Compensating for Information Externalities in Technology Diffusion Models,” *80 American Journal of Agricultural Economics* 2 (1998).

Contributor to Guide to the Western Ephemera Collection at the DeGolyer Library, Southern Methodist University, 1993, edited by Kristin Jacobsen.

“The Impact of Technology on the Modern Labor Market,” *11 Southwestern Journal of Economic Abstracts* 1 (1990).

RESEARCH PAPERS

“Actavis in Practice” in submission to *Antitrust Source*

“Identifying Benchmarks for Applying Non-Discrimination in FRAND” with Dennis Carlton (2014 - SSRN)

“An Economic Interpretation of FRAND” with Dennis Carlton (2013 – SSRN)

“An Evaluation of the Social Costs of Payment Methods Literature” (2012 – SSRN)

“A New Direction in Mixed Income Housing,” submitted to Chicago Housing Authority (1993).

“A Survey of the Economics of Information, Focusing on Water” (1992).

“Petroleum Price Shocks and Rationality,” B.S. Honors Paper (1991).

OTHER PROFESSIONAL EXPERIENCE

Panelist at American University, Washington College of Law’s Patent Pledges: Developing a Research Agenda conference, May 30, 2014.

Panelist at Texas Intellectual Property Law Journal's 15th Annual Intellectual Property Symposium, FRAND and the Antitrust / Intellectual Property Interface, February 21, 2014.

Panelist at Georgetown University Law Center's Hotel & Lodging Legal Summits, "Navigating Antitrust Issues Arising from the Online Distribution World" (October 24-25, 2013).

"An Economic Interpretation of FRAND" paper with Dennis Carlton, presented by Carlton at the Heath Lecture & Workshop on FRAND, University of Florida Law Advocacy Center (September 2013).

Interviewed by *IEEE Spectrum* for "The High Cost of Taking Your Money" (June 2012).

"Testing Interchange Fee Models Using the Australian Experience," presented as part of a special session "Interchange Fees: Regulation and Implications" at Economics of Payments VI conference, Bank of Canada, May 24, 2012.

Interviewed by *The Oregonian* for "Those credit card rewards cost us a lot of cash" (July 31, 2010).

Participant in "The Law and Economics of Interchange Fees and Credit Card Markets" symposium sponsored by International Center for Law & Economics (December 8-9, 2009).

"The Evaluation of Social Welfare for Payment Methods," 2009 Oxford Business & Economics Conference (June 24-26, 2009).

Interviewed by *Cards Insider* for "Payments: Cash Replacement, Anonymity provides lifeline for cash over cards" (January 28, 2008).

"Boom and Bust in Network Industries: Rising from the Ashes," 6th Global Conference on Business & Economics, Harvard University (October 15-17, 2006), with Hal S. Sider.

"House of Cards: The Economics of Interchange Fees," Presentation to the Federal Reserve Bank of New York Conference, *Antitrust Activity in Card-Based Payment Systems: Causes and Consequences* (September 16, 2005), with Alan S. Frankel.

"The Impact of Technology on the Modern Labor Market," 68th Annual Meeting of the Southwestern Social Science Association (March 29, 1990)

Presented papers on information externalities and technology diffusion at the *Economics and Public Policy Workshop* (3) and *Price Theory Workshop* (1), University of Chicago (1995, 1996)

Coordinated the *Conference on Valuing Non-Market Goods*, University of Chicago (July 21-22, 1995)

Assisted in coordinating the *Conference on Research in Health Economics*, University of Chicago (October 21-22, 1994)

Assisted in organizing the *Economic Policy and Public Finance Workshop*, University of Chicago (1993 - 1996)

Member of the *American Economics Association*

Associate member of the *American Bar Association*

Referee for the *Agricultural and Resource Economics Review*, *American Journal of Agricultural Economics*, *Antitrust Law Journal*, *Journal of Business* and *Journal of Evolutionary Economics*.

Finance Committee (2010 – 2014), Vestry (2007-2009), Treasurer (2006), St. Mary's Episcopal Church, Park Ridge

TESTIMONY AND REPORTS

Declaration, Before the Federal Communications Commission, WC Docket No. 15-247, Special Access Proceeding, January 7, 2016 (with Dennis Carlton, Mark Israel and Hal Sider).

Declaration, Before the United States Patent and Trademark Office, Patent Trial and Appeal Board, Chervon et al. v. Milwaukee Electric Tool Corporation, et al., Case No. IPR2015-00595, November 23, 2015. Deposition, February 10, 2016.

Declaration, Before the United States Patent and Trademark Office, Patent Trial and Appeal Board, Chervon et al. v. Milwaukee Electric Tool Corporation, et al., Case No. IPR2015-00596, November 23, 2015.

Declaration, Before the United States Patent and Trademark Office, Patent Trial and Appeal Board, Chervon et al. v. Milwaukee Electric Tool Corporation, et al., Case No. IPR2015-00597, November 23, 2015.

Comments, Before the Info-Communications Development Authority of Singapore, August 25, 2015 (with Janusz Ordovery).

Trial Testimony, Before the United States International Trade Commission, Investigation No. 337-TA-613, Remand, January 28, 2015.

Rebuttal Witness Statement, Before the United States International Trade Commission, Investigation No. 337-TA-613, Remand, December 12, 2014.

Direct Testimony, Before the United States International Trade Commission, Investigation No. 337-TA-613, Remand, November 20, 2014. Amended Direct Testimony, November 25, 2014.

Reply Expert Report, Before the United States International Trade Commission, Investigation No. 337-TA-613, Remand, October 3, 2014. Deposition, October 22, 2014.

Expert Report, Before the United States International Trade Commission, Investigation No. 337-TA-613, Remand, September 12, 2014.

- Supplemental Declaration, Before the Federal Communications Commission, MB Docket No. 10-71, Programming Exclusivity Rules, July 24, 2014 (with Mark Israel).
- Report, Before the Korea Fair Trade Commission, Case No. 2014GiGuel1474 Regarding Microsoft Corporation and Nokia Corporation's Merger, July 21, 2014 (with Dennis Carlton).
- Declaration, Before the Federal Communications Commission, MB Docket No. 10-71, Programming Exclusivity Rules, June 26, 2014 (with Mark Israel).
- Whitepaper on Patent Licenses Negotiated Subject to Judicial Review, submitted to the Chinese NDRC on behalf of Qualcomm, May 16, 2014 (with Dennis Carlton).
- Declaration Commenting on Commitments Offered by Google to Address Competition Concerns, Case COMP/C-3/39.740 – Foundem and others, July 1, 2013 (with Janusz Ordover).
- Reply Declaration in the Matter of Special Access for Price Cap Local Exchange Carriers, Before the Federal Communications Commission, WT Docket No. 05-25, March 12, 2013 (with Dennis Carlton).
- Supplemental Declaration before the Federal Maritime Commission, Docket No. 11-12, Hanjin Shipping Co., Ltd. et al., v. the Port Authority of New York and New Jersey, January 31, 2013 (with Fredrick Flyer).
- Reply Declaration in the Matter of Policies Regarding Mobile Spectrum Holdings, Before the Federal Communications Commission, WT Docket No. 12-269, January 3, 2013.
- Declaration in the Matter of Policies Regarding Mobile Spectrum Holdings, Before the Federal Communications Commission, WT Docket No. 12-269, November 26, 2012.
- Expert Report to the Australian Competition & Consumer Commission with regards to the regulatory treatment of the National Broadband Network, September 24, 2012 (with Janusz Ordover).
- Report in the Matter of Promoting Interoperability in the 700 MHz Commercial Spectrum, Interoperability of Mobile User Equipment Across Paired Commercial Spectrum Blocks in the 700 MHz Band, Before the Federal Communications Commission, WT Docket No. 12-69, July 16, 2012 (with Mark Israel and Michael Katz).
- Declaration in the Matter of Joseph I. Marchese on Request for Inspection of Records, Comments of Deutsche Telekom AG and T-Mobile USA, Inc., FCC FOIA Control No. 2012-12, filed November 14, 2011.
- Declaration in the Matter of Joseph I. Marchese on Request for Inspection of Records, AT&T Inc.'s Opposition to Bursor & Fisher, P.A.'s FOIA Request, FCC FOIA Control No. 2012-12, filed November 14, 2011.

Declaration in the Matter of Joseph I. Marchese on Request for Inspection of Records, Review of Freedom of Information Action, FCC FOIA Control No. 2011-445, filed September 22, 2011.

Declaration, In Re Bursor & Fisher, P.A., v. Federal Communications Commission, Case No. 1:11-cv-05457-LAK, U.S. District Court, SDNY, August 26, 2011.

Reply Declaration, in Re: the Merger of AT&T with T-Mobile: Before the Federal Communications Commission, WT Docket No. 11-65, June 9, 2011 (with Dennis Carlton and Hal Sider).

Declaration, In Re: the Merger of AT&T with T-Mobile: Before the Federal Communications Commission, WT Docket No. 11-65, April 20, 2011 (with Dennis Carlton and Hal Sider).

Declaration, In Re Payment Card Interchange Fee and Merchant Discount Antitrust Litigation (Master File No. 1:05-MD-1720-JG-JO), February 10, 2011.

Declaration on behalf of the Port Authority of New York & New Jersey re CFC recovery fee, December 9, 2010 (with Fredrick Flyer).

Supplemental Declaration to the Federal Communications Commission, in the Matter of Implementation of Section 224 of the Act; A National Broadband Plan for Our Future (WC Docket No. 07-245), November 2, 2010 (with Jonathan Orszag).

Declaration to the Federal Communications Commission, in the Matter of Implementation of Section 224 of the Act; A National Broadband Plan for Our Future (WC Docket No. 07-245), October 4, 2010 (with Jonathan Orszag).

Declaration, In Re Gabapentin Patent Litigation (MDL No. 1384, Master Docket No. 00-CV-2931 (FSH)), March 29, 2010.

Reply Declaration to the Federal Communications Commission, In the Matter of Special Access Rates for Price Cap Local Exchange Carriers (WC Docket No. 05-25), February 24, 2010 (with Dennis Carlton and Hal Sider).

Reply Declaration to the Federal Communications Commission, Verizon Wireless / ALLTEL transaction (WT Docket No. 08-95), August 19, 2008 (with Dennis Carlton and Hal Sider).

Declaration to the Federal Communications Commission, Verizon Wireless / ALLTEL transaction (WT Docket No. 08-95), June 13, 2008 (with Dennis Carlton and Hal Sider).

Ex parte filing before the Federal Communications Commission on behalf of Verizon, "Verizon/MCI Merger: Analysis of Special Access," September 9, 2005 (with Gustavo Bamberger and Dennis Carlton).

Comments to the New York Public Service Commission, In the Matter of the Joint Petition of Verizon Communications, Inc. and MCI, Inc. for a Declaratory Ruling Disclaiming Jurisdiction Over or, in the Alternative, for Approval of Agreement and Plan of Merger;

and Joint Petition of SBC Communications Inc., AT&T Corporation, Together with its Certificated New York Subsidiaries, for Approval of Merger (CASE 05-C-0237 and CASE 05-C-0242), August 5, 2005 (with Gustavo Bamberger and Dennis Carlton).

Reply Declaration to the Federal Communications Commission, In the Matter of Verizon Communications Inc. and MCI, Inc., Application for Approval of Transfer of Control (WC Docket No. 05-75), May 24, 2005 (with Gustavo Bamberger and Dennis Carlton).

Declaration to the Federal Communications Commission, In the Matter of Verizon Communications Inc. and MCI, Inc., Application for Approval of Transfer of Control (WC Docket No. 05-75), March 9, 2005 (with Gustavo Bamberger and Dennis Carlton).

Reply Declaration to the Federal Communications Commission, In the Matter of Section 272(f)(1) Sunset of the BOC Separate Affiliate and Related Requirements (WC Docket No. 02-112) and 2000 Biennial Regulatory Review of Separate Affiliate Requirements of Section 64.1903 of the Commission's Rules (CC Docket 00-175), July 28, 2003 (with Dennis Carlton and Hal Sider).

Declaration to the Federal Communications Commission, In the Matter of Section 272(f)(1) Sunset of the BOC Separate Affiliate and Related Requirements (WC Docket No. 02-112) and 2000 Biennial Regulatory Review of Separate Affiliate Requirements of Section 64.1903 of the Commission's Rules (CC Docket 00-175), June 30, 2003 (with Dennis Carlton and Hal Sider).

Reply Declaration to the Federal Communications Commission in the Matter of 2000 Biennial Regulatory Review Spectrum Aggregation Limits for Commercial Mobile Radio Services, WT Docket No. 01-14, May 14, 2001 (with Robert Gertner).

Declaration to the Federal Communications Commission in the Matter of 2000 Biennial Regulatory Review Spectrum Aggregation Limits for Commercial Mobile Radio Services, Docket No. 01-14, April 13, 2001 (with Robert Gertner).

Report to Directorate General IV of the European Commission: "Remedies in the United States," in *Remedies in the United States*, in *Remedies in EU Competition Law: The Policy and Practice of the European Commission, A Report for Directorate General IV of the European Commission*, July 1998, Report (with James Langenfeld).

ACADEMIC HONORS

Undergraduate:

Graduated Summa Cum Laude, Honors, Departmental Distinction

Award for Excellence (given to the outstanding senior in the Economics Department as decided by the vote of the faculty)

Presidential Scholarship (full scholarship)

National Merit Scholar (honorary)

Hyer Society (honorary society of Southern Methodist University)

Honor Roll (1987-1991)

Phi Beta Kappa

Alpha Lambda Delta (Treasurer, honorary society recognizing academic achievement)

Phi Eta Sigma (honorary society recognizing academic achievement)

Omicron Delta Epsilon (international honor society in economics)

Kappa Mu Epsilon (honor society in mathematics)

Graduate:

Full Scholarship (tuition and stipend)

Exhibit 3: Materials Relied Upon

Materials Relied Upon for Initial Report

nbn's revised SAU as of September 19, 2012

The nbn Corporate Plan 2012 – 2015, dated August 6, 2012

ACCC Determination – Applications for authorisation lodged by nbn Limited in respect of provisions of the HFC Subscriber Agreement entered into with SingTel Optus Pty Ltd and other Optus Entities, dated July 19, 2012

nbn's Supporting Submission nbn Special Access Undertaking to the Australian Competition & Consumer Commission ("ACCC"), dated December 20, 2011

A Statement of Expectations from Shareholder Ministers in the Australian Government to nbn, dated December 17, 2010

Mark Armstrong and David Sappington, "Recent Developments in the Theory of Regulation," in *Handbook of Industrial Organization*, M. Armstrong and R. Porter (eds), 2007

Paul Levine, John Stern and Francesc Trillas, "Utility price regulation and time inconsistency: comparisons with monetary policy" *Oxford Economic Papers* 2005, 57

David Sappington, "Regulating Service Quality: A Survey," *Journal of Regulatory Economics* (2005) 27(2)

Jean-Jacques Laffont and Jean Tirole, *Competition in Telecommunications*, 2001, MIT Press

David Newbery, *Privatization, Restructuring, and Regulation of Network Utilities*, 1999, MIT Press

B. Levy and P. Spiller (eds) (1996) *Regulations, Institutions and Commitment*, Cambridge University Press, Cambridge

William Encinosa, III and David Sappington, "Toward a Benchmark for Optimal Prudency Policy," *Journal of Regulatory Economics* (1995) 7

Richard Gilbert and David Newbery, "The dynamic efficiency of regulatory constitutions," *RAND Journal of Economics* (1994) 25(4)

Bruce Greenwald, "Rate base selection and the structure of regulation," *RAND Journal of Economics* (1994) 15(1)

Additional Materials Relied Upon

nbm Special Access Undertaking, December 18, 2012, varied on November 18, 2013

ACCC Assessment of Telstra's revised Migration Plan, Final Decision, June 2015

Statement of Expectations, April 8, 2014 ("Revised Statement of Expectations")

nbm, NBN Multi-Technology Deployment Principles, November 13, 2014

nbm Wholesale Broadband Agreement – Service Levels Schedule, January 30, 2015

nbm, HFC: Consultation Outcomes and Final Product Construct, May 2015

<https://community.sprint.com/baw/community/sprintblogs/announcements/blog/2015/04/29/faqs-about-the-wimax-network-shutdown>

Avinash Dixit & Robert Pindyck, Investment Under Uncertainty, Princeton University Press, 2004

Telecommunications Regulatory and Structural Reform, December 2014

NBN non-commercial services funding options, Consultation paper, April 1, 2015