

The NBN: 2009 to 2016 and Beyond

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22 June 2016, University of Melbourne

Good evening. It is a pleasure to be here and I would like to thank the folks from the **Melbourne Networked Society Institute and Telsoc** for inviting me to speak about the NBN.

This evening I am going to make the case that a Fibre to the Premise or FTTP based NBN was, and still is, the right answer for Australia's fixed broadband needs.

I intend to demonstrate to you that the original NBN vision would have been successful in terms of costs and timing. To do this I will have to convince you that a lot of the criticism of the FTTP based NBN that you have heard and read, is wrong.

Why is it important that we all understand the true picture regarding the original FTTP based NBN?

Because unless the reality about the deployment costs and timing of FTTP is known and understood, decisions will continue to be made about the NBN based on incorrect information.

Compared to the original FTTP based NBN, we are currently on a path to end up with a much poorer performing broadband network. It will have increased long term costs and will be completed at about the same time as the original project would have been completed.

Around the world, the direction in which new builds of fixed broadband networks are headed has become clear. The world is increasingly moving towards FTTP. As a consequence advances are being made in FTTP technology that make it cheaper and easier to deploy.

These developments which have taken place in the last few years have only reinforced the rationale for basing Australia's NBN on FTTP.

It is not too late to change the current direction of the NBN but of course that change would need to be made in a controlled and managed way to ensure the project is not subject to another major disruption.

Why has it been so hard to get at the facts regarding the costs and timing of the FTTP based NBN? The answer, as we all know, is that the NBN project has been, from its inception, a contentious political issue.

That NBN project, initiated by the Labor party back in 2009, is a good example of a Government being courageous enough, and I mean courageous in the Sir Humphrey Appleby sense, to initiate a large and complex project for the public good.

The original NBN was a visionary project and would have created a valuable asset for the Australian public.

But it didn't take long for the attacks on the project to start.

Barely a year after the company came into existence the people of NBN Co, who were working very hard to get the project off the ground, were reading the public statements you see here:



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Shadow Minister of Finance and Debt Reduction, Andrew Robb, has used the launch of the Opposition's national broadband policy to attack NBN Co, claiming it is filled with talentless staff.

Speaking at Parliament House in Canberra, Robb claimed that by virtue of being a government-owned company, NBN Co would be unable to attract quality staff

".... They will not go and join a stodgy government bureaucracy with all its rules and bureaucracy and dictate to the Australian community," he said.

Reported by Computerworld, 10 August, 2010

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One of my aims this evening is to demonstrate to you that not only were these comments wrong but that these criticisms and others like them are based on a premise that if accepted will do a great disservice to infrastructure development in Australia.

The implication made in the quote is that any major project undertaken by a Government entity is going to be badly managed, inefficient and a waste of taxpayers money.

It is true that there are a number of activities in a big public project, like the NBN, that you don't have with a major project in the private sector.

But there are also many positives in managing a nation-building public project. The NBN in its early years had many employees who were enthusiastic, committed and creative.

They felt privileged to be part of NBN Co and as a result they were willing to work long hours and apply themselves enthusiastically to solving the many complex issues that arose.

In those early years of the NBN, the desire to succeed and the creativity that I saw displayed in solving technically complex problems was as strong as anything I had previously experienced in the commercial world – including what I had seen in some very successful Silicon Valley start-ups.

That is why I simply don't accept the assumption that a Government entity has to be stodgy, bureaucratic and filled with talentless staff.

That view is not supported by what I saw being achieved by the employees of NBN Co from 2009 to 2013.

I know that runs counter to the perception that has been created about the early years of the NBN.

And just to illustrate how pervasive that perception became, I would like to share with you an experience I had when NBN Co had been running for a few years.

I visited a very senior public servant in Canberra to provide him with an update on the NBN. He was an intelligent and informed individual but one who had no direct day to day involvement in the NBN.

After we had exchanged pleasantries he said. "Mike, can you tell me why the NBN project is so over budget?". My response was "Why do you think the NBN is over-budget?". I then got out all the data and showed him how the project was progressing.

It was running about 9 months behind the original schedule because of the time it took to complete a highly complex deal with Telstra. But the Capital Costs, the Operating Costs, **and** the Peak Funding were virtually unchanged from the original projections.

He reflected for a minute and said, almost to himself, "Why did I think it was over-budget?".

Why? Because he had read or heard on an almost daily basis that the NBN was way behind schedule and way over-budget. A good example of that quote attributed to Lenin that "A lie told often enough becomes the truth".

It is likely that some of you here tonight will have heard many times that very little was achieved by NBN Co between 2009 and 2013.

I hope that by the end of this evening you will see why that view of NBN Co's early achievements is completely wrong.

There is a bigger question also of whether public entities, if tasked wisely and managed well, can efficiently build economically and socially valuable infrastructure for the public good.

The historical evidence is pretty clear that the answer is yes.

Felix Rohatyn's book "Bold Endeavours: How our Government Built America and why it must Rebuild Now" provides a clear and cogent argument that the infrastructure projects initiated and managed by the US Government underpinned America's economic success.

He cites ten examples. I have shown four on this slide.



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The Erie Canal
The Transcontinental Railroad
Rural Electrification
The interstate Highway System

- *Bold Endeavors* by Felix Rohatyn

The Overland Telegraph
The Copper Access Network
The Snowy Mountains Scheme
CSIRO

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I have also listed three nation building projects undertaken in the past by Australian Governments. And have added the CSIRO as it is one of the world's most successful government research laboratories.

What most of these big projects had in common, both here in Australia and in the US, is that they were initially opposed as being a waste of resources – often labelled "white elephants".

The reality is that these projects produced significant long term public benefits.

This is well summarised by Rohatyn in the epilogue of his book.



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“In the preceding pages, I have shared ten episodes from very different eras in American History...

Together, these stories form a narrative which demonstrates that, contrary to the glib reaction from many contemporary naysayers, large scale public investments *can* work, and with remarkable long-term success.”

From Epilogue of *Bold Endeavors* by Felix Rohatyn

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What Rohatyn says in his epilogue is illustrated by what the people of NBN Co achieved in their first 4 years:

They built from scratch a company, which employed about 2,800 people as of June 2013, with all of the processes and systems needed to run a functioning Telco.

They created a successful Interim Satellite service and designed and built a Long Term Satellite solution. Following the launch of the first satellite earlier this year, that work is now being celebrated by all parties.

They designed and initiated the rollout of a Fixed Wireless network which provided services to regional and rural Australians.

They designed and built a Transit Network which is the basis of connectivity for all NBN access technologies using more than 65,000 kilometres of fibre links and more than 1,000 access nodes.

They built a New Developments or Greenfields solution to provide an FTTP

service to any new apartment block or housing estate anywhere in the country.

In 2013 that solution was running below the budgeted cost and was keeping up with the growing demand from housing developers.

They also designed, developed and deployed a set of IT systems. Those IT systems never became a bottleneck to deployment – a rare achievement for such a complex project.

They also built a National Test Facility and a Network Operations Centre.

They negotiated with the industry and a range of stakeholders a suite of products covered by agreements with Retail Service Providers and detailed in a Special Access Undertaking.

That Special Access Undertaking, which has been approved by the ACCC, supports both the future long-term profitability of NBN Co and a satisfactory financial return for Australian tax-payers.

Then there was the Brownfields FTTP network. Brownfields means existing, already built premises, as opposed to new or Greenfields premises. It is the Brownfields part of the network that is most visible to people, as it is the part of the NBN that rolls down streets and into homes and businesses.

The FTTP Brownfields build relied on a complex deal which was negotiated with Telstra. It provided NBN Co with access to existing ducts, pits, exchange space, dark fibre links and lead-in conduits.

That deal saved NBN Co billions of dollars in not having to replicate the Telstra duct network.

Perhaps, even more importantly, part of the deal was for Telstra to decommission their voice and broadband copper and HFC networks. HFC is the pay-TV network which uses a combination of fibre and coaxial cable – hence the name Hybrid Fibre Coax.

The decommissioning part of the Telstra deal meant that NBN Co's revenue profile was effectively 'underwritten' because of the virtually guaranteed uptake as Telcos, including Telstra, transferred their wholesale and retail customers onto the NBN.

A mandatory requirement in that original deal was Telstra taking responsibility for ensuring everything they provided to NBN Co was fit for purpose.

This insistence by NBN Co that Telstra take responsibility for the quality and performance of the facilities they delivered was one of the reasons it took a long time to finalise the deal. But it was the only way that NBN Co could ensure that it – and the Australian taxpayer - would not incur unknown and unbudgeted costs.

As many of you may be aware, that deal was subsequently renegotiated after the Coalition came to power, and unfortunately under that new Telstra deal those protections have been diluted. This has resulted in a reduced cost exposure for Telstra but an increased exposure for NBN Co.

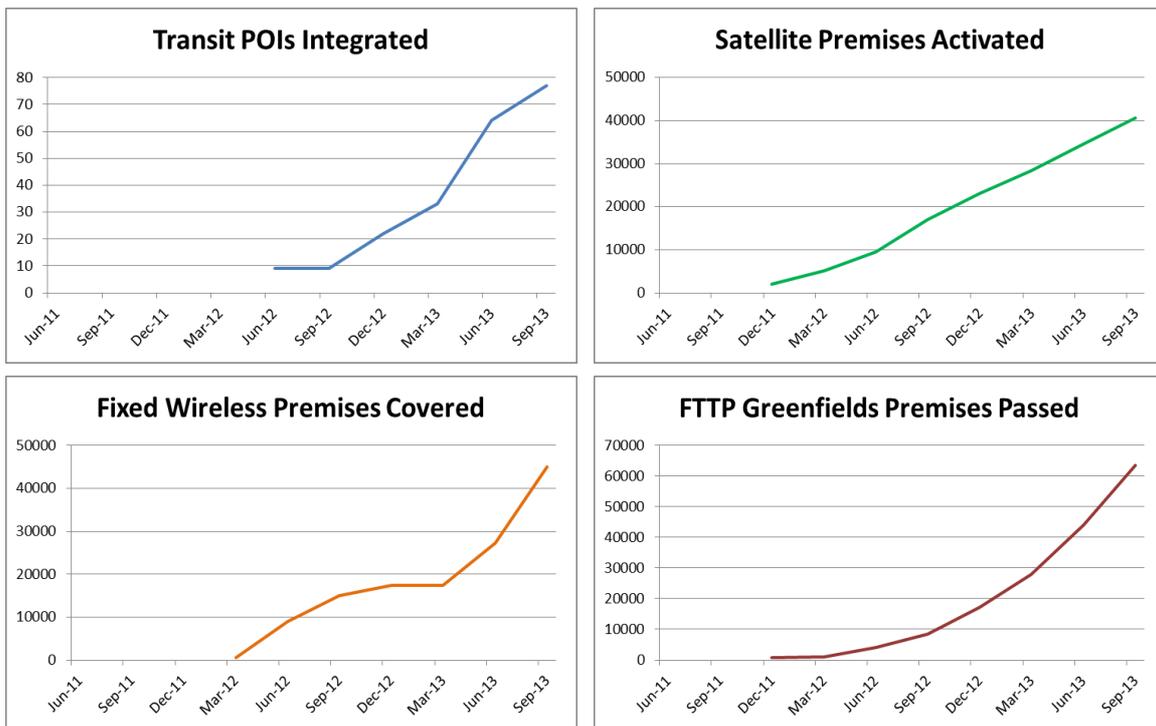
Which explains why Telstra’s CEO said that the renegotiated deal is “undoubtedly better for Telstra shareholders”.

So between July 2009 when NBN Co came into existence and September 2013, the foundations of the NBN were planned and built.

And in those 4 years there was also considerable progress made in building the network. These graphs:



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show the outcomes for the Transit, Fixed Wireless, Interim Satellite and Greenfields FTTP, to September 2013. They are the **cumulative** output versus time.

To remind you: the Transit network was the backbone of the NBN. It provided the fibre connectivity between the access nodes supplying the connection to each premise in an area and the Point of Interconnect, or PoI, where all the retail service providers connected to the NBN.

So this first upper left chart shows the progress in integrating or bringing into operation the Poles. The ACCC required that there should be 121 of these Poles across the country.

The other 3 charts show the progress for Satellite, Fixed Wireless and Greenfields FTTP.

In each case, it took some time to complete the product definition work, the network design and architecture and then the procurement of the technology. It is only then that the build of each of these components could start.

And, as expected, each ramps up in volume, month by month.

So what about FTTP Brownfields?

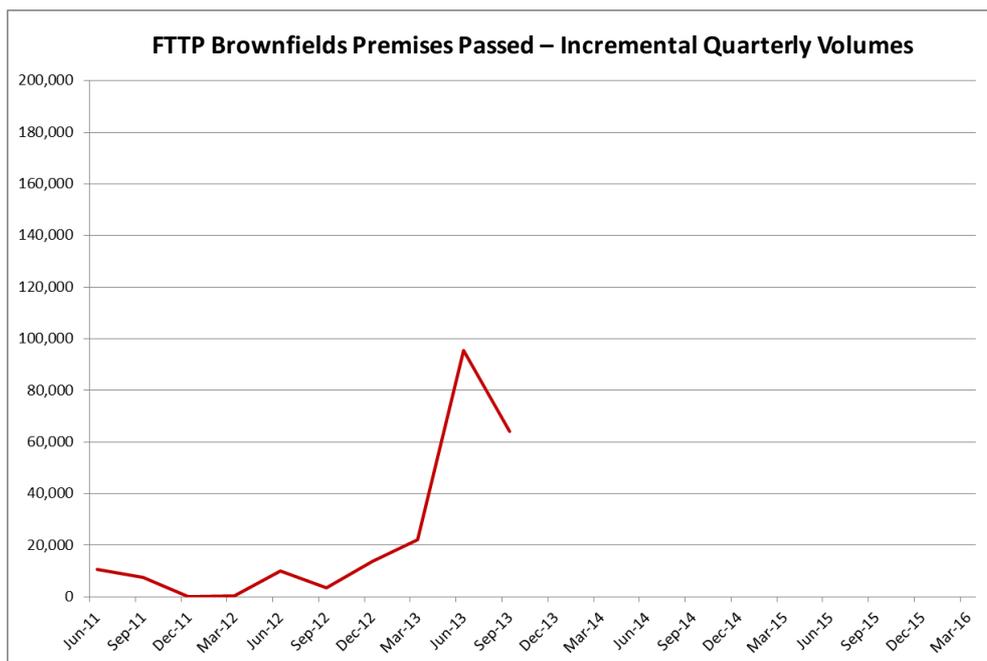
The first thing I would like to say is that when we were preparing our first Corporate Plan in 2010 we had the opportunity to try to “sandbag” the numbers to not give ourselves too difficult a target.

But we did not do that. We set ourselves challenging targets with the aim of driving the company hard to get up the volume ramp.

In hindsight perhaps we were too ambitious in the first few years of the rollout. But remember there were a lot of unknowns back in 2010, including the timing of the Telstra deal, which if it had been completed faster would have allowed a quicker ramp up.



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This graph shows the 3 month **incremental** output - how many Brownfields premises have been passed with FTTP in the previous 3 months.

There were some trials carried out during 2011 but the volume ramp had to wait for the Telstra deal to be finalised before it could get going, which it did in mid 2012.

Numerous issues had to be addressed as the FTTP Brownfields volumes ramped up – construction project management issues, database compatibility issues and inconsistencies with the various geospatial data sets. But each of these challenges was being tackled and overcome. So each month the output increased.

This is exactly what I had seen numerous times in the past in the private sector with large project builds or even the start-up of factories.

I recall the start of the Port Botany Optical Submarine cable factory in Sydney. It took quite some time to get the output ramped up but once it did, it produced much higher monthly cable output than had been originally anticipated.

And as many of you know, as the volumes increase the unit cost comes down. It was what I had seen in the past in every factory or Telco network build I had been associated with – from the manufacture of phones to the building of large access or switching networks.

Of course in the private sector one has the luxury of doing all the trial work and fine tuning of processes out of the public gaze.

Would this have happened with the Brownfields FTTP? Well of course it would have.

And the FTTP build had two big advantages.

First, the volumes were very high. We are talking about 10 million premises. So the incentives and opportunities to improve efficiencies and reduce costs were huge.

And second, since most of the broadband world is deploying FTTP there were, and still are, very rapid improvements in technology, which were driving deployment costs down, driving build efficiencies up and driving build times down.

You can see on the chart that from early 2012, once the Telstra deal was approved that the FTTP Brownfields rollout was starting to pick up, and this accelerated through 2012 and into early 2013.

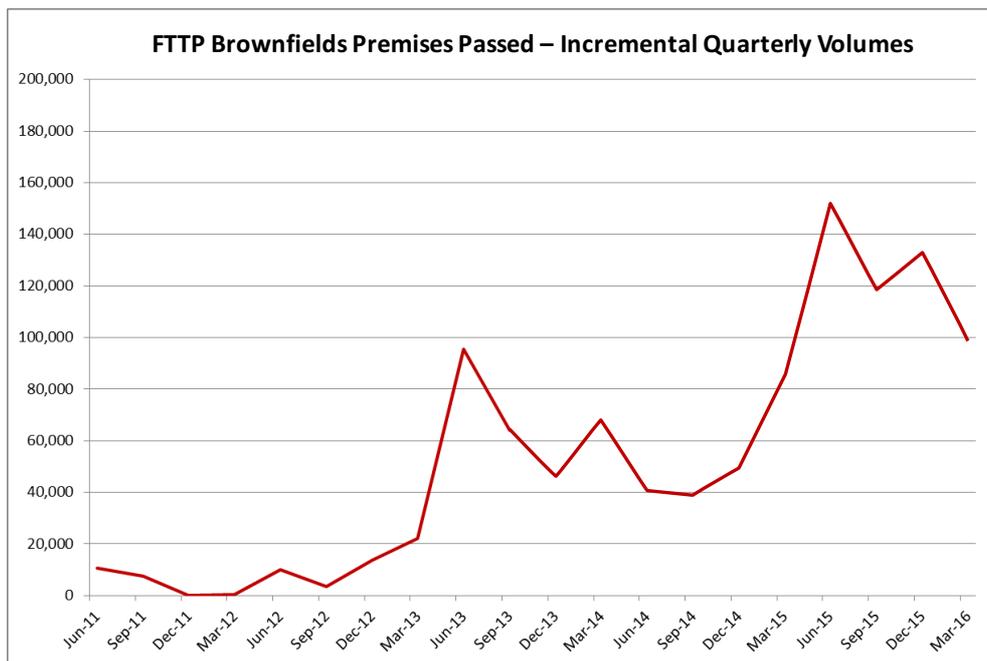
Then, as you may recall, in mid 2013 Telstra encountered problems with asbestos in its pits. For several weeks the FTTP build essentially stopped completely, and as you can see this impacted output in the July and even more, the September quarters of 2013.

This problem was of course resolved and is another example of a problem that was discovered and was fixed in the early stages of a rollout.

Unfortunately the FTTP Brownfields deployment hit a plateau from September 2013 to the end of 2014 as you can see in this slide:



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I have continued the quarterly incremental FTTP volumes out to the March 2016 quarter - the last quarter for which data is available.

The asbestos issue had been solved by September/October 2013 but after the change of Government in September 2013, NBN Co turn its attention to what we now know as the “Multi Technology Mix” or MTM.

The MTM was the Coalition’s plan to terminate the Brownfields FTTP deployment and build the Brownfields network using a combination of Fibre to the Node or FTTN and HFC.

FTTN uses street cabinets housing the electronics which connects to the premise using the Telstra copper cable. HFC uses the Telstra and Optus Pay-TV cable.

It was anticipated that FTTN and HFC would be rolled out very quickly and so it is natural that NBN Co’s focus would be on making this happen.

But by the end of 2014 it was clear that neither FTTN nor HFC were going to happen as fast as was hoped.

Fortunately, FTTP was available to fill the gap so there was an acceleration of the Brownfields FTTP from the end of 2014. And what you can see from this chart is that in the June 2015 quarter, approximately 150k Brownfields premises were passed using FTTP and a small amount of FTTB.

It is not hard to see what would have been possible if NBN Co's attention had remained exclusively on FTTP for the Brownfields rollout.

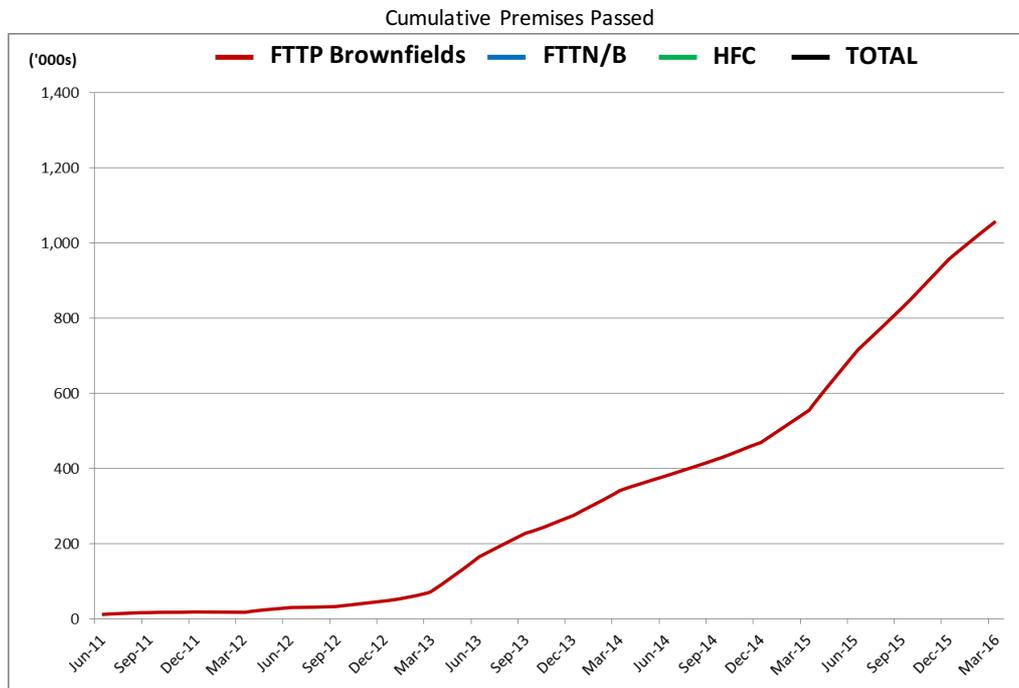
If after the asbestos problem had been resolved the focus had been on FTTP the quarterly volume could have recovered by the end of 2013. And it could have continued to increase from there – as it did later.

Just doubling the quarterly rate achieved in the June 2015 quarter would have meant the completion of all the Brownfields premises with FTTP and FTTB by the first half of 2022.

With the improvements in FTTP build technologies that were occurring this would have been quite achievable.

The issuing of new FTTP construction contracts was wound back and you can see the impact in the last 3 quarters.

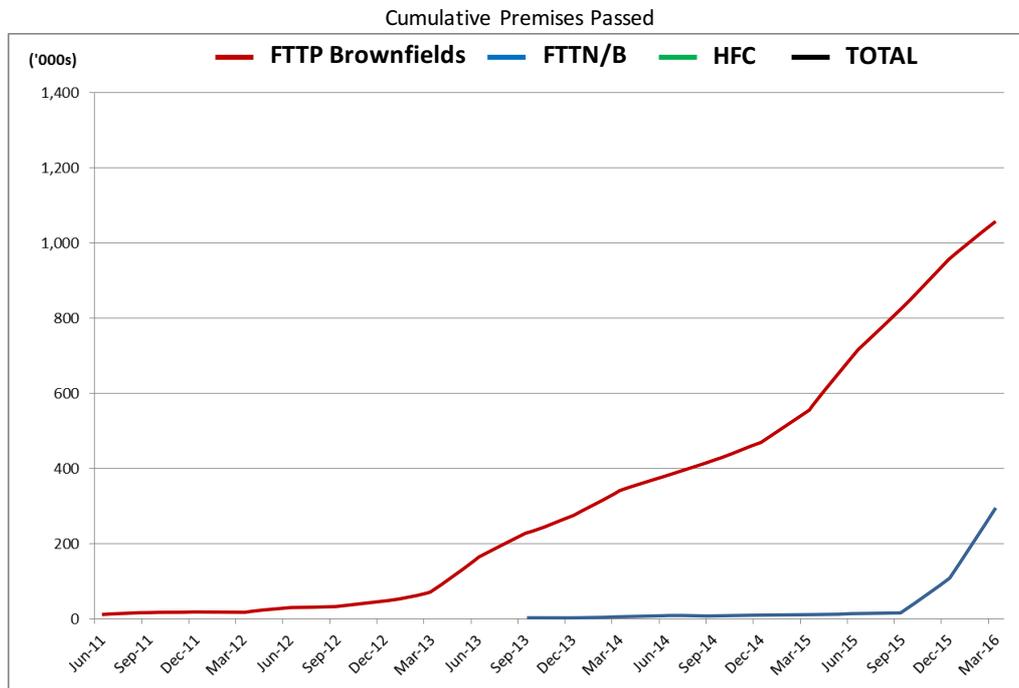
How does this look if we change our perspective from incremental quarterly FTTP Brownfields volumes to **cumulative** volumes at the end of each quarter.



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It is not difficult to see what would have been possible if the focus had remained exclusively on FTTP.

On this next slide I have added the estimated cumulative quarterly volumes for FTTN/B.



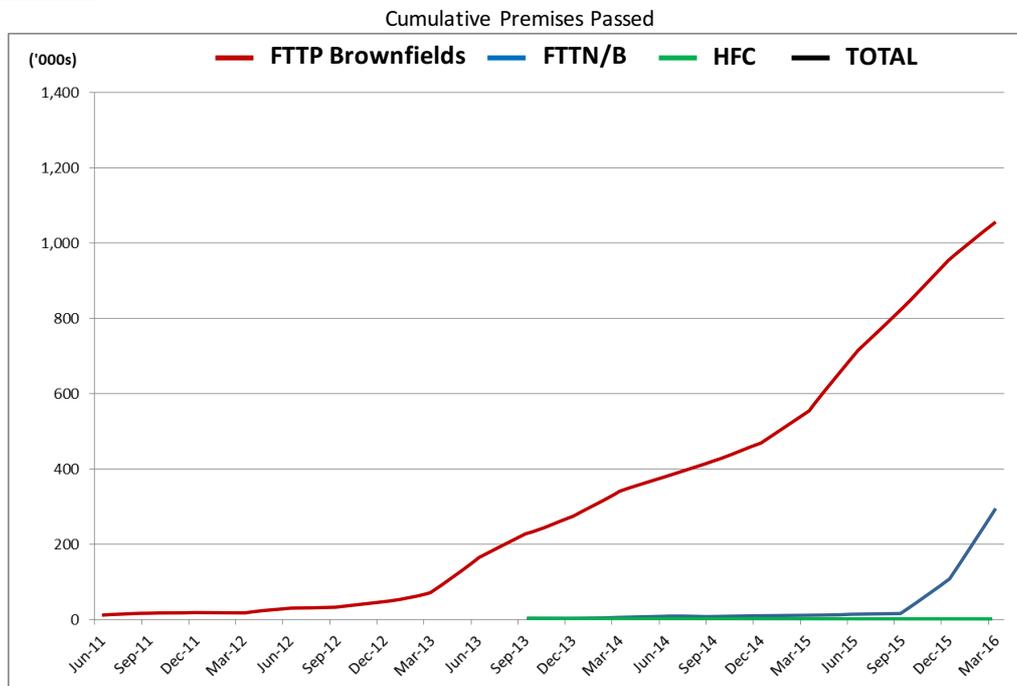
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You can see it takes quite some time to get going and then the volumes accelerate. I would expect to see an even greater acceleration in the next June quarter. Given that NBN Co now has about 5000 employees compared to the 2800 we had back in 2013 you would expect to see volumes increasing pretty rapidly.

The picture for HFC is not looking so good. It is not even out of the starting blocks yet:



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When we decided back in 2010 that we would overbuild the HFC rather than try to use it we were very aware of just how much effort it would have taken to use this older infrastructure both in hardware upgrades and IT development.

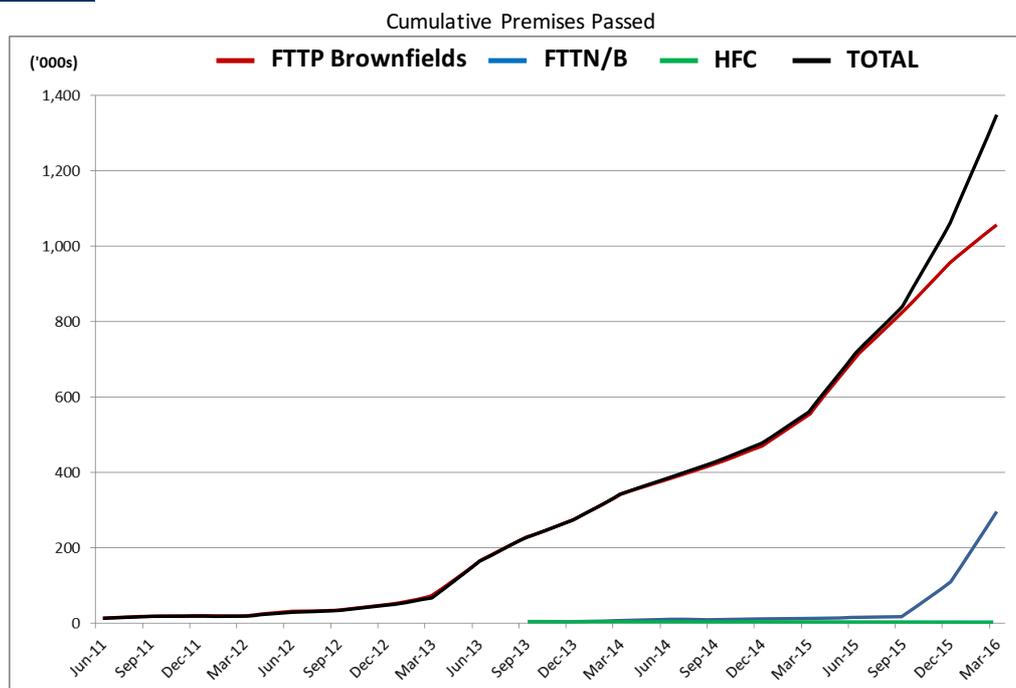
And of course, every different technology you introduce into a network, especially older technologies, adds to the long term operational costs.

Presumably with the \$1.6Bn contract that NBN Co has placed with Telstra the HFC will look a bit different in the next few quarters.

And finally the total quarterly cumulative volumes for Brownfields show that FTTP is still by far the greatest percentage of the Brownfields premises passed to the end of March 2016 - again the last quarter for which data is available.



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As you can see, the HFC component of the rollout has proven to be much more difficult than was anticipated with very little progress having been made so far in terms of premises passed or connected.

I want to be clear that I am not criticising the people of NBN Co for the fact that 3 years into the MTM one of the major components, HFC, which was expected to be deployed the fastest, is still not in volume rollout.

These big projects are complex and difficult and it takes time to overcome all of the teething problems.

Irrespective of whether it is FTTP, FTTN or HFC, or for that matter, Transit, Fixed Wireless or Satellite, they are all complex and all take time to get going.

Which is why the worst thing you can do in these large complex projects is change direction. When you are in the midst of the start up problems it may be tempting to change direction but history proves that the benefits of changing are usually overestimated.

This is often because the estimates of the costs and timing of the new approach are far too optimistic.

This was certainly the case in changing the NBN from a FTTP based model to the MTM model.

When the Coalition's intention to shift to the MTM model was made public in April 2013 the projection for the completion date, to have at least 25Mb/s to everyone in the fixed line footprint, was the end of 2016 - and the end of 2019 for at least 50Mb/s to 90% of premises.

The total project peak funding was going to be \$29.5Bn.

If you compare these MTM costs and dates published prior to the 2013 election with the FTTP based NBN costs and dates around the same time there appears to be a big difference.



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	FTTP NBN Sept 2013	MTM NBN Apr 2013
Peak Funding	\$45Bn	\$29.5Bn
Build Completion	Dec 2021	25Mb/s - 2016 50Mb/s - 2019

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It is not surprising that people would have been convinced that a change to an MTM based NBN would save a lot of time and a lot of money.

But as we now know, those original MTM estimates were a fiction. Within only a few months the estimated MTM costs had increased dramatically and the 25Mb/s to every premise in Australia by the end of 2016 was abandoned.



	FTTP NBN Sept 2013	MTM NBN Apr 2013	MTM NBN Aug 2015
Peak Funding	\$45Bn	\$29.5Bn	\$46 - \$56Bn
Build Completion	Dec 2021	25Mb/s - 2016 50Mb/s - 2019	Dec 2020

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There were subsequently further large increases in costs so that by August 2015 the total funding for the MTM had risen to as high as \$56 billion, with a target of \$49Bn.

The build completion date is now end 2020. And even that date is dependent on a very large increase in the build rate which is projected to start from July this year.

At this point I'd like to dispel a myth related to the reasons for these cost increases on the MTM. All of the cost increases associated with the MTM are a consequence of underestimating the costs and deployment timing of FTTN and HFC in the April 2013 MTM policy document.

They have nothing whatsoever to do with the previous FTTP plan nor the previous NBN management.

That fact has now been confirmed by NBN Co's CEO, although it has not prevented others from continuing to claim otherwise.

In the same way as the original MTM costs and time estimates were a fiction, so too are the Coalition's estimates for the costs and timing of completing the original FTTP based NBN.

You can see on this next chart the estimates of those costs first by the Labor Government and then subsequently by NBN Co. They ranged between \$41Bn and \$45Bn over the space of 4 years.



Peak Funding Estimates for FTTP NBN

Labor/NBN Co

Apr 2009	\$43Bn
Dec 2010	\$41Bn
Apr 2012	\$44Bn
Sept 2013	\$45Bn

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The increase that occurred between Dec 2010 and Aug 2012 was mostly a result of including the Optus HFC deal. That deal increased the peak funding but improved the Internal Rate of Return – basically the rate of interest the Government earns on its investment in NBN Co.

These costs all retained a 10% contingency. What that means is that from 2009 through to 2013 the NBN Co financial projections retained a 10% buffer to allow for unexpected cost increases.



Peak Funding Estimates for FTTP NBN

Labor/NBN Co		Coalition/NBN	
Apr 2009	\$43Bn	Apr 2013	\$94Bn
Dec 2010	\$41Bn	Dec 2013	\$64-\$73Bn
Apr 2012	\$44Bn	Aug 2015	\$74-\$84Bn
Sept 2013	\$45Bn		

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But you can see that the Coalition estimates of the cost for the FTTP based NBN were all over the place.

They started at \$94Bn but that was such a ridiculous number it was quickly abandoned, although once again, it is something you still hear.

A Strategic Review was initiated when the Coalition came into Government and its aim was to put cost and time estimates on various options for completing the NBN. As well as having a Scenario for the MTM there were two scenarios created for continuing with the FTTP based NBN. These were called Scenarios 1 and 2.

When the Strategic Review was completed in December 2013, Scenario 1, which had a set of totally unrealistic assumptions, estimated a peak funding number of \$73 Bn and Scenario 2, with a set of slightly less unrealistic assumptions, estimated a peak funding number of \$64Bn.

The contingency for both of these estimates had been doubled from what was in the original FTTP based plan and I believe both scenarios had included costs for 3 satellites rather than 2.

There was then an estimate done for the August 2015 Corporate Plan by the NBN company. It gave the range for the FTTP based NBN as \$74 - \$84Bn.

Now most people would have thought that the NBN Company should know what they are talking about and this really must have been how much the original FTTP

based NBN would have cost if it had continued.

However, as it emerged at one of the Senate Committees, that is not what the NBN Company was asked to cost. They never tried to estimate what an FTTP-based NBN would have cost if it had continued.

They were asked to cost a **change back** to the FTTP plan after a delay of a few years and after many billions of dollars had already been committed and spent on the MTM.

If by now you are confused and wondering what the original FTTP NBN really would have cost, I can tell you - \$45Bn.

I want to explain why that is still the correct peak funding cost if the project had been allowed to continue.

In a talk such as this I would not normally go into this level of detail.

But given the massive increases that have taken place in the costs of the MTM together with the delays in the MTM rollout, the question of the real costs of the FTTP are critically important.

If I am right on the FTTP peak funding costs, and I intend to demonstrate that I am, then the move to the MTM has been a colossal mistake.

One that will burden Australia with a much poorer and more expensive fixed broadband network than it could have had if it had continued with the FTTP based NBN.

Understanding the true FTTP costs is also crucial in making the right decisions going forward.

[Detail in text below summarised during verbal presentation]

If you sum the costs for all the other parts of the FTTP based NBN - the transit network, the initial and long term satellite solutions, the fixed wireless network, the greenfields FTTP deployments and the IT systems - the total was running at or around budget.

So the difference between the \$45Bn in Peak Funding that NBN Co was projecting in September 2013 and the \$94Bn, or \$64Bn, or \$73Bn or \$84Bn or whatever constructed number you may wish to use, is in the FTTP.

It is not just the capital costs to build the FTTP that impacts on peak funding but it is also the revenue you can generate from the network.

And the revenue largely depends on the Average Revenue per User – what on average each customer pays per month and on the Take-up rate – what percentage of premises are on an NBN service.



FTTP Brownfields – Main Factors impacting Peak Funding:

- 1. The capex to pass and activate approximately 10m brownfields premises**
- 2. The time it takes to complete the build of the brownfields FTTP network**
- 3. The take-up rate of customers on the brownfields FTTP, and**
- 4. The Average Revenue Per User realised for those customers**

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So the Brownfields FTTP peak funding costs are very largely dependent on four factors:

1. The capex to pass and activate approximately 10m Brownfields premises
2. The time it takes to complete the build of the Brownfields FTTP network – because the longer it takes the bigger the gap between costs invested and revenue collected.
3. The take-up rate of customers on the Brownfields FTTP, and
4. The ARPU realised for those customers.

Lets tackle these in turn.

On the matter of FTTP capex costs, NBN Co is now saying that the capex costs for Brownfields FTTP is \$3700 per premise. The Coalition has implied that that number was about \$2000 per premise higher than what NBN Co had assumed in their 2013 Corporate Plans. And if they are right, that would equate to a massive \$20 billion increase in overall capex costs.

But they are not right. Today, NBN Co includes a range of costs in its cost per premises calculations that were previously reported separately. There is nothing wrong with doing that – just as there was nothing wrong with the way NBN Co

previously reported – but if you are going to compare numbers it is frankly disingenuous not to compare them on the same basis.

When you compare apples with apples you get a cost per premise difference of closer to \$500 not \$2000.

Now \$500 per premise difference is still a big number. If you multiply it by 10m Brownfields FTTP premises you get an additional \$5Bn. But an additional \$5Bn does not turn the \$45Bn into \$94Bn or even \$64Bn.

But even the \$500 difference would not be maintained. The FTTP per premise capex costs would have come down for a variety of reasons, some of which were already in the projections that NBN Co had made in its September 2013 Corporate Plan.

The improvements in FTTP technology have been very rapid in the last few years with such things as lower diameter cables, sometimes called “skinny fibre”, new joint enclosures, new splitter technology and improved connection methods.

We have seen with some of the NBN Co documents that were leaked, that these technology improvements when trialled by NBN Co led to reductions in both costs and time to construct.



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In 2015 NBN Co trialled a new FTTP technology called “skinny fibre” in Ballarat and Karingal in Victoria. This new smaller technology resulted in lower construction costs.

These technology improvements have reduced capex costs for FTTP by about 12% (from \$3,700 to \$3,250).

Source: Hansard, Senate Select Committee on the National Broadband Network (15 March 2016), p. 17.

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In fact the costs quoted in those leaked documents put the per premise capex cost at \$3250 rather than the \$3700 being used in the estimates. That drop alone virtually eliminates the true \$500 difference.

It is not at all surprising that these technology changes would have driven the capex costs of FTTP down. The NBN Brownfields deployment is not a one-off construction like a bridge or tunnel or opera house.

It is more like a distributed factory where you are building the same thing thousands of times over.

There are many opportunities for cost reductions and speed improvements and that is what has been seen by Telcos all around the world, including Verizon in the US and Chorus in NZ.



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Chorus reduced its FTTP per premise cost by 29% in a year (NZ\$4,753 in FY14 to NZ\$3,367 in FY15).

And they are forecasting a further 11% reduction to NZ\$3003 in FY16

Verizon decreased its FTTP per premise cost by 38% in 3 years (from US\$2,600 per premise in 2004 to approx. US\$1,600 per premise in 2006).

Sources: Chorus Annual Report 2014, p33 ; Chorus Annual Report 2015, p22;
Hansard, Kurt Rodgers reporting to Senate Select Committee on the National Broadband Network (4 March 2016), pp. 25-26.
Ovum, "FTTx: Current Status and the Future," IEEE Communications Magazine, 2008, p. 93.

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You can see they have made substantial year on year reductions in their FTTP build costs.

So it is a nonsense to assume that the per premise cost of the FTTP build of \$3700 today would stay at that level for the duration of an FTTP rollout.

Looking now at the next major element that impacts FTTP Brownfields total funding – the time to complete the build.

NBN Co's Corporate Plan in September 2013 predicted a completion date of December 2021. That was a 12 month delay compared to the first Corporate Plan published in December 2010.

The major reason for shifting the build completion from Dec 2020 to Dec 2021 was the 9 month delay in finalising and gaining approval for the Telstra deal. But there was also the impact of the asbestos issues that were encountered and overcome and the usual start up problems of a big complex project.

As we saw in the slide earlier on Brownfields quarterly premises passed, NBN Co achieved a peak of about 150k Brownfields premises passed per quarter in the June 2015 quarter.

All of these Brownfields premises were passed using FTTP and a little FTTB. This was achieved by NBN Co even though their mission was to terminate the Brownfields FTTP program and shift to FTTN and HFC.

In other words, NBN Co achieved a peak FTTP rate of 150k in a quarter at a time when the organisation was focused on FTTN and HFC and the FTTP program was being rolled back.

NBN Co would only have needed to double this peak rate, to around 300k premises per quarter, in order to complete the build by 2022.

Does anyone really believe that 150k per quarter is the peak output that NBN Co could ever have achieved if it had focussed on FTTP and not had to change course to build Brownfields based on HFC and FTTN?

But this is exactly what we are being asked to believe when statements are made that the FTTP build would not have been completed until 2028.

Moving on to ARPU and Take-up rates.

When you do the modelling over the build period, APRU and Take-up rates have a big impact on the peak funding. They also have a big impact on the rate of return when you look at a 30 year business plan.

And for both of these factors the Coalition got it wrong. These errors would have made a large difference to the peak funding estimates.



NBN Co Plan 2013	Coalition Assertions	The Outcome
June 2015 ARPU: \$39	June 2015 ARPU: \$29 June 2021 ARPU: \$38	June 2015 ARPU: \$40 Dec 2015 ARPU: \$43

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Starting with ARPU – from 2010 to 2013 NBN Co had predicted that by 2015 the ARPU would be \$39 per premise per month.

In the Coalition paper on Broadband in April 2013 this was ridiculed, saying that NBN Co was being “wildly optimistic” – and according to the Coalition, by 2015 the ARPU would be only \$29, and it would only reach \$38 by 2021.

So what has actually happened?

According to recent published results, ARPU in June 2015 was actually \$40, and by December 2015 it had risen to \$43. So, yet again the Coalition got it just plain wrong. NBN Co in early 2013 wasn’t being “wildly optimistic” at all – if anything they were too conservative.

And what about take-up rates? This is the measure of how many homes and businesses that have access to FTTP actually decide to take up, and pay for, a service.



NBN Co Plan 2013	Coalition Assertions	The Outcome
June 2015 ARPU: \$39	June 2015 ARPU: \$29 June 2021 ARPU: \$38	June 2015 ARPU: \$40 Dec 2015 ARPU: \$43
FTTP Long term Take-up Rate: 74%	FTTP Long term Take-up Rate: 64%	MTM Long term Take-up Rate assumed: 73%

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From 2010 to 2013 NBN Co estimated that the long term take up rate would be 74%. The Coalition thought this also was ridiculous, and in its April 2013 policy document it claimed that take up rates would only reach 64%.

What has happened since? From the information now made available it appears that in the early FTTP sites the NBN take-up rates are over 70%. And in its latest Corporate Plan of August 2015, NBN Co itself now assumes a long term take up rate of 73% for MTM based services which are obviously not as attractive to the end user as an FTTP based service.

[Detail ends]

What can you conclude from all of this?

To believe that the original FTTP deployment would have required a peak funding of somewhere between \$64Bn and \$94Bn you have to make totally unrealistic assumptions about take-up rates and ARPUs, assumptions that have proven to be wrong. You then have to distort per premise capex numbers and finally you have to ignore the improvements in technology that are driving down costs, increasing productivity and reducing build times for FTTP everywhere else in the world.

Given the complexity of all of this information it is little wonder that it is very difficult for the average person, or even the media, to sort out fact from fiction concerning the peak funding costs for the original FTTP based NBN.

But what is clear is that every forecast regarding the NBN that the Coalition has made, for which there is now data, whether for their own MTM or for the original FTTP plan - every one of them has been wrong.

There is one further example of where the Coalition was completely wrong and I want to bring it to your attention because it expresses the same sentiments that were made by Mr Robb in that first slide I showed.



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NBN Co Plan 2013	Coalition Assertions	The Outcome
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FTTP Long term Take-up Rate: 74%	FTTP Long term Take-up Rate: 64%	MTM Long term Take-up Rate assumed: 73%
Plan to Design, Build and Launch 2 NBN Satellites	“When these two satellites are launched there will be huge spare capacity on them. Once again, NBN is investing more than is needed to achieve its mission”	NBN Aug 2015 Corp Plan confirms at least 2 satellites needed to meet demand

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I recall the hours spent in Joint Parliamentary committees defending NBN Co’s decision to design and launch two satellites.

Why was so much time spent on this issue – because the Coalition was utterly convinced we were wasting public money in designing and planning to launch two satellites. The public statements they made never displayed a shadow of doubt about this.

The Coalition statements appeared to be reasoned, plausible and from the media reports, very convincing. But once again they were completely wrong, as time has shown.

In fact, after the December 2013 Strategic Review the Coalition did a complete U-turn and actually contemplated launching not two but three satellites saying “Further satellite capacity may be the only viable solution”.

These comments reflect a common theme – that because NBN Co was a government entity involved in building public infrastructure using public funding they were from 2009 to 2013 unconcerned about how much taxpayers money they were spending.

Nothing could be further from the truth. During this period NBN Co was deeply concerned with building a modern and future-proof network for the Australian people that would last a very long time, with low maintenance costs and negligible upgrade costs, while minimising build costs.

NBN Co was also very concerned with managing the capital build costs , which is why in 2013 they refused to throw more money at their construction partners just to get a short term lift in the rollout numbers – even though to do so would have made their life considerably easier.

I believe any fair and reasonable analysis of the NBN would conclude that an enormous amount of progress was made by the employees of NBN Co in those first 4 years. Yes, there were some start-up challenges to overcome but these were being progressively tackled and solved.

What I don't think I need to convince you of this evening is the importance of having a first rate fixed line broadband network for Australia. And I hope that you are convinced that the only safe long term bet is to base that network largely on FTTP.

I think that point was best made by AT&T in their submission to the FCC last year.



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“Demand is growing for faster broadband speeds than AT&T, or anyone else for that matter, can deliver with FTTN.

... FTTP facilitates a better, more compelling set of products, and AT&T expects FTTP to have a longer economic lifespan than FTTN and other prior wireline network technologies.”

AT&T submission to US FCC - April 2015

The drivers for faster speeds and capacities for fixed broadband have not abated , quite the contrary. The latest Australian Bureau of Statistics data shows that internet usage has increased 400% in the last 4 years and Cisco is forecasting that global broadband speeds will nearly double between 2015 and 2020.

That is why in the US and Asia the debate is about Gigabit per second speeds not about whether 25 or 50Mb/s is sufficient.

It is a bit surprising that we continue to hear the argument that “nobody is buying a 1 Gig service today, so why build a network that can deliver that much speed – 25 to 50 Mbps is more than enough”.

This has been a constant mantra of the Coalition, and they were supported in this view by their hand-picked Vertigan committee, who, if I remember correctly, assumed that the median household would require only 15Mb/s by 2023.

It seems especially curious that a Government that styles itself as the “Innovation and Infrastructure Government” should argue this. Because this argument betrays a complete lack of understanding of what the original FTTP NBN was all about.

It was about providing the vital infrastructure that Australia needs in order to remain competitive internationally in the 21st century.

It is arguably true that today most homes and businesses can get by with speeds of up to 50 Mbps. But already there are many home based businesses that can't and that are demanding 100 Mbps or more.

Gigabit services are just starting to emerge elsewhere in the world, so the applications that can take advantage of this type of speed are in their infancy. But we all know they are coming.

To spend billions of dollars to build a major piece of national infrastructure that just about meets demand today, but doesn't allow for any significant growth in that demand over the next 10 or 20 years is incredibly short sighted.

It is such a pity that so much time and effort has been spent on trying to discredit and destroy the original FTTP based NBN plan. And equally a pity that the Coalition has put their faith in what has turned out to be a short-sighted, expensive and backward looking MTM plan based on copper.

The nation is going to be bearing the consequences of those decisions for years to come in higher costs and poorer performance in an area that is critical to its long term future.

Betting tens of billions of taxpayers dollars at this time on copper access technologies, as the Coalition has done, is a huge miscalculation.

The number of Telcos who are still focussed on squeezing out the last bit of value from their old copper networks continues to decrease every year. Even BT – which has been the poster child for FTTN - is now planning to increase its FTTP deployment, in part as a response to pressure from the UK regulator, Ofcom.

Yes, it is true that BT is planning to deploy G.Fast technology using an FTTdp architecture. G.Fast is the latest variant of DSL which can provide high speeds but the copper loop needs to be much shorter.

This technology requires fibre to be deployed much deeper into the network all the way to a box located close to the half dozen premises it serves. But you still end up with active electronics in the street - in a pit or up a pole - to convert the optical signal to an electrical signal which then travels down that last piece of copper into the premise.

As far as I am aware no Telco has yet undertaken a large-scale volume rollout of FTTdp. This is not a trivial technology to deploy and will come with its own start-up and deployment issues.

And it is clear which technology Ofcom, the UK's Telco regulator, believes is the better investment, as you can see from a recent statement by the Chief Executive of Ofcom.



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The regulator's chief executive Sharon White signalled a major shift in policy that will attempt to increase investment in fibre-optic lines into homes and businesses.

She told MPs recently: "My own view is that if you take a 10-year perspective, particularly if you are interested as much in the resilience and the quality of the network as in the speed that can be achieved from that, the future is fibre."

<http://www.telegraph.co.uk/business/2016/05/04/bt-prepares-ultrafast-broadband-investment-for-two-million-homes/>

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So where to next?

No matter what the outcome of the upcoming election the original vision of a broadband network built largely on a future-proof FTTP solution is now going to happen over a longer period and at a greater cost to taxpayers.

The Coalition are likely to continue with the FTTN and HFC deployments and the peak funding is likely to be in the range of \$49 to \$56Bn. It will take a “heroic” effort, as NBN Co’s Chairman has said, to have the network complete by the end of 2020. I would guess it will be sometime in 2022 given the current issues with HFC.

Just when the FTTN equipment will need to be upgraded to provide higher speeds is an unknown but given what is happening overseas, it is unlikely to be very long. No one has yet made public the estimated costs of this upgrade.

It looks likely that the Coalition will deploy at least some G.Fast DSL using an FTTdp architecture, similar to what BT say they will do.

But at this point in time G.Fast/FTTdp could not be described as a mature and proven technology.

In fact it is not yet clear that it will be a technology that will have a significant worldwide deployment. So it would be wise to be cautious in committing to use this technology in the Australian NBN.

Should the Labor party win the election then, from reading their policy statement, we can expect a managed transition from FTTN to FTTP, increasing the number of premises served by FTTP by about 2million.

They have also committed to undertake a study to determine how best to deal with the FTTN and HFC footprints and the commitments that now exist.

Given what we now know about the deployment costs of FTTP versus FTTN, I would not expect this transition to FTTP to make a big difference to the deployment costs or timing of completing the NBN. It will result however in a network that is a step closer to the desired end state.

And ongoing maintenance and upgrade costs will be lower.

The Labor policy appears to be taking a cautious stance with respect to G.Fast and FTTdp. And given the issues I mentioned with this technology that is probably wise.

While it is impossible to turn back the clock on the MTM it is still possible to make changes to the current direction, without introducing another major disruption. Changes that will get us closer to building the right network for the long term.

It is becoming increasingly obvious, especially to end customers, that an NBN based on FTTP is a much better network than an MTM based NBN – from every angle –

speed and capacity delivery, maintenance costs, reliability, longevity and upgrade costs.

An FTTP network would be a much more valuable public asset and could generate greater cash flows for the Government due to the lower maintenance, higher revenues and almost no upgrade costs. And it would be vastly superior in driving growth through the wider economy.

So it is a great pity that before making the shift to the MTM the Coalition did not heed the words of Tony Windsor – “do it right, do it once, do it with fibre”.

Thank You