



Ministry of Economic Affairs

# Reflections on trans-sector innovation

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## 1. Foreword

“Reflections on Trans-Sector Innovation” is nr. 12 in a series of Reflections on Electronic Communications that is edited by the Dutch Ministry of Economic Affairs. This series was developed to confront us with the insights of people from outside looking in. It forces us to consider new options for action or reconsider our present policies. Authors have been invited to share their reflections with us because of their specific knowledge, their critical vision or the originality of their opinions. Mr. Paul Budde certainly is no exception here: as a pioneer in trans-sector innovation, as a frontman of the Australian broadband movement and as an international consultant in the field of telecommunications, he could be expected to bring something visionary and profound to the table. He most certainly did so, by laying down an ambitious transition program for the reorganisation of many sectors that are crucial for the future of our economy and society. His views do not necessarily represent the views of the Ministry of Economic Affairs or any of the policies that it is responsible for. But we are sure this Reflection contributes to a lively discussion on trans-sector innovation, smart living and – who knows – smart policies.

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## 2. Executive Summary

In June 2009 Paul Budde presented a copy of the Big Think Strategies Report: *Trans-Sector Thinking – Leading to Smart Communities* to Staatssecretaris Frank Heemskerk. Other copies of the report were presented to the governments in the USA, Australia and New Zealand. It indicated the importance of government leadership on the demand side of broadband infrastructure through a trans-sector approach towards economic stimulus packages aimed at infrastructure developments, and in particular investments in broadband and smart grids.

Such investments, the report argued, should be based on the economic multiplier effect that such an investment can achieve if it is based on a trans-sector approach. Currently government policies are based on a silo approach, but we have seen that such projects experience great problems in achieving their full potential (smart grids, OV kaart, electronic patient records, and so on).

In order to create an innovative economy, we need to move away from this silo approach and embrace trans-sector thinking; however, this is only possible if responsibility is taken at the highest government levels. Even on a ministerial level the policies made are silo-based. It is up to the Cabinet to support national policies that can lead the country towards trans-sector innovation. The Cabinet does not operate within a silo and is therefore in a unique position to lead the other ministries, agencies and NGOs in introducing trans-sector usage of this new infrastructure. The Minister for Economic Affairs is in an ideal position to develop, coordinate and implement such a policy, as some of the key sectors are part of her portfolio.

Of course, we can use the various initiatives that have been taken so far across sectors (healthcare, education, energy, telecoms, etc) but they need to be developed further within the trans-sector concept.

We are currently also seeing a rather ‘silo-ed’ approach by businesses. There is no united ICT approach towards more innovative economic and social policies and strategies, as is the case in the USA (Big Think Strategies Group) and Australia (DEIWG).

Businesses in the Netherlands should also unite to provide government with input that will lead to a more innovative economy. Rather than coming up with more pilots and projects, businesses should concentrate on innovative policy suggestions in which they can also take a leadership role.

The Netherlands can take a leadership position in this development. It already has a track record of high achievements in many sectors; however currently there is a possibility that the country is slipping behind some of its trading partners who have adopted a more radical approach to change. The financial and environmental crises are forcing governments to come up with new more innovative policies – as has become clear from some of silo-based innovation initiatives the linear approach towards some of these developments is no longer an option.

President Obama has established a trans-sector team within the White House and the FCC has appointed a National Purpose Director. They are the agents of change. I have had discussions with both. President

Obama has motivated people to think big, and also differently, and this has certainly been one of the driving forces behind the ideas presented in this report.

Apart from the socio-economic benefits, the cost savings of trans-sector policies are significant.

- care savings per sub-sector are ranging between 20% and 70%;
- savings to energy costs are estimated at between 15% and 30%; and
- education savings are estimated to be between 10% and 15%.

These are all gigantic budget items. Any government serious about cutting costs should put trans-sector thinking at the core of its policy generation.

## 3. Trans-sector innovation

### 3.1 What is trans-sector innovation?

The key element of the trans-sector concept is that governments and industries need to develop policies and strategies that will bring various sectors together to address some of the daunting issues that are arising in nearly every aspect of life.

In our increasingly connected world problems become more complex, which is why we need to take a more horizontal approach when searching for solutions. There is evidence of this type of change in the academic world, but still most R&D still takes place within silos. Also, government policies are often specifically defined within the silos, and this forces even those who would like to operate in a more trans-sectoral way to abide by the guidelines and remain within their silos. The same applies to businesses, however, they generally do find it easier to more rapidly accept the trans-sector approach. By bringing the various disciplines (sectors) together problems will be solved as different participants react to different aspects of the problem in different ways, but all still with the same direction or goal in mind.

This applies as much to government as it applies to industry – perhaps even more importantly to government. In trying to deal with the many problems that countries are facing (environment, healthcare, security, education, energy, etc), it has become clear that the problems in these sectors cannot be solved from within. This has been tried for over a decade now, and little progress has been made. By bringing trans-sector innovation into governments far more innovative policies will be created, policies that will help to address the current social and economic problems. These policies are crucial to drive trans-sector innovations throughout our society. Once government leadership is in place we will start seeing industry and the financial sector coming on board, willing to develop and invest along these new lines.

The benefits to society are huge, and these will be covered throughout this report. Key is however that a more personal and interactive level of interaction and communication becomes possible. So far many of the traditional innovations have delivered results within B2B and B2G models, but in most situations – in particular in relation to personal and interactive services – very few of these innovations have filtered through to the end-user. This will allow for solutions to be pushed out much more deeply into society – to people's homes, where eventually most of the healthcare, education and energy issues need to be dealt with. Trans-sector innovation is all aimed at empowering people at the grassroots level. A trans-sectoral use of infrastructure will bring the required level of participation to all users across society and economy. A connected society will see interaction and communications between citizens, business, government and NGOs in every combination imaginable.

### 3.2 Key sectors that can benefit the most from a trans-sector approach

Currently the ICT debate is mainly focussed on cheap telephone calls (e.g. VoIP), high-speed broadband access to the Internet and HDTV and IPTV entertainment. And if this is all we are concerned about, then there is no need for government policies to either become involved in infrastructure development or in trans-sector policies linked to that infrastructure. The market can be left to itself to find its way through infrastructure upgrades and business models that will provide the money to deliver these commercial applications. However there is clearly far more at stake.

If the government has the vision that this infrastructure can be used to address critical issues in care, education, the environment and other sectors than there is a role for the government to stimulate these developments. These sectors are all under the direct control of the government and it is beyond the capacity of these sectors to build their own digital infrastructure for the delivery of their services as ITU Secretary General Hamadoun Touré indicated in meeting I had with him; nor would this be an efficient way to solve these problems. There simply is no economic case for the overbuilt of digital infrastructure on a sector by sector basis.

*Exhibit 1 – Sectors that benefits from a trans-sector approach*

- Retail trade
- Manufacturing
- Health care and social assistance
- Public education
- Services
- Business services
- State and local government
- Wholesale trade
- Construction
- Finance and insurance
- Forestry, fishing, hunting and agricultural support
- Transportation and warehousing
- Arts, entertainment and recreation

For a concrete example of benefits in relation to the care sector see appendix C. Appendix B provides international examples and further information on these sectors in a more general sense. Chapter 3.7 mentions some broader benefits. They can only be taken into account in a business model developed by the government as they would not stand up in a straight forward market-based business model.

The three key sectors listed below provide examples of where trans-sector innovations linked to digital infrastructure can assist the government to solve the massive problems that these sectors are facing. While telecoms can't solve these problems, none of them can be solved without communications (or, better perhaps, without ICT).

### **3.2.1 Healthcare**

Healthcare is one of the sectors that are set to benefit the most from the advent of 'smart communities'.

In the western world we are facing a massive dilemma in relation to healthcare. New technologies and medical advances have resulted in increased life expectancy and improved lifestyles; however the cost of this is enormous and we simply can no longer afford to finance these huge advances through the public health systems. In countries with proper broadband infrastructure we see e-health shaping up as a way to allow us to enjoy these advances in medicine at a more affordable cost.

Yet the healthcare bureaucracy is a major stumbling block in achieving the benefits for healthcare. A major trans-sector reform needs to take place within the highly siloed healthcare system before they can fully embrace e-health.

Local healthcare facilities and clinics will need to be totally interconnected with the community. We will not be able to maintain the current level of care if we fail to implement services like remote patient monitoring. Video communications between medical staff and ageing people in their homes is the only way to address the for ever growing shortage in care personnel.

E-health is rapidly shaping up as one of the key areas on the truly high-speed broadband networks and millions of people around the world can potentially benefit from e-health applications.

### **3.2.2 E-Education and E-Science**

Similar to healthcare facilities educational institutions also need to be wired into the smart communities – at a far more strategic, rather than a simple technological, level. People within the community should be able to follow lessons and lectures and to participate in courses that are offered within the educational institutions in their community. The reorganisation of education along these lines will require a massive effort.

The Internet and associated Web 2.0 technologies have already broadened the quality and possibilities for remote education. 'Virtual classrooms' are used to optimise the use of scarce resources such as specialised teachers and other experts. E-education is becoming increasingly important in training health professionals in remote areas. Corporations, universities and enterprises are continuing to adopt e-learning solutions in an effort to lower costs and provide training and education to a wider audience.

The education system is well advanced in its trans-sector thinking and could be able – at a rather early stage - to start reaping the benefits of these new opportunities.

### **3.2.3 Energy: smart grids**

Energy and communications technologies offer a powerful coalition that could lead to an energy/comms revolution, resulting in unprecedented opportunities that will benefit the planet, save energy and thus lower costs and create new business opportunities. The concept of smart electricity grids is key here. It consists of adding an intelligent IP overlay onto the electricity grid, with sensors and other equipment.

Smart Grids allow utilities to much better manage their network, limit electricity loss, prevent outages, and arrange loadshed. Renewable energy targets can not be met without smart grids, which are essential in managing hundreds of thousands of distributed energy sources (solar panels, windmills). Energy supply to and from e-cars can't be managed without smart grids, as are smart (energy-neutral) buildings (such as the Dutch Embassy in Canberra (see Appendix B). Smart meters without a smart grid are dumb meters: via smart meters these grids supply customers(via smart meters) with in-house information and tools to better manage their own energy use. Utilities will be able to reduce their carbon emissions, which will offer interesting opportunities on the carbon trading market.

Only from a government owned/controlled network will utilities be willing to buy infrastructure capacity required for their smart grids. These companies require end-to-end network control of their communication flows and will not buy such services on a wholesale basis from a standard commercial network operators.

## 4. The economics of Trans-sector innovation

### 4.1 Financial crisis

The financial crisis has given rise to a major rethink of how we operate in the world. It has become clear that without making massive changes to our political, social and economic systems we cannot sustain the lifestyle we enjoy today – nor can we improve the lifestyle of others less fortunate than ourselves.

The environment had already caused alarm bells to ring, but the advent of the financial crisis clearly demonstrated that the systems we presently rely on are damaged beyond repair. We need to start from scratch and build a new, more sustainable future.

This cannot be done by savings only. Trans-sector policies need to be implemented, aimed at redirecting the budget of the sectors involved, perhaps supplemented by targeted new investments. Eventually the savings that will result from trans-sector policies could by far outweigh the traditional processes of budgetary cost-cutting.

The crisis also brought into question the judgment of the vested interests that have been in control for the last fifty years. In the past the power wielded by some of these entities has made them untouchable, especially in the area of finance, but their spectacular fall from grace has now opened the door for a widespread review of the way in which the world operates.

Market rationalists used to believe that the market would solve all problems and that it would sort things out without the need for intervention. We now know that this is not so. Quite the opposite even: many regulation-averse people and institutions were very quick to ask their governments to bail them out. Almost the entire global financial system was nationalised overnight, because of the incredible miscalculations they made.

Doubts are already being expressed about the ability of bureaucrats to run these systems, and I, too, am sceptical. No doubt the market will eventually manage the various systems and services again, but not before some serious structural changes have been made, creating a more transparent and democratic environment.

We now know how to develop economic systems that allow the participation of the government, with clear exit strategies attached. With regards to infrastructure, the market doesn't have any serious issues with the principle of this. Important however is the governance of such a model.

As will be discussed below, the most important role the government can take on is to provide political leadership aimed at creating economic innovations.

## 4.2 Trans-sectoral thinking assisting resolving the financial crisis

None of the large-scale problems we are facing can be solved by fixing broken systems. It is essential that a new approach be formulated in all sectors – healthcare, education, energy, environment and the economy.

These new approaches should amongst others would enable communities to wrest power from the vested interests and take control of some of these developments.

An unprecedented level of grassroots knowledge and education is now available to do things in a different way. We also have communications systems that allow us more involvement than ever before. And the Internet and associated technologies such as email, blogs, social networks, etc have supplied the horizontal communications tools that could be crucial to recovery. In stead of a few large corporations running the show a host of smaller grassroots entities could now become involved in the new developmenApplying lessons learned in the 1930s, a new approach of economic stimulus packages may enable us to build newer and better systems in all of the above sectors. This would have a major effect on future infrastructure developments, and telecoms infrastructure is seen as a spearhead in the activities aimed at economic revival. The thinking of Professor Carlota Perez on issues like these can be inspirational. Her latest work: “After the crisis: creative construction”<sup>1</sup>. See is especially applicable to the current phase of the financial crisis<sup>2</sup>.

### *Exhibit 2 – Perfect Storm*

The economic, social and environmental crises we are presently facing are creating four forces, all offering different solutions, coming from different directions:

- **Technocracy** – solving a societal problem by (preferred) implementation of a technical solution and implementing change by design reviews;
- **Bureaucracy** – solving a societal problem by (preferred) implementation of a regulatory solution and due process dispute resolution;
- **Econocracy** – solving a societal problem by (preferred) instituting financial (dis)incentives and allocation of property rights and entitlements; and
- **Sociocracy** – solving a societal problem by (preferred) exemplary behaviour and fostering social (peer) pressure (from gentle ‘winks’ up to naming, shaming and ostracising).

It seems that we have, or are very close to, a ‘perfect storm’ with all these forces pushing in the same direction. When that happens far-reaching change tends to occur very quickly. If we want to create ‘true change’ we need to work with all four forces.

But the bureaucracy seems to be trapped in the silo mentality, rather than taking a trans-sectoral approach, where administrations function across departments and ministers perform a coordinating and facilitating

<sup>1</sup> See <http://www.opendemocracy.net/article/economics/email/how-to-make-economic-crisis-creative>

<sup>2</sup> Also see: *Global - Analysis - Strategic vision for comms after the crisis* and *Global - Investing in the Communications Revolution*.

role, for example in the distribution of these services. As an example, if we build new telecoms infrastructure we should make use of the multiplier effect that digital infrastructure can produce in areas such as healthcare, education, climate change and energy. The same broadband infrastructure can be used simultaneously for all those sectors. This would allow a massive increase in the scale, scope and quality of these services and generates significant economic savings. So, in addition to Internet and media services, we can use the same infrastructure for e-health, tele-education and smart grids. But that's only possible if the related institutions are actively involved and are not just recipients of the infrastructure.

To enable trans sector innovation government will have to remove the internal blockages that obstruct the use of this new infrastructural environment. For instance:

- under most current healthcare regulations a video consultation is not covered under health insurance.
- in the energy sector, electricity utilities are discouraged from investing in intelligent networks as that is not seen as core by the energy regulator.

So, as well as the telecoms regulatory approach, we should simultaneously be operating a very positive campaign promoting the social and economic benefits of the open access infrastructure, and stimulating these organisations to begin making internal changes to adapt to the new environment.

A trans-sectoral approach should also be taken when looking at other infrastructure developments – look at combining roads, electricity, water, gas and telecoms projects:

- When stringing electricity cable, why not include smart infrastructure?
- When replacing sewerage facilities, include smart infrastructure at the same time.
- When building roads and bridged built in smarts that can be used to monitor traffic, faults, etc

The ICT industry can play a leadership role in this environment. ICT is one of the few sectors that can facilitate the trans-sectoral approach and we believe that they are in a prime position to assist governments in building these new platforms – the systems that will enable society to obtain the economic benefits associated with the use of digital infrastructure.

### **4.3 Social and economics benefits**

Economists quite rightly look at the economics based on what they have in front of them. They don't like to model costs on what the economics should look like. But in order to build an economically viable business case for a national infrastructure that, for example, would provide an Fibre-to-the-Home (FttH) or an equivalent connection to all premises, it is essential to take into account that trans-sector services will be delivered over that network.

The purpose of this report is not to provide costing models – as that all depends on what you do want to put into the model – but to build the case for a national trans-sectoral approach by providing ideas and suggestions for government policies that can be considered and which then need to be further developed so that economists can work with them in their costing models.

Only governments can provide the guarantees the economists need to be able to build a sound business model. It is rational to do so, because the benefits to society are far larger than the revenues generated from traditional (telecoms) services. In the end it is a matter of cost allocation, something governments have been doing for centuries in relation to essential infrastructure.

The use of new technical solutions such as FttH linked to trans-sector models will alter the economic pay-offs. This, in turn, will induce a change in social behaviour and alter the laws and regulations. That, in its turn, will take into account the financial gains and/or savings to these sectors. This, then, will make it possible to cost model the economic gains.

Many sectors have been developing e-applications for more than a decade, but they have been mainly between institutions – more like a Business-to-Business (B2B) model. These now would have to be extended to end-users and there will be many new applications as a result – based on the knowledge that was gained from the B2B models. To make this work anchor tenants from across the various sectors will need to make a commitment to participate, and to specify what type of applications they will develop over this infrastructure. In order to make the model attractive to these anchor tenants it is important that the entire population is connected. Even if some people choose not to sign up for (commercial) data services, if the connection is there others can count on it for their own purposes – eg healthcare monitoring services or smart meters. Getting the last few people is expensive – not too bad when blended into an entire operation, but astronomical if left as a separate project at the end. In the Netherlands, this has also been recognised by companies such as Reggefiber. It has changed its rollout model and is now connecting all homes (with the consent of the home owners).

Initial indications from the French FttH operators are that once access to public services reaches virtually 100% there are two major positives:

- People who are more expensive to reach via fibre are also more expensive to reach via road, etc. One less hospital visit and you have paid for one or several years of fibre extension.
- Certain services have to be available to virtually everybody (by law, custom, etc). While some have fibre and some do not certain services either cannot be offered, or must be offered in several forms. But once virtually 100% coverage is achieved, just the one, presumably low-cost, method of delivery can be used.

#### **4.3.1 E-health**

What does it cost for a doctor's visit that might be replaced by 'remote diagnostics' some of the time? We already have a range of self-test tools for blood, urine etc. Currently these are limited to the diagnostics that can cost-effectively be built into a remote device. But if we used broadband to expand the distance between the data-gathering device and the analysis device (just as we use video to expand the distance possible between patients and doctor), far more sophisticated devices might become cost-effective. Neil Neuberger ([www.tcf.org](http://www.tcf.org)) estimated in 2007 that in the USA remote monitoring of health conditions would reduce the need for hospitalisation of the elderly by at least 40%. Global e-health software company iSoft has told an Australian Senate inquiry in August 2009 that using the planned National Broadband Network (NBN) for electronic healthcare alone could pay for the network twice over within its implementation timeframe. Their studies showed that integration of patient information across the healthcare system could save AU\$8-10 billion a year, a 10% saving on the current investment in healthcare. It predicts healthcare will take up 25% of the NBN's bandwidth. Post-surgery care through patient home monitoring services could, on

average, reduce hospital time by one day, which could save the hospital bed crisis.

#### **4.3.2 E-education**

What does it cost to bus a child to school every day? If broadband helps with e-education, we should be able to count the bus trips saved. We might also add the cost of classroom space per student. There probably still will be classroom and transportation expenses some of the time (just like part-time telecommuting) but the net result could still show considerable savings. The increasing number of health and security scares no longer need to disrupt education.

Based on current developments India would need 2,500 new universities before 2050.

E-education could assist developing countries in facing the impossible problem of building tens of thousands of schools and universities.

#### **4.3.3 Transport**

Transport to and from appliance repair, private music lessons, language, dance, tutoring, etc. Remote does not work for all things at all times, but each time it does work there should be a savings calculation – traveling to a library, the cost of maintaining the library's public access, etc.

#### **4.3.4 Smart Grids and E-meters**

The economic crisis has stimulated governments to look at infrastructure investments that can create new economic activity and, as a result, new value-added jobs. Smart grids are now high on the political agenda in several countries – in the USA, for instance, with a US\$20 billion stimulus package. They are critical in addressing the current environmental crisis. Smart grids are also the key to smart living. A smart grid has many trans-sector elements in itself – renewables, energy saving, e-cars, smart living – while at the same time it can also use the trans-sector elements of a national broadband network.

Savings to the various sectors are in the billions. According to an EPRI report from June 2008 (*The Green Grid*) it is estimated that smart grids can save between 15% and 30% of the energy. Peak power usage is another thing; experiments at Pacific Northwest (PNNL) showed reductions of up to 50%. To this savings can be added on the cost of human or 'drive-by' meter readers, fire, safety, crime, and environmental monitoring, etc.

#### **4.3.5 The business sector**

It is important to take into account the trans-sector benefits to the business market. It is this sector that in many situations already uses the broadband/telecoms network in a trans-sector format. The trans-sector supply chains of the corporate market represent 35% of the economy, being the combined market share of this sector in the combined ICT market.

#### **4.3.6 Consumers**

A study from the British Office of National Statistics has shown that the financial benefits to customers of being online via a broadband connection are around €100 per month.



## 5. Political leadership and the role of Government

### 5.1 We have become a society of silos

Both the environmental problems and the financial crisis are linked to a lack of coordinated management and governance at a level above that of the environmental, economic and financial systems.

Slowly but surely we have changed into a society of silos, with very few people (if anyone) being in charge of the total process. We have ‘outsourced’ our activities to a range of sectors: healthcare, education, energy, communications, business, finance, transport, trade and so on. Economists have identified twenty such sectors. This system has served us reasonably well until recently, but the problems we are now facing in nearly all of the sectors indicate that something is wrong with the overall management of system – not just with the individual sectors. Also, while the world has faced similar crises (environmental ones at least) in the past hundred thousand years, the effects have been so slow that they were hardly noticeable. The impact of change over the last 50 years has been so rapid that our planet and we, its inhabitants, are facing the threat of being unable to deal with it.

If we want to move forward we will have to, at least partly, dismantle this silo system and start looking for cross-sector points that will help us create new arrangements. Imagine how many cross-sector points there are associated with silos! There will be many new opportunities to explore as we create the next overarching, inclusive management system.

### 5.2 The buck stops with the heads of government

For well over a decade we have been strong advocates of a vision to develop strategies that would see the telecoms industry moving beyond telephony and Internet access and the electricity grid being digitised to assist in addressing some of the energy and environmental problems we are facing.

The digital economy will only work if both governments and industry embrace ‘trans-sector thinking’. Governments can take a lead here by linking e-health, smart grids, smart cities and smart infrastructure directly to the success of that infrastructure; thus creating an economic multiplier effect. The benefits of the multiplier effect will have to be understood, accepted and promoted by the government to the other stakeholders (other government sectors, investors, industry, business and consumer groups, etc). The various sectors then may become key anchor tenants of the new infrastructure; not just for the sake of the success of the infrastructure itself, but to reap the associated financial and social benefits. The government can also promote this policy in the context of opening up the infrastructure for innovations, more choice and more competition.

With visionary plans for these broadband and smart grid packages in place in many countries it is no longer just a theoretical affair – the success of these packages now depends on actually achieving a trans-sector status. If we are unable to get a trans-sector buy-in it will indeed be a very expensive infrastructure just for the delivery of fast Internet.

The most important strategy that governments can now implement to transform the vision into a reality is to take that trans-sector approach and show government leadership to ensure that e.g. the Ministers of Health Care, Education, Energy and Environment, move to set up their own strategic project groups aimed at developing the e-applications, which have been discussed and piloted for sometimes more than a decade. It is crucial that a whole-of-government approach be taken to develop and introduce these anchor applications on the new infrastructure. It is also essential that the economic stimulus packages are used to develop the infrastructure and the applications in parallel with each other, so they can be introduced simultaneously.

There is only one person in any given country who can make this happen and that is the President or the Minister President. They alone don't operate within one of the silo sectors and in general they have the vision and the power to establish a trans-sector approach for these stimulus packages. The most critical roles of government are:

- To create a high level of coordination between the various sectors (ministries) so as to guarantee the multiplier effect of government policies (such as the muni-networks) in relation to infrastructure.
- To direct coordinated management at securing key anchor tenants to use the infrastructure.
- To create confidence for investors.
- To make sure the best people are at the helm of these projects.
- To formulate a long-term view that will ensure political and financial stability.
- To develop a five- or ten-year plan for any serious trans-sector developments.

There must be well-defined goals regarding where we want to be in five years' time, but at the same time this plan needs to have sufficient flexibility to profit from the rapidly changing environment that will be the result of the four forces mentioned above. Defining these goals in relation to sectors as healthcare, education, environment would be an excellent starting point.

A key risk factor is that complex programs such as these can easily derail or end up in chaos, eventually splintering into smaller outcomes that bear no relation to trans-sector solutions. A sound hierarchy and a level of modularity need to be in place in any trans-sector model to prevent this from happening. It will be crucial to break the complex system into more or less independent (government) modules, still managed from within the one hierarchy. Smaller more manageable modules are an essential element here. It is often difficult for governments, given their large bureaucracies, to adopt a trans-sector approach. The move towards such a different concept could be driven by groups of inter-disciplinary experts from industry, government and academics. I suggest that under the leadership of the government trans-sector projects be established that include people who can interface with the other relevant sectors. And, to ensure a successful trans-sector approach each of these groups should also have a senior person from the ministry/company in charge of the infrastructure. The Ministry of Economic Affairs could play a coordinating role with the local councils as in many situations national services in the Netherlands will be delivered over a variety of local networks.

### 5.3 Australian Cabinet and White House Trans-sector teams

In Australia the Prime Minister was the person providing his personal support for a trans-sector policy. The smart grid/smart city project described below is a true trans-sector project, as it is run by the Department of the Environment, together with the Department of Energy and the Department of Broadband.

This process is underpinned by the management of the Prime Minister's department. A Strategic Policy and Implementation Group has been established within the Department of the Prime Minister and Cabinet (DPM&C). While this is not called a trans-sector team it very much fits within that definition. It works in a project-based way, using strategic consulting style methodologies, on important whole-of-government, as well as specific, policy areas. The gamut of methodologies runs from early-stage policy development through to monitoring and direct involvement in implementation. In the USA a trans-sector team operates within the White House, also looking from a strategic level at all the important investments the Obama government is making in relation to the economic stimulus funds. For a full overview of International Examples see Appendix B.



## 6. Networks and design principles

Over the last few years the broader industry has started to put its weight behind a trans sectoral vision and has, for example, been advocating FttH as the key infrastructure to move ahead to a digital economy. While this may be the ultimate infrastructure solution there are different ways to get there.

- Australia and New Zealand have national FttH plans in place.
- The USA included regional broadband and smart grid networks in its economic stimulus packages.
- Governments in Finland, Norway, Switzerland, Greece, Korea, Mauritius, China and Japan are all directly supporting FttH developments (some already for a long time).
- The Netherlands and Sweden have embarked on muni-based FttH projects.

There is widespread industry agreement that FttH should be the infrastructure end goal for the digital economy. It provides close to infinite bandwidth and the incremental costs are very low. It can also be interconnected with other infrastructure projects such as smart grids and smarts in transport infrastructure. It is not just speed and capacity that matters here – security and reliability are equally important. These are essential elements in the design of networks that need to be used for care and energy services. The copper and coax based network are not up to scratch for such high quality services

It is also important to note that applications will come and go, and they will continually improve, but the infrastructure at its most fundamental level should be sustainable, should last near-forever, and should incur only routine, periodic improvements along the way. There is no argument among network architects and engineers that FttH can provide this level of investment and technology security.

It is therefore essential that the government set out clear national infrastructure policies and regulations that guarantees that the country moves towards an all fibre environment that can be used by all sectors of the digital economy. As to costs, these are national infrastructure costs, not telco costs. They are typically depreciated over a 10-20 year period. So a €1200 FttH investment should in fact be valued at €60 per annum, less than the cost of painting maintenance of a house over that period.

### 6.1 Governance model

It is essential that a governance model and architecture be designed, to reduce complexity and interrelations. Within a national policy framework the sectors need to be directed to develop joint trans-sector teams to explore how new systems and structures can be created using the new infrastructure that becomes available through the stimulus package – and, more importantly, new government policies. It is critical here for the large, complex trans-sector model to be divided into manageable projects. The municipality approach in the Netherlands is a good example of such an execution model. Another aspect of good governance in this respect is to look for low-hanging fruit – in particular in greenfield projects (The Dutch Embassy in Canberra is a good example in this case).

## 6.2 Open networks

Trans-sector only works on open infrastructure. Common open standards and easy access to simple wholesale products and/or services will liberate the innovation potential that at present has to rely on the goodwill of ‘industry-insiders’.

- Any interface/protocol used in a trans-sector model must be open.
- Through separation from its applications such an open environment is going to deliver both new services and new players into the market.
- Each sector must be able to remain completely in control of their end-to-end activities, with well-regulated access and connectivity.
- The ‘end-to-end principle’ must be applied as much as possible and this can only be achieved if the infrastructure is available to these sectors on an open wholesale basis.

As indicated above without such an open network utilities will never use these national infrastructure for their smart grid applications. Vertical integrated models can be major barriers for the development of commercial viable applications in care and education and for economic innovation in general.

Government policies can be implemented along the lines of the more aggressive Australian and New Zealand examples, but models based on a more gradual transition – which will most likely be the case in the Netherlands – could also work, as long as they are constructed according to that all-important open network wholesale principle.

Importantly, the concept of the open network has now also been recognised by the FCC in a recent report they commissioned from the Berkman Center for Internet and Society at Harvard University.

## 6.3 Trans-sector enlarges the pie

It is gratifying to see that an increasing number of stakeholders involved in the broader ICT market are providing their support to government policies aimed at developing infrastructure that will facilitate, through its wholesale arrangements, a range of very innovative and competitive new ICT (retail) services.

With the trans-sector approach people are beginning to recognise the potential to increase the size of a rather limited telecoms pie, and to realise that a decrease of market power from some of the telcos, on the one hand, can be more than compensated for by an increase in overall ICT business. What we see in countries that are embracing the trans-sector approach is that, once they understand the government’s policies and see the government’s commitment towards using infrastructure for these others sectors, they ‘voluntarily’ begin to change from vertically-integrated companies to more structurally-separated models. These changes can take a long time, depending on the level of government leadership.

- Both KPN and, very recently, Telstra in Australia, are now fully behind the trans-sector use of their infrastructure and they are both active promoters of the concept – they now see the increased business opportunities.
- Australian pay TV operators Foxtel and Austar have indicated that they will use the national FttH infrastructure for their media business.

However, without the government's 'carrot and stick' approach none of these changes would have happened.

It is critical for the infrastructure to be developed in such a way as to facilitate the industry transition. We need to ensure that the intentions behind the trans-sector vision provided by the government is adequately translated in the implementation of the broadband infrastructure. As indicated before, the government will need to follow this up with further supporting policies in other sectors and the infrastructure/wholesale facility will be the most critical element in the actual implementation. However, it is essential that the bigger picture is kept in mind. It would be far too easy for such projects to become bogged down in endless technical details. It is up to the government to make sure that the vision remains intact.

#### 6.4 The role of the infrastructure company

Trans-sector innovation depends on open infrastructure being made available on a utilities basis. The aim is that this infrastructure can be used for the delivery of a range of commercial and public ICT services on a trans-sectoral basis. Wholesale services need to be available in such a way as to enable the infrastructure company to facilitate this trans-sectoral approach, whereby these 'sectors' can independently buy and deliver services to create their own retail services. The network will have to provide a multiple access facility within each premise that allows for the independent delivery of these trans-sector services. For this purpose it is important that the infrastructure company is seen as a regulated basic infrastructure provider and not as a telecommunications company. Its tariffs should be subject to regulatory approval.

*While we are talking here about a national infrastructure company such as has been proposed for Australia and New Zealand exactly the same principles apply to a municipality-based approach such as that proposed for the Netherlands.*

New infrastructure policies should be carried out, not in a telecoms-centric manner, but in a truly trans-sector context. The infrastructure company (municipalities) should facilitate not only telcos but a broad range of access seekers. The needs of these other sectors will also have to be facilitated by them. From a social and economic policy perspective it is essential that these sectors receive special attention in the debate, especially since these sectors are not well-represented here.

Specific (trans-sector) requirements will also need to be facilitated within the new regulatory environment. A broader participation of sectors in the new infrastructure will have far-reaching consequences for issues such as regulations, privacy, security, USOs, etc. The underlying government policy should be aimed at facilitating both public and commercial arrangements, which can be developed by wholesale customers through a model facilitating maximum choice, competition and innovation, both at a wholesale and a retail level. The Dutch regulatory model already has many elements that can be used to facilitate this development. Cooperation with like-minded regulators such as the FCC in USA and the ACCC in Australia is recommended.

From a government policy point of view the infrastructure company should be able to provide wholesale services (only) that will allow for the creation of a range of independent services:

- telecommunications retail services (voice, data, video) – customers can include telecommunications carriers, ISPs, mobile operators, and non-carrier companies including information service providers, broadcasters, cable/pay television service providers, digital media companies, etc;
- sensor-based networks providing end-to-end connectivity for utilities (smart grids), M2M networks, monitoring networks, etc;
- infrastructure facilities that allow for the establishment of e-health, tele-education and e-government services;
- corporate and other government networks as well as large system integrators.

The infrastructure company should impose no restrictions on the sharing or resale of its facilities. The end result of this should be that any access seeker will have, in principle, the opportunity either to buy basic infrastructure to develop their own services, directly from the infrastructure company, or to buy from wholesale providers who might offer ‘value-added’ infrastructure services.

## 6.5 Municipal Broadband

With the increased awareness of broadband also cities, regions and communities are beginning to understand the social and economic benefits that broadband can offer them. In this respect they are often showing more vision than the industry – and often more vision than national governments. They intuitively know that it is not so much a matter of costs or profitability of the network; but that the network is a facilitator that allows them to generate much higher social and economic benefits. For them there is a natural separation between the network and the benefits that can be derived from it. There is never any great opposition from the people to policies aimed at providing the infrastructure on a utilities basis. As a matter of fact in the election campaign in Australia, the Australian Telecommunications User Group (ATUG) found that 80% of residential people and 60% of businesses were in favour of that.

Telcos using a vertically-integrated business model are reluctant to embrace that utility approach and to invest in this infrastructure. As a result some cities, in particular in the USA and Europe, have become impatient and started to develop their own infrastructure.

Several of the municipal networks in the USA are leading the trans-sector approach, adding smart grid applications to their communications and entertainment applications. However they are severely hampered by ongoing court cases initiated by the incumbent telecom and cable industry. Municipalities are all recognising the critical importance of them taking charge of the development of their knowledge-based environments. They understand the principles of smart communities (see Appendix A). But while a proactive local government is a vital element in the development of broadband to the point where it can begin to deliver community benefits in education, healthcare, community services, job creation and export, the reality is that the majority of these municipal bodies lack the management skills and the continuity to roll out broadband infrastructure. For example municipalities find it very difficult to roll out infrastructure in competition with existing players. Nevertheless, muni-networks can play a pivotal role in becoming the infrastructure providers for telcos and cablecos, as well as the other sectors. The local councils – as neutral infrastructure providers – can perform the same role as, for example, the new national government supported infrastructure companies in Australia and New Zealand.

The Dutch government is now committed to empowering local communities to build their own networks and with the right policies it should now also support this move with (national) trans-sector policies that will see new applications being delivered over these networks. While this municipality based approach could work the reality is that some very large economic interests are at play, which could easily undermine the success of this policy. Most likely more policy initiatives will be needed for this approach to succeed. Local (vertically-integrated) networks will never be able to successfully compete with incumbent operators with national or regional networks. But, if combined, these municipal infrastructure-only operators could, over time, become the new national infrastructure. It will be important for the users of this infrastructure to be able to successfully operate at a national level also, so common standardisation and national interoperability of these networks is a critical issue. OPTA will have a key role to play here.

The problems being encountered by the Amsterdam FttH model, and the fact that it appears that this network will eventually be run by an incumbent (KPN/Reggefibres), are a signal of what other municipalities might expect in the near future. Amsterdam, of course, has been very successful in forcing the issue. They provided the vision, but the technical implementation is perhaps better left to the private industry. It is most important that these developments be protected from anti-competitive behaviour by the incumbents. The creation of open networks is the best course.



## 7. Development in the Netherlands and Australia

### 7.1 Developments in the Netherlands

As a trading nation with a long-standing international outlook the Netherlands have always taken a leadership role in approaching new developments with an open mind, and this has put them in a position to also be an early beneficiary of the outcome of such developments.

For the last few decades the government has made strong commitments to competition and innovation but it is very frustrated by how little progress its policies have generated in some of these sectors. After all those years the traditional incumbents are still in control. In healthcare and telecoms, at least, there have been great silo-based innovations, but despite this the overarching structural problems in these sectors remain.

For more than a decade regulators have tried to regulate prices and access in these sectors, and despite numerous expert reports most countries have made very little progress toward true reform. This has also been recognised by the USA, where the Obama Team, the Administration (Department of Commerce) and the FCC are now all aligned in their assessment that true network neutrality means a separation between (in their words) pipes and content. They are working towards far-reaching and fundamental changes in their telecoms policies, which the FCC will present in their broadband report in February 2010.

The Netherlands has already shown international leadership in relation to the regulation of fibre networks. Being at the 'bleeding' edge of such developments now requires a finetuning of the regime, based on the results so far. The cost structure makes it very difficult to develop over-the-top (OTT) applications, which are in essence very similar to trans-sector applications. The next step is aimed at stimulating the development of municipal broadband, which fits in nicely with the need for a more modular implementation model of new infrastructure, as well as with the more grassroots approach that is becoming increasingly prevalent in modern policy thinking. These measures are expected to overcome the investor reticence that has crept in since the start of the global economic downturn. The question is whether this will be enough to keep the Netherlands in the lead – or will the country have to follow other countries that are prepared to implement changes that will have more far-reaching positive social and economic consequences?

### 7.2 Groundbreaking new policies to stimulate muni-broadband

Municipal fibre projects have been the bedrock of fibre growth in Europe during the last few years, particularly since the incumbent telcos failed to develop their own strategies until forced to respond to the commercial successes of their main competitors who had begun to invest in fibre. Latterly, government funds made available through various economic stimulus packages have also stepped up fibre interest and deployment. Fibre has become the main growth area for broadband connections in Europe: in the year to June 2009 the number of FttH/C subscribers in the EU increased by 18%, considerably higher than growth in the DSL and cable sectors and matched only by mobile broadband connections. There are currently more than 230 projects in progress across Europe, many operated by local governments.

The Scandinavian countries rank highest in Europe for fibre penetration, led by Sweden with a penetration of around 11% (according to the most recent FttH Council Europe league table). The Netherlands has dropped back to eighth position, but newly proposed legislation aims to address this by facilitating the ability of local councils to roll out their own fibre networks. Recognising that telcos are not going to take these initiatives on their own (or will do so too slowly) and spurred on by the success of Amsterdam's open access CityNet network, which in February 2009 moved to the next stage of its project to provide a further 100,000 connections, the Dutch government will combine legislative measures to ease municipal projects with funds made available from energy privatisation (including the sale of Essent, a public utility 74% owned by six provinces and 26% owned by more than 100 local municipalities).

An additional benefit of municipal fibre projects is that local governments are well-positioned to take a trans-sector approach, maximising their use of these networks to deliver and expand on services for which they are responsible (healthcare, education, e-government services etc). By incorporating the traffic from government-related bodies (high resolution medical imaging and instant distance-consultations realistically require a fibre connection) the overall cost of the network for consumers can be brought down, since the network will support much more than commonly used broadband applications.

One of the main obstacles to municipality-*owned* fibre deployments is the kind of regulation, which is intended to prevent market distortion. Many municipalities can gain the regulatory go-ahead to start their deployments by cited market failure, or more specifically the failure of operators to invest in local fibre networks.

The EC does not deem municipal involvement in fibre projects to constitute state aid as long as municipalities participate in projects on the same terms as other market investors. This acknowledges the premise that local and national governments cannot resort to state aid to finance projects where competition is present and/or where private market players are willing to invest on their own terms. However, further national policies will be required to actually see the development of a trans-sector approach towards this new FttH infrastructure. While some good initiatives have been made in fibre regulation and municipal broadband, trans-sector policies have so far been missing from the action. Based on a trans-sector approach the abovementioned initiatives need to be finetuned in order to bring all the elements together into one cohesive policy, covering both infrastructure and application issues. Once such an overall policy has been formulated a more effective and efficient implementation can be developed. The key to success here is the support provided not just by the Minister for Economic Affairs, but by the Ministers for Healthcare, Education, Energy and the Environment also.

### 7.3 Developments in Australia

So far Australia is the only country in which the government has actively taken a trans-sector approach to its economic stimulus package for the national broadband network. The Obama Team in the White House does have a trans-sector team that meets weekly but so far they have not turned that into a full-blown approach. The FCC network neutrality review, however, is going to be the most important step in this process. There are obviously many more initiatives around the world that include concepts like e-health, smart grids and tele-education. In the Netherlands there is the program *Maatschappelijke sectoren en ICT* and the recently launched *Smart Living* Project. These projects have often been labelled 'death by pilots'. As far as we know, none of them have grown to a regional, let alone national, level. The reason for this is that they were all developed within silos – there is no trans-sector innovation policy behind them. This clearly shows the difference between 'normal' innovation and trans-sector innovation.

The lead-up discussions to what is now the Australian government's National Broadband Network (NBN) has been a catalyst to this trans-sector thinking report.

Under the auspices of the Australian Digital Economy Industry Work Group (DEIWG), and based on previously developed Open Access Principles, an industry discussion took place over a number of months. This provided the basis for a collaborative industry paper, prepared for the present Minister for Broadband, Communications and the Digital Economy, Senator Stephen Conroy. This group (150 companies) extensively discussed the industry's vision with the Minister at a half-day Roundtable in March 2008 and took the decision to investigate the importance of the new infrastructure for the broader (digital) economy, taking a trans-sector approach to the AU\$43 billion commitment the government is going to make in digital economy infrastructure. As a follow-up on this the CEO Forum of the Industry Group met with the Minister once again, after which they organised high-level meetings with other Cabinet members. These included the Deputy Prime Minister and the Ministers for Education, Healthcare, Energy Finance, Environment and Climate Change, as well as many of their political advisers and heads of Departments. Key elements in these discussions were the need for a policy review of trans-sector government thinking and the development of the digital economy in parallel with any new infrastructure (telecoms, smart grids, transport). The conclusion was quickly reached that it would all be about smart communities ('smart' in the sense of interconnected and sustainable).

There are now half a dozen trans-sector projects under development, detailed in Appendix B. At the BuddeComm Telstra Roundtable in September, the decision was made to develop a national e-health project for the primary care sector specifically designed for the NBN. This will be presented to the Prime Minister in late October, along the same lines as the smart grid/smart city project was developed and presented (See Appendix B). At the same time a high-level business lobby group has been formed to ensure that the trans-sector interests are going to be looked after in a debate that remains rather telco-centric. These businesses initiatives are missing in the Netherlands. Discussions are underway to see if this can be rectified.



## 8. Conclusion: Change required to innovation policies

A new innovation driven economy and society requires trans-sector innovations.

In order to stimulate new innovations, we can no longer rely on linear developments within each sector. Many of these sectors, such as healthcare, education and environment are in some sort of crisis. Throwing more R&D money or more regulations at the same old problems in the hope of fixing them has, in the current financial and environmental atmosphere, clearly come to nothing. We also will not maximise the economic recovery process if we cling to traditional systems and approaches. This is what got us into the present predicament in the first place. Trying to fix broken systems would be the wrong approach. If we want to address the problems in modern societies there is no other way than to bring the various sectors together and have them tackle the problems in a trans-sector way; which is very different from simply cross-sector. Yet there is strong pressure from these sectors to leave them alone. They often claim that only they have knowledge of their particular sector and they are the ones who can fix the problems as long as they are given enough time and money. However,

- so far the healthcare sector has been unable to come up with good public e-health applications; as shown by the failure of the electronic record systems;
- the energy industry has failed to build smart grids and develop renewable energy technologies, beyond some pilots;
- the telco industry claims that within their silo there is no business case for a national FttH broadband network;
- the transport industry has failed to deliver universal public transport smart cards (OV kaart);
- the education system opposes opening up their systems to new ways, claiming quality control issues;
- we are still building unsustainable, non-smart, buildings and cities;
- securities and pricing are other reasons regularly given to stop trans-sector involvement.

And the list goes on.

The trans sector vision should be based on smart communities and smart buildings. The major problem with smart living communities and projects is that unless they are broken down into smaller modules they remain rather elusive. High level vision, support and coordination are needed, but the hard work needs to be done at ground level.

Putting all the elements of trans-sector innovation together it becomes clear that certain policies need to be in place in order to achieve the social and economic benefits of this new way of thinking. This will make many of the services that are now available in the silo-based structure far more accessible to the end-users. It will engage people in these new models as the end-users are going to be an integral part of the social and economic solutions offered by the trans-sector model. It will empower people to become active participants in e-health, tele-education, energy efficiency, etc. If we are serious about using the current economic crisis to guide our economy and our society in general in a more sustainable direction, we need to ensure that new developments are based on a trans-sector model.

Changes to begin this process of economic innovation will need to be led from the top, as we have seen in other countries. This is the single most important issue that needs to be addressed by government leaders.

The Ministers in charge of the infrastructure (Economic Affairs, Public Works and Water Management, Spatial Planning) should take both the leadership and the coordinating role. The Dutch are in a prime position to make that transition, provided they succeed in establishing clear and strong trans-sector leadership. As indicated above this transformation must be led by the Cabinet. At the Netherlands/Australia Broadband Conference in Sydney in 2006, the Minister President spoke about the importance his government placed on innovation policies.

With international changes requiring innovations to be more trans-sectoral, the Ministry of Economic Affairs could lead this new process, once it has redefined the relationship between innovation, telecommunications and ICT policies. Empowered municipalities would result in this level of government, as well as the Ministry, becoming leaders in this development. This would combine national government vision with local government execution. However, a clear shift towards a trans-sector approach would be an essential prerequisite. Only when we move on from the old R&D policies, platforms and silos, will we be able to start seriously addressing the new problems of the world in which we are now living.

#### *Exhibit 3 – Proposed action plan*

- Start the trans-sector policy from the top downwards and stimulate the various sectors to work together.
- Inventory of changes made so far (fibre regulations, municipal policies, various pilots and projects).
- Align this with the new trans-sector policy
- Roll-out digital infrastructure in such a way that it can be used in an economic viable (affordable) way by all sectors.
- Think nationally while acting locally (munies).
- Develop open systems policies across all sectors, the infrastructure and the applications.
- Allow for a transition period that allows all (incumbent) participants to move towards this new environment.
- No need to stimulate commercial developments such as telecoms, broadband, media and entertainment; they will develop on their own accord and automatically profit from the scaling benefits of the trans-sector approach.
- Active promotion of the social and economic benefits that will result from a trans-sectoral use of the infrastructure aimed at getting the essential (political) support for these new policies.
- Develop a trans-sector approach also towards other infrastructure and look for synergies: roads, bridges, water, gas, electricity, sewerage, etc.
- Remove regulatory obstacles in, amongst others, telecoms (vertical integration), care (insurance issues), and utilities (investment barriers).

## 9. APPENDIX A – Smart Communities

### 9.1 Smart thinking People

The linear thinking (silo) approach that has grown over the last 50 years is actually quite different from the way people used to be organised. We didn't have the level of specialisation that we have these days and with fewer specialisations, individuals within these organisations did a far greater variety of tasks. Many of these specialised functions have been outsourced over the last 50 years (maintenance, IT, cleaning, staffing, etc). In addition, young students were taught more subjects at school and had a far broader skills base before they decided to specialise. More work was done within the family unit and family members were involved in a much broader set of activities, such as gardening, washing, childcare, healthcare, entertainment, etc. Now many of these tasks have been outsourced to specialists. While in general these developments have provided great benefits for all involved, at the same time we have lost some 'smarts' in the process. 'Street smart' comes to mind in this respect. We will need to organise ourselves to regain some of our smart thinking skills in order to address the challenges that we are facing as individuals and as societies, and to find solutions to some of the new problems we are facing in the areas of energy, environment, transport, healthcare, etc.

Most of this trans-sector thinking exists within individual people as we are using many different tools from different 'sectors' to address day-to-day life. We need to bring some of this smart thinking back into our organisations. For most people this is common sense and therefore not something that we need to learn. The fact that in essence we are 'trans-sector thinking people' is one the key reasons why many of the measures discussed by governments in relation to solutions for the current environmental and economic crises are broadly supported by the general public. However, the silo organised systems within government and industry is what is holding us back from implementing smart solutions.

In order to tap into the trans-sector skills we all have, government and businesses need to return to trans-sector thinking and build new structures that allow their organisations to look for solutions in a more horizontal way. As we have developed our specialisations over the last 50 years we now have a large number of highly qualified silo experts. By establishing a trans-sector policy over these groups we can start tapping into their specialisations across the sectors.

## 9.2 Smart communities

When organisations have rearranged themselves to tap into these smart thinking people, we can then start to build smart communities. A smart community combines our individual and group smarts and applies them to the way we live, work, travel, etc, within our communities. The concept of smart communities is based on intelligent infrastructure such as broadband (FttH) and smart grids, so that connected and sustainable communities can be developed. They are holistic and include environmental elements such as self-sufficient energy buildings, energy exchanges for renewable energy and e-cars, delivery of e-health, e-education and e-government services, as well as digital media and Internet services.

### *Exhibit 4 – Smart City – Masdar City – Abu Dhabi*

This new city on the Gulf will accommodate 40,000 people and provide work for another 50,000 commuters. Over US\$24 billion over 8 years will be invested to create a carbon neutral, waste neutral and energy positive community. It includes intelligent buildings that generate wind and solar energy. This energy will also 'fuel' a revolutionary public transport system – cars will not be allowed in the new city. Because of the desert environment, 78% of all energy will be based on photo voltaic energy (rooftop panels). The other 22% will be provided by five other renewable sources. Through building design alone 70% of energy savings are expected to be realised. All waste will be recycled into energy.

The city will be built in four phases and each one of them will have its own mini smart grid. The grids will all be interconnected during the course of the project.

The city is asking for international collaboration. It will also host a university and R&D institute dedicated to the new sciences that are involved in its establishment, and they also aim to become a net supplier of scientists in this field.

Interestingly this leading world initiative is being taken by an oil state (60% of national income is derived from oil).

Rather than looking at these elements in isolation, a smart community looks at them in an integrated way. The smart systems which we can then develop will result from the smart concept that can be applied to each of these elements. Creating a workplace at home will have its impact on travel and on the way we build business centres. In order to have a workplace at home a good telecoms infrastructure is required. This infrastructure can also be used by other sectors such as healthcare, education and energy. For example it could assist in addressing problems in hospitals; patients could be monitored from their homes, thereby reducing the need for more hospital beds and more retirement villages, and also alleviating at least some of the need to share the already scarce nursing resources.

Buildings need to be smart in all aspects – from design to the materials used, production of raw materials, climate control, daylight, acoustics, temperature, ventilation, lifespan of the building, trees on the site and water usage.

### Exhibit 5 – Smart Homes

Smart Homes such as ‘habitat control’ or ‘intelligent home’ type networks are equipped with devices that possess an amount of integrated intelligence required to manage and exchange data.

Though home automation systems were being offered in the past as devices that enhanced lifestyle, in recent times security, energy and access control systems have gained increased prominence and usage. The market is also displaying signs of maturity as the demand for integrating home automation systems with the Internet is on the rise. In fact, even the current demand for simple applications has prompted broadband service providers to include home networking products in their installation packages and even go to the extent of integrating them with the existing systems at home free of charge.

Smart home functions include entertainment, communications, energy and climate control, security, alternative energy and energy neutral applications, lighting and robotics.

Facilities for tele-working are another important element in smart home designs.

Increasingly the definition of smart homes also starts to include ‘zero-energy’. These buildings have zero net energy emissions. Carbon emissions generated from on-site or off-site fossil fuel use are balanced by the amount of on-site renewable energy production. This can also include carbon emissions generated in the construction of the building and the embodied energy of the structure.

Smarts (as in ICT) built in infrastructure such as grids, gas and water pipes, roads, bridges, etc, will assist in addressing some of the issues in traffic congestion, road safety, energy saving, environment and climate change. These smarts can also be linked into the national telecoms infrastructure above.

Smart transport will integrate all of the above and then apply it to both public and private transport.

There are obviously many more extensive reports on each of the sections mentioned under the chapter ‘smart’ but it goes beyond the scope of this report to address them in more detail. The purpose of this report is to touch upon all the various elements of smart and other areas could be added – this report is certainly not exhaustive. But in the end the result will be a well integrated smart society.

### 9.3 Smart countries

The next level up – a smart society – is the end result of the smart policies discussed above in trans-sector innovation. Led by smart policies, countries will be able to sustain their level of social and economic welfare (welvaart). People in developed countries are generally becoming more interested in lifestyle welfare than in wealth welfare. Obviously a smart country also has all the elements mentioned under smart people and smart communities. At the same time smart countries will also maintain their leading economic positions and will excel in international trade and other international affairs. Having a leadership role in global developments is essential for the welfare of any country in a globalised world.



## 10. APPENDIX B – International Trans-sector Examples

Since 2008 several trans-sector projects have been launched in Australia.

### 10.1 E-education: Australia's first trans-sector initiative

Prior to the government's announcement of the entire scope of the NBN it had already taken a trans-sector initiative. This was the 'National Secondary School Computer Fund' which will see every Australian student in years 9-12 with access to their own school computer. Upon analysis, the implications of this are rather revolutionary. The combined initiative of 1:1 computers in the school and the 100Mb connections to all the schools in the country is going to open up avenues that will totally revolutionise the education system in the country.

The size of the project and the trans-sector approach to it will create a range of business opportunities. It allows for a standardisation of hardware and software, which will then open the way to an enormous explosion in e-education innovation. There is already a very healthy education software and content market, which will be only too eager to take their current developments a step forward. Aside from the benefits to Australian students the trans-sector approach will certainly attract world attention and open up export opportunities as well.

As with any revolutionary development one of the most critical issues will be to ensure that the education system is actually capable of leading this change. This will necessitate very significant professional development. Often a great deal of attention and money goes into the technology but very small resources, if any, are available to ensure that those who will have to make it work are equipped to implement and guide that process. Teachers and other educational staff will need significant support – without this, despite the enormous investment the government is making, the project could still fail. A successful implementation will allow for a truly new approach to education – 1:1 education. Each student can, within the context of the education system, gain individualised education. The pace and the subjects studied will be set by the students, once again all within the context of the education system. It will be project-based and both students and teachers will greatly benefit from the new interactive, personalised educational material.

This will be beneficial for fast learners, who can simply steam ahead; also children who have learning difficulties can be supported with specialised services. Management of both these groups is problematic under the current system – it is difficult to cater for them in a cost-effective way. Teachers will be able to coach students in a more individual environment; and when cut loose from the 'school-based' structure the education system will be able to go global. Students can tap into knowledge and expertise from all over the world. We only have to look at developments such as Google and Wikipedia to see what this might lead to in an educational framework.

Teaching as a profession will also change radically, as not all teachers will need to be school-based. For example, female teachers who leave the system when they start their own families can be retained in the far more flexible structure of e-education.

Australia has a unique trans-sector opportunity to truly revolutionise the education system, enabling students to fully profit from the new digital society. As a matter of fact, most of these youngsters are already truly digital outside the school; while inside the school they remain caught in an environment that was created several hundred years ago. In the end, as many government and industry leaders have said, investing in education is the soundest economic investment you can make. It is a social development, but it is perhaps even more an economic one. Economic capital has moved towards knowledge and this e-education trans-sector approach is building up that knowledge capital and spreading it throughout society, basically providing every child in the country with an equal opportunity for their education.

## 10.2 Trans-sector project: smart grids

In May 2009 the Australian government announced a AU\$100 million investment in a new smart grid demonstration project that is linked to the National Broadband Network. Smart Grid Australia, an industry alliance established in 2008, asked for AU\$50 million for demonstration projects (see [www.smartgridaustralia.com.au](http://www.smartgridaustralia.com.au)), but the government provided AU\$100 million in 2009/10 for what they call the National Energy Efficiency Initiative to develop an innovative smart-grid/smart-community. Combining broadband with intelligent grid technology, smart meters in homes and an arrangement of other sustainability elements in buildings and transport (e-cars), this demonstration project will enable greater energy efficiency and better integration of renewable energy resources such as solar and wind power. Funding will be provided to a consortium of state and local government, public and private energy companies, and other private sector investors for the large scale demonstration of integrated smart grid technologies.

This initiative builds on the government's investment in the National Broadband Network, household energy efficiency and renewable energy. It includes the AU\$3.9 billion Energy Efficient Homes Package that provides rebates for the installation of insulation and solar hot water systems, the new Solar Credits Scheme supporting home micro-generation, and the expanded Solar Cities program.

Smart grid technology uses sensors to monitor electricity supply across distribution networks using communications networks, such as broadband technology. Smart grids help to more easily integrate renewable energy like solar and wind power into the grid, and enable energy generated in homes, schools and businesses to be stored and shared. Combined with smart meters in homes, this technology will allow consumers to access immediate information on how much energy they are using, at what cost, and how they can save money. It will also allow for more efficient and reliable network operation.

Subject to an implementation study, the demonstration project will lead to an integrated system of renewable energy, smart grid and smart meter technology and infrastructure in any Australian city, town or region. It will bring together electricity power generation, transmission, and distribution providers as well as private partners and IT experts, and will inform the wider national deployment of smart grid technologies. It will also examine links with the National Broadband Network and work closely with the Ministerial Council on Energy's National Stakeholder Steering Committee providing advice on the national smart metering program. By investing in this project now, Australia will be better placed to take advantage of the capabilities of the National Broadband Network, including the rollout of smart grid networks across the country. The Government has invested heavily in energy efficiency and is determined that Australia now

takes the next step to harness new technologies that drive even further energy efficiency. The National Energy Efficiency Initiative will position Australia to be at the forefront of global efforts to use energy more efficiently as part of our broader commitment to combat climate change.

### **10.3 Trans-sector e-health: The National Health Reform Agenda**

The Australian Government's health reform plan launched in July 2009 is clearly aiming at technology to be used to address some of the long-standing problems in healthcare. The government has indicated that if it doesn't act now Australia will see a meltdown of its healthcare in the foreseeable future.

The government has not yet made firm commitments to any of the recommendations of the National Health and Hospitals Reform Commission but is starting a consultation program lasting six months.

With these changes on the horizon there are clearly opportunities for the broadband industry to become involved. For instance, with an electronic record system 'connectivity' will be the bloodline that will make this happen. It is not too difficult to envisage that from that point a range of other e-health (video monitoring and other) services could be developed.

A huge investment in an e-health system over the next few years is a major recommendation of the Commission, which called for a major shake-up of the nation's health system, with the Commonwealth taking over the funding of most the state-based services. The government has also flagged the National Broadband Network as one of the spearheads to be used in this overhaul, and it is obvious that there are significant synergies between these initiatives. The report suggests that by 2012 every Australian should have a personal electronic health record (similar to the Dutch 'Electronische Patienten Dossier') under a sweeping plan for an Australia-wide e-health program linked to the National Broadband Network. As in the Netherlands and elsewhere, for more than a decade discussions have been taking place within the healthcare silo in Australia but which have continuously failed to be implemented, mainly because of differences about this system within the healthcare system itself.

It stresses that the e-health record would at all times be owned and controlled by the individual involved. The plan could see the introduction of a personal card that would carry information such as a patient's vaccinations, medication, test results and past procedures. The electronic record system has been discussed many times. Previously it has been indicated that it could save AU\$30 billion in healthcare costs over a ten year period, and that it could lead to a drop in death rate of around 1,300 people per annum. The latest announcement is that it is expected that by 1 July 2010 the government will introduce unique personal identifiers for individuals and for health professionals and organisations. It also recommends a "national social marketing strategy" to inform consumers and health professionals about the benefits and safeguards of the e-health approach.

Payment of all public and private health benefits would depend on using data that could be incorporated into a personal e-health record; and GPs, specialists, pharmacists and other health and aged care providers must be able to transmit key data electronically by 1 January 2013. The government should set an open technical standards framework for e-health by 2011/12, and should make "significant" funding available for e-health teaching and training, and encourage increased enrolments in health informatics tertiary courses.

The Commission says ensuring access to the National Broadband Network (or alternative technology such as satellite) for all Australians will be critical to the uptake of personally-controlled electronic health records, as well as to realise potential access to electronic health information and medical advice.

### **Changing the silo system**

As with the NBN and the smart grid/smart city project, it is heartening to see that the Prime Minister is leading from the top, and hopefully he will be able to cut through the complex silo system that the healthcare bureaucracy has developed over the last 50 years. The vested interests within these silos have been able to block the move into e-health. They were reluctant to support progress of this kind because it could mean that their silo would lose power, or that their section would become more transparent.

It has been said that silos like the pharmacists or the GPs wield more power than the Minister for Health herself. This is typical of those silo systems and unless the Prime Minister intervenes they will stand in the way of the transformation of the entire sector.

## **10.4 Trans-sector project for social services**

Under a AU\$60 million initiative known as the 'Digital Regions Initiative' the government announced in June 2009 that it will form partnerships with state, territory and local governments to drive digital development in the key service areas of education, health and emergency services. Again this project will also build on the NBN and the smart grid/city project. A competitive selection process for these digital services in regional, rural and remote Australia will commence later in 2009.

Examples of possible initiatives include but will not be limited to:

- remote medical consultation, diagnosis and treatment to address regional skills shortages and enhance patient care;
- digital resources and services such as teleconferencing to improve access to educational opportunities for regional, rural and remote students and teachers, and
- digital technologies to improve emergency and disaster response.

## **10.5 Smart infrastructure**

The Australian Minister for Broadband also tried very hard to mandate smart sensors in every infrastructure project, but unfortunately he was unable to get this visionary trans-sector policy accepted and he had to make do with the second-best option – a requirement to take a case-by-case approach.

This shows how difficult it is to build trans-sector bridges between government departments, since it is clear that intelligent infrastructure is the way of the future, and that, by accepting the relatively low extra costs involved in embedding intelligence in the infrastructure (roads, bridges, railways, waterways, gas pipes, buildings, etc) at the outset, maintenance and repair savings could be achieved – savings that could easily be more than a hundred times the cost of the actual intelligence. On the other hand, installing intelligence after the physical infrastructure is in place could increase the installation costs tenfold – not to mention the fact that early detection could avoid disasters and save lives. On top of all this, in May 2009 Access

Economics forecast that over a ten-year period smart infrastructure would create 70,000 new jobs in Australia and add AU\$80 billion to GDP, increasing even more the economic benefits attached to intelligent infrastructure development.

It will be much cheaper to roll out fibre networks when building roads, rolling out electricity networks, gas pipelines etc. And cost savings will also be made if smart infrastructure is embedded during the actual construction phase of home-building.

Nevertheless, the Minister has been able to put the issue on the agenda and has at least got it to the point where the option will now be part of government policy. This is a great improvement on the previous situation, where smarts were seldom considered.

With increased awareness of trans-sector approaches towards infrastructure investments, and with the issue now clearly on the agenda, it will become easier from here on to take the next step and make this compulsory. This will happen once other government departments become more aware of the economic multiplier effect of a trans-sector approach – that they are not just building roads, etc, but are part of the overall development of smart communities that are emerging around the world.

## 10.6 Dutch smart embassy in Canberra

The Dutch Government will build a smart embassy in Canberra. This will be the world's first smart embassy. The initial project was aimed more at 'green' and 'sustainability', but with the trans-sector discussions going on in Australia other smarts have since been added to the project in which I am playing a facilitating role, particularly in relation to telecoms (connected to the National Broadband Network), smart grids, and other communications and IT smarts. An Australian team of stakeholders, which also includes other sectors such as communications, energy, education and healthcare, has now been added to the project.

The project now includes various 'green' and 'smart' aspects – from design to materials used, production of the raw materials, climate control, daylight, acoustics, temperature, ventilation, lifespan of the building, trees on the site and water usage.

The aim is to be 100% carbon neutral. The architecture of the building is stunning. It is a round structure with an atrium in the middle and a 'sun mill' – a sun panel that moves with the sun – on the roof, similar to the Dutch windmills that were turned according to the direction of the wind. The building will also use thermal energy.

But the vision of the Dutch government goes beyond the actual building. They also want to use this project to bridge the distance between the two countries, to make it a joint venture. It was designed in the Netherlands but will be built by Australians, with local expertise and materials.

The Netherlands will also use this embassy to position themselves for the future. There is a rich history between the two countries but here the focus is on the future. It is envisaged that experts and companies from both countries will use the opportunity to build research, expertise and commercial bridges. There was an open invitation from the Dutch Ambassador for others to become involved with ideas, suggestions and participation in the project (as such adding an export trans-sector element). It will be interesting to see

how all these different elements will come together in this project, delivering one truly integrated end result. The aim for completion is late 2010.

The embassy is currently developing a website where it will present its plan, and where progress reports will be published. They will have blogs about the many aspects of the building and they hope to engage students and other interested parties to discuss and debate the pros and cons as the building progresses. I envisage that this could become a highly visible demonstration of a smart building project. It will enable the broader industry to show how a 'green' and 'smart' trans-sector approach can work. Presentations of this project in both Australia and the Netherlands will certainly also feature in some of the industry conferences covering various smart areas in relation to planning and architecture, energy and sustainability, communications and IT. These presentations would highlight the capabilities of those involved in the project in both countries. It could also be considered that this project should be linked to the Dutch 'Smart Living' project.

## 11. APPENDIX C – Trans-sector benefits E-Health

### 11.1 Introduction

E-health is rapidly shaping up as one of the key killer apps on high-speed broadband networks. Around the western world we are facing a massive dilemma in relation to healthcare. New technologies are increasing life expectations and improving lifestyle. The cost of this, however, is enormous and society simply can no longer afford to finance these huge advancements through the public health systems.

In countries with proper broadband infrastructure we already see e-health shaping up as a way that will allow people to enjoy these advances in medical technology and medical services, at a more affordable cost. However, a more trans-sectoral approach is needed in order to make this national service.

*Exhibit 6 – Healthcare spending statistics*

- US health care spending is expected to increase and reach US\$4.2 trillion in 2016, the equivalent of 20% of GDP (up from around \$2.3 trillion in 2007);
- Healthcare spending in China is forecast to grow to US\$323 billion by 2025;
- Health care spending accounts for around 10.9% of the GDP in Switzerland, 10.7% in Germany, 9.7% in Canada and 9.5% in France;
- Healthcare spending in the UAE is around 2.5% of GDP;
- Health spending is rising faster than incomes in most developed countries.

*(Source: BuddeComm based on various industry sources, 2009)*

### 11.2 Aged care services at home

Aged care services are at the forefront of developments. With a rapidly ageing population there simply won't be enough nurses and retirement villages to cater for the enormous growth. It is estimated that there are currently around 550 million seniors worldwide. A 2008 whitepaper from Parks Associates found that the world's elderly population increases each by month by around 795,000. The elderly outnumber children in countries such as Japan, Bulgaria, Germany, Greece, Italy, and Spain. In China, more than 88 million people are seniors.

The key solution here, of course, is homecare services. Video-based broadband connections allow people to stay at home and still have access to medical staff through what is called video nurse services. These are medical call centres with qualified nurses on call, 24/7. The nurses maintain contact with people who need medical assistance and other medical specialists can be brought in as required via video link. Certain diagnostic facilities such as heart rate, blood pressure and urine samples are linked to the broadband service, and other diagnostic tools can be implemented through these links.

### **11.3 Social networking through video cams**

Interestingly, first experiences with these video call centres showed that 80% of the calls don't have an actual medical element, but are more of a socio/psychological nature. People feel lonely. However, as more and more people are connected to high-speed broadband, family and friends can stay in contact through video links. Most of the video call centres now also have lists of volunteers who are happy to have a video chat with those who feel a bit lonely.

These new broadband communication technologies will be tremendously helpful to the millions of carers around the world, whose contributions often pass unnoticed but who are, themselves, are under great pressure.

### **11.4 Online patient record systems**

Another hot issue regarding privacy is the online patient record system that needs to be available to all those with the authorisation to use it. People in countries that lack high-speed broadband and therefore also the availability of e-health applications encounter ignorance, which only makes it more difficult for these countries to develop effective policies. While privacy, security and reliability are paramount, FttH networks can provide the level of quality that is needed for such services.

### **11.5 Digital healthcare appointment system**

A totally different application is a digital healthcare appointment system. With the current overload in most, if not all, of the world's medical systems; waiting times are increasing and valuable time is being wasted. In Europe, several general practice and other medical service organisations are trialling systems whereby video consultation is provided to their clients. One very basic service is an appointment service, where you can check dates and times for appointments.

At this stage, more advances are being made in the private healthcare sector, where patients and medical practitioners have a greater freedom to use such services. However, there is no doubt that over time these will be implemented into the public healthcare system as well.

### **11.6 Video consultation and monitoring**

Within the private sector, many medical support services are now being provided online through video links. Consultations with dieticians, exercise trainers, opticians, mental health services and so on are occurring. Another growing e-health area is the monitoring of patients – from pregnant women to mental health patients. The monitoring of heart patients and diabetes is also being trialled.

## 11.7 There simply is no alternative to e-health

Another issue often mentioned in this debate is that older people have a problem with technology. Our response to this is that when you get older you don't necessarily get dumber. And technology can be learned. However, having said this, many systems operate via the TV, with simple Set-top Boxes (STBs) – sometimes as simple as one with a black and a red button that connects you to the service.

The alternative to not embracing e-health is to accept a significantly inferior healthcare service in the future. Countries that are lagging in these broadband infrastructure developments are going to face, not just a telecoms dilemma – but, more importantly, they are going to face a health crisis.

A World Health Organisation (WHO) report revealed an estimated shortage of almost 4.3 million doctors, midwives, nurses and support workers worldwide. The shortage is most severe in the poorest countries, especially in sub-Saharan Africa.

There is no doubt that e-health is going to totally transform the national healthcare systems and that society will need time to make the adjustment. Training is vital, and not just of medical professionals. Equally important is the training of other carers, volunteers, and the patients themselves.

### *Exhibit 7 – Advantages of e-Health*

Reduced travel:	<ul style="list-style-type: none"> <li>• Patient and doctor journeys are minimised.</li> </ul>
Improved consultation:	<ul style="list-style-type: none"> <li>• Local medical staff can consult with specialists anywhere in the world.</li> </ul>
Cost savings:	<ul style="list-style-type: none"> <li>• Reduced hospital establishment and travel costs.</li> </ul>
Improved services:	<ul style="list-style-type: none"> <li>• Specialist hospitals can spread their expertise more widely.</li> </ul>
Training and education:	<ul style="list-style-type: none"> <li>• Students can watch an operation being performed thousands of kilometres away.</li> </ul>
Independent living:	<ul style="list-style-type: none"> <li>• Seniors may be able to stay in their own homes longer with in-home monitoring and treatment. This may include dispensing medication, monitoring exercise, sleep, blood pressure, glucose levels, meals and nurse visits. Emergency response services can also be offered.</li> </ul>
Wireless connectivity:	<ul style="list-style-type: none"> <li>• Extend the service outside the home by providing mobile connectivity via 3G to allow user location tracking, enabling out-of-home assistance.</li> </ul>
Improved response times:	<ul style="list-style-type: none"> <li>• Rapid medical intervention if abnormal vital parameters are detected. When set parameters are deviated from, the care team is automatically alerted for an immediate response.</li> </ul>
Improved quality of life:	<ul style="list-style-type: none"> <li>• Improved preventive care and quality of life. The focus is not just on managing a single task (eg measuring blood pressure at a certain time) but on creating an interactive communication channel between patients with the same conditions, medical staff, family and friends. It also helps to prevent isolation and exclusion by maintaining a social network, contributing to a better quality of life.</li> </ul>

(Source: BuddeComm, 2009)

Interfaces for new sensors, alarm management and an emergency call button are continuously improving as well. Issues like wearability and non-invasive and less-invasive biomedical sensors to collect new physiological data are part of the continuous improvement to the users experience, as well as the extension of the 'safety net' to other population groups.

## 12. APPENDIX D – About Paul Budde

Dutch born Australian Telecoms Consultant en researcher Paul Budde and his company BuddeComm (founded in 1978) have been a long standing advocates of a trans-sector approach towards telecommunications infrastructure. With that vision in mind they have also formed ideas and suggestions for government policies, new industry structures and business developments, both inside and outside the traditional telecommunications industry.

Budde has taken many industry initiatives since the mid-1990s, amongst which :

- initiated the Electronic and Online Services Forum;
- organised the first National Broadband Summit in Australia;
- lead a team of international experts providing Big Think Strategies Reports for the Obama Team, Minister for Economic Affairs in the Netherlands and the Communications Ministers in Australia and New Zealand;
- managed a range of industry initiatives under the banner of 'Digital Economy Industry Workgroup';
- founded Smart Grid Australia, an industry association that will assist in creating an 'intelligent' energy network aimed at reducing CO<sup>2</sup> emissions and saving energy.

Since 2004 Paul Budde has been in regular contact with Senator Stephen Conroy, who in late 2007 became the Australian Minister for Broadband, Communications and Digital Economy and is a great supporter of the ideas around the development of a National Broadband Network based on a trans-sector approach towards the use of that infrastructure. Based on the success of the Australian government policy, Paul has discussed these developments at very senior levels with the governments of the USA, the Netherlands and New Zealand.

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## Colophon

This is a publication of the Ministry of Economic Affairs of the Netherlands. The Reflections-series offers people from outside the Ministry the opportunity to reflect on the activities of the Directorate-General for Energy and Telecommunications in the field of electronic communications and energy. Its contents reflect the visions and opinions of the author and not necessarily those of Economic Affairs.

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