PUBLIC

EXECUTIVE COUNCIL

CONFIDENTIAL

Title of Report: Strategic Telecommunications Review

Paper No: 37/15

Date: 11th March 2015

Report of: Financial Secretary / Director of Central Services

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1. Purpose

1.1. To present the Strategic Telecommunications Review report undertaken by consultants on FIG's behalf and make recommendations for next steps.

2. Recommendations

2.1. Honourable Members are invited to:

a) note the Strategic Telecoms Review report attached at Appendices A and B;
b) agree the publication of Part A – Landscape report (redacted as shown for confidential and security information) and a redacted covering report;
c) agree not to publish Part B – Technical and Regulatory Recommendations;
d) **[Redacted for confidentiality]**
e) **[Redacted for confidentiality]**

3. Additional Budgetary Implications

3.1. None

4. Background

4.1. In August 2014 FIG issued an invitation to tender for a Strategic Review of Telecommunications Provision in the Falkland Islands. Following a tendering exercise Cartesian Ltd (in partnership with Preiskel & Co) was appointed in November 2014 to undertake this review. The purpose was to undertake a detailed technical review of telecommunications services and infrastructure in order to assist FIG in future decision-making regarding investments in telecommunications and in its future approach to the licencing of telecommunications services within the Islands.

4.2. The work was intended to cover three broad workstreams to address these issues and to provide the information and advice that FIG required:

- Phase 1: Independent technical appraisal of the existing telecommunications arrangements in the Falkland Islands, including examination of the strengths and limitations of the existing infrastructure from a social, technical, economic, environmental and political perspective. The analysis to identify the most important issues to be considered in determining the future provision of telecommunications services to the Islands.
- Phase 2: Independent appraisal of technical solutions (current and emerging) available to the Falkland Islands, including an assessment of the degree to which these options are realistic and achievable given the geographic, socio-economic, and political environment of the Falkland Islands.
- Phase 3: Review of market conditions to ascertain potential for competition, versus continuation of a licenced monopoly.

4.3. Sure has an exclusive licence that can be terminated any time after December 2019. As of 31 December 2014, FIG can serve notice at any point with a 5 year effective date.

4.4. FIG conducted a public consultation questionnaire to highlight views from the community relating to Telecommunications. The results of this consultation were provided in full to Cartesian and have been factored into the final report. The consultation results are discussed in more detail in ExCo 31/15 on this agenda.

4.5. Cartesian visited the Islands in the first week of December 2014 and met with key stakeholders as outlined on p94 of Part A. A draft report was provided to FIG in mid-January and Cartesian visited again in February 2015 to discuss findings with FIG. The final report has now been received.

4.6. The Telecoms Working Group has met a number of times to discuss the progression and findings of the Cartesian review and input from the Group has been incorporated into the final report. Industry groups previously requested a seat on the working group however it was not felt appropriate for these groups to be involved in the decision-making process. However, it is clear that important knowledge is held by these stakeholders and therefore Cartesian met with individuals and sector groups whilst in the Islands to ensure that the report considered all information.

4.7. The report has been split into two parts. The first covers the landscape assessment of the existing arrangements in the Falkland Islands and provides some interesting insights in terms of benchmarking services. The second part contains the technical and regulatory recommendations for FIG.

5. Landscape assessment (Part A)

5.1. Key points highlighted in the Cartesian review:

- Mobile and fixed telephony prices are reasonable and in some cases lower than other benchmarked territories;
- The key issues with broadband are limited data caps and overage charges (rather than headline subscription fees);
- There are social impacts of the night time window (particularly with regards to usage by children);
- Business services offered are relatively basic compared to international markets;
- The infrastructure is solid but the 2G and WiMax networks are due for renewal (and suppliers have gone into administration);
- International capacity is insufficient to meet current and future usage;
- **[Redacted relating to financial affairs of a business];**
- The price cap has increased broadband speed and data caps but not reduced broadband pricing and spend significantly;
- The current regulatory regime does not address VSAT, Universal Service Obligations or customer protection;
- Bill-shock is common due to high overage charges, interestingly the average user uses 8GB a month and as such would achieve the lowest cost on the Business Bronze package (Figure 26 Part A pg 40) (though there are currently only 7.5% of users on this package).
- The average overage revenue received by Sure is 31% of the total broadband revenues.
- Section 9.2 of the Landscape report (Part A) pp87-89 provides a list of the key issues identified by Cartesian and whether they were prioritised for inclusion in Part B of the report which contains the technical assessment and recommendations which are summarised in Annex A of Part A, pp96-99.

6. Technical and Regulatory assessments (Part B)

6.1. The report identifies seven options that could be considered in this respect together with an assessment of the pros and cons associated with each option. These options were also reviewed in terms of the ultimate question of whether there should be an exclusive licence or not and then whether notice should be served by FIG.

[Redacted for confidentiality]

7. Next Steps

[Redacted for confidentiality]

8 Financial Implications

[Redacted budgetary information]

9 Legal Implications

[Redacted legal advice]

10 Human Resources Implications

10.1 None.

FIG Strategic Telecoms Review

Part A – Landscape Report

19th March 2015

Prepared for:

FIG

Version History

Version	Date	Author	Changes	Distribution	Approval
1.0	04/03/2015	Cartesian and Preiskel&Co	Final report part A, for public distribution	FIG Telecoms Working Group	FIG Telecoms Working Group
1.1	19/03/2015	Cartesian and Preiskel&Co	Minor amendments, following review by FIG and Sure	FIG Telecoms Working Group	FIG Telecoms Working Group

Confidentiality

This document is for public distribution. Those sections of the internal report provided to FIG which contain sensitive information have been redacted for this public version. The redacted sections are marked with these symbols: ✂ ---------- ✂

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Cartesian Ltd. Registered in England and Wales. Registered Number: 03230513 Registered Office Address: Descartes House, 8 Gate Street, London WC2A 3HP United Kingdom

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1. Introduction

Background

The Falkland Islands Government (FIG) has engaged Cartesian and Preiskel & Co to conduct a Strategic Review of the telecoms infrastructure and services in the Falkland Islands with the goal of recommending licensing, regulatory and technical options to FIG.

The current incumbent, Sure, is owned by Batelco, which acquired the business from Cable and Wireless in April 2013. Sure holds an exclusive licence to provide telecom services in the Falkland Islands. The licence may be terminated any time after 31st December 2019, subject to a 5-year notice period. As at the date of publication of this report, no such notice has been served on Sure. FIG is seeking recommendations with respect to both the renewal of Sure's exclusive license agreement, as well as potential changes that are required to the regulatory framework.

Objectives and Scope

The core objectives of this engagement are to:

- Perform a comprehensive technical appraisal of existing telecommunications infrastructure and services in the Falkland Islands;
- Conduct a critical appraisal of the effectiveness of the current exclusive licence arrangement for the provision of telecommunications services across the Falkland Islands;
- Make an independent appraisal of technical options (both proven and emerging) that may have applications in the Falkland Islands in the future (with due regard to the specific social, economic and political factors in the Islands); and
- Evaluate options and provide recommendations based on the information resulting from the above appraisals.

This assessment is focused on telecommunications provision within FIG's jurisdiction, as outlined in the 1988 Telecoms Ordinance; it does not consider specific telecommunications services and infrastructure being provided to the military and FCO outside of the current exclusive telecoms licence.

This piece of work is separate to the Price Cap review that is currently being undertaken by the economist Chris Doyle. As part of this assessment, we have been requested to provide an opinion as to whether the Price Cap mechanism has achieved its desired outcomes.

Report Format

Based on consultation with FIG, the final version of Cartesian's report has been divided into two sections as follows:

Part A – Landscape Assessment: includes an assessment of the telecommunications infrastructure and services provided by Sure, as well as a review of the current telecoms regulatory situation in the Falkland Islands. It also compares the services provided versus those offered in other benchmarked markets, as well as provides a summary of the key priority market issues to address.

Part B – Options Identification / Assessment and Final Recommendations: assesses and recommends a number of technical and regulatory enhancements aimed at addressing the key

market issues, as well as provides recommendations to support FIG with respect to negotiating the exclusive licence currently in place with Sure.

A redacted version of Part A has been prepared for public distribution, and due to the confidentiality of Part B, this is currently reserved for FIG internal purposes only.

2. Executive Summary

2.1 Context

This document is the first part of the report (Part A) which Cartesian and Preiskel & Co have prepared for the Falkland Islands Government. This executive summary and report focuses on the Landscape Assessment only.

The Falkland Islands telecoms market is served by Sure South Atlantic Limited ("Sure") under an exclusive licence agreement with FIG. The licence may be terminated any time after Dec 2019, subject to a 5 year notification period that may be served at any time from 31st December 2014. As at the date of this Report no such notice has been served on Sure.

The purpose of the strategic review is to undertake a strategic appraisal of telecoms services and infrastructure, as well as the current regulatory environment in order to evaluate and recommend the optimal approach to licencing, regulation and technical investment within the telecoms sector.

2.2 Market Landscape

2.2.1 Telecom Services Overview

The Falklands Islands telecommunications market (considering only the revenues of the telecom incumbent) was estimated at ✂---✂ in 2013, slightly down from ✂---✂ in 2012 (based on financial accounts from Sure). Overall total revenue has grown at an annual rate of 7% since 2009, with a dip of 2% in 2013.

Commercially, Sure offers fixed telephony, broadband, mobile services and a range of business services including leased lines. Sure also offers a Wi-Fi service that can be accessed from public hotspots across the Falklands Islands, which is most heavily used by military personnel in MPA.

The two largest revenue streams are internet services and mobile services, driving 34% and 21% of total revenues respectively. In line with markets internationally, fixed telephony revenues have decreased, at approximately 10% year on year since 2009, contributing to 17% of total revenues in 2013.

Inbound roaming (calls made by tourists and temporary residents whilst in the Falkland Islands) and Wi-Fi hotspot usage contributes to 44% and 36% respectively of mobile and broadband revenues, demonstrating the importance of temporary residents, business visitors and tourists to the Falkland Islands' telecommunications market.

Our benchmarking shows that mobile and fixed telephony prices are reasonable and in a number of cases lower than the international benchmarks that Cartesian have reviewed (e.g. domestic calls, local SMS), and in terms of broadband, the key issue is with respect to limited data caps and overage charges, rather than the headline subscription fees. The free night time window (where all internet usage is zero rated between midnight and 6am) has helped reduce the effective rate paid per MB, however, we have noted significant social implications of the service, particularly with respect to fatigue and children having unmonitored internet usage whilst using the internet late at night. Note this has been an unexpected side effect of a service that is intended to improve customer satisfaction.

Sure has selectively developed custom solutions such as international connectivity access (e.g. oil and gas customer), a Wide Area Network connecting education centres (public sector), and show cased a video conference facility for Stanley hospital. We do believe there is room for further innovation, particularly with respect to broadband billing, pricing and local VPN propositions.

2.2.2 Infrastructure / Technical Assessment

Given the small market size (less than 5,000 population when including the Falkland Islands' resident military personnel, families and supporting civilian contractors) and the challenging geographic characteristics of the Falklands, Sure has built out a solid fixed and mobile infrastructure. In particular, Sure has taken seriously the commitment to provide communications in Camp even though they are likely to achieve limited, if any returns from customers served in Camp.

For fixed telephony and broadband, 100% of households in the Falkland Islands receive service. Mobile coverage currently stands at 95% of population and 40% of landmass, with the main coverage gaps in West Falkland and Lafonia.

The key concern is associated with the age of both its 2G network, and fixed wireless (WiMAX) network in Camp which are both due for renewal. Added to this, both the current 2G and WiMAX infrastructure vendors have entered into administration, increasing the need to swap out both networks. However, we understand from Sure that they have stockpiled a number of network spares, enabling them to safely provide in Camp voice and broadband for a further 5 – 10 years. In addition, equipment of the fixed network will also need to be replaced in the next few years, as it will reach end of life (e.g. MSAN, Softswitch).

In terms of international capacity, Sure has taken effort to increase capacity which has grown from 25 Mbps to 68 Mbps over the last 15 months. However, it is clear that whilst there has been a significant proportional uplift, in absolute terms the current levels of capacity are insufficient to meet the current and future usage needs of the Falklands Islanders.

2.2.3 Financial Assessment

There is perception in the market that Sure is making "excessive" financial returns which is a common concern amongst the business and residential community in the Falkland Islands. To better understand the financial performance of Sure we have reviewed their financials against a number of benchmarked operators. A range of profitability and investment metrics have been considered based on 2013 data including EBITDA, capital intensity, ROCE and RoA.

Sure's operations in the Falkland Islands have lower rates of capital intensity and higher rates of ROA/ROCE compared to the other benchmarked companies. However, it needs to be taken into account that the levels of investment for 2013 (and largely for 2014, too) were set by CWC prior to the Batelco acquisition, and it is likely that investment was low in 2013 due to uncertainty with respect to the licence renewal and planned disposal of the business by CWC. Looking forward, we believe the investment ratios will become more aligned with international benchmarks, following new LTE infrastructure roll-out which would be agreed as part of the licence negotiations between FIG and Sure.

Sure's EBITDA margin increased from ✂---✂ in 2012 to ✂---✂ in 2013, which is significantly higher than the benchmarked operators ranging between 13 and 41% EBITDA margin. Again, a number of similar considerations need to be taken into account when using this comparison, such

as CWC's likely intent to minimise OPEX and CAPEX costs prior to the disposal of Sure in order to maximise the valuation of the Falkland Islands' operation, and different characteristics of the benchmarked countries in terms of market size, dynamics and ownership profile of the operators in those markets. Whilst the EBITDA margins are higher than average, the absolute returns generated remain small. Any telecoms operator operating in the Falkland Islands will require a minimum level of absolute returns in order to justify operating in the Falkland Islands.

2.2.4 Regulatory Assessment

The current licence issued to Sure is an "exclusive licence" for the operation and provision of telecommunications services in the Falkland Islands. The Telecommunications Ordinance 1988 (the "Ordinance") is currently the legal basis for the regulation of telecommunications services in the Falkland Islands. Whilst it has been amended on a number of occasions between 2000 and 2013 in order to introduce certain regulatory measures such as the price cap regulation, it is now dated and requires a refresh to ensure it is relevant to the current and future provision of telecommunications services in the Falkland Islands.

The Price Cap Review was set up by FIG in September 2012 to specifically address broadband pricing issues. Whilst the Broadband Service Obligations had initial success in increasing broadband speeds and data caps, the Price Cap formula itself has not achieved the desired impact of reducing broadband pricing and spend. Based on the current formula and higher than anticipated inflation, it has allowed Sure to accumulate a large carry-over factor, meaning that Sure could decide to increase broadband service prices, and still be compliant with the price-cap regulation. Looking forward the price cap formula will need to be reviewed taking into account broadband usage, pricing packages and overage spend currently experienced in the market.

From a regulatory perspective, there are a number of gaps within the current regime which raise uncertainty as to the scope of the licence and the extent of obligations placed on Sure. For example, rules with respect to VSAT supply will need to be clearly defined in the new Ordinance and licence (note, we recommend that VSAT self-supply is not allowed at this stage). Other areas include Universal Services Obligations (USO), where there is reference to the universal services concept with regard to telephony services, although no commitment with respect to the provision of broadband in Camp. Likewise, there is no clear customer protection framework in place today to address customer billing issues, or provisions with respect to Service Level commitments placed on Sure. Defined policies around co-investment in infrastructure, as well as issuing and managing spectrum are also excluded from the existing regulatory framework. These and other points should be addressed by FIG in a full regulatory review.

2.2.5 Summary of Key Market Issues

Our assessment has identified fixed broadband pricing as the single biggest issue for residential and business customers, with many exceeding their monthly broadband allowances on a regular basis. The current pricing plans are not aligned with customer usage profiles, ultimately resulting in high overage charges for those that exceed their usage bundle. For example, an average broadband subscriber consuming ~8,000 MB per month outside of the night-time window (this figure includes corporate subscribers) needs to subscribe to a Business grade package. As a result, bill shock is common, with the situation being more akin to mobile roaming in Europe, prior to the introduction of preventative billing policies, which were introduced following regulatory intervention.

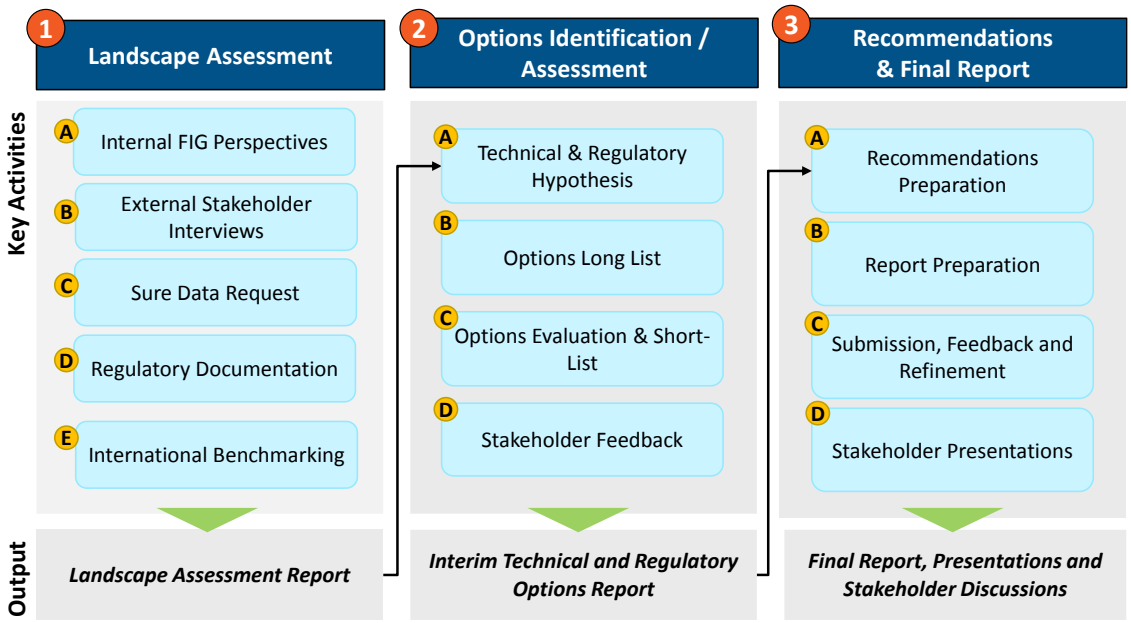
Other major issues cited include limited fixed broadband access speeds particularly for Wi-Fi hotspots users, broadband stability concerns noted during the night-time window, limited mobile coverage across Camp and constraints with current international capacity levels. The issues are not standalone. International capacity is a major supply side issue having a detrimental impact on both cost (once overage is taken into account) and user experience, which will be exacerbated once faster mobile broadband is deployed.

The age of both the 2G network across the Falkland Islands, and WiMAX network in Camp are the major infrastructure concerns that need to be addressed. Sure already has plans in place to upgrade the 2G network, as well as deploy LTE in Stanley and MPA once new license terms are agreed.

3. Approach

A three phase approach has been followed over a 3 month timescale starting with the Landscape Assessment, followed by the Options Identification and Assessment and concluding with the Recommendations and Final Report.

Figure 1: Methodology



Landscape Assessment

The initial phase focused on both desk research, such as document review and international benchmarking, as well as meetings with both business and consumer users of the services to understand their key issues, pain points and evolving needs.

As part of this exercise, we conducted a field visit to the Falkland Islands, week commencing 30th November, where we had the opportunity of interviewing a wide number of internal and external stakeholders from across the business community, public sector and government. In total, we engaged with over 30 stakeholders, which provided a wealth of detail on the market. We are very grateful for the generous input provided by so many participants; a full list of acknowledgements can be found in section 11.

The Falkland Islands' telecommunication market has been reviewed from both a technical and commercial perspective, and benchmarked against a range of other Island markets. We also spent time with Sure to (1) review its business, (2) to understand the initiatives it has already put in place to address some of the key issues in the market, and (3) to understand the unique challenges it faces in serving the Falkland Islands given the size and remoteness of the territory. We have also conducted a detailed review of the documentation supporting the current regulatory environment.

Options Identification and Assessment

Following the landscape assessment we identified potential technical options and regulatory enhancements that could be implemented to improve telecommunications services on the Falkland Islands. In evaluating the technical options we spoke with a range of vendors and satellite providers to validate our assumptions and cost inputs, as well as understand future plans and / or suitability for deployment in the Falkland Islands.

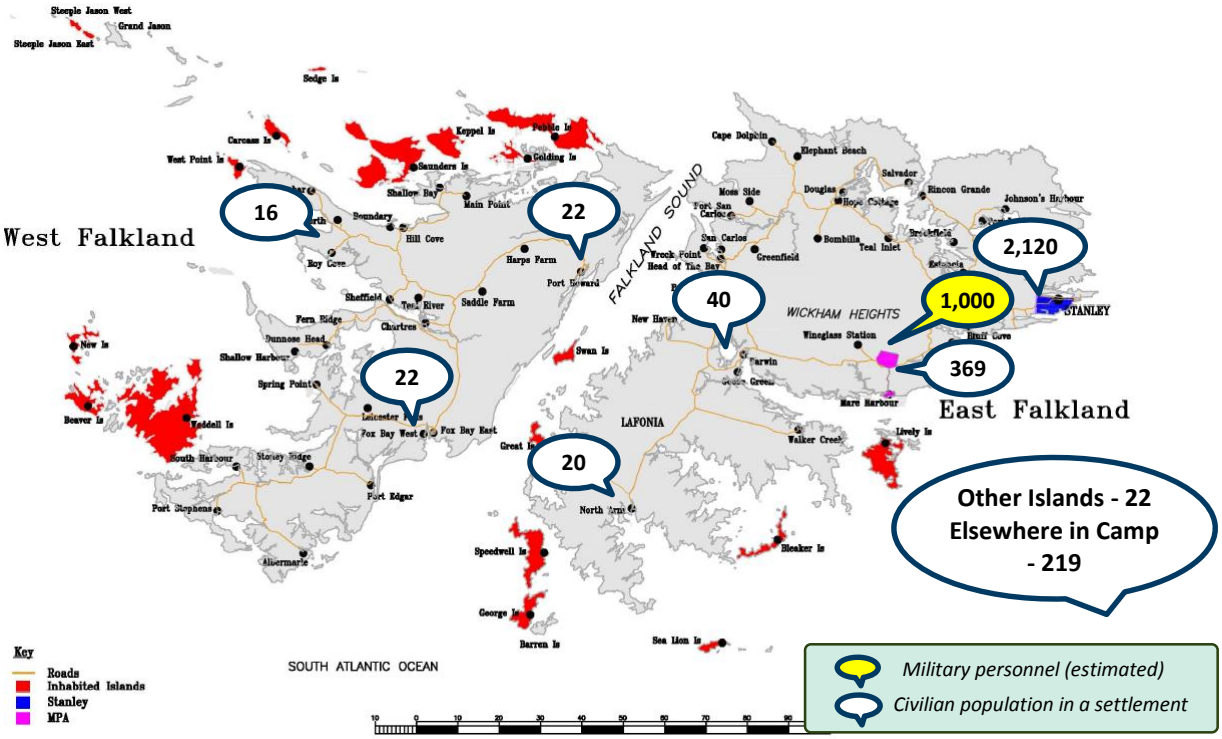
We conducted initial analyses to assess both the regulatory and technical options, creating a short-list of initiatives which were assessed using a robust qualitative and quantitative evaluation including feasibility, cost assessments, and pros and cons analysis. For example, costs have been prepared to assess the different satellite capacity upgrade options, as well as the multiple LTE deployment options open to Sure across Stanley, MPA and wider Camp.

4. Landscape Introduction

4.1 Geographic Characteristics

The Falkland Islands is an archipelago located in the South Atlantic Ocean. The principal islands are about 700 kilometres east of the Patagonian coast at a latitude of about 52°S. The archipelago which has an area of 12,173 square kilometres comprises East Falkland, West Falkland and 776 smaller islands. Stanley, the capital, is located on East Falkland. The terrain is characterised by hills and mountains and, in some of the islands, rolling boggy plains.

Figure 2: Falkland Islands Map



Source: FIG

As of the 2012 census, the population of Stanley, at 2,120 persons, accounted for almost 75% of the total number of residents[1] in the Islands. Another important area in East Falkland is RAF Mount Pleasant (also known as MPA), a Royal Air Force station. The airfield is part of the British Forces South Atlantic Islands (BFSAI). Home to between 1,000 and 2,000 British military personnel, it is located approximately 30 miles (48 km) southwest of Stanley. The 2012 census counted 369 civilians (military families or contractors) living at MPA (i.e. ~13% of the total number of residents).

Outside of Stanley and MPA, the Islanders live in small, dispersed communities. The population in Camp[2] stood at 351 persons with the most populated settlements in Camp being Goose Green (40); Fox Bay (22); Port Howard (22); North Arm (20); and Hill Cove (16).

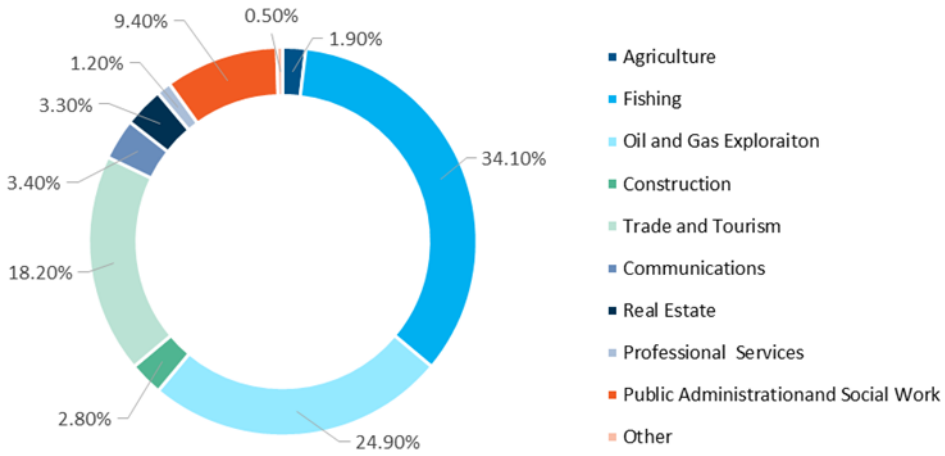
1 Census 2012 figures do not include military personnel serving in the Falkland Islands or their dependents.
2 Camp is the term used in the Falkland Islands to refer to any part of the islands outside the islands' only significant town, Stanley, and often the large RAF base at Mount Pleasant.

The population density at only 0.26 people per square kilometre sets the Falkland Islands apart from most other small states and territories. With harsh weather conditions during winter, some remote areas can become difficult to access via ground transport.

4.2 Socio-economic Characteristics

The Falkland Islands is economically self-sufficient in all areas except defence. In 2012, the Falkland Islands' Gross Domestic Product (GDP) was £198.4 million, with main contributing sectors being Fishing (34.1% of the GDP), Oil and Gas exploration (24.9%), and Trade and Tourism (18.2%).

Figure 3: Gross Domestic Product 2012[3]



Source: National Accounts 2007-2012, FIG

The residents' incomes vary by location with the median and average incomes in Stanley (Average: £23,300 / Median: £17,500) higher than those in Camp (Average: £21,200 / Median: £12,500).

Employment in the Falkland Islands is above 83%[4] with the top 5 sectors by employment of residents being:

- Public Services: 25.4%
- Agriculture: 9.9%
- Wholesale and Retail: 9.6%
- Hospitality: 7.8%
- Construction: 7.5%

Historically the Falkland Islands economy was based on high-quality wool production, but since 1986 it has been dominated by the fishing industry, which currently contributes between 30% and 40% of total GDP annually. Agriculture continues to be a major employer (c.150 employees) and contributes approximately £3million to annual GDP. The emergent tourism sector has seen rapid growth in the last 15 years, with around 60,000 tourists visiting the Falkland Islands by cruise ship

[3] Falkland Islands National Accounts 2007 - 2012. The numbers might not sum up to 100% due to the rounding
[4] Census 2012. % of working age population. Employment figures exclude the military. Fishing and Oil explorations mainly employ non-residents

each year, and a further 1,600 'land-based' tourists arriving by air annually. The tourism sector is another major contributor to the economy and contributes about £4m to annual GDP.

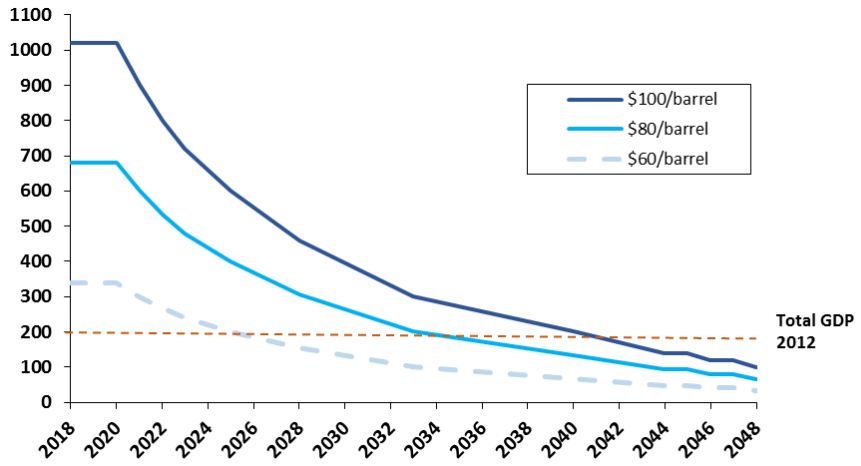
While Mount Pleasant does not employ a significant number of local residents it contributes to GDP indirectly though the consumption of local goods and services by the military personnel, supporting civilians and their families. The majority of the military staff at Mount Pleasant are deployed on a short-term basis for periods of 4-6 months, with some families spending 1-2 years on the Falkland Islands.

Oil and Gas Industry

In 1995 the Falkland Islands Government issued the first licences to explore for hydrocarbons in the waters around the Falkland Islands. The first commercial oil discovery was made in May 2010. With positive follow-up exploration results in 2012, the taxation on oil revenues, even though small relative to world benchmarks, have had a major impact on overall income for the territory contributing £49.5 million (24.9%) to total GDP in 2012. Another round of explorations will start in early 2015, to assess the viability of large-scale oil production.

However, some future development projects have been downsized or put on hold in response to the falling oil prices. Therefore, the future contribution of the Oil and Gas industry to the GDP of the Falkland Islands remains unclear. The chart below (Figure 4), extracted from a study from the Falkland Islands Government, shows the projected impact of the oil industry on GDP, for different oil barrel prices.

Figure 4: Impact of Oil and Gas Exploration on GDP, £ million[5]



Source: Regeneris Consulting, 2013; Cartesian

If the oil exploration activities go ahead, they will likely bring changes to the population. With the scenario of only Sea Lion exploration and development, Regeneris Consulting estimates a 560 people short-term population increase for 2014-2018 and a 9% (240 people) long-term increase in population through emigration[6].

[5] Annual flow rates based on projections by Gaffney Cline Associates, 2012; total costs of production assumed at $40/barrel; exchange rate assumed at £1=$1.5; excludes income tax paid by oil and gas workers and corporation tax by FI companies; excludes any impacts from further exploration activity. Contribution at $60/barrel is estimated by Cartesian based on the same assumptions as above

[6] Regeneris consulting estimates. Based on 2012 census population numbers.

4.3 Political Situation

The Falkland Islands is a British overseas territory which has internal self-governance, with the United Kingdom being responsible for defence and foreign affairs. In March 2013 FIG held a referendum to determine the political status of the territory. The majority of the electorate voted to remain a UK overseas territory.

The political framework in the Falkland Islands is a constitutional monarchy and parliamentary representative democratic dependency as set out by the Constitution. The political landscape is mainly shaped by several bodies:

- FIG exercises control over the telecoms services provided in the market: the Attorney General is ultimately responsible for the regulation of the telecoms market.
- The Governor exercises the duties of head of state in the absence of the monarch and is directly appointed by the Foreign Office in the UK.
- Legislative Assembly consists of 8 full-time Members (MLA) who are elected every 4 years, the Chief Executive and the Financial Secretary.
- The Executive Council is made up of the Governor, the Chief Executive, three MLAs who are voted annually to represent the Assembly, and the Financial Secretary.
- The FIG Civil Service is an informal body led by the Chief Executive who acts as the Head of Government and is appointed by the Governor on the advice of the Executive Council.

4.4 Implications for Telecommunications

The unique socio-economic environment of the Falkland Islands drives the reliance on telecommunications services: internet penetration in the Falkland Islands is amongst the highest in the world.

With many Islanders staying in contact with their friends and family overseas, Skype has cannibalised a significant proportion of traditional fixed line for international calls. In order to communicate internally within the Falkland Islands, Internet, and Facebook in particular, is widely used. Facebook groups are true community hubs: residents use them as an informal marketplace, shops use them to advertise products, charities use them for promotion, and there are a number of clubs and societies (e.g. photography) using the service.

Being closely connected with developed economies, e.g. the UK, and with considerably high levels of income per capita, the Falkland Islanders are aware of the most recent technological advancements and latest devices available in the market. Therefore their expectations of internet usage, telecommunications networks' technical capabilities and service prices are closely aligned with developed markets rather than territories with similar geographic conditions (e.g. islands in the Pacific). However, the large difference in economies of scale between the Falkland Islands and the UK needs to be factored in, as it will inevitably have an impact on the telecom prices.

The nature of the business activity in the Falkland Islands also creates special demands for telecommunications. Farming and fishing industries are major exporters that require constant international communications and connectivity with other ships / colleagues to ensure safety of the workforce. For machine-intensive businesses (e.g. farming), connectivity is an important tool for remote equipment assessment and help with repairs. In the absence of wide local advertisement and trading channels, small local businesses and residents use online community notice boards to advertise their service or personal items for sale. The growing tourism industry

will bring more visitors to the Falkland Islands which will lead to an increase in inbound roaming and Wi-Fi hotspot usage.

If oil production is confirmed to be a viable activity, the oil and gas sector will bring major changes to the economic landscape and telecommunication requirements in the Falkland Islands. Oil rigs require high-quality, very reliable internet connectivity for constant and robust connectivity between rigs and data centres for analytics and safety (Sure are already providing telecoms communications to some oil companies in the Falkland Islands). It will also lead to increases in the population by migration, further increasing the demand for local and international connectivity.

Developments in the public sector will also drive an increasing demand for telecom services. With the increasing use of technology in education, teachers rely on connectivity for the use of educational and managerial applications, whilst students rely on connectivity when using the computer labs, for homework assignments, and especially home schooling. The desired virtual learning platforms and video links are largely unavailable, partially due to the speed and data allowance caps but also due to lack of clear initiatives and specialist resources within the school to truly deploy these services. Sure have provided a Wide Area Network which connects the education centres in the Falkland Islands, but it was not working at the time of this report due to issues with the IT infrastructure, outside of Sure's scope.

The medical personnel in the Falkland Islands have a strong desire to embrace telecommunications in order to improve the services to their patients. Video consultations, video links with doctors in other countries (e.g. during surgery), data exchange and improvements in patient record systems are the top priorities. C&W demonstrated video consultations between the Falkland Islands and an NHS hospital in the UK in March 2011 and shared experiences of telemedicine in Panama & Maldives. This in an area which has not been prioritised by FIG or the hospital, partially due to the lack of technical resourcing available within the hospital and other priorities.

With regards to the political environment in the Falkland Islands, it is very stable and actively encourages growth and investments in the territory. This positive attitude towards economic growth is expected to have a positive impact on telecom revenues, as businesses invest in the Falkland Islands.

There are also some political sensitivities in the region which need to be taken into account when analysing the various possible technical enhancements to improve the telecom services in the Falkland Islands.

5. Telecoms Regulatory Review

5.1 Current Exclusive Licence

We have reviewed the Telecommunications Ordinance 1988 (the "**Ordinance**") which is currently the legal basis for the regulation of telecommunications services in the Falkland Islands. The Ordinance followed an agreement between Cable and Wireless South Atlantic Limited (now Sure South Atlantic Ltd, a Batelco Group company)[7] and FIG aimed at deploying a new and unified telecoms system in Camp and Stanley for both internal and external telecommunications services. It also sets out the criteria for issuing the relevant licence and ongoing obligations.

The Ordinance has been amended a number of times between 2000 and 2013[8] in order to introduce certain regulatory measures on the basis of the technological development and attempt to address *ad hoc* needs and expectations of Falkland Islands stakeholders, such as the price cap regulation. Those changes reflected the underlying negotiations and understandings between the Falkland Islands Government and Cable and Wireless South Atlantic Limited (now Sure South Atlantic Limited).

The current licence issued by Falkland Islands Government for the operation of the telecommunications system and provision of telecommunications services is expressed as an "exclusive licence". The exclusive licence was granted in 1989 by the Falkland Islands Government pursuant to s.3(2) of the Ordinance to Cable and Wireless South Atlantic Limited (now Sure South Atlantic Limited) to provide internal and external telecommunications systems for the Falkland Islands. The obligations to be complied with by Cable and Wireless South Atlantic Limited, i.e. the telecommunications utility, may be found both in the Ordinance, the 1988 Agreement and any subsequent arrangements put in place by the parties.

As a consequence of the undertaking provided by the Falkland Islands Government on 8 January 2008, the licence has taken the form of an indefinite licence subject to a 5 years prior written notice which cannot be given prior to 31.12.2014 subject to a material breach of either the Ordinance or the agreements between the parties, including certain Heads of Understanding dated 4th October 2007, which were not intended to be legally binding.

The licence, however, can be generally revoked for material breach pursuant to the Ordinance, in which case a leave from the Supreme Court must be obtained by the Falkland Islands Government.

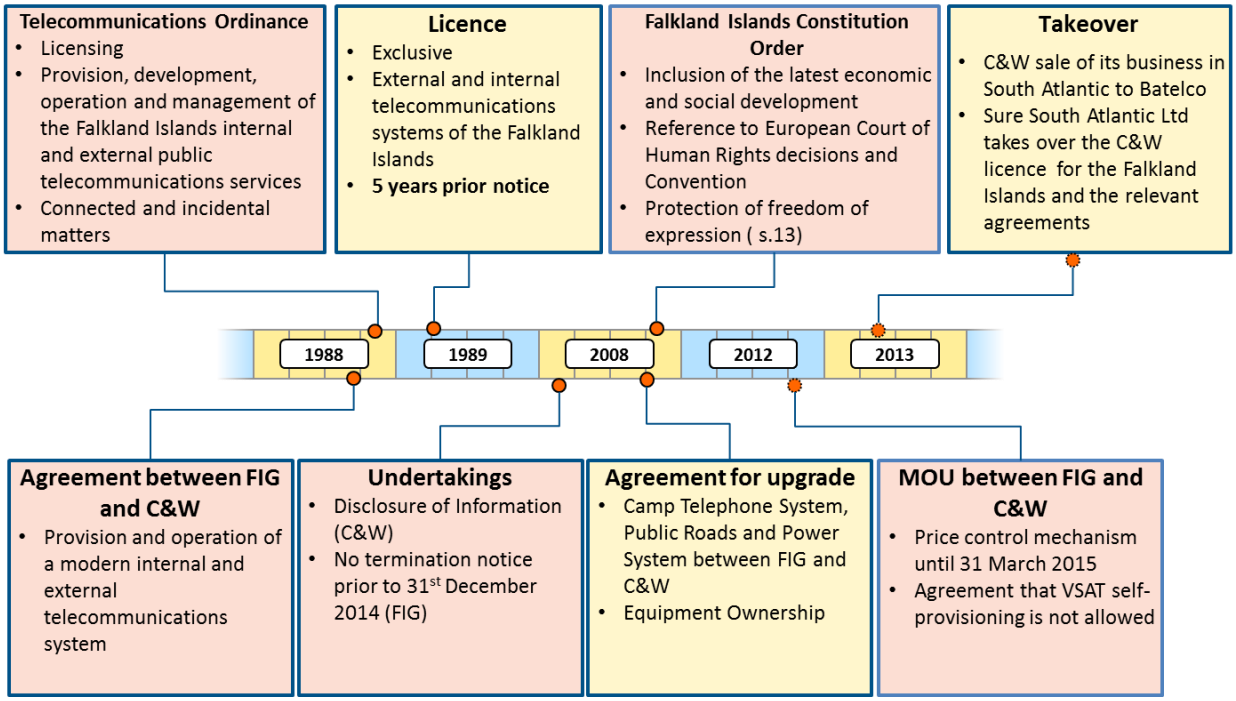
According to s.3(4) if an exclusive licence is in place "no further licence shall be granted under subsection (2) which takes effect before the expiry or sooner determination of that licence".

✂ ---------- ✂

[7] Batelco acquired the entire shareholding of Cable & Wireless Communications Plc in the South Atlantic region. http://www.cwc.com/assets/uploads/files/Press%20Releases/Cable%20&%20Wireless%20Communications%20-%20M&I%20Disposal%20Agreement%20FINAL.pdf.

[8] Please note that we were not provided with each single amendments passed but with a consolidated version of the Telecommunications Ordinance which we have been advised may contain inaccuracies.

Figure 5: Timeline of Telecom Regulatory Changes in the Falkland Islands



Source: Cartesian, FIG

5.2 Falkland Islands Regulator

We noted that under s.2A of the Ordinance the Governor may appoint a Regulator to deal with the remit set out in the Ordinance. However, the powers of the Regulator do not extend to functions relating to subsidiary legislation, compulsory purchase, revocation of licences and the consequences of revocation. The functions of the Regulator are carried out by FIG's Head of Regulatory Services and include handling any complaints raised under the Code of Practice. We are not aware of any documents that set out precisely the functions of the Regulator.

5.3 Spectrum Allocation

The licence also covers use of the spectrum according to the Ordinance and s.3 - Saving for Telecommunications Ordinance 1988 - of the Wireless Telegraphy Ordinance 1994[9]. However, in the licence document issued there is no mention of the spectrum allocated to Sure South Atlantic, nor are there any provisions in the Ordinance related to the management of such spectrum and/or standards applicable to the relevant apparatus. Under the Wireless Telegraphy Ordinance 1994 the Governor may set obligations, fees and other conditions related to the wireless telegraphy licences and no person shall establish or use any station for wireless telegraphy or install or use any apparatus for wireless telegraphy (s.1).

[9] Nothing in this Ordinance shall-
(a) render unlawful anything which is done under the authority of a licence granted under the Telecommunications Ordinance 1988;
(b) require the holding of a licence for the doing of anything for which a licence under that Ordinance has been granted; or
(c) render lawful anything which is unlawful unless done under the authority of a Licence granted under that Ordinance.

5.4 Price Cap Regulation

5.4.1 Overview of Price Cap Review

In September 2012, the Falkland Island Government and Sure agreed on the introduction of a price cap mechanism, designed by the economist Chris Doyle, which would regulate the prices of the telecom services provided under the exclusive licence in the Falkland Islands.

The main objectives were to protect consumers against the possibility of sudden price increases in telecom services, and to decrease overall prices for telecom services. An indirect benefit of the price cap was to reduce the profitability of the service provider (Cable and Wireless at the time) to levels expected for a competitive operator in a similar market environment.

The price cap mechanism was retroactively applied from April 2011, with a validity period of 4 years – until March 2015. Compliance with the price cap is reviewed on an annual basis.

The price-cap regulation is part of a wider set of obligations, which are known as the New Regulatory Package. In this package the Broadband Service Obligations and the pure Price-Cap mechanism are included.

5.4.2 Broadband Service Obligations (BSO)

BSO are a set of conditions imposed by FIG when the price cap mechanism was negotiated with the service operator, with the aim to improve the conditions of the Broadband service. The key aspects were:

- Price reduction obligation: Initial 25% price reduction on the broadband monthly subscription of all packages, to be applied by October 2012
- Increase of Data allowance: 25% increase in the monthly data allowance for all packages by April 2013, and a further 25% increase by April 2014
- Downlink speed: increase to at least 1,280kbps by the 1st April 2013 and to at least 2,048kbs by 1st April 2014 for Gold broadband packages (business and residential)
- Night time window to continue at least until 31st March 2015.

Sure has undertaken the obligations described above, bringing considerable benefits to the end user.

5.4.3 Price Cap Mechanism

The key concept behind the retail price-cap regulation is that the weighted average of the annual price increase of all the regulated services should not exceed a parameter called “controlling percentage”. The weighted average is calculated by applying the relative share of revenue of each service over the total. The price increase or decrease is calculated as the difference in headline rate between the current and the previous year, e.g. price per minute for voice calls, effective price per MB within a broadband bundle

A simple example to illustrate this concept would be a service provider offering two services (see Figure 6: below), where the Controlling Percentage is set at minus 10%.

Figure 6: Evolution of Prices and Revenue Share of an Example Operator

	Service A	Service B
Price decreased	8% over the last year	10% over the last year
Revenue share	70% of the total last year	30% of the total last year

In order to find out if the service provider complies with the regulation, we calculate:

(A price decrease %) x (A revenue share) + (B price decrease %) x (B revenue share) < -10%

(-8 % * 70%) + (-10%*30%) = -8.6%. As -8.6% is not lower than -10%, the service provider in this example would not comply with the Price Cap Regulation.

The Controlling Percentage consists of an expression with 4 parameters. See below the formula and the explanation of the various parameters.

$$CP_{(t)} = \Delta\ RPI_{(t-1)} - X_{(t)} + CO_{(t-1)} + Y_{(t-1)}$$

Inflation

$\Delta\ RPI_{(t-1)}$ corresponds to the inflation variation of the previous year, in percentage terms.

Offset factor X

This value was set to ✂---✂. The value is positive as its primary purpose is to reduce the returns on capital employed.

Carry-over CO

A 'Carry-over' factor measures the gap between the price changes allowed by the regulation, and the actual price changes implemented by the operator. If Sure decides not to increase prices by as much as permitted under the price-cap, the difference will be transferred as carry-over from the current price control year into the next price control year.

Cost pass-through Y

This parameter allows the provider to pass through cost changes which are not under their direct control. The key changes can be due to:

- Tariff changes from the Satellite provider on the space segment rental
- Dollar-Sterling exchange rate, as the space segment is purchased in dollars
- Changes in the cost of electricity

To provide a simple example: in a scenario where both CO and Y are zero, and assuming that the Inflation is 1%, the Controlling Percentage would be CP = 1 – 5 = -4%. The weighted average price reduction of the services should be of at least 4%, for the provider to comply with the regulation.

5.4.4 Analysis of Impact

There has been a clear impact on the consumer resulting from the BSO obligations, especially as users saw speeds and data caps increase twice in 2 years (speeds doubled between April 2012 and January 2014, and data caps increased 50% during the same time period).

Similarly, the monthly subscription packages saw a price reduction of 25% in April 2012.

However, the BSO measures are not sufficient to satisfy the usage needs of customers. Cartesian received feedback that the data caps are still seen as very limited (e.g. all residential packages including the Gold plan have less than 5,200 MB allowance), and some people cited speeds as not being sufficient. Based on our analysis in section 6.4, the current pricing packages are out of sync with customer usage profiles, with the most recent usage statistics suggesting a subscriber with the average broadband usage observed in the market (note this includes consumer and business subscribers) should be on a Business Bronze plan. Consumer-only data usage was not available, so we could not assess the optimal broadband plan for average consumer usage.

Regarding price, Cartesian has not received significant complaints about the headline monthly subscription price. It is currently the overage charges that are causing most concern, which were not directly addressed in the Broadband Service Obligations.

With regards to the price-cap formula, it has allowed Sure to accumulate large carry-over factors, of 7% of the revenues in 2012 and 17% in 2013, partly due to the high levels of inflation in the last 2 years (5.7% and 8%), ✂---✂. This means that Sure could decide to increase service prices and they would still be compliant with the price-cap regulation (in reality, they have not done so).

✂ ---------- ✂

5.5 Jurisdiction's Boundaries with Other Authorities

From our review we can conclude that there are no specific requirements upon FIG to involve other parties in its decision making process as to telecommunications services in the Islands.

However, it has to be taken into consideration that:

- certain activities do not fall within FIG's jurisdiction, specifically defence and internal security (exemptions for Crown, HM Armed Forces and British Antarctic Survey are set out in the Ordinance and the arrangements between the parties)
- a consent of Crown or of Government is required to carry out works on shore, on the sea bed and on submarine cables under international law
- upon compliance with certain conditions set out by s.8 of the Ordinance, private telecommunications systems do not require a licence
- the Governor is required to consult a telecommunications utility if it would be affected by the amendments under retail price-cap provisions or in relation to the Telecommunications Appeals Panel, which currently is not operational
- the FCO is permitted to review any proposed telecommunications legislation and as such recommend any changes or refinements

5.6 Legal Processes for Regulatory Changes

5.6.1 Introducing New Regulation

In order to implement new legislation replacing and/or amending the Ordinance the formal process as set out in the Constitution must be clearly followed.

However, pursuant to s. 55 of the Ordinance, the Governor may make regulations prescribing anything necessary or convenient to be prescribed for the purposes of this Ordinance. Such regulation should not be inconsistent with the Ordinance itself.

By virtue of s.2A some of the powers granted under the Ordinance to the Governor may be exercised by the Regulator, such as the creation of new classes of licenses.

The issuance of more than one licence is not per se contrary to the Ordinance.

According to s.2(A) the Regulator may exercise functions vested by or under the Ordinance in the Government or the Governor. Therefore, it may grant to any person or body corporate a licence to provide to other persons telecommunications services upon such terms and conditions, not inconsistent with the Ordinance, as the Governor thinks fit. However, as the current licence is expressed as an exclusive licence, the Regulator may not grant further licence that takes effect before the expiry or sooner determination of that licence unless a new non-exclusive licence is granted and/or clause 17.1 of the 1988 Agreement is triggered.

5.6.2 License Fees (setting and changing license fees)

According to s. 55(2) of the Ordinance:

- Regulations made under that subsection may provide
  - (a) for fees to be paid on the issue or renewal of any licence to which the regulations relate; and
  - (b) the amount of such fees (and different provision may be made in relation to different licences, according to the nature, terms, provisions, limitations and duration of such licences).

In the event of price-cap modifications however the power to make subsidiary legislation (which may amend the Ordinance) to implement changes to the retail price-cap cannot be exercised by the Regulator.

5.7 Short-comings of Existing Regulatory Framework

5.7.1 Key Gaps, Omissions and Issues

We have identified a number of gaps within the current regime which may raise uncertainty as to the services provided, the extent of the telecommunications utility obligations, scope of the licence and the remedies that can be implemented to rectify any distortion. We recommend that the Ordinance is updated, so that there is no room for uncertainty.

In particular:

- The Ordinance seems not to define a telecommunications system, although it is illegal to provide telecommunications systems and services to other persons without a licence (s.3(1) of the Ordinance). In accordance with s.3.2 of the Ordinance a licence may be granted to any person or body corporate for the provision to other persons of telecommunications services. Telecommunications systems are defined within s.8 of the Ordinance, with regard to private telecommunications systems only, which would indicate that such definition has not been considered exhaustive. The consequence of such uncertainty reflects on what has to be considered exclusive under the licence, i.e. is the

exclusivity covering the operation of the systems and provision of the services or solely the provision of services?

- There is no clarity about whether telecoms service self-supply (e.g. VSAT) is allowed by the Ordinance. However, if an exclusive licence has been granted to someone, no further licence which takes effect before the expiry or sooner determination of that licence may be granted under s.3(2) Ordinance.
- There is also some uncertainty as to the meaning of the following terms: "establishment and/or operation of a telecommunications system", "is independent of any telecommunications system operated by any other person" and "telecommunications service provision" for which a licence should be sought after causes concerns.
- The Ordinance does not expressly take into consideration the right for FIG to license somebody else if the telecommunications utility is not willing or not able to provide a service that FIG consider essential for the economic and social development of its population. Such a provision instead is enshrined in Clause 17.1 the 1988 Agreement, which according to s.5 of the Ordinance, can provide inter alia for obligations to be observed by the telecommunications utility in or in connection with the provision of telecommunications services.
- There is no express commitment to Universal Services Obligations (USOs) to ensure the availability of a minimum set of high-quality services (including services for customers with disabilities) that are available to all users at an affordable price. However, a reference to a universal services concept is found in clause 10 of the 1988 Agreement with regard to Camp. In particular, clause 10 states that the company (i.e. the telecommunications utility) has an obligation to "offer" to subscribers in Camp similar services and facilities to those offered by the company to subscribers in Stanley. Such obligation is qualified on a "so far as reasonably practicable" basis and refers to national and international telephone services, including telex and facsimile. Broadband services are not currently included within this obligation. Likewise maintenance obligations related to Camp equipment is on a "so far as reasonably practicable" basis.
- The services shall be provided according to a standard level. Clause 9 of the 1988 Agreement set out that the company shall improve and develop the systems and services consistently with the advance of the telecommunications technology. To comply with that the company has to utilise suitable equipment and apparatus wherever these can be shown to be appropriate and cost effective. The parties also have to consult in order to keep track of the government objective but there is no benchmarking mechanism expressly stated there or in the Ordinance.
- As it stands, according to the 1988 Agreement and 2008 Upgrade Agreement, it seems that ownership of the equipment in Stanley and Camp is with the company.
- The 1988 Agreement (clause 20) and the Ordinance (s.54) set out purchase obligations and/or compensation rights in favour of the telecommunications utility once the licence is brought to an end. Pursuant to s.54 of the Ordinance, the compensation right would apply in any event of termination (including by way of expiry or revocation) unless the licence is renewed. However, if the telecommunications utility breaches its obligations under the licence and therefore the licence is revoked for breach, the amount of compensation is reduced. The overlapping of terms in the Agreement and the Ordinance renders the interpretation of the current existing framework somewhat difficult and open to potential criticism.

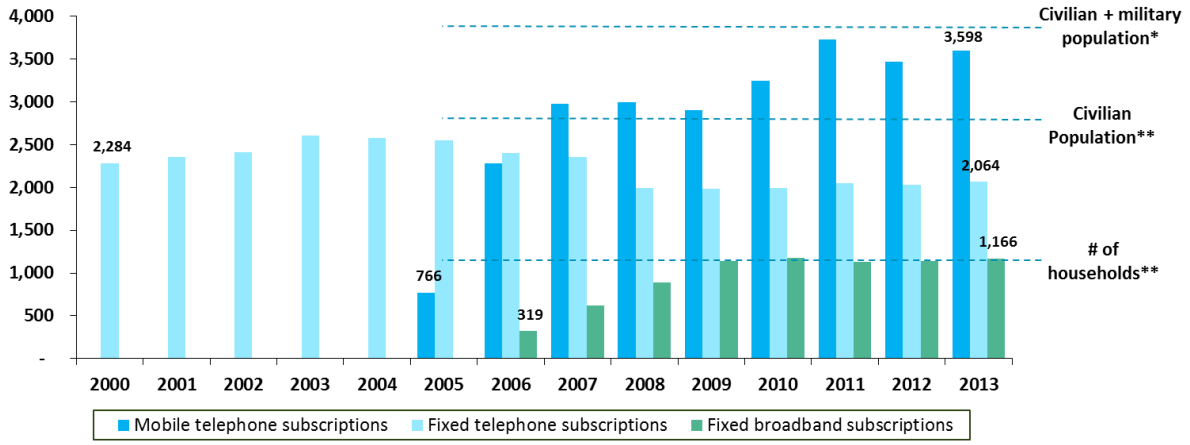
- Retail Price Cap (s.46 to 46H) has been included in the Ordinance together with a procedure to be complied with for the revision of the same and failure to comply. Currently the Retail Price Cap as it is will be applied throughout March 2015 and new price cap cannot be implemented before April 2015. Such Retail Price Cap refers to a range of regulated retail services which are not defined in the Ordinance (if not by implication). In determining the revised Price Cap it has to be taken into account that the telecoms utility has to operate on an economic basis; and with a reasonable return on its investment (taking into account the utility's expected cost of capital).
- There is no express termination of the 1988 Agreement and it was not expressly repealed on entry into force of the Ordinance. What is set out in the agreement and in the Ordinance is revocation and consequences of expiry of the licence for either effluxion or revocation (i.e. compensation). However, we would recommend a stipulation that if the licence is terminated by the service of the minimum notice, then no compensation would be due.
- We have been made aware that the Telecommunications Appeal Panel is currently not operating. Therefore matters such as compliance with the Retail Price Cap, compliance with information obligations, consultations before adopting a measure in the telecoms sector, resolving a dispute between the Government and the utility are not dealt by the Telecommunications Appeal Panel (s.2B of the Ordinance).

6. Telecoms Services Overview

6.1 Introduction

The Falkland Islands has very high penetration of communication services in general, ranking consistently at the top of international benchmarks for fixed, mobile and broadband penetration. For some years now, the Falkland Islands has also ranked as the top place in the world for internet penetration.

Figure 7: Telecom Subscriptions in the Falkland Islands, 2000-2013



Source: Sure

Mobile subscriptions peaked in 2011 at ~3,700 subscribers, decreasing to ~3,600 in 2013. Whilst the local population has reached saturation at over 100% penetration[10], the total volume fluctuates dependent on the number of temporary visitors and military personnel taking mobile services from Sure.

Sure is currently able to provide telephony and broadband service to all households in the Falkland Islands. The number of fixed telephony subscriptions declined in the 2006-2008 period, partially explained by the switch from dial-up to broadband internet. The number of fixed telephony and broadband customers has now plateaued standing at 2,064 and 1,166 respectively in 2013.

The telecoms market in the Falkland Islands has grown ✂----------✂, growing at an average annual rate of 7% since 2009, with a small dip of 2% in 2013. The main revenue-generating services are the traditional services of fixed telephony, mobile voice and internet (accounting for 71% of revenue in 2013). As with most international operators, revenue generated by fixed telephony services has been steadily declining, offset by the growth in revenue from mobile services. Internet access and services including broadband and hotspot services is the largest revenue stream. Internet revenues have grown by 73% in absolute terms since 2009 and currently drive 34% of total revenue, increasing from 25% in 2009.

✂ ---------- ✂

[10] The rate is below 100% if MoD personnel are included into the population

As mentioned, fixed voice and broadband services are available to all residents, and mobile services are available to 95% of the population, covering 40% of the landmass. Visitors holding foreign SIM cards can use voice roaming services while in the Falkland Islands; data roaming is available with 11 operators but no UK operators.

Wireless hotspots are available to residents and visitors, who can purchase pre-paid cards in most hotspot locations and retail outlets in Stanley, MPA and Camp where there are hotspots available. Residential and business broadband subscribers can also log into wireless hotspots using their broadband account details. The pre-paid card can also be used to make calls from either 7 out of 9 payphones in Stanley (the rest are coin-operated) or from any local fixed or mobile phone.

For those travelling to or residing in the zones with no mobile coverage but still requiring mobile connectivity, the telecom provider offers satellite phone services either on subscription or short-term rental basis.

The main telecoms services offered by Sure and their availability across the territory is summarised below.

Figure 8: Availability of Telecom Services across the Falkland Islands

		Stanley		MPA		Camp	
		Available	Technology	Available	Technology	Available	Technology
Fixed	Phone	✓	PSTN - Copper line	✓	PSTN - Copper line	✓	SIP over WiMAX/ MSAN (50%/50%)
	Broadband	✓	DSL* Max speed 2Mbps	✓	DSL Max speed 2Mbps	✓	WiMAX (50%)/ MSAN (50%) Max 2 Mbps
	Wi-Fi Hotspots	✓ (24 hotspots)	Wi-Fi Max 300 kbps	✓ (55 hotspots)	Wi-Fi Max 300 kbps	(9 hotspots across all of Camp)	Wi-Fi Max 300 kbps
Mobile	Voice	✓	2G	✓	2G	(40% of landmass, two settlements in West Falklands, and some areas of East Falklands)	2G
	Data		GPRS/EDGE DL speed <135 kbps		GPRS/EDGE DL speed <135 kbps		GPRS/EDGE DL speed <135 kbps
	Voice Roaming (for visitors)	Inbound and outbound roaming available with select overseas partner networks, in those areas with coverage					
	Data Roaming (for visitors)	Data roaming is available with 11 operators but no UK operators					
Others	Prepaid phone cards	Prepaid phone cards can be used from telephone lines, payphones (9 available in Stanley) and local mobile SIMs					
	Satellite Phone	Coverage in all areas 'Iridium' satellite phone service resold by Sure					

*SHDSL and leased lines for largest customers

Source: Sure

6.2 Mobile Services

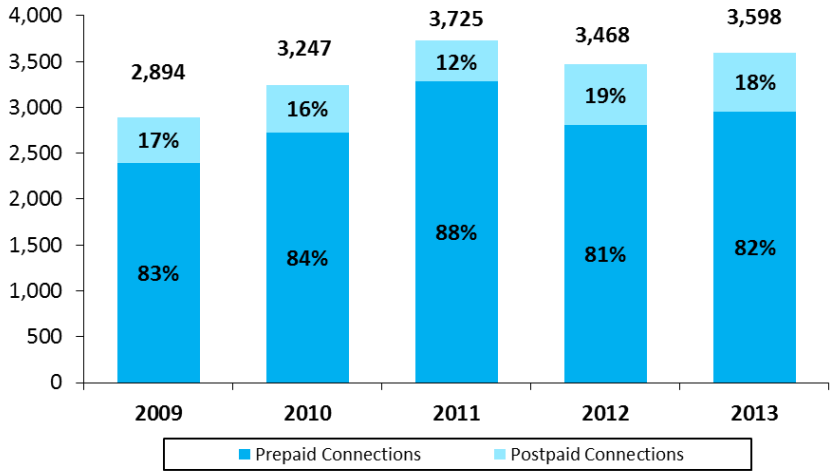
6.2.1 Overview of Market

Mobile communication services were introduced in the Falkland Islands in 2005, based on 2G technology. In 2011 the mobile network was extended around the Islands, increasing coverage in Camp. Currently the technology offers a performance equivalent of up to 2.75G (download speeds up to 135 kbps).

The number of mobile connections has been growing year-on-year, peaking in 2011 at 3,725 connections, but decreasing in 2012 to 3,468 connections, with a decline of 7%[11]. With 3,598 mobile connections at year end 2013 and reported population of 2,840, the mobile penetration rate stood at 122%. If we include an additional 1,000 military personnel, the effective mobile penetration rate would be in the region of 90%.

The majority of mobile connections are pre-paid (82%). The share of pre-paid connections declined from the peak of 88% in 2011, coinciding with the introduction of mobile data services in 2012. However, mobile data usage is limited due to the slow speeds offered by the service.

Figure 9: Mobile Connections in the Falkland Islands, 2009-2013



Source: Sure

Revenue from mobile services grew between 2009 and 2011, plateauing in 2012, and decreasing slightly thereafter[12]. Roaming calls made by visitors to the Falkland Islands represent nearly 50% of the total mobile revenues (✂---✂). The second-largest contributor to the total mobile revenue is outbound voice calls, which declined slightly in years 2012 and 2013 compared to 2011.

✂ ---------- ✂

6.2.2 *Products and Services*

6.2.2.1 Local Services

Sure offers three post-paid 12-month packages and one pre-paid package. These packages are used by business customers and residential users alike.

[11] In 2012 mobile data packages were introduced and methodology for counting connections has changed. The drop in reported number of connection can be related to the change in methodology rather than actual decrease in amount of users. Another possible explanation is the termination of connections used by the foreign workers engaged in the initial oil explorations

[12] The data excludes a retrospective negative adjustment of £100,000 made in 2013 for fair accounting purposes

The post-paid packages offer different allowances of national voice minutes, national texts and data. The overage prices for local voice and texts are the same for all three packages, whilst the rate for data is between 10-12p/MB, decreasing with the increase in package price.

The pre-paid plan offers voice, text and data services which are charged on a per minute / text / MB basis. The local and international calls are more expensive than the post-paid overage rates – 10p vs. 15p and 80p vs. 90p respectively. The data charges for pre-paid are the same as for the lowest priced post-paid package – 12p/MB. The pre-paid plan also requires a monthly top-up (£5 minimum) to keep the account active. This charged is justified by Sure as the minimum charge required to serve and maintain a very small mobile customer base.

Figure 10: Mobile Plans Offered in the Falkland Islands

Pay monthly

Premium 25	
Connection fee (one off payment)	£30
Monthly fee	£25
Monthly fee for 6 or more packages on one account	£19.99
Bundled national minutes	125
Bundled national texts	25
Bundled data allowance	25MB
Bundled national MMS	5
Local calls per minute	10p
International calls per minute[1]	80p
National SMS (text message)	10p
International SMS	25p
Over data charge	12p/MB
National MMS (picture/video message)	30p
International MMS	40p
Payment method	Monthly bill

Premium 40	
Connection fee (one off payment)	£30
Monthly fee	£40
Monthly fee for 6 or more packages on one account	£34.99
Bundled national minutes	140
Bundled national texts	40
Bundled data allowance	240MB
Bundled national MMS	10
Local calls per minute	10p
International calls per minute[1]	80p
National SMS (text message)	10p
International SMS	25p
Over data charge	11p/MB
National MMS	30p
International MMS	40p
Payment method	Monthly bill

Premium 60	
Connection fee (one off payment)	£30
Monthly fee	£60
Monthly fee for 6 or more packages on one account	£54.99
Bundled national minutes	260
Bundled national texts	60
Bundled data allowance	360MB
Bundled national MMS	15
Local calls per minute	10p
International calls per minute[1]	80p
National SMS (text message)	10p
International SMS	25p
Over data charge	10p/MB
National MMS	30p
International MMS	40p
Payment method	Monthly bill

A 12 month contract applies to all Premium packages

Pay as you go

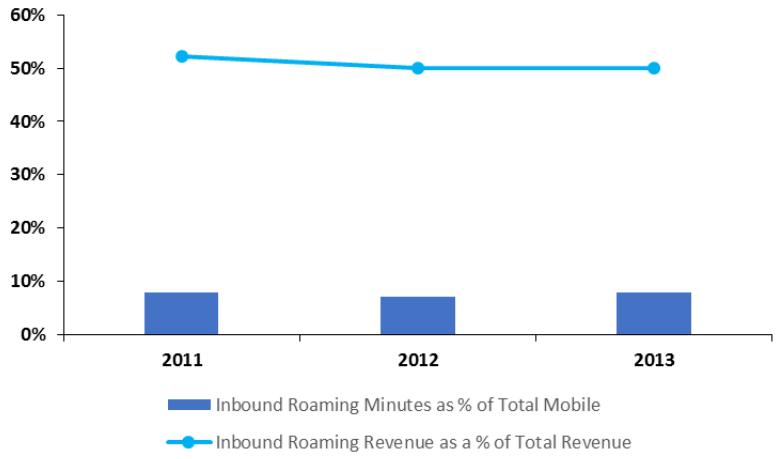
Connection fee (one off payment)	£30
Credit included with connection kit	£10
Initial validity	60 days
Local calls per minute	15p
International calls per minute[1]	90p
National SMS (text message)	10p
International SMS	25p
Data charge	12p/MB
National MMS (picture/video message)	30p
International MMS	40p
Payment method	Top up
Account does not expire if kept active (every £5 top up extends validity by 30 days)	

Source: Sure

6.2.2.2 Roaming Services

Inbound voice roaming accounted for ~8% of all mobile call minutes generated between 2011 and 2013 but contributed ~ 50% to total mobile revenues each year. Since the inbound traffic is mainly generated by short-term visitors to the Islands, the mobile revenue stream is heavily dependent on the volume of business visitors, temporary workers and the tourism industry.

Figure 11: Contribution of Inbound Roaming to Total Mobile Traffic and Revenue



Source: Sure

Whilst Sure does have outbound roaming agreements with a number of partners, mobile roaming currently represents less than 1% of the total mobile revenues. This is likely caused by the residents using local SIMs of the countries they are visiting (e.g. UK, Chile) to save on calling costs.

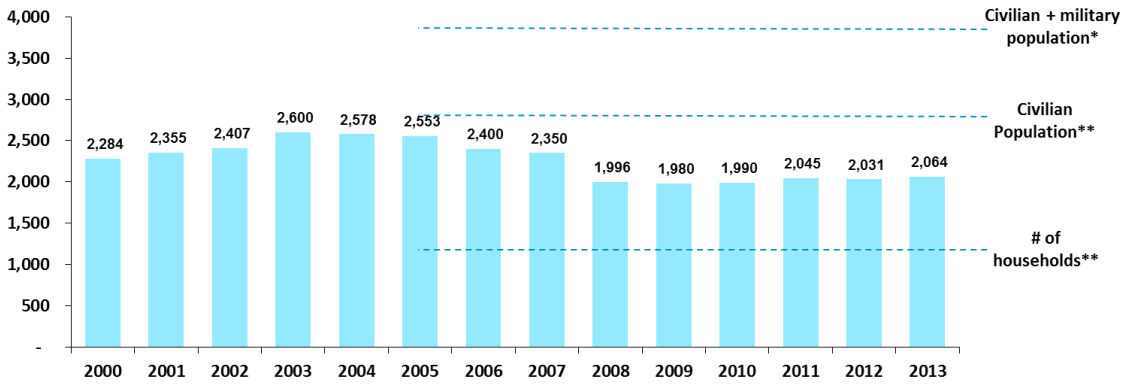
6.3 Fixed Voice Service

6.3.1 Overview of the Market

The two alternative ways to make fixed calls are using a fixed phone line or one of the payphones in Stanley.

The number of fixed line subscribers has fluctuated over time peaking in 2003 with 2,600 connections, reducing to its lowest point in 2009 to slightly less than 2,000 connections. Connections have stayed relatively constant since this point increasing slightly to 2,064 connections in 2013.

Figure 12: Fixed Line Connections in the Falkland Islands, 2000-2013

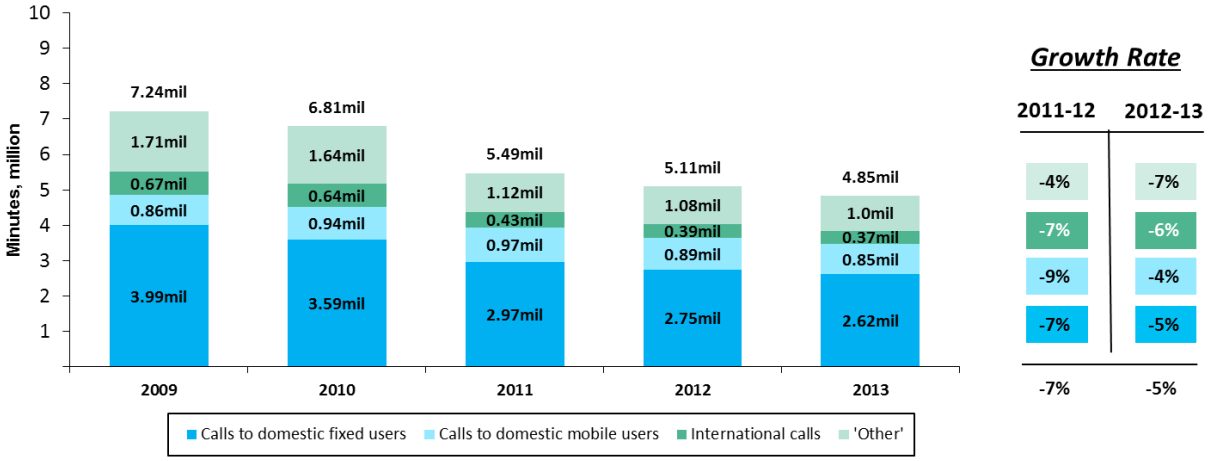


Source: Sure

The vast majority of households have a fixed line connection (PSTN or fixed wireless), whilst the remaining connections serve businesses, local organisations and MPA. Business and residential customers have different monthly subscription fees: £8 for residential connections and £20 for business.

The number of fixed voice call minutes has been falling since 2009, across all categories. This trend is in line with operators worldwide, and is partly driven by fixed-to-mobile substitution. A significant proportion of outbound fixed voice traffic is domestic fixed-to-fixed, representing 55% of the total traffic in 2013. Calls from fixed to mobile phones contributed to 18% of the total traffic, with fixed to international destinations accounting for a further 8% of traffic. The 'Other' fixed call category includes phone card calls and the Falkland Islands directory enquiries.

Figure 13: Minutes of Fixed Line Usage by Destination



Source: Sure

Following the declining trend in minutes of usage, overall fixed line revenues have decreased from ✂---✂ in 2009 to ✂---✂ in 2013. This decline has been driven solely by the year on year reduction in call revenue, which accounted for 82% of total revenues in 2009 declining to 75% in 2013. Overall, call revenues fell by 9% per year over the 2011 to 2013 period. The revenue for subscription charges increased slightly in 2013 to ✂---✂, up from ✂---✂ in the previous years. The revenue for 'Other' charges, which include installations, transfers etc., grew by 41% in 2013 although it represents a very small portion of the total (✂---✂).

✂ ---------- ✂

6.3.2 Products

Local fixed calls are charged at 6p per minute to all landlines and 10p per minute to mobiles, regardless of the type of customer (business or residential) or the type of originating connection (landline or pre-paid phone card). Directory inquiry calls are charged at 10p per minute. The prices for international calls are dependent on the time of the day and are more expensive when calling from phone cards than from landlines. The pricing structure consists of two international calling zones, UK and rest of world.

Figure 14: International Fixed Line Call Prices, 2014

From a landline

SERVICE	TARIFF PER MINUTE
Telephone	
UK (standard rate)	£0.90
UK (off peak rate – Weekends & 6pm to 6am week days)	£0.60
Rest of the world (standard rate)	£1.00
Rest of the world (off peak rate – Weekends & 6pm to 6am week days)	£0.80

From a prepaid phone card

SERVICE	TARIFF PER MINUTE
Telephone	
UK (standard rate)	£0.99
UK (off peak rate – Weekends & 6pm to 6am week days)	£0.80
Rest of the world (standard rate)	£1.10
Rest of the world (off peak rate – Weekends & 6pm to 6am week days)	£0.99

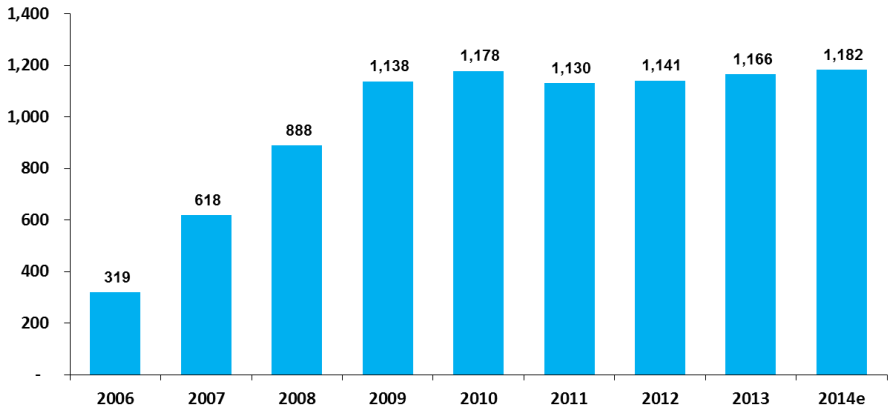
Source: Sure

6.4 Fixed Broadband Service

6.4.1 Overview of the Market

In 2006, fixed broadband services were introduced in Stanley and MPA and were rolled out across the Falkland Islands in 2008-2009. The number of subscriptions grew rapidly in the 2006-09 period, completely replacing dial-up services in 2009. Since then, the number of broadband subscriptions has stayed relatively flat, at approximately 1,100-1,200 customers.

Figure 15: Number of Broadband Subscriptions in the Falkland Islands[13]



Source: Sure

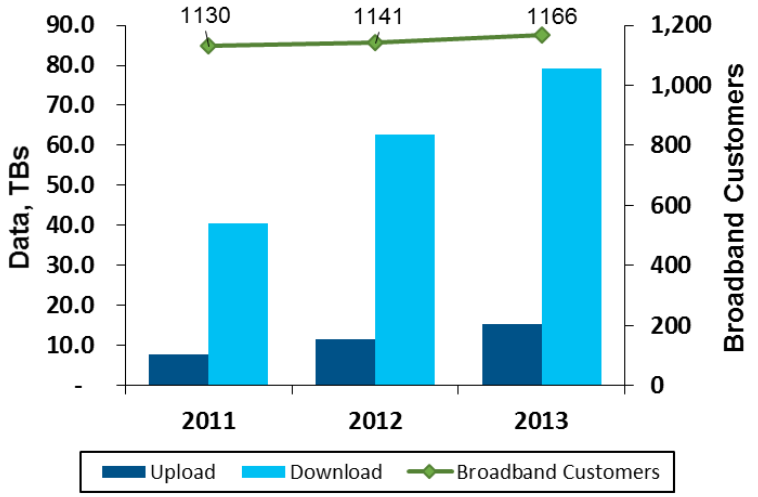
[13] 2014 number is estimated based on the 2011-2013 growth rate, as Sure could not provide the consolidated average subscriber numbers so far in 2014. Sure did provide the snapshot of subscribers in November 2014, corresponding to 1,354 fixed broadband subscribers

Broadband traffic has grown significantly, with downloaded data almost doubling between 2011 and 2013 (see Figure 16: below). However, residents identify the limited data allowance usage cap and high overage charges as the main obstacles to broadband use.

There is a latent demand to increase Internet usage even further, which is driven by a number of factors, including:

- Continued adoption of smartphones and tablets will drive both increased consumption of internet content and data required for operating system and apps updates
- Increased familiarity and take up of VoIP-like services (e.g. Skype) which have increasingly replaced traditional fixed international calls
- P2P content sharing (e.g. BitTorrent), primarily for film downloads
- Very high social media adoption rate in the Falkland Islands, with social media being used for personal and community matters like community notice board, public discussion forums, and sharing of user-generated content
- Necessity to use internet for purchases and services (e.g. online banking), given the remoteness of the Falkland Islands and reliance on UK-based services
- Increasing number of businesses using the internet to support their day-to-day marketing, business sales, research and procurement

Figure 16: Broadband Traffic 2011-2013



Source: Sure

6.4.2 *Customer Segments and Broadband Packages*

Sure offers six different broadband plans: three for residential use and three for business with monthly subscriptions ranging between £17 to £80 and £180 to £425 respectively. The principal differences between the residential packages are the data allowance and connection speed. All business packages have the maximum speed of 2 Mbps but differ in the data caps. The overage charges vary for each package and range from 10p/MB for the entry level Residential package to 5p/MB for the high-end Business bundle.

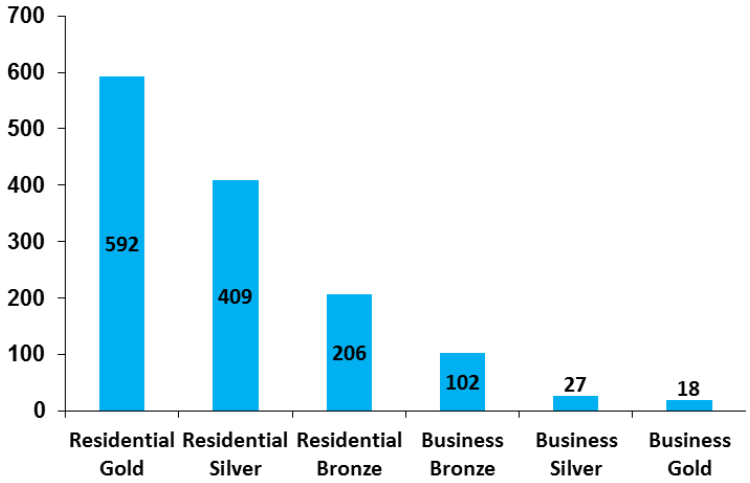
Figure 17: Fixed Broadband Packages Offered in the Falkland Islands

		Monthly Charge	Data Allowance	Overage
Residential	Bronze	£17	700 MB	10p/MB
	Silver	£40	2,000 MB	9p/MB
	Gold	£80	5,150 MB	8p/MB
Business	Bronze	£180	10,500 MB	7p/MB
	Silver	£300	18,750 MB	6p/MB
	Gold	£425	31,250 MB	5p/MB

Source: Sure

Subscribers can choose between residential and business packages irrespective of their status – some residential users purchase business packages to have a larger allowance, and vice versa. Sure also offers a dual-play offer with the Residential packages, where customers can purchase a broadband bundle and a post-paid mobile bundle at a reduced price (from £2 to £5 discount on the monthly broadband package). The top-selling packages are the Residential Gold and Residential Silver packages, accounting for nearly 75% of the total subscriptions.

Figure 18: Broadband Subscribers by Plan, Nov-2014



Source: Sure

Once a customer reaches the data allowance cap, the same quality of service continues to be supplied with the user being billed overage charges per additional MB consumed based on their pricing plan. Customers can opt in to receive email and text alerts once 80% and 100% of their allowance is reached; customers can also choose to receive alerts when they reach 125%, 150%, 175%, etc. of the monthly caps. Customers can also check their remaining allowance on Sure's website (usage shown is not real-time with a delay of around 1 hour), with many keeping a careful

'inventory' of data consumed during the month. Despite these measures, users often go over the data cap and sometimes can face high charges. The low data allowances and high overage charges are the main source of users' dissatisfaction with the current plans[14].

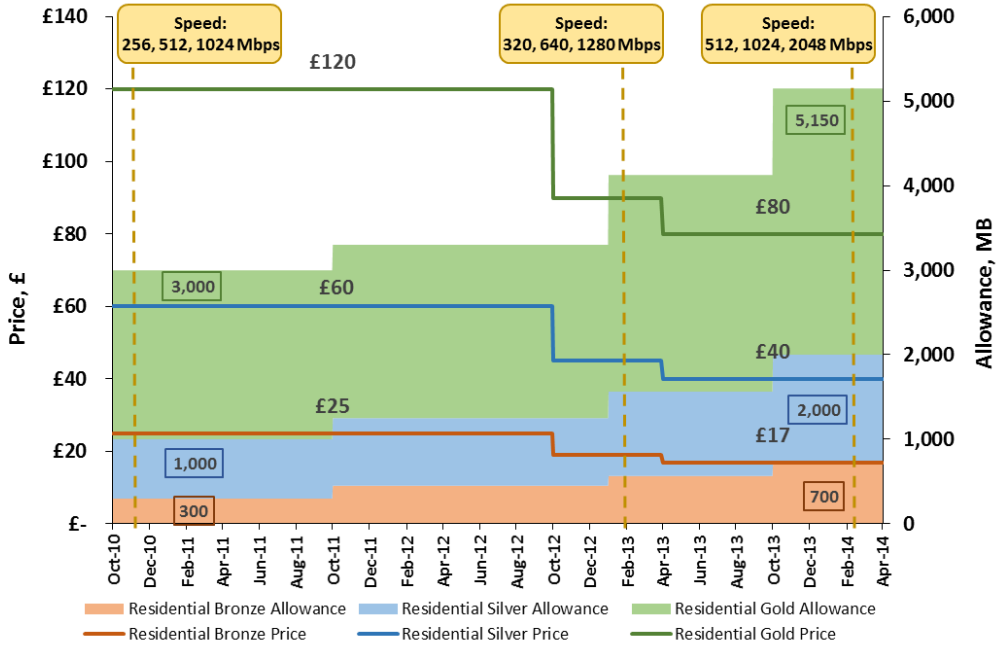
Sure has taken a few initiatives to inform and educate customers on how to manage their internet usage (e.g. brochures, information on the website).

6.4.3 *Evolution of Broadband Packages*

Since broadband was introduced in 2006, there have been moderate increases in speeds and data caps, and reductions in the monthly fees, most of them occurring after the price cap regulation was introduced in 2011 (see section 5.4 for more details on the Price Cap).

For the residential plans, speeds have increased twice: first in Q1 2013, then in Q1 2014, doubling from 256kbps, 512kbps, and 1024kbps to 512kbps, 1024kbps, and 2048kbps, respectively. The data allowance cap has also increased three times since 2011 growing from 300MB to 700MB for the Bronze Plan, from 1,000MB to 2,000MB for the Silver Plan and from 3,000MB to 5,150MB for the Gold Plan. The monthly subscription price has decreased twice, first in Q4 2012 and then in Q2 2013, decreasing by 1/3 for all three plans.

Figure 19: Evolution of Residential Plans

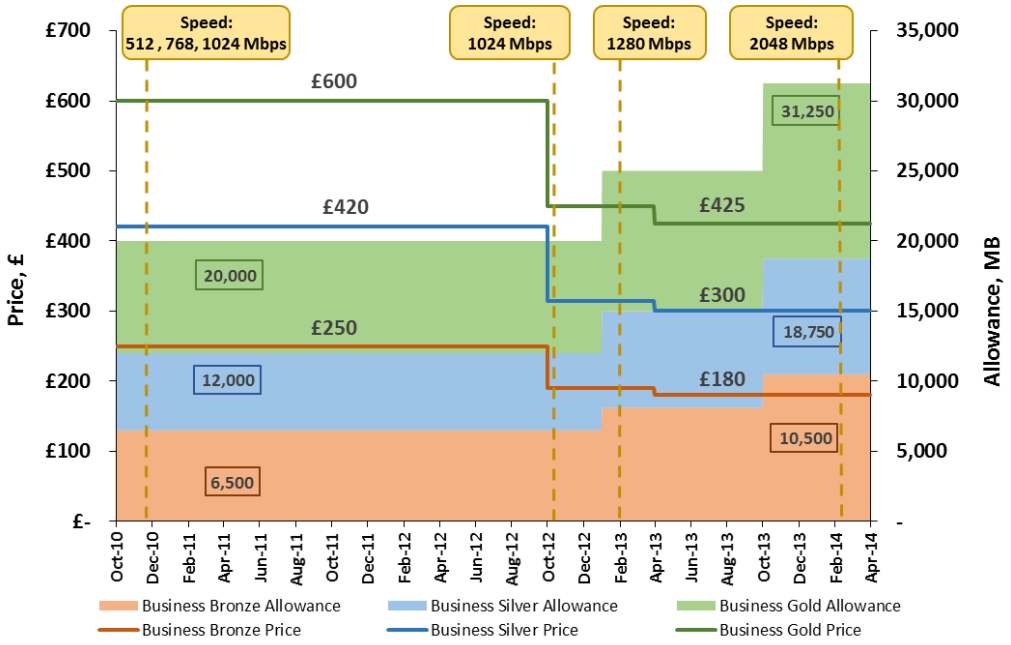


Source: Sure

For the business plans, access speeds have increased three times since 2011. By the end of 2012 the maximum speed for each package was harmonised at 1024Mbps, followed by increases in Q1 2013 and Q1 2014 (currently at 2,048Mbps for each business plan). The data cap has increased twice: in Q1 and Q4 2013 growing from 6,500MB to 10,500MB for the Bronze plan, from 12,000MB to 18,750MB for the Silver Plan, and from 20,000 to 31,250MB for the Business Gold Plan. The price of the plans has also decreased twice since 2011, decreasing by ~28% across all three plans.

[14] FIG Telecoms Survey 2014

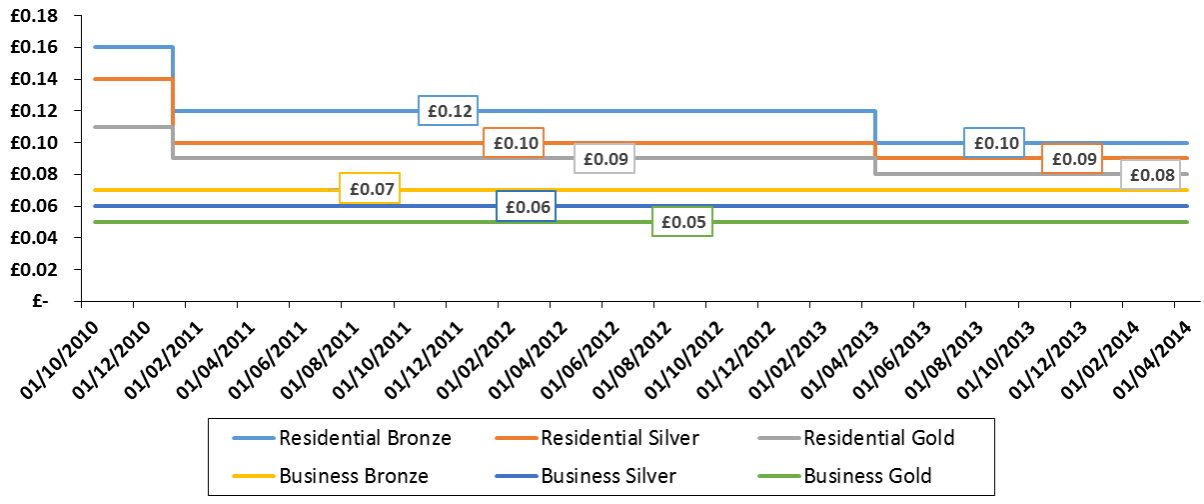
Figure 20: Evolution of Business Plans



Source: Sure

Overage charges have not changed significantly over the past 3 years with residential overage charges being reduced once, in Q2 2013, by 1p/MB for the Gold and Silver packages and by 2p/MB for the Bronze package. The overage charges for all business packages have stayed the same since 2010. Figure 21: below shows the evolution of the overage charges over the last 4 years.

Figure 21: Evolution of Overage Charges



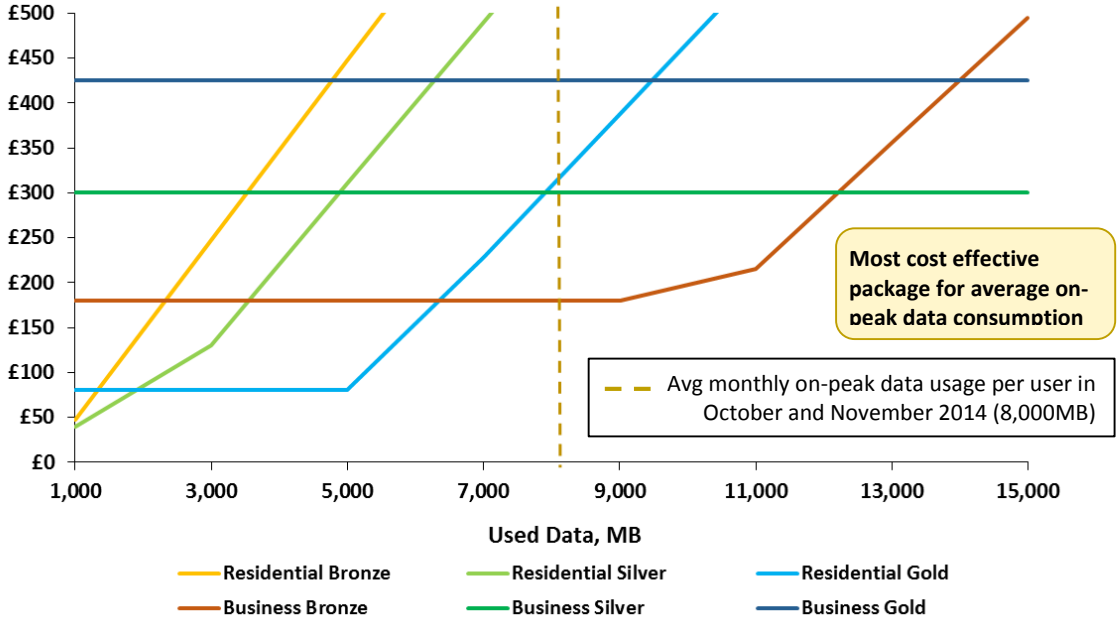
Source: Sure

6.4.4 *Analysis of Broadband Pricing*

To understand the impact of the data caps and overage charges, we have analysed the cost effectiveness of each package depending on the data used in a month. Figure 22: provides a

graphical representation with usage up to 15 GB, and Figure 23: provides a table with the monthly cost for a number of usage values between 1 and 50 GB.

Figure 22: Monthly Cost by Data Usage (MB) on all Broadband Packages[15]



Source: Sure

Figure 23: Monthly Cost by Broadband Package

Monthly Usage		Residential			Business		
GB	MB	Bronze	Silver	Gold	Bronze	Silver	Gold
1	1024	49	40	80	180	300	425
2	2048	152	44	80	180	300	425
5	5120	459	321	80	180	300	425
8	8192	766	597	323	180	300	425
15	15360	1,483	1,242	897	520	300	425
20	20480	1,995	1,703	1,306	879	404	425
25	25600	2,507	2,164	1,716	1,237	711	425
50	51200	5,067	4,468	3,764	3,029	2,247	1,423

Source: Sure

The currently average usage per subscriber[16] is around 12,000 MB per month, with ~4,000 MB used during the night time window and ~8,000 MB used during the peak window. This figure of ~8,000 MB is significantly higher than data allowance of the residential plans (the Residential Gold plan has a cap of 5,150 MB), indicating that the data caps for the residential plans are too low to meet the needs of most users.

[15] On-peak usage is used as a reference due to off-peak (night-time) usage not being counted within the monthly allowance. Average usage is calculated based on the estimated number of users in 2014 (1,182 users) and total on-peak bandwidth in Oct-Nov 2014

[16] The subscribers figure includes business and corporate subscribers, which could substantially increase the average usage. Sure was not able to provide the breakdown of data used by the residential accounts.

The analysis shows that the most cost effective package for an average on-peak usage of ~8,000 MB is Business Bronze, which is priced at £180 a month. Even the Business Silver package would provide better value than the Residential Gold package: £300 for the Business Silver monthly fee compared to £323 for Residential Gold (with £243 coming from overage charges). Note that consumer-only data usage was not available, so we could not assess the optimal broadband plan for average consumer usage.

When analysing the price of the overage charges compared to the in-bundle charges, overage prices are significantly higher relative to effective in-bundle price per MB. Assuming 100% of the available usage allowance is utilised the in-bundle cost per MB is highest for the Residential Bronze package at £0.024 per MB declining to £0.016 for the Residential Gold plan. This compares to £0.1 and £0.08 per MB respectively for overage charges. The differential between the in-bundle and overage rates per MB ranges between 422% and 512% for the residential plans and 373% and 398% for the Business plans. For example, overage charges per MB on the Residential Gold plan are over 5 times higher compared to the in-bundle pricing. See the table below (Figure 28) with the details of the in-bundle and overage data prices for the six broadband packages available.

Figure 24: In-bundle and Overage Data Prices, by Broadband Package

Plan	Usage Cap / Monthly Price			Price per MB (100% utilisation of bundle)			Price per MB (70% utilisation of bundle)		
	GB	MB	£	In-Bundle (£)	Overage (£)	Variance	In-Bundle (£)	Overage (£)	Variance
Residential									
Bronze	0.7	700	17	0.024	0.10	412%	0.032	0.10	309%
Silver	2	2,000	40	0.020	0.09	450%	0.027	0.09	338%
Gold	5	5,150	80	0.016	0.08	515%	0.021	0.08	386%
Business									
Bronze	10	10,500	180	0.017	0.07	408%	0.023	0.07	306%
Silver	18	18,750	300	0.016	0.06	375%	0.021	0.06	281%
Gold	30	31,250	425	0.014	0.05	368%	0.018	0.05	276%

Source: Sure

Whilst we would expect to see a decline in the effective price per MB for high priced monthly plans (e.g. the larger the monthly usage bundle / plan, the lower the in-bundle price per MB), we would not expect to see such a significant differential between in-bundle and overage usage charges per MB.

This would also apply when taking into account utilisation level, assuming that the average customer in a normal pricing environment would not exceed their bundle. For example, if 75% utilisation is applied, the overage price per MB for the Residential Gold plan is ~385% higher than the effective in-bundle price.

As a result, overage makes up a significant proportion of the monthly fee. For example, at an average usage of 8,000 MB per month (outside of the night time window), the overage charge accounts for 98%, 93% and 75% for the Residential Bronze, Silver and Gold respectively. The higher the usage per month, the higher the proportion of overage charges to total fees. The table below shows the percentage of overage charges over the total broadband spend, for different levels of monthly data usage.

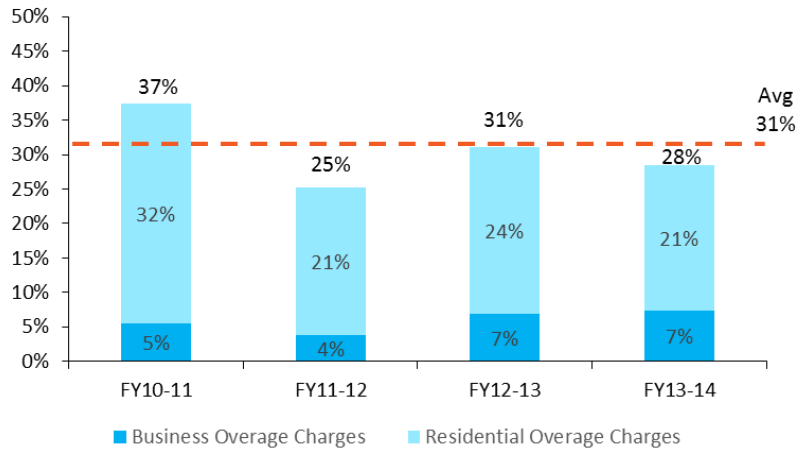
Figure 25: Percentage of Broadband SAR

Monthly Usage		Residential (overage as % of total fee)			Business (overage as % of total fee)		
GB	MB	Bronze	Silver	Gold	Bronze	Silver	Gold
1	1024	66%	0%	0%	0%	0%	0%
2	2048	89%	10%	0%	0%	0%	0%
5	5120	96%	88%	0%	0%	0%	0%
8	8192	98%	93%	75%	0%	0%	0%
15	15360	99%	97%	91%	65%	0%	0%
20	20480	99%	98%	94%	80%	26%	0%
25	25600	99%	98%	95%	85%	58%	0%
50	51200	100%	99%	98%	94%	87%	70%

Source: Sure

As a result of the high overage prices coupled with low data caps, the overage charges contribute significantly to Sure's revenues: ✂---✂. Most of the revenue comes from subscribers on the residential packages (21%-32% of the total revenue) while overage fees for the business package subscribers contribute 4%-7%. Since the introduction of the free night-time window in FY10-11, the share of revenue from overage has dropped from 37% in 2011 to 25%-31% in FY11-12 to FY1-14. The figure below (Figure 30) represents the contribution of overage charges towards the total broadband revenues during the period 2011-14.

Figure 26: Overage Charges' Share of the Total Broadband Revenues[17]



Source: Sure

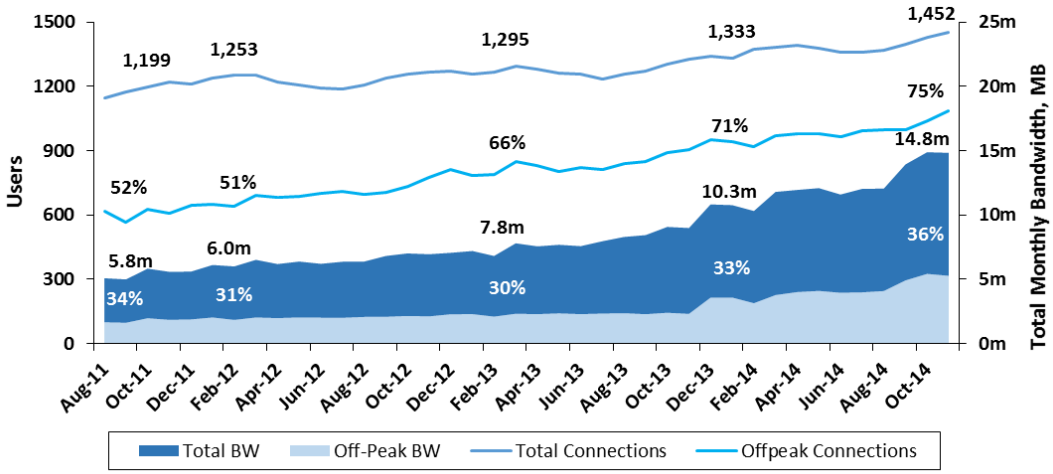
✂ ---------- ✂

[17] YTD figures as of March of each year

6.4.5 *Off-Peak (Night-time) Internet Usage*

The traffic growth was significantly influenced by the introduction of the free internet night-time window in April 2011 whereby internet usage between 00:00 and 06:00 does not count towards the package data allowance. The share of broadband customers making use of the night-time window has been increasing steadily since its launch, from 52% of the total users in 2011 to 75% in November 2014. The share of off-peak traffic has stayed relatively constant, at 34-36% of the total traffic.

Figure 27: Monthly Broadband Usage in the Falkland Islands[18]

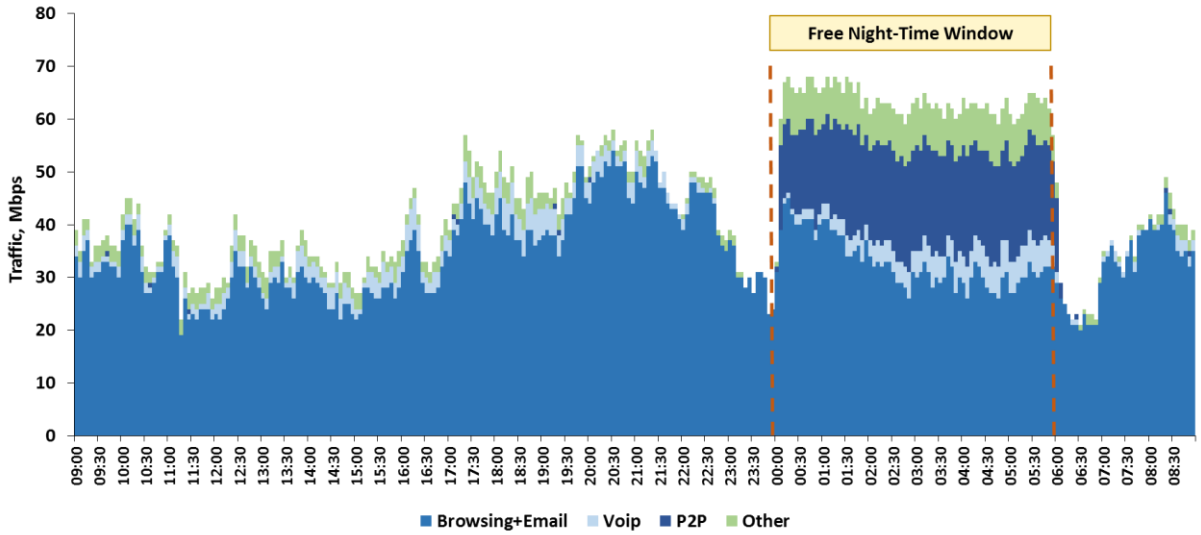


Source: Sure

The intense use of the night-time window leads to the full utilisation of the international capacity link, whereas during the day the utilisation is at around 50-70%.

[18] The total connections numbers include active session (web cameras, visa terminals, multiple user access, etc.) therefore are higher than the number of broadband subscriptions

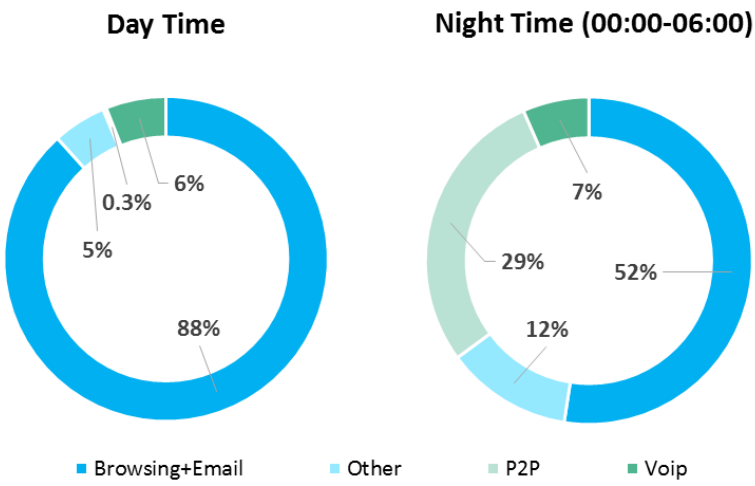
Figure 28: Daily Bandwidth Usage by the Type of Service[19]



Source: Sure

As can be observed in Figure 29: below, P2P traffic (e.g. BitTorrent) occupies a significant share of the night-time window traffic. Sure has reported that a moderate number of people download vast amounts of data using Peer-to-Peer services, whereas a larger number of subscribers make a more moderate use, downloading content on a less regular basis. ✂----------✂

Figure 29: Total Daily Bandwidth Usage by the Type of Service [20]



Source: Sure

There are various unexpected social consequences of the free night window, especially impacting school-age children. With parents seeking to minimise the cost of their broadband bills, some youngsters stay online late at night. The school staff have noted an increasing number of children suffering from poor concentration due to lack of sleep. Medical personnel at Stanley hospital also

[19] A sample of a 24h window
[20] A sample of a 24h window

reported multiple cases of patients who have been affected by frequent late night internet use. Most seriously, the late night, unsupervised internet use has led to cases of online offences against minors. This is a wider issue beyond Sure's control, and which relates to online safety, where parental control, education services and law enforcement can help mitigate this unexpected consequence. In Part B we consider potential changes to the night time-window proposition that could help address this issue.

6.4.6 Conclusions

The introduction of the night-time window (00:00-06:00) when usage does not count towards the monthly data allowance has been widely adopted by the broadband users: 75% currently make use of it, accounting for 35% of the total traffic downloaded during these 6 hours (25% of the total time).

However, data caps continue to be too low, as on-peak traffic volumes have increased at a faster rate (156% increase over 3 years) than the data caps increases for the various packages (74% increase over 3 years). This means that more users are exceeding the data cap, and are doing so more often. This trend has increased since September 2014, according to the general feedback received during Cartesian's visit to the Falkland Islands. The main reason cited was due to system updates to smartphones and tablets that consume significant volumes of data.

At the same time, overage prices per MB have had limited reductions over the last three years, with 1p/MB and 2 p/MB reductions for the residential packages. The high overage charges coupled with the low data caps have translated into significant overage revenues, averaging ✂---✂ or 31% of the total broadband revenues. As a result, overage revenues are currently funding international capacity costs (✂---✂). Based on this, we believe there is potential to increase international capacity expenditure, which is covered in more detail in Part B.

The average on-peak monthly data usage per subscriber has increased steadily over the last few years, standing at ~8,000 MB (note that subscribers include large corporate users) in Oct-November 2014. The most cost effective package for this average use would be Business Bronze, with a monthly cost of £180, followed by Business Silver, with monthly subscription of £300. Currently, only 9.5% of users have purchased these packages.

6.5 Hotspot Internet Service

6.5.1 Overview of the Hotspot Service

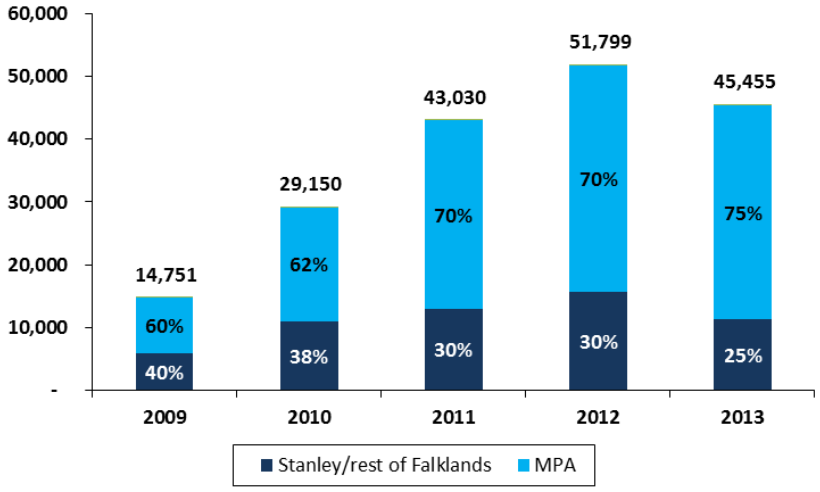
An alternative method for internet access is using the Wi-Fi hotspots located mainly in Stanley and MPA. As of November 2014, the total number of hotspots stood at 88. The hotspots are used primarily by visitors to the Islands, including tourists, temporary workers employed in the oil and farming industries, foreign fishermen and military related personnel.

The hotspots can be accessed by purchasing Wi-Fi / telephone cards, available in £5 and £10 denominations providing 50 minute and 100 minutes of internet connection respectively (subject to T&Cs). Alternatively, the fixed broadband subscribers can login using their user name and password, with usage being charged against their residential account.

The number of sold pre-paid cards grew significantly from 14,751 in 2009 to 51,799 in 2012, with a drop in 2013 to 45,455 cards. Most of the cards are being sold in the MPA for the personal use

of the MoD staff (the numbers do not include the bulk card purchases made by the MoD and distributed to the staff as part of their welfare allowance).

Figure 30: Number of Sold Pre-paid Cards[21]



Source: Sure

The absence of fast mobile broadband, combined with expensive roaming calls and uptake of VoIP services such as Skype has contributed to the growth in the use of and revenue from hotspots.

✂ ---------- ✂

We believe that the Wi-Fi hotspot charges, at £1 per 10 min of internet usage, are considerably high, especially for medium-term visitors who use the hotspots as their main way to access the Internet. A moderate Internet usage of 1 hour per day translates into a cost of £180 per month. With regards to the military personnel, even though they are offered the services with a certain discount, the price paid is high due to Wi-Fi being their primary method of internet access.

6.6 Other Services

Sure offers a limited number of additional services aimed at the business and residential sector.

6.6.1 Business Value-Added Services

These include dedicated internet circuits for the largest customers (14 customers in 2014), dedicated telephony circuits (16 customers), national and international leased circuits (6 customers) and managed virtual data hosting solutions. Sure also offers a video conferencing facility available for lease. The contribution of the broadband value-added services to the total broadband revenues is estimated at 5-7%. Dedicated voice circuits contribute around 2% to the revenues for fixed voice.

6.6.2 Other Consumer Services

[21] Numbers don't include welfare cards purchased by MoD but include retail cards bought by MoD staff independently. Cards can be used for Wi-Fi and calling services

For customers travelling to remote locations or spending time in areas without mobile signal, Sure rents Iridium satellite phones on a weekly or monthly basis. The residents owning their own satellite phones can also sign up for a monthly Iridium connection service to their phones. The service is not widely used, mostly due to very high costs of satellite calls, and contributes less than 1% to the total revenue.

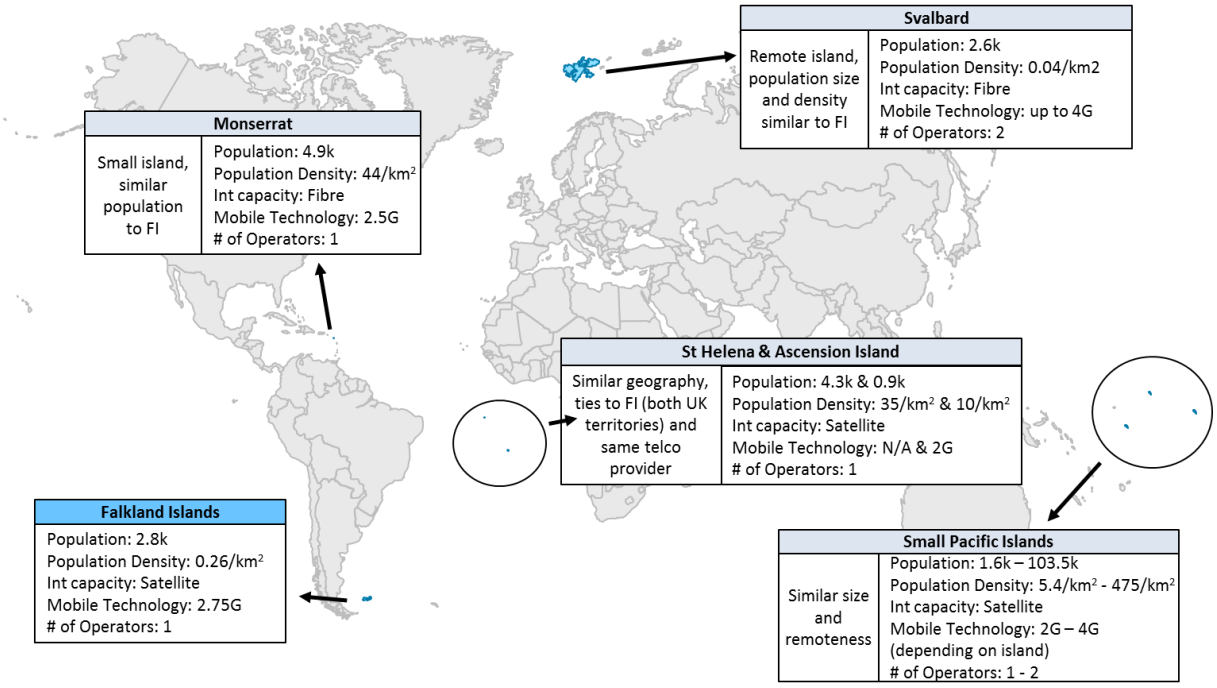
7. International Benchmarking

7.1 Methodology

The purpose of this section is to compare the telecoms services and prices in the Falkland Islands with those of other markets which are comparable in terms of their population size, remoteness, and geographical size. Most of the markets assessed (11 out of 13) rely on satellite for international capacity, which enables a more like-for-like comparison with Sure Falkland Islands compared to those that are connected by fibre. However, even with fibre, it is still useful to understand pricing trends and the regulatory environment in these markets (note, we have removed them from the international capacity comparison).

Benchmarking was conducted across four areas: telecoms services and prices, regulatory framework, international capacity and the financial accounts of telecoms providers.

Figure 31: Map Showing Selected Benchmark Countries



Source: Cartesian

Both **St. Helena and Ascension** were chosen due to their ties to the Falkland Islands (since all three are UK territories), the small population as well as the fact that they share Sure as their sole telecoms provider. However it should be noted that both St. Helena and Ascension have population densities higher than that of the Falkland Islands at 5.4/km^2 and 475/km^2 respectively compared to the Falkland's 0.26/km^2. Mobile technologies in both islands are behind the Falkland Islands; Ascension's mobile coverage is limited to 2G, whilst St. Helena currently has no cellular service (it is planned for 2015).

Svalbard is more similar to the Falkland Islands in terms of its population (2,600), population density (0.04/km^2), and remoteness. However, Svalbard's proximity and close relationship with Norway means that it is connected to the mainland through a high-capacity submarine cable (as

opposed to the Falkland Islands' satellite link). It is also served by Norwegian operators with a universal service obligation.

Christmas Island in the Indian Ocean is, like Svalbard, a wholly dependent territory. Similar to Svalbard, its sole mobile operator Telstra has a universal service obligation mandated by the Australian government. It has a population lower than the Falkland Islands at 2,072, but a population density that is higher at 10.39/km^2. Its mobile network is based on 2G technology, and it is connected to the rest of the world via satellite.

Montserrat in the Caribbean and **Nauru** in the Pacific are similar to the Falkland Islands in so far as their telecoms are exclusively provided by a single division of a multi-national telecommunications provider specializing in remote island states. Similar to the Falkland Islands, 2.5G technology is used for mobile data. Nauru's international connectivity is provided by satellite link, whereas Montserrat's network is linked to Antigua via a wireless connection, which in turn is connected to the other Caribbean islands and the mainland by a submarine fibre cable. The population and population densities of both islands are higher than that of the Falkland Islands (4,900 and 44/km^2 in Montserrat and 9,378 and 447/km^2 in Nauru).

Norfolk Island in the South Pacific has a relationship with Australia that is similar to the Falkland Islands' relationship with the UK. It is a self-governing territory with a population that is lower than that of the Falkland Islands at 2,302 (although its population density is much greater at 61.9/km^2), and its mobile network only supports 2G service.

The Cook Islands in the South Pacific are a state in free association with New Zealand (similar to both Norfolk Island and the Falkland Islands). Both their population (13,889) and population density (57.87/km^2) are far higher than the Falkland Islands. In Rarotonga, citizens can benefit from mobile broadband through 3G technology. The rest of the islands are served by the older 2.5G standard.

Kiribati has the highest population of all the islands benchmarked (103,500), although this population is split over 32 atolls and a single raised coral island. This has created a unique challenge for the government in its provision of telecoms services and has led to a range of technologies being employed across different islands. These range from 4G and 3G on South Tarawa and Betio to slower 2G provision on its other, more remote islands. Satellite technology is used to connect Kiribati to the outside world, as well as keeping the islands connected to one another over the 3.5 million km^2 area that they cover.

Niue has a lower population (1,611) than the Falkland Islands, but a higher population density (5.35/km^2). Its sole, government-owned mobile operator offers 2G services across the island, and the international capacity is via satellite.

Tuvalu has both a higher population and a higher population density than the Falkland Islands. Like Niue it has a single, government-owned mobile operator, 2G reception across much of the island, and an international connection that's provided over a satellite.

7.2 Regulatory Framework

Independent Regulators

There is significant variation between countries with regards to how their telecoms markets are regulated. Out of the thirteen islands analysed, only four have independent regulators, and two of these are regulators for the governing country (the Norwegian Post and Telecommunications Authority and the Australian Communications and Media Authority). The other two small island regulators are the Montserrat Information Communication Authority and the Communications Commission of Kiribati.

Competition

With the exception of Svalbard and Nauru all of the islands have a single monopoly operator providing both fixed and mobile services. Svalbard has three operators, Telenor which provides fixed and mobile services, and Tele2 and Netcom which provide mobile services. All three are Norwegian mainland providers. Nauru has two providers: a fixed and a mobile operator.

Government Ownership

The Governments own the telecom operators (totally or partially) in six out of the thirteen island markets analysed, pointing at the challenges of private companies operating in small isolated markets. Examples include Niue, Cook Islands and Kiribati.

USO

The degree of legislation around Universal Service Obligation varies significantly amongst the benchmarked countries. Two territories, Christmas Islands and Svalbard, are covered by the USO of their ruling country (Telstra in Australia and Telenor in Norway). This obligates the operators to provide access to fixed telephony services for the population, although Telstra's obligation is nullified in cases when the cost of this provision is deemed "unreasonable". Other countries, such as Palau, Kiribati and Montserrat, also have USOs placed upon the respective operators to provide access to telephony services.

In the Falkland Islands, FIG and the operator (C&W at the time) agreed, when rolling out the Camp network in 2008, that all residents would have access to fixed voice services. As voice and broadband are delivered via the same technology in Camp (WIMAX), all residents have access to broadband services. This has been successfully achieved, even though it is technically challenging due to the dispersed population in Camp.

At the other side of the spectrum, a number of islands have references to a universal service obligation, but in very generic terms. Telecom Cook Islands, for instance, commits to "maintaining certain levels of service and must invest a minimum amount of money in upgrading/maintaining service to the Outer Islands each year". Another example is Nauru, where the Telecoms Act mentions that one of the objectives is "to provide for the establishment, maintenance, operation and regulation of telecommunications services in, to and from Nauru". The Telecom Ordinances in St Helena and Ascension have generic provisions in the licence for imposing service obligations, which would be agreed with the operator.

Pricing Control

Price controls are implemented in a variety of ways across different markets. Montserrat and Nauru have a stipulation that services must be provided at a cost that is "just and reasonable" or "affordable". In the case of Niue and Norfolk Island, due to the ownership structure of the operator, the government directly controls prices. St. Helena, Cook Islands and the Falkland Islands have established a retail price cap mechanism, while Palau, Kiribati, Svalbard, and Ascension Island have no price control mechanisms in place.

Figure 32: Regulation across Benchmarked Markets

Island	Independent Regulator	Number of Providers	Universal Service Obligation	Price Control
Falkland Islands	No	1 – Privately Owned	Yes – Voice	Retail Price Cap
Ascension	No	1 – Privately Owned	No – but provision in the licence	None
Christmas Island	Yes – Australian Communications and Media Authority	1 – Privately Owned	Yes – Fixed (USO Australia)	Retail price cap (Fixed Line)
Cook Islands	No	1 – 40% Government Owned	No – just generic reference	Retail Price Cap
Kiribati	Yes – Communications Commission of Kiribati	1 – Government in process of selling	Yes	None
Montserrat	Yes – Montserrat Information Communications Authority	1 – Privately Owned	Yes	Obliged to provide at "just and reasonable" cost
Nauru	No	2 – Fixed Operator Government Owned	No – just generic reference	Obliged to provide at "affordable cost"
Niue	No	1 – Government Owned	No – just generic reference	Government controls charges
Norfolk	No	1 – Government Owned	No Data	Government controls charges
Palau	No	1 – Privately Owned	Yes	None
St Helena	No	1 – Privately Owned	No – Governor in agreement with licence may impose obligations	Retail Price Cap
Svalbard	Yes – Norwegian Post and Telecommunications Authority	3 – Privately Owned	Yes – Fixed (USO Norway)	None
Tuvalu	No	1 – Government Owned	No – just generic reference	No Data

Source: Cartesian, ITU, Ascension Island Government, University of French Polynesia, Buddecomm

7.3 Telecom Services and Prices

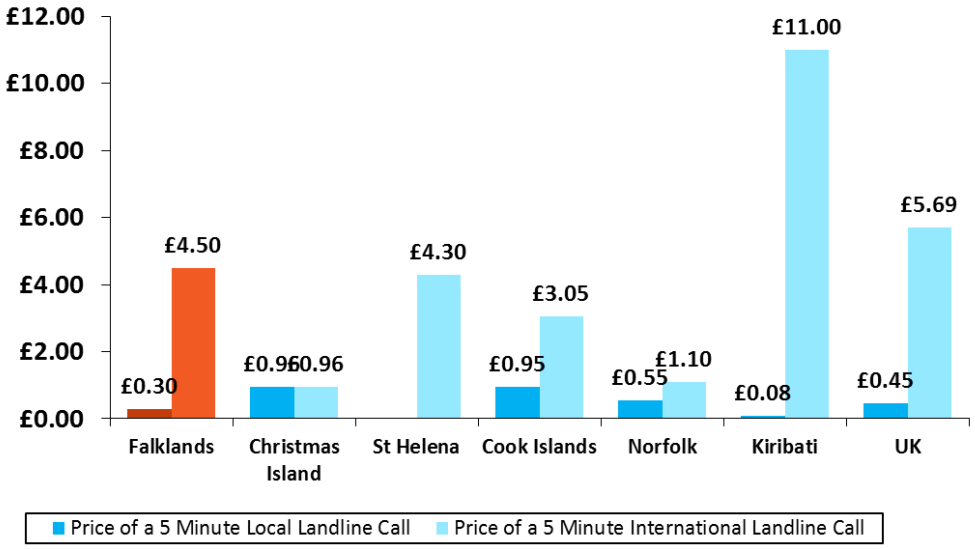
The prices of fixed phone, fixed broadband and mobile services in the Falkland Islands have been benchmarked against operators in the markets defined above. The benchmarks provide comparison of how telecom service prices in the Falkland Islands compare to other territories. However, there are some caveats to the analysis:

- It does not take into account the Purchasing Power Parity (PPP) of the different countries
- All the prices include the VAT of the respective countries

7.3.1 Fixed Telephony

In order to compare the calls charges from a fixed line, the price of a 5-minute call has been benchmarked. This is to allow for any call set-up fees that might apply on a per-call rather than per-minute basis. The destination of an international call varies between countries: for the Falkland Islands and St Helena the destination is the UK, for the Pacific Islands is Australia, and for the UK the destination is the Falkland Islands.

Figure 33: Fixed Outbound Call Charges of a 5-Minute Call



UK – standard BT International pricing
Source: Cartesian, Company Websites

The price of a 5-minute domestic call from a landline in the Falkland Islands is £0.30, lower than in most benchmarked countries. The price of a 5-minute international call varies considerably between markets with the lowest being the price of a call from Christmas Island at £0.96 and the highest being Kiribati at £11. The charges in the Falkland Islands are in the middle of this range, and in the same region as St Helena or the Cook Islands. We have included the prices for the UK to demonstrate that fixed outbound call pricing in the Falkland Islands is quite competitive, e.g. both domestic and international rates are lower than in the UK.

Line rental charges were also compared. These range from £4.40 a month in Kiribati to £13 in Christmas Islands. In comparison, line rental in the Falkland Islands is again in the middle of the range, with £8 a month for a residential line (£20 for businesses)

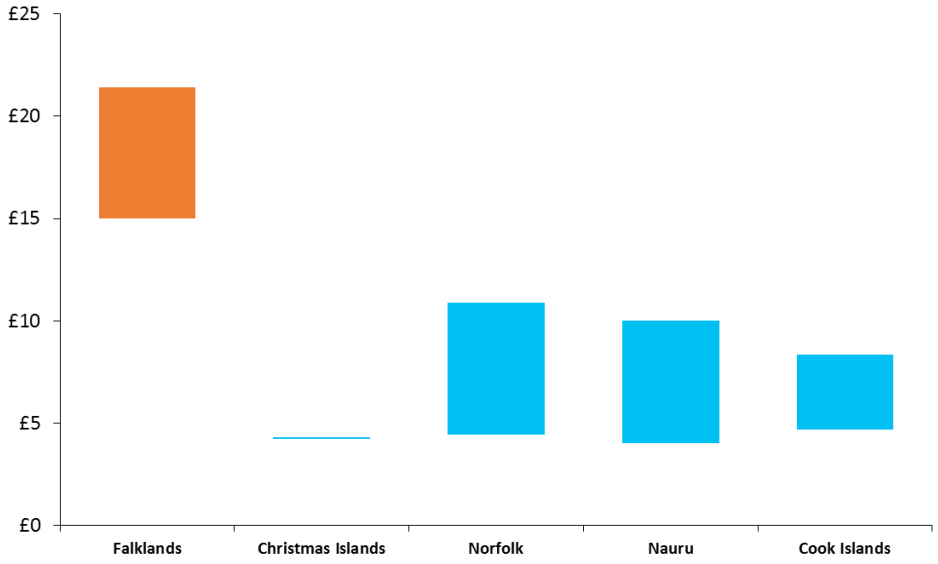
7.3.2 Fixed Broadband

Fixed broadband bundles usually come with data caps in islands served solely by satellite. For the territories with a data cap in place, the price per GB was calculated across every broadband package offered. Packages with a higher data cap lead to lower charges per GB. The charges per GB are significantly higher in the Falkland Islands than in any other market benchmarked. Prices per GB range from £15 to £22 in the Falkland Islands. The next highest prices per GB are £11 and £10 for the cheapest packages on Norfolk Island and Nauru.

Note that price per MB in the Falkland Islands corresponds to data used in the period 6am-midnight. Sure offers a night-time window proposition, whereby users can download unlimited data at no additional cost from midnight to 6am. If traffic in this window was taken into account in the calculations, the effective price per MB would decrease. However, we believe that the effective price would still be higher than in the other markets when considering the current levels of traffic during the night-time window (36% of the total).

The only country we are aware that has a night-time window offering is Christmas Island[22]. Norfolk Island' proposition is slightly different: fixed broadband data caps are split into peak and off-peak usage. Their ADSL 230 plan, for example, includes 28GB of peak usage and 28GB of off-peak usage.

Figure 34: Price Range per GB of Fixed-Line Data



Source: Cartesian, Company Websites

With regards to overage, operators take different approaches. For example, in Christmas Islands the bandwidth is throttled once the data cap is reached, whereas others apply overage charges. The administration of overage charges also varies between markets, with overage charges on Norfolk Island depending on whether use is peak or off-peak, as opposed to the Falkland Islands or Cook Islands where charges vary based upon the data bundle purchased. The figure below (Figure 35:) shows a benchmark of the overage charges.

Figure 35: Maximum Monthly Data Allowances and Overage Charges in Selected Markets

	Falkland Islands	Christmas Islands	Cook Islands	Norfolk Island
Min data allowance	700 MB	8,192 MB	1,536 MB	200 MB
Max data allowance	31,250 MB	8,192 MB	76,800 MB	28,672 MB*
Min overage charges (£/MB)	£0.05	£0.01	£0.01	£0.003
Max overage charges (£/MB)	£0.10	£0.01	£0.03	£0.05

Source: Cartesian, Company Websites

* Norfolk Islands allowance includes peak allowance only; additional 28GB (=28,672 MB) can be used off-peak

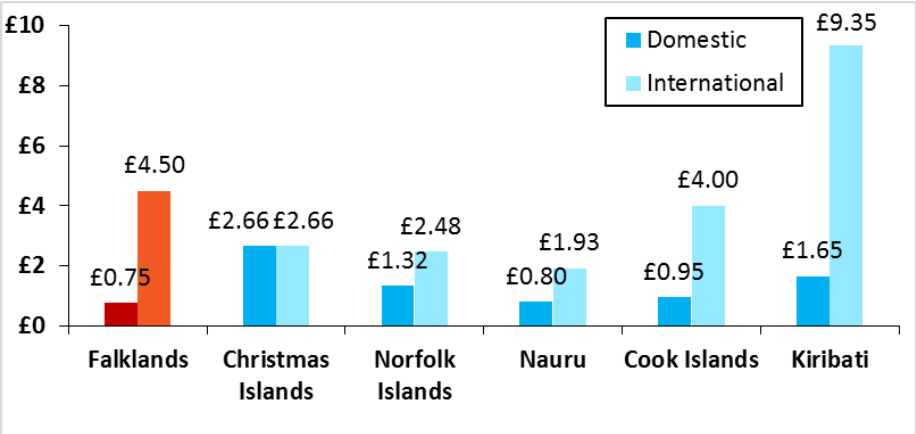
[22] Christmas Island Internet Administration Limited (CIIA) is a not-for-profit organisation providing basic broadband services in Christmas Islands. CIIA purchased the assets from the original private ISP provider, which determined it was not economically viable to justify operating in Christmas Islands:http://www.aph.gov.au/parliamentary_business/committees/house_of_representatives_committees?url=ncet/economicenvironment/subs/sub08.pdf

7.3.3 *Mobile Services*

Pre-paid Mobile Services

Mobile services have been benchmarked using the same methodology as fixed services (using the price of a 5 minute call domestically and internationally to select destinations).

Figure 36: Mobile Outbound Call Charges of a 5-Minute call



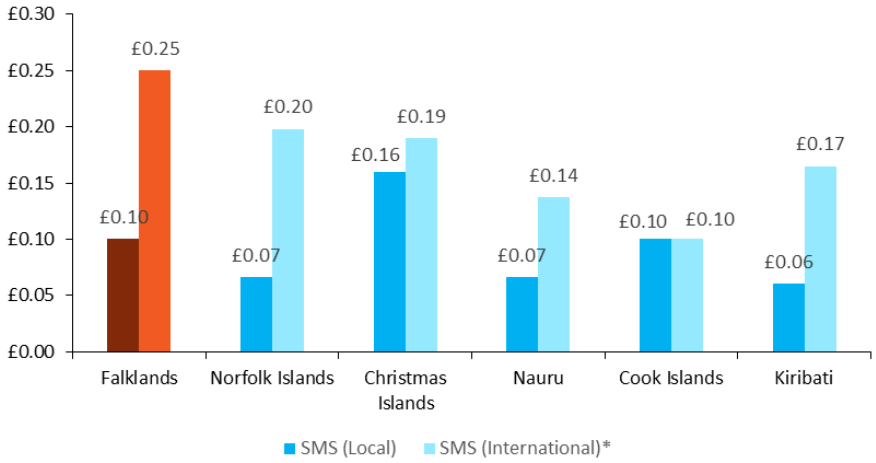
Source: Cartesian, Company Websites
* Destination is UK for the Falkland Islands, and AUS for the Islands in the Indian/Pacific oceans
**Christmas Islands have price cap applicable to 5 minute calls, making international and domestic calls equally-priced.

The charges of a 5-minute local call is lowest in the Falkland Islands, at £0.75 compared to an average of £1.48 across the other countries benchmarked.

International calls in the Falkland Islands are averagely priced in comparison to the benchmarked countries at £4.50. Charges range from between £1.93 in Nauru to £9.35 in Kiribati. It should be noted that the reason international and domestic calls are the same price on Christmas Island is that Telstra has a price cap on domestic calls that is reached after the 5-minute mark which does not apply to international calls. As a result, the longer the call, the greater the difference in price between international and domestic calling rates.

A similar process was used to benchmark the prices of pre-paid SMS messages, both domestic and international.

Figure 37: Price of a Pre-paid SMS



Source: Cartesian, Company Websites

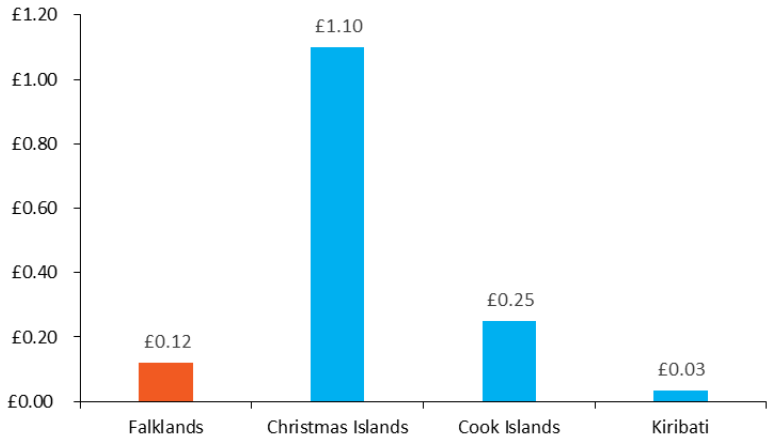
* Destination is UK for the Falkland Islands, and AUS for the Islands in the Indian/Pacific oceans

The price of a pre-paid domestic SMS in the Falkland Islands is £0.10, compared to an average across the benchmarks of £0.09. Prices elsewhere range from £0.06 in Kiribati to £0.16 on Christmas Island.

The Falkland Islands compare less favourably in terms of the cost of international text messages. The standard price of an international SMS in the Falkland Islands is £0.25. This compares to an average of £0.17 across all territories, a minimum of £0.10 in the Cook Islands and a maximum price of £0.25 in the Falkland Islands.

We also compared the pre-paid mobile data charges, measured on a per MB basis. Less data was available for this metric and so fewer countries have been compared.

Figure 38: Price of Pre-paid Mobile Data



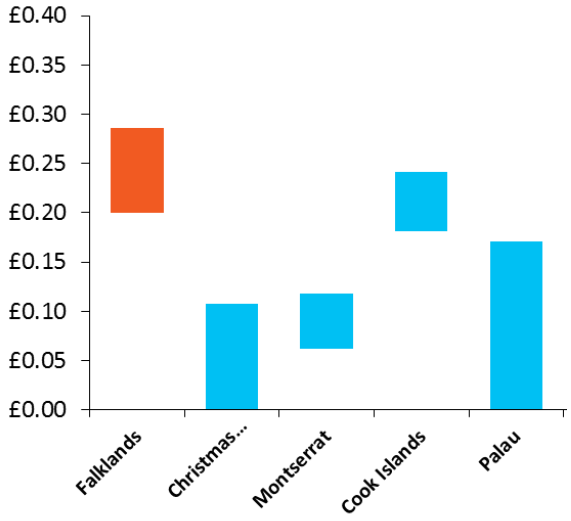
Source: Cartesian, Company Websites

The Falkland Islands rate (£0.12 per MB) is lower than both Christmas Islands (£1.10 per MB) and the Cook Islands (£0.25 per MB), but higher than Kiribati.

Post-paid

Post-paid bundles have also been assessed. The charge per minute for voice calls varies with the bundles. As a result, a range of bundles were selected to establish the lowest and highest price per minute. Bundles also include an allowance of SMS messages and mobile data, which have also been separately evaluated.

Figure 39: Range of Price per Minute within Bundles

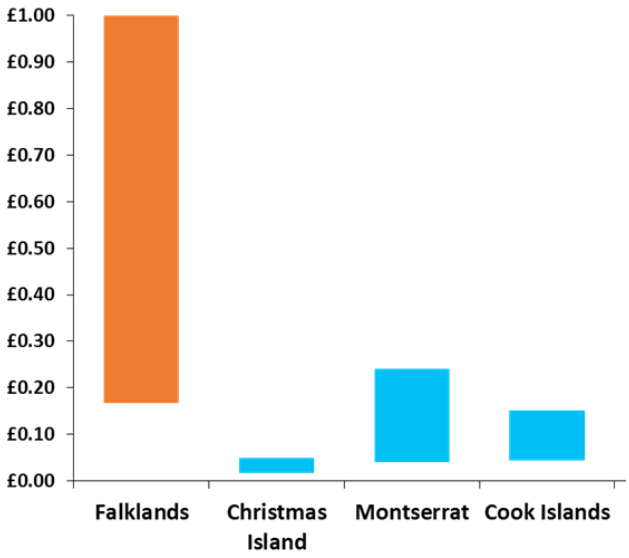


Source: Cartesian, Company Websites

The price per minute within bundles in the Falkland Islands is more expensive than in most other islands, ranging from £0.20 to £0.29. Some territories offer unlimited bundles of minutes, bringing the effective cost per minute close to zero (hence the range starts at £0.00) within these bundles. Rates in the Cook Islands are very similar to those in the Falkland Islands.

The price per MB of data within bundles is shown below in the same format.

Figure 40: Range of Price per MB within Mobile Bundles



Source: Cartesian, Company Websites

Mobile data rates in the Falkland Islands vary significantly depending on the bundle: Premium 60 offers data at an equivalent rate of £0.16/MB, whereas the rate increases to £1/MB for the entry-level Premium 25 bundle. The lowest rate of £0.16/MB is comparable to those in Montserrat and the Cook Islands, while Christmas Islands offers the lowest rates.

7.3.4 Summary of International Benchmarks

Fixed telephony prices in the Falkland Islands are quite reasonable when compared to other markets: near-average line rental price, mid-range international call charges and low domestic call charges.

Mobile service benchmarks vary depending on the service. For example, pre-paid domestic calls and pre-paid data are relatively low compared to SMS prices and post-paid data, which are higher than in the other benchmarked countries.

Fixed broadband data charges in the Falkland Islands are consistently higher in comparison to other territories, although when taking the free night-time usage window into account, this lowers the effective charge per MB and the price differential with the other benchmarked countries.

7.4 International Capacity Benchmark

7.4.1 Introduction

The Falkland Islands' international connectivity is, like many other small remote islands, provided over a satellite link.

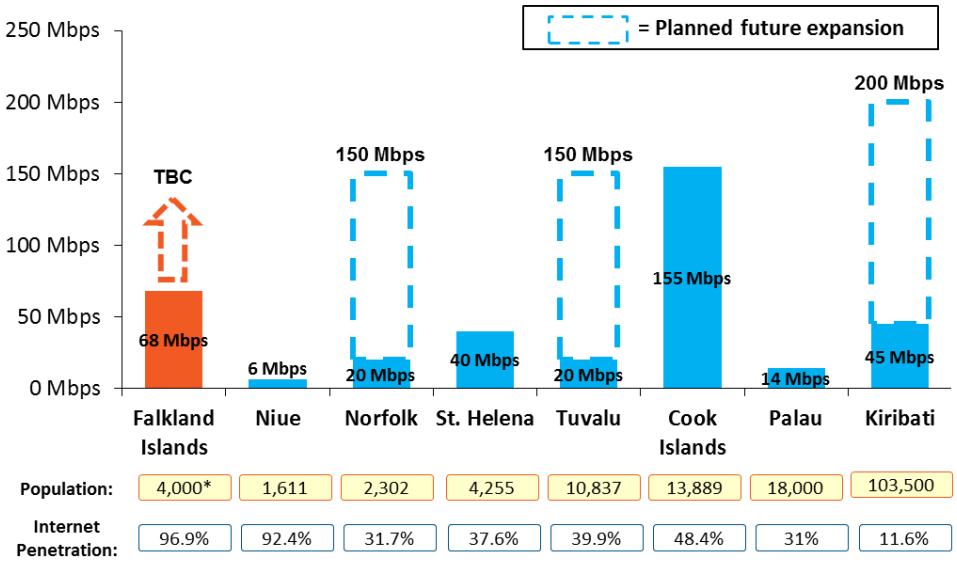
The purpose of this section is to compare the international capacity available in the Falkland Islands with that of similar territories, in terms of geography or population. Data was gathered from a range of online sources, and was supplemented by interviews conducted with satellite providers.

7.4.2 Benchmark of International Capacity

The chart below shows the international capacity of various benchmarked territories. It is important to note that the benchmarked territories have very diverse levels of internet penetration: ~97% in the Falkland Islands, compared to ~40% in Tuvalu and ~12% in Kiribati[23]. It is important to consider population alongside internet penetration to provide a more accurate reflection of international capacity for each island territory.

[23] International Telecommunication Union, World Telecommunication/ICT Development Report and database, and World Bank estimates.

Figure 41: International Capacity of Island Territories[24]



*Including 1,000 personnel in the MPA military base
Source: Cartesian, Company Websites, IWS

The Falkland Islands has seen its international capacity increase over the past 5 years from 6 Mbps in January 2009 to 68 Mbps in December 2014. The bandwidth is provided over a satellite connection with the earth station in Stanley and provides international connectivity for the Falkland Islands' population of 2,932, with an additional 1,000-2,000 at the MPA military base. Sure has stated that if the licence is extended, they will commit to upgrading the levels of international capacity. However, the plans are not concrete at this stage and will be determined by the outcome of the licence discussions and technical review of the satellite providers (e.g. O3B).

Niue, with a population of just 1,600, is the least populated island on the benchmark list, which is reflected in low international bandwidth of 6 Mbps. It should be noted, however, that the most recent data available for Niue is from 2010, when the international bandwidth increased six-fold from 1 Mbps. It is likely that there have been further investment and speed increases.

Norfolk Island has a population of 2,300 and a bandwidth capacity of 20 Mbps. In 2010, the incumbent operator entered into an agreement with O3b to use their medium Earth orbit satellites. Following this agreement, Norfolk Island will see bandwidth increased from 20 to 50 Mbps shortly.

St. Helena saw its bandwidth double from 20 Mbps to 40 Mbps in January of 2014. With a population of 4,250, and an internet penetration at ~33%, the capacity per online user is higher than in the Falkland Islands. As a new South Atlantic Express Cable is proposed to run from Brazil to South Africa and Namibia, there is a campaign to have a separate branch terminating in St Helena, thus significantly increasing the available bandwidth.

Tuvalu has a 20 Mbps connection which serves the island's 10,840 residents. In June 2014 Kacific announced a five-year agreement with the Tuvalu Telecommunications Corporation (TTC) to provide satellite services to the island. Kacific will initially provide TTC with 80Mbps of bandwidth capacity, which will gradually be increased to 150Mbps within four years. This new satellite is

[24] Svalbard and Turks and Caicos are served by fibre cable

expected to launch in late 2016 or early 2017, and will be the first geo-stationary high-throughput Ka-Band satellite serving the Pacific. Once the satellite is commissioned, all Tuvaluans will be able to receive broadband access via a small dish antenna (VSAT).

The Cook Islands is also served by O3b, and have had an international bandwidth capacity of 155 Mbps since March 2014 (when the MEO satellite went live) serving a 13,900 population. However, since the Cook Islands are a collection of islands, the service has not yet been extended across the whole island footprint. Although the new O3b satellite has significantly reduced the islands' cost-per-MB as well as increased speeds, the current plan is to split traffic equally between MEO and GEO satellites to maximise the benefits of both.

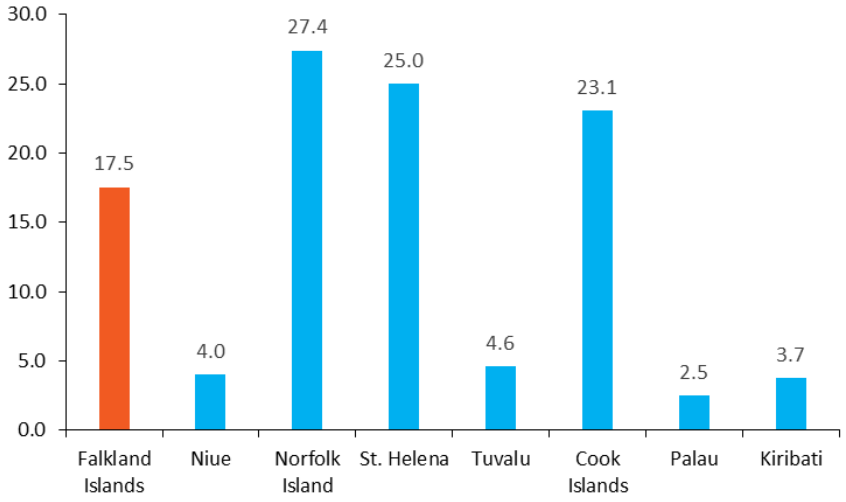
Palau's population of 18,000 with an internet penetration of ~31% is served by a total international bandwidth of 14 Mbps (as of 2008). No more recent data is publicly available. In January of 2014, Palau Telecoms signed a Letter of Intent with Xtera Communications to supply a submarine cable system to connect Palau to Guam which is planned for completion by mid-2015. The completion of such a cable would significantly increase the international bandwidth available to Palau, since Guam is a hub of several submarine cables across the Pacific.

Kiribati and its islands have a total international bandwidth of 45 Mbps, served over a satellite connection through Bairiki Gateway earth station. Although Kiribati is the most populous territory benchmarked with a total population of 103,500, it also has the lowest internet penetration, at ~11%. In October 2014, the government of Kiribati signed a 5-year agreement with Kacific which will increase the country's international capacity to 200 Mbps over the course of the contract. The satellite is scheduled to be launched in early 2017 and is the same satellite which Tuvalu have contracted.

Svalbard is served by submarine cables, therefore the international capacity level, at 5 Tbps, cannot be compared with that of countries served by satellite. For this reason we have not included it in the charts.

Figure 41: showed the total international capacity available (and planned) in each of the territories. An alternative way to represent the international capacity is by calculating the equivalent capacity available per internet user in the territory. To calculate this, we divide the total capacity by the estimated number of internet users in the territory (total population x internet penetration). This calculation is not exact, as internet users might not necessarily be subscribers, e.g. a person could use internet at work but not have internet at home. However, it provides an approximate idea of relative capacity in each territory, as seen in the figure below (Figure 42:).

Figure 42: Current International Capacity per Internet user (in Kbps)



International capacity in the Falkland Islands, at 17.5 kbps per internet user, is above the average of the benchmarked countries (13.5 kbps). Norfolk Island, St Helena and Cook Island show higher levels of relative capacity than the Falkland Islands (23 to 27 kbps), whereas Tuvalu, Niue, Kiribati and Palau are at the bottom of the list of benchmarked countries, with levels between 2.5 and 4.6 kbps per internet user.

7.4.3 Conclusion

Sure has significantly upgraded the international capacity to the Falkland Islands over the last 5 years, from 6 Mbps in 2009 to the current 68 Mbps (downlink). As seen in the international capacity section, the link is currently not fully utilised during the day, reaching peaks of 60-70% capacity. This is due to the fact that the broadband usage is closely monitored and rationed by the users during the day, in order to avoid or minimise overage charges. Conversely, during the night-time window the link reaches 100% capacity.

The current level of international capacity in the Falkland Islands is comparable to the other countries relying on satellite, when taking into account the bandwidth available per internet user. However, a number territories with low levels of international capacity have already secured contracts with alternative satellite providers such as O3b or Kacific (note that the latter is only available in the Pacific Ocean, not in South Atlantic) to aggressively increase the international capacity in the next few years.

Sure is currently evaluating satellite alternatives in order to significantly increase international capacity, and this should be discussed with FIG as part of the licence negotiations.

7.5 Section redacted for public report

✂ ---------- ✂

8. Telecoms Technical Assessment

8.1 Introduction

A core component of the project was understanding the current telecommunications infrastructure in place in the Falkland Islands. Cartesian conducted a wide range of interviews with various individuals at Sure, as well as leveraging existing telecoms knowledge within the firm.

Additionally whilst in the Falkland Islands, Sure organised a site visit to various parts of the telecoms infrastructure in order to better understand their operation. Data and diagrams provided by Sure have been used to further enhance the assessment.

The level of technical detail provided in this section has been adjusted to an audience which we assumed is not very familiar with telecommunication networks.

8.2 Mobile Network

8.2.1 Mobile Network Infrastructure

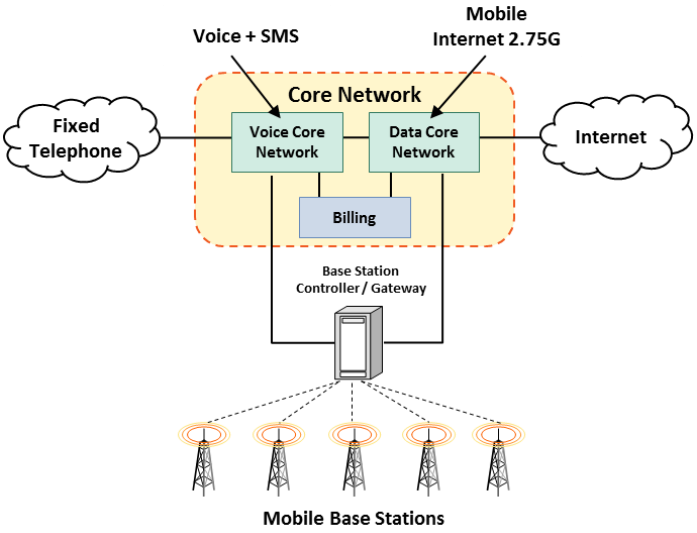
The Falkland Islands' first mobile network was installed in 2005. At that time the network was 2G GSM with 6 sites to cover Stanley and MPA, which could only be used for voice calls and SMS, not for mobile data. In 2010 a new core infrastructure was installed and 6 additional base stations were added to extend coverage. The equipment for these upgrades was supplied by Altobridge Networks.

2012 saw the completion of a further mobile project during which GPRS/EDGE data services (aka 2.75G) were added to the network. This mobile data service supports limited download speeds, of up to 135 kbps.

Figure 43: below shows a simplified diagram of the Mobile Network architecture, which consists of the following parts:

- The access network which is currently made up of 12 mobile base stations, and the equipment controlling/ routing the calls and data from the base stations to the core network.
- The Mobile Core Network, which is divided into Voice and SMS components, and the Mobile Data core network. This part of the network is in charge of call and mobile data control, route control, billing, authentication, and subscriber management, amongst other functions.
- Interfaces to outer networks, where the core network connects to the Internet for mobile data, and to the fixed telephony network via a Softswitch, which would be the modern equivalent of a telephone exchange.

Figure 43: Sure's High Level Mobile Network Diagram



Source: Cartesian

A key problem with the network architecture is that Altobridge went into administration in 2014 and the equipment tailored for the current network will no longer be available. Sure uses Altobridge's core network equipment (R4S) and an access system aimed at remote locations, which consists of IP-based Mobile base stations (Altopod) and a Gateway (Altobridge Gateway) connecting back to core network.

8.2.2 Mobile Coverage

Currently the mobile coverage is concentrated around the north-east of the Falkland Islands, with Stanley, MPA and the largest settlements such as Goose Green in the coverage area.

In the West Falkland Island, coverage is limited to Fox Bay and Port Howard.

According to Sure, mobile service currently serves over 95% of the population and approximately 40% of the total land area. Sure states that 62% of Camp residents have some mobile coverage.

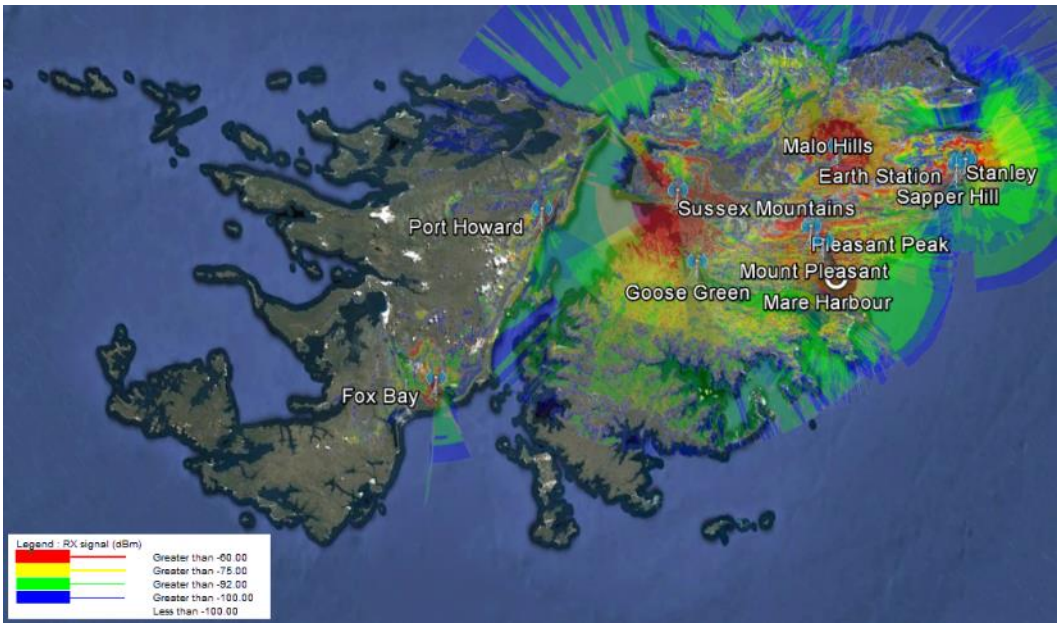
The map of the Falkland Islands in the figure below (Figure 44:) shows the approximate areas with mobile signal.

Figure 44: Sure GSM Approximate Coverage Map (as of Jan-2014)

Source: Sure

However, it should be noted that this map does not account for the mountainous terrain of the Falkland Islands, which negatively impacts mobile coverage. Hills and mountains can block the signal from a mobile antenna or otherwise reduce its strength. As such, certain areas within the yellow circles in Figure 44: may have reduced coverage, or may have little or no coverage at all. Figure 45: shows the predicted coverage of the mobile network, with different levels of mobile signal strengths represented by the spectrum of colours, after taking into account the terrain conditions.

Figure 45: Sure's Mobile Network Predicted Coverage Map



Source: Sure

8.3 Fixed Network

8.3.1 Wired Access Network

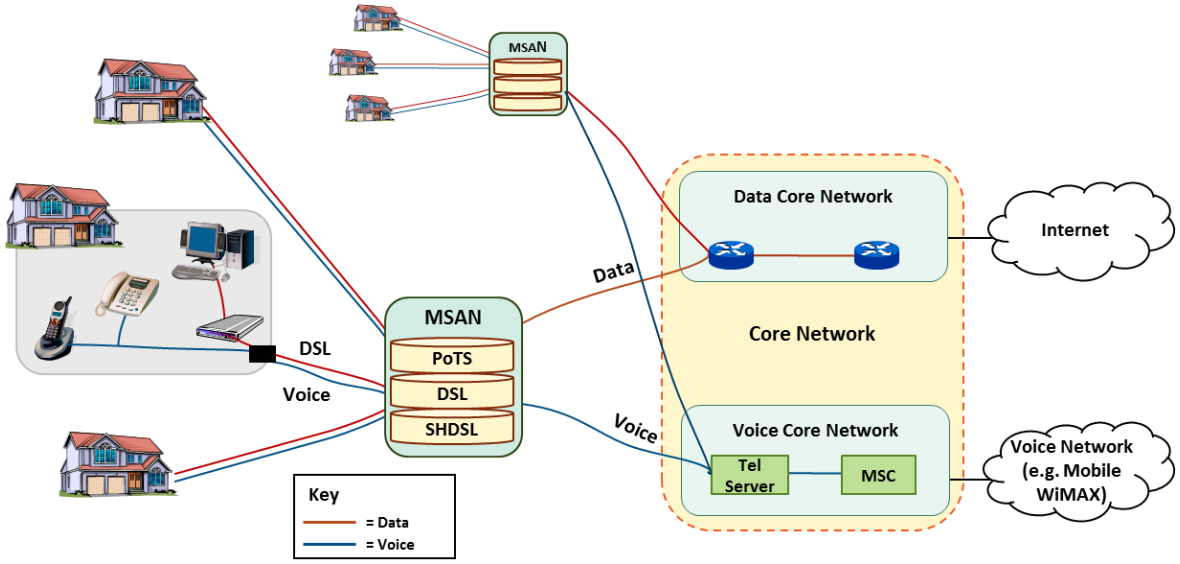
8.3.1.1 Description

There are two methods to deliver voice and data services in the Falkland Islands using wired access: fibre optic and copper.

Sure has built a fibre optic ring around Stanley to deliver this technology to its largest customers (e.g. FIG, an oil company). The fibre cable coming from the customer premise is connected to the fibre ring at the various cabinets spread around Stanley.

Copper cables are used to provide residential users and the majority of businesses with fixed voice and data services. The copper pairs from a number of premises are connected to one of the twenty Multi Service Access Nodes which Sure has installed across the Falkland Islands. The MSANs integrate multiple network functions into a single platform, and route the voice and data traffic into the voice and data core networks, respectively. These Access Nodes support the two DSL technologies currently available to the customers: ADSL, aimed at consumers and business with low upload speed requirements, and SHDSL, aimed at businesses which require symmetrical upload/download speeds. The figure below (Figure 46:) shows a high level diagram of the copper access network.

Figure 46: High Level Copper Access Network Diagram



Source: Cartesian

Even though current ADSL service access speeds are limited at 2 Mbps (and lower for the entry-level residential packages), the broadband network infrastructure supports ADSL 2+ technology, with speeds up to 22 Mbps.

8.3.1.2 Coverage

Sure's fixed wireline network is available throughout Stanley and MPA, with approximately 1,300 subscribers in these areas.

Additionally, there is a significant level of wireline network infrastructure deployed in Camp and in some Outer Islands, with 12 MSANs delivering voice and broadband services in the following locations: Fox Bay, Fitzroy Ridge, Fitzroy, Goose Green, Hill Cove, Mount Kent, Mount Alice, Byron Heights, North Arm, Port Howard, Pebble Island and Sea Lion Island.

The total number of Camp subscribers with MSAN connectivity is 171, which compares to 172 WiMAX Camp subscribers.

8.3.2 Wireless Access Network

8.3.2.1 Description

In 2008-09, the Rural Radio Network upgrade program saw the introduction of broadband services to remote areas of Camp using WiMAX, a fixed wireless technology.

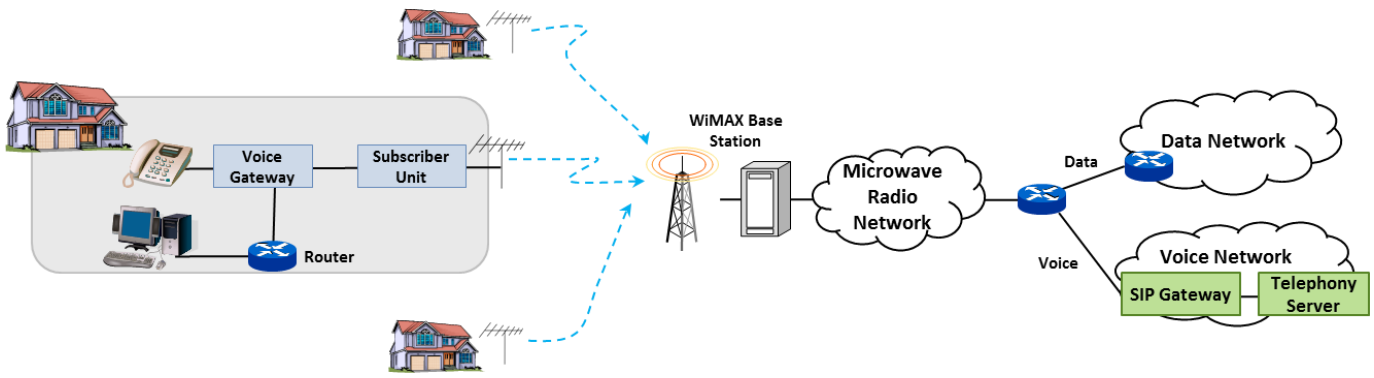
At a very high level, the WiMAX access network can be divided into the following components:

- Customer Premise Equipment: refers to the set of devices installed at the subscriber location. It includes a WiMAX antenna, which is connected to an indoor Subscriber Unit device. Additionally, a router is required for the broadband service, and a Voice Gateway to provide the fixed telephony service.
- WiMAX Base stations: receives the data from the subscribers in the coverage area. There are 14 WiMAX base stations in the Falkland Islands.
- Microwave Radio network: the WiMAX base stations are connected to the microwave backhaul radio network, which transports the signal back to the core network.
- Core Network: the voice and data traffic are separated at the core network, which is in charge of managing, routing and charging for that traffic (to the Internet in the case of data, or to another subscriber in the case of a local call).

Figure 47: shows a high level representation of the WiMAX network.

With regards to the access speeds provided by WiMAX, they are in line with the ADSL speeds: from 512 kbps up to 2Mbps (download).

Figure 47: High Level WiMAX Access Network Diagram



Source: Cartesian

One of the key setbacks of this WiMAX deployment comes from the fact that the equipment manufacturer, Alvarion, sold its WiMAX Business to Telrad before filing for bankruptcy later on in 2013. The product Alvarion's BreezeMax Macro/Micro has a 'Last time to buy' in December 2014, meaning that maintenance (using stocked parts) and vendor support will be possible for another few years. However, upgrades of existing base stations will not be possible with equipment swaps being required instead.

The pictures below show the external WiMAX antenna located at the subscriber premise, and the cabinet containing the Voice Gateway and the power supply unit, which is located next to the WiMAX antenna.

Figure 48: WiMAX Customer Premise Equipment

Source: Cartesian

8.3.2.2 Coverage

The frequencies used for the transmission of the WiMAX signal are relatively high, using 2.5 GHz or 3.5 GHz in the Falkland Islands, depending on the technology used to synchronise the transmission of data amongst the different subscribers. The higher the frequencies used, the worse the signal propagation as line-of-sight is required, and the higher the penetration loss in walls, resulting in lower indoor coverage. Additionally, the sparseness of the population in Camp means that the subscribers can be very far from the nearest base station. These are the reasons why most WiMAX antennas in the Falkland Islands need to be installed outside of the house. Sometimes, the antenna will even have to be installed away from the house and at height, in order to have better reception from the nearest WiMAX base station.

Sure have deployed a total of 14 WiMAX base stations across the Falkland Islands, 6 in East Falkland and 8 in West Falkland, providing coverage to every resident which does not have access to MSAN-based wired access technology. The total number of WiMAX subscribers is 172, with 109 located in East Falkland and 63 in West Falkland.

Given the sparseness of the Camp population, the number of subscribers on each base station is very low, which means that these stations are significantly underutilised: 9 of the 14 stations have 10 subscribers or less, and the most utilised base station is Malo Hills with only 28 subscribers.

The coverage area for each base station has been configured in order to ensure the subscribers have sufficient signal. There are 4 stations with extremely long WiMAX links of up to 65 km. Figure below (redacted) shows a map with the location of the WiMAX base stations and of the WiMAX subscribers.

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8.3.3 *Telephony Core Network*

The voice traffic generated from the WiMAX, Copper+MSAN and Mobile networks, as well as traffic from call centres deployed by businesses, is routed back to the Voice Core Network.

The two main elements of the Voice Core Network are:

- MSC: as described in the mobile section, it routes the calls and SMS from the mobile access network to the Softswitch.
- Softswitch: provided by Ericsson, separates call control from connectivity and access, and supports legacy call-oriented traffic over an IP-based infrastructure. Call control is performed by the Telephony Servers (TeS) in the control layer. Switching and media interworking is handled by the Media Gateways (MGW) in the connectivity layer. The softswitch replaces the traditional telephone exchange.

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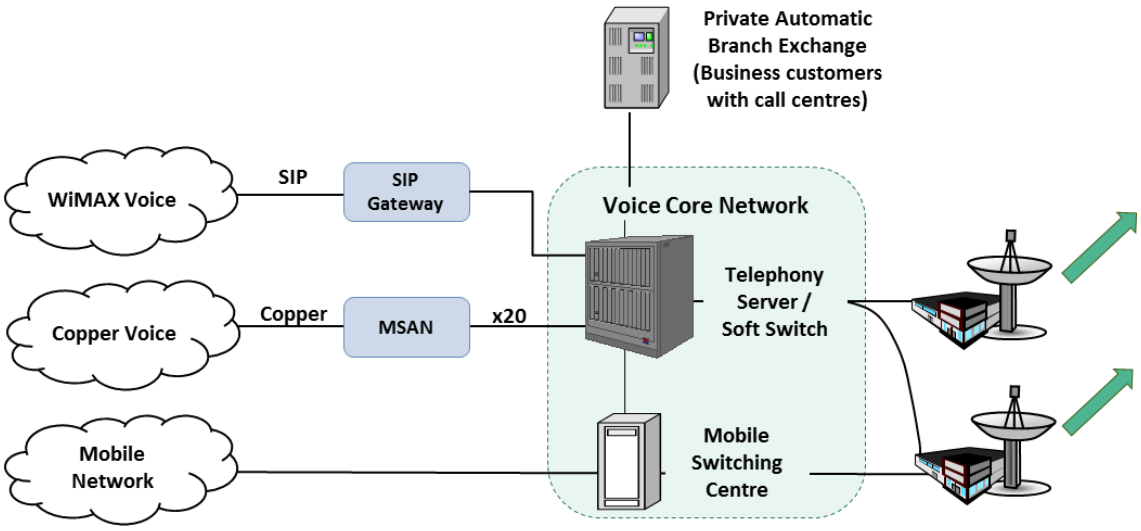
Figure 49: Telephony Core Network Diagram



Source: Cartesian

8.3.4 *Broadband Backbone*

The broadband backbone network deployed by Sure receives all data traffic, coming from the broadband access network (copper-MSAN, WiMAX), the Wi-Fi hotspot network, Sure's corporate network and other Private network services, and routes it out to Stanley's Earth station. The traffic

is sent via the satellite link to the Vodafone UK landing station, which provides Internet Services, routing the traffic to the correct IP address.

One of the central elements of this backbone is the Broadband Remote Access Server (BRAS), which effectively acts as the core router of the network, facilitating the convergence of multiple Internet traffic sources.

The broadband backbone diagram provided by Sure provides a cache router, which would temporarily store specific content locally, so that there is no need to route the traffic through the satellite link. However, Sure states that the levels of efficiency achieved with this solution are very low.

8.4 Wi-Fi Hotspots

8.4.1 Infrastructure and Coverage

Sure has been increasing the number of Wi-Fi hotspots available in the Falkland Islands. The figure at the time of writing is 88, with 24 located in Stanley, 55 in MPA and the other 9 across Camp.

The access speed available on the hotspots has been limited to 300 kbps, so that it is slower than the entry-level broadband package (512 kbps).

From an infrastructure point of view, the traffic from the hotspots is routed back via the backhaul network through to the broadband backbone, and similar to other data traffic, will be routed to the Vodafone Internet service over the satellite link.

8.5 Backhaul Network

8.5.1 Backhaul Radio Network

The backhaul radio network has gradually been expanded, and it now consists of two central rings with 16 sites, and 10 additional backhaul sites which hang off the central rings, and which serve the more remote settlements.

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Therefore, it is a reasonably high capacity backhaul network, and given the limited capacity demand coming from Camp, this infrastructure has room for growth.

The figure below (redacted) shows a diagram of the backhaul network.

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The backhaul sites may also host a WiMAX and/or Mobile base station, leveraging the existing infrastructure (tower, power equipment, road access to the site) and removing the need to build. Figure 50: below shows a picture of a site which is used for backhaul, mobile and WiMAX services.

Figure 50: Sure Site Used for Backhaul, WiMAX and Mobile Services

Source: Cartesian

8.5.2 Powering Backhaul Sites

Providing uninterrupted power to the backhaul sites is one of the key network infrastructure challenges that Sure faces. Many locations do not have national power grid, therefore Sure is responsible for the power generation of these sites. Additionally, the remoteness and inaccessibility of the sites, especially during winter time, makes it extremely challenging to reach if there are problems which require onsite intervention or maintenance.

The more remote sites are powered through either wind or solar renewable power sources with a generator to provide backup power generation during a calm or overcast period. ✂ ---------
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The Mt. Kent, Sapper Hill, Pleasant Peak and Goose Green antennas utilise public power and have back-up generators. They are housed in existing local built equipment cabins. All sites have a battery bank to provide storage and protection.

8.6 Section redacted for public report

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8.7 OSS/BSS

In this section, Cartesian provides a very high level overview of the main OSS/BSS systems deployed in the Falkland Islands: the Network Operations Centre, the Billing system and the Traffic management system.

8.7.1 Network Operations Centre (NOC)

Sure stated that the NOC recently underwent a major overhaul to upgrade it and to meet Health and Safety requirements. It is located in one room at Sure's central offices in Stanley, and it the only service in the Falkland Islands which is operated on a 24/7/365 basis. This is the reason why other companies from the Falkland Islands have requested Sure to provide them with 24x7 monitoring facilities (e.g. location of vessels).

The NOC monitors most elements of the network, including the status of the satellite link, the MSAN architecture, the Wi-Fi hotspots, Camp network and the Mobile Network. Additionally, it displays the images from the CCTV cameras deployed throughout the network to visually check any anomaly. The picture below (Figure 51:), provided by Sure, shows the NOC.

Figure 51: Sure's Network Operations Centre

Source: Sure

8.7.2 Billing

The billing system deployed by Sure supports pre-paid and post-paid mobile services, and the post-paid broadband service. Given the importance of broadband pricing and billing, in this section we will only focus on the post-paid broadband service billing capabilities.

The broadband users can access a portal which informs them of their data usage during the billing period (peak and off-peak), as well as showing a history of usage in previous months. Additionally, subscribers cap opt in to receive alerts via email and SMS when their usage reaches certain thresholds: it used to inform customers when reaching 80% and 100% of the allowance, and in 2014, Sure added notifications when reaching 125%, 150%, 175%, etc. Figure 52: shows a screenshot of Sure's broadband portal.

Figure 52: Detail of Sure's Broadband Portal of a Residential Silver Subscriber

Date	Peak Upload (MB)	Peak Download (MB)	Peak Combined (MB)	Off-Peak Combined (MB)
December 1st	3.20	68.73	71.93	0.00
December 2nd	2.48	23.60	26.09	20.43
December 3rd	3.06	30.05	33.11	0.77
December 4th	3.19	50.65	53.84	0.00
Total	**11.93**	**173.03**	**184.97**	**21.20**

Monthly Total 184.97 MB, Package Quota 2000 MB, Used 9.25% (Alerts)

Source: Sure

The billing system which feeds this information, however, does not have real-time capabilities. Sure stated that it can take up to 1h for the usage to be updated. This poses problems from a customer protection point of view: a user with access speeds of 2 Mbps downloading content (e.g. an OS update) will not be notified until 1 hour after having reached the allowance, by which point he/she could have downloaded ~ 900 MB, resulting in significant overage charges (e.g. over £70 for a Residential Gold customer).

Sure will need to provide guidance on the capability of the billing system to understand what pricing and billing features can be offered to mitigate bill shock (e.g. out-of-bundle add-ons or opt-outs, setting of an upper limit to overage charges, or application of a Fair Usage Policy). Further detail is provided in Part B.

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8.8 International Capacity and Internet Peering

8.8.1 Satellite Infrastructure

Falkland Island's mobile, fixed voice and broadband international traffic is routed via an Earth station located in Stanley, which is linked to two geo-stationary Intelsat satellites. The picture below (Figure 53:) shows the two satellite dishes at Stanley's earth station.

Figure 53: Sure's Satellite Earth Station in Stanley

Source: Cartesian

The smaller satellite dish, with a 4.8m diameter, was manufactured by Vertex and installed in 2008.

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The largest satellite dish which has a diameter of 11m, was manufactured by NEC and was installed in 1998. ✂ ---------- ✂

The available download bandwidth for the Falkland Islands is currently 68 Mbps, and 17 Mbps for the uplink.

The satellite links are a single point of failure, but in order to increase the resilience, there are two satellite modems at each side (Falkland Islands and the UK) to continue to provide service if one of them goes down.

Figure 54: Vodafone's Earth Station in the UK

Source: geograph.org.uk

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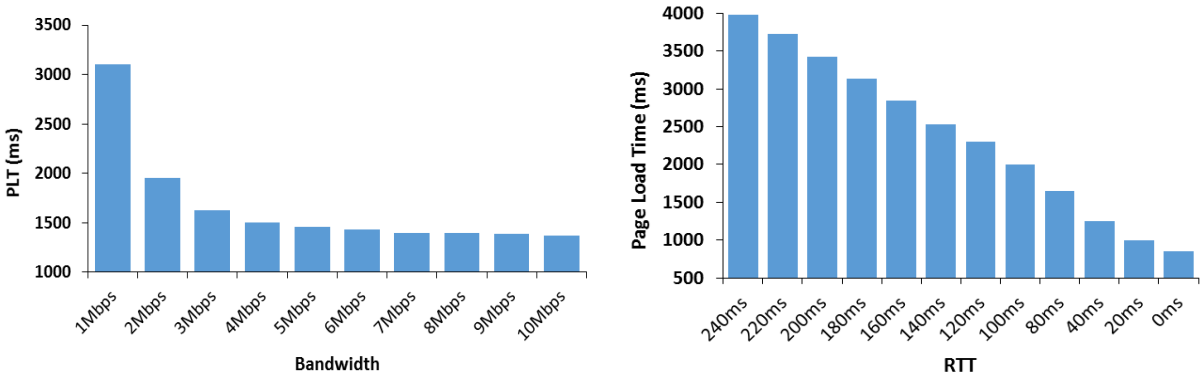
Both satellites are geostationary, which means that they orbit at an altitude of 36,000km, rotating at the same speed as the Earth. Therefore, from the Earth they always appear to be at a fixed position: the satellite antennas connect to the satellite from an anchored position. In part B of the report we analyse possible enhancements to the satellite connectivity, and we will explain in detail other satellite alternatives which are not geostationary.

The latency (or delay) introduced by geostationary satellites is considerably high, in the region of 560ms for a round trip. Latency is one of the main contributors for the time it takes a webpage to load: the relationship between the two parameters is nearly linear (see the right chart in Figure 55: below). On the other hand, the web page load time also depends on the bandwidth available, but only at low speeds (less than 4 Mbps). After 5 Mbps the gains from increasing the bandwidth are quite moderate (see the left chart below).

Figure 55: Effect of Bandwidth (left) and Latency (right) on a Web Page Load Time



Source: Mike Belshe

When analsying different satellite options in Part B, we will see that other satellite systems at the Medium Earth Orbit (8,000km) have a significantly lower latency, in the region of 150 ms.

With regards to the frequency used for the satellite communication, Sure uses the so-called C-band. This band enjoys very stable signal levels, even in harsh weather conditions.

8.8.2 Vodafone IP Backbone

The Falkland Islands IP network is connected to the UK network via Vodafone: the satellite signal arrives at the UK landing station, which is connected to a Service Aggregation router. Vodafone configures this router for peering and routing IP traffic to the rest of the world, via Vodafone's IP backbone.

This part of the network constitutes a Single Point of Failure, which is outside of Sure's control in the sense that it is Vodafone that configures the router: if there is any problem with the configuration, it can affect all international traffic to and from the Falkland Islands.

8.8.3 Service Availability

In this section we analyse the service outages that Sure have experienced and their cause, to see the impact of this single point of failure on the service availability.

Sure provided Cartesian with detailed information of all the service outages that have been experienced during the last 3 years, including the cause and length.

The table below shows the total duration of the outages for different categories:

- **Maintenance outages:** they are planned, so that the provider can upgrade, test, and replace a part of the network. Sure announces these outages to the subscribers.
- **Problems**: non-planned outages due to the failure of part of the network.
- **Sun outage**: distortion of geostationary satellite signals caused by interference from solar radiation. The effect is due to the sun's radiation overwhelming the satellite signal. It is known when they will affect the signal and it normally occurs for a few days in both spring and autumn.

Figure 56: Summary of Service Outages, in Minutes

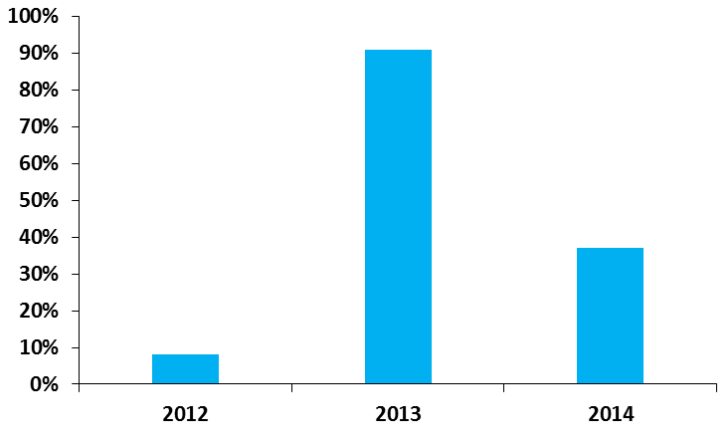
	2012	2013	2014
Sure problem	10	18	53
Vodafone problem	100	1329	303
Sure maintenance	1040	86	362
Vodafone maintenance	82	0	61
Sun outage	20	27	40
Total outage	1252	1460	819
Availability (%)	99.762	99.722	99.844

Source: Sure

Figure 56: summarises the services outages incurred in the international link. The overall availability has increased considerably in 2014, to 99.84% with the duration of the outages reducing by 40% compared to 2013. The average in 2014 (data up to December) was approximately 1h15min outage per month.

In 2013, problems at the Vodafone end accumulated 22h of outage, accounting for over 90% of the total. It seems to be an unusual spike, as in 2012 and 2014 the outages due to Vodafone problems were considerably lower, with 1.6h and 5h respectively. Figure 57: below shows the percentage of outage duration caused by Vodafone problems.

Figure 57: Duration of Outages Caused by Vodafone Problems (% of Total)



Source: Sure

A technical solution to minimise the outages caused by the Internet peering provider would be to add an additional independent route for the international data. With this solution, known as dual homing, a routing protocol will identify if any link is down and will automatically update the routing tables to divert all traffic to the link which is up.

This solution would inevitably add a significant cost overhead. With the levels of service availability currently being high (99.844% in 2014), Cartesian believes that providing a dual home solution with the sole purpose of increasing resilience does not provide sufficient value for money: there are more important issues that deserve Sure's attention and investment, such as bandwidth availability and overage charges.

There is a way, however, to provide the equivalent of dual homing in addition to other key benefits: in part B, we assess a satellite solution which would increase the international capacity

considerably and provide lower latency. This solution would be complementary to the existing satellite solution and would not replace it. As a side result, as the earth station of this new provider would be in a different location (not the UK), the combined solution would effectively provide resilience to the international link.

8.9 Conclusion

Service and Coverage

Given the challenging geographic characteristics of the Falkland Islands (rugged terrain, very dispersed population in Camp), providing fixed voice and broadband to 100% of the population and mobile services to 95% of the population and 40% of the landmass is impressive.

Network Architecture

Sure has deployed a simple but very solid, carrier-grade network for both fixed and mobile services. Both the mobile and fixed networks have only one instance of some of the core elements, such as the MSC (switching functions, such as call set-up, release, and call/SMS routing), Softswitch (telephony exchange) and BRAS router (routing broadband traffic to the Internet).

While only one instance of these elements constitutes a Single Point of Failure (SPOF), carrier-grade equipment, as deployed by Sure, comes with a number of features in order to minimize any impact, e.g. hot swap of interface cards. Additionally, Sure have implemented additional measures to minimise the risk of service disruption, e.g. backup power with diesel generators and batteries, security fencing, CCTV and access control. The fact that the core equipment is in a single centralised site also dramatically reduces the mean time to repair. However, duplication of equipment would automatically increase resilience, and wherever possible Sure should consider it.

The solution implemented by Sure uses vendors and solutions aimed at small operators or at operators covering remote areas. Therefore it allows a degree of scalable growth. However, there are other pieces of equipment which cannot scale down, and actually support a few hundred thousand subscribers. This results in some parts of the infrastructure being inevitably over-provisioned.

One of the key problems with Sure's current network architecture comes from the fact that two of the main equipment vendors, Altobridge and Alvarion, went into administration, stopping equipment production and support. Sure uses Altobridge for the mobile network, and Alvarion for WiMAX. Therefore, an infrastructure upgrade of the mobile network is very urgent, especially as some of the elements are already 10 years old. With regards to WiMAX, we understand from Sure that they have stockpiled a number of network spares, enabling them to safely provide in Camp voice and broadband for a further 5 – 10 years. This needs to be validated and further discussed during the licence negotiation.

Whilst WiMAX still remains available as a technology, it is not deployed in the same volumes as LTE and therefore does not benefit from the same economies of scale. As a consequence, standardisation of WiMAX (led by IEEE) has slowed down and many vendors have created migration paths to LTE, the mainstream technology.

Wi-Fi Hotspots

The Wi-Fi hotspots access speeds are considerably low, at 300 kbps shared amongst the users of a hotspot. This is especially problematic for medium-term visitors, who stay in the Falkland Islands for a few months, but cannot lock into a broadband contract. For these users (e.g. MoD personnel), Wi-Fi hotspots are practically the only technology available to communicate with relatives and families abroad. With a shared connection of 300 kbps, having Skype sessions is just not possible.

Security

Sure takes network security and data confidentiality very seriously and goes beyond the licence requirements. Sure has implemented carrier-grade security systems and provides ad-hoc security assistance to the local IT companies and to the government when required, as there is significant local expertise.

OSS/BSS

The Network Operations Centre in Stanley is a well-designed, fit for purpose facility from where most elements of the network can be monitored and controlled.

The billing system facilities are rather limited, with real-time billing, Fair Usage Policy and out-of-bundle opt-in/opt-out features currently not supported. The limited set of capabilities, coupled with the current pricing of the broadband packages as seen in the telecom services overview has led to significant frustration amongst the broadband users, who have been incurring significant overage charges, especially since the second half of 2014. We believe Sure should review the current billing capabilities and propose a way to minimise bill shock from overage charges.

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International Capacity and Internet Peering

The levels of international capacity available in the Falkland Islands have increased considerably since December 2013 (growing from 26 Mbps in Dec-13 to the current 68 Mbps), however they continue to be very limited for the current levels of data usage. Even though, as seen in Section 6.4.5, utilisation during the day averages 50-70% of the total capacity, this is caused by the fact that people constrain their usage during the day in order to avoid incurring overage charges.

The satellite link and the connection to the IP backbone in the Vodafone landing station in the UK constitute single points of failure. However, the satellite links use a frequency band which is more reliable and less prone to disruption from bad weather conditions (C-Band). All in all, the levels of service availability have been quite high during 2014 (99.84%), but in 2013 there were more outages, caused mostly by problems on the Vodafone side in the UK.

9. Conclusions on Telecom Market Issues

9.1 Prioritisation Approach

This section sets out the priority market issues and gaps that need to be addressed through technical enhancements and regulatory measures. As FIG has a limited budget and resources, and with the need to make a decision regarding Sure's licence term, it is important to prioritise the key issues that should be addressed through technical initiatives and/or regulatory measures.

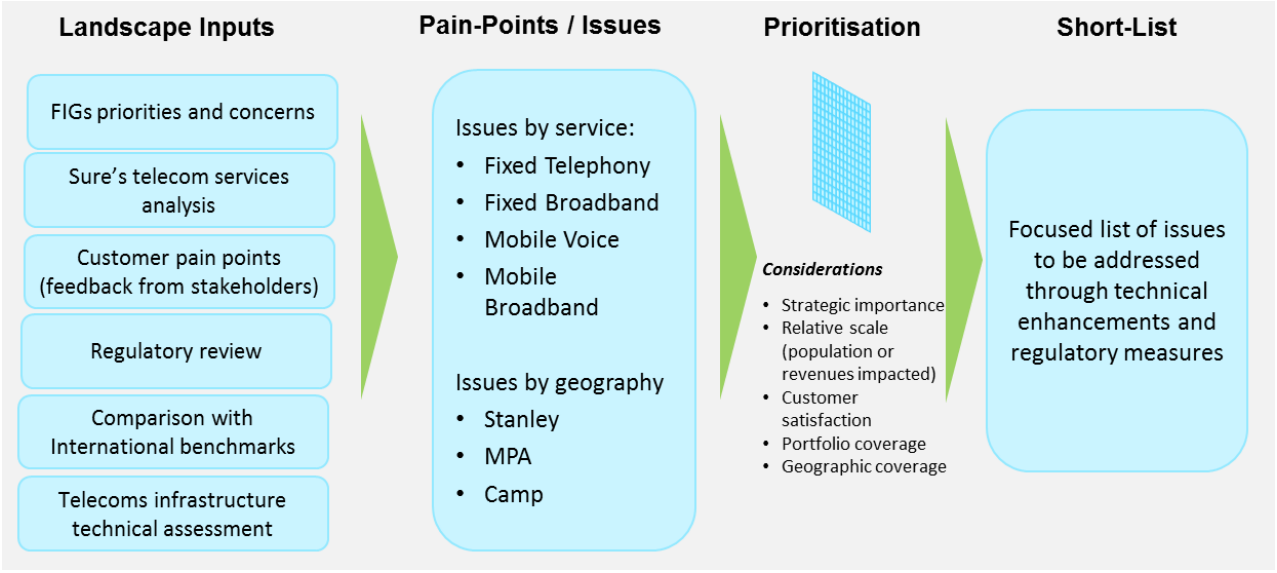
Further detail on the customer feedback collected through the stakeholder interviews can be seen in Annex A of this document.

It is noted that the Falkland Islands has a unique telecoms sector based on the remoteness and small scale of the market, and the fact that the current provider is operating under an exclusive licence. As such, we have used a simple framework to prioritise the market issues identified.

The criteria is as follows:

- **Strategic Relevance:** Relevance of the issue to the development of the electronic communications sector and economy in the Falkland Islands.
- **Relative Scale:** Revenue associated with the market which has issues, to help prioritise the relative importance vis-a-vis other issues / markets.
- **Customer Satisfaction / Impact:** Detrimental impact the issue is having on customers.
- **Portfolio Coverage:** Extent to which the issue covers multiple service lines.
- **Geographic Coverage:** Extent to which the issue covers Stanley, MPA and / or Camp.

Figure 58: Inputs to Perform the Analysis on the Telecom Market Issues



Source: Cartesian

9.2 Assessment

9.2.1 Summary of Issues Captured

The services assessed as part of this initiative are as follows:

Service	Segment	Geography
Fixed telephony services	Consumer & Business	Stanley, MPA and Camp
Fixed Broadband	Consumer & Business	Stanley, MPA and Camp
Mobile Voice & Broadband	Consumer and Business	Stanley, MPA and Camp
Wi-Fi	Consumer and Business (military)	Stanley, MPA and Camp

We have summarised the key issues captured during the landscape assessment and using the approach outlined above, prioritised those which we believe are the most important to address through technical enhancements and / or regulatory measures.

The summary of the landscape review and prioritisation is as follows:

Figure 59: Landscape Review and Prioritisation

Market Issue Captured	Segment	Geography	Prioritized	Rationale
Fixed Telephony				
Cost of international inbound to local number (specifically from Skype)	Consumer	All	No	Not a major pain-point. Only raised by two stakeholders. Most people use free Skype to Skype calls
Outbound calls not connecting / disconnecting	Consumer	Camp	No	Too few people complained of issue
Fixed Broadband				
Pricing: Usage caps too low (average customer should be on Business Bronze package)	Both	All	Yes	Mass customer dissatisfaction, largest product line revenue stream, driver of high broadband revenues and profitability. Impacting public sector services, productivity and use of internet as a business tool
Pricing: High overage charges per MB relative to in-bundle charge Overage charges (5-9p/MB) when the limit has been exceeded	Both	All	Yes	
Pricing: headline monthly price per package (e.g. £17, £40, £80)	Both	All	No	Few customers complained about this. They are more concerned with overage charges and usage allowances
Pricing: Request for separation of fixed / mobile traffic (to zero rate or have lower rate for locally hosted traffic)	Both	All	Selectively	Locally hosted traffic today is a very small proportion of overall traffic consumed; discouraging development of healthcare and education use cases (e.g. remote consultations and video learning / classrooms respectively). Relevant for VPN access to local office servers
Unintentional implications of Night Time Window (e.g. social impacts)	Consumer	Yes	Yes	Cause for major concern across many stakeholders, particularly education and healthcare (resulting in fatigue and potential for unmonitored internet usage of minors). This problem is beyond Sure's control and relates to online safety
Minimal customer control over spend (e.g. ability to opt-in to overage charges)	Consumer	All	Yes	One of the biggest drivers of bill shock; control features requested by many stakeholders to address dissatisfaction with current broadband service

Need for further customer education / messaging with respect to usage, bandwidth consumption and tips to reduce bills	Consumer	All	No	Partly addressed by Sure already. Further improvements are possible
Limited international capacity (currently 69 Mbps)	Sure	All	Yes	The number one reason holding back increasing size of usage caps. Growth essential to facilitate future growth in usage caps and mobile data usage (once LTE is deployed)
Slow service speeds (particularly during night time window) - 512 kbps for the cheapest bundle, and up to 2 Mbps for the most expensive	Both	All	Yes	Significant impact on employee productivity and difficult to use select applications. Should be managed in conjunction with capacity increases
High latency impacting usage experience when using select applications (round trip time currently 560 ms)	All	All	No	Whilst customers recognize it is an issue due to reliance on satellite, this is not a key pain-point for most customers interviewed; high latency is beyond the control of Sure with the current satellite provider. One of the alternative technologies explored (e.g. O3B) has the indirect benefit of reducing latency significantly
Slow time to install (e.g. ~30 days)	Consumer	Camp	No	Too few references. Comparable with international benchmarks
Age of WiMAX network / end of life	Both	Camp	Yes	Strategic importance to upgrade network to ensure high QoS, reliability and continued supply. Need to upgrade will become increasingly important as network reaches end of life. New network relevant for fixed broadband and mobile services
Mobile Voice and Broadband				
Poor coverage (2G)	Both	Camp	Yes	Second largest issue raised behind broadband pricing. Impacting business / productivity for Camp based businesses
Poor coverage (2G)	Both	Stanley	No	Several complaints only; partly explained by poor indoor coverage
2G network reaching end of life	Both	All	Yes	Strategic importance to upgrade network to ensure high QoS, reliability and continued supply. Need to upgrade will become increasingly important as network reaches end of life.
Slow speeds / no mobile broadband	Both	All	Yes	4G services will come with 2G upgrade
High pricing for mobile data relative to int'l benchmarks	Both	All	No	Very few subscribers currently using mobile data. Review situation again once mobile broadband is launched
Wi-Fi services				
Slow service speed (Wi-Fi) capped at 300 kbps impacting user experience	Consumer + Military	MPA	Yes	Significant number of users at MPA. Major issue for military personnel and families. Wi-Fi usage contributes 36% of broadband revenues. Poor experience using apps such as Skype
Pricing: high price of Wi-Fi internet cards (e.g. £10 for 100 minutes)	Consumers + Military	All	Yes	No differentiated pricing for temporary / longer term residents vs. tourists. Very expensive for those that use Wi-Fi as primary source of internet access

Financial Performance				
Profit and returns are perceived as being high (in terms of EBITDA, ROCE and RoA)	N/A	N/A	Yes	High EBITDA margin relative to Batelco Group and selected benchmarks, whilst absolute profits are very low (understandably given size of the market). Increased margins likely given high overage revenues in 2014 Caution required with respect to the financials: limited investment prior to C&W disposal to maximise valuation, 2013 financials were outside of the control of Batelco), relatively low investment in infrastructure whilst there is regulatory uncertainty and different characteristics of benchmarked markets
Capital intensity is low relative to benchmarks	N/A	N/A	Yes	

When considering the above issues, it should be recognised that Sure has built out a quality, well developed network considering the characteristics of the market (low population, large land area, remote islands). The NGN / MSAN are comparable with developed markets, although it has been impacted by choice of suppliers (e.g. Altobridge going out of business and Alvarion going bankrupt and finally acquired by smaller Valley Telecom). Sure is also deeply committed to serving the market, in some cases going beyond the call of duty (given the lack of specific obligations in the current regulatory regime). For example, Sure has taken seriously the commitment to provide communications in Camp (with partial funding from FIG) despite the very limited returns from serving customers in Camp.

9.2.2 Priority Issues to Address through Technical and Regulatory initiative

A summary of the priority issues by theme is outlined below (Figure 60:). In Part B of the report, we will analyse technical and regulatory enhancements in order to address these issues.

Figure 60: Priority Issues to Address

Issue	Key Pain-Points	Fixed Telephony	Fixed BB/Wi-Fi	Mobile
Size of Monthly Caps / Usage Allowance	• Allowance in broadband packages too low for current usage profiles Average customer needs to subscribe to Business Bronze package		✓	
	• Mobile likely to become issue in future when LTE is deployed			✓
Retail Pricing	• Fixed broadband is seen as very expensive by the majority of the internet users • High overage charges (5-10p/MB) when broadband limit exceeded (significant differential between in and out of bundle) • Wi-Fi charging is high for frequent users (currently 100 minutes for £10) • Resulting social impacts of night time window • Minimal customer control over spend (e.g. ability to opt into overage charges) • Demand for separation of fixed / mobile traffic (to zero rate, lower rate for locally hosted traffic) • Price cap has not had desired impact in reducing prices		✓	✓
Access Speeds & Service	• Access speeds are quite slow according to the majority of users (survey) • Slow service speeds (particularly during night time window) • 512 kbps for the cheapest bundle, and up to 2 Mbps for the most expensive; will need to ramp to support video services • Wi-Fi service speed capped at 512 kbps, particularly impacting MPA		✓	
	• No mobile broadband today			✓
Coverage	• Low mobile coverage across camp today (x% of area; % population)			✓
International Capacity & CDN	• Current international capacity levels are not sufficient to support required fixed broadband usage requirements • No clear content strategy to minimise international traffic		✓	
	• Current international capacity levels will not support expected ramp up in mobile data (with planned LTE roll-out)			✓
Performance & Investment	• Mobile and WIMAX networks reaching end of life; immediate / near term investment is required		✓	✓
	• Perception of high profitability levels vs. international benchmarks (e.g. EBITDA, RoA, ROCE)	N/A		

Source: Cartesian

10. Glossary of Terms

Abbreviation	Definition
ADSL	Asymmetric Digital Subscriber Line - a type of communication technology that enables broadband internet access over copper lines, with speeds up to 12 Mbps
ADSL2+	Asymmetric Digital Subscriber Line 2+ - a type of communication technology that enables broadband internet access over copper lines, with speeds up to 24 Mbps
ARPU	Average Revenue Per User – total revenue divided by total users, usually on a month basis
BSO	Broadband Service Obligation
BTS	Base Transceiver Station
CAGR	Compound Growth Rate
CDN	Content Delivery Network - system with a number of distributed servers that host content, and which are accessible via the Internet
CPE	Customer Premise Equipment - any terminal and associated equipment located at a subscriber's premises and connected with a telecommunication network
CWC, C&W	Cable and Wireless Communications , Cable and Wireless
DSL	Digital Subscriber Line/Loop - technology used to provide internet access by transmitting digital data over telephone lines
EBITDA	Earnings Before Interest, Tax, Deductions and Amortisations
EDGE	Enhanced Data for GSM Evolution - an advanced system for Global Systems for Mobile communications
EPC	Evolved Packet Core - the core network of the LTE system
FCO	Foreign & Commonwealth Office - department of the British Government responsible for protecting and promoting British interests worldwide
FIG	Falkland Islands Government
FTTC	Fibre To The Cabinet - fibre-optic communication delivery, in which an optical fibre is from the central office to a cabinet near the premises. A coaxial cable or twisted pair connects from the cabinet to the subscriber
FTTP	Fibre To The Premise - fibre-optic communication delivery, in which an optical fibre is from the central office to the subscriber premises
GB	Giga Byte – unit of memory equivalent to 1,024 MB
GDP	Gross Domestic Product – a measure of economic output of a country
GEO	Geostationary Earth Orbit – a region of space (~ 35,785km) where satellites orbit at a fixed position
GPRS	General Packet Radio Service - packet oriented mobile data service on the 2G and 3G cellular communication system
GSM	Global System for Mobile communications - standard developed by the European Telecommunications Standards Institute (ETSI) to describe protocols for second-generation (2G) digital cellular networks used by mobile phones
IEEE	Institute of Electrical and Electronics Engineers
IMS	IP Multimedia core network Subsystem - architectural framework for delivering IP multimedia services

Abbreviation	Definition
IPTV	Internet Protocol television - system through which television services are delivered using the Internet
KPI	Key Performance Indicator
LTE	Long-Term Evolution (same as 4G) - wireless communication standard
MPA	Mount Pleasant Airport – military base operated by the MoD in the Falkland Islands
MEO	Medium Earth Orbit – a region of space at around 8,000km above sea level
MoD	Ministry of Defence – the office of the UK government tasked with administering the military
MPA	Mount Pleasant Airport – the Royal Air Force base located in the Falkland Islands
MSAN	Multi-Service Access Node - connects customers' telephone lines to the core network, to provide telephone, and broadband from a single platform
OSS	Operational Support Systems - Software (occasionally hardware) applications that support back-office activities which operate a telco's network, provision and maintain customer services.
OTT	Over-the-top content – content delivered without the direct involvement of a multiple-system operator
P2P	Peer-to-Peer – method of distribution of internet data that sends traffic between users rather than from a central server (e.g. BitTorrent)
POP	Point of Presence – server with access to the Internet, and whose content can be accessed by Internet users
PPP	Purchasing Power Parity – a technique used to determine the relative value of different currencies
PSTN	Public Switched Telephone Network – aggregate of the world's circuit-switched telephone networks
QoS	Quality of Service
RAF	Royal Air Force
ROA	Return On Asset – financial metric
ROCE	Return On Capital Employed – financial metric
SHDSL	Symmetrical High-speed Digital Subscriber Line - form of digital subscriber line (DSL) which enables symmetrical data rates (upstream and downstream)
SIM	Subscriber Identity Module – a card with a unique identification number placed inside a mobile device
T&C	Terms and Conditions
USO	Universal Service Obligation – a mandated requirement to provide equivalent service to all population
VDSL2	Very-high-bit-rate Digital Subscriber Line - a type of communication technology that enables broadband internet access over copper lines, with speeds up to 80 or 100 Mbps
VoIP	Voice over Internet Protocol – technology for the delivery of voice communications over a network such as the Internet

Abbreviation	Definition
VPN	Virtual Private Network – the extension of a private network (i.e. of a school or business) across a public network (usually the internet) whilst remaining private
VSAT	Very Small Aperture Terminal – a satellite connection small enough to service a single premises or vessel
WACC	Weighted Average Cost Of Capital - A calculation of a firm's cost of capital in which each category of capital is proportionately weighted
WAN	Wide Area Network – a network that stretches across multiple sites
WiMAX	A fixed wireless access technology
YTD	Year To Date

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12. Annex A: Telecom Services Feedback from Stakeholders

Throughout the course of the project we have interviewed a wide range of stakeholders across the business community and public sector including government, education and healthcare, as well as members of the public who have provided their perspectives with respect to telecoms services provision. In addition, during many of the stakeholder discussions, both business and residential perspectives were shared.

It is important to consider feedback with respect to both positive comments and pain points/market issues, as they support our analysis and help to focus and prioritise the key issues to be addressed through proposed regulatory measures.

Feedback has been broken out by service type. Positive comments mainly refer to coverage and stability of the fixed network (i.e. fixed phone and broadband), whereas pain points focused mostly on fixed broadband pricing, followed by mobile coverage.

12.1 Mobile

Coverage:

- There is general consensus that coverage in Stanley and MPA is good, but that in Camp coverage is very patchy. Within Camp, East Falkland has better service than West Falkland, where only Port Howard and Fox Bay have mobile signal.
- Stakeholders interviewed generally understand that it is challenging to deliver service to such a dispersed population, but they would like to see more Camp settlements and main roads covered, the latter primarily due to health and safety concerns.
- There was a single complaint that a household no longer receives mobile signal in Fitzroy River in addition to road coverage in the same area. This is due to Sure taking a network planning decision to increase coverage in the MPA area at the expense of Fitzroy River, justified by the number of customers that will now receive improved coverage in the MPA area.
- Several interviewees cited black spots within Stanley, although there was an explanation from Sure that some of the black spot issues are due to poor indoor coverage, rather than issues with the network.

Access speeds:

- Mobile data, which uses EDGE, is considered to be extremely slow, to the point that it is hardly usable. Most users would like to see enhanced, faster services in order to truly embrace data on the move (for enhanced business productivity and for personal use).
- Several interviewees stated that they would be satisfied with blanket Wi-Fi coverage in Stanley rather than wait for a new mobile network to be deployed.

Stability of service:

- This issue is less significant than the previous two. However, a few people complained about the number of dropped calls, and about times when it is not possible to connect a call.

Size of monthly cap:

- Some interviewees argued that the monthly caps for mobile data are too low (25, 240 or 360 MB per month). At the same time, they said that the slow speed of the service does not allow them to fully utilise the data bundle allowance.

12.2 Fixed Telephony

On the whole, interviewees were satisfied with the fixed telephony service that they receive whether through PSTN or fixed wireless. This includes both outbound call pricing and quality of service that they receive from Sure.

12.3 Fixed Broadband

Fixed broadband services (via copper and wireless) received the most attention during the discussions with local stakeholders.

Coverage and quality of service:

- Acknowledgement that Sure does a good job in providing island-wide broadband coverage to all households and businesses.
- Sustained uptime and good network stability during peak periods.

Size of the monthly caps:

- Acknowledgement that Sure had increased the size of the caps following the Price Cap review.
- However, everyone that we spoke with explicitly stated that size of data caps are too small to meet their usage needs, with most interviewees exceeding the usage cap on a monthly basis.
- Issues with the size of the cap applies to both businesses and consumers, with the current caps impeding many personal and business activities that require use of the internet (in order to keep usage and overage charges to a minimum). This is having a knock on impact on productivity of workers across a number of sectors interviewed (e.g. oil, education, healthcare).

Cost of Service and Bill Shock:

- The cost of monthly overage charges was the most single most common issue raised, particularly with respect to the lack of control and visibility over broadband spend.
- In particular, interviewees raised the need to have greater billing control with the ability to cap total monthly spend once the data cap has been exceeded. In such cases the service could be blocked, once spend had exceeded a pre-set level (e.g. £50 overage charges), or alternatively, customers would have to opt in to continue receiving the broadband service once overage charges are incurred.
- Residential customers expressed dissatisfaction with respect to “losing” their allocated MB, if they have not used all of their allowance in a given month (particularly if they have been on holiday or away from home for a period of time). In such cases, customers are keen to see some form of roll-over introduced if their data allowance has not been fully consumed during any given month or quarter.

- Several businesses had concern with the cost of broadband service provision, although on the whole we did not receive a significant number of complaints with respect to the monthly pricing plans.
- The cost of the overage charges are currently preventing businesses and public sector organisations (e.g. health and education) from using internet in the way in which they would like to (e.g. downloads, internet searches, large email file transfers, video calling, etc.). As such this is impeding productivity and business performance.
- Based on the feedback received, there appears to be limited confidence in the accuracy of Sure's billing for broadband data consumption. This is particularly relevant to unexpected data usage (e.g. hardware system updates), as well as Sure's proactiveness in informing customers with respect to high spend.

Access Speeds and Latency:

- Latency was seen as less of an issue by customers that we met during our visit to the Falkland Islands. Generally slow network speeds is the key concern particularly impacting business and public sector productivity such as the time taken to undertake routine tasks such as downloading standard equipment updates / drivers, accessing local or international severs via VPN and undertaking bandwidth intensive research (including video streaming).

Local vs. International Traffic:

- Many interviewees cited the issue of Sure charging local and international hosted traffic at the same rate. There is a perception that customers are being charged for using international bandwidth irrespective of whether the content is cached or hosted locally in the Falkland Islands.
- Business stakeholders in particular identified the need for select traffic types to be recognised as local in order to bring down cost of broadband. This was particularly relevant for the IT service providers interviewed (e.g. Synergy and Jaytec), as well as the education sector where the potential cost of holding video-based lessons with pupils living in Camp is prohibitive due to the cost of broadband usage.
- The same concept was referenced during the interview with the CMO at Stanley's hospital. The cost of video on broadband is currently prohibitive in undertaking video-based consultations with patients living in Camp.

Social Implications:

- The night-time window has led to a number of unexpected social implications.
- Fatigue has been referenced as an important problem that needs to be addressed resulting from widespread usage of the internet during the night-time window. For example, employees using the internet late at night for work purposes, as well children staying up during the night-time window for both homework and general leisure purposes (referenced by the school, hospital and a wide range of interviewees that we met).
- Most concerning is the unsupervised late night internet use that has led to cases of online offences against minors. This is a wider issue relating to online safety, where parental control, education services and law enforcement can help mitigate this unexpected consequence.

12.4 Wi-Fi Hotspots

The key issues raised with respect to the hotspot service are access speeds and pricing.

Speeds:

- Hotspots speeds are, by design, capped at a lower value than the entry level broadband package (300/128 kbps for hotspots compared to 512/128 kbps for Residential Bronze). This is especially problematic for the MoD personnel, who are deployed in the Falkland Islands for a period of 4-6 months up to a year, and for whom Wi-Fi hotspots are their main telecom service to communicate with their families.

Pricing:

- A key complaint is the price of the vouchers that are issued. The hotspots can be accessed by purchasing Wi-Fi cards available in £5 and £10 denomination. Currently the same pricing is offered to temporary / longer term visitors (e.g. military, farm workers, etc.) as to tourists that use the Wi-Fi services for a very short period.
- Some expressed the need to offer reduced rate calling cards that can be issued for longer periods of time (e.g. one week, one month). In addition, others expressed the need to base the billing on usage rather than time, which is the current billing approach.
- A discount is currently offered via the MoD for Wi-Fi cards issued by the MoD at MPA. Views were expressed that the discount could be increased supported by the volume of cards which the MoD distributes to employee, families and civilian workers.

12.5 Other

Business:

- Representatives of the oil and gas industry highlighted Sure's willingness to understand and meet their telecoms requirements.
- However, several businesses have complained about lack of desire for innovation and lack of willingness to push for additional business services, which could in turn provide Sure with additional revenue streams. Examples include VPN services.
- In addition, many businesses cited the need for local traffic charging to avoid broadband fees for content / traffic which does not leverage international capacity.

Complaints procedure:

- Several customers explained that there is not a robust and clear enough policy / practice for making formal complaints, particularly around billing. This is particularly relevant with respect to the large overage charges that many customers are receiving.

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