Fixed Wireless Access Consultation Paper

June 2004

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1 Executive Summary

Fixed Wireless Access (FWA) is a technology with the potential of offering broadband access with good service quality at an affordable price via the use of radio frequencies. It presents an alternative way of delivering broadband access and associated services in Malta. This is highly desirable given the importance of information and communication technologies in the local economy. It is also widely recognised that a significant increase in broadband access penetration is strategically of critical importance. This has been highlighted within the National Broadband Strategy Document issued by the National Information Society Advisory Council (NISCO) recently. In other jurisdictions, FWA has been around for a number of years and thus the technology is tried, tested and equipment is readily available. Local investors have already voiced considerable interest in the deployment of this technology.

This consultative document outlines a number of possibilities regarding the local introduction of FWA while providing insight into the market sector itself. This document seeks to elicit feedback from interested parties in a number of areas.

2 Overview

2.1 What is FWA?

FWA (Fixed Wireless Access) is the use of radio spectrum to provide an alternative in the so-called 'last mile' connectivity between the subscriber and the fixed telecommunications network. Wireless access systems provide an opportunity to increase competition in the telecommunication market by giving more choice and innovation to consumers. Fixed Wireless Access removes the need to drape wires across the country or dig up roads to provide fixed telecommunication links, as is the case for fixed telephony and cable networks. As a result, it can easily also provide an effective platform from which to expand existing infrastructure, or serve to provide infrastructure in hitherto under-served areas.

There are mainly two ways in which FWA can be implemented:

In **point-to-multipoint systems**, a single base station will provide telecommunications services within a specifically defined geographical service area. The service area will be centered at the geographic location of the proposed base station.

On the other hand, **"Mesh" networks** do not utilize a central base station but smaller nodes, thus the service area is centered at an operator defined geographic location rather than the location of a specific base station.

2.2 FWA Spectrum Overview

Fixed wireless access can typically be implemented in the following spectrum bands:

3.4GHz – 3.6GHz, 10.5GHz, 26GHz, 28GHz and 42GHz.

Broadband wireless technology at any of these frequencies has the capacity to offer exactly the same set of services, however, the capabilities of 3.5GHz networks differ from those of the other frequencies because of the larger geographical reach of tried and tested equipment for use at 3.5GHz. These favourable properties made this frequency band the preferred choice for vendors.

Thus significant technological advances have been made in this area, which enabled the production of mass-market radio products at this frequency. This in turn resulted in cheaper products being made available for prospective operators and customers alike.

There are mainly two ways in which the download and upload bands can be implemented:

Time-division duplex (TDD) refers to duplex communications links where the uplink is separated from the downlink by the allocation of different time slots in the same frequency band.

Frequency division duplex (FDD) is a technique in which one frequency band is used to transmit and another used to receive.

In the case of Frequency Division Duplex (FDD) systems will need to be licensed for a frequency channel consisting of an upper and lower frequency (e.g. 2 x 28MHz in the 3.5GHz band). Time Division Duplex systems (TDD) will need to be licensed for one half of the FDD channel as outlined above (e.g. 1 x 28MHz in the 3.5GHz band).

3 International Situation

3.1 The Drive behind the Technology

In the world of telecommunications, two of the fastest growing areas are fixed and mobile IP services. The main reasons for this are deregulation, increased competition, market demand for broadband services, and the introduction of new technology.

New fixed wireless broadband technologies give operators an opportunity to address the ever-increasing demand for bandwidth caused by the surge in Internet and intranet traffic, LAN-to-LAN interconnect and the mounting interest in voice over IP (VoIP). Thus the market is demanding an access network solution that can carry different kinds of broadband multimedia services.

In this respect, FWA is a good alternative to DSL and cable modem technologies and offers several benefits:

Time to market: By deploying an efficient radio-access system, operators can reduce the time to market for new services, thereby enabling them to remain successful in this business.

Ownership of infrastructure: This implies independence from other operators as well as from the unbundling process of the local loop.

Low cost: Fibre is expensive to deploy and copper is expensive to maintain. The main cost of radio access is the equipment, which is falling in pace with the development of new technologies. Furthermore, maintenance costs are lower for radio access since they don't involve the additional cost of digging up and there is no associated erosion and decay with the transmission medium.

Flexibility: The infrastructure can be expanded as the operator's business grows.

3.2 Spectrum allocation methodologies and costs

Bandwidth allocations in Europe for the various spectrum bands for FWA started way back in 1999. In particular, allocations for the 3.5GHz band commenced in

2000. In some countries, such as the UK, regional licences were granted, while in others, such as Denmark and Luxembourg, granted national licences. The number of licences granted in the spectrum also varied from country to country.

Several methods were used to allocate the spectrum: beauty contest, auction, “first come first served” and by public tenders. By far the most popular methods were auctions and beauty contests.

In beauty contests, the services to be provided by the operators upon granting of the license were stated in the tender, together with specific economic and technical criteria that had to be met. These contests usually entail low upfront payments, however, annual fees are then proportional to either revenue or some other factor, such as, number of base stations installed. This methodology might therefore create some problems for the operator; whereby licensing issues override technological and business needs when network rollouts are being planned.

Auctions are seen as a fast, transparent, fair and economically efficient way of allocating the spectrum. On the other hand, auctions tend to give a head start to large operators as a result of the high upfront payment that is required. However, in this case, there is a higher probability that the license will be awarded to the operator that values it most and will thus ensure very good use of it.

As already outlined in the previous paragraph, incumbents tend to create an issue when it comes to bandwidth allocations. Across Europe, several regulators faced the dilemma as to whether operators of other broadband networks should be allowed to participate in spectrum allocations for FWA or whether such allocations should only be restricted to new entrants. In the end, most of them ended up allowing incumbents into the arena.

The value set for the spectrum varied, especially in countries where regional licenses were granted. Of course, one should take into account that before the 2000 high level of payments were being made for spectrum. However, following the collapse in market valuations that happened during that year, a period of severe adjustment took place, during which most companies had to reduce their investments and introduce other cost-cutting measures. This of course affected prices paid for the spectrum in the post-2000 era. The allocation process used also affected the prices:

Country	Allocation Process	Year of Allocation	Price	Price in LM	Price Per Capita (in LM)
Luxembourg [1]	First Come, First Served		LUF 500,000	5,268.86	0.01
Portugal [1]	Public Tender	1999	30 million PTE	63,613.66	0.01
Ireland [2]	Beauty Contest	2003	€ 112000	47,667.80	0.01
UK [3]	Auction: Total price paid over all regions	2003	£6,975,000	4,388,414.70	0.075
New Zealand[4]	Auction: Total price paid over all regions	2002	$6,165,000	1,428,525.99	0.36
Greece [5]	Auction: Reserve price	2000	2,000 million GRD	2,492,061.54	0.23
Netherlands [6]	Auction	2003	€ 4,000,075	1,699,017.44	0.11
Austria [7]	Auction: Total price paid over all regions	2001	€ 87,207.40	574,069.79	0.07

Table 1: FWA Spectrum Prices Across the World

This benchmark analysis related to prices paid in other countries has given a range of between Lm 4000 and Lm 92000 per band/operator.

The conditions imposed were varied. One of the most important conditions, imposed in a number of countries including Ireland and Finland, was that operation had to start within a year of the license grant, which would otherwise be revoked. There was substantial divergence also for the duration of the license. Ireland opted for an annual license, while Finland went for a 6-year license. On the other hand, Luxembourg went for a 30-year license, while Germany opted for an unlimited license. However, most of the other countries went for a 10 or 15-year license.

3.3 FWA rollouts

Fixed wireless access rollouts across Europe have already been implemented in the 3.5GHz band or in some other part of the spectrum. On analysis of the number of broadband connections in the EU as at July 2003, these could be split out as follows: [8]

DSL – 71.6 %
Other – 28.4 %

The latter figure could be further subdivided as follows:

Cable modems – 82%
Leased lines – 10%
Other (mainly fibre) – 7%
FWA – 1 %

Thus, although on average the market share of incumbents was reduced, infrastructure based competition in the European broadband market remains weak.

Besides this, even though broadband is already available to the majority of households in the European Union, only a fraction of them have chosen to subscribe. Data shows the existence of a significant gap between availability and effective use of broadband infrastructure. Adoption not deployment is becoming the main issue for the development of the broadband market.

Different factors might explain the gap between supply and demand. Consumers' take up and acceptance of new technologies is positively related to ease of use. Other determinants of consumers' choice are prices combined with the availability of useful, innovative and advanced services.

[1] Summary of Fixed Wireless Access (FWA) Licensing Practice in EU Member States 03 May 2001

[2] Guidelines to Applicants for Fixed Wireless Access Local Area – 3.5GHz (FWALA) Licenses

[3] http://www.ofcom.org.uk/static/archive/spectrumauctions/pfwa/auction_results/auct_res_index.htm

[4] http://www.med.govt.nz/rsm/auctions/auction05/results.html

[5] http://www.eett.gr/eng_pages/telec/adeiodotisi/diagnwstikes/fixed/FWAinvitationtotender-en.doc.

[6] http://www.ez.nl/default_bel.asp?pagina=wll

[7] http://www.rtr.at/web.nsf/englisch/Telekommunikation_Frequenzvergabe_Bisherige+Auktionen_BisherigeAuktionen_WLLVergabe_WLLAuktionsergebnis?OpenDocument

[8] Communications Committee Working Document: Broadband Access in the EU COCOM03-40 Annex Sept. 2003

4 Local Situation

Though it is useful to examine the international situations in the deployment of new technologies, it is important to analyse this in context of local market nuances. Given the size, population density and other factors otherwise theoretically and legally feasible solutions in other countries may not yield the desired outcome locally.

4.1 Policy Objectives

The main objective of this policy is to promote investment, competition and consumer choice in the broadband access through the implementation of fixed wireless access.

Any policy decision and subsequent allocation has to be guided by the relevant terms of the EU Directives as well as by the legal regulatory framework applicable in the country. Consideration must be given to the very limited size of the local market and the possibility of having multiple operators in a competitive environment must be balanced against the need for market sustainability. Thus several factors were considered during this assessment.

4.1.1 Compliance with Accession Obligations and eEurope 2005 Action Plan

The electronic communication sector is seen of crucial importance in the economic texture of the EU. It plays such a role because of its size, dynamism and impact on nearly all other economic activities. Recent evidence shows that it has been the largest contributor to European labour productivity growth.

As a result, the European Union is stressing the importance of sustainable growth for the sector that can only be achieved through a revival in capital spending and further deployment of new innovative services. This calls for actions on facilitating deployment of the necessary infrastructure, broadband and Third Generation Mobile Communications (3G). In fact, this document complements the overall National Broadband Strategy that was issued jointly by MITI and the MCA in April this year, and which addresses all these issues.

Thus, implementation of the new regulatory framework for electronic communications needs to be effective and consistent across the European Union. The new Member States are also being encouraged to take all the steps necessary to ensure a timely implementation of the framework. This is also taking place within the *e*Europe framework, where Member States who have not yet put in place a national broadband strategy are being called upon to do so within the minimum delay.

Particular emphasis is being made on competition, since this is conductive to investment. However, competition can be achieved in two ways, either by enforcing the incumbents to open their infrastructure or else by allowing new infrastructures to be employed. In this aspect, FWA provides for an alternative infrastructure.

4.1.2 Ensuring market sustainability, competition and economic welfare

A number of licences could be offered in this spectrum, however, in this area, particular attention should be paid to market sustainability. In fact, even in other jurisdictions, restrictions were applied.

In Malta this is even more crucial since broadband availability is already quite widespread, given that ADSL and Cable modems have good geographical coverage. Thus one of the main drivers for this technology, i.e. providing access to rural areas, is already negated. Besides this, from a European experience, DSL and Cable modems remained the most popular broadband access technologies.

On the other hand, though the coverage rates in Malta are extremely high for DSL and cable modem technologies, the take-up is not as high as would be expected, as can be seen from these figures, as at December 2003.

	Number of Subscriptions	% Population
ADSL	13,001	3.3
Cable Modems	9,735	2.5
Total Number of Internet Subscriptions (Incl. Dial-up, ISDN, mobile Internet)	76,814	19.4

Table 2: Internet Subscription In Malta Overview

Thus there is the potential for FWA to gain a significant market share given a reasonable price/quality service is offered. This would in itself contribute a positive effect on the economy on the whole, not only directly as a result of increased revenue from Internet subscriptions but also indirectly, from the rollout of new services. The resulting employment opportunities in the service sector would also have a beneficial effect on the economy.

However, while the proliferation of operators would increase competition, one has to be mindful of the number of operators allowed into this market since the viability of the ventures could be called into question, given the population size. Thus the idea is to ensure viable competition between different infrastructures as well as competition between services based on the same infrastructure.

The issue of whether the local incumbent should be allowed to take part in the overall selection process for granting of the spectrum licence was the cause for debate throughout Europe. In most cases, incumbents were allowed into the process, however local nuances may limit the economic benefits.

4.1.3 Defining rollout obligations

In order to ensure that any spectrum allocation is used effectively, key obligations of its use should be clearly stated in the call for interest, and penalties associated with them clearly stipulated in the final contract.

4.2 Environmental and Social Assessment

Strengths and Opportunities	Weaknesses and Threats
Indepence from incumbents	Few rural areas
Increase in competition	Feasibility
Flexible infrastructure	High license price
Possibility of lower costs	Investment viability
Increase in popularity for broadband access	New base station antennas
Sound business cases	
Ideal for rural areas	
Learn from mistakes	

One of the major strengths for the operators is that this solution enables them to become independent from the incumbents, thus avoiding prolonged negotiations as well as allowing them to perform with greater efficiency. This also means that competition across infrastructures is increased.

Also because of the very nature of the system, the infrastructure can be scaled as the business increases which is a very important consideration for small-sized operators. There is also the potential of lower costs for operators depending on licence prices and infrastructure requirements, as opposed to fees to be paid to the incumbent.

FWA therefore offers a viable alternative platform for providing a Broadband access services. Besides its comparative low capital cost for deployment, it enables the opportunity to provide coverage in underserved areas without the requirement to lay cable. While this issue presented a strong business case in some countries such as Spain, in Malta this has less of an impact, due to the ample coverage of existing technologies. Nevertheless, FWA could offer the opportunity for incumbents to cover all areas, which are currently not considered economically viable to reach using legacy deployments. FWA has been deployed, or is in the process of being deployed, in a number of other countries. Both regulator and operators can use the fact that these countries have a head start to their advantage by learning and benefiting from experience gained during such FWA rollouts.

However, FWA has also a number of weaknesses and threats that need to be taken into consideration as well.

License costs are potentially an issue. The setting of a price too high could make for an uneconomical business case. Conversely, if the price is too low and there is substantial interest and take up, there is risk the small local market may not sustain viably a large number of investors. Moreover, FWA reliance on radio spectrum implies the requirement of deployment and installation of new radio base stations and antennas in order to enable communication with each base station. This significant proliferation of base stations and antenna deployments across the country, despite being subject to conforming to required health emission standards, may receive strong opposition from consumer groups opposed to the installation of such infrastructure in built up areas.

4.3 Political Economic Social and Technological Analysis

Political	**Economical**
EU Policy Overcoming Digital Divide Revenue Opportunity	Flexible Deployment Market Sustainability
Social	**Technological**

Increase in Competition Advance in Technology Environmental Concerns	Simpler Access Transmission Problems

From a social standpoint there are a number of issues that make the implementation of this technology attractive. Mainly, there is the strong stress the EU is making on the rollout of broadband strategies, as well as the concept that no one is left out because of where they live. The social aspects of this issue are also divergent, on one side the rollout of FWA represents an advance in technology and might represent a good point for the tourist and business travelling industry. On the other hand, the need for even more antennas will mean that the general public will have to be reassured that FWA transmissions are no threat to human health.

From a technological standpoint, though radio access is simpler than cabling, it introduces problems such as signal path loss, line of sight and so on, which are non-existent for wired technologies. These problems might affect the quality of real-time services such as voice and video.

4.4 Spectrum Availability

The 3.5GHz spectrum has been chosen, since it is the most popular one for FWA, given its advantages over the other spectrums available.

The allocations within the 3400-3600 MHz as stated in the ITU Radio Regulations (Radiocommunication Region 1), CEPT ECC Report 25 and our National radio frequency allocation plan (NFAP) are tabulated hereunder:

Frequency Band	ITU Radio Regulations	CEPT		NFAP	
		Allocation	Utilisation	Allocation	Utilisation
3400-3500 MHz	FIXED FIXED- SATELLITE (S/E) Mobile Radiolocation	FIXED FIXED- SATELLITE (S/E) MOBILE Amateur Radiolocation	Amateur Fixed links FWA Radars SAP/SAB	FIXED	Fixed links
3500-3600 MHz	FIXED FIXED- SATELLITE (S/E) Mobile Radiolocation	FIXED FIXED- SATELLITE (S/E) MOBILE	Fixed links FWA Mobile applications	FIXED	Fixed links

Whilst CEPT ERC Recommendation 13-04 identifies the band 3400-3600 MHz as one of the preferred bands for Fixed Wireless Access (FWA) applications, CEPT ERC Recommendation 14-03 recommends the harmonized radio frequency channeling arrangements and block allocations for low and medium capacity systems within the said band.

Point-to-Point (P-P) Systems:

In terms of Annex B2.2 of ERC Recommendation 14-03, only 25 channels with 3.5 MHz channel spacing (100 MHz duplex spacing) are available (please vide table below). However, in our case, within this band, only 24 channels are available for assignment, since two channels of 1.75 MHz channel spacing each have been assigned for radio links.

3.5 MHz channel spacing					
Ch. No.	**Go**	**Return**	**Ch. No.**	**Go**	**Return**
1	3411.75	3511.75	14	3457.25	3557.25
2	3415.25	3515.25	15	3460.75	3560.75
3	3418.75	3518.75	16	3464.25	3564.25
4	3422.25	3522.25	17	3467.75	3567.75
5	3425.75	3525.75	18	3471.25	3571.25
6	3429.25	3529.25	19	3474.75	3574.75
7	3432.75	3532.75	20	3478.25	3578.25
8	3436.25	3536.25	21	3481.75	3581.75
9	3439.75	3539.75	22	3485.25	3585.25
10	3443.25	3543.25	23	3488.75	3588.75
11	3446.75	3546.75	24	3492.25	3592.25
12	3450.25	3550.25	25	3495.75	3595.75
13	3453.75	3553.75			

Point-to-Multipoint (P-MP) Systems:

In terms of Annex B1 of ERC Recommendation 14-03, P-MP systems may be operated in the radio frequency range 3410-3500 MHz paired with 3500-3600 MHz. However, frequency assignments shall in all cases be based on 0.25 MHz slots. Where a frequency duplex allocation is required, the spacing between the lower edges of each paired sub-band shall be 100 MHz.

5 Implementation Strategy

After analysing all the aspects outlined above, the following options and proposals were formulated.

5.1 Allocation Method

Though technically it is possible to grant more than one license, the idea is to grant only two spectrum bands for this technology, at least initially, especially given the limited size of the country and market.

This allocation is also being seen as an opportunity to stimulate investment by new entrants in the field. However, a compromise needs to be found since incumbents cannot be totally excluded from the spectrum grant process, once they show interest in it.

A possible solution could be to open one spectrum band allocation to ANY bidder, while the other allocation is restricted ONLY to new entrants with no participation possible by existing operators. This will have the effect of allowing existing undertakings to enter the market but also ensuring the possibility of new entrants being allocated spectrum. This has the scope to encourage new investment and to prevent foreclosure to the maximum extent possible by eliminating concentration of infrastructures and limiting market power.

An auction is seen as the most effective, fair and transparent way of assigning the spectrum resource. In its nature it tends to favour the strong players in the market, however, it ensures that the operator who is ultimately assigned the licence will be the one who values it most.

On the downside, there are some administrative and auction implementation fees that would have to be paid. However, these can be covered by means of a submission fee to be paid by all operators participating in the auction.

5.2 Spectrum lease duration

It is being proposed that the spectrum is leased for 15 years. This is considered sufficiently long to allow a solid business case to be constructed. A longer period, say, 20 years, may restrict Government should technologies change in the future and the spectrum has to be re-assigned for other purposes. This lease should be bound by a number of rollout obligations, the most important of which will be outlined in the following section.

5.3 Rollout obligations

The main rollout obligation is that the commercial launch of the service must take place within a year of the spectrum grant. Failure to comply with this obligation could lead to the revocation of the allocation. This should ensure that none of the incumbents acquires a band for hoarding or anti-competitive purposes and leaves it unutilised.

Coverage of national territory should also be ensured by rollout obligations,. The operator is bound to achieve coverage at a rate of 33% of national territory every 12 months for 3 successive years commencing from date of service grant, This means that within 36 months there will potentially be two national FWA networks in operation.

In this case, national territory is defined in terms of service availability within local council boundaries not absolute physical population or geographic coverage.

Sanctions could be imposed on operators that fail to significantly comply with this schedule. These would include the levy of fines or in extreme cases where the failure is persistent and of a certain magnitude, the revocation of the spectrum grant would be invoked. For failing to meet rollout obligations by more than 50%, the maximum penalty will be the loss of the spectrum band.

5.4 Payment and Pricing

The price for spectrum has been determined via a complex benchmarking process. It must also be compared with what other operators using a different technology would pay for the right to build and operate an infrastructure capable of triple-play services, although a wireless system is far less intrusive in terms of road and land disruption. If each operator is allocated 25MHz worth of spectrum, then it is being proposed that, on an annual fee basis, this should be set at a value of **Lm 20000.**

In the auction process, if there is sufficient interest for this to take place, the Lm 20000 set price would be the price floor. The auction process, which is yet to be designed, may have a number of iterations that could result in an increase in the initial price depending on the value perceived by the auction participants.

The successful bidders will be bound to pay the amount raised via the auction process immediately upon termination of the process. Then on subsequent years, the annual fee of Lm 20000 for spectrum will be due.

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5.5 Proposed Timeframes for Allocation Process

Date	**Action**
June 2004	Issue of consultative document
2nd August 2004	Close of Consultation period
30th August 2004	Report on Consultation & Publication of Final Policy Position
6th September 2004	Call for expression of interest to operate an FWA network
17th September 2004	Close of call for expression of interest
27th September 2004	Announcement of Auction (if necessary)
1st January 2005	Proposed date of grant of spectrum bands to successful bidders

6 Summary

Fixed Wireless Access constitutes an important alternative for enabling the rollout of broadband infrastructure in Malta. The spectrum is available for multiple operators but caution has to be exercised in the number of bands that are made available to ensure market sustainability.

In view of this, it is being proposed that two bands are made available. One would be open to bids by all undertakings, while the other would be restricted to new entrants (i.e. undertakings that are not, at the time of the auction, authorised to operate an electronic communications network and infrastructure). This with the view to fostering competition and preventing market concentration or foreclosure by existing operators.

If demand for spectrum outstrips supply, an auction will be undertaken to determine the undertakings who are ultimately successful in securing a spectrum band. The minimum price for a band will be set at Lm 20000 in the first year, with that amount becoming due in subsequent years also.

Rollout obligations will be imposed in such a way as to ensure the timely and effective deployment of the FWA networks with sanctions being imposed for non-compliance. These will be reflected in the conditions of grant.

A rigorous timeline has also been proposed such that the allocation of spectrum takes place by the beginning of 2005.