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Spectrum: Getting the most out of a hugely valuable resource

How we can help

pwc

Introduction

The explosion of mobile data usage over the past few years has put significant strain on operator's existing spectrum resources.

In response to ever higher levels of demand for mobility and for high speed data services regulators and policy makers have switched their concern from the provision of basic voice access to expanding the provision of broadband through wireless technologies. The objective is the universal provision of these services including in remote areas with limited fixed infrastructure.

As a result, spectrum issues have moved up to the top of the agenda of the boardrooms of operators as well as those of telecoms regulators.

PwC has significant experience working for both operators and regulators on spectrum issues. We have assisted **regulators and governments** in:

- Developing a spectrum strategy and policy consistent with their long-term objectives
- Spectrum re-farming and re-allocation
- Developing a national broadband strategy and implementation plan
- Assessing potential competition issues
- Estimating possible demand for spectrum

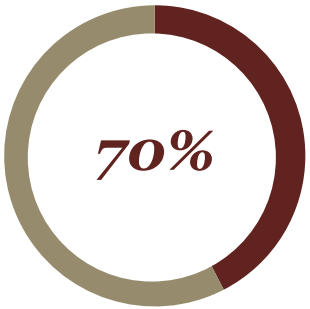
We have also advised **mobile operators** on:

- Spectrum demand forecasting
- Spectrum strategy
- Spectrum valuations
- auction/bidding support
- License renewal negotiations

Our professionals help clients navigate all types of spectrum matters. We are there when expert advice really matters.

We bring together international specialist expertise in spectrum and regulation with the knowledge of local markets

Our team bring together UK spectrum and regulatory experts and local professionals with a thorough knowledge of the local telecommunications market. As one of the largest professional services firms globally, PwC can mobilise people and industry experts with in-depth local knowledge in any region of the globe.

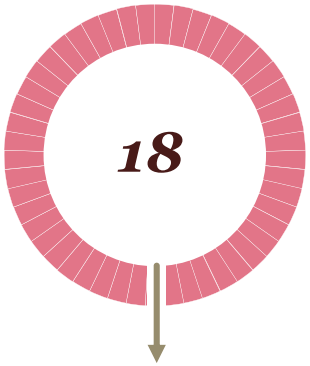


Our regular clients generate over **70%** of the telecoms sector worldwide

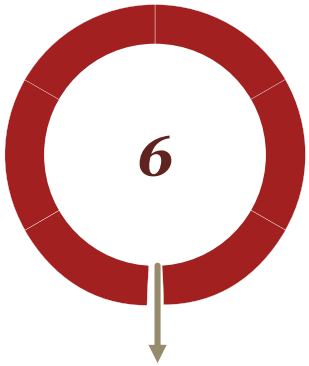
We have a global presence with offices in **158** countries worldwide

An example of where PwC UK has done telecoms work in recent

- Angola
- Brazil
- Cameroon
- Croatia
- India
- Indonesia
- Ireland
- Israel
- Jamaica
- Japan
- Jordan
- Kenya
- Malaysia
- New Zealand
- Nigeria
- Oman
- Pakistan
- Poland
- Portugal
- Qatar
- Rwanda
- Saudi Arabia
- Slovenia
- South Africa
- Tanzania
- The Gambia
- Turkey
- U.A. E
- United Kingdom
- Uganda
- U.S.A.
- Zambia

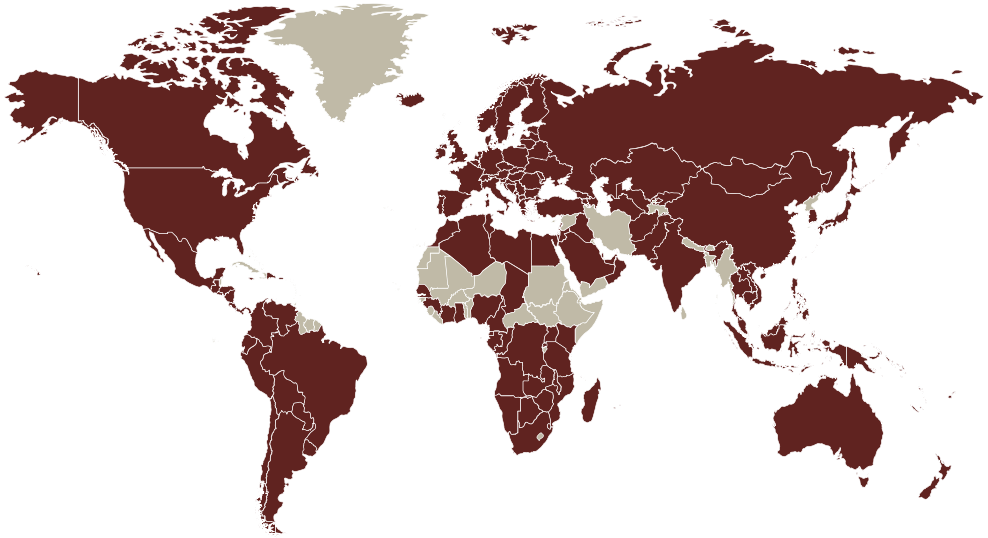


Our regular clients include **18** of the top **20** global telecoms players



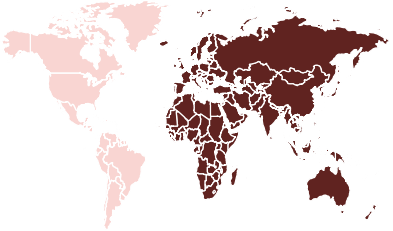
We have delivered spectrum related projects across **6** continents

Territories with local PwC presence

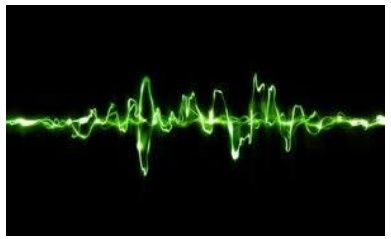


We have a track record in advising operators and regulators on spectrum and regulatory strategy

We have a strong track record of advising our clients at board level; communicating complex issues to equip decision makers with the insights they need



We have provided bid support across markets in 4 continents



We have worked with governments and regulators on licensing issues

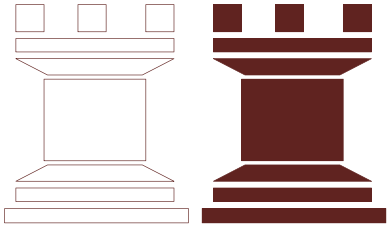
We have published relevant thought leadership on spectrum and telecoms issues

We have worked with a number of mobile operators in connection with spectrum valuations

We have worked with a number of mobile operators in connection with spectrum auctions

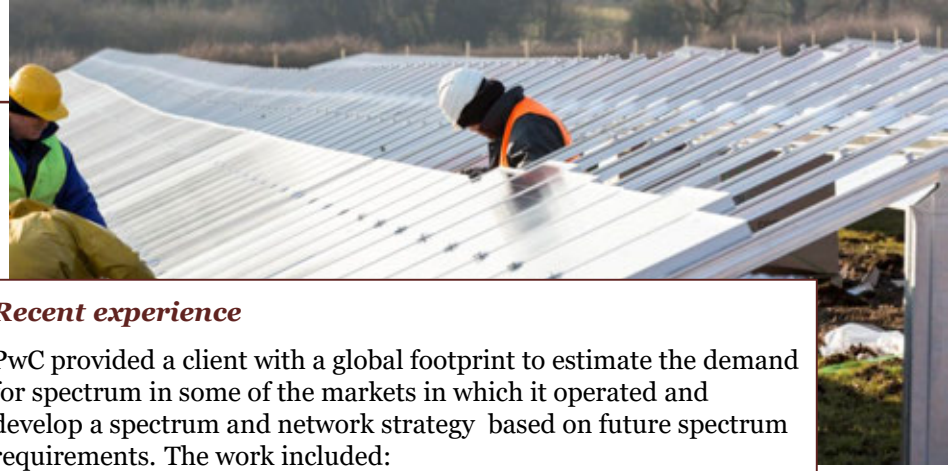
Technology, Media and Communications

We have also worked with global operators in strategy and business planning development



We have provided a range of strategic advice in connection with other regulatory and spectrum issues

Demand for spectrum



Given the constant change and evolution of the telecommunications sector spectrum demand estimation needs to take into account the trends in market demand (demand for data speeds and total download amounts) as well as the availability of new technologies and how existing and future networks would manage this additional traffic.

In this context it will be important to take into account the trade-offs between spectrum requirements and cell size, and hence the number of base stations to be built.

Thinking of spectrum management as a life cycle, rather than as discrete activities, is quickly becoming industry best practice

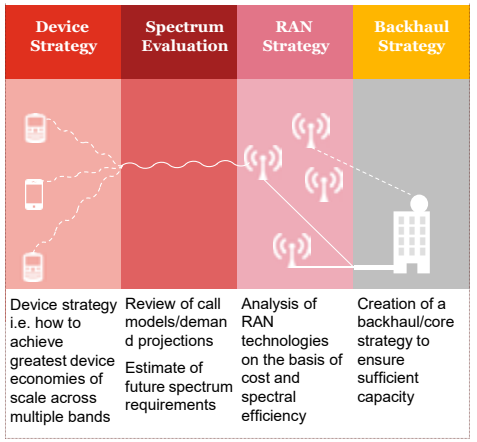
We help to:

- Forecast traffic demand for different services
- Assess the key developments that are likely to have an impact on the spectrum requirements in the near future (upcoming auctions, launch of additional technology, evolution of services, network configuration, etc.)
- Assess the impact of new technologies that increase the efficiency of spectrum use
- Use cost modelling to quantify the relationship between the amount of spectrum available and network costs

Recent experience

PwC provided a client with a global footprint to estimate the demand for spectrum in some of the markets in which it operated and develop a spectrum and network strategy based on future spectrum requirements. The work included:

- Network traffic demand model based on operator call and data traffic statistics in five different markets
- Device strategy to assist the operator in achieving the greatest device economies of scale across the multiple spectrum bands
- Network dimensioning, for both coverage and capacity, across multiple geotypes (urban, suburban and rural) using Hata, COST-231 and Erceg propagation models
- Review of the potential RAN technologies to ensure that the optimum cost/GB could be achieved based on demand
- Estimated the spectrum capacity in each of the operators 5 markets and the likelihood of spectrum exhaustion based on detailed demand projections
- Developed a backhaul transmission strategy to ensure sufficient capacity for future increases in data traffic.



Spectrum strategy

As a result of the increase in the use of wireless devices, coupled with the dwindling availability of additional spectrum, operators are increasingly under pressure to find new ways to optimise spectrum use.

The answer to providing a competitive service offering to consumers while reducing network costs is not always to acquire additional spectrum. Additional strategies may include, among others:

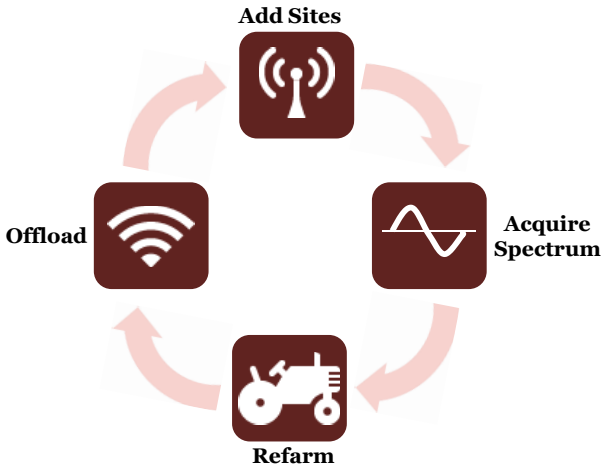
- Improve technology of exiting network
- Refarming/reallocating existing spectrum
- Offloading to other technologies (e.g. Wi-Fi)
- Expanding the network by adding sites

Recent experience

PwC helped the client identify key markets to focus on and developed an improved spectrum strategy to ensure that they remained competitive.

The scope of this assignment included:

- Analysis of our clients spectrum holdings, calculating the total spectral capacity in each market and producing demand projections to evaluate future spectral demand
- PwC identified which markets were likely to face spectrum exhaustion and developed a pragmatic strategy based on four key options
  - Acquisition of additional spectrum
  - Potential for Site Splitting?
  - Spectrum refarming to aid introduction of more efficient RAN technologies e.g. LTE
  - Offload traffic on to alternate networks e.g.WiFi



Spectrum valuation

Spectrum is an extremely valuable resource. Each country should endeavour to use it in the most efficient and productive manner.

Overpricing spectrum may result in non-allocation and/or limited investment. Selling spectrum right too cheaply may result in sub-optimal use. It is vital for regulators to strike the right balance and to price spectrum with a view to encouraging efficient usage.

For operators, on the other hand, it is important to develop an understanding of the value a given tranche or combination of spectrum would add to their business.

We have developed and applied tools to estimate the value of spectrum in terms of (i) its value to the operators as well as (ii) what would constitute a fair price from an economic efficiency point of view.

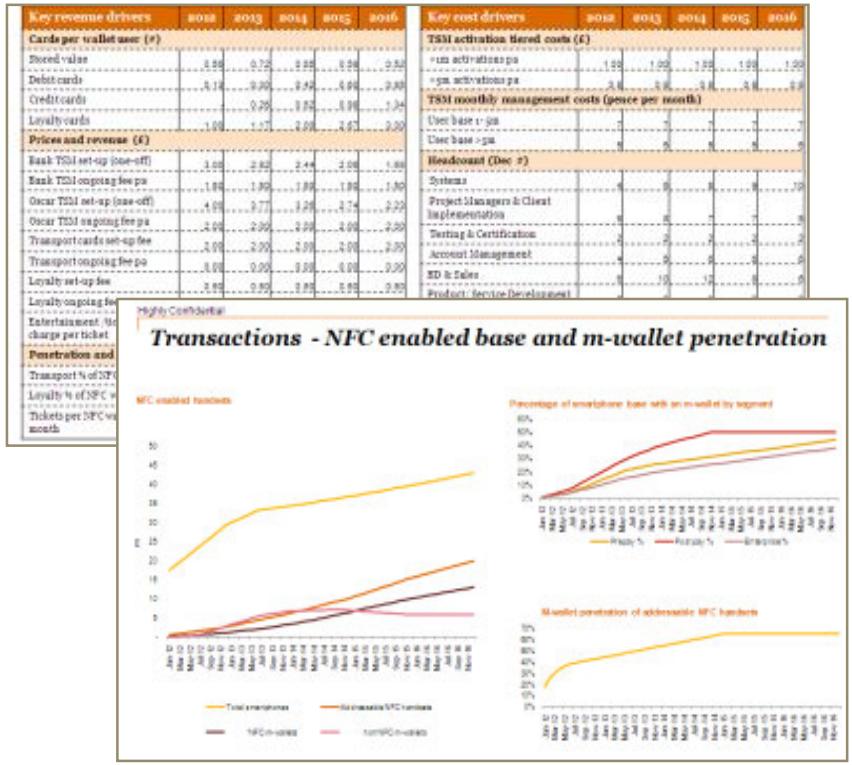
We have used a range of techniques including:

- Discounted cash flow estimation
- Benchmarking based on our proprietary database
- Econometric analysis to adjust for country specific differences

Recent experience

We recently carried out the valuation of the spectrum of an operator in West Africa as part of its licence renewal process. This involved not only its current spectrum holdings but also the spectrum it expected to acquire for the delivery of 3G services.

This project involved building a DCF model which would allow the estimation of the value of the spectrum under different scenarios. A benchmark and econometric analysis was also carried out to find alternate values for this spectrum.



Spectrum auction/bidding support

We also assist operators in setting out their bidding strategies for spectrum auctions by:

- Assistance responding to regulatory consultations
- Estimation of the potential value of the spectrum on offer
- Analysing the potential value of spectrum for other operators
- Running of auctions simulations in order to determine the optimal bidding strategy
- Bid support during the auction process

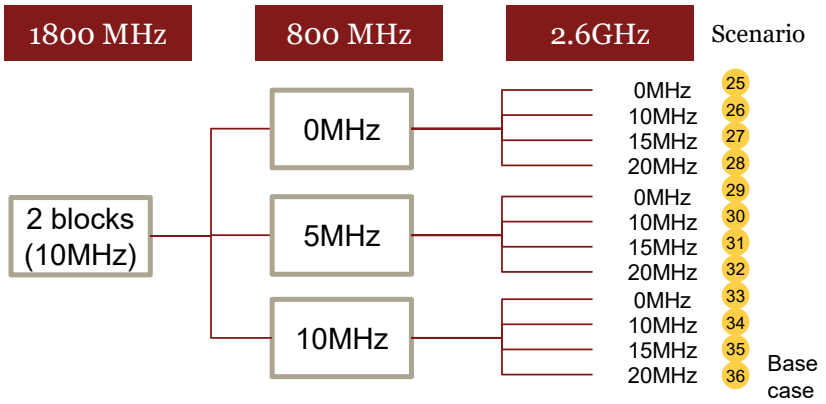
In order to determine the ideal bidding strategy we carry out an analysis that:

- Identifies current and likely future areas of spectrum shortage
- Assess the trade-offs between using different spectrum bands
- Identify the potential alternatives to spectrum acquisition

Recent experience

We assisted a European operator in the development of the bidding strategy for the 3G auctions (800MHz, 1800MHz and 2.6 GHz).

This included carrying out an estimation of the value to the operator of the different spectrum lots being made available in the auction as well as the potential value to its competitors. Auction simulations were then run in order to determine the optimal strategy.



Regulatory negotiations, licencing and licence renewal

PwC has significant experience supporting operators with negotiations with the regulator including licencing and licence renewals. Our work includes, among others:

- Support operators during regulatory consultation processes including support in drafting submissions to the regulator
- Finding evidence to help build the case for the operator's position
- Develop a negotiation and/or lobbying strategy
- Participating in meetings with the relevant regulator and/or government officials

Asses regulatory framework → **Analyse precedent** → **Agree licensing regime/ terms** → **Decide on spectrum to acquire**

Carry out spectrum valuation → **Elaborate bidding strategy** → **Make an offer** → **Carry out spectrum negotiations**

Recent experience

PwC recently supported an operator in the Middle East in the renewal of its spectrum licence.

PwC not only carried out a valuation of the spectrum held by the operator but it also developed the negotiation and lobbying strategy.

PwC also supported the operator in meetings with the regulator and other government authorities, putting forward arguments to defend their position.

Spectrum and competition issues

Being a scarce resource and a significant barrier to entry, competition issues can arise from the way in which spectrum is used and allocated.

Some regulators have sought to address this through the imposition of spectrum caps and/or through restrictions on the eligibility of bidders. Whilst some measures along these lines may be justified in some cases (e.g. where there is a danger of strategic accumulation of spectrum with a view to foreclosing other players), in other cases such measures may be overly onerous.

We have significant experience advising competition authorities and operators on competition issues. We have also acted as expert witnesses for different tribunals.

Recent experience

We have carried out market assessment for several Sub-Saharan African countries in which we did a review of the entire telecommunications sector. As part of this competition assessment we took into account the impact of barriers to entry to competition, including the current spectrum holdings by the existing operators.

When assessing the possible alternatives to deal with potential competition issues we explored the possibility of allowing more operators to come into the market, taking into account the availability of spectrum in the country.

Spectrum and sector policy

PwC can provide support to operators, government entities and regulators in the development of a Spectrum Policy to achieve the policy goals.

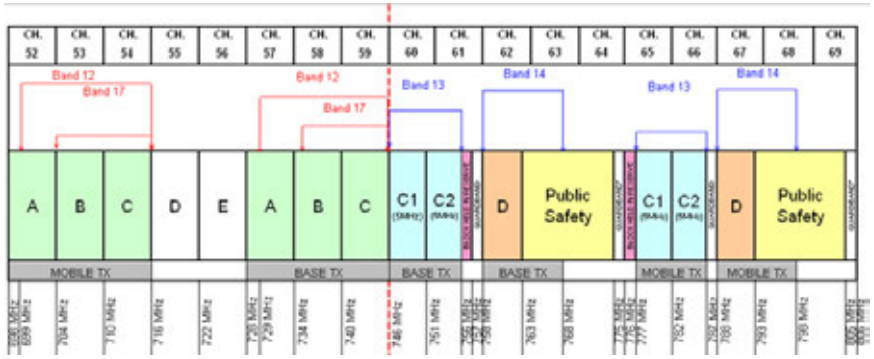
We help to:

- Determine the priorities in terms of spectrum use such as:
  - Deployment of rural broadband
  - Promotion of specific technologies
  - Increase competition
  - Incentivise the efficient use of the existing spectrum
- Advise on target structure of industry
- Develop target allocation of suitable spectrum
- Advise on spectrum re-farming (change of use) and re-allocation (amongst operators)
- Assess feasibility of implementation of specific policies, such as licence conditions, existing regulations and legislation, etc.
- Carry out benchmarking to determine common spectrum policies around the world
- Assess the potential impact of different policies
- Run consultations and industry workshops
- Drafting of policy documents
- Provide support on regulatory advocacy, drafting responses to consultations and other regulatory/policy discussions

Recent experience

PwC has advised a regulator in the Middle East in the spectrum strategy required to bring a fourth operator into the country. This included:

- Assess the need for the new operator to be able to provide 3G-only or 3G/GSM service and the spectrum needed as a result
- Assessing whether the new operator would need 900MHz spectrum to make it viable and, if so, determine how much needed to be reframed from the existing operators
- Define the strategy to make the existing operators yield part of their 900MHz spectrum voluntarily to make way for the new operator
- Determine the necessary spectrum allocations in the 1,800 MHz and 1,900/2,1000 MHz bands
- Determine the viability of a fifth operator in the future



Digital dividend

Around the world the switchover to digital TV is taking place. While some countries have completed the move, other countries are preparing for it, including setting up the logistics of switching existing TV sets to digital TV.

While the switchover has the potential to provide significant benefits, achieving a successful switchover is a complex task. Among others it should consider:

- Prospective allocation of the spectrum post-switchover
- Standard selection
- Process management (upgrading broadcasting equipment, information and education programs, replacement or upgrade of existing TVs, addressing needs of vulnerable people, etc.)
- Allocation of the freed up spectrum (allocation mechanism, pricing, duration, terms, etc.)

Recent experience

A TMT client needed to develop its spectrum strategy and investigate the feasibility of bidding for spectrum in the upcoming auction of 470-862MHz, the 'Digital Dividend'.

We carried out a detailed assessment of the client's current spectrum holdings and the spectrum requirement of potential services that it was envisaging launching in the future. This highlighted the potential gains from using existing spectrum more efficiently as well the future spectrum capacity demands of new services.

We explored the range of possible uses for the spectrum e.g. cellular and WiMAX communications services, mobile TV, and digital terrestrial broadcasting (high and standard definition) as well as potential bidders.

The PwC spectrum team in the UK

Alastair Macpherson
Partner

- Worked in the telecommunications industry for over 25 years working for operators, regulators and governments in over 45 countries.
- Leads PwC's Centre of Excellence in telecoms regulation. He specialises in the provision of regulatory, policy, economic and strategic advice to the telecoms sector.
- Assisted operators with all aspects of their regulatory obligations including separation remedies, interconnection and access pricing and costing, retail price controls, universal service and regulatory reporting.
- Worked extensively for mobile network operators and has led various projects which included examining the impact on network costs of different spectrum holdings and the introduction of mobile licenses for new operators.
- Acted as an expert in regulatory, competition and arbitration proceedings including the UK Competition Commission, Competition Appeals Tribunal, European Commission DG Competition and the London Court of International Arbitration

Simon Harris
Director - Valuations

- Successfully completed the CFA qualification and is a full member of the CFA Institute. He leads PwC's Technology, Media and Telecommunications Valuation team and has twelve years' experience valuing businesses and assets in those sectors.
- Reviewed valuations of four of the five UK mobile network operators and has a major focus on spectrum licence valuation – and has spoken at conferences on this topic and has written a paper on the subject titled 'Timing is Everything – Releasing the value of Spectrum'.
- Valued spectrum licences for a number of global players and also developed a spectrum licence valuation model for a global mobile network operator.
- Assessed the value of a 3G licence for a new market entrant in a Middle East market, assisted a mobile network operator in Europe with the valuation of wireless spectrum in order to assist them with their ongoing spectrum strategy and valued a WiMAX licence for an operator in the Australian market.

Daniel Jacobson
Spectrum regulation expert

- Provided support to a Middle Eastern operator in the process to renew its spectrum licence. This involved valuing the spectrum and setting out the negotiation strategy with the regulator
- Key role in negotiations between T-Mobile UK and UK Government and Ofcom, analysing various solutions to the Spectrum Liberalisation and re-allocation issue in UK. Lead author of T-Mobile's response to Ofcom's consultation on this issue.
- Responsible for preparing T-Mobile's papers and lobbying material concerning Ofcom's proposals for the Digital Dividend Spectrum.

Darren Shea
Network strategy expert

- Created a network evolution strategy to enable an operator to upgrade its network to 4G: a full business plan for a phased network upgrade from HSPA to HSPA+ to LTE which included RF network planning to avoid unnecessary over provisioning of the network. The RF dimensioning modelling used HATA, COST-231 and Ergcel planning models
- Darren developed the business and operating plan for a WiFi/WiMax mobile broadband city network for a new market entrant

PwC firms provide industry-focused assurance, tax and advisory services to enhance value for their clients. More than 161,000 people in 154 countries in firms across the PwC network share their thinking, experience and solutions to develop fresh perspectives and practical advice. See www.pwc.com for more information.

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