

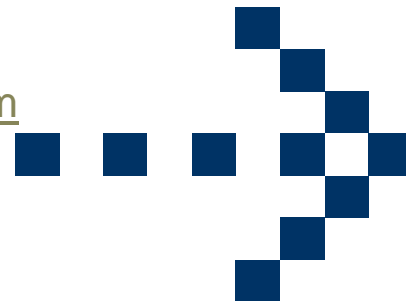
The pricing of radio spectrum: using incentives mechanisms to achieve efficiency

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Prepared for the ITU Workshop “Market mechanisms for
spectrum management”, Geneva, 22 and 23 January 2007

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January 2007

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Overview

- ⌘ Spectrum pricing
- ⌘ Policy background in the UK
- ⌘ Administered Incentive Prices (AIP): Theory
- ⌘ AIP: In practice
- ⌘ Smith-NERA method
- ⌘ AIP revenues in the UK
- ⌘ Concluding remarks

Pricing spectrum

- ❑ Traditionally spectrum has been:
 - ❑ Assigned free on a first come first served basis, or
 - ❑ Assigned at a charge to recover administrative costs, or
 - ❑ Assigned at an arbitrary price intended to raise revenue

- ❑ In the UK pricing incentives introduced since 1998
 - ❑ Pricing of spectrum raises around £160m per year

Policy background in the UK

- Independent Review of Radio Spectrum Management or 'Cave Review', March 2002:

Recommendation 7.9 of the review:

“Spectrum pricing should be applied at more realistic levels and more comprehensively across spectrum uses. Where spectrum pricing has already been implemented, and where there is evidence of continuing shortage of spectrum, then incentive prices should be set at the full opportunity cost level, rather than at the current 50 per cent of the levels derived from pricing models.”

AIP: Theory

- AIP are targeted at economic efficiency
- Economic efficiency has three dimensions:
 - Allocative efficiency (spectrum is allocated to uses and assigned to users in a way that best meets consumer interests)
 - Productive efficiency (spectrum is held by producers who are able to supply services at the lowest cost)
 - Dynamic efficiency (the holders of spectrum face the right incentives to innovate)
- In the absence of market determined prices for spectrum, AIP are a surrogate for missing markets
- AIP strictly aim at productive efficiency

AIP: In practice

- ⌘ Smith-NERA (1996) proposed a method (call it the 'Smith-NERA Method') for calculating opportunity costs making use of 'the least-cost alternative' – emphasising the opportunity cost of assigning more/less spectrum to a user
- ⌘ Method calculates willingness to pay for a marginal unit of spectrum
 - ⌘ For example, the marginal unit of spectrum for a cellular operator may be 2 x 2.4MHz (= 1 RF channel per sector in a 4 x 3 cluster)
 - ⌘ The least cost-alternative for a cellular operator is the lowest cost way to meet current demand at the current quality level by adding/subtracting a marginal unit of spectrum to/from the operator's existing spectrum holding
 - ⌘ This cost provides a figure for the marginal value of spectrum to the cellular operator
- ⌘ AIP do not apply where spectrum rights have been assigned by auction – though post-auction assignments may be inefficient

Smith-NERA Method: example

- ❑ Suppose:
 - ❑ 3 uses for spectrum: I, II and III
 - ❑ 3 different frequency bands: *a*, *b* and *c*
 - ❑ Administrative management has resulted in band *a* being allocated to use I, band *b* to use II and band *c* to use III

Smith-NERA Method

	Frequency bands			Alternative non-spectrum input
Uses	<i>a</i>	<i>b</i>	<i>c</i>	
I	100	75	0	0
II	35	60	30	0
III	10	10	15	5

Table 1

	Frequency bands			Alternative non-spectrum input
Uses	<i>A</i>	<i>b</i>	<i>c</i>	
I	90	70	0	0
II	38	70	32	0
III	10	10	15	5

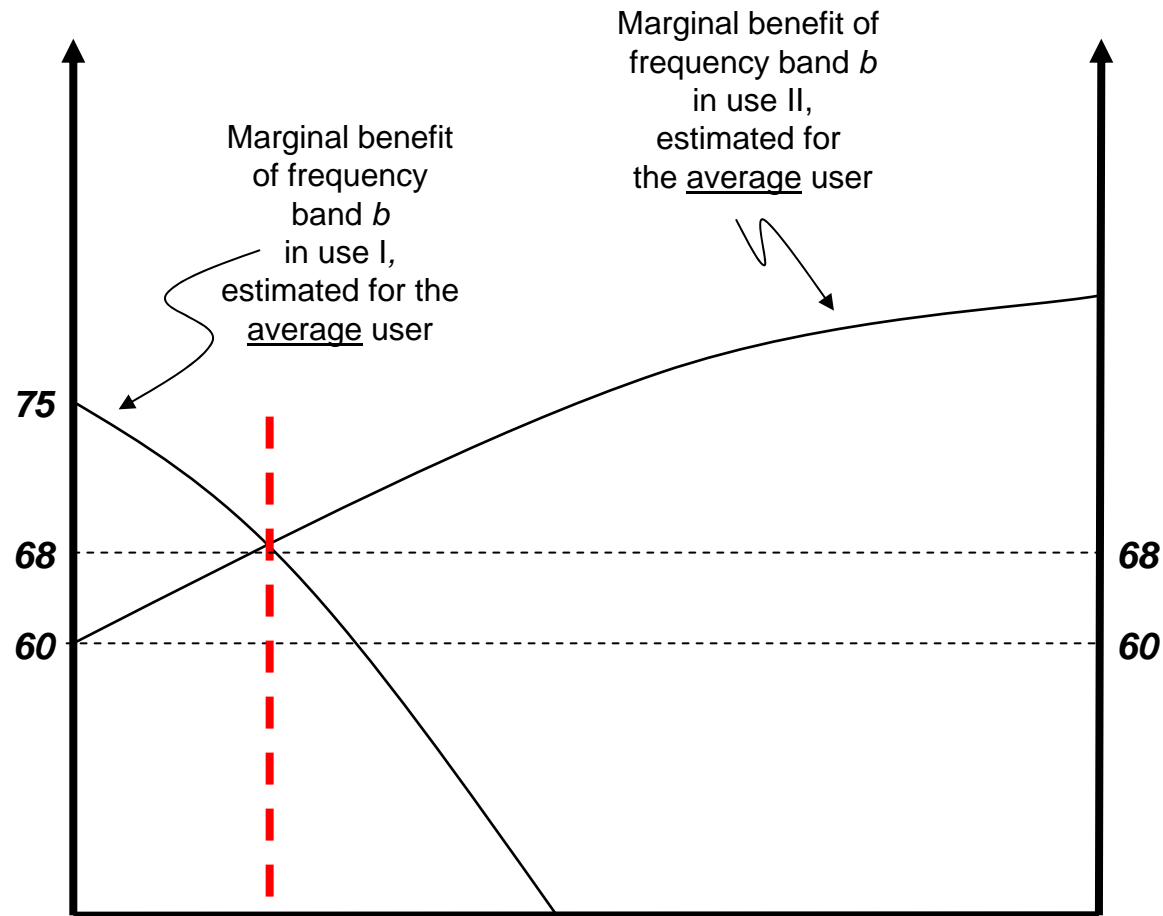
Table 2

Smith-NERA method

Uses	Frequency bands			Alternative non-spectrum input
	<i>a</i>	<i>b</i>	<i>c</i>	
I	87	68	0	0
II	36	68	25	0
III	12	12	25	4

Table 3

Efficient allocation of frequency band b



AIP revenues in the UK

AIP revenue raised by sector in the UK £000

Sector	2004/2005	2005/2006
1 Aeronautical	818	931
2 Amateur and Citizen's band	1,030	883
3 Broadcasting	2,454	4,001
4 Business Radio	15,187	11,838
5 Fixed Links	18,203	20,895
6 Maritime	1,723	2,031
7 Programme Making and Special Events	1,145	1,412
8 Public Wireless Networks	63,868	63,011
9 Science and technology	112	745
10 Satellite	928	974
11 Ministry of Defence	24,314	55,398
Total	<u>132,168</u>	<u>164,094</u>

Concluding remarks

- ❑ Suitability for AIP depends on:
 - ❑ Excess demand (existing and alternative uses)
 - ❑ Can spectrum be used for something else?
 - ❑ Are there policy or practical impediments?
- ❑ Apply to specific frequency bands and geographic areas as appropriate
- ❑ When AIP not appropriate, charges should be set to recover management costs
- ❑ AIP is a good method of introducing incentive based mechanisms for managing radio spectrum