Towards "Good Spectrum Citizenship": Some Possibly Useful Heresies

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We are big fans of the EU's framework for electronic communications. This framework is founded on bedrock principles of liberal market economics and distills "best practices" that developed piece-meal over decades, forming them into a coherent package. We especially applaud the policy of "regulating only where necessary" and in particular the policy of "licensing only where necessary" as expressed in the Authorisation Directive.

So it should not be a surprise to see how positively the European Commission's Terms of Reference for this study on the "collective use of spectrum" treats its subject – asking how the "commons" paradigm can be extended, "what technological development will enable a wider use of shared spectrum... concrete measures to exploit the benefits of the 'collective use' approach," etc. *Bravo!*

Many of you undoubtedly came to this meeting by train. When we take a long journey by train, we often have a choice of a private cabin, a shared cabin, or open seating without any cabins at all. Railroads know that most people will choose open seating to save money, so most of the seating they provide is in wagons without cabins. But the option of getting an exclusive space for the journey is available to those who want it and who are willing to pay more for it.

The analogy may be simplistic, but it might be useful to consider this approach in radio spectrum management. Traditionally, individual spectrum users are not free to choose whether they operate under a licensed or license exempt, exclusive or shared, primary or secondary regime because the regulator and the ITU have already made that choice for them. But when the Commission launched its WAPECS consultation in 2005 a survey of EU members found that "a wide range of frequency bands was identified for WAPECS, the majority being for licence-exempt operation".

A possibility of choice

Since both licensed and unlicensed bands are being considered for WAPECS – and for WiMAX, and for radio LANs in the 5 GHz band – and perhaps even for Ultra-Wideband – these are situations in which service providers have some possibility to choose among licensing regimes. These are opportunities where the Commission can see what happens when providers are offered a choice, and so better understand which regime is appropriate for various services under various conditions, from the users' perspective, and learn more about how heterogeneous mixes of spectrum rights within a service interact.

It has proven difficult for the Radio Spectrum Policy Group (RSPG) to determine when a given service should be licensed or license exempt. We think this is something that ought to be decided by the marketplace, and even by individual users, as it is on trains – although it might reduce spectrum utilisation efficiency somewhat and require some new techniques to enable users with different rights and restrictions to coexist. Of course, shared bands with primary and secondary users have dealt with these issues for decades – and found them workable.

We must also comment on the current study's

obligation to assess "the amount of spectrum to be made available for 'collective use' in the future."

Is licensing the norm?

Many people still have the habit of thinking of radio licensing as the norm, and exemption from licensing as a special case that must be justified by need. This is contrary to EU policy. At the risk of stating what is already well-known to this group, the Authorisation Directive says:

> "The granting of specific rights may continue to be necessary for the use of radio frequencies... [but] rights of use should not be restricted except where this is unavoidable in view of the scarcity of radio frequencies and the need to ensure the efficient use thereof."

In other words, licensing is the exception that must be justified by need, not license exemption. The question that should be asked is:-

*how much spectrum to allocate for **licensed** services?*

Is there a way to estimate the spectrum needs of all the services requiring the protection of a license? When one rephrases the question this way, one can see how unreasonable it is. Especially now that hybrid systems – combining licensed base stations with unlicensed handsets, as in GSM networks – are so widely deployed. Would you count the GSM bands as licensed or unlicensed? The licensing treatment of frequencies above 25GHz is also still being debated, and the outcome of that debate can shift the size of the allocation estimate by an enormous amount.

The auction incentive

Unfortunately, since licensed spectrum is increasingly awarded by auction, governments have a strong incentive to answer the question of how much licensed spectrum to make available with a simple "as much as possible." Even without auctions, administrative fees levied for licenses cover a large part – or even the entire – cost of operating a regulatory agency. So to extend the "commons" paradigm, the current study might recommend incentives for the allocation of spectrum for collective and license exempt use, to counterbalance the incentives which now reward licensed allocations.

The EC recently released a draft report on license exemption's impact on the funding of spectrum management. Summarising and analysing a recent survey of regulators in the EU member states, this report complements the study we're discussing. With regard to converting services from licensed to license exempt, the EC notes that:

> "only one risk was mentioned by respondents, while a long list of benefits could be drawn out of all the comments made. This stands in contrast with the current extent of licence exemption or with the relatively low number of administrations that intend to exempt further applications in the future."

Commission leadership

Part of the problem may be that the "long list of benefits"apply mainly to the market or to society at large, not to the regulator. Although license exemption was said to yield savings in staff time and a lightening of the workload, the loss of revenue from license fees apparently counteracts these benefits.

The ECC report also makes the important point that while regulators generally have positive experiences with license exemption, they are are not moving swiftly to de-license more bands, even though that seems to be called for by the EU's electronic communications framework. We think more Commission leadership is needed to drive this process forward. EC leadership would undoubtedly promote harmonisation, and the regulators say harmonisation helps them de-license.

Maritime mobile

So let me offer a specific suggestion:-

set a deadline for de-licensing the maritime mobile service throughout the EU.

Countries with laws foreclosing that option should move from individual licenses to class licenses or general authorisations by the deadline date.

You may know that last year Ofcom proposed

de-licensing ship radios in the UK, but found many users opposed to this, in part because they would still need a radio license when they left UK waters. However, ECC Report 83 points out that Denmark has been gradually de-licensing maritime radio since 1997, while Sweden plans to exempt the use of VHF by private boats this year, and the Netherlands plans to exempt some maritime mobile equipment in the near future. Australia, New Zealand and the US have already taken similar steps.

So here is a service where there is a limited risk of interference, there is already some uncoordinated movement toward de-licensing, and where de-licensing would clearly be more acceptable with a harmonised approach.

The issue of harmonisation

The ECC report also discusses the broader significance of harmonisation, revealing a strange schizophrenia: "Administrations are more likely to embark on exemption when a harmonised CEPT approach is taken," the report asserts. And yet numerous examples are cited of services that are being de-licensed without harmonisation.

My own feeling is that while harmonisation is desirable, it should not be a prerequisite for de-licensing. Countries have enough autonomy in spectrum use that they can exempt devices from licensing when they do not cause trans-border interference, even when they do not conform to the international table of frequency allocations, and even without international coordination.

The movement toward de-licensing is fragile enough that it should not be burdened with a *requirement* for EC-wide harmonisation. If the US had waited for regional harmonisation, the introduction of WiFi, Ultra Wideband, etc., might have been delayed indefinitely. Mexico did not officially de-license WiFi until last month.

George Soros has often pointed out that open free societies are more complicated than closed totalitarian ones. Therefore, time, effort, learning, strife, debate, money, creativity and work are needed to evolve a closed society into an open one. One cannot simply say, "go now and be free" and expect a sustainable political lifestyle to appear automatically.

Self-managing space

The same may be true in the radio spectrum. Simply de-licensing a band will not instantaneously produce a peaceful orderly commons filled with polite users causing no interference. Users need to learn how to self-manage their space, although it is tremendous advantage that radios are getting smart enough to handle some aspects of their operation on their own, from channel selection to power level settings.

Device-based and user-generated conventions, strategies and institutions must be cultivated in newly de-licensed bands, as they were in the licensed bands of "collective use" like amateur radio, aeronautical mobile, and so on. Associations of community networks in the WiFi band, and the many user-created websites with educational materials, directories, recommendations and discussions about license exempt equipment are early buds on this tree which facilitate the formation of sustainable commons.

Tiers of spectrum access rights

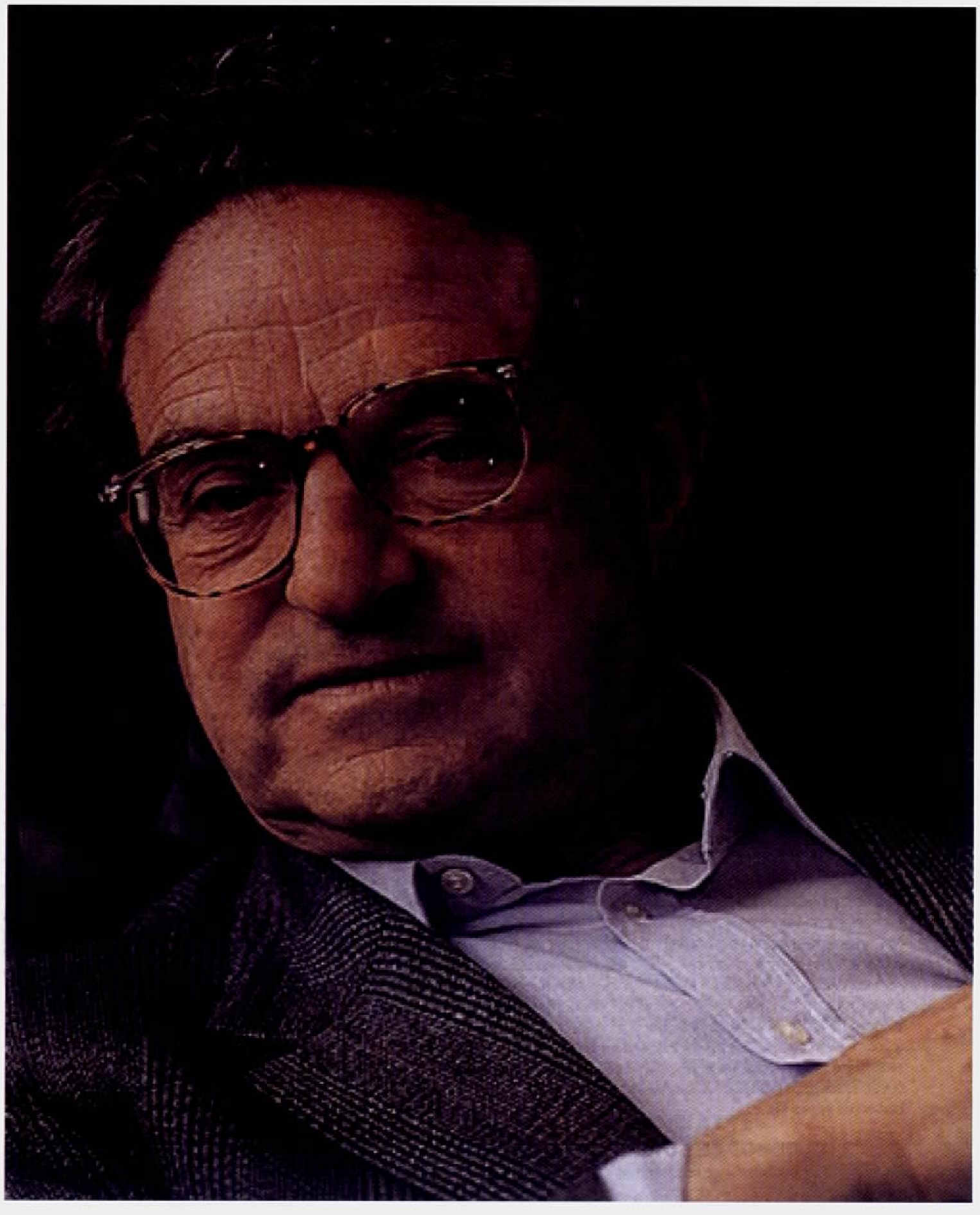
I would close by drawing your attention to some recent ideas from Kalle Kontson and Michael O'Hehir. In their presentation at this year's ISART symposium in Colorado, they outline a

> "regulatory model that rewards the implementation and deployment of spectrum-efficient technologies by offering incentives in the form of progressively expanded tiers of spectrum access rights in proportion to device performance."

The sharp distinction between licensed and license exempt (which is inflated by the "spectrum as property" model) would be replaced by a continuum of spectrum rights. Actually that has already occurred, but the link to device performance is not yet as direct as it is in Kontson and O'Hehir's proposal. Nevertheless spectrum access rights already come in many shades and degrees of freedom:

> License exempt bands open to a wide variety of applications (e.g. ISM)
>
> License exempt bands open only to one application

(cont.)



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(e.g. cordless phones)

License exempt bands open only to devices with mitigation technology (e.g. 5GHz)

License exempt bands where registration is required (high-powered RLANS in Japan)

Class-licensed bands (many countries)

"Light licensed" bands (e.g. in the UK)

Licensed bands accessible to large numbers of users by administrative fee

License bands accessible to a few users through competitive bidding

License bands open only to tested/certified operators.

In addition to helping us see what is already here, Kontson and O'Hehir provide a missing piece of the puzzle: where a transmitting device fits in the continuum of spectrum access rights could be based on a "scorecard" assessing the device's "spectrum citizenship." This scorecard would be a refinement of the existing processes of equipment testing and type approval. Instead of a simple binary judgment – "approved" or "not approved" – equipment could be graded by a "standard set of metrics and tools to assess the worthiness of individual devices to reap rewards for good spectrum behavior, and restrict bad behavior."

How the scorecard might work

Points might be awarded for spectral efficiency, resistance to interference, high data throughput, etc., while points might be subtracted for spurious emissions, lack of automatic transmit power control, the absence of interference mitigation techniques, etc. The net effect would be that higher scoring devices would enjoy more spectrum access rights. Devices falling below some minimum score would have no access rights at all.

A system that dynamically links device performance to spectrum access rights would be challenging to put into practice, particularly as it conflicts with the idea of awarding spectrum rights by auction, trade or payment. But it has its own market-like logic and seems consistent with the trend suggested by WAPECS, expanding existing procedures into a more general and flexible framework. There would be no clash of award systems if this was implemented in the license exempt bands, which need incentives for "good spectrum citizenship" anyway.

OTHER PERSPECTIVES

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"Policing the Spectrum Commons" by Phil Weiser and Dale Hatfield, *Fordham Law Review*, Volume 74, pages 101-132 (2005) – available online at http://ssrn.com/abstract=704741

"Spectrum licensing and spectrum commons - where to draw the line" by Martin Cave and William Webb, presented at "Wireless Communication Policies and Politics: a Global Perspective", an Annenberg Research Network workshop at the University of Southern California, 8-9 October 2004 – available online at http://arnic.info/WirelessWorkshop/ Spectrum-Licensing_Cave.pdf

"Study into Mixed Sharing - Converged Solutions (Final Report)" by A. P. Hulbert and Z. Dobrosavljevic, Roke Manor Research Ltd., Report No. 72/04/R/107/U (April 2004) – available online at http://www.ofcom.org.uk/research/technology/other/sss/ay4587.pdf.

"Unlicensed and Unshackled: A Joint OSP-OET White Paper on Unlicensed Devices and Their Regulatory Issues" by Kenneth R. Carter, Ahmed Lahjouji and Neal McNeil, FCC Office of Strategic Planning and Policy Analysis, Working Paper number 39 (May 2003) – available online at http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-234741A1.pdf