



TECHNOLOGY
POLICY
INSTITUTE

**Comments filed with the Federal Communications Commission
on Technological Advisory Council Spectrum Policy Recommendations**

January 2018

Thomas M. Lenard

**Comments of Thomas M. Lenard, Ph.D.
Senior Fellow and President Emeritus
Technology Policy Institute**

**On
Federal Communications Commission's Technological Advisory Council
Spectrum Policy Recommendations
ET Docket No. 17-340
January 31, 2018**

The Federal Communications Commission's (FCC) Office of Engineering and Technology has requested comments on a series of spectrum policy recommendations proposed by the FCC's Technological Advisory Council (TAC) "to address the increasing challenges of efficient and fair allocation of spectrum in congested RF [radio frequency] environments, and in particular, the challenges of finding a balance between the rights and responsibilities of transmitters and receivers."¹ According to the Notice, "The TAC believes that adoption of these principles...could be useful in helping to improve the compatibility of services that operate under [existing or] new spectrum allocations."

Using the limited amount of spectrum efficiently has always been important for both the economy and consumers. It is now increasingly important with the introduction of new uses and emerging technologies such as the Internet of Things. The FCC has made important progress in improving the efficiency of spectrum use with a more market-based spectrum-allocation system. The flexibility of a market-based system is particularly advantageous when different uses and technologies operate in close proximity to each other and when there is demand for spectrum for new uses.

The central problem in the management of spectrum is interference, which the TAC policy recommendations are designed to address. It is important to note, however, that while mitigating interference and its effects in real time is a technological issue, truly dealing with the problem in a longer-term, more robust way requires thinking about it as an economics and incentives problem.² We would expect a flexible, market-based system to provide the best incentives to

¹ <https://ecfsapi.fcc.gov/file/120168266117/DA-17-1165A1.pdf>

² Ronald Coase, William H. Meckling & Jora Minasian, Problems of Radio Frequency Allocation, Rand, September 1995, available at <https://www.rand.org/content/dam/rand/pubs/drafts/2008/DRU1219.pdf>

address interference problems in a cost-effective manner and to promote efficient use of the spectrum.³

These comments discuss the TAC recommendations in light of these criteria and are divided into three parts:

- Defining the goal of spectrum policy.
- Establishing initial interference limits.
- Modifying interference limits.

Spectrum Policy Goal: Maximizing Spectrum Value

Spectrum policy should be designed to maximize the value or net social benefits of spectrum use. This involves minimizing the sum of all relevant costs (including opportunity costs) associated with interference, including the costs of interference, interference abatement and interference coordination/enforcement.⁴

Ideally, spectrum rights-holders would work out interference problems without any government or other regulatory involvement. That kind of market-based transaction will almost always yield the highest net benefits.

Although not stated in those terms, the TAC's spectrum policy recommendations generally appear to be guided by a cost-benefit balancing framework that would minimize interference-related costs. The principles recognize that as a general rule imposing conditions only on transmitters is unlikely to yield the highest net benefits, but instead will require actions by both transmitting and receiving services. It would be inefficient, for example, to require transmitters to undertake costly actions when less costly actions on the part of receivers could achieve the same result. Consumers would likely end up paying these additional costs.

Principles #1 and #4-#6 reflect this focus on the shared role of transmitters and receivers. The actions required may include investments in equipment or changes in location or behavior. We

³ For a discussion of some of the issues discussed here, see Digital Age Communications Act, Report from the Working Group on New Spectrum Policy, Release 1.0, Thomas M. Lenard and Lawrence J. White, Co-Chairs, The Progress & Freedom Foundation, March 2006, available at <http://www.pff.org/issues-pubs/books/060309dacaspectrum1.0.pdf>

⁴ See Lenard and White, p. 8. The Working Group Report notes that "By including opportunity costs we thereby incorporate the appropriate social goal with respect to spectrum management more broadly conceived, which should be to maximize net social benefits."

would expect this to be the result under a flexible, market-based system, where both parties would have incentives to minimize costs and negotiate to ameliorate interference problems in a cost-efficient way.

In some instances, however, the TAC principles are worded in ways that may not be consistent with overall cost-minimization. For example, should systems use techniques to mitigate degradation from interference *at all* layers of the stack (principle #5) regardless of cost? Should transmitters *minimize* transmitted energy outside their frequencies (principle #6), again regardless of cost?

Maximizing spectrum value also implies that it will not be optimal to mitigate all instances of interference. For example, reducing interference to zero everywhere will likely not be optimal, because at the margin the costs of doing so would be high while the benefits would be low. Similarly, the benefits will not realistically outweigh the costs of mitigating service degradation from exceptional events. This is reflected in principal #3.

Establishing Initial Interference Limits

Principles #8 and #9 address the issue of establishing initial interference limits. Initial interference limits should be based on the best estimate of the limits that would be cost-minimizing. Identifying these limits is difficult, however, since new services and technologies will likely be introduced after these initial limits are established.

According to the Coase Theorem, if transaction costs are low and there are no significant asymmetric information problems, then initial interference limits are less important, because the parties will be able to negotiate changes that will move toward the cost-minimizing outcome. These two conditions may not hold in many situations involving spectrum. Therefore, the initial limits matter and the Commission should gather the best information available to set those limits, including a quantitative analysis of interactions between services, to the extent they are known (principle #9). This quantitative analysis should include an assessment of both the probability and consequences of harmful interference.⁵

⁵ The FCC should recognize, however, that there may be diminishing returns to “exactitude” in defining the relevant rights. See discussion in Thomas W. Hazlett and Sarah Oh, Exactitude in Defining Rights: Radio Spectrum and the “Harmful Interference” Conundrum, 28 Berkeley Tech. L.J. (2013). Available at: <http://scholarship.law.berkeley.edu/btlj/vol28/iss1/6>

Modifying Interference Limits

Even if the initial limits succeed in approximating the cost-minimizing interference-mitigation strategy, new technologies and services are likely to change that strategy. The parties themselves will have the best information and be in the best position to negotiate changes, including changes in the relative responsibilities of transmitters and receivers. A flexible, market-based incentive structure will be most conducive to such negotiations.⁶ Moreover, a market-based system will incentivize technology firms to design better transmitters and receivers that mitigate interference harms.

Concluding Comments

The TAC's spectrum policy recommendations are for the most part consistent with the goal of minimizing the sum of all relevant interference and interference mitigation costs. The Commission should recognize, however, that this is ultimately an economic problem – one with important technological constraints and considerations. This should explicitly be recognized as the Commission moves forward with its recommendations. Most importantly, the Commission should recognize that dealing with interference efficiently requires the right incentives, which are provided by a flexible, market-based system.

⁶ See Lenard and White, and Hazlett and Oh.