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Hidden Costs Of The Wireless Broadband Lifestyle: Comparing Consumer Protections In The United States, Canada, And The European Union

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HIDDEN COSTS OF THE WIRELESS BROADBAND LIFESTYLE: COMPARING CONSUMER PROTECTIONS IN THE UNITED STATES, CANADA, AND THE EUROPEAN UNION

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I. INTRODUCTION

[1] Spurred by relatively inexpensive and widely available retail equipment and increased residential Internet penetration, consumer demand for more wireless broadband options continues at a rapid rate.[1] Now, with consumers increasingly looking for mobile Internet interconnectivity over greater distances and with greater flexibility, technology companies are pushing the next generation of wireless broadband technologies with the promise of freeing consumers from location-based Internet access.[2] These newer technologies can provide robust video and audio capabilities, such as digital television, on-demand video, and VoIP on a variety of digital devices.[3] Yet, the rise of wireless

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[1] *Cf.* CTIA, The Wireless Association: Wireless Quick Facts, http://www.ctia.org/advocacy/research/index.cfm/AID/10323 (last visited Nov. 20, 2008) (showing the increase in wireless penetration from 1995 to 2008).

[2] *See* LINDA K. MOORE, CONG. RESEARCH SERV., WIRELESS TECHNOLOGY AND SPECTRUM DEMAND: ADVANCED WIRELESS SERVICES 3 (2006); Wireless Innovation Alliance, http://www.wirelessinnovationalliance.com (last visited Nov. 20, 2008) (discussing a coalition of technology and public interest groups focused on expanding wireless broadband access).

[3] *Id.* VoIP refers to Voice over Internet Protocol. *Id.* at 3.

broadband networks and the roll-out of new technologies pose new public policy and regulatory challenges for spectrum management.[4] If these issues are not addressed, rather than yielding ultimately beneficial private, public, and commercial uses of spectrum, the result could be detrimental frequency interference with negative impacts on equipment functionality, the integrity and reliability of networks, and the quality of service for spectrum-dependent commercial services.[5]

[2] To address some of these issues in the United States, the Federal Communications Commission (FCC) established the Wireless Broadband Access Task Force in 2004 to assess and recommend how to increase wireless broadband penetration in cost-effective and efficient ways.[6] The Task Force concluded that universal wireless broadband access will depend on unlicensed mass-market consumer devices and greater spectrum access for such devices.[7] The Task Force recommended that the FCC: (a) continue and expand spectrum access by unlicensed devices; (b) consider increased power limits by unlicensed devices to permit greater range from Internet access points; (c) promote voluntary industry cooperation to mitigate potential interference among consumer devices; and (d) work closely with industry to address intentional regulatory violations that cause detrimental interference.[8] Most consumers and technology groups support the Task Force's recommendations because increased spectrum access could foster market competition and thus

[4] *See* Memorandum on the Spectrum Policy for the 21st Century, 1 PUB. PAPERS 605 (May 29, 2003) ("The existing legal and policy framework for spectrum management has not kept pace with the dramatic changes in technology and spectrum use.").
[5] *Cf.* Michael K. Powell, Chairman, Fed. Commc'ns Comm'n, Remarks at the Silicon Flatirons Telecommunications Program at the University of Colorado at Boulder: Broadband Migration III: New Directions in Wireless Policy (Oct. 30, 2002), *available at* http://www.fcc.gov/Speeches/Powell/2002/spmkp212.html (discussing changes in the role of interference in spectrum policy).
[6] *See* Press Release, Fed. Commc'ns Comm'n, FCC Chairman Michael K. Powell Announces Formation of Wireless Broadband Access Task Force (May 5, 2004); Press Release, Fed. Commc'ns Comm'n, Wireless Broadband Access Task Force Seeks Public Comment on Issues Related to Commission's Wireless Broadband Policies (May 5, 2004).
[7] *See* WIRELESS BROADBAND ACCESS TASK FORCE, FED. COMMC'NS COMM'N, CONNECTED & ON THE GO: BROADBAND GOES WIRELESS 5-8 (2005) (calling for "innovative" regulatory approaches).
[8] *Id.* at 5-6.

promote innovative, low-cost, and high-speed wireless communications and consumer equipment options.[9]

[3] In action consistent with the Task Force's recommendation to increase spectrum access for wireless broadband devices, the FCC voted unanimously on November 4, 2008 to allow "new, sophisticated" unlicensed devices to operate on a shared, secondary basis in unused broadcasting spectrum.[10] The unused spectrum, commonly referred to as "white spaces," will become available upon the transition to digital television scheduled to occur on February 17, 2009.[11] The ruling allows for fixed and mobile wireless broadband devices for consumers and businesses.[12] To address the concerns of commercial operators that such shared-spectrum devices may cause interference with licensed services,[13] the ruling imposes stricter regulatory approval requirements for shared-spectrum devices.[14] All devices must have geolocation ability, spectrum-

[9] *See* Comments of The New America Foundation Consumers Union et al. at 2, 25-26, *In re* Unlicensed Operation in the TV Broadcast Bands, Additional Spectrum for Unlicensed Devices Below 900 MHz and in the 3 GHz Band, ET Docket Nos. 04-186, 02-380 (Apr. 17, 2003) (endorsing the allocation of more unlicensed spectrum and sharing in licensed spectrum).

[10] *In re* Unlicensed Operation in the TV Broadcast Bands, Additional Spectrum for Unlicensed Devices Below 900 MHz and in the 3 GHz Band, ET Docket Nos. 04-186, 02-380, (Nov. 14, 2008), *available at* http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-08-260A1.pdf; *see also* Press Release, Fed. Commc'ns Comm'n, FCC Adopts Rules for Unlicensed Use of Television White Spaces (Nov. 4, 2008), *available at* http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-286566A1.pdf (announcing the unanimous adoption of the Second Report and Order FCC 08-260)

[11] *See* Telecommunications Act of 1996, Pub. L. No. 104-104, 110 Stat. 56 (1996), *amended by* Deficit Reduction Act of 2005, Pub. L. No. 109-171, 120 Stat. 4 (2006) (to be codified at 47 U.S.C. § 309) (implementing FCC rules to require digital terrestrial broadcasts by February 17, 2009).

[12] *See* Press Release, Fed. Commc'ns Comm'n, *supra* note 10.

[13] Leaders of News Corp., Disney, CBS, and NBC Universal wrote to the FCC Chairman in 2007 to recommend that unlicensed mobile devices should not be allowed in the digital television band due to their potential to cause harmful interference, including possible "permanent damage" to licensed services. *See, e.g.*, John Eggerton, *Network Chiefs Oppose Mobile Unlicensed Devices*: *Big Four Heads Write FCC Chairman Martin*, BROADCASTING & CABLE, Oct. 10, 2007, *available at* http://www.broadcastingcable.com/article/CA6488840.html?industryid=47171&q=Network+Chiefs+Oppose.

[14] *See* Press Release, Fed. Commc'ns Comm'n, *supra* note 10.

sensing technology to find available spectrum, and Internet access to a centralized database of incumbent licensees to determine which spectrum may be used by the unlicensed device at that location.[15] The FCC will test and certify devices in the laboratory.[16] For devices relying solely on spectrum-sensing technologies, the FCC will test the devices in both the laboratory and real-world settings.[17] If an approved device causes harmful interference once on the market, the FCC asserts that it will act promptly to remove such equipment from the market and will require the responsible parties to remedy any interference.[18]

[4] Because legal enforcement to halt interference relies on individual consumers ceasing to operate the devices, commercial operators worry that after-the-fact enforcement to protect licensed services from interference could prove time-consuming and inadequate, particularly if the offending technology is on portable devices or becomes widespread in the marketplace.[19] Although the ruling asserts a right of FCC enforcement action in the event of harmful interference, it does not guarantee compensation to licensees or consumers of licensed services for outages or degraded signal reception caused by offending unlicensed devices. The ruling is also silent on consumer remedies, such as the right to compensation, product return, or product exchange, should the unlicensed

[15] *See id.*
[16] *See id.*
[17] *See id.*
[18] *See id.*
[19] *See* Joint Comments in Support of "Emergency Request" at 5, *In re* Unlicensed Operation in the TV Broadcast Bands, Additional Spectrum for Unlicensed Devices Below 900 MHz and in the 3 GHz Band, ET Docket Nos. 04-186, 02-380 (Oct. 24, 2008), *available at* http://www.nab.org/xert/corpcomm/pressrel/releases/102408_StateBroadcasters_WhiteSpaces.pdf ("The Congress, the FCC, and very likely state and local law enforcement, will be inundated with potentially millions of complaints from members of the public looking for the causes of interference to their television sets."); Reply Comments of MSTV and NAB to OET Measurement Report on DTV Receiver Interference Rejection Capabilities at 4, *In re* Unlicensed Operation in the TV Broadcast Bands, Additional Spectrum for Unlicensed Devices Below 900 MHz and in the 3 GHz Band, ET Docket Nos. 04-186, 02-380 (May 15, 2007), *available at* http://www.nab.org/AM/Template.cfm?Section=Filings1&CONTENTID=8338&TEMPLATE=/CM/ContentDisplay.cfm (arguing that interference from portable devices that can be operated in and relocated to any geographical area will be difficult, if not nearly impossible, to identify and to resolve the interference).

devices cause harmful interference that renders them unlawful to operate.
[5] This article explores the impact on U.S. consumers when wireless broadband devices interfere with or suffer interference from licensed and unlicensed devices. This interference causes degraded device performance and makes devices unlawful to operate according to the FCC regulations. First, the article briefly discusses the regulation of wireless consumer devices in the United States. Specifically, the article addresses consumer notification requirements regarding rights of use and states that consumers have a duty to eliminate harmful interference. The article also describes consumer rights and possible remedies when interference renders equipment unusable or unlawful to operate.

[6] Next, the article compares the U.S. approach with the regulatory approaches of Canada and the European Union, which rely on similar technical interference standards. The article then discusses how interference from multiple wireless technologies and black-market devices can impact consumer protections. The article explores the advantages and limitations of possible market, regulatory, and legislative mechanisms designed to enhance consumer protection. The article asserts that consumers will benefit from a continued light regulatory approach for unlicensed wireless devices. Yet, emergent wireless broadband technologies for consumer devices are challenging traditional notions of spectrum management and how and when consumers may use unlicensed devices. Thus, the article recommends greater consumer advocacy in the regulatory process to ensure adequate consideration of consumer rights, duties, and remedies when a wireless broadband device creates or suffers from interference.

II. REGULATION OF WIRELESS CONSUMER DEVICES IN THE UNITED STATES

[7] Unlicensed wireless consumer devices sold in the United States are permitted under 47 C.F.R. § 15, subject to the rules and minimum technical performance specifications issued by the FCC.[20] Consumers

[20] *See* 47 C.F.R. § 15.1 (2008); c*f.* U.S. DEP'T OF COMMERCE, NAT'L TELECOMMS. & INFO. ADMIN., MANUAL OF REGULATIONS AND PROCEDURES FOR FEDERAL RADIO FREQUENCY MANAGEMENT annex K (2008) (applying similar regulations and standards

have been able to use unlicensed devices since 1934 due to a government spectrum policy to "generally encourage the larger and more effective use of radio in the public interest" through flexible regulation of standards-based devices.[21] Assigned licenses can limit marketplace innovation, competition, and efficient spectrum usage by creating barriers to entry and conferring legal rights to a limited number of market actors.[22] Because of these limiting possibilities, the FCC has pursued a parallel public-interest policy to allow non-exclusive and secondary spectrum access for unlicensed devices, provided that these devices operate within permissible frequencies and power rates. The FCC also prohibits such devices from causing harmful interference to licensed services and devices.[23] This unlicensed regulatory approach supports shared usage and increases spectrum access for multiple market actors. This approach, however, does not recognize consumer rights to legal protections against interference while operating unlicensed devices.

[8] In light of public policy goals that promote marketplace flexibility and due to the absence of legal mechanisms to protect consumers from unwanted interference, this section examines four aspects of the regulatory principles and duties of the consumer under 47 C.F.R. § 15: (a) the regulatory approach of devices for use in the residential environment; (b) labeling and consumer notification requirements; (c) the consumer's duty to eliminate harmful interference; and (d) the remedies available to consumers when equipment becomes unusable or unlawful to operate.

A. REGULATION OF UNLICENSED WIRELESS DEVICES IN RESIDENTIAL ENVIRONMENTS

[9] License-exempt devices, referred to as unlicensed devices throughout, are regulated under 47 C.F.R. § 15, which sets forth relevant administrative, technical, and marketing rules.[24] Nearly all consumer,

as Part 15 when the federal government devices interfere with federal uses of the spectrum).

[21] 47 U.S.C. § 303(g) (2000).

[22] *See* Harold Feld, *From Third Class Citizen to First Among Equals: Rethinking the Place of Unlicensed Spectrum in the FCC Hierarchy*, 15 COMMLAW CONSPECTUS 53, 85-86 (2006).

[23] *See* 47 C.F.R. §§ 15.5(b); *see also id.* §§ 15.205, 15.209.

[24] *See id.* § 15.1(a) (describing the scope of FCC regulations).

retail wireless devices in the United States are regulated under 47 C.F.R. § 15 and thus do not require licensing.[25] But in order to market or sell unlicensed wireless devices in the United States, manufacturers must show that devices comply with minimal performance standards established under 47 C.F.R. § 15.[26] Unlicensed equipment includes intentional, unintentional, and incidental radio-frequency radiators.[27] Many wireless broadband technologies are designed to emit radio frequency energy; therefore, "unlicensed devices" will be used throughout this article to refer primarily to intentional radiators.[28]

[10] The FCC regulations located at 47 C.F.R. § 15 prioritize the management of interference. The regulations achieve this objective by dividing equipment into two major categories with different interference standards: non-residential Class A and residential Class B equipment.[29] Unlicensed devices designed for use in residential environments[30] must comply with interference standards under the FCC regulations.[31] This policy decision reflects two presumptions. First, residential devices likely will be located closer together, which increases the risk of interference. Second, manufacturers of low-cost, mass-market consumer devices lack sufficient competitive incentives to include interference abatement beyond the minimum regulatory limits.[32] Accordingly, 47 C.F.R. § 15 defines permissible frequency bands, restricts device power limits, and specifies minimum operating performance standards.[33] Manufacturers are responsible for complying with 47 C.F.R. § 15 verification or certification

[25] *See id.* § 15.1; *id.* § 15.3 (defining the devices regulated under Part 15).
[26] *See id.* § 15.1(c) (requiring manufacturers of devices to comply with the administrative and technical provisions of 47 C.F.R. § 15 before marketing the devices).
[27] *See id*. § 15.1(a).
[28] *See id*. § 15.3(n)-(o), (z).
[29] *See id*. § 15.3(h)-(i).
[30] *See id.* § 15.3(i).
[31] *See id*. § 15.209.
[32] *See, e.g.*, Notice of Proposed Rulemaking, *In re* 1998 Biennial Regulatory Review – Conducted Emissions Limits Below 30 MHz for Equipment Regulated Under Parts 15 and 18 of the Commission's Rules, ET Docket No. 98-80 (Oct. 13, 1999), *available at* http://www.fcc.gov/Bureaus/Engineering_Technology/Notices/1999/fcc99296.txt (supporting continued regulation of unlicensed devices through a standards-based approach).
[33] *See* 47 C.F.R. §§ 15.202, 15.247; *see also id.* § 15.247 (discussing performance rules relevant to wireless local area networks).

requirements (depending on the type of device as specified in the regulations) before marketing the equipment to consumers.[34] This light regulatory approach to the use of spectrum and devices aims to minimize regulatory bureaucracy, thereby creating incentives for technological innovation and encouraging market actors to negotiate efficient uses of shared spectrum.[35]

B. MANDATORY LABELING AND CONSUMER NOTIFICATION REQUIREMENTS

[11] For residential consumer devices, the FCC regulations impose four major mandatory labeling and notification requirements on manufacturers.[36] For most devices, the FCC's first requirement instructs manufacturers to place a label on the device in a "conspicuous location," indicating that it complies with 47 C.F.R. § 15.[37] The label may be either a textual statement—"This device complies with Part 15 of the FCC Rules"[38]—or, if the device is too small, an FCC-defined graphical identifier.[39] Manufacturers are required to provide compliance information on the external product packaging only when the required textual statement is not provided on the device or in the owner's manual.[40] Thus, the requirements permit manufacturers to provide compliance information to the consumer inside the product packaging and after the point of sale.

[12] Second, manufacturers must notify consumers in writing of their limited rights when operating an unlicensed device.[41] The required

[34] *See id*. § 15.1.
[35] *See* Kathleen Q. Abernathy, *My View from the Doorstep of FCC Change*, 54 FED. COMM. L.J. 199, 205 (2002) (highlighting market-based advantages and consumer benefits under the FCC's regulatory approach to 47 C.F.R. § 15).
[36] *See* 47 C.F.R. § 15.19.
[37] *Id*. § 15.19(a)(1). *See also id.* § 15.19(b)(1).
[38] *Id*. § 15.19(a)(3). *Compare id., with id.* § 15.19(b)(1)-(4) (requiring a permanent label, text, and the graphical identifier devices subject to Declaration of Conformity approval but allowing some text to be placed in the owner's manual if the device is too small).
[39] *Id*. § 15.19(a)(5).
[40] The labeling information must be placed on the product, or, if that is impracticable, in the instruction manual or on the device's container. *See id.* Compliance labels must be "readily visible" to the consumer at the time of purchase for devices subject to Declaration of Conformity approval by the FCC. *See id.* § 15.19 (b)(1)-(4).
[41] *See id*. § 15.19(a)(3), (a)(5).

statement must affirm that the device complies with 47 C.F.R. § 15 and that operation is subject to two conditions: "(1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation."[42] Logistically, this notification must be provided in one of three ways: (1) on the device; (2) in a "prominent location in the instruction manual" supplied to the consumer; or (3) "on the container in which the device is marketed."[43] Accordingly, manufacturers may provide pre-sale notification on the external product packaging,[44] but, in practice, they generally provide post-sale notification inside the packaging, typically in the owner's manual.[45] The regulations allow the owner's manual to be included as a printed booklet, on a digital media disk, or on a manufacturer's website.[46] In 2004, the FCC explained that online access to manuals "will provide increased flexibility to manufacturers, result in cost savings to the industry and could enhance access to the disabled community because computers could 'read' information to the user or magnify it for easier viewing."[47]

[13] Third, consumers must be informed in the owner's manual that any modification to the unlicensed device voids regulatory compliance and may preclude lawful use.[48] The regulations do not require this notification to appear on the label.[49] In practice, the caution against device modification by the consumer generally appears on the same page or in the same section in the owner's manual as the regulatory compliance statement and statements regarding the prohibition of harmful interference

[42] *Id*. § 15.19(a)(3); *cf. id.* § 15.19(a)(1) (requiring that "receivers associated with the operation of a licensed radio service" provide notice to consumers that the operation "does not cause harmful interference").
[43] *Id.* § 15.19(a)(3), (a)(5).
[44] *See id.* § 15.19(a)(5).
[45] *See, e.g.*, Wii Operations Manual, *available at* http://www.nintendo.com/consumer/downloads/WiiOpMn_setup.pdf.
[46] 47 C.F.R. § 15.21 (allowing manufacturers to provide information to the user through "computer disk or over the Internet").
[47] Review of Part 15 and Other Parts of the Commission's Rules, 19 F.C.C.R. 22311, 22312 (2004).
[48] *See* 47 C.F.R. § 15.21.
[49] *See id.*; *see also id*. § 15.19(a)(5) (enumerating specific requirements for consumer notification).

and risks of interference.[50] Fourth, manufacturers must inform consumers of the recommended steps to take to correct interference.[51] This requirement is discussed below, within the description of self-correction as a potential remedy for consumers.[52] Thus, 47 C.F.R. § 15 requires manufacturers to provide compliance information on the device when possible and additional information in the owner's manual, including a warning of potential interference with other devices, a statement to warn against unauthorized modifications, and a list of recommended steps to correct interference.

C. DUTY OF CONSUMER TO ELIMINATE HARMFUL INTERFERENCE AND TO ACCEPT ANY INTERFERENCE

[14] Pursuant to required labeling language, consumers may operate an unlicensed wireless broadband device as long as it "accept[s] any interference received, including interference that may cause undesired operation" and does not cause "harmful interference."[53] These critical device limitations are sufficient to warrant special regulatory attention to facilitate consumer awareness, as reflected in the requirement that manufacturers must include this notice on the device when possible or in the owner's manual.[54] Notably, the standard does not impose an absolute prohibition on causing *interference*; rather, it prohibits "*harmful interference*."[55] While manufacturers are not required to provide clarification to consumers, the FCC regulations define "harmful interference" as "[a]ny emission, radiation or induction that endangers the functioning of a radio navigation service or of other safety services or seriously degrades, obstructs or repeatedly interrupts a

[50] *See, e.g.*, iGo Stowaway Bluetooth Keyboard Owner's Manual, *available at* http://corporate.igo.com/support/Download%20Support/PPC/En/om/Stowaway%20Bluetooth%20for%20PPC%20Owner%20Manual_US.pdf; Yamaha mLan Expansion Board Owner's Manual, *available at* http://www2.yamaha.co.jp/manual/pdf/emi/english/synth/mLAN16E2_en_om_a0.pdf.
[51] 47 C.F.R. § 15.105(b).
[52] *See infra* Part II.D.
[53] 47 C.F.R. § 15.19(a)(3).
[54] *See id.* § 15.19(a)(5).
[55] *See id.* § 15.19(3); *see also* R. Paul Margie, *Can You Hear Me Now? Getting Better Reception from the FCC's Spectrum Policy*, 2004 STAN. TECH. L. REV. 5, ¶ 25 (2004) (emphasis added).

radiocommunications service operating in accordance with this chapter."[56] The FCC regulations do not define what constitutes "degrades," "obstructs," or "repeatedly interferes."[57] Further, no court has addressed whether the definition is overly vague.[58] Thus, consumers face both incomplete information and a vague legal standard when determining whether a device is causing harmful interference. Further, consumers must accept *any* interference, including harmful interference, as a condition of operating devices.[59] Interference could cause degradation of performance, connectivity, or range of the wireless broadband equipment.[60]

[15] Two duties of the consumer when operating an unlicensed device—to avoid causing harmful interference and to accept any interference—are augmented by two additional constraints given in the regulations but not mandated in the labeling and consumer notification requirements. First, under the general requirements for operation, the consumer does not receive or possess a "vested or recognizable right to continued use of any given frequency" on the basis of device certification or use.[61] Being the owner of the device does not guarantee the consumer exclusive, continuous, or ongoing usage of that wireless device at a specific frequency.[62] Although a consumer may operate an unlicensed wireless device for weeks, months, or years, this operation does not confer a first-in-time "vested" right to continue to operate the device if another licensed or unlicensed device begins to operate at that frequency.[63] Applying a property rights framework to the spectrum, the FCC essentially grants the consumer permissive usage rights but does not allow the consumer to claim a per se right to spectrum possession or access simply because the unlicensed wireless device complies with 47 C.F.R. § 15.[64] This lack of

[56] 47 C.F.R. § 15.3(m).
[57] *See* Margie, *supra* note 55, at ¶ 27.
[58] *See id.* ¶ 28 (stating that the FCC and courts have not expanded on the "harmful interference" standard).
[59] *See* 47 C.F.R. § 15.19(a)(3).
[60] *See* Margie, *supra* note 55, ¶ 1.
[61] 47 C.F.R. § 15.5(a).
[62] *See id.*
[63] *See id.* § 15.5(a)-(c).
[64] *Cf.* Thomas W. Hazlett, *Assigning Property Rights to Radio Spectrum Users: Why Did FCC License Auctions Take 67 Years?*, 41 J.L. & Econ. 529, 532 n.8 (1998) (reviewing spectrum rights in the context of a radio spectrum).

affirmative spectrum rights assures that licensees are protected from harmful interference and permits shared spectrum access by allowing multiple unlicensed devices within a specific frequency band.

[16] The second requirement of 47 C.F.R. § 15 relevant to consumers, but not mandated by the labeling or notification requirements, is related to enforcement authority. Specifically, the regulations clarify who is authorized to require consumers to cease device operations and under what circumstances they may exercise such authority.[65] For most consumer devices, the current mandatory labeling and notification requirements neither explicitly instruct the consumer to cease operation if the device causes harmful interference, nor identify the appropriate authority to enforce the duty of non-harmful interference.[66] The information merely warns the consumer that operation of the device is "subject to" a restriction against harmful interference; thus, the duty to cease operations in the event of harmful interference is only implicit.[67] Further, there is no required language to inform the consumer what constitutes sufficient notice of harmful interference.[68] As a result, a consumer may be uncertain whether notification by a neighbor or other non-FCC entity constitutes sufficient notification to require the consumer to cease operation when such a party asserts that the consumer's device is causing harmful interference.

[17] The regulations, however, clearly indicate that the appropriate authority is the FCC: "[t]he operator of a radio frequency device shall be required to cease operating the device upon notification by a Commission representative that the device is causing harmful interference. Operation shall not resume until the condition causing the harmful interference has been corrected."[69] The operator of an interfering device is not required to stop using the device until notified by the FCC; thus, enforcement issues are raised when other parties provide notice of interference.[70]

[18] Thus, consumers have a legal duty to cease operation of an

[65] *See* 47 C.F.R. § 15.5(c).
[66] *See id.* §§ 15.5(c), 15.19(a)(3).
[67] *See id.* § 15.19(a)(3).
[68] *See id.*
[69] *Id.* § 15.5(c).
[70] *See id.*

unlicensed wireless device when it causes harmful interference to licensed devices and services or as otherwise specified by the FCC.[71] In addition, unlicensed devices must accept interference from other licensed and unlicensed devices, even if the device becomes inoperable.[72] Although a manufacturer may certify and sell a device as compliant with 47 C.F.R. § 15, the consumer ultimately bears the burden of eliminating harmful interference or resolving any interference that impairs the proper functioning of the device.[73] Accordingly, even if an unlicensed device meets technical compliance standards, the regulations require interference correction on an individual consumer basis.[74]

D. CONSUMER REMEDIES WHEN UNLICENSED WIRELESS DEVICES CAUSE INTERFERENCE

[19] Should a consumer's unlicensed wireless device create harmful interference, the consumer faces five options: (1) self-correction, (2) product return, (3) warranty, (4) after-market resale or recycling, and (5) consumer complaint to the FCC. The first option, mentioned explicitly in the owner's manual for a wireless broadband device, encourages the consumer to attempt to correct the interference by: a) reorienting the device or its receiving antenna; b) increasing the distance between the interfering device and other devices; c) connecting the equipment into a different circuit than that used by the receiver; or d) consulting the dealer or an experienced technician for further assistance.[75] These FCC recommendations aim to reduce harmful interference so that unlicensed devices comply with the regulations and are permissible to operate.[76] Self-correction of interference, however, merely provides conventional procedures for prescriptive relief rather than an external remedy.[77] If the device causes harmful interference and the consumer is unable to mitigate the interference, the consumer must stop using the device.[78]

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[71] *See id.*
[72] *Id.* § 15.5(b).
[73] *See id.* § 15.5(c).
[74] *See id.*
[75] *See id.* § 15.105(b) (providing explicit text for inclusion in device owner's manuals related to how consumers may abate or attempt to correct interference).
[76] *See id.*
[77] *See id.*
[78] *See id.* § 15.5(c).

[20] The second option is to return the device to the place of purchase for a refund or replacement. This option may be less desirable because it requires that consumer product returns adhere to state law, retailer terms, specified timeframes for return, and possible restocking fees.[79] This remedy is of limited value to a consumer who discovers harmful interference after the window of product return has passed and is unable to resolve interference by following the FCC recommendations.

[21] The third option assumes that an express or implied product warranty may protect the consumer. This option, however, is unlikely to cover product return or replacement where there is no material or workmanship defect that renders the device noncompliant with 47 C.F.R. § 15.[80] Consider a consumer's device that is causing interference and is no longer lawful to operate under the regulations. So long as the interfering device meets minimal technical performance standards and is certified by the FCC for sale and use in the marketplace, it is unlikely that the FCC will require the dealer or manufacturer to provide a remedy to the consumer. Rather, the duty is on the consumer, as the operator of the device, to correct and resolve any interference problems.[81]

[22] The FCC regulations foresee potential interference risks, explicitly warn the consumer that operation of the device is subject to interference constraints, and ultimately shift the financial burden of device operation from manufacturers to consumers.[82] Therefore, in the absence of an FCC-mandated remedy for product recalls, the manufacturer has no duty and little incentive to provide consumers with a refund for a compliant device that receives or causes harmful interference on an isolated basis.[83] For a warranty claim, the consumer would need to demonstrate that the product

[79] *See, e.g.*, Apple Sales and Refunds Policy, *available at* http://store.apple.com/Catalog/US/Images/salespoliciesEdIndividual.html.
[80] *See* U.C.C. § 2-719 (1998) (remedies are available to the buyer for non-conforming goods).
[81] *See* 47 C.F.R. § 15.5(c).
[82] *See id.* § 15.19(a)(3); *see also id.* § 15.5(c) (warning that an operator must cease operating a device that causes harmful interference).
[83] *See* James T. O'Reilly, *Product Recalls & the Third Restatement: Consumers Lose Twice from Defects in Products and in the Restatement Itself*, 33 U. MEM. L. REV. 883, 884, 888-91 (2003) (discussing the processes and incentives for product recalls, including the lack of incentives for manufacturers to compensate consumers in the absence of government-mandated recalls).

violates the technical performance standards of device certification and is consequently no longer compliant with 47 C.F.R. § 15.[84] This policy reflects the expectation that consumers are in the appropriate position to absorb the marketplace costs arising from occasional interference through additional purchases of non-interfering wireless devices. This expectation is based on the following assumptions: 1) the FCC's light regulatory approach benefits consumers by lowering overall costs for unlicensed wireless devices; and 2) better replacement technologies will gradually provide broader interference correction in the marketplace, fuel competition, encourage innovation, and generate more product options.

[23] Pursuant to the fourth option, after-market resale, the consumer may sell the device with the hope of recouping costs.[85] The presumption is that another consumer would be subject to different environmental factors, such as a further distance from incompatible devices, which would allow the device to operate legally and correctly. This option may provide only partial financial compensation. Further, resale shifts the risks to another consumer rather than to other market actors who may be better able to absorb the costs.[86] These actors could include manufacturers, retailers, and technology companies that provide wireless broadband services through unlicensed devices.

[24] Consumers' fifth option is to file a complaint with the FCC, seeking investigation and enforcement action against the party operating the interfering device. Because the owner of an unlicensed device must accept the risks of any interference, the owner will not likely be successful unless the interfering device is an unlawful black-market device. Consumers can also file complaints with the FCC against manufacturers or retailers, but consumers will likely receive little to no redress.[87]

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[84] See, e.g., Motorola, Software License, Warranty, Safety, and Regulatory Information Broadband Home Networking Products, *available at* http://broadband.motorola.com/consumers/products/BR700/downloads/BR700_Warranty.pdf.

[85] *See, e.g.*, eBay: Sell, http://sell.ebay.com/sell (last visited Nov. 19, 2008).

[86] *See, e.g.*, BLUETOOTH MUSIC GATEWAY USER GUIDE 12, *available at* http://www.kyocerawireless.com/support/pdf/wireless-music-gateway-user-guide.pdf.

[87] U.S. GOV'T ACCOUNTABILITY OFFICE, TELECOMMUNICATIONS: FCC HAS MADE SOME PROGRESS IN THE MANAGEMENT OF ITS ENFORCEMENT PROGRAM BUT FACES LIMITATIONS, AND ADDITIONAL ACTIONS ARE NEEDED 1 (2008)**,** *available at*

According to a U.S. Government Accountability Office Report on FCC enforcement measures released in February 2008, the FCC does a poor job of resolving consumer complaints and rarely pursues enforcement actions.[88] FCC Field Office officials in the Spectrum Enforcement Division, which has oversight of unlicensed consumer wireless devices, assert that the majority of investigations do not lead to enforcement action because FCC rules were not violated.[89] Yet, when tracking consumer complaints, the FCC's internal database frequently omits the outcome or the reason why the complaint was closed.[90]

[25] As of 2004, FCC enforcement letters no longer recommend that consumers contact manufacturers to request their voluntary cooperation when seeking relief.[91] The current letters include a reminder to the consumer that they must uphold their duty to correct harmful interference.[92] The 2004 revisions also added a warning to the consumer that failure to correct the problem or cease using the device may result in an FCC violation and fine.[93]

[26] Thus, contractual, marketplace, and regulatory enforcement remedies

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http://www.gao.gov/new.items/d08125.pdf [hereinafter U.S. GOV'T ACCOUNTABILITY OFFICE REPORT].

[88] *See id.* at 7, 21.

[89] *See id.* at 34.

[90] *Id.*

[91] *Compare*, *e.g.*, FCC Enforcement Letters (Dec. 27, 2004), http://www.arrl.org/tis/info/HTML/ plc/FCC_enforcement/part-15/alarm-12-24-04.html (omitting any reference to manufacturers and consistent with other letters since 2004), *with* Letter from Sharon Bowers, Deputy Chief, Consumer & Governmental Affairs Bureau, to Keith F. Higginbotham (June 2, 2003), http://www.arrl.org/tis/info/HTML/plc/FCC_enforcement/part-15/cordless-speakerphone-03-06-02.html ("Manufacturers will often bear some of this responsibility as a courtesy to their customers. We encourage the parties and manufacturers involved to voluntarily resolve this matter without FCC intervention.").

[92] *See* FCC Enforcement Letters (Dec. 27, 2004), http://www.arrl.org/tis/info/HTML/plc/FCC_enforcement/part-15/alarm-12-24-04.html.

[93] *See*, *e.g.*, FCC Enforcement Letters (Jan. 30, 2007), http://www.arrl.org/tis/info/HTML/plc/ FCC_enforcement/part-15/unknown-device-07-01-30.html (last visited Nov. 20, 2008) ("While the FCC has confidence that most people are able to resolve these issues voluntarily, the FCC wants to make you aware that this unresolved problem may be a violation of FCC rules and could result in a monetary forfeiture (fine) for each occurrence.").

may provide protections for consumers when a device becomes inoperable. Although pragmatic, the protections are largely limited. The remedies reflect public policy choices as to who should bear the risks and costs of technological innovation. To date, the public policy strategy prioritizes interference prevention through device certification, regulatory oversight, and the channeling of financial risks to the consumer.[94] The strategy has proven successful thus far because innovative consumer electronics at bargain basement prices make it reasonably inexpensive for consumers to replace interfering devices with newer technologies. New technologies, however, may challenge this cost-based presumption. The increasingly sophisticated and complex components of emergent technologies and the convergence of technologies may result in higher-priced devices. Part IV of this article discusses the channeling of financial risks to consumers in greater detail and analyzes its relation to emergent technologies and the proliferation of black-market devices. Part V discusses whether to modify underlying public policy and regulatory approaches that channel financial risks to consumers.

III. REGULATION OF WIRELESS CONSUMER DEVICE REGULATION IN CANADA AND THE EUROPEAN UNION

[27] This section compares the U.S. approach to consumers' rights and responsibilities when operating wireless broadband devices with the regulatory approaches of Canada and the European Union. A comparison of the U.S. approach with these jurisdictions is beneficial because each has adopted, with some modifications, international standards under the auspices of the International Electrotechnical Commission[95] that are similar to the domestic standards imposed by 47 C.F.R. § 15.[96] The EU

[94] *See* MANASI DESHPANDE & DOUGLAS W. ELMENDORF, AN ECONOMIC STRATEGY FOR INVESTING IN AMERICA'S INFRASTRUCTURE 31-32 (2008), *available at* http://www.brookings.edu/~/media/Files/rc/papers/2008/07_infrastructure_elmendorf/07_infrastructurestrat_elmendorf.pdf (encouraging more flexibility in the FCC's policy of interference prevention).

[95] *See* International Electrotechnical Commission: Members of the IEC, http://www.iec.ch/dyn/www/f?p=102:5:0::::FSP_LANG_ID:25

[96] *See, e.g.*, Manual for Dell Wireless LAN Adapter: Model TM1100PC, *available at* http://support.euro.dell.com/support/edocs/network/079nk/declare.htm (featuring similar compliance statements that reference the limitation or prevention of interference: 47 C.F.R. § 15 for the United States; Radio Standards Specifications RSS-210 for Canada; and the European Telecommunications Standard ETS 300.328).

and Canadian regulatory approaches and consumer protections differ from those in the United States in several specific ways. The EU and Canadian approaches purport different definitions for what constitutes a "residential" environment. They also permit different amounts and types of marketing of non-residential equipment to residential consumers, labeling and consumer notification requirements, and threshold standards for interference. All three jurisdictions, however, lack legal protections for consumers whose devices become inoperable or unlawful due to harmful interference after the permissible time period to return a product for a refund has passed.

A. MARKETING INDUSTRIAL DEVICES TO CONSUMERS FOR USE IN RESIDENTIAL ENVIRONMENTS

[28] Device regulations vary slightly across jurisdictions based on whether the consumer intends to use the device in a residential or industrial location, what constitutes a "residential" environment, and when companies may market certain technologies to consumers. The regulation of devices for residential environments has become increasingly important and complicated as lower equipment costs make commercial-grade wireless technologies more attractive to home consumers, neighborhood groups, and municipalities, and as mobile wireless devices allow consumers high-speed broadband access from locations outside the home.[97] The U.S. regulatory approach focuses on managing interference and divides permissible marketing activities into two categories: consumer devices and all other devices (based on the presumption of use in residential or non-residential locations).[98] This approach prohibits manufacturers from marketing industrial-grade devices to U.S. consumers but does not preclude commercial clients from purchasing or using consumer-grade devices.[99]

[29] The European Union similarly distinguishes between consumer and

[97] *See, e.g.*, Vivato Indoor & Outdoor Wi-Fi Base Stations, *available at* http://www.vivato.net/downloads/VP12001210%20Datasheet.pdf (advertising an unlicensed Class B wireless modem for use indoors or mounted on the building's exterior for connectivity outdoors).
[98] *See* 47 C.F.R. § 15.3(h)-(i) (2008).
[99] *See id.* § 2.803; *see also id.* §§ 15.101(a), 15.107, 15.109 (listing the devices and their authorization, frequency, and radiation emission requirements).

industrial devices for regulatory purposes but imposes no marketing prohibitions.[100] For example, the European Union neither requires demonstration of device compliance before marketing to consumers nor precludes the marketing of industrial devices for residential purposes.[101] Rather, the consumer is warned that the device may cause radio interference in a residential environment, which may lead to restricted use of the device.[102] Thus, EU consumers are allowed to purchase and operate industrial wireless devices that are more likely to create interference. Accordingly, EU consumers assume the increased risk of purchasing non-residential devices that may become impermissible to operate. In addition, the EU regulatory approach does not preclude consumers from using commercial-grade devices when in a non-residential environment.[103] Thus, the EU approach recognizes a regulatory distinction between industrial devices and consumer devices but, unlike the United States, it does not impose marketing restrictions to preclude sales to consumers.

B. MANDATORY DEVICE LABELING AND CONSUMER NOTIFICATION

[30] The labeling and consumer notification requirements in the European Union and Canada illustrate two approaches: (a) mandatory labeling and consumer notification including required notification of *general* interference risks, and (b) mandatory device labeling for compliance with required notification of *specific* interference risks. Pursuant to the first approach, the European Union uses mandatory labeling and consumer notification requirements similar to the FCC approach.[104] Manufacturers

[100] *See generally* Council Directive 2004/108, 2004 O.J. (L 390) 24 (EC) (regulating electromagnetic compatibility of equipment); Council Directive 93/68, 1993 O.J. (L 220) 1 (EC) (describing the restriction or prohibition measures of device marketing where noncompliance continues).

[101] *See* Council Directive 2004/108, *supra note* 100, art. 4.

[102] *See* Council Directive 2004/108, *supra* note 100, art. 9(4) ("Apparatus for which compliance with the protection requirements is not ensured in residential areas shall be accompanied by a clear indication of this restriction of use, where appropriate also on the packaging.").

[103] *See* Council Directive 2004/108, *supra* note 100, art. 4.

[104] *See* Council Directive 2004/108, *supra* note 100, art. 9 (requiring apparatus identification and instructions). *See generally* EUROPEAN COMM'N, GUIDE TO THE IMPLEMENTATION OF DIRECTIVES BASED ON THE NEW APPROACH AND THE GLOBAL APPROACH 44-46 (2000), *available at* http://ec.europa.eu/enterprise/newapproach/legislation/guide/document/1999_1282_en.pd

are required to include text or a graphical mark on the device to indicate that the product complies with all applicable minimum performance requirements adopted by standardization bodies,[105] as consistent with European Community directives.[106] The European Community also requires consumer notification related to interference if the product may cause interference in a domestic environment and places the burden on the consumer to correct the interference.[107] Thus, U.S. and EU consumers receive information, even if limited and generally post-sale, on device conformity with minimal performance standards and a general duty of the consumer to prevent and correct harmful interference.

[31] The second approach, illustrated by Canada's regulatory approach, similarly requires manufacturers to test and label devices as compliant with technical performance standards.[108] Canada, however, is increasingly requiring manufacturers to provide more detailed interference notification for certain types of devices.[109] This notification requirement may be met solely through the inclusion of text in the owner's manual.[110] For example, a wireless local-area-network device operating in specific frequencies must provide a warning in the owner's manual that the device may only be used indoors and that operating in specified frequency bands could cause interference or damage to the consumer's device.[111] This enhanced notification requirement signals a departure from Canada's light regulatory approach to device compliance and consumer notification of

f (discussing labeling requirements, including the requirement that the mark on the device be at least 5 mm and indelible).

[105] *See* Council Directive 2004/108, *supra* note 100, arts. 8-9 (requiring that devices have the "CE" mark in text or in graphic form).

[106] *See* Council Directive 93/68, *supra* note 100, art. 2 (EU) (stating that devices must have a "CE" mark affixed to it); Council Directive 89/336, annex I, 1989 O.J. (L 139) 19 (EU) (describing the "EC" conformity mark);

[107] *See* Council Directive 2004/108, *supra* note 100, art. 9(4).

[108] *See* Radiocommunication Regulations (Radiocommunication Act), SOR/96-484 (Can.).

[109] *See, e.g.*, Radio Standards Specifications RSS-210, Annex 9.5(7) (2007) (Can.) (requiring information about interference risks in specific frequency bands to be included in the user manual of local-area-networks).

[110] *Cf. id.*

[111] *See id*. Annex 9.3(2).

general interference risks.[112] Previously, Canada boasted to consumers that 95% compliance rates could be achieved and interference problems severely limited through minimal regulatory intervention in product labeling and an as-needed approach to post-market enforcement.[113] Canadian regulators have asserted that a light regulatory approach, based on technical enforcement, decreases up front regulatory intervention, lowers costs, and streamlines device certification without unduly affecting consumer protections.[114] Even with increased interference notification requirements for specific types of devices, Canada limits the labeling and consumer-notification obligations of manufacturers to the inclusion of such information in the owner's manual or on the device.

[32] The European Union, the United States, and Canada are similar in that they impose no requirements on pre-sale information or external product packaging and thereby limit consumer access to decision-making information prior to or at the time of purchase. Accordingly, consumers generally do not learn of the device's compliance, operational limitations, or interference constraints until after they purchase the product. Arguably, a compliance statement on the external packaging may not serve a valuable role if consumers expect all devices on the market to meet minimal technical standards. Information at the point of sale, however, may be beneficial in helping consumers to understand potential limitations on the operation of a device and to identify potential black-market devices.[115]

C. DUTY OF CONSUMER TO RESPOND TO HARMFUL INTERFERENCE COMPLAINTS

[33] Similar to the United States, both the European Union and Canada impose, either explicitly or implicitly, a duty on the consumer to prevent

[112] *See* Radio Standards Specifications RSS-Gen, § 7.1.5 (2007) (Can.) (requiring notification in the user manual or on the device that the device may not cause and must accept any interference).
[113] *See* Claude Beaudoin, Indus. Can., Canadian Experience with Supplier's Declaration of Conformity (SDoC) in the Telecommunications Sector: Presentation for the WTO TBT Committee Workshop on Suppliers' Declaration of Conformity 11-13, 16 (Mar. 21, 2005).
[114] *See id.* at 14-16.
[115] *See infra* Part IV, for a discussion of black market devices.

harmful interference. The European Community explicitly notifies the consumer of the duty. In comparison, Canada provides notification to the consumer of interference risks but fails to inform the consumer of recommended actions to correct interference.[116] All three jurisdictions fail to inform the consumer of the consequences of continued operation of an interfering device.

[34] Similar to the FCC approach, the European Union requires manufacturers to certify wireless broadband devices as meeting minimal technical performance standards before being sold to consumers and then imposes a duty on consumers to protect against harmful interference.[117] Specifically, the consumer is warned that harmful interference may require the consumer "to take adequate measures" to abate the interference.[118] Similar to the vague U.S. legal standard, the EU standard does not specify what constitutes "harmful interference."[119] Further, the word "adequate" is not defined; this creates pragmatic and legal uncertainty for the consumer and enforcement.[120] As a result, both the U.S. and the EU approaches lack clarity on thresholds of unacceptable interference levels for unlicensed devices used by the consumer. Unlike the FCC rules and recommendations for self-correction of interference,[121] the EU regulations do not require manufacturers to suggest steps a consumer might take to remedy interference.[122] Significantly, neither the U.S. nor the EU regulatory regime requires manufacturers to provide explicit notification to the consumer of the consequences of inaction and continued operation of an interfering device.[123] Thus, both the United States and the European Union first rely on product conformity with technical standards. They then transfer the responsibility of noninterference to the consumer, including the duty to cease operation if the consumer is unable to correct the interference.

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[116] *See infra* notes 122-124.
[117] Council Directive 2004/108, *supra* note 100, arts. 3-5, annex I.
[118] *See generally* Council Directive 2004/108, *supra* note 100 (mentioning "harmful interference" but failing to include a definition in Article 2).
[119] *See generally id.* (showing that "adequate" is not included in the definition section of Article 2).
[120] *See id.*; 47 C.F.R. § 1.907 (2008) (defining the term "harmful interference").
[121] *See supra* notes 77-78 and accompanying text.
[122] *See* Council Directive 2004/108, *supra* note 100.
[123] *See* Council Directive 2004/108, *supra* note 100; *see also supra* Part II.B.

[35] Canadian consumers similarly have a duty under national regulations to cease operations if there is interference, even when the device is fully compliant.[124] Despite the absence of notification with the product, consumers must take measures to correct interference caused by compliant devices. When a consumer fails to mitigate the harmful interference in response to a complaint, a government inspector may conduct an investigation and determine what measures should be taken.[125] Should a consumer fail to comply with the appropriate recommended measures, such as ceasing to use the device, the consumer will be subject to imprisonment and a financial penalty for each additional day of noncompliance and continued operation of an interfering device.[126] Thus, the Canadian approach follows the U.S. and EU approach to interference prevention through device certification, but it does not impose a duty on manufacturers to inform consumers that they must take action to eliminate interference or of the consequences related to a failure to act in such instances.

[36] All three jurisdictions provide limited or no information to consumers at the point of sale to inform them of their duty to avoid harmful interference. In spite of this, the countries impose such a duty on consumers and subject them to legal action if they do not uphold this duty.[127] Even when consumers receive information about whose responsibility it is to resolve interference, they receive little, if any, information about what constitutes harmful interference, which circumstances require the cessation of device operation, and consequences of continued use. Accordingly, there is a gap between what manufacturers have told consumers pursuant to regulatory requirements and what consumers are required to know about interference mitigation requirements, the potential risks associated with devices, and their right to operate such devices.

[124] *See* Radiocommunication Regulations (Radiocommunication Act), SOR/96-484 (Can.).
[125] *See id.* § 52(1).
[126] *See* Radiocommunication Act, R.S.C., ch. R-2, §§ 9-10 (1985) (Can.) (implementing either a fine that does not exceed five thousand dollars for an individual or imprisonment for a term not exceeding one year).
[127] *See* discussion Parts II.D, III.B-C.

D. COST-SHIFTING TO CONSUMERS WHEN WIRELESS CONSUMER DEVICES CAUSE INTERFERENCE

[37] Similar to the United States, the European Union and Canada recognize pragmatic and contractual remedies for consumers when unlicensed wireless devices become unlawful to operate due to harmful interference, but these jurisdictions ultimately shift the costs to the consumer if those remedies are unsuccessful.[128] The consumer's remedies are largely dependent upon self-correction of interference, product return, product warranty, and resale (discussed in section II of this article). Although jurisdictions vary slightly in how they implement these remedies,[129] consumers in all jurisdictions must absorb the financial loss when a device that is deemed compliant causes harmful interference.[130] In such situations, the consumer must stop using the device. Consequently, consumers in all three jurisdictions generally lack legal remedies for financial compensation when a compliant device becomes inoperable or unlawful to operate beyond the window for product return.[131]

IV. POTENTIAL INTERFERENCE THREATS TO CONSUMER DEVICES

[38] The rapidly evolving wireless landscape raises issues of spectrum coexistence policies to permit traditional and emergent technologies to proliferate in shared spectrum frequencies. Inherent problems with addressing this issue include the difficulty of determining the compatibility and coexistence of technologies and increased risks of interference. Interference risks arise from an increase in the number of unlicensed devices, a greater range of devices, and the proliferation of

[128] Graham Longford, Presentation on Open Spectrum and Community Wireless Networking in Canada: a Preliminary Review of the Policy and Regulatory Landscape 6-7 (Jan. 11, 2007), *available at* http://www.cwirp.ca/publications.php) (discussing the lack of protections for Canadian consumers when harmful interference occurs); *see also* Jennifer S. Martin, *An Emerging Worldwide Standard for Protections of Consumers in the Sale of Goods: Did We Miss an Opportunity with Revised UCC Article 2?*, 41 TEX. INT'L L.J. 223, 240-42, 255-56 (2006) (discussing EU and Canadian contract law).
[129] *See* Martin, *supra* note 128, at 240-42, 255-56 (contrasting EU and Canadian contract law).
[130] *Id.*
[131] *See id.*; U.C.C. § 2-719 (1998).

mobile wireless devices.[132] This section discusses emergent interference threats posed by different technologies operating at the same location and black-market devices and how these interference threats impact consumer protections.

A. DIFFERENT WIRELESS BROADBAND TECHNOLOGIES OPERATING IN ONE LOCATION

[39] Multiple wireless infrastructure technologies and the growing variety of devices operating in one location are increasing the potential for interference across devices and technologies.[133] Interference concerns are exacerbated in high-density urban and residential environments where the likelihood of the number of devices operating within a given area increases and the distance between devices decreases.[134] The vast quantity and different types of interference sources have raised concerns about adequate prevention of harmful interference before technologies become widespread in the marketplace,[135] effective enforcement to protect

[132] *See* Robert Lemos, *Got Interference? Data-Crowding Problems Loom for Wi-Fi*, WIRED, July 17, 2007, *available at* http://www.wired.com/gadgets/wireless/news/2007/07/wifi_interference (discussing increasing sources of interference from overlapping municipal, neighborhood, residential wireless networks, and the myriad of residential electronics); Paul G. Schreier, *Spectrum Analyzers Respond to Digital Modulation*, TEST & MEASUREMENT WORLD, June 2007, at 45, *available at* http://www.tmworld.com/contents/pdf/6447664.pdf (identifying a trend towards greater interference among wireless consumer devices across wider frequency ranges and from a dramatic increase in signal sources).

[133] *See* Raul Etkin, Abhay Parekh & David Tse, *Spectrum Sharing for Unlicensed Bands*, 25 IEEE J. ON SELECTED AREAS IN COMMS. 517, 517 (2007), *available at* http://www.eecs.berkeley.edu/~nikhils/gtpres/repeatedgame-spectrumsharing.pdf (concluding that interference may cause unfair and inefficient outcomes for consumers as determined by a hypothetical urban scenario of multiple wireless systems operating in the same band); Gadi Singer, Chief Tech. Officer, Intel Corp., Abstract, Presentation on Communication Infrastructure from Vision to Reality (Oct. 25, 2004) (asserting that no single technology – 3G, UWB, Wi-Fi and WiMax – will become dominant and thus a combination of technologies must coexist).

[134] *See* Lemos, *supra* note 132 (discussing interference in high-density environments with overlapping wireless infrastructures).

[135] *See* Joint Reply Comments of the Ass'n for Maximum Serv. Television, Inc. and the Nat'l Ass'n of Broadcasters at iii, *In re* Unlicensed Operation in the TV Broadcast Bands, Additional Spectrum for Unlicensed Devices Below 900 MHz and in the 3 GHz Band, ET Docket Nos. 04-186, 02-380 (Mar. 2, 2007) [hereinafter MSTV & NAB Joint Reply Comments] (concluding that laboratory device testing inadequately addresses

licensees when harmful interference occurs,[136] and spectrum congestion.[137] These issues can directly impact consumers because they threaten to degrade the performance of wireless broadband devices and may require consumers to stop using devices. These issues also suggest a possible increase in the number of consumer disputes, which currently lack adequate dispute-resolution mechanisms.[138] Thus, greater numbers of wireless broadband technologies operating at the same location may result in more consumers being burdened with devices that require updates or require that consumers replace such devices with non-interfering devices. Such changes are likely to be at the consumer's expense and may be more frequent due to rapidly changing technologies.

B. BLACK-MARKET DEVICES: UNLAWFUL INTERFERENCE

[40] The major difficulties with increased market penetration of black-market devices arise from two dependent factors: detection and

marketplace conditions and that the FCC should not allow unlicensed devices in licensed spectrum due to unacceptable interference risks to commercial services); *see also* Reply Comments of MSTV and NAB to the OET Report on the Performance of Prototype TV-Band White Space Devices at 6-8, *In re* Unlicensed Operation in the TV Broadcast Bands, Additional Spectrum for Unlicensed Devices Below 900 MHz and in the 3 GHz Band, ET Docket Nos. 04-186, 02-380 (Aug. 27, 2007) (stating that unlicensed personal/portable devices ineffectively prevent harmful interference to the television spectrum). *But see* IEEE-USA Board of Directors, Improving Spectrum Usage Through Cognitive Radio Technology (Nov. 13, 2003), http://www.ieeeusa.org/policy/positions/cognitiveradio.asp (asserting that innovative technologies can facilitate temporal and geographical sharing of spectrum in the future).

[136] *See* MSTV & NAB Joint Reply Comments, *supra* note 135, at 7-18 (recommending that the FCC implement protections should unlicensed consumer devices be allowed to operate in licensed broadcast spectrum); *MSTV Lobbies Against Unlicensed Devices*, BROADCAST ENGINEERING, Dec. 18, 2006, *available at* http://broadcastengineering.com/RF/mstv-against-unlicensed-devices1218/ (spotlighting MSTV's concerns with FCC enforcement should a product become widespread and with the lengthy process for product recalls).

[137] Lemos, *supra* note 132 (discussing how consumers may find too many users operating within the same location and thus experience degraded device performance and Internet connectivity).

[138] *See* Philip J. Weiser & Dale N. Hatfield, *Policing the Spectrum Commons*, 74 FORDHAM L. REV. 663, 684-86 (2005) (discussing how increasingly rival unlicensed spectrum users are looking for dispute mechanisms).

enforcement.[139] First, the black-market device must be detected and identified by the consumer at or before the point of sale or when a consumer device is subject to interference from an unlawful black-market device.[140] At the point of sale, a U.S. consumer's attempt to identify a black-market device is frustrated by the lack of mandatory requirements for external product packaging.[141] After purchase, the consumer will likely find that black-market devices do not abide by labeling and consumer notification requirements, or technical standards for power limits and frequency emissions.[142] As such, the lack of mandatory external product packaging requirements may frustrate the consumer's initial decision to purchase only lawful devices and may result in a consumer unknowingly purchasing and operating an unlawful device that causes harmful interference.

[41] Although a consumer operating a compliant wireless device must accept most interference, the consumer still has legal rights against interference caused by unlawful black-market devices.[143] The consumer, however, is unlikely to possess the knowledge or sophisticated equipment required to detect and confirm that the interference is caused by an unlawful black-market device. Accordingly, the ability to detect and identify interference from a black-market device is limited by consumer awareness, technical ability to identify unlawful devices, and dependency on other market actors (including regulators) for black-market prevention, detection, and enforcement.

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[139] *See* Press Release, Indus. Can., Buyer Beware: Industry Canada Cautions Canadians Against Buying Illegal Satellite Systems (Dec. 17, 2002) (on file with author), *available at* http://www.ic.gc.ca/epic/site/ic1.nsf/en/02624e.html (warning consumers of unlawful black-market direct-to-home satellite devices, providing a checklist for consumers when purchasing these devices, and informing the consumers of legal consequences of unlawful device operation and risks of "useless" equipment).

[140] *See id.*

[141] *See* 47 C.F.R. § 15.19 (2008) (requiring labels for compliant devices on the item itself, and, for devices too small for the label, allowing the manufacturer to choose whether to place the label in the device manual or on external packaging).

[142] Press Release, Indus. Can., *supra* note 139.

[143] *See* 47 C.F.R. § 15.5 (stating that a FCC representative can require a device no longer be used if it is causing harmful interference).

V. CONSUMER PROTECTION MECHANISMS

[42] Thus far, the FCC's light regulatory approach to evolving wireless technologies has fostered the proliferation of low-cost, unlicensed wireless devices and achieved social and public policy goals to increase consumer choice and a robust marketplace.[144] In its consideration of how to make more broadband services available to consumers, the Task Force recommended continuing this trend through voluntary cooperation across industry actors and consumers using unlicensed wireless devices.[145] It is unclear, however, whether a solely voluntary approach to spectrum coordination and interference management will adequately protect consumers' interests, particularly in light of emergent interference concerns, weak enforcement mechanisms, and cost-shifting to the consumer when devices become unlawful to operate. Thus, this section examines the advantages, disadvantages, and limitations of possible marketplace, regulatory, and legal reforms designed to enhance protections for U.S. consumers operating unlicensed wireless broadband devices in licensed and unlicensed spectrum.

A. MARKETPLACE SOLUTIONS: VOLUNTARY COOPERATION AND CONSUMER EDUCATION

[43] Key industry associations and technology proponents support the Task Force's recommended *laissez-faire* approach to the effective management of interference issues. A voluntary approach allows manufacturers, industry stakeholders, and consumers to choose which

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[144] *See* Yochai Benkler, *Some Economics of Wireless Communications*, 16 HARV. J.L. & TECH. 25, 30 (2002) (referring to the rapid growth of consumer equipment and how this enables low-cost solutions of social benefit through open networks); *see also* OFFICE OF COMMC'NS, DIGITAL DIVIDEND REVIEW: A STATEMENT ON OUR APPROACH TO AWARDING THE DIGITAL DIVIDEND 3 (2007), *available at* http://www.ofcom.org.uk/consult/condocs/ddr/statement/statement.pdf ("Wireless services are now widely available at low cost, to the benefit of both individuals and society as a whole."); Press Release, Commc'ns Research Ctr. Can., CRC Highlights 2006-2007: Building Next Generation Communications Technologies for Canada, *available at* http://www.crc.ca/en/html/crc/home/info_crc/publications/highlights_0607/highlights_0607 (highlighting that wireless standards foster low-cost wireless equipment and will enable broadband access in rural areas of Canada in 2009).

[145] *See* WIRELESS BROADBAND ACCESS TASK FORCE, *supra* note 7, at 5-6.

technologies and services will dominate, thus promoting market-based technical innovation.[146] Specifically, the groups advocate for the use of private self-certification efforts by manufacturers, private dispute-resolution mechanisms, technical solutions, and preventative consumer education.[147] As an example of the self-certification approach, the Wi-Fi Alliance asserts that its private testing program protects the interests of "both the consumer and the industry."[148] The Wi-Fi Alliance allows participating manufacturers to include the Wi-Fi Alliance-certified logo on product packaging to help consumers identify reliable products.[149] The Wi-Fi Alliance website does not indicate whether the Wi-Fi Alliance has ever initiated an enforcement action nor does it specify whether information about enforcement against manufacturers would be made public.[150] The Wi-Fi Alliance serves as an example of how industry self-certification programs can create market benefits through decreased regulatory costs, potentially lower device costs for consumers, and improved product branding to help guide consumer choices. In the absence of effective dispute-resolution mechanisms and transparency of enforcement actions, however, consumer benefits remain limited.

[44] With respect to market-based technical solutions, technology advocates have proposed various technologies and methods that allow devices to dynamically share permissible frequencies or to operate within limited geographical areas.[151] Organizations, such as the National

[146] *See generally* Comments of the Wireless Commc'ns Ass'n Int'l, Inc., *In re* Modification of Parts 2 and 15 of the Commission's Rules for Unlicensed Devices and Equipment Approval, ET Docket No. 03-201 (Oct. 15, 2007), *available at* http://wcai.com/images/pdf/fcc_oct15.pdf.

[147] *Id.* at 2 ("WCA continues to support voluntary frequency coordination and other 'best practices' among unlicensed users, approaches that do not undermine the flexibility and technological innovation that has been critical to the success of unlicensed services over the past decade.").

[148] *See* Jeffrey Silva, *M2M Companies Ask for Spectrum Etiquette as More Unlicensed Devices Come to Market*, RCR WIRELESS NEWS, Oct. 26, 2007, *available at* http://www.rcrwireless.com/article/20071026/SUB/71026017/M2M-companies-ask-for-spectrum-etiquette-as-more-unlicensed-devices-come-to-market.

[149] *See* Weiser & Hatfield, *supra* note 138, at 678-79 (noting the Wi-Fi Alliance is worth considering but recognizing that it is still too early to assess its effectiveness at enforcement).

[150] *See* Wi-Fi Alliance Website, http://www.wi-fi.org (last visited Nov. 21, 2008).

[151] *See* Comments of the Nat'l Telecommunications and Info. Admin. at 39-43, *In re* Facilitating Opportunities for Flexible, Efficient, and Reliable Spectrum Use Employing

Telecommunications and Information Administration, assert that lower regulatory burdens promote new market entrants, responsiveness to technological changes, and consumer benefits by enhancing product choices.[152] The emerging technologies, however, are criticized as unproven,[153] questionably effective,[154] difficult to certify for noninterference,[155] and easy to alter.[156] These technologies are also burdened by internalized bargaining costs as consumers work out acceptable congestion levels for those operating unlicensed devices.[157] Further, these technologies may render equipment more costly due to increased complexity in software programming and product development.[158]

[45] Consumer education has also been seen as a valuable market-based activity to promote best practices by industry and consumers to minimize interference in residential environments.[159] David Case, a senior regulatory engineer for Cisco Systems Inc., believes that because "the consumer ultimately ends up with the problem. . . . [t]he only solution at this time is better consumer education."[160] He asserts that because retail

Cognitive Radio Technologies, ET Docket No. 03-108 (Feb. 15, 2005) (describing compliance measurements for interruptible radio, listen-before-talk, and geolocation technologies).

[152] *Id.* at viii.

[153] *See id.* at 18 (discussing the lack of maturity of the sensing and geolocation techniques supported by software-defined radio and cognitive radio technologies).

[154] *See* OFFICE OF COMMUC'NS, TECHNOLOGY RESEARCH PROGRAMME: RESEARCH AND DEVELOPMENT AT OFCOM 2005/06, at 13 (2006) (highlighting that CR technologies may be unable to detect "hidden" primary users due to receive-only devices or unfavorable "propagation" conditions).

[155] *See* Raul Etkin, Abhay Parekh & David Tse, *supra* note 133, at 517.

[156] *See id.*

[157] *See* Thomas W. Hazlett & Matthew L. Spitzer, *Advanced Wireless Technologies and Public Policy*, 79 S. CAL. L. REV. 595, 664 (2006) (examining the regulatory proposal to impose new unlicensed spectrum allocations, rejecting the "commons" unlicensed spectrum approach, and asserting beneficial outcomes where unlicensed devices do not extensively share spectrum in complex ways).

[158] *But see id.* at 656-57.

[159] *See* Denis Kuwahara, Boeing Co., Comments to IC UWB Consultation on IEEE P802.18 Radio Regulatory – TAG (Apr. 2005) ("Consumer education on the use of license-exempt devices could do much to eliminate interference.").

[160] David A. Case, *Residential Spectrum Management: The Manufacturer's Role*, COMPLIANCE ENGINEERING, http://www.ce-mag.com/archive/05/01/014.html (last visited Nov. 21, 2008).

salespeople generally lack sufficient product knowledge to adequately inform consumers, manufacturers should provide "specific" warnings inside product packaging which describe interference risks, spectrum compatibility with competitors' products, and other devices designed to operate in the same spectrum.[161] Case's solution, however, is based on post-sale information provided to consumers. His solution relies on the presumption that consumers will return a product after receiving such information.[162] Even if the information is provided during the sales cycle, the all-voluntary approach remains prone to lackluster participation because companies lack incentives to promote another company's devices rather than their own.[163] The voluntary approach could also lead to consumers receiving inconsistent information about a device's compatibility with other spectrum-dependent devices.[164] Further, the voluntary warnings may increase manufacturer costs and product prices.[165]

[46] One solution is for consumer protection groups and the media to educate and inform consumers.[166] Such efforts are limited because they indirectly impact consumers, whereas manufacturers and retailers directly enhance consumer awareness by providing information in product

[161] *Id.*
[162] *See id.*
[163] *Cf.* ELISE GOLAN ET AL., U.S. DEP'T OF AGRIC., ECONOMICS OF FOOD LABELING 8 (2001) (discussing the limitations to market incentives for voluntary labeling programs, such as where the labeling by one manufacturer could result in benefits to rivals); Nicole Darnall, *Addressing Global Environmental Challenges: Using Information as a Novel "Local" Policy Approach*, 4 GLOBAL STUD. REV. 1, 2 (2008) (asserting that most companies would not participate in voluntary-labeling programs for environmental products).
[164] *Cf.* Darnall, *supra* note 163, at 2 (concluding that voluntary programs "would not be useful at providing consumers consistent information to inform their purchasing decisions").
[165] *Cf.* Letter from Gregory Jaffe, Co-Director, Biotechnology Project, Center for Science in the Public Interest, to Dockets Management Branch (HFA-305), Food and Drug Administration (May 16, 2001), *available at* http://www.cspinet.org/biotech/cspi_gepoll.html (stating that consumers are unwilling to pay higher prices for food labeling).
[166] *See, e.g.*, Digital Television Transition (DTV), http://www.dtvtransition.org/ (last visited Nov. 21, 2008) (describing a public-private coalition to educate consumers about the digital television switchover in the United States in 2009).

enclosures.[167] Voluntary consumer education could provide consumers additional beneficial information, but market forces alone would be unlikely to produce optimal consumer education required for effective interference management. Lastly, voluntary activities neither confer greater legal protections to consumers when the equipment becomes inoperable, nor provide greater enforcement mechanisms to ensure the legal rights associated with licensed services and devices. Thus, an all-voluntary approach to protecting the economic interests of licensees and the property rights of consumers in their devices may yield inefficient and unfair outcomes.[168]

B. REGULATORY SOLUTIONS: RULES, OUTREACH, AND EFFECTIVE ENFORCEMENT

[47] A second solution is to improve and enhance the FCC's regulatory activities to protect consumers by providing better labeling and notification requirements, educational programs, increased clarity in interference standards, and enhanced regulatory oversight of compliance and enforcement.[169] First, the FCC could amend its labeling and notification requirements to require notice before or at the point of sale.[170] This additional requirement could augment, rather than replace, the existing requirements to provide notification inside the packaging or through electronic notification.

[48] Second, to limit the imposition on manufacturing companies and dealers to provide plain English rules relevant to consumers, the FCC could conduct a consumer education campaign to communicate the

[167] *See* 47 C.F.R. § 15.117(k) (2008) (requiring sellers of analog televisions without digital tuners to provide a conspicuous "Consumer Warning Alert" on the equipment at the point of sale).
[168] *See* Raul Etkin, Abhay Parek & David Tse, *supra* note 133, at 517 (pointing to mathematical modeling of transmitters and receivers in a fixed system to ascertain that the asymmetries and selfish behavior in a voluntary system of spectrum noninterference management contribute to inefficient solutions).
[169] *Cf.* GOLAN ET AL., *supra* note 163, at 13-18 (discussing the reasons, costs, and benefits of mandatory labeling as a policy tool).
[170] *See, e.g.*, 47 C.F.R. § 15.117(k) (requiring a conspicuous "Consumer Alert" to be placed on the screen or on top of analog televisions that lack digital tuners, prior to sale).

advantages and limitations of unlicensed devices.[171] The campaign could help consumers understand which factors are significant before choosing an unlicensed device.[172] Third, the FCC could clarify technical standards for interference (such as according to each type of device) and elaborate on the legal definition of harmful interference for consumer-operated devices. [173] The current vague standard offers flexibility but also leads to unexpected surprises for consumers. As equipment prices of unlicensed devices increase, cost-shifting to the consumer and a dearth of remedies deprive the consumer of adequate market protections. Given that manufacturers and retailers seek to sell more devices, they have an incentive to shorten market cycles for equipment replacement and may be driven by motives contrary to consumer financial interests. As a result, the FCC should reevaluate the impact of equipment price increases and the resultant cost-shifting to consumers.

[49] The FCC should continue to take a cautious approach to device certification, requiring all new devices to comply with noninterference.[174] Noninterference testing is particularly important when the device is intended to operate in shared licensed spectrum,[175] or where there is a potential for interference with existing spectrum uses, such as medical and astronomy services.[176] Lastly, the FCC could provide enhanced complaint processing and dispute resolution mechanisms.[177]

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[171] *See, e.g.*, Fed. Commc'ns Comm'n, The Digital TV Transition: What You Need to Know About DTV, http://www.dtv.gov/ (last visited Nov. 21, 2008) (providing educational information about the advantages of the digital television transition and about the DTV equipment available to consumers).

[172] *See, e.g.*, FCC Consumer Advisory, Buying the Right TV: What Every Consumer Should Know (Jan. 3, 2008), http://www.fcc.gov/cgb/consumerfacts/dtvlabels.html.

[173] *See* Margie, *supra* note 55, at ¶¶ 16-29.

[174] *See generally* 47 C.F.R. § 15 (requiring unlicensed devices to comply with rules and regulations regarding noninterference).

[175] *See, e.g.*, Press Release, Fed. Commc'ns Comm'n, The FCC's Office of Engineering and Technology Announces the Initiation of Field Testing for Prototype TV White Space Devices: ET Docket No. 04-186 (July 10, 2008), *available at* http://hraunfoss.fcc.gov/edocs_public/attachmatch/DA-08-1635A1.doc.

[176] *See, e.g.*, Letter from Richard Whitt, Washington Telecom & Media Counsel, Google, to Marlene H. Dortch, Office of the Sec'y, Fed. Commc'ns Comm'n 3 (Mar. 21, 2008) (proposing a "safe harbor" of spectrum to protect, in part, medical and astronomy devices and services from interference by unlicensed broadband devices).

[177] U.S. GOV'T ACCOUNTABILITY OFFICE REPORT, *supra* note 87, at 34-36 (recommending improvement for new processes and accountability of FCC's

[50] The disadvantages of a greater regulatory role are three-fold. First, increased administrative oversight will increase regulatory costs and may result in higher consumer costs.[178] Second, it remains uncertain how to better certify devices given increasingly complicated hardware and software device components, and how such re-certification would occur when newer replacement technologies enter the marketplace.[179] Third, even licensee incumbents may find a lack of efficient and productive enforcement mechanisms against consumers using interfering devices after the devices enter the marketplace.[180] In such cases, market forces may provide a better remedy by creating consumer incentives to purchase replacement equipment.

C. CONSUMER PROTECTION LEGISLATION: THE LAST RESORT

[51] The third option is to improve consumer protection laws and contractual mechanisms to provide a right of product return. As discussed above, at present, consumers with an interfering device have limited legal options after the window of time for product returns has passed. Generally, this is not an issue for lower-cost items. Consumers historically have replaced technologies on a voluntary, cost-benefit basis, exchanging older products for newer devices.[181] As expensive unlicensed devices permeate the marketplace, however, the cost-benefit basis disfavors consumers. Thus, mechanisms may be needed to mitigate consumer costs when equipment becomes unusable or interference causes the performance to degrade.

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enforcement program due to insufficient resolution of consumer complaints and rarity of enforcement actions).

[178] *See* GOLAN ET AL., *supra* note 163, at 16.

[179] *See* Louis E. Frenzel, *Complex Wireless Standards Put Instruments to the Test*, ELECTRONIC DESIGN, June 18, 2008, http://electronicdesign.com/Articles/ArticleID/19010/19010.html (discussing how increasingly advanced technologies are complicating the testing for regulatory compliance and interoperability requirements).

[180] *See* U.S. GOV'T ACCOUNTABILITY OFFICE REPORT, *supra* note 87, at 3, 14 (finding that FCC enforcement actions are rare).

[181] *See* David S. Joachim, *The Word on Warranties: Don't Bother*, N.Y. TIMES, Nov. 1, 2006, *available at* http://www.nytimes.com/2006/11/01/technology/circuits/01warr.html (discussing how consumers groups advise consumers not to purchase warranties because prices for replacement electronics keep falling).

[52] The disadvantage of increasing consumer protections is that it confers greater rights to the consumers and could be abused to allow consumers a right of return for any reason, rather than meeting its purpose of mitigating inoperable or interfering equipment. This could cause cost-shifting to manufacturers and retailers, which could significantly deter major technology investments and new product designs.[182] Further, the legislative approach may not adequately respond to technological innovation.[183] New legislation may also impinge on existing licensees' rights and consumers who pay for wireless services. Moreover, the legislative approach may foster litigation rather than innovation. Lastly, it could further impede investment and confidence in emergent technologies. Thus, increased consumer legislation should be reserved for use only after other mechanisms are proven to be ineffective at adequately protecting consumers.

VI. CONCLUSION

[53] Historically, consumers have benefited from innovative uses of spectrum and arguably will continue to benefit from increased technological solutions and a light regulatory approach to unlicensed consumer devices. Thus far, the impacts to consumers from harmful interference and inoperable devices have been mitigated by: 1) interference prevention through FCC-mandated technical standards; 2) compliance testing; and 3) voluntary consumer action, including efforts to correct interference and gradual equipment replacement as technologies evolve to offer more features and capabilities. Emergent wireless broadband technologies for consumer devices, however, increasingly challenge traditional notions of spectrum management, when and how consumers use unlicensed devices, and the cost of those devices.

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[182] *Cf.* Doug Johnson, *Will Legislation Improve Energy Efficiency in Consumer Products?*, ELECTRONICS WKLY., Mar. 12, 2008, *available at* http://www.electronicsweekly.com/Articles/2008/03/12/43315/will-legislation-improve-energy-efficiency-in-consumer-products.htm (asserting that a government mandate to require energy compliance by consumer electronics would "stifle innovation, limit consumer choice, and interfere with competitive trends").

[183] *See* PETER H. SCHUCK, THE LIMITS OF LAW: ESSAYS ON DEMOCRATIC GOVERNANCE 450 (2000) (stating that dynamic policy environments, such as computer technology, require responsive adjustments to avoid market distortions or unnecessary barriers).

[54] Even though the FCC has now authorized additional spectrum access for wireless broadband devices, multiple market actors continue to lobby the FCC for their competing positions. Incumbent licensees, such as commercial broadcasters and cellular providers, are urging the FCC to reconsider its position on shared spectrum access and to protect the financial interests of licensees and consumers of commercial services.184 Technology and equipment companies, such as Google, Microsoft, and Motorola, continue to promote the consumer benefits of technological advances, such as increased innovation and equipment choices.185 These companies also have an implicit motivation to increase online advertising, fee-based services, and device sales. Consumer advocates have largely supported the positions of equipment manufacturers and technology companies because of overall consumer benefits.186 Consumer advocates, however, have remained silent on implications for consumers should emergent, unlicensed, wireless broadband devices be deactivated, recalled, or declared unlawful to operate after purchase.

[55] The FCC's plan to rely on enhanced certification standards for wireless broadband devices will play a crucial role in promoting innovation and marketplace competition, while building confidence in consumers and other market actors through interference prevention. Focusing on interference prevention, however, does not address consumer rights, duties, and remedies should interference occur. Given that regulatory experimentation is intended to benefit consumers, the FCC should consider the adequacy of remedies for consumers when devices cause or suffer from harmful interference, particularly if devices become more costly for consumers to replace with non-interfering technologies.

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[184] *See, e.g.*, Press Release, Nat'l Ass'n of Broadcasters, NAB Statement on Today's FCC Ruling on 'White Spaces' (Nov. 4, 2008), *available at* http://www.nab.org/AM/Template.cfm?Section=Press_Releases1&CONTENTID=13447&TEMPLATE=/CM/ContentDisplay.cfm; Joint Comments in Support of "Emergency Request," *supra* note 19, at 1-6.

[185] *See, e.g.*, Olga Kharif, *FCC Opens New Airwaves to the Public*, BUS. WK., Nov. 5, 2008, http://www.businessweek.com/technology/content/nov2008/tc2008115_197440.htm ("Some within the industry see white-space gear and services taking off as quickly as Wi-Fi, which debuted in 2000.").

[186] *See, e.g.*, Press Release, Pub. Knowledge, Public Interest Organizations Commend FCC for Boosting Wireless Internet (Nov. 4, 2008), *available at* http://www.publicknowledge.org/node/1850.

[56] The FCC could also play a role in ensuring consumers understand the implications of interference enforcement for newer products prior to or at the point of purchase. This objective could be accomplished through consumer education campaigns and enhanced information on external product packaging. Further, the FCC could promote more effective public and private complaint and dispute-resolution mechanisms.

[57] Consumer advocacy groups should lobby the FCC for greater inclusion of consumer protections in policy discussions. Increased advocacy and consumer representation will help ensure adequate consideration of consumer interests as distinct from other market actors. Representation of consumer interests is particularly important with respect to burden-shifting to consumers to resolve harmful interference, technical proposals to disable or deactivate interfering equipment remotely without the consumer's consent or prior notification, privacy safeguards, and enhanced enforcement and dispute mechanisms.