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4 ``CREATING OPPORTUNITIES THROUGH IMPROVED GOVERNMENT SPECTRUM  
5 EFFICIENCY''

6 Thursday, September 12, 2012

7 House of Representatives,

8 Subcommittee on Communications and Technology

9 Committee on Energy and Commerce

10 Washington, D.C.

11 The Subcommittee met, pursuant to call, at 10:16 a.m.,  
12 in Room 2123 of the Rayburn House Office Building, Hon. Greg  
13 Walden [Chairman of the Subcommittee] presiding.

14 Members present: Representatives Walden, Terry,  
15 Stearns, Shimkus, Bono Mack, Blackburn, Bilbray, Bass,  
16 Gingrey, Scalise, Latta, Guthrie, Kinzinger, Barton, Eshoo,  
17 Markey, Matsui, Barrow, Christensen, DeGette, and Waxman.

18 Staff present: Gary Andres, Staff Director; Ray Baum,

19 Senior Policy Advisor/Director of Coalitions; Andy  
20 Duberstein, Deputy Press Secretary; Neil Fried, Chief  
21 Counsel, Communications and Technology; Debbie Keller, Press  
22 Secretary; Alexa Marrero, Deputy Staff Director; David Redl,  
23 Counsel, Telecom; Charlotte Savercool, Executive Assistant;  
24 Lyn Walker, Coordinator, Admin/Human Resources; Roger  
25 Sherman, Democratic Chief Counsel; Shawn Chang, Democratic  
26 Senior Counsel; David Strickland, Democratic FCC Detailee;  
27 Margaret McCarthy, Democratic Staff; and Kara Van Stralen,  
28 Democratic Special Assistant.

|  
29           Mr. {Walden.} If everybody would please take their  
30 seats, we will get started here.

31           Good morning, and welcome to our hearing on creating  
32 opportunities to increase government spectrum efficiency. I  
33 welcome our witnesses and appreciate their counsel as we  
34 examine ways to increase government spectrum efficiency and  
35 satisfy American consumers' growing demand for wireless  
36 broadband services. I am convinced we can create new jobs  
37 from our work and bring innovation and efficiency to the  
38 Federal Government.

39           In the months since the Congress passed the Middle Class  
40 Tax Relief and Job Creation Act, including the spectrum  
41 incentive auction provisions this subcommittee brought to the  
42 table, we have turned our attention to Federal Government  
43 usage of spectrum. In coordination with Representative  
44 Eshoo, I appointed a working group led by Brett Guthrie and  
45 Doris Matsui, and asked them to examine in depth how the  
46 government uses its spectrum. Our goal is to create more  
47 jobs by freeing up spectrum to meet demand and spur  
48 innovation in America. It is also our goal to bring  
49 innovation and spectrum efficiency to the government users.

50           One way we can create additional spectrum opportunities  
51 is through use of the Commercial Spectrum Enhancement Act.

52 As you know, under the CSEA, commercial providers bear the  
53 cost of moving federal incumbents to clear spectrum. Given  
54 the budgetary pressures facing the country, and the potential  
55 for sequestration to pose significant challenges, especially  
56 to our defense agencies, we have an opportunity to work  
57 together to optimize the value of underutilized spectrum and  
58 upgrade equipment and services used by our federal agencies.

59 The best example of this process is the 2006 AWS-1  
60 auction, which made 90 megahertz of spectrum available for  
61 wireless broadband and raised more than \$13.7 billion for the  
62 Treasury.

63 The President's Council of Advisors on Science and  
64 Technology, affectionately known as PCAST, has provided us  
65 with one view of how to create spectrum opportunities in  
66 federal bands. Rather than look to ways to increase the  
67 efficiency of the government users, however, the recently  
68 released PCAST report assumes that it would cost too much and  
69 take too long to move most federal systems. Instead, the  
70 report recommends that commercial providers operate around  
71 government systems and share spectrum. The concept of  
72 sharing is not new, and is certainly worth continued  
73 exploration. Sharing technologies and the underlying  
74 business models, however, are not sufficiently developed to  
75 make it the entire focus of our spectrum strategy nor to

76 supplant clearing.

77           Spectrum sharing may hold potential in the future for  
78 some spectrum bands where clearing is impossible or we have  
79 certainty that the cost of relocation exceeds the value of  
80 that spectrum. I am not ready to accept the opinion that  
81 ``the norm for spectrum use should be sharing'' today. That  
82 is simply not good enough.

83           I am also concerned about the conclusion which appears  
84 based, at least in part, on a recent NTIA report concluding  
85 that it would cost \$18 billion and take 10 years to clear the  
86 Federal Government from the 1.7 gigahertz band. The NTIA has  
87 admitted, however, that it did not conduct an independent  
88 analysis to reach those estimates. Instead, the NTIA  
89 compiled estimates from the federal users. As the GAO's  
90 written testimony for today's hearing indicates, we need more  
91 rigorous analysis before giving up on clearing spectrum and  
92 working to maximize efficiency in how the government uses  
93 that spectrum.

94           I appreciate our witnesses' testimony today. You are  
95 all very talented individuals who really help us in our work,  
96 and we appreciate what you are bringing to the table. I am  
97 particularly pleased to see Major General Wheeler with us  
98 today, as NTIA's preliminary responses to a letter from our  
99 government spectrum working group indicate that the

100 Department of Defense is the largest government user of  
101 spectrum, with just under 90 percent of the ground-based  
102 assignments and over 99 percent of the airborne use of  
103 government spectrum below 3.1 gigahertz. Government systems  
104 can and should be comprised of the most efficient and  
105 technologically advanced products available. We appreciate  
106 the work you have given to our working group, and to this  
107 committee.

108 Working together, I think we must increase efficiency,  
109 upgrade government systems, and make spectrum available to  
110 meet our country's wireless broadband demand.

111 [The prepared statement of Mr. Walden follows:]

112 \*\*\*\*\* COMMITTEE INSERT \*\*\*\*\*

|  
113           Mr. {Walden.} And with that, I would yield the balance  
114 of my time to the Vice Chairman of the subcommittee, Mr.  
115 Terry, for additional comments.

116           Mr. {Terry.} Thank you, Mr. Chairman. I just want to  
117 thank you for holding this hearing and this series on how we  
118 are able to more efficiently use our spectrum. This time,  
119 the issue is spectrum efficiency and discussions about  
120 Department of Defense spectrum, and whether it is best used  
121 in a variety of different ways by allowing access to it by  
122 either having full power over it or shared to the private  
123 sector, and as consumers continue to demand more spectrum or  
124 access to spectrum.

125           Now, I also--just in my balance, General Wheeler, I  
126 represent Stratcom, a big user of the communication system  
127 and the spectrum, and so I probably have more of a nuanced  
128 position in making sure that we protect those assets for our  
129 military, at the same time, making sure that we do use the  
130 spectrum most efficiently.

131           And I yield back.

132           [The prepared statement of Mr. Terry follows:]

133           \*\*\*\*\* COMMITTEE INSERT \*\*\*\*\*

|  
134           Mr. {Walden.} Gentleman yields back the balance of his  
135 time. I now recognize my friend from California, Ms. Eshoo,  
136 for her opening statement, and thank her for her work on the  
137 working group.

138           Ms. {Eshoo.} Thank you, Mr. Chairman, and good morning  
139 to all of the witnesses. We thank you for being here. This  
140 is a very distinguished panel. To Major General Wheeler, I  
141 think that this may be a first. I don't ever recall in my  
142 service on this subcommittee where we had the DoD testifying  
143 relative to telecommunications and spectrum. So this is an  
144 important hearing, and I think we are all going to draw a  
145 great deal from your testimony.

146           To advance a 21st century spectrum policy, I think we  
147 have to think outside of the box. With data traffic on  
148 mobile service provider networks expected to increase 18  
149 times from 2011 to 2016, we have to, I think, also move  
150 quickly, while we, of course, consider both clearing and  
151 sharing to most efficiently use this scarce resource. I  
152 don't see this as an either/or situation. I think that they  
153 are complimentary.

154           Through the passage of legislation authorizing voluntary  
155 incentive spectrum auctions, our subcommittee took an  
156 important step toward achieving the President's goal of

157 freeing up 500 megahertz of spectrum for expanded wireless  
158 broadband service. But our work is not complete, as  
159 evidenced by NTIA's report on the 1755 megahertz band, as  
160 well as the recently adopted report by the President's  
161 Council of Advisors on Science and Technology, as the  
162 Chairman said we affectionately call PCAST.

163 Today, I would like to offer three observations that I  
164 believe are necessary to achieve our vision of a 21st century  
165 spectrum policy.

166 First, there is a simple reality that federal agencies  
167 do not have the same financial incentive as commercial  
168 wireless providers to efficiently use the spectrum they hold.  
169 The PCAST report wisely proposes the concept of spectrum  
170 currency, because it does have enormous currency--it is gold--  
171 an accounting, an allocation, and an incentive system that  
172 would encourage federal agencies to relinquish or share more  
173 of their spectrum.

174 Second, we need greater investment in R&D. The use of  
175 database technology as well as automatic wifi switches, small  
176 cell technology, and cognitive radio can be part of the  
177 solution, making more efficient use of spectrum and even  
178 increasing the usability of spectrum above 2 gigahertz.

179 Finally, increased communication between the Federal  
180 Government and commercial wireless providers will promote

181 greater collaboration and a mutual understanding of each  
182 other's needs. I don't think that has really taken place. I  
183 am encouraged by recent industry testing that explores the  
184 feasibility of sharing spectrum between federal and  
185 commercial users in the 1755-1780 megahertz band. Embracing  
186 these concepts will support a growing base of mobile users  
187 with the bandwidth needed to drive the next generation of  
188 mobile applications and services.

189 I think that this is an opportunity for us to plan our  
190 spectrum future, and to keep America number one in this, and  
191 I think that is the goal for all of the members of the entire  
192 subcommittee.

193 I now would like to yield the balance of my time to  
194 Congresswoman Matsui, who has done, I think--really made  
195 wonderful contributions to the working group with Mr.  
196 Guthrie, and also has offered legislation with Mr. Stearns on  
197 this very subject matter.

198 [The prepared statement of Ms. Eshoo follows:]

199 \*\*\*\*\* COMMITTEE INSERT \*\*\*\*\*

|  
200 Ms. {Matsui.} Thank you very much, Ranking Member  
201 Eshoo, for yielding me time, and I want to thank the Chairman  
202 for holding this hearing today. I want to join in welcoming  
203 our witnesses here today.

204 You know, over the last several months the spectrum  
205 working group has conducted a series of productive meeting  
206 with government and industry stakeholders, and I do believe  
207 that DOD, NTIA, and the FCC understand the urgency that they  
208 must reevaluate underutilized government spectrum holdings.  
209 There could be viable opportunities for both spectrum  
210 clearing and sharing to meet the short-term and long-term  
211 demands for a digital economy, all while protecting our  
212 national security interests.

213 It is my hope that today's panel will provide clear  
214 answers on which spectrum bands can be cleared below 3  
215 gigahertz, and as a practical manner, which bands or areas  
216 would be ideal for sharing above 3 gigahertz. In addition, I  
217 am also interested in hearing from our panelists about how we  
218 can move forward in the short-term on repurposing the 1755 to  
219 1850 bands, especially the lower megahertz between the 1755  
220 and 1780 bands. I am also interested in hearing new ideas on  
221 incentivizing government agencies to relocate, including  
222 PCAST recommendations on spectrum currency.

223           The CSMAC process should have the full involvement of  
224 all sides. The government needs to talk to industry and vice  
225 versa. The process must not be a one-way street. The  
226 industry testing effort by T-Mobile, Verizon, and AT&T will  
227 also provide valuable insight and hopefully answer some  
228 important questions.

229           I do look forward to working with my colleagues and all  
230 stakeholders moving forward. I yield back the balance of my  
231 time.

232           [The prepared statement of Ms. Matsui follows:]

233 \*\*\*\*\* COMMITTEE INSERT \*\*\*\*\*

|  
234           Mr. {Walden.} The gentlelady yields back the balance of  
235 her time. The Chair now recognizes the former Chairman of  
236 this subcommittee, Mr. Stearns, for his comments.

237           Mr. {Stearns.} Thank you, Mr. Chairman. In February, I  
238 think all of us realized after a year of hearings and  
239 discussions which affected all the stakeholders, we passed  
240 important legislation that will result in a new--in a number  
241 of new spectrum auctions. Obviously, however, our work is  
242 not done. We must ensure that all spectrum users are using  
243 their spectrum as efficiently as possible, including the  
244 Federal Government. Examining spectrum that could be  
245 reallocated from government agencies and commercially  
246 auctioned could open money-raising opportunities to offset  
247 the upcoming sequestration.

248           As my colleague, Congresswoman Matsui, has indicated, I  
249 encourage my colleagues to take a serious look at the bill  
250 that she and I introduced, which is H.R. 4817, earlier this  
251 year. I believe spectrum sharing should be explored as part  
252 of a long-term solution. We simply, my colleagues, do not  
253 have the technology for such sharing available today is my  
254 understanding, and it is unclear what business models would  
255 sustain them if we used it. So I believe that sharing should  
256 not be considered simply as a substitution for clearing. I

257 appreciate, Mr. Chairman, this subcommittee's continuing  
258 focus on spectrum. It is extremely important for innovation,  
259 productivity, and the future of this country.

260           And so I look forward to hearing from our witnesses  
261 today.

262           [The prepared statement of Mr. Stearns follows:]

263 \*\*\*\*\* COMMITTEE INSERT \*\*\*\*\*

|  
264           Mr. {Walden.} Thank the gentleman for his testimony. I  
265 now recognize the gentlelady from California who has been a  
266 real leader on our telecom issues, Ms. Bono Mack.

267           Mrs. {Bono Mack.} Thank you, Mr. Chairman. Yesterday  
268 in my own subcommittee, the Subcommittee on Commerce,  
269 Manufacturing, and Trade, we took a hard look at growth in  
270 the app economy. Mr. Chairman, the sector is booming.  
271 Today, an estimated 90 million U.S. consumers spend about 60  
272 minutes each day accessing the Internet with smartphones,  
273 while another 24 million people spend 75 minutes a day using  
274 the Internet on their tablets. If you haven't heard business  
275 leaders talk about the importance of mobile to their future,  
276 then you haven't been listening very closely. But what  
277 drives all of this growth? You guessed it, spectrum, and we  
278 need more of it.

279           Today we are examining federal uses of spectrum.  
280 Unfortunately, the Administration seems willing to settle  
281 only for spectrum sharing, and in my opinion, has based that  
282 strategy on an incomplete analysis. Spectrum sharing is an  
283 important piece of the puzzle, but by no means the only  
284 solution.

285           So I look forward to hearing from all of our witnesses  
286 today. I especially welcome Dr. Marshall, who is a fellow

287 Trojan, working at USC, and I know we might not agree on all  
288 the issues, but we do agree that we are hoping for a big year  
289 out of Matt Barkley and the USC Trojans, and sorry, Mr.  
290 Chairman--

291 [The prepared statement of Mrs. Bono Mack follows:]

292 \*\*\*\*\* COMMITTEE INSERT \*\*\*\*\*

|  
293 Mr. {Walden.} The gentlelady yields back her time.

294 Mrs. {Bono Mack.} --your Ducks, you know--

295 Mr. {Walden.} We have done all right.

296 Mrs. {Bono Mack.} Yes.

297 Mr. {Walden.} We have done all right. Rose Bowl, yes.

298 Ms. Blackburn, we recognize you now.

299 Mrs. {Blackburn.} I thank you, and I want to welcome  
300 our witnesses. We do appreciate that you are here, because  
301 we all agree that we are going to face a spectrum shortage or  
302 a spectrum crisis. Chairman Bono Mack referenced the hearing  
303 that we did yesterday that dealt with the app economy. We  
304 know what is coming toward us, what innovators are bringing  
305 to the marketplace very soon.

306 Now, one of the things we will want to explore today is  
307 the PCAST report, and then the GAO report, and the  
308 differences in these two. I think we can all agree that  
309 these two reports were not compatible when it comes to  
310 meeting consumer expectations of what is going to be there  
311 for their use and available spectrum.

312 So welcome to all, and I yield back my time.

313 [The prepared statement of Mrs. Blackburn follows:]

314 \*\*\*\*\* COMMITTEE INSERT \*\*\*\*\*

|  
315           Mr. {Walden.} Gentlelady yields back. Anyone else on  
316 our side who wants to make a comment? If not, we will return  
317 the balance of the time and I now recognize the Chairman  
318 Emeritus, Mr. Waxman, for an opening statement.

319           Mr. {Waxman.} Thank you very much, Chairman Walden, for  
320 holding this timely hearing on the role of the Federal  
321 Government and how we can play a part in easing our Nation's  
322 anticipated spectrum crunch.

323           Since April, members of the bipartisan federal spectrum  
324 working group led by Representatives Matsui and Guthrie have  
325 met with federal agencies and industry stakeholders to  
326 explore opportunities for maximizing federal spectrum  
327 efficiency. Today's hearing provides an opportunity for the  
328 entire subcommittee to discuss these issues.

329           I believe the Administration is appropriately pursuing  
330 an all of the above approach to make more spectrum available  
331 for commercial mobile services. In 2010, the President  
332 called for 500 megahertz of spectrum to be made available for  
333 mobile broadband. Since then, the Administration has already  
334 identified and begun freeing up over 400 megahertz of  
335 spectrum currently occupied by federal users. With the  
336 Administration's support, this committee has taken action as  
337 well to increase available spectrum. Working on a bipartisan

338 basis, we passed legislation that authorizes the first ever  
339 incentive auctions. Experts believe the new auction  
340 mechanism could clear up to 120 megahertz of underutilized  
341 broadcast television spectrum for commercial broadband  
342 services.

343 In preparation for this hearing, our staff spoke with  
344 several companies in the wireless industry to discuss options  
345 for utilizing federal spectrum better. I am pleased to hear  
346 that these companies report that there has been an  
347 unprecedented level of cooperation between federal and  
348 commercial stakeholders. In fact, one company told our staff  
349 that federal agencies have shared more information in the  
350 last 2 months than in the previous 10 years. This  
351 collaborative process must continue if we are to meet our  
352 shared goal for greater spectrum availability.

353 Many individual have contributed to the progress we are  
354 making, and I want to commend Mr. Nebbia, Major General  
355 Wheeler, Mr. Sharkey, and the other members of the Commercial  
356 Spectrum Management Advisory Committee for their coordinated  
357 efforts to make more spectrum available, to fuel wireless  
358 innovation, and economic growth. I also want to commend  
359 efforts by members of the President's Council of Advisors on  
360 Science and Technology in authoring a forward thinking report  
361 focused on spectrum sharing as a way to improve the use of

362 underutilized federal spectrum. Given the looming spectrum  
363 crunch, I agree that we cannot afford to take any options off  
364 the table. Spectrum sharing is an innovative concept that  
365 should be part of a multi-prong strategy going forward, and I  
366 look forward to hearing from Dr. Marshall on the work of  
367 PCAST.

368         When Congress passed the Middle Class Tax Relief and Job  
369 Creation Act of 2012, they made significant changes to the  
370 federal relocation process that created new incentives to  
371 encourage agencies to participate in the clearing or sharing  
372 of spectrum. Today, we should explore whether there may be  
373 additional incentives that would encourage federal users to  
374 relinquish more underutilized spectrum. This could be a  
375 winning proposition for both the commercial and public  
376 sectors. Properly crafted incentives can give federal users  
377 better tools to help fulfill their missions and ensure our  
378 Nation's long-term spectrum needs are met.

379         Mr. Chairman, I thank you for this time and I want to  
380 yield the balance of time that's been allocated to me to Mr.  
381 Barrow.

382         [The prepared statement of Mr. Waxman follows:]

383 \*\*\*\*\* COMMITTEE INSERT \*\*\*\*\*

|  
384 Mr. {Barrow.} I thank the gentleman for yielding.

385 Mr. Chairman, today we tackle the important issue of how  
386 to use government spectrum more efficiently and how to create  
387 new opportunities that serve our national interest through  
388 improved efficiency.

389 As technology advances, broadband spectrum becomes more  
390 and more essential to everything we do in our daily lives.  
391 Given that our spectrum resources are limited, it is  
392 essential that we identify areas where spectrum isn't being  
393 used so well and make it available to those who can put it to  
394 higher and better use. For the past 4 months, I have had the  
395 privilege of working with the bipartisan federal spectrum  
396 working group on a constructed examination of how we can use  
397 the Nation's airwaves better. I look forward to hearing our  
398 panelists' perspectives on spectrum clearing and spectrum  
399 sharing, and working on a common sense strategy to free up  
400 spectrum to meet demand before we reach a spectrum crisis.

401 I thank Mr. Waxman for the time, and I yield back.

402 [The prepared statement of Mr. Barrow follows:]

403 \*\*\*\*\* COMMITTEE INSERT \*\*\*\*\*

|  
404           Mr. {Walden.} Gentleman yields back the balance of his  
405 time. I think we have had our opening statements from both  
406 sides, so we will now proceed with the hearing and our  
407 witnesses. We thank you again for your work in preparing  
408 your statements and assisting our committee in its work.

409           We will start with Mr. Mark Goldstein--I am sorry, Mr.  
410 Karl Nebbia. We will start at that end. Associate  
411 Administrator, Office of Spectrum Management, National  
412 Telecommunications and Information Administration. So Mr.  
413 Nebbia, we appreciate your being here today. Pull that  
414 microphone close and turn it on, and you are on.

|  
415 ^STATEMENTS OF KARL NEBBIA, ASSOCIATE ADMINISTRATOR, OFFICE  
416 OF SPECTRUM MANAGEMENT, NATIONAL TELECOMMUNICATIONS AND  
417 INFORMATION ADMINISTRATION (NTIA); MAJOR GENERAL ROBERT  
418 WHEELER, DEPUTY CHIEF INFORMATION OFFICER FOR COMMAND,  
419 CONTROL, COMMUNICATIONS AND COMPUTERS (C4) AND INFORMATION  
420 INFRASTRUCTURE (DCIO FOR C4IIIC), U.S. DEPARTMENT OF DEFENSE;  
421 MARK GOLDSTEIN, DIRECTOR, PHYSICAL INFRASTRUCTURE ISSUES,  
422 GOVERNMENT ACCOUNTABILITY OFFICE (GAO); DOUG SMITH, PRESIDENT  
423 AND CEO, OCEUS NETWORKS; PRESTON MARSHALL, PH.D., DEPUTY  
424 DIRECTOR, INFORMATION SCIENCES INSTITUTE, UNIVERSITY OF  
425 SOUTHERN CALIFORNIA, ON BEHALF OF THE PRESIDENT'S COUNCIL OF  
426 ADVISORS ON SCIENCE AND TECHNOLOGY; MARK RACEK, DIRECTOR,  
427 SPECTRUM POLICY, ERICSSON INC.; AND STEVE SHARKEY, DIRECTOR,  
428 FEDERAL REGULATORY AFFAIRS AND CHIEF, ENGINEERING AND  
429 TECHNOLOGY POLICY, T-MOBILE USA, INC.

|  
430 ^STATEMENT OF KARL NEBBIA

431 } Mr. {Nebbia.} Chairman Walden, Ranking Member Eshoo,  
432 and members of the subcommittee, thank you for the  
433 opportunity to testify on behalf of NTIA, the President's  
434 principle advisor on telecommunications and information  
435 policy, and manager of federal use of the radio spectrum. As

436 Associate Administrator for NTIA's Office of Spectrum  
437 Management, I oversee frequency assignment, engineering,  
438 planning, and policy activities. It has been my privilege to  
439 work along side NTIA's staff, federal spectrum managers, our  
440 FCC counterparts, industry representatives, and your staff.

441 Spectrum--it cannot be overstated the importance of  
442 spectrum to our Nation. Increasing commercial use of  
443 broadband is transforming business, healthcare, government,  
444 and public safety. PCAST estimated that increasing spectrum  
445 for wireless broadband could yield benefits of over \$1  
446 trillion, and create millions of American jobs.

447 Spectrum also supports vital agency missions. Federal  
448 radio systems have supported the war on terror, including  
449 helping to eliminate Osama bin Laden. Weather satellites  
450 project hurricane paths, helping Americans prepare. Air  
451 traffic systems ensure that the American public fly safely.  
452 These safety and security systems provide the underlying  
453 framework that allows our society to thrive. Federal systems  
454 also put Neil Armstrong on the Moon, and more recently set  
455 curiosity to work on Mars.

456 In June, 2010, the President directed that an additional  
457 500 megahertz be made available for wireless broadband by  
458 2020. NTIA and other federal agencies working in  
459 collaboration with the FCC, OMB, and OSTP have explored

460 options and priorities. By November, 2010, NTIA recommended  
461 relocating, reallocating 115 megahertz of the 1695 to 1710  
462 and 3550 to 3650 bands. NTIA and the other agencies then  
463 pressed forward to evaluate the 1755-1850 band. Federal uses  
464 include military tactical radio, law enforcement  
465 surveillance, drone control, air combat training systems, air  
466 nautical telemetry, and satellite control, among others.  
467 They all share that spectrum. Spectrum to which to relocate  
468 these systems is dwindling, as many operations actually  
469 require characteristics best suited for the spectrum beach  
470 front.

471 In March, 2012, NTIA reported that the full 95 megahertz  
472 could be repurposed once certain challenges are overcome, and  
473 based on estimates from 20 agencies with over 3,100 frequency  
474 assignments in the band, the report projected that clearing  
475 users would take at least 10 years and cost approximately \$18  
476 billion. While the cost and time estimates are preliminary,  
477 relocating every system will be costly and take a long time.

478 Therefore, NTIA is pursuing a new path to make this band  
479 available faster and at lower cost than under a relocation-  
480 only process. Such an approach relies on relocating federal  
481 users where feasible and affordable, and sharing spectrum  
482 where practical.

483 A critical component of this approach is to bring

484 industry and government together to work collaboratively. In  
485 using our Spectrum Management Advisory Committee, NTIA  
486 organized groups of industry and government experts and by  
487 accounting for each federal system, along with innovation and  
488 commercial technology, these groups can tailor and determine  
489 the best approach. In many cases, we expect recommendations  
490 for traditional relocation or geographic sharing. In others,  
491 we would expect that they approach a third option, that is,  
492 the possibility that commercial and federal users can share  
493 frequencies through spectrum availability and technical  
494 flexibility. Sharing this spectrum could allow for more  
495 efficient use, matching intermittent or localized government  
496 use with other uses, and may reduce the uncertainties and  
497 disruptions that result from the constant threat of  
498 relocating in the future. We expect the findings of these  
499 groups in early 2013.

500 In support of this effort, NTIA and federal agencies are  
501 working with Mr. Sharkey at T-Mobile and other carriers to  
502 perform measurements, while Verizon has committed \$5 million  
503 to test sharing approaches. NTIA is also evaluating 195  
504 megahertz in the 5 gigahertz range for unlicensed wifi  
505 devices that enable service providers to offload traffic. In  
506 October, NTIA will complete a study identifying the risks as  
507 required by the Middle Class Tax Relief Act. Further

508 collaborative work with industry will be required to  
509 understand what technology approach will yield the best  
510 results, and safeguard federal missions.

511 I want to thank the subcommittee for your efforts and  
512 support to improve the Commercial Spectrum Enhancement Act,  
513 allowing agencies to recover costs for planning, sharing,  
514 equipment upgrades, and moving to non-spectrum technology or  
515 commercial services where possible. Other provisions support  
516 the transparency and effectiveness of the auction preparation  
517 process and band transition, and NTIA has begun to implement  
518 these provisions. NTIA and the federal agencies have made  
519 substantial progress and are currently close to meeting the  
520 President's goal. Our work on the federal side has already  
521 recommended or is currently working on as much as 405 total  
522 megahertz, while safeguarding federal operations, minimizing  
523 the cost and making spectrum available quickly.

524 We look forward to the successful incentive auctions by  
525 the FCC, and other initiatives to improve access to  
526 nonfederal spectrum. I welcome your questions.

527 [The prepared statement of Mr. Nebbia follows:]

528 \*\*\*\*\* INSERT 1 \*\*\*\*\*

|

529           Mr. {Walden.} I thank you for your testimony. We will  
530 now go to--Major General Robert Wheeler is next, the Deputy  
531 Chief Information Officer for Command, Control,  
532 Communications, and Computers, C4, and Information  
533 Infrastructure at the U.S. Department of Defense. Major  
534 General Wheeler, first, thank you for your service to the  
535 country. We are all indebted to you and the men and women  
536 who wear our Nation's uniform and have worn it in the past,  
537 and we are especially indebted to you for your work with us  
538 on this topic, so please, go ahead.

|  
539 ^STATEMENT OF MAJOR GENERAL ROBERT WHEELER

540 } General {Wheeler.} Thank you, sir, I appreciate that.  
541 Good morning, Chairman Walden, Ranking Member Eshoo, and  
542 distinguished subcommittee members. Thank you for the  
543 opportunity to testify before this subcommittee regarding the  
544 vital importance of scarce radio frequency spectrum to U.S.  
545 national defense capabilities, the economy, and consumers.  
546 My name is Major General Robert E. Wheeler, and as we  
547 discussed, I am the Deputy Chief Information Officer for  
548 Command, Control, Communications, and Computers, and  
549 Information Infrastructure Capabilities.

550 Military spectrum requirements are diverse and complex  
551 given the variety of different missions the Department must  
552 support around the world. For example, the Air Combat  
553 Training System uses the 1755-1850 megahertz band to support  
554 combat readiness pilot certification for U.S. aircrews, as  
555 well as for crews from allied countries. The system is used  
556 at training ranges and bases across the U.S. with over 10,000  
557 training flights per month. I have personally used this  
558 system several hundred times.

559 Spectrum is the critical enabler that ensures  
560 information is dependably available to train our forces and

561 ensure safe and successful mission accomplishment. The  
562 Department's use of unmanned aerial systems to support its  
563 overseas operations requires spectrum to process volumes of  
564 critical intelligence, surveillance and reconnaissance data.  
565 Our inventory of UAS platforms has increased from 167 in 2002  
566 to nearly 7,500 in 2010, and created an associated increase  
567 in demand for spectrum to satisfy those particular missions,  
568 and I believe it is going to increase even further.

569         Within the DoD, we understand that the strength of our  
570 Nation is rooted in the strength of our economy. We are  
571 dependent on industry for innovative products that can be  
572 used for national security. In that regard, we remain fully  
573 committed in support of our national economic and security  
574 goals of the President's 500 megahertz initiative. The  
575 implementation of more effective and efficient use of this  
576 finite radio spectrum and the development of solutions to  
577 meet these goals is equally important to both national  
578 security and the economic goals.

579         The Department continues to work with NTIA, other  
580 Administration partners, and industry to develop the  
581 information required to ensure balanced spectrum repurposing  
582 decisions that are technically sound and operationally viable  
583 from a mission perspective.

584         The reallocation feasibility assessment of the 1755-1850

585 megahertz band shows that while there are challenges to  
586 overcome, it is possible to repurpose all 95 megahertz of  
587 that particular spectrum, based upon the conditions outlined  
588 in the NTIA report. DoD is fully engaged in addressing these  
589 challenges, by closely working with industry to evaluate  
590 sharing possibilities.

591         The Department estimated it would cost almost \$13  
592 billion to vacate or relocate out of the 1755 to 1850  
593 megahertz band. This estimate was led and overseen by the  
594 Department's independent Cost Assessment and Program  
595 Evaluation, CAPE organization, to ensure consistency in  
596 methodologies and assumptions. The cost to modify or replace  
597 the existing systems to use the identified comparable  
598 spectrum were also included in the DoD's analysis.

599         Let me briefly address the issue of the lower 25  
600 megahertz or the 1755 to 1780 megahertz band. As we worked  
601 within NTIA's established process to identify the 500  
602 megahertz directed by the President, the federal agencies,  
603 including DoD, were instructed to study reallocation of the  
604 entire 95 megahertz, as 25 megahertz would not reflect  
605 significant progress toward the overall end goal. This was  
606 due in part to the fact that many of the systems, including  
607 critical DoD systems, operate in this frequency band,  
608 operating across the entire 95 megahertz band. Thus, a

609 detailed study of vacating solely the lower 25 megahertz has  
610 not been conducted, and the results of the full 95 megahertz  
611 band study cannot be extrapolated to a solution for just the  
612 lower 25 megahertz.

613         The Department has and continues to work with NTIA and  
614 the Federal Communications Commission to determine ways to  
615 share spectrum with commercial users when possible. A recent  
616 success is the FCC's new rules for Medical Body Area Network  
617 sensor devices in the 2360 to 2390 megahertz band. DoD is  
618 also cooperatively working with three major wireless  
619 providers to evaluate sharing the 1755 to 18 megahertz band,  
620 including spectrum monitoring at selected DoD sites.

621         DoD recognizes the need to move forward. We are  
622 developing a spectrum strategy focused on investing in  
623 technologies and capabilities aimed at more effective and  
624 efficient use and management of spectrum, and that begins at  
625 the acquisition cycle.

626         The ability to operate spectrum-dependent national  
627 security capabilities without causing and receiving harmful  
628 interference while understanding the critical needs of our  
629 Nation's economy remains absolutely paramount to this  
630 Department. The Federal Government and our industry partners  
631 have built an impressive team that is working toward solving  
632 the technical and policy issues so we can move ahead.

633 Together, we will develop long-term solutions to achieving a  
634 balance between national security spectrum requirements and  
635 meeting the expanding demand of commercial broadband  
636 services.

637 I thank you for listening, and the time.

638 [The prepared statement of Major General Wheeler  
639 follows:]

640 \*\*\*\*\* INSERT 2 \*\*\*\*\*

|  
641           Mr. {Walden.} We appreciate your testimony.

642           We will now go to Mr. Mark Goldstein, Director, Physical  
643 Infrastructure Issues for the Government Accountability  
644 Office. Mr. Goldstein, thanks for your work. We look  
645 forward to your testimony.

|  
646 ^STATEMENT OF MARK GOLDSTEIN

647 } Mr. {Goldstein.} Good morning, Mr. Chairman, members of  
648 the subcommittee. Thank you for the invitation to testify  
649 today on issues related to the management of federal spectrum  
650 and spectrum sharing.

651 Demand for spectrum is increasing rapidly with the  
652 widespread use of wireless broadband devices and services.  
653 However, nearly all usable spectrum has been allocated either  
654 by NTIA for federal use or the FCC for commercial and  
655 nonfederal use. Federal initiatives are underway to identify  
656 federal spectrum that could be repurposed or possibly shared  
657 by federal users, or wireless broadband providers and other  
658 nonfederal users. Our statement today discusses how NTIA  
659 manages spectrum to address government-wide spectrum needs,  
660 the steps NTIA has taken to repurpose spectrum for broadband,  
661 and as part of an ongoing review, the statement also  
662 discusses preliminary information from the factors that  
663 prevent spectrum sharing and actions that can encourage  
664 sharing efficient spectrum use.

665 The following is what GAO has found in the two reports  
666 that we are talking about today.

667 First, while NTIA is responsible for government-wide

668 federal spectrum management, GAO reported in 2011 that its  
669 efforts in this area had been limited. Almost 10 years ago,  
670 the President directed NTIA to develop plans identifying  
671 federal and nonfederal spectrum needs, and in 2008, NTIA  
672 issued the federal plan. We found that this plan did not  
673 identify government-wide spectrum needs and did not contain  
674 key elements and conform to best practices for strategic  
675 planning. Generally, NTIA's primary spectrum management  
676 operations do not focus on government-wide needs. Instead,  
677 NTIA depends on agency self-evaluation of spectrum needs, and  
678 focuses on mitigating interference among spectrum users with  
679 limited emphasis on overall spectrum management.

680         Additionally, NTIA's data management system is  
681 antiquated and lacks internal controls to ensure the accuracy  
682 of agency-reported data, making it unclear if reliable data  
683 informed decisions about federal spectrum use. NTIA is  
684 developing a new management system, but its implementation is  
685 years away.

686         Despite these limitations, NTIA has taken steps to  
687 identify spectrum that could potentially be made available  
688 for broadband use. For example, in 2010, NTIA evaluated  
689 various spectrum bands and identified 115 megahertz of  
690 spectrum that could be repurposed within the next 5 years.  
691 For each of the identified bands, NTIA reviewed the number of

692 federal frequency assignments within the band, the types of  
693 federal operations and functions that the assignments  
694 support, and the geographic location of federal users.  
695 However, the private sector has indicated that most of the  
696 frequencies located in these bands are not the most useful  
697 for expanding commercial broadband activities.

698         Second, in addition to efforts to repurpose spectrum,  
699 some stakeholders have also suggested that sharing spectrum  
700 between federal and nonfederal users be considered to help  
701 make spectrum available for broadband. However, ongoing work  
702 has identified several significant barriers that limit  
703 sharing. Primarily, many federal users may lack incentives  
704 to share inside a spectrum. Typically, paying the market  
705 price for a good or service helps to inform users of the  
706 value of the good and provides an incentive for efficient  
707 use. Yet federal agencies pay only a small fee to NTIA for  
708 spectrum assignments and may, in some contexts, have little  
709 incentive to conserve or to share it. And accurate  
710 information about which areas might be best shared is  
711 inadequate. Federal agencies may also have limited budgets  
712 to upgrade to more spectrally efficient equipment that would  
713 better enable sharing. Nonfederal users also are reluctant  
714 to share with federal users, due to a variety of regulatory  
715 hurdles, and are also wary of sharing with others in the

716 private sector due to competition concerns.

717           Finally, GAO's ongoing work suggests that some actions  
718 might provide greater incentives and more opportunities for  
719 more efficient spectrum use in sharing. These actions could  
720 include studying spectrum usage fees to provide economic  
721 incentive for more efficient use in sharing, expanding the  
722 availability of unlicensed spectrum, and increasing the  
723 federal focus on research and development of technologies  
724 that can enable spectrum sharing as well.

725           That concludes my statement, Mr. Chairman. I would be  
726 happy to answer any questions that the committee may have.

727           [The prepared statement of Mr. Goldstein follows:]

728 \*\*\*\*\* INSERT 3 \*\*\*\*\*

|  
729           Mr. {Walden.} Mr. Goldstein, thanks for the work you  
730 and your people do at GAO. We appreciate it.

731           We will now go to Mr. Doug Smith, President and CEO of  
732 Oceus Networks. Thank you for being here. We look forward  
733 to your comments, sir.

|  
734 ^STATEMENT OF DOUG SMITH

735 } Mr. {Smith.} Good morning, Chairman Walden, Ranking  
736 Member Eshoo, and distinguished members of the subcommittee.  
737 Thank you for inviting me to talk with you about how  
738 commercial wireless broadband technologies can provide  
739 opportunities to make government spectrum use more efficient  
740 and effective.

741 I am here today to discuss the importance of commercial  
742 wireless broadband technology, specifically, 4G LTE as a part  
743 of the tool set to meet growing broadband communications  
744 requirements for military and other federal users.

745 Oceus Networks provides mobile broadband communication  
746 services and tactical military solutions for delivering high  
747 speed voice, video, and data communications. We are  
748 headquartered in Reston, Virginia, with a major R&D center in  
749 Plano, Texas. Our 4G LTE solution, Xiphos, provides mission-  
750 critical apps for federal users, including the Department of  
751 Defense, for situational awareness, video streaming, voice  
752 over IP applications, among other lifesaving apps. Our  
753 solution provides the functionality of a full cellular  
754 network in a single unit to address warfighter broadband  
755 requirements on the move, without traditional cellular

756 architectures.

757         Our mobile LTE networks can be placed aboard ships,  
758 installed in tactical warfighter vehicles, mounted on  
759 unmanned aerial systems, and/or be soldier backpacked. We  
760 provide these capabilities to standard headsets or switching  
761 algorithms. This allows the full cost savings of commercial  
762 economies of scale to flow to government users.

763         The mobile broadband revolution that is transforming  
764 consumers' daily lives has profound implications for  
765 government users, presenting both opportunities and  
766 challenges. DoD has a level of spectrum requirements that is  
767 unprecedented, driven by increasing data needs and increased  
768 reliance on advanced technology capabilities. Congress  
769 recognized the prevalence of LTE as the worldwide commercial  
770 standard for wireless broadband when adopting it as the  
771 standard for the nationwide public safety network. Such  
772 policies reflect an even larger reality. The expanded apps,  
773 continually evolving devices, and improved network  
774 performance of commercial mobile networks are embraced by  
775 most of our Nation's young men and women who are entering the  
776 military service. They grew up with wireless broadband  
777 devices, ranging from smartphones to tablets. They ask how  
778 the same advanced capabilities with stronger security  
779 features and military-appropriate apps could be made

780 available when in training and in battle.

781           How are these technologies being used by the military  
782 today? One example is a Navy pilot in which Oceus Networks  
783 is participating to provide communication systems using our  
784 Xiphos solution, which marks the first operational deployment  
785 of 4G LTE for the Department of Defense. This 4G tactical  
786 network, using Android devices, will support communications,  
787 including classified communications, for up to 3,500 Marines  
788 and sailors deployed with the Kearsarge Amphibious Ready  
789 Group. The project designates 4G as a mission-critical  
790 requirement for the Counter-Piracy Task Force, which mostly  
791 operates off the Horn of Africa.

792           Oceus Networks is also using its 4G LTE-based solution  
793 to support the FCC's consideration of the role of high  
794 altitude platforms in the national public safety network. In  
795 a trial this fall, we will demonstrate the role of 4G LTE in  
796 a rapidly deployable aerial communications architecture that  
797 can provide broadband communications to disaster areas  
798 shortly after the occurrence of a major natural disaster or  
799 terrorist attack.

800           As directed by the Middle Class Tax Relief Act, the  
801 FirstNet network will provide much-needed nationwide  
802 broadband reach for first responders, including deployment  
803 milestones for substantial rural coverage. Our mobile LTE

804 solution cost effectively extends the LTE broadband footprint  
805 to public safety users in remote and rural communities.

806         Looking forward, policymakers are increasingly  
807 interested in sharing as a potential option to both enhance  
808 the effective and efficient spectrum use of government  
809 operations, and provide capacity for commercial broadband  
810 use. For new policies based on sharing to remain viable as a  
811 true win/win solution for commercial and government spectrum  
812 users, sharing must be viewed as a two-way street. To obtain  
813 improved economies of scale by adopting commercial  
814 technologies such as LTE, federal users need access to  
815 commercial bands. As one aspect in a larger spectrum  
816 supportability tool set, this is an important option for  
817 government users, for whom modifying commercial technology to  
818 work effectively in government bands is expensive, time  
819 consuming, and off the commercial roadmap.

820         The timing of today's hearing comes as we remember the  
821 tragedy of September the 11th. It underscores the importance  
822 of giving our soldiers and first responders interoperable  
823 communications as they defend our Nation. Also this week,  
824 Apple has announced the release of LTE-based iPhone 5, which  
825 demonstrates widespread adoption of the technology and U.S.  
826 leadership in key technologies.

827         I want to thank the committee for asking the important

828 question and raising awareness of how to advance commercial  
829 and military interests, and provide these critical advanced  
830 communications capabilities for our economy and our Nation's  
831 security.

832           Thank you for the opportunity to testify at today's  
833 hearing, and I look forward to answering any questions you  
834 may have.

835           [The prepared statement of Mr. Smith follows:]

836 \*\*\*\*\* INSERT 4 \*\*\*\*\*

|  
837           Mr. {Walden.} Mr. Smith, thank you. We appreciate your  
838 testimony and good work.

839           Now we will turn to Dr. Preston Marshall, Deputy  
840 Director, Information Sciences Institute, University of  
841 Southern California, who is an advisor to the President's  
842 Council of Advisors on Science and Technology.

843           Dr. Marshall, good to see you again. Thank you for  
844 being here. We look forward to your comments.

|  
845 ^STATEMENT OF PRESTON MARSHALL

846 } Mr. {Marshall.} Thank you, Chairman Walden and Ranking  
847 Member Eshoo. I appreciate this opportunity to continue the  
848 dialogue we had with many of the members and staff of the  
849 spectrum working group. My name is Preston Marshall. I am,  
850 as you said, Deputy Director of Information Sciences  
851 Institutes, author of several books in the field, and I was  
852 the program manager for 7 years at DARPA developing some of  
853 the wireless technology now being deployed in DoD, and have  
854 participated as an advisor.

855 Mr. Chairman, as you have noted, spectrum sharing is not  
856 new. There is nothing the PCAST report has that hasn't been  
857 done for decades. LTE shares with LTE, cellular shares with  
858 other commercial users, DoD shares with DoD, DoD shares with  
859 other federal agencies, federal agencies share with civil.  
860 What makes PCAST report unique is that it proposes to take  
861 sharing out of one-on-one relationships that are  
862 unpredictable and put it into a framework where every  
863 American can see what spectrum is available for new  
864 innovation and new business opportunities. It proposes to  
865 take it out of one-on-one relationships between a cellular  
866 provider and a federal agency, and that federal agencies

867 document all the sharing opportunities they can provide,  
868 publish them, and make them available for innovators.  
869 Someone wishing to innovate in spectrum doesn't have to worry  
870 that they get into the death spiral or light-squared saw or M  
871 to Z, or some of these other conflicts. This is a  
872 fundamentally different approach to sharing. It is not  
873 technologically new, but it makes sharing the norm. It says  
874 we are going to share spectrum, we are going to document what  
875 it does. It addresses many of the issues the GAO brought  
876 up. It provides a way for federal agencies to monitorize the  
877 value of the spectrum by having a secondary market but a  
878 right to share federal spectrum. You can measure its goal.

879         We have always had a problem that federal agencies can  
880 get acquisition money from Congress but not operational  
881 money. This is a way to bring an operational cash stream in  
882 to fund for the kind of offload for military systems to civil  
883 systems. It is appropriate. It provided a new framework at  
884 the White House for the spectrum management team to recognize  
885 that spectrum policy is fundamentally a policy decision, not  
886 just an engineering one, and to elevate and create and  
887 understand the tensions between economic opportunity and  
888 national security, and other federal emissions.

889         We have been criticized--the report has been criticized  
890 for essentially concurring in the NTIA report, and that is

891 certainly true. It concurred in the general framework that  
892 sharing--clearing spectrum has become increasingly difficult.  
893 We essentially created a--certainly you don't have it in  
894 California, but if you grew up in New England, as a plow  
895 pushes against the snow, it starts out very soft and it  
896 becomes and turns into hard ice. Well in some cases, our  
897 federal spectrum has turned into hard ice. We pushed and  
898 pushed, we compressed federal users. It becomes  
899 exponentially more difficult to relocate them. Where it can  
900 be done, my reading of the PCAST report is that it was quiet.  
901 If there are ways to clear 25 megahertz or 50 megahertz for  
902 cellular, it in no way proposes to stand in the way. What it  
903 does say is that our goal should not be 50 or 100 megahertz,  
904 it should be support massive innovation throughout the  
905 spectrum on an order of a gigahertz a spectrum. And the only  
906 way to do that is to share what is there. We are not going  
907 to relocate a gigahertz of federal users.

908         We are enabled in this by the fact that new low power  
909 technologies are much more sharable. When you look at the  
910 report from NTIA and you look at the restrictions on the use  
911 of, say the 3.6 gig band, you see that it is essentially  
912 useless for civil if you put high power LTE, but massively  
913 useful if you put low power devices. There is a convergence  
914 between where technology is going and where spectrum sharing

915 can do. More power, more local communications is the way we  
916 are going to meet wireless needs, and spectrum sharing is  
917 particularly appropriate to that.

918         For those who read the report and say my gosh, it is all  
919 different, we will have to do different things, imagine if  
920 you had gone to the wireless industry 10 years ago, perhaps  
921 when Mr. Sharkey was at QUALCOMM, and said we want you to  
922 take your--50 percent of your wireless business, put it over  
923 congested, open to everyone, shared with every device in the  
924 country, \$100 devices, only 80 megahertz, and all of you have  
925 to share it, they would have laughed at you, and yet today,  
926 over half of our smartphone traffic runs across wifi. These  
927 are the opportunities for innovation. We are the first to  
928 meet this. We are the first to come up against this spectrum  
929 crunch. This is not bad, this is an opportunity to own the  
930 beach front innovation, and the key to that is sharing  
931 spectrum, not to walk away from licensed and exclusive use.  
932 I am a communications engineer. I know I would rather have a  
933 clear channel. I don't want to deal with sharing, but if the  
934 alternative is no spectrum at all, then this is a desirable  
935 path. This is an opportunity to do all of the above,  
936 continue the path on unlicensed and exclusive licensing, but  
937 open up this new opportunity for this third way which goes  
938 right down the middle. It draws the best from licensed use

939 and it draws the best from unlicensed.

940 Thank you very much.

941 [The prepared statement of Mr. Marshall follows:]

942 \*\*\*\*\* INSERT 5 \*\*\*\*\*

|  
943           Mr. {Walden.} Thank you, Dr. Marshall. We appreciate  
944 your comments and your good work on the PCAST report, and for  
945 briefing our committee before.

946           We will now go to Mr. Mark Racek, Director, Spectrum  
947 Policy of Ericsson. So we appreciate your being here and  
948 look forward to your testimony. Go ahead.

|  
949 ^STATEMENT OF MARK RACEK

950 } Mr. {Racek.} Thank you, Mr. Chairman, and good morning  
951 to all the members of the committee. My name is Mark Racek  
952 and I help lead the development of Ericsson's global  
953 legislative, regulatory, and industry positions with regard  
954 to spectrum. As communication changes the way we live and  
955 work, Ericsson is playing a key role in this evolution.  
956 Using innovation to empower people, business, and society, we  
957 are working towards a networked society in which everything  
958 that can benefit from a connection will have one.

959 For our part, Ericsson is responsible for more than 40  
960 percent of the world's mobile traffic which passes through  
961 our networks every day serving roughly 2.5 billion  
962 subscribers, and we have been at this game a long time. When  
963 our company was founded 136 years ago, Ulysses S. Grant  
964 occupied the White House. With time has come experience,  
965 knowledge, and we believe, credibility.

966 The lifeblood of the networked society is a network that  
967 is built on a robust mobile broadband ecosystem made possible  
968 by access to sufficient licensed spectrum, something that is  
969 in short supply and high demand.

970 A market data report Ericsson released last month cited

971 a doubling of global mobile data traffic from 2011 to 2012  
972 with a growth forecast of 15 times that amount by 2017.  
973 Ericsson invests more than \$5 billion dollars annually in  
974 research and development, employs 22,000 R&D engineers, and  
975 holds 30,000 patents, all in an effort to improve the  
976 capability of networks and increase the efficient use of  
977 spectrum. But technology alone won't cure the demand for  
978 capacity.

979         Mr. Chairman, you and your colleagues deserve a great  
980 deal of praise for passing voluntary incentive auction  
981 legislation. While this key achievement was an important  
982 step, the question still remains, where can more spectrum be  
983 found?

984         Federal spectrum holdings prove to be the next logical  
985 possibility given that Federal Government is the largest user  
986 of spectrum below 3 gigahertz. And the new spectrum law is  
987 encouraging efficiency through collaboration with industry,  
988 and the federal spectrum holders. As opportunities are  
989 identified within the Federal Government, a determination  
990 must be made as to which approach will serve the solution  
991 best, spectrum clearing or spectrum sharing?

992         Being a global leader in building networks that can  
993 operate in numerous spectrum ecosystems, we believe there are  
994 two key points to keep in mind as we answer that question.

995           The first is that clearing spectrum for licensed use is  
996 still the best option available today. The engineering is  
997 ready and there is a well-established and commercial business  
998 model for providers to rely upon to profitably build and  
999 operate such systems.

1000           Second, while there is a lot of interest in the concept  
1001 of spectrum sharing, I would caution policymakers from being  
1002 too optimistic about its potential. There are a host of  
1003 challenges to building and operating shared spectrum networks  
1004 and there is no evidence yet that business models exist to  
1005 sustain them. The examples of challenges come in at least  
1006 four different areas. The first is economic potential. The  
1007 value of spectrum is directly dependent upon the extent to  
1008 which services can be guaranteed. There has not been  
1009 sufficient testing of technology or economic modeling to  
1010 prove that the types of services can be met by a system  
1011 predicated on sharing. Without these certainties, there will  
1012 be little incentive for large scale investment.

1013           Number two is the technical and commercial viability.  
1014 Existing commercial mobile technologies have been optimized  
1015 based upon a well-understood licensed spectrum, which has  
1016 fueled innovation and investment. The technical requirements  
1017 for a shared environment, on the other hand, are undefined  
1018 and will require significant time for researching and for

1019 testing.

1020           Number three, the operational complexity. For sharing  
1021 to work, carriers will need clear answers to many questions  
1022 about operational constraints. For example, what kinds of  
1023 services can be supported in a shared environment, or can the  
1024 spectrum be used nationwide?

1025           And finally, number four, the regulatory structures.  
1026 Sharing raises a number of regulatory challenges which will  
1027 take years to test and model. Will shared spectrum users  
1028 have to meet public interest requirements such as CALEA and  
1029 E-911? Can this spectrum be auctioned? What are the  
1030 interference protections for incumbent users?

1031           Taken together, I believe that an analysis including  
1032 these four factors leads us to the conclusion that while  
1033 spectrum sharing solutions in the right circumstances may be  
1034 able to support licensed operation and should be further  
1035 assessed, sharing should not be considered as a substitute  
1036 for cleared, licensed, spectrum to meet our Nation's needs.  
1037 And when met, those needs will yield great returns for the  
1038 economy.

1039           The work ahead will be challenging, but our mission is  
1040 clear: to ensure that everything that can benefit from being  
1041 connected is connected. This will transform lives, it will  
1042 revolutionize businesses, but more important than that, it

1043 will have a profound impact on our entire society. Our  
1044 industry needs spectrum to deliver on that promise.

1045 Thank you, Mr. Chairman, for the invitation to be here  
1046 today, and I look forward to answering any questions that  
1047 this subcommittee has.

1048 [The prepared statement of Mr. Racek follows:]

1049 \*\*\*\*\* INSERT 6 \*\*\*\*\*

|  
1050           Mr. {Walden.} Mr. Racek, thank you for your testimony  
1051 and your work on this topic.

1052           And now to our final witness on today's panel, Mr. Steve  
1053 Sharkey, who is the Director, Federal Regulatory Affairs, and  
1054 Chief Engineering and Technology Policy for T-Mobile USA,  
1055 Inc. Mr. Sharkey, thank you for being here. We look forward  
1056 to your testimony.

|  
1057 ^STATEMENT OF STEVE SHARKEY

1058 } Mr. {Sharkey.} Thank you. Good morning, Chairman  
1059 Walden and Ranking Member Eshoo, and members of the  
1060 subcommittee. My name is Steve Sharkey and I am the  
1061 Director, Chief Engineering and Technology Policy for T-  
1062 Mobile, USA. Thank you for inviting me to testify today.

1063 Mobile broadband is a significant economic driver,  
1064 providing millions of jobs, economic opportunities for  
1065 Americans, and billions of dollars in productivity  
1066 improvements that help America compete in a global economy.  
1067 The demand for mobile broadband data continues to grow at an  
1068 unprecedented rate, and the need for additional spectrum to  
1069 meet this demand is well-documented. The wireless industry  
1070 is investing billions of dollars in new technologies to solve  
1071 this problem by improving spectrum efficiency, adding cell  
1072 sites, and improving network management practices, but it  
1073 will not be enough. Additional spectrum must still be made  
1074 available to meet exploding demand.

1075 Among bands under consideration for reallocation, the  
1076 1755 to 1780 megahertz band stands out as uniquely suited for  
1077 commercial use. This spectrum is immediately adjacent to  
1078 spectrum that we use today for mobile broadband, and could be

1079 readily integrated with existing networks to expand services.  
1080 The band is identified internationally and already used  
1081 around the world for mobile broadband. Harmonized use of  
1082 spectrum will facilitate rapid equipment development and  
1083 service deployment, and produce economies of scale and scope  
1084 that reduce the cost of deploying services.

1085         There is also broad support in the wireless industry for  
1086 pairing the 1755 to 1780 band with spectrum currently  
1087 available for licensing at 2155 to 2180 megahertz, which  
1088 Congress required to be licensed by February of 2015.  
1089 Pairing 1755 to 1780 with 2155 to 2180 aligns with existing  
1090 services and will facilitate faster deployment and maximize  
1091 efficient use of the spectrum.

1092         These benefits are reflected in how the spectrum is  
1093 valued. One study found that auctioning the 2155 to 2180  
1094 megahertz band by itself would yield \$3.6 billion, but  
1095 auctioned together with 1755 to 1780, the band would generate  
1096 \$12 billion, over three times as much. Auctioning these  
1097 bands on a paired basis will ensure the best economic return  
1098 for taxpayers and provide the most efficient use for  
1099 broadband services.

1100         NTIA released a report earlier this year describing the  
1101 considerable challenges to making the 1755 to 1780 megahertz  
1102 band available for commercial use, given current federal

1103 operations. T-Mobile believes, however, that the assessment  
1104 of these challenges and their costs are overly pessimistic.  
1105 T-Mobile's experience in relocating federal users from the  
1106 AWS-1 band, which was also reallocated from federal to  
1107 commercial use, demonstrates that the challenges of  
1108 relocation and sharing during a transition can be  
1109 significantly overcome with dialogue and cooperation between  
1110 federal users and industry.

1111         Fortunately, several steps have now been taken that T-  
1112 Mobile believes will provide a path forward to transition the  
1113 1755 to 1780 megahertz band from federal to commercial use.  
1114 First, the FCC, working with NTIA, has granted T-Mobile  
1115 special temporary authority to explore the prospects for  
1116 limited sharing of the band. As part of an industry effort,  
1117 we have already begun to work with the Department of Defense  
1118 to identify the locations at which we will monitor the use of  
1119 the band, and are pleased with the spirit of cooperation that  
1120 has characterized our work with the Department of Defense and  
1121 others so far. We anticipate that preliminary results for  
1122 monitoring and simulations will be available before the end  
1123 of the year and will provide a foundation for field testing.

1124         Second, T-Mobile is participating in working groups  
1125 created under NTIA's Commerce Spectrum Management Advisory  
1126 Committee, or CSMAC. These working groups are a forum for

1127 exchanging technical and operational information between  
1128 federal entities and industry regarding their respective  
1129 systems and the potential for sharing or facilitating  
1130 relocation out of the band.

1131         Third, important changes to the Commercial Spectrum  
1132 Enhancement Act, or CSEA, provide resources for government  
1133 agencies to study relocation options and to update equipment  
1134 to facilitate clearing or shared use of the spectrum. We are  
1135 hopeful that these efforts, taken together, will provide a  
1136 path forward for making the 1755 to 1780 megahertz band  
1137 available on a primary basis for commercial broadband use,  
1138 while fully protecting federal operations.

1139         Where sharing is necessary, either through a transition  
1140 period or indefinitely, it is important that the conditions  
1141 for shared use are well understood and are clearly defined,  
1142 and that substantial access for commercial operations is  
1143 provided.

1144         Certainty regarding the extent of access to the spectrum  
1145 is necessary to provide the incentive for carriers to make  
1146 the very substantial investments needed to deliver world-  
1147 leading, high quality mobile broadband services to American  
1148 consumers.

1149         Thank you again for the opportunity to appear before you  
1150 today. T-Mobile looks forward to continuing to work with you

1151 on these important and timely issues. I would be pleased to  
1152 answer any questions you have.

1153 [The prepared statement of Mr. Sharkey follows:]

1154 \*\*\*\*\* INSERT 7 \*\*\*\*\*

|  
1155 Mr. {Walden.} Mr. Sharkey, thank you very much for your  
1156 testimony. We appreciate that of all our panelists today.  
1157 It is most helpful in our effort.

1158 I am going to start out with questions, and then of  
1159 course we will go back and forth here on the dais.

1160 Mr. Goldstein, I want to start with you. You have  
1161 testified about fundamental flaws in the way the NTIA manages  
1162 federal spectrum, namely, the NTIA does no independent  
1163 analysis of the information federal spectrum users provide or  
1164 of whether those users need all the spectrum they have, is my  
1165 understanding of your work. Did the NTIA fix those flaws  
1166 before issuing their most recent estimates relied upon by  
1167 PCAST in their report that clearing the 1755 to 1850  
1168 megahertz band would take more than \$18 billion and 10 years?

1169 Mr. {Goldstein.} I don't believe they have fixed those  
1170 flaws yet, Mr. Chairman. The system I am talking about,  
1171 which is called the Government Master File, which NTIA used  
1172 to record the information that agencies send them on  
1173 spectrum, is still being used today and won't be replaced for  
1174 at least 6 years.

1175 Mr. {Walden.} All right, thank you.

1176 Mr. Sharkey, Mr. Racek, Mr. Goldstein's written  
1177 testimony points out that federal users will have a low

1178 tolerance for even the possibility of interference, which  
1179 seems logical. Private sector, however, will be reluctant to  
1180 invest significant capital in spectrum network equipment or  
1181 devices if it doesn't have greater assurances that it will be  
1182 able to use the spectrum it pays for when and how it needs  
1183 to, that certainty piece that you were speaking of. Isn't  
1184 this precisely why we should continue to emphasize clearing  
1185 over sharing as our main strategy, not our singular strategy,  
1186 but our main strategy if we are going to meet the spiraling  
1187 demand for wireless broadband? Mr. Sharkey, Mr. Racek?

1188 Mr. {Sharkey.} Thank you, yes. You know, I think it is  
1189 important to stay focused on relocation and clearing as much  
1190 as possible, and there are a variety of different uses in the  
1191 1755 to 1780 megahertz band, and the NTIA report makes it  
1192 clear that a number of those can be cleared in a more  
1193 accelerated time, within five years. There are a number of  
1194 systems where it is likely to take longer or be more costly  
1195 to move those, and that is where we are focusing our efforts  
1196 to try and look at sharing options that would be limited  
1197 geographically or by time.

1198 Mr. {Walden.} All right. Mr. Racek?

1199 Mr. {Racek.} Thank you, Mr. Chairman. The exclusive  
1200 and dedicated globally allocated spectrum below 3 gigahertz  
1201 is what we feel is necessary to be able to provide the

1202 regulatory certainty that is needed to be able to continue  
1203 the investment and the innovation that has been done within  
1204 the industry. So what we would like to see is a continuation  
1205 of that. There is--part of the problem is with unlicensed  
1206 type of spectrum that you get a level of uncertainty. It is  
1207 ad hoc. It is definitely viewed as something that could be  
1208 seen as a complement to licensed type of spectrum, but based  
1209 upon its regulatory uncertainty it will not be the preferred  
1210 methodology.

1211 Mr. {Walden.} All right, thank you, Mr. Racek.

1212 Major General Wheeler, Mr. Goldstein notes in his  
1213 written testimony that the federal users ``often use and rely  
1214 on older technology that is not conducive to operate as  
1215 efficiently or flexibly as state of the art technologies may  
1216 allow.'' The Commercial Spectrum Enhancement Act, or CSEA,  
1217 which we made even better in the spectrum legislation as  
1218 noted by my friend, Mr. Waxman, provides a mechanism to  
1219 upgrade federal facilities with private sector funding during  
1220 the relocation process. Don't we have an opportunity here to  
1221 help agencies better meet their missions in a fiscally  
1222 challenged climate while simultaneously freeing spectrum for  
1223 commercial broadband?

1224 General {Wheeler.} I think there are some opportunities  
1225 there in this particular area, sir, but I also understand

1226 that if you take a look at, for example, the satellite  
1227 systems that are already up there in space right now with a  
1228 single receiver or transmitter, the opportunity to change  
1229 those out without significant costs and time, if you will, to  
1230 put up a new satellite system, for example, is an example of  
1231 where that area won't work very well, and just the mass  
1232 numbers of specific systems that we have. For example, if  
1233 you were going to use the ACT system we talked about, which  
1234 is the combat training system we discussed, that particular  
1235 technology, there is no commercial variant of that particular  
1236 one available, and that is in all of our airplanes, to  
1237 include, for example, now internally to all of our Stealth  
1238 airplanes, the F-35 and the F-22.

1239         So there are examples of where that can work very well,  
1240 and there are examples of where that doesn't have an  
1241 applicability to that specific system.

1242         Mr. {Walden.} All right, thank you.

1243         Mr. Racek, Mr. Sharkey, in the past 5 years we have seen  
1244 two other significant attempts at sharing. The 700 megahertz  
1245 D block failed to garner a winning bid because commercial  
1246 providers were reluctant to pay for a spectrum they would  
1247 need to share with public safety officials, the way that one  
1248 was structured. Nearly 4 years after the FCC white spaces  
1249 order, there are very few takers willing to or able to build

1250 a business around unlicensed devices in the TV broadcast  
1251 band. Is there any reason to believe commercial providers  
1252 would be more willing to spend money under the PCAST  
1253 approach? You are representing the commercial side, what do  
1254 you think?

1255 Mr. {Sharkey.} I think both of those examples are good  
1256 examples of the need to have substantial access for  
1257 commercial services in cleared spectrum and certainty about  
1258 what is available. The problem with both of them was that  
1259 700 megahertz, there was no certainty about what would be  
1260 available for commercial use at the end of the day and what  
1261 that use would cost, so you were asked to pay a high cost up  
1262 front with no certainty on the back end about what you were  
1263 getting.

1264 Mr. {Walden.} All right.

1265 Mr. {Sharkey.} And on the TV white space, there was  
1266 availability in very rural areas, but the top markets had  
1267 little to no spectrum available.

1268 Mr. {Walden.} All right, Mr. Racek, very quickly if you  
1269 can?

1270 Mr. {Racek.} Yes, the--I think the difficulty is that  
1271 sometimes the answer comes actually before the definition of  
1272 the problem in sort of the TV white spaces that the trying to  
1273 be able to utilize that to be able to provide the type of

1274 services that you see that are being used by the tablets and  
1275 the iPhones and those sort of type of things needs a certain  
1276 type of service level, some guaranteed type of service level.  
1277 Unfortunately, some of the solutions that you are talking  
1278 about actually haven't considered that. There are some--  
1279 especially like when it comes to TV white spaces, the ability  
1280 to gain access to spectrum is going to be limited, mostly to  
1281 rural types of environments, but where you actually need the  
1282 capacity is going to be in the urban type of environment. So  
1283 it is sort of providing a solution, but not addressing sort  
1284 of the needs of the commercial industry.

1285         Mr. {Walden.} All right, thank you very much. My time  
1286 is more than expired.

1287         I will turn now to the ranking member of the  
1288 subcommittee, Ms. Eshoo, for questions.

1289         Ms. {Eshoo.} Thank you, Mr. Chairman, and first I would  
1290 like to ask unanimous consent that the letter to the  
1291 committee from the Competitive Carriers Association be made  
1292 part of the record.

1293         Mr. {Walden.} Without objection.

1294         [The information follows:]

1295 \*\*\*\*\* COMMITTEE INSERT \*\*\*\*\*

1296 Ms. {Eshoo.} Thank you, Mr. Chairman.

1297 First of all, thank you to each one of you. I think  
1298 that this has been an exciting panel, and you all come at  
1299 this from different ways, which is not a surprise, but it is  
1300 instructive to us.

1301 I would like to start with Dr. Marshall. The Majority  
1302 has concerns that the PCAST approach is ``too speculative''  
1303 to be the focus of the committee's spectrum strategy. Do you  
1304 agree with this assertion? And I also have another question,  
1305 and that is the PCAST report places a particular emphasis on  
1306 spectrum bands over 2 gigahertz. Are there ways in which  
1307 these higher bands of spectrum could be used by wireless  
1308 carriers to fill in gaps in coverage or provide additional  
1309 capacity in dense urban areas? You just heard Mr. Racek and  
1310 Mr. Sharkey speak about certainty and that the service or the  
1311 outcomes would apply to areas that--where we won't be able to  
1312 optimize what we are looking for. So if you could just give  
1313 the briefest and the best answer, okay? Thank you.

1314 Mr. {Marshall.} I think Mr. Chairman himself noted the  
1315 TV white space has been out there for 3 years. It is a  
1316 particularly unattractive spectrum option, but it did develop  
1317 a technology base that the PCAST builds on. It does not  
1318 build on the cognitive radio, many of the innovative and new

1319 ideas that are flowing. Those will make it better, but its  
1320 basic deployment is the 3-year-old TV white space that  
1321 otherwise has not had a lot of commercial uptake.

1322 I would certainly look at the spectrum that is made free  
1323 not as filling gaps in coverage, but filling gaps in  
1324 capacity. What we face is not a coverage shortfall--if I can  
1325 go and get those little maps that cellular providers give and  
1326 they are all colored whatever color is supposed to be good.  
1327 The issue we have is capacity, and for that higher frequency,  
1328 short range, low power, like the wifi offload, is in fact  
1329 what the carriers need to meet 50 times more capacity.

1330 So I think we have to look at two strategies in  
1331 wireless. One is coverage, and very clearly the licensed  
1332 spectrum has allowed that to happen. When we talk about  
1333 dense areas and urban, we get the opposite effect of the  
1334 previous witness. Instead of--whereas TV is built where  
1335 people are, much of the military is where people aren't or  
1336 where they don't want them. And so here we have the  
1337 opportunity to have the reverse to the TV white space  
1338 experience. He can keep all the spectrum he wants in the  
1339 Mojave Desert, and we take it in New York. He keeps his peak  
1340 allocation, which is what he needs to do his job, and we can  
1341 provide lots of offload capacity, much better than wifi. And  
1342 very clearly, industry is willing to invest in that because

1343 you can't go 2 weeks without seeing a press release of one  
1344 major provider of Internet saying we are rolling out lots of  
1345 wifi. And there is no spectrum less predictable and less  
1346 desirable than wifi. And even so, it is attracting  
1347 incredible investments. Think what a gigahertz could do.

1348 Ms. {Eshoo.} Thank you very, very much.

1349 I am interested--and I don't know what witness wants to  
1350 speak to this, but what is the global picture on this? Do we  
1351 use--do our federal agencies use more spectrum than other  
1352 countries? I mean, we are larger and far more sophisticated,  
1353 I believe, but are there any lessons that we can learn from  
1354 others in what they are doing? I just don't know what the  
1355 answer to that is. Does anyone? Mr. Racek?

1356 Mr. {Racek.} Thank you, Chairwoman Eshoo.

1357 Ms. {Eshoo.} Thank you for calling me Chairman. That  
1358 is very nice. I will remember that.

1359 Mr. {Racek.} Congresswoman Eshoo.

1360 Ms. {Eshoo.} You are my new best friend.

1361 Mr. {Racek.} I could take a little bit of a stab at  
1362 that, and that is that the--Ericsson is very involved in  
1363 standardization type of activities with respect to 3G PP,  
1364 which is the Third Generation Partnership Program, and in  
1365 that standardization development activity is where  
1366 technologies like LTE that you have heard talked about are

1367 being developed. And one of the ways that they sort of  
1368 develop the technology is by identifying bands, and then  
1369 identifying the technology around that band.

1370 Ms. {Eshoo.} And you are doing this globally?

1371 Mr. {Racek.} Yes, this is a global standards  
1372 development organization, and the difficulty, though, is  
1373 that the bands that are--sometimes that are identified seem  
1374 to have more difficulty in actually being identified in the  
1375 U.S. versus other countries.

1376 Ms. {Eshoo.} I see.

1377 Mr. {Racek.} So it makes that in the U.S., oftentimes  
1378 we end out having sort of unique solutions, and we try to  
1379 work with the incumbents, work with the various regulators in  
1380 each one of the countries to come up with as unified a  
1381 position as we possibly can. And this is particularly for  
1382 the 1755 to 1780. Originally in 3G PP, the band that is now  
1383 called AWS-1 actually extended all the way up to 1780  
1384 megahertz. This is one of the reasons why 1755 is--to 1780  
1385 is so important is because it extends the band that we would  
1386 have in the U.S. to be more in line with what the other  
1387 regions may actually be able to allocate. So it has some  
1388 alignment, at least regionally.

1389 Ms. {Eshoo.} General Wheeler, would you like to  
1390 comment? Thank you, Mr. Chairman.

1391           General {Wheeler.} Ranking Member Eshoo, the one thing  
1392 I would add is from a--let us say, a Department of Defense  
1393 perspective. They are watching how other militaries in the  
1394 world--they come to us because they can't get spectrum in  
1395 their country. So for example, doing the training they do,  
1396 our allies come to us before they deploy forward. When they  
1397 are going to be our partners in Afghanistan, they come to the  
1398 U.S., for example, and go out to that Mojave Desert area that  
1399 we just discussed and we actually do the training out there  
1400 because the frequency is available there and they can get  
1401 that ``best training in the world,'' not just for spectrum,  
1402 but because of the air space out there as well. So that  
1403 becomes a big part of why they are so partnered with us,  
1404 because we have the tools available to make them better and  
1405 keep them safe in combat. And that is one of the areas, and  
1406 that area that we are talking about, the 1755 to 1850 is  
1407 where in other countries they use it for other purposes out  
1408 there.

1409           The other part is we are the only country with a large  
1410 number of UAS's. The unmanned aerial vehicles, we have a ton  
1411 of those particular types of things, and it has grown  
1412 astronomically--

1413           Ms. {Eshoo.} It has.

1414           General {Wheeler.} --in the last 10 years, and that is

1415 an area where--that we, again, fall into that particular  
1416 spectrum.

1417 Ms. {Eshoo.} Thank you. Thank you, Mr. Chairman.

1418 Mr. {Terry.} [Presiding] Sure, thank you.

1419 Sticking a little bit with General Wheeler and Mr.  
1420 Goldstein, some commenters--we have actually had some people  
1421 that have come to our office and presented the sharing option  
1422 with the carrot approach, i.e., Department of Defense can  
1423 share some of their spectrum with private sector companies  
1424 and would be able to lease that spectrum, therefore, being a  
1425 source of revenue for the Department of Defense or a  
1426 particular agency government. Does that type of carrot  
1427 approach resolve some of the issues with sharing? Have you  
1428 looked into that type of a proposal?

1429 Mr. {Goldstein.} We haven't specifically at that,  
1430 Congressman, we have looked more broadly at sharing. A  
1431 couple things that I think respond, well, that may be  
1432 possible. One of the things we have found in our review in  
1433 talking to really dozens of industry stakeholders is that  
1434 there is not simply a lot of sharing going on between the  
1435 public and the private sector. Most of the people we talked  
1436 to couldn't really name more than one or two, and they are  
1437 very well-known examples, and it is because the business  
1438 model essentially does not work because of the uncertainty

1439 involved and frankly, the faith in technology--the leap of  
1440 faith that is still required in many ways to get us there.

1441         So it is something that can happen, I think, at the  
1442 margins, but I think many of the challenges that were talked  
1443 about in our testimony are going to exist for some time to  
1444 come.

1445         Mr. {Terry.} All right. General Wheeler, what is your  
1446 thoughts or the Department of Defense's thoughts on sharing,  
1447 but you control--in essence, you become the lessor under  
1448 certain conditions. Is that something that is appetizing?

1449         General {Wheeler.} It is an interesting concept, sir.  
1450 What I would argue here is we are interested in sharing  
1451 because we think that is a quicker way to vacate areas that  
1452 you need, if you will. So in other words, to share would be  
1453 an area to get availability of a set amount of spectrum, so  
1454 we are looking at that from that perspective. The  
1455 incentivizing, you know, I have a whole teams that works this  
1456 and I put, actually, a lot of extra people on that. In fact,  
1457 I pretty much dried up all the spectrum knowledgeable people  
1458 within DoD to work on these particular parts, and the  
1459 incentive for them is they believe that the economy is  
1460 paramount so they really do force and work towards this.  
1461 When you talk about a leasing aspect, we don't physically own  
1462 the spectrum--

1463 Mr. {Terry.} Right.

1464 General {Wheeler.} --so we don't have that ownership of  
1465 the said spectrum. So while I think an incentivizing model  
1466 would be useful to DoD to move things out of there from a  
1467 monetary perspective, I don't think it will make it move any  
1468 faster from the perspective because our folks are working  
1469 very hard and fast to try to find solutions to it to make  
1470 sure that we can do that to make sure that we are following  
1471 through on the President's desire for the 500 megahertz.

1472 Mr. {Terry.} If sharing is possible, more through some  
1473 of the regulatory aspects that have been raised here by your  
1474 testimony, I wonder, though, are there any security  
1475 implications? Is there ways to protect secret classified  
1476 information if you are sharing the same spectrum?

1477 General {Wheeler.} That is a good question, sir. I  
1478 think I am going to go back to what Ranking Member Eshoo  
1479 started in her opening statement where she talked about it is  
1480 not just the sharing or the vacating, but I think it is going  
1481 to be--in some cases, it is going to be actually vacating or  
1482 relocating to a different location. I think there is also  
1483 going to be sharing in some aspects, especially if you want  
1484 to do this in a shorter period of time. I also think there  
1485 are going to be some technologies out there that will make us  
1486 use our areas more efficiently within the area that we are

1487 given. In other words, it is going to be that basket, if you  
1488 will, of ways of approaching this to get us moving in the  
1489 right direction quicker. But there are methodologies to  
1490 protect the security in most aspects, and where we can't, we  
1491 will vacate and move forward and have to go with those  
1492 particular types of approaches. But we have that thought  
1493 through pretty well.

1494 Mr. {Terry.} General Wheeler seems more optimistic on  
1495 the abilities to do this than you did, Mr. Racek. What do  
1496 you think?

1497 Mr. {Racek.} Thank you. The--I think if we look at the  
1498 3550 to 3650 band--and this was one of the bands that was  
1499 identified earlier by Mr. Karl Nebbia, NTIA, and this is one  
1500 of the bands that could possible be made used for commercial  
1501 types of services. And as we have heard before, though, is  
1502 that there was a recognition that this spectrum could not be  
1503 used for LTE high-powered types of systems. Well, this is  
1504 typical where you actually sort of identify well yes, this  
1505 spectrum could be shared but with sort of further  
1506 identification, you understand well, there are going to be  
1507 substantial limitations to its availability, and therefore,  
1508 you start to question whether that spectrum could actually be  
1509 used for the purposes that you had in mind.

1510 Mr. {Terry.} Thank you. My time has ceased.

1511 Ms. Matsui, you are recognized for your 5 minutes.

1512 Thank you.

1513 Ms. {Matsui.} Thank you very much, Mr. Chairman.

1514 I have a question for Mr. Sharkey. We know that the FCC  
1515 has less than 3 years to auction and license the 2155 to 2180  
1516 band, and we know that the 1755 to 1780 band is an ideal  
1517 pairing opportunity. How important is it to move forward and  
1518 find a solution in a timely manner to get this spectrum out  
1519 there?

1520 Mr. {Sharkey.} We think it is very important to move  
1521 forward quickly and make it available, and we think that it  
1522 is doable. We have a very good process in place now between  
1523 the CSMAC working groups and the work that we are doing with  
1524 DoD to really get the right people in the room that can dig  
1525 down into the technologies and figure out the complexities  
1526 around sharing.

1527 Ms. {Matsui.} Okay, and how long to you anticipate the  
1528 industry testing will last, and given we need to pair it with  
1529 the 2155 to 2180 band in a timely manner?

1530 Mr. {Sharkey.} The--as I said in my earlier testimony,  
1531 we expect to have some preliminary information from  
1532 monitoring and some simulation work before the end of the  
1533 year. That will lay the foundation for additional testing.  
1534 We hope to have a good picture of what we can do moving

1535 forward early into next year, and then that can be refined as  
1536 the overall regulatory process moves forward.

1537 Ms. {Matsui.} Okay, thank you.

1538 Mr. Nebbia, given that the FCC has less than 3 years to  
1539 pair the AWS-3 band, do you believe the industry and the  
1540 agencies are working cooperatively to ensure the 1755 to 1780  
1541 band will be made available for pairing with AWS-3 in the  
1542 next 3 years?

1543 Mr. {Nebbia.} Certainly we have been encouraged by the  
1544 cooperation that is going on between government and industry.  
1545 As was said earlier, I believe, by Congressman Waxman the  
1546 amount of information that is being passed back and forth is  
1547 unprecedented and I believe we can, in fact, conclude on this  
1548 range of spectrum in a timely manner. So we are very  
1549 hopeful. We see a lot of great work going on.

1550 Ms. {Matsui.} Okay, so that is great.

1551 Mr. Racek and Dr. Marshall, as we explore each band for  
1552 potential repurposing, which specific bands will be ideal to  
1553 clear below 3 gigahertz and which specific bands or areas  
1554 will be better suited for sharing above 3 gigahertz? I  
1555 really would like you to be specific. Mr. Racek?

1556 Mr. {Racek.} Thank you. We would like to actually come  
1557 back with you and provide some additional information. I do  
1558 have some examples to give. We don't have with me sort of an

1559 all-inclusive list of all of the bands that we think would be  
1560 applicable for clearing below 3 gigahertz. If I can give you  
1561 an example, the one is that we have talked about  
1562 substantially and that is the 1755 to 1850. The other one  
1563 happens to be the 2.7 to 2.9 gigahertz band. This is the  
1564 band that was also identified in the PCAST report, but it was  
1565 a band that was identified by NTIA some time ago in one of  
1566 its analyses as a possible band that could be reviewed--could  
1567 be analyzed for the purpose of commercial usage. We are very  
1568 supportive of that band; we have been for quite a while. We  
1569 operate in this International Telecommunications Union, and  
1570 in that process, you know, we have talked to other regulators  
1571 in other countries and found that this spectrum would be  
1572 available in other countries, and feel like this could be  
1573 something useful for the U.S.

1574         Now, for sharing above the 3 gigahertz, I think one of  
1575 the things that probably would be useful to identify is that  
1576 in the sharing opportunity, it isn't just about sort of  
1577 unlicensed. For our view, unlicensed definitely has its  
1578 benefits. It has already been talked about sort of an  
1579 offloading perspective, but it does bring uncertainty and we  
1580 are very interested in sort of achieving economies of scale.  
1581 And so our approach is as more of a licensed shared access,  
1582 either on a co-primary or a secondary type of basis.

1583 Ms. {Matsui.} Okay.

1584 Mr. {Racek.} And we see that sort of being above 3  
1585 gigahertz. And the work that is being done within the 5  
1586 gigahertz, the 195 megahertz is the right step, but sort of a  
1587 licensed approach is the step we would support.

1588 Ms. {Matsui.} Okay. Dr. Marshall, do you have the  
1589 specific bands that are ideal below 3 gigahertz, and specific  
1590 bands above--I mean, for sharing above?

1591 Mr. {Marshall.} Okay. I think the industry--most over  
1592 1755. That was an incomplete action from--it was a political  
1593 compromise from AWS-1, and like all compromises, it gets  
1594 revisited. I think I am really enthused about the  
1595 opportunity in 3.6, not just because it is spectrum that is  
1596 available, but it does fit this new class of license that  
1597 PCAST proposes, which is to provide certainty of access to  
1598 the industry partners, lets them acquire it, doesn't take it  
1599 away from DoD, and labels them to meet their emission but  
1600 still gives them the certainty of access and premise of  
1601 access for a certain--a large amount of that spectrum. Very  
1602 clearly we are putting a lot of traffic off onto wifi. Wifi  
1603 is very inadequate compared to spectrum with certainty, so I  
1604 think here is an opportunity to provide industry what it  
1605 wants, which is certainty of access, along with sharing of  
1606 federal bands and not damaging the federal emission.

1607 Ms. {Matsui.} Okay, thank you very much. I see I have  
1608 been over my time.

1609 Mr. {Terry.} Gentleman from Florida, Mr. Stearns, is  
1610 recognized for your 5 minutes.

1611 Mr. {Stearns.} Thank you, Mr. Chairman.

1612 Mr. Nebbia, when federal users were relocated from the  
1613 AWS-1 band so that those bands could be auctioned for  
1614 commercial use, CBO estimated that DoD's relocation costs  
1615 would exceed \$4 billion. By the time the auction occurred,  
1616 the OMB approved relocation cost for DoD dropped to less than  
1617 \$400 million. Given that track record, shouldn't we consider  
1618 NTIA's \$18 billion estimated for relocating federal users  
1619 from the 1755 to 1850 bands as merely a starting point for  
1620 serious discussions about relocation costs?

1621 Mr. {Nebbia.} Well certainly we have used that as a  
1622 starting place, and it has, in fact, helped us to begin the  
1623 communications and discussions regarding that particular  
1624 band. The 1710 to 1755 band doesn't act as a terrific  
1625 example in all cases, but for instance, the agencies first  
1626 supplied estimates of about \$2.1 billion, and in that case  
1627 later was adjusted to around \$900 million, and now we are  
1628 back up to about \$1.5 billion. So we do realize there is  
1629 some fluid activity, and certainly as we look at what systems  
1630 we do not have to move out of the band, obviously that will

1631 have an impact on the cost.

1632 Mr. {Stearns.} Mr. Sharkey, based upon T-Mobile's  
1633 experience with the AWS-1 relocation, would you care to  
1634 comment?

1635 Mr. {Sharkey.} I think it is an excellent question  
1636 that, you know, the costs came down significantly from  
1637 initial estimates, and it is important to go back and--

1638 Mr. {Stearns.} Four billion to four hundred million?

1639 Mr. {Sharkey.} So it is very important to go back and  
1640 make sure that the costs are as accurate as possible. You  
1641 know, I think like Karl noted, some of the work that we are  
1642 doing now to look at sharing and transition issues and how to  
1643 facilitate transition out of a band, I think will  
1644 significantly impact any relocation costs for moving out of  
1645 the band.

1646 Mr. {Stearns.} Okay. Mr. Marshall, you state in your  
1647 testimony that ``if bands can be cleared and auctioned with  
1648 exclusive licensing,'' you ``believe the PCAST  
1649 recommendations in no way preclude that.'' Does this mean  
1650 that you agree with the statement of Genachowski, the  
1651 chairman, and many commercial entities that while spectrum  
1652 sharing should be explored, it should not come at the expense  
1653 of clearing?

1654 Mr. {Marshall.} I think the argument in PCAST is you

1655 are going to have difficulty clearing. To the extent that  
1656 argument doesn't hold out, then certainly clearing is a  
1657 desirable option. No electrical engineer could possibly get  
1658 up and say they wouldn't want cleared spectrum over shared  
1659 spectrum, so it is an absolute truth.

1660 The question is the pragmatic issues that get in the way  
1661 of it, not the theoretic.

1662 Mr. {Stearns.} Okay. Mr. Sharkey, getting back to you.  
1663 As you know, I have worked with Congresswoman Matsui to  
1664 specifically reallocate and auction the 1755 to 1780  
1665 megahertz band for commercial use. Can you explain why this  
1666 band is of particular value to the industry, and why NTIA  
1667 should look at this band individually instead of the entire  
1668 1755 to 1850 megahertz and?

1669 Mr. {Sharkey.} The 1755 to 1780 is really unique in  
1670 that it is used around the world for mobile services, so use  
1671 would be harmonized with other commercial services. It is  
1672 immediately adjacent to our AWS-1 band, so we can add on to  
1673 what we are already using, expand services very quickly. So  
1674 it is--and we have got spectrum that is paired with it--can  
1675 be paired with it, 2155 to 2180. That spectrum is available  
1676 now. It has been available for a long time, and now has a  
1677 clock ticking of February, 2015, where that must be  
1678 auctioned.

1679           So this really is a unique opportunity that we need to  
1680 move on very quickly, and I think, you know, one of the--one  
1681 thing to keep in mind, too, with having it licensed by 2015,  
1682 that doesn't mean that government users would have to be off  
1683 the band by 2015, but that there is a transition process that  
1684 has been identified.

1685           Mr. {Stearns.} Good point. General Wheeler, with the  
1686 assumption that relocation involving the bands between 1755  
1687 and 1850 megahertz is coming, what percentage of current  
1688 federal operations could be delivered or accomplished in  
1689 bands above the 3 gigahertz?

1690           General {Wheeler.} Before I answer that, sir, if I may  
1691 clarify the last part, that might help illuminate a little  
1692 bit there in a discussion about the costs in the 1710 to the  
1693 1755. That particular study was done for a larger area of  
1694 spectrum, and then when there was an agreement to only do the  
1695 last 45 megahertz there, that price came down significantly  
1696 in that aspect there. For DoD perspective, we ended up  
1697 retuning, basically, many of our systems out of the 1710 to  
1698 1755 megahertz into the 1755 to 1850. So we just finished  
1699 that this year, in fact, and we moved some of our systems out  
1700 of there into this other band that we are now looking at. So  
1701 that is the reason why the cost came down, from a DoD  
1702 perspective, because it was a smaller area than was

1703 originally looked at, so we didn't have to vacate and we were  
1704 able to tune many of those systems just into the adjacent  
1705 band, which happened to be the 1755 to 1850 and. So that is  
1706 what created some of those specific issues that made the  
1707 differences in the cost.

1708 Mr. {Stearns.} Thank you, Mr. Chairman.

1709 Mr. {Terry.} Thank you, Mr. Stearns.

1710 Gentlelady from Colorado, the list that I was provided  
1711 had you next. Gentlelady from Colorado is now recognized for  
1712 5 minutes.

1713 Ms. {DeGette.} Thank you very much, Mr. Chairman.

1714 First of all, I want to thank the Chairman and Ms. Eshoo  
1715 for appointing me to the federal spectrum working group. I  
1716 have really enjoyed the entire process and learned a lot.

1717 I just want to ask a couple of questions. I want to  
1718 start with you, Dr. Marshall. I want you to comment about  
1719 whether there is a standard to measure efficiency in spectrum  
1720 use?

1721 Mr. {Marshall.} There is a very engineering one of bits  
1722 per hertz that gets misapplied horribly that becomes the Holy  
1723 Grail to people. The PCAST report proposes that we should  
1724 really measure spectrum reuse, not spectrum use.

1725 Ms. {DeGette.} You need to speak into the microphone  
1726 from this angle over here. I can't hear everything.

1727 Mr. {Marshall.} The PCAST report proposes that we  
1728 should really be measuring spectrum reuse. If I use a lot of  
1729 spectrum but 100 people can use it over and over again, then  
1730 that is much more valuable than one person using it once, and  
1731 that that should become the objective of federal systems, not  
1732 so much to optimize the signal, but to optimize how many  
1733 signals sit in the spectrum.

1734 Ms. {DeGette.} But there is no--what you are saying is  
1735 that there is no agreed upon standard that is used right now,  
1736 just the standard that is proposed?

1737 Mr. {Marshall.} Only what someone wants to prove.

1738 Ms. {DeGette.} How can concepts of efficiency be used  
1739 to distinguish a measure of actual spectrum use between  
1740 commercial and federal users? Does PCAST talk about that?

1741 Mr. {Marshall.} PCAST proposed that the SMT propose a  
1742 set of metrics that probably look a little different than  
1743 what NTIA would do. For example, we might want to measure  
1744 federal spectrum usage as a function of POP, so we don't  
1745 charge a lot of federal bucks when they use it in Mojave,  
1746 but we charge them a lot when they use it in New York. And  
1747 so we clearly want to measure the opportunity costs  
1748 associated with federal spectrum use, not the use itself.  
1749 And that, I think, was the key to that appendix.

1750 What is the opportunity that federal spectrum usage is

1751 taking away from the civil sector and being able to either  
1752 share the spectrum or lease it?

1753 Ms. {DeGette.} And let me talk about that a little bit,  
1754 because I think that is one of the questions. Everybody  
1755 makes allegations that both commercial and federal users are  
1756 sitting on spectrum, but there is no agreed upon way to  
1757 monitor how we build it out, how we deploy it in daily use,  
1758 who is using it, and we talk a lot in particular about the  
1759 federal spectrum about how it is just sitting there. I want  
1760 to know, after listening to this panel testify today, what  
1761 incentives actually exist for a commercial site to use  
1762 spectrum effectively?

1763 Mr. {Marshall.} Well, I think you have to ask--

1764 Mr. {Sharkey.} So I can answer--

1765 Ms. {DeGette.} Feel free.

1766 Mr. {Sharkey.} I think there is tremendous incentives  
1767 to use spectrum efficiently on the commercial side, and we do  
1768 invest billions of dollars to use it efficiently.

1769 Ms. {DeGette.} So what are those incentives?

1770 Mr. {Sharkey.} They are--as the FCC has moved to  
1771 auctioning spectrum, there are financial incentives through  
1772 auctions that cost us a lot of money to obtain new spectrum.  
1773 Obviously, the more customers we can serve and the more  
1774 information we can provide them or data we can provide, the

1775 more money we can make by serving a larger base of customers.

1776 Dr. Marshall's comment about measuring reuse and the  
1777 ability to reuse frequencies as part of the efficiency, we--  
1778 the technologies that we are implementing today reuse the  
1779 same frequency everywhere. So where previous technologies  
1780 would only reuse it--a particular slice of frequency every so  
1781 often, new technologies use this entire spectrum we have  
1782 available every place.

1783 Ms. {DeGette.} Okay. Mr. Goldstein, I wanted to ask  
1784 you, some people have said that the GAO should take a greater  
1785 role in investigating the federal agency's spectrum use.  
1786 Does the GAO have the resources and expertise to conduct this  
1787 type of analysis.

1788 Mr. {Goldstein.} We were talking about this the other  
1789 day. We think maybe the best way to do this is getting the  
1790 postal service to do it. They pass every house and every  
1791 building in America. GAO would not have--

1792 Ms. {DeGette.} Assuming the postal service is still  
1793 around.

1794 Mr. {Goldstein.} Exactly.

1795 Ms. {DeGette.} So seriously, does the GAO have the  
1796 resources to conduct these types of analyses?

1797 Mr. {Goldstein.} I think it would be a tall order to  
1798 ask almost anyone to be able to inventory federal spectrum

1799 usage at this point in time.

1800 Ms. {DeGette.} So your answer is no?

1801 Mr. {Goldstein.} That is correct.

1802 Ms. {DeGette.} Is there anybody who could do it at all?

1803 Mr. {Goldstein.} I don't know. We have not looked at  
1804 that. I can certainly talk with staff and get back to you--

1805 Ms. {DeGette.} It would seem to me--

1806 Mr. {Goldstein.} --and see whether we have any  
1807 suggestions for you.

1808 Ms. {DeGette.} If we are trying to figure out where the  
1809 spectrum is, it might be helpful to have that.

1810 Mr. {Goldstein.} Of course.

1811 Ms. {DeGette.} Thank you very much, Mr. Chairman.

1812 Mr. {Terry.} Thank you. The gentleman from Illinois is  
1813 recognized for his 5 minutes.

1814 Mr. {Shimkus.} Thank you, Mr. Chairman. It is great to  
1815 have you all here. It is great testimony. It is a great  
1816 debate, and timely and needed.

1817 Mr. Chairman, first I want to seek unanimous consent to  
1818 enter into the record a letter from CTIA, the Wireless  
1819 Association, Information Technology Industry, High Tech  
1820 Spectrum Coalition, TIA, the Wireless Broadband Coalition,  
1821 the Consumer Electronics Association, 4G America, urging the  
1822 government to make more licensed, paired spectrum available.

1823 And I do this because then I go to--

1824 Mr. {Terry.} Without objection.

1825 [The information follows:]

1826 \*\*\*\*\* COMMITTEE INSERT \*\*\*\*\*

|  
1827           Mr. {Shimkus.} Mr. Racek, do you think shifting  
1828 emphasis toward the PCAST approach is more or less likely  
1829 than clearing to help make such spectrum available? What  
1830 does your crystal ball say?

1831           Mr. {Sharkey.} I think that there are still a lot of  
1832 opportunities that exist to clear spectrum and make it more  
1833 fully available. Certainly we are open to sharing and the  
1834 conditions around sharing will depend on, you know, the  
1835 specifics. It is not an easy process, and it is, you know,  
1836 it really is a process where the parties need to sit down and  
1837 understand and make sure that you are not going to interfere  
1838 with the other user, which is the process that we are going  
1839 through in 1755 right now. A broader sharing that is, I  
1840 think, at least out of the PCAST report, has been largely  
1841 portrayed of a database that allows free use, I think, you  
1842 know, doesn't provide the kind of certainty that we need to  
1843 provide a commercial service. You know, there does need to  
1844 be substantial access to spectrum to be able to provide a  
1845 reliable commercial service.

1846           Mr. {Shimkus.} Mr. Racek?

1847           Mr. {Racek.} Could you go ahead and repeat the  
1848 question?

1849           Mr. {Shimkus.} The point I was making was do you think

1850 shifting emphasis towards the PCAST approach is more or less  
1851 likely than clearing--to clearing spectrum to help make such  
1852 spectrum available?

1853         Mr. {Racek.} I think that the type of services that the  
1854 licensed spectrum provide is real time type of services.  
1855 These are services that are statutorily mandated by the FCC.  
1856 These are CALEA, this is e-911, you know, these are--there is  
1857 a quality of service that is guaranteed on this spectrum.  
1858 Those are the type of services that are currently in use.  
1859 The types of services that we see for a licensed shared  
1860 environment or a spectrum sharing environment, those are sort  
1861 of like complementary to providing support for licensed type  
1862 of operation. So you could see that as more of a best effort  
1863 type of services, very good for sort of offloading, but it is  
1864 an offloading of a licensed type of network.

1865         Mr. {Shimkus.} And I appreciate Dr. Marshall's comment.  
1866 Obviously being with PCAST, but as an engineer, you know that  
1867 having it is better than sharing it. And for the private  
1868 sector, their real testimony is they don't want to blow and  
1869 lose capital, and they have got to have consumers and they  
1870 want to maximize the potential of that spectrum use. I mean,  
1871 it is a great capitalist debate of how to best get the max  
1872 use out of a spectrum is give it to the private sector and  
1873 see if they can turn a profit by maximizing use in that area.

1874           But we have a history--I mean, we have history of  
1875 sharing, or at least what happens to the economics of it, and  
1876 the D block does talk about any takers. We also--and so the  
1877 other question I have is--and sometimes we do this. I don't  
1878 like to compare United States with what Europe is doing and  
1879 what other folks are doing, because we are so big and all  
1880 that stuff. But can anyone tell me of any other country that  
1881 is in the high tech arena, like maybe in Asia, Japan, Korea,  
1882 South Korea, Europe? Has anyone talked about shared spectrum  
1883 and the like, and does the PCAST report--you look like you  
1884 are interested in answering this.

1885           Mr. {Marshall.} Yes, in the EU Spectrum Management  
1886 Conference, which the community just had, they actually got  
1887 up and said if they don't get ahead of America, they will be  
1888 in the dust. I think we have started a race to see who  
1889 develops the technology that uses shared spectrum, because it  
1890 is the next big sweet spot. There is some spectrum probably  
1891 left over as Steve describes, but we are going to move to an  
1892 era where this is the next--just like you moved out of the  
1893 suburbs into further land, and after you did the plains you  
1894 went to a little bit rockier soil because that was the only  
1895 land available to farm. This is the place to farm for  
1896 innovation, and I think the EU sees that opportunity as one  
1897 they want to get ahead of us on.

1898           Mr. {Shimkus.} In my last second, what examples do we  
1899 have of spectrum sharing right now by federal agencies, and  
1900 the difficulties or challenges that have been faced?

1901           Mr. {Nebbia.} There is a great deal of sharing that  
1902 already goes on among the federal agencies, day in and day  
1903 out. Few federal assignments are exclusive types of  
1904 assignments, but at the same time, we also share with a  
1905 number of nonfederal uses. We share with wifi, we share with  
1906 a system called Low Jack that we use to find stolen cars, we  
1907 share with medical telemetry, public safety, land mobile  
1908 satellite systems operated by the nonfederal side, amateurs.  
1909 Almost every weekend, federal spectrum is used by the  
1910 broadcasting community to transmit signals related to  
1911 sporting events that you are watching on TV. Weekend  
1912 activities are a nice way to share. So that goes on all the  
1913 time. The government has actually been operating in the TV  
1914 white spaces for years, doing DoD training in those gaps  
1915 between the broadcasters.

1916           Mr. {Shimkus.} Thank you, Mr. Chairman. Thank you.

1917           Mr. {Walden.} Thank you. Now I turn to Dr. Christensen  
1918 for 5 minutes for questions.

1919           Dr. {Christensen.} Thank you, Mr. Chairman, and thank  
1920 you for this hearing. It has been very informative.

1921           I want to go back so I understand about the costs and

1922 the time frames. That March, 2012, NTIA report on the  
1923 potential for clearing and reallocation of the 1755 to 1850  
1924 megahertz band indicates that the--indicated that the full  
1925 relocation would take up to 10 years and cost maybe \$18  
1926 billion, and those projections, as we discussed already, were  
1927 provided by federal spectrum users. As the government and  
1928 the commercial providers are like endeavors to find a  
1929 solution to access this spectrum, are we still--in light of  
1930 the response, and I believe it was in response to the  
1931 question by Chairman Stearns and some comments by General  
1932 Wheeler, are we continuing to rely on that data?

1933 Mr. {Nebbia.} Congresswoman, that data is our starting  
1934 point for the discussions we have been having. Certainly as  
1935 we find ways to share the spectrum and we find opportunities  
1936 where maybe some of those systems do not have to be moved, we  
1937 will certainly see some of those numbers change. As we get  
1938 closer to any auction process, there will be another review  
1939 of that under the CSEA.

1940 Dr. {Christensen.} And I believe GAO recommended that  
1941 NTIA reevaluate your approach to validating the agency-  
1942 reported data. How do agencies get--derive that data? What  
1943 are you doing to assess and scrutinize them to getting a more  
1944 accurate assessment, and to gain a better understanding of  
1945 the costs to reallocate federal spectrum users and to tighten

1946 the timeframes for vacating?

1947 Mr. {Nebbia.} Well first of all, I think it is  
1948 important to recognize that, for instance, in the cell phone  
1949 community, the people that are organizing that spectrum space  
1950 have base stations, they have handsets, and they have  
1951 backhaul. In the government, we have got satellite systems,  
1952 we have got sensing systems, we have got military tactical  
1953 systems, and with the great number of different operations  
1954 that we have, we simply have to rely on the experts in those  
1955 systems to look at their uses and needs and to project the  
1956 kind of costs that they will have to relocate and the time to  
1957 relocate. That simply can't be determined by our spectrum  
1958 staff.

1959 Dr. {Christensen.} Okay, thank you.

1960 Mr. Sharkey, Mr. Marshall has testified that wifi  
1961 offloading is ``providing more capacity per megahertz than a  
1962 dedicated cellular spectrum.'' Is offloading broadband  
1963 traffic on wifi an acceptable alternative to commercial  
1964 wireless providers?

1965 Mr. {Sharkey.} It is not an acceptable alternative, but  
1966 we do offload a lot of traffic onto wifi systems, and I think  
1967 all the carriers now do that. Our devices can be set so that  
1968 they prefer to be on a wifi network as a way to move traffic  
1969 off of the broadband mobile network. However, you know, the

1970 projections that we see about growth of data on the broadband  
1971 network are on the broadband network. When we report numbers  
1972 about how much data our devices use, they don't include the  
1973 data that has been offloaded onto wifi networks, so the  
1974 growth that we see continues to impact the broader mobile  
1975 network which provides highly reliable services wherever  
1976 people are. And we, you know, we need dedicated spectrum  
1977 that will continue to meet that demand and that growth, and  
1978 at the same time, we are always interested and always moving  
1979 to implement new technologies and techniques to minimize the  
1980 impact of that growth.

1981 Dr. {Christensen.} Thank you. I wanted to get that  
1982 question in, and maybe I would go back to Mr. Goldstein to go  
1983 back to my first question and your recommendation that NTIA  
1984 reevaluate how they validate the agency's assessment of  
1985 costs, and if you wanted to add anything to what Mr. Nebbia  
1986 said about the difficulty in doing that and meeting that  
1987 recommendation?

1988 Mr. {Goldstein.} Ma'am, it is a very critical part of  
1989 what has to happen, because whether we are talking about  
1990 clearing space or whether we are talking about sharing  
1991 spectrum, it is impossible to really figure out how to do  
1992 this effectively if we don't know who is using what space,  
1993 what spectrum. And in our analysis of use last year, we did

1994 a survey of all the Iraq members, and we found that many of  
1995 them told us that they made many errors in assignments when  
1996 they went back and looked, and for those agencies that  
1997 actually did sample surveys or site visits to help them  
1998 determine the accuracy of the information that they were  
1999 providing to NTIA, much of the information that they provided  
2000 they recognized was in error.

2001 Dr. {Christensen.} Okay. Thank you, Mr. Chairman. I  
2002 think I will just yield back.

2003 Mr. {Walden.} Thank you, Dr. Christensen.

2004 We will now go to the gentlewoman from California, Ms.  
2005 Bono Mack, for questions.

2006 Mrs. {Bono Mack.} Thank you, Mr. Chairman, and I thank  
2007 our panelists for very interesting and enlightening  
2008 discussion.

2009 Mr. Sharkey, my first question is to you. Mr. Marshall  
2010 says that the people who say industry won't share spectrum  
2011 are wrong because industry shares the wifi band, but as I  
2012 understand it, commercial mobile providers do not use the  
2013 wifi band as the primary means of enabling consumers to  
2014 access mobile services. Instead, commercial mobile providers  
2015 used--they use cleared spectrum for which they have exclusive  
2016 rights. Isn't that correct?

2017 Mr. {Sharkey.} That is correct, and as I mentioned, the

2018 projections of growth are growth on that cleared spectrum,  
2019 that dedicated spectrum, and having that enables us to--we  
2020 are on a cycle of updating technology almost annually now for  
2021 our network and implementing new techniques and technologies,  
2022 and having that cleared assured access to spectrum gives us  
2023 incentives to continue that innovation and growth so that we  
2024 can provide greater data and serve more customers.

2025           Mrs. {Bono Mack.} Thank you, and also, Mr. Sharkey,  
2026 haven't preliminary conversations in the Commercial Spectrum  
2027 Management Advisory Committee indicated that the federal  
2028 agencies had some fundamental misunderstandings about the  
2029 technical specifications underlying the commercial sector's  
2030 proposed use of the spectrum, and don't these types of  
2031 misunderstandings underscore the need for independent  
2032 verification of agency costs and time estimates?

2033           Mr. {Sharkey.} I certainly support verification of  
2034 costs of relocating systems, and I think the, you know, some  
2035 of the fundamental misunderstandings go to even our ability  
2036 to share either through a transition period or indefinitely.  
2037 In our AWS-1 clearing, we were--we had to work with DoD to  
2038 get access to spectrum earlier than originally anticipated,  
2039 and we found that once--well, initially it looked like we  
2040 would not get access to it. Once the engineers were able to  
2041 sit down and explain that how our systems operate and how

2042 they limit the potential for interference and noise into  
2043 where the government systems would operate, we were able to  
2044 access and deploy that spectrum years earlier than originally  
2045 anticipated.

2046 Mrs. {Bono Mack.} Thank you.

2047 Dr. Marshall, in defending PCAST recommended sharing  
2048 model, you assert that sharing will be based on the  
2049 fundamental principle that underutilized federal spectrum  
2050 should be shared to the greatest possible extent. If that  
2051 federal spectrum is being underutilized, why shouldn't  
2052 federal users be consolidated into fewer bands, rather than  
2053 require commercial providers to share spectrum with  
2054 inefficient and underutilized government systems?

2055 Mr. {Marshall.} Thank you for the question. So the  
2056 premise of the PCAST report was that there is fundamental  
2057 different usage between the kind of spectrum represented by  
2058 the commercial world and much of the federal agencies.  
2059 Federal agency spectrum is largely driven by contingency and  
2060 very geographically specific. So in the western test ranges,  
2061 it is very hard to find any open frequencies because there is  
2062 so much test training activity out there, whereas that  
2063 spectrum in New York may be very underutilized. The fact  
2064 that it is underutilized in New York or is it used 7 percent  
2065 across America--and I don't want to quote the number--doesn't

2066 mean that you can reduce it by 14. They need the peak out in  
2067 the western test range, but they can make available that  
2068 spectrum in New York. If you do reallocation, you  
2069 essentially have to say I am going to squeeze them  
2070 everywhere. If you do spectrum sharing, you open the  
2071 opportunity to say we are going to commit 90 percent spectrum  
2072 availability in New York, minus a 9/11-like event, but we are  
2073 going to let you still test and train with a full complement  
2074 of spectrum for all your systems. So it lets you not have to  
2075 make a one size fits all, one size goes everywhere in the  
2076 United States solution. So there is no tension at all behind  
2077 saying that federal spectrum is underutilized in many cases,  
2078 in fact, where people are, while at the same time saying you  
2079 can't reduce those allocations. That is the conundrum you  
2080 faced every time people have come to you to say reallocate,  
2081 reallocate. The PCAST report says there is a different  
2082 solution. Leave it like it is, learn to share. It is  
2083 inconvenient, it is new. We don't know how to do it. We  
2084 shouldn't be afraid of that. Let the Federal Government keep  
2085 what it needs for its contingency. Now whether that  
2086 contingency number is right or wrong is another question, but  
2087 let it keep what it needs for contingency while you made the  
2088 underused portion of that, the temporally and geographically  
2089 underused portion available to people like Steve. It is a

2090 compromise that meets both side's needs without having to do  
2091 grievous injury to either.

2092           Mrs. {Bono Mack.} Thank you. Mr. Chairman, I will  
2093 yield back my time.

2094           Mr. {Walden.} Gentlelady yields back. Now gentleman  
2095 from Massachusetts, Mr. Markey, is recognized.

2096           Mr. {Markey.} Thank you, Mr. Chairman, very much.

2097           Back in 1993 when I was Chairman of this subcommittee,  
2098 we held hearings on reclaiming spectrum from the military  
2099 from other government agencies, and it was necessity. We  
2100 only had two cell phone companies. They were both analog and  
2101 they were both charging 50 cents a minute. And so we have  
2102 the hearings here, and we moved over 200 megahertz of  
2103 spectrum. General, your predecessor on the job was sitting  
2104 there, raising national security concerns, which we  
2105 appreciated. But we moved over the 200 megahertz and created  
2106 a third, fourth, fifth, and sixth cell phone license in each  
2107 market in the United States by the year 1996, and the four  
2108 new companies in each market went digital, dropped the price  
2109 to under 10 cents a minute, and that is the year you all  
2110 bought a cell phone. I am pretty sure you didn't have brick  
2111 you were carrying around in a bag. There might have been a  
2112 few people, but not many. So we needed that revolution.

2113           And so now we reach, you know, this modern era here

2114 where the surging growth and data-intensive devices and  
2115 applications is leaving our mobile industries gasping for air  
2116 or spectrum. So it is important for us to find ways of  
2117 efficiently, in these 20 years later--it is only actually  
2118 like 15 years. Everyone thinks they have had a cell phone in  
2119 their pocket their whole life, much less an iPhone, and they  
2120 haven't. It is just a very brief period of time that this  
2121 whole era has existed, but this committee had to move over  
2122 the spectrum and kind of balance the interests of the  
2123 military and other government agencies with the need to  
2124 continue to provide that extra spectrum.

2125         So when I--Mr. Goldstein, when I talked to Commissioner  
2126 Knapp last year here in the subcommittee hearing, he told me  
2127 that it would be possible that we could increase the  
2128 efficiency of the spectrum we have from 10 to 50 percent. Do  
2129 you agree with that?

2130         Mr. {Goldstein.} We haven't looked at that, sir. I  
2131 would be happy to talk to staff about doing it, but we have  
2132 not done work specifically examining that.

2133         Mr. {Markey.} Okay. General Wheeler, what do you  
2134 think?

2135         General {Wheeler.} I don't have a specific number out  
2136 there, but I don't think that is unreasonable. I think that  
2137 we can increase efficiencies across the board, given the new

2138 technologies that are going out there.

2139           If I could clarify about a comment back on that vacating  
2140 of the frequency, I was not here for the DoD guy that was  
2141 nervous, I can tell you that. I was a young captain.

2142           Mr. {Markey.} I am sure you understand this.

2143           General {Wheeler.} I do, because I was a B2 guy, a  
2144 stealth bomber guy, and part of the area you vacated was the  
2145 area for my radar, and so in that particular area that we had  
2146 in there, we actually had to physically turn off in the  
2147 weather on certain cases. And so we were at a 10-year area  
2148 where we actually had to replace the radar for \$1.1 billion  
2149 and weren't sure we could do it in the timeline we did, but  
2150 we did find a way to do it. It did turn out to work. It did  
2151 cost us money. It caused us some safety issues for a while,  
2152 but we worked through those.

2153           Mr. {Markey.} You know what? Here is the deal. Every  
2154 Democrat and Republican on this committee would support  
2155 whatever money you need in order to do that, because  
2156 honestly, by 1996 everybody had a cell phone in their pocket  
2157 and as a result of that, the devices got so inexpensive and  
2158 it was digital that it went to every village in the world.

2159           General {Wheeler.} It started to balance.

2160           Mr. {Markey.} So that is quite a revolution, you know,  
2161 that all happened because the military understood that that

2162 might actually be a good thing to spread this communications  
2163 technology, but we have to lead it here. So my hope is that-  
2164 -you are not opposed to this sharing of the spectrum?

2165         General {Wheeler.} No, sir, not at all. I think one of  
2166 the points that I think is good to understand is that there  
2167 is also geographics here, and I think that is where we are  
2168 driving to over here, because there are areas where it is  
2169 more difficult to move things from a cost perspective and  
2170 those areas may--for example, a satellite control station,  
2171 very difficult to change a satellite's receiver in orbit,  
2172 obviously. So instead of doing that, you don't use that  
2173 frequency in that particular area. Go ahead, sir.

2174         Mr. {Markey.} If I may, according to the President's  
2175 Council of Advisors on Science and Technology, the Federal  
2176 Government's use of domestic spectrum is rising in part  
2177 because of the increasing drone usage here at home.  
2178 According to this report, the number of drones operating by  
2179 the Department of Defense has drastically increased from 167  
2180 to nearly 7,500 from 2002 to 2010, and the systems are  
2181 carrying larger payloads and collecting increased volumes of  
2182 intelligence, surveillance, and reconnaissance data, and that  
2183 has resulted in a much larger increase in the number of  
2184 domestic training requirements.

2185         Dr. Marshall, in developing this report, what can you

2186 tell us about the types of information that the Pentagon  
2187 collects when it flies drones over American soil, and what  
2188 the Department does with that information?

2189 Mr. {Marshall.} We certainly didn't audit what the  
2190 government does with the information from the drones.  
2191 Really, it wasn't our--I don't think the PCAST's job to audit  
2192 the federal usage. It was enough to see that there were  
2193 these very large federal systems like air traffic controller  
2194 radar--

2195 Mr. {Markey.} I guess what I am asking is do they have  
2196 policies to delete information about innocent Americans that  
2197 they are collecting, the military? Do they have a policy in  
2198 place to delete it?

2199 Mr. {Marshall.} I hope they have a policy not to  
2200 collect it.

2201 Mr. {Markey.} You hope they do. Do you have a policy  
2202 to delete--

2203 General {Wheeler.} May I clarify? Yes, sir, we have--  
2204 there is a whole legal piece in there and they do that.

2205 Mr. {Markey.} Can you provide to the committee the  
2206 Pentagon policy on eradicating all information that is  
2207 gathered by 7,500, you know, drones flying over the United  
2208 States of private American citizens--

2209 General {Wheeler.} Can I clarify a little bit on that

2210 particular--

2211 Mr. {Walden.} The gentleman will need to move on.

2212 General {Wheeler.} I think it is important to  
2213 understand that what happens in Iraq and Afghanistan today,  
2214 those pilots in those UAVs, in many cases, are actually in  
2215 the United States. The airplane may very well not be flying  
2216 over the United States, but the spectrum and the uplink going  
2217 to the satellite, that individual could be, for example, at  
2218 Nellis Air Force Base and he is actually flying the airplane  
2219 over Iraq and Afghanistan. No video taken over the United  
2220 States, but in fact actually using that uplink from Nellis--

2221 Mr. {Markey.} No, I appreciate that, and I have been--  
2222 but what I would ask is if, you know, anything that is  
2223 gathered here domestically, in training missions, anything--

2224 General {Wheeler.} Absolutely.

2225 Mr. {Markey.} --what happens to that? And there is a  
2226 policy, is that--

2227 General {Wheeler.} There is policy there, there is data  
2228 not allowed to be used. There is no--they are very cautious  
2229 of that particular Federal Government--and we will provide  
2230 those rules to you so you can have those.

2231 Mr. {Markey.} I think both sides would love to know  
2232 what those rules are. Thank you, Mr. Chairman.

2233 Mr. {Walden.} Thank you. We will now go to Mr. Scalise

2234 for 5 minutes for questions.

2235           Mr. {Scalise.} Thank you, Mr. Chairman. I appreciate  
2236 you having this hearing. I know as we have done this work on  
2237 the task force over the last few months, I think we all  
2238 recognize that if you look at the economy, one of the growth  
2239 sectors has been the technology industry, and probably one of  
2240 the few, but one of the greatest growing--and you know, as we  
2241 all use more technology, new technology, you know, 3G  
2242 networks are now 4G networks, the demand continues to  
2243 increase for spectrum. And then, of course, as that demand  
2244 is met it allows for more innovation, for more great new  
2245 products that make everybody's life easier, but also creates  
2246 thousands of new high-paying jobs. You know, the jobs in  
2247 this industry are tremendously high-paying, really important  
2248 to our economy, and also helps us as we try to increase  
2249 exports to lead the world, it is one of the areas where we  
2250 continue to be a dominant force. So figuring how to free up  
2251 more spectrum is critical, not only for the industry and the  
2252 growth of jobs, but also for America's economy to grow.

2253           I appreciate the federal agencies that we have met with  
2254 over these last few months, and the conversations we have had  
2255 because clearly, there is a lot of spectrum held by the  
2256 Federal Government, and some, I think everybody acknowledges,  
2257 of which can be freed up. How do we best go about that? I

2258 think where we start, how do we best get an inventory of that  
2259 available spectrum, and I think that has been probably one of  
2260 the hardest things to get a grip on. I think the GAO report  
2261 brought this up and I want to ask Mr. Goldstein about this,  
2262 because one thing it seems like is, you know, to get the  
2263 inventory we have today it was almost like, you know, they  
2264 went to everybody and said how much money do you have  
2265 available in your savings account that you don't want to use?  
2266 And you know, so when you are asking everybody how much  
2267 spectrum do you have that you don't need, I don't know if  
2268 that is the most objective way to get an inventory of  
2269 spectrum.

2270         So if you, Mr. Goldstein, can comment on the inventory  
2271 that we have, and is there a better way to get an impartial,  
2272 true inventory of what the federal agencies hold that they  
2273 really don't need, or could use more efficiently, especially  
2274 if more was freed up where you generate money that could help  
2275 build out a more efficient system for them so that more can  
2276 be cleared and reallocated?

2277         Mr. {Goldstein.} Congressman, I think because there is  
2278 a lack of economic incentive on the part of agencies, we  
2279 found that many of them simply don't do the work to figure  
2280 out how best to use the spectrum they have. And we also  
2281 found in a report last year when we surveyed all of the

2282 members, you know, in Iraq that 15 of the 18 Iraq members  
2283 expect that they will have significant new needs for  
2284 spectrum. I know that is probably not popular in this room  
2285 right now. We have been talking about commercial needs, but  
2286 almost all of them expressed the need for additional--  
2287 significant additional spectrum themselves.

2288         Now certainly you could argue they ought to better use  
2289 the spectrum they have, and there needs to be ways in which  
2290 they should do that. One of the recommendations we made to  
2291 NTIA, working with Iraq, was to figure out how better to do  
2292 that, and they agreed with that recommendation. What I don't  
2293 know is how far along they have gotten on that recommendation  
2294 since that report last April.

2295         Mr. {Scalise.} And I mean, those are fair points to  
2296 bring up because if you look at, you know, a number of  
2297 federal agencies, we all acknowledge that some have spectrum  
2298 that they are using and you can identify those areas, but  
2299 there are also areas that they are not using today that they  
2300 say they will need in the future, you know, and in some cases  
2301 you have got to dig in and see is that really something that  
2302 is realistic? Is that something that they are going to truly  
2303 be using? In some cases the answer is yes, and in some cases  
2304 the answer is probably no, but in the case where the answer  
2305 is yes--and I really want to ask General Wheeler this

2306 question, because we see in so many constraints with the  
2307 threats of sequestration, the threats to the Department of  
2308 Defense, you know, one of our main constitutional duties is  
2309 to provide for our national defense. I think everybody here  
2310 strongly supports that and wants to make sure that you have  
2311 the tools you need to meet your mission, but while at the  
2312 same time if there have been constraints that have held you  
2313 back from making the most efficient use of the spectrum you  
2314 have, and even the spectrum you are holding that you are not  
2315 using that you might want to use later, if this concept of  
2316 having some kind of incentive, which is a very important  
2317 concept to bring to the table, because of billions of dollars  
2318 will be generated to the Federal Government to make this  
2319 available in the private sector to create those jobs and  
2320 innovation, some of that money can be set on the side to help  
2321 incentivize the agencies that have spectrum today to make  
2322 better use of it, where in some cases you know you can make  
2323 better use, you just don't have the money to do it. And some  
2324 of that money could be made available to give you better use  
2325 of your spectrum, which also frees up spectrum that can then  
2326 go and generate even more money, billions of dollars to the  
2327 Federal Treasury to go out to the private market. So if you  
2328 can share with us what you have looked at in terms of the  
2329 things that you could do if you had some money that was freed

2330 up from the sale of some of that spectrum that you can  
2331 actually use to help make a more efficient use of what you  
2332 have today?

2333         General {Wheeler.} From the DoD perspective, that is  
2334 the basis of the NDA language that says that we have to have  
2335 comparable spectrum. That is going to take us time, and then  
2336 we are going to have to have money to actually move those  
2337 systems. Where sometimes that difficulty comes in is that  
2338 happens after the auction occurs, and while you are trying to  
2339 do some of the planning up front, we basically front the  
2340 money, per se, and we don't have real good avenues to receive  
2341 that money within DoD from that side of the ballpark. The  
2342 expectation is when we vacate something out of there is that  
2343 we will have to get comparable spectrum time and money per  
2344 the NDA language that actually addresses that specific issue.

2345         As far as other monetary incentive schemes, we would be  
2346 happy to study those. I don't have any direct answers to  
2347 them, depending upon what the exact language, but I would  
2348 also go back to one of my other comments that I made, that  
2349 for the most part we are trying to vacate those areas and  
2350 share, if you will, and find those efficient methodologies,  
2351 because we also see from our perspective, economy is the  
2352 strength of our Nation. So we are moving those forward, so  
2353 we are putting a lot of assets against that. We actually

2354 move those specific areas that we are looking at,  
2355 specifically we talk about the 1755 to the 1850. The other  
2356 side of it is also from the DoD perspective is a long-term  
2357 strategy, a long-term strategy for all of our spectrum, so we  
2358 know what to expect and what we are going to move, and how to  
2359 better purchase equipment, if you will, that has flexibility  
2360 in the future. We can't put a satellite up--we are thinking  
2361 we have to move that particular frequency with a single  
2362 receiver or single transmitter, because it is very difficult,  
2363 obviously, to move that particular piece. And that is where  
2364 that thinking ahead acquisition type cycles are very  
2365 important. And many of the weapons systems that we are  
2366 bringing online today were envisioned, built, engineered 10,  
2367 15 years ago, in many cases where this was not an issue. So  
2368 that is what we are running into right now is we are having  
2369 to change the way we think from that perspective.

2370         So we are looking forward to building a long-term  
2371 strategy for our spectrum, from a DoD perspective, to make  
2372 sure that we are using it the most efficient way so that we  
2373 can predict where to put our future systems so we don't run  
2374 into the issue that we recently ran into where we moved from  
2375 1710 to 1755 into the 1755 to 1850 and now we are looking to  
2376 move again quickly. So we are trying to find smart ways of  
2377 doing this.

2378 Mr. {Scalise.} Thank you, Mr. Chairman. I yield back  
2379 the balance of my time.

2380 Mr. {Walden.} Thank you. We will now move on to Mr.  
2381 Latta from Ohio. We welcome your questions.

2382 Mr. {Latta.} Well thank you, Mr. Chairman, for the very  
2383 informational hearing that we are having today, and I want to  
2384 thank all of our panelists that are here today for not only  
2385 their testimony, but for their reasoned answers to a lot of  
2386 questions.

2387 Mr. Racek, if I could turn to your testimony. I found  
2388 it rather interesting because you have a lot of questions  
2389 that you pose, and I would like to see what kind of answers  
2390 you might be able to get.

2391 You know, in starting with it, you state that your  
2392 premise that pretty much on spectrum clearing or spectrum  
2393 sharing, which way to go, and you said the best way to look  
2394 at this and be the cleanest would be that we should have  
2395 spectrum clearing over the other option of spectrum sharing.  
2396 If I could just ask you a few questions on what you stated,  
2397 let us get on the technical side because, you know, in your  
2398 testimony a little earlier, you said that--you cited a  
2399 doubling of the global mobile data traffic from 2011 to 2012  
2400 with a global forecast of that going up 15 times by 2017. Do  
2401 we have the technology out there in that--this next 5 years

2402 to be able to do that, you know, keep up with this if we are  
2403 looking at global sharing versus global clearing?

2404 Mr. {Racek.} Thank you, Congressman. That was sort of  
2405 the point of the testimony is that the preference for the or  
2406 the need for dedicated license spectrum is based upon looking  
2407 at the data traffic study, predicting the growth and the  
2408 ability to--for technologies to be able to address that  
2409 growth. There are a lot of developments--as I said in the  
2410 testimony, Ericsson is spending \$5 billion in R&D every  
2411 single year to be able to increase the spectrum efficiency of  
2412 the technology to be able to address these sort of data  
2413 traffic demands. But it is not going to be enough. The only  
2414 way to be able to do that is going to be through licensed  
2415 spectrum.

2416 Now, licensed spectrum provides the certainty needed for  
2417 the investment and the performance and will be able to  
2418 provide the types of services, but the recognition is that,  
2419 you know, licensed spectrum, it may not always be possible.  
2420 Obviously if the band is identified by 3G PP, we would not  
2421 want to see that band be identified for spectrum sharing, but  
2422 spectrum sharing may be the only option for some bands that  
2423 are identified by 3G PP, but not available in the U.S. So we  
2424 would still like to sort of pursue that as an option, but it  
2425 is not going to replace the need for 500 megahertz as

2426 identified by the National Broadband Plan.

2427           Mr. {Latta.} Let me ask--let me go on with that, then,  
2428 because in one of your other points, especially on the  
2429 regulatory side, you say it is going to take--you say sharing  
2430 raises a number of regulatory challenges, all of which will  
2431 take years to test and model. How many years do you think it  
2432 will take to test and model?

2433           Mr. {Racek.} I think that is a difficult question to  
2434 answer, because not all of the questions have been identified  
2435 yet. I think that is part of the activity that we are  
2436 involved in, especially if we look for--look towards CSMAC  
2437 and the investigation that is being conducted within the  
2438 working groups, as well as looking towards international  
2439 types of activities that are starting to maybe look at this  
2440 type of activity, even within PCAST. These sort of things  
2441 are looking at what are the questions and what are the  
2442 answers to those questions. I think that that--we are still  
2443 in sort of the infancy of that process, and there are  
2444 questions that are out there that are yet to be asked, and  
2445 obviously not answered.

2446           Mr. {Latta.} Let me just--one last question. Sorry  
2447 that I am picking on you here, but overall, what would you  
2448 say would be the best way to conduct a spectrum auction?  
2449 What would be the best way to conduct an auction, a spectrum

2450 auction?

2451 Mr. {Racek.} And you are considering spectrum sharing?

2452 Mr. {Latta.} On your end, what would you see as how we  
2453 should do something like that when you are looking at, you  
2454 know, instead of on the sharing side but saying that we  
2455 should go ahead and have some kind of an auction. What would  
2456 you--how would you foresee that and how should we do it?

2457 Mr. {Racek.} Well, I think if we are looking--for  
2458 instance, there has been a discussion about the 3550 to 3650  
2459 megahertz band, and that because of the radar operation in  
2460 the band, it is likely that you would not be able to sort of  
2461 utilize that in the same way with the same type of  
2462 technologies that you use in sort of lower bands that are  
2463 exclusive use types of bands. But there may still be an  
2464 opportunity to provide some regulatory certainty for that  
2465 spectrum through a licensed shared approach. The licensing  
2466 provides you the protection that you need to be able to  
2467 operate without the fear for being interfered with so you can  
2468 provide a good quality of service to your customers, and  
2469 also, it provides you with the ability, therefore, to have an  
2470 understanding of what the terms and conditions of operations  
2471 are up front, and that, in effect, would provide more value  
2472 for the spectrum so that there is the possibility to auction  
2473 that type of spectrum.

2474 Mr. {Latta.} Thank you. Mr. Chairman, I yield back.

2475 Mr. {Walden.} Gentleman yields back. Chair now  
2476 recognizes the gentleman from Kentucky, Mr. Guthrie, who co-  
2477 led our working group on this topic. Thank you.

2478 Mr. {Guthrie.} Thank you, Mr. Chairman, and I  
2479 appreciate you appointing the working group and bringing that  
2480 together. I really enjoy working with Congresswoman Matsui  
2481 and a lot of you that participated that are here today. We  
2482 appreciate that very much, and no, not every military  
2483 installation is where people don't want to be. Matter of  
2484 fact, I would suggest coming to Fort Knox, Kentucky. It is a  
2485 very beautiful place, and we are next to Louisville. I mean,  
2486 Fort Knox is within 10 miles, probably, of definitely--not  
2487 the heart of Louisville, but suburban Louisville, and so  
2488 there are San Diego and Jacksonville and areas like that that  
2489 we have to be mindful of in sharing. I have been to the  
2490 Mojave Desert and I agree that I probably wouldn't want to go  
2491 back to the national training center, but California has some  
2492 other beautiful places that the military is located, so you  
2493 have got to be mindful of that.

2494 One thing--I think I heard Mr. Goldstein said it and I  
2495 wrote down, leap of faith in technology for sharing. I guess  
2496 my question is, if we got all this decided today and tomorrow  
2497 we could turn over either full sharing or licensed--clearing

2498 license and all--we could snap our fingers and it happened,  
2499 is the technology, I guess, Dr. Marshall, in place today to  
2500 take advantage of that, or is this--we will build it and put  
2501 it out there and have to innovate ourselves to make this  
2502 work?

2503           Mr. {Marshall.} So very clearly the technology exists  
2504 for clear spectrum, although we have shown it takes, even  
2505 with the technology in place, 8 years, if you look at the  
2506 national broadband plan, between identification and  
2507 occupancy. So it is not exactly a rapid process.

2508           On the shared side, the PCAST report is remarkably  
2509 conservative. We have been attacked for being too  
2510 aggressive, but there are equal attacks for being  
2511 unaggressive. The database technology is not the best way to  
2512 do this, but it is available and it is certain, and it would  
2513 provide certainty to federal users that they could protect  
2514 their equities while more fancy technologies came into play.  
2515 So it is technologically unstressing.

2516           What it does do is it continues the evolution towards  
2517 much more flexibility in the provider's side, and so it will  
2518 require the providers to make use of newer technologies,  
2519 tunable filters and all.

2520           Mr. {Guthrie.} New technology on the horizon, or new  
2521 technology I will just have to completely--you are imagining

2522 technologies that don't exist?

2523           Mr. {Marshall.} To fully exploit this, they will have  
2524 to make adjustments and initially, like 3.6 gig, one could  
2525 imagine that that band, they could start to use in a sharing  
2526 fashion very, very rapidly. Putting many, many frequencies  
2527 in a handset probably is going to evolve technologies and  
2528 filters, hopefully led by the United States. But LTE already  
2529 has 27 different frequencies, 42 different--so they are  
2530 heading that way anyway.

2531           So the PCAST is really a fast, low tech way to go there,  
2532 and then you are going to build the technology in behind it.  
2533 But you will get a lot out of it initially, and then you are  
2534 going to make it better over 5 years.

2535           Mr. {Guthrie.} And then the second question, I guess,  
2536 Congressman Latta as he talked to Mr. Racek on the regulatory  
2537 scheme that would have to come into play, and do you agree  
2538 that is a barrier to the type sharing that--I was asking Dr.  
2539 Marshall that--from the PCAST report. Did you all address  
2540 that? I mean, I know you talked about it, but--

2541           Mr. {Marshall.} We need to do a regulatory regime that  
2542 is focused on sharing. Today we treat sharing as a special  
2543 case. Steve is negotiating it with Karl, making their  
2544 private deals. We have no framework for it. I think part of  
2545 the PCAST report is just let us admit that that is going to

2546 become more and more fundamental to our approach to spectrum,  
2547 and let us not treat it as a stepchild. Let us make it  
2548 transparent. Let us make everyone able to make the same deal  
2549 Steve does with Karl, and make that competitive, and in fact,  
2550 let us auction the right to make that deal in a full and open  
2551 marketplace. So I think it is different regulation. I think  
2552 it is a fundamental commitment to a policy there. If we just  
2553 do it--you don't need PCAST if you just want to go do it. We  
2554 are doing it anyway. The PCAST recommendation is to move it  
2555 forward, put it in front, and really think about the policies  
2556 for financial remuneration, like how do I design an auction  
2557 for shared spectrum? How do I deal with the e-911 and all  
2558 those issues.

2559       Mr. {Guthrie.} It is difficult to address, but the  
2560 uncertainty for the users would be--and I am just kind of  
2561 thinking out loud--is that we just said that we are going to  
2562 create a system that nobody--you have to innovate to get  
2563 there, and then people in Washington are going to have come  
2564 up with a regulatory regime to try and manage that and a  
2565 regulatory process is not as flexible as people innovate.

2566       Mr. {Marshall.} So we put a new generation of wifi out  
2567 every year. That is incredible. We put a new generation of  
2568 cell phone out every 10 years. If we leave people alone,  
2569 they will innovate the technology. PCAST proposes 3 years to

2570 implement it, and that was two and three quarters of them in  
2571 Washington, and maybe 3 months for the engineers to start  
2572 rolling things out. It will require a different kind of  
2573 regulation. It requires a different thinking about what  
2574 spectrum rights mean. It doesn't replace what we have now,  
2575 but it extends it, and that is an important dialogue. And  
2576 frankly, it is a dialogue you are not having now if we do  
2577 spectrum sharing as a bunch of one off deals. It is to put  
2578 it in the framework, put it up front, make it a norm, make it  
2579 so someone who is building a venture capital proposal  
2580 understands what the rules are if they go and invest in  
2581 something that takes spectrum. Imagine doing that now where  
2582 it is 8 years from seeing spectrum going up for auction to  
2583 when you get into it, or do it when you are worried about  
2584 light squarage and you have got to find out what a whole pile  
2585 of forces are. I mean, it is to make this thing transparent  
2586 and predictable, rather than private.

2587 Mr. {Guthrie.} Thanks. Thank you, I yield back.

2588 Mr. {Bass.} [Presiding] Gentleman yields back. Chair  
2589 recognizes himself for 5 minutes for questions. I want to  
2590 apologize in advance because I have been in and out of this  
2591 hearing.

2592 Mr. Sharkey, your comments focus on the 1755 to 1780  
2593 megahertz sub-band. Does NTIA's reported costs of

2594 reallocating the current government systems from the entire  
2595 1755 to 1850, \$18 billion, fit with your own internal  
2596 estimates and your experiences with the cost of reallocating  
2597 government systems in the AWS-1 band, and if not, are there  
2598 any estimates that specifically look at costs and potential  
2599 revenues in the 1755 to 80 sub-band?

2600 Mr. {Sharkey.} Well first, if I can just make it clear  
2601 that there are no private agreements between myself and Karl  
2602 Nebbia. The process we are doing is an open--

2603 Mr. {Bass.} Correction, so noted.

2604 Mr. {Sharkey.} I think the costs--and I think we do  
2605 need to take a careful look at the costs of relocating  
2606 systems. The costs varied significantly from initial  
2607 estimates of clearing AWS-1 to what were the final costs of  
2608 clearing that spectrum. In a 2001 report, NTIA estimated  
2609 that clearing the entire band up to 1780 would be about \$4.6  
2610 billion, so now we have got an estimate that is \$18 billion,  
2611 and you know, there may be a lot that has changed and it is  
2612 difficult for us to know what the--you know, what underlies  
2613 that estimate. So I think it is an important one to look at,  
2614 and you know, one of the important issues about getting that  
2615 estimate right is that under the CSEA, the costs of the  
2616 monies raised in an auction to have to cover the cost of  
2617 reallocating, relocating government users. So it is

2618 important that the estimate is accurate enough so that we  
2619 have--so that an auction can actually go forward to cover the  
2620 costs.

2621         Mr. {Bass.} Second for, I suppose, Mr. Racek, you could  
2622 address this as well. The PCAST study asserts that ``Today's  
2623 apparent shortage of spectrum is, in fact, an illusion  
2624 brought about because of the way spectrum is managed.'' We  
2625 have spent quite a while talking about this, actually. Do  
2626 you agree with that statement? Do you think that carriers  
2627 are not managing spectrum efficiently, or are there design  
2628 issues associated with it?

2629         Mr. {Racek.} I think they were probably talking about  
2630 different services other than commercial mobile type of  
2631 services. Maybe they were pointing to other type of  
2632 activities that we see ongoing right now, maybe with respect  
2633 to incentive and voluntary incentive auctions, but I don't  
2634 think they were talking about our industry.

2635         Mr. {Bass.} Anybody else want to comment on that? All  
2636 right.

2637         Mr. Smith, NTIA's report lists a number of video  
2638 surveillance bands that are used by various federal agencies.  
2639 Is there any reason law enforcement video systems couldn't  
2640 use LTE to shrink their footprint and share resources?

2641         Mr. {Smith.} That is a great question, and certainly,

2642 law enforcement can and does use cellular technology today  
2643 for certain video streams, and LTE being a video and high  
2644 definition video technology certainly enables that quite  
2645 substantially.

2646 While I have the mic for just a second, if I could  
2647 comment, there has been a number of questions around clearing  
2648 versus sharing, and I just wanted to make--offer up the  
2649 thought that geographic sharing--

2650 Mr. {Bass.} Mr. Smith, you said they have it, but are  
2651 they using it?

2652 Mr. {Smith.} Yes. Well, I don't know how much is being  
2653 used.

2654 Mr. {Bass.} All right.

2655 Mr. {Smith.} In particular, LTE is just being largely  
2656 rolled out the last year or two, but I don't know how much  
2657 today.

2658 But if I could just finish one quick thought and take a  
2659 moment. Geographic sharing is being--you know, has been done  
2660 in the industry, in the cellular industry from the start.  
2661 You know, it is not a technological issue. So if, you know,  
2662 DoD bases today are 24 million acres out of 2.3 billion acres  
2663 in the United States, roughly 1 percent, mostly where people  
2664 are not, and you know, the notion of considering--  
2665 policymakers considering having geographic sharing exclusions

2666 on bands for LTE use by DoD on bases is something that is in  
2667 the realm of the doable today.

2668 Mr. {Bass.} Thank you. I have no further questions. I  
2669 would like to recognize the Ranking Member of the committee  
2670 for statement.

2671 Ms. {Eshoo.} Thank you, Mr. Chairman, and first to all  
2672 of our witnesses, you--each one of you is absolutely superb.  
2673 You really engaged the members and our thinking. You have  
2674 given us even more to work with, answered a lot of, you know,  
2675 the tough questions, and we are very grateful to you. And  
2676 sitting here as a member of the committee, I can't help but  
2677 think collectively this is why our country is so great and  
2678 has such enormous potential. You all represent that, and we  
2679 are grateful to you.

2680 Mr. Stearns is not here, and--but I wanted to make a--  
2681 say a few words about his service, both as a Chairman of this  
2682 subcommittee. He has been a member of this subcommittee for  
2683 well over a decade, and has taken the issues very, very  
2684 seriously, has moved the needle on so many things, and I just  
2685 want to say on behalf of my colleagues on this side of the  
2686 aisle, that we wish him all of our best. We wish him all of  
2687 our best and that he will be missed here, and today may very  
2688 well have been the last--his last Telecom Subcommittee  
2689 hearing. So we wish him Godspeed. We thank him for working

2690 so hard to make important investments for the future of our  
2691 country. And with that, I will yield back.

2692         Mr. {Bass.} The Chair thanks the Ranking Member for her  
2693 comments and would like to associate himself with those  
2694 remarks as well, as I am sure all of the other members of  
2695 this subcommittee and full committee as well.

2696         There being no other members wishing to ask questions,  
2697 members are reminded that the record will remain open for 10  
2698 days to submit questions for the record. There being no  
2699 other business to come before the subcommittee, the  
2700 subcommittee stands adjourned.

2701         [Whereupon, at 12:40 p.m., the Subcommittee was  
2702 adjourned.]