company could accomplish on its own, allowing the combined company to carry much more voice and data traffic for more customers and provide significantly better service quality. The transaction will allow us to:

- free up an additional 4.8 to 10 MHz of spectrum in each market where AT&T and T-Mobile USA offer GSM service by eliminating redundant GSM control channels, greatly improving the combined company's flexibility to meet capacity and performance challenges;
- maximize the capacity-enhancing "channel pooling" efficiencies associated with combining separate channel pools that allow more customers to be served per MHz of spectrum deployed, providing a substantial capacity boost even in areas where both companies' networks are heavily loaded; and
- optimize the spectrum allocation in areas where one company's network and spectrum are underutilized relative to the other's, driving improvements in both performance and capacity in those areas.

13. These efficiencies, in combination, will provide substantial additional capacity gains where we need them most, allowing us to improve performance (*e.g.*, reduced blocked and dropped call rates, improved data connections, and better coverage, especially in-building) and to accelerate the shift of spectrum from less spectrally efficient to more spectrally efficient network technologies (*i.e.*, GSM to UMTS and UMTS to LTE). We anticipate that in some of the areas where AT&T's capacity constraints are most severe, this transaction will allow for the deployment of additional UMTS carriers and additional spectrum for LTE, increasing our capacity and bridging the gap between our existing capacity and the demands that will be placed on our networks, until new spectrum is made available and can be deployed.

14. The transaction also will deliver significant additional LTE benefits throughout the country, including both improved mobile broadband performance and substantially expanded coverage. The transaction will ease LTE capacity constraints that we otherwise expect to face as early as **[Begin Confidential Information]** **[End Confidential Information]** by providing

the combined company with the flexibility to use existing AWS spectrum positions or to re-farm and re-purpose T-Mobile USA's AWS spectrum to address LTE network spectrum exhaust challenges in certain markets (and ultimately to add that AWS spectrum and additional capacity to the LTE deployment in all markets). The transaction will also greatly enhance LTE network coverage, providing tens of millions of Americans who would not have been able to receive LTE service from AT&T or T-Mobile USA that option. With the efficiencies associated with the transaction, the combined company will deploy LTE to over 97% of the U.S. population, including in rural and smaller communities, thereby reaching approximately 55 million more Americans than under AT&T's current LTE deployment plans.[3]

15. In short, this transaction will allow the combined company to "bridge the capacity gap" while AT&T's LTE network is deployed and customers are migrated to that more efficient radio technology and until new spectrum and new technologies become available. In doing so, the transaction will provide enormous benefits to consumers who will enjoy better and more innovative wireless services.

III. TECHNOLOGICAL OVERVIEW

16. Spectrum is the building block for the evolution of wireless technology. Each evolution in wireless technology brings spectrum efficiencies. Those improvements to wireless technology fuel more data-intensive applications and increased subscriber consumption and

[3] When the parties announced this transaction in March 2011, AT&T initially stated that it would deploy LTE to 95% of the U.S. population. AT&T has now conducted a more refined analysis of the scope and capabilities of their combined network and identified T-Mobile USA and AT&T cell sites that it had not previously counted on for LTE expansion, but that will allow the expansion of LTE into areas not previously included. The parties are thus now increasing the scope of this commitment to more than 97.3%.

expectations for more advanced mobile wireless services, triggering the need for additional spectrum resources. Moreover, as new technologies are introduced, AT&T must continue to provide quality service to its embedded base of subscribers on prior generations of technology until those customers migrate to the new technologies.[4] This transaction provides AT&T with the spectrum and network depth that it needs to support its current and future wireless networks in the near and medium terms and will bring the most advanced wireless service to more Americans than otherwise possible.

A. **Digital Cellular Services**

17. AT&T delivers its second generation digital service using the GSM standard.[5] GSM technology provided increased speed and bandwidth over analog technologies and enabled more data-intensive applications such as mobile-to-mobile photo messaging and emails with complex attachments. GSM has a much lower spectral efficiency than more recent technologies.[6]

18. AT&T uses its 850 MHz cellular and 1900 MHz PCS spectrum to provide service on its GSM network. The company's GSM network covers more than 300 million people in the United States. As of the end of 2010, AT&T had approximately **[Begin Confidential**

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[4] Customer handsets, purchased over many years, are designed for particular standards and frequency bands, and they will not work with newer technologies or on other frequency bands.

[5] The first generation of wireless service in the United States – analog cellular networks – are no longer used.

[6] The General Packet Radio Service ("GPRS") standard is a second generation technology that provides low to medium speed data transmission capability. Enhanced Data rates for Global Evolution ("EDGE") is an initial stage of mobile broadband technology that provides medium speed data transmission capability.

Information] **[End Confidential Information]** GSM-only subscribers. AT&T's GSM subscribers have dual-band handsets that are compatible with 850 MHz cellular and 1900 MHz PCS spectrum.

19. Like AT&T, T-Mobile USA has deployed second generation digital service using GSM technology.[7] As described in the Declaration of Dr. Kim Kyllesbech Larsen, T-Mobile USA uses its 1900 MHz PCS spectrum to provide service on its GSM network, which covers 280 million people.[8] T-Mobile USA has approximately **[Begin Confidential Information]**

[End Confidential Information] GSM-only subscribers, which constitutes about **[Begin Confidential Information]** **[End Confidential Information]** of its subscriber base.[9] In order to facilitate roaming, the vast majority of T-Mobile USA's GSM subscribers have dual-band handsets that are compatible with the 850 MHz cellular and 1900 MHz PCS spectrum GSM technologies deployed in AT&T's network.[10]

B. **Mobile Broadband Services**

20. AT&T initially deployed mobile broadband services using the UMTS standard, which was later enhanced with High Speed Downlink Packet Access ("HSDPA"). With the UMTS/HSDPA combination, AT&T provided higher-speed data transmission, which allowed for more advanced applications, faster Internet access, music downloads, remote access to a

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[7] *See* Declaration of Dr. Kim Kyllesbech Larsen, Senior Vice President, Technology Service and International Network Economics, Deutsche Telekom AG, ¶ 11 (April 19, 2011) ("Larsen Decl.").

[8] *See id.*

[9] *See id.*

[10] *See id.*

home or office desktop, and more efficient, high-quality voice service. The AT&T network was later upgraded to include High Speed Uplink Packet Access ("HSUPA"). The combination of HSDPA and HSUPA is referred to as High Speed Packet Access ("HSPA"). UMTS/HSPA is significantly more spectrally efficient than GSM.

21. AT&T uses 10 MHz blocks of spectrum for each "carrier" of UMTS traffic, with 5 MHz for the downlink and 5 MHz for the uplink. Subsequent pairs of 5 MHz blocks of spectrum are needed for each additional carrier. Additional carriers of spectrum are the means by which additional capacity is provided to meet increasing demands for mobile broadband service. Thus, UMTS capacity can be grown in building-block fashion so that AT&T's network can provide service to a larger number of simultaneous users who use more bandwidth-intensive data services. Because of the high demand for wireless broadband services, AT&T already has deployed four carriers (using a total of 40 MHz of spectrum) in some areas and, to the extent spectrum is available, has plans to deploy more in the near future.

22. AT&T presently supports UMTS with 850 MHz cellular and 1900 MHz PCS spectrum, which it also uses for GSM services. Therefore, every carrier deployed for UMTS requires 10 MHz of this spectrum that must be re-purposed from GSM. AT&T has deployed HSPA+ to all of its UMTS sites and is expanding the UMTS/HSPA+ network to include the remaining GSM-only sites. AT&T's UMTS network presently covers approximately 260 million people and, as of the end of 2010, had approximately **[Begin Confidential Information]**

[End Confidential Information] UMTS subscribers. AT&T's UMTS subscribers have dual-band handsets that are compatible with cellular and PCS spectrum and that support GSM services when UMTS is not available.

23. Like AT&T, T-Mobile USA has deployed a mobile broadband network using the UMTS standard with HSPA or HSPA+. T-Mobile USA's HSPA network now covers 212 million POPs and its HSPA+ coverage includes 200 million POPs. The company currently serves approximately **[Begin Confidential Information]** **[End Confidential Information]** UMTS subscribers with its HSPA/HSPA+ network. T-Mobile USA has utilized its AWS spectrum to provide service to its UMTS subscribers.[11] Those subscribers have handsets that use AWS frequencies for HSPA/HSPA+ and PCS spectrum for GSM. The vast majority of handsets also support GSM services on 850 MHz spectrum.

C. **Long Term Evolution**

24. AT&T has begun deployment of LTE, a further advanced mobile broadband technology. LTE is a major advancement for the mobile industry concerning performance and spectral efficiency. Unlike HSPA, which is approaching the end of its development cycle, LTE development is just starting to gain momentum. Even in its launch phase today, LTE offers peak data speeds that are up to four times faster than HSPA+ and two times faster than HSPA+ with dual carriers. With LTE, AT&T will be providing a new, high speed broadband alternative throughout the country, including in rural areas.

25. In addition to offering faster peak data speeds, LTE technology is about 30-40% more spectrally efficient than HSPA+ (and 860% more spectrally efficient than GSM with EDGE, given equivalent amounts of spectrum). LTE average sector throughput increases

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[11] *See* Larsen Decl. ¶ 11.

linearly with the bandwidth deployed, and there is also a frequency selective scheduling gain, that provides an additional 2.5-5% of spectral efficiency with greater bandwidths.[12]

26. LTE also has dramatically reduced latency, which provides subscribers with a significantly better mobile broadband experience. The basic time scheduling unit or "frame" time for LTE is 1 millisecond, which is half the frame time for HSPA/HSPA+. This allows LTE to schedule twice as many users on average and thus realize a net capacity gain in a multiple user environment. In addition, the shorter frame time allows for more retransmissions of packets in a given time interval, which improves the probability that a packet is delivered correctly without inducing unacceptable delay. Reduced latency is particularly important for delay-sensitive services such as VoIP, online gaming, and video conferencing. LTE uses an Internet Protocol ("IP") based architecture, which, among other things, can carry voice over IP and data in the same channel, allowing for more efficient carriage of traffic and new and innovative converged applications that use both voice and data.

27. AT&T is using its AWS and 700 MHz spectrum holdings to deploy its LTE network and currently plans to cover approximately 250 million people, or 80% of the U.S. population, by the end of 2013. As it rolls out LTE and customers begin to migrate to the service, AT&T also must continue to reserve sufficient spectrum to provide high-quality service for its GSM and UMTS subscribers for a number of years. AT&T projects that it will use its cellular and PCS spectrum holdings to support GSM services and UMTS for a number of years

[12] This latter gain is achieved provided the cell densities are such that operation is more interference-limited than noise-limited, which will be the case with a mature LTE deployment.

because of the relative infancy of the LTE ecosystem and the time it will take subscribers to migrate to handsets utilizing the next generation of technologies.

IV. LIMITATIONS IMPOSED BY AT&T'S NETWORK CAPACITY CONSTRAINTS

28. Although all wireless carriers are experiencing increasing demand for mobile broadband service, AT&T faces unique spectrum and capacity constraints in certain areas that are specific to its need to support three technologies with its usable spectrum and its position as an industry leader in wireless innovation and smartphone adoption. Absent a solution, these constraints will lead to the degradation of existing services and the inability to deploy innovative new services and devices that would drive further increases in demand.

A. Demand for Mobile Broadband Services

29. The wireless industry is evolving rapidly in response to the growing demand for wireless broadband services. Over only a few years, handsets have evolved from simple phones capable of basic voice communication to integrated broadband devices that support social networking, streaming video and music, video teleconferencing, and other bandwidth-intensive applications. Hundreds of thousands of applications are available for these smartphones, with more being released every day. The "always on" nature of these applications increases both data traffic and the corresponding signaling that consumes valuable radio resources. In the past year, tablet devices also have become increasingly popular.

30. As explained by John Donovan, as an industry leader in wireless innovation, AT&T has been at the center of the skyrocketing demand for mobile broadband services. AT&T has both enhanced the capabilities of its networks and launched a portfolio of Internet-connected devices, like the iPhone and Android smartphones, the iPad and Android tablet computers,

eReaders, and others. AT&T subscribers in turn have embraced these bandwidth-intensive devices, placing unprecedented demand on AT&T's network. Due in part to the rapid adoption of these devices and applications, AT&T experienced an 8,000% increase in mobile data use from 2007-2010. We project this trend will continue, fueled by the proliferation of new wireless broadband devices for both consumers and businesses and an ever-increasing array of new wireless applications and services.

B. Efforts to Keep Pace with Demand Are Increasingly Inadequate

31. AT&T has aggressively pursued every means reasonably available to it to address capacity concerns and to attempt to meet projected demand in each of the areas it serves. We have invested heavily to upgrade to each successive, more spectrally efficient UMTS technology, often doing so before any other carrier. As noted, we have already deployed HSPA+ throughout our UMTS footprint, and we are expanding the deployment of HSPA+ to our GSM-only service areas (where spectrum is available).

32. We have deployed more and more of our limited spectrum resources to our UMTS networks, adding successive additional 10 MHz carriers as demand outstrips capacity. At the same time, we are constantly investing in modifications to our network architecture to increase capacity and optimize performance. AT&T has added capacity-expanding cell sites, reducing cell sizes and increasing cell density to add capacity. And we have reoriented sectors, upgraded and optimized antennas, added radios and nodes, and taken numerous other steps to improve performance. In recent years, AT&T has spent approximately **[Begin Confidential Information]** **[End Confidential Information]** per year on these capacity-expanding activities.

33. Because we are running out of spectrum to deploy another 10 MHz carrier in many areas, we have pursued opportunities to purchase or lease spectrum when and where contiguous spectrum bands are available.[13] AT&T also has acquired spectrum for and begun a multi-billion dollar deployment of LTE technology, which is more spectrally efficient than HSPA+ and will ease capacity constraints on its UMTS network once a significant number of subscribers migrate.

34. AT&T has also invested heavily in the full range of "off-loading" solutions designed to shift usage from our congested macro wireless network to other networks. AT&T operates more than 24,000 Wi-Fi hotspots, and we also deploy indoor and outdoor DAS networks. For example, in Downtown Chicago, AT&T installed a DAS network to off-load heavy usage due to business and festival traffic in a concentrated area. AT&T also has deployed a Wi-Fi Hotzone[14] in Times Square in New York City to allow AT&T subscribers free Internet access using any Wi-Fi-enabled device. AT&T has launched Wi-Fi Hotzones in other congested areas as well, including downtown Charlotte, North Carolina, and Chicago's Wrigleyville. AT&T also has implemented a tiered pricing structure for data plans to encourage heavy data users to be more mindful of their usage.

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[13] The spectrum that AT&T acquired in 2010 as a result of the divestitures made by Verizon Wireless/Alltel primarily expanded AT&T's footprint to cover areas where AT&T previously had not owned a network. Because there was very little overlap between AT&T's existing service area and the areas covered by the acquired wireless business, that transaction did not provide any relief from AT&T's capacity challenges.

[14] An AT&T Wi-Fi "Hotzone" is essentially an outdoor Wi-Fi network that covers a larger area than a Wi-Fi hotspot.

35. Despite these various measures by AT&T to conserve its spectrum by using it more efficiently – from deploying UMTS, then HSPA and HSPA+, to cell splitting and other capacity-expanding measures, to off-loading traffic, to adopting rate plans that incent heavy users to be mindful of their usage – the pace at which AT&T must expand its network capacity continues to increase as a result of the growth in mobile broadband traffic on its network.

C. **Impact of Spectrum Constraints**

36. AT&T projects that it will not have enough cellular and PCS spectrum to support both GSM and UMTS services over the next three years in more than **[Begin Confidential Information]** **[End Confidential Information]** CMAs, which cover more than **[Begin Confidential Information]** **[End Confidential Information]** people.[15]

1. Inability to Deploy New UMTS Carriers Where Needed

37. AT&T expects, because of spectrum constraints, it will be unable to deploy additional carriers in areas when and where they will be needed. Indeed, AT&T projects that, over the next three years, it will require, but currently lacks, the cellular and PCS spectrum to deploy additional UMTS carriers in approximately **[Begin Confidential Information]** **[End Confidential Information]** covering nearly **[Begin Confidential Information]** **[End Confidential Information]** people. Of these, there are **[Begin**

[15] The projections are based on AT&T's most recent forecast of GSM and UMTS voice and data traffic. This forecast includes assumptions regarding subscribership, usage, and other factors that are applied through a model for capital budgeting and network planning purposes. Given the complex characteristics and variability at a market level, operational performance metrics such as power and code exhaust are used to determine the actual date to trigger additional carriers and re-purpose spectrum to UMTS. We have found that, in practice, spectrum exhaust may, and in some cases will likely, occur even sooner than forecasted by the planning models.

Confidential Information] **[End Confidential Information]** CMAs that we expect will exhaust between now and **[Begin Confidential Information]** **[End Confidential Information]**, and **[Begin Confidential Information]** **[End Confidential Information]** additional CMAs by the end of **[Begin Confidential Information]** **[End Confidential Information]**. These areas include large markets, such as **[Begin Confidential Information]** **[End Confidential Information]**, as well as smaller cities and rural areas, such as **[Begin Confidential Information]**

[End Confidential Information]. In addition to these **[Begin Confidential Information]** **[End Confidential Information]** markets exhausting in the next three years, AT&T projects other markets will face exhaust in subsequent years.

38. The inability to expand capacity when and where it is needed will have real and substantial adverse effects on subscribers if no solution is obtained. There would be a degradation in service, and consumers would experience increased blocked and dropped calls and data connections, slower broadband service, and other reductions in service quality. Conversely, with the cell site and spectrum utilization efficiencies provided by this transaction – that would both push out spectrum exhaust dates and provide a path for accelerated re-farming of GSM spectrum to UMTS networks – broadband throughput speeds will rise, more calls and data traffic can be accommodated, and customers will experience decreased rates of dropped and blocked calls.

2. Inability to Launch and Support UMTS Service

39. AT&T's capacity constraints threaten to affect much more than service quality. In **[Begin Confidential Information]** **[End Confidential Information]** CMAs, covering more than **[Begin Confidential Information]** **[End Confidential Information]** people throughout the country, AT&T lacks the cellular or PCS spectrum in one or more counties to launch and support UMTS service. These areas include **[Begin Confidential Information]**

[End Confidential Information]. Without more spectrum, AT&T can only provide GSM service in these areas. In all of these areas, without additional spectrum, AT&T's capacity constraints mean that customers will be denied the significant benefits that accompany an upgrade from GSM to UMTS with HSPA+, and AT&T will be unable to take advantage of the spectral efficiencies that flow from such an upgrade.

D. **LTE Is Not A Solution to Capacity Concerns In the Near to Mid Term**

40. Although the efficiency and capacity gains from the ultimate transition to LTE will be significant and will eventually relieve pressure on our UMTS networks, that relief will take many years to realize. AT&T currently plans to deploy LTE to reach 70 million people by the end of 2011 and approximately 250 million people – 80% of the U.S. population – by the end of 2013. Even then, it will take a number of years before a majority of customers to whom LTE is available actually use LTE. Based on experience, AT&T projects that it will have to continue to utilize spectrum to provide quality service to GSM and UMTS customers for a substantial period of time, preventing AT&T from re-purposing such spectrum to support LTE service for many years. Indeed, in the first year after AT&T launched UMTS service, **[Begin Confidential**

Information] **[End Confidential Information]** of its customers subscribed to UMTS service. After five years, about **[Begin Confidential Information]** **[End Confidential Information]** of its customers subscribed to UMTS service.

41. This long transition time means that the deployment of LTE will not help address AT&T's current capacity concerns. Moreover, as we migrate subscribers to LTE, they will place heavy demand on that network, and our current forecasts suggest that we are likely to face LTE capacity challenges in a number of areas as early as **[Begin Confidential Information]** **[End Confidential Information]** without additional spectrum.

V. THIS TRANSACTION ADDRESSES CAPACITY CONCERNS AND CREATES SIGNIFICANT EFFICIENCIES AND CONSUMER BENEFITS

42. Due to the highly complementary nature of the AT&T and T-Mobile USA technology deployments, cell site grids, and spectrum holdings, this transaction provides by far the most efficient and effective means to address both companies' spectrum and network capacity constraints. Integrating the companies and their networks will result in a variety of unique network synergies that will directly benefit both companies' customers and could not be realized either at all or to the same extent through other transactions or methods. As described more fully in the following sections, the many synergies that will directly address the merging companies' spectrum exhaust issues can be grouped into two broad categories: (1) capacity and performance improvements associated with increased cell density, and (2) capacity and performance improvements associated with more efficient network utilization. It is important to recognize that each of these projected synergies will provide not only direct capacity and performance benefits as networks are integrated, but equally, if not more, important capacity and performance benefits in accelerated migration of spectrum from less spectrally efficient networks

to more spectrally efficient networks – *i.e.*, GSM to UMTS and, ultimately, to LTE. An additional set of synergies will provide both companies' customers with a much better next generation experience through an LTE network with greater capacity and expanded coverage. With this transaction and the attendant network efficiencies, the combined company will be able to provide a higher quality of service more efficiently, sooner, and to a larger number of subscribers than either company could on its own.

A. **Cell Site Density Expansion from Integration of T-Mobile USA Sites**

43. Cell-splitting has a direct and immediate impact on capacity. In certain circumstances, "splitting" of cells through the addition of new cell sites is feasible and can produce dramatic capacity gains. To provide a simple example, if a cell covering a given area is divided into two equally-sized cells covering that same area, total capacity – the total amount traffic that can be handled in that area – can *double*. The problem, of course, is that after years of aggressive cell-splitting activities to improve capacity, coverage, and performance, it has become more and more difficult to find suitable locations where new sites can be deployed in a timely, economically feasible manner. In many cases, there simply are no suitable locations that could be brought on line in time to meaningfully address spectrum exhaust issues. This transaction solves that problem by making available to AT&T thousands of already operational cell sites that T-Mobile USA has built over many years (and vice versa). The two network grids

are remarkably complementary – T-Mobile USA has many sites where AT&T needs them and AT&T has many sites where T-Mobile USA needs them.[16]

44. AT&T estimates that it will integrate more than **[Begin Confidential Information]** **[End Confidential Information]** of T-Mobile USA's cell sites into the combined company's networks. This integration, which will provide tremendous capacity gains in some areas, can begin immediately upon closing, can be targeted on a rolling basis to the areas facing the most serious spectrum constraints, and can provide dropped call, higher throughputs and other service improvements in areas of certain markets in nine months, with nationwide integration complete in twenty-four months after closing.

45. The fact that both companies use the same compatible network technologies will allow for a more rapid integration of T-Mobile USA's cell sites into AT&T's networks than if different network technologies were employed. Much of the specialized hardware at cell sites will be compatible with both networks, and employees from both companies will have expertise in the other company's network technology and architecture. Moreover, AT&T has a proven track record of quickly integrating cell sites after mergers.

46. AT&T will begin the integration process by identifying those areas most in need of capacity relief. The company will then attach a multi-band (700 MHz, 850 MHz, 1900 MHz, and AWS bands) antenna to the site and place AT&T's equipment on it. This will add the site

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[16] **[Begin Confidential Information]**

[End Confidential Information].

into AT&T's network, effectively achieving an "instant" cell split and expanding network capacity equal to building an entirely new site. Each added site will approximately double the amount of network traffic that can be carried in existing spectrum in the vicinity of the site and relieve nearby sites of network congestion. These instant cell splits will provide additional capacity on the combined company's existing GSM and UMTS network. Further, as AT&T deploys LTE, the approximately **[Begin Confidential Information]** **[End Confidential Information]** integrated cell sites will provide a denser grid and enhance capacity for LTE as well.

47. These cell density synergies can be achieved in urban areas and to a lesser degree in rural areas, although the extent will vary by market. For example, AT&T projects that integration of T-Mobile USA's sites will increase cell density by as much as 35-45% in Chicago; 25-35% in San Francisco and New York; nearly **[Begin Confidential Information]** **[End Confidential Information]** in Wichita, Kansas; and nearly **[Begin Confidential Information]** **[End Confidential Information]** in Tupelo, Mississippi and Jefferson City, Missouri. These increases in network density will improve capacity far more quickly than either company could hope to accomplish on its own in the same time period – either by adding cell sites, building more towers, or through other commercial arrangements. And, it allows AT&T to push back projected spectrum constraint dates in capacity-challenged markets.

B. **Elimination of Redundant Control Channels**

48. The combined company also will be able to free up a significant quantity of spectrum devoted to GSM service by eliminating redundant control channels, which handle signaling. AT&T and T-Mobile USA now each generally dedicate a range of 4.8 to 10 MHz of

spectrum to GSM control channels, depending on the network design.[17] As the GSM networks are integrated, the combined company will be able to eliminate redundant control channels, freeing spectrum for other use on a nationwide basis. This gain in spectrum, upon integration of the GSM networks, can be used to improve GSM service in congested areas or redeployed and used more efficiently to address congestion on UMTS networks. Eliminating the redundant control channel is a unique benefit to this transaction that would not be possible if not for the compatible nature of the two companies' technologies. The control channel efficiency will significantly enhance the combined company's flexibility to respond to UMTS spectrum exhaust. For example, in markets where AT&T currently has only 5 MHz of UMTS-compatible spectrum available, freeing up an additional 5 MHz of such spectrum through elimination of redundant GSM control channels may allow the deployment of an additional 10 MHz UMTS carrier that would not otherwise have been possible.

C. Channel Pooling Efficiencies[18]

49. Because AT&T and T-Mobile USA use GSM technologies and similar spectrum bands, the combined company's GSM network (and also the UMTS networks as they are integrated over time)[19] will have the unique benefit of "channel pooling" efficiencies. Combining the companies' GSM spectrum in areas where there is overlap will create channel

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[17] The amount of spectrum for a GSM control channel varies based on frequency reuse plans of each company in a given market.

[18] Channel pooling efficiencies are also referred to as trunking efficiencies.

[19] Because T-Mobile USA's UMTS subscribers have handsets that are incompatible with AT&T's UMTS/HSPA network, channel pooling efficiencies will be realized on the combined companies' UMTS/HSPA networks only as T-Mobile USA's subscribers are migrated to AT&T's network with compatible handsets.

pooling efficiencies that will allow the combined company to carry more traffic (more calls and more megabytes of data traffic per busy hour) than what the two companies could collectively carry if their GSM networks continued independently.

50. Channel pooling efficiencies apply equally to voice and data service. A modern cellular system more efficiently provides service to a large number of potential users in a cell by sharing a set of lines, or a "pool" of channels, instead of providing them individually. That efficiency-enhancing technique takes advantage of the low probability that all potential users will use the channels in the cell at the same time. Increasing the number of channels in the pool, by combining the separate AT&T and T-Mobile USA GSM channels, decreases the likelihood that a call will be blocked because no channel is available. As a result, "pooling" AT&T's and T-Mobile USA's GSM channels increases the number of subscribers that can be accommodated at busy hours and produces substantial capacity gains. Although efficiency gains from the combined pooling of channels will vary by location, our initial analysis indicates that we expect to achieve 10-15% capacity gains in many areas.

51. A useful analogy is to the ticket agent lines at an airport. One line that is served by four ticket agents will provide more prompt and efficient service for customers than two separate lines, where each line is served by two ticket agents and customers cannot change lines. When one line is served by four ticket agents, whenever an agent is available the next customer in line will be served. With two separate lines, if one line is empty and the other is full, the ticket agents serving the empty line are not utilized because the customers cannot change lines. Combining the two lines into a single "channel pool" results in better service to the customers as

a whole, uses the ticket agents more efficiently, and provides the capacity to serve more customers.

52. There are two aspects of channel pooling efficiencies that may be counterintuitive. First, channel pooling efficiencies are nonlinear capacity gains. They result in capacity greater than merely combining the same amount of total capacity into one network rather than two. In other words, channel pooling efficiencies result in 1+1=3 capacity gains, achieving more capacity than the sum of the capacities of the two standalone companies. Second, channel pooling efficiencies are independent of, and unaffected by, the load levels on the networks being combined.[20] In other words, the channel pooling efficiencies are achieved even if both networks being combined are heavily loaded and appear to have no "spare" capacity. This means that, in markets such as **[Begin Confidential Information]** **[End Confidential Information]** where both companies face capacity challenges, network integration and the resulting channel pooling efficiencies will provide an immediate boost in capacity that will benefit customers of both companies once the networks are integrated.

53. The channel pooling efficiencies from the integration of AT&T's and T-Mobile USA's networks will allow the combined company to improve the quality of its network, increase capacity, or realize cost savings as a result of utilizing less resources for the same capacity. In capacity constrained areas, channel pooling efficiencies will result in fewer dropped

[20] The variation in the size of the channel pooling efficiencies we expect in different areas is instead a function of the size of the existing channel pools of each company in each area – greater channel pooling gains can typically be achieved when smaller pools are combined than when larger pools are combined.

and blocked calls and other improvements in service for millions of GSM subscribers. In less capacity-constrained areas, channel pooling efficiencies will free up spectrum that can be shifted toward the UMTS network to address capacity challenges there.

D. **Utilization Efficiencies**

54. In a number of areas in which AT&T faces capacity constraints, like **[Begin Confidential Information]** **[End Confidential Information]**, T-Mobile USA's network (and spectrum) are less heavily loaded. In **[Begin Confidential Information]**

[End Confidential Information], T-Mobile USA's GSM network is more heavily loaded than AT&T's GSM network. Consequently, each company has pockets of excess capacity that can be used to carry traffic more efficiently and to address congestion on the other company's network in specific areas. The transaction will thus provide substantial utilization efficiencies very rapidly upon integration of the GSM networks (improving GSM performance and freeing up yet more spectrum for UMTS) and over the longer term as UMTS resources are integrated and customers ultimately migrate to LTE.

55. To better understand these utilization efficiencies, imagine that the two GSM networks in a given market are two water bottles of identical size, each representing a block of spectrum capacity. The first is filled 80% with water (representing heavy usage) while the second is only 10% filled (representing light usage). One network integration option would be to pour all the water from the second bottle into the first bottle, which would then be 90% full and would continue to operate to serve the combined company's GSM subscribers. The second bottle would then be empty and would become substantially larger when re-purposed for more efficient UMTS technology. The integrated network could therefore carry much more traffic,

address UMTS capacity challenges, and move out the UMTS spectrum exhaust date. The transaction will give the company the flexibility to optimize spectrum usage at the local level, while both maintaining service quality for existing GSM subscribers and repurposing underutilized spectrum from GSM to UMTS.

56. Similarly, the transaction will enable the combined company to re-purpose T-Mobile USA's AWS spectrum currently devoted to UMTS for more spectrally efficient LTE service. Over time, and at a rate that will vary market by market, AT&T will migrate T-Mobile USA's subscribers either to the integrated UMTS network or its LTE network. As this migration occurs and more AWS spectrum is cleared, AT&T will be able to use it for LTE. In some areas, like **[Begin Confidential Information]** **[End Confidential Information]**, T-Mobile USA holds AWS spectrum that it has not deployed for UMTS service, which the combined company can re-purpose for LTE without having to migrate subscribers.

E. **Immediate Coverage Improvements**

57. As noted above, the majority of T-Mobile USA's GSM subscribers have handsets that will work on AT&T's GSM network. Immediately after closing, and even before the two networks are fully integrated, we expect T-Mobile USA subscribers in certain areas will be able to benefit from having access to both networks. In these areas, access to AT&T's GSM network, including its low band 850 MHz cellular spectrum, will provide T-Mobile USA subscribers with improved coverage, including superior in-building service and coverage compared to T-Mobile USA's existing GSM network. Additional gains also can be expected by deploying 850 MHz spectrum to the complementary T-Mobile USA sites on the integrated network grid. In addition,

we expect there may be areas where AT&T's GSM customers will immediately benefit from additional capacity afforded by T-Mobile USA's GSM network.

58. Moreover, as T-Mobile USA's UMTS subscribers migrate to the AT&T network, they will gain broader on-net UMTS coverage, including more than double the geographic UMTS coverage they have today and better in-building coverage as a result of access to low-band 850 MHz cellular spectrum and a higher density cell grid post-integration.

F. **Broader LTE Deployment**

59. The combined company will provide the approximately 34 million T-Mobile USA subscribers with robust LTE services that T-Mobile USA would not have been able to offer with its existing spectrum holdings. In addition, as a result of the increased spectrum and other benefits resulting from the transaction, AT&T has committed to extend its deployment of LTE service to over 97% of the U.S. population. This means that approximately 55 million more people throughout the country will have access to AT&T's LTE service, including residents of numerous rural and other smaller communities. In fact, a substantial number of the build-outs will be in non-urban areas. Moreover, AT&T will be using the same LTE technology throughout the country, and, subject only to spectrum constraints, LTE subscribers in rural areas and small communities will experience the same benefits as subscribers in urban areas.

60. The transaction will enable AT&T to deploy LTE in areas in which it currently lacks any spectrum to do so and improve LTE service in areas where T-Mobile USA's additional spectrum will enable a more robust deployment than would have been possible without the transaction. AT&T lacks 700 MHz and AWS spectrum with which to launch LTE in approximately **[Begin Confidential Information]** **[End Confidential Information]** CMAs,

covering about **[Begin Confidential Information]** **[End Confidential Information]** people, and T-Mobile USA holds AWS spectrum in these areas that could be re-purposed to provide LTE service. These markets include **[Begin Confidential Information]** **[End Confidential Information]**, among others. Within approximately **[Begin Confidential Information]** **[End Confidential Information]** additional CMAs, covering nearly **[Begin Confidential Information]** **[End Confidential Information]** people, AT&T holds an average of 10 MHz of AWS or less and/or 12 MHz of 700 MHz spectrum or less. T-Mobile USA's AWS spectrum will provide the combined company with at least an average of 20 MHz of AWS spectrum in each of those CMAs. This will enable a more robust deployment of LTE in such places as **[Begin Confidential Information]** **[End Confidential Information]**, and other major cities. It also includes rural markets such as **[Begin Confidential Information]** **[End Confidential Information]**. Over time, the transaction also will help remedy the LTE capacity shortage we are anticipating as early as **[Begin Confidential Information]** **[End Confidential Information]** in such places as **[Begin Confidential Information]** **[End Confidential Information]**.

G. **Overall Improved Service Quality**

61. The network integration synergies – a denser network through "instant" cell splitting, the elimination of redundant GSM control channels, channel pooling and utilization efficiencies, re-farming of AWS spectrum to more spectrally efficient LTE, and broader LTE deployment – will result in a combined network with significantly larger capacity than the sum

of both companies' networks standing alone. AT&T projects, at the time of integration, these significant capacity improvements for the combined networks will be achieved in numerous markets, both large and small, throughout the country. The combined company can use these capacity gains to address the particular needs of each individual market – either by increasing the amount of traffic that can be carried during peak hours on the network without service degradation, improving the quality of service, increasing throughputs, or a combination of one or more of these benefits. In short, these capacity gains will give the combined company the flexibility to service tens of millions of new and existing subscribers more efficiently than either company could do on its own. In many areas, subscribers will experience significant improvements in dropped and blocked call rates, fewer failed or slow downloads and other performance issues.

62. Further, the increased network cell density will allow AT&T to spread traffic across more cell sites, creating a faster and more consistent experience, especially during peak usage times, because each site is carrying less traffic. The integration of T-Mobile USA sites also will help current AT&T cell sites perform better in certain situations. For example, today the performance of AT&T's current cell sites in certain areas may be degraded when mobile devices that are close to the antenna utilize so much power that devices that are farther away or in-building are not able to keep a connection to the cell site. Users in these "far" areas experience degraded service. Adding T-Mobile USA's complementary sites between existing AT&T sites within AT&T's network grid will bring subscribers closer to a cell site, substantially reducing service degradation attributable to this "near-far" problem. **[Begin Confidential**