DECLARATION OF DR. KIM KYLLESBECH LARSEN
Senior Vice President, Deutsche Telekom AG

I, Kim Larsen, hereby declare the following:

I. BIOGRAPHICAL INFORMATION

1. I am the Senior Vice President, Technology Service and International Network Economics of Deutsche Telekom AG ("DT") and am responsible for International Network Economics, a department that I founded within T-Mobile International in 2003. This area of responsibility includes techno-economical modeling, applied data mining, technology strategy and technology-related business development. My team's techno-economical models, optimization and analyses support the DT group's capital planning, strategic thinking and business development. I have an advisory role towards Deutsche Telekom executives on techno-economics topics including acquisition and mergers, spectrum economics, capex and technology cost structures, etc.

2. My professional experience includes DT's acquisition and merger of Tele.ring in Austria (group responsible for technology due diligence and benefit analysis). I was also the technology lead on: (a) T-Mobile's acquisition and merger of Orange Netherlands in The Netherlands and the technology post-merger integration of Orange Netherlands with T-Mobile Netherlands and (b) the joint venture (network sharing deal) between Orange UK and T-Mobile UK. I was the DT executive responsible for the business modeling and network design and planning including purchasing strategy and numerous other key strategic business development projects. I am also a Board member in Airway International, a Chinese broadband company. Moreover, I have been providing detailed DT group guidance of mobile capex demand and mobile technology cost structure for the annual budget process, using my own developed capex

demand model considering all relevant market, strategic, traffic and technology drivers. In addition, I have developed several advanced traffic engineering models being used by the DT group to understand the impact of mobile broadband and smartphone uptake in the mobile network for HSPA and LTE.

3. Prior to my current role, I was responsible for designing, planning and building the T-Mobile NL (*i.e.*, former Ben BV) mobile transport, core and value added service networks. During this period, I developed the UMTS technical business model for evaluating and supporting the 3G license bid. I hold a Ph.D, degree in Physics from Aarhus University, Denmark and a Masters degree in Physics and Mathematics, also from Aarhus University. After my Ph.D., degree I carried out fundamental and applied physics research at various research organizations in Europe. During my academic career, I have written and contributed to more than 40 scientific papers published in academically recognized journals.

II. INTRODUCTION AND SUMMARY

4. I have reviewed the Declaration of William Hogg ("Hogg Declaration").

5. Specifically, I have reviewed Section III in the Hogg Declaration. I concur with his description of the evolution of wireless technologies and the challenges posed to wireless providers in the United States.

6. Additionally, I have reviewed the technical assertions made in Section V in the Hogg Declaration concerning efficiencies gained through the combination of AT&T and T-Mobile USA ("T-Mobile USA") and concur with those findings. There should be significant efficiency gains from merging the two GSM-based networks.

7. One way in which the networks should experience gains in efficiency is from the elimination of redundant GSM control channels. I concur with the estimates made in the Hogg Declaration that 4.8 to 10 MHz of spectrum (20% efficiency gain) will be freed up from control channel efficiency gains. Another source of efficiencies is the complementary infrastructure grids of both companies. This will allow for rapid site sharing and cell splitting that will expand capacity and improve service quality for both customer bases.

8. In most markets, the GSM quality (for T-Mobile USA and AT&T customer bases) should improve by providing more effective spectral capacity due to channel pooling efficiency gains and increased cell site density (*i.e.*, as described in the Hogg Declaration). Furthermore, on average there will be more spectrum available for voice and data usage, due to the described efficiency gains, which will reduce traffic load and improve quality.[1] In top markets, the quality gain in call drop and call setup success rates should be significant.

9. In sum, I believe there will be substantial benefits for all subscribers (T-Mobile USA as well as AT&T) resulting from the transaction, including higher GSM quality and greater spectrum capacity available for HSPA+ and/or LTE, thus boosting mobile voice and data quality. T-Mobile USA has no clear path to LTE without this transaction and so T-Mobile USA customers will benefit from the availability of LTE. Aggressive re-farming of existing spectrum, if possible, **[Begin Confidential Information]**

[End Confidential Information]. Such a roll-out, in any event, would not be competitive with other wireless

[1] This is often described as optimized fractional load in frequency hopping implementations with high frequency re-use.

providers' LTE offerings unless additional spectrum was secured. **[Begin Confidential Information]**

[End Confidential Information] Additionally, T-Mobile USA subscribers will have substantially improved coverage reach and depth, including rural and underserved areas, due to the lower frequency bands used by AT&T. Moreover, the T-Mobile USA infrastructure grid is complementary to AT&T's network, thereby allowing for rapid site sharing and cell splitting that will provide immediate benefits to consumers. Due to the complementary nature of the technologies used by both companies, this transaction realizes greater efficiencies than would any other alternative.

10. T-Mobile USA is also already facing capacity constraints due to explosive growth in data services. Absent the availability of additional spectrum, T-Mobile USA is projected to reach capacity exhaustion in as much as **[Begin Confidential Information]**

[End Confidential Information] The merger with AT&T will allow T-Mobile USA a clear path to LTE in an efficient, expeditious fashion.

III. T-MOBILE USA IS FACING SPECTRUM EXHAUSTION ISSUES

11. T-Mobile USA currently operates a second generation digital mobile service using the GSM standard on its 1.9 GHz PCS spectrum.[2] T-Mobile USA's GSM network covers approximately 280 million people in 48 states, the District of Columbia, Puerto Rico and the Virgin Islands. T-Mobile USA has approximately **[Begin Confidential Information]** **[End Confidential Information]** GSM-only subscribers, which make up approximately **[Begin**

[2] T-Mobile USA has a single 850 MHz cellular license that also utilizes GSM.

Confidential Information] **[End Confidential Information]** of its overall subscriber base. The vast majority of T-Mobile USA's GSM subscribers have multi-band devices that are compatible with AT&T's GSM systems in the 850 MHz cellular and PCS bands. T-Mobile USA has also deployed HSPA and HSPA+, including dual carrier HSPA+, using its 1.7/2.1 GHz AWS spectrum. T-Mobile USA's HSPA network now covers 212 million POPs and its HSPA+ coverage includes 200 million POPs. T-Mobile USA currently serves approximately **[Begin Confidential Information]** **[End Confidential Information]** UMTS subscribers with its HSPA/HSPA+ network.[3]

12. T-Mobile USA has experienced explosive growth in mobile wireless demand over the past several years. This is primarily due to T-Mobile USA's HSPA+ network expansions which utilize its 1700/2100 MHz Advanced Wireless Service ("AWS-1") spectrum and the concomitant growth in use of data services by its customers. T-Mobile USA has also deployed a very extensive fiber-to-the-base-station network (*i.e.*, **[Begin Confidential Information]** **[End Confidential Information]** of T-Mobile USA HSPA cells will be served by fiber by the end of 2011) allowing for improvements in data speeds. Nonetheless, T-Mobile USA faces spectrum exhaust in a number of markets due to explosive growth in demand.

13. More specifically, T-Mobile USA has experienced very rapid growth in data traffic over the past 4 years, which is expected to increase with the accelerated penetration of smartphones and associated data plans in the contract segment. By 2015, T-Mobile USA expects data traffic on its network to be at least 20 times that of the 2010 level.

[3] T-Mobile USA's HSPA+ subscribers can (and will) make use of the GSM network where there is no HSPA+ coverage.

14. Smartphones, and the data demands placed by consumers using these devices, have driven much of this growth. In the next 5 years--2011 to 2015--analysts predict that smartphone penetration will exceed 80% for most U.S. mobile carriers. Approximately **[Begin Confidential Information] [End Confidential Information]** of the T-Mobile USA contract customer base now uses a smartphone. In the next five years, the vast majority of contract customers and a substantial portion of the prepaid segment are expected to have a smartphone.

15. Smartphone usage trends are also driving further traffic growth in a number of respects. As the voice-centric (2G) customer base migrates to data-centric services provided over HSPA+, T-Mobile USA has found:

- Increased per user data usage as mobile applications proliferate and develop;
- Increased load from mobile applications, which typically involve frequent interaction with the web (*e.g.*, social networking updates, location updates, advertising, mobile-peer-to-mobile-peer, *etc*);
- Significant growth of mobile video and streaming media traffic; and
- Additional data traffic as voice-centric communications become supplanted by data-centric messaging, including the use of VoIP.

16. Notably, with the uptake of smartphones and the popularity of mobile applications and social networking (*e.g.*, Facebook, Twitter), the rate of growth in data signaling has grown beyond that of the data traffic itself (be it volume or throughput). The underlying reason for this is that mobile applications stimulate very frequent status updates and interactions with the web resulting in substantially more signaling events than for a normal voice-centric mobile device. Annual growth rates of approximately 400% in data signaling have occurred in the last couple of

years. This growth rate is likely to continue with the accelerated penetration of smartphones in the market.

17. When today's mobile data network was initially specified and designed, the architects did not predict the signaling growth from the smartphone and mobile applications paradigm, and therefore the resulting impact was not considered in the fundamental design of next generation mobile technologies. This further stresses the current mobile network's infrastructure as well as the scarce available spectrum resources.

18. These factors have caused capacity constraints for T-Mobile USA. **[Begin Confidential Information] [End Confidential Information]** for example, will have demand exceed AWS-1 capacity in **[Begin Confidential Information] [End Confidential Information]**. Several more markets are expected to reach spectrum exhaustion by **[Begin Confidential Information]**

[End Confidential Information]T-Mobile USA anticipates that anywhere from **[Begin Confidential Information]**

[End Confidential Information] of markets could reach spectrum exhaustion.

19. In all traffic scenarios, T-Mobile USA expects data traffic demand to continue to grow exponentially over the period 2011 to 2015. Thus, the severity of spectrum exhaustion will increase proportionally as well. As T-Mobile USA only has two spectrum bands and is limited from spectrum re-farming by the GSM to HSPA+ migration rate, **[Begin Confidential Information]**

[End Confidential Information]

20. When considering spectrum exhaustion, it is important to understand the spectrum options and restrictions within T-Mobile USA's existing portfolio. T-Mobile USA operates its GSM services in the PCS band and its HSPA+ services in the AWS-1 band. The average spectrum position of each individual band is approximately 25 MHz. However, the variation in spectrum across U.S. markets is substantial, *i.e.*, standard deviation is 6 MHz and 11 MHz for PCS and AWS respectively.

21. Given spectrum exhaust timelines, T-Mobile USA must act now to address these deficiencies. While the FCC has indicated it will make additional spectrum available in the future, the timing of the availability of that spectrum is uncertain. In addition, newly allocated spectrum, for example, is not immediately available to relieve capacity after licensing because of implementation delays necessitated by: (1) the standards process, (2) equipment manufacturing, (3) site upgrade issues and (4) potential incumbent clearance of the spectrum. Any newly allocated spectrum that is not already commercialized (such as the mobile satellite spectrum) will require actions at the relevant standards bodies prior to deployment of the spectrum. In general, standards efforts are a 12 to 18 month process. After new bands have been added to existing standards, additional time is needed to manufacture and test new devices designed to utilize the new spectrum. The design, manufacturing and testing process generally requires at least 6 to 12 months to complete. Additionally, depending on the propagation characteristics of newly acquired spectrum, tower sites may need upgrading to deploy the new spectrum – there may not be capacity at a particular site, rezoning may be required, or the deployment may require a renegotiation of lease terms to add space to accommodate the new operations. Finally, should any incumbent operations remain in the newly allocated spectrum, time will be required to remove or relocate these systems.

22. Even if a new spectrum band can be made available and can be brought into use immediately (*e.g.*, a secondary market transaction for 700 MHz spectrum), handset penetration requires time before capacity exhaust issues in existing bands can be positively impacted by the introduction of the new band. Meaningful capacity relief requires handsets compatible with new bands to make up a significant portion of the user base, and it takes time to migrate customers to newly banded handsets. Technology diffusion, even when a new technology becomes available, still typically takes years before a critical mass can be achieved and benefits of such can be expected.

IV. T-MOBILE USA HAS NO CLEAR PATH TO LTE IN AN ECONOMICALLY AND TECHNICALLY SUSTAINABLE FASHION

23. Due to spectrum exhaustion, difficulty in aggressive re-farming of existing spectrum holdings and a lack of other viable spectrum options, T-Mobile USA has no clear path to an effective, economical deployment of LTE. **[Begin Confidential Information]**

[End Confidential Information]

24. When T-Mobile USA secured its AWS spectrum, it had a choice of which technology to pursue in that band. At the time, however, UMTS/HSPA was the only logical choice for the company. Unlike LTE, which, at the time, was not standardized and not available for T-Mobile USA, HSPA was a mature technology that offered significant spectral efficiency and data rate improvements over GSM. In fact, it is only now that LTE networks are being

broadly deployed, and while the technology now offers clear benefits over HSPA, those benefits were purely theoretical at the time T-Mobile USA was making its choice for the AWS band.

25. Further, the longer T-Mobile USA must rely upon HSPA+, **[Begin Confidential Information]** **[End Confidential Information]** as the majority of its competitors roll out LTE services. Given its lack of spectrum for LTE **[Begin Confidential Information]**

[End Confidential Information]

26. Finally, due to delays in implementing LTE, as well as an LTE deployment that would be sub-optimal, **[Begin Confidential Information]**

[End Confidential Information]

27. LTE is a major advance for the mobile industry in terms of performance and efficiency. Unlike HSPA, which is approaching the end of its deployment cycle, LTE deployment is just starting to gain momentum. T-Mobile USA requires a clear path to LTE because LTE offers long-term spectrum efficiencies over HSPA+. Given the burgeoning demand for mobile broadband data, there is a need for greater spectrum bandwidths to meet the capacity and data speed requirements. LTE is up to 40% more spectrally efficient than HSPA+ in larger effective bandwidths, even with a dual carrier HSPA+ configuration. LTE standards contemplate and are optimized for larger bandwidths that are required for mobile broadband

data. LTE, in these larger bandwidths, will have 1.5 to 2 times faster peak data rates than HSPA+ with dual carriers,[4] will drive down latency, and improve and lower signaling overhead.

28. As noted above, there are two possible methods for obtaining additional spectrum: (1) re-farming existing spectrum or (2) acquisition of new spectrum. Each of these approaches, when contrasted with merging with AT&T, are sub-optimal.

29. Re-farming would require moving the existing T-Mobile USA customer base from GSM in the 1900 MHz PCS band to the HSPA+ network in the 1700/2100 MHz AWS-1 band. This would free up the PCS spectrum for deployment of LTE, if sufficient amounts of spectrum could be cleared by this approach. However, T-Mobile USA's lack of spectrum depth dictates that re-farming will only provide a limited amount of spectrum. To accommodate its existing GSM customer base, at least **[Begin Confidential Information] [End Confidential Information]** of PCS spectrum must be reserved for GSM based on current usage (approximately **[Begin Confidential Information] [End Confidential Information]** of T-Mobile USA base are GSM only – approximately **[Begin Confidential Information] [End Confidential Information]**). In the meantime, the existing customer base is also heavily utilizing the AWS-1 spectrum for broadband data services (approximately **[Begin Confidential Information] [End Confidential Information]**). As such, it is unlikely that more than **[Begin Confidential Information] [End Confidential Information]** could be cleared by re-farming and be made available for LTE in the near term as these existing services and customers require continued support and spectrum bandwidth.

[4] These efficiency gains are based on the use of the same amount of allocated spectrum. Higher peak speeds can be realized by dedicating additional spectrum to LTE operation.

30. **[Begin Confidential Information]**

[End Confidential Information].

31. Alternatively, T-Mobile USA could seek to re-farm its PCS operations to HSPA+ and AWS-1 to LTE. This would put T-Mobile USA on a path to conform with market competition in terms of spectrum and bandwidth. However, it would be highly complex and in **[Begin Confidential Information]** **[End Confidential Information]**. Existing customer devices would need to be migrated to support such a technology path. Realistically, this would require T-Mobile USA to have access to additional PCS and/or AWS-1 spectrum to ensure a seamless transition for its existing customer base. **[Begin Confidential Information]**

[End Confidential Information]

32. **[Begin Confidential Information]**

[End Confidential Information], T-Mobile USA also has carefully studied the market for the acquisition of new spectrum. While the Federal Communications Commission ("FCC") has consistently announced its intent to focus on the allocation and licensing of additional mobile broadband spectrum, none of these initiatives appears to remedy the particular spectrum needs of T-Mobile USA in sufficient time to avoid spectrum exhaust.

33. A first choice for additional spectrum would be to find spectrum below 1 GHz (low band spectrum) to allow for better coverage at more economic costs of deployment. The FCC has two spectrum blocks targeted for potential allocation and licensing: (1) the 700 MHz D Block and (2) UHF television spectrum. Neither of these bands appears to be capable of being licensed in the near-term.

34. The 700 MHz D Block has a Presidential priority and recommendation for reallocation to public safety use. Similarly, the UHF television spectrum (572-698 MHz), which is directly adjacent to the existing 700 MHz commercial wireless spectrum band, would be well suited for commercial LTE deployment. The FCC has targeted this 120 MHz of spectrum for reallocation but has determined that it requires Congressional action to authorize "incentive auctions" to reallocate the spectrum from television broadcasters to commercial wireless use. While the White House and the FCC both strongly support Congressional action, it is unclear if any legislation will pass this year. Further, even if the FCC received this authority from Congress this year, incentive auction rules and the auction itself will take a significant amount of time to develop and implement and the spectrum would not be commercially available for many years. As such, the UHF television spectrum would not be a near-term solution for T-Mobile USA.

35. In addition, the FCC also has spectrum above 1 GHz within its inventory. The AWS-2 and AWS-3 bands are allocated for commercial mobile services but have not had final service and auction rules adopted for their use. The AWS-2 spectrum (the so-called H and J Blocks) is paired and spectrally adjacent to both PCS and AWS-1 spectrum bands. However, the H Block has some significant concerns regarding interference to existing PCS operations that have yet to be resolved, and the J Block uses a non-standard pairing (indeed, the spectrum may

end up being unpaired to add spectrum to AWS-3). Finally, AWS-3 (2155-2175 MHz) is unpaired spectrum and the FCC is awaiting resolution of potential pairing from spectrum currently allocated to the Federal government. In general, the FCC appears unlikely to complete service and auction rules for these two spectrum bands for many years.

V. COMBINING T-MOBILE USA AND AT&T SPECTRUM AND NETWORKS PROVIDES A CLEAR PATH TO LTE.

36. Reviewing all of the facts, I concur with the benefits of the transaction analysis provided in Section V of the Hogg Declaration. The merger will allow the combined entity access to enough spectrum and network infrastructure to increase capacity significantly, and to achieve demonstrable service improvements for its subscribers that could not occur but for the transaction. It will provide a clear path for LTE for T-Mobile USA in the most effective, expeditious manner possible.

37. First, as noted above, the efficiencies gained from combining AT&T and T-Mobile USA's networks are substantial. Redundant GSM control channel spectrum will no longer be required, freeing up 4.8 to 10 MHz of spectrum for the combined company. Moreover, in areas where AT&T and T-Mobile USA's 1900 MHz PCS spectrum overlap, the existing GSM channels can be more efficiently pooled, improving service to both company's customers.

38. As AT&T and T-Mobile USA both rely upon the same network technology (GSM and HSPA), **[Begin Confidential Information]**

[End Confidential Information].

Moreover, T-Mobile USA's network grid is complementary to AT&T's network, allowing T-Mobile USA's sites to achieve "instant" cell splitting (as discussed in more detail in the Hogg

Declaration). This in turn allows the combined company an extensive increase in network capacity that would otherwise require years of new site builds to accomplish.

39. Finally, the AT&T and T-Mobile USA (PCS and AWS-1) spectrum bands are complementary. This means that: (1) the efficiency gains discussed above are more pronounced and (2) AT&T can readily use T-Mobile USA's AWS-1 spectrum for LTE in the most efficient fashion in combination with its own AWS-1 spectrum. Moreover, the PCS spectrum holdings of T-Mobile USA can be more efficiently used for both GSM (improving dropped and blocked call rates for customers) and HSPA+ (allowing for the launch of additional carriers and easing capacity concerns in congested markets) following this transaction.

40. In sum, the combination of AT&T with T-Mobile USA will allow a clear, efficient path to LTE that would not otherwise exist for T-Mobile USA. This will provide GSM, HSPA+ and LTE services for customers of the combined entity in a better, more rapid fashion than any other alternatives. It will allow for broader coverage, greater capacity, and a robust and efficient deployment of LTE. The merger will result in a company with sufficient spectrum and capacity to offer LTE services on a scale necessary to compete with other companies while continuing to support legacy services and customers.

I declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct.

DATED: April 19, 2011

By: _____

Dr. Kim Kyllesbech Larsen
Senior Vice President
Deutsche Telekom AG