**3GPP TSG RAN WG1 #119**

**Melbourne, Australia, September 9th – 12th, 2024**

**Title: Moderator Summary on Rel-19 NES**

# Introduction

The Rel-19 WID on network energy savings has following checkpoint in RAN#105 (Sept ’24):



This document summarizes company contributions submitted to RAN#105 regarding the checkpoint as well as comments made during the first round of online discussions in RAN#105.

# Status of discussions on On-Demand SIB1

## Cases discussed by WGs

* Case 1: UE obtains UL WUS configuration from NES Cell, UE transmits UL WUS on NES Cell, UE receives on-demand SIB1 from NES Cell
* Case 2: UE obtains UL WUS configuration from Cell A, UE transmits UL WUS on NES Cell, UE receives on-demand SIB1 from NES Cell
* Case 3: UE obtains UL WUS configuration from Cell A, UE transmits UL WUS on Cell A, UE receives on-demand SIB1 from Cell A



## WG conclusions/agreements on Case 1, Case 2, and Case 3

RAN1 recommends to specify Case 2 only:

***Agreement***

*RAN1 recommends specifying on-demand SIB1 only for Case 2 (Option 1+B+X) in Rel-19.*

* *Note: RAN1 strive to minimize impact to legacy UE.*
* *Note: RAN1 specification impact to support this feature should be minimized.*

RAN1 concluded on Case 1 and Case 3 as follows:

***Conclusion***

*For on-demand SIB1 in idle/inactive mode, RAN1 was not able to achieve consensus to support Case 1 (Option 1+A+X) in Rel-19, while Case 1 is technically possible from RAN1’s perspective.*

**Agreement**

For on-demand SIB1 in idle/inactive mode, Case 3 (Option 2+B+Y) is feasible from RAN1 perspective for some scenarios. Case 3 (Option 2+B+Y) is lower priority compared to Case 2 from RAN1 perspective.

RAN1 is inconclusive on whether the required specification support is justified by the observed NES gain for Case 3

RAN2 recommends to specify Case 2:

***Agreement on OD-SIB1***

*OD-SIB1 SI conclusion:*

*8. RAN2 conclude that on-demand SIB1 is feasible from RAN2 perspective and recommend normative work of case 2 for on-demand SIB1.*

RAN2 concluded on Case 3 as follows (no conclusion on Case 1):

**Conclusion:**

No consensus for RAN1 case 3 in RAN2.

RAN3 concluded on Case 2 as follows (no conclusion on Case 1 or 3):

*RAN3#124:*

*Focus on case2 in RAN3 first.*

*RAN3#125:*

**Case 2 can be supported with the below details:**

* ***UL WUS configuration is decided by NES Cell DU.***
* ***UL WUS configuration transmission from NES Cell DU to NES Cell CU. NES gNB-CU sends UL WUS configuration to Cell A gNB-CU over Xn Interface.***
* ***Upon the reception of the UL WUS configuration, Cell A can provide feedback to NES Cell on whether the WUS configuration Transmission for NES Cell is accepted in Cell A (e.g., confirm, reject).*** *FFS if Cell A broadcasts it right away or not.*

## Summary of first round of online discussions in RAN#105

Following views were shared by companies:

* Majority of companies were supportive of normative work for Case 2
* A number of companies were supportive of normative work for Case 1 in addition to Case 2 (e.g. RP-242141 – co-sourced by 8 companies including 3 operators)
* A number of companies were supportive of normative work for Case 3 in addition to Case 2 (e.g. RP-242038)
* At least two companies (Intel and Samsung) indicated that while they are okay with normative work to support Case 2, the observed gains are small and not proceeding with normative work was also acceptable
* Qualcomm proposed to have the following in addition to Case 2
	+ *NES cell provides WUS configuration for other NES cells to the UEs camping on the NES cell*

# Proposal for Rel-19 NES normative phase

Considering the WG conclusions/agreements and first round discussions in RAN1#105, the moderator proposes the following:

|  |
| --- |
| * Support Case-2 as part of normative work on on-demand SIB1 for Rel-19 NES
	+ Case 2: UE obtains UL WUS configuration from Cell A, UE transmits UL WUS on NES Cell, UE receives on-demand SIB1 from NES Cell
* Above does not preclude discussion on the following in RAN2
	+ *NES cell provides WUS configuration for other NES cells to the UEs camping on the NES cell*
 |

Companies are invited to share their views on the above proposal in the table below:

| **Company** | **Comment** |
| --- | --- |
| Qualcomm | We are ok with the proposal. As an additional note, it has been discussed before that in general NES features may be allowed to have some negative impact to legacy UEs, if the energy savings provided by them are substantial. In our view on-demand SIB1 does not provide energy savings high enough to justify any impact to legacy UEs. That means that legacy UEs should see the NES Cell’s SSB as NCD, or the cell being barred. It may be worthwhile to capture this also in the WID to streamline the discussions. But even if RAN decides not to capture it, it would be our assumption going forward.  |
| ZTE | --We are fine to only specify case-2 in the normative phase.--For the second bullet on NES cell providing WUS configuration for other NES cells, we understand when a NES cell starts to broadcast SIB1 upon request, it turns into a “cell A” for some time. Thus we understand this proposal does not go beyond case-2 but whether to support this would require discussion and decision in RAN2 so we prefer to leave this further discussion in WG level.With the above consideration, we only need to update the WID to make it clear that we only specify case-2 for normative phase while leave further detailed discussion in WG level. |
| DT | My online question on Case 2 is not covered in the section 2.3:I asked if Case 2 also covers the case that the cell A and the NES cell are the same, but such cell would operate as Cell A at one time and as NES cell another time. Hence it would not be needed that there is always an anchor Cell A, but the “UL WUS config” would be downloaded while the cell in question is operating in Cell A mode (normal) and be used later towards this cell if changed to be a NES cell.We think that this is an important point for operational scenarios and should be covered by case 2. Hence case 2 shall not be restricted to require two different cells (but the same cell operating in Cell A and NES mode in different time instances). |
| Nokia | While we acknowledge the merits of case 1 for a more complete solution. We supportive of the proposal due to the limited amount of time available to finalize the work in Rel-19. It should be noted as well that the level of technical maturity on case 1 is well below that of case 2, and hence including that case would mean a significant addition on the workload. However, the proposed addition by Qualcomm can be discussed in RAN2 based on contributions rather than included in the WID.  |
| NTT DOCOMO | We are basically ok with the proposal from moderator.Regarding how to avoid impact to legacy UEs, our understanding is that it is under discussion in RAN2, and hence RAN does not need to take any action for it at this moment.Regarding whether the NES cell can provide WUS configuration of other NES cells (including the NES cell itself) to UEs camping on the NES cell, we think it can/should be discussed in WGs. So, to address DT’s comment, we suggest modifying the last bullet in moderator’s proposal as below.* Above does not preclude discussion on the following in RAN2
	+ *NES cell provides WUS configuration for other NES cells (as well as NES cell itself) to the UEs camping on the NES cell*
 |
| Ericsson | We are fine with the 1st bullet. While we still think the gains of on-demand SIB1 are marginal, we understand that the majority wants to proceed with normative work, so we can agree as long as the specification effort is kept small (i.e., Case 2 *only*). Regarding the 2nd bullet, our view is that this aspect can be left to RAN2 to discuss and does not need to be explicitly agreed at RANP. However, if the 2nd bullet must stay, then our view is that is necessary to clarify that for Case 2, there is still always the presence of Cell A transmitting SIB1, i.e., SIB1 is not turned off for Cell A (otherwise this becomes Case 1). This can be clarified by adding a note to the above agreement which copies the highlighted part of the following RAN1 agreement:***Agreement****For discussion purpose, the following assumption will be used in RAN1** *Cell A: A cell that is periodically transmitting at least its own SIB1*
* *NES Cell: A cell that may transmit SIB1 transmission in response to UL WUS from a UE*

Regarding the above comments from DT, we have a concern that Case 2 might be modified to include the case of the same cell operating in both Cell A mode and NES mode in different time instances, e.g., Cell A transmitting SIB1 during the daytime and turning off SIB1 at night. Aside from contradicting the highlighted bullet in the above agreement, our concern is that this will create a coverage hole at night when Cell A turns off SIB1. A legacy UE trying to access that cell at night will not be able to access it (due to lack of SIB1). This could be problematic for a UE trying to access emergency services. This is also true for a Rel-19 NES capable UE that has not received SIB1 (including WUS configuration) sometime before the cell turned off SIB1, e.g., during the day. It cannot be guaranteed that such a UE trying to access the cell at night would have received SIB1 (and thus WUS configuration) from the cell during the day. During WG discussions, the key assumption about Case 2 is that there are always two cells: Cell A (always transmitting SIB1 with WUS config for a NES cell) and NES cell.Regarding Qualcomm’s comment about “legacy UE should see the NES cells’ SSB as NCD, or the cell being barred,” we don’t think a WID update is needed on this point. We think such details are better discussed at WG level, and the current WID scope does not preclude such discussion, especially due to the 1st sub-bullet in the following RAN1 agreement: ***Agreement****RAN1 recommends specifying on-demand SIB1 only for Case 2 (Option 1+B+X) in Rel-19.** *Note: RAN1 strive to minimize impact to legacy UE.*
* *Note: RAN1 specification impact to support this feature should be minimized.*
 |
| CMCC | We support to convert Case 2 into normative work.Regarding the second bullet, RAN2 already reached the agreement in RAN2#127 meeting:***WUS configuration of NES cell from NES cell:******4. Once Rel-19 NES UE camps on the NES cell, the UE expects to receive UL WUS configuration updates from the NES Cell, e.g., via legacy SI modification procedures.***Thus, we share the same view with DCM that the NES cell shall also provide its own WUS configuration, so that the UE can obtain the updated version via NES cell when the corresponding setting is changed.In addition, during RAN1#117~RAN#118 meeting, companies had provided the evaluation results for Case 1 in RAN1 and reach no consensus on the benefits in NES gain. Therefore, although the NES cell can transmit the WUS configuration with some certain condition, it is recommended that the signaling that carries WUS configuration in NES cell shall not be an always-on signaling.Based on the above analysis, we suggest to modify the last bullet as follows:* Above does not preclude discussion on the following in RAN2
	+ *NES cell provides WUS configuration for itself and/or other NES cells to the UEs camping on the NES cell*
	+ *Note that the signalling that carries WUS configuration for the above bullet is not an always-on signalling*
 |
| Xiaomi | We are supportive to the direction that only convert case 2 to normative work, not only from technical maturity point of view but also from workload point of view. Even for case 2, which is recommended from RAN1, minimal impacts on legacy UE and minimal impacts on specification are pursued. Hence, a reasonable scope for normative work on OD-SIB1 is important.Second, we second the comment from Ericsson that periodically transmitted SIB1 on cell A is the pillars of the whole discussion of OD-SIB1. Therefore, we do agree that case 1 and case 2 are separate cases, which should not be coupled together.Regarding to the second bullet, we respect the intention to minimize the impacts on legacy UE. However, we agree with the other companies that it should be left to WG-level discussion. |
| Apple | Given the limited gain of OD-SIB1 due to always-on SSB with 20 ms periodicity, our view is that the normative work should be limited with minimal specification impact to fit in current TU budget. Therefore, we agree moderator’s proposals to normative work on Case 2 only and are fine to clarify “*NES cell provides WUS configuration for other NES cells to the UEs camping on the NES cell*”.We understand the modified Case 2 by DOCOMO (*NES cell provides WUS configuration for NES cell itself to the UEs camping on the NES cell*) is the same as Case 1. Potential solution provided in R1-2407103 for Case 1 was that WUS configuration on NES cell is transmitted only on SSB slot where majority cases would be the cases of FDM between SSB and WUS configuration. This requires additional step to transmit OD-SIB1 depending on WUS reception at gNB. We think the same goal can be achieved by implementation based solution of FDM between SSB and SIB-1 (not OD-SIB1) in the perspective of network energy saving. |
| Panasonic | We support that Case 2 into normative work.Based on the referred RAN2 agreement referred by CMCC, our understanding is NES cell provide its own WUS configuration when NES cell is activated/enabled its own SIB1. i.e. it is like normal cell or can be called as cell A. On the other hand, in some time later, how to transit to NES cell deactivated/disabled SIB1 again needs some discussion as to be cell A always does not allow NES gain. |
| Futurewei | We are generally ok with proposal and support NTT DCM’s revision as it reflects the RAN2 agreements. |
| OPPO | We are generally OK for the first set of bullets.The second set of bullets seems into much details of RAN2 discussion. In one hand some companies even want to clarify that the NES cell could be all NES cells. In other hand, some may restate the Cell A will always broadcast its SIB1. We think this could lead to copy all the RAN2 conclusions into the WID, which may not be necessary.Maybe it’s simple to remove bullets from “Above does…” |
| LGE | We support the proposal from the moderator. Although case1 including its variant (like DT mentioned) could offer more NES gain, RAN WGs have been already seeing the support of case1 almost infeasible in this release due to substantial specification impacts.Regarding the QC point, we think this issue has been under discussion in RAN2. So, we do not think we need to revise WID to address this.  |
| CATT | We support to specify Case 2 and share the same understanding with Ericsson for Case 2 that there are always two cells, i.e. Cell A and NES cell. So the case that Cell A and NES cell is the same cell is not Case 2. The issues for this case have already been well explained by Ericsson, which are the same as for Case 1. For the case that NES cell provides WUS configuration for other NES cells, we think that can be left to WG level discussion and no update in WID is needed. So we do not think the second bullet is needed.So we support the first bullet and do not think the second bullet is needed. |
| vivo | We are generally fine with the moderator proposal. To allow further discussion on the use case raised by DT, we are fine with CMCC suggested revision as below.* Support Case-2 as part of normative work on on-demand SIB1 for Rel-19 NES
	+ Case 2: UE obtains UL WUS configuration from Cell A, UE transmits UL WUS on NES Cell, UE receives on-demand SIB1 from NES Cell
* Above does not preclude discussion on the following in RAN2
	+ *NES cell provides WUS configuration for itself and/or other NES cells to the UEs camping on the NES celli*

Regarding minimizing the legacy UE impacts as raised by Qualcomm, we believe this is an important design target when designing the feature, but prefer to capture it in an more generic manner, if needed, without mentioning specific solution.  |
| Huawei, HiSilicon  | We support the first bullet in the moderator proposal to specify on-demand SIB1 for case 2 per the WG recommendations. Regarding the second bullet, we don't think it is necessary since details can be up to WGs discussions. If companies insist to include it, we can accept to keep the second bullet, but it should not be included in the updated WID. Regarding the question from DT, we think it is relevant to standalone deployment scenarios. We do think it is also important to do some NES enhancements for standalone deployment, it would be great if we can also do something in R19. However, it is observed that there are concerns on the potential RAN1 workload in R19, we can consider to do the corresponding enhancements in future release, e.g. R20.Regarding whether to limit NES cell with NCD-SSB as raised by Qualcomm, whether to allow NES cell provide WUS configuration for itself proposed by DCM and whether the WUS configuration signalling is always on or not, such details all depend on detailed design which are appropriate to be discussed and decided in WGs, and there is no RAN guidance needed.   |
| Samsung | The observed gains for on-demand SIB1 is limited – even for Case-2. However, given the RAN1 recommendation and strong support from other companies, we are fine with taking Case-2 for normative work. However, we are not okay with expanding Case-2 to include Case-1. Based on RAN1 agreement on the definition of Cell A and NES cell, these are two different cells (as explained by Ericsson). |
| MediaTek | We support Moderator new proposal in WF below.  |

# WF on the support of on-demand SIB1 in Rel-19 NES

Based on the input from the companies, the moderator makes the following observations:

* Companies are in general fine with progressing with normative work on Case-2.
* A number of companies have voiced support to expand Case-2 to also cover the case that the cell A and the NES cell are the same. However, a number of companies have provided negative comments to this expansion of Case-2.
* A number of companies indicated that the gains observed for on-demand SIB1 is limited and as a result, they strongly prefer a compact work scope.
* On the second bullet proposed by the moderator, revised wording will be provided in the final proposal to RAN that reflects the comments received.

The following proposal is made for RAN approval.

**Proposal:**

* Support Case-2 as part of normative work on on-demand SIB1 for Rel-19 NES
	+ Case 2: UE obtains UL WUS configuration from Cell A, UE transmits UL WUS on NES Cell, UE receives on-demand SIB1 from NES Cell
	+ Update Rel-19 NES WID accordingly
* Above does not impact the ongoing discussion in RAN2 on WUS configuration update for UEs camping a NES cell
	+ No update to Rel-19 NES WID is necessary

# APPENDIX: Summary of contributions on Rel-19 NES

|  |  |
| --- | --- |
| **Company** | **Proposals** |
| Spreadtrum | ***Proposal 1: Specify at least Case 2 to support on-demand SIB1 in Rel-19.*** |
| vivo | **Proposal 1: Convert on-demand SIB1 to normative work and follow RAN WG recommendation to specify case 2 only in Rel-19 NES.** |
| Beijing Xiaomi Mobile Software |  |
| Nokia | **Proposal: Proceed with normative work on Case 2 only for on-demand SIB1 for UEs in RRC idle/inactive mode in Rel-19.** |
| ZTE Corporation, Sanechips  | With the above consideration, we suggest to specify on demand SIB1 only for Case 2 in the normative phase.**Proposal: Specify Case 2, i.e. UE obtains the UL WUS configuration from Cell A, transmits UL WUS to NES Cell and receives on-demand SIB1 from NES Cell, in the normative phase of on-demand SIB1** **for UEs in idle/inactive mode.** |
| CATT | **Proposal: For RAN#105 on-demand SIB1 checkpoint,** •**Start normative work for on-demand SIB1 for UEs in idle/inactive mode in Rel-19 NES only for Case 2 (Option 1+B+X)** •**Option 1: UE transmits UL WUS to NES Cell** •**Option B: UE obtains the UL WUS configuration from Cell A** •**Option X: UE receives on-demand SIB1 from NES Cell**  |
| Samsung  | **Proposal**•Update WID to specify case 2 (Option 1+B+X) only. |
| Ericsson | For the normative work on on-demand SIB1 for Rel-19 NES, the following WID update (no track changes) is proposed i.e. to specify on-demand SIB1 for only Case 2. Revised WID is in RP-241868. |
| Huawei, HiSilicon | **Proposal: Support normative work for on-demand SIB1 for UEs in idle/inactive mode based on Case 2 in Rel-19.** * + **Case 3 can also be included, striving for minimized additional specification impact.**
 |
| Qualcomm Incorporated | • If there is consensus to support, specify support of on-demand SIB1 for idle/inactive UEs (RAN2, RAN1, RAN3)• UE sends an WUS for requesting SIB1 to a NES cell and receives the requested SIB1 from theNES cell• Cell A provides WUS configuration for NES cells• NES cell provides WUS configuration for other NES cells to the UEs camping on the NES cell• Only non-cell defining SSB is transmitted in a NES cellModerator’s note: First two sub-bullets of the above proposal correspond to Case 2  |
| OPPO  | **Proposal 1: Support on-demand SIB1 normative work in R19 with the focus on Case 2****Proposal 2: Both RRC\_IDLE/RRC\_INACTIVE UE and RRC\_CONNECTED UE are considered for this normative work.****Proposal 3: The enhancement should avoid impact to on-demand SIB1 non-capable UE in both RRC\_IDLE/RRC\_INACTIVE and RRC\_CONNECTED state.**  |
| Intel Corporation | While RAN1 and RAN2 recommended to specify Case 2 (UE transmits UL WUS to NES Cell, UE obtains the UL WUS configuration from Cell A, UE receives on-demand SIB1 from NES Cell), the NES gains for the most promising use case is rather marginal.Approving normative work for on-demand SIB1 should be considered only if there are sufficient TU in RAN1 and RAN2. |
| CMCC | **Proposal 1: Case 1 for on-demand SIB1 is not supported in Rel-19 due to the marginal NES gain.****Proposal 2: Support convert Case 2 for on-demand SIB1 into normative work.****Proposal 3: Case 3 for on-demand SIB1 is not supported in Rel-19 due to there is no consensus in both RAN1 and RAN2.** |
| Futurewei  | **Proposal 1: Specify on-demand SIB1 for Case 2 (Option 1+B+X) in Rel-19.****Proposal 2: Consider starting the normative work for Case 3 in R19 if time permits.****Proposal 3: Consider starting the normative work for Case 1 in R19 if time permits.** |
| NEC  | **Proposal 1:** Support specification of on-demand SIB1 in Rel-19**Proposal 2:** Support specification of on-demand SIB1 using Case 2nUE obtains the UL WUS configuration from Cell A nUE transmits UL WUS to NES CellnUE receives on-demand SIB1 from NES Cell  |
| InterDigital, Inc. | * Study Specify procedures and signaling method(s) to support on-demand SIB1 for UEs in idle/inactive mode only for Case 2, including: [RAN1/2/3]
 |
| Apple  | 2. Study Specify procedures and signaling method(s) to support Case 2 only for on-demand SIB1 for UEs in idle/inactive mode, including: [RAN1/2/3] |
| MediaTek Inc.  | * 1. Proceed to normative work for On-demand SIB1 addressing Case 2 only, with the following preconditions:
		1. - Impact to legacy UE shall be minimized
		2. - RAN1 spec impact shall be minimized
 |
| Vodafone, Deutsche Telekom, Orange, Lenovo, Google, Fraunhofer IIS and Fraunhofer HHI, ETRI, CEWiT  | **Proposal 1: The co-signing companies recommend supporting Case 1 in Rel 19 in addition to case 2.** |