
**INTERCONNECTION OFFER FOR THE PROVISION OF
SERVICES ON THE NEXT GENERATION NATIONWIDE
BROADBAND NETWORK**

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**NETWORK COMPANY PROPOSED CO-LOCATION SPACE &
SERVICE IN NEW CO-LOCATION ROOM**

Submission by Nucleus Connect Pte Ltd to the Info-communications
Development Authority of Singapore

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1. General

Fair and Non-discriminatory Treatment

As a Dominant Licensee, OpenNet has the responsibility to treat all RLs in a transparent, fair and non-discriminatory manner. However, Nucleus Connect has encountered situations where OpenNet has not complied with its obligations.

In one incident, OpenNet had allowed a RL to install its racks in violation of OpenNet's House Rules which prohibit hot air from being expelled into the Cold Aisle.

This, and the many other incidents already made public in the media, gives the industry little confidence that OpenNet is able to discharge its obligations responsibly and competently. To this end, Nucleus Connect believes that it is IDA's responsibility to ensure that OpenNet complies with its obligations, and to take OpenNet to task for any non-compliance.

No Monitoring Capability in its COs

From our past experience with OpenNet, it appears that OpenNet has no means of monitoring the situation in its Co-location Space. For example, there has been at least one incident where Nucleus Connect had detected that our equipment co-located in OpenNet's COs were experiencing power failure. However, when informed, OpenNet claimed that it had no information of any power failures in its COs, only to be proven wrong subsequently.

In a second incident, Nucleus Connect had alerted OpenNet that its Bukit Panjang CO was over-heating based on signals we were receiving from our own equipment. OpenNet subsequently confirmed that one of its fan coil units (for its air-conditioning system) had failed.

It is therefore unclear how OpenNet is able to competently provide a Co-location Service without being able to keep track of the operational performance of its Co-location Space.

Monitoring of Space Allocation

The provision of Co-location Space is a Mandated Service to be provided by the NetCo. Therefore OpenNet must carefully and diligently monitor the space allocation in its COs, and to source for additional space to ensure that its RLs are never deprived of Co-location Space. We would note that if there is a lack of Co-location Space provided to RLs, RLs will not have the ability to provide services to their downstream customers.

IDA should therefore impose strict requirements on OpenNet to ensure that OpenNet is never allowed to let its COs run out of space. IDA should also impose a penalty framework on OpenNet for any failures to ensure that adequate space is available to RLs.

OpenNet must state its House Rule upfront

OpenNet must be required to establish and state its House Rule upfront. OpenNet appears to make up its House Rule “along the way” and RLs only find out about the House Rules at a late stage. This leads to much uncertainty, higher costs for RLs and, most importantly, a delay in implementation as RLs will need to adjust plans and/or seek an increase in budgets.

3-phase Power should be part of OpenNet’s offer

We would note that is common for RLs to require 3-phase power for their Co-location Equipment. This being the case, OpenNet should be required to include such a provision in its Co-location Service Schedules. This will ensure that RLs have certainty over the processes and charges this service.

Need to establish clear guidelines of when rack bolting is required

Nucleus Connect notes that under certain circumstances OpenNet will require RLs to bolt down their racks. Therefore, such requirements should be made known upfront so that RLs have some certainty. This will also ensure that OpenNet implements its requirements in a transparent, fair and non-discriminatory manner.

2. Specific Comments

Nucleus Connect’s comments on specific clauses of Schedule 12C are tabulated below:

Clause Reference	Nucleus Connect’s Comments
<i>General</i>	
Clause 1.2	<p>As Schedule 12B is not applicable to this service schedule, we would seek confirmation that OpenNet bears full responsibility to ensure that it provides adequate cooling capacity under Schedule 12C.</p> <p>Further, we believe that OpenNet should provide information on the type of cooling solution it is providing, and the maximum cooling capacity on a per rack basis.</p>
Clause 1.3,	The entire wording “Where certain work is to be carried out by

1.3(b), 1.3(c), 1.3(d)	<p>OpenNet under this Schedule, and the quantum of the Charge is not defined under Schedule 15 (Charges), the Requesting Licensee shall pay all costs incurred by OpenNet in provisioning Co-Location Service...” onwards ought to be deleted.</p> <p>For clarity and in order to avoid any potential disputes, all Charges for the Co-Location Service must be clearly stated in Schedule 12C or 15. This is consistent with IDA’s position for the charging regime in OpCo’s Interconnection Offer. There should not be a generic and vague “backdoor” avenue for OpenNet to impose additional charges.</p>
Clause 1.5	It should be made clear that existing User Accounts used to access the OpenNet Platform for other services offered under OpenNet’s ICO, can also be used for Schedule 12C.
Clause 1.6	<p>To amend the words “a negligent, wilful or reckless breach of this ICO Agreement” in line 5 to “breach of this ICO Agreement”.</p> <p>There is no logical or reasonable basis to peg OpenNet’s responsibility for breach to a further threshold of “negligent”, “wilful or reckless”. If the damage is caused by OpenNet’s breach of contract, it must be responsible.</p>
Clause 1.8, sections 1 to 4 of Annex 12A-1	The persistent poor service delivery of ON since its launch demonstrates that the SLA remedy frameworks in ON ICO are not sufficiently adequate to deter ON from continuing with its poor service delivery. Therefore, there ought not to be any maximum cap on the SLA remedies and clause 1.8(b) ought to be deleted in their entirety.
Clause 1.8(b)	We believe that the clause reference should be to Clause 1.8(a), and not 1.7(a).
Availability at a Central Office	
Clause 2.1	We note that the amount of space available in each of OpenNet’s COs under Schedule 12C has not been made available. We submit that this information should be available as soon as possible, and in any case, before the approval of this Service Schedule, to facilitate planning by RLs.
Ordering and Provisioning Procedure	
Clause 3.1	While this clause states that OpenNet will allocate space in a non-

	<p>discriminatory manner, Nucleus Connect would note that it has brought to both OpenNet's and IDA's attention that OpenNet has not been able to police its own House Rules and/or ensure that its RLs abide by the terms and conditions of its ICO. Further, during our correspondence with OpenNet, it appeared that OpenNet was unaware of the breaches until informed by Nucleus Connect. We note that to-date OpenNet has not addressed Nucleus Connect's queries on its discriminatory practices. This leaves Nucleus Connect with deep concerns over OpenNet's ability to be non-discriminatory. To this end, we would strongly urge IDA to audit OpenNet's operational practices frequently to ensure that all RLs have a level playing field.</p> <p>Nucleus Connect also submits that OpenNet must make available to RLs information on the amount of rack space remaining in each of its COs. Such transparency will enable RLs to ensure that they are treated in a non-discriminatory manner, as well as facilitate the RLs network planning.</p>
	<p>Finally, we believe that there must be some flexibility exercised by OpenNet in determining whether Co-location Space should be taken back. For example, RLs could face delays in the delivery of equipment resulting in Co-location space being left empty for more than 30 Business Days. It would not be fair for such RLs to give up Co-location Space, only to have to acquire the space again later. We propose that any space to be taken back by OpenNet be subject to IDA's approval, and/or that this clause be modified to ensure that RLs are not unfairly penalized for legitimate delays beyond their control.</p>
<p>Clause 3.2</p>	<p>OpenNet should be required to specify the type of information it will require to determine whether it will allocate more space to a RL. This will ensure a more efficient process for space allocation and reduce delays in the provision of Co-location Space.</p>
<p>Clause 3.3</p>	<p>Nucleus Connect submits that the Request Quota should be increased. It is typical that a RL such as Nucleus Connect would submit requests for multiple COs at any one time. This would immediately result in at least half of the Request Quota being used up. Further, we would note that the Request Quota is for both new requests as well as modification requests which would exacerbate the situation. Nucleus Connect therefore submits that the Request Quota be removed, or at least doubled to 32 requests per week.</p>

<p>Clause 3.4 (A) & (B) (c)</p>	<p>It is unclear why OpenNet requires such information and how OpenNet uses such information in its assessment or allocation of space. Nucleus Connect has come across at least one incident where OpenNet did not verify nor ensure that RLs complied with the information provided in their submission. We would submit that OpenNet must be clear and transparent in how it will audit and ensure that RLs comply with OpenNet's House Rules, as well as terms and conditions of its ICO, to ensure that all RLs have a level playing field.</p>
<p>Clause 3.4 (A) & (B) (f)</p>	<p>Nucleus Connect would note that this clause already exists in Schedule 12 of OpenNet's ICO, and that Nucleus Connect has been providing forecasts to OpenNet on a regular basis. However, despite the provision of forecasts, we note that OpenNet still allowed space in its COs to run out, resulting in a need for IDA's intervention. OpenNet's insistence that RLs provide forecasts, and yet do not seem to competently use such information in its planning simply wastes the time and effort of RLs. Nucleus Connect therefore submits that unless OpenNet can demonstrate that it will indeed use such information for its space planning, this clause should be deleted.</p> <p>Further, IDA should impose penalties on OpenNet should it ever mismanage its space in its COs again, and allow Co-location Space to run out without already securing additional space. Based on Nucleus Connect's experience over the last 2 years, it is clear that short of regulatory intervention, OpenNet has no interest in improving its performance.</p> <p>We would also note that OpenNet did not use the forecasts to ensure that its COs do not over-heat but instead irresponsibly delayed the implementation of its Supplementary Cooling service.</p>
<p>Clause 3.4 (A) & (B) (g)</p>	<p>We would note that in meetings with IDA and OpenNet, prior to IDA's release of Schedule 12C, Nucleus Connect had highlighted that, in order to cater for future technology (such as 10G PON or WDM PON), a higher heat load of 4kW is required. There is a need to cater for the higher heat load now so that the Next Gen NBN is in a position to take advantage of such technology as its comes on-stream.</p> <p>We have attached the minutes of the meeting between the parties for IDA's ease of reference.</p>

<p>Clause 3.5(A)(c) & 3.5(B)(c)</p>	<p>Any decommissioning of the Central Office must be subject to IDA's approval. To amend Clauses 3.5(A)(c) and 3.5(B)(c) accordingly.</p>
<p>Clause 3.6(b)</p>	<p>As a NetCo, OpenNet is obliged to provide the Co-Location Service which is crucial to the success of the operations of Next Gen NBN. OpenNet cannot evade this obligation simply on the basis of alleging that there are "technical or engineering issues". As a NetCo and service provider, it is OpenNet's responsibility to address and resolve these issues.</p> <p>Accordingly, the words "significant health, safety, technical or engineering issues" ought to be amended to "significant health or safety issues".</p>
<p>Clause 3.8</p>	<p>If OpenNet manages the space in its COs competently, there should not be a need for this clause as OpenNet would have already sourced for additional space, and ensured that the additional space is ready for service. As the provision of Co-location Space is a Mandated Service, OpenNet should not be allowed to shirk its responsibility of ensuring that it is able to continually provide the service by hiding behind such clauses. Therefore this clause should be deleted in its entirety and OpenNet must be responsible to provide additional space as required and with the same SLGs.</p>
<p>Clause 3.9</p>	<p>While Nucleus Connect does not object to OpenNet retaining the right of determining allocation and placement of Co-location Equipment, we submit that there is a need for OpenNet to commit to taking into consideration the existing configuration of Co-location Equipment, as well as the airflow within the RL's Co-location Space.</p> <p>Further, Co-Location Service is a key and critical component of the Next Gen NBN service. Accordingly, the words "reasonable endeavours to" ought to be amended to "best endeavours to".</p>
<p>Project Study</p>	
<p>Clause 4.4</p>	<p>We submit that OpenNet must be required to provide a committed quotation for the Charges, and not just an estimate.</p> <p>However, should IDA not require OpenNet to provide a committed quotation, then we submit that there is a need to define the scope of an estimated quote. Nucleus Connect would submit that the variation</p>

	<p>of the actual charges from the estimate should be minor, and only to cover costs such as an under-estimation of actual man-days to complete the work.</p> <p>Based on Nucleus Connect's experience, OpenNet has been so incompetent as to provide an estimate that has excluded key charges/work. OpenNet subsequently provided a second quotation, after Nucleus Connect already accepted the first estimate, resulting in much delay. This is clearly unacceptable.</p> <p>This clause should be modified to state that OpenNet cannot revise its charges once an RL has accepted it, and that any variation between the actual charges and the estimated charges cannot be due to OpenNet's oversight in its original estimate.</p> <p>The same should apply to other clauses under Site Preparation Work (Clause 6).</p>
<p>Modification of Co-location Request</p>	
<p>Clause 5.4(a)</p>	<p>As a NetCo, OpenNet is obliged to provide the Co-Location Service which is crucial to the success of the operations of Next Gen NBN. OpenNet cannot evade this obligation simply on the basis of alleging that there are "technical or engineering issues". As a NetCo and service provider, it is OpenNet's responsibility to address and resolve these issues.</p> <p>Accordingly, the words "significant health, safety, technical or engineering issues" ought to be amended to "significant health or safety issues".</p>
<p>Installation and Maintenance of Co-location Equipment in Co-location Space</p>	
<p>Clause 7.4(a)</p>	<p>The words ", in OpenNet's reasonable opinion," ought to be deleted. The test should be objective.</p>
<p>Clause 7.5 & 7.6</p>	<p>We note that these clauses are similar except that Clause 7.6 makes a reference to "pig tails". It is unclear how these clauses operate within Service Schedule.</p>
<p>Clause 7.9(b)</p>	<p>The word "guidelines" ought to be amended to "reasonable guidelines".</p>

<p>Clause 7.11</p>	<p>OpenNet should commit to carrying out fibre diversion activities outside of office hours, which is in-line with industry practice. Currently, it appears that the majority of the fibre diversion works carried out by OpenNet is done during office hours which results in much inconvenience, especially to Non-residential End Users. If incumbent operators like StarHub and SingTel are able to carry out fibre diversion activities outside of office hours, there is no reason that OpenNet cannot do the same.</p>
<p><i>Cross-connection between Co-location Room</i></p>	
<p>Clause 8.1</p>	<p>It is unclear whether OpenNet will impose MRC for the provision of cross-connection. We believe that it is important for any charges to be stated upfront.</p>
<p>Clause 8.2</p>	<p>With the current low fill ratio experienced on the Next Gen NBN due to OpenNet's chosen network configuration, Nucleus Connect believes that 96 fibre core is insufficient. It is not fair for RLs to be penalized for a situation that is caused by OpenNet. Therefore, Nucleus Connect would submit that OpenNet should provide at least 2 x 96 fibre core, as well as committing to meet a certain splitter fill ratio. Should OpenNet fail to meet the minimum splitter fill ratio, OpenNet must be required to continue to provide additional fibre for free.</p> <p>We would also note that OpenNet has not catered for UTP cables which are essential to allow for monitoring of the Co-location Equipment. Without the provision of UTP cables, RLs will need to rely on the 96 fibre core provided by OpenNet which will exacerbate the situation.</p>
<p>Clause 8.3</p>	<p>As a NetCo, OpenNet is obliged to provide the Co-Location Service which is crucial to the success of the operations of Next Gen NBN. OpenNet cannot evade this obligation simply on the basis of alleging that there are "technical or engineering issues". As a NetCo and service provider, it is OpenNet's responsibility to address and resolve these issues.</p> <p>Accordingly, the words "significant health, safety, technical or engineering issues" ought to be amended to "significant health or safety issues". At the very least, OpenNet must use best endeavours to remedy any technical or engineering issues and provide reasons for its decision to not provision or cease provisioning.</p>

Term of Licence	
Clause 9.1	We note that OpenNet is not offering a 25-year licence term under Schedule 12C. However, we believe that OpenNet should be required to offer a 5-year contract term for this and other Co-location services, especially since once a RL takes up co-location services from OpenNet, it is unlikely to terminate such services.
Clause 11.3(d), (e) & (f)	It is reasonable and logical that the Requesting Licensee ought to have a reciprocal right of termination for any of the scenarios stated in clauses 11.3(d), 11.3(e) and 11.3(f) when it is clear that such scenarios are not due to the Requesting Licensee's fault. To amend the clauses accordingly.
Additional Co-location Space, Co-location Equipment and/or Transmission Tie Cable	
Clause 12.4	Should OpenNet not approve any requests under this clause, OpenNet should be required to provide a reason to the RL. This clause should be modified accordingly.
Clause 12.5	OpenNet must be required to state clearly what would constitute a "removal of equipment". For example, when there are faulty cards or equipment, RLs should not need to provide any evidence of authorization as this would further delay the resolution of the fault.
Annex 12A-1	
Service Guarantees	Level Nucleus Connect submits that OpenNet must be required to provide SLGs for the provision of power and cooling as these are critical to the operations of a Co-location service, and any failures can result in disruption of services on the Next Gen NBN.
Annex 12D-1	
Clause 1.1.1	This clause should be modified to state that only in situations where there is deviation from the original request submitted by the RL will there be a need to re-submit equipment specifications. OpenNet should not make the process more cumbersome when there are no changes to the initial submission.
Clause 1.5.2	As drafted, this clause implies that there could be situations where RLs can find their equipment stranded without the requisite power to operate them, since OpenNet has stated the maximum power it will provide.

	<p>For example, from Nucleus Connect’s computation, based on 120kW, there would be 2,500A DC power available based on 48V DC. This means that only approximately 39 x 63A circuit breakers are available for deployment. This is clearly highly inadequate compared to the total rack space available to RLs. We also note that if RLs use AC power, it will deplete the power supply available even more rapidly.</p> <p>It is also unclear:</p> <ul style="list-style-type: none"> • How OpenNet will allocate the power supply • The amount of power it will provide per rack • Whether OpenNet will use the circuit breaker capacity or the actual power consumption to determine its allocation • Who is responsible to provision the power cables, and for the handover of such power cables or circuit breakers to RLs <p>Given the above-mentioned uncertainty, as well as the previously mentioned concern over OpenNet’s ability to manage its Co-location Space and to ensure fair and non-discriminatory treatment of its RLs, Nucleus Connect has little confidence that OpenNet will be able to competently offer such a crucial service as power supply.</p> <p>In the circumstance, Nucleus Connect submits that IDA should require OpenNet to offer RLs the choice of providing and managing their own power supply. Further, we believe that OpenNet should base its charges on actual consumption, rather than basing its charges on circuit breaker capacity which does not reflect the actual consumption and significantly increases the costs to RLs.</p>
Annex 12F-1	
Clause 1.4	There should not be a need to provide OpenNet with a fresh master list of persons. Instead OpenNet should rely on the same master list provided to OpenNet under Schedule 12.
Clause 1.8	OpenNet must be required to clearly state that RLs are allowed to access the Co-location Space provided under Schedule 12 and 12C via a single Physical Access Request. It is clearly inefficient for RLs to raise separate Physical Access Requests for each Service Schedule, and pay additional access charges.
Clause 1.8.1 (c)	Nucleus Connect submits that OpenNet should increase the number of persons accessing the Co-location Space to 8. The limit to 4 persons is

artificial as it only results in RLs having to submit 2 applications, resulting in the doubling of the RL's access charges. We would note that despite submitting 2 applications, OpenNet only deploys 1 escort and therefore OpenNet's costs are not increased.

Should OpenNet be concerned with over-crowding in its COs due to concurrent access by multiple RLs, or its own representatives, we believe that OpenNet can work with RLs to then limit the numbers accessing the Co-location Space and/or managing the access times of different RLs. But from Nucleus Connect's experience, we have never encountered over-crowding in the COs, and therefore believe that such occurrences are low.