BUREAU OF INDIAN STANDARDS

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TESTING LABS: THE OUTSOURCING DILEMMA OF BIS

Arun Swaminathan, Deputy Director General (Laboratory Operations) at Bureau of Indian Standards (BIS) was oblivious to the ongoing celebration of World Standards Day around him. The ongoing seminar on "Niche Capacity Building by Government Organizations" had drifted his mind to the million-dollar question; Capacity Building v/s Outsourcing of BIS laboratory activity which had been occupying his mind for quite some time now. BIS had established itself as the renowned body dealing with standards and a pioneer and front-runner in laboratory testing activity. Galloping rate of increase in the number of samples to be tested due to increasing outreach of BIS however posed a serious challenge to the activity. Arun Swaminathan knew that the organization had to come up with some scaling strategy to improve the laboratory setup and subsequently the testing dynamics. Time and again he had thought of the evident challenges and the repercussions in the process of removing the resource crunch of testing laboratories. Outsourcing the activity appeared to be a viable solution to the problem, but the solution had its own challenges.

Dilemma

Ensuring the testing standards, transparency, reliability were his main concerns apart from the fact that outsourcing the activity would mean losing the edge BIS had gained in the testing industry over span of decades. Should BIS be investing its resources in capacity building of BIS owned laboratories or think of a mechanism to establish a trustworthy relationship with already empanelled outsourced laboratories or was there a middle path? With limited resources at his disposal DDG (Laboratory Operations) was battling to decide on what should be the roadmap for BIS laboratories in the coming years?

Background

BIS overview: Bureau of Indian Standards, the 'National Standards Body' of India was established as a statutory organization under Bureau of Indian Standards (BIS) Act, 2016. The organization had its roots in Indian Standards Institution (ISI), which was established on 06 January, 1947 around the time of independence. Through the journey of 70 plus years, BIS had evolved itself into a premier institution for formulation of National Standards, for providing Conformity Assessment Schemes to the Industry, and providing reliable testing services to the stakeholders. BIS had also grown in multiple of its support activities including Training Services, Grievance Handling Mechanism, Consumer Affairs, Action Research, etc.

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Major Activities of BIS

Standards Formulation: BIS took up formulation of Indian standards through 16 division council representing diverse area of economy and technology like chemical, metallurgy, food etc. Standardization helped in ensuring the safety, interoperability and compatibility of goods produced thus forming a base of agreement to which every industry and manufacturer had to adhere to.

Conformity Assessment: To protect consumer's interest, BIS was operating various conformity assessment schemes which was the second core activity of the organization. Under these schemes, BIS granted licenses/registrations to such manufacturers who were capable of producing goods conforming to relevant Indian Standards, on continuous basis. Various schemes like Product certification, Self-declaration of conformity (SDOC), Foreign manufacturer certification scheme (FMCS), Hallmarking of Gold and Silver articles, Management systems certification scheme (MSCS) etc. were part of the conformity assessment activity of BIS.

Laboratory Operations: An important component of Conformity assessment schemes was testing of the end product being ISI marked. To support these schemes, testing of products was required on regular basis for checking conformity to the relevant Indian Standards. BIS had established a network of eight laboratories and approved various other third-party laboratories, including laboratories owned by major research organizations, academic institutions and PSUs.

Product Certification and need of testing

Product certification was the process of certifying a product that had passed certain performance & quality assurance tests and met the qualification criteria stipulated in specifications or regulations etc. This enhanced the performance requirements of product, increased customer satisfaction, established credibility, streamlined processes, promoted savings on the cost; and there were numerous benefits for industries, customers and stakeholders.

Under BIS' ISI product certification scheme there were 1030 products covered on which more than 38000 licenses were operative. Out of these, 146 products were mandatory and 854 products were voluntary.

Product certification was often mandatorily required in sensitive product and marketplace areas where a failure of the products could have serious consequences, such as negatively affecting the health and welfare of the people or person using the product. For instance, certification was made mandatory for Gas cylinders & their fittings since the products were extensively used in every household for domestic purposes and any sub-par product could tend to lead towards a major accident affecting households, specifically women. Similarly, SDOC was made mandatory for mobile phones and other hand-held electronic devices, which were being used ever so commonly. They had to pass through RF emissions criteria failing which would result into a health hazard. Other sensitive product areas including food, electrical equipment and construction material used in bridges and high-rise structures etc. were also brought under gambit of mandatory certification.

Apart from these, in order to ensure delivery of the product of the purity advertised, Hallmark was

made mandatory for gold articles and it was expected that the variants like white-gold, silver etc. too would be soon made mandatory.

Government of India had the regulatory role and ministries concerned with each product would issue Quality Control Orders (QCOs) to notify these products for mandatory certification. A manufacturer willing to sell any of the products covered under QCOs had to mandatorily take a BIS license for the same. Increase in number of licenses would directly result in increase in the number of samples received for testing.

In order to issue license to a manufacturer, the product being manufactured had to be tested thoroughly as per the specifications in the corresponding standard. A robust system of testing laboratories was the primary requirement for the same. These laboratories not only needed to be well-equipped in terms of infrastructure, machinery, skilled manpower etc. but they also had to be diverse to cater to the wide variety of products.

Arun knew that Government of India was in the process of making ISI mark mandatory for an additional 215 products which mean that manufacturers of all of these products would be applying for license in near future. These mandatory products were spread across manufacturing spectrum and included diverse products like Cement, Household Electrical goods, Food & Related Products, Cylinder, Valves and Regulator, Steel products, Chemicals, Toys, Air conditioner, footwear, Transports engineering etc.

Apart from this, under the BIS SDOC Scheme, 76 more electronic products were being notified as mandatory. Furthermore, under Hallmarking scheme, gold jewellery was recently notified as mandatory and BIS was anticipating multi-fold increase in the number of jewellers seeking BIS registration. With increase in the number of licenses, the number of samples to be tested was bound to increase many times over.

Testing and BIS

BIS was operating eight self-owned laboratories across country catering to a wide spectrum of products. However, since the testing requirement was much more than the capacity of BIS labs, around 35 labs owned and operated by various research organizations, academic institutions and PSUs were empanelled and roughly 255outside laboratories (OSLs) were recognised by BIS for testing and issuing reports. Majorly these labs were private laboratories, recognised by BIS under Lab recognition scheme (LRS). Under this scheme, BIS audited the labs for their process and technical capabilities for each product for which they were being recognized. Further, periodic audits of these labs were also done under the LRS scheme to ensure adherence to the prescribed system.

Testing vis-à-vis Certification

Mandatory Certification: BIS propagated creation of complete testing facilities, to the extent possible, for the products covered under the mandatory certification. To ensure the same, BIS tried to divert major fund allocation towards procurement of modern test equipment and creation of increased testing infrastructure by converting the dispensable office spaces of regional offices into laboratories and hiring outsourced personnel dedicated towards laboratory testing.

Voluntary Certification: Manufacturers tended to acquire a BIS license for their products even

though they were not covered under the ambit of QCOs since an ISI mark on their product would increase their sales value and customer demand.

Also, it was observed that products with ISI mark had better market in neighboring countries like Bhutan, Bangladesh, and Nepal. Hence BIS labs needed to gear up as per the growing demands of the manufacturers, who were mostly of medium and small scale and required timely service from BIS w.r.t faster testing time with accurate results.

Self-Declaration of Conformity (SDOC):

This was a unique scheme being operated by BIS under which the manufacturer needed to get their products (IT and related products) tested from third party labs and submit the test reports along with other relevant documents, for registration of their product with BIS and to apply registration mark on their products. A major challenge with the scheme in terms of laboratory testing was that the version/model of the products involved being mostly related to electronics goods would get upgraded/modified rapidly. Hence it required the entire process of registration involving third-party testing to be completed within few days. Laboratories needed to respond promptly with the testing reports once the sample was received by them to support the dynamic nature of industry.

All the BIS laboratories put together had complete testing facilities for 398 products and partial testing facilities for 320 products to support the certification schemes of BIS which was roughly 70% of the 1030 products for which BIS had granted 38,000 licenses. Total testing capacity of all the BIS owned laboratories was around 36,000 samples [see Exhibit 1 for details]

The legal provision of BIS Act 2016 granted the body the power to recognize any laboratory in India or Outside India for carrying out testing of samples in relation to conformity assessment and quality assurance. BIS had recognized 255 such labs to fulfil the ever-growing demand of product testing. Similarly, 35 laboratories of National repute/Research Organizations were empanelled by BIS for utilization of testing facilities.

BIS however, had no test facility for a massive 436 products and these were being tested by OSLs in totality. These were the products which required specialized testing setup and the same was not available at BIS owned laboratories. Developing this expertise and infrastructure in BIS would require substantial investment in terms of capital and manpower, which was not viable because these expensive facilities would cater only to a specific type of product.
One such example was setting up a laboratory to test Polycarbonate sheets as per IS 14443. Bullets had to be fired at test pieces under defined conditions for testing the resistance of sheets against bullets. Not only the expertise required for firing bullets was not available in BIS, developing this expertise for only one such test was not viable owing to the safety concerns involved. The required test facility however was available with government empaneled labs like DRDO. Similarly, the Central Institute of Petrochemicals Engineering & Technology (CIPET) had equipment and infrastructure with respect to testing related to Pipes and fittings. Samples of Ceramic pipes and pipes used for transportation of gases, etc. being bulky in nature required specialized tests and CIPET had test facility for such products. Establishing these test facilities at BIS labs required substantial resources in terms of land, machinery, manpower and expertise.

BIS Laboratories: Problem Areas

Financial implications: Setting up testing facility was a costly affair, prices running into Crores of rupees at times for products which required specialized. For instance, setting up the testing facility for IS 15322: 2003: Particle Filters Used in Respiratory Protective Equipment, would require a total investment of around 1 Crore, neglecting the fixed cost which would be incurred in the process. Considering the fact that only a handful of licenses existed for the product, the investment did not seem to be viable at the moment.

Testing time: BIS owned laboratories though eight in number received a variety of samples ranging across the categories of mandatory products (products that have been covered under mandatory quality control orders) and voluntary products. The infrastructure of BIS labs was restricted with regard to the availability of manpower, type of equipment and these could not be increased suddenly based on the occasional increase in in-flow of samples.

Samples received were being tested on FIFO (First -In First- Out) basis. However, applicant samples, samples drawn from licensees under stoppage of marking and resumption of marking were required to be given priority while considering for testing. Such situations would cause delay in testing of samples and creation of test reports, resulting in over-all testing time of the queued products. Exceptional scenarios like COVID lockdowns added to the plight of labs thereby increasing the testing time further.

These instances of delayed testing time led to an overall increase in time taken for granting of licenses by the branch offices, thereby resulting in financial loss for applicant and creating a sense of disbelief towards BIS testing facilities. The testing capacity of BIS owned laboratories was bound to increase after the ongoing centralized as well as local procurement process for laboratories but Arun Swaminathan knew this was not enough.

Product coverage: The central government having realized the importance of ISI mark was bringing more and more products under QCOs. In order to cater to testing of these products, it was needed to overhaul a lab completely by adding new equipment as per the modern test methods; installation, operation and calibration of the same. Installation of these equipment many a times required expansion of the testing area of laboratories. Training of the testing personnel was also required to operate new instruments and, in a few instances, new and additional testing personnel had to be recruited to meet the pace of testing.

Procurement Time: As per Rule 149 (Government e-Market place (GeM)) of General Finance Rules (GFR), 2017, the Government of Indian had mandated the government buyers to utilize GeM portal for direct on-line purchases. Cumbersome rules specified for the procurement process on GeM made the process difficult.

Arun Swaminathan knew that procurement of equipment would take a lot of time and various hoops would have to be jumped through which would in turn will lead to delay in procurement of new equipment and therefore rendering the solution moot in the short run. He recalled instances where the model of equipment purchased had been superseded with another version by the time it got installed in the laboratory for use.

Out-Sourced Laboratories (OSLs)

While it was of utmost necessity that complete and time-bound testing of the sample may be done as defined in the relevant Indian Standard, the same was not feasible with the help of eight BIS labs only. A lucrative option available was to outsource the testing to a third-party lab or outside labs.

In order to ensure efficacy and legitimacy of these labs, BIS was operating a Lab Recognition Scheme (LRS) under which audits were carried out at these lab premises by BIS Scientific Cadre Officers and these labs were granted recognition, which was renewable in every three years. These labs undertook complete testing of samples drawn by BIS officials under the Conformity Assessment Schemes, in lieu of BIS laboratories. These laboratories then made the test reports of these samples accessible to BIS.

Samples were being diverted to OSLs if the BIS laboratories were over-burdened or the required test facility was not available at BIS owned laboratories. For instance, BIS laboratories did not have the required facilities for testing of pneumatic tyres for passenger car vehicles and thus any sample taken for these products was directly being sent to OSLs. Similarly, there were scenarios where BIS owned laboratories had only partial testing facility for a product and the remaining tests had to be conducted by OSLs. One such example was Packaged drinking water (IS 14543). One of the tests prescribed in the IS for detecting radioactive residues had to be done by OSLs as BIS owned laboratories did not have the requisite equipment required for this test. Approximately 60% of the total samples tested were done by OSLs [see Exhibit 2 for detailed breakup]. Over time it was observed that the number of samples tested by OSLs had by far surpassed the testing of BIS owned laboratories [see Exhibit 4 for details]

OSLs had emerged as a major support mechanism for BIS. However, Arun Swaminathan knew that picture was not as rosy at it appeared. Through his experience he knew that there were red flags raised time and again about plethora of issues, which made relying on OSLs completely a risky affair. Instances of negligence regarding various facets had been reported in past, including

- Failure to take adequate time to perform the lab tests
- Use of the incorrect or faulty lab equipment
- Ambiguous or ill-defined results
- Errors in the recording of results
- Tendency to report test results conforming to Standard

A significant difference in the percentage of samples passing in BIS owned laboratories and OSLs was an important information to be analysed [see Exhibit 3 for details]. Apart from these, in general high testing charges quoted by these OSLs as compared to BIS owned laboratories was another issue.

Arun Swaminathan was also concerned about the fact that the reputation BIS had gained of being the domain expert in field of Standardization, of which testing was a major facet would deplete with time. Due to lack of testing facility for products, BIS would lose the edge and expertise in testing and thereby would also deprive its Standards Formulation activity of the valuable and much needed input and insight, which otherwise was provided by these laboratories and their personnel. He repulsed the idea of the possibility of losing such enriching unbiased and consumer centric input that the BIS owned laboratories provided.

Capacity Building at BIS:

The obvious need of the hour was capacity building. Scaling the facilities to be at par with the testing requirements appeared to be most viable solution to the problem at hand. However, there were challenges accompanying the solution.

Capital Expenditure: Purchasing or leasing expensive instrumentation and equipment emerged as a financial challenge for both BIS and outside labs. While OSLs had the option to set up test facilities for only the products which seemed financially viable but, being the national standards body, BIS did not have that leverage. The best possible scenario was a no-profit-no-loss testing.

Tedious procurement process added to the woes of the bureau. Further, there had been instances when the machinery installed was rendered useless due to update in the IS as a result of disruptive change in technology being used in the market. These instances had resulted in massive losses, further making the process of budget approval for purchases difficult.

Capacity Utilization of labs: Under-utilization of laboratories had emerged as another major issue in the process of capacity building. Till such time that the complete test facility was built, the partial facility had to cover for the overhead expenses of the vacant lab which made the setup further unviable. Private labs were dealing with this issue by filling vacant lab space with tenants. For example, since the early 1990s, Shell Chemical had sold about half their chemical businesses, substantially reducing the need for lab space at their Westhollow Technology Centre in Houston. Much of this lab space was now being rented by the new owners of these businesses such as Dow Chemical, Hexion, and Kraton. This practice was becoming global. These options however, were not available to BIS owned laboratories.

Recruitment and manpower management: Both BIS labs and OSLs were looking to strengthen their labs with the best available manpower with appropriate academic backgrounds and work experience for the available positions. But there were road-blocks in doing so.

BIS owned laboratories or rather BIS was deluged with applications. However, finding appropriate candidate from the plethora of applications was a tedious and time taking process. In the past, many scientists had applied for jobs for which they were not qualified in the hopes that another job for which they would qualify would soon become available. Sorting for the ideal candidate turned out to be a tedious and time-consuming for human resources officials. Small OSLs had the opposite problem — not enough candidates.

BIS however had historically held the advantage in finding qualified candidates. Their size permitted larger recruiting budgets for advertising, maintaining a careers section on their corporate website, offering a fair process of recruitment. Being the national standards body BIS personnel had advantage of understanding the standards and better skill in interpretation thereby increasing the testing efficiency. Intermittent recruitment done by small labs was more expensive as it was done on a per candidate basis. Small company staffing efforts were often geographically limited too.

However, the trend of online advertisement had made recruitment comparatively easier for small laboratories thereby cutting the cost of expensive newspaper and trade magazine advertisements.

Data bases of interested candidates through online job-portals further made the process easy for them. Dearth of skilled manpower however still existed thereby making the process of recruitment a tedious and time-taking task.

Safety and regulatory Mechanism: The scope of workplace safety and environmental regulations (their complexity and reporting requirements) has been increasing continuously. The process of acquiring land, establishing a laboratory, managing testing wastes etc. has been getting tougher by day.

Pilot Reports

Arun Subramanyam had been mulling over this decision and to take an informed step, he had already commissioned a study. He had set up an internal committee a few months back to study various aspects of testing of certain products. In particular, reports based on two products had caught his eye.

Test facility for Packaged Drinking Water other than Natural Mineral water (IS 14543: 2016): This standard prescribed the requirements, method of sampling and tests for packaged drinking water (other than natural Mineral water) offered for consumption and /or for sale in packaged form.

This product had been under mandatory certification for a long time now and more than 12,000 licenses had been granted for the same. Eight BIS laboratories were functioning with partial test facility of the product and 82 OSLs had complete testing facility. Packaged During water (PDW) having limited shelf life, had to be diverted to OSLs due to backlog at BIS owned laboratory. Issues like ensuring safe delivery of sample by parcel service to designated OSL within shelf life without any breakage were faced by BIS on a daily basis.

Result of the study indicated that total investment in setting up a facility for testing of the product turned out to be around 10 Crores and the profit envisaged per annum would be approximately 170 lakhs, which would result in a payback period of 6years [see Exhibit 5]

Test facility for Outdoor/Indoor Type Oil Immersed Distribution Transformers upto and including 2 500 kVA, 33 kV - Mineral Oil Immersed as per IS 1180 (Part 1):2014: IS 1180 (part 1): 2014 specified the requirements and tests including standard loss levels of mineral oil immersed, natural air-cooled, outdoor type, double wound distribution transformers for use in power distribution systems with nominal system voltages up to and including 33 kV and of following types and ratings: a) Three phase ratings up to and including 200 kVA both non-sealed type and sealed type. b) Three phase ratings higher than 200 kVA, up to and including 2 500 kVA both non-sealed type and sealed type. c) Single phase ratings up to and including 25 kVA sealed type.

This product was under mandatory certification and BIS had granted approximately 800 licenses all over India for the product. None of the BIS owned laboratory had the facility to test Distribution transformers. Eight OSLs had complete test facility with NTH(NR) having to test up to 200 KVA.

Study indicated that setting up a transformer laboratory would incur a total cost of Rs. 40.5 cores and the profit envisaged would be approximately Rs. 222 lakhs per annum which would translate into a payback period of 18 years [see Exhibit 6]

What lies ahead?

While BIS is focused towards providing complete testing solution for covering all variety of products and catering to the ever-increasing influx of samples for testing, Arun Swaminathan was indecisive between the two options; Capacity building of BIS owned laboratories v/s Outsourcing of the testing activity. Capacity building though had been the focus of the organization till off-late, sustainability of the same was being doubted since quite some time now. OSLs however, was an option with its own associated issues. With limited resources at his disposal, moving forward in both the directions was not an option for Arun Swaminathan. Dedicating his resources for setting up new BIS owned laboratories was a major risk given the dynamic nature of market and technology, however it would give BIS complete autonomy and ensure reliable operations. It would also mean that BIS would be able to retain its knowledge base and therefore remain to be a front-runner in the testing industry of the country.

Focusing on empanelment and recognition of new OSLs and strengthening the process of auditing of these labs has its obvious advantages. It would leave BIS with substantial resources to dedicate on activities like commissioning required studies, periodic training of personnel and leverage to focus on other activities of BIS. However, it was bound to slowly deplete the knowledge base of BIS laboratory personnel and losing the edge it had gained in the testing industry.

Arun Swaminathan was also considering the possibility that this might not be a binary decision situation. What would be the nature of future of laboratory testing activity of BIS? What was to happen to the front-runner in laboratory testing legacy of BIS? Was the consumer safe and receiving the product quality and safety promised? Was there a third, more balanced solution the problem? Was BIS utilizing the available resources in the best interest of the consumers and organization? Arun Swaminathan, no doubt, had a tough call to take.

Exhibit 1

Testing Capacity of BIS Owned Laboratories

S. No.	Lab	Testing Capacity per year
1	Patna Branch Office Laboratory (PBOL)	1,000 Samples per year
2	Northern Region Office Laboratory (NROL)	4,000 samples per year
3	Eastern Region Office Laboratory (EROL)	4,500 samples per year
4	Central Laboratory (CL)	12,000 samples per year
5	Western Region Office Laboratory (WROL)	4,500 samples per year
6	Southern Region Office Laboratory (SROL)	7,240 samples per year
7	Bangalore Branch Office Laboratory (BNBOL)	3,000 samples per year
8	Guwahati Branch Office Laboratory (GBOL)	127 samples per year
	TOTAL	36,367 samples per year

Exhibit 2

S. No.	Quarter, Year	Test request to BIS Labs	Test Request to OSLs	TOTAL
1.	2017 (last 3 quarters)	6121	4235	10356
2.	2018	5344	9933	15277
3.	2019	4833	8621	13454
4.	2020	1338	2829	4167
	TOTAL	17636	25618	43254

Number of Samples tested by BIS Labs and OSLs (Samples for IS 14543)

Exhibit 3

Ratio of samples passing and failing in BIS labs and OSLs (Samples for IS 14543)

S. No.	Quarter, Year	BIS Labs			OSLs			TOTAL		
		No. of samples	No. of samples Passing	No. of samples Failing	No. of samples	No. of samples Passing	No. of samples Failing	No. of samples	No. of samples Passing	No. of samples Failing
1.	2017 (last 3 quarters)	6121	4452	1420	4235	3527	571	10356	7979	1991
2.	2018	5344	3833	1411	9933	8755	1080	15277	12588	2491
3.	2019	4833	2833	1752	8621	7252	1295	13454	10085	3047
4.	2020	1338	630	541	2829	2471	299	4167	3101	840
	Total	17636	11748	5124	25618	22005	3245	43254	33753	8369
	Percentage		66.82%	29.05%		85.90%	14.10%		78.03%	21.97%

Exhibit 4

Time taken for testing by BIS labs and OSLs (Samples for IS 14543)

S. No.	Quarter, Year	BIS Labs		OSLs		TOTAL	
		No. of samples	Average time taken	No. of samples	Average time taken	No. of samples	Average time taken
1.	2017 (last 3 quarters)	6121	55.7	4235	44.08	10356	49.88
2.	2018	5344	62.39	9933	27.4	15277	44.88
3.	2019	4833	86	8621	27.57	13454	56.79
4.	2020	1338	38.54	2829	26.68	4167	32.61
	Total/Average	17,636	60.99	25,982	30.59	43,618	45.79

Exhibit 5

Pilot Report on IS 14543: 2016

Payback Period for Packaged Drinking Water Laboratory as per the specifications in IS 14543: 2016

S. No.	Details	Cost
1.	Total Investment	10 Crore
2.	Return per annum	170 Lakhs
3.	Payback Period	6 years

Note: This is the case-writers estimation and it may vary from the actual figures.

Exhibit 6

Pilot Report on IS 1180 (Part 1):2014

Payback Period for Outdoor/Indoor Type Oil Immersed Distribution Transformers up to and including 2 500 kVA, 33 kV - Mineral Oil Immersed Laboratory as per the specifications in IS 1180 (Part 1):2014

S.No.	Details	Cost
1.	Total Investment	40.5 Crore
2.	Return Per annum	222 Lakhs
3.	Payback Period	18 years

Note: This is the case-writers estimation and it may vary from the actual figures.

SUGGESTED DISCUSSION QUESTIONS:

1. *What are the dimensions in which BIS might get affected due to outsourcing? (Economic, capacity building, depletion of knowledge base of the employees, domain shifting)*

2. *Should BIS establish the criteria to decide whether testing of a product should be retained in-house or outsourced or carried out in both the modes? What are these criteria broadly?*

3. *What are the checks and balances which can be put in place to ensure swift and monitored operation at OSL end?*

4. *Can the OSLs be graded on the basis of their performance and feedback? Should BIS go for capital investment for its own lab or hire them on contractual*