Energy Efficiency Interventions at NITI Aayog

ENERGY DIVISION | NITI AAYOG | APRIL 2015

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Energy consumption in buildings can be broadly categorized under heating, water heating, cooling, ventilation, lighting etc. Residential and Commercial sectors account for 29% of the total electricity consumption in India and this share is rising at a rate of 8% annually. A significant part of this percentage goes into meeting the energy demand from heating, cooling and lighting. The Indian commercial sector exhibits a massive savings potential on the demand side, through energy efficiency interventions. As per one estimate, there is going to be a rapid growth in buildings in India and the present building space will comprise only 30% of the likely covered area in 2030. Hence, buildings will continue to be a major energy guzzler in the Indian context. There is also an opportunity, which can be leveraged on the supply side by introducing renewable energy generation in buildings.

For the realization of the above, there is a need for tackling various gaps including the problem of information asymmetry through the propagation of project experiences and best practices and the issue of transactional barriers. While new buildings are already adopting efficient technologies, it is the existing stock of buildings which offer a challenge to the economy. It is little appreciated that energy efficiency is also a money-saver in a short period, and the ESCO model even obviates the need for the building owner to spend money, which is sometimes a vital concern in Government.

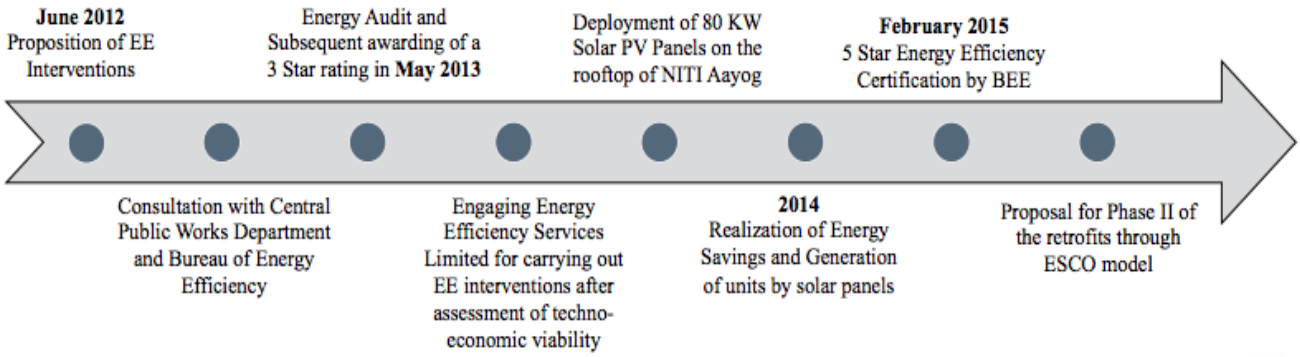
The Government at various levels from New Delhi to panchayats, is also a major energy consumer in its offices, hospitals, railway stations, PSUs and staff colonies. Energy efficiency measures in these existing facilities can save enormous quantities of energy and catalyse a new set of entrepreneurs as ESCOs and RESCOs. NITI Aayog (Erstwhile Planning Commission of India) has recently set a national precedent by initiating two types of energy efficiency interventions. The process of introducing energy efficiency in NITI Aayog started in June 2012. In close consultation with the CPWD and the Bureau of Energy Efficiency, two interventions were proposed:

1. **Facilitation of the applicability of energy efficiency retrofits in order to move towards securing a BEE 5 star rating for its office.**

2. **Approaching the MNRE, parallely, for the assessment of the feasibility and subsequent deployment of Solar PV panels on the rooftop of NITI Aayog.**

NITI Aayog undertook this exercise as a proof of concept for adoption of energy efficiency measures in buildings, particularly those of the Government. Undertaking this exercise helped scale the wall of the barriers for easy adoption of energy efficiency interventions in government buildings.

The exercise is being carried out in two phases. Following the completion of Phase I of the retrofits which targeted 60% of the building load, and the deployment of Solar PV panels on the rooftop of the office building, NITI Aayog has been awarded the 5 Star energy efficiency rating by the Bureau of Energy Efficiency in February 2015 **(Annexure A).** It has also, with the help of the rooftop solar PV panels, started generating its own electricity, which feeds into the electricity grid and is available for use at a reduced tariff. Phase II of the exercise, which will target 30% of the building load not covered under phase I, is going to be undertaken through the ESCO model.



To promote and ease the replicability of this exercise in other Government buildings, NITI Aayog has relentlessly pursued the acting agencies (CPWD, Ministry of Urban Development etc.) for facilitating policy interventions in light of the challenges that it faced in terms of transactional barriers to take up the ESCO model. NITI Aayog has been successful in getting directives for taking up the ESCO model in its own building for the next phase of energy interventions and also in Nirmaan Bhawan, Government of India. **(Annexure B). This opens up the path forward for conversion of a large stock of Government buildings to energy efficient star rated consumers, resulting in large electricity and money savings.**

The process of undertaking these interventions involved a variety of learnings, challenges and best practices. This note attempts to address information asymmetry and capture the above interventions to showcase NITI Aayog as a demonstration project in energy efficiency interventions and map the way forward in terms of an easier and widespread adoption of energy efficiency measures in buildings.

Intervention #1

The Energy Efficiency Retrofit of NITI Aayog

1. Background

- Electricity and fuel are the **main sources of energy** for NITI Aayog used via transformers (two, of 1000 KVA each) to meet the power requirement of the building and via Diesel Generator sets (two, of 320 KVA, one, of 110 KVA and one, of 100 KVA) to meet the power requirement of the building during power failure.

- **Electricity Supply**: The sanctioned load of NITI Aayog is 827.78 KW and contracted demand is 875.03 KVA as per electricity bills.

- **Fuel and electricity usage:** The energy consumption in NITI Aayog was 28,30,310 units in 2010-11 (June 2010-May 11), 30,35,795 units in 2011-12 (June-11 to May-12) , 22,07,596 in 2012-13 (June-12 to May-13) and 20,11,932 (June-13 to May-14) which amounted to an expenditure incurred of Rs. 1,10,38209/- in 2010-11, Rs. 1,41,23,965/- in 2011-12, Rs. 1,29,84,916/- in 2012-13 and Rs. 1,67,34,799/- in 2013-14 (note, electricity tariffs have been changing as well). In addition to the above, around 3000 litres of fuel i.e. HSD is used in DG sets which generates around 9000 -10000 units per annum.

2. NITI Aayog- A snapshot

The NITI Aayog office building was awarded a three star energy efficiency rating by the Bureau of Energy Efficiency (BEE) in May 2013. The energy efficiency retrofit intervention was undertaken to upgrade from the three star rating to a five star rating. NITI Aayog sought the help of BEE in this task. The latter in turn got a DPR prepared, envisaging the need for implementation of various techno-commercially viable energy conversation measures at the NITI Aayog.

Evaluating the choices:

The different choices for implementing these measures were evaluated to establish the economic viability of this exercise, and whether it would be favourable to NITI Aayog to undertake the same through the Energy Services Company (ESCO) model**,** or on a bought out basis. Initially, the decision was in favour of doing this retrofitting project through Energy Efficiency Services Limited (EESL), a joint venture company of the PSUs of Ministry of Power, Government of India via the ESCO model[1] . Accordingly, while the

[1] *In the ESCO Shared Savings model, the ESCO generally provides or arranges for most or all of the financing needed for the implementation of the project. The Energy Savings Performance Contract specifies the sharing of the cost savings between the Energy Savings Provider and the host facility over a period of time. The sharing of the payments is structured such that the Energy Savings Provider will recover its implementation costs and obtain the desired return on its investment within that period.*

initial study was done by a private agency, the task was handed over to EESL to submit its own analysis. However, owing to procedural bottlenecks faced on the CPWD front, the project was converted to a bought out one (EPC) wherein the entire capital cost was paid upfront by NITI Aayog. In this model, the entire savings arising out of lower electricity bills would accrue to NITI Aayog, and would not be shared with anybody else.

When the ESCO study was undertaken, the economic viability had been found to be highly attractive as is evident from the Table below. The highlights of the features of the building as well as the estimates of the proposal based on the energy efficiency work and the shared savings model developed by EESL is as under:

1	Built up area	23116 Sq.m (Ground+ Five Floors)
2	Energy Performance Index before interventions	129.75 kWh/hour/annum
3	Estimated Capital Requirement	Rs. 84.6 lakhs (excluding service fee)
4	Present Annual Energy Consumption	30 Lakh KVAh/annum
5	Estimated Annual Energy Savings	8.9 Lakhs kVAh/annum
6	Total energy bill before retrofit	Rs. 167 lakhs
7	Annual Cost Savings (at a unit rate of Rs.6.2)	Rs. 55.7 Lakhs
8	Performance Contract Period	4 Years
9	EESL share of monthly savings	Rs. 4.1 Lakhs (90%) for 48 months
10	NITI Aayog Share	Rs. 0.5 Lakhs (10%)
11	Estimated payback period	1.6 Years

3. How the process evolved:

The BEE invited request for proposals (RfP) for hiring an ESCO to carry out the performance enhancement of NITI Aayog, based on its actual performance. Subsequently, the BEE hired an ESCO, Pranat Engineers Pvt. Ltd., for carrying out the aforementioned job. The ESCO conducted the energy audit of the building. However, on grounds of transparency and the high IRR sought by the private agency, it was decided to offer the said work to Energy Efficiency Services Limited (EESL) - a PSU, under the supervision of BEE, in collaboration with CPWD. EESL's proposal was better both technically and financially, as compared to the other proposal. It may be pointed out that the BEE model was of hiring an agency to do an energy audit and then grant the ESCO job to it as well. This was not found by the NITI Aayog to be transparent, as the agency to execute the work ought to be contracted after offering the audit report for bidding, instead of granting the job in the beginning itself, when the economics of the task is not known. Based on NITI Aayog's observations, BEE has changed its procedure for contracting and now the contractor is transparently discovered.

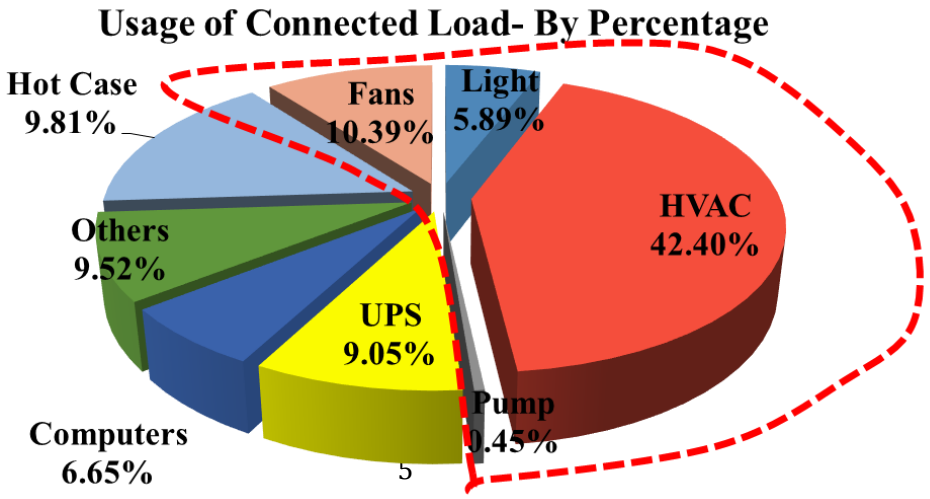
- **Salient features in the energy efficiency audit:**

– Energy Performance Index of NITI Aayog was around 129.75 units/sq m./year
– To make it 5 star, EPI value should be around 90 units/sq.m/year
– Covered area: 23116 sq.m
– Conditioned area: 15206 sq.m
– Connected load: 827.78 KW
– Contracted demand: 875.03 KVA
– Targeted area: Fans, Lights, HVAC and Pumps and Power factor improvement.

- EESL prepared a draft EPA for implementation of the energy efficiency project at NITI Aayog. EESL issued an RfP for procurement of the performance enhancement measures. This was, and is being done, through a competitive bidding process in accordance with public sector norms to ensure transparency.

- **Target areas:**

In order to identify the interventions, the connected load of the building was analysed and the components which utilize the highest percentage were identified as target areas for intervention in Phase I.



Air Conditioning	• 22 ACs retrofits (all 1.5 TR) — 15 window and 7 split • 15 window AC 1.5 TR BEE 5 star for 1st floor to replace ductable units usage
LED Lights	2176 lighting points replaced with LED retrofits
Ceiling fans	591 old fans replaced with BEE 5 star fans
A/C energy saver	328 micro processor AC energy savers deployed
Water Pumps	1, 15 HP water pump replaced with energy efficient 12.5 HP pump
Power Factor Improvement	Augmentation of existing capacitor system
Energy Management System (EMS) deployed to optimize operational controls and enhance savings	

4. Financial Aspects

The project was undertaken by EESL on a Full Capital Cost Recovery model.

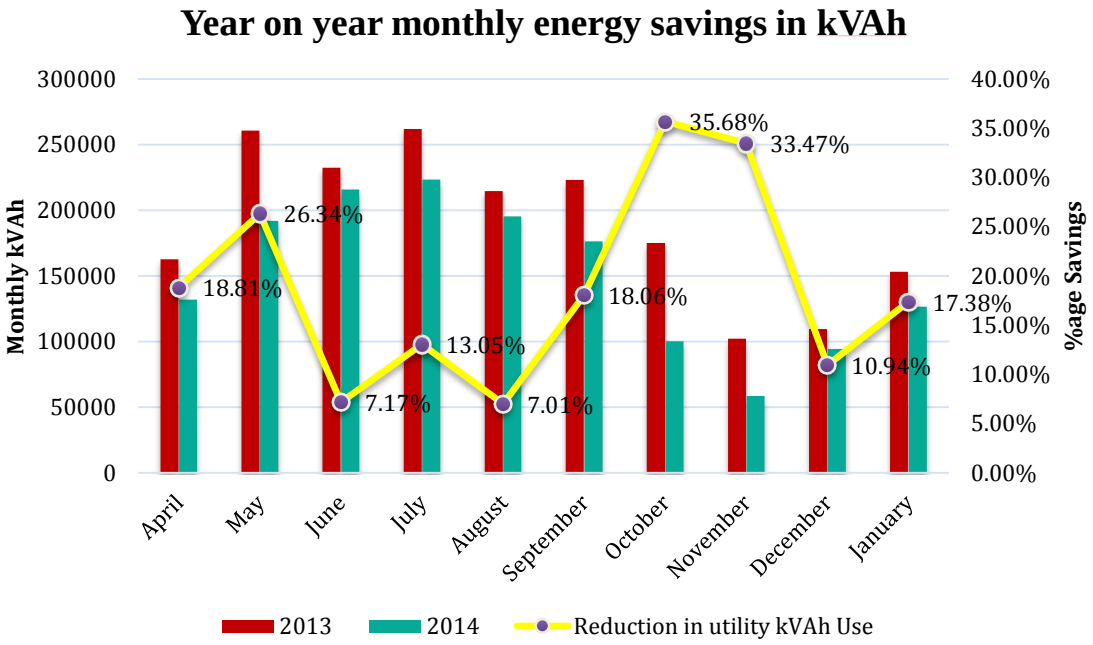
Total Capital Cost: **Rs. 89.75 Lakhs**

According to the preliminary savings projection by EESL at the time of implementation, the project was expected to yield a savings of Rs. 55.7 Lakhs per annum in the electricity bill as per the level of tariff on the date of estimation. This was expected to make the project payback period 1.6 years.

Hence, the above project on a bought out basis (with NITI Aayog expense) was projected to have very bright economic viability. The maintenance cost notwithstanding, the savings in electricity bill were expected to be stupendous. As the power tariff keeps going up the savings would be yet higher. If the project had been executed on ESCO basis, the Internal Rate of Return would have been 15%. The investment made by the EESL would accrue out of the project over a period of four years. The proposed arrangement for 4 years was with a monthly payment of Rs. 4.10 lakhs to the ESCO (EESL). In this model, the savings share of the NITI Aayog was estimated to be Rs. 0.5 lakhs per month for 48 months, without any capex in implementing the energy efficiency measures. So, even in the ESCO model, the NITI Aayog would have been a net saver without needing to invest the capital.

Actual Efficiency Gains Realized and Financial Analysis:

The actual savings from the Energy Efficiency Measures being implemented in Phase I by NITI Aayog are presented as follows:



The financials calculated for the period April 2014 to March 2015 are as follows:

Total Capital Cost	Rs. 89.75 Lakhs
Cost accrued due to resold fittings	Rs. 8.53 Lakhs
Net Capital Cost	**Rs. 81.22 Lakhs**
Savings in energy *(Projected till March 2015)*	**4.1 Lakh Units (~19.4%)**
Total Savings in the Electricity Bill	Rs. 18.88 Lakhs
O&M gains	Rs. 2 Lakhs
Total financial benefits	**Rs. 20.88 Lakhs (13%)**
Payback period	**2 years and 10 months**

** Remarks: The above are actual on bill savings and the true energy savings at load end where replacements have been affected (estimated to be around 8 Lac kVAh initially) are much higher due to the following issues:*

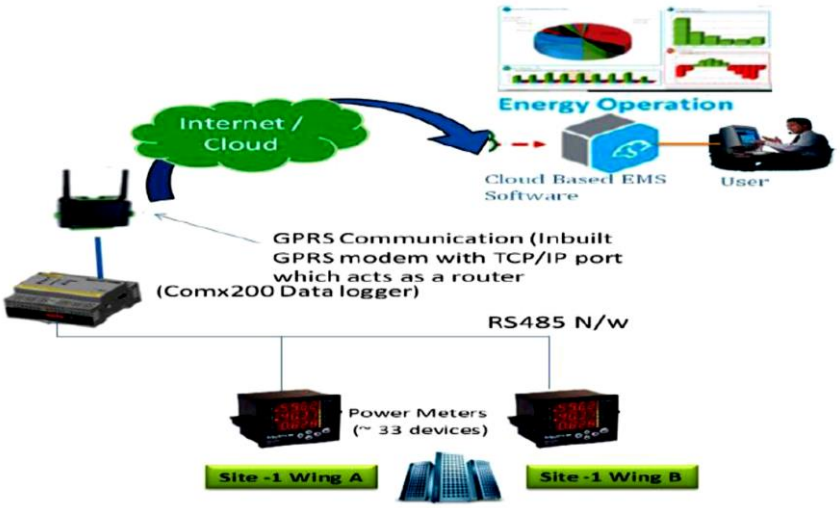
· Some of the old inventory dismantled has been re-used within the building which has contributed to load growth as building has expanded its functions.
· There are some additional seasonal loads have cropped up such as tea makers, room heaters, etc. along-with prevalence of some other non-energy efficient practices that also contribute to additional energy consumption and reflect negatively on the true energy savings.

5. Monitoring and Measurement

- The deployment of an Energy Management and Information System (EMIS) which tracks the buildings energy consumption and its compliance with ECBC norms.
- BEE had also agreed to carry out the monitoring and verification of the interventions annually through a certified energy auditor which would be based on the physical verification of the replaced equipment and their operating wattage.
- A redressal mechanism has been established by constituting a Joint committee consisting of CEO, NITI AAYOG as chair and DG, BEE and MD, EESL as members.

Cloud Based Energy Management and Information System

- Enables setting up baselines, measurable targets and tracking of same in real time
- Seamless integration of the system within the existing electrical distribution network with minimum downtime
- Cloud based systems obviates the need for costly servers at client site
- Enables reporting and compliance as per norms such as for ISO:50001, ECBE, etc.
- Acts as a strong measurement and verification tool
- Effectively captures areas of possible energy wastage to yield additional cost savings, thereby securing energy efficiency investment in long term.



6. Objections faced to the ESCO Route

The proposed financial arrangement, in the ESCO route was that there would be no upfront payment and the energy saving would be calculated on the basis of the saving in electricity consumption achieved after the installation of energy efficient installations vis-a-viz the consumption just prior to the installation. This would give assurance to the building owner placing the entire risk of return of capital on the ESCO. The EESL would look after the maintenance for 4 years after the installation and the CPWD and the EESL would share the savings in the ratio of 10:90 for the period of 4 years. It was envisaged that the EESL would recover its capital expense and earnings by way of the 90% share of the savings paid to them by the CPWD (as CPWD pays the electricity bills of NITI Aayog). The latter in turn would find the funds for this payment from the savings in the electricity bill. However, the CPWD authorities raised certain issues which led to the NITI AAYOG abandoning the ESCO route. The objections of CPWD were the following:

(i) CPWD was not agreeable to maintaining the equipment installed by a private agency through EESL. The latter had however offered maintenance arrangements. Maintenance of equipment for 4 years is also covered. Beyond 4 years, identification of suitable agency for AMC of equipment through a tendering process would also be facilitated by the EESL.

(ii) As CPWD makes electricity bill payments, it was not willing to pay the EESL on a monthly basis out of the savings in the electricity bill. It was not sure whether it would be permitted by Ministry of Finance to pay for capital expenses out of the budget of electricity bills/consumables.

(iii) CPWD was also not willing to vouch for the safety aspects of the installation and the subsequent issues which may arise out of this arrangement. This was also perceived by many as an obstructionist attitude towards ESCOs.

It is evident that if any organisation/Government office has the necessary capital to undertake the energy efficiency measure, it is definitely more profitable. But, the ESCO route is ideal if one does not have the capital to invest, and the maintenance part is to be entirely offloaded to the ESCO.

7. Current Status

As on 1st April 2015, Phase I of the Energy Efficiency interventions have been successfully carried out and the savings have started being realized. The success in savings led the NITI Aayog to persuade MoUD, the administrative Ministry of CPWD, to allow ESCO approach and direct it to pay for energy efficiency measures through savings in utility bills. Following the policy decision by the MoUD **(Annexure B)**, Phase II of the project, is about to commence shortly through the ESCO route.

8. Challenges faced

1. **Information asymmetry** – A need for propagation of project experiences and best practices. This would help in instilling confidence and gaining technical clearance.

2. **Transactional Gaps for implementation of other models** E.g.: ESCO and RESCO models which provide an efficient mechanism to scale up projects on other buildings without the government having to budget for the capital cost.

9. The way forward: *Developing replicable lessons for similar projects*

This sector can be looked upon as a major energy saving opportunity, and procedures can be standardized as a vast potential exists not only in the buildings of the central government but across the country in state governments too. The NITI AAYOG also proposes to urge states to adopt energy efficiency in government owned buildings through a similar business model, which would help in higher performance of their buildings and create market confidence for its wide scale replication.

A wider policy decision, building on the existing directives, on whether to promote ESCO approach or not needs to be taken by the Government. If adopted completely, this is likely to open a wide window of entrepreneurial activity in the country without the cumbersome requirement of tendering, maintenance and capital deployment.

The future course of action after this pilot can be summarized as follows:

a) **Replicability:** The pilot which presents the viability of energy efficiency interventions is a ready and adoptable precedent for other Ministries/Departments/Private Buildings

b) **Standardization of procedures and equipment:** This sector is a major energy saving opportunity and procedures and equipment can be standardized as a vast potential exists in commercial buildings – Enables higher performance of buildings and creates market confidence for its wide scale replication.

c) **Acceptance of other models:** ESCO and RESCO models if adopted, this is likely to open a wide window of entrepreneurial activity in the country without the cumbersome requirement of tendering, maintenance and capital deployment.

d) **Long term gains:** Contribution in ameliorating the difficult electricity supply situation in Delhi and also help to advance the clean energy goals.

10. FAQ:

Q1. What is an ESCO model?

In the ESCO Shared Savings model, the ESCO generally provides or arranges for most or all of the financing needed for the implementation of the project. The Energy Savings Performance Contract specifies the sharing of the cost savings between the Energy Savings Provider and the host facility over a period of time. The sharing of the payments is structured such that the

Energy Savings Provider will recover its implementation costs and obtain the desired return on its investment within that period.

The ESCO model helps in case an entity does not have/ chooses not to invest the capital required for carrying out energy efficiency interventions.

Q2. What are the functions of an ESCO?

- Finalization of technical specifications of energy efficient equipment
- Undertaking the bid management process including preparation of bidding documents, soliciting bids, pre-bid meetings and bid finalization. All procurements done on competitive bidding as per public procurement norms
- Supervision of work related to supply, installation and commissioning of various items under the project having 4 year installation warranty
- Provision of necessary technical and operations information with regard to the new energy efficient equipment to ensure durability and service levels
- Active O&M support being enforced from equipment supplier (to be done for the next 4 years)
- Provision of training to the notified staff of NITI Aayog for usage of new equipment.
- Setting up a cloud based energy monitoring and control system for ensuring tighter control of parameters.

Intervention #2

Installation of Solar PV (SPV) panels on the rooftop of NITI Aayog

1. Background

In an effort towards the adoption of clean energy, it was decided by the NITI Aayog to install SPV on the roof of the NITI Aayog. Not only would this make use of the vacant space on the roof, it would also be advantageous in several other ways. Firstly, the electricity so supplied would replace the fossil fuel based present supply. Secondly, it would help augment electricity supply during day light hours particularly in the summer, when electricity demand (peak) especially due to air-conditioning and business hours is maximum in Delhi. Thirdly, the SPV based power has been found to be cheaper than the highest slab rate at which NITI Aayog procures power from NDMC. Fourthly, the panels due to their function as reflectors, would cool the 5^{th} floor (top floor) of the NITI Aayog, and reduce the load on the air conditioning system. Keeping above in mind, the NITI Aayog approached the MNRE for assistance in the above direction, and we are happy to report that a **78.24 kWp** SPV power system has been installed on the roof of the NITI Aayog. While it was first planned to have a 100 kWp plant, but the availability of space restricted the same to the above size.

A good rooftop system coming up on the building of the NITI Aayog will be a good demonstration of the rooftop concept on a government building. The benefits of this technology are also long lasting just like the ones from energy efficiency.

2. The system:

Principle: The solar modules generate DC electricity whenever sunshine falls on the modules. The modules are connected in a series and these resulting series are strung together in parallel and are called a solar array. The grid connected invertors exports solar power to a utility grid.

In the case of NITI Aayog, the solar units generated are connected with the AC main and synchronized with the load thereby contributing towards meeting the electricity demand of the building. This results in lesser units being demanded from the electricity grid and hence reflecting savings in the electricity bill.

3. How the process evolved:

Initially, NITI Aayog was advised by the MNRE that it would be preferable that Government buildings adopt a **Renewable Energy Service Company (RESCO) model**, wherein a developer installs the equipment at its own expense. In such cases, the administration of the chosen building signs a Power Purchase Agreement (PPA) for a definite length of time, and pays the RESCO for the power as if it were a utility. In such an arrangement, as long as the rate of the electricity so supplied is lower than the one at which the procurer buys from the usual utility, it stands to benefit from this arrangement from day one. **MNRE's nominated agency, Solar Energy Corporation of India** (SECI) is administering a scheme, viz. The scheme of grid connected roof top projects, under which SECI took up the responsibility of developing and executing the project through the selected bidder. The latter was arrived at through a competitive bidding process, wherein it offers a 30% capital subsidy to the developer on such installations on Government buildings (also available with conditions to private buildings). The same currently has been revised to 15% capital subsidy. As SECI has already signed contracts with developers after following bidding process at a very competitive rate, MNRE offered this option to NITI Aayog. In the alternative, the NITI Aayog could have gone in for bought out panels at its own expense, and established them on its building and generated electricity from its self-owned equipment. In the latter case, the economics would definitely be more beneficial than the previous option; however it could give hassles of maintaining and also finding funds for such an installation. In the light of the above, NITI Aayog chose the RESCO option.

In consultation with SECI, **a PPA was finalised by the Energy Division of the NITI Aayog with the nominated developer, viz., M/s Azure Power.** It may be noted that the RESCO model has not yet been implemented in the Government at all, and this would have been the first case of its application. Due to the benefit of not having to find Government funds for such an installation, should there be a policy decision to promote SPV installations in the Government; this model can readily find acceptability, in the Government of India and also in the State Governments. Keeping in mind the usual initial resistance in the Government to adopt a new policy/process, the test case of approving the RESCO approach by the NITI Aayog, would have been a ready and adoptable precedent for other Ministries/Departments. This could have catalysed installation of SPV systems in the Government on a large scale. It may be noted that as per the slab based tariff system in vogue, NITI Aayog pays an annual average figure of Rs.6.56 per kWh for grid based supply. The NITI Aayog has already been in the above slab, and for estimating the savings by adopting a SPV system, this highest tariff could be used for comparison. In this respect, it was found that the rates so derived by SECI (after allowing a 30% capital subsidy), were Rs. 6 per kWh thereby offering an immediate financial saving to the NITI Aayog and saving the outflow from the Government exchequer on this count, without making any investment. This rate would be fixed for the next 25 years, as per the arrangement arrived at with the ESCO, as selected through the MNRE in a transparent manner. Further, the surplus power that would be generated on holidays would be surrendered to the grid. When this project was conceived, DSERC had not notified net-metering policy, which has since been announced.

Therefore, negotiating and finalising the PPA for RESCO based SPV system was a great facilitator for mass roll-out of this project.

4. Constraints faced:

Having formalised this decision to a great degree, the NITI Aayog brought in CPWD for consultations, especially because not only are they deemed to be owners of the NITI Aayog building, but also because the electricity installation work and its maintenance in the building is in their domain. They also pay the electricity bills. It is at this stage that the proposal faced hindrance. CPWD had the following objections, which were shared by them in informal discussions:

1. They were generally averse to the involvement of a private agency, particularly so as the contract had not been finalised through the CPWD tender process. Therefore, they were hesitant to give us a technical clearance for installation of the SPV equipment.

2. There was lack of clarity on the technical aspects especially relating to supply of electricity, and other technical issues such as the rating of power supply and any liability arising out of quality and disruptions, which may come to the NITI Aayog by this involvement.

3. It may be noted that the electricity bill of the NITI Aayog is paid by CPWD. They were not very clear whether they could enter into an electricity supply agreement with an agency other than NDMC, for payment of electricity charges through the RESCO model.

4. It was also argued by CPWD that the PPA agreed rates would implicitly have a component of reimbursement of the equipment supplied by the contractor. CPWD was unclear whether the sub-head under its budget for payment of electricity charges, could be used towards a defrayment of expense of a capital nature.

5. There was also a feeling amongst CPWD officials that if the NITI Aayog wanted a SPV installation, may be this task could be undertaken by the CPWD itself, and not by the NITI Aayog directly through MNRE or any other agency.

In the light of the above objections, in spite of meetings between NITI Aayog officials, even at the Secretary level with senior officials of the CPWD, a formal clearance from the CPWD could not be obtained. Consequently, the NITI Aayog dropped the idea of installing the above equipment through the RESCO model and **went in for a bought out model (EPC).**

5. Cost of the project:

The total **project cost** is Rs. 55,55,040/- + 8% administrative charges on the total project cost (80 kWp).

According to the scheme of SECI, **30% subsidy** is available on the project cost, amounting to Rs. 16,66,512/- , therefore, the remaining 70% i.e. 38,88,528/- was borne by the NITI Aayog.

Out of the 38.89 Lakhs**, 40% of the initial estimated project cost**, Rs.19.88 Lakhs has been released to the SECI.

The balance of the revised project cost, i.e**. Rs.23,44,931/-** (Rs. 38,88,528 + Rs.4,44,403 (Administrative Charges) - Rs. 19,88,000/-) are being released to the SECI.

Payment process: Two indemnity bonds, one of Rs. 19.88 Lakh and another of Rs. 23.44Lakh

6. Realized Gains:

In 2014, **16853 kWh** was generated by the Solar PV panels on the rooftop of NITI Aayog. (Specific Yield- 215.4 kWh/kWp) and till date, **6714 units** have been generated. It may be noted that the equipment was installed pnly in October (??), 2014 which was followed by low solar intensity winter months. These contribute towards meeting the electricity consumption of our building. The monetory gain, approximating an average electricity tariff of Rs. 7 per unit comes out to be **Rs. 1.65 Lakh** till date. The generation in the coming months, due to higher solar radiance in the months of summer as well as resolution of issues of non-availability of mains supply, is expected to be higher. Projecting the savings at the existing rate, the payback period of the installation would be **7-8 years**. It would further decrease if the power tarriff slab rates become higher.

7. Present Status:

NITI Aayog had approached the MNRE for assistance in installing the SPV equipment on an outright purchase model. It was very gratifying that SECI had even concluded procurement tenders for this methodology for installation of SPV panels on outright purchase basis under 30% subsidy, just as it has contracts for ESCO route. NITI Aayog concluded a contract with M/s Tata Solar, as the nominated agency of SECI. It has gone in for 78.24 kW installation at a cost of Rs. 38.89 Lakhs (Inclusive of a 30% capital subsidy from MNRE). The NITI Aayog has entered into a maintenance contract with M/s Tata BP Solar for a period of 2 years for a charge of Rs 5.86 Lakhs. In the future years, should the NDMC charges go up, which is the likely case, the savings will be yet higher as the difference between the contract price of solar power and grid power tarriff would go up.. With the DERC's net metering regulations in place, NITI Aayog will also soon be able to export electricity units to the grid on holidays and before/after office hours, when the generation may be more than the lighting demand when the offices are not in operation. This would be a net revenue for the NITI Aayog as it would become a supplier of electricity.

8. Challenges

- Generation by Rooftop Solar PV is subject to certain constraints like the non-availability of the main supply and low levels of solar radiation. This causes the units produced to deviate from the actual projected units to a small extent.
- Administratively, for the purpose of maintenance, the RESCO model is more convenient than the bought out model as there is greater accountability of the RESCO as his cost recovery is based on the productivity of the Solar PV installations.

9. Recommendations and the way forward:

As the above note indicates, roof top solar, especially in the light of the earlier 30% capital subsidy, which has now been brought down to 15%, is a win-win situation for all stakeholders. This could go a long way in ameliorating the difficult electricity supply situation in Delhi, and also help to advance the clean energy goals. As the cost of solar equipment keeps falling as per past trend, and electricity tariff keeps going up in the future years, it is going to become an even more attractive proposition. The Government also ought to avail of this opportunity because it is a large owner of buildings, and is also a major consumer of electricity. While both the RESCO and the self-owned models are advantageous, however, keeping in mind the paucity of funds in Government and also the difficulty of maintaining/operating Government's self-owned equipment, it is always preferable to go in for the RESCO model. There is a large community of entrepreneurs who can quickly translate the RESCO model on a wide spread basis in the Government buildings.

The critical factor in the RESCO model is payment assurance. If major Government Departments/high visibility buildings (North Block, South Block, Rashtrapati Bhawan, Parliament House, etc.) were to adopt the model, it could become a template for the others to follow. However, being a new idea, the procedural bottlenecks especially relating to CPWD as enumerated above, need to be evened out. It is understood that the Ministry of Power and MNRE will need to move the Ministry of Urban Development (nodal Ministry for CPWD) for issuance of clear orders, for rolling out the roof top SPV in Government buildings. For this, they may need support of the Department of Expenditure in allowing CPWD to pay the RESCO agency for supply of electricity to Government Departments. (Which as per a letter by the Department of expenditure in September 2014, has been agreed to be included as a provision in the Performa for Committee on Non Plan Expenditure Proposals, subject to a reference from MNRE). In the meanwhile, it is a matter of satisfaction, that based on the savings realised by NITI Aayog, the MoUD has directed CPWD to implement 2MWp size of roof top SPV projects in Government buildings in Delhi. Hence, while rooftop SPV may take off, however, it will remain constrained by budgetary allocations. The new target ought to be adoption of RESCO model, for which the success in EPC route ought to be adequate assurance of the technical and economic rationale.

ANNEXURE A

5 Star Energy Efficiency Certificate by BEE

It is certified that NITI Aayog Bhavan, New Delhi *located in Hot & Dry climatic zone has been awarded a BEE 5* ★★★★★*Label with the details below:*

Name of the building	:	*NITI Aayog Bhavan, New Delhi*
Connected load	:	*881 kVA*
Climatic zone	:	*Composite*
Building Type	:	*Day Use Office Building*
Percentage Air Conditioning Area	:	*65.78 Percent*
Built up area	:	*23116 sq.meter*
Annual Energy Consumption	:	*1680970 kWh*
EPI(Energy Performance Index)	:	*72.72 (kWh/sqm/annum)*
BEE Star Label Awarded	:	*5*★★★★★

The label would be valid for a period of 5 years.

F.no. 08/01/Star rating/OB/09/DUO-128R
Dt. 4th February, 2015

Sanjay Seth
Energy Economist

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ANNEXURE B

By Fax and Email

भारत सरकार
केन्द्रीय लोक निर्माण विभाग
कार्यालय मुख्य अभियंता सी.एस.क्यू. (वै0)
कमरा न. 231, ए– विंग, निर्माण भवन,
नई दिल्ली – 110011
दूरभाष न. 011–23062120 फैक्स नं. 011–23061418

No. 30(31)/Energy Efficiency/मु0अ0(वै0)सी.एस.क्यू/2015/92 Dated 27.03.2015

To,

The Chief Engineer,
NDZ-V, CPWD,
Vidyut Bhawan, Shankar Market
New Delhi-110001

Sub:- Energy efficiency measures through ESCO mode in Nirman Bhawan and NITI AAYOG Building.

Ref:- D.O. No A13032/4/2013-Gen. I dated 24.02.2015 (Copy Enclosed).

It has been decided that Energy Efficiency Measures shall be carried out in Nirman Bhawan and NITI AAYOG Building, through ESCO mode through EESL, a public sector company of Ministry of Power, Government of India. Hence immediate necessary action be taken for getting the energy efficiency measures executed.

Copy of the letter dated 24.02.2015 from CEO NITI AAYOG addressed to Secretary UD is enclosed. CE (NDZ-V) may discuss with CEO NITI AAYOG regarding role of CPWD in undertaking balance energy efficiency measures of this building through ESCO model.

This issues with the approval of ADG (TD).

Encl:- As above.

(D.K. Tulani)
Superintending Engineer

Copy to:-

1. MD, EESL, this is in reference to his discussion with DG, CPWD in third week of March, 2015.
2. PPs to ADG (TD), CPWD Nirman Bhawan, New Delhi.

Superintending Engine