

Perspective of Government Officials on Solar Energy in the Commercial Sector in India

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Abstract: Today, India can well be identified as an energy guzzler. The demand for power is increasing exponentially and the scope of growth of this sector is immense. India's energy consumption has almost doubled since the year 2000 and the potential for further rapid growth is massive. India has been dependent on fossil fuels such as coal, oil, and gas for its energy requirements. Fossil fuel reserves are diminishing rapidly across the world, intensifying the stress on existing reserves day-by-day due to increased demand. Owing to its location between the Tropic of Cancer and the Equator, India has huge solar potential. Ministry of New and Renewable Energy (MNRE) is the nodal ministry of the Government of India at the central level for all matters relating to new and renewable energy. Government, being the main regulatory body, is promoting the use of renewable energy in general and solar energy in particular in the country by their policies, programs and incentives to achieve energy security in a sustainable manner. The study is significant as it makes an attempt to understand the initiatives from the stakeholders' perspective in terms of their awareness, accelerators, barriers and satisfaction level regarding these policies, programs and incentives. The study also envisaged understanding the impediments in implementing these initiatives from the perspective of the government and generating a framework for better acceptance and implementation of such initiatives.

Keywords: Commercial establishments; Government officials; Solar Energy

1. INTRODUCTION

Energy is necessary for economic growth, improving the quality of life and increasing opportunities for development. It is inevitable for human life, and a secure and accessible supply of energy is crucial for the sustainability of modern societies and economy (Bureau of Energy Efficiency [BEE], 2012; Planning Commission, Government of India, 2014). Future economic growth crucially depends on the long-term availability of energy from sources that are affordable, accessible and environmentally friendly (International Energy Agency, 2016).

Global energy consumption is projected to increase by 48 percent from 1990 to 2040. The combination of the growth in world population and in Gross Domestic Products (GDP) of all the nations, will, in the absence of dedicated policies, lead to a steady growth in energy consumption (U.S. Energy Information Administration, 2016). Today, India can well be identified as an energy guzzler. The demand for power is growing exponentially and the scope of growth of this sector is immense (Ministry of New and Renewable Energy [MNRE], n.d.). India's total installed capacity of electricity generation has expanded from 42,584.72 MW at the end of the 6th Plan to 2,88,664.97 MW by end of February, 2016 (12th Plan) (Central Electricity Authority [CEA], 2016).

Despite impressive growth in the generation capacity since independence, India has always experienced shortage in terms of peak capacity requirement of energy. In the financial year 2014-15, the energy shortage was 3.6 per cent and

peak shortage was 4.7 per cent (Jog, 2015). Coal has been the most vital fuel in the India's energy mix and remains the backbone of the Indian power sector. However, India's recent climate pledge emphasized the country's commitment to a growing role for low-carbon sources of energy, led by solar and wind power.

Strategies to meet India's energy requirement are constrained by country's energy resources and import possibilities. Unfortunately, India is not well endowed with natural energy resources. Reserves of oil and gas are meagre. While coal is abundant, it is regionally concentrated and is of low calorific and high ash content. The extractable reserves, based on current extraction technology, remain limited. The growing gap between the demand and supply of energy, and environmental externalities associated with fossil fuel require immediate and substantial increases in electric power generation and transmission capacities, and exploitation of new avenues of energy supply that are more stable and environment friendly (International Energy Agency, 2015).

The share of renewable power in global power generation reached 6.7% in 2015, almost doubling in five years from 3.5% in 2010 (BP Statistical Review, 2016). Talking about India, renewable energy has a share of 13% in the country's total installed power generation capacity (MNRE, 2015). The key drivers for renewable energy are factors like the demand-supply gap (especially as population increases), a large untapped potential, concern for the environment, the need to strengthen India's energy security, pressure on high-emission industry sectors from their shareholders and viable solution for rural electrification. Accelerating the use of renewable energy is also indispensable if India is to meet its commitments to reduce its carbon intensity. With most parts of India having 300 - 330 sunny days in a year, India has substantial solar potential, and as estimated by India's National Institute of Solar Energy, it stands at around 750 GW. This represents almost three-times India's total installed power capacity today (International Energy Agency, 2015). Currently, India's total installed capacity from solar energy is approximately 8,505 MW (as of July' 2016). Out of these, about 8,175 MW is from grid-connected and the rest from off-grid systems. India has set a target to have solar energy installed capacity of 100 GW by 2022 (MNRE, 2016a).

Renewable energy has been an important component of India's energy planning process since the early 1970s. Ministry of New and Renewable Energy (MNRE) is the nodal Ministry of the Government of India at the central level for all matters relating to new and renewable energy (MNRE, 2016b). The Ministry has been undertaking various initiatives including the implementation of wide range of programmes like harnessing renewable power, electrification of rural areas through renewable energy and use of renewable energy in urban, industrial and commercial applications (MNRE, 2016a). It is also involved in research and development; framing national policies, and strengthening the institutional mechanism (MNRE, 2016c).

2. SIGNIFICANCE

Given the vast potential of decentralized solar technologies in India, all it needs is a framework of comprehensive policies. Government, being the main regulatory body, is promoting the use of renewable energy in general and solar energy in particular in the country by their policies, programs and incentives to achieve energy security in a sustainable manner (Saxena, 2011). Literature review showed that some studies which have looked into government's policies, programs and incentives have data on targets achieved, fund released and installation base. The stakeholders' perspective regarding these initiatives was found missing. Further, the study is significant as it makes an attempt to understand the initiatives from the government's perspective in terms of their awareness, satisfaction level, accelerators and barriers that they encounter while implementing these policies, programs and incentives.

3. METHODOLOGY:

The study was conducted in six states/UTs (Union Territories) of India. The states/UTs were selected based on their total solar installed capacity under various Government Programmes. Government officials, both from the central and state/UT governments, were selected to get an understanding of the initiatives of the government for off-grid SPV/SWH systems for commercial establishments. From the central government, officials were taken from the Ministry of New and Renewable Energy (MNRE), India Renewable Energy Development Agency (IREDA) and Solar Energy Corporation of India Ltd. (SECI). From the state nodal agencies, officials were selected from Gujarat Energy Development Agency (GEDA), Rajasthan Renewable Energy Corporation Limited (RRECL), Punjab Energy Development Agency (PEDA), Haryana Renewable Energy Development Agency (HAREDA), Energy Efficiency and Renewable Energy Management Centre (EE & REM Centre, Delhi) and Chandigarh Renewable Energy Science and Technology Promotion Society (CREST). Since government officials are the implementers of the policies, programmes and incentives, it was significant to take their perspective for a holistic understanding of the policy framework and the associated accelerators and barriers.

4. RESULTS AND DISCUSSION

4.1 Framework of Government Initiatives for SPV and SWH installations (Grid-connected and Off-grid)

Ministry of New and Renewable Energy (MNRE) is the nodal Ministry of the Government of India and is involved in research and development, framing national policies and strengthening the institutional mechanism for new and renewable energy in the country (MNRE, 2016b, 2016d). MNRE has nodal agencies in every state/UT of India to cater to the renewable energy needs of that particular state/UT and implement the policies made by MNRE in their respective state/UT. Some state/UT governments have formulated their own policies and programmes, over and above those of MNRE to further incentivise the renewable energy sector (Figure 1).

The MNRE programmes/schemes for off-grid SPV and SWH systems are being implemented through a number of agencies including the state nodal agencies, channel partners, SECI and financial institutions. Four of the major incentives offered by MNRE under both the schemes are capital subsidy, accelerated depreciation benefit, soft loan and interest subsidy. The data revealed that there was not much difference in off-grid SPV and SWH systems in terms of the government incentives offered for both. Only in terms of capital subsidy, it went as high as 90% for SPV systems in special category states, however, for SWH systems, it was only 60% in the special category states. Other than this, the incentives were similar for both the technologies. Within SWH, there were some difference in the capital subsidy given to the Flat Plate Collector (FPC) and Evacuated Tube Collector (ETC) systems.

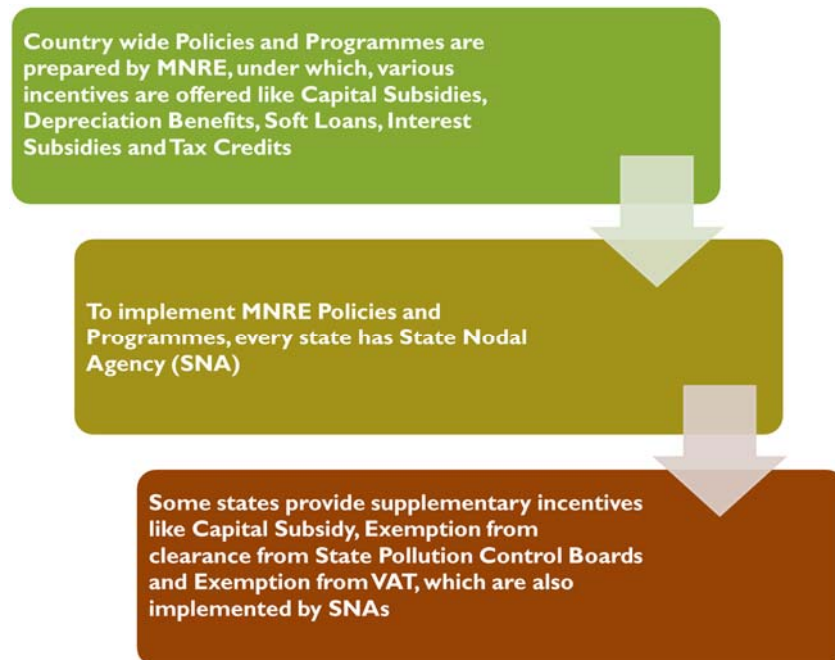


Figure 1. Structure of Government Initiatives for Off-grid SPV/SWH Installations

4.2 Responses of Government Officials regarding Accelerators, Barriers, Suggestions and Satisfaction level with respect to implementation of Government Initiatives for SPV/SWH installations

Government officials comprised of officials from central government (MNRE, IREDA and SECI) and state nodal agencies (Gujarat, Rajasthan, Punjab, Haryana, Delhi and Chandigarh). When asked about the objectives of formulating policies and programmes for off-grid solar installations, varied responses were received like reduction in carbon emissions, meeting the peak demands of power through harnessing solar energy and reducing dependence on grid by promoting off-grid SPV and SWH systems. Further, government officials stated that the government initiatives for SPV/SWH installations were framed with the objective of making the states/UTs self-sufficient in terms of energy and to meet the RPO targets given by the MNRE.

Regarding the role of government in promotion of solar energy, varied responses were received. Government officials reported that they were involved in making policies and programmes for new and renewable sources of energy, awareness generation through various media like newspapers, live demonstration vans and seminars, and providing financial and fiscal incentives for various new and renewable energy sources. The incentives included capital subsidy, depreciation benefits, soft loans, interest subsidy, VAT exemption and other incentives for grid-connected systems. Further, they reported being involved in carrying out research and development for new and renewable technologies, along with other initiatives and activities for mainstreaming SPV/SWH systems in their respective states/UTs.

According to the government officials, the highest mean rating of 4.50 (on a scale of 1-5), as an accelerator behind the installation of SPV/SWH systems in commercial buildings was given to government policies and incentives, with a standard deviation of 0.62 (Table 1). They felt that since government was giving financial and fiscal incentives, owners of commercial establishments got motivated to install SPV/SWH systems in their buildings. The second highest mean rating of 4.24 was given to savings in electricity bills, with a standard deviation of 1.08. The respondents said that even though the initial cost of SPV/SWH systems was high, they ultimately saved money by reduction in the monthly electricity bills. Some other accelerators were environmental considerations, better rental value and power cuts, which were given mean ratings of 3.69, 3.13 and 2.96 respectively. The least mean rating was given to improved prestige and image (mean rating computed to be 2.05, with a standard deviation of 1.41). Accelerators with mean rating of > 2.0 have been classified as minor, those with mean rating of 2-3.5 are medium and those > 3.5 have been grouped under major accelerators.

Table 1: Mean Scores given by Government Officials for Accelerators behind commercial establishments installing SPV/SWH systems

Ratings given by Government Officials for Accelerators behind installation of SPV/SWH systems	Categories of selected States/UTs						Central Government (N=20)		Total (N=80)		p value for ANOVA
	High (Gujarat, Rajasthan) (N=20)		Medium (Punjab, Haryana) (N=20)		Low (Delhi, Chandigarh) (N=20)						
	M	SD	M	SD	M	SD	M	SD	M	SD	
Government policies, programmes and incentives	4.80	0.41	4.30	0.47	4.40	0.68	4.50	0.76	4.50	0.62	0.058
Savings in electricity bills and high costs of conventional power	3.55	0.10	4.65	0.93	4.55	0.89	4.20	1.20	4.24	1.08	0.004*
Environmental Considerations	3.45	1.10	3.45	0.89	3.70	1.03	4.15	0.99	3.69	1.03	0.100
Better Rental Value	3.50	1.40	2.45	0.89	2.75	1.45	3.80	0.95	3.13	1.30	0.002*
Power cuts	3.50	1.61	2.75	1.74	3.05	1.64	2.55	1.57	2.96	1.65	0.292
Improved Prestige and Image	1.40	0.68	2.65	1.81	2.05	1.32	2.10	1.41	2.05	1.41	0.046*
M=Mean, SD= Standard Deviation, 1 = Least Important, 5 = Very Important											
*Significant at p < 0.05 level											
Major Accelerators				Medium Accelerators				Minor Accelerators			
<ul style="list-style-type: none"> Government policies, programmes and incentives Savings in electricity bills and high costs of conventional power Environmental Considerations 				<ul style="list-style-type: none"> Better Rental Value Power cuts Improved Prestige and Image 				-			
Mean Rating < 2.0 = Minor Accelerators, 2-3.5 = Medium Accelerators, > 3.5 = Major Accelerators											

The government officials were asked to provide details regarding the time taken at each step of availing government incentives for SPV/SWH systems. The process along with the ideal time frame and that reported by the government officials is illustrated in Figure 2. The figure depicts discrepancies in the ideal time taken at each step vis. a vis. the time frame reported by the government officials.

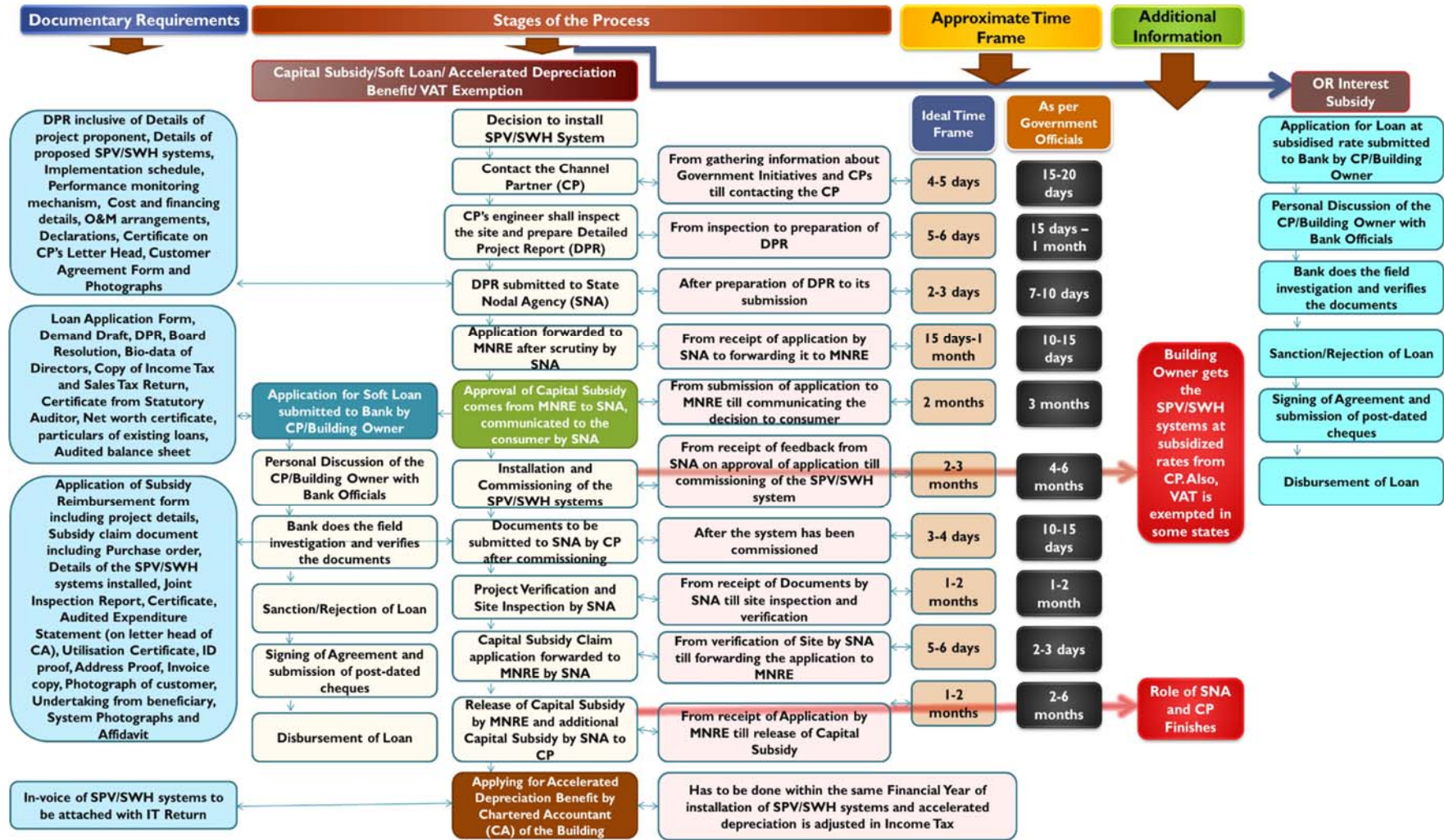


Figure 2. Time Frame and Documentary Requirements to avail MNRE and State/UT Government Incentives for SPV/SWH systems

The government officials were asked to report the barriers faced at different stages of SPV/SWH installation by building owners/managers, as beneficiaries of government incentives (Table 2). As far as identifying the government policies and incentives, and gathering information about the SPV/SWH technologies was concerned, about 34% of the government officials reported that there was lack of awareness among building owners/managers regarding the benefits of solar energy and government initiatives for the same. Moreover, reliable sources of information available were limited in number (reported by about 22% of the respondents). About 67% of the government officials opined that the building owners/managers did not face any barrier at this stage as government was providing enough information.

Table 2: Responses of Government Officials on Barriers faced by Owners/Managers of Commercial Establishments while installing SPV/SWH systems in the buildings and availing Government Incentives

Barriers faced by commercial establishments as a beneficiary of Government Incentives	Categories of selected States/UTs			Central Government (N=20)	Total (N=80)	
	High (Gujarat, Rajasthan) (N=20)	Medium (Punjab, Haryana) (N=20)	Low (Delhi, Chandigarh) (N=20)		N*	%
	N	N	N	N		
(a) Identifying the Government Policy, Programs and Incentives and gathering information about SPV/SWH technologies						
Lack of Awareness among building owners/managers regarding benefits of solar energy and Government Initiatives for the same	9	7	8	9	27	33.75
Sources of information are limited, with unclear, technical and incomplete information	7	5	4	1	17	21.25
No Barrier	14	12	9	18	53	66.25
*The total sample is exceeding N because of multiple responses given by the respondents						
(b) Locating Channel Partners/Vendors						
Limited CPs available	6	9	11	6	32	40.00
Listing of CPs not updated on MNRE website	9	11	5	0	25	31.25
No Barrier	6	6	4	16	32	40.00
(c) Preparing DPR for Capital Subsidy and Soft Loan						
Delayed site inspection by Channel Partners	16	15	10	12	53	66.25
Detailed and Intensive documentary requirements	3	2	5	6	16	20.00
No Barrier	14	11	9	12	46	57.50
(d) Applying to the State Nodal Agency/Bank for the Incentive/s and their feedback						
Rejection of Soft Loans by Banks	15	16	11	11	53	66.25
Delayed feedback from Banks on status of loan application	8	8	6	10	32	40.00
Delayed feedback by SNA after verification, on the status of submitted application	4	5	3	0	12	15.00
No Barrier	15	15	15	18	63	78.75
(e) Installation, Commissioning and Submission of Documents for Incentives						

Intensive documentation requirements for claim of capital subsidy and soft loans	16	15	12	10	53	66.25
Delay in release of capital subsidy by MNRE	12	15	12	0	39	48.75
Delayed installation and commission by CP	3	5	6	5	19	23.75
Delayed site inspection by SNA after submission of application	0	0	0	12	12	15.00
No Barrier	5	8	6	14	33	41.25
*The total sample is exceeding N because of multiple responses given by the respondents						
Major Barriers	Medium Barriers		Minor Barriers			
<ul style="list-style-type: none"> • Delayed site inspection by Channel Partners • Rejection of Soft Loans by Banks • Intensive documentation requirements for claim of capital subsidy and soft loans 	<ul style="list-style-type: none"> • Lack of Awareness among building owners/managers regarding benefits and solar energy and Government Initiatives for the same • Limited CPs available • Listing of CPs not updated on MNRE website • Delayed feedback from Banks on status of loan application • Delay in release of capital subsidy by MNRE 		<ul style="list-style-type: none"> • Sources of information are limited, with unclear, technical and incomplete information • Detailed and Intensive documentary requirements • Delayed feedback by SNA after verification, on the status of submitted application • Delayed installation and commission by CP • Delayed site inspection by SNA after submission of application 			
< 25% = Minor Barriers, 25-50% = Medium Barriers, > 50% = Major Barriers						

As far as locating the channel partners was concerned, 40% of the selected government officials reported that there were limited number of channel partners available in the market. This barrier was reported mostly in the low performing states/UTs, which justified the low performance of these states/UTs in terms of solar energy installed capacity. About 32% of the government officials from the state nodal agencies opined that the listing of MNRE certified channel partners was not updated on the MNRE website. Once the owner/manager of the building identified and contacted the channel partner, the next step was preparation of DPR. While preparing DPR, about 67% of the government officials reported that there was delay in site inspection by the channel partners, which was the first step to prepare the application. Twenty per cent of the government officials also reported that building owners/managers were required to submit detailed documents, which was a time consuming process. Even though the process of documentation was carried out by the channel partners, most of the documents had to be acquired from the building owners/managers.

Once the DPR was prepared, it was submitted to the state nodal agency for capital subsidy and to the banks for soft loan. At this stage, more than 66% of the government officials reported that the loan applications were generally rejected by the banks. The most common reason cited for rejection of loan by the banks was the issue of collateral. Forty per cent of the government officials also reported delay in feedback from the banks on the status of loan application. Further, 15% of the government officials reported that there was delay in feedback from the state nodal agencies on the status of the submitted applications. This barrier was reported by officials from the state nodal agencies. They added that due to delay from MNRE on the status, the building owners/managers could not be updated on time about the status of the application.

Once the project was sanctioned, the next step was availing the incentives. More than 66% of the government officials reported that intensive documentation was required for claiming capital subsidy and soft loans, which acted as a barrier. About 49% of the government officials from state nodal agencies stated that there was delay in release of capital subsidy by MNRE due to lack of funds. Fifteen per cent of the government officials (all from central government) also reported that there was delay in site inspection by the state nodal agencies before forwarding the application to MNRE, which caused further delays in release of capital subsidy.

The government officials were asked to rate the barriers faced by them while implementing the policies, programmes and incentives for off-grid SPV/SWH systems. The highest mean rating of 4.18 (on a scale of 1-5) was given to poor RPO (Renewable Purchase Obligation) mechanism, with a standard deviation of 1.97 (Table 3).

A mean rating of 4.05, with a standard deviation of 1.14 was given to change in policies of MNRE without consulting the state nodal agencies. This was closely followed by lack of awareness among building owners/managers regarding benefits of solar energy. This was given a mean rating of 4.00, with a standard deviation of 1.18. Limited financial incentives from the government and the projects being spread across the states/UTs leading to delay in site inspection by the state nodal agencies were given mean ratings of 2.98 and 1.83 respectively. As per the government officials, they received applications for projects from across the state/UT, and site verifications had to be done for each and every project of all the channel partners, which was a humongous task. This barrier received a higher mean rating in the high performing states/UTs because these states/UTs were geographically more spread out as compared to other states/UTs selected for the study. It was found that there was a significant difference in the responses of government officials from the three categories of states/UTs and central government regarding lack of awareness and motivation, and limited government incentives as barriers faced by them.

The suggestions to overcome the barriers reported by government officials have been discussed under two categories. The first set of suggestions is related to the barriers faced while implementing the policies and programmes, while the others are the additional suggestions to increase the solar installation base. It was suggested that publicity funding should be given by MNRE to the state nodal agencies to catalyse large scale awareness campaigns for different sections of the society, focussing on the government policies and incentives for SPV and SWH systems. Government officials also suggested having stringent rules for channel partners to meet the time frames for installation and commissioning of the SPV/SWH systems.

Regarding soft loans, it was suggested that time frames should be set for banks to speed up the process. Moreover, the off-grid solar sector should be brought under priority sector lending. Officials from the state nodal agencies also felt that the national level policies should be made in consultation with them, and the changes should be notified on the MNRE website. Another suggestion given by the government officials was that since the process of site inspection was taking a long-time, third-party inspections should be undertaken, which is being done only in a few states/UTs at present. The details of the suggestions for the barriers reported by the government officials have been presented in Table 4. Table 5 further presents the additional suggestions given by the government officials to increase the solar installation base in the commercial sector.

Table 3: Mean Scores given by Government Officials for Barriers faced by them in implementing the Policies and Programmes for SPV/SWH installations

Ratings for Barriers faced by Government Officials in implementing the Government Initiatives	Categories of selected States/UTs						Central Government (N=20)		Total (N=80)		p value for ANOVA
	High (Gujarat, Rajasthan) (N=20)		Medium (Punjab, Haryana) (N=20)		Low (Delhi, Chandigarh) (N=20)						
	M	SD	M	SD	M	SD	M	SD	M	SD	
Poor RPO Mechanism	4.00	1.97	3.90	1.68	4.70	2.16	4.10	2.10	4.18	1.97	0.582
Policies of MNRE change from time to time without any consultation with state nodal agencies	4.40	1.14	3.85	1.18	3.85	1.14	4.10	1.07	4.05	1.14	0.370
Lack of awareness and motivation among commercial beneficiaries regarding SPV/SWH systems and government initiatives for the same	4.20	0.77	3.45	1.47	4.50	0.89	3.85	1.27	4.00	1.18	0.028*
Limited financial incentives from central and state/UT governments for SPV/SWH	2.90	0.72	3.30	1.13	2.40	0.10	3.30	1.13	2.98	1.06	0.017*
Projects spread across the state/UT, causing delays on-site verification of SPV/SWH systems	2.10	0.45	1.95	1.15	1.75	1.45	1.50	1.28	1.83	1.15	0.384
M=Mean, SD= Standard Deviation, RPO= Renewable Purchase Obligation SPV = Solar Photovoltaic systems, SWH = Solar Water Heating systems 1 = Not Important, 5 = Very Important *Significant at $p < 0.05$ level											

Table 4: Responses of Government Officials regarding barriers faced by them and the Building Owners/Managers while implementing/availing Government Incentives for SPV/SWH systems

Barriers Faced	Suggestions
Lack of awareness and motivation among commercial beneficiaries regarding SPV/SWH systems and government initiatives for the same	<ul style="list-style-type: none"> • Publicity funding should be provided by MNRE to state nodal agencies for undertaking large scale awareness campaigns
Sources of information are limited, with unclear, technical and incomplete information	<ul style="list-style-type: none"> • Technical aspects of SPV/SWH should be communicated effectively to the building owners/managers
Listing of CPs not updated on MNRE website	<ul style="list-style-type: none"> • MNRE website should be regularly updated with latest information and notifications regarding policies, programmes and certified channel partners
Delayed site inspection by Channel Partners	<ul style="list-style-type: none"> • Stringent rules should be laid for channel partners for meeting timelines • Penalties should be laid on channel partners not meeting timelines
Delayed feedback from Banks on status of loan application	<ul style="list-style-type: none"> • Time frames have to be set by Government for banks regarding sanction of loans • Off-grid solar loans should be brought under priority sector wherein a time limit is there within which, the bank communicates its decision in writing to the applicants
Policies of MNRE change from time to time without any consultation with state nodal agencies	<ul style="list-style-type: none"> • National level policies by MNRE should be framed in consultation with the state nodal agencies • Notifications should be put on the website regarding change in policies and programmes for public information
Limited financial incentives from MNRE and state/UT governments for SPV/SWH	<ul style="list-style-type: none"> • Both MNRE and state/UT government should develop targeted incentives that take into account the specific requirements of different regions and sectors • Existing incentives should not be stopped
Projects spread across the state/UT, causing delays on-site verification of SPV/SWH systems	<ul style="list-style-type: none"> • Third party inspection should be promoted in every state/UT, which is there in a few states/UTs as of now

Table 5: Additional Suggestions by Government Officials to increase the Solar Installation Base

Barriers Faced	Suggestions
Inefficient/cumbersome supply chain of SPV/SWH systems	<ul style="list-style-type: none"> • MNRE needs to work on a package of fiscal/financial incentive policy to promote product/technology development, extensive distribution network, and quality-standards • Providing incentives to new start-ups in the field of SPV/SWH to boost the sector • There has to be transparency of vendors in terms of their listing, size of operations and contact details, for the building owners/managers to be able to contact them without any hassles • Having state/UT wise list of channel partners, ensuring easy availability of SPV/SWH systems
Lack of mandatory policies from state/UT and centre for SPV/SWH	<ul style="list-style-type: none"> • There have to be mandatory provisions for installation of SPV/SWH systems • Systems to be functional and not just installed • Fines/Penalties to be levied on the commercial establishments not meeting the mandate • Mandates have to be proportionate to the size of the commercial establishments, initially targeting the bigger commercial establishments, having the required resources • High-potential regions should be targeted initially for implementation of mandatory policies
High initial costs of installation of SPV/SWH systems	<ul style="list-style-type: none"> • Capital subsidy should not be withdrawn • Larger commercial establishments, both government and private, should be tapped first to increase the installation base • High capacity SPV/SWH systems should be given higher incentives
No clear and immediate business benefits to the users of SPV/SWH	<ul style="list-style-type: none"> • Building owners/managers need to be communicated about the long term advantages of SPV/SWH systems in terms of reductions in electricity bills
High maintenance of SPV/SWH systems, mainly batteries for SPV	<ul style="list-style-type: none"> • Awareness generation regarding maintenance and proper working of the system should be there among commercial users as consumers are ignorant when it comes to maintenance of SPV/SWH systems, as a result, the systems do not work beyond the AMC period, which leads to bad word of mouth publicity
No timely release of Incentives from MNRE	<ul style="list-style-type: none"> • Funds should be released in advance to the SNAs in the starting of each financial year
Some of the incentives presently offered are not used by the building owners/managers	<ul style="list-style-type: none"> • Continuation of financial and fiscal incentives from government which are used by the building owners/managers • Interest subsidy to be made functional by giving benefits to commercial banks • Solar energy sector should be brought under priority sector for all cases of loans

Out of the total sample of government officials, majority (62.50%) were either satisfied or highly satisfied with government initiatives for SPV/SWH systems. On the other hand, only about 21% of the government officials were dissatisfied or highly dissatisfied with the government initiatives. It was observed that none of the government officials from high performing states/UTs were dissatisfied with the government initiatives.

The overall mean satisfaction score was computed to be 3.58, with a standard deviation of 1.15. There were differences found among the different categories of states/UTs. Highest satisfaction score of 4.10 was found in the high performing states/UTs, with a standard deviation of 0.72, whereas the medium and low performing states/UTs received mean satisfaction scores of 2.75 and 3.85 respectively. The central government officials received a mean satisfaction score of 3.60 with a standard deviation of 1.32. Thus, it was observed that barring the medium performing states/UTs, all the other categories of states/UTs, including the central level government officials were satisfied with the government initiatives for SPV/SWH systems.

Most of the government officials (nine out of 17) who were dissatisfied reported that the reason for dissatisfaction was that, there were no additional incentives from the state/UT governments which had a negative impact on the building owners/managers. Six of the respondents said that the reason for dissatisfaction was that the capital subsidy from MNRE had been stopped for both SPV and SWH systems from 2014 onwards. Moreover, the soft loan scheme of the government was practically non-functional.

Six of the government officials also said that channel partners were not state/UT specific, leading to poor after sales services. Five of the government officials opined that there was no mandatory provision for installation of SPV/SWH systems. As per them, some mandate, along with policy, had to be there for it to be effectively functional. Three respondents also felt that the workforce in the government offices lacked young professionals, which, according to them, had new ideas.

5. SUMMARY AND CONCLUSION

Use of fossil fuels is set to lead to multiple challenges, global warming and other environmental concerns. Renewable energy is the solution to the growing energy challenges as they are abundant, inexhaustible and environmentally friendly. Thus, government being the main regulatory body in the country has an important role to play in promoting renewable energy in the country. The current study is significant in today's scenario as it identifies the bottlenecks in the existing policy structure at both the central and state/UT levels. It is recommended that the policy should have clear instructions for the building owners/managers regarding the process of availing government incentives for installation of SPV/SWH systems. Policy should also include a clear time line to be followed at each step.

Further, instead of having separate state/UT level policies and programmes, states/UTs should assist MNRE in implementing the policies of the central government in an effective and efficient manner without any delays. Such steps would prevent state/UT to state/UT differences in terms of policies and programmes and thus, would be helpful for all the stakeholders. Government incentives like accelerated depreciation benefits, interest subsidy, soft loans and VAT exemption should be differentiated based on the size of SPV/SWH systems. Bigger sized systems should be given higher incentives. It is suggested that suitable mandatory provisions should be made in the policy for installation of off-grid SPV/SWH systems in the commercial establishments. The above mentioned steps will go long way in minimising the time lapses at various stages, improving the process inefficiencies and taking the momentum of solar installation forward.

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