Making Tariff Rationalization for Domestic Consumers A Winning Proposition for all Stakeholders

A Briefing Note

AurovilleConsulting

Sustainable Energy Transformation Series

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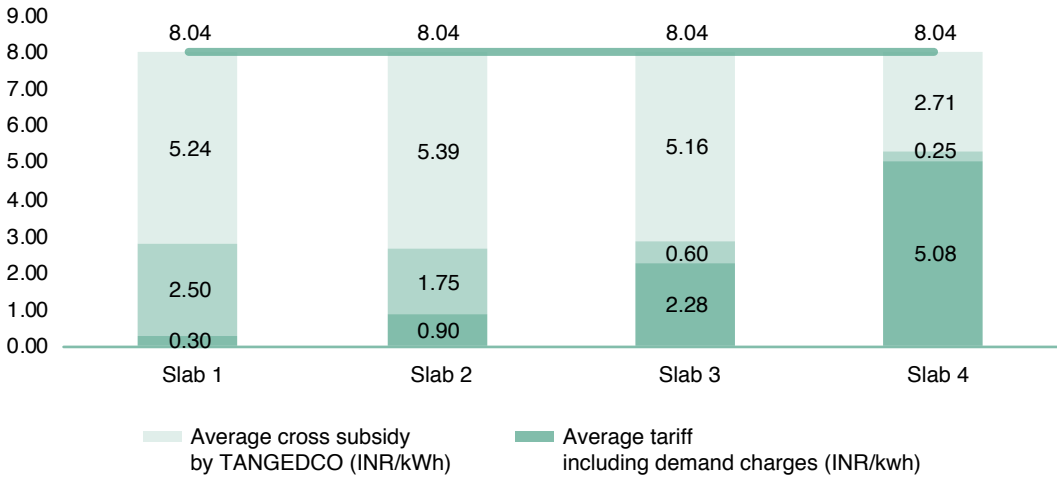
EXECUTIVE SUMMARY

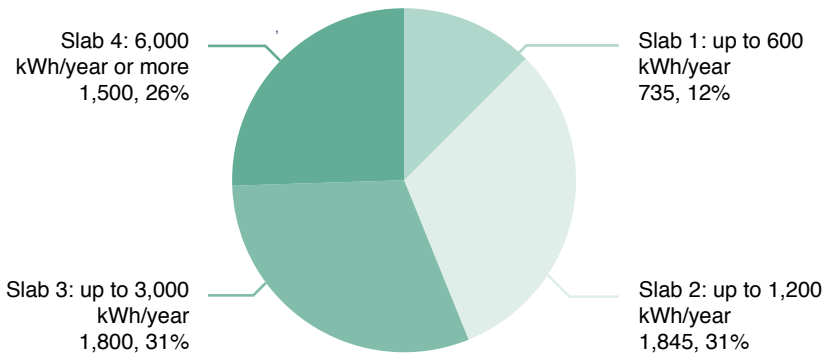
The combination of (i) phasing out electricity subsidy for all domestic consumers, (ii) a tariff rationalization for the domestic electricity category (I-A), (iii) a revision of the existing solar net feed-in tariff and (iv) a TANGEDCO facilitated and State Government supported solar scheme has the potential to result in substantial financial 25-year savings of INR 18,436 Crore (31%) for the State Government and savings of INR 2,79,920 Crore (103%) to TANGEDO. At the same time this approach will be benefiting the domestic consumers. In addition to the financial gains, such an approach results in the creating green jobs, increasing income from tax revenue and contributing to meeting the State's solar energy and climate targets.

BACKGROUND

TANGEDCO serves a total of 21 million domestic service connections. The total subsidy allocation by the State Government for domestic consumers in FY 18-19 was 3,073 INR Crore. In the financial year 2018-19, domestic Slab 1 and Slab 2 consumers account for a combined 25% of the total domestic electricity consumption, for a 61% of domestic service connections and for a 54% share of the total subsidy disbursement by the State Government. The per service connection (meter) subsidy disbursement indicates that Slab 2 and Slab 3 benefit from the highest annual subsidy disbursement in the range of INR 1,800 per year (refer to figure 1). Slab 1 receives the lowest subsidy in terms INR per service connection, but benefits from a 100% free electricity altogether. Figure 1 further indicates that the cross-subsidy amount per kWh provided by TANGEDCO for the first 3 domestic consumers slabs is higher, than the electricity subsidy contributed by the State Government. TANGEDCO literally suffers on account of the prevailing domestic electricity tariff policy, even with the Slab 4 consumers, cross-subsidy is still required. Every kWh of avoided supply to domestic consumers therefore results in a financial gain to TANGEDCO, an argument to actively promote domestic rooftop solar, in particular so for the lower consumer Slabs (1 &2), as solarization of these will reap the highest financial gains to TANGEDCO (refer to figure 7 & 8).

Figure 1 Analysis of domestic consumer tariffs and subsidy disbursement FY 2018-19





SCENARIO ANALYSIS

Three scenarios where analyzed:
Scenario 1: Business as usual (BAU) with existing domestic tariff structure and no solar.
Scenario 2: Existing domestic tariff structure, and consumers installing solar energy systems (utilizing the existing MNRE subsidy).
Scenario 3: Rationalization of domestic tariffs, whereby the Average Billing Rate (ABR) is marginally higher (by 3%) than the Average Cost of Supply (ACoS), thereby eliminating the need of both Government tariff subsidy and tariff cross subsidy. The State Government provides an upfront solar capital subsidy for former domestic Slab 1 and Slab 2 consumers of 80%.

Former Slab 1 and Slab 2 consumers become participants in community solar systems. The existing solar net feed-in tariff will need to be revised through an appropriate tariff determination process to make this proposal viable. For the purpose of this analysis a solar net feed-in tariff or INR 4.80 per kWh is assumed. Additionally, a virtual net-feed-in mechanism is proposed.

This tariff rationalization has the following advantages: (i) TANGEDCO stops selling power below cost. (ii) Avoidance of Government subsidies and (ii) rooftop solar PV for domestic consumers becomes an attractive proposition.

For former Slab 3 and Slab 4 consumers TANGEDCO facilitates a rooftop solar program utilizing the existing MNRE subsidy mechanism.

Solar energy for domestic consumers results in significant benefits to TANGEDO. Though the benefits for TANGEDO are more attractive under Scenario 2 as compared to Scenario 3, however it is unlikely that a larger number of domestic consumers will install rooftop solar (refer to Table 1) with Scenario 2 and with the present tariff structure (refer to Table 3).

Table 1 25-year Benefits to TANGEDCO by Scenario

	Scenarios	Slab 1	Slab 2	Slab 3	Slab 4
25 year cost (INR)	Scenario 1 :BAU no solar/no tariff rationalization	(29,190)	(88,852)	(89,303)	39,149
	Scenario 2: Solar/not tariff rationalization	33,869	7,223	1,05,938	1,86,759
	Scenario 3: Solar and tariff rationalization	23,263	4,651	81,504	88,149
25 year benefits in % over BAU	Scenario 1: BAU no solar/no tariff rationalization	0%	0%	0%	0%
	Scenario 2: Solar/not tariff rationalization	162%	106%	158%	332%
	Scenario 3: Solar and tariff rationalization	148%	104%	140%	148%

Scenario 2 indicates a reduction in subsidy disbursement for Slab 1 and Slab 2 consumers, but an increase in subsidy for Slab 4 consumers. This is on account of Slab 3 consumers moving to lower tariff slabs because of solar self-consumption and therefore reducing TANGEDCO average billing rate from these consumers. Scenario 3 results in marginally higher subsidy costs to the State Government for Slab 1 and Slab 2 consumers.

Table 2 25- year Benefits to State Government by Scenario

	Scenarios	Slab 1	Slab 2	Slab 3	Slab 4
25 year cost (INR)	Scenario 1: BAU no solar/no tariff rationalization	(26,903)	(36,328)	(31,650)	(29,077)
	Scenario 2: Solar/not tariff rationalization	(19,105)	(31,539)	(31,601)	(1,09,742)
	Scenario 3: Solar and tariff rationalization	(28,358)	(42,537)	0.00	0.00
25 year benefits in % over BAU	Scenario 1: BAU no solar/no tariff rationalization	0%	0%	0%	0%
	Scenario 2: Solar/not tariff rationalization	29%	13%	0%	-277%
	Scenario 3: Solar and tariff rationalization	-5%	-16%	100%	100%

Scenario 3 is the most attractive option for all domestic consumer categories. It also presents the only scenario that promises a rapid uptake of rooftop solar for domestic consumers.

Table 3 25-year Benefits to domestic consumers

	Scenarios	Slab 1	Slab 2	Slab 3	Slab 4
25 year cost (INR)	Scenario 1: BAU no solar/no tariff rationalization	0%	0%	0%	0%
	Scenario 2: Solar/not tariff rationalization	-792%	-88%	12%	24%
	Scenario 3: Solar and tariff rationalization	650%	34%	6%	23%
Payback on equity	Scenario 1: BAU no solar/no tariff rationalization	N/A	N/A	N/A	N/A
	Scenario 2: Solar/not tariff rationalization	21.00	21.00	15.00	10.00
	Scenario 3: Solar and tariff rationalization	1.00	1.00	13.00	9.00

Table 4 shows the estimated benefits for TANGEDCO and the State Government of the community solar program for Slab 1 and Slab 2 consumers. This assumes that the domestic tariff subsidy is now used as a capital subsidy, resulting in a total elimination of tariff subsidy in the long-term. If this proposal is implemented for all Slab 1 and Slab 2 domestic consumers, savings of INR 18,436 Crore (or 31%) for the State Government and INR 2,79,920 Core (or 103%) for TANGEDCO are estimated.

Table 4 Assumptions and results: savings from community solar scheme for State Government and TANGEDCO

KEY ASSUMPTIONS		
Domestic service connections	2,14,43,000	No
Service connections in slab 1	72,01,000	No
Service connections in slab 2	58,79,000	No
Total TN Government allocation domestic electricity FY 18-19	3,073	INR Crore
Solar capacity slab 1	1.00	kW
Solar capacity slab 2	1.50	kW
Total estimated solar capacity	14,498	MW
Cost of solar	33,500	INR/MW
Total capital required	48,570	INR Crore
Consumer share on capital requirements (upfront equity)	9,714	INR Crore
Net capital cost to Government	38,856	INR Crore
Government equity ratio	0%	%
Government debt ratio	100%	%
NPV debt service	41,115	INR Crore
Equity	0	INR Crore
Total cost to Government	41,115	INR Crore
Reduction in subsidy	59,551	INR Crore
RESULTS		
Government benefits (INR)	18,436	INR Crore
Government benefits (%)	31%	%
TANGEDO benefits (INR)	2,79,920	INR Crore
TANGEDCO benefits (%)	103%	%

Therefore, it is proposed to go for Scenario 3 (tariff rationalization and solar energy).

APPROACH TO IMPLEMENT SCENARIO 3

Creating an enabling environment for distributed solar, that offers a win-win situation for all stakeholders, utility, the state government, consumers and generators, will need to address some of the current and emerging challenges and it will possible need a new set of policy, regulatory and market instruments to address these. Distributed solar energy, if well planned, has substantial potential for creating upstream benefits in the grid network for utilities, such as avoiding grid congestion, deferring and avoiding investment in transmission and distribution infrastructure, reducing T&D losses and avoiding investment into additional generation capacity addition by the utilities. The magnitude of achievable benefits in terms of T&D loss reduction and infrastructure costs deferral depends on the siting of the distributed solar generator within the distribution network. It can be argued that, the closer distributed solar is to the load, the better it is for the overall system. For example, a rooftop solar system may lead to avoided system costs upstream from the metering point. Distributed solar connected anywhere in the LT or HT distribution network may lead to avoided system costs upstream from that interconnection point (Auroville Consulting 2019c, 2020a). Considering these potential advantages of distributed solar a number of current challenges, presented in table 1 below, will need to be addressed first in order to facilitate the growth of distributed solar energy in Tamil Nadu.

STEP 1: TARIFF RATIONALIZATION (FOR ALL DOMESTIC TARIFF SLABS

Replace the existing 4 slab domestic tariff system (refer to Annexure 1) with a single domestic tariff rate and appropriate demand charges to cover TANGEDCO's Average cost of supply.

STEP 2: INCREASE SOLAR NET-FEED IN TARIFF

Along with the proposed consumer tariff rationalization, a petition for a new solar net feed-in tariff is required. The current solar net feed-in tariff of INR 2.28 per kWh results into financial unviable propositions for domestic rooftop solar, despite the MNRE capital subsidy available. A revised net feed-in tariff in the tune of INR 4.50 to 5.00 per kWh would make rooftop solar attractive to all domestic consumers. A sensitivity analysis in Annexure 2 and Annexure 3 presents the impact of different net feed-in tariffs and solar capacities on the consumer and TANGEDCO for a typical Slab 2 consumer. This shows, that with a net feed-in tariff of INR 4.80 per kWh savings of TANGEDCO would be 104% over 25 years.

STEP 3: COMMUNITY SOLAR FOR FORMER DOMESTIC SLAB 1 AND SLAB 2 CONSUMERS

Community solar systems are MW capacity systems, as this reduces the upfront capital cost. Government of Tamil Nadu phases out all electricity subsidy for consumers under the domestic tariff category (I-A). In place of the current electricity subsidy an upfront capital subsidy of 80% is provided to former Slab 1 and Slab 2 consumers for investing into a 1 kW (Slab 1) and a 1.5 kW (Slab 2) share of a community solar system. A 70% debt and 30% equity financing is proposed. The debt service may be facilitated by TANGEDCO through adjustments in the electricity bills. Newly added domestic service connections may either benefit from the same scheme (community solar) or get facilitated access to existing MNRE promoted rooftop solar schemes.

The introduction of a virtual net feed-in mechanisms, whereby the energy generated by the community solar system is credited to the electricity bill of each participating consumer, pro rata their participation in the scheme. The credit will be based on the proposed net feed-in tariff on INR 4.80 per kWh. This can be done on real-time basis or on slot-to-slot basis (for example 15 min intervals). Smart metering will be required for this scheme, the cost of the smart meters maybe included in the capital cost of the solar energy system.

It is recommended that the community solar systems will be located either on large rooftops or are ground mounted. The solar capacity per plant shall not exceed a capacity of 10 MW. Limiting the capacity to 10 MW has the following advantages:

(i) The solar systems can be connected to existing 11 kV and 22 kV feeders, therefore no investment into evacuation infrastructure is required.

(ii) Voltage improvements at the distribution feeder level and therefore a reduction in distribution losses can be expected.

(iii) As most of the solar energy will be absorbed within the distribution feeder, or the substation, transmission losses are avoided, resulting in additional savings to TANGEDCO.

(iv) Distributed generation also means distribution of risks and enhances grid resilience.

(v) Less impact on land-use through distribution of the solar systems.

STEP 4: FACILITATED ROOFTOP SOLAR OFFERING FOR FORMER SLAB 3 AND SLAB 4 CONSUMERS

For former Slab 3 and Slab 4 consumers a TANGEDCO facilitated rooftop solar program is proposed, utilizing the available Central Financial Assistance by MNRE. TANGEDCO aggregates the demand for rooftop solar, manages the bidding and contracting part and acts as a guarantor to the bank for loan servicing. Solar system capacity and specifications to be standardized (e.g. two or three standard capacities). Solar hybrid inverters may be included in this scheme. This has the benefit of making the participating consumers 'energy storage ready'. The consumer finances the solar rooftop system with the available MNRE subsidy, and with 30% equity and 70% debt. Repayment of loan is facilitated via the consumers electricity bill.

Even for former Slab 3 and Slab 4 consumers who are not participating in a solar rooftop program the financial impact of the proposed tariff rationalization will be in a range of 17% to 74% increase in electricity billing over 25 years (refer to Annexure 4).

CONCLUSION

To facilitate the transition from a heavily subsidized domestic tariff structure to a rationalized tariff structure, solar energy systems can reduce the financial impact for consumers, while also benefiting TANGEDCO and the Government of Tamil Nadu.

Apart from the direct financial benefits to all stakeholders, significant co-benefits can be expected. For example: Green job creation, GHG emission reduction and meeting the Tamil Nadu solar energy target of 9,000 MW by 2023. Table 5 below quantifies some of those benefits for the proposed community solar program (for former Slab 1 and Slab 2 consumers).

Table 5 Co-benefits of proposed community solar program

Impact of community solar program for Slab 1 and Slab 2 consumers		
Job Creation Potential	89,165	FTE
GHG Emission reduction 25 years	426	t/million
Solar Energy Generation as % on total Energy of FY 18-19	26%	%

ANNEXURE

Annexure 1 Domestic (I-A) Tariff rates as of FY 19-20t

Domestic, Handloom, Old age homes, Consulting rooms etc.	Energy Charges (Rs./unit)	Fixed Charges for two months (Rs.)	Energy Charges after Govt's subsidy (Rs./unit)	Fixed Charges after Govt's subsidy (Rs./unit)
Slab 1: 0 units upto 100 units bi-monthly				
0-100 units	2.5	30	0	0
Slab 2: 100 upto 200 units bi-monthly				
0-100 units	2.5	30	0	20
101-200 units			1.5	
Slab 3: > 200 units upto 500 units bi-monthly				
0-100 units	2.5	40	0	30
101-200 units			2	
200 - 500 units	3		3	
Slab 4: above 500 units bi-monthly				
0-100 units	2.5	50	0	50
101-200 units	3.5		3.5	
200 - 500 units	4.6		4.6	
above 500 units	6.6		6.6	

Annexure 2 Sensitivity analysis solar capacity and net feed-in financial impact one typical Slab 2 consumer

		Net feed-in tariff (INR/kWh)						
		2.28	**3.00**	**3.50**	**4.00**	**4.50**	**4.80**	**5.00**
Solar Capacity (kW)	**0.50**	-105%	-102%	-100%	-98%	-95%	-94%	-93%
	0.80	-90%	-80%	-73%	-67%	-60%	-56%	-53%
	1.00	-80%	-66%	-56%	-46%	-36%	-30%	-26%
	1.20	-70%	-51%	-38%	-25%	-12%	-4%	1%
	1.50	-55%	-30%	-12%	6%	24%	34%	41%
	2.00	-31%	6%	32%	57%	83%	98%	109%
	2.50	-6%	42%	76%	109%	143%	163%	176%
	3.00	18%	78%	119%	161%	202%	227%	243%
	3.50	43%	114%	163%	212%	262%	291%	311%

Annexure 3
Sensitivity analysis solar capacity and net feed-in financial impact one TANGEDCO (Slab 2 consumers)

		Net feed-in tariff (INR/kWh)						
		2.28	3.00	3.50	4.00	4.50	4.80	5.00
Solar Capacity (kW)	0.50	81%	79%	78%	77%	76%	75%	75%
	0.80	102%	97%	94%	90%	87%	85%	84%
	1.00	114%	108%	103%	98%	94%	91%	89%
	1.20	126%	118%	112%	106%	100%	97%	94%
	1.50	142%	131%	124%	116%	109%	104%	101%
	2.00	165%	150%	140%	131%	121%	115%	111%
	2.50	184%	167%	155%	143%	131%	124%	119%
	3.00	200%	181%	167%	153%	140%	132%	126%
	3.50	214%	192%	177%	162%	147%	138%	132%

Comment: Assumes a 6.5% average annual tariff increase for BAU case and a 5% average annual tariff increase for the case of tariff rationalization.

Annexure 4
Financial impact of proposed tariff rationalization on the consumer & TANGEDCO

25 year impact on Consumers & TANGEDO	NO SOLAR				SOLAR			
	Consumer		TANGEDCO		Consumer		TANGEDCO	
	25 year losses/ gains (INR)	25 year losses/ gains (%)	25 year losses/ gains (INR)	25 year losses/ gains (%)	25 year losses/ gains (INR)	25 year losses/ gains (%)	25 year losses/ gains (INR)	25 year losses/ gains (%)
Slab 1	-58,093.62	-2761%	30,790	111%	13,680	650%	71,896	148%
Slab 2	-1,40,905	-344%	93,951	120%	14,050	34%	1,19,636	104%
Slab 3	-1,67,730	-74%	1,38,532	83%	13,156	6%	2,82,813	140%
Slab 4	-1,47,121	-17%	1,17,437	18%	2,00,916	23%	2,72,863	148%

Annexure 5
Sensitivity analysis impact of solar capacity on TANGEDCO and typical Slab 3 and Slab 4 consumers

Solar capacity (kW)	TANGEDCO gains (slab 3)	TANGEDCO gains (slab 4)	Consumer gains (slab 3)	Consumer gains (slab 4)
3.00	130%	104%	6%	19%
4.00	140%	123%	14%	21%
5.00	149%	137%	23%	23%
6.00	156%	148%	32%	24%
7.00	162%	156%	40%	26%
8.00	167%	163%	49%	28%
9.00	171%	169%	58%	30%

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