BROOKINGS INDIA
QUALITY. INDEPENDENCE. IMPACT

Delhi's Household Electricity Subsidies: High and Inefficient

Rahul Tongia

BROOKINGS INDIA

QUALITY. INDEPENDENCE. IMPACT

Delhi's Household Electricity Subsidies: High and Inefficient

Dr. Rahul Tongia[1]

---

[1] Dr. Rahul Tongia is a Fellow with Brookings India

Key Points

- The Government of Delhi's household electricity subsidy is amongst the most "generous" in India. With eligibility based on how much you consume, the upper bound threshold for availing subsidies is so high that on average about 80 per cent of households qualify for a 50 per cent *taxpayer* subsidy. In some months, this goes as high as more than 95 per cent of households. This is beyond cross-subsidies approved by the Delhi Electricity Regulatory Commission (DERC) in the tariffs that keep household power prices lower than the cost.

- The subsidies are regressive – mid-level consumers of power, ostensibly the middle classes, enjoy more benefits on a percentage basis than the lowest consumers (the poor). The lowest tier, on average, gets under 33 per cent net billing subsidy, while those using a little under the limit get over 40 per cent net subsidy.

- The average household subsidy varies from a little over ₹1,000/year for those who consume up to 100 units per month to over ₹9,000/year for those whose consumption is 300-400 units per month.

- Altering the subsidy rules only slightly can save significant money, while still offering benefits to targetted segments of the population. For example, lowering the threshold of maximum monthly consumption to be eligible for the subsidy from 400 to 300 units per month results in almost 30 per cent taxpayer savings while reducing coverage by only about 13 per cent. Going to 200 units a month still covers over half the population (compared to 80 per cent today) but can save two-thirds or about ₹1,000 crore per year.

Introduction – Background to Electricity Subsidies and Cross-subsidies

Subsidies in the power sector aren't new or unique to Delhi. These can play a helpful role in keeping power affordable for citizens, but the downside of poor subsidy designs range from poor signalling of true costs (possibly leading to wastage), over-charging some users (a burdensome cross-subsidy), to financial losses for the utilities.

There are only a few ways that utilities or governments can make electricity cheaper for citizens. They can make it actually cheaper, through efficiency, improved sourcing of power (generation), etc. That is the *cost* of electricity as delivered to end-users. Or they can make it cheaper by making someone else pay for it. Instead of engineering, this can sometimes involve "financial engineering".

The latter has several modes, including subsidies, which are given in the form of direct payments by the government, or cross-subsidies, where some users overpay, thereby reducing tariffs for others. For those in India that consume less than 1 megawatt of power, regulators set retail tariffs that let utilities earn a stipulated rate of return on average. This equity rate of return is typically set several percentage points above the debt interest rate.

Pricing gets further complicated as one can have cross-subsidies not only across categories of consumers (e.g., agricultural underpaying by far, and commercial and industrial overpaying), but even within a consumer category. For most residential consumers in India, there are tiers or slabs of tariffs, which increase as you pay more.[2] This sort of progressive tariff system—where lower users, ostensibly the poorer, pay less—is the norm across India, designed to keep power affordable for the poor. There can be other differentials, such as slightly different tariffs for rural versus urban households.

Since the 1970s, the Indian power sector has been facing sharp increases in subsidies and cross-subsidies (Tongia, 2007). Part of this stems from the debate over whether electricity is a commodity or a public good; the former is amenable to markets, while the latter has been viewed as a basic, if not fundamental, right.

---

[2] These are also called Increasing Block Tariffs, and prevalent throughout the world, but not everywhere. These are more prevalent in developing regions, but present even in parts of OECD countries, such as with TEPCO (Tokyo Electric) or the state of California (USA).

If we examine all public utilities and services, many involve some amount of cross-subsidy across consumers, and have pricing that may not cover the cost for the utility, most notably, in the case of water. In the absence of price discrimination beyond creating simple categories of consumers, a single price per category, even if break-even on average, means some pay more than the cost, and some less. For example, a remote occasional user of any service costs more than higher-volume users in reasonable densities. In mobile telephony, where the marginal costs are low and fixed costs are high, given that average revenues per user in mid-2016 in India were as low as ₹138.62/month, the "cream" of consumers (those who have heavy usage of both voice and data) account for a majority of profits.[3] The issue isn't just whether cross-subsidies are reasonable, but whether the overall domain is viable.

In theory, a cross-subsidy as set by a regulator could be a zero-sum-game (some overpay to compensate for those who underpay), but it leads to distortions in the ecosystem. Lower prices can lead to wasteful consumption, and higher total consumption raises overall system costs. In theory, even a taxpayer subsidy shouldn't financially harm the service provider, assuming the government compensates the service provider on time, but it also leads to similar distortions. The worst is when the combination of subsidies and cross-subsidies isn't enough to keep the utility from bearing losses. In India's power sector, many times the losses are hidden due to financial jugglery and creation of "regulatory assets" or deferred payments. On average, using official data for 2014-15 released in 2016, power distribution utilities in India lost 74 paise per unit (kilowatt-hour, or kWh) (PFC, 2016).[4] Fixing this gap between cost and revenues has involved several strands of effort, ranging from reduction of losses (both technical and commercial, i.e., theft or non-payment) to increasing retail tariffs. The latter, as one can imagine, is fraught with political risk.

Regardless of how we view electricity, it has a cost. Someone has to pay. Even if we want to subsidise the poorer consumers, subsidies should be targeted and efficient. For any government subsidy of electricity above and beyond discounts the regulator offers, a fundamental question is what is the purpose? Is it to light up a home that would otherwise be in the dark? To provide electricity for necessary or basic human needs?

Subsidies aren't just about taxpayer money. Pricing provides a powerful signal for how people want to consume. Price anything too low will lead to wastage. Instead of subsidising each unit, a

---

[3] This ARPU figure is for Q2 2016, from the Cellular Operators Association of India (COAI), before the effect of a "price war" by new entrant Jio, which has led to a measurable fall in ARPUs across carriers (as per newspaper reports).

[4] This is inclusive of subsidies on a realized basis (Annexure - 1.6.3 in the report). If one uses subsidies as received on a gross basis, it came to ₹ 0.60 gap per kWh, inclusive of subsidies received.

far more effective mechanism would be up-front subsidies or payment transfers, which still allow for prices that reflect the marginal or true costs to serve. This is even being experimented with agricultural consumers in parts of India, a far greater challenge than urban households in Delhi.

This paper examines Delhi's power subsidies in detail, with data for the calendar year 2016, focusing on whether they are efficient or expensive for the government, and therefore the taxpayer. We begin by looking at the cost structure and tariffs applicable, then examine utility (distribution company, or Discom) data on consumer billing to see the subsidy coverage, quantum, cost implications, etc. We then compare Delhi with other parts of the country for tariff levels, and finish with providing alternatives to the current threshold system of 400 units/month, which could be less expensive while still helping the deserving.

Delhi's Power Tariffs and Subsidies Analysed

There are three sets of subsidies or cross-subsidies enjoyed by segments of Delhi's domestic (residential) electricity consumers. On average, the domestic sector underpays compared to the Cost of Supply to them, while several other sectors typical overpay. Within the domestic sector, most users (under 400 units/month and 200 units/month) pay progressively lower tariffs even compared to the average domestic tariff. Lastly, the government provides household consumers a separate energy subsidy of 50 per cent to consumers using less than 400 units/month. Thus, compared to the notified average cost of supply of a little over ₹7.3/kWh, the marginal tariff for consumers under 200 units/month is only ₹2/kWh. The design of the subsidies turns out to be regressive, helping larger consumers, who are likely richer, more than lower consumers, and costs taxpayers over 6 per cent of the state non-Plan Budget.

Delhi was one of the pioneers in power sector reforms when it created three private distribution utilities in 2002 that covered most of Delhi. Two relatively small areas remained under the Municipal Corporation of Delhi (MCD) in Lutyens Delhi, and the Military Engineering Services (MES). These three utilities today are Tata Power Delhi Distribution Ltd. (TPDDL), BSES-Yamuna (BYPL) and BSES-Rajdhani (BRPL), each covering a portion of Delhi. While these are "private" utilities, they include significant shareholding by the Government of Delhi, which also reflects the stake from the erstwhile electricity board, the Delhi Vidyut Board. As part of the reforms, Delhi created an independent regulator, the DERC, which sets prices (tariffs).

Delhi has had explicit power subsidies for residents for the past few years, as part of the poll promise made by the Aam Aadmi Party (AAP). This is over and above any tiers or slabs in residential tariffs set by DERC (which inherently already have cross-subsidies). A 50 per cent governmental subsidy was offered for consumption below 400 kWh, but if one went over the 400 kWh threshold, one would lose the subsidy. However, any cross-subsidies would remain. While many states delay their promised subsidies, the Delhi government actually pays on time.

Table 1 details the aggregate cost of supply of electricity, based on the 2015-16 Tariff Order.[5]

Table 1: 2015-16 Cost of Supply for Delhi Discoms

	Discom	Cost of Supply (₹/unit)
LT level	BRPL	7.67
	BYPL	7.33
	TPDDL	7.46
Average across all voltages *	BRPL	7.45
	BYPL	7.14
	TPDDL	7.35

Source: DERC 2015-16 Tariff Orders

* Note: LT (low tension, or low-voltage), is the supply for almost all homes and typical/smaller users (delivered at 220 volts single phase or 400 volts 3 phase). The average level is only for LT, 11 kV, and 33/66 kV levels. Above 66 kV level are out of the purview, and costs would be lower.

This average cost, inclusive of Discom profits, is to be recovered by the consumers. Any retail charge below the Cost of Supply (Table 1) does not cover costs. There is a small wrinkle in this calculation: since total consumer costs consist of fixed plus variable charges—cost of the connection and cost of the energy consumption, respectively—we compare the total cost per unit. We have used aggregate ₹/kWh for consumers in our calculations where possible, equivalent to the Average Billing Rate (ABR). According to the respective Tariff Orders, domestic consumers are charged an ABR lower than this cost to serve. Table 2 compares key consumer tariffs category-wise to the average Cost of Supply. We see that the cost recovery for households is just over 75 per cent for the three Discoms.

---

[5] This is the most recent tariff order issued; the same tariffs would apply after 2015-16.

Table 2: Delhi Average Billing Rate compared to Cost of Supply

Only key selected segments of consumers are shown.

Category	Discom	Average Billing Rate (ABR) [₹/kWh]	Average Cost of Supply (ACoS) [₹/kWh]	Ratio of ABR to ACoS
Domestic	TPDDL	5.55	7.35	75%
	BRPL	6.11	7.45	82%
	BYPL	5.43	7.14	76%
Non-Domestic LT (non-industry)	TPDDL	10.83	7.35	147%
	BRPL	10.44	7.45	140%
	BYPL	10.70	7.14	150%
Non-Domestic HT (non-industry)	TPDDL	10.30	7.35	140%
	BRPL	9.80	7.45	131%
	BYPL	9.98	7.14	140%
Small Industry	TPDDL	9.48	7.35	129%
	BRPL	9.52	7.45	128%
	BYPL	9.46	7.14	132%

Source: DERC 2015-16 Tariff Orders

If cross-subsidy is based on ABR versus Cost of Supply, are costs easy to calculate? One should actually use LT (low tension, or low voltage) figures for homes, as almost all homes are LT consumers, while DERC uses average Cost of Supply across all voltage levels. Thus, the DERC calculation *understates the cross-subsidy*. This is before we factor in the actual cost to serve for different consumers isn't just based on the voltage level, but also their time of use of consumption, their capacity utilisation factor, etc. Based on these, most countries that price consumer segments based on true costs to serve fix a cost of supply for residential consumers above the average cost, e.g., in the United States (Table 3) This suggests there is a higher, although not quantified, further cross-subsidy for residential consumers.

Table 3: US Average Prices for Electricity by Sector (January 2017)

	US Cents/kWh	₹/kWh (@ $1=₹66)
Residential	12.22	8.07
Commercial	10.19	6.73
Industrial	6.57	4.34
Transportation	9.32	6.15
Average US	10.15	6.70

Source: EIA

As we can see, Delhi's domestic consumers underpay the utility on average. DERC has allowed subsidies primarily for them as well as for agriculture—the latter being a small load in Delhi—and

marginal subsidies for public lighting and the Delhi Metro Rail Corporation. In terms of total number of consumers, the share for domestic dominates by far, e.g., in 2016 one Discom had over 83 per cent of consumers in the domestic category.

Table 4: Residential (Domestic) Consumption in Perspective

2013-14 data	Domestic Consumption (Million Units or MU)	Total Discom Consumption (MU)	Share domestic consumption (units)
TPDDL	3,109	7,187	43.26%
BYPL	2,804	5,215	53.77%
BRPL	5,348	9,689	55.20%
Total of 3 Delhi Discoms	11,261	22,091	50.98%

Source: DERC 2015-16 Tariff Orders

Looking at tariffs more closely, we see that the fixed charges (a capacity charge based on connection size) are a measurable fraction of total costs for small consumers, who may only pay a few hundred rupees per month in total. As one consumes more, share of variable charges in the total bill rises. Hence, any subsidy only on variable charges (like Delhi's 50 per cent subsidy) helps the higher consumers more than the lower consumers. It's worth noting that fixed costs are based on sanctioned loads, and actual peak demand may be less than that – or more, if it is unmonitored, which is the case with older or analog meters.

Table 5: Fixed charges for household consumers (all Delhi Discoms)

Sanctioned Load	Fixed Charges
Below 2 kW	₹ 40 / month
Between 2kW and 5 kW	₹ 100 / month
Above 5 kW	₹ 25/kW/ month

Source: DERC 2015-16 Tariff Orders

Examining the variable charges (Table 6), compared with the Average Cost of Supply figures, the first two slabs are subsidised, and the third slab is either cross-subsidised or close to cross-subsidised (varies by Discom as well as the fixed costs applicable for a particular consumer).

Table 6: Variable charges for domestic users (all Delhi Discoms)

The shaded portions are cross-subsidised tariffs; lighter shading indicates conditional cross-subsidy based on the Discom and fixed costs charge to the consumer.

|	ps/kWh
0 – 200 units	400
201 – 400 units	595
401 – 800 units	730
801 – 1200 units	810
1200+ units	875

Source: DERC 2015-16 Tariff Orders

Delhi's Governmental Subsidy

The Delhi government has also chosen to offer a substantial subsidy, of 50 per cent of energy charges, to consumers whose monthly consumption is under 400 units. This is over and above the cross-subsidy being offered to residential consumers, which are both within categories (by slab or tier – Table 6), as well as across categories (Table 2). This further lowers their total bill by almost 50 per cent (they still have to pay fixed charges), but in a manner that ostensibly doesn't worsen the utility finances. This means any consumer using under 200 units per month (the majority) sees a marginal cost of ₹2/kWh, amongst the lowest in the nation (see Table 10 for comparisons of notified tariffs across India).

Using data from the three Discoms, we find that 400 units per month is not the threshold for the poor – it even crosses the middle class (over 80 per cent of consumers).

Figure 1 shows the consumers fitting into different buckets for the three Discoms cumulatively (anonymised).

Figure 1: Fraction of domestic consumers by buckets of consumption (2016)
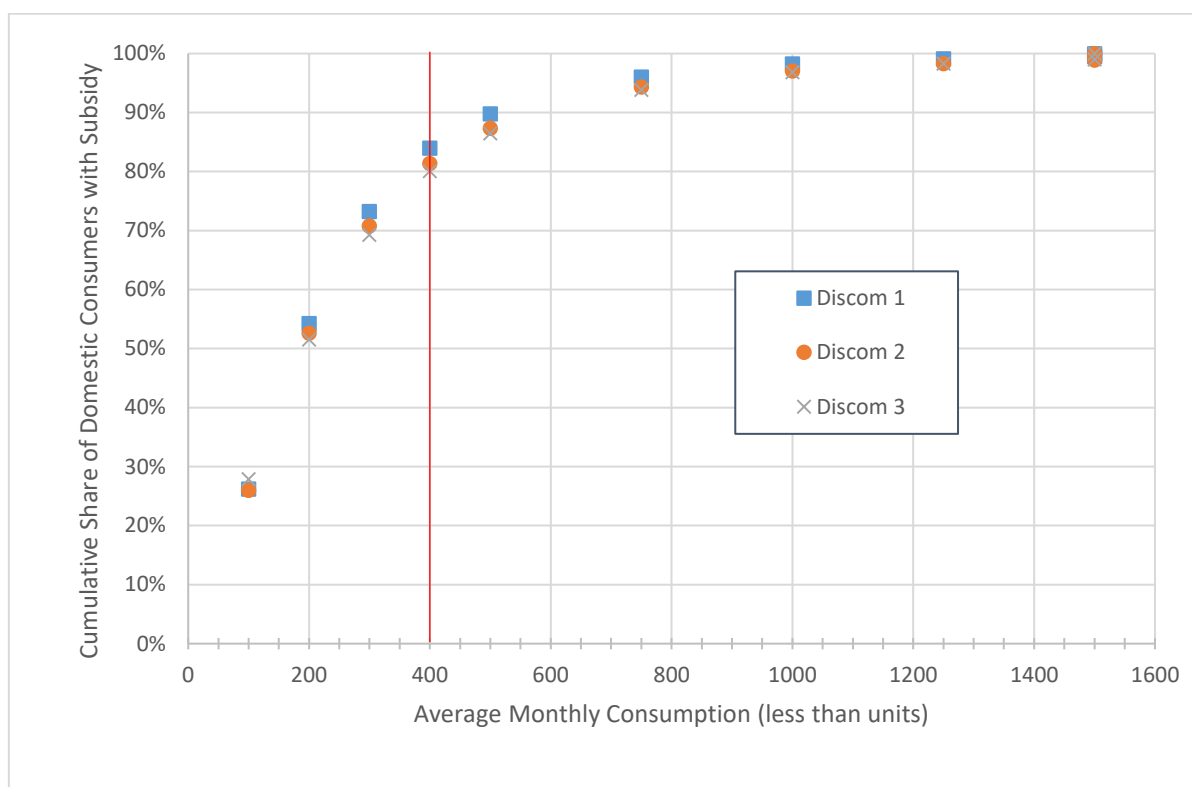
Source: Discom Data

Note: The data methodology used by the three Discoms varies slightly, with two giving buckets of consumption monthly, which were averaged, while one giving the average itself. These give similar results (data was provided as buckets being less than 100 units, 100 – 200 (marked as 200 in the chart), 200-300, etc. up to 500, then by 250 size until 1,500 units).

The situation is even starker given the fact that these are annual averages. Since the rules apply every month, we use more granular monthly data available from two Discoms and see how even the upper-middle class, and in some cases the upper class, of consumers benefit from subsidies (Figure 2). In many months, well over 90 per cent of consumers benefit from the 50 per cent subsidy in energy charges!

Note that we don't have identical data available across the three Discoms, and so for the rest of the paper we focus on two Discoms for some of the financial and energy calculations (Discoms 1 and 2 above). Given the similar coverage of the three Discoms (Figure 1), we assume the percentages are relatively similar across the three.

Figure 2: Share of domestic consumers and domestic consumption subsidised
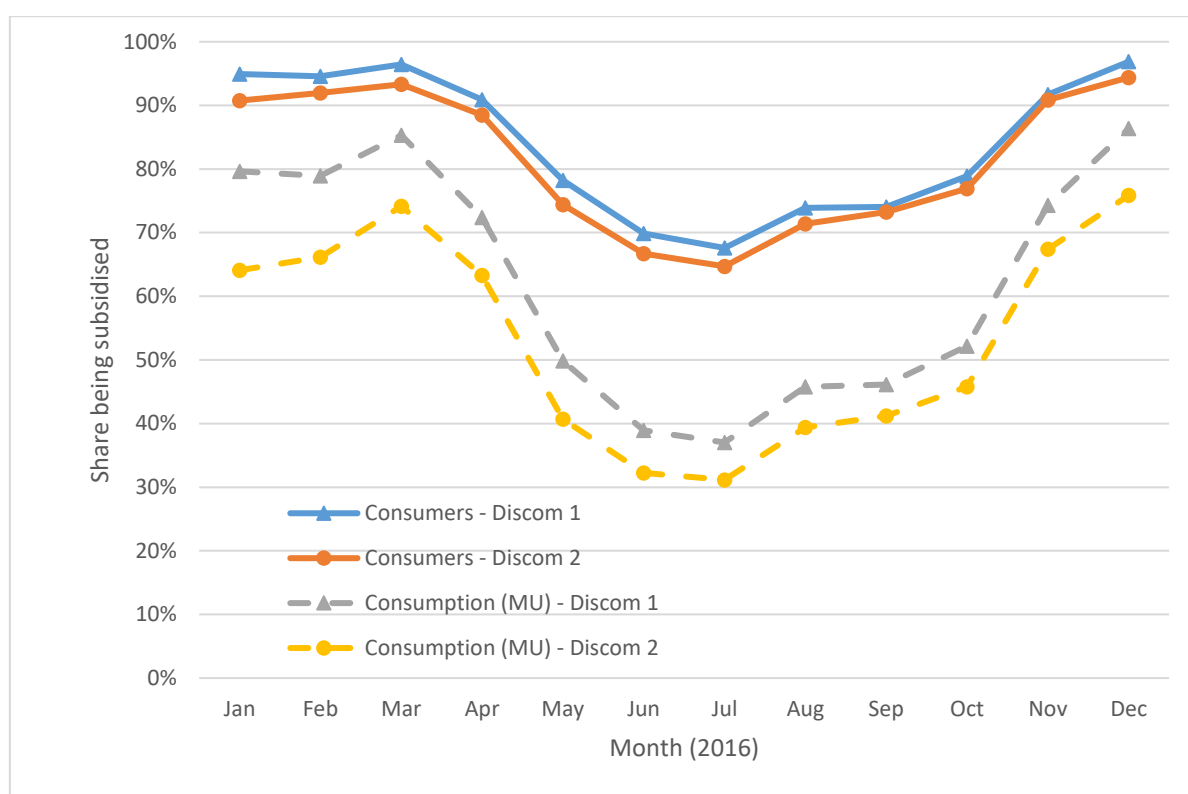
Source: Discom Data

MU = Million Units (kWh)

Figure 2 shows not only the share of domestic consumers, but also the share of total domestic units (kWh) being subsidised (in million units, or MU). Importantly, even subsidised consumption is itself quite high, but with more variance – for example, in the summer months we would expect more cooling devices to be used. The annual averages (using monthly averages as buckets for calculation) for the number of domestic consumers being subsidised in Discoms 1 and 2 are 84.0 per cent and 81.4 per cent, respectively, and the units of domestic electricity subsidised are 56.2 per cent and 48.5 per cent, respectively.

One cannot comment much on a legislative/executive decision of the state government—who I'm sure know the figures on coverage and cost—but one can analyse subsidies using criteria such as coverage of consumers, income distributions, etc. If one's intent is to offer subsidies, the logical questions becomes to whom and by how much, etc.?

Financial Implications of just the 50% Tariff Subsidy

A 50 per cent subsidy isn't as bad for the utility's overall finances as it sounds since the household consumer already enjoys a regulator-approved discounted tariff via cross-subsidies, paid for by commercial and industrial users.

Using more granular data for these two Discoms, we find that the domestic subsidies over 2016 were as given in Table 7. Domestic units are just over half the total units consumed, but from a revenue perspective these are obviously lower. While data are not yet available for this time period, doing a back-of-the-envelope calculation, one would expect the total taxpayer subsidy share from total utility billing (all segments of consumers) to be between 5 and 7 per cent. Adding cross-subsidy implications compared to the Average Cost of Supply, the total "discount" could be 8-10 per cent for domestic consumers out of total utility finances.

Table 7: 2016 Domestic Electricity Subsidy
This is the governmental subsidy, and excludes any cross-subsidy. The Total billing is inclusive of subsidies.

	₹ Crore Subsidy to households	Subsidy as % of total Domestic Billing
Discom 1	415.81	19.9%
Discom 2	659.89	16.3%

Calculated from Discom Data

The amounts shown above are a non-trivial share of the total revenue, and these are only for two of the three major Discoms in Delhi. Adding the third major Discom at a minimum level of Discom 1 would mean the 2016 subsidy is at least ₹1,500 crore!

In fact, in the 2016-17 Delhi Budget, the subsidy for electricity is projected to be at ₹1,600 crore, while for water the subsidy budgeted is only ₹250 crore. It's worth pointing out that the water subsidy only corresponds to the "free water" subsidy available for users who use up to 20,000 liters/month per household and no more (like electricity, the water subsidy also disappears if you go over the threshold). This water subsidy figure doesn't include substantial budgetary support for Delhi Jal Board overall, whose tariffs don't come close to covering costs. Based on the tariffs of the Jal Board (excluding discounts for water harvesting or recycling), a household using the full 20,000 liters—which is a generous allowance[6]—would have paid only ₹287/month as notified tariff, of which the majority is fixed costs (over ₹146). The total variable costs appear low, and includes 37.5 per cent as variable costs for sewerage.

To put this in perspective, the Delhi Budget for 2016-17 had a non-Plan Budget of ₹26,000 crore, implying an electricity subsidy burden on taxpayers of 6.15 per cent.[7] One could argue that 6.15 per cent of the state budget is not much for an essential service like electricity, but is 400 kWh a

---

[6] 20,000 liters for a family of five comes to approximately 133 L daily per person, which is more than the average consumption in the UK for a household of five persons, as per the UK Consumer Council for Water.

[7] The total budget is for ₹46,000 crore, adding in ₹20,000 crore of Plan expenditure, a heading under which tariff subsidies would not fall.

level commensurate with "essential services"? As we shall see later in the paper, it offers far more electricity than most would consider "essential". In such a case, subsidies are not well-targetted.

Examining the costs at a household level (Table 8), if we use electricity consumption as a proxy for income or wealth (not a perfect one, since demand can be a function of household size as well as other factors, including apartments versus standalone houses), we see that larger consumers just under the 400 kWh/month threshold, who are likely richer than lower consumers, get far more subsidy than others. The average subsidy for households receiving it—over 80 per cent of homes—for Discom 1 and Discom 2 came to ₹346 and ₹334 per month, respectively. This is more than the *maximum possible subsidy* for a home using the limit of 20,000 litres of water in a month.[8] Doing a simple back-of-the-envelope calculation suggests that a ₹250 crore water subsidy, reportedly available to 1.9 million homes as per newspaper reports, compared to 3.57 million beneficiaries for subsidised power, comes to ₹110/month water subsidy per *covered* home.

Table 8: Average annual subsidy (2016) by billing bucket size.

Note: consumers above 400 units show some amount of subsidies as these are adjustments for prior month bills. Also, the averages are for each bucket, and not calculated with individual bills.

Average Billed Units (per month)	Average subsidy in ₹/ household in the range – Discom 1	Average subsidy in ₹/ household in the range – Discom 2
0-100	1,117	1,059
101-200	3,589	3,578
201-300	6,391	6,409
301-400	9,088	9,084
401-500	1,978	1,531
501-750	291	254
751-1000	328	184
1001-1250	405	197
1251-1500	443	171
> 1500	969	270

Calculated from Discom Data

While it may be natural for larger users to have larger absolute savings as they consume more (Table 8), this may not be the desired intention. Far worse, given that fixed costs are not

---

[8] The water subsidy is available to less consumers than for power as there are relatively more homes without an individually piped water connection, and one requirement for availing subsidies is proper metering. Reportedly, metering has helped reduces losses of water.

subsidised and because subsidies rise with increasing tariffs means that higher consumers (below the threshold) enjoy a greater *percentage* subsidy than lower consumers (Table 9).

Table 9: Household average subsidy per billing range as fraction of total non-subsidised bill.

Consumers over 400 units see some benefits as there are adjustments from prior months, plus the subsidies are monthly.

Billed Units (monthly)	Average subsidy (2016) per household in the range – Discom 1	Average subsidy (2016) per household in the range – Discom 2
0-100	32.9%	32.4%
101-200	38.8%	38.7%
201-300	40.5%	40.4%
301-400	38.0%	37.6%
401-500	5.2%	3.9%
501-750	0.4%	0.4%
751-1000	0.2%	0.1%
1001-1250	0.1%	0.1%
1251-1500	0.1%	0.1%
> 1500	0.2%	0.1%

Calculated from Discom Data

Putting Delhi in Context (Inter-state comparisons)

Delhi is one of the richest states in India, with limited agricultural power load and the highest household per capita consumption of power. Thanks to the subsidies and cross-subsidies, its "entry" consumers (0-200 units/month) at the upper bound pay a lower rate for their electricity than almost all states in India, especially factoring in the higher threshold for the first or "entry" slab.

Delhi is one of the richest states in India, with very limited agricultural consumption. The 6.15 per cent of non-Plan Budget for household electricity subsidies should be taken in this context. Delhi's per capita income is about three times that of the rest of India (Delhi Statistical Abstract, 2014). Power consumption in Delhi is also far higher, as one would expect, and is roughly twice that of the second-highest consuming state on a per capita level (Prayas, 2016). Discoms 1 and 2, have household consumptions of approximately 246 and 273 kWh/month, respectively. In contrast, BESCOM, the utility in Karnataka which is around half of the state load as it also includes Bengaluru (and is thus higher than typical in India), has a total household average load

in 2015-16 of approximately 67 kWh/month.[9] Even if we only look at urban areas for BESCOM (Bengaluru plus five municipalities), the average monthly household bill is only ₹87 kWh/month (FY 2016). Comparing across the country, the ratio of monthly consumption in Delhi homes is likely to be more than five times higher.

If one were to put a similar threshold for 50 per cent subsidy for all homes across India, the share of homes eligible for subsidy would be far higher (see Figure 3 and Table 10). The estimated ₹1,600 crore annual subsidy in Delhi would scale to tens of thousands of crores for households across India.

In contrast to domestic subsidies, some states have a special subsidy for the very poor (lifeline or *Bhagya Jyoti/Kutir Jyoti* schemes), and could even have special categories of tariffs for the same, not counted in regular "domestic" consumers. In this paper, we don't consider such a special category in our calculations, in part because these are limited in the total units per month allowed and/or are only for Below Poverty Line consumers and/or SC/ST/OBC consumers, and in part because these aren't offered by all states (e.g., Delhi doesn't offer such a category). While a number of states do offer a taxpayer subsidy for such lifeline schemes, Delhi is rare in offering *taxpayer* subsidy for a large swath of "domestic" consumers, over and beyond cross-subsidies which make many residential tariffs far below Cost of Supply.

There other states that offer governmental subsidy to most homes, e.g., the Tamil Nadu government offers a residential subsidy, with *free* power to all homes for their first 100 units bi-monthly (~50 units/month), plus a sliding scale of additional subsidies for users above this threshold. Progressive indicates the poorer get more benefits, measured by lower consumption; after the free units, Tamil Nadu decreases the subsidy as consumption goes up. In contrast, in Delhi, since the subsidy is a 50 per cent one, the higher the consumption—to the second slab of 201-400 units—the *higher* the subsidy per unit as the notified tariff increases! This is another reason the Delhi subsidy is extra regressive, benefitting the richer (higher consuming) much more than the poor.

While Tamil Nadu may have some free units for all consumers, even this household subsidy has an estimated budgetary cost of ₹4,563.90 crore for a far higher population coverage, and at a much lower share of the Tamil Nadu budget. Normalising for the total homes supplied power, we see Delhi's subsidies are about 45 per cent higher, for a state with about double the per capita

---

[9] Calculated from BESCOMs form D-2 in the Tariff Filings with the Regulator, KERC. This includes rural and urban consumers, and also the subsistence households (*Bhagya Jyoti / Kutir Jyoti*).

income.[10] If we normalise based on homes that have been provided subsidised power (just over 80 per cent of total homes in Delhi) instead of total homes, the differential would be even greater.

Comparing Delhi with the rest of India is not straightforward. Beyond the fact that the notified tariff and effective tariff (post subsidy) are different for most consumers, Delhi's entry slab is very broad as well (0-200 units). Most other states have far smaller entry slabs, with lower tariffs, but they raise their tariffs sharply beyond their entry slabs. Thus, one cannot easily compare Delhi's 100 unit and 200 unit consumer (who pay the same) with other states where they would pay very differently. We attempt to compare states in Table 10.

We note that the notified entry tariff in Delhi appears high, which is possibly a commendable attempt by DERC to limit the cross-subsidy burden, and is in line with the requirement of the Electricity Act 2003 that aims to gradually diminish and phase out cross-subsidies. However, this doesn't reflect the true picture: the effective tariff is far lower, and applies for higher-usage consumers than most other states. In other states, low-tariff but low-sized entry slabs are financially manageable since the aggregate quantum of units is small.

As an example, looking at comparable slab bounds, even Jharkhand, with roughly one-fifth of Delhi's per capita income and a similar entry slab of 0-200 units/month, has an entry tariff of ₹2.6/kWh. Delhi's effective tariff (₹2/unit post subsidies) is measurably lower. Most other states have far higher tariffs by the time you are at 200 units. Why Delhi's subsidies are generous isn't just their coverage—Tamil Nadu has 100 per cent coverage—but the overall impact, given the scope, extends to not just 50 units per month (like for free power in Tamil Nadu) but up to 400 units per month.

---

[10] One reason the Tamil Nadu government residential subsidy per household is lower is because the notified tariff for usage is lower than Delhi's, but another is the fact that the subsidies are progressive and more focused on lower thresholds for subsidies, with subsidies above the 100 bi-monthly units phasing out for consumers with usage over 250 units per month (measured bi-monthly).

Table 10: Domestic Tariffs across India for the entry slab (lowest consumer slabs).

Tariff comparisons between Delhi and others states are shown below. Many states have conditions for tariff applicability such as prior consumption, connected load, etc., so solid blocks indicate unconditionally higher or lower tariffs than Delhi, with darker (red) and lighter (green) shading, respectively. Striped shading indicates conditionally higher (red) or lower (green) tariffs than Delhi, with horizontal (red) stripes conditionally higher, and vertical (green) stripes conditionally lower. Only a handful of states have higher *regulator-notified* tariffs than Delhi for the "lowest slab of consumers", which in Delhi is ₹ 4/kWh up to 200 units/month [column E], but the 50 per cent subsidy means the *effective* marginal cost is ₹ 2/unit in Delhi, almost the lowest in the country [column F]. Comparisons are made for the respective state's 200 unit-consumption tariff (not shown in the table); many states have lower tariffs but for much lower entry slabs. Note that incomes in Delhi (column G, using Net State Domestic Product, or NSDP, data) are far higher than virtually all of India's (only Goa's is higher).

State [A]	Date Notified [B]	Condition [C]	Entry Slab (units per month) [D]	Tariff Order Rate (₹/kWh) [E]	Rates vs. Delhi's 50% Subsidy Rate (₹2/kWh) [F]	Per capita NSDP compared to Delhi (2013-14) [G]
Andhra Pradesh	Mar-16	Last Year Consumption <= 900 units	1-50	1.45	1.45	0.38
Andhra Pradesh	Mar-16	Last Year Consumption > 900 units & <= 2700	1-100	2.6	2.6	0.38
Andhra Pradesh	Mar-16	Last Year Consumption > 2700	1-50	2.6	2.6	0.38
Andaman & Nicobar	Apr-16		1-100	2	2	0.51
Arunachal Pradesh	Feb-16		1-above	4	4	0.4
Assam	Jul-16	for connected load up to 5 KW	1-120	4.95	4.95	0.21
Assam	Jul-16	for connected load more than 5 KW	1-above	7.53	7.53	0.21
Bihar	Mar-16	Single Phase with connected load < 7 kW	1-100	3	3	0.15
Bihar	Mar-16	Three Phase with connected load > 5 kW	1-100	3	3	0.15
Chandigarh	Apr-16	Monthly Units	1-150	2.55	2.55	0.74
Chhattisgarh	Apr-16		1-40	3.6	3.6	0.28

Daman & Diu	Apr-16		1-50	1.2	1.2	n.a.
Delhi	*Sep-16*		*0-200*	*4*	*2 ***	*1*
Goa	Apr-16		1-100	1.3	1.3	1.06
Gujarat	Mar-16		1-50	3.05	3.05	0.50
Gujarat-Torrent-Ahmedabad	Mar-16		1-50	3.2	3.2	n.a.
Gujarat-Torrent-Surat	Mar-16		1-50	3.2	3.2	n.a.
Haryana	May-16	Consumption less than 100 Units	0-50	2.7	2.7	0.63
Haryana	May-16	Consumption between 101 & 500 Units	0-250	5	5	0.63
Haryana	May-16	Consumption more than 500 Units	0-above	6.75	6.75	0.63
Himachal Pradesh	May-16		1-125	1.5	1.5	0.43
Jammu and Kashmir	Aug-16		1-100	1.54	1.54	0.28
Jharkhand	Dec-16	for load upto 4 KW	1-200	2.6	2.6	0.22
Jharkhand	Dec-16	for load more than 4 KW	1-above	3.2	3.2	0.22
Karnataka	Mar-16		1-30	3	3	0.42
Kerala	Aug-14	Consumption less than 250 Units	1-50	2.8	2.8	0.49
Kerala	Aug-14	Monthly units between 250 - 300 (all units)	1-300	5	5	0.49
Kerala	Aug-14	Monthly units between 300 – 350 (all units)	1-350	5.7	5.7	0.49
Kerala	Aug-14	Monthly units between 350 – 400 (all units)	1-400	6.1	6.1	0.49
Kerala	Aug-14	Monthly units between 400 – 500 (all units)	1-500	6.7	6.7	0.49
Kerala	Aug-14	For Monthly units above 500 (all units)	1-above	7.5	7.5	0.49
Lakshadweep	Mar-16		1-100	1.25	1.25	n.a.
Madhya Pradesh	Apr-16		1-50	3.65	3.65	0.24
Maharashtra	Nov-16		1-100	4.16	4.16	0.55
Manipur	Mar-16		1-100	3.2	3.2	0.20
Meghalaya	Apr-16		1-100	3.15	3.15	0.29

Mizoram	Mar-16		1-50	2.35	2.35	0.36
Mumbai-Reliance	Oct-16		1-100	3.6	3.6	n.a.
Mumbai-Tata Power Direct Consumers	Oct-16		1-100	2.9	2.9	n.a.
Mumbai-Tata Power Changeover Consumers	Oct-16		1-100	3	3	n.a.
Mumbai-BEST	Oct-16		1-100	3.42	3.42	n.a.
Nagaland	Mar-16		1-30	3.5	3.5	0.37
Odisha	Mar-16		1-50	2.5	2.5	0.25
Puducherry	May-16		1-100	1.1	1.1	0.68
Punjab	Aug-16	Load upto 50kW	1-100	4.52	4.52	0.44
Punjab	Aug-16	Load 50 – 100kW	1-100	4.07/kVAh	4.07/kVAh	0.44
Punjab	Aug-16	Load above 100 kW/kVA	1-100	4.16/kVAh	4.16/kVAh	0.44
Rajasthan	Sep-16		1-50	3.85	3.85	0.31
Sikkim	Apr-16		1-50	1.1	1.1	0.83
Tamil Nadu	Dec-14	for units less than 50	1-50	3	3	0.53
Tamil Nadu	Dec-14	for units less than 100	1-100	3.25	3.25	0.53
Tamil Nadu	Dec-14	for units less than 250	1-100	3.5	3.5	0.53
Tamil Nadu	Dec-14	for units more than 250	1-100	3.5	3.5	0.53
Telangana	Jun-16	Consumption less than 50 Units	1-50	1.45	1.45	0.45
Telangana	Jun-16	Consumption between 51 & 100 Units	1-50	1.45	1.45	0.45
Telangana	Jun-16	Consumption between 101 & 200 Units	1-100	3.3	3.3	0.45
Telangana	Jun-16	Consumption more than 200 Units	1-200	5	5	0.45
Tripura	Nov-14	Single Phase Supply (less than 3 kW Connected load)	1-50	4.84	4.84	0.33
Tripura	Nov-14	Three Phase Supply (more than 3 kW Connected load	1-above	7.2	7.2	0.33
Uttar Pradesh	Aug-16		1-150	4.4	4.4	0.17

Uttarakhand	Apr-16		1-100	2.45	2.45	0.49
West Bengal	Oct-16	Quarterly Total Units	1-102	5.3	5.3	0.33
West Bengal- Kolkata- CESC	Oct-16		1-25	4.89	4.89	n.a.

Data Sources: (1) Regulatory Commission Notices/Orders as compiled by Jain, Abhishek and Jain, Manisha (2016)
(2) NITI Aayog data for State Net Domestic Product calculations

Is this quantum of subsidy defensible based on Delhi's higher than average cost of supply? The subsidies go far beyond any such differential. Cost of supply is determined by an independent regulator, and without digging deeper into the cost structures of Delhi's Discoms, one must recognize that costs depend on many variables and factors, some of which are out of the control of the Discoms. Costs also depend on the quality of service, especially outages, and Delhi has vastly better supply than most of India, with almost no load-shedding. Mumbai, with perhaps the best supply, has even higher residential tariffs (excluding the lowest slab of 0-100 units).

If we examine income across states, Delhi has a higher income spread across the population, with a longer tail of ultra-rich. Using poverty line measures (Tendulkar Methodology), in 2012, around 9.91 per cent of the population of Delhi was living Below Poverty Line (BPL), while the all-India figure was 21.92 per cent (Delhi Statistical Abstract, 2014).

While good data on Delhi's income deciles isn't easy to get for this period, Delhi's higher income reduces the case for lower tariffs even further. If we simply examine the all-India deciles for income, the 80th percentile of incomes is some quarter higher than the mean income. If we assume the same to be true for Delhi and estimate that the average income in this period is above ₹2.5 lakh/capita, with a representative household size of four persons, that means the upper end of the 200-400 kWh slab which is getting subsidies could be households with incomes of some ₹10 lakh/year—perhaps even more—and they get a discount of almost ₹3/unit on the notified tariff. As taxpayer subsidies go, this seems poorly targeted.

Suggestions for alternatives to keep power affordable

If the goal is to maximise the benefits at minimum cost, lowering the subsidy threshold can meet this goal effectively. There are also a number of alternatives ranging from progressive subsidies (more for the poorer) to add-ons for improved identification of deserving consumers that can be used based only on electricity data, including total consumption over time (last quarter or year), connection size, etc. Lowering the size of the first tariff slab by the regulator from 0-200 units to a lower bound but with a lower tariff can also reduce the need for the additional governmental subsidy.

There is no doubt that bill reductions (through subsidies and cross-subsidies) are both useful for many consumers and, for political reasons, going to remain in force for some time in India. The question becomes how can they be improved?

A few of the criteria for effective and viable subsidy and cross-subsidy designs for the power sector would include that they:

- Focus on helping those who need the most help, i.e., the poorest;
- Are progressive: the relatively better-off get lower support;
- Encourage energy savings;
- Have a specific goal and ideas for phasing out or diminishing over time, to align with the true costs to serve;
- Are not overly complex and don't encourage gaming the system;
- Promote a healthy view of paying for electricity. Partly subsidised is superior to 100 per cent subsidised (free); this also ensures the value and sanctity of metering.

Delhi's homes are already cross-subsidised, especially the lower-end consumers (those below 200 units/month, or over half the homes), whose notified tariff of ₹4/kWh is only some 55 per cent of the Cost of Supply or thereabouts, depending on the fixed costs. On top of this, they receive a 50 per cent subsidy on energy costs, translating to some 35-40 per cent further reduction in their bill. Thus, they only pay out of pocket less than 30 per cent of the average costs of their electricity.

The first and easiest to address challenge with the current norms is the fact these aren't properly progressive (percentage subsidy versus usage, Table 9). This can be rectified by adding in fixed costs into the subsidy norms, like Tamil Nadu does. In addition to rectifying the issue of fixed costs causing distortions amongst tiers below 400 units, one could have a progressive system of decreasing subsidy as one approaches the threshold (which Tamil Nadu also has). This would

encourage more energy savings even if the consumption isn't anywhere near the threshold and ensure the maximum benefits go to the smaller consumers. Today's 50 per cent subsidy model needs fixing since it allows higher consumers (the second slab of 201-400 units) to get a higher subsidy per unit than the poorer, entry-level consumers.

A more challenging question is one of targeting. Is the subsidy meant to focus on the "deserving" or on almost everyone? That's a policy choice, though some may claim it's a political choice. Unless one has unlimited money for subsidies, the wider the net, the less each household can get. Comparisons with other states (Table 10) show how a very high share of consumers benefit due to the high thresholds (200 units) for deep discounts (combination of the 50 per cent subsidy and cross-subsidy). According to 2014 National Sample Survey Office data, Delhi had a much higher mean and median consumption of household electricity.[11] While other states cover more of their population in their entry slabs, these are still for lower units/month, a reflection of their lower level of demand (and economic development). Delhi has a high notified tariff for its entry slab (0-200 units), but this can be addressed by the regulator who could create a newer entry slab more in line with other states and Delhi's consumption profile, allowing lower tariffs only for this smaller subset of the population.

---

[11] Even factoring in the fact that Delhi is mostly urban, the urban versus total state comparisons (for other states) don't shift by more than a few percent on average. Note that NSSO data isn't 100 per cent accurate (slabs as used in this study are actual 2016 data for *all* the consumers for the three major Delhi Discoms). NSSO is a size limited sample based on a survey, and hence is representative but not necessarily accurate.

Figure 3: Domestic consumer billing ranges across selected Indian states (units/month)
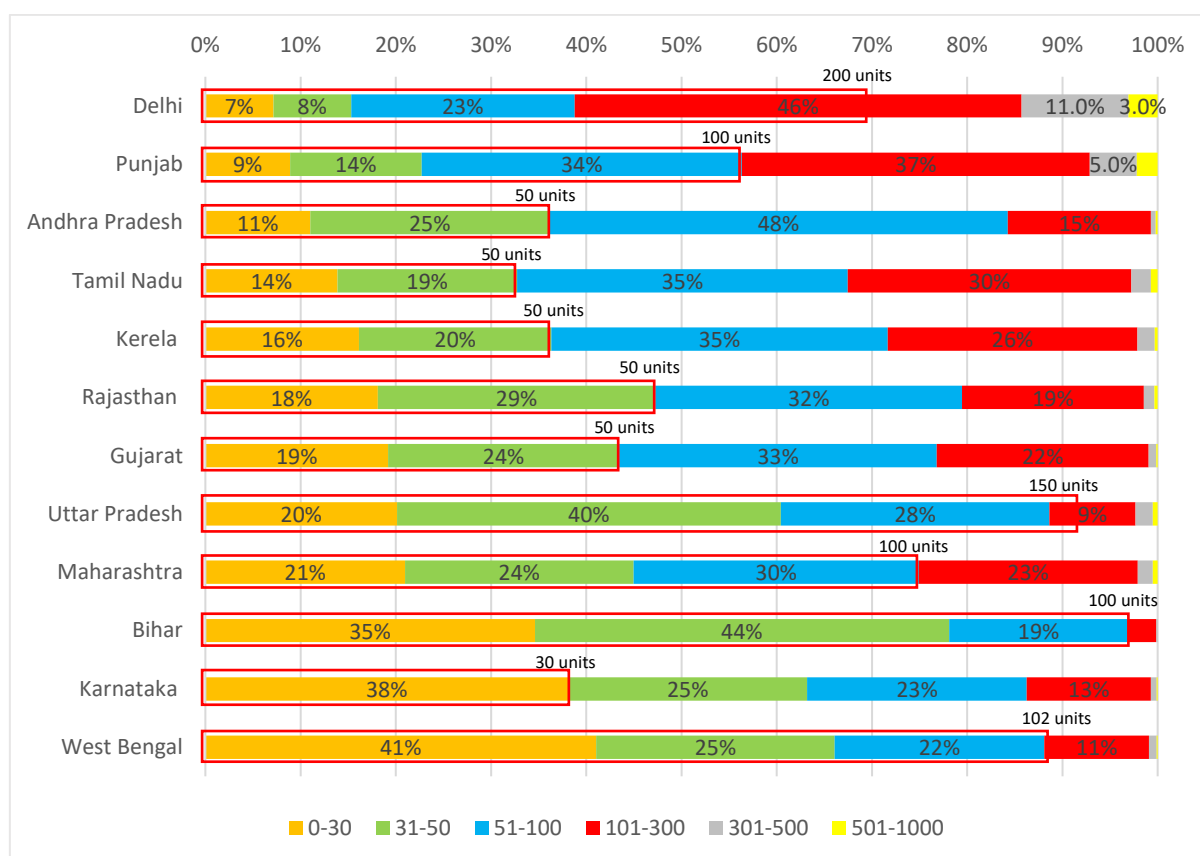
Underlying Source: Prayas (2016), based on NSSO 2014 Data

Entry slabs based on Table 10.

Overlaid as a red box is the minimum "entry" slab in each state, which garners the lowest tariff to the consumer. Delhi's entry slab up to 200 units is one of the highest in the country. Note that if the slab upper bound doesn't match an exact boundary, an estimate is made as to where it would lie (with a slight skew towards more consumers at the lower end of the slab than upper end). Note that these are per NSSO, and may not be entirely accurate, E.g., for Delhi we have actual 2016 consumption data, which shows fewer people than above consuming less 100 units/month (and more "mid-level" consumers).

A simple solution to better target those who need subsidies the most is to lower the threshold. Setting the threshold at 300 kWh or 200 kWh or 100 kWh per month would mean instead of over 80 per cent of households eligible for subsidy, we would have, on average, roughly 70 per cent of the homes, a little over a half, and a little over a quarter of domestic consumers eligible for the subsidy, respectively (Figure 1). Even a threshold of 100 kWh means well more than BPL levels getting subsidies. Any reduction in the threshold would mean reduction in subsidised units (Figure 4), subsidy costs, but also coverage (Figure 5).

Figure 4: Share of total domestic energy (kWh) subsidised for various subsidy thresholds
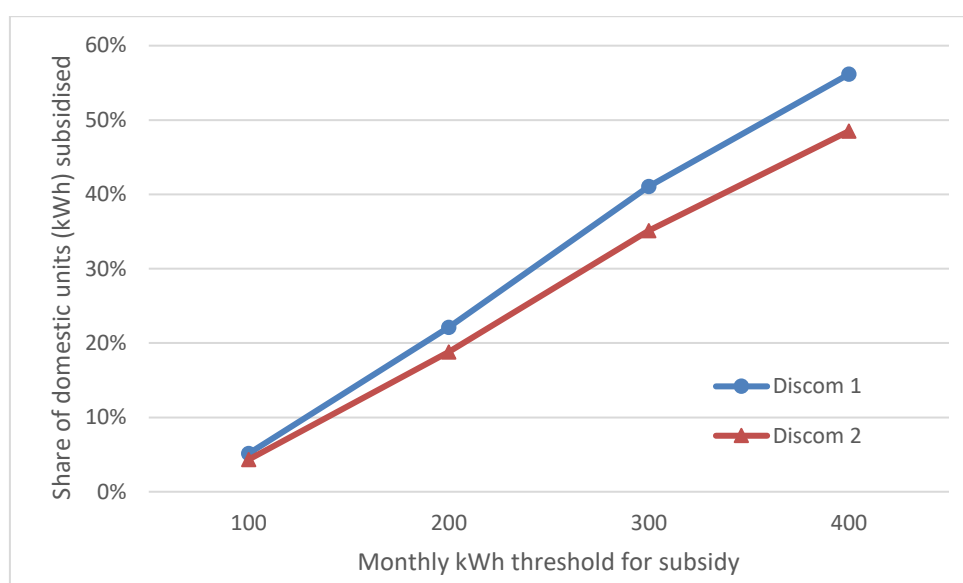
Source: Discom Data

In terms of rupees, the savings could be enormous, even for a relatively small decrease in the threshold (Figure 5). E.g., just for a 12-13 per cent reduction in consumers covered, the subsidy burden can be reduced by almost 30 per cent (going from a threshold of 400 units, the baseline, to 300 units). While the slope is diminishing as the threshold falls from 400 to 300 to 200 units, etc., even at a threshold of 100 units, subsidy-eligible consumers will reduce by some 68 per cent, but subsidy costs will reduce by over 90 per cent. Even at 200 units as the threshold, savings can be about ₹1,000 crore/year (see Table 11 for absolute costs and coverage for different subsidy thresholds).

Figure 5: Reduction in subsidy quantum versus reduction in subsidy coverage for lowered subsidy thresholds.

400 units is the base (today) and hence has zero reductions. The reduction in consumers covered is relative to the current scenario with a 400 unit threshold.
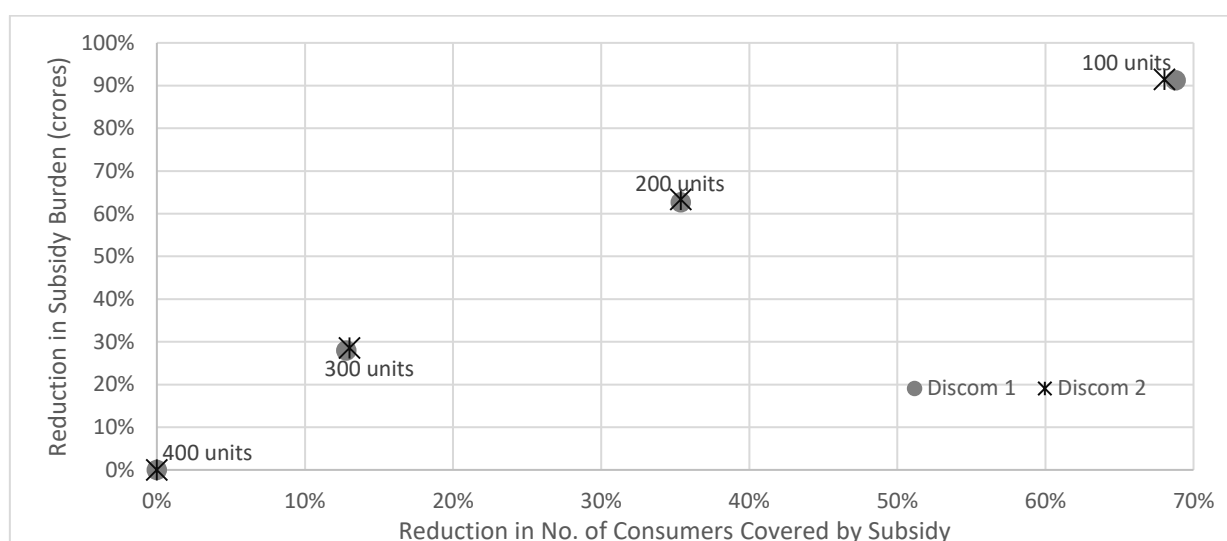
Calculated from Discom Data

Table 11: Coverage and estimated subsidy cost for different thresholds

The cost figure uses data from Discoms 1 and 2 and scales up to add for the 3rd one by a multiplication factor (and hence is an estimate). This is for the same 50 per cent subsidy on units (variable cost only) as today. The total homes is about 4.37 million consumers, so even 200 units gives well above 50 per cent households covered.

(Threshold for Subsidy – units)	100	200	300	400
Homes covered by subsidy	1,162,890	2,302,748	3,100,302	3,567,292
Est. Subsidy Cost (₹ Crore)**	134	578	1,122	1,566

Calculated from Discom Data

What does about ₹1,000 crore/year savings offer? One could either lower taxes or spend the savings elsewhere. Electricity is important for modern life, but it's a commodity that functions well in a market form, unlike many social and development services. Markets don't mean no regulation, or that there is no role for discounted prices, just that those should be well designed and targeted. In contrast to making electricity cheaper, which discourages energy saving, subsidies or support make sense for under-funded social objectives, where more usage is better. Skill development, safety, and tackling mosquitos are just some of the sectors or initiatives that come to mind. In education, 1,000 crores per year could give 2 million school children ₹5,000 of free/enhanced education each.

If one wanted to keep these savings within the power sector, one could pay for energy efficiency (a long-run savings that is woefully underfunded), or every year pay outright for some 500 non-polluting electric buses at ₹2 crore each. If one insisted on using the subsidy money only for power discounts, one could focus it better towards the poorer. This could be done using just electricity

data, instead of looking outside for determining poorer users, e.g., via the use of BPL certifications.

Could one consider the use of sanctioned load (connection size) as a marker for who gets or doesn't get how much subsidy? Sanctioned load can help, but may not be a precise measure, and maximum demand, which is a better marker for wealth, may differ. For that, we would have to measure actual maximum consumer demand, which Delhi can do as at least two of its three utilities have virtually 100 per cent digital meters that record such data.[12] As we can see in Table 10, some states use sanctioned load as a condition for tariff slab determination. Such information can also be used to make graded or progressive subsidies, instead of today's binary (yes/no) system.

Linked to better targeting is the issue of monthly applicability: even some households within the upper 5 per cent of consumption, (likely the richest) get a subsidy in some months. One could use a 12-month or moving average for this, though this would increase the complexity. One could also use a cap mechanism, so if your bill goes above "x" (say, for two or three months), you lose the subsidy for the next "n" months. With sufficient data, one could tease out how many of the consumers are most deserving of subsidies. E.g., in Figure 2, we see how in the summer, compared to a few months prior there is a ~20 per cent dip in coverage under the threshold, but a 40 per cent dip in energy (units) eligible for subsidy. These sorts of data can help pinpoint who are better off at least based on appliance ownership.

Other updates to the norms could include variable scales for the summer months to normalisation based on average household bills (which allows more use in summer but then also requires more savings in the shoulder periods). A hybrid mechanism of annual average, instantaneous (monthly), and peak month billing might be a good metric for identifying applicability of subsidies, but needs to be balanced with simplicity and costs of management. The easiest solution may be to just lower the threshold, and maybe add in subsidies for the fixed costs as well.

If one wanted to make power entirely free to consumers under 100 units (not that I'm advocating free power for other reasons – maybe 75 or 85 per cent subsidy is enough), it would be very affordable, estimated only at about ₹135 crore additional cost compared to today's 50 per cent subsidy costs for this segment. This is a small fraction of the ₹1,000 crore savings from reducing

---

[12] These meters actually capture Time of Day consumption, which could help lead to not just more precise subsidies but even more precise pricing with Time of Day / Time of Use pricing. ToD pricing is today mandatory only for larger *non-domestic* users in Delhi (above 25kW/ 27kVA connection).

the threshold to 200 units. There are infinite options, and one can work backwards to spread the savings across consumers in a progressive manner (more subsidy for the lower consumers).

It's worth mentioning that the taxpayer subsidies today are only for household consumers. One could ask why shouldn't a struggling shopkeeper, a commercial user, also not get a subsidy, especially with a reasonably low threshold (capping the financial burden)? In fact, such users already over pay (cross-subsidise). If one accepts conventional wisdom that SMEs (small and medium enterprises) provide much of employment, then any reduction in cross-subsidies for at least SMEs should help employment if not economic growth.

Lifeline power supply – a basis for thresholds?

There is no simple rule or consensus for what is the minimum level of electricity consumers need. It is subjective, and a moving target over time. *Lifeline* power supply is meant to cover minimum household needs, and typically covers lighting, fans, and maybe even a TV and fridge. One can run all of those in under 100 kWh/month, especially as technologies are improving and the government is encouraging energy efficiency.

In one study on basic demand (Narula et. al, 2015), different estimates have been compared, and these range from the Planning Commission's 2006 minimum lifeline number of 1 kWh/day per household to LBL's *target* (non-lifeline) estimate for urban India at 50 kWh/month per capita.

What does even 100 units as a threshold mean? It is ~3.3 kWh/day. LED bulbs operating for six hours per day are only 0.060 kWh each (or less with newer bulbs as per the government's DELP programme), and even a typical fan uses only some 75 watts. According to current data from the Bureau of Energy Efficiency (BEE), the best 150 litre fridges only use under 12 kWh/month, and even a 1-star poor efficiency fridge uses less than 30 units/month. A hundred kWh/month is not low, even for Delhi. Of course, in the summer, one may desire a room cooler or an air-conditioner. The policy question is whether this is worthy of a subsidy or not, that too for all consumers.

Discussion – Limitations, Distortions, and Games that Ensue

The subsidies, even if they are widespread, may not reach the intended beneficiaries. Means-based testing is complex and has its own limitations. Ultimately, simple yet targeted mechanisms will help to provide proper signaling of true costs as well as reduce the subsidy burden on taxpayers, freeing up money for other social objectives.

There is no perfect solution. Any threshold or other subsidy system will have people who missed the benefits despite being the targetted users, and vice-versa. If you create an income-based threshold, there are many challenges, starting with complexity and management. Means-based testing is prone to not just errors but also gaming and manipulation. The truly poor may lack the certification needed to be categorised as poor (such as a BPL card), while fudging is a whole different ballgame. A plus side of using consumption as a proxy, if done right, is that it can encourage conservation. Unfortunately, the threshold as currently set has too much leeway to encourage energy conservation for many users.

There are other distortions that one may want to address. If one accepts the premise that the poor are the ones deserving of support (at what level is a different question), then one sees two possible failures: First, many poor do not have an electricity connection in their name – they rent, and the owner owns the connection. Even if the owner gets the subsidy, they don't always pass it on the consumer. They often sub-meter each tenant or paying-guest occupant, billing them not only at the official residential rates as per the regulator, but sometimes at even higher rates. This can only be tackled by increased awareness and citizens asking for their rights, as enforcement is a limited tool.

Second, even the rich are taking advantage of this by gaming the system. Consider a two-storeyed house used by a single family. They will sometimes register it as two different dwellings for electricity purposes only, so that each has its own meter, and is thus likely to get the electricity subsidy, especially for the lower floor, where there may be no bedrooms. Surely, one doesn't want subsidies for the rich.

One may counter that a joint family has more people, and so the number of people would be a valid criteria for normalising consumption, and thus worthy of subsidy. But this is unmanageable from a practicality purpose. The same problem occurs if we try to regulate "farmhouses". These are sometimes used by the rich as second homes only on weekends, and thus consume low enough electricity to garner subsidies. One cannot know who has a second home (or not), let alone the usage pattern, so it's not enough to simply say the subsidy is only for the "primary" dwelling.

The answer really is simplicity and transparency, and this inevitably leads one towards better, more targetted, and effective subsidy regimes. While 400 kWh/month is transparent and simple, it doesn't meet the other criteria listed earlier. This analysis suggests lowering the threshold to as far as appropriate, and perhaps using poverty levels as a guide. If a government wants to "help" the maximum number of consumers, one could do so separately from the electricity tariff, e.g., in the form of a one-time or monthly fixed payment.

If one only had a threshold-based system like today, and if higher usage corresponded to the richer using the service more, then crossing the threshold means they lose *all* the subsidy. Seems extra-progressive, but *it isn't progressive below the threshold*. On the other hand, the alternative, which is more common and seen even in income tax slabs amongst other places, is to have progressive slabs that apply for all users, regardless of total levels. Thus, even the rich get a tax break for the first ₹3 lakh of income, a measurable but smaller break for up to ₹5 lakh of income, etc. This system has the advantage of cushioning the blow in case one's income reduces, but with energy, we actually do want people to use less of it. In that sense, a "pure" threshold system of subsidy would more likely encourage energy conservation *as long as the threshold isn't too high*. Unfortunately, "too high" will vary by consumer, and a single threshold would provide limited incentive to conserve energy for many users. Alternatively, a progressive system of subsidies gives an incentive to save even more energy, but with a lower penalty for not saving enough (the subsidy won't go away, just diminish). It also gives lower users, ostensibly the poorer, a higher percentage benefit per unit of electricity.

A separate challenge is subsidies that may be for "residential" usage actually cover commercial usage, which is technically not allowed but happens regularly. A new example of this is the charging of electric rickshaws (e-rickshaws) using household connections. 5 kWh/day of e-rickshaws being charged is still only 150 kWh a month. This is possibly something within the buffer of many consumers and the 400-unit threshold for subsidies.

If the Delhi government/regulators/utilities are able to share more historical data, especially before and after the 50 per cent subsidy rule, we could analyse whether this actually led to less energy efficiency. It's not sufficient to just look at the growth rate of sub-400 unit consumers since lower base consumers would be expected to have higher growth rates of consumption than higher users, especially those closer to saturation in terms of appliances and lifestyle.

While we don't have sufficient data for India or Delhi, general trends across the world indicate a price elasticity on the order of negative 0.2 to negative 0.3 in the short run, and higher in the long

run, ostensibly as capital stock like appliances change (Horáček, 2014).[13] (Price elasticity means for a doubling of price, i.e., 100 per cent growth of price, there is an "x" per cent change in demand.)

It's not necessary that the converse is true, that for a halving of price, one sees an "x" per cent increase in demand, especially since most figures include commercial/industrial consumption, where energy input prices are a factor in quantum of production (a driver for more usage). Houses have no income-increasing incentive to use more power even if the power is cheaper, *but* they may still increase their usage for convenience reasons, plus they may opt for less efficient appliances (the longer-term effect). Thus, without pinning down a figure for energy usage and price elasticity (reflecting energy efficiency), it's safe to assume that for some segments of users, discounted energy prices do mean higher energy consumption than otherwise. A plausible negative 0.2 elasticity for power suggest there might be a 10 per cent increase in consumption for almost 80 per cent of homes, which is a lot of energy, that too at a loss for the utility (and with higher taxpayer subsidy).

Getting subsidies right is not easy, especially in the power sector. Agricultural (irrigation pumpset) consumption has for decades enjoyed subsidies, ostensibly to keep food prices low – vote bank politics are a "fringe benefit".[14] The problem is the truly poor don't benefit from discounted or free power for pumpsets. According to the 2011 Socio-Economic Caste Census (SECC) for Rural India, the majority of rural Indian households (56.4 per cent) do not own land. Of the remaining less than half, most do not own a pumpset—only 9.83 per cent own any irrigation equipment, including kerosene, diesel, electric, drip, etc. Even factoring in the homes that have irrigated land via canals or elsewhere (non-owned), according to the SECC, this still leaves 29.6 per cent of rural households with unirrigated land. We see that (a) irrigation coverage is modest, and (b) the beneficiaries are a small, most likely the better-off, subset.[15]

---

[13] Removing outliers or biased data, the author found an elasticity averaging approximately negative 0.19.

[14] The entire premise of free or heavily subsidized power has led to enormous financial and operational challenges for utilities across India. A few writers have asked can or should pre-poll subsidy promises come under the purview of the Election Commission? While it may sound appealing, it is a slippery slope that risks stepping into the realm of public policy. Alternative venues for discussion and feedback may be more helpful, including by Electricity Regulators to the extent possible (who also cannot step into the realm of public policy). What is clear is that non-Regulator subsidies do distort the system, something that impacts pricing signals and the overall ecosystem.

[15] A number of farmers with pumpsets sell their water to neighbours, so ownership data doesn't provide a complete picture. These owners actually sell, at a profit, subsidised or free power based water! This is before the issue of discrepancies or falsehoods in responding to the survey. Regardless, the beneficiaries of discounted or free agricultural power are a small fraction of total farmers or rural households.

One general suggestion for subsidies is to provide them up-front, but then charge for the good or service at full cost. This discourages wastefulness. With pumpsets, if the power is virtually free, the farmer will buy the cheapest (i.e., least efficient) pumpset. Direct Benefit Transfers (DBT) should help maintain subsidies while encouraging consumption reduction and financial savings.

Simply by lowering the threshold for subsidy, even to 200 units (which would still cover over half the population) Delhi could find ₹ 1,000 crore extra. These savings could then be used for other social or public services or more focused electricity support. We also recommend a more progressive system of subsidies, and for adding in fixed costs.

How you frame a question drives how people will answer. If you pre-suppose that the private Discoms are too expensive if not over-charging, then "reducing the bill" for the maximum people seems like generosity. On the other hand, if you recognize there is a total (finite) money to subsidize electricity, then Delhi should aim for more energy-saving, fairer, and progressive subsidy systems. After all, discounted or "free" has a cost – just elsewhere.

References

BEE: Bureau of Energy Efficiency. (2013). Bureau of Energy Efficiency (BEE) Energy Star Ratings (online – updated periodically). Retrieved April 7, 2017 from: https://www.beestarlabel.com/ and also third party websites

BESCOM: Bangalore Electricity Supply Company Limited. (2015). BESCOM Tariff Petition as filed with KERC, 2015-16 (2015). Retrieved April 7, 2017 from: http://www.karnataka.gov.in/kercold/Downloads/COURT-ORDERS-2015/TARIFF%202015-16/BESCOM-TARIFF-FILING-2015.rar

CCW: Consumer Council for Water. (n.d.). Save Water and Money, Average Water Use. Retrieved April 6, 2017 from: https://www.ccwater.org.uk/savewaterandmoney/averagewateruse/

COAI: Cellular Operators Association of India. (2017). ARPU Report Q2 2016. Retrieved April 7, 2017 from: http://www.coai.com/statistics/arpu-and-revenue-report

DERC: Delhi Electricity Regulatory Commission. (2016). Tariff Order 2015-16. Retrieved April 6, 2017 from: http://www.derc.gov.in/ordersPetitions/orders/Tariff/Tariff%20Order/TariffOrder%20-%202015-16.html

DJB: Delhi Jal Board. (2015, August). Water tariff applicable from 14.08.2015. Retrieved April 7, 2017 from:
http://www.delhi.gov.in/wps/wcm/connect/74fc0a8049fb1e4f84afcee4899821f2/Tariff+14.08.2015.pdf?MOD=AJPERES&lmod=-820044332&CACHEID=74fc0a8049fb1e4f84afcee4899821f2

EIA: US Energy Information Administration. (2017, March). *Electric Power Monthly*, Data for January 2017. U.S. Energy Information Administration. Retrieved April 7, 2017 from: https://www.eia.gov/electricity/monthly/epm_table_grapher.cfm?t=epmt_5_6_a

GoD: Government of Delhi. (2014, November). Statistical Abstract of Delhi 2014. Retrieved April 5, 2017 from:
http://www.delhi.gov.in/wps/wcm/connect/f508bc8046667b0e9cf6bcf5a4ed47e7/Stattistical+Abstract+of+Delhi+2014.pdf?MOD=AJPERES&lmod=66436406&CACHEID=f508bc8046667b0e9cf6bcf5a4ed47e7

GoD: Government of Delhi. (2016). Delhi Budget 2016-17 (highlights). Retrieved April 5, 2017 from:
http://delhi.gov.in/wps/wcm/connect/6f7ad4804c31d85e809e905f8a73cac9/Highlight+English+Final.pdf?MOD=AJPERES&lmod=-1128161209&CACHEID=6f7ad4804c31d85e809e905f8a73cac9

GoI: Government of India. (2011). Socio-Economic Caste Census (SECC) 2011. Retrieved April 6, 2017 from: http://secc.gov.in/welcome

Horáček, P. (2014). *Price Elasticity of Electricity Demand: A Meta Analysis* (Dissertation), Charles University, Prague. Retrieved April 5, 2017 from:
https://is.cuni.cz/webapps/zzp/download/130140681/?lang=en

Jain, A. and Jain, M. (2017, January 5). Residential Tariffs compilation across India. *Bijli Bachao.* Retrieved April 4, 2017 from: https://www.bijlibachao.com/news/domestic-electricity-lt-tariff-slabs-and-rates-for-all-states-in-india-in-2016.html

Narula, K., Reddy, B. S., and Pachauri, S. (2015). Sustainable Energy Security for India: An Assessment of Energy Demand Sub-System. Retrieved April 6, 2017 from:
http://www.igidr.ac.in/pdf/publication/WP-2015-013.pdf

NITI Aayog. (2015, July 31). Per Capita NSDP at current prices (2004-05 to 2014-15). Retrieved April 7, 2017 from: http://niti.gov.in/content/capita-nsdp-current-prices-2004-05-2014-15

PFC: Power Finance Corporation. (2016, June). The Performance of State Power Utilities for the years 2012-13 to 2014-15. Retrieved April 5, 2017 from:
http://www.pfcindia.com/writereaddata/userfiles/file/Operations/state_performance/Report%20on%20Performance%20of%20State%20Power%20Utilities%202012-13%20to%202014-15.pdf

Prayas (Energy Group). (2016, December). Residential Electricity Consumption in India: What do we know? Prayas. Retrieved April 6, 2017 from: http://www.prayaspune.org/peg/publications/item/331-residential-electricity-consumption-in-india-what-do-we-know.html

TNERC: Tamil Nadu Electricity Regulatory Commission. (2016, August 2). Provision of Tariff subsidy for FY2016-17, Order No. 6 of 2016. Retrieved April 11 from:
http://www.tnerc.gov.in/orders/Tariff%20Order%202009/2016/SUBSIDY%20ORDER%202016-17.pdf

Tongia, R. (2007). The Political Economy of Power Sector Reform in India. In Victor, D. and Heller, T. (Eds.), The Political Economy of Power Sector Reform: The Experiences of Five Major Developing Countries (pp. 109-174). Cambridge University Press, Cambridge, ISBN: 978-0-521-86502-9. Retrieved April 4, 2017 from: http://www.cambridge.org/gb/knowledge/isbn/item1173817/?site_locale=en_GB

Acknowledgements and Disclaimer

The views are expressed in this publication are those of the author, and like all outputs of Brookings India, meant to inform and stimulate dialogue amongst stakeholders. Brookings India does not hold any institutional views. Brookings India recognises that the value it provides is in its absolute commitment to quality, independence, and impact.

Author

Dr. Rahul Tongia

Fellow, Brookings India

An expert in technology, policy and design of infrastructure, Tongia's research covers energy, electricity and sustainable development, with additional expertise in information technology and telecommunications. His work focuses on smart grids, which use innovative information and communications technology to improve management of the electric utility grid; renewables and renewable integration; shortfalls of electricity and mitigation measures; and electricity pricing. He is also an Adjunct Professor at Carnegie Mellon University, and was the founding technical advisor for the Government of India's Smart Grid Task Force.