The Electricity-Groundwater Conundrum: Case for a Political Solution to a Political Problem

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Low cost and low quality electricity for agriculture contributes to erosion of electricity distribution systems and encourages wasteful consumption, even as farmers are increasingly deprived of adequate and good quality power. While past efforts to solve this problem have focused on technocratic approaches, this paper attempts to articulate a political interpretation of the electricity-groundwater conundrum. The paper argues that farmers are quite rational in their current decision-making given the problematic context within which they make choices. It outlines a more explicitly political approach to the problem, based on state level bargains between stakeholders and a multifaceted approach to implementing bargains.

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The problematic interface between electricity use and groundwater access has been a subject of debate for well over a decade. In brief, below cost, often free, and unmetered electricity supply for agriculture has contributed to an erosion of electricity distribution systems and also encouraged wasteful groundwater use. Over time, an entire political economy has sprung up around this relationship between electricity and water, raising substantial obstacles to any progressive policy change. The electricity-groundwater conundrum has implications for the productivity, viability, and sustainability of India's agrarian economy, but also for the health and future viability of the larger project of electricity reform in India. For the viability of both the water and electricity sectors, this interlinked problem needs resolution.

1 Introduction

Although the debate on the electricity-groundwater link is long-standing, it is marked by a focus on technocratic approaches to policymaking rather than an appreciation for the entrenched political nature of the problem. Fixes have tended to be economic (raise prices to farmers) and/or technical (install meters). Both are standard elements of the electricity reform prescription that the nation has struggled, largely unsuccessfully, to implement over the last five to 10 years. Failures to follow both prescriptions are ascribed to a lack of "political will". And there the matter rests. Until politicians develop a backbone, it is argued, there is little that can be done.

By contrast, this paper seeks to develop a more consciously political interpretation of the electricity-groundwater conundrum, and consequently a case for a more deliberate political solution. The "lack of political will" argument suggests that when technocratic solutions run into a political obstacle, the political process should be bypassed, either by stealth, or by pinning hopes on a political strongman at the state level who can demonstrate the way forward for the rest.[1] If, by contrast, there is some weight given to the democratic process through which policy change must pass, then the reasons why farmers have been so opposed to the standard reform prescription must be taken seriously, weighed, and addressed. This is not to say that the prescriptions themselves are necessarily wrong, but it is to say that a political solution is needed to provide a larger framework within which technical and economic solutions can be embedded. Efforts to solve the electricity-water problem by advocating technological and economic fixes have so far have put the cart before the horse; sustainable reform first requires a workable political bargain to which the various parties involved, particularly farmers, can agree. Technical and economic instruments are then needed with which to implement the political bargain.

This paper is organised around three parts. Section 2 provides a brief summary account of the electricity-water intersection, and the nature and history of the problem. Section 3 discusses some of the conventional wisdom on which the standard prescriptions of tariff increases and metering agricultural supply rests, and argues that farmers may indeed have good reason to be concerned about their future under these prescriptions, concerns that are not being taken sufficiently seriously. This discussion provides the basis for a political understanding of the problem. Section 4 then briefly reviews some proposed solutions to assess them in light of the political understanding developed in Section 3. Section 5 provides some reflections toward a political solution.

2 The Electricity Water Linkage

Indian agriculture is heavily dependent on groundwater. Indian farmers extract about 150 km^3 of groundwater, making India by far the largest user of groundwater in the world [Shah, Giordano and Wang 2004]. About 55-60 per cent of India's agricultural lands rely on groundwater for irrigation [Shah, Giordano and Wang 2004], and groundwater supported agriculture contributes about 10 per cent of GDP [World Bank 1998b]. Even more significant, about 55-60 per cent of India's population is estimated to depend on groundwater for their livelihoods [Shah, Giordano and Wang 2004]. Consequently, although much more public money has gone into surface irrigation, farmers have invested heavily in small pumps, so that 70-80 per cent of the value of agricultural production is based on groundwater rather than surface water [World Bank 1998b, p 2]. This is quite understandable, since yields are estimated to be one-third to one half higher in groundwater irrigated areas than in areas irrigated by other means [Dhawan 1995].

This picture of groundwater dependence varies by region.[2] In the west and south, groundwater dependence is firmly entrenched, water levels have been falling for a couple of decades, and farmers have been engaged in a chase to keep up with water levels, leading to a concentration in control over groundwater. In other parts, notably the eastern plains, groundwater remains in abundance, but investment in pumps has been limited in part because of a lack of assured electricity supply.[3]

Groundwater-driven agricultural productivity rests firmly on access to electricity. This is particularly so in the areas where groundwater use has become entrenched, such as north Gujarat, Tamil Nadu, and parts of Andhra Pradesh, but also in areas of high agricultural productivity such as Punjab and Haryana. As a result, farmers and agriculture are estimated to account for between a quarter and a third of electricity use irrigation [Shah, Giordano and Wang 2004]. The Centre for Monitoring the Indian Economy puts this figure at 31 per cent [cited in Kumar 2005]. While the numbers are extremely hard to pin down, for reasons discussed further below, there is little doubt that in quantitative terms alone, agricultural users are too large for the electricity sector to ignore.

However, the real complexity in the water-electricity link rests not in the proportion of electricity that is used by agriculture, but in the way in which the use of electricity by farmers has evolved overtime. Electricity provision for agriculture has its roots in the Green Revolution strategy of agricultural intensification. Arguably, this strategy was successful, since the Green Revolution technologies would not have been feasible without water, which in turn required electricity. In the late 1970s, various state governments dramatically changed the relationship between farmers and the electricity boards. By providing farmers with electricity at flat rather than metered rates, and eventually for free, successive state governments across India let loose a chain of events with serious long-term consequences for the sector. According to some this shift was an indulgence in populist politics to cultivate and seize an important and powerful vote bank [Dubash and Chella Rajan 2000]. Others see it as an inevitable result of the logistical difficulty of metering, the prevalence of harassment by meter readers, and the high transactions cost of a meter-based electricity system irrigation [Shah, Giordano and Wang 2004]. Whatever the dominant motivation, and it is certainly feasible that both factors were at play, the result was a gradual de-metering of the Indian countryside, the introduction of water use patterns and cropping decisions that do not reflect the scarcity value of either water or the cost of electricity, and a culture of agrarian entitlement to free electricity.

From a water perspective, there are good reasons to believe that flat rate tariffs and cheap power contributed to accelerating groundwater use through the 1980s and 1990s [Narayana and Scott 2004]. For example, after a shift to free power in Punjab and Tamil Nadu in 1991, groundwater abstraction rates rapidly increased. As a result, between 1984-85 and 1992-93, the number of blocks registered as "dark" or "critical" in terms of groundwater overuse have been steadily increasing at 5.5 per cent a year. The impact of rapid groundwater decline is considerable. The economic pain of higher cost water, the centralisation of control over water, typically by the more wealthy, the associated health costs in terms of lower quality drinking water, and the ecological costs of groundwater decline on surface flows are all serious [Dubash 2002; IWMI-Tata Water Policy Programme 2002; World Bank 1998b].

From an electricity perspective, cheap or subsidised power, particularly administered through a flat rate, has had ripple effects through the sector. De-metering has led to a culture of unaccountability in the sector, leading to theft and line losses being hidden within the agricultural category. Crucially, it has also led to an unbounded system of cross-subsidy from industrial and commercial to agricultural users. As industrial consumers have got ever more fed up with rising cross subsidy costs of agricultural users, they have threatened to leave the system, leaving even less money for maintenance and upgrading. Indeed, the Electricity Act 2003, which facilitates industrial consumers seeking the lowest cost power, may be read as an expression of this frustration. This nest of problems has dogged the process of reforming the electricity system. Any new management system, whether private or public, faces a losing battle seeking to reform a system under the current conditions. Moreover, the current deadlock acts as a drag on efforts to electrify the 50 per cent of India's rural households without electricity. Irrigation pumpsets, which could provide the productive base on which rural electrification can be made commercially viable, are instead loss makers. The net effect is a low level equilibrium in electricity reforms, with farmers suffering ever declining supply of low quality – even if cheap-electricity, and industrial, commercial and household users facing a run-down electricity system with little prospect of improvement.

3 A Second Look at the Conventional Wisdom

The history summarised above has frequently been turned into a narrative of farmers standing in the way of much-needed national level reforms. While this may indeed be part of the picture, I believe it is too simple a presentation of reality. This next section examines more closely the situation and incentives that farmers face in order to better understand the underlying politics of the water-electricity conundrum. To do so, I examine a set of related questions: farmer contribution to subsidy burden; farmer motivations in demanding subsidy; the distribution of subsidies; and the macro-politics of farmer subsidies.

3.1 Farmers and Public Finance

To what extent do electricity subsidies to farmers contribute to the problematic state of electricity sector, and therefore state finances? That State Electricity Board (SEB) finances are in a mess, and that the burden on states is considerable, are both indisputable. In 2001-02, commercial losses of all the SEBs and electricity departments were Rs 24,063 crore, which amounted to about 23 per cent of the gross fiscal deficit of the states. Explicit subventions by the state governments, meant to compensate SEBs for subsidies, accounted for only Rs 8,680 crore. At the level of individual states, the levels of SEB commercial loss are at similar levels to important social expenditures such as on health and education.

It is also the case that subsidy accounted to agricultural consumers is the single largest share of the uncovered subsidy that forms the bulk of SEB commercial losses. The average agricultural tariff in 2000-01 of Rs 0.42 was just over 8 per cent of the average supply cost of Rs 3.50. Through the late 1990s, agricultural subsides accounted for 70-80 per cent of gross subsidies to the sector. As Figure 1 shows, agricultural and household subsidies have been rising consistently in absolute terms, even while the available cross subsidy from industry and commercial users has been relatively constant. Consequently, the cross subsidy as a proportion of the total subsidy has steadily declined, raising the pressure on state finances. All these numbers point to the importance of agriculture in understanding, and therefore addressing, the parlous condition of state finances.

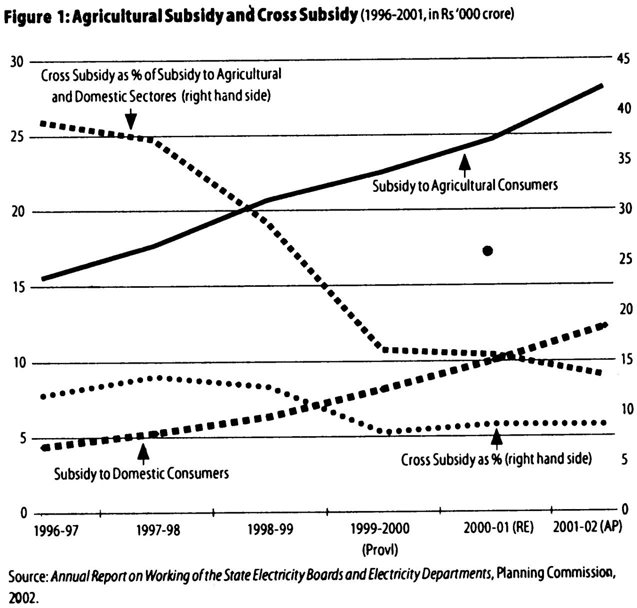
However, a growing body of evidence is confirming what many had always suspected: by no means are all the subsidies placed under the agriculture column actually going to agricultural users. Since unmetered consumption is composed of agricultural load and transmission and distribution (T&D) losses, there is considerable scope for manipulation in agricultural use, simply through apportionment of the total unmetered consumption among the two categories. In recent years, it is striking that the same picture of overestimates of agricultural use and under-reporting of T&D losses has emerged from a broad range of states.

An early study in Andhra Pradesh based on a survey of pumpsets suggests that agricultural load was overstated and T&D losses were underestimated by about 6 per cent [Sankar 2003]. In practice, it appears the electricity board maintained the T&D losses at a convenient level and booked the residual loss as agricultural consumption. Similar findings for Karnataka in 1994-95 suggest an even larger discrepancy – pumpsets accounted for 26 per cent of consumption as compared to 37 per cent booked by the utility, with T&D losses of about 30 per cent as compared to 19 per cent used by the Karnataka State Electricity Board (KSEB) [Reddy and Sumithra 1997]. The study also notes that the official assignment of T&D losses is further suspect because KSEB has been reporting decreasing losses overtime, even while the low tension (LT) load is increasing which, in the absence of system improvements, should lead to higher loss rates.

In Maharashtra, a study by Prayas Energy Group showed that the Maharashtra SEB overestimates the number of pumpsets in use, and hence agricultural consumption, by 23 per cent as compared to the minor irrigation census [Dixit and Sant 1997]. The poor state of data on which assumptions about agricultural consumption rest are illustrated by a recent MSEB tariff filing which suggests that Maharashtra's agricultural load remains roughly constant over the year, irrespective of cropping season even while the distribution loss dips mysteriously during the monsoon months when agricultural load is lowest [Prayas Energy Group 2004]! Similarly, a World Bank study in Haryana-based on pump metering found that consumption by agriculture is as much as 35 per cent below utility estimates [World Bank 2001].

Recent efforts by electricity regulatory commissions (ERCs) to scrutinise actual loss figures have added to the evidence. Based on recent tariff orders, T&D loss estimates were revised from about 18 per cent to 32 per cent in Maharashtra, from 19 per

Figure 1: Agricultural Subsidy and Cross Subsidy (1996-2001, in Rs '000 crore)



Source: *Annual Report on Working of the State Electricity Boards and Electricity Departments*, Planning Commission, 2002.

cent to 32 per cent in Karnataka and 19 per cent to 35 per cent in Andhra Pradesh and from 27 per cent to 42 per cent in Uttar Pradesh [Honnihal 2004].

While it is hard to prove definitely, several commentators suggest that a substantial proportion of agricultural consumption may, in fact, be due to theft by non-agricultural users, including commercial and industrial users, which is accounted for as agricultural consumption [Gulati and Narayanan 2003; Gurtoo and Pandey 2001; Reddy and Sumithra 1997; Sankar 2003]. Indeed, State Electricity Boards and their employees may have benefited from the ability to hide inefficient functioning and what may be collusion in theft behind agricultural use. The state-level information collated above suggests that agricultural use is, in fact, about a quarter or a third less than is reported, and that "commercial loss" or theft, combined with other factors, accounts for an equivalently greater share of total consumption.

This conclusion is supported by other circumstantial evidence, which shows that since the mid-1980s, power consumption in agriculture has far outpaced the growth in connected load, while this has not been the case for other LT users, such as industry [Gulati and Narayanan 2003; World Bank 1998a]. This observation would be true only if installed pump capacity utilisation is growing.[4] But, instead, across the country, the hours of electricity available to farmers have been shrinking, which should lead to the opposite result; connected load outstripping consumption. If much or all of this rapid growth in consumption over connected load is indeed non-agricultural consumption, it also raises a further important point: a substantial, if indeterminate, portion of the growth in electricity subsidies may be due to non-agricultural theft. Limiting this unmetered non-agricultural consumption is an important first step to containing the problem, and to ensuring that the subsidy burden does not continue to spiral out of control.

Table 1: Irrigation Costs as a Percentage of Gross Farm Income in Haryana and AP

Components of Irrigation Costs as % of Gross Farm Income	Haryana	Andhra Pradesh
Electricity tariff (average)	6-13 (8)	2-7 (4.5)
Electricity variable costs (tariff + motor burnout + maintenance) (average)	8-26 (15)	5-17 (9)
Electricity total irrigation cost (annualised fixed cost + variable cost) (average)	15-38 (25)	18-64 (34)
Diesel variable costs (average)	8-15 (12)	8-13 (11)
Diesel total costs (average)	17-45 (31)	18-78 (48)
Canal irrigation	0.5	4

Source: Based on World Bank (2001).

There are two important conclusions to be drawn from this brief survey. First, and most obviously, while farmers do contribute to problems with state finances, their contribution to the problem is substantially overstated, perhaps to the extent of 25-35 per cent. Second, knowledge of the extent to which farmers are contributing to state fiscal problems, and, equally important, how much they are likely to do so in the future (the growth in agricultural load vs other load) rests on a solution to the accounting problem.

In the absence of individual meters, full metering of distribution transformers is one important, if partial, solution to this accounting problem [Rao 2004]. It would enable an assessment of how much electricity is going to agriculture, and how much is used by others whilst being falsely attributed to agriculture. This information would also enable an estimate of the true per unit price of electricity paid by farmers, rather than an artificially low estimate based on higher than accurate consumption figures. In turn, this information would be valuable for the political decision-making process around agricultural pricing. Political debate could proceed based on a more realistic estimate of future subsidy burden, and a more accurate estimation of the proportion of the subsidy enjoyed by farmers.

3.2 Are Farmers Wrong in Demanding Subsidised Electricity?

The conventional wisdom on the motivation for subsidised electricity rests on a perception of farmers as misguided at best and greedy at worst. For example, an otherwise important and useful World Bank study (described further below) starts with the statement that progress on electricity reform has been slowed by "understandable but misplaced" farmer concern that higher tariffs would hurt them (even though the subsequent text, in my view, does not support this statement). To what extent are farmers misguided in demanding subsidised electricity? This section addresses this question by first examining the costs of electricity to farmers and discussing their "willingness to pay" for electricity.

There is indeed a potentially strong case that subsidies are bad for farmers, and that farmers are misguided in seeking continuation and even expansion of subsidised electricity. In essence, the case rests in a viscous and destructive cycle within which farmers and SEBs are trapped. Low farmer tariffs have contributed to precarious SEB finances, both directly, and by forcing higher cross subsidies from industry, which in turn results in industry exit from the grid. Parlous SEB finances contribute to poor maintenance and technical standards, which translate into poor service and rationing. Since farmers are loss-making, they are the first option when load needs to be shed. Bad quality power feeds into farmer unrest and translates into refusal to pay high tariffs for low quality. There is little doubt that farmers and electricity utilities are trapped in a low level equilibrium.

However, to say that there is a better, higher level equilibrium where farmers receive better quality electricity and electricity utilities are able to charge farmers higher prices begs the question of how to get to this higher state. The challenge lies in the transition, and it is here that there is good reason to believe farmers are being hard-headed realists, rather than either misguided or greedy, in their stance against removal of subsidies. Two studies based on survey data illuminate the economics of groundwater irrigation and shed light on farmers' political positions.

The first, undertaken by the World Bank (2001) was a substantial survey of 1659 farmers in Haryana and 2120 farmers in Andhra Pradesh (AP) complemented by an attitude survey. As Table 1 shows, a heavily subsidised tariff accounts for a relatively modest proportion – 8 per cent in Haryana and 4.5 per cent in AP – of irrigation cost. However, it is only when other costs due to poor quality power are factored in that the true cost to farmers becomes apparent. Motor burnout costs, for example, are of the same order of magnitude as tariffs. The cost of re-winding motors (not shown in the table) is 23-33 per cent of tariff in

Haryana and 80-110 per cent of tariff in AP.[5] Transformer burnout, amount of power available per day, and unscheduled power cuts were also found to take a toll on net farm income.[6] Putting tariff, motor winding costs and pump maintenance (travel and other costs) together yields a variable cost of irrigation of 8-26 per cent of gross farm income in Haryana and 5-17 per cent in AP. Marginal farmers account for the high end of these numbers while large farmers account for the low end. When annualised fixed costs are added, irrigation cost climbs to an average of 25 per cent of gross farm income in Haryana and 34 per cent in AP. For marginal farmers, these numbers climb as high as 38 per cent of gross farm income in Haryana, and 64 per cent in AP. Interestingly, the study also shows that diesel based irrigation costs – both variable and total – are of the same order of magnitude, and canal irrigation costs are a small fraction of groundwater irrigation costs.

A second study of farmers in AP based on a sample of 449 farmers, reports results with the same broad trends. Instead of benchmarking costs against gross farm income, Dossani and Ranganathan (2004) use annual income as measured by the proxy of personal expenditure, hence excluding production costs.[7] Farmers are categorised by pumpset size rather than by landholding.

Farmers are found to be massively subsidised, to the extent that on average farmers pay only 11 per cent of the cost of supply. Despite this huge subsidy, electricity tariffs are, on average, 15 per cent of income. This figure starts at a low of 3 per cent for small pump owners and rises to 24 per cent for large pump owners.[8] Pump burnouts, which happen on average 1.6 times a year, increase irrigation costs by 78 per cent, very much in line with the World Bank study. The study also examines a further cost to farmers, the practice of "rostering" or providing interrupted supply. Rostering raises effective costs by forcing farmers to re-water portions of land that were left incompletely watered, and requiring the farmer to purchase multiple pumpsets. The authors estimate that rostering leads to excess use of power by 15.5 per cent. Dossani and Ranganathan then ask how much the subsidy could be lowered if the utility took what they felt to be a slew of reasonable measures. By eliminating burnouts (and capturing the benefits for the utility through higher prices), curtailing rostering, and by raising user fees 50 per cent for pumpsets larger than 15 HP (based on willingness to pay as recorded in the survey), the authors find that average subsidy can be brought down from 89 per cent to 74 per cent, a modest drop of 15 per cent.

Main Message

The main message that emerges from these studies is that at current quality levels, the real cost of groundwater irrigation even with subsidised power is a considerable proportion of farmer costs (World Bank) or income (Dossani and Ranganathan). For marginal farmers, variable irrigation costs can be as high as a quarter of gross income, and total irrigation costs as high as two-thirds of gross income when quality problems are factored in. Phrased differently, tariff increases, without up front quality improvements, place a real burden on farmers.

Studies such as these are often used to make the argument that farmers are willing to pay more for better quality power. In its study, the World Bank indeed finds significant willingness to pay for better quality power although the details of the results are occasionally curious.[9] Even accepting the general point, studies such as this only measure what economists think farmers should be willing to pay but cannot capture their actual willingness, which rests on farmer judgments on the likelihood that quality or quantity improvements will be forthcoming in a timely manner. And the studies show quite forcefully that if tariff increases are loaded on without immediate quality improvements, the burden to small and marginal farmers, at least, will indeed, be high.

Credibility Gap

Given the current state of electricity supply to farmers, and the failure to improve quality in the last decade, it seems quite likely that SEBs face a considerable credibility gap with farmers. Farmers are well aware that agricultural load is heavily subsidised and is a loss-making segment for utilities. They also know that utilities have little prospect of recovering the costs of quality improving investments in the short or medium term, and that, so far, the volumes of bridge financing to enable short-term quality improvements simply are not available. In this context, I believe farmers quite correctly conclude that, in reality, they face a choice between low quality power at low prices, and low quality power at somewhat higher prices. In this situation, it may well be entirely rational for individual farmers to lobby for low prices, extract as much surplus from agriculture as possible, and use the surplus to exit agriculture. Indeed, there is good evidence that this is what is occurring in Gujarat [Dubash 2002]. The threat of groundwater depletion makes this exit strategy even more compelling.

Farmer willingness to participate in paying the up-front costs of improving quality are further reduced by two important perceptions. First, in conversation groundwater dependent farmers argue that they are interested in water, not electricity. From this perspective, they compare their situation unfavourably with their brethren who have access to canal irrigation at negligible cost (0.5 per cent of gross farm income in Haryana and 4 per cent in AP).[10] Admittedly, the frequency and reliability of canal irrigation is extremely poor compared to that of groundwater irrigation, but nonetheless, the perception that groundwater dependent farmers are hard done by compared to farmers in the command of surface irrigation projects remains.

Second, farmers implicitly contest the extent of subsidy they receive by arguing that the quality of the power they receive is hardly worth paying for. And indeed, there is a good basis for challenging the computation of the subsidy on sound economic grounds. Sankar (2003) argues that since agriculture is typically supplied at off-peak times there is a case for not including the fixed cost in their cost to serve. Moreover since farmers essentially face an interruptible supply, for which the standard practice is to give a price benefit, they should be given a further discount. Based on these two factors, he argues that the real cost to serve for farmers is about 50 per cent of the average cost to serve, and hence the real subsidy is, in fact, far smaller than is typically claimed.[11]

Taken together, that poor power quality imposes real costs on farmers, and that there is a considerable lack of SEB credibility on the quality question suggests that far from being misguided, farmers are being realistic and are, at least in the short-term, acting rationally in their self interest in resisting up-front tariff hikes, and even arguing for tariff reductions. While this is not a sensible medium term strategy – the prospect of ever declining power quality and quantity is highly undesirable – short run motivations appear to dominate. The need of the moment, therefore, is a strategy to bridge the credibility in the short run, and to allow the possibility of more productive medium term strategies.

3.3 Do Electricity Subsidies Benefit Only Large Farmers?

Studies on the distribution of electricity subsidies described further below are a salutary reminder that not all farmers are equal, and it is problematic and misleading to generalise across farmers. At the same time, if electricity subsidies benefit only a few, why do we not see a breakdown in farmer solidarity over the question of subsidies? This section addresses both the available evidence on subsidy incidence, and the more confused question of farmer solidarity given the distribution of subsidies.

Information available on the incidence of agricultural power subsidy is relatively thin given the available information. Yet the limited information does indicate that agricultural power subsidies are disproportionately captured by a few.

A study of Maharashtra based on data on agricultural pumpsets combined with assumptions about pump HP, crop choice, hours of use and other parameters suggests that 79 per cent of farmers receive no subsidy at all [Sant and Dixit 1996b]. Instead a small number of lift irrigation societies that control just 2 per cent of landholding receive 19 per cent of the subsidy, while owners of small irrigation pumpsets (IPS) who own 14 per cent of the land receive 80 per cent of the subsidy. In 1993-94, this translated into an absolute annual subsidy of Rs 11,777 for members of lift irrigation societies, and Rs 7,049 for small IPS. Sant and Dixit also heavily critique the use of fixed rates for electricity, noting that where water is available, fixed rates encourage the use of more thirsty crops. Thus, the effective unit electricity rate for sugar cane cultivation is Rs 0.19, while for jowar it is Rs 1.03. Put differently, sugar cane growers pay a nominal 1.1 per cent of their gross income for electricity, while jowar cultivators pay 5.2 per cent. From a water depletion perspective, the perverse incentives are clear: the thirstier the crop, the lower the cost per unit of irrigation.

The message on skewed subsidies comes through equally if not more strongly in Howes and Murgai (2003) who study Karnataka by combining household survey data and irrigation data from the National Sample Survey (NSS). They find that 72 per cent of the population is either landless or irrigates no cultivated land, and therefore is presumed to receive none of the subsidy. Moreover, the proportion of non-irrigators below the poverty line is twice as high as irrigators, suggesting the subsidy is targeted to the non-poor. Medium and large farmers (those who own more than 2 ha) account for 11 per cent of the population but receive 80 per cent of the subsidy. The subsidy is also highly unequally distributed between those who do benefit. Marginal farmers (< 1 ha) receive about Rs 3000 while large farmers (> 4 ha) receive Rs 29,000, which is about 10 times what they would receive if the subsidy were equally distributed among all rural households.

While the information is thin and limited to a few states, what is available suggests there is a strong case that agricultural power subsidies disproportionately benefit wealthy farmers. Not only is the subsidy highly regressive, its form – flat rate tariffs – also contribute to reinforcing cropping patterns that are highly problematic from a water use perspective. Despite all this, the information that subsidies are pernicious and highly regressive does not clinch the argument that subsidies should only be supported by a few rich farmers and opposed by the rest, for at least four reasons.

First, what is likely to matter most for farmers is the absolute subsidy they receive, not the relative subsidy. And there is some evidence to suggest that across the board electricity subsidies add to farmer disposable income. Dossani and Ranganathan's (2004) survey data show that electricity subsidy is equivalent to anywhere between 45 per cent (3 hp pump owners) and 130 per cent (15 hp pump owners) of farmer income (or more properly personal expenditure, which they use as a proxy for income) with an average of 120 per cent since ownership is skewed toward larger pump sizes.[12] Also, as argued above, the true subsidy to farmers may be as much as 50 per cent lower than computed here based only on the average cost to serve, due to the fact that they are provided off-peak and interruptible supply. Even so, subsidy levels half that reported by Dossani and Ranganathan, of 22.5 per cent to 65 per cent of expenditure, are considerable. If correct, and there is an important need to verify this result with other studies in other states, this result helps explain why most farmers support the subsidy even though it is regressive.

Second, agricultural power subsidies likely bring spill-over benefits to labour, and hence to landless populations and marginal farmers. Shah (1993) has long argued that increased and enhanced access to irrigation provides more labour opportunities and can also lead to higher wages. Irrigation allows double cropping and use of otherwise marginal land. While electricity subsidies may indeed lead to excess irrigation – irrigation in excess of the marginal value product – this fact is not relevant from the point of view of labourers for whom employment benefits are paramount.

Third, power subsidies are likely to be passed through to buyers in groundwater markets, which allows small and marginal farmers, as well as sharecroppers to gain from subsidies. In parts of north Gujarat, groundwater markets are regulated through a form of social negotiation and bargaining between buyers and sellers, and that electricity price is a key element in determining what is deemed a legitimate and acceptable price for water, and what is determined an exploitative price and hence contested [Dubash 2002]. Put differently, since higher electricity prices are deemed a legitimate reason for raising water prices, it is in the interest of water buyers, among whom small and marginal farmers and sharecroppers disproportionately number, to seek continuation of electricity subsides.

Finally, it is important not to underestimate the solidarity building effects of shared experience, and that farmers are likely to be not moved by economic rationality alone but by social forces. Farmers share a common experience of low quality and unreliable supply, having to irrigate their fields in the middle of the night, and dealing with unresponsive utility staff. These social factors are backed up by a strong political one – relations of power and domination in the countryside leave many small farmers and landless with little choice but to follow the lead of large farmers. In this light, appeals to an urban-rural divide, or agricultural-industrial divide, are likely far more resonant than implications that some farmers benefit more than do others.

In the light of these important qualifications, farmer solidarity is unlikely to breakdown in the light of information on the incidence of subsidies. The micro-politics of agricultural power subsidies indicate little reason to expect cracks, at least in the short-term, in farmer demands for free or cheap power. How do these demands translate to the macro-political level?

3.4 Macro-Politics of Agricultural Power Subsidies

Agricultural power subsidies are not only the key for farmers' interests, they have also become a litmus test of a government's commitment to a larger programme of economic reform. For example, conditions on power subsidies were frequently built into conditions on World Bank loans to states during the past few years. As Lal (2005) usefully suggests, politicians are forced to tack between an urban policy and financial elite (including international donors and investors) who judge actions against a long-term theoretically defined trajectory of change, and their political constituency, including farmers, for whom short-term impacts of policy measures are more important. The jagged trajectory of economic reforms, and indeed of agricultural power subsidies, can usefully be viewed through this lens.

Looking back at the recent past bears out this observation. In 2003, seemingly bold measures in Andhra Pradesh, Tamil Nadu and Punjab seemed to signal that fresh concessions to farmers were unlikely, even if old concessions would not be withdrawn. A line seemed to have been drawn in the sand. By mid-2004, all such expectations had vanished. Following the victory of Congress Party in AP, in whose campaign free power to farmers figured prominently, other states fell in line in rapid succession. Within days, the AIADMK government in Tamil Nadu, which had previously been congratulated for raising farmer tariffs somewhat and instituting metering, issued a statement that they would be stopping all metering, and would re-establish free power. Within a couple of months, Maharashtra announced free electricity to farmers and a waiver of interest on loans [*Indian Express* 2004]. Shortly thereafter, Haryana shifted from a progressively increasing fixed tariff to a flat tariff for all pump sizes that was lower than the lowest slab under the earlier tariff structure [*Financial Express* 2004].

Were these events democracy at work or raw populism? To address this question requires understanding the inner workings of state-level politics which are well beyond this paper. As the foregoing sections have argued, however, perhaps the best answer is that it was a bit of each, as is normally the case for most policy changes. However, drawing a line between and assigning proportions to each explanation is not easy to do.

In many ways, attempting to do so is fruitless, as the perception of whether power subsidies to farmers are politically important is as significant as the reality of whether they are. In AP, the Congress Party carried both rural and urban areas, which suggests that the impact of the free power pledge may be overblown. Yet, the perception was sealed, and other states rapidly fell in line. For better or for worse, the national elections of 2004 have cemented the perception that agricultural power subsidies are a potent political tool.

Given this reality, there is little point arguing what would have happened had the Congress not succumbed to the populist lure, if that is indeed what it was. Given the unfortunate history of unmetered power provided free or at a flat tariff described earlier, calling for politicians to stand firm against pressures, whether democratic or populist, is only fighting against time. And using the commitment device of a donor's condition does little to ease the long-term pressures. The conundrum of free or cheap power calls for a more permanent political solution.

4 Are Existing Options Viable?

A viable solution to the electricity groundwater conundrum should: address both the electricity and water dimensions of the problem; be a long-term and structural solution; and help to untangle the political thicket that this paper has argued surrounds the use of electricity for agriculture. This section briefly re-visits and critiques four approaches to the problem: economic, administrative, technical and institutional. While elements of these may be combined, a point I return to in the conclusion, here I keep them separate for ease of exposition.

4.1 Economic Solutions: Managing Subsidies

The conventional solution to the electricity and groundwater problem – metering plus a tariff hike – is based on a straightforward neoclassical economic interpretation of the situation. Farmers receive an incentive distorting subsidy that lowers the price of electricity and the effective price of water far below where it should be, indeed well below the average cost of supply. Therefore, tariffs need to move at least toward the cost of supply. Moreover, a per unit tariff along with metering of use should be re-introduced in order to provide signals to farmers on the scarcity value of electricity and water along with necessary metering of use. The result would be a shift out of the current low level equilibrium and to a new high level equilibrium of higher prices, but also vastly improved service quality.

At one level, there is little to fault these arguments. Metering and tariff hikes would indeed send more appropriate price signals, encourage better management and more efficient use. However, this solution ignores the political context within which the sector is embedded. It assumes that electricity can and should be treated as a commodity, but this ignores a half century during which electricity was an instrument of social policy. During this time, farmer practices and farmer investments have developed around the notion of cheap power, power at flat rates, and ultimately free power in some cases. This history has also shaped political alliances. Monetary gains, much of it benefiting from the accounting chicanery enabled by unmetered power, have become entrenched. All these practices may be bemoaned, but they cannot be wished away instantaneously.

One recent idea that seeks to manage the subsidy burden while acknowledging need for continued subsidy suggests partitioning generation to set aside low cost capacity (such as cheap hydropower plants) for rural and agricultural use [Sankar 2002]. While antithetical to the current market orientation of the sector, the idea brings many benefits. First, it provides an assured mechanism for subsidy provision, the amount of which does not vary with the political winds since it is tied to particular generating plants. Second, the subsidy is built into the supply source and does not require utilities to extract payments from governments, which have proven difficult to do in the past. Third, and perhaps most important, the subsidy is finite and not open ended. Any adjustment to cost recovery would have to occur within the window provided by the lifetime of the cheap electricity source.[13] As this last point suggests, to be fully successful, this approach would require a set of complementary policies that help the sector transition out of dependence on partitioned generation sources and cheap power as a source of subsidy.

4.2 Administrative Solutions: A 'Rational Flat Tariff'

Some critics of metering argue that metering is near impossible to implement in the Indian context of inadequate authority of utilities over farmers, lack of control over corrupt meter readers, and lack of financial incentives to comply with the regime. In Orissa, for example, after a push to install meters during the privatisation of the late 1990s, collections have steadily declined from 90 per cent of billing in 1995-96 to 75 per cent in 1999-2000. The case of India is contrasted against China, where relatively high agricultural tariffs relative to other sectors and high collection rates are seemingly effortlessly achieved. [Shah, Giordano and Wang 2004]. The absence of strong local level institutions and structures of authority, it is argued, doom any Indian effort at replicating the Chinese experience.

They advocate, instead, a flat tariff that faces few of these constraints of feasibility or cost. Moreover, proponents suggest a rational flat tariff could combine flat tariffs with intelligent supply management. For example, a supply schedule could mimic the pumping behaviour of diesel pump sets in the same area which are subject to a per unit tariff, or could be based on agronomic conditions and crop choice to mimic availability in canal systems.[14] Supply could be assured during periods of high moisture stress, and can be correspondingly reduced during the non-growing season. Advocates suggest this approach provides solutions to the problem of groundwater overdraft, limits fiscal pressures, and limits political fallout by ensuring water is provided at scarce times.

While persuasive, the case for a "rational flat tariff" is by no means watertight. First, the case against the feasibility of metering may be somewhat overblown. China is not the only country that has achieved high rural electricity collection rates. Nearer home, Bangladesh has achieved collection rates of over 95 per cent and line losses of 15-17 per cent based on a rural electrification cooperative structure [Waddle 2007],[15] and in the complete absence of anything resembling the strong local level Communist party structure that has worked to achieve the same ends in China.

Second, a rational flat rate tariff places an enormous pressure on administrative capabilities of the SEB and other authorities to be, indeed, rational. But for just the same reasons that the metering system is difficult to implement, the rational flat tariff will pose a challenge. Political pressures will simply shift from demanding lower cost to more hours of electricity. Overtime, it is quite possible that a deliberate electricity rationing system will spawn its own sub-structure of corruption and influence seeking. Moreover, the information needs of a rational flat tariff are enormous, such as pump use, agronomic patterns and so on. The more finely grained and localised the system, the more effective it will be (with the limiting case being farmer by farmer tailoring of supply, which is exactly what a metering system provides), but with greater local detail the greater are the monitoring challenge and opportunities for graft.

Finally, the implementation difficulties of the flat tariff become even greater when viewed in a dynamic context. Farmers frequently adjust cropping patterns year to year to reflect output prices, prevalence of crop-specific disease, availability of processing or marketing facilities and the like.

In sum, the rational flat tariff may be useful as a stop gap, a band aid to curtail the worst excesses of the current irrational flat tariff. However, by cementing acceptance of a lack of metering, and further undermining a per unit tariff, it risks working against a long-term solution.

4.3 Technical Solutions

One technical strategy promoted as a "no-regrets" approach calls for investing in separating out electricity feeders for agricultural pumpsets [Planning Commission 2007]. This allows closer monitoring of how much electricity is used by agriculture, even if not at the level of individual pumpsets, and limits the ability non-agricultural theft can be hidden under agricultural consumption. If a "rational flat tariff" is introduced, feeder separation also facilitates demand management targeted at agricultural users alone. For example, agriculture can be supplied electricity at off-peak times, effectively reducing the subsidy burden. There is some evidence that this approach has been fruitful in Gujarat.

Another technical measure that could help both utilities and farmers is aimed at increasing the efficiency of agricultural pumpsets. Sant and Dixit (1996a) suggest a slew of measures, such as efficiency standards and installing pipes of the appropriate size, which could reduce energy consumption by 35 per cent. For farmers, more efficient pumps mean less time consumed in irrigation and lower irrigation costs (but only if electricity is metered). Moreover, pump energy efficiency measures more than pay for themselves, a highly desirable feature in the cash strapped electricity sector.

As this discussion suggests, however, these technical solutions are potentially important tools, but will not solve the problem in isolation. Feeder separation makes monitoring of consumption more effective, and is an important instrument that complements other approaches, while pump efficiency needs metering to unlock its full potential.

4.4 Institutional Approaches: Collective Action

In recent years, various promising micro-institutional efforts have been attempted that play some role in addressing the electricity groundwater conundrum. One such is the Akshay

Prakash Yojana in Maharashtra.[16] In essence this is a demand management scheme, where villagers, through a formal resolution in their gram sabha, agree to organise themselves internally to limit use of high consumption appliances, such as agricultural pumps but also household devices such as heaters, during peak hours. This is accomplished through local institutions such as a village surveillance committee to monitor compliance. In return, the villagers are guaranteed assured supply for 23 hours in a day. Notably, the scheme started through discussion between schoolchildren who complained about lack of electricity at night with which to study, and the local utility. Based on a positive reaction from the utility and enthusiasm from villages in the area, the scheme has now spread to 5050 villages and four towns.

The gains are considerable. Participants in the programme gain from reliable access to electricity, less voltage fluctuations, and a reduction in transformer burn out. The utility gains from a peak demand reduction of 960 MW, effectively eliminating the need for a power plant that would have cost around Rs 3,000 crore [Prayas Energy Group and Kalpavriksh 2007].

Another approach builds on a recent government of India policy that calls for rural electricity distribution to be reorganised around decentralised systems using a franchisee approach as a condition for accessing funds under the Rajiv Gandhi Grameen Vidyutikaran Yojana (RGGVY). This policy is based on some early experiments with electricity distribution franchisees in Orissa [Mishra 2004]. For example, one pilot approach being tested in AP is based on a feeder level model franchisee, which aims to rationalise and ultimately improve billing and collection and provide a platform for both technical upgrades to minimise transformer failures and improved demand-side management services and end-use efficiency. This will be accomplished through an institutional form that delivers financial incentives to the franchisee, who is also accountable to a local coordination committee.[17]

If well implemented, such experiments promise a new institutional mechanism to deliver several gains necessary for resolution of the electricity groundwater conundrum, notably improved pump efficiency, better service to farmers, credibly metering and ultimately relations of trust.

Institutional solutions aimed at micro-collective action solutions are important, not least because they build trust and goodwill between the public and the utility, laying the ground for even deeper changes and reforms. However, these efforts would have to be embedded in larger changes if they are to change the current destructive cycle between groundwater use and electricity use.

5 Conclusions: Toward a Real Political Solution

The various economic, administrative, technical and institutional solutions discussed above all provide only partial basis for a resolution to the electricity-groundwater conundrum. My main argument in this paper is that the electricity-groundwater conundrum is perpetuated by farmer decisions that are entirely logical within the existing context of short-time horizons and a lack of credibility in the electricity reform process. These contextual factors have ossified overtime into a rigid political economy that traps electricity use for irrigation in a low-level equilibrium. Ignoring these political roots is neither feasible, nor necessarily desirable. At the same time, politics as usual through the party political process has only deepened the vicious cycle at the heart of the conundrum. As a result, farmers do not fare particularly well in the current situation and the costs to the electricity system are considerable. What is required is a transition path out of the current "lose-lose" situation. This path will have to be politically defined in that it will have explicitly address and engage the various interests at stake.

In this concluding Section I try to explore what the elements of a lasting political solution to the electricity groundwater conundrum might be. I tentatively suggest a three stage path that involves building a common base of understanding through improved understanding of farmer's perspectives; negotiated compromise between various parties involved; and a multifaceted implementation strategy selectively combining economic, administrative, technical, and institutional solutions. I discuss each step in more detail below.

(a) Deepen Understanding, Particularly of Farmer Perspectives: The problems of SEBs are well known: falling revenues, rising costs, shrinking cross-subsidies, lack of ability to monitor electricity use, low morale, low management ability, and internal structures that do not create incentives for efficiency. Farmers often get blamed for perhaps too large a share of these problems. There is little doubt that agricultural use does contribute to electricity problems through below cost tariffs, low collection rates, and an accounting problem due to lack of metering. This paper has argued, however, that there is an incomplete understanding of farmers' perspectives on why it is rational in the short run for farmers to continue with the status quo even in the face of declining quality of electricity supply to agriculture. The discussion here is necessarily incomplete and needs to be complemented by extensive interviews and discussion with farmers and farmers groups. Nonetheless, the following points might serve as a starting point for dialogue:

(i) there may well be a legitimate case for continued electricity subsidy to farmers in the short and medium term;

(ii) although rich farmers benefit disproportionately, the rural economy as a whole also benefits, and the absolute benefit to many, including small farmers, is significant (although much more work needs to be done to substantiate this point);

(iii) farmers are not the only nor even necessarily the main villains in undermining the finances of SEBs; more detailed work needs to be done to assess the true extent of commercial losses and the culprits;

(iv) low quality power provided to farmers is also cheaper power, and calculation of the extent of subsidies should reflect this lower-than-average cost of supplying farmers (although more work needs to be done to quantify the real costs);

(v) farmers are justified in seeking a credible commitment to improving quality of power delivered before agreeing to any changes such as metering or tariff increases.

(b) Negotiated Efforts Toward a Transition Path: Essential to a political solution to the electricity-groundwater conundrum is that it be negotiated and forged through a political process. But party politics, as Lal (2005) describes oscillates between trying to satisfy demands by urban elites for bold reforms, and farmer pressures for a more populist approach. One reason for this trend is that debates over proposed solutions to policy problems of this sort are often discussed only among policy elites and experts, and the resulting conclusions are presented as a fait accompli, provoking a political backlash when they see the light of day.

By contrast, a more discursive approach based on extensive dialogue between farmers and organised farmers interest groups, other electricity users, utilities, and government representatives may be more productive. This approach draws on the idea of "multi-stakeholder dialogues" as a way of moving forward decision-making on intractable policy issues.[18] Such dialogues, through conversation, are aimed at first understanding contending positions, then seeking to identify outcomes that all parties can agree are desirable, and finally moving to trade-offs that each set of interests are willing to make in order to move toward a mutually desirable outcome. Such dialogues are necessarily a time intensive and cumbersome process, but offer several advantages if done well.

First, if sufficient trust is built up between participants over time, they help broaden the information base for decisions. For example, how do farmers view their medium term prospects if the current cycle of low electricity prices but bad and declining supply quality continues? Second, they allow different stakeholders to understand each others' perspective. For example, the challenges of managing electricity look very different from a utility manager's perspective and from a farmer's perspective. Third, they allow identification of the costs and benefits of different measures to different groups, as an important component of working toward a shared plan of action.

Given the variation across electricity conditions and specifics of farmer interests and organisations across states, any such dialogue is likely best organised at the state-level. To be credible, such dialogues would have to be convened by a neutral forum. One possible option would be for state electricity regulators to play this role, if indeed, they are in a position to win the trust of all sides. While regulators have historically not played a role of convening dialogue, this could be a useful extension of their current tasks [Dubash and Rao 2007].

While multi-stakeholder dialogues may seem utopian, it is important to remember that most participants in this debate agree that it is possible to achieve a state in which all sides are made better off, but that there is insufficient trust to work toward that better state. Thus, utilities talk of being stymied by farmers in all their efforts toward a healthier sector. For their part, farmers are sceptical of promises of future quality improvements in exchange for metering and tariff hikes now, or of assurances that metering now will not lead to uncapped tariff hikes in the near future. It is precisely these gaps in perception and credibility that structured dialogue is meant to overcome.

(c) Crafting a Multifaceted Implementation Strategy: While dialogue among stakeholders is essential, it must also move beyond a sharing of perspectives, and towards consideration of concrete implementation steps. Here it may be valuable to consider a multifaceted approach that combines elements of the various economic, administrative, technical and institutional solutions identified above. These solutions offer an array of options that participants in a dialogue could explore, and potentially combine to knit into a transition strategy that meets social and economic objectives in a politically acceptable manner.

For example, one could imagine a viable agreement knitted around a subsidy commitment based on dedicating low cost hydro to farmers for a fixed time period, in exchange for farmers allowing metering. These efforts could be applied in conjunction with substantial public investment in pumpset efficiency and local collective action efforts through feeder management programmes to improve distribution of electricity. A package such as this would give the farmers security of a subsidy in the medium term without locking the public exchequer into a burdensome long-term commitment. But it would also start down the path of a long-term solution, through metering and enhanced efficiency of pumpsets, and local institutions for better management of use. This is but one illustrative example; other combinations of policies may be devised that cater to state-specific circumstances.

A real political solution would require all of the steps above. Without trust building and a common base of understanding, key stakeholders, notably farmers, may be unwilling to come to the table. Efforts at reform that are not embedded within a transition strategy derived from a process of negotiation are unlikely to be sustained. Adopting a single solution instead of a composite solution can lead to excess rigidity and insufficient scope to distribute the costs of adjustment across stakeholders in a politically viable fashion.

The approach laid out here is open to the criticism that it will simply take too long and that the current situation calls for urgent and desperate measures. While this approach will indeed be time intensive, piecemeal efforts at economic, administrative, technical or institutional solutions over the past 15 years and more have failed to produce a sustained solution. It may be appropriate to now attempt a more deliberate political process through state-level multi-stakeholder dialogues to produce multi-faceted and state-specific solutions to the electricity-groundwater conundrum.

NOTES

1 There is a robust debate on the relative merits of quick and stealthy reform versus slower, more transparent and deliberative reform, in the context of efforts at structural adjustment and neoliberal reform that many countries embarked upon in the 1980s and 1990s. See Rodrik (1996) for a survey.

2 See IWMI-Tata Water Policy Programme (2002) for a discussion of the varied regional "socio-ecology" of groundwater in India.

3 Indeed, recent work recommends a rapid increase in access to electricity in areas like West Bengal to ramp up access to groundwater.

4 Another, alternative explanation is that connected load is increasing, but is not reported as such because of the practice of "plate-switching" to show a lower power rating on pumps (Kishore and Sharma).

5 The range represents different assumptions on how much of the cost of rewinding motors can be attributed to poor quality electricity. The lower bound represents 70 per cent of costs, while the upper bound represents 100 per cent of costs.

6 The details of these effects are not entirely intuitive and require further exploration. For example, the effect of transformer burnout and unscheduled power cuts are significant only for medium and large farmers, while the effect of power availability is a significant cost only on marginal and small farmers [Dossani and Ranganathan 2004, pp 23-24].

7 This is a less satisfactory benchmark than gross farm income, as it excludes production costs altogether. Moreover, it is unclear how good a proxy expenditure is for income.

8 Note that while the World Bank study finds tariffs are regressive with landownership, this study finds that they are progressive with pump size.

9 For example, the study finds that marginal and small farmer willingness to pay for improvements in reliability and days lost due to transformer burnout is not significant, but it is for larger farmers. Conversely, large farmers have zero willingness to pay for an additional hour of power a day, whether in the short term or in the medium term, allowing for shifts in cropping patterns, irrigation capacity, etc. This result implies that large farmers have systematically over-invested in pumping capacity beyond the requirements of their land, rendering an additional hour of power not particularly valuable, although reliability remains valuable. For this finding to hold, small farmers have to have systematically under-invested making every hour of power precious. But since pump size is lumpy, and a minimum size is often required to access the water table, it is often the case that small farmers end up overinvesting in capacity, which is inconsistent with this data. Moreover, it is not clear why small farmers would also not value reliability.

10 That this is a politically potent argument is attested to by the use of just this argument by chief minister Y S R Reddy in his announcement of a modification to the free power policy in Andhra Pradesh [*The Hindu Business Line* 2005].

11 Shah et al (2004) also argue that the lower cost of off-peak service is seldom factored into calculations of subsidy, and additionally note that since power to agriculture is charged on a flat rate basis, the cost of metering and billing should be further deducted when computing the true cost to serve farmers.

12 Unfortunately this data is not presented by landholding size, so the benefit for small farmers cannot be isolated. It would be incorrect to assume that small farmers necessarily own small pumps, since pump Hp is driven to a great extent by hydrogeology and land size, in addition to wealth. However, from landholding data alone, the average landholding of the bottom 20 per cent is 3.1 acres, and the next 20 per cent is 6.1 acres (personal correspondence, Rafiq Dossani, 15/2/2005), which suggests that the sample includes a significant number of relatively small farmers.

13 It is worth noting that this mechanism of subsidy provision was and is used in the US through a policy of "preference power" which set aside power from large public generators such as the Tennessee Valley Authority for the use first of rural electrification cooperatives, and only then for other users. See, for example, http://home.europa.com/~ruralite/energy%20topics/Preference%20power.pdf.

14 Tushaar Shah, presentation at a workshop on 'Energy-Water Nexus: Policy Issues in Governance', Hyderabad, June 10, 2004, International Water Management Institute.

15 In reality, it is less the cooperative structure and more the strong central control of the Bangladesh Rural Electrification Board that has enabled this outcome.

16 For details, please see www.mahadiscom.in.

17 Personal communication, staff of the Administrative Staff College of India (ASCI), 26/11/07.

18 Although there is relatively little experience with such approaches in India, there is a growing body of international experience attempting to complement traditional approaches to decision-making with such stakeholder dialogues [Hemmati 2002]. In India, this effort has most explicitly been applied to disputes over water.

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