

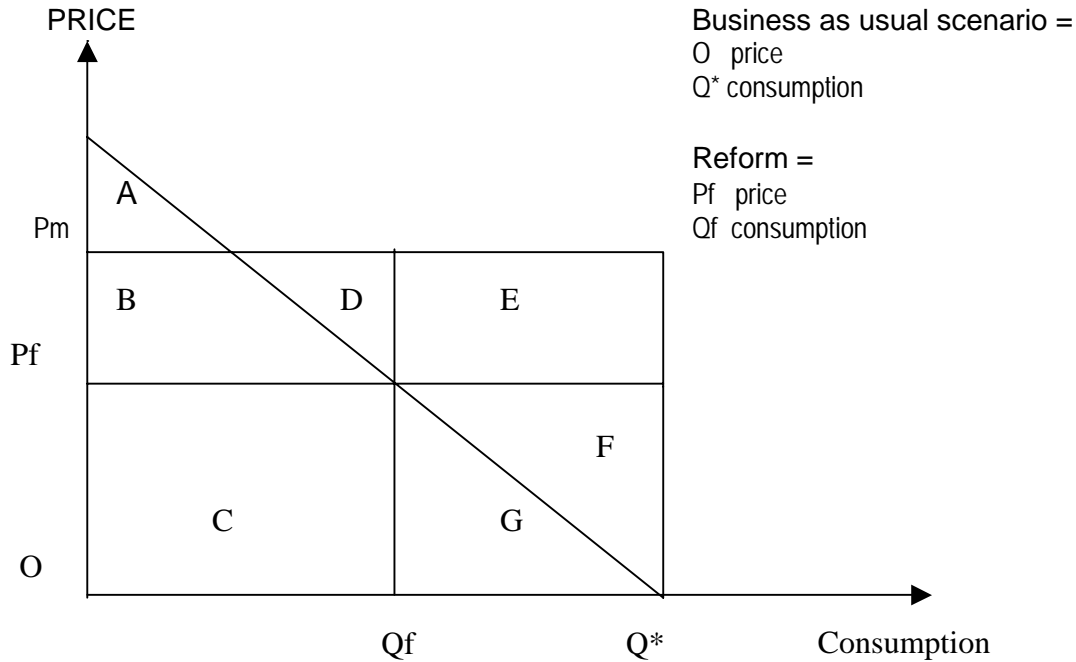
ECONOMIC BENEFITS OF METERING

Metering all consumers would allow utilities and public at large, to reliably quantify the level of electricity consumption and therefore system losses. This, in turn, would allow utilities to identify high loss areas, and prepare and implement a plan for their reduction. From the economic point of view, non-technical losses represent transfer payments, either from Government (through the utility by subsidies) or from other consumers through cross-subsidies. A methodology to estimate the net economic benefits of a metering program is included in the AP Economic Analysis Report and here below summarized. In essence, as a result of the metering program, previously unmetered consumers are expected to suffer an economic loss, (equivalent to a reduction in their consumers surplus), which is however offset by the avoided cost of supply consequent to their reduction in consumption (likely to occur with the introduction of meters). The net economic benefit is equivalent to the deadweight loss less the cost of meters. In a supply constrained scenario, however, the electricity freed up by the reduction in consumption of previously unmetered consumers can be resold. The net economic benefit therefore is not equivalent to the avoided cost of supply, but its value to other consumers, which may be taken as the difference between their willingness to pay and the cost of supplying that energy. In the case of Haryana, the assumed reduction in consumption is resulting from the metering program was taken as 50%. Assuming the costs shown in the table below, a cost of supply of Rs. 3.00/kWh, an average tariff of Rs. 2.63/kWh, a willingness to pay of Rs. 4.00/kWh, the net economic benefits of metering about 263,000 consumers in Haryana is estimated at Rs. 3,872 Million equivalent to an ERR of 46.1%.

Cost Item		Cost
Total number of unmetered consumers (as of FY2000)	283,000	
Cost of installation of one meter with box, and cabling		Rs. 5,000 (\$109)
Total Capital cost		Rs. 1,415 Million (\$30 Million)
No. Meters read each month for bi-monthly cycle (assuming 20 average number of meters read by one person)	400	
Cost of reading each meter (assuming Rs. 10,000=manmonth cost)		Rs. 25 (\$0.54)
Annual cost of reading 283,000 (6 cycles)		Rs. 42.5 Million (\$0.91 Million)
O&M cost @ 4% per year		Rs. 56.4 Million (\$1.2 Million)
Total Annual Cost		Rs. 98.9 Million (\$2.1 Million) [7% of capital cost]

The financial benefits of metering consists of the following: (i) the revenue collected from previously unmetered consumers, and (ii) since the consumption of electricity by the previously unmetered pilferers will likely decrease once paid for, the corresponding decrease in consumption may be sold to other consumers in the supply constrained situation. Assuming an average cost of supply of about Rs. 3.00/kWh and an average tariff of Rs. 2.63/kWh, and a 50% split between additional sales and cost reduction, the financial benefits would be massive at about Rs. 4.2/billion per year. The FRR is infinite because the cash flow would be positive from the start up.

Impact of Non-Technical Loss Reduction: Unmetered consumers



Assumption = No constraints in supply

Unmetered consumes Q^* units at a cost of $P_f \cdot Q^*$ [=B+D+E+C+G+F]

Consumers Benefits = [A+B+C+G]

	Utility	Unmetered Consumer	Society
Before metering			
1. Benefits		A+B+C+G	A+B+C+G
2. Cost of Production			
	-B-C-D-E-F-G		-B-C-D-E-F-G
3. Tariff Revenue to utility			
4. Net Benefit	-B-C-D-E-F-G	A+B+C+G	A-D-E-F
After metering			
5. Benefits		A+B+C	A+B+C
6. Cost of production			
7. Cost of meters	-B-D-C-X		-B-D-C
8. Tariff Review	C	-C	-X
9. Total	-X-B-D	A+B	A-X-D
IMPACT	C+E+F+G-X	-C-G	E+F-X
		Loss of cons. surplus	

Code	Description	Reference		Implementation		Cost		Benefit		Net		Total		Net		Impact of		
		Benefit	Cost	Benefit	Cost	Benefit	Cost	Benefit	Cost	Benefit	Cost	Benefit	Cost	Benefit	Cost			
		(\$)	(\$)	(\$)	(\$)	(\$)	(\$)	(\$)	(\$)	(\$)	(\$)	(\$)	(\$)	(\$)	(\$)			
200		1.02	4011	80	-	27%	1.00	300	6.71	1.70						2.70	-	
201	20	14.40	1.55	4011	80	-	137	27%	1.00	237	5.74	1.70				2.94	10%	
202	40	48.30	1.52	4011	80	96	492	27%	1.00	214	6.27	1.60	0.1	35	1.40	1.45	2.00	10%
203	60	96.30	1.52	4011	80	241	988	27%	1.00	211	6.21	1.60	0.2	220	1.20	1.39	2.20	10%
204	100	160.30	1.52	4011	80	401	1603	27%	1.00	200	5.20	1.55	0.5	351	1.14	1.72	2.35	10%
205	160	256.30	1.52	4011	80	602	2405	27%	1.00	200	4.20	1.45	0.7	421	1.01	1.74	2.36	10%
206	240	384.30	1.52	4011	80	803	3207	27%	1.00	200	3.20	1.40	0.9	541	0.91	1.74	2.36	10%
207	320	512.30	1.52	4011	80	1004	4009	27%	1.00	200	2.20	1.35	1.0	661	0.81	1.74	2.36	10%
208	400	640.30	1.52	4011	80	1205	4809	27%	1.00	200	1.20	1.30	1.1	821	0.71	1.74	2.36	10%
209	480	768.30	1.52	4011	80	1406	5609	27%	1.00	200	0.20	1.25	1.2	981	0.61	1.74	2.36	10%
210	560	896.30	1.52	4011	80	1607	6409	27%	1.00	200	0.20	1.20	1.3	1141	0.51	1.74	2.36	10%
211	640	1024.30	1.52	4011	80	1808	7209	27%	1.00	200	0.20	1.15	1.4	1301	0.41	1.74	2.36	10%
212	720	1152.30	1.52	4011	80	2009	8009	27%	1.00	200	0.20	1.10	1.5	1461	0.31	1.74	2.36	10%
213	800	1280.30	1.52	4011	80	2210	8809	27%	1.00	200	0.20	1.05	1.6	1621	0.21	1.74	2.36	10%
214	880	1408.30	1.52	4011	80	2411	9609	27%	1.00	200	0.20	1.00	1.7	1781	0.11	1.74	2.36	10%
215	960	1536.30	1.52	4011	80	2612	10409	27%	1.00	200	0.20	0.95	1.8	1941	0.01	1.74	2.36	10%
216	1040	1664.30	1.52	4011	80	2813	11209	27%	1.00	200	0.20	0.90	1.9	2101	-0.09	1.74	2.36	10%
217	1120	1792.30	1.52	4011	80	3014	12009	27%	1.00	200	0.20	0.85	2.0	2261	-0.19	1.74	2.36	10%
218	1200	1920.30	1.52	4011	80	3215	12809	27%	1.00	200	0.20	0.80	2.1	2421	-0.29	1.74	2.36	10%
219	1280	2048.30	1.52	4011	80	3416	13609	27%	1.00	200	0.20	0.75	2.2	2581	-0.39	1.74	2.36	10%
220	1360	2176.30	1.52	4011	80	3617	14409	27%	1.00	200	0.20	0.70	2.3	2741	-0.49	1.74	2.36	10%
221	1440	2304.30	1.52	4011	80	3818	15209	27%	1.00	200	0.20	0.65	2.4	2901	-0.59	1.74	2.36	10%
222	1520	2432.30	1.52	4011	80	4019	16009	27%	1.00	200	0.20	0.60	2.5	3061	-0.69	1.74	2.36	10%
223	1600	2560.30	1.52	4011	80	4220	16809	27%	1.00	200	0.20	0.55	2.6	3221	-0.79	1.74	2.36	10%
224	1680	2688.30	1.52	4011	80	4421	17609	27%	1.00	200	0.20	0.50	2.7	3381	-0.89	1.74	2.36	10%
225	1760	2816.30	1.52	4011	80	4622	18409	27%	1.00	200	0.20	0.45	2.8	3541	-0.99	1.74	2.36	10%
226	1840	2944.30	1.52	4011	80	4823	19209	27%	1.00	200	0.20	0.40	2.9	3701	-1.09	1.74	2.36	10%
227	1920	3072.30	1.52	4011	80	5024	20009	27%	1.00	200	0.20	0.35	3.0	3861	-1.19	1.74	2.36	10%
228	2000	3200.30	1.52	4011	80	5225	20809	27%	1.00	200	0.20	0.30	3.1	4021	-1.29	1.74	2.36	10%
229	2080	3328.30	1.52	4011	80	5426	21609	27%	1.00	200	0.20	0.25	3.2	4181	-1.39	1.74	2.36	10%
230	2160	3456.30	1.52	4011	80	5627	22409	27%	1.00	200	0.20	0.20	3.3	4341	-1.49	1.74	2.36	10%
231	2240	3584.30	1.52	4011	80	5828	23209	27%	1.00	200	0.20	0.15	3.4	4501	-1.59	1.74	2.36	10%
232	2320	3712.30	1.52	4011	80	6029	24009	27%	1.00	200	0.20	0.10	3.5	4661	-1.69	1.74	2.36	10%
233	2400	3840.30	1.52	4011	80	6230	24809	27%	1.00	200	0.20	0.05	3.6	4821	-1.79	1.74	2.36	10%
234	2480	3968.30	1.52	4011	80	6431	25609	27%	1.00	200	0.20	0.00	3.7	4981	-1.89	1.74	2.36	10%
235	2560	4096.30	1.52	4011	80	6632	26409	27%	1.00	200	0.20	-0.05	3.8	5141	-1.99	1.74	2.36	10%
236	2640	4224.30	1.52	4011	80	6833	27209	27%	1.00	200	0.20	-0.10	3.9	5301	-2.09	1.74	2.36	10%
237	2720	4352.30	1.52	4011	80	7034	28009	27%	1.00	200	0.20	-0.15	4.0	5461	-2.19	1.74	2.36	10%
238	2800	4480.30	1.52	4011	80	7235	28809	27%	1.00	200	0.20	-0.20	4.1	5621	-2.29	1.74	2.36	10%
239	2880	4608.30	1.52	4011	80	7436	29609	27%	1.00	200	0.20	-0.25	4.2	5781	-2.39	1.74	2.36	10%
240	2960	4736.30	1.52	4011	80	7637	30409	27%	1.00	200	0.20	-0.30	4.3	5941	-2.49	1.74	2.36	10%
241	3040	4864.30	1.52	4011	80	7838	31209	27%	1.00	200	0.20	-0.35	4.4	6101	-2.59	1.74	2.36	10%
242	3120	4992.30	1.52	4011	80	8039	32009	27%	1.00	200	0.20	-0.40	4.5	6261	-2.69	1.74	2.36	10%
243	3200	5120.30	1.52	4011	80	8240	32809	27%	1.00	200	0.20	-0.45	4.6	6421	-2.79	1.74	2.36	10%
244	3280	5248.30	1.52	4011	80	8441	33609	27%	1.00	200	0.20	-0.50	4.7	6581	-2.89	1.74	2.36	10%
245	3360	5376.30	1.52	4011	80	8642	34409	27%	1.00	200	0.20	-0.55	4.8	6741	-2.99	1.74	2.36	10%
246	3440	5504.30	1.52	4011	80	8843	35209	27%	1.00	200	0.20	-0.60	4.9	6901	-3.09	1.74	2.36	10%
247	3520	5632.30	1.52	4011	80	9044	36009	27%	1.00	200	0.20	-0.65	5.0	7061	-3.19	1.74	2.36	10%
248	3600	5760.30	1.52	4011	80	9245	36809	27%	1.00	200	0.20	-0.70	5.1	7221	-3.29	1.74	2.36	10%
249	3680	5888.30	1.52	4011	80	9446	37609	27%	1.00	200	0.20	-0.75	5.2	7381	-3.39	1.74	2.36	10%
250	3760	6016.30	1.52	4011	80	9647	38409	27%	1.00	200	0.20	-0.80	5.3	7541	-3.49	1.74	2.36	10%
251	3840	6144.30	1.52	4011	80	9848	39209	27%	1.00	200	0.20	-0.85	5.4	7701	-3.59	1.74	2.36	10%
252	3920	6272.30	1.52	4011	80	10049	40009	27%	1.00	200	0.20	-0.90	5.5	7861	-3.69	1.74	2.36	10%
253	4000	6400.30	1.52	4011	80	10250	40809	27%	1.00	200	0.20	-0.95	5.6	8021	-3.79	1.74	2.36	10%
254	4080	6528.30	1.52	4011	80	10451	41609	27%	1.00	200	0.20	-1.00	5.7	8181	-3.89	1.74	2.36	10%
255	4160	6656.30	1.52	4011	80	10652	42409	27%	1.00	200	0.20	-1.05	5.8	8341	-3.99	1.74	2.36	10%
256	4240	6784.30	1.52	4011	80	10853	43209	27%	1.00	200	0.20	-1.10	5.9	8501	-4.09	1.74	2.36	10%
257	4320	6912.30	1.52	4011	80	11054	44009	27%	1.00	200	0.20	-1.15	6.0	8661	-4.19	1.74	2.36	10%
258	4400	7040.30	1.52	4011	80	11255	44809	27%	1.00	200	0.20	-1.20	6.1	8821	-4.29	1.74	2.36	10%
259	4480	7168.30	1.52	4011	80	11456	45609	27%	1.00	200	0.20	-1.25	6.2	8981	-4.39	1.74	2.36	10%
260	4560	7296.30	1.52	4011	80	11657	46409	27%	1.00	200	0.20	-1.30	6.3	9141	-4.49	1.74	2.36	10%
261	4640	7424.30	1.52	4011	80	11858	47209	27%	1.00	200	0.20	-1.35	6.4	9301	-4.59	1.74	2.36	10%
262	4720	7552.30	1.52	4011	80	12059	48009	27%	1.00	200	0.20	-1.40	6.5	9461	-4.69	1.74	2.36	10%