



National growth by lowering energy intensity

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ABSTRACT

Prime Minister for India recently on 63rd Independence day addressing the nation from Red Fort said we need a new culture of energy conservation, since our natural resources are limited. India spent Rs. 3,40,572 cr. Excess Energy (8% loss in GDP) in 2007 compared to U.K. & Denmark. There was a saving of Rs. 65,000 cr. in 2007 by improving energy efficiency and energy conservation methods. India is facing energy shortage 12%-14% and peak power shortage of about 16%. GOI programmed 78,000 mw edition in 11th Plan. Hence energy shortage may be low in future by 12th Planning Ending. Direct loss on this account has been assessed to Rs. 43,205 cr. (1% loss in GDP) in 2008-09. This has posited the opportunity cost of the power shortage to a hopping some of Rs. 2,89,000 cr. i.e., (6% loss in GDP), thus 15% loss in our National GDP of around Rs. 42,00,000 cr. has to be reduced. Countries like Saudi Arabia, Russia, Canada, Indonesia, US., China, South Korea, have to improve energy conservation and energy affiances for better environment, since the energy intensity is from 0.419 to 0.194 kgoe for 1 US \$ GDP in PPP Terms against UK at 0.115 kgoe.

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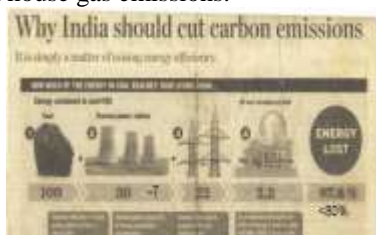
Introduction

In pursuance of the decisions taken by Prime Minister and Dy. Chairman, Planning Commission, GOI, New Delhi, it has been decided to set up 21 member "Expert Committee" in 8/2004 on Integrated Energy Policy to study the requirement of energy for the next 25 years for India. Central Cabinet approved the Document on 26th December 2008.

The 1st Page in the report "THE CHALLENGES", said, India Energy Intensity was 0.16kgoe (Kilo gram oil equivalent) per capita for 1 US \$ GDP in PPP (Purchasing Power Parity) terms compared to 0.13 kgoe for Denmark in 2003. Energy Intensity is the energy required for manufacturing a product / for extending services etc.

Background:

Energy management center used to make efforts for efficient use of energy and its conservation prior to 2001. Energy conservation act 52/2001 has been enacted on 29th September 2001 Bureau of Energy Efficiency (BEE) has been in operation from 01-03-2002, under ministry of Power, GOI, New Delhi. Energy Efficiency will not only reduce the need to create new capacity requiring mobilization of huge resources, but will also result in sustainable environmental benefits in terms of reduced green house gas emissions.



Bath by using geyser is costlier than using Gas.

14.5kg domestic gas cylinder can produce 600 buckets of hot water if the Gas used for power generation., 15 buckets hot water will only.

Recommendations of Integrated of Energy Policy

India faces an enormous challenge if it is to meet her energy requirement over the coming 25 years and support a growth rate of 8 percent. This challenge can be met with a coherent approach, which develops all available energy resources. The main area of action, for which detailed policy recommendations have been make as follows.

1. Reducing energy requirements through energy efficiency and conservation.
2. Augmenting energy resources and supply.
3. Rationalization of fuel prices to mimic free market prices that promote efficient fuel choice an substitution.
4. Promoting coal imports.
5. Accelerating power sector reforms.
6. Cutting cost of power.
7. Encouraging renewables and local solutions.
8. Enhancing energy security.
9. Promoting and focusing energy R&D.
10. Promoting household energy security, gender equity and empowerment through targeted entitlements for the poor.
11. Creating an enabling environment and regulatory oversight for competitive efficiency.

With the implementation of the recommendations of the committee, India can meet her energy requirement in an efficient, cost effective way and be on a path sustainable energy security.

For 2008 World GDP is 63,866 Bil \$, 3.97% raise TPES is 12,267 Mtoe, 1.98% raise, Electricity is 18,603 BU, 1.09% raise and CO2 29381 Mton, 1.4% raise Energy intensity is dropped by 1.89%.

For 2009 World GDP is 64,244 Bil \$, 0.59% raise TPES is 12,150 Mtoe, 0.62% drop, Electricity is 18,456 BU, 0.79% drop and CO2 28999 Mton, 1.27% drop Energy intensity is dropped by 1.56%. drop.

For India Raise has been noted for all above items, except energyintensity2008

Energy intensity is the energy required for making a product and also for extending services in any country, around the globe. Lowering energy intensity is the main objective of the developed and developing countries. Energy efficiency and energy conservation are required for all the countries for better environment of the world. Energy poverty for people of the globe has to be eradicated quickly.

Recommendations of Integrated of Energy Policy

India faces an enormous challenge if it is to meet her energy requirement over the coming 25 years and support a growth rate of 8 percent. This challenge can be met with a coherent approach, which develops all available energy resources. The main area of action, for which detailed policy recommendations have been make as follows.

Reducing energy requirements through energy efficiency and conservation. (1st of the 11 recommendations made in 8/2006)

1. Introduction : Energy is in need for all citizen of the globe, now a days.
2. Objective : To minimise excess usage of energy in all countries.
3. Data collecting : Websites, Books, Right to information Act-2005.
4. Energy Conservation methods:some
5. Presentation : Case studies of Govt. Buildings and Institutions.
6. Conclusions

Key Words: Energy Intensity, Purchasing Power Parity, Integrated Energy Policy, Kgoe.(TPES/GDP)

Nuclear Power Is Our Gateway To A Prosperous Future –

Former President: A.P.J. ABDUL KALAM

10,000 Ton coal = 500 kg of Natural Uranium

= 3.5 kg of Uranium-235 Fuel

Ref:The Hindu Dt.06-11-2011 Open page World has 441 nuclear plants in 29 countries under operation for 3,75,000 Mwe. 60 Nos. under construction, for 58600 MWe India has 20 plants under operation, for 4780 Mwe, 2 nos. under construction at Kudankulam (Tamilnadu) for 2000 Mwe + another five other than Tamilnadu.



Direct Reservation Methods

- Replacement of incandescent bulbs with CFLs in Domestic and Commercial sector. 400 mil. incandescent bulbs are in use in India and are to be replaced. 6000 MW., fall in demand, 24 mil T, CO₂ emission less in every year.
- Auto power factor maintaining at 0.95 to 0.99 lag.
- On/Off switches for street lights and group control lighting in remote operation.
- Adequate capacitors for inductive loads for buildings of 500 KW / 1000 mtrs.sq. plinth area.
- Change over to electronic chokes and electronic regulators for fluorescent lamps and fans respectively.

▪ Hissing noticed, may be air leak, or gas leak. To be attended soon.

▪ Indian Railways has 3160 electric locos and has more than 500 locos under Re-generative system (Rezon converter). Power is pumped to grid in down gradiants.

▪ ADB study said Rs. 14000 cr. investment to save 54000 MU annually i.e., Rs.10800 cr. saving at Rs. 2 per unit. Pay back period is 16 months.

▪ Room AC Temperature has to be maintained at 26⁰ C instead of 19⁰ C, like Garib Radha trains.

▪ Energy Clubs are to be opened in the colleges for making energy audit.

▪ Services to 5-6 surrounding villages may be extended by the college students on Energy Audit.

▪ Temples Churches, Masjid Heads have to motivate the devotees on Energy conservation awareness like in Kerala State.

▪

▪ 5. Supply indicating bulbs consume 6 kWh (units) electricity yearly. Hence we have to dummy all these points keeping one for domestic / commercial service, instead keeping 5 to 6 locations in each room.

▪ 6a. Switch off one of the lights which are right now not in need-Bangkok to keep grid out of critical condition.

▪ 6b. Aim to reduce electricity bill by 1% monthly.

Moon light dinner, monthly ones on roof top in candles and keep home switching off all electrical equipment for one hour Use Gas cylinders instead of electric heaters in Organizations / Institutions for Refreshments for the Guests - IIT ROORKEE

Benefits by energy conservation

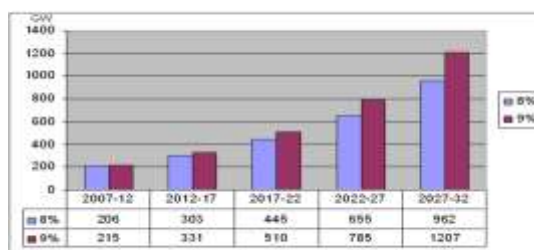
• The World has observed more benefits by Energy Conservation. Reduced CO₂ by 2.37% (-1.45%) in 2009.

• For the year 2009, 14 countries of the 19, G-20 countries reduced CO₂, highest 9.93% (Italy) to lowest 2.90 % (Mexico)

• 5 countries of the G-20 countries raised CO₂ from 2.4% (S-Arabia) to 9.66% (India)

• Only S-Africa raised CO₂ to 8.07% in 2009 from 2.48% reduction in 2008. (Ref:www.iea.org)

Plan-wise Projected Installed Capacity (GW)



SOURCE : INTEGRATED ENERGY POLICY 8/2006

ENERGY INTENSITY INDICATORS for YEARS 2003, 06 & 07

S/N	Country	TPES/GDP Kg-oel/US \$2000 PPP-2003	TPES/GDP Kg-oel/US \$2000 PPP-2005	TPES/GDP Kg-oel/US \$2000 PPP-2007
1.	China	0.225	0.216	0.197
2.	Australia	0.199	0.194	0.195
3.	Brazil	0.149	0.152	0.151
4.	Denmark	0.133	0.122	0.114
5.	Germany	0.167	0.155	0.143
6.	India	0.1607	0.1541	0.1478
7.	Indonesia	0.237	0.225	0.225
8.	Netherlands	0.184	0.157	0.151
9.	S-Arabia	0.465	0.409	0.417
10.	Sweden	0.206	0.177	0.169
11.	UK	0.145	0.132	0.115
12.	US.	0.221	0.205	0.204
13.	Japan	0.152	0.149	0.142
	World	0.2145	0.2039	0.1958

ENERGY INTENSITY – India-2009

GDP / Capita = 4567 Bil \$ / 1155 = 3953\$

TPES/Capita = 676 Mtoe / 1155 = 585 kgoe.

(kgoe – Based on Calorific value of Pri eng)

Energy intensity = 585 / 3953 = 0.1480 kgoe

Government of India has taken Denmark as reference for Energy intensity study, since the fall is on higher side.

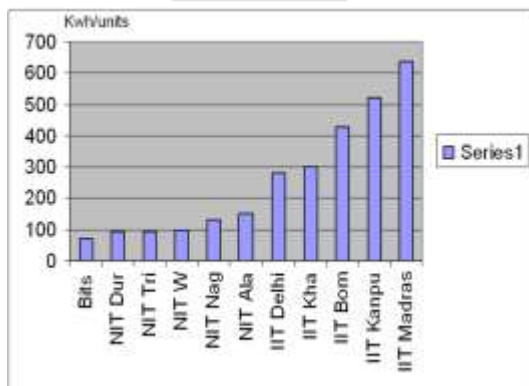
Denmark encourages mass travel, wind and solar energy.

Electricity Consumption of Reputed Technical Institutions for 2007-08 & 2008-09

Sl. No.	Name of Institution	No. of Students	Yearly 2007-08 Consumption in Kwh. in Lakhs	Yearly 2008-09 Consumption in Kwh. in Lakhs	Consumption per month per Student in 07-08	Consumption per month per Student in 08-09
1.	IIT – Kanger	4885	166.99	257.43	517	623
2.	IIT – Bombay	5420	221.94	278.62	341	426
3.	IIT – Delhi	5070	156.87	175	258	281
4.	IIT – Kharagpur	6118	277.77	250.87	375	300
5.	IIT – Madras	3699	262.00	316.96	606	637
6.	IISc-Bangalore	4000	245.46	Data availed	511	Data availed
7.	BITS Pilani	4296	37.86	36.32	77	72
8.	NIT – Nagpur	2237	28.11	30.22	106	130
9.	NIT – Allahabad	2532	57.81	54.40	183	148
10.	NIT-Durgapur	2493	30	23.39	104	93
11.	NIT – Taty	3600	77.3	41.12	257	95
12.	NIT-Warangal	2630	26.1	31.55	83	100

BITS Pilani has 90,000 LPC (Liters per day) on Solar System.
 IIT Kanger has 38,000 Do –
 IIT Nagpur has 14,000 Do –
 Students for 2008-09 have been taken almost same as previous year for electricity consumption.
 IIT Students are consuming 300-500 units monthly and IIT Students are consuming 100-150 units monthly almost 25% of IIT Students. BITS, Pilani is using lowest energy usage.
 Energy conservation is in need more in IITs.

BAR CHART



Electricity usage by each student per month in 2008-09

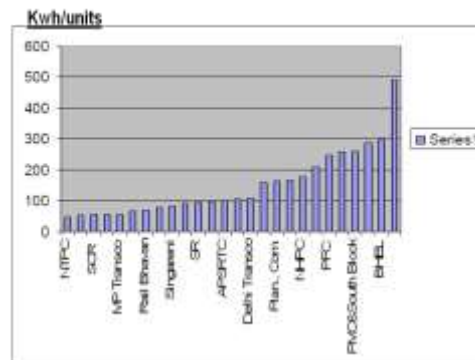
Energy Consumption of various organizations per month per employee for 2005-06

Sl. No.	Name of Organisation	Total employees in H.Q.	Yearly consumption in Kwh. Lakhs	Units/ month/ employee kwh.
1.	NTPC - Delhi	783	4.54	48
2.	REC - Delhi	363	2.26	52
3.	SCR – Secunderabad	3350	22.1	55
4.	TNEB – Chennai	2421	15.18	55
5.	M.P. Transco – Jabalpur	2325	15.4	55
6.	ONGC – Dehradun	2689	21.26	66
7.	Rail Bhawan-Delhi	3000	24.96	69
8.	A.P. Transco – Hyd.	1500	14.20	79
9.	Singareni – Kothagudem	659	6.45	82
10.	RBI – Mumbai	4000	44.89	93
11.	Southern Rly-Chennai	3313	3748	94
12.	Western Rly-Mumbai	4597	5310	96
13.	APSRTC-Hyd.	952	11.53	100
14.	Dak Bhawan - Delhi	921	11.6	105

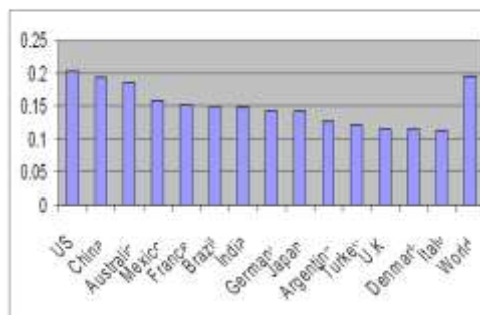
16.	Delhi Transco-Delhi	282	3.64	107
16.	Nuclear Power-Mumbai	1537	28.93	157
17.	Planning Commission-Delhi	1183	23.26	194
18.	U.G.C. - Delhi	324	6.46	196
19.	NHPC-Delhi	1623	34.5	177
20.	Shram Shakti & Tran Bhawan - Delhi	800	20.4	208
21.	PFC - Delhi	289	8.62	248
22.	Power Grid – Delhi	831	25.68	258
23.	PMO & South Block – Delhi	2954	92.4	280
24.	CEA – Delhi	1176	40.38	246
25.	BHEL-Delhi	850	30.16	296
26.	GAIL – Delhi	498	27.5	480
27.	Rashtrapathi Bhawan – Delhi (Incl. Mogal Gardens & Qtrs.)	311	55.7	

NTPC, the highest generating company (India), in Asia has 48 Kwh (Units) consumption per month per employee in 2005-06 against GAIL at 450 Kwh units consumption per employee/month.

Electricity Usage / month / employee in Main Building 2005-06



ENERGY INTENSITY OF GDP IN 2009 FOR DIFFERENT COUNTRIES
 TPES / GDP (Kgoe / \$ - 2000 PPP) per capita



CO₂ EMISSIONS IN G-20 COUNTRIES IN 2005, 06 & 07. (Per Capita)

Sl. No.	Country	2005		2006	2007	
		Population in Mil.	CO ₂ in Mil.Ton	CO ₂ Per Capita in Kg.	CO ₂ Per Capita in Kg.	
1.	China	1311	5901	3991	4282	4575
2.	Australia	20.47	377	18406	19019	18745
3.	Brazil	186.41	329	1796	1756	1812
4.	Denmark	5.42	46	8798	10143	9342
5.	Germany	82.46	613	9895	9667	9706
6.	India	1094.58	1147	1048	1126	1179
7.	Indonesia	220.56	341	1546	1500	1672
8.	Canada	32.27	547	17000	16518	17372
9.	S-Arabia	23.12	320	13827	14359	14789
10.	Russia	143.11	1544	10727	11138	11207
11.	U.K.	60.22	530	8799	8663	8605
12.	U.S.	296.28	5817	19607	19000	19098
13.	Japan	127.76	1214	9504	9492	9677
14.	France	62.7	388	6194	5673	5810
15.	Mexico	105.3	389	3698	3674	4144
16.	Argentina	38.75	141	3637	3801	4116
17.	S-Korea	48.29	449	9296	9657	10085
18.	S-Africa	46.89	330	7045	7216	7266
19.	Turkey	72.07	219	3037	3286	3568
20.	Italy	58.53	454	7757	7612	7376
	World	6432	27136	4219	4284	4382

Results

Excess Energy Spent in 2007 – Detailed Analysis :

For 2007, India used TPES (Total Primary Energy Supply) 594.91 Mtoe.

India energy intensity for 2007 = 0.1478 kgoe, TPES/GDP in PPP, in per Capita.

Denmark energy intensity = 0.1144 kgoe.

If we consider our energy intensity on par with Denmark, the excess energy saving = 0.0334 kgoe / 1 US \$ GDP / Capita.=22.6%

India total TPES in 2007 = 594.91 Mtoe.

Excess Energy India spent = 0.0334 x 594.91 / 0.1478 = 134.44 Mtoe.

= 985.45 Million Barrel oe. (1T = 7.33 Barl)

= Rs. 3,40,572 cr. (1 Bar = \$72, 1\$= Rs.48)

TPES for India = 591.91 x 7.33 = 4360.69 M.B. (Million Barrels)

TPES, cost = Rs.15,07,055 cr.

Saving in India in 2007 compared to 2006 = 0.0063 kgoe.

For 594.91 Mote, saving is 25.36 Mote = 185.875 M.B. = Rs. 64,238.46 cr.

(1 ton = 7.33 barrel, 1 barrel = 72\$, 1 \$ = Rs. 48.

This has not reflected in Energy Intensity when it is taken for 2nd decimal place In iea.org website. When it is taken up to 4th decimal place, saving of Rs. 64,239 cr. was achieved by India. (Noticed)

For 2006 TPES = 565.82 Mtoe at 0.15 kgoe. energy intensity. Saving of 0.01 kgoe, compared to 2003 = 37.72 Mote = Rs.95588 cr.

Excess Energy spent in 2009 in India

- Energy Intensity of India = 0.1480 Kgoe/per \$ GDP in PPP
- Energy Intensity of Denmark = 0.1154 Kgoe/per \$ GDP in PPP
- Energy Intensity Difference = 0.1480 – 0.1184 = 0.0326 kgoe
- Total Oil Consumption = 675.83 MTOE
- Excess Oil Consumption = 0.0326 x 675.83/0.1480 = 148.87 MTOE (w.r.tDenmark)

1 Ton = 7.33 barrel, 1 barrel = 72 \$, 1 \$ = 46 Rs.

Excess Energy Spent in India for 2009 w.r.tDenmark = 148.87 x 7.33 x 72 x 46 = **Rs.3,61,491 Cr.**

No saving in India for 2009 with respect to 2008

Excess Energy intensity in 2009 = 0.1480 – 0.1440 = 0.0040 Kgoe
 Excess Energy spent over 2009 = .004 x 675.83/0.1440 = 18.75 MTOE
 = 18.75 x 7.33 x 7 x 46 = **Rs.45,519Cr.**

Ref. iea.org

EARNINGS FOR 1 UNIT (kWh) IN G-20 COUNTRIES - 2009

- INDONESIA 6.70\$ \$ 938 Bil /140 B KWh
- INDIA 6.62\$ \$ 4567 Bil /690 B KWh
- U.K. 4.95\$ \$ 1743 Bil/352 B KWh
- U.S. 2.88\$ \$ 11357 B/3962 B kWh
- World 3.48\$ \$64244 B/18456 BKWh

www.iea.org

CO₂ Emissions in G-20 Countries for 2009

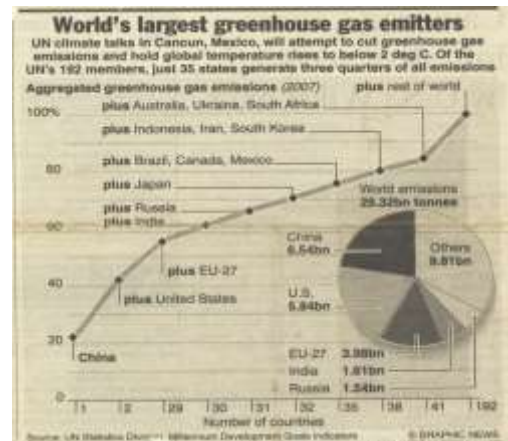
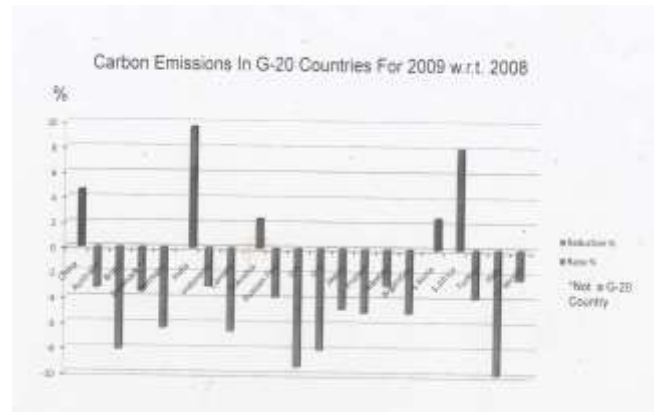
Sl.No.	Country	Pop MB	CO ₂ in M tons	Reduction %	Rate %	CO ₂ per capita in t/y
1	China	1336.00	6877.00		4.60(7.89)	5140
2	Australia	22.10	294.88	3.22(-0.32)		17868
3	Brazil	193.73	337.80	8.11(-5.07)		1744
4	Denmark	5.52	46.78	3.49(4.06)		8474
5	Germany	81.88	750.18	6.41(-0.73)		9152
6	India	1155.35	1585.82		9.66(7.83)	1373
7	Indonesia	229.87	376.26	3.08(-2.22)		1636
8	Canada	33.74	520.75	6.63(2.86)		15434
9	S.Arabia	25.38	410.47		2.40(3.7)	16166
10	Russian Fed.	141.90	1532.60	3.91(-0.41)		10801
11	U.K.	61.79	495.80	9.41(-2.37)		7538
12	U.S.	307.48	5195.02	8.99(1.02)		16896
13	Japan	127.33	1292.86	4.78(-8.87)		8503
14	France	64.48	354.30	5.07(-0.21)		5452
15	Mexico	107.44	399.67	2.95(-8.78)		3720
16	Argentina	40.28	196.61	5.08(-6.63)		4136
17	S.Korea	48.75	515.46		2.54(2.50)	10574
18	S.Africa	49.32	399.37		8.07(-2.48)	7489
19	Turkey	71.90	556.31	3.88(-0.50)		3555
20	Italy	60.19	389.28	9.63(-1.82)		6428
	World	6761.00	28995.00	2.37(-1.45)		4288

14 Countries reduced CO₂, & only 5 countries raised.

World average CO₂ reduced by 2.37% (1.45%)

Only S.Africa has rise in CO₂ to 8.07% (-2.48%)

Italy, U.K, Brazil, U.S. had highest reduction in G-20 countries at 9.93%, 9.41%, 8.16% & 8.06% respectively in 2009.



World Energy Indicator for 2003, 05, 06, 07, 08 & 09

Sl. No.	Year	Energy Intensity kgoe/\$ GDP	GDP/capita US\$ PPP	TPES in kgoe/capita	Electricity kWh/capita
1.	2003	0.2145	7868	1688	2429
2.	2005	0.2094	8492	1778	2596
3.	2006	0.2039	8809	1796	2659
4.	2007	0.1958	9295	1820	2752
5.	2008	0.1921	9549	1834	2782
6.	2009	0.1891	9502	1797	2730

Sl. No.	Year	Energy Intensity kgoe/\$ GDP	GDP / capita US \$ PPP	TPES kgoe/ Capita	Electricity kWh/capita
1.	2003	0.1607	2732	439	533
2.	2005	0.1598	3072	491	620
3.	2006	0.1541	3308	510	672
4.	2007	0.1478	3583	530	686
5.	2008	0.1440	3781	545	700
6.	2009	0.1480	3953	589	749

SELECTED ENERGY INDICATORS OF G-20 COUNTRIES FOR 2009 www.iewa.org

Sl. No.	Country	GDP/ cap in PPP US \$	TPES Kgoe/ cap	Elec/ cap kwh	Elec Usage/ \$GDP kwh	TPES/ GDP Energy intensity kgoe	% GDP raise/ drop	% Elec raise/ drop
1	China	9293	1698	2650	0.2852	0.1827	12.07*	7.24**
2	Australia	31847	5931	11039	0.3466	0.1862	0.89*	-1.21
3	Brazil	8528	1240	2200	0.2580	0.1454	0.65	1.43
4	Denmark*	29204	3371	6250	0.2140	0.1154	6.08	3.28
5	Germany	27396	3890	6781	0.2475	0.1420	0.85	-4.83
6	India	3953	585	749	0.1895	0.1480	4.55*	5.49**
7	Indonesia	4082	878	609	0.1492	0.2151	3.79*	3.4**
8	Canada	30263	7532	15467	0.511	0.2189	3.89	5.13
9	S. Arabia	14648	6217	7843	0.5354	0.4244	4.05	3.53**
10	Russian Fed.	10783	4559	6133	0.5688	0.4228	5.68	4.81
11	UK	28202	3184	5694	0.2019	0.1129	6.08	6.15
12	US	36936	7034	12844	0.3477	0.1904	4.02	4.21
13	Japan	26646	3707	7833	0.2940	0.1391	5.43	2.96
14	France	26392	3973	7495	0.2840	0.1491	3.36	2.70
15	Maxico	10452	1626	2026	0.1938	0.1556	6.6	0.50
16	Argentina	15513	1843	2744	0.1769	0.1188	0.34	1.61
17	S.Korea	23405	4701	8979	0.3836	0.2009	0.14	1.42**
18	S. Africa	10705	2921	4532	0.4234	0.2728	1.08	4.99
19	Turkey	10975	1358	2296	0.2092	0.1237	8.45	4.33
20	Italy	24508	2735	5271	0.2151	0.1116	6.43	6.81
World ave.		9502 ↓	1797 ↓	2730 ↓	0.2873 ↓	0.1897 ↓	0.49 ↓	-1.87

* Raise in GDP, Remaining all Lowered., ** Raise in Electricity.

World Energy Gross Data

Sl. No	Year	Population Mil.	GDP Bil.\$ PPP	TPES Mtoe	Electricity B.U.	CO ₂ MT
1.	2005	6432	54618	11434	16695	27136
2.	2006	6536	57564	11740	17377	28003
3.	2007	6609	61428	12029	18187	28962
4.	2008	6668	63866	12267	18603	29381
5.	2009	6761	64244	12150	18456	28999

India Energy Gross Data

Sl. No	Year	Population Mil.	GDP Bil.\$/ PPP	TPE S Mtoe	Electricity B.U.	CO ₂ MT.
1.	2005	1095	3362	537	526	1137
2.	2006	1110	3671	566	558	1250
3.	2007	1123	4025	595	610	1324
4.	2008	1140	4310	621	645	1428
5.	2009	1155	4567	676	690	1586

SELECTED INDICATOR FOR 2009 www.iaea.org

Sl.No.	Country	GDP (PPP) Bil 2000 US \$	TPES Mtoe	Elec. BU	CO ₂ MT.	Pop. Mil
1	China **	12434	2272	3545	6877	1338
2	Australia	704	131	244	395	22
3	Brazil	1652	240	426	338	194
4	Denmark *	161	19	35	47	5.52
5	Germany	2243	319	555	750	82
6	India	4567	676	690	1586	1153
7	Indonesia	939	202	140	376	230
8	Canada	1021	254	522	521	34
9	S-Arabia	372	158	199	410	25
10	Russian Fed	1530	647	870	1533	142
11	U.K.	1743	197	352	466	62
12	U.S.	11357	2163	3962	5195	307
13	Japan	3393	472	997	1093	127
14	France	1702	256	483	354	64
15	Mexico	1123	175	218	400	107
16	Argentina	625	74	111	167	40
17	S-Koria	1141	229	438	515	48.75
18	S-Africa	528	144	224	369	49.32
19	Turkey	789	98	165	256	72
20	Italy	1475	165	317	389	60
	World	64244	12150	18456	28999	6761

* Not a G-20 Country ** China exceeded US 1st Time.

US EXCESS ENERGY CALCULATIONS - 2008
 Pop. : 304.54 Mil. GDP = 11742 Bil \$, TPES = 2284 Mtoe. Elec = 4156 BU,
 CO₂ = 5596 Mt.
 Energy Intensity = 0.1945 kgoe / \$ GDP, Per Capita = 38559 \$
 Energy equivalent = 7499 kgoe / Capita
UK Pop. = 61.35 Mil., GDP = 1842 Bil \$., TPES = 208 Mtoe.
 Elec = 372 BU, CO₂ = 511 Mt.
 Energy intensity = 0.1131 kgoe / \$ GDP, Per Capita = 30029 \$
 Energy equivalent = 3398 kgoe / capita.
 Excess energy intensity spent in US w.r.t. U.K. = 0.1945 - 0.1131 = 0.0814 kgoe.
 Excess energy spent = 0.0814 x 2284 / 0.1945 = 956 Mtoe. (42%)
 = 7007 Mil. Barrel = 505 Bil \$ (1 Barrel = 72 \$)
 US saving in 2008 w.r.t. 2007 = 0.2040 - 0.1945 = 0.0095 kgoe.
 Saving in energy in oil equivalent = 0.0095 x 2284 / 0.1945 = 112 Mtoe.
 = 821 Mil. Barrel = 59 Bil \$.

2007 Excess Energy Calculations
 Excess Energy Intensity w.r.t. U.K. = 0.204 - 0.115 = 0.089 kgoe.
 Excess Energy spent = 0.089 x 2340 / 0.204 = 1021 Mtoe. (44%)
 = 7484 Mil. Barrel = 539 Bil \$
 Savings in 2007 w.r.t. 2006 = 0.206 - 0.204 = 0.002 kgoe.
 Saving in Energy in oil equivalent = 0.002 x 2340 / 0.204 = 23 Mtoe.
 = 169 Mil. Barrel = 12 Bil \$

2006 Excess Energy Calculations
 Excess Energy Intensity w.r.t. U.K. = 0.206 - 0.132 = 0.074 kgoe.
 Excess Energy spent 0.074 x 2321 / 0.206 = 834 Mtoe. (36%)
 = 6113 Mil. Barrel = 440 Bil \$.
 Savings in 2006 w.r.t. 2005 = 0.213 - 0.206 = 0.007 kgoe.
 Savings in energy in oil equivalent = 0.007 x 2321 / 0.206 = 79 Mtoe.
 = 579 Mil. Barrel = 42 Bil \$

Energy usage & Savings in US 2006 to 2008.

Sl. No.	Year	TPES Mtoe. Saving.	Saving in Bil.\$	Excess Energy Bil.\$	Excess Energy Mtoe.	Usage Mtoe	World TPES Mtoe.
1.	2006	79	42	440	834	2321	11740
2.	2007	23	12	539	1021	2340	12029
3.	2008	112	59	505	956	2284	12267
4.	2009	46	24	420	795	2163	12150

US spent 42%, 44% and 36% excess energy in 2008, 07 and 06 respectively w.r.t. U.K.
 Source : www.iaea.org

CONCLUSION

One unit (kwh) secondary energy saved = 4.35 units primary energy saved. Conservation of energy is necessary to keep coal, water, gas, oil etc for future generations.

Reduce excess energy for a product / service

Spread the message and make others also to follow.

My grandpa rode camel 🐫 , my dad car 🚗 , My self aero plane ✈️. My Child will fly in rocket 🚀, but my grand child will ride camel 🐫 ? Hence we have to **follow energy conservation.**

An African proverb says "If you want to go quickly, go alone. If you want to go far, go together. But we want go far quickly.