Indian Farmers Fertiliser Cooperative Ltd. (IFFCO) Anola, Bareilly

(i) <u>Unit profile</u> :

Towards increasing the fertiliser production, the overall national planning for utilisation of natural gas available from Bombay high, Indian Farmers Fertiliser Cooperative Ltd. (IFFCO) was entrusted for setting up a Urea fertiliser complex with annual capacity of 8.646 lakh MT of Urea at Anola, Bareilly. The site at Aonla is about 28 KM south west of Bareilly on Bareilly-Aonla road. In the year 1996 the production capacity was doubled with the commissioning of Aonla-II having Urea production capacity of 8.646 lakh MT.

Aonla-II is having a 1520 MT per day Ammonia plant and two Urea plants with a total capacity of 2620 MT per day. Steam and power generation units, inert gas generation plant, water treatment plant, cooling towers, product handling plant, Ammonia storage, Urea silo etc., are the other auxiliary units of the fertiliser complex.

Right from the inception of the project, Aonla-II has achieved several milestones. Aonla-II project was completed in 38 months and the commercial production was started in 39 months from the zero date. The project was completed well ahead of schedule and saved around Rs. 5 crores compared to budgeted cost.

IFFCO-Aonla has received following recognitions/awards till date:

1) Implementation of Aonla-I project has been taken as a model for future projects by Government of India.
2) National Award for best project implementation (second prize) by Ministry of Programme Implementation, Govt. of India.
3) Award for technical film "New Horizons – Aonla project " by FAI.
4) ASCI, Hyderabad has adopted implementation of Aonla-I project as a model case study for their general management level courses.

5) Doordarshan, Lucknow and Delhi in its national network presented the story of the Aonla-I project highlighting project completion and its other social activities.
6) Adjudged first in the country for excellence in energy conservation and management by Ministry of Power (Fertiliser sector), Govt. of India for the year 1993.
7) Commendation certificate in appreciation of the efforts made in the field of energy conservation in fertilisers sector for the year 1995 from Ministry of Power, Govt. of India.
8) National productivity council has presented a certificate of merit in the year 1995 in recognition of the performance in productivity during the year 1993-94.
9) Certified for ISO-9002 & ISO-14001 by M/s KPMG & M/s BVQI respectively.
10) FAI Award for Excellence in Safety for the year 2001-2002.
11) NSCI Safety Award-2000 (Prasansa Puraskar) from National Safety Council of India.
12) National Energy Conservation Award, 2002 (Certificate of Merit) in fertiliser sector by Ministry of Power, Government of India.
13) Fertiliser Association of India has awarded the Best Article Award (3^{rd} prize) for the article Maintenance and Inspection of a Modern Fertiliser Plant.
14) National Energy conservation Award-2003 (Certificate of Merit)
15) NSCI Safety Award-2002 (Prashansa Patra)
16) Corporate Environment Award 2002-03 (certificate of participation) from TERI in recognition of the efforts made towards environment management and sustainable initiative.
17) Golden Peacock Environment Management Award – 2005 (certification of commendation).
18) National Safety Award – 2004 (Runner under scheme-II).
19) 'Yogyata Pramana Patra' for the year 2004 by National Safety Council for developing and implementing effective occupational safety and health management system & Procedures.
20) ICQESMS 2005 Excellence Award for the paper presented in 4^{th} Indian Congress on Quality, Environment, Energy and Safety Management System by Central Board of Workers Education, Ministry of Labour and Employment.
21) Rajiv Ratna National Award-2005 for excellence in Indian Industries by the journal 'Public Sector Today'.
22) ISO-9001: 2000, ISO-14001:1996 and OHSAS-18001:1999.
23) Aonla-II has won National Award for Energy Management 2006 as an " Excellent Energy Efficient Unit"
24) ICQESMS 2005 Excellence Award for the paper presented on ' Safety and Health in Chemical Industry' and ' Hazard Identification & Risk Management'.
25) NSCI safety award-2006 (Prasansha Puraskar) from National Safety Council of India.
26) National Safety Award – 2005 (Runner under scheme-II) which was constituted by DGFASLI & Ministry Labour and employment.

(ii) Energy consumption

Include information on total energy consumption (i.e. coal, oil, gas, electricity and money value). Information on energy consumption in terms of percentage of manufacturing cost should also be presented. Also, it should highlight the specific energy consumption for the period 2004-2005, 2005-2006 & 2006-07. Good Computer Graphic Presentation related to Specific Energy Consumption may also be incorporated.

Information on total energy consumption:

S No	Description		Unit	Year		
	Raw Material	Details		2004-05	2005-06	2006-07
1.	Purchased Electricity	Quantity	Lakh Kwh	11.62	20.184	9.932
		Money Value	Rs Lakhs	217.48	163.14	46.40
2.	APMG	Quantity	Lakh SM^3	4629.909	2493.219	2228.194
		Energy (GCV)	MKcal	4328738.049	2314202.635	2068465.69
		Money Value	Rs Lakhs	18940.59	11275.78	10199.36
3.	PMTG	Quantity	Lakh SM^3	0.000	985.016	1015.708
		Energy (GCV)	MKcal	0.000	913170.115	942143.215
		Money Value	Rs Lakhs	0.00	4816.79	4638.71
4.	RLNG	Quantity	Lakh SM^3	289.859	1174.086	1098.571
		Energy (GCV)	MKcal	268681.959	1088697.073	1021753.643
		Money Value	Rs Lakhs	2194.89	8916.10	8955.46
5.	Spot RLNG (GAIL)	Quantity	Lakh SM3	0.000	0.000	45.284
		Energy (GCV)	MKcal	0.000	0.000	42264.010
		Money Value	Rs Lakhs	0.00	0.00	826.03
6.	Spot RLNG (IOC)	Quantity	Lakh SM3	0.000	0.000	328.227
		Energy (GCV)	MKcal	0.000	0.000	305639.632
		Money Value	Rs Lakhs	0.00	0.00	6380.98
7.	Swap RLNG	Quantity	Lakh SM3	0.000	0.000	45.944
		Energy (GCV)	MKcal	0.000	0.000	42629.536
		Money Value	Rs Lakhs	0.00	0.00	374.53
8.	Overdrawn Gas	Quantity	Lakh SM^3	0.000	91.93	24.585
		Energy (GCV)	MKcal	0.000	85943.822	22758.571
		Money Value	Rs Lakhs	0.00	698.12	274.38
9.	Naphtha	Quantity	MT	61193.839	78426.026	82338.072
		Energy (GCV)	MKcal	693962.489	887879.392	932617.158
		Money Value	Rs Lakhs	12309.32	20394.50	24668.91

10	F. O.	Quantity	KL	0.000	0.000	0.000
		Energy (GCV)	MKcal	0.000	0.000	0.000
		Money Value	Rs Lakhs	0.00	0.00	0.00
11	**Total**	**Electrical Energy**	**Lakh Kwh**	**11.62**	**20.184**	**9.932**
		Thermal energy	**MKcal**	**5291382.498**	**5289893.037**	**5378271.454**
		Money Value	**Rs Lakhs**	**33662.27**	**46264.44**	**56318.362**
Energy consumption in terms of percentage of manufacturing cost				77.96	82.01	83.11

IFFCO Aonla-II commenced Ammonia production on 13th Dec., 1996, Urea production on 18th Dec., 1996 and went into commercial production on 25th Dec., 1996. Since then IFFCO Aonla-II unit has attained number of achievements and records to its credit. In the very first full year (1997-98) of its operation, Aonla-II performed creditably by achieving a capacity utilisation of 105.29% and 114.45% for Ammonia and Urea plants respectively and the performance of Aonla-II has improved steadily over the years.

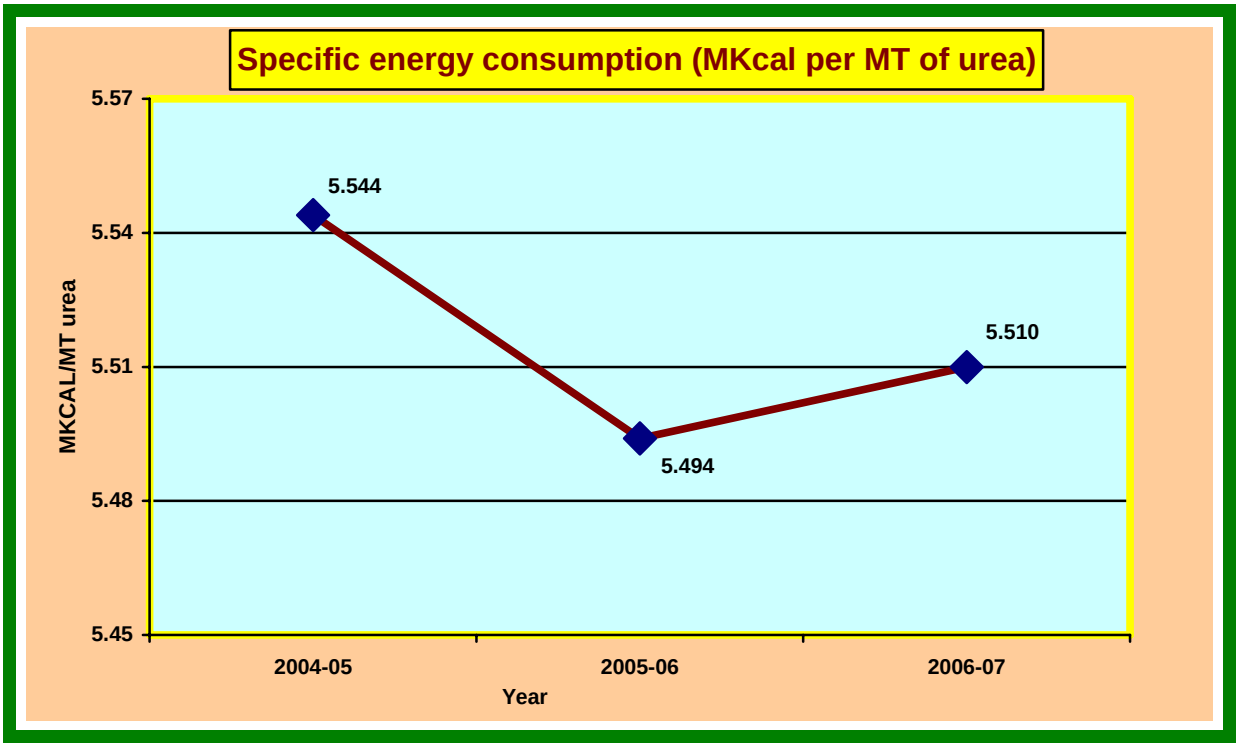
During the year 2006-2007, Aonla-II has created many new records on production and energy front and achieved many milestones as shown below:

Production:

Description	New Record (MT)
Highest daily ammonia production	1804 (07.03.2007)
Highest daily urea production	3421 (29.01.2007)
Highest monthly ammonia production	53679 (March, 2007)
Highest monthly urea despatch	90718 (March, 2007)
Highest yearly urea production	885002
Highest yearly urea despatch	885001

Energy:

Description	New Record (Gcal/MT)
Monthly B. L. specific energy consumption per MT ammonia	7.347 (Oct, 2006)
Monthly overall specific energy consumption per MT urea	5.297 (Oct, 2006)



Note: ***Energy in the Year 2006-07 is higher due to partial load operation / shutdown because of Natural Gas shortage from GAIL caused by floods in Hazira area and longer shutdon periods because of implementation of Energy Saving Project.***

(iii) Energy conservation commitment, policy and Organisational set-up:

(Please include photocopy of unit's Energy Conservation Policy, if decided)

Energy conservation is a major corporate objective for IFFCO as such, and more so, for Aonla-II unit. General Manager (Technical) coordinates the activities of energy conservation and cost reduction at IFFCO Aonla unit. Five different energy auditing, plant health and performance monitoring cells have been formed one each for Ammonia, Urea, product handling, offsites and power plant. Each cell consists of one person each from technical, respective production, maintenance and instrumentation sections with the person from technical as the coordinator of the cell. Persons selected for these cells are from middle management level having experience of about 15 years. These cells directly report to Senior General Manager. These cells have been made responsible for coordinating the various activities and its implementation so that no snowballing takes place for purpose of implementation.

Energy conservation & cost reduction measures have been classified broadly into three categories viz:

I) Change in operating practices without any investment.

II) Minor process modifications involving small investments.

III) Incorporation of major energy saving retrofits involving large investments.

In addition to this, a number of plant performance and energy reports are prepared on daily, weekly, monthly and yearly basis by this group depicting the specific consumption of inputs, plant wise specific energy consumption etc. And their deviations from design figures are circulated among the plant operating personnel which help to a great extent in monitoring and optimising the plant performance. Equipments performance evaluation, steam balance etc. Are also done periodically to find out the inefficiency in any section of plant and to take corrective action in advance.

The salient features of the strategy being followed at Aonla to reduce energy consumption are:

A) Incorporation of proven energy conservation schemes involving large investments.
B) In-house minor modifications for energy conservation schemes involving small investments.
C) Utilisation of excess steam from one plant to another.
D) Continuous efforts to reduce steam consumption of condensing turbines, thereby reducing heat loss to C.W. which is a major heat sink.
E) Measures to reduce unproductive energy consumption during start up.
F) Modifying some of the operational procedures to reduce energy consumption.
G) Trimmed operation of cooling towers to achieve most optimum cooling water temperature.
H) Good house keeping.
I) Above all, sincere efforts to remove the bottlenecks which do not permit the operation of plant at design load on a continuous and sustained basis by way of minor modification or modifying operating practices.

Copy of Energy Management Policy is attached.

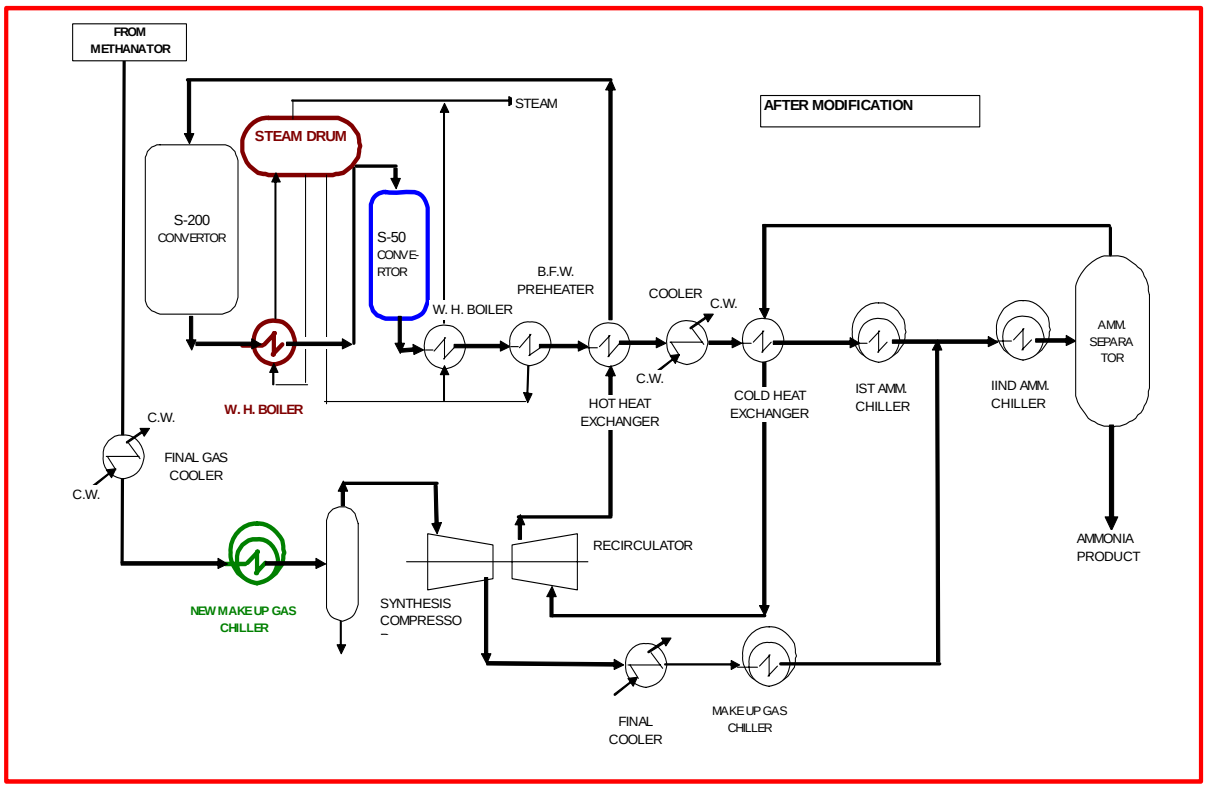
(iv) Energy conservation achievements:

Include one paragraph write up on each major energy conservation project implemented during the year 2006-2007 only

Following energy conservation measures have been implemented in 2006-07:

1. S-50 Converter with HP Boiler alongwith Make up Gas Chiller in Ammonia Plant:

Two schemes have been implemented under above title:



a. S-50 Converter with HP Boiler:

The S-50 converter has been installed downstream the existing S-200 Converter. The S-50 Converter increases the conversion per pass and reduces the gas circulation rate through the Synthesis loop and thereby the pressure drop in the loop is reduced. Thus there is saving in the power consumption of the Synthesis Gas Compressor. Furthermore, an HP waste heat boiler is installed downstream the S-50 for utilisation of the heat produced in the new converter.

The loop pressure, circulation rate, etc. has been optimized with the additional S-50 Converter.

The benefit of the S-50 converter is as mentioned above, a higher ammonia conversion which is 36% per pass in place of 30% per pass without S-50 Converter and a lower loop circulation rate.

b.Make up Gas Chiller:

In order to reduce power on the synthesis gas compressor, K 3431, a make-up gas chiller, E 3316, is introduced to cool the make-up gas from 30°C to 6°C with the help of liquid ammonia from the refrigeration loop.

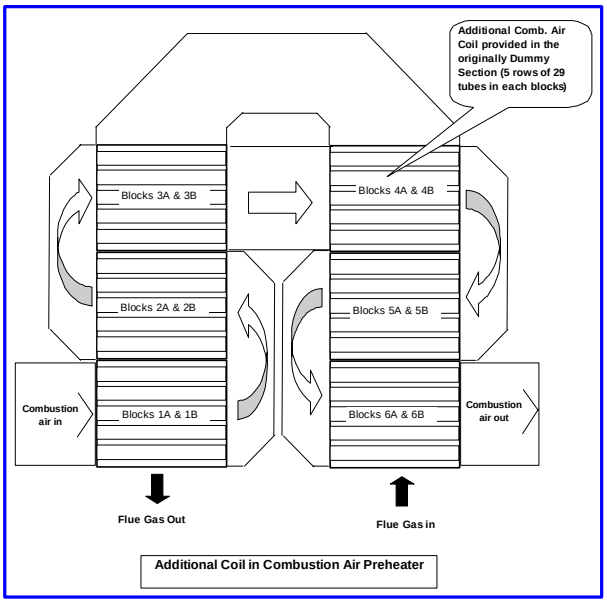
In the original plant layout the make-up gas is cooled to 30°C in the Final Gas Cooler before being compressed in the synthesis gas compressor, K 3431.

A saving in power in the Synthesis Gas Compressor is achieved by cooling the gas to 6°C by way of increasing the compression efficiency of the 1st stage of the compressor.

Net Energy Saving by above schemes: 0.125 MKcal/MT ammonia

2. Additional combustion air Module in convection Section of Primary Reformer in Ammonia Plant:

The existing combustion air pre-heater, (E-3205) in the convection section of the Primary reformer is provided with a dummy section for installation of new modules in future for increase in the surface area of the pre- heater. Installation of 290 tubes in the dummy section increased the air preheating duty and decreased the outlet temperature of the flue gas from the waste heat section.



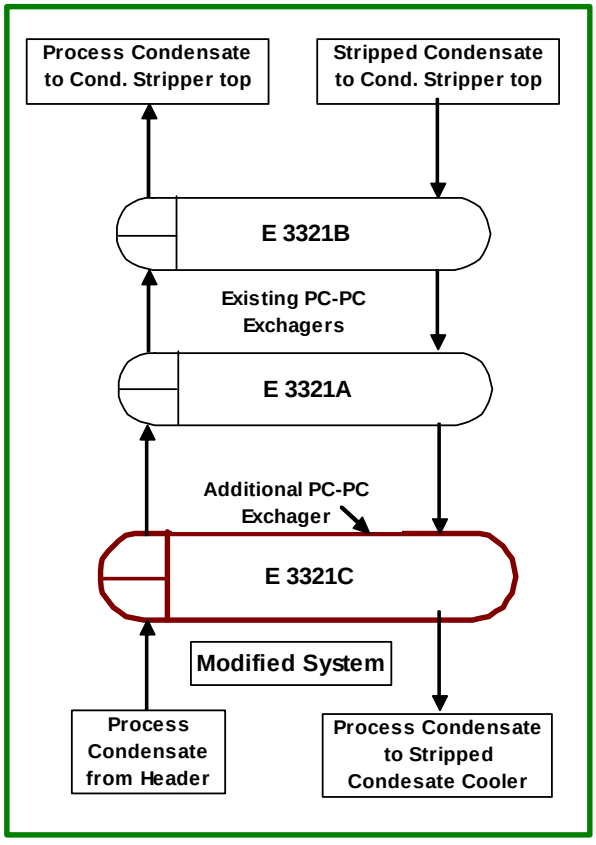
The installation of an additional heat transfer in the combustion air pre- heater E -3205 has resulted in slightly lower specific energy consumption owing to less fuel gas consumption in the Primary reformer burners.

The total energy saving by installation of additional air pre- heater module is 0.01 Gcal/ MT of ammonia.

3. Installation of additional feed/effluent exchanger in process condensate system to recover heat

In the original system heat of stripped condensate was recovered by the Plant process condensate in Condensate feed/effluent exchanger (also known as PC-PC Exchanger) comprising of two exchangers E-3321 A & B. It was observed that the process condensate from the, condensate feed/effluent exchanger, E-3321 A/B was remaining 155°C against the design temperature of 125°C. Due to high temperature at the inlet of

the water cooler, E-3322, which is located at the down stream of the condensate feed/effluent exchanger, E-3321 A/B, tube leak was observed at frequent intervals.



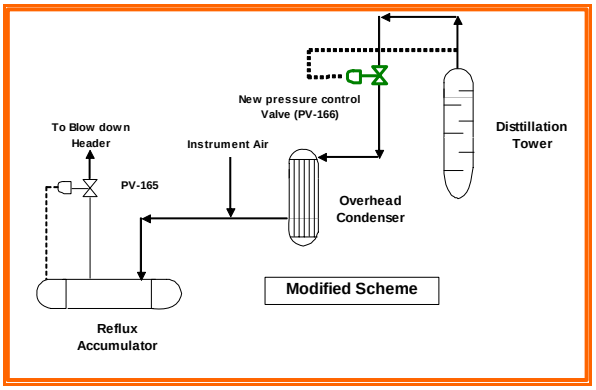
An additional feed/effluent exchanger, E 3321C has been installed in series with the existing exchangers, which has reduced the condensate temperature to the water cooler to 125°C thereby totally stopping the tube leak in the water cooler.

The total energy saving by installation of additional feed/effluent exchanger, E 3321 C is 0.04 Gcal/ MT of ammonia.

4. Provision of pressure Control Valve in Distillation Tower (C-2) Off gas line in Urea Plant

In original system, air had to be continuously put in Reflux Accumulator (V-8) to maintain Distillation Tower (C-2) pressure. Air, while coming out the vent valve (PV-165), carried ammonia along with it resulting ammonia loss through the vent stack.

Distillation tower pressure was operated at 1.5 kg/cm2g, which is being maintained through PV-165. This pressure control valve is mounted after over head condenser (E-17) and reflux accumulator (V-8).



For operational feasibility of Distillation Tower (C-2), PV-165 was kept floating. For this purpose, air had to be continuously fed in V-8, which leads to ammonia losses.

Before modification, analysis of this gaseous mixture on dry basis was as under:

A new control valve (PV-166) has been installed between Distillation Tower and Over Head Condenser (E-17) so that pressure of C-2 is maintained and air injection into V-8 is stopped. With this modification, saving of around 14 Kg/hr of ammonia has been achieved.

(v) Energy conservation plans and targets:

For achieving reduction in energy consumption of plant, many small investment energy saving schemes are under pipeline and measures also being taken for capacity enhancement.

Energy Saving Schemes, which are in the pipeline, has already been mentioned above in point No. 18. and following project has been undertaken for capacity enhancement:

Capacity Enhancement Project

The Capacity Enhancement Project (CEP) is being implemented for increasing the production capacity of Ammonia and Urea plants by around 15% and is expected to be completed in the year 2008.The present and enhanced capacities are given as under:

Plant	Unit	Present Capacity	Enhanced capacity
Ammonia plant	MTPD	1520	1740
Urea Plant	MTPD	2x1310	2x1515

Energy targets fixed for the coming years are as under:

Year	Unit	Sp. Energy Consuption
2007-08	MKcal/MT urea	5.49
2008-09	MKcal/MT urea	5.45

(vi) Environment and safety :

Safety aspect:

Aonla unit has not lagged behind on safety front also. Several safety features are in built in the design of the plant. Longest continuous accident free running figures of 947 and 1080 days have been achieved two times which is equivalent to 15.6 and 13 million man-hours respectively. IFFCO Aonla has given an utmost importance for Safety Management and very much recognized & commended for its achievement by various National Bodies. Over the years the safety performance has been improved steadily and the weighted average accident frequency rate (WAFR) and severity rate are found to be negligible or nil. A detailed disaster management action plan has been prepared to overcome any unforeseen occurrence. Well laid fire hydrant network is available with water charged condition at pressure 9 Kg/cm2g to meet any type of eventuality. Fire alarm system network has been installed and commissioned throughout the factory, consisting of automatic fire detection system and manual call alarm system. IFFCO Aonla unit has been certified for OHSAS- 18001:1999 (Amendment-I 2002) by M/s NQA-QSR, New-Delhi. IFFCO Aonla has won FAI safety award for the year 2001-02, National Safety Award – for the years 2004&2005 (Runner under scheme-II) continuously constituted by Ministry Labour and employment and got prashansha patra from National Safety Council of India for the years 2000,2002,2004 & 2006.

IFFCO Aonla has won following awards in the field of Safety Practices, Management, and for its zero accident & frequency rate:

NSCI safety award-2000 (Prasansha Puraskar) from National Safety Council of India.
IFFCO Aonla unit has won the FAI award for excellence in safety for the year 2001-2002.
NSCI safety award-2002 (Prasansha Puraskar) from National Safety Council of India.
NSCI safety award-2004 (Prasansha Puraskar) from National Safety Council of India.
NSCI safety award-2006 (Prasansha Puraskar) from National Safety Council of India.
National Safety Award – 2004 (Runner under scheme-II) which was constituted by DGFASLI & Ministry Labour and employment.
National Safety Award – 2005 (Runner under scheme-II) which was constituted by DGFASLI & Ministry Labour and employment.
ICQESMS 2005 Excellence Award for the paper presented in 4th Indian Congress on Quality, Environment, Energy and Safety Management System by Central Board of Workers Education, Ministry of Labour and Employment.
ICQESMS 2007 Excellence Award for the paper presented in 4th Indian Congress on Quality, Environment, Energy and Safety Management System by Central Board of Workers Education, Ministry of Labour and Employment.

Environment management:

To keep pace with the stringent environmental regulations and to maintain ecological balance, zero effluent technology for Ammonia and Urea plants has been selected at the outset of plant inception. An expenditure of Rs.13 crores has been incurred on various effluent treatment schemes to meet statutory requirements. The quality of liquid effluents discharged from the factory is monitored continuously and always remains much lower than the norms prescribed by the U.P. Pollution Control Board and MINAS. The lagoons constructed to store the treated effluent attract a large number of migratory birds specially during winter seasons which speaks of high quality of the effluents. The air quality is also constantly monitored by providing high volume samples at different locations around the factory campus. 80 meters wide green belt (total area 452 acres) has been developed around the factory to keep the environment clean. Efforts are being made to achieve zero liquid effluent discharge from plant. A 10 Km pipeline has been laid around plant & township for using the effluent water for irrigation of green belt.
IFFCO Aonla has won Awards in the field of environment as given below:
Certified for ISO 14001-2004, ISO:9001:2000 and OHSAS 18001: 1999 by M/s NQA-QSR, New Delhi.
Corporate Environment Award 2002-03 (Certificate of Participation) from TERI in recognition of the efforts made towards Environment Management and sustainable initiatives.

Golden Peacock Environment Award – 2005 (certificate of commendation).

Carbon Dioxide Recovery Plant:

IFFCO has always endeavored to use the cheapest available feed/fuel to reduce the cost of production and subsidy outgo of Government of India. Thus IFFCO has installed 450 MTPD Carbon dioxide Recovery (CDR) Unit at a cost of Rs. 58.8 Crores in Dec, 2006 to avoid the usage of costlier Naphtha to meet the shortfall of carbon dioxide (CO2). Carbon dioxide from the flue gases of Primary Reformer of Ammonia Plant is recovered and used for urea production. This has reduced 450 MT per day CO2 emissions to the atmosphere.