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ITER PROGRESS CITED

Soviet leader cites ITER to European Parliament.

The ITER was recently cited by an eminent leader as an outstanding example of international co-operation. Mr. Mikhail Gorbachev, speaking before the Parliamentary Assembly of the Council of Europe in Strasbourg on 6 July 1989, included the following statement.

"In 1985 in Paris President Mitterand and I put forward the idea of developing an international thermonuclear experimental reactor. It is an inexhaustible source of environmentally clean energy.

Under the IAEA aegis this project - the result of pooling scientific capabilities of the Soviet Union, West European countries, the United States, Japan, and other countries - is moving to the stage of practical research.

Scientists believe that such a reactor could be built by the end of the century. It is a great achievement of academic thought and technological art, which will serve the future of Europe and the entire world."

ISTAC MEETING IN GARCHING

by N. Pozniakov, ISTAC Secretary

Advisory Committee reviewed R&D and design status.

Preceding by two weeks the ITER Council meeting, the third official meeting of the ITER Scientific and Technical Advisory Committee (ISTAC) was held in Garching from 26 to 28 June 1989. In accordance with the ITER Council (IC) charges to the ISTAC, extended from 1988 through 1989, three principal topics were addressed in the course of the meeting:

- Progress in implementation of Technology R&D Programme,
- Physics R&D Programme, and
- Status of the Design Activities.

Technology R&D tasks have been undertaken.

ITER Design Unit Leaders described the progress being made in all main areas of the ITER Technology R&D Programme, namely: "Blanket", "Plasma Facing Components", "Magnets", "Fuel Cycle", "Heating and Current Drive" and "Maintenance." The ISTAC concluded that the progress in the planned technology R&D by the four Parties had been good, especially considering the large number of areas to be covered and the large number of groups involved in the work. At the same time, the ISTAC made specific recommendations aiming at the achievement of the technology R&D product, which could be efficiently used for resolving those particular problems that ITER designers now face. Among the recommendations are those addressed to breeding blanket selection, plasma-facing components design, current drive techniques development and others.

A plan for co-ordinated efforts by the four Parties on ITER-related Physics R&D in 1989/90 was submitted by the ITER Management Committee to the ISTAC for assessment. The creation of this programme was the result of the IC call for voluntary contributions from the ITER Parties to meet the ITER physics R&D needs.

This call produced a very positive response: more than 140 R&D actions were offered. (An overview of the Physics R&D is given in the following article by Dr. F. Engelmann, who led the efforts of the ITER team in compiling this programme.)

Physics R&D tasks, both current and longer range, are co-ordinated.

The ISTAC found that the presented ITER-Related Physics R&D Programme plan has appropriately focussed the Parties' efforts, which should provide good coverage of most of the major physics issues affecting the design of ITER. The exceptions, where intensified or redirected activity is needed, were identified. The ISTAC recognized, however, that the requirement that the current plan include only tasks that can be performed by the end of 1990 has imposed constraints on the content of the Physics R&D Programme. Since it has generally been difficult to initiate new activities on such a short time-scale, the proposed R&D Programme is mainly composed of activities that were already part of on-going programmes, or that have resulted from moderate redirection of existing programmes. Taking this into account, the ISTAC recommended that the ITER team prepare an extended Physics R&D Programme that serves to maintain focus of the world tokamak programmes on major ITER-related issues beyond 1990, to ensure the availability of the additional data needed should the ITER activities proceed into the Engineering Design phase. A similar recommendation was made with regard to the Technology R&D Programme as well.

Comprehensive presentations on the status of the Design Activities, made by the ITER Project Unit Leaders, covered the four main areas: "Physics," " Basic Device Engineering," "Nuclear Engineering" and "System Analysis." Progress made in the design since October 1988, when the ISTAC reviewed the results of the Definition Phase, was reported. Reports included data base development, design integration and optimization and proposals to solutions of the critical issues. The strong emphasis now being put on the safety and environmental aspects of the ITER design was evident.

Co-ordinated design is progressing, addressing remaining issues.

The ISTAC concluded that substantial steps forward were being made in all major areas of the machine design, though some important design issues, such as volt-second capability, constraints with regard to the divertor and difficulties associated with the transition from the physics to the technology phase, still need more detail analyses.

Critical issues should be accommodated by further design optimization and, possibly, by the integration of some innovative technological approaches in the machine design. In this regard, some recent developments in fusion technology were considered; particularly the experiments at JET and JT-60 with beryllium and a new type of launchers for current drive, respectively. The results of those experiments are encouraging and may have a positive impact on the ITER design.

Participants in 26-28 June 1989 Meeting of ISTAC at ITER Technical Site, Garching, FRG

ITER-RELATED PHYSICS R&D ACTIVITIES

by F. Engelmann, ITER Physics Group

When the European Community, Japan, the Soviet Union and the United States, with assistance from the IAEA, were setting up the ITER Conceptual Design as a quadripartite activity, it was realized that for this work to be successful it was essential to imbed it in the fusion research and development programmes of the four Parties. It was considered necessary not only to transmit all the ITER-relevant information being generated by the four fusion R&D programmes to ITER, but also to ensure that those R&D activities of the four Parties would "focus on the feasibility issues critical to a conceptual design that meets the ITER objectives."

ITER physics R&D needs are being met by voluntary contributions by Parties.

Early in the joint activities, the four Parties agreed that the approximately $ 10 M per year that each Party had planned to spend on ITER-related R&D should be applied entirely to technology development to meet ITER needs. Concurrently the Parties agreed to implement a "voluntary" ITER-Related Physics R&D Programme to which the fusion programmes of the ITER partners would contribute over the years 1989 and 1990 according to the possibilities of the tokamak research programmes of the respective countries. This way of proceeding does not imply any difference in priority between the physics and technology R&D needs.

Needs were described in 1988.

The first step in setting up the Physics R&D Programme was the definition of a list of ITER-Related Physics R&D Tasks, covering specifically either directly design-related issues or areas of performance-related tokamak physics that were not sufficiently addressed for ITER purposes by the on-going programmes of the Parties. This list was made by the ITER team during the Definition Phase of ITER in summer 1988. At the same time, technical descriptions of the problems to be covered under each task were developed. Table 1 is the current version of the list. It must be emphasized that these tasks, of course, do not cover all the physics R&D needs of ITER. Information essential to ITER is being obtained in areas of tokamak physics that are not listed but are well covered by the on-going fusion programmes of the ITER Parties. Such areas include the full range of energy and particle transport issues, beta and q limits, heating physics and systems (the latter being also addressed as part of the ITER Technology R&D Programme) as well as lower hybrid and bootstrap current drive.

Parties have offered 142 actions.

After presentation and discussion of these Physics Tasks during the ITER Scientific and Technical Advisory Committee (ISTAC) and ITER Council meetings in autumn 1988, the preparatory work for calling for contributions started within the fusion programmes of the four Parties. A decision on the organizational structure of the ITER-Related Physics R&D Programme and a common format for the description of the technical content of the individual contributions was reached in January 1989. The offers to contribute were received in February/March 1989. The response was very positive, indeed: 130 actions could be included in the programme proposal which was worked out and discussed by a special group set up by the ITER Parties which met at Garching on 14 and 15 March 1989. This programme proposal together with twelve additional actions that had been offered in the meanwhile, was considered and endorsed by the ISTAC at its meeting on 26 to 28 June at Garching (see Table 1). It is foreseen that the results of this work will be laid down in more than 300 reports from the responsible investigators to the ITER Team during 1989 and 1990. Summary reports on progress will be made by contributors at the end of September 1989, the end of March 1990 and the end of September 1990. Several of the actions included in the programme proposal constitute collaborative efforts among groups from different ITER Parties. Table 2 indicates the experimental facilities in which the work contributed by the Parties is being done.

The ITER-Related Physics R&D Programme provides a very satisfactory coverage of most of the tasks. For many tasks several contributions will be made, in part complementary and in part overlapping. This will allow cross checking the results and, therefore, a quite solid data base can be expected to result from the work.

TABLE 1. ITER-RELATED PHYSICS R&D TASKS

A. Design-Related Issues

I. Power and particle exhaust conditions

1. Power and helium exhaust conditions
2. Radial distribution of helium in high-temperature tokamak discharges
3. Viability of a radiative edge
4. Sweeping of the thermal load on the divertor target
5. Characterization of low-Z materials for plasma-facing components
6. Characterization of high-Z materials for plasma-facing components

II. Disruptions

7. Characterization of disruptions
8. Control of disruptions

III. Start-up related issues

9. Use of RF in plasma formation and preheating
10. Use of RF in current initiation
11. Scaling of volt-second consumption during current ramp-up in large tokamaks

IV. Other

12. Alpha-particle losses induced by the toroidal magnetic field ripple
13. Compatibility of plasma diagnostics with ITER conditions

B. Performance-Related Issues

I. Bulk plasma performance

14. Steady-state operation in enhanced confinement regimes (H-mode and "enhanced" L-mode)
15. Comparison of theoretical transport models with experimental data
16. Control of MHD-stability
17. Density limit
18. Plasma performance at high elongation
19. Alpha-particle simulation experiments

II. Non-inductive current drive

20. Electron cyclotron current drive
21. Ion cyclotron current drive
22. Impact of Alfven wave instability on neutral beam current drive

III. Central fuelling

23. Proof of principle of fuelling by injection of field-reversed compact toroids

TABLE 2. FACILITIES EMPLOYED BY PARTIES IN CONTRIBUTIONS TO ITER-RELATED PHYSICS R&D PROGRAMME

TASKS	ITER PARTY	EC										JA				SU					US						
	EXPERIMENTAL FACILITY	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	
Design-Related																											
01	Power and He exhaust conditions	●	-	●	●	●	-	-	-	-	-	●	●	-	●	-	-	-	-	-	●	●	●	-	-	-	01
02	radial distribution of Helium	●	-	●	●	-	-	-	-	-	-	●	-	-	-	●	●	-	-	-	●	●	●	-	-	-	02
03	Viability of a radiative edge	-	-	●	-	●	-	-	-	-	-	●	-	-	-	-	-	-	-	-	●	-	●	-	-	-	03
04	Divertor sweeping	-	-	-	-	-	-	-	-	-	-	●	-	-	-	-	-	-	-	-	-	-	●	-	-	-	04
05	Low-Z Materials for PFC	●	-	●	●	●	-	-	-	-	-	●	-	-	-	-	-	-	-	-	●	-	●	-	-	-	05
06	High-Z Materials for PFC	-	-	-	-	-	-	-	-	-	-	●	-	-	-	-	-	●	-	-	-	-	-	-	-	-	06
07	Characterization of disruptions	●	-	-	-	●	-	●	-	-	-	●	●	-	-	●	-	●	-	●	●	●	●	●	-	-	07
08	Control of disruptions	-	-	-	-	●	-	-	●	●	-	●	●	-	-	●	-	-	●	●	-	●	●	●	-	-	08
09	RF plasma formation/preheating	-	-	-	-	●	-	-	-	-	-	●	●	●	-	●	-	-	-	●	●	-	●	-	-	●	09
10	RF plasma current initiation	-	-	-	-	-	-	-	●	-	-	●	-	●	-	-	-	-	-	-	-	-	●	-	-	-	10
11	Ramp-up consumption of V-s	●	-	-	●	●	●	-	-	-	-	●	●	-	-	●	-	-	-	-	●	-	●	-	-	-	11
12	Ripple losses of alpha particles	-	-	-	-	●	-	-	-	-	-	-	-	-	-	-	-	-	-	-	●	-	-	-	●	-	12
13	Plasma diagnostics	-	-	-	-	-	-	-	-	-	-	●	-	-	-	-	-	-	-	-	●	-	-	-	-	-	13
Performance-Related																											
14	Steady-state, enhanced confinement	●	●	-	●	-	-	-	-	-	-	●	●	-	-	-	-	-	-	-	●	●	●	-	-	-	14
15	Test theoretical transport models	●	●	●	●	-	●	●	-	-	●	●	●	-	-	●	-	-	-	-	●	-	●	-	●	-	15
16	Control of MHD activity	●	-	-	●	●	-	-	-	●	-	●	●	-	-	●	-	-	●	-	●	●	●	●	-	-	16
17	Density limit	●	-	●	●	-	-	-	-	-	-	●	●	-	-	-	-	-	-	●	●	-	●	-	●	-	17
18	Performance at high elongation	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	●	-	-	-	-	●	●	-	-	-	18
19	Alpha-particle simulations	●	-	-	-	●	-	-	-	-	-	-	-	-	-	-	-	-	-	-	●	-	●	-	-	-	19
20	Electron cyclotron current drive	-	-	-	-	●	-	●	●	-	-	-	●	●	-	●	-	-	-	-	-	-	●	●	-	●	20
21	Ion cyclotron current drive	●	-	-	-	-	-	-	-	-	-	●	●	-	-	-	-	-	-	-	-	-	●	-	-	-	21
22	Alfven wave instability on NBCD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	●	-	●	-	-	-	22
23	Injection of F-R compact toroids	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	●	-	-	23

A=JET	JET	J=	NFR	Tuman-3	
B=TEXTOR	EB	K=JT-60	JAERI	S FT-1	Ioffe I.
C=TEXTOR	KFA	L=JFT-2M	JAERI	FT-2	
D=ASDEX	IPP	M=WT-3	Kyoto U.	T=TFTR	PPPL
E=TORE-Sup	CEA	N=LINEAR	Nagoya U.	U=PBX-M	PPPL
F=FTU	ENEA	0=T-10	Kurchatov	V=DIIID	GA
G=RTP	FOM	P=TVD	Kurchatov	W=MTX	LLNL
H=DITE	UKAEA	Q=T-3M	Kurchatov	X=ATF	ORNL
I=COMPASS	UKAEA	R=TO-2	Kurchatov	Y=VERSATOR II	MIT

Significant new results are anticipated to be obtained within 1990 on most of the tasks, but in many cases more definitive results will become available after 1990, typically within the first four or five years of the next decade.

Intensified efforts in some areas are being requested.

An area in which a strongly intensified effort will be needed over the next years is power and particle exhaust. The work in this field will have to include also testing of new concepts in order that an optimized solution can be developed for ITER. Other areas requiring more attention include the investigation of disruptions and in particular disruption control, non-inductive current drive by RF waves especially also for reducing the transformer flux swing needed for current ramp-up, and issues related to the physics of fusion alpha-particles in a tokamak plasma. A special case is the adaptation and development of diagnostics for ITER conditions. It has been recognized that this cannot be done adequately within a voluntary programme, but requires design-specific R&D activities. Parties will be asked to initiate such activities as soon as the diagnostic needs of ITER and the impact these diagnostics have on the device are better identified. A Workshop for this purpose was held from 10 to 14 July at Garching.

Contributors and ITER team are communicating effectively.

Communication between the contributors and ITER will be ensured, on the ITER side, by co-ordinators, responsible for given areas of tokamak physics within the organization of each ITER Party, and in the laboratories by responsible investigators who are directly involved in the research work. It is recognized that the success of the programme crucially depends on an effective interaction between the co-ordinators and the responsible investigators, which ensures that full information on the results of the work in each area is transmitted to ITER as well as to all of the contributors, and, in addition, to the fusion programmes of the ITER Parties in general.

Longer-range efforts have been outlined.

Owing to the importance of a continuing Physics R&D effort after 1990, it was recommended by ISTAC that an extended programme be produced. An outline of this extended Physics R&D Programme for ITER will be worked out by the ITER Team in summer 1989. The main areas to be covered by such a programme are:

(i) power and particle exhaust physics (i.e. the combined areas of the physics of the plasma edge and plasma-wall interaction as well as impurity control, with due attention to new concepts);
(ii) disruption control and operational limits;
(iii) steady-state operation in enhanced confinement regimes and understanding of the transport mechanisms prevailing;
(iv) long-pulse operation (including the use of non-inductive current drive); and
(v) ignition physics.

The programme will have to ensure that the additional information needed when a detailed design of ITER is being performed will be made available. It will be based on the tokamaks presently operational and the new and upgraded devices coming into operation in the early nineties.

Editor's Note

Design work is integrated.

ITER design activities are highly integrated, technically as well as internationally. The design of the poloidal field system, described in the following article, is a good example. The system has its own distinct functions that it must perform, but its design is strongly interconnected with that of other parts of the tokamak machine. The way that design solutions are worked out through close co-operation with other units of the ITER team demonstrates the process of design integration.

POLOIDAL FIELD SYSTEM DESIGN ACTIVITIES

by Y. Shimomura, Leader, Poloidal Field System Design Unit

Poloidal field system controls plasma.

In the ITER tokamak, the shape of the plasma and its location within the toroidal vacuum vessel are controlled by the poloidal field (PF) system. This system, shown schematically in Fig. 1, consists of passive and active stabilizers to control fast vertical displacements and a slow control system for maintaining plasma equilibrium with superconducting (SC) poloidal field coils. Dimensions of these coils are listed in Table 1.

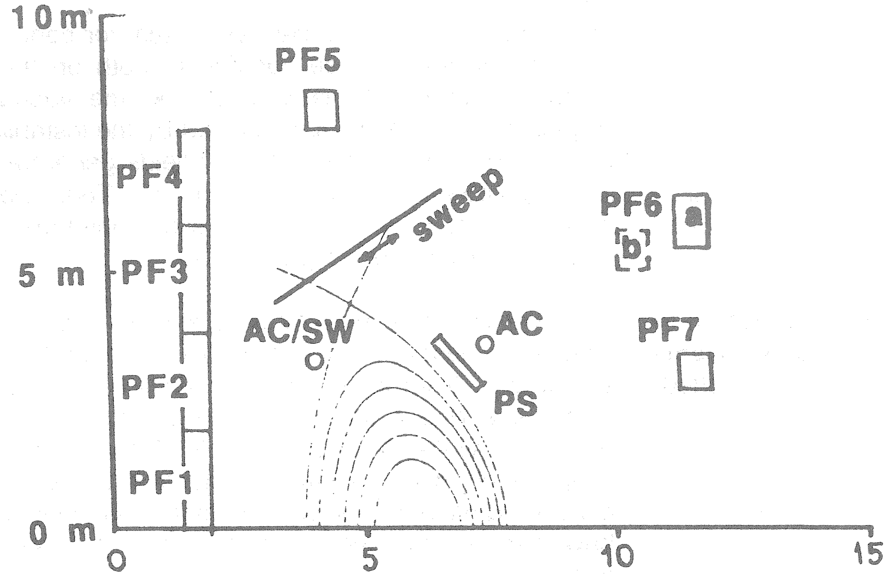

Fig. 1. Schematic of Poloidal Field System Elements

PF1-PF7	Poloidal Field coils (superconducting).Reference (a) and alternate (b) positions of PF6 are shown.
PS	Passive Stabilizer (attached to blanket)
AC	Active Coil (normal) for fast control of vertical motion
AC/SW	Active Coil (normal) for sweeping separatrix across divertor plate.

TABLE 1. DIMENSIONS OF SUPERCONDUCTING POLOIDAL FIELD COILS

Designation	PF1	PF2	PF3	PF4	PF5	PF6 (a)	PF7	PF6 (b)
Radius (m)	1.58	1.58	1.58	1.58	3.90	11.50	11.50	10.20
Vertical location (m)	0.95	2.85	4.75	6.65	8.20	6.00	3.00	5.50
Radial thickness (m)	0.48	0.48	0.48	0.48	1.00	0.50	0.50	0.80
Vertical thickness (m)	1.90	1.90	1.90	1.90	1.00	1.50	1.00	0.60
MA-turns	21	21	21	19	18	18	10	12

In the ITER Conceptual Design Activities, the PF System Design Unit works on plasma configuration, transient electromagnetics related to plasma behaviour, poloidal field design and the power supply system for the poloidal coils. The design of the PF system is of necessity integrated with other parts of the tokamak. There are especially strong interactions with the Physics Project Unit and the Magnet Design Unit; responsibilities for these interfaces are assigned to J. Wesley and N. Mitchell, respectively. For each task in the PF system area, an appointed task leader co-ordinates the work contributed by the four ITER Parties. Examples of the activities of the design unit are described in the following paragraphs.

Design Unit works with others.

Vertical Position Control (Task Leader: E. Coccoresse)

The requirements of an effective system for control of the vertical instability of the tokamak plasma impose constraints both on the plasma configuration and the design concepts of the blanket and the vacuum vessel. Any rapid vertical displacement of the plasma caused by the instabilities associated with the vertical elongation is initially restrained by fields generated by the eddy currents induced in the passive structure (PS in Fig. 1). Then the active coils (AC in Fig. 1) are excited to provide the restoring field. Therefore the essential parameters are the stability margin and the growth rate.

Unstable motion of elongated plasma is controlled.

Because of the strong requirements of the confinement physics for a highly elongated plasma, the vertical position control is being investigated with realistic structures. It appears that a carefully designed system can effectively control plasmas with elongation up to about 2.2 at the null point, which is therefore employed as the maximum value in ITER. Design analyses include optimizing the shape of copper or aluminium saddle loops attached on each outer blanket and minimizing each gap between neighbouring blankets. Requirements for stabilizers have been determined. The active control system is under study; the required coil current is about 100 kA.

PF coil optimization (Task Leader: M. Sugihara)

The minimum number of independent coil pairs started from 5 but was agreed to be 7, i.e., four central-solenoid coil pairs, one divertor coil pair at the bottom and top of the device, and two outer-coil pairs outside the outer legs of the toroidal coils as shown in Fig. 1. This number of coils provides flexible and extended capability, which is essential for the plasma operation.

Plasma configuration is controlled by the three pairs of SC poloidal field coils that are located outside the toroidal coils (PF5-PF7 in Fig. 1). Optimization of the number, position and cross-section of the SC coils is being carried out. The criteria used to assess the configurations are: controllability of null location, separatrix line shape, current density, circuit energy, field levels and forces of poloidal field coils.

Analyses and tradeoffs determine locations of coils.

The location of the PF6 coil pair has been the subject of much analysis and discussion. The first computations of circuit energy, carried out separately by two Parties, gave different results for the circuit energy. One analysis indicated 15 GJ at position (a) and 10 GJ at position (b). (See Fig. 1.) Another analysis indicated 11 GJ and 10 GJ at (a) and (b) respectively. D. Pearlstein suggested that the difference in the conclusions comes from different plasma current profiles considered. This was immediately confirmed by K. Shinya and L.E. Zakharov. It is clear that locating PF6 in position (b) offers advantages in performance, especially for controlling plasmas with flat current profiles. The required range of coil currents to accommodate a reasonable range of plasma parameters is also less at position (b). Another advantage of position (b) for plasma control is that the time constant of the plasma control is 2.7 times faster when the plasma current profile changes. For these reasons the PF Design Unit proposed position (b). On the other hand, position (b) has the disadvantage of greater difficulties in maintenance because at (b) the lower PF6 coil would be trapped by the toroidal field coils. The problem is still under discussion.

Required plasma operation scenarios, including ignition mode, extended mode with a higher current, steady state mode and hybrid modes, are now being studied.

Separatrix Sweep (Task Leaders: E. Tada/K. Koizumi)

Separatrix sweeping poses challenging design problems.

In order to spread the heat flux on the divertor plate, the separatrix sweep is very useful, as demonstrated in JT-60. The feasibility of using the SC coils to sweep the separatrix has been studied. The required change of the SC coil currents can be produced by the PF power supply system. However, an important problem pointed out and studied by the Magnet Group is AC-losses induced in the coil structure and conductor by the changes of the coil currents. Assuming ± 20 cm sweep on the divertor plate with frequency of 0.1 Hz, calculated AC-loss values of poloidal coil conductors were 5 kW by one Party and 50 kW by another Party in early 1989. This changed to 5kW and 35 kW in March, and 5 kW and 15 kW in June, this year. The AC-loss is still under study in Magnet Group and the sweep range is not clear at this time. The effects of the field changes on the SC coils can be minimized by optimizing the position and current of such in-vessel coils. The required coil current is about 50 kA for ± 10 cm sweep on the divertor plate. The sweep frequency can be up to 1 Hz or a higher value and the range of uncertainty of the heat flux can be accommodated by this scheme. Another sweep scheme employing normal-conducting copper coils inside the vacuum vessel (AC/SW in Fig. 1) is also being studied in the Containment Structure Unit and the Assembly and Maintenance Unit.

PF Power Supply System (Task Leader: A. Kostenko)

Powers in Gigawatt range are required.

As the first step in the design process, the required net power and installed power were studied for a reference plasma operation scenario. The values initially calculated were 0.4 GW net power and 2 GW installed power. After optimization of the operation scenario, involving very small changes of the current waveforms, the net power was reduced to 0.27 GW. In principle, the installed power could be reduced to a minimum of 0.8 GW by switching several sets of power supply units during one pulse but the required system would be complex. A simple system would require 1.5 GW. It is necessary to design the power supply system to know which solution is better. The most important design issue is to define a power supply system which can accommodate the reasonable range of the plasma parameters. This task is proceeding.

Other Tasks

Other very important tasks are "Plasma Control" (Task Leader: J. Wesley) and "Transient Electromagnetics" (Task Leaders: R. Litunovskij/S.N. Sadakov). It is essential to have a high performance of plasma control system to achieve ignition and steady-state operation while avoiding serious disruption effects that would threaten damage to the machine, especially the plasma facing components. The task, "Plasma Control", is therefore one of the critical issues in the continuing design work. Disruptions, breakdowns and other fast plasma behaviour induce electric fields, magnetic fields, currents and electromagnetic forces. The transient electromagnetics, which relate closely to the design of in-vessel components, vacuum vessel, SC-coils and so on, are under study jointly with other groups.

Plasma disruption effects must be accommodated.

Especially significant are the electromagnetic forces produced by plasma disruptions, which have serious effects on design because of the unprecedented magnitude of the plasma current in ITER. One method of analysis, employed mainly in the USSR and the USA, is based on a numerical code that includes plasma simulation. Plasma behaviour can be calculated consistently with induced currents in the device but only a rather simple representation of the structure of the device can be included in the code. The other method, employed mainly in the EC and Japan, includes a detailed representation of the structure, but the plasma behaviour has to be given as input data. Together, both analyses are very useful to understand the disruption effects and they provide the design guidelines including not only values of the electromagnetic forces but also possible methods to reduce the forces.

ITER NEWSLETTER: WHERE IT STANDS AND WHERE IT GOES

by N. Pozniakov, ITER Information Officer

This is the tenth issue of the ITER Newsletter, which is regularly assembled by the ITER Secretariat and published monthly at the IAEA Headquarters in Vienna. Responsibility for the ITER Newsletter rests with the ITER Council acting through its Chairman. Following the goals and editorial policy outlined in its first issue of September 1988, the Newsletter disseminates broad information both on the activities within the scope of the ITER agreement and other activities that materially affect ITER. Up to this time, more than 60 articles and informations have been made available for our readers. The authors of those publications are more than 30 people, both members of the ITER team and contributors from national research centers, governmental institutions and the IAEA.

Newsletter is widely distributed.

Copies of the Newsletter are distributed to scientists, engineers, news media, government officials and administrative staffs, not only in ITER Parties but in all member states of the IAEA. Interest and the distribution list have grown until in June of this year more than 1650 copies were distributed to recipients in 112 countries. The growth in the Newsletter distribution is shown in Fig. 1.

The ITER Conceptual Design Activities are widely recognized as an unprecedented international cooperation and the importance of informing the world fusion community and other interested organizations and individuals about these ITER activities is well understood. Therefore requests for inclusion in the Newsletter distribution list are always considered positively.

A wide range of topics are included.

Publications in the Newsletter cover quite a range of topics including: ITER goals, policies and strategy, joint work management, activities of each Party, results of ITER design work, ITER-related R&D, human aspects of co-operation, and ITER events. The Secretariat has received communications from Newsletter readers which indicate that the materials published are mainly assessed as being rather interesting and informative. Therefore, various articles on the above-mentioned topics will be regularly included in future issues of the Newsletter.

Series of technical articles are planned.

At the same time, since the Conceptual Design Activities have advanced into their second half, the Newsletter could provide room for more detailed presentations and discussions on the current and coming results and achievements of the ITER design team. A series of technical articles on different aspects of the ITER design that has been already initiated by the Newsletter will be continued. Among articles of that series which have already been published, are the ones written by ITER Design Unit Leaders: "Magnet System Design" (C.D. Henning, J.R. Miller, January 1989), "Heating and Current Drive in ITER" (V.V. Parail, June 1989), and "Poloidal Field System Design Activities" (Y. Shimomura, July 1989). Another series of technical articles which is planned for the end of 1989/beginning of 1990, will familiarize the Newsletter readers with the fusion activities of some research centers and laboratories of the ITER Parties contributing to ITER R&D Programme, with the emphasis of the articles on progress in implementation of R&D tasks of special importance to ITER.

Communications from readers, both information and comments, on ITER-related topics that may be interesting for the ITER design team and the fusion community in connection with the ITER activities are welcome. Hopefully this kind of information feedback can facilitate the design work and be helpful in assuring the attainability of the ITER Conceptual Design Activities goals.

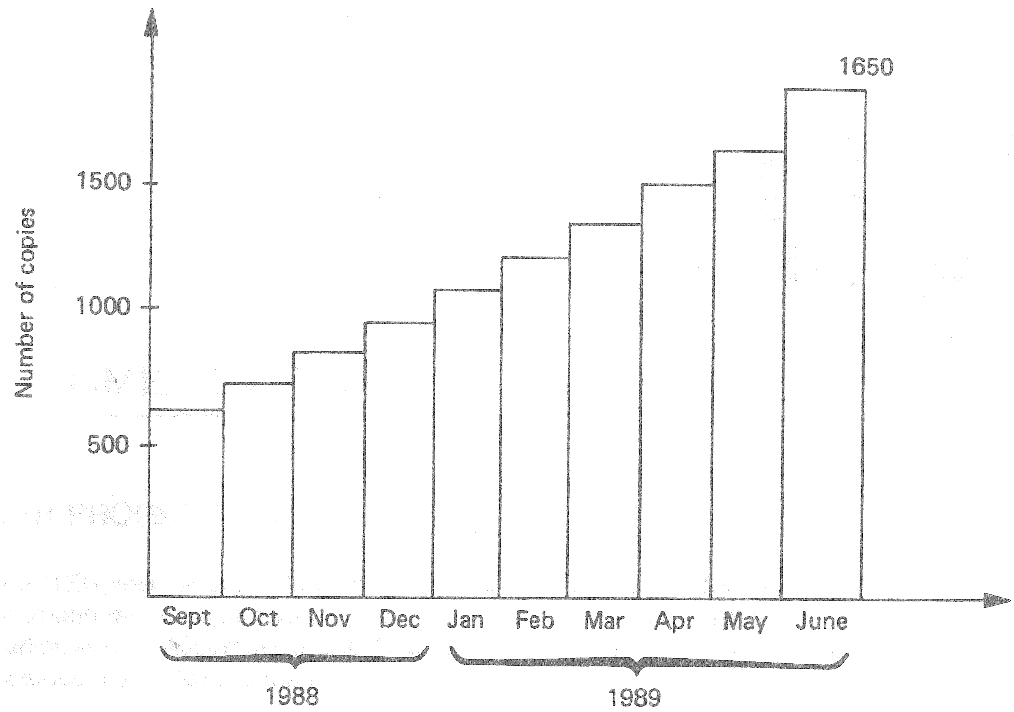

Fig. 1. Growth in Distribution of ITER Newsletter

ITER EVENTS CALENDAR - 1989

- Joint Work Session	Garching	1 June - 20 Oct
- Symposium on Fusion Engineering	Knoxville	2 - 6 Oct
- Meeting of Working Party on Ways and Means	Garching	9 - 11 Oct
- ISTAC Meeting	Los Angeles	15 - 17 Nov
- ITER Council Meeting	Vienna	30 Nov - 1 Dec

In support of the ITER team design work, several specialists' meetings are being held in Garching during the summer session of joint work on the following topics:

- Basic Device Engineering Requirements/Siting	10 - 12 July
- Diagnostics	10 - 14 July
- Power/Particle Control (Model Validation)	17 - 21 July
- Safety	31 July - 4 Aug
- Tritium Fuel Cycle	1 - 8 Aug

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