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## Fusion energy program under the gun, again

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*Fusion expert Stephen O. Dean exposes the attempt of a Department of Energy functionary to sabotage the technology that could solve the world's energy problems.*

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*Fusion power holds the promise of unlimited energy for the future, for all mankind. Using isotopes of hydrogen obtainable from water for fuel, fusion can produce high-quality energy for electricity, industrial processing, and even space propulsion.*

*For the past decade, however, there has been an unremitting campaign to derail the research and development of this crucial energy source. The argument is continuously made that we do not know enough about the science of fusion to proceed with the needed next-step experimental machines. Clearly, however, without those experiments we will never solve the problems of fusion. In the same vein, if we had waited until we knew all of the physics of the Saturn V rocket engine, we would never have gone to the Moon.*

*The most advanced fusion research has been with the tokamak machines, where a series of magnets confine a plasma of hydrogen to produce the conditions at high temperature, where they can fuse and produce energy. Inertial fusion, using primarily lasers for input energy, has also been under development, but in the United States it has been largely limited to physics studies of larger thermonuclear explosions in weapons systems.*

*Though the Congress passed, and President Carter signed into law, the Magnetic Fusion Energy Engineering Act of 1980 to accelerate the magnetic fusion energy program, there have been continuing efforts to sabotage the research. For the past year, the director of the Office of Energy Research, Dr. Robert Hunter, has been trying to find any number of ways to make sure this nation never develops fusion energy.*

*Stephen O. Dean is the president of Fusion Power Asso-*

*ciates, in Gaithersburg, Maryland. He was formerly the head of the magnetic confinement systems division at the Department of Energy's Office of Fusion Energy. This interview with Dr. Dean was conducted by 21st Century Science and Technology Associate Editor Marsha Freeman on Aug. 15.*

**EIR:** There has recently been a severe cut in the Fiscal Year 1990 magnetic fusion budget request. There has also apparently been a change in the policy for developing magnetic fusion on the part of the Department of Energy. I understand this has been promulgated by Dr. Robert Hunter, the director of the Office of Energy Research, and that he testified before Congress in June, asking that \$50 million be cut from the magnetic fusion energy budget. What is this change in policy?

**Dean:** Hunter is trying to create a competition between magnetic fusion and inertial fusion under guidelines that he says he has from [Energy Secretary Adm. James] Watkins, and the Office of Management and Budget. The total budget of those two programs [together] has to remain the same as the total is now. He believes that since magnetic fusion is at a \$350 million [budget level] and inertial fusion is \$150 million, that that's not a fair competition. He wants to boost the inertial fusion program by about \$100 million, and he doesn't know where to find that money. He proposes to take half of it out of magnetic fusion and find the other half somewhere else. That is how he comes up with the [proposed] \$50 million [cut in the magnetic fusion budget].

Hunter wants to put another \$100 million in inertial fusion so it can compete with the tokamak during the 1990s for an

ignition machine. Of course this means that magnetic fusion has to be slowed down, because he's cutting its budget. But he says, "That's okay," because he's going to slow down the Compact Ignition Tokamak [CIT]. He's pulling it from the FY 90 budget, and instead of having it operate in 1996 or 1997, he's going to try to have both programs have an ignition experiment by the year 2000. The motto of the new policy is "ignition 2000." He claims that Watkins endorses that policy and will commit the government to having two ignition experiments running by the year 2000, but Watkins won't give him any more money for it.

**EIR:** Who proposed the policy to have two ignition experiments?

**Dean:** That's not clear. Hunter says this is Watkins's policy, that Watkins has looked into it and wants a competition, didn't think that the magnetic fusion program was going to get to ignition anyway, with the presently proposed CIT machine. This is the other element in all of this. They did a review of CIT and decided that the machine, as proposed, had a low probability of ignition. This was presented to Watkins in April and the word was that Watkins said, "Then we won't do it."

**EIR:** Who did that study, and what was their basis for saying that the proposed CIT would not ignite the fusion fuel?

**Dean:** MFAC [Magnetic Fusion Advisory Committee] panel 22 under Kim Molvig did that study. It's a complicated story. Basically what happened was that there was a machine, CIT, that had a high probability of ignition. It had lots of extra, auxiliary power [planned in the design], but the cost of that machine was [about] \$750 million, and the OMB said, "You can't have \$750 million, you can only have \$500 million." So the Office of Fusion Energy [at the Department of Energy] last year created what they called the "two-phase plan" [for CIT] in which the first phase was only \$440 million and it might ignite, or it might need extra power. All the extra power would be in phase two, which was not in the budget. They were going to ask for the extra money, when and if they needed it.

Hunter said that that's misleading the Congress, because the Congress, no matter what you say, thinks that a phase-one machine for \$440 million will ignite, whereas, the panel points out, and everybody had admitted this earlier, that it might *not* ignite for \$440 million. You might have to add some extra power. The problem is that we don't know from the physics exactly how much extra power will be needed. The fusion program people thought they were being responsible by not asking for \$750 million, since they might not need that much. The CIT might ignite at \$440 million or might need an extra \$50 million of power. It might need an extra \$100 million of power. They didn't know.

**EIR:** So the panel 22 from MFAC evaluation that the CIT

might not reach ignition was based on this scaled-down version of the CIT, not the one that the fusion scientists had originally designed and planned to build?

**Dean:** Exactly.

**EIR:** Isn't that something of a setup then, to scale it down, and then say it may not work?

**Dean:** Hunter was not involved in the original decision to make it a two-phase program. He came in after this had already been done, and then acted as if he uncovered this scam. But it wasn't a scam. It was very openly described to the OMB and the Congress. People knew exactly what they were getting, but, of course, Watkins and Hunter weren't a part of that, so they can claim that they didn't know what they were getting. They came in and simply saw a machine called CIT costing \$440 million, and figured that that should definitely be the whole machine, and should ignite. When they found out that that wasn't the case, they used it against the program to create this new policy which would call into question the scaling laws of the physics on the CIT, and slow it down. As part of the package, they came up with this idea to give some money to inertial fusion to let it compete. The inertial fusion scientists have also been saying that they want to go ahead with an ignition experiment in the 1990s.

**EIR:** When Hunter came in a year ago, as I recall, he started to make trouble for the program pretty quickly. He proposed to redistribute amounts of money within the program. As I remember, he had resurrected the old saw of Reagan science adviser Jay Keyworth, that more money should go into the physics and less into the hardware.

**Dean:** Yes, but it's all related, because the argument as to why more had to go into the physics was based on the issue of why the physics weren't good enough to guarantee the ignition in CIT. What they discovered was that the reason we weren't sure what the probability of ignition would be in the CIT in the first phase was because the scaling laws were not that well pinned down. Why weren't the scaling laws pinned down? Why were there several different scaling laws that people were looking at? It's because we didn't understand the physics of the electron transport well enough to be sure whether these laws would be valid in that regime. All of these things are connected. All of this was very quickly uncovered by Hunter when he first came in, because we were saying it, ourselves. These things were being argued. We had a summer study that pointed all these things out in late August, so all of that information was available to Hunter when he came in. And he heard all of the comments going on within the fusion community. He'd bring physicists into his office and they'd all argue in front of him and he could see they didn't all agree.

**EIR:** So here was another setup. Because if you don't have the money to try new experiments and regimes even if you

don't understand all of the physics, you can't start to test out the differing ideas. If you scale down the experiments you certainly can't making any precise predictions about what will happen. Didn't he "reprogram" money from last year's budget?

**Dean:** The first thing Hunter said was, "In this circumstance I need money for physics experiments. Where am I going to get it? . . . There's \$25 million earmarked at Princeton for getting the equipment ready for putting tritium in the TFTR [Tokamak Fusion Test Reactor]. I'll stop that. I'll take that money, or as much of it as I can." And he started looking around at other parts of the program for places where he could collect money, and that was the motivation for all of that reprogramming, to collect money to put into the physics of the tokamak.

**EIR:** What is the effect of delaying all of the experiments that were supposed to have been done already, on the TFTR in terms of solving these physics problems?

**Dean:** The money that he took away from Princeton was not taken out of physics experiments. They fired 160 industry people on one day's notice. These were people who were designing and building the tritium-handling equipment for TFTR, getting ready for the day when we might put tritium in. So there no money taken out of Princeton that was earmarked for physics experiments on TFTR.

**EIR:** What is the effect on the program of continuously delaying the burning of tritium in the TFTR machine?

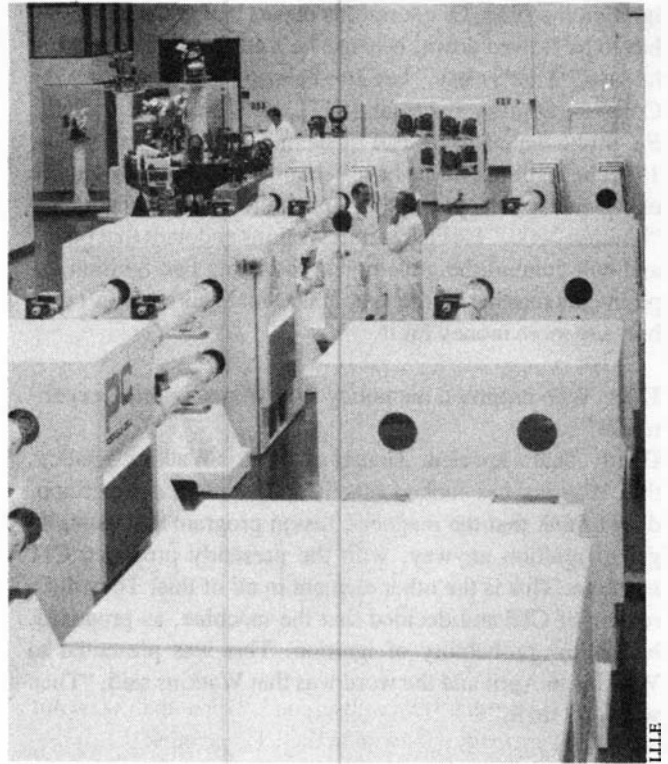
**Dean:** The fact is that we'll never put tritium in that machine now. All of the people and activity that were aimed at doing that are gone. Officially they've only delayed it for two or three years, but the reality is that that option is gone.

**EIR:** In what sense?

**Dean:** They'll never have the money to come back and do the work to be ready to do it.

**EIR:** What would we have learned from the tritium experiments?

**Dean:** The idea was to learn about what happens in a plasma when particle energy from the fusion reaction starts getting deposited internally in the plasma. In other words, when internal heat generation from the fusion reaction starts to heat the plasma internally, as opposed to putting in power from the outside. The idea was that something different might happen to the confinement of the plasma, so people want to see that in the laboratory. Is that a big tragedy or not? I guess it depends on the individual, because the fact is that JET [the Joint European Torus] will probably do that, and probably do it as well or better than we would have been able to do in TFTR. One of the reasons tritium got into trouble in TFTR was the fact that we did not reach breakeven, and the whole reason for putting tritium in TFTR was to actually do it at



*Left: The University of Rochester's Omega Laser fusion experiment (inertial confinement). Right: The Princeton Tokamak Fusion Test Reactor (an example of magnetic confinement). Robert Hunter of the Department of Energy is attempting to set up a phony competition between the two types of fusion, which would tragically delay development of commercial fusion.*

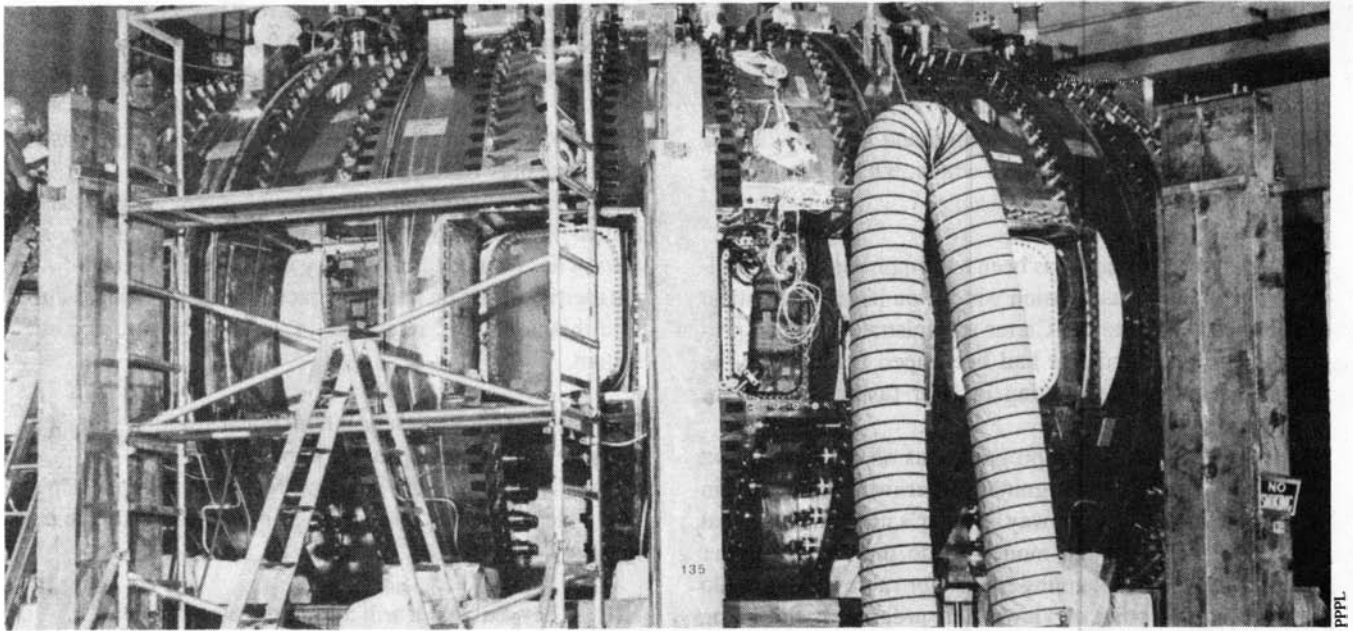
breakeven and see what would happen. If you're not at breakeven, the reasons for putting the tritium in are harder to justify. In other words, you're not going to get breakeven anyway and because you're not at breakeven, the effects you're looking for will be weaker. Therefore, the experiment is not as definitive as it would have been if we had breakeven, or better.

**EIR:** Why hasn't the TFTR produced net energy, or breakeven?

**Dean:** I think the fact is that the confinement is not as good as people had hoped when the machine was built.

**EIR:** Why do you think that is the case?

**Dean:** It's been a problem in the physics. The fact is that we never did know exactly how the scaling was going to go. We tried to over-design and we came up a little short. That has, in fact, led to all these other problems. The question was: "Why is the physics a little worse than you thought it might be? Do you understand it?" And the answer was, "No." And that is what has gotten the program in such a weakened position to argue with Hunter, because the reality is that the physics is not as well understood as we thought it would be,



and the scaling that we've observed is worse than we would like it to be in order to go on to the CIT machine.

So the tokamak program is in a somewhat unfortunate situation. It's not a disaster, but nature was not kind to us. It didn't break so that things came out a little better than we'd designed for, they came out a little worse. This allowed people like Hunter to come in and question the depth of understanding of the physics and call a halt to going forward until that situation is better in hand.

**EIR:** But the commitment to build the TFTR was made even before all the experiments had been done on the previous machine, the Princeton Large Torus. The idea was that you have to go ahead and plan and build the next machine, anyway, even if you cannot answer all the questions beforehand. What would you recommend doing, if there were no question about the money to do it? What should the focus for the program be?

**Dean:** It's a good question. If we had the kind of budgets we still think are reasonable, instead of budgets that have gone down 50% in the last 10 years, then I think you would simply over-design the next machine and take an aggressive step in the CIT. You'd build the kind of machine the scientists were originally looking for, and you'd put in all the extra power that you would like to have, or at least you'd plan to be ready to put it all in. I don't think the plan was all that bad.

It was a plan for a CIT that had enough size and field to get to ignition and the exact amount of power was the variable. But the exact amount of power could be determined later and added, so you would only add the amount that you would need. That allowed you to go ahead and start building, even though you had a certain amount of ignorance, and hopefully

during the next several years, as you're building it, your ignorance would decline and you'd be able to pin down the amount of power to buy. Then, even if it should turn out you got all the way to having the machine built, and you still weren't sure how much power you needed, you could start adding it in increments with full confidence that eventually you would either get to where you wanted to go or at least have definitive results on exactly what was happening so you could make corrections.

**EIR:** Do you have to reach energy breakeven before you try to reach ignition?

**Dean:** There's no reason to do breakeven except as a public relations milestone along the way. There was nothing magic that was supposed to happen at breakeven. It's just an obvious, understandable point you have to pass on your way to making net power. We've been ready to go beyond that for years. We've been trying for ten years to get a commitment to a machine that would out-perform the TFTR. Whether that was ignition, or a high-gain. . . .

**EIR:** In other words, *whatever* the TFTR could do, you need the next machine to do something better.

**Dean:** Exactly. We've known for years how to design such machines, and they've had various names. We've never been able to get them funded. People have been looking for a sales pitch and they latched on to this word "ignition" as something they thought people could understand and hang their hat on. There's nothing magic about ignition, either. Once you start making more power than you're putting in, things start happening in the plasma, and you learn from that. You need to have more energy out than in, but you don't necessarily have

to have ignition.

**EIR:** Is Hunter interested in pushing the laser fusion program because that is his background?

**Dean:** His background is in excimer and krypton-fluoride lasers, not necessarily fusion as a whole, but he's done some work in fusion.

**EIR:** It is true that there has been a deemphasis on the civilian applications of laser fusion which you have been critical of. This goes back to the Carter administration, when programs were classified that had been open before. Are the results that people are getting in laser fusion a cause for accelerating the program?

**Dean:** The inertial fusion program was on a schedule that would have them start an ignition experiment some time in the early to mid-1990s anyway. Hunter's judgment was that they didn't have enough money to do that in the proper fashion. They were planning to ask for more money to do that. From their point of view, their program is not being accelerated. It's just being given more to keep on the schedule that they thought they were on, anyway.

**EIR:** How were the laser fusion people going to get an ignition experiment without any civilian applications?

**Dean:** The inertial people were proposing to sell a machine to the defense people that would operate by the year 2000. They hadn't costed it out yet and they hadn't put it in the budget, and when they did they were going to ask for more money. They had a plan to ask for more money and build such a machine, long before Hunter came on the scene and said, "Let's take it seriously, and let's give you guys more money now." They were always planning to be on that schedule. They believe their results justified such a schedule. Some people in their program think, of course, that it's justified to start building such a machine right now.

I think that the fact is that their results do justify serious design and planning for an experiment that would be what they call "high gain." It would be 100 times more energy out of each shot than goes in and the pellets would be ignited. But the key thing for them is not the ignition of the center of the pellet. Producing 100 times more energy out than the laser puts in is their figure of merit, or their goal.

**EIR:** From the laser fusion side of the question, then, this is not a change in policy, regardless of what Hunter says?

**Dean:** Well, the change in policy from their point of view, is that they were doing all of this for, and by, the weapons people, who have a test facility for weapons effects, and weapons physics. What's new in this policy is that has now been identified as a competitor with a civilian purpose. If they work out, and they win this competition, or they are judged well in this competition, presumably they are positioned to be taken seriously as the fusion civilian energy

source. So that's the element for them. They were not playing in that game, even though many of them had that motivation. Officially, the department did not fund them for that purpose.

**EIR:** Do you think that Admiral Watkins is getting his information only from Hunter?

**Dean:** Hunter and Tom Johnson, who is now a special assistant to Watkins. He's a big inertial fusion enthusiast, and always has been, and this is very much part of his belief—to put inertial fusion on a civilian track. I think he's successfully sold this argument, internally in the department, as a consultant.

**EIR:** Has there been any international reaction to this attempt to delay the magnetic fusion program?

**Dean:** There's been a whole bunch of letters written to Watkins by leaders of the foreign programs protesting this change in policy.

**EIR:** They feel that it will also hurt their research?

**Dean:** They feel that they've been brought in by the U.S. to this international collaboration psychology for fusion and their future very much hinges on everybody continuing to have a strong program. If the U.S. starts to pull back on its funding, they see the U.S. not being able to hold up its share of the International Thermonuclear Experimental Reactor (ITER) or other international agreements. They feel that these agreements have all been fine, and they're meeting their commitments, and they're concerned to see the U.S. starting to say and do things which they see as copping out.

**EIR:** This must be shocking to them anyway, to refuse to build the next-step machine. They all have plans to do that. How could the U.S. contribute to international machines, if it would not build its own machines?

**Dean:** Exactly. Also, part of Hunter's policy plan that's been leaked, has a chart which shows that there wouldn't be an engineering test reactor until after the CIT was built and operated. So in his plan, it's clear, he doesn't see the U.S. getting involved in an engineering machine like ITER until after the year 2000, whereas the international team plan is to build it during the 1990s. The Europeans, Japanese, and Soviets never really did see a CIT as necessary. They thought it was great the U.S. was going to do it, it was going to be helpful, but they wanted it to be done quickly and gotten out of the way, because they didn't want it to be used as an excuse for not building ITER. They don't feel a necessity to build a machine like CIT just to do ignition physics. They want to build an engineering machine which would be designed to ignite as a by-the-way kind of thing.

**EIR:** Is there any motion from the Congress to try to intervene in this proposed policy change?

**Dean:** They've required Admiral Watkins to carry out a

policy review—what they call an “independent policy review,” of this proposed policy before it’s implemented. Watkins promised on June 15 he’d do it and he’d have it done in two months. It’s now two months, and he hasn’t even started. We don’t know when this policy review will get finished.

**EIR:** Have the people been selected for the review?

**Dean:** Nope. They have tried to start it but apparently the way they wanted to do it was illegal, or judged to be illegal. There are a lot of tricks to the trade of the government establishing an advisory panel, and Hunter, of course, didn’t want to be bothered with any of those procedures. He just wanted to have the review. He tried to set it up in a way that the lawyers said was not appropriate and now he’s being forced to set it up right, and that takes time. The process is going ahead to set it up, but it’s just not moving very fast.

**EIR:** But you said that the Congress wants the review before the policy is implemented, but the new policy is in the next budget, which is supposed to go into effect on Oct. 1?

**Dean:** The Congress is trying to put little words in the bill that says, “thou shalt not make any radical changes until you finish the policy review; thou shalt not cut anybody’s programs off or withhold any large amounts of money from anybody in anticipation of implementing your new policy, until it’s been reviewed.” There are various people in the Congress trying to tie the department’s hands and force the department to come back to them with the new plan whenever it’s finished.

Of course, the Office of Management and Budget is also worried because they’re about to start the review of *next* year’s budget [fiscal 1991] and they expect that this policy review will not be finished on a timely basis for them to use it in their deliberations in October or November.

**EIR:** Would this be the first time that anyone has stated publicly that beneath it all, the policy really is to slow the fusion program down.

**Dean:** [Former Reagan science adviser] Dr. George Keyworth said that if inertial fusion works out, we’ll also look at it as an energy source. But it’s never been the policy to carry the laser fusion program out on the motivation of trying to develop it as a civilian fusion energy source. It’s been carried out on the basis of its relevance to the military. The laser fusion program is reviewed by the Armed Services Committee. Frankly, on the Hill, there’s no interest in this [inertial versus magnetic fusion] competition. The civilian panels do not want to take over inertial fusion responsibility. The Armed Services committee people don’t want to give it up, and so there’s been no preparation of these people for the transition, and the danger is that in the transition, inertial fusion will actually *lose* money and support on the Hill, because the Armed Services people are advocates of inertial fusion and if it’s no longer in their committee, they will not protect it.



U.S. Department of Energy

*Robert Hunter, director of the Office of Energy Research at the Department of Energy. He may be the first Washington bureaucrat ever to demand that his own budget be slashed.*

They will not find the money for it, and the new Committee that gets it doesn’t have a history of paying for it, so it will be amongst all the other things they’ve got. You’d have to start reestablishing the constituency for it in the committee.

**EIR:** Watkins has taken a very strong stand on keeping the Shoreham nuclear power plant from being torn down in New York, and managed to get the Seabrook nuclear plant up and running in New Hampshire. But he seems to be taking no leadership on the national energy policy question. Is there any input on fusion to this energy plan?

**Dean:** Not yet. As usual, fusion is not quite in their mind when they talk about an energy strategy. . . . We’ve tried to get them to invite some fusion people to some of these other hearings elsewhere. We haven’t found any resistance on their part in putting fusion into the plan, it’s just that these people don’t have the foggiest idea at the moment, how to prepare the plan.

**EIR:** The same philosophy was evident a number of years ago *within* the magnetic fusion program, when people said that there should be a competition between the mirror machines and the tokamaks. They would say that it was an unfair competition if the tokamak devices were ahead, so it was proposed that the tokamaks be slowed down to allow, for example, the mirror technology to catch up. Isn’t that the same kind of approach?

**Dean:** Exactly. In fact, this whole plan is a warmed-over version of the Deutch 1978 plan, because Tom Johnson wrote that one, too. He was an aide to [Office of Energy Research

director Deutch. Johnny Foster was brought in to chair a review for [Energy Secretary James] Schlesinger at that time. Schlesinger wanted to cut the budget and Deutch brought them in to review the program. They came up with this competition between the mirror machines and the tokamaks. Schlesinger then decided not to cut the budget, but we had this big competition and we slowed the tokamaks down, and we accelerated the mirror. It was exactly the same plan, put together by exactly the same people, and now Johnson has just come back ten years later, and recreated this plan all over again. Although, as you say, instead of competing in the mirror, he's competing in inertial fusion.

**EIR:** I knew this plan sounded familiar!

**Dean:** And Hunter wants to put Johnny Foster on this policy panel, so people think he just wants to stack the panel, and it's a mess.

**EIR:** There have certainly been many reviews of both the magnetic and inertial fusion programs in the past few years. How will this be different?

**Dean:** This will be a limited-life advisory committee, if they ever get it set up and get all the people cleared to be on it, of people that have been picked ostensibly by Watkins, but in reality by Hunter. This is the other bone of contention. People do not want Hunter to have the authority to pick this panel. Yet he is picking the panel. People have tried to get this panel legislated to be a [National Academy of Sciences] advisory panel, so Hunter would not be able to pick the panel. So far, however, Admiral Watkins is letting Hunter run the show. Hunter is acting exactly like Deutch, and Deutch is one of Hunter's buddies. This is a very tight-knit group that is running all of this. They're all part of the same Air Force Weapons Lab/Defense Science Board clique.

**EIR:** Admiral Watkins is holding hearings all around the country listening to a gaggle of people's opinions about what the national energy policy should be—

**Dean:** We went to their first hearing in Washington and tried to speak, and were told that all the slots were filled. . . . Watkins is just piling all this stuff up for the record so that he can say he did it, and they'll pick and choose and listen to whom they want. They'll highlight the ones that agree with them and ignore the ones that don't agree with them, but it will be able to be said that they listened, even though they didn't agree. They're doing this simply to make a show and compile a record that, in fact, they had the hearings. They're trying to preempt the critics.

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any input on fusion to this energy plan?

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## Documentation

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### Hunter: 'Value of fusion overstated'

*Testimony of Robert O. Hunter, Jr., director, Office of Energy Research, U.S. Department of Energy, before the Senate Subcommittee on Energy Research and Development of the Committee on Energy and Natural Resources, June 14, 1989.*

There now exists in the department's fusion program a considerable amount of controversy over the scope and design of future fusion programs.

The immediate focus of controversy within the magnetic fusion program is construction of the Compact Ignition Tokamak (CIT). . . .

The department is persuaded by the findings of MFAC [Magnetic Fusion Advisory Committee] subpanel 22 that the CIT has a very low probability of achieving its ignition objectives. The department is also convinced, both by MFAC 22 and by extensive discourse with members of the magnetic fusion community, that the fundamental physics of tokamak confinement is not understood.

Secretary [of Energy Adm. James] Watkins is considering deferring the CIT construction project until we understand enough of the fundamental phenomena controlling tokamak transport, to assure ourselves that it will succeed. The department does not believe that CIT is worth constructing if it will not ignite with high probability.

Secretary Watkins has taken a strong personal interest in the future of fusion R&D. He has outlined the essential principles of a comprehensive new policy for fusion energy that embraces both magnetic and inertial confinement fusion, and directed me to develop a detailed policy [based] upon these principles. The intent of the policy is to revitalize both fusion programs, focus them on key unknowns, and push both to achievement of ignition of fusion reactions in new experimental devices within about 10 years. This will permit us, early in the next century, to evaluate the practical potential

of both approaches based upon solid experimental evidence, and to choose the best integration of technologies to advance to commercialization of a fusion reactor.

In both magnetic and inertial fusion about three to four years of highly concentrated research efforts will be required to answer the remaining critical physics and scaling questions. Both could then be prepared for construction of the large experimental devices that will finally demonstrate convincingly that we can deliver on the promise of fusion energy.

It is worth restating just what that promise really is. From the department's viewpoint, some fusion supporters have in the past actually undermined their own case by overstating the potential advantages of fusion power. The department thinks that a properly qualified statement of those advantages remains very exciting. . . .

The policy that Secretary Watkins has directed us to develop is based on four principles. The first principle is the necessity to focus work within the existing programs on solving the critical problems that will allow us to proceed with

the next decisive phase of fusion research.

The second principle is competition. We want to get the full value of competitive research, and from the commercial power possibilities of all our fusion research. In summary, we would like to compete, over a realistic time scale, the magnetic fusion program and a program designed to evaluate the energy and production prospects of inertial fusion. Indeed, this was first offered as the department's official policy more than 10 years ago, but that policy was never actually followed.

The third principle is a commitment to specific major milestones—in this case, to both a workable version of the CIT and to a Laboratory Microfusion Facility (LMF) for inertial fusion. These are the devices that will achieve the major goal of ignited plasma by about the turn of the century.

The fourth principle is fiscal responsibility. The department will not propose to build either of these devices with major increases above the current funding levels of these programs. . . .

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## Watkins: 'We need competition in R&D'

*Letter from Secretary James D. Watkins to Rep. Robert Roe, (D-N.J.), chairman, House Committee on Science, Space, and Technology, June 14, 1989.*

I am writing to you to modify the Department of Energy's position on the construction project for the CIT. Due to lack of resolution of key scientific unknowns, the department is no longer proposing to begin actual construction of this device in FY 1990.

A review chartered under the auspices of our Magnetic Fusion Advisory Committee (MFAC) reported in March 1989 that the CIT as previously submitted for congressional approval has only a very low probability of achieving its primary research milestone of plasma ignition. After receiving the formal report of the review panel, I met with leaders of the magnetic fusion community in late April to discuss that finding. I am now convinced of the possibility that the CIT will be unlikely to meet the key ignition goal, and this raises questions which need to be answered. While numerous arguments have been proposed to continue with the project in spite of its low probability of success or the fact that we do not understand the fundamental physics mechanism controlling plasma confinement in tokamaks, I cannot condone such an approach under the circumstances. As a result, I propose that for the present the Congress defer without prejudice the funding of construction for this device, while at the same

time continuing funding for the rest of the magnetic fusion program.

Proceeding to the next major step in magnetic fusion research requires study of an ignited plasma. But we cannot construct the device to achieve that without solving the critical unknown physics of plasma confinement. As a consequence, I have determined that the strategy under which we conduct fusion research must be restructured to meet this requirement.

I had hoped to be able to present to you the full account of an innovative new policy that embraces all the fusion research in the department—both magnetic and inertial confinement approaches. This new policy would focus research on resolution of the key unknowns that now limit progress, and inspire strongly competitive research and development to achieve specific objectives over the mid and long terms. A draft of such a policy now exists, and meets the general tenets I have described. But because of the significance of such a decision, I am persuaded that the department should conduct an independent, high-level policy review of the draft to assure that its managerial and scientific logic are sufficiently solid to meet responsible critique by both advocates and detractors of fusion research.

I hope to have the policy review completed, and the final version of the new policy validated, within the next two months. I request that, to the maximum extent allowed by your own responsibilities and exigencies of schedule, you defer final decisions on the individual line items contained with the Fiscal Year 1990 budget for fusion until I can present that full policy to you. In any event, we would still require the same total amount of funding to permit the focused research effort toward an eventual research experiment.