

Angelo Baracca, Saverio Craparo, Roberto Livi, Stefano Ruffo

THE ROLE OF PHYSICS STUDENTS AT THE UNIVERSITY OF FLORENCE IN THE EARLY ITALIAN ANTI-NUCLEAR MOVEMENTS (1975-1987)

No reconstruction of the history of civilian nuclear programs can be considered complete without a contextual attention to the attitude and role of public opinion: even less so in the case of Italy, where nuclear programs were buried by popular will with two referendums, in 1987 and then in 2011. This is a thorny problem, which must be addressed using different approaches than the ones offered by the history of technology, or of industry, which can be based on objective or official documents, reports, data, technical correspondence, and contracts. Changes in public opinion must instead be reconstructed drawing on personal recollection or interviews, newspaper articles, opinion surveys or polls, which can rarely be officially or objectively verified. It is not a coincidence that oral history has in recent decades become a respected academic discipline in fields in which official documents are lacking. Every approach has its own criteria of rigor, which cannot be considered better or worse, since it deals with different, although complementary problems, but can be difficult to compare. It is generally not easy to crosscheck the results of these two kinds of approaches. In particular, it seems difficult to ascertain to what extent opinions or new points of view spread in society and influence public opinion, at different levels, even as far as political positions are concerned. This is probably a sociological rather than a historical problem. For instance, how could one objectively “measure” how, and to what extent, the outcome of the 1987 referendum was the result of an increasingly anti-nuclear public opinion, or was instead influenced by the Chernobyl disaster? We argue that the evolution of public opinion, coupled with the increasing problems posed by unrealistic nuclear programs, had a deep influence on political positions and on the fate of the Italian nuclear plan. Otherwise, how could one explain why the minority anti-nuclear positions in the Partito Comunista Italiano (PCI) almost prevailed a decade later at the XVII Congress, on the eve of the Chernobyl disaster? (See below).

This chapter presents our personal recollections of the period, which was marked by a strong interest in the issue of nuclear power in Italy. We offer the viewpoint of a group

of students, almost all from the Faculty of Physics of the University of Florence, and highlight their active public engagement in rising popular movements, and their favorable disputes with the scientific community and even with nuclear technicians.

A GENERAL CONSIDERATION

It is important to open our analysis with a premise. In the first half of the 1970s, when this story begins, most of us were students (and not all of us were students of physics). Angelo Baracca was the only graduate and professor of physics among us, although he had never attended a course specifically devoted to nuclear physics. Before the end of the 1970s, he was already politicized and was involved in various political movements concerned with environmental and health issues, but he had never dealt with problems of nuclear power.

Indeed, during a course of studies in physics, one learns only some basic notions about the physical properties of the atomic nucleus and radioactivity, at best concepts of nuclear fission and fusion, in relation to their civilian and military applications. Not even academic specialists in basic nuclear research have specific notions or skills in nuclear energy technology, as we have constantly and directly verified in the past decades. A nuclear physicist has a deeper knowledge of nuclear structures and properties, but the competence of general scientists to assess the real need, advantages or reliability of nuclear power is, in general, not much higher than that of learned and well-informed people.

How could it happen that a group of students (not even all of them physicists), working alone (there was no internet!), succeeded in a relatively short period of time in acquiring basic, but specific, physical and technical knowledge about nuclear technology? At a level that allowed them to keep up with professional researchers in nuclear physics, and even with civilian nuclear technicians! As for Professor Baracca, the aforementioned group of students introduced him to these issues, and only later did he become actively engaged in the field of nuclear technology.

All these considerations and our experience lead us to a conclusion. We are perfectly aware that the majority of people might not share our ideas. However, contrary to the prevailing arguments in the technical, scientific and economic milieus, we are deeply convinced that our position is valid. In our opinion and experience, nuclear technology is far from being an *advanced*, if not *the most* advanced, technology, as it is usually considered. It is instead an *extremely complicated* (not only a *complex*) and *rigid* technology, with sprawling ramifications, which are very dangerous and difficult to keep under control. These features are the opposite of an “advanced” technology, which must instead be flexible, adaptable, controllable, relatively simple, and in some sense reversible. Such a

complicated technology induces specialists in the field to become super-specialized, and loose sight of the general picture and the complicated interweaving among the social, environmental, health and economic aspects of nuclear technology. In public debates, we have often found it relatively simple and effective to confront specialized nuclear technicians and to respond to specific technical arguments, by simply “widening” the point of view, and insisting on other intertwined aspects.

Some examples can clarify this point. Our group of students did not limit itself to nuclear power (which, at the time, was glorified by left-wing parties and unions, as well as by technicians, as a symbol of “Progress”, branding every criticism as regressive, a “return to the candle”), but assumed a pioneering role and broadened its analysis to include “alternative” energy sources (as they were called then), about which nuclear scientists and technicians were widely insensitive and unprepared. Moreover, in that period of rampant nuclear power, there were not many concerns or programs for the management of nuclear waste and exhausted fuel. Civilian nuclear technicians hardly had any real knowledge about the military applications of nuclear power, or about proliferation risks and nuclear disarmament issues. The possibility of nuclear accidents and the dangers of radioactivity were strongly downplayed, as the accidents of the 1970s and 1980s dramatically demonstrated. One should add that specialized technicians were usually arrogant, they considered themselves repositories of the truth, from which common people were excluded, and assumed their arguments could not be challenged.

It is possible that this scientific mentality and approach were more accentuated in Italy, but it does not seem that the clash with the scientific community was so different in other countries.

In general, in that period an open contradiction took shape between the scientific community and the ideology of science as an intrinsic source of progress emerged from World War II, and against a growing popular common sense.

PRIOR EVENTS AND GENERAL BACKGROUND

The 1970s represented an extremely complex decade, from a social and political point of view. The echoes of the radical student protests and of the May 1968 events in France were far from being dampened, while the “Hot Autumn” of 1969 opened a season of strong conflicts, which saw new forms of alliance and collaboration between the student movement and the working class. In particular, the establishment of new forms of direct democracy and representation, the Consigli di Fabbrica e di Zona, which were often inter-branch organisms that reinforced the unity of the movement.

The relatively small Faculty of Physics of the University of Florence (locally isolated, far from the city center and the remaining parts of the University, on Galileo's "Arce-tri hill") had no political tradition, and in the first years of the student movement it was exceptionally quiet. Baracca took up position as lecturer (professor on an annual contract) on November 1, 1968. Around 1970-1971, students who matriculated revitalized and strongly politicized (in close collaboration with Professor Baracca) the embryo of a political committee of physics students, the Comitato Politico di Fisica (CPF), which had already been established but had had a difficult life. In a couple of years, the CPF took root among the students, and along with the Student Assembly it advanced important requests to the faculty. Furthermore, it forged bridges with the outside world, particularly with the working class, with the explicit consciousness that science had to undergo deep changes in order to answer the needs of the exploited class. One of the most important forms of cooperation with the working class, related to our topic, was the one established with the Commissione Organici e Investimenti del Consiglio di Fabbrica of the Nuovo Pignone, Florence's biggest and most technically advanced factory, which worked internationally to build turbines, and develop energy and oil technology. The need for, and the new opportunities offered by, renewable energies were among the main topics of discussion between the Commissione and the students of the CPF, and were introduced in open assembly debates of both factory workers and physics students.

One must remember that the unexpected 1973 oil crisis challenged all world forecasts on energy resources, production, and consumption. In Italy, at the beginning of 1974 the "oil crisis" had several grotesque implications, worth remembering in order to better understand subsequent developments. During the Yom Kippur War, several magistrates investigating the oil embargo found a few explosive documents belonging to oil managers, which compromised all Italian political parties (with the exception of the PCI), managers of the Ente Nazionale per l'Energia Elettrica (ENEL), and ministers, who were accused of carrying out illegal procedures and providing subsidies to the oil industry. As often happens in Italy, these allegations for corruption – involving billions of Italian lire – had no legal consequences on political representatives' and company managers' careers.

One of the results of the scandal was to allow the people who had put a stop to the Italian nuclear program (after the so-called "Ippolito scandal" in 1963) to re-emerge. In December 1973, ENEL, after being assured by the government that a new legislation would be introduced, decided to buy not one but two nuclear power plants, and in the summer of 1974 it increased its orders to four. In August 1975, the government passed a law regulating localization procedures, which drew on the recently published American "Reactor Safety Study" (known as the "Rasmussen Report"), establishing a 16-km-radius safety zone around nuclear plants (then confirmed in 1978 by the Nuclear

Regulatory Commission).¹ Following this law, ENEL advanced the idea that the four plants should be placed in Central Italy, two in the Lazio region (as we will show, one was built in Montalto di Castro) and two in the Molise region.

In December 1975, after oil prices suffered a further increase, the Comitato Nazionale per l'Energia Nucleare (CNEN) submitted a Piano Energetico Nazionale (PEN), which was approved by the Comitato Interministeriale per la Programmazione Economica (CIPE). The Plan forecast different (and highly inflated, as became clear later) scenarios for Italy's energy demand, and planned the installation of a total of 13,000-19,000 MW in nuclear power (up to twenty power stations) for the period 1983-1985, and the building of even more nuclear plants in order to achieve a total between 46,100 and 62,100 MW by 1990. Going back to our initial premise about the nature of nuclear technology, and the attitude of the Italian scientific community, it seems hard to believe that no Italian scientist ever wondered how fifty-seventy nuclear power plants could fit, and respect all the necessary safety rules, on the densely populated and often inhospitable Italian territory!

THE AUTONOMOUS RESEARCH OF THE STUDENTS LEADING TO *I NUCLEODOLLARI*,
1975-1977

In the late spring of 1975, students of the CPF were involved almost by chance in discussions about the PEN, when they participated – talking a critical standpoint – to a public debate organized by ENEL in Florence, in which several professors of physics also took part (as they were considered “experts”, although they had little experience about energy issues). Students were strongly criticized (with paternalistic and sarcastic tones) for their improvisation and lack of preparation.

Burned by this experience, they succeeded in obtaining a copy of the PEN, and felt the need to study the whole problem more seriously and rigorously. As a result, in the fall of 1975 they established a students' working group, which was collateral but formally independent from the CPF. It was composed almost entirely of students of physics (with the exception of Lorenzo Vallerini, who studied architecture): Sergio Ciliberto, Saverio Craparo, Giovanni Del Fante, Roberto Livi, Marco Lugli, Marco Pettini, Antonio Politi, Andrea Raspini. Their average age was twenty-three. The group met weekly for more than a year,² it collected all the documents it could find, sharing the tasks but

1 It should be said that a large portion of the plants built in previous decades, following these regulations, are at present at much smaller, hence unsafe, distances from residential areas.

2 The meetings of the working group took place in the evenings, excluding the daily commuter students. On the other hand, the division of labor was a usual practice among the limited number of students of physics, and this always took place in complete harmony. According to the authors of this chapter, Stefano

discussing collectively all the problems and results. It also repeatedly consulted with outside experts, such as geologist Giorgio Marinelli from Pisa. It must be stressed that (of course) at the time there was no Internet, and that the technical documents concerning specific issues (such as nuclear technology) were rare and/or very specialized, and not easy to understand.³ As we have already pointed out, the academic curriculum in physics provided only superficial notions about nuclear technology (just the notions of nuclear fission and fusion, or the role of nuclear fusion in stars), and (often until now, at least in Italy) no information about energy issues and renewable sources. As mentioned, the perspectives and opportunities offered by renewable energies had already been at the core (although still in general terms) of debates between workers technicians of Nuovo Pignone and students of physics.

After more than one year of studies, Saverio Craparo's proposal to write and publish a book was accepted – it appeared in the spring of 1977 with the title *I nucleodollari*.⁴ The volume was one of the first comprehensive studies to be published, at least in Italy.⁵ It was accessible to the general public, and offered a broad view, an economic as well as a political analysis, an evaluation of costs, and devoted a specific attention to alternative energies, and comparative evaluations. The title chosen for the book evoked the political dimension of prevailing energy choices. It drew attention to the fact that “hard” energies, whether fossil or nuclear fuels, were ultimately controlled by, and benefited, big business, exploiting and bypassing collective interests (as was clear in the case of Italy's

Ruffo, who was very active in the CPF but resided some twenty kilometres outside Florence, was penalized, although he later re-engaged very actively in the anti-nuclear movement, as we shall see.

³ The references explicitly cited in the book *I nucleodollari* include: David J. Rose, “Nuclear Electric Power”, in *Energy: Use, Conservation and Supply*, ed. Philip Hauge Abelson (Washington: American Association for the Advancement of Science, 1974): 89; *La crisi energetica*, monographic issue, *Sapere* 769 (February 1974); *Libro bianco su Caorso*, ed. Confederazioni Sindacali: see G. B. Zorzoli, “La prospettiva nucleare europea: ne discutono operai, contadini, ricercatori. Libro Bianco su Caorso”, *Sapere* 784 (July 1975): 52; Zorzoli, *Fisica Sperimentale dei Reattori Nucleari* (Milano: Feltrinelli, 1971): a technical treaty on neutron physics, no specific treatment of nuclear reactors; Zorzoli, *Il Dilemma Energetico* (Milano: Feltrinelli, 1975); Zorzoli, “Il fascino discreto dell'energia nucleare”, *Sapere* 783 (June 1975): 57-65; Zorzoli, *Proposte per il Futuro* (Milano: Feltrinelli, 1976); Zorzoli, “Industria nucleare e politica energetica”, in *Chi ha paura del sole? Problemi e limiti della scelta nucleare*, ed. Marco Martorelli (Milano: Mazzotta, 1976), 26-40; Giorgio Nebbia, “I conti sbagliati del programma nucleare”, *Mondo Operaio* 10 (1976), 67-75.

⁴ Sergio Ciliberto, Saverio Craparo, Giovanni Del Fante, Roberto Livi, Marco Lugli, Marco Pettini, Antonio Politi, Andrea Raspini and Lorenzo Vallerini, *I Nucleodollari. Costi e rischi dell'energia nucleare in Italia. Le alternative possibili*, with a foreword by Angelo Baracca (Florence, CP Editrice: 1977).

⁵ Previous analyses had appeared, but they were mainly political polemics, e.g. Mario Silvestri, *Il costo della menzogna. Italia nucleare 1945-1968* (Turin: Einaudi, 1968).

ambitious nuclear project, which was sunk in the early 1960s with the “Ippolito affair”, leading the country to be strongly dependent on fossil fuels).⁶

The structure of the book revolved around the following topics: the energy model in the West and in Italy; the uranium cycle and nuclear reactors; political and economic analyses of the nuclear choice; environmental problems of the nuclear choice; alternative energy sources (as they were called at that time); plutonium and breeder reactors. This last issue was relatively new for the Italian public, but at the center of much attention, given that ENEL was launching a demanding and costly program to participate in the French fast breeder reactor (FBR) project. The authors strongly criticized such an alternative as unrealistic and dangerous. Four explanatory boxes devoted to enriched the book: radioactivity, nuclear energy, nuclear reactors, and breeders.

An excerpt from the conclusion gives a sense of the radical but articulate approach of the book, and its effort to relate the energy system and energy choices to the specific social situation of the time:

Therefore the trend to replace conventional with nuclear energy cannot simply be rationally approached, but must be entirely rejected.

Although we have so far expressed a heavily negative opinion on the perspective of replacing (even gradually) oil with nuclear energy, one must not believe that this authorizes us to speak of nuclear energy as “bad” in itself. It is a false problem to search for intrinsically good sources; rather, we must analyze the deep (ever existing) connections between the proposed ways of utilization and the relations of production in society.⁷

The analysis of all the possible technical choices concluded significantly that, “*The problem is political*”.

⁶ In fact, the ploy was twofold, since the ousting of Felice Ippolito coincided with the elimination of Enrico Mattei, who tried to develop a national oil policy contrasting the interests of the so-called “Seven Sisters”: this gave the green light to Italy’s increased dependence on fossil fuels, until the “nuclear party” tried to re-emerge around the mid-1970s with unrealistic projects. Among the plentiful literature available, we refer to the sharp analysis of Angelo Baracca, Giorgio Ferrari, Roberto Renzetti, “The ‘go-stop-go’ of Italian Civil Nuclear Programs, Beset by Lack of Strategic Planning, Exploitation for Personal Gain and Unscrupulous Political Conspiracies: 1946-1987”, forthcoming (a preliminary version was published as Angelo Baracca, Giorgio Ferrari, Matteo Gerlini, Roberto Renzetti, “The ‘Go-and-Stop’ of the Italian Civil Nuclear Programs, among Improvisations, Ambitions, and Conspiracies” in *A Comparison of European Nuclear Energy Programs*, ed. Albert Presas i Puig, (Berlin: Max-Planck-Institut für Wissenschaftsgeschichte, Preprint 419, 2011), 51-70, <https://www.mpiwg-berlin.mpg.de/en/resources/preprints>, last accessed May 1, 2016.

⁷ Ciliberto et al., *I Nucleodollari*, 185.

CONCRETE INITIATIVES IN THE GROWING ITALIAN ANTI-NUCLEAR MOVEMENT

The book circulated widely among the growing anti-nuclear movements, a remarkable result considering that in that phase connections were still evolving, and there was no general national coordination, and, above all, that the main left-wing forces strongly supported nuclear energy. The student group was invited in numerous public meetings and debates, in which – as we mentioned – they had no problem confronting ENEL technicians or university specialists. In particular, they received invitations by the population of several towns the successive editions of PEN designated as potential nuclear sites. Unfortunately, no complete record is left of the public meetings held in Pisa, Varese, Casalmaggiore, Genova, and Cremona.

A crowded meeting we vividly remember was held in Florence. It was organized by professors and specialists from the Faculty of Nuclear Engineering of the University of Pisa, and saw a large participation of professors of Nuclear Physics from the Institute of Physics of the University of Florence (several of whom were members of the PCI). Their aim was clearly to use their academic authority to establish, “with no ifs and buts”, the absolute validity, modernity, and safety of nuclear technology. However, at this meeting these “specialists” met their match: they insistently asked critics or opponents of nuclear power to “bring objective data”, but they could not reply to the arguments presented by some of the students on a less technical and more general ground, closer to common sense.

It seems relevant to highlight the spirit of this (and other) forms of political engagement. At that time, there was a complete “division of labor” and interchangeability among the members of the student group (even with Professor Baracca): it was not relevant *who* accomplished a specific task, but that *the tasks were accomplished*.

In the meantime, the debate on nuclear energy grew, along with the anti-nuclear movement, involving larger sector of society as well as members of the cultural and technical elites. One of the most important initiatives taken in the 1970s was the launching of a new series of the monthly magazine *Sapere* entrusted by the publisher Dedalo to the direction of Giulio Maccacaro – a physician who was deeply engaged ideologically – between 1974 and his premature death in 1977 (although the magazine continued to be published by the editorial group until 1982). Maccacaro surrounded himself with a group of involved and (not merely academically) qualified collaborators, which became an extraordinary breeding ground, and a political school, for left-wing scientists and workers’ representatives who wanted to offer a critical analysis of science and society. Between 1978 and 1979, *Sapere* published five broad and in-depth special issues on nuclear energy, the energy problem and alternative energy.⁸

⁸ They were: *Il rischio nucleare. Leggiamo criticamente il Rapporto Rasmussen*, special issue, *Sapere* 809 (March 1978) (a premonitory, comprehensive critical analysis of the official underestimation of the risk

There were other initiatives as well: the journal *Quaderni del Comitato siciliano per il controllo delle scelte energetiche* was established in 1979, and had a national resonance. It was explicitly devoted to energy choices, and nuclear power received special attention. At that time, even local political and critical initiatives spread generally, and more directly than in the times of the Internet. Another important initiative was the magazine *Rosso Vivo*, created in 1979 by ecologist Dario Paccino (author in 1972 of *L'imbroglione ecologico*).⁹

Anti-nuclear movements drew on these critical analyses, and grew considerably. As the succession of events became increasingly feverish and excited, the nuclear problem emerged as one of the hottest issues debated in Italy.

1979, THE STUDENT GROUP DISSOLVES, AND IN PART REASSEMBLES. THE NEW FRONTIER OF NUCLEAR DISARMAMENT

In 1979, the authors of *I Nucleodollari* dissolved for “physiological” reasons, since most of them became absorbed in the preparation of their bachelor theses. They then became professionally engaged and in part dispersed in different towns. However, some of them met again several years later and engaged in similar activities, although no longer as students.

In the meantime Professor Baracca, who had previously been concerned with other issues (on which he worked with the same students of the CPF, two of which, Livi and Ruffo, prepared their theses with him), “inherited” the legacy of the student group and, as a professor, developed and expanded it further.

The March 28, 1979 Three Mile Island accident gave new impetus to the anti-nuclear movement. During the 1980s, public initiatives multiplied, especially in secondary schools, where ENEL was particularly interested in promoting nuclear energy. The initiatives always took the form of a debate between a “popular expert” and an ENEL technician or nuclear expert, but the latter invariably met with a strong opposition.

In the meantime, nuclear issues became more complicated, with the problem of Euro-missiles being installed and the concrete risk of a nuclear confrontation between the Western and the Eastern blocs. The anti-nuclear movement assumed an antiwar character, fighting mostly for nuclear disarmament, although the opposition to nuclear power continued.

of nuclear accidents); *Energia. Il nucleare: una scelta imposta*, special issue, *Sapere* 810 (April-May 1978) (an extensive monograph – 160 pages. Due to a series of “academic accidents”, an essay by the authors of *I Nucleodollari* was excluded); *Energia. Le condizioni per l'alternativa*, special issue, *Sapere* 813 (September-October 1978) (94 pages); *Energia. Il dibattito nel movimento*, special issue, *Sapere* 815 (December 1978); *Il rischio nucleare. Lo scheletro nell'armadio*, special issue, *Sapere* 819 (June 1979).

⁹ Dario Paccino, *L'imbroglione ecologico. L'ideologia della natura* (Torino: Einaudi, 1972).

Baracca became strongly involved on both fronts. In 1981, he launched a document of Italian physicists against the deployment of new cruise missiles in Comiso, Sicily (although this action had its core at the University of Rome, and was promoted by Professor Edoardo Amaldi, who was the first authoritative signatory). In 1982, riding the wave of this document's success (which had almost 900 signatories), he was among the promoters of the *Unione Scienziati per il Disarmo* (USPID).

In 1981-1982 Ruffo, who graduated with Baracca, held a public debate on cruise missiles in Florence. In 1982, the Florence section of USPID was established, revolving around Baracca, Ruffo and Livi, with the latter as its secretary. USPID held numerous public activities, mainly aimed at high schools, and promoted and spread an official document on the effects of nuclear explosions.

Ruffo established a collaboration with the *Forum per i Problemi della Pace e della Guerra*, an organization that was independently founded in Florence in 1984, and had a more academic and less radical position than USPID, potentially juxtaposed to it. In particular, mention of both problems of "peace and war" sounded ambiguous, at least to many of the Florentine members of USPID, but a contrast between two pacifist organizations seemed absurd, especially in that delicate and dangerous phase. Ruffo's fruitful relationship with the Forum led to the publication of an article for the fourth issue of its *Quaderni*.¹⁰ It focused on horizontal nuclear proliferation, in particular the increased risks of dual-use following the expansion of civilian nuclear programs, an issue that contributed to link movements against civilian nuclear programs to those in support of nuclear disarmament. Ruffo analyzed the nuclear fuel cycle and the risks of diversion in the manufacture of nuclear weapons, particularly in relation to fissionable plutonium in nuclear waste, and discussed the practicability of a nuclear-powered plan using reactor-grade material. He emphasized in particular the risks of horizontal proliferation.

BARACCA'S INVOLVEMENT WITH DEMOCRAZIA PROLETARIA IN THE TUSCAN REGIONAL COUNCIL, UP TO THE CHERNOBYL DISASTER

In 1985, the extreme left-wing party *Democrazia Proletaria* (DP) nominated Baracca head of the list for the regional elections of Tuscany, as a well-known representative of the anti-nuclear and antiwar movements. He was elected regional councilor. One of the central points of the electoral program was, along with numerous social and envi-

¹⁰ Stefano Ruffo, "La proliferazione orizzontale delle armi nucleari e l'utilizzo pacifico dell'energia nucleare", *Quaderni del Forum per i problemi della pace e della guerra* 4 (December 1987): 1.

ronmental issues, an opposition to the fast breeder reactor (FBR) program, which was supposed to lead to the building of a reactor on the Apennines between Tuscany and Emilia-Romagna, not far from Florence and Bologna, an unsuitable place for a nuclear reactor. The project aimed at establishing an experimental FBR, called Prova Elementi di Combustibile (PEC), which, after previous redirections, was formally designed to test the fuel elements for the French FBRs' spinneret. Italy would thus contribute to the FBR program while at the same time participating financially by obtaining a 33 per cent share.¹¹ In 1985, the reactor not only presented severe design shortcomings, but also suffered an enormous delay with respect to the overall program, to such an extent that it became irrelevant for the French program. As one document put it, "old errors added to the persistent incapability of realization and of relations with industry".¹²

At the beginning of 1986, DP's regional group organized an all-inclusive survey about the PEC. It was carefully prepared, and preceded by the organization of local public assemblies. A series of meetings with local administrations and the local health boards of the provinces of Prato, Pistoia, and Porretta Terme (where the center was located) revealed the existence of serious problems (although health boards were more aware of the issues connected to PEC):

- they had no data on the state of health of the population, nor were they in a condition to undertake a survey about it;
- they *had never even considered the problems connected to PEC*, in particular the need to monitor specific pathologies in the most exposed population groups, nor were they able to start the process rapidly (just a few weeks after the meeting, 13.5 tons of low activity uranium stealthily arrived at Brasimone and, according to official

11 The first Italian FBR program was proposed, very ambitiously, as early as 1962-1963. It was based on the uranium-thorium fuel cycle, and was called Rapido-Torio-Uranio-Sodio (RAPTUS). After the "Ippolito affair," CNEN's second five-year plan (1965-1968) included the PEC project, devoted to the development of a fuel element for an Italian FBR. Due to political pressures from the Christian Democratic congressman Angelo Salizzoni, from the Emilia-Romagna Region, and in contrast with the technical and safety requirements needed, PEC was to be built in the inadequate research area of Brasimone, where a "dome" previously built for the Progetto Reattore Organico (PRO) could be used, given that the PRO project was impracticable. The project was approved only in 1974, when ENEL decided to participate in the French FBR program, along with West Germany. Funding for the program rose from 100 to 196,5 billion lire (of which the PEC covered 29 per cent), and was not accompanied by an official political decision, presenting the Italian Parliament with a "fait accompli", along with an established practice. French technical experts pointed out that the PEC project had to be completely redone, reducing from three to one the planned proof channels (see below). It should be remembered that the project of the three channels had been entrusted to the American company APDA, at a cost of 500 billion lire, while the "path of the fuel" was assigned first to the English Electric society, then to the French, at a cost of 115 billion lire.

12 *Libro bianco sul reattore nucleare PEC del Brasimone*, ed. Gruppo Consiliare di Democrazia Proletaria (Florence: Consiglio Regionale Toscano, 1986), 36.

plans, in 1987 the first charge of plutonium could have arrived, nullifying the creation of a previous socio-medical database);
– they suffered a shortage of qualified staff.

No scheme existed for an emergency plan, and there was no study concerning the socio-economic effects a possible accident might have (which could divide the peninsula in two, given that the town of Brasimone was just a short distance from Italy's two most vital communication arteries connecting the North to the South, the freeway and the railway).

The core of the survey was an official inspection by the DP delegation of the Brasimone research center. The delegation consisted of Professor Baracca, the DP regional secretary, and the physicists Paolo Bartolomei (a member of DP Bologna and of the Agenzia nazionale per le nuove tecnologie, l'energia e lo sviluppo economico sostenibile, ENEA, Bologna) and Giorgio Cortellessa (from the Istituto Superiore di Sanità, Rome). After visiting the plant, the delegation held a lively four-hour meeting with ENEA's technical staff and the plant's development engineers. Every aspect was carefully discussed, and the delegation severely questioned the project's alleged design shortcomings or errors: in particular, the space for testing and operation, and consequently the plant's safety, which was inherited from the adaptation of the vessel built for a previous nuclear design, the Progetto Reattore Organico (PRO).

Some excerpts from the full transcript of that lively discussion are sufficiently eloquent:

DP – "... this means that we have wiped away the breeding".

ENEA – "For the next ten, twenty years yes".

DP – "One has the impression that one is very cramped for space ... three channels are reduced to one not so much because there has been a change of philosophy ... because they did not fit, and even so a difficulty exists ... There is not yet a final design, such as to ensure that everything of the reactor fits".

ENEA – "... the structure that derived [from the adaptation on the previous container], with 16-meter long channels, in the presence of thermal gradients and of phenomena of deformation, also under radiation, which could occur, did not give sufficient guarantees. ... Certainly what you say is true, it is extremely adventurous to try to fit three independent circuits in the limited spaces that exist inside the metal container. You know the topic of the metal container well; you know that it was here [from the previous project...]; it is clear that it is an expensive constraint both for the plant design arrangement and the blockage of the equipment, and the problems concerning the assembling of pipes, components and instrumentation. It is really a problem of accessibility to the components that we have found".

DP – "Such a blockage is not dangerous?"

ENEA – "It not an optimal situation, no doubt. From the point of view of maintenance, and more directly of safety, specific problems must be solved.

... one can say that [the remark] in quotation marks is true. ... in order to solve these problems it is necessary to carry out a more sophisticated design ...".¹³

These substantial statements by the project designers left the entire DP delegation astonished, although not surprised, since they seemed almost obvious.

The *Libro bianco sul reattore nucleare PEC del Brasimone* prepared by the DP regional group after the survey was carried out was distributed to the regional council and presented to the press. It was a very critical phase of the Italian nuclear program. Meetings with the regional council and other political groups were organized in order to discuss and share the results, and a specific debate took place in the regional assembly.

In the meantime, the wind was changing at a national level. During the XVII Congress of the PCI (traditionally strongly pronuclear), held on April 9-13, 1986, an anti-nuclear motion was presented and was supported by almost 50 per cent of the votes. Two weeks later, on April 26, 1986, the Chernobyl disaster took place. It left a deep impression on Italians and led to widespread concern for the so-called "Chernobyl cloud" and the levels of radioactivity in food, a situation that reinvigorated public debates and polemics.

On a local level, the survey carried out by the DP regional group and its results contributed to change the position of the PCI in Tuscany. The debate in the regional assembly ended with a vote in favor of shutting down PEC.

¹³ *Libro bianco*, ed. Gruppo Consigliare, 43-47 (excerpts from the transcription of the tape recording of the discussion).