SOCIOECONOMIC IMPACT ASSESSMENT AND NUCLEAR POWER PLANT LICENSING:

GREENE COUNTY, NEW YORK

Elizabeth Peelle

**Energy Division
Oak Ridge National Laboratory*
Oak Ridge, Tennessee 37830**

MASTER

DISCLAIMER

This book was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

**For Presentation at the NSF sponsored Conference on
"Improving the Scientific and Technical Information
Utilized in Environmental Impact Statements," May 19-
23, 1980, at The Institute on Man and Science,
Rensselaerville, New York.**

***Operated by the Union Carbide Corporation under Contract
No. W-7405-eng-26 with the U. S. Department of Energy**

DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED

20

**SOCIOECONOMIC IMPACT ASSESSMENT AND
NUCLEAR POWER PLANT LICENSING:
GREENE COUNTY, NEW YORK**

Elizabeth Paella
Energy Division
Oak Ridge National Laboratory*
Oak Ridge, Tennessee 37830

ABSTRACT[†]

The Final Environmental Statement for the proposed Greene County Nuclear Power Plant (Hudson River below Albany, New York) is unique among Nuclear Regulatory Commission impact statements in containing an extensive socioeconomic analysis and an unprecedented aesthetic analysis, and in being the first Nuclear Regulatory Commission FES ever to recommend denial of a construction permit on aesthetic and socioeconomic grounds.

Adverse and unmitigable impacts upon local cultural, scenic and historic resources of national importance were the prime reason for the FES conclusions. Additional adverse socioeconomic impacts supported the finding which also depended on the identification of several preferable alternate sites. The main socioeconomic impacts issues arose from the tax exempt status of the utility [Power Authority of the State of New York (PASNY)], possible displacement of an existing tax paying industry, with potential losses in taxes, jobs, and opportunity costs for local jurisdictions, serious impacts from an elaborate but inadequate series of road access improvement proposals, and visual and secondary impacts on the numerous historic properties in the 10-mile impact area. These conclusions reversed those of the 1975 Draft Environmental Statement because of development of extensive new information, enlargement of the appropriate impact area to include offsite impacts, and recognition of the need for an aesthetic analysis.

The paper reviews the setting, participants and status of the joint federal-state hearings, findings of the FES, problems of conducting social impact assessment (SIA) for the GCNPP, and the nature and effect of public participation in the formal, legalistic hearings process. The GCNPP is evaluated in terms of trends in Atomic Energy Commission-Nuclear Regulatory Commission social impact assessments from 1972 to 1979. Progress in the adequacy and relevance of social impact assessment is defined according to steps in a lengthy, evolutionary legitimization process. The legitimization process for SIAs requires a capable technical staff, interactive relations with agency managers, access to needed research information about impacts, supportive/permissive agency goals, and public interest and participation in licensing actions.

* Operated by Union Carbide Corporation under Contract No. W-7405-eng-26 with the U.S. Department of Energy.

[†] Invited Paper for NSF Sponsored Conference on "Improving the Scientific and Technical Information Utilized in Environmental Impact Statements," May 19-23, 1980 at the Institute on Man and Science, Rensselaerville, New York.

Suggestions for improving future joint hearings processes, public participation and the technical adequacy of SIAs are given. The GCNPP FES is seen as representing the increasing independence, scope and relevance of SIA in NRC environmental statements. While improving, SIAs lag behind what is technically possible because of continuing administrative, time, and resources constraints. Outcomes of individual statements are strongly affected by random and accidental factors, such as timing and delays, characteristics of the utility, competing agency priorities, availability of experienced staff with needed skills, and the presence of knowledgeable intervenors. The valuable information resource created by the hearings remains mostly inaccessible because of its formidable volume and fragmentation. Public participation serves a vital role in setting the agenda for technical assessments, but fails to meet other important public needs.

SOCIOECONOMIC IMPACT ASSESSMENT AND NUCLEAR POWER PLANT
LICENSING: GREENE COUNTY, NEW YORK

Elizabeth Peelle

Energy Division
Oak Ridge National Laboratory

INTRODUCTION

Since the passage of the National Environmental Policy Act of 1969, the revolutionary mandates of NEPA have been the cause of intense activity in public agencies, private industry, activist groups, impacted areas, and among those professionals charged with evaluating impacts of proposed actions through the environmental impact statement (EIS) process. The 10,000 EISs produced through 1978 also resulted in 938 lawsuits (CEQ, 1978), innumerable meetings and supporting studies, and have greatly expanded whole disciplines such as social impact assessment (SIA). This activity is carried out by hundreds of professionals and supporting staff in a variety of working environments (university, institute, government agency, national laboratories, and consulting firms), some of which were expressly created or expanded for this purpose.

In the evaluation being widely conducted ten years later, it is appropriate to ask whether NEPA's objectives and promises are being fulfilled, and how. Is agency decision-making being affected? Are non-economic factors included in assessments? How are social and aesthetic factors treated relative to the technical and economic factors which have historically determined development decisions? Are social impacts being adequately defined and dealt with? Are those who bear the burdens of development involved in the decision-making which ultimately affects their quality of life and life options? How are social impact issues and assessments defined and conducted within differing agencies? How does agency structuring and organization affect inclusion and treatment of social impact factors in project acceptance and/or conditioning decisions?

Some of the above questions will be addressed in this paper as we review the precedents set by the content and decisions of the Nuclear Regulatory Commission's (NRC) final environmental statement (FES) in the licensing action of the proposed nuclear plant for Greene County, New York (GCNPP). This evaluation of a particular plant is also reviewed in light

of numerous nuclear plant statements conducted since 1972 at Oak Ridge National Laboratory for the Atomic Energy Commission (AEC) and its successor, the NRC. In the process, we trace significant developments in the initiation, conduct and increasing importance of SIAs at ORNL, as well as the (usual) problems of conducting adequate SIAs. Some observations of the role of public participation in nuclear licensing actions are made.

The three main theses of this paper are that:

- (1) adequacy and effectiveness of SIAs in nuclear plant EISs have increased over time;
- (2) enlarged SIA scope and relevance as demonstrated in the GCNPP are due to a complex interaction of public participation, timely access to certain research information, growing technical expertise in SIAs, agency policy, and interactive relations among technical, management and agency staff; and
- (3) the evolution of SIAs within EISs can be viewed as the process of legitimation of a new task-discipline within complex organizations and the usual struggles over utilization of new and potentially threatening knowledge.

II. THE SETTING OF THE GREENE COUNTY NUCLEAR POWER PLANT LICENSING ACTION

As background to the subsequent discussion of social impact assessment evolution within environmental impact statements, the organizational setting, history of the Greene County EIS and joint hearings in New York State will be reviewed herein, and findings of the NRC EIS will be presented (Sect. III).

As the second major joint state-federal nuclear licensing action,* the organizational milieu included several large public bureaucracies as well as affected local governments, private organizations and a local industry. The large bureaucracies and their respective roles were: U.S. Nuclear Regulatory Commission (federal regulator and licensor); Oak Ridge National Laboratory (technical assistance for NRC); various New York State agencies providing technical expertise to the New York State Board on Electric Generation, Siting and the Environment (NYSBEGSE) (state regulator and licensor). The New York State agencies included Department of Public Service, Department of Environmental Conservation, Department of Parks and Recreation; and the Power Authority of the State of New York (PASNY) (applicant for power plant license).

The U.S. Nuclear Regulatory Commission is empowered by Congress** to issue construction permits and operating licenses for nuclear power plants following the independent evaluation of impacts of the proposed project as required by NEPA. The NRC issues in increasingly detailed series of environmental impact statements which culminate in a final EIS (FES). The NRC sub-contracts major portions of the technical analyses and impact statement writing to various national laboratories (currently Argonne or Oak Ridge) while retaining control over all policy, scheduling, budgetary and legal matters involved with statement publication and the licensing hearing. This involves review and veto power relative to all technical analyses and conclusions. NRC appoints a project manager for the two licensing actions: safety and engineering assessments, and the environmental assessments. Internal staff from at least three divisions are involved in the review and approval of any EIS: technical, licensing, and legal. All of these staff and their managers will interact,

*Douglas Point in Maryland was the first.

**NRC's principal authority to license nuclear installations comes from the Atomic Energy Act of 1954 and is supplemented by NEPA, and various judicial and administrative decisions.

during the course of statement preparation and hearings, with the laboratory technical staff who actually analyse the data, write the EIS, and testify in subsequent hearings before the Atomic Safety and Licensing Board (ASLB).

Oak Ridge National Laboratory (ORNL) is likewise a large and complex bureaucracy but one devoted to research, development and assessment rather than regulation (current staff: 5100 including 50 social science professionals). Within ORNL, EISs are produced by multidisciplinary task forces of 4-10 professionals. Each member of the GCNPP task group was responsible to a home division or group (environmental sciences, social impacts, economics, thermal hydraulics, etc.) while she/he received task assignments from the EIS management within the laboratory. In a high priority, controversial EIS like that of Greene County, the analyses and findings of the ORNL staff are given extensive multi-level disciplinary and management review before they are sent to the NRC for further review. The Social Impact Assessment Group within which the author works was created in 1975 and now includes eight professionals plus graduate students representing the disciplines of political science, planning, sociology, demography and engineering. The aesthetic analysis on which rejection of the licensing application was based in part was conducted by a landscape architect in the ORNL Resources Analysis Group (cultural and physical geographers, a systems analyst, a lawyer, a landscape architect and extensive support personnel).

Beginning in 1975, PASNY presented its 3-volume Environmental Report (ER) as required to the NRC and applied for a construction permit to build a one-unit 1200 MWe pressurized-water reactor at Cementon, New York on the Hudson River about 40 miles south of Albany. One 450-foot natural draft cooling tower was proposed for the plant. The tower and plume would be visible six miles downstream from Olana, the hill-top home of the 19th century landscape painter, Frederic Church. The home and grounds is now a National Historic Landmark. It was designed to frame the view of the "Bend in the River" which Church also painted at least 35 times. These oil sketches now hang in Olana as well as in various national galleries.

The site for the \$1.8 billion nuclear plant included most of the plant and property of one of three rather ancient cement companies which provide a noticeable share of the employment, tax, and economic base of the neighboring

towns of Catskill and Saugerties and surrounding counties. The only road access to the plant was to be a narrow, no-shoulder, blind-curve section of U.S. 9W, noted for two very narrow railroad underpasses.

Under the joint hearings protocol signed by the NRC and the New York State siting board, one joint hearing on most issues was to be held before a joint hearing board composed of 3 NRC commissioners and 2 New York State Public Service Commission examiners. Beginning in May, 1977, hearings were conducted in Albany, New York in a Public Service Commission hearing room until suspension of the proceedings in April, 1979, two months after the NRC FES was issued. Because of differing procedures and objectives of the two licensing bodies, the joint hearings as structured led to proceedings of extraordinary diffuseness and length (22,000 pages of testimony during the first round of hearings involving witnesses for only one of the six parties to the licensing action). Thousands of pages of supporting exhibits, studies and documents were also involved. For instance, while the New York State Board and its supporting agencies concentrated upon the question "Which of two sites (Cementon or Athens) and two methods of generation (nuclear or coal) is most suitable for construction of a PASNY generating plant?", the NRC was considering two questions: "Is Cementon an acceptable site for construction of this particular nuclear plant?" and "Do any obviously superior alternate sites exist?" Other significant differences included the differing staff role and hearing functions for the two licensing agencies; since the New York state agencies did not prepare a full-fledged EIS, they normally use hearings to generate, discover and verify information for the testimony they prepare for hearing commissioners at the end of the proceedings. Laboratory staff, on the other hand, normally assess the applicant's ER and other relevant information in order to prepare their FES which becomes part of the information basis for hearings before the NRC licensing board (ASLB). Recommendations of the NRC staff in the FES are usually adopted by the ASLB with occasional addition of modifying or mitigating conditions following testimony by all parties about the validity and intensity of the expected impacts. Because large quantities of new information were being introduced into the proceedings via the hearings, the NRC FES was delayed for almost two years after the start of the hearings while new issues and information were

analyzed and included. The FES in this case was a result of the joint hearings, rather than a prime input to hearings. It would have undoubtedly had a major effect upon subsequent hearings, had the process continued.

More than most other licensing actions with which ORNL staff is familiar (~60 since 1971),* the GCNPP licensing issues evolved, changed and grew over the four-year licensing period. New issues were developed as a result of extensive new information and additional depth of analysis. A succession of technical staff were involved (as principal author of the FES SIA sections, I was the fourth SIA staff person). The net result was an unprecedented reversal of the conclusions of the draft environmental statement of 1976 (where impacts were deemed acceptable) by the FES in February, 1979 (impacts deemed unacceptable since several alternate sites had been identified). The new issues in the FES included aesthetic impacts upon Olana and the area, effects of the elaborate system of transportation and road alternatives proposed to handle construction traffic, and impacts resulting from the possible closing of the Lehigh Portland Cement Company. Because very little had been included in the utility's ER about these impacts, the relative importance of that document upon the final outcome was much less than usual.

Dozens of "contentions" about anticipated adverse impacts were submitted by the several intervenor groups, the cement company, and the local governments. Those contentions which were accepted by the licensing board as germane to the proceedings were subsequently addressed either in the FES or in separate testimony by ORNL or NRC staff. These concerns included possible adverse effects of 1) the cooling tower upon land use and aesthetics, property values in adjacent areas, and neighboring apple orchards, 2) the radiation releases upon health of the public, 3) a large incoming workforce upon community services and housing (a "boom-bust" situation), 4) the proposed road modifications upon traffic safety and the Lehigh Cement Company, and 5) pre-emption of cement company land upon local employment and tax base, among others.

The utility's response to the negative findings of the FES included the submission of 560 interrogatories to NRC about the nature, background, and history of staff assessment. Shortly before the Three Mile Island accident, the PASNY Chairman suggested the "sale of the assets" of the

* Only the Indian Point licensing actions exhibited comparable evolution and change in issues over time.

plant...because of the extensive escalation of the cost of the proposed plant to \$3.1 billion. The PASNY board delayed action on this proposal until April 9, shortly after the Three Mile Island accident, when it decided to proceed with sale of the assets (reactor and steam supply elements on order). No mention was made of the FES and its findings by the utility. However, PASNY's cost escalation estimates included estimated relocation costs for moving the plant from Cementon to Athens, a preferable site (Nuclear News, May, 1979). PASNY opposed termination of the proceedings despite its announced intention to sell. The joint hearing was suspended indefinitely (with PASNY required to report back in October, 1979 as to the status of its application and the proposed sale of the Babcock and Wilcox reactor unit) and then cancelled altogether in January, 1980 at the applicant's request. The NRC license application had not been withdrawn as of April, 1980, however.

III. CONTENT AND FINDINGS OF THE EIS

Because other alternate sites could be identified without the severe and unmitigable aesthetic impact of the cooling tower and plume upon the National Historic Landmark, Olana, and other local cultural, scenic and historic resources of national importance, the FES recommended denial of a construction permit at the Cementon site (Greene County NRC FES, 1979). Additional serious to severe socioeconomic impacts contributed to the unfavorable rating of the site. Seven alternate sites were deemed preferable on the basis of reconnaissance level data.

Because of the subjective nature of aesthetic analysis, three separate analyses were done by Carl Petrich, ORNL landscape architect. The studies involved objective measures of visual quality and visibility, subjective measures of local values using comparative evaluation of local scenes (through a visual preference survey), and an historical-cultural evaluation of the mid-Hudson Valley in American history. All studies pointed to the same conclusion of severe aesthetic impact (Petrich, 1979). Petrich spent two years doing the studies once it was decided by ORNL and NRC that the importance of the possible aesthetic impacts warranted special analyses.

Our socioeconomic analyses showed the major probable impacts at Cementon not to be the "boom and bust" feared by local governments, but to be the effects of the workforce upon roads, selected schools that were already overcrowded, and the large number of unprotected historical structures in the region, as well as the impact of the possible loss of the cement company. The effects arising from the loss of the cement company included possible Lehigh job loss (223 workers), opportunity cost losses (if Lehigh was prevented from expanding its operations as claimed), and the \$200,000 yearly tax loss to Greene County if the tax-exempt Power Authority displaced a tax-paying local industry. An extensive analysis of the socioeconomic effects of the six proposed road alternatives uncovered serious defects with the new and temporary roadway solutions, and found only the "soft" solution of busing from selected peripheral parking lots to be acceptable under additional mitigating conditions. Though we found the applicant's estimate of a 2100-person workforce to be seriously outdated by 1979 (we suggested 3000 instead), we found the ER estimate of 14% in-movers to be still reasonable, adapting this to a more credible range of 14-20%. We anticipated that most workers would commute from nearby (in this case, Albany or Kingston) laborsheds

as is the pattern for most northeastern nuclear labor forces. Baseline estimates showed selected schools in the two most desirable (to in-movers) nearby towns would still be overcrowded in the proposed peak workforce period. Because of these school estimates and because of the unavoidable uncertainty surrounding estimates of this type, we required that the applicant devise an acceptable (to NRC) mitigation plan for all community services in a three-county impact area for the construction period. Few other services impacts were foreseen at the expected in-mover rates, though the locally "tight" housing market would be strained in the "worst case," and more serious impacts would begin to occur if our in-mover estimates were exceeded. These impacts were not ranked as serious in the overall evaluation of plant effects because a satisfactory "fall-back" mitigation plan could be devised.

Results of the extensive mitigation analysis done for each impact is shown in Table 1 (Table 4.17 of the FES). In some cases, institutional authority did not exist to require needed mitigation (Lehigh tax loss), while in others, only unwieldy solutions existed (required retraining or other compensation for Lehigh workers who lose jobs). In these instances, a voluntary commitment by PASNY would have provided basis for negotiation and possible solutions. The partial mitigation of incompatible land use changes affecting the many historical properties was beyond the authority of the federal government; the FES suggests that local governments may wish to exercise their authority through protective land use and zoning changes. No apparent solution existed for the Olana aesthetic impacts, the highly adverse local opinion, or for project-induced inflation. The tax exempt status of the utility was identified as the source of certain intractable mitigation dilemmas since it resulted in lack of resources to deal with difficult compensation and equity problems.

Another unusual feature of the social impact assessment was the discussion of distribution of impacts. While several important regional benefits were identified (employment, regional economic stimulus in an economically depressed area, state tax payments, plant purchases, etc.), only modest local benefits could be identified. Since many adverse local impacts were found, we observed that the relationship between local costs and benefits appeared to be adverse overall. In our judgment, regional benefits cannot be used to justify uncompensated losses for a local area.

Table 1
Mitigation of socioeconomic impacts of GCNPP at Cementon site

Socioeconomic impacts at Cementon	Mitigable?	Possible solution
Road alternatives		
1B	No	
1BR	No	
2TB	No	
2T	Yes	Suggested solution: require removal of temporary driveways and regrading Require measures to prevent increased number of deficient roadway links
2TR	Yes	
Park and Ride	Yes	
VII	Yes	
Tax loss		
Lehigh site and road properties	No*	Replacement payments for life of plant
Community opportunity cost (site use)	No	None
Lehigh Rent costs	Yes	Through court action
Lehigh site taking	No mitigation available for community	Equivalent site found
Lehigh job loss (223 workers)	Partially	Estimated 50% find jobs; PASNY-supported job assistance and retraining
Aesthetics		
View from Otane, etc.	No	None
Other historical resources	Partially	Historical and cultural area designation, local zoning
Local legal positions (Road 1B)	Yes	Select different road alternative
Local opinion	No	No siting
Relocation		
Site + 1B + transmission lines	Partially	Only owners will be compensated
Site + Park and Ride + transmission lines	Yes	Adequate taking and relocation payments
Public services	Yes	Monitoring and mitigation plan - schools, police, etc.
Transmission lines	Partially	Visual screening, selective routing
Inflation if		
In-movers > 300	No	None
Work force > 2100	No	None

*Not mitigable under present laws.

Source: Table 4.17, Greene County Nuclear Power Plant FES, page 4-47.

IV. PROBLEMS OF SOCIAL IMPACT ASSESSMENT IN ACTION

The serious problems confronting social impact assessors have remained remarkably similar over time and in different institutional settings (cf. Jobs, 1976, or Friesema and Culhane, 1976). As seen again in the GCNPP statement, they are lack of adequate time and resources to do the task,* administrative and organizational conflicts which hinder the pursuit of the analysis, and occasional lack of autonomy on critical substantive questions. Nonetheless, significant gains were made in procedural, substantive, and policy matters on the GCNPP SIA, so problems must be viewed on a relative basis and in a broader perspective, as well, as provided in Sect. VI.

One common problem which was blessedly absent on the Greene County case was interdisciplinary misunderstanding or conflict. The entire ORNL task force was supportive of the on-going aesthetic and socioeconomic work as it gradually became obvious that these issues would be predominant. After reviewing the completed work of all task group members, the task force voted unanimously that several obviously superior alternate sites existed; most of the task force also viewed the Cementon site as unacceptable.

The usual low priority status of SIAs was gradually altered over the years of this statement, rising dramatically in the final year with the assignment of additional staff until 2-4 analysts were involved simultaneously, instead of the previous 1/4-1/3 time person.

Adequacy of resources to do assessment must be measured against the size of the task, however. For Greene County, as in most impact statements, social impact assessment was defined by EIS management to include roads and traffic, noise, land use (non-ecological aspects), historical, and archaeological resources as well as the usual services, community and fiscal impacts. Fortunately, the aesthetic analysis which is usually also assigned to the "catch-all" SIA bin, was removed half way through the analysis period and assigned to a specialist in that field (see previous discussion). Since four of these areas proved to have major impacts requiring extensive independent analysis, the task was a very large one, requiring numerous technical skills not normally possessed by social impact analysts. Clearly, if social impact

* An exception was the aesthetic analysis task where the two years (full time) allotted and the considerable resources allocated were considered

assessment often looks more like civil engineering in its emphasis on services, sewers and roads (see Cortese, 1977 and Wilke and Cain, 1977), this is in part the result of being overloaded with non-social subjects in addition to standard community effects, something still outside the control of SIA staff.

The two most serious problems impeding SIA assessment on Greene County were somewhat rare: the huge volume of relevant material from the hearings which had to be reviewed, and its diffuse and haphazard organization. Approximately 12,000 pages of material was relevant to our broadly-defined SIA tasks (one-third of the 22,000 pages of testimony plus 6,000 pages of road studies, ER's and amendments, interrogatories, cement company business, intervenor-funded studies, and numerous secondary sources concerning the mid-Hudson Valley). After nearly two months on the stand and two rounds of cross-examination by all parties, the testimony of a key PASNY socioeconomic witness was scattered and fragmented in the record. The attempt of one of the New York State agencies to bring order out of chaos resulted in a 46-page index of this testimony. The information-gathering task was transformed into an arduous, frustrating search for the latest version of a particular fact, and a continuing sifting and evaluation of contradictory "facts" and conflicting assertions. Much needed information was omitted altogether in the record and the ER and had to be independently secured, generated or estimated. Thus, the entire time allotted for assessment could have easily been consumed in mere information-seeking and organization; a full-time information specialist would have been invaluable. The inevitable deadline pressures mean that shortcuts are made, and there is premature pressure to come to conclusions before the analysis is truly complete.

The "moving target" syndrome also plagued assessment efforts on the GCNPP. Road proposals changed at least three times in the four years we worked on Greene County, from no road proposals to a preferred new road to six road alternatives among which the applicant declined to choose. This entailed about six times as much assessment work. New transmission line routings were submitted in the third year, requiring major reassessment.

The administrative and organizational conflicts involved lengthy, iterative discussions over whether certain subject matter deemed important by the

SIA staff should be included. NRC managers finally agreed to inclusion of an appendix which included documentation of 20 local government actions concerned with (mostly opposed to) the GCNPP. Extended negotiation was also necessary to achieve inclusion of a small section which discussed pre-construction effects in the community using four quantitative measures: local government expenditures in opposition to the plant, increased historical preservation activity, increased polarization of local opinion and the structuring of the opposition effort by the seven local jurisdictions involved (p. 2-8, GCNPP FES). Part of the compromise involved re-titling the section as "pre-construction activity" and shifting it from the impact chapter (4) to the profile chapter (2). As interpreted by NRC management, "pre-construction impacts" are not germane to a construction permit since they have already occurred and will be unaffected by judgments on whether or not to build the plant. "Impacts" could not exist, by this definition, if they occurred prior to the issuance of a permit to construct. Inclusion of the substantive concerns of local governments (p. 2-9, GCNPP FES) was also a matter for discussion with NRC management who argued that inclusion would merely duplicate the contentions of intervenors which were already recorded in the legal proceeding. The argument over impact definition was subsequently used by NRC in deleting (over ORNL staff protest) the item of "pre-construction impacts" from Table 4.17. Numerous other NRC-ORNL staff discussions were held on the Lehigh question, and treatment of distribution of impacts. These arguments typically involved definitions of appropriate subject matter, scope, and analytical treatment. While NRC clearly has the right to determine what goes into its statements, the basic desires and judgments of the SIA analysts usually prevailed (after sometimes extended discussions), except as previously indicated. Delation over staff protest occurred in only the single case mentioned above, where legalistic definition prevailed over substantive technical judgment - a remarkable record for one of the most controversial and precedent-setting EISs ever issued by the NRC.

V. SOME OBSERVATIONS ON PUBLIC PARTICIPATION IN THE GAME OF EXPERTS

Public interest and concern over the potential impacts of the Greene County Nuclear Power Plant was high from the very beginning, as evidenced by the four-year record of the Greene County Legislature (see FES Appendix J), a review of local newspaper files, or the initial presence of 80 intervenors in the proceedings (later condensed to 6 intervenor groups).

Because of the formal, legalistic framework of the joint hearings, however, only those concerns which fit this framework and which were accepted by the two boards could be considered. As certain concerns were repeated and reiterated by group after group, they were highly effective in setting the agenda for the written FES and agency testimony, however. Considerable additional information was generated and assessment conducted by both the applicant and the reviewing state and federal agencies on aesthetic impacts, effects on property values, Olana, and road alternatives, among others as a result of this definition of issues. The process was lengthened, complicated, delayed, and finally, significantly altered because of these public inputs.

The hearings testimony, however, reveals a significant hidden agenda of additional concerns which kept bursting out and for which no provision could be made. Some such unaddressed local concerns were clearly visible in other settings (newspapers or conversation with local residents) but remained invisible in the hearings. For example, local residents resented the fact that the power to be generated by the GCNPP was destined for New York City, 90 miles away, while they would sustain any impacts from its construction and operation. While these issues will not be examined in detail here, some observations follow: these needs may include the desire for meaningful consultation with the utility about local concerns, road location, etc., need for clear and credible information, unaddressed concerns on equity and mitigation, and needs for reassurance. In the absence of all of the above, feelings of outrage develop and the intent to delay may emerge.

Considerable frustration of intervenors is evident as they attempted to question PASNY witnesses on technical details of aesthetic and socio-economic matters. Without technical background in these areas, they were

unable to complete (or sometimes even to pursue) a fruitful line of questioning despite their frequent probing of PASNY "weak spots." Without technical support of their own, they were at a considerable disadvantage in playing the hearings game which recognizes the credentialled expert. Thus, the modest funding given to Greene County to fund its own studies of roads, socioeconomic and aesthetic effects was very significant in attempting to redress a highly uneven balance of power in the hearings room. Most of these studies were not completed until the first two years were past or about the time of FES completion. The suspension of the licensing action came after only one party (the utility) had been heard and cross-examined. The most obvious effect of the intervenor funding would probably have been seen later in the direct testimony of these parties as they used the additional information and analyses to enhance their claims or to evaluate the utility and NRC studies.

VI. CHANGES AND TRENDS IN AEC-NRC SOCIAL IMPACT ASSESSMENTS (1972-1979)

The socioeconomic precedents and achievements of the Greene County Final Environmental Statement stand in sharp contrast to the first attempt at social assessment in the Mendocino PDES of 1972. The extent of the change and the nature of the trend may be seen in milestones set in the process of assessing impacts of numerous other nuclear plants* for licensing in between.

The Mendocino social impact assessment was begun months after the rest of the large task group had started its work. The task involved figuring out what should be in a social impact assessment, collecting data, devising an analysis mode, and writing the statement in a total of seven weeks without benefit of a site visit. As such, it was a portent of things to come in other areas of EIS work when dozens, and then hundreds of other analysts were faced with a brand new task and left virtually to their own devices to produce data, analyses, and written output in a few months. That the Mendocino SIA was undertaken at all and that it was given to a sociologist is due to the perception of EIS management** that the social impacts of this isolated California coastal site were potentially very great, and their belief that someone with appropriate disciplinary background should be involved. Though the Mendocino action was stopped (by San Andreas fault and passage of California Coastal Zone Management Act), the author continued to explore the boom town impacts and develop the first SIA typologies for the next year under ORNL and AEC sponsorship (Peelle, 1974). But not every nuclear plant was seen to have large social effects, and few social scientists were employed by ORNL in the early seventies, so social impacts were addressed, if at all, on an ad hoc and occasional basis (usually by engineers) until 1975 or later. Summit (1974) was the first plant wherein a social scientist participated in the acceptance review of the utility's ER and in the usual process of sending questions to the applicant about additional data and analyses needed before the EIS analysis was to

*Includes only ORNL-generated statements, omitting NRC statements generated at other federal laboratories, except for the Hartsville FES (Argonne National Laboratory).

**Roy Thoma (chemist and Mendocino Task Group Leader) and Ed Struxness health physicist and then EIS management head.

begin. For the Comanche Peak FES (1974), "community impacts" appeared for the first time since Mendocino in the outline for the statement. Early ER's rarely included information about host or other neighboring communities that might be affected by the plant or construction process, so unlike the ecological or thermal hydraulics analysts, the social impact assessor was faced with attempting to secure basic data within the already-short deadlines.

Major gains for the state of SIA occurred with the Hartsville EIS and subsequent licensing hearings in 1975. Here the active presence of several intervenors, including all jurisdictions ranging from the City of Hartsville to the State of Tennessee, resulted in social impacts being put on the agenda of high priority subjects for the first time. As a result, social impacts were belatedly addressed in both the Tennessee Valley Authority's and NRC's environmental statements, a major precedent was set with TVA's \$10 million social impact mitigation plan (Peelle, 1979), and the adequacy of both the SIA and the mitigation plan became a focus of the hearings. For the first time, social impact mitigation and monitoring became conditions of the license issued by NRC (Hartsville LWA, 1976).

With the formation of a social impact assessment group at ORNL in late 1975, and the commitment of funds to support staff in 1976, social scientists began to be regularly assigned to specific EISs and to participate in the process as regular task group members. Treatment of social impacts gradually expanded, more attention was devoted to improving analytical tools, and a reservoir of experience and expertise began to accumulate in the group. With increased experience, major steps were taken toward independent SIA assessment with the challenge of the ER's workforce estimates and devising our own estimates of worker relocation in the Blue Hills early site review in 1977 (Blue Hills FES, 1978).

Another milestone was passed with the Sundesert ER (1977), a major improvement in timely utility analysis of community impacts. Its extensive community participation and planning emphasis set it apart from anything previously received from a utility, reflecting the growing sophistication of (some) industry efforts to site nuclear plants and the active role taken in power plant siting by the state of California.

The first major aesthetic analysis of a large cooling tower was conducted for the Montague DES in 1977. Unlike the later Greene County aesthetic analysis, only visibility studies were included.

Guidelines for social impact assessment were developed by NRC in 1976 and 1977 in the form of the Environmental Standard Review Plan (ESRP), replacing the largely economics-oriented guidelines for services and population growth of the 1973 AEC Regulatory Guide 4.2 for Preparation of Environmental Reports (Applicants). The new ESRP guidelines specify data requirements, analysis procedures and evaluation for such areas as population projections, worker relocation, and community services demands; they detail compliance with the historic preservation regulations, and consideration of mitigation needs in communities. New areas for analysis included local planning and political decision processes, social structure and community cohesion.

Also begun in 1975 were the NRC-sponsored series of post-licensing studies of effects upon nuclear host communities. These research studies originated at ORNL (where two were performed) as a result of the major gaps identified in the data, methodology, and theory available for applied work through the Mendocino effort. In the first study, Bruce Purdy and his co-workers reviewed the changes which had occurred in the two matched northeastern nuclear communities, Plymouth, Massachusetts (Pilgrim I) and Waterford, Connecticut (Millstone I and II) (Purdy et al., 1977). Because of the large numbers of commuting workers, little worker in-movement occurred and the major construction effects were traffic. During operation, however, the large additions to local tax bases from the nuclear plants (roughly 50% of local assessments) were seen to cause a variety of changes including the option to stabilize or reduce local taxes, impetus toward increasing and professionalizing the functions of local government, and increasing frictions both within and between local jurisdictions over existing and new issues. The major difference between the two towns (Plymouth doubled its population during the construction period while Waterford grew only 11%) was seen as a function of the prior presence of strict zoning and land use plans in Waterford and the absence of such planning tools in Plymouth.

The second post-licensing study compared effects of operating nuclear plants in Baxley, Georgia and Brunswick, North Carolina where about half of the workforce moved in during construction and where large amounts of tax revenue are paid by the utilities to local communities (Shields et al.,

1979). As in the two northeastern communities, local attitudes were very favorable toward the plants, viewing them as symbols of and as stimuli to growth. Though attitude surveys were not taken on the second study, the researchers judged local citizen and leadership attitudes to be similarly favorable in 1977 as Plymouth and Waterford had been in 1975. Local government and Business people appeared to be equally favorable in a neighboring county which had received much of the growth but none of the tax revenue, leading Shields to speculate that the common underlying factor was attitudes toward growth rather than receipt of taxes by local jurisdictions.

These parallel, simultaneous research programs have been carried out at ORNL by the same people who conduct the applications (EIS) work, an arduous and somewhat perilous course where deadlines are a high-priority item. Such joint staffing arrangements enable the rare situation wherein immediate transference of research findings is possible, and where researchers have an intimate understanding of the constraints and objectives of the assessment process.

A third post-licensing research study of 14 additional operating plants is currently being conducted for NRC by Mountain West.

Moving toward the inclusion of more truly social factors, the New England Power DES mentioned the state of local attitudes for the first time in noting the outcomes of several local referenda opposing the siting of the plant. As in the later GCNPP analysis, these facts were included as pertinent data but were not analyzed. The San Onofre operating license assessment identified the closed beach area as a social cost, one of the first instances found in our nuclear plant assessment experience in which the cost was also borne primarily by the beneficiaries (users) of the power. The common dissociation of "costs" and "benefits" had been identified early on (Peelle, 1974), a result of the scale mismatches involved in nuclear plant siting.

Interpreting the above events, the legitimization process in NRC social impact assessments appears to go through the following stages:

- broaching the subject (introducing new types of data and ideas)
- treatment and scope definitions (what data should be collected and how shall we treat it?)
- policy inputs (conditions affecting issuance of license)

- procedural specifications (conditions set by technical staff on minimum docketing standard, necessity of site visits as a precondition to SIA participation, etc.)

The milestones discussed previously represent all these categories: substantive, analytical, policy and procedural. They may occur in any order, but most of the early ones seem to have been substantive, while most of the later ones seem to be procedural. Significant policy questions were broached in both the Hartsville and Greene County FESs over the treatment of mitigation--should it be required, and how much? The ultimate policy questions--Can aesthetic or other social impacts ever be severe enough to recommend disqualifying a site?--was answered affirmatively by the Greene County FES. It had been a common assumption by NRC and ORNL management prior to GCNPP that the opposite was true; if need for power, water availability and acceptable geological and ecological conditions could be demonstrated, it was assumed that these factors were enough to assure granting a license. Ecological impact analysis achieved similar legitimacy with the much earlier Indian Point FES in which addition of a closed cycle cooling system was required in order to prevent severe damage to the striped bass population.*

The road toward legitimation and acceptance of SIA inputs in the FES process is bumpy, uneven, full of detours and reverses, and not for the faint-hearted or those requiring normal professional recognition and rewards. Even now, well-established technical considerations may not always prevail against legalistic considerations of "sensitivity" as in the recent Virgil Summer DES for the operating license where NRC deleted all mention of the racial composition in the South Carolina population profile over continuing ORNL staff protests. After lengthy negotiations, NRC agreed to re-insert the data providing it was identified as "minorities" rather than as "blacks". Though some improvement is apparent, many SIA staff have had their requests for additional data, expanded analytical treatment or their impact conclusions interpreted by EIS and NRC management as indicators of anti-nuclear sentiment. Many battles were left unrecorded in this paper and not all the wounded feel it was worth the struggle. Nonetheless, that advancement of both the state of the art and of the continuing legitimation process within these complex, interacting bureaucracies has occurred at all is a remarkable achievement.

*Note that this condition has not been implemented and is still being challenged by the licensee, Consolidated Edison of New York. The NRC is awaiting resolution of the matter in EPA 316B hearings as to whether cooling towers represent the "best available technology" to prevent damage to the biota.

A key question for the continued growth in independent assessment capability is how the decisions are made relative to the need for, conduct, scope, and adequacy of social impact assessments.* Who decides that a social impact assessment is not needed, for instance? Frequently, SIA staff were not involved in such decisions (Seabrook, early Erie, etc.). As these decisions have begun to shift to technical staff from the administrative and management staff, concomitant gains in the adequacy and relevance of assessments may be anticipated. The power to make procedural specifications relative to minimum acceptance standards or the necessity for site visits is thus viewed by SIA staff as one of their most important achievements in the legitimation process.

Though it would be valuable with hindsight to specify shortcuts in the legitimation process, one of our principal findings as participant-observers in the process is that at least until well-experienced technical, agency, and managerial staff is available, there are few shortcuts. Since both EISs and SIA are a NEPA creation, and neither got underway until the early seventies, there were no specifically experienced people. All of us who participated in EISs learned by doing it; defining the concepts and components, developing criteria and standards, adapting and inventing methodologies and analytical modes, learning how to interact with the complex intra-agency management chain, and refining the process as we went along. We learned as much from our failures as from our successes. Thus, the development of SIA competence in both technical staff and agency management was a lengthy, interactive, evolutionary process** as we all grappled with the nature and scope of this invention and sought its proper place in the decision-making process.

The major components in the legitimation process as seen from this vantage point include:

- a capable, stalwart, multidisciplinary technical staff ready to explore the applications wilderness, submit to many constraints, defend every conclusion, and overcome uncertainties while working under severe staff and time constraints;***

*See the 1978 Council on Environmental Quality Regulations for a discussion of "tiering" of EIS assessments.

**I am indebted to Lois Martin Bronfman for her enunciation of this concept in our many discussions of the health and progress of SIA.

***My continuing salute to the intrepid ORNL SIA staff (both past and present), especially Bruce Purdy, Tadlock Cowan, Mark Shields, Lois Bronfman, Robert DeVault, Thomas Martinich, Jr., Ben Bronfman, Robert Bridd, Martin

- interactive relations of technical staff with agency management;
- concomitant research programs which provide basic information about necessary variables, relationships and analytical techniques;
- agency and management goals which are supportive of or at least not hostile toward inclusion of SIA information;
- public and intervenor interest in social impact issues, and participation in licensing actions.

Each of the above components had an essential role to play in the process of SIA legitimization. Failures or reversals in the process can generally be attributed to the absence of one or more of these factors. There is much yet to do. The process continues to be heavily influenced by the past record, including the milestones listed and precedents set, as in the Greene County final environmental statement.

VII. SUGGESTIONS FOR IMPROVING THE EIS AND LICENSING PROCESS

How can things be made to work better? Our experience in assessment and licensing suggests three areas for improvements: public involvement, joint hearings structuring, and the social impact assessment process within government.

While public involvement has served important functions in agenda setting as discussed here, there are obvious public participation needs not being met by the highly structured, legalistic framework of existing hearings. Many public concerns cannot be addressed in the existing framework. These needs could be better met through 1) earlier public involvement in the process, 2) allowing a wider range of questions to be addressed, perhaps in tiered or hierarchical sequence, and 3) equalizing public interest group and local government resources if the process is to be continued as one requiring "expert" credentials.

The several advantages foreseen* for the joint hearing process have yet to be realized, if the Greene County joint state-federal hearings are any example. Enormous amounts of technical and agency time were consumed by the two and one-half year hearings, and a decision was nowhere in sight when the proceedings were stopped in mid-stream. The procedures used resulted in a highly fragmented and disorganized record, impeding use of the record. At least one state agency whose participation was essential to resolution of a key issue was not involved in the process, apparently by its own choice. While cooperation between federal and state technical staff was excellent in the social impact area (in accord with the directives of the joint protocol), this was apparently the exception rather than the rule for other subject areas. Some of these problems might be addressed through:

* These include at least reduction of duplication and paperwork by avoiding separate licensing actions by state and federal parties, improving coordination and understanding by requiring all relevant parties to participate in the same proceedings, thereby saving time and resources for all concerned, and speeding up the licensing process.

- better coordination of goals and objectives when different agencies are involved so that the same question is being addressed;
- requiring all relevant decision-makers to participate in licensing actions (certainly all with veto power over decisions);
- cleaner separation of information and assessment functions in hearings so that shifting from one function to another is less common;
- stronger encouragement of inter-agency cooperation and sharing of information in all technical fields;
- proceeding on a subject-oriented rather than a party-oriented basis, or grouping treatment by party so that the continuing merry-go-round of subjects is avoided.

Improvements in the technical adequacy and relevance of social impact assessment could result from:

- more attention to defining critical assessment issues early in the process;
- focusing on assessment, rather than description; (requiring data before assessment can begin)
- primary evaluation of technical issues and content by technical, rather than legal, solely economic or administrative criteria;
- more input and decision-making power over procedural issues by technical working group staff;
- use of outside technical review groups to evaluate social impact analysis adequacy; and
- more time and resources to conduct assessments, in accord with the difficulty of the task rather than only the amount of money available.

VIII. CONCLUSIONS

The Greene County final environmental statement is unique and/or important in that it:

- is the first NRC FES to recommend denial of a construction permit;
- is the first NRC FES to make "unacceptable aesthetic impacts" the basis of that denial;
- advanced the state of the art in aesthetic impact analysis, especially with the inclusion of local attitudes and behavior;
- reversed the major conclusions of the DES;
- found major adverse socioeconomic impacts in the areas of roads and transportation, possible loss of local industry with subsequent employment and tax loss impacts, secondary effects upon the area's numerous historical structures;
- established additional major factors which must be considered in power plant siting;
- advanced the state of the art in mitigation analysis for socioeconomic impacts;
- represents the increasing scope and relevance of SIAs in NRC FESs, despite its remaining flaws; and
- illustrates the increasingly independent assessment role for SIA.

In another perspective, the GCNPP FES is not the unique, once-upon-a-time event, but the outgrowth of a long, evolutionary process at ORNL which involved direct experience by assessors by a varied series of assessment and research tasks, and a lengthy organizational legitimation process for the new social impact assessment knowledge. In the legitimation process, the new knowledge was tested, defined, organized, expanded, and (partially) utilized by a large agency to meet new demands of its public regulatory role. The process was evolutionary in that it involved extensive interaction and cross-education of social impact professionals, ORNL EIS management, and NRC administrative and management staff. Though the process is an arduous one, the gains made for public decision-making are large while the strains and pains are probably typical features of the process of utilization of new knowledge where the stakes are high. Lest we give the mistaken impression of inevitability or "onward and upward forever" in this discussion of evolution of SIAs, we also note the following: outcomes of individual statements are strongly affected by assorted accidents

and random factors such as timing, delays, characteristics of the utility, competing agency priorities, availability of particular staff and relevant skills, presence of knowledgeable intervenors, as well as the nature and severity of the impacts.

While the state of the practice is improving, SIAs in EISs continue to lag behind what is currently possible because of continuing administrative, time, and resources constraints. Precedents may continue to be set in community impact mitigation analysis (Greene County) or requirements (Hartsville) but enforcement is neglected.

Turning from the problems and progress of social impact assessments to the broader questions of the public purposes served by the licensing process, we note the following.

Public participation plays a vital role in setting the agenda for issues to be considered in SIAs, but still falls far short of meeting goals of public involvement in decision making. Many public concerns are not addressed in the formalized procedures set up for licensing nuclear power plants. Furthermore, public groups and local governments are at a severe disadvantage in these licensing actions because of the formal legalistic structuring as a game of experts to be played only by those with the proper chips (technical studies) and certain credentials. These disadvantages were partially offset in the Greene County case by the New York State Power Plant Siting Board which supplied local governments with modest funding for technical studies.

In the interest of improving future joint federal-state licensing proceedings, more attention needs to be given to establishing common objectives, more efficient and inclusive procedures, and better inter-agency cooperation and information sharing. The enormous amount of information made available by the joint licensing process is a distinct public and assessment benefit but only if it is better organized in the future. The volume, diffuseness and fragmentation of the Greene County record hindered effective utilization by all parties, especially the public interest and local government intervenors.

REFERENCES

- Cortese, Charles and Bernie Jones, *The Sociological Analysis of Boom Towns*, *Western Sociological Review* 8, pp. 76-90, 1977.
- Environmental Quality, Council of Environmental Quality, 1978, pp. 407.
- Friesema, H. Paul and Paul J. Culhane, *Social Impacts, Politics and the EIS Process*, Natural Resources Journal 16:339-356, April 1976.
- Jobes, Patrick, *Practical Problems Facing Sociologists Preparing Environmental Impact Statements*, Social Impact Assessment 8:12-17, 1976.
- PASNY Cancels Plant*, pp. 43-44, Nuclear News, May 1979.
- Petrich, Carl, *Aesthetic Impact of a Proposed Power Plant on an Historic Wilderness Landscape*, Proceedings of National Conference on Applied Techniques for Analysis and Management of the Visual Resource, Incline Village, Nevada, April 23-25, 1979 (in press).
- Peelle, Elizabeth, *Social Impacts of a Remote Coastal Nuclear Power Plant: A Case Study of the Mendocino Proposal*, unpublished, Oak Ridge National Laboratory, Oak Ridge, TN, 1974.
- Peelle, Elizabeth, *Social Effects of Nuclear Power Plants*, ERDA-5, Milwaukee, WI, in C. P. Wolf, ed., Social Impact Assessment (1974), pp. 113-120.
- Peelle, Elizabeth, *Mitigating Community Impacts of Energy Development: Some Examples for Coal and Nuclear Generating Plants in the U.S.*, Nuclear Technology 44:132-140, June 1979.
- Purdy, Bruce J. et al., *A Post Licensing Study of Community Effects at Two Operating Nuclear Power Plants*, ORNL/NUREG/TM-22, Oak Ridge National Laboratory, Oak Ridge, Tennessee, 37830 (September 1977).
- Shields, Mark A. et al., *Socioeconomic Impacts of Nuclear Power Plants: A Paired Comparison of Operating Facilities*, ORNL/NUREG/TM-272, Oak Ridge National Laboratory, Oak Ridge, Tennessee, 37830 (July 1979).
- U. S. Atomic Energy Commission, *Final Environmental Statement Related to the Proposed Comanche Peak Steam Electric Station, Units 1 and 2*, Texas Utilities Generating Company, Docket Nos. 50-445 and 50-446, June 1974.
- U. S. Atomic Energy Commission, *Regulatory Guide 4.2, Preparation of Environmental Reports for Nuclear Power Stations*, 1973.
- U. S. Nuclear Regulatory Commission, *Final Site Environmental Statement Related to the Determination of Suitability of Site G for Eventual Construction of the Blue Hills Station, Units 1 and 2*, Gulf States Utilities Company, Docket Nos. 50-510 and 50-511, NUREG-0449, July 1978.

REFERENCES (continued)

U.S. Nuclear Regulatory Commission, Draft Environmental Standard Review Plans for the Environmental Review of Construction Permit Applications for Nuclear Power Plants, Part I, NUREG-0158, Part I, January 1977.

U.S. Nuclear Regulatory Commission, Partial Initial Decision in the Matter of Tennessee Valley Authority (Hartsville Nuclear Plant, Units 1A, 1B, 2A, and 2B), April 20, 1976.

U.S. Nuclear Regulatory Commission, Draft Environmental Statement Related to Construction of New England Power Units 1 and 2 (NEP I and II), Docket Nos. STN50-568 and 50-569, NUREG-0529, May 1979.

U.S. Nuclear Regulatory Commission, Draft Environmental Statement Related to operation of San Onofre Nuclear Generating Station, Units 2 and 3, Southern California Edison Company, San Diego Gas and Electric Company, Docket Nos. 50-361 and 50-362, NUREG-0490, November 1978.

U.S. Nuclear Regulatory Commission, Final Environmental Statement Related to Construction of Greene County Nuclear Power Plant, Power Authority of the State of New York, Docket No. 50-549, NUREG-0512, January 1979.

Wilke, Arthur S. and Harvey R. Cain, "Social Impact Assessment under NEPA: The State of the Field," *Western Sociolog. Review*, 8:105-108, 1977.