

# Energy Studies

70  
NON-CIRCULATING  
NTSU LIBRARY

Volume 4 No. 3  
January/February 1979

This newsletter is published six times a year by the Center for Energy Studies at The University of Texas at Austin and distributed free upon request. Not published with state-appropriated funds.

Editor: Jennifer Evans



## Model Developed to Help Rural Towns with Problems of Energy-Related Growth

When residents of a small town first hear that a big power plant, coal mine, or similar facility is to be built nearby and hundreds of workers and their families will be settling in the area, the first reaction of many is "Great!"

The hardware store owner realizes that sales will go up. The teenager in high school hopes that he may be able to get a good job after school. The property owner realizes that his property in town and even his tract out on the highway will both be worth more. The economy of the town is entering a golden period of vigorous growth, it seems.

But another sort of change happens, too. The owner of the town's florist shop finds that a sleazy bar is opening next door. The doctor finds that he is treating stabbing and gunshot wounds. The seventy-five-year-old lady who has been living on Social Security in a boardinghouse finds that her rent is being tripled. Growth is not all good, the town begins to learn.

The town fathers have some of the worst headaches. They know from experience that getting bonds to build new public facilities proposed, approved, and voted in can take more than a year and that design and construction of these multi-million-dollar projects can take even longer. Meanwhile the hospital is overflowing, the school is overflowing, the sewage treatment system is overflowing.

The new folks in town are not particularly happy, either. The housing shortage forces many of them to live in bleak trailer camps. Because of the lack of big-city entertainment, restaurants, parks, and shopping, they find life frustratingly dull. Among the workers productivity is low, and absenteeism and turnover are high—as are divorce and alcoholism.

The boom town phenomenon has been with us in the United States at least since the Gold Rush. Social scientists recently have been giving more and more attention to the problem, because a new trend of boom towns is beginning, and it will hit small towns in the United States like a tidal wave.

US demand for energy is still growing, domestic petroleum production is declining, and foreign petroleum supplies are not completely reliable. These factors combine to create a strong demand for new domestic forms of energy and new power plants. Primarily, it is rural communities that will be the willing and unwilling hosts of hundreds of new energy facilities. In the United States, six types are foreseen: (1) coal-fired power plants, (2) nuclear power plants, (3) coal and lignite mines, (4) uranium mines, (5) deepwater ports, and (6) offshore drilling support facilities.

That certain rural communities should have to bear the negative impacts of these energy facilities while  
(Continued on page 2)



## What CLIPS Predicts

- Population (by age group, births, deaths, location of residence)
- Employment (business-serving, household-serving, export-industries, construction, school, unemployment)
- Construction work force characteristics (occupation, age, family size, family ages, family births and deaths, local-migrant ratio, type and location of residence, turnover)
- Housing (number of mobile homes, multifamily homes, single-family homes)
- Schools (number of elementary and high school pupils, change in school building space, capital costs, operation and maintenance [OM] costs)
- The previous forecasts can be used by both state and local planners, but the following forecasts are aggregate, not specific, in nature and thus are most useful in state-level planning.*
- Streets (amount [in linear feet] of minor, collector, and arterial streets; capital costs; OM costs)
- Gas and electric utilities (unit costs for service to each new dwelling, distribution and collection network costs, system-wide costs, capital costs, OM costs)
- Water facilities, storm drainage, sanitary sewerage (similar to utilities)
- Libraries, health care, government administration, solid waste disposal, fire, and police (capital costs, OM costs)
- Parks and recreation (open space land requirements, parks and playground requirements, capital costs, OM costs)

the country as a whole receives most of the positive benefits of their outputs is considered unfair by many. But the policy issues are complicated: What responsibility does the federal government have? What responsibility do state governments have? What responsibility do the communities, the owners of the facilities, and the local taxing entities have? Is funding the answer? Is cutting down on red tape the answer? Could the local governments use special loans or special

programs? Should siting be regulated?

All of these issues and possible strategies are being discussed exhaustively. An important development in this area is the federal Coal Conversion Act of 1978, which sets aside \$60 million in 1979 and \$120 million in 1980 for energy impact assistance for regions affected by expansion of coal or uranium production.

Policy at various levels of government is one important aspect of the community impact problem. A second area is that of how to deal directly with the problem—planning. It is in this area that Center for Energy Studies researchers have been active.

Effective planning can be a strong tool to deal with the Pandora's box of problems carried in with a flood of new population. Foresight is a valuable commodity in this situation—hindsight is plentiful but nearly useless.

Researchers in the CES Social Systems Analysis Division have developed a computer method to predict specific community impacts.

The result of their work is called CLIPS, short for Community-Level Impacts Projection System. The CLIPS model is a state-of-the-art computer system for looking into a community's future, and a combination report/user's guide for CLIPS has recently been completed.

The model was developed with a grant from the Texas Energy Development Fund, which was created in 1978 by the Texas Legislature and is administered by the Texas Energy Advisory Council.

The three researchers directly involved in developing CLIPS are Dr. J. Kenneth Monts, research associate; Dr. Sally Cook Lopreato, director of the Social Systems Analysis Division; and Mr. Ray Bareiss, research assistant.

One of the most important considerations in developing CLIPS, said Dr. Monts, was that it be simple enough that people with no knowledge of computers could use it—people like a county commissioner, a school superintendent, or a city manager.

Once the system is set up for a certain community—for example, Impacttown, Texas—an Impacttown city council member can sit down at a small computer terminal, read questions on the screen, type

answers on the keyboard, and generate forecasts of the town's population by age group, sex, and type of employment for a variety of economic and demographic conditions. The superintendent of schools can sit down next and generate the number of new pupils to expect in the Impacttown schools over the next twenty years and the estimated costs of building the extra classrooms they will require. And so forth.

"Running the program costs \$1.25," said Dr. Monts. "If CLIPS is available, a local city council won't have to hire a consultant every time it wants to do something." To generate forecasts, the program requires some simple data on the specific community and the size of the proposed facility's work force.

As the CLIPS report explains, the crucial data for all the predictions are population numbers. There are only three ways by which the population of an area can change: birth, death, and migration. Of the three, migration rates are the hardest to predict. In CLIPS, changes in total employment determine migration; that is, when jobs are available, families will migrate into an area, and when jobs are not available, families will migrate out.

Thus when a large construction project begins in an area, in-migration increases, and population can change dramatically.

In order to predict the changes caused by this type of sudden influx of population, CLIPS must also predict something else: baseline trends. If a community has been recently losing population, it probably will have underused services, housing, and other facilities available for the new population. But if the community has been growing at a healthy pace, it probably will not have a cushion of unused facilities, and so the impact will be larger. Thus baseline trends must be incorporated into any calculation of impacts.

The projections that can be generated by CLIPS are detailed, quantitative, and useful (see accompanying box, *What CLIPS Predicts*). However, like all such efforts to model socioeconomic impacts, the CLIPS model has not been validated. The accuracy or inaccuracy of a model is provided with the passage of time.

"We have made a painstaking effort to assemble what we deemed  
(Continued on page 5)



# CES Update

## Office of Director

The director of research of Consolidated Edison of New York will visit The University of Texas at Austin April 2-3 and give two lectures.

Dr. Robert Bell, a UT alumnus, will discuss Consolidated Edison's synthetic fuel research in a lecture at 4 p.m. April 2 in ECJ 1.202. The public is invited.

On April 3 he will give a lecture on fuel cell research to a power systems graduate seminar. Consolidated Edison has received a US Department of Energy contract to install and operate a prototype fuel cell unit, a project described as "the first effort to apply the fuel-cell concept in a utility environment."

Dr. Bell's visit is sponsored by the Center for Energy Studies and the Departments of Electrical and Mechanical Engineering.

Dr. Lee A. Kilgore, a world-renowned electric machinery expert, made a similar visit to the university February 13-22, lecturing on the theory and technology of electric machines. Dr. Kilgore, now a consultant, is a former director of engineering with Westinghouse. His visit was sponsored by CES, the Center for Electromechanics, and the Departments of Mechanical and Electrical Engineering.

## Conservation

Classes for the **Home Energy Analysis Training (HEAT) program**, developed by the Center for Energy Studies Conservation Division, are under way or are soon to begin in thirteen Texas cities.

Students in the courses will learn to perform home energy conservation audits and will acquire detailed knowledge of home heating and cooling systems, insulation, appliances, solar equipment, audit procedures, and financing.

The Home Energy Analysis Training Program is sponsored by the Governor's Office of Energy Resources and funded by the federal government as part of the Texas Energy Conservation Plan.

The course is aimed at personnel from utilities, which are required by recent federal legislation to offer energy audits to their residential customers. HEAT is also aimed at people such as building contractors, heating and air conditioning installers, insulation contractors, architects, engineers, real estate appraisers, and local government planners.

At some schools the course is offered free, but at most the cost is \$10 to \$15. Duration and scheduling of the course also vary. Locations, beginning dates, and telephone numbers for more information follow:

—Austin, Center for Energy Studies, April 23 (5-day short course), (512) 471-4946.

- Brownsville, Texas Southmost College, March 26, (512) 541-1241.
- Dallas, Dallas County Community College:
  - Eastfield campus, March 31, (214) 746-3198.
  - Cedar Valley campus, summer 1979, (214) 746-4790.
- Houston area:
  - Houston Community College, April, (713) 659-8686
  - North Harris County College, March 12 (713) 443-7190.
- Odessa, Odessa College, May 14, (915) 337-5381, ext. 371.
- San Antonio, San Antonio College, March 26, (512) 734-7311, ext. 201.
- Waco, Texas State Technical Institute, April 3 (817) 799-3611, ext. 261.

Courses are now in progress at Amarillo College, Del Mar College in Corpus Christi, El Paso Community College, Tarrant County Junior College in Fort Worth, San Jacinto College in Pasadena, South Plains College in Levelland, and Tyler Junior College.

## Environmental

The economic and environmental impacts of increased coal use in Texas have been detailed by Dr. Hal B. H. Cooper, Jr., in a paper to be presented at the national meeting of the American Institute of Chemical Engineers April 1-5 in Houston. Dr. Cooper is director of the Environmental Studies Division and an associate professor of civil engineering.

Photos by Bill Peck



The Center for Energy Studies' Advisory Committee is just that—a group formed to give advice on the center's activities from the outside perspectives of industry, academia, and public interest. The Advisory Committee met in Austin March 12 and 13, and members brought their viewpoints to bear on current and proposed projects, supplying feedback of the most valuable and hard-to-get kind. Members are (from left) Prof. Ben C. Ball, Jr., MIT; Ms. Laura Keever, League of Women Voters of Texas;

Dr. Thomas H. Lee, General Electric Company; Mr. W. W. Madden (alternate), Exxon Company U.S.A.; Mr. Fred C. Repper, Gulf States Utilities; Ms. Sharron Stewart, Texas Environmental Coalition; (not pictured;) Mr. Ron W. Haddock, Exxon Company U.S.A.; Dr. William H. Hogan, Harvard University; Mr. Hans H. Landsberg, Resources for the Future.



A study of **population exposure to radioisotopes** emitted by a coal-burning power plant in the San Antonio area is under way in the Environmental Studies Division.

Researchers have found that minute amounts of uranium, thorium, and radium can be contained in the plume of coal- and lignite-fired power plants and are dispersed downwind of the plant, affecting natural background radiation levels.

Radioactivity levels in emissions of coal- and lignite-burning plants are not presently monitored nor regulated by the state of Texas.

However, a bill has been introduced in the current session of the legislature that would grant to the Texas Air Control Board regulatory authority over radioactive isotope emissions from fossil-fuel-burning plants.

Participants in the study are Dr. Cooper and graduate student Prabhath Bhargava.

A project to study the **potential for acid rainfall** in a region of the Southwest is beginning in the Environmental Studies Division.

One of the many potential environmental impacts of increased coal and lignite combustion at power plants is an increase in the acidity of rain falling in the surrounding areas. Sometimes natural dust in the air can neutralize these acidic constituents, which for the most part are sulfur oxides and nitrogen oxides.

The area being studied includes East Texas, East Oklahoma, Arkansas, and Louisiana. The goals of the project are to characterize present background levels of acid rainfall in the region and to determine how background dust neutralizes the acids and to what extent.

Participants in the project are Dr. Cooper and civil engineering graduate student Jose Lopez.

---

## Nuclear Studies

---

**Dr. E. Linn Draper**, director of the Nuclear Studies Division, has resigned from the university to become assistant to the chairman of the board of Gulf States Utilities Company of Beaumont. Taking over the direction of the Nuclear Division is Dr. Dale Klein, assistant professor of mechanical engineering.

**Several nuclear engineering research projects** are underway in the Nuclear Division, among them:

- *Study of heat removal from sub-surface nuclear spent fuel repositories*—Spent fuel is highly radioactive and gives off heat, which cannot be allowed to build up nor to harm the surface environment of geologic repositories. The dissipation of the heat is affected by the surrounding soil and by the size and nature of the spent fuel containers, as well as by their depth, spacing, and pattern of arrangement. Researchers are studying the heat dissipation patterns of different repository designs through a computer model of three-dimensional heat transfer processes available through Argonne Associated Universities.

- *Systems analysis of transmutation of long-lived radioactive wastes*—It is possible to render long-lived radioisotopes relatively harmless by bombarding them with an intense neutron source, such as a breeder or fusion reactor or an accelerator device. In the current studies, a model is being set up that represents the performance of a system designed to transmute waste. Chemical reprocessing is necessary in such a system for two reasons: to concentrate the toxic radioactive elements before bombardment and then to remove the newly transmuted elements, which tend to absorb neutrons and thus interfere with transmutation. The

### CES Researchers Participate in Nat'l Energy Conference

Three researchers at the Center for Energy Studies participated at the Sixth Annual Energy Technology Conference and Exposition February 26–28 in Washington, D.C.

The session on nuclear technology was organized by Dr. Herbert H. Woodson, director of the Center for Energy Studies, and Dr. E. Linn Draper, former director of the center's Nuclear Studies Division.

Dr. Jerold W. Jones, director of the Conservation Division, was an invited speaker at the session on the impact of DOE Building Energy Performance Standards. He spoke on the impact of the standards on the design professions.

model being developed is particularly useful because it integrates the various stages of the system and can allow researchers to compare and identify the chemical processes that are most promising for improvement.

The transmutation research is sponsored by the Center for Energy Studies and the Texas Atomic Energy Research Foundation.

- *Analysis of heat transfer in gas-cooled fast-breeder reactors (GCFR)*—In a GCFR, helium is the coolant, the substance used for transferring heat away from the intensely hot and radioactive core of fuel rods. It is known that roughening the surfaces of the nuclear fuel rods creates turbulence in the helium, which increases heat transfer. The purpose of this study is to evaluate ways of roughening this metal coating without weakening it.

Another aspect of the inner environment of a GCFR is also being studied: the temperature and pressure distribution surrounding grid spacers, the perforated metal plates that hold fuel rods in position.

The project is sponsored by the Center for Energy Studies and the UT Bureau of Engineering Research. Part of the research is being conducted at the core flow test loop at Oak Ridge National Laboratories.

- *Analysis of the hazard of structural activation in fusion reactors*—During operation of a fusion reactor, the shielding components would receive much neutron bombardment and eventually become radioactive. The purpose of this study is to compare the potential radiation hazard of structural activation for a variety of proposed shielding materials. Several first-wall replacement strategies are being evaluated for risk both to workers and to the public. The research is supported by the Center for Energy Studies and the Texas Atomic Energy Research Foundation.

---

## Social Systems Analysis

---

**Energy development in the Soviet Union and Eastern Europe** was the topic of a one-day symposium sponsored by the Social Systems Analysis Division, in cooperation with the University of Texas Departments of Geography and Economics.



The November 28 meeting was organized as a discussion forum for interested individuals from industry, government, and academia.

Speakers included Drs. Samuel Ellison (geological sciences, University of Texas), Leslie Dienes (geography, University of Kansas), Victor Mote (geography, University of Houston), Edward Hewett (economics, University of Texas), George Hoffman (geography, University of Texas), and Mr. Denny Ellerman (deputy assistant secretary for international research, US Department of Energy).

**State-of-the-art techniques** for projecting and assessing small-

community growth were explored February 24 in a workshop sponsored by the Center for Energy Studies and Alvin Community College.

Alvin, Texas, is near the site of a geopressured-geothermal test well; this and other types of energy developments may bring sudden growth to the community. The workshop dealt with ways to anticipate and cope with energy-related growth, impact assessment techniques from the Texas Department of Community Affairs, the General Land Office, and the Center for Energy Studies (see page 1 article on the CLIPS model), and the comparative usefulness of these systems to leaders in local Texas communities.

Texas General Land Office Commissioner Bob Armstrong was the introductory speaker at an earlier workshop, held November 2-3. This meeting provided a forum for community and local government leaders and state and federal agency representatives to discuss the multitude of problems that can arise because of sudden small-community growth—problems of basic city-county services, environmental regulation, land use, and taxes.

"The Future: Who Pays the Bills?" will be the topic of the last workshop in the series, to be held in Alvin in mid-June. The series is funded by the US Department of Energy and the Texas College and University System Coordinating Board.

(Continued from page 2)  
the most trustworthy theoretical approaches available," said Dr. Monts in the CLIPS manual. The CLIPS model draws from ten other models and many other statistical sources. An illustrative case study of projections for Limestone County, Texas, has been completed, but CLIPS has not yet been put to actual use.

How and when CLIPS could be used was discussed March 14 in Austin at the first public presentation of the system. At this meeting, held at the Texas Department of Community Affairs, the model was introduced, and its potential ap-

plications for local, regional, and state planning in Texas were discussed. The CES researchers will be explaining CLIPS to representatives from Texas councils of government in a series of meetings scheduled in late spring for Amarillo, Dallas, Austin, Brownsville, and Houston.

The present version of CLIPS is oriented specifically for Texas, said Dr. Lopreato, but the model can be adapted for other states or even other countries. Work is continuing on further refinements of CLIPS with support committed by Central and Southwest Corporation, the Lower

Colorado River Authority, and Texas Utilities Company.

The need for a planning model like CLIPS is a real one in Texas today, and the need can be expected to grow over the next decade: lignite mine/power plants, uranium strip mines, nuclear power plants, and western-coal-fired power plants—facilities of all these types are likely to appear on the rural Texas scene (some have already), bringing thousands of workers into tiny towns. National and international energy developments could bring about increased drilling and refining activity in Texas. A superport off the Texas Gulf Coast is being proposed. Large extraction/power plant facilities may spring up along the coast to exploit Texas' geopressured-geothermal energy resources. The towns near these large construction projects will be taken by surprise, then forced to struggle in the dark with unfamiliar problems.

If towns faced with population booms are able to better prepare themselves, the benefits are many: the town is a better place to live for newcomers and oldtimers alike, the facility is built with a minimum of delay and expense, and the general public receives the facility's output at a lower price. CLIPS is a tool available for achieving these aims.

(A limited number of copies of the report, *Community-Level Impacts Projection System*, by J. Kenneth Monts and E. Ray Bareiss, are available from the Center for Energy Studies, ENS 143, The University of Texas at Austin, Austin, Texas 78712.)

### **Energy Impacts Stretch from Scotland to Siberia**

Lerwick, Shetland Islands, Scotland—Since huge oilfields were discovered offshore in the North Sea, crime has risen 40 percent in three years, youngsters are being "lured by fat paychecks" to drop out of school, and strippers hired to entertain camps of oil workers are creating turmoil among the religiously conservative islanders. (Associated Press)

Villahermosa, Mexico—In this tropical state capitol, hordes of oil workers arrive every week, "bringing merchants and prostitutes in their wake." (*Newsweek*)

Appalachia—With a new national demand for coal, Appalachia is reawakening, and 200,000 new homes are needed by 1985; the political structure of the area

is topsy-turvy with the changes. (*Christian Science Monitor/Houston Post*)

Neryungri, USSR—In this new mining town in Siberia, workers and their families are being rapidly imported, and one school has only 362 seats for 1,232 pupils. (*The Wall Street Journal*)

Elk City, Oklahoma—Property owners are renting "sleeping rooms" to make up for the rental shortage created by oil workers who have been pouring into the area. (*Houston Post*)

Lich-Steintrausse, West Germany—A mining company is buying property, relocating inhabitants, and tearing down all the buildings in three towns to allow a huge open pit lignite mine. "It is as if I have lost my life," said one inhabitant. (*The Wall Street Journal*)



ADDRESS CORRECTION REQUESTED

# UT Austin Energy

## MINING AND MINERAL RESOURCES RESEARCH INSTITUTE

**Dr. Willem C. J. van Rensburg**, an authority in mineral resources and economics, has been named director of the new Mining and Mineral Resources Research Institute at The University of Texas at Austin.

Members of the Texas Mining and Mineral Resources Research Committee have also been named: Dr. Peter Flawn, president-elect of The University of Texas at Austin; Dr. John C. Calhoun, executive vice-president of the Texas A&M University System; and Commissioner Mack Wallace of the Texas Railroad Commission.

Members of the committee are evaluating scholarship, fellowship, and research grant applications in the areas of mineral exploration, extraction, processing, and development; mining and mineral technology; mineral supply and demand; conservation and best use of available supplies of minerals and other resources affected by mineral extraction; economic, legal, and social aspects of mining; reclamation; and research and demonstration projects of industry-wide application.

Final selection on research proposals will be made by the Office of Surface Mining of the US Department of the Interior, which funds all the grants. Operating funds are matched by the university.

The Mining and Mineral Resources Research Institute and similar institutes in twenty-two other

states were provided for in the Federal Surface Mining Control and Reclamation Act of 1977.

In the same year then-Governor Dolph Briscoe selected The University of Texas at Austin to establish the state's Mining and Mineral Resources Research Institute. His selection was endorsed by the 65th Texas Legislature, which also called for the development of a cooperative program between the UT System and the Texas A&M System.

At The University of Texas at Austin, the institute is an administrative unit of the Bureau of Economic Geology; other participating members are the College of Engineering and the Department of Geological Sciences.

In addition to directing the institute, Dr. van Rensburg will also serve as an associate director to the Bureau of Economic Geology and as a professor of geological sciences. For the past year he has been a professor and chairman of the Department of Geosciences at West Texas State University.

Before he came to the United States last year, Dr. van Rensburg held a number of posts in his native South Africa, including British Petroleum Professor of Energy Economics and director for energy studies at Rand Afrikaans University, technical director and acting director of the South African Minerals Bureau, head of the Economic and Costing Division of the National Institute for Metallurgy, and deputy director of the Department of Planning and the Environment.

His research interests center on coal utilization, mineral and energy economics, and metallurgy. He is the author or coauthor of numerous books and articles.

**NON-CIRCULATING  
NTSU LIBRARY**