TESTIMONY

Prepared Testimony of
David N. Cook, General Counsel
North American Electric Reliability Council
Hearing Before the United States Senate
Committee on Governmental Affairs
June 28, 2001

Summary

The North American Electric Reliability Council (NERC) firmly believes steps must be taken now to ensure the continued reliability of the electric transmission system if the Nation is to reap the benefits of competitive electricity markets. The changes taking place as the electric industry undergoes restructuring are recasting the long-established relationships that reliably provided electricity to the Nation's homes and businesses. Those changes will not jeopardize the reliability of our electric transmission system IF we adapt how we deal with reliability of the bulk power system to keep pace with the rest of the changes that the electric industry is now experiencing. NERC and a broad coalition of state, consumer and industry representatives are supporting legislation that would transform the current system of voluntary operating guidelines into a set of mandatory and enforceable transmission system reliability rules.

NERC is a not-for-profit organization formed after the Northeast blackout in 1965 to promote the reliability of the bulk electric systems that serve North America. It works with all segments of the electric industry as well as customers to "keep the lights on" by developing and encouraging compliance with rules for the reliable operation of these systems. NERC comprises ten Regional Reliability Councils that account for virtually all the electricity supplied in the United States, Canada, and a portion of Baja California Norte, Mexico.

Reliability

Reliability means different things to different people. For the consumer it could mean, "Does the light come on when I flip the switch?" Or, "Does a momentary surge or blip re-boot my computer or cause me to lose a whole production run of computer chips I was manufacturing?"

NERC defines the reliability of the interconnected bulk electric system in terms of two basic and functional aspects, "adequacy" and "security." *Adequacy* means the ability of the electric system to supply the aggregate electrical demand and energy requirements of consumers at all times, taking into account scheduled and reasonably expected unscheduled outages of generators and transmission lines. *Security* means the ability of the electric system to withstand sudden disturbances such as electric short circuits or unanticipated failure of generators or transmission lines. As the electric industry restructures and competition increases, we must address both the adequacy of the bulk electric transmission system and our continuing ability to operate that system securely.

How the System Works

California's experience with electricity has focused peoples' attention on electricity issues in ways they never have in the past. Because of that increased awareness, we can draw on the California experience to understand more about how the bulk electric system really works. California is not an island; it is part of a much larger grouping of electric systems that we refer to as an Interconnection. The North American grid is divided into three Interconnections. The Western Interconnection includes not only California, but also the rest of the United States from the Rocky Mountains to the Pacific coast, as well as the Canadian provinces of British Columbia and Alberta, and a portion of Baja California Norte, Mexico. The Eastern Interconnection includes not only most of the United States east of the Rocky Mountains, but also Canadian provinces from Saskatchewan through the Maritimes. The third Interconnection comprises the Electric Reliability Council of

Texas. Attached to my testimony is a map depicting the three Interconnections. The map also shows the ten NERC Regional Reliability Councils.

Each Interconnection is a single very large machine. Power flows freely throughout the grid in each of these Interconnections—there are no valves or switches. With very limited exceptions, there is no ability to direct power flows over a particular line; instead, power flows over all lines in the system, according to the laws of physics. All generators within an interconnection are magnetically linked, in effect as though all the generators are on a single shaft—all rotating at the same speed (think of a tandem bicycle—the front and back pedals are linked together by a chain, and rotate at the same speed; if one rider takes his feet off the pedals, the other rider has to work harder to maintain the same speed). What happens on one part an interconnection affects the entire rest of the interconnection. The frequency of the system in British Columbia is the same as the frequency in Arizona, and also at all points in between. When the frequency declines, because a large generating unit trips off, the rest of the generators automatically and instantaneously work harder to serve the customer demands.

The interconnected nature of electric system operations makes possible the transfer of power from one area to another for economic reasons as well as sharing resources in emergencies. California is a summer-peaking area, and it normally imports surplus power from the Pacific Northwest in the summertime to augment its own generating resources. By contrast, the Pacific Northwest is a winter peaking area, and it normally imports surplus power from California in the wintertime. That isn't happening this year. Load has grown throughout the West, and other regions have less power to export to California. In addition, the Pacific Northwest and California both depend substantially on hydroelectric power. Severe drought conditions this year have seriously depleted the ability of the hydroelectric plants to produce energy.

California has also demonstrated the limits on the transmission system. Path 15 is a major transmission link between Southern and Northern California. Earlier this year, on some days the California Independent System Operator had to curtail firm load in Northern California, even though additional generation was available in Southern California to meet the load. Path 15 was loaded to its maximum safe

reliability limit and there simply was no way to move additional energy into Northern California without risking the reliability of the entire Western Interconnection.

Interconnected operations also mean that a disturbance occurring in one part of an Interconnection can have adverse effects throughout the Interconnection. The 1996 Western outage that affected San Francisco, Los Angeles, and the desert Southwest and shut down the Diablo Canyon nuclear power plant started with a tree contacting a power line in Idaho. And whether an individual state chooses to open up to retail competition or not, the electric systems in those states are still connected together, and dependent on one another, as part of one Interconnection.

The grid is generally operated in a first contingency mode, that is, so that the grid can withstand the loss of its largest transmission line or generator and remain stable and secure. That means that all the remaining transmission lines will still be operating within their own limits and the system will remain stable and secure (meaning that the failure of a particular line or generator won't cause a cascading, uncontrolled failure of the entire grid). When a large transformer or generator fails or lightning strikes a power line, as happens as a matter of course, the grid can absorb that loss without causing other elements to fail. Operating in this manner preserves the stability of the grid, but it does sometimes place limits on the amount of power that can be moved from one part of the grid to another.

This is the area where NERC's rules operate, setting the standards by which the grid is operated from moment to moment, as well as the standards for how future transmission systems should be planned and designed. By planning I mean the things that need to be taken into account when one plans, designs, and constructs an integrated system that is capable of being operated securely. The NERC standards do not specify how many generators or transmission lines to build, or where to build them. They do indicate what tests the future system must be able to meet to ensure that it is capable of secure operation. Up to now, NERC's rules have generally been followed, but they have not been enforceable. As more entities become involved in the operation and use of the bulk electric systems, and use these systems to full competitive advantage, NERC is seeing an increase in the number and severity of rules violations. Hence the voluntary approach is no longer adequate for maintaining the reliability of the bulk power system. Just as the rest of the electric industry is changing, the reliability infrastructure must

change, too.

NERC's formation was the electric industry's response to legislation that had been introduced in the Congress that would have given the then Federal Power Commission a central role in the reliability of the bulk electric system. Instead of adopting that legislation, the country opted for a voluntary industry effort. For more than thirty years it has worked very well, and we have had an extremely reliable electric system. But the reliability rules or standards have no enforcement mechanism. Peer pressure has been the only means available to achieving compliance.

As good as that system has been, as the electric industry restructures the voluntary system will not serve us well for the future. Here's why:

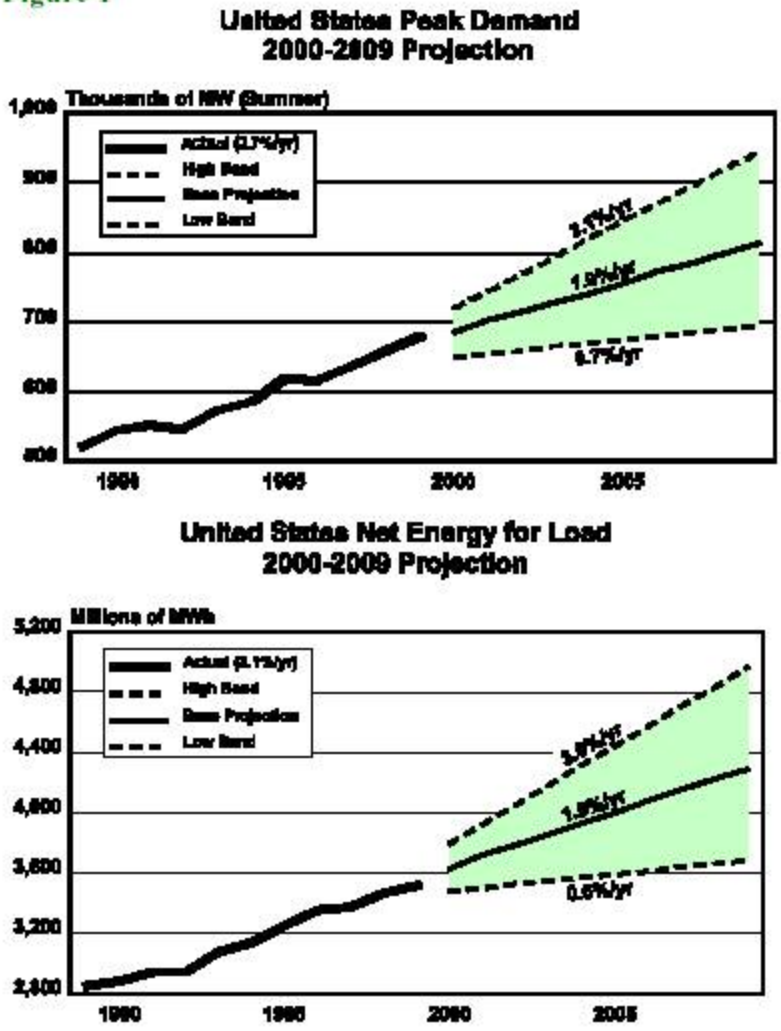
- The grid is now being used in ways for which it was not designed.
- There has been a quantum leap in the number of hourly transactions, and in the complexity of those transactions.
- Transmission providers and other industry participants that formerly cooperated willingly are now competitors.
- Rate mechanisms that in the past permitted utilities to recover the costs of operating systems reliably are no longer in place, or are inadequate given increased risks and uncertainties.
- The single, vertically integrated utility that formerly performed all reliability functions for an area is being disaggregated, meaning that reliability responsibilities are being divided among many participants.
- Some entities appear to be deriving economic benefit from bending or violating the reliability rules.
- Construction of additional transmission capacity has not kept pace with either the growth in demand or the construction of new generating capacity, meaning the existing grid is being used much more aggressively.

Not dealing with the reliability side of the business as the industry restructures would be like the airlines switching to jet airplanes without increasing the length of the runways.

What's Happening Now: Demand and Generation

A number of factors have contributed to our present circumstance. First, demand has been steadily increasing. The consensus projection for the average annual growth in both peak demand and energy use over the next ten years is a relatively modest 1.9%. (Figure 1.) "Demand" is a measure of the highest aggregate load that all customers place on a system at a particular point in time. "Energy use" is a measure of the total amount of electricity that all customers use over a certain period of time (e.g., one year). The projected growth in demand is similar to the projections of the last several years. High and low bands around the base forecast show a range of the forecast uncertainty to account for weather, economic growth, industry deregulation, and other factors. Both peak demand and energy projections are substantially below the actual growth rates experienced over the last ten years as demand has been driven by extreme weather at peak times and a strong economy. Actual demand and energy growth rates experienced in the United States over the last ten years have been closer to the projected high band rate of about 3% for both demand and energy.

Figure 1



(Source: NERC Reliability Assessment 2000-2009.)

Second, in many parts of the country merchant generators are now building new plants to meet that increased demand, in response to the increased prices that we have been seeing in the wholesale electricity markets. During the past 10 years, generating capacity increased at the rate of less than 1% per year, even while demand was growing at the rate of 2.7 % per year. That picture is changing, although in some parts of the country supplies will be tight for the next few years. Over 20,000 MW of new merchant capacity came on line to serve demand in the United States for the summer 2000. This year, New England has added another 2,300 MW. The Electric Reliability Council of Texas has added more

than 6,000 MW. The East Central Area Reliability Council has added more than 4,000 MW since last summer. A crucial 600 MW is being added within New York City and Long Island. While that story is not being repeated everywhere, even California, which is experiencing shortages now, is expected to have significantly increased reserve margins within a few years.

What's Happening Now: Transmission

The same is not true for transmission. Over the last 10 years, circuit-miles of high voltage transmission lines (230 kv and above) increased at only 0.75 % per year. Over the next 10 years we are projecting that circuit miles of high voltage transmission will increase a total of just 4.2 %, or a rate of less than 0.5 % per year. Stated another way, in North America 10 years ago we had a little less than 200,000 circuit-miles of high voltage transmission lines. Right now we have about 200,000 circuit-miles of those lines. And 10 years from now we are projecting that we will have just a little over 200,000 circuit-miles of high voltage transmission lines. For the most part, the transmission dollars that are being spent today are to connect the new generation to the grid—they are not going to build major new lines to strengthen the grid's ability to move large blocks of power from one part of the country to another. That lack of additional transmission capacity means that we will increasingly experience limits on our ability to move power around the country and that commercial transactions that could displace higher priced generation won't occur. And, it will mean that areas experiencing supply shortages, like California is now, won't be able to count fully on other areas with ample generating resources to help in emergencies.

Moreover, the existing grid is being pushed harder and is being used in ways for which it was not designed. Historically, each utility built its system starting in the city-centers, because the early generating stations were located close to load centers. As the cities grew, the electric systems grew with them, spreading outward from the center. The weakest part of the electric grid is generally at the places where one system abuts another. Initially utilities installed connections between two systems for emergency purposes and to share generating reserves to keep costs down. Gradually those interconnections were strengthened so that adjoining utilities could buy and sell electricity when one had lower cost generation available than did the other. But the systems were not

generally designed to move large blocks of power from one part of the country to another, across multiple systems. Yet that is the way business is being conducted today. The volume and complexity of transactions on the grid have grown enormously since the advent of open access transmission.

Electric industry restructuring adds to the challenge. In the past a vertically integrated utility had complete responsibility for all aspects of its electric system, from planning and building the transmission system, through assuring that sufficient generation was constructed, to operating and maintaining the transmission and distribution systems, all to serve consumers in a designated area. With restructuring, there may no longer be a designated group of consumers for which to plan service. Instead, responsibilities to construct and maintain generation, transmission and distribution are being divided among multiple entities and, in some cases, those responsibilities may be falling between the cracks. Regional Transmission Organizations may provide a means to reintegrate some of these functions. But the RTO proposals that have been filed to date vary considerably in the extent to which the RTO has the authority to plan and expand the transmission system, not only to connect new generation, but to meet broader needs of regional reliability.

The result of all this is that the transmission grid is being increasingly stressed. That stress shows up in two ways. **First,** NERC is seeing **more congestion** on the grid, for more hours of the day. Last summer in the Eastern Interconnection there were substantial transfers of power from north to south. Cooler temperatures in the north meant that surplus generation could be sent to the south where the temperatures were hot and natural gas prices were high. On many days security coordinators had to invoke NERC transmission loading relief procedures to curtail transactions that were overloading transmission facilities between north and south. For generation sellers, these curtailed transactions resulted in lost business. Buyers were forced to replace these transactions with higher priced power, or in some cases, to cut off power to certain "interruptible" customers. In addition, what do not show up are the transactions that merchants or marketers decided not to engage in because of the likelihood they would be interrupted. Today, we know that those same transmission facilities are fully subscribed for the coming summer, meaning we could see a repeat of last year's pattern if we experience similar weather conditions and fuel prices.

Second, NERC is seeing **increasing violations** of its reliability rules. As I mentioned earlier, the grid is generally operated in a first contingency mode, that is, so that the grid can withstand the loss of its largest element and remain stable and secure. Last summer there were a number of instances where operators allowed facilities to remain loaded above their known security limits for extended periods of time, placing the grid at prolonged risk of major failure. Some entities have made the economic judgment that it is less costly to them to violate the rules than to follow them. We have seen entities improperly "leaning on," or taking power from, the Interconnection, causing unscheduled and unmanageable flows and potential voltage problems. As the limits of the system are reached and transactions must be curtailed, we are beginning to hear suggestions to relax the reliability rules to allow higher flows to occur. In an interconnected system, however, taking increased risks to allow some entities to realize short-term economic gain affects not only the system where the limit occurs, but also all the systems in the same Interconnection. For example, in the 1996 outages in the Western Interconnection, customers far away from the initiating problems were interrupted for significant periods of time.

What's Needed

First, we need legislation to change from a system of voluntary transmission system reliability rules to one that has mandatory rules coupled with an enforcement mechanism backed by government. In August 1997 NERC convened a panel of outside experts to recommend the best way to set, oversee and implement policies and standards that ensure the continued reliability of North America's interconnected bulk electric systems in a competitive and restructured electric industry. On a parallel track, in the aftermath of two major system outages that blacked out significant portions of the West in July and August 1996, the Secretary of Energy convened a task force on reliability, chaired by former Congressman Phil Sharp. Both groups came to the same conclusion: The current system of voluntary guidelines should be transformed into a system of mandatory, enforceable reliability rules, and the best way to accomplish that was to create an independent industry self-regulatory organization, patterned after the self-regulatory organizations in the securities industry, with oversight in the United States by the Federal Energy Regulatory Commission.

NERC and a broad coalition of state, consumer and industry representatives have been pursuing legislation to implement those recommendations. That coalition includes the American Public Power Association, the Canadian Electricity Association, the Edison Electric Institute, Institute for Electrical and Electronics Engineers—USA, the Large Public Power Council, the National Association of Regulatory Utility Commissioners, the National Association of State Energy Officials, the National Association of State Utility Consumer Advocates, the National Electrical Manufacturers' Association, the National Rural Electric Cooperatives Association, the Northwest Regional Transmission Association, the Transmission Access Policy Study Group, and the Western Interconnection Coordination Forum.

Goals of Reliability Legislation

- Mandatory and enforceable reliability rules, for
- All operators and users of the bulk power system in North America
- Fairly developed and fairly applied, by
- Independent, industry self-regulatory organization
- Oversight within U.S. by FERC
- Must respect the international character of the interconnected North American electric transmission system
- Regional entities will have a significant role in implementing and enforcing compliance with these reliability standards, with delegated authority to develop appropriate Regional reliability standards.

Role of FERC

Because of FERC's limited jurisdiction and authority, because of the international character of the North American grid, and because of the technical expertise required to develop and oversee compliance with bulk power system reliability standards, this is not a job that can simply be given to FERC. FERC does not have clear authority over reliability matters. Legislation that would have given FERC's predecessor, the Federal Power Commission, plenary authority over reliability matters was introduced in Congress following the Northeast blackout in 1965, but that legislation was not passed. Instead, the electric industry took on responsibility for assuring the reliability of the interconnected bulk power system. NERC was formed in 1968 to lead that industry effort.

The most direct statement in the Federal statutes on this subject is found in section 209(c) of the Public Utility Regulatory Policies Act, and it provides only for the making of recommendations with respect to industry reliability standards:

> The Secretary, in consultation with the [Federal Energy Regulatory] Commission, and after opportunity for public comment, *may recommend* industry standards for reliability, to the electric industry, including standards with respect to equipment, operating procedures and training of personnel, and standards related to the level or levels of reliability appropriate to adequately and reliably serve the needs of electric consumers. The Secretary shall include in his annual report—
>
> (1) any recommendations made under this subsection or any recommendation respecting electric utility reliability problems under any other provision of law, and
>
> (2) a description of actions taken by electric utilities with respect to such recommendations. (16 U.S.C. § 824a-2, emphasis added)

FERC also lacks jurisdiction over approximately one-third of the transmission facilities in the United States. It lacks jurisdiction over facilities owned by municipalities and state agencies, rural electric cooperatives that have Rural Utility Service financing, the Federal power marketing administrations (such as the Bonneville Power Administration

and the Western Area Power Administration), the Tennessee Valley Authority, and utilities within the Electric Reliability Council of Texas.

A further impediment to FERC's acting directly on reliability matters is that the grid is international in nature. Because the grid is a single machine, it must be operated under a common set of rules. NERC is a private, international organization, as is the new electric reliability organization envisioned by the pending legislation. There is strong Canadian participation within NERC now, and that is expected to continue with the new organization. Having reliability rules developed and enforced by a private international organization, with oversight in the United States by FERC and with oversight by Canadian regulators in Canada, is a practical way to address the international character of the grid. Otherwise, U.S. regulators would be dictating the rules that Canadian interests must follow – a prospect that would be unacceptable to them.

Having an industry self-regulatory organization develop and enforce reliability rules under government oversight also takes advantage of the huge pool of technical expertise that the industry currently brings to bear on this subject. The interconnected grid is a very complex machine. Hundreds of industry volunteers take part in NERC's standards development and related activities. FERC does not now have the technical expertise and resources to take on that effort, and it would not be cost-effective for it to do so. FERC's strong competence lies in assuring fairness and openness of process and regularity of proceedings. The combination of industry technical expertise to work on substantive reliability rules and FERC oversight to assure due process is an effective and efficient way to address the issues.

Status of Reliability Legislation and RTOs/ISOs

Last year the Senate adopted the NERC legislation as S. 2071, but the bill died in the House. Senator Smith reintroduced that legislation this year (S. 172). In addition, the NERC legislation (including provisions addressing coordination with regional transmission organizations (RTOs)) has been included as part of both Senator Bingaman's bill (S. 597) and Senator Murkowski's bill (S. 389). Similar language has been

introduced in the House of Representatives by Mr. Wynn (H.R. 312).

The pending legislation addresses the role of both independent system operators (ISOs) and RTOs, as well as the role of state commissions. Independent system operators and regional transmission organizations fall within the defined term "system operator" in the pending legislation. As system operators, both ISOs and RTOs would be obligated to comply with established reliability rules, just as other kinds of system operators and other users of the bulk power system would be obligated to comply with those rules. In Order No. 2000, FERC stated that RTOs must perform their short-term reliability functions consistent with established NERC (or its successor) reliability standards and notify the Commission immediately if implementation of these or any other externally established reliability standards will prevent it from meeting its obligation to provide reliable, non-discriminatory transmission service.

The issue of coordinating the reliability-related activities of the new electric reliability organization envisioned by this legislation and RTOs arose during last year's legislative efforts. NERC worked with FERC, PJM, the California Independent System Operator and several others to address that issue. We agreed to specific language to address that issue, and that language has been incorporated in both Senator Bingaman's bill (S. 597) and Senator Murkowski's bill (S. 389). It is also included in the bill pending in the House of Representatives (H.R. 312).

The NERC reliability legislation also addresses the role of state commissions. The legislation gives the new electric reliability organization authority to set and enforce rules for only the bulk power system. Eighty per cent of power outages take place on local distribution systems, and those remain wholly under state jurisdiction. Language has been included to make clear that issues concerning the adequacy and safety of electric facilities and services, matters traditionally within the purview of state commissions, remain with the state commissions. The new reliability legislation specifically would not preempt actions by a state commission with respect to the safety, adequacy, and reliability of electric service within that state, unless the state's actions were inconsistent with reliability rules adopted by the new reliability organization. Those provisions were worked out with representatives of the states. Both Senator Bingaman's and Senator Murkowski's bills contain that language.

NERC strongly urges you to adopt legislation containing these reliability provisions in this session of Congress. That will enable us to develop an organization and infrastructure to enforce the reliability rules and keep the grid secure.

Expanding the Transmission System

In addition to making transmission system reliability rules mandatory and enforceable for all operators and users of the bulk power system, we also need to remove the impediments to expansion of the transmission grid. NERC submitted extensive testimony on that subject to the Senate Committee on Energy and Natural Resources on May 15, 2001. I refer you to that testimony. Briefly, I would group the impediments to expanding the transmission grid into three areas.

The first has to do with the certification and siting of new transmission facilities. Projects that would strengthen the grid are today being delayed due to an inability to obtain certification and rights of way. Other projects are not even attempted, as potential developers decide not to undertake the effort.

A second major impediment to expanding the transmission grid has to do with economics. The cost of transmission is a relatively small portion (6 to 8 %) of the overall cost of delivered electricity. A robust transmission system would pay large dividends by increasing our supply options and allowing us to move large blocks of power from where it is available to where it is needed. Yet the regulated rates that we allow transmission owners to charge may not compensate for the risk they take on, and are not sufficient to attract the large amounts of capital necessary to upgrade our systems.

Finally, there is the issue of how many different entities own pieces of the grid and have various responsibilities for it. I earlier spoke about the changes occurring from restructuring as the functions and responsibilities

formerly handled by a vertically integrated utility are divided among different entities. Who has the responsibility and authority to build transmission is now less clear. We need to develop mechanisms for assessing what additional facilities the network requires and clearly assigning who has the responsibility and authority to build them.

Conclusion

NERC commends the Committee for attending to the critical issue of assuring the reliability of the interconnected bulk power system as the electric industry undergoes restructuring.

A new electric reliability oversight system is needed now. The continued reliability of North America's high-voltage electricity grids, and the security of the customers whose electricity supplies depend on them, are at stake. An industry self-regulatory system is superior to a government system for setting and enforcing compliance with grid reliability rules. Pending legislation would allow for the timely creation and FERC oversight of a viable self-regulatory reliability organization. . The reliability of North America's interconnected transmission grid need not be compromised by changes taking place in the industry, provided reliability legislation is enacted now.

Committee Members | Subcommittees | Hearings | Key Legislation | Jurisdiction
Press Statements | Current Issues | 1997 Special Investigation | Video of Select Hearings | Sites of Interest