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Energy Planning Advisory Board
Concord, NH 03301

Energy Stakeholder Forum

Dear Board Members:

Granite State Hydropower Association ("GSHA") appreciates the opportunity to submit its comments as the Board works to identify key energy issues for Legislative and Executive action to combat higher energy costs and to develop a state energy policy premised on security, affordability and sustainability

By way of background, GSHA is a volunteer association made up of owners and other individuals and organizations representing the small hydropower industry in New Hampshire. GSHA members include owners of approximately 50 small-scale hydroelectric projects (i.e., those less than 10 MW) located throughout New Hampshire. GSHA plants have a total installed electric capacity of approximately 50 megawatts and produce approximately 200 million kilowatt-hours of electricity each year. All GSHA projects are "run of river" projects, that is, they do not store water, but use river flow as and when available. GSHA member plants provide significant environmental benefits through the operation of fish ways, recreation facilities (i.e. boat ramps), and removal of trash from New Hampshire's rivers. Several GSHA members operate projects at dams owned by the State of New Hampshire. These NHDES related projects make annual payments to the state of approximately $850,000 and relieve the state of maintenance expense of those dams. The electrical output of GSHA member plants is absolutely emissions-free.

GSHA feels strongly that any legislative or executive action relating to energy policy should recognize the benefits of hydroelectric power, both environmental and economic. GSHA also believes that the Board should recognize that it is just as important to assure the continued operation of existing renewable resources as to focus on the development of new renewable resources, particularly the ongoing operation of existing hydroelectric projects as well as the expansion of New Hampshire's hydroelectric resource. This can be accomplished by reducing unnecessary costs, expanding market opportunities, and ensuring that hydroelectric plants compete on a level playing field in the restructured and competitive electric power industry.

The EPAB may not be aware that some small-scale hydroelectric projects are faced with very difficult economic conditions. Several small hydroelectric plants recently have shut down after the expiration of long-term contracts because they could not financially justify continued operation when selling power at market rates. The market rates of electricity have been very volatile over the past several years. If existing hydroelectric projects are shut down, their

electrical output necessarily will be replaced by less environmentally friendly fossil-fuel-burning power plants.

With respect to expansion opportunities, it is unlikely that many, if any, new hydroelectric plants will be built within the ISO-NE region. However, there are opportunities to replace existing inefficient turbines and to make incremental expansions at some existing hydroelectric plants. At least one of the GSHA plants presently is evaluating the installation of a minimum flow turbine that would improve the utilization of existing water flow. However, current market conditions make it difficult to justify capital investments given the volatility of the current electrical energy market. Future legislative and executive action could facilitate this sort of incremental additions to hydroelectric capacity by providing financial incentives and facilitating regulatory approval.

I have attached background material on GSHA, the technology behind hydropower and a discussion of the present day challenges facing the hydropower industry in New Hampshire. GSHA looks forward to participating in the future activities of the Board and would be happy to provide additional information about GSHA and its member projects if so requested.

Sincerely,

GRANITE STATE
HYDROPOWER ASSOCIATION

Richard A. Norman
President

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**GRANITE STATE HYDROPOWER ASSOCIATION**

## ORGANIZATION

The Granite State Hydropower Association (GSHA) is the trade association for the independent hydroelectric power industry in New Hampshire. Its members own operate and manage approximately 50 hydroelectric projects located throughout New Hampshire. The projects have a total installed capacity of approximately 50 MW with an average size of 1,000 KW. There are also a number of other hydroelectric projects in New Hampshire owned by paper mills, public utilities and other independent power producers which are not part of GSHA. Some of these hydroelectric plants, particularly those located on the Connecticut River, are larger, if not much larger, than GSHA projects

Virtually all of the GSHA projects were built or redeveloped in the 1980's as a result of the passage of the Public Utility Regulatory Policy Act (PURPA). Since the late 1980's no new hydroelectric projects have been constructed due to the then low prevailing price of electricity in New England and adverse changes in the federal tax code made in 1987. The recently enacted 2005 energy bill contains tax credit and other provisions that will benefit the hydropower industry. However, given the difficulty of permitting new hydroelectric projects and the volatility of the electric market the incentives may not be sufficient to cause new or expanded hydropower development in New Hampshire.

Although GSHA projects have different individual characteristics, virtually all of them are regulated by the Federal Energy Regulatory Commission (FERC). GSHA projects typically are located at the site of dams constructed in the 1800's or early 1900's as part of New England's early industrial development. Many of these projects are sited in old mill buildings or in close proximity to the center of various New Hampshire towns and cities. Most GSHA projects have not changed the historical level of impoundments formed by project dams. The largest GSHA project is 10MW with the remaining GSHA projects having 5MW or less installed capacity. Because GSHA projects only can generate when water is available, the actual usable installed capacity is significantly less than the nameplate rating, generally about 40-45% of stated nameplate capacity.

The congressionally mandated philosophy by which FERC regulates hydroelectric projects is the encouragement of multiple uses of rivers for such complimentary purposes as fishing, swimming, boating, electric power generation, flood control and drinking water. Many GSHA projects, located on rivers with fish restoration efforts, have incorporated upstream and/or downstream fish passage facilities that primarily serve cold water fisheries. Other projects provide enhanced warm water fishing in project impoundments. GSHA projects also remove significant amount of trash from NH rivers, as trash accumulated at plant intakes is removed to permit project operations. In essence, GSHA project owners act as stewards of NH rivers for the many users of these rivers.

**GRANITE STATE HYDROPOWER ASSOCIATION**

## THE TECHNOLOGY OF HYDROPOWER

Hydropower has been with us in some form at least since the first century B.C., allowing us to say with certainty that waterpower technology is both "tried and true". Indeed, some of the Granite State Hydropower Association (GSHA) stations use old turbines and generators recently rehabilitated for their current use. Most of this older equipment was built in the United States between 1920 and 1940 and runs as well today as it did when it was first manufactured. Today there are no more major, U.S. owned turbine manufacturers. All new equipment is imported. The system efficiency of hydroelectric turbine installations has been improved marginally over the years, but there is little likelihood that overall system efficiency will see a significant increase over the 85-90% of existing hydroelectric stations.

The choice of turbine type and the number of turbines to be installed at a particular site will be determined by project head (the distance the water falls, equal to headwater elevation minus tailwater elevation) and the amount and frequency of the water flow at the site. A site with a very steady flow (say at the outflow of a large impoundment) would probably be appropriate for a single, non-regulated machine; while a site on a extremely variable river might be better suited for one or more adjustable machines capable of maintaining high efficiencies over a wider range of river flows.

In addition to selecting the type of turbine to install, hydroelectric station planners must also identify the optimum machinery size, considering river flows and head at the site. This is largely an economic question, based primarily on the duration of specific quantities of river flow. That is, while a particular site may be able to generate a great deal of power during the spring season, when snow is melting and rains are heavy the installation of a large generating capacity to accommodate this flow may preclude operation during other months when flows are much lower. Therefore, attention must be paid both to the quantity and to the duration of river flows during the course of a normal year.

Once it has been determined around which maximum flow the site should be designed, the standard formula for calculating the proper installed capacity for a hydro station is as follows:

$$\mathbf{kW = (H \times Q \times e)/11.8}$$

| | | |
|---|---|---|
| WHERE: | kW | = Power |
| | H | = head |
| | Q | = design flow |
| | | and, |
| | e | = overall efficiency |

Given naturally variable water flows during the course of a year, no turbine/generator will operate at full capacity all of the time. The relationship between the number of kilowatt hours that could be produced by a turbine-generator operating at full capacity for a full year and

the actual number of kilowatt hours actually produced during an average year is known as annual plant factor or capacity factor and is stated as a percentage. Therefore, projected annual electric energy output at a site may be calculated using the following formula:

Annual Energy in kWh = Installed Capacity x 8760 hours/year x Plant Factor

At most hydroelectric stations in New England, plant factors range between about 40% and 60%. In the past, river flows were extensively regulated by means of careful water storage and release programs at upstream impoundments, and plant factors often exceeded 60%. However, owing to contemporary concerns about fisheries habitat and competing recreational uses of lakes and rivers, such extensive river flow regulation is very rare today. Virtually all GSHA projects operate as “run of river” projects. This means that projects are not allowed to vary the level of their impoundments and must use the river flow as and when it occurs. Thus, the nameplate capacity of most hydroelectric stations provides only a measure of the instantaneous generating capacity of a project, but does not reflect the amount of unusable energy that is produced in a generating year.

**GRANITE STATE HYDROPOWER ASSOCIATION**

## PRESENT DAY CHALLENGES

Economics

The majority of GSHA projects are small with a average size of 1,000 kW. If one assumes a plant capacity factor of 45% and an average power cost of $.06/kwh, it is seen that the annual revenue from this plant would be $106,434. The plant owner is required to pay all operating costs including insurance, property tax, maintenance, labor. Small plants are extremely sensitive to extraordinary operating expenses like legal costs (for tax appeals, etc.), major plant failures, etc. Moreover, if a project owner is required to sell plant output to a purchaser other than the local utility the owner must incur a wheeling charge in order to reach market. Moreover, since the amount of power produced from a typical GSHA plant is very small in relation to the market it is virtually impossible to sell electricity other than through a power marketer. The rate received by the project owner is thus reduced and project economics can become very marginal.

The recent legislative session provides an example of how legislation can be enacted to support the renewable industry on a "win-win" basis. At the time GSHA projects were developed in the 1980's NH state law permitted municipalities to negotiate Property in Lieu of Tax (PILOT) agreements with independent power producers (IPPs) for up to a maximum term of 20 years. Annual payments were fixed as a percentage of revenues received by the IPP projects at a maximum ceiling of 5% of project revenues. For the past 20 years or so PILOT agreements proved to be easily administered and worked to the mutual benefit of IPP project owners and municipalities. In 1998 NH state law was changed to prohibit municipalities from entering into new or extended PILOT agreements.

Recently some PILOT agreements began to expire. This required municipalities to assess GSHA hydroelectric for the first time. Both the municipalities and GSHA project owners encountered great difficulty in reaching agreement on property tax assessment values. Few, if any, municipalities have specific knowledge of the hydroelectric industry. At least two projects h appealed tax assessment decisions to NH superior courts casing both the municipalities and the projects to incur substantial expense in the appeal process. The assessment methodologies used by municipalities and the assessed values assigned to projects have varied widely. Many more PILOT agreements will expire in the coming years.

The economic burden of property tax assessment disagreements are especially severe for small project owners since the cost of using legal advisors and assessors is disproportionately high relative to the revenue potential of small projects. Moreover, since each municipality has individual responsibility for assessments within its jurisdiction there is significant duplication of effort and waste when assessing IPP projects at the expiration of PILOT agreements.

Recognizing the problem, the legislature has passed HB 1758 (the governor has not yet acted on this bill). HB 1758 reauthorizes PILOT agreements, but only on a voluntary basis. GSHA believes the availability of PILOT agreements will provide a simple, well tested and well understood tax policy for IPP projects and will reduce administrative costs and eliminate

potential court challenges to property assessment decisions.

Recommendations

GSHA believes that the EPAB should consider the following additional legislative, regulatory and administrative actions related to the renewable power industry as a part of New Hampshire's energy policy.

1) **Mandatory Power Purchase Obligation** - GSHA projects were developed at a time when provisions of the Public Utility Regulatory Policy Act ("PURPA") and New Hampshire's Limited Electric Energy Producers Act ("LEEPA") mandated that local utilities purchase the output from qualifying renewable facilities (including GSHA projects). Recent legislative changes have raised questions about whether local utilities, in a deregulated environment, still have the legal obligation to purchase power from qualifying facilities. GSHA has explained that qualifying facilities necessarily incur extra costs if forced to wheel power to remote purchasers thus placing them at a cost disadvantage to larger electrical plants that, in most cases, are directly interconnected to the electrical grid. These cost disadvantages are especially significant for small renewable projects like typical GSHA plants. If it is established that LEEPA and PURPA do not require local utilities to purchase power from qualifying facilities within their franchise area then GSHA believes legislation, like Connecticut's Act 980, should be passed to require local utilities to make such purchases. During the legislative process the size of the qualifying facilities covered by this legislation, the power rate, recovery of administrative charges by the utility and other such factors could be addressed.

2) **Renewable Portfolio Standard** - GSHA supports the adoption of a New Hampshire Renewable Portfolio Standard ("RPS") program. The states of Massachusetts, Connecticut and Rhode Island have existing programs that are providing significant incentives to the renewable power industry. The basic provisions of SB 314, recently considered by the legislature, would establish a similar an effective program in New Hampshire. However, if such a program were to be enacted, it would only be effective if it contained economic incentives similar to those of the other New England states.

3) **Regional Greenhouse Gas Incentive** – If New Hampshire joins in the Regional Greenhouse Gas Incentive Program GSHA believes that existing and new hydroelectric facilities should be included in such a program.

**GRANITE STATE HYDROPOWER ASSOCIATES**

**THE BENEFITS OF HYDROPOWER**

**The OBVIOUS BENEFITS of hydropower are the following**:

- GSHA hydroelectric producers provide over 50 MegaWatts (MW) (50,000,000 watts) of generating capacity to New Hampshire's electric customers. PSNH, large multinational companies and paper company owned plants provide more than 375 MW of additional generating capacity.

- Annual energy output from this GSHA capacity is approximately 200,000,000 kiloWatt hours, which represents a savings of approximately 503,000 barrels of oil per year.

- The hydroelectric industry in New Hampshire pays annual state and local property taxes of approximately $1,000,000.00.

- The leasing of state owned dams for hydroelectric production provides approximately $850,000 per year to the state dam maintenance fund and thus contributes to the safety of all state owned dams.

- Hydroelectric producers provide additional income to the state by paying water user fees at projects located downstream of state and federal controlled impoundments.

- Hydroelectric power is clean, renewable, and largely inflation-proof.

**The HIDDEN BENEFITS of hydropower are the following**:

- As small, decentralized electric energy sources, small scale hydropower sites offer greater reliability to the overall electric system, since plant failure will not cause massive system disturbance.

- Small, decentralized hydro stations are typically closer to the end users and thus represent greater overall efficiency, as they do not entail major transmission losses.

- The re-utilization of existing dams increase public safety because it involves the repair of abandoned structure and the regular monitoring of water flows.

- The installation of hydroelectric projects facilitates lake level management and thus enhances recreational resources.

- Many hydroelectric projects have improved the appearance of old dams and mill building and thus improved the quality of our daily lives. Significant trash is removed from the state river system at GSHA plant intakes.

- Many hydroelectric projects enhance fisheries and wildlife habitat, not only by controlling water flows, but also by making necessary physical changes in the environment to optimize habitat conditions.

- Hydroelectric projects make it possible for migratory fish to swim past existing dams where, in the absence of hydroelectric development, no fish passage facility would be provided. It is projected that independent hydroelectric site owners will spend approximately $3.6 million to provide upstream and downstream fish passage by the year 2008, and approximately $116,000 annually to operate these facilities. None of this expense will be passed through to the electric consumer.