Summary

AFS Policy Statement #17:
Tidal Power Development and Estuarine and Marine Environments
(Abbreviated)

Production of electricity by harnessing the power of ocean tides is being examined with renewed interest by many industrialized nations. Tidal power has become economically feasible as a result of the continuous rise in price of fossil fuels, and a number of nations already possess working tidally driven electric generating facilities. A tidal power plant is similar in principle to hydropower generation facilities in rivers. A barrage (dam) with a powerhouse and turbines is constructed across an estuary or embayment to form a basin (headpond) of sufficient size to allow production of electricity over a reasonable period. For the simplest design, the basin is allowed to fill during flood tide through floodgates and powerhouse, with turbines spinning freely. Power is produced on ebb tide.

Environmental concerns at issue with tidal power include alterations of primary and secondary productivity, fish mortality, changes in the tidal regime, local weather patterns, and local and regional socioeconomic structure. Tidal hydropower developments may encompass large embayments and affect wide geographic areas. Removing energy from the tide and reducing volume of seawater exchange across the barrage site, will alter water circulation patterns and tidal regimes both behind and seaward of the barrage. Seaward of the barrage tidal amplitudes may increase as far as 500 km from the barrage site, inundating narrow but substantial portions of nearby coasts and raising long-term storm damage potential. Within the headpond tidal range will be reduced but mean water level will rise causing increased stratification, producing greater extremes in surface temperatures and more ice cover in temperate climes. In some headponds turbidity will decrease and sedimentation will increase. Reduced storm surges and extreme tides could diminish flooding and erosion, but changes in tidal amplitude may alter groundwater drainage and cause changes in local climate conditions. Effluent disposal and assimilation problems in headpond areas could also develop because of reduced flushing time.

Changes in turbidity and sedimentation would alter biotic conditions in the headpond areas, shifting invertebrate species composition and thus altering the food chain. Fisheries impacts would be greatest in those areas where fish are abundant and fish passage is repeated by the same population many population many times over the year. Introducing hydraulic turbines into an estuarine environment will create the problems inherent to fish passage associated with riverine power installations, with several important exceptions: the estuarine environment contains larger fish populations, larger fish species, and marine mammals. Impacts may include altered migration routes and changes in the availability of food organisms.

The AFS policy regarding tidal power development in estuarine and marine environments is to:

1. Promote compilation and synthesis of information regarding pre- and post-construction of existing tidal power sites so it can be used to estimate, at least on a gross scale, the potential effects of proposed projects.

2. Encourage all relevant international, national, state, and provincial agencies to become involved and consider preparing policy statements on tidal power, regardless of their regulatory jurisdiction over the project. One of the specialized organizations of the United Nations could serve as a coordinating body.

3. Encourage development of management-oriented programs and decisions based on scientific evidence while being cautious of alarmist reactions or emotional response to proposed projects.

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4. Encourage long-term, multi-source funding of regional studies to determine ecosystem effects of tidal power both before and after construction. Such studies should follow the conceptual approach outlined by the Ocean Sciences Board of the National Academy of Sciences.

5. Encourage response to tidal power projects similar to that of other large-scale construction projects, including: (a) preparation of appropriate environmental impact statements and long-term pre- and post-operational studies and (b) involvement of resource researchers and managers at all stages of tidal power development.

6. Encourage better cross-discipline discussion on the effects of tidal power projects among engineers and fishery biologists.

7. Encourage the holding of appropriate symposia in conjunction with other suitable international meetings to develop consensus on research priorities for assessing tidal power impacts, and minimum information needs for adequate long-term monitoring.