

# PROJECT BRIEF

## **Hybrid2, Hybrid Power System Simulation Software**

by Ian Baring-Gould 12/97

### **Background**

With the increasing need for electricity generation in the developing world, the market potential for renewable-based hybrid power systems is emerging. In order to address this emerging market, an analysis tool was needed by industry, researchers, and development institutions to accurately model the performance and economics of alternative hybrid designs. This analysis tool would have to have enough versatility to model the many system locations, widely varying hardware configurations, and differing control options for potential hybrid power systems. In response to this need, the *Hybrid2* software was developed. *Hybrid2* is a time-series/probabilistic model that uses time-series resource and load information, combined with statistical analysis, and manufacturers' data for hybrid system equipment to accurately predict the performance and cost of hybrid power systems. *Hybrid2* allows direct comparison of many different renewable and non-renewable power system designs. This is completed in a user-friendly format where off-the-shelf equipment is incorporated into potential power systems.

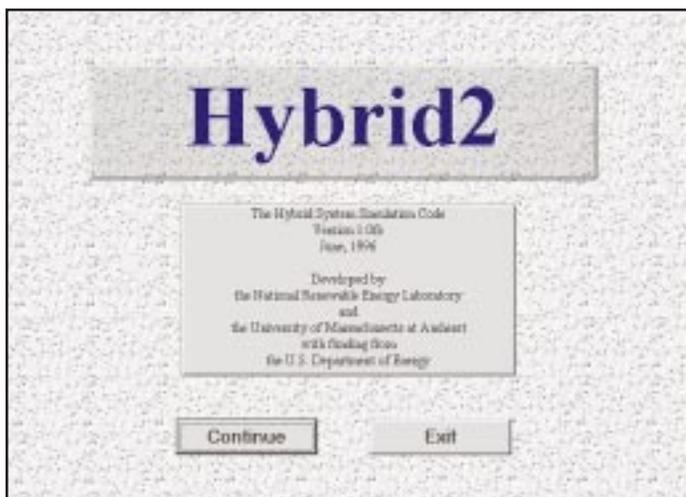
### **Scope**

To define the performance of a variety of wind/ diesel and hybrid power system configurations, the University of Massachusetts and the National Renewable Energy Laboratory (NREL) developed the *Hybrid2* software. The *Hybrid2* code can model many combinations of wind turbines, photovoltaic arrays, diesel generators, power converters, and battery storage, both in AC, DC, or two-bus systems. *Hybrid2* also allows for more than 100 different dispatch configurations with multiple diesel generators, renewable sources, and battery storage. The model has an easy to use graphical interface, an in-depth library to facilitate system design, and a detailed glossary of frequently used terms to assist users who are not familiar with hybrid power system terminology. The code also includes a comprehensive economics package.

### **Status**

The *Hybrid2* code was released in June at the 1996 American Wind Energy Association Wind-Power Conference in Denver, Colorado. The software has undergone numerous updates and is available to the general public for a \$100 reproduction charge. The University of Massachusetts is providing support for software users and has set up a homepage where more information can be located. The software is used extensively at NREL and approximately 150 copies have been distributed worldwide.

The *Hybrid2* software will be undergoing continuous upgrades over the next year with planned releases of updated versions in June and December of this year. Possible upgrades include the addition of a synchronous condenser, simplified system dispatching, a user-defined control offset and a simple pre-filter for wind and solar resource data.



*Hybrid2 was released in June of 1996.*

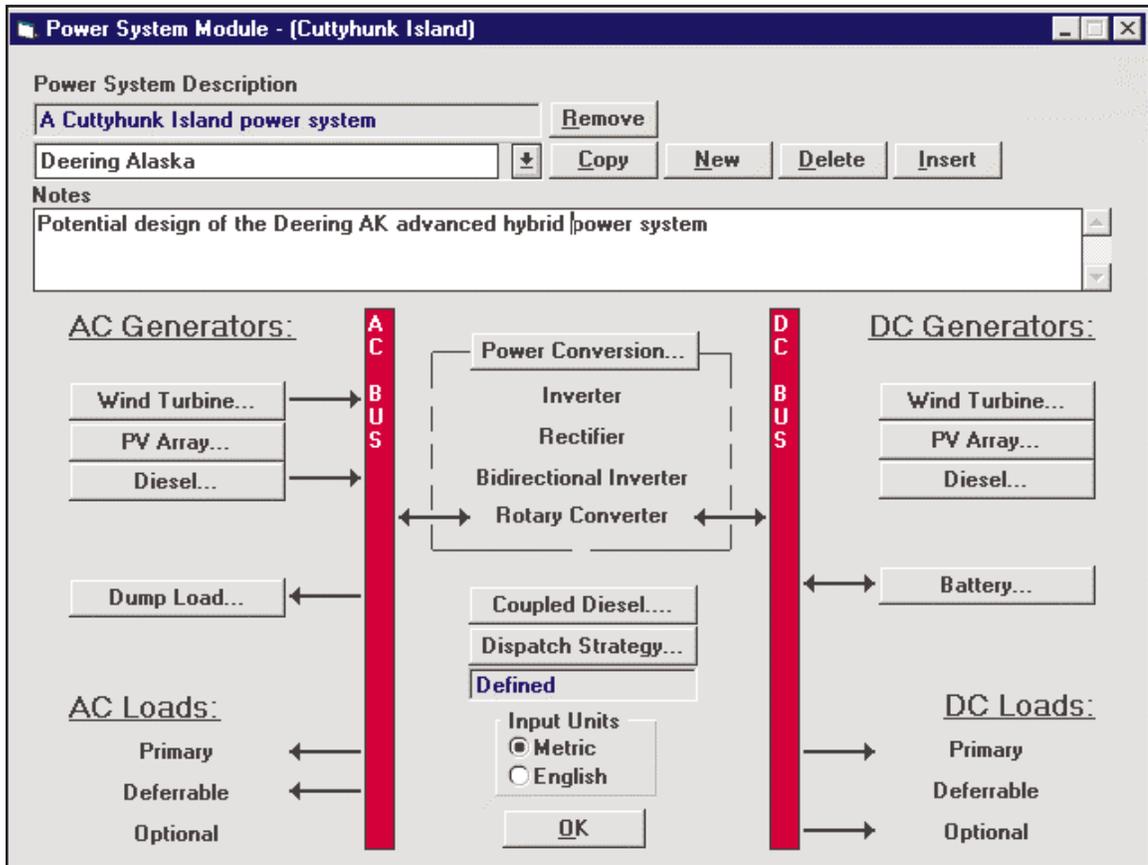
### **Team Participants**

- The University of Massachusetts
- NREL

## NREL Contact

Web site: <http://www.rsvp.nrel.gov>

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Hybrid2 software can model many combinations of equipment in AC, DC, or two-bus systems.

Produced by the National Renewable Energy Laboratory, a U.S. Department of Energy national laboratory.

Printed with renewable source ink on paper containing at least 50% wastepaper, including 20% postconsumer waste.

NREL/FS-510-24197