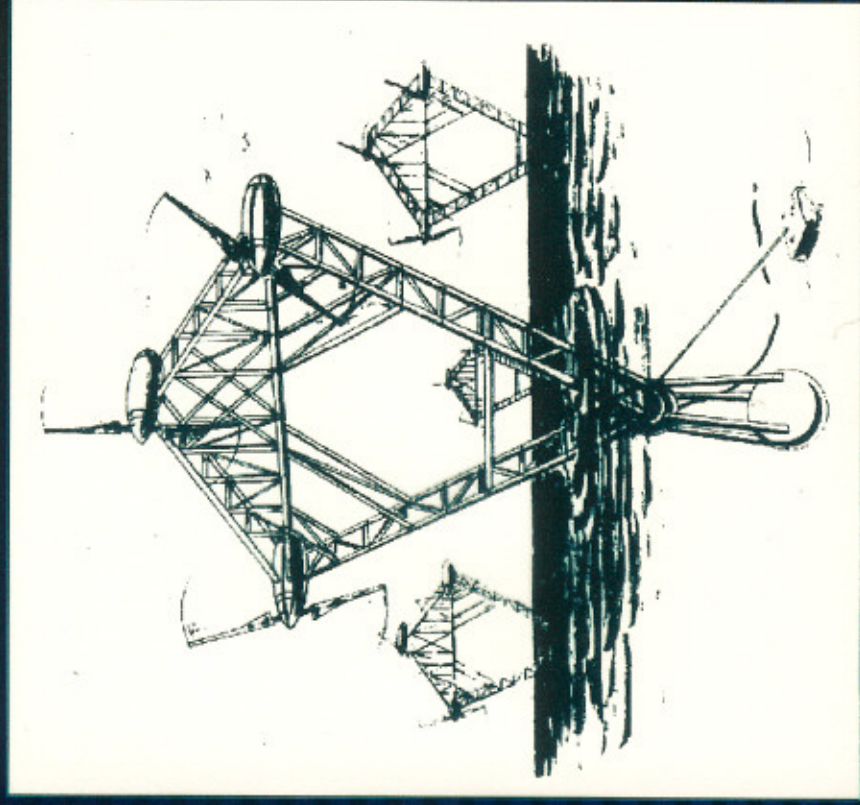


OWES BACKGROUND

- UMass Ocean Engineering Program (C 1971).
- Nixon's Energy Policy Committee (1960's).
- Palmer C. Putnam and Percy Thomas (C 1948).

OFFSHORE WINDPOWER

- Energetic Winds
- Eased Regulation
- Worldwide Resource
- Accessibility
- More Options Than Ashore



THE OWES CONCEPT

- Prevailing winds intensify greatly over the ocean.
- Very energetic winds over continental shelves.
- Path to the Hydrogen Economy:
Most wind energy at remote sites.
Energy umbilical to market necessary otherwise.
- Wind Ships are required:
Wind energy capture maximized.
Large diameter rotors impractical.
Arrays look promising due to inherent economies.
Distributed rotors provide lower c.g. and aloft weight.
Down-tower-power is possible.



ECONOMY OF SCALE?

LARGE TURBINES

- Large Installed Power
- Increased Height Costly
- Simplicity
- Centralized
- Reaching Mobility Limits
- Square-Cube Law
- Very Large Gearboxes
- Maintenance (?)

SMALL TURBINES

- Manufacturing Economies
- Wide Choice of Materials
- Economy of Volume
- Shipping
- Crane Size
- Either Up- or Down-wind
- Distributed Load Sources
- Reliability
- Vertical Windpower Efficiency
- Maintenance (?)

OWES TECHNOLOGY:

**WE THINK THESE TECHNOLOGY FEATURES ARE
INDEED INNOVATIONS AND ARE PROPRIETARY.**

- 1. WE CAN DEMONSTRATE THAT THE OWES
CONCEPT MAKES FEASIBLE GRAND-SCALE
UTILIZATION OF WIND ENERGY WHICH IS DENIED
TO LARGE SINGLE ROTOR SYSTEMS.**

OWES TECHNOLOGY :

**WE THINK THESE TECHNOLOGY FEATURES ARE
INDEED INNOVATIONS AND ARE PROPRIETARY.**

- 2. WE KNOW HOW TO SEND PRACTICAL WIND
ENERGY SYSTEMS TO SEA WHERE THE WIND
RESOURCE IS MORE RELIABLE FROM YEAR TO
YEAR AND MUCH MORE ENERGETIC.**

OWES TECHNOLOGY :

WE THINK THESE TECHNOLOGY FEATURES ARE
INDEED INNOVATIONS AND ARE PROPRIETARY.

3. THE OWES DOWN-TOWER-POWER CONCEPT
MAKES THE WIND SHIP NAVAL ARCHITECTURE
MORE COST EFFECTIVE.

OWES TECHNOLOGY :

WE THINK THESE TECHNOLOGY FEATURES ARE INDEED INNOVATIONS AND ARE PROPRIETARY.

4. THE DOWN-TOWER SYSTEM UTILIZING A LARGE NUMBER OF VARIABLE SPEED MECHANICALLY DRIVEN A.C. GENERATORS MAKES POSSIBLE MORE EFFICIENT FOLLOWING UP AND DOWN THE WIND ENERGY CUBIC POWER CURVE THAN CAN BE DONE WITH ONLY ONE OR TWO LARGE GENERATORS DRIVEN BY A SINGLE LARGE ROTOR.

OWES TECHNOLOGY :

WE THINK THESE TECHNOLOGY FEATURES ARE INDEED INNOVATIONS AND ARE PROPRIETARY.

5. THE MODERATE DIAMETER WIND WHEEL OF THE OWES SYSTEM WILL PERMIT SIGNIFICANT IMPROVEMENT IN PERFORMANCE, PROVIDE MODULARITY, AND ACHIEVE MANUFACTURING AND MAINTENANCE SIMPLIFICATION.

OWES TECHNOLOGY :

**WE THINK THESE TECHNOLOGY FEATURES ARE
INDEED INNOVATIONS AND ARE PROPRIETARY.**

**6. A SINGLE LARGE DIAMETER, SLOW-TURNING,
MULTIPOLE, MULTI-UNIT D.C. GENERATOR,
RIDING ON A MASSIVE FLYWHEEL AT THE ARRAY
BASE, COULD RESULT IN HUGE COST SAVINGS IN
SYSTEMS WHICH MAKE HYDROGEN. U.S. NAVY
FLEET SUBMARINE D.C. GENERATORS AND
MOTORS ARE GOOD PROTOTYPES HERE.**

OWES TECHNOLOGY :

WE THINK THESE TECHNOLOGY FEATURES ARE INDEED INNOVATIONS AND ARE PROPRIETARY.

7. AT-SEA MAINTENANCE OF WIND SHIPS IS FACILITATED GREATLY BY AVAILABILITY OF A STURDY TOWER FOR WEIGHT LIFTING, AND THE RELATIVELY LOW WEIGHT OF ANY INDIVIDUAL OWES WIND WHEEL UNIT.

OWES TECHNOLOGY :

WE THINK THESE TECHNOLOGY FEATURES ARE
INDEED INNOVATIONS AND ARE PROPRIETARY.

8. THE NAVAL ARCHITECTURE OF THE WIND
SHIPS IS NOVEL.

OWES TECHNOLOGY :

WE THINK THESE TECHNOLOGY FEATURES ARE
INDEED INNOVATIONS AND ARE PROPRIETARY.

9. THE "LOWERABLE BALLAST BOX" CONCEPT IS
NOVEL.

OWES TECHNOLOGY :

WE THINK THESE TECHNOLOGY FEATURES ARE INDEED INNOVATIONS AND ARE PROPRIETARY.

10. THE CONCEPT OF A SHALLOW-WATER SYSTEM, A PILL-BOX HULL CAPABLE OF RIDING UP AND DOWN IN THE TIDE, ON A MULTIPLICITY OF PILES, IS NOVEL, AND A SIGNIFICANT IMPROVEMENT OVER PRESENT EUROPEAN SEABED OFFSHORE WIND SYSTEMS. OFFSHORE MASSACHUSETTS USE OF SEABED MATERIAL TO BUILD ARTIFICIAL ISLANDS IS FORBIDDEN BY LAW.

OWES TECHNOLOGY :

**WE THINK THESE TECHNOLOGY FEATURES ARE
INDEED INNOVATIONS AND ARE PROPRIETARY.**

**11. THE SEMI-SUBMERSIBLE HULL CONCEPT,
CAPABLE OF DRAMATIC REDUCTION IN WIND SHIP
MOTION EXCITED BY WIND WAVES, IS NOVEL.**

SUMMARY:

WHAT COULD OWES TECHNOLOGY DO FOR THE HUGE RENEWABLE ENERGY INDUSTRY THAT MUST BE STARTED SOON, IN THE USA?

- 1. MULTI-WHEEL, MODEST DIAMETER WINDWHEEL ARRAYS MAKE POSSIBLE GRAND-SCALE HARVEST OF WIND ENERGY AT SITES WHERE SINGLE LARGE DIAMETER WINDWHEELS CANNOT BE ERECTED OR SAFELY OPERATED.**

SUMMARY:

WHAT COULD OWES TECHNOLOGY DO FOR THE HUGE RENEWABLE ENERGY INDUSTRY THAT MUST BE STARTED SOON, IN THE USA?

2. DOWN-TOWER-POWER FROM MULTI-WHEEL ARRAYS MAKES WIND SHIPS AND WIND STATIONS MUCH LIGHTER AND MUCH MORE CAPABLE OF CAPTURING HIGH-END WINDS.

SUMMARY:

WHAT COULD OWES TECHNOLOGY DO FOR THE HUGE RENEWABLE ENERGY INDUSTRY THAT MUST BE STARTED SOON, IN THE USA?

3. MODEST DIAMETER WINDWHEELS LEAD TO SIGNIFICANT IMPROVEMENT IN PERFORMANCE, LARGE REDUCTION IN WEIGHT, EASIER PRODUCTION-LINE MANUFACTURE, HIGHER BASIC INSTALLED POWER, AND AERODYNAMIC OPTIMIZATION FOR MICROSITES.

SUMMARY:

WHAT COULD OWES TECHNOLOGY DO FOR THE HUGE RENEWABLE ENERGY INDUSTRY THAT MUST BE STARTED SOON, IN THE USA?

4. USEFUL ENERGY PRODUCTS CAN BE MADE AT REMOTE SITES, THEN BROUGHT TO MARKET, ANYWHERE IN THE WORLD.

SUMMARY:

WHAT COULD OWES TECHNOLOGY DO FOR THE HUGE RENEWABLE ENERGY INDUSTRY THAT MUST BE STARTED SOON, IN THE USA?

5. MULTI-USE PRODUCTS FROM SYSTEMS WHICH ACCEPT THE SEASONAL PATTERN OF THE WIND ENERGY RESOURCE BECOME ATTRACTIVE.

SUMMARY:

WHAT COULD OWES TECHNOLOGY DO FOR THE HUGE RENEWABLE ENERGY INDUSTRY THAT MUST BE STARTED SOON, IN THE USA?

6. WHEN WE DECIDE THAT WE MUST CURTAIL, OR STOP, COMBUSTION OF FOSSIL FUELS, OFFSHORE WIND POWER SYSTEMS ON THE GRAND SCALE CAN BE A SUBSTITUTE THAT DOES NOT REQUIRE HUGE CUTBACKS IN THE WORLD ECONOMY.

SUMMARY:

WHAT COULD OWES TECHNOLOGY DO FOR THE HUGE RENEWABLE ENERGY INDUSTRY THAT MUST BE STARTED SOON, IN THE USA?

7. IN THOSE LOCALES WHERE FOSSIL FUEL EMISSIONS HAVE ALREADY CREATED UNACCEPTABLE CONDITIONS, LARGE-SCALE USE OF WIND ENERGY WITH APPROPRIATE STORAGE SUBSYSTEMS COULD SOLVE THE PROBLEM.

SUMMARY:

WHAT COULD OWES TECHNOLOGY DO FOR THE HUGE RENEWABLE ENERGY INDUSTRY THAT MUST BE STARTED SOON, IN THE USA?

8. ONLY GRAND-SCALE SUBSTITUTION OF SOLAR ENERGY SYSTEMS FOR FOSSIL FUEL SYSTEMS CAN IMPACT THE GLOBAL CLIMATE CHANGE MECHANISMS. WIND ENERGY MADE POSSIBLE USING OWES TECHNOLOGY, HAS SIGNIFICANT ADVANTAGES OVER OTHER SOLAR ENERGY SYSTEMS. OWES OFFSHORE WIND POWER SYSTEMS COULD MAKE THE HYDROGEN ECONOMY HAPPEN.

HOW & WHERE COULD SUCH LARGE WIND ENERGY HARVESTS BE USED?

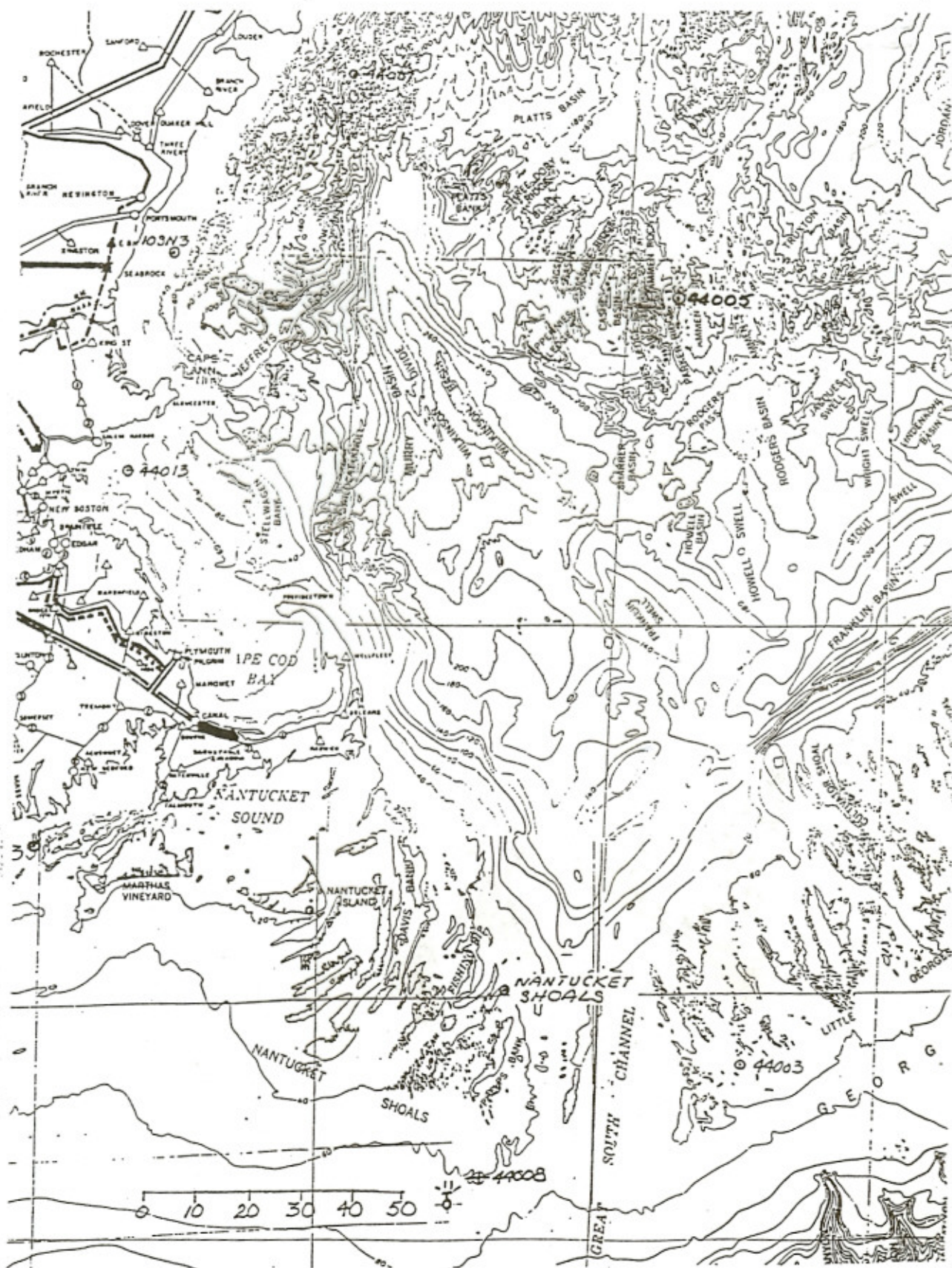
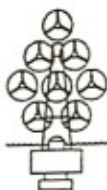
- **Direct feed to existing utilities:** fuel saver/GHG reducer, stochastic grid-quality electricity.
- Expand above to **create a true National Grid.**
- The “**Multi-Use**” **Concept:** wind furnace, wind cooling, plus stochastic grid-quality electricity.
- **Maximize sale of peaking electricity** (storage system necessary).
- **Make and distribute gaseous hydrogen** (utilize sea/land high pressure GH_2 containers)
- **Make and distribute liquid hydrogen** (utilize sea tankers, shore-side transfer, and LH_2 distribution).
- **Make and distribute LNH_3** as “N-Ferts” or as H_2 fuel carrier.
- **Make and distribute CH_3OH :** in collaboration with coal-fired stack gas cleanup, in collaboration with relocated Portland cement industry, or in collaboration with relocated Aluminum industry.



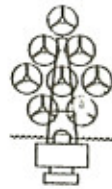
OCEAN WIND ENERGY SYSTEMS

**William E. Heronemus,
Professor Emeritus**

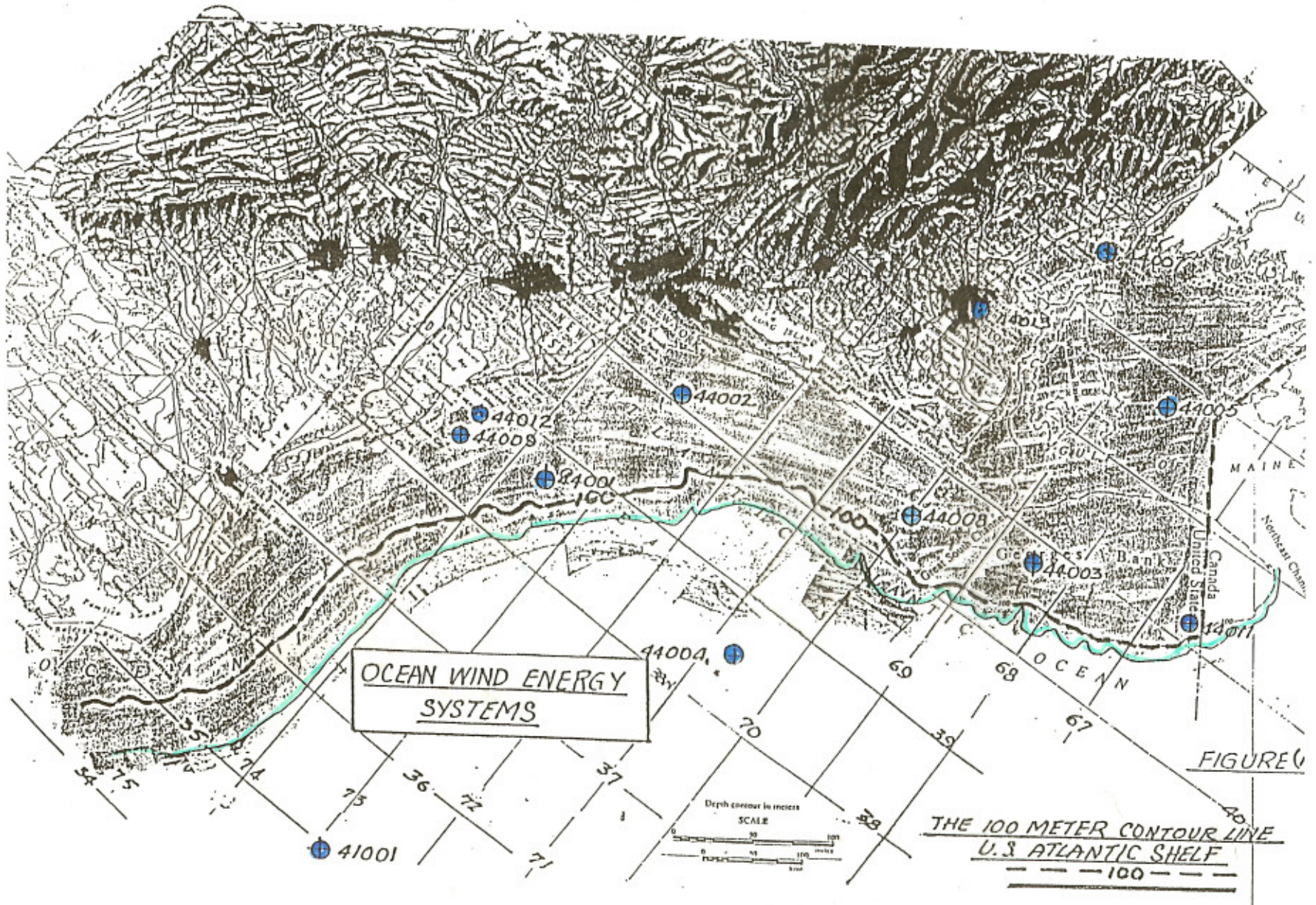
**Woody Stoddard,
Wind Energy Consultant**

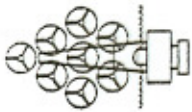


OCEAN WIND



ENERGY SYSTEMS

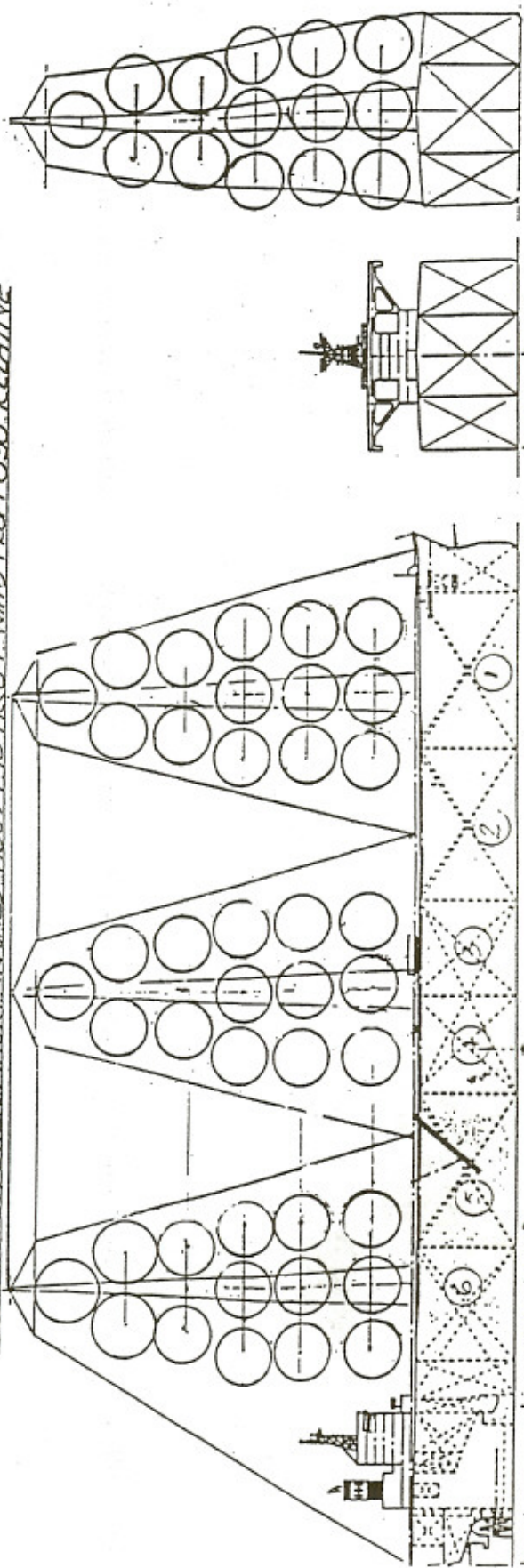




OCEAN WIND

ENERGY SYSTEMS

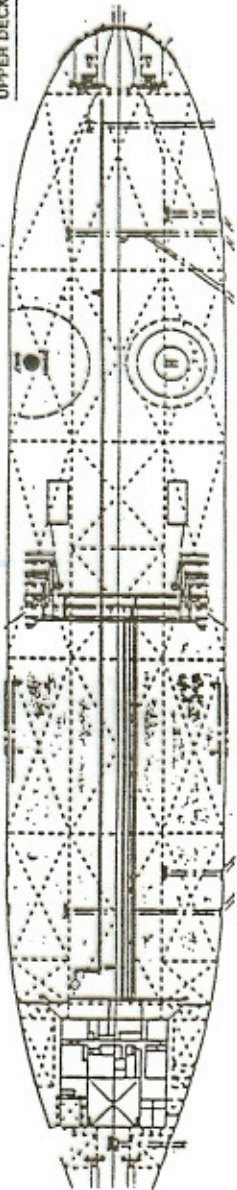
ALL THREE POWER MASTS TRAINED OBEDIENT TO ACCEPT WIND FROM 050° RELATIVE

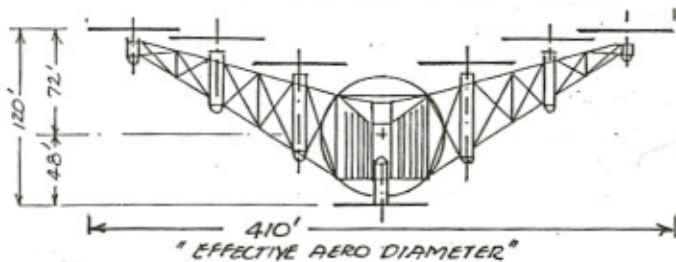


H-50m BEAM
BRIDGE FRONT & TANK SECTION

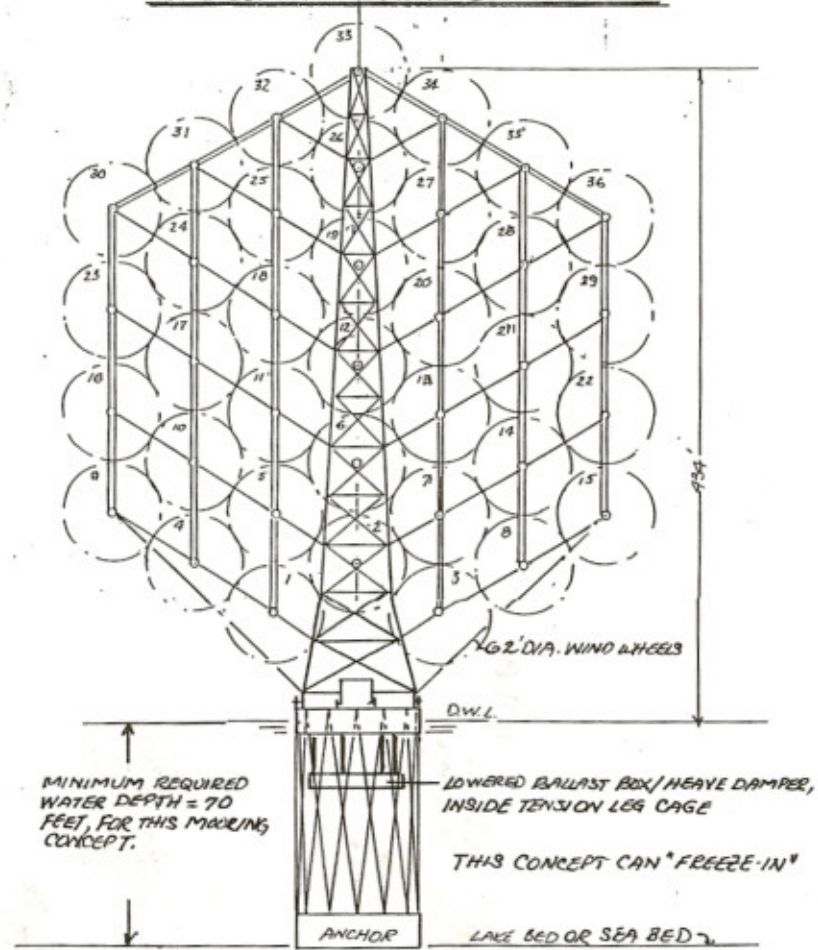


UPPER DECK





THE SURFACED WIND SHIP CONCEPT



A 36 WHEELER WITH ROTATABLE TOWER & 14 LINE TENSION-LEG MOORING

II-19

OCEAN WIND ENERGY SYSTEMS

FIGURE (11)

(COMPARISON, NDBC* VS. USN+ (

ONES, 2/00 (

	JAN	FEB	MAR	APR	MAY	JUN	JULY	AUG	SEP	OCT	NOV	DEC
<u>GEORGES BANK</u>												
* 44013												
+ 42N, 68W	18.5	18.5	16	14	12	10	9	9	11	13	17	18
* 44002												
+ 40.N, 73W	17	18.5	16	14	12	11	10	10	11	13	16	17

United States

