
*FINANCING HYDROGEN TECHNOLOGIES
IN A
TURBULENT MARKET*

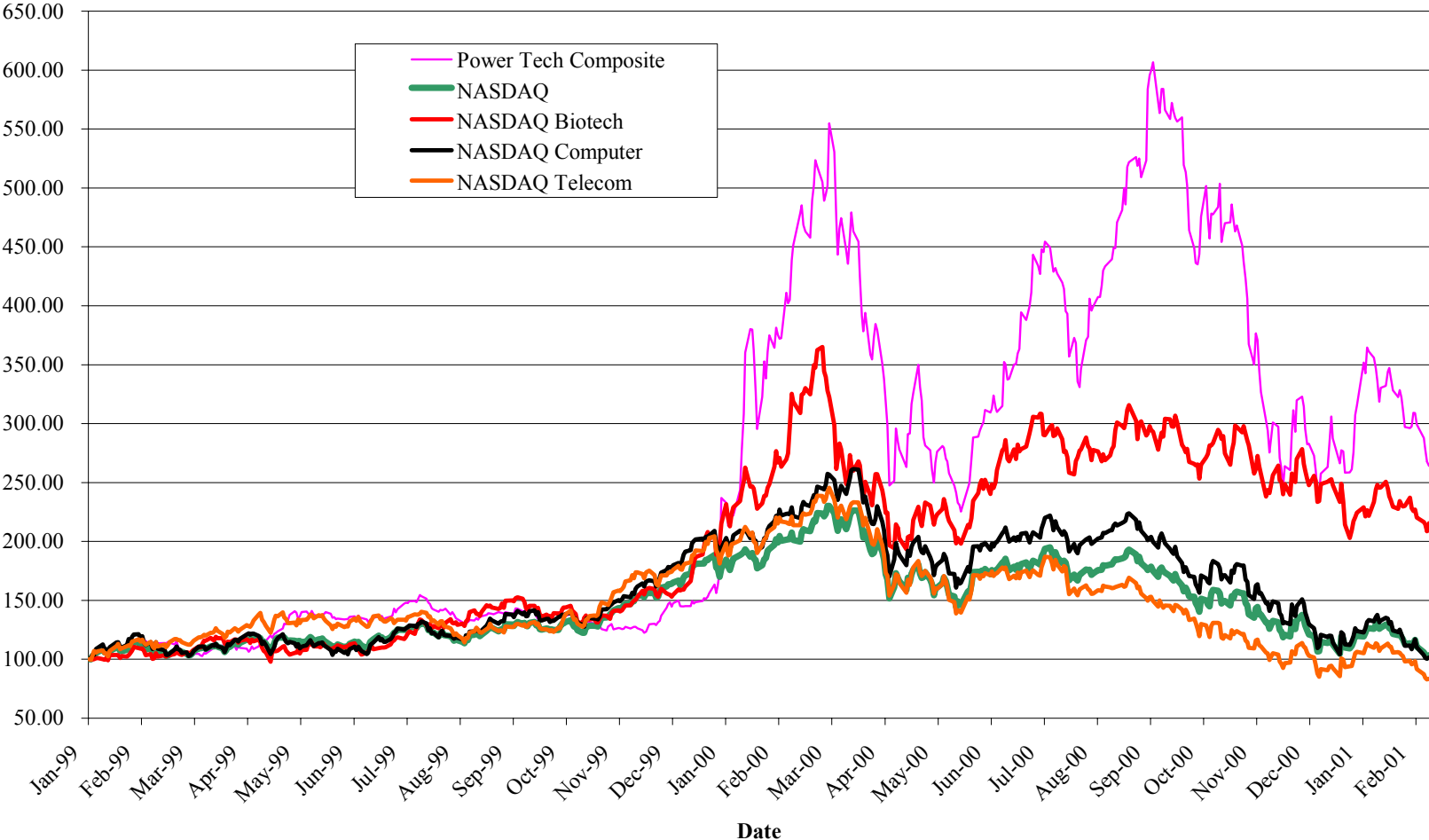
*Robert W. Shaw, Jr.
President
Areté Corporation*

CANADIAN HYDROGEN CONFERENCE
June 18, 2001

THE ENERGY TECHNOLOGY SECTOR IS “HOT”

- THE LAST YEAR HAS BEEN ONE OF DRAMATIC CHANGE
 - » WIDESPREAD MARKET RECOGNITION OF THE POWER TECHNOLOGY SPACE
 - » PROLIFERATION OF PUBLIC COMPANIES
 - MANY INVOLVING HYDROGEN TECHNOLOGY
 - MOST STILL VERY EARLY STAGE
- THE POWER TECHNOLOGY INDEX
 - » HAS FLUCTUATED WILDLY
 - » BUT HAS STILL OUTPERFORMED THE MARKET OVERALL
 - » AND NOW SEEMS TO BE STRENGTHENING

POWER TECHNOLOGY STOCKS ARE VOLATILE



Sources: FactSet, StockVal and CIBC World Markets.

INVESTING IN HYDROGEN TECHNOLOGIES

SUCCESSFUL INVESTING IN THESE TURBULENT TIMES
REQUIRES DISCIPLINE --

- DEFINE YOUR INVESTMENT SPACE PRECISELY
- UNDERSTAND THE DYNAMICS OF THE MARKETS
- PICK WINNERS BY FOCUSING ON THE BASICS
- BUILD A DIVERSE PORTFOLIO
- COMMIT TO THE LONG HAUL

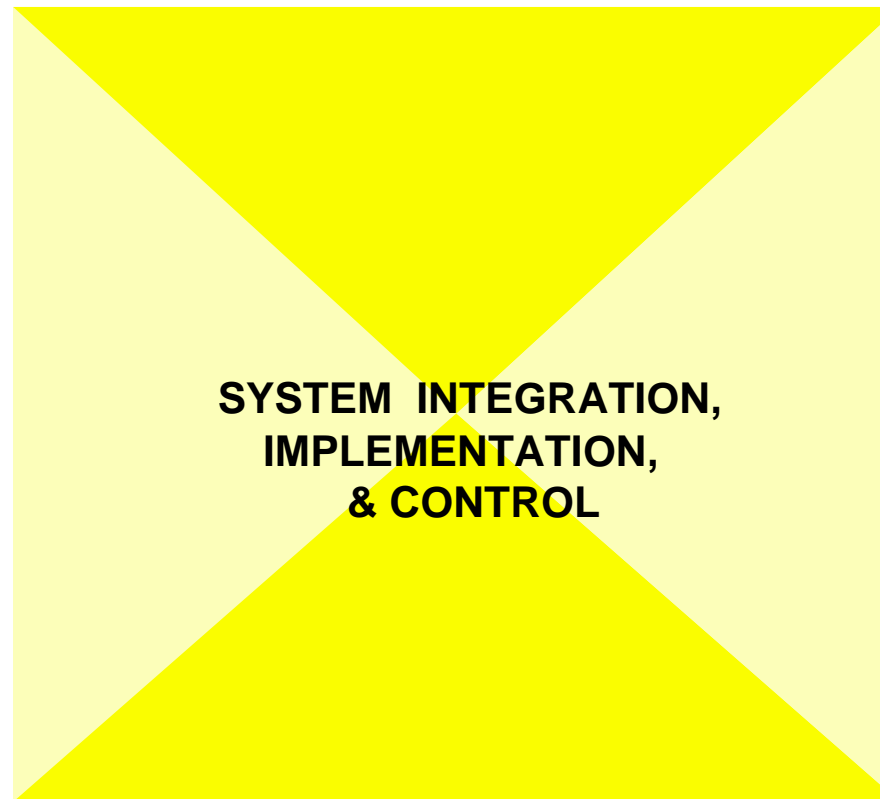
HYDROGEN SYSTEM TECHNOLOGIES -- A CORNERSTONE OF THE MICRO-GENERATION REVOLUTION

FOSSIL FUEL MICRO-GENERATION

- TURBINES
- I.C. ENGINES
- FUEL CELLS
- STIRLING ENGINES
- ALTERNATE CYCLES
- THERMAL PV

HYDROGEN SYSTEM TECHNOLOGY

- FUEL CELLS
- ELECTROLYZERS
- STORAGE
- REFORMERS



MICRO-STORAGE / POWER QUALITY

- MICRO - SMES
- FLYWHEELS
- BATTERIES
- ULTRA-CAPACITORS

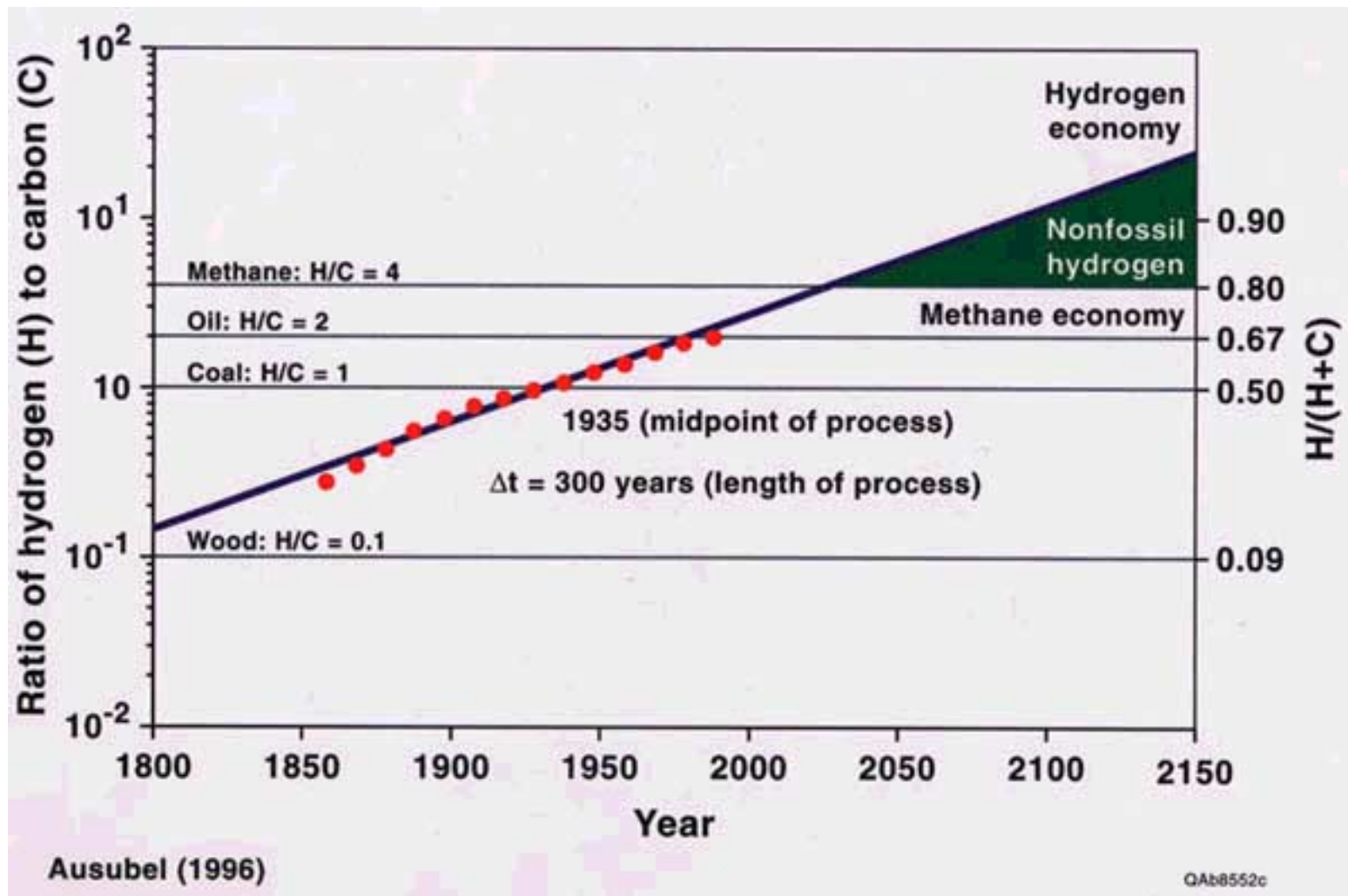
RENEWABLES / MICRO-GENERATION

- WIND
- PHOTOVOLTAICS
- BIO - GENERATION
- EMERGING TECHNOLOGY

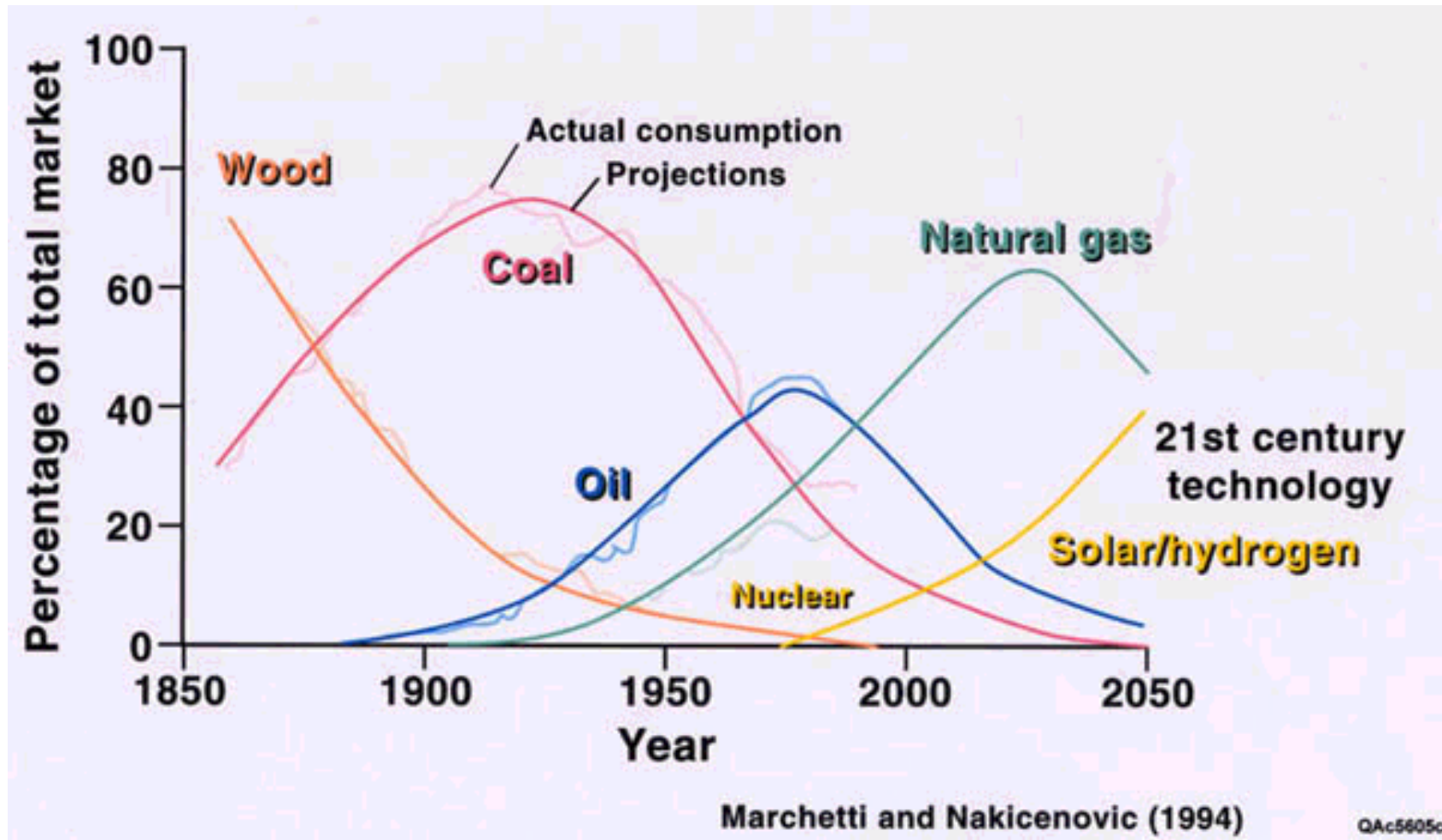
THREE DRIVERS OF THE ENERGY TECHNOLOGY MARKET

- BASIC SHIFT IN ENERGY MARKETS TO GASEOUS FUELS -- WITH HYDROGEN THE LONG TERM WINNER
- POWER QUALITY AND RELIABILITY REQUIREMENTS OF THE NEW ECONOMY
- MASS - PRODUCED ENERGY APPLIANCES RESTRUCTURING THE ELECTRIC UTILITY INDUSTRY

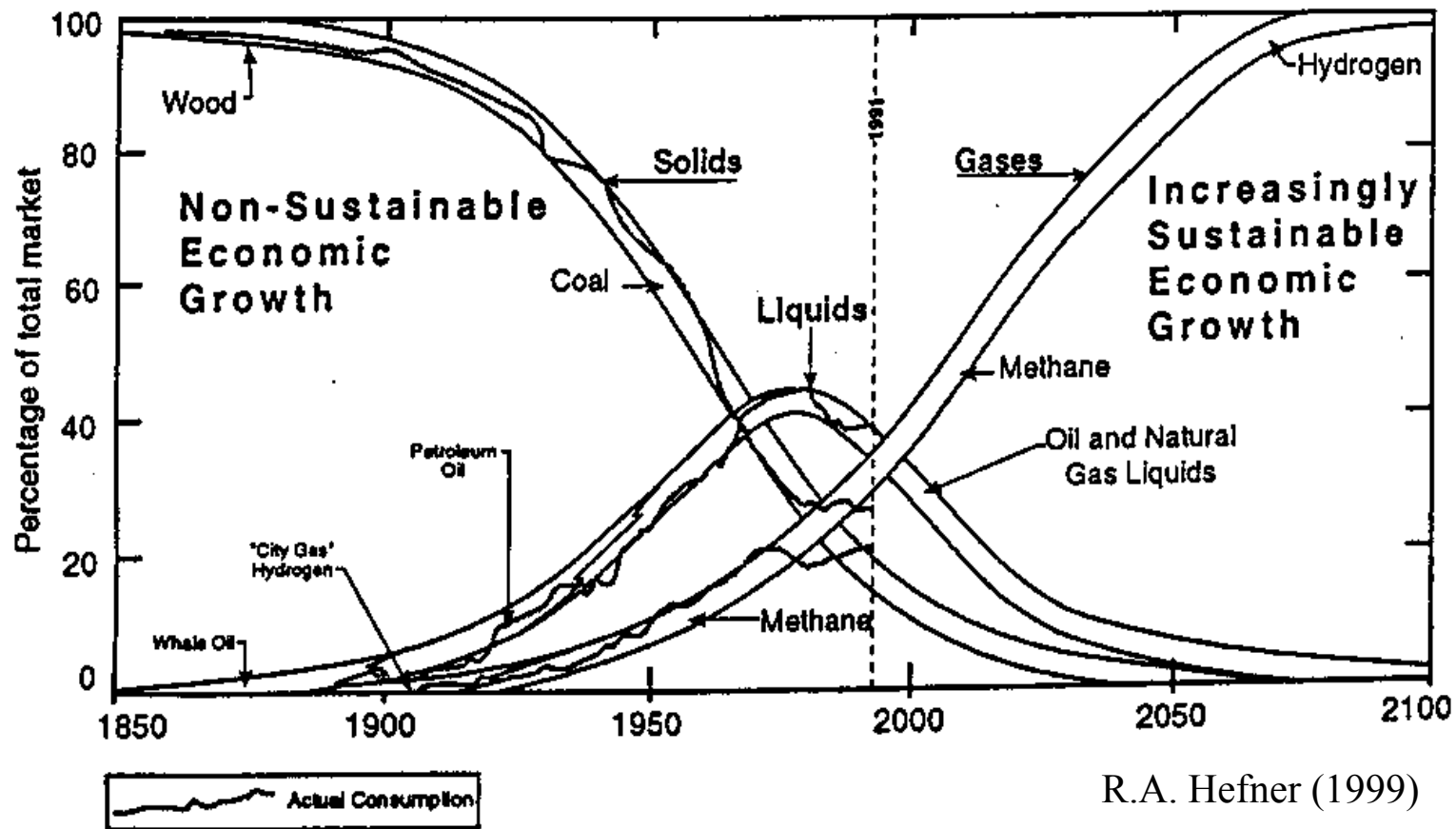
THE ENERGY ECONOMY IS SHIFTING TO GASEOUS FUELS



THE ENERGY ECONOMY IS SHIFTING TO GASEOUS FUELS...



THE ENERGY ECONOMY IS SHIFTING TO GASEOUS FUELS...



WHY ALL THE EXCITEMENT ABOUT ENERGY TECHNOLOGIES ?

- DISTRIBUTED GENERATION AT THE 250 KW TO 5 MW SCALE HAS BEEN AVAILABLE FOR YEARS
 - » GAS ENGINES AND DIESEL GENSETS
 - » AIRCRAFT DERIVATIVE TURBINES
- THESE UNITS HAVE PROVIDED
 - » PEAKING POWER
 - » GRID STRENGTHENING
 - » BACK - UP POWER
- VERY SMALL SCALE (5 KW) GENSETS ARE ALSO AVAILABLE COMMERCIALY
 - » INEFFICIENT
 - » SHORT OPERATING LIFE
 - » EMERGENCY POWER ONLY

WHY ALL THE EXCITEMENT ?

- TECHNOLOGY DEVELOPMENT EFFORTS UNDERWAY FOR DECADES ARE NOW GIVING BIRTH TO COMMERCIAL PRODUCTS
 - » FUEL CELLS
 - » MICRO - TURBINES
 - » PHOTOVOLTAICS
 - » STIRLING ENGINES
 - » HYDROGEN SYSTEMS
- “NEW” MICRO - GENERATION TECHNOLOGIES PROMISE
 - » HIGH PERFORMANCE / RELIABILITY -- AND MODULARITY
 - » LOW COST -- WITH MASS PRODUCTION
 - » MINIMAL ENVIRONMENTAL FOOTPRINT
 - » CUSTOMER CONTROL

WHY ALL THE EXCITEMENT ?

- SIMULTANEOUSLY, THE NEW ECONOMY IS MAKING UNPRECEDENTED DEMANDS ON THE AGING UTILITY INFRASTRUCTURE
 - » EXTRAORDINARY DEMANDS FOR RELIABILITY: 6 - 9's / 24 X 7
 - » EXCEPTIONAL REQUIREMENTS FOR POWER QUALITY / VOLTAGE STABILITY
- THE CONVERGENCE OF THIS MARKET NEED AND THE AVAILABILITY OF MICRO - GENERATION TECHNOLOGIES -- INCLUDING HYDROGEN - BASED TECHNOLOGIES -- THAT CAN ADDRESS IT HAS LED TO A RUSH OF INTEREST IN THE FINANCIAL WORLD

MICRO - GENERATION WILL RESTRUCTURE THE UTILITY INDUSTRY

- THE EXISTING UTILITY INFRASTRUCTURE
 - » IS VULNERABLE TO WEATHER RELATED OUTAGES
 - » IS EXPERIENCING DISRUPTIVE SYSTEM FAULTS
 - » IS AGING AND REQUIRES UPGRADE
 - » HAS A SERIOUS ENVIRONMENTAL FOOTPRINT
- WITH OPENING OF UTILITY MARKETS TO COMPETITION
 - » NEW PLAYERS OFFERING MICRO - GENERATION SOLUTIONS WILL ENTER -- FIRST IN NICHE, THEN IN MAINSTREAM
 - » “MICRO-GRIDS” WILL BE SET UP TO ENHANCE LOCAL RELIABILITY AND CAPTURE LOAD DIVERSITY
 - » IN TIME, “WIRELESS” MICRO - GENERATION SYSTEMS AT CUSTOMER SITES WILL “STRAND” THE EXISTING T&D SYSTEM

THE PACE OF CHANGE COULD BE FAST

- THE IMPACT OF DISTRIBUTED GENERATION COULD BE FELT MORE RAPIDLY THAN MANY BELIEVE
 - » 15,000,000 AUTOMOBILES / YEAR IN THE U.S., WITH
 - » 50 KW EQUIVALENT POWER PLANT / VEHICLE, MEANS
 - » 750,000 MW OF GENERATING CAPACITY IS PRODUCED BY THE AUTOMOBILE INDUSTRY EACH YEAR
 - » INSTALLED UTILITY CAPACITY IN THE U.S. = ~ 750,000 MW
- DISTRIBUTED GENERATORS ALREADY EQUAL A SUBSTANTIAL FRACTION OF INSTALLED CAPACITY
- “STRUCTURAL CHANGE CAN OCCUR WITH SURPRISING SPEED WHEN PEOPLE STOP TAKING THE DOMINANT PARADIGM FOR GRANTED”

-- DUNN, WORLDWATCH INSTITUTE

INSTALLED DIESEL GENERATOR CAPACITY

UNITED STATES, 1996

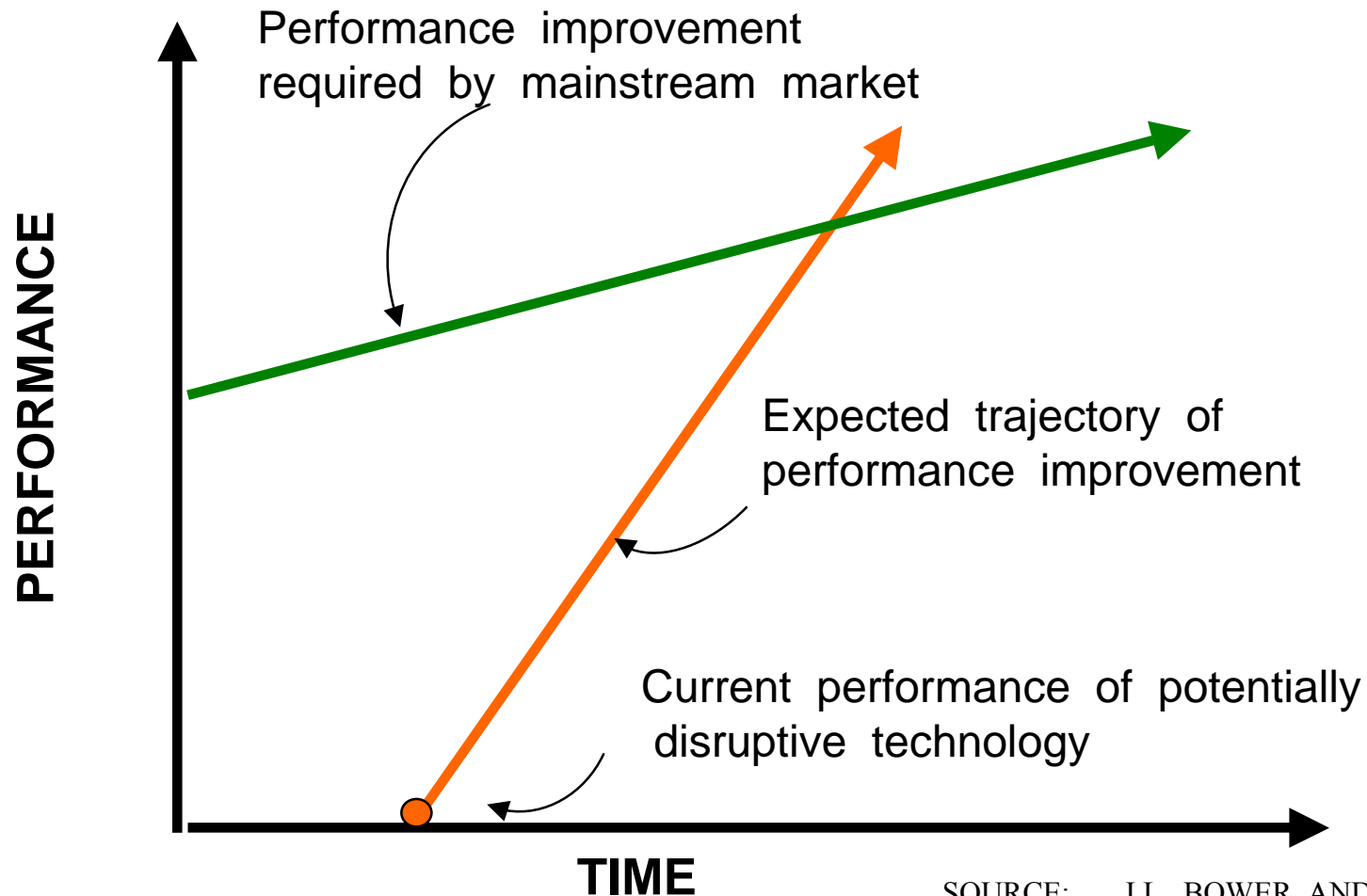
<i>Size</i>	<i>Installed Units</i>	<i>Average Kilowatts</i>	<i>Installed Capacity</i>
2.2 - 4.5 kW	6,235	4.2	26.4
4.5 - 8.2 kW	34,543	6.2	212.9
8.2 - 11.9 kW	40,262	10.4	417.5
11.9 - 29.8 kW	104,448	19.3	1,898.2
29.8 - 74.6 kW	153,705	53.6	8,104.9
74.6 - 130.6 kW	108,415	100.7	10,918.5
130.6 - 223.8 kW	72,434	183.5	13,292.8
223.8 - 447.6 kW	49,690	320.0	15,902.5
447.6 - 746 kW	38,318	560.2	21,467.4
Over 746 kW	24,674	1,208.5	29,819.5
Total	626,489	166 kW	102,061 MW
Note: Totals do not match due to rounding			

Source: Singh, REPP Research Report No. 12, Winter 2001

MICRO-GENERATORS HAVE TWO IMPORTANT ADVANTAGES

- CLASSIC “DISRUPTIVE TECHNOLOGIES”
 - » ATTACK NICHE FIRST
 - » BUILD VOLUME TO DRIVE COSTS DOWN
- SMALL-SCALE UNITS OF PRODUCTION
 - » EASILY MASS-PRODUCIBLE APPLIANCES
 - » BENEFIT FROM “EXPERIENCE CURVE”

DISRUPTIVE TECHNOLOGIES

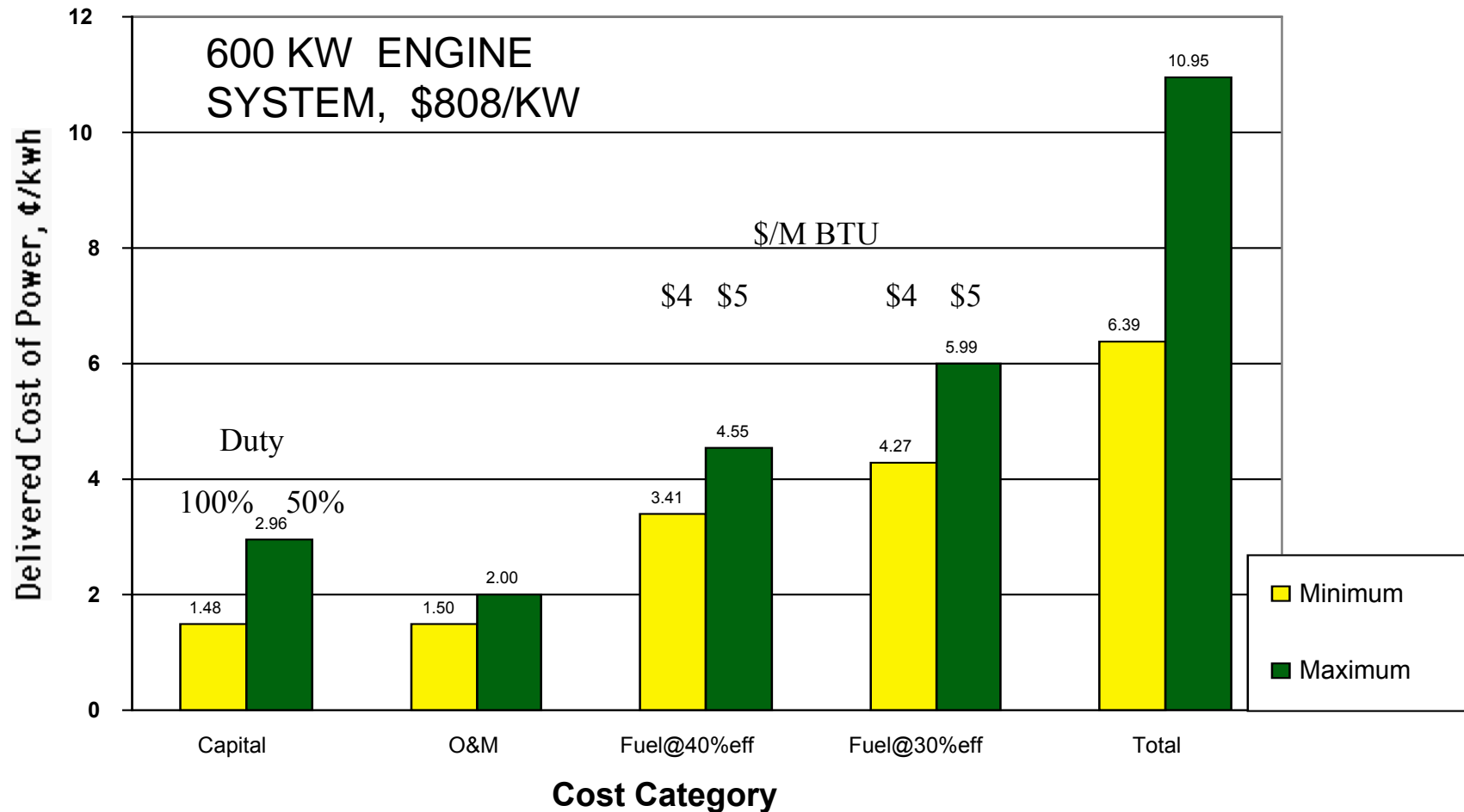


SOURCE: J.L. BOWER AND C.M. CHRISTENSEN
HARVARD BUSINESS REVIEW
JANUARY - FEBRUARY, 1995

HOW CRITICAL IS COST ?

- MICRO - GEN SYSTEMS COMPETE WITH THE DELIVERED COST / KWH -- INCLUDING T & D CHARGES
- IN EARLY COMMERCIAL MARKETS, COST / KWH MAY BE FAR LESS CRITICAL THAN 6 - 9's RELIABILITY
 - » BANK DATA CENTERS
 - » CYBER SUPER SITES
 - » TELECOM NETWORKS
- MANY RESIDENTIAL AND COMMERCIAL CUSTOMERS WILL PAY A PREMIUM TO AVOID WEATHER RELATED OUTAGES

EFFICIENCY DRIVES DELIVERED POWER COSTS



PICKING WINNERS

- SOLID, PROPRIETARY TECHNOLOGY BASE
- ACCESS TO LARGE, DIVERSE MARKETS
- SUPERB MANAGEMENT TEAM

ARETÊ FUNDS: INVESTING IN HYDROGEN TECHNOLOGIES FOR MICRO-GENERATION

1. **BALLARD POWER SYSTEMS, INC.***
2. Astropower, Inc.*
3. American Superconductor, Inc.*
4. Superconductivity, Inc.
5. Evergreen Solar, Inc.*
6. Statpower Technologies Corp
7. Northern Power Systems, Inc.
8. **PROTON ENERGY SYSTEMS, INC.***
9. Capstone Turbine Corp*
10. Metallic Power, Inc.
11. Encorp, Inc.
12. BurstPower Technologies
13. Beacon Power Corp*
14. **HYDROGENICS CORPORATION***
15. Bowman Power Systems, Ltd
16. Powerzyme
17. CellTech Power, Inc.
18. **H2 GEN INNOVATIONS, INC.**
19. Solo Energy
20. STM Power, Inc.

P.E.M. FUEL CELLS

Photovoltaics

HTSC wire

Micro-SMES (now ASC)

Photovoltaics

Inverters (now Xantrex)

System Integrator

P.E.M. ELECTROLYZERS / URFC

Microturbines

Zn - Air fuel cell

Controls and Integration

Ultracapacitors (now CellTech)

Flywheel UPS /PQ systems

P.E.M. TEST STATIONS

Microturbine CHP

Organic Battery

Solid Oxide Fuel Cell

STEAM METHANE REFORMER

Microturbines

Stirling Engine Gensets

HYDROGEN TECHNOLOGIES

* PUBLIC COMPANY

COMMIT TO THE LONG HAUL

- SIX YEARS AGO WE FIRST BEGAN TO FLAG THE PARADIGM SHIFT THAT DG IS CREATING IN THE UTILITY INDUSTRY
- NOW MOST PEOPLE GET IT -- EVEN THE U.S. GOVERNMENT IS NOW PROJECTING 20 - 30% OF POWER WILL COME FROM DG IN THE NEXT 30 YEARS
- BUT WE ARE STILL AT THE VERY BEGINNING OF THIS SEA CHANGE. INVESTORS SHOULD --
 - » SELECT A PORTFOLIO OF LIKELY WINNERS
 - » AND STICK WITH THEM THROUGH TURBULENT TIMES
- PATIENCE IS PARTICULARLY CRITICAL FOR HYDROGEN TECHNOLOGIES