



GreenTech



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Comparative Core Technology Analysis of Environmentally Aware Innovators

Patent Analysis Report

**Analysis of United States Patents and Published Applications
by Broadly Defined Green Technology Market Segments**

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Overview

This report is a broad overview of the core technologies being patented in the various industry segments. Although “green technology” is currently portrayed as an investment bubble, many of the “new” technologies have been developed as a matter of course in the “pre-green tech” era. This report takes an objective look at the core technologies being patented across these industry segments.

- Wind Power
- Hydropower
- Cogeneration
- Natural Foods
- Natural Gas
- Solar Power
- Geothermal
- Batteries
- Clean Water
- Recycling
- Ocean Energy
- Biomass
- Fuel Cells
- Clean Air

Follow on investigation is required, and would look at the individual technology clusters, common patent ownership within a given market, patent ownership across multiple markets, common inventors, patent filing trends in each market, and a number of other indices to assess investment, acquisition, product development or operations strategies.

Generally, the development of patent-based business information follows the “broad-to-narrow” research process:

- First: Broadly search the industries, markets or general technologies using Latent Semantic Analysis.
- Second: Narrow the search using Semantic search criteria that will focus results on the individual industry segments.
- Third: After identifying the various technologies in each segment, repeat searches for each targeted technology.
- Forth: Within the technology search results, analyze and identify target patents by quality, ownership, and other metrics.
- Fifth: Develop the appropriate investment or acquisition strategy for the patents, or company owning the patents.

Understanding Chart Data

The scope of this report is limited to only the First and Second steps outlined above. Individual Industry Segment Reports will address the Third, Forth and Fifth steps with more focused patent research.

THE FIRST STEP in developing the chart data was to develop and search using a broad description of each of the general market areas outlined above. Using [Latent Semantic Analysis](#) search technology, the broad “Green Tech” description used for each industry segment identified, and relevancy-ranked the most important US patents and patent applications disclosing the core technologies for each market area.

LSA search technology identifies core technologies, even if the most relevant patents do not contain the actual words used in the search query. This capability provides considerable advantage over every other Boolean “keyword” patent search engine since it identifies patents across all of the Green Tech market segments that contain the core technology.

THE SECOND STEP following the market-by-market analysis was the creation of a comparison grid that identified where the core technologies within one market area were the same or similar to, and overlapped the core technologies in any of the other “green technology” markets.

In each of the charts shown in this report, the “focus technology” is highlighted in yellow. Then, the occurrence of each primary technology in other markets is shown, highlighted in blue.

The Semantic identification of technologies overlapping different markets is significant since it uncovers patent opportunities and risks that are otherwise missed. Boolean keyword search technologies cannot find patents that do not contain the exact keyword being searched. LSA delivers a knowledge advantage since different industries often use different jargon.

Investment: A financial investment, or an R&D product development commitment within any given market area must recognize that the same or similar technologies are, or have been developed in other market segments - for solving substantially the same problem.

An investment in a PORTFOLIO of companies should recognize core competencies, as well as core technologies, and leverage distribution channels, production capability, engineering expertise, and know how across the portfolio.

Strategy: Understanding where the same or similar technologies reside in relatively non-competitive market areas allows strategic planners to:

- a) shorten development cycle time and cost by licensing relevant technologies FROM other patent owners,
- b) mitigate infringement risk by developing products that work around competitive technologies,
- c) leverage R&D investments by licensing TO companies likely to be interested in the technology,
- d) identify and acquire key patents as stand-alone assets that can be deployed across a portfolio of companies.

Reading The Chart

The chart for each industry segment (yellow column) lists the core technologies for that segment on the left. The occurrence of these core technologies in other Green Tech industry segments is shown by the appearance of the (blue) box where the technology overlap appears.

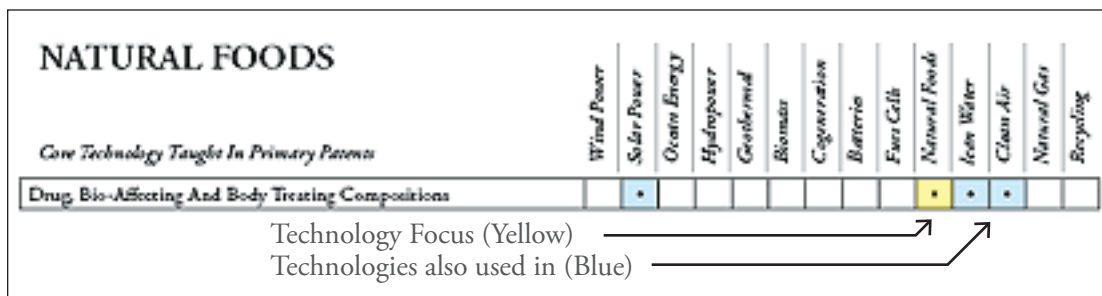


Figure 1.

THIS IS A SAMPLE SUMMARY REPORT, AND DOES NOT CONTAIN THE GRANULARITY OR PRECISION NEEDED TO SUPPORT INVESTMENT DECISIONS. NO REPRESENTATION OF ACCURACY OR COMPLETENESS IS MADE. THIS REPORT DOES NOT CONTAIN ANY LEGAL OR FINANCIAL RECOMMENDATIONS OR OPINIONS WHATSOEVER.

WIND POWER

Core Technology Taught In Primary Patents

	Wind Power	Solar Power	Ocean Energy	Hydropower	Geothermal	Biomass	Cogeneration	Batteries	Fuel Cells	Natural Foods	Clean Water	Clean Air	Natural Gas	Recycling
Power Plants	•	•	•	•	•	•	•					•	•	
Prime-Mover Dynamo Plants	•	•	•	•	•	•	•							
Chemistry Of Inorganic Compounds	•		•	•		•						•	•	
Distillation: Apparatus	•	•	•	•	•		•							
Aeronautics And Astronautics	•	•	•	•										
Induced Nuclear Reactions: Processes, Systems	•				•		•					•		
Etching A Substrate: Processes	•		•		•									
Rotary Kinetic Fluid Motors Or Pumps	•		•	•										
Fluid Reaction Surfaces (I.E., Impellers)	•		•	•										
Heating Systems	•						•							
Surgery: Light, Thermal, And Electrical Application	•	•												
Data Processing: Generic Control Systems Or Specific Applications	•											•		
Coherent Light Generators	•													

OCEAN POWER

Core Technology Taught In Primary Patents

	Wind Power	Solar Power	Ocean Energy	Hydropower	Geothermal	Biomass	Cogeneration	Batteries	Fuel Cells	Natural Foods	Clean Water	Clean Air	Natural Gas	Recycling
Power Plants	•	•	•	•	•	•	•					•	•	
Prime-Mover Dynamo Plants	•	•	•	•	•	•	•							
Distillation: Apparatus	•	•	•	•	•		•							
Aeronautics And Astronautics	•	•	•	•										
Electrolysis: Processes		•	•	•	•			•	•					
Chemistry Of Inorganic Compounds	•		•	•		•						•	•	
Etching A Substrate: Processes	•		•		•									
Rotary Kinetic Fluid Motors Or Pumps	•		•	•										
Fluid Reaction Surfaces (I.E., Impellers)	•		•	•										
Wells			•			•						•	•	
Chemistry: Electrical And Wave Energy			•				•		•			•		•
Hydraulic And Earth Engineering			•	•							•	•		•
Measuring And Testing			•					•				•		
Ships			•	•								•		
Cleaning And Liquid Contact With Solids			•								•	•		
Acoustics			•									•		
Communications, Electrical: Acoustic Wave Systems			•	•										
Electric Heating			•											
Agitating			•											
Surgery: Kinesitherapy			•											

FUEL CELLS

Core Technology Taught In Primary Patents

	Wind Power	Solar Power	Ocean Energy	Hydropower	Geothermal	Biomass	Cogeneration	Batteries	Fuel Cells	Natural Foods	Clean Water	Clean Air	Natural Gas	Recycling
Chemistry: Electrical Current Producing Apparatus		•		•		•	•	•	•				•	
Chemistry: Electrical And Wave Energy			•				•		•			•		•
Fuel And Related Compositions						•			•				•	•
Gas Separation: Processes						•			•			•	•	
Electrolysis: Processes		•	•	•	•				•					
Stock Material Or Miscellaneous Articles									•					

SOLAR POWER

Core Technology Taught In Primary Patents

	Wind Power	Solar Power	Ocean Energy	Hydropower	Geothermal	Biomass	Cogeneration	Batteries	Fuel Cells	Natural Foods	Clean Water	Clean Air	Natural Gas	Recycling
Power Plants	•	•	•	•	•	•	•					•	•	
Prime-Mover Dynamo Plants	•	•	•	•	•	•	•							
Distillation: Apparatus	•	•	•	•	•		•							
Aeronautics And Astronautics	•	•	•	•										
Surgery: Light, Thermal, And Electrical Application	•	•												
Chemistry: Electrical Current Producing Apparatus		•		•		•	•	•	•				•	
Stoves And Furnaces		•				•								
Electrolysis: Processes		•	•	•	•				•					
Drug, Bio-Affecting And Body Treating Compositions		•								•	•	•		
Batteries: Thermoelectric And Photoelectric		•					•	•						
Electrical Transmission Or Interconnection		•		•				•						
Electricity: Battery Or Capacitor Charging		•		•				•						
Data Processing: Fin, Bus Practice, Mgmt, Cost/Price		•									•			•
Metal Working		•						•						
Card, Picture, Or Sign Exhibiting		•												
Harvesters		•												
Weighing Scales		•												
Motor Vehicles		•												
Supports		•												
Active Solid-State Devices		•												
Optics: Eye Examining, Vision Testing And Correcting		•												
Optical: Systems And Elements		•												
Illumination		•												
Optical Waveguides		•												
Semiconductor Device Manufacturing: Process		•												
Amusement Devices		•												

GEO THERMAL ENERGY

Core Technology Taught In Primary Patents

	Wind Power	Solar Power	Ocean Energy	Hydropower	Geothermal	Biomass	Cogeneration	Batteries	Fuel Cells	Natural Foods	Clean Water	Clean Air	Natural Gas	Recycling
Power Plants	•	•	•	•	•	•	•					•	•	
Prime-Mover Dynamo Plants	•	•	•	•	•	•	•							
Distillation: Apparatus	•	•	•	•	•		•							
Electrolysis: Processes		•	•	•	•				•					
Etching A Substrate: Processes	•		•		•									
Induced Nuclear Reactions: Processes, Systems	•				•		•					•		
Gas: Heating And Illuminating					•	•	•						•	
Liquid Heaters And Vaporizers					•	•	•							•
Refrigeration					•		•					•	•	•

HYDROPOWER

Core Technology Taught In Primary Patents

	Wind Power	Solar Power	Ocean Energy	Hydropower	Geothermal	Biomass	Cogeneration	Batteries	Fuel Cells	Natural Foods	Clean Water	Clean Air	Natural Gas	Recycling
Power Plants	•	•	•	•	•	•	•					•	•	
Prime-Mover Dynamo Plants	•	•	•	•	•	•	•							
Distillation: Apparatus	•	•	•	•	•		•							
Electrolysis: Processes		•	•	•	•				•					
Aeronautics And Astronautics	•	•	•	•										
Chemistry Of Inorganic Compounds	•		•	•		•						•	•	
Rotary Kinetic Fluid Motors Or Pumps	•		•	•										
Fluid Reaction Surfaces (I.E., Impellers)	•		•	•										
Hydraulic And Earth Engineering			•	•							•	•		•
Ships			•	•								•		
Communications, Electrical: Acoustic Wave Systems			•	•										
Chemistry: Electrical Current Producing Apparatus		•		•		•	•	•	•				•	
Electrical Transmission Or Interconnection		•		•				•						
Electricity: Battery Or Capacitor Charging		•		•				•						
Ammunition And Explosives				•										
Electric Resistance Heating Devices				•										
Marine Propulsion				•										

BIOMASS

Core Technology Taught In Primary Patents

	Wind Power	Solar Power	Ocean Energy	Hydropower	Geothermal	Biomass	Cogeneration	Batteries	Fuel Cells	Natural Foods	Clean Water	Clean Air	Natural Gas	Recycling
Power Plants	•	•	•	•	•	•	•					•	•	
Prime-Mover Dynamo Plants	•	•	•	•	•	•	•							
Chemistry Of Inorganic Compounds	•		•	•		•						•	•	
Chemistry: Electrical Current Producing Apparatus		•		•		•	•	•	•				•	
Gas: Heating And Illuminating					•	•	•						•	
Liquid Heaters And Vaporizers					•	•	•							•
Wells			•			•						•	•	
Stoves And Furnaces		•				•								
Chemistry: Molecular Biology And Microbiology						•					•	•	•	•
Fuel And Related Compositions						•			•				•	•
Gas Separation: Processes						•			•			•	•	
Furnaces						•	•					•		•
Liquid Purification Or Separation						•					•	•		•
Chemistry: Fertilizers						•					•			•
Chemical Apparatus And Process Disinfecting						•					•	•		
Hazardous Or Toxic Waste Destruction Or Containment						•						•	•	
Fluid Handling						•					•			
Mineral Oils: Processes And Products						•							•	
Chemistry: Purification Or Recovery Of Products						•							•	
Chemistry Of Hydrocarbon Compounds						•							•	
Internal-Combustion Engines						•								
Distillation: Processes, Separatory						•								
Metallurgical Apparatus						•								
Multicellular Living Organisms And Unmodified Parts Thereof						•								

BATTERIES

Core Technology Taught In Primary Patents

	Wind Power	Solar Power	Ocean Energy	Hydropower	Geothermal	Biomass	Cogeneration	Batteries	Fuel Cells	Natural Foods	Clean Water	Clean Air	Natural Gas	Recycling
Chemistry: Electrical Current Producing Apparatus		•		•		•	•	•	•				•	
Batteries: Thermoelectric And Photoelectric		•					•	•						
Electrical Transmission Or Interconnection		•		•				•						
Electricity: Battery Or Capacitor Charging		•		•				•						
Measuring And Testing			•					•				•		
Metal Working		•						•						
Telecommunications								•						
Data Processing: Measuring, Calibrating, Or Testing								•						

COGENERATION

Core Technology Taught In Primary Patents

	Wind Power	Solar Power	Ocean Energy	Hydropower	Geothermal	Biomass	Cogeneration	Batteries	Fuel Cells	Natural Foods	Clean Water	Clean Air	Natural Gas	Recycling
Power Plants	•	•	•	•	•	•	•					•	•	
Prime-Mover Dynamo Plants	•	•	•	•	•	•	•							
Chemistry: Electrical Current Producing Apparatus		•		•		•	•	•	•				•	
Gas: Heating And Illuminating					•	•	•						•	
Liquid Heaters And Vaporizers					•	•	•							•
Furnaces						•	•					•		•
Distillation: Apparatus	•	•	•	•	•		•							
Induced Nuclear Reactions: Processes, Systems	•				•		•					•		
Refrigeration					•		•					•	•	•
Chemistry: Electrical And Wave Energy			•				•		•			•		•
Batteries: Thermoelectric And Photoelectric		•					•	•						
Heating Systems	•						•							
Heat Exchange							•							

NATURAL GAS

Core Technology Taught In Primary Patents

	Wind Power	Solar Power	Ocean Energy	Hydropower	Geothermal	Biomass	Cogeneration	Batteries	Fuel Cells	Natural Foods	Clean Water	Clean Air	Natural Gas	Recycling
Chemistry: Molecular Biology And Microbiology						•					•	•	•	•
Gas Separation: Processes						•			•			•	•	
Power Plants	•	•	•	•	•	•	•					•	•	
Refrigeration					•		•					•	•	•
Chemistry Of Inorganic Compounds	•		•	•		•						•	•	
Wells			•			•						•	•	
Hazardous Or Toxic Waste Destruction Or Containment						•						•	•	
Compositions												•	•	
Combustion												•	•	
Chemistry: Electrical Current Producing Apparatus		•		•		•	•	•	•				•	
Fuel And Related Compositions						•			•				•	•
Gas: Heating And Illuminating					•	•	•						•	
Mineral Oils: Processes And Products						•							•	
Chemistry: Purification Or Recovery Of Products						•							•	
Chemistry Of Hydrocarbon Compounds						•							•	
Specialized Metallurgical Processes													•	•
Mining Or In Situ Disintegration Of Hard Material													•	
Earth Boring, Well Treating, And Oil Field Chemistry													•	
Organic Compounds -- Part Of The Class 532-570													•	

NATURAL FOODS

Core Technology Taught In Primary Patents

	Wind Power	Solar Power	Ocean Energy	Hydropower	Geothermal	Biomass	Cogeneration	Batteries	Fuel Cells	Natural Foods	Clean Water	Clean Air	Natural Gas	Recycling
Drug, Bio-Affecting And Body Treating Compositions		•								•	•	•		
Animal Husbandry										•	•			
Food Or Edible Material: Processes										•	•			
Drug, Bio-Affecting And Body Treating Compositions										•	•			

CLEAN AIR

Core Technology Taught In Primary Patents

	Wind Power	Solar Power	Ocean Energy	Hydropower	Geothermal	Biomass	Cogeneration	Batteries	Fuel Cells	Natural Foods	Clean Water	Clean Air	Natural Gas	Recycling
Drug, Bio-Affecting And Body Treating Compositions		•								•	•	•		
Chemistry: Molecular Biology And Microbiology						•					•	•	•	•
Liquid Purification Or Separation						•					•	•		•
Chemical Apparatus And Process Disinfecting						•					•	•		
Hydraulic And Earth Engineering			•	•							•	•		•
Cleaning And Liquid Contact With Solids			•								•	•		
Plant Husbandry											•	•		•
Chemistry: Electrical And Wave Energy			•				•		•			•		•
Gas Separation: Processes						•			•			•	•	
Measuring And Testing			•					•				•		
Power Plants	•	•	•	•	•	•	•					•	•	•
Furnaces						•	•					•		•
Induced Nuclear Reactions: Processes, Systems	•				•		•					•		
Refrigeration					•		•					•	•	•
Chemistry Of Inorganic Compounds	•		•	•		•						•	•	
Wells			•			•						•	•	
Hazardous Or Toxic Waste Destruction Or Containment						•						•	•	
Ships			•	•								•		
Acoustics			•									•		
Data Processing: Generic Control Systems Or Specific Applications	•											•		
Compositions												•	•	
Combustion												•	•	
Package Making												•		
Gas Separation: Apparatus												•		
Surgery												•		
Fire Extinguishers												•		
Fluid Sprinkling, Spraying, And Diffusing												•		
Facsimile And Static Presentation Processing												•		
Catalyst, Solid Sorbent, Or Support												•		

CLEAN WATER

Core Technology Taught In Primary Patents

	Wind Power	Solar Power	Ocean Energy	Hydropower	Geothermal	Biomass	Cogeneration	Batteries	Fuel Cells	Natural Foods	Clean Water	Clean Air	Natural Gas	Recycling
Drug, Bio-Affecting And Body Treating Compositions		•								•	•	•		
Animal Husbandry										•	•			
Food Or Edible Material: Processes										•	•			
Drug, Bio-Affecting And Body Treating Compositions										•	•			
Chemistry: Molecular Biology And Microbiology						•					•	•	•	•
Liquid Purification Or Separation						•					•	•		•
Chemistry: Fertilizers						•					•			•
Chemical Apparatus And Process Disinfecting						•					•	•		
Fluid Handling						•					•			
Hydraulic And Earth Engineering			•	•							•	•		•
Cleaning And Liquid Contact With Solids			•								•	•		
Data Processing: Fin, Bus Practice, Mgmt, Cost/Price Determination		•									•			•
Plant Husbandry											•	•		•
Fishing, Trapping, And Vermin Destroying											•			
Butchering											•			
Cleaning Compositions For Solid Surfaces											•			
Surgery											•			

RECYCLING

Core Technology Taught In Primary Patents

	Wind Power	Solar Power	Ocean Energy	Hydropower	Geothermal	Biomass	Cogeneration	Batteries	Fuel Cells	Natural Foods	Clean Water	Clean Air	Natural Gas	Recycling
Chemistry: Molecular Biology And Microbiology						•					•	•	•	•
Refrigeration					•		•					•	•	•
Fuel And Related Compositions						•			•				•	•
Specialized Metallurgical Processes													•	•
Liquid Purification Or Separation						•					•	•		•
Hydraulic And Earth Engineering			•	•							•	•		•
Plant Husbandry											•	•		•
Chemistry: Electrical And Wave Energy			•				•		•			•		•
Furnaces						•	•					•		•
Chemistry: Fertilizers						•					•			•
Data Processing: Fin, Bus Practice, Mgmt, Cost/Price Determination		•									•			•
Liquid Heaters And Vaporizers					•	•	•							•
Drying And Gas Or Vapor Contact With Solids														•
Compositions: Coating Or Plastic														•
Paper Making And Fiber Liberation														•
Classifying, Separating, And Assorting Solids														•
Solid Material Comminution Or Disintegration														•
Plastic And Nonmetallic Article Shaping														•
Industrial Electric Heating Furnaces														•