

Trends in Power and Energy Commercialization Based on Patent Filings and Grants

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- **Agenda**
 - Patents 101
 - Patents and Commercialization
 - Renewable Energy
 - patent applications and filings
 - Energy Storage
 - patent applications and filings
 - Smart Grid
 - Summary
 - Questions

- Patents 101

- A patent provides the right to **exclude** others from making, using, selling and importing what is claimed in the patent.
- Patents are examined by the USPTO determine if an invention is novel, non-obvious, and useful.
- USPTO backlog for first examination – 18-30 months.
 - Accelerated examination possible for power saving technology
- Patents are published by default at 18 months from earliest priority date (usually filing date of application)
 - Applicant can request non-publication at time of filing

- **Patents and Commercialization**
 - To stay competitive, companies need to protect their technologies.
 - Protect market share
 - Patents vs. trade secrets
 - Patents have many uses
 - Reward innovation (prevent competitors from copying)
 - Revenue source (licensing)
 - Marketing (patented technology)

- Renewable Energy
 - International Energy Agency definition
 - First Generation technologies
 - Industrial revolution
 - Hydropower, biomass combustion, geothermal power, heat
 - Second Generation technologies
 - R&D since 1980s, recently in markets
 - Solar heating, wind power, photovoltaic
 - Third Generation technologies
 - Still under R&D, not widely available
 - Biomass gasification, biorefinery, ocean energy

- Renewable Energy
 - Most patent activity is for second generation technology
 - Most R&D performed in recent years
 - First generation has considerable prior art
 - Third generation is still underway, early in process
 - Most active second generation technologies in patents:
 - Wind Power
 - Photovoltaic
 - Biofuels

- **Renewable Energy**
 - Second Generation issued patents

	2007	2008	2009	2010	2011
Wind Power	48	43	66	103	69 (118)
Photovoltaic	14	14	17	33	29 (50)
Biofuels	3	4	17	29	14 (24)
Solar Heating	13	5	6	16	12 (21)

- Renewable Energy
 - Second Generation published patent applications

	2007	2008	2009	2010	2011
Wind Power	92	144	200	270	153 (262)
Photovoltaic	48	91	142	190	145 (249)
Biofuels	43	87	119	178	111 (190)
Solar Heating	47	72	89	120	74 (127)

- Renewable Energy
 - Third Generation technologies

	2007	2008	2009	2010	2011
BioRefinery – issued patent	1	2	3	4	11 (19)
BioRefinery – pub. App.	11	53	40	71	47 (81)
Ocean power – issued patent	3	10	7	11	10 (17)
Ocean Power – pub. App.	11	22	25	39	23 (39)

- Energy Storage
 - Very active area in patents issued and filed applications
 - High number of filings
 - Increasing trends
 - Most activity is in batteries
 - Automobile, mobile device

- Energy Storage
 - Issued patents

	2007	2008	2009	2010	2011
Battery – auto	94	95	149	200	109 (187)
Battery – mobile device	88	107	127	139	105 (180)
Fuel Cells	137	126	157	251	138 (237)

- **Energy Storage**
 - Published patent applications

	2007	2008	2009	2010	2011
Battery – auto	239	293	353	414	334 (573)
Battery – mobile device	260	307	311	353	212 (363)
Fuel Cells	403	380	367	352	193 (331)

- **Smart Grid**
 - Introduction to market is recent
 - Not much patent data to identify trends in US
 - Minimal prior art – large potential for patent protection

Published patent applications					
	2007	2008	2009	2010	2011
Smart Grid control systems	6	6	22	35	29 (5)

- **Summary**
 - **Most patent Activity**
 - Energy Storage
 - Highest level of commercialization
 - **Highest rate of increase in patent activity**
 - Second Generation Renewable Energy
 - Hottest increase in commercialization
 - **Foreseeable increase in Patent activity**
 - Smart Grid
 - Third Generation Renewable Energy
 - Future commercialization

Thank you!

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