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LANDSCAPE STUDY –SMART GRID

[SAMPLE]

May 2019

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1. INTRODUCTION

1.1. What is Smart Grid?

A Smart Grid is the modernization of the existing electricity delivery system. A smart grid differs from the traditional grid in that it allows two-way communication of electricity as well as related data, rather than just the electricity. Smart grids enable real-time data collection concerning electricity supply and demand during the transmission and distribution process, making monitoring, generation, consumption and maintenance more efficient [Source].

Most grids are based on one-way interaction from the stages of generation to consumption. Smart grids, on the other hand, integrate the action of all users in the power network using computer-based remote control and automation. This two-way interaction is what makes the grid "smart". Like the internet, the Smart Grid consists of controls, computers, automation, telecommunication, and equipment that work together, but in this case, these technologies work with the electrical grid to respond digitally to our quickly changing electric demand[Source].

1.2. Features of A Smart Grid

Flexible and easier to manage variations in generation and consumption better.

Reliable, as it works in real-time and allows remote management of the grid; thus, the risk of power failures and incidents is reduced.

Accessible, as it can be integrated into any grid. Thanks to interconnections between grids, consumers can also take advantage of renewable energy generated in large quantities in neighboring countries when there isn't enough in Belgium.

Savings, as it leads to better management and reduced costs[Source].

1.3. Smart Grid Technologies

To achieve a smart grid, a wide range of technologies should be developed and must be implemented. These technologies generally grouped into the following key technology areas, discussed below[Source].

Intelligent Appliances: Intelligent appliances have capable of deciding when to consume energy based on customer pre-set

preferences. This can lead to going away along toward reducing peak loads which have an impact on electricity generation costs. For

example, smart sensors, like temperature sensor which is used in thermal stations to control the boiler temperature based on predefined temperature levels.

Smart Power Meters

The smart meters provide two-way communication between power providers and the end user consumers to automate billing data collections, detect device failures and dispatch repair crews to the exact location much faster.

Integrated communications

The key to a smart grid technology is integrated communications. It must be as fast as enough to real-time needs of the system. Depending upon the need, many different technologies are used in smart grid communication like Programmable Logic Controller (PLC), wireless, cellular, SCADA (Supervisory Control and Data Acquisition), and BPL.

Key Considerations:

- Ease of deployment
- Latency
- Standards
- Data carrying capacity
- Secure
- Network coverage capability

Smart Substations

Substations are included monitoring and control non-critical and critical operational data such as power status, power factor performance, breaker, security, transformer status, etc. substations are used to transform voltage at several times in many locations, that providing safe and reliable delivery of energy. Smart substations are also necessary for splitting the path of electricity flow into many directions. Substations require large and very expensive equipment to operate, including transformers, switches, capacitor banks, circuit breakers, a network protected relays and several others.

Wide-area monitoring and control

Real-time monitoring and display of power system components and performance, across interconnections and over large geographic areas help system operators to understand and optimise power system components, behavior and performance. Advanced system operation tools avoid blackouts and facilitate the integration of variable renewable energy resources. Monitoring and control

technologies along with advanced system analytics – including wide-area situational

awareness (WASA), wide-area monitoring systems (WAMS), and wide-area adaptive protection, control and automation (WAAPCA)
– generate data to inform decision making, mitigate wide-area disturbances, and improve transmission capacity and reliability.

Distribution grid management

Distribution and sub-station sensing, and automation can reduce outage and repair time, maintain voltage level and improve asset management. Advanced distribution automation processes real-time information from sensors and meters for fault location, automatic reconfiguration of feeders, voltage and reactive power optimization, or to control distributed generation. Sensor technologies can enable condition- and performance-based maintenance of network components, optimizing equipment performance and hence effective utilization of assets.

Advanced metering infrastructure

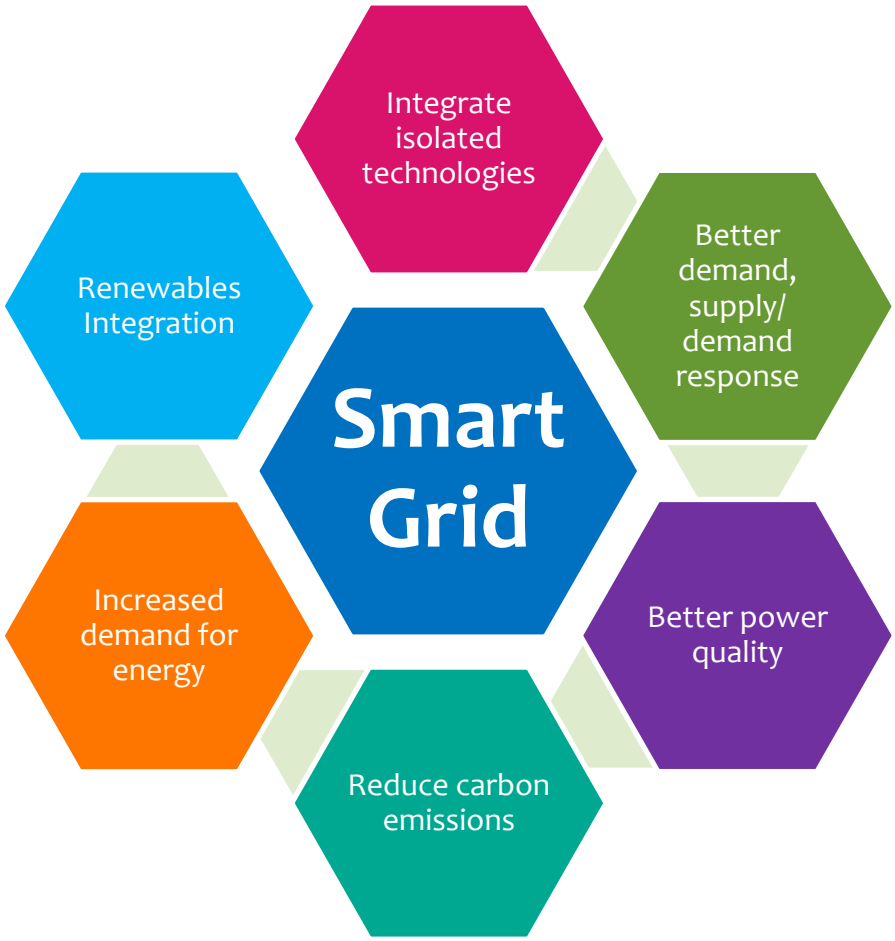
Advanced metering infrastructure (AMI) involves the deployment of a number of technologies – in addition to advanced or smart meters12 that enable two-way flow of information, providing customers and utilities with data on electricity price and consumption, including the time and amount of electricity consumed. AMI will provide a wide range of functionalities:

- Remote connection and disconnection.
- Remote consumer price signals, which can provide time-of-use pricing information.
- Ability to collect, store and report customer energy consumption data for any required time intervals or near real time.
- Improved energy diagnostics from more detailed load profiles.
- Ability to identify location and extent of outages remotely via a metering function that sends a signal when the meter goes out and when power is restored.
- Losses and theft detection.

What does a Smart Grid do[Source]?

The Smart Grid represents an unprecedented opportunity to move the energy industry into a new era of reliability, availability, and efficiency that will contribute to our economic and environmental health. During the transition period, it will be critical to carry out testing, technology improvements, consumer education, development of standards and regulations, and information sharing between projects to ensure that the benefits we envision from the Smart Grid become a reality.

1.4. Benefits of Smart Grid[Source]



1.5. Disadvantages of Smart Grid

Privacy Problems[Source]

The biggest concern is Security in a smart grid system. Grid system uses some smart meters, which are automated and provides communication between power provider and customer. Here some type of the smart meters can be easily hacked, and they may control the power supply of a single building or an entire neighborhood.

Grid Volatility

Smart Grid network has much intelligence at its edges; that is, at the entry point and at the end user's meter. But the grid has insufficient intelligence in the middle, governing the switching functions. This lack of integrated development makes the grid a volatile network. Engineering resources have been poured into power generation and consumer energy consumption, which are the edges of the network. However, if too many nodes are added to the network before developing the software intelligence to control it, the conditions will lead to a volatile smart grid.

1.6. Applications of Smart Grid

Smart grid plays an important role in modern smart technologies. Following are the most common applications of smart grid technology[Source].

Future Applications and Services	Real Time Market
Business and customer care	Application data flow to/ from end-user energy management systems
Smart charging of PHEVs and V2G	Application data flow for PHEVs
Distributed generation and storage	Monitoring of distributed assets
Grid optimization	Self-healing grid: fault protection, outage management, dynamic control of voltage, weather data integration, centralized capacitor bank control, distribution and substation automation, advanced sensing, automated feeder reconfiguration.
Demand response	Advanced demand maintenance and demand response, load forecasting, and shifting.
AMI (Advanced metering infrastructure)	Provides remote meter reading, theft detection, customer

BUILDING AND TESTING THE SMART GRID

The Smart Grid will consist of millions of pieces and parts—controls, computers, power lines, and new technologies and equipment. It will take some time for all the technologies to be perfected, equipment installed, and systems tested before it comes fully on line. And it won't happen all at once—the Smart Grid is evolving, piece by piece, over the next decade or so. Once mature, the Smart Grid will likely bring the same kind of transformation that the Internet has already brought to the way we live, work, play, and learn[Source].

1.7 Industry Structure

The smart grid market is poised to touch US$ 86.6 billion by 2024, according to a report published by Research Cosmos. The market, which was valued at US$32.4 billion in 2015, is expected to grow at a CAGR of 13.15% during the forecast period of 2016 to 2024, says the report. Research Cosmos is an aggregator of syndicated and bespoke market research, business intelligence and consulting services[Source].

Growth drivers

The growing demand around the world for the preservation of energy has been at the forefront of the development of smart grids. The smart cities being built in many developed and developing nations will also propel the growth of smart grids.

The existing grid infrastructure in most electric networks around the world is traditional and need an upgrade. The increasing need for renewable energy can fuel the market for smart grids. The Internet of Things (IoT) can also boost the demand for smart grids.

Prominent projects

Advanced Grid Intelligence and Security (AGIS) initiative - implemented by the Public Service of Colorado to make the electric distribution system more secure and efficient.

Smart Grids Italia - The focus of SMARTGRIDSITALIA is the theme of Interoperability between equipment and systems in the field of Smart Grids obtainable through the use of Standard Architectures and the development of applications based on advanced standardized approaches.

Smart Grids Flanders - Flanders – Smart Energy Region SGF aims to position Flanders as a 'Smart Energy Region' by focusing on five innovation zones, in which a complete, innovative value chain will be created. These five zones are (1) energy harbors, (2) microgrids, (3) integrated energy flows on larger sites, (4) energy platforms and apps and (5) nearly zero energy building renovation.

Smart Grid Market, By Region[Source]

The U.S. smart grid market, in 2017 was valued over USD 3 billion. Growing severity and regularity of natural disasters including storms and unplanned power outages have significantly imposed the adoption of smart grid across the country. For instance, in April 2017, a massive power outage in San Francisco was triggered in the utility substation leaving over 90,000 electricity customers without power. Furthermore, Harvey and Irma, both Category 4 hurricanes caused damages of over USD 130 billion in 2017 to the country's power infrastructure.

Europe smart grid market will witness growth on account of substantial investments toward smart meter roll outs owing to favorable energy and climate policies. The EU aims at replacing at least 80% of electricity meters with smart meters by 2020. The ongoing integration of renewable energy into power grids is further creating significant growth prospects in the region.

Asia Pacific market is set to grow over 12 % by 2024.High T&D losses, rising electricity thefts, ageing grid infrastructure will entail significant deployment of smart grid across diverse utilities. Stringent regulatory requirements aimed at reducing carbon emissions and energy consumption will further boost the product demand. The State Grid Corporation of China (SGCC), which overlooks the electricity distribution in China has announced investment plans of over 100 billion toward the development of smart grid between by 2020.

Brazil industry will witness growth owing to rising electricity demand and high technical and non-technical losses across the country's grid infrastructure. Low grid reliability, coupled with significant renewable energy potential, is creating substantial opportunities for the expansion of digital grids AES Eletropaulo, the largest power distribution company in Latin America, in 2015 invested over USD 32 million in smart

2. OBJECTIVES

- To perform detailed analysis of granted patents and published applications pertaining to Smart Grid and to understand underlying technologies.

- In depth analysis of patents/applications, in order to categorize them and to understand focusing areas of applicants.

- Graphical representation of trends (Filing, Publication, etc.) from the mined data of relevant patents/applications.

Image Courtesy

3. SEARCH METHODOLOGY

Image Courtesy

The first step is to create and define a patent set that will serve as the basis of analysis. Using renowned patent databases Questel Orbit and Derwent Innovation as our data source, we used following search query to retrieve our dataset.

Search was carried out in Abstract, Title, and Claims fields of a patent, by using keywords and International Patent Class.

4. EXECUTIVE SUMMARY

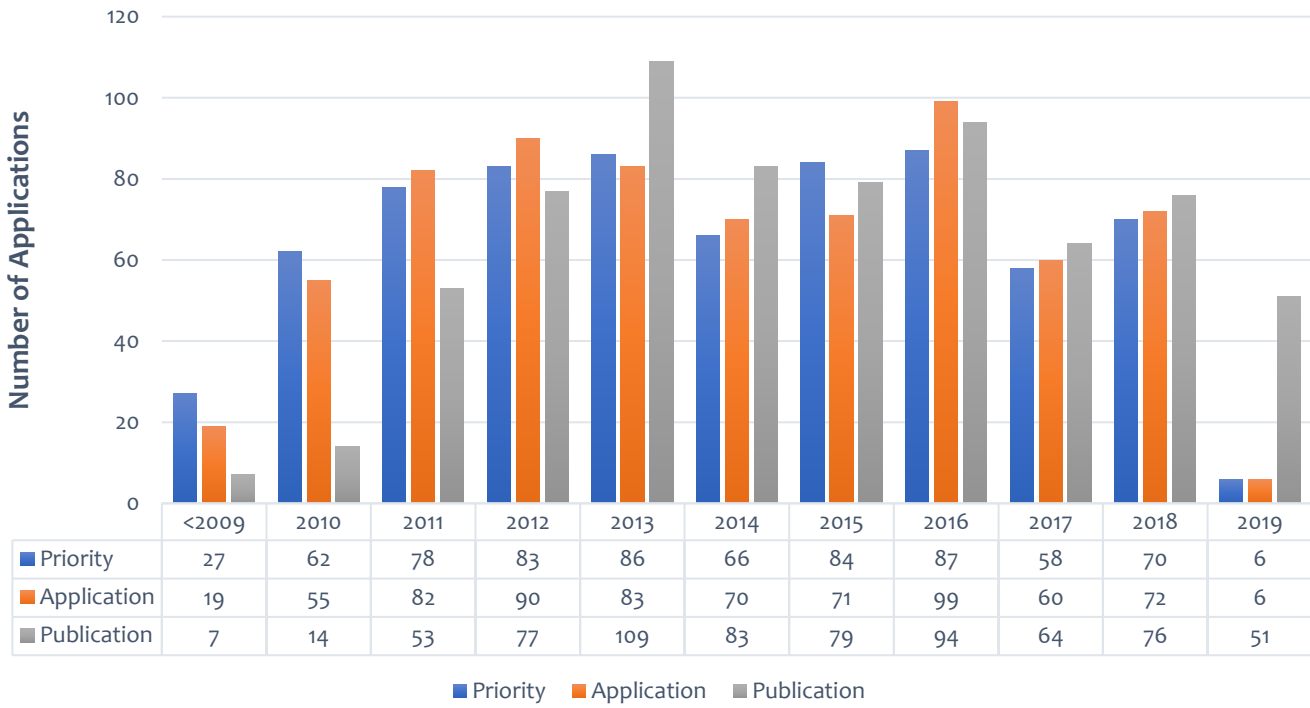
- This report explores the patent landscape pertaining to Smart Grid Technology, globally.
- A set of 707 patent families filled in the field of Smart Grid Technology were analyzed. A total of 1184 individual patents/applications forms parts of these families.
- It is observed that there is a rise in patent filing activities in Smart Grid Domain. The year 2011 has witnessed maximum patent application filings.
- State Grid Corporation of China (101 patent families) is the world leader among patent applicants, followed by Itron (16 patent families). Other applicants having a significant quantity of patent application filings are Sabic Global Technologies, Chengdu Tianjin Instrument, and Jiangsu Electric Power Company among others.
- Inventors Yang Jian, Mediratta Gaurav, Sheth Kapil Chandrakant are leaders in innovations in Smart Grid Technology. Zhang Yu, Ramalingam Hariharan, and Wang Yang also have significant contributions.
- China registers itself as the country with the most number of innovations. Over 422 patent families were filed in China itself, followed by Korea with 104 patent families.
- Out of the set of 707 patent families focusing on specific technology areas are Integrated communications (443), Smart Meter/ AMI (Advanced Metering Infrastructure) (288), Smart Switch(218), Grid Management (156), Smart Substation (100),Residential (43), Industrial(22), Commercial (18), Intelligent Appliances (15), Wide-Area Monitoring and Control (11) and Others (148).

5. NON-TECHNICAL ANALYSIS

5.1 PRIORITY, FILING, PUBLICATION YEAR BASED TREND ANALYSIS

5.1.1 ANALYSIS BASED ON REPRESENTATIVE MEMBER PER INPADOC FAMILY

Below graph represents priority year, application year, and publication year trends for the patent publications pertaining to Smart Grid.



	<2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Priority	27	62	78	83	86	66	84	87	58	70	6
Application	19	55	82	90	83	70	71	99	60	72	6
Publication	7	14	53	77	109	83	79	94	64	76	51

Note: Attributed to non-published patent applications, there may be a higher count in the years 2015-2018.

INSIGHT:

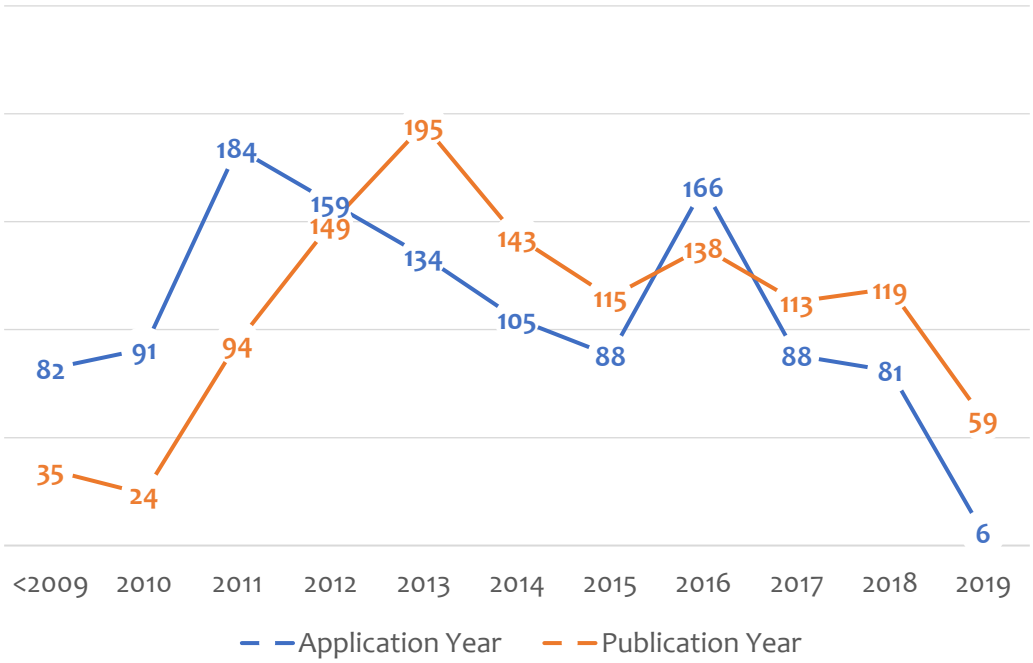
- Priority year trend provides insights related to priority years of the patent applications. Most patent applications claim priority of the years 2011-2016.

- Filing year trend provides insights for the number of applications filed across the years. As depicted in the graph, there is a gradual rise in patent applications filing over the years, wherein maximum numbers of patent applications were filed in the years 2011-2016.

- Publication trend provides insights for the number of applications published across the years. As indicated in the graph, there is a gradual rise in publication over the years, wherein maximum numbers of patent applications were published in the years 2012-2016.

5.1.2 FILING AND PUBLICATION TREND ANALYSIS BASED ON EXPANDED FAMILY DATA

The below graph shows trends for the application against publication years, wherein we have considered each family member of a particular patent family.



Note: Attributed to non-published patent applications, there may be a higher count in the years 2015-2018.

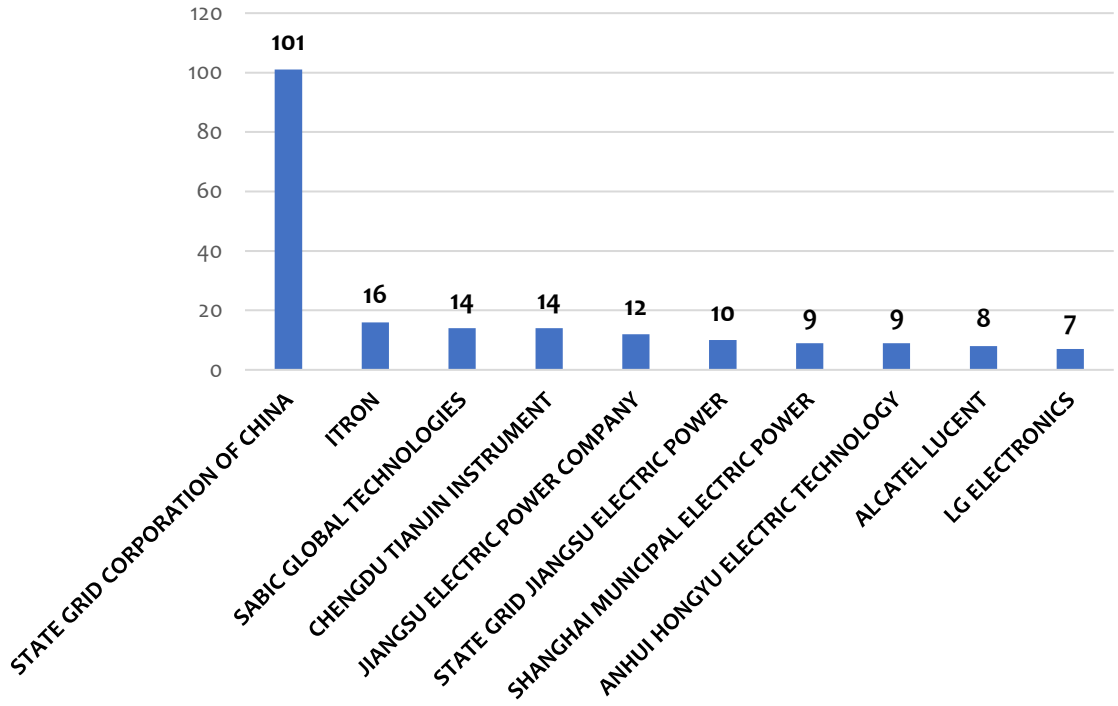
INSIGHT:

As evident from the above trends, there is a continuous rise in the patent application filing and patent application publication, over the period of time, wherein the maximum number of applications (184) were filed in 2011 and the maximum number of application were published (195) in 2013.

5.2 ASSIGNEE BASED TREND ANALYSIS

5.2.1 MAJOR ASSIGNEES (BASED ON REPRESENTATIVE MEMBER PER FAMILY)

The below graph represents major assignees in the domain.



Note: Attributed to non-published patent applications, there may be a higher count in the years 2015-2018.

INSIGHT:

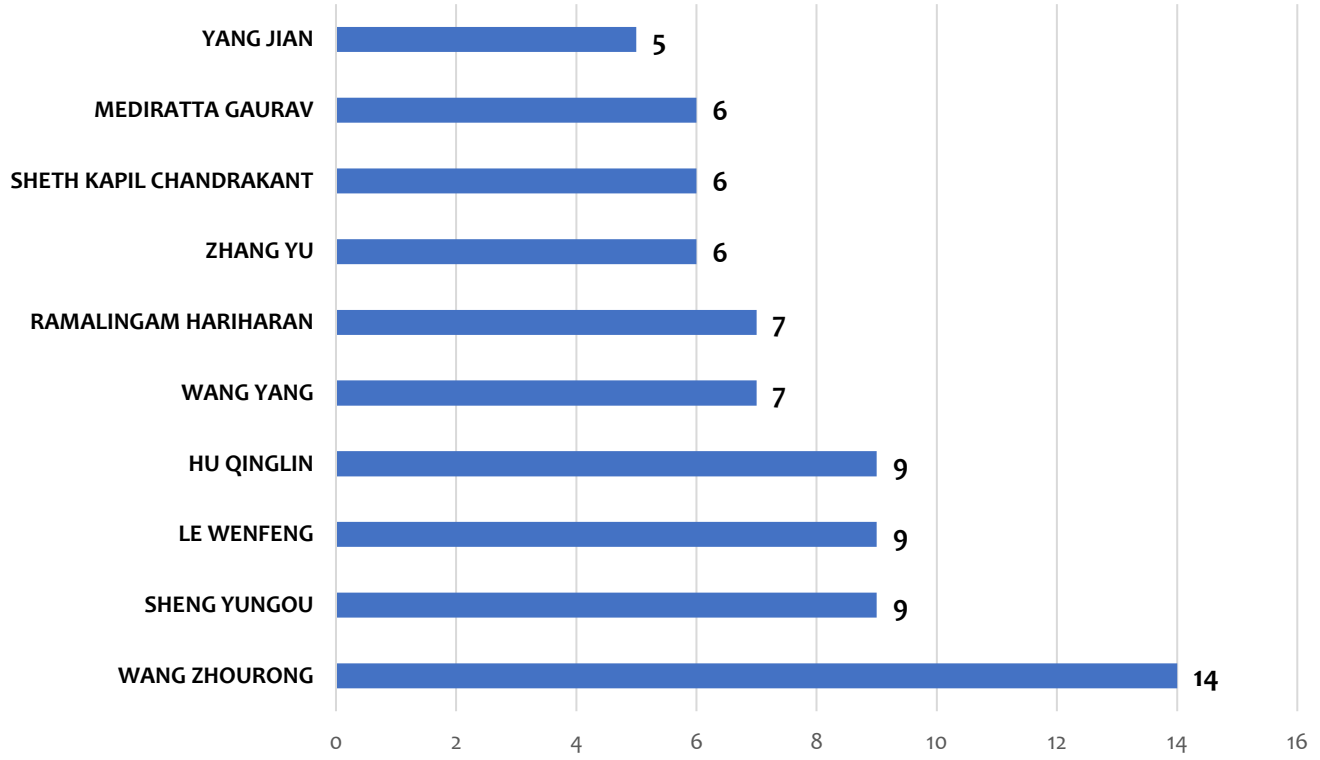
As evident from the chart herein above, "State Grid Corporation of China" (101 patent families), "Itron" (16 patent families), "Sabic Global Technologies" (14 patent families)" and "Chengdu Tianjin Instrument" (14 patent families) are key assignees with significant filing activity worldwide.

THE TOP ASSIGNEES ARE:

- STATE GRID CORPORATION OF CHINA
- ITRON
- SABIC GLOBAL TECHNOLOGIES
- CHENGDU TIANJIN INSTRUMENT
- JIANGSU ELECTRIC POWER
- STATE GRID JIANGSU ELECTRIC POWER
- SHANGHAI MUNICIPAL ELECTRIC POWER
- ANHUI HONGYU ELECTRIC TECHNOLOGY
- ALCATEL LUCENT
- LG ELECTRONICS

5.3 KEY INVENTORS

The below graph names the inventors with most number of innovations on their name.



Note: Attributed to non-published patent applications, there may be a higher count in the years 2015-2018.

INSIGHT:

The chart demonstrates top inventors, wherein 'Wang Zhourong' emerges out as the leading inventors in Smart Grid technology followed by Sheng Yungou, Lee Wenfeng, and Hu Qinglin.

5.4 GEOGRAPHY BASED TREND ANALYSIS

5.4.1 GEOGRAPHICAL DISTRIBUTION OF PATENT APPLICATION FILINGS

Priority Year → / Priority Country ↓	< 2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Grand Total
CN	2	13	23	47	52	43	55	69	46	66	6	422
KR	8	18	23	17	13	8	4	6	6	1		104
US	9	21	18	8	13	4	19	5	3			100
JP	2	3	3	1	2	2	2					15
EP	3		4	3	1	2		2				15
WO	1		2	3	1	1		3				11
IN			3	1	1	1	1	1	1	2		11
DE		3	1		2	3						9
TW		1	1	1			1					4
AU				2				1		1		4
Others	2	3			1	2	2		2			12
Grand Total	27	62	78	83	86	66	84	87	58	70	6	707

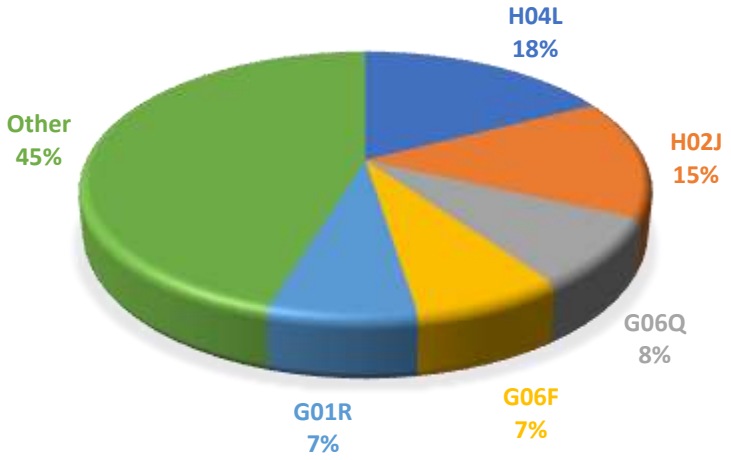
Note: Attributed to non-published patent applications, there may be a higher count in the years 2015-2018.

INSIGHT:

Trend related to Geographical filing demonstrates that the maximum number of filings were originated in the CN followed by KR and US jurisdictions.

5.5 INTERNATIONAL PATENT CLASSIFICATION BASED TREND

The below graph represents frequently assigned international patent classes.



INSIGHT:

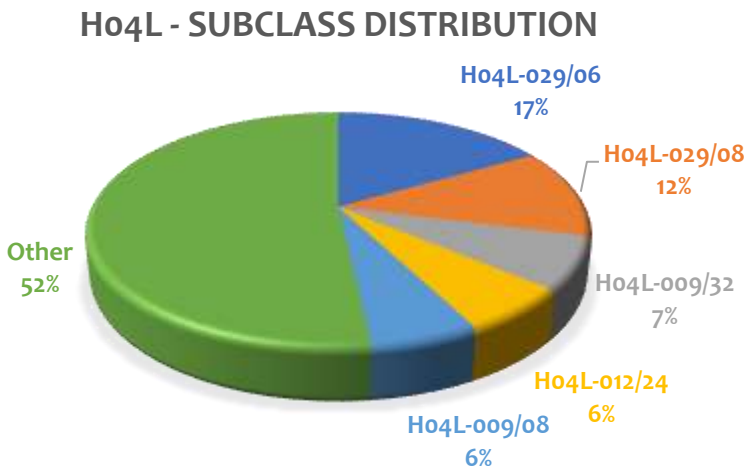
Majority of patent applications were assigned with IPC "H04L" followed by "H02J".

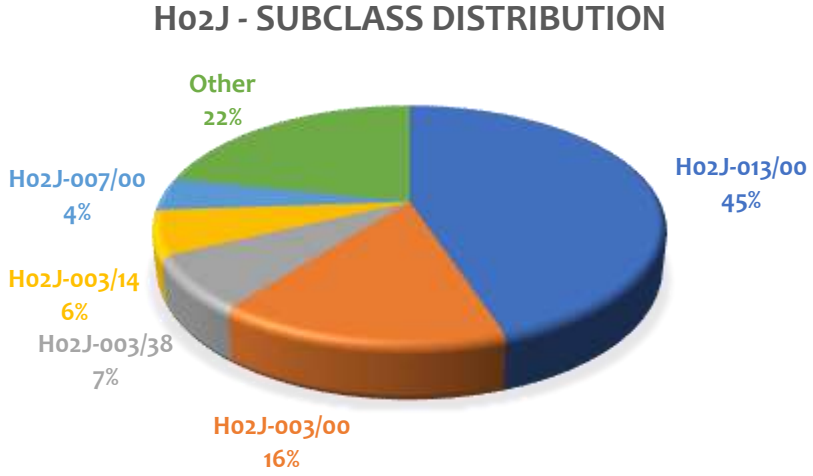
IPC DEFINITIONS

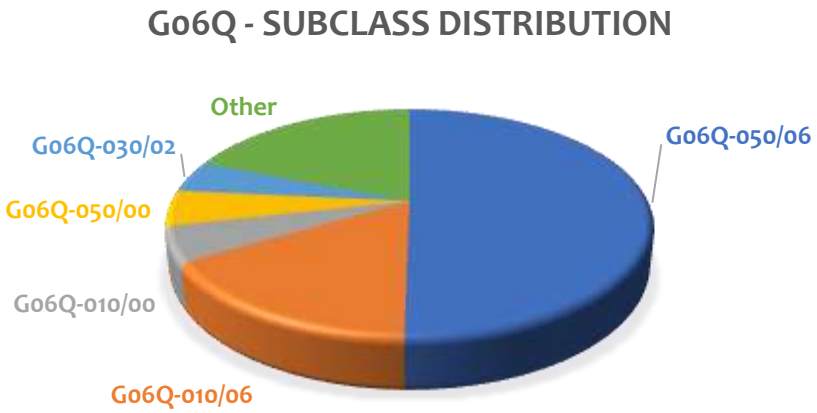
IPC	Definition
H04L	Transmission of digital information
H02J	Circuit arrangements or systems for supplying or distributing electric power; systems for storing electric energy
G06Q	Data processing systems or methods, specially adapted for administrative, commercial, financial, managerial, supervisory or forecasting purposes; systems or methods specially adapted for administrative, commercial, financial, managerial, supervisory or forecasting purposes, not otherwise provided for
G06F	Electric digital data processing
G01R	Measuring electric variables; measuring magnetic variables

5.6 INTERNATIONAL PATENT SUB-CLASSIFICATION BASED TREND

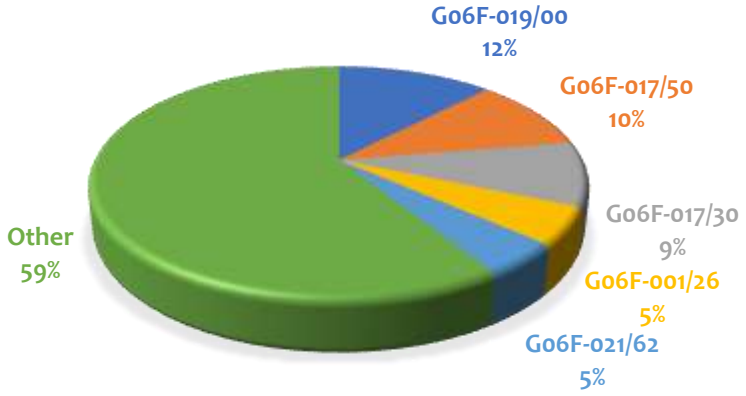
The below graph represents sub-classes pertaining to one of the top/main patent classes.



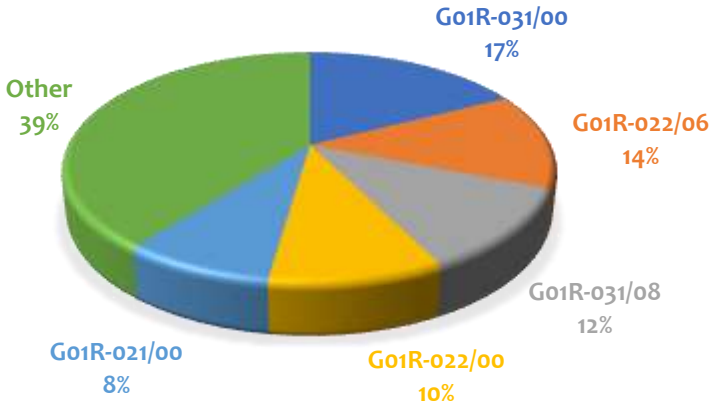




G06F - SUBCLASS DISTRIBUTION



G01R - SUBCLASS DISTRIBUTION



IPC DEFINITIONS:

IPC Subclass	Definition
H04L	TRANSMISSION OF DIGITAL INFORMATION, e.g. TELEGRAPHIC COMMUNICATION
H04L 29/00	Arrangements, apparatus, circuits or systems, not covered by a single one of groups
H04L-029/06	characterised by a protocol
H04L-029/08	Transmission control procedure, e.g. data link level control procedure
H04L 9/00	Arrangements for secret or secure communication
H04L-009/32	including means for verifying the identity or authority of a user of the system
H04L 12/00	Data switching networks (interconnection of, or transfer of information or other signals between, memories, input/output devices or central processing units
H04L-012/24	Arrangements for maintenance or administration
H04L-009/08	Key distribution
H02J	CIRCUIT ARRANGEMENTS OR SYSTEMS FOR SUPPLYING OR DISTRIBUTING ELECTRIC POWER; SYSTEMS FOR STORING ELECTRIC ENERGY

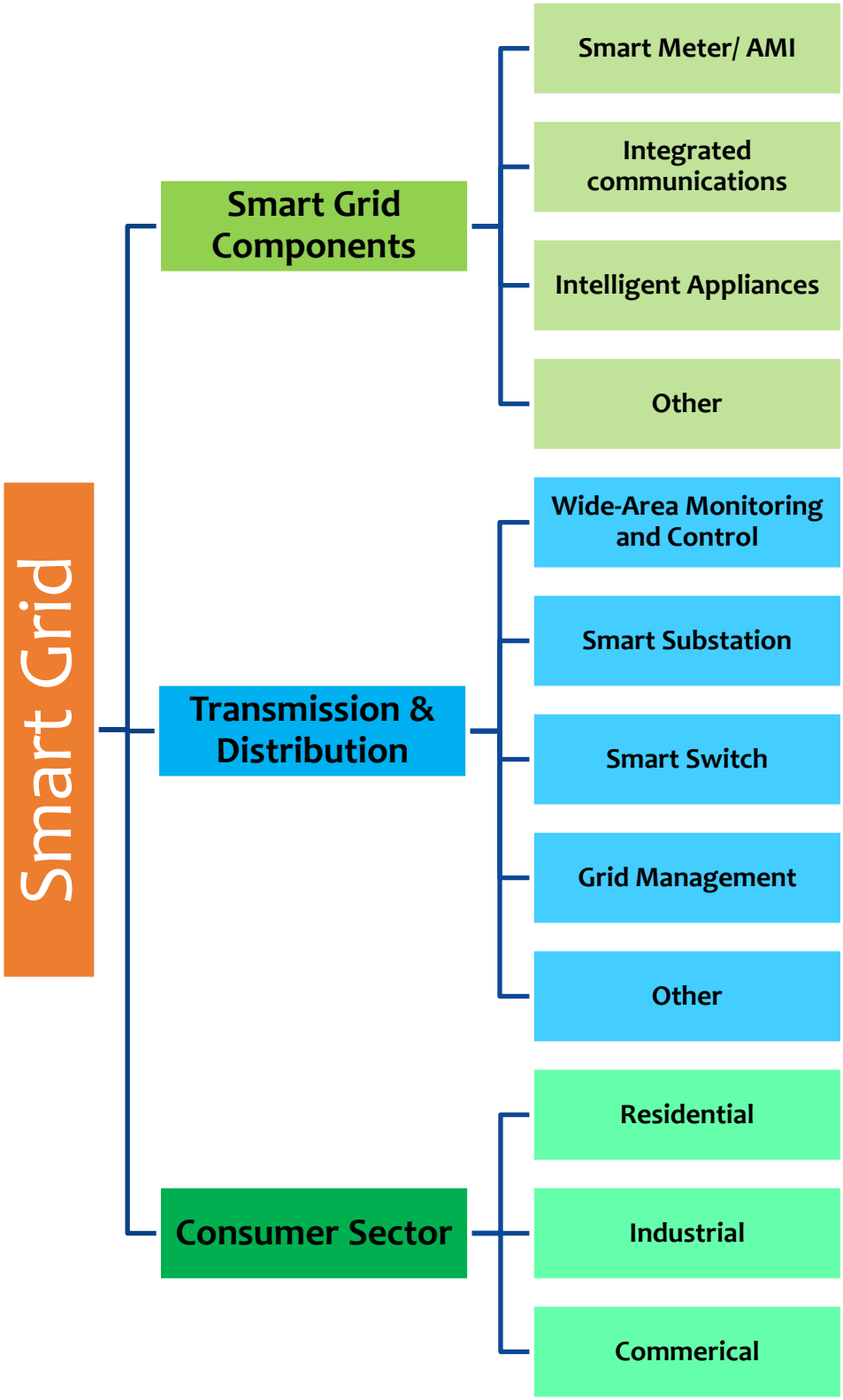
H02J-013/00	Circuit arrangements for providing remote indication of network conditions, e.g. an instantaneous record of the open or closed condition of each circuitbreaker in the network; Circuit arrangements for providing remote control of switching means in a power distribution network, e.g. switching in and out of current consumers by using a pulse code signal carried by the network [2006.01]
H02J-003/00	Circuit arrangements for ac mains or ac distribution networks
H02J-003/38	Arrangements for parallelly feeding a single network by two or more generators, converters, or transformers
H02J-003/14	by switching loads on to, or off from, network, e.g. progressively balanced loading
H02J-007/00	Circuit arrangements for charging or depolarising batteries or for supplying loads from batteries
G06Q	DATA PROCESSING SYSTEMS OR METHODS, SPECIALLY ADAPTED FOR ADMINISTRATIVE, COMMERCIAL, FINANCIAL, MANAGERIAL, SUPERVISORY OR FORECASTING PURPOSES; SYSTEMS OR METHODS SPECIALLY ADAPTED FOR ADMINISTRATIVE, COMMERCIAL, FINANCIAL, MANAGERIAL, SUPERVISORY OR FORECASTING PURPOSES, NOT OTHERWISE PROVIDED FOR
G06Q 50/00	Systems or methods specially adapted for specific business sectors, e.g. utilities or tourism (healthcare informatics G16H)
G06Q-050/06	Electricity, gas or water supply
G06Q-010/06	Resources, workflows, human or project management, e.g. organising, planning, scheduling or allocating time, human or machine resources; Enterprise planning; Organisational models
G06Q-010/00	Administration; Management
G06Q-030/00	Commerce, e.g. shopping or e-commerce
G06Q-030/02	Marketing, e.g. market research and analysis, surveying, promotions, advertising, buyer profiling, customer management or rewards; Price estimation or determination
G06F	ELECTRIC DIGITAL DATA PROCESSING
G06F-019/00	Digital computing or data processing equipment or methods, specially adapted for specific applications (specially adapted for specific functions G06F 17/00; data processing systems or methods specially adapted for administrative, commercial, financial, managerial, supervisory or forecasting purposes G06Q; healthcare informatics G16H)
G06F-017/00	Digital computing or data processing equipment or methods, specially adapted for specific functions
G06F-017/50	Computer-aided design (for the design of test circuits for static stores G11C 29/54)
G06F-017/30	Information retrieval; Database structures therefo
G06F-001/00	Details not covered by groups G06F 3/00-G06F 13/00 and G06F 21/00 (architectures of general purpose stored program computers G06F 15/76
G06F-001/26	Power supply means, e.g. regulation thereof (for memories G11C)
G06F-021/00	Security arrangements for protecting computers, components thereof, programs or data against unauthorised activity
G06F-021/62	Protecting access to data via a platform, e.g. using keys or access control rules

G01R	MEASURING ELECTRIC VARIABLES; MEASURING MAGNETIC VARIABLES
G01R-031/00	Arrangements for testing electric properties; Arrangements for locating electric faults; Arrangements for electrical testing characterised by what is being tested not provided for elsewhere
G01R-022/00	Arrangements for measuring time integral of electric power or current, e.g. electricity meters
G01R-022/06	by electronic methods
G01R-031/08	Locating faults in cables, transmission lines, or networks
G01R-022/00	Arrangements for measuring time integral of electric power or current, e.g. electricity meters
G01R-021/00	Arrangements for measuring electric power or power factor

6. TECHNICAL ANALYSIS

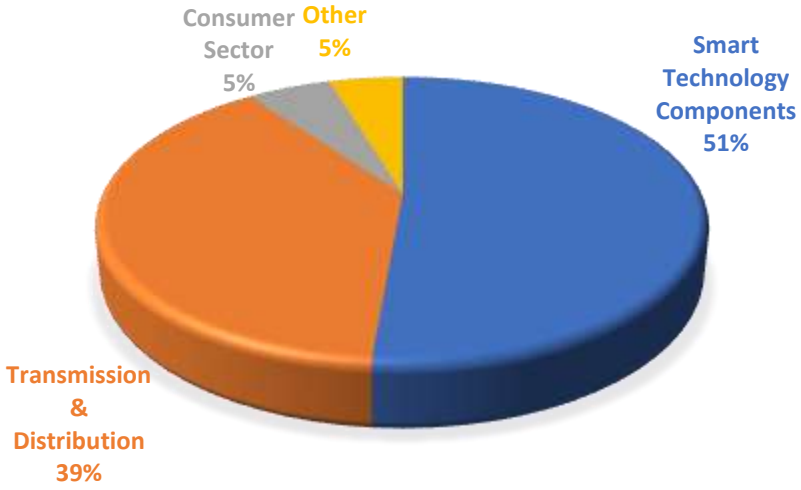
6.1 TAXONOMY DEVELOPED FOR BUCKETING OF RELEVANT PATENT DOCUMENTS

A set of 707 patent families were analyzed in depth to identify the focus areas of the patents related to Smart Grid Technology.



6.2 DISTRIBUTION OF PATENTS/APPLICATIONS PERTAINING TO SMART GRID TECHNOLOGY

This category deals with patents/applications pertaining to dissection of smart grid technology. Below representation shows the dissection in terms of Components, Transmissiom & Distribution, Consumer Sectors, and others.



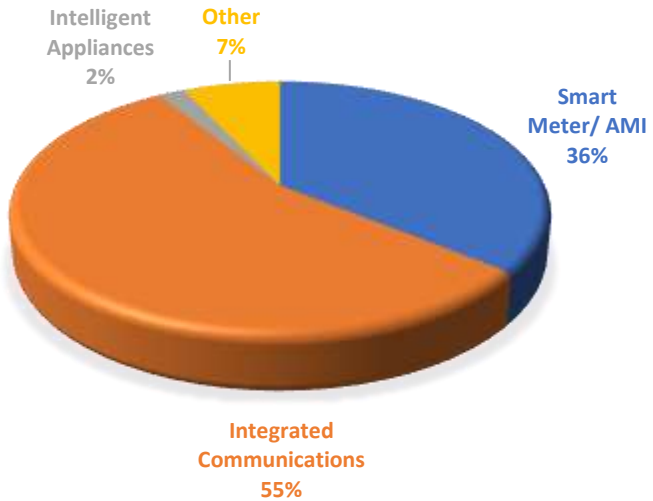
INSIGHT:

As evident from the graph, maximum number of patents/applications are falling under Smart Technology Components (51%) followed by Transmission & Distribution (39%), and Customer Sector (5%).

*The 'Other' category includes Patents/Applications related to Power Generation (Renewable Energy, Nuclear Energy and Cross-Border Interconnection) and Grid Security.

6.2.1 DISTRIBUTION OF PATENTS/APPLICATIONS PERTAINING TO SMART GRID COMPONENTS

This category deals with patents/applications pertaining to the various smart grid components being incorporated in the Smart Grids. Below representation shows sub-categories, such as, Integrated Communications, Smart Meter/ AMI, Intelligent Appliances and others.

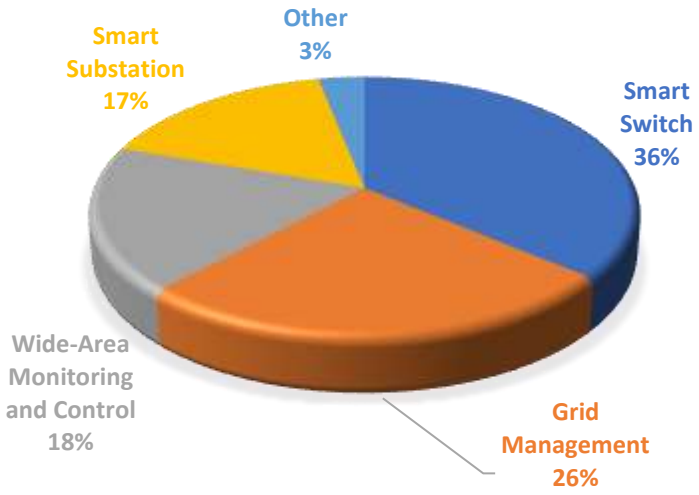


INSIGHT:

As evident from the graph, maximum number of patents/applications are falling under Integrated Communications (55%) followed by Smart Meter/ AMI (36%).

6.2.2 DISTRIBUTION OF PATENTS/APPLICATIONS BASED ON TRANSMISSION & DISTRIBUTION

This category deals with patents/applications pertaining to Transmission and Distribution Techniques being incorporated in Smart Grid Technology. Below representation shows sub-categories such as Smart Switch, Grid Management, Wide-Area Monitoring and Control and Smart Substation, etc.



INSIGHT:

As evident from the graph, maximum number of patents/applications are falling under Smart switch (36%) followed by Grid Management (26%).

7. CONCLUSION

- This report explored patent landscape pertaining to Smart Grid Technology, globally.
- A set of 707 patent families filled in the field of Smart Grid Technology were analyzed. A total of 1184 individual patents/applications forms parts of these families.
- It was observed that there is a rise in patent filing activities in Smart Grid Domain. The year 2011 has witnessed maximum patent application filings.
- State Grid Corporation of China (101 patent families) is the world leader among patent applicants, followed by Itron (16 patent families). Other applicants having a significant quantity of patent application filings are Sabic Global Technologies, Chengdu Tianjin Instrument, and Jiangsu Electric Power Company among others.
- Inventors Yang Jian, Mediratta Gaurav, Sheth Kapil Chandrakant are leaders in innovations in Smart Grid Technology. Zhang Yu, Ramalingam Hariharan, and Wang Yang also have significant contributions.
- China registers itself as the country with the most number of innovations. Over 422 patent families were filed in China itself, followed by Korea with 104 patent families.
- Out of the set of 707 patent families focusing on specific technology areas are Integrated communications (443), Smart Meter/ AMI (Advanced Metering Infrastructure) (288), Smart Switch(218), Grid Management (156), Smart Substation (100),Residential (43), Industrial(22), Commercial (18), Intelligent Appliances (15), Wide-Area Monitoring and Control (11) and Others (148).

DISCLAIMER

IIPRD has prepared this sample report as an exemplary report, wherein the content of the report is based on internal evaluation of Patents and Non-Patent Literature that is conducted based on Databases and Information sources that are believed to be reliable by IIPRD. A complete list of patent documents retrieved is not disclosed herein as the report is exemplary but can be shared if desired based on terms and conditions of IIPRD. IIPRD disclaims all warranties as to the accuracy, completeness or adequacy of such information. The above sample report is prepared based on the search conducted on the keywords and other information extracted from the understanding of the Patent Analysts of IIPRD, and subjectivity of the researcher and analyst. Neither IIPRD nor its affiliates nor any of its proprietors, employees (together, "personnel") are intending to provide legal advice in this matter.

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