

Bachman v. PECO

C-2017-2623504

Exhibit GP-1

Glenn Pritchard Resume

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GLENN A. PRITCHARD, PE

OBJECTIVE

To combine my technical aptitude, leadership skills and innovative style into a leadership role where I can lead, guide and coach others to create a progressive, results-oriented environment.

EXPERIENCE

Exelon/PECO Energy, Philadelphia, Pennsylvania

Key-Manager – Advanced Grid Operations and Technology, August 2015 to Present

As the Manager of the Advanced Grid and Technology team, my responsibilities include leading a team of Engineers and Analysts whose responsibilities include managing PECO's Smart Grid Center of Excellence, PECO's Smart Grid Engineering Team and the Network Operations Team. This opportunity builds on my technical and business acumen and allows me to lead, coach and mentor others to grow PECO's knowledge base on Smart Grids.

- **Smart Grid Center of Excellence** – PECO's Smart Grid Center of Excellence is responsible for developing innovation new solutions and applications that leverage the Smart Grid platform to deliver new benefits to PECO. Current areas of focus include Smart Cities applications, Microgrids, Demand Response, Distributed Generation and Energy Storage applications.
- **Smart Grid Engineering** – The Smart Grid Engineering team consists of individuals responsible for Network Engineering, AMI/Smart Meter Engineering and Distribution Automation Engineering. These subject matter experts support the Smart Grid Operations team by solving complex operational matters, optimizing the smart grid system and introducing new hardware and solutions to the Smart Grid environment.
- **Smart Grid Network Operations** – Responsibilities include the daily operation, maintenance and alarm response for PECO's Smart Grid Communication Network of over 175 network collectors. System performance and availability has been maintained at levels exceeding 99.99%.

Principal Engineer/Technology Lead, Smart Grid/Smart Meter Project, January 2009 to August 2015

As the Technology Lead for PECO's Smart Grid/Smart Meter (SG/SM) Project, my responsibilities vary from being one of the principal authors of PECO's legal filings and grant applications to representing PECO and testifying at industry and governmental forums to leading the technology and vendor selection processes for significant portions of the SG/SM project. My activities include weekly briefings with senior executives and departmental leadership on the status and progress of the project.

- **Technology Lead** – Responsibilities include the development of key strategies and technology recommendations. Examples are PECO's Smart Grid Communications Infrastructure, the Advanced Meter Infrastructure Platform and various end-point selections for both Smart Meters and Distribution Automation devices. This role also includes maintaining relationships with external organizations such as EPRI, NEETRAC, IEEE, UCA, NAESB and Underwriters Laboratories.
- **Application Development** – In order to maximize the use and benefit of the SG/SM infrastructure, my work includes the development of several advanced applications. These include PECO's Conservation Voltage Reduction/Volt-VAR management program, the Advanced Meter Outage

System (AMOS) and the use of metering data and analytics to supplement T&D asset management programs.

- **Business Process Design** – Beyond the hardware and software realms, my role requires deep integration with the business process design teams who have developed the deployment plans and change management activities for all facets of the PECO's SG/SM project.
- **Smart Grid & AMI Subject Matter Expert** – Frequent speaker, author and presenter at world-wide industry events such as Distributech, IEEE PES events and numerous international Smart Grid Symposiums (countries include Italy, Jordan, Saudi Arabia, South Africa, Toronto, Turkey & Vietnam).

Principal Engineer, Meter Reading Technologies, December 2007 to December 2008

This assignment provided greater responsibility by expanding my responsibilities across multiple organizations within Exelon. Primary focus continues to be on Metering Systems and advanced applications of metering data.

- **PECO Advanced Metering Infrastructure & Smart Grid Team** – Lead the Technical Analysis and Benefits teams for the Pa. Act 129 Filing that required all in-state electric Utilities to install Smart Meters for all customers. This effort included working with all Energy Delivery business units to determine maximum benefit from a Smart Meter deployment and assessing the current state of the marketplace to recommend the most appropriate solution to meet business needs.
- **Converged Advanced Metering Infrastructure and Distribution Automation Project** – Designed a novel application to combine communications from multiple endpoints into a cost-effective solution that is becoming the foundation for PECO's Intelligent Distribution Grid.
- **PECO Customer/1 Customer Information System Project** – Lead the reintegration of the PECO/Cellnet automated metering interface. This project converted PECO's legacy customer information system to the Anderson Customer-One platform. The project included restructuring 12 unique interfaces to ensure the timely and accurate delivery of meter reading information. Post implementation performance was equal or better than the previous implementation.

Project Manager, AMR Strategies/Meter Reading Technologies, March 2002 to December 2007

The purpose of this assignment is to create value and margin by identifying, proposing and developing new uses of PECO's AMR system and the data that is acquired from the meters.

- **AMR/OMS Project** – Initiated, justified and managed a project that linked PECO's Outage Management and Automatic Meter Reading systems. The result is a state-of-the-art application that self-identifies, qualifies and predicts customer power outages for 99.5% of PECO's 1.75M electric customers. This project received an industry-wide "Integration Project of the Year" Award for 2006.
- **Smart-Thermostat Programs** – Lead two Residential Demand Response deployments that demonstrated the feasibility and potential benefits of such a program. Each project was active for a minimum of 24 months and included over 100 customers. The specific projects included Sage's Aladyn and Invensys' GoodWatts systems.
- **AMR Value Creation Projects** – Lead the development, analysis, business cases development and piloting of several new applications for PECO's AMR system, including installing meters on unit substations and in manholes. These projects created a method to cost-effectively provide remote monitoring where traditional SCADA implantations were impractical.

Project Leader, Exelon Communications, 2000 to March 2002

Primary function was to support PECO/Philadelphia through fiber optic network expansion and customer additions. Responsibilities also included maintaining knowledge of new telecommunications technologies and analyzing these products for use by Exelon.

- **Project Leader** – Responsible for the design, construction, documentation and maintenance of the Exelon/PECO/Philadelphia fiber optic network. Managed over 100 projects whose magnitude ranged from \$10,000 to \$250,000. Projects include aerial, underground, rural, urban and metropolitan environments. Maintained 24x7 on-call status for fiber emergencies.
- **New Technologies Engineer** – Lead the investigation into several “Last Mile” Internet delivery technologies including Digital Subscriber Lines, Power Line Carrier and Passive Optical Networking. Responsibilities include developing financial models, engineering designs and senior management recommendations.

Reliability Engineer, Engineering & Design, Philadelphia Region, 1998 to 2000

This multifaceted role required the ability to simultaneously manage several diverse assignments through task prioritization and delegation, good communication skills for frequent interactions with external customers and management, and an intimate knowledge of the Pennsylvania Electric Tariff and the FERC regulations governing electric power distribution.

- **Reliability Engineer – Project Manager/ Design Engineer** – Responsible for ensuring peak performance of distribution circuits through preventative maintenance programs, circuit reconfiguration and new circuit designs. Continually interacted with customers to address their needs and ensure their satisfaction. A detailed knowledge of power distribution systems was developed and maintained.
- **Philadelphia Distribution Engineer – Lead Responsible Engineer** – Lead new business construction and facility relocation projects throughout the city of Philadelphia. Project responsibilities included design, economic cost/benefit evaluation, creation of bid-packages, construction management and final testing.

Project Engineer - Special Projects, Engineering Services Department, 1995 to 1998

As the “Out-of-Box Thinker”, I was paired with recognized experts of various disciplines. I was given the opportunity to propose, develop and implement non-traditional projects. A close relationship with management was necessary to ensure project funding and sponsorship.

- **Substation Integration Project - Lead Responsible Engineer** – Responsible for all phases from conceptual design to field implementation of this \$15 million project that automated 87 substations. The project included the installation and integration of digital relays, substation equipment condition monitors, programmable logic controllers, and a graphical human-machine interface.
- **Switched Broadband Network – Design Engineer** – Designed and installed a novel electric distribution system for a “fiber-to-the-curb” telecommunication and entertainment system pilot. The system included remote monitoring and emergency response plans for the power supplies and cable.

Engineer, Engineering & Design Division, 1992 to 1995

As a member of the Consulting Services department, I was involved in various projects. Throughout this assignment, I was responsible for the division’s budgets and analyzing financial performance.

- **Dynamic Thermal Circuit Rating Project – Project Manager/Lead Engineer** – Managed a \$500,000 research project between the Electric Power Research Institute and PECO Energy with the purpose of creating a static and real-time system that predicts an equipment’s electrical ratings based on past, present and future conditions.

ACCREDITATIONS, MEMBERSHIPS AND AWARDS

- Professional Engineer, Registered in the State of Pennsylvania, PE-052180-E, 1997
- ITIL Foundation Certification, 2012
- Distributech Board Member, 2010 – Present
- IEEE Power Engineering Society, member since 1998
- Electric Power Research Institute's Technology Transfer Award – Smart Grid Demonstration Project, 2014 - Presented in recognition of Pritchard's work in the Smart Grid field, specifically on developing, presenting and educating others on how to design, deploy and operate Smart Grid Solutions.
- IEC GridVision Award – 2010, International Engineer Consortium, this award celebrates outstanding contributions within the electronic power industry, with specific focus on Smart Grid advancement
- Utility Professional of the Year – 2008, Utilimetrics, which recognizes leaders in the field of metering and the application of metering data

EDUCATION

Clemson University Clemson, South Carolina 1990
Bachelor of Science, Electrical Engineering

- Senior Project – Lead a five person team in the development of a prototype tracking system to be used for victims of Alzheimer's Disease that are prone to wandering away and getting lost.

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Exhibit GP-2

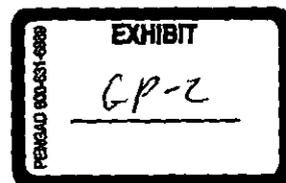
Landis + Gyr AMR System

2000 - April 2017

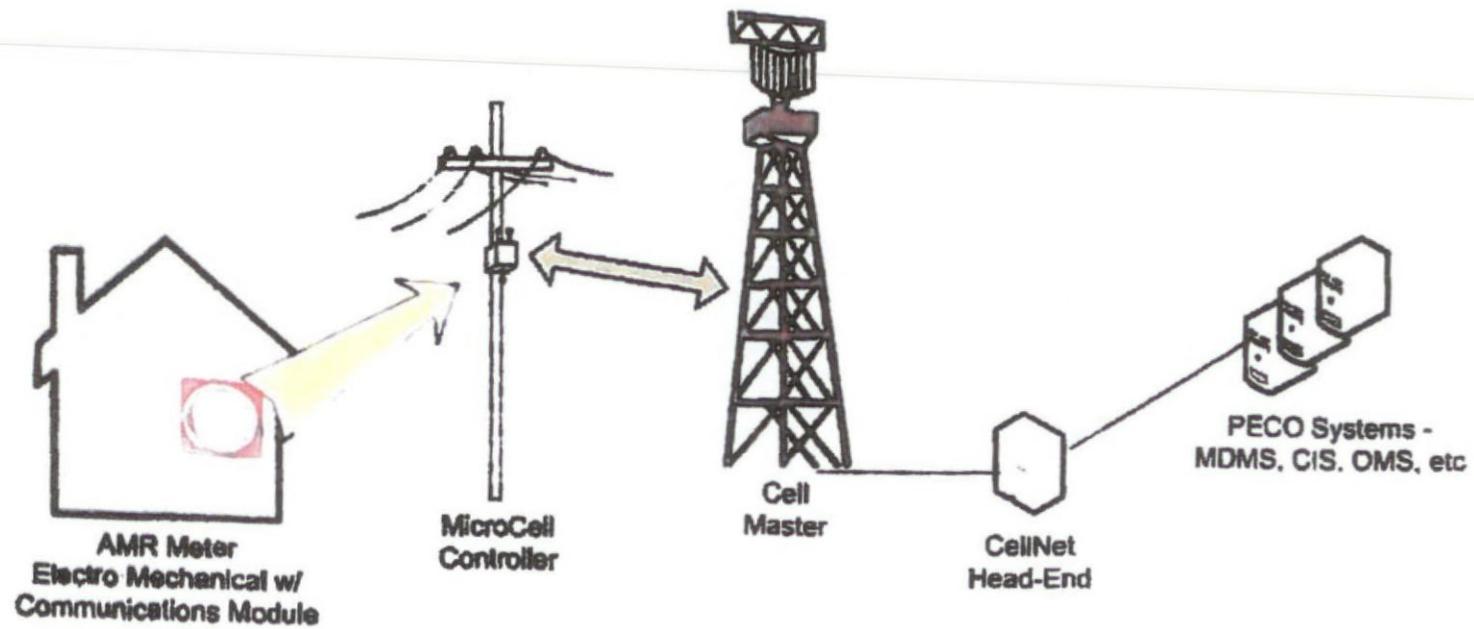
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Landis+Gyr AMR System



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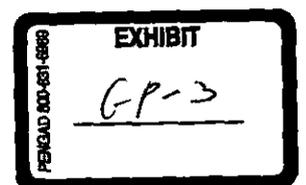
Exhibit GP-3

PECO AMR Transmission Characteristics

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PECO Exhibit GP-3

PECO AMR Transmission Characteristics

Periodicity of Transmissions (system average)	Number of Transmissions per day (system average)	Power of transmission	Length of transmission	Total transmission time per 24 hours
Every 5 minutes	288	1 watt	20 milliseconds	5.76 seconds

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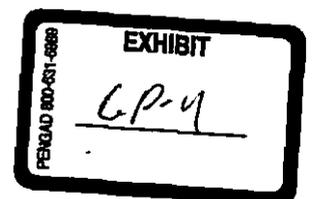
Exhibit GP-4

Sensus AMI System

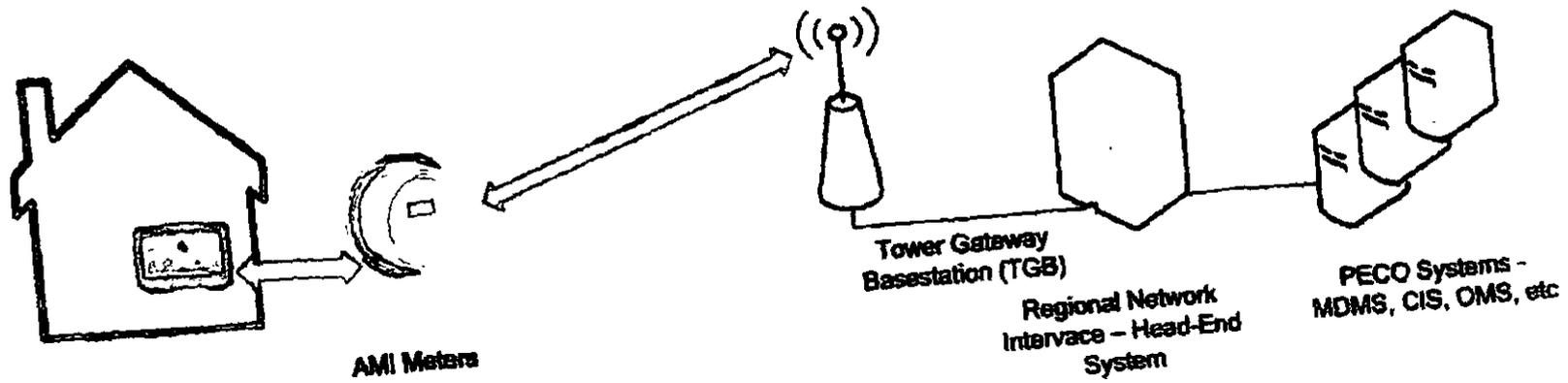
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Sensus AMI System



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Exhibit GP-5

PECO AMI Transmission Characteristics

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PECO Exhibit GP-5

PECO Electric AMI/Non-Aclara Transmission Characteristics

	Periodicity of Transmissions (system average)	Number of Transmissions per day (system average)	Power of transmission	Length of transmission	Total transmission time per 24 hours
FlexNet	~ Every 180-240 minutes for most meters	6-8	2 watts	70 milliseconds	.42 to .56 seconds
Zigbee	Every 30 seconds until pairs with device	2880	130.92 milliwatts	0.7 milliseconds	2.016 seconds
Both radios combined					2.426 seconds to 2.576 seconds

PECO Electric AMI Aclara Transmission Characteristics

	Periodicity of Transmissions (system average)	Number of Transmissions per day (system average)	Power of transmission	Length of transmission	Total transmission time per 24 hours
FlexNet	~ Every 180-240 minutes for most meters	6-8	2 watts	70 milliseconds	.42 to .56 seconds

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Exhibit GP-6
United States Frequency Allocations
The Radio Spectrum

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UNITED STATES FREQUENCY ALLOCATIONS

THE RADIO SPECTRUM

RADIO SERVICES COLOR LEGEND

AIRCRAFT	AIRTEL	AIRCRAFT

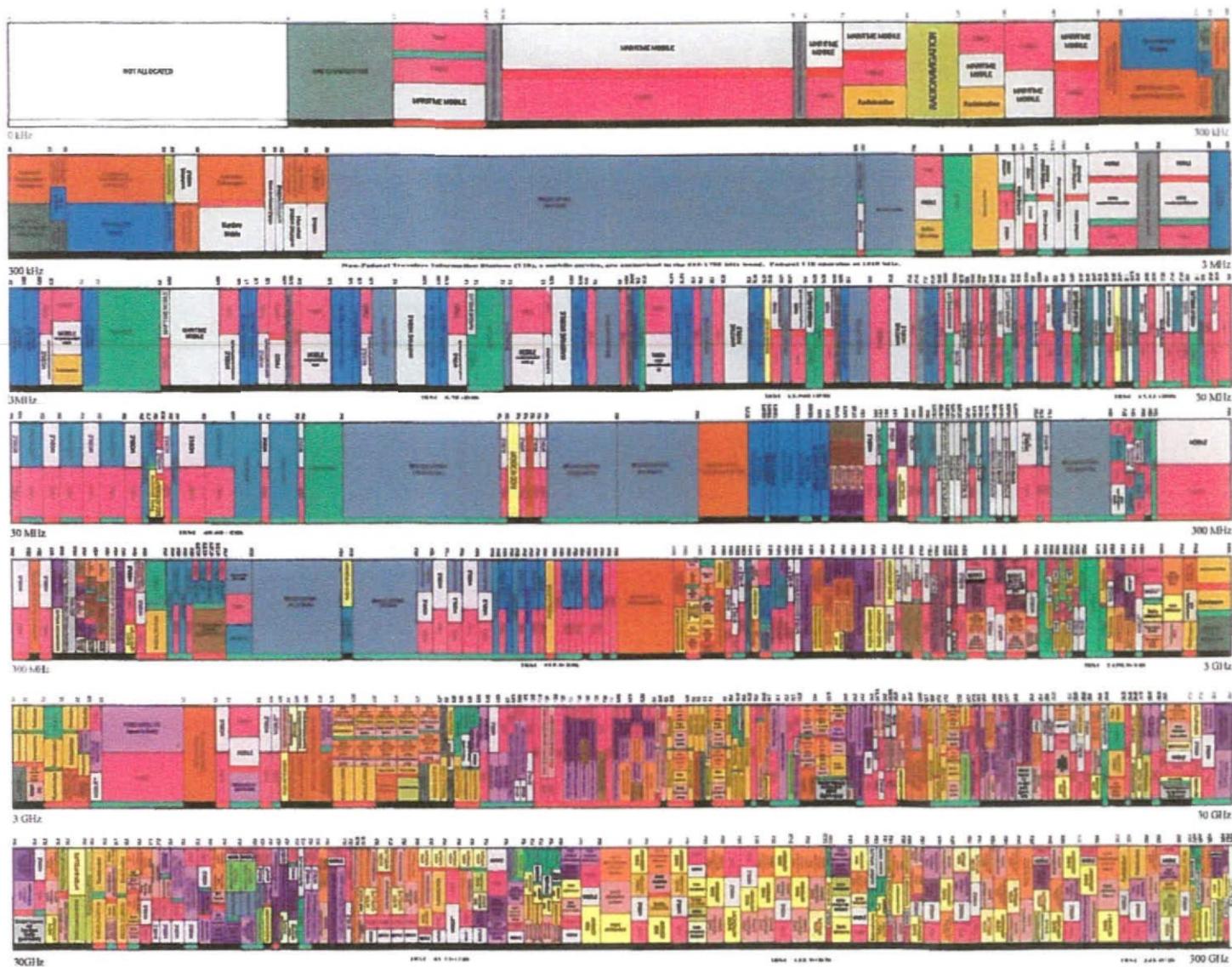
ACTIVITY CODE

FEDERAL GOVT	FEDERAL GOVT
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ALLOCATION USAGE DESIGNATION

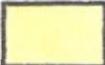
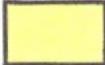
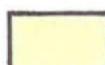
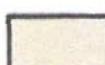
SERVICE	CLASS	REMARKS
...

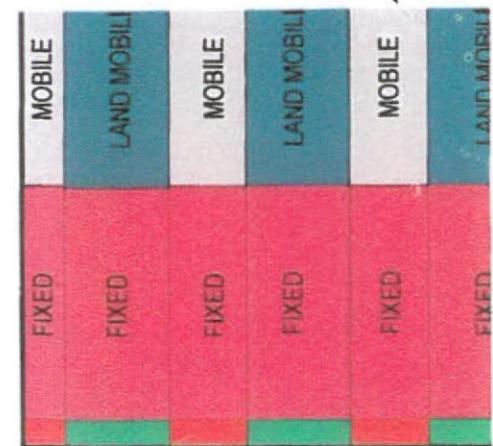
U.S. DEPARTMENT OF COMMERCE
National Telecommunications and Information Administration
Office of Spectrum Management
JANUARY 2016



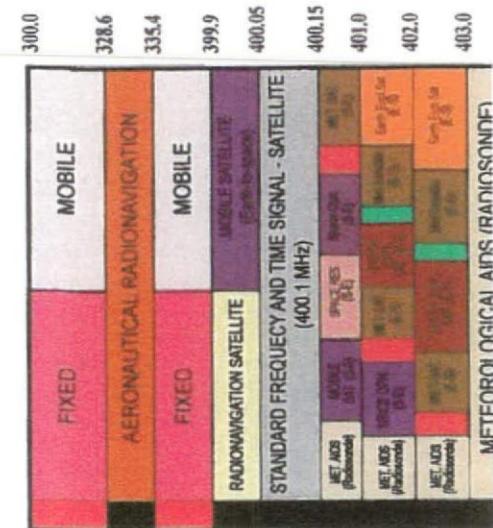
THIS CHART IS A SUMMARY OF THE FREQUENCY ALLOCATIONS AND IS NOT A SUBSTITUTE FOR THE FEDERAL COMMUNICATIONS COMMISSION'S REGULATIONS.

RADIO SERVICES COLOR LEGEND

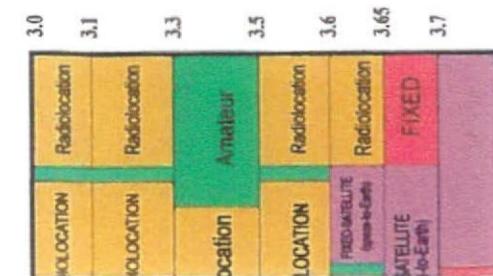
	AERONAUTICAL MOBILE		INTER-SATELLITE		RADIO ASTRONOMY
	AERONAUTICAL MOBILE SATELLITE		LAND MOBILE		RADIODETERMINATION SATELLITE
	AERONAUTICAL RADIONAVIGATION		LAND MOBILE SATELLITE		RADIOLOCATION
	AMATEUR		MARITIME MOBILE		RADIOLOCATION SATELLITE
	AMATEUR SATELLITE		MARITIME MOBILE SATELLITE		RADIONAVIGATION
	BROADCASTING		MARITIME RADIONAVIGATION		RADIONAVIGATION SATELLITE
	BROADCASTING SATELLITE		METEOROLOGICAL		SPACE OPERATION
	EARTH EXPLORATION SATELLITE		METEOROLOGICAL SATELLITE		SPACE RESEARCH
	FIXED		MOBILE		STANDARD FREQUENCY AND TIME SIGNAL

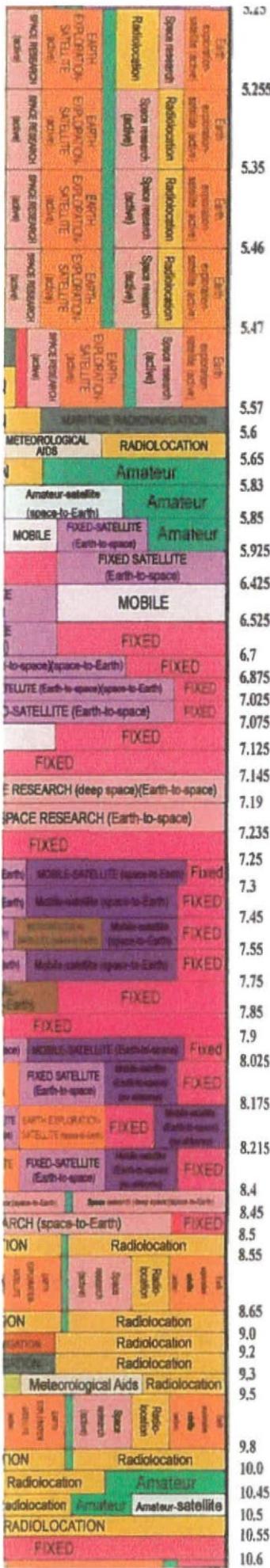


30 MHz

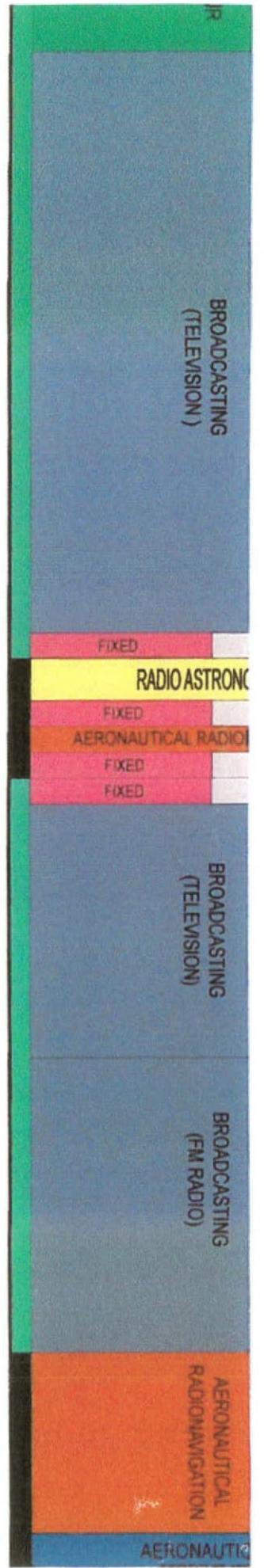
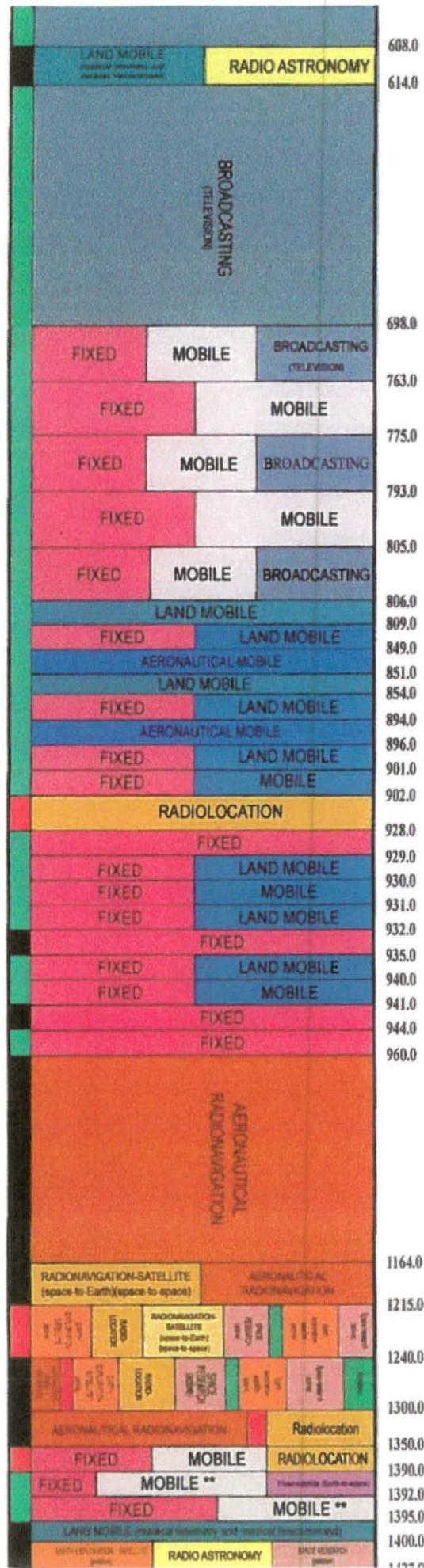


300 MHz





ISM - 915.0±.11 MHz



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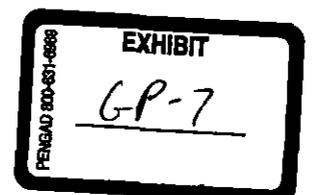
Exhibit GP-7

AMR Meter Functional Block Diagram

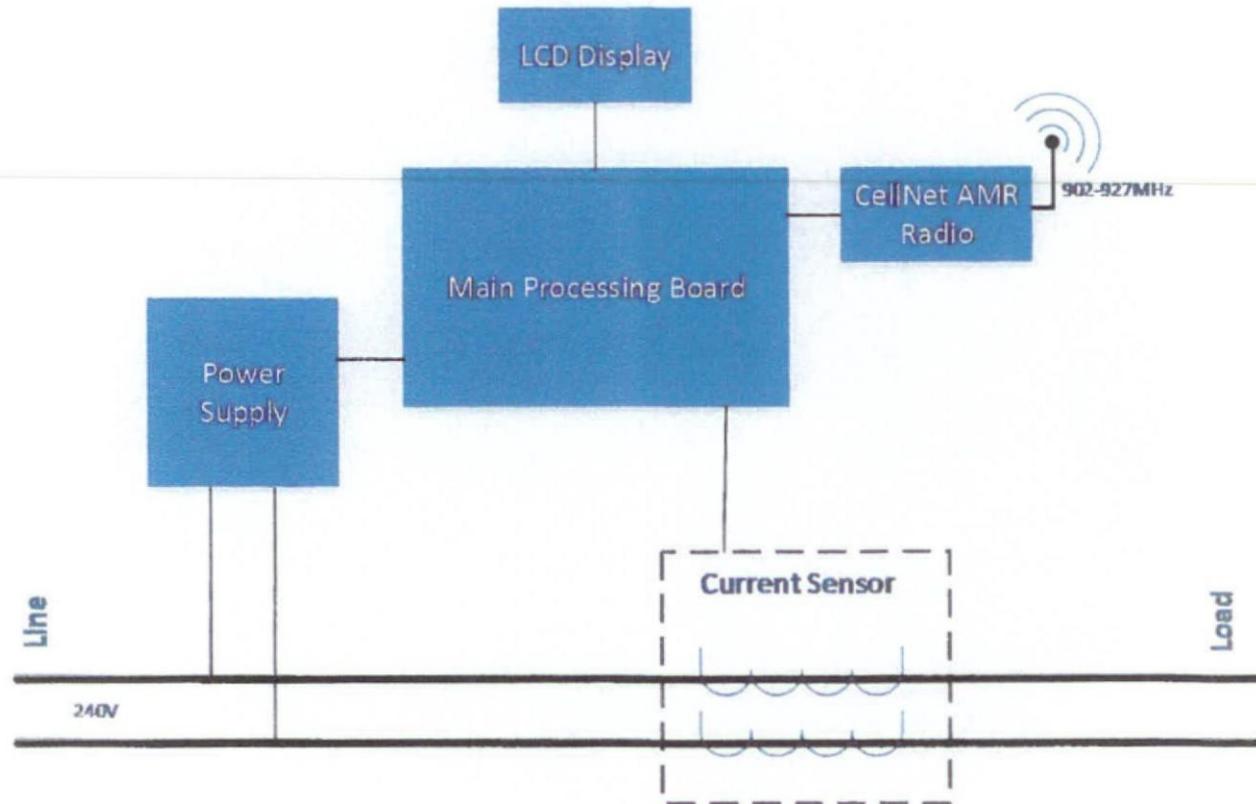
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AMR Meter Functional Block Diagram



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Exhibit GP-8

AMI Meter Functional Block Diagrams

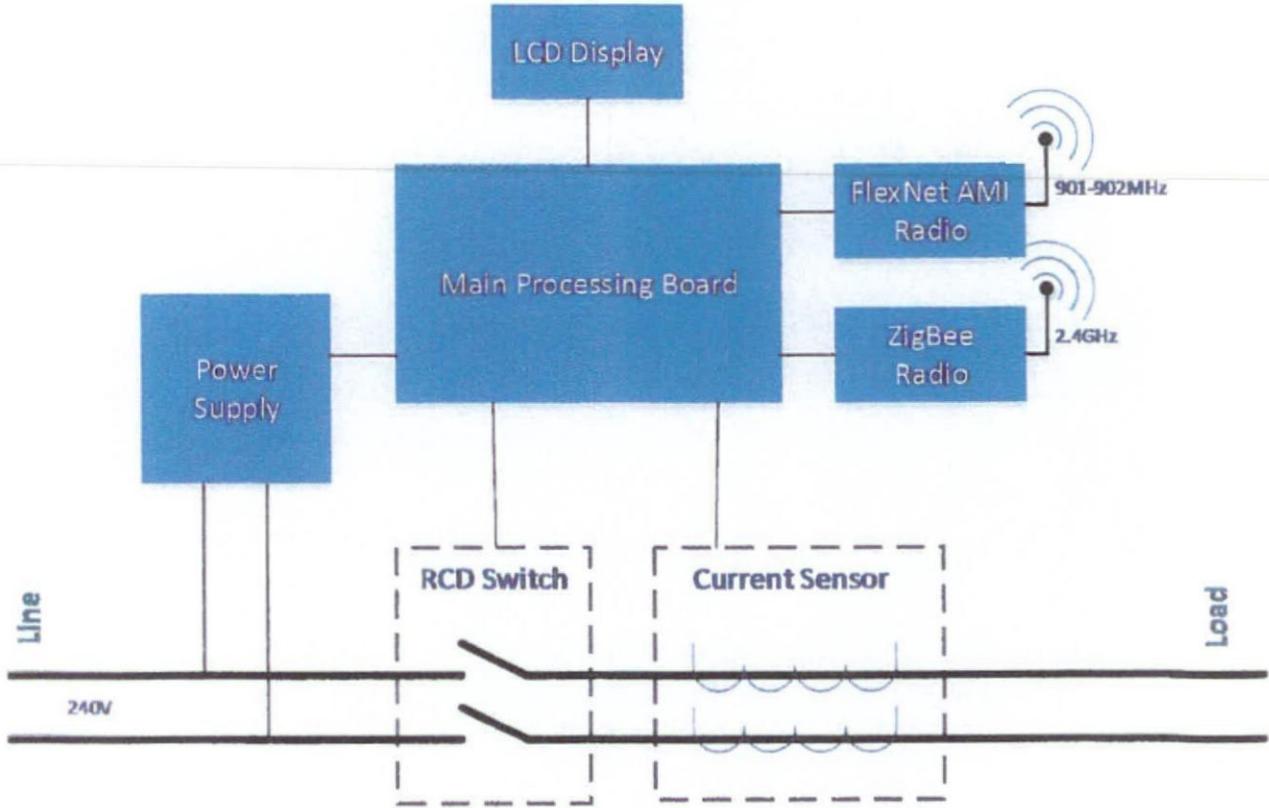
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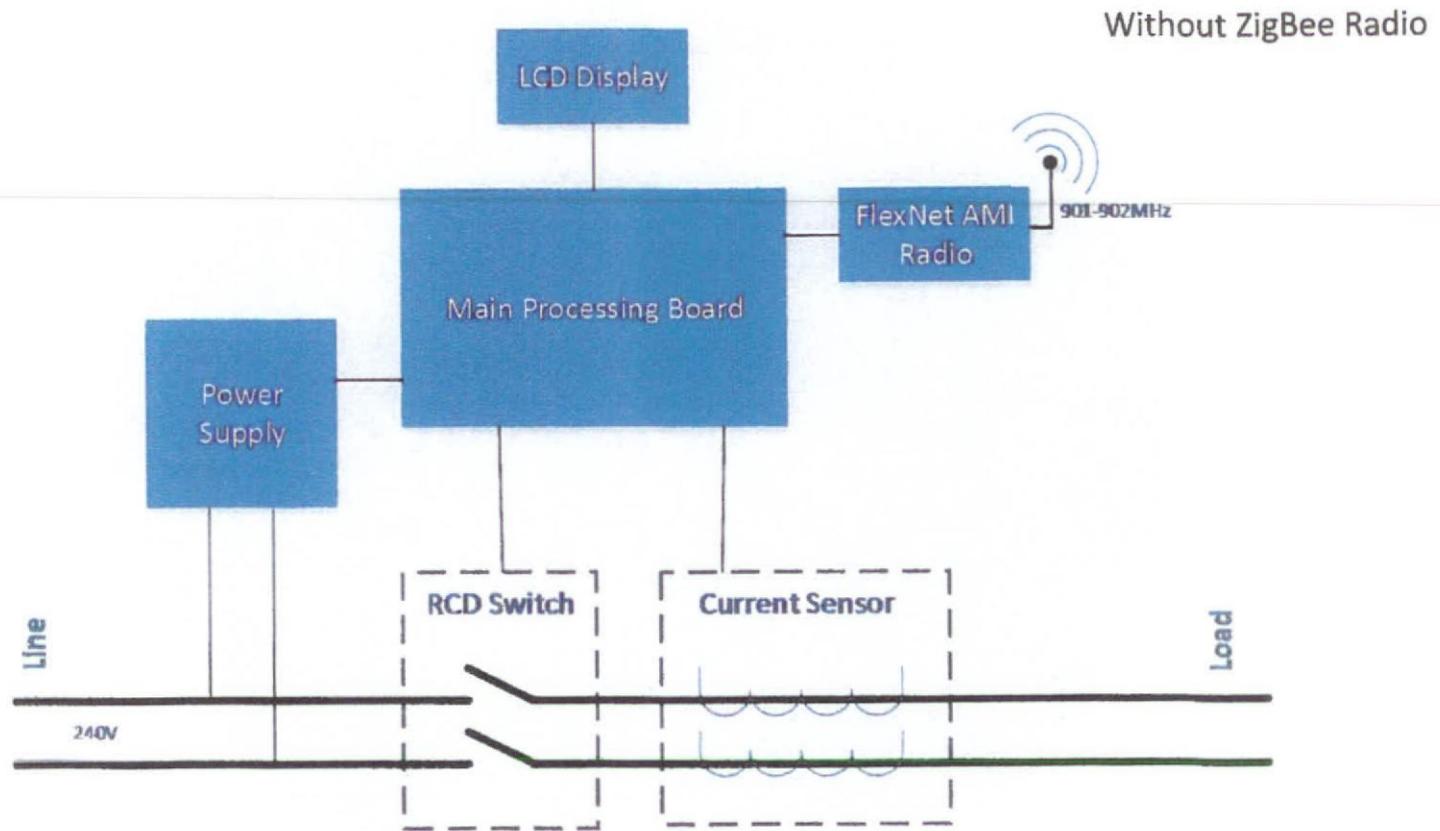
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AMI Meter Functional Block Diagram



AMI Meter Functional Block Diagram

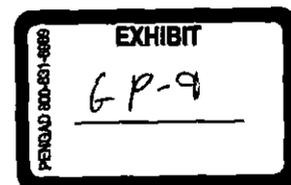


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Exhibit GP-9
Selected Tariff Rules

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**Exhibit GP-6
Select Tariff Rules**

3.2 METER LOCATION. There shall be provided, free of expenses to the Company, at a location outdoors, unless otherwise designated by the Company or another AMSP, which the Company or another AMSP will designate in writing upon request, a suitable place for the meter or meters and any other supply, protective or control equipment of the Company or another AMSP which may be required in the provision of service. The customer shall provide access and space, in an amount deemed necessary by the Company, to install and maintain its meter(s) and equipment. This location shall be convenient, unimpeded and easily accessible to the Company's employees, contactors and agents. The Customer shall also minimize any risk for damage and/or harm to the Company's employees, contractors, agents and equipment at the meter location. There also must not be any impediment or obstruction of the Company's ability to receive, an adequate communication signal from its meter(s) for remote reading purposes. The meter(s) location shall also be situated so that the meter(s) are not concealed, but shall be situated in a fashion acceptable to the Company.

3.4 SERVICE ENTRANCE EQUIPMENT. All equipment beyond the point of delivery, except the meter, shall be installed by the customer. Installation shall be in conformity with the National Electrical Code and the Company's published "Electric Service Requirements", and shall include, where necessary, an approved sealable device for mounting a meter. The meter will be supplied, owned and sealed by the Company or another AMSP.

6.2 SERVICE - SUPPLY ALTERATIONS. Changes related to a service-supply line or a meter owned by the Company, including the installation of protective devices or visual markers to denote safe operating distance from the Company's facilities, for the accommodation of the customer, shall be at the expense of the customer. If the alteration to the Company's facilities is temporary in nature and the materials used in that alteration can later be re-used by the Company, as for example the installation of protective "hard cover" to allow a customer, developer, or contractor to work safely in close proximity to the Company's facilities, then at the Company's discretion it may charge a refundable deposit in lieu of charging the customer for the cost of the re-usable materials.

10.5 RIGHT OF ACCESS. The Company's identified employees shall have access to the premises of the customer at all reasonable times for the purpose of reading meters, and for installing, testing, inspecting, repairing, removing or changing any or all equipment belonging to the Company. In the event of an emergency, the Company shall have the right to access customer owned facilities and equipment for the purpose of restoring electric service, for the purpose of rendering the electric facilities safe and reliable, or for the purpose of reducing the likelihood of damage to the Company's facilities and equipment.

14.1 SUPPLY OF METERS. An EGS that is also an AMSP may provide Advanced Meter Services in accordance with the Electric Generation Supplier Coordination Tariff. Otherwise, subject to Rules 14.3 and 14.9, the measurement of service for billing purposes shall be by meters furnished and installed by the Company. The Company will select the type and make of metering equipment to be used for meters supplied by the Company, and may, from time to time, change or alter the equipment, its sole obligation being to supply meters that will accurately and adequately furnish records for billing purposes. In fulfilling its obligations with respect to metering and meter reading, and with respect to AMSPs that provide Advanced Meter Services, the Company will comply with Electric Generation Supplier Coordination Tariff.

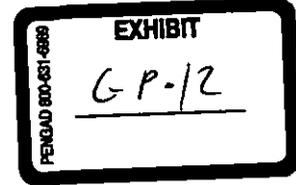
TCB

GRANT OF EQUIPMENT AUTHORIZATION

GP-12

TCB

Certification Issued Under the Authority of the Federal Communications Commission By:



Advanced Compliance Solutions, Inc. 5015 B.U. Bowman Drive Buford, GA 30518

Date of Grant: 04/17/2015

Application Dated: 04/17/2015

Sensus Metering Systems Inc. 639 Davis Drive Morrisville, NC 27560

Attention: Richard Daniel, Director, Engineering NPI and Project Management

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NOT TRANSFERABLE

EQUIPMENT AUTHORIZATION is hereby issued to the named GRANTEE, and is VALID ONLY for the equipment identified hereon for use under the Commission's Rules and Regulations listed below.

PA PUBLIC UTILITY COMMISSION SECRETARY'S BUREAU

FCC IDENTIFIER: SDBFLEXI210 Name of Grantee: Sensus Metering Systems Inc. Equipment Class: PCS Licensed Transmitter Notes: Remote Telemetry Module Modular Type: Single Modular

Table with 6 columns: Grant Notes, FCC Rule Parts, Frequency Range (MHZ), Output Watts, Frequency Tolerance, Emission Designator. Contains 20 rows of technical specifications.

Power listed is conducted. The antenna gain must not exceed 2.6 dBi. The antenna(s)

used for this transmitter must be installed to provide a separation distance of at least 20cm from all persons and must not be co-located or operated in conjunction with any other antenna or transmitter except in accordance with FCC multi-transmitter product procedures. Users and installers must be provided with antenna installation instructions and transmitter operating conditions for satisfying RF exposure compliance.

TCB

GRANT OF EQUIPMENT AUTHORIZATION

TCB

Certification
Issued Under the Authority of the
Federal Communications Commission

By:

Advanced Compliance Solutions, Inc.
5015 B.U. Bowman Drive
Buford, GA 30518

Date of Grant: 05/12/2016
Application Dated: 05/12/2016

Sensus Metering Systems Inc.
639 Davis Drive
Morrisville, NC 27560

Attention: Richard Daniel , Director, Engineering NPI and Project Management

NOT TRANSFERABLE

EQUIPMENT AUTHORIZATION is hereby issued to the named GRANTEE, and is VALID ONLY for the equipment identified hereon for use under the Commission's Rules and Regulations listed below.

FCC IDENTIFIER: SDBIDTB004
Name of Grantee: Sensus Metering Systems Inc.
Equipment Class: PCS Licensed Transmitter
Notes: Remote Telemetry Module
Modular Type: Single Modular

<u>Grant Notes</u>	<u>FCC Rule Parts</u>	<u>Frequency Range (MHZ)</u>	<u>Output Watts</u>	<u>Frequency Tolerance</u>	<u>Emission Designator</u>
	24D	901.0 - 902.0	1.2764	1.0 PM	5K00F1D
	24D	901.0 - 902.0	1.2764	1.0 PM	5K60F1D
	24D	901.0 - 902.0	1.2764	1.0 PM	5K90F1D
	24D	901.0 - 902.0	1.2764	1.0 PM	10K0F1D
	24D	901.0 - 902.0	1.2764	1.0 PM	11K3F1D
	24D	901.0 - 902.0	1.2764	1.0 PM	11K9F1D
	24D	901.0 - 902.0	1.2764	1.0 PM	4K80F2D
	24D	901.0 - 902.0	1.2764	1.0 PM	9K60F2D
	24D	930.0 - 931.0	1.2764	1.0 PM	4K70F1D
	24D	930.0 - 931.0	1.2764	1.0 PM	9K30F1D
	24D	930.0 - 931.0	1.2764	1.0 PM	5K90F1D
	24D	930.0 - 931.0	1.2764	1.0 PM	11K8F1D
	24D	940.0 - 941.0	1.2764	1.0 PM	4K70F1D
	24D	940.0 - 941.0	1.2764	1.0 PM	9K30F1D
	24D	940.0 - 941.0	1.2764	1.0 PM	5K90F1D
	24D	940.0 - 941.0	1.2764	1.0 PM	11K8F1D
	101C	928.85 - 929.0	1.2764	1.0 PM	5K00F1D
	101C	928.85 - 929.0	1.2764	1.0 PM	5K60F1D
	101C	928.85 - 929.0	1.2764	1.0 PM	5K90F1D
	101C	928.85 - 929.0	1.2764	1.0 PM	10K0F1D
	101C	928.85 - 929.0	1.2764	1.0 PM	11K3F1D
	101C	928.85 - 929.0	1.2764	1.0 PM	11K9F1D

101C	928.85 - 929.0	1.2764	1.0 PM	4K80F2D
101C	928.85 - 929.0	1.2764	1.0 PM	9K60F2D
101C	932.0 - 932.5	1.2764	1.0 PM	5K00F1D
101C	932.0 - 932.5	1.2764	1.0 PM	5K60F1D
101C	932.0 - 932.5	1.2764	1.0 PM	5K90F1D
101C	932.0 - 932.5	1.2764	1.0 PM	10K0F1D
101C	932.0 - 932.5	1.2764	1.0 PM	11K3F1D
101C	932.0 - 932.5	1.2764	1.0 PM	11K9F1D
101C	932.0 - 932.5	1.2764	1.0 PM	4K80F2D
101C	932.0 - 932.5	1.2764	1.0 PM	9K60F2D
101C	941.0 - 941.5	1.2764	1.0 PM	4K70F1D
101C	941.0 - 941.5	1.2764	1.0 PM	9K30F1D
101C	941.0 - 941.5	1.2764	1.0 PM	5K90F1D
101C	941.0 - 941.5	1.2764	1.0 PM	11K8F1D
101C	959.85 - 960.0	1.2764	1.0 PM	4K70F1D
101C	959.85 - 960.0	1.2764	1.0 PM	9K30F1D
101C	959.85 - 960.0	1.2764	1.0 PM	5K90F1D
101C	959.85 - 960.0	1.2764	1.0 PM	11K8F1D

Modular Approval. Power listed is conducted. This Modular Approval is limited to installation for mobile and fixed applications only. This grant is valid only when the device is installed by the grantee or contractors employed by the grantee who are instructed to ensure that the end-user has no manual instructions to remove or install the device. The transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter. Installers and end-users must be provided with transmitter operation conditions for satisfying RF exposure compliance.

Class II Change as described in this filing.

TCB

GRANT OF EQUIPMENT AUTHORIZATION

TCB

Certification Issued Under the Authority of the Federal Communications Commission By:

Advanced Compliance Solutions, Inc. 5015 B.U. Bowman Drive Buford, GA 30518

Date of Grant: 02/20/2013 Application Dated: 02/20/2013

Sensus Metering Systems Inc. 639 Davis Drive Morrisville, NC 27560

Attention: AI Servais , Reliability and Compliance Program Manager

NOT TRANSFERABLE

EQUIPMENT AUTHORIZATION is hereby issued to the named GRANTEE, and is VALID ONLY for the equipment identified hereon for use under the Commission's Rules and Regulations listed below.

FCC IDENTIFIER: SDBLGZ1000 Name of Grantee: Sensus Metering Systems Inc. Equipment Class: PCS Licensed Transmitter Notes: Flexnet L&G Focus transceiver with Zigbee Modular Type: Single Modular

Table with 6 columns: Grant Notes, FCC Rule Parts, Frequency Range (MHZ), Output Watts, Frequency Tolerance, Emission Designator. Rows include FCC Rule Parts 24D and 101C with corresponding frequency ranges and emission designators.

Modular Approval. Power listed is conducted. This Modular Approval is limited to installation for mobile and fixed applications only. This grant is valid only when the device is installed by the grantee or contractors employed by the grantee who are instructed to ensure that the end-user has no manual instructions to remove or install the device.

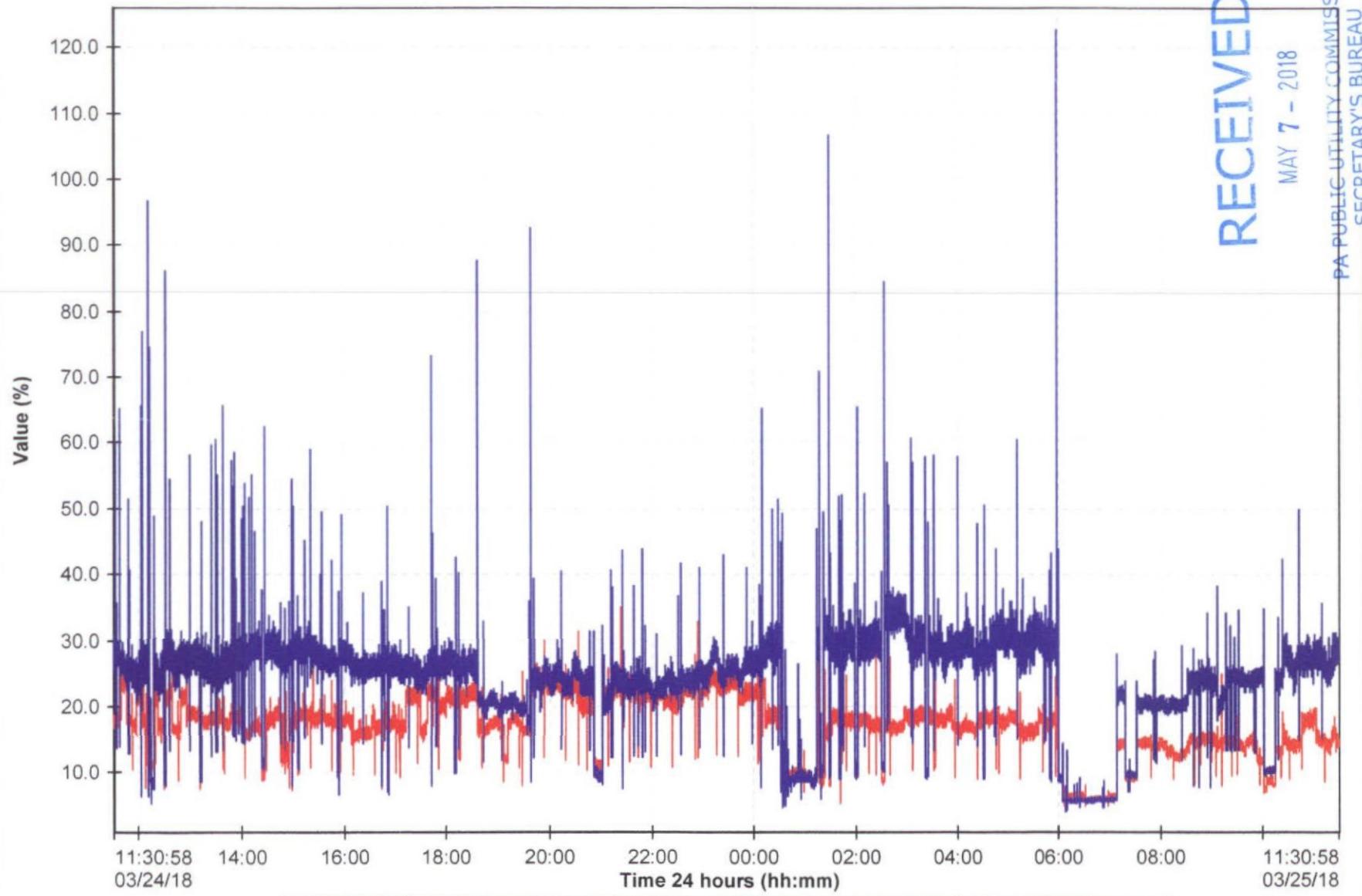
Class II Change as described in this filing.

EXHIBIT
 CP-13
 PENGAD 800-031-6888

View1

GP-13

258 Heyburn %THD (current)



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MAY 7 - 2018

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 SECRETARY'S BUREAU

	Maximum	Minimum	Average		Maximum	Minimum	Average
— % THD of Ia	64.2	4.7	17.0	— % THD of Ib	123.1	4.0	23.4

