STRATEGIC ANALYSIS OF CELLULAR M2M COMMUNICATION OPPORTUNITIES WITHIN THE SMART ENERGY INDUSTRY

by

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Abstract

This paper applies a strategic analysis framework to analyze a new market opportunity for Sierra Wireless within the smart energy industry. It considers the industry value chain and competitive forces that influence the market structure to identify opportunities and challenges. The core competence-based view of the firm recognizes the existing strengths and competitive advantages that Sierra Wireless can leverage for profitable growth within the market.

As different strategies are required for new and existing markets, this report identifies which of the existing competitive advantages Sierra Wireless should apply to the emerging smart energy market. Recommendations present strategy to manage, develop, and apply Sierra Wireless' core competencies.

Keywords: Strategy; Internal Analysis; External Analysis; Five Forces; Core Competence; Sierra Wireless; Smart Energy

Executive Summary

This paper analyzes the opportunity for Sierra Wireless in the smart grid energy industry and presents recommendations for market entry strategy. Sierra Wireless is a world leader in the cellular wireless data communications industry and continues to seek new markets for profitable growth. Cellular machine-to-machine (M2M) communication represents one of Sierra Wireless' key corporate target market segments and refers to the automated ability of electronic devices to communicate directly with each other. While cellular M2M solutions are marketed towards a wide range of industry sectors, this paper posits that the greatest opportunity lies within the smart energy vertical market segment.

The global energy market faces a convergence of challenges to meet the ever-increasing demand through an aging power grid infrastructure. Smart energy technology presents solutions to these challenges through modern information and communication technology applications, including cellular M2M. The opportunity is substantial, as industry forecasts predict the number of worldwide machine-to-machine device connections to grow from an estimated 62 million in 2010 to over 2.1 billion in 2020, with over 1.3 billion of these connections represented within the smart energy market.

This report analyzes the industry structure of the energy market as it transitions from a highly centralized asset model, controlled largely by the utility supplier, towards a more distributed value chain. The analysis identifies significant opportunity for Sierra Wireless to operate as a technical partner within this ecosystem, given that there are too many new communication technology requirements in the emerging smart grid for utility companies to handle on their own. Furthermore, utility supply firms typically operate within a highly regulated industry subject to significant government oversight and, as such, most are ill equipped to adapt to the fast-paced development of cellular communications technology and the responsibility of designing consumer-based products.

Internal analysis of Sierra Wireless identifies the strategic assets and core competencies that can be leveraged into competitive advantage within the smart energy industry. Specifically, Sierra Wireless' product quality, wireless communication development expertise, culture of both

innovation and customer-focus, and experience in acquisition and integration position the firm to capture significant value. However, it is also recognized that the core competencies that have enabled success for the firm thus far may not be the same as those required for new market entry. To this end, this paper recommends strategy to manage, develop, and apply the appropriate core competencies to profitably maximize cellular M2M communication opportunities and further expand the firm's leading market share.

Success within the smart energy market for Sierra Wireless will depend upon the confluence of appropriately developed corporate and business strategies that deliberately match the strengths of the firm to the needs of the market. However, beyond establishing clear goals and corporate objectives, good strategy must also honestly acknowledge the specific market challenges and establish the firm's appropriate response to overcoming the obstacles. Without a detailed understanding of the challenges and opportunities presented by the smart energy market, Sierra Wireless is unlikely to activate the resources and core competencies required to succeed.

Dedication

To my wife Melinda and son Riley, for their continual patience, understanding, and never-ending support through too many long days and late nights.

Acknowledgements

I would like to acknowledge the contributions, support, feedback, and guidance received from both my colleagues at Sierra Wireless and classmates within the Management of Technology MBA program.

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Glossary

2G	2nd Generation
3G	3rd Generation
3GPP	3rd Generation Partnership Project
4G	4th Generation
AMI	Advanced Metering Infrastructure
GSM	Groupe Spécial Mobile, later Global System for Mobile communications
HAN	Home Area Network
HSPA	High Speed Packet Access
HSPA+	HSPA Evolution or HSPA Plus
LAN	Local Area Network
LTE	Long Term Evolution
M2M	Machine to Machine
OEM	Original Equipment Manufacturer
PLC	Power Line Carrier
RF	Radio Frequency
SMS	Short Message Service
USB	Universal Serial Bus
VOIP	Voice Over Internet Protocol
WAN	Wide-Area Network
Wi-Fi	Wireless Fidelity, commonly references wireless local area network based on 802.11x standard
ZigBee	Short-range wireless communication protocol developed by the ZigBee Alliance and standardized as IEEE 802.15.4

1 Introduction

This paper analyzes a new market opportunity for Sierra Wireless in cellular broadband communications and presents recommendations for market entry strategy. Sierra Wireless is the current world leader in the cellular machine-to-machine data communications industry and continues to seek profitable growth from emerging markets. One such market of interest is the smart grid energy market. This report presents an external analysis of this specific vertical market segment to identify the industry value chain and influential competitive forces. Then, through the lens of Prahalad and Hamel's core competence-based view of the firm (1990), an internal analysis identifies and aligns Sierra Wireless' competitive advantages to the market requirements and opportunities.

Data presented within this report was gathered through a combination of primary and secondary research methods. Primary interviews with key representatives from Sierra Wireless management, cellular M2M module developers, and product managers provided much of the context for the company history, market opportunities, and internal analysis of the firm. Secondary research included the examination of publicly available financial documents, product data sheets, vendor and customer web sites, whitepapers, and industry market reports that the author judged to be reliable.

The first chapter introduces Sierra Wireless through a brief history of the company and an overview of the relevant cellular communications technologies developed and marketed by the firm. Details of Sierra Wireless' product and service portfolio and corporate target markets provide further context for the current operating state of the firm.

Chapter 2 focuses on the machine-to-machine communications (M2M) industry, one of the key markets for Sierra Wireless. Details of the core technology elements of M2M communications and the predominant industry drivers and challenges highlight the opportunities for Sierra Wireless' product and service portfolio. Comparison of the key industry vertical markets reveals a particularly strong cellular broadband communication opportunity within the smart grid energy market.

An external analysis of the smart energy market with respect to wireless M2M communication technologies is discussed within Chapter 3. This chapter presents a thorough

understanding of how the competitive structure of the smart grid technology may influence and shape the future strategy of Sierra Wireless. An overview of the three application categories of the smart grid energy market highlights the core benefits for both consumers and the utility suppliers. Thus, through the examination of the industry structure, value chain, and competitive forces this chapter endeavours to expose the key industry partner relationships and values that will provide profitable growth opportunities for Sierra Wireless.

Chapter 4 examines the core competencies of Sierra Wireless as the foundation for an appropriate strategy to address the smart grid energy market. The internal analysis presents an understanding of how a company's strategic resources and capabilities combine to serve as the source of the firm's core competencies. Identifying and understanding these core competencies is a key step in the formulation and implementation of any proper strategy. The chapter presents the core competencies of Sierra Wireless both as possible sources of competitive advantage and as they relate to meeting the specific needs of the smart grid energy market.

Finally, Chapter 5 presents several strategic recommendations for Sierra Wireless senior management based upon a combination of the preceding external analysis of the smart energy market and the internal analysis of the firm. This report provides recommendations with specific regard to the management, development, and application of Sierra Wireless' core competencies to gain competitive advantage within the smart energy cellular M2M communications industry.

This report presents an initial strategic analysis of the smart grid energy market as it aligns with the cellular M2M communications industry. As such, a detailed business plan outlining the specific actions for execution and implementation by Sierra Wireless falls outside the scope of this particular report. However, should Sierra Wireless senior management commit to the targeted pursuit of the smart grid energy market, subsequent implementation plans would be well-served by the strategic analysis contained within this report.

1.1 Sierra Wireless Inc.

Sierra Wireless is a global leader in the wireless communications solutions industry, providing voice and data services through wireless cellular technologies. Sierra Wireless designs, manufactures, markets, and supports integrated hardware and software solutions for mobile broadband cellular modems.

Founded in 1993, Sierra Wireless has a rich history in the development of wireless data device technology. From humble beginnings as one of the pioneering technical champions of

cellular digital packet data (CDPD), Sierra Wireless is now world renowned for its strong technology leadership position and its reputation for high quality, first-to-market devices.

Headquartered in Richmond, British Columbia, Sierra Wireless employs a global workforce with research and development centres in Canada, China, France, Hong Kong, and the United States. Satellite sales and support offices provide local representation in over twelve countries around the globe.

In early 2009, Sierra Wireless completed the acquisition of Wavecom S.A., a global leader in machine-to-machine solutions, headquartered in Issy-les-Moulineaux, France. The acquisition and subsequent integration of Wavecom significantly expanded Sierra Wireless' presence within the global M2M market. In addition to a broadened product offering, the acquisition also significantly increased the size and representation of the firm within both European and Asian markets. A key strategic component of the Wavecom acquisition was to diversify both the product and key customer portfolio to reduce Sierra Wireless' reliance on a concentration of key operators within the mobile computing business line. The combined company now operates under the Sierra Wireless brand.

In late 2010, following integration, Sierra Wireless implemented a new corporate organizational structure to align the company into three business units to reinforce a customer-centric focus on the firm's primary corporate markets. The restructuring aimed to sharpen focus on distinct industry opportunities and accelerate profitable growth within these markets. Dedicated sales, marketing, and research and development teams within each business unit brought teams closer to their customers. However, corporate strategy emphasizes that each of the three business units still operate under the values, organizational culture, and the strength of one company. Utilizing shared core wireless technologies, an integrated supply chain, and a highly competitive scale, each business unit leverages the global presence of Sierra Wireless.

As of year-end, 2010, Sierra Wireless had 880 full time employees globally with more than half of the employees involved in product development. A further fifth of the workforce provided sales and support, with the remaining employees split among manufacturing, marketing, administration, and finance. The corporate head office in Richmond, British Columbia houses over a quarter of the total global workforce, with the remaining balance distributed throughout Asia, Europe, and North America (Sierra Wireless, Inc., 2011).

In 2010, Sierra Wireless achieved record annual revenue of $650.3 million, up from $526.4 million in 2009 (Sierra Wireless, Inc., 2010). Further breakdown and analysis of the revenue contribution from key product lines and market segments follows in subsequent sections.

1.2 Mobile Broadband Device Technology

Cellular data modems were first commercially available in the early 1990s, but sales were relatively low, due largely to slow network data throughput speeds and the low market demand for portable computing. Initial cellular networks provided data services through a patchwork of overlaid protocols such as CDPD, with speeds of 8 to 14.4 kbps before the evolution of 2G, 3G, and today's 4G cellular technologies shifted network focus to data performance and network signalling efficiency.

Mobile broadband data technology has its roots in the evolution and convergence of two separate technologies – digital data transmission and wireless voice communications. In the 1970s, early computers and modems allowed for the transmission of data over telephone networks to connect computers and establish the early internet. Modems were specific hardware devices to encode and decode the digital data transmissions over analog voice telephone systems.

Then, in the 1980s, telephone services began to appear over wireless technologies, with car-phones and the first cellular telephones beginning to emerge. Initially digital data was encoded and modulated into a series of tones and sounds over wireless voice networks in much the same way as initially performed on traditional wired telephone systems. Soon, with the introduction of portable computers, personal data assistants, and pagers, the demand for mobile data began to grow and significant efforts to raise the spectral efficiency of wireless data transmission were made.

As mentioned, CDPD, developed in 1993, was one of the first wireless protocols designed for cellular data, with Sierra Wireless a key contributor in the development of the open specification. Over the next several decades, wireless cellular protocols continued to evolve as did the demand for mobile data and devices.

Today's wireless data service via cellular networks provide data throughput at speeds rivalling traditional high-speed wired broadband service. Key 2G and 3G cellular technologies vary by geographic region, with GSM and WCDMA prevalent in Europe and Asia, while CDMA has dominated North America. However, the industry is working towards standardization of

communication protocols. Today, 3G HSPA+ and 4G LTE technologies are developed and implemented globally by a variety of network operators.

Interestingly, the next generation of 4G wireless communication protocols have supplanted the analog voice protocols with the all-digital implementation of voice-over-IP. This represents a revolutionary reversal of roles, whereas data services were initially "fit-over-top" of cellular voice networks, modern 4G networks now digitize voice communications and essentially the entire network is comprised of packet data.

1.3   Products and Services

Sierra Wireless develops and markets a wide range of wireless products that include consumer mobile broadband devices, embedded modules, ruggedized intelligent gateways, and an innovative cloud-based software services platform. Sierra Wireless markets these mobile solutions under four brand initiatives for the mobile broadband data industry: AirCard® Mobile Broadband Devices, AirPrime™ Embedded Wireless Modules, AirLink™ Intelligent Gateways and Routers, and the AirVantage™ M2M Cloud Platform.

1.3.1   AirCard® Mobile Broadband Devices

The AirCard® Mobile Broadband device family is a product line of portable, external cellular modems designed for the mobile consumer. Available in a variety of convenient and standardized form factors such as USB, PC Card, and ExpressCard modems, as well as mobile Wi-Fi hotspots, the AirCard® device family provides an easy way for consumers to connect portable electronic devices such as notebook, netbook, and tablet computers to the mobile internet.

Sierra Wireless sells the AirCard® devices to wireless operators around the world and holds strong positions with AT&T, Telstra, Sprint, and CLEAR networks. The AirCard® device family is designed for ease of use, consistent reliable performance, and durability. Sierra Wireless has a strong technology leadership reputation for offering first-to-market support for the latest cellular technologies with reliable, high-quality products. Sierra Wireless recently received international recognition for offering the world's first and fastest mobile broadband USB modems for HSPA+ networks in 2009, dual-channel HSPA+ networks in 2010, and the ongoing activation of LTE networks in mid-2011.

The AirCard® device family support all of the major mobile broadband technologies, including LTE, HSPA+, HSPA, EV-DO, WiMAX, and Wi-Fi, across each of the various frequency bands around the world. The primary competitors within this consumer mobile broadband device market include ZTE Corporation, Huawei Technologies, and Novatel Wireless. In 2010, sales of AirCard® mobile broadband devices generated $291.5 million in revenue and contributed 45% of Sierra Wireless' total annual revenue (Sierra Wireless, Inc., 2010).

1.3.2 AirPrime™ Embedded Wireless Modules

AirPrime™ Embedded Wireless modules offer a wide variety of cellular network support and processing functionality for original equipment manufacturers (OEMs) worldwide. From surface mount modules to the standardized PCI Express MiniCard form factor, the AirPrime™ embedded modules are integrated into mobile computing and M2M product designs to suit a variety of wireless connectivity needs.

AirPrime™ embedded modules are sold to a wide range of global OEMs, including Tier 1 and Tier 2 manufacturers of personal computers, e-readers, payment terminals, network routers, and automobiles. Sierra Wireless created the embedded wireless module product line following the acquisition of AirPrime Inc. in August of 2003. The AirPrime™ product portfolio expanded significantly following the acquisition and integration of Wavecom S.A. in February 2009. Wavecom had a strong product line of machine-to-machine modules for use within automotive applications in the European and Asian markets.

The primary competitors for the AirPrime™ embedded modules include Gemalto NV, Telit Communications, SIMCom Wireless Solutions, Ericsson, Novatel, and Huawei. In 2010, sales of AirPrime™ wireless embedded modules generated $297.9 million in revenue, up from $181.4 million in 2009, and contributed 46% of the total annual revenue (Sierra Wireless, Inc., 2010).

1.3.3 AirLink™ Intelligent Gateways and Routers

The AirLink™ device family offers a diverse range of ruggedized gateways, routers, and modems for various enterprise, industrial, and in-vehicle applications. These industrial-grade devices offer low-cost, programmable functionality with serial, Ethernet, and Wi-Fi connectivity options with support for both 2G and 3G cellular technology.

Sierra Wireless markets and sells the AirLink™ intelligent gateway products to distinct customer segments in public safety, transportation, field service, energy management, and

industrial markets. For example, within the police service application of the public safety segment, AirLink™ intelligent gateway devices enable secure, in-vehicle access to department resources throughout the mobile fleet.

In May 2007, Sierra Wireless acquired and integrated AirLink™ Communications, based in California, United States, to create the AirLink™ device product family. Primary competitors for the AirLink™ product line include Digi International, BlueTree Wireless Data, CalAmp, and Multi-Tech Systems. In 2010, AirLink™ Intelligent Gateways and Routers contributed $48.6 million to the total revenue, up from $41.0 million in 2009, and representing 7% of the total annual revenue (Sierra Wireless, Inc., 2010).

1.3.4   AirVantage™ M2M Cloud Platform

The AirVantage™ M2M Cloud Platform offers a comprehensive platform for managed development, deployment, and remote operation of machine-to-machine applications. The Sierra Wireless AirVantage™ platform hosts a powerful set of M2M application development tools and web services applications to support rapid development and integration for complete end-to-end M2M service solutions. The platform offers cellular subscription management and remote device management for supported AirPrime™ and AirLink™ products. The AirVantage™ software services are secure, scalable, and compatible with a broad range of Sierra Wireless mobile broadband devices and cellular technologies.

Sierra Wireless sells the AirVantage™ software and solutions platform to application providers, OEMs, and wireless operators around the world to accelerate deployment of complete M2M solutions. Anyware Technologies originally developed the technology behind the AirVantage™ M2M Cloud Platform, prior to acquisition by Wavecom in 2008. Upon the acquisition and integration of Wavecom with Sierra Wireless in 2009, the company discontinued the Anyware brand and re-launched the M2M software service and solution package under the AirVantage™ brand initiative.

The primary competitors for the AirVantage™ services and solutions platform include nPhase, Jasper Wireless, and Axeda Corporation. In 2010, AirVantage™ Services and Solutions generated approximately $12.2 million in revenue and contributed 2% of the total annual revenue (Sierra Wireless, Inc., 2010).

1.4 Target Markets

The Sierra Wireless corporate strategy focuses on addressing two key markets within the cellular broadband communications industry to pursue strong growth and improved profitability: Mobile Computing and Machine-to-Machine communications. Sierra Wireless anticipates significant growth within each of these markets as the number of devices and services utilizing cellular wireless data continue to increase. By addressing each market with two or more of the core product and service lines discussed previously, Sierra Wireless is able to leverage core device technology, an integrated supply chain, global R&D, sales and technical support between these key markets.

1.4.1 Mobile Computing

The mobile computing segment delivers wireless data devices to both enterprise and consumer markets to enable mobile broadband access to the internet. Mobile broadband can serve as a both a complement and substitute for traditional fixed broadband internet service, enabling a mobile workforce with broader access to email and corporate applications. Sierra Wireless addresses the mobile computing market through the AirCard® mobile broadband device family as well as a portion of the AirPrime™ embedded wireless module product line targeted towards personal computing OEMs.

Within this market, Sierra Wireless represents an industry leader in new air interface standards, including the latest 4G wireless technologies such as HSPA+, LTE, and WiMAX. Working closely with cellular network operators such as AT&T, Sprint Nextel, Telstra, and with OEM customers, Sierra Wireless is consistently first-to-market with new mobile broadband devices that provide high performance mobile internet connectivity for end consumers.

Sierra Wireless' strategy for the mobile computing market segment is to secure and defend the firm's leading position by focusing efforts on key wireless operator customers. Sierra Wireless leverages innovation and experience gained from driving the latest cellular device technologies through lead customers by opportunistically pursuing secondary launches of proven technology with smaller wireless operator customers. New applications within the mobile computing market, such as tablet computers, continue to present profitable opportunities for mobile broadband devices.

In 2010, the mobile computing business line contributed $317.9 million in sales, up 3% from $309.9 million in 2009. Mobile computing sales represented 49% of the total company

revenue in 2010. Interestingly, as recently as 2008, the mobile computing business line contributed nearly 84% of Sierra Wireless' total revenue of $567.3 million revenue. This shift reflects the deliberate and successful corporate strategy to reduce the firm's dependency upon a single business line with a handful of industry partners (Sierra Wireless, Inc., 2010).

1.4.2   Machine-to-Machine

Machine-to-machine communication technology, or M2M, refers to the capability of devices to communicate data autonomously for remote measurement, management, and control. From its roots in proprietary telemetry solutions, M2M technology has expanded across a multitude of industries and applications. From fleet management to security systems, remote data collection and offsite diagnostics and maintenance, wireless M2M offers significant flexibility in mobility and the widespread availability of cellular networks.

Within the M2M communications market, Sierra Wireless is a global market leader and continues to invest in its product and service portfolio to both expand its offering and to grow market share. The wireless M2M market is still early in its technology adoption curve and continues to offer significant profitable growth opportunities. However, given the competitive nature of the wireless industry, the future success of Sierra Wireless in this market will hinge upon its ability to continue to develop differentiated products and services that meet the evolving technology, design, and price requirements.

Sierra Wireless' strategy for this market is to expand its position in the M2M value chain through offering complete solutions and services for OEMs, industry partners, and operators. By leveraging technological developments across several key vertical segments in the M2M market, Sierra Wireless aims to further expand its leading market share and become the M2M provider of choice.

In 2010, sales in the M2M business line contributed $332.4 million to revenue, contributing 51% of total company sales. This value also represents an increase of 54% from $216.5 million reported in 2009 (Sierra Wireless, Inc., 2010).

2 Market Overview

This chapter presents an overview of the machine-to-machine communications industry, one of Sierra Wireless' key corporate target market segments. In recent year, Sierra Wireless has experienced significant growth within the market, due in large part to the acquisition and integration of Wavecom S.A. in early 2009. Sierra Wireless continues to focus on emerging markets and opportunities within the M2M communications industry. This chapter reviews the core technology elements, the predominant market drivers and challenges and introduces the key vertical markets within the machine-to-machine communications industry. The key cellular M2M applications and segment forecasts provided were garnered from secondary market research reports.

The chapter concludes with a discussion on why the smart grid energy market segment is of particular interest to Sierra Wireless, thus setting the stage for the forthcoming analysis presented throughout the remainder of this report.

2.1 Machine-to-Machine Industry

Machine-to-machine (M2M) communication technology refers to the automated ability of electronic devices to communicate directly with each other, without the need for human intervention. Many of today's everyday products have embedded digital microprocessors, sensors, and communications to facilitate this information exchange. The data transmission can be through either wired or wireless connections; however, the term M2M most commonly refers to wireless implementations.

Evolved from telemetry, a technology that allows the remote measurement and reporting of information, examples of M2M applications are now evident across nearly every industry. Prophesized as the next evolution of the information age, soon nearly any device or machine will be capable of discreetly gathering and sharing information to impact and optimize the world around us. Many of the initial applications are already in place, such as the automated recording and transmission of video and photographic evidence against speeding automobiles from traffic cameras. As will be presented, M2M offers a variety of distinct capabilities and value propositions throughout a wide range of key market segments.

Early cellular M2M examples included automated paging and Short Message Service (SMS) to notify field service personnel of a remote event or alarm that required manual attention and reaction. These initial service implementations were typically one-way communications systems that required a human operator to receive, interpret, and respond to the event notification. Today's M2M solutions have evolved to require two-way communication features. That is, M2M devices must not only be capable of automatically transmitting event notifications but must also be able to receive instructions and requests for action based on the remote, automated analysis and processing of the information by software algorithms operating on central servers.

Specific characteristics of the wireless M2M communication industry serve to shape the market requirements. For example, M2M does not typically need high data rates, but applications instead rely upon the consistent, scheduled transmission of discrete amounts of data. The periodic reporting of diagnostic status information or an asynchronous alert of an error or alarm represents the typical application solutions of the M2M industry. These features place a premium on quality and reliability, rather than the maximization of throughput speeds with the latest cellular technology.

Cellular M2M applications operate over the wireless data service protocols of public cellular telephone networks. The entire range of 2G, 3G, and 4G communication technologies enable this connectivity, including GSM, GPRS, CDMA, HSPA, LTE, WiMAX and Wi-Fi, with a range of communication throughput speeds and data management features available across each of the technologies. In general, wireless M2M operations can occur over a relatively short range, or across a distance of many kilometres. There exist a variety of communication technologies and networks to suit each solution, with cellular solutions typically marketed towards long-range service applications.

Not surprisingly, each of the world's leading cellular network operators are actively promoting and advancing the use of cellular wireless for M2M applications. Largely due to the pervasiveness of the cellular network coverage and the ever-lower costs for both data services and modules, cellular has become the network of choice for a wide array of M2M segments.

It is worth noting that both wired and wireless communication technologies can often compete for the same applications. However, wireless technologies offer a distinct advantage for applications that demand either mobility or adaptability to harsh environments. Depending upon the requirements of the application, wireless M2M communication solutions can span a variety of wireless network technologies, from satellite to cellular to Wi-Fi.

The variety of devices capable of wireless communications extends far beyond the traditional portable computers and cell phones to which consumers have become accustomed. Today, virtually every electronic product has inherent data processing capabilities and the potential to be networked; from vending machines to billboards to elevators. The advancement of digital technology, combined with increased coverage of wireless networks, an accelerated adoption of information technology systems, and a continually decreasing cost for embedded communications and processing hardware has significantly strengthened the business case for M2M solutions. As machines are increasingly capable of analyzing and interpreting data autonomously, the need for human intervention is further reduced, allowing for lowered costs, increased productivity, and optimized processes.

2.1.1   Industry Value Chain

Wireless M2M communications solutions are fundamentally composed of three core elements – devices, networks and applications. As M2M communication solutions are extremely complex, they often demand cooperation from many technical partners in a variety of diverse roles. It is therefore vitally important for businesses within the cellular communication community to understand the potential effects of the relationships required and how to best to position themselves today for opportunities in new or emerging markets.

Cellular M2M devices enable machines to reply to remote requests for data and transmit data autonomously. Based on cellular chipset technology, devices are generally packaged as modules that form part of an M2M terminal to be integrated within the complete product. Networks serve as the communication link between devices and utilize public cellular infrastructure. Applications for M2M solutions include consumer electronics, automotive telematics, fleet management, smart metering, each of which are presented in the subsequent discussion of the key M2M vertical markets. Figure 2.1, below, illustrates the core elements of the cellular M2M communications solutions.

Figure 2.1   Cellular M2M Solution Core Elements
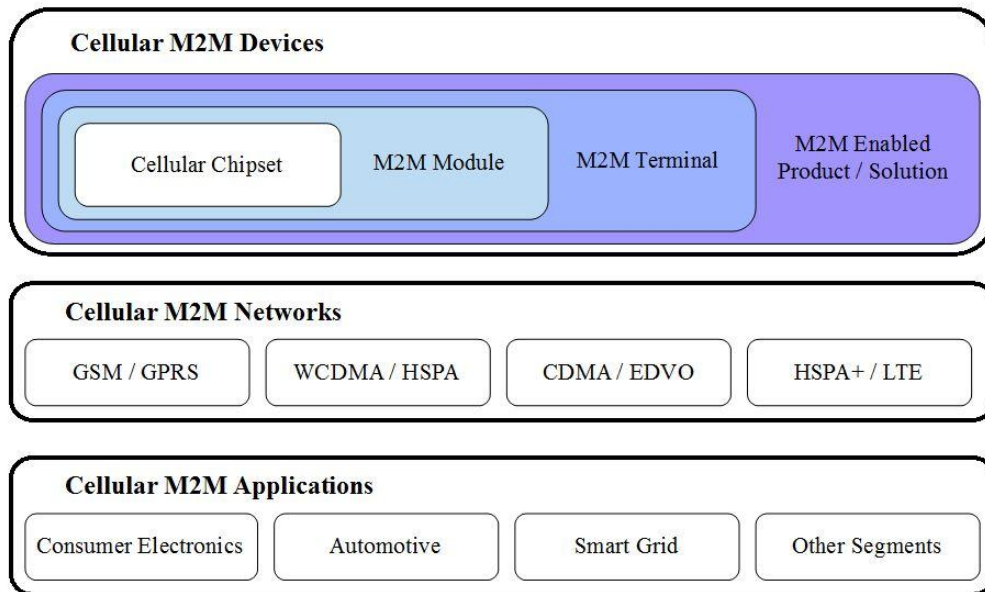
Source: Adapted from Berg Insight, 2009.

2.1.1.1   M2M Devices

Wireless cellular M2M modules are communication devices embedded into product designs to enable the sending and receiving of data and voice transmission via cellular networks. Today, wireless modules are available in many standard form factors for easy integration into countless applications and are available for all major cellular network standards.

Above, Figure 2.1 illustrates the hierarchy of M2M cellular communication devices. At the core of all wireless M2M devices is the cellular chipset technology, utilizing the same technology as other cellular devices such as mobile handsets and USB-modems. As product development at the chipset level is extremely complex and time consuming, most vendors, including Sierra Wireless, also embed the cellular chipset technology into M2M modules. Modules provide wireless M2M communication features in a standard form factor package for easy integration into circuit board designs. In many cases, the module is designed into an independent M2M terminal modem, which is then in turn integrated within the final solution.

Sierra Wireless operates across the entire device value chain. For example, Sierra Wireless incorporates the cellular chipset technologies from key suppliers directly into the design of the consumer mobile AirCard® device family of USB modems and mobile hotspots. Similarly, the cellular chipsets are also foundation for the discrete embedded wireless modules

available for OEM customers through the AirPrime™ product line. The AirLink™ device family of ruggedized cellular gateways and routers further integrates the AirPrime™ cellular data modules into a standalone cellular product solutions with additional functionality. Finally, the AirVantage™ service platform combines the AirPrime™ embedded module technology with device management software to provide a complete end-to-end cellular M2M communications application solution.

Examples of the various form factors available from Sierra Wireless include PCI Express Mini Card to surface-mount modules, with a variety of cellular technologies supported for operation in each of the global radio bands. The various form factors are designed to meet the diverse demands of M2M applications, from extremely power efficient, small modules to rugged, shock resistant models capable of operating in extreme temperature conditions.

The cellular M2M module offers significant advantages for integrators further down the value chain. Module manufacturers such as Sierra Wireless are typically responsible for the approval and certification of the cellular module against regulatory bodies, network operator requirements, and government product and radio safety bodies. Module integrators then reference these module approvals and certifications within their designs, translating into significant time and cost savings for OEM designers integrating proven wireless communication functionality for faster time to market.

2.1.1.2   M2M Networks

Virtually any communication network can accommodate M2M applications, from fixed-line networks to short and long-range wireless. From a network perspective, M2M communication has several unique characteristics. The life cycle of an M2M device is often far longer than a typical consumer device and expectations often exceed 10 years. Additionally, the data messages typically contain limited content and are transmitted in short bursts, thereby requiring low bandwidth. However, uninterrupted service availability is extremely important, as typical applications often include the notification of alarms or critical system messages.

As of 2009, the 2G GSM-family of cellular technologies dominated the global cellular M2M industry with a market share of over 90 percent. As illustration of cellular M2M communication market size, at that time there were over 3.8 billion active mobile subscriptions in 220 countries, operating across more than 700 wireless networks (Berg Insight, 2009). While there are significant regional differences and variations in the network availability and allocation

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of radio frequencies, the core cellular technology in the GSM-family of radio communications is common, simplifying the development and deployment of devices worldwide.

Beyond public cellular operator technologies and networks, there exist a host of other viable M2M networks. From simple SMS-only implementations, to satellite, to the license-free industrial, scientific, and medical radio frequency bands. In fact, it is common for wireless M2M solutions to span and include any number of network technologies to offer a complete end-to-end solution. For example, in many applications, local or home area networks are often used as the "last mile" link for individual users while cellular operator networks connect aggregation points over longer distances to a central server.

2.1.1.3   M2M Applications

In the space of a few decades, M2M communication technology has found a multitude of solution applications across nearly every industry sector. Many M2M communication solutions have specific application requirements, such as the use of GPS in automotive telematics and fleet management. These requirements serve to differentiate and segment the cellular M2M communication industry into distinct vertical markets. Subsequent sections of this report detail the key cellular M2M vertical markets and include examples of the dominant applications within each segment.

2.1.2   Industry Drivers

A variety of trends and market characteristics are shaping the growth of the global cellular M2M communications industry. The cellular M2M opportunity is reaching a new level of maturity with a substantially greater recognition of the technological capabilities and potential benefits of connected devices. The discussion below identifies the primary industry drivers as recognized by Sierra Wireless representatives.

Cellular coverage is expanding aggressively worldwide; according to a recent International Telecommunication Union report, approximately 90% of the world population have access to mobile networks, with an estimated 5.3 billion mobile subscriptions worldwide (ITU, 2010). With the cellular infrastructure already in place, new solutions are developed upon established global communications network infrastructure, thereby avoiding the direct cost of network development and maintenance.

Both module device prices and data service subscription rates are falling, benefiting largely from aggressive research and development activities and the scale of the mobile handset

industry. By leveraging the same cellular chipset technology of mobile telephones and mobile broadband modems, cellular M2M module prices are experiencing a general decline, pushed further by the introduction and influence of several low-cost providers from China.

Automation, telematics, and telemetry are being recognized as sources of greater operational efficiency and incremental data subscription revenue across many industries. Two of the generally accepted notions within the technology management industry are particularly favourable to the cellular M2M communications industry: (1) more information is better and, (2) before a performance metric can be improved upon it must first be measured.

Additionally, wireless network operators are seeking to expand data service subscriptions to cover the cost of infrastructure maintenance and upgrade. As new cellular technologies roll out, pushing the data throughput capabilities, cellular network operators must constantly be upgrading or maintaining the backhaul infrastructure to ensure a sufficient level of service for customers. Given the initial commoditization of voice plans and airtime, combined with the ongoing transition to all-data networks, cellular operators are struggling to replace the once healthy margins from voice services.

Finally, new government mandates are appearing around the world that require the use of remote communication interfaces and are increasingly stipulating the use of wireless M2M technology. Examples include smart grid, healthcare, and security market applications.

2.1.3   Industry Challenges

While the M2M communications industry offers large potential, there are also global challenges that threaten not only profitability but also mass market acceptance. As discussed with Sierra Wireless product management representatives, each of the challenges presented below impact the firm's strategy and value proposition.

The specific technical knowledge and experience required for cellular M2M is still limited among potential customers, demanding substantial customer support from a variety of technology partners. The cost of support and ongoing service subscription costs can serve as an inhibitor for many applications.

Decreasing average revenue per unit figures and the move towards commoditization threatens the value proposition for cellular M2M module vendors. The market will rely upon a significant number of connections to generate sufficient revenue, but wireless operators and solution integrators must manage cellular connections very efficiently due to low margins.

Integration obstacles surrounding the use of different hardware, software, and network technologies from a wide range of vendors pose a significant threat to success unless agreed upon standards and protocols become mandated. The geographic regionalization of cellular networks around the world compounds the complexity through multiple radio protocol technologies and various frequency bands. Industry alliance standards will enable at least a minimum measure of interoperability and facilitate common security and performance metrics.

Finally, the M2M application ecosystem is extremely complex with multiple technology partners in play. As M2M solutions are often highly customized per application, they demand a high level of engineering knowledge and experience to manage the complex, disparate data formats, diverse networks, and customized services. Applications must be compatible across different device types, configurations, operating systems and be supported by different wireless networks for the customer to gain value.

2.1.4   Industry Summary

Swedish research firm Berg Insight predicts strong growth trends in the M2M industry for the coming years. As shown in the figure below, shipments of cellular M2M devices are forecast to reach up to 67 million units in 2014 (Berg Insight, 2009).

Figure 2.2   Global Cellular M2M device shipments forecast, 2008 – 2014
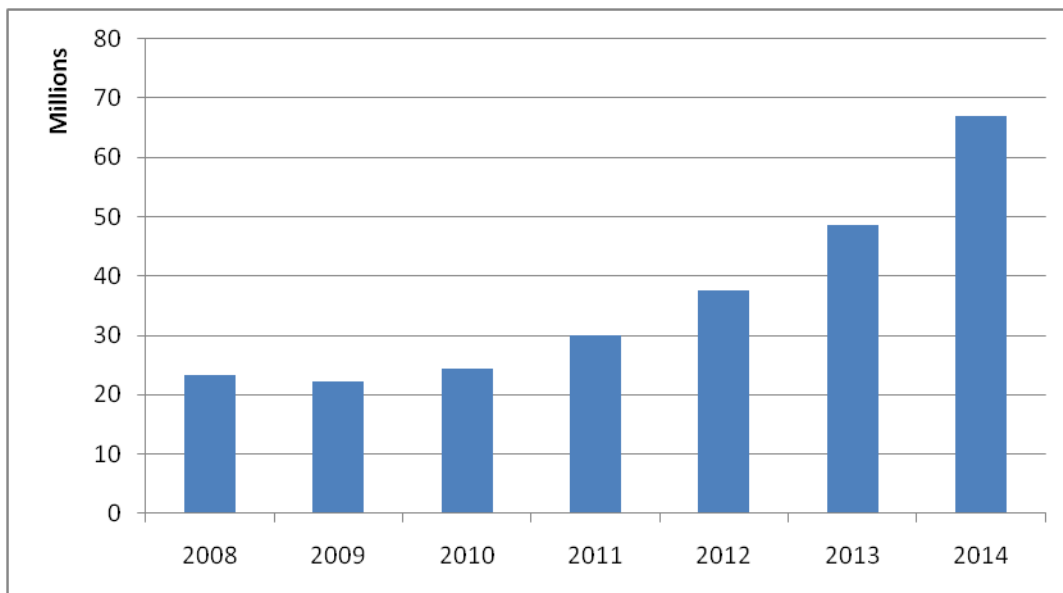
Source: Adapted from Berg Insight, 2009.

Furthermore, Berg Insight also found that as of the end of 2010, only 2% of the worldwide mobile network connections were utilized for wireless machine-to-machine communications, reflecting the severe imbalance between consumer mobile data and M2M applications. However, the number of M2M subscribers continues to grow and increased by 46% year-over-year from 2009 to an estimated 81.4 million subscribers. In fact, the number of wireless M2M connections is forecast to grow at a compound annual growth rate of 32% to reach 294.1 million connections in 2015. Yet even then, M2M will still only represent approximately 4% of the worldwide cellular connections (Berg Insight, 2010).

Cellular M2M communication solutions offer considerable potential for both growth and savings on cost. Ultimately, most of today's machines are not capable of communicating with one another as the lack of standardization in cellular technologies, wireless interfaces, and data formats between data end-points continues to pose significant challenges.

2.2   Key Vertical Market Segments

Cellular M2M solutions have been marketed towards a wide array of industry sectors. Given the scope and breadth of the potential M2M communication applications, it is essential for companies to identify and target specific vertical market segments to achieve success. Segmentation allows for specialization and the development of an appropriate strategy tailored to the needs of each targeted market.

While most industry analysts predict strong growth for cellular M2M industry as a whole, there is no expectation that this growth will be spread evenly among all vertical markets. In fact, given the assorted application characteristics of these markets, a variety of factors will drive or inhibit the growth of cellular M2M within each.

To be useful, a market segment must be differentiated, relevant, accessible, and of an appropriate size. The remainder of this chapter introduces several of the key vertical market segments as identified by both Sierra Wireless and the M2M communication industry associations. The dominant segments include consumer electronics, automotive telematics and transportation fleet management, and the smart energy market. Relevant market applications and data were gathered largely from secondary industry market research reports.

2.2.1 Consumer Electronics Market

Cellular connectivity is being directly integrated into a number of different consumer electronics devices such as digital cameras, eBook readers, personal GPS navigation devices, and portable media players. Fundamentally, cellular connectivity enables transparent content delivery to and from the device.

In 2005, embedded 3G wireless modules started to appear in laptop computers. In the years since then, there has been a dramatic upsurge in the volume of consumer electronics products with integrated cellular connectivity. The most important consumer electronics category to date for cellular connectivity is portable computers. In the gap between increasingly small netbooks and ever more advanced smartphones, several new wireless device categories are emerging, such as connected personal GPS navigation devices, tablets, and e-readers. Wireless connectivity is also being added to existing product categories such as cameras, personal media players, handheld gaming systems, and digital photo frames. Subsequently, the consumer product verticals where cellular connectivity has been introduced now include personal computing, multimedia, and entertainment and imaging (Berg Insight, 2011).

2.2.2 Automotive Telematics and Fleet Management Market

Today, a new standard of automotive cellular connectivity is being integrated in a large number of both consumer and commercial cars and trucks. Cellular communication and data technology, along with GPS positional services, link the vehicle and driver to remote logistics and assistance centres for a variety of services. Key applications include emergency call roadside assistance, transportation fleet management services, and in-vehicle infotainment.

Automatic emergency call (eCall), one of the largest initiatives, is currently completing standardization within the European market and will be mandatory for all new registered passenger vehicles in Europe from 2014 and beyond (Berg Insight, 2009). In the event of a crash or serious accident, in-vehicle sensors will automatically initiate a voice call enhanced with location information to a call centre or the nearest emergency response centre. Along with the voice connection, containing key information about the accident, such as the time, exact geographic location and bearing, and vehicle description is sent via cellular data services to aid and inform the emergency responders. This system can also be manually activated to provide driver roadside assistance in the case of a vehicle breakdown.

Transportation fleet management services incorporate data logging, satellite positioning, and data communication solutions to improve operational efficiencies and provide a seamless option to stay connected to fleet assets when on the road. Vehicle tracking via GPS coordinates enables stolen vehicle recovery and/or immobilization, improved transportation efficiency, scheduling and logistics. Wide varieties of vehicle and driver management services are available. Remote monitoring of vehicle position, engine data and status using GPS and in-vehicle data interfaces to reduce fuel consumption and maintenance costs. Improvements to operational efficiency are enabled through order management, route optimization, cargo monitoring, and integration with ERP software. Remote functionalities include stolen vehicle location, ignition block, remote vehicle unlocking, and vehicle diagnostics.

Rounding out the potential opportunities for cellular M2M within the automotive market segment are in-vehicle internet and infotainment services, electronic road tax and toll payment capabilities, and remote vehicle diagnostic data collection. The total addressable automotive market is sizeable, as the global motor vehicle population is approaching 1 billion. The International Organisation of Motor Vehicle Manufacturers reported a further annual contribution of approximately 70 million new vehicles produced in 2008 (Berg Insight, 2009).

2.2.3   Smart Grid Energy Market

The energy market faces a convergence of industry, government, and consumer challenges to meet the increasing energy demand through an aging power grid infrastructure. The smart energy market presents solutions to these challenges through modern information technology and communication applications. Three main business segments exist within the smart grid solution: advanced metering infrastructure (AMI), grid transmission and distribution applications, and customer applications.

Advanced metering infrastructure, or smart metering, provides two-way, real-time communications between energy suppliers and consumers. This technology facilitates real-time, automated reporting of energy usage and outages, enables the remote management and disconnect of utility services and operational efficiencies through the elimination of manual meter reading.

The grid application segment of the smart energy ecosystem refers to utility infrastructure and back-haul networks. An enormous amount of information is required for load balancing across the operation of interconnected utility grids. Similar to the advanced metering infrastructure, cellular M2M connectivity enables a variety of new potential services and

processes. Automation of the grid and real-time distribution of information enables operational optimizations through accurate grid balancing and a reduction in losses.

Finally, new customer applications can be leveraged from the advanced metering infrastructure to enable the real-time display of energy usage and pricing statistics for responsible demand management. Combined with usage aware devices and localized home area networks, various home automation applications also become possible.

The smart energy market represents an enormous opportunity for cellular M2M communications. Every household and commercial business in the developed world has one or more utility meters to measure electricity consumption. At the end of 2009, industry analysts estimated an existing worldwide installation base of nearly 1.7 billion electricity meters. Furthermore, the annual global demand for energy meters reached about 159 million units in 2008, and is predicted to continue to grow by 5-10 percent annually (Berg Insight, 2009).

2.2.4   Other segments

Cellular M2M communications present further application opportunities in a variety of other markets. Many of these applications include those that have traditionally relied upon fixed line, or wired, communications such as security alarms, information technology networking, and retail sales and payment systems.

There exist two dominant drivers for the trending migration to cellular M2M communications solutions. First, wireless technologies often serve as a backup communication channel to the primary wired connection. Redundant communication paths are a common feature within enterprise and high-end residential security alarms to improve system integrity and reliability and this trend has begun to extend to many other markets such as retail point-of-sale terminals. Secondly, many of the emerging markets in developing countries have limited or unreliable fixed line infrastructure and have instead progressed directly to a scenario in which cellular networks are the preferred option.

Within the security market, typical applications will include personal security devices, remote video surveillance, and premise monitoring. The higher bandwidths of 3G and 4G cellular technologies have enabled cellular data communication as a viable option for video streaming applications. Other fixed wireless segments include networking solutions for consumer and enterprise mobile broadband routers and gateways.

Retail sales and payment applications include point-of-sale devices, ATM and cash register services, and mobile payment systems for vending and delivery services. Wireless connectivity enables the processing and authentication of card payments in a variety of businesses where it was previously unavailable, such as home delivery services, outdoor venues for restaurants, temporary kiosks and markets, and any nature of service professionals, such as electricians or plumbers. With billions of cards in circulation and annual transaction volumes valued in the trillions, POS-terminals are indispensable at any retail location.

2.2.5   Vertical Market Summary

While each of the identified vertical market segments offer significant potential for cellular M2M growth and opportunity, the remainder of this report will present analyses of the intelligent metering and smart grid market segment. As shown below, this specific market offers significant opportunity for Sierra Wireless and the upcoming analysis will examine how Sierra Wireless can position itself to best capture the opportunity and differentiate from competitors.

A 2009 report from Berg Insight estimated an approximate global production of 750 million machines for housing, transportation, and industrial use for the year 2008. The figure below illustrates the distribution of this annual production among major home appliances, energy meters, and motor vehicles. Energy meters represent one of the largest industry sectors by volume, and numerous market forecasts call for further growth.

Figure 2.3   Estimated Annual Production of Machines by Segment

Source: Adapted from Berg Insight, 2009.

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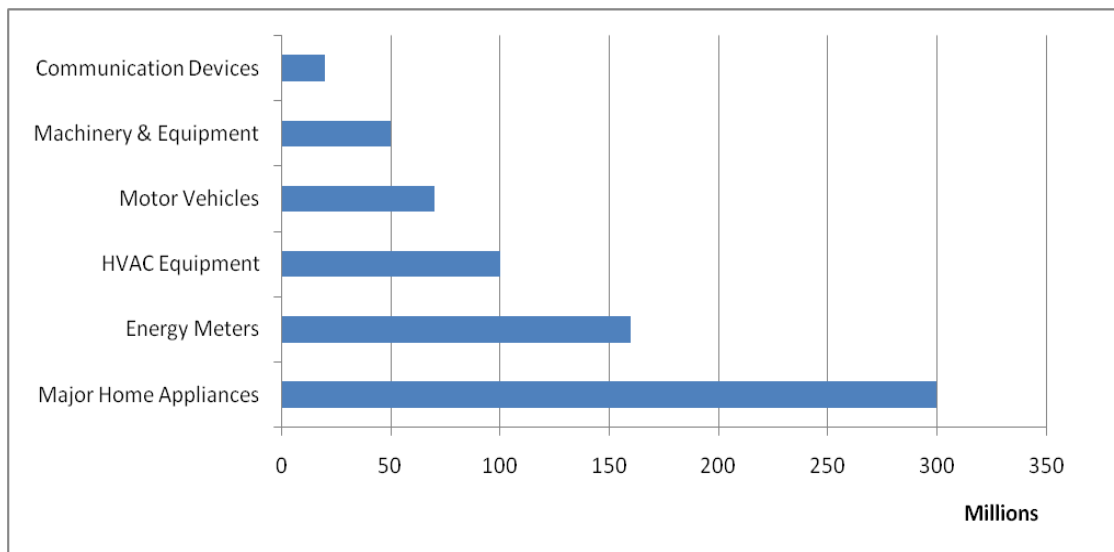
Summarized in the table below are some of the annual production values for 2008 along with the global installation base for several of the key vertical segment device categories. The table demonstrates the significant potential of the energy meter market, both in terms of the annual production volume of new units as well as the existing global installation base.

Table 2.1   Global Annual Production and Total Population for Key Machine Segments

Machine Segment	2008 Annual Production	2009 Global Population
Motor Vehicle	70 million	1.1 billion population base
Energy Meter	159 million	1.7 billion installed base
POS-terminals	12 million	45 million installed base
Security Alarms	7 – 10 million	29 million installed base

Source: Adapted from Berg Insight, 2009.

Data from telecom industry advisor Analysys Mason, further illustrates the dramatic opportunity presented within the smart energy market for cellular M2M communications. Similar to data presented earlier from Berg Insight, Analysys Mason forecasts the number of machine-to-machine device connections worldwide to grow to 2.1 billion in 2020, from an estimated 62 million connections in 2010 (Hilton, 2010). The firm went on to offer an industry breakdown according to vertical market segment, as illustrated below in Figure 2.4.

Figure 2.4   2020 Projection of Global M2M Device Connections by Industry Sector
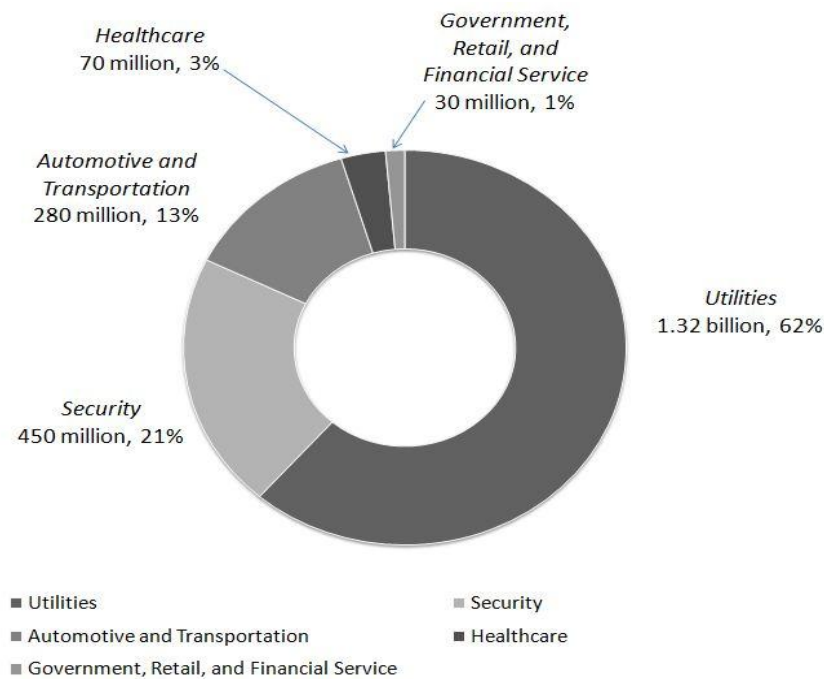
Source: Adapted from Hilton, 2010.

As discussed earlier, one of the primary challenges for the cellular M2M communications industry is the complex industry supply chain that spans from cellular chipset providers and module manufacturers to application vendors and system integrators. The technology leaders within each category will vary not only by industry solution but also by geography, further hindering the development of industry-standard M2M solutions.

This perspective reinforces the notion of Sierra Wireless developing a targeted strategy for each of the key vertical market segments. In fact, Sierra Wireless is already in strong position to address some of the key vertical market segments identified. Strong OEM partnerships and a wide embedded module offering position Sierra Wireless favourably to address the consumer space, while experience with the AirLink™ ruggedized modem product line and integrated GPS functionality lend itself toward the automotive and transport segments.

The remainder of this report shall therefore focus on the smart grid energy market to identify the key technologies and differentiations that will enable Sierra Wireless to succeed within this market.

3 Market Analysis

This chapter examines the external environment of the smart grid energy market with respect to wireless M2M communication technologies. The smart grid energy market can be fundamentally grouped into three broad application categories: (1) grid applications, (2) advanced metering infrastructure, and (3) customer applications. The chapter begins by exploring each of these categories in terms of the core benefits presented to both the consumers and the utility suppliers. Further sections present evidence to highlight which of the three application categories is expected to be implemented first and the associated opportunities available for cellular M2M communications solution providers.

The corporate strategy of a firm is primarily concerned with deciding which industries and markets to engage in and how to allocate appropriate resources among them. Such decisions require a detailed and informed assessment of the attractiveness of a potential market with respect to the profit potential.

One of the fundamental assertions of external industry analysis is that the level of profitability is neither random nor the result of entirely industry-specific influences, but rather it is determined by the systematic influences within the industry's structure (Grant, 2008). Thus, through the examination of the industry structure, value chain, and competitive forces this chapter exposes the key relationships and values that will provide profitable growth opportunities for Sierra Wireless within this market.

The primary objective of this chapter is to understand how the competitive structure of the smart grid and intelligent metering infrastructure may influence and shape the future strategy of Sierra Wireless. The chapter first presents evidence as to reason why the advanced metering infrastructure applications are expected to be the first segment deployed. This serves as foundation for the detailed treatment of the segment in the remainder of the report, including the specific challenges and requirements within this segment.

Analysis of the advanced metering infrastructure value chain reveals the technologies and key business relationships in play. This chapter also presents an evaluation of market attractiveness in terms of the specific requirements, opportunities, and competitive landscape as viewed through the framework of Michael Porter's five forces of competition (Porter, 1979).

Many of the industry challenges presented in the previous chapter for the cellular M2M communications industry as a whole are also evident within this particular vertical market segment. As such, the path of the smart grid energy market development and adoption remains far from obvious. However, within these enormous challenges also lies great opportunity. Smart grid technologies promise to have a profound impact on the electric power industry and offer significant opportunity for cellular M2M communication solutions. This chapter concludes with a presentation of many of the market trends that are specifically driving growth within the market with respect to Sierra Wireless and their M2M product and service offerings.

3.1   Smart Grid Energy Market

As energy suppliers around the world begin to invest in new technologies to modernize electricity grids, the concept of the smart grid is beginning to take shape. In its general form, the smart grid implies an electricity network with an integrated, two-way, digital communications infrastructure to optimize the supply and demand of electricity. With a constant stream of diagnostic information available in near real-time, utilities will be able to capture the details of energy transmission and consumption as never before.

Energy suppliers will be able to optimize operations for generation and distribution, improve reliability through more effective response to outages and advanced asset management, reduce peak consumption through demand response initiatives, boost efficiency through improved diagnostics, and incorporate new sources of energy such as electric vehicles and solar into the grid. The targeted result is the ability of the energy utility to serve more customers with less energy supply.

The stakes within the smart energy are substantial. According to estimates by McKinsey & Company analysts, the successful deployment within the United States alone of smart grid applications could yield an annual savings of $130 billion to society by 2020 (Booth, 2010).

Figure 3.1   *Smart Grid Application Technologies.*

Customer Applications   **Advanced Metering Infrastructure**   **Grid Applications**
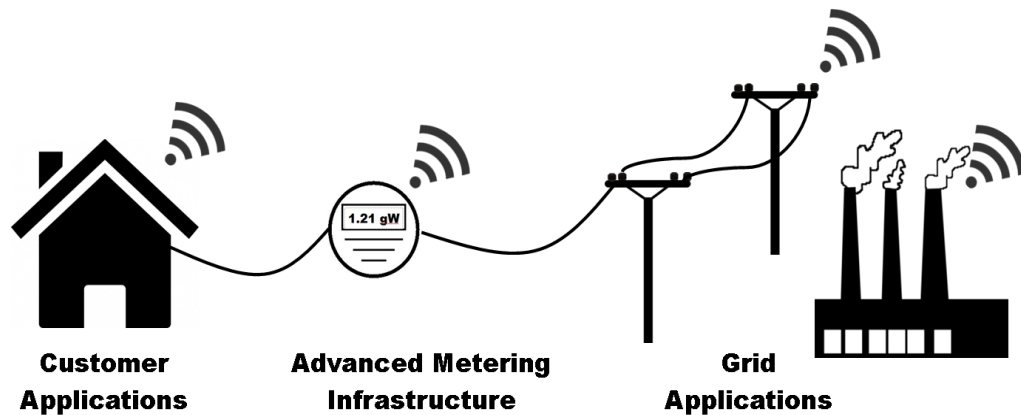
Source: Adapted from Booth, 2010.

As illustrated above, this report separates smart grid application technologies into three broad categories: grid applications, advanced metering infrastructure, and customer applications. The following sections evaluate the three categories with specific attention drawn to the direct benefits offered and the potential opportunities for cellular M2M communications solutions. Further analysis reasons the presumed order of introduction for these technologies and identifies which, if any, core competencies and specific technical requirements are in play.

3.1.1   Grid Applications

Within smart grid technology, grid applications include all aspects of energy generation, transmission, and distribution. Focused on the utility supplier's grid infrastructure, these applications involve the monitoring, controlling, and automating operations of the electricity supply networks. Intelligent communications technologies can provide a wealth of near real-time operational data to central servers for automated processing and analysis to improve operational efficiency, service reliability, and asset management.

Utility companies gain operational efficiency through the availability of detailed information across the entire grid infrastructure. This facilitates precise control over the operating voltage and improves the real-time response to dynamic conditions of the grid. The dramatic scale of energy instantaneously produced and distributed throughout the infrastructure equates relatively small changes in operating conditions, such as a temperature reduction, into a significant impact on the grid operation as a whole. Previously, without the ability to precisely

monitor and control information, energy suppliers had to operate with a significant overhead in capacity at all times to ensure the power grid could accommodate any unanticipated changes in the operating dynamics.

Along with operational efficiency, greater access to grid data allows for better asset management. Utilities can use this data to promptly address and avert an impending failure of key assets, such as transformers overheating. Furthermore, inspection and maintenance schedules can be optimized to reflect actual usage and operating conditions, thereby improving asset lifetimes and utilization while reducing overhead. Preventative maintenance rather than reactive repair can reduce the risk of collateral damage to other utility assets.

Finally, intelligent and independent communication systems can enable dramatic improvements to fault detection. Most of today's utility firms rely upon customer feedback to notify them of outages and system faults. Smart technology will enable not only the precise remote notification of a fault, but also automatically dispatch an appropriate service recovery and maintenance crew to address the issue. Increased data precision regarding the nature and impact of the fault can allow the utility supplier to isolate the fault to a smaller area, thereby creating a secondary benefit of increased reliability for the grid as a whole.

Cellular M2M communication opportunities within the grid application smart technology space essentially focus on the facilitation of the near real-time monitoring of the grid infrastructure. The utility infrastructure data networks are generally of proprietary design, unique to each utility implementation and may involve a combination of private and public communication networks. An increasing number of utility providers are turning to cellular communication networks as a redundant communication path option or to leverage the pervasive coverage and outsourced overhead of public cellular networks. In turn, Sierra Wireless has addressed these opportunities through partnerships with a variety of utility suppliers and integrated solution providers. For example, the ruggedized cellular gateways and routers of the AirLink™ device family offer reliable, remote communications management and are designed for use in harsh operating conditions.

3.1.2 Advanced Metering Infrastructure

Advanced metering infrastructure, or smart metering, consists of digital utility meters with integrated communication capabilities to provide timely energy usage data to energy suppliers and consumers. The U.S. Federal Energy Regulatory Commission and U.S. Energy Information Administration define advanced meters as:

"**Advanced Meters**: Meters that measure and record usage data at hourly intervals or more frequently, and provide usage data to both consumers and energy companies at least once daily. Data are used for billing and other purposes. Advanced meters include basic hourly interval meters, meters with one-way communications, and real-time meters with build-in two-way communication capable of recording and transmitting instantaneous data" (FERC, 2010).

Traditional utility meters are basic electromechanical devices that do little more than capture total energy consumption. With no communication ability, these meters must be manually read by field representatives and offer no additional information on customer consumption patterns or trends over time. In contrast, smart meters capture and store detailed consumption information at frequent intervals throughout the day and automatically provide this data to both the consumer and the energy supplier. For example, the current smart metering program being introduced by BC Hydro collects hourly consumption data and communicates this data back to BC Hydro four to six times per day, with an average daily data transmission time of no more than one minute (BC Hydro, 2011).

The essence of the smart metering application is the extension of detailed monitoring and communications capabilities up to consumer homes and businesses. The advanced metering infrastructure essentially represents the end-point of the utility supplier's value chain and delivers direct benefits to both the utility and the consumer.

For utilities, smart meters enable more accurate billing, leading to fewer field investigations and customer service calls. Similarly, with automated monitoring of meter data over two-way communication networks, field operational expenses are further reduced through the remote management of previously manual operations such as meter reading and service connection / disconnection.

As with the grid applications, detailed information available from the end destination points of the power grid improve the energy supplier's ability to forecast power consumption and better detect / prevent energy theft, each of which can pose serious problems in some utility markets. Localizing the detailed stream of information to consumer homes allows utilities to pinpoint network faults and outages beyond the level of grid infrastructure. Finally, advanced metering infrastructure enables utilities to implement tariff rate structures based on both the actual cost of producing electricity and demand throughout the day.

Energy consumers also benefit from increased access to data reflecting their energy consumption and the applicable rates charged by utility firms. Today, there are few options for consumers to manage electricity use because the current meters do little more than capture total energy consumption. However, with specific and timely information about consumption, it will be significantly easier for consumers to make informed decisions and actively manage their electricity use to maximize the benefit from potential variable electricity tariff and pricing structures.

Even more importantly, advanced metering infrastructure serves as the gateway to the remaining category of smart technology solutions, consumer applications. With a suitable communication eco-system in place, smart meters provide opportunity for additional devices within the home or business to be networked for smart home automation features and demand response management.

As will be presented in the subsequent sections detailing the value chain and competitive landscape, there exist many opportunities for wireless M2M communications solutions within the advanced metering infrastructure. From opportunities to serve individual smart meters to network aggregation points, utility suppliers and solution integrators around the globe are evaluating various value propositions and network models. Sierra Wireless has already established relationships with several of the key participants, from meter manufacturers to communications solution providers. Opportunity exists for a variety of Sierra Wireless' products and services, from embedded cellular data modules within the smart meters themselves to a hosted software services and device management platform.

Given the importance of the advanced metering infrastructure as a bridge between consumer and grid applications, it is not surprising that a significant amount of development and funding is already in place. Many industry analysts and technology leaders have suggested that advanced metering applications are the critical first step in modernizing the world's power grid. As will be shown in the in the market analysis, along with the challenges of a new technology market lay significant opportunities.

Table 3.1   Smart Meter and Traditional Meter feature comparison.

Traditional Meter	Smart Meter
Displays total electricity consumption	Reports voltage, power quality measurements, time-stamped data information as well as electricity consumption
No communication capability	Integrated two-way communication between the meter and the utility and the meter and premise
No outage detection	Automated outage detection and notification
No tamper detection	Automated meter tamper alarms and support for theft detection and other analytics
Manual on-site meter reading Manual meter connects and disconnects	Automated and remote meter readings Remote meter connect and disconnects
Estimated cost and consumption feedback provided through bi-monthly bills only	Customer cost and consumption feedback provided in near real-time via multiple access technologies

Source: Adapted from BC Hydro, 2011.

3.1.3   Consumer Applications

In-home display technology and consumer applications communicate with the advanced metering infrastructure in near real-time to provide information on the amount of energy used, when it is used, and at what cost in dollars and cents. Timely information about consumption patterns and costs is a key first step in promoting active demand response among consumers to conserve energy.

Both consumers and utility suppliers benefit from an increased awareness of energy usage and costs to promote voluntary consumer behaviour to shift demand away from peak periods, where possible. Demand shifting saves consumers from peak demand pricing while simultaneously reduces the overall peak energy supply required from the utility and stems the demand for new energy generation capacity. If energy conservation and demand shifting efforts

can help energy suppliers avoid the cost of adding future generation plants then the overall cost of capacity can be maintained, if not reduced.

Consumer applications can range from complete home automation solutions that manage energy usage efficiency by automatically turning off lights and electronics when not in use and optimizing heating and cooling solutions based on vacancy within the home to the provision of usage data to promote voluntary consumer response. Effective combinations of a variety of technologies will equip consumers with the tools and incentives to reduce the burden they place on their finances, the grid, and the environment (Booth, 2010).

Consumer applications are predominantly located within the home or business and rely upon local or home area networks. These network communication technologies are currently outside of Sierra Wireless' product and service offering. While some product development has utilized Wi-Fi within the mobile cellular hotspot devices family, the core of Sierra Wireless' products are cellular communication based, a technology that is not specifically designed to operate indoors or in small area network deployments.

Many communication technologies are being targeted for the consumer application segment, most of which will also require an active interface into the advanced metering infrastructure ecosystem. It is within this culmination of wireless technologies that opportunity for differentiation exists for Sierra Wireless. Just as mobile cellular hotspots combine cellular data technology with localized Wi-Fi access to share mobile broadband internet connectivity – so too can consumer gateways to the smart grid bridge the wireless technologies from consumer in-home applications to the advanced metering infrastructure and beyond.

3.1.4   Smart Grid Summary

Based on the scale of power grid infrastructure and capital investment required to incorporate smart technology throughout the network, the first stage of the smart grid rollout is generally in the deployment of smart meter technology. The advanced metering infrastructure introduces the possibility of both consumer demand response management to ease peak energy demands while also delivering the benefits of detailed monitoring and automated communications to the utility. Advanced metering further enables the gateway to the consumer application market, capitalizing on consumer trend of connected technology and the "internet of things".

Essentially, smart metering systems allow utility suppliers to achieve the benefits of both grid and consumer application markets with limited infrastructure investment and a reduction in

operating costs through the elimination of key field manual operations. Having reviewed the benefits and opportunities of each of the three smart grid application categories, the remainder of this chapter explores the specific opportunities within the industry and the market attractiveness.

3.2 Market Value Chain

The traditional energy utility value chain focused solely on the provision of electricity to consumers and relied upon a highly centralized asset model controlled by the utility company itself. However, with the myriad of new technological capabilities being introduced by the smart grid, many of which are far outside the core competencies of utility companies, the value chain has expanded dramatically to include many new partnerships and relationships and shifted towards a distributed value chain.

The figure below depicts the dramatic shift in the industry value chain. A traditional energy market has energy generation, transmission, and distribution all controlled by either the utility itself or arms-length associations. For the most part, utilities owned and operated all of the grid infrastructure and networks, down to the electromechanical meters on consumer's homes. The utility corporation, requiring a massive capital investment in not only grid infrastructure but human resources as well, handled the operations, maintenance and service for each of the segments illustrated below in Figure 3.2.

Figure 3.2   Traditional and Emerging Electricity value chain.

Traditional energy supply value chain:

Power Generation & Trading → Power Transmission → Power Distribution → Energy Services → Electric Devices & Meters → End-Use Customers

Emerging energy supply value chain:

Distributed Resources (Distribution, Network Infrastructure, Storage)

Power Generation & Trading → Power Transmission → Power Distribution → Energy Services → Electric Devices & Meters → End-Use Customers

Power Flow ——→
Information Flow ·······▶

Information & Services Platform

Information & Services

Information Devices

Source: Adapted from Valocci, 2010.

However, in today's emerging smart grid, there are so many new communication technology requirements that it is too large for utility companies to handle on their own. Gone are the days of massive proprietary data networks. In fact, in order for the smart grid to reach its maximum potential, utility power grids from various providers and regions must be designed to work together, suggesting an agreed upon standard for communication technologies and protocols.

Even within the previous discussion on the three smart grid application categories, there is evidence of different requirements and technologies in play. Consider the grid infrastructure, automated M2M communication solutions must be capable in operating in even the most remote and harsh conditions, with wide area communications capable of transmitting critical data to central servers from nearly any point on the grid. Alternatively, consumer applications require much more localized communications solutions. Home automation solutions will need to communicate with a number of devices within the home, limiting the interference caused within adjacent homes and with completely separate design requirements.

The traditional value model for the energy industry focused upon delivering value to customers in the form of power, with expectations for reliable and universal access within the

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geographic service area. The emerging smart grid technology is raising the consumer value expectations to include concern for environmental impact, cost savings, and information sharing. Along with an expanded value demanded by consumers, the number of parties involved in delivering this value has also expanded. No longer is the relationship limited to the utility supplier and the energy consumer. In today's industry, developers of third party products and service providers are now an integral part of the value model. However, it is important to note that as consumers demand more of utilities, they are simultaneously are offering more in return. The same content rich data necessary for consumers to actively manage their demand response is also integral to the success of the smart grid as a whole and provides dramatic operational benefits to the utilities.

In the following sections, this report will continue to expand the discussion of value chain and competitive landscape with analyses of the market attractiveness, growth potential, and the role of advanced metering infrastructure technology vendors. Advanced metering infrastructure requires the involvement of the meter manufacturer, the utility company, and the information technology integrator responsible for the billing and customer information systems of the utility. Additionally, the solution must involve a communication module vendor, a system integrator working with the meter manufacturer and, depending on the type of communications utilized, a network service provider. Since metering is a fixed location application, it is possible to employ either fixed or wireless communication technologies.

3.2.1   Intelligent Meter Original Equipment Manufacturer

Meter manufacturers develop and market the smart meter products to solution integrators as well as utility companies for incorporation within advanced metering infrastructure solutions. Sierra Wireless has strong relationships with a number of OEMs, through the firm's extensive product line of embedded cellular modules. Leveraging the success of other consumer mobile and M2M communications solutions, Sierra Wireless has a strong reputation, proven product line, and organizational support already in place.

With differences in national standards for utility power specifications as well as wide-area communication frequency allocations and technologies, smart meter models often need to be tailored to specific countries – a circumstance that maintains the fragmentation of the market. Depending upon the communication technologies offered by the smart meters, there may be proprietary protocols or standardized implementations in place. Key manufacturers within the smart metering include Itron, Landis+Gyr, Sensus, Elster, and GE. However, it is important to

note that while these companies manufacture the meters, other companies such as Ember Networks, Freescale, Texas Instruments, and Sierra Wireless provide the communications modules to smart meter manufacturers for integration within the device.

3.2.2   Utility Supply Company

Utility companies are both the end client and principal driver for smart grid technology. While many utilities operate private communication networks as part of the power grid infrastructure, the cost of expanding this communications infrastructure to the entire network of consumer homes and the required maintenance and support is driving the business case for outsourcing the communications backhaul and support to public networks such as cellular. Furthermore, as utilities are typically a highly regulated industry with significant government regulation, many utility companies are ill equipped to adopt the responsibility of developing consumer based products for the home and business.

3.2.3   Communication Technology Vendors

Given the objective of this report for analyzing wireless opportunities within the smart energy industry for Sierra Wireless, the scope of the technologies evaluated will be limited to wireless implementations. A broad range of wireless technologies are utilised within smart metering applications, from localized short-range and long-range radio frequency (RF) solutions, to wide-area cellular technologies.

Short-range communication technologies focus on serving the localized communication requirements between the meter and consumer in-home application devices. In the absence of a universally accepted communication protocol standard, manufacturers are implementing a multitude of vendor-specific short-range communication solutions that limit the interoperability of current products. On the other hand, cellular technologies are highly standardised, with multiple industry bodies governing the development.

Major semiconductor companies, such as Freescale and Texas Instruments, provide short-range RF technology solutions. Additionally, many of the top global meter manufacturers like Landis+Gyr, Elster, and Itron have also made significant investments in acquisitions or R&D related to short-range communications. Sierra Wireless, Telit, Motorola and other providers of M2M communication solutions, provide cellular technology solutions. These communications solutions are offered through a variety of device packages to suit a variety of integration, service and cellular network needs (Berg Insight, 2010).

3.2.4   Value Chain Summary

While the smart energy and advanced metering is rich in opportunity and massive in scale, the industry will not be dominated by any one company or partnership. Due in large part to the fragmented nature of the utility industry, both from one country to the next as well as from state to state and province to province, there is opportunity for a significant number of firms. However, it is in evaluating the value chain of the M2M smart metering industry that a clear understanding of the potential opportunity for Sierra Wireless begins to present itself.

Sierra Wireless is both fortunate and uniquely positioned to contribute to the growth and value proposition in nearly every stage of the value chain. However, with many technology companies seeking to enter the market and secure industry partnerships and alliances, it is important for Sierra Wireless to seek strategic technological capabilities to differentiate itself from the competition.

To this end, this paper identifies and analyzes the key complementary technologies that are poised to play a significant role in the development and growth of the industry. However, the evaluation must also acknowledge the significant amount of change required to develop and implement the smart grid technology. Beyond the technical challenges, utilities will be required to make significant business process changes. The capacity for and reliance on flexibility is not generally reflective of the traditional utility industry.

3.3   Market Attractiveness

The evaluation of the attractiveness of a particular market depends not only on the structure of the industry itself, but also on the competitive forces and market trends at play within the market. The preceding discussion introduced the value chain of the smart energy ecosystem and potential opportunities for Sierra Wireless' cellular M2M solutions.

This section presents further discussion on the attractiveness of the advanced metering infrastructure market through evaluation of the influencing competitive forces and the market size and growth trends.

3.3.1   Porter's Five Forces of Competition Framework

In his seminal 1979 paper, "*How Competitive Forces Shape Strategy*", Michael Porter develops and presents a widely used and intuitive framework for classifying and analyzing the forces that influence market competition and profitability. Identifying and understanding the

underlying sources of these competitive forces provides a foundation for firms to select an appropriate strategy for market entry (Porter, 1979).

The five forces framework is useful in determining the most influential competitive forces such that the firm can shape its strategy to address these challenges. Below, Figure 3.3 presents an illustration of the five forces shaping the structure of an industry. The forces of Porter's framework include the threat of entry, the bargaining power of buyers and suppliers, the threat of substitute products, and the internal rivalry among the incumbent firms. The combined strength of all these forces influences the industry's overall level of profitability.

Figure 3.3   Porter's Five Forces of Competition.
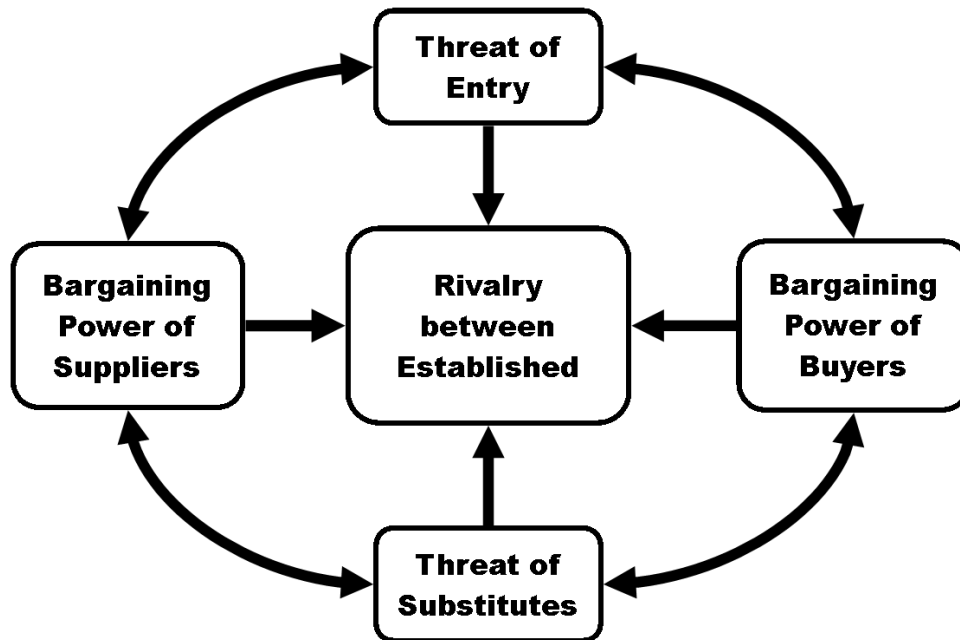
Source: Adapted from Porter, 1979.

The following sections examine and assess the influence each force poses for the advanced metering infrastructure industry.

3.3.1.1   Threat of Entry

The threat of entry newcomers pose to incumbent firms is dependent upon both the barriers to entry presented by the industry structure itself as well as the expected response from

the incumbent firms (Porter, 1979). The following discussion analyzes the most pertinent barriers to entry within the advanced metering infrastructure market.

Advanced metering solutions require significant capital requirements in terms of the investment in research and development and the intellectual property regarding communication protocols and embedded processing. Moreover, new entrants will need to acquire software development tools, licenses, and a variety of hardware and communications-based test platforms. The cost of these highly specialized tools is substantial and serves as a significant barrier to entry.

The economies of scale present another barrier to entry for this market segment. To operate profitably, firms need to sell a sufficient number of devices at appropriate margin to cover the significant capital costs outlined above. Sierra Wireless realizes considerable benefits from economies of scale through leveraging core wireless technology development, marketing, and sales across consumer mobile products and a variety of other vertical segment M2M product lines.

Firms entering the advanced metering market also face significant barriers in terms of the reputation and buyer loyalty towards incumbent firms. This barrier to entry is of particular concern within the cellular M2M communications industry as devices are expected to remain in service for ten or more years with reliable operating performance and minimal maintenance. Value chain partners such as cellular operators and utility suppliers are hesitant to collaborate with a new entrant firm that lacks a proven record of success and experience in bringing devices to market or the financial stability to provide going concern for the lifetime of the product.

Another relevant barrier to entry is the potential cost disadvantages independent of size and economies of scale. An incumbent firm gains significant experience from successfully bringing products to market, from cellular operator approval and certification processes to the applicable government regulatory compliance certifications. Each of these tasks can be a costly and time-consuming process in which past experience and success can be leveraged to streamline future applications.

Finally, access to distribution channels poses a particularly difficult barrier to new entrants. With a limited number of sales channels within the advanced metering infrastructure and a highly integrated industry value chain, existing partnerships and supplier-buyer loyalties will be difficult for new entrants to overcome. Especially given the specific market requirements of highly reliable long-lifecycle products, new entrants lack the experience and reputation required to secure key contracts with the typical risk-adverse utility supply firms.

Overall, the threat of entry is low. Sierra Wireless in particular is well positioned to defend these high barriers to entry with an established reputation for quality products, service, and support. Furthermore, with over 18 years of experience in the industry, Sierra Wireless has established strong relationships with key suppliers and buyers.

3.3.1.2   Bargaining Power of Suppliers

Suppliers that are sufficiently concentrated and dominant within an industry can exercise bargaining power over industry partners in various ways, such as an increase in prices or a reduction in the quality of purchased goods and services. The predominant suppliers within the advanced metering infrastructure industry in terms of cellular communications services are the cellular chipset providers and the technical engineering human capital required for development and support.

The cellular chipset and protocol firmware stack comprise the core technology within a cellular communications module. Qualcomm has established itself as the leader in cellular chipsets and Sierra Wireless, along with many of its competitors, relies heavily upon Qualcomm. Absent Qualcomm's cellular chip products and support, Sierra Wireless is unable to provide a solution to the market.

Apart from the industry being dominated by a few key cellular chipset supply companies, there also exist significant switching costs as the software development tools, production services, and licenses are tied to a specific cellular chipset. Switching to a competing cellular chipset supply company requires a massive capital investment in tools and knowledge.

Cellular chipset suppliers also pose a credible threat of integrating forward and competing directly with Sierra Wireless. As mentioned previously, the core technology of cellular communication modules is the cellular chipset provided by Qualcomm and other suppliers. Given the large knowledge base and favourable supply conditions, it is entirely possible for Qualcomm to introduce a competing cellular device absent the differentiating features provided by Sierra Wireless at a reduced cost to compete in the market. In fact, this exact scenario played out in 2008 when Qualcomm introduced the Gobi line of embedded cellular chipsets.

As for other areas of supply, development of advanced communication devices for the smart metering industry also relies upon experienced engineers. Engineers in this industry require knowledge of wireless technologies such as long-range cellular GSM, EDGE, GPRS,

UMTS, and short-range protocols such as ZigBee. As the demand for specialized human capital increases, so too could the expected salary, thereby increasing the cost of research and development and driving down operating margin.

However, for other more general electronic parts there is a lack of concentration in supply. There exists a wide range of global suppliers available with suitable components for non-chipset related components, many competing with low cost offerings.

Overall, the relative bargaining power of suppliers is high.

3.3.1.3   Bargaining Power of Buyers

Sierra Wireless sells cellular M2M modules for use in advanced metering infrastructure to meter manufacturing OEMs and communication solution integrators through supply contracts. These contracts typically involve a large number of partners within the value chain and represent a cohesive advanced metering infrastructure solution. Given the size and typical market position of utility companies and cellular operators, Sierra Wireless and other solution providers experience significant pressure to deliver quality products at extremely competitive prices.

While utility and cellular network operators typically function in government-mandated monopoly or oligopoly economic market structures, the industry as a whole remains largely fragmented. Utility suppliers often serve very specific geographic regions and solution implementations can vary from one utility to the next. Similarly, cellular network operators also operate regionally and nationally, often with different physical wireless protocols and frequency allocations that distribute the range of solution offerings.

This report notes that while there are a variety of utility and cellular partners, the key firms represent significant opportunities with volumes in the tens of millions of customers. Add to this that utility companies and cellular operators are firms with traditionally very low profit margins they are generally more price sensitive. Each of these factors increase the bargaining power of buyers.

However, the bargaining power is somewhat diluted by the lack of industry standards mandating recommended communications solutions and technology requirements. Without recognized standards, there exists opportunity for differentiated solution offerings. In fact, to large extent, utility buyers are reliant upon system integrators and other value chain partners to determine and provide the dominant technology expected to satisfy the complete product lifecycle. This loss of bargaining power is also evident in the utilities inability to integrate

backwards and develop the smart metering product offerings themselves as implementation and development requirements lie far outside the core competencies of the firms.

Given the contrasting discussion above, the bargaining power of buyers is judged to be medium to low.

3.3.1.4   Threat of Substitutes

A variety of communication protocols are implemented around the world, differing according to national and regional utility providers, national communications standards and radio frequency allocations, and national regulatory considerations. The industry is highly fragmented with a variety of possible solutions. In fact, given that the advanced metering infrastructure is a fixed position application, that is to say, it does not require mobility, then the available communications options expands to include fixed line communications.

The threat of substitutes is considered to be high because there are many other technologies forming a strong offering within the advanced metering infrastructure industry. Notably, the recent trend of ubiquitous access and availability of Wi-Fi in most laptops and smartphones is rapidly expanding the availability of wireless access points. However, significant reliability and security concerns have thus far prevented Wi-Fi from capturing a strong presence in the advanced metering infrastructure market.

3.3.1.5   Rivalry between Established Competitors

The slow pace of introduction and implementation of pilot programs within the advanced metering infrastructure market precipitates increased competition among rivals to secure contracts and establish market share. Furthermore, as differentiation decreases, products become commoditized and compete more intensely on a per unit cost basis. Intense rivalry among existing competitors can lead to decreased product margins as competitors reduce their selling price in order to secure contracts with implementation partners.

However, as will be demonstrated, the advanced metering infrastructure is a growing market and as the global market continues to grow, rivalry will tend to decrease. Incumbent firms may not have the scale to meet the market and service demands and will leave part of the market share to other firms. Firms may limit development and production to a handful of the global wireless technologies thereby limiting sales to specific geographic regions. As the market continues to expand, firms may be able to sustain themselves with smaller percentage market share, reducing rivalry.

Rivalry is further reduced through the product and service differentiation promoted within the market. As previously discussed, the advanced metering infrastructure market is highly fragmented both in terms of communications technologies as well as national regulatory and utility standards. Combined, this provides an environment of significant differentiation and large switching costs for buyers.

Overall, the rivalry between established firms is considered to be medium.

3.3.2 Market Size and Growth Potential

Leveraging data provided by market research reports and discussions with Sierra Wireless marketing personnel, the following section presents estimates of the current advanced metering infrastructure market size and forecasts for future growth. Along with the key competitive forces, market trends and growth expectations offer significant influence over a market's attractiveness.

With a significant number of advanced metering infrastructure pilot programs and initial roll-outs underway, the market already presents a substantial opportunity. In several markets worldwide, smart meter deployments are ongoing with a variety of technology platforms and partners. As previously presented within introduction of the key vertical markets, the worldwide electricity meter installation base was nearly 1.7 billion devices as of 2009. Global annual production contributed over 159 million units in 2008, with predictions for 5-10 percent annual increase (Berg Insight, 2009).

The largest global smart meter deployment thus far occurred in Italy, where the country's main utility, Enel, installed over 30 million smart electricity meters. Similarly, the Ontario Energy Board has completed the rollout of 4.6 million smart electricity meters and as of May 2011, new time-of-use electricity pricing initiatives have been introduced, made possible through the deployment of the advanced metering infrastructure. BC Hydro is currently rolling out a new smart meter program with an estimated 1.8 million meters to be deployed within the province (BC Hydro, 2010).

Within the United States, over 60 separate pilot program initiatives have been announced, covering the installation of at least 35 million meters. With significant government funding and rebate programs in place, development is certain to accelerate and further expand.

3.3.3 Market Research Forecasts

Market analyst reports generally provide estimates and forecasts for both revenue and volume of units within the smart metering industry. Citing historical sales data combined with market trends, this secondary research provides some insight into market structure and trends.

Overwhelmingly the forecast for smart meter development and implementation is optimistic and positive. Each of the key market research firms calls for smart meter shipments into the hundreds of millions within the next few years. For example, ABI Research projects that the global shipments of smart meters will grow from approximately 79 million in 2009, to over 100 million in 2011, and expand to more than 250 million by 2016 (ABI Research, 2011). Similarly, Pike Research, a clean-technology market consultancy firm, forecasts more than 250 million smart meters will be installed by 2015, up from 46 million in 2008 (Pike Research, 2010).

Beyond individual opportunity for firms within the industry, a variety of other societal factors, such as energy conservation initiatives, are driving growth and development of the smart energy market. McKinsey & Company, through an analyst series on smart grid potential, estimated that within the United States customer applications and the associated advanced metering infrastructure would represent a combined annual value of over $68 billion annually by 2019 (Booth, 2010).

3.4 Market Trends

Significant trends affecting the market structure, competition, and profitability include consolidation of competitors and the creation of government mandates targeted towards smart grid technology.

3.4.1 Government Incentives, Regulations, and Mandates

As presented in the preceding discussion, there is a fundamental business case for the smart grid energy market for both consumers and energy suppliers in terms of energy conservation and demand response management. Government regulatory incentives aligned with promoting energy conservation initially kick-started the move towards smart grid technology. However, as government and industry each develop a deeper understanding of the potential benefits offered, several key stimulus packages targeted specifically towards the development and deployment of smart grid technology have accelerated investment.

One of the most notable and influential government mandates to influence smart meter development is that of the European Union's 3rd Energy Package, approved by European Parliament in early 2009. The legislation mandates that 80 percent of all electricity customers in all EU Member States be fitted with smart meters by 2020, subject to national economic assessments, with total coverage by 2022 (ERGEG, 2010). Current industry analyst estimates place the number of energy meters within Europe at 240 million devices.

Within the United States, smart grid technology investment has received several key contributions from government in the past few years. In 2009, the U.S. Department of Energy distributed $3.4 billion in Smart Grid Investment Grant (SGIG) awards for the development of smart grid technology, mostly focused on advanced metering infrastructure and grid monitoring and control. Including the matched private investment, the SGIG program will provide more than $8 billion in total investment. Similarly, the American Recovery and Reinvestment Act economic stimulus package of 2009 included approximately $11 billion for Smart Grid and Smart Metering projects, with $7.1 billion earmarked for distribution in 2010 (Bloomberg, 2011). More recently, the United States government also unveiled a smart grid policy framework to continue the modernization of the grid through sharing of best practices and empowering consumers with information. The report, released in June 2011, "*A Policy Framework for the 21st Century Grid: Enabling Our Secure Energy Future,*" highlights several government initiatives to spur smart grid adoption.

Finally, State Grid Corporation of China (SGCC), the state power utility that covers over 80 percent of the population, has pledged to have the smart grid operational by 2020. Industry analysts have estimated the Chinese government is spending between $7.3 and $10 billion annually on smart grid development, more than is currently spent on power generation. See Appendix A for a compilation of the significant government stimulus investments in the smart grid energy market by country for 2010.

3.4.2   Market Consolidation

Another dominant trend within the smart metering market is consolidation of technology providers. Many of the world's largest electrical multi-national corporations are accelerating the pace of acquisition within this market in an effort to position themselves favourably for scalable growth within the industry. For example, in May of 2011, Toshiba, best known within the smart grid industry for its power generation, grid transmission and distribution business segments,

acquired Landis+Gyr, one of pioneering firms of the smart meter technology, for an estimated $2.3 billion.

In June of 2011, two of the global leaders of intelligent meter manufacturing, Itron and Landis+Gyr, announced plans to integrate their communication platforms into each other's meters. The agreement strengthens the market share of each firm, by effectively doubling the installed meter capacity with which each firm's communication solutions can interoperate. Furthermore, this positions the pair favourably for advanced metering infrastructure projects requiring multi-vendor solutions.

Furthermore, while meter manufacturers continue to compete aggressively within the marketplace, North American firms have banded together to form the Smart Meter Manufacturers' Association of America (SMMAA). The association includes each of the major manufacturers, such as, Echelon, Elster, GE, Itron, Landis+Gyr, and Sensus. With a mandate to "educate legislators, regulators, media and other stakeholders about the benefits of smart meters and to advocate for federal and state policies that support their deployment," the association provides a consolidated voice for the industry to promote development and deployment.

3.4.3   Market Trends Summary

One of the key difficulties in assessing the current state of the smart grid market is that it is new. The boundaries for technologies and communications solutions are not yet firmly established as firms, industry alliances, and government all continue to define their role in the definition and influence of the market. While there is little doubt that wireless M2M communication solutions will play an integral role in the success of the smart grid, as of yet there is little clarity as to which technology will serve a dominant role.

Recent trends towards market consolidation and industry standardisation continue to narrow the field of contending solutions. However, firms can ill afford to adopt a passive position whilst awaiting a preferred implementation solution to present itself. Rather, industry participants must serve an active role in the developing and influencing the deployment of the products and services that best suit the core competencies of their firm so as to maximize the value extracted from market opportunities.

4 Internal Assessment of Sierra Wireless

This chapter examines the core competencies of Sierra Wireless as the foundation for a strategy to address the advanced metering infrastructure market. Having examined the market structure and competitive forces influencing advanced metering infrastructure opportunities, the focus of the report now shifts inwards to the resources and capabilities of Sierra Wireless as a firm.

An internal analysis presents an understanding of how a company's strategic resources and capabilities form the foundation for the firm's core competences. Identifying and appraising these core competences is a key step in the formulation and implementation of any proper strategy. This chapter presents the current resources and capabilities of Sierra Wireless as they relate to meeting the needs of the advanced metering infrastructure market and as possible sources of competitive advantage within this market.

Just as corporate strategy formed the basis for the external analysis of the market, business strategy frames the internal analysis and subsequent discussion presented. Business strategy is generally concerned with establishing competitive advantage by matching a firm's resources and capabilities to the opportunities that arise in the external environment (Grant, 2008). Building upon the market opportunities and attractiveness created by the industry value chain and competitive forces, the following discussion examines which core competences are required for Sierra Wireless to establish, secure, and defend a leadership position within the advanced metering infrastructure market.

Following an introductory inventory of Sierra Wireless' strategic resources, the internal analysis examines the organizational capabilities through the lens of C. K. Prahalad and Gary Hamel's landmark paper, "*The Core Competence of the Corporation*." The fundamental premise of this view suggests that to remain competitive in a modern global market firms must seek competitive advantage from its organizational capabilities. Firms can then gain competitive advantage by reapplying these core competences across multiple markets, facilitating diversification and new market entry with established competitive advantages (Tampoe, 1994). Most importantly, the firm must establish a thorough and insightful understanding of its own

resources and capabilities to select an appropriate strategy and allocate sufficient resources to develop the correct core competences required by the market (Grant, 2008).

4.1 Core Competence-Based View

In their 1990 paper, "*The Core Competence of the Corporation*", C.K. Prahalad and Gary Hamel present management theory to suggest that it is a firm's core competencies, not discrete individual assets or products, which are the key to developing sustainable competitive advantage. Core competencies are those unique organizational capabilities that span multiple product lines, strategic business units, and markets (Prahalad & Hamel, 1990). The competence-based view stresses the understanding and development of the right competencies for the long-term success of the firm.

Within this view, a firm's internal resources and capabilities comprise the fundamental inputs to core competencies. It is then the core competencies of the firm which can create sustainable competitive advantage within a market. In Figure 4.1 below, a graphical illustration of this ecosystem is presented to delineate the definitions and roles of each component.

Figure 4.1   Internal Ecosystem of a Firm's Resources, Capabilities and Competencies
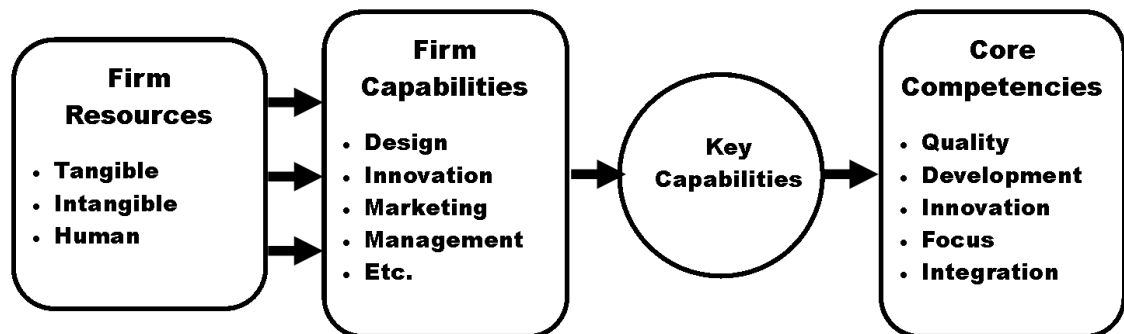
Source: Adapted from Hafeez, 2002.

Within their paper, Prahalad and Hamel suggest application of the following three tests to identify the core competencies of a firm:

1. Provides potential access to a wide variety of markets

2. Makes significant contribution to the perceived customer benefits or the end products

48

3. Difficult for competitors to imitate

The two major sources of a firm's profitability stem from industry attractiveness and competitive advantage. Whereas industry attractiveness is dependent upon the external factors of competitive forces, competitive advantage derives from the resources and capabilities of the firm. Unique, sustainable competitive advantage allows the firm to create value, generate higher profit margins, and secure market share. An important understanding is that core competencies are the foundations for profit, not the result of it.

When the external market requirements are in a state of flux and lack clear definition of consumer needs, as with the current advanced metering infrastructure and smart energy markets, an internal assessment of the firm can be an extremely useful tool in developing business strategy. Equipped with a thorough understanding of the firm's key resources, capabilities, and core competencies, management of the firm can implement an appropriate strategy to leverage these strengths.

While most firms offer a diverse portfolio of product lines, those of sufficient size also manage a portfolio of strategic business units. The competence-based view of the firm suggests that in addition to product portfolios firms should also actively manage a portfolio of competencies and devote appropriate attention to the development and application of these key competencies across each of the firms core products and markets. By leveraging the most successful and productive capabilities of the firm, new markets can be identified and entered with established competitive advantage immediately applied.

To this end, the remainder of this chapter will identify the strategic resources and capabilities that contribute to the core competencies of Sierra Wireless and how each of these can be applied appropriately to the advanced metering infrastructure industry value chain.

4.2 Resources

> "*Analysts have tended to define assets too narrowly, identifying only those that can be measured, such as plant and equipment. Yet the intangible assets, such as a particular technology, accumulated customer information, brand name, reputation, and corporate culture, are invaluable to the firm's competitive power. In fact, these invisible assets are often the only real source of competitive edge that can be sustained over time.*"

Hiroyuki Itami, Mobilizing Invisible Assets

A wide variety of definitions for a firm's resources exists within strategic management literature. This paper will adopt the view presented by Robert M. Grant, which offers that resources are the "productive assets owned by the firm" (Grant, 1991). While individual resources do not create competitive advantage in and of themselves, together, a set of strategic resource assets can create organizational capability and competence.

The traditional resource-based view classifies resources into three subcategories: tangible, intangible, and human resources. Resources that possess the attributes of valuable, rare, inimitable, and non-substitutable are deemed to be the strategic assets that contribute to the organizational capability and create competitive advantage (Grant, 2008). The following sections present an inventory of Sierra Wireless' strategic assets within each of the three subcategories.

4.2.1   Tangible Resources

Tangible resources, such as financial holdings and physical assets, are typically the easiest category to identify and understand. However, the key is to identify those assets that differentiate the firm and create potential advantage. As will be shown, Sierra Wireless has a strong financial standing and possesses key physical assets which can be leveraged within the advanced metering infrastructure market.

4.2.1.1   Financial Position

Sierra Wireless has demonstrated strong and consistent revenue growth for a number of years. Through the acquisition and integration of Wavecom in 2009, Sierra Wireless dramatically broadened their product portfolio and diversified the firm's revenue streams. This reflects Sierra Wireless' positive focus on future opportunities to raise the return on investment, through a continued focus on new opportunities to raise net income.

As the end of the first financial quarter of 2011, Sierra Wireless was debt free and had a strong cash position of $110.8 million USD. Quarterly revenue was reported as $144.3 million, with a gross margin of 27.4%. This quarterly revenue figure was within the management guidance, but down from $151.3 first quarter revenue in 2010. As pertinent to the smart energy market, revenue attributed to Sierra Wireless' machine-to-machine business unit was $72.7 million for the first quarter of 2010. This contribution reflects a dramatic improvement in M2M contribution to corporate revenue from the 2009 first quarter M2M market contribution of only 28% (Sierra Wireless, Inc., 2010). Sierra Wireless has dedicated significant resources to growing the M2M product offering and profitability.

The financial position of Sierra Wireless presents a considerable advantage in the cellular M2M communication and the smart energy markets. Within these markets, the financial stability of value chain partners is extremely important to customers with significant investments in products with long expected life cycles. Furthermore, access to working capital allows for future strategic acquisitions.

4.2.1.2 Physical Resources

Sierra Wireless holds development offices spread around the world to provide localized support and development expertise for the region's market demand. Given the fragmented nature of both the utility and wireless telecommunication industry due to national and regional standards, Sierra Wireless has been able to distinguish each research and development engineering site as centre of excellence for the appropriate cellular communication technology. Through the acquisition of Wavecom in 2009, Sierra Wireless added two new research and development offices in France, along with a new design centre in China, each of which have strengthened Sierra Wireless' presence in Europe and Asia.

Furthermore, a strong inventory of modern test equipment, development platforms and licenses enables Sierra Wireless to design and manufacture quality cellular communication devices across each of its product lines. One of the key examples of a strategic physical asset is the 2009 accreditation of Sierra Wireless' test laboratories in both Richmond, British Columbia and Carlsbad, California as CTIA Authorized Test Lab status for Over the Air (OTA) Performance testing. With this authorization, Sierra Wireless is able to submit OTA test results directly to network operators for network certification of a variety of wireless devices and OEM designs. This resources saves both time and money by streamlining the certification and approval processes.

4.2.2 Intangible Resources

For most firms, intangible resources are more valuable than tangible resources (Grant, 2008). In large part, the value created by intangible resources is due to their nature of being both more difficult to identify and imitate.

4.2.2.1 Technology Assets and Intellectual Property

Sierra Wireless' expertise in wireless technology development and implementation, along with experience in regulatory and carrier certifications offers significant benefits to the firm.

With a broad base of technical development spanning 2G, 3G, and 4G wireless cellular technologies and successful deployments around the globe, Sierra Wireless is equipped to serve virtually any cellular M2M communication need.

In addition, Sierra Wireless has a rich inventory of intellectual property assets, from patents and licensed IP from key suppliers such as Qualcomm. As compared to many other potential competitors, Sierra Wireless is litigious in protecting the firm's intellectual property and able to offer true indemnity against technology license violations.

4.2.2.2   Sales and Distribution Channels

With over 18 years in the cellular data communications industry, Sierra Wireless has strong relationships with many of the world's leading cellular network operators. Network operators serve as the primary distribution channel for Sierra Wireless' mobile consumer product lines and represent a significant value chain partner within the cellular M2M communications and advanced metering infrastructure markets.

Meanwhile, within the M2M industry, each vertical market segment has specific value chain dynamics and partners. As highlighted in the previous chapter, the smart energy and advanced metering infrastructure markets have a broad industry value chain with a variety of potential partners. With significant OEM and cellular certification approval experience, Sierra Wireless is able to offer substantial value to industry partners through trusted relationships.

4.2.2.3   Brand Reputation

Sierra Wireless has a strong reputation as the global market leader in terms of market share for the cellular M2M communications industry. The Sierra Wireless brand reputation is founded upon integrity, innovation, and excellence in execution. Integrity distinguishes the firm's character as a trusted business partner and results from a rich history within the cellular data industry. Innovation drives the Sierra Wireless business forward, with several first-to-market cellular technology device launches. Finally, by producing results that customers can rely on and emphasizing superior customer-focused responsiveness, Sierra Wireless consciously reinforces its reputation for excellence in execution.

Each of these helps Sierra Wireless secure key supply contracts. Furthermore, Sierra Wireless has a rich history of technology partners, such as network operators, to strengthen its position in the advanced metering infrastructure market in which a distributive solution that spans the industry value chain is often required.

The Sierra Wireless brand name represents a significant reputational asset, creating value through instilling customer confidence. Sierra Wireless has successfully differentiated its products through superior quality and service, and the price premium that customers are willing to pay for Sierra Wireless products over that of an unbranded or unknown brand reflects this reputational value.

However, while Sierra Wireless' reputation is strong among select personal computing OEMs and cellular network operators, the firm will need to leverage and expand this reputational capital to include new industry partners that are specific to the smart energy market. Examples include utility supply companies, advanced metering infrastructure information technology integrators, and OEMs in the metering and consumer application domains.

4.2.3   Human Resources

The key strategic human resources that create value within a firm are the skills, knowledge, and collective attitudes of superior performers (Grant, 2008). Sierra Wireless has an extremely strong team spanning multiple organizational functions. Expertise in cellular communications engineering spans the disciplines of radio frequency, hardware, firmware, and software. Additionally dedicated wireless communication solution and support representatives along with customer-focused product management personnel contribute to a complete wireless offering.

4.2.3.1   Wireless Technology Expertise

Throughout Sierra Wireless' 18 years of experience in designing, developing, and marketing wireless cellular data products and solutions, the firm has gained invaluable experience and expertise in each cellular technology standard. Sierra Wireless is one of the few suppliers to offer technical products for each of the world's cellular radio protocols. This wealth of experience in both in-house design and OEM support has allowed Sierra Wireless to streamline processes and reduce the time to market.

Supplemental experience in project and product management for wireless technology further contributes to Sierra Wireless' strengths. From leading edge cellular technology innovations to aggressive project schedules and demands, Sierra Wireless is well equipped to meet a variety of industry partner needs.

4.2.3.2 Organizational Culture

Organizational culture within a firm reflects the complex set of values, beliefs, and assumptions that combine to define how a firm conducts business (Grant, 2008). The primary tenets of the Sierra Wireless culture are teamwork, responsiveness, and achievement. Teamwork defines the culture by encouraging the sharing of knowledge and resources across strategic business units and functional teams. Responsiveness reflects the firm's commitment to customer loyalty and value chain relationships. Thirdly, a culture of achievement demands passion and individual commitment from employees in order to achieve both individual and corporate goals.

Adding to the resolve of this culture, Sierra Wireless has been able to maintain a low employee turnover rate. In fact, several of Sierra Wireless' original employees from the 1993 founding still maintain an active and influential role within the firm. Employee retention has served to reinforce the principles of growth and achievement that helped establish the company in the early days of the mobile communications industry. Even through periods of significant growth and multiple acquisitions, Sierra Wireless has preserved and promoted its corporate culture through office cross-pollination and maintaining a relatively flat organizational structure hierarchy.

Finally, Sierra Wireless also promotes a strong culture of empowerment. Employees are trusted and encouraged to be proactive in both external customer response and internal continuous improvement processes. This enables a theme of mutual respect and flexibility as individuals seek to implement the best solution given the resources available. This empowerment is made possible through an atmosphere of trust earned through many years of corporate challenges, success, and employee development.

4.3 Capabilities and Core Competencies

Whereas resources inventory the strategic assets that the firm owns, capabilities reflect what the firm can do (Grant, 2008). More accurately, a firm's capabilities are the skills that bridge the link between the corporate strategy and its successful implementation (Tampoe, 1994).

As previously illustrated, firm resources serve as the inputs to the firm's capabilities. While firms have a rich supply of capabilities, some will play a more important role than others in realizing the business objectives of the firm. As suggested in the core competence-based view of the firm, these are the key capabilities upon which strategy and core products can be built (Hafeez, 2002).

Particularly within today's fast-moving, technology based industries, new companies and new products are built around specific technological capabilities (Grant, 2008). This observation is pertinent to both the wireless and smart energy industries, but with different reasoning. While the wireless telecommunications industry is highly standardised and regulated, the velocity of innovation and technology constantly pushes development forward at a blistering pace. Contrast this with the smart energy market, where standards and industry technologies are only beginning to take shape and the market is in a state of constant flux as newcomers and incumbents each fight to establish their position and role within the ever-shifting industry value chain. Within each of these markets, customer needs are constantly shifting as trusted technologies move toward obsolescence and new industry standards redefine the market requirements.

Core competency is the competitive strength established by the combination of technology, skill, and expertise. Often deeply embedded within organizational culture and processes, core competencies are difficult for competitors to imitate (Sato, 2009). Prahalad and Hamel position a firm's core competencies as the true source of competitive advantage and an essential factor in the establishment of corporate strategy. Unfortunately, a firm's core competencies are often not only hidden from competitors, but can also be hidden from the organization itself.

In the core competence concept of the firm, corporate structure is viewed as a portfolio of competencies, core products and businesses. Sierra Wireless has addressed some of these through the corporate restructuring into three business units and the establishment of four core product lines. The importance of core competencies cannot be understated, they are not only the predominant source of existing business profits but also drive new business development and market entry forward (Prahalad & Hamel, 1990).

Through discussion with several key senior managers within Sierra Wireless, the following core competencies were identified as the principal sources of competitive advantage and success for the firm. Each of the following competencies was applied against the three Prahalad and Hamel tests to qualify as a core competency: (1) provides potential access to a wide variety of markets, (2) makes significant contribution to the perceived customer benefits, and (3) are difficult for competitors to imitate (Prahalad & Hamel, 1990).

4.3.1   Product Quality

While this competency has served as a strong source of differentiation and competitive advantage for Sierra Wireless in the past, it is unfortunately evolving into the price of market

entry within the cellular M2M communication industry. With the new market requirements for long product life-cycles exceeding 10 or 15 years, product quality has rapidly become a minimum market entry requirement for industry partners within the advanced metering infrastructure and smart energy market.

This core competency is being further diminished through increased rivalry from competitors and the industry's progression towards commoditization. As many cellular M2M communications competitors rely upon the same cellular chipsets a handful of suppliers, it becomes more difficult to differentiate on product quality – unless quality can be reflected in other terms, as will be presented shortly.

4.3.2 Wireless Communication Development

More than any one particular piece or process, this core competency is embedded within the design, development, production, and management processes of Sierra Wireless. Encapsulating the diverse range of technical skills, processes, and industry know-how, Sierra Wireless is capable of delivering products and services which confer sustainable and unique competitive advantage to the firm.

Technical expertise coupled with a strong organizational culture serve to reinforce this competency. In fact, Sierra Wireless' corporate structure is organized to promote and support this competency across all levels of the company. As presented previously in Chapter 1, as of year-end 2010, Sierra Wireless had a total 880 full-time employees worldwide, with 477 employed in product development capacity (Sierra Wireless, Inc., 2011).

4.3.3 Innovation

One of Sierra Wireless' primary strengths is that of its ability to innovate and grow. With several successful industry-leading launches of new cellular technology devices, Sierra Wireless has a strong reputation for being first to market with industry leading technology. One such example includes the Sierra Wireless Turbo 21 cellular data modem. Launched in 2009, this device shared in the Guinness World Record award for the fastest national mobile broadband network, developed in partnership with Australia's Telstra Next G mobile network.

Sierra Wireless has received international recognition for consistently bringing the world's first and fastest mobile broadband USB modems to market. From HSPA+ devices launched in 2009, dual-channel HSPA+ devices in 2010, through to the ongoing deployment of LTE devices in mid-2011.

4.3.4 Customer Focus

Sierra Wireless maintains a culture of customer responsiveness throughout the organization. As the cellular M2M communication industry relies upon a tightly knit value chain of cellular network operators and OEM customers, Sierra Wireless devotes a significant amount of resources to customer relations and support. Traditionally, Sierra Wireless has relied upon a select number of industry partners and as a result has integrated a number of customer-focused processes into the core business operations. From joint technology and device road map development, to an integration of device approval and regulatory certification processes, attention, loyalty, and exceptional service to customers is reinforced throughout many of Sierra Wireless quality initiatives.

4.3.5 Acquisition and Integration

Sierra Wireless has a rich company history of successful technology acquisition and mergers. In fact, half of Sierra Wireless' brand initiatives stem from acquisition and integration initiatives. The most recent integration of Wavecom, which effectively doubled the size of Sierra Wireless, propelled the firm to global market share leader for the cellular M2M communication industry. This core competency has particular to the smart grid energy market as a myriad of technology partners each compete to establish leading market position. Combined with the industry trend towards market consolidation and Sierra Wireless' strong financial position, the firm is well-equipped to seek new candidates for technology partnerships and/or merger.

4.4 Value Proposition

Sierra Wireless is well positioned to leverage many of the firm's competencies and past development experiences into competitive advantage within the advanced metering infrastructure market. Given the nature of communications solution applications, each of the previously identified core competencies creates value for the Sierra Wireless in terms of entering the smart energy market.

Specifically, Sierra Wireless has extensive wireless product development and success in each of the world's cellular technologies, allowing the firm to address and support smart energy markets worldwide. Furthermore, with an existing and extensive cellular M2M communications product line, Sierra Wireless can quickly bring new industry OEM partners to market with proven product development, certification, and management processes in place. As a trusted partner for

several of the world's leading cellular network operators, Sierra Wireless can leverage these relationships to form new industry partnerships and expand their role within the value chain.

Furthermore, the possibility exists for Sierra Wireless to combine and leverage multiple core competencies such as innovation and wireless expertise. Beyond the cellular wide-area communication opportunities, advanced metering infrastructure and consumer applications within the smart energy industry also require short-range home-area network technologies. While a variety of technology standards are being proposed as the market solution, Sierra Wireless could adopt one of the short-range technologies, such as ZigBee to pair with its cellular communications offering. A move such as this would allow Sierra Wireless to differentiate itself from the competition while at the same removing one of the required industry value-chain partners, allowing Sierra Wireless to capture greater value. Sierra Wireless management will need to consider whether to develop new short-range wireless capabilities in-house through the application of the firm's wireless expertise and innovation competencies, or if these capabilities are best added through acquisition and integration efforts.

As part of removal of an additional industry partner to implement the short-range wireless component of smart metering and consumer applications, Sierra Wireless simplifies integration, while simultaneously reducing solution package cost and size. Sierra Wireless is uniquely equipped with a strong history in both the cellular M2M communications and ruggedized cellular modem industries. Boasting product reliability and brand reputation, Sierra Wireless has opportunity to gain significant market share in rapidly growing industry of smart grid energy.

5 Recommendations and Conclusion

This chapter will present several strategic recommendations for Sierra Wireless senior management based upon a combination of the preceding external analysis of the smart energy market and internal analysis of the firm. Recommendations are made with specific regard to market entry and application of the Sierra Wireless' core competencies to gain competitive advantage within the smart energy cellular M2M communications industry.

Sierra Wireless is currently positioned as the world market leader for cellular M2M communication modules. However, as Hamel and Prahalad advise, "There's no such thing as 'sustaining' leadership; it must be regenerated again and again" (1994, p: 127). For Sierra Wireless to continue to generate profitable growth and extend leadership to the smart energy market, the firm must evaluate its current capabilities and determine how each will specifically apply to new markets to generate competitive advantage and capture value.

Through the following discussion, this report will offer recommendations on how Sierra Wireless can take decisive action to manage, develop, and apply the appropriate core competencies to profitably maximize cellular M2M communication opportunities and expand the firm's leading market share.

5.1 Smart Grid Energy Market Entry

In the short term, Sierra Wireless should expand upon the industry value chain analysis presented within this report to specifically identify relevant industry partners throughout. As mentioned previously, Sierra Wireless has strong business relationships with many of the world's largest cellular network operators, original equipment manufacturers, and system integrators. Sierra Wireless needs to initiate discussions with the firm's existing relevant partners to establish a shared vision of market development, coordinate a complete solution offering, and communicate commitment to participation within the smart grid industry. An advanced metering infrastructure application solution developed and presented jointly by multiple representatives within the industry value chain strengthens Sierra Wireless' market position and potential share.

As the smart grid energy market ecosystem begins to take shape and requirement standardizations continue to evolve, there exists opportunity for leading firms to influence, if not

dictate, the key solution technologies. Sierra Wireless shares a common motivation with several of the firm's key technology suppliers and buyers to position cellular M2M communications as the preferred application solution. Given the scope of the global market, this initiative is likely to require a focused internal committee comprised of key representatives from several of Sierra Wireless' functional departments. With stakeholder representation from within engineering, marketing, sales, and corporate senior management, Sierra Wireless can determine the most appropriate position for market entry.

Beyond leveraging the existing technical partnerships, it is also recommended that Sierra Wireless conduct a comprehensive evaluation of the competitive landscape in the hopes of identifying a suitable candidate for technology partnership or acquisition. Sierra Wireless is well-equipped to form valuable partnerships through the firm's strong financial position, history of successful technology mergers and acquisitions, and a respected organizational reputation within the cellular M2m communications industry.

Finally, Sierra Wireless will likely need to adapt internal processes to adjust to the pace of development and culture of the utility suppliers in the market. Developing and marketing cellular M2M solutions to government and utility customers will represent a vastly different experience than Sierra Wireless' traditional consumer mobile and network operator based product lines. Through defining a specific product and service mix that accommodate the unique requirements of the smart grid energy market and utility firms, Sierra Wireless can position itself to capture significant value within this market.

5.2 Core Competency Management

As presented within the internal analysis, the basis for competitive advantage in today's global technology markets is shifting from capital-based resources to the intangible human resources and organizational capabilities of the firm. Successful competitive advantage therefore requires active inventory management and monitoring of these competencies, similar to that imposed upon capital resources. Just as a firm must have a thorough understanding of its available financial resources to maximize return, so too must the firm understand where its strengths truly lie (Tampoe, 1994).

The report has suggested several of the core competencies that enable Sierra Wireless to succeed as a firm and capture value through competitive advantage. This analysis was based upon discussions with select senior management representatives and the author's application of accepted core competence-based methodologies. However, it should be recognized that the core

competencies that have enabled success for the firm thus far may not be the same as those required for new market entry. Furthermore, to remain profitable, the firm's core competencies must to continue to evolve alongside the competitive forces of the industry.

5.2.1 Management of Existing Competencies

Core competency exists as the assembly of technology, skills and knowledge to create benefits to customers (Sato, 2009). However, as the competencies are typically embedded deep within the technical and managerial processes of the firm, they often remain hidden from not only competitors but from the firm itself. Careful evaluation must identify not only the firm's competitive strengths, but should go further to assess the specific processes and personnel that contribute to these competencies.

For each of the core competencies identified within this report: wireless technology development, innovation, customer focus, and acquisition and integration, Sierra Wireless senior management needs to identify the processes and people which embody these critical capabilities. With clarification of the components adding the most value to the firm, Sierra Wireless can actively manage both the retention and redeployment of these strategic assets throughout the firm. Unlike physical assets, core competencies do not diminish with use (Prahalad & Hamel, 1990). Rather, competencies are enhanced through application and sharing throughout the organization. However, this view requires a deep understanding and commitment which transcends the organizational boundaries of strategic business units and functional divisions.

While Sierra Wireless has begun to make strides in this area, there still exist substantial opportunities for further commitment. Sierra Wireless has experienced significant growth in both revenue and size over the past number of years, most of which stemmed from the successful acquisition and integration of complementary technologies and firms. This has enabled Sierra Wireless to establish a literal global footprint and diverse portfolio of technical capabilities. However, it has also affected the organizational cohesiveness and created a patchwork of accepted practices. Recently, key personnel ranging from product managers to sales executives to firmware developers have been loaned to other business units and development offices to encourage knowledge and process transfer and leverage established capabilities.

Further company-wide discussion and acknowledgement of the established core competencies would not only raise awareness but also encourage commitment to the core strengths of Sierra Wireless.

5.2.2   Development of New Competencies

Sierra Wireless needs to recognize that as markets continue to develop and evolve, the competitive advantages required for profitable success will also shift and change. Capabilities that were once competitive differentiators in the past can evolve to become the standard price of market entry (Hamel, 1994). With this in mind, Sierra Wireless needs to diligently and continuously reassess the core competencies and capabilities of the firm against the requirements of desired markets. Only then can the firm invest the appropriate resources into developing the capabilities that it expects to drive competitive advantage for future market opportunities.

As an example, traditional firm advantages such as quality, time-to-market, and customer responsiveness are beginning to be reclassified as the minimum market entry requirements (Hamel, 1994). No longer viewed as innovative foresight, it has become necessary for firms to develop new sources of differentiation within the fast-paced technology industry.

The external analysis of the smart energy industry provided earlier within this report confirmed the market attractiveness and opportunity with respect to cellular M2M opportunities. However, further detailed investigation will need to be upheld as the smart energy market continues to develop. As industry and governmental standards evolve, roles and boundaries for many of the industry value-chain partners will begin to arise. If Sierra Wireless can accurately anticipate the emerging market demands and position itself accordingly, the firm can gain the innovator's advantage of influencing the market and establishing itself as the industry standard (Tampoe, 1994).

Commitment to the above strategy will require the substantial and sustained focus of Sierra Wireless. Some of the key questions for management to address will include: "What new core competencies will we need to build? What alliances will we need to form? What long-term regulatory initiatives should we pursue? How do we want the industry to be shaped in five or ten years? What must we do to ensure that the industry evolves in a way that is maximally advantageous for us? What skills and capabilities must we begin building now if we are to occupy the industry high ground in the future? How should we organize for opportunities that may not fit neatly within the boundaries of current business units and divisions?" (Hamel, 1994).

Recently, Sierra Wireless has initiated an advanced technology group, independent of the strategic business units, to investigate emerging technologies, trends, and opportunities for the firm. Similarly, members of this group take an active, participative role in various key industry and regulatory alliances. However, it must be re-emphasized that to maximize the potential for

targeted success Sierra Wireless must define and develop capabilities, not just new technologies. In fact, given the myriad of vertical market segment applications for cellular M2M communication solutions, one of the pertinent capabilities required will be the ability to assess the potential of new technologies.

5.2.3   Targeted Application of Competencies

Finally, in light of the external market and internal firm analysis presented within this report, Sierra Wireless needs to determine how best to apply the established and developing firm capabilities to capture specific opportunities within the smart energy industry. Industry foresight requires deep insights into technological trends, industry regulations, and consumer demographics and lifestyles. As these understanding and implications are spread across various business units and function groups within the firm, Sierra Wireless senior management must strive to capture and exploit the foresight that exists throughout the organization.

One recommendation is for Sierra Wireless to initiate core application committees comprised of some of the key contributors to core competencies across business lines and geographic offices. Similar to an independent change management team, this implementation promotes both collaboration and buy-in from key resources within the firm. By devoting targeted attention to new market opportunities across a variety of functional divisions, Sierra Wireless can leverage the size and depth of its human resources while creating a sense of unity and shared responsibility among internal stakeholders.

With each committee targeting the specific needs of an appropriate market, core competencies can be developed and applied in the most efficient manner. The primary function of the committee would be to utilize core competency personnel to aid in the investigation of how to apply their collective strength to maximize the potential for success. However, an equally important secondary function of the committee would be to engage these key contributors in the strategic development of Sierra Wireless as a firm to reinforce the organizational culture or teamwork and personal empowerment.

The smart energy market in particular depends upon new innovations such as extended communication structure, new user experiences, and developments to link consumer devices with utility infrastructure management. With a history of technological innovation and wireless communication expertise, Sierra Wireless is uniquely positioned to contribute wireless M2M communications solutions to foster market development.

Similarly, with the extended industry value chain of the smart energy ecosystem, development will rely upon a number of interworking products and technologies. Sierra Wireless has significant experience in collaborating with and supporting various OEM and cellular network operators. Many of the embedded processes and technical knowledge can be extended to support new industry partners such as information system integrators and utility supply companies. Furthermore, it is expected that Sierra Wireless will be able to both leverage and transition the reputational capital earned from existing relationships into new profitable industry alliances. One of the key recommendations for Sierra Wireless is to exploit the established core competencies to establish a leadership role in the innovation, development, and support of new cellular M2M communication applications within the smart energy industry.

5.3 Conclusion

Success within the smart energy market for Sierra Wireless will depend upon the confluence of appropriately developed corporate and business strategies that deliberately match the strengths of the firm to the needs of the market. However, beyond establishing clear goals and corporate objectives, good strategy must also honestly acknowledge the specific market challenges and establish the firm's appropriate response to overcoming the obstacles. Strategy based upon the firm's available resources and competencies stand a much greater chance of being accomplished. Without this detailed understanding of the challenges and opportunities presented in the smart energy market, Sierra Wireless is unlikely to activate the resources and core competencies required to succeed.

Finally, Sierra Wireless must also communicate a clear strategic vision throughout the organization, such that coherent and coordinated policy can guide execution. By focusing the firm on managing, developing, and applying the core competencies to appropriate opportunities presented within the smart energy market Sierra Wireless can leverage competitive advantages to maximize profitable growth and secure market leadership.

Appendix

Appendix A: Smart Grid Government Stimulus Investment, 2010

Smart Grid Energy Market Government Stimulus Investment by Country, 2010	
Country	**$US Millions (2010)**
China	$7,323
United States	$7,092
Japan	$849
South Korea	$824
Spain	$807
Germany	$397
Australia	$360
United Kingdom	$290
France	$265
Brazil	$204

Source: Adapted from Kema Data Compilation, 2010.

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