Summary continued

However, utilities long have been aware of these issues, and many report 10,000 or more attempted network security breaches per month, and have done so for years, according to research from Sierra Energy Group (SEG), the research and analysis division of Energy Central.

In the aftermath of the 9/11 terrorist attacks on the U.S. the federal government moved to ensure utilities take all necessary measures to mitigate these attacks. Through the Federal Energy Regulatory Commission (FERC) and the North American Electric Reliability Corp. (NERC) the government issued a set of standards and requirements to ensure this mitigation. These standards and requirements are called NERC-CIP (CIP=Critical Infrastructure Protection). These mostly have been developed by private enterprise through vendors and other organizations.

Telecommunications carriers such as AT&T have addressed cyber security longer than most utilities because of the public nature of their communications systems. On the average business day, AT&T transports approximately 17 petabytes of data on its network. As a result, AT&T has gained significant knowledge and experience in regard to security architectures and encryption methodologies.

Utilities in the Crosshairs

The U.S. utility is challenged as never before in history. The challenges are myriad: from generation capacity constraints and declining capacity margins to environmental global warming remediation demands, to economic conditions, to cyber and physical security concerns. The April 2009 Wall Street Journal story referenced earlier brought additional attention to a security issue utilities have been aware of, and attempted to mitigate for years.

Before the Wall Street Journal article brought the issue to widespread public attention utilities knew they were under attack. SEG is aware that utilities have quietly collaborated with the FBI, various national laboratories, vendors, the Department of Homeland Security and others to mitigate these on-going attacks. What was different about the Wall Street Journal article was the claim by various government officials that some of these attacks have been successful and that cyber spies from hostile countries have been mapping the U.S. electrical grid, and leaving behind bits of sleeper code that could be activated and used to damage the grid or cause blackouts in the event of war.[2]

For several years it has been general knowledge that cyber spies have been disrupting utility systems and causing blackouts in Eastern Europe and around the globe; sometimes even demanding ransom money to cease the attacks. Electric, water and wastewater utilities in several countries have been affected according to SEG. Thus far, no similar attacks have been publicly acknowledged[3] in the U.S., but the Journal article pointed to the likelihood that such attacks may be inevitable and may have even already occurred.

Attack Vectors

The widespread use of the Internet as a communications mechanism is a major driver for increased cyber attacks, but the problems go much deeper. Since the 1980s utilities increasingly have been using computerized communications systems and networks, primarily SCADA (Supervisory Control and Data Acquisition) and DA (Distribution Automation), to communicate with and control many remote devices on electrical grids and both natural gas and water distribution systems. Many of the early SCADA and DA systems that are still in service today were built with early technologies that are relatively easy for sophisticated hackers with modern tools to breach and manipulate. Recent technology trends have emphasized the "networking" of all utility computers and control systems for efficiency and collaboration. As more networks are linked, the pathways for cyber spies become myriad and the means of protecting such networks becomes increasingly difficult to maintain. There now are a large number of cyber pathways at most utilities and a determined hacker – particularly one backed by a less-than-benign government – likely will find one.

Furthermore, prior to the September 11, 2001 terrorist attacks there really was not a systematic security approach to address utility critical infrastructure protection in the United States. Each utility was essentially on its own, and security of computer systems and even physical security at plants, substations and other facilities were the responsibility of individual utilities without any oversight. This created a significant risk in that there are more than 3,000 electric and natural gas utilities and approximately 15,000 water distribution utilities in the U.S. Before the terrorist attacks there were many different approaches to cyber and physical security.

Critical Infrastructure Protection

In 2008, FERC approved eight new CIP reliability standards designed to protect the nation's bulk power system against potential disruptions from cyber security breaches. These standards were developed by the NERC and provide a cyber security framework for the identification and protection of Critical Cyber Assets.

The eight Cyber security standards address the following:

- Critical Cyber Asset Identification
- Security Management Controls
- Personnel and Training
- Electronic Security Perimeters
- Physical Security of Critical Cyber Assets
- Systems Security Management
- Incident Reporting and Response Planning
- Recovery Plans for Critical Cyber Assets

As mentioned NERC-CIP is a framework to help address security of our national utility systems, but there is still much work to do. For example, there have been cases where security updates have not been installed on assets, and unfortunately many "patches" are only issued after a hacker or cyber spy already has found and taken advantage of a security flaw. Multiply potential flaws by the number of utilities and again by the number of utility networks and you can begin to understand the cyber-security challenges around securing utility networks.

AT&T has invested significant resources in developing cyber security systems for its networks, and thus has significant expertise that utilities may find helpful in addressing their own security needs.

For AT&T cyber security is the collective set of services, procedures and practices. These capabilities assure the information, applications and services AT&T's customers want and use are secure, accurate, reliable and available wherever and whenever they are needed. Cyber security is a corporate priority and AT&T is investing significant resources in making its network and customers' information secure.

Cyber security capabilities include understanding and identifying emerging threats in early phases of their development. Network exploits, malware, flooding attacks, protocol anomalies and other threats are generally visible and often abundant on the Internet long before they have any significant affect on enterprise security.

AT&T is uniquely established to understand and deal with cyber threat. These include:

- Operating as the largest provider of Internet services
- Operation of a global IP network footprint
- An Internet data analysis platform that examines internet threats including botnets, network worms, DoS attacks, network exploits and other activity anomalies
- An analysis team that operates 24x7 to assess any significant activities on the Internet that could affect network services
- An algorithm research team that continually investigates and tests methods for automated detection of network threats
- AT&T Labs and Chief Security Office researchers, who participate in the security and networking research communities

The technology within AT&T's network is rapidly evolving to support new applications and services. In the course of 2009 alone, AT&T expects to invest $17-18 billion in expanding the capabilities of its network and infrastructure to meet the rapid global expansion of advanced information technology and services to enhance reliability and security. The size and scope of AT&T's global network, coupled with AT&T's industry-leading cyber-security capabilities, gives it a unique perspective into malicious cyber-activity.

AT&T's advanced network technology currently transports on average more than 17 Petabytes each business day of IP data traffic and the load is expected to double every 18 months for the foreseeable future. AT&T's network technologies give the company the capability to analyze traffic flows to detect malicious cyber-activities, and in many cases get very early indicators of attacks before they have the opportunity to become major events. For example, AT&T implemented the capability within its network to automatically detect and mitigate most Distributed Denial of Service Attacks within the AT&T network infrastructure before they affect service to AT&T customers. AT&T has grown from one domestic scrubbing complex to multiple locations across the United States, as well as having scrubbing nodes in Europe and Asia. This gives the AT&T the ability to filter attack traffic as close to the source of the threat as possible.

AT&T has made significant investments in the security of its mobility network. AT&T's Radio Access Network (RAN) complies with 3GPP airlink security standards. The RAN uses secure protocols in order to maintain and manage communication with the mobile station as well as specific procedures including power control and handover management. An important security mechanism that protects the radio link against eavesdropping is encryption. Encryption protects both user data and network control information and occurs between the cellular towers and the wireless device.

Following authentication and key agreement the network and end user equipment uses a 128-bit key and strong encryption algorithms. Significant resources have also been invested in the AT&T core mobility and wide area network in order to comply with and exceed industry security standards.

Cyber Security Assets

AT&T is responsible for managing the security of a worldwide data network, which consists of multiple components converging into a common Multi-Protocol Label Switching (MPLS) network. In order to support these objectives, AT&T maintains a comprehensive global security organization comprised of over 700 security professionals. This organization is dedicated to the physical and logical security of the AT&T global network and its service offerings. It supports a broad range of functions from security policy management to customer-facing security solutions. The AT&T global security organization reviews and assesses AT&T's security control posture to keep pace with industry security developments and to satisfy regulatory and business requirements. AT&T actively participates in a number of global security organizations, and maintains a comprehensive set of security standards based in part on similar leading industry standards (COBIT, ISO/IEC 27001:2005, etc.). Given the dynamic environment that AT&T supports, the library of AT&T security standards is continually re-evaluated and modified as industry standards evolve and as circumstances require. In addition, AT&T supports the following programs.

Confidentiality

To ensure confidentiality, information is accessible only to those authorized. AT&T has implemented a three-tiered Information Classification framework for categorizing information based on sensitivity of the content and specific legal requirements.

Physical Access Control Requirements

AT&T operates in a highly secured environment where physical access to staff office space, switching centers, global network and service management centers and other network facilities is strictly monitored and controlled.

Network Element Access Controls

Access is provided to AT&T technical support personnel only on an as-needed basis for individuals with responsibility for network element maintenance and support.

Network Perimeter Protection

AT&T external network connections are protected by firewalls that screen incoming and outgoing traffic based on source and destination address, protocol and port, in accordance with the security policy.

Intrusion Detection

AT&T employs a combination of internally developed and commercial tools to detect attempts by unauthorized persons to penetrate AT&T Global Network. AT&T does not monitor individual customer connections for intrusions, except when part of a managed security service.

Workstation Security Management

Workstation security policies protect AT&T and customer assets through a series of processes and technologies including verification of personnel workstation accesses, PC anti-virus protection, operating system hardening and updates, full disk encryption where permitted by law to protect sensitive information on portable assets, along with a personal firewall intrinsic to remote access software implemented on workstations or portable PCs that remotely connect to the AT&T network.

Security Status Checking and Vulnerability Testing

AT&T conducts regular tests and evaluations to ensure that security controls are maintained and are functioning in accordance with policy. These initiatives include Security Status Checking and Vulnerability Testing, Security Incident Reporting and Management. AT&T uses a consistent, disciplined global process for the identification of security incidents and threats in a timely manner, to minimize the loss or compromise of information assets belonging to both AT&T and its customers and, to facilitate incident resolution.

Business Continuity and Disaster Recovery

AT&T Corporate Business Continuity Planning Services provides technical consultation and program management expertise to address the business continuity, disaster recovery and managed security needs of AT&T and its customers.

Security Products and Services

AT&T offers managed security products and services to its customers designed to assess and protect their vital network infrastructure, including managed services in the area of Intrusion Detection, Firewall Security, Endpoint Security, Token Authentication, Encryption Services, Security Email Gateway Services, Vulnerability Scanning and Consultative and Engineering Security Services.

Managed Services and Hosting

AT&T Managed Services take advantage of the security of AT&T's global Internet Protocol/Multi Protocol Label Switching (IP/MPLS) network. MPLS technology enables the creation of feature-rich network-based services coupled with AT&T's management expertise, tools and automation. AT&T's network-based managed services include Enhanced Virtual Private Network and Managed Internet Services.

Hosting Services

Hosting services provide utility computing services that offer tailored or turnkey solutions. The mix-and-match tailored solutions offer IT infrastructure, hardware and/or software components, reliable and secure data center facilities, value-added services (i.e., security, backup and restore, professional services, monitoring, portal/reporting, utility and disaster recovery), server virtualization and integrated client networking. A fully managed turnkey solution provides capacity on demand, managed firewall and network Intrusion Detection System (IDS) functionality, proactive alerting and patching dedicated virtual servers and, total isolation of each client's data in a data center environment.

AT&T has implemented in-depth access control layers with multiple levels of firewalls that isolate core network element functions from customer-facing interfaces. These security perimeters enable AT&T to offer voice and data interfaces to its customers while helping to preserve the integrity of its core network resources. AT&T offers a Commercial Connectivity Services (CCS) solution which allows utilities to define transport network paths for data delivery. This enables utilities to transport data from the Advanced Metering Infrastructure (AMI) to core IT infrastructure using authorized and encrypted capabilities.

CCS implements custom Access Point Names (APNs) that provide linkage from the wireless network to the utility's core IT infrastructure using either frame relay circuits or MPLS connectivity. AT&T also offers Enterprise on Demand (EOD), which enables customers to selectively activate and deactivate devices (SIMs) on a real-time basis. These capabilities involve multiple levels of security, access controls and encryption that many electric, natural gas and water utilities will find beneficial.

In addition to CCS and EOD, AT&T offers a suite of Security and Business Continuity Services that will assess vulnerabilities, secure data and infrastructure, detect attacks, respond to suspicious activities and provide for non-stop operations.

AT&T stands ready to work with utilities and bring its extensive experience and capabilities in cyber security to the many challenges ahead.

1. Electricity Grid in U.S. Penetrated by Spies by Siobhan Gorman, Wall Street Journal, April 8, 2009.

2. Ibid

3. Ibid

For more information contact an AT&T Representative or visit www.att.com/business.

GSMA Mobile Broadband Data Summary October 2009

	Continent	Country	Operator	Operator WI Name	HSDPA Status	UMTS Freq Band	HSDPA Data Rate	HSDPA Launch date	HSUPA Status	HSUPA Data Rate	HSUPA Launch date	HSPA+ Status	HSPA+ Data Rate	HSPA+ Launch date	LTE Status
1	Europe	Andorra	STA	STA	Planned			Dec-07							
2	Africa	Angola	Unitel	Unitel	In Service		1.8Mbps	Sep-07							
3	South America	Argentina	Claro (CTI Movil)	CTI Movil	In Service		1.8Mbps	Nov-07							
4	South America	Argentina	Movistar	Movistar	In Service		1.8Mbps	Jul-07							
5	South America	Argentina	Telecom Personal	Personal (Telecom Argentina), Argentina	In Service		7.2Mbps	May-07	None						
6	Asia	Armenia	Vivacell	VivaCell (MTS), Armenia	In Service		1.8Mbps	Apr-09							
7	Central America	Aruba	SETAR	Setar, Aruba	In Service		7.2Mbps	Dec-07							
8	Oceania	Australia	3 / Hutchison Australia	3 / Hutchison Australia	In Service		3.6Mbps	Feb-07							
9	Oceania	Australia	Optus Australia	Optus Australia	In Service		3.6Mbps	May-07							
10	Oceania	Australia	Telstra	Telstra, Australia	In Service		14.4Mbps	Oct-06	In service	5.76Mbps	Feb-07				Planned
11	Oceania	Australia	Virgin Mobile	Virgin Mobile	In Service		3.6Mbps	Jul-07							
12	Oceania	Australia	Vodafone Hutchison Australia	Vodafone Hutchison, Australia	In Service		14.4Mbps	Oct-06	In service						
13	Europe	Austria	3 Austria	3 (Hutchison), Austria	In Service		7.2Mbps	Sep-06	In service						Planned
14	Europe	Austria	mobilkom austria	mobilkom austria	In Service		21Mbps	Jan-06	In service	1.4Mbps		In Service	21Mbps	Mar-09	In trial
15	Europe	Austria	ONE	ONE	In Service		7.2Mbps	Jun-06							
16	Europe	Austria	T-Mobile / Telering Austria	T-Mobile / Telering Austria	In Service		3.6Mbps	Apr-06	In deployment						In trial
17	Middle East	Bahrain	Batelco	Batelco, Bahrain	In Service		14.4Mbps	Dec-07							
18	Middle East	Bahrain	Zain (MTC-Vodafone Bahrain)	Zain (MTC-Vodafone Bahrain)	In Service		1.8Mbps	May-06							
19	Asia	Bangladesh	GrameenPhone	GrameenPhone	Planned			Dec-10							
20	Europe	Belarus	life :)	life) (Turkcell), Belarus	Planned							Planned			
21	Europe	Belgium	Belgacom Proximus	Belgacom Proximus	In Service		3.6Mbps	Jun-06							
22	Europe	Belgium	KPN Base	Base (KPN), Belgium	Planned			end of 2009							
23	Europe	Belgium	Mobistar	Mobistar	In Service		1.8Mbps	Aug-06							
24	Asia	Bhutan	Bhutan Telecom	Bhutan Telecom	In Deployment			Jun-08							
25	South America	Bolivia	Tigo		In Service		3.6Mbps	Jan-09							
26	Europe	Bosnia and Herzegovina	BH Telecom	BH Telecom	Planned			2009							
27	Europe	Bosnia and Herzegovina	Telekom Srpske	mtel, Bosnia and Herzegovina	In Deployment			2009							
28	Africa	Botswana	Mascom	Mascom	In Service		1.8Mbps								
29	South America	Brazil	Brazil Telecom	Brasil Telecom, Brazil	In Deployment			Apr-08							
30	South America	Brazil	Claro	Claro (America Movil), Brazil	In Service		1Mbps	Nov-07							
31	South America	Brazil	CTBC	CTBC	In Service		1.8Mbps	Apr-08							
32	South America	Brazil	Sercomtel Celular	Sercomtel Celular	In Service		14.4Mbps	Dec-08	In service	5.76Mbps	Dec-08				
33	South America	Brazil	Telemig Celular	Telemig Celular	In Service		1.8Mbps	Nov-07							
34	South America	Brazil	TIM	TIM	In Deployment			Jul-08							
35	South America	Brazil	Vivo	Vivo	In Service		1.8Mbps		In service	1.4Mbps					
36	Asia	Brunei	DST (Datastream Technology)	DST (Datastream Technology)	In Service		7.2Mbps	May-08							
37	Europe	Bulgaria	Cosmo Bulgaria Mobile/Globul	Globul, Bulgaria	In Service		14.4Mbps	Sep-06	In Service	2Mbps					
38	Europe	Bulgaria	Mobitel Bulgaria (Vodafone)	M-Tel (mobilkom austria), Bulgaria	In Service		21Mbps	Mar-06	In service	1.4Mbps	Aug-07	In service	21Mbps	Sep-09	
39	Europe	Bulgaria	Vivatel/BTC Mobile	Vivatel/BTC Mobile	In Service		1.8Mbps	Jun-07							
40	Asia	Cambodia	CamGSM	Cellcard (Mobitel), Cambodia	In Service		1.8Mbps	Mar-08							
41	Asia	Cambodia	QB (Cambodia Advanced Communications)	QB (Cambodia Advanced Communi	In Service		1.8Mbps	May-08							
42	North America	Canada	BCE	BCE	Planned			2010							Planned

43	North America	Canada	MTS Mobility (MTS Allstream)	MTS Mobility (MTS Allstream), Canada	Planned										
44	North America	Canada	Rogers Wireless	Rogers Wireless	In Service	21Mbps	Nov-06	In service	2Mbps	In service	21Mbps	Aug-09			
45	North America	Canada	Telus Mobility	Telus Mobility, Canada	Planned		Sep-09	None							
46	North America	Canada	Globalive	Globalive, Canada	In Deployment										
47	North America	Canada	Videotron	Videotron, Canada	Planned										
48	North America	Canada	DAVE wireless	DAVE wireless, Canada						Planned					
49	North America	Canada	SaskTel	SaskTel, Canada	Planned		2010								
50	South America	Chile	America Movil - Smartcom (Claro)	Claro (America Movil), Chile	In Service	1.8Mbps	Dec-07								
51	South America	Chile	ENTEL PCS	ENTEL PCS	In Service	3.6Mbps	Dec-06								Planned
52	South America	Chile	Telefonica Chile	Telefonica Chile	In Service	1.8Mbps	Dec-07								Planned
53	Asia	China	China Mobile	China Mobile	In Trial		Jan-00								In Trial
54	Asia	China	China Unicom	China Unicom, China	In deployment	7.2Mbps		In deployment							
55	South America	Colombia	Comcel	Comcel	In Service	1.8Mbps	Feb-08								
56	South America	Colombia	Movistar (Telefonica Moviles)	Movistar (Telefonica Moviles)	In Service	1.8Mbps	Dec-08								
57	South America	Colombia	Tigo		In Service	2.0Mbps									
58	Central America	Costa Rica	ICE Costa Rica	ICE Costa Rica	In Deployment		Jun-08								
59	Europe	Croatia	Tele2	Tele2, Croatia	In Service	7.2Mbps	Jun-08	In service	1.4Mbps						
60	Europe	Croatia	T-Mobile	T-Mobile, Croatia	In Service	7.2Mbps	Nov-06	None							
61	Europe	Croatia	VIPnet	Vipnet (mobilkom austria), Croatia	In Service	21Mbps	Apr-06	In service	1.4Mbps	Feb-07	In Trial	21Mbps	May-09		
62	Europe	Cyprus	CYTA Mobile	CYTA Mobile	In Service	900	1.8Mbps	Jul-08							
63	Europe	Cyprus	MTN (Areeba)	MTN (Areeba)	In Service		1.8Mbps	Apr-08							
64	Europe	Cyprus	Turkcell	Turkcell	In Service		1.8Mbps								
65	Europe	Czech Republic	Telefonica / O2 (Eurotel Praha)	Telefonica / O2 (Eurotel Praha)	In Service		3.6Mbps	May-06							
66	Europe	Czech Republic	T-Mobile Czech Republic	T-Mobile, Czech Republic	In Service		Jun-06	In deployment							
67	Europe	Czech Republic	Vodafone Czech Republic	Vodafone Czech Republic	Planned		Dec-07								
68	Europe	Denmark	3 Denmark	3 Denmark	In Service		21Mbps	Nov-06			Planned	21Mbps	2009		
69	Europe	Denmark	Sonofon	Sonofon, Denmark	In Service		3.6Mbps	Sep-07							
70	Europe	Denmark	TDC Mobil	TDC, Denmark	In Service		7.2Mbps	Jan-08							
71	Europe	Denmark	Telia (TeliaSonera)	Telia (TeliaSonera)	In Service		3.6Mbps	Dec-07	In deployment						
72	South America	Dominican Republic	Claro Dominicana	Claro (America Movil), Dominican Republic	In Service		3.6Mbps	Aug-07							
73	South America	Ecuador	Porta		In Service		1.2Mbps								
74	Africa	Egypt	Etisalat Mist	Etisalat Misr, Egypt	In Service		7.2Mbps	May-07	In service		Nov-07				
75	Africa	Egypt	Vodafone Egypt	Vodafone Egypt	In Service		3.6Mbps	May-07							
76	Central America	El Salvador	Claro (America Movil)	Claro (America Movil)	In Service		1.8Mbps	Jan-08							
77	Central America	El Salvador	Tigo		In Service		3.6Mbps								
78	Europe	Estonia	Elisa (Radiolinja Estonia)	Elisa (Radiolinja Estonia)	In Service		1.8Mbps	Jul-06							
79	Europe	Estonia	EMT	EMT	In Service		7.2Mbps	Apr-06	In service	1.5Mbps	Dec-07				
80	Europe	Estonia	ProGroup Holdings (Bravocom)	ProGroup Holdings (Bravocom)	In Deployment			Jul-06							
81	Europe	Estonia	Tele2	Tele2	In Service		1.8Mbps	Nov-06							
82	Europe	Faroe Island	Faroese Telecom	Faroese Telecom, Faroe Island	In Deployment			Sep-09			In deployment		Sep-09		
83	oceania	Fiji	Vodafone Fiji	Vodafone Fiji	In Service		7.2Mbps	Nov-08	In service	2.0Mbps	Nov-08				
84	Europe	Finland	Elisa (Radiolinja)	Elisa (Radiolinja)	In Service		3.6Mbps	Apr-06	In service	1.4Mbps		In Deployment			
85	Europe	Finland	Finnet	DNA, Finland	In Service		2Mbps	Feb-07	In service	1.4Mbps	Jun-08				
86	Europe	Finland	TeliaSonera	Sonera (TeliaSonera), Finland	In Service		3.6Mbps	Aug-07	None						Planned
87	Europe	France	Bouygues France	Bouygues France	In Service		6.7Mbps		In service	1.4Mbps					
88	Europe	France	Orange France	Orange, France	In Service		7.2Mbps	May-06	In service	1.4Mbps					
89	Europe	France	SFR (Vodafone)	SFR, France	In Service		3.6Mbps	Jun-06	In deployment						
90	Oceania	French Polynesia	Mara Telecom	Mara Telecom	In Deployment			Dec-08							
91	Oceania	French Polynesia	Tikiphone	Tikiphone	Planned										

92	oceania	French Polynesia	Vini (Tikiphone)	Vini (Tikiphone)	Planned		Jun-08									
93	Europe	Georgia	Geocell	Geocell	In Service	3.6Mbps	Jun-08									
94	Europe	Georgia	Magticom	Magticom	In Service	14.4Mbps	Dec-08									
95	Europe	Germany	E-Plus	E-Plus, Germany	In Trial	7.2Mbps	2009	In trial	1.4Mbps	2009						
96	Europe	Germany	O2 Germany	O2 (Telefonica), Germany	In Service	7.2Mbps	Dec-06	In Service	2.0Mbps							
97	Europe	Germany	T-Mobile Deutschland	T-Mobile Deutschland	In Service	7.2Mbps	Mar-06	In service	1.4Mbps		Planned		In trial			
98	Europe	Germany	Vodafone Germany	Vodafone, Germany	In Service	14.4Mbps	Mar-06	In service	3Mbps	Nov-07						
99	Africa	Ghana	MTN Ghana	MTN, Ghana	In Service	1.8Mbps	Jan-09									
100	Africa	Ghana	Zain Ghana	Zain Ghana	In Service	1.8Mbps										
101	Europe	Greece	Cosmote	Cosmote	In Service	21Mbps	Jun-06	In service	1.5Mbps	Apr-08	In Service	21Mbps	May-09			
102	Europe	Greece	Vodafone	Vodafone, Greece	In service	21Mbps	Mar-07	In service	5.76Mbps		In Service	21Mbps				
103	Europe	Greece	TIM Stet Hellas	Wind (Weather), Greece	In Service	7.2Mbps	Nov-06									
104	Asia	Guam	Guamcell	DoCoMo Pacific (NTT DoCoMo)	In Service	1.8Mbps		Planned								
105	Central America	Guatemala	Claro (America Movil)	Claro (America Movil)	In Service	1.8Mbps	Dec-07									
106	Central America	Guatemala	Tigo		In Service	1.5Mbps										
107	Europe	Guernsey Island	Sure/C&W (Guernsey Telecom)	Sure/C&W (Guernsey Telecom)	In Deployment		Dec-07									
108	Europe	Guernsey Island	Wave Telecom	Wave Telecom	In Deployment		Dec-07									
109	Central America	Honduras	Claro (America Movil)	Claro (America Movil)	In Service	1.8Mbps	Dec-07									
110	Central America	Honduras	Tigo		In Service	3.6Mbps										
111	Asia	Hong Kong	CSL New World Mobility	CSL New World Mobility	In Service	21Mbps	Sep-06				In Service	21Mbps	Mar-09			
112	Asia	Hong Kong	3 (Hutchison)	3 (Hutchison), Hong Kong	In Service	14.4Mbps	Dec-06	In service	1.4Mbps		In deployment					
113	Asia	Hong Kong	PCCW (Sunday)	PCCW (Sunday)	In Service	21Mbps	Mar-07				Planned	21Mbps	2009			
114	Asia	Hong Kong	Smartone-Vodafone	Smartone, Hong Kong	In Service	14.4Mbps	Jun-06	In service	5.76Mbps	Nov-06	In Trial			Planned		
115	Europe	Hungary	Pannon GSM	Pannon GSM	In Service	3.6Mbps	Mar-07									
116	Europe	Hungary	T-Mobile Hungary	T-Mobile Hungary	In Service	7.2Mbps	May-06	In service	1.4Mbps	Dec-07						
117	Europe	Hungary	Vodafone Hungary	Vodafone Hungary	In Service	3.6Mbps	Jun-07									
118	Europe	Iceland	Nova	Nova	In Service	3.6Mbps	Apr-08									
119	Europe	Iceland	Telecom Iceland/Siminn	Siminn, Iceland	In Service	1.8Mbps	2007									
120	Asia	India	Bharti Televentures	Airtel (Bharti), India	Planned		Oct-10	None								
121	Asia	India	BSNL	BSNL	Planned		Mar-09									
122	Asia	India	MTNL	MTNL	Planned		Dec-08									
123	Asia	India	Spice Telecom	Spice Telecom	Planned		Dec-08									
124	Asia	Indonesia	Excelcomindo Pratama ProXL	Excelcomindo Pratama ProXL	In Service	2.6Mbps	Nov-06									
125	Asia	Indonesia	Hutchison CP Telecom	Hutchison CP Telecom	In Service	1.8Mbps	Jun-07									
126	Asia	Indonesia	Indosat	Indosat	In Service	14.4Mbps	Dec-06	In service	1.4Mbps	May-08						
127	Asia	Indonesia	Telkomsel	Telekomsel (Telekomunikasi Selular), Indone	In Service	3.6Mbps	Apr-07									
128	Asia	Iran	Etisalat (Tameen Telecom)		Planned											
129	Europe	Ireland	3 Ireland	3 (Hutchison), Ireland	In Service	7.2Mbps	Dec-06	None			In deployment					
130	Europe	Ireland	Meteor Mobile	Meteor, Ireland	In Service	14.4Mbps	Mar-09				Planned					
131	Europe	Ireland	O2 Ireland	O2 Ireland	In Service	7.2Mbps	Jul-07	In service	1.4Mbps	Jul-08						
132	Europe	Ireland	Vodafone Ireland	Vodafone Ireland	In Service	3.6Mbps	Nov-06									
133	Europe	Isle of Man	Manx Telecom	Manx Telecom	In Service	3.6Mbps	Nov-05									
134	Middle East	Israel	Cellcom Israel	Cellcom Israel	In Service	3.6Mbps	Jun-06	In deployment								
135	Middle East	Israel	Orange (Partner Communications)	Orange (Partner Communications), Israel	In Service	3.6Mbps	Mar-06	In deployment			In Deployment					
136	Middle East	Israel	Pelephone	Pelephone Communications, Israel	In Service	1.8Mbps	Jan-09	In Service		Jan-09						
137	Europe	Italy	3 Italy	3 (Hutchison), Italy	In Service	7.2Mbps	Feb-06	In service	5.8Mbps	Sep-07						
138	Europe	Italy	TIM Italy	TIM Italy	In Service	28Mbps	May-06	In service	5.8Mbps	Jun-09	In service	28Mbps	Jun-09	Planned		
139	Europe	Italy	Vodafone Italy	Vodafone, Italy	In Service	7.2Mbps	Jun-06				Planned					
140	Europe	Italy	Wind	Wind	In Service	3.6Mbps	Jun-07									

141	Central America	Jamaica	Claro Jamaica	Claro Jamaica	In Service	1.8Mbps	Nov-07										
142	Central America	Jamaica	Cable and Wireless	LIME	In Service	3.6Mbps	Jun-09										
143	Asia	Japan	eMobile (eAccess)	eMobile, Japan	In Service	21Mbps	Mar-07	In Service	5.8Mbps	Nov-08	In Service	21Mbps	Aug-09	Planned			
144	Asia	Japan	KDDI											Planned			
145	Asia	Japan	NTT DoCoMo	NTT DoCoMo, Japan	In Service	7.2Mbps	Aug-06	In trial		Jun-09				Planned			
146	Asia	Japan	Softbank (ex-Vodafone) Japan	Softbank (ex-Vodafone) Japan	In Service	7.2Mbps	Oct-06				Planned			Planned			
147	Europe	Jersey Island	Airtel (Vodafone)		In Service	1.8Mbps	Jun-07										
148	Europe	Jersey Island	Jersey Telecom	Jersey Telecom	In Deployment		Dec-08										
149	Europe	Jersey Island	Sure (C&W Jersey)		In Service	2.0Mbps	Dec-07										
150	Africa	Kenya	Safaricom	Safaricom	In Service	7.2Mbps	May-08										
151	Middle East	Kuwait	Viva, Kuwait	Viva, Kuwait	In Service	21Mbps	Sep-08				In Service	21Mbps					
152	Middle East	Kuwait	Wataniya Telecom Kuwait	Wataniya Telecom, Kuwait	In Service	7.2Mbps	Dec-07										
153	Middle East	Kuwait	Zain (MTC-Vodafone)	Zain (MTC-Vodafone)	In Service	21Mbps	Jan-07	In deployment			In Service	21Mbps	Aug-09				
154	Europe	Latvia	Bite	Bite	In Service	7.2Mbps	Sep-06	In service	1.4Mbps	Jan-08							
155	Europe	Latvia	LMT	LMT	In Service	3.6Mbps	Sep-06										
156	Europe	Latvia	Tele2	Tele2	In Service	3.6Mbps	Mar-07										
157	Middle East	Lebanon	Alfa (Orascom)	Alfa (Orascom), Lebanon	Planned	21Mbps	Dec-09				Planned		Dec-09				
158	Africa	Libya	EL Madar	EL Madar	In Deployment		Jan-09										
159	Africa	Libya	Libyana Mobile Phone	Libyana Mobile Phone	In Deployment		Dec-07										
160	Europe	Liechtenstein	Mobilkom FL1	Mobilkom FL1	In Service	1.8Mbps	Feb-07	In deployment									
161	Europe	Liechtenstein	Orange	Orange	In Service	3.6Mbps	Sep-07										
162	Europe	Liechtenstein	Tele2 (Tango)	Tele2 (Tango)	In Deployment		Jun-08										

163	Europe	Lithuania	Bite	Bite	In Service	7.2Mbps	Jun-06	In service	1.4Mbps	Jan-08		
164	Europe	Lithuania	Omnitel	Omnitel	In Service	1.8Mbps	Jun-06					
165	Europe	Lithuania	Tele2	Tele2	Planned		Jun-07					
166	Europe	Luxembourg	P&T Luxembourg (LUXGSM)	P&T Luxembourg (LUXGSM)	In Service	7.2Mbps	May-07					
167	Europe	Luxembourg	Tele2 (Tango)	Tele2 (Tango)	Planned		Dec-07					
168	Europe	Luxembourg	VOX Mobile	VOX Mobile	In Service	1.8Mbps	Jun-07					
169	Asia	Macau	CTM	CTM	In Service	3.6Mbps	Jun-07					
170	Asia	Macau	Hutchison Telecom	Hutchison Telecom	In Service	3.6Mbps	Oct-07					
171	Europe	Macedonia	Comofon (Cosmote)	Cosmofon, Macedonia	In Service	1.8Mbps	Sep-08					
172	Europe	Macedonia	T-Mobile	T-Mobile (Makedonski Telekom), Macadonia	In Service	7.2Mbps	Jun-09					
173	Europe	Madeira	Optimus	Optimus	In Service	1.8Mbps	Feb-06					
174	Asia	Malaysia	Celcom Malaysia	Celcom Malaysia	In Service	1.8Mbps	Jun-06					
175	Asia	Malaysia	DiGi	DiGi, Malaysia	In Service	14.4Mbps	Mar-09					
176	Asia	Malaysia	Maxis Malaysia	Maxis Malaysia	In Service	1.8Mbps	Sep-06	In deployment				
177	Asia	Malaysia	U-Mobile (MITV)	U-Mobile (MITV)	In Deployment		Jun-07					
178	Asia	Maldives	Watinlya Telecom Maldives	Watinlya Telecom Maldives	In Service	1.8Mbps	May-08					
	Europe	Malta	Melita	Melita, Malta	In Service							
179	Europe	Malta	Mobisle Comm. (go mobile)	Mobisle Comm. (go mobile)	In Service	3.6Mbps	Dec-06					
180	Europe	Malta	Vodafone Malta Ltd	Vodafone Malta Ltd	In Service	1.8Mbps	Dec-06					
181	America	Martinique	Outremer Telecom		In Service	1.8Mbps	Dec-08					
182	Africa	Mauritius	Cellplus Mauritius	Cellplus Mauritius	Planned		Jun-08					
183	Africa	Mauritius	Millicom Mauritius (Emtel)	Millicom Mauritius (Emtel)	In Service	1.8Mbps	Sep-07					
184	Central America	Mexico	America Movil - Telcel	America Movil - Telcel	In Service	1.8Mbps	Feb-08					
185	South America	Mexico	Movistar	Movistar	In Service	1.8Mbps	Nov-08					
	Europe	Moldova	Orange Moldova	Orange, Moldova	In Service	14.4Mbps	Nov-08	In Service	5.76Mbps			
186	Europe	Moldova	Moldcell	Moldcell	In Service	7.2Mbps	Sep-08					
187	Europe	Monaco	Monaco Telecom/Monacell	Monaco Telecom/Monacell	Planned		Dec-07					
188	Asia	Mongolia	MobiCom	MobiCom, Mongolia	In Service	7.2Mbps	Apr-09					
189	Asia	Mongolia	Skytel	Skytel, Mongolia	In Deployment							
190	Europe	Montenegro	m:tel	M:Tel, Montenegro	In Service	7.2Mbps	Jul-07	None				
191	Europe	Montenegro	Promonte	Promonte, Montenegro	In Service	7.2Mbps	Jun-07	None			Planned	
192	Europe	Montenegro	T-Mobile	T-Mobile, Montenegro	In Service	3.6Mbps	Jun-07	None				
193	Africa	Morocco	Maroc Telecom	Maroc Telecom	In Service	3.6Mbps	Jan-08					
194	Africa	Morocco	Meditel	Meditel	In Service	3.6Mbps	Apr-07					
195	Africa	Mozambique	mcel	mcel	In Deployment		Jan-08					
196	Africa	Namibia	CellOne (Powercom)	CellOne (Powercom)	In Service	1.8Mbps	Jun-07					
197	Africa	Namibia	MTC	MTC	In Service	1.8Mbps	Nov-06					

198	Asia	Nepal	Nepal Telecom	Nepal Telecom	Planned		Dec-07									
199	Europe	Netherlands	KPN (Telfort)	KPN (Telfort)	In Service	3.6Mbps	Dec-06	In Service	1.4Mbps	Mar-08						
200	Europe	Netherlands	T-Mobile Netherlands	T-Mobile Netherlands	In Service	1.8Mbps	Apr-06									
201	Europe	Netherlands	Vodafone Netherlands	Vodafone Netherlands	In Service	1.8Mbps	Jul-06									
202	Oceania	New Zealand	2 degrees	2 degrees, New Zealand	Planned		Jan-10						Planned			
203	Oceania	New Zealand	TCNZ	Telecom, New Zealand	In Service	14.4Mbps	May-09	In Service	5.7Mbps	May-09	In Deployment		Dec-09			
204	Oceania	New Zealand	Vodafone New Zealand	Vodafone, New Zealand	In Service	7.2Mbps	Oct-06	In Service			In Trial					
205	Central America	Nicargua	Claro (America Movil)	Claro (America Movil)	In Service	1.8Mbps	Dec-07									
206	Africa	Nigeria	Celtel	Celtel	In Trial		Nov-06									
207	Africa	Nigeria	Emerging Market Telecom Services (EMTS)	Emerging Market Telecom Services (EMTS)	Planned											
208	Africa	Nigeria	Globacom	Globacom	In Service	3.6Mbps	Dec-07									
209	Africa	Nigeria	MTN	MTN	In Service	3.6Mbps	Dec-07									
210	Asia	North Korea	Koryolink (Orascom)	Koryolink (Orascom)	Planned											
211	Europe	Norway	H3G Access	H3G Access	Planned		Jun-08									
212	Europe	Norway	Netcom (TeliaSonera)	Netcom (TeliaSonera)	In Service	3.6Mbps	Apr-07									
213	Europe	Norway	Telenor Mobil	Telenor Mobil	In Service	3.6Mbps	Oct-07									Planned
214	Middle East	Oman	Nawras Telecom (TDC)	Nawras Telecom (TDC)	In Service	7.2Mbps	Dec-07									
215	Middle East	Oman	Oman Mobile	Oman Mobile (Omantel), Oman	In Service	14.4Mbps	Jan-09	None								
216	South America	Panama	Movistar	Telecom Personal	In Service	1.8Mbps										
217	South America	Paraguay	CTI Movil	CTI Movil	In Service	3.6Mbps	Nov-07									
218	South America	Paraguay	Personal Paraguay	Personal Paraguay	In Service	1.6Mbps		In deployment								
219	South America	Paraguay	Tigo		In Service	3.6Mbps										
220	South America	Peru	Claro	Claro	In Service	3.6Mbps	Jul-07	In service	1.92Mbps							
221	Asia	Philippines	Digitel/Sun Cellular	Sun Cellular (Digital Mobile), Philippines	In Service	1.8Mbps	May-08									
222	Asia	Philippines	Globe Telecom	Globe Telecom, Philippines	In Service	2.0Mbps	May-06	None								
223	Asia	Philippines	RED Mobile (CURE)	RED Mobile (CURE)	In Service	1.8Mbps	Nov-08									
224	Asia	Philippines	Smart Comms	Smart (PLDT), Philippines	In Service	2.0Mbps	Jan-07	None								
225	Europe	Poland	Centertel (Orange)	Orange (Telekom Polska), Poland	In Service	7.2Mbps	Dec-06	In service	1.4Mbps	Dec-07						
226	Europe	Poland	Era	Era, Poland	In Service	21Mbps	Oct-06	In service	1.4Mbps		In Service	21Mbps	Sep-09			
227	Europe	Poland	P4	Project 4 Poland, Poland	In Service	14.4Mbps	Mar-07									
228	Europe	Poland	Polkomtel / Plus	Plus (Polkomtel), Poland	In Service	3.6Mbps	Nov-06									
229	Europe	Portugal	Optimus	Optimus	In Service	21Mbps	Dec-06	In service	5.76Mbps	Dec-07	In Service	21Mbps				
230	Europe	Portugal	TMN	TMN (Portugal Telecom), Portugal	In Service	21Mbps	Apr-06	In Service	1.4Mbps		In Service	21Mbps	Jun-09			
231	Europe	Portugal	Vodafone Portugal	Vodafone Portugal	In Service	21Mbps	Mar-06	In service	5.76Mbps		In Service	21Mbps	2009			
232	South America	Puerto Rico	AT+T	AT+T	In Service	1.8Mbps	Nov-06									
233	South America	Puerto Rico	Claro Puerto Rico	Claro Puerto Rico	In Service	1.8Mbps	Dec-07									
234	Middle East	Qatar	Qtel	Qtel, Qatar	In Service	7.2Mbps	Jul-07	In service	2.0Mbps	Feb-09						
235	Middle East	Qatar	Vodafone	Vodafone, Qatar	Planned											
236	Asia	Reunion	Dubemer Telecom		In Service	1.8Mbps	Dec-08									
237	Asia	Reunion	SRR(SFR)	SRR(SFR), Reunion	In Service	1.8Mbps	Jan-09									
238	Europe	Romania	Orange Romania	Orange, Romania	In Service	7.2Mbps	Jun-07	In service	1.4Mbps	Oct-07						
239	Europe	Romania	RCS&RDS	RCS&RDS	Planned		Jun-08									
240	Europe	Romania	Vodafone Romania	Vodafone Romania	In Service	7.2Mbps	Sep-07	In service	1.4Mbps	Mar-08	Planned					
241	Europe	Romania	Cosmote (zapp)	Cosmote (OTE), Roamania	In Service	21Mbps	Jul-09	In service	5.8Mbps	Jul-09	In Service	21.6Mbps	Jul-09			
242	Europe	Russia	MegaFon North-West branch	MegaFon North-West branch	In Service	3.6Mbps	Oct-07	In deployment								
243	Europe	Russia	MTS	MTS Group	In Service	3.6Mbps	May-08	None								
244	Europe	Russia	VimpelCom	VimpelCom	In Service	3.6Mbps	Sep-09									
245	Middle East	Saudi Arabia	EAE (Mobily)	Mobily, Saudi Arabia	In Service	7.2Mbps	Jun-06	In service		Mar-09						
246	Middle East	Saudi Arabia	STC (Saudi Telecom)	STC (Saudi Telecom), Saudi Arabia	In Service	1.8Mbps	Jan-06				In Deployment					

247	Middle East	Saudi Arabia	Zain (MTC SA)	Zain, Saudi Arabia	In Service		1.8Mbps	Aug-08		In deployment		In Trial						
248	Africa	Senegal	Orange Senegal	Orange Senegal	Planned													
249	Europe	Serbia	Telekom Srbija	Telekom Srbija	In Service		1.8Mbps	Dec-06										
250	Europe	Serbia	Telenor	Telenor	In Service		1.8Mbps	Mar-07										
251	Asia	Singapore	M1	M1, Singapore	In Service		14.4Mbps	Dec-06		In Service	5.76Mbps		Planned					
252	Asia	Singapore	SingTel Mobile	SingTel, Singapore	In Service		7.2Mbps	May-07					Planned					
253	Asia	Singapore	StarHub	StarHub	In Service		21Mbps	Aug-07		In service	5.76Mbps	Aug-07	In Service	21Mbps	Q2 2009			
254	Europe	Slovakia	Orange Slovensko	Orange, Slovakia	In Service		7.2Mbps	Sep-06		In service	1.46Mbps	Jan-08	Planned					
255	Europe	Slovakia	T-Mobile Slovensko	T-Mobile Slovensko	In Service		3.6Mbps	Aug-06										
256	Europe	Slovenia	Mobitel Slovenia	Mobitel Slovenia	In Service		7.2Mbps	Sep-06		In Service	1.4Mbps	Dec-07						
257	Europe	Slovenia	Si.mobil - Vodafone	Si.mobil - Vodafone	In Service		3.6Mbps	Sep-07										
258	Europe	Slovenia	T2	T2	In Deployment													
259	Europe	Slovenia	Tusmobil	Tusmobil	In Service		14.4Mbps	Jun-08										
260	Africa	South Africa	MTN South Africa	MTN, South Africa	In Service		7.2Mbps	Mar-06		In service	1.8Mbps							
261	Africa	South Africa	Telkom South Africa		In Service		7.2Mbps	Dec-08		In service	2.4Mbps	Dec-08						
262	Africa	South Africa	Vodacom South Africa	Vodacom, South Africa	In Service		7.2Mbps	Mar-06		In service	1.8 Mbps	Feb-08						
263	Asia	South Korea	KTF	KTF	In Service		3.6Mbps	Jun-06		In service	3.6Mbps							
264	Asia	South Korea	SK Telecom	SK Telecom	In Service		3.6Mbps	May-06		In service	5.76Mbps						Planned	
265	Europe	Spain	Orange Spain	Orange Spain	In Service		3.6Mbps	Jun-06		In service	1.8Mbps	Mar-07						
266	Europe	Spain	Telefonica Moviles	Telefonica Moviles	In Service		7.2Mbps	Oct-06		In service	1.8Mbps	Jul-07	Planned		mid-2009			
267	Europe	Spain	Vodafone Spain	Vodafone, Spain	In Service		7.2Mbps	Jun-06		In service	1.92Mbps	Jun-07	In Trial		Oct-09			
268	Europe	Spain	Yoigo (Xfera / TeliaSonera)	Yoigo (Xfera / TeliaSonera)	Planned			Dec-07										
269	Asia	Sri Lanka	Bharti Airtel Lanka		In Service		1.8Mbps	Jan-09										
270	Asia	Sri Lanka	Dialog Telekom	Dialog Telekom	In Service		1.8Mbps	Aug-06					In Trial					
271	Asia	Sri Lanka	Millicom Sri Lanka (Celltel - TIGO)	Millicom Sri Lanka (Celltel - TIGO)	Planned			Dec-07										
272	Asia	Sri Lanka	Mobitel Lanka	Mobitel Lanka	In service		7.2Mbps	Dec-07		In service	1.92Mbps							
273	Africa	Sudan	Zain Sudan	Zain Sudan	In Service		3.6Mbps	Apr-08										
274	Europe	Sweden	3 Sweden	3 Sweden	In Service		7.2Mbps	Nov-06		In service	1.4Mbps	Sep-07	Planned		2009			
275	Europe	Sweden	Svenska UMTS-Nat (Tele2)	Tele2, Sweden	In Service		14.4Mbps	Apr-07									Planned	
276	Europe	Sweden	Telenor	Telenor	In Service		3.6Mbps	Jun-07									Planned	
277	Europe	Sweden	TeliaSonera	Telia (TeliaSonera), Sweden	In Service		14.4Mbps	Jun-07									Planned	
278	Europe	Switzerland	Orange Switzerland	Orange Switzerland	In Service		1.8Mbps	Jul-06										
279	Europe	Switzerland	Swisscom	Swisscom, Switzerland	In Service		14.4Mbps	Mar-06		In service	1.4Mbps	Nov-07	In Deployment		Oct-09			
280	Europe	Switzerland	TDC Switzerland - Sunrise	TDC Switzerland - Sunrise	In Service		3.6Mbps	Feb-07										
281	Middle East	Syria	Areeba Syria	Areeba Syria	Planned			Dec-07										
282	Middle East	Syria	Syriatel	Syriatel	In Service		7.2Mbps	Aug-08										
283	Asia	Taiwan	Chungwa Telecom	Chungwa Telecom	In Service		7.2Mbps	Sep-06		In service	2.0Mbps		Planned				Planned	
284	Asia	Taiwan	FarEastone	FarEastone	In Service		3.6Mbps	Feb-07										
285	Asia	Taiwan	Taiwan Mobile Co	Taiwan Mobile Co	In service		3.6Mbps	Jan-07										
286	Asia	Taiwan	VIBO Telecom	VIBO Telecom	In Service		3.6Mbps	Sep-07										
287	Asia	Tajikistan	Indigo Tajikistan	Indigo Tajikistan	Planned			Mar-09										
288	Asia	Tajikistan	Josa Babilon Mobile	Babilon-Mobile, Tajikistan	In Service		7.2Mbps											
289	Asia	Tajikistan	Tacom	Tacom	In Service		3.6Mbps	Apr-07										
290	Asia	Tajikistan	TT Mobile	MLT (MegaFon), Tajikistan	Planned			Jun-09										
291	Africa	Tanzania	Vodacom Tanzania	Vodacom Tanzania	In Service		1.8Mbps	Mar-07										
292	Asia	Thailand	AIS	AIS	In Service		7.2Mbps	Dec-08										
293	Asia	Thailand	DTAC, Thailand	In Trial														
294	Asia	Thailand	Thai Mobile (TOT)	Thai Mobile (TOT), Thailand	Planned			Dec-09										
295	Asia	Thailand	True Move (True Corporation)	True Move (True Corporation), Thailand	In Trial													

296	Middle East	Turkey	Avea	Avea (Turk Telekom), Turkey	In Service		7.2Mbps	Jul-09							
297	Middle East	Turkey	Turkcell	Turkcell, Turkey	In service		21Mbps	Jul-09			In service	21Mbps	Jun-09		
298	Middle East	Turkey	Vodafone	Vodafone, Turkey	In Service		7.2Mbps	Jul-09							
299	Africa	Uganda	Uganda Telecom	Uganda Telecom	In Service		1.8Mbps	Nov-07							
300	Europe	Ukraine	life :)	life :)	In Trial										
301	Europe	Ukraine	Utel (Ukrtelecom)	Utel (Ukrtelecom)	In Deployment			Jun-07							
302	Middle East	United Arab Emirates	Du	Du	In Service		1.8Mbps	Apr-07							
303	Middle East	United Arab Emirates	Etisalat	Etisalat, United Arab Emirates	In Service		14.4Mbps	Apr-06	None						
304	Europe	United Kingdom	3 UK	3 (Hutchison), United Kingdom	In Service		3.6Mbps	Aug-06	In deployment						
305	Europe	United Kingdom	O2 UK	O2 UK	In Service		3.6Mbps	Feb-07	In deployment	7.2Mbps					
306	Europe	United Kingdom	Orange UK	Orange, United Kingdom	In Service		3.6Mbps	Feb-07	In deployment						
307	Europe	United Kingdom	T-Mobile UK	T-Mobile, United Kingdom	In Service		7.2Mbps	Aug-06	In service	1.4 Mbps	Jul-08				
308	Europe	United Kingdom	Vodafone UK	Vodafone, United Kingdom	In Service		14.4Mbps	Jun-06	In service	1.92Mbps	Dec-07				
309	South America	Uruguay	Ancel	Ancel	In Service		3.6Mbps	Jul-07							
310	South America	Uruguay	CTI Movil	CTI Movil	In Service		1.8Mbps	Mar-08							
311	South America	Uruguay	Movistar (Telefonica Moviles)	Movistar (Telefonica Moviles)	In Service		3.6Mbps	Jul-07							
312	North America	USA	AT&T	AT&T, United States of America	In Service		3.6Mbps	Dec-05	In service	1.4Mbps	Oct-07	Planned		Planned	
313	North America	USA	Edge Wireless	Edge Wireless	In Deployment			Dec-07							
314	North America	USA	Stelera Wireless		In Service		7.2Mbps	Dec-07	In deployment		Jul-08				
315	North America	USA	Terrestar		In Deployment										
316	North America	USA	T-Mobile USA	T-Mobile, United States of America	In Service		1.8Mbps	May-08	None			In Deployment		Jan-10	
317	North America	USA	Verizon											Planned	
318	Asia	Uzbekistan	MTS Uzbekistan	MTS, Uzbekistan	In Service		1.8Mbps	Dec-08							
319	Asia	Uzbekistan	Ucell/Coscom	Ucell, Uzbekistan	In Service		7.2Mbps	Sep-08	In Service	1.4Mbps					
320	South America	Venezuela	Digitel	Digitel, Venezuela	In Service		3.6Mbps	Mar-09							
321	South America	Venezuela	Movilnet	Movilnet, Venezuela	In Trial			Dec-09							
322	South America	Venezuela	Movistar	Movistar (Telefonica), Venezuela	In Service		1.8Mbps	Dec-08							
323	Asia	Viet Nam	Mobifone Viet Nam	Mobifone, Vietnam	Planned			Dec-09							
324	Asia	Vietnam	Viettel Telecom	Viettel Telecom, Vietnam	In Deployment			Dec-09				In Deployment			
325	Asia	Viet Nam	Vinaphone	Vinaphone, Vietnam	In Deployment			Oct-09							

SMARTSYNCH CASE STUDIES

Customer:	**LADWP**
Application:	Customer Load Profiling
Goal:	Ensure sufficient power supply during peak customer demand to minimize brown-outs.
Challenges:	Analyze pre- and post-peak consumption traits to gauge future demand by accessing more granular usage data beyond monthly kWh readings. Collect delivered and received load profile information on all solar installations.
Solution:	SmartSynch A3 SmartMeter, SmartSynch Data Acquisition System, and GPRS wireless network
Results:	LADWP is now able to retrieve load profile data, including usage and instrumentation profiling, and power quality data on an as-needed basis. Solutions also provide real time alerts, such as outage notifications, that enable utilities to minimize service interruptions for customers.

Customer:	**Hydro One, Ontario, Canada**
Application:	Billing Reads for Residential Customer Accounts
Goal:	Save time and labor by conducting electricity bill reads wirelessly as needed instead of manual, monthly kWh readings.
Challenges:	Collect energy consumption data wirelessly from smart meters as needed to calculate monthly electricity bills for select residential customers throughout Ontario.
Solution:	SENTINEL SmartMeter, SmartSynch Data Acquisition System, and GPRS wireless network
Results:	In July 2008, Hydro One began using data collected wirelessly from SmartSynch solutions to calculate monthly electricity bills for 25,000 residential customers. Smart Meters have consistently performed at the highest levels since their deployment. Additionally, SSI's SmartRouting Solution enables authorized customers to securely access their meters and monitor energy usage traits on their own.

Customer:	**Florida Power & Light (FP&L)**
Application:	Load Profile/Power Quality Data far C&I Customers
Goal:	Ensure sufficient power supply during peak customer demand and efficient use of power by select C&I customers in service area.
Challenges:	Research energy consumption traits during peak/non-peak periods by accessing more granular data than monthly kWh readings. Provide power quality and outage management notifications to customers.
Solution:	A3 SmartMeter SmartSynch Data Acquisition System, and GPRS wireless network. SmartSynch created an interactive Power Quality feature for the A3, which included low- and high-voltage events, three-phase outage reporting and MIVs events.
Results:	FP&L now retrieves daily load profile and power quality data, including usage and instrumentation profiling, for its largest commercial accounts on an as-needed basis. Solutions provide real-time alerts, such as outage notifications, enabling utilities to minimize service interruptions for customers. Customers are also able to conduct real-time reads via e-mail interface with SmartSynch's Data Acquisition System. Power Quality functionality is a revenue source FP&L actively markets to customers.

Customer:	**NSTAR**
Application:	Load Profile for Load Research Sites/TOU Accounts
Goal:	Ensure sufficient power supply during peak customer demand and accurate billing of Time-of-Use customer accounts..
Challenges:	Research energy usage traits to gauge demand. Access daily five-minute interval and register data - more granular than monthly kWh readings - to apply to Time-of-Use rates.

Solution: A3 SmartMeter, SmartSynch Data Acquisition System, and GPRS wireless network.

Results: Each solution provides two channels of 5-minute load profile data wirelessly per day. NSTAR monitors usage, trends, creates billing rates based on time of use, and maintains an energy supply to meet customer demand. SSI's Coverage Validation Unit site survey tool has helped NSTAR increase the effectiveness and reliability of each deployment.

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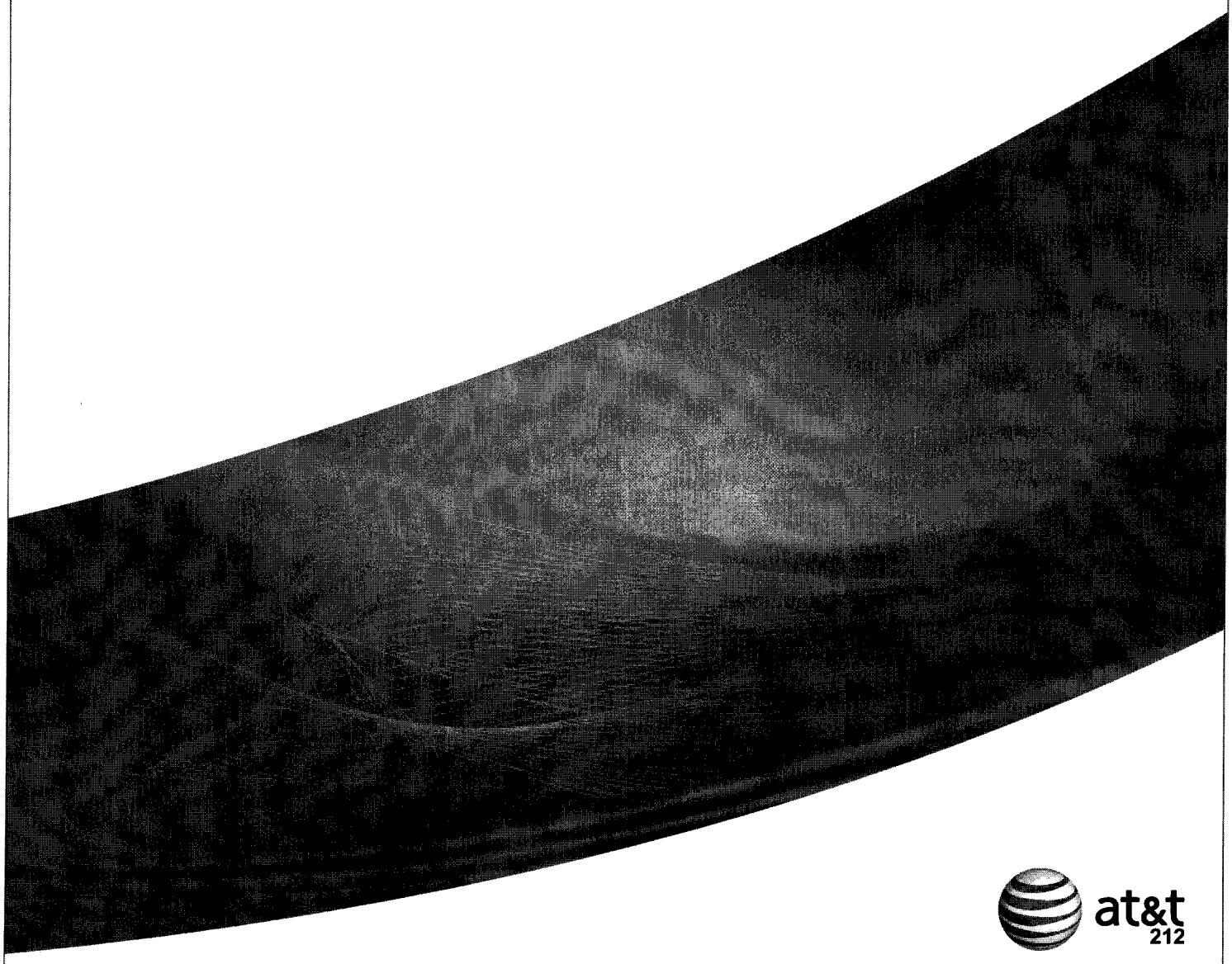
Deploying AMI Solutions

A Best Practices Approach

This paper is authored by Salim Patel, Richard Scafuto, Warren Westrup and Don Troxell.

Executive Summary

This white paper is intended to help Utility customers plan their AMI deployment by adopting best practices. The paper outlines best practices around the design, deployment and operation of wirelessly enabled smart meters. These best practices will help avoid common deployment, testing and management problems.



at&t

Smart Grid is a framework to modernize the power generation, transmission and distribution systems via the use of latest information technologies. The Department of Energy defines a Smart Grid as the transformation from a centralized, producer-controlled network to one that is less centralized and more consumer-interactive. Efficiency, reliability, flexibility, remote monitoring and grid visibility are some of the key attributes used to define a Smart Grid.

Fundamental enabling technologies for Smart Grid are sensing and measurement technologies with data from the sensing and measurement devices integrated with the utility's integrated system communications. These technologies provide real-time information and control to support faster and more accurate response such as remote monitoring, time-of-use pricing and demand-side management.

Within the Smart Grid framework, technologies like Advanced Metering Infrastructure (AMI) leverages 'smart' devices deployed at homes and other end-points to not only measure and analyze usage but also offer pricing based on time of use and device types. This is achieved via the use of two-way data transmission with the smart meter.

Wireless enabled devices like smart meters are being adopted in AMI solutions utilizing the AT&T wireless data network. A comprehensive approach in the planning, design and deployment of wireless AMI solutions can help avoid some of the common pitfalls. A robust wireless AMI solution must account for factors like wireless coverage variability and end-point manageability.

This white paper describes several best practices identified by AT&T that can help utilities avoid common deployment, testing and management problems associated with their wireless AMI deployment.

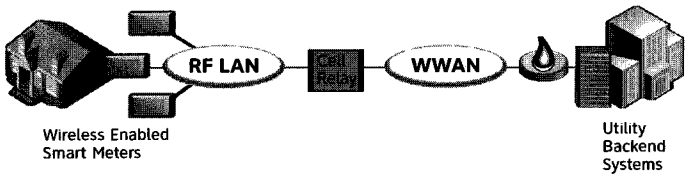
AMI Solution Reference Architecture

Wireless AMI solutions come in two basic flavors: mesh and point-to-point. In a point-to-point solution, each wireless end-point connects directly to the backend systems over a cellular/WWAN link. In a mesh solution, multiple end-points are aggregated locally over a WLAN; each aggregation point connects to the backend systems over a cellular link.

Mesh networks can be comprised of a Home Area Network (HAN), commonly based on Zigbee standard and a Local Area Network (LAN) that can operate in both licensed and unlicensed spectrum. The aggregation point, often called a Cell Relay (CR), is equipped with a cellular modem. The radios in the device (e.g. meter) end points transmit to the CR over a private RF network, primarily over unlicensed spectrum. It has the capability to aggregate multiple end-points and transport the information over the WWAN to the backend systems. The CR can be under-glass or pole mounted types. In the under-glass type the cellular modem and antenna is within the meter housing with no external antenna port. Pole mounted types have external antenna for improved wireless reception.

The CR connects to the backend systems, hosted by the Utility customer, over private links. AT&T offers a comprehensive solution for data center connectivity, which leverages custom Access Point Name (APN) defined in the GSM/UMTS standard.

Figure 1: Mesh AMI Solution Architecture



AT&T Mobility Commercial Connectivity Services

AT&T Mobility Commercial Connectivity Services (CCS) enables a customer to extend its private network into AT&T Mobility's cellular network CCS enables cellular connected devices to appear 'on the customer network' using the customer's IP addressing scheme and security policies.

There are three parts to the CCS design architecture: (a) cellular end-point configuration, (b) network connectivity and (c) customer network configuration. Each one has associated best practices that can stand alone, but following best practices on all three component parts can result in a more comprehensive solution.

Cellular End-Point Configuration

In both point-to-point and mesh architectures, each cellular end-point (or CR) should have a static IP address. A static IP address can better facilitate a correlation between IP address, phone number and wireless device serial number. Once entered into customer's databases and management systems, the IP address will be constant for the life of the device.

Dynamic IP addressing should be used only if the device has the ability to update the customer-owned server each time the IP addresses changes on the device. The customer must have a backend server that will log the current IP address of each device (dynamic DNS) and provide the ability for management systems to acquire the updated IP address when needed.

Each IP address should also be in the private IP address range. Utility customers may find it useful to refer to Internet Engineering Task Force (IETF) Request for Comment RFC 1918 – Address Allocation for Private Internets for private IP addressing standards. Unlike IP addresses in the public IP address range, these private IP addresses are not globally assigned and are not routable on the public Internet.

In addition to IP address considerations, wireless device functionality should be analyzed before deploying a wireless AMI solution. Specifically, some cellular devices have SMS capability. SMS can be used for device wake up or device management functions. For device wake up, after receiving an SMS message, the device issues a packet data protocol (PDP) connection request message to the wireless network. This limited connection request is relatively benign from a security perspective. For device management, the device is able to accept commands from users, execute the command and generate a reply to the SMS message. It is possible for unauthorized users to exploit the SMS device management functionality to gain access to the

device information and control device behavior by issuing commands. Accordingly, it is a good idea to disable the SMS command functionality or turn off SMS altogether via SIM provisioning. It is also recommended to disable voice call capability via SIM provisioning.

AT&T Network Connectivity

CCS provides multiple options for network-to-network connectivity. These options include Frame Relay, Network VPN and IP-enabled PVC. The Network VPN option can be used as the back up option for Frame Relay or IP-enabled PVC. CCS offers a number of customizations tailored to the customer needs.

To help ensure the highest level of CCS service availability, CCS is deployed with Geo-Diversity features as a standard practice. Redundant connections are deployed between the CCS customers' private Enterprise Network and 2 different Geo-Diverse AT&T Data Centers to help ensure that CCS service is not impacted in the event of a single CCS Network-to-Network connection outage.

AT&T has multiple Geo-Diverse Data Centers in the U.S. In the unlikely event of a catastrophic failure of a data center, the redundant data center can provide backup connectivity. Within data centers, each system has built-in redundancy and utilizes carrier grade appliances. Carrier grade systems are tested and engineered to high availability standards, and provide fast fault recovery.

Customer Network Configuration

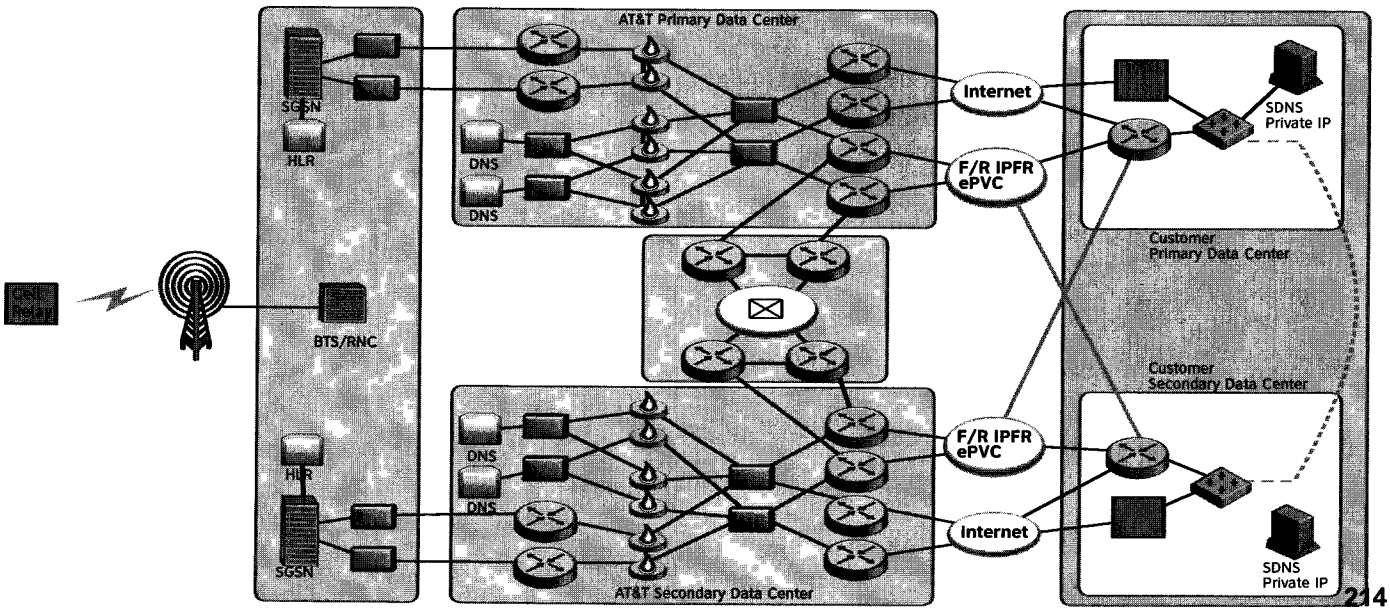
Utility customers desiring to connect their corporate data centers to AT&T's wireless network using one of the CCS offers should also build their network with full geo-redundancy. A primary/secondary data center concept should be employed where the customer's data centers are geographically separated. Each customer data center should not share a carrier's point of presence (POP) for connectivity. For example, two geographically diverse circuits traversing through the same fiber bundle can negate the geo-diverse redundancy. In addition, all IP addressing such as servers, NTP, DNS, etc. should use private static IP addressing as discussed earlier.

The customer's primary and secondary data centers should also be connected. If the AT&T primary data center fails, all traffic will be routed to the AT&T secondary data center and then to the customer's secondary data center. Two options are available if the customer would like the traffic to be routed to their primary data center. The first option is for the customer to provide a back-end network allowing traffic to flow through the customer's secondary data center to the customer's primary data center (red dotted line in figure 2). The second option is for the customer to add PVCs or IP-enabled PVCs on the front-end network (red solid line in figure 2). When building data links, the customer must calculate the maximum bandwidth required and provide adequate availability and performance.

All connectivity should employ BGP as the routing protocol. BGP is a standard protocol document in Internet Engineering Task Force (IETF) Request for Comment RFC 4271 providing a robust mechanism for network reach-ability. When choosing the BGP Autonomous Systems (AS) number, the customer can use their registered number (1-64511) or can use a number set aside for private use (64512-65535, excluding 64601). Within BGP the customer should provide a default route to AT&T. The customer can then manipulate how traffic is routed from the AT&T network to the customer's network without the need to contact AT&T.

The customers should provide their own Domain Name Servers (DNS). This allows easy IP address additions and changes to servers within their network. Mobile devices can make requests to names rather than IP addresses. If the customer wishes to change the IP address of that server, they can simply make a change to the DNS, without changing each wireless end-point.

Figure 2: AT&T CCS Reference Diagram



AT&T Enterprise On-Demand

AMI deployments are large in scale with millions of possible end-points. Wireless deployments of this magnitude require device activation and inventory management tools to ensure operational ease.

AT&T's Enterprise on Demand solution provides a unique set of services to give utility customers added flexibility with sizable wireless data deployments. EOD is a SIM ordering, activation and management platform that helps high-volume customers to self-manage large numbers of wireless end-points more cost-effectively. It provides customers flexibility and autonomy to control and administer wireless data services.

EOD activities are administered via a custom web portal. Some of the key functionalities include self-activation of SIM, SIM inventory management, feature management and reporting tools. It also provides access to enterprise help desk with ability to enter and track service tickets.

AMI Smart Meter Site Selection

Wireless coverage is variable in nature and smart device and cell relay (CR) location is a critical consideration. Unlike traditional mobile devices, the CR location is in the meter attached to a pole or a house and therefore fixed. RF conditions may change over time and a poor location choice will be detrimental to the CR performance.

CR placement can be a source of many issues. These issues are generally around the topic of accuracy of coverage information provided by service providers. Anecdotal reports points to a variance of up to 20dB between the RF propagation information provided to the customer and the actual observed signal levels. This can result in a reevaluation of the site selection process. Wireless propagation modeling is an estimation that depends on the accuracy of terrain and morphology information used in the tools.

Following are some best practices for the CR site selection process:

- Utility customer should develop a comprehensive Methods and Procedures (M&P) document for site survey and selection process to standardize the field team activities. This M&P will help vendors and sub-contractors adhere to the policies and best practices outlined by the utility customer.
- Prescreen site candidates using network data and other operational criteria; select a minimum of four candidates. Do not solely rely on wireless propagation data, combine propagation maps with drive test data and cell site information. Cell location, antenna height and orientation can help better predict expected coverage. Note that drive test data is not readily available in all areas and available data is generally at street level. AT&T can provide network data under NDA, but the customer should have the expertise to interpret and effectively utilize this information to streamline the site selection process.
- Survey each candidate; take at least ten measurements per candidate, and use the median value for final decision. Define multiple measurement points per location to identify any multipath effects in the area. Wireless coverage is non-line of sight in nature; coverage can vary at a location due to obstructions and moving objects close to or far from the measurement point. Build a fading margin of +/- 5dB in the measurements. Document the measurement by taking pictures of the location and identifying measurement points. Ensure no possibility of physical obstruction and analyze foliage growth. If possible, mount a cell relay close to the final location for measurement. Create a diagram onsite to document the test location and signal strength.
- Utilize a coverage validation tool or a cell relay in test mode as the survey device. Ensure proper calibration to avoid incorrect measurements. Do not use a phone in test mode; different phones have different front-end sensitivity and can provide readings not representative of a CR. Ensure that RSSI measurements are recorded in dBm (signal strength relative to 1mW) Some measurement devices may require correlating the actual reading with a translation table to calculate dBm values. Please refer to the user guide of the test equipment for details.
- Select a location with coverage from one dominant server (cell site). If possible, avoid hand off borders. This will result in consistent coverage, by avoiding 'ping-pong' between two or more cell sites. Record dominant cell ID and strong neighbor ID for future reference.
- Select the best overall candidate for installation, only select locations registering RSSI greater than -85dBm. Consider the +/- 5dB fade margin in making the final decision.
- Consider pole mounted CR with external antenna option to address locations with marginal coverage. External antenna options can help improve received signal strength.

AMI Deployment and Acceptance Testing

Deployment and acceptance testing refers to methods and procedures to install, turn up, test and document the CR installation.

Typically, CRs are installed if the selected location has an RSSI better than -85dBm. The technician installs and turns up the CR and confirms successful connectivity by visual inspection. No actual burn-in tests are conducted and backhaul connectivity is verified through Network Management Systems. This methodology is not comprehensive and can overlook common problems that can be easily addressed in the installation and commissioning process.

If after deployment the CRs encounter connectivity failure, the troubleshooting process determines the best course of action. The corrective measures can range from the use of previously surveyed alternate site or the use of pole-mounted, external antenna or repeater solution.

Following are some best practices to facilitate smooth deployment and help minimize costly relocations:

- Create a pre-production/lab environment for configuration and change management. Test and verify all new and modified system parameters before deployment in the lab environment.
- Use standard coverage validation tool or CR to verify surveyed RSSI and covering cell site. Ensure the signal strength at the exact installation location is better than -85dBm.

- Define a standard set of tests that can be conducted from the CR or from the backend systems. These tests can include ICMP pings to and from the CR, transfer of typical files (e.g., 5MB) to and from the CR, opening and closing of specific ports on the CR (e.g., port 1153) and other application layer testing available in the solution.
- After installing the CR conduct burn in testing, repeat the set of tests at least 3 times. Document test results like success rates, throughput, latency, serving Cell ID and signal strength. Make note of any anomalies encountered during the testing.
- Utility customer must define a troubleshooting and triage process to isolate problem source. The complete AMI solution leverages multiple radio technologies, connectivity solutions, service providers, device vendors, backend systems, etc. A comprehensive troubleshooting process can help avoid confusion during outage resolution. Utility customers should have in-house expertise to isolate problems by connectivity segments and have the proper escalation paths defined to contact the proper resources. AT&T Enterprise Technical Support is a help desk to help desk service available to utility customers with AMI solutions from AT&T. AT&T Enterprise Technical Support can troubleshoot issues related to AT&T's wireless network.

AMI System Monitoring and Reporting

CR performance and status monitoring is an important component of the AMI solution. However, most vendors do not have a comprehensive Operational Support System (OSS) strategy.

In some instances ping tools are in-use to monitor the CR status after install. These tools ping the CR at a user configurable setting. Summary reports are available to identify unresponsive devices. Ping tools are limited in scope and cannot provide reliable performance statistics. Some cellular enabled devices are capable of providing modem specific logs; these logs can provide more comprehensive performance indicators.

As smart meters proliferate, more focus will shift towards comprehensive troubleshooting and reporting capabilities. It is important to incorporate such capabilities in the design phase of the solution. Ongoing operational aspects like status monitoring, key performance indicators and reporting must be defined in details. Monitoring and reporting of wireless devices can be performed from the device and network perspective.

Device Side Metrics

Device side statistic refers to parameters reported by the wireless modem on the smart meter. These can include usage and performance statistics. Metrics like connection attempts and failures, throughput, latency, and PDP context statistics can be extracted from the modem logs. These metrics can extend the monitoring capability beyond ICMP ping.

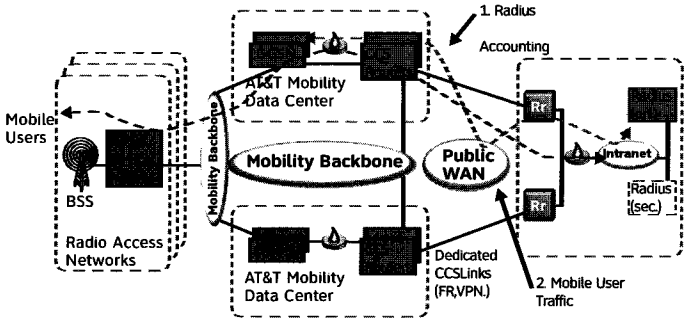
AMI vendors must provide Network Management Systems that can extract these statistics from individual end-points and provide canned reporting solutions. Care must be taken not to overload the smart device with management tasks.

Network Side Metrics

Network side statistics refer to metrics collected and reported by wireless networks. These statistics are reported at a cell site level; customer device specific reports are not readily available. Customer specific monthly manual reports can be generated, but they are not useful for near-real-time monitoring.

RADIUS accounting records is another option to collect, monitor and report CR activities from the wireless network perspective. These statistics can identify issues related to wireless connectivity. A utility customer wanting to leverage RADIUS records for end-point management must have a commercial RADIUS product that supports all required capabilities specified in the IETF RFCs defining the RADIUS protocol for accounting: RFC2866. This RFC is available online at www.ietf.org/rfc/rfc2866.txt .

Figure 3: Sample Customer Hosted RADIUS Accounting Solution



The various attributes available in a RADIUS start and stop records are summarized in the following tables:

Figure 4: RADIUS Start Record

AVP Name	AVP Type Code (Decimal)	Value Format	Value Default
User-Name	1	String	
Class	25	String	
Acct-Session-ID	44	String	
Acct-Status-Type	40	Integer	(1)
NAS-IP-Address	4	IP Addres	
NAS-Port	5	Integer	(60,000)
Service-Type	6	Integer	(2)
Framed-Protocol	7	Integer	(7)
Framed-IP-Address	8	IP Address	
NAS-Port-Type	61	Integer	(5)
Calling-Station-Id	31	String	MSISDN
Calling-Station-Id	30	String	(APN name)
NAS-Identifier	32	String	
Acct-Authentic	45	Integer	
Acct-Delay-Time	41	Integer	
NAS-Port-ID	87	String	(GGSN name)

Figure 5: RADIUS Stop Record

AVP Name	AVP Type Code (Decimal)	Value Format	Value Default
User-Name	1	String	
Class	25	String	
Acct-Session-ID	44	String	
Acct-Status-Type	40	Integer	(1)
NAS-IP-Address	4	IP Addres	
Service-Type	6	Integer	(2)
Framed-Protocol	7	Integer	(7)
Framed-IP-Address	8	IP Address	
NAS-Port-Type	61	Integer	(5)
Calling-Station-Id	31	String	MSISDN
Calling-Station-Id	30	String	(APN name)
NAS-Identifier	32	String	
Acct-Authentic	45	Integer	
Acct-Delay-Time	41	Integer	
Acct-Input-Octets	42	Integer	
Acct-Output-Octets	43	Integer	
Acct-Input-Packets	47	Integer	
Acct-Output-Packets	48	Integer	
Acct-Termin.-Cause	49	Integer	
Acct-Session-Time	46	Integer	
NAS-Port-ID	87	String	(GGSN name)
NAS-Port	5	Integer	(60,000)

AT&T can provide RADIUS start and stop records; this option is available as a part of the CCS offer. RADIUS accounting records are provided on a best effort basis. Start and stop records may be delivered out of sync, and utility customer's collection and reporting tool must be able to account for this anomaly. Standard UDP port 1813 is used for all RADIUS accounting records. It is recommended that utility customers implement RADIUS servers in an N+1 redundant configuration. AT&T GGSN will deliver these records directly to the customer RADIUS servers.

Utility customers can collect the various attributes recorded in the RADIUS accounting records and develop metrics to monitor end-point usage and performance. Metrics like uptime, session time, transferred packets, termination cause, etc. can be used to monitor end-point status and performance.

Key Performance Indicators and Thresholds

Key Performance Indicators refer to summary statistics derived from individual counters. KPI can collect a variety of counters and combine them to summarize performance conditions.

KPI's can be utilized to monitor status or performance on a near real-time basis. It can also be used for daily/weekly/monthly summary reports. Performance thresholds can be defined based on historical averages or industry standards.

AMI Security

AMI solution security must be viewed within the larger context of Smart Grid security. Smart Grid security is sub-divided in three security domains: generation systems, transmission systems and distribution systems. Each domain poses unique security challenges. System availability, data integrity and confidentiality are all important to the smooth operation of any AMI solution.

AMI solutions of today leverage a variety of connectivity options for normal operation. A single smart meter can have multiple wired and wireless connections like Zigbee, EDGE/UMTS etc. Each link or connection point should employ security features and access should be restricted by the utility to authorized users.

Some AMI vendors leverage SMS for management tasks. As discussed earlier, this is a potential security risk and utility customers should minimize the risk by either disabling the SMS command functionality or by turning-off SMS via SIM provisioning. Similarly, voice call functionality should be disabled. Any management connections and ports should employ access control mechanisms established by the utility customer. Utility customers should also encrypt their transmitted and stored data to help protect consumer privacy and minimize device tampering.

AMI and Smart Grid security is an important topic and is addressed in depth in a separate white paper.

Summary

The use of wireless technologies in AMI solutions may be a new trend but the technologies themselves are not. Wireless packet data networks have been in operation for almost a decade. Many of the best practices gleaned from AT&T's experience with wirelessly enabling a variety of applications directly apply to AMI solutions. AT&T believes that AMI deployments can greatly benefit from these best practices.

Specifically, a comprehensive plan that leverages best practices around the solution design, deployment methods, management tools and security measures can result in a successful and smooth AMI deployment.

References

Department of Energy, The Smart Grid – An Introduction, prepared for the U.S. Department of Energy by Litos Strategic Communication http://www.oe.energy.gov/DocumentsandMedia/DOE_SG_Book_Single_Pages.pdf.

For more information contact an AT&T Representative or visit www.att.com/business.

Exhibit GLK-10

Filed Highly Confidential and Highly Sensitive

Exhibit GLK-11

Filed Highly Confidential and Highly Sensitive

PUC DOCKET NO. _____

BEFORE THE PUBLIC UTILITY COMMISSION OF TEXAS

TEXAS-NEW MEXICO POWER COMPANY
REQUEST FOR APPROVAL
OF AN ADVANCE METERING SYSTEM (AMS)
DEPLOYMENT AND AMS SURCHARGE

PREPARED DIRECT TESTIMONY AND EXHIBITS
OF
F. ALLAN BURKE

ON BEHALF OF
TEXAS-NEW MEXICO POWER COMPANY

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I. INTRODUCTION AND QUALIFICATIONS

Q. PLEASE STATE YOUR NAME, BUSINESS ADDRESS, AND PLACE OF EMPLOYMENT.

A. My name is F. Allan Burke. I serve as Director of the Retail Electric Provider (REP) Relations Department of Texas-New Mexico Power Company ("TNMP" or "Company"). My business address is 577 North Garden Ridge Boulevard, Lewisville, Texas, 75067.

Q. ON WHOSE BEHALF ARE YOU TESTIFYING?

A. I am testifying on behalf of Texas-New Mexico Power Company.

Q. PLEASE DESCRIBE YOUR EDUCATIONAL BACKGROUND AND PROFESSIONAL EXPERIENCE.

A. I earned a Bachelor of Business Administration in Accounting in 1992 from The University of Texas at Arlington. I obtained my Certified Public Accountant license in 1995. I have over 15 years of professional accounting experience, including financial preparation and analysis, budgeting, and forecasting.

In March 1999, I joined Facility Works, Inc., an unregulated affiliate of Texas-New Mexico Power Company, as Controller. After a few weeks, it was determined that future financial profitability of Facility Works was questionable and a decision was made to terminate operations in October 1999. I returned in February 2000 to Texas-New Mexico Power Company as a project manager for electric deregulation. In 2002, I was promoted to Manager of the newly created REP Liaison Department, as a result of deregulation in Texas. Shortly after the TNMP acquisition by PNM Resources in 2005, I was promoted to Director – REP Relations.

I have previously filed testimony in Docket No. 36025, TNMP's most recent rate case.

Q. PLEASE SUMMARIZE YOUR DUTIES AS THE DIRECTOR OF REP RELATIONS FOR TNMP?

A. I am responsible for the REP Relations Department and report directly to the Vice-President of Texas Operations. The department is responsible for providing a primary point of contact for market issues that affect TNMP's billing and operations. The REP Relations Department handles the initial contact and resolution for Market Participants,

including ERCOT, Retail Electric Provider's (REP), and other Transmission and Distribution Service Providers (TDSP's).

Q. HAVE YOU PREPARED ANY EXHIBITS?

A. Yes. I am sponsoring Exhibits FAB-1 through FAB-2, which are attached to my testimony. Each of these exhibits was prepared by me or under my direction and control. The information contained in these exhibits is true and correct to the best of my knowledge and belief.

II. PURPOSE AND OVERVIEW OF TESTIMONY

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY IN THIS PROCEEDING?

A. The purpose of my testimony will be to:

- Describe the objectives sought to be achieved by TNMP's implementation of its AMS.
- Describe the implementation and deployment of TNMP's AMS.
- Describe costs that will be saved and incurred as a result of TNMP's implementation of its AMS.

Q. WHAT IS YOUR ROLE IN THE IMPLEMENTATION OF TNMP'S AMS?

A. From an operational perspective, I will be overseeing the implementation of approximately 240,000 advanced meters in TNMP's service territory. This entails coordinating the meter implementation schedule with the 3rd party vendor, accounting for both incoming and outgoing inventories, and handling any end-use customer and REP issues as they arise.

III. OVERVIEW OF TNMP'S APPLICATION

Q. WHY IS TNMP MAKING THIS FILING?

A. Through this petition and application, in accordance with P.U.C. SUBST. R. 25.130(d), TNMP requests approval of its proposed Advanced Metering System Deployment Plan and approval of an AMS surcharge. Under its advanced meter deployment plan, TNMP will provide full deployment of advanced meters to approximately 240,000 retail electric customers over the period 2011-2015. In addition, TNMP requests approval of an AMS Surcharge tariff to recover the reasonable and necessary costs it will incur under the

deployment plan for the full deployment of advanced meters to residential and non-residential customers in its retail electric service area, except for those customers who have Interval Data Recorder (IDR) meters or take unmetered service.

Q. PLEASE SUMMARIZE THE PRINCIPAL ELEMENTS OF TNMP'S AMS INITIATIVE.

A. This initiative involves the installation and operation of AMS technology across TNMP's non-contiguous service territories beginning in the first quarter of 2011 with completion of the system build out in 2015. The system will meet all the functionality requirements of the Commission's rules as described in detail by Mr. Gary Kessler. TNMP's plan is to use a two-way communication system over public wireless, IP-based, Smart Grid technology for its AMS. Mr. Kessler's testimony describes the back-office systems and enhancements required to enable the AMS system. He will also describe the required Web Portal integration and its deployment schedule. Together, these will provide market participants and customers with usage data as prescribed by the rule. As Mr. Stacy Whitehurst will describe, TNMP will implement activities to educate retail consumers and REPs about the benefits and information available through use of the AMS system so they may better take advantage of those benefits. Additionally, as described by Mr. Whitehurst, TNMP will provide low-income consumers with home energy monitors. These monitors will provide real-time energy usage information, which will enable these low-income customers to adjust their consumption to reduce their current electric bill. This information may also prepare them to take advantage of time-of-use pricing products that may be offered by REPs in the future.

IV. OBJECTIVES SOUGHT TO BE ACHIEVED BY AMS

Q. WHY DOES TNMP PROPOSE THE INSTALLATION OF THE AMS?

A. TNMP is the last major investor-owned utility in ERCOT with over 50,000 Electric Service Identifier (ESI ID's) that has not filed for an approval of a deployment and surcharge. TNMP proposes to install and operate AMS technology in order to make the benefits the technology provides available to the retail electric market participants as well as end-use retail customers. The Texas Legislature and the PUCT have both encouraged electric delivery utilities, through various rulemakings and workshops, over the last few years to deploy AMS so the consumers in the Texas retail market will be able to take advantage of potential new service offerings from REPs. Texas consumers will gain access to better understanding of their energy usage information through

various tools to better manage their energy budgets. End use customers will now be given a chance to better control their electricity usage with the increased knowledge that AMS provides them and their REPs, who hopefully will initiate energy conservation programs, such as time-of-use rates, dynamic pricing, and other energy efficiency and demand responsive products. These new offerings have the promise of helping to control the rate of demand growth in ERCOT, which has benefits for customers as well as the environment. Second, TNMP should see improved reliability with the advent of AMS. With instantaneous data from the meter, and the utilization of an Outage Management System (OMS), TNMP will know of outages before consumers. Third, the deployment and use of AMS is voluntary unless ordered by the Commission. From a financial forecasting perspective, it makes more sense for TNMP to proactively file and control any regulatory risk of being ordered to deploy an AMS before thorough investigation and analysis can be performed.

Q. PLEASE EXPLAIN HOW THE AMS WILL ENABLE TNMP TO PROVIDE BETTER SERVICE TO THEIR END-USE CONSUMERS.

A. As previously stated, TNMP is the last major ERCOT investor owned utility to file for approval of AMS deployment plan and surcharge. This will allow ERCOT and REPs to have data from more meter points in order to more timely and accurately allow full settlement of the wholesale market. AMS technology will enable TNMP to provide more granular, accurate, and timely electric consumption information to REPs and end-use consumers. It will provide the mechanism to perform connections and disconnections of service more quickly by means of the remote connection/disconnection switch in the new 200 amp meters. AMS technology will provide TNMP with real time outage information not currently available today. This information will enable faster, more accurate outage analysis and improved restoration response time. The new system will also provide TNMP with load and voltage data information for each meter point. That data will aid in finding, analyzing, and responding to power quality problems affecting consumers.

Q. WILL AMS ALLOW TNMP TO REDUCE THE COSTS OF PROVIDING SERVICE TO END USE CUSTOMERS AND REPS?

A. The primary cost savings for TNMP is related to reducing the cost of reading meters. Meter reading cost savings will be driven by reduced labor and fleet expenses due to eliminating the need to manually access each meter monthly to obtain usage information. In TNMP's rate case, Docket No. 36025, the test year adjusted meter

reading expense was $1,911,782[1] (test year was from April 2007 to March 2008). Second, there will be some savings associated with move-ins where existing service has already been installed, move-outs, reconnects, and disconnects. Improved outage restoration information and power quality monitoring will be useful for proving better service, but are not likely to significantly reduce costs. The meter reading and cost savings do not equal the increase in costs resulting from the AMS capital investment recovery and new operations and maintenance (O&M) expenses necessary to operate the new system. That is why a surcharge is necessary for TNMP to continue with this investment. The largest beneficiaries of the new AMS system will be REPs and end-use customers for the reasons that were discussed previously. Additional cost savings for end-use customers will be realized through reduced discretionary fees for connects, disconnect/reconnect for non-pay, and special read orders.

Q. WHAT ARE THE ESTIMATED COST SAVINGS AS A RESULT OF THE DEPLOYMENT OF ADVANCED METERS?

A. One of the areas where TNMP expects to save costs is in elimination of the meter reader position. As of the date of this submittal, the Company has twenty-four (24) full-time regular meter readers and eleven (11) temporary meter readers throughout its territories. The chart showing the number and timing of the reductions follows:

City	Full-Time / Temp	Number	Reduction (#-Year)
League City	Temp	9	4-2011, 5-2012
League City	FT	3	2-2012, 1-2013
West Columbia	FT	4	2013
Lewisville	Temp	2	1-2013, 1-2014
Lewisville	FT	2	2014
Pilot Point	FT	1	2014
Leonard	FT	2	2014
Bogota	FT	1	2014
Nocona	FT	1	2015
Olney	FT	1	2015
Gatesville	FT	1	2015
Clifton	FT	3	2015
Glen Rose	FT	1	2015
Fort Stockton	FT	1	2015
Pecos	FT	2	2015
Kermit	FT	1	2015
	TOTAL	**35**	

[1] Please see the Schedules supporting the Stipulation from Docket No. 36025.

Current estimated yearly cost savings as a result of headcount reductions is as follows:

Position	Count	Average Salary	Total
Meter Reader	24	[2]$44,699	$1,072,776
Meter Reader – Temp	11	[3]$35,000	$385,000
Total	35		$1,457,776

Additional savings will result from the reduction in items such as fleet, fuel charges, and maintenance costs. These savings are quantified in the McKinsey model.

Q. WHEN WILL THE COST REDUCTION RELATED TO METER READING BE ACHIEVED?

A. The deployment schedule will permit TNMP to achieve savings related to meter reading in the Gulf Coast and North Texas regions first, followed by subsequent savings in the remaining regions of Central and West Texas. As a result of headcount reduction, savings will be achieved as early as 4Q-2011. Said savings will continue as the Company rolls out the Advanced Meters throughout its territories, thereby reducing headcount in accordance with deployment. As such, TNMP is expected to achieve savings in 2011 – 2015 respectively. These savings will be realized as sufficient meters are installed in specific areas. Meter reader positions will be eliminated within 30-90 days after the appropriate amounts of meters are replaced.

Q. WILL THERE BE SEVERANCE COSTS ASSOCIATED WITH TNMP'S AMS DEPLOYMENT PLAN?

A. Yes. There will be severance costs associated with the Company's AMS deployment plan, specifically in the aforementioned reduction of all full-time regular meter reader positions. Impacted employees will be eligible to receive severance in accordance with the Company's severance plan which includes four (4) months salary; six (6) months benefit coverage, an added modifier based on full years of service, and any other company standard benefits.

Q. PLEASE EXPLAIN WHY SOME OFFICES WILL NOT SEE A REDUCTION IN METER READING EXPENSES.

[2] Includes Health and Welfare benefits costs

Because of TNMP's diverse and non-contiguous service territory, many smaller offices are not using, and do not require, fully dedicated meter reading resources. These offices are Emory and Whitewright in North Texas, Strawn and Whitney in Central Texas, and Sanderson in West Texas. Meters are read in these areas by Meter Readers from other nearby locations so that the smaller office Energy Technicians (ETs), who provide a multitude of other services, can continue to maintain reliability and response times.

Q. DOES TNMP EXPECT TO INCUR ANY ADDITIONAL COSTS AS A RESULT OF THE IMPLEMENTATION OF THE AMS DEPLOYMENT PLAN?

A. Yes. TNMP is expected to increase headcount, an additional nine (9) employees, in some areas due to the new accountabilities, systems, and implementation of new technology. The majority of these additions will be at a professional/exempt level and a higher salary and benefit cost. These factors should compound annually, therefore increasing the operations and maintenance budget significantly over the years. Furthermore, severance (see above) will be an additional cost as a result of the AMS implementation, as well as costs associated with unemployment wages for those employees who are laid-off and subsequently file an unemployment claim. As such, the Company expects to see an increase in unemployment claims, which will result in increased employer paid taxes in accordance with the Texas Unemployment Compensation Act and the Texas Workforce Commission.

Q. PLEASE DETAIL THE INCREASE IN HEADCOUNT FROM ABOVE AND DESCRIBE THE DUTIES FOR EACH NEW POSITION.

A. Due to the increase in information received from the AMR meters, TNMP will need to add 9 new employees:

- AMS Program Manager – (1)
- Fraud Coordinator – (1)
- Meter Shop Manager – (1)
- Outage Management System Operators – (4)
- Cost Accountant – (1)

[3] Includes temporary markup costs

- Meter Shop Technician – (1)

The AMS Program Manager is needed to serve as a primary coordination position for this major project. Primary job requirements for this position include:

- Provides leadership on statistical, modeling, and business analytics for assigned project teams
- Monitors project progress, status and risk using conventional project management methods appropriate for scale and complexity
- Provides consolidated view of analytics for operations within a business unit to facilitate information-based strategic planning, process improvement, and metrics development

The Fraud Coordinator is a new position needed by TNMP in order to gain a better understanding of all the new meter tamper data that will be created. TNMP does not currently have any position like this since tampering is handled by the Service Technicians on a one off investigation, as needed. Primary job requirements for this position include:

- Compliance with new PUCT meter tampering rule
- Revenue Protection
- Coordinate gathering data to work with Legal Department to prosecute offenders
- Single Point of Contact (PH/PR)

The Meter Shop Manager will be needed to coordinate with current meter shop staff all new incoming AMR meters will be tested in accordance with TNMPs current test policy. This position is also needed due to the vast increase in the amount of incoming inventory. Other job requirements for this position include:

- Oversees problem solving for meter issues for Load Department
- Assist Power Operations with Meter Audits for System Metering
- Assists System Engineering and the Meter departments with meter issues

The four (4) Outage Management System (OMS) Operators will be needed to provide full-time, 24 hour a day monitoring of TNMP's new OMS system. The new AMR meters will provide real

time outage and tampering information which will need to be analyzed with the OMS system. Other job requirements for this position include:

- Controls and operates the Company's transmission resources (voltage levels 46kV and above) and monitors the generation resources from a reliability perspective
- Coordinates and directs switching operation and maintenance of the transmission system
- Operates the system on a minute-by-minute basis to match firm and interruptible resources to obligations, balance generation and transmission shares between utility companies/market entities

The Cost Accountant will be needed to provide full financial reporting to the Program Manager. This position is warranted due to the magnitude of the cost of this project. Other job requirements for this position include:

- Acts as a liaison across functional and accounting groups to develop appropriate accounting treatment for project transactions
- Accesses emerging reporting needs on behalf of management and coordinates changes in reporting systems and formats to accommodate management decision processes

The Meter Shop Technician will be needed to provide start up project help for the new AMR meters as well as providing some additional help to the current Meter Shop personnel. Other job requirements for this position include:

- Meter programming and validation
- Old meter disposal by inspection
- Power quality

V. TNMP'S DEPLOYMENT PLAN

Q. WHAT HAVE BEEN THE FIRST STEPS OF THE AMS DEPLOYMENT PLAN?

A. TNMP initiated the first Pilot Program in December 2007 installing approximately 100 Elster A-3 meters in Clifton, Texas. This location was chosen in order to test the SmartSynch communication capabilities in a non-metropolitan area. These meters were successfully used to obtain remote, on-demand, and monthly billing reads on single-

family residential and small commercial premises. Following the Clifton Pilot, TNMP then deployed approximately 500 Echelon meters in various locations in the Gulf Coast territory and Lewisville on multi-family residential premises in June 2008. The Echelon meters were not only used to obtain on-demand and monthly meter readings, but also were used to successfully initiate on-demand turn-on and turn-off of meters for Disconnect for Non-Pay and Move-in/Move-out requests. TNMP then initiated the final Pilot Program in April 2009 and recently completed the installation of approximately 10,000 GE I210+C meters (8,000 meters in the Gulf Coast and 2,000 meters in Lewisville), in March 2010. The vast majority of these meters were installed on multi-family residential dwellings to expedite installation and reduce costs. This Pilot Program allowed TNMP and SmartSynch (SSI)[4] to test the functionality of the meters as prescribed in the Commission's rule. It provided the opportunity to identify and resolve problems with hardware, software, and communication issues. Please refer to witness Kessler's testimony for a more technical discussion of the three Pilot Programs.

Q. PLEASE DESCRIBE TNMP'S NEXT STEPS FOR AMS DEPLOYMENT.

A. TNMP's non-contiguous, diverse service territory will provide many challenges. The Company plans to deploy meters beginning in January 2011 in the densely populated Gulf Coast area first, followed by the densely populated area of Lewisville, then the rest of North Texas, followed by Central Texas, and finally West Texas, ending in December 2015. The plan will ensure the meters are deployed to the largest population of end-use customers in the most efficient and effective manner. Postponing implementation in the more rural areas of North, Central, and West Texas will allow cell phone technology, or other cost effective communication technologies to become more readily available. TNMP believes this strategy will allow the largest number of end-use customers and REP's the advantage of AMS benefits in the timeliest manner.

Q. WHY WERE THE CITIES IN THE GULF COAST AREA AND LEWISVILLE SELECTED FOR THE INITIAL FULL SCALE AMS DEPLOYMENT?

A. The deployment plan to install advanced meters in more populated, contiguous areas first allows TNMP to obtain efficiencies of meter readings and field operational costs as quickly as possible. Having the largest number of meters closest to existing field offices will allow TNMP quick and easy access to correct meter problems. Larger, more

[4] Please reference Mr. Kessler's testimony for more information about SmartSynch.

densely populated areas will greatly reduce the chance of poor communication issues. Also, deploying in higher populated areas first allowed the largest number of end-use customers and REP's the chance to gain advantages of AMR meters as quickly as possible by allowing quicker service order request times. These locations also provided the largest number of multi-family dwellings. This will also allow customer education efforts, as described in witness Whitehurst's testimony, to be focused in a smaller area to obtain the greatest understanding.

Q. HOW WILL THE AMS DEPLOYMENT CONTINUE AFTER THE INITIAL DEPLOYMENT?

A. After completion of implementation to the highly populated areas of the Gulf Coast service territory and Lewisville, TNMP will continue to deploy meters in the more rural North Texas areas. This is a more efficient use of resources since installation crews will already be in the Lewisville area. After the North Texas deployment is complete, installation crews will be directed to the Central Texas areas, including the cities of Clifton, Meridian, and Gatesville. Upon completion of all towns and rural areas in Central Texas, implementation crews will go to West Texas, including the towns of Pecos and Fort Stockton to complete installation of all TNMP service areas.

Q. IS IT THE EXPECTATION OF TNMP THAT THE AMS SYSTEM WILL PROVIDE FULL FUNCTIONALITY AND CUSTOMER BENEFITS IMMEDIATELY AFTER DEPLOYMENT?

A. Yes. Meters become fully functional within a few hours of installation. TNMP should have access to the automation of the newly installed meters within one to two business days after installation. TNMP plans to transmit 15 minute interval to the Smart Meter Texas Web Portal within one year after deployment begins.

Q. WILL THE INITIAL DEPLOYMENT INCLUDE THE FUNCTIONALITIES ASSOCIATED WITH THE JOINT WEB PORTAL UNDER DEVELOPMENT IN PROJECT NO. 34610?

A. As Mr. Kessler discusses in his direct testimony, TNMP expects Joint Web Portal (Smart Meter Texas) functionality within one year after deployment begins.

Q. WHEN DOES THE COMPANY PROPOSE TO COMMENCE MONTHLY STATUS REPORTS?

A. TNMP will file monthly progress reports within 15 days following the appropriate month end and semi-annual status reports commensurate with approved market procedures following the approval of the AMS Deployment plan by the Commission as required by PUC Substantive Rule 25.130 (d)(9). Assuming deployment begins on January 1, 2011, the first monthly status report should be filed on or about February 15, 2011.

Q. PLEASE PROVIDE EXAMPLES OF ANY REP RETAIL ENERGY PRODUCTS THAT ARE DEPENDENT ON AMS DEPLOYMENT THAT HAVE BEEN OFFERED TO RESIDENTIAL AND SMALL COMMERCIAL CUSTOMERS IN TNMP'S SERVICE AREAS WITHIN ERCOT.

A. I am not aware of any specific products being offered by REPs in TNMP's service territory as of the current time, although TNMP has been contacted by two companies to begin testing Home Area Network (HAN) devices once the TNMP filing has been approved.

Q. PLEASE PROVIDE THE ESTIMATED ACCURACY OF EXISTING STANDARD METERS ON THE TNMP SYSTEM.

A. Per the ANSI Meter Standards (C12.20), all accuracy class 0.5 meters (which are used by TNMP) must be within +/- .2% accurate under normal conditions. TNMP has been using a combination of Landis and Gyr single-phase and poly-phase residential and Elster commercial meters for the several years. In 2009, TNMP tested 3,929 single-phase meters with 56 failing these standards (1.43%), and 382 poly-phase meters with 2 failing (0.52%). All testing was done in accordance with ANSI C12.20 standards.

Q. PLEASE PROVIDE THE ESTIMATED ACCURACY OF NEW ADVANCED METERS WHICH TNMP PLANS TO DEPLOY ON ITS SYSTEM.

A. The complete meter accuracy process is described below. For the 10,000 meter Pilot Project, in 2009, TNMP tested 605 GE I210+C meters with 0 failing these standards (0%). TNMP has also dual metered 10 meters (8 Residential and 2 Light Commercial) in the Clifton pilot with no discernable differences between usage on the Elster A-3 meters and the previously installed meters. There are also plans to dual meter approximately 20 additional meters in the Gulf Coast and Lewisville areas in the near future.

Q. PLEASE DESCRIBE THE PROCESS TNMP PLANS TO IMPLEMENT IN ORDER TO ENSURE ACCURACY OF NEW ADVANCED METERS WHICH WILL BE DEPLOYED.

A. The new General Electric (GE) I210+C meters are also ANSI C12.20 class 0.5 meters and, therefore will have the same standards. All meters are tested in the GE factory before being shipped to TNMP. For the 10,000 meter Pilot Project, as well as meters to be deployed in the future, GE tests all meters prior to shipment to SSI. After SSI installs its communication module into the meter, SSI then retests the meters to ensure accuracy has not been compromised. See witness Kessler's testimony for more detailed description of the communication module installation process. A copy of an SSI test sheet is attached in Exhibit FAB-2. In addition to factory and SSI testing, TNMP tests one box in each pallet (approximately 4.2%) of meters prior to installation. If any meter in that box fails the accuracy test, TNMP then tests another box from the same pallet. If any meter from the second box fails the accuracy test, the entire pallet is rejected and returned to SmartSynch, which in turn would be returned to GE. If the second box passes the accuracy test, any inaccurate meter from the test would be returned.

Q. PLEASE PROVIDE SUPPORTING DETAILS FOR THE FIELD EMPLOYEES AND RELATED LABOR COSTS INCLUDED IN THE AMS DEPLOYMENT COST ESTIMATES FOR TNMP AND INDICATE WHETHER THESE ARE EXPECTED TO BE NEW EMPLOYEES.

A. TNMP will not hire any new employees to install the new advanced meters. As part of its bid, in addition to purchase of meters, SmartSynch also proposed acting as the primary contractor for installation of the AMR meters. SmartSynch will use Utility Partners of America (UPA), a third party meter installation company that has been in business since 1997, and has installed over six million gas and electric meters.

Q. PLEASE DESCRIBE THE MAJOR ASPECTS OF THE METER INSTALLATION PROCESS UPA WILL USE.

A. Prior to removal of the old meter, UPA will obtain the current meter reading and enter it into a handheld data collection device. UPA then takes a digital photograph of the old meter that will be used to re-verify the accuracy of the final read. All final meter readings will be 100% audited for validation. UPA then performs a voltage check on the meter base to ensure proper thresholds. UPA will then take a picture of the new meter. Both pictures of the old and the new meter will be stored electronically for future use and validation. After the new meter is installed, UPA will leave a door hanger at the customer premise notifying them of their new advanced meter. A copy of the wording of this door hanger is referenced in witness Whitehurst's testimony.

Q. HOW WILL TNMP NOTIFY CUSTOMERS OF THEIR UPCOMING ADVANCED METER INSTALLATION?

A. TNMP will send customers a postcard notifying them of their upcoming advanced meter installation approximately 2 weeks in advance of the anticipated installation date. The cost of customer notification is included in the Customer Education program.

VI. TNMP'S AMS COSTS

Q. HOW MUCH DOES TNMP EXPECT TO SPEND FOR THE AMS PROJECT FROM THE START OF THE PILOT PROJECT THRU DECEMBER 2010?

A. The chart below details all actual costs incurred to date and budgeted costs through December 31, 2010.

Description of Expenses	Total	Disposition of Dollar Spend
Elster A-3 Meter Project	65,502	Already Spent
Echelon Meter Project	74,303	Already Spent
GE I210+C Meter Project	3,478,306	Already Spent
Total Meter Project Expenses	**$ 3,618,111**	
AMS Case Expenses	1,012	Already Spent
AMS Surcharge	27,171	Already Spent
Advanced Metering Meetings and Meter Communication / Support Expense	121,599	Already Spent
Smart Grid Project Planning	436,521	Already Spent
TX AMS Business Study	143,477	Already Spent
Plexus - AMR Business Case Study	89,964	Already Spent
Solutions Cube Group - AMIT Meeting Facilitator	4,200	Already Spent
Travel	85,000	Ongoing
Meter Communication / Support Costs	78,600	Ongoing
Surcharge Proceeding Expense	350,000	To be Spent
Product Maintenance - OMS	60,000	To be Spent
Customer Education	298,808	To be Spent
New Employee Salaries	87,500	To be Spent
Corporate Overhead	38,518	To be Spent
Tax on 2010 Items to be Spent	18,447	To be Spent
Total IT Capital Spend	3,078,628	To be Spent
Total Pre-2011 Costs	**$ 8,537,556**	

Q. DO ALL OF THE COSTS DISCUSSED IN YOUR TESTIMONY TIE OUT DIRECTLY WITH THE COSTS INCLUDED IN THE MCKINSEY MODEL?

A. No. As set forth in the testimony of witness Michael Montgomery, while all of these costs are initially included in the McKinsey Model, these costs are adjusted after application of TNMP's loads and applicable taxes so as to develop the specific inputs into the Model.

Q. PLEASE DISCUSS THE COSTS OF THE METERS THAT WERE CHOSEN BY TNMP FOR THE AMR INSTALLATION.

A. TNMP has chosen to use the GE I210+C meter for single-phase residential installations and the GE KV2C for poly-phase commercial installations. A small number of poly-phase meters will be equipped with Reactive Power and Power Quality software for future use. The specific costs of these meters and the software can be found in the McKinsey model. Please refer to witness Kessler's testimony for more information on the GE I210+C meter.

Q. PLEASE DISCUSS THE COST OF METER INSTALLATION THAT WILL BE INCURRED DURING THE DEPLOYMENT OF AMR METERS.

A. As discussed previously, SmartSynch will act as the primary contractor for meter installation. SmartSynch will use UPA for the actual meter installation. Due to TNMP's diverse service territory, UPA bid its meter installation for single and poly-phase installations into three tiers: Suburban, Rural, and Desolate. Cities in each tier were determined using meter population and distance away from the nearest TNMP construction center (warehouse facility). The classification tier of each TNMP city can be found in the deployment plan (Exhibit FAB-1). The specific costs of the meter installation price, by phase and tier, can be found in the McKinsey model.

Q. PLEASE DISCUSS THE CREDIT FOR METER SALVAGE THAT TNMP WILL RECEIVE.

A. TNMP will receive $0.22 per pound from Utility Recycling Services (URS) as salvage value for each meter. Assuming an average meter weight of 3.5 pounds, TNMP is using a $0.77 per meter credit for salvage reimbursement.

Q. PLEASE DISCUSS ANY AMOUNT PAID TO THE METER VENDOR FOR PROJECT MANAGEMENT SUPPORT.

A. TNMP has agreed to pay SmartSynch for "Project and Deployment Management" on a per meter basis. The support provided from SSI includes:

- Project & Budgetary management
- Deployment design
- Front-End System Implementation training and support to include Transaction Management System (TMS) training, Meter Shop Training, and TMS Installation and Support
- Field Engineering Suport
- Site Validation
- RMA Management

The specific costs of the SmartSynch Project and Deployment Management can be found in the McKinsey model.

Q. PLEASE DISCUSS THE AMOUNTS INCLUDED IN ONGOING O&M EXPENDITURES FOR THE AMR DEPLOYMENT.

A. TNMP has agreed to pay SmartSynch for "Hosted Solution / Managed Services" on a per meter per month basis. These services include:

- Data Hosting, Collection, and monthly secured data delivery
- Airtime for data communication with meters
- Monthly Secured Data Collection and Delivery and Support
- Daily Export File via FTP or as needed
- Periodic on-call data
- Provide and operate the server and the communications connection to the wireless network
- Coordinate technical operations to manage meter and meter data
- Manage secure transfer or access to daily billing data and error reports generated by the server
- Perform daily backup of database and files

The specific costs of the SmartSynch Hosted Solution / Managed Services fees can be found in the McKinsey model.

VII. CONCLUSION

Q. WHAT ACTION DO YOU PROPOSE THAT THE COMMISSION TAKE IN THIS PROCEEDING?

A. As per PUCT Substantive Rule 25.130, electric utilities are authorized to assess a non-bypassable surcharge to recover costs for deploying an advanced metering system. TNMP is seeking approval of the deployment plan and the related surcharge in order to recover cash flow required for a project of this magnitude.

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes, it does.

AFFIDAVIT

STATE OF TEXAS §
§
COUNTY OF DALLAS §

BEFORE ME, the undersigned authority, on this day personally appeared F. Allan Burke, who, upon proving his identity to me and by me being duly sworn, deposes and states the following:

"My name is F. Allan Burke. I am of legal age, a resident of the State of Texas, and have never been convicted of a felony. I certify that the foregoing testimony, offered by me on behalf of Texas-New Mexico Power Company, are true and correct and based upon my personal knowledge and experience."

F. Allan Burke

SWORN TO AND SUBSCRIBED before me, Notary Public, on this 25th day of May, 2010, to certify which witness my hand and seal of office.

SEAL:

TARRA L. STAUFFER
Notary Public, State of Texas
My Commission Expires
June 10, 2012

NOTARY PUBLIC in and for the
State of Texas

My Commission expires 6/10/12

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		Active			Inactive						Pilot Project Meters											
REGION	CITY	Single	Poly	Total	Single	Poly	Total	Sub-Total	Blank	SUB-GRAND TOTAL	Previously Installed Single	To Be Installed Single	Pilot Project Total	GRAND TOTAL	Const Ctr	Sub/Rural/ Des	Miles to CC	Sub-Seq	Master-Seq	Q1	Q2	Q3
GULF COAST	LEAGUE CITY	31,517	1,147	32,664	456	56	512	33,176		33,176	(4,698)	(1,500)	(6,198)	26,978	League City	S		1	1	10,000	11,000	5,978
GULF COAST	DICKINSON	8,731	435	9,166	339	17	356	9,522		9,522	(240)		(240)	9,282	League City	S		2	2			6,000
GULF COAST	TEXAS CITY	17,975	1,229	19,204	678	74	752	19,956		19,956	(2,238)	(500)	(2,738)	17,218	League City	S		3	3			
GULF COAST	LA MARQUE	5,895	468	6,363	282	20	302	6,665		6,665	(45)		(45)	6,620	League City	S		4	4			
GULF COAST	GALVESTON COUNTY	329	6	335	6		6	341		341			0	341	League City	R		5	5			
GULF COAST	FRIENDSWOOD	9,665	451	10,116	57	15	72	10,188		10,188	(81)	(300)	(381)	9,807	Friendswood	S		1	6			
GULF COAST	PEARLAND	401	1	402	4		4	406		406			0	406	Friendswood	S		2	7			
GULF COAST	ALVIN	13,493	826	14,319	599	26	625	14,944		14,944	(735)	(406)	(1,141)	13,803	Friendswood	S		3	8			
GULF COAST	WEST COLUMBIA	3,094	165	3,259	108	5	113	3,372		3,372			0	3,372	West Columbia	S	0	1	9			
GULF COAST	OLD OCEAN	12	1	13	1		1	14		14			0	14	West Columbia	R	8	2	10			
GULF COAST	MATAGORDA COUNTY	17		17			0	17		17			0	17	West Columbia	R		3	11			
GULF COAST	SWEENY	2,938	111	3,049	144	1	145	3,194		3,194			0	3,194	West Columbia	R	9	4	12			
GULF COAST	BRAZORIA	4,867	92	4,959	133	7	140	5,099		5,099	(61)		(61)	5,038	West Columbia	R	10	5	13			
GULF COAST	BRAZORIA COUNTY	916	60	976	30	5	35	1,011		1,011			0	1,011	West Columbia	R		6	14			
GULF COAST	HILLCREST VILLAGE	1		1			0	1		1			0	1	West Columbia	R		7	15			
GULF COAST	BAILEY'S PRAIRIE	353	11	364	10		10	374		374			0	374	West Columbia	R	9	8	16			
GULF COAST	ANGLETON	10,198	556	10,754	388	29	417	11,171		11,171			0	11,171	West Columbia	R	14	9	17			
GULF COAST	HOLIDAY LAKES	374	1	375	33		33	408		408			0	408	West Columbia	R	16	10	18			
LEWISVILLE	LEWISVILLE	37,850	2,218	40,068	439	64	503	40,571		40,571	(1,901)	(300)	(2,201)	38,370	Lewisville	S		1	19			
LEWISVILLE	DENTON COUNTY	1		1			0	1		1			0	1	Lewisville	S		2	20			
LEWISVILLE	COPPELL	1	19	20			0	20		20			0	20	Lewisville	S		3	21			
NORTH TEXAS	PILOT POINT	1,892	141	2,033	62	6	68	2,101		2,101			0	2,101	Pilot Point	R	0	1	22			
NORTH TEXAS	TIOGA	541	29	570	30		30	600		600			0	600	Pilot Point	R	6	2	23			
NORTH TEXAS	AUBREY	1,233	37	1,270	37	1	38	1,308		1,308			0	1,308	Pilot Point	R	7	3	24			
NORTH TEXAS	KRUGERVILLE	54		54	1		1	55		55			0	55	Pilot Point	R	9	4	25			
NORTH TEXAS	LEONARD	1,046	48	1,094	65	1	66	1,160		1,160			0	1,160	Leonard	R	0	1	26			
NORTH TEXAS	BAILEY	142	5	147	16		16	163		163			0	163	Leonard	R	6	2	27			
NORTH TEXAS	CELESTE	461	19	480	28	1	29	509		509			0	509	Leonard	R	7	3	28			
NORTH TEXAS	TRENTON	398	40	438	22	4	26	464		464			0	464	Leonard	R	7	4	29			
NORTH TEXAS	RANDOLPH	165	2	167	18		18	185		185			0	185	Leonard	R	8	5	30			
NORTH TEXAS	WHITEWRIGHT	1,213	74	1,287	56	1	57	1,344		1,344			0	1,344	Leonard	R	14	6	31			
NORTH TEXAS	WESTMINSTER	355	4	359	19		19	378		378			0	378	Leonard	R	15	7	32			
NORTH TEXAS	BLUE RIDGE	453	22	475	27	1	28	503		503			0	503	Leonard	R	15	8	33			
NORTH TEXAS	TOM BEAN	403	24	427	22		22	449		449			0	449	Leonard	R	18	9	34			
NORTH TEXAS	BELLS	533	18	551	28	3	31	582		582			0	582	Leonard	R	20	10	35			
NORTH TEXAS	ANNA	68	2	70	1		1	71		71			0	71	Leonard	R	21	11	36			
NORTH TEXAS	FARMERSVILLE	434	19	453	18	7	25	478		478			0	478	Leonard	R	25	12	37			
NORTH TEXAS	PRINCETON	2,595	96	2,691	133	4	137	2,828		2,828			0	2,828	Leonard	R	30	13	38			
NORTH TEXAS	GRAYSON COUNTY	1		1			0	1		1			0	1	Leonard	D		14	39			
NORTH TEXAS	BOGATA	868	22	890	58	1	59	949		949			0	949	Bogota	S	0	1	40			
NORTH TEXAS	ROSALIE	87		87	11		11	98		98			0	98	Bogota	R	2	2	41			
NORTH TEXAS	RUGBY	10		10			0	10		10			0	10	Bogota	R	4	3	42			
NORTH TEXAS	JOHNTOWN	141	15	156	13		13	169		169			0	169	Bogota	R	4	4	43			
NORTH TEXAS	DEPORT	414	14	428	29	1	30	458		458			0	458	Bogota	R	7	5	44			
NORTH TEXAS	FULBRIGHT	34	1	35	2		2	37		37			0	37	Bogota	R	8	6	45			
NORTH TEXAS	TALCO	416	39	455	50	6	56	511		511			0	511	Bogota	R	10	7	46			
NORTH TEXAS	MILTON	20		20	1		1	21		21			0	21	Bogota	R	11	8	47			
NORTH TEXAS	PATTONVILLE	159	5	164	5	1	6	170		170			0	170	Bogota	R	13	9	48			
NORTH TEXAS	CUNNINGHAM	106	2	108	6		6	114		114			0	114	Bogota	R	14	10	49			
NORTH TEXAS	MINTER	20		20	2		2	22		22			0	22	Bogota	R	16	11	50			
NORTH TEXAS	DETROIT	491	18	509	52		52	561		561			0	561	Bogota	R	16	12	51			
NORTH TEXAS	BLOSSOM	673	20	693	29	6	35	728		728			0	728	Bogota	R	19	13	52			
NORTH TEXAS	BAGWELL	138	1	139	12		12	151		151			0	151	Bogota	R	22	14	53			
NORTH TEXAS	SYLVAN	43		43			0	43		43			0	43	Bogota	R	23	15	54			
NORTH TEXAS	SUN VALLEY	2		2			0	2		2			0	2	Bogota	R	24	16	55			
NORTH TEXAS	LAMAR COUNTY	2		2			0	2		2			0	2	Bogota	D		17	56			
NORTH TEXAS	EMORY	843	57	900	60	4	64	964		964	(1)		(1)	963	Emory	R	0	1	57			
NORTH TEXAS	POINT	449	15	464	42		42	506		506			0	506	Emory	R	8	2	58			
NORTH TEXAS	LONE OAK	350	22	372	33		33	405		405			0	405	Emory	R	14	3	59			
NORTH TEXAS	EDGEWOOD	33		33			0	33		33			0	33	Emory	R	16	4	60			
NORTH TEXAS	RAINS COUNTY	11	1	12	1		1	13		13			0	13	Emory	D		5	61			240

REGION	CITY	Active Single	Active Poly	Active Total	Inactive Single	Inactive Poly	Inactive Total	Sub-Total	Blank	SUB-GRAND TOTAL	Pilot Project Meters Previously Installed Single	Pilot Project Meters To Be Installed Single	Pilot Project Total	GRAND TOTAL	Const Ctr	Sub/Rural/ Des	Miles to CC	Sub-Seq	Master-Seq	Q1	Q2	Q3
NORTH TEXAS	VAN ZANDT COUNTY	4		4			0	4		4			0	4	Emory	D		6	62			
NORTH TEXAS	NOCONA	1,861	208	2,069	146	12	158	2,227		2,227			0	2,227	Nocona	R	0	1	63			
NORTH TEXAS	BELCHERVILLE	4		4			0	4		4			0	4	Nocona	R	7	2	64			
NORTH TEXAS	MONTAGUE	266	46	312	16		16	328		328			0	328	Nocona	R	9	3	65			
NORTH TEXAS	RINGGOLD	120	3	123	11		11	134		134			0	134	Nocona	R	13	4	66			
NORTH TEXAS	SAINT JO	561	56	617	51	3	54	671		671			0	671	Nocona	R	14	5	67			
NORTH TEXAS	HENRIETTA	1		1			0	1		1			0	1	Nocona	R	28	6	68			
NORTH TEXAS	PETROLIA	528	42	570	45		45	615		615			0	615	Nocona	R	42	7	69			
NORTH TEXAS	DEAN	8		8			0	8		8			0	8	Nocona	R	43	8	70			
NORTH TEXAS	BYERS	274	20	294	18	1	19	313		313			0	313	Nocona	R	47	9	71			
NORTH TEXAS	WICHITA FALLS	13		13	1		1	14		14			0	14	Nocona	R	48	10	72			
NORTH TEXAS	CLAY COUNTY	3		3			0	3		3			0	3	Nocona	D		11	73			
NORTH TEXAS	MONTAGUE COUNTY	50	1	51	2	2	4	55		55			0	55	Nocona	D		12	74			
NORTH TEXAS	OLNEY	1,153	143	1,296	108	8	116	1,412		1,412			0	1,412	Olney	R	0	1	75			
NORTH TEXAS	JEAN	26	2	28	5	3	8	36		36			0	36	Olney	R	10	2	76			
NORTH TEXAS	MEGARGEL	144	55	199	17	7	24	223		223			0	223	Olney	R	12	3	77			
NORTH TEXAS	NEWCASTLE	134	5	139	14	1	15	154		154			0	154	Olney	R	13	4	78			
NORTH TEXAS	LOVING	85	30	115	9	2	11	126		126			0	126	Olney	R	17	5	79			
NORTH TEXAS	GRAHAM	17	3	20	2		2	22		22			0	22	Olney	R	23	6	80			
NORTH TEXAS	JERMYN	82	23	105	5	2	7	112		112			0	112	Olney	R	24	7	81			
NORTH TEXAS	BRYSON	418	93	511	34	9	43	554		554			0	554	Olney	R	32	8	82			
NORTH TEXAS	ELIASVILLE	108	52	160	2	2	4	164		164			0	164	Olney	R	40	9	83			
CENTRAL TEXAS	GATESVILLE	3,742	247	3,989	176	10	186	4,175		4,175			0	4,175	Gatesville	R	0	1	84			
CENTRAL TEXAS	JONESBORO	26		26	1		1	27		27			0	27	Gatesville	R	16	2	85			
CENTRAL TEXAS	MCGREGOR	1		1			0	1		1			0	1	Gatesville	R	20	3	86			
CENTRAL TEXAS	CLIFTON	3,263	183	3,446	146	9	155	3,601		3,601	(94)		(94)	3,507	Clifton	R	0	1	87			
CENTRAL TEXAS	VALLEY MILLS	1,093	45	1,138	52	2	54	1,192		1,192			0	1,192	Clifton	R	11	2	88			
CENTRAL TEXAS	MERIDIAN	892	83	975	57	1	58	1,033		1,033			0	1,033	Clifton	R	12	3	89			
CENTRAL TEXAS	MORGAN	453	18	471	31		31	502		502			0	502	Clifton	R	20	4	90			
CENTRAL TEXAS	CRAWFORD	528	23	551	35		35	586		586			0	586	Clifton	R	20	5	91			
CENTRAL TEXAS	WALNUT SPRINGS	492	21	513	25	1	26	539		539			0	539	Clifton	R	23	6	92			
CENTRAL TEXAS	KOPPERL	488	7	495	20	1	21	516		516			0	516	Clifton	R	28	7	93			
CENTRAL TEXAS	BOSQUE COUNTY	2		2			0	2		2			0	2	Clifton	D		8	94			
CENTRAL TEXAS	GLEN ROSE	2,949	204	3,153	150	5	155	3,308		3,308			0	3,308	Glen Rose	R	0	1	95			
CENTRAL TEXAS	RAINBOW	25		25			0	25		25			0	25	Glen Rose	R	5	2	96			
CENTRAL TEXAS	TOLAR	404	25	429	15		15	444		444			0	444	Glen Rose	R	17	3	97			
CENTRAL TEXAS	GRANBURY	280	8	288	28		28	316		316			0	316	Glen Rose	R	17	4	98			
CENTRAL TEXAS	BLUFF DALE	87	3	90	4		4	94		94			0	94	Glen Rose	R	24	5	99			
CENTRAL TEXAS	HAMILTON	1,965	113	2,078	78	6	84	2,162		2,162			0	2,162	Hamilton	R	0	1	100			
CENTRAL TEXAS	CARLTON	102	4	106	6		6	112		112			0	112	Hamilton	R	17	2	101			
CENTRAL TEXAS	GUSTINE	308	27	335	30	1	31	366		366			0	366	Hamilton	R	21	3	102			
CENTRAL TEXAS	HICO	960	58	1,018	58	3	61	1,079		1,079			0	1,079	Hamilton	R	21	4	103			
CENTRAL TEXAS	IREDELL	278	15	293	16	1	17	310		310			0	310	Hamilton	R	31	5	104			
CENTRAL TEXAS	COMANCHE COUNTY	2	8	10			0	10		10			0	10	Hamilton	D		6	105			
CENTRAL TEXAS	HAMILTON COUNTY	1		1			0	1		1			0	1	Hamilton	D		7	106			
CENTRAL TEXAS	WHITNEY	1,697	95	1,792	152	11	163	1,955		1,955			0	1,955	Whitney	R	0	1	107			
CENTRAL TEXAS	BLUM	292	19	311	20		20	331		331			0	331	Whitney	R	15	2	108			
CENTRAL TEXAS	OSCEOLA	24	2	26	4		4	30		30			0	30	Whitney	R	21	3	109			
CENTRAL TEXAS	RIO VISTA	417	33	450	29	4	33	483		483			0	483	Whitney	R	22	4	110			
CENTRAL TEXAS	COVINGTON	354	25	379	25		25	404		404			0	404	Whitney	R	23	5	111			
CENTRAL TEXAS	ITASCA	27	1	28	3		3	31		31			0	31	Whitney	R	23	6	112			
CENTRAL TEXAS	PARKER	29	1	30	5		5	35		35			0	35	Whitney	R	28	7	113			
CENTRAL TEXAS	GRANDVIEW	116	4	120	11		11	131		131			0	131	Whitney	R	33	8	114			
CENTRAL TEXAS	STRAWN	498	55	553	31		31	584		584			0	584	Strawn	R	0	1	115			
CENTRAL TEXAS	MINGUS	251	16	267	12		12	279		279			0	279	Strawn	R	5	2	116			
CENTRAL TEXAS	GORDON	542	18	560	14	5	19	579		579			0	579	Strawn	R	8	3	117			
CENTRAL TEXAS	PALO PINTO	9		9			0	9		9			0	9	Strawn	R	21	4	118			
CENTRAL TEXAS	SANTO	305	17	322	13	1	14	336		336			0	336	Strawn	R	26	5	119			
CENTRAL TEXAS	ERATH COUNTY	2		2			0	2		2			0	2	Strawn	D		6	120			
CENTRAL TEXAS	PALO PINTO LAKE	103		103	3		3	106		106			0	106	Strawn	R		7	121			
WEST TEXAS	FORT STOCKTON	5,123	542	5,665	139	30	169	5,834		5,834			0	5,834	Fort Stockton	S	0	1	122			241

Meter Barcode	WECO Owner	WECO Meter No	Date_Time	Step	Test Type	Element	Volt	Amp	Phase Angle	Upper Limit	Lower Limit	Std_mode	Servie Type	Optic Source	Revs	Notes	Freq	Pause	AF	AL
40201961	0	01961	12/11/2009 9:26	1	FL	S	240	30	0	100.25	99 7	W	SN	0	2	Passed	60	F	99.8694	99 8694
40201962	0	01962	12/11/2009 9:21	1	FL	S	240	30	0	100.25	99 7	W	SN	0	2	Passed	60	F	99.9213	99.9213
40201963	0	01963	12/11/2009 9:24	1	FL	S	240	30	0	100.25	99 7	W	SN	0	2	Passed	60	F	99.8677	99 8677
40201964	0	01964	12/11/2009 9:22	1	FL	S	240	30	0	100.25	99.7	W	SN	0	2	Passed	60	F	99.9146	99.9146
40201965	0	01965	12/11/2009 8:41	1	FL	S	240	30	0	100.25	99.7	W	SN	0	2	Passed	60	F	99.8816	99.8816
40201966	0	01966	12/11/2009 8:37	1	FL	S	240	30	0	100.25	99 7	W	SN	0	2	Passed	60	F	99 9018	99 9018
40201967	0	01967	12/11/2009 8:39	1	FL	S	240	30	0	100.25	99.7	W	SN	0	2	Passed	60	F	99.9458	99.9458
40201968	0	01968	12/11/2009 8:40	1	FL	S	240	30	0	100.25	99 7	W	SN	0	2	Passed	60	F	99.8829	99.8829
40201969	0	01969	12/11/2009 9:31	1	FL	S	240	30	0	100.25	99 7	W	SN	0	2	Passed	60	F	99.9021	99.9021
40201970	0	01970	12/11/2009 9:28	1	FL	S	240	30	0	100.25	99.7	W	SN	0	2	Passed	60	F	99.8383	99.8383
40201971	0	01971	12/11/2009 9:32	1	FL	S	240	30	0	100.25	99 7	W	SN	0	2	Passed	60	F	99 9088	99 9088
40201972	0	01972	12/11/2009 9:30	1	FL	S	240	30	0	100.25	99 7	W	SN	0	2	Passed	60	F	99.8991	99.8991
40201973	0	01973	12/11/2009 8:02	1	FL	S	240	30	0	100.25	99.7	W	SN	0	2	Passed	60	F	99.9705	99.9705
40201974	0	01974	12/11/2009 7:19	1	FL	S	240	30	0	100.25	99 7	W	SN	0	2	Passed	60	F	99.8535	99.8535
40201975	0	01975	12/11/2009 7:58	1	FL	S	240	30	0	100.25	99.7	W	SN	0	2	Passed	60	F	99.8966	99 8966
40201976	0	01976	12/11/2009 7:56	1	FL	S	240	30	0	100.25	99.7	W	SN	0	2	Passed	60	F	99 8592	99 8592
40201977	0	01977	12/11/2009 8:04	1	FL	S	240	30	0	100.25	99.7	W	SN	0	2	Passed	60	F	99 963	99 963
40201978	0	01978	12/11/2009 8:01	1	FL	S	240	30	0	100.25	99.7	W	SN	0	2	Passed	60	F	99 9248	99 9248
40201979	0	01979	12/11/2009 8:03	1	FL	S	240	30	0	100.25	99.7	W	SN	0	2	Passed	60	F	99 8555	99 8555
40201980	0	01980	12/11/2009 8:07	1	FL	S	240	30	0	100.25	99.7	W	SN	0	2	Passed	60	F	99 9221	99 9221
40201981	0	01981	12/11/2009 9:13	1	FL	S	240	30	0	100.25	99.7	W	SN	0	2	Passed	60	F	99.8707	99.8707
40201982	0	01982	12/11/2009 9:09	1	FL	S	240	30	0	100.25	99.7	W	SN	0	2	Passed	60	F	99.8944	99.8944
40201983	0	01983	12/11/2009 9:11	1	FL	S	240	30	0	100.25	99 7	W	SN	0	2	Passed	60	F	99.9008	99 9008
40201984	0	01984	12/11/2009 9:10	1	FL	S	240	30	0	100.25	99 7	W	SN	0	2	Passed	60	F	99.8689	99 8689
40201985	0	01985	12/11/2009 8:32	1	FL	S	240	30	0	100.25	99.7	W	SN	0	2	Passed	60	F	99 8609	99 8609
40201986	0	01986	12/11/2009 8:40	1	FL	S	240	30	0	100.25	99 7	W	SN	0	2	Passed	60	F	99 8816	99 8816
40201987	0	01987	12/11/2009 8:37	1	FL	S	240	30	0	100.25	99.7	W	SN	0	2	Passed	60	F	99 9071	99.9071
40201988	0	01988	12/11/2009 8:34	1	FL	S	240	30	0	100.25	99 7	W	SN	0	2	Passed	60	F	99.936	99.936
40201989	0	01989	12/11/2009 8:18	1	FL	S	240	30	0	100.25	99 7	W	SN	0	2	Passed	60	F	99 9363	99 9363
40201990	0	01990	12/11/2009 8:11	1	FL	S	240	30	0	100.25	99.7	W	SN	0	2	Passed	60	F	99 9633	99.9633
40201991	0	01991	12/11/2009 8:14	1	FL	S	240	30	0	100.25	99 7	W	SN	0	2	Passed	60	F	99 9043	99.9043
40201992	0	01992	12/11/2009 8:15	1	FL	S	240	30	0	100.25	99 7	W	SN	0	2	Passed	60	F	99.9256	99.9256
40201993	0	01993	12/11/2009 9:24	1	FL	S	240	30	0	100.25	99 7	W	SN	0	2	Passed	60	F	99.8979	99.8979
40201994	0	01994	12/11/2009 9:23	1	FL	S	240	30	0	100.25	99 7	W	SN	0	2	Passed	60	F	99.9423	99.9423
40201995	0	01995	12/11/2009 9:21	1	FL	S	240	30	0	100.25	99 7	W	SN	0	2	Passed	60	F	99.8345	99.8345
40201996	0	01996	12/11/2009 9:22	1	FL	S	240	30	0	100.25	99 7	W	SN	0	2	Passed	60	F	99.8794	99.8794
40201997	0	01997	12/11/2009 9:10	1	FL	S	240	30	0	100.25	99.7	W	SN	0	2	Passed	60	F	99.9216	99.9216
40201998	0	01998	12/11/2009 9:13	1	FL	S	240	30	0	100.25	99.7	W	SN	0	2	Passed	60	F	99.9218	99.9218
40201999	0	01999	12/11/2009 9:12	1	FL	S	240	30	0	100.25	99.7	W	SN	0	2	Passed	60	F	99.8881	99.8881
40202000	0	02000	12/11/2009 9:11	1	FL	S	240	30	0	100.25	99.7	W	SN	0	2	Passed	60	F	99.9071	99.9071
40202001	0	02001	12/11/2009 8:42	1	FL	S	240	30	0	100.25	99 7	W	SN	0	2	Passed	60	F	99.8694	99.8694
40202002	0	02002	12/11/2009 8:47	1	FL	S	240	30	0	100.25	99.7	W	SN	0	2	Passed	60	F	99.8475	99 8475
40202003	0	02003	12/11/2009 8:46	1	FL	S	240	30	0	100.25	99.7	W	SN	0	2	Passed	60	F	99.9253	99 9253
40202004	0	02004	12/11/2009 8:44	1	FL	S	240	30	0	100.25	99 7	W	SN	0	2	Passed	60	F	99 9116	99.9116
40202005	0	02005	12/11/2009 9:00	1	FL	S	240	30	0	100.25	99 7	W	SN	0	2	Passed	60	F	99 9056	99.9056
40202006	0	02006	12/11/2009 9:02	1	FL	S	240	30	0	100.25	99 7	W	SN	0	2	Passed	60	F	99 8674	99.8674
40202007	0	02007	12/11/2009 8:55	1	FL	S	240	30	0	100.25	99 7	W	SN	0	2	Passed	60	F	99 8694	99.8694
40202008	0	02008	12/11/2009 8:58	1	FL	S	240	30	0	100.25	99 7	W	SN	0	2	Passed	60	F	99.8946	99 8946
40202009	0	02009	12/11/2009 9:00	1	FL	S	240	30	0	100.25	99.7	W	SN	0	2	Passed	60	F	99.9313	99 9313
40202011	0	02011	12/11/2009 8:54	1	FL	S	240	30	0	100.25	99 7	W	SN	0	2	Passed	60	F	99 9208	99 9208
40202012	0	02012	12/11/2009 8:55	1	FL	S	240	30	0	100.25	99 7	W	SN	0	2	Passed	60	F	99 9915	99.9915
40202013	0	02013	12/11/2009 8:34	1	FL	S	240	30	0	100.25	99 7	W	SN	0	2	Passed	60	F	99 8786	99.8786
40202014	0	02014	12/11/2009 8:32	1	FL	S	240	30	0	100.25	99 7	W	SN	0	2	Passed	60	F	99 9693	99.9693
40202015	0	02015	12/11/2009 8:34	1	FL	S	240	30	0	100.25	99 7	W	SN	0	2	Passed	60	F	99.9221	99.9221
40202016	0	02016	12/11/2009 8:35	1	FL	S	240	30	0	100.25	99 7	W	SN	0	2	Passed	60	F	99.8757	99 8757
40202017	0	02017	12/11/2009 8:53	1	FL	S	240	30	0	100.25	99.7	W	SN	0	2	Passed	60	F	99.8599	99 8599
40202018	0	02018	12/11/2009 8:49	1	FL	S	240	30	0	100.25	99.7	W	SN	0	2	Passed	60	F	99.9425	99 9425
40202019	0	02019	12/11/2009 8:52	1	FL	S	240	30	0	100.25	99.7	W	SN	0	2	Passed	60	F	99 9006	99.9006
40202020	0	02020	12/11/2009 8:50	1	FL	S	240	30	0	100.25	99 7	W	SN	0	2	Passed	60	F	99 9048	99.9048
40202021	0	02021	12/11/2009 8:13	1	FL	S	240	30	0	100.25	99 7	W	SN	0	2	Passed	60	F	99 8482	99.8482
40202022	0	02022	12/11/2009 8:19	1	FL	S	240	30	0	100.25	99.7	W	SN	0	2	Passed	60	F	99 8378	99 8378

Meter Barcode	WECO Owner	WECO Meter No	Date_Time	Step	Test Type	Element	Volt	Amp	Phase Angle	Upper Limit	Lower Limit	Std_mode	Servie Type	Optic Source	Revs	Notes	Freq	Pause	AF	AL
40202023	0	02023	12/11/2009 8:17	1	FL	S	240	30	0	100.25	99 7	W	SN	0	2	Passed	60	F	99 9201	99 9201
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40202026	0	02026	12/11/2009 9:16	1	FL	S	240	30	0	100.25	99 7	W	SN	0	2	Passed	60	F	99 9068	99.9068
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40202031	0	02031	12/11/2009 8:09	1	FL	S	240	30	0	100.25	99 7	W	SN	0	2	Passed	60	F	99.9181	99 9181
40202032	0	02032	12/11/2009 8:08	1	FL	S	240	30	0	100.25	99 7	W	SN	0	2	Passed	60	F	99.962	99.962
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PUC DOCKET NO. _____

BEFORE THE PUBLIC UTILITY COMMISSION OF TEXAS

TEXAS-NEW MEXICO POWER COMPANY
REQUEST FOR APPROVAL
OF AN ADVANCE METERING SYSTEM (AMS)
DEPLOYMENT AND AMS SURCHARGE

PREPARED DIRECT TESTIMONY AND EXHIBITS
OF
KIMBERLY K. MORRIS

ON BEHALF OF
TEXAS-NEW MEXICO POWER COMPANY

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I. INTRODUCTION AND QUALIFICATIONS

Q. PLEASE STATE YOUR NAME, BUSINESS ADDRESS, AND PLACE OF EMPLOYMENT.

A. My name is Kimberly Morris, and I am employed by PNMR Services Company ("PNMR Services"), a wholly owned subsidiary of PNM Resources, Inc. ("PNM Resources"). My business address is 225 E. John Carpenter Freeway, Irving, Texas 75062. My current title is Director – Architecture, within the Business Technology Services (BTS) department.

Q. ON WHOSE BEHALF ARE YOU TESTIFYING?

A. I am testifying on behalf of Texas-New Mexico Power Company ("TNMP" or "Company").

Q. PLEASE DESCRIBE YOUR EDUCATIONAL BACKGROUND AND PROFESSIONAL EXPERIENCE.

A. Exhibit KKM-1 describes my background and experience.

Q. HAVE YOU PREVIOUSLY TESTIFIED BEFORE THE PUBLIC UTILITY COMMISSION OF TEXAS OR BEFORE ANY OTHER REGULATORY BODY?

A. No.

Q. PLEASE BRIEFLY DESCRIBE THE BTS DEPARTMENT AND ITS ROLE TO TNMP.

A. Business Technology Services (BTS), a department within PNMR Services, is responsible for developing, operating, and maintaining the information and communications systems and networks used by PNM Resources operating companies. The BTS function manages all hardware, software, and telecommunication resources that the business units use, as well as the applications that serve multiple business units. The BTS function also has the responsibility for overall policy and standards, technology architecture, information security, and strategic planning.

Q. WHAT ARE THE PRIMARY RESPONSIBILITIES OF YOUR CURRENT POSITION?

A. My primary responsibilities are to direct a team of individuals who have responsibilities which include a) strategy, definition, and enforcement of the software development and infrastructure standards and tools for PNMR; and b) information security policy and compliance. My organization includes a group of Enterprise Architects and certified

information security specialists who are responsible for the overall enterprise architecture and security decisions for PNMR.

Q. HAVE YOU PREPARED ANY EXHIBITS?

A. Yes. I am sponsoring Exhibits KKM-1 through KKM-2, which are attached to my testimony. Each of these exhibits was prepared by me or under my direction and control. The information contained in these exhibits is true and correct to the best of my knowledge and belief.

II. PURPOSE OF TESTIMONY

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY IN THIS PROCEEDING?

A. The purpose of my testimony will be to:

- provide the associated development and integration costs for TNMP back-office IT systems required to support wide-scale advanced meter system (AMS) deployment;
- provide the Operation & Maintenance savings that will occur through the implementation on new systems.

Q. PLEASE SUMMARIZE THE ESTIMATED COSTS THAT YOU HAVE PREPARED FOR THE MODIFICATIONS AND ENHANCEMENTS TO THE BACK-OFFICE SYSTEMS AND WEB PORTAL WHICH YOU SPONSOR.

A. Exhibit KKM-2 sets forth the estimated costs for the modifications and enhancements to the back-office systems and web portal that support TNMP's AMS deployment. Because TNMP is a part of a larger family of companies sharing several of the back-office systems, the Company typically receives the full benefit of enhancements to these shared systems while only paying an allocated share of the costs. The web portal, on the other hand, is an application that will be used only by TNMP, so 100 percent of its development costs are allocated to TNMP.

As shown on Exhibit KKM-2, and as described further in my testimony, I estimate that $10.8 million in IT capital costs will be incurred. I also estimate that $15.6 million of operations and maintenance (O&M) expense will be incurred in connection with the IT modifications and enhancements over the requested surcharge period; this amount includes yearly security audits. Exhibit KKM-2 lists the various back-office system and

web portal enhancements necessary to support TNMP's AMS deployment along with the resulting costs provided by me to Applicants' witness Michael Montgomery for inclusion in TNMP's surcharge models.

III. CAPITAL AND O&M COSTS

Q. WHAT NEW APPLICATIONS ARE BEING ADDED TO TNMP'S BACK-OFFICE SYSTEMS TO SUPPORT THE PROPOSED AMS?

A. As discussed in more detail by Mr. Kessler, the new back-office systems necessary to support TNMP's deployment of AMS will include an Advanced Metering Infrastructure (AMI) head-end system and a new Web Portal. The AMI head-end system is the centralized back-office software application that is used to communicate messages between the back-office systems and the advanced meters.

Q. WHAT MODIFICATIONS TO THE EXISTING BACK-OFFICE SYSTEMS ARE NECESSARY TO SUPPORT THE PROPOSED AMS?

A. As described in detail by Mr. Kessler, the following must occur to support the proposed AMS solution:

1. Purchase and install a new Meter Data Management System (MDMS).
2. Purchase and install a new Complex Billing System to support interval data billing.
3. Purchase and install new Outage Management System (OMS) to support reading, routing, and management of AMS Meter alarms.
4. Integration of new systems with TNMP's existing systems. This will require extensive work to allow the new systems to share data with, Banner (CIS), GIS, the Meter Head-End System (TMS), Texas Common Portal, Meter Inventory System, EDI Transaction management system and TIBCO Enterprise Data Transport.
5. Modifications to TNMP's EDI Gateway and Banner (Customer Information System) will be required so that these systems can handle messages and information required by new AMS market rules associated with EDI transactions to ERCOT.