Auction 903 Short-Form Application Operational Questions

Responses to these questions and any supporting documentation will be withheld from public disclosure.

Operational History (if applicable)

Westfield Gas & Electric (WG&E) History

Beginning in 1997 optical fiber were deployed by WG&E. Once complete in the late 1990's, the optical system was expanded to sever the City's reliance upon high-priced, low speed data circuits provided by the telephone company. The Department then constructed drops to all municipal facilities including the school system.

Over the next few years, the WG&E continued to find value in the installed fiber, through connecting all municipal and school facilities with high speed data networks. Operationally, the Department replaced its Supervisory Control and Data Acquisition (SCADA) communications that connected the Department's remote facilities, providing secure, real-time, high speed communications to key operational assets. Additionally, connecting municipal facilities allowed the City to realized savings through a centralized data center design, rather than previously distributed computing. At this time, WG&E provided installation, activation, and network support services to the City. During this time, another market began to present itself to the WG&E. Large commercial customers had a need to connect different facilities to each other within Westfield. WG&E leveraged its available fiber to provide both managed lite circuits to the Internet and private wide area networks, as well as dark fiber.

WG&E benefits from several strategic alliances by receiving very competitive pricing on services, allowing the company to offer competitive pricing on its services to customers.

WG&E began constructing and operating Whip City Fiber a residential fiber to the home network in 2015. After successfully researching, designing and constructing a pilot area. This generated very positive response and results WG&E has secured financing to extend Whip City Fiber building over 180 miles, to over 15,000 residential and commercial sites by the end of 2018. The subscriber base for combined gas and electric nears 30,000, and we are seeing significant growth in our Whip City Fiber customer base, all while competing against a large incumbent service provider.

See www.whipcityfiber.com for additional information.

Answer on a nationwide basis:

Has the applicant previously deployed consumer broadband networks (Yes/No)?

YES

If so, identify the date range for when broadband service was offered and in which state(s) service was offered. What specific last mile and interconnection (backhaul) technologies were used? Provide an estimate of how many subscribers are currently served. (If the applicant is no longer providing service in any state, estimate the number of customers that were served at the beginning

of the last full year that the applicant did provide service.) What services (e.g., voice, video, broadband Internet access) were provided?

Response-WE&E began servicing municipal and business customers in 1998, for both Internet and Private Networks, utilizing Active Ethernet service and Dark Fiber Services. In 2105 residential Whip City Fiber (WCF) branded one (1) Gbps symmetrical Internet service to the premise utilizing Gigabyte Passive Optical Network (GPON) technology.

Backhaul is achieved using a 10 Gbps ethernet ring to a data center in Springfield, MA, with two current multi-gigabyte Internet circuits, with carrier and physical path diversity. Additionally, a third multi-gigabyte carrier is connected to the network in Westfield, MA, adding additional diversity.

Currently there are approximately 140 business/municipal locations with varying services. WCF residential service is actively being built out in the city, there are approximately 1800 residential subscribers. As of January 2017, the business subscribers were approximately 125 and residential subscribers were approximately 200.

The services provided are Internet service and third party VOIP voice service.

Proposed Network(s) Using Funding from the Phase II Auction

Answer for each state the applicant selected in its application:

1. Which network architectures and technologies will be used in the applicant's proposed deployment?

   Response- GPON with Ethernet backhaul utilizing Nokia Optical Line Terminals 7360 FX series with Alcatel-Lucent Network Terminals at each subscriber premise.   How will voice services be provided? With third party VOIP service from Ooma. How will broadband Internet access service be provided? GPON network with fiber to the premise at symmetric one Gigabyte service level.

2. What are the relevant industry standards, if any, for the last-mile technologies in the applicant's proposed deployment?

   Response- Industry standard GPON network utilizing Nokia Optical Line Terminal and Optical Network Terminal at the premise.

   If the applicant is proposing to use non-standard technologies, the applicant should identify which vendor(s) and product(s) are being considered, and provide links to the vendors' websites and to publicly available technical specifications of the product(s). (If technical specifications for the non-standard technologies are not available on a vendor's website, they may be submitted with this application.) Regardless of whether the applicant proposes to use standard or non-standard technologies – what capabilities of this technology and proposed network will enable performance tier (speed and usage allowance), latency and (where applicable) voice service mean opinion score (MOS) requirements to be met?

   Response-WCF service speed is symmetric One Gigabyte Internet service, with an expected latency of <100 mms, with no current usage allowance.

3. Can the applicant demonstrate that the technology and the engineering design will fully support the proposed performance tier, latency and voice service requirements for the requisite number of locations during peak periods (Yes/No)?

   Yes

   What assumptions about subscription rate and peak period data usage is the applicant making in this assertion?

   WG+E uses Netflow and other diagnostic tools to evaluate peak traffic loads, always adding backhaul and transport capacity in anticipation of growing bandwidth demands. In our current residential base peak usage is less than 4 Mbps per subscriber multiplied by subscriber base. Describe concisely the information that can be made available to support this assertion.

   Response- Historic Netflow data and end user speed test data measured with each new subscriber installation.

4. Can the applicant demonstrate that all the network buildout requirements to achieve all service milestones can be met (Yes/No)?

   Yes

   The applicant will be required to submit a detailed project plan in the long-form application if it is named as a winning bidder. Describe concisely the information that the applicant would make available in such a detailed project plan.

   Response- WG+E would utilize Smartsheet project software to with project timelines and goals.

5. For the proposed performance tier and latency combination, can the applicant demonstrate that potential vendors, integrators and other partners are able to provide commercially available and fully compatible network equipment/systems, interconnection, last mile technology and customer premise equipment (CPE) at cost consistent with applicant's buildout budget and in time to meet service milestones (Yes/No)? Yes

   Describe concisely the information and sources of such information that the applicant could make available to support this response.

   Response- WG+E is currently deploying identical networks, tracking progress with Smartsheet project software and additionally has detailed budget forecast.

6. Can the applicant describe how the network will be maintained and services provisioned (Yes/No)? Yes Can the applicant demonstrate that it can provide internally developed operations systems for provisioning and maintaining the proposed network including equipment and segments, interconnections, CPE and customer services at cost consistent with applicant's buildout budget and in time to meet service milestones (Yes/No)?

   Yes

   If not, can the applicant demonstrate that potential vendors, integrators, and other partners are able to provide commercially available and fully compatible operations systems and tools for provisioning and maintaining the proposed network at cost consistent with applicant's buildout budget and in time to meet service milestones (Yes/No)?

   Describe concisely the information and sources of such information that the applicant could make available to support these responses.

Response- WG+E can provide operations and supporting tasks, primarily with current internal customer service, field service, network construction, and engineering staff. Additionally, third party contractors are retained for network restoration events such as accidents or weather related damage. Organizational charts and contractor agreements

7. If the applicant is using satellite technologies, describe concisely the total satellite capacity available and possible methods the applicant will utilize to assign bandwidth and capacity for each spot beam.

Auction 903 Spectrum Chart

Spectrum Band/Service	Paired Licensed		Unpaired Licensed	Unlicensed
	Uplink Freq. (MHz)	Downlink Freq. (MHz)	Uplink & Downlink Freq. (MHz)	Unlicensed (MHz)
600 MHz	663-698	617-652		
Lower 700 MHz	698-716	728-746	716-728 (Downlink only)	
Upper 700 MHz	776-787	746-757		
800 MHz SMR	813.5/817-824	858.5/862-869		
Cellular	824-849	869-894		
Broadband PCS	1850-1915	1930-1995		
AWS-1	1710-1755	2110-2155		
AWS (H Block)	1915-1920	1995-2000		
AWS-3	1755-1780	2155-2180	1695-1710 (Uplink only)	
AWS-4			2000-2020 2180-2200 (Downlink only)	
BRS/EBS			2496-2690	
WCS	2305-2315	2350-2360	2315-2320 2345-2350	
CBRS (3.5 GHz)			3550-3700	
UMFUS (terrestrial)			27,500-28,350 38,600-40,000	
70-80-90 GHz unpaired & 70-80 GHz paired (point–to–point terrestrial)	Point-to-Point Pairs for 70-80 GHz 71,000-76,000 with 81,000-86,000		71,000-76,000 81,000-86,000 92,000-95,000	
TV White Spaces				54-72 76-88 174-216 470-698
900 MHz				902-928
2.4 GHz				2400-2483.5
5 GHz				5150-5250 5250-5350 5470-5725 5725-5850
24 GHz				24,000-24,250
57-71 GHz				57,000 – 71,000
Ku Band (satellite)	12,750-13,250 14,000-14,500	10,700-12,700		
Ka Band (satellite)	27,500-30,000	17,700-20,200		
V Band (satellite)	47,200-50,200 50,400-52,400	37,500-42,000		

Abbreviations

AWS	Advanced Wireless Services
BRS/EBS	Broadband Radio Service / Education Broadband Service
CBRS	Citizens Broadband Radio Service
PCS	Personal Communications Service
SMR	Specialized Mobile Radio
UMFUS	Upper Microwave Flexible Use Service
WCS	Wireless Communications Service

APPENDIX C

Commenter Short Names

Short Name	Name of Filer
ACA	American Cable Association
ADTRAN	ADTRAN, Inc.
AT&T	AT&T Services, Inc.
GeoLinks	California Internet, L.P. DBA GeoLinks
Hughes	Hughes Network Systems, LLC
IEC	Illinois Electric Cooperative
ILSR	The Institute for Local Self-Reliance
ILSR et al.	The Institute for Local Self-Reliance
	Public Knowledge
	Appalshop
	Center for Rural Strategies
	Access Humboldt
	National Digital Inclusion Alliance,
	Virginia Rural Health Association
	Tribal Digital Village
	Broadband Alliance of Mendocino County, California
	Center for Rural Policy
	Access Sonoma Broadband
	The Utility Reform Network
ITTA	ITTA – The Voice of America's Broadband Providers
Microsoft	Microsoft Corporation
Rural Coalition	Association of Missouri Electric Cooperatives
	Midwest Energy Cooperative
	Great Lakes Energy
	HomeWorks Tri-County Electric Cooperative
	Indiana Electric Cooperatives
	Alger Delta Cooperative Electric Association
	Arkansas Electric Cooperatives, Inc.
	National Rural Electric Cooperative Association
	NTCA—The Rural Broadband Association
	Utilities Technology Council
RWA	Rural Wireless Association, Inc.
SpaceX	Space Exploration Technologies Corp.
Sacred Wind	Sacred Wind Communications, Inc.
US Cellular	United States Cellular Corporation
USTelecom	USTelecom Association
WISPA	Wireless Internet Service Providers Association