Fiber to the Community

Ad-Hoc Committee Presentation to City Council

November 13, 2018

Agenda

1. Introductions

2. Goals and Objectives of the Committee

3. Uptown Survey

4. Pros and cons of a government run fiber network
   - Success Story (Fairlawn, Dublin)
   - Failure Story (Medina County)
   - Marketing / Education

5. Technical Review
   - Network Design
   - Benefits of Fiber Networks
   - Security
   - Disrupters
   - Smart City and Smart Homes

6. Financial Models

7. Recommendations

Committee Members:

Bob Bellin
Patrick Bright
Scott Honnold
Harun Rashid
Jim Sredinski

Prior Report:

1) What we learned

2) What we didn't

3) What we still need to know

Uptown Results

Much of the survey was accurate and valuable, but some key items were leading, biased or both.

Valid Results:

1) *Internet Penetration (virtually everyone)*

2) *Vendor Breakdown*

3) *Vendor Satisfaction*

4) *Areas that need improvement*

5) *% of Hudson that would switch to city supplied Internet if available*

Areas Where Additional Info Could Be Helpful
Key Items:

1) *Rank Ordering and Scaling of All Viable Options*

2) *Subscription Rates at different price points*

3) *Price Point and funding option questions use actual numbers, not formulas: "The cost would be $60/month", not "the cost would be $8 per $100,000 of the appraised value of your home"*

4) *As a baseline to be validated (or not) via a consumer test: Most consumer product roll outs begin with research to gauge interest, followed by test rollouts to confirm survey findings/uncover unforeseen challenges, followed by full scale execution if the test phase confirms the potential in initial research. The committee recommends that if council decides to pursue FTTH, that it adopt this approach.*

RFP for Follow Up Survey

Circulated by Jody Roberts per subcommittee developed specs:

1) *Negotiated timeline, methodology and cost with responding vendors*

2) *Several were similar in methodology and acceptable*

3) *Of these, Baldwin Wallace was offered the lowest price and fastest turnaround*

4) *We recommend they be engaged if council decides to proceed with another survey*

Conclusion

The committee feels strongly that a follow up survey would be very helpful toward:

1) *Assessing Hudson's true appetite for different financing options for FTTH*

2) *Assessing Hudson's true appetite for city run FTTH at different price points*

3) *Assessing how critical Hudson residents feel FTTH/smart grid are to the city's future and vitality*

4) *Council should decide quickly – even the renegotiated fastest timeline requires this be done quickly*

The Committee recommends that if council decides to initiate a follow up survey, they draw on the expertise of the fiber committee to help ensure that questions are not leading or biased and to assist in managing the process.

Pros and Cons of a Government Run Fiber Network

Pros

- Better Internet for the Residents
- Builds infrastructure for the next generation city, business, resident, student
- Provides the road to become a smarter city
- Allows residents to have a better work from home experience
- Provides another big advantage in gaining prospective residents
- Allows schools to do more outside of the classroom
- Drives the “Internet Of Things” and Delivers “Connectiveness”
- Allows the city to achieve savings and safety through smart devices

Cons

- Mitigated Financial, Operational, and Adoption Risk
- City responsible for the service, like HPP
- IT Staffing (24/7) to support the program
- Technology refresh every 4~5 years
- Competition with major players entering small city market (i.e. Verizon)

Government Run Fiber Network - Success Story

Fairlawn, Ohio

- Partnered with Fujitsu to design and manage project
- Construction began in 2016, services began in 2017
- 7,500 potential customers, 47% take rate (May 2018)
- All work is done in house, 45 support calls a month
- Staffing: 1 Dept. Manager, 2 office staff, 2-3 Tech staff, 4 Field Techs, splicing done by contractor
- 24 hour SLA for residential, 4 hours for business
- Provides a Wireless Backup Link
- Direct Link to AWS (Amazon Web Services)

Government Run Fiber Network – Success Story

Dublin, Ohio (Dublink)

- 100 Gig fiber network stretching 125 miles servicing SMB markets
- Does not serve residential at this time
- Connects to 13 ISP Carriers, being carrier neutral
- Provides access to OARnet, National Science Foundation (NSF), Central Ohio Research Network (CORN), and others
- Partnered with Ohio State on several environmental research projects
- Frequently asked to be keynote speakers at municipal fiber conferences

Also: Chattanooga, TN & Longmont, CO

Government Run Fiber Network - Unsuccessful

Medina County Fiber Network

- 151 Mile Network Completed in 2013
- Connects Brunswick, Medina, Wadsworth, Seville, and Westfield Center
- 150 customers as of May 2018, 8 of 10 largest employers in the county.
- $14.4M Funded through 20 Year Revenue Development Bonds
- Contracted with One Community
  - Medina County sued One Community for breach and misconduct

Source: http://www.thepostnewspapers.com/medina_county_news/county-s-fiber-optic-network-growing/article_21aa02c4-3f13-57f8-8edc-2afc771ae6ec.html

Marketing / Education

One common variable to all successful municipal FTTH initiatives was an extensive and effective marketing campaign. The media used was market specific–everything from full TV/Radio/Social Media campaigns to door flyers to signs at the community trash dump. This marketing should include education as well as information about what is being offered at what price(s).

The committee strongly recommends that any FTTH plans include a budget for an effective education and marketing effort to the community.

Education should focus on the future of Internet of things (IOT) for smart city and smart home.

Technical Review

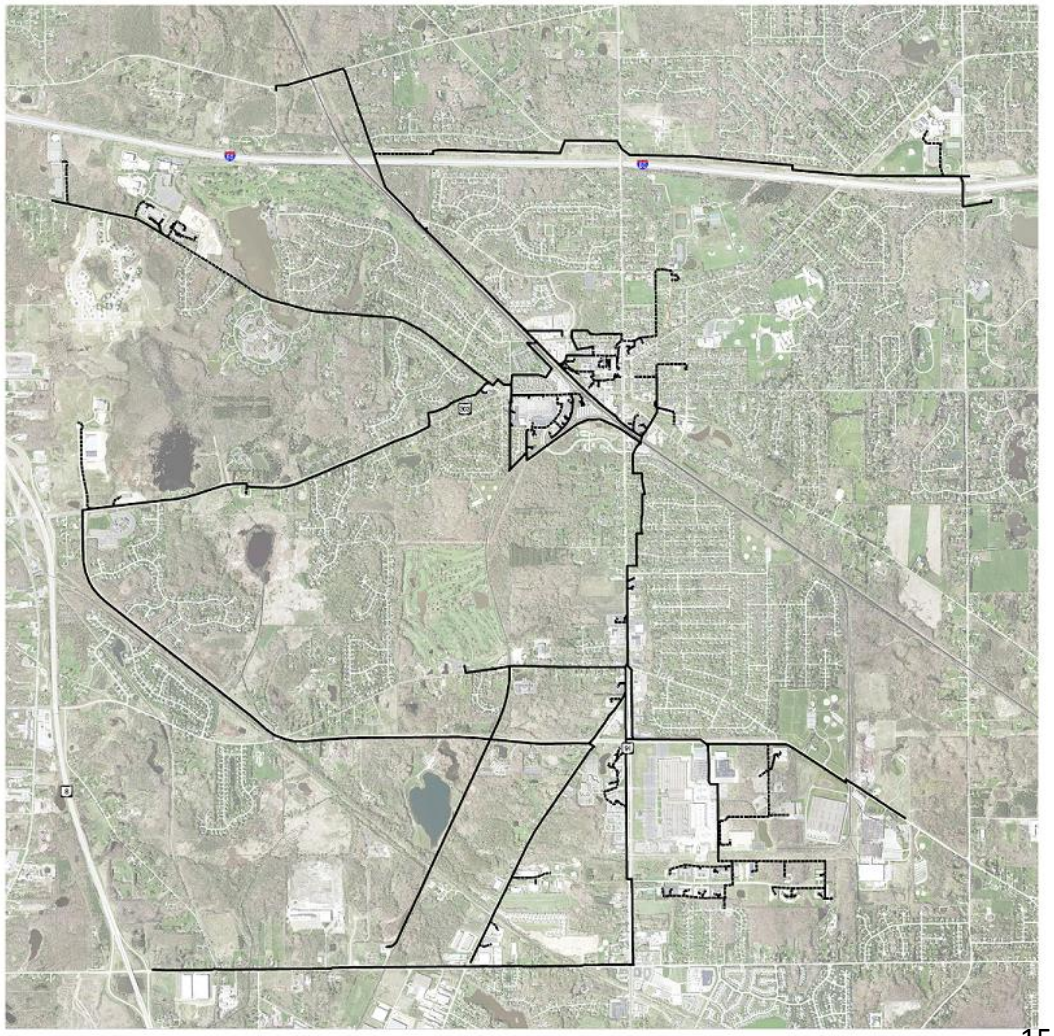
Technical Review – Network Design

Existing Velocity Network

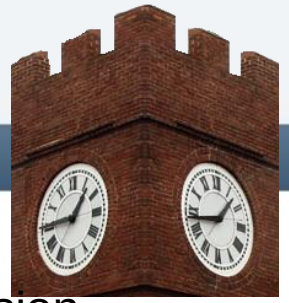
32 Mi of Overhead Lines
13 Mi of Underground
12 Miles of Drops

203 customers
32% Take Rate

Dedicated to VBB
1 FTE Broadband Manager
1 FTE Customer Service/Sales
0.5 FTE Scheduling/Marketing



Benefits of Fiber Optic Networks



- Extremely High Bandwidth: No other cable-based data transmission medium offers the bandwidth that fiber does. The volume of data that fiber optic cables transmit per unit time is far great than copper cables.

- Speed and attenuation: in fiber optic transmission, optical cables are capable of providing low power loss, which enables signals to be transmitted at a longer distance than copper cables.

- Less of the shared bandwidth impact

DOWNLOADS	SIZE	15Mb	25Mb	50Mb	100Mb	1Gb
4-minute Song	4MB	2 seconds	1 second	0.6 seconds	0.3 seconds	0 seconds
5-minute Video	30MB	15 seconds	9 seconds	5 seconds	2 seconds	0.2 seconds
45-minute TV Show	200MB	1.7 minutes	1 minute	31 seconds	15 seconds	1.5 seconds
2-hour Movie	1GB	8.5 minutes	5 minutes	2.5 minutes	1 minute	8 seconds

*Download speeds based on

- Reliability, Durability, Security, and Eco Friendly

Security

- *Cyber security* : Fiber-optic internet is touted as a cost effective way of instantly increasing Internet security. Putting a tap on a fiber-optic internet cable to intercept data transmissions is incredibly difficult. It's also easy to quickly identify compromised cables, which visibly emit light from transmissions.

- *Resistance to Electromagnetic Interference:* In practical cable deployment, it's inevitable to meet environments like power substations, heating, ventilating and other industrial sources of interference. However, fiber has a very low rate of bit error, as a result of fiber being so resistant to electromagnetic interference. Fiber optic transmission is virtually noise free.

- *Low Security Risk:* Data or signals are transmitted via light in fiber optic transmission. Therefore there is no way to detect the data being transmitted by "listening in" to the electromagnetic energy "leaking" through the cable, which ensures the absolute security of information.

Security Concerns

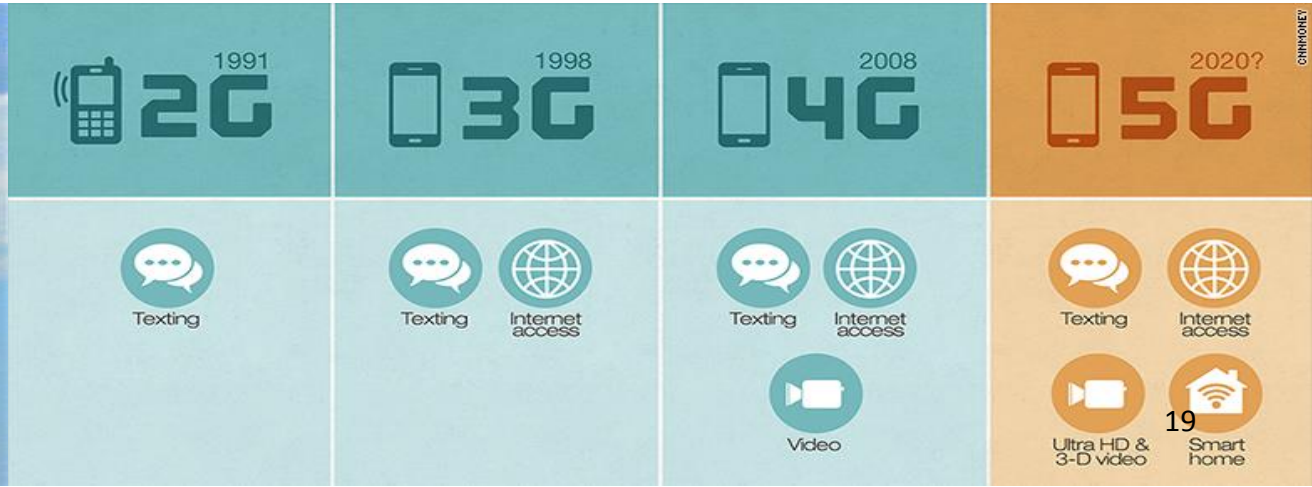
Considerations Regarding Security / Policy

- Velocity needs to have a good private policy in place to ensure customers it is not collecting or sharing personal information.
- Net neutrality is a longtime principle that says all internet traffic must be treated equally. The repeal eliminates certain federal consumer protections and gives internet service providers a free hand to slow or block websites and apps as they see fit or charge more for faster speeds.
- Ensure data transmitted is secure by adhering to solid encryption policies and adopting a Distributed Denial of Service (DDOS) solution to protect user data.

Disrupters - Home Internet Service Providers

5G and Wireless Internet

- 2018 - Initial 5G rollout to select cities
- 2019 – Initial handsets being deployed
- 2019-2024 - Major markets are being targeted
- Equipment is expensive and not readily available due to lack of 5G standards
- **Both need FIBER to access the internet**



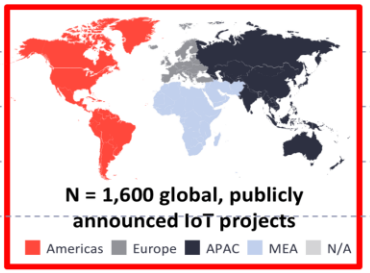
Global Trend

IOT ANALYTICS

2018

Insights that empower you to understand IoT markets

	IoT Segment	Global share of IoT projects[1]	Americas	Europe	APAC	Trend[2]
1	Smart City	23%	34%	45%	18%	↗
2	Connected Industry	17%	45%	31%	20%	↘
3	Connected Building	12%	53%	33%	13%	↑
4	Connected Car	11%	54%	30%	12%	→
5	Smart Energy	10%	42%	35%	19%	→
6	Other	8%	50%	34%	11%	→
7	Connected Health	6%	55%	29%	15%	→
8	Smart Supply Chain	5%	49%	36%	12%	↗
9	Smart Agriculture	4%	39%	26%	31%	→
10	Smart Retail	4%	53%	35%	9%	→

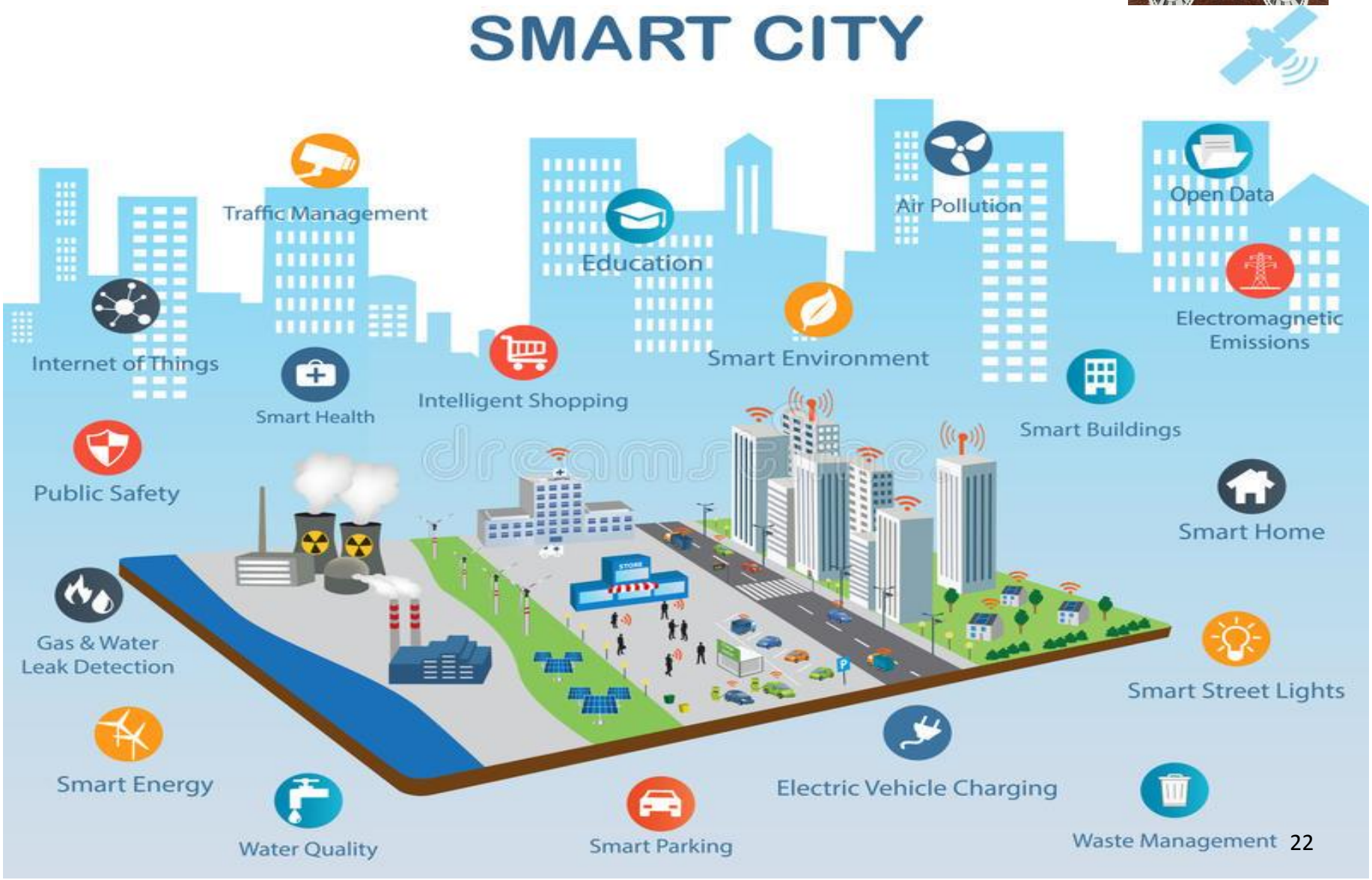


1.Based on 1,600 publicly known enterprise IoT projects (Not including consumer IoT projects e.g., Wearables, Smart Home). 2.Trend based on comparison with % of projects in the 2016 IoT Analytics Enterprise IoT Projects List. A downward arrow means the relative share of all projects has declined, not the overall number of projects 3. Not including Consumer Smart Home Solutions. **Source**: IoT Analytics 2018 Global overview of 1,600 enterprise IoT use cases (Jan 2018)

Source: IoT Analytics, Jan 2018

Smart Home of the Future – It's coming, whether you like it or not.

City of the Future



Financial Overview

Financial Overview

I. Fiber Telecom industry dynamics

II. Current proposal assessment

III. Alternative funding and models

Fiber-based Telecom Industry Economics

Industry Characteristics:

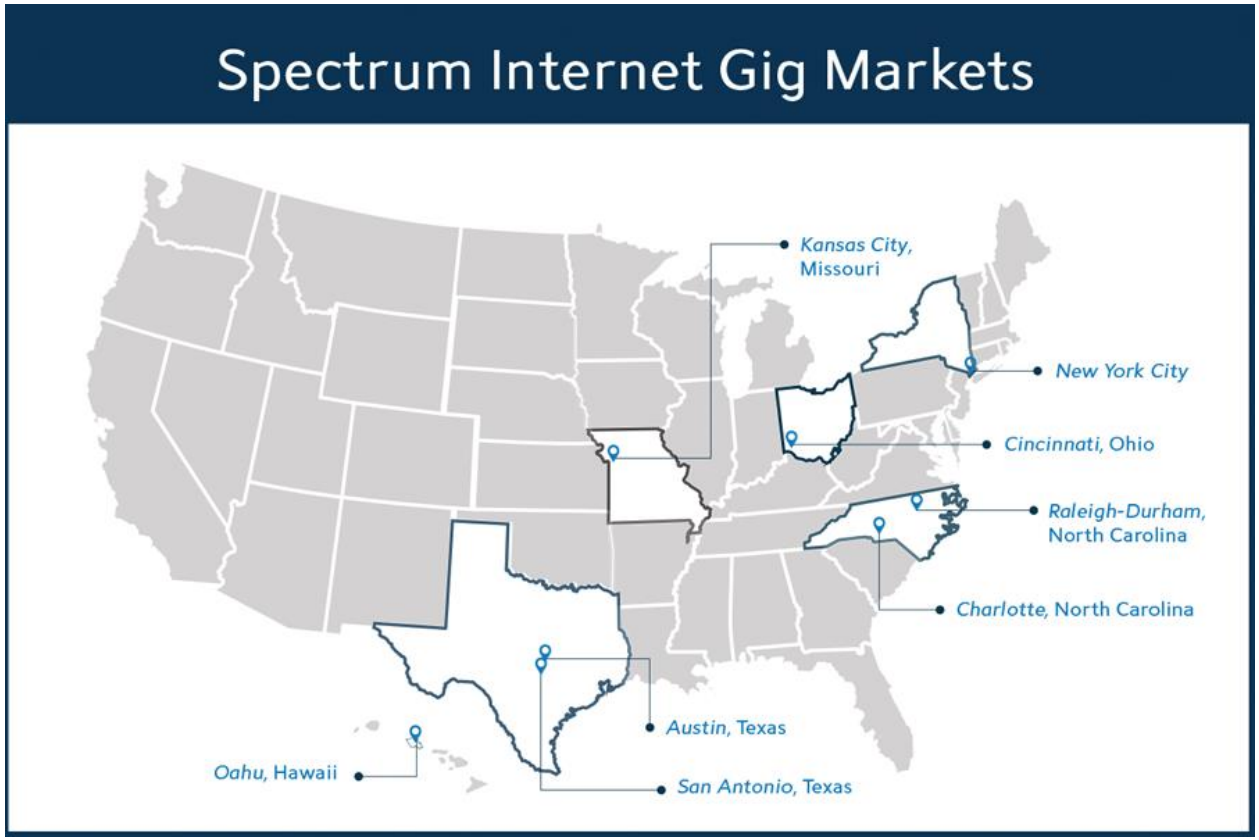
- Requires significant upfront investment
- Returns earned via large number of comparatively small revenue streams
- Payback occurs over long period of time
- Need access to funding until returns adequate

Implications:

- Most attractive markets are large and densely populated
- Reluctance to invest in rural and some suburban areas due to higher cost and fewer customers
- Reluctant to invest due to cost of exiting existing technology

Where are major players investing in Fiber?

(Spectrum Example)



Note: most of noted markets only have fiber backbone with coaxial cable to the home

Source: https://newsroom.charter.com/news-views/spectrum-internet-gig-available-millions-homes-eight-markets/

Incumbents only invest in large and dense markets

Size and Density Matter

	Hudson, OH	Charlotte, NC
Population	22,448	731,424
Households	7,700	319,918
Density-ppl./sq. mi.	870	2,400
Private Fiber Providers	0	3

Profit potential of large, densely populated market are attractive for investment, not so for small, less dense markets

Overview – Current Proposal

- Make fiber available to all Hudson residents
- Enable “smart city” technology
- Complete over ~2.5 years
- Total cost of project ~ $21 million (includes current business investment and contingency)
- Funding provided by general obligation bond backed by property levy
- Requires additional temporary funding source during ramp up period
- Monthly internet fee of $30 per month

Overview – Current Proposal

Review of detailed business case:

- ❑ Revenue based on 7,700 households with take rate ramping up to 52% based on Uptown survey
- ❑ Operating costs based on current experience, extrapolated for larger business
- ❑ Capital investment based on current experience, extrapolated for larger business
- ❑ Later years assume flattening revenue and 2% inflation on expenses

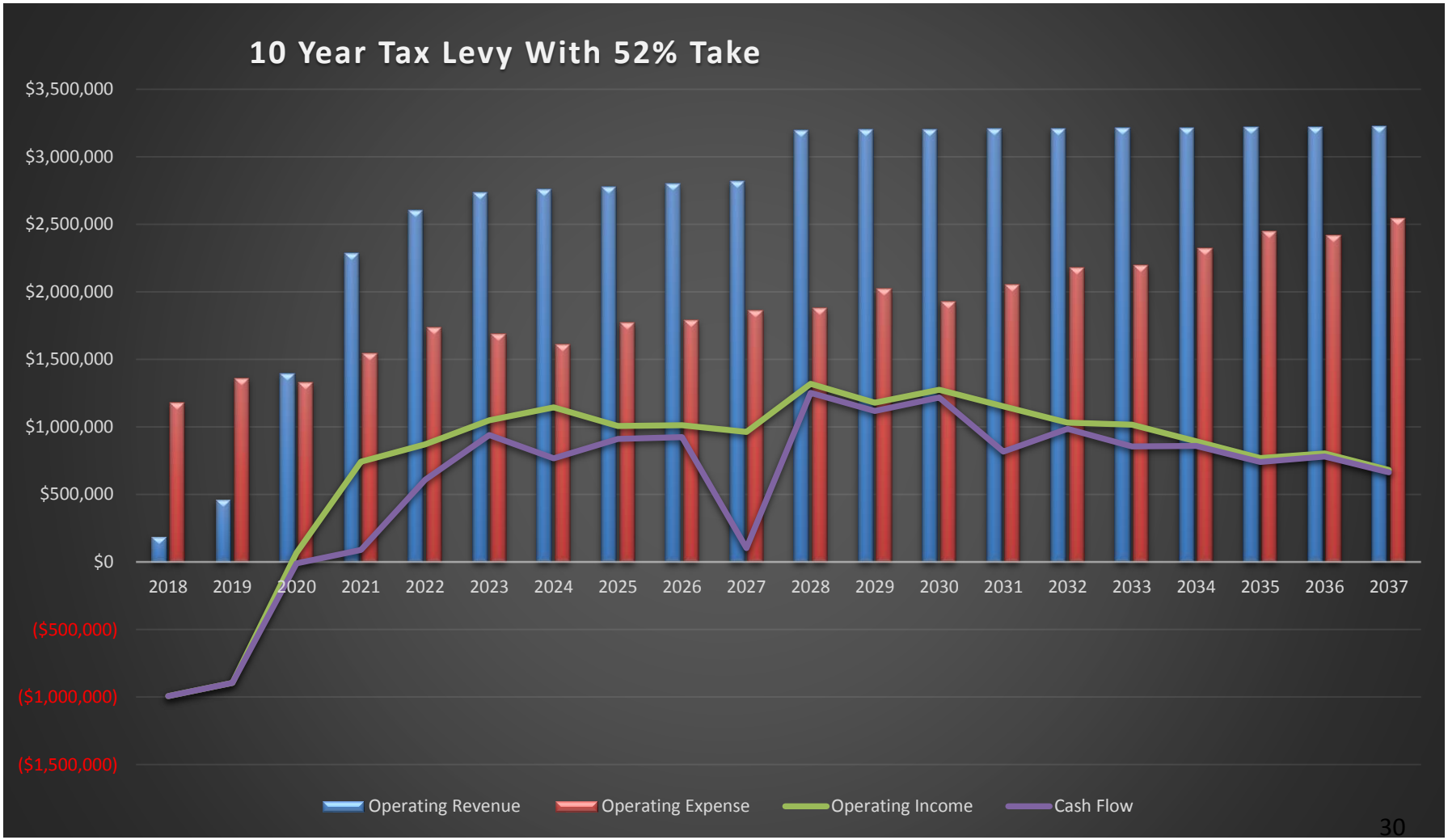
Observations:

- ❑ Need new independent survey to validate take rate
- ❑ Recommend more budgeted for Velocity leadership
- ❑ Recommend more budgeted for marketing/public relations
- ❑ Need documented marketing plan
- ❑ Revenue and expense assumption in latter years conservative

Not material to overall business case

Business case assumptions reasonable; key take rate assumption needs further validation via survey

Overview – Current Proposal



Total Cost to Residents (example)

- Total monthly cost includes internet fee and cost of levy
- Cost of levy based on average assessed value in Hudson
- Levy calculated monthly; actually paid annually
  - Avg. Appraised value of $324,600 x .35 x .0027 12= $26

	Monthly Cost
Internet Fee	$30
Levy	$26
Total Cost	$56

*Total cost for 1G symmetrical service less than total cost of current provider for 100 mbps down/10 mbps up service**

*Spectrum pricing for unbundled undiscounted service of $65 per month.

Assessment – proposed funding

	Pros	Cons
General Obligation bond funded by levy	+Lowest risk +Low cost +Take rate break even 25%	-Requires a levy -Flexibility may be limited

Note: The term "risk" used herein means risk of adverse results of Velocity causing City or taxpayers to have to put more money into Velocity to keep it going.

Very low risk given levy funded bond and significant take rate cushion

Alternate Models - Assessment

Alternative	Pros	Cons
Go slow/Self funding	+No Levy needed +No bond issued*	-Upfront funding by City general fund -Risk of completing "smart city" -Take 20+ years -Higher total investment cost
Ammon, Id Model - Using investment districts and attaching cost to property of those opting for service	+No bond issued +No Levy needed +Only those opting for service pay cost	-Upfront costs funded by City GF -Long time to completion -Risk of never completing project -Higher total investment cost
Modified Ammon – Designate Hudson as investment district, once take rate known, issue GO bond to fund and attach cost to properties of those opting in	+No Levy needed +Only those opting inpay cost +Funding sufficient to complete project +Low risk	-Cost/effort of upfront education -Need systems/operational capability to handle complexities Further legal assessment underway to determine compliance with Ohio Law
General Obligation bond funded with income from Velocity	+low cost +flexible +No levy needed	-Higher Risk
Industrial Revenue Bond	+No levy needed	-Higher Risk -Higher Cost -Restrictive terms

Modified Ammon approach attractive, needs full legal, operational, and financial review

Committee Recommendation

- Educate the community on the benefits of FTTH, smart city and smart home
- Conduct secondary survey
- Develop relationships with carriers to build out network
- Develop financing plan
- Create Pilot Opportunities

Pilot Opportunities

- Hudson can support 5G by both accommodating and controlling the small cell and node build out by constructing central 5G hub points and fiber presence
- Lessens the amount of construction to roads and right of ways
- Provides broadband revenue
- Meet with the carriers to discuss 5G layout and secure service contracts with carriers
- Pilot advantage
  - Low cost way to gauge interest and success
  - Allows Velocity to work out deployment issues
  - Mitigates risk by being a finite project
  - Scalable if successful

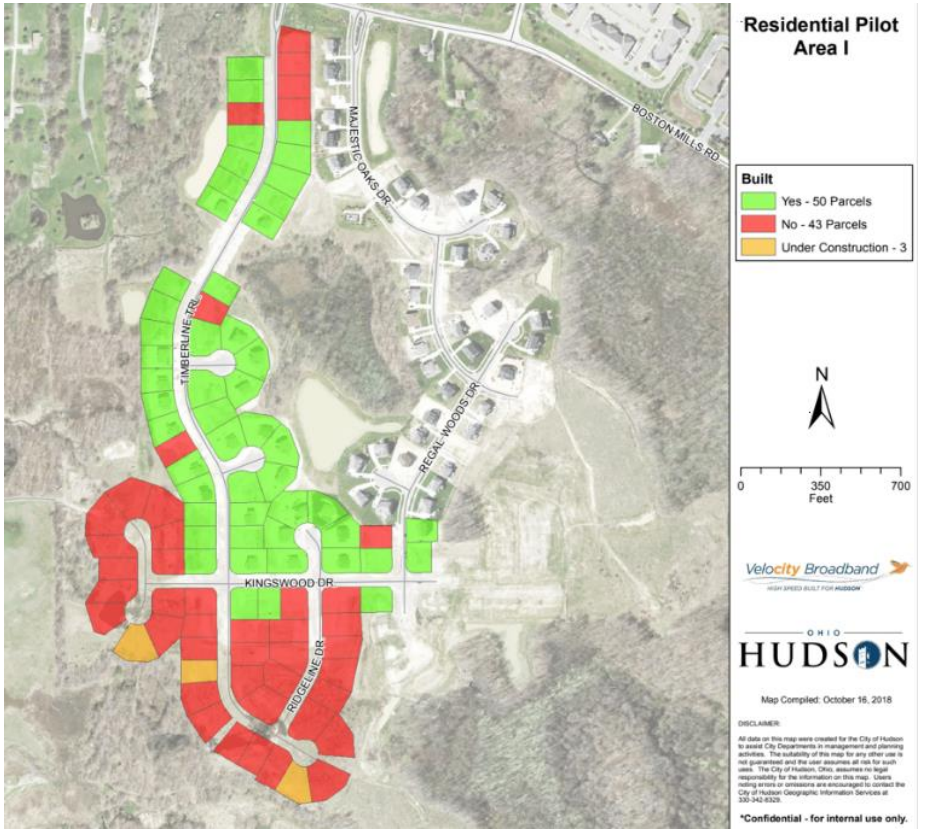
Pilot Opportunities

237 Homes
Age Demographics (currently available for Colony Park area only)

- 22.3% age 18-30
- 18% age 30-40
- 18% age 50-60
- 23.7% age 60-88

Rollout schedule average 4 – 5 months

Timeline based on material lead times and weather



Thank you