Electric Metering Approach Business Case Analysis

Citizen Advisory Board Meeting

Presented by:
Gordon Wilson
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FCS GROUP
Solutions-Oriented Consulting

Purpose and Sequence of Topics

- **Purpose of presentation**
  - Share findings from research and analysis into electric metering approach
- **Sequence of Topics**
  - Options Considered
  - Criteria
  - Economic Analysis
  - Non-Economic Analysis
  - Summary and Recommendation

- **Vocabulary**
  - **AMR** – Automated Meter Reading – allows one-way radio transmission
  - **AMI** – Advanced Metering Infrastructure – allows two-way radio transmission
  - **Collectors** – equipment that gathers data from a group of meters
  - **Backhaul** – Process of sending information from collectors to District office
  - **Net Present Value (NPV)** – up-front equivalent value of a future stream of payments, using an assumed discount rate
  - **Net Revenue** – Additional revenue minus the cost of a given option
  - **Change in Net Revenue** – Difference between net revenue of an option and the status quo

Updated Options and Criteria

Options

- **Status Quo – Old L&G meters being gradually replaced with drive-by AMR meters**
  - » Used for frame of reference, but not preferred option
  - » Goal is to help the District choose an intentional approach to metering, using best available information
- **Meter Replacement Options**
  - » Digital Hand-Read Meters
  - » Mechanical Hand-Read Meters
  - » Drive-by AMR Meters
  - » Hybrid AMR/AMI Meters
    - – AMR meters with one TUNet device per 8 meters; TUNet devices can be collectors or AMI meters
  - » AMI Meters

Criteria

Economic analysis:

- **Net Present Value**
  - » Change in net revenue from status quo

Non-economic analysis:

- **Potential Radio Frequency (RF) Health Impacts**
- **Privacy**
- **Vulnerability to Hacking**
- **Reliability/Accuracy**
- **Compatibility**
- **Functionality**
- **Allows Time of Use (TOU) Metering**

Economic Analysis – Introduction to Cost Model

- **Cost Model**
  - » Assumptions
  - » Financial Calculations – capital costs, operating costs and revenue by year
    - – Spread over 25-year forecast, to account for full replacement cycle
  - » Summary of Results
  - » Supporting tabs
    - – Meter Capital $
    - – Meter Accuracy
    - – Other Capital $
    - – Number of Meters
    - – Vehicle Calculations
    - – Revenue Calculations

Economic Analysis – Assumptions

- **Overall Economic Assumptions**
  - Inflation factors
  - Sales tax rates
  - Discount rate for Net Present Value
- **Current Meters**
  - Meter inventory
  - Number of L&G meters replaced each year
- **Cost of meters**
  - Used AMR drive-by
  - New digital walk-up
  - Refurbished mechanical walk-up
  - New AMR
  - New AMI
- **Collectors**
  - Cost per collector
  - Number of collectors needed
  - Cost of batteries for collectors
  - Frequency of battery replacement
- **Installation costs**
    - Time to install new meter (by PUD employees)
    - Loaded hourly rate
    - Time to install collectors
    - Cellular backhaul cost per collector (10-year lease)
    - Project management/other up-front cost
  - Software and equipment cost
  - Shipping and taxes

Economic Analysis – More Assumptions

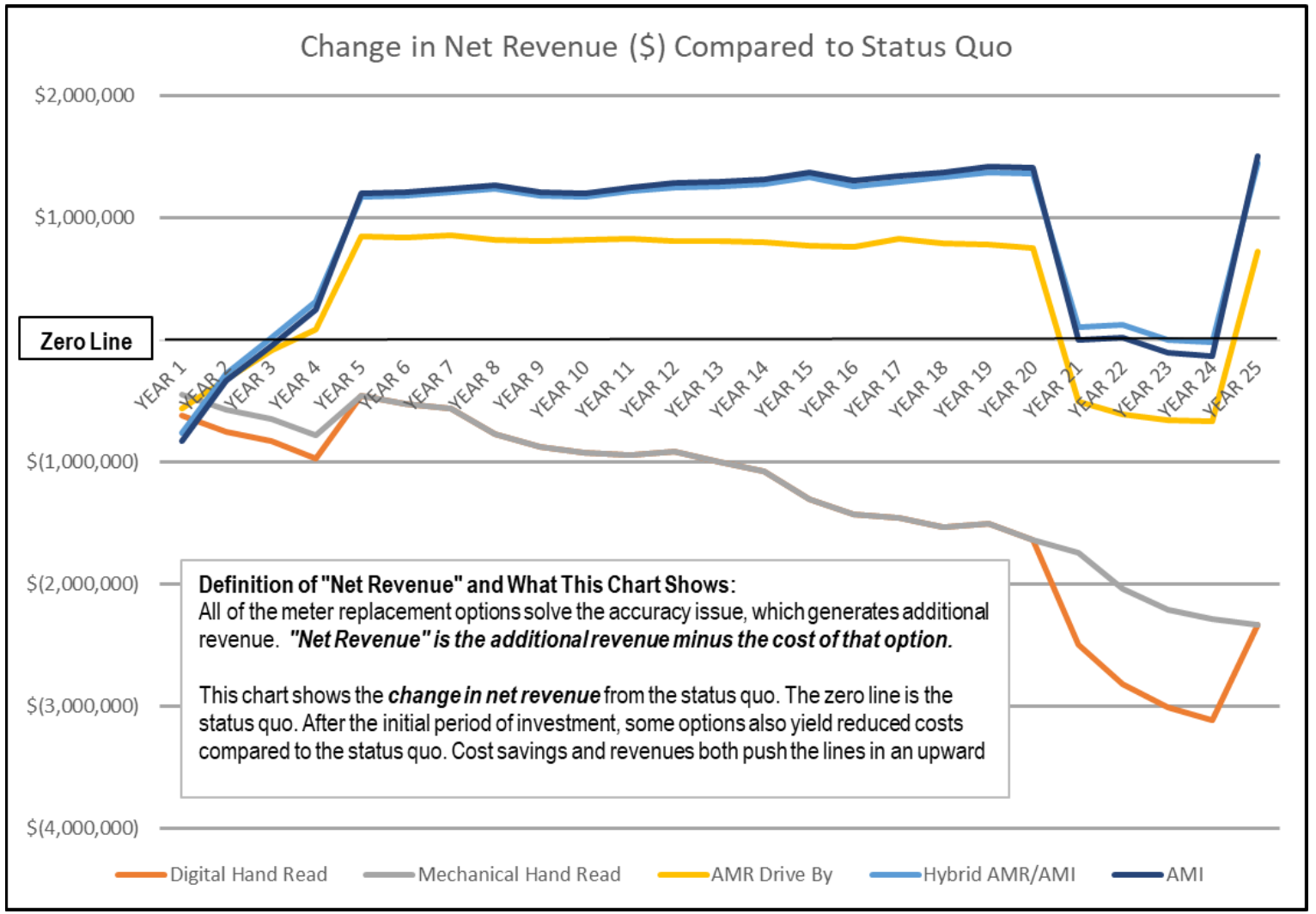
- **Ongoing Costs – Equipment & Software**
  - System/software support
  - Annual maintenance of collector units
- **Ongoing Costs – Labor and Vehicles**
  - Meter reading costs
  - Time required per drive-by read
  - Time required per walk-up read
  - New FTEs needed
  - Current L&G contract – weighted cost per meter
  - Number of vehicles needed
  - Gas/maintenance cost per AMR and manual-read meter
  - Cost per new vehicle
  - Life expectancy of vehicle
- **Current L&G contract – weighted cost per meter**
- **Assumptions Related to AMI System Management Functionality**
  - Number of annual disconnects
  - Time required per disconnect
  - Number of on-demand (move out) reads
  - Time required per on-demand read
  - Number of annual outages
  - Number of line workers per outage
  - Time required per outage
  - Loaded hourly rate for line workers
  - Percentage of outages reported after hours (requiring OT)
  - Overtime labor multiplier
  - Percent revenue loss due to inaccurate reads

Economic Analysis – Flow of Calculation

- **Assumptions**
- **Financial Projections by Year for Each Option**
  - » Capital costs
  - » Meter reading and other operating costs
  - » Additional revenue
  - » Additional revenue minus capital and operating costs
- **Result: Net Revenue by Year for Each Option**
  - » Subtract net revenue by year for Status Quo
- **Result: *Change in Net Revenue* by Year for Each Option**
  - » Discount each year to calculate equivalent present value
  - » Sum the present values for each year
- **Result: Net Present Value for each Option**

Results of Economic Analysis – Change in Net Revenue

- On this chart, the zero line is the status quo. Cost savings and revenue both push the lines upward.
- Data points above the zero line are economically better than the status quo.
- Data points below the zero line are worse than the status quo, because their costs (downward direction) exceed the cost of the status quo, even after taking into account the added revenue.
- The dip after Year 20 is from future replacement of meters



Net Present Value

- **Collapses the year-by-year Change in Net Revenue results into a single overall number**
- **Because money now is more valuable than money in a future year, future dollars "shrink" when converted into today's equivalent**
  - » Dollars in the near future shrink by a little; dollars in the distant future shrink a lot
- **Discount rate:**
  - » A measure of the District's willingness to exchange money today for money tomorrow
  - » Similar to interest rate, long-term cost of capital
  - » The higher the discount rate, the faster the dollars shrink
- **Example: AMR Drive-by option:**
  - » The discounted ("shrunken") cash flows summed together equal about $7.5 million
- **Net Present Value is useful for comparing alternatives**

Net Present Value (NPV) Illustration - AMR Drive-By Option

Assumed discount rate:		2.50%	
	Change in Net Revenue (from Status Quo)	Present Value of Change in Net Revenue	Discounted Value as % of Future Value
Year 0 ("The Present")	$ -	$ -	
Year 1	$ (560,217)	$ (546,553)	98%
Year 2	$ (327,503)	$ (311,722)	95%
Year 3	$ (89,673)	$ (83,270)	93%
Year 4	$ 79,817	$ 72,310	91%
Year 5	$ 837,759	$ 740,457	88%
Year 6	$ 832,654	$ 717,995	86%
Year 7	$ 844,907	$ 710,791	84%
Year 8	$ 804,069	$ 659,937	82%
Year 9	$ 797,952	$ 638,943	80%
Year 10	$ 809,147	$ 632,105	78%
Year 11	$ 820,833	$ 625,593	76%
Year 12	$ 799,542	$ 594,504	74%
Year 13	$ 792,263	$ 574,724	73%
Year 14	$ 784,611	$ 555,291	71%
Year 15	$ 758,682	$ 523,844	69%
Year 16	$ 750,227	$ 505,371	67%
Year 17	$ 808,861	$ 531,579	66%
Year 18	$ 775,662	$ 497,328	64%
Year 19	$ 766,839	$ 479,679	63%
Year 20	$ 730,140	$ 445,583	61%
Year 21	$ (524,844)	$ (312,485)	60%
Year 22	$ (622,978)	$ (361,866)	58%
Year 23	$ (676,704)	$ (383,486)	57%
Year 24	$ (683,252)	$ (377,753)	55%
Year 25	$ 704,553	$ 380,029	54%
Net Present Value of AMR Drive-By Option		$ 7,508,928	
Net Present Value (rounded)		$ 7,500,000	

Results of Economic Analysis – Change in Net Revenue

- **Hand-read is more costly than the status quo due to meter reading labor.**
  - » The last two options substitute collectors and backhaul costs for employee time. The annual savings justifies the initial capital investment.
- **Hybrid AMR/AMI and full AMI are very close economically.**
  - » Full AMI has higher average cost per meter but also higher ongoing savings.
- **Drive-by is better than the status quo but more costly than AMI or hybrid.**
- **By replacing old meters, all replacement options will eliminate the inaccuracy problem equally**

Change in Net Revenue - Net Present Value at 2.50%	
Digital Hand Read	($22,800,000)
Mechanical Hand Read	($20,300,000)
AMR Drive By	$7,500,000
Hybrid AMR	$14,500,000
AMI	$14,500,000

- **Positive numbers are better than the status quo; negative numbers worse**
- **Sensitivity analysis**
  - » We tested meter replacement cycle, discount rate, inaccuracy percentage
  - » Robust results – NPV changed but not priority of options

Non-Economic Analysis

- **Potential Health Impact of Radio Frequency (RF)**
  - Ionizing radiation does have health impacts – e.g. X-rays, gamma rays
  - Non-ionizing radiation carries frequencies many thousands of times weaker
  - For decisions about cellular or AMR/AMI, the question has to do with whether there are potential impacts from *non-ionizing* radiation
  - On that question, the science is inconclusive
    - Standard-setting bodies (IEEE, U.S. Food & Drug Administration) so far consider the risk of health impacts to be minimal or inconclusive
    - There are public health advocates who argue that RF is a non-negligible risk
    - All agree that further research is needed
  - The question for the PUD is what decision to make in the absence of conclusive scientific evidence
  - We suggest that consumer behavior is the best indicator of acceptable risk – whether people continue to carry around a cell phone in their pocket
  - If so, allowing individual customers to opt out is sufficient protection to the public

Non-Economic Analysis

- **Privacy**
  - » Concern is potential for misuse of data about individual customer electricity usage
  - » Again, we suggest following consumer behavior to gauge acceptable risk
  - » If most customers use social media, then they must be willing to accept significant exposure of personal data
    - – In its potential use of data, the PUD is much more benign than social media companies
  - » Again, allowing customers to opt out is sufficient to address this concern

- **Vulnerability to Hacking**
  - » Because AMI has operational capability, choosing AMI would increase potential consequences of hacking
  - » Choosing AMI would put a greater premium on data hygiene

Non-Economic Analysis

- **Reliability/Accuracy**
  - » All of the options would solve the current inaccuracy problem
  - » No differentiation
- **Compatibility**
  - » All of the options would have to be compatible with existing software
  - » No differentiation
- **Functionality – System Management**
  - » Only AMI has operational functionality – real-time system view, improved system control, allows customers to track their own usage
- **Functionality – Allows TOU Metering**
  - » AMR can support Time of Use rates but only inefficiently. Only AMI has the ability to offer TOU metering for residential meters in a cost-effective way

Non-Economic Analysis

Non-Economic Considerations	Status Quo	Digital Hand Read	Mechanical Hand Read	AMR Drive By	Hybrid AMR/AMI	AMI	Implications
Potential RF Health Impacts	=	+	+	=	Partial +	Partial +	Opt-out should be allowed.
Privacy	=	+	+	=	=	=	Opt-out should be allowed.
Vulnerability to Hacking	=	=	=	=	=	-	AMI requires good data hygiene.
Reliability/Accuracy	=	+	+	+	+	+	Any new option will solve accuracy issue.
Compatibility	=	=	=	=	=	=	Any new option has to be compatible.
Functionality	=	=	=	=	=	+	AMI allows quicker response, more control.
Allows Time of Use metering	=	=	=	=	=	+	Only AMI allows residential TOU rates.

- **AMI would bring increased responsibility for good data security practices**
- **AMI would offer system management capability**
  - Remote disconnects and reconnects
  - Outage notifications
  - On-demand reads (for move-outs)
  - Power theft notifications, low voltage notifications, hot socket detections (notify customers of fire hazards)
  - Daily reads that allow customers to track their own usage through an app
- **AMI would also offer cost-effective Time of Use rates for residential customers.**

Summary and Recommendation

- The strongest options economically are AMI and AMR/AMI hybrid.
- As long as opt-out is allowed and good data hygiene is practiced, the non-economic factors do not swing the business decision away from AMI.
- Two of the non-economic considerations favor AMI – the system management functionality and the ability to efficiently implement TOU metering for residential customers.
- We recommend AMI overall. The economics clearly favor the AMI and hybrid options, and between those two, the AMI has stronger non-economic advantages that justify the higher initial cost of the meters.

Questions?