BOSTON SMART UTILITIES

BOSTON REDEVELOPMENT AUTHORITY

CITY OF BOSTON
Martin J. Walsh, Mayor

7 / 13 / 2016

WHITEBOARDING SESSION RECAP DOCUMENT

CONTENTS

BSU WHITEBOARDING SESSION OVERVIEW

INTRODUCTION

The Boston Smart Utilities project seeks to enhance the sustainability, resilience, and equity benefits of utility services by coordinating the planning and implementation of above ground and underground utility infrastructure including water, energy, transit, and communications services.

This document provides a summary of the Boston Smart Utilities whiteboarding session ("session") convened by the Boston Redevelopment Authority ("BRA") held at District Hall on May 25th, 2016. The primary purpose of the Whiteboarding Session was to solicit feedback from multiple stakeholder groups on a preliminary draft Request for Proposals ("RFP") for consultant services to initiate the Boston Smart Utilities project.

This document summarizes the presentations and tabletop exercises and synthesizes the findings of the Whiteboarding Session.

OVERVIEW OF THE WHITEBOARDING SESSION

City of Boston and BRA officials gave presentations that illustrated the current state of problems experienced in the Public Works Department and also the opportunity for new urban growth created by the PLAN: South Boston Dorchester Avenue planning initiative ("PLAN: South Boston Dot Ave"). See Appendix A for the Whiteboarding Session Agenda.

IMAGE 1: WHITEBOARDING SESSION AT DISTRICT HALL

Attendees were assembled into 8-10 person teams. See Appendix B for a list of attendees. Teams collaborated in multiple tabletop exercises to provide feedback on the preliminary draft Request for Proposals. The exercises explored topics such as: risks and rewards of more coordinated utility planning and implementation, mapping value drivers to stakeholders, and feedback on the preliminary draft RFP. After each table top exercise, the groups reported their finding in a plenary session.

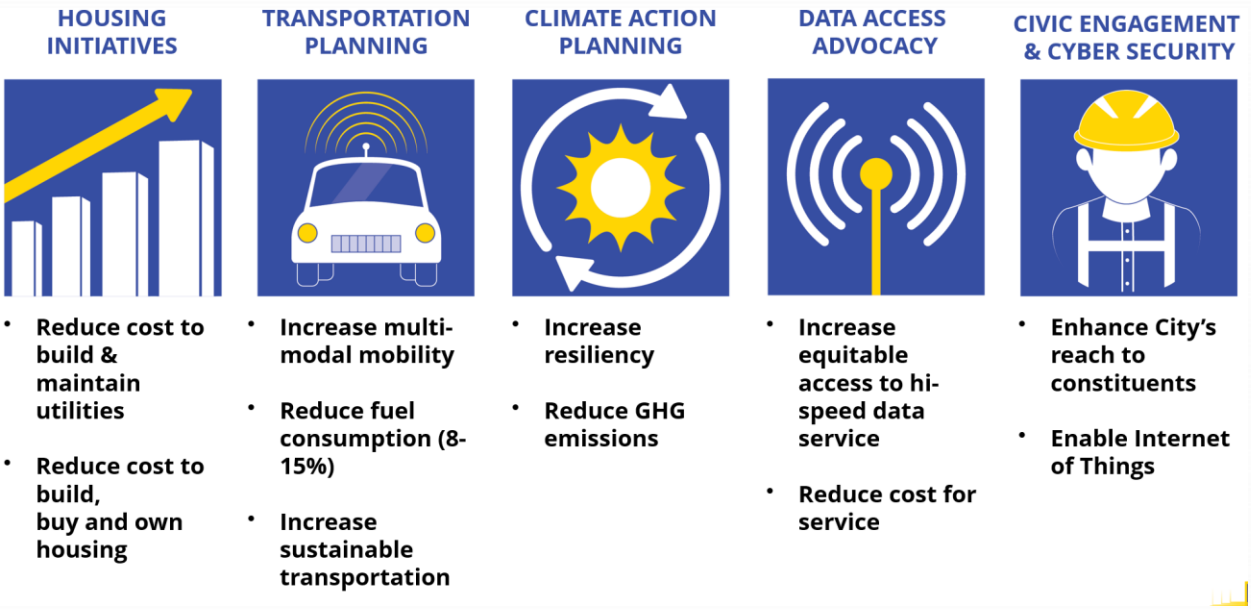
After lunch, 16 attendees presented case studies highlighting best practices in technology deployment, procurement, and utility innovation. Dr. Sarah Slaughter and John Macomber served as moderators for the presentations and provided insightful connections between the case studies and the objectives of the Boston Smart Utilities project.

The session was brought to a close through table top discussions that sought to answer two questions. The first question was, "What is the minimal viable product required to create a pilot project that illustrates the benefits of better coordinated utility planning and implementation?" The second question requested attendees to elaborate on earlier concepts of creating a multi-stakeholder, neutral, center of excellence where larger issues such as state legislation and regulatory changes would be discussed, governed, and implemented.

MORNING PRESENTATION OVERVIEW

In the morning presentation, leaders from the City of Boston described various policy initiatives that are impacted by the quality, cost, sustainability, and resilience of utilities. The underlying goals of those policy initiatives include reducing the cost to maintain utilities, reducing the cost to buy and own housing, increasing multi-model mobility, increasing resiliency to man-made and natural disasters, increasing equitable access to high-speed data service, and enabling Internet of Things ("IoT")[1]. City leaders expressed that one step in achieving those goals is better coordination of utility planning such as energy, communications, water, and transit infrastructure. City leaders noted that the focus on utilities comes at a time of growing interest in emerging Smart Cities technologies and unprecedented urban growth in Boston.

FIGURE 1. POLICY INITIATIVES SUPPORTED BY BOSTON SMART UTILITIES PROJECT



Lara Mérida, the Deputy Director of Community Planning at the BRA, provided an overview of the PLAN: South Boston Dot Ave planning initiative and its 144-acre study area ("study area"). The draft plan of the study creates the potential for 2 miles of new roadways in the study area. These new roadways present a unique opportunity to pilot both the policies and the technologies identified through the Boston Smart Utilities project.

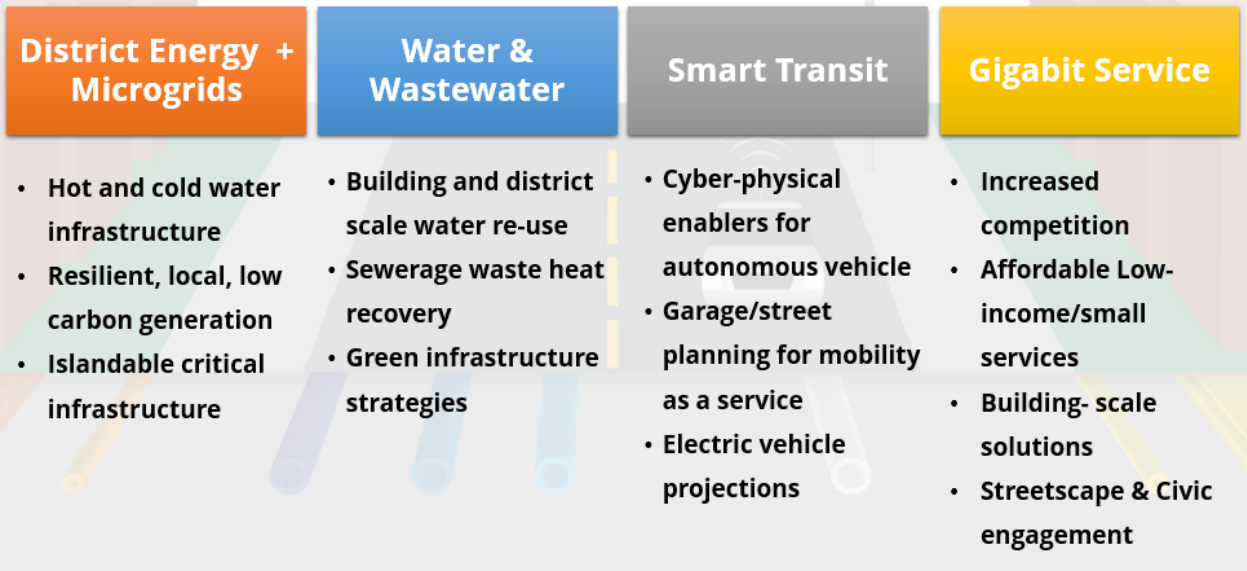
Amy Cording, Chief Engineer of the Public Improvement Commission of the City of Boston, provided an overview of the process for utility development in Boston. She noted that road excavation and

[1] The Internet of Things is the name given to the rising network of "smart" devices capable of communicating with one another wirelessly across a wide range of applications. In this context, it refers to multiple classes of utility equipment relaying information wirelessly, enabling the ability to optimize performance in real-time.

utility planning are highly unpredictable and costly because of the age and congestion of Boston's infrastructure.

Travis Sheehan, Senior Infrastructure Advisor at the BRA, provided an overview of the Smart Utilities Technologies ("SUT") identified as key drivers to meet the City's goals. SUTs are were classified into four classes: District Energy + Microgrids, Water + Wastewater, Smart Transit, and Gigabit Data Service. See Appendix C for a full description of SUTs.

FIGURE 2: DESCRIPTION OF SMART UTILITIES TECHNOLOGIES ("SUT")



For the Whiteboarding Session, the City and the BRA identified two Outcomes for the RFP. The first Outcome is a set of design guidelines for underground and overhead utilities to be applied to the construction of new streets and road reconstruction projects. The second Outcome is a set of implementation strategies for government and utility companies. The City drafted a preliminary draft RFP with a Scope of Services and specific Deliverables.

The preliminary draft RFP now reflects a broader set of outcomes and deliverables that have incorporated the findings of the Whiteboarding Session.

TABLETOP EXERCISE OVERVIEW

The Outcomes and the Deliverables were explained in detail as a precursor to the tabletop exercises. Tabletop exercise 1 focused on the Outcomes, asking participants to discuss, "What value do these outcomes provide to various stakeholders?" Each team discussed the topic and reported back key recommendations in a plenary session.

For tabletop exercise 2, each table was asked to provide feedback on one out of the three Deliverables. The participants responded to the question, "What are the challenges, data needs, and partnership opportunities presented by the Deliverable?" Teams provided feedback and reported back their recommendations in a plenary session.

REVIEW OF SCOPE OF SERVICES

City officials explained the rationale for each deliverable.

DELIVERABLE 1: Engineering analysis of the benefits and costs of "SUT" deployed in the study area, from present day through 2030.

The engineering analysis is a proving ground to understand the risks and rewards of deploying SUTs in urban development. The consultant services would first identify the baseline of "business-as-usual" urban development including utility costs on the building and district scale. The consultant services would then create a second scenario where the SUTs are implemented and, finally, compare and contrast the benefits of each. This deliverable requests that service providers answer critical questions: Will there be added costs to development? Will there be shared savings between utilities providers and property owners? The consultant services required for this deliverable include risk and benefits modeling for the economics of a large urban community development.

DELIVERABLE 2: Governance and financing strategies to enable Smart Utilities that include all infrastructure asset classes.

The governance and financing strategies are enabling agreements, protocol, and guidelines for the participation of stakeholders in coordinated utility planning and implementation. To complete this Deliverable, consultant team should have experience with financing infrastructure projects and experience working with lenders, creditors and lawyers in the implementation of infrastructure projects. District energy assets provide a useful example. If the benefit/cost is positive and there is no clear ownership structure for that district energy assets, then the consultant services would help provide options to multiple stakeholders to understand who is most fit to own and operate that utility. Additionally, Deliverable 1 may suggest that there are shared utility duct banks or utility vaults. The

consultant services would answer the critical question, "Who would own and operate shared utility duct banks or utility vaults?" Ultimately, the consultant services provided in Deliverable 2 will help provide insights to City and utility company leadership for the integration of SUTs.

DELIVERABLE 3: Street Design Guidelines that reduce lifecycle costs and enable "sut"

For Deliverable 3, consultant services will be required to synthesize engineering recommendations from Deliverable 1 with the financing and governance from Deliverable 2 into design guidelines for underground and overhead utilities that reduce lifecycle costs and enable SUTs. Those guidelines are intended to be enacted through the City of Boston's Public Improvement Commission, which serves as the hub for approvals of roadway construction in Boston. Consultant skills required to complete these guidelines include civil engineering.

KEY FINDINGS OF THE TABLETOP EXERCISES

Attendees were seated in multi-disciplinary teams of 8-10 people per table. Throughout the day, the teams engaged in tabletop exercises led by facilitators. The exercises were structured to provide feedback on the overall concept of the Boston Smart Utilities project and the RFP.

THEMES

Various themes emerged regarding the overall concept of the Boston Smart Utilities project.

Taking the Long-View on Investment

Participants noted that different stakeholders (real estate developers, utility companies, etc.) have differing capital investment time horizons in urban development. For example, utility companies invest and gain returns on their assets very differently than property owners; therefore, the questions emerged, "How can various stakeholders participate in lifecycle cost assessments of shared assets?", and, "How can multiple stakeholders overcome the "business-as-usual" focus on first costs?"

A Center of Excellence for Utility Innovation

Attendees repeatedly mentioned that the stakeholders involved in the Boston Smart Utilities project would need an overarching entity to achieve the implied level of data and planning coordination. The overarching entity could take the form of a committee or a non-governmental organization that served as an impartial clearing house for new ideas, new standards, and new implementation strategies. Some suggested that this be anchored within a university, some suggested that this be anchored within City Hall; however, most suggested this be a new organization, such as a "center of excellence" for innovation in the utilities sector.

Legislation and Regulation Concepts

Attendees noted that most successful examples of high-coordinated utility implementation strategies involved public/private partnerships and the financing strategies that support those partnerships. Attendees noted that there is no applicable legislation that enables public/private partnerships in the utilities sector. Additionally, attendees noted that the stakeholders are operating under different regulatory paradigms, thus raising the question, "If multiple utility companies decide to engage in capital planning together, are they enabled by regulations to do so?" Finally, participants noted that Massachusetts legislation lacks formal vehicles for government entities to participate in Pubic Private Partnerships and that Florida's House Bill 85 is an example for Public/Private Partnership Statues.

Need to Build Capacity Inside City Hall

Many attendees questioned if there was a need for new capacity within Boston City Government to carry out any new responsibilities created while coordinating multiple stakeholders such as additional staff for the Public Works Department who would enforce design guidelines for utilities utility infrastructure.

Data Acquisition, Security, and Monetization

Attendees noted that Smart Utility Technologies create an opportunity to collect data on environmental factors such as noise pollution and on the performance of utility assets such as electric system power quality. This is often known as "Big Data" and there is an increasing trend towards monetizing this data. Additionally, attendees noted that creating a platform for the Internet of Things would require a great deal of coordination among device manufacturers and the cyber security issues would need to be championed by a single entity.

Underground 3D Mapping

Attendees noted that underground 3D mapping is a burgeoning field of practice. Both City officials and private sector attendees noted the opportunity for underground 3D maps to increase efficiencies in the permitting process and to enhance construction risk analysis.

A Different Philosophy of the Public Involvement with Infrastructure

Many attendees noted the definition of public domain is extended to public/private partnerships in European countries and that governments often share risks and rewards with their utility partners.

OVERALL FEEDBACK ON THE DRAFT RFP

Attendees provided feedback on the Scope of Services that may apply to all deliverables.

Create a Tiered Master Plan with Longer Time Horizons

Attendees noted that the 2030 timeframe, occasionally noted within the RFP, was too limited. Attendees noted that this may not represent the true nature of urban development and that multiple milestones should be considered for economic and engineering simulations. Attendees suggested that there might be, for example, a 2015, 2030, and 2070 milestones to capturing the growing risk of climate change and local flooding.

Add Performance Metrics

Attendees noted that there are no clear metrics by which SUT solutions could be measured against the business-as-usual utility development economic and environmental outcomes. Although the city has outlined its goals, these should made more explicit and measurable as part of the consulting services.

Add Sea Level Rise or Other Climate Change Adaptation Objectives

Attendees noted that sea level rise was not explicitly mentioned and that the study area is vulnerable to flooding in future sea level rise scenarios.

Release an RFQ with Interdisciplinary Teams

Attendees noted that a Request for Qualifications for interdisciplinary teams may lead to more flexible outcomes than the current concept of an RFP.

Attendees also provided feedback and questions on specific deliverables.

FEEDBACK ON DELIVERABLE 1

Explore the Effects of Underground Utility Design on Above Ground Urban Design

Attendees noted that design guidelines for utilities below a street will affect the urban design above the street and there should be internal coordination in the BRA to resolve any possible conflicts.

How Do Planners Grapple With the Uncertainty of Future Demand for Utilities?

Attendees noted that with technological changes at the building level, utility demands may increase or fall for essential services such as electricity, water, and communications. Attendees suggested that the consultant services should include a study of the 'building of the future'.

Ask for a Deliberate Quantification of Risks

Attendees noted that there was very little mention of climate change adaptation and investment risks posed by increasing frequency and amplitude of natural disaster events. Attendees suggested this should be made explicit in the engineering analysis.

Impacts to the Surrounding Neighborhoods

Attendees noted that the benefits of Smart Utilities will go far beyond the district level. Attendees raised the question, "How can the benefit of new utility services, such as a place with continuous power during a major electrical grid outage, be monetized?

FEEDBACK ON DELIVERABLE 2

Create a "Condo" or Master Services Agreement

City officials noted early in the presentation that property owners in the Boston Seaport District have a formal agreement with terms for coordination of public realm improvements, such as sidewalk beautification, known as a "Master Services Agreement". Attendees noted that the costs and benefits of coordinated utility planning can be shared among property owners by creating the equivalent of a condo association, whose purpose is to jointly bear the cost of utilities development.

Internal Examination of the Role of the City

The attendees were curious to understand City's use of eminent domain power and bonding authority to support the development of Smart Utilities Technologies.

Aligning Financial Interest

Attendees noted that the RFP should be used as a means to align capital plans among utility companies, despite varying levels of regulations and investment restrictions.

Instruments for Financing Infrastructure

Attendees provided multiple examples of financing strategies including business improvement districts, impact investment, Revolving Loans Funds, and tax-exempt bonds. Attendees noted these should be mentioned specifically in the RFP.

FEEDBACK ON DELIVERABLE 3

Nexus of New to Old Infrastructure

Attendees noted that a new paradigm of coordinated utilities will still require connection to existing, congested streets that may have highly uncoordinated utilities.

"One Big Pipe"

Attendees noted examples around the globe of "utilidors", such as those used on college and military campuses. Utilidors contain all utility assets in one large tunnel that reduce surface-street disruptions for utility upgrades. Attendees noted this should be explicitly mentioned in the RFP and explored in the consultant services.

Design for Flexibility

Attendees noted that the design guidelines should accommodate future technical innovations and thus provide solutions that are flexible.

Streamlining Approvals

Attendees noted that this process should save time for all stakeholders because it should be aimed at streamlining the approval of road construction.

Archetypes and Modules

Attendees noted that different districts of the city will require different types of utilities services. Attendees suggested that multiple 'types' of design guidelines could be applied to different districts.

Cyber/Physical Security Guidelines

Attendees noted that with increased sensing technologies and Big Data gathering, there is greater risk of data being compromised. They noted that design guidelines should include measures for cyber and physical security.

LIST OF SMART UTILITIES CASE STUDIES

Please refer to the BRA website to download these presentations:

http://www.bostonredevelopmentauthority.org/planning/planning-initiatives/boston-smart-utilities-project

Singapore Urban Systems Modeling | **Bob Button**, CDM Smith

City of Copenhagen | **Chris Dziekan**, Hitachi Insight Group

Philadelphia Navy Yard | **Jayant Kumar**, GE Energy Connections

Worcester Smart Grid Pilot | **Joe Mellusi**, Itron

San Diego LightGrid System | **Josh Paradise**, Current powered by GE

Smart City Hamburg | **Justin Hodgson**, CISCO

Vision Zero PoC | **Majid Khan**, Verizon

Energy Storage and Microgrids | **Mark Johnson**, Schneider-Electric

Montreal Public Works Portal | **Martin Plante**, K2 Geospatial

Aurangabad Industrial City | **Peter von Zweck**, CH2M

Smart Grid and Smart Water| **Scott McCarley**, ThingWorx

Town of Cary Advanced Meters (Aquastar) | **Tim Fairchild**, SAS

Building Energy Models| **Todd Lukesh**, IES

Commonwealth of PA Computing Services | **Tony West**, Unisys

Chula Vista Smart Development | **Jennifer James,** Black & Veatch

EXPO Milano 2015 Smart City | **Valerio Vadacchino**, Enel

APPENDIX A: AGENDA

8:00 **EVENT CHECK-IN**

8:30-9:40 **INTRODUCTION TO BOSTON SMART ULTILITIES [70 MIN]**

- Welcome and overview of the workshop
- Introduction from City of Boston Officials
  - *Sara Myerson, Director of Planning*
  - *Chris Osgood, Chief of Streets*
  - *Jascha Franklin-Hodge, Chief Information Officer*

- Presentations on Planning Initiatives, Existing Policies for Utility Development, and Introduction of the Smart Utilities Vision
  - *Lara Merida, Deputy Director of Community Planning*
  - *Katie Choe, Chief Engineer/ Director of Construction*
  - *Amy Cording, Chief Engineer, Public Improvement Commission*

9:40-9:50 BREAK

9:50-10:05 **INTRODUCING THE TABLETOP EXERCISES [15 MIN]**

10:05-10:50 **TABLETOP EXERCISE 1: EXPLORING THE PROJECT OUTCOMES [45 MIN]**

10:50-11:00 BREAK

11:00-11:45 **TABLETOP EXERCISE 2: REFINING THE SCOPE OF SERVICES [45 MIN]**

11:45-12:00 **REPORT BACK AND OVERVIEW OF AFTERNOON SESSIONS**

12:00- 1:30 **LUNCH**

1:30-2:30 **SMART UTILITIES CASE STUDIES + Q&A [60 MIN]**

- *Moderated by Dr. Sarah Slaughter, President, Built Environment Coalition*

2:30-2:40 BREAK

2:40-3:40 **SMART UTILITIES CASE STUDIES + Q&A [60 MIN]**

- *Moderated by John Macomber, Senior Lecturer, Harvard Business School*

3:40 – 3:45 BREAK

3:45-4:15 **TABLETOP EXERCISE 3: SYNTHESIZING FINDINGS [30 MIN]**

4:15-4:30 **CLOSING [15 MIN]**

- Tables Report-Out findings, Plenary Conversation, and Closing Remarks

4:30-5:30 **ONSITE NETWORKING AT GATHER RESTAURANT**

APPENDIX B: ATTENDEE LIST

NAME	ORGANIZATION	TABLE
Alistair Pim	NECEC	3
Amy Cording	City of Boston	8
Anne Schweigger	City of Boston	7
Austin Blackmon	City of Boston	
Bill Abolt	AECOM	1
Brad Swing	City of Boston	1
Bruce Douglas	Natural Systems Utilities	9
Bryan Glascock	Boston Redevelopment Authority	2
Carl Nylen	ESRI	4
Carl Spector	City of Boston	4
Chris Cavanaugh	National Grid	3
Chris Dziekan	Hitachi	8
Chris Osgood	City of Boston	
Christopher Ranahan	Eversource Evergy	5
Curtis Page	Alphinat	7
David Carlson	Boston Redevelopment Authority	5
Eileen Sneker	Boston Water and Sewer Commission	10
Erica Krueter	Massworks Competetive program, EOHED	1
Faith Nicholas	City of Boston	10
Frank Curran	Consultant	10
Galen Nelson	MassCEC	4
Geoff Segal	Macquarie	1
Gretchen Stewart	Intel	7
Herb Boynton	Lightower	7
Hillary Flynn	National Grid	2
Irene McSweeney	Boston Water and Sewer Commission	5
Jaimie Scranton	JP Morgan	3
Jarrid Hall	Elster	8
Jascha Franklin-Hodge	City of Boston	
Jason Nelson	Smart Cities Council	10
Jason Zhuang	Hauwei	6
Jayant Kumar	GE Energy Connections	3
Jennifer Ducey	Stantec	5

Jennifer James	Black & Veach	2
Jennifer Sanders	Dallas Innovation Alliance	9
Joe Mellusi	Itron	10
John "Tad" Read	Boston Redevelopment Authority	5
John Cleveland	Innovation for Cities	10
John Daly	Eversource Energy	2
John Hoey	Eversource Energy	1
John Macomber	Harvard Business School	1
John Markowitz	Mass Development	2
Joshua Pardise	GE Current	2
Justin Hodgson	Cisco	8
Karl Seidman	MIT, School of Architecture and Planning	4
Katie Choe	City of Boston	7
Keilani Lei Hipp	Mass Clean Energy Center	2
Kevin Joyce	Partner, Brown Rudnick	2
Kris Carter	City of Boston	8
Lara Merida	Boston Redevelopment Authority	-
Mackay Miller	National Grid	1
Maegan Lefebvre	Mass CEC	4
Majid Khan	Verizon	6
Marcy Ostberg	City of Boston	1
Mark Ferri	National Grid	4
Mark Johnson	Schneider Electric	7
Mark Walsh Cooke	ARUP	9
Martin Plante	K2 Geospatial	5
Matthew Foran	National Grid	8
Mia Goldwasser	City of Boston	5
Michael Berger	Allied Telesis	10
Michael Hernon	Get PSPC	5
Michael Murphy	MassCEC	9
Monica Ridgeway	C40	7
Navjeet Bal	Social Finance, Inc.	1
Nigel Jacob	City of Boston	6
Patrick Brown	Boston Water and Sewer Commission	4
Patrick Haswell	Veolia	6
Peter von Zweck	CH2M	5
Phil Cohen	Boston Redevelopment Authority	4
Philip Bane	Smart Cities Council	8

Richard Jabba	Fort Point Associate	3
Robert Albee	VHB	10
Robert Button	CDMSmith	3
Ruthbea Clark	IDC	8
Sarah Slaughter	Built Environment Coalition	2
Scott McCarley	PTC Thingworx	7
Scott Turner	Nitsch Engineering	9
Sean Carroll	Department of Telecommunications	6
Sheila English	Lambert Associates	3
Steve Caliri	National Grid	7
Stuart Cowan	Smart Cities Council	9
Susan Nguyen	City of Boston	6
Thomas Daly	Boston Water and Sewer Commission	8
Tim Fairchild	SAS	6
Tim O'Donohue	Boston Water and Sewer Commission	9
Todd Lukesh	IES	9
Tony DeBenedictis	Eversource Energy	9
Tony West	Unisys	8
Travis Sheehan	Boston Redevelopment Authority	
Valerio Vadacchino	Enel	4
Vanessa Fox	MIT Enterprise Forum on Cambridge	3

APPENDIX C : SMART UTILITIES TECHNOLOGIES

DISTRICT ENERGY + MICROGRIDS

- Hot and cold water distribution infrastructure
- Resilient, local, low-carbon energy generation
- Electrical distribution infrastructure that can 'island' during grid outage

SMART TRANSIT

- Autonomous vehicles: hardware and software to enable market
- Mobility as a service [streamlined ride sharing services]: garage and street space required to enable service
- Electric Vehicles: hardware and software to enable market

WATER + WASTEWATER

- Water re-use technologies: infrastructure to support building or district scale water recapture and re-use
- Sewage waste-heat recovery as a source of low-cost, no-carbon heating to buildings
- Green infrastructure: hardware to reduce loads on storm water infrastructure

"GIGABIT"/ HIGH SPEED COMMUNICATIONS

- Conduit and Fiber: to increase competition in the marketplace and lower end-user costs
- Wireless hardware: to support Internet of Things for utilities and personal devices
- Communications Protocols: software and standards solutions that enable secure communications for utilities and personal devices

APPENDIX D: WHITEBOARDING SESSION NOTES

Report Out Exercises

E1 = Report out from Exercise 1
E2 = Report out from Exercise 2

TABLE 1:

E1:

- Aim at taking a longer term view at investment.

E2:

- Increased financing.
- Detailed engineering analysis, less efficient.
- Regulatory planning in infrastructure.
- Look for specific approaches, models, for basic reforms of the systems.
- Strategy for capturing of values.
- EXAMPLE: San Fran. Public Utility
    - Established public reliance.

TABLE 2:

E1:

- There needs to be an overarching entity.
- Everyone needs a voice.
- Respecting public values/ rate payers.

E2:

- Understand cost benefit needs.
- Microgrid pilot to understand what costs are.
- Price is based off how much space you use.
    - Forces efficiency.
        - Reimagine public space, maybe underground utility may not work.
        - Financing must be shared.
        - “Cross-subsidization”

TABLE 3:

E1: Long Term.

- Tiered master plan that encourages cooperation.
- Engage all of different stakeholders especially innovation and investment community.

E2:

- State legislation needs to change in Boston to enable Public/Private Partnerships.
- City needs to take on deeper sense of risk evaluation.
- Understanding how to build to capacity within the city.

TABLE 4:

E1:

- Focus on RFP process.
- Focus on process innovation.
- Building towards consensus.
- Third party entity.
- Funding support, public and private

E2:

- The advance infrastructure lies in the public realm.
- Demand is a standard.
- How can you predict demand patterns with the public?
    - Modeling, testing, certification
- Semi-autonomous body that evaluates.
- Should we shoot for district scale performance guidelines?
- Security around data is a concern, may have to be withheld in third party.
- Add more clarity in benefits, esp. within surrounding communities.
- Where are the impacts around the community?

TABLE 5:

E1:

- A long term vision of utilities.
- Coordination.
- Who installs utilities?
    - Need authority to implement.
    - With leaders vision can develop.

E2:

- Time horizon is 2030, there should be a greater time horizon that goes further into the future.
- Sea level rising is of great importance.
- Comprehensive data mapping for all users.

TABLE 6:

E1:

- Need for a general “who, not what”.
- Importance of coordinating
    - § What is going on with a project?
    - Help give guidance.

- Optimizing information within entities.
- Overarching developer who understands long term and short term.

E2:

- Don't want to miss opportunity by innovation.
- Rethink guidelines. Rethink governance and policy regulation and hardware for utilities that provide framework for next generation framework.
- Trenching is a key level of focus.

TABLE 7:

E1:

- Need a public-private stakeholder.
- Proof of concepts from incentives.
- Negotiate what works and what not works.
- Set ground rules as foundation for partnership.

E2:

- Practical application of what comes out of this.
- No such idea of "new" street, how do we share the risk?
- How does the guideline secure this?
- Can the corridors connect new and old infrastructures?
- Concept of public-private partnership.
- New skillset for contractors.

TABLE 8:

E1:

- "Big smart pipe".
- Continual flexibility as times change.

E2:

- The underground design needs to happen BEFORE above ground design.
- Above ground effects below ground and vice versa.
- What are the impacts of this for the public?

TABLE 9:

E1:

- Shared risk, shared reward.
- Expect change.

E2:

- Team based work early is vital.
- Discovery faze with correct team.
- What are the innovation standards of the future?
- Shared knowledge builds cities.
- Need for investable cities through this method.

TABLE 10:

E1:

- Look for new infrastructure planning committee.
- Quarterly or monthly meetings.
- Slowly invite public.
- How do we get better information and data?

E2:

- Learning what is in the streets, above and below.
- More analysis.
- Operational definitions.
- Deep learning of important needs of surrounding area.
- "Live and learn"

COMMON TAKEAWAYS:

- Finding a way to do large scale, high profile meetings more often.
- Capacity, more than anything else.
- Planning can only talk about capacity levels, planning may not cover everything when it is time to build.
- Knowledge sharing advocacy group is vital.
- 3D modelling can prove useful.

BIG IDEAS

- Center of excellence
- Illustrating smart utilities
- Identify obstacles and local government procurement options
- Governing board
- Need for changes in regulation of private utilities
- Opportunity in this location for changing legislation in this particular area?
- Need for shared information
- Mayor up for election in November
- Make sure a vocal supporter of choice
- Make fiber a fourth public utility
- Without compromising competition to ensure access for low income
- Find concrete quick wins with competitive ROI
- Smart parking
- Open data
- Water efficiency
- Someone who owns and articulates the vision from mid to long term period (Travis??)
- Universities
- Money – need to entice developers
- Transparent
- Open to competition

MINIMUM VIABLE PRODUCT

- Know what's already there and what we'll need – sandbox to bring stakeholders in the room
- Who would run this project, financing
- Comfort to share info
- RFQ, for more flexibility
- Modular
- Mandate to be from interdisciplinary teams – expertise from finance, governance, law, utilities, IT
- Build a shared framework
- Intermediary third party for data
- § Take that data, make some private for city or public, sell data, feed revenues back into third party to keep going
- Creating a framework for objectives of smart utility district
- Creating data platform
- Central Repository of initiatives and planning
- Roadmap of legal and regulatory obstacles
- Strong consensus, shared vision around the idea

WHITEBOARD 1/ BRAD SWING

Exercise 1

Benefits to Stakeholders

Outcome #1

- Cost reduction
    - Coordinated activities are cost recovery
- Potential to unlock private development
- Sustainable development of communities
    - Increase quality of life
- Develop open access network -
    - all partners have access
    - Refocus capital on providing service (Kentucky wired)
- Aligned incentives to minimize ROE

- Strategic opp. For power and test new ,models to roll out more broadly in other areas
    - PLAN: DOT AVE serves as test ground
        - National Grid
    - Pilot in Worcester but would be great to pilot here
    - AECOM piloting in Chicago
- Can we take into account carbon reduction as well?
    - Currently no premium for this
- Could generate revenue because more people want to be there
    - Bigger carrot than reduced cost

Structure the Solution

Outcome #1

- Pilot - allows to test model
    - Work out kinks
- New structure that has autonomy vs. overlay
- How does this tie to other areas?
- How does it translate to state?
- By nature of area is pilot
    - Causes geographically district
- Master Developer?
    - This could help coordinate area.
    - Could open up; cubed for funding infrastructure
        - Don't really do TIF, but instead; cubed
        - Examples: New Balance
- Exemptions needed to coordinate multiple utilities
- Challenge is multiple private parcels
- 2 pilots - master developer vs. better coordination of capital plans and budgets
- City owns street and lease back to utilities
    - Broadband

Outcome #2

- Fiber lines are different - costs is all in installation, materials almost nothing
    - Easy to over-build
- Broad band should be treated like regulated utility
    - Example: Chattanooga and need to store outside specific municipality
    - Talling tees or lease back
        - Example: Stockholm energy
            - Minimized street disruption
- Want 5 year ahead view
- Parcelling of development will have to deal with
    - Should assume given
- Realistic estimate of demand and build to that from beginning
- UK regulates good model
    - Total expenditure
        - Encouraged to minimize opp. expenditure

Key Takeaways (cont)

- Employing Longer term view on return on operating
- RIIO -Regulation
    - 8 year time frame
    - Shift between capital expenditure and operating expenditure

Exercise 2

Challenges, Data Needs, and Partnership Opportunities

2.1 Pathways

- CHALLENGES
    - Proprietary networks for broadband will stunt scale (it won't be ubiquitous)
        - Building use changes are piece meal
- DATA
    - Building common visibility for "partnership planning"
    - Physical, Floor area ration, Money

2.2 Governance

- LEVERAGE
    - Zoning process to provide greater certainty around max demand
    - Ensuring profits are equitably distributed

2.3 Financing

- How to prove CAFD for alternate financing compare base vs. smart
- Put utility rates and TIFs and state revolving fund together
- For electric utility cost certainty = value

Challenges, Data Needs, and Partnership Opportunities (cont)

2.1

BLANK

2.2

- Joint Pole Agreement "2.0" to streamline

2.3 Financing

- Be more explicit about requesting suggestions for next-gen accounting
    - E.g. SF PLIC "good neighbor"/3BL
- Link said accounting systems to new pools of capital
    - Align incentives
- Very clear metrics
    - Performance based regulations

Exercise 3

Big Idea (or) Minimum Viable Product (the boards say "synthesis" or maybe no heading at all.

- Invest!
- Monetizing Rev's now, maximize down the road.. Carve out $ for utilities
- Prop values, sales tax, i3 BID, envision Charlotte, BIP volunteering assessment… "spent wisely" and "here"

- MGL 23L -Bonds from Mass Dev…
    - Debt financing for utilities
    - Munifull backstuff
    - TIF for Utilities
        - Grid Mod
- Util. makes case for investment
- Development Districts/ oversight
    - Council … MIT/ Forrest City)
        - Special util. Commission
- Above utility heeds… "planning coordination"
    - Dealing with public, util., Prop. Owners
- "Smart Infrast. Center of Excell"
    - Testing thru city wide testing
    - Inter-operability
- Revolving funds for infrast.
    - "What it could be"
    - "ID obstacles in state/local solutions"

COE

- Oversight council
- Inter-operability
- Co-funded
- Pilots
- Only 1 on east coast
    - UMass Resiliency

WHITEBOARD 2/ BRYAN GLASCOCK

Exercise 1: Value to Stakeholders

Benefits to Stakeholders

Outcome #1: Design Guidelines

- Hardware and Software interconnection
- Create planning scenarios to accommodate different outcomes
- Energy useage
    - Post economic downturn to indicate future energy usage
- Current state analysis and scenario analysis
    - Resilience: organized guidelines to accommodate change
    - Explicitly include rapid change

QUESTIONS

- Extent of district heat system and status of it
- Water and sewer mains on DOT. AVE

Benefits to Stakeholders (cont)

Outcome #2: Implementation Strategies

- Restructuring current infrastructure

- Aim of consultants unifying different stakeholders needs
    - Creating groups and engaging stakeholders
        - who becomes alpha partner?
    - Value capture techniques
        - Where will it come from?

QUESTIONS

- Who becomes alpha partner?
    - Financing
    - City of Boston

Structure the Solution

Outcome #1: Design Guidelines

- What is the motivation for current change?
    - Density bonus (Fenway, Boylston)
    - Estimated value
        - Infrastructure
- How to coordinate timeframe of development?
    - Eminent domain
        - What other processes to use to catalyze department?
- Ways to use [&] towards development or if money can be created through value add
- Nanogrids
- Financing incentives to build resiliency
- Corridor
    - City?
    - Utility?
    - Condo?
        - Bonding, public capital for projects
        - Incentive to accommodate new technologies
- Public sector isn't most active market actor
- Stormwater infrastructure, GI and resiliency
- Engage private sector

Structure the Solution (cont)

Outcome #2: Implementing Strategies

- Must be collaborative, yet one entity must lead the drive
    - Ex: electricity and microgrids
        - Developers and tech companies will lead, not utilities
            - Or regular incentive
- Utility corridor: space will be rented and became known revenue stream, incentive to finance development
- Quantifying current and future development and demand

Key Takeaways (cont)

- Structure: overarching entity to facilitate and spearhead; able to create joint value proposition.
- City/ Public representative to advocate for long term public good.

- Outcomes respect ratepayers
- Interest and values

Exercise 2

Challenges, Data Needs, and Partnership Opportunities

2.1 Pathways

- Costs of infrastructure
- Price escalation
- Understanding changes in local/state takes, changes in private interests
- Changes in quality
    - Increases in data points/ sensors to better understand quality

CHALLENGES

- Uncertainty of future energy use
    - Need an explicit conversation about resiliency

2.2 Governance

- Current energy needs/ baseline and projected values
    - Future technologies
- Data Needs
    - Shifting federal regulation
    - Regulatory and financing terms
        - Also for state
    - How open can utilities be with info/data
    - What initiative are there to understand cost
    - Sharing data based on benchmarks (NYSERDA microgrids)
    - Cost evaluation (Boston microgrid study)
- Public/utility framework

2.3 Financing

- Water usage
- Uncertainty of what is under the streets for possible mitigations

What Would You Change?

2.1 Pathways

- Value of resiliency (health issues)
- Decide where critical buildings are
- Backup
    - What are we looking at?
    - What do we need to change?
        - Then we can ask data needs, challenges, ect.
- Adaptive planning after creating baseline of data and scenario
- Buffering risks or spread risk over everyone
- Think internationally about what is public domain

How would you re-write (or whatever the actual heading is) (cont)

2.2 Governance

- Coordination
- Align values of public and private to ensure financing from both parties
- Understand viability of development projects
- Value add of DOT.AVE consortium

2.3 Financing

- Focus on most catalytic opportunities and their financing
- Identify what needs public financing
- Are there critical facilities to add private investments?
- Understand government financing is key to resiliency, but private investments is needs to continue to grow project

Synthesis

- How to coordinate multiple players
- Standardization between utilities
- Master financing/development agreement
- Balance energy values of private/public, increase cooperation of the two
    - Shift baseline norm
- Should underground be public domain?
- Public spaces, public access keep utilities above ground

Key Takeaways

- Understand cost-benefits needs to better monetize added value
- New revenue opportunities
- Think internationally about what is the public domain

WHITEBOARD 3/ ALISTAIR PIM

Exercise 1

Benefits to Stakeholders

Outcome #1: Design Guidelines

- Utility: better planning
- Collaborate with ???
- New business model and repeatability
- Financial Structure
- Collaboration amongst all
    - Property owners
        - Reduced time and money
            - Predictability
    - Regulators
        - Enable more coordination planning
            - Reverse 60/40
    - City Developers
        - Not using own balance sheet to finance
- Planning horizon coordination

    - 20 vs. 50 years
        - How does that improve financeability?

Benefits to Stakeholders (cont)

Outcome #2: Implementing Strategies

- Privatization
    - Improvement districts
    - Assessment district (tax)
- Core Infrastructure
    - **Tiered master plan**

Structure the Solution

Outcome #1: design Guidelines

- Create economic dev. NGO
    - Like EDIC
- EX: Weymouth Military Development Commision
- The How: City takes as **eminent domain** and hires master developers

Outcome #2: implementation Strategies

- Coordinating utility body
    - TIF (Tax Increment Financing)
- Change current policies
    - Re: infiltration and inflow
- 3P/PPP/P3 - Public/Private partnership
    - City convener
        - Private owners = stakeholders

Key Takeaways

- Tiered master plan
    - Collaboration
    - Predictability
    - Easier to finance
    - Governance (City led P3)\
        - w/ master plan
            - Or a new economic NGO
    - Long Term value
        - Ability to achieve desired outcomes
    - All people/entities have skin in the game

Exercise 2

Challenges, Data Needs, and Partnership Opportunities

2.1 Pathways

- Legislation
    - for a statewide framework for a P3
    - Scalability/ standardization

        - Delete all approvables
            - Like Florida model
    - Different timelines
        - Sewers, water, etc…

2.2 Governance

- Many different entities to govern
- Not a long history of public-private partnerships
    - Timelines
    - Current regulations of stakeholders

2.3 Financing

- Long term
- Different ways to do
- Different expectations of Return guide lines
- Different Schedules

Challenges, Data Needs, and Partnership Opportunities (cont)

21. Pathways

- DATA: What's under there?
    - Costs to mediate
- Federal guidelines not to share because (terrorists) (NDA's)
    - Security

2.2 Governance

- Need to find incentives/accountability to keep all involved
- Balance investment infrastructure and keep rates low

What Would you Change?

2.1 Pathways

- New legislation (P3)
- Need more people to implement these ideas ("Capacity Tools")
- Given capacity-skillset to do new

2.2 Governance

- Knowledge sharing
- Change term constrains
- Better continuity better administrations

2.3 Financing

- Attitude to business long financing projects
    - Make it easy
    - Known process
- Costs tax exempt follows low(?)
    - Bet lots risk containment (?)

Exercise 3

Synthesis

- Deeper risk evaluation
    - New options
- P3

    - Scalable legislation
        - Different finance alternative
    - Internal; capacity within city domain
        - Knowledge and experience
            - Multi-year process
                - Foundations pay for these new things and knowledge
                    - Impact investing and revolving fund

MINIMAL PRODUCT 1 YEAR

- Multi-discipline team
    - A Master developer
    - 4 Pillars
        - Utilities
        - Finance
        - Surveying (?)
        - Legal
            - Energy
            - transportation
            - water
            - Network

WHITEBOARD 4/ GALEN NELSON

Exercise 1

Benefits to Stakeholders

Outcome #1: design Guidelines

- Less disruption, better service, reduced costs
- Lower development costs for developers
- Reduce maintenance costs, accelerate maintenance
- Lower operating costs
- Better mix of uses
- Greater scrutinizing - higher quality services
- New revenue - generates opportunities? Create new opportunities by design
- Coordinating synergies between utilities

Outcome #2: Implementation Strategies

- How do you engage "future stakeholders"?
- Overarching values/goals must be shared by all stakeholders (and defined the same way)
- Addressing procurement challenges
- Energy condo/ stormwater condo
- Create district gov/fin structure up front
- Higher property value

Structure the Solution

Outcome #1 Design Guidelines

- energy /stormwater/etc. Condos
- District gov/fin structure

- System now- what can it handle; how can it be expanded?
- Understanding reduced loads on utilities w/ improved design standards
    - Can build less for same quality services
- Pish stakeholders to shared goals/ objectives
- Design simulations
    - Allow stakeholders to provide feedback
- Broadly replicable across city

Outcome #2: Implementation Strategies

- LEssons learned from EcoDistricts
- Flexible/RFP process
    - Able to change adaptive
- Scope and bring in new expertize as we discover new needs
- City as convening authority
- Zoning
- Overlay district with new dev. Approval standards

Structure the Solution (cont)

Outcome #1

- What is stakeholders and who from state?
- Identify state level barriers relevant regulators at table early
    - State and federal (EPA, DPU, DEP)
- Fully establish existing state

Outcome #2

- Third party entity holds developement to a set of standards, updates standards, manages process

Key Takeaways (cont)

- Innovative process
    - Flexible/adaptive approach
- Champions in key stakeholder group
- Third Party entity to host modelling exercise along the way
    - Test assumptions

Exercise 2

Challenges, Data Needs, and Partnership Opportunities

1.1 Future Demands

- Modelling based on existing standards
    - How do you model future demand considering changes to how buildings are designed?
    - How to calc. Demand?
- How does tech impact future demand?
- Changes in how space gets used
- Do you replace infrastructure or build for increased demand?
- What are future standards?
- How can we predict citywide code changes?

1.2 Utility Expansion

- Standards/codes often dictate design, not demand
- Governing body should hold developer tk new stnds.
- Utilities must share data-keep confidential
- ID experts who can predict future tech, demand, standards - including tech innovators

1.3 Quantify Benefits

- Behavioral changes
- Changes in building programming
- Habits of occupant

Challenges, Data Needs, and Partnership Opportunities (cont)

1.1 Future Demands

- Set a performance goal of the area (LEED for neighborhood); stimulate to this standard
- What do benefits, mean? Financial quantifications
- Need in depth modeling
    - Quantify biz as usual vs. smart utilities
- Benefits will be a range of outcomes, not a single-solution approach

1.2 Utility Expansion

- Challenge - relying on infrastructure in bldgs. (private) as part of solution
- Operation and maintenance
    - Eg. stormwater - water between pub. And private property; who maintains infra.?

What Would you Change

1.1 Future Demand

- Performance standard for entire area
- Modeling to range of growth/ demand scenario
- What standards influence capacity (besides demand?) analyze capacity to change those standards

1.2 Utilities Expansion

- Identifies how expanding one utilities would impact others; how can utilities learn from each other?
- Consider demand mngmt. (Cannot assume demand/ behaviors don't change) and other behavioral changes

1.3 Quantity Benefits

- Establish entities to op/maintain related infra. In area (eg. all green roofs)
- Identify how “benefits” translate into financial benefits and who benefits

How would you re-write (or whatever the actual heading is) (cont)

1.1 Future Benefits

- Identify users and predict their needs (res. Vs comm. Vs ind.)

1.2 Utility Expansion

- Identify synergistic opptys. With shared infrastructure

1.3 Quantify benefits

- What are the incentives/mechanisms to capture identified benefits (create markets within district)

Exercise 3

Synthesis

- Cannot be designed in a vacuum - development. Will impact surrounding area and how utils. Operate in surrounding area
- Some existing infra cannot dramatically change - must consider how these pieces impact rest of system
- Quantify benefits in $

WHITEBOARD 5/ JOHN READ

Exercise 1

Benefits to Stakeholders

Outcome #1

- Maintain access to deeper utilities, reduces costs saves time
- Need map for future, what needs to work over next clear vision
    - Pop. growth, utilities phasing, 50 yrs. Building in additional capacity
- Manage convergence of traditional/ IT utilities
- Consistency across private properties

Outcome #2

- Cost: lower construction, operational phasing is more efficient
- Streamlined permit reviews
- Downfall: implementation, no oversight
- Required as-built to turn on project built in 3D modelling to identify conflicts and utilities (need standards)
- Appropriate sizing

Structure the Solution

Outcome #1

- BWSC has 5 year plan to implement infrastructure
    - What about other utilities?
    - How coordinated?
- Meed pverarchig gov. Structure
    - utilities /authorities/telecon have diff. Oversight
    - Role of PIC: guidelines in place need to implement
        - How old are guidelines?
    - Missing adjudications process, oversight
- Needing to make sure installation is done right

Outcome #2

- City plays traffic cop over installation but delays/changes occur in jobs when turned over to customer, tracking is difficult
    - Currently role of utility
- Who's coordinating between utilities making sure installation is done right, and making sure there is capacity for the future

- Gov. structure could be geographic - specific

Structure the Solution (cont)

Outcome #1

- Good coordinating model: joint chiefs of staff at DOD
- Temp. authority for certain geo. Area
- Article 80 is info. Clearing house
    - Needs expanded infrastructure reg.
    - Schedule for who goes first in utility installation

Key Takeaways (cont)

- Vision and follow through enforcement from construction to as-built
- Starts with DPW/PIC joints chiefs of staff or temp geog. Based

Exercise 2

Challenges, Data Needs, and Partnership Opportunities

1.1 Future Demand

- CHALLENGES - rise of distributed gen.?
    - Uncertainties of demand
- Unpredictability in market, build out timing
- Growth of Internet of Growth: hard to predict data communications needs
    - Changing technology
        - Ex: solar pavement, solar bldg envelope

1.2 Utility Expansion

- Sea level rise:
    - How to adapt to changing conditions whether people want to invest in area
    - Amend guidelines for future utilities planning
- Need to know utility capacity, can extend outside of study area

1.3 Quantify Benefits

BLANK

Challenges, Data Needs, and Partnership Opportunities (cont)

1.1 Future Demand

- DATA NEEDS
    - Accurate maps of what is there
    - Sharing information across utilities
    - Need base utilities map
        - Ex: Knoxville, TN
            - KGIS

1.2 Utility Expansion

- Sea level rises projections
- Laser scan to assist in real time monitoring
- PARTNERSHIP
    - Data and map sharing

1.3 Quantifying Benefits

- Lessons learned
- Shared resources and infrastructure identification

What Would you Change?

1.1 Future Needs

- Be clear about future demand year
- Consider multiple planning horizons that correspond to sea level rise predictions
    - Ex: British system every 8 yrs
- Include projected sea level rise

1.2 Utility Expansionism

- Identifying difference in cost/benefits
    - BAU vs. Smart Utilities
- Also of green infrastructure in utility construction, recharges systems in private dev. Areas and park areas

1.3 Quantifying Benefits

- Process benefits in permitting, design, construction

Key Takeaways

- Clear time horizons and multiple (beyond 2030)
    - More phasing from BAU - Smart Utilities
- Comprehensive data/map sharing
    - Data partnerships
- Inclusion of sea level rise projections and strategies in engineering analysis

Exercise 3

Synthesis

- Government funding
- Change of governance/regulation
    - Rate recovery
        - making
- As-builts
- Shared info syst.
- Pilot Proj.

WHITEBOARD 6/ NIGEL JACOB

Exercise 1

Benefits to Stakeholders

Outcome #1

- Capture value from copartners
    - Less liability w/ DPD
    - More optimization
- Gov't: better direction-guidance
    - Achieve goals more directly

- Private (soft) - leverage response
- Analytics: gaps and guidance

Structure the Solution

Outcome #1

- Need to define owner
    - Guidance
    - Governing structure
- Got ppl to the table
    - Incentives to participate?
        - Who first to catalyze
        - Gov't voice?
            - Coordinate pathway define
            - benefits/ services
        - Define value prop.
        - Hot to instill politics?

Outcome #2

- How to prototype?
    - Where to start?
        - City define area. Increase FAR
            - (FAR=value)
    - Heat map of current state
        - But data??
        - Communication - easier w/ hord.
        - Bring ppl to the table

Exercise 2

Challenges, Data Needs, and Partnership Opportunities

3.1

- Partnership
    - Gov.
    - Policy/Reg
    - Finance
    - Tech

Challenges, Data Needs, and Partnership Opportunities (cont)

3.2

- Develop last practice to start categorizing existing
    - Every Time you dig - put in sensors
    - Before dig - check system to optimize knowledge
        - Req. add data/knowledge

WHITEBOARD 7/ ANNE SCHWEIGGER

Exercise 1

Benefits to Stakeholders

Outcome #1

- Who are the stakeholders?
    - Citizens
    - developers/ property owners
    - City
        - Utilities
    - Businesses
    - Tourists
    - Investors (i.e. PPP)
        - Motivation to give back
    - Environment/ Wildlife
    - Surface IoT/ Smart Cities

  Companies that work in this space need robust broadband backup
    - Uber, etc…

Outcome #2

- Need robust approach to tracking as-builts
        - Need to be better built
    - Shadow conduit
    - Status (use condition)

Benefits to Stakeholders (cont)

Outcome #1

- How can startups tap into procurements?
- Partners with larger companies
- Benefits
    - Quality of life
    - Jobs
    - Affordable housing
    - Can be very strategic in how developers connect to rest of word
    - Increased density

Outcome #2

- Proof of concept… tech that will be used and processed
- Engagement of citizens in process is beneficial
- How the key stakeholders coordinate/show ownership

Structure the Solution

Outcome #1

BLANK

Outcome #2

- Proof of concept

- But how would you do this on utility side?
- Who regulates?
- Who comes up with $?
- Transit trucks issue?
  - User fee
- PPP
- Access Issues
- Be smart in determining when you do poc.
- Case Studies

Structure the Solution (cont)

Outcome #1

- Major corporate entities
- Fitting OOB thinkers into city organ. structures
- Build it and they will come doesn't work...
  - Share up front cost, risk
    - Companies and developers share

Outcome #2

- Govt.
  - Be open to PPP in this space
  - How can city facilitate
  - Consortium/Governing body that holds participant accountable... ensures that metrics are being used
    - EX: NYC (lightowers)
  - Stakeholders (ppl. At event) share resp. Of creating, defining
  - Rules
  - Trusting space

Key Takeaways (cont)

<u>Shared ownership - PPP</u>

- Creation of process
- Governance and accountability
- Up-front costs
- Currents and future stakeholders all well and earned by arrangement
- Case studies about short and long term
- Make citizens part of process, aware

Test this all is Proof of Concept

Exercise 2

Challenges, Data Needs, and Partnership Opportunities

3.1 New Street Construction

- No such thing as new street construction in Boston!
- Can't start from scratch
- Hesitation re:change in Boston
- Affordable housing is nearly impossible to find

- Street guides need to be in plan
    - Not sure what they want

3.2 Existing Street Construction

- Everything is expensive
    - How does this impact the cost of rent, ownership, running a business
- Timing

Challenges, Data Needs, and Partnership Opportunities (cont)

3.1

- Timing
    - This does not happen overnight… so how do you phase the building and utilities in the given rec.?
- How do you future proof?
    - Don't head all
        - I.e. 15 sensors now… but might later! (?)
- Interface between buildings and street
- Lateral utility street design

3.2

- Build street and have street design that can handle climate change
- Prediction and future demand is though
    - So how do you det. How much capacity to install?

What Would you Change?

3.1

- Assessment of data needs
    - Capture value and data
- Incentive for construction costs
    - Change construction practice: take time and educate
- Assoss. How underground currently serves above ground, nor it will in future
    - I.e. DAS/ small cell
    - Aboveground infrastructure such as streetlights

3.2

- Monetization and data, information
- What do the edges need to look like for POC and reg. City infras. Linkup?
- Engaging the ppl who are interested
    - Education, homeland security
    - Metering
    - Ways to use meterning to change behavior

Key Takeaways

- PPP Maker challenge/ RFI
    - Ask for ideas for how to do this?
- What can you do with space freed up above ground?
- RFP needs to include questions about data
- Link to other city wide strategies

- IB 2030
- Market survey
    - Is it buildable
        - Contractors available?
- What are the implications for long term revenue and control of infrastructure?
    - Ie street lights
    - PPP
- New skills and processes among
    - Contractors
    - City employees
- No such thing as “new” streets in Boston
    - Shared buy-in on how to address the “surprises” underground
- Turn to COBUCS for data
- Be proactive on the edges
- Vision
    - Clarity about rel. Between underground and aboveground
    - PPP maker challenge/RFI
    - Link to other long-term city plans

BIG IDEA

- How do we grow and launce in the next 5 years?
    - What is the entity that helps move forward?
- Leverage existing orgs:
    - Mass High tech Council
- Dedicated ppl from each org
    - Reps. from these would help facilitate this going forward
        - Funding
            - $
        - Metrics
- What does each org. Contribute?
- Who makes the rules?
    - City? Some other entity… also interest on part of state/federal
    - Do developers help make rules?
- Types of rules:
    - Who determines where utilities get put in street?
- Key role for developers… value
    - Need to deliver
- How to do all of this in a transparent, por-competition way
- Roger Dennis - the idea guy

Vision -

- who is the Steward? (Travis)
- Universities
- Existing orgs/

Execution

- $

- Transparent
- Pro-competition
- Developers
- City govt.
- Metrics
    - Multiple sources

WHITEBOARD 8/ KRIS CARTER

Exercise 1

Benefits to Stakeholders

Outcome #1

- Big empty tunnel for utilities
    - Not water, sewer, or gas electric and fiber
    - Less road construction
    - Less public inconvenience
    - Less accurate forecasting need callows margin of errors
- Key Issues
    - Security design =
        - Cyber/digital and physical

Benefits to Stakeholders (cont)

Outcome #1

- Easy access (physical)
- Visual sensing access remond (IoT strategy)
- Security design
- Digital Twin
- Utility fusion center
- Streetlight Strategy
    - LED, small cell, wifi equity
- Data Standards
- City owned tunnel
- Who owns data?
- Data strategy

Structure the Solution

Outcome #1

- Value Proposition
    - Build in flexibility
        - Timing
        - Planning
    - Data model
    - Standards/ best picture
        - Value to all stakeholders

Outcome #2

- Look to NYC for high level guidelines
- Think of data model first
- Regulatory infrastructure for IRR for utilities for investments

Structure the Solution (cont)

Outcome #2

- BIG PIPE implementation
    - Procurement/Bids must include paying into common pipe for future utilities
    - Coop/ Condo governance structure for the pipe
        - Easement/pipe carries with the land
- Data Analytics
    - Ownership?
    - EX: Copenhagen

Exercise 2

Challenges, Data Needs, and Partnership Opportunities

3.1 New Street Constructions

CHALLENGES

- Need visions of energy and transport policy
- Set up underground big pipe when least disruption (bike, pedestrian, greenway, road)
- Need master developer's plan for utility investments
- Must engage public and private utilities upfront bia forecasted demand
- Maintenance challenge
    - Multi-tenant long smart pipe
        - Who maintains?

3.2 Existing Street Construction

- Master developer must design for gas, electric, fiber capacity
- Lack of coordinated asks for fiber/planning

Challenges, Data Needs, and Partnership Opportunities (cont)

3.1 New Street Construction

- Design policy: underground build is 1st
- NOT designed for individual car ownership
- Need for flexibility to future proof changing transport within constraint of physical uder/over street inflexibility

3.2 Existing Street Constructions

- Assume underground is less flexible than above ground
- Opportunities to collaborators w/ city and utilities Run Fiber
    - City owned
- Design above ground for flexibility
    - Change road materials
        - Street standards
- Mandate fiber all new dev.
    - DATA USE

How would you re-write (or whatever the actual heading is)
BLANK

Key Takeaways
KEEP ALIVE FOR 5 YEARS
- Align with mayors specific smart utility
  - Vision for next 5 years that he wishes to make law
  - Vocal Sponsor (Mayor)
- Make Fiber a 4th Public Utility
  - Gas, Electric, Water to CIO's point without compromising competitions
- Find Concrete Quick Wins
  - I.e. Smart LED lights
  - " " Parking
  - Open Data
  - Water efficiency

WHITEBOARD 9/ STUART COWAN

Exercise 1

Benefits to Stakeholders
Outcome #1: Design Guidelines
- Pilot Zone
- Model calibrated to "as-built"
- R&D Lab
- Proof of concept
- City-Wide economic strategy
- Decreased demand (Big Picture)
- More Resiliency (Stretch Cities Infrastructure)
- Keep up with demand; keep rates affordable
- Efficiencies, Economy of scale
- Efficient use of space

Outcome #2: Implementation Strategies
BLANK

Benefits to Stakeholders (cont)
Outcome #1: Design Guidelines
- Predictability
- Incorporate Art to Illustrate
- Improve visual appeal
- Accelerated Permitting
- Adaptability to multi-use
- Common platform that is visual

    - Speaks to a lot of stakeholders
    - Can engage with
- Optimize current assets
- Data and Analytics
- Streamline commercialization process
- Buildings sharing resources
    - Requires proper planning

Outcome #2: Implementation Strategies

- Incentivize first mover when sharing resources/utilities
    - Subsidize First investment

Structure the Solution

Outcome #1: Design Guidelines

IES

- Adapt midway through process
- Coordination amongst utilities
- Civic leader
- Academic
- Design Professionals
- Contractors/ Developers
- Land Owners
- Finance
- Emerging/Innovation
- Programmers (Data Scientists)

Outcome #2: IMplementation Strategies

- Long-term visionary
- First mover incentive
- Dedicated authority
- Piloting costs
- Home companies
- Streamline Permits
- Enterprise fund
- Top down/ bottom up
- Continuity of engagement
- " " of Leadership
- Common Platform

Structure the Solution (cont)

Outcome #1: Design Guidelines

BLANK

Outcome #2: Implementation Strategies

- Innovative maintain agreements
- State and federal programming
- Shared reward
- Continuity of staff/leadership
- Spirit of cooperation between utilities

- Updated standards
- Harmonized Standards
- Shared Risk (above and below ground)
- PPP3
- Innovative procurement
- Streamlined Piloting

Key Takeaways (cont)

- Shared Risk
- Shared Reward
- Expect Change

Exercise 2

Challenges, Data Needs, and Partnership Opportunities

2.1 Pathways

- GIS
- Long term forecasting of data
- Climate Resilience
- Future proofing
- Data ownership
- Acquisition of data from utilities
- What is the needed data?
- IMproved Accuracy of data
- Visualization Software
- Common platform

2.2 Governance

- Overarching objective for data
- Standardized codes
- Incentivize innovation
- Reuse
- Data security/monetization

2.3 Financing

- Need accurate cost analysis
- Innovative fee structures
    - SW Fees
    - Graduated Fees
- Public Sector interest rate
    - Buy done
- State funding
    - Federal
    -
    - Ner zero medel
    - Reuse of financial to capture efficiency

What Would you Change?

2.1 Pathways

- Improved defined RFP
- Qualifications based "RFQ" approach to selection
- Get design right
- Multi-stakeholder approach to scoping, planning, RFP design
- Create Human Bandwidth
- Demonstration of entities working together

2.2 Governance

- Dynamic
- Performance Driven
- Collaboration
- Shared Risk: between government academia, utilities, private sector, non-profit
- Cultural Inertia to overcome

2.3 Financing

- Taxable bonds
- Tax exempt bonds
- Private infrastructure financing

Exercise 3

Synthesis

- Dynamic set of implementation standards
- Qualifications based RFQ
- Deliverable based
- Adaptability
- Evolving process beyond the RFP
- Business GSE(?) approach to making the case
- Shared Risk
- Enable PPP

<u>Minimum Viable Product</u>

- Build Consensus around idea
    - The investments
- Framerate of what the objectives are
- Cost share model between multiple towns
    - Show this visually
- Connecting disparate projects
- Smart Utilities/ Infrastructure authority
- Work from a point of consensus
- Characterize needs to make progress
- Road map for legal/regulatory enablers
- Data platforms and repository of overlapping initiatives

- Equity (social)
- Incorporate this process into Boston Master Plan

WHITEBOARD 10/ FRANK CURRAN

Exercise 1

Benefits to Stakeholders

Outcome #1

- Predictable planning
- Look what is underground
    - Look ahead of time
- Better communication in zoning/permitted process
- Investing of "as is" utilities

Outcome #2

- "As is" plan and investing for utilities
    - With line up dates
    - Uniform w/ all utilities

Benefits to Stakeholders (cont)

Outcome #1

- Master plan
    - For utilities
    - For developers
- New, add'l streets for specific uses
- Bldg. layout and capacities should known in advance
    - And communications

Outcome #2

- Integrated infrastructure plan
- Straight streets

Structure the Solution

Outcome #1

- Utility District
- Public wifi initiative
    - EX: NYC

Outcome #2

- City and BRA messaging
    - This project will shape future
    - Monthy? Regular meeting of primary decision makers

Structure the Solution (cont)

Outcome #1

- Coord. Mechanism for utilities
- Regulatory approval process
- Credible information
- Central organization
    - like DigSave
- Geospatial tech baseline
    - Location dimension capacity
- Independent third party
- Planning group - infrast. Planning
    - Including utilities

Outcome #2

- Make location of utilities (like DigSave)
- Utilities to provide data to 3rd party

Key Takeaways (cont)

- New infrastructure planning committee
    - w/ utilities
    - City agencies
        - Later add citywide
            - Stakeholders
        - Vendor community

Exercise 2

Challenges, Data Needs, and Partnership Opportunities

1.1 Future Demand

- Pipes carry commodities
- Capacities in future - sizing
    - design of master plan driving
        - Needs to be larger than DOT:AVE
- Enough capacities coming in from outside to support design of space
- Clarify expectations of new dimensions and diff. Planning
    - What about generation?
        - New tech vs. existing utilities and tech

1.2 Utility Expansion

- Go outside the zone
- phased -in approach, based on how fast building
- What's the repository?
- Data Standards
    - Profile: existing and new capacities

1.3 Quantify Benefits

- Microgrids
    - Cheaper, reliability
        - Emergency mngmt

Challenges, Data Needs, and Partnership Opportunities (cont)

1.1 Future Demand

- Renewable energy plans for long term
- Assumptions - carbon - neutral bldgs. 80x50
- Water recycling, water recorvery
- Sea level rises
    - Buildings-where?

1.2 Utility Expansion

BLANK

1.3 Quantifying Benefits

- Carbon Neutrality
- Low cost public wifi
- Waste recovery
- Minimize public disruption
    - Design corridors

What Would you Change?

1.1 Future demand

- Vendor recommendations of how to build ongoing data repository
- Current best practices
    - Emerging standards
- Projection of future utility tech.

1.2 Utility Expansion

- Design criteria in plans

1.3 Quantifying Benefits

- Platform of future (this project)

What Would you Change (cont)

1.1 Future Benefits

- Solve one problem, pilot, go from there
    - Incremental
- Current baseline costs projected of business as usage
    - Compare to what it could be
        - Change - lower costs
        - Monetize reduction of delays

Synthesize

- Not as bad set of deliverables, but analysis of business as usual vs. planned
- Operational definitions of metrics used to quantify benefits

<u>NEXT YEAR MIN. VIABLE PRODUCT</u>

- Go back to US Olympic group
- Intermediary for Data