

The Leverett Municipal Broadband Model

An Overview of Institutional, Contractual
and Financial Arrangements

MLP Board of the Town of
Leverett, MA

Preface



This material was developed by consultants at DHInfrastructure in cooperation with the Leverett Municipal Light Plant (LMLP) and the Town of Leverett, Massachusetts. The material is meant to inform policymakers and the general public on Leverett's approach, and in particular, to offer information that will help towns considering how best to bring high speed Internet to unserved or underserved populations.

The LMLP is a municipal light plant established under Massachusetts General Law 164 to provide high speed Internet and telephony services to residents, public buildings and businesses in the Town of Leverett. The service is known as "LeverettNet". As a municipal entity, the LMLP serves as the custodian of the network assets, which are in turn owned by the Town. The LMLP is governed by a three member board of un-paid volunteers, each appointed by the Town's Select Board. The LMLP board appoints a Manager to oversee all contracts related to network operations. The LMLP Manager concurrently serves as the Town Administrator. More information on LeverettNet and the LMLP may be found at lmlp.leverettnet.net.

The LMLP makes this report available for use by persons and organizations interested in municipal broadband, particularly in projects aimed at meeting rural broadband needs. LeverettNet is one model of how a small, rural town tackled the problem of providing 21st century telecommunications infrastructure to its residents, businesses, and municipal departments.

DHInfrastructure LLC is an economic consulting firm that specializes in regulated network infrastructure. DHInfrastructure advises governments, investors, and utilities on matters related to the energy, water, telecommunications and transport industries; applying principles of economics and finance to public policy, regulation, litigation of disputes and infrastructure acquisitions. More information on DHInfrastructure may be found at www.dhinfrastructure.com.

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About Leverett and LeverettNet



The Town of Leverett, population 1,800, is located in Franklin County, Massachusetts, between the Towns of Amherst, Montague, Sunderland, Wendell, and Shutesbury. An elected three-member SelectBoard oversees Leverett government, along with several other elected and appointed officials. The Town has approximately 43 miles of roads. The 2012 median income was \$36,503 (MassDOR). Leverett has a diverse, rich cultural history, ranging from early industrial corridors along rivers and streams to the first Peace Pagoda in the country, to large tracts of forestland. Approximately 53% of the land in town is classified under M.G.L. Chapter 61 for forest, agriculture, or recreation protection.

In August 2015, Leverett completed LeverettNet, a "last-mile" town-wide Fiber-Optic-to-the-Home (FTTH) broadband network. LeverettNet is owned by the Town and operated under the telecom authority of the Leverett Municipal Light Plant (LMLP), which contracts with third parties for Network Operator, Internet Services Provider, and maintenance functions.

LeverettNet provides symmetrical 1-Gigabit-per-second (1Gbps) Active Ethernet connectivity between each subscriber location and the Internet Point of Presence. LeverettNet connects from the Point of Presence to the Internet Service Provider at 2-Gigabits-per-second, via the Massachusetts Broadband Institute "middle mile" network, a project of the Massachusetts Technology Collaborative.

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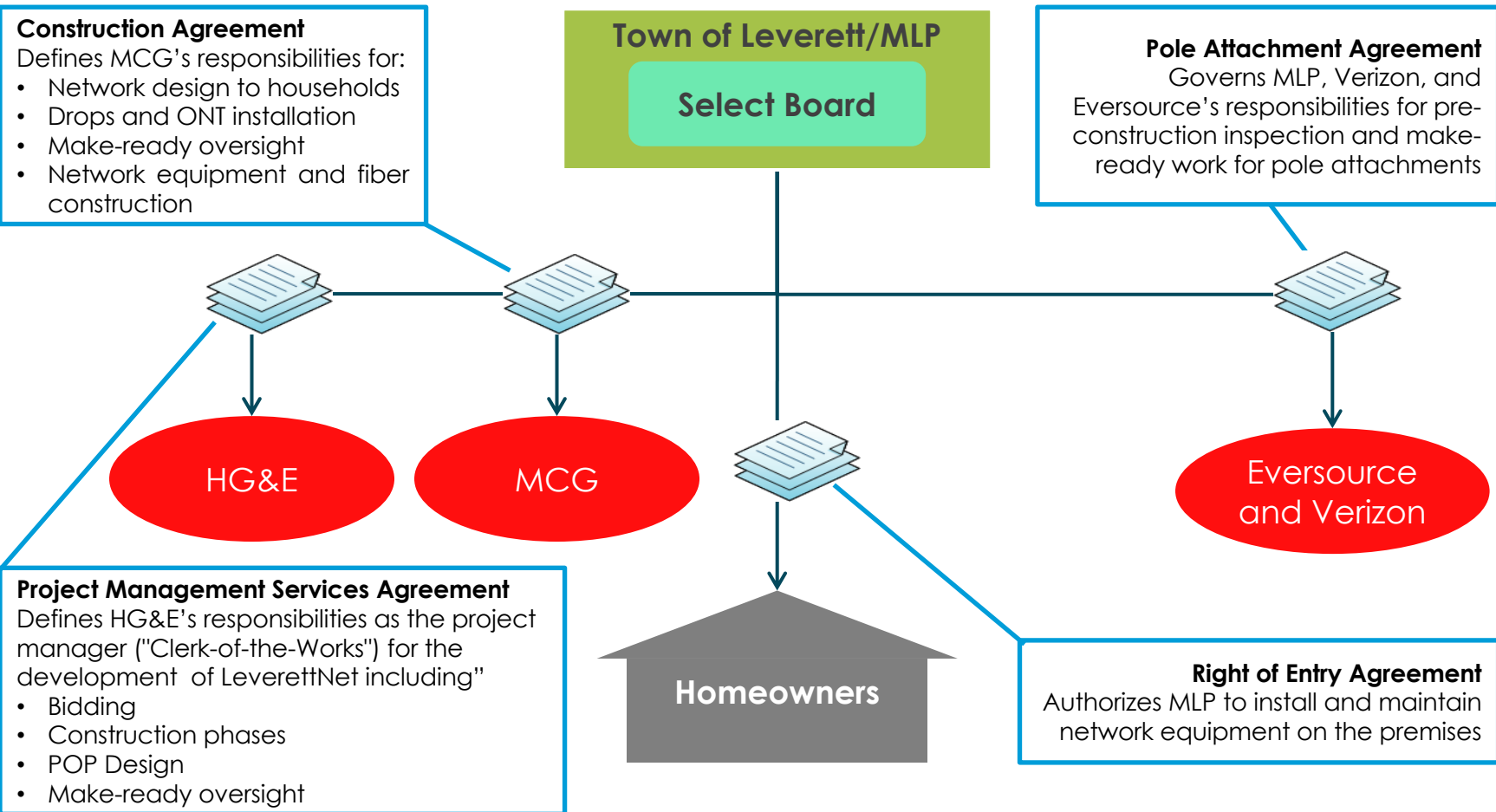
Contractual Arrangements





Contractual Arrangements

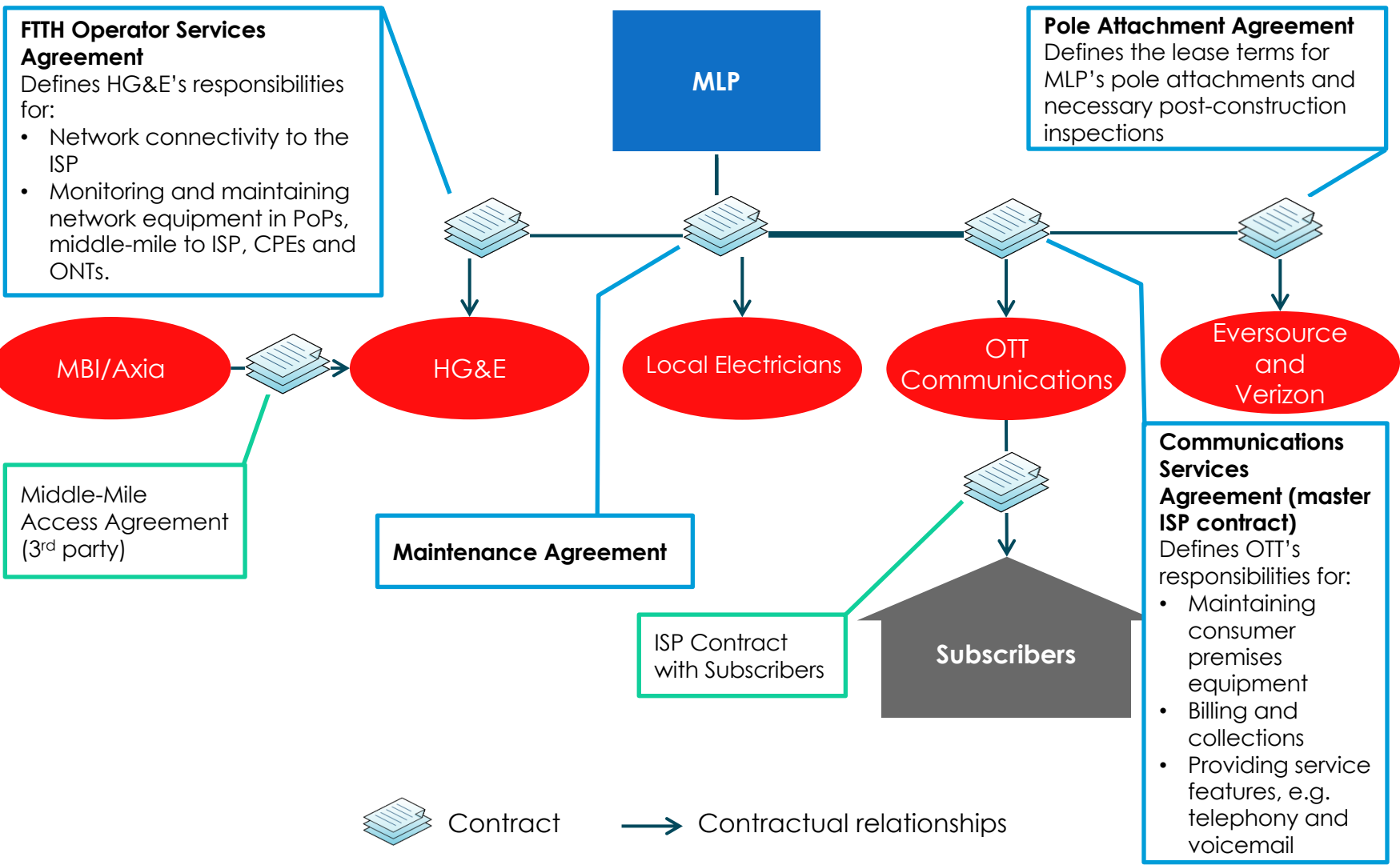
Pre-construction and construction phases





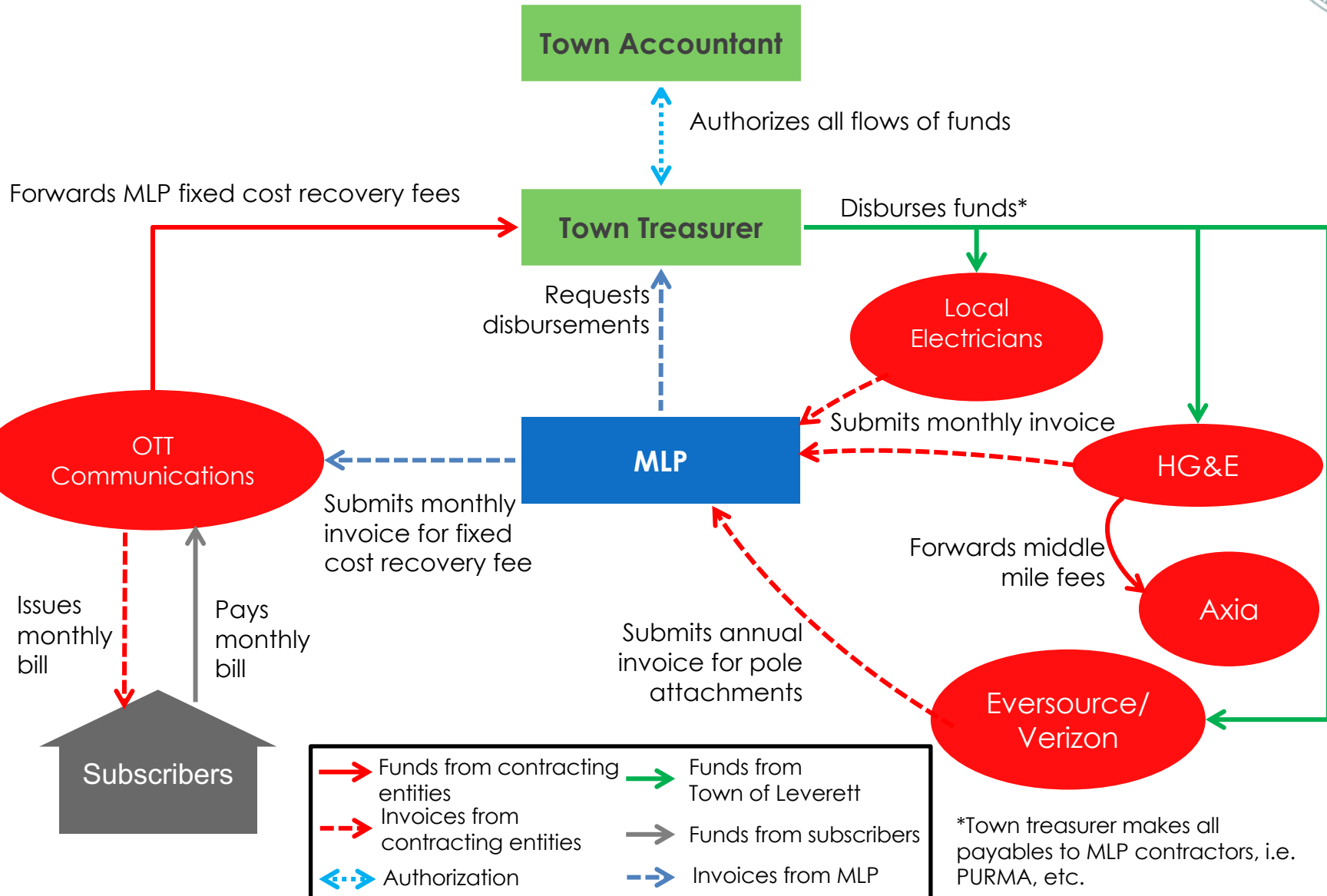
Contractual Arrangements

Operations



Contractual Arrangements

Operational flow of funds



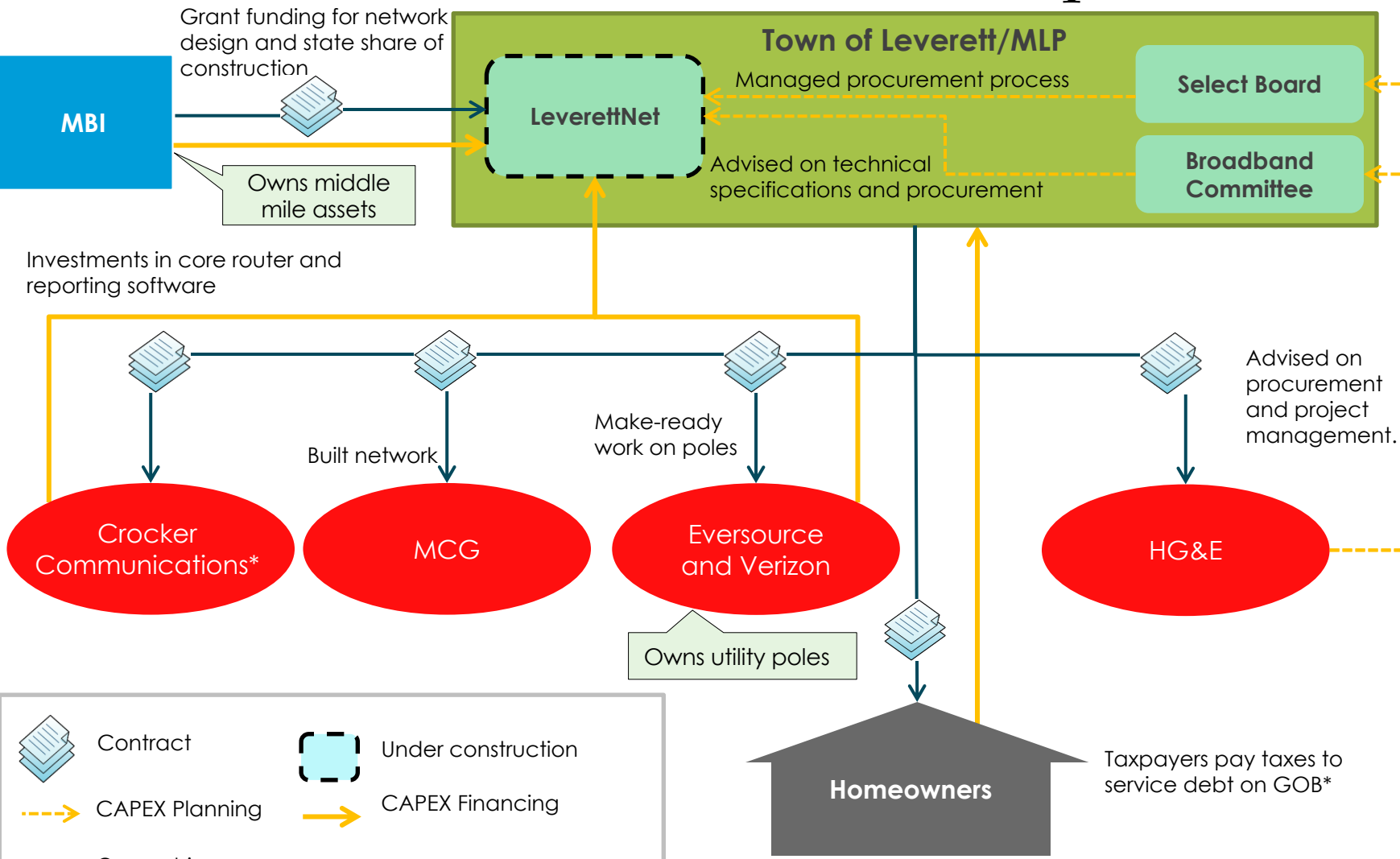
Allocation of responsibilities





Allocation of Responsibilities

Pre-construction and construction phases



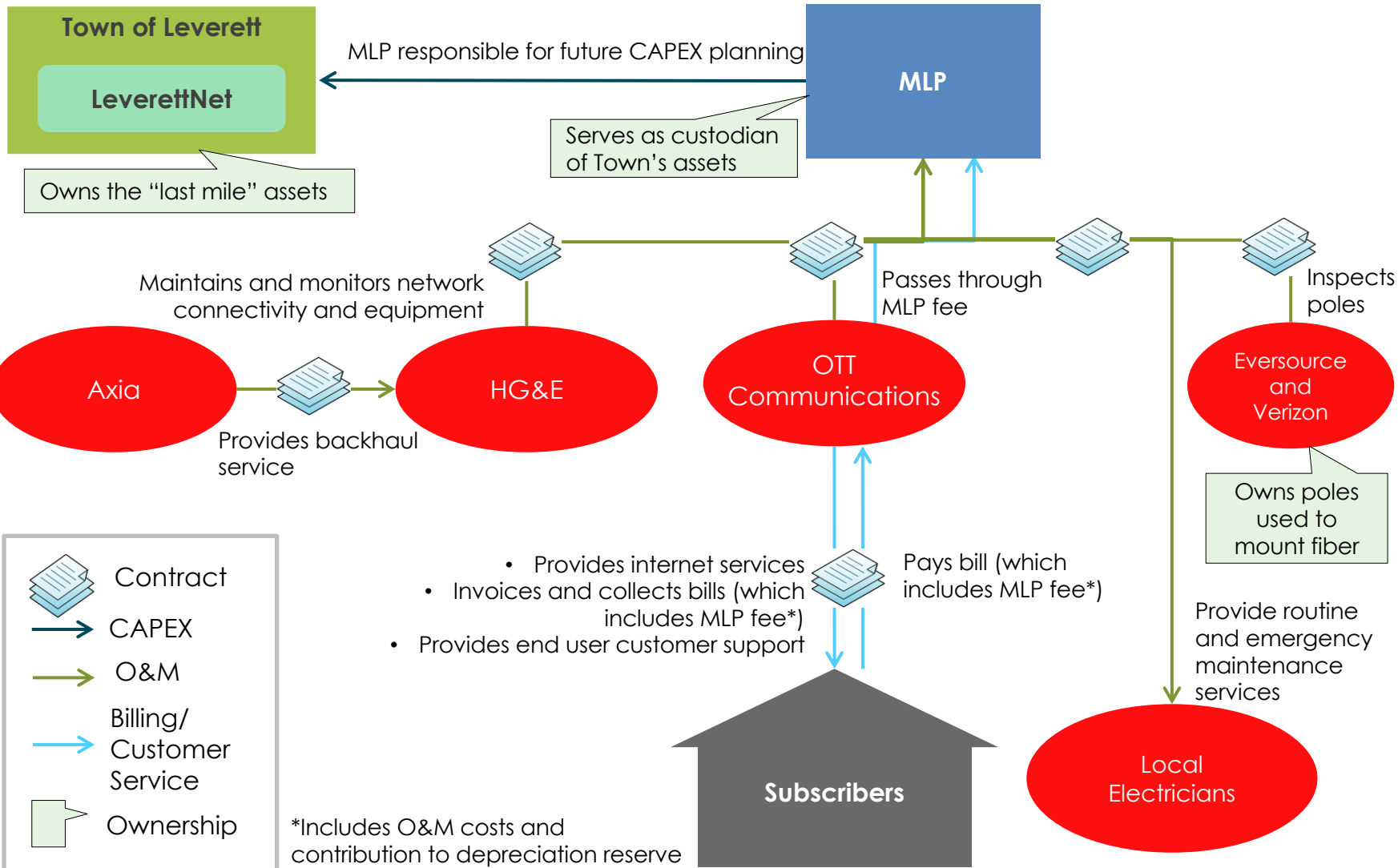
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*GOB = General Obligation Bond
 * Crocker Communications was the ISP during the construction phase. OTT Communications is the current ISP.

Allocation of Responsibilities

Operations



Allocation of Responsibilities



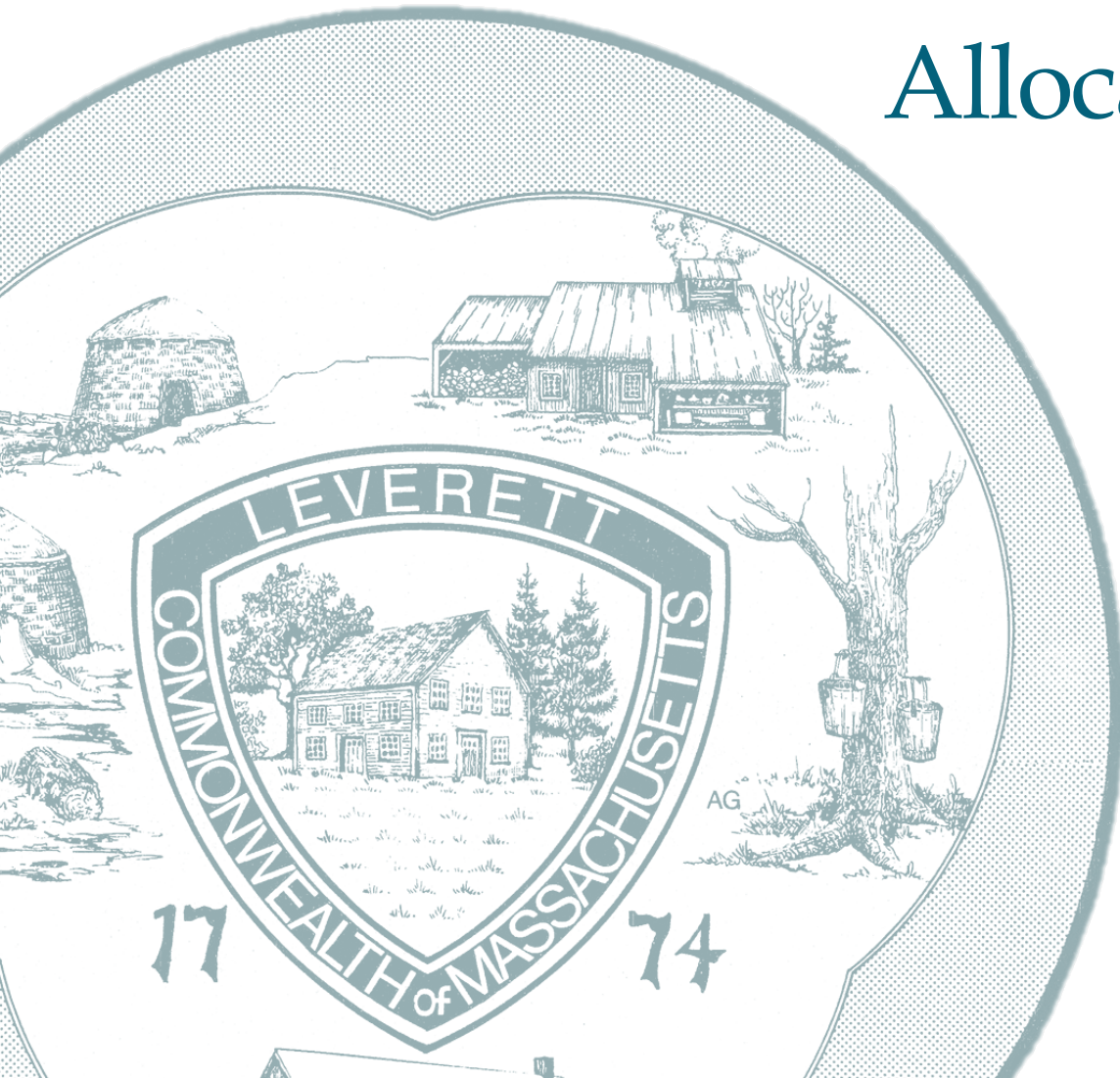
Function	Role of Entities
Ownership of Assets	<ul style="list-style-type: none"> ▪ Town of Leverett owns the “last mile” assets. ▪ MLP serves as the custodian of the Town's assets. It may borrow against the revenue stream from assets, but is restricted by MGL 164 in its ability to sell or dispose of the assets. ▪ MBI owns the middle mile assets which run to Town "anchor institutions"; MLP connects to middle mile at one location. There are two PoPs, one connected to the other, and one connected to the middle mile. ▪ Verizon and Eversource own poles used to mount fiber. MLP is licensed by the utilities to use the poles under a lease agreement.
CAPEX Planning	<ul style="list-style-type: none"> ▪ Town of Leverett managed the procurement of LeverettNet. It issued IFBs and RFPs and managed the bid process for network design and construction. ▪ HG&E was hired to advise on procurement and project management. ▪ MLP will be responsible for future CAPEX planning.
CAPEX Financing	<ul style="list-style-type: none"> ▪ Town of Leverett taxpayers pay taxes to service debt on general obligation bond. ▪ MBI provided grant funding for network design and state share of construction. ▪ Subscribers through monthly fees pay O&M expenses, which include contribution to a depreciation reserve. ▪ Crocker Communications made investments in core router and reporting software before commencing operations.

Allocation of Responsibilities



Function	Role of Entities
Operations	<ul style="list-style-type: none"> ▪ HG&E maintains and monitors network connectivity and equipment under a 5-year operating contract with the MLP. ▪ Axia NGNetworks USA provides backhaul service under a contract with HG&E. ▪ OTT Communications provides internet and telephone services to the subscribers. ▪ Verizon and Eversource periodically inspect leased utility poles.
Maintenance	<ul style="list-style-type: none"> ▪ MLP contracts for maintenance with local electricians.
Billing and collections	<ul style="list-style-type: none"> ▪ OTT Communications invoices and collects bill payments from subscribers. Pays MLP fee to MLP's account with Town of Leverett Treasurer. MLP fee covers O&M, which includes a contribution to a depreciation reserve account.
Customer Service	<ul style="list-style-type: none"> ▪ OTT Communications handles end-user customer support. ▪ Collins Electric handles network service calls up to ONT on subscriber premise. ▪ Edelberg Electric and Grace Electric handle service calls at the residence, including the ONT.
Regulation	<ul style="list-style-type: none"> ▪ MA Department for Public Utilities reviews annual reports submitted by MLP. ▪ MLP sets prices for end-user services as established by MGL 164.

Allocation of Risks



MLP Risks



Risk category*	Description/Notes
Site risk	<ul style="list-style-type: none"> ▪ Tree trimming necessitated by pole attachments (and possible cost-sharing for tree trimming related to adverse weather events) ▪ Need to install deterrent measures to prevent unauthorized access and environmental damage to POPs ▪ Site risks associated with equipment upgrades
Design, construction and commissioning risk	<ul style="list-style-type: none"> ▪ Risk of loss related only to actions, omissions or willful misconduct of MLP, or risk of loss related to presence of toxic or hazardous materials on site
Sponsor risk	<ul style="list-style-type: none"> ▪ Risk related to Axia/MBI services and services of MLP's sub-contractors
Financial risk	<ul style="list-style-type: none"> ▪ Risk that total MLP fee is set too low, though MLP has ability to increase fee annually
Market risk	<ul style="list-style-type: none"> ▪ Risk that, over time (> 1 year), number of customers drops, making cost of service financially unviable for ISP
Operating risk	<ul style="list-style-type: none"> ▪ Risk on operation of fiber, POP, Calix Management System, and ONTs (except ONT batteries). Risk on other equipment limited to some extent by warranties
Network and interface risk	<ul style="list-style-type: none"> ▪ Risk of interruption of service related to activity by Verizon or Eversource ▪ Risk of interruption of service from middle-mile network
Legislative and government policy risk	<ul style="list-style-type: none"> ▪ Risk that Commonwealth of Massachusetts will no longer contractually or financially support the middle-mile network ▪ Risk that Commonwealth of Massachusetts may retroactively force transfer of assets to ISPs**

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*Appendix A contains more information on standard definitions and categories of risks

** Motherboard, "The 21 Laws States Use to Crush Broadband Competition" January 2015

https://motherboard.vice.com/en_us/article/the-21-laws-states-use-to-crush-broadband-competition

Currently, California and Utah allow municipalities to construct fiber networks but must sell or transfer the network to a willing and available ISP. Six states have total bans on municipal broadband, although some cities within those states are challenging state laws.

Service Provider Risks



HG&E

Risk category	Description/Notes
Operating risk	<ul style="list-style-type: none"> Risk on operation of the equipment used to monitor the network. Liable if any incidents such as fires are unreported
Market risk	<ul style="list-style-type: none"> Risk that costs increase faster than Northeast Region CPI
Network and interface risk	<ul style="list-style-type: none"> Risk of interface with ISP

ISP

Risk category	Description/Notes
Operating risk	<ul style="list-style-type: none"> Risk related to equipment and facilities required to connect to the MLP Network and to initiate Connection Services or Communications Services. Risk that ISP fails to meet 99.999% uptime requirement excluding equipment failure and planned maintenance
Financial risk	<ul style="list-style-type: none"> Risk that ISP fees will not cover full costs of service (including MLP fee) Risk that bad debt exceeds 1% of monthly MLP subscriber charge
Market risk	<ul style="list-style-type: none"> Risk there are too few subscribers to internet service or additional services
Network and interface risk	<ul style="list-style-type: none"> Risk of interface with HG&E Risk that additional services crowd bandwidth allocation

Customer / Taxpayer Risks



Risk category	Description/Notes
Site risk	<ul style="list-style-type: none">▪ Customer responsible for damaged to fiber caused by digging and tampering.
Operating risk	<ul style="list-style-type: none">▪ Customer responsible for replacement of ONT batteries.
Network and interface risk	<ul style="list-style-type: none">▪ Customer responsible for consequences of any network activity prohibited by the law or by the ISP User Agreement.
Financial risk	<ul style="list-style-type: none">▪ By law, O&M costs and cost overruns are passed to the taxpayer; MLP can incur debt and will pass obligations to taxpayer; risk of default and bankruptcy are passed to taxpayer.
Force majeure risk	<ul style="list-style-type: none">▪ MLP passes to taxpayers risk on all non-insurable force majeure events which may disrupt service.
Asset ownership risk	<ul style="list-style-type: none">▪ As taxpayers and subscribers, risk of technology obsolescence. Risk mitigated to some extent by limited term of contract with ISP.

Verizon/Eversource Risks



Risk category	Description/Notes
Site risk	Tree trimming necessitated by pole attachments (and possible cost-sharing for tree trimming required by adverse weather events).
Operating risk	Risk of weather-related damage to poles (shared with MLP)
Financial risk	Uncontrollable costs related to pole maintenance

Insurance Company Risks

Risk category	Description/Notes
Force Majeure risk	Company assumes all insurable Force Majeure risk.

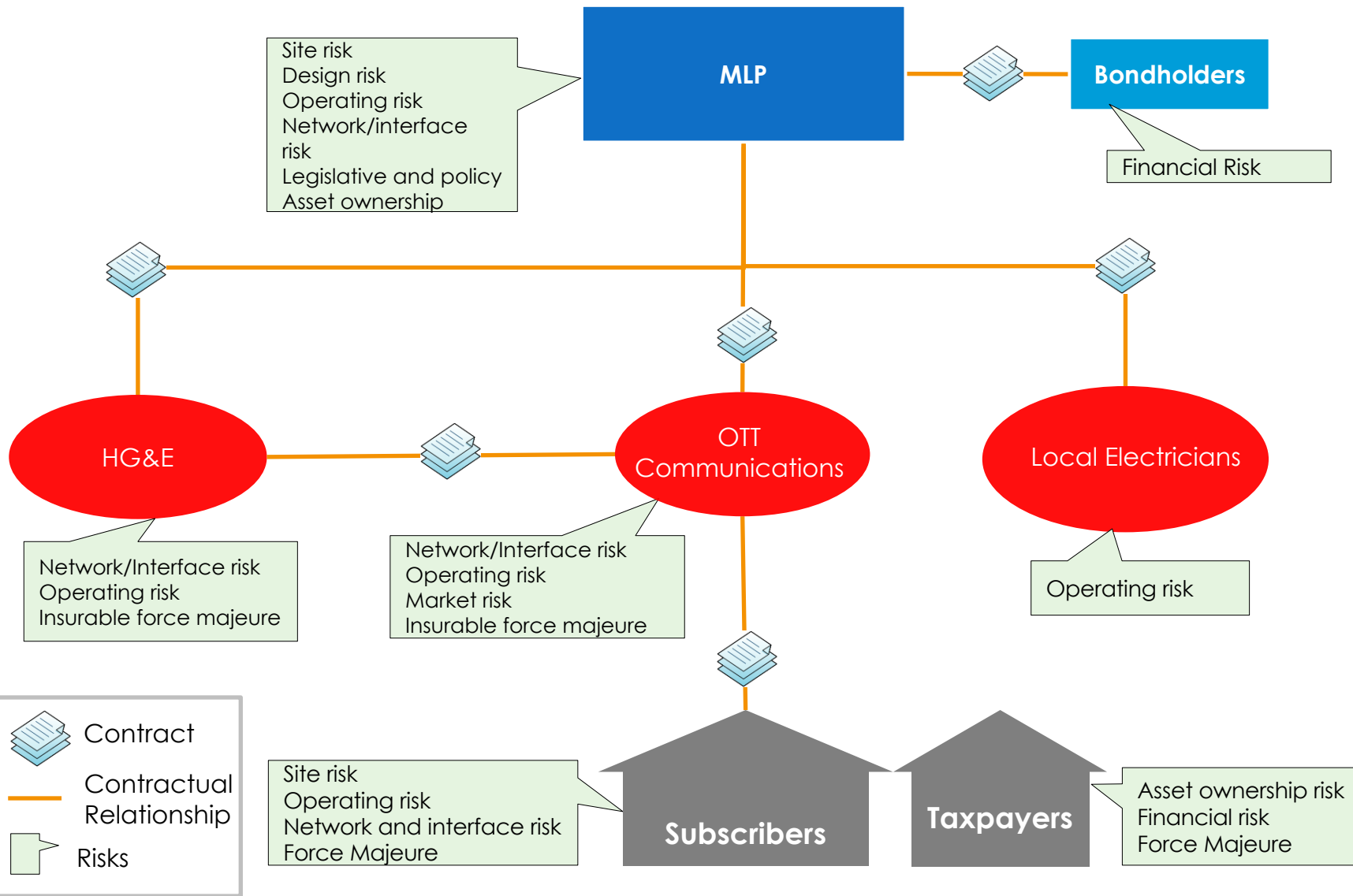
Electrician Company Risks

Risk category	Description/Notes
Operating risk	Operating risk associated with installation/repair

Allocation of Risk



Operations



Risk mitigation

How Leverett dealt with the biggest risks



Risk Category	How Town/MLP dealt with risk*
Market risk	<ul style="list-style-type: none"> ▪ Preliminary survey of costs, reliability and speed of service of pre-existing service ▪ High level of support for bond issue to finance network ▪ Aggressive pre-subscription signup campaigns ▪ Diversification: ISP takes some demand risk (risk of customers signing-up and staying with service) because the MLP fee is set annually, based on number of subscribers in previous year
Operating risk	<ul style="list-style-type: none"> ▪ Insurance ▪ Warranties ▪ Diversification: Some operating risks passed to HG&E, ISP and customers
Financial risk	<ul style="list-style-type: none"> ▪ MLP fee (which includes debt service cost on bond) is re-set annually ▪ Diversification: ISP has obligation to pay full MLP fee, regardless of customer demand and payment
Force majeure risk	<ul style="list-style-type: none"> ▪ Insurable force majeure risks passed to insurance companies ▪ Uninsurable force majeure risks passed to taxpayer
Design, construction and commissioning risk	<ul style="list-style-type: none"> ▪ Passed to companies hired for design and construction

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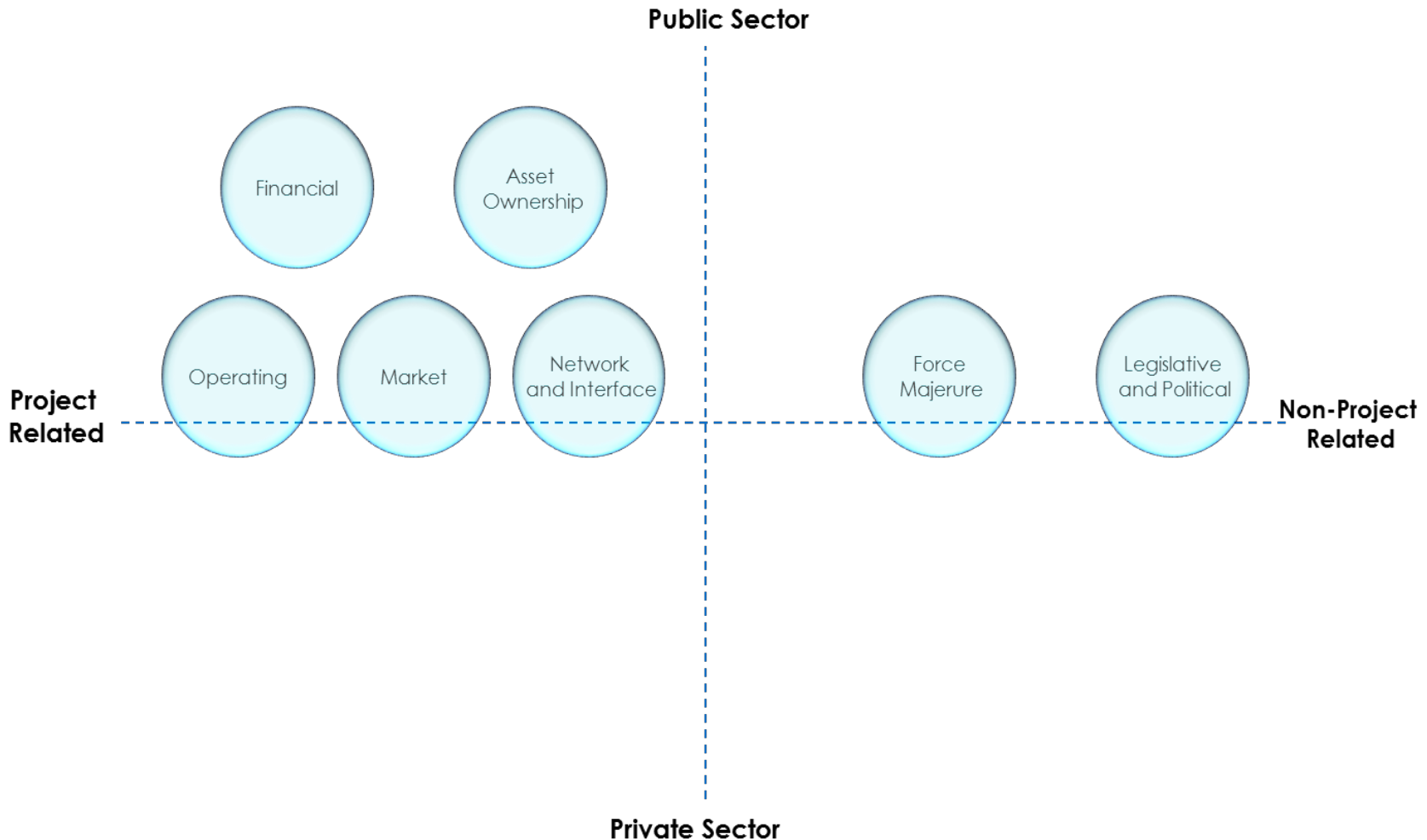
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*Appendix B contains an analysis of how the Leverett Model compares to other models of infrastructure service delivery.

Allocation of Risks



HG&E Contract



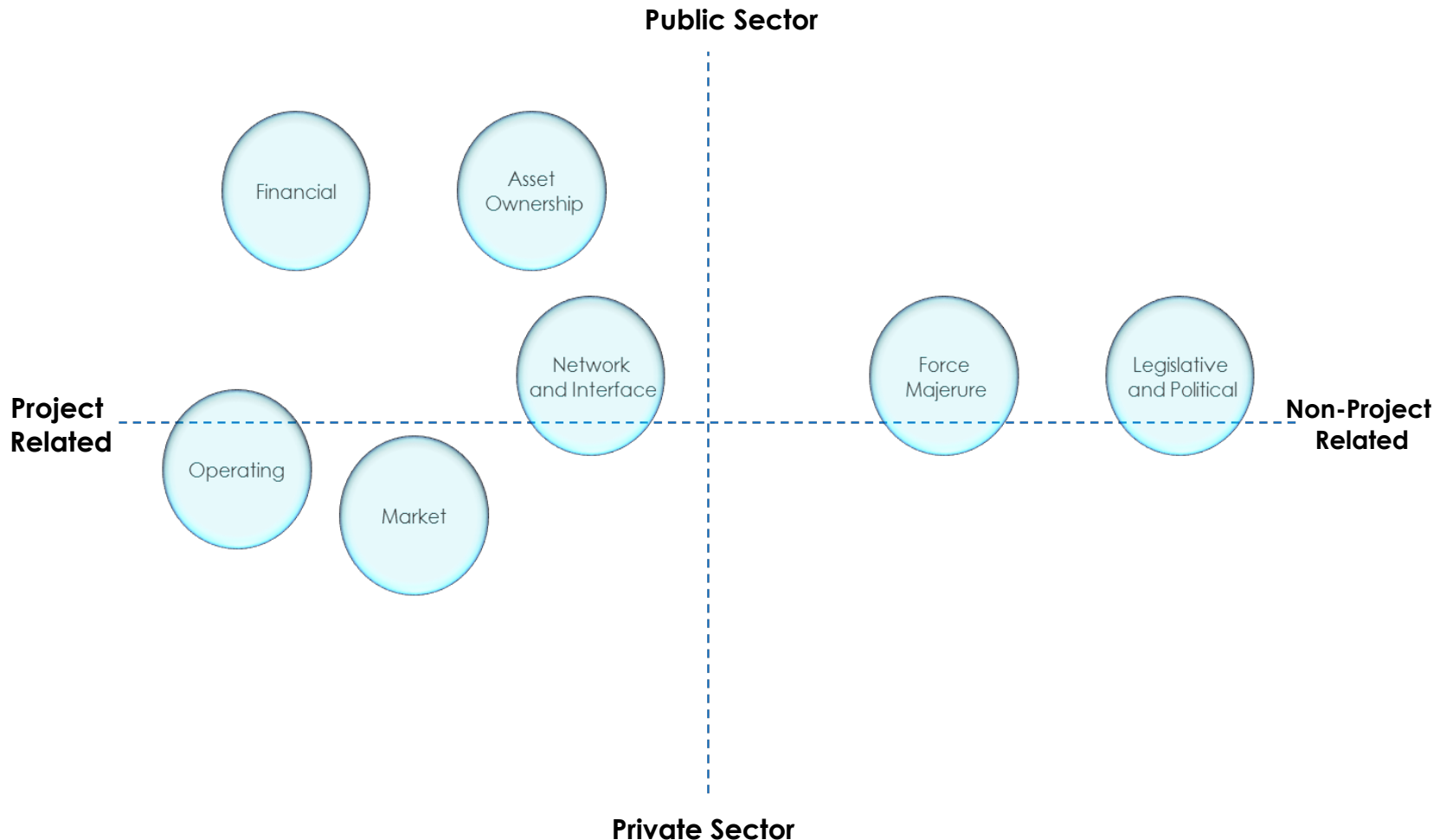
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Allocation of Risks



ISP Contract



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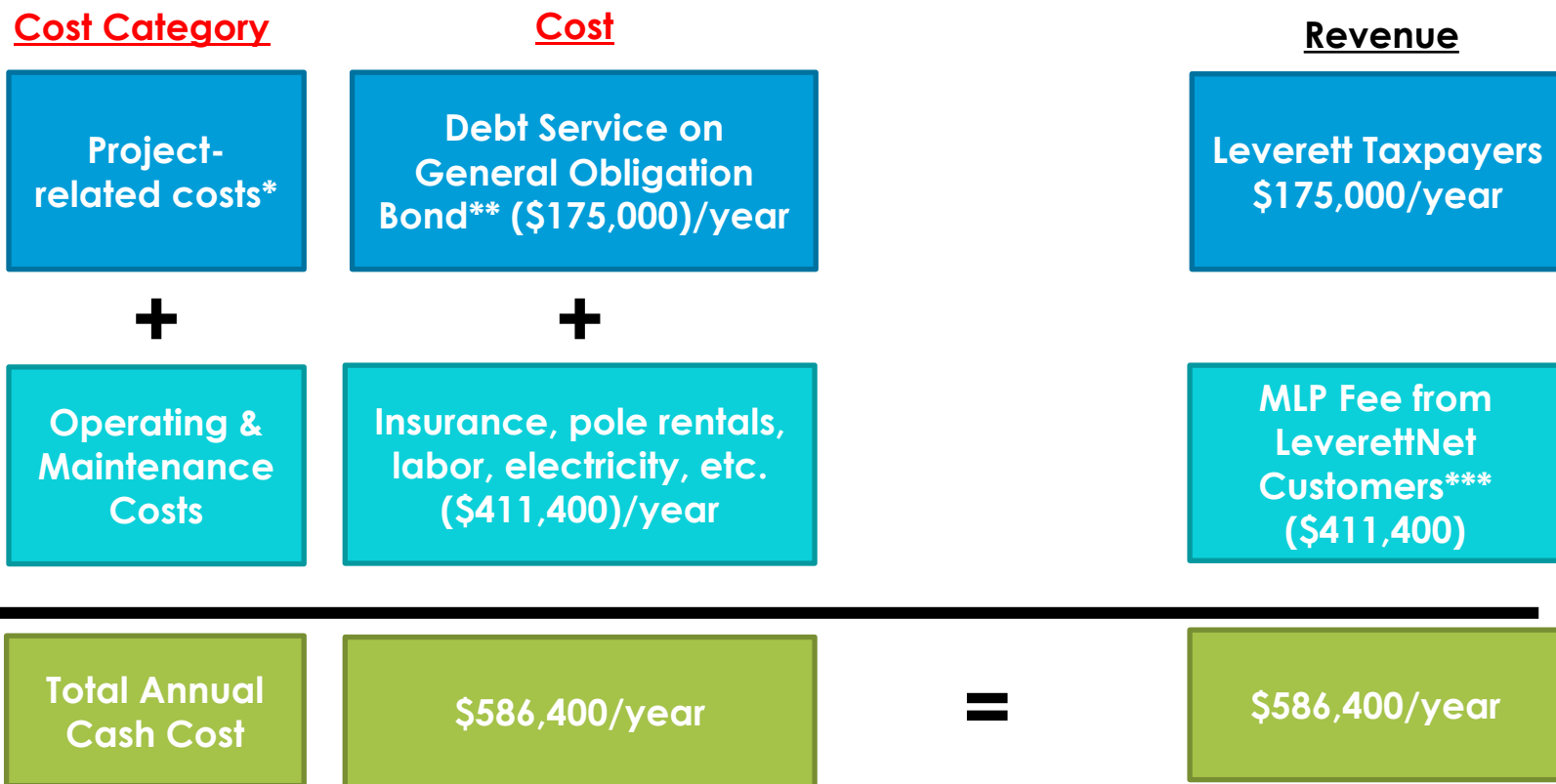
Financial Arrangements





Overview of Costs

Estimated Annual Cash Cost (2016)



*Includes other project costs, such as make ready costs, and police details. See slides on Project-related costs for more details.

**The annual interest rate on the bond, and hence debt service, vary from year to year, between 2% and 4%.

***The MLP fee is a separate charge billed by the ISP, OTT Communications, and transferred to the LMLP. The fee is set to recover network operation and maintenance costs, as determined by the LMLP.

Cost of Service

Project-related Costs and Funding



<u>Costs</u>	<u>Funding (before bonding)</u>		<u>Funding (after bonding)</u>	<u>Funding (total)</u>
Preliminary Design Cost (\$40,000)	MBI Grant in 2011 \$40,000	MBI Grant in March 2015 \$27,700	MBI Grants July-Sept 2015 \$738,300*	MBI Grants \$806,000
+		+	=	+
Construction & related costs (\$3,645,049)	Revenue Anticipation Notes			Pre-subscription revenue \$26,817
+				+
Other start-up costs (\$48,685)				General Obligation Bond \$2,900,917
Total Project Costs (\$3,733,734)				Total Funding \$3,733,734

*MBI paid an additional \$100,000 after the Town issued the General Obligation Bond. This funding will be applied to reduce the Town's debt service on the municipal bond, in accordance with the terms of the Leverett Town Meeting bond authorization vote.

Cost of Service

Total Project Costs



Expense Item	Cost (USD)
Preliminary design (G4S)	40,000
Construction (MCG)	2,592,593
Contract with HG&E	207,000
Application fee to Eversource	66,150
Application fee to Verizon	20,521
Additional pay to Verizon	6,313
Application fee to National Grid	2,239
Verizon Conduit search	1,029
Modular Building construction	264,360
Make ready costs	327,577
Police details	107,000
Bond	8,400
Other insurance	400
Advertising	628
Legal	20,060
Grants consultant	6,500
Miscellaneous – postage	469
Printing costs	2,353
POP Electricity	1,364
Auditor	1,800
UTC membership	500
Tree work	6,250
Website	807
Fire extinguishers at PoPs	736
Other start-up costs	48,685
Total committed or spent	3,733,734

Cost of Service

Budgeted Operating and Maintenance Costs



Expense Item	Cost (USD)
Depreciation of fiber plant*	99,000
Depreciation of electronics*	60,000
PURMA dues	1,300
Insurance	23,400
Bond fee for poles	4,200
Pole rental	12,000
Auditor	6,200
General Administration	2,500
Maintenance	75,000
Network operator	82,800
Legal	5,000
POP electricity	5,000
Contingency**	35,000
Total OPEX	411,400

*MGL Chap 164 Sec. 57 requires that the MLP collect revenue to cover depreciation and deposit the revenue in a separate fund used only for asset renewals.

**MGL Chap 164 Sec. 58 allows recovery of a return of up to 8% of the cost of the plant. Leverett has instead opted to recover an amount equal to roughly 3% of operating costs, as a contingency (well below the 8% allowed return on assets).

Appendix A

- Risk Definitions & Concepts
 - Categories of Risk



Risk: Definitions and concepts



- ‘Possibility of loss or injury’ (Merriam-Webster)
- ‘The chance of an event occurring which would cause actual project circumstances to differ from those assumed when forecasting project benefit and costs.’ (Partnerships Victoria, Australia)*
- Risk allocation = risk diversification

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* Chris Furnell, Risk identification and risk allocation in project finance transactions, paper presented at the Faculty of Law, The University of Melbourne, May 2000, p. 1.

Categories of risk*



Risk Category	Definition
<p>Site risk</p>	<ul style="list-style-type: none"> ▪ Risk that the project land will be unavailable or unable to be used at the required time, in the manner or at the cost anticipated, or that the site will generate unanticipated liabilities, with the result that the contracted service delivery and/or projected revenues are adversely affected.
<p>Design, construction, and commissioning risk</p>	<ul style="list-style-type: none"> ▪ Risk that the design, construction or commissioning of the facility or certain elements of each of these processes, are carried out or not carried out in a way which results in adverse cost and/or service delivery consequences. The consequences if the risk materializes may include delays and/or cost increases in the design, construction and commissioning phases, or design or construction flaws which may render the infrastructure inadequate for effective service delivery, either immediately or over time.
<p>Sponsor risk</p>	<ul style="list-style-type: none"> ▪ Where the SPV and/or its sub-contractors are unable to fulfil their contractual obligations to government, risk that government will be unable to enforce those obligations against the sponsors or recover some form of compensation or remedy from the sponsors for any loss sustained by it as a result of the SPV's breach ▪ Risk that the sponsor(s) is, for security or other probity reasons, inappropriate or unsuitable to be involved in, or (through the private party) connected with, the delivery of a project, and in so being may harm the project or bring it into disrepute.
<p>Financial risk</p>	<ul style="list-style-type: none"> ▪ Risk that the financiers (debt and equity) will not provide or continue to provide funding to the project (risk of financial uncertainty) ▪ Risk that financial parameters will change prior to the private party fully committing to the project, potentially adversely affecting price (financial parameter risk) ▪ Risk that the financial structure is not sufficiently robust to provide fair returns to debt and equity over the life of the project (and hence calls into question the continuing viability of the project) (risk of robustness of financial structure).
<p>Operating risk</p>	<ul style="list-style-type: none"> ▪ Risk that the process for delivering the contracted services — or an element of that process (including the inputs used within or as part of that process) — will be affected in a way which prevents the private party from delivering the contracted services according to the agreed specifications and/or within the projected costs.

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* Partnerships Victoria, Australia

Categories of risk* (continued)



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Risk Category	Definition
Market risk	<ul style="list-style-type: none"> ▪ Risk that demand for a service will vary from that initially projected ▪ Risk that price for a service will vary from that initially projected, so that the total revenue derived from the project over the project term varies from initial expectations.
Network Risk	<ul style="list-style-type: none"> ▪ Risk that the network(s) needed for the private party to deliver the contracted services will be removed, not adequately maintained or otherwise changed — including being extended to include additional infrastructure or services not foreseen or anticipated at the date of the contract — in a way that either prevents or frustrates the delivery of the contracted services, affects the quality of the specified outputs or in some other way affects the viability of the project.
Interface risk	<ul style="list-style-type: none"> ▪ Interface risk is the risk that the method or standard of delivery of the contracted services will prevent or in some way frustrate the delivery of the core services or vice versa.
Industrial relations risk	<ul style="list-style-type: none"> ▪ Industrial relations risk is the risk of any form of industrial action — including strikes, lockouts, work bans, work-to-rules, blockades, picketing, go-slow action and stoppages — occurring in a way which, directly or indirectly, adversely affects commissioning, service delivery or the viability of the project.
Legislative and government policy risk	<ul style="list-style-type: none"> ▪ Risk that government will exercise its powers and immunities, including but not limited to the power to legislate and determine policy, in a way which negatively impacts on or disadvantages the project.
Force majeure risk	<ul style="list-style-type: none"> ▪ Risk that a specified event entirely outside the control of either party will occur and will result in a delay or default by the private party in the performance of its contractual obligations.
Asset ownership risk	<ul style="list-style-type: none"> ▪ Risk that events such as loss events, technological change, construction of competing facilities or premature obsolescence will occur, with the result that the economic value of the asset may vary, either during or at the end of the contract term, from the value upon which the financial structure of the project is based.

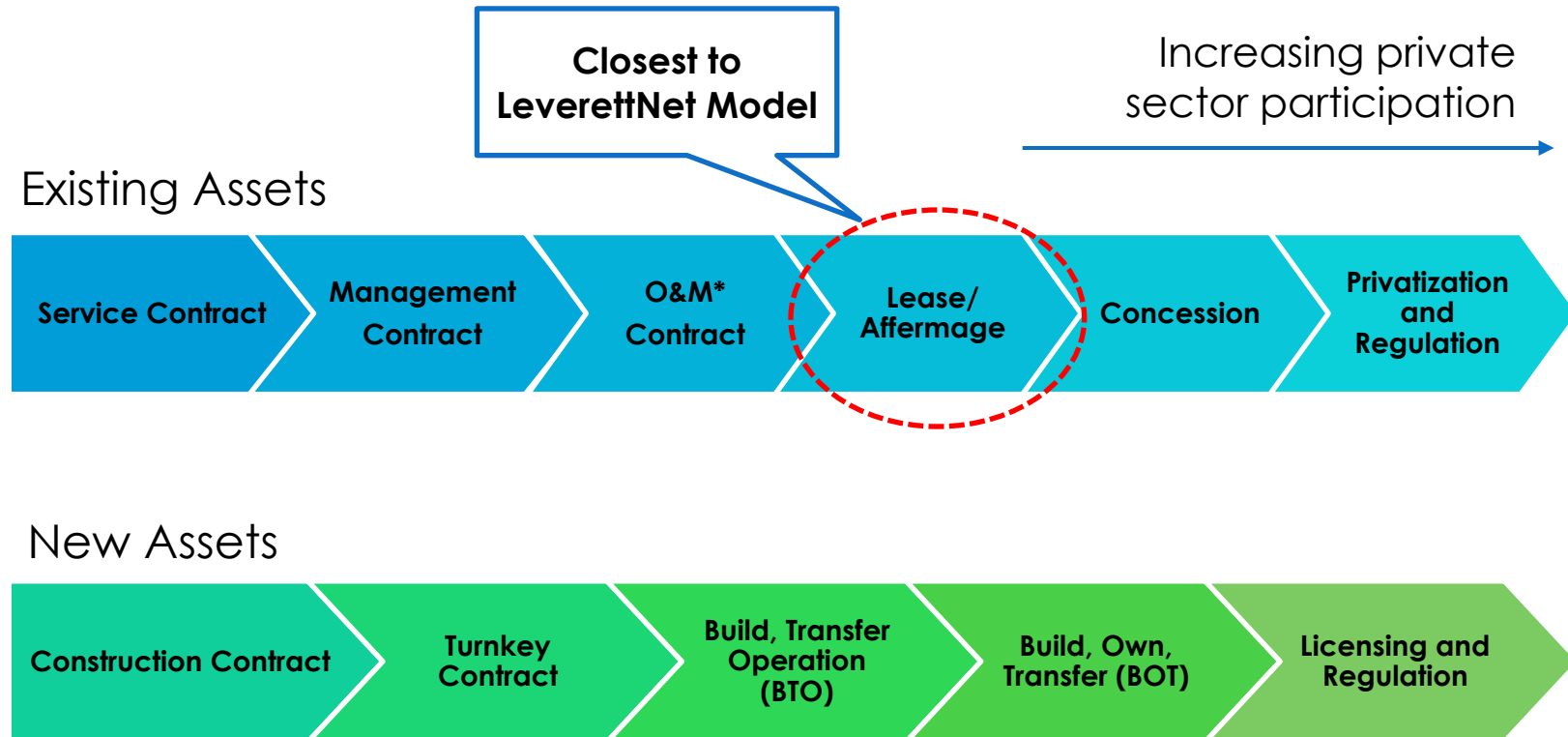
* Partnerships Victoria, Australia

Appendix B

The “Leverett Model” in context: Comparisons to global practice in infrastructure service delivery



Standard Arrangements for Infrastructure Service Delivery



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Allocation of Responsibilities in Infrastructure Service Delivery



Closest to LeverettNet Model

Functions	Public	Public Private Partnerships			Private
	Corporatized Public Entity	Management Contract	Lease or Affermage Contract	Concession Contract	Divestiture (Privatization)
Who owns the assets?	Public entity	Public entity	Public entity	Public entity	Private Company
What is the private operator's responsibility?	Managing the operating area	Managing the operating area	Providing utility service	Providing utility service	Providing utility service
Who receives the tariff revenue?	Public entity	Public entity	Private company receives part of tariff to cover O&M; Public entity receives part of tariff to cover capital costs	Private Company	Private Company
How is the private operator remunerated?	N/A	Fixed monthly or annual fee + incentive payments	Operating profit	Total profit	Total profit
Which risk does the private operator bear?	N/A	Loss of remuneration	Risk related to operations and/or demand†	Most risk of service provision (operations and investment)	All risk of service provision (operations and investment)
Who employs the staff?	Public entity	Public entity	Private Company	Private Company	Private Company
Who is responsible for capital expenditure?	Public entity	Public entity‡	Public entity‡	Private Company	Private Company
What is the typical term?	Perpetual	2-5 years	10-15 years	15-30 years	Perpetual

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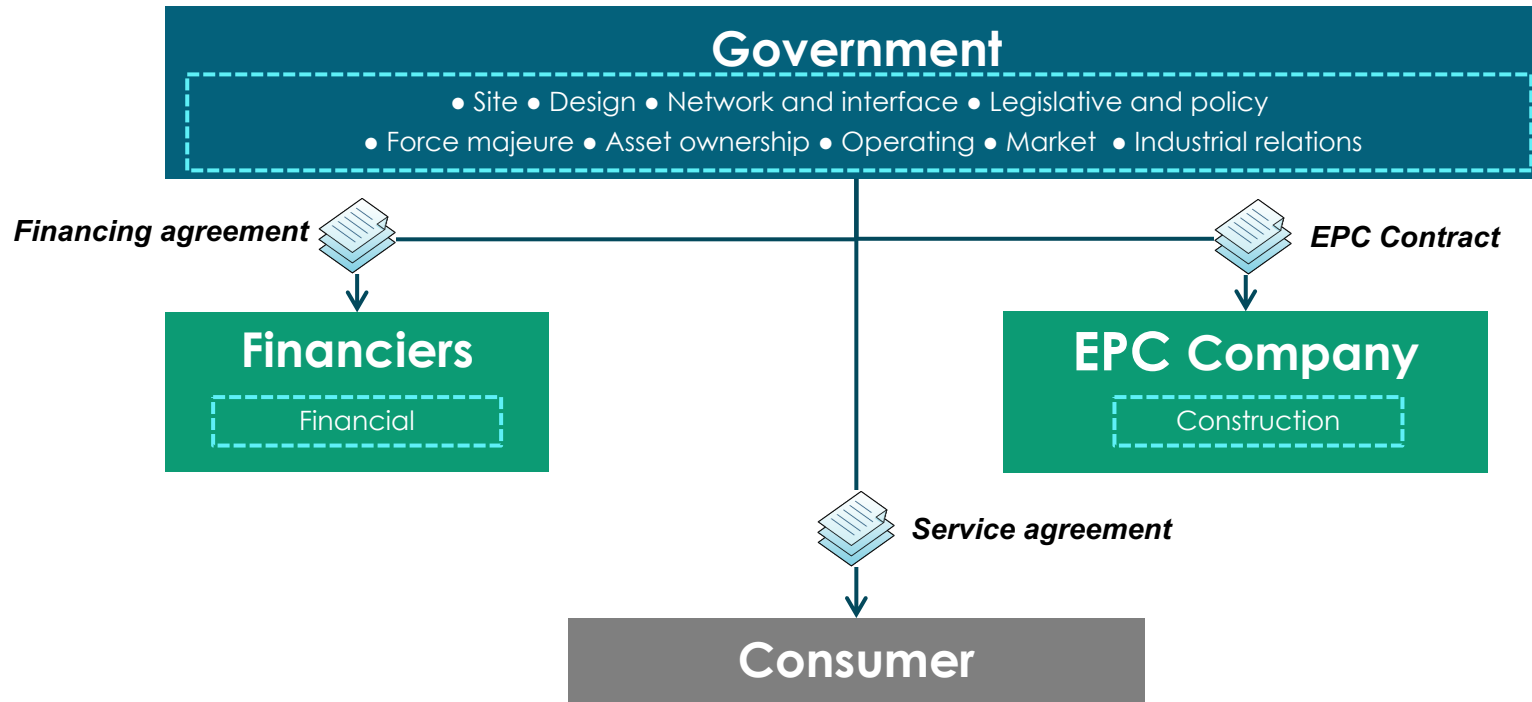
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† Demand risk differs between lease and affermage contracts.
‡ The outside operator may manage implementation.

Source: Adapted from United Nations Economic and Social Commission for Asia and the Pacific (ESCAP): A Primer to Public-Private Partnerships in Infrastructure Development
http://www.unescap.org/ttdw/ppp/ppp_primer/221_basic_features_of_ppp_models.html

Indicative Risk Allocation

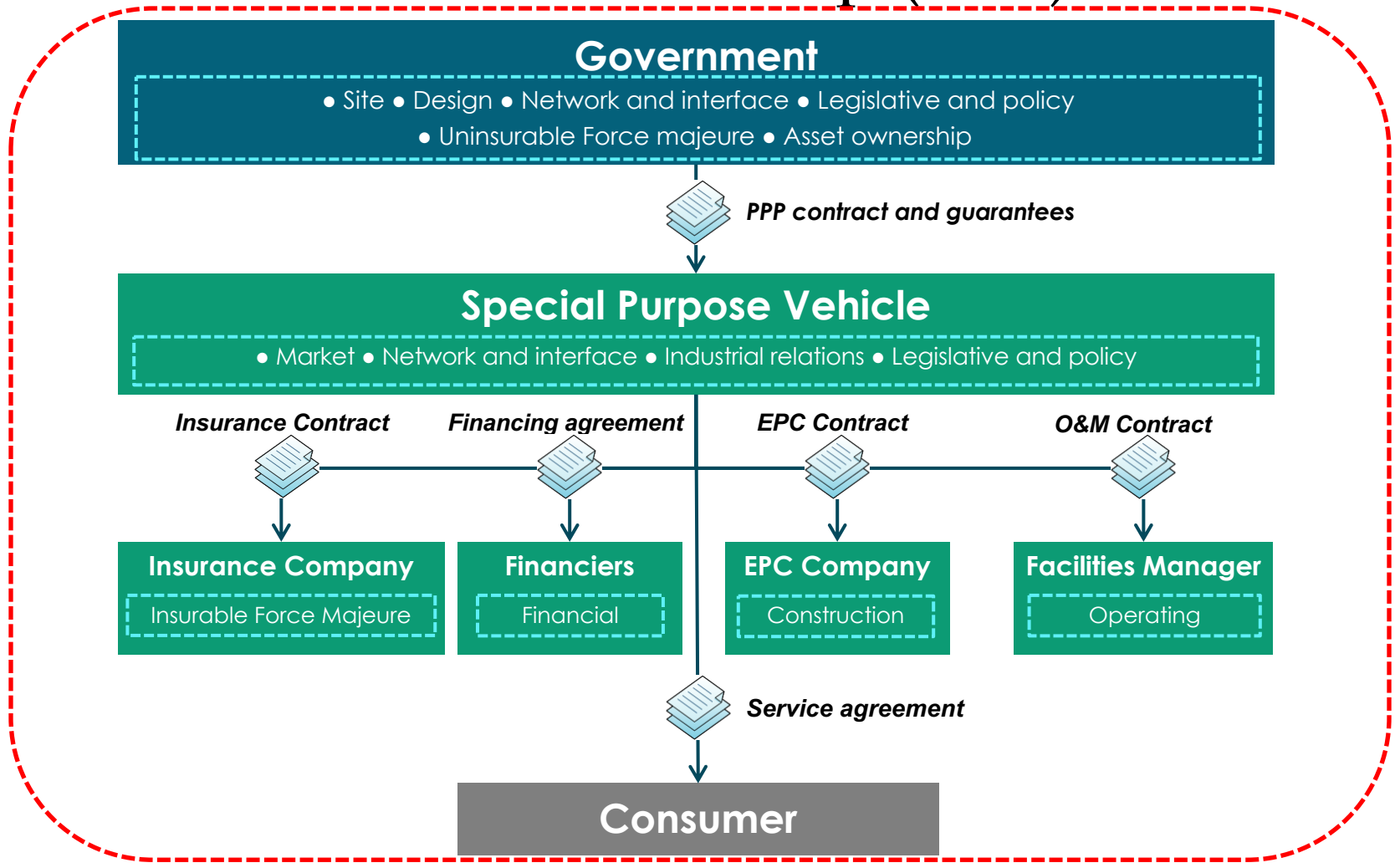
Public sector infrastructure project



Indicative Risk Allocation

Public Private Partnership (PPP)

Closest to LeverettNet Model



Appendix C

Glossary of Acronyms & Abbreviations



Glossary of Acronyms & Abbreviations



Acronym/Abbreviation	Meaning
CAPEX	Capital Expenditure
CPE	Customer Premises Equipment
GOB	General Obligation Bond
EPC	Engineering, Procurement and Construction
HG&E	Holyoke Gas & Electric
IFB	Invitation for Bid
ISP	Internet Service Provider
LMLP	Leverett Municipal Light Plant
MA	Massachusetts
MBI	Massachusetts Broadband Institute
MCG	Millennium Communications Group, Inc.
MGL	Massachusetts General Law
MLP	Municipal Light Plant
O&M	Operations and Maintenance
ONT	Optical Network Terminal
OPEX	Operating Expenditure
PoP	Point-of-Presence
PPP	Public-Private Partnership
PURMA	Public Utilities Risk Management Association
RFP	Request for Proposals
SPV	Special Purpose Vehicle