CostQuest's Modeling Approach
USF and CACM/CAM Overview

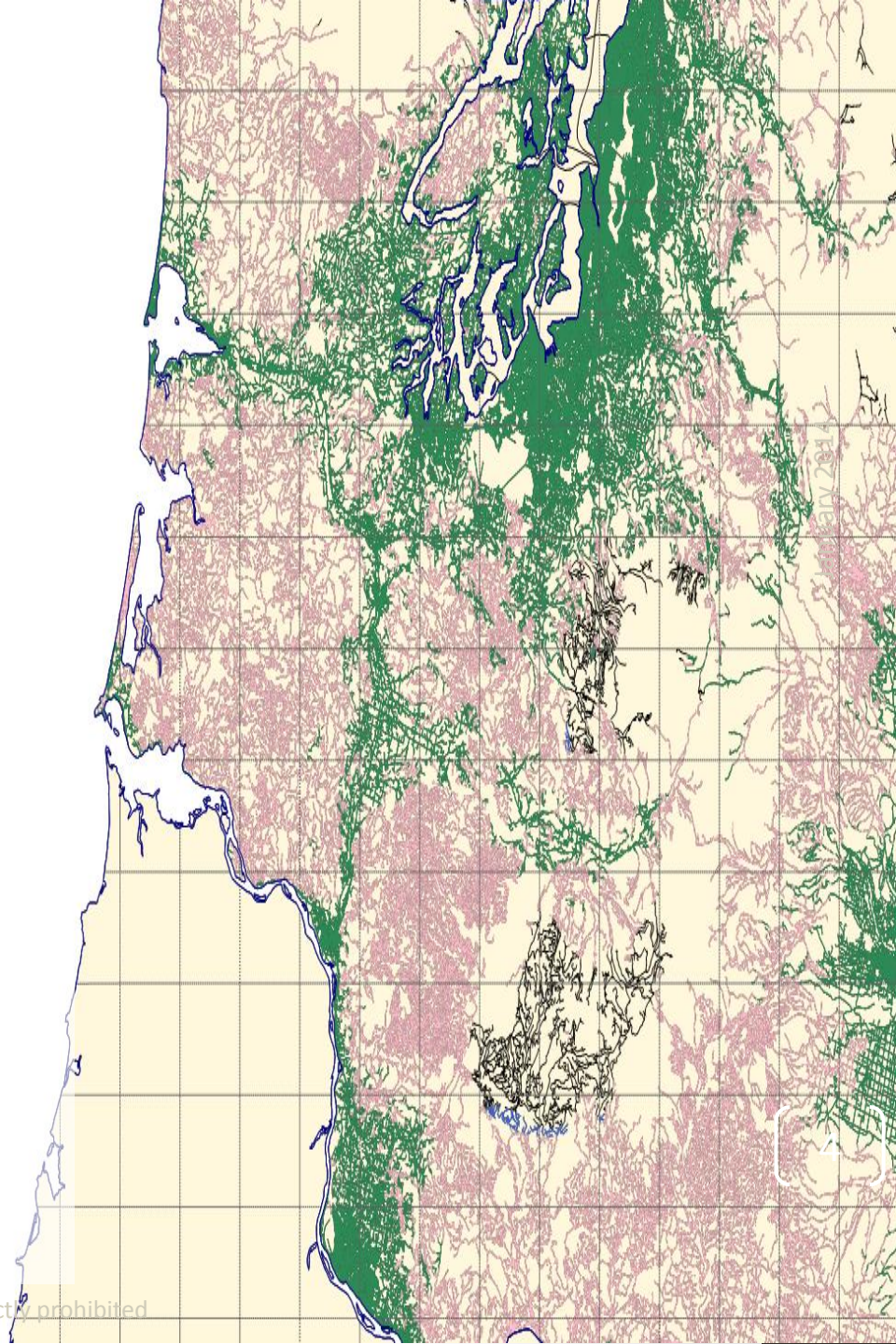CostQuest Associates

January 2014

Agenda

- Introduction: CostQuest's Profile
- USF and Broadband Deployment
- US Broadband Landscape
- USF Models: Overview of CACM
- Business Case and Profitability Analysis
- Q&A

January 2014

2

COSTQUEST INTRODUCTION

Introduction

CostQuest Associates
Corporate Profile

- Internationally recognized as leading telecommunication network modeling, costing and profitability experts

- Global experience in developing, supporting regulatory and competitive practices

Introduction

CostQuest Associates

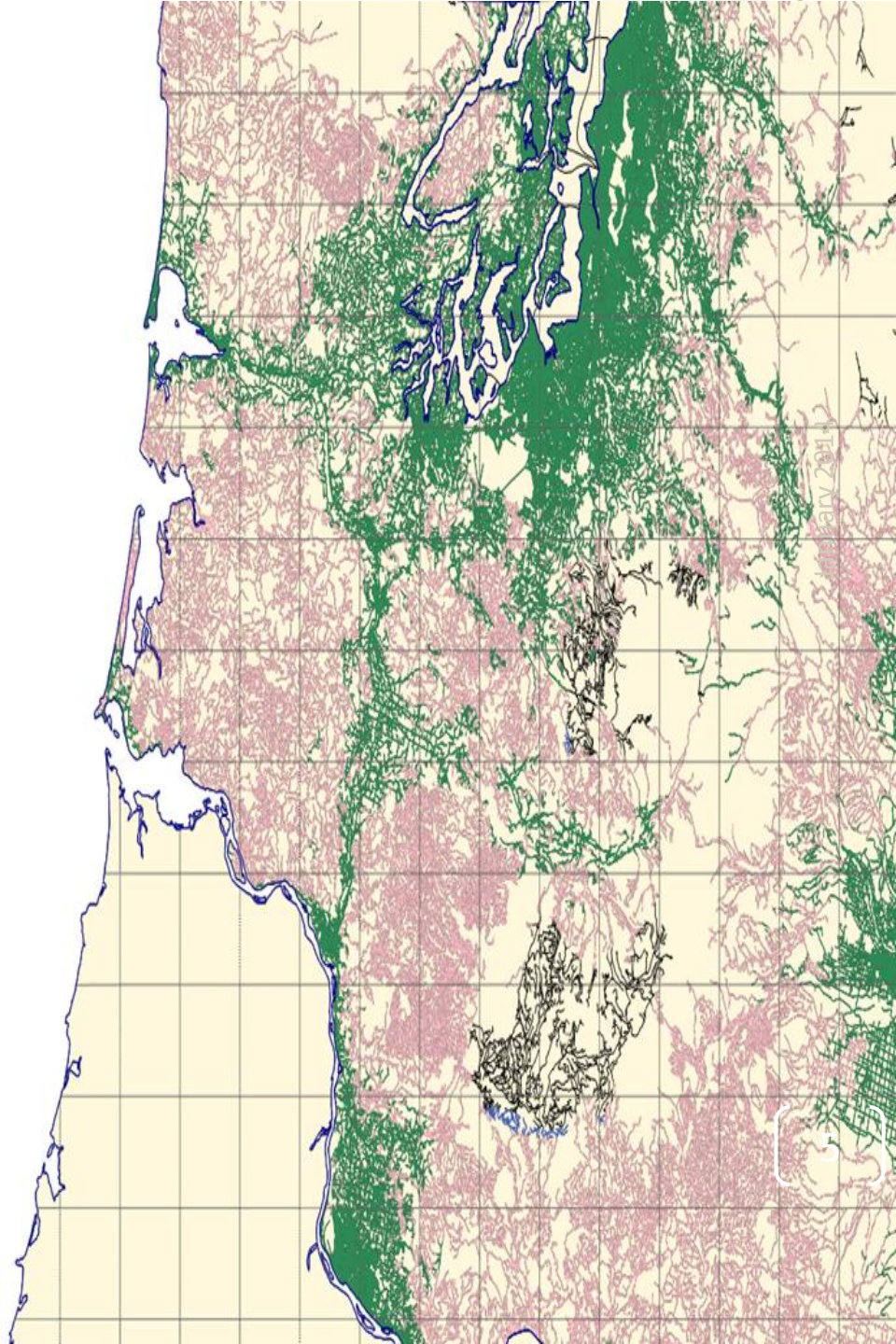**Corporate Profile**

Cincinnati – Seattle – Washington D.C.

Formed in 1999

Partners: 4

Employees: 16+

Core Competencies:

- Economic Network Modeling
- Mapping/GIS
- Regulatory Support
- Valuation/Costing
- Profitability
- Expert Testimony

Introduction

CostQuest Associates
Corporate Profile

Model Products/Services
- Wireline Models
    - CQ Landline (CQLL)
    - CQ Middle Mile (CQMM)
    - Connect America Cost Model (CACM)
    - CQUSF – State USF Model

- Wireless Models
    - CQ Wireless
    - CQ FixedWireless

- Valuation and Appraisal
    - CQ Landline RCN
    - CQ Wireless RCN

- Business case and Profitability
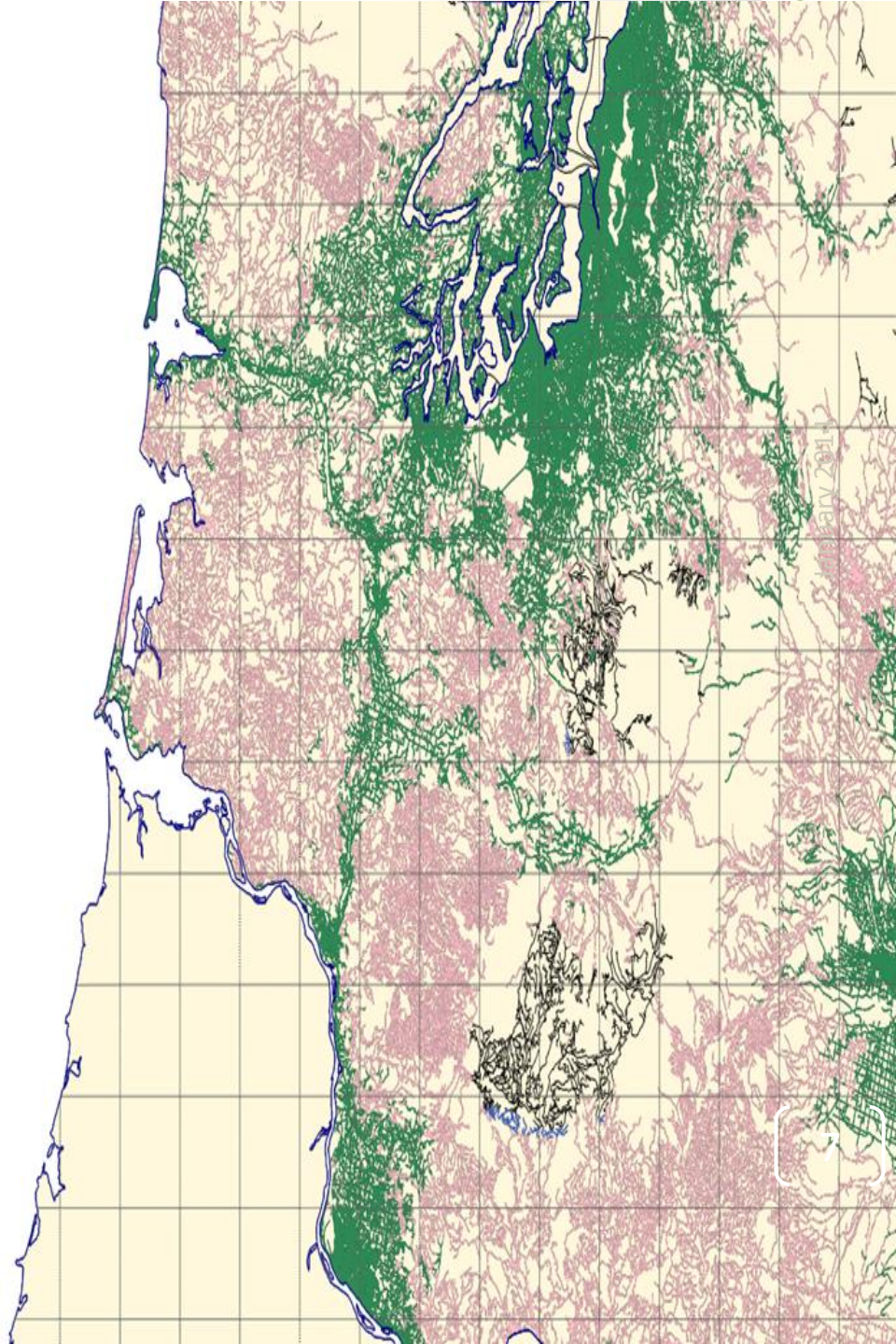   - Gigabit Cities
    - COMPASS
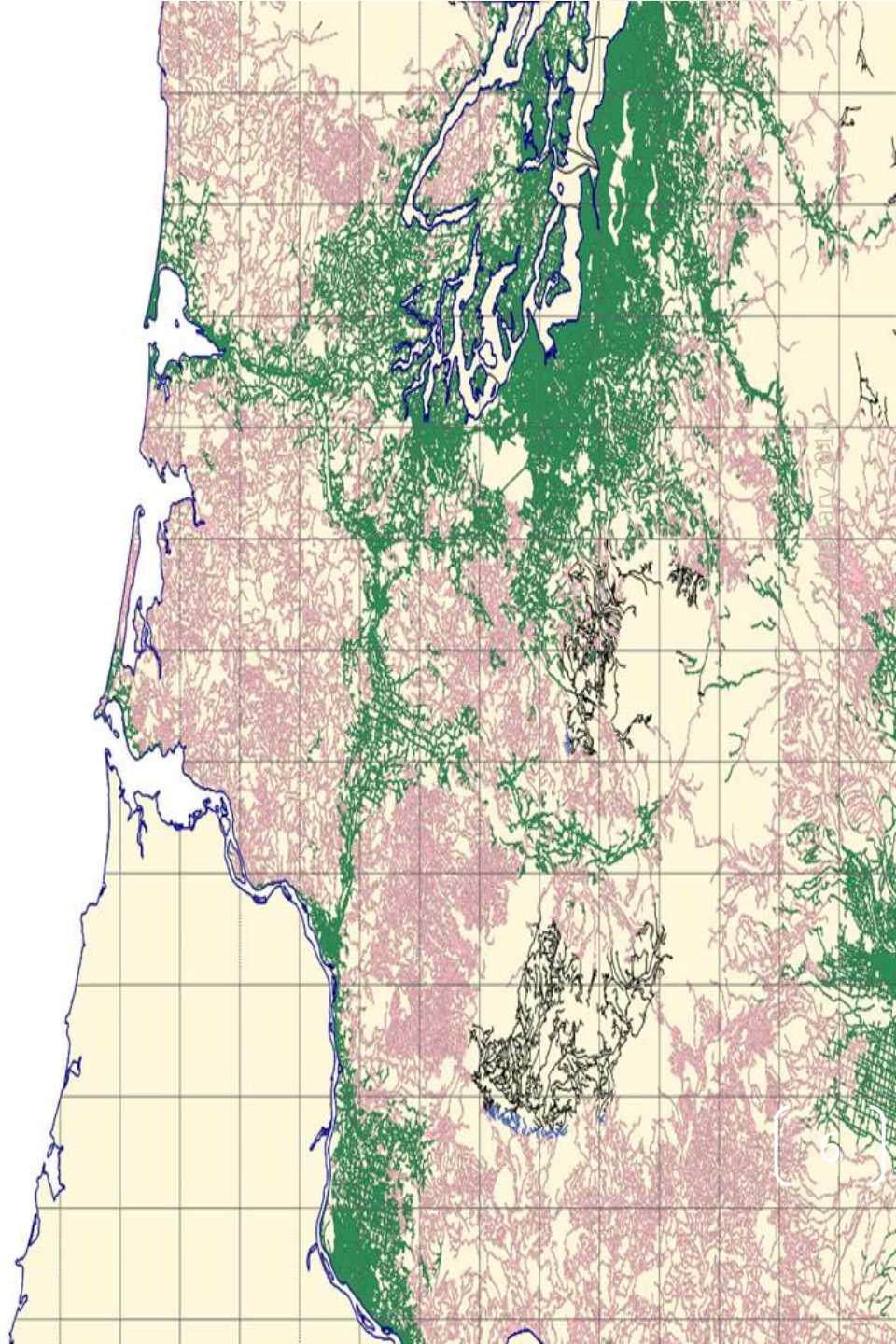
Introduction

CostQuest Associates
Corporate Profile

Other Products/Services
- GIS/Mapping

- Online Tools
  - Bandwidth Assessment Tool
  - Mapping Analysis Tool

- Auction Toolset

- CostQuest's Data Pantry

Introduction

**CostQuest Associates
Corporate Profile**

Notable Projects

- Broadband and USF models: BAM used by FCC for NBP, CACM being used as national CAF/USF model, CPM California, CPM Hong Kong, BCPM, NUSC Australia, CostPro-Core New Zealand
- RCN and Loop models: CostPro in use by carriers with operations in all 50 states, well received by commissions in all Pricing efforts and in UNE and Tax proceedings
- Wireless Costing: Wireless Models NTIA, CTIA, Wireless Carriers
- Wireless Work: USAC Filings, Audits and Reviews, USAC/USF Workshops, GIS Analysis, Policy Support, USF Auctions
- Interconnection model: CostPro-Core in use by the New Zealand Commerce Commission to set rates
- Profitability models: COMPASS, MAPS, ProfitMap, CPMS, and MIDAS – economic based contribution models over various business dimensions

Client Mix
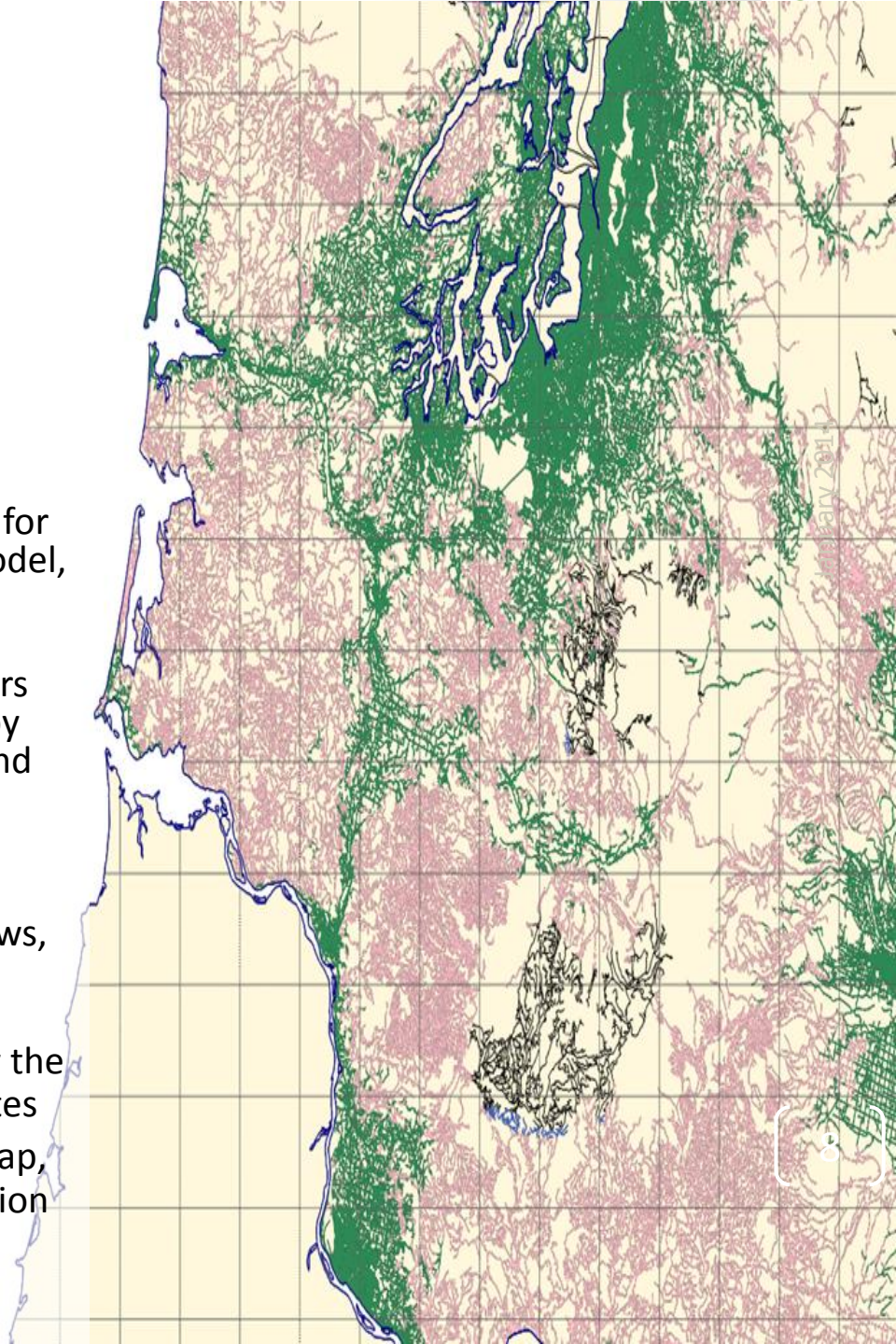
Telecom/Broadband Clients

LARGE TELECOMS
AT&T
Verizon
Qwest/CenturlyLink
Cincinnati Bell
Embarq/Sprint

CABLE PROVIDERS
Comcast
Time Warner

RURAL PROVIDERS
Frontier Communications
Consolidated
Windstream
Iowa Telecom

AND OTHERS

Wireless

LARGE MOBILE PROVIDERS
AT&T Mobility
Verizon
T-Mobile
U.S. Cellular

RURAL WIRELESS PROVIDERS and Others
Alltel
ATNI
TWN
Western Wireless
Bluegrass Cellular
M3 Wireless
Commnet

AND OTHERS

Government

Federal Government
Federal Communications Commission
USAC
U.S. Department of Commerce
NTIA

State Government
State of Alabama
State of California
State of Idaho
State of Wisconsin
State of Wyoming

International Government
New Zealand Commerce Commission
Australia Commerce Commission
Government of Hong Kong

Other Clients/Partners

McKinsey & Company
LR Kimball
Bernstein Researh
Duff and Phelps
Parsons Applied Economics
University of Florida
University of Wisconsin
University of Alabama
University of Idaho
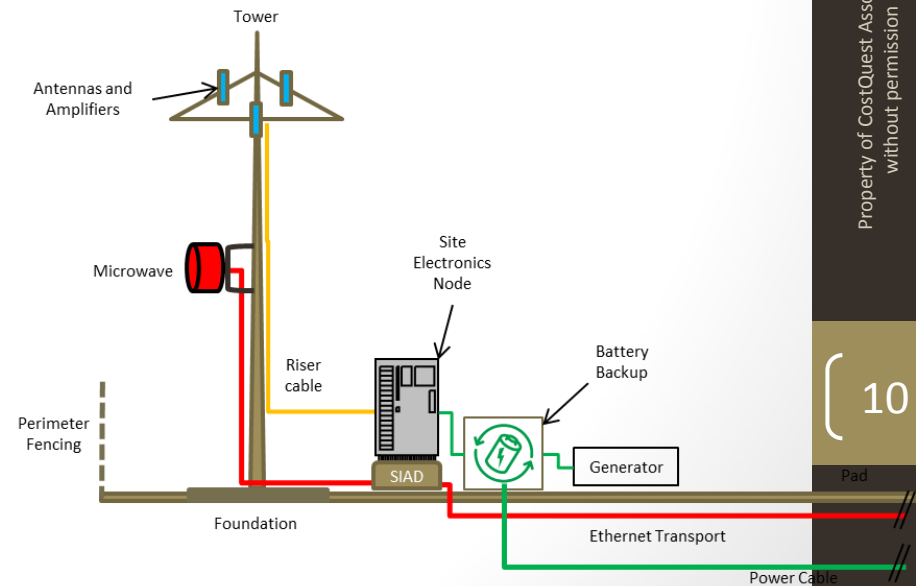KeyTech/Bermuda
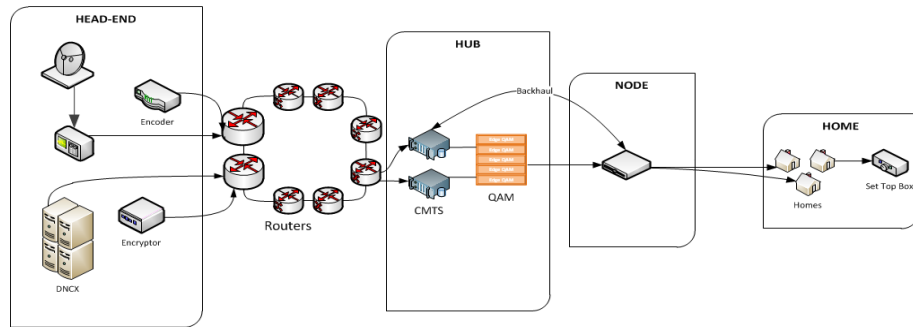The Enterprise Group
VisionTech 360
The EdLab Group
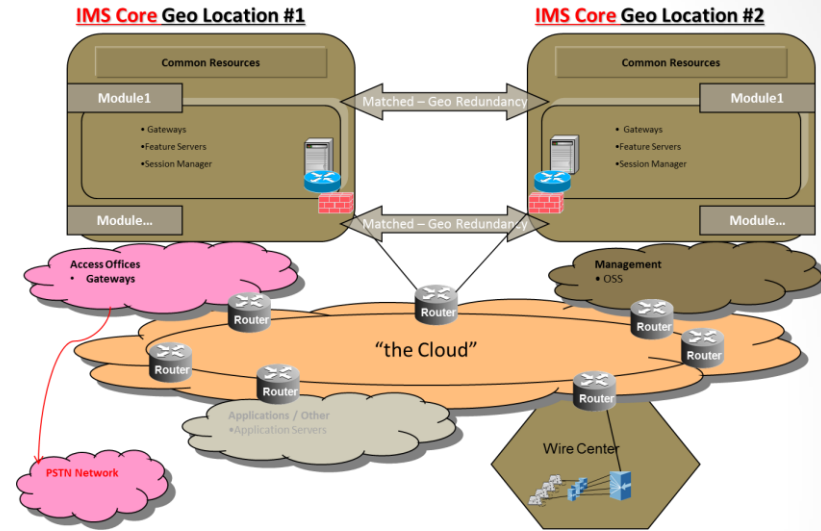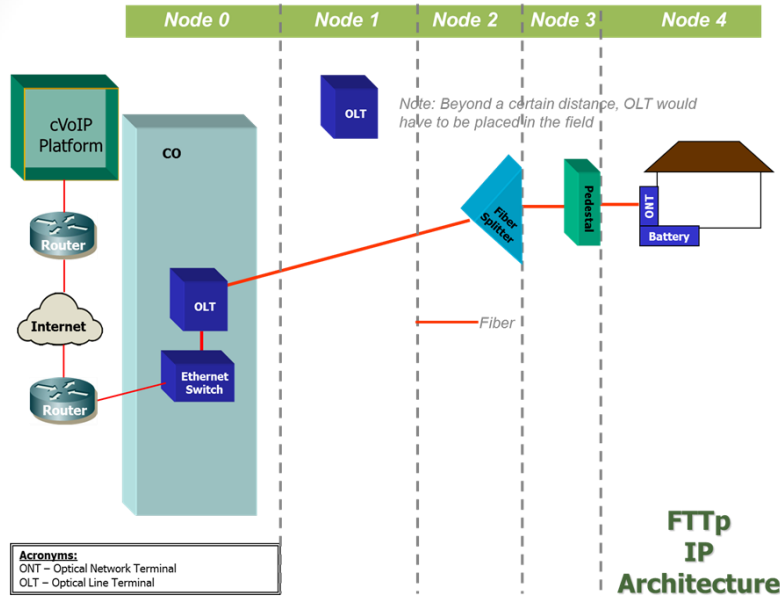City of Cincinnati

AND MANY OTHERS

January 2014

9

Network Experts

FTTp
IP
Architecture

Acronyms:
ONT – Optical Network Terminal
OLT – Optical Line Terminal

January 2014

10

Pad

USF AND BROADBAND DEPLOYMENT

January 2014

11

The Broadband Challenge

- Consumers desire for high quality, low cost, high speed broadband services
- Telecoms need to cover cost, provide a return to shareowners, compete effectively and on a fair basis
- Governments desire to provide for the well being of its citizens, provide an environment that supports economic development, and spend limited public funds in a fair and effective manner

January 2014

Our Experience

- CostProCORE for TSO in New Zealand
  - Model based
  - Annual funding cost in high cost areas
- NUSC Australia
  - Model based
  - Annual funding in high cost areas
- CPM HongKong
  - Model based
  - Annual funding to high cost customers
- BCPM, BAM, CQBAT, CACM in USA
  - Model based
  - Annual funding for high cost areas
  - Initial investment funding
  - Auction Support

Model Benefits

The benefits of a properly developed forward looking economic cost model for universal service and broadband deployment include:
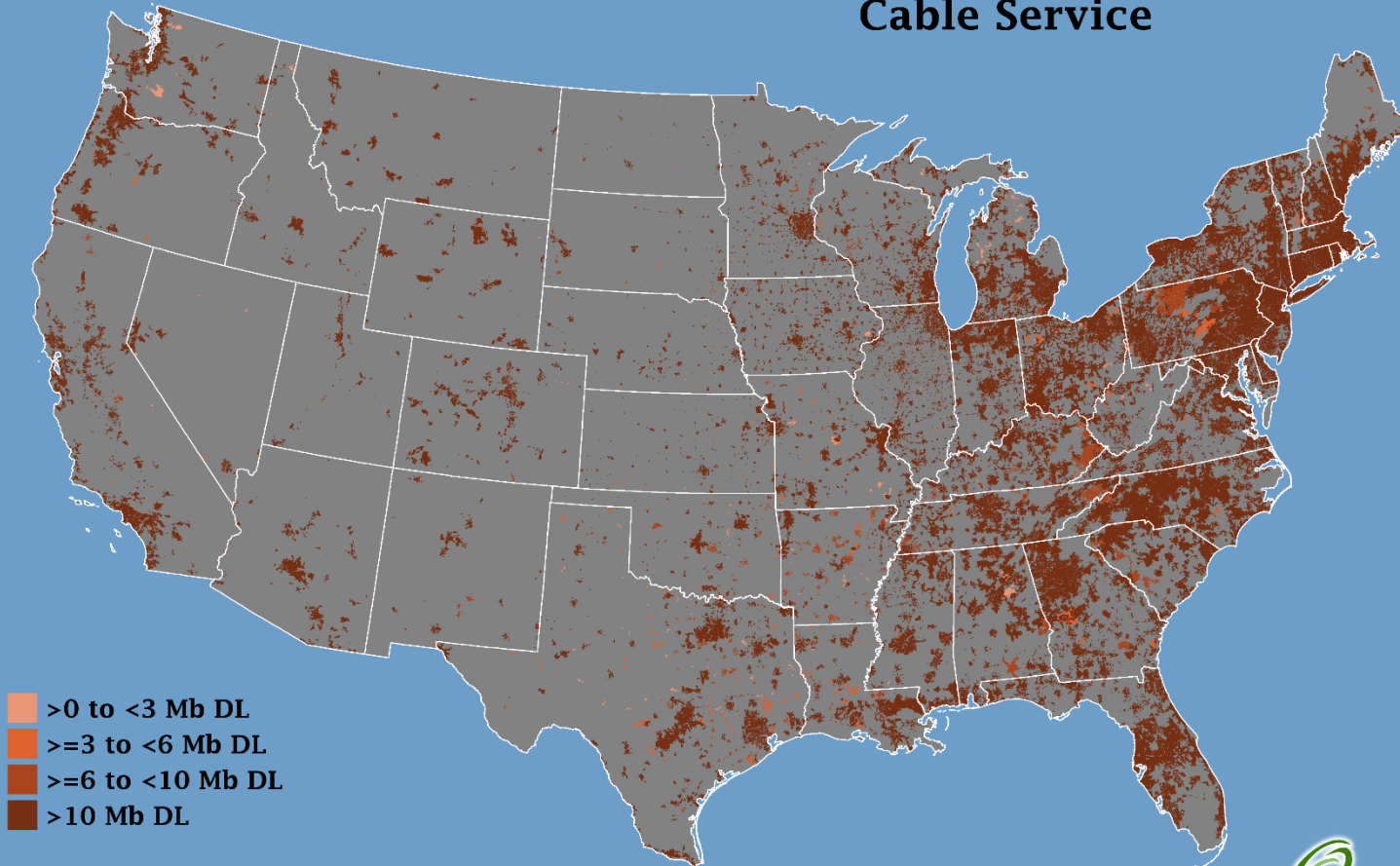
- Clarification of concepts of the efficient provider
- Normalization of participants
- A less onerous process for stakeholders and policy makers
- An avoidance of asymmetric embedded costs mechanisms
- A tool to look at various scenarios in a quick and accurate manner
- Metrics and analytics to examine issues such as
  - Benchmarks, targeting, reserve levels for auctions, service definitional changes, etc..
  - Loan and grant requests
  - Monitoring and measuring
  - Product/Service profitability
- A clear link between defined service and costs developed and the impact of the current and/or future environment (e.g., line loss)
- A tool to inform the dispersal of limited public funds to achieve government desires
- Support for various cost concepts -- LRIC, TSLRIC, Marginal Costs, etc.. – for various uses – funding, pricing, reserve prices, benchmarks, etc..

January 2014

USA BROADBAND LANDSCAPE

January 2014

15

Broadband Coverage
Cable Providers

National Broadband Map - Round 6, June 2012
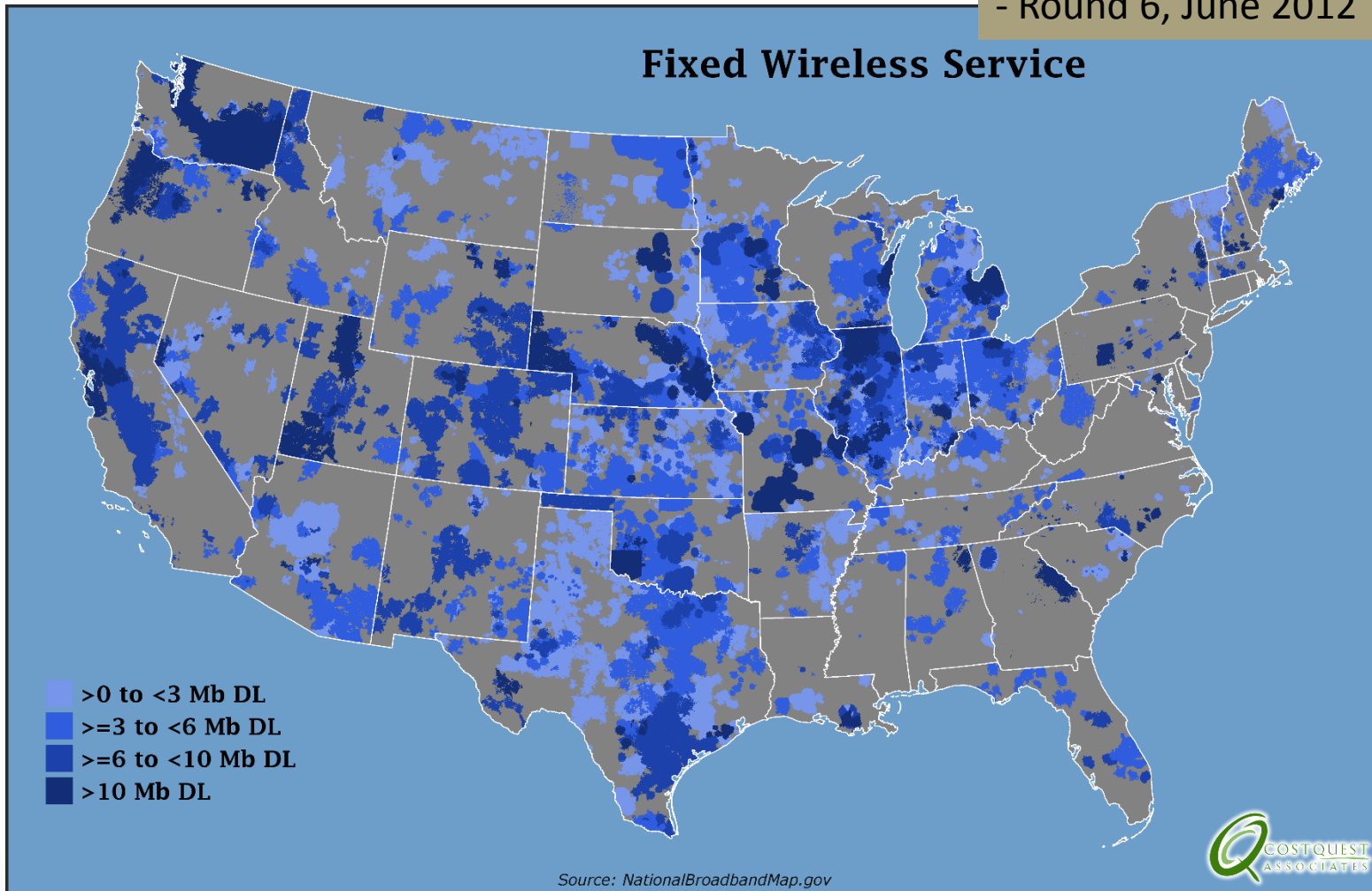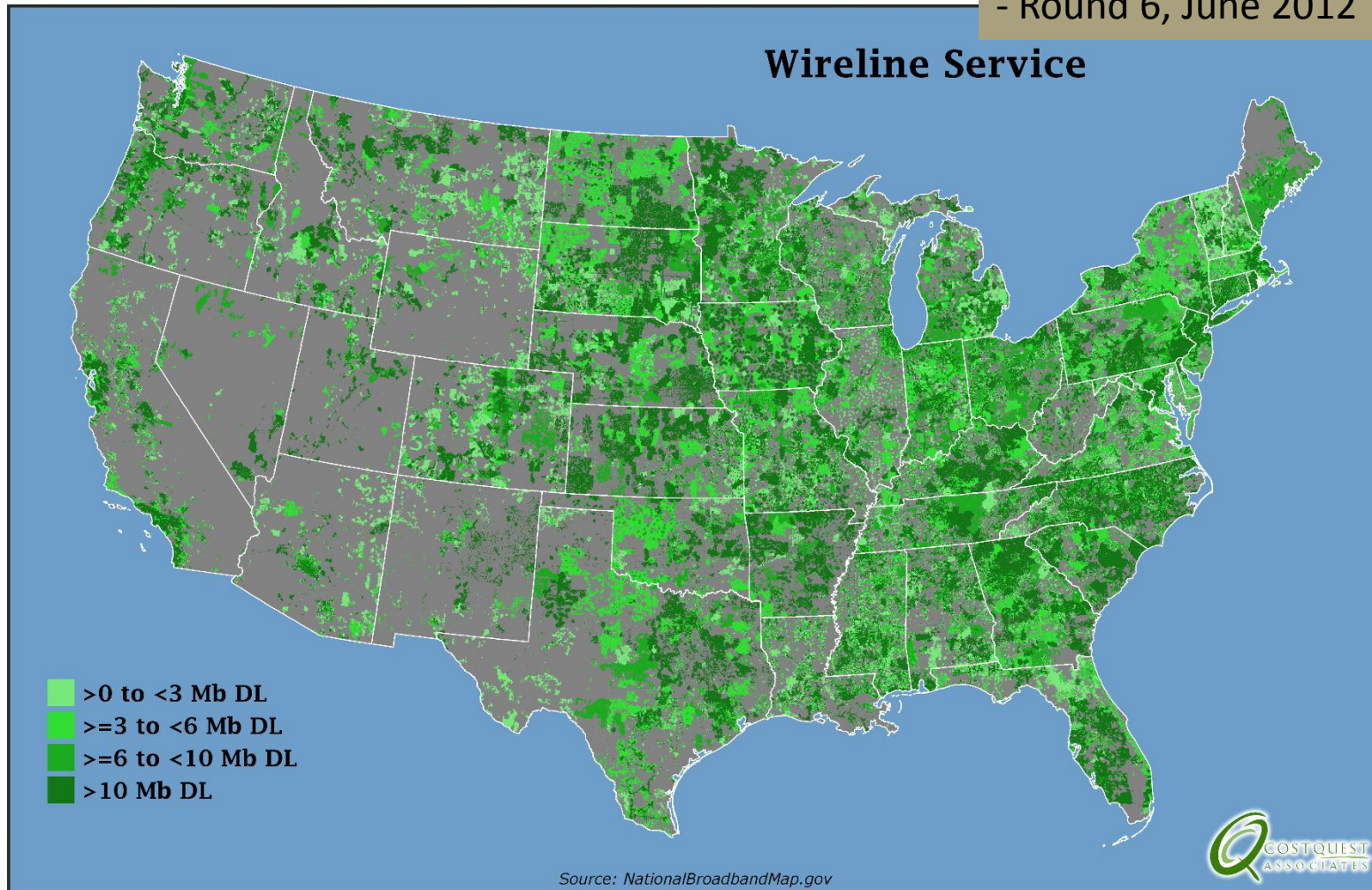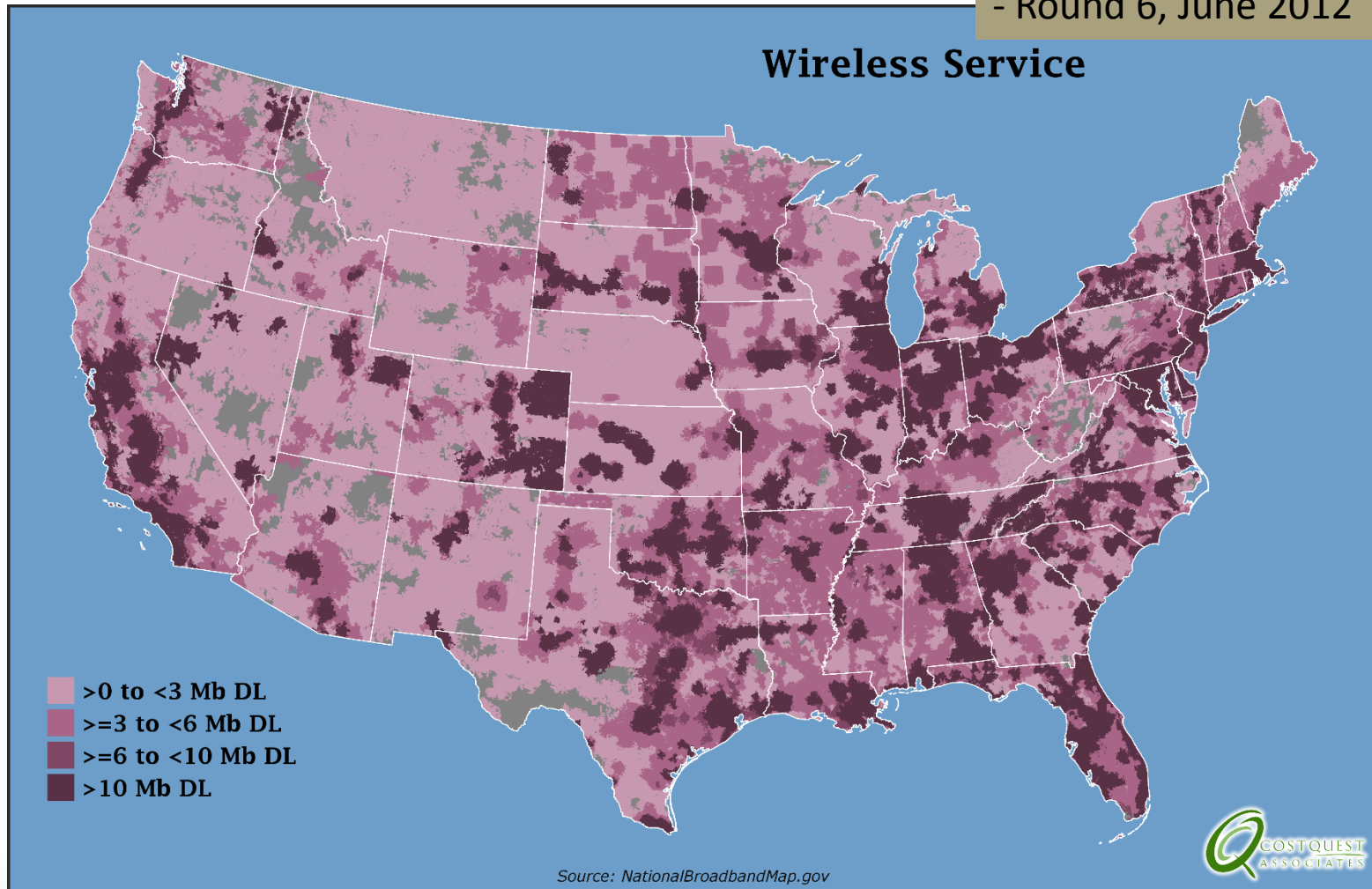
Cable Service

>0 to <3 Mb DL
>=3 to <6 Mb DL
>=6 to <10 Mb DL
>10 Mb DL

Source: NationalBroadbandMap.gov

January 2014

16

Broadband Coverage
Fixed Wireless Providers

Fixed Wireless Service

>0 to <3 Mb DL
>=3 to <6 Mb DL
>=6 to <10 Mb DL
>10 Mb DL

Source: NationalBroadbandMap.gov

January 2014

17

Broadband Coverage
Wireline Providers

Wireline Service

Legend:
- >0 to <3 Mb DL
- >=3 to <6 Mb DL
- >=6 to <10 Mb DL
- >10 Mb DL

Source: NationalBroadbandMap.gov

January 2014

18

Broadband Coverage
Wireless Providers

Wireless Service

>0 to <3 Mb DL
>=3 to <6 Mb DL
>=6 to <10 Mb DL
>10 Mb DL

Source: NationalBroadbandMap.gov

January 2014

19

The Challenge

January, 2013

Full U.S. FTTp Deployment - RCN

20
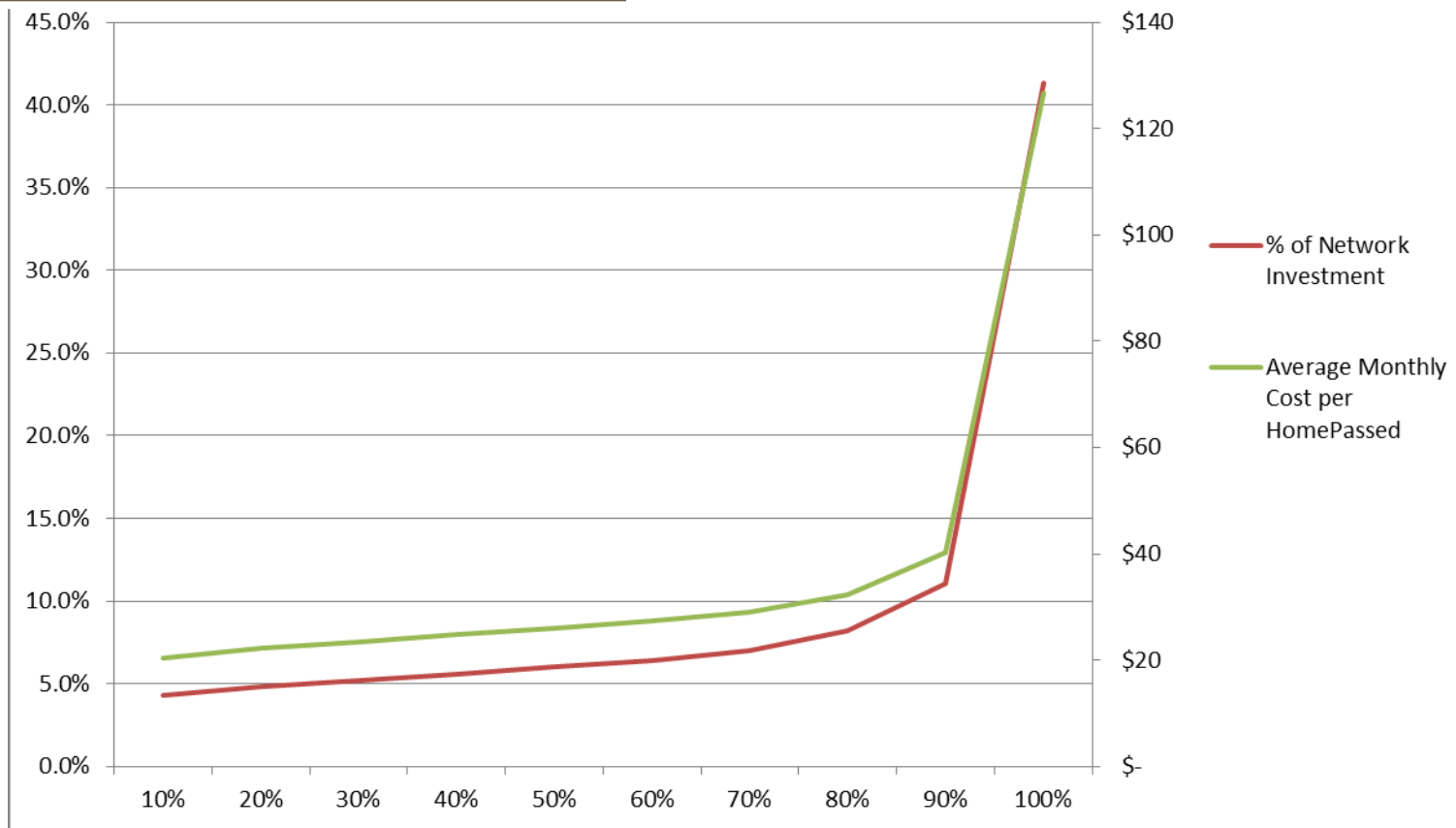
National Broadband Plan

State Efforts

FCC Mobile Subsidization (CAF)

FCC Landline Subsidization (CAF)

BTOP/ARRA Update

RUS Loans

NTIA's FirstNet

US GOVERNMENT RESPONSE

National Broadband Plan "Connecting America"

- National Broadband Plan
  - Goals
    - At least 100 million homes having affordable access at 100 megabits per second download and 50 megabits per second up loads
    - US should lead world in mobile innovation
    - Every American should have affordable access to robust broadband service
    - Every American community should have affordable access to 1 gigabit per second broadband service to schools, hospitals, and government buildings
    - To ensure the safety the safety of the American people, every first responder should have access to a nationwide wireless broadband public safety network
    - Ensure America leads in in the clean energy economy
  - Key Objectives
    - Move money from the Universal Service Fund to a new Connect American Fund to help support the National Broadband Plan in unserved areas
    - Create a Mobility Fund to ensure the wireless network nationwide 3G coverage
    - Develop plans to give access to broadband for low income Americans
    - Launch a National Digital Literacy Corps to train youth and adults digital literacy skills
  - The impact of the National Broadband Plan is to make the United States a world leader in providing internet communications nationwide

January, 2013

Government Developments

- FCC
  - Revisions to the universal service
    - Connect America Fund – Focus is on Broadband deployment in high cost areas via landline and wireless technologies -- $45B over 10 years
  - Broadband Acceleration Initiative
    - Lowers the cost of stringing new fiber on utility poles and reducing the wait times for cell tower approval
  - Spectrum expansion (wireless and wifi)
    - 35% increase in unlicensed 5 Ghz band for Wifi
    - Broadcaster incentive auctions for white space (120Mhz in the 600Mhz band, estimate of $22B)
    - Allowance of DISH to use S band for terrestrial service
    - First Responders network

January, 2013

23

Government Developments

- States/Cities
  - ID, AL, WY, WI, etc...
    - States are looking at economic development plans and the cost to deploy
  - Cities are encouraging fiber deployment
    - Chattanooga and Kansas City have built out fiber networks that have gained attention
    - Other cities have plans: Cleveland, Lafayette, LA, Chicago, New York, Seattle to name a few
    - In all, 42 communities in 14 states have access to "ultra-high-speed" fiber providers that reach a gigabit
  - Various states are looking at revamping their state specific USF programs

Connect America Fund: Mobile

- Connect America Fund (CAF): $6,400,000,000 for deployment and operations of Mobile Broadband over the next 10 years
- Phased approach
  - Phase 1: $300mil one time deployment fund through reverse auction
  - Phase 2: $500mil per year for ongoing support
  - Plus: $100mil - Tribal lands deployment and $100mil/year ongoing
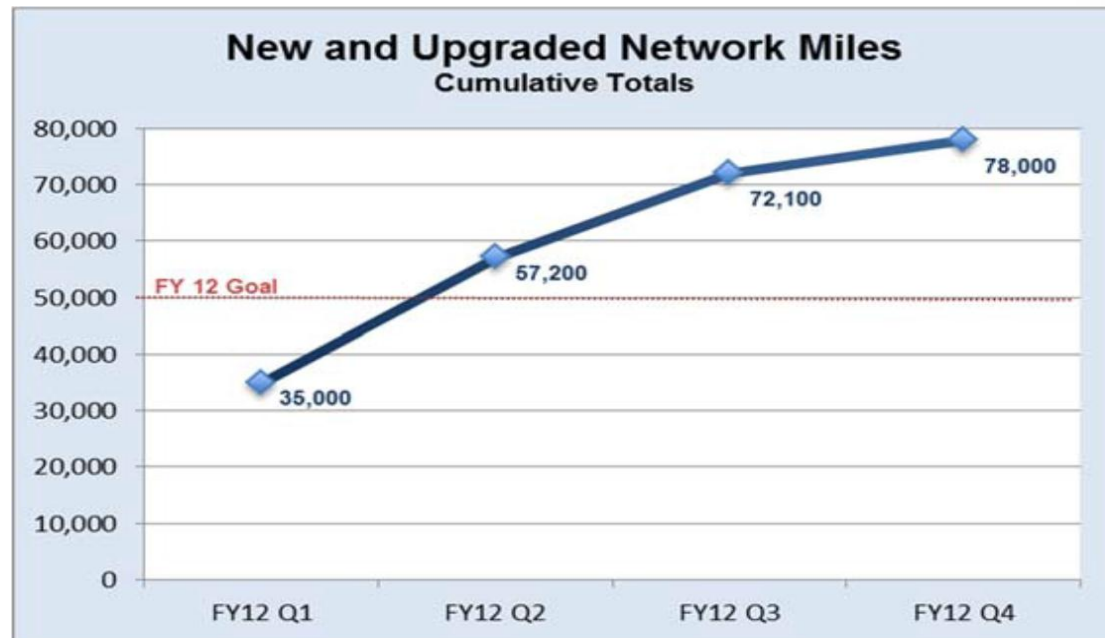
January, 2013

Connect America Fund: Fixed

- Connect America Fund - Landline
  - CAF1 was to distribute $300M in one time support to Price Cap carriers to spur immediate 4/1 buildout
    - Disbursement based on CostQuest regression model of cost
    - Carriers will receive $775 for each unserved location deployed
    - Only a portion was accepted by carriers
    - Continued discussion at the FCC to encourage providers to accept funding
  - CAF2 will distribute up to 4B annually to landline providers
    - Up to $1.8b annually to high cost areas served by Price Cap Carriers
    - Up to $100m for remote very high cost areas
    - Up to $2b annually to high cost areas served by Rate of Return carriers

CostQuest and CAF2

- CostQuest was retained by USAC to develop and deploy the model to guide disbursement of CAF2's $1.8B in annual funds for Price Cap Carriers
  - Model is referred to as CACM >> Connect America Cost Model
- CACM
  - Based on prior work:
    - BAM and CQBAT
  - Models every wire center and every customer in the U.S.
    - Includes AK, PR, VI, HI, MP
    - Over 20,000 service areas
    - Over 160M customer locations
  - Current efforts focused on Price Cap areas
  - Forward looking network deployment: FTTp
  - Funding to high cost census blocks
  - Excludes areas already served by an unsubsidized competitor (e.g., cable)

Broadband Technology Opportunities Program – NTIA

- BTOP: NTIA invested approximately $4 billion in 233 BTOP projects benefitting every state. The portfolio of projects initially included:
  - Infrastructure projects totaling $3.5 billion in Federal grant
  - Public Computer Center (PCC) projects totaling $201 million
  - Sustainable Broadband Adoption (SBA) projects totaling nearly $251 million
  - State Broadband Initiative (SBI), NTIA granted approximately $293 million to states

  - Source: NTIA, January 2012

New and Upgraded Network Miles
Cumulative Totals

	FY12 Q1	FY12 Q2	FY12 Q3	FY12 Q4
Network Miles	35,000	57,200	72,100	78,000

FY 12 Goal: 50,000

RUS Loan Program Update

RUS 2012 - $173 million in telecommunications loans and grants

- RUS 2009-2011 - Broadband Initiatives Program (ARRA) - Completed
  - 320 awards obligated a total of $3.529 billion
    - 285 last-mile projects that totaled over $3 billion,
    - 12 middle-mile awards total $172.6 million,
    - 4 satellite awards for $100 million, and
    - 19 technical assistance awards for over $3.4 million

Source: RUS, January, 2012

USF MODELS
OVERVIEW OF CACM

CQUSF

The Forward Looking Economic Model Financial Template

January 2014
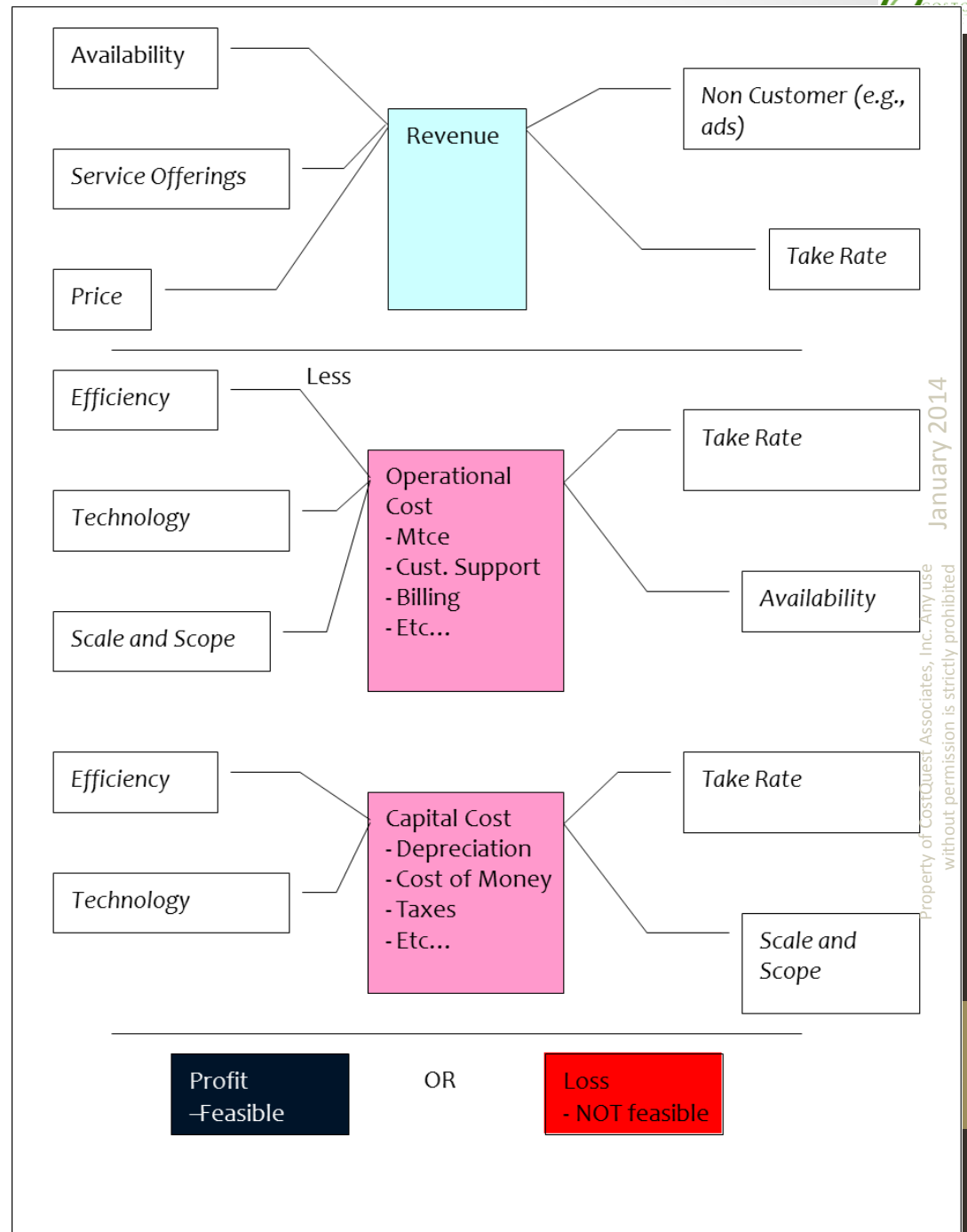
# What is CACM

- The Connect America Cost Model - CACM
  - Overall Design
    - Scorched node
    - Forward looking
    - New network built to all locations (POLR)
    - Active customers hooked up with broadband pipe capable of voice and data service
  - Contemporary / real-world wireline systems engineering standards are used for the modeling of the networks
    - More specifically, the model uses current engineering practices for landline deployments that have been reviewed against forward-looking standards in a wide array of regulatory proceedings and field tests

January 2014

Basic Model Definitions

- CACM, like every universal program, relies upon both a "cost model" and a "support model"

- Definitions:

  - "Cost Model": A systematized collection of mathematical procedure that takes as inputs geographic and non-geographic data and that produces an estimate of the cost of a network that is capable of providing one or more specified services

  - "Support Model" : A mathematical procedure that takes cost and other factors as inputs and that produces a universal service support amount for a carrier or customer

    - This is sometimes called a "support mechanism"

CACM
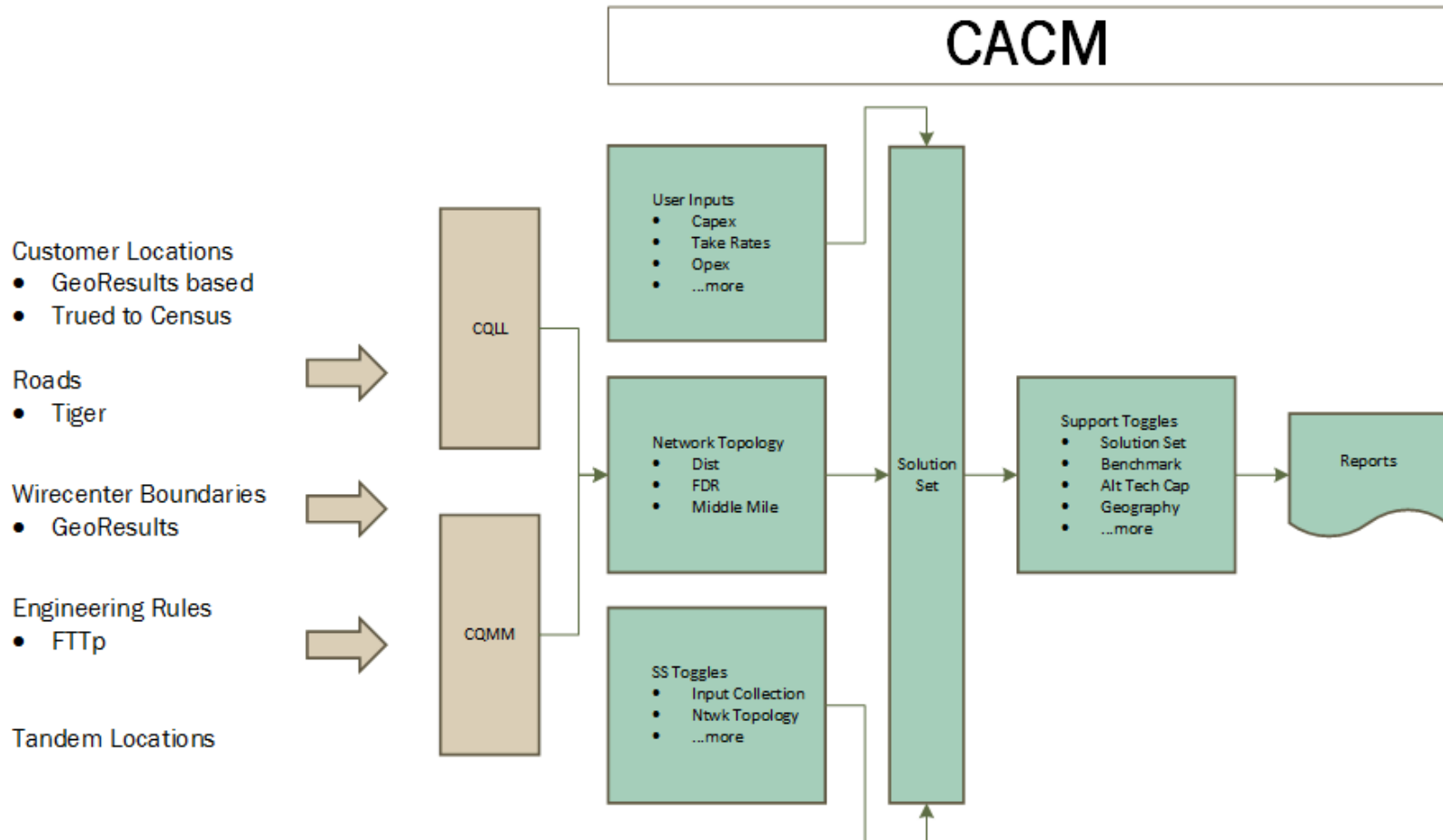
CQLL Network Topology

ILEC Wire Center service area with geocoded customer locations and roads

January 2014

35

CQLL Network Topology

Network Node locations are based upon user inputs and general network design principles

Picture captures network nodes with red dashed line representing Road Based Clusters
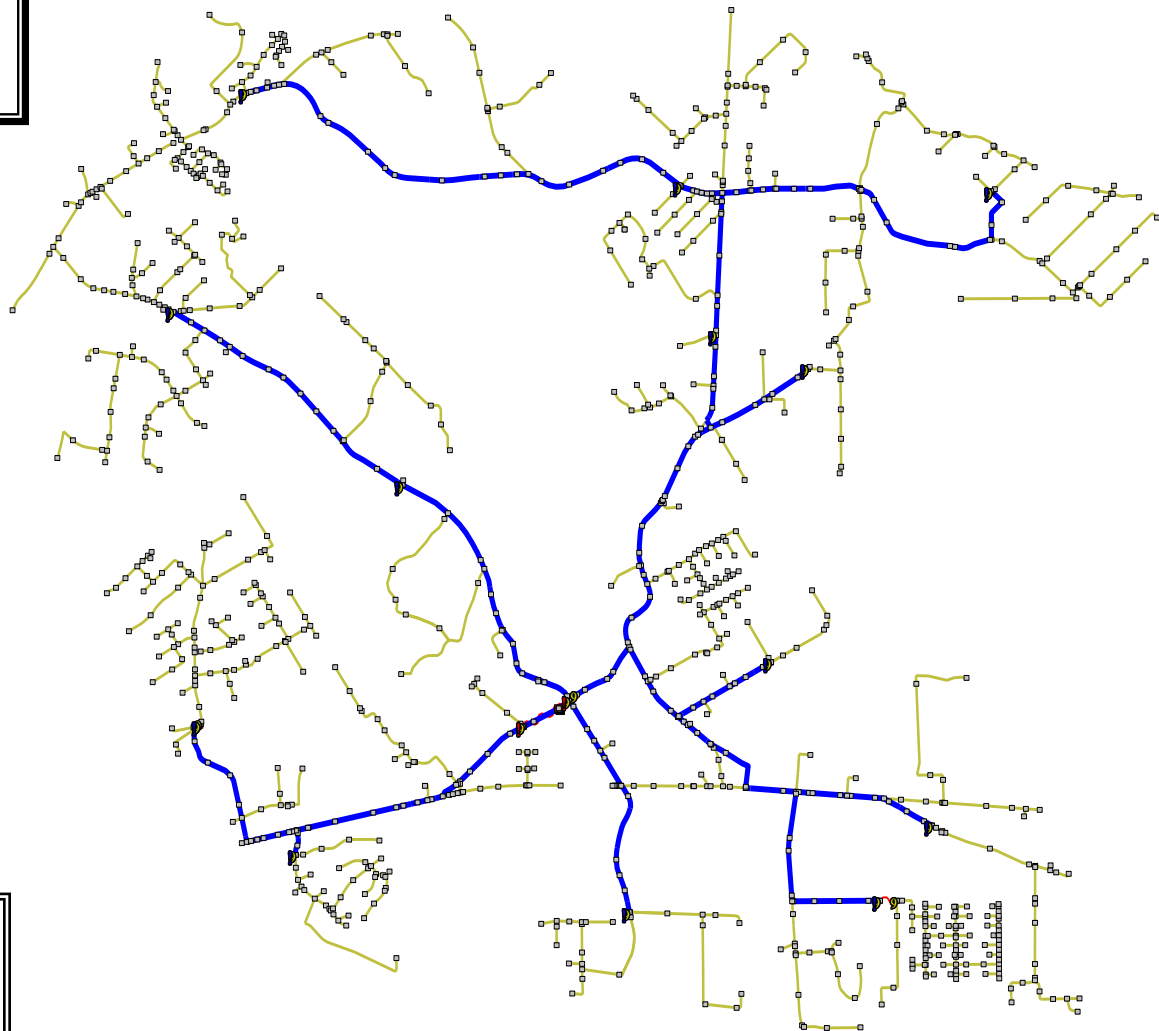

Legend:
- ■ – Node
- ■ – Fiber fed Splitter
- ■ – Pedestal

CQLL Network Topology
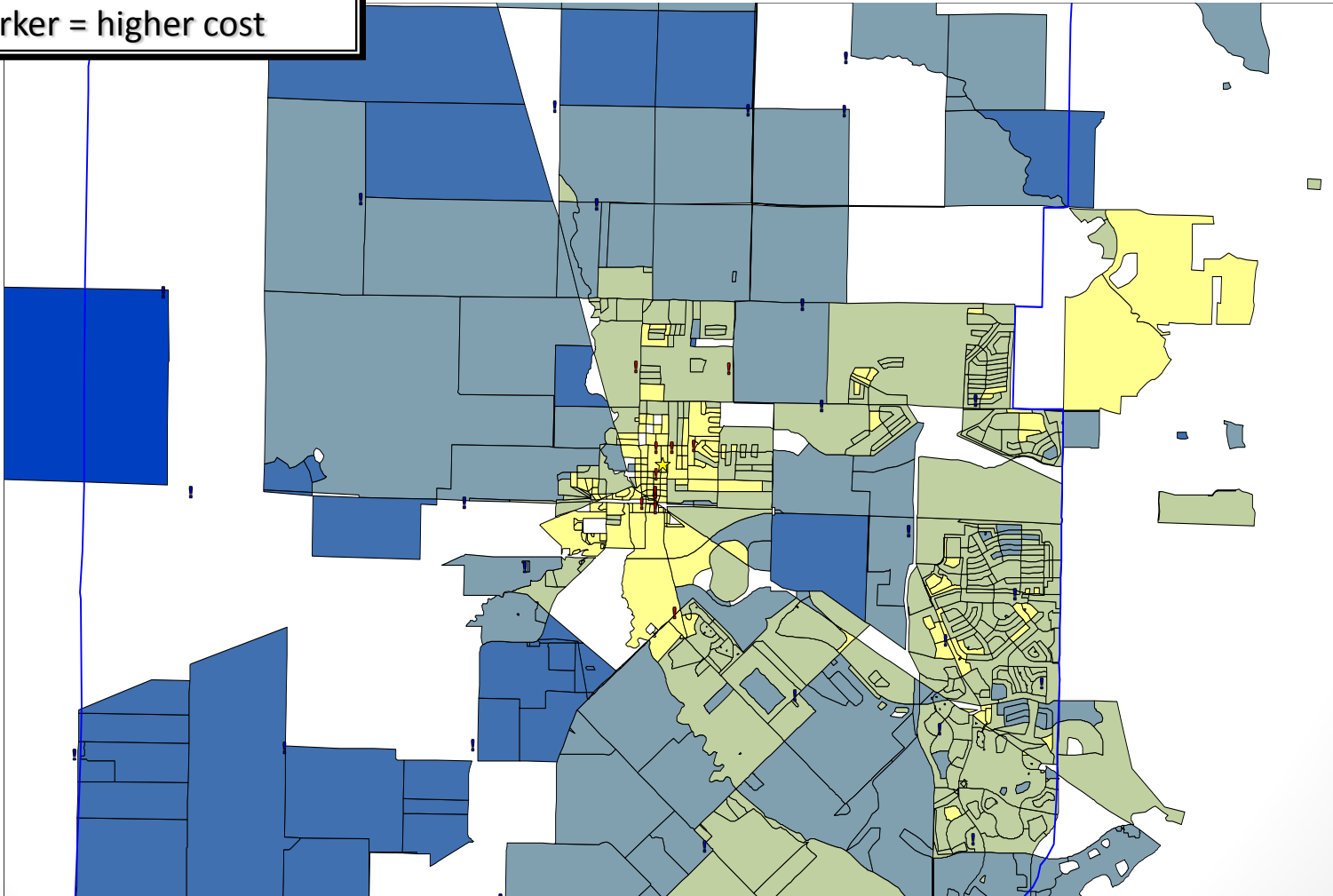
Designed Network with overlaid cabling, no roads

Legend:
- ■ / ■ – Node2
- ■ – Pedestal
- -- – Feeder
- -- – Distribution

CQLL Network Topology

Census Block Cost Surface
- Darker = higher cost

38

CACM Cost Calculation

- Basic Formula
  - Cost = Investment * Annual Charge Factors ("ACF") + Direct Opex + Shared and Common Opex Costs
- Components of Costs
  - Investment Models: Loop, Central Office, and Interoffice
  - Annual Charge Factor Models
    - Depreciation, Taxes, Cost of Money
  - Opex Models
    - Operations, Shared, Common

Note: Annual Charge Factors convert investments into Depreciation, Cost of Money, and Tax costs
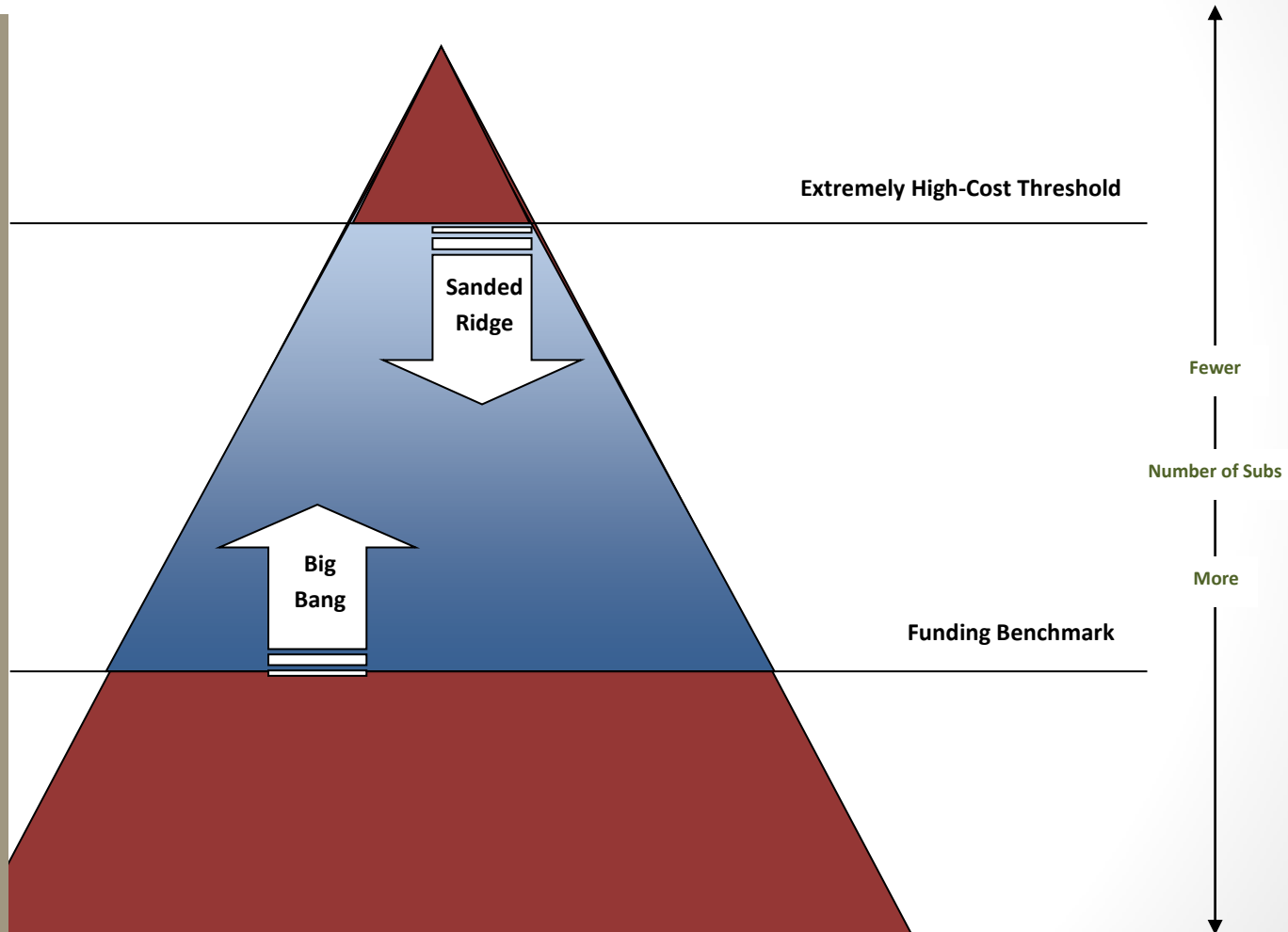
January 2014

Support Model

- With regard to Support, CACM allows the ability to adjust the design attributes to understand the impact
- Key Parameters for Support include:
  - Participants in the funding
  - Utilization of a cap
  - The benchmarks to be used for funding
  - Exclusion of competitively served areas

January 2014

Support Approach

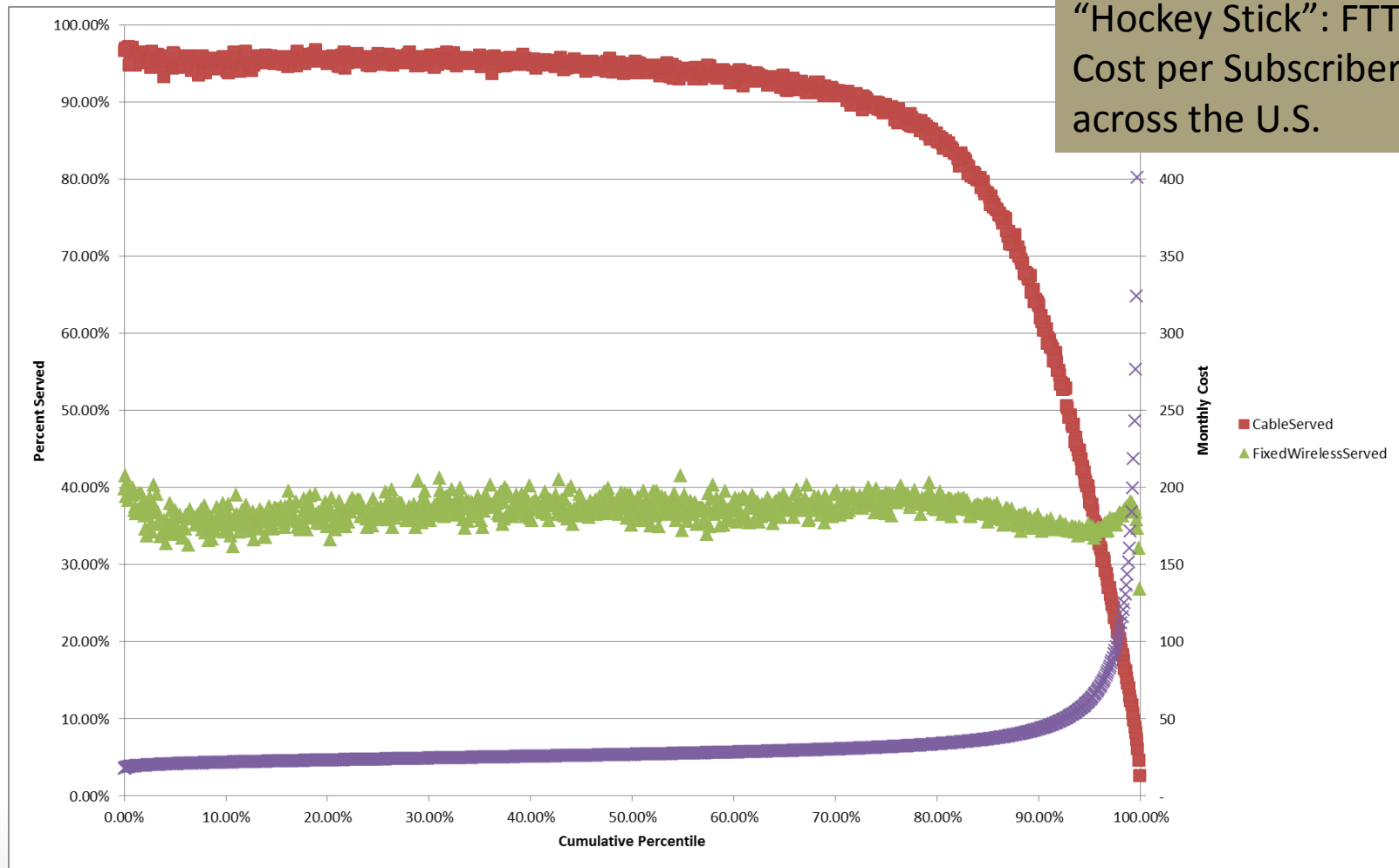January 2014

Funding Approach

- "Big Bang" starts at a benchmark – stretches limited funds to most locations, but may not fund high cost locations like the "Sanded Ridge"

- "Sanded Ridge" starts at a cost cap – impacts the highest cost locations, but may not fund as many locations as "Big Bang"

Extremely High-Cost Threshold

Sanded Ridge

Big Bang

Funding Benchmark

Fewer

Number of Subs

More

41

MODEL RESULTS
(PRELIMINARY RESULTS)

January 2014

Illustrative Results – Compared to Existing Coverage

"Hockey Stick": FTTp Cost per Subscriber across the U.S.

Legend:
- CableServed
- FixedWirelessServed

January 2014

43

Illustrative Results

FTTp Network

Cost Breakout for FTTp Service

- TAX 7%
- NetworkOperationsPSOpex 6%
- NetworkOperationsNPSOpex 12%
- CustomerOperationsMktOpex 20%
- GenAdminOpex 13%
- BadDebtOpex 3%
- DEPR 21%
- COM 18%

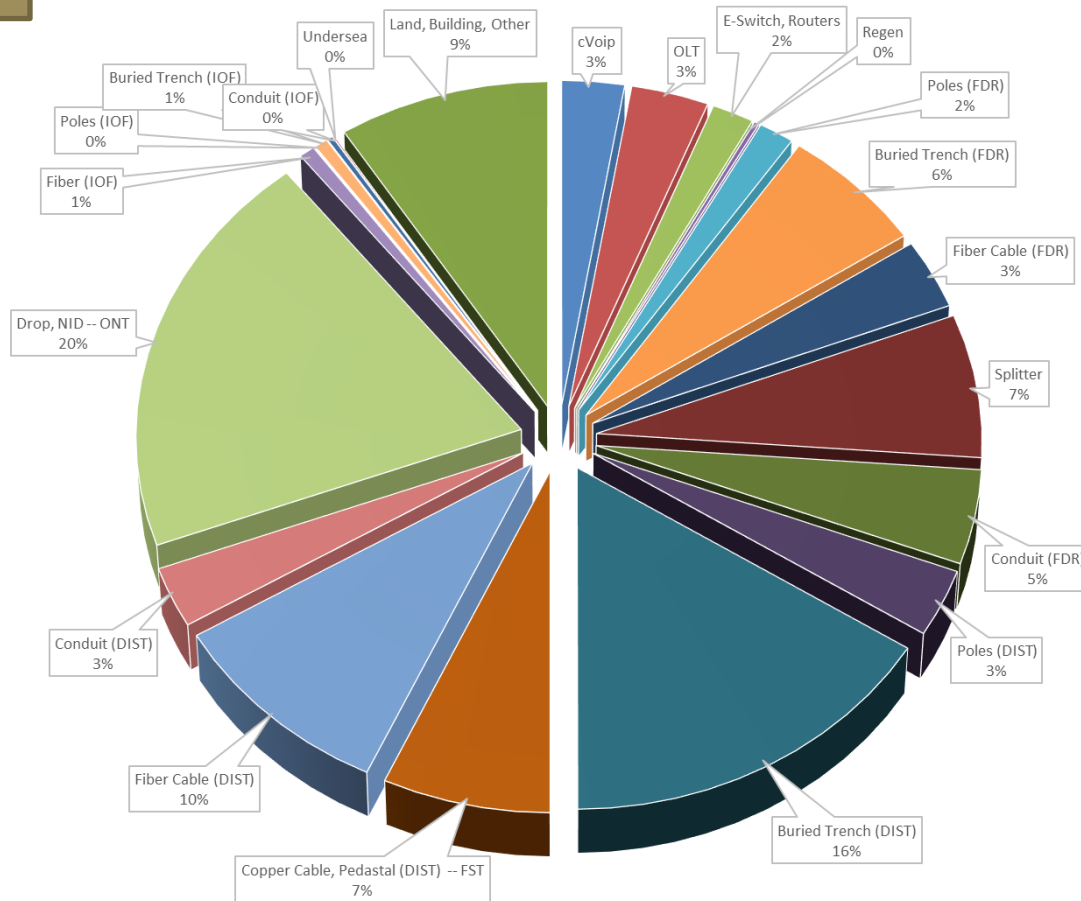*Preliminary results – for discussion purposes only*

January 2014

Illustrative Results

FTTp Network

Investment Breakout for FTTp Service

January 2014

45

Preliminary results – for discussion purposes only

Illustrative Results

FTTp Network

FTTp Cost verus Company Size

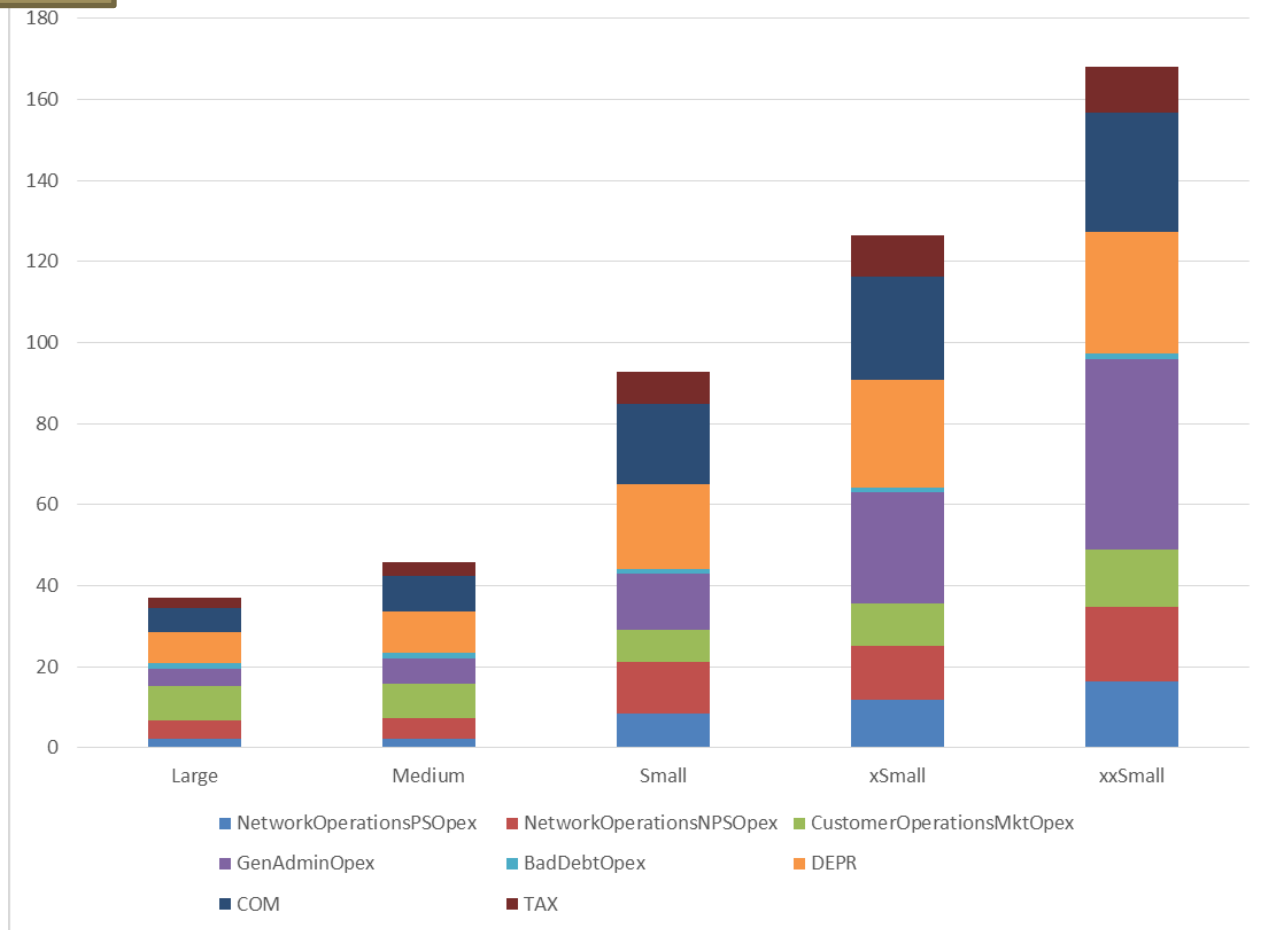*Preliminary results – for discussion purposes only*

January 2014

46

Nationwide Cost at CB level
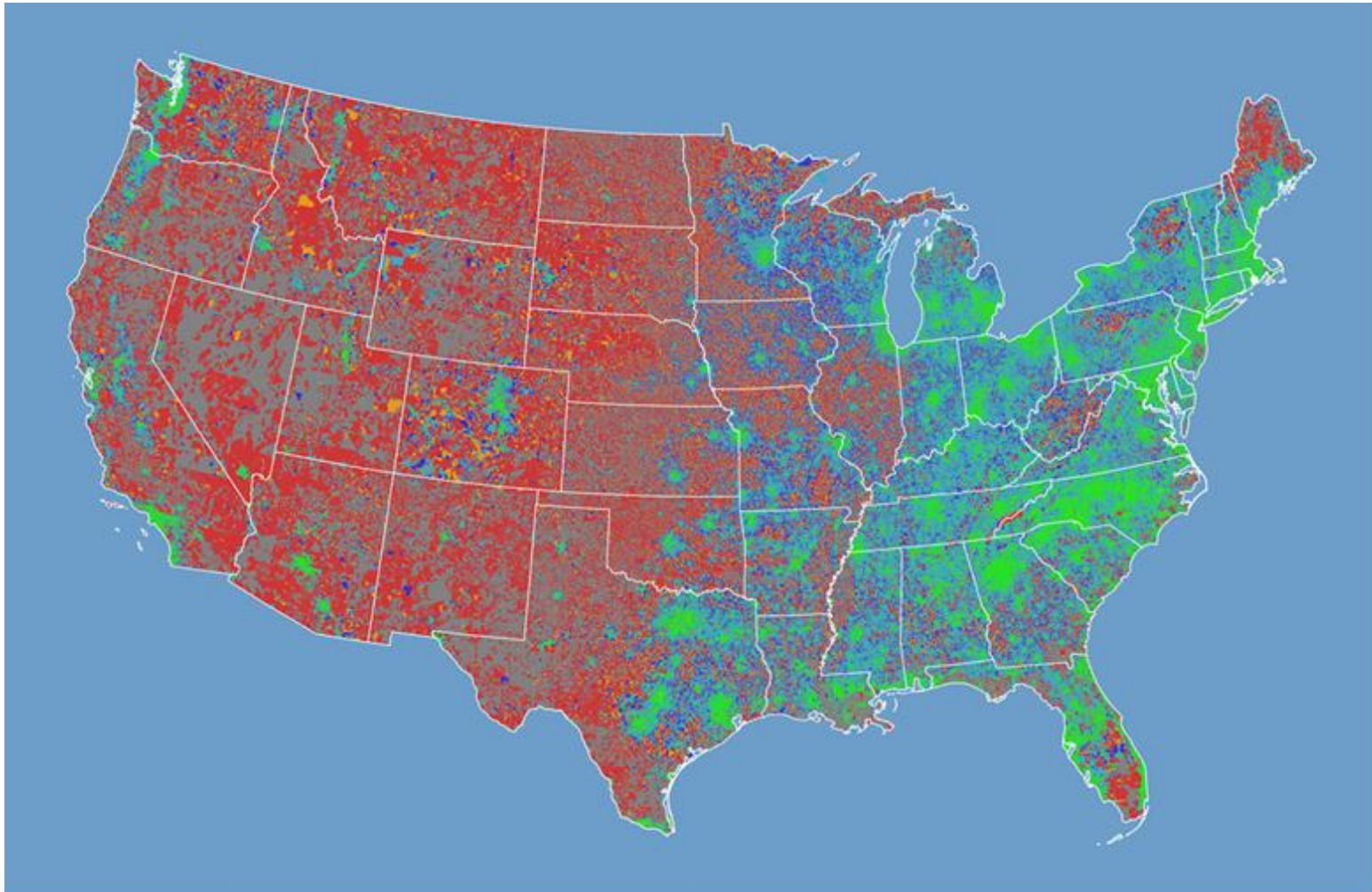
January 2014

Preliminary results – for discussion purposes only

PRODUCT AND SERVICE PROFITABILITY OVERVIEW OF COMPASS

January 2014

COMPASS
Product Economic Profitability System

- The approach
  - Focused on governance needs
    - Internal / decision support / coordination focus
  - Grounded in economics
    - Uses impact attribution approach
  - Activity based logic
    - Uses widely-held / practical approach to costing
  - N-dimensional mapping of costs and revenues
    - Products, markets / customers, channels, etc.
  - Can accommodate / coordinate both cost perspectives
    - Historical and forward look (via cost functions)

A Simple Concept

January 2014
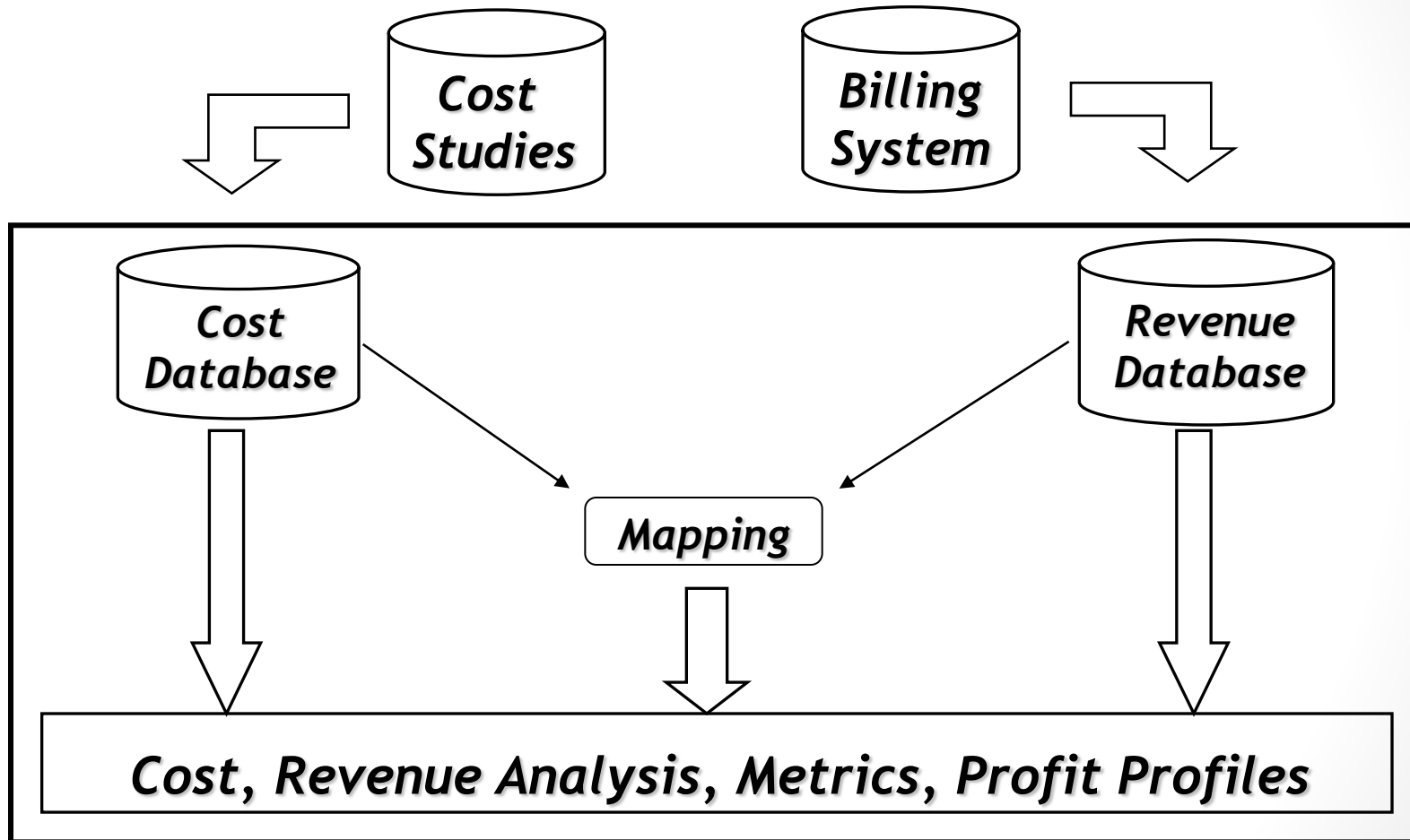
Sample Output

Report: P&L Report (TotalCost_Cap)
View: Market Area=ABC, Bundle Area=Platinum
Period: Aug-02

Product Family	Combo Actual	Internet Actual	Video Actual	Voice Actual	TOTAL Actual
REVENUES:					
Recurring		160,415	320,326	510,559	991,300
TOTAL REVENUE	0	160,415	320,326	510,559	991,300
VOLUME SENSITIVE COSTS:					
Corp					
Establish Service					
Manage Connections and Disconnections	8				8
Invoice and Collect Revenue					
Manage Bad Debt and Write Offs		6,142	15	1,344	7,501
Manage collection of revenue	0	75	150	239	464
Prepare and Deliver Invoices	197				197
Provide Service Assurance					
Provide Customer Repair				8	8
Take Customer Calls and Provide Service	5,685				5,685
Network					
Hub					
CMTS		2,550			2,550
IP Transport		7,416			7,416
SONET Transport				3,944	3,944
IP Leased Costs					
Backbone		6,023			6,023
LD Switched Access					
Originating Switched Access				6,548	6,548
Terminating Switched Access				42,948	42,948
Local Leased Costs					
Reciprocal Compensation				39,465	39,465
Regional Backbone				2,715	2,715
MegaPop					
IP Transport		7,416			7,416
SONET Transport				3,944	3,944
Subscriber Location					
Cable Modem		17,322			17,322
Digital Set Top Box			92,846		92,846
Inside Wire	37,416				37,416
RSU				57,856	57,856
Service Drop	29,101				29,101
Opex					
Establish Service					
Manage Connections and Disconnections	2,607				2,607
Invoice and Collect Revenue					
Manage Bad Debt and Write Offs	0	(3,788)	(6,012)	(8,092)	(17,891)
Manage collection of revenue	0	1,648	3,291	5,246	10,185
Prepare and Deliver Invoices	4,952				4,952
Programming					
Basic			86,301		86,301
Digital			20,178		20,178
Premium			126,337		126,337
Provide Service Assurance					
Provide Customer Repair				732	732
Take Customer Calls and Provide Service	78,164				78,164
TOTAL VOLUME SENSITIVE COSTS	158,130	44,805	323,107	156,897	682,940
CONTRIBUTION TO FIXED COSTS	(158,130)	115,610	(2,781)	353,663	308,361

Q&A/Open Discussion

January 2014