



Hydro One Density Study (2011)

Stakeholder Presentation

Prepared by
London Economics International LLC
& PowerNex Associates, Inc.

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Objective of stakeholder session

To determine whether stakeholders are in general agreement with the proposed methodology and to gather specific feedback

FACILITATOR

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PRESENTERS

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1 Introduction

Summary of Proposed Methodology

3 Details of Proposed Methodology

4 Additional Discussion & Questions



LEI and PNXA were engaged by HONI to evaluate the relationship between customer density and distribution service costs

- ❑ **The objectives of the engagement closely follow the Ontario Energy Board's (OEB's or the Board's) direction**
 - London Economics International LLC (LEI) and PowerNex Associates, Inc. (PNXA) are to evaluate the relationship between 'customer density' and distribution service costs
 - LEI and PNXA are to assess whether the existing density-based rate classes and density weighting factors appropriately reflect this relationship
 - LEI and PNXA are to consider, qualitatively, the appropriateness and feasibility of establishing alternate customer class definitions

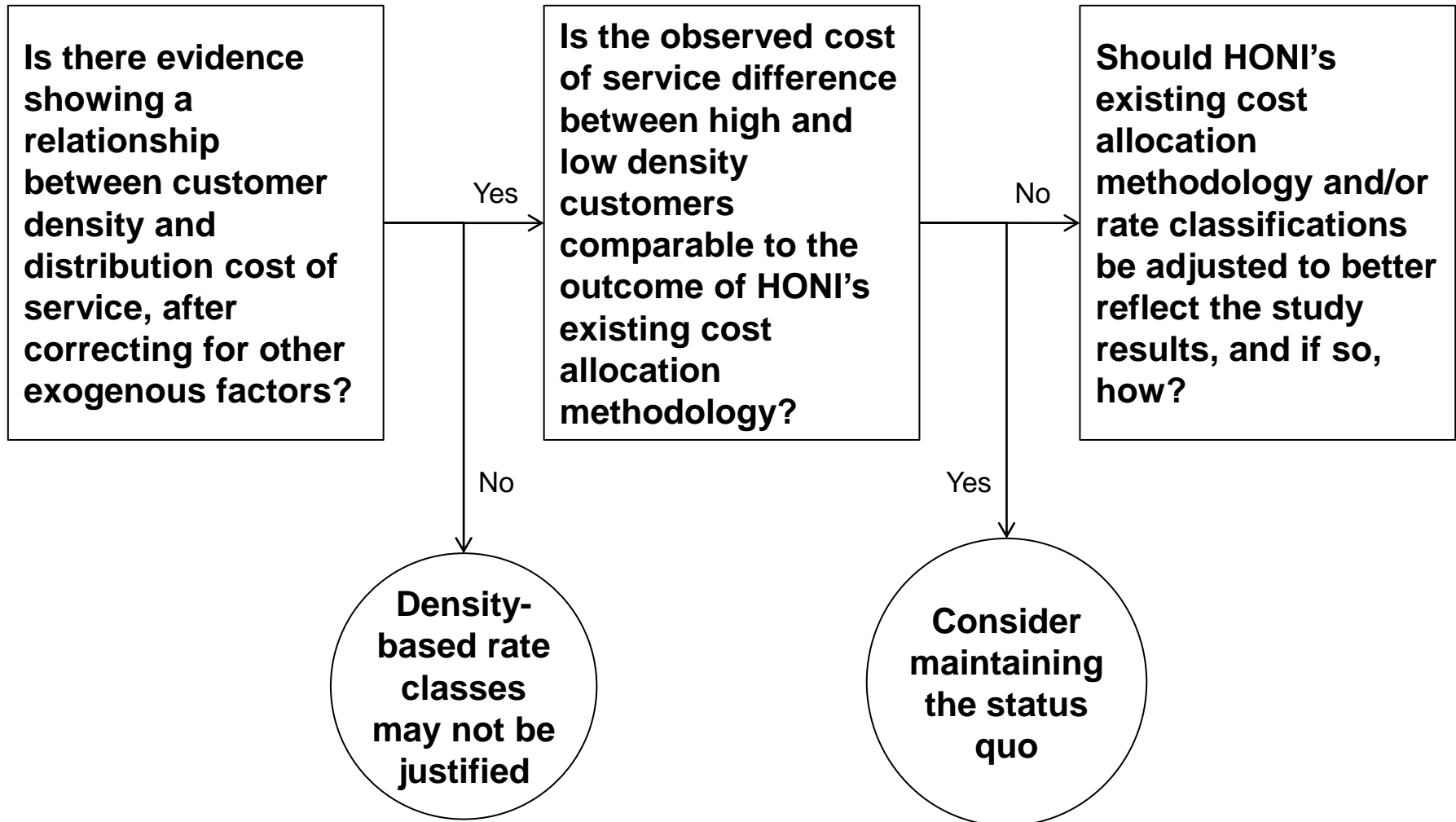
Under HONI's current methodology a higher proportion of costs are allocated to 'rural' classes, relative to the number of customers

- Current density weighting factors are based on the apportionment of lengths of distribution feeders and the net book value of transformers to individual sub-classes

Illustrative Results of HONI Cost Allocation Model				
	UR	R1	R2	Seasonal
w/ Density Weighting Factors (\$M)	59.0	273.4	431.7	96.0
<i>\$ per customer per month</i>	35.0	55.2	98.0	51.0
w/o Density Weighting Factors (\$M)	106.6	336.8	334.8	84.1
<i>\$ per customer per month</i>	63.2	68.1	76.0	44.7
Percent Increase/Decrease	81%	23%	-22%	-12%
	UGe	GSe	UGd	GSd
w/ Density Weighting Factors (\$M)	8.7	121.5	12.6	128.8
<i>\$ per customer per month</i>	68.2	102.5	927.3	1,457.6
w/o Density Weighting Factors (\$M)	15.7	113.9	22.3	117.4
<i>\$ per customer per month</i>	123.8	96.1	1,641.4	1,328.6
Percent Increase/Decrease	82%	-6%	77%	-9%

Source: HONI OEB Cost Allocation Model, 2010/2011 Distribution Rate Application

The study will consider a number of specific questions



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The proposed methodology consists of two separate but complementary analyses

**Econometric
Analysis**

**Engineering
Analysis**

**Econometric analysis
using HONI operating
area data (OM&A
costs Only)**

**Direct assignment of
HONI annual OM&A
and CAPEX cost data
to sample areas**

**Econometric
analysis using
HONI operating
area data (OM&A
and capital costs)**

**Asset intensity
analysis of HONI
capital costs in
sample areas**

- The proposed methodology takes into account feedback provided by stakeholders in the previous session and the OEB's direction

The econometric analysis will isolate the impact of customer density on HONI's distribution service costs

- ❑ The analysis will focus specifically on HONI's operating areas
- ❑ The econometric analysis will analyze the extent to which differences in cost across HONI's operating areas are explained by differences in customer density

Steps in Econometric Analysis

Identify a utility cost function that includes inputs, outputs, and operating characteristics

Compile a data set that incorporates the necessary input, output, and operating characteristic variables

Solve the model to minimize the error term in the cost function (i.e. such that the predicted values are very close to the actual values)

The estimated coefficients reveal the sensitivity of utility costs to changes in each of the independent variables

The engineering analysis will identify the cost associated with serving specific groups of customers across HONI service territory

- ❑ The focus is to identify how HONI's costs vary across groups of customers with different densities
- ❑ Will select and analyze sample areas across HONI's distribution service territory
- ❑ The analysis will directly assign HONI's costs to each sample area
- ❑ Will determine an average cost per customer within each sample area and a profile of average costs across HONI's service territory
- ❑ Analysis will incorporate the majority of HONI's costs

Steps in Engineering Analysis

Select sample areas and corresponding operating areas

Compile data on sample areas and operating areas

Calculate assignment factors

Assign operating area and provincial level costs to sample areas

Calculate the asset intensity for each sample area

The distribution of costs across the sample areas is indicative of the cost to serve groups of customers

Are there other considerations that should be included with these two approaches?

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The econometric analysis will consider a number of distinct inputs, outputs, and operating characteristics

- ❑ The analysis will look at two separate cost functions (OM&A only, and OM&A and capital)
- ❑ In most jurisdictions, including Ontario, data availability has restricted economists' ability to analyze utility cost functions that extend beyond OM&A costs
 - Across HONI's operating areas the data limitations are less restrictive

Variables to Consider			
O&M Costs	CAPEX Costs	Asset Count and Type	Asset Value
Number and Type of Customers	Throughput (kWh)	Customer Density (linear/aerial)	Total km of Line
Physical Geography	Input Prices	Storm Data	Age of Assets

Are there other variables (inputs, outputs, operating characteristics) that should be considered in the econometric analysis?



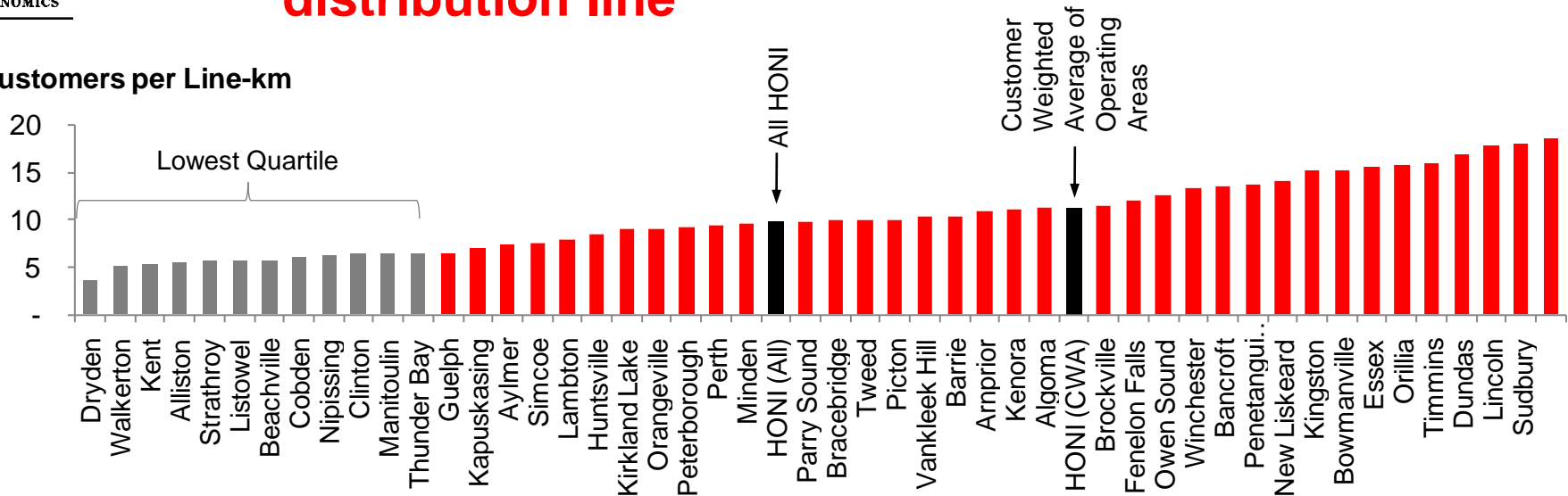
HONI's operating areas cover the entire province



Source: HONI

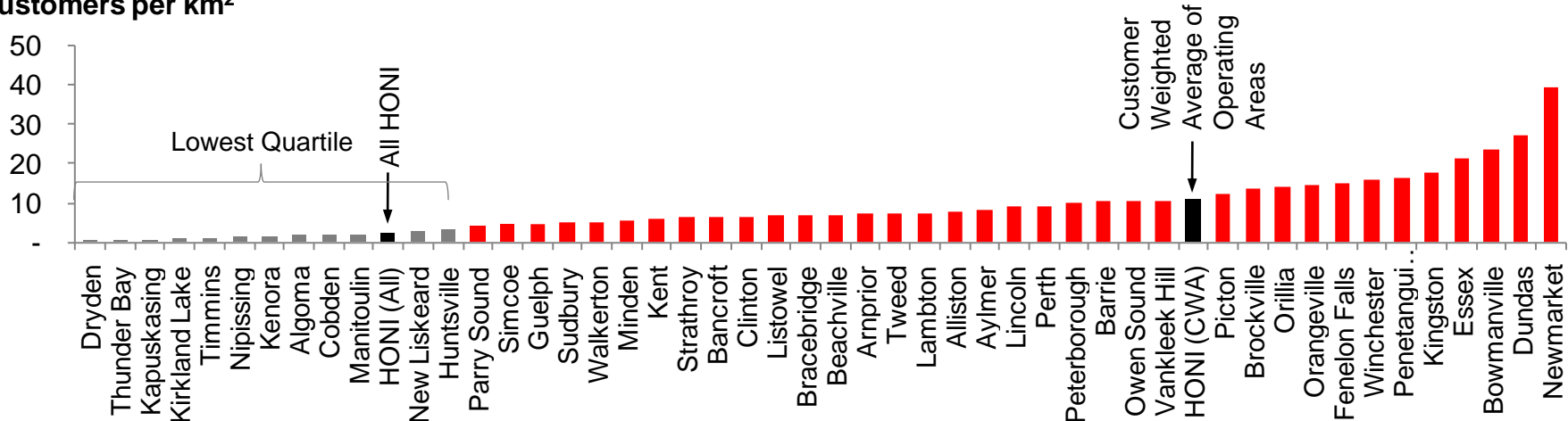
HONI's operating areas exhibit linear densities ranging from 3.6 to 18.6 customers per km of distribution line

Customers per Line-km



□ Likewise the operating areas exhibit aerial densities ranging from 0.1 to 39.2 customers per km²

Customers per km²



The engineering analysis will directly assign the majority of HONI's costs

- ❑ **The engineering analysis will utilize a “top-down” approach to assign costs**
 - The top-down approach starts with the highest level of costs, (i.e. the total aggregated OM&A and CAPEX related costs), and systematically works down through identifiable levels of cost tracking to the lowest practical level of cost tracking, at which point the costs are directly assigned to sample areas
- ❑ **The assignment of costs utilizes two complementary methods**
 - Annual OM&A and CAPEX are assigned using specific factors' that are selected and designed based on engineering and utility operation principles
 - Fixed asset related costs will be examined through an 'asset intensity' analysis
- ❑ **Approximately 80 percent of HONI's total revenue requirement will be assigned using specific factors and asset intensity**
 - The remaining 20 percent will be assigned in proportion to the number of customers

A number of operational and customer/asset characteristics will be used to define the assignment factors

Range of Assignment Factors Being Considered

Assignment Factor	Full Name	Definition
AIR	Asset Intensity Ratio	Replacement cost of assets in sample area (SA) / replacement cost of assets in operating area (OA)
CR	Customer Ratio	Number of customers in sample area / total number of customers in OA
CKM	Customer-km Ratio	\sum of dist from customers in the SA to Service Center (SC) / \sum of dist from customers in OA to SC
PDR	Pole Distance Ratio	\sum of distance from poles in SA to SC / \sum of distance from poles in OA to SC
UGR	Underground Feeder Ratio	\sum UGR km in SA / \sum UGR km in OA
IR	Interruptions Ratio	Total number of interruptions in SA / total number of interruptions in OA
IRWOS	Interruptions Ratio without Storms	Number of non-storm related interruptions in SA / number of non-storm related interruptions in OA
IR-Storm	Storm Interruptions Ratio	Number of storm related interruptions in SA / number of storm related interruptions in OA

Assignment factors will be applied to each cost category

- ❑ **Costs are generally tracked at one of three levels: provincial (e.g. engineering services); operating area (trouble calls); or feeder level (vegetation management)**
 - Assignment factors will be applied to operating area level costs
 - Provincial level costs will be apportioned to the operating areas and then assigned to sample areas using the assignment factors
 - Feeder level costs will be assigned based on the percentage of the feeder length located within a sample area

Proposed Assignment Factors for Major OM&A Work Programs

2010 Provincial Level Lines Sustainment OM&A

Eng Tech Serv - Major Impact Studies
 PM: Recloser & Regulator Maintenance
 Other Demand Lines DM P&P's
 Field Collections, Special Invest
 SQI Measures
 Dx Lines Patrol
 ERA
 Meter Replacement Services
 PM: Switch Maintenance (ABS & LBS)
 Small External Demand Requests
 Other Planned Lines DM P&P's
 Misc Mtce
 Eng/Tech Studies & ERA
 Micro FIT & FIT Generation Connect
 Not assigned
 Data Collection

TOTAL: \$23M

2010 Operating Area Lines Sustainment OM&A

Trouble Calls
 Cable Locates
 Dx Lines Patrol
 Field Meter Reading
 Disconnect/Reconnect
 Field Collections, Special Invest
 CM: Defect Corrections
 Small External Demand Requests
 Meter Replacement Services
 Other Planned Lines DM P&P's
 Sentinel Light Maintenance
 Not assigned
 Eng/Tech Studies & ERA
 Pole Transformer Inspect & Test
 Other Demand Lines DM P&P's
 Wood Pole Testing

TOTAL: \$129M

Proposed AF

IRWOS x PDR
 UGR
 PDR
 CKM
 CKM
 CKM
 PDR
 CKM
 CKM
 PDR
 CKM
 CKM
 CKM
 CR
 CR
 CKM
 PDR
 PDR

Note: Only provincial level categories with 2010 total cost greater than \$250k are included

Are there any additional factors that should be considered and/or should any of the proposed factors be adjusted or enhanced?

Data will be compiled from a number of HONI databases

- ❑ **HONI will assist in compiling the required data**

- ❑ **Four databases will be used:**
 - SAP Enterprise Resource Planning System
 - Annual operating, maintenance, and administrative (OM&A) expenses as well as annual capital expenditures (CAPEX) and information on fixed assets
 - Customer Information System (CIS)
 - Customer related information, including usage history, rate class, customer and service address, meter number, customer number, etc.
 - Geographic Information System (GIS)
 - Up-to-date information on the type and location of assets and customers across the entire network
 - Outage Response Management System (ORMS)
 - Trouble-call management system

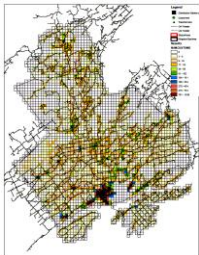
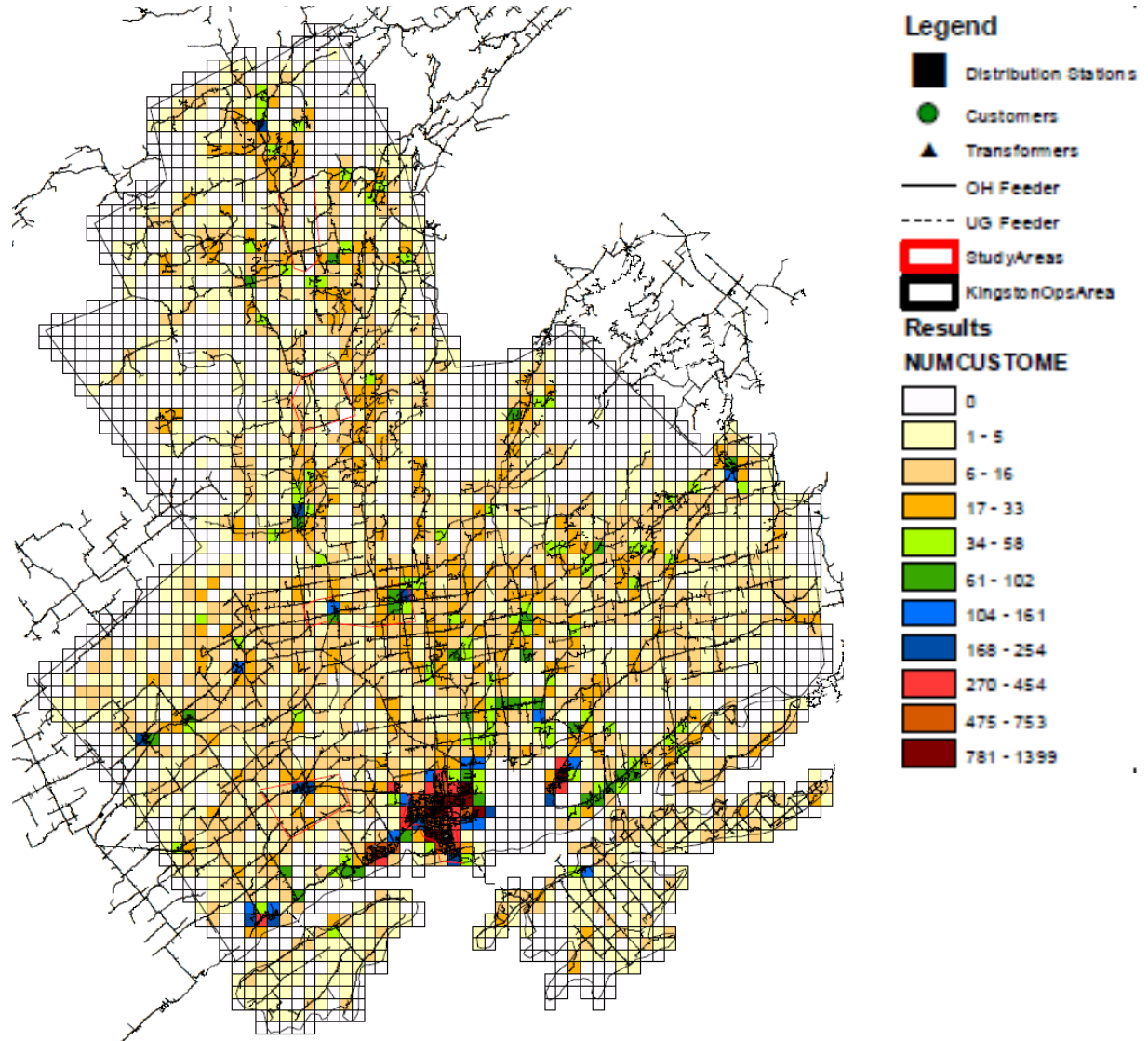
Selection and number of sample areas is critical in assuring statistical significance and confidence

- ❑ **Sample areas will be selected such that they represent a range of high, medium, and low density customer groups**

- ❑ **The size and boundaries of sample areas will be chosen to ensure that they represent a material cross section of actual conditions, customers, and geography across HONI's network**

- ❑ **Data from a significant number of sample areas and operating areas is required to ensure statistical significance of conclusions**
 - LEI/PNXA estimate that at least 15 sample areas of each category will be required

Using HONI's GIS system, it is possible to create maps which illustrate the density of customers across the province



Specific conclusions can be made based on the results of econometric and engineering analyses

□ Results of the econometric analysis will:

- Identify to what extent differences in costs across HONI's operating areas are explained by differences in customer density
- Determine whether one measure of customer density has better explanatory power than the other

□ Results of the engineering analysis will:

- Identify how HONI's costs vary across areas and groups of customers with high, medium, and low densities, taking into account other characteristics such as distance from service centers, type of assets in use, etc.
- Allow for the comparison of the differences in directly assigned costs for high, medium, and low density sample areas to the differences in costs allocated to existing rate classes under HONI's current cost allocation methodology

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