



Is the grid ready for all-electric business districts?

Barry Hooper

June 20, 2023

SAN FRANCISCO

ENVIRONMENT

DEPARTMENT

Agenda

Problem

Resources

Findings

SFE

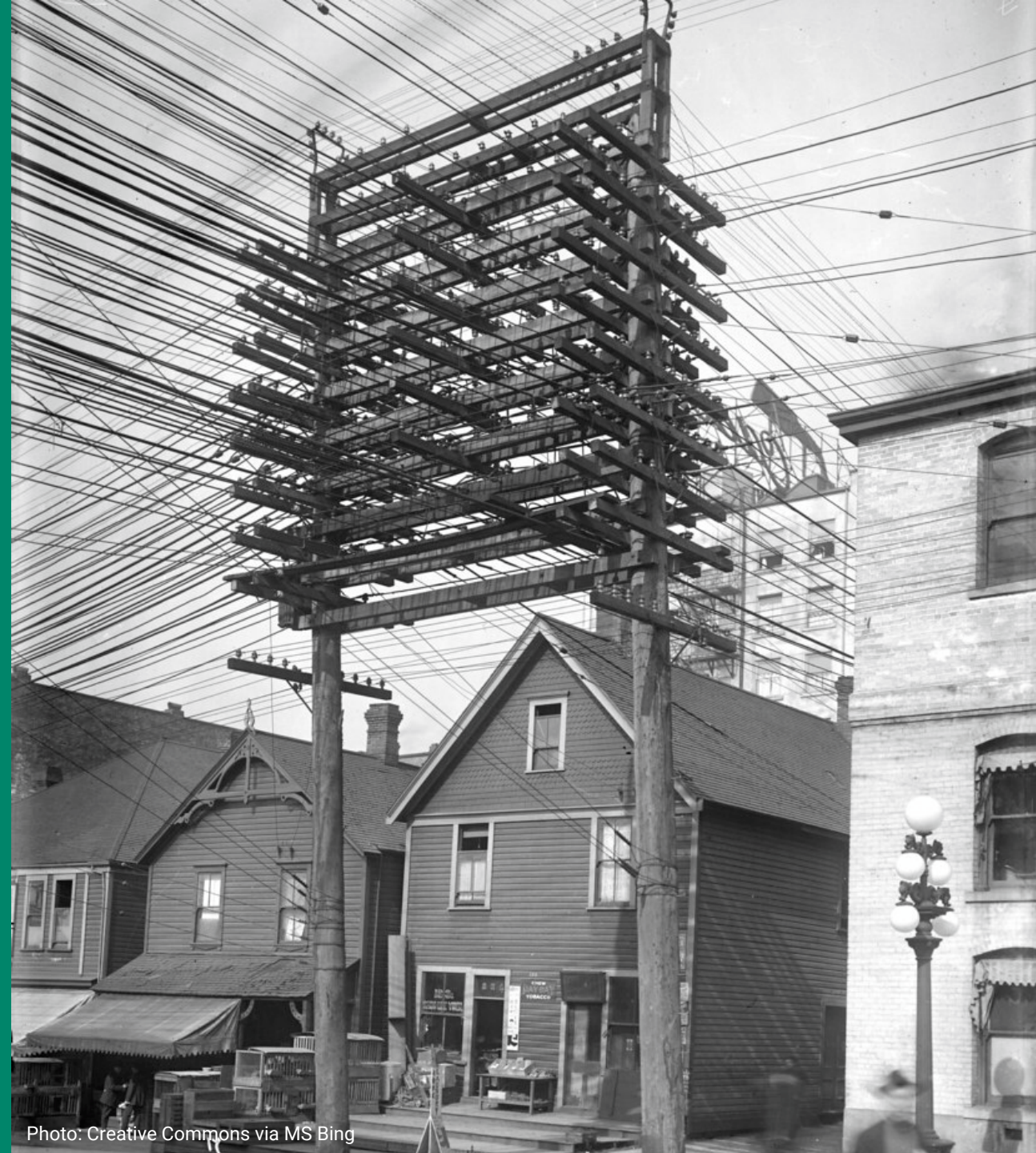


Photo: Creative Commons via MS Bing



Zero Emission Buildings Task Force

The cost of failing to act on climate risk is great.

The City and constituents have shared interest in climate risk mitigation

SFE



Climate Action Goals

2030

Reduce emissions 61%

2035

Large existing commercial:
zero emissions

2040

Net zero emissions citywide

SFE

Roles

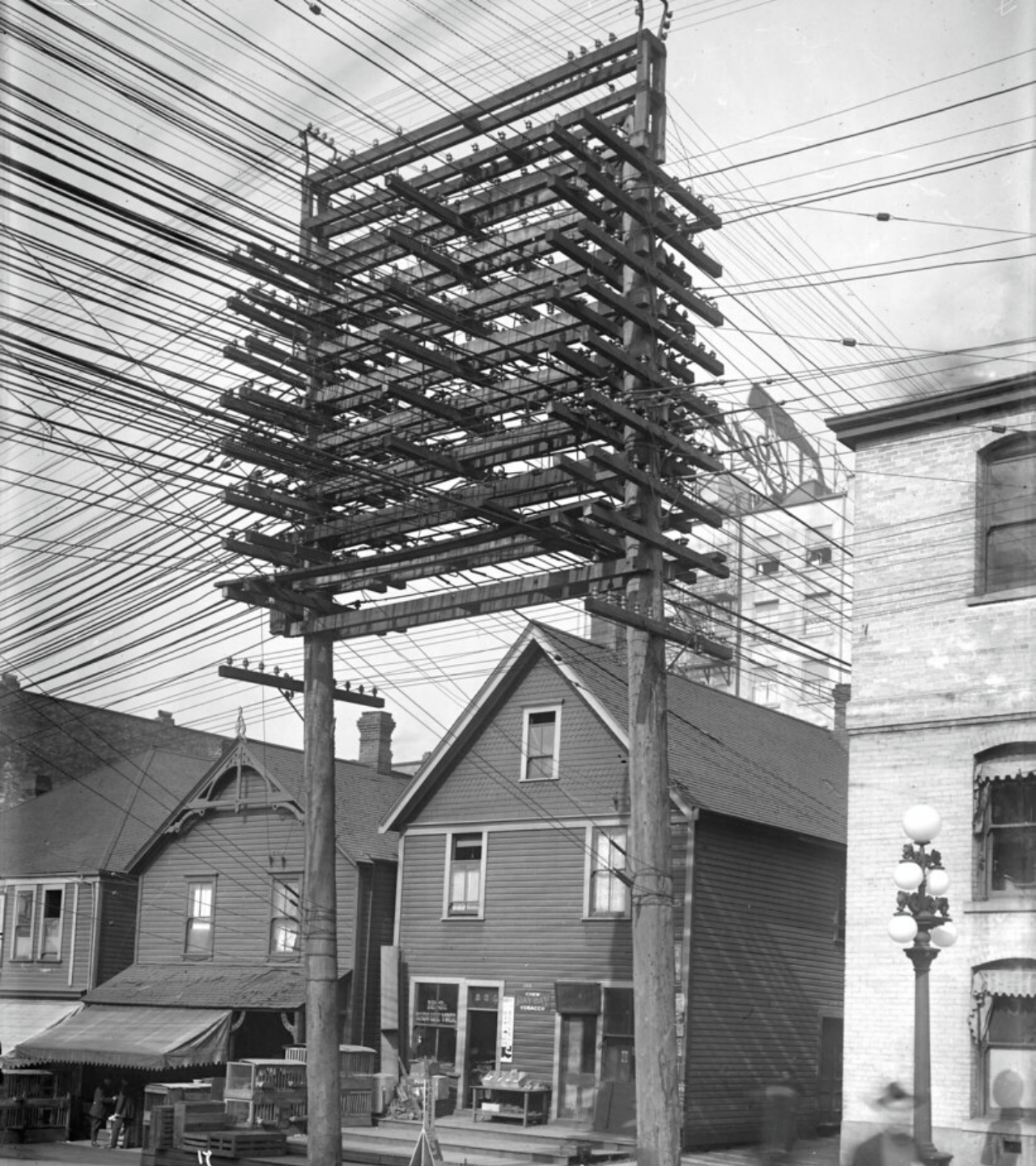
Building owner
Electrify a building

Utility
Serve customers
Safe infrastructure

City
Economy
Public safety



- SF buildings
- Convalescent/Nursing Homes
- Hospitals
- Medical
- Flat & Store
- Office
- Hotel
- Retail
- Mixed use
- Theatres
- Churches, Convents, Rectories
- Schools
- Public Buildings (Govt)
- Industrial Warehouse
- Industrial
- Industrial Condominium
- Industrial Data Center
- Industrial Mixed/Other Use
- Mixed Uses (With Residential)
- Multi-family
- Single-family
- University of California Property
- NetworkedSecondaryBuffer



Grid infrastructure improvements

- Slow
- Expensive
- Complex
- *Local government knowledge?*
 - New development: Yes
 - Existing buildings: ?



Public records

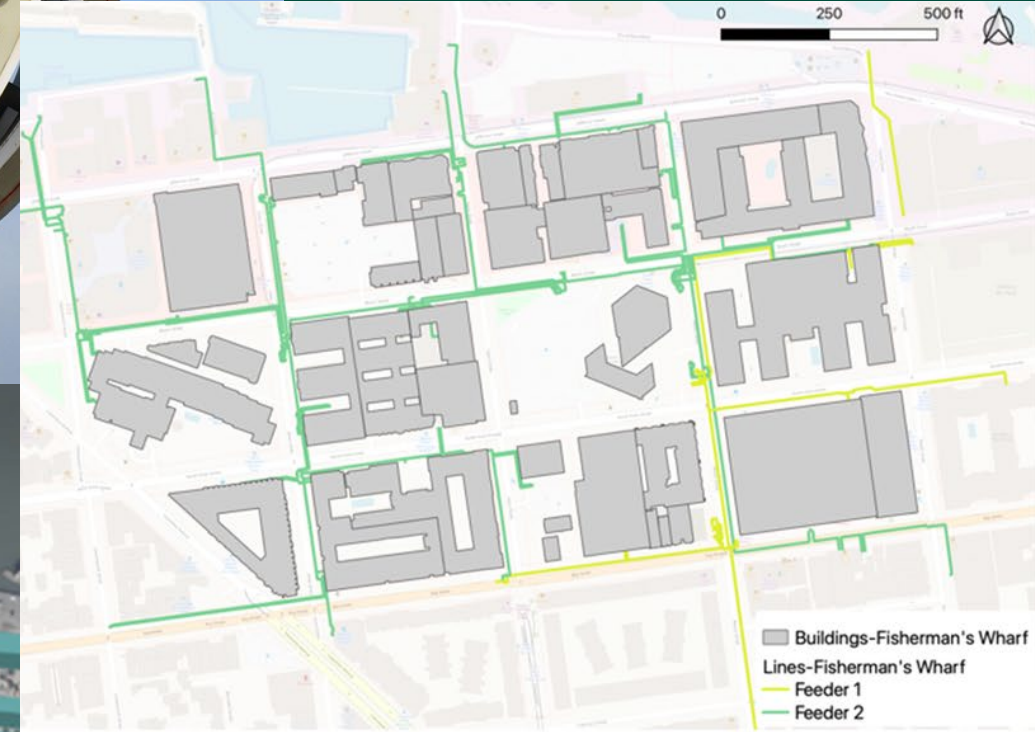
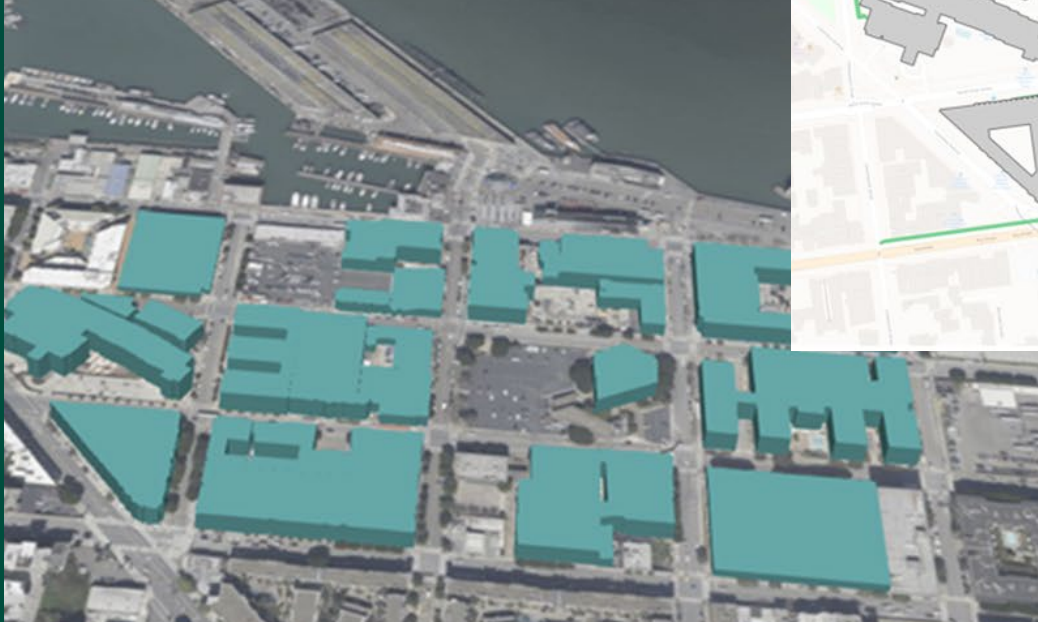
City

- Land use
- Code vintage and equipment
- Energy use

Utility

- Integration Capacity Analysis (ICA)
for Distributed Energy Resources

Quantify impact
of electrifying all
buildings in a
business district



(and repeat
for another
district)

Analysis

1) Calculate 10-minute load profile for each building

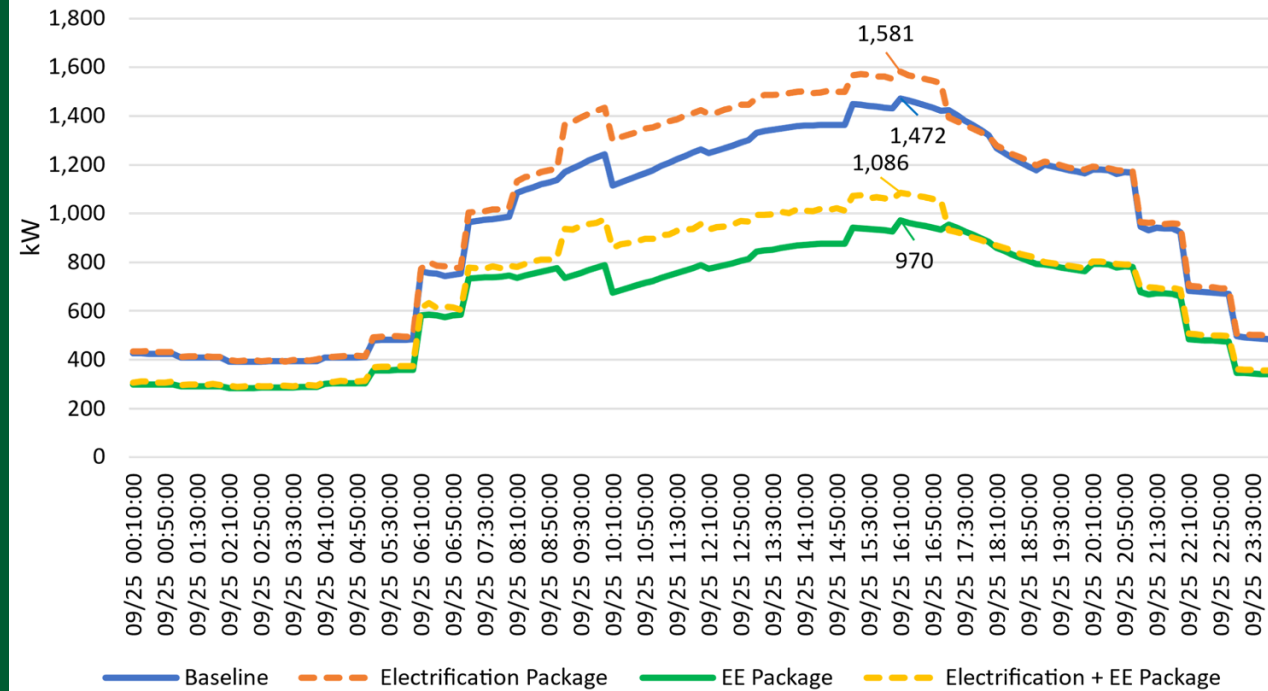
Calibrate baseline (today's electric grid)

Add electrification and energy efficiency

2) Aggregate to district

3) Is peak demand greater or less?

Fisherman's Wharf 10-minute Interval Power Profile on Peak Demand Day



Scenario	Measure	Small hotel	Small office	Medium office
Electrification package	Replace existing HVAC with PTHP	X		
	Replace existing HVAC with ASHP		X	X
	Replace existing central gas boiler for space heating with an air-to-water heat pump			
	Replace gas water boiler with HPWH	X	X	X
	Replace gas cooking system with induction cooking system			
	Replace gas laundry system with electric system	X		
Energy efficiency package	Retrofit lighting with LED	X	X	X
	Add daylight controls	X	X	X
	Add occupancy sensors for lighting control	X	X	X
	Add roof insulation	X	X	X
	Install low-flow faucets and showerheads	X	X	X
	Install plug-load controls		X	X
	Enable demand controlled ventilation		X	X
	Add or repair economizer	X	X	X
	Add air sealing to reduce infiltration through envelope	X	X	X
	Add energy recovery ventilation unit		X	X

SFE Electrification and efficiency measures (normal stuff)

Scenarios

Baseline (today's electric grid)

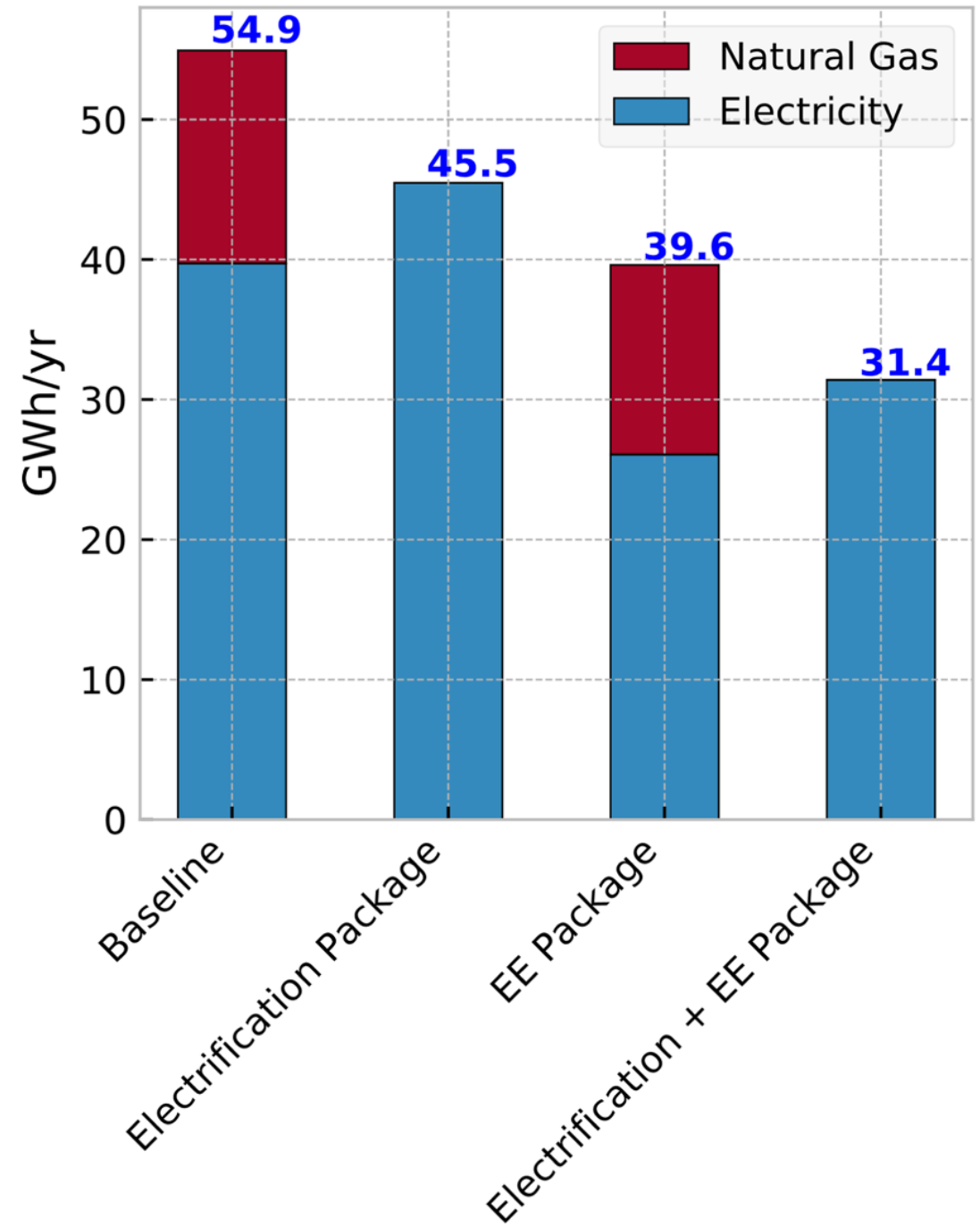
Electrification (~T24)

Efficiency only

Efficiency and electrification

Updating equipment improves efficiency

Energy Consumption: Fisherman's Wharf



Results

Electrification only

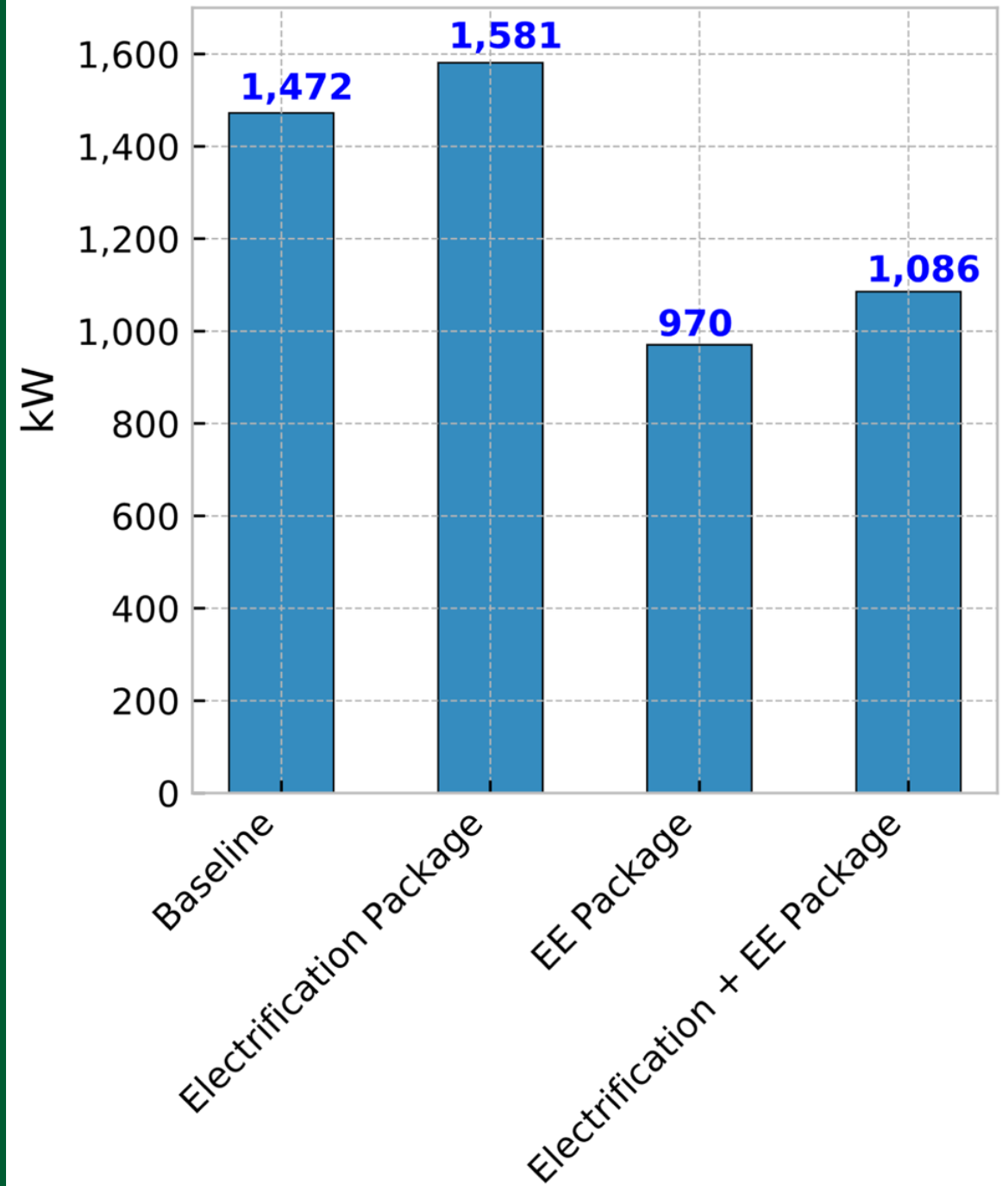
- Wharf: Peak increased 7%
- Design District: Peak decreased 1%

Efficiency and electrification

- Wharf: Reduced peak 26%
- Design District: Reduced peak 40%

*All results were within capacity of today's grid**

Peak Electricity: Fisherman's Wharf

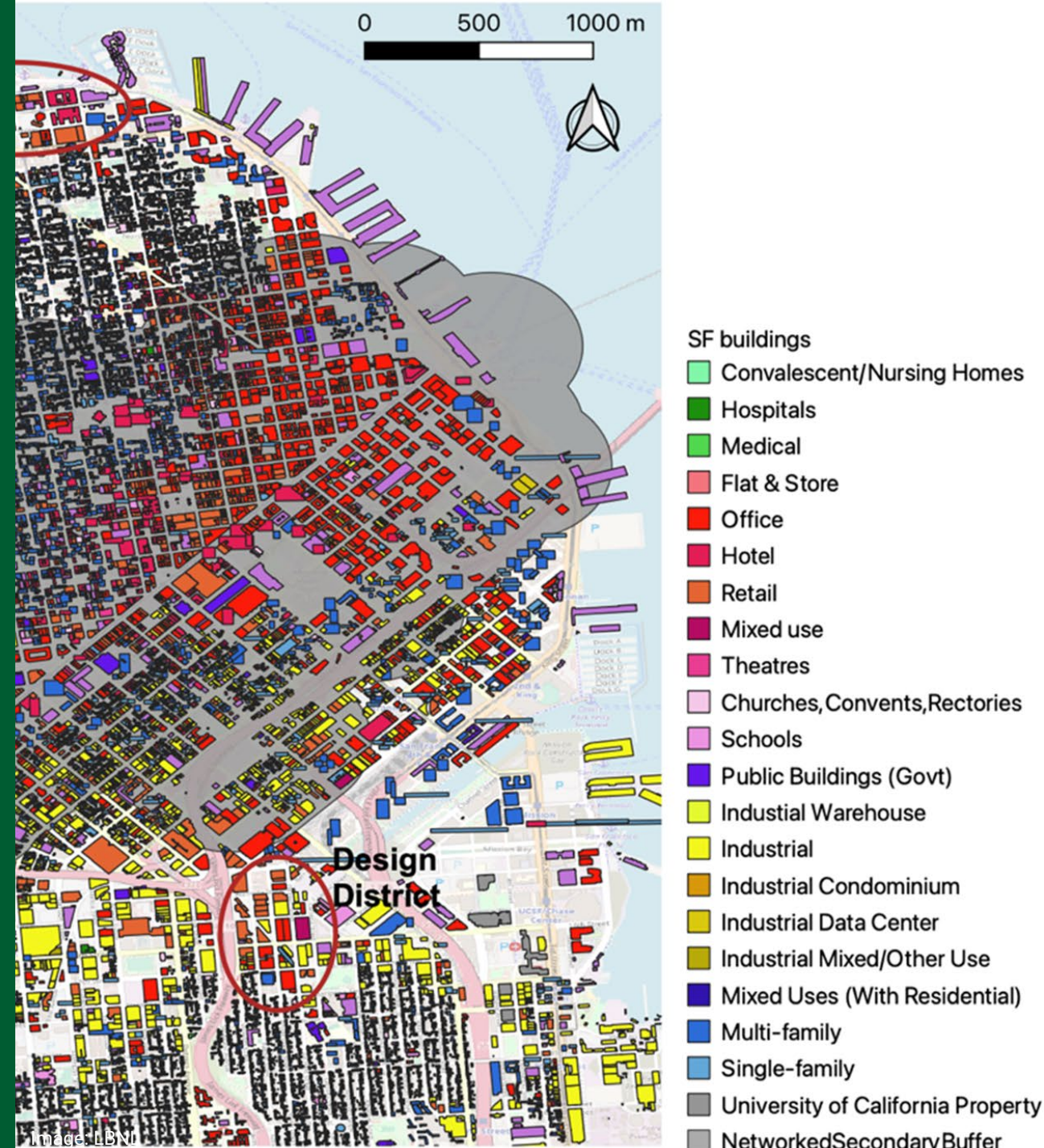


Lessons

Public data can help answer electrification policy questions *

Efficiency improves confidence the grid can handle electrification

** This analysis is not a substitute for utility grid planning!*



SAN FRANCISCO

ENVIRONMENT

DEPARTMENT

