


Predicting Energy Use in Buildings

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1. SF Commercial Building Energy Benchmarking - Site EUI in kBtu/ft²
2. SF Property Information Map info




San Francisco Property Information & Resources

Public Access to Useful Property Information & Resources at the Click of a Mouse

Step 1: Search or Click on the Map

Search Examples: 400 Van Ness Ave 0767/001
Mission and Van Ness 2015-005040PRJ
Ferry Building



Step 2: Review Property Information

Click tabs below to view property or planning information

Property | Zoning | Preservation | Planning Apps | Building Permits | Other Permits | Complaints | Appeals | BBNs

Please send requests for data changes directly to the [Office of the Assessor-Recorder](#)

Address:	945 FRONT ST
Parcel:	0136002
Assessed Values:	
Land:	\$3,116,911.00
Structure:	\$2,077,940.00
Fixtures:	-
Personal Property:	-
Last Sale:	7/7/2010
Last Sale Price:	\$1,856,000.00
Year Built:	1955
Building Area:	20,010 sq ft
Parcel Area:	12,465.75 sq ft
Parcel Shape:	Rectangular
Parcel Frontage:	-
Parcel Depth:	37.5 ft
Construction Type:	Masonry or concrete
Use Type:	Office
Units:	10
Stories:	2
Rooms:	15
Bedrooms:	4
Bathrooms:	-
Basement:	-

[Recorded Documents for this property](#)

C FINANCE NO.

1 [Environment Code - Existing Commercial Buildings Energy Performance]

Ordinance amending the San Francisco Environment Code by adding Chapter 20, Sections 2000 through 2009, to adopt the San Francisco Existing Commercial Buildings Energy Performance Ordinance, requiring owners of nonresidential buildings to conduct Energy Efficiency Audits of their properties and file Annual Energy Benchmark Summaries for their buildings, and making environmental findings.

[illegible]

Why Building Energy Use?

Buildings are at the intersection of energy use and infrastructure

- Close to 40% of US carbon emissions and total energy consumption is related to energy use in the residential and commercial building sectors.
- Grid modernization means that we are using predictive software to control energy assets - understanding energy demand is vital to deploying renewable resources, controlling storage, and making smart investments of capital.

GRID OPTIMIZATION

Defining the True Market Opportunity for Distributed Energy Resource Management Software



A true enterprise DERMS platform doesn't exist yet —but utilities and vendors are building up the central, edge and fleet platforms to get there.

by Jeff St. John
July 19, 2017

Greentech Media

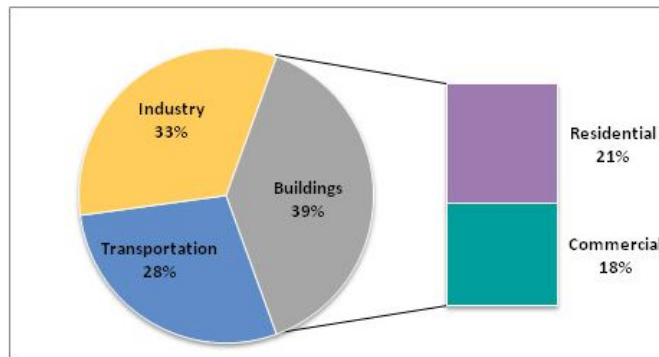
SCIENTIFIC METHOD —

Distributed energy sources can reduce cost of electricity up to 50%, study says

Traditional grids will have to change. Modelling can help find the best way forward.

MEGAN GEUSS (US) - 20/7/2017, 06:35

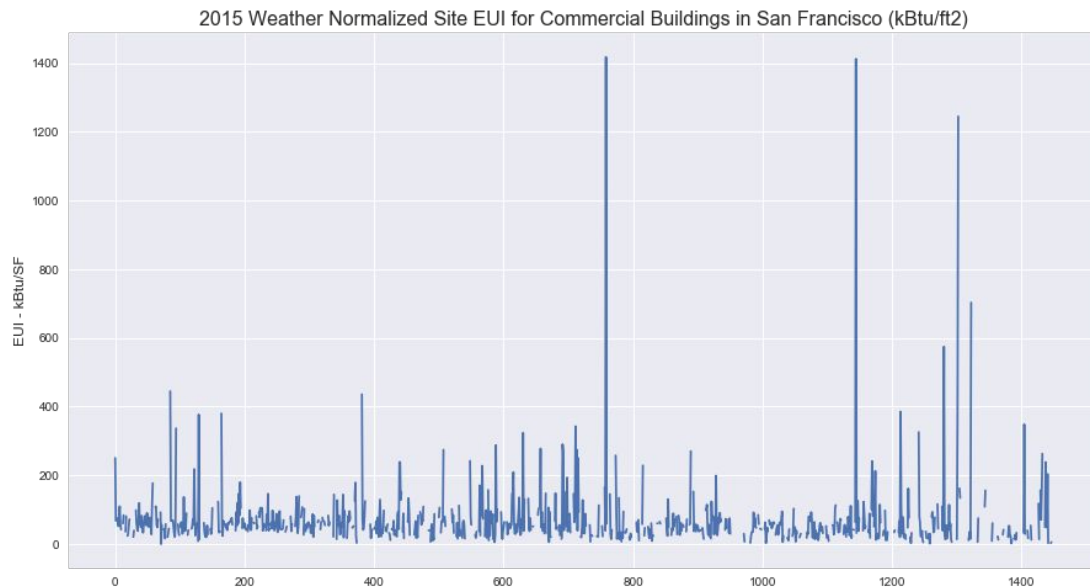
Nature Energy



Source: U.S. Department of Energy (DOE), 2008 *Buildings Energy Data Book*, Section 1.1.1, 2008.

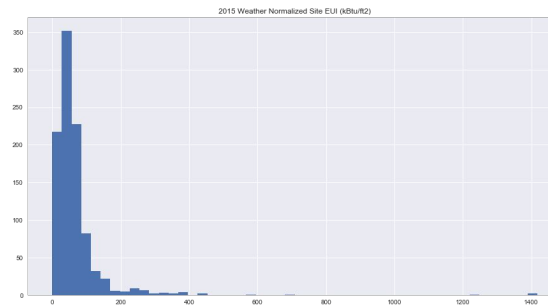
DOE

Building Energy Use is Highly Variable



NYC: EUI comparisons show wide swings

Variation in source energy use intensity (EUI) within five sectors.



- Y Target - Weather normalized energy use per SF for 2015

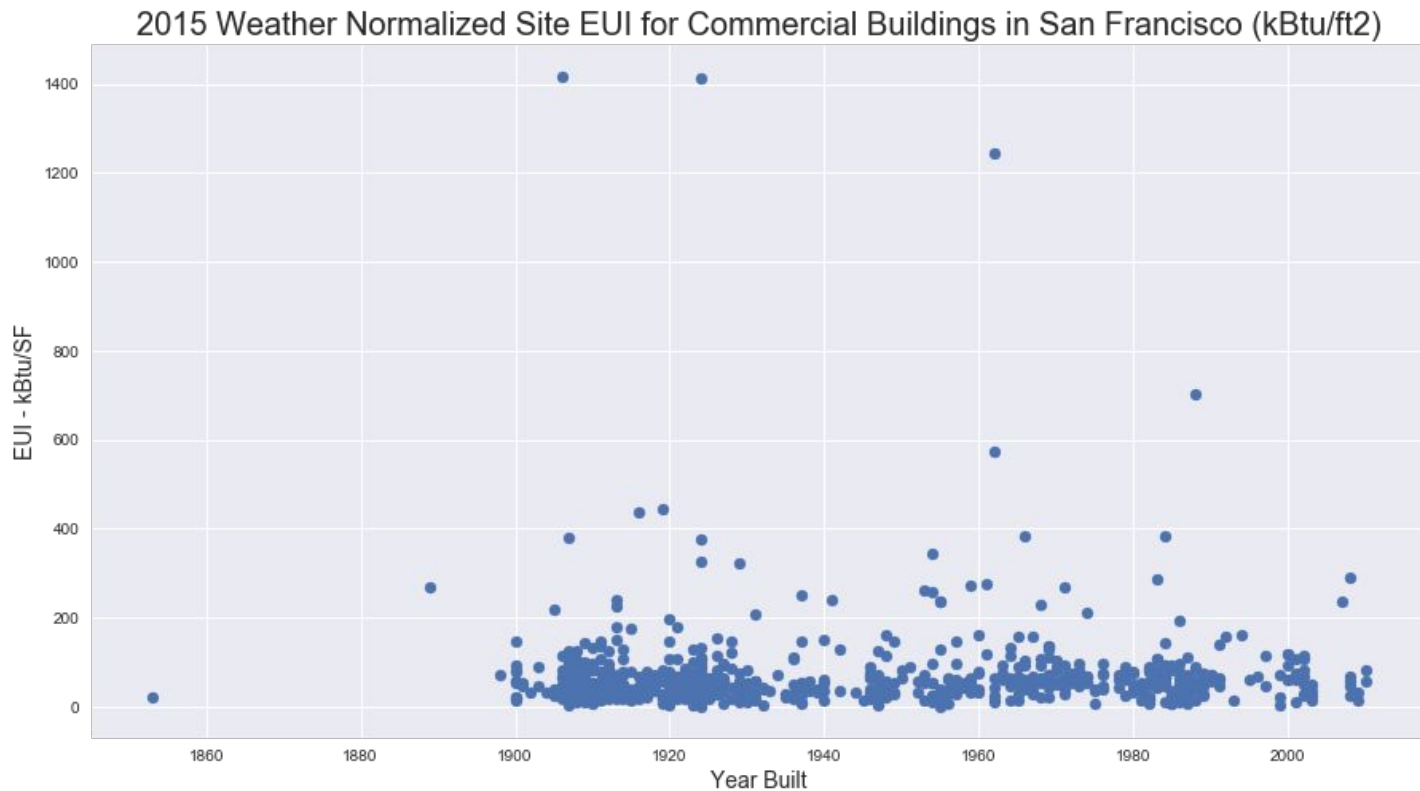


Possible Predictors

- Postal Code
- Energy Audit Status
- Property Type
- Date Next Energy Audit Due
- Land Value
- Structure Value
- Basement Area
- Building Area
- Last Sale Price
- Last Sale Date
- Parcel Area
- Year Built
- Parcel Frontage, Depth, Shape
- Construction Type
- # of Units, Stories, Rooms, Bathrooms, Bedrooms

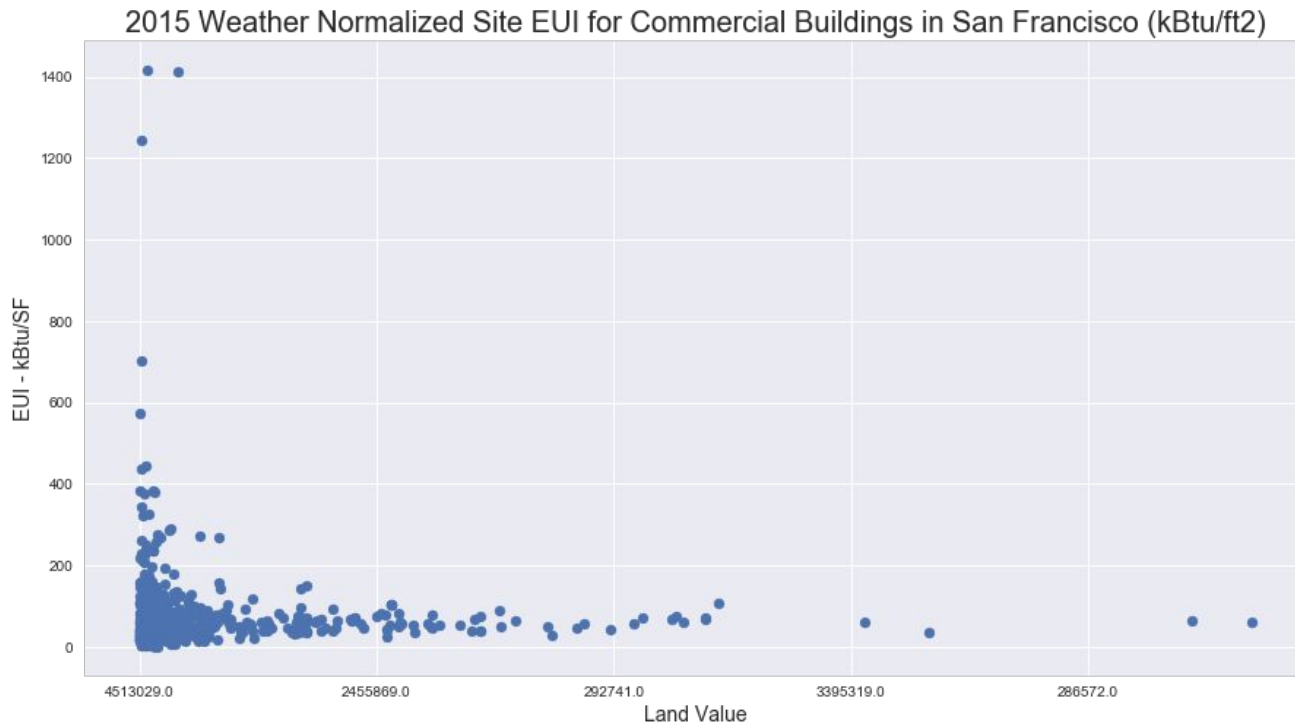


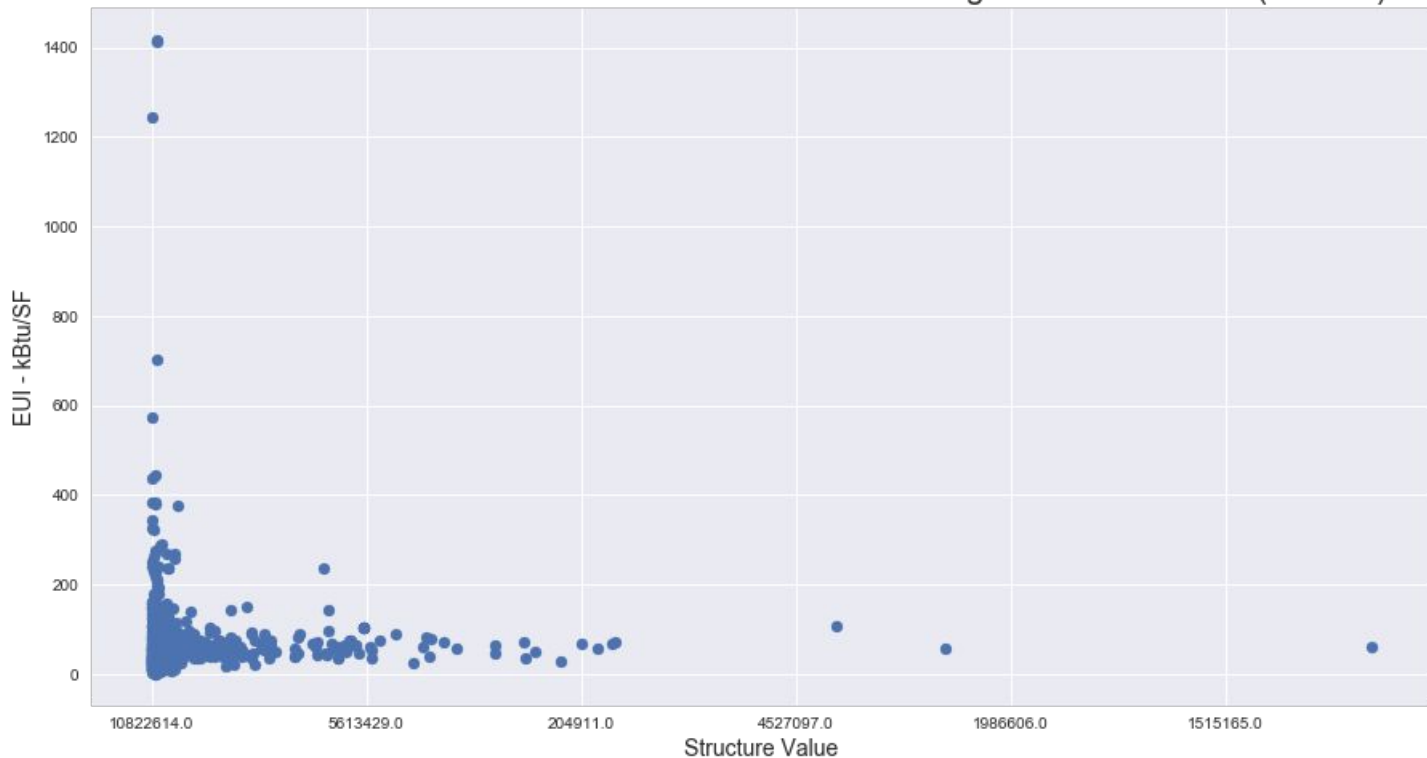
Possible Predictors - Year Built





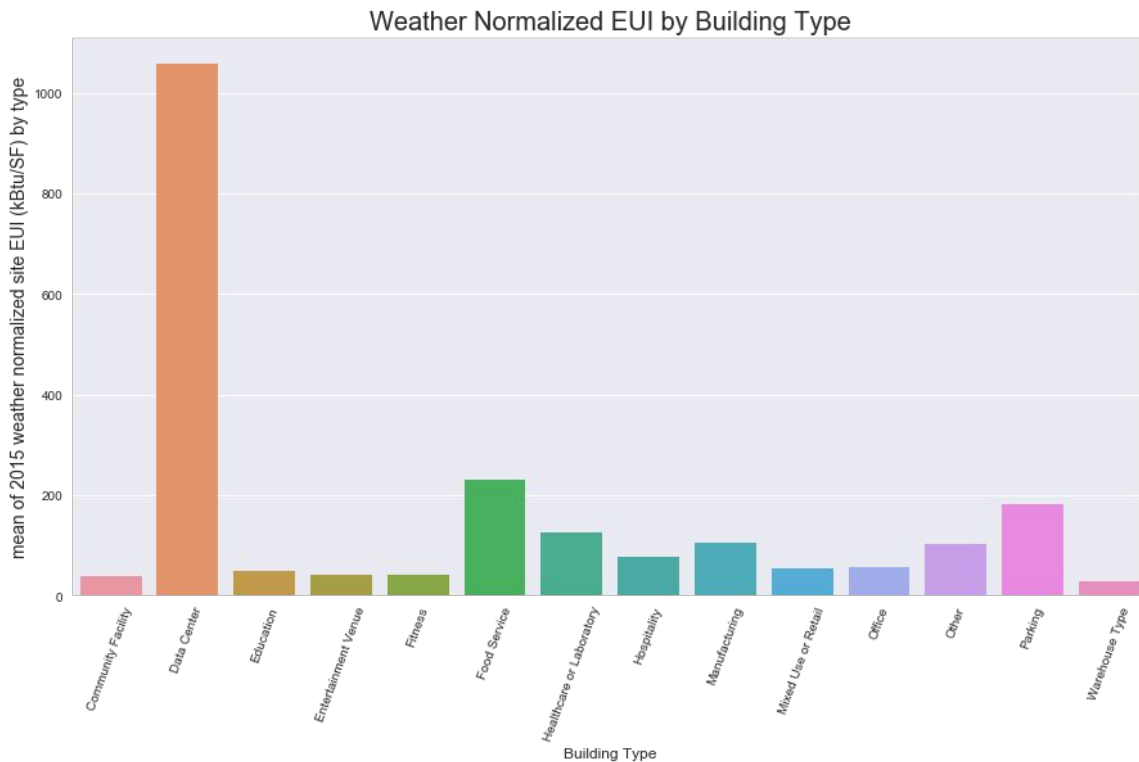
Possible Predictors - Land Value







Possible Predictors - Building Type





How Do The Various Models Do?

Model: ridge_model
Score: 0.311807434888

Model: lasso_model
Score: 0.256958683729

Model: robust_regression
Score: -2.23242995967e+60

Model: eps_insensitive
Score: -2.70337307506e+62

Model: extratrees
Score: -0.217041621211

Model: randomForest
Score: 0.0756431243302

Model: adaboostedTrees
Score: -0.00646716583959

Model: gradboostedTrees
Score: -0.188728972461



What parameters are important?

- Is it a data center? (++)
- Is there a lot of refrigeration? (++)
- Is it a warehouse? (--)
- Is it a hospital or laboratory? (++)
- Is it a church? (--)
- Is it ZNE certified? (small -)
- Property value (0)
- Building size (0)
- Structural value (0)
- Energy audit compliance (0)

The ZNE Factor

Energy Audit Status_clean_Exempt - ZNE Certified', -33.11

Coefficient - the 'Design Dream Team' factor

EUI = - 0.6 kBTU/ft²

**DPR's SF Office Wins CIBSE's
2017 International Project of the
Year**

February 24, 2017



2016 Technology
Award Winner -
National



REVEAL.

THE ENERGY EFFICIENCY LABEL

Project Name: DPR San Francisco

Project Owner: DPR Construction

Architect: FME Architects

MEP Engineer: Integral Group

Building Type: Commercial Office

Location: San Francisco, CA

Climate Type: Marine

Square Footage: 20,010

Time stamp: 2015-2017

EUI
(kbtu/SF/yr)



52%

reduction from baseline
ASHRAE 90.1 - 2007

+113%

renewable production
% of energy use

INTERNATIONAL LIVING FUTURE INSTITUTE™ living-future.org

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Linear Regression - Ridge with Cross Validation

We just ran this model using k-folds of: 3, The best lambda value was: 0.545, the R^2 score was: 0.318, the rmse was: 60.0
This means that in order of impact on model results, features and their coefficients from most to least impact per unit of the feature are:

- 'Property Type - Data Center', 496
- 'Property Type - _Hospital', 140
- 'Property Type - Urgent Care/Clinic/Other Outpatient', -106
- 'Grouped_Building_Type_Mixed Use or Retail', -92.7
- 'Grouped_Building_Type_Warehouse Type', -78.3
- 'Grouped_Building_Type_Education', -75.29
- 'Grouped_Building_Type_Community Facility', -74.34
- 'Grouped_Building_Type_Office', -65.23
- 'Grouped_Building_Type_Food Service', 62.88
- 'Grouped_Building_Type_Entertainment Venue', -61.0
- 'Property Type - Fitness Center/Health Club/Gym', -58.93
- 'Grouped_Building_Type_Fitness', -58.93
- 'Property Type - Self Selected_clean_Veterinary Office', -53.572
- 'Property Type - _Self-Storage Facility', -52.30
- 'Property Type - Self Selected_clean_Restaurant', 50.90



Linear Regression - Ridge w/ Standardization and K-Folds Cross-Validation

We just ran this model using kfolds of: 3, The best lambda value was: 0.775, R^2 score was: 0.527, rmse was: 70.53

Features and their coefficients from most to least impact per unit of the feature are:

Data Center', 13.75

Food Service', 13.35

Restaurant', 11.73

Hospital - 11.635074284626226)

('Property Type - Self Selected_clean_Supermarket/Grocery Store', 10.492695614326074)

('Property Type - Self Selected_clean_Other', 7.0107696258721139)

('Grouped_Building_Type_Other', 7.0107696258713394)

('Grouped_Building_Type_Warehouse Type', -5.376004972121013)

('Property Type - Self Selected_clean_Parking', 5.2538594506356828)

('Grouped_Building_Type_Parking', 5.2538594506328309)

('Property Type - Self Selected_clean_Worship Facility', -4.4598749529090158)

('Property Type - Self Selected_clean_Non-Refrigerated Warehouse', -4.4538992269131903)

('Property Type - Self Selected_clean_Laboratory', 4.2861995521146241)

('Property Type - Self Selected_clean_Senior Care Community', 4.2665411275709966)