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# Zero Energy Performance Targets

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## Outline

1. The need for high performance energy targets
2. Recommended targets for zero energy buildings
3. Implementation of energy targets

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## Why do we need targets?

- “I want a Zero Energy building. Where do I start?”
- Establish endpoint for policy



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## Developing the performance targets

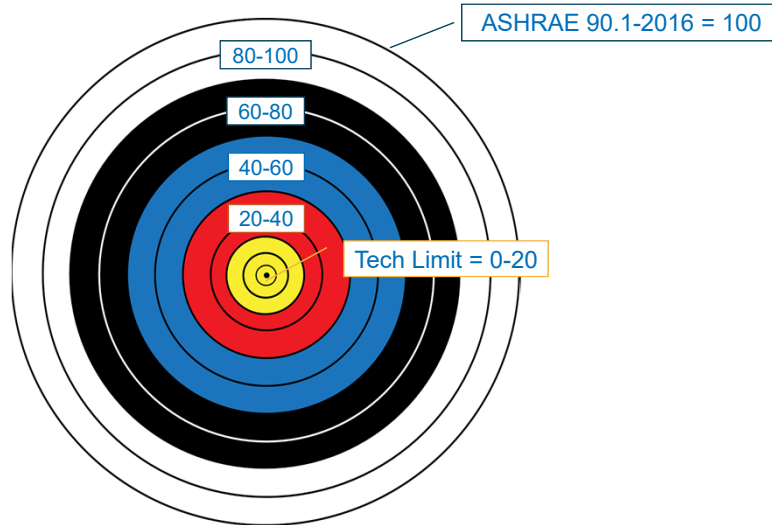
- Datasets:
  - Measured data
  - Modeling analyses
- Set by climate zone and building type



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## Take aim!

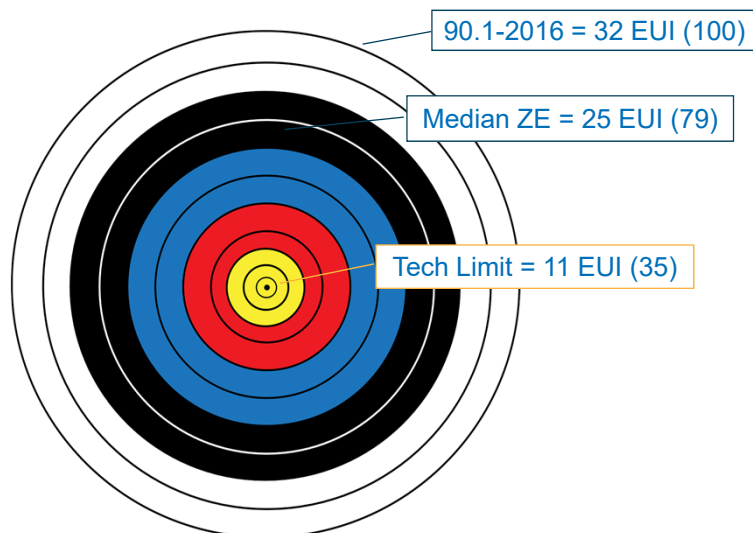
Where would you design a zero energy medium office?



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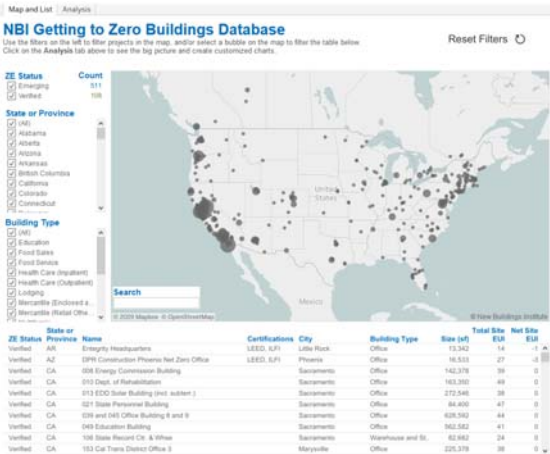
## Take aim!

Medium office  
50,000 ft<sup>2</sup>  
Average climate

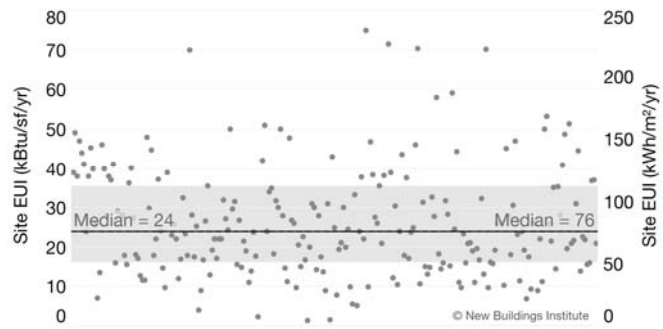


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# Measured data from the Getting to Zero Database



- 300+ projects with energy data
- Adjusted for climate zone

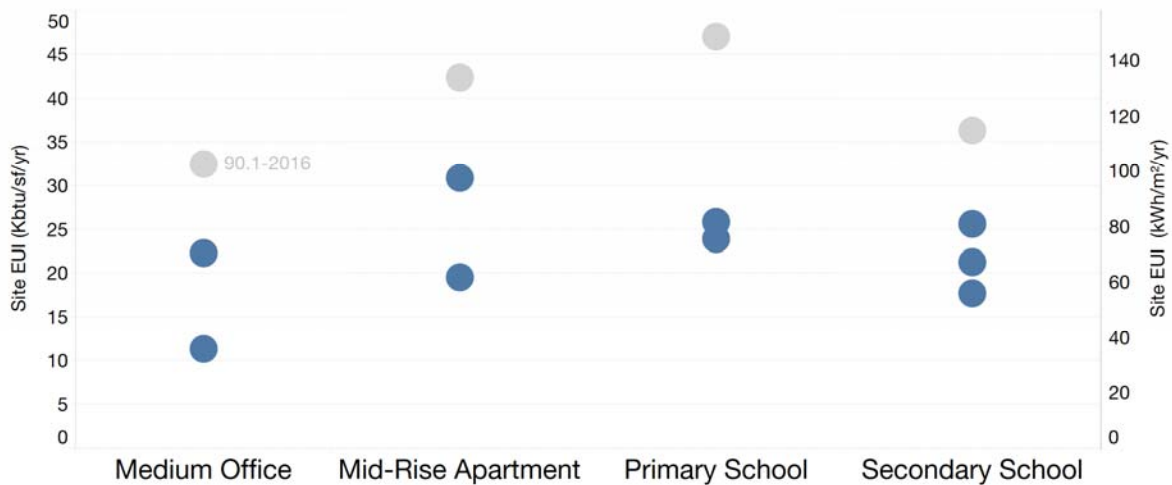


<https://newbuildings.org/resource/getting-to-zero-database/>



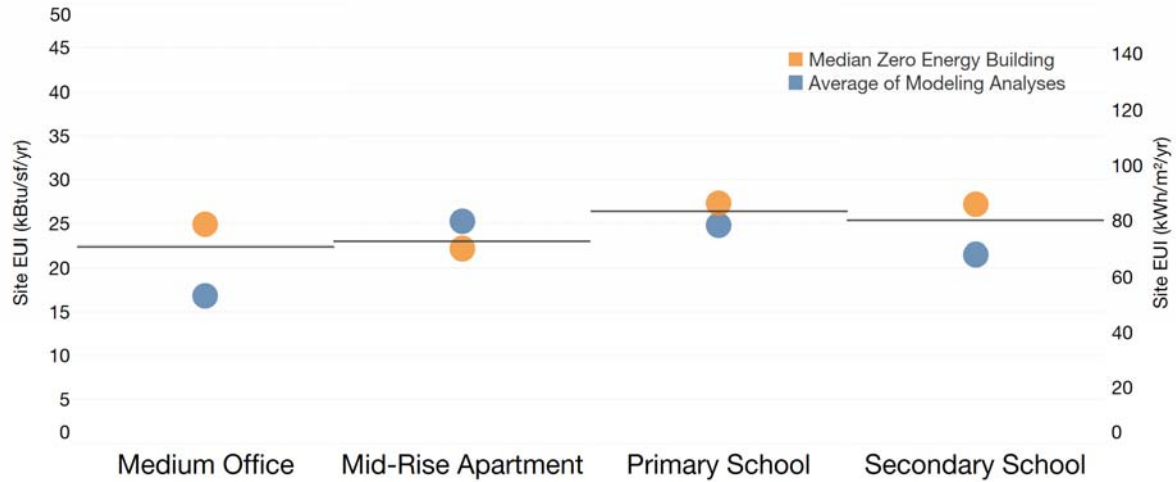
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# Modeling analyses: What's the best we can do?



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## Modeling analyses supplement the measured data



## Target Table [kBtu/sf/yr]

Building Type	1A	1B	2A	2B	3A	3B	3C	4A	4B	4C	5A	5B	5C	6A	6B	7	8
Primary School	26	25	26	25	27	23	21	27	24	24	28	25	24	29	26	30	39
Low-Rise Apartment	20	21	19	20	21	19	17	21	20	20	24	21	20	24	23	27	31
Medium Office	24	24	23	23	23	21	17	22	20	20	24	21	20	25	23	22	27
Small Office	19	20	18	19	18	18	16	17	18	17	18	17	16	18	18	20	24
Secondary School	29	29	26	27	26	25	22	24	26	26	25	29	23	24	24	25	35
Public Assembly	27	28	27	27	28	26	24	28	26	26	30	28	27	31	29	34	40
Standalone Retail	27	30	26	28	25	26	21	25	26	26	26	28	26	27	26	29	35
Mid-Rise Apartment	22	23	21	22	23	21	19	24	22	22	26	23	23	27	25	30	34
Strip Mall	30	33	31	32	33	29	25	34	29	31	39	34	33	41	37	46	60
High-Rise Apartment	28	28	27	27	28	26	22	29	27	27	33	29	27	33	30	37	43
Warehouse	5	8	6	8	7	7	7	9	8	8	11	9	9	11	10	15	16
Small Hotel	36	35	35	35	35	34	32	36	34	34	38	35	34	39	37	41	47
Fire Station	29	30	29	29	30	28	25	30	28	28	33	30	29	33	31	36	43

## Target Table [kWh/m<sup>2</sup>/yr]

Building Type	1A	1B	2A	2B	3A	3B	3C	4A	4B	4C	5A	5B	5C	6A	6B	7	8
Primary School	82	79	82	79	85	73	66	85	76	76	88	79	76	91	82	95	123
Low-Rise Apartment	63	66	60	63	66	60	54	66	63	63	76	66	63	76	73	85	98
Medium Office	76	76	73	73	73	66	54	69	63	63	76	66	63	79	73	69	85
Small Office	60	63	57	60	57	57	50	54	57	54	57	54	50	57	57	63	76
Secondary School	91	91	82	85	82	79	69	76	82	82	79	91	73	76	76	79	110
Public Assembly	85	88	85	85	88	82	76	88	82	82	95	88	85	98	91	107	126
Standalone Retail	85	95	82	88	79	82	66	79	82	82	82	88	82	85	82	91	110
Mid-Rise Apartment	69	73	66	69	73	66	60	76	69	69	82	73	73	85	79	95	107
Strip Mall	95	104	98	101	104	91	79	107	91	98	123	107	104	129	117	145	189
High-Rise Apartment	88	88	85	85	88	82	69	91	85	85	104	91	85	104	95	117	136
Warehouse	16	25	19	25	22	22	22	28	25	25	35	28	28	35	32	47	50
Small Hotel	114	110	110	110	110	107	101	114	107	107	120	110	107	123	117	129	148
Fire Station	91	95	91	91	95	88	79	95	88	88	104	95	91	104	98	114	136

## Target Implementation

- Adjust as needed for other variables (24/7 operations, data centers, etc.)
- *First step* for:
  - Owner project requirements
  - Stretch code development
  - Zero energy roadmaps
  - Other policies





## Target Implementation Examples

- Seattle Energy Code
- City of Boulder, CO
- California Department of General Services



Wayne Aspinall Federal Building & Courthouse | Grand Junction, CO Photo: GSA

## Conclusion

- High performance targets focus design teams toward a common goal
- When in doubt, target 20-30 kBtu/ft<sup>2</sup>-year
- Targets are a *starting point*
- Targets may be leveraged at a single building or broad policy scale

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Questions?  
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## Further Reading

- EUI Targets Report:  
<https://newbuildings.org/resource/zero-energy-commercial-building-targets/>
- Getting to Zero Database:  
<https://newbuildings.org/resource/getting-to-zero-database/>

