



**A landlord and a tenant
walk into a bar...**

**Dane Christensen
AEG Washington Q3 Stakeholder Challenge
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Dane Christensen

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National Renewable Energy Laboratory

B.S. Mechanical Engineering, Rice University

Ph.D. Mechanical Engineer, University of California, Berkeley

12.5 years at NREL

Research on building energy efficiency, grid integration, IoT,
cybersecurity, and data-driven analytics/controls

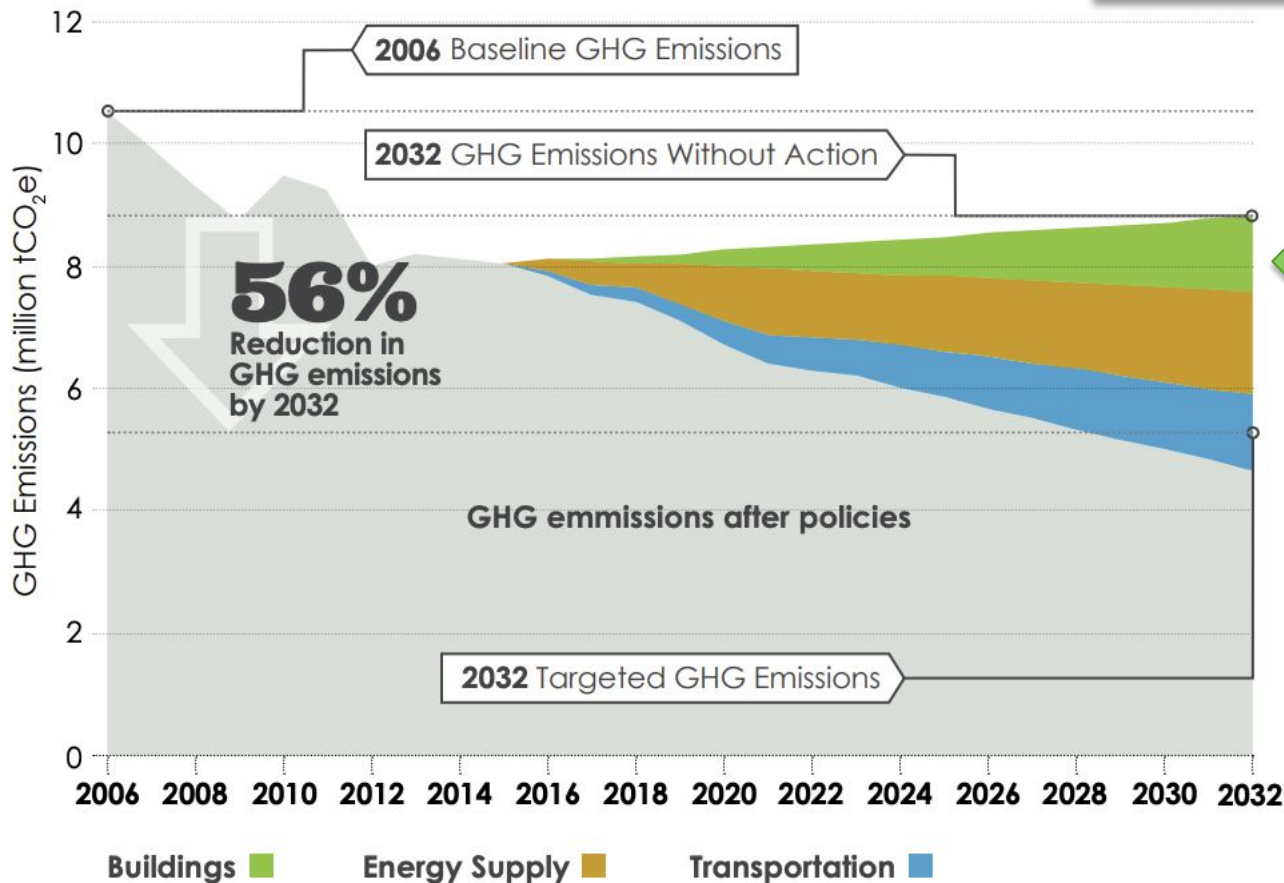
Awarded 2018 R&D 100 Award for **foresee**, NREL's novel
home energy concierge technology

>60 peer reviewed publications, 4 issued patents

Clean Energy DC

Clean Energy DC is the District's plan to cut **GHG emissions in half by 2032**

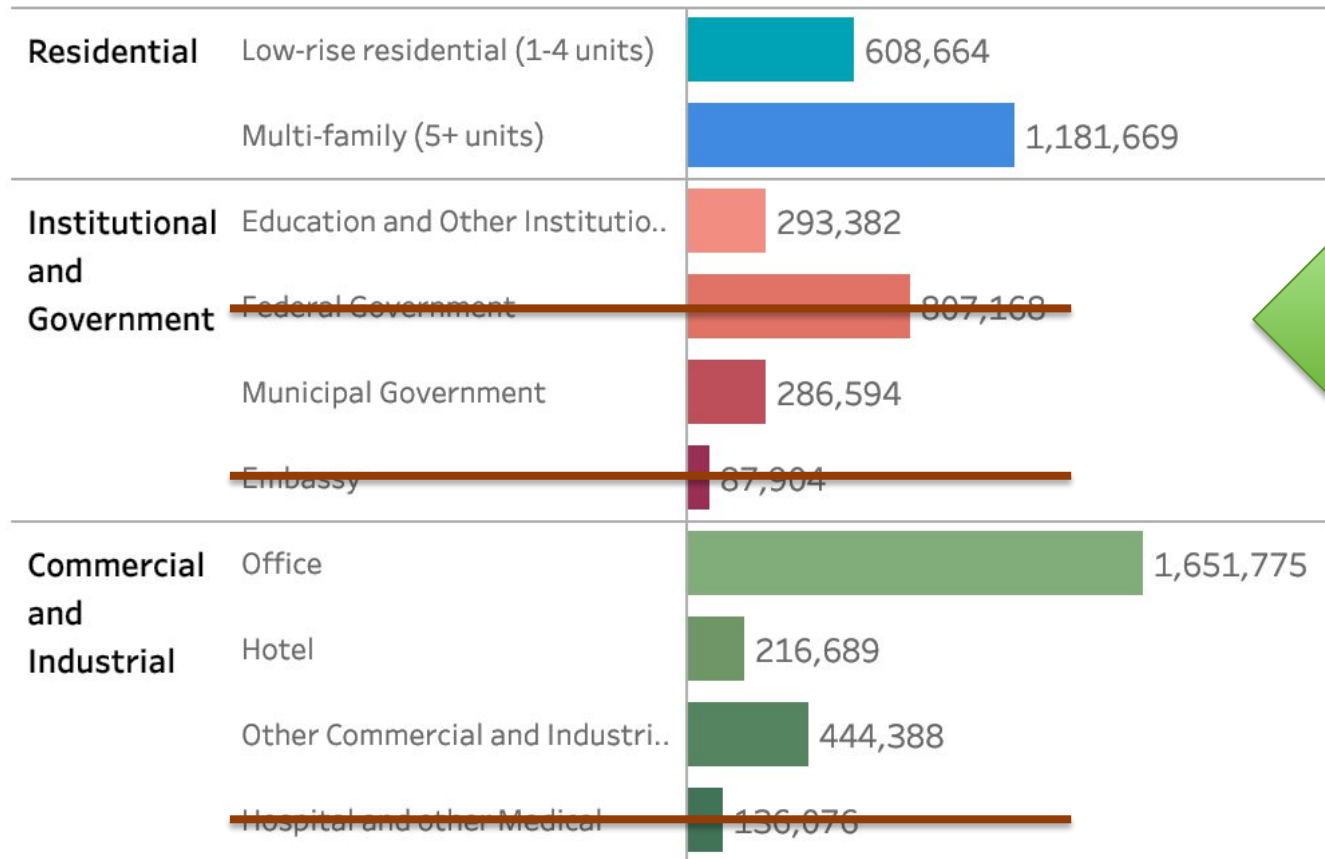
ESTIMATED GHG SAVINGS



Success requires ~1.2 MMtCO₂e from buildings

Is 56% possible?

2015 GHG Emissions by Building Type (tCO₂e)



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~1.2 MMtCO₂e
from buildings

Hidden Actions and Landlord-Tenant Incentives

- Hidden actions are actions taken by one side of an economic relationship that are unobservable by other side.

		<u>Occupancy Type</u>	
		Owner	Renter
Energy Bill	Occupant Pays	No split incentive	Landlord: Lacks incentive for capital investment (hidden action) Tenant: High incentive to conserve energy
	Occupant does not Pay	Lack of incentive to make capital investment or to reduce energy use (hidden action)	Landlord: High incentive for capital investment Tenant: Lacks incentive to conserve energy (hidden action)

Hypothesis: Transparency enables Action

1. How can IoT provide insight into hidden actions?
2. How can IoT facilitate open actions?
3. How can IoT result in policies and delivery solutions to reduce capital investment cost?

Table adapted from: Gillingham, K. and M. Harding, "Split Incentives in Residential Energy Consumption." *The Energy Journal*, 33 (2), March 2012. DOI: 10.5547/01956574.33.2.3

The challenge

Regarding IoT, Technology and Innovation, the most critical obstacle for DC to overcome is:

**Disincentives to adopting
energy efficiency and
building electrification
at the landlord—tenant interface.**

Thank you!

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