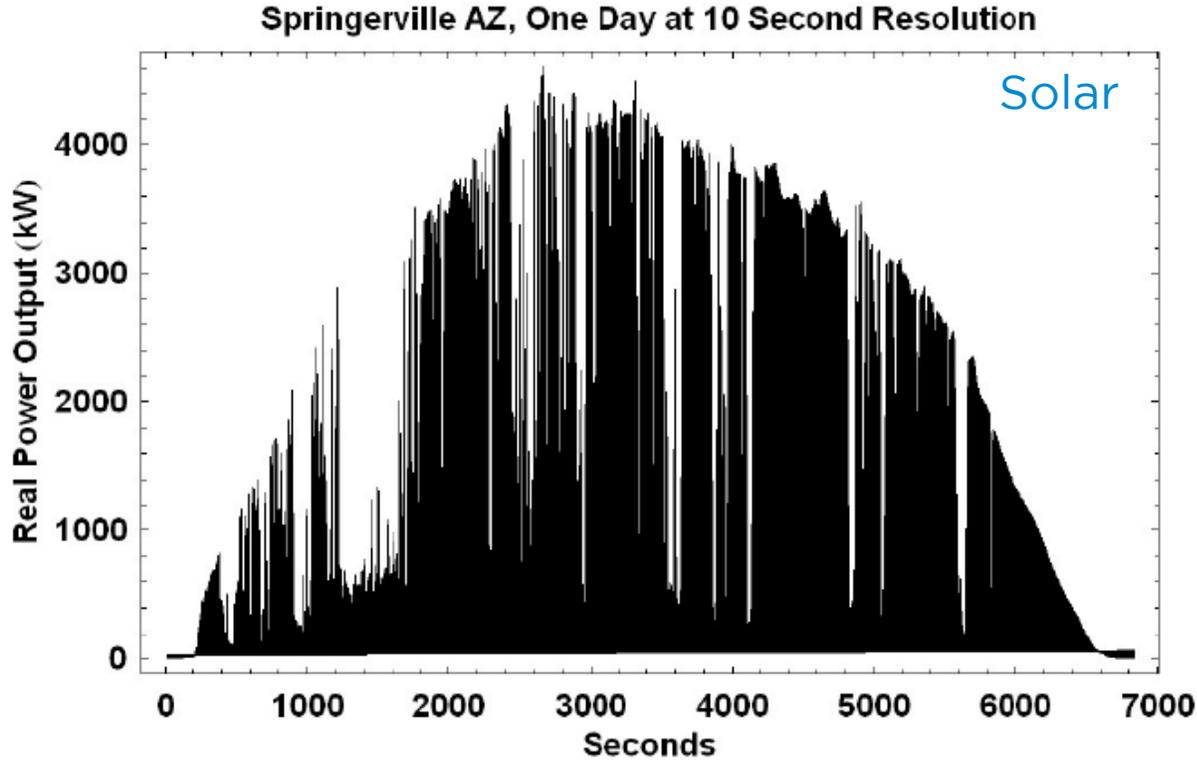
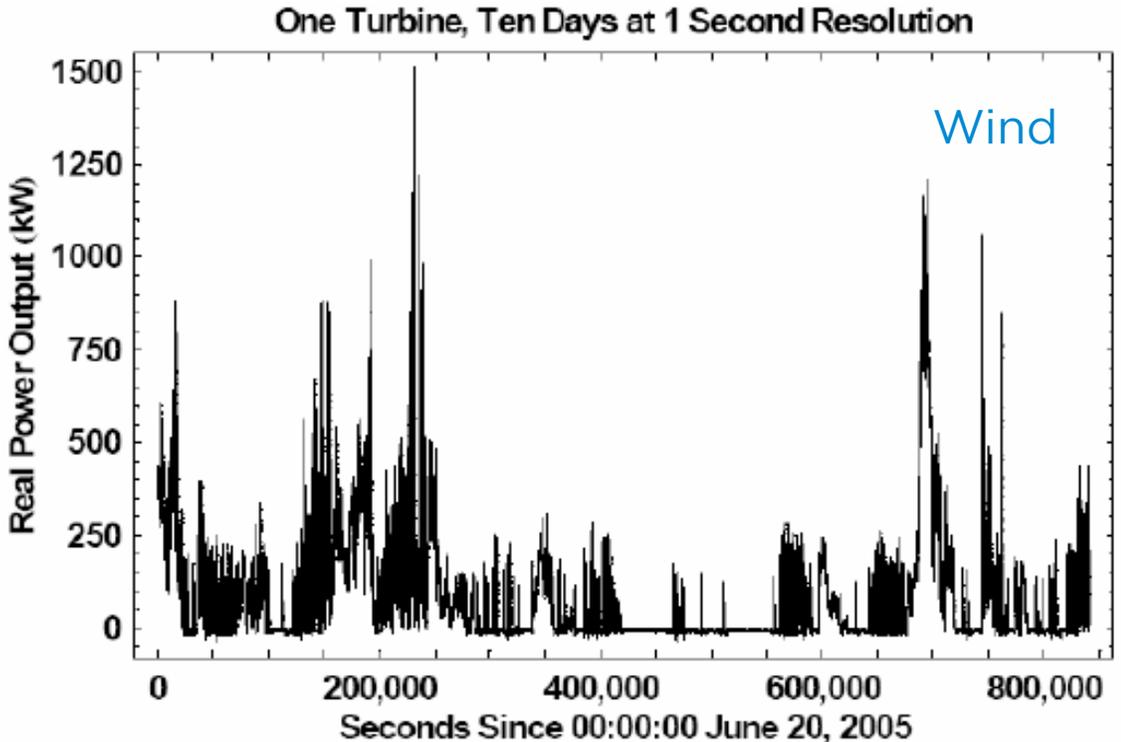


CLEAN, AFFORDABLE, RESILIENT, SIMPLE ENERGY

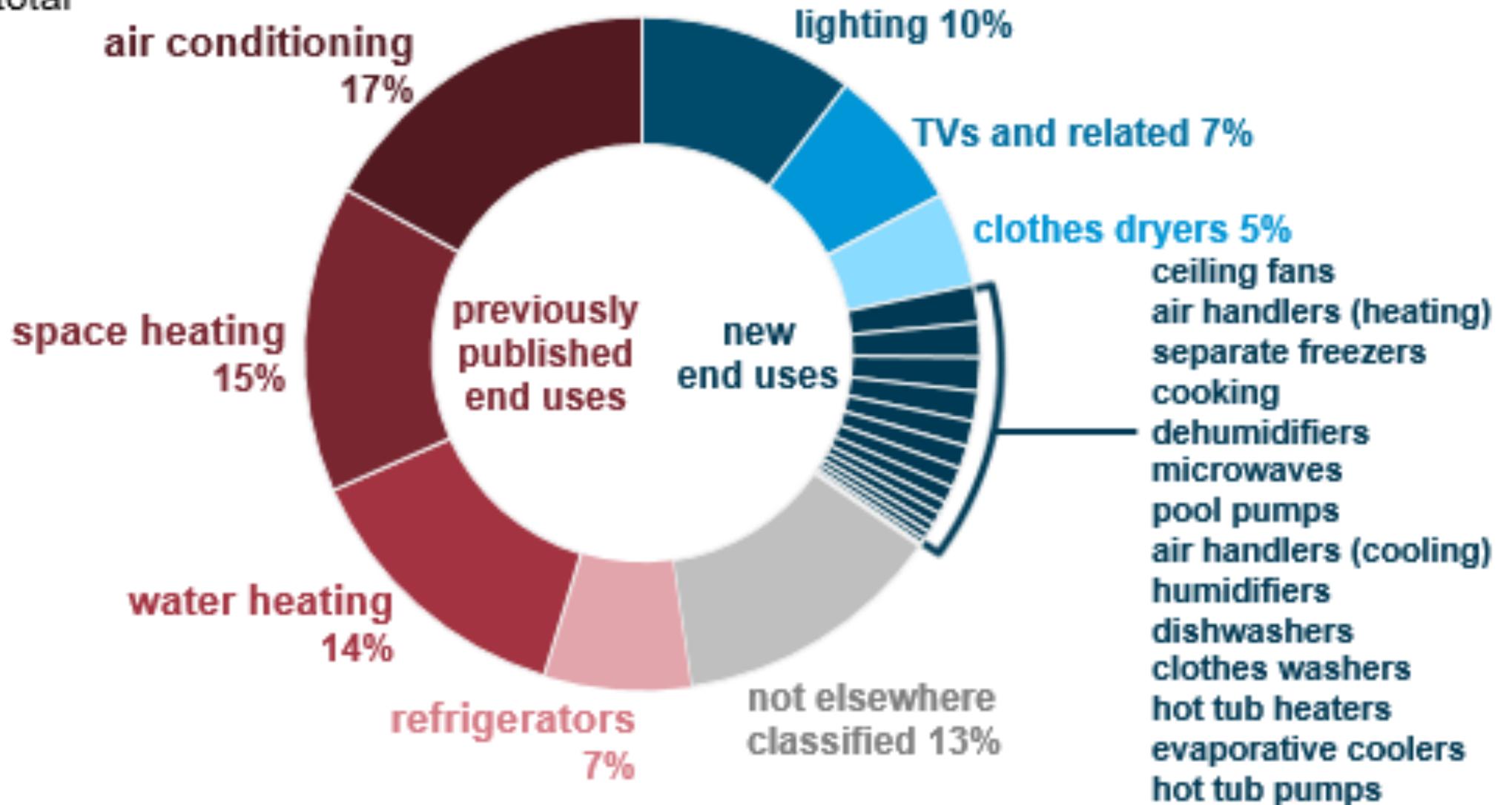


A RENEWABLE ENERGY FUTURE REQUIRES FLEXIBILITY

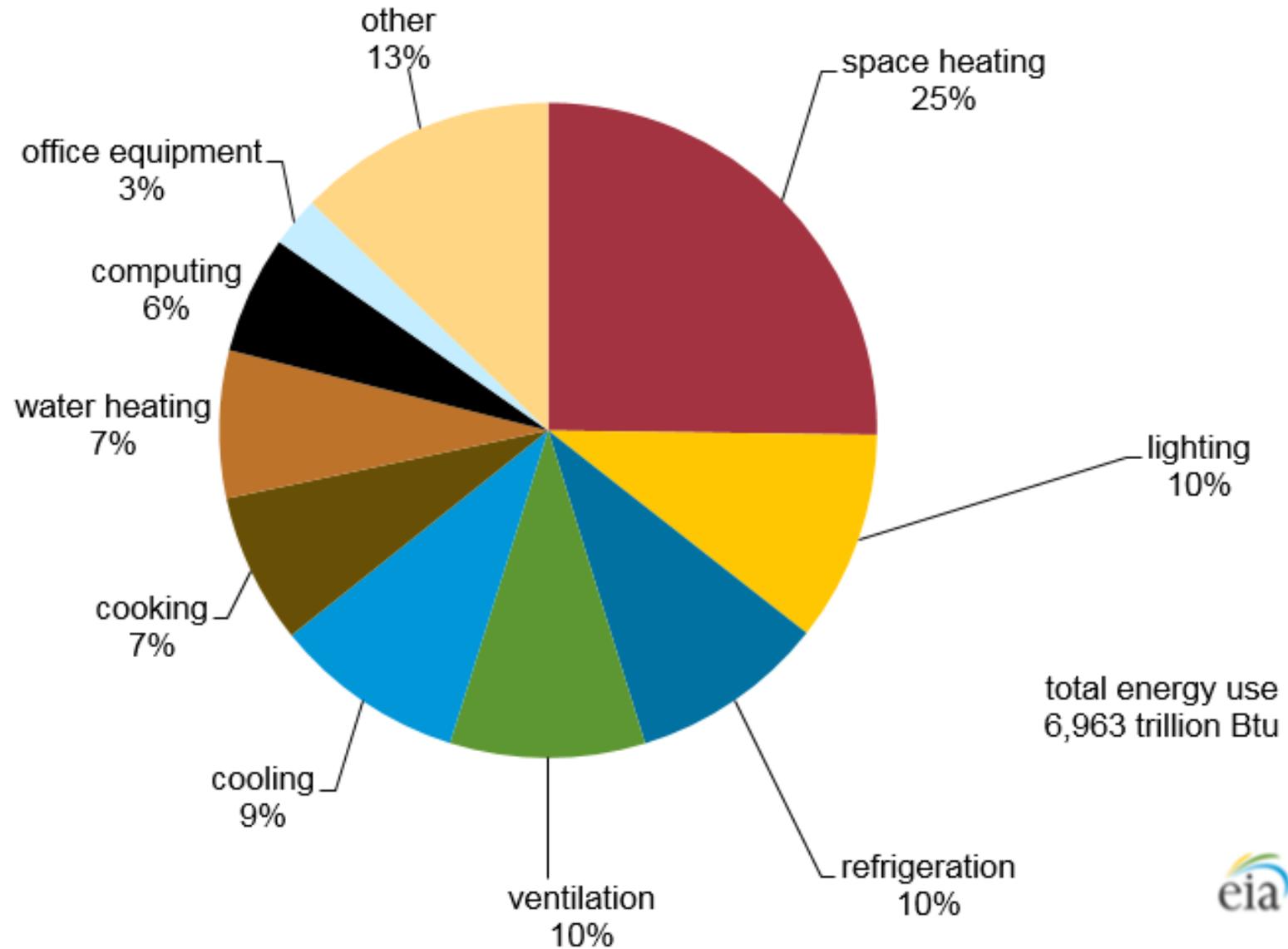


RESIDENTIAL ENERGY DEMAND

percent of total



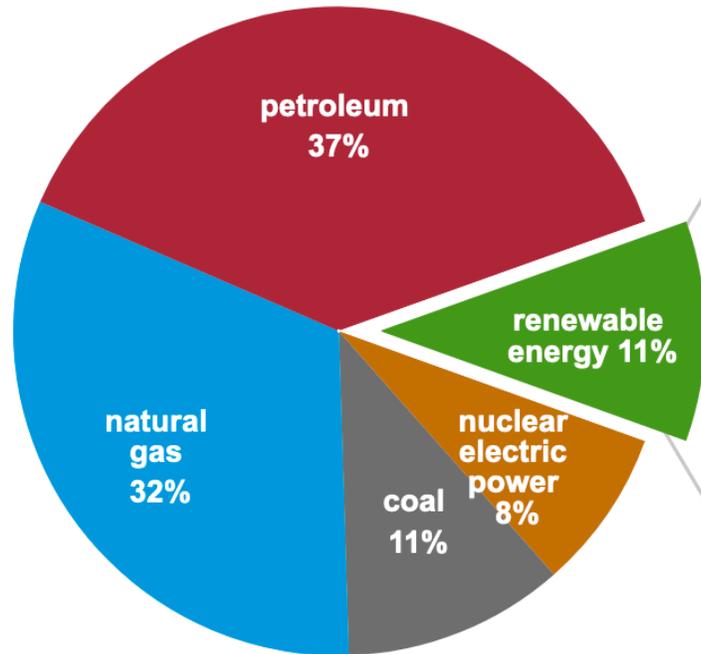
COMMERCIAL ENERGY DEMAND



Source: U.S. Energy Information Administration, 2012 Commercial Buildings Energy Consumption Survey.

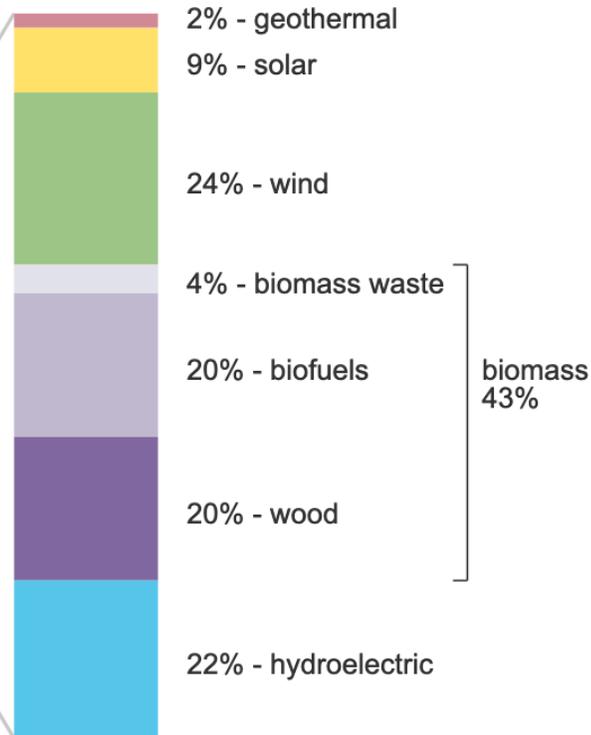
HOW MUCH FLEXIBLE LOAD IS THERE?

total = 100.2 quadrillion
British thermal units (Btu)



1 quad/yr ~ 33 GW

total = 11.4 quadrillion Btu



US Total Energy
Demand = 3.3 TW

At least 1/3 of load
is ultimately flexible.

~1000 GW

US currently has
about 20 GW of DR
and about 115 GW
of wind/solar

BUT ONLY IF WE DO THREE THINGS SIMULTANEOUSLY

FLEXIBILITY

Minimize
capacity cost

ELECTRIFICATION

Fossil fuel -> Electric

EFFICIENCY

Minimize fuel
usage

WHAT DO PEOPLE PAY FOR ENERGY SERVICES?

TRANSPORTATION



HVAC



WATER HEATING



OTHER



Customer-owned capacity is the largest chunk

A huge chunk of fuel cost is utility-owned capacity.

Capacity is the primary driver of cost.

Flexibility enables us to better manage capacity costs.

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HOW DO WE MAKE FLEXIBILITY THE EASIEST CHOICE?

Simple to choose



Simple to pay



Simple to manage



OPTION 0

Utility develops simple time-varying rate (fixed TOU)



RESULT

Limited flexibility enabled for utility.

Many days customers are working hard to curtail load when the system has plenty of capacity.

Allows people to get started.

OPTION 1

Utility develops complicated real-time pricing



RESULT

Sophisticated customers do well.

Customers without access to capital or capacity to install sophisticated devices do not benefit.

Limited flexibility + equity and access challenges.

OPTION 2

Aggregator provides enabling technology to utility

Utility develops simple flexible rate plans and bring technology to customers



Flexible load is:
Simple to choose
Simple to pay
Simple to manage

But utility needs to cover behind-the-meter CapEx

OPTION 3

Utility develops sophisticated real-time pricing



Aggregator provides simplified flexible rate plans



**Arcadia
Power**



**PACKETIZED
ENERGY**

Flexible load is:
Simple to choose
Simple to pay
Simple to manage

ONE ENERGY BILL: CAPACITY AND FUEL TOGETHER?

TRANSPORTATION



HVAC



WATER HEATING



OTHER



Energy services:
\$300/mo

WHAT IS NEEDED?

- **Minimize financial friction**
Project capital for customer-owned stuff
Rates that make flexibility the easy choice
Clear methods for measurement and verification (including value of future avoided T&D)
- **Minimize technology friction**
Smart systems maximize overall affordability with real-time flexibility
Easy to choose.





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