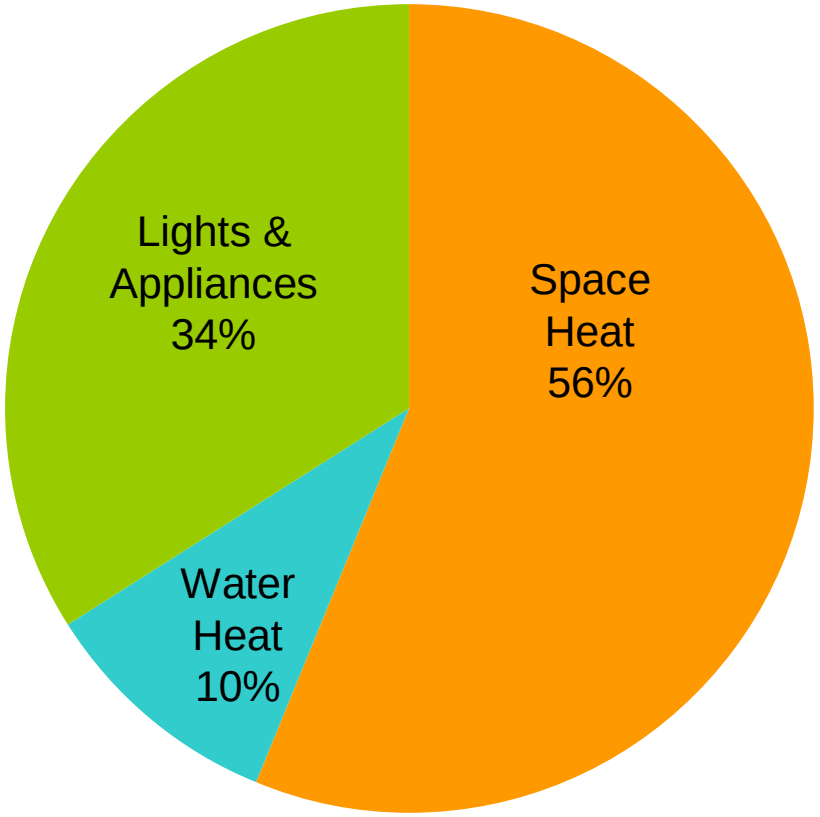
May 8, 2010 Portland Oregon

SOLAR OREGON

2010 Goal Net Zero HOME TOUR

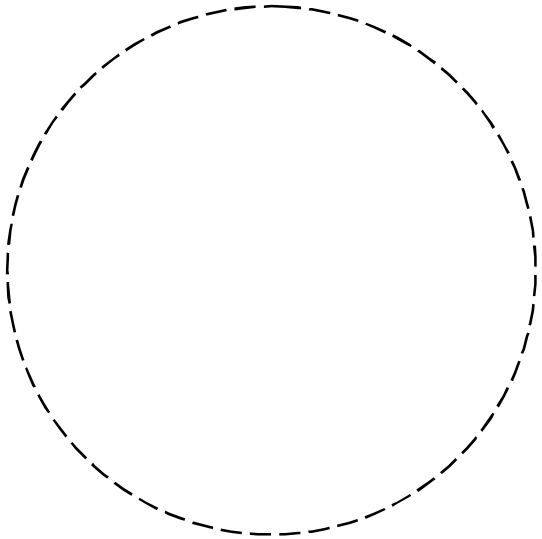
Energy in Average American Home



2,000 sf using 27,000 kwh or 920 therms

Energy Information Agency www.eia.doe.gov/emeu/recs/recs2001

Getting to Net Zero



Goal Net Zero, here today

A grid-tied home that
combines energy efficiency and
on-site renewable energy production
to produce as much energy as it uses

Annual net metering
No/low fossil fuel use

What is your EUI?

Your utility bills converted to kbtu

Square feet * year

Compares buildings of different sizes

Therms to kbtu

1 Therm = 100,000 btu

1 Therm = 100 kbtu

kwh to kbtu

1 kwh = 3.413 kbtu

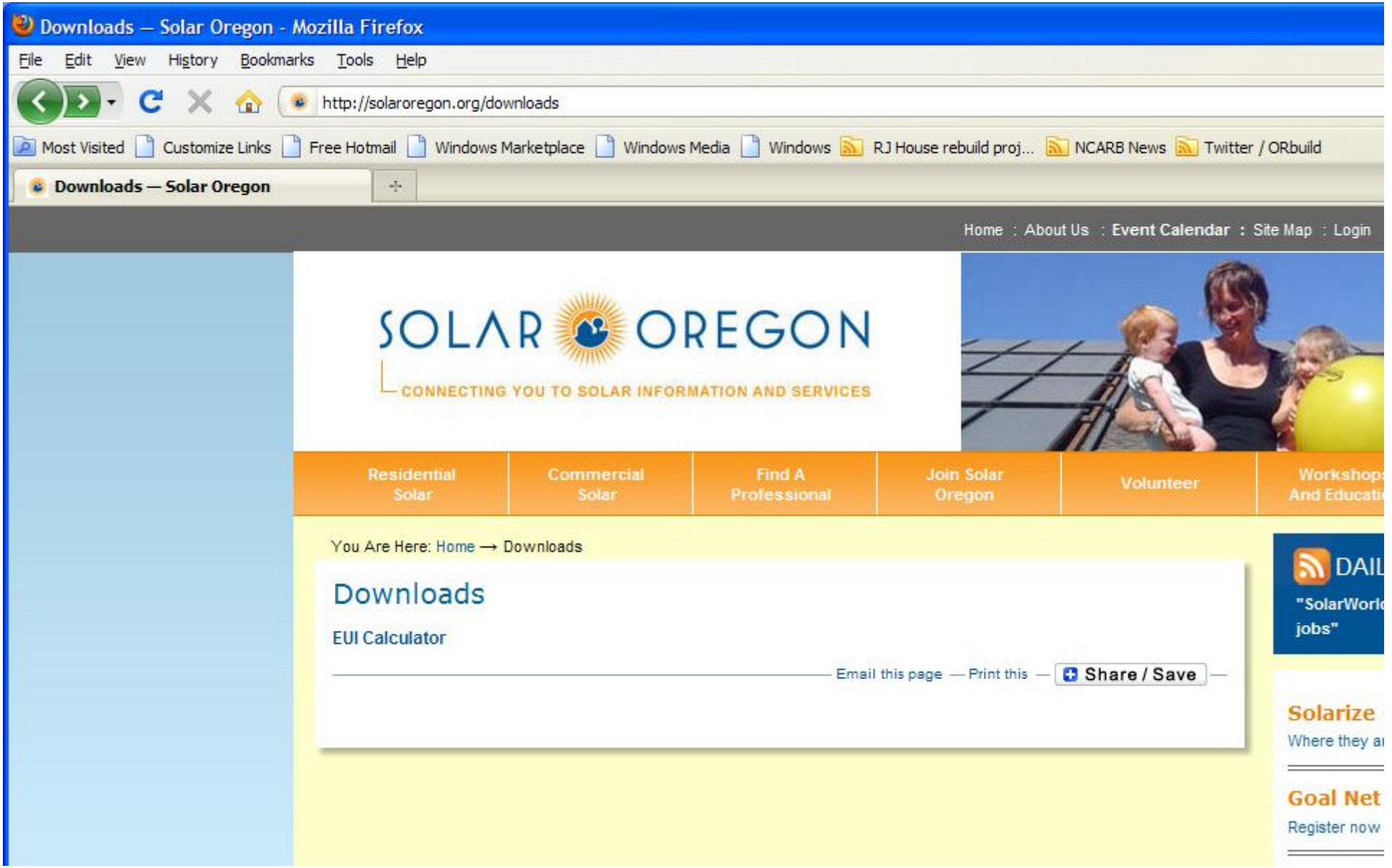
Energy units are fully convertible

The average US household uses 92,000,000 btu each year.

The average US household uses 92,000 kbtu each year.

The average US household uses 27,000 kwh each year.

Solar Oregon website



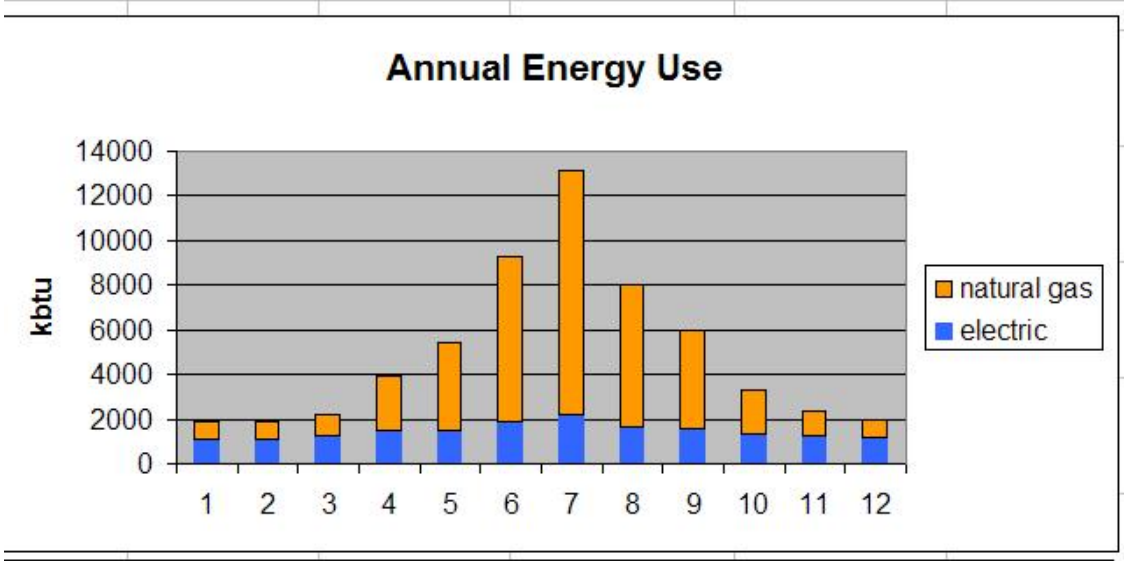
Online tool

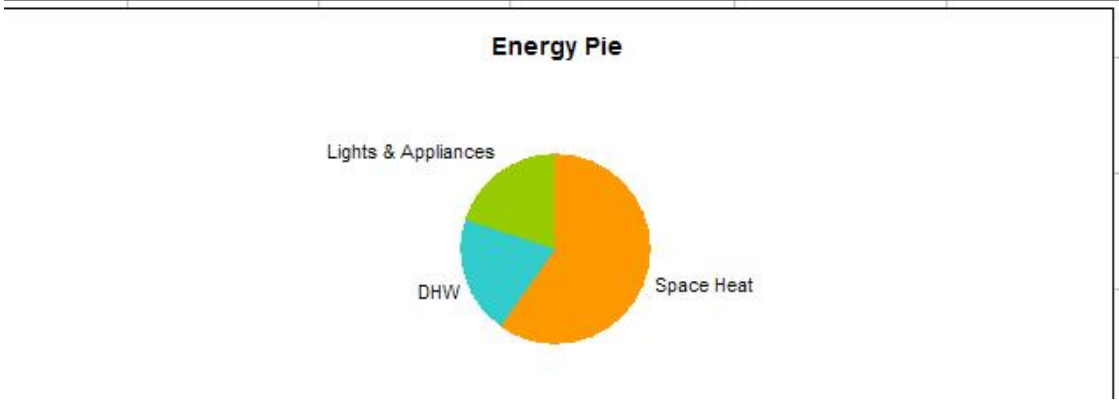
G23

	A	B	C	D	E	F
1	Project:	Example Residence Portland, OR				
2	House area in square feet	1,800				
3	EUI kbtu/sf/yr	32.9				
4		Enter your utility kwh in this column	kwh converted to kbtu	Enter your utility therms in this column	therms converted to kbtu	total kbtu per month
5	July	300	1024	9	900	1924
6	August	310	1058	8	800	1858
7	September	345	1177	10	1000	2177
8	October	412	1406	25	2500	3906
9	November	410	1399	40	4000	5399
10	December	525	1792	75	7500	9292
11	January	620	2116	110	11000	13116
12	February	450	1536	65	6500	8036
13	March	435	1485	45	4500	5985
14	April	375	1280	20	2000	3280
15	May	340	1160	12	1200	2360
16	June	312	1065	9	900	1965
17						
18	Annual totals	4834		428		59298
19		kwh		therms		kbtu

Sheet1 Sheet2 Sheet3

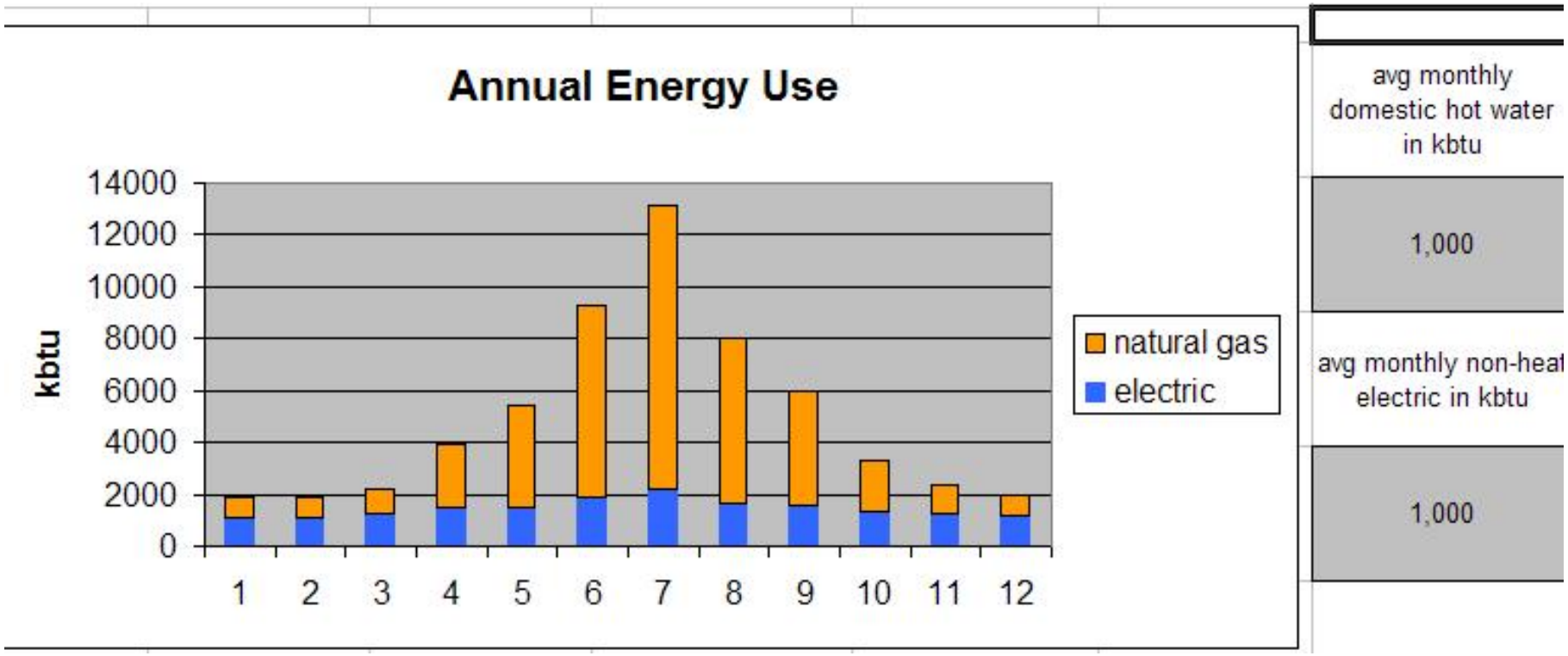
Make your own energy pie



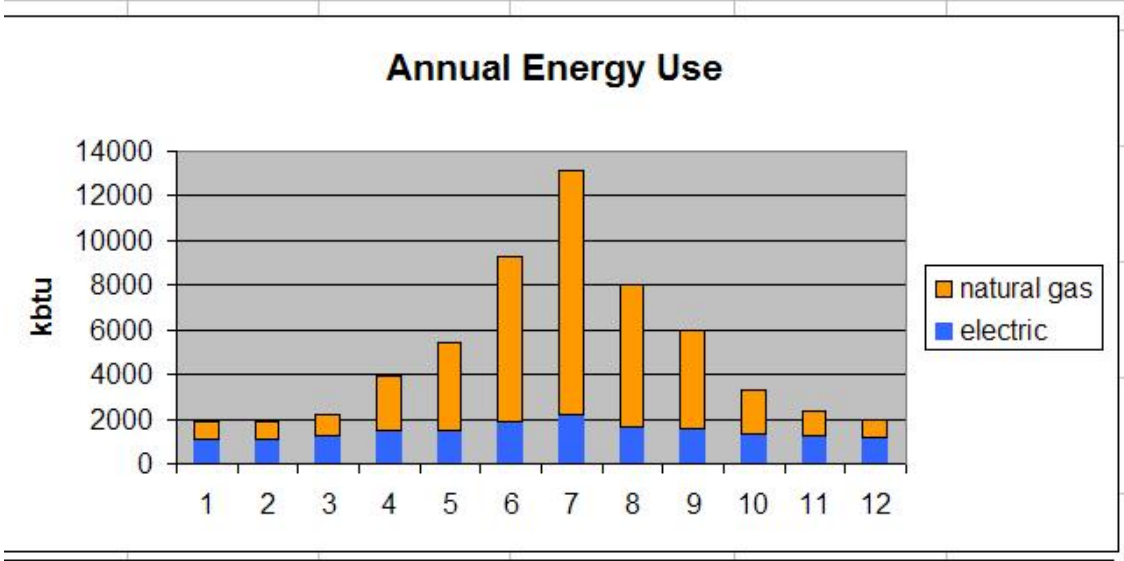


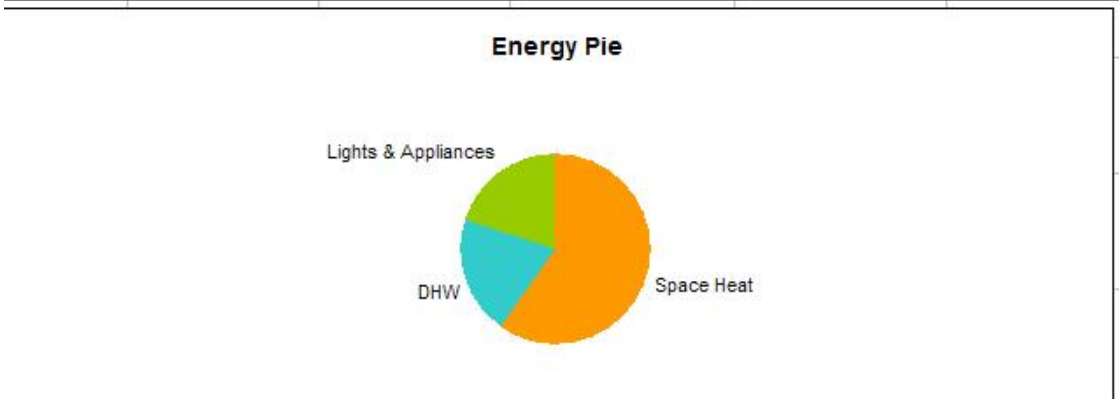
avg monthly domestic hot water in kbtu	annual space heat in kbtu	35298	60%
1,000	annual DHW in kbtu	12,000	20%
avg monthly non-heat electric in kbtu			
1,000	annual non-heat electric in kbtu	12,000	20%

Make your own energy pie



Make your own energy pie





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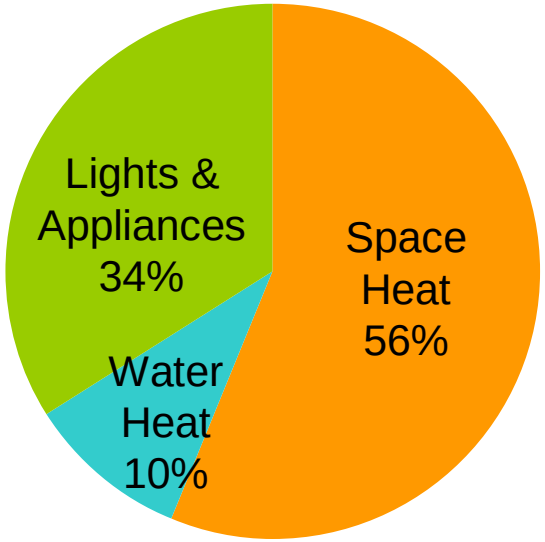
Where we are now



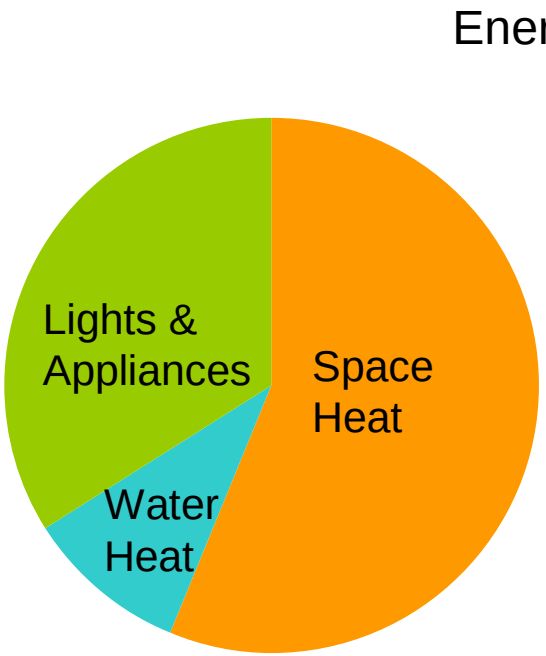
US Average House 2000 sf

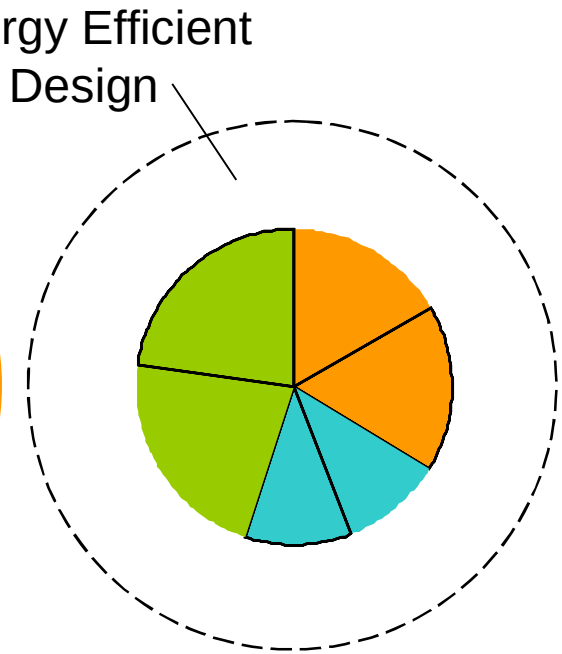
= 27,000 kwh

= 920 therms

Energy Information Agency www.eia.doe.gov/emeu/recs/recs2001

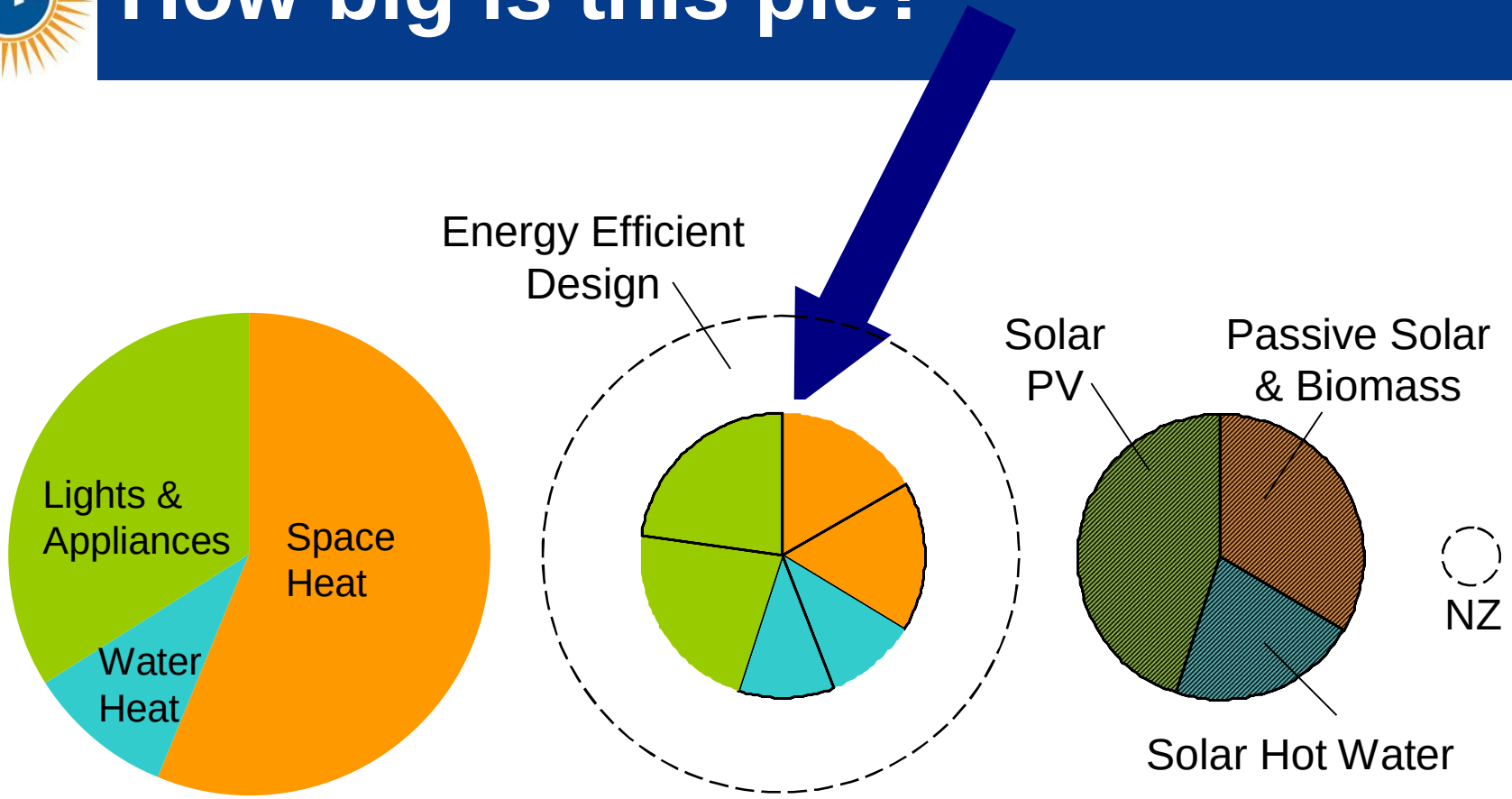
Getting to Net Zero





US Average	Energy Efficient Design
= 27,000 kwh	= 13,000 kwh
= 920 therms	= 440 therms
2,000 sf	2,000 sf

How big is this pie?



US Average

= 27,000 kwh

= 920 therms

2,000 sf

Energy Efficient Design

= 13,000 kwh

= 440 therms

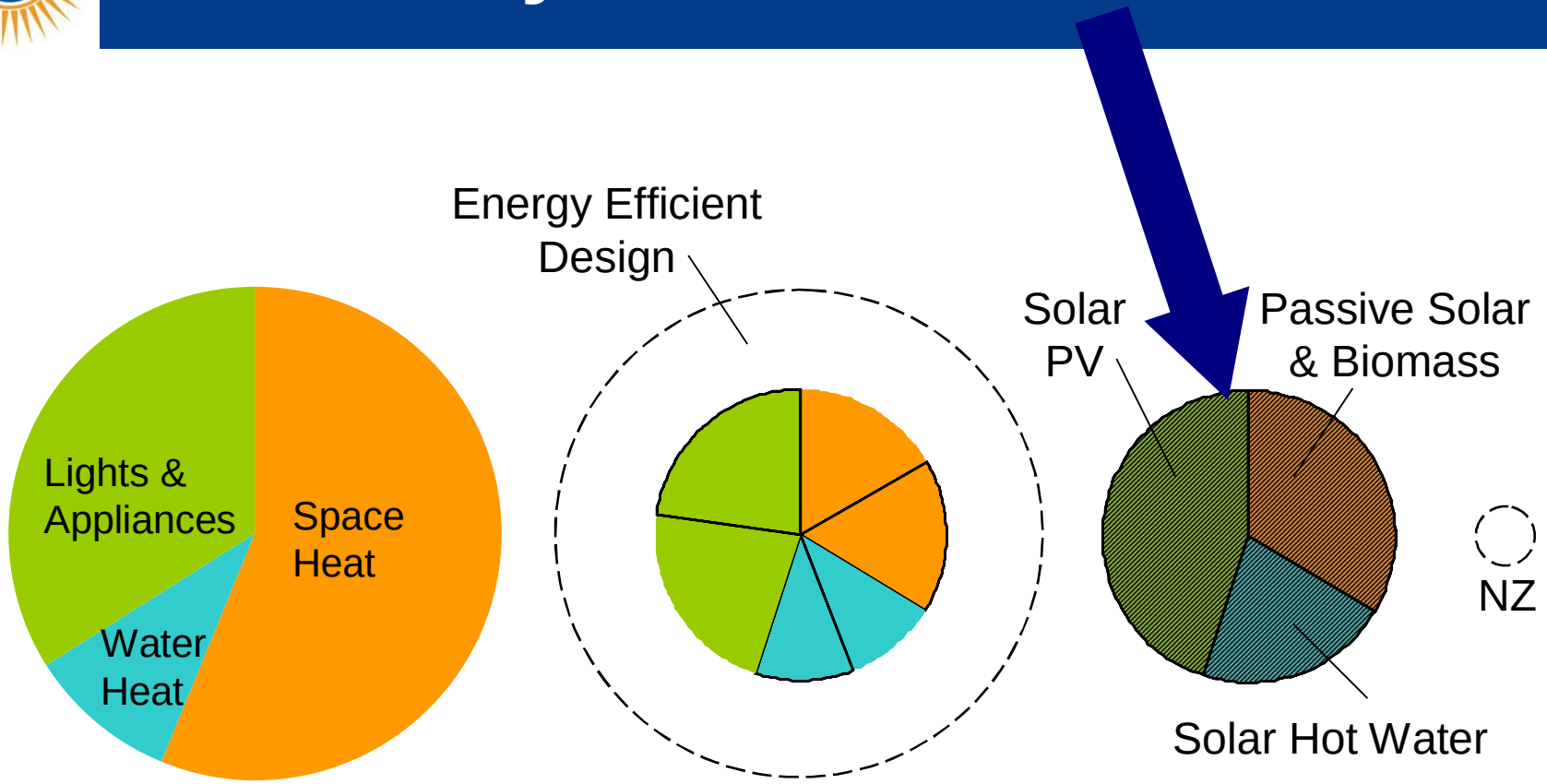
2,000 sf

EE With Renewables

= 0 kwh

= 0 therms

What are your site resources?



US Average	Energy Efficient Design	EE With Renewables
= 27,000 kwh	= 13,000 kwh	= 0 kwh
= 920 therms	= 440 therms	= 0 therms
2,000 sf	2,000 sf	

Basic Recipe

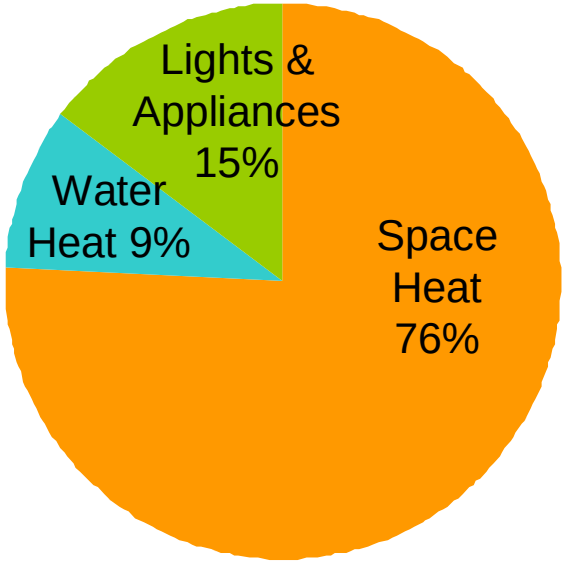
- Establish the sites renewable budget
- Orient to the sun
- Keep form simple & compact
- Design a high performance envelope
- Use energy efficient appliances & lights
- Match demand with renewables
- Integrate systems
- Model / Test / Verify

Basic Recipe for Renovation

- Establish the sites renewable budget (usually a solar site analysis)
- Evaluate passive opportunity relative to building use & mass storage
- Analyze energy use history (utility bills)
- Test – blower door at least
- Develop a long range work plan
- Upgrade to energy efficient appliances & lights
- Develop a family plan for living sanely during construction

Blower door testing

CFM_n x 1.08 x 24 x 4500 = btu/yr

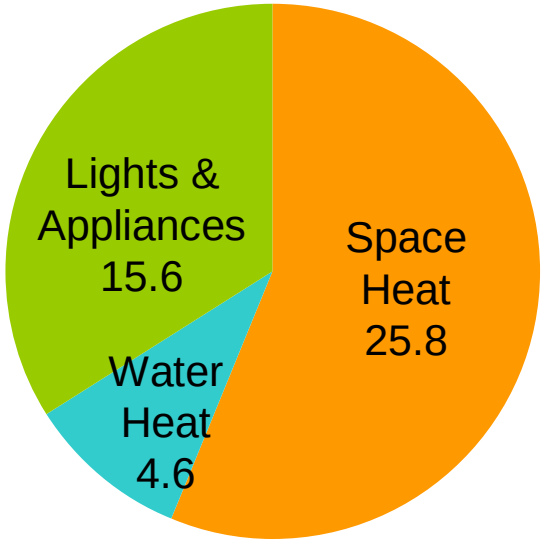


Kaplan Carty home: Blower door initially tested more than 6600 CFM_{50}

This calculates to 55% of space heat or 42% of their overall energy use.

$$\frac{6600}{20} \times 1.08 \times 24 \times \frac{4500}{1000} = 38{,}491 \text{ kbtu/yr}$$

Comparing Passive House



Passive House
Space Heating

New: 4.75 kbtu/sf/yr

Retrofit: 11.1 kbtu/sf/yr

US Average House 2000 sf

= 46 kbtu/sf/yr

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