

Driving to Net 0

How you **can** make a difference!



Genesis 2:15 The LORD God took the man and put him in the Garden of Eden to work it and take care of it.



Cyber Tribe

4020



4

0

2

0



Team
4020

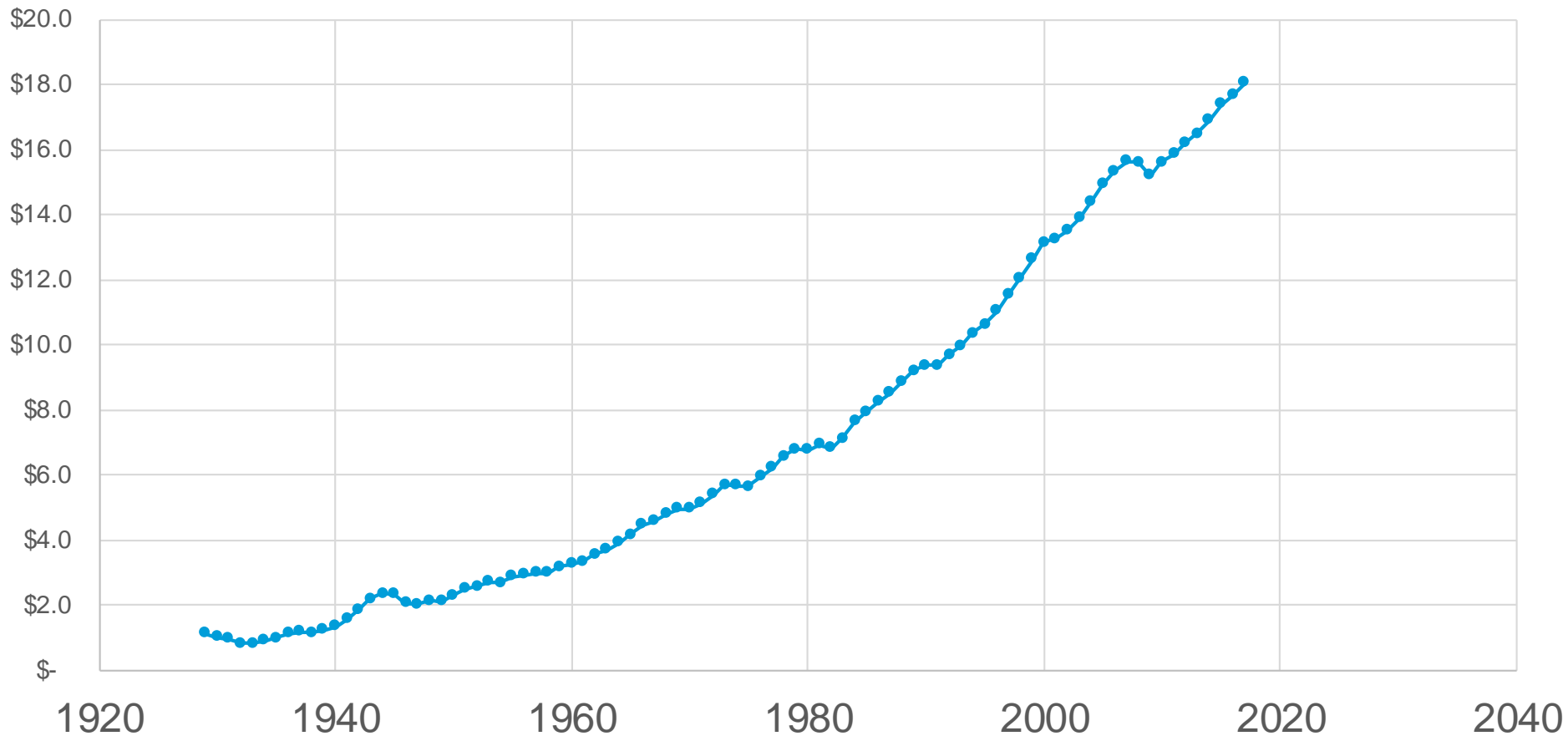


Team
4020

4553
4020

Can you imagine a world without fossil fuels?

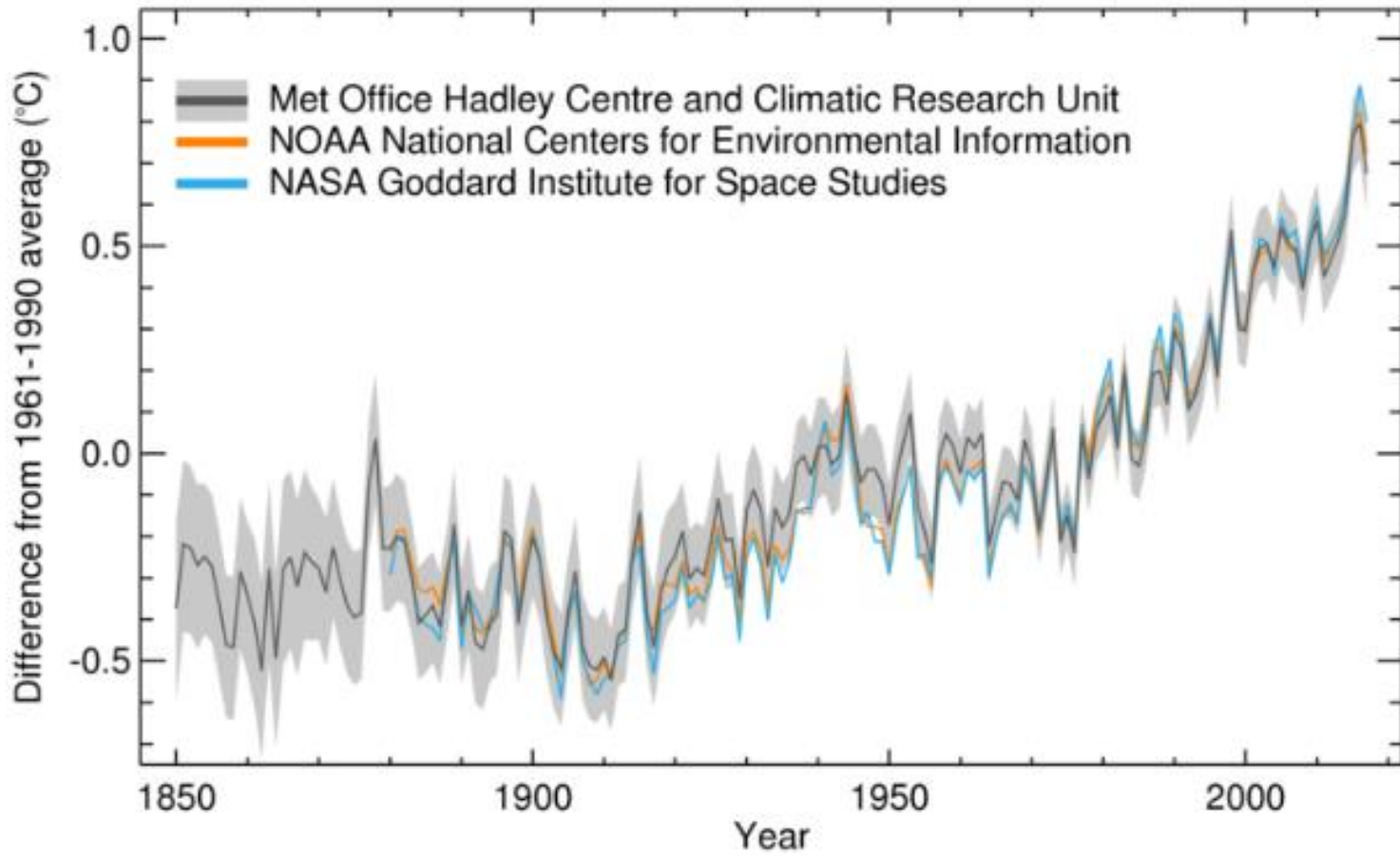
Real GDP (trillions)



Can you imagine a world without fossil fuels?



Global average temperature anomaly
(1850-2017)



Can you imagine a world
without fossil fuels?



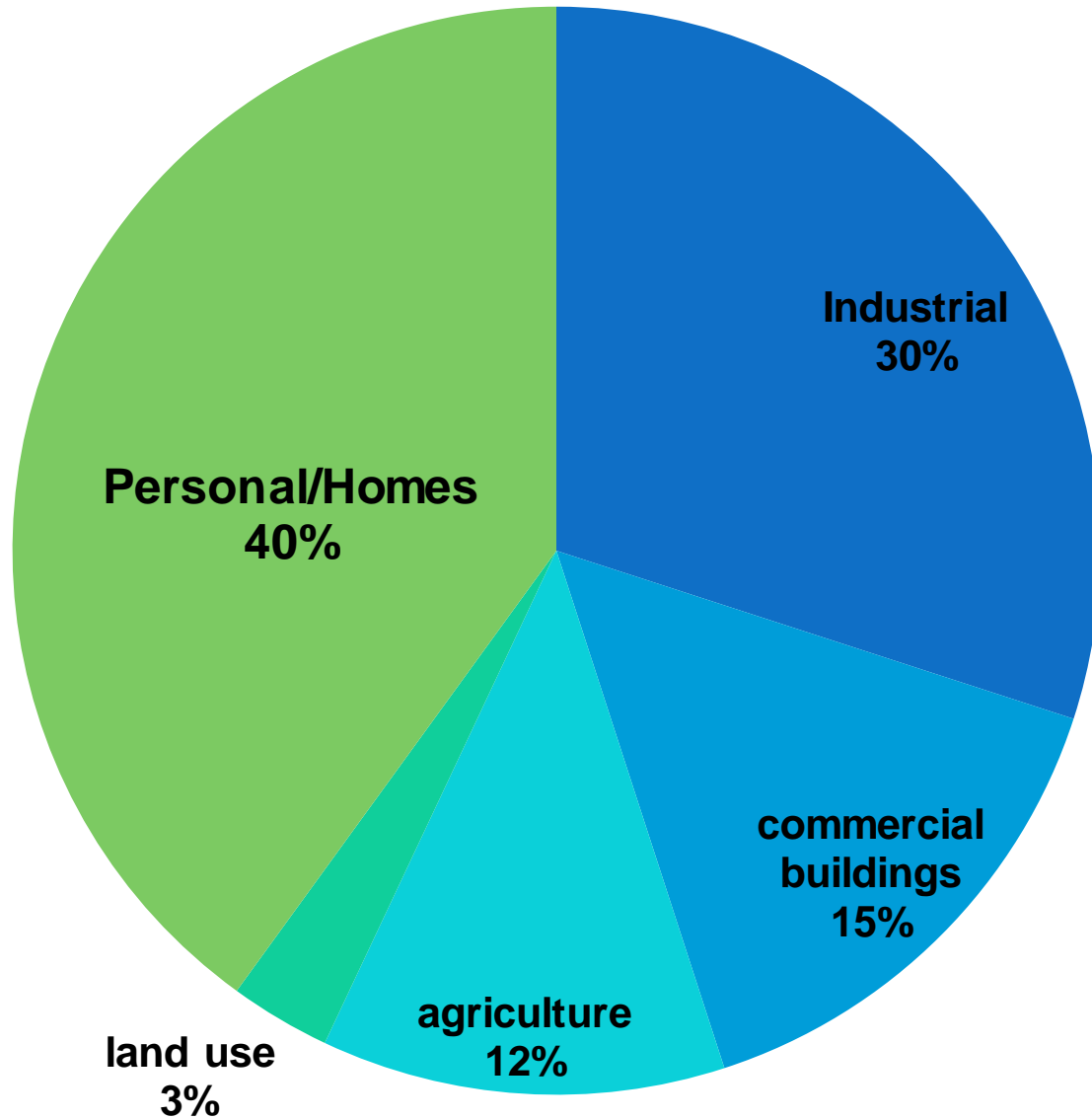
Driving to Net 0

- Introduction and problem
- **Why we need to make a difference**
- Home design
- Vehicles
- Solar production
- Little things add up
- I'm not alone

Why

- Do you like to be self sufficient?
 - Do you like to save money?
 - Do you care about the environment?
 - Do you like leaving your corner of the world better than you found it?
-
- **Then sustainability is for you!**

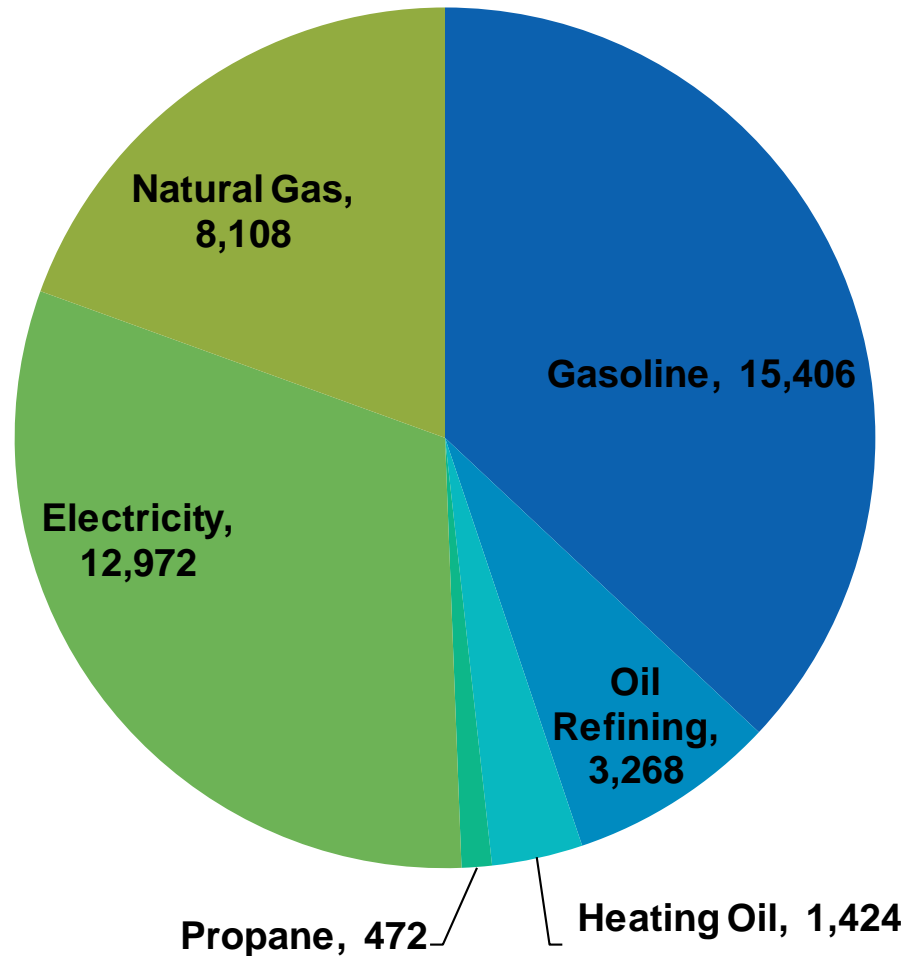
CO₂ Sources



Why Cars & Homes

CO₂ - Average US Household - 41,649 lbs.

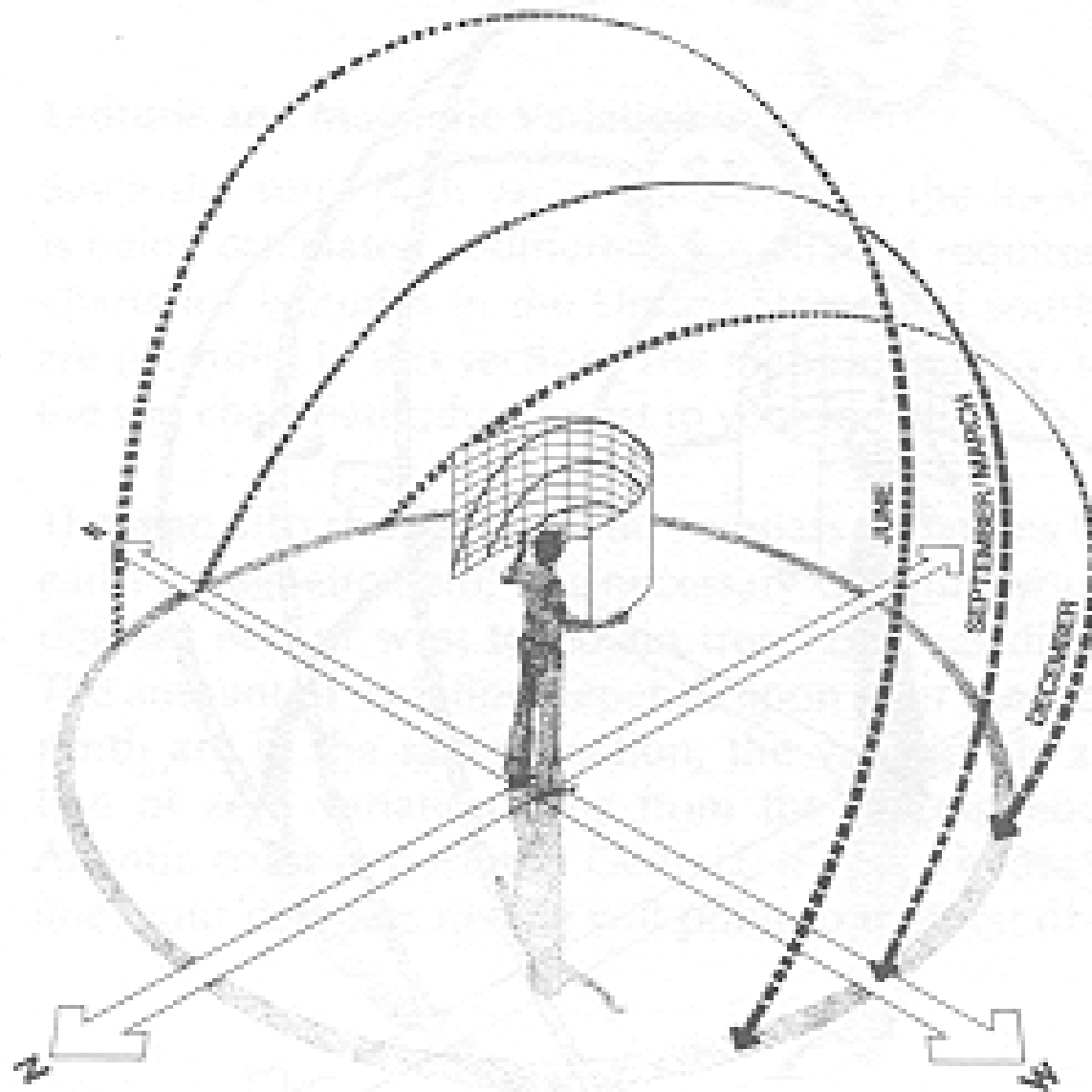
Average people – 2.58
Average house size –
2150



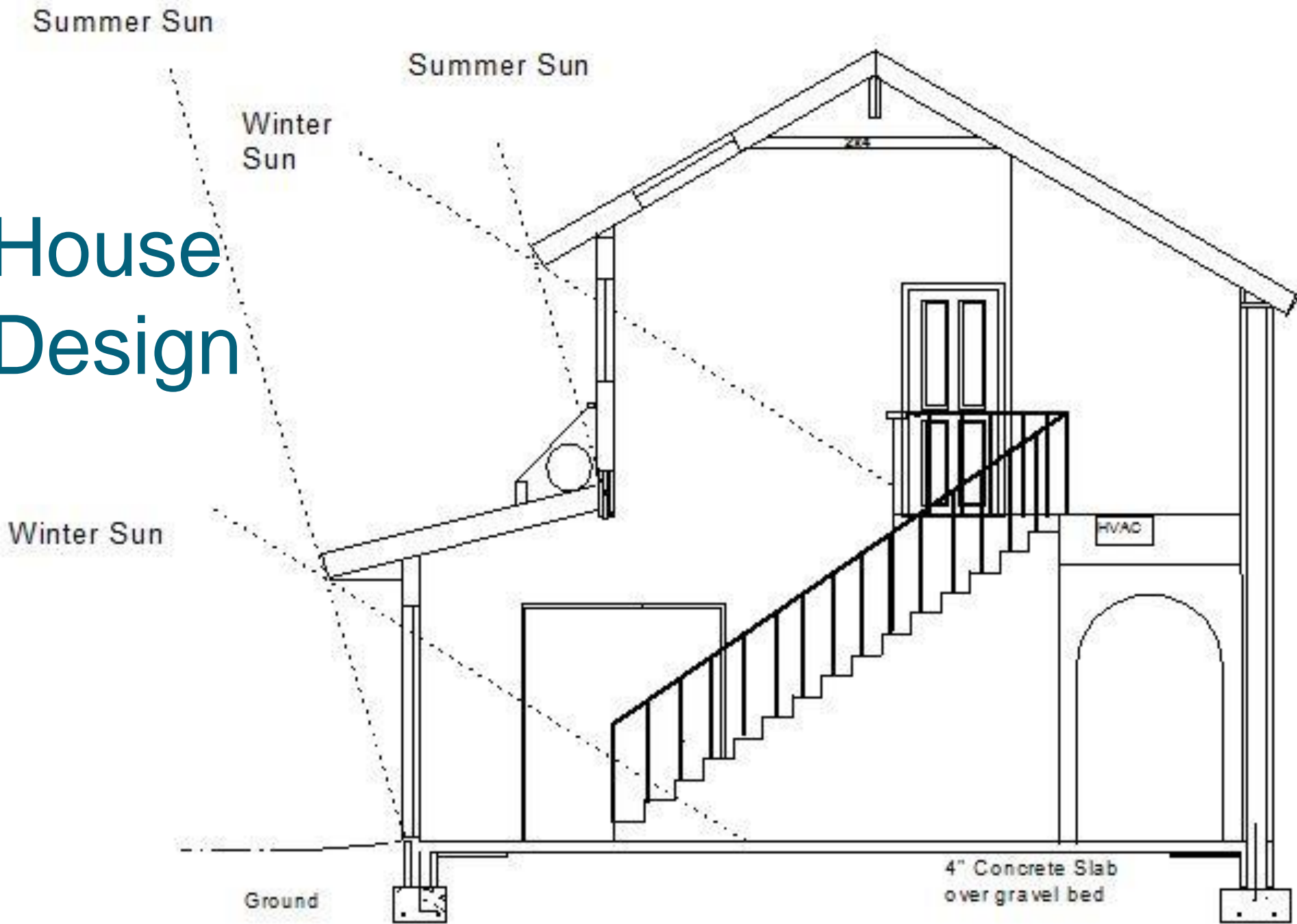
Driving to Net 0

- Why we need to make a difference
- **Home design**
- Vehicles
- Solar production
- Little things add up

Sun



House Design



House top view

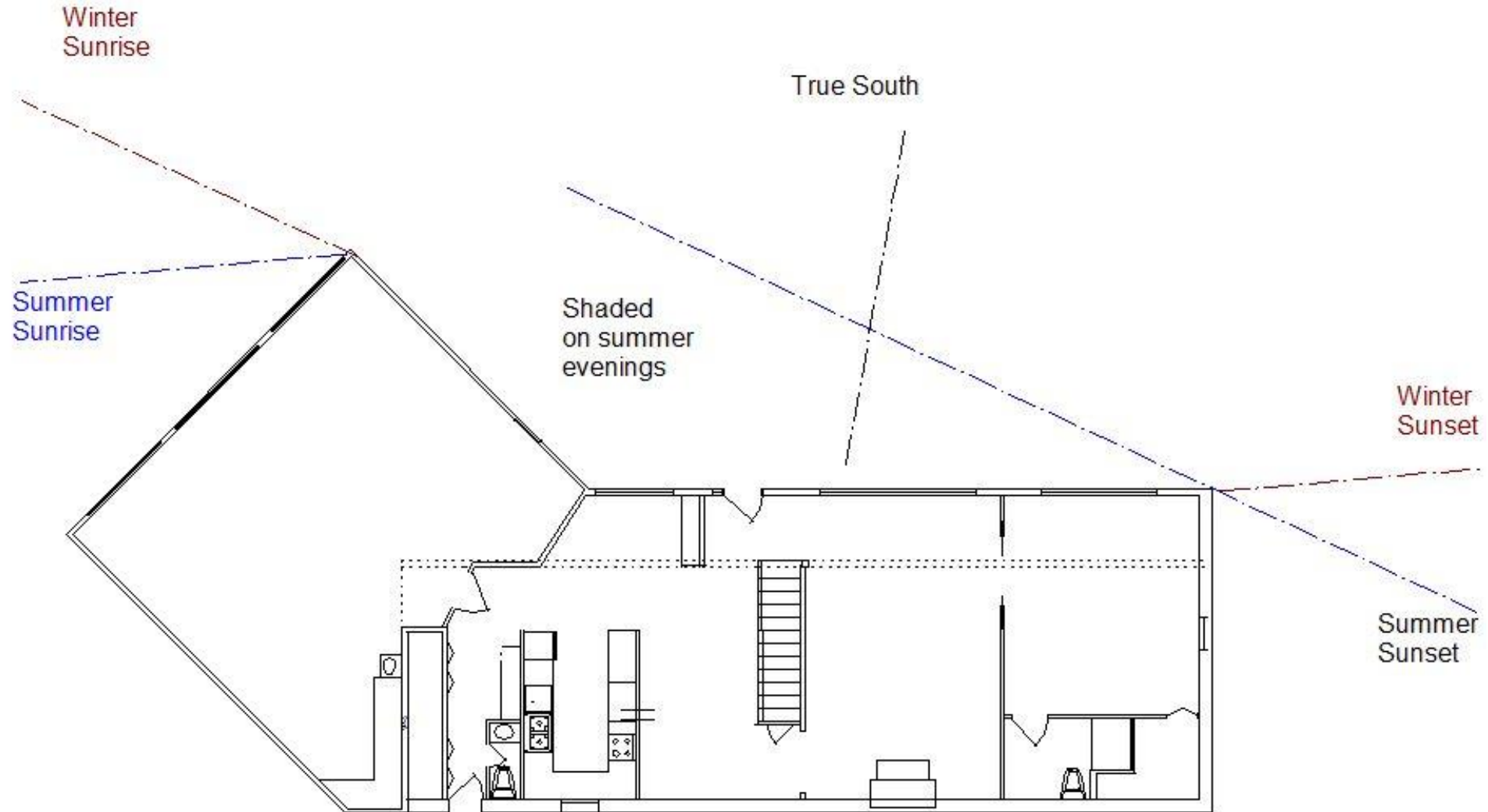
Winter
Sunrise

True South

Shaded
on summer
evenings

Winter
Sunset

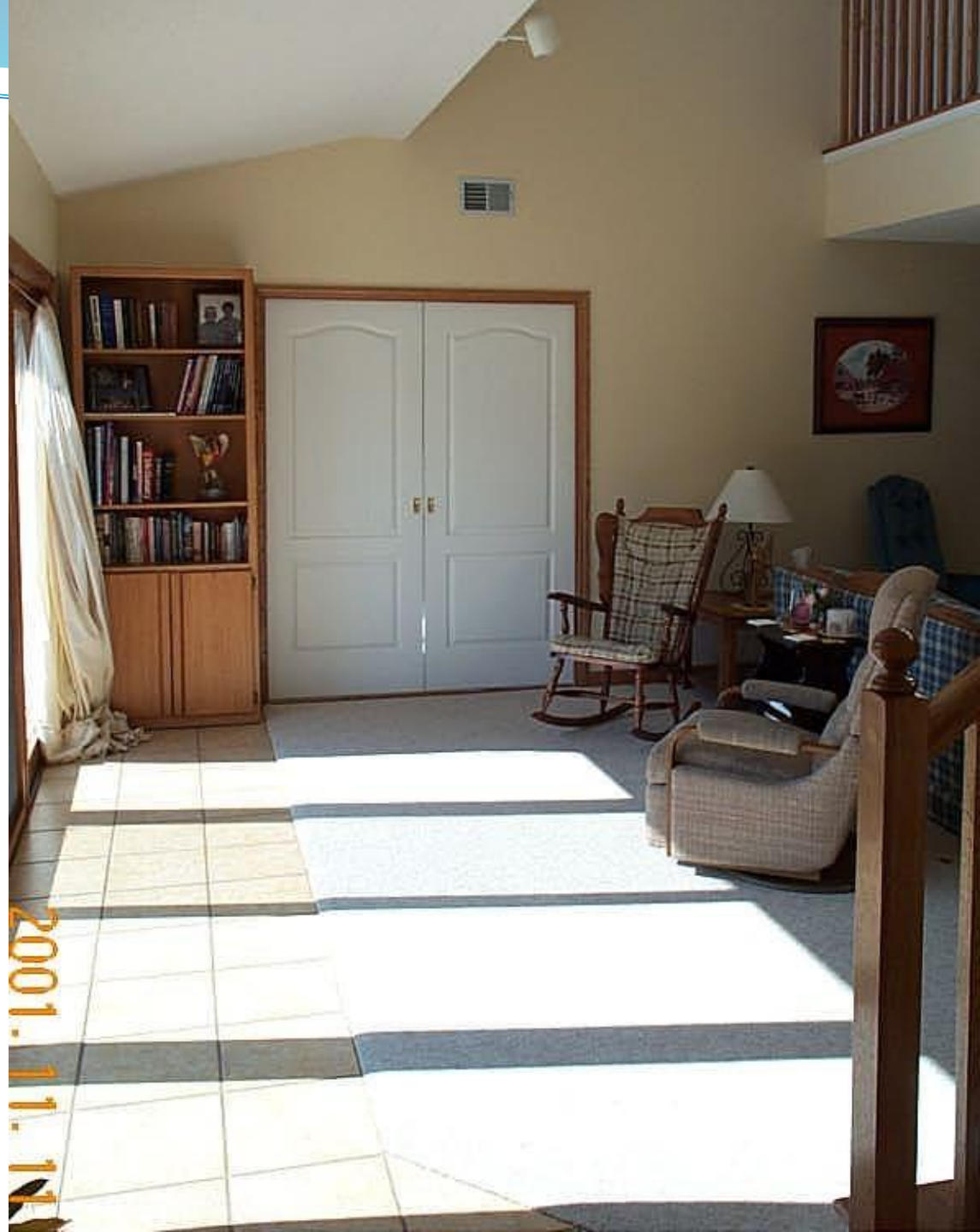
Summer
Sunset



December & January

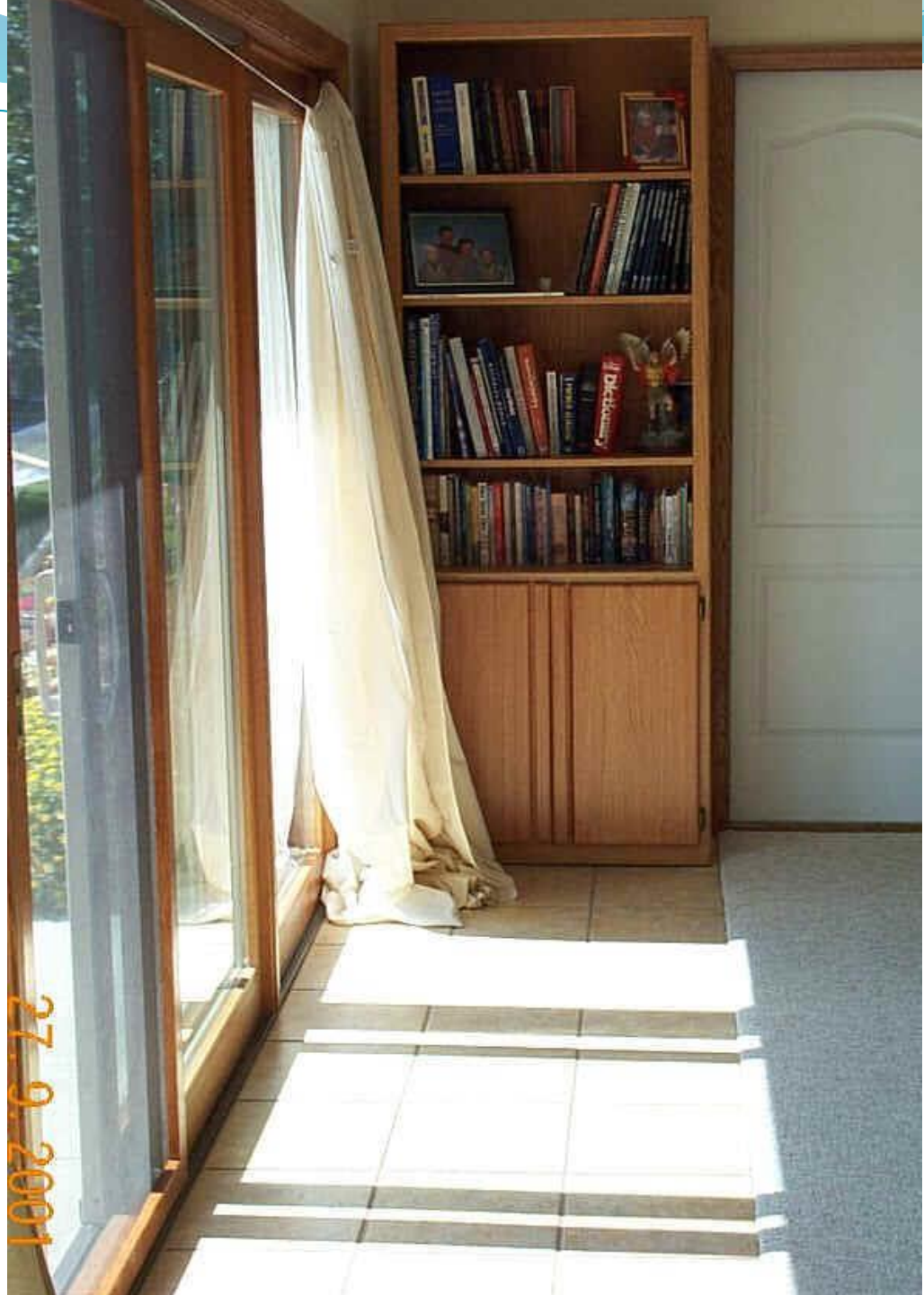


November & February



2001. 11. 11

September & March



27.9.2001

April & August



June & July



Home Envelope



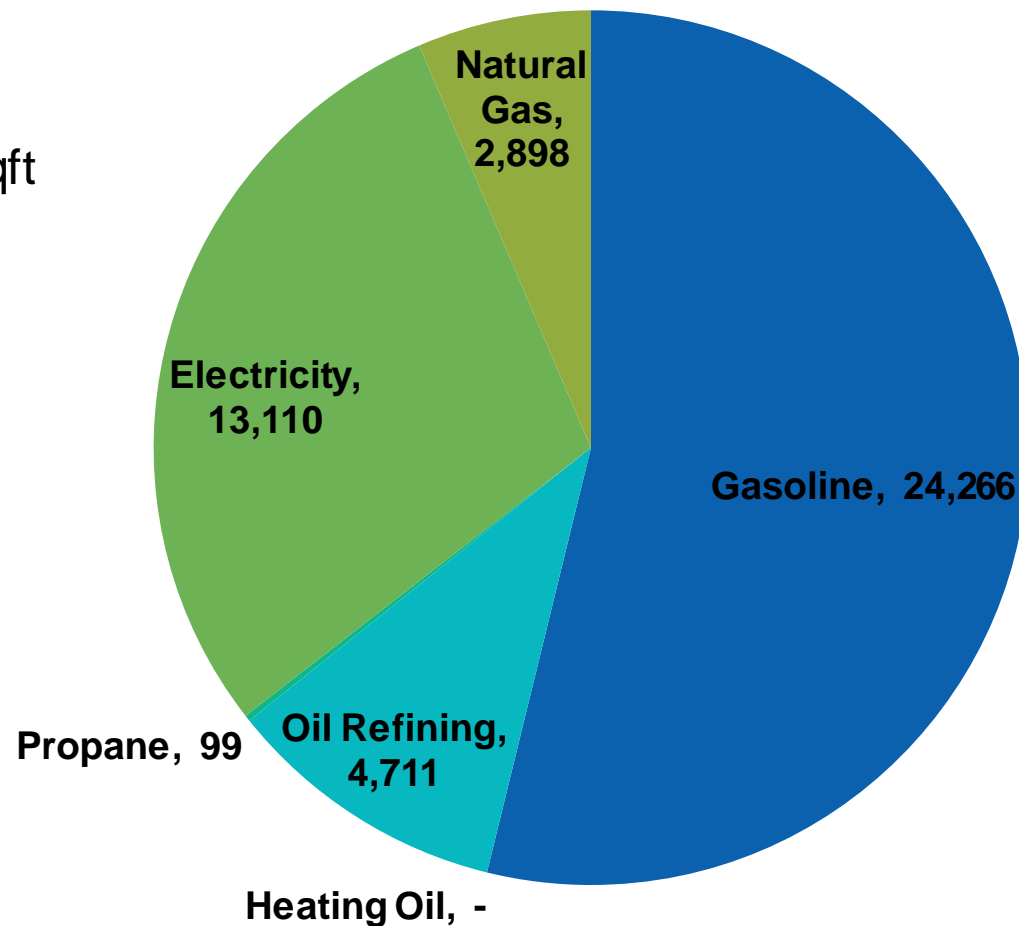
Home Envelope



Baseline – 7% Above average

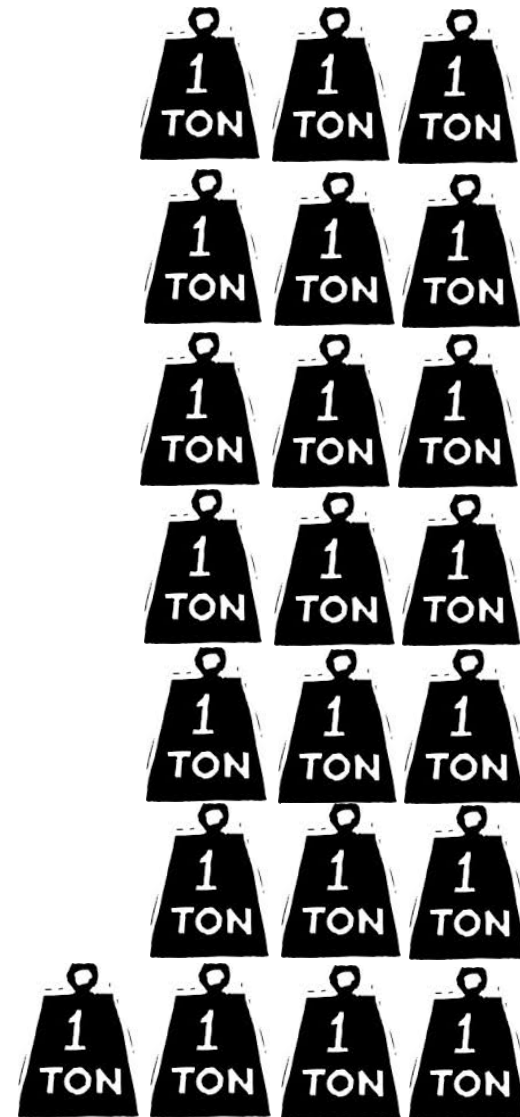
Hrivnak's 2009 - 44,601 lbs.

of people – 4
House size – 2600 sqft



Driving to Net 0

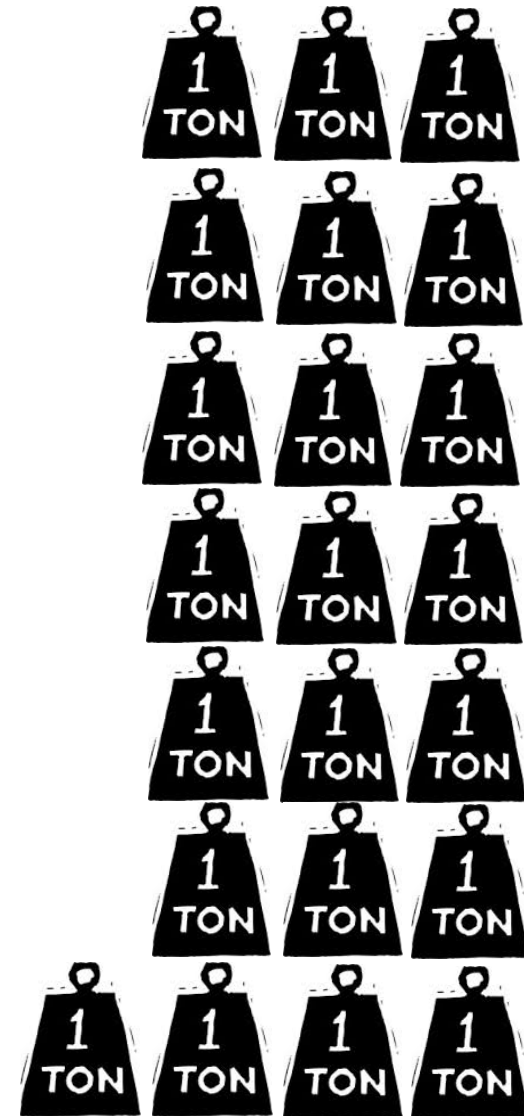
- Why we need to make a difference
- Home design
- **Electric Vehicles**
- Solar Production – Photovoltaic
- The Little Things
- I'm not alone



Transportation – Baseline 2009

- 25,000 miles/yr – 29,000 lbs/yr
- Avalanche - 16.4 mpg
14,000 miles 20,000 lbs CO₂/yr
- Prizm – 28.5 mpg 11,000 miles 9,000 lbs CO₂/yr

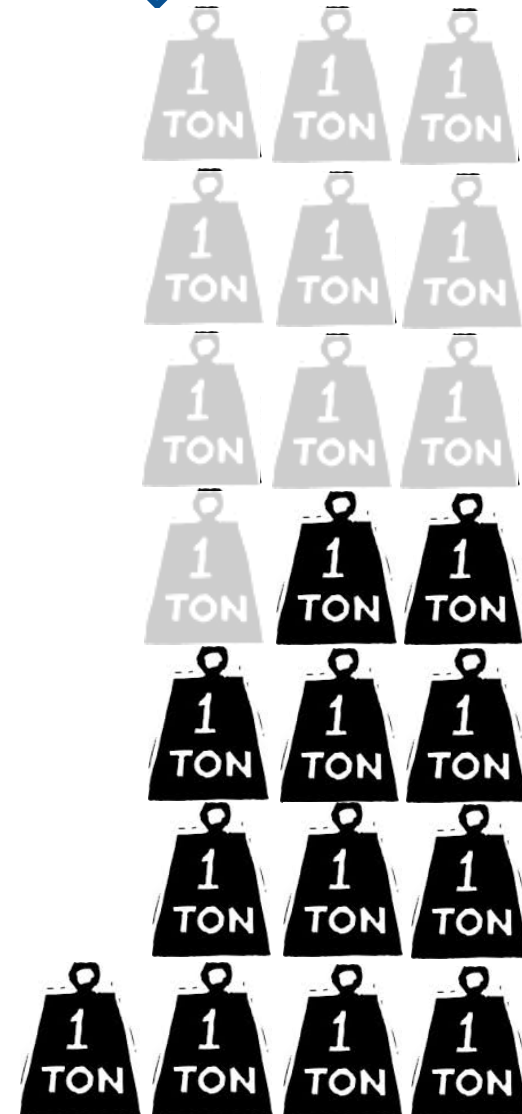
\$3700 Fuel costs @ \$3.00/gas



Transportation – 2016

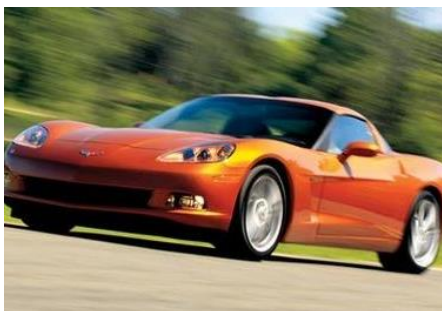
↓ 45%

- 21,000 miles/yr – 7,900 lbs/yr
- Tesla – 119 MPGe 7,000 miles
 - 2400 lbs CO₂/year
- Volt – 70 MPGe 14,000 miles
 - 6700 lbs CO₂/year



\$2,500 Fuel savings @ \$3/gas

Electric Cars – They're Better



| 2008 | Tesla Roadster | Chevy Corvette | Toyota Prius |
|-----------------------|----------------|----------------|--------------|
| Fuel Efficiency | 119 MPGe | 18 MPG | 46 MPG |
| EPA fuel cost | \$540 | \$3,200 | \$1150 |
| CO ₂ /mile | .39 lbs * | 1.23 lbs | .50 lbs |

* Assumes 73% of electricity comes from coal

Chevrolet Volt

- Fully electric 50 Miles (2017+)
- Range extended gas motor

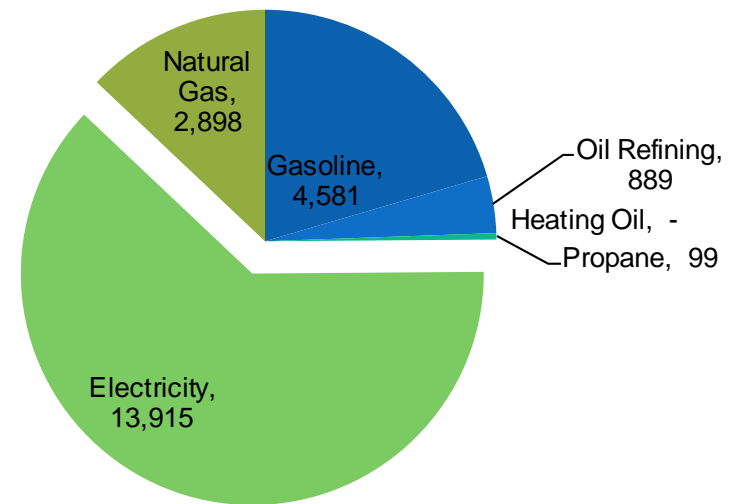


And I can still tow



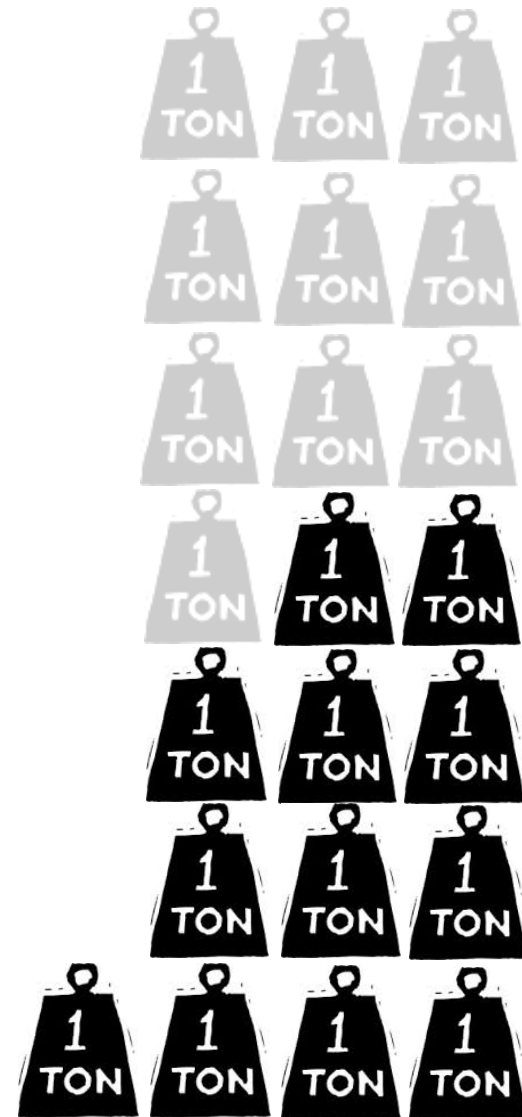
Solar Power – Next Slice

**Hrvnak w/EV's - 22,382
lbs**



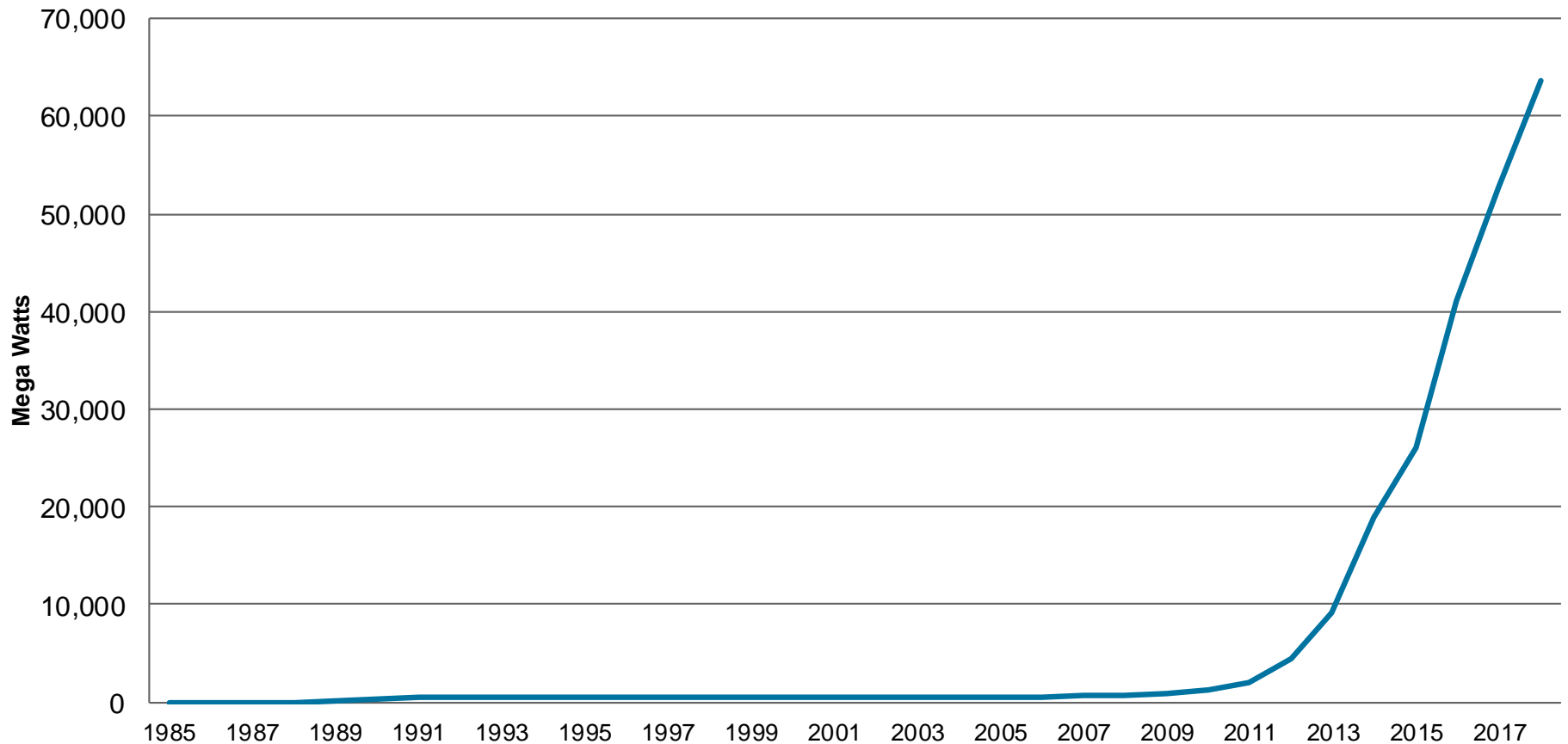
Driving to Net 0

- Why we need to make a difference
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- **Solar Production – Photovoltaic**
- The Little Things
- I'm not alone



Solar is going through the roof!

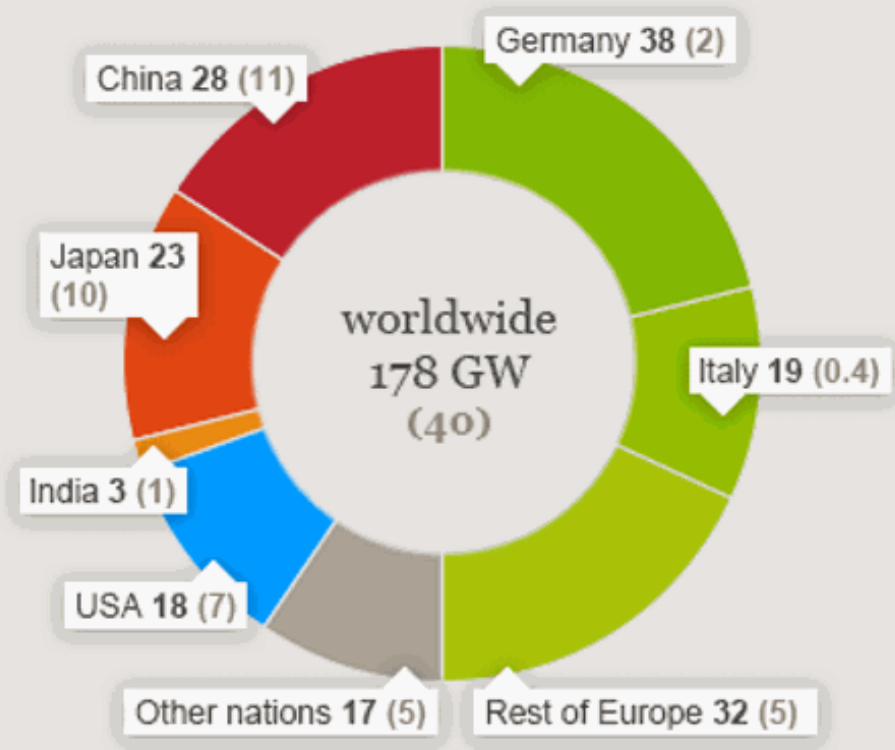
United States Solar Capacity



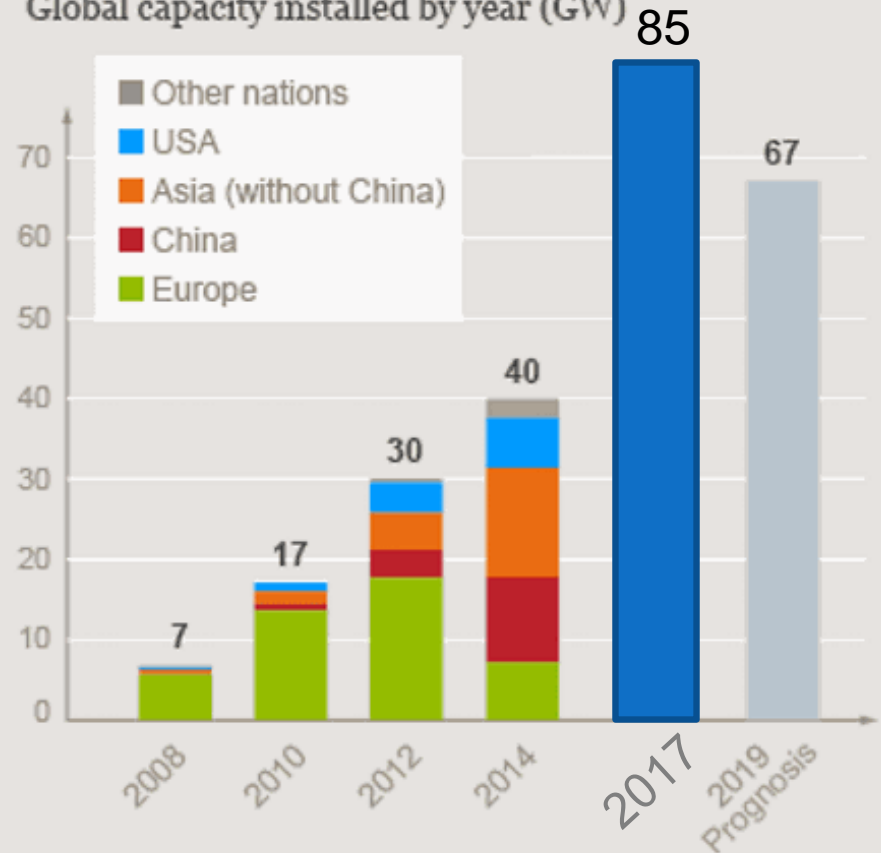
The USA playing catch-up

Global solar photovoltaic

Cumulative capacity in Gigawatt (GW) by end of 2014 (added in 2014)



Global capacity installed by year (GW)



Source: SolarPower Europe

© DW

In 2016 India Built the worlds Largest Solar Plant 648 MW

Built in 8 months
Cost \$679M
Or \$1.04/watt



Until 2017 when China Built a 850MW plant

Cost \$884M
Or \$1.04/watt



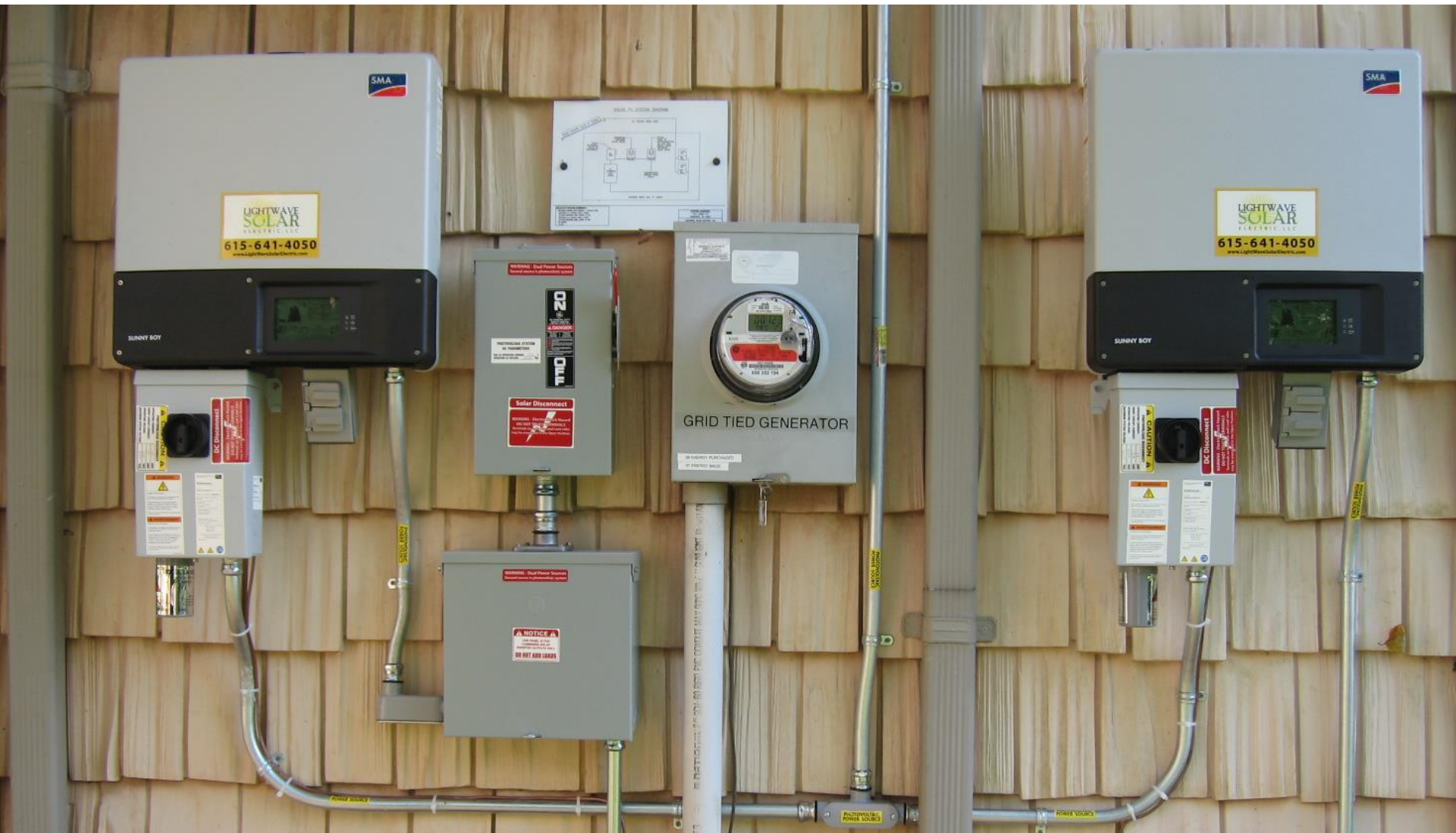
Until 2018 India building 2000 MW



Next Step – Solar Panels

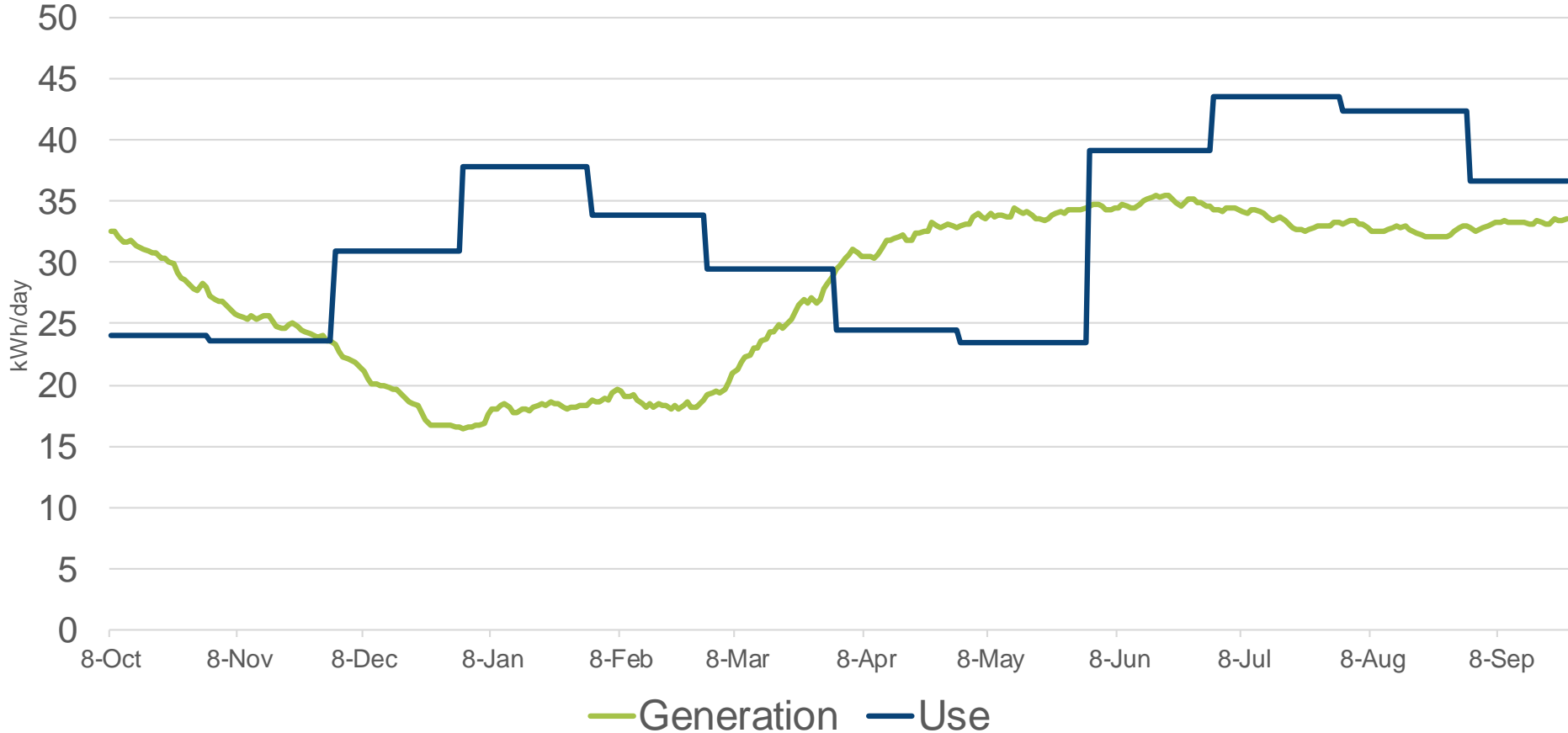


Grid Tied



Personal Generation

Solar Generation & Use 8.3 kW system



Does Solar Pay?

And that includes 1000 miles of driving in electric cars



Send Inquiries To:
PO BOX 24
CANTON, OH 44701-4414

\$13.06

Net Amount Due

\$

Amount Enclosed

Do Not Pay This Bill.

DAVID HRIVNAK
BRENDA HRIVNAK
2124 LAMONT ST
KINGSPORT, TN 37664-2024

Make Check Payable and Send To:
AEP - APPALACHIAN POWER
PO BOX 24414
CANTON OH 44701-4414



00000130600000130601000000000000154760860219061007015900009

Please turn on dotted line

Return top portion with your payment

Service Address:
DAVID HRIVNAK
BRENDA HRIVNAK
2124 LAMONT ST
KINGSPORT, TN 37664-2024

Rate Tariff: Residential Service-015

| Account Number | Total Amount Due | Due Date |
|-----------------|------------------|--------------|
| 015-476-086-0-2 | \$13.06 | Jul 10, 2017 |
| Meter Number | Cycle-Route | Bill Date |
| 85032194 | 15-05 | Jun 10, 2017 |

Questions About Bill or Service, Call:
1-800-687-4237
by Phone: 1-800-611-0864

IN APCO Messages

To avoid unnecessary delays in crediting our electric payment, please do not paper lip or staple your check to the bill payment stub.

| Previous Charges: | | |
|----------------------------------|----------|--------|
| Total Amount Due At Last Billing | \$ | 13.06 |
| Payment 06/08/17 - Thank You | | -13.06 |
| Previous Balance Due | \$ | .00 |
| Current TN APCO Charges: | | |
| Tariff 015 - Residential Service | 06/10/17 | |
| Distribution Service | \$ | 12.83 |
| Prompt Payment Discount | | -.19 |
| City of Kingsport Franchise Fee | | .62 |
| Current Electric Charges Due | \$ | 13.06 |

Net Amount Due **\$13.06**
Do Not Pay This Bill. This Amount Will Be Deducted From Your Bank Account On July 10, 2017.

| Meter | Service Period | Meter Reading Detail | | | | |
|------------|----------------|----------------------------|----------|--------|---------|--------|
| Number | From | To | Previous | Code | Current | Code |
| 85032194 | 05/17 | 06/18 | 28029 | Actual | 28394 | Actual |
| Multiplier | 1.0000 | Metered Usage 365 KWH Divd | | | | |
| 85032194 | 05/17 | 06/18 | 39288 | Actual | 39988 | Actual |
| Multiplier | 1.0000 | Metered Usage 700 KWH Divd | | | | |
| 85032194 | 05/17 | 06/18 | 0.000 | Actual | 12.800 | Actual |

| Month | Total KWH | Days | KWH Per Day | Cost Per Day | Average Temperature |
|--------------|-----------|------|-------------|--------------|---------------------|
| Current | 0 | 30 | 0 | \$0.44 | 68°F |
| Previous | 0 | 28 | 0 | \$0.47 | 63°F |
| One Year Ago | 0 | 30 | 0 | \$0.24 | 70°F |

Your Average Monthly Usage: 0 KWH

Net Usage : -335 KWH

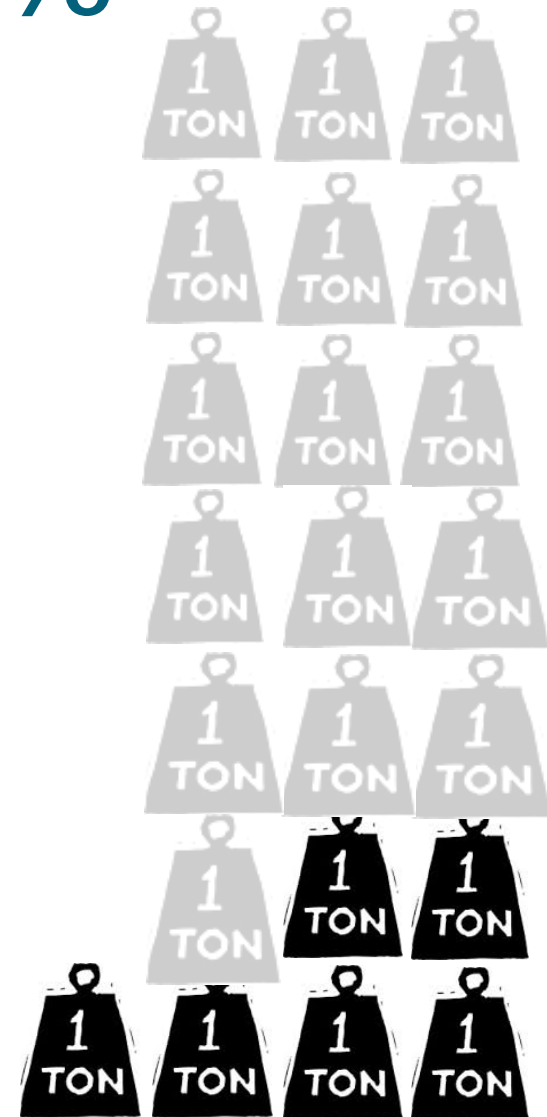
Billable Usage: 0 KWH

Does Solar work in the winter?



Driving to Net 0 - 73%

- Why we need to make a difference
- Home Design
- Electric Vehicles
- Solar Production – Photovoltaic
- **The Little Things**
- I'm not alone



Little Things Add Up



What is the cheapest?

| | LED | CFL | Incandescent |
|---------------|--------|--------|--------------|
| Cost per bulb | \$1.99 | \$1.50 | \$1.25 |

Another Use of Lighting?

| | |
|------------------|----------|
| # of Light bulbs | 30 |
| Hours/day | 4 |
| Wattage savings | 51 |
| KWh/month | 184 |
| Savings+month | \$ 15.61 |



Little Things Add Up

Reduce

Reuse

Recycle

Agenda

- Why we need to make a difference
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- Electric Vehicles
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From 7% above average to 85% below average

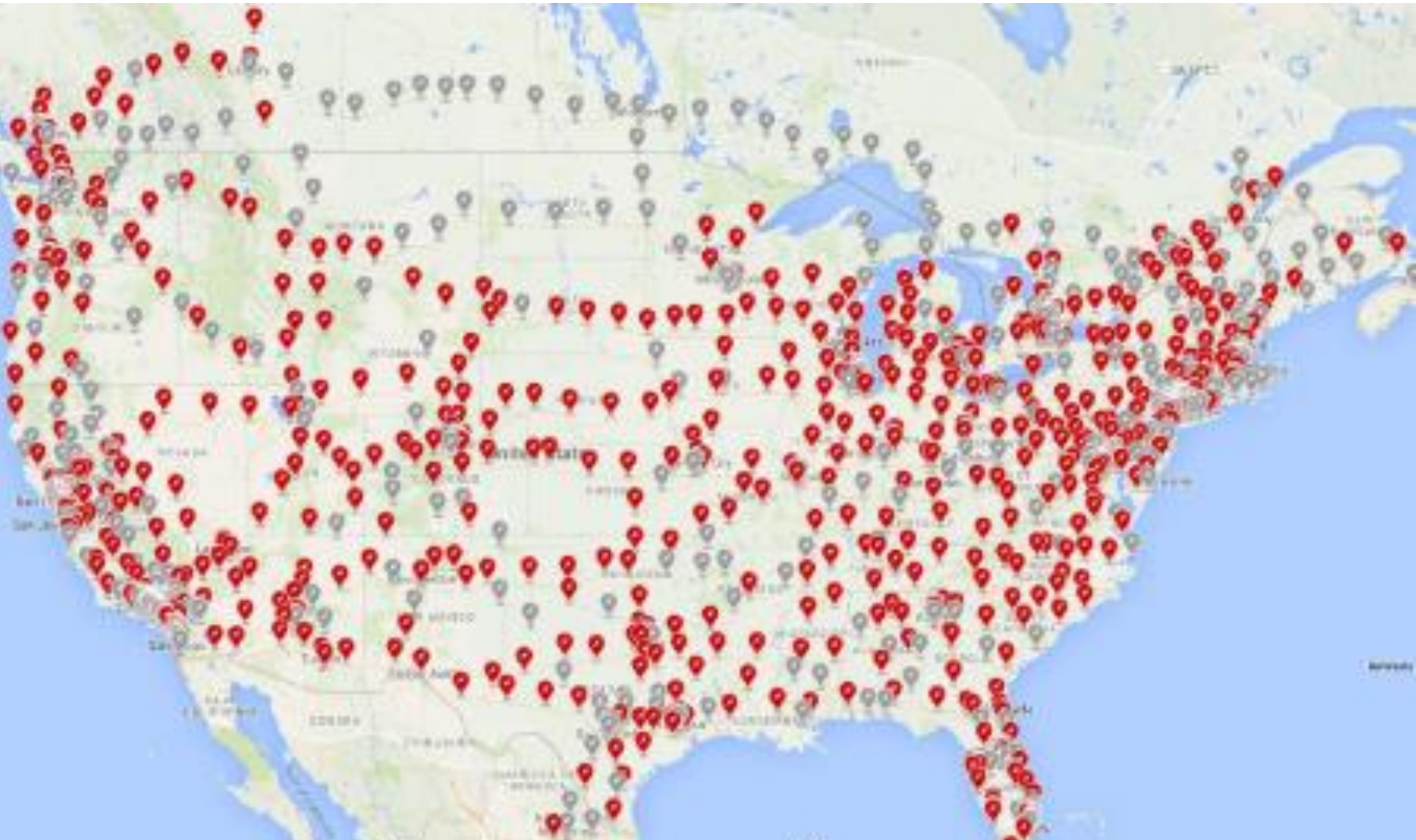
19 tons of CO₂ averted per year

Save about \$3,000/yr.

Not only is 80% possible, in many it's better

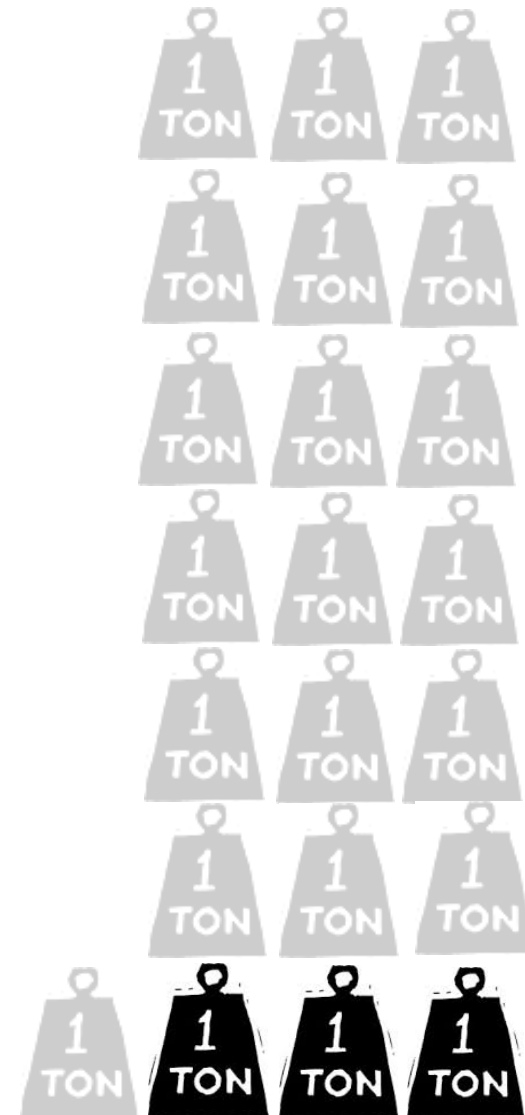


Continual Improvement



Driving to Net 0

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I am far from alone

Do you have solar to power your car?



Driving to Net 0 – Other Pioneers

- **Bishops'**
- Erbs'



Bishops'

- **Net Emissions Reduction** – 77% less than neighboring homes
- **Home** – 3300 sq ft, in North East Tennessee
- **Technologies Employed** – Geothermal Heat Pump, air to air ventilation, Solar PV, Electric Vehicles
- **Annual Energy Costs** - \$300 down 95%



Bishops'

- **Net Emissions Reduction** – 77% less than neighboring homes
- **Home** – 3300 sq ft, in North East Tennessee, USA
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- **Annual Energy Costs** - \$300 down 95%



Driving to Net 0 – Other Pioneers

- Bishops'
- Erbs'



Erb's

- **Net Emissions Reduction** – 97 percent less than the typical American household
- **Home** – 1,400 square feet in Western North Carolina
- **Technologies Employed** – Ground Sourced HP, Heat Pump water heater, solar PV, electric car
- **Annual Energy Costs** - \$285, down 96%



Erb's

- **Net Emissions Reduction** – 97 percent less than the typical American household
- **Home** – 1,400 square feet in Western NC
- **Technologies Employed** – Ground Sourced HP, Heat Pump water heater, solar PV, electric car
- **Annual Energy Costs** - \$285, down 96%



So who now thinks a 80% reduction
in fossil fuels is possible?



Questions?



Genesis 2:15 The LORD God took the man and put him in the Garden of Eden to work it and take care of it.

www.Hrivnak.com