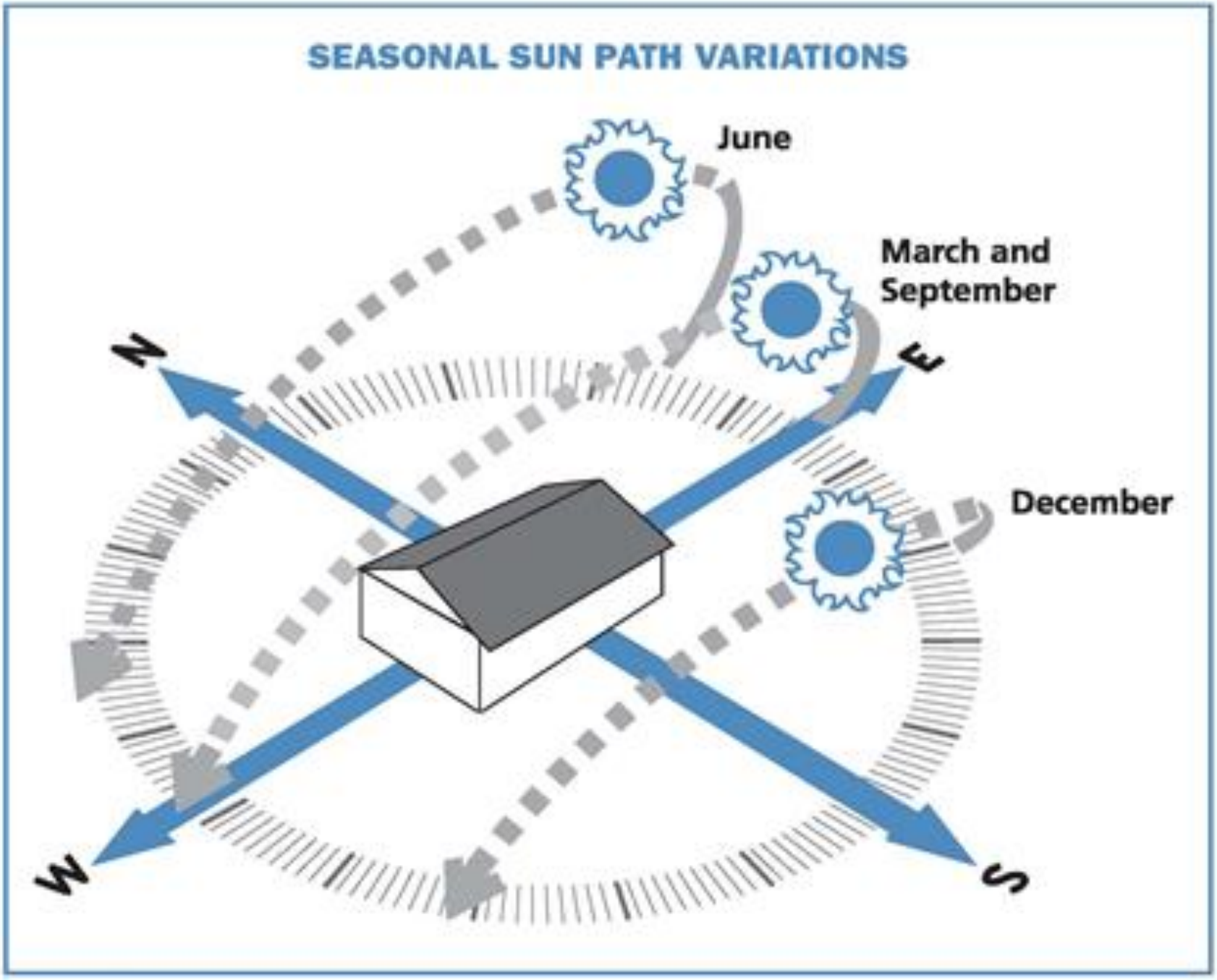
PASSIVE SOLAR DESIGN

MAXIMIZE SOLAR HEAT GAIN IN WINTER AND MINIMIZE IT IN SUMMER


SEASONAL SUN PATH VARIATIONS
June
March and
September
December
N
E
W
S

PASSIVE SOLAR HEATING

DIRECT GAIN

INDIRECT GAIN

ISOLATED GAIN

DIRECT GAIN

SOLAR RADIATION OR DIRECT SUN LIGHT THAT PENETRATES AND IS STORED IN THE LIVING SPACE

1000 WATTS PER SQUARE METER

- 1 - 3’ X 5’ SINGLE PANE WINDOW TAKING DIRECT SUMMER SUN

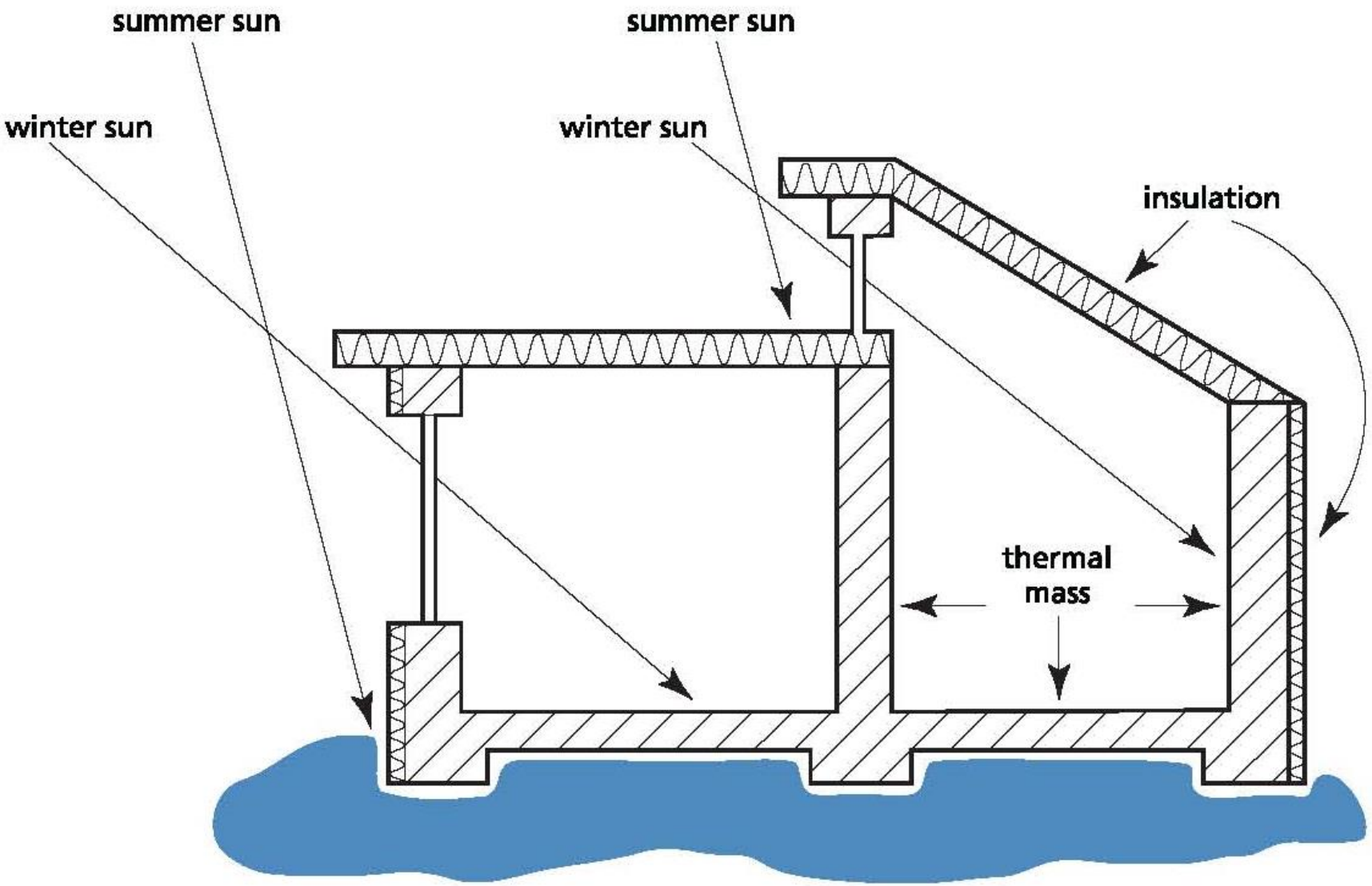
- FROM 9:00 AM TO 3:00PM

- FOR 75% OF THE DAYS

- CAN ADD APPROXIMATLY

135 kWh TO MONTHLY SUMMER ELECTRIC BILL

SUN ANGLES AND SHADING



SUN TEMPERING

Up to 7 percent of floor area in windows…

SOUTH FACING WINDOWS

2800 sq. ft house

X

7% = 196 square feet

13 – 3’x5’ windows

SHADING

Calculate the sun angle to determine proper overhang

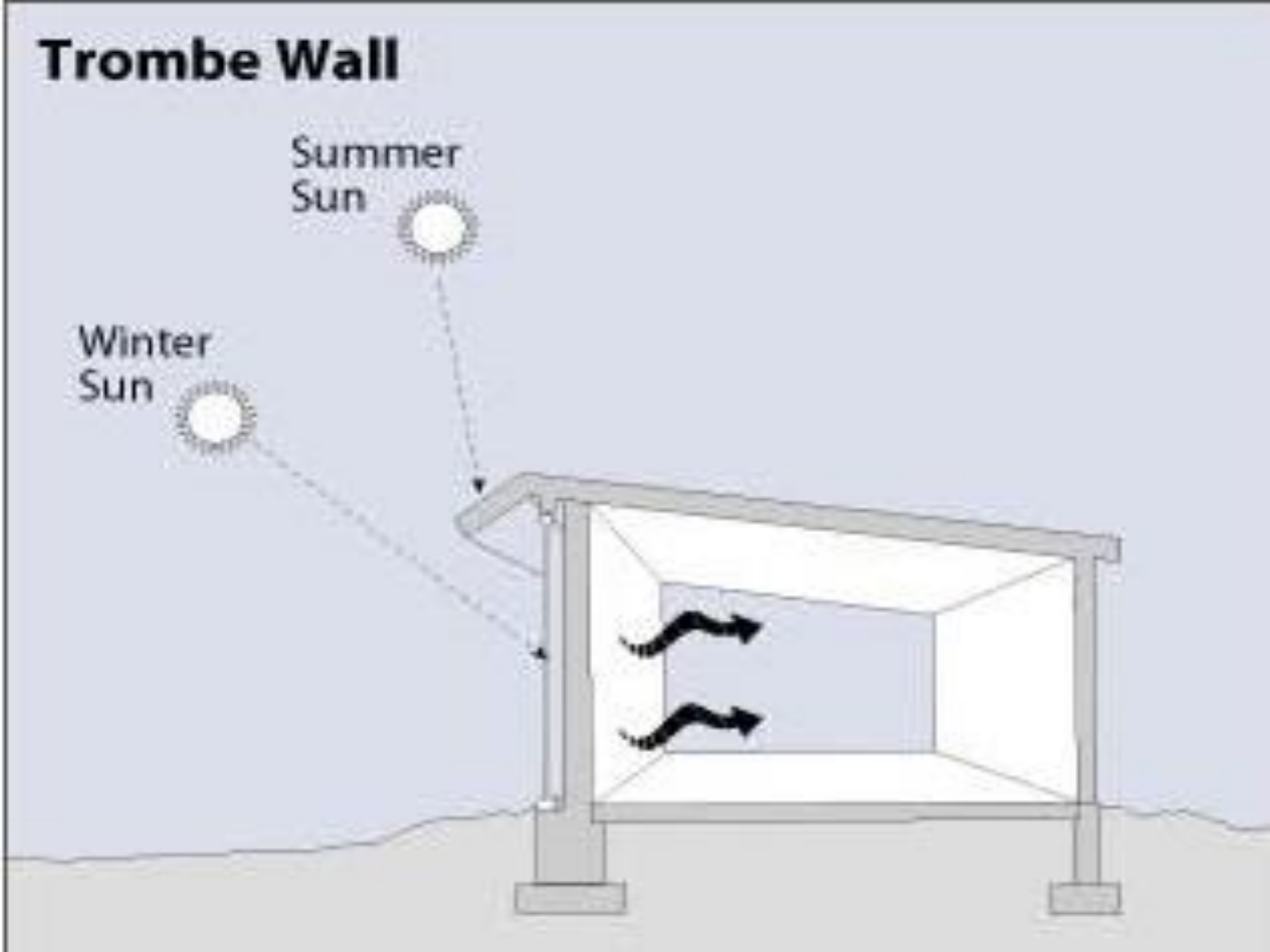
Mature deciduous trees

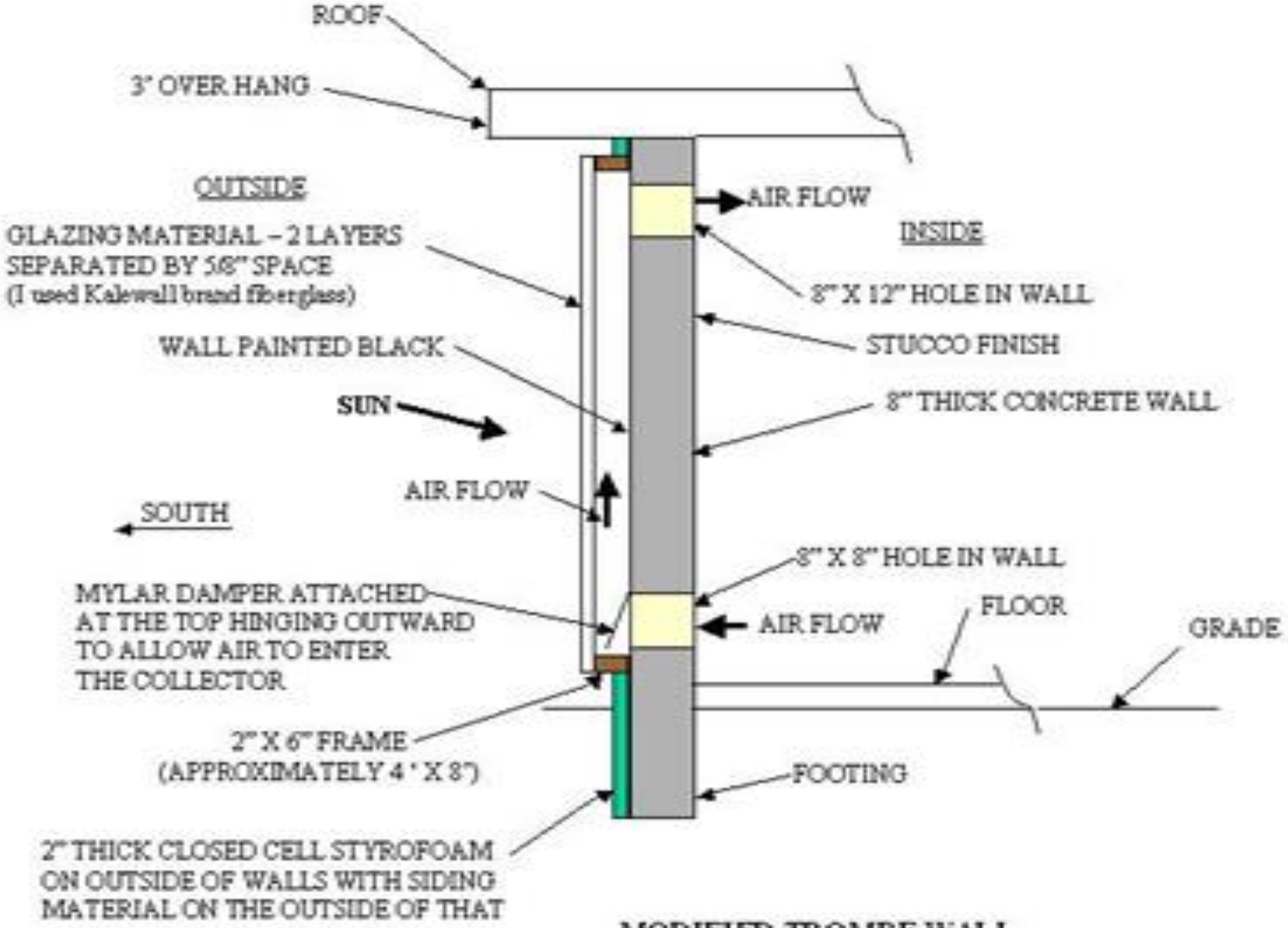
Building integrated awnings

INDIRECT GAIN

COLLECTS, STORES, AND DISTRIBUTES SOLAR RADIATION USING THERMAL MASS

Trombe Wall





MODIFIED TROMBE WALL

ISOLATED GAIN

COLLECT SOLAR RADIATION IN AN AREA THAT CAN BE SELECTIVELY CLOSED OFF OR OPENED TO THE REST OF THE HOUSE

HEAT STORAGE

Thermal mass

Use Brick, Rock, Concrete on the INSIDE of your house

THERMAL MASS

MATERIAL	VHC
WATER	4186
CONCRETE	2060
SANDSTONE	1800
COMPRESSED EARTH BLOCKS	1740
RAMMED EARTH	1673
DRYWALL	1530
BRICK	1360
EARTH WALL(ADOBE)	1300
WOOD	350

NATURAL LIGHTING

Use sunlight for daytime interior lighting

5% of room floor area in glass

Skylights are RARELY a GOOD choice

WINDOW SELECTION

Minimize on the West, East and North

Maximize on the South

Proper shading either with overhangs, shutters, vegetation or solar window screens

WINDOW TECHNOLOGIES

ARGON OR KRYPTON GAS: ECONOMICAL CHOICES

LOW E COATING: HAS TRADE OFFS

HEAT MIRROR® and SUPERGLASS® QUAD: THE ULTIMATE WINDOW TECHNOLOGY?

BETWEEN GLASS FABRIC SHADES: ADDS TO R AND U VALUE

GLAZING PERFORMANCE TERMS

- SHGC – Solar Heat Gain Coefficient – The amount of SH entering a room and becoming heat- Variable
- U Factor – The rate of heat transfer – Lower is better
- VLT - Visible Light Transmission - the % of light transmitted -Variable
- RHG – Relative Heat Gain - the actual amount of heat entering – Variable
- SC – Shading Coefficient – the amount of solar heat ÷ amount passing trough 1/8" glass – Variable
- LBL DF - Lawrence Berkley Labs Damage Function – predicts UV light fading damage – Lower is better

UNSHADED WINDOW

NORTH
SHGC/U Factor/RHG/LBL DF – LOWER
VLT/SC – HIGHER

EAST/WEST
SHGC/U Factor/RHG/SC/LBL DF – LOWER
VLT/SC – LOWER

SOUTH
SHGC/U Factor/LBL DF – LOWER
VLT/RHG/SC - LOWER

SHADED WINDOW

NORTH

SHGC/U Factor/RHG/LBL DF – LOWER

VLT/SC – HIGHER

EAST/WEST

SHGC/U Factor/RHG/SC/LBL DF – LOWER

VLT/SC – HIGHER

SOUTH

U Factor/LBL DF – LOWER

SHGC/VLT/RHG/SC - HIGHER

ADDED INSULATION

R value = A measure of resistance to heat flow

ICF: Insulated Concrete Form up to R 50 in an 11" thick wall
SIP: Structural Insulated Panel up to R 22.32 in a 7" thick wall

URETHANE FOAM up to R 20.65 in a 3.5" application(5.9 p/i)
ICYNENE® up to R 12.6 in a 3.5" application(3.6 p/i)
BIOFOAM up to R 13.4 in a 3.5" application(3.8p/i)
CELLULOSE up to R 14 in a 3.5" application(4.0 p/i)
FIBERGLASS up to R 12.6 in a 3.5" application(3.6 p/i)

EXPANDED POLYSTYRENE up to R 12.6 in a 3.5" application(3.6 p/i)
RIGID FOAM up to R 17.5 in a 3.5" application(5.9 p/i)
POLYISOCYANURATE up to R 6.25 in a 1" application (6.25 p/i)

RETROFITTING INSULATION

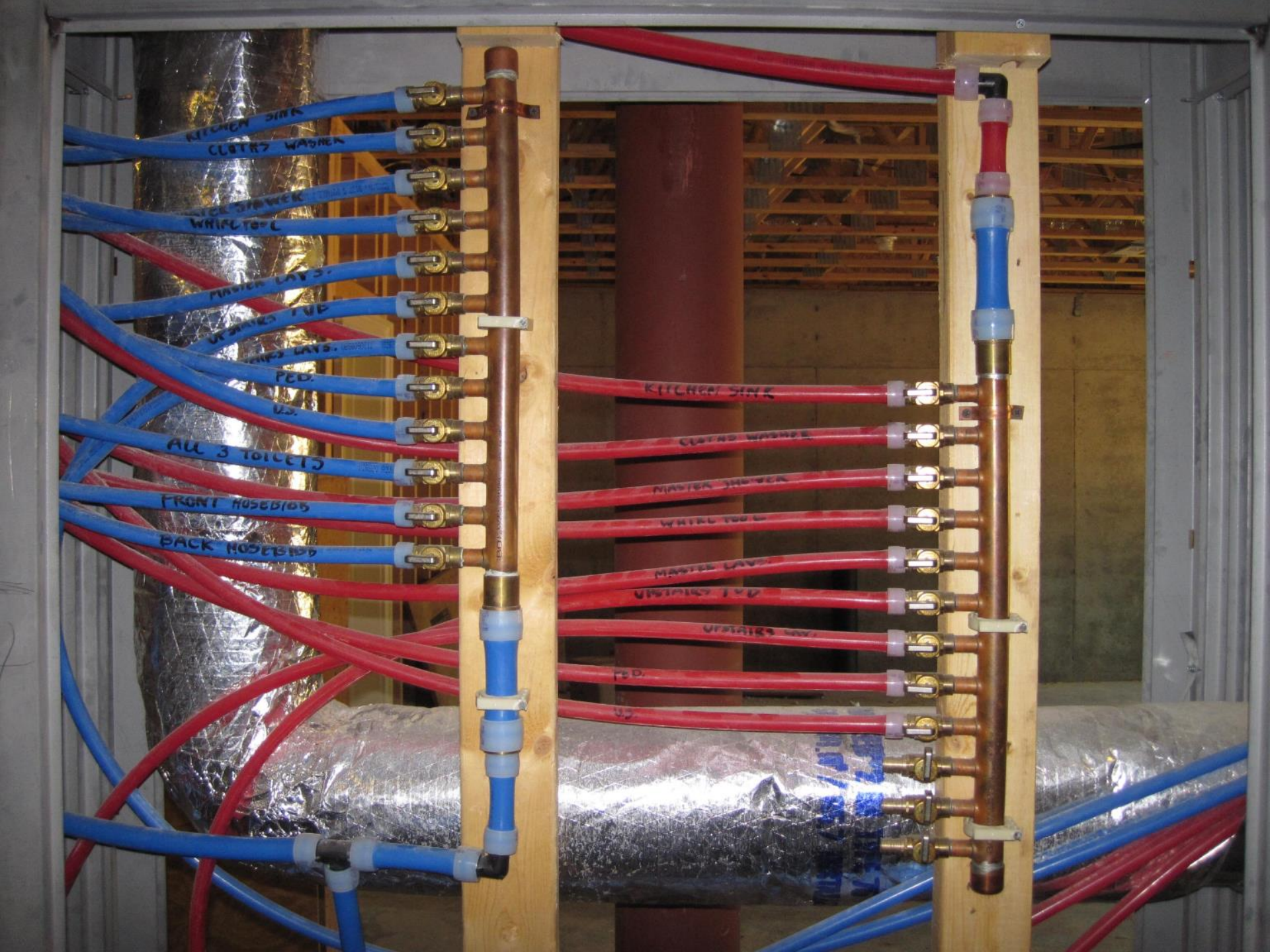
- EIFS: $8.00 per s/f (old or new exterior wall)

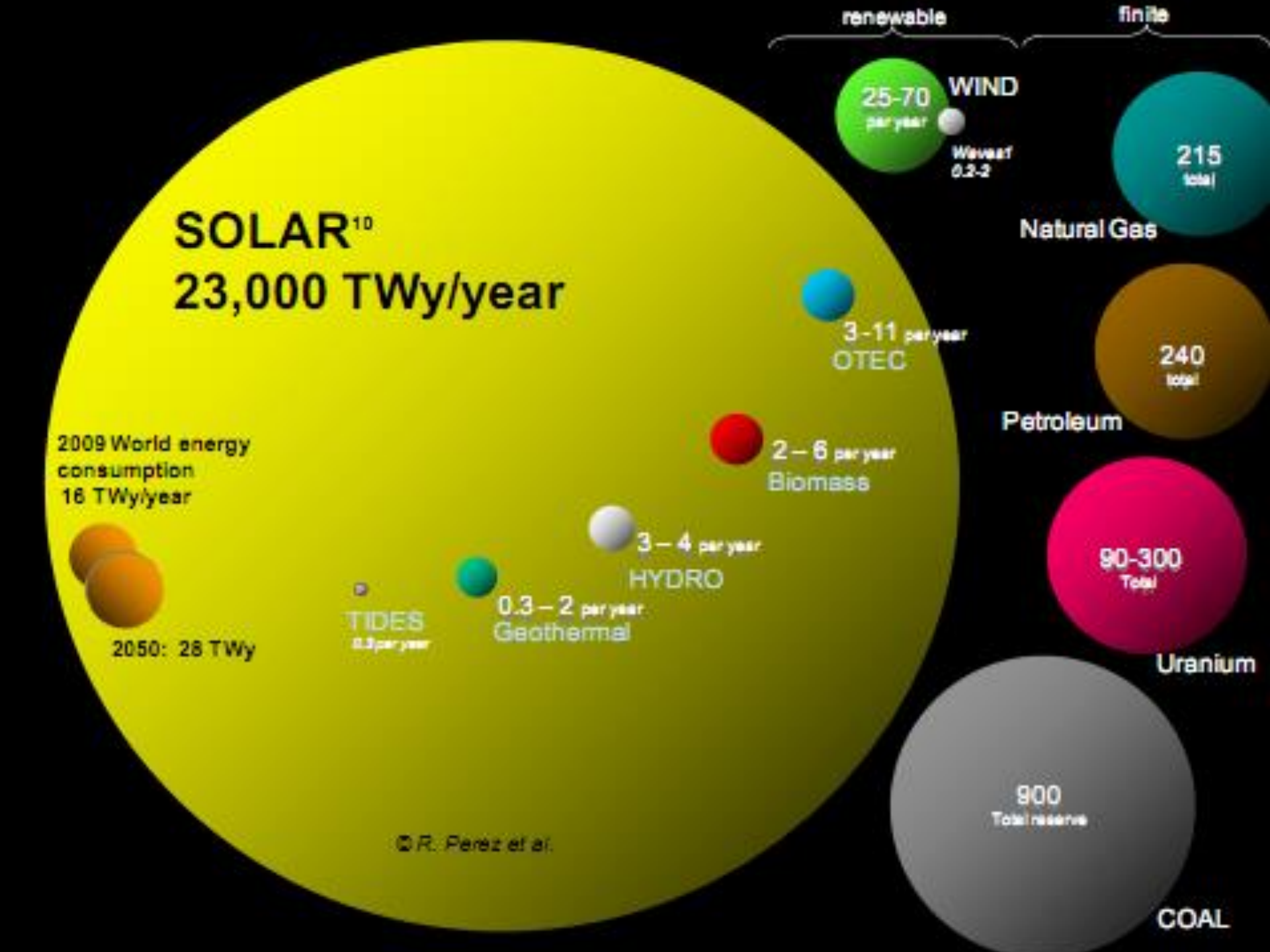
- Icynene®/Bio foam: $1.20 per s/f (new wall)
- Wet blown cellulose: .50¢ -.65¢ per s/f (new wall)
- Dry blown cellulose: $1.00 per s/f (old wall)
- Dry blown cellulose: .50¢ per s/f (attic)
- Blown fiberglass: .65¢ per s/f (attic)
- Fiberglass batting: .45¢ per s/f (wall)
- Fiberglass batting: .60¢ - .65¢ per s/f (attic/floor)

HELPFUL WEBSITES

- energystar.gov – Home Energy Audit
- efficientwindows.org – Window information
- toolbase.org – Technical Information
- nrel.gov – Energy-10™ software
- eere.energy.gov – RESFEN software, EE and RE
- buildinggreen.com – Design/Build information
- coloradoenergy.org – R Value tables
- southwall.com – Heat Mirror® Windows
- pella.com – New and replacement windows


104
Rinnai


KITCHEN SINK
CLOTHES WASHER
WHIRLTUB
ALL 3 TOILETS
FRONT HOSEBIBS
BACK HOSEBIBB
KITCHEN SINK
CLOTHES WASHER
MASTER SHOWER
WHIRLTUB
MASTER LAVS.
UPSTAIRS TUB
UPSTAIRS LAVS.
F.D.
U.D.


renewable
finite
25-70
per year
WIND
Wavest
0.2-2
215
total
Natural Gas
SOLAR[10]
23,000 TWy/year
3-11 per year
OTEC
240
total
Petroleum
2009 World energy
consumption
16 TWy/year
2 – 6 per year
Biomass
3 – 4 per year
HYDRO
90-300
Total
Uranium
0.3 – 2 per year
Geothermal
TIDES
0.3 per year
2050: 28 TWy
900
Total reserve
COAL
© R. Perez et al.

3.797 million mi^2

8,100 miles2

Mainstream Forecasts: Linear – despite evidence

- Mainstream Forecasts:
  - Linear
  - Backwards-looking
  - Siloed
- They don't take into account
  - Technology cost curves
  - Product Innovation
  - Business Model Innovation
  - Reality: evidence of exponential nature of technology adoption

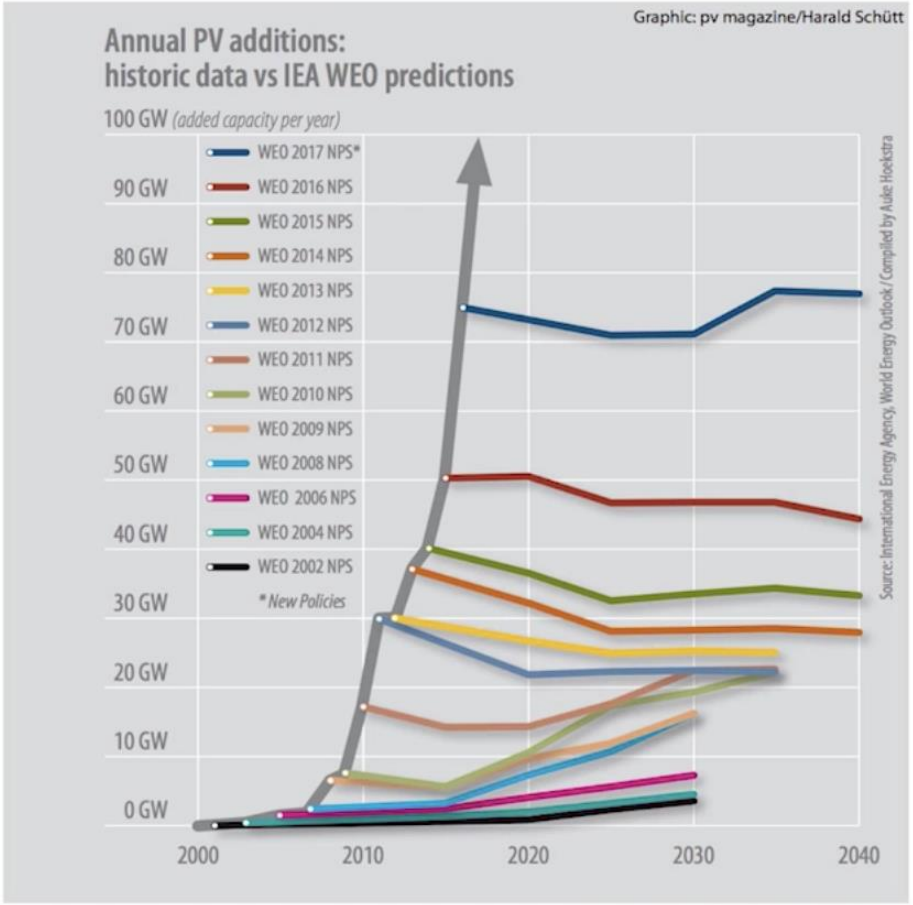
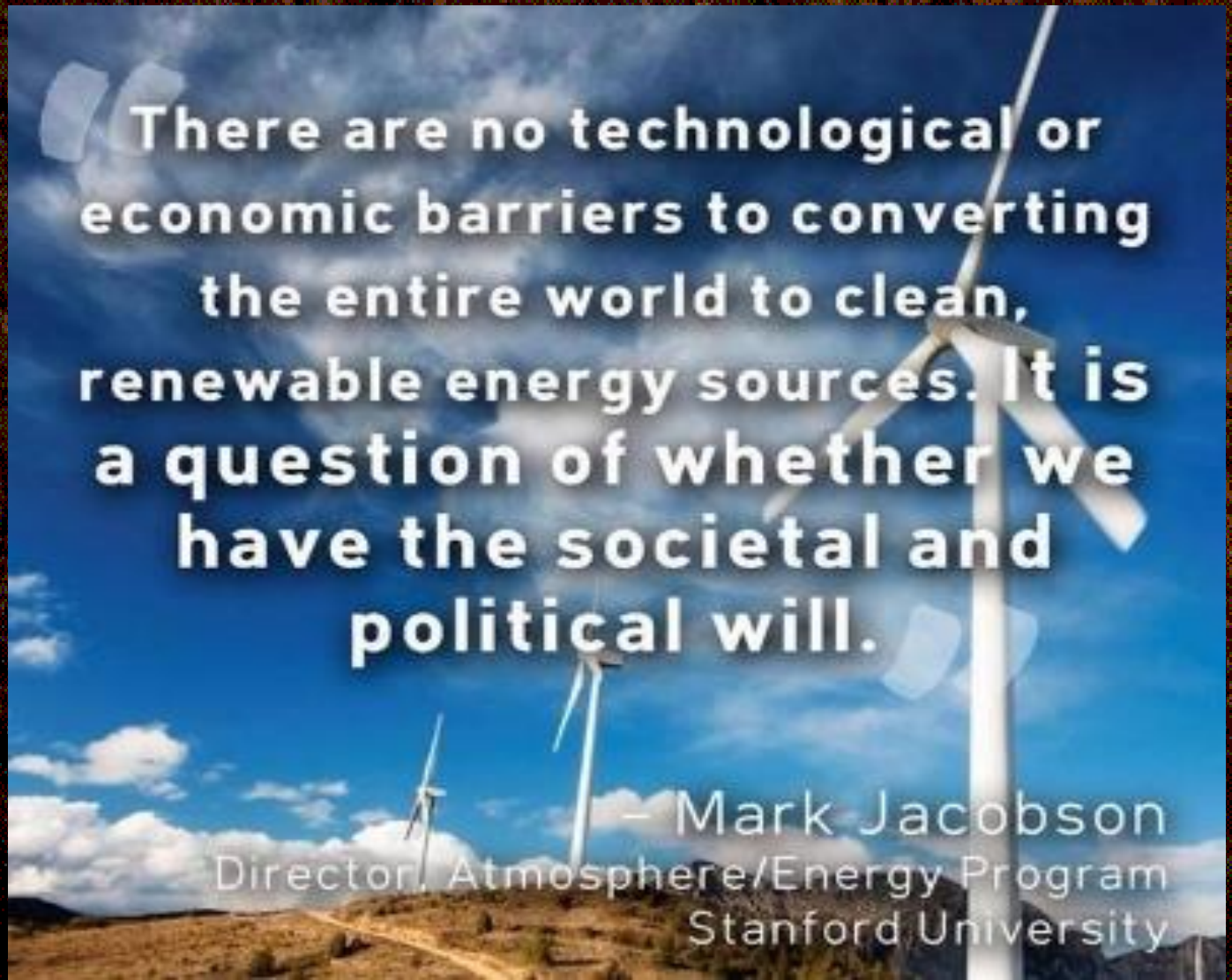


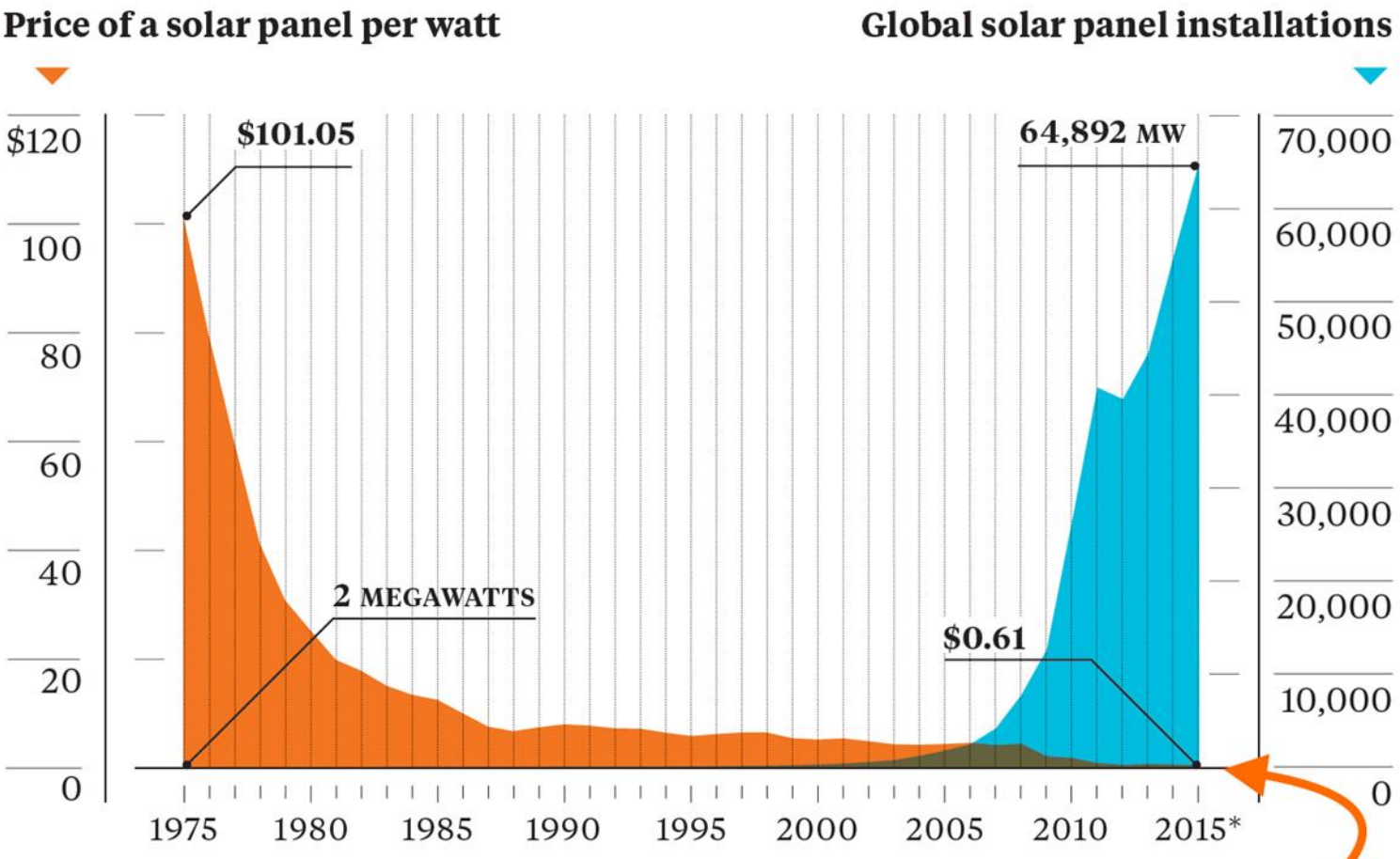
Image Source: PV Magazine

We have all the technologies we need to solve all the challenges facing humanity



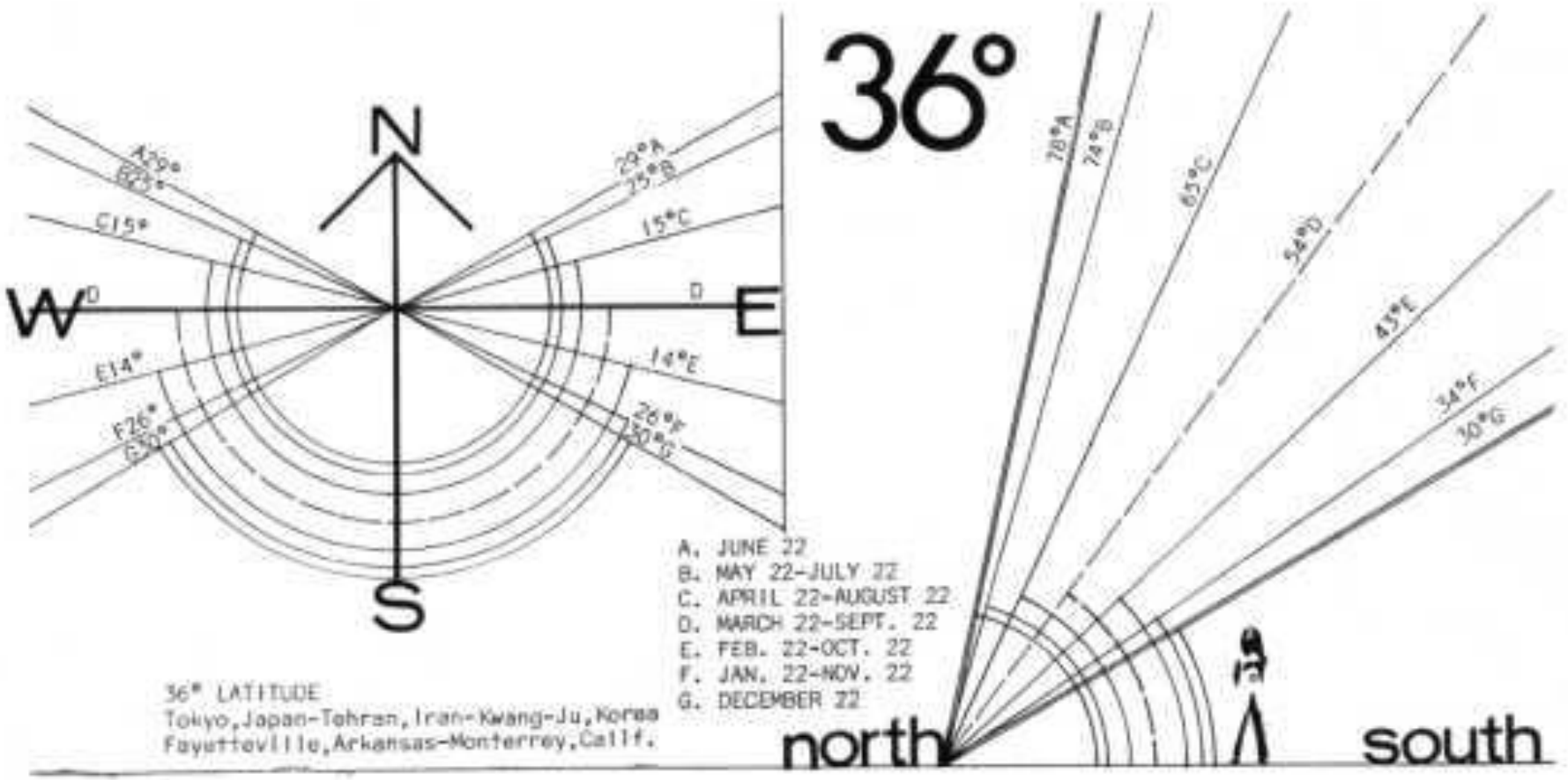
Solar on Fire

As prices have dropped, installations have skyrocketed.

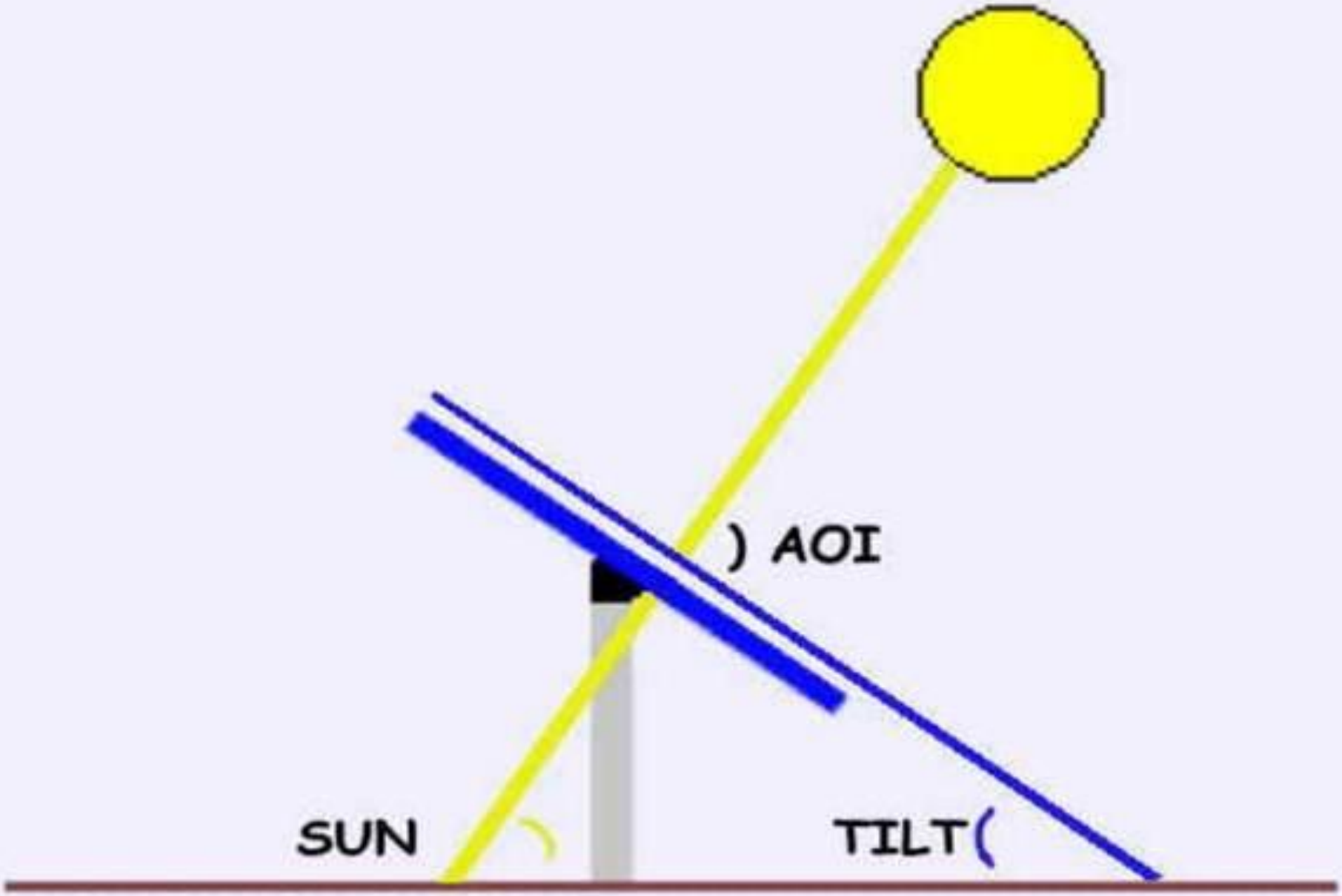


*Estimate. Sources: Bloomberg, Earth Policy Institute, www.earth-policy.org

Down to $0.447 in August 2016



WATTS YOUR ANGLE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N
Google™
Image State of Arkansas
Pointer 34°44'47.98" N 92°17'20.22" W elev 344 ft Streaming 100%
Eye alt 1071 ft

2001 - Net-metering passes in legislative session without a single no vote. Act known as the Arkansas Renewable Energy Development Act(AREDA).

2002 - Net-metering rules and procedures promulgated at PSC.

2007 - Net-metering improved by extending forfeiture rule to end of calendar year.

2009 - HB 1851 - Renewable Energy Feed-in Act fails in House Ins. and Commerce Committee.

2010 - Governor launches Renewable Technology Rebate Plan.

2011 - SB 721 - CLEAN Energy Act fails in Senate Ins. and Commerce Committee.

2013 - HB 1390 – Distributed Generation Act fails in Joint Energy Committee.

2013 - Net-metering improved slightly by new formula extending forfeiture period to April of following year.

2013 - PSC opens docket addressing impediments to net-metering.

2013 - PSC removes mutual indemnification clause for entities with sovereign immunity.

2013 - PSC adds meter-aggregation to net-metering rules.

2015 - HB 1885 The Arkansas Distributed Generation Act fails in Joint Energy Committee.

2015 – HB 1633 becomes Act 1088 Allowing a utility to enter into a Power Purchase Agreement and receive additional sum if PPA is not with an affiliate of the utility. Does not apply to an electric cooperative corporation or electric utility customers.

2015 – HB 1004 becomes Act 827. Net-metering improved by allowing indefinite carry over of unused kWh generation with option to cash out at avoided cost rate after a twenty four month period.

Act 827 also increased the size limits for residential and commercial installations to the size necessary to create 110% of highest monthly usage.

The Act also directed the PSC to determine if the costs of net-metering policy outweigh the policy's electrical system benefits, public benefits and environmental benefits. Language allowing utilities to charge net-metering customers extra fees, if costs outweigh benefits, has been in AREDA since its passage in 2001. The difference is that Act 827 allowed cover for the utilities to be able to say it was the legislatures idea not theirs.

2016 – PSC opened docket 16-027-R to satisfy the requirements of Act 827.

2016 – PSC opened docket 16-028-U without a direct requirement from the legislature to investigate policies related to renewable distributed generation.

2107 – PSC rules that existing NMC's will be grandfathered under existing rules for next twenty years. Additionally, the ruling states that any NM installation completed before final ruling regarding rate changes are also grandfathered for next 20 years.

30% Federal Income Tax credit

1 Year Accelerated Depreciation On 85% Of Installed Cost


Google
Google
34°47'07"N 92°21'45"W 715 ft


Google
Google
34°43'46"N 92°04'34"W 478 ft

Bearskin Solar Center, LLC

Contact: Frank Kelly @ 501.225.8398

E-mail: frank@arkansas.solar

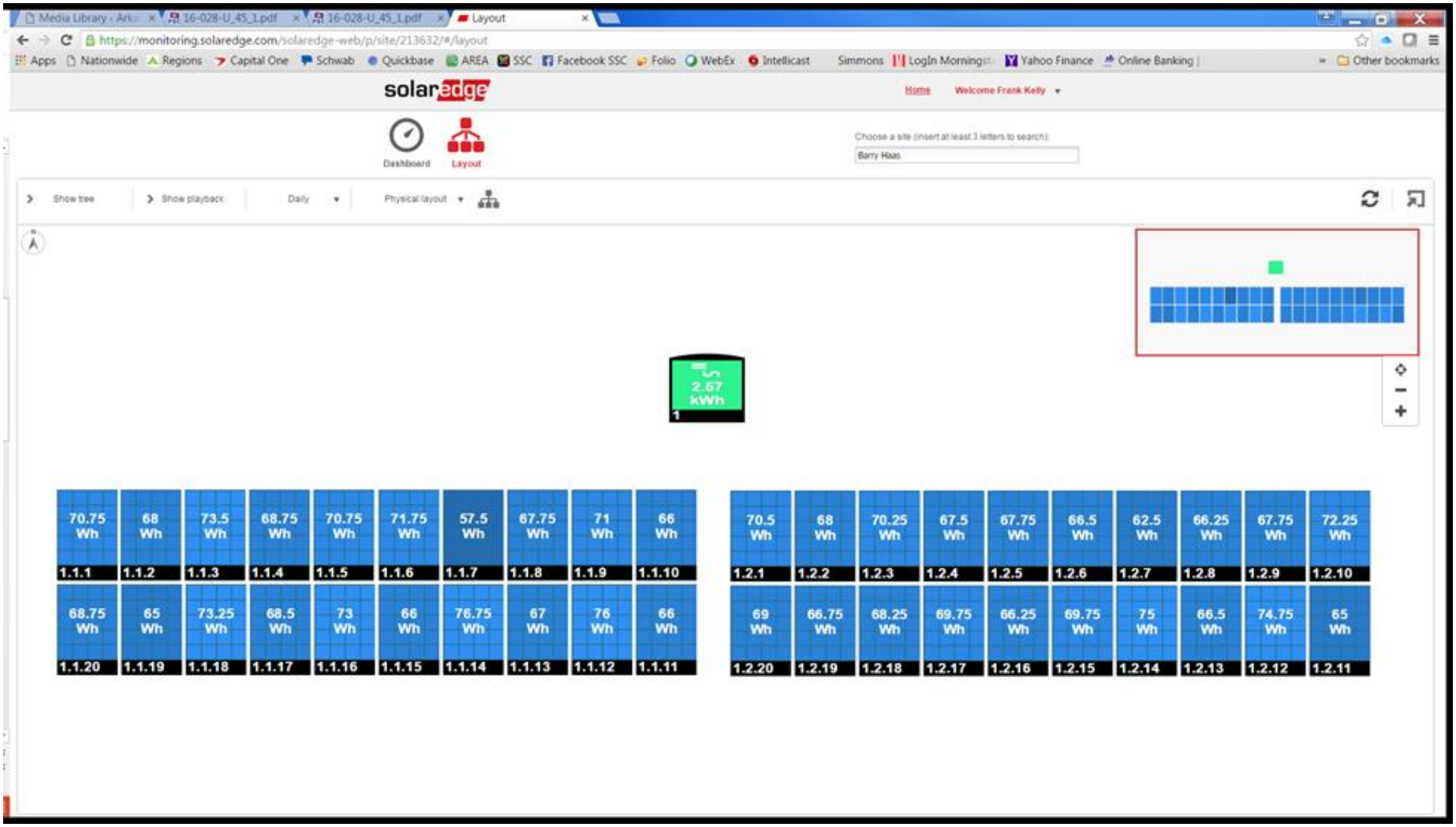
Request a Solar Quote: www.arkansas.solar

Arkansas' first solar garden allows interested citizens to "plant" solar modules and grow electricity. Arkansas customers of Entergy simply register a new electric meter in their name and attach a solar array that produces kilowatt hours of electricity. Monthly kWh production is credited against monthly kWh consumption on existing meters at another home or business location.

Through a program called meter-aggregation, Entergy customers can sight their array here at Bearskin Solar Center and create kWh generation which will offset usage from another Entergy meter anywhere else in Arkansas.

If your home or business does not have suitable solar access or you just want to have your array sighted elsewhere, you can purchase a minimum of 20 modules at Bearskin Solar Center and apply the generation to any other number of existing electric meters.

The purchase price includes an initial 20 year land lease and a 25 year performance warranty with daily web access monitoring of solar modules in each individual array. A modest annual maintenance fee is assessed to keep the grass mowed and the modules clean.


Media Library ‹ Ark...
16-028-U_45_1.pdf
16-028-U_45_1.pdf
Layout
https://monitoring.solaredge.com/solaredge-web/p/site/213632/#/layout
Apps
Nationwide
Regions
Capital One
Schwab
Quickbase
AREA
SSC
Facebook SSC
Folio
WebEx
Intellicast
Simmons
LogIn Morning
Yahoo Finance
Online Banking
Other bookmarks
solaredge
Home
Welcome Frank Kelly
Dashboard
Layout
Choose a site (insert at least 3 letters to search):
Barry Haas
Show tree
Show playback
Daily
Physical layout
2.57 kWh
1
70.75 Wh 1.1.1
68 Wh 1.1.2
73.5 Wh 1.1.3
68.75 Wh 1.1.4
70.75 Wh 1.1.5
71.75 Wh 1.1.6
57.5 Wh 1.1.7
67.75 Wh 1.1.8
71 Wh 1.1.9
66 Wh 1.1.10
68.75 Wh 1.1.20
65 Wh 1.1.19
73.25 Wh 1.1.18
68.5 Wh 1.1.17
73 Wh 1.1.16
66 Wh 1.1.15
76.75 Wh 1.1.14
67 Wh 1.1.13
76 Wh 1.1.12
66 Wh 1.1.11
70.5 Wh 1.2.1
68 Wh 1.2.2
70.25 Wh 1.2.3
67.5 Wh 1.2.4
67.75 Wh 1.2.5
66.5 Wh 1.2.6
62.5 Wh 1.2.7
66.25 Wh 1.2.8
67.75 Wh 1.2.9
72.25 Wh 1.2.10
69 Wh 1.2.20
66.75 Wh 1.2.19
68.25 Wh 1.2.18
69.75 Wh 1.2.17
66.25 Wh 1.2.16
69.75 Wh 1.2.15
75 Wh 1.2.14
66.5 Wh 1.2.13
74.75 Wh 1.2.12
65 Wh 1.2.11

solaredge

Home Welcome Frank Kelly ▾

Dashboard Layout

Overview

Current Power	Energy today	Energy this month	Lifetime energy
863 W	39.11 kWh	2.15 MWh	2.17 MWh

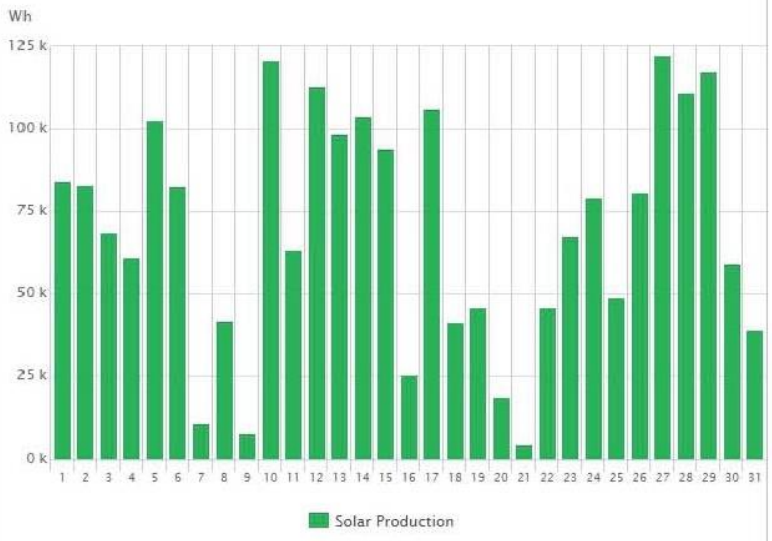
solaredge

Power and Energy

Week **Month** Year

01/01/2016 - 01/31/2016

Solar Production: **2.15 MWh**



Site summary

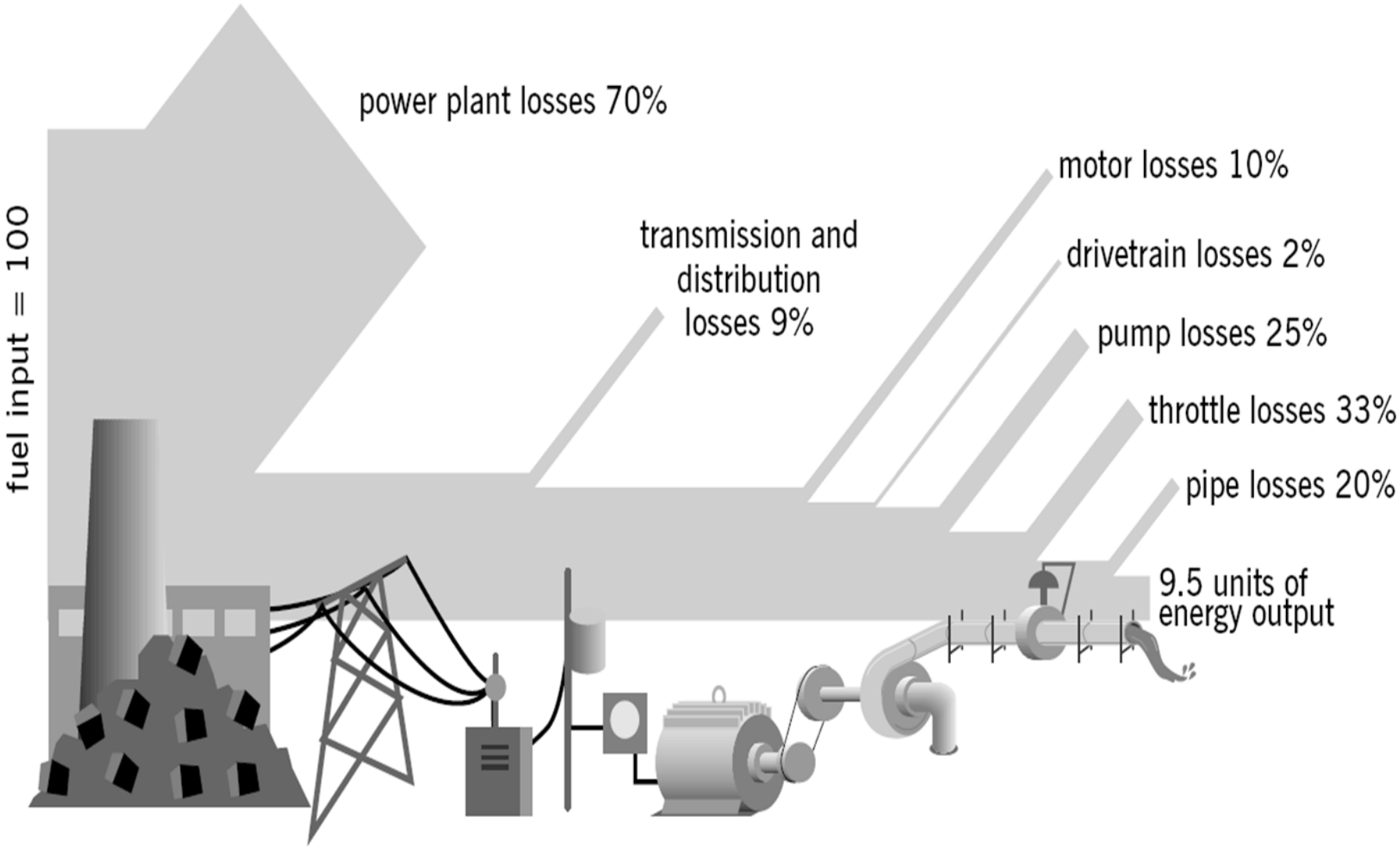
Id	
Name	
Country	United States
State	Arkansas
City	Scott
Address	Bearskin Lake Loop 126
Installed	12/31/2015
Last updated	01/31/2016 17:00
Peak power	21.2 kWp

Weather

Temperature 73.4 °F
Partly Cloudy
Feels like 73.4 °F
Wind SSW, 13.79 MPH
Humidity 50 %
Sunrise at 07:08
Sunset at 17:37

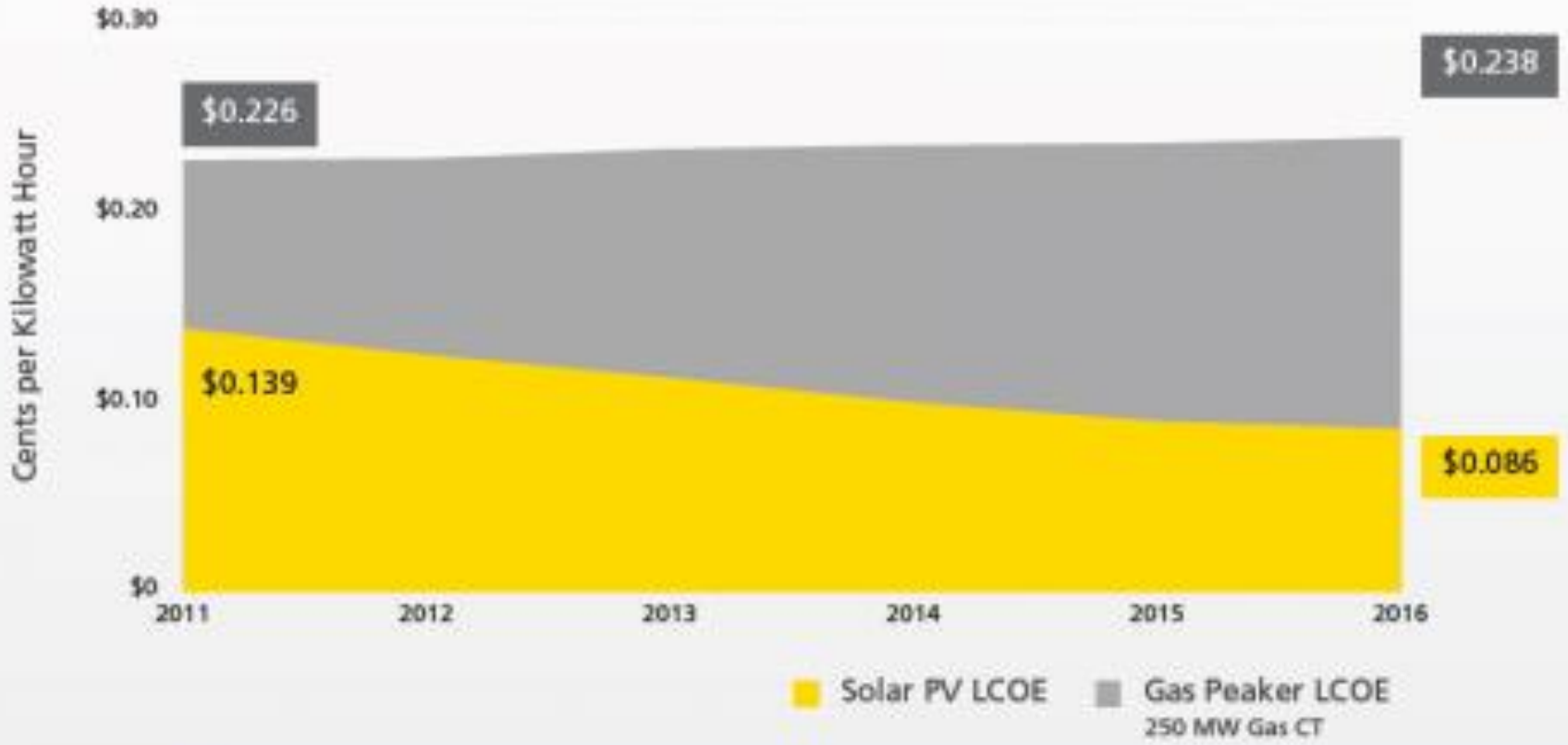
Sunday	Monday	Tuesday
69.8 - 50 °F	62.6 - 55.4 °F	66.2 - 37.4 °F
Partly Cloudy	Partly Cloudy	Partly Cloudy


Bearskin Solar
Center
www.arkansas.solar



From the *Drivepower Technology Atlas.* Courtesy of E SOURCE, www.esource.com.

Solar Beats Natural Gas Peak Power Today



Gas peakers pollute 3 times more than natural gas power plants.

Sources: 2011 gas price is the mid-point of the LCOE range given by Lazard, version 5.0. 2016 gas price is illustrative, calculated assuming 1% annual escalation; 2011 & 2016 PV Prices from DOE, Advanced Research Projects Agency - Energy, $1/Watt Photovoltaic Systems, May 2011 (further validated by prices bid by solar developers into the California market).

THE TRIPLE BOTTOM LINE