

CALIFORNIA DREAMIN'

IGHSPA 2013 FALL CONFERENCE

Bill Martin

Consulting services for:

- Energy-wise planning / design
- Energy source cost comparisons
- Ground source heat pump technology

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Bill Martin built an air-sourced heat pump home in 1977 and was certified in the '80s as an RCS auditor trainer, schools & hospitals auditor, and Title-24 instructor. Efficiency in residential design is his passion, and GHPs are his favorite technology. He is an IGSHPA-certified installer.

www.MartinEnergetics.com

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“California is currently the home to 12.1 percent of the country’s population, represents only 2.3 percent of ground source heat pump activity”

Source: Project Negatherm, 2009

**HOW CAN WE INCREASE GHP INSTALLATIONS
IN THIS STATE?**

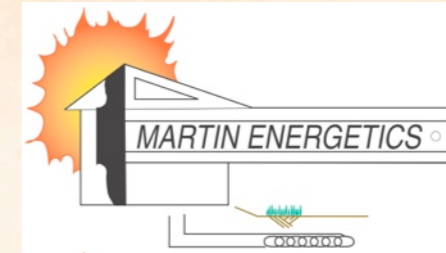
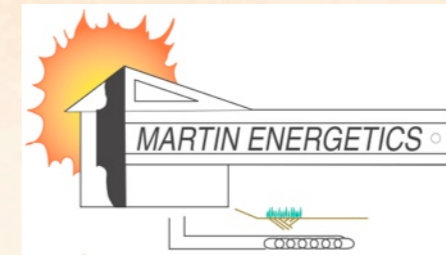


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I. Questions about California's current geothermal heat pump market status

Will mortgage lenders increase construction loans to cover GSHP installation?

Are there low interest loans for no/low carbon (green) HVAC systems?

Have electric IOUs established rate schedules to incentivize GSHPs?

Has GSHP's potential to lower greenhouse gases been recognized by regulators?

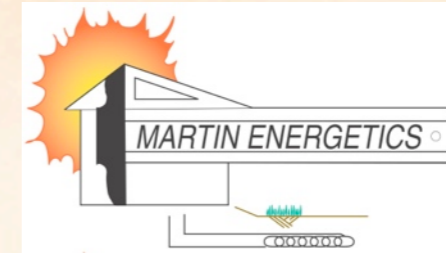
Have electric IOUs financed ground loops thru on-bill financing? [PSREC has]

Have 14+ years of defining "borehole" as "water well" been helpful or acceptable?

Is there modest cost/uniform permitting for ground loop construction?

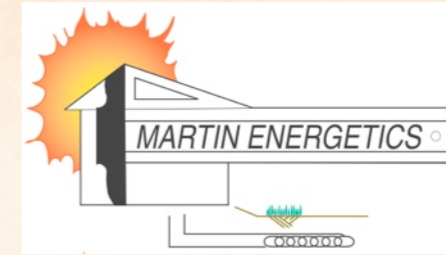
Since GSHP's ground loops represent local, stored energy, why no RPS credit?

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II. State energy history and the formation of the California Energy Commission

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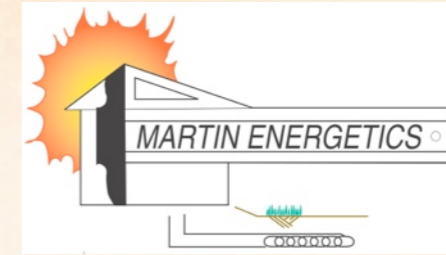
1/6/75 (First Term) Gov. Jerry Brown signed AB 1575
The Warren-Alquist Act of 1974

{then opposed only by CA Manufacturer's. Asso. and General Electric}

California Energy Commission was born

- **reliable supplies of electricity**
- **one-stop generation siting authority**
(with time limits for rejection/approval)
- **independent 20-year electric forecasts**
(every two years)
- **policies fostering electric energy conservation**

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Those Energy Conservation Policies are:

Electric conservation measures

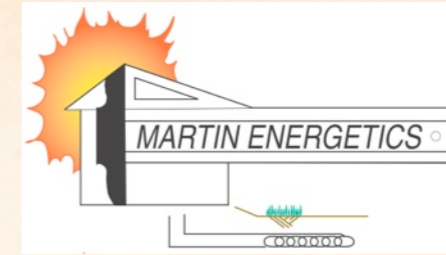
Design standards for buildings (those became Title-24)

Minimum standards for electric appliances

Standards for buildings' climate controls

Recommendations to PUC on electric rates

CEC operations funded by a consumer bill charge of
.2mils (\$.0002)/Kwh



Results of California electric use since 1974

It's Worked!

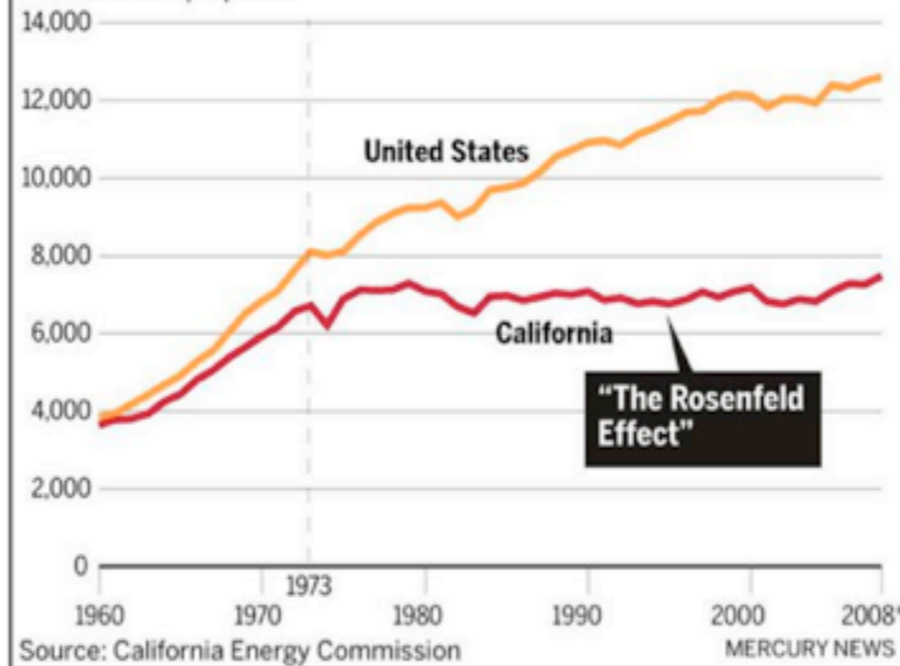
The "Rosenfeld Effect" explains California's relatively flat per capita electricity usage since 1973 in contrast to the sharp rise across the rest of the United States in the same time period. It is a very impressive

"The Rosenfeld Effect"

Though electricity use has risen sharply in the United States, California's per capita electricity use has remained relatively flat since 1973 because of the state's strict efficiency regulations. This leveling is dubbed "The Rosenfeld Effect," after physicist Arthur Rosenfeld who has championed the energy conservation movement since the '70s.

Per capita electricity sales (not including self-generation)

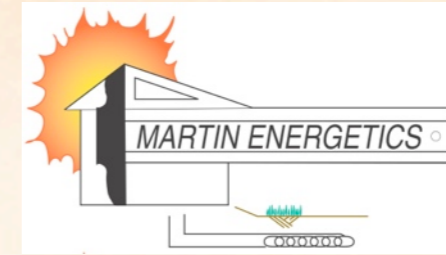
In kilowatt hours per person



California's energy efficiency history.

achievement, a testament to the leadership of Art Rosenfeld, and symbolic of California's historic position of energy efficiency innovation. Unfortunately, it is only a beginning.

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Solar Tax Credits in California:

1975 - 1985 (40% Fed 15% State) for solar hot water

159,000 installed before tax credits withdrawn in '86

—ACEE, 2010

July, 2007 Solar Water Heating Pilot Program (SWHPP)

Began as an 18-month incentive thru San Diego Gas & Electric
Funded by the PUC through a rate tariff
Expanded thru 2009 or until funds run out

2007 AB 1470 Solar Water Heating & Efficiency Act

PUC jurisdiction for 13¢/month surcharge on gas bills

Rebates after installation to reduce natural gas consumption

\$250 million over 10 years

Goal of 200,000 SWHs by 2017

By 3/09 \$500,000 had been rebated

EXCERPT FROM PACIFIC GAS & ELECTRIC TRAINING CENTER
CURRICULUM ON SOLAR ENERGY

SHOEMAKER, HOLLOWAY, & MUFFET

**30 years ago, the utilities made money like most
businesses: on profits from sales.**



**The more energy they sold, the more profit
they made.**

**EXCERPT FROM PACIFIC GAS & ELECTRIC TRAINING CENTER
CURRICULUM ON SOLAR ENERGY**

SHOEMAKER, HOLLOWAY, & MUFFET

**Since 1978 (gas) and 1982 (electricity)
California's regulated utilities have made
profits on INVESTMENTS, not SALES.**

**These investments are directed by the CPUC
and include energy efficiency and
conservation.**

EXCERPT FROM PACIFIC GAS & ELECTRIC TRAINING CENTER
CURRICULUM ON SOLAR ENERGY

SHOEMAKER, HOLLOWAY, & MUFFET

DECOUPLING

Separating profits from sales.



EXCERPT FROM PACIFIC GAS & ELECTRIC TRAINING CENTER
CURRICULUM ON SOLAR ENERGY

SHOEMAKER, HOLLOWAY, & MUFFET

Example of EE investment and target:

- 1. The CPUC authorizes PG&E to spend the money to give away 1,000,000 CFLs.**
- 2. The target over 3 years is to reduce electric consumption [xx] mWh.**
- 3. If PG&E makes the target they can set rates so that they earn [x]% for their shareholders.**
- 4. If they exceed the target they can earn more, if they miss the target they earn less or even get penalized.**



**EXCERPT FROM PACIFIC GAS & ELECTRIC TRAINING CENTER
CURRICULUM ON SOLAR ENERGY**

SHOEMAKER, HOLLOWAY, & MUFFET

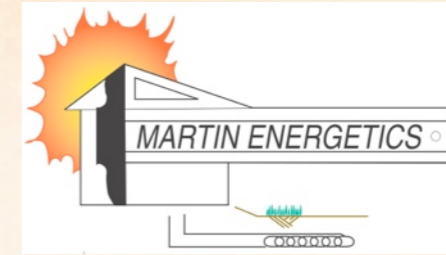
California utilities have NO incentive to increase energy usage.

They DO have mandates and incentives for energy efficiency, conservation, and renewables.

The result?

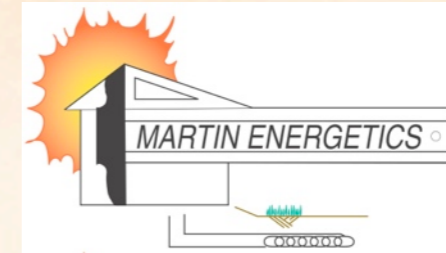
California, and PG&E, is the leader in energy efficiency and renewable generation.

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**III. Homegrown in CA— PACE financing
(Property Assessed Clean Energy)**

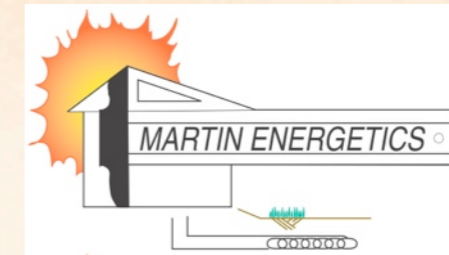
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PACE Financing (Property Assessed Clean Energy) History:

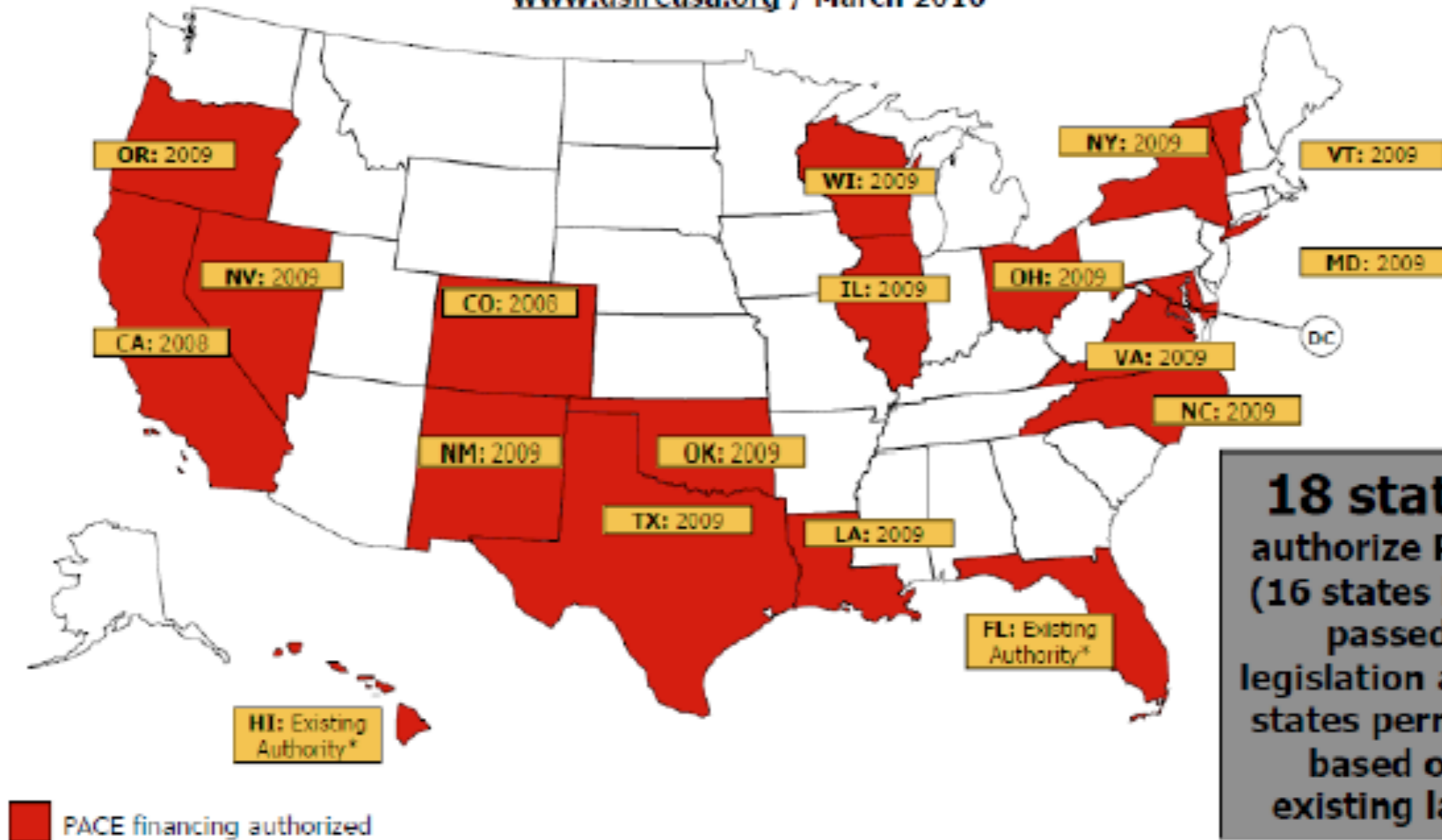
- 2005** Conceived in the Monterey Bay Regional Energy Plan
- 2008** Implemented in the City of Berkeley, CA
Dan Kammen, Cisco DeVries
- Implemented in the City of Babylon, NY
- CA AB 811 PACE legislation for residential, commercial, industrial
- 100 jurisdictions in CA have PACE program infrastructure
- Congress passed the Housing and Economic Recovery Act
- Creation of FHFA (Federal Housing Financing Agency
(the conservator for Fannie and Freddie)
- 2009** Sonoma County (CA) Energy Independence Program (PACE)
- 2010** FHFA said PACE financing is a loan not a lien—can't be senior
Fannie/Freddie will not refinance encumbered properties
- '09-'11 Five bills introduced in Congress to protect PACE—all died
- 2012** Sonoma County, CA, et al file against FHFA in fed court (and win)
- 3-19-13** 9th Circuit upholds FHFA w/o oral arguments, dismisses case

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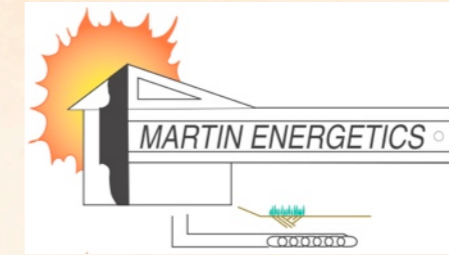


Property Assessed Clean Energy (PACE)

www.dsireusa.org / March 2010



18 states authorize PACE (16 states have passed legislation and 2 states permit it based on existing law)



FEDERAL HOUSING FINANCE AGENCY



STATEMENT

For Immediate Release
July 6, 2010

Contact: Corinne Russell (202) 414-6921
Stefanie Mullin (202) 414-6376

**FHFA Statement on Certain Energy
Retrofit Loan Programs**

After careful review and over a year of working with federal and state government agencies, the Federal Housing Finance Agency (FHFA) has determined that certain energy retrofit lending programs present significant safety and soundness concerns that must be addressed by Fannie Mae, Freddie Mac and the Federal Home Loan Banks. Specifically, programs denominated as Property Assessed Clean Energy (PACE) seek to foster lending for retrofits of residential or commercial properties through a county or city's tax assessment regime. Under most of these programs, such loans acquire a priority lien over existing mortgages, though certain states have chosen not to adopt such priority positions for their loans.

First liens established by PACE loans are unlike routine tax assessments and pose unusual and difficult risk management challenges for lenders, servicers and mortgage securities investors. The size and duration of PACE loans exceed typical local tax programs and do not have the traditional community benefits associated with taxing initiatives.

To see PACE's beginnings, go to:

<http://www.youtube.com/watch?v=7rT7I6ASw6k>

PACE Financing History, continued:

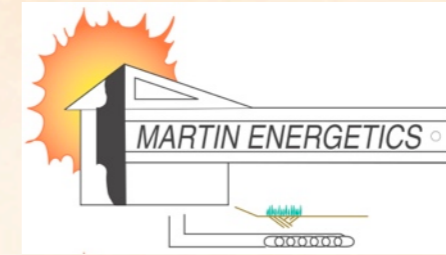
3/19/13 Federal 9th Circuit Court of Appeals dismissed the case—

“We now conclude that FHFA’s decision to cease purchasing mortgages on PACE-encumbered properties is a lawful exercise of its statutory authority as conservator of the Enterprises. Because the courts have no jurisdiction to review actions that FHFA takes as conservator, we **VACATE the district court’s order and **DISMISS** the case.”**

For more on the sequential history of PACE’s status, go to:

<http://www.ase.org/resources/inception-pace-financing-its-support-and-its-potential>

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PACE Financing History, continued:

3/19/13 On the *same day* the PACE case was dismissed by the 9th Circuit—

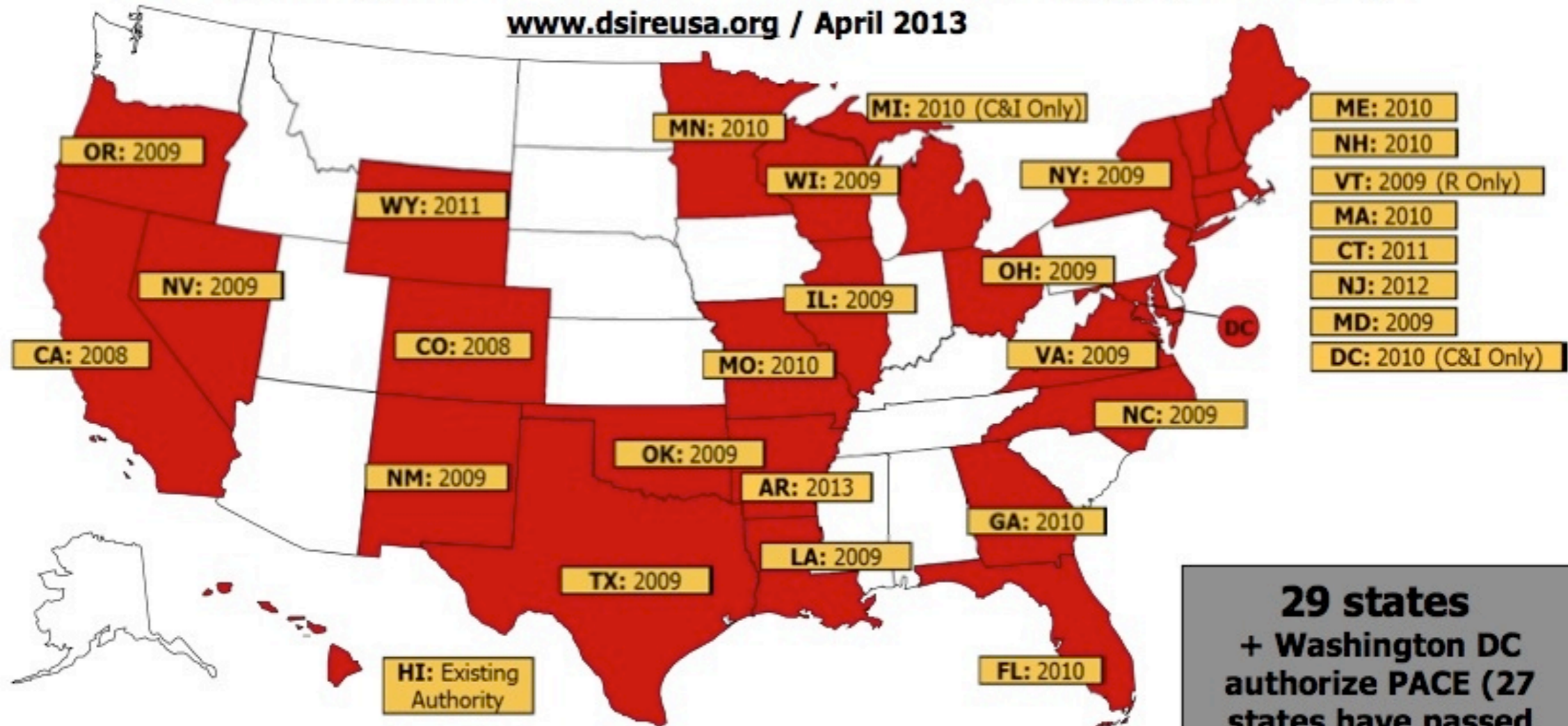
The University of North Carolina released a study that sampled 71,000 mortgage loans in 38 states [25,000 Energy Star qualified and 46,000 non-Energy Star homes].

The Energy Star homes presented a 32% lower chance of mortgage default.

<http://ccc.sites.unc.edu/files/2013/05/Tian-AREUEA-5-30-13.pdf>

Property Assessed Clean Energy (PACE)

www.dsireusa.org / April 2013



■ PACE financing authorized by the state*

*The Federal Housing Financing Agency (FHFA) issued a statement in July 2010 concerning the senior lien status associated with most PACE programs. In response to the FHFA statement, most local PACE programs have been suspended until further clarification is provided.

**29 states
+ Washington DC
authorize PACE (27
states have passed
legislation and HI
permits it based on
existing law)**

From Chapter 3: *Reckless Endangerment*, *How outsized ambition, greed, and corruption led to economic armageddon.*

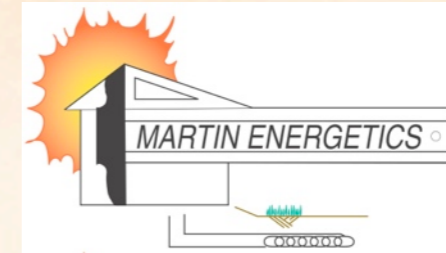
Gretchen Morgenson, 2011

- **Fall, 1993 Fannie & Freddie join with three partners to create “Alternative Qualifying”**
- **Eliminated debt limits and mortgage payment limits against income**
- **Substituted applicants’ demonstration of previous ability to pay debts**
- **As GSEs (government sponsored enterprises) Fannie & Freddie got funds for less than private lenders, they did not pass the savings along**
- **In 1995, F & F kept 1/3 (\$2.1 billion) for themselves and shareholders**
- **CBO auditors found a loan volume compensation system that paid Fannie CEO Johnson \$5.1 million—equal to Jack Welch of GE at the time**

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IV. The RPS (Renewable Portfolio Standard) [for electricity]

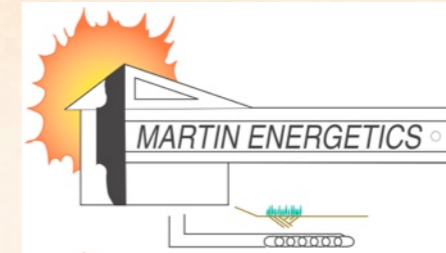


What is the Renewable Portfolio Standard?

A **Renewable Portfolio Standard (RPS)** is a [regulation](#) that requires the increased production of [energy](#) from [renewable energy sources](#), such as [wind](#), [solar](#), [biomass](#), and [geothermal](#). Other common names for the same concept include **Renewable Electricity Standard (RES)** at the United States federal level and **Renewables Obligation** in the UK.

— Wikipedia

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“California Renewable Energy Resources Act”

California Senate Bill X1-2

Signed by Gov. Jerry Brown, 4/12/11

**Change the electric energy profile:
(for both IOUs and POUs) to:**

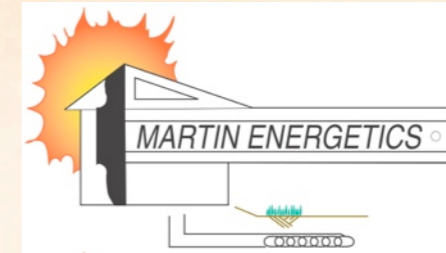
**20% renewable electricity supply by 2013
(≥ 50% from inside California)**

**25% by 2016
(≥ 65% from inside California)**

**33% by 2020
(≥ 75% from inside California)**

Nationwide, first half of 2013, renewable electricity generation hit 14.2% —Renewable Energy World.com

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CA XB1-2 (continued)

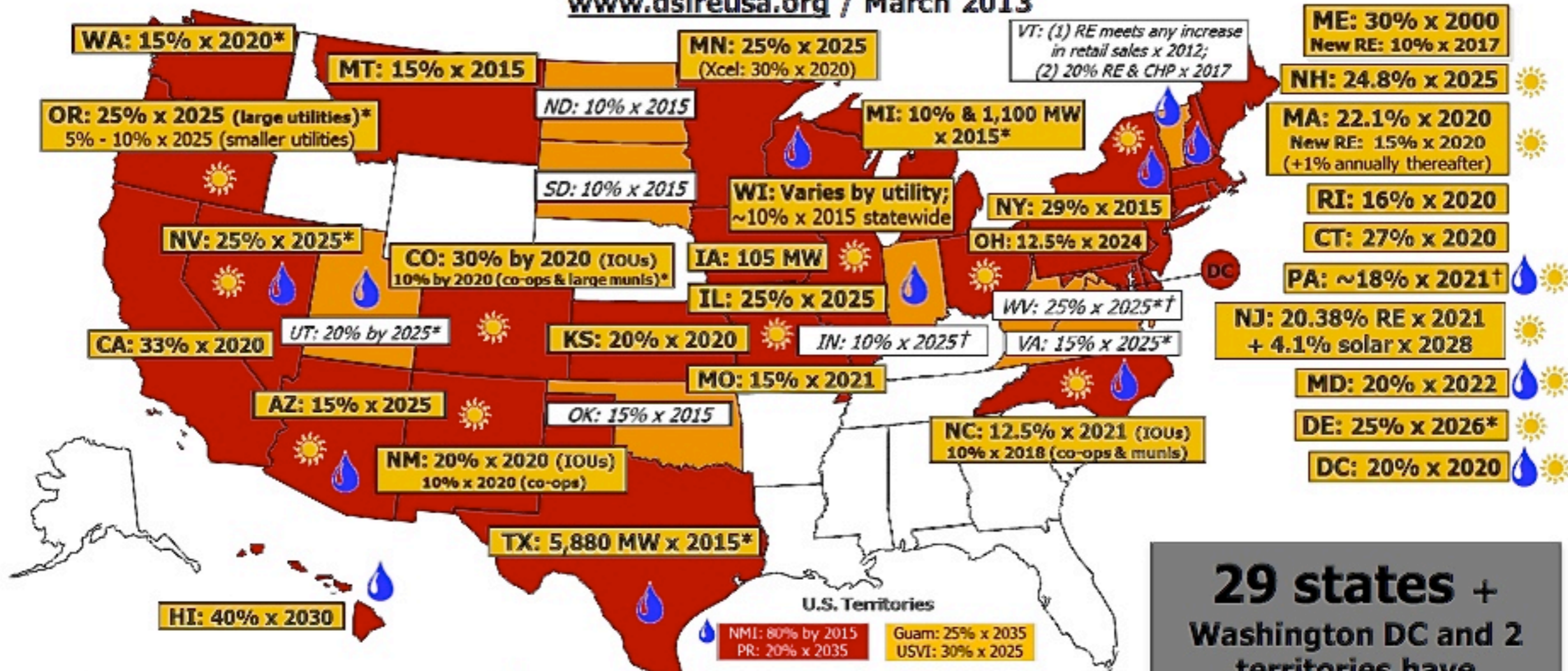
The law acknowledges that new transmission will be necessary, even with added (distributed) generation. And the Legislature intends that this measure will:

Displace fossil fuel consumption
Add new generation facilities and transmission
Reduce air pollution
Meet CA reduction of GHGs from electric gen.
Promote stable retail electric rates
Meet needs for balanced/diversified RPS
Assist meeting need for adequate resources
Contribute to safe/reliable electric grid oper.
Implement transmission/land use planning
related to development of renewable energy



Renewable Portfolio Standard Policies

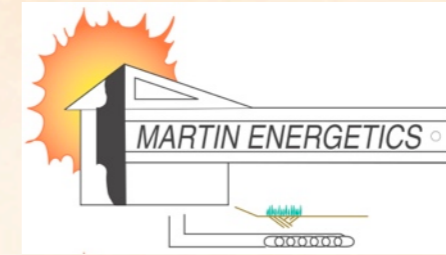
www.dsireusa.org / March 2013



- Renewable portfolio standard
- Renewable portfolio goal
- 💧 Solar water heating eligible
- ☀️ Minimum solar or customer-sited requirement
- ✳️ Extra credit for solar or customer-sited renewables
- † Includes non-renewable alternative resources

29 states + Washington DC and 2 territories have Renewable Portfolio Standards
(8 states and 2 territories have renewable portfolio goals)

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For California RPS Credit:

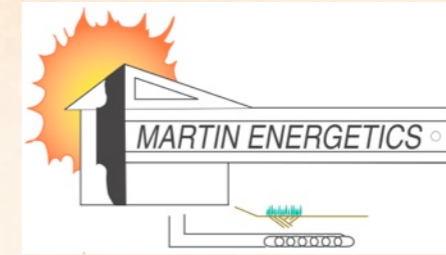
A “renewable electrical generating facility” must use one of the following:

Biodiesel
Biogas, + biomethane
Biomass
Conduit hydro*
Digester gas
Fuel cell (renwbl. fuel)*
Geothermal (hot rock)
Wind*

Hydro retrofit for effic. +*
Landfill gas
Municipal solid waste
Ocean wave or tidal*
Ocean thermal*
Solar thermal (steam)
Solar photovoltaic*
Small hydro <30MW*

*** Only eight from the above 16 avoid combustion, air pollution, greenhouse gases or condenser water consumption**

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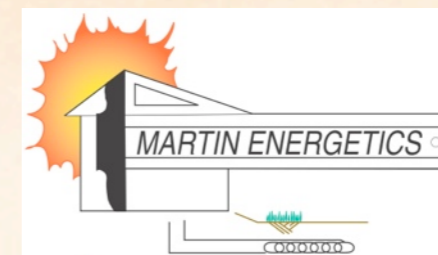


As of 1/1/13, State of Maryland RPS Eligibility Guidelines (HB 1186) Include:

- **Energy from geothermal heating and cooling eligible for meeting the Renewable Energy Portfolio standard**
- **Shall receive Renewable Energy Credit converted from Btus to Kilowatthours**
- **For determining the annual amount of RECs awarded, convert the annual Btus into annual megawatthours**

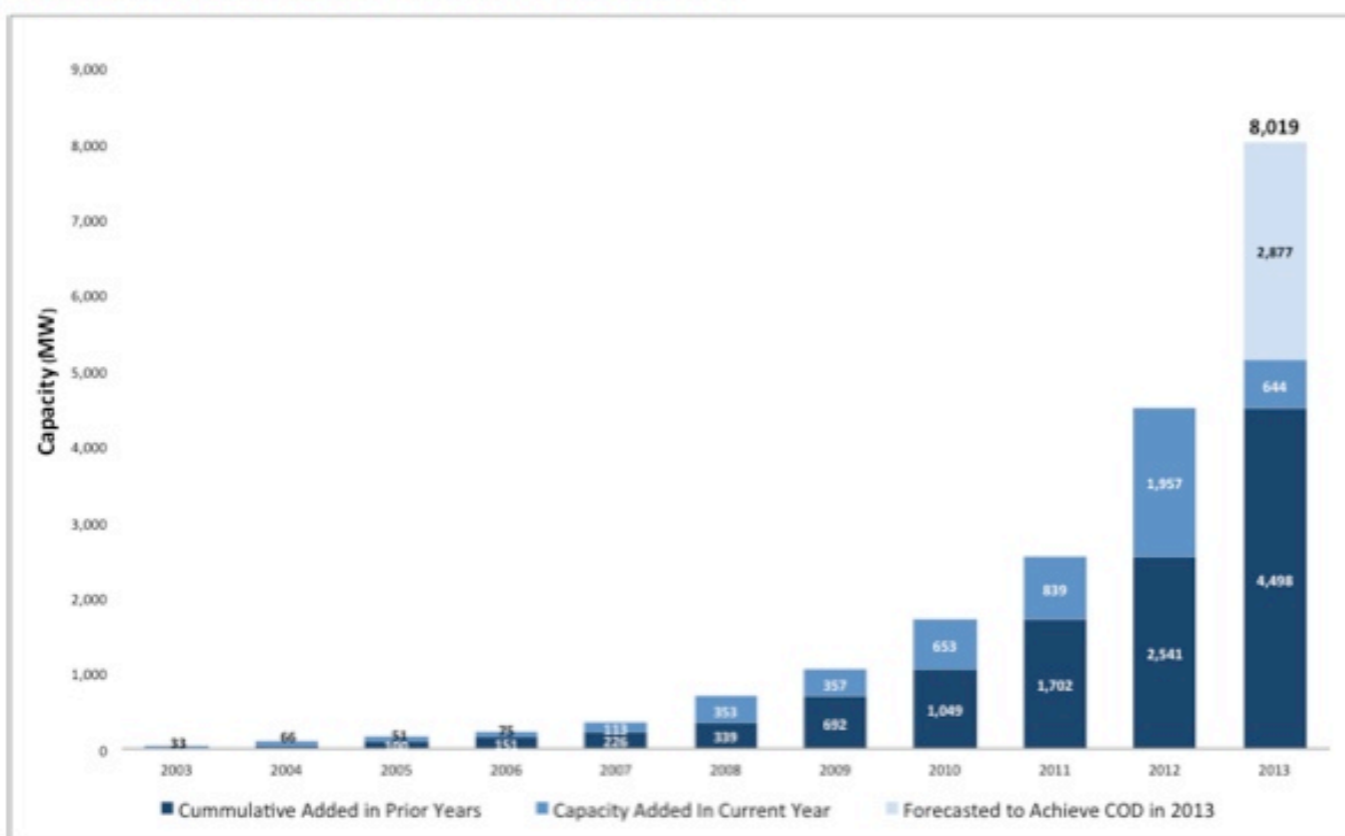
http://mgaleg.maryland.gov/2012rs/chapters_noln/Ch_557_hb1186E.pdf

California is already at least second. Will it follow Maryland? Will our IOUs and POUs end up with a loan program supporting up-front ground loop costs?



California's Renewable Portfolio Standard Progress

Figure 1. RPS Capacity Installed Since 2003, By Year⁵



Current Renewable Procurement Status

California's three large IOUs collectively served 19.6% of their 2012 retail electricity sales with renewable power.

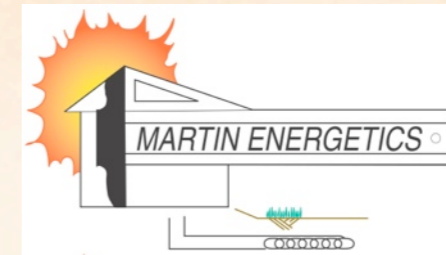
- Pacific Gas and Electric (PG&E) - 19.04%
- San Diego Gas and Electric (SDG&E) - 20.31%
- Southern California Edison (SCE) - 19.9%

California Energy Commission

California's three large IOUs are close to achievement of their 2013 RPS

CAPUC 1st Quarter RPS report

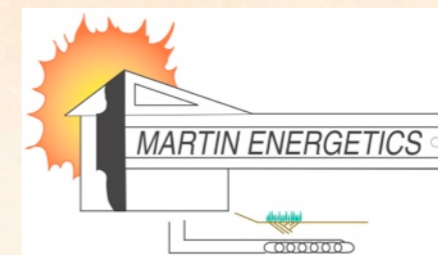
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V. Barriers to expansion of the GHP market in California



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Overcoming Barriers to Geothermal Heat Pump Expansion—

Geothermal (Ground-Source) Heat Pumps: Market Status, Barriers to Adoption, and Actions to Overcome Barriers

December 2008

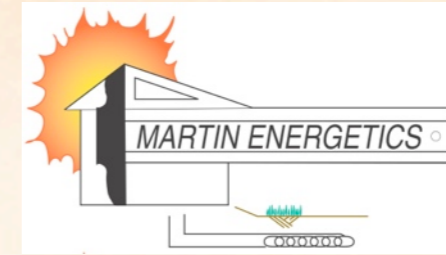
Patrick J. Hughes, Energy & Transportation Science Division

Sponsored by EERE Geothermal Technologies Program U.S. DOE

Abstract

... (GHPs), sometimes called ground-source heat pumps, have been proven capable of producing large reductions in energy use and peak demand in buildings. However, GHPs have received little attention at the policy level as an important component of a national strategy. Have policymakers mistakenly overlooked GHPs, or are GHPs simply unable to make a major contribution to the national goals for various reasons? ... The scope of the study includes determining the status of global GHP markets and the status of the GHP industry and technology in the United States, ... **identifying key barriers to application of GHPs**, and identifying actions that could accelerate market adoption of GHPs...

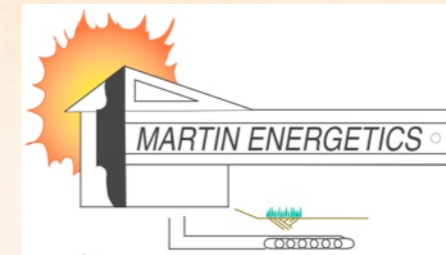
http://www1.eere.energy.gov/geothermal/pdfs/ornl_ghp_study.pdf



Endemic Barriers to GHPs (Hughes)

- 1. High first cost of GHP systems to consumers**
- 2. Lack of consumer knowledge and/or trust or confidence in GHP system benefits**
- 3. Lack of policymaker and regulator knowledge of and/or trust or confidence in GHP system benefits**
- 4. Limitations of GHP design and business planning infrastructure**
- 5. Limitations of GHP installation infrastructure**
- 6. Lack of new technologies and techniques to improve GHP system cost and performance**

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Overcoming Barriers to Geothermal Heat Pump Expansion, cont'd

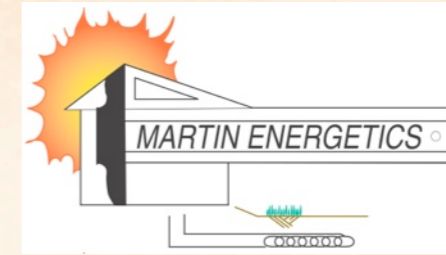
Public Interest Energy Research (PIER) Program

FINAL PROJECT REPORT **Project Negatherm**

Murphy, Dennis, Kyla Westphal. GroundSource Geothermal, Inc. 2011 *Project Negatherm for Ground Source Heat Pumps: Improving the Geothermal Borehole Drilling Environment in California*. California Energy Commission. Publication number: CEC-500-2011-025.

<http://www.projectnegatherm.org>

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Overcoming Barriers to Geothermal Heat Pump Expansion, cont'd

Carl Hauge

Department of Water Resources (Retired)

In a questionnaire back to Project Negatherm

July 22, 2009

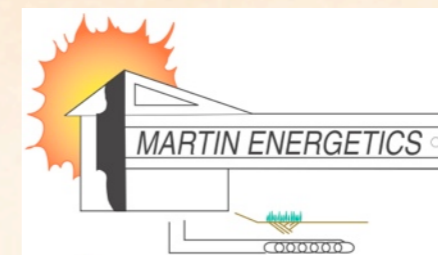
*“I have worked in groundwater issues for 31 years. In the early 90s, the **CEC** was interested in pushing the **GSHP** industry because the cost of electricity was going up, and they wanted to avoid building new plants.*

The CEC invited people from IGSHPA, bentonite industry, drilling, EPRI, – it was recognized that there needed to be some standards. The result is the DWR Draft Standards from April 1999.

I am no longer full time staff with the DWR, and there is no budget for this work, but I’m doing what I can.”

**The aforementioned (draft) standards are now 14+ years old.
Has California dropped the ball?**

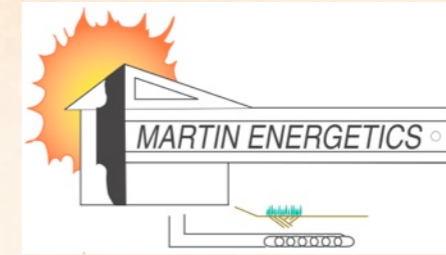
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Project Negatherm's Borehole Regulation Survey— Plumas County, CA

County	Plumas
Special Jurisdiction	None
Agency	Environmental Health
Contact	530.283.6355
Drilling Classification	Geothermal heat exchange wells
Rationale	GHEWs are treated a little bit differently; for example, the permit fees are different.
Regulations	California Department of Water Resources Water Well Standards. Plumas county code - Ch 8, Sec 6-8.05. The standard for the geothermal wells is half the distance (set back) vs. water well.
Permits	Required
License	C-57
Fees	\$514 permit fee for 1-10 GHEWs
Additional Comments	Set-backs is their biggest concern, they have a lot of septic systems in their county. The one company that does the majority of the GHEWs does the bentonite seal all the way to the top. They allow them to do that mainly because they know they are doing the seals correctly. There is another company they do not allow to do so - that company has to do cement.

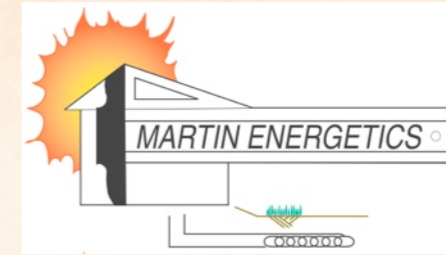
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Project Negatherm's Borehole Regulation Survey— S.F. County, CA

County	San Francisco
Special Jurisdiction	None
Agency	City of San Francisco Public Works/Water Quality
Contact	415.554.5860/5810 / (415) 252-3849
Drilling Classification	Monitoring Well
Rationale	
Regulations	The construction is not regulated. However, an application to operate a well and a well completion report are required.
Permits	Monitoring Well Permit required
License	C-57
Fees	Fees are as follows: \$298 dollars per site and \$800 deposit. If the loops come together before entering building it is considered 1 well. Each well requires a permit to operate it which costs \$47 dollars per year, per well
Additional Comments	There is one GSHP system at City College.

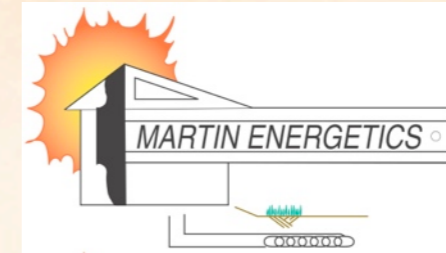
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Project Negatherm's Borehole Regulation Survey— Imperial County, CA

County	Imperial
Special Jurisdiction	None
Agency	
Contact	760.482.4675 ext. 4278
Drilling Classification	From a building perspective there is no difference between water well drilling and borehole drilling
Rationale	Unfamiliar with technology
Regulations	California Department of Water Resources Water Well Standards Title 9 land use ordinance
Permits	Required
License	C-57
Fees	A conditional use permit is required for all wells drilled in the county. Well permit = \$600, the conditional use permit is \$3,500 - this is a discretionary permit that goes to planning commission for approval.
Additional Comments	They do not yet have their permits online but they are planning to do so in the future and also post a pricing schedule.

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Overcoming Barriers to Geothermal Heat Pump Expansion, cont'd

Roy MacBrayer

Deputy State Architect

State of California

In a questionnaire back to Project Negatherm

October 19, 2009

*“Solar is the big paradox – it really isn’t very cost effective and there are many things you can do that would give you a better Return on investment than PV systems. With PV you barely get ROI by the time systems wear out. **One of the reasons people get them is the visual factor**; you wonder if you were to get into the walls of the house if there were other things they could have done that would be less costly, like insulation etc.”*

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VI. AB 2339— A new statute to bring down barriers to GHPs in CA

AB 2339:

http://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201120120AB2339

The CEC, in consultation with the PUC and jurisdiction stakeholders shall:

- **Evaluate and recommend policies and implementation strategies to overcome barriers to the deployment and use of geothermal heat pump and geothermal ground loop technologies**

and shall consider:

- **Reduced greenhouse gas emissions related to electricity and natural gas through the use of geothermal heat pump and geothermal ground loop technologies**

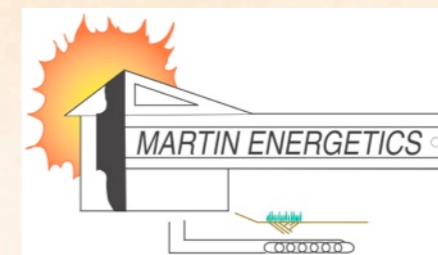
- **Statutory and permit requirements impacting geothermal heat pumps and their loops**

- **Positive impacts of GHPs and their loop technologies toward achieving goals of AB32**

and:

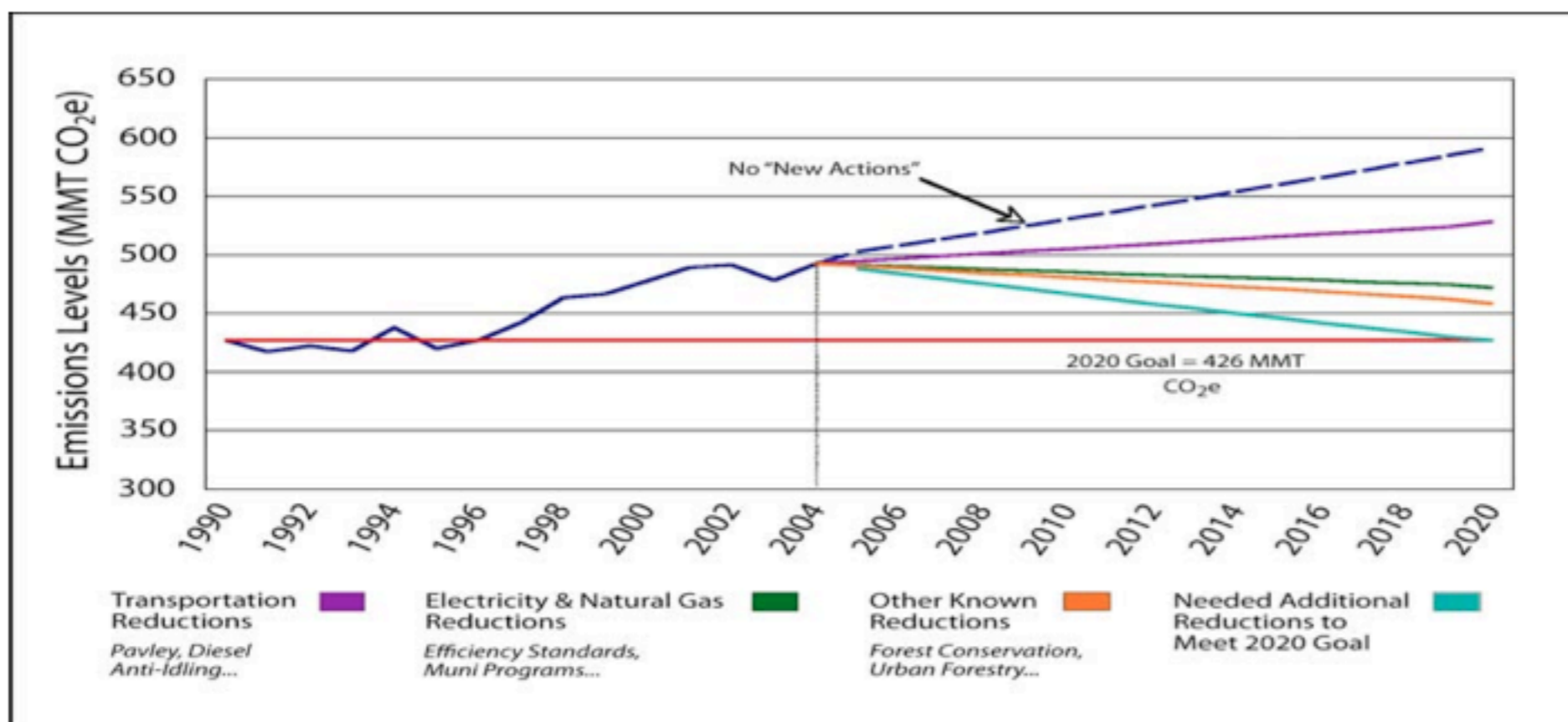
- **Evaluations of recommendations herein shall be included in subsequent Integrated Energy Policy Reports, beginning in 2013**

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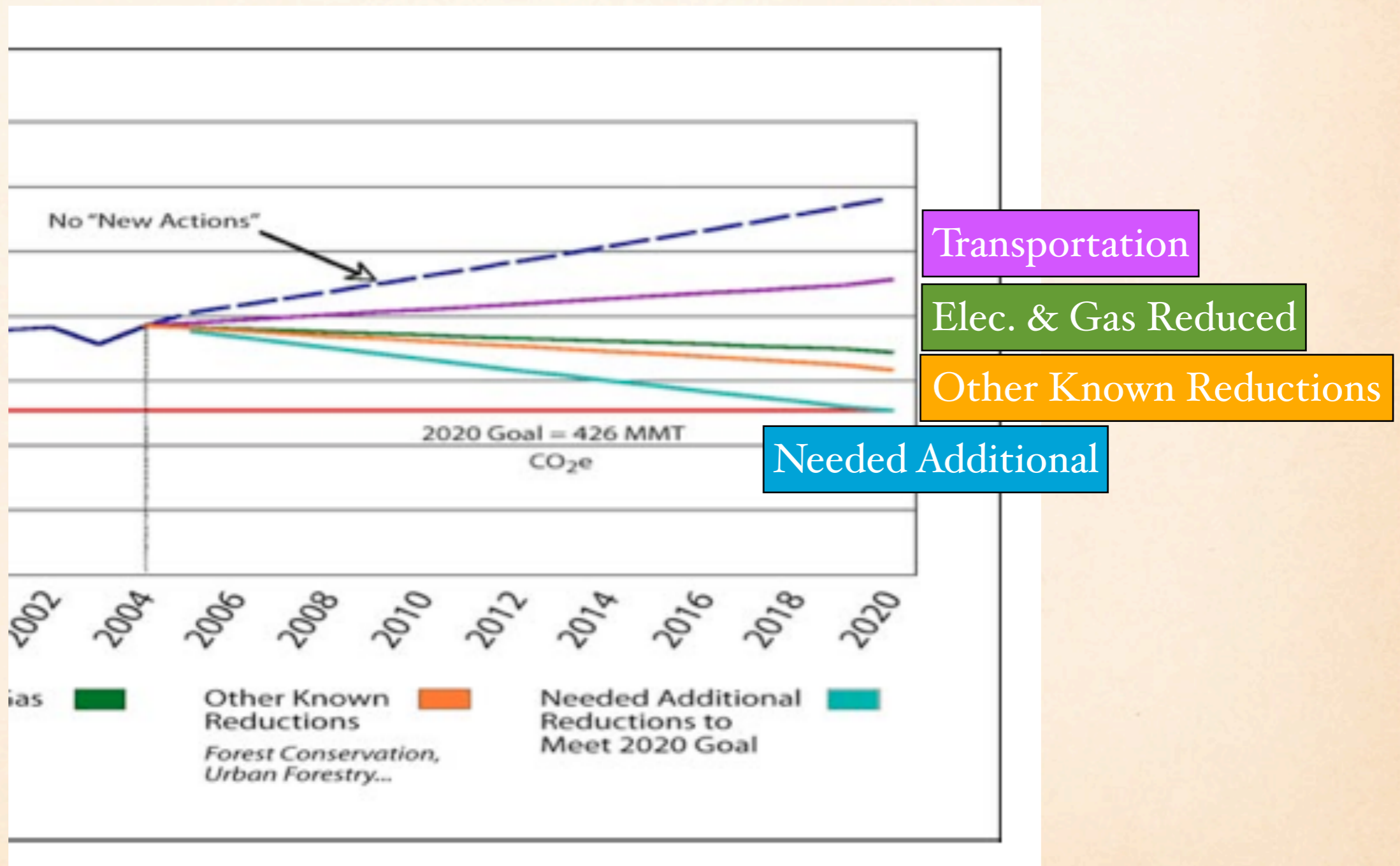
How To Get Back To The '90s (In GHGs, that is)

Figure ES-1: California's CO₂ Emission Reduction Strategies

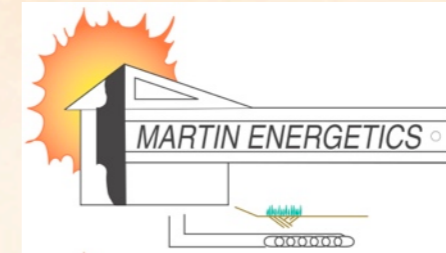


Source: California Energy Commission, Climate Action Team data 2007

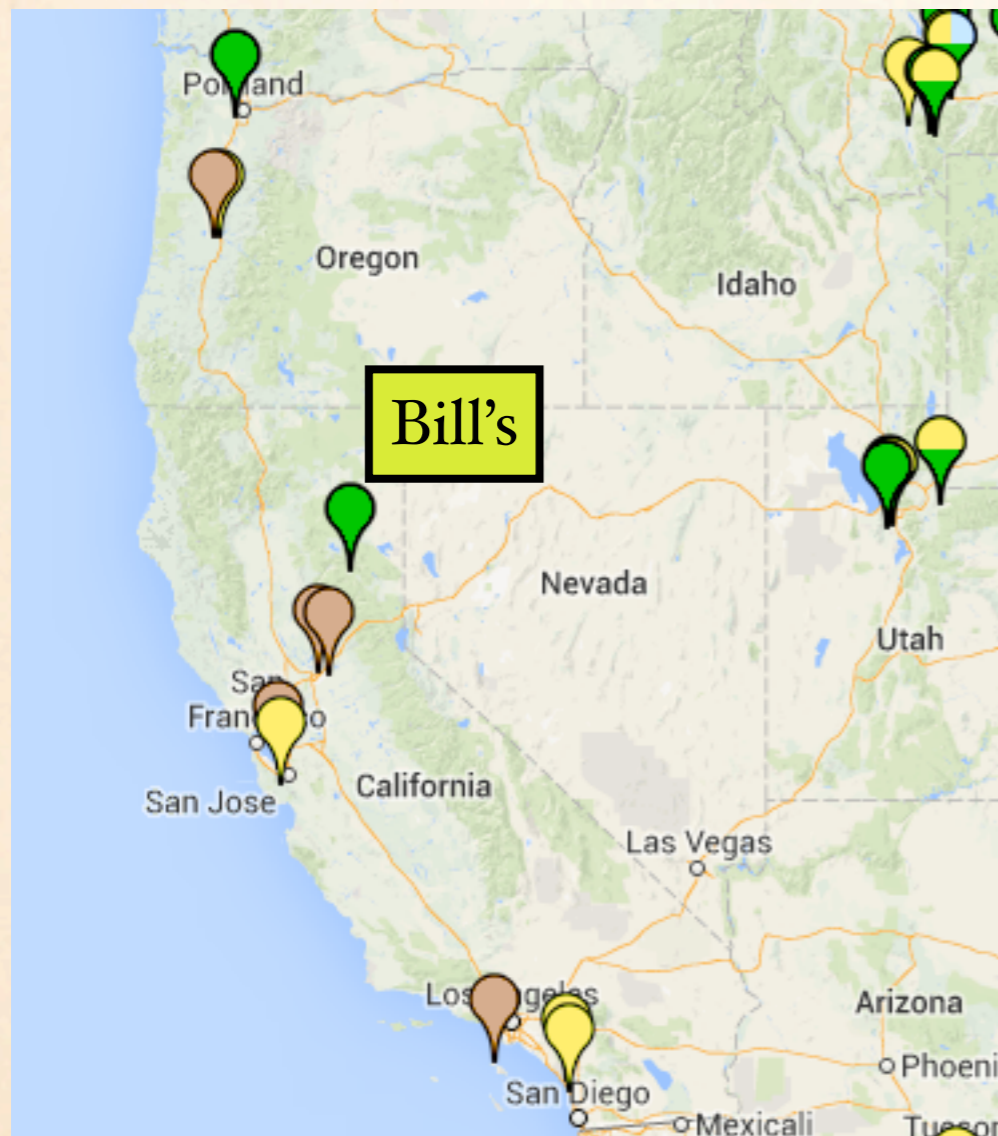
Should we let GeoExchange help us get to the “teal-colored line?”



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<http://www.welserver.com>

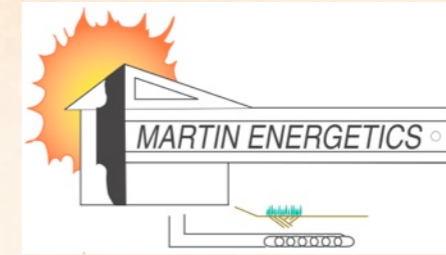


WEL = Web Energy Logger

Internet posted data w/
graphics and description of
systems

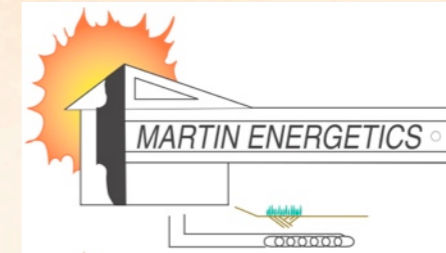
[http://www.welserver.com/
WEL0058/](http://www.welserver.com/WEL0058/)

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VII. What Could / Should happen in the future

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Comparative Criteria	Fossil Furnace w/AC	Air-to-Air Heat Pump	Geothermal Heat Pump
Proven load reduction in conventional const.?	NO	NO	YES
Reduction in summer peak KW utility load?	NO	NO	YES
Energy from on-site renewables?	MAYBE	MAYBE	YES
On-site storage of renewable energy?	NO	NO	YES
Mature, non-complex technology?	YES	YES	YES
Reduced summer Kwh sales preserve RPS%?	NO	NO	YES
Barriers to deployment and market growth?	NO	NO	YES

California Energy Commission
Draft Integrated Energy Policy Report
(p.48 Excerpts Regarding GHPs) October, 2013

CEC supports proper design/installation of GHP technology for meeting California's energy efficiency goals. Here's what is still needed from industry:

- Submission to CEC of an ACM (Alternate Calculation Method) consistent with Building Energy Efficiency Standards Sec.10-109(c)(2)
- Propose protocols for design, installation, site verification, and commissioning of GHP ground loop systems
- Create standardize training / certification of industry professionals (proper design, installation, site verification, and commissioning of ground loop systems so that owners/operators gain assurance systems will perform)
- Develop a model local ordinance for adoption by local jurisdictions
- Collaborate with fed, state, and local agencies to resolve permitting

Why is industry being asked to perform ALL the barrier removal?

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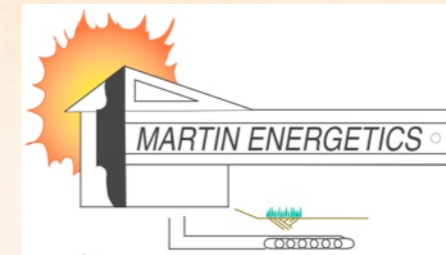
and:

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What Could/Should Happen? (Specific To California's Needs)

- 1 End the 14+ year delay of DWR borehole regulations
Apply those regulations evenly through 58 CA counties**
- 2 Cause California to count GHP toward RPS requirements
and GHG reduction goals**
- 3 Cause CEC to take the lead to incorporate GHPs into Title-24
without industry having to take on ACM development**
- 4 Remind utilities of their public purpose OBR responsibility
toward loop leases (cheap peak shaving and GHG reduction)**
- 5 Continue with development of CA installer/designer stds.
Promote training and certification for all GHP labor specialties
Engage with trade associations to promote GHP installs
Train building inspectors in GHP technology
Continue to interact with PACE jurisdictions
Ready a GHP promotional and advertising campaign**

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VIII. Comments / Questions from the audience