# Decentralized Energy – Impact of California Policies and Markets

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and NYSERDA CHP Expo

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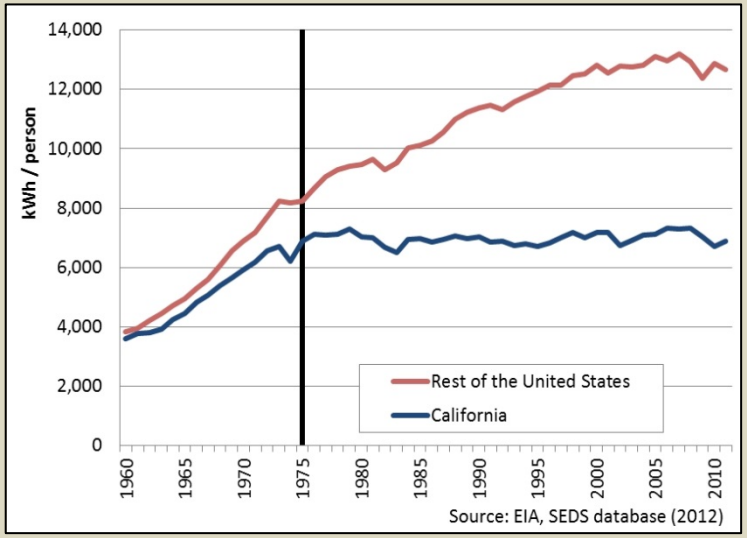
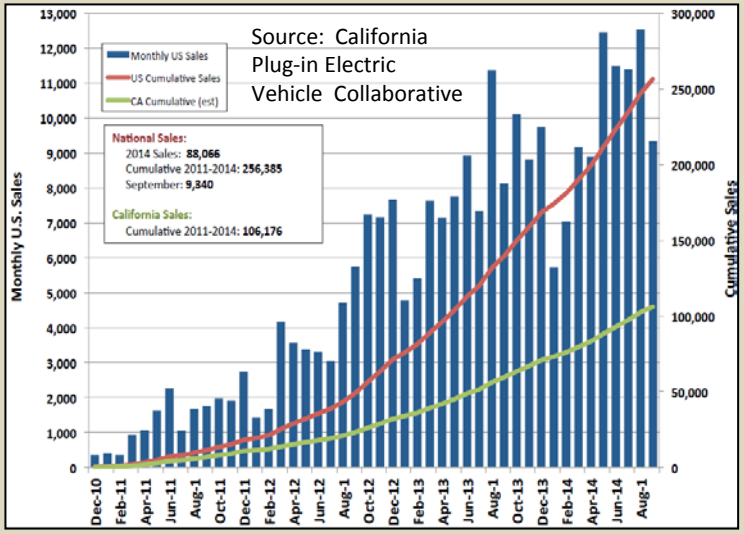
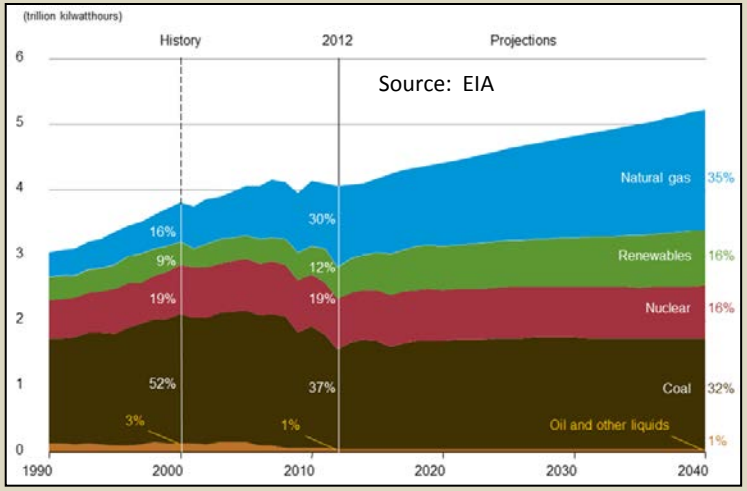
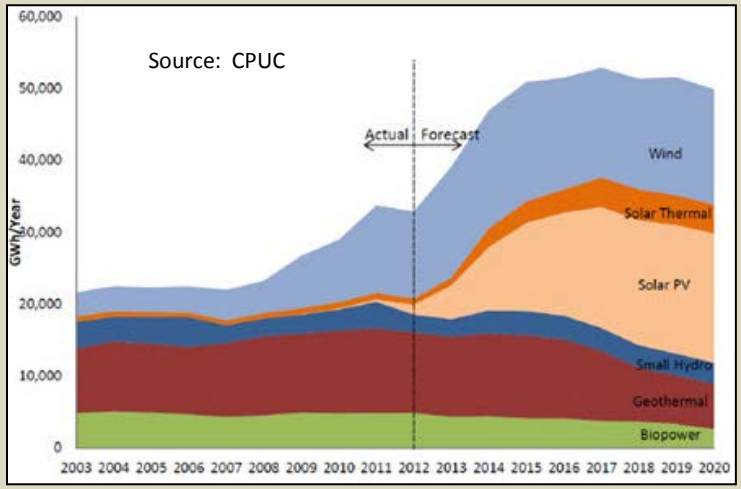
# California Electricity Policies and Markets

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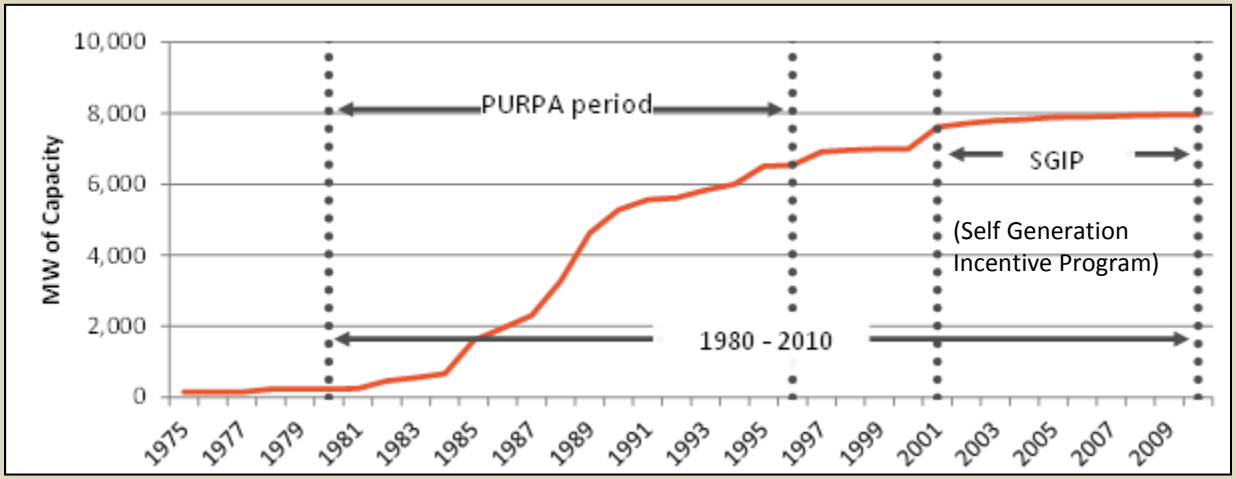
# California CHP Deployment: from PURPA to Cap and Trade




Source: http://www.energy.ca.gov/chp/documents/2014-07-14_workshop/PGandE_CRRI_CHP_paper-June_2013.pdf

| Study Name | 2020 New CHP Estimate (MW) | 2020 GHG Reduction Estimate (MMT) | |
|---|---|---|---|
| 2008 ARB Scoping Plan | 4,000 | 6.7 | |
| 2012 ICF for CEC | | No RPS Interaction | With RPS Interaction |
| Base Case | 1,499 | 1.8 | 0.5 |
| High Case | 4,865 | 5.5 | 2.0 |

Sources: California Air Resources Board, 2008, *Climate Change Scoping Plan, A Framework for Change*
California Energy Commission, 2012, *Combined Heat and Power: 2011-2030 Market Assessment Report*

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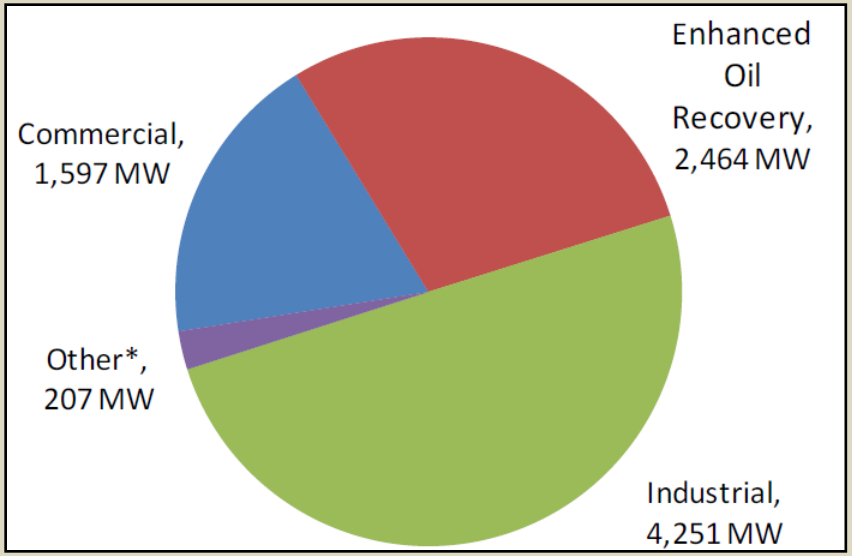
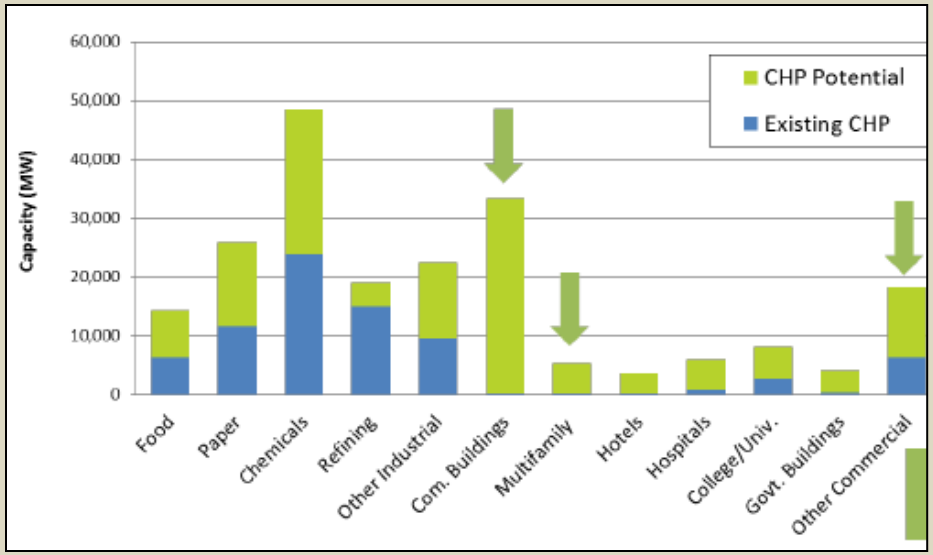
# California and US CHP Status

## Existing CA Capacity




## Existing US Capacity (82 GW) and Potential (130 GW)




Source: ICF International

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# California and US Solar PV Status and Outlook

**New US Generation Capacity**
**H1 2014**

| Solar | 53% |
|---|---|
| Natural Gas | 30% |
| Coal | 0% |
| Wind | 14% |
| Other | 3% |
| Total | 100% |

Source: FERC

**New US Solar PV Capacity**
**GW**

| | US | CA |
|---|---|---|
| **2014E** | **6.5GW** | **3.3GW** |
| Residential | 20% | 25% |
| Non-Res | 30% | 10% |
| Utility | 50% | 65% |
| **2018E** | **9GW** | **3.1GW** |
| Res | 35% | 60% |
| Non-Res | 35% | 25% |
| Utility | 30% | 15% |

Source: SEIA, GTM Research, Other

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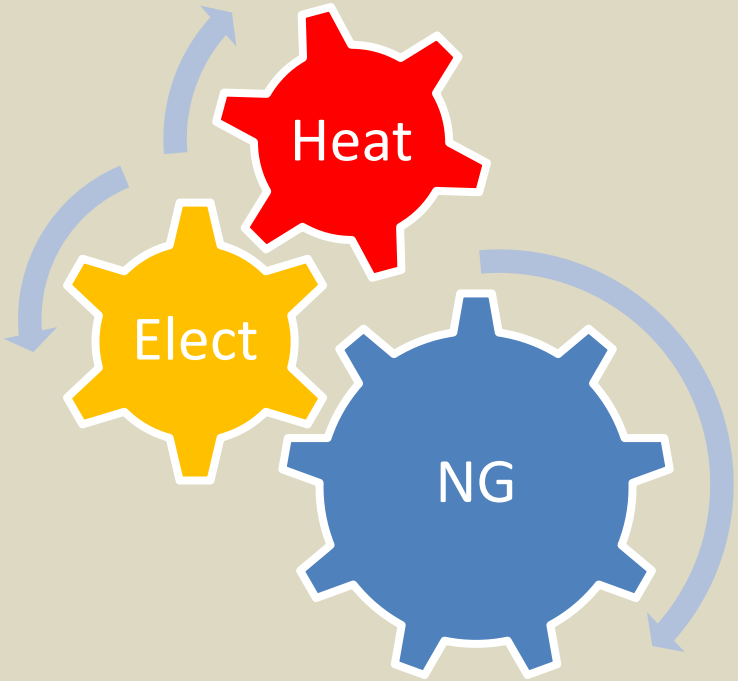
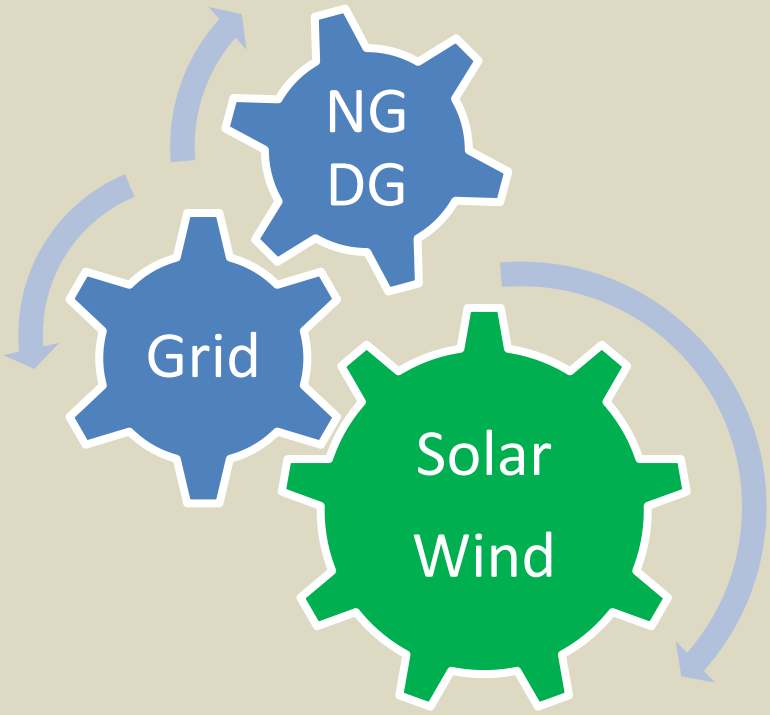
# The Future of Decentralized Energy Integration

## CHP




## Local Power

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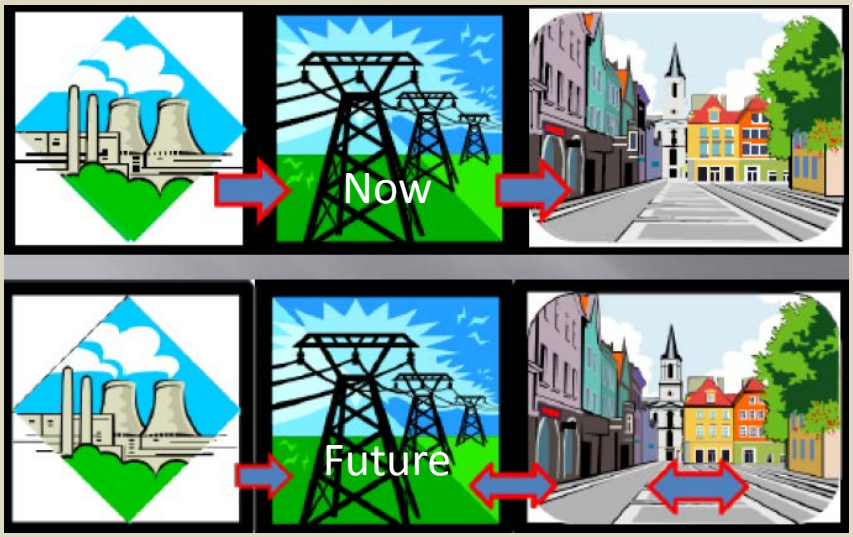
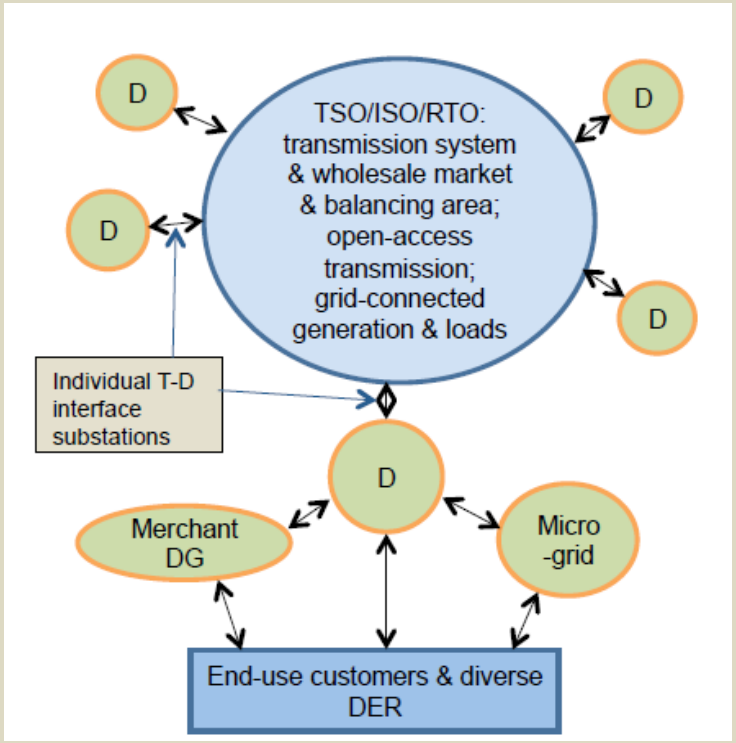
# “Integrated, Decentralized” Regional Electric System Structure

Multi-directional energy flows;
Multi-level optimizations




Future “integrated decentralized” electricity system with high-DER




Source: Lorenzo Kristov, CAISO

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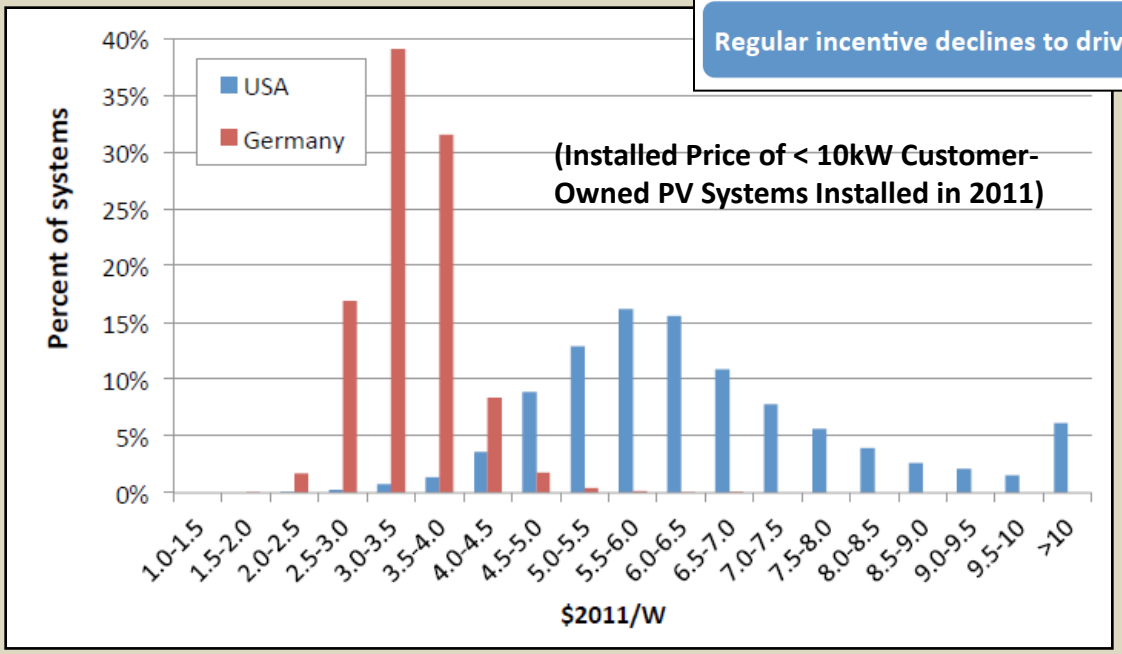
## Deployment Cost is a Policy Choice for both Distributed Solar and Packaged CHP

### Reducing residential PV prices in the United States may require policies that enable:

- A large and durable market size
- A concentrated market → minimize fragmentation
- A simple, transparent, certain incentive structure / value proposition
- Simple interconnection, permitting, and inspection requirements
- Regular incentive declines to drive & follow cost reduction




Source: Berkeley Lab
http://emp.lbl.gov/sites/all/files/german-us-pv-price-ppt.pdf

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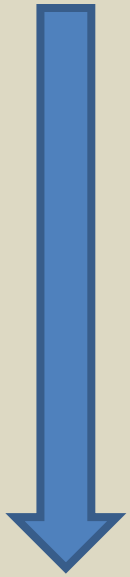
# California Policy and Market Transformers

- New, high growth industries
- Low cost variable electricity sources
- Decentralized energy finance
- Decentralized grid planning and operation
- Higher efficiency, lower cost local energy
- De-monopolization
- Integrated data & analytics
- Pervasive programmed energy use
- Dual purpose mobile generation and storage
- Carbon-free fuels

Now



Future

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# Thank you!

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