

# PV Development Today: Rapid Growth But Facing New Challenges

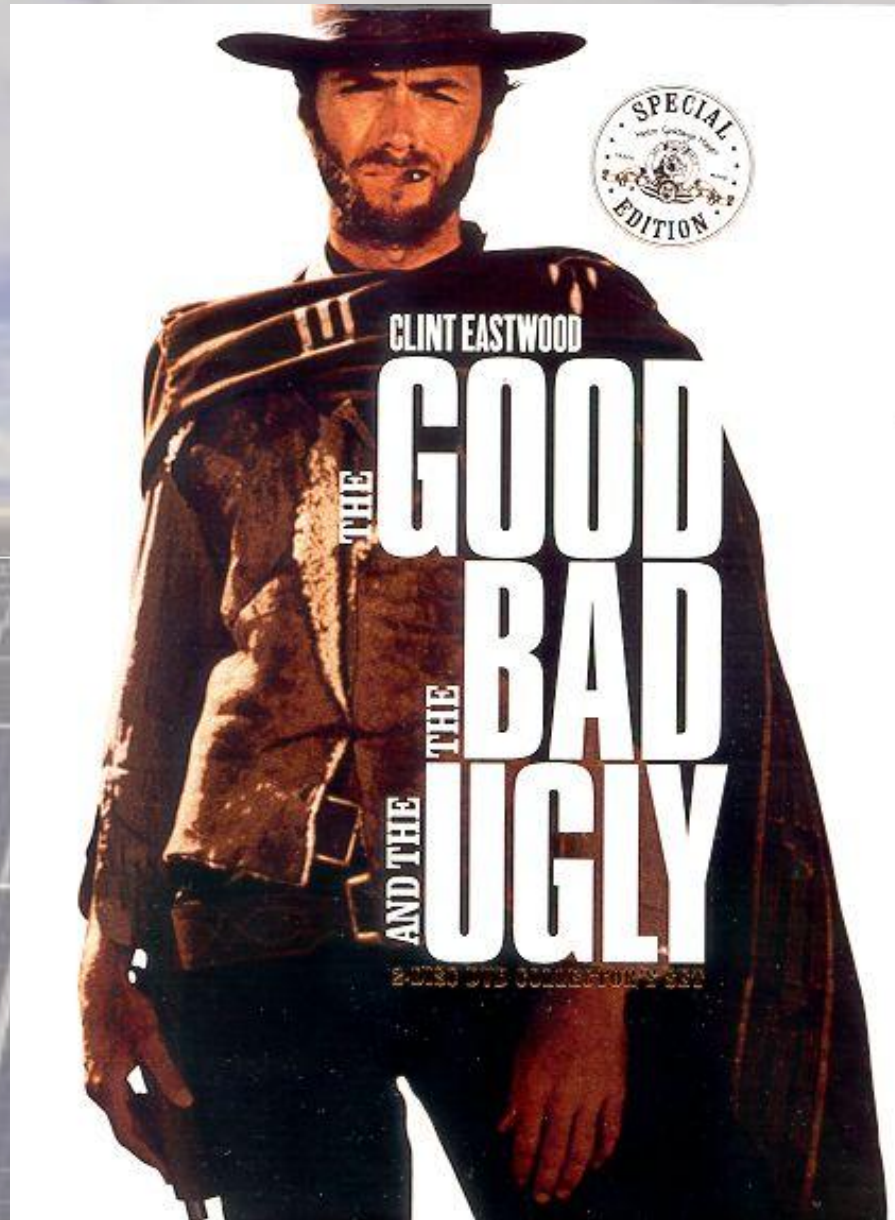
## Building Energy 2011

---

**Paul Lyons, P.E.**  
**President**  
**Zapotec Energy, Inc**

Background Photo: SunEdison and Zinn  
Photography

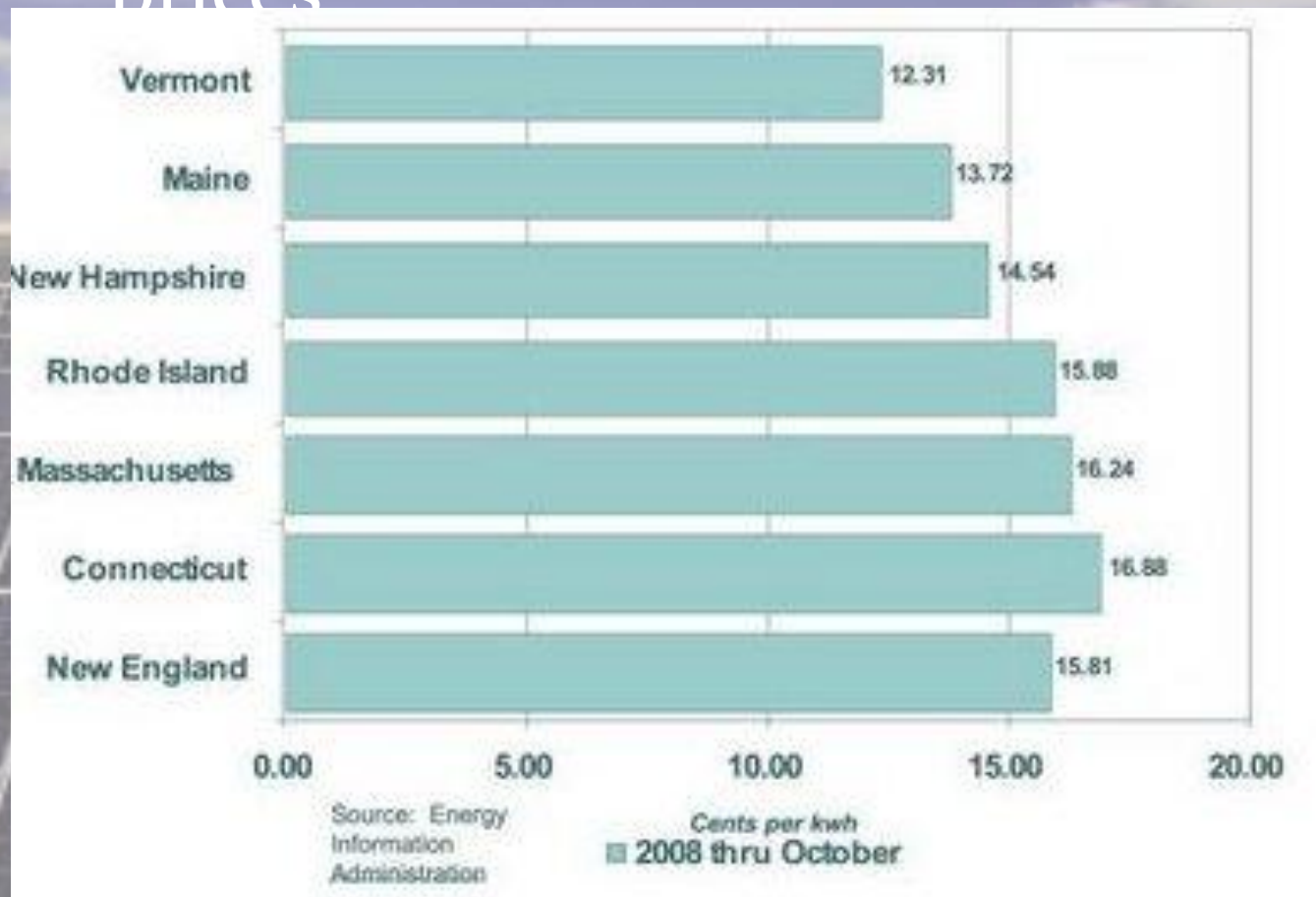
In three words...



# PV in New England

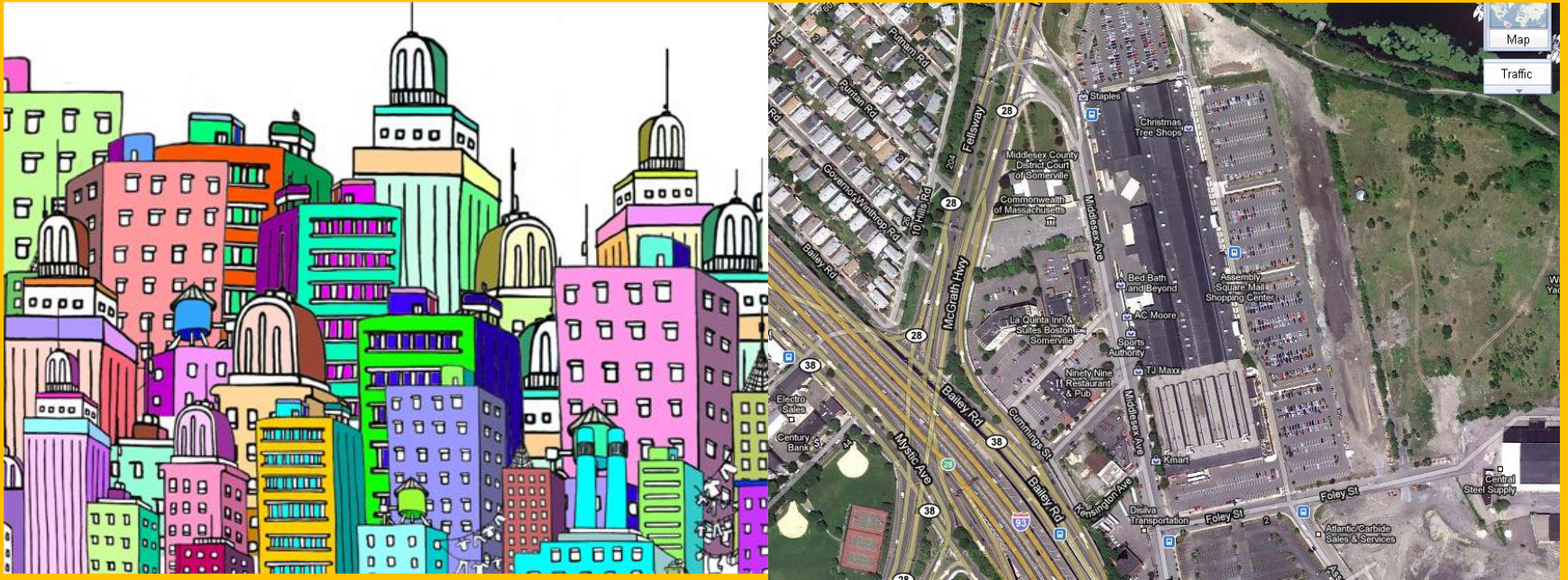
## *THE GOOD*

- High electricity prices



# PV in New England

## *THE BAD*



- Not much roof space
- Not much land space
- Old roofs and historic buildings

# PV in New England

## *THE UGLY*



***SNOW!***



# PV Modules

## *THE GOOD*



### The 1980s

- \$6/Watt
- Each panel < 100 W
- Few panel manufacturers
- Aesthetically dull

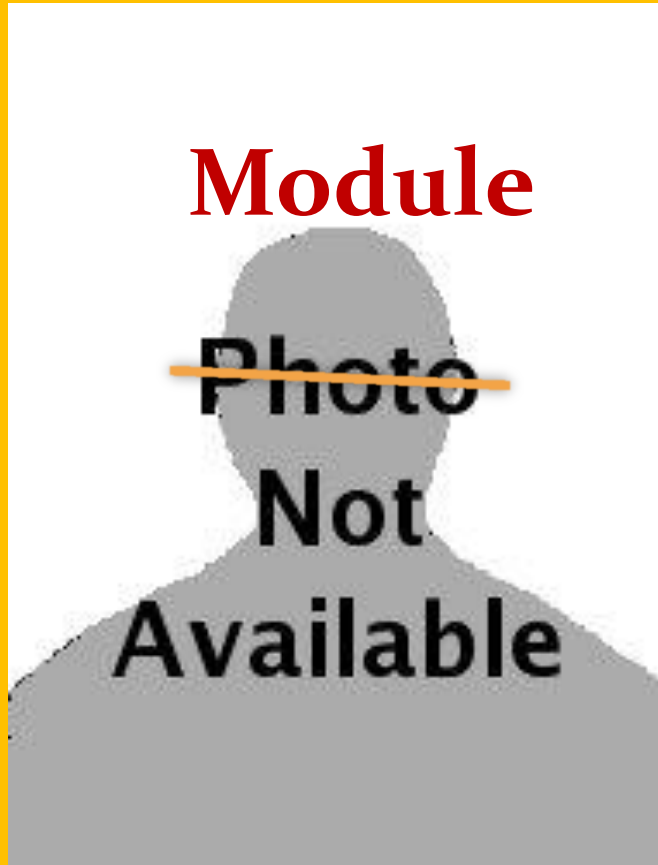


### The 2010s

- \$2/Watt or less
- Panels up to 315 W
- Wide choice of panel manufacturers
- Better marketing

# PV Modules

## *THE BAD*



- Modules available at the start of project are unavailable by the time drawings are approved
- Modules are produced and sold quicker than install manuals are put together

PV Modules  
*THE UGLY*

**BREAKING NEWS**

**SOLAR PANEL MAKER MOVES  
TO CHINA – New York Times**

**EVERGREEN SOLAR TO SHIFT OPERATIONS TO CHINA – Boston Globe**

**Can Evergreen Solar Be Our Sputnik  
Moment? – Renewable Energy World**

# Inverters *THE GOOD*



**Satcon™**

**PVPowered**

**xantrex**

Two companies at our doorstep...  
and many more options

# Inverters

## *THE GOOD*



### Local inverter companies

- Technical support can easily arrive onsite to diagnose problem with first-hand observations



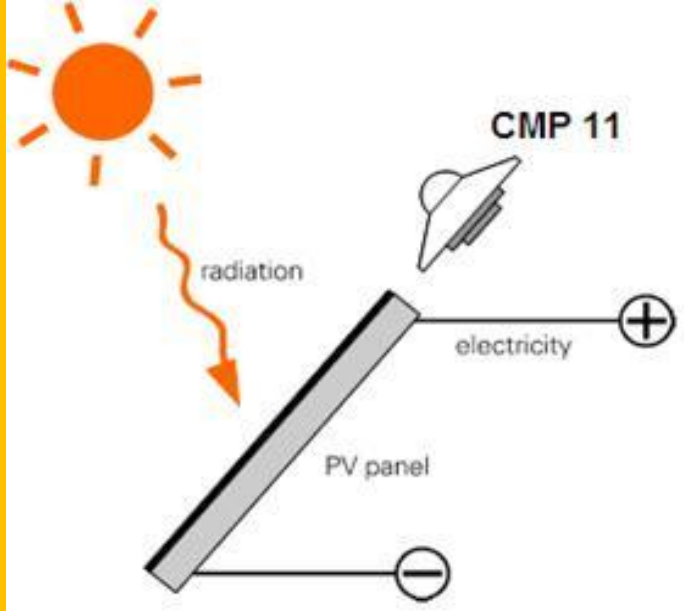
- Satisfied the made-in-Massachusetts requirement for extra funding

# Inverters

## *THE BAD*



## Lab Conditions



# Inverters

## *THE BAD*



### Lab Conditions

- Standard Test Conditions (STC)
  - Nominal Operating Cell Temperature (NOCT)
  - Controlled environments
- External variables affecting max power voltage and current
    - ❖ shading
    - ❖ snow
    - ❖ temperature
  - On-site inverter behavior unknown until field installation

# Inverters

## *THE UGLY*



*Danger: > 600 V*



**INVERTER  
WON'T START!**

# Installations

## *THE GOOD*

- Enjoy nice sunny days, working outdoors
- Enjoy helping people by providing a good service
- More installations, more acceptance of solar into energy and utilities industry

# Installations *THE GOOD*



# Installations

## *THE BAD*



Extreme



# Installation

## *THE UGLY*



© Original Artist  
Reproduction rights obtainable from  
[www.CartoonStock.com](http://www.CartoonStock.com)

# Installation *THE UGLY*

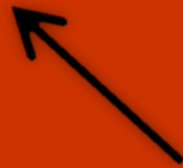


# Installation

## *THE UGLY*



Shocks



High  
Voltages



Fires

# Major Challenges in 2011

1. Integration of modules, inverters and racking
2. 10 different trades and professions required to accomplish one project
3. Cooperation of local electric T &D companies
4. Transition from a niche industry to a 12-month mainstream enterprise
5. The inefficiencies of the contracting industry