

# The Governor's Conference on Energy

Dick Sheehy, CH2M HILL  
October 14, 2010



CH2MHILL

# Agenda

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- **CH2M Hill Roots**
- **Site Selection Criteria for Photo Voltaic**
- **How does Virginia Stack up?**
- **Example Site Selection Project**
- **Conclusion**

# Founded on Values

*Established in 1946 by three engineers and a professor, CH2M HILL operated from its very beginning on four simple values: take care of clients, deliver great work, do right by employees, and stay true to our integrity and honesty.*

**Holly Cornell**



**James Howland**



**Burke Hayes**



**Fred Merryfield**



**Clair Hill**



**CH2MHILL**

**CH2MHILL**

Confidential and Proprietary

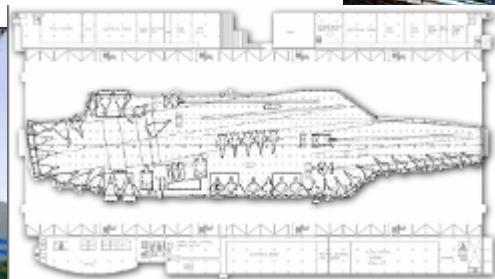
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# Industrial & Advanced Technology

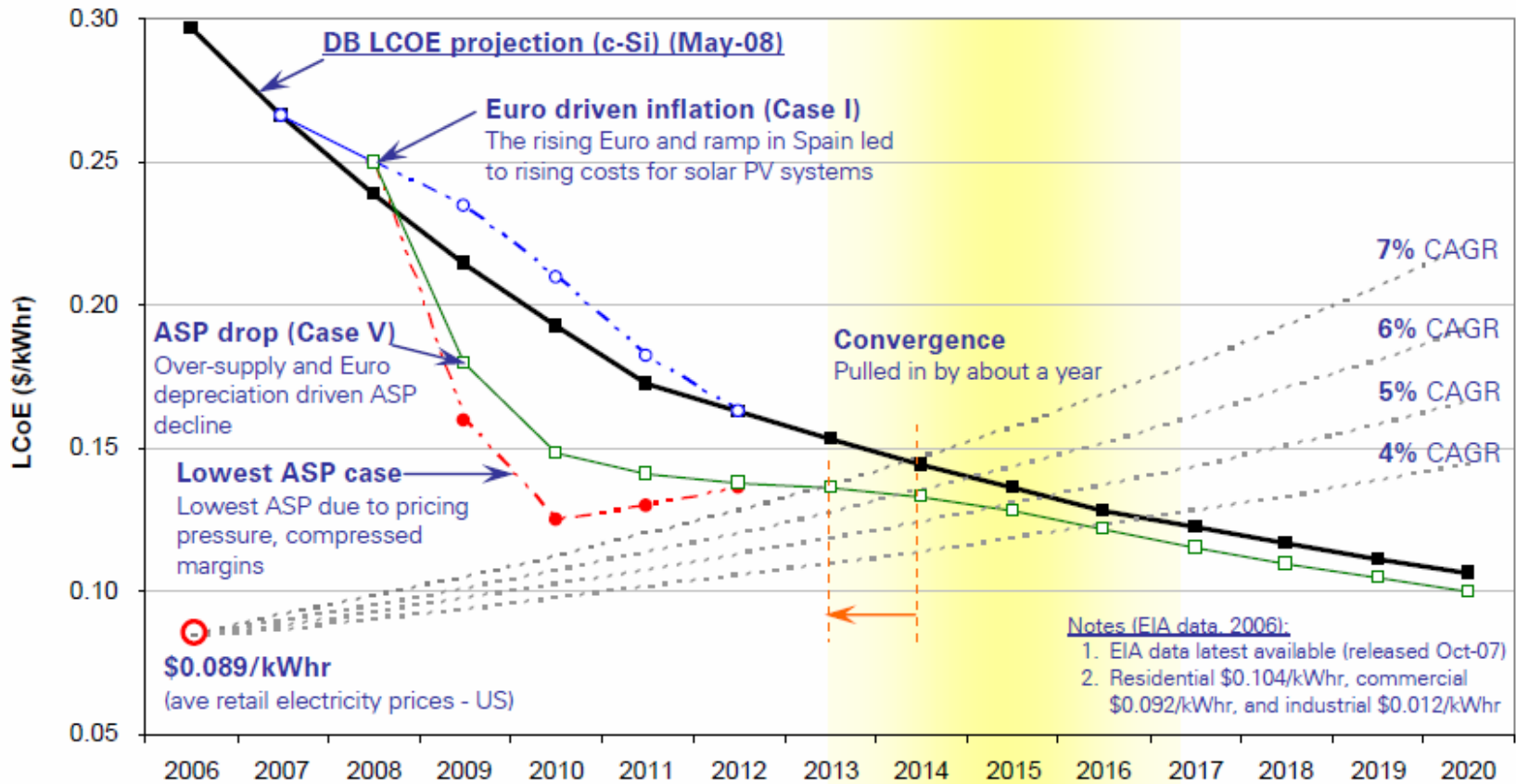
## – What We Do

- **Semiconductor**
  - worked on >250 sites (30 out of 56 WW 300 mm)
  - highest complexity cleanrooms, support systems
- **Flat Panel Display**
  - the largest cleanrooms, complex AMHS
  - most of the large fabs in China
- **Solar Energy**
  - fast growth, strong cost focus
  - multiple material platforms
- **HDD Thin Film Heads**
  - high volume, intense cost focus
- **High-Density Data Centers**
  - advanced modeling, energy focus
- **Front End Consulting**
  - advance planning, site selection, funding applications, IE reports, and high tech ED consulting



# When Can We Stop Subsidizing?

**Figure 23: Convergence projection – c-Si solar PV LCOE versus average grid electricity prices in the US**



Source: Deutsche Bank estimates

# Selected Projects across main PV technologies

## Brown & Greenfield – from MW to GW

Wacker  
Siltronic



REC



Spectrawatt



Trina Solar



CRYSTALLINE SILICON

Polysilicon

Wafer

Cell

Module

THIN FILM

Silicon

CdTe

CIGS



Applied  
Materials



First Solar



Solyndra

# Sun Jobs

## Front End Manufacturing

- High Value Direct Jobs
  - Centralized base of 10s of Scientists, Engineers & Managers, 100's of skilled technicians
  - Needs a high tech community of University, legal, and financial experts
  - High multiplier
- Construction of High Tech Factories
- Focused high tech supply chain of materials and services
  - 'Big Wins' get more press/publicity
  - Best in areas with existing and relevant knowledge economy and expertise
  - Dominated by incentive packages



## Assembly & Installation

- Medium Value Direct jobs
  - 100s to 1000s in a de-centralized workforce
  - Wider net - Incremental growth of existing contractors
  - Lower multiplier
- Some retraining
- Lower value materials & supply chain
- Decentralized platform = less attractive incentives



# Site Selection Process

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- 1. Site Elimination – Fatal Flaws***
- 2. Site Evaluation***
- 3. Site Negotiation***
- 4. Site Selection***



# Site Selection Criteria for PV

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## Qualitative:

- Political
- Distance to Existing Operations
- Supplier Infrastructure
- Markets
- Image and Customer Relations
- Strategic Support, Partners
- Labor Availability, Quality
- Staff Retention and Recruiting
- Accessibility, Logistics
- Regulatory Environment / Land Use, Constraints
- Risk of Natural Disasters

## Quantitative:

- Incentives
- Facility Lease & TI Costs
- Labor Costs
- Taxes
- Logistics Costs
- Utility Rates
- Utility Capacities and Quality
- Site Development Costs
  - Utility Capacity
  - Upgrades/Extension Costs
- Schedule

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Solyndra

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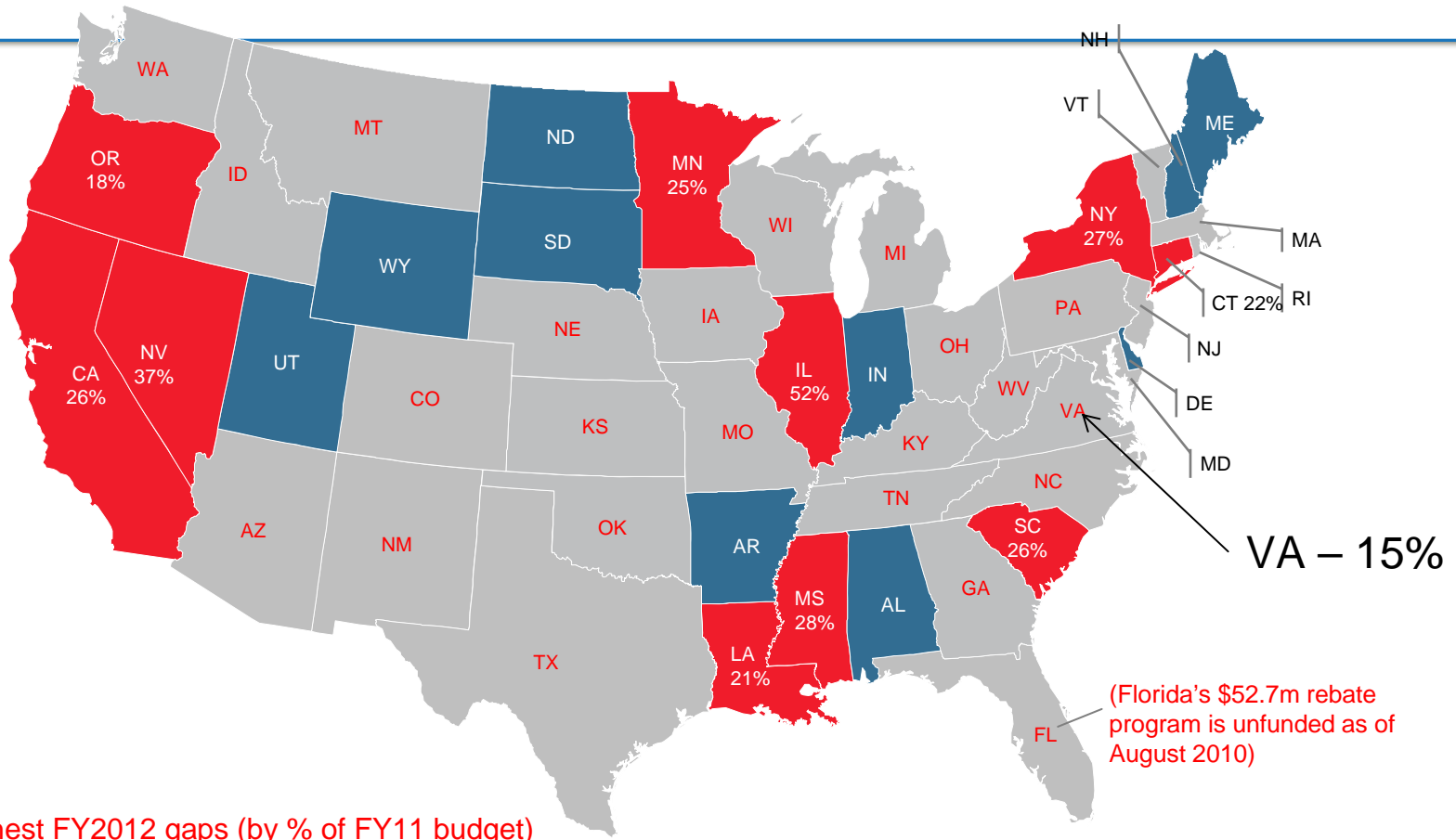
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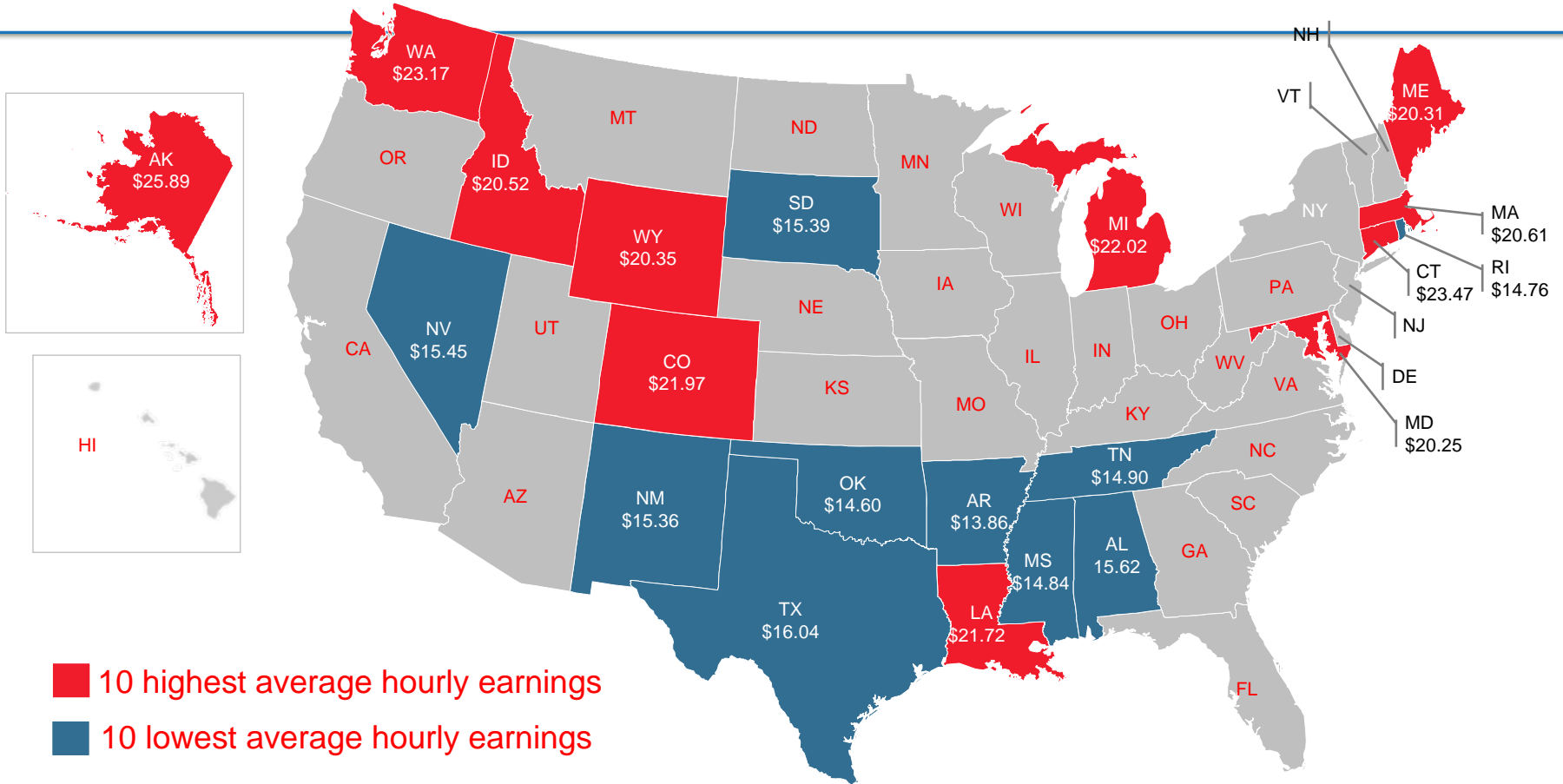
# Forecast of State Budget Gaps



- States with highest FY2012 gaps (by % of FY11 budget)
- States with no projected FY2012 gaps

(Florida's \$52.7m rebate program is unfunded as of August 2010)

# Earnings



■ 10 highest average hourly earnings

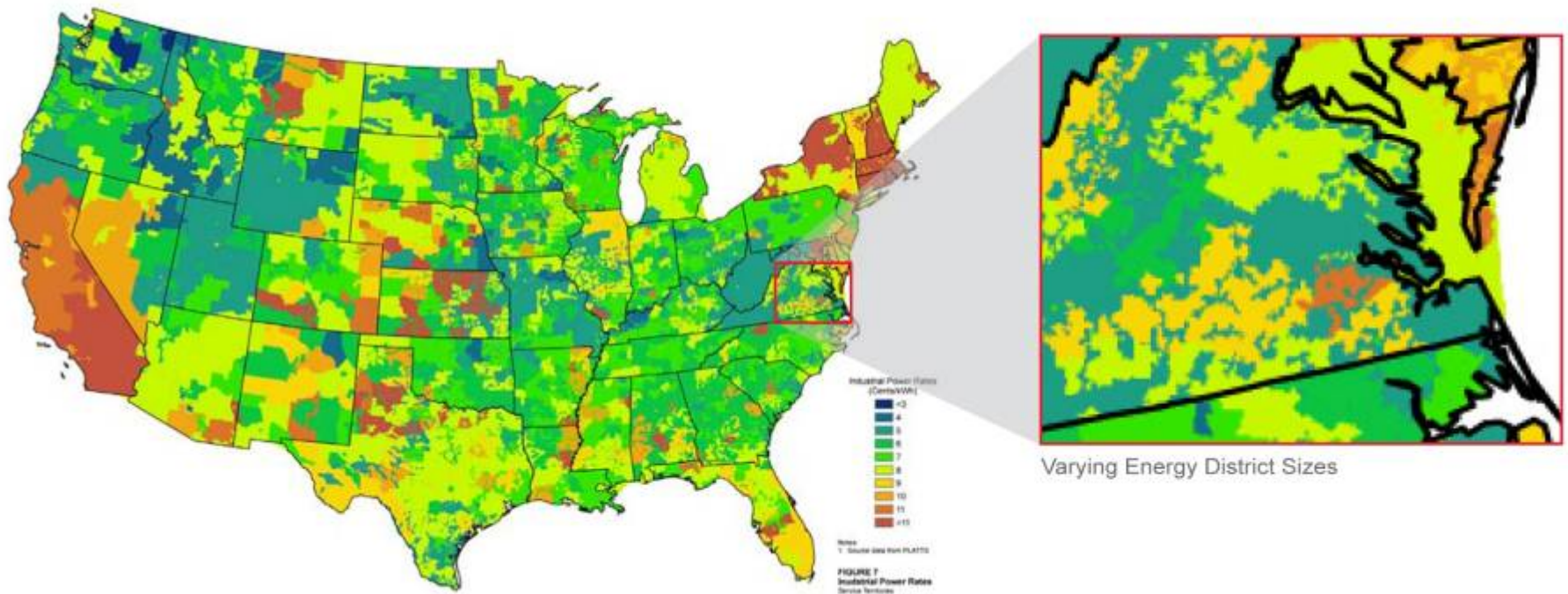
■ 10 lowest average hourly earnings

BLS, State and Metro Area Employment, Hours, & Earnings, B-19.  
Average hours and earnings of production employees on  
manufacturing payrolls in States and selected areas, May 2010





# Electricity is NOT an Average Thing

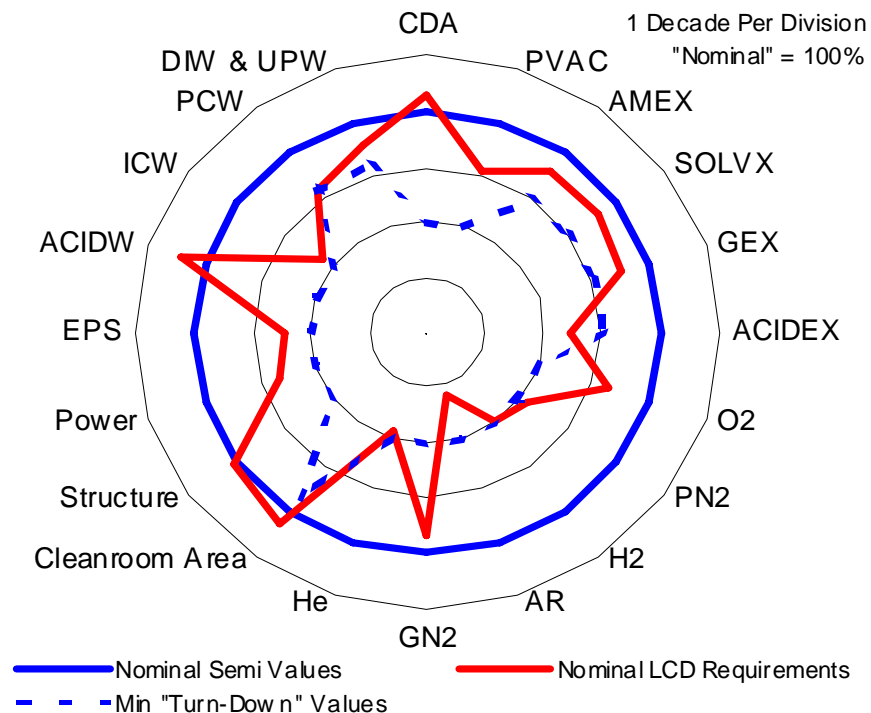


Industrial Power Rates

Varying Energy District Sizes

# Maybe You've Already Got A PV Manufacturing Building?

- There are many underutilized 6" and 8" semi fabs in the US
- The facility systems needed for solar manufacturing are similar
  - cleanroom, air handling, bulk chemicals, abatement, structural loading, etc.
  - workforce!
- Typical semi system exceed solar requirements, but most within efficient operating range
- Retrofit can save time, energy, materials, and money



# LED's

- Lighting accounts for ~ 20% of WW electricity
- Traditional incandescents bulbs are being legislated out
- CFL's contain mercury
- LED's are coming – 1<sup>st</sup> in notebooks, then TV's, then lighting
- LED manufacturing is similar to semiconductor from 30 years ago





# VA Forecast : Partially Sunny





# Thank You

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