Michigan Public Service Commission
Combined Solar Work Group

Provider Solar Programs

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Utility Solar Programs

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  EARP came out of the desire for a standard offer for solar
- Å Both programs proposed and approved in 2009 in the initial Renewable Plans – U-15805 and U-15806
- Å Programs participation have been transitioned from first-come-first-serve to lottery selection
  - ï If demand is greater than availability
- Å Offer prices have dropped significantly

DTE Electric Solar Program
Phase I

- Customer-owned Solar Current Program (Phase 1)
  - 5 MW Program
  - At least half reserved for residential customers
  - System size limited to between 1 and 20 kW
    - Net metering based
      - only category 1 net metering systems qualify (20 kW or less)
  - Contract term of 20 years
  - REC pre-payment $2.40/watt up-front
    - ~half of installed cost
  - Ongoing payment of $0.11/kWh
  - Fully Subscribed as of May 2011
  - 5,030 kW from 589 customers

DTE Electric Solar Program

- December 20, 2011 Commission ordered Staf to convene a work group to explore further solar program opportunities
- November 16, 2012 the 2 MW expansion was approved (Phase 2)

DTE Electric Solar Program
Phase II

- Customer-owned SolarCurrents Program (Phase 2)
  - 2 MW expanded Program
  - 1.5 MW residential and 0.5 MW non-residential
  - System size limited to between 1 and 20 kW
    - Net metering based
      - only category 1 net metering systems qualify (20 kW or less)
  - Contract term through August 31, 2029

DTE Electric Solar Program Phase II

- Residential payment
  - REC prepayment $0.20/watt
    - ~30% of the installed cost
  - ongoing payment of $0.03/kWh
- Non-residential payment
  - REC prepayment $0.13/watt
  - ongoing payment of $0.02/kWh
- 207 kW from 38 projects

DTE Electric Solar Program
Customer Owned

- Company-owned program size of 15 MW
- Projects range from 60 kW to just over 500 kW
- Company owns the system and pays participants easement payments over 20 years
- Currently there are 19 projects installed that total 7.315 MW
- Three projects on the construction, design or feasibility phase totaling 2.571 MW

Consumers Energy Solar Program Phase I and II

- Consumers Experimental Advanced Renewable Program first approved in 2009 case 15805
- 2 MW Program
  - 1500 KW for commercial systems
    - Up to 150 KW
  - 500 KW for residential systems
    - Up to 20 KW
- Phase 1 - $0.525-$0.65/kWh
  - 12 year contract
- Phase 2 - $0.375-$0.45/kWh
  - 12 year contract
- June of 2011 the program was fully subscribed with 102 agreements in place

Consumers Energy Solar Program Expansion

- Renewable Program was approved in May of 2011
- Significantly redesigned from original program (Phase 1 and 2
  - 3 MW expansion (5 MW total)
  - Later in 2011 a 0.25 MW expansion was approved (5.25 MW total)
  - Company proposed an increase to 6 MW total in May of 2013 in U-17301
  - Contract term of up to 15 years
  - Limited to customers usage (similar to net metering)
  - 4 MW split between residential and non-residential
  - Limited capacity in each Phase chosen by lottery
  - Dynamic Price range: $0.20-$0.259/kWh
    - (June 2013 marked the elimination of price floor)
    - $0.001 per KWh bonus for Michigan Labor and Materials

Consumers Energy Solar Program Expansion

- 16 phase have been awarded
  - residential $0.249/kWh
- Total of 4.06 MW capacity participating
- All Phases have gone to lottery

Consumers Energy Solar Programs Proposed

- EARP Developer Program
  - Proposed in May of 2013 in Case U-17301
  - Designed for new structures only
  - Three 75 KW blocks of capacity
    - Will take from unused residential capacity
- Company-Owned Solar Demonstration Project
  - $1 million ICC funded
  - Educational institutions
  - Company owned for 15 years

Program Design Task

Report on:

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MICHIGAN PUBLIC SERVICE COMMISSION

Strengths of Existing Programs

- Allows Companies to gain knowledge on and/or experiment with:
  - Various mounting configurations
  - Cost
  - Distribution integration
  - Billing and customer support
    - Streamlining processes
- Provides a guarantee to customers
  - Defined long term contract

Weaknesses of Existing Programs

- Limited to small subset of customers
- Shifts cost recovery to non-participating customers (similar to net metering)
- Utilities have limited access/control to/of system for resource planning
- Reliability benefits have not been evident
- No MISO reserve margin credit
- Costs are higher than other intermittent resources
- Lottery structure does not provide the confidence needed for customers to proceed with projects
  - Some customers have applied for numerous Phases and still do not receive contracts
- Limited to PV

Vision for Changes to Existing Programs

- Å ά t Ŝ NJ Ŧ Ŝ Ŏ ú t NJ ƛ Ŏ ƛ ƴ Ǝ έ ű Ƙ participation eliminating the need for a lottery
- Å Inclusive renewable product offering that reflects cost based pricing
  - ï No cross subsidizing
- Å Virtual net-metering/aggregate metering
- Å Value of solar pricing

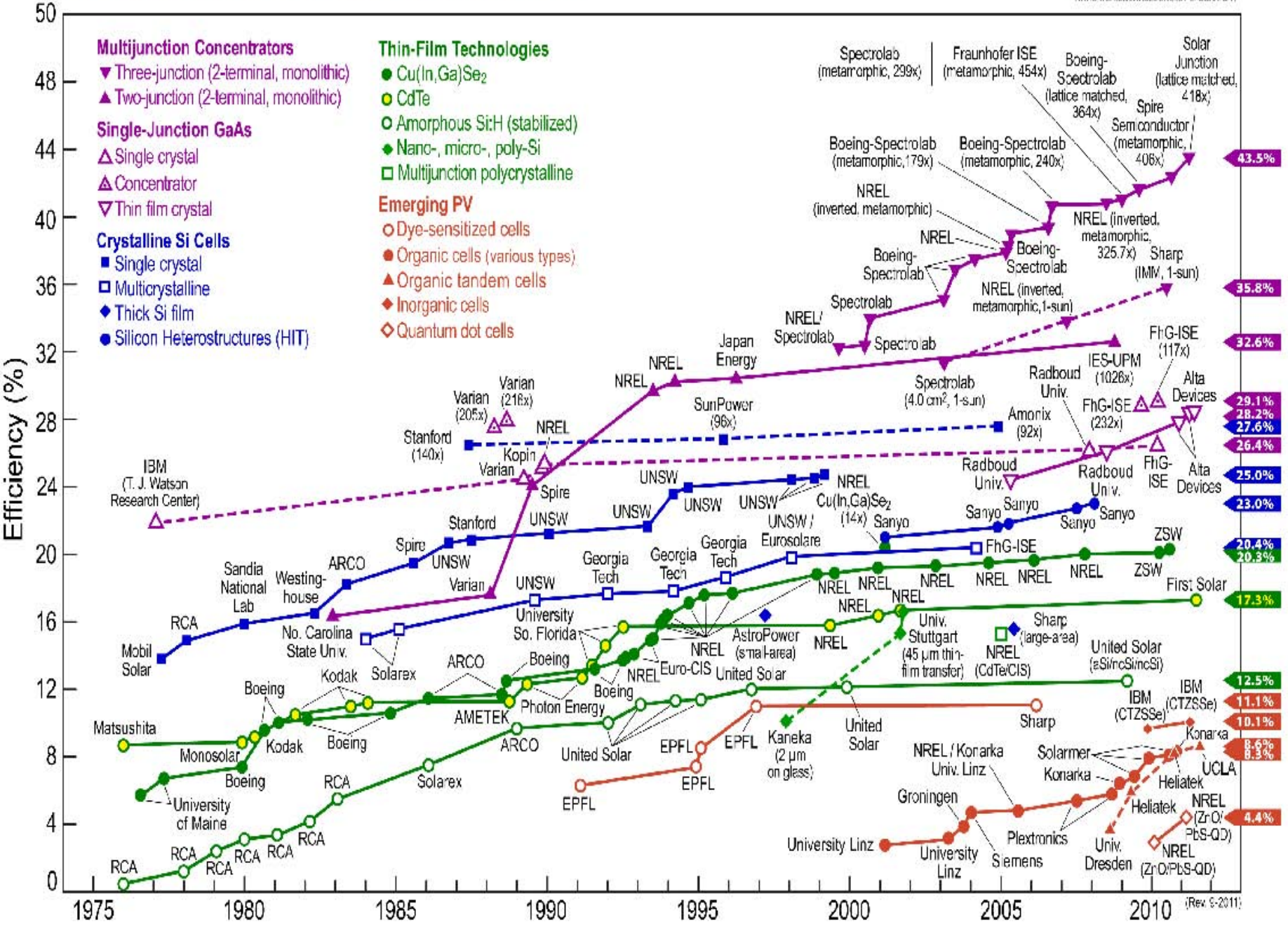
Vision for Community Solar

- Company-owned model
  - Tariff structured so that full cost recovery and grid services are included
- Variety of pilot programs
  - Variety of sizes
  - Variety of ownership models
- VOS rate
- Shares less than $500 each

Cherryland/Traverse City L&P Community Solar

- Å Þ п т л LJŜNJ ά ă Ƙ l· NJŜ έ ó LJ l·
- Å Customers receive $75 Energy Optimization Rebate
- Å Provider pays wholesale electric price
  - ï ~$2.00 per month average
- Å 136 shares have been purchased as of July 2013

Best Research-Cell Efficiencies

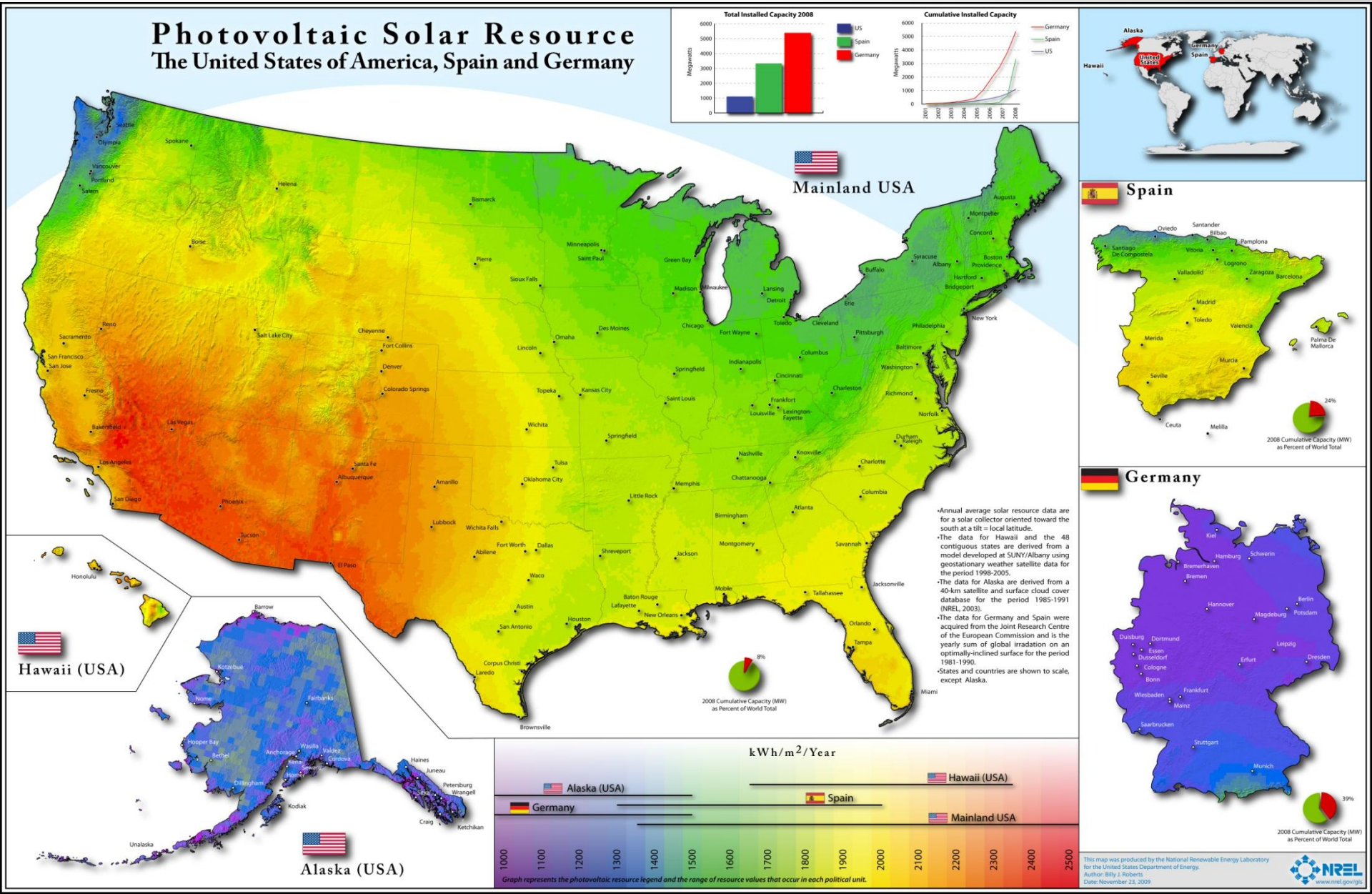


Learning Curve Cost Reductions

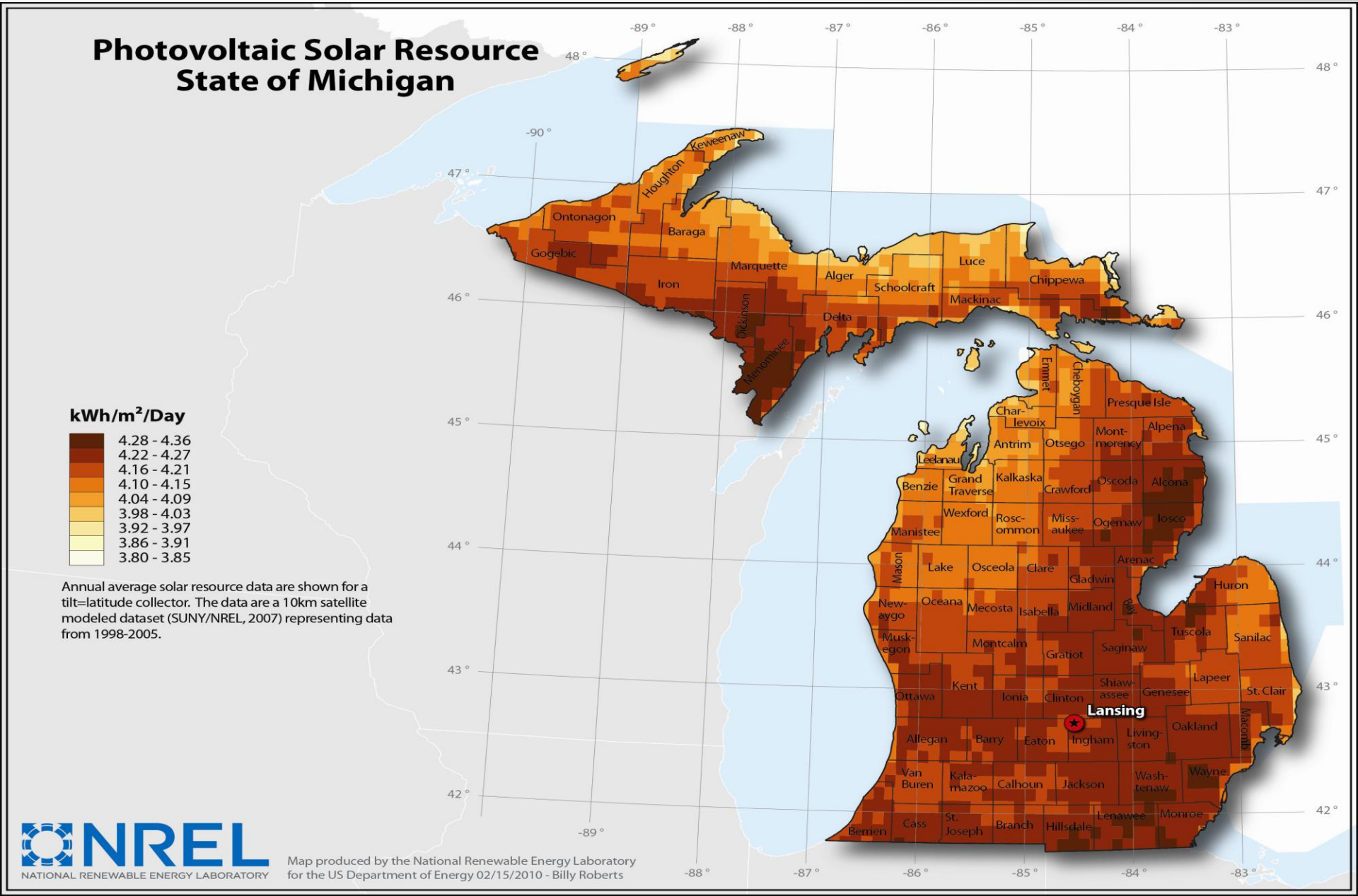
- *The DOE SunShot Initiative is a collaborative national initiative to make solar energy technologies cost competitive with other forms of energy by reducing the cost of solar energy systems by about 75% before 2020.*

http://www1.eere.energy.gov/solar/sunshot/

Increased Capacity Factors



Increased Capacity Factors



NREL White Papers

- *The Value of Grid-Connected Photovoltaics in Michigan*
- *Market Barriers to Solar in Michigan*

The Value of Grid-Connected Photovoltaics in Michigan

- Value is higher than average due to correlation with peak prices
- Valued at $0.138/kWh (annual basis)*
- 75% of value is from energy, capacity and environmental attributes*

The Value of Grid-Connected Photovoltaics in Michigan

Å PV Value Components

- ï Energy and Generation
  - Å Offset of fuel and O&M from other plants
- ï Capacity
  - Å Reduce need to run high cost plants during peak
- ï Transmission and Distribution
  - Å Distributed PV reduces infrastructure and losses
- ï Reactive Power Support
  - Å Eliminates the need for capacitors to support VAR
- ï Environmental Benefits
- ï Other
  - Å Disaster recovery and other ancillary benefits

The Value of Grid-Connected Photovoltaics in Michigan

- Energy market value above $0.07/kWh in Summer months and peaks at $0.093/kWh in August
- December is the only month that average PV market value is less than average market electricity prices
- Overall annual energy market value is $0.063/kWh

The Value of Grid-Connected Photovoltaics in Michigan

Conclusion

- Combined Average Value of Solar in Michigan $0.138/kWh*
  - Average annual market energy value = $0.063/kWh
  - Transmission, capacity, VAR support value = $0.04/kWh
  - Other = $0.01/kWh
  - Environmental benefit (REC price) = $0.025/kWh*
    - *Detroit Edison reverse REC auction for vintage RECs = $0.24/REC $0.00024/kWh
    - *Consumers Energy and Detroit Edison estimate REC values at ~$7/REC or $0.007/kWh
    - Using above REC values X 3: *$0.114/kWh $0.134/kWh range

Market Barriers to Solar In Michigan

1. Lack of streamlined and consistent permitting between jurisdictions
2. Tax classification inconsistency and lack of residential tax exemption

Market Barriers to Solar In Michigan

- Permitting requirements can comprise half of the time and cost of solar installations
- Inconsistent permitting between jurisdictions mitigate learning curve reductions and adding frustration

Market Barriers to Solar In Michigan

Solutions:

1. Installer provide permitting process information up front
2. Jurisdictions draft a permitting checklist
3. Online applications and permitting using templates
4. Cap fees
5. Adoption of Solar ABCs Expedited Building Permit Process

- Led to a 17% decrease in installed PV cost in San Jose CA
- Could lead to a 5-13% increase over BAU in installed Solar in Michigan

Market Barriers to Solar In Michigan

- Inconsistent classification as real or personal property
  - Confuses assessors and system owners
  - Precludes system owners from taking advantage of tax relief (commercial and industrial only under MCL 211.9)
  - Potential residential tax impact of $0.084/kWh to system owners

Market Barriers to Solar In Michigan

- Solutions

1. Legislative action
2. Educational working sessions with assessors
3. Uniform message from installers and system owners
   - Tax liability offset from exemption would have equated to .00276% in 2008-2009