IPL Local Green Power Advisory Committee

Meeting #1

January 8, 2016

Welcome & Introductions

What we will cover today

- Advisory Committee objectives
- IPL renewables experience
- Initial Local Green Power (LGP) program ideas
- Describe solar as a Local Green Power option
- Local and national trends in shared solar programs
- Other Indiana initiatives
- Program design factors
- Roundtable discussion
- Next steps

Advisory Committee (AC) Objectives

- Purpose of the Advisory Committee
- Focus of each meeting

Date	IPL	Advisory Committee
Jan 8, 2016	Provide background	Share perspectives
	Present program options	
Feb 4, 2016	Share initial program design	Share perspectives
Mar 16, 2016	Present revised program design	Provide feedback

IPL's renewables experience

- Existing Green Power program
- Wind Power Purchase Agreements (PPAs)
- Former Renewable Energy Incentive program
- Net metering
- Renewable Energy Production (Rate REP)
- Resulting in IPL's changing generation mix

Existing Green Power Program

- Standard Contract Rider No. 21 – Green Power Initiative
- Voluntary option for customers to purchase Renewable Energy Credits (RECs)
- Modest premium to retail rates ($0.0015/kWh)
- Program dates to March 1998
- Currently about 4,400 customers
- Sales to Customers: 165 GWh annually (or slightly more than 1% of IPL Retail sales)

Wind Energy - Power Purchase Agreements (PPAs)

- IPL has two agreements in place to purchase a significant amount of wind
- Hoosier Wind Park - Benton County, Indiana – 100 MW since 2009
- Lakefield Wind Park – Minnesota - 200 MW since 2011
- Together these wind projects provide about 5 percent of IPL's generation

Renewable Energy Incentive Program

- Demand-Side Management (DSM) offering (from 2004 to 2014)
- Initially provided grants to purchase demonstration projects
- Evolved from grants to $1 per watt credit in 2010
- IPL provided incentive payments for 57 customer owned systems from 2010 thru 2014

State Fair Demonstration Project

- Under Construction – Circa 2009

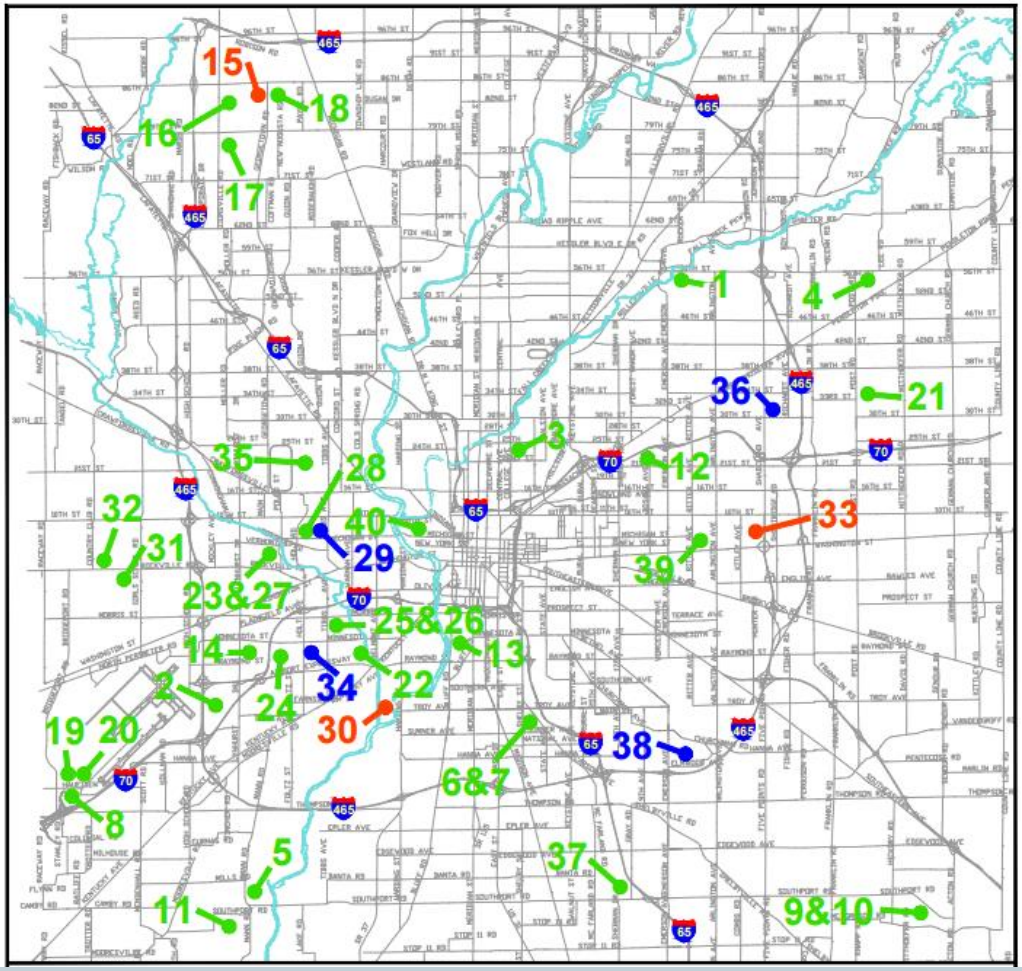
Net Metering

- Available to all IPL customers that self produce wind, hydro or solar energy – up to 1 MW in size.
- Customer bills are credited the full retail rate for all kWh displaced
- IPL currently has 79 net metered customers
  - 78 solar and one wind
  - Installed solar capacity approximately 1.45 MW
  - 21 new systems added in 2015

Renewable Energy Production (Rate REP)

- Fully subscribed in 2013
- 36 operating solar farms with 95 MW of solar capacity
- Indianapolis is ranked second in the amount of solar PV on a per capita basis

Rate Renewable Energy Production (REP)



Legend

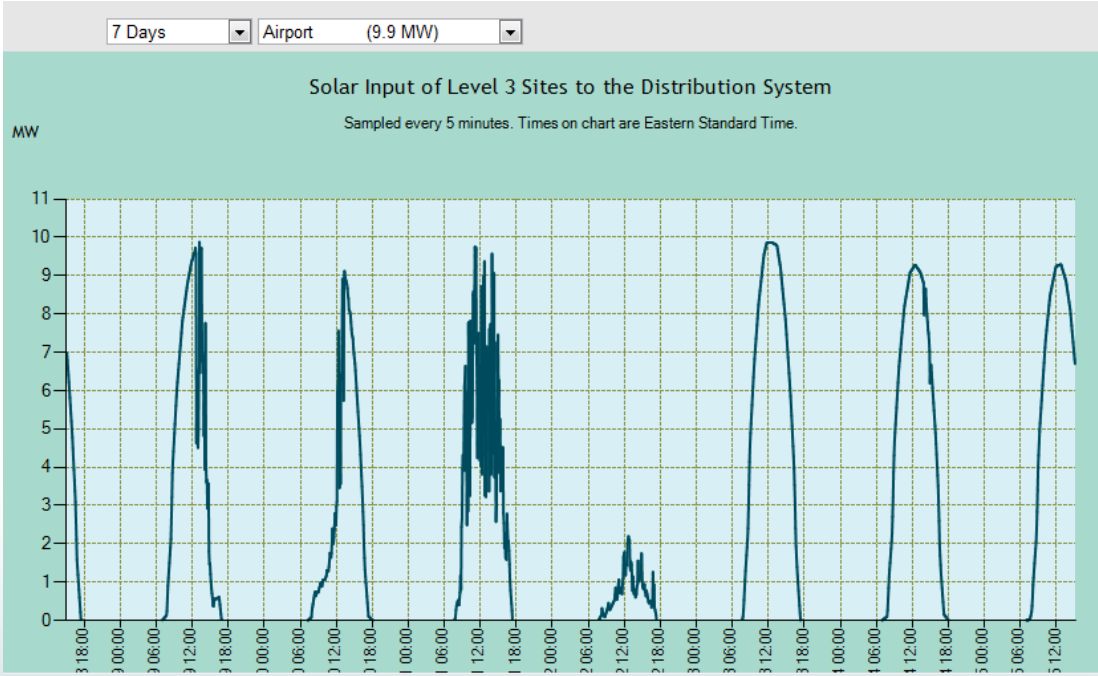
Green = Operating

Red = Under Construction

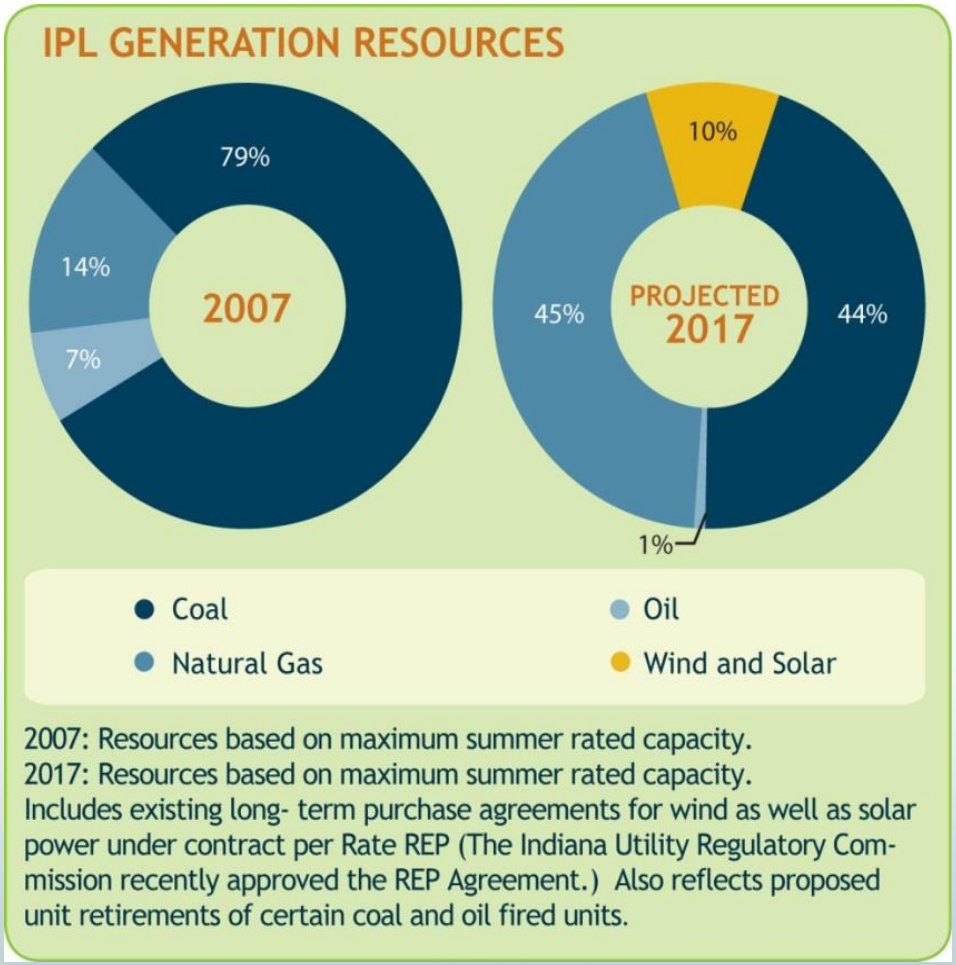
Blue = In Development

Rate REP - Solar Lessons Learned

- Overall performance of ~18% of all hours vs. estimated 15%
- IPL communicates closely with operators 24/7
- Intermittency causes voltage fluctuations
- System protection settings are site specific
- Feeder maintenance causes facilities to be taken off line



IPL's Changing Generation Mix



Why is IPL considering a LGP offering?

- Listened to public feedback during the 2014 Integrated Resource Plan process
- Provide customers with tangible ways to participate in energy choices
- Continue to diversify our portfolio
- Foster continued leadership in industry

IPL's initial Local Green Power ideas

- Local renewable resource
- Voluntary offering for all customers
- Self-sustaining subscription-based
- IPL owned and operated – competitively sourced
- 1 MW blocks (7 to 10 acres per MW)
- Customer transaction based on energy produced
- May include "anchor" corporate subscribers

Potential local renewable resource options

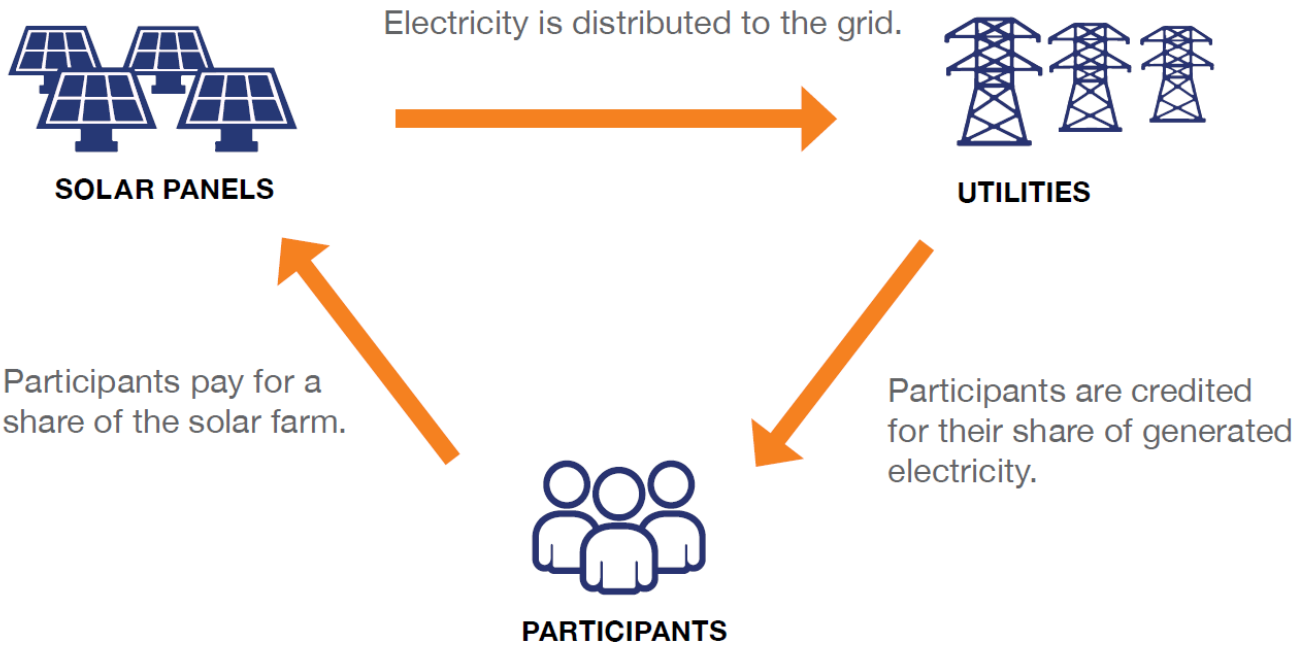
Resource	$/kW to build	Benefits	Limitations
Solar[1]	$3,000	Visually appealing	Land requirement
Wind[2]	$2,213	Low cost per kWh	Limited local resource
Biomass[3]	$4,114	Consumption of waste fuel	Limited fuel availability

[1]Source: IPL generated from IRP
[2]Source: State Utility Forecasting Group, 2014 Indiana Renewable Energy Resources Study, does not include transmission costs
[3]Source: State Utility Forecasting Group, 2014 Indiana Renewable Energy Resources Study

Why is solar a good option for Local Green Power?

- Solar is modular and flexible
- Solar is most suitable renewable resource for Indianapolis
- Solar is most easily sited in an urban area
- Solar provides high visibility improving marketability

Shared solar simply stated



Source: Solar Electric Power Association (SEPA), Community Solar Program Design Models

Solar LGP provides significant benefits

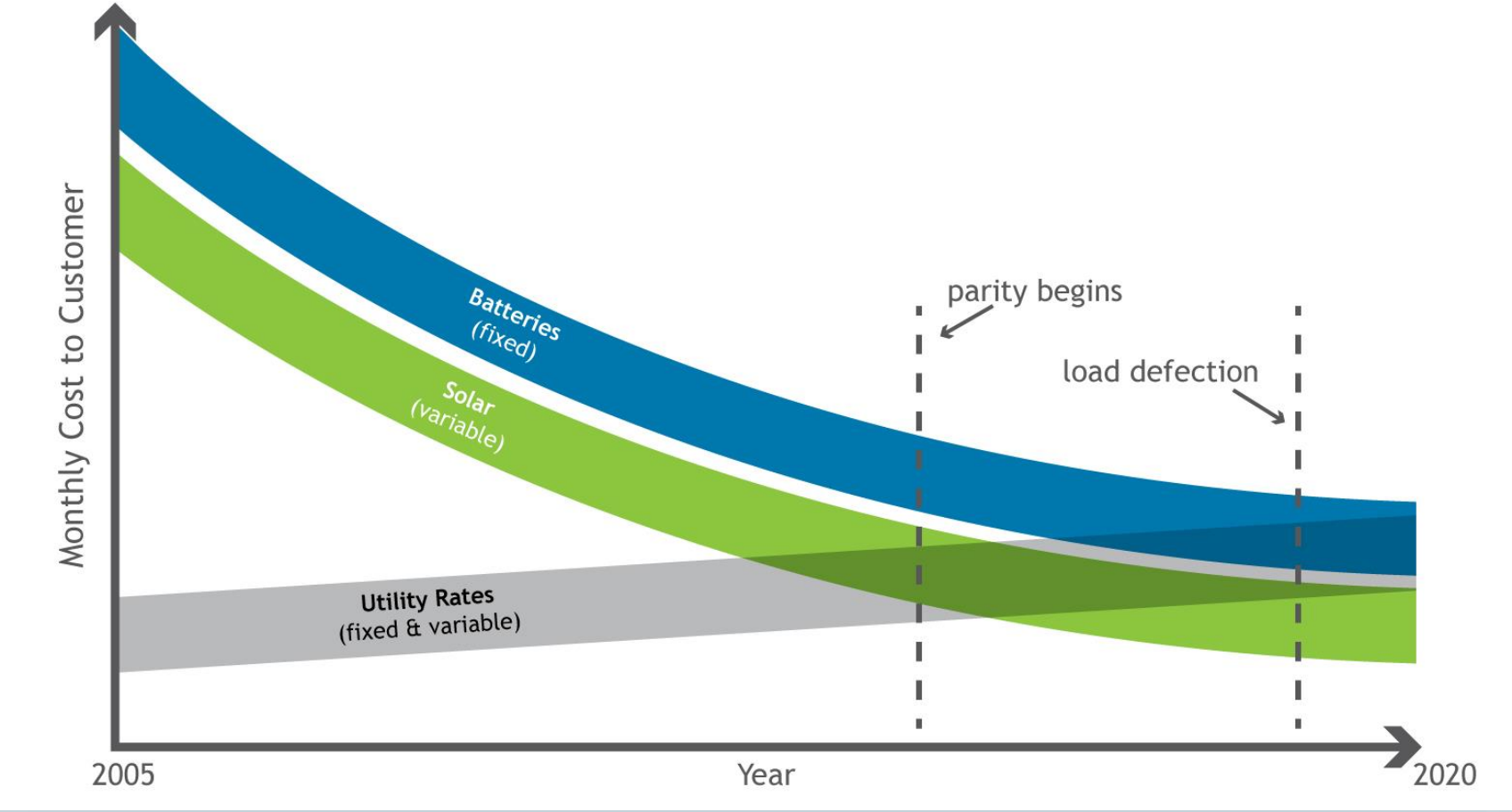
Customer Benefits

- Additional customer choice
- Overcomes barrier that many homes are not conducive for rooftop PV
- All customers, not just homeowners, may participate
- Lower capital cost than dispersed small scale renewables (i.e. rooftop)
- Solar production is optimized

Utility Benefits

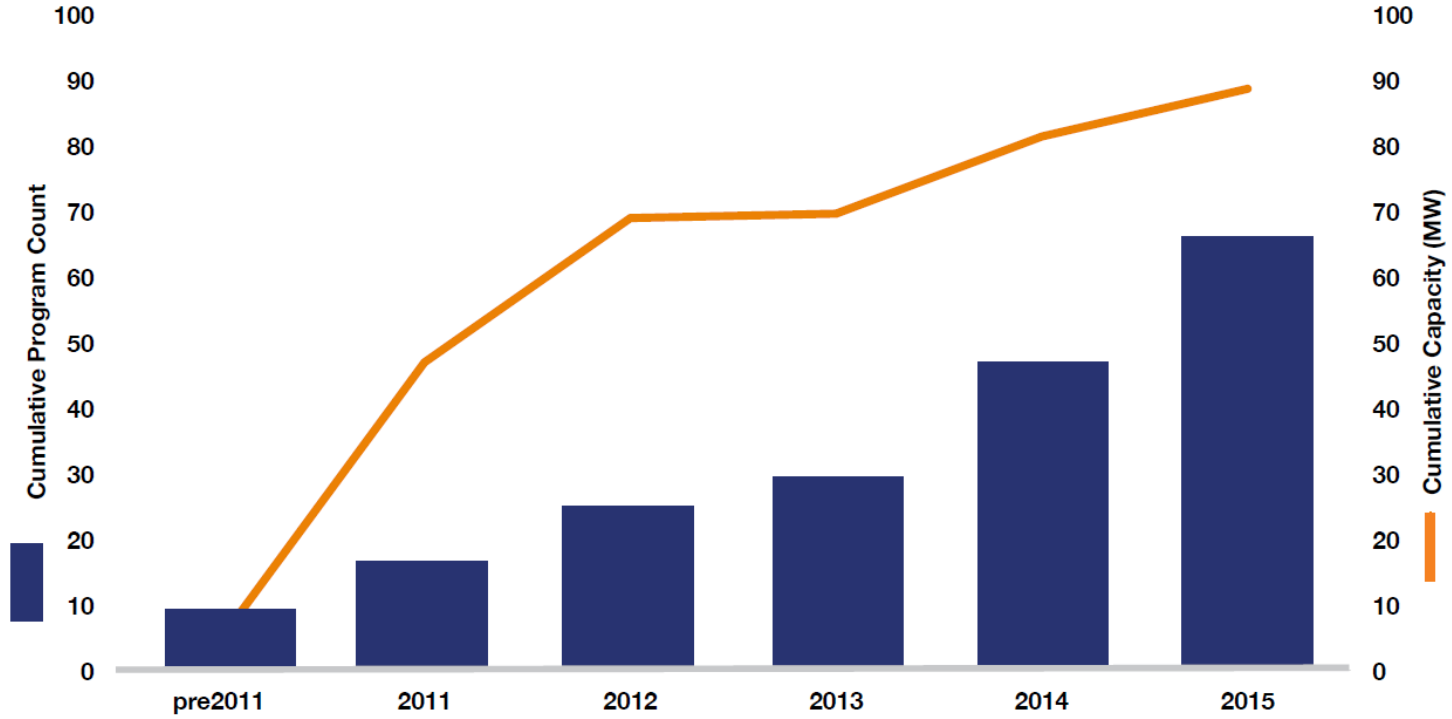
- Proactive approach to market disruptions
- Positive customer and community engagement
- Control power quality
- Potential to mitigate impact of future CO_2 regulations
- Eases grid integration

Alternative energy solutions are causing market disruptions



Source: Global Trends in Renewable Energy Investments 2015, BNEF
Distributed Generation defined as < 1MW

Nationally, there is a steady increase in shared solar programs



Source: SEPA research

Other Initiatives in Indiana - Public Utilities

- Indiana Municipal Power Agency (IMPA)
  - Six solar projects totaling 10 MW
  - Plans to build a solar project in all 60 communities IMPA serves
- Hoosier Energy
  - Hoosier has a variety of renewable resource
  - Ten 1 MW solar projects are planned by the end of 2016
- Tipmont REMC
  - Installment plan charging $3 per Watt (purchase model)

Other Initiatives in Indiana – Investor Owned Utilities

Duke

- Utilizing their existing GoGreen Program to purchase RECs from the 4 PPAs (25MW total, 5MW each) on behalf of the program

I&M – Clean Energy Solar Pilot Project (CESPP)

- Solar Power Rider (SPR) to recover program costs
- SRECs: customer retires them, I&M also reserves the right to comply with future mandates
- Building at substations

NIPSCO – Feed-In Tariff Program

- Phase I - Ended in March 2015
- Phase II – Currently Enrolling

Program design factors

- Facility ownership & operation
- Customer Offer
    - Upfront payments ($/watt)
    - Ongoing payment ($/kWh)
- Subscription Transfer
- Participation limit (capacity & usage)
- Siting and Scale
- Program Length
- Minimum Term

See SEPA report: *Community Solar: Program Design Models*

Roundtable Discussion

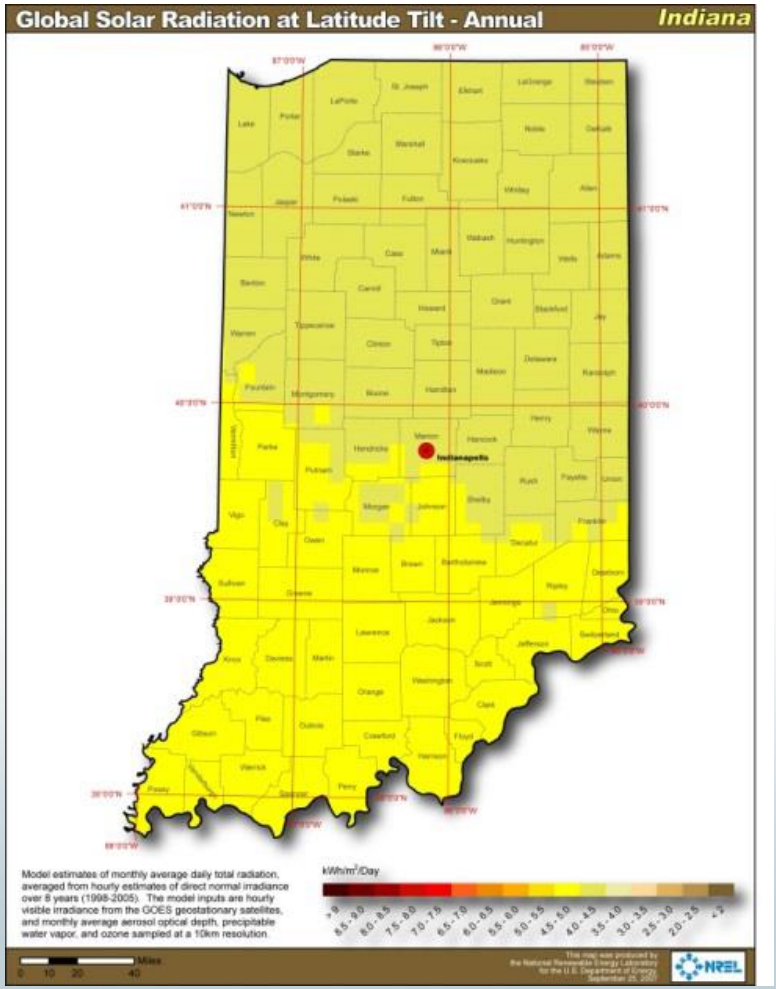
Next Steps

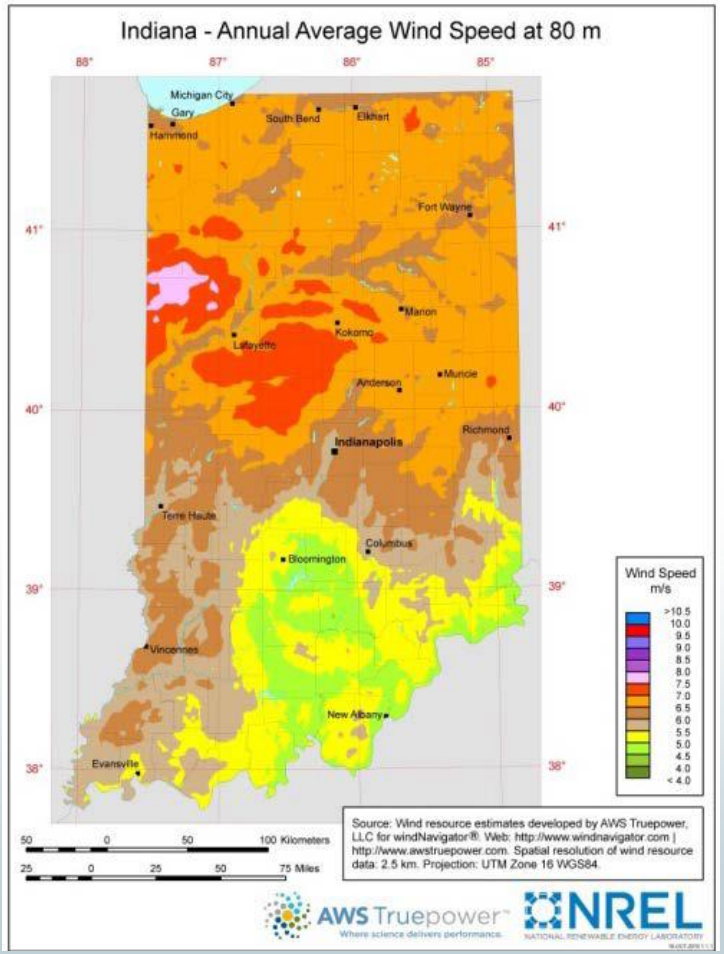
- IPL prepare strawman and initial design(s) for the next meeting
- IPL will continue to develop market research framework to determine customer interest
- Other ideas?

Next Meeting February 4, 2016

Appendix

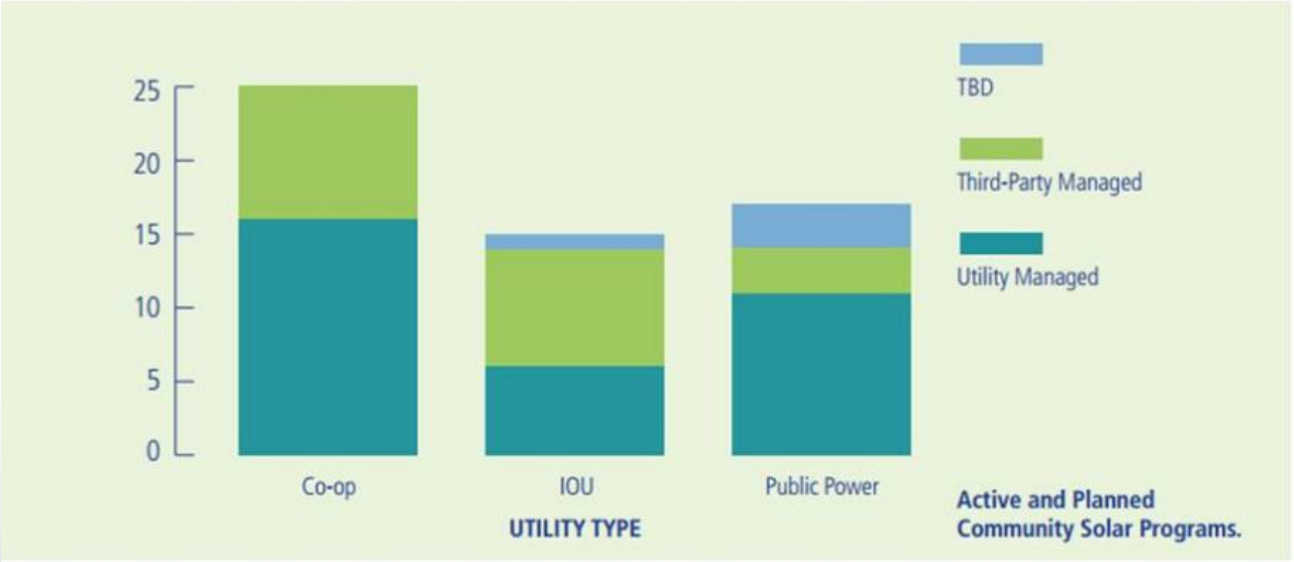
Solar and wind resources vary in IN





Community solar programs ownership differs based on the utility type

Utility Role in Shared Solar Varies

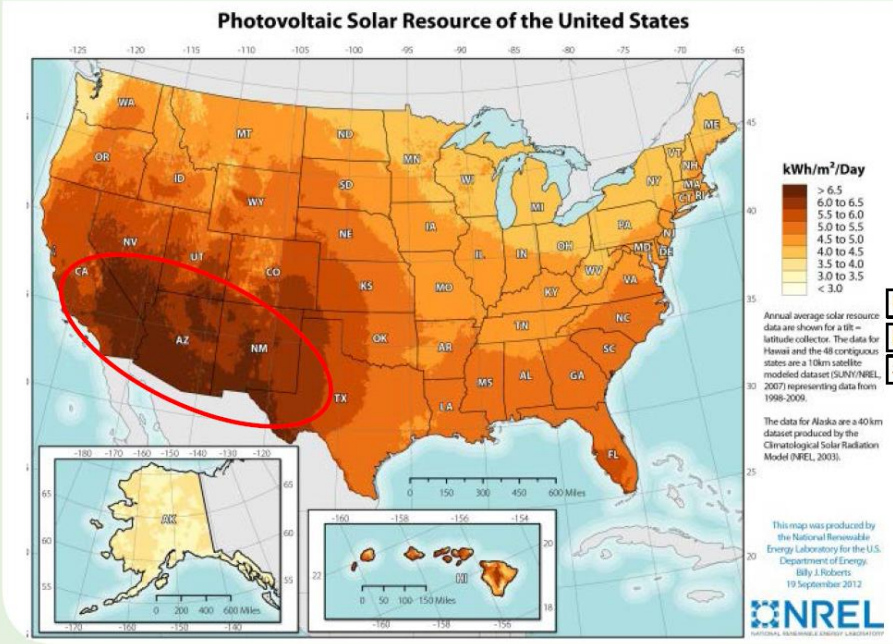


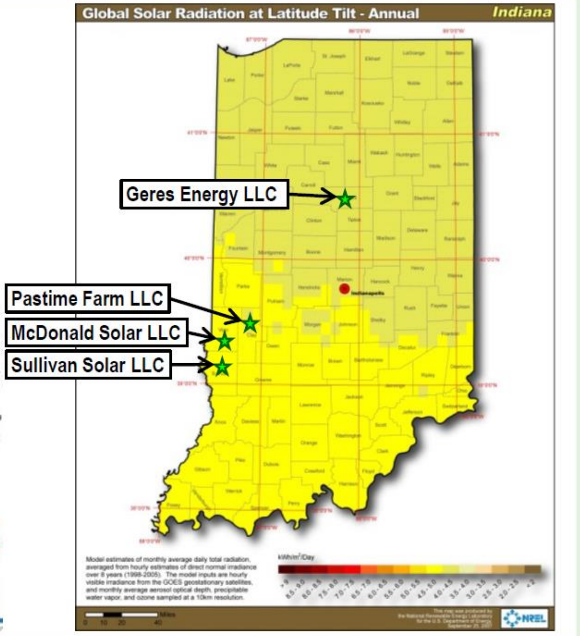
Source: Campbell et al. (2014). Expanding Solar Access Through Utility-led Community Solar: Participation and Design Trends from Leading U.S. Programs

NATIONAL RENEWABLE ENERGY LABORATORY 6

Duke IRP Solar Slide (from June 2015)

Solar Resource Distribution





43

DUKE ENERGY

I&M IRP Solar Update Slide (from May 2015)

AEP INDIANA MICHIGAN POWER
A unit of American Electric Power

I&M Solar Pilot Project

Program highlights:

- A significant amount of new Solar Generation has been added to various AEP operating company IRPs beginning the next decade, including I&M
- I&M began planning and regulatory activities associated with the ~ 16 MW Clean Energy Solar Pilot Project in 2014 to gain experience ahead of next decade's ramp-up in solar activity
- Regulatory case filed with Indiana Commission
  - Initial filing on 7/7/2014
  - Order from IURC authorizing costs approved on 2/4/2015
  - Cost recovery via a "Solar Power Rider"
  - Voluntary "Green Power Rider" wherein customers could seek more renewables
- Pilot Project consists of four (4) facilities (2.5 – 5.0 MW ea.) on I&M owned sites adjacent to I&M substations Additional ~ 1 MW distribution level solar facility may be added
- Interconnection applications for 4 sites filed with PJM on 4/29/2014
- Total cost is expected to be ~ $38 M
- Expected On-Line Dates
  - 2 Projects (Q4-2015)
  - 2 Projects (Q4-2016)

Benefits

- Experience to be gained in critical areas
  - Day-ahead forecasting
  - Operations
  - Development and Construction
  - Technology
- Social / Economic Benefits

41

IPL Local Green Power Advisory Committee

Meeting #2

February 5, 2016

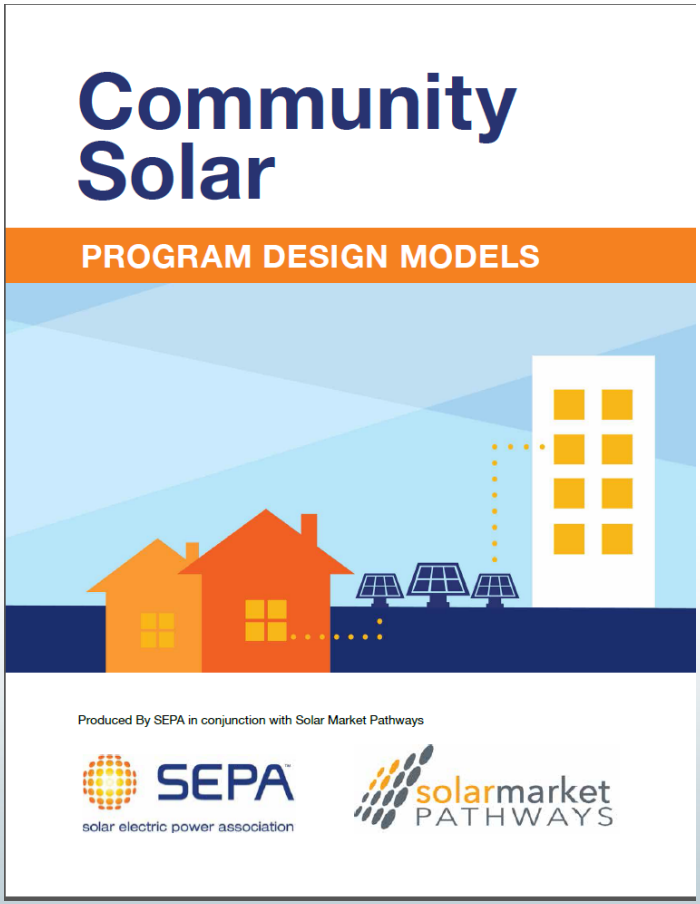
Welcome & Safety Message

What we will cover today

- Recap of 1st meeting
- SEPA Community Solar: Program Design Models Report Discussion
- Key Success Factors
- Break
- Design Factor Survey Results
- IPL Strawman Proposal
- Site Selection Draft Criteria
- Potential Grant Opportunities
- Economic Analysis Framework
- Expectations for Next Meeting
- Closing Comments

Recap of 1st Meeting

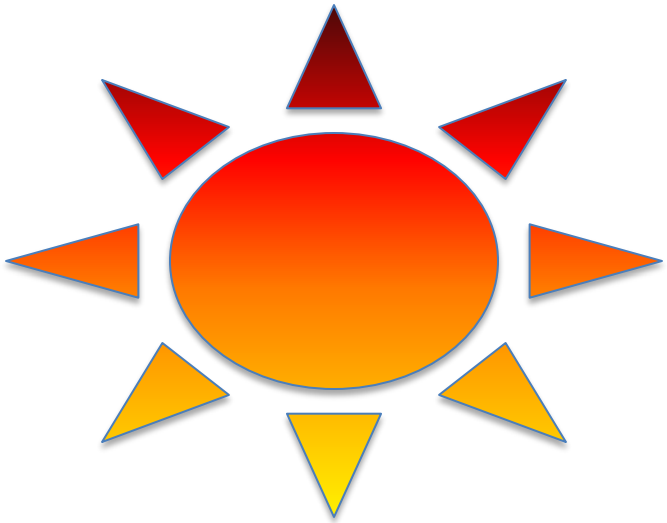
SEPA Community Solar: Program Design Models Report Discussion



Key Success Factors

- Size of projects
- Electricity generated
- Number of local projects
- Subscribers
- Indy's national solar ranking
- Reduction in pollutants
- Customer Satisfaction
- Environmental and economic justice
- Displacement of coal
- CPP
- Financial
- Jobs
- Where projects are located

BREAK



Design Factors, IPL Strawman & Survey Results

Design Factors	IPL Strawman
Facility Ownership & Operation	IPL owned and operated
Customer Offer	Fixed kWh block or customer choice
Subscription Transfers	IPL managed, prorated for the rest of the minimum term, unless waitlist can pick it up
Participation Limits	100% of average usage, to allow for more broad participation for the first offering, if not fully subscribed then future offering could allow for future blocks for customers
Siting & Scale	RFP Criteria
Program Length	Based on the asset life, for example: 25 years
Minimum Term	24 months

- Discussion of survey results (see handout)

Site Selection Draft Criteria

- Cost to Construct with grid interconnection
- Feasible to interconnect (not on circuit with large Rate REP facility already)
- Brownfield reuse benefits
- Community Visibility
- Anchor sponsorship
  - e.g. non-profit, corporation, public funding
- Levelized cost per kWh

Potential for Grant Opportunities

- Solar Electric Power Association (SEPA)
  - Grants for technical assistance to 8 Utilities for Program Design
  - Research request made to SEPA staff to identify other potential opportunities
- Other Grant Opportunities?

Economic Analysis Framework

Factors to calculate net costs & benefits include the following:

- RFP results for project costs
- 25 year asset life
- Financial metrics
- Credit for avoided generation expense based on 2014 IRP forecast
- Value of renewable attributes such as Solar Renewable Energy Credits (SRECs) or carbon
- Forecasted utility solar costs to determine likely break-even/grid parity
- Compare to rooftop solar forecasted costs

Expectations for Next Meeting

- Discussion

Next Meeting: Wednesday, March 16

IPL Local Green Power Advisory Committee

Meeting #3

March 18, 2016

Welcome & Safety Message

What we will cover today

- Recap of 2nd meeting
- IPL Local Green Power Project Illustrative Solar Economic Analysis
- Findings
- Break
- Discussion
- Next Steps
- Closing Remarks

Recap of 2nd Meeting

Grocers Supply Roof, 1MW rooftop system.

IPL Local Green Power Project
Illustrative
Solar Economic Analysis

*This analysis represents a snapshot in time and is for discussion purposes ONLY and is not intended for a regulatory filing.

Assumptions and Data Sources

Item		Unit	Source
Size of Solar PV System	1 MW		IPL Assumption
Capacity Factor	18%		IPL's Rate REP experience
Capital Cost of Solar	$2.93	$/W - AC	2015 SunShot-National Renewable Energy Laboratory (NREL) Solar Report, Photovoltaic System Pricing Trends, normalized and converted from DC to AC
Useful Life (Depreciation)	25 years		http://www.nrel.gov/analysis/tech_footprint.html
Development Capital Costs	15%		NREL report, U.S. Photovoltaic Prices and Cost Breakdowns: Q1 2015 Benchmarks for Residential, Commercial and Utility-Scale Systems, p. 39
Federal Tax Credit	30%		Reflected as a credit to the intial project cost; research and analysis continue on IPL's ability to take advantage of the ITC. 30% through 2019 http://energy.gov/savings/residential-renewable-energy-tax-credit
IPL WACC & PV Discount Rate	6.91%		From IPL Rate Case Cause 44576 using a 10.93% Requested ROE
Annual O&M	$ 0.02	per watt	http://www.nrel.gov/analysis/tech_cost_om_dg.html
O&M Escalation	2.46%		Averaged 20YR and 30YR Daily Treasury Yield Curve Rates
			https://www.treasury.gov/resource-center/data-chart-center/interest-rates/Pages/TextView.aspx?data=yield
Degradation	0.50%	per year	NREL report, Photovoltaic Degradation Rates - An Analytical Review, listed in abstract
Avoided Energy Cost (Fuel)	$ 0.032	$/kWh	Fuel cost based on Cost of Service Study (COSS) from IPL Rate Case Cause 44576
Avoided Energy Cost (Non-Fuel)	$ 0.002	$/kWh	Non fuel, variable O&M cost based on Cost of Service Study (COSS) from IPL Rate Case Cause 44576
Avoided Capacity Cost (Reserve Margin)	7%		Avoided Planning Reserve Margin Requirement (PRMR)
Avoided Capacity Cost	Ranging from ~$0.50 in 2016 to ~$113 in 2021	$/kW-yr	Curve is based on IPL's bilateral transactions in the short term plus Capacity Prices from ABB Fall 2015 Reference Case
Avoided Capacity Credit (Peak Reduction)	47%		% reduction at forecasted peak based on Rate REP Solar experience
Avoided Long-Term Distribution Capital Costs	$ 0.001	$/kWh	Reflects % of IPL circuits that may require upgrades based on the avoided cost of a new distribution circuit and % of peak reduction
Avoided T&D Losses	1.8%		Estimated from recent line loss study
Solar RECs Credit	$21 in 2016	$/MWh	Forward Price Forecast from ACES Power Marketing group

Illustrative Local Green Power Model - Inputs

			Capacity Factor	
Annual Hours of Solar		1,577	18%	
Base Cost of Solar PV System	$	2.93	$/watt AC	
Development Cost of Solar PV System	$	0.29	15%	
Total Cost of Solar PV System	$	3.22	$/watt AC	
Size of Solar PV System		1,000	kw	
Total Cost of Solar PV System	$	3,223,000		
Federal Tax Credit	$	(966,900)	30%	
Net Cost of Solar PV System	$	2,256,100		
IPL WACC (Weighted Average Cost of Capital)		6.91%		
Revenue Coversion Factor (Return on)		1.43067		
Revenue Coversion Factor (Recovery of)		1.02043		
Annual Depreciation	$	90,244	25	years
Annual O&M	$	20,000	$ 0.02	per watt
O&M Escalation		2.5%		
Solar Production Degradation		0.5%		
Avoided Line Losses		1.8%		

	2016	**2017**	**2018**	**...**	**2039**	**2040**	**2041**
Solar Production (kWh)	1,576,800	1,568,916	1,561,071		1,405,101	1,398,075	1,391,085
Investment Balance	$ 2,256,100	$ 2,165,856	$ 2,075,612		$ 180,488	$ 90,244	$ 0

Illustrative Local Green Power Model - Results

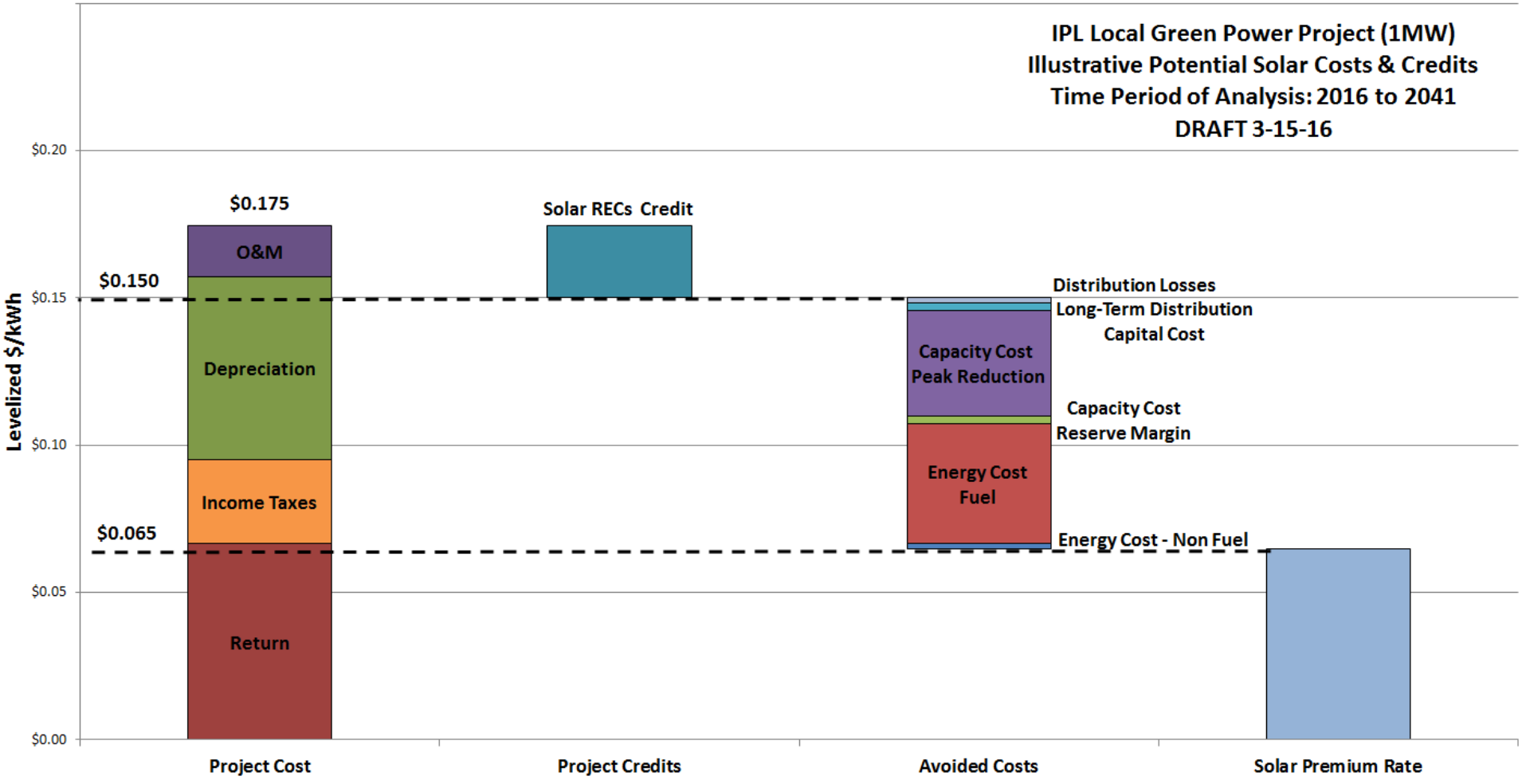
	2016	2017	2018	...	2039	2040	2041
Solar Production (kWh)	1,576,800	1,568,916	1,561,071		1,405,101	1,398,075	1,391,085
Investment Balance	$ 2,256,100	$ 2,165,856	$ 2,075,612		$ 180,488	$ 90,244	$ 0
Project Cost							
Return	$ 223,036	$ 214,115	$ 205,194		$ 17,843	$ 8,921	$ 0
Recovery Depreciation	$ 92,088	$ 92,088	$ 92,088		$ 92,088	$ 92,088	$ 92,088
Recovery O&M	$ 20,409	$ 20,911	$ 21,425		$ 35,691	$ 36,569	$ 37,469
Total Project Cost	$ 335,533	$ 327,113	$ 318,706		$ 145,622	$ 137,579	$ 129,557
Levelized Rate ($/kWh)	$0.175						
Project Credits							
Solar RECs Credit ($/kWh)	$ 0.021	$ 0.021	$ 0.021		$ 0.031	$ 0.032	$ 0.032
Solar RECs Credit	$ (33,113)	$ (33,214)	$ (33,469)		$ (43,839)	$ (44,431)	$ (45,029)
Levelized Rate ($/kWh)	($0.025)						
Total Project Cost less Project Credits	$ 302,420	$ 293,899	$ 285,237		$ 101,783	$ 93,148	$ 84,527
Levelized Rate ($/kWh)	$0.150						
Avoided Costs							
Avoided Energy Cost - Fuel ($/kWh)	$ 0.0315	$ 0.032	$ 0.033		$ 0.051	$ 0.051	$ 0.052
Avoided Energy Cost - Fuel	$ (49,669)	$ (50,380)	$ (51,724)		$ (71,877)	$ (71,945)	$ (72,013)
Avoided Energy Cost - Non-Fuel ($/kWh)	$ 0.0015	$ 0.002	$ 0.002		$ 0.002	$ 0.002	$ 0.002
Avoided Energy Cost - Non-Fuel	$ (2,365)	$ (2,399)	$ (2,463)		$ (3,423)	$ (3,426)	$ (3,429)
Avoided Long-Term Dist Capital Costs ($/kWh)	$ 0.002	$ 0.002	$ 0.002		$ 0.004	$ 0.004	$ 0.004
Avoided Long-Term Dist Capital Costs	$ (3,429)	$ (3,496)	$ (3,564)		$ (5,344)	$ (5,448)	$ (5,554)
Avoided Cap Cost - Reserve Margin ($/kWh)							
Avoided Cap Cost - Reserve Margin							
Avoided Cap Cost - Peak Reduction ($/kWh)							
Avoided Cap Cost - Peak Reduction							
Avoided T&D Losses ($/kWh)	$ 0.001	$ 0.001	$ 0.001		$ 0.002	$ 0.002	$ 0.002
Avoided T&D Losses	$ (1,134)	$ (1,294)	$ (1,681)		$ (3,046)	$ (3,104)	$ (3,149)
Total Avoided Cost to Solar Customers	$ (64,141)	$ (73,199)	$ (95,098)		$ (172,254)	$ (175,526)	$ (178,073)
Levelized Rate ($/kWh)	($0.085)						
Net Charge to Customer	$ 238,279	$ 220,700	$ 190,139		$ (70,471)	$ (82,378)	$ (93,546)
Levelized Premium Solar Rate ($/kWh)	$0.065						

Dist=Distribution

Cap=Capacity

Cap cost is proprietary, and therefore is redacted.

Components of the Costs and Credits

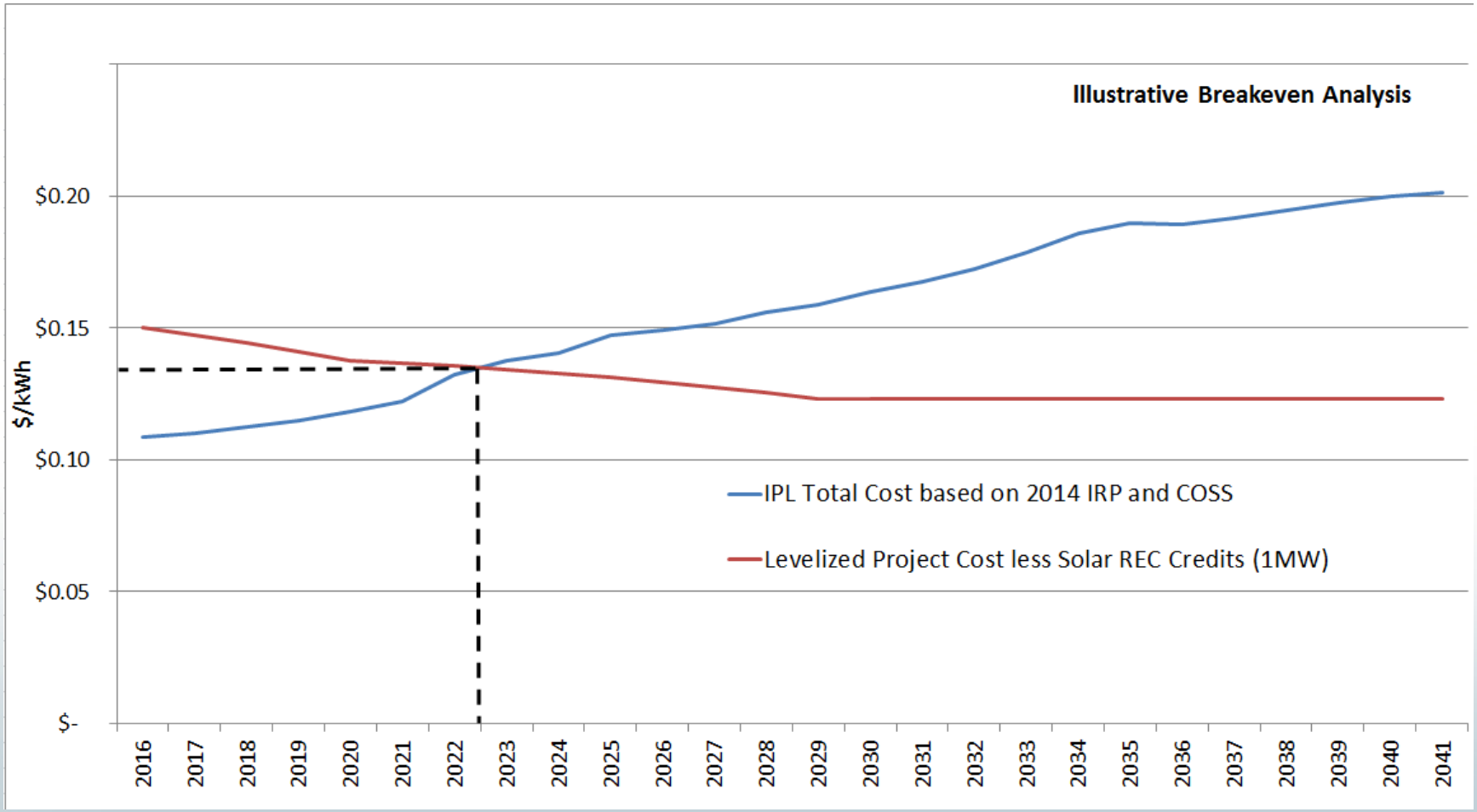


Solar Economic Analysis - Levelized Cost of Production

Solar System Size	Capital cost ($/watt - AC)	Levelized Cost – Before Credits ($/kWh)
1 MW	$2.93	$0.175
5 MW	$2.27	$0.139
4 kW – Customer Build 4% Cost of Capital	$3.50	$0.157
4 kW – Customer Build 10% Cost of Capital	$3.50	$0.238

Source:
2015 SunShot-National Renewable Energy Laboratory (NREL) Solar Report, Photovoltaic System Pricing Trends

A decrease in solar capital costs would improve the value to the customer



Findings

- Solar resources remain more expensive than current IPL retail rates
- A larger site produces economies of scale, however, subscription risk is greater
- As capital costs for solar decrease, the economic case for solar improves
- Cost of carbon will impact future levelized costs

Break

Discussion

Next Steps

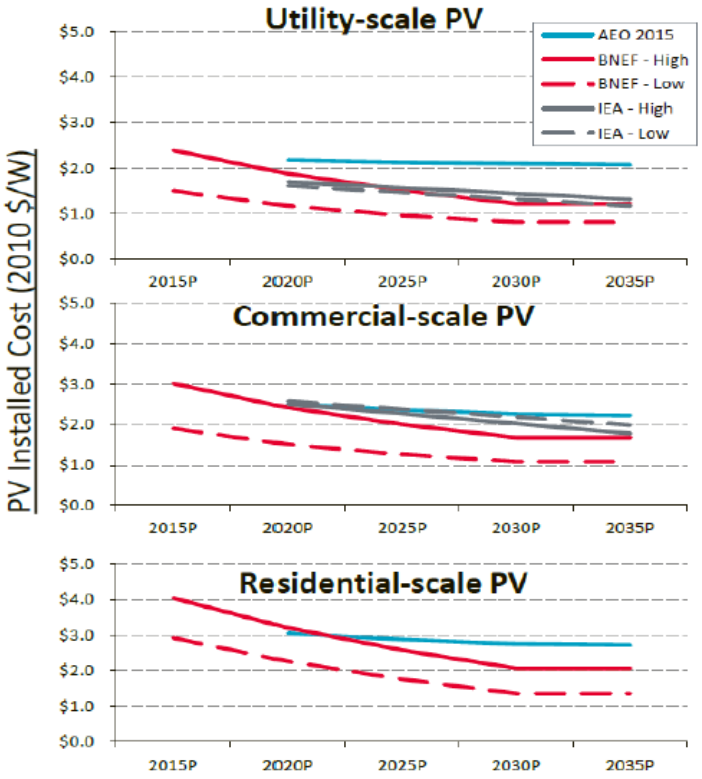
- Consider the following questions:
  - Does it make sense to do this now?
  - If not, when will it make sense?
  - How large of an economic gap will altruism cover?
  - How do we address the gap between the asset life (25 years) and the customer subscription commitment (1 year)?
  - Besides economics what are other drivers for customers to choose solar?

- Incorporate economic analysis into 2016 IRP

Closing Remarks

Appendix A - Cost of Solar

Range of Analyst Expectations of Long-term U.S. System Price



- BNEF and IEA expect pricing in all PV markets to continue to decrease and to get very close to the SunShot targets between 2020-2030
- AEO has a much more conservative outlook with respect to PV system pricing, with system pricing projected to remain relatively flat through 2035
- Analyst expectations of future pricing are currently far lower than projections made even just a few years ago, reflecting very rapid change in the U.S. market.

Sources: International Energy Agency, "World Energy Outlook 2014," November 2014 (New Policy & 450 Scenarios for utility-scale & commercial-scale); Bloomberg New Energy Finance, "H1 2015 North American PV Outlook" (01/16/15); U.S. Energy Information Administration, Annual Energy Outlook 2015 (June 2015). In years where projection was not made, most recent projection used.

SunShot U.S. Department of Energy

energy.gov/sunshot

31

Appendix B – Minnesota Ex.

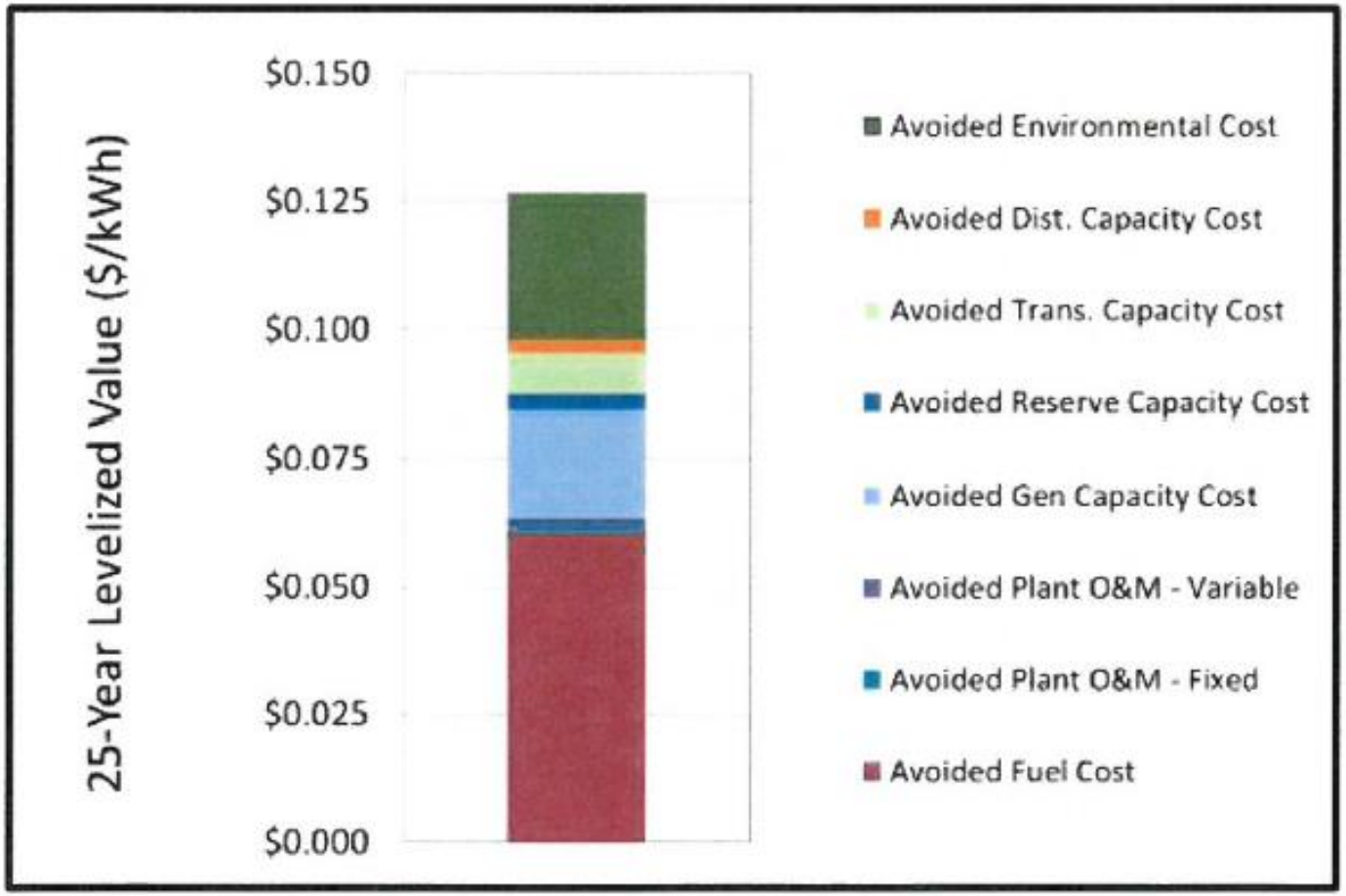


Figure 2. Minnesota VOS – sample calculations

Source: MN DOC (2014)

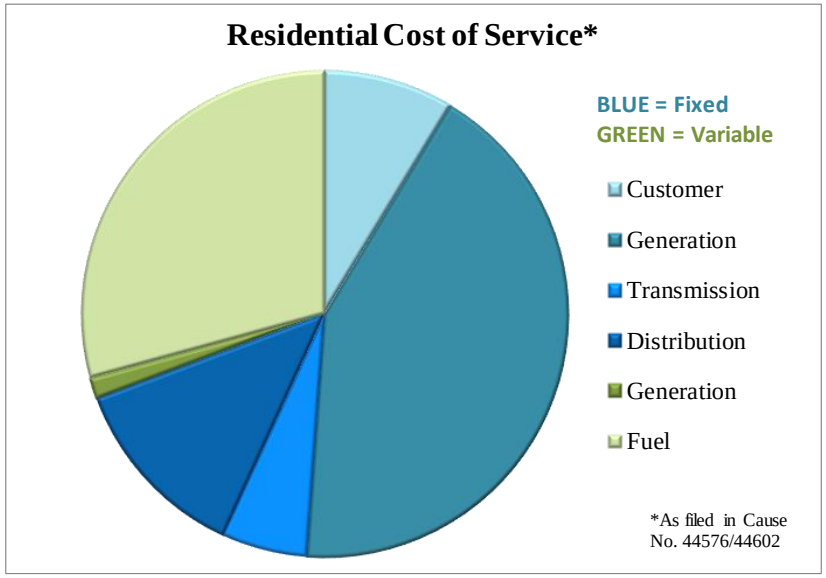
Appendix C - IPL Rates 101

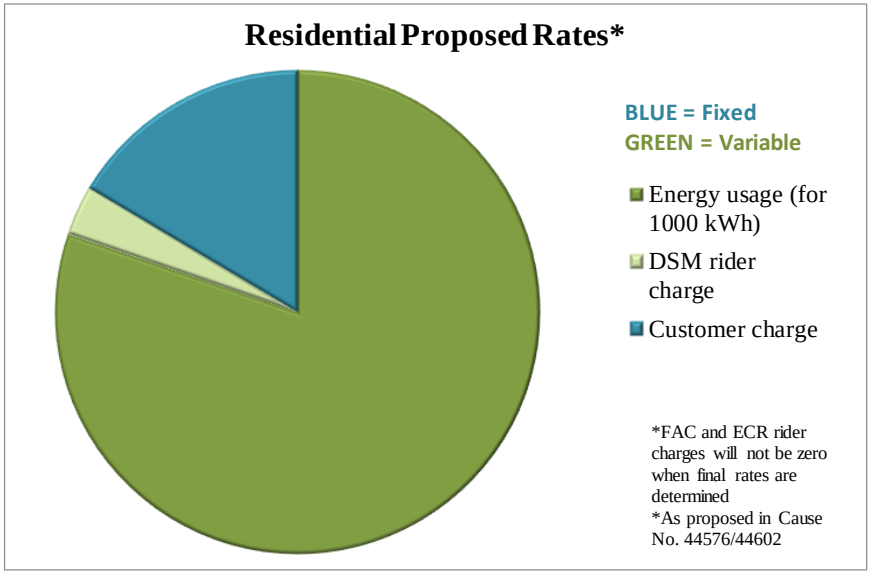
IPL Rates 101 DRAFT 3-15-16

Local Green Power Project - Supplementary Material

	Residential Cost of Service
	% of Total
Customer	9%
Generation	43%
Transmission	6%
Distribution	12%
Generation	1%
Fuel	29%
Total	100%

	Residential Proposed Rate
Energy use (first 500 kWh)	$0.0936
Energy use (next 500 kWh)	$0.0727
Energy usage (for 1000 kWh)	**$83.13**
DSM rider charge	**$3.48**
Customer charge	**$17.00**
Total	**$103.61**





This illustrates how IPL's costs are largely fixed costs, while customers' bills are based mostly on their variable usage.

2017 IPL Local Green Power Advisory Committee (LGP AC)

Meeting #1

March 3, 2017

Welcome & Safety Message

Ice Breaker

Meeting Agenda

- Introductions / Expectations
- Review of 2016 LGP AC Activities
- Updated Solar Economic Analysis
- *Break*
- SEPA Technical Assistance – Customer Market Research
- Discussion
- Preview of Next Meeting & Next Steps

Introductions/Expectations

- Name
- Organization
- What do you hope to gain from this group?
- Group expectations

Review of 2016 LGP activities

Why is IPL considering a LGP/Community Solar offering?

- Respond in a meaningful way to feedback during the 2014 and 2016 Integrated Resource Plan (IRP) processes
- Provide customers with tangible ways to participate in energy choices
- Continue to diversify our portfolio
- Foster continued leadership in industry

IPL's initial LGP ideas

- Local renewable resource
- Voluntary offering for all customers
- Self-sustaining subscription-based
- IPL owned and operated – competitively sourced
- 1 MW blocks (7 to 10 acres per MW)
- Customer transaction based on energy produced
- May include "anchor" corporate subscribers

Review of 2016 LGP AC Meetings

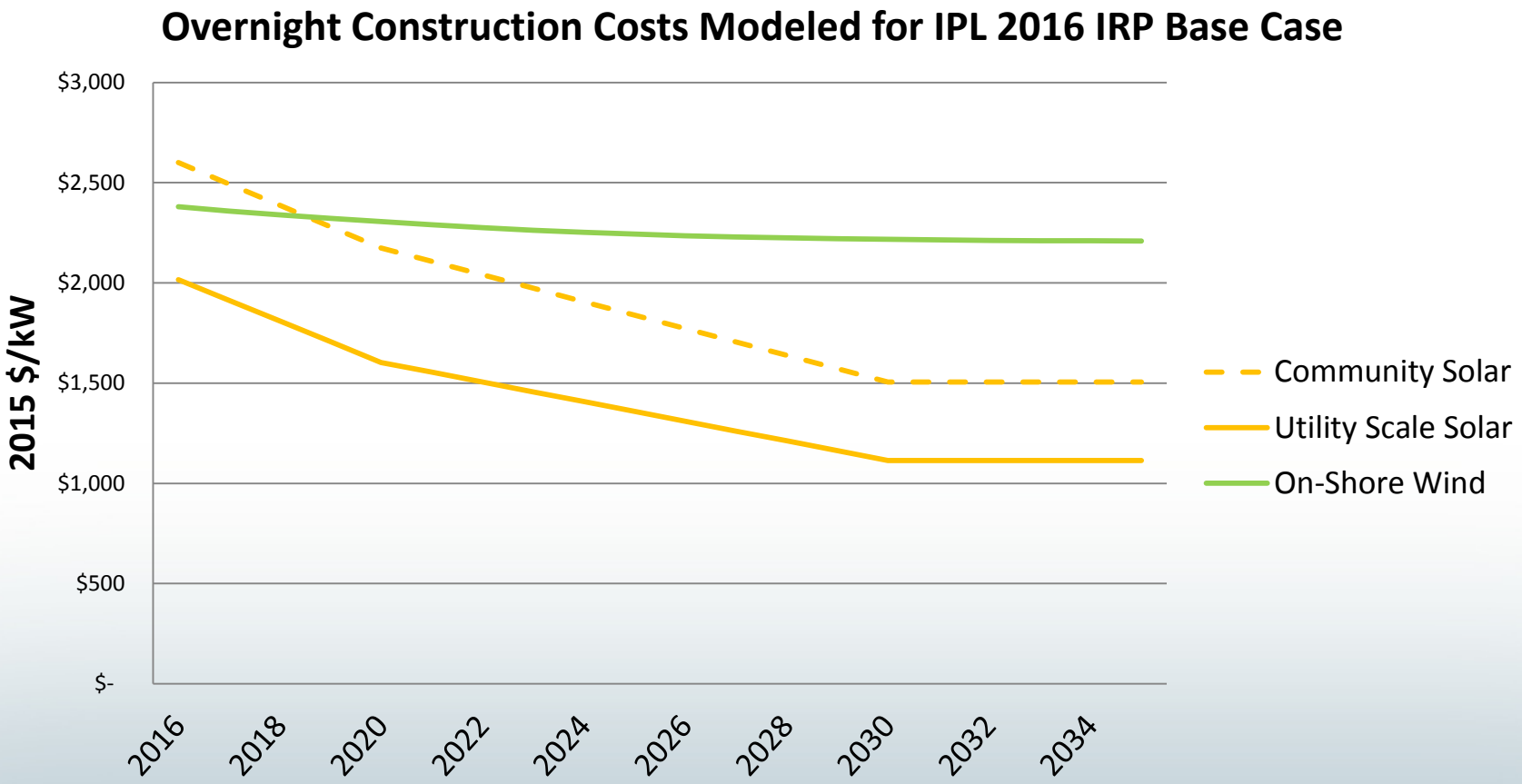
- Focused on education of renewable costs, benefits, challenges led to solar as likely option
- Established Key Performance Indicators (KPI)
- Stakeholders ranked top 5 KPIs:
  - Financial – cost of project
  - Access & equity – affordable for all customers
  - Displacement of fossil fuels/ emission reductions
  - Number of subscribers
  - Customer satisfaction
- Costs were prohibitive to move forward

Additional research has been revealing

- IPL regularly reviews renewable energy penetration reports, cost forecasts and other community solar programs (e.g. See last page of Appendix)
- Engaged in discussions with other AES entities
- Costs have declined aggressively in 2016
- SEPA announced technical assistance
- Costs look much more favorable

Updated
Solar Economic Analysis

Renewable costs are declining



Source: 2016 IPL IRP, Figure 5.16, pg. 80

Solar capital costs have declined

Modeling Vintage**	Capital Cost for >1MW ($/W AC)	Levelized Premium Solar Rate ($/kWh) – retiring the RECs	Levelized Premium Solar Rate ($/kWh) – monetizing the RECs
March 2016	$2.93[1]	$0.095	$0.065
February 2017	$1.91[2]	$0.035	$0.001

**The analysis presented in this table is a snapshot in time and is for discussion purposes ONLY and not intended for a regulatory filing.

[1] Solar capital cost source: 2015 SunShot National Renewable Energy Laboratory (NREL) Solar Report, Photovoltaic pricing trends

[2] Solar capital cost source: NREL Annual Technology Baseline for 2016, http://www.nrel.gov/analysis/data_tech_baseline.html

Cost analysis entails multiple elements

- Inputs include:
  - Capital costs
  - Useful life
  - Annual O&M
  - Federal tax credit
  - Capacity factor
  - Avoided costs: energy (fuel and nonfuel), capacity costs, distribution costs, T&D losses
- Preliminary 2017 analysis updated the capital costs
- Detailed analysis will be discussed at the next meeting

Break

SEPA Technical Assistance for Market Research

- IPL successfully secured $20,000 of Community Solar Technical Assistance funding from SEPA* to support market research
- The US Department of Energy provides the funds to SEPA to administer
- SEPA will support:
  - Customer surveys for residential customers and small Commercial & Industrial (C&I) customers
  - Three focus groups:
    - Residential customers who rent their homes
    - Residential homeowners
    - Small C&I customers

*Smart Electric Power Alliance

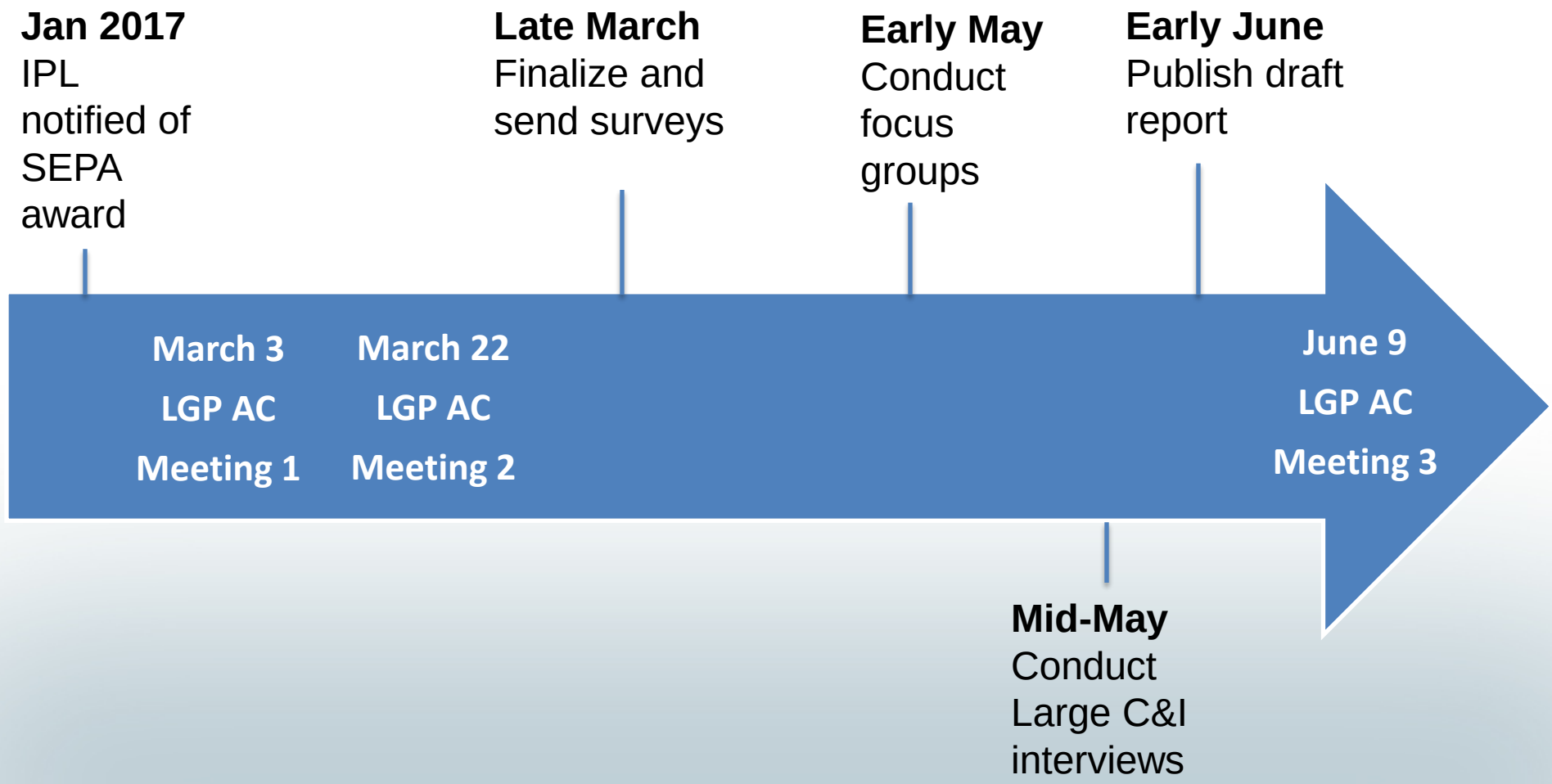
IPL seeks to understand…

- Would IPL customers support a community solar program?
- What program terms appeal to customers?
- How do customers want us to treat the Renewable Energy Certificates (RECs)?
- Does the visibility or geographic location of the project matter to customers?
- What price premium compared to base rates will customers tolerate?

IPL plans to expand market research

- Re-engage stakeholders in this LGP AC forum
- Include large commercial & industrial customer interviews
- Combine results in final report
- Share results

Key milestones



Discussion

Survey Review

Objective: high-level feedback on the proposed market research survey

- Stoplight Exercise
  - What works about the survey in its current state?
  - What doesn't work?
  - What's missing?
- Residential
- Small Commercial

Preview of Next Meeting

- 2017 LGP AC Meeting #2: Wednesday, March 22
  - Review draft survey feedback
  - Review potential large C&I customers to interview
  - Present detailed solar economic analysis
  - Discuss focus groups – script, schedule, etc.
  - Review KPIs
  - Other items?

Next Steps

- LGP AC members provide feedback by March 10
- IPL provide additional materials by March 15
- LGP AC Meeting 2 scheduled for March 22
- Finalize surveys to send by email ~March 28
- Receive survey responses ~April 14
- Coordinate focus group meeting details (expected to be held in May)
- Establish Large C&I interview schedule

Thanks for participating!

Feel free to contact IPL with any questions or follow up items before the next 2017 LGP AC Meeting.

Appendix

Solar LGP provides significant benefits

Customer Benefits

- Additional customer choice
- Overcomes barrier that many homes are not conducive for rooftop PV
- All customers, not just homeowners, may participate
- Lower capital cost than dispersed small scale renewables (i.e. rooftop)
- Solar production is optimized

Utility Benefits

- Proactive approach to market disruptions
- Positive customer and community engagement
- Control power quality
- Potential to mitigate impact of future CO_2 regulations
- Eases grid integration

Community Solar Examples

Program Term	Ameren Missouri	Madison Gas and Electric	Rocky Mountain Power - Utah
System Size	Two 500 kW arrays	500 kW	20 MW
Customer Offer	Blocks of 100 kWh	Blocks of 250 watts, up to 3 kW	Blocks of 1kW, estimated to produce 200 kWh
Customer Participation Limit	50% of their average usage	50% of average usage	up to 100%
Program Length	25 years	25 years	20 years
Required subscription length	2 years	none	3 years
Subscription Transfer	Customers on the waiting list will take the open spot	customers on the waiting list will take the open spot for the first 3 years	Customers on the waiting list will take the open spot
Start-up fee	$25/100 kWh, nonrefundable	$47.25/250 W, nonrefundable	None
Cancellation Fee	None	None	$50 / 250 W block
Rate per kWh	TBD - early drafts suggested a total of $0.16/kWh for residential and $0.15/kWh for small businesses	$0.12/kWh, plus a reduced transmission charge of $0.008.	$0.117 for residential, and $0.01 for small businesses.
Eligible Customers	Residential and small business	Residential	Residential, small businesses, and large C&I

2017 IPL Local Green Power Advisory Committee (LGP AC)

Meeting #2

March 24, 2017

Welcome & Safety Message

Ice Breaker

Meeting Agenda

- Customer market research
  - Surveys
  - Focus Groups
  - Large C&I Customer Interviews
- *Break*
- Detailed 2017 solar economic analysis
- Discussion
- Next Steps

Customer Market Research: Surveys

Survey feedback

Response to your feedback:

- Reorganized questions so that the educational questions come first
- Eliminated battery storage question
- Eliminated trigger words

Today's Goal:

- Final review and discussion

Survey Methodology

- Web-based survey via Survey Monkey engine
- 109,923 Residential & 2,867 Small Commercial customers have opted to allow IPL to contact them via email
- Random sample generated based on IPL customer contact list
- IPL will tie NAICS codes to Small Commercial customers that volunteer the necessary information

Customer Market Research: Focus Groups

Focus Group Details

- Early May
- 3 sessions in one day, 1 hour each
- Noon, 5:30pm, 7:00pm
- 8-10 participants in each group
- 10 - 12 people may observe
- Video and audio recordings will be available

Focus Group Facility

Indy Focus

- 1314 N Meridian St. Indianapolis, IN 46202
- Located just north of downtown

Herron Research Associates – The Idea Center

- 6049 Lakeside Blvd. Indianapolis, IN 46278
- Located on the Northwest side at I-465 and 71st St.

Focus Group Script

- Incorporated LGP AC feedback on surveys into the focus group script
  - Put the education portion at the beginning
- Included questions about treatment of solar renewable energy credits (RECs)
- The script is a dynamic document that will be fine-tuned based on survey responses and feedback from SEPA's facilitator

Why have focus group sessions?

- Purpose:
  - To complement the quantitative survey results with qualitative research
  - The focus group sessions will allow IPL to take a deeper dive into customer preferences and survey responses
  - IPL may receive more accurate responses in a focus group setting

Focus Group Script Feedback – Stop Light Exercise

Customer Market Research: Large C&I Customer Interviews

Large C&I Customer Market Research

Potential interviewees include the following:

- Pharmaceuticals
- Manufacturers
- Healthcare providers
- Universities
- Big Box retailers

Themes for Large C&I Interview Questions

How community solar can fit with the customer's sustainability goals

Visibility of a solar project

Corporate branding

Preferred program terms and structure

Program cost

Other?

Break

Detailed Solar Economic Analysis

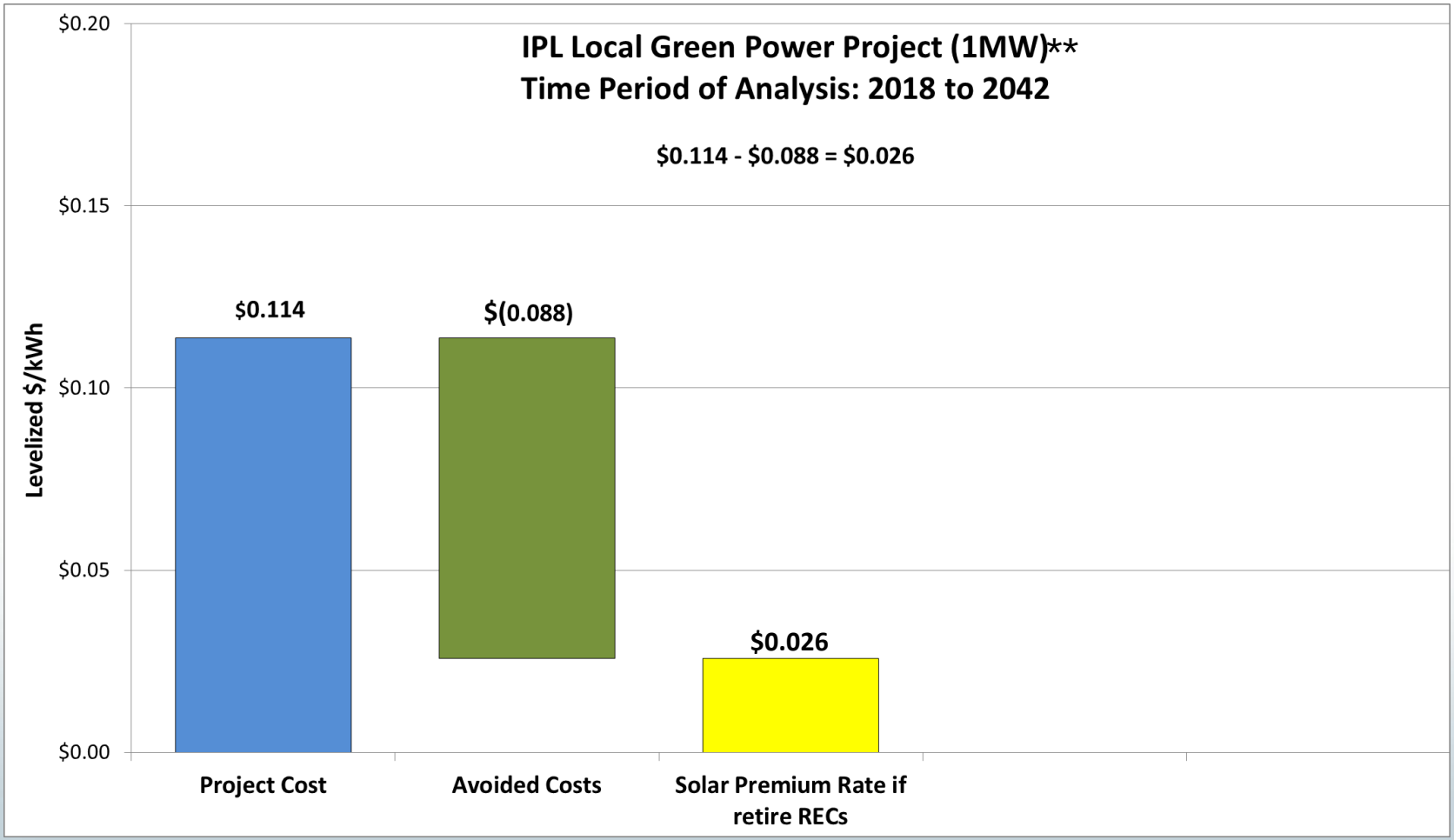
Economic Analysis Overview

- Update and gather feedback on assumptions
- Understand major drivers on local green power premium rate
- Gain a high level understanding of the model
- Determine REC price impact on the rate
- Understand the impact of a later in-service date
- Determine what is next in the economic analysis

Updated Assumptions

Annual Hours of Solar	1,577	18%	capacity factor
In-Service Date	2018		
Base Cost of Solar PV System	$ 1.91	$/watt AC	
Development Cost of Solar PV System	$ 0.19	10%	
Total Cost of Solar PV System	$ 2.10	$/watt AC	
Size of Solar PV System	1,000	kw	
Total Cost of Solar PV System	$ 2,101,000		
Federal Tax Credit	$ (630,300)	30%	
Net Cost of Solar PV System	$ 1,470,700		
IPL WACC (Weighted Average Cost of Capital)	6.41%		
Revenue Coversion Factor (Return on)	1.43067		
Revenue Coversion Factor (Recovery of)	1.02043		
Annual Depreciation	$ 58,828	25	years
Annual O&M	$ 20,000	$ 0.02	per watt
O&M Escalation	2.5%		
Solar Production Degradation	0.5%		
Avoided Line Losses	1.8%		
***Green shaded data are inputs**			

Illustrative Potential Solar Costs & Credits – 1 of 3



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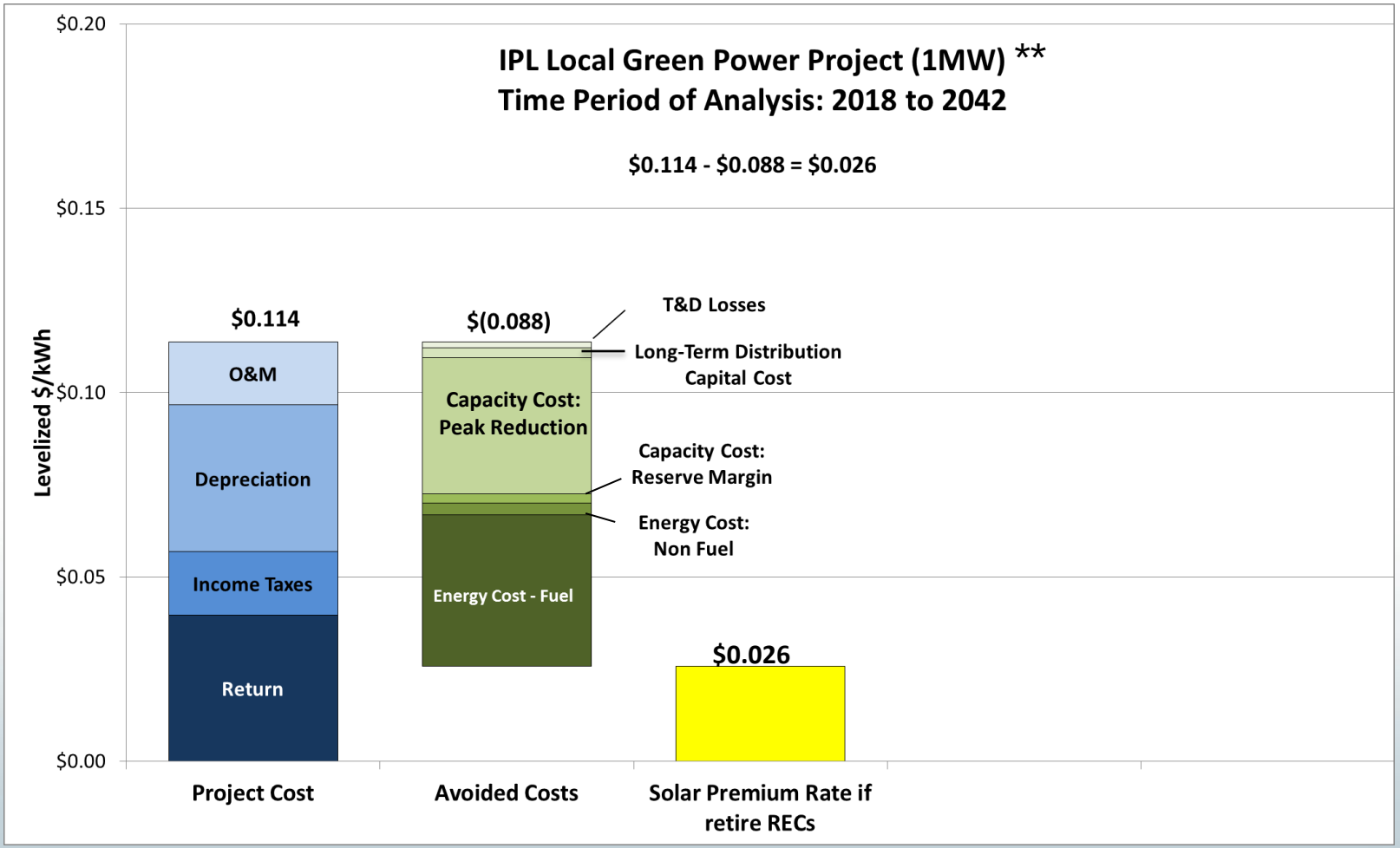
Illustrative Potential Solar Costs & Credits – 2 of 3



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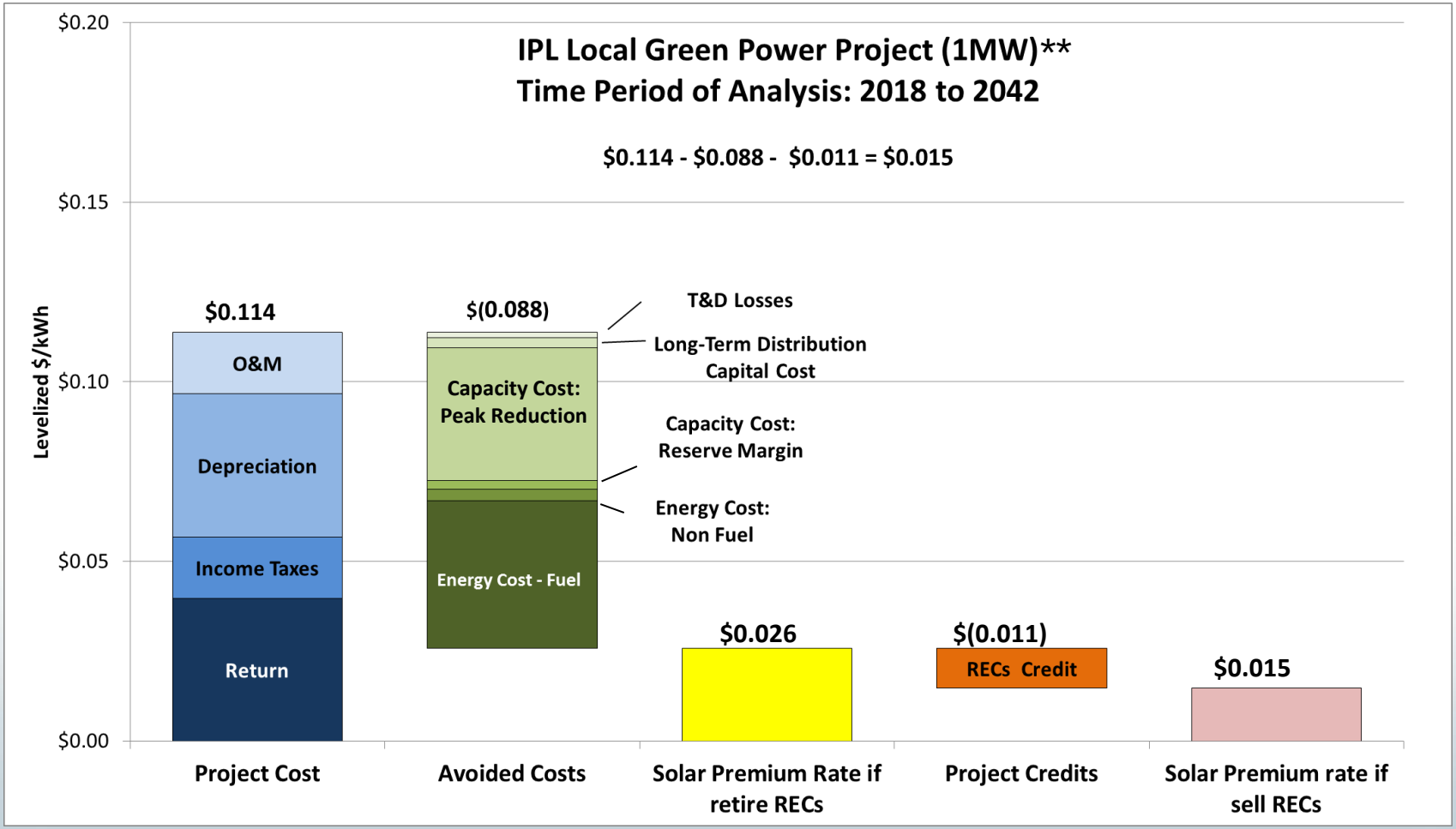
Illustrative Potential Solar Costs & Credits – 3 of 3



**The analysis presented is a snapshot in time and is for discussion purposes ONLY and not intended for a regulatory filing.

Determining 25 year levelized Revenue Requirement**

	1	2	...	24	25
(2018-2042 - 25 year asset life)	**2018**	**2019**	**...**	**2041**	**2042**
Solar Production (kWh)	1,576,800	1,568,916		1,405,101	1,398,075
Investment Balance	$ 1,470,700	$ 1,411,872		$ 117,656	$ 58,828
Project Cost					
Return	$ 134,872	$ 129,477		$ 10,790	$ 5,395
Recovery Depreciation	$ 60,030	$ 60,030		$ 60,030	$ 60,030
Recovery O&M	$ 20,409	$ 20,911		$ 35,691	$ 36,569
Total Project Cost	$ 215,310	$ 210,418		$ 106,511	$ 101,994
Levelized Rate ($/kWh)	**$ 0.114**				
Project Credits					
Solar RECs Credit	$ (12,812)	$ (13,140)		$ (24,290)	$ (25,014)
Levelized Rate ($/kWh)	**$ (0.011)**				
Avoided Costs					
Avoided Energy Cost - Fuel	$ (51,408)	$ (54,633)		$ (71,666)	$ (71,734)
Avoided Energy Cost - Non-Fuel	$ (3,942)	$ (4,189)		$ (5,495)	$ (5,501)
Avoided Long-Term Dist Capital Costs	$ (3,429)	$ (3,497)		$ (5,380)	$ (5,486)
Avoided Cap Cost - Reserve Margin	$ (2,306)	$ (2,843)		$ (5,744)	$ (5,744)
Avoided Cap Cost - Peak Reduction	$ (32,938)	$ (40,613)		$ (82,064)	$ (82,064)
Avoided T&D Losses ($/kWh)	$ 0.001	$ 0.001		$ 0.002	$ 0.002
Avoided T&D Losses	$ (1,692)	$ (1,904)		$ (3,066)	$ (3,070)
Total Avoided Cost to Solar Customers	$ (95,715)	$ (107,678)		$ (173,416)	$ (173,598)
Levelized Rate ($/kWh)	**$ (0.088)**				
Net Charge to Customer w/ monetizing RECs	$ 106,784	$ 89,599		$ (91,194)	$ (96,618)
Net Charge to Customer w/o RECs	$ 119,595	$ 102,739		$ (66,905)	$ (71,604)
Levelized Premium Solar Rate ($/kWh) w/ monetizing RECs	**$ 0.015**				
Levelized Premium Solar Rate ($/kWh) w/o monetizing RECs	**$ 0.026**				

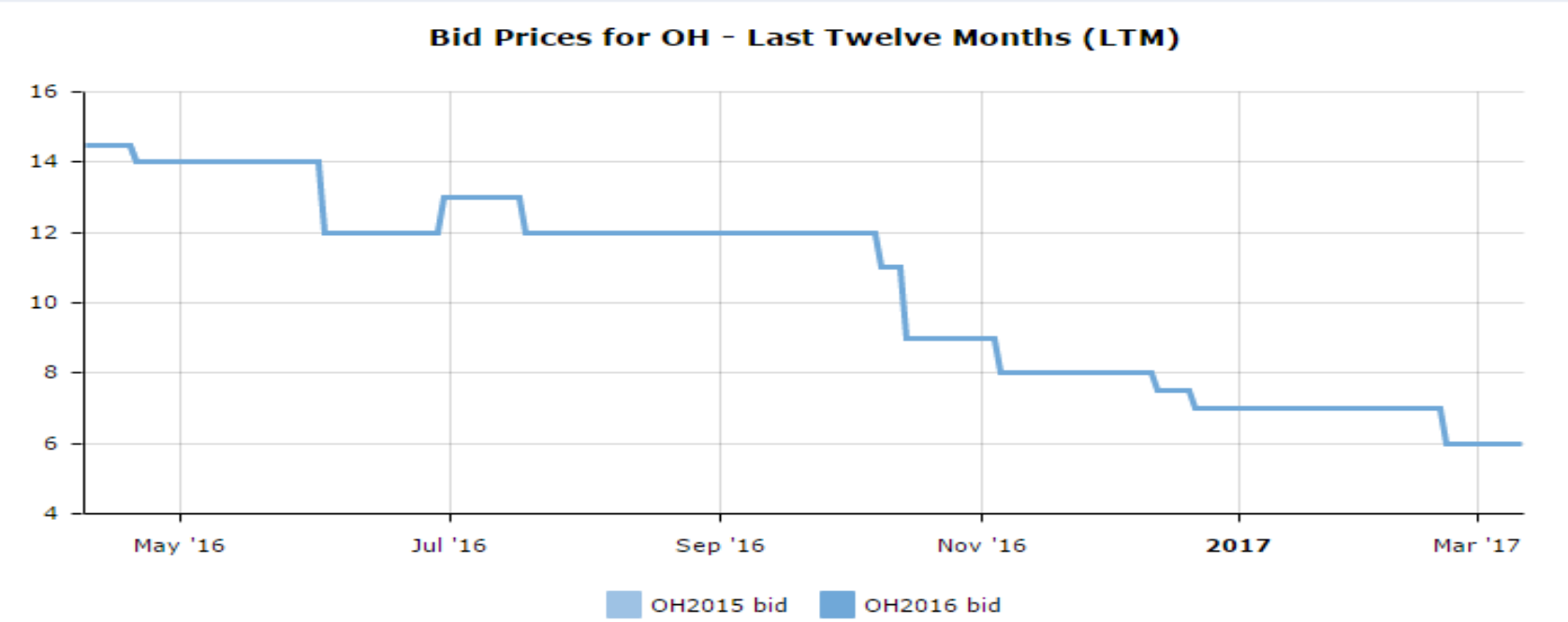
**The analysis presented is a snapshot in time and is for discussion purposes ONLY and not intended for a regulatory filing.

Solar Resource Energy Credit (RECs) Pricing

DC MA MD NJ **OH** PA

*Publically available at: www.srectrade.com
Retrieved on: March 13, 2017

Get more data



Measurable Improvement in Premium Solar Rate

Modeling Vintage**	Capital Cost for >1MW ($/W AC)	Levelized Premium Solar Rate ($/kWh) – retiring the RECs	Levelized Premium Solar Rate ($/kWh) – monetizing the RECs
March 2016	$2.93[1]	$0.095	$0.065
March 2017	$1.91[2]	$0.026	$0.015

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[1] Solar capital cost source: 2015 SunShot National Renewable Energy Laboratory (NREL) Solar Report, Photovoltaic pricing trends

[2] Solar capital cost source: NREL Annual Technology Baseline for 2016, http://www.nrel.gov/analysis/data_tech_baseline.html

2018 vs 2019 Community Solar Build

Modeling Vintage**	Capital Cost for >1MW ($/W AC)[1]	Levelized Premium Solar Rate ($/kWh) – retiring the RECs	Levelized Premium Solar Rate ($/kWh) – monetizing the RECs
2018 Build	$1.91	$0.026	$0.015
2019 Build	$1.71	$0.016	$0.005

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[1]Solar capital cost source: NREL Annual Technology Baseline for 2016, http://www.nrel.gov/analysis/data_tech_baseline.html

Findings & Future Economic Analysis

- Volumetric Rate Premium appears to be at an attractive level
- IPL would competitively bid project
- IPL will update assumptions in the model
- IPL will begin to model approaches consistent with the design of a program
  - Lease payment (fixed monthly)
  - Rate payment (volumetric monthly)
  - Upfront payment (initial investment)
- Tax benefit may change with a partner

Discussion

Next Steps - Timeline

Date	Research Task
March 28th	Finalize and send surveys
April 14th	Receive survey results
Late April	Contact potential focus group participants
May 2nd , 3rd or 4th	Conduct the three (3) focus group meetings
May	Conduct Large C&I interviews
April - May	Summarize findings
June 2nd	Publish draft report
June 9th	*LGP AC Meeting 3*

Preview of Next Meeting

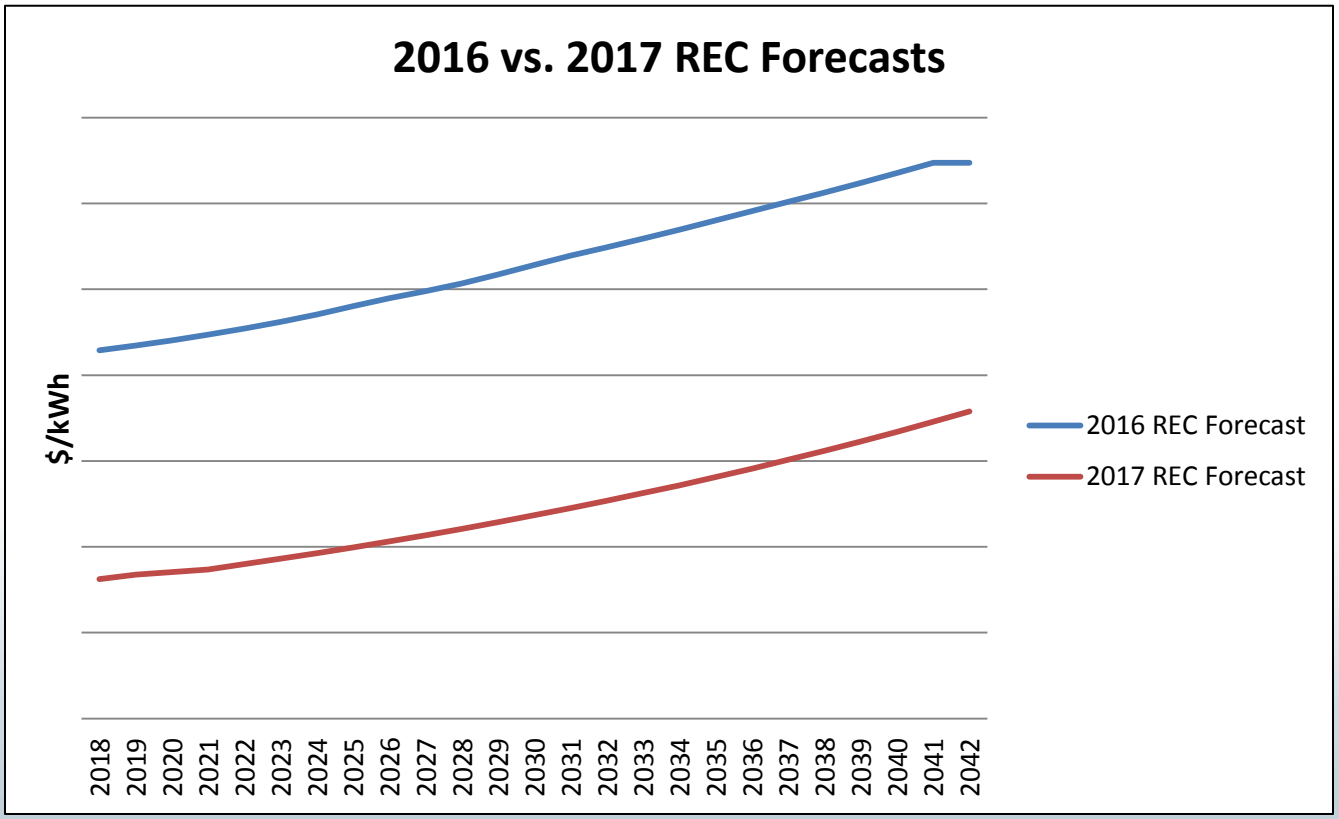
- 2017 LGP AC Meeting #3: Friday, June 9
  - Review draft customer market research report
  - Discuss findings, including preference for certain program design elements
  - Gather stakeholder feedback
  - Establish program goals, initial KPIs and high level implementation timeline if appropriate

Thanks for participating!

Feel free to contact IPL with any questions or follow up items before the next 2017 LGP AC Meeting.

Appendix

REC pricing comparison



2017 IPL Local Green Power Advisory Committee (LGP AC)

Customer Market Research Results

Meeting #3

June 9, 2017

Welcome & Safety Message

Ice Breaker

Meeting Agenda

- Recap of 2017 LGP AC Key Milestones
- Results of IPL/SEPA Customer Market Research Efforts
  - Surveys
  - Focus Groups
- *Break*
- Results of IPL/Smallbox Large C&I Customer Interviews
- Ideas for Consideration
- Discussion

Key milestones

Jan 2017
IPL notified of SEPA award

March 3
LGP AC Meeting 1

March 22
LGP AC Meeting 2

Late March
Finalize and send surveys

Early May
Conduct focus groups

Mid-May
Conduct Large C&I interviews

Early June
Publish draft report

June 9
LGP AC Meeting 3

Customer Market Research Results: Surveys

Survey Results
Participation

An online survey was distributed to customers via email in April 2017.

82,867 customers targeted by survey

4,318 residential customers started the survey

3,999 residential customers completed

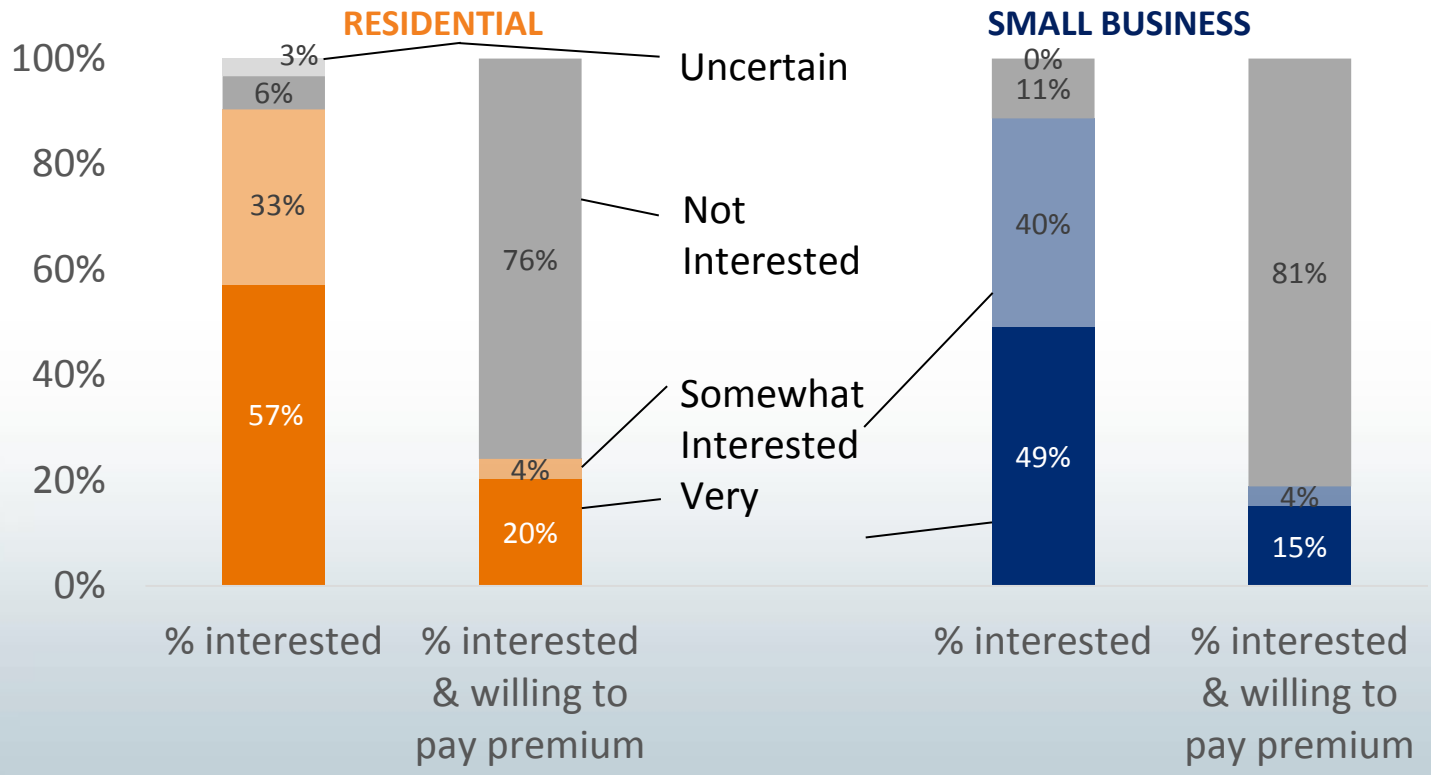
53 small business customers started the survey

47 small business customers completed

Survey Results

Customer Interest

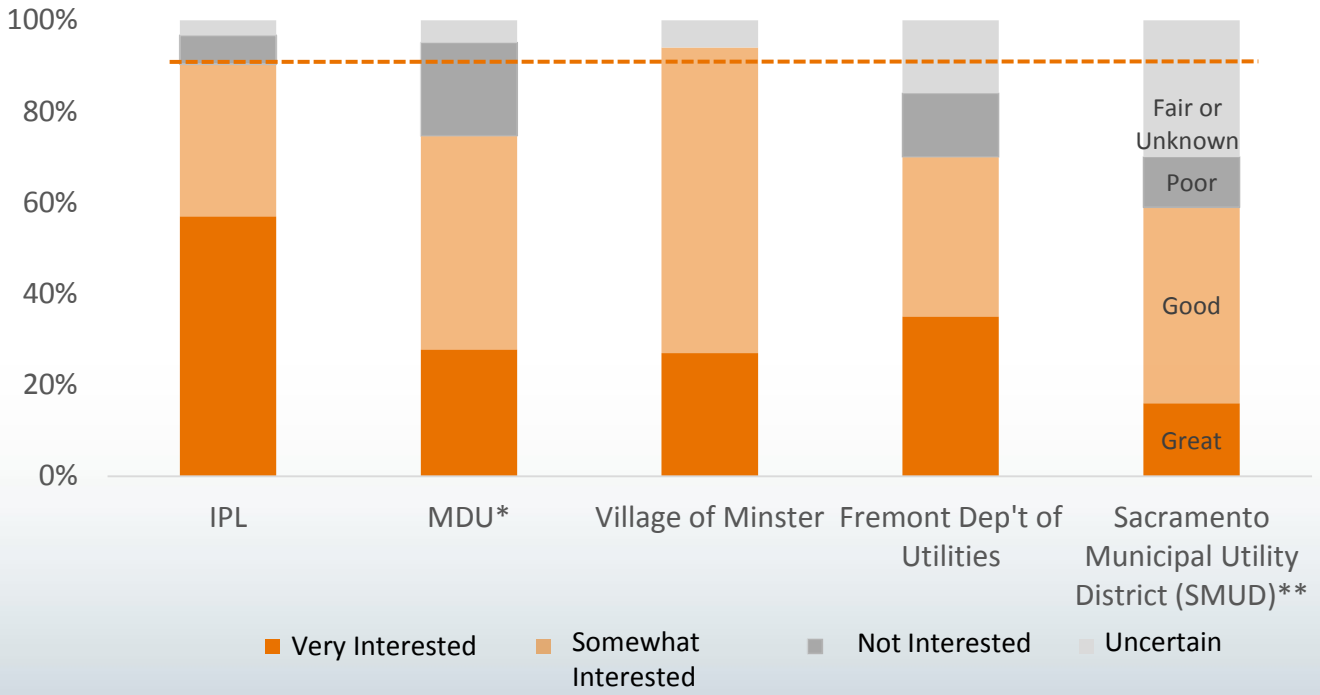
How interested are you in learning more about participating in an IPL community solar program?



Survey Results

Customer Interest Comparable

How interested are you in learning more about participating in an IPL community solar program?



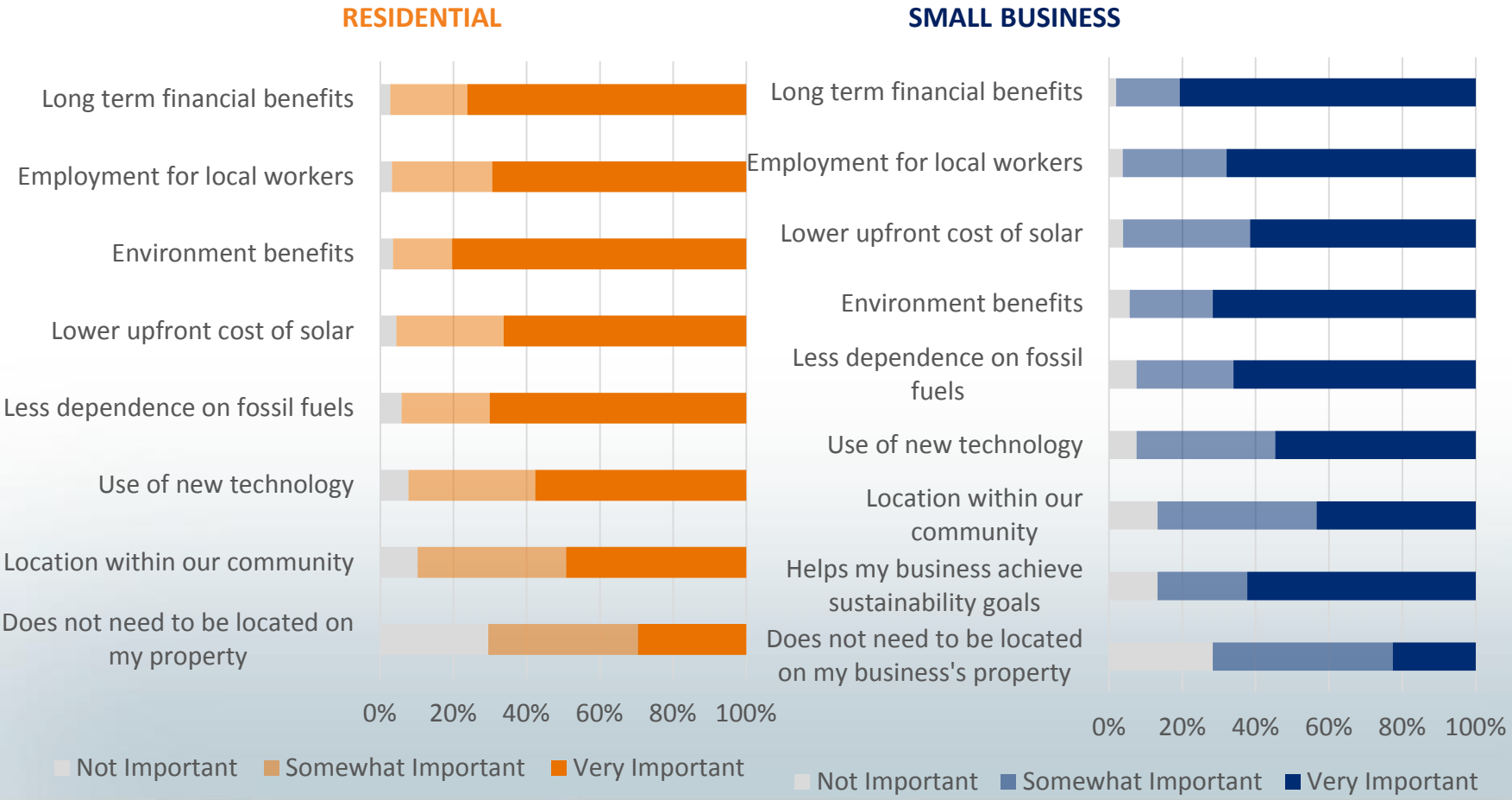
*Montana Dakota Utilities

**The SMUD survey varied by asking respondents to rate the program concept.

Survey Results

Key Benefits

How important are the following potential benefits of the community solar program to you?



Survey Results
Supportive Comments

Smart Electric Power Alliance

Of the 464 responses providing comments, 167 were positive, 258 were neutral and 39 were negative.

Example positive comments:

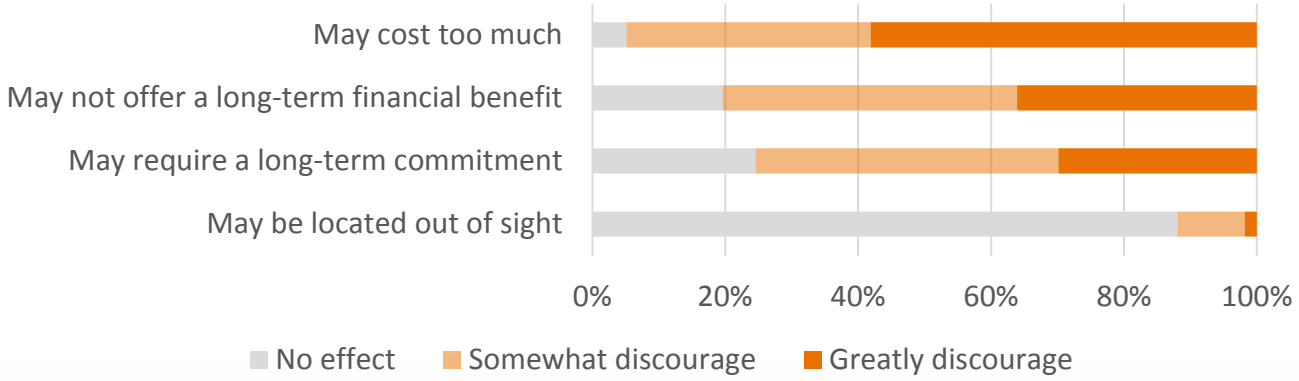
- *About time! / Could I say this is about time!*
- *Got to save that environment.*
- *YES PLEASE / YES! YES! YES!*
- *Great idea /This would be great / Great! I love it.*
- *We are a pro-solar family but have not opted for rooftop panels yet. this would be awesome.*
- *Wish I could afford my own put I'll take what I can get. IPL is moving in the right direction*
- *I'm all in because I'm not a dummy*
- *Would LOVE to be involved in a solar program!*
- *We'd go entirely solar if we could.*

Survey Results

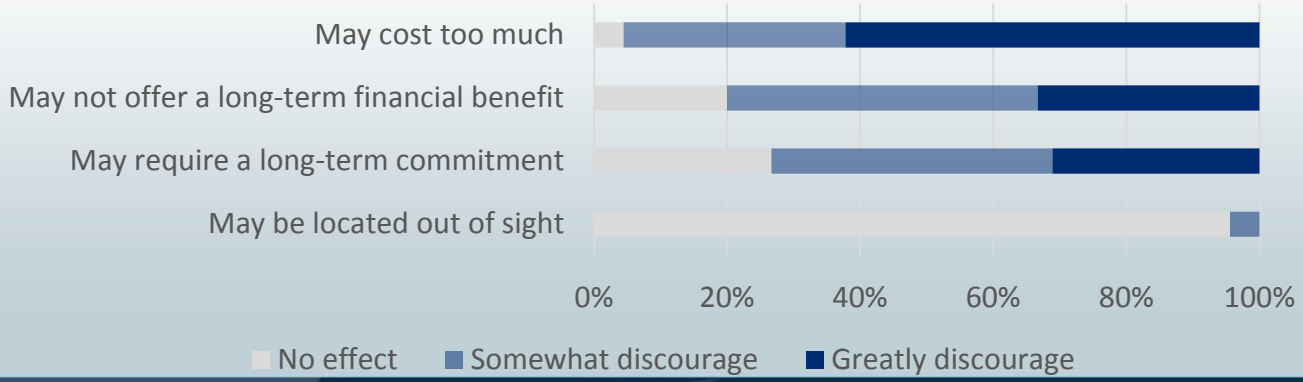
Key Barriers

How much would each of the following potential issues discourage you from participating in an IPL community solar program?

RESIDENTIAL



SMALL BUSINESS



Survey Results
Customer Concerns

Smart Electric Power Alliance

Below is a sample from the 39 negative comments:

General distaste

- *Greed is a great motivation in corporations, even not-for-profits, until it gets in the way of creating freedom for all. This is a sophisticated plan IPL considering, but it seems it's about sharing risk and making the company look more invested in alternative energy than is truthfully is. Image is so critical when you are a utility. This feels more like a PR ploy than an actual altruistic venture.*
- *Continue burning Indiana coal*
- *I don't want to be an early adopter. / I do not adjust well to change /I'm a very busy person*

Concerns about payback

- *Too costly for the time being - want to move that way*

Confusion about Offering

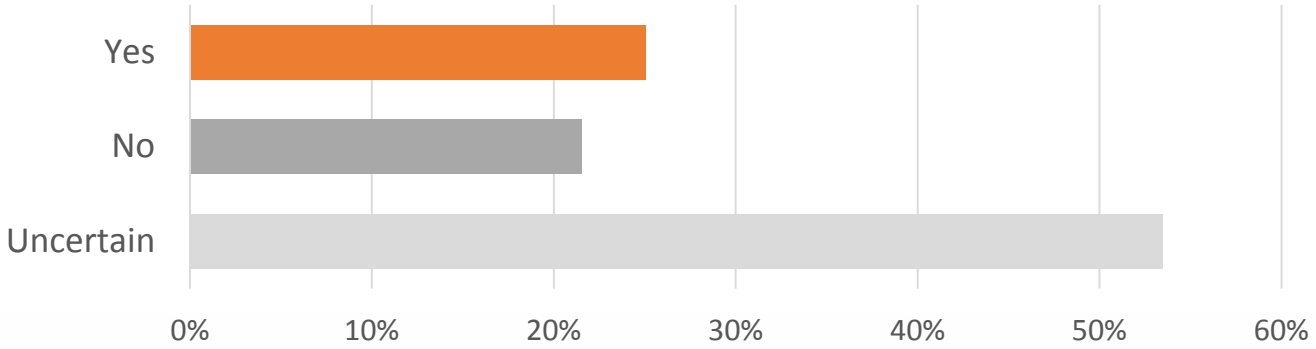
- *I'm in an HOA which doesn't allow solar panels / But I rent... / I already have a solar light.*

Survey Results

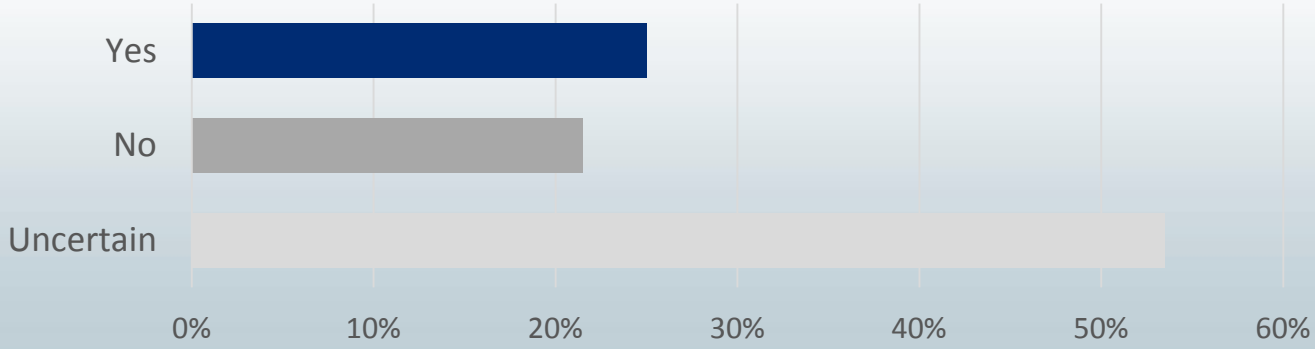
Willingness to Pay any Premium

Would you be willing to pay a premium to voluntarily participate in an IPL community solar program?

RESIDENTIAL



SMALL BUSINESS



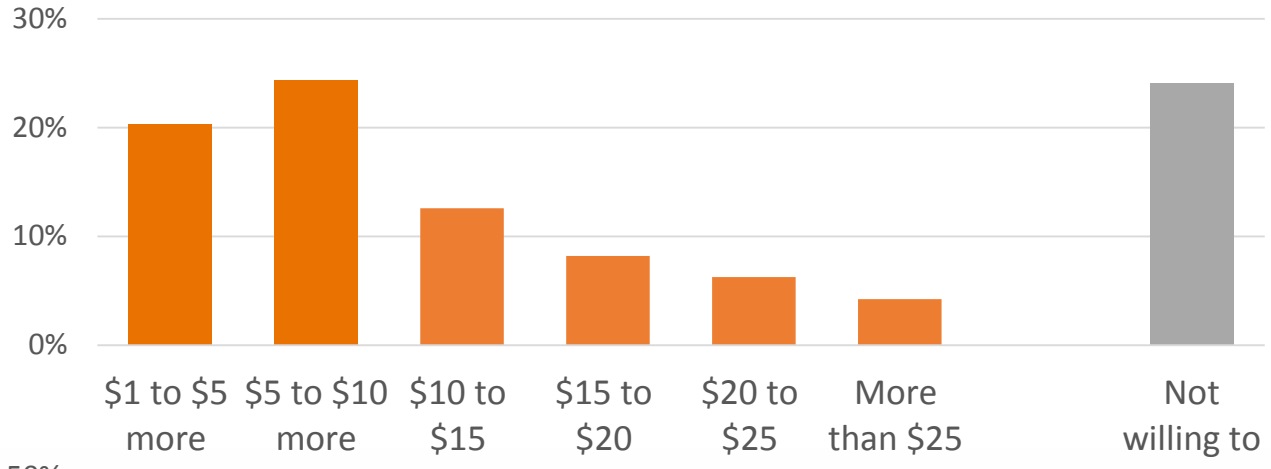
Survey Results

Premium Amount

Assuming your bill mirrors the average IPL residential customer bill of $100 a month, what is the highest additional amount you would be willing to pay to power your home with solar energy?

RESIDENTIAL

Sample Average Bill	$115
Sample Median Bill	$100
Sample Range	$20 to $400



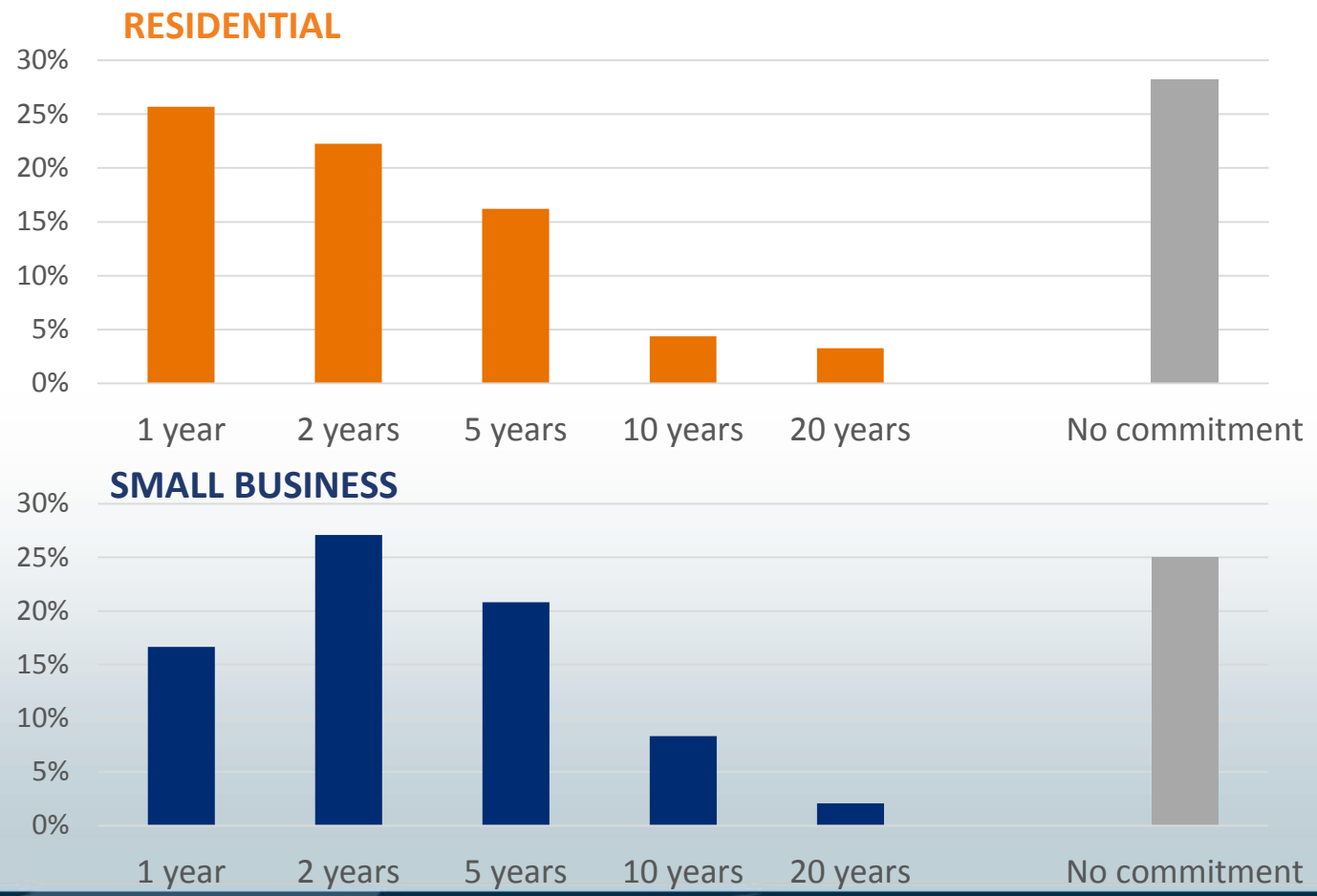
SMALL BUSINESS

Sample Average Bill	$1,180
Sample Median Bill	$500
Sample Range	$50 to $20,000

Survey Results
Contract Length

Smart Electric Power Alliance

……what is the maximum length of time to which you would be willing to commit?



Customer Market Research Results: Focus Groups

Focus Group Findings

IPL conducted three focus group meetings on May 3, 2017.
Group 1 – 10 Small Businesses

Group 2 – 12 Homeowners

Group 3 – 12 Renters

Key Takeaways:

- **Interest in solar is primarily driven by saving money, followed at a distance by environmental concerns.**
- **Two to three year program terms were deal breakers for many of the participants.**
- **RECs were not a meaningful value to most.**
- **For the most part, customers were not concerned where the solar facility would be located.**
- **Customers were fairly split between interest in paying more and locking in a rate vs paying a bit less.**

Focus Group Findings

Universal Comments by All Groups

Smart Electric Power Alliance

Interest in solar is primarily driven by saving money, followed at a distance by environmental concerns.

- "Whatever reduces my electric bills." – business
- "Solar doesn't have any fuel costs. The price should drop over time." - rental
- "I'm 72. I just don't see how I could benefit from this program? Can I pass it on to my children?" – homeowner

The participants were fairly split on the impact of a potential sign up fee.

- "I'm fine with it if you want to pay my $50 fee."
- "Sure. No problem."

Focus Group Findings

Universal Comments by All Groups

Smart Electric Power Alliance

Two to three year program terms were deal breakers for many of the participants.

- "This is a newish technology that's still improving. I'd be nervous that signing up for a longer term contract would hurt my ability to improved programs."
  - homeowner
- "I don't even like to sign up for cable TV contracts." - homeowner
- "A year even feels a bit long for me. Can this be offered as a 6 month contract or less?" - renter

Focus Group Findings

Universal Comments by All Groups

Smart Electric Power Alliance

RECs were not a meaningful value to most.

- "RECs seem more about bragging rights. I'm more concerned with creating real change." - homeowner
- "I do want to get some recognition for participation. I paid for it. I might as well get a sign or sticker." - business

Focus Group Findings

Universal Comments by All Groups

Smart Electric Power Alliance

For the most part, customers were not concerned where the solar facility would be located.

- "Wherever it is most cost effective." - business
- "I like that the upkeep cost of a large rectangular facility is going to be much cheaper than having to maintain some panels on my roof, some on yours, some on yours." – business
- "If you can't see where it is, can you be really sure that you're getting solar energy?" - renter

Focus Group Findings

Homeowner Specific Comments

Smart Electric Power Alliance

Customers were fairly split between interest in paying more and locking in a rate vs paying a bit less.

- "So there is the potential that I could one day be paying less than the rest of customers. I like this." - homeowner
- "What happens if rates go down? Do I pay less?" - homeowner

Overall Focus Groups Impressions

- Education would be essential to help customers understand that this would not be a service, but a community program which they are supporting.
- This would be a voluntary program not an "Uber" service.
- This program may be one of many IPL customer offerings.
- Other?

Break

Customer Market Research: Large C&I Customer Interviews

Large C&I Customer Market Research

IPL interviewed five customers with a local third party facilitator, SmallBox Consulting.

- Eli Lilly and Company
- Rolls-Royce
- Indiana University Health
- Butler University
- ConAgra Foods

*The companies above wish to remain anonymous. Please do not share their names.

Key takeaways

- Most customers have explored investing in on-site solar energy in the past, but did not proceed due to cost.
- Paying a premium can be a non-starter… Unless the organization has a history or value of investing in sustainability.
- Beyond cost, achieving sustainability goals and Public Relations value are the main drivers in solar adoption.
- Public Relations examples:
  - Employee visibility
  - Customer visibility
  - Student education component
  - Competitive advantage versus other industry players
  - Public visibility

Additional takeaways

- All customers expressed interest in the community solar concept… as long as it is a cost-neutral option.
- One customer cited a target solar cost of $1.00/W.
- Customers described participation in voluntary sustainability reporting.
  - Carbon Disclosure Project
  - American College & University Presidents' Climate Commitment
- Desired contract length varied dramatically between 1 year and 20 year commitments.

Interview lessons learned

- Opportunity to talk with customers was very favorable
- In-person was much more effective than phone only
- Variety of sustainability approaches ranging from minimal to all in
- Contract term of 3 -5 years was most prevalent
- For most customers, cost is the primary driver
- Customers expect future solar costs to be lower
- Customers seek future cost certainty
- If a corporate anchor customer commits, 1 MW array is too small

Ideas for consideration

1. How do these results confirm or differ from your expectations?
2. What offering structure will support customers' interests?
3. What can we learn from other companies?
4. How might we recognize the personal commitments of participants, e.g. window sticker, access to real time solar data?
5. What else do we need to consider?

Discussion

Thanks for participating!