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A Report Prepared for:

SaskPower

"Let's Talk Solar" Final Report

April 28, 2017

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Executive Summary

There is growing interest in solar energy in Saskatchewan. The cost of installing solar panels has fallen sharply in recent years and Saskatchewan is home to the best solar resource in Canada.

Growing interest in solar energy has meant renewed interest in SaskPower's existing self-generation programs. Stakeholders would like to see these self-generation programs improved and offered suggestions on how to improve them.

As changes are made to solar programs, participants felt that decisions should be guided by principles such as: community participation, life cycle sustainability, affordability, quality, and innovation. Participants felt strongly that solar should be recognized for providing pollution reduction benefits, and that it should be part of an integrated vision for reducing greenhouse gas emissions from the Saskatchewan electricity sector.

There are barriers that prevent the adoption of solar generation. Common barriers identified by stakeholders include: lack of education about solar technology and current solar programs, the upfront capital cost of installing solar generation, and questions around the state of technology, including concerns that investing in solar generation too early could mean missing the next wave of solar technology innovations.

Participants support continued incentives for solar energy generation. Specific program ideas to enable solar generation included: an enhanced Net Metering program, a new Virtual New Metering program, a Feed-In-Tariff program, and a market based program that would create grid access for self-generators.

The diversity of program ideas highlights that there were diverse perspectives expressed in the engagement process. There were competing views on how SaskPower's business model should evolve into the future. The authors have worked to represent stakeholders' views to the best of our ability. We hope that stakeholders find their voices echoed within this report.

Who We Are

Brett Dolter, PhD

Brett is an ecological economist specializing in climate and energy policy and is the Principal at B.D. Green Solutions. His PhD research focused on greening the Saskatchewan electricity system.

Martin J Boucher, PhD Candidate

Martin is a PhD candidate at the University of Saskatchewan's School of Environment and Sustainability researching socio-technical transitions and sustainable energy pathways.

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Insightrix Research Inc. (www.insightrix.com) provides consulting services in study design, questionnaire development, data collection, qualitative services (such as focus groups), and data analysis. With headquarters in Saskatoon, SK, Insightrix is wholly Canadian-owned and managed by two partners, Corrin Harper, MBA (President), and Larry Goodfellow, MBA (Chief Financial Officer).

Scope of the Work

This report summarizes the results of a SaskPower initiated stakeholder engagement process carried out in Saskatchewan from February to March 2017.

The purpose of the stakeholder engagement process was to inform the development of a solar strategy for SaskPower, and consider ways to refine and potentially expand customer solar programs in accordance with SaskPower's solar strategy.

The engagement process consisted of collaborative, hands-on workshops where a cross-section of expert stakeholders were asked to design solar generation programs for the province (see Appendix A); focus groups where members of the general public (urban/rural, residential/business) with some interest in solar were asked to provide feedback on self-generation and solar generation programs in Saskatchewan (see Appendix B); employee input and feedback; and online feedback opportunities (including a survey) that invited Saskatchewan residents to share their views on solar and solar programs.

SaskPower partnered with Brett Dolter and Martin Boucher to conduct the stakeholder workshops and Insightrix Research to conduct the focus groups. An online survey was hosted on SaskPower's external and internal websites from February 16, 2017 until March 31, 2017.

This report is the product of a collaboration between Brett Dolter, Martin Boucher, and Dylan Cody (Insightrix Research).

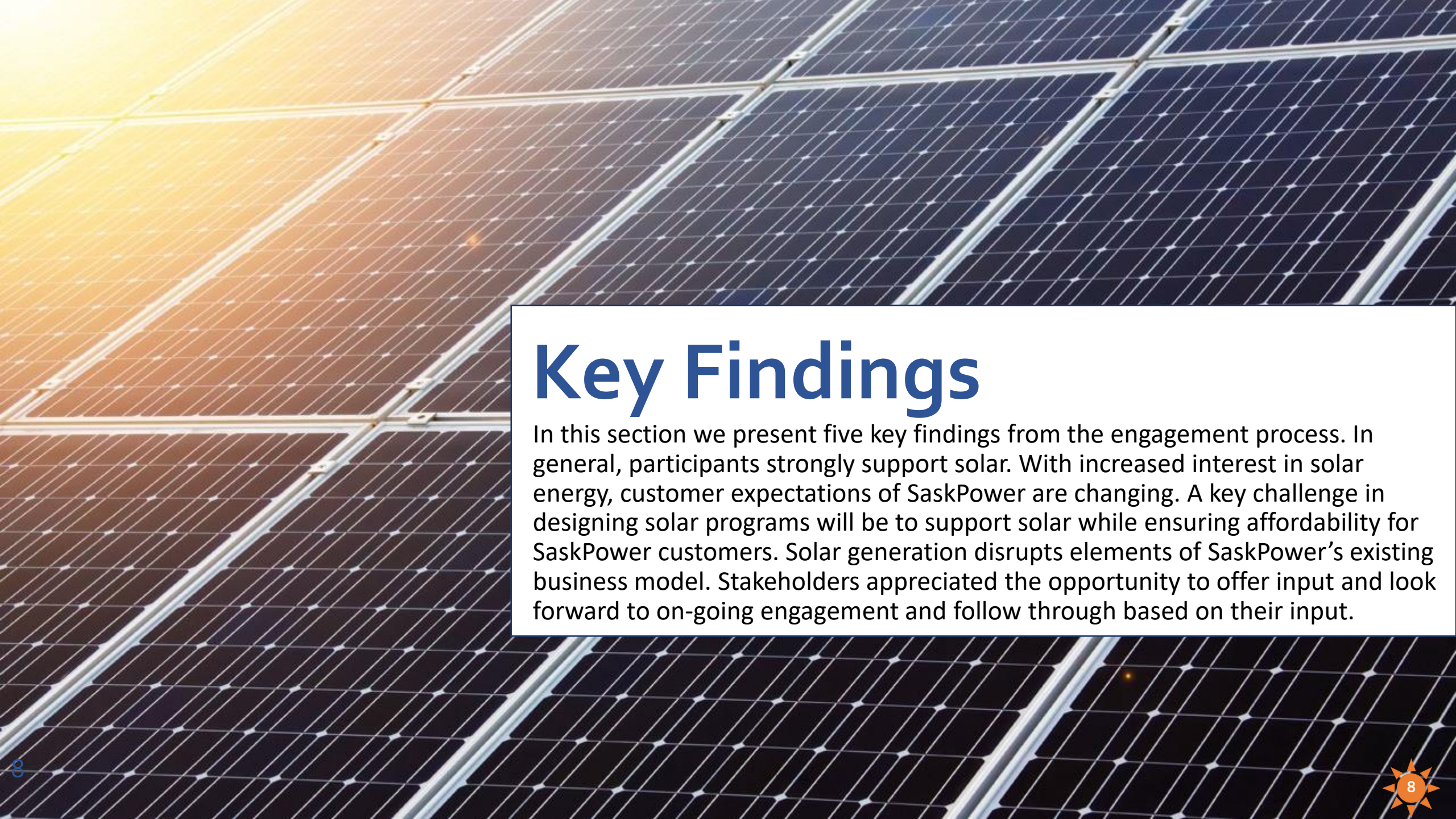
Participation in the Process

- In total, seven external workshops were held between February 16 – March 31, 2017. The workshops were attended by 232 stakeholders representing solar vendors, environmental non-profit organizations, urban and rural municipalities, provincial government, business associations and organizations, First Nations, university students, and SaskPower staff;
- An online public survey was made available on SaskPower's website from February 16 – March 31, 2017. There were 625 responses to the online survey by the public and 261 responses from staff at SaskPower.
- In total, six focus groups were held across Saskatchewan. Each focus group consisted of 7-8 invited representatives of the public who had indicated some degree of interest in solar generation (see Appendix B).
- In addition to the external consultation and engagement activities, SaskPower employees were also given an opportunity to contribute through an internal workshop and an internal online survey that generated 261 responses.

Acknowledgements

The authors would like acknowledge the support of the following individuals and groups:

- **SaskPower Solar Team:** Janson Anderson (Project Lead) Director, Customer Programs; Iain Harry (Stakeholder Lead) Director, Clean Energy; Raman Mall (Technical Lead) Senior Engineer, Supply Planning & Integration; Corinne Hauglum (Finance Lead) Consultant, Finance; Tyler LeCouffe (IT Lead) Specialist, IT&S; Zenia Birnie (Admin Lead) Administration Coordinator, SaskPower/NorthPoint.
- **Workshop Facilitators:** Stephen Hall, Shawn Silzer, Dylan Cody, Ruth Muturi, Adedamola Idowu, Megan Hinzman, Bethany Templeton, Sandra Moore, Ayodele Olagunju, Mike Cavallaro, Jania Chilima, Bonnie Heilman, Michael Paul, Jibodu Gbolahan, Chris Matzke, Petergaye Gilliard.
- **Photographer:** Workshop photos within this report were taken by Stephen Hall.
- **Collaborators:** Trent Blezy and Kathleen McNutt from the Johnson-Shoyama Graduate School of Public Policy.
- **Participants:** The participants from around the province who volunteered their time to provide input on solar in Saskatchewan.



Key Findings

In this section we present five key findings from the engagement process. In general, participants strongly support solar. With increased interest in solar energy, customer expectations of SaskPower are changing. A key challenge in designing solar programs will be to support solar while ensuring affordability for SaskPower customers. Solar generation disrupts elements of SaskPower's existing business model. Stakeholders appreciated the opportunity to offer input and look forward to on-going engagement and follow through based on their input.

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1. Strong Support for Solar Generation

There was strong support for solar generation throughout the engagement process:

- Workshop participants generally supported solar generation and wished to see it expand;
- On-line survey respondents overwhelmingly favoured solar generation. Of the 150 respondents who commented on their support for solar, over 90% wanted SaskPower to support solar-generation (see chart). Put another way, of the 886 participants who completed an on-line survey, only 14 individuals (1.6% of respondents) thought that SaskPower should not support solar;
- Focus group participants were unanimously interested in solar and wished to learn more about it.

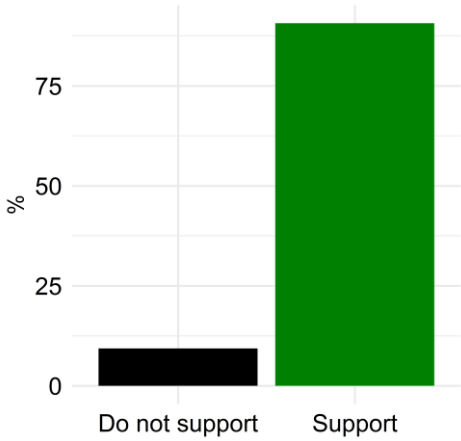
In considering whether to invest in solar generation, participants identified the following benefits and concerns:

Benefits

- Save money after initial investment
- Reduce greenhouse gas emissions
- Become less dependent on electricity provider
- Profit by selling back to SaskPower
- Support clean, sustainable energy

Concerns

- Large upfront investment
- Return on investment not high enough or too far in the future
- May be too soon to invest because solar technology could improve
- Unsure if it would increase property taxes, or raise or lower the value of one's home
- Ongoing maintenance costs, ability to withstand hail, and impact on one's roof



Survey Respondents' Solar Generation Support

2. Changing Expectations of SaskPower

There are changing expectations around SaskPower's role in solar generation. Participants recommended SaskPower:

Support Solar Generation

Participants would like SaskPower to support solar generation with:

- **Education:** Provide information outlining how solar generation works
- **Programs**: Provide supportive programs such as incentives, financing, and shared solar investment opportunities

Enhance Customer Focus

Participants desired a new customer relationship based on:

- **Partnership:** Pursue solar projects with individuals, businesses, and communities
- **Customer Service:** Simplify the application process, and improve connection times
- **Protection:** Certify the quality of solar vendors and installed solar technology

Demonstrate Leadership

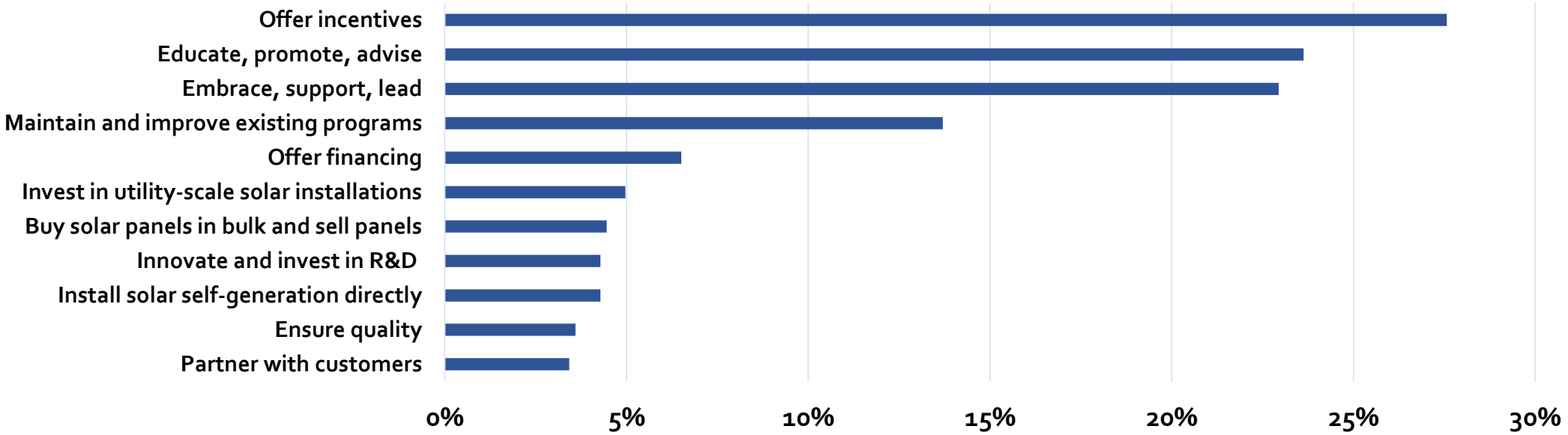
Participants asked SaskPower to demonstrate:

- **Environmental leadership:** Champion renewable energy, and achieve ambitious greenhouse gas emissions reductions
- **Technology leadership:** Demonstrate innovative technologies and approaches to solar generation, storage, and micro-grids

3. Contrasting Views on the Affordability Challenge

There is a tension between participants' interests in supporting solar generation and participants' concerns about the affordability of electricity. On one hand, participants would like SaskPower to offer incentives for solar generation. For example, when asked 'What role should SaskPower play to best support Solar Power in Saskatchewan?', on-line survey respondents most often responded that SaskPower should 'offer incentives' (see chart below).

What role should SaskPower play to best support Solar Power in Saskatchewan?



On the other hand, participants also expressed concerns that offering incentives to solar self-generators could lead electricity rates to increase, which would in turn harm low-income customers. For that reason, participants encouraged SaskPower to consider equity impacts when designing solar generation programs. Many wanted to see incentives and financing offered to solar adopters but not at the cost of those who cannot afford solar. These contrasting views create a challenge for the design of SaskPower's solar programs.

4. Game-Changing Potential of Solar Technology

Solar generation has the potential to disrupt the Saskatchewan electricity system. Below we summarize some of the ways in which solar generation challenges the existing electricity utility business model.

Equity Impacts
Self-generators can install solar to reduce their electricity bills. Participants expressed concern that payments to self-generators could increase the electricity bills of non-self-generators

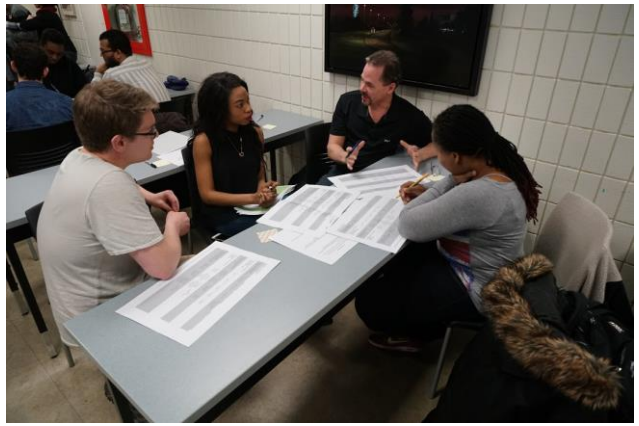
Customer Participation
Customers want to participate in the electricity system as self-generators, investors, and owners

Electricity Grid Management
Change from one-way flow of electricity from generator to customer, to two-way flow of electricity

Environmental & Health Benefits
Solar is an emissions-free generation technology & advocates are asking for recognition of its pollution-reduction benefits

Variability Management
The variable nature of solar electricity requires a flexible generation system, and opens up the potential to explore electricity storage options

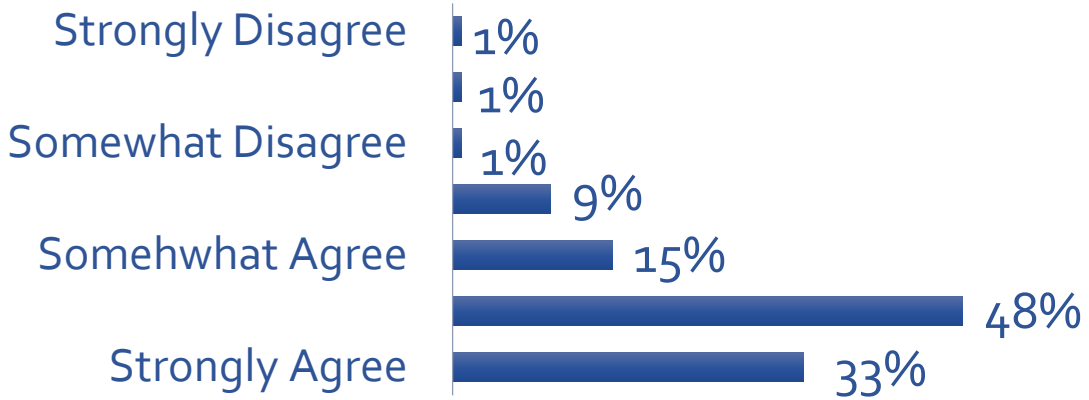
5. Desire for Continued Engagement and Follow Through



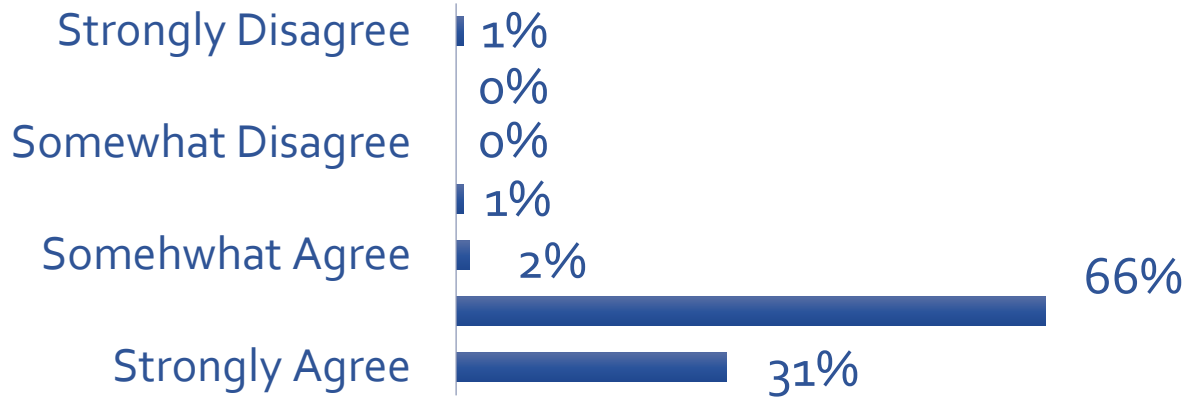
The workshop exit surveys indicated that participants enjoyed the experience and would like to be involved in on-going stakeholder engagement events in the future.

SaskPower can build on the momentum created by this process by implementing a solar strategy and solar programs informed by the input provided by stakeholders.

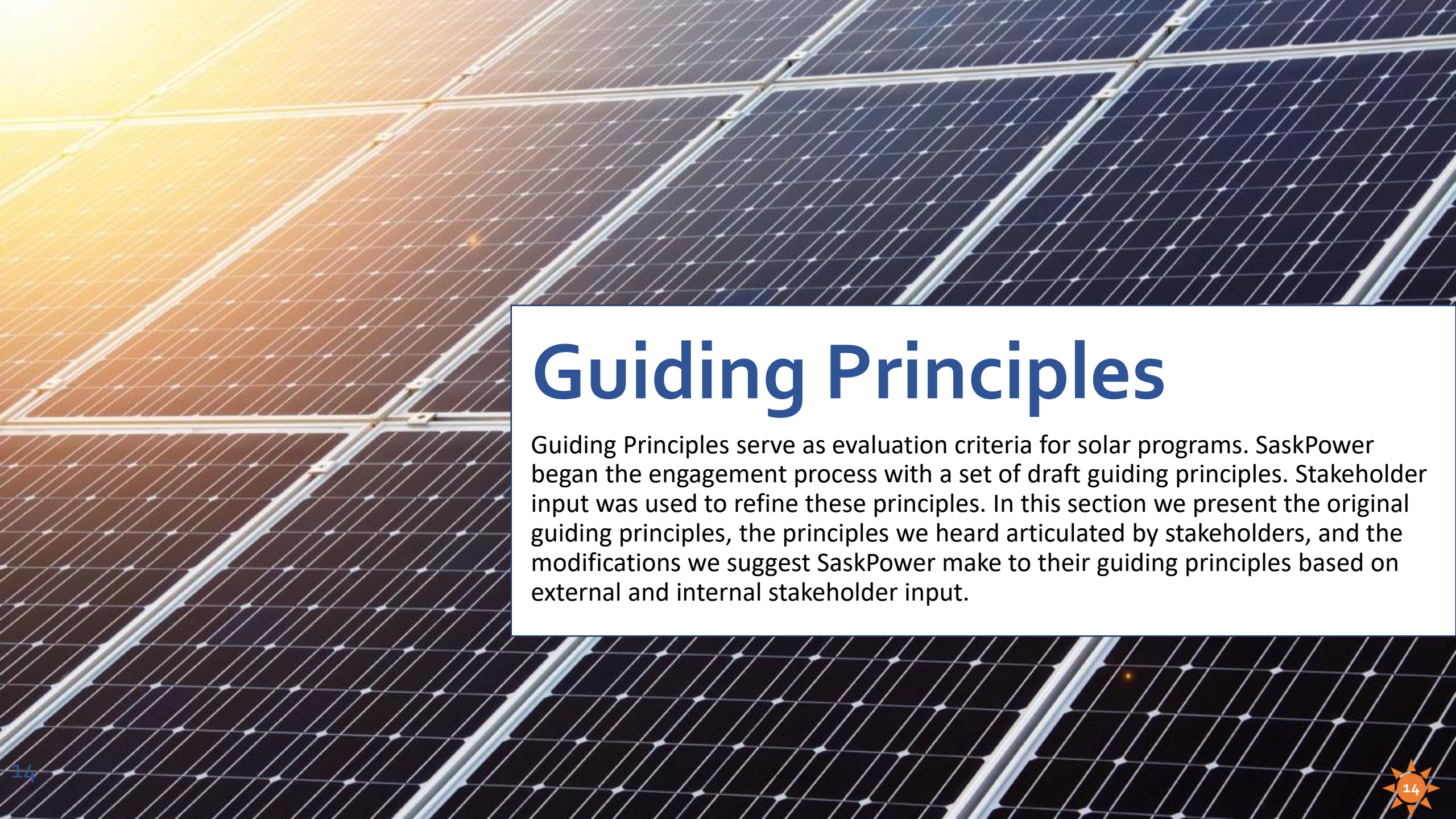
"***The sun is shining, let's get things going***"
Workshop Participant



Based on this experience, I am more likely to become involved with similar stakeholder engagement events.



I enjoyed the experience of interacting with others in a workshop setting.



Guiding Principles

Guiding Principles serve as evaluation criteria for solar programs. SaskPower began the engagement process with a set of draft guiding principles. Stakeholder input was used to refine these principles. In this section we present the original guiding principles, the principles we heard articulated by stakeholders, and the modifications we suggest SaskPower make to their guiding principles based on external and internal stakeholder input.

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SaskPower's Original Solar Strategy Mission, Goals, and Guiding Principles

Mission

Recommend how SaskPower will support solar for Residential, Small & Medium Businesses and communities in Saskatchewan.

Goals

Development of a broad customer and community solar strategy that:

1. Meets the growing customer interest in solar generation;
2. Addresses longer-term financial implications for SaskPower and its customers;
3. Addresses implications for interconnection and system reliability;
4. Explores the merits and SaskPower's role in new solar business models;
5. Identifies the internal resources and approaches required to support program implementation and ongoing management.

Guiding Principles

Ensure solar strategies/programs:

- Are informed by comprehensive stakeholder engagement and input (internal and external);
- Provide a quality end-to-end customer experience (SaskPower and partners);
- Improve customer accessibility and affordability;
- Minimize cross-subsidies from non-solar customers;
- Are financially sustainable;
- Are safe;
- Do not compromise system reliability;
- Leverage partnerships wherever possible;
- Do not impede the growth of the Saskatchewan Solar Industry;
- Are designed flexibly to adapt to change.

Guiding Principles

Workshop participants then provided 260 distinct suggestions. We have coded these suggestions and arranged them by overarching theme in the pages that follow. *Italics* indicate input from participants in their own words, including input from focus group participants and external and internal online surveys. The prevalence of each theme is indicated with the icons according to the key below.

In the workshops we asked,
"*Are these the right guiding principles? Would you change the wording of any? Are any missing?*"

Key

75-100% of workshops mentioned theme

50-74% of workshops mentioned theme

25-49% of workshops mentioned theme

Major theme in focus groups

20%+ mentioned in external online survey

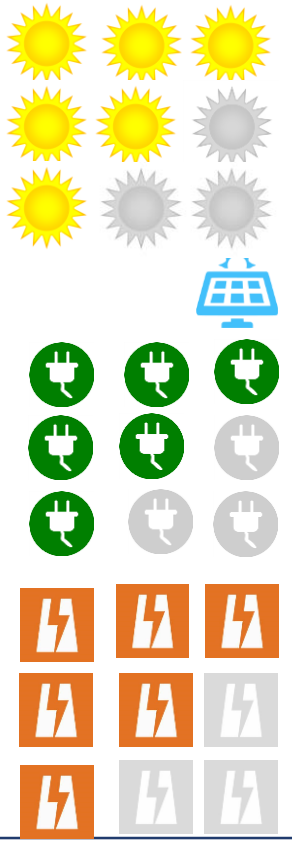
10-20% mentioned in external online survey

5-10% mentioned in external online survey

20%+ mentioned in internal online survey

10-20% mentioned in internal online survey

5-10% mentioned in internal online survey



Guiding Principles

Proactive Education

Highlight the benefits (of solar) to all customers and encourage *greater energy literacy*. This could also include *installer training* and *basic technical training to solar Net Metering customers*. The general public has a low awareness of solar and a desire for more education about how it works, how much it costs, and solar program supports.

Environmental Sustainability

Ensure that solar programs *provide environment benefits* and *reduce environmental impacts.* Programs should be *environmentally sustainable* over the life cycle of solar equipment. To ensure sustainability, *consider the toxicity of panels and inverters* and develop *principles around decommissioning* to ensure panels are *safe at the end of life*.

Integrated Planning

Ensure solar is recognized as an important part of an overall energy program that includes *energy storage goals*, *smart meters*, and *energy conservation*.

Guiding Principles

Foster Innovation

Design solar programs to *foster innovation. Invest in solar technology* and *promote research*. *Partner with other utility companies - public/private* - to understand best practices. *Learn from what has worked in Europe and China. Increase research and development to make it better, be on the forefront of new technology*

Community Participation

Design solar programs to *enable community participation and empower local ownership.* Encourage *partnerships with local institutions*, *First Nation communities*, and *farmers*.

Customer Focus

Provide a quality consumer experience by creating a *more streamlined application process* and *speeding up time for customer connection.* In all programs ensure that *customer satisfaction comes first and value the input of the customers.*

Guiding Principles

Lead and Encourage Solar Industry

Actively encourage growth of the Saskatchewan solar industry by providing *stable and predictable programs* that are *communicated in a way that doesn't send signals to wait for something better.*

Ensure Quality

Provide *quality assurances for solar* by certifying *qualified installers* and *sourcing technology* to *mitigate individual's risk*. There should also be a *focus on safety*, including solar safety education for customers.

On-going Engagement

Ensure solar programs are informed by *ongoing engagement*, including *youth engagement.*

Guiding Principles

Accessibility for All

Ensure solar programs *are accessible to all customers* no matter their location, or the size of the project. Ensure solar programs are also financially accessible and address the high upfront costs of installing solar.

Cost and Affordability of Electricity

SaskPower retains its commitment to the citizens for affordable electricity and not pay as much on their bills.

Decentralized Grid

Encourage the development of micro-grids and this *grid transformation* will lead to a *small is beautiful* model of *distributed solar development.*

Cross-Subsidization Concerns

Some participants took issue with the principle: "*Minimize cross-subsidies from non-solar customers.*" For the utility, cross-subsidization is a concern when self-generating customers are subsidized by non-self-generating customers. For participants, the '*minimize cross-subsidization*' guiding principle evoked reactions from disbelief (*i.e.* there is no cross-subsidy), to justification *(e.g.* the cross-subsidy is a useful incentive; a premium is paid for other generation sources), to calls for the inclusion of the social benefits of solar when accounting for the value of solar generation (*e.g.* greenhouse gas emissions reduction, economic development and employment opportunities for communities, reduced heath care costs, etc.). The issue of cross-subsidization is explored in more depth in Appendix C of the report.

Revise Cross Subsidization

Participants argued a premium is paid for other energy sources like *carbon capture and storage* and for that reason concern for the cross-subsidization of solar is a *red herring* and *bogus*.

Account for Social, Economic & Environmental Benefits

Properly value the environmental and human health consequences of solar, including the *cost avoidance value*, the value of having *generation close to load*, and the *greenhouse gas emissions externality costs*. Participants argued this *full cost* valuation would shift perceptions around cross-subsidization.

Internal Feedback on Guiding Principles

The feedback provided by internal SaskPower staff on the mission, goals, and guiding principles mirrored some of the input provided by external stakeholders and also provided some unique perspectives. The following additional guiding principles arose from internal SaskPower input.

Add Value to SaskPower

Provide *new revenue to SaskPower,* perhaps through *carbon credit sales*. When designing any program *make sure it's a good deal for SaskPower*.

Enhance System Reliability

Enhance system reliability by using *distributed energy generation to help with outage management*, and using *storage to deploy stored solar energy during on-peak use*.

Revising the Guiding Principles

Stakeholder input has provided grounds to modify and improve the mission, goals, and guiding principles drafted by the solar team at SaskPower.

Strong agreement exists on guiding principles such as proactive education, ensuring the life cycle sustainability of solar equipment, and conducting integrated planning to ensure solar generation is part of a comprehensive supply vision for Saskatchewan.

Disagreements exist over the issue of cross-subsidization. A minority of participants feel that cross-subsidization is acceptable, while most feel that efforts should be made to design programs that avoid it (see Appendix C for more detail). Stakeholders emphasized the importance of ensuring affordable power for all customers, especially low-income households. We suggest removing the guiding principle '*minimize cross-subsidization…*' and capturing the sentiment with the guiding principle "*ensure fair financial outcomes and affordability for all customers*."

Internal SaskPower staff echoed many of the points raised by external stakeholders and also suggested additional guiding principles such as ensuring solar programs enhance system reliability, ensuring programs are financially sustainable for SaskPower and all stakeholders, and measuring and monitoring solar programs for cost-effectiveness.

Based on the stakeholder feedback received we suggest a revised mission, goals, and guiding principles. Revisions to the guiding principles based on external stakeholder feedback are presented on the next slide. We then offer additional revisions based on feedback from internal SaskPower staff.

Mission

Recommend how SaskPower will ~~support~~ champion solar for Residential, Small & Medium Businesses and communities in Saskatchewan, and to achieve sustainability.

Goals

Development of a broad customer and community solar strategy that:

1. Meets the growing customer interest in solar generation;
2. Addresses longer-term financial implications for SaskPower and its customers;
3. Addresses implications for interconnection and system reliability;
4. Explores the merits and SaskPower's role in new solar business models;
5. Identifies the internal resources and approaches required to support program implementation and ongoing management;
6. Lowers greenhouse gas emissions;
7. Maximizes renewable energy on the grid; and
8. Improves overall energy literacy of customers by providing accessible information and education.

External Stakeholder Feedback Revision

Based on feedback from stakeholder here are the revised mission, goals, and guiding principles. Additions are indicated in red type while deletions are indicated by ~~strike-through~~ text.

Guiding Principles

Ensure solar strategies/programs:

- Are informed by comprehensive and on-going stakeholder engagement and input (internal and external);
- Provide a quality end-to-end customer experience (SaskPower and partners) and ensure timeliness and ease of application process;
- Improve ~~customer~~ program accessibility and ensure fair financial outcomes and affordability for all customers;
- ~~Minimize cross-subsidies from non-solar customers;~~
- Are financially sustainable while accounting for social, economic, and environmental benefits;
- Are safe and of high quality;
- Do not compromise system reliability;
- Leverage partnerships with local communities, First Nations, institutions, and industry wherever possible;
- ~~Do not impede~~ Encourage the growth of the Saskatchewan Solar Industry with stable and predictable programs;
- Are designed flexibly to adapt to change, foster innovation, and take advantage of synergies with storage and energy conservation; and
- Advance environmentally sustainability by accounting for greenhouse gas emissions, land-use impacts, and project life-cycle impacts of solar.

Mission

Recommend how SaskPower will ~~support~~ champion solar for Residential, Small & Medium Businesses and communities in Saskatchewan, and to achieve sustainability.

Goals

Development of a broad customer and community solar strategy that:

1. Meets the growing customer interest in solar generation;
2. Addresses longer-term financial implications for SaskPower and its customers;
3. ~~Addresses implications for interconnection and~~ Improves system reliability;
4. Explores the merits and SaskPower's role in new solar business models;
5. Identifies the internal resources and approaches required to support program implementation and ongoing management;
6. Lowers greenhouse gas emissions;
7. Enables SaskPower to meet its 50% renewable target by 2030;
8. Diversifies the supply mix and contributes to SaskPower's long-term supply plan; and
9. Improves overall energy literacy of customers by providing accessible information and education.

Internal Stakeholder Feedback Revision

Based on feedback from SaskPower staff here are the revised mission, goals, and guiding principles. Additions are indicated in **purple type** while deletions are indicated by ~~strike-through~~ text.

Guiding Principles

Ensure solar strategies/programs:

- Are informed by comprehensive and on-going stakeholder engagement and input (internal and external);
- Provide a quality end-to-end customer experience (SaskPower and partners) and ensure timeliness and ease of application process;
- Improve ~~customer~~ program accessibility and ensure fair financial outcomes and affordability for all customers;
- ~~Minimize cross-subsidies from non-solar customers;~~ Allow customers to make economically rational decisions;
- Are financially sustainable for SaskPower and all stakeholders while accounting for social, economic, and environmental benefits;
- Are measured and monitored to ensure cost-effectiveness;
- Are safe and of high quality;
- ~~Do not compromise~~ Enhance system reliability;
- Leverage partnerships with local communities, First Nations, institutions, industry and other utilities wherever possible;
- ~~Do not impede~~ Encourage the growth of the Saskatchewan Solar Industry with stable and predictable programs;
- Are designed flexibly to adapt to change, foster innovation, and take advantage of synergies with storage and energy conservation; and
- Advance environmentally sustainability by accounting for greenhouse gas emissions, land-use impacts, and project life-cycle impacts of solar.

Barriers & Rural Concerns

Stakeholders identified barriers that prevent the installation of solar. Rural stakeholders identified their unique concerns about solar programs. This section outlines these barriers and unique rural concerns.

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Barriers Exercise

In the workshops we asked, "*What are the barriers to solar in Saskatchewan?*"

We organized participants into groups of 6-8 people and asked each participant to "*please take five minutes to write down as many barriers as you can think of that prevent households, businesses, or communities from installing solar.*"

Workshop participants registered 625 distinct responses to this question. We have coded these suggestions and arranged them by overarching theme in the pages that follow. *Italics* indicate input from participants in their own words, including input from focus group participants, who discussed barriers throughout the focus group sessions. The prevalence of each theme is indicated with the icons according to the key below.

Key

75-100% of workshop groups mentioned theme	☀☀☀
50-74% of workshop groups mentioned theme	☀☀
25-49% of workshop groups mentioned theme	☀
Heard consistently in the focus groups	▦

Barriers to Solar

1. Economic

The *cost of solar equipment* is a barrier to solar adoption. Solar customers may not *have access to financing* to overcome the high *upfront costs*. The *payback period* and *return on investment* also serve as barriers since *it's a lot of money to pay upfront when you have to wait so long for any returns*. Solar customers *need a 'top down' rate of return of 10 years* to justify investment. As it stands, *25 years is too long to wait to get your money back. It may also be too soon to invest in solar* given expected improvements to solar technology that may decrease the capital cost. Other costs that serve as barriers include *maintenance*, *insurance*, the *costs of solar upgrading repairs, inverters, and batteries*, and *interconnection costs*.

2. Education

There is a *lack of education about solar, solar development, and paybacks* and for program success *people need to understand how it all works*. SaskPower could engage in *public education and promotion* to enhance customer understanding of solar. Pro-active education is required to encourage solar program uptake as *SaskPower can't expect people to setup solar if no one knows about it.* Along with public education, SaskPower could invest in *training* to ensure adequate *trained labour to match the anticipated growth* of solar.

Barriers to Solar

3. Grid Integration

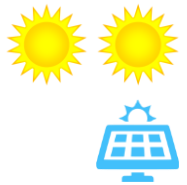
There are technical challenges surrounding grid integration of solar generation. The *present grid system* has a *rigidity of structure and lack of flexibility*. This makes it difficult to integrate *intermittent* energy from solar generation. This challenge is exemplified by the *duck curve*. *Gas peaking* plants can help to react to the *ramp-up* of solar energy production, as can electricity *storage*. An improved *east-west grid* would enable a *national policy for energy sharing among provinces*. Conversely, *a move to a broader distributed power grid also has benefits since a decentralized system ensures a more efficient power system*.

4. Corporate Culture

Some stakeholders felt SaskPower's corporate *culture is not supportive of solar*, while others felt there was a *lack of enthusiasm from SaskPower, though there is evidence of change* (e.g. the solar engagement process). Perceptions are influenced by *past active negativity from SaskPower*. This has some people asking, *Is SaskPower the right ambassador for solar?* Or does it face *institutional inertia*, a *lack of openness to change*, *entrenchment* in old business models and *doesn't want competition* from solar producers? To change perceptions of SaskPower, the company needs to *walk the talk* and demonstrate *leadership*. At the moment, staff recognize that *today SaskPower is not a leader* in solar.

Barriers to Solar

5. Quality Assurance



Customers would benefit from *quality control standards* related to solar panels and installers. Potential solar customers worry about the risk of *unqualified contractors/electricians* and *fly-by-night* companies. SaskPower could provide *certification* for installers and products, and provide a *list of installers* so customers know *who to call*. SaskPower can also work to ensure the *safety* of installations by drafting *fire standards*, asking government to legislate *province-wide regulations for safety, code, and fire*, and drafting a *white paper on safety* for installers and customers.

6. Application Process

The current solar application process is *burdensome*, with too much *red tape*. The *slow approval process* may be due to a lack of *internal resources* and the *lack of a one-stop department to handle applications*. A more *streamlined* inspection process, would be possible and applicants could *send in a picture* rather than requiring SaskPower to *send an inspector*.

Barriers to Solar

7. Customer Service

SaskPower needs to *put customers first*. Solar customers and vendors are looking for *collaboration and communication* with SaskPower. They want a *point of contact to 'talk to' about opportunities* but at present there is a *lack of sufficient SaskPower staff who are dedicated to solar transition and service*. This leads to *poor customer service*. One idea to overcome this problem is to have a *dedicated team at SaskPower* on the solar program file.

8. Negative Perception

Some people may not like *how it looks*. To overcome *aesthetic* concerns we should ask *can we make them look good?* Solar may also suffer from negative perceptions that *being green is nutty* and that solar is *seen as a tree hugger thing*. When proposing a solar development there may be *NIMBY* (Not-in-my-backyard) attitudes that reject solar projects, especially if there has been a *lack of community consultation*. Some also worry that *solar installation will impact the resale value of their homes* in a negative fashion.

Barriers to Solar

9. Missing Synergies

When developing programs, SaskPower could explore synergies and take an integrated approach. Programs could incorporate *more energy efficiency goals* and consider *opportunities to combine renewable technologies* like *solar and wind* and *solar for heat production*. The *lack of storage* is a barrier to solar, and *SaskPower could invest in storage and promote Net Metering rebates on storage systems*. This energy storage could be *grid scale*, in *electric vehicles*, or in the form of stored *hydrogen gas*. If storage is installed SaskPower staff felt they *need to be able to control it* to ensure system reliability.

10. Lack of Accounting for Solar's Full Value

If SaskPower conducted *full cost-accounting* of the benefits of solar it would ascribe a higher value for solar electricity. These benefits include *reduction of greenhouse gas emissions*, *grid stability*, *contributing less to transmission losses*, and *investment/job creation for Saskatchewan residents*. The value of solar would also be enhanced with *carbon pricing*. SaskPower could capitalize on solar generation benefits by *spending the same on development of solar as on carbon sequestration*. As it explores solar generation opportunities, *SaskPower should look 5 years ahead for technology* and *remember that costs will continue to drop for solar and storage*.

Barriers to Solar

11. Regulation

To encourage solar, the province needs to *change new building codes to require solar ready homes* and in general create an *energy code* for buildings. Changes are also necessary to the *Cities Act* to enable municipalities to create *property assessed clean energy (PACE)* programs for solar project financing. Federally, there is a need to remove *import tariffs* on solar panels. Generally, there is a concern that if solar increases property values, extra property taxation *would diminish incentives for solar*.

12. Solar Access

Due to *neighbourhood orientation*, *inappropriate roof space*, and *solar access of buildings*, *solar is not an option for many people*. Municipalities can *lead the way* on solar by developing a *shadow policy* to protect solar access and carrying out solar-conscious *city planning*.

13. SaskPower's Uncertain Role

There are questions surrounding SaskPower's role in the solar space. Is SaskPower *becoming a renewable energy company?* Is SaskPower's role as an electricity *supplier or grid operator*? The *public wants to know SaskPower's plan for solar*, whether it will be pursuing *centralized generation or distributed generation*, and its *future role* in the province.

Barriers: Additional Focus Group Reactions

In order to provide further context and supplement the previous, collective information on barriers, prominent themes discussed by focus group participants are captured below:

Economic Barriers

- "We need to think about the environment but given the costs, this doesn't work for me."
- "I'll be long gone before I get my money back…"
- "Needs to be lower risk and quicker reward."
- "25 years? That's way too long. If I invested, I'd like to start seeing savings in about 5 years."
- "What about maintenance or increased taxes? What if I don't stay in my house for 25 years?"
- "We need more incentives and grants to offset the upfront costs."

Education and Knowledge Barriers

- "SaskPower should lead the way and inform the public about solar. I bet most people are not aware."
- "We need more knowledge. Why isn't SaskPower promoting this?"

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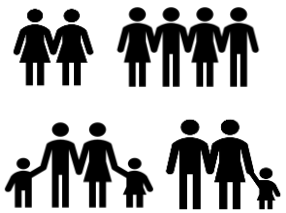

Rural Concerns

Stakeholders representing rural municipalities had unique concerns about solar projects. These concerns are summarized below.

Land Concerns

Large, utility-scale projects are typically ground-mounted. These create concerns related to the *use of viable farmland*. To ensure sustainability, solar projects should *not use prime land*. If used in pastureland, there is also concern they may lead to *habitat change* introducing *weeds* in place of *native grasses*. These ground-mounted systems may also require *weed control*. For that reason, it may be useful to conduct an *environmental impact study* to understand, *what is the environmental impact of a solar farm?* Despite these concerns, the perception remains that *wind power systems are more intrusive than solar systems*.

Added Municipal Responsibility

Solar projects may introduce additional responsibilities for municipalities. Rural municipalities will need to consider providing *access to panels for maintenance* and wonder *who pays for the road?* Changes to *land use planning* and *by-laws* may be necessary. There are also opportunities for revenue generation, but first rural municipalities (RMs) must consider property tax *assessment issues* and work to understand *how do RMs tax* solar projects? There is general agreement that SaskPower should work with municipalities to show positive examples of successful community solar projects.

Program Improvements

Stakeholders at the workshops offered detailed recommendations for ways to improve SaskPower's net metering and small power producers programs. Stakeholders in the focus groups were asked about their knowledge of existing programs. Many had not heard of existing solar programs and expressed an interest in receiving more information.

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Program Improvements: Workshop Suggestions

Stakeholders offered a range of suggestions on how SaskPower could improve its current solar program offerings. Suggestions for improvements were offered at every table at every external workshop. Here are the most common suggestions for improvements:

1. The *Net Metering* ***contract length is too short*** and could be *changed from 2 to 20 years* to enhance customers' ability to access financing.
2. There is currently *no incentive to over-produce* in the Net Metering program because there is *no payout for leftover credits at the end of the year*. Solar projects could ***get paid for the excess production*** instead of having *Net Metering credits net to zero after 12 months*.
3. There is currently a *lack of virtual Net Metering process*, which means you *can't share with a neighbour* because you *must have solar physically connected to a meter instead of having solar at one location offsetting a meter at another*. This is a problem for farmers who often have *6 meters for 1 operator*. This could be remedied with **a *Virtual Net Metering*** program that would allow ***transferable credits*** and ***virtual billing*** across meters. This could also provide *easier program access for co-ops* and opportunities *for people who cannot install or afford solar.*
4. Currently, SaskPower keeps carbon credits, but the *value of* ***carbon credits*** could be *factored into the price* paid for solar or the credits could be awarded to solar customers.
5. For both Net Metering and the Small Power Producers (SPP) program, the ***100 kW program limit*** **is** ***too small*** *for commercial installations* and the cap could be *changed from 100 kW to 1 MW* or removed altogether.
6. As well, SaskPower could ***increase SPP rates at the same rate as retail rate increases*** rather than the current 2% which may be *less than inflation*.
7. In general, investors would benefit from *transparency for the future of solar programs* and a higher degree of ***program certainty and stability***.
8. Municipalities could use ***clarity around timing of new programs*** *to prepare for the new programs; e.g. secure sites, bylaws, community notification, grants*.
9. Lastly, SaskPower would be wise to ***fix programs before promotion***.

Program Awareness: Focus Group Results

Awareness of current SaskPower solar programs (Net Metering and SPP) was low among focus group participants. However, most expressed an interest in receiving more information.

- When presented with information on the current Net Metering and SPP programs, few focus group participants claimed awareness of the programs.
- Generally, program concepts were grasped quickly and most participants wanted more information about the programs.
- There was a common belief that SaskPower should be doing more to promote these programs to the public and "lead the way" to drive more people to use the programs.
- Based on details provided, most react positively to the current programs but would like more information.
- A majority believe that if the Net Metering program were designed to produce excess power, participants should be paid a wholesale rate for the excess power.

Program Ideas

Stakeholders in the workshops were asked to work collaboratively to develop a solar program for Saskatchewan. This exercise generated a range of program ideas. In this section we present some of the specific program ideas, along with the aggregated results of the program design segment of the solar workshops.

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Net Metering *Plus*

Concept

Program Target: Homeowners, landowners & business owners.

Description: An enhanced version of the current Net Metering program. Self-generating customers would continue to receive credits on their bill for electricity generated. The following enhancements would be made to the program:

- Contract length extended beyond two years;
- Excess generation purchased at the end of the year;
- 100 kW cap increased;
- More than one meter can receive credits for electricity generated;
- Approval process simplified and made faster; and
- Connection process made less expensive.

Strengths: This modified program would include many of the improvements suggested by stakeholders.

Weaknesses: The program does not address the issue of cross-subsidization. As shown in the 'by the numbers' panel to the right, nearly 25% of the groups that proposed this program thought it was alright for back-up and stand-by costs to be subsidized by non-self-generating customers.

By the Numbers

- 21% of workshop participants proposed programs that improved the existing Net Metering program
- 67% of those who proposed a Net Metering plus program wanted longer term contracts
- 44% wanted to increase the 100kw limit
- 78% wanted to receive retail or above retail rate
- 25% wanted cost subsidized by non-self-generating customers
- Sentiments of this program were expressed in the focus groups

By the Numbers

- 19% of workshop participants proposed a program of this type
- 73% of those who supported Virtual Net Metering wanted to increase the 100kw limit
- 36% wanted to receive credits paid at the retail or above the retail rate
- 45% wanted longer terms contracts
- 42% wanted to place solar projects in locations that would better serve the grid
- Nearly all focus group participants saw shared/community solar as a more attractive investment than personal, rooftop solar given perceptions of lower risk, shared investment, and quicker payback periods.

Virtual Net Metering

Concept

Program Target: Individuals, businesses, and community groups.

Description: This program would allow electricity customers to invest in larger community-size solar projects. Investors would collect credits in proportion to their investment. These credits would be applied to their electricity bills, reducing their costs. Investments would be repaid through utility bill savings.

Strengths: This program possesses a number of strengths:

- It would allow a greater number of customers to participate in solar programs, including individuals without solar access;
- It would formalize a process for community projects to attract investment;
- It could allow solar projects to be geo-targeted to locations that best serve the grid.

Design Considerations: Of those who proposed this program there was significant support for increasing the 100 kW cap on Net Metering projects (see 'by the numbers' panel on the left). This would allow larger, community-scale projects to be built.

Design Variations: Proposals for Virtual Net Metering were varied. Some suggested receiving credits for electricity generated at the retail rate or above, while others suggested receiving credits at a value less than the retail rate. The latter proposals were often targeted at addressing the issue of cross-subsidization.

Feed-In-Tariff

Concept

Program Target: Profit-minded investors and independent power producers.

Description: The utility purchases solar electricity at a fixed price, ensures grid access, and prioritizes solar in the merit order. In this way the program concept resembles the Small Power Producers (SPP) program.

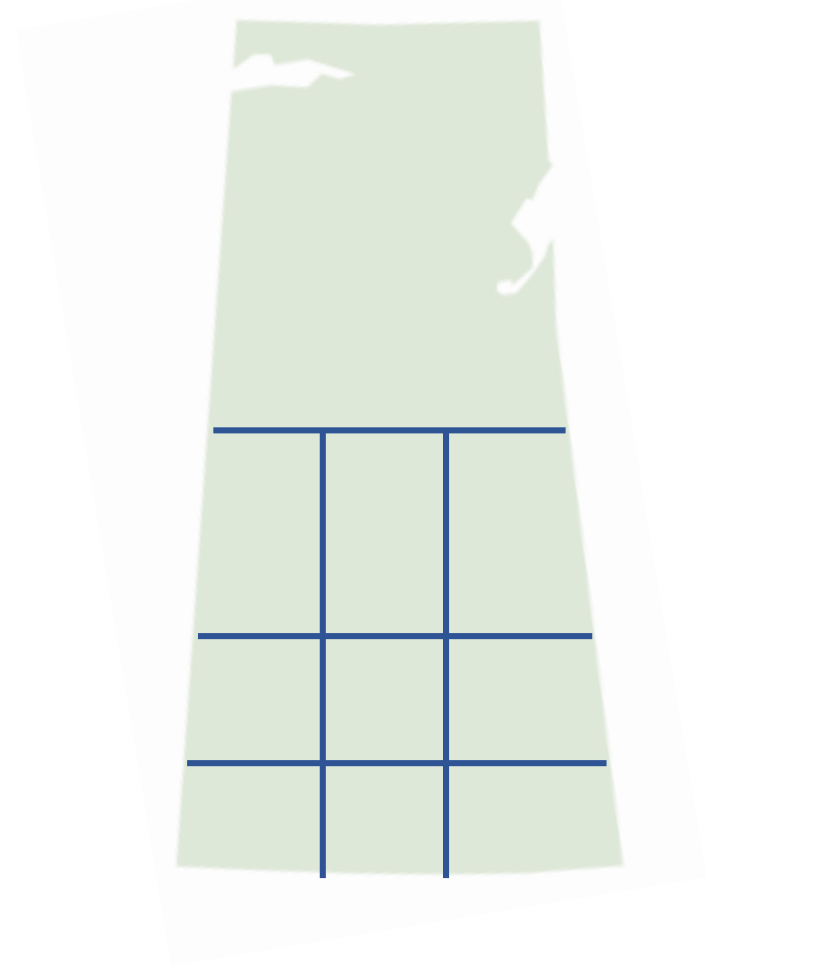
Key Quote: "Put solar (+ wind) on the grid first - before coal - and guarantee the per-kwh price."

Strengths: This program allows investors to profit from solar power projects. This makes the program attractive to independent power producers, as well as individuals and businesses interested in more than offsetting the cost of their electricity bills.

The Importance of Price: For investors, the relative desirability of this approach depends on price. Over half of participants who proposed a program with feed-in-tariff features wanted to be paid at the retail rate (e.g. 13.7¢/kWh for residential customers) or higher, which does not address the issue of cross-subsidization (see Appendix C). As an alternative, one program proposal suggested paying a feed-in-tariff at the levelized cost of solar power plus a 6% return for investors. That payment price would then decline as the cost of solar declines.

By the Numbers

- 49% of workshop participants proposed a program with feed-in-tariff features
- 63% of those supporting a feed-in-tariff type program wanted longer term contracts
- 79% wanted the 100kW limit increased
- 50% wanted be paid at the retail rate of electricity or higher



Regional Solar Auctions

Concept

Program Target: Community groups and independent power producers.

Description: The province is divided into regions and each region is allocated a set solar target (*e.g.* 10 Megawatts (MW) solar capacity). In this model, the price of solar could be set by a regional auction or request for proposals (RFP) process, or set at a fixed rate by the utility.

Strengths: This program possesses a number of strengths:

- It would encourage a distributed electricity generation model;
- It would allow for greater participation in solar projects throughout the province; and
- If the price is set through an auction process, it would drive down the cost of solar in the province.

Weaknesses: The solar resource is variable throughout Saskatchewan and is highest in the southern third of the province. The price of solar achieved in each region could vary according to the available solar resource.

Key Quote: "Each area will have a certain amount of renewable energy they need to fulfill. Encouraging distributed generation. Break it into multiple 100 kW chunks to encourage local development. Local ownership."

Pilot Projects

Concept

Program Target: Select communities.

Description: Sites would be selected by the utility to participate in a pilot project. Potential candidates for pilot projects would include:

- Post-secondary educational institutions;
- Schools;
- Existing urban neighbourhoods;
- New urban developments; and
- First Nations.

Equity model: One innovative proposal suggested a community-scale pilot for a small town. The utility would offer low-interest loans and would administer the installation of the solar panels. Low-income households would be provided with grants to encourage solar adoption. Panels would be owned by the participating households after the initial capital cost has been repaid through utility bill payments.

Strengths: Pilot projects offer an opportunity for the utility to learn more about solar. They offer the opportunity for participating institutions or communities to 'go green'.

Weaknesses: There were concerns that this program would unfairly advantage a limited number of people who were able to participate in the pilot project.

Crown Solar

Concept

Program Target: Provincial electricity system.

Description: SaskPower would reduce the cost of solar by directly purchasing and installing panels. SaskPower would achieve economies of scale through the bulk purchase of solar modules. An internal team would be dedicated to installing solar panels. By standardizing the solar installations, the need for inspection would be reduced.

Strengths: This program would build on SaskPower's electricity sector expertise and take advantage of its status as a publicly owned Crown Corporation. The proponents suggested that SaskPower could generate enough demand for solar panels to justify manufacturing solar panels in the province.

Weaknesses: Some participants were adamant that SaskPower not compete with solar vendors by installing panels. This approach would impede the private solar industry in the province.

SaskPower

Solar

~~SaskPower~~

Electricity Rate Restructuring

Concept

Program Target: Provincial electricity system.

Description: The rate structure for residential, rural, and commercial customers would be restructured. The goal would be to price services at their true cost to enable economically rational decision-making. This rate restructuring would apply to all customers, not just self-generators. (For more information on the current rate structure see the discussion of cross-subsidization in Appendix C)

Key concepts: Key components of this concept include:

- The per kilowatt-hour (kWh) cost of electricity would reflect energy and variable costs, and exclude fixed costs;
- Fixed charges on bills would be based on the peak demand (in kW) for a given month or year. This would provide an incentive for customers to shave their peak demand and conserve electricity using technologies like energy storage;
- Power purchasing programs would be technology neutral and would not differentiate between solar, wind, demand side management, energy storage, or any technology;
- SaskPower would increasingly take on the role of system operator, specializing in maintaining grid services.

Challenge: Higher fixed charges on bills provide an incentive for customers to change behaviour, but do not provide incentives for the electricity utility to become more efficient.

SaskPower — Restructured Electricity Bill

SaskPower — Date: April 7, 2017

Bill to: Pete Jones

Date	Description	Unit Cost	Amount
4/7/17	Electricity bill for period March 1 - 31st, 2017		
	Basic administrative fee	$22.01	$22.01
	Transmission line fee	$20.00	$20.00
	Distribution line fee	$40.00	$40.00
	Peak capacity stand-by fee	$40.00	$40.00
	Electricity consumption:		
	1028 kilowatt-hours		
	Energy charge	$0.0401	$41.24
	GST	5%	$8.16

Current	Past due				Amount Due
$171.42	$0.00				**$171.42**

Make all checks payable to SaskPower

Thank you for your business!

"Feed the Funnel"

Concept

SaskPower

Customer Applications

Program Target: Individuals, households, businesses, communities, and the solar vendor community.

Description: SaskPower would reduce the soft costs of installing solar by taking on the role of one-stop shopping centre for solar. In this role SaskPower would:

- Promote solar on their website and on utility bills;
- Provide on-line solar analysis tools for households to evaluate the suitability of their home for a solar project;
- Accept applications from customers interested in self-generating;
- Provide project financing through partnerships with financial institutions;
- Sign standing offers with solar vendors who are qualified to install solar in the province enabling them to bid on approved solar projects, both household and community scale;
- Issue tenders each week allowing solar vendors to bid on ready-to-install projects.

Strengths: Over two-thirds of the cost of a solar installation is for soft costs above and beyond the price of solar panels. SaskPower would streamline the solar marketing and financing process, reducing the need for solar vendors to market to customers. By tendering ready-to-install projects to solar vendors SaskPower would help to drive down solar installation costs in the province. In turn, this would ensure more affordable electricity for all customers.

Complementary EV & Storage Programs

Concept

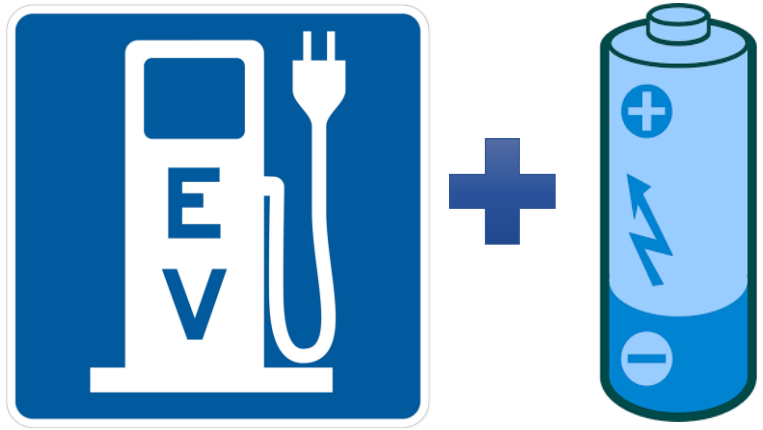
Program Target: Solar self-generators and program participants

Description: Stack self-generation programs with measures to encourage electric vehicles and energy storage.

Electric Vehicle Benefits: Self-generation reduces the revenue received by the utility by lowering demand for utility-distributed electricity. Electric vehicles (EV) represent an opportunity to increase revenue for the utility. Utility revenue sources could include:

- Charging premium rates for fast-charge services; and
- Charging for connection upgrades to accommodate EVs.

Electric vehicles also offer opportunities for flexible load; that is, electric vehicle owners could be rewarded for curtailing vehicle charging during periods of high demand. This demand side management (DSM) measure would complement SaskPower's existing DSM programming.



Storage Benefits: Self-generators continue to rely on the electricity grid to meet their electricity needs when the sun is not shining. The value of solar generation to the SaskPower electricity grid could be enhanced if it were stored and provided during times of peak demand.

Cross-Cutting Concepts

Stakeholders provided other program ideas that could be incorporated into many of the options outlined in the preceding pages. Frequently mentioned concepts included the following:

Utility financing: Of the program design teams, 42% suggested that SaskPower create a low-interest financing program. Low-interest financing would help remove the economic barriers to installing solar by providing the necessary capital to pay for the installation. Self-generators would then repay the cost of their solar installation through monthly utility bill payments. Stakeholders suggested this program could be established quickly by adding solar photovoltaics to the list of appliances eligible for the SaskEnergy-SaskPower EnergyStar Loan program: http://www.saskenergy.com/residential/appliancefinancing.asp.

Time-of-sale pricing: One-third of program design teams recommended time-of-sale pricing for rewarding solar generation. Time-of-sale pricing would reward self-generators for supplying the grid at times of peak demand. This may involve providing a fixed floor payment of 10.8-13.7 ¢/kWh and then offering a premium payment if solar is generated at times of peak demand. This arrangement would also incentivize energy storage technologies.

Certified Installers: As part of recommendations for SaskPower to ensure the quality of solar installers and technology, stakeholders suggested SaskPower organize a certified solar installer network. This network would ensure high-calibre solar vendors and prevent "fly-by-night" operations. The network could borrow from SaskTel's *Authorized Dealers* and SaskEnergy's *Member Network* approaches.

Cross-Cutting Design Considerations

Stakeholders placed emphasis on the following design considerations:

Community and Local Ownership: Many of the groups emphasized a desire for community or local ownership of solar projects. Program design concepts were often framed as being targeted at local community groups and co-operatives.

Affordability and Equity: Younger stakeholders, such as university students, were keenly aware of the equity impacts of solar program design. Most of the design teams in the university sessions worked to enable solar ownership for low-income households. Suggestions to increase affordability include rent-to-own programs, financing programs, and low-income grant programs.

One theme expressed by internal SaskPower staff related to cost-effectiveness:

Ensure cost effectiveness: SaskPower should be focused on the overall costs to all customers. *Everything should be based on an internal avoided cost metric* and *allow it to occur at a fair or close to fair market price.*

Johnson-Shoyama Case Competition Winners

Focus Group Program Reactions

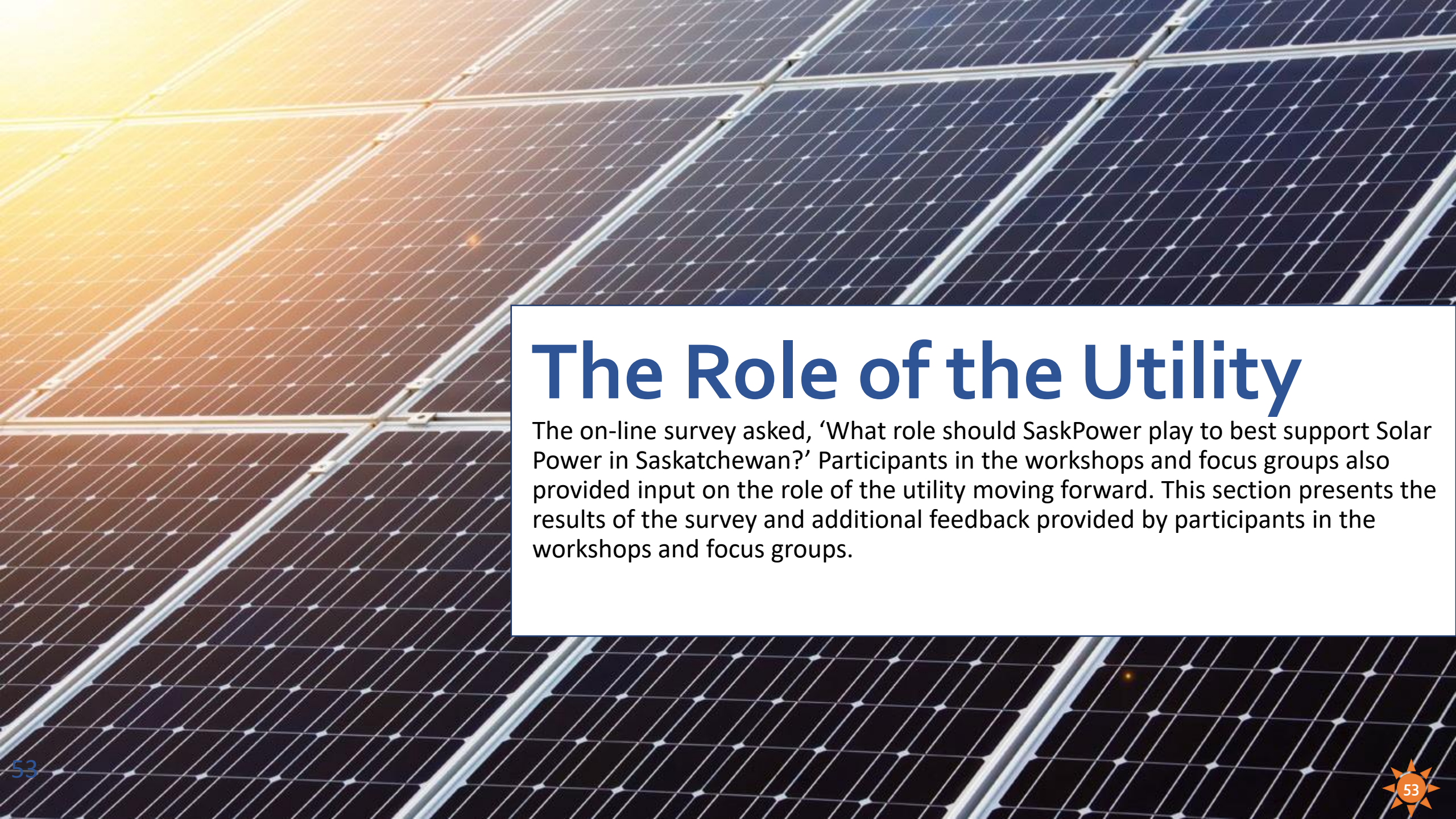
Among focus group participants, two community solar program concepts were reviewed; Traditional Community Solar and Virtual Net Metering. Focus group participants had the following reactions to the program ideas:

- There was a high interest in shared/community solar among the focus group participants. Nearly all participants saw shared/community solar as a more attractive investment than personal, rooftop solar given perceptions of lower risk, shared investment, and quicker payback periods.
- Despite high interest in shared solar projects, few participants could mention details they would like to see in these types of projects.
- Participants mentioned they would like to see returns on their investments quickly.
- Most believed that shared solar projects are highly beneficial for the environment and SaskPower should work with communities and RMs to help set up these types of projects.
- Due to a high interest in shared solar, some believed SaskPower needs to create more awareness of these programs and show positive examples and success stories in order to encourage others to invest.
- Despite being somewhat critical of SaskPower, Regina participants specifically mention that SaskPower should publicly invest in solar on behalf of Saskatchewan in order to benefit the entire province and reduce coal emissions.

Focus Group Program Reactions

Here are reactions from focus group participants in their own words:

- "If the return is good, I agree with it. 30% for me, annually….that sounds crazy but that is what I am looking at….30% as a return on investment for the whole project/community."
- "If the whole town agrees on solar power, take hectares of land and SaskPower can set it up and would be able to make some money."
- "Keep the subsidy - this means I am being rewarded for installing solar."
- "I need a proven example. Let SaskPower set up a prototype."
- "People can put in as much as they can and create a pool of money to receive a proportional dividend… We are all used to the co-op model."
- "If it runs right, it's a good investment!"
- "I support the shared project. Utilizing the space you have, it's a great idea."



The Role of the Utility

The on-line survey asked, ‘What role should SaskPower play to best support Solar Power in Saskatchewan?’ Participants in the workshops and focus groups also provided input on the role of the utility moving forward. This section presents the results of the survey and additional feedback provided by participants in the workshops and focus groups.

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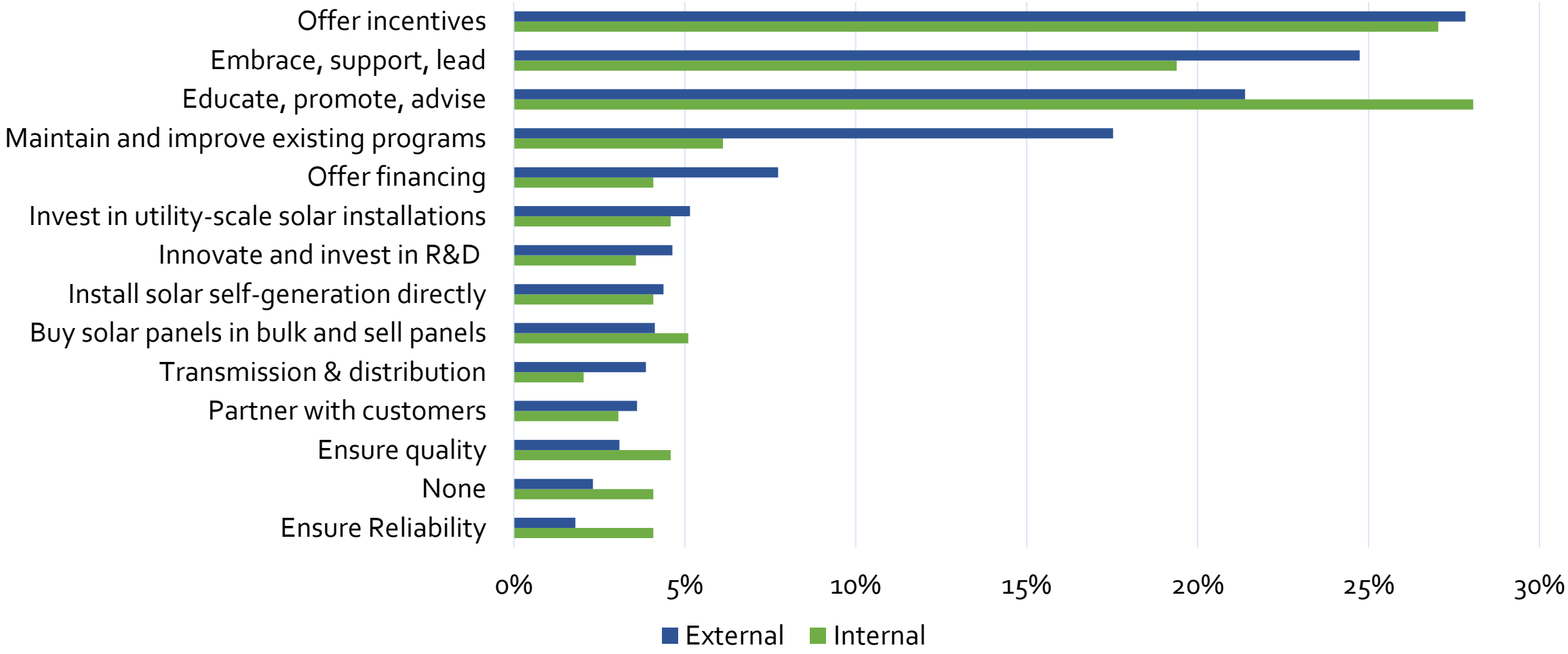
The Role of the Utility: Survey Responses

Participants who responded to the online surveys were asked, "What role should SaskPower play to best support Solar Power in Saskatchewan?" This question was open ended and participants were not limited in their possible responses. A range of diverse ideas came from posing this question. Of note, the results from the external and internal survey participants were remarkably similar.



The Role of the Utility: Survey Responses

To paint a picture of what is meant by each role here are some descriptions of the top choices for 'role of the utility' written using the words of the survey participants. *Italics* indicate ideas expressed by the participants directly.

Offer incentives and financing: Make *solar more accessible and easier to set-up* by providing *rebates, low-interest loans, grants, financing.* SaskPower should *pay a rate to help foster the solar uptake* and *make it as viable as possible for people to generate their own renewable power.*

Embrace, support, lead: SaskPower *needs to be an advocate and a leader* and *encouraging the technology. Be a leader, provide education and information, to set the example for everyone in Saskatchewan that we all have the responsibility to end our use of coal, oil and gas.*

Educate, promote, advise: *Provide accurate information about costs of such options, taking overall impact of cost of electricity into account. SaskPower should provide expertise to assist customers* by providing *objective information on solar power generation in Saskatchewan.*

Other Roles Identified by Survey Respondents

- SaskPower to provide the guidelines and rules for solar while the government is responsible for all grants or subsidies

Regulator

- SaskPower to purchase solar panels in bulk to benefit from economies of scale

Bulk Buying

- SaskPower to install solar panels for homeowners and business

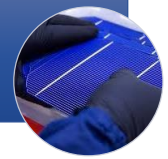
Installation Services

- SaskPower sells batteries, energy efficiency products, solar panels, and other energy systems products

Sell Energy Systems

- SaskPower to invest in research and development of new technologies and practices

Innovation



- SaskPower to be central point of contact for setup, financing, installation, and maintenance of solar system

One Stop Shop

- SaskPower to develop partnerships with industry, businesses, and First Nations

Foster Partnerships

- SaskPower to provide a certified solar vendor list

Solar Vendor List

- SaskPower to ensure simple, timely, and responsive customer service

Customer Focus

- SaskPower should not play a role in solar energy. No subsidies should be provided to solar

None

The Role of the Utility: Workshop and Focus Group Feedback

Workshop Participants

- Many participants wanted SaskPower to ensure the quality of installations by certifying solar installers.
- Over 42% of program design teams wanted the utility to offer a financing program.
- Over 43% of program design teams wanted the utility to offer all customers the option of participating in a community solar project.
- Less than one-quarter of program design teams felt that the utility is responsible for post-install servicing and maintenance, while 88% felt it was the responsibility of solar project owners.
- Participants had mixed views on the future of the utility. Some supported continued public ownership of generation, while others argued that the utility of the future will be a grid operator, enabling generation by private power producers.
- Social role – should account for social benefits of solar such as reduced greenhouse gas emissions, reduced health impacts due to reduced emissions

Focus Group Participants

- Agreement that SaskPower needs to take a leadership role in creating awareness of solar programs and also work with early adopters to prove to the public that solar holds benefits.
- Many focus group participants believe SaskPower needs to: "promote awareness by showcasing successful solar examples."
- The focus group participants wanted SaskPower to "work with communities to setup shared solar projects" in order to "gain solar project leaders."
- Though less apparent, some (specifically in Regina) believed SaskPower should be the owner of shared solar projects throughout the province, to initiate and benefit all Saskatchewan residents.

A Business Model for the Future

Participants offered competing visions for the future of SaskPower. Here are a range of ideas on how SaskPower's business model could evolve.

Market-Based Grid Operator: SaskPower's operations would be split into two parts; one focused on operating SaskPower owned generating assets, and another focused on operating the grid. As a grid operator, Sask*Grid* would ensure the reliable supply of electricity, and would purchase electricity based on competing bids from generators. Support for solar self-generation would come from general government revenues. Because incentives would come from general revenue, support for solar self-generation would not impact the rates paid by non-self-generating customers. Some participants felt that transitioning SaskPower to the role of grid operator would level the playing field and remove institutional barriers to solar self-generation.

Enhanced Crown Corporation: SaskPower would use its market power to achieve economies of scale in solar generation. SaskPower would purchase panels in bulk and install panels on leased land and roofs. Generation and distribution and transmission would remain under SaskPower's control. Solar generation would be installed in order to diversify supply and contribute to environmental objectives. Many focus group participants expressed interest in this model.

Social Mandate Crown Corporation: SaskPower's mandate would expand to include the provision of social and environmental benefits. In the words of one participant, "SaskPower needs to consider more than just their own bottom line. They have a role as a provincially owned corporation to act in the best interest of their owners (the people of Saskatchewan). There are significant, long term employment, social and environmental benefits to a local community surrounding power generation facilities, and particularly a solar power generation facility. The importance of these non-financial benefits must be accounted for in the development of a community solar program."

Careful thought and consideration is required to decide which business model or models SaskPower will pursue.

Next Steps

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Continue to Engage with the Public and Stakeholders

Workshop exit surveys indicated the workshops were a learning opportunity; 86% of participants who said they were "not very knowledgeable" before participating in a workshop said they were "somewhat knowledgeable" afterwards. This demonstrates that engagement can be an opportunity for education, and conversely education can be used as a tool for engagement.

SaskPower has the opportunity to leverage the social capital developed through this process and continually engage with the public and stakeholders. Moving forward it would be worthwhile to consider new opportunities to promote engaged and informed customers and producers of solar energy. We highlight here a few suggestions.

Engage through educational opportunities

Customer testing of proposed program ideas (e.g. survey & focus groups)

Develop innovative pilot projects alongside stakeholders

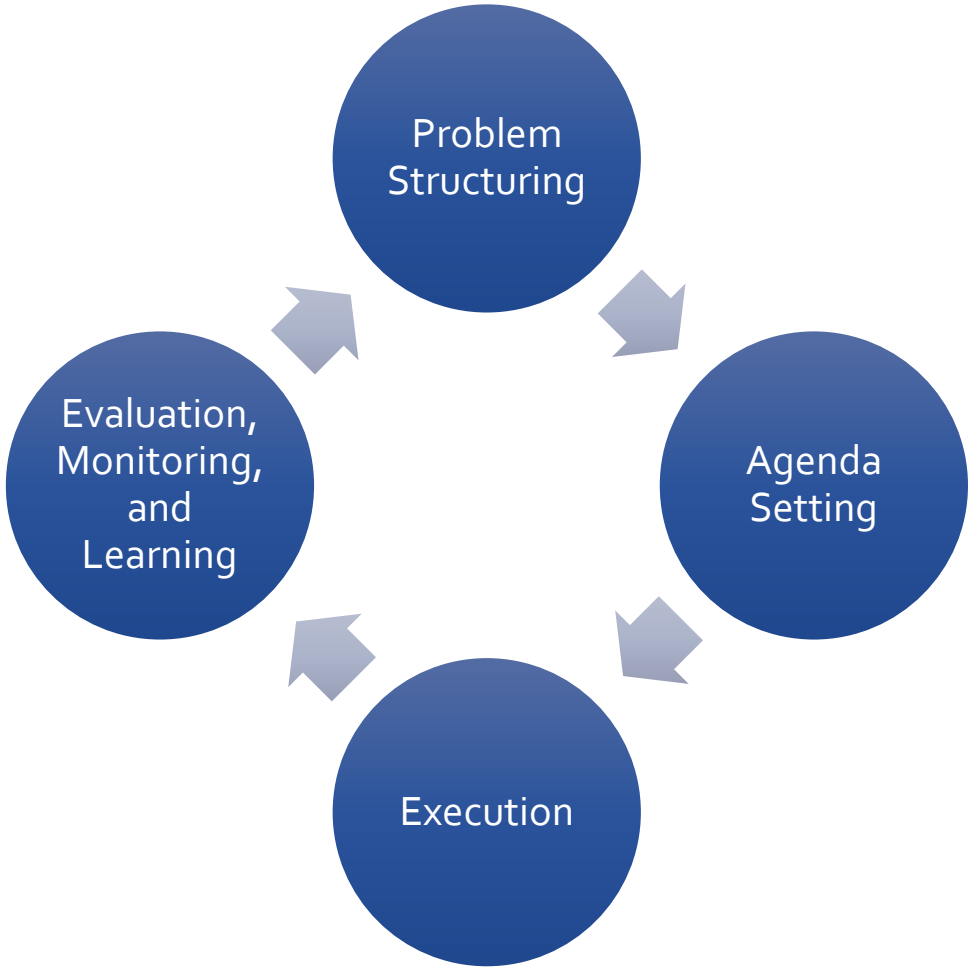
Provide accessible information on program developments

Next Step Example: Pilot "Transition Group"

- Develop and implement a pilot program in a Saskatchewan community of a stakeholder coalition transition group dedicated to providing strategic advice to multiple levels of government: municipal, provincial, and SaskPower.
- Run program for one year with 8-12 stakeholders from solar firms, ENGOs, industry, municipal government, provincial government, SaskPower, and academia.
- Use a Transition Management approach as a model for the process.

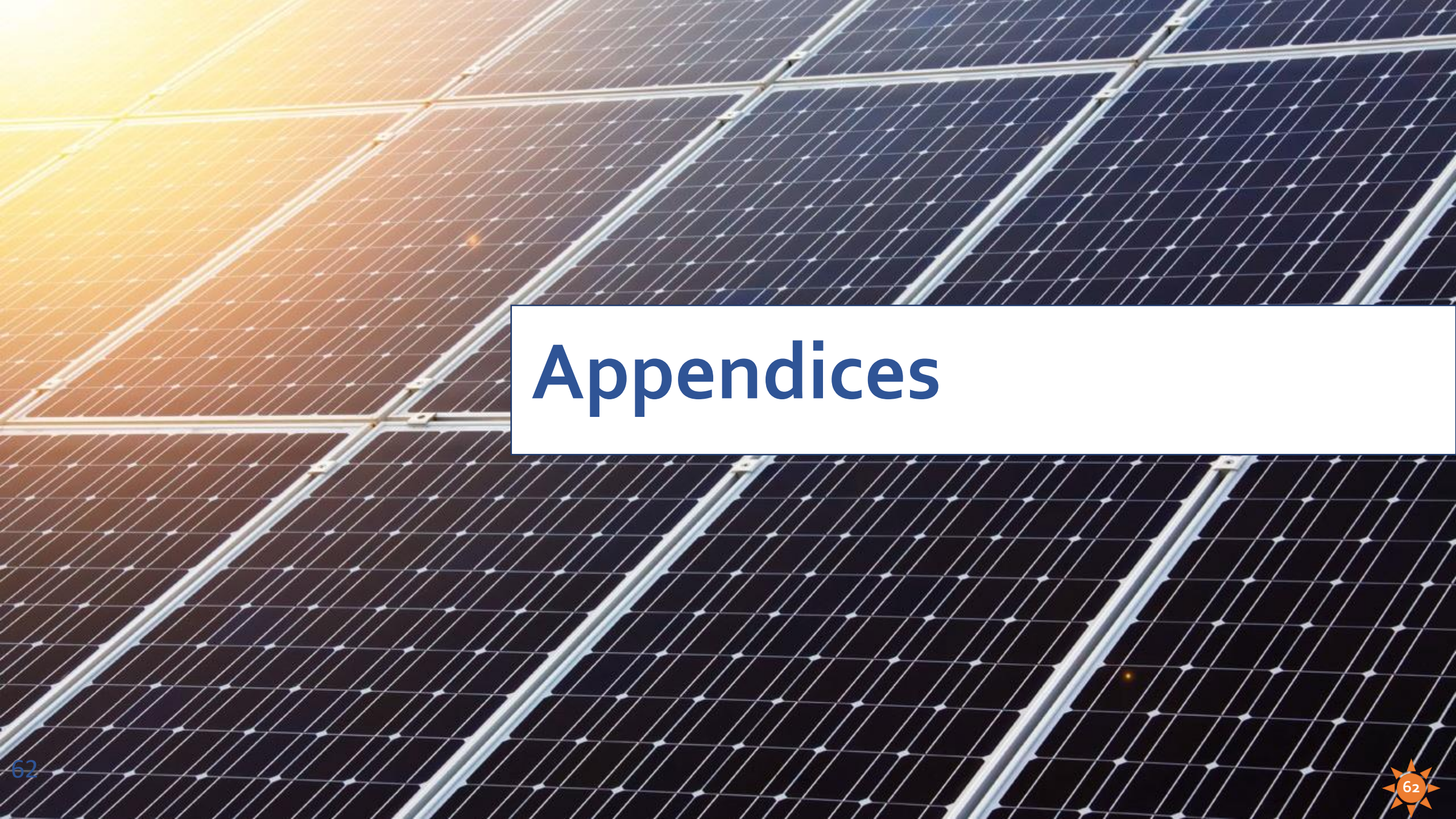
Benefits: Cost effective approach for SaskPower to continue its stakeholder engagement. Be provided in-depth information on the transition challenges in Saskatchewan.

Challenges: Need to ensure committed group of stakeholders are involved.



Transition Management

The emphasis of transition management is on long-term societal and sustainability goals while providing short-term operational actions. Transition management understands societal transitions as nonlinear process and uses a dynamic and co-evolutionary approach as a governance framework and seeks to bring together actors to create aligned visioning and goals. See Appendix F for a graphic representation of energy transition.



Appendices

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Appendix A – Workshop Methodology

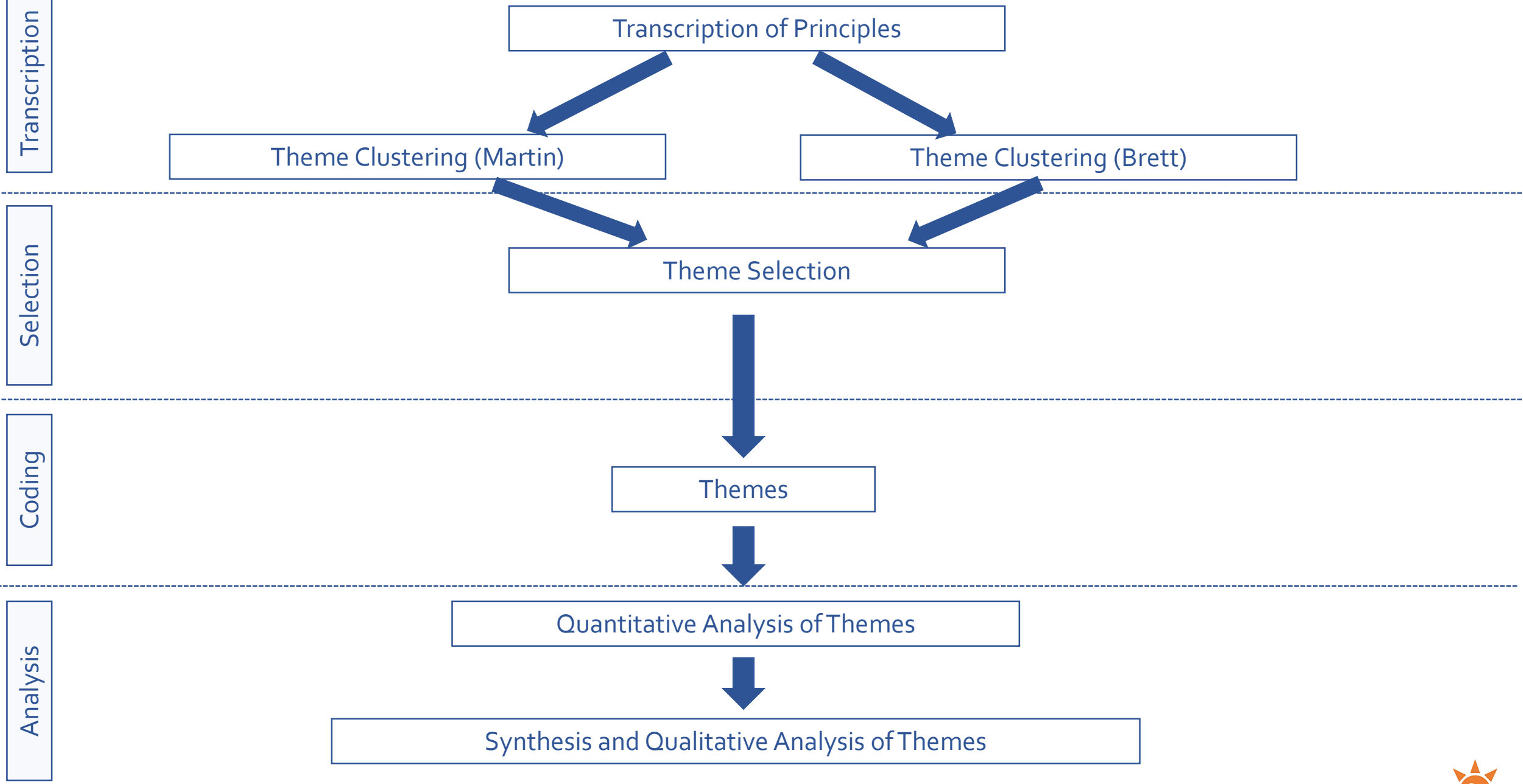
Objectives of the workshops included:

- To educate participants about the integration costs, technical challenges, program considerations, and SaskPower's perspective on solar;
- To better understand the priorities and perspectives of participants with regards to solar programs in Saskatchewan;
- To obtain meaningful input on solar program options for Saskatchewan; and
- To build trust and set a positive tone for the long term.

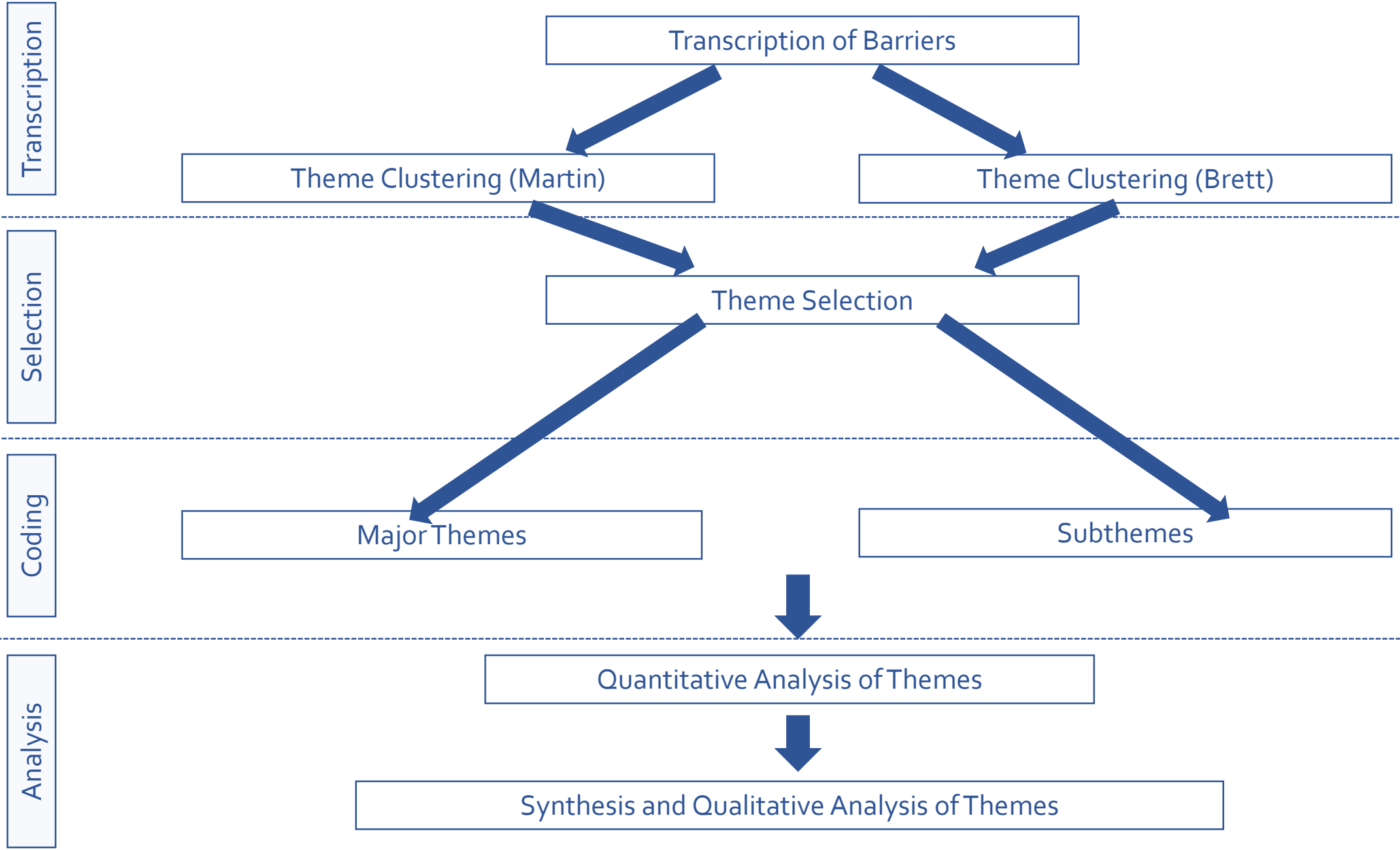
In order to achieve the objectives, 8 stakeholder workshops were held across Saskatchewan. Stakeholders were invited from target groups including: solar vendors and installers, environmental groups, municipal government, First Nations, universities, and business advocacy groups. Below are the dates and attendance of the workshops:

Workshop Details							
February 16	**February 23**	**March 13**	**March 14**	**March 15**	**March 16**	**March 31**	**April 3**
Regina (40 participants)	Swift Current (23 participants)	SARM (25 participants)	Saskatoon (40 participants)	Saskatoon (52 participants)	UofS (14 participants)	Johnson-Shoyama GS (13 participants)	SaskPower (22 participants)

Appendix A – Guiding Principles Data Analysis Methodology



Appendix A – Barriers Data Analysis Methodology



Appendix A: Program Design Template

Questions to consider when designing solar programs	Response Possibilities – Please circle your selection				Rationale and Additional Comments
1. Who are you designing this program for? (circle one or more)	Homeowners & Landowners	Business Owners	Communities	Customers facing Barriers to Participation	
2. What sizes of solar project are you targeting? (please indicate range)	1 kw — 10 kw — 100 kw — 1 MW — 10MW+				
3. Who will own the solar panels? (circle your choice)	Individual households and businesses	Community (e.g. co-operative, municipality)	Private power developer	Power utility	
4. Where will the solar panels be located? (circle one)	On-site at premises of owner	Off-site of premises at location selected by owner or project proponent	At a location selected by power utility to increase benefit to the grid	Other (please explain)	
5. What payment method or mechanism will be used to value the solar electricity produced?	Owners receive **credits** on their electricity bill	Owners receive payment at a **fixed rate**	Owners receive payment at a **variable rate** (i.e. higher at times of peak demand)	Other (please explain)	

DISCLAIMER: This form is designed to gather information. It is one of several methods of obtaining feedback on solar power programs.

Appendix A: Program Design Template

6. At what price will solar generation be valued? (please indicate with a mark on the line)	3¢/kwh 6¢/kwh 9¢/kwh 12 ¢/kwh 15¢/kwh (avoided cost 3-7¢) (SPP 10.8 ¢) (retail price 13.4 ¢)				
7. What is the best way to pay for the stand-by/back-up services provided by the electricity grid? (circle your choice)	Costs subsidized by non-solar customers	Flat fee paid by solar producers	Variable fee for solar producers based on size of project ($/kw)	Revised billing increases fixed charges on all utility bills	
8. How is solar project financed? (circle your choice)	Owner financed	Vendor offers financing	Utility offers financing program	Other (please explain)	
9. How do customers who do not have the opportunity to own or install solar participate? (circle your choice)	No participation	Utility offers opportunity to invest in community project	Utility offers opportunity to support utility-owned solar (e.g. green power program)	Other (please explain)	
10. What role, if any, does the utility have in achieving customer access to high-quality solar generation products and services at the lowest possible cost?	Please explain in space provided:				

DISCLAIMER: This form is designed to gather information. It is one of several methods of obtaining feedback on solar power programs.

Appendix A: Program Design Template

Questions to consider when implementing solar programs	Response Possibilities – Please circle your selection				Rationale and Additional Comments
11. Who is responsible for post-install maintenance and servicing?	Solar Project Owners	Solar Product Vendors	Power Utility	Other (please explain)	
12. What is the preferred length of contract? (please indicate on line)	1 year	5 years	10 years	15 years	20+ years
13. Who is responsible for consumer protection? (circle your choice)	Solar Product Owners	Solar Vendor Community	Power Utility	Other (please explain)	
14. How often should programs be reviewed? (circle one)	At regular time intervals (e.g. Annually)	When the price of installing solar ($/kw) reaches a certain threshold	When a certain amount of solar (MW) has been installed	Other (please explain)	
15. What else should be considered with designing and implementing solar programs?	Please explain in space provided:				

DISCLAIMER: This form is designed to gather information. It is one of several methods of obtaining feedback on solar power programs.

Appendix B - Focus Group Methodology

Objectives of the focus groups included:

- Understanding benefits and drawbacks/barriers of solar power generation
- Measuring awareness of two current solar programs offered by SaskPower
- Gauging interest in several solar power generation concepts

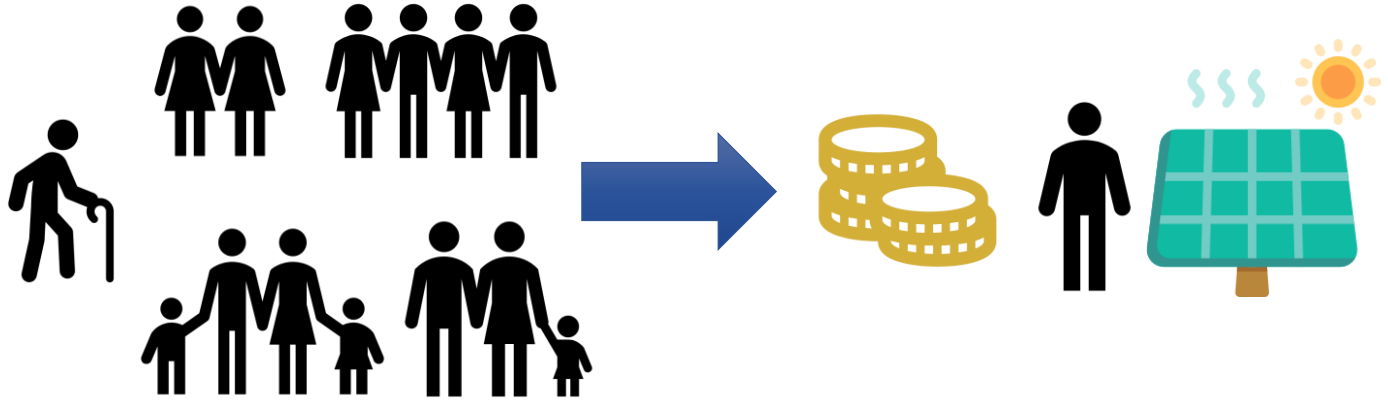
In order to achieve the research objectives, 6 focus groups were held across Saskatchewan. Participants were screened for having optimal conditions for solar generation and a mix of optimal and non-optimal participants were included in each group. A mix of both males and females as well as age groups were also included in the research. Below are the dates and general make-up of the groups:

Group Details				
March 22	**March 23**	**March 27**	**March 28**	**March 29**
Saskatoon (Residential- 8 Participants)	Swift Current (Farms/Small towns- 8 participants)	Saskatoon (SMB- 8 participants)	Yorkton (Farms/Small towns- 8 participants)	Weyburn (Farms- 7 participants)
-	-	-	-	Regina (Residential- 7 participants)

Appendix C - Cross-Subsidization

"Minimize cross-subsidies from non-solar customers"

Some participants took issue with the principle: "*Minimize cross-subsidies from non-solar customers."* For the utility, cross-subsidization is a concern when self-generating customers are subsidized by non-self-generating customers. The graphic below indicates a financial subsidy being directed from the bulk of SaskPower customers to solar self-generating customers.



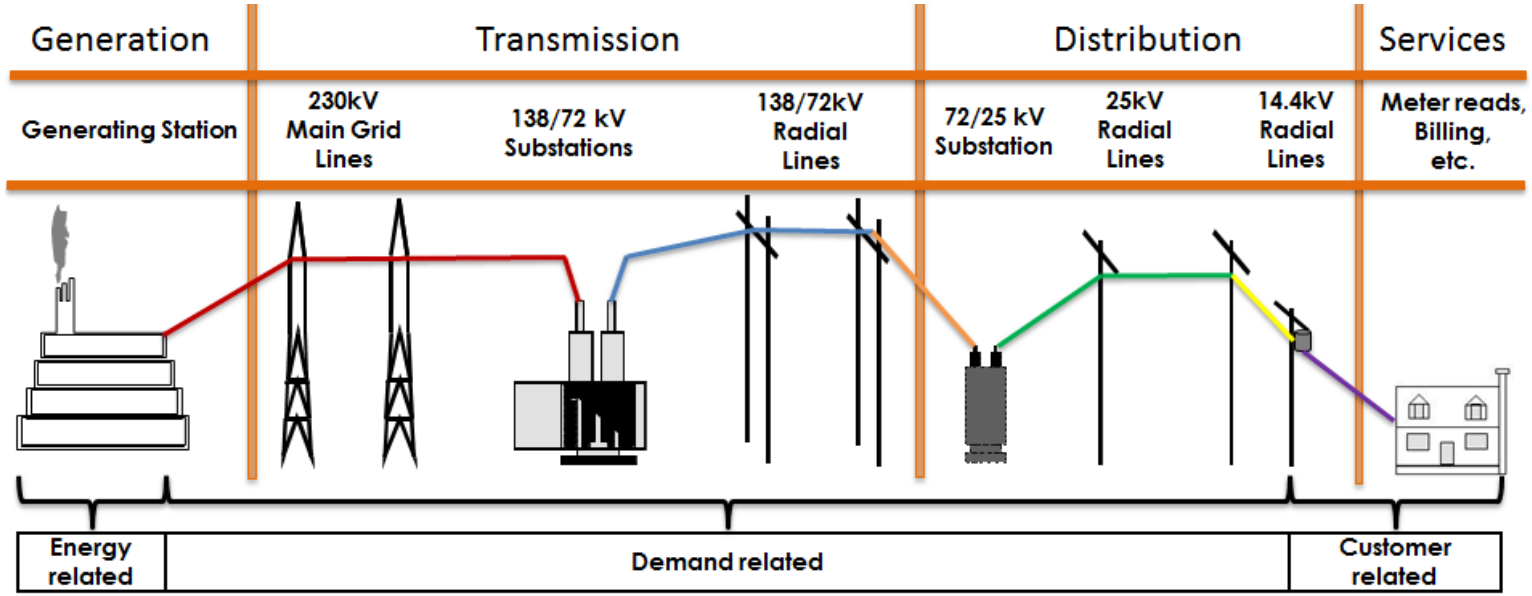
For example, through the net metering program, solar self-generating customers receive a rebate up to 20% of the capital cost for installing solar. Solar self-generating customers then receive credit for each kilowatt-hour of electricity generated and sent to the grid. Equipped with a bi-directional meter, Net Metering customers receive the retail rate (13.74 cents/kwh) for the electricity they supply to the grid. With a large enough solar installation, customers can reduce their electricity bill to the monthly administrative charge ($22 – $31.77 for residential customers) plus the GST on electricity drawn from the grid. This means the rebate must be supported by the utility bill payments made by other customers. It also means that self-generating customers provide very little revenue to pay for the services offered by the utility. Discussion of this reality evoked a number of reactions from stakeholders, which we present in the pages that follow.

Appendix C - Cross-Subsidization: Fixed and Variable Costs

Electric utilities can break their costs into two categories: fixed and variable. **Fixed costs** include the capital cost of assets (generation capacity, transmission lines, and distribution lines), the cost of operating and maintaining assets, as well as administrative costs such as meter reading and billing. Capital costs are "fixed" in the short and medium term because generation, distribution, and transmission assets are expensive, long-lived, and as such must be amortized over a long time period.

Variable costs depend on the level of electricity demand. These include the cost of purchasing fuels like natural gas and coal, and some of the operating and maintenance costs. For many plants, the more they are used, the more maintenance is required.

The self-generation of solar electricity offsets the variable costs of the electricity system. This avoided cost is valued at approximately 4 cents/kWh. The fixed costs do not disappear because self-generating customers still require the services provided by the grid in order to ensure they have power at all times (especially when solar energy is not available).



Appendix C - Cross-Subsidization: Rate Structure

Cross-subsidization is an artefact of the rate structure for certain customer classes at SaskPower. When SaskPower designs their rates they set a per kilowatt-hour (kWh) charge that is adequate to recoup the cost for the services provided to customers in their rate class. This rate is currently set at $.1374 for residential customers. The current rate structure for residential customers makes it appear as if most of the costs are variable (see mock electricity bill on the left). However, if fixed and variable costs were broken out on the electricity bill, only 15-25% of SaskPower's costs would be related to variable electricity consumption and the rest would be fixed (see the restructured electricity bill on the right. Note: numbers are approximations only).

SaskPower

Current Electricity Bill

SaskPower Date: April 7, 2017

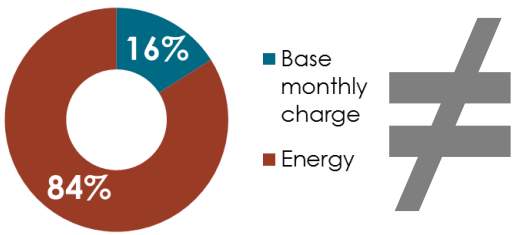
Bill to: Pete Jones

Date	Description	Unit Cost	Amount
4/7/17	Electricity bill for period March 1 - 31st, 2017		
	Basic administrative fee	$22.01	$22.01
	Electricity consumption:		
	1028 kilowatt-hours	$0.1374	$141.25
	GST	5%	$8.16

Current	Past due	Amount Due
$171.42	$0.00	**$171.42**

Make all checks payable to SaskPower
Thank you for your business!

Customer's Electrical Bill[1]



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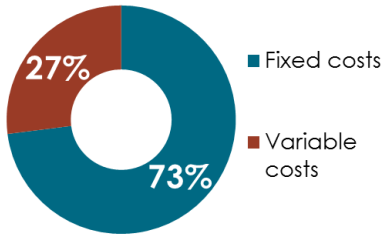
SaskPower Actual Costs[1]



SaskPower

Restructured Electricity Bill

SaskPower Date: April 7, 2017

Bill to: Pete Jones

Date	Description	Unit Cost	Amount
4/7/17	Electricity bill for period March 1 - 31st, 2017		
	Basic administrative fee	$22.01	$22.01
	Transmission line fee	$20.00	$20.00
	Distribution line fee	$40.00	$40.00
	Peak capacity stand-by fee	$40.00	$40.00
	Electricity consumption:		
	1028 kilowatt-hours		
	Energy charge	$0.0401	$41.24
	GST	5%	$8.16

Current	Past due	Amount Due
$171.42	$0.00	**$171.42**

Make all checks payable to SaskPower
Thank you for your business!

Appendix C - Cross-Subsidization: The Evolving Economics of Solar

The economics of solar self-generation are improving and will likely continue to improve over time. At an installed capital cost of $3600/kW, the levelized cost of solar electricity is around $.18/kWh. At an installed capital cost of $2300/kW, the levelized cost is $.12/kwh.

The retail rate of electricity for residential customers is $.1374/kwh and has been increasing at an annual average of 3% since 2000. It will likely continue to increase. This creates a widening incentive to subscribe to programs like Net Metering.

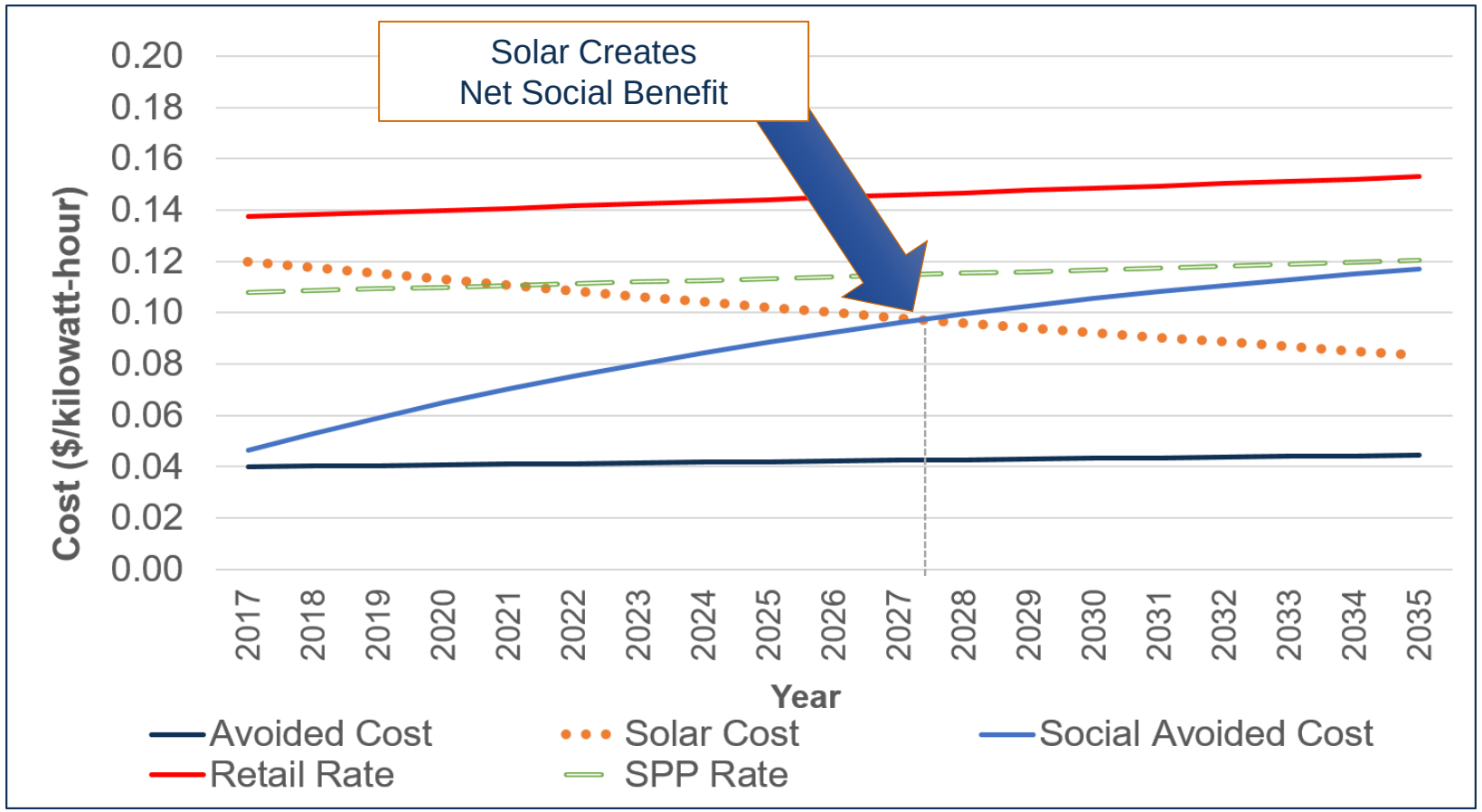
At the same time, the *financial* value of solar to the utility is the avoided variable cost of $.04/kwh (see black line labelled avoided cost on the next page). The avoided cost will likely rise slowly over time as fuel prices increase.

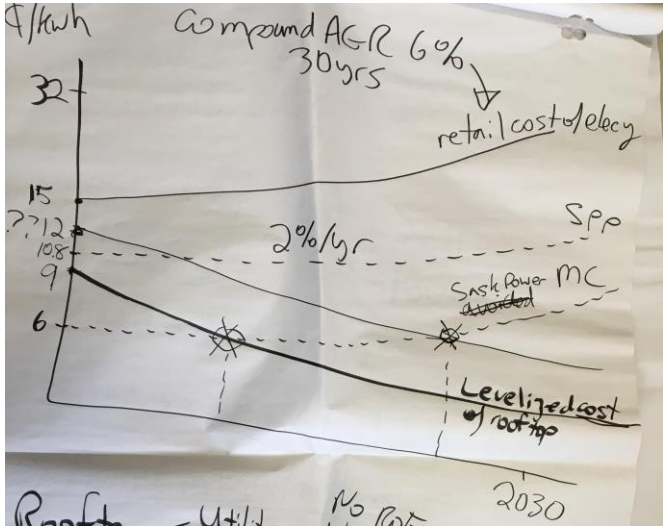
Some participants encouraged SaskPower to consider solar from a full cost accounting perspective that would value the social, economic development, and environmental benefits it creates. The full-cost *social* value of solar includes avoided fuel costs, reduced greenhouse gas (GHG) emissions, and reduced health impacts (see the blue line labelled 'social avoided cost' on the next page).

As solar costs decline and the social avoided cost increases (for example, due to GHG emission reduction goals), solar reaches a point where the benefit (avoided social cost) is greater than the cost of solar. At that point, solar creates a net social benefit (see diagram on the next page).

One challenge is that SaskPower does not have a mandate to value and incorporate the social cost of carbon, or the health benefits of pollution reduction into their financial reporting. SaskPower's mandate would have to be expanded by the provincial government in order to make the avoided social cost measure relevant to SaskPower.

Appendix C - Cross-Subsidization: The Evolving Economics of Solar





Note: The original version of this diagram was introduced by a participant in the Regina workshop.

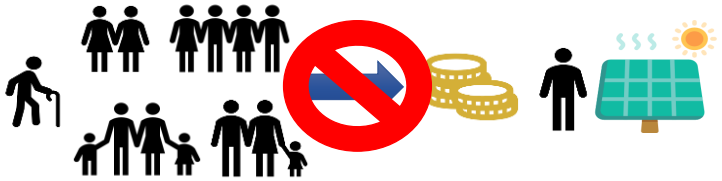
Assumptions underlying this graph are as follows:
Avoided cost at $.04/kWh and increasing by .6%/yr
Solar cost at $.12/kWh (assuming an installed capital cost of $2300/kW) and decreasing at 2%/yr
System GHG intensity 661 tonnes CO2e/MWh, declining at 3%/yr
Avoided social cost of carbon value at $10/tonne, increasing by $10/year
Social avoided cost = avoided cost + GHG reduction value (i.e. system GHG intensity x carbon value)

Appendix C: Cross-Subsidization - Workshop Concerns

Some participants took issue with the principle: "*Minimize cross-subsidies from non-solar customers."* Here are some reactions to cross-subsidization in the words of workshop participants:

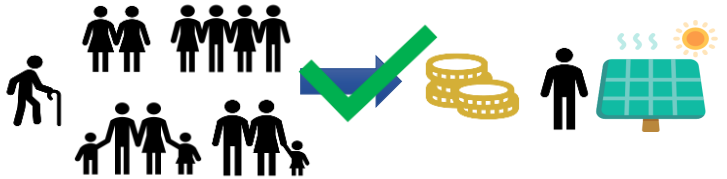
Disbelief

- "Cross-subsidization - We see that as a red herring"
- "Biased assumption that solar is a burden"



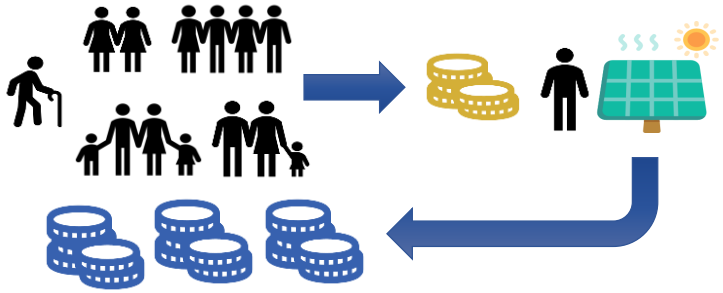
Acceptance but Justification

- Subsidize at "early stage of development – till solar is established – then grid access charge."
- "Item 4 (cross-subsidization) is bogus because of other cross-subsidies at SaskPower."
- "Either invest the same amount on solar as carbon sequestration or a portion of the latters' funds towards solar energy development."



Account for Solar's Social, Economic & Environmental Benefits

- "Properly value the environmental and human health consequences" of solar, including the "cost avoidance value", the value of having "generation close to load", and the "GHG externality costs." Participants argued this full cost valuation would shift perceptions around cross-subsidization.



Appendix C: Cross-Subsidization - Focus Group Reactions

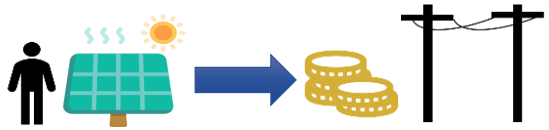
The range of views on cross-subsidization within the focus groups is captured by the following stakeholder quotes:

Support for creating an incentive to install solar

- "This is a good incentive to switch to solar - we need more incentives like this."
- "Keep the subsidy - this means I am being rewarded for installing solar."

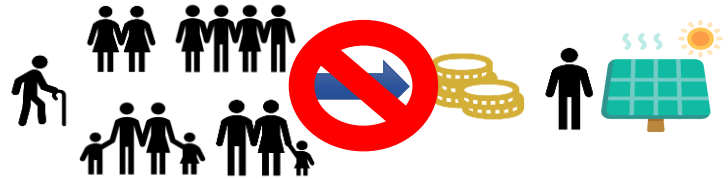
Those who use the grid should pay

- "If I offset my entire bill, I shouldn't pay but if I use the grid I should pay for what I use."
- "The costs should be fair and equitable based on usage of the grid."



Avoid cross-subsidy to ensure fairness

- "We need to make solar accessible. Those who can't afford shouldn't be penalized."
- "I can afford it, I'm the one saving, why should my poor neighbour pay for that?"
- "It's a good incentive for solar but no one should be penalized."

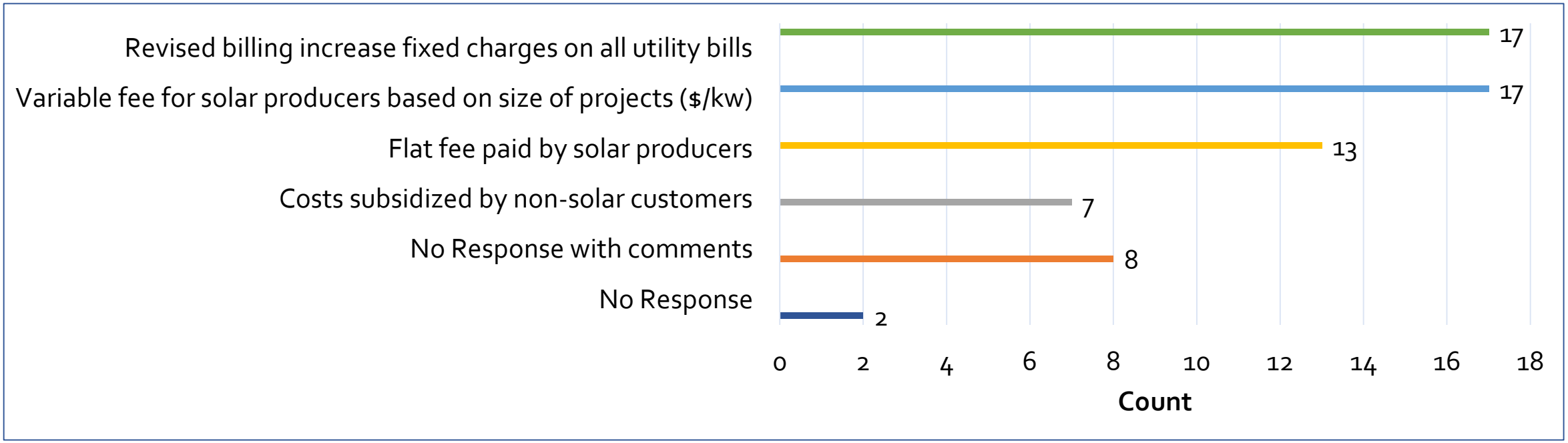


At first participants appeared opposed to cross-subsidization due to fairness considerations, but when asked directly if solar customers should pay to be connected to the grid, participants were concerned that this would act as a disincentive to installing solar.

Appendix C: Cross-Subsidization - Workshop Program Design Results

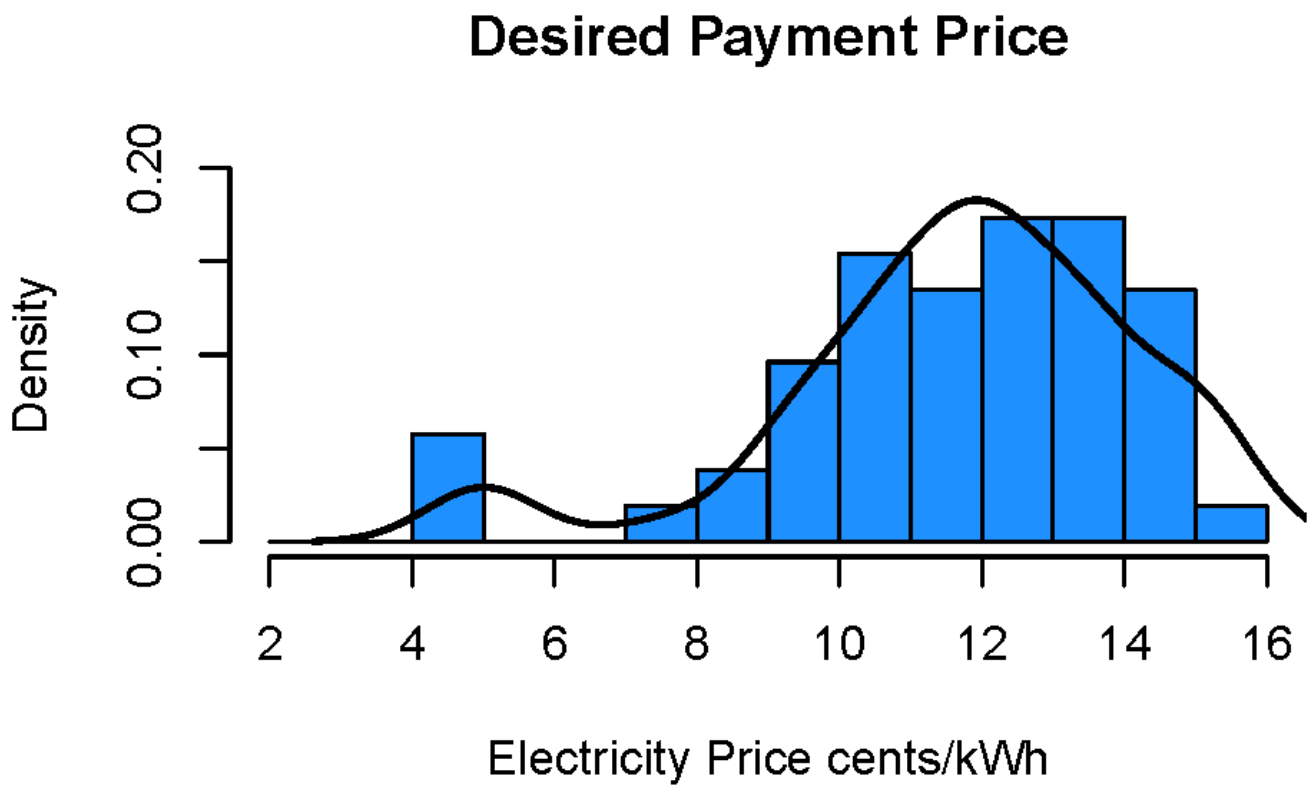
Participants in the workshops were asked to design a solar program using a program design template (see Appendix A). In total, participants completed sixty-four program design templates. Question 7 on the template asks, 'What is the best way to pay for the stand-by/back-up services provided by the electricity grid?' The responses to question 7 are presented below. It is clear that those who would like non-solar customers to subsidize solar customers are in the minority; only seven groups felt that costs should be subsidized by non-solar customers. Of the eight that did not choose one of the four options, but left a comment, only one expressed the sentiment that subsidization was not an issue saying "Already carrying it by the current monthly charge."

Question 7. What is the best way to pay for the stand-by/back-up services provided by the electricity grid?



Appendix C: Cross-Subsidization – Conflicting Responses

The majority of stakeholder participants wanted to receive a higher than avoided cost price for solar electricity production. The graphic below presents the distribution of responses received in the program design exercises. The average suggested range for the price paid to solar producers was $0.011/kwh to $0.013/kwh. Although the concept of cross-subsidization had overall mixed responses by stakeholders in the workshops, focus groups, and survey responses, the majority of workshops participants designed their programs to receive payments above the avoided cost rate (estimated at $0.03/kwh to $0.07/kwh).



Appendix C: Cross-Subsidization - Focus Group Results

Focus group participants were mixed on cross-subsidization. Some participants believe it is unfair to non-self-generating customers while others believe it incentivizes those interested to invest in solar.

- The residential Saskatoon group unanimously felt that cross-subsidies or transfer of costs to non-self-generating customers were unfair for customers who cannot participate.
- Unlike Saskatoon, the Swift Current group was not overly concerned about the cross-subsidy and thought it was a good incentive for people to think about solar.
- Among the Saskatoon small-medium businesses group, participants believed the cross-subsidy to be unfair and mentioned that customers should not be rewarded to use the grid for less if they can afford it.
- Yorkton participants all tended to agree that solar customers should be paying to be connected to the grid as it is needed for backup.
- Weyburn participants believe the cross-subsidy is okay since it provides an incentive for solar and takes the environmental impact into account.
- In Regina specifically, no one could agree on the cross-subsidy issue and the group flip-flopped and did not feel strongly either way.

Appendix C: Cross Subsidization Summary

Stakeholder views on cross-subsidization are diverse.

The majority do not want to see wealth transferred from electricity customers to solar self-generators. When participants contemplated the equity impacts of cross-subsidization, concern for cross-subsidization increased. Stakeholders felt it was unfair for low-income households to pay higher electricity rates in order to support solar programs enjoyed by wealthier households.

Some stakeholders see cross-subsidization as a useful incentive to encourage solar. These stakeholders believe that electricity rates will not increase by much because solar program uptake is low. Cross-subsidization only becomes a problem once solar is widely adopted. While that may be true at current levels of demand, it is a pessimistic view that assumes a continued low level of interest in solar.

Another group of stakeholders feel that if a full cost account were taken of the value of solar, then the social benefit of spending on solar would exceed the social cost. These stakeholders were keen to see the value of carbon included in the evaluation of the cost of solar. This is currently not part of SaskPower's mandate and the provincial government would need to expand the SaskPower mandate to include incorporating the social cost of carbon and the health benefits of pollution reduction. More study is likely required to determine a monetary value for the health benefits created by pollution reduction.

Many stakeholders recognized that self-generators continue to rely on the provincial electricity grid and felt that those who use the grid should pay for those services.

Workable solutions to cross-subsidization are at hand. In the program design exercise, roughly 70% of the groups supported addressing cross-subsidization by either increasing fixed charges on all bills, charging solar customers a flat fee, or charging solar customers a fixed fee based on the size of their solar installation.

Appendix D – Focus Group Reasons for Investing in Solar

Overall, the two primary reasons for showing interest in solar power among the focus group participants include investing now and saving later and reducing the environmental impact caused by other forms of power generation.

Primarily, participants chose the top two items below but the key difference is between the Regina and Swift Current group. In Regina, participants were highly focused on the environment while in Swift Current, participants were more interested in return on investment. The other groups had more blended reasons.

Primary Reason	Number of Participants Selecting Each Option	Percentage
Invest now, save later	14	30%
Reduce environmental impact	12	27%
Sell back to SaskPower	8	17%
Less dependent on provider	7	15%
Save money now	3	7%
Other	2	4%
Total	46	100%

Appendix D - Key Takeaways from the Focus Groups

- Consistent across groups, awareness/knowledge of current programs low overall but want more information.
- The Saskatoon residential group holds inflated risk perceptions (e.g. weather, maintenance, taxes, utility charges) which kept the group overly cautious despite maintaining an interest in solar.
- Participants are mixed on the cross-subsidization idea. Some believe it is unfair to non-self-generation customers, while others believe it incentivizes those interested in solar.
- There exists acknowledgment that a provincial power grid of some kind will still need to exist into the future.
- Specifically, the Swift Current group was highly interested in return on investment and want the ability to sell back to the grid.
- Consistent between groups, the majority are not overly excited about the potential to save $13,000 over 25 years given the optimal rooftop scenario.
- Most participants want higher returns and/or a shorter payback period in order to make the investment attractive.
- The primary barrier to investing (besides perceived long payback) is the uncertainty of how technology will improve and the potential for more savings if one chooses to wait.
- Despite critical perceptions of an unattractive rooftop solar investment, all participants remain highly interested in solar generation.
- Some participants expect SaskPower to demonstrate proven success stories for solar in order to encourage others to invest.
- Nearly all participants see shared/community solar as a more attractive investment than personal rooftop solar given perceived lower upfront investment and ability to start earning returns in a shorter time period.
- Believe that shared solar projects are highly beneficial for the environment and SaskPower should work with communities and RM's to help set up these types of projects.

Appendix E - Geographic Distinctions

Some of the ideas expressed varied by geographic location. Here are three ideas that found support in specific geographic areas.

Cross Subsidy as Unfair

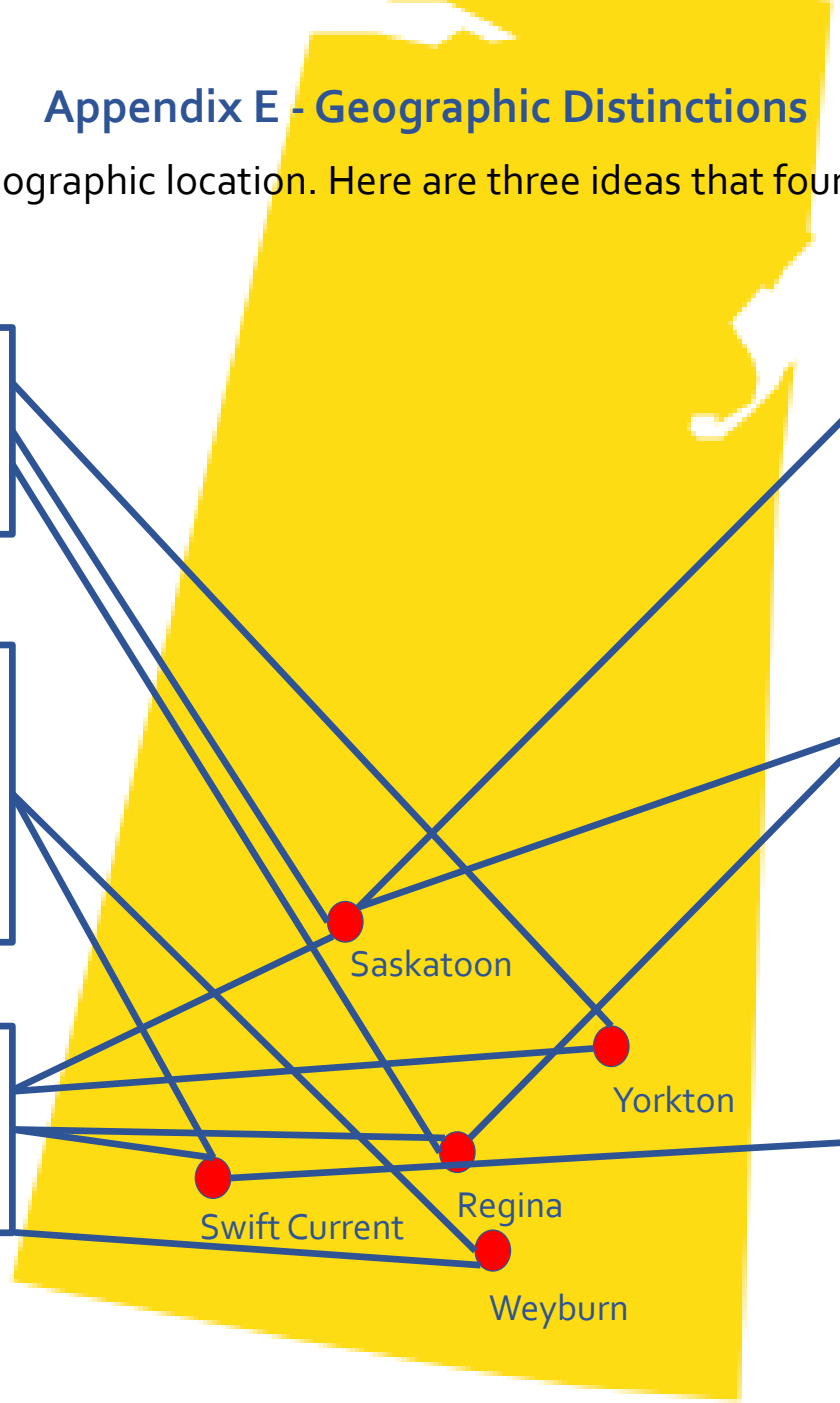
Focus group customers agreed that cross subsidies were unfair and programs should ensure that they are minimized.

Cross Subsidy as Fair

Focus group customers agreed that solar producers should be recipients of a form of cross subsidy. Concerns, however, were raised on the impact towards low income customers.

Shared Solar

Focus group customers agree that shared solar is most attractive given lower investment per person and more benefits for the environment



Decentralized Grid

Workshop participants in Saskatoon supported a vision of a decentralized, distributed electricity generation future.

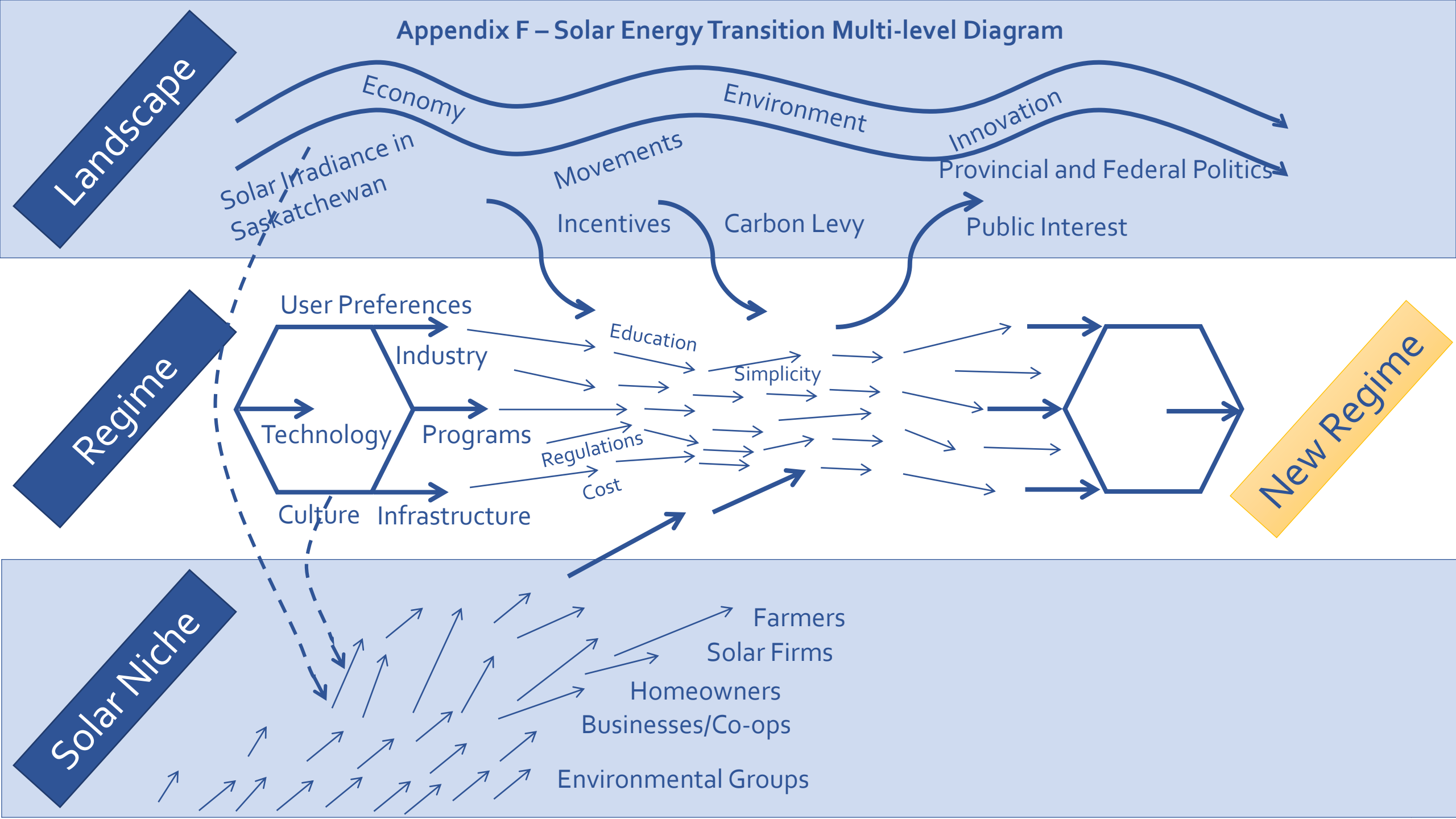
Full Cost Accounting of Solar's Benefits

Workshop participants in Saskatoon and Regina felt it was important to take a full cost accounting approach to valuing solar.

Profit Motivation

Focus group participants in Swift Current were quite familiar with wind power generation projects and were critical of solar investments given perceived shorter payback and higher returns for wind generation. More than any other focus group location, Swift Current participants were concerned about return on investment.

Appendix F – Solar Energy Transition Multi-level Diagram



References

Solar panel image on front cover:

http://www.publicdomainpictures.net/view-image.php?image=9099&picture=solar-panels

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