International Solar Alliance Expert Training Course: Session 7

Solar PV Policy: NET-FITs

In partnership with the Clean Energy Solutions Center
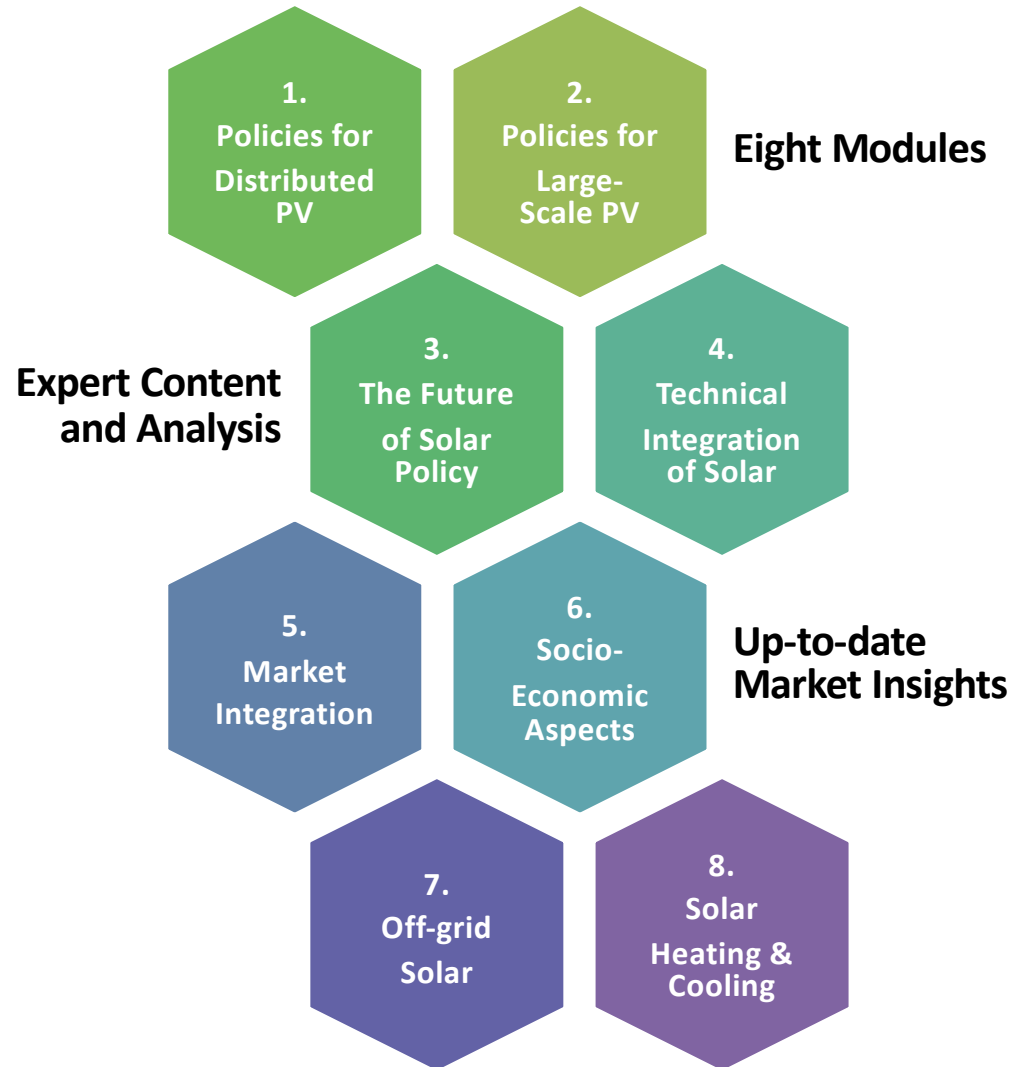
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Overview of Training Course Modules

This Training is part of <u>Module 1</u>, and focuses on the issue of **NET-FITs**

Eight Modules

Expert Content and Analysis

Up-to-date Market Insights

1. Policies for Distributed PV

2. Policies for Large-Scale PV

3. The Future of Solar Policy

4. Technical Integration of Solar

5. Market Integration

6. Socio-Economic Aspects

7. Off-grid Solar

8. Solar Heating & Cooling

Overview of the Presentation

1. **Introduction: Learning Objective**

2. **Main body of presentation**

3. **Concluding Remarks**

4. **Further Reading**

5. **Knowledge Check: Multiple-Choice Questions**

1. Introduction: Learning Objective

Learning Objectives

❖ **Understand NET-FITs**

❖ **Understand how NET-FIT policies emerged and how they differ from traditional Net Metering and FIT policies**

❖ **Understand where NET-FITs are currently being used in jurisdictions around the world**

❖ **Understand the advantages and challenges of NET-FIT policies for scaling-up distributed solar**

2. NET-FIT Policies

Introduction to NET-FITs

- Net Feed-in Tariffs (NET-FITs) emerged first in Australia in the 2000s:

- Classic "Germany-style" FIT = payment for 100% of output: a **so-called "gross" FIT**

- Australia's policy is a "net" Feed-in tariff, as a **payment is only offered for the net excess generation**. Such an arrangement can simply be called a "Feed-in Tariff" but this leads to confusion: useful to distinguish between "net" and "gross" FITs

- **A NET-FIT = cash payment strictly for the net excess generation exported to the grid**

https://www.dnrm.qld.gov.au/__data/assets/pdf_file/0005/1379678/solar-bonus-scheme.pdf

Introduction to NET-FITs

Formula for NET-FITs:

Payment for net excess generation = A specific cash payment (in $/kWh), typically determined by the utility or regulator

Excess electricity injected into the grid results in a cash payment ($/kWh)

The customer receives both a bill, and a check

Overview of DG Policies

Policy Mechanism	Relation to the Retail Rate	Possibility of Cash Payment (Y/N)
Net Metering	_**At**_ the retail rate	No
Net Billing	_**Below**_ the retail rate	Typically not
NET-FIT	**Typically** _**below**_ **the retail rate**	**Yes**
"Classic" FIT	No relation to the retail rate: **Set at the LCOE of each technology**	Yes

NET-FITs

The NET-FIT rate can be defined in a range of different ways:

1. **The wholesale market rate**

2. **The "time of use" rate**

3. **The avoided cost rate**

4. **The "value of solar" rate**

5. **Some other rate as set by the regulator**

NET-FITs

Depending on how the NET-FIT rate it set, it may result in cost savings or cost impacts for the utility and its customers

In Australia in the 2000s, the NET-FIT rate was set above retail prices in order to catalyze the market (e.g. AUD $0.44/kWh in Queensland)

Since then, the rate has been dropped (in most cases outside of Victoria, which adopted time-of-use pricing) to between 7-12 cents/kWh and differs by State and by utility

Australia's NET-FITs are now below retail prices and differ by utility

State	Current policies	Size Caps	Rate Paid
VIC	Two options from 1 July 2018: 1. A flat, minimum rate of 9.9c/kWh for excess solar energy; or 2. A time-varying rate between 7c and 29c/kWh	Up to 100kW	Depends on retailer, but current minimum rates start at 7c/kWh (see 'Current Schemes' column)
SA	No mandatory minimum rate; customers can search around for competitive rates	10kVA – approx 10kW – per phase (most households are single phase), or 30kVA total	Depends on retailer: Currently ~7-15c/kWh
ACT	No mandatory minimum rate; customers can search around for competitive rates	5kW for single phase connections, 30kW for 3-phase connections	Depends on retailer: Currently ~8-17c/kWh
QLD	No minimum feed-in tariff rate for residential customers in southeastern QLD (rates depend on retailer competition)	Southeast QLD: 5kW for single phase, 15kW for 3-phase	Depends on retailer – currently about 10-16c/kWh
NSW	No mandatory minimum rate; customers can search around for competitive rates	Depends on network, but generally 5kW for single phase and 30kW for 3-phase	Depends on retailer: Currently about 6-16c/kWh

https://www.solarchoice.net.au/solar-rebates/solar-feed-in-rewards

NET-FITs have declined to track PV costs

NET-FIT prices in Australia have come down significantly as solar PV costs have declined:

- In 2011, a 5kW system cost between $17,000 and $25,000 after rebates.
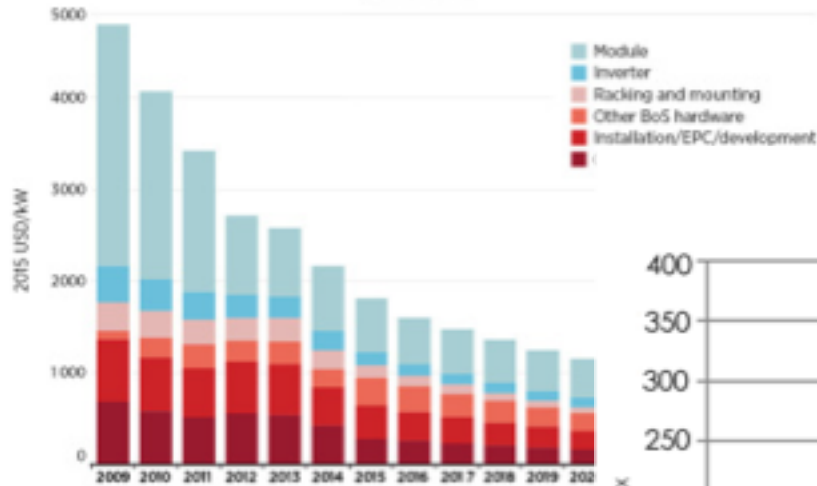- Today, the same size system costs between $4,000 and $8,000 without rebates

Moreover, **retail prices have increased, making self-consumption more financially attractive**

This means that the NET-FIT rate can be quite low and still prove economically attractive for customers
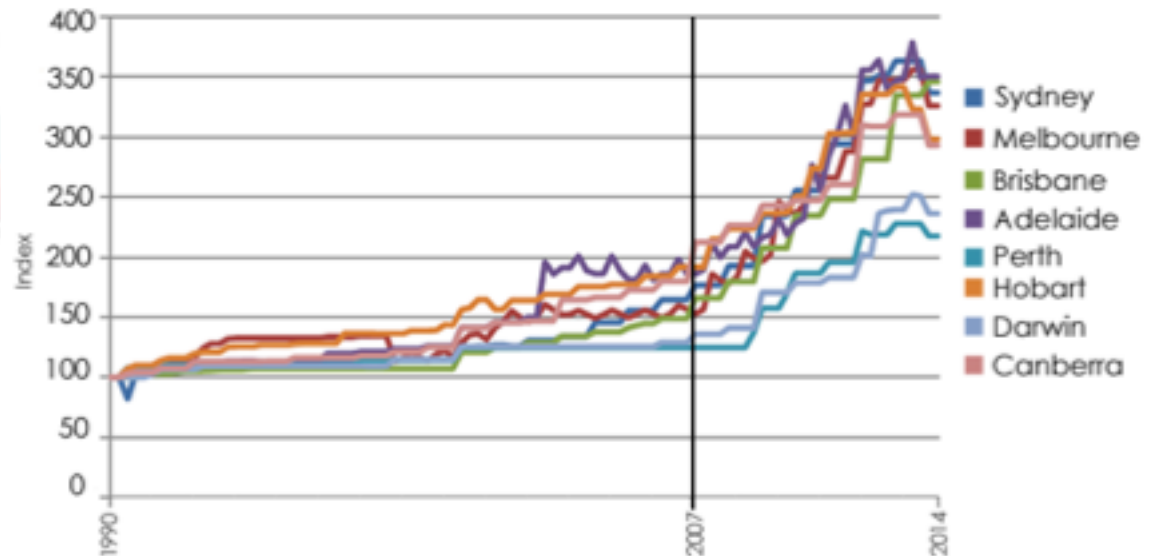
Solar PV Costs

Electricity retail prices in Australia: 1990 = 100

Solar PV Costs

At these rates, installing solar for own-use is good economics

Payback rates in Australia for a rooftop solar system range from 2-5 years
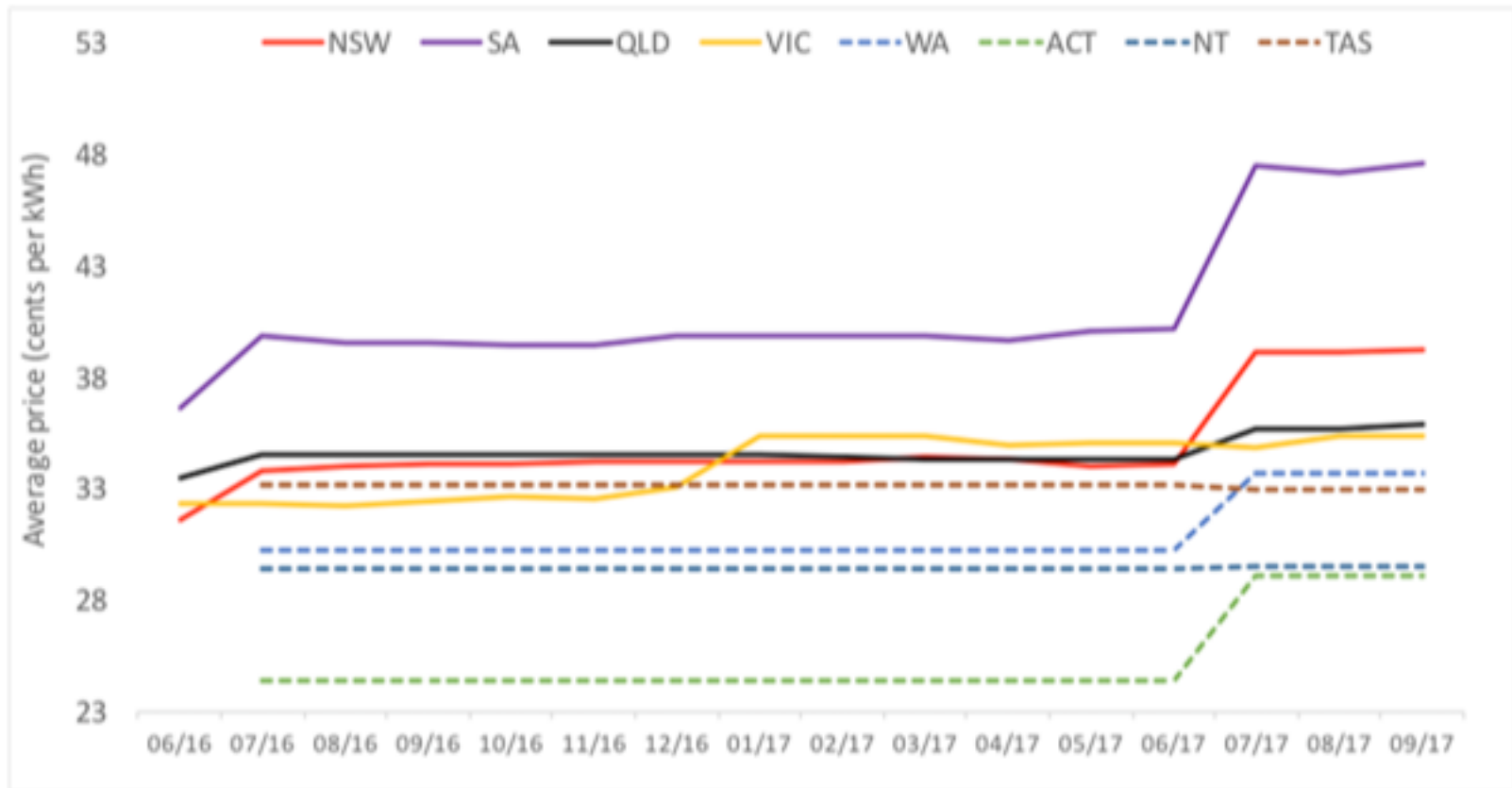
1 Australian Dollar (AUD) = USD $0.72

https://theconversation.com/australian-household-electricity-prices-may-be-25-higher-than-official-reports-84681
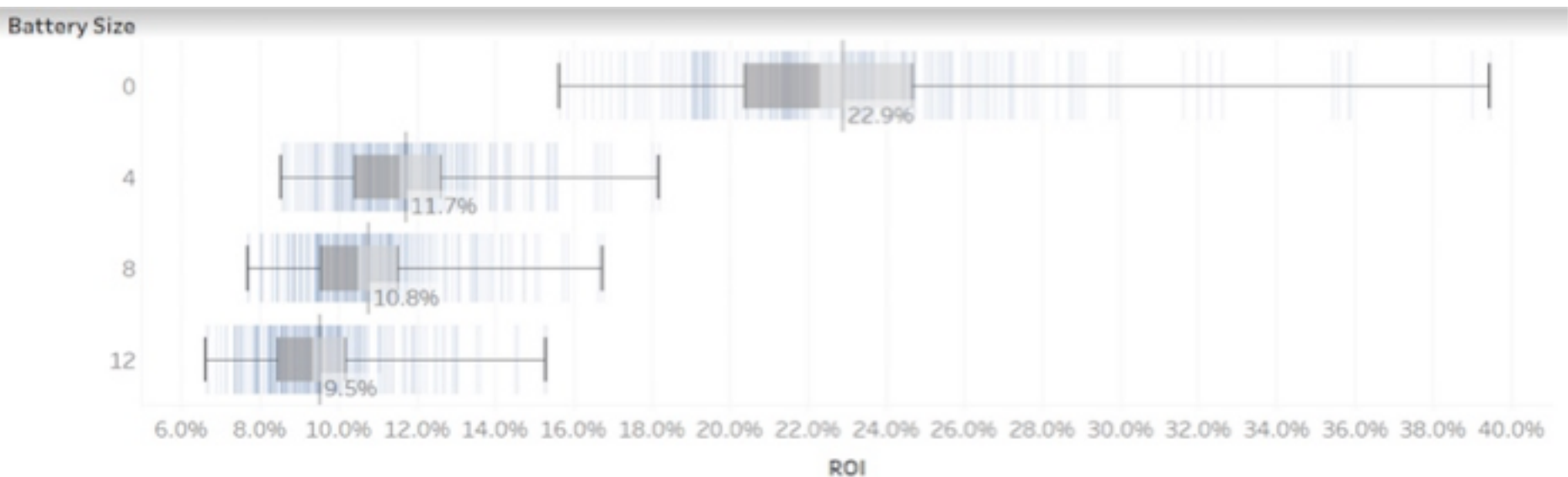https://www.choice.com.au/home-improvement/energy-saving/solar/articles/solar-panel-payback-times

ROI for pure solar PV system >20%
For systems with storage between 9-12%

Systems in Australia are still more profitable without storage

But this could change as storage costs continue to decline

Australia also offers location-specific NET-FITs

In Western Australia, different buy-back rates are offered depending on the location

Pricing is based on the utility's avoided cost of generation in that region

NET-FIT rates range from AUD $0.07/kWh to $0.50/kWh depending on location

This represents another policy option for NET-FIT design, effectively linking the NET-FIT rate to independent benchmarks

https://cabinet.qld.gov.au/documents/2016/Dec/SolRo/Attachments/Report.pdf

Victoria has introduced Time-Varying NET-FITs

Another innovative policy design found in Australia's NET-FIT policy is **Time-of-Use pricing** (TOU) for the net excess generation

The State of Victoria has recently introduced the following time-varying rates for the net excess generation;

	Weekdays	Weekends	NET-FIT Rate (in AUD $/kWh)
Off-Peak	10PM – 7AM	10AM – 7AM	7.1 cents/kWh
Shoulder	7AM – 3PM, 9PM – 10PM	7AM-10PM	10.3 cents/kWh
On-Peak	3PM – 9PM	N/A	29.0 cents/kWh

https://www.solarchoice.net.au/blog/news/victoria-regulator-variable-feed-in-tariffs

Customers given a choice

Customers are provided with the choice:

1. Remain at a fixed, flat rate of 9.9 cents/kWh

2. Adopt TOU pricing at the rates agreed below

	Weekdays	Weekends	NET-FIT Rate (in AUD $/kWh)
Off-Peak	10PM – 7AM	10AM – 7AM	7.1 cents/kWh
Shoulder	7AM – 3PM, 9PM – 10PM	7AM-10PM	10.3 cents/kWh
On-Peak	3PM – 9PM	N/A	29.0 cents/kWh

https://www.solarchoice.net.au/blog/news/victoria-regulator-variable-feed-in-tariffs

Rationale for Time-Varying NET-FITs

Aim of the policy is to **drive behavioral change** to reduce stress on the power system:

- **Load-shifting** (e.g. swimming pool pumps),

- **Orient their solar PV panels to the west** to generate more electricity later in the day

- **Install battery storage**, etc.

Utilities in Victoria are also looking at introducing "critical peak tariffs" that would potentially pay even more for NET-FIT generation

https://www.solarchoice.net.au/blog/news/victoria-regulator-variable-feed-in-tariffs

Residential and Commercial Customers Differ

Residential prosumer

Grid injection

Self Consumption

Commercial prosumer

Grid injection

Self Consump-tion

kWh

For Grid Injection:
Residential customers typically more exposed to the NET-FIT rate due to lower self-consumption ratio

For Self-Consumption:
Customer can offset their consumption from the grid by onsite use, saving money
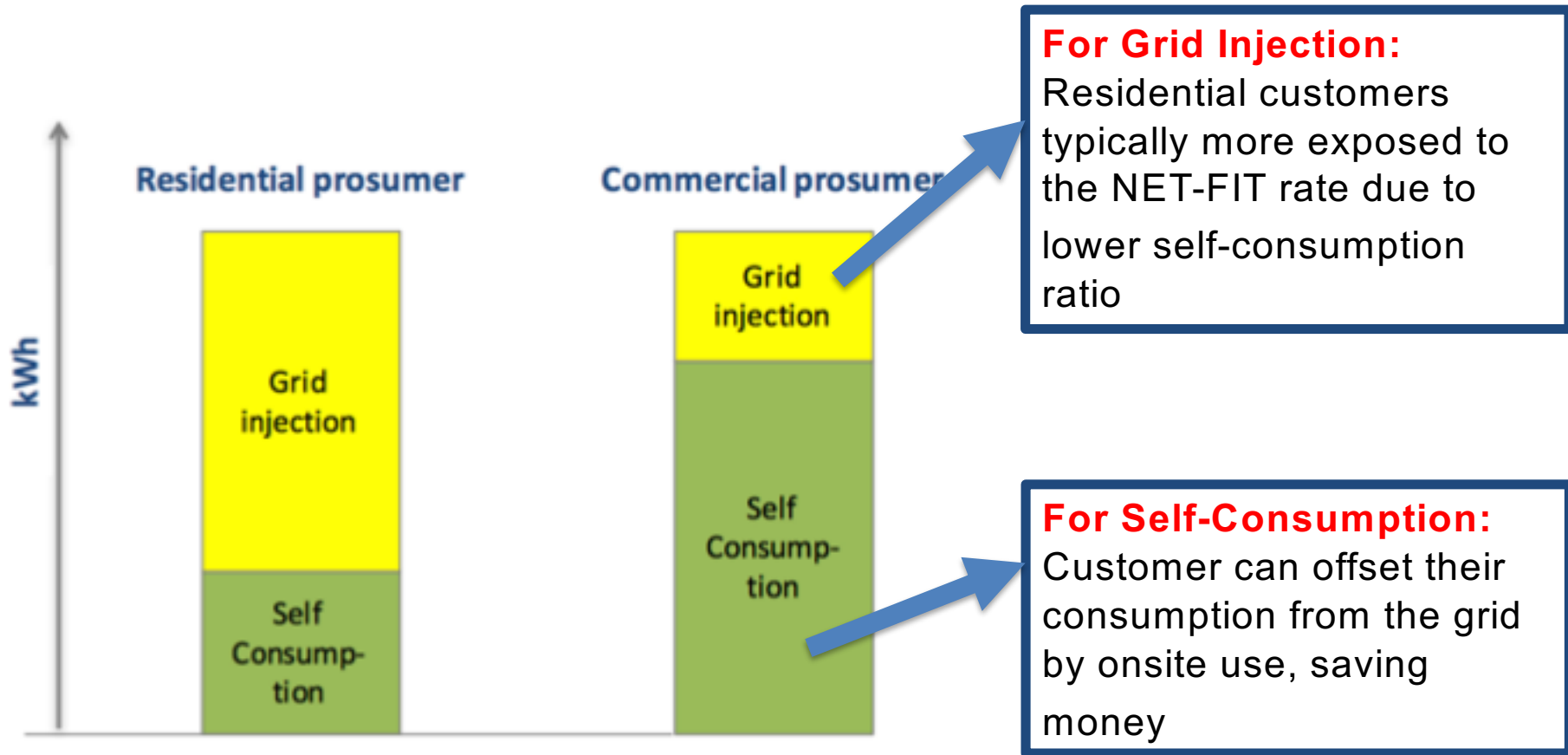
Senegal adopted its own NET-FIT in Q4:2018

Quick Facts:

- **Population**: Approx. 15.85 Million
- **Annual Generation**: 2.875 GWh (2016)
- **Installed Capacity**: Approx. 968 MW (17% renewable, including 100MW of solar PV)
- **Peak Demand**: 560MW
- **Retail Electricity Tariffs**: between USD $0.15 – 0.23/kWh depending on consumption and customer class

NET-FIT in Senegal differentiated by customer class, technology, and voltage level

	Customer Class	NET-FIT (in FCFA)	NET-FIT (USD/kWh)
Solar PV	Small Domestic	75	0.130/kWh
	Medium Domestic	70	0.121/kWh
	Large Domestic	60	0.104/kWh
	Small Commercial	65	0.113/kWh
	Medium Commercial	60	0.104/kWh
	Large Commercial	50	0.087/kWh
	Medium Voltage Customers	50	0.087/kWh

http://www.crse.sn/sites/default/files/2018-11/D%C3%A9cision%20n%C2%B02018-09.pdf

NET-FIT in Senegal also includes other non-solar technologies

Biogas technologies also receive a minimum NET-FIT (USD $0.087/kWh) along with a range of other renewable energy technologies that connect to the grid

A flat rate has been introduced for all medium-voltage customers

IRRs vary widely by customer class and project size, but range from 5-17% (most between 12-15%); as installed costs decline further, the IRRs will continue to improve

NET-FIT is critical to unlocking financing

http://www.crse.sn/sites/default/files/2018-11/D%C3%A9cision%20n%C2%B02018-09.pdf

NET-FITs: Advantages

- NET-FITs recognize that the cost of rooftop solar is increasingly below the retail price that customers pay: paying for this net excess generation (rather than simply compensating it) can therefore be a **"win-win" for both utilities and customers**

- **NET-FITs are more bankable** than either Net Metering or Net Billing: possibility of a cash payment provides a price floor for banks (a "worse case")

- **NET-FIT rate can be differentiated** by project size, location, and time of day if desired

NET-FIT: Advantages (con't)

- **NET-FIT rate can be linked to independent benchmarks** (e.g. wholesale market prices, utility avoided costs), removing the appearance of "subsidies"

- **Fewer issues with cross-subsidization** between customer classes

- **Easier to adjust the compensation rate**, since the NET-FIT rate is not linked to the retail price

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E3 ANALYTICS

NET-FITs: Challenges

- Under NET-FITs, customers may be unfairly/insufficiently compensated for their electricity: distributed generation **may be worth _more_** than the NET-FIT rate provided: this may encourage customers to "shop around" for a customer willing to pay more

- **Administrative burden:** issuing cash payments to customers for small sums (e.g. under USD $50) to settle their net excess generation account may be costly if the processes are not sufficiently automated

- Potential **tax issues**, esp. for commercial customers

NET-FITs: Key Decision Points

1. How to determine the NET-FIT rate?

2. Is the rate a flat rate or is it differentiated by size, location, and/or time-of-day?

3. Which technologies are eligible?

4. Which customer types are eligible?

5. What are the project size categories?

6. Is there a cap on the total allowable capacity?

7. What is the length of the NET-FIT agreement?

8. Do existing projects qualify?

9. Are there any additional charges or fees?

10. Are any bill components "ring-fenced" (i.e. non-erasable through self-consumption)?

4. Concluding Remarks

Concluding Remarks

- Providing a cash payment for net excess generation represents a fundamental step forward for distributed solar policy, making it **more bankable** for a wider range of customers

- NET-FITs can help **catalyze much needed investments** in clean energy

- **NET-FIT rate can be set below the retail rate**, providing benefits both to the utility and to other customers

5. Further Reading

Further Reading

- Jacobs, D., Couture, T.D., Zinaman, O., Cochran, J., (2016). "RE-TRANSITION: Transitioning to Policy Frameworks for Cost-Competitive Renewables," IEA-RETD, Paris. Available at: http://iea-retd.org/wp-content/uploads/2016/03/IEA-RETD_RE-TRANSITION.pdf

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    Rickerson, W., Koo, J., Crowe, J., Couture, T., (2016). "Tapping the Potential of Commercial Prosumers: Drivers and Policy Options," IEA-RETD, Paris. Available at: http://iea-retd.org/wp-content/uploads/2016/04/RE-COM-PROSUMERS-Report.pdf

- Zinaman et al. (2018). Distributed Generation Compensation Mechanisms (2018): https://www.nrel.gov/docs/fy18osti/68469.pdf

- https://gridworks.org/wp-content/uploads/2018/01/Gridworks_SustainingSolar_Online.pdf

Further Reading

- Couture, T., Jacobs, J., Rickerson, W., Healey, V., (2015). "The Next Generation of Renewable Electricity Policies: How Rapid Change is Breaking Down Conventional Policy Categories," Clean Energy Solutions Center, in collaboration with the National Renewable Energy Laboratory, Available at: http://www.nrel.gov/docs/fy15osti/63149.pdf

- Rickerson, W., Couture, T., Barbose, G., Jacobs, D., Parkinson, G., Belden, A., Becker-Birck, C., Chessin, E., (2014). "A Study on the Effects of a Large Uptake of Non-Incentivised Residential PV (RE-PROSUMERS)", IEA-RETD: Paris, France. Available at: http://iea-retd.org/wp-content/uploads/2014/06/RE-PROSUMERS_IEA-RETD_2014.pdf

- EU Study on Prosumers in the EU: https://ec.europa.eu/commission/sites/beta-political/files/study-residential-prosumers-energy-union_en.pdf

Thank you for your time!

6. Knowledge Checkpoint: Multiple Choice Questions