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Are electricity network incentive schemes rewarding the wrong behavior?

03 May 2022

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Agenda

01 Project Drivers and Key Objectives

02 Cost Benefit-Assessment Results

03 Key Barriers and Solutions

04 Questions

05 Potential Future Topics

01

Introduction: Project Drivers And Objectives

Renew Stage II Objectives

Stage 1 found a more in-depth study needed to:

- Develop the technical understanding and evidence base through a consumer-focused, stakeholder-engaged process designed to influence industry practice and thinking
- Inclusion of generation and transmission costs and benefits, consideration of DER resource development and more advanced modelling of LV networks, resources and load

Stage 2 key objectives:

- Optimise consumer side solutions by using best possible evidence base for the costs and benefits of consumer side solutions to ensure they are correctly considered on par with other system resources
- Envision consumers and prosumers' current and future needs, so that this perspective may be given equal weight and consideration in future market design
- Identify and quantify optimal policy, market and industry settings based the long-term interests of consumers

02

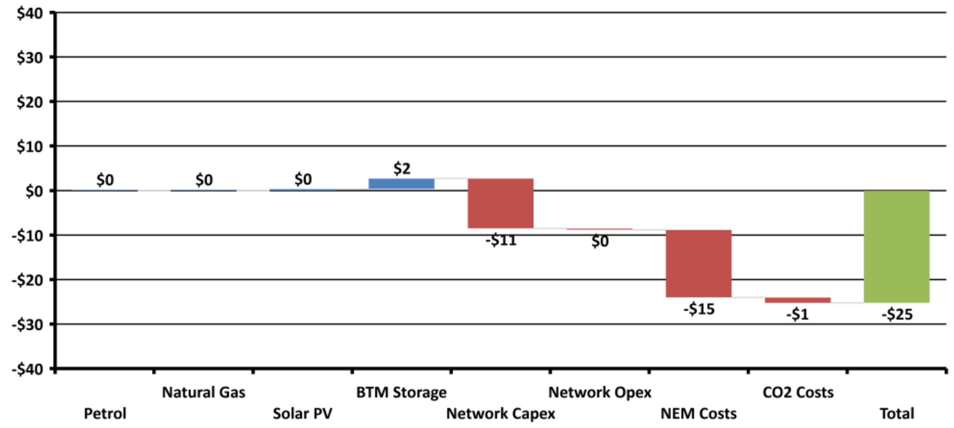
Cost-Benefits Assessment

- 15 year NPV
- 30 year NPV

Cost-Benefits Assessment (CBA) Results

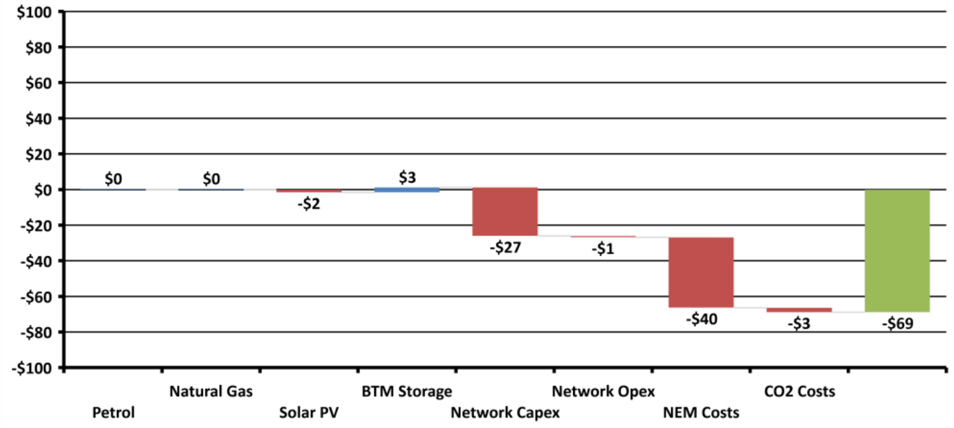
- Modelling showed the Consumer High DER Scenario to be $25 billion lower cost over the next 15 years
- Most of the savings comes from reduced utility scale generation capital and operational expenditure
- Avoided network capex is the second largest source of savings
- There is very little difference in DER costs other than BTM storage costs, which are higher
- Consumer High DER Scenario costs were $69 billion lower than the ISP Step Change scenario over 30 years
- Interestingly, BTM solar PV costs are slightly lower, other costs and benefits are roughly proportional
- Please see our previous webinar for more information regarding the underpinning modelling

CBA of Consumer High DER Compared to ISP Step Change (15 year)



Source: Energeia modelling

CBA of Consumer High DER Compared to ISP Step Change (30 year)



Source: Energeia modelling

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03

Key Barriers

Key Barriers

- Signals
  - LRMC
  - Time-of-Use Periods
- Level Playing Field
  - RIT-D
  - LV Substations
- Enablement
  - Integrated distribution resource planning
  - 3rd party service technical and market platforms
- Incentives
  - Regulatory
  - Investor

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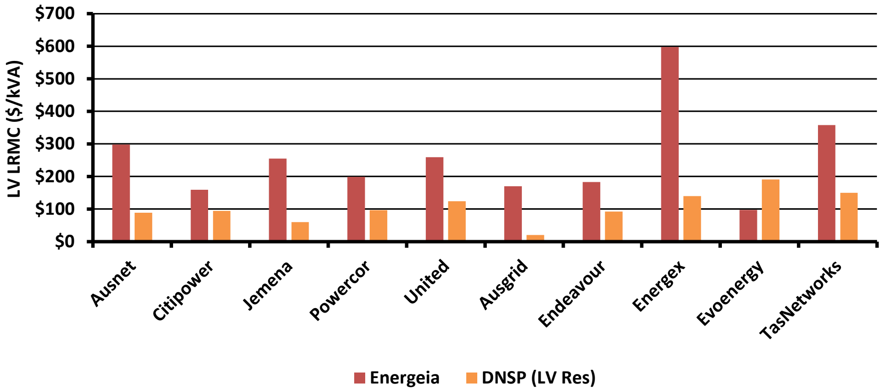
Signals – Fix LRMC Methodology

LRMC incl. 50% Repex and Connex

% Expenditure incl. vs. AER FD		VIC				NSW			QLD		ACT	SA	TAS
		AusNet	Jemena	CitiPower / Powercor	United	Ausgrid	Endeavour	Essential	Energex	Ergon	Evoenergy	SA Power	TasNetworks
	Repex	10%	0%	0%	-	1%	142%	10%	-	-	0%	9%	-
	Augex	0%	6%	174%	-	40%	27%	18%	-	-	89%	69%	-
	Connex	0%	21%	0%	-		43%		-	-	109%	0%	-
	Opex %	1.0%	4.3%	0.5%	-	2.0%	2.0%	-	1.5%-2.5%[1]	1.5%-2.5%[1]	2.0%	1.5%-2%	4.5%

Source: Energeia analysis

LRMC incl. 100% of Augex and 50% Repex



Source: Energeia research

- Australian DNSP LRMC methodologies are perhaps one of the greatest barriers to optimal DER investment and operation
- LRMC is used to set peak prices, which in turn drive avoidable cost of BTM DER investment
- They are also used in grid planning, e.g. RIT-D filtering steps, which rule out DER thought to be uneconomic
- Rules[1] are **not explicit** regarding nature or level of augex, repex or opex to be included
- They do say that the long-run is the period over which **all costs are variable**, which implies **all costs in LRMC**
- Correcting this signal will increase efficient DER investment and reduce inefficient DNSP system investment

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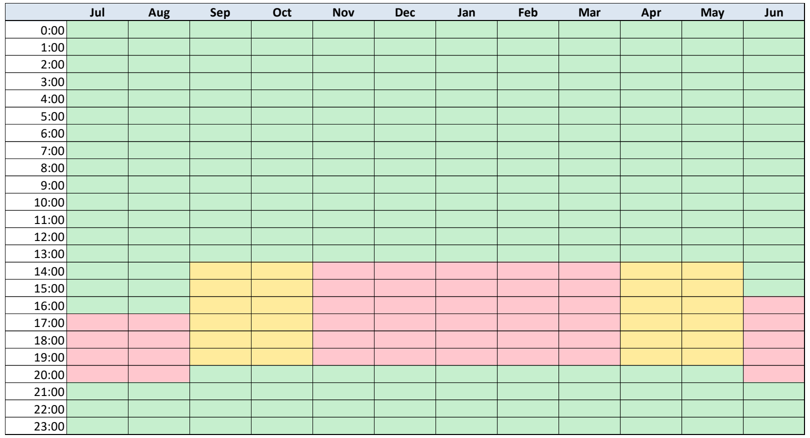
Signals – Fix Congestion Classification

% of ZS >= 90% of Peak Demand by Period

	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
0:00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
1:00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
2:00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
3:00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
4:00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
5:00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
6:00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
7:00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
8:00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
9:00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
10:00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	1.52%	0.00%	0.00%	0.00%	0.00%	0.00%
11:00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	4.55%	0.00%	0.00%	0.00%	0.00%	0.00%
12:00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	7.58%	0.00%	0.00%	0.00%	0.00%	0.00%
13:00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	16.67%	0.00%	0.00%	0.00%	0.00%	0.00%
14:00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	28.79%	4.55%	0.00%	0.00%	0.00%	0.00%
15:00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	34.85%	21.21%	0.00%	0.00%	0.00%	0.00%
16:00	0.00%	0.00%	0.00%	0.00%	0.00%	3.03%	43.94%	43.94%	0.00%	0.00%	0.00%	0.00%
17:00	0.00%	0.00%	0.00%	0.00%	0.00%	4.55%	63.64%	80.30%	0.00%	0.00%	0.00%	1.52%
18:00	4.55%	3.03%	0.00%	0.00%	0.00%	7.58%	84.85%	87.88%	0.00%	0.00%	0.00%	9.09%
19:00	6.06%	3.03%	0.00%	0.00%	0.00%	4.55%	77.27%	83.33%	0.00%	0.00%	0.00%	10.61%
20:00	1.52%	1.52%	0.00%	0.00%	0.00%	1.52%	63.64%	46.97%	0.00%	0.00%	0.00%	3.03%
21:00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	24.24%	7.58%	0.00%	0.00%	0.00%	0.00%
22:00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
23:00	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%

Source: Energeia analysis

Congestion (Peak) Period Classification



Source: Energeia analysis

- Peak period definitions are another key barrier to efficient DER adoption and operation
- Peak periods that are too long dilute the value of peak reductions, and associated efficient investment levels
- Section 6.18.5 of the NER governs that network tariffs must be justifiably cost-reflective. However, no unifying definition of peak period.
- The result is that most peak periods are inaccurate, as exemplified in the example to the left
- In this example, the true peak, where additional consumption could increase peak demand on > 50% of zone substations just on 8 hours a year, while the DNSP peak is set for 43 hours a year
- The resulting $/kWh or $/kW (recovering LRMC) will therefore be a fraction of the true cost, violating allocative efficiency principles (marginal revenue = marginal cost)

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Signals – PV Congestion Classification (Illustration)

% of ZS >= 90% of Peak Demand by Period

	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
0:00	7.91%	9.04%	18.08%	19.21%	16.38%	11.86%	5.08%	5.65%	11.30%	25.42%	11.86%	8.47%
1:00	17.51%	18.08%	36.72%	37.85%	36.72%	32.20%	16.38%	21.47%	29.38%	48.02%	33.33%	18.08%
2:00	31.07%	33.90%	59.89%	57.63%	58.19%	58.76%	47.46%	45.20%	53.11%	72.88%	55.93%	37.85%
3:00	57.06%	61.02%	76.84%	72.88%	78.53%	76.84%	70.06%	68.93%	74.58%	83.05%	73.45%	59.89%
4:00	65.54%	69.49%	83.05%	82.49%	80.23%	83.05%	77.97%	71.19%	76.27%	84.18%	79.66%	67.80%
5:00	54.24%	61.58%	81.36%	75.71%	74.58%	81.36%	74.01%	64.97%	71.75%	84.18%	72.32%	58.19%
6:00	11.86%	12.43%	78.53%	49.15%	45.20%	72.88%	59.89%	31.07%	36.72%	75.14%	32.20%	36.16%
7:00	1.69%	2.26%	67.23%	8.47%	9.60%	49.15%	28.81%	3.39%	5.08%	59.32%	3.95%	23.73%
8:00	0.56%	2.82%	33.90%	3.95%	6.78%	20.34%	9.60%	0.56%	3.95%	32.77%	1.13%	19.21%
9:00	1.13%	4.52%	20.90%	12.43%	12.43%	13.56%	6.21%	3.95%	6.21%	28.25%	5.65%	19.77%
10:00	3.39%	11.86%	20.34%	19.21%	19.77%	12.99%	6.78%	7.34%	10.17%	29.94%	12.99%	4.52%
11:00	7.91%	19.21%	24.86%	23.73%	20.90%	14.69%	7.34%	10.73%	16.38%	32.20%	18.08%	9.60%
12:00	11.30%	21.47%	28.25%	27.68%	22.03%	14.69%	6.78%	12.43%	15.82%	33.33%	19.77%	13.56%
13:00	11.86%	23.16%	29.38%	27.68%	23.16%	16.38%	7.34%	11.86%	16.95%	34.46%	19.77%	14.12%
14:00	12.99%	23.16%	27.68%	28.81%	22.60%	18.64%	8.47%	11.86%	18.64%	37.29%	18.64%	14.69%
15:00	11.30%	20.34%	27.12%	28.25%	22.03%	16.95%	6.21%	11.86%	18.08%	35.03%	16.38%	12.43%
16:00	3.95%	12.43%	22.60%	25.42%	16.95%	10.17%	4.52%	5.08%	14.12%	22.03%	6.21%	4.52%
17:00	2.26%	3.39%	9.60%	13.56%	5.08%	3.39%	2.26%	1.13%	5.08%	8.47%	1.69%	1.69%
18:00	1.13%	2.26%	3.39%	4.52%	2.82%	1.13%	1.69%	1.69%	2.82%	5.08%	1.13%	0.56%
19:00	0.56%	1.69%	2.26%	3.95%	2.26%	1.13%	1.69%	2.26%	1.13%	5.08%	1.13%	0.56%
20:00	0.56%	2.26%	2.82%	3.39%	1.69%	1.13%	0.56%	1.69%	1.13%	7.34%	1.13%	0.56%
21:00	1.13%	2.82%	5.65%	2.82%	1.69%	1.69%	0.56%	1.69%	2.26%	10.17%	1.69%	1.69%
22:00	1.69%	3.39%	7.34%	5.08%	3.39%	2.82%	0.56%	1.69%	2.82%	11.30%	2.82%	2.26%
23:00	4.52%	5.65%	13.56%	11.30%	7.91%	5.08%	1.13%	2.26%	4.52%	14.69%	4.52%	4.52%

Source: Energeia analysis

- A similar situation is emerging during the peak solar PV or export period
- The example to the top left shows the actual timing of minimum demand over the year, compared to the pricing signal (bottom left)
- SAPN’s estimated timing of minimum demand is a good indicator of what a forward looking, accurate solar PV or export period would look like

Congestion (Peak) Period Classification

	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
0:00												
1:00												
2:00												
3:00												
4:00												
5:00												
6:00												
7:00												
8:00												
9:00												
10:00												
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16:00												
17:00												
18:00												
19:00												
20:00												
21:00												
22:00												
23:00												

Source: Energeia analysis

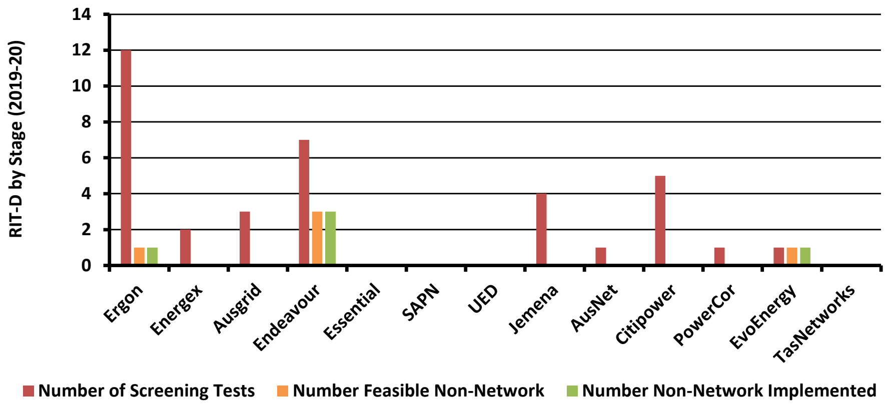
% of ZS <=90% of Min Demand by Period (SAPN)

	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
0:00	3.82%	4.46%	12.10%	8.92%	8.92%	10.83%	8.28%	7.64%	10.19%	9.55%	5.10%	3.18%
1:00	7.64%	7.01%	15.92%	10.83%	20.38%	14.65%	9.55%	9.55%	9.55%	17.20%	13.38%	5.73%
2:00	14.01%	12.74%	23.57%	17.20%	18.47%	26.11%	19.75%	15.29%	16.56%	20.38%	14.65%	10.19%
3:00	15.29%	14.65%	25.48%	19.11%	17.83%	28.66%	21.02%	15.92%	19.75%	22.29%	16.56%	12.74%
4:00	15.29%	12.10%	26.11%	17.83%	17.83%	30.57%	21.02%	15.92%	20.38%	24.84%	17.20%	13.38%
5:00	10.83%	8.92%	21.66%	16.56%	13.38%	28.03%	20.38%	14.01%	19.11%	22.29%	15.92%	9.55%
6:00	2.55%	1.91%	13.38%	7.01%	7.64%	29.30%	17.20%	5.73%	16.56%	17.83%	12.74%	6.37%
7:00	2.55%	0.64%	7.64%	1.27%	1.27%	24.20%	12.74%	0.64%	9.55%	14.65%	5.73%	2.55%
8:00	3.18%	0.64%	6.37%	1.91%	1.27%	21.02%	12.10%	0.64%	6.37%	19.11%	4.46%	1.27%
9:00	2.55%	1.27%	8.28%	6.37%	7.01%	33.12%	18.47%	3.18%	4.46%	29.94%	2.55%	1.91%
10:00	2.55%	8.28%	27.39%	31.21%	33.76%	55.41%	38.85%	12.74%	12.10%	49.68%	10.83%	2.55%
11:00	3.82%	22.29%	48.41%	49.68%	51.59%	67.52%	58.60%	39.49%	31.85%	65.61%	29.30%	10.19%
12:00	7.01%	24.84%	48.41%	52.87%	53.50%	71.34%	60.51%	46.50%	42.68%	64.33%	36.31%	9.55%
13:00	5.73%	30.57%	52.23%	54.14%	52.23%	71.97%	61.15%	46.50%	47.13%	67.52%	39.49%	12.74%
14:00	5.10%	22.93%	46.50%	56.05%	50.96%	68.79%	61.15%	48.41%	43.95%	60.51%	30.57%	11.46%
15:00	5.10%	8.28%	25.48%	50.96%	49.68%	64.97%	56.05%	43.95%	42.68%	37.58%	14.01%	4.46%
16:00	0.64%	2.55%	21.02%	35.03%	36.94%	52.87%	33.76%	28.66%	19.11%	10.83%	5.10%	2.55%
17:00	0.64%	0.64%	14.65%	5.10%	3.82%	10.83%	7.01%	3.18%	5.10%	4.46%	2.55%	2.55%
18:00	0.64%	0.64%	14.65%	1.91%	1.27%	5.10%	2.55%	1.27%	1.91%	4.46%	1.91%	1.27%
19:00	0.64%	0.64%	12.74%	1.27%	2.55%	5.10%	1.27%	0.64%	1.91%	3.82%	2.55%	3.18%
20:00	1.91%	0.64%	13.38%	1.91%	1.91%	5.10%	1.27%	0.64%	1.91%	3.82%	3.18%	3.18%
21:00	2.55%	1.27%	12.74%	2.55%	2.55%	3.82%	1.91%	0.64%	3.18%	5.10%	4.46%	3.82%
22:00	1.91%	1.91%	12.10%	3.18%	3.82%	5.10%	2.55%	3.18%	4.46%	7.01%	5.73%	3.82%
23:00	3.18%	2.55%	14.01%	6.37%	7.01%	10.19%	3.18%	7.01%	7.64%	8.28%	5.73%	5.10%

Source: Energeia analysis

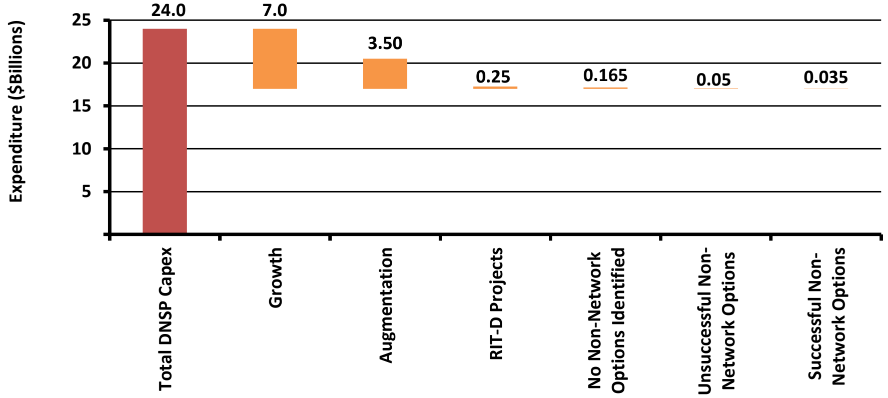
Level Playing Field – Fix the RITD

RITD Outcomes by Reporting Stage (2019-20)



Source: DNSP RIT-D Reports

DNSP RIT-D Revenue Outcomes (2013-17)

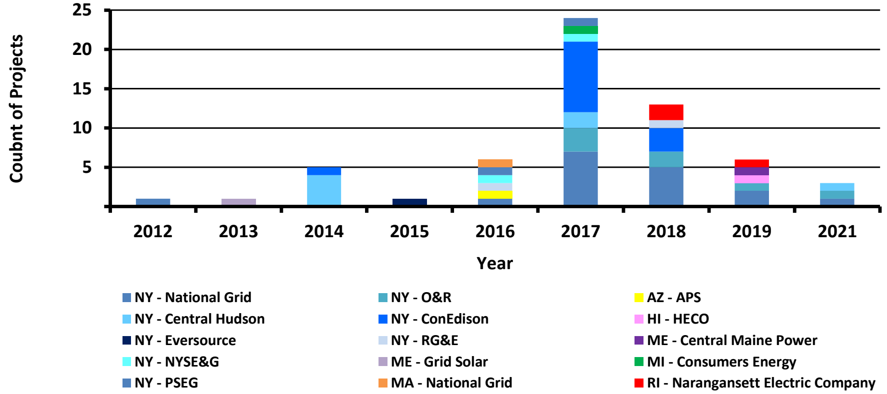


Source: AER

- DER screening processes typically rule out going to market where DER is either too expensive or too little
- Posted (tariff) pricing that is diluting the signal for BTM DER investment is undermining DER availability
- Energeia's research found the RIT-D process leading to almost no DER tenders (5/36) over the 2020-19 period
- DER projects that are found to be feasible are currently limited to a few years of deferral, limiting their value
- AER study found less than $0.035b (0.15%) out of $24b capital expenditure over the 2013-17 period
- Adopting global best practices will increase number and success of non-network alternatives

Level Playing Field – Best Practice?

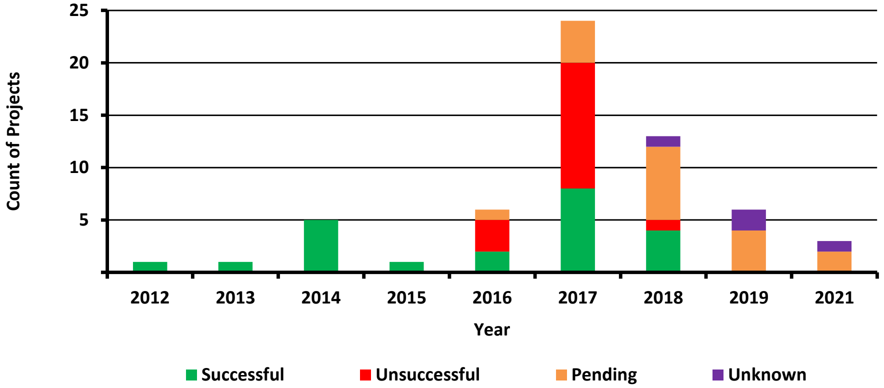
Count of Projects by Year by Utility



Source: Energeia Research

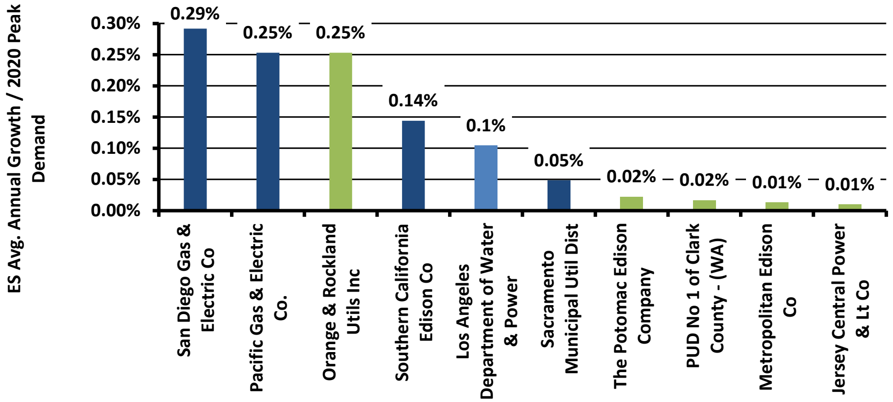
- Energeia's research of US best practice DER integration found that NY achieved highest NWA tenders
- NY issued 23 DER tenders to the market in 2017, of about half were unsuccessful, mostly due to the lack of DER availability (similar price signal issues)
- NY DNSPs have identified key lessons learned and expect to improve their process moving forward
- NY utility ranked highest in national behind-the-meter storage growth as a result (CA growth mandated)

Count of Projects Based on Project Status by Utility



Source: Energeia Research

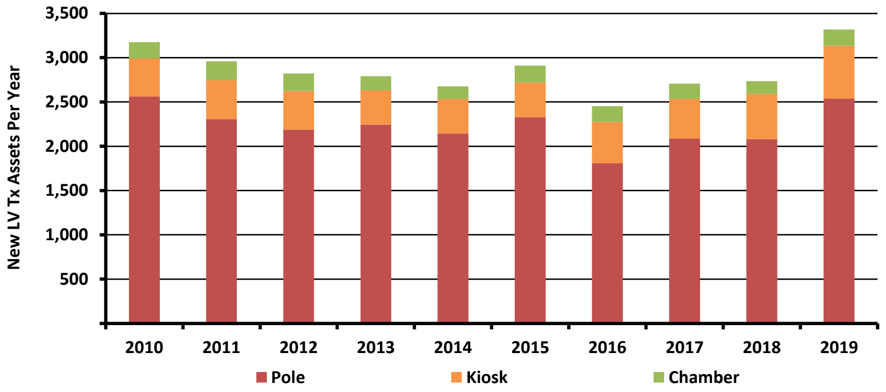
Behind-the-Meter Storage Growth as a Percentage of Peak Demand



Source: Energeia Analysis

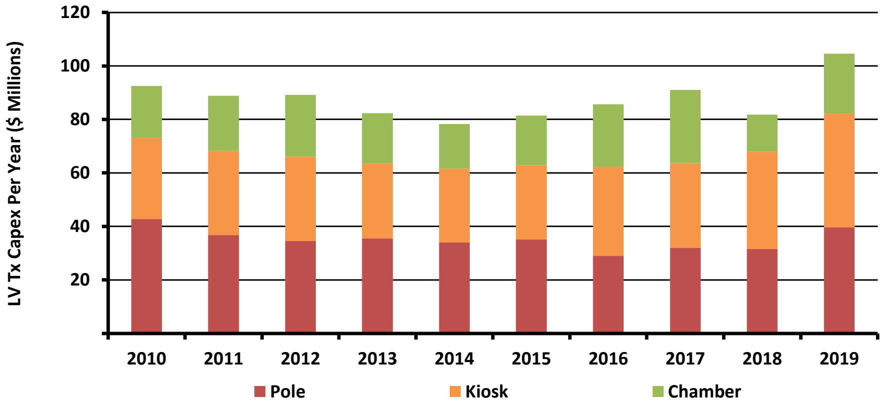
Level Playing Field – <$5m Projects (LV Tx Example)

LV Tx Assets (VIC)



Source: DNSP Category Analysis RINs

LV Tx Capex (VIC)

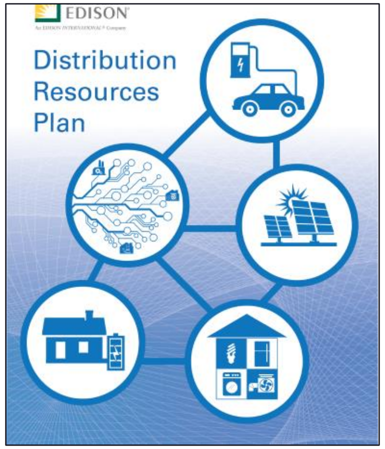


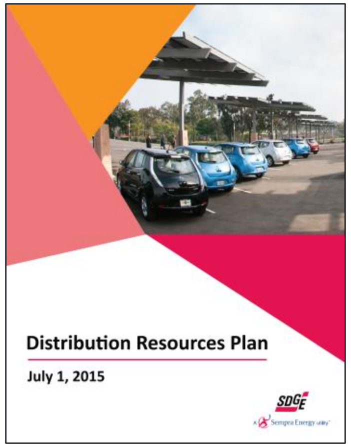
Source: DNSP Category Analysis RINs

- One key barrier to efficient DER investment is that the RIT-D process only applies to large investment projects
- It does not apply to large investment programs, such as LV substations, which are billions per year
- The size of LV substations in total numbers and in total capex is much bigger than RIT-D projects
- Solar PV driven LV substation upgrades a potential wave of work at risk of inefficient investment
- Energeia notes that DNSPs are already engaging with the market around this asset class

Enablement – IDRP / Technical Platforms

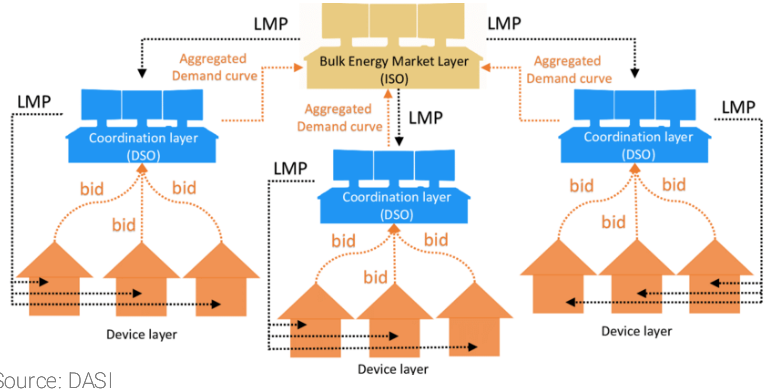
Integrated Distribution Resource Planning (Examples)





Source: Company Websites

Markets (DSO not Transactive Model Shown)

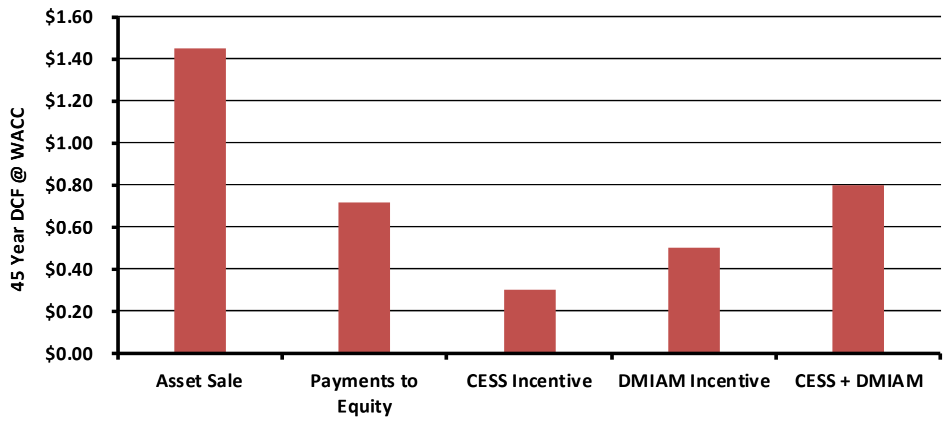


Source: DASI

- A number of key investment and industry processes are needed to enable optimal DER investment levels
- Integrated Distribution Resource Planning (IDRP), where DER is an integral part of the process, is US best practice
- Implementation of industry standard services for grid and market services, is global best practice
- Distribution network investment in these capabilities not yet required, other than indirectly for efficiency

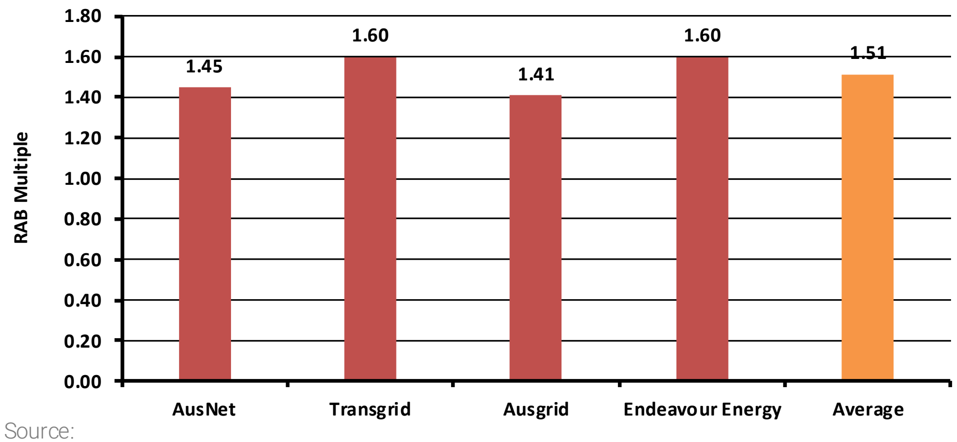
Incentives – Key Signals

Valuation of Various Incentive Related Strategies



Source: AER, Energeia Research

Recent Network Valuations as Regulated Asse Base Multiple



Source:

- Shareholders appoint executive management, who are typically judged on a total return basis, which includes capital appreciation and dividends
- Energeia's analysis shows the Regulatory Asset Base (RAB) multiplier to be the key driver of total return
- The highest non-network investment incentive is DMIAM + CESS, however, no one is actually doing this
- In summary, our analysis shows that DNSPs investing in non-network alternatives under the current incentive system are destroying shareholder value
- NY and the UK have attempted to replace capital investment as the key driver of shareholder value, but this has reportedly failed in the UK; could NY be a model for Australia?
- In any case, our analysis shows Australian system is currently sending the wrong investment signals to DNSPs, and fixing this will be necessary to unlock $69b in benefits by 2050

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04
Questions?

Future Topics

- Key Drivers Accelerating our Transport Electrification Outlook
- Long-term Behind-the-Meter Solar PV and Storage Cost Forecasts
- Best Practice Integrated Distribution Resource Planning

Thank you!

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