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Cost Reflective Electricity Network Pricing

Economic Concepts

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The Importance of Network Pricing

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The two roles of prices:

- To send signals to consumers and distributors to balance benefits of network services with costs
- To allow distributors to recover the costs incurred to provide network services

Marginal cost pricing promotes efficient use of and investment in network infrastructure

If prices were cost reflective...

… then distributors would be indifferent about changes in use of the network because revenue changes would be exactly offset by cost changes

What is Marginal Cost?

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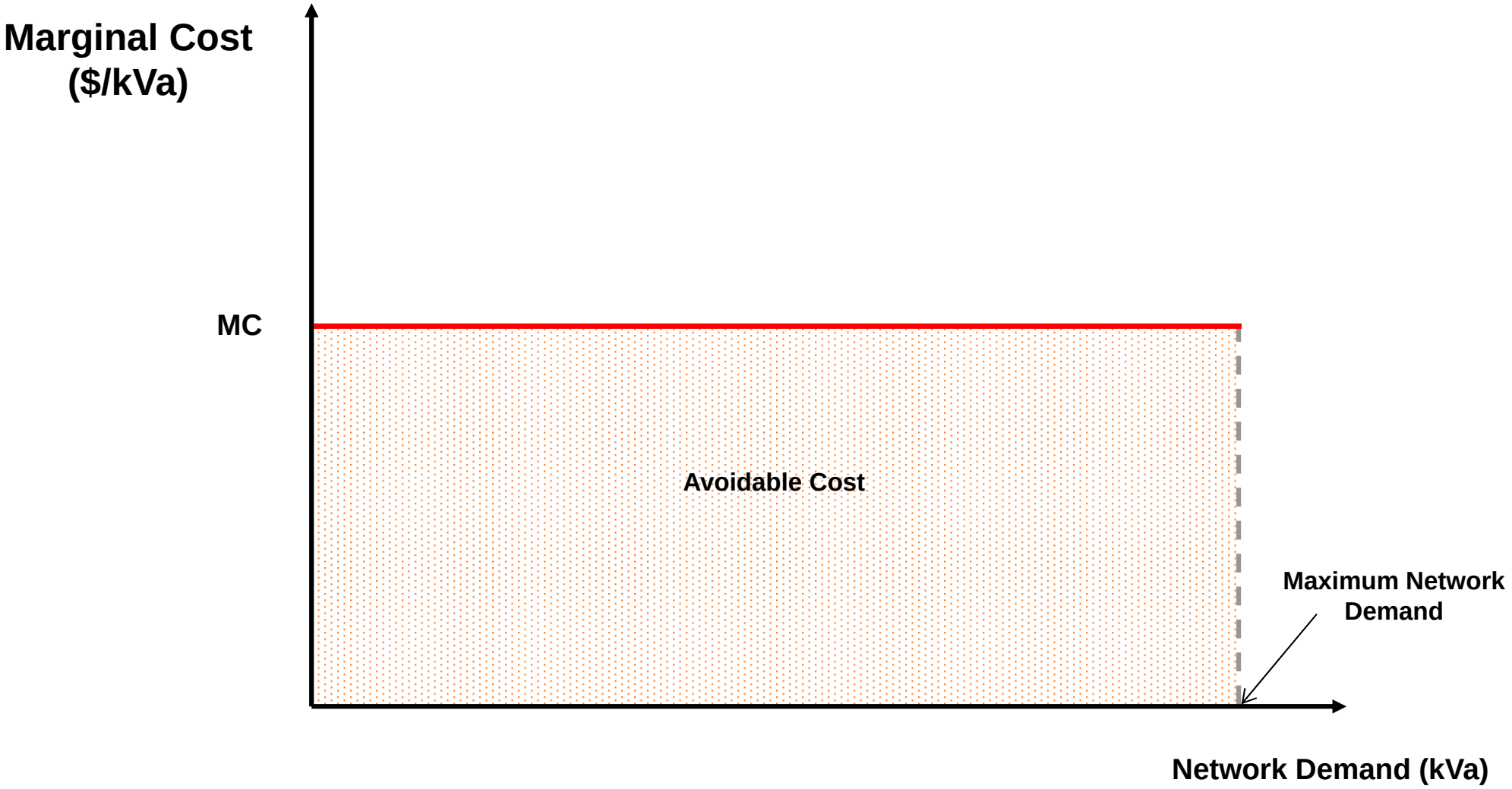
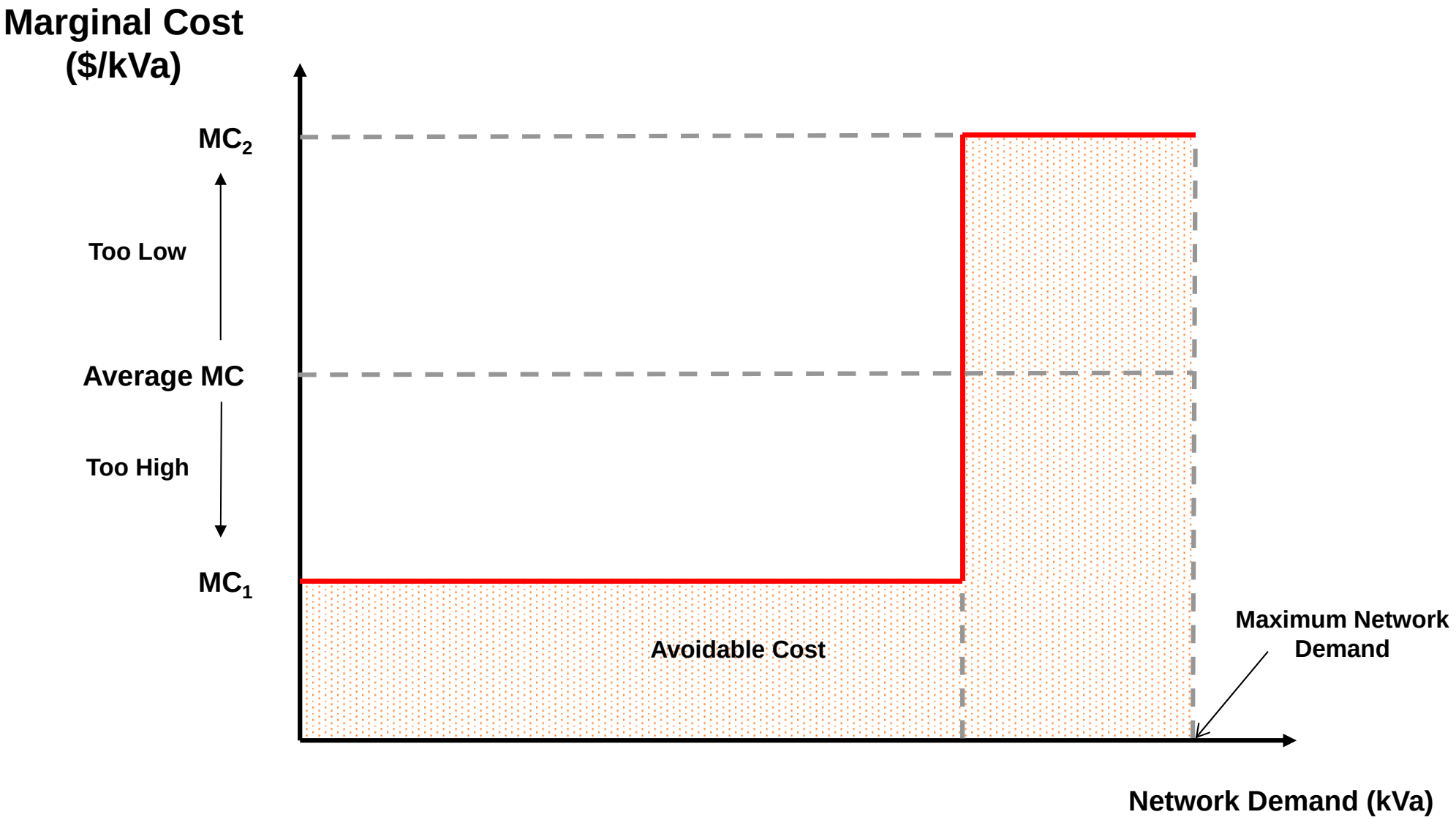
- Forward-looking concept
- Linked to drivers of costs
- Varies by customer, times of use, location etc.
- Short and long term concept

Relationship between Marginal Cost and Avoidable Cost



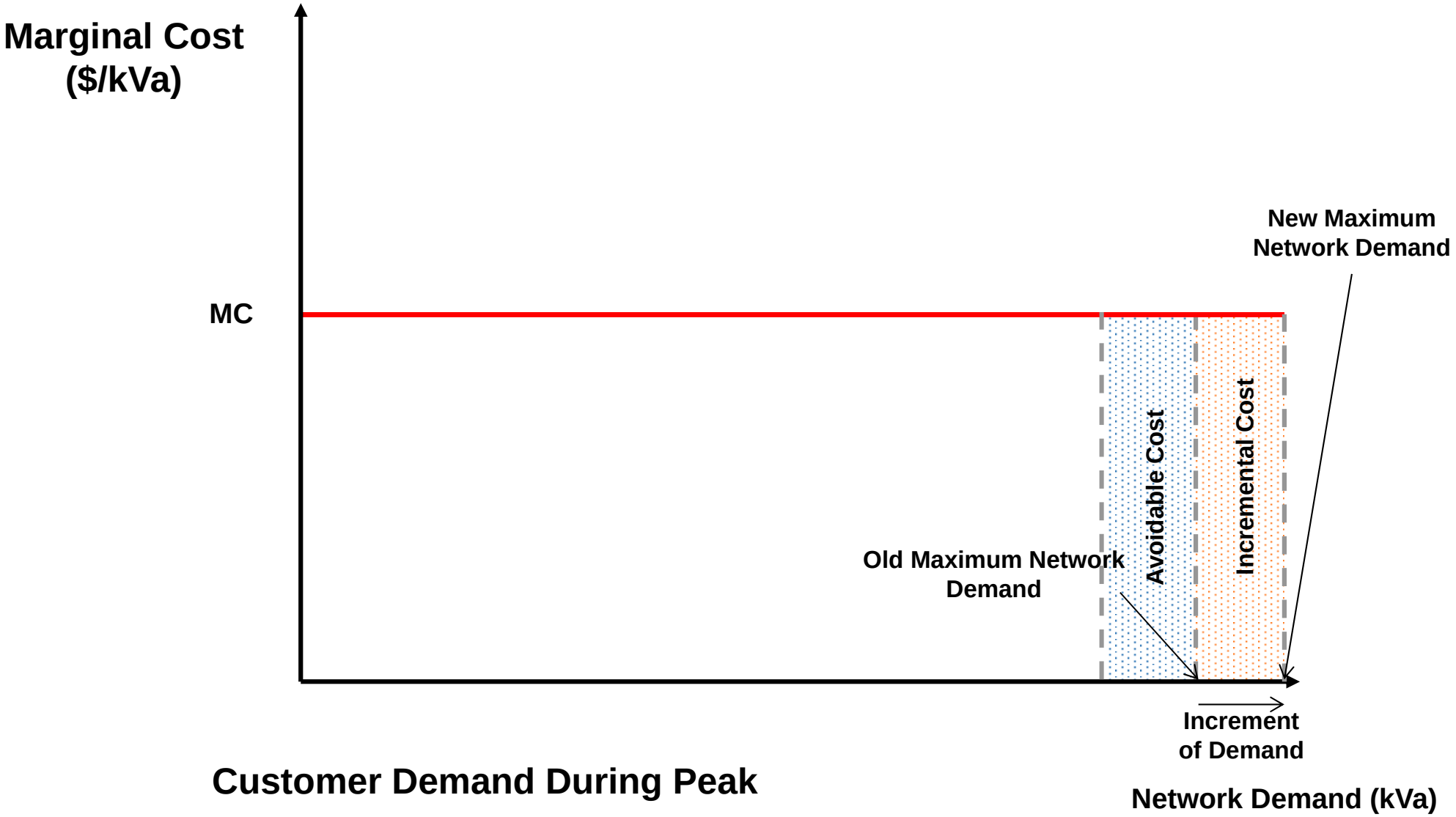
Customer Demand During Peak

Comparing the Marginal Cost of Different Customers

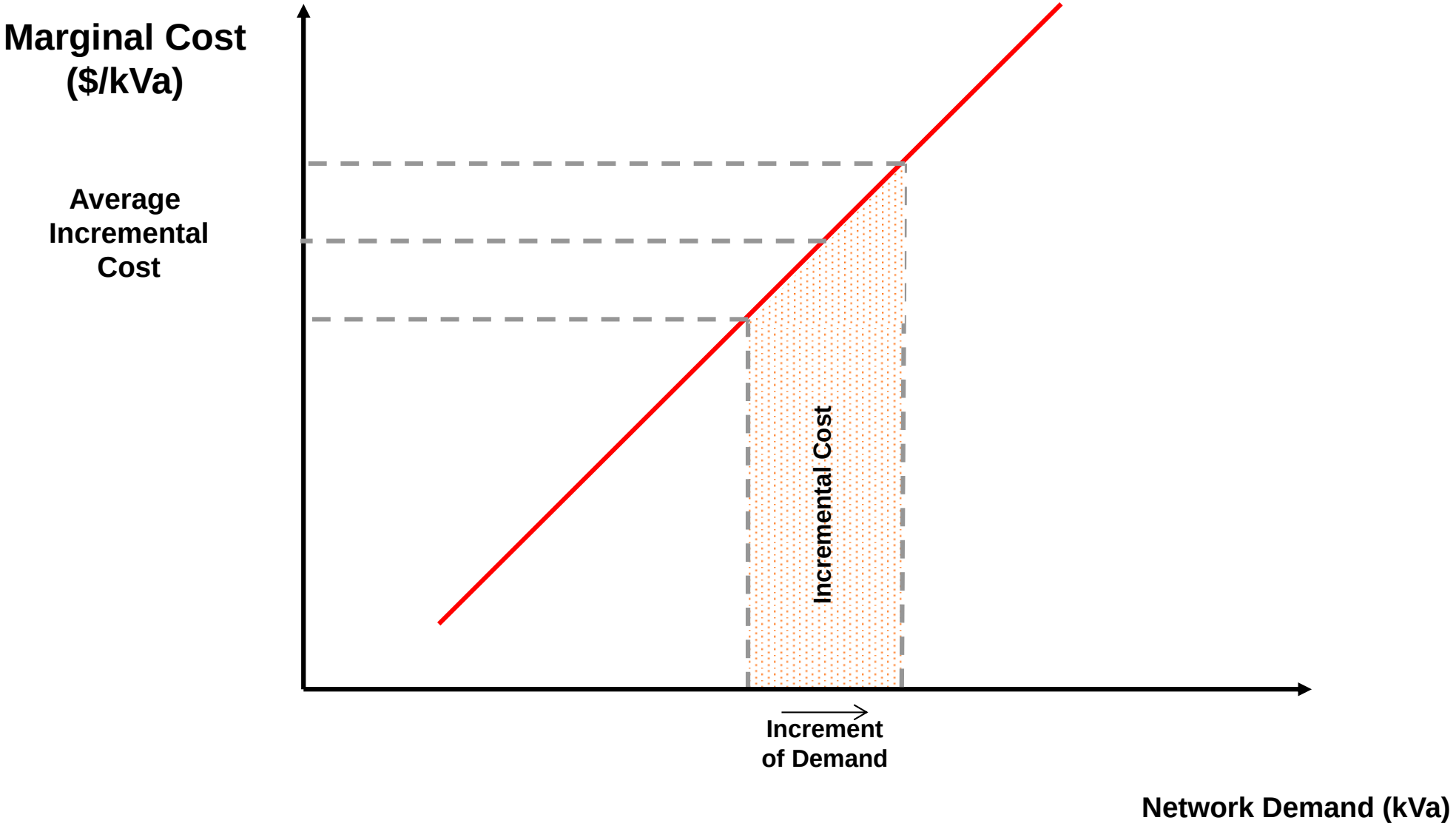


Customer Demand During Peak

Relationship between Avoidable and Incremental Cost



Average Incremental Cost Approximates Marginal Cost



Marginal Cost of What?

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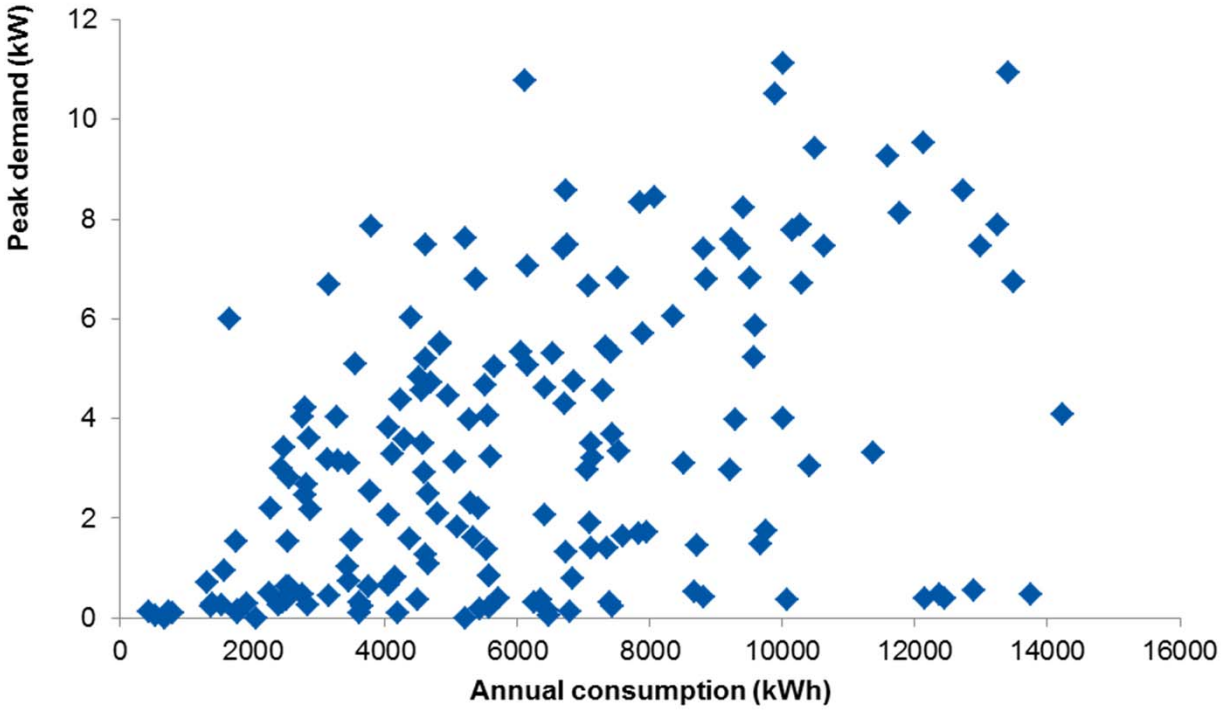
Peak kW Demand vs Annual kWh Consumption



Source: Ausgrid.

Tariff design requires tradeoffs between reflecting costs and practicalities

Recovering Total Costs

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- Pricing at marginal cost will not allow a business to recover its total costs
- Ramsey charging (ie, markups above MC that minimise behavioural changes)
- It can be appropriate to charge above LRMC on any charging parameter

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Practical Measurement of Long Run Marginal Cost

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Developing Cost Reflective Tariffs

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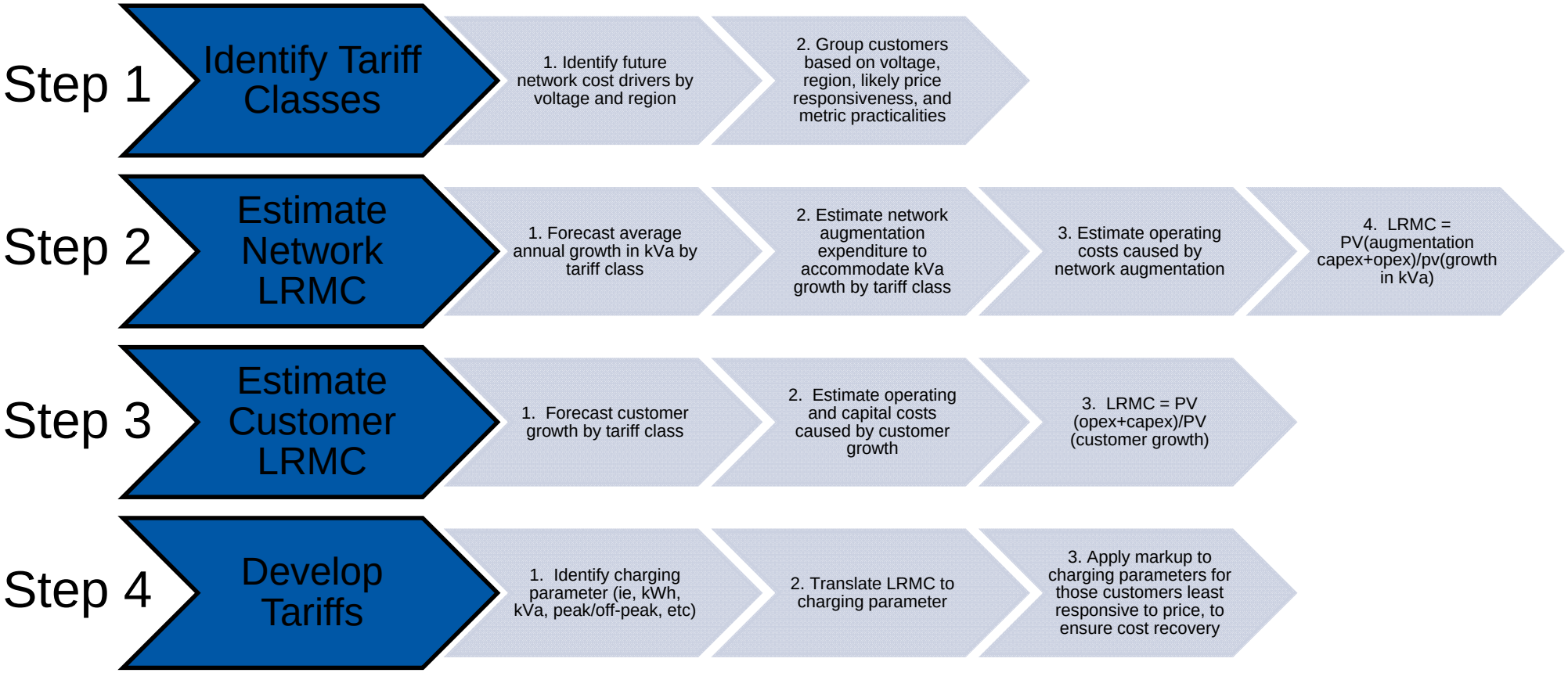
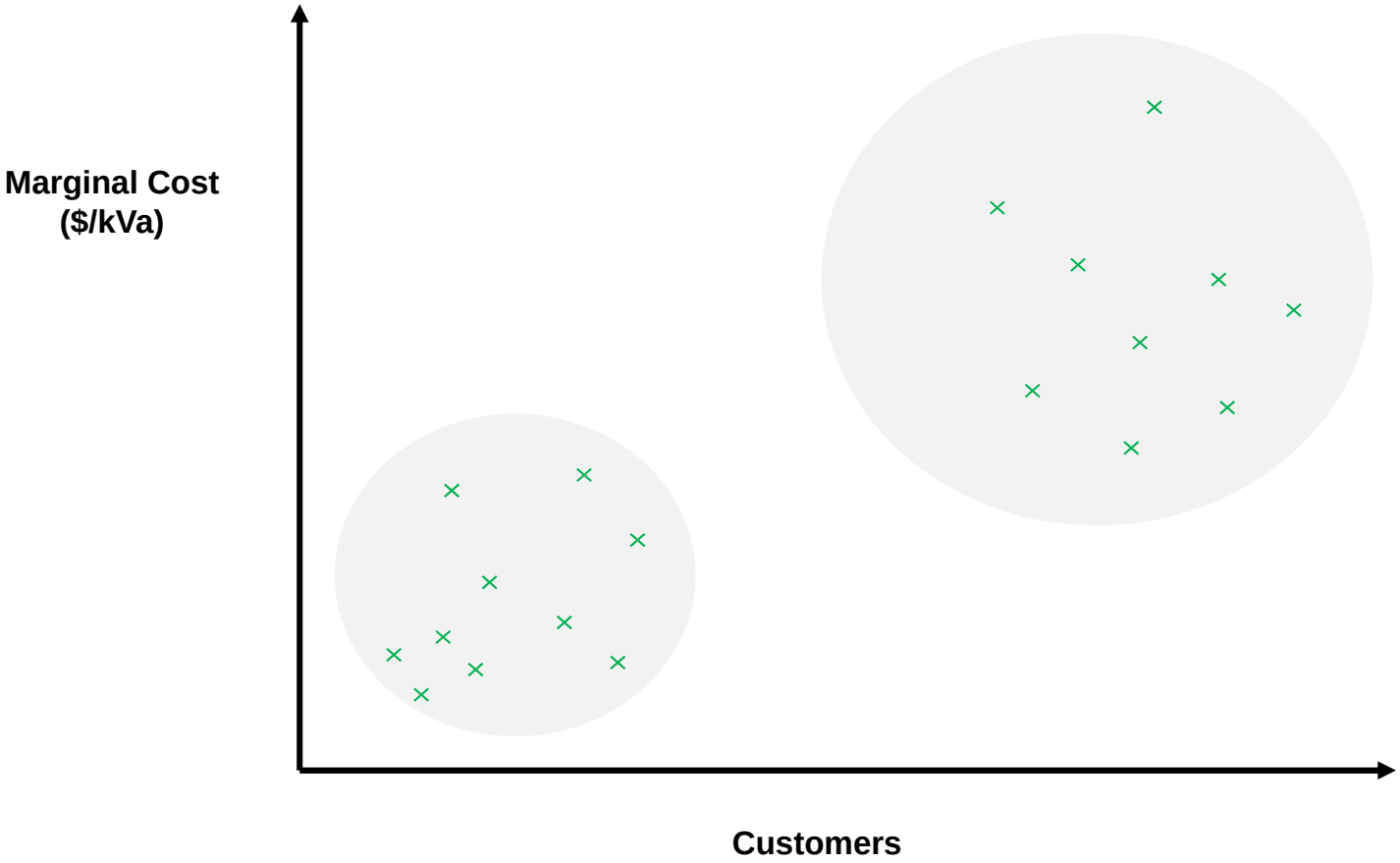


Step 1: Define Tariff Classes

Aim: To identify customers that cause similar future network costs



Factors to consider:

- Geographic location
- Voltage
- Load shape

Questions to consider when identifying tariff classes

- What locations within the network are significant network upgrades needed over the next, say ten, years?
- Are there particular, identifiable, customers causing future network costs (ie, contributing to worsening network load factor)?
- Are these customers likely to respond to price signals?
- Is it feasible/cost effective to charge a separate charge to these customers?

If yes to these questions – then a separate tariff class should be created

Step 2: Estimate Network LRMC

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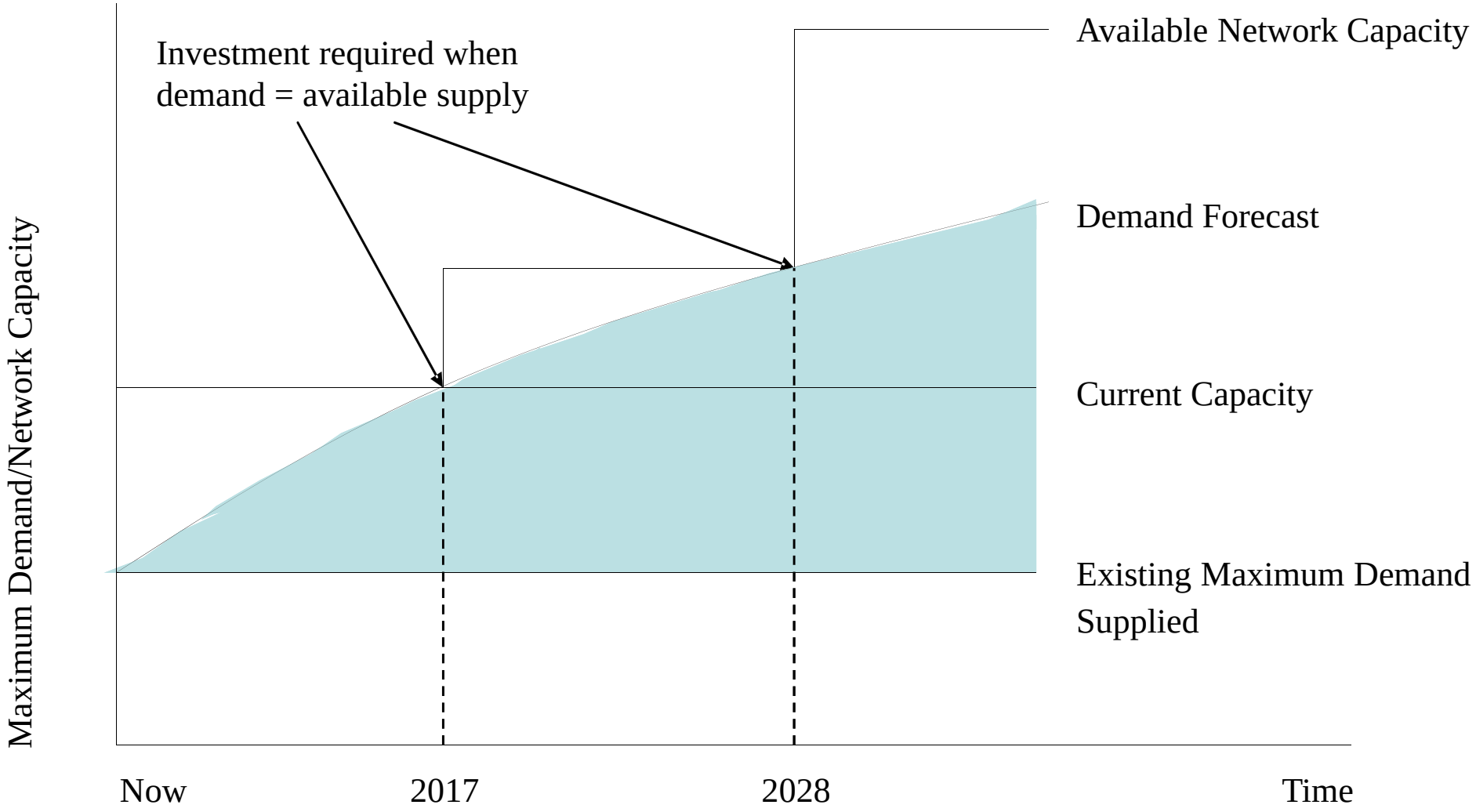
Aim: To determine how future network costs are influenced by changes in use of the network

- Theoretically, LRMC should be estimated at each network connection point, so as to provide the best signal to customers

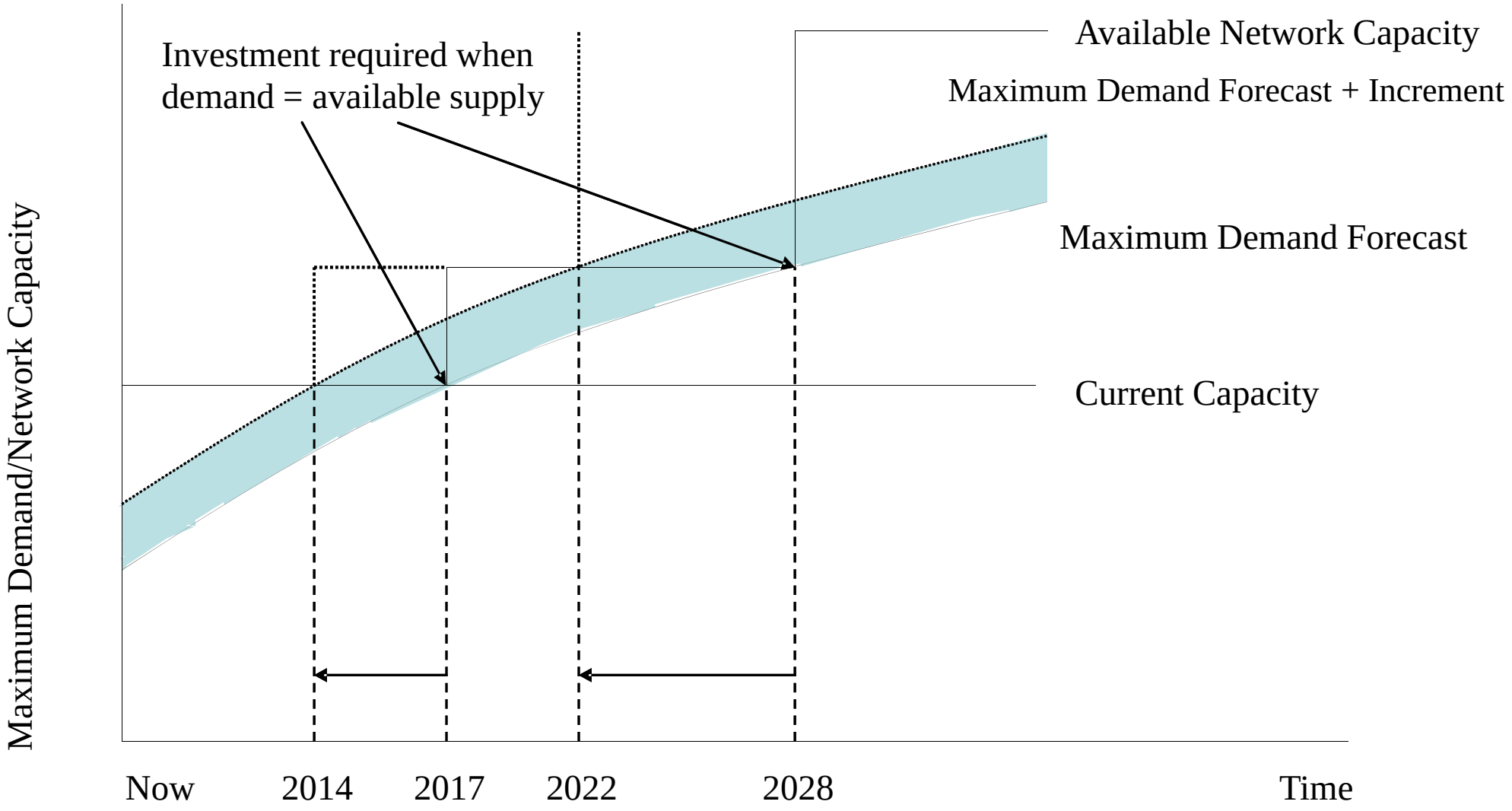
- Requires information on:
  - forecast changes in average maximum demand
  - forecast capital costs required to satisfy network reliability requirements
  - forecast operating costs to service changes in maximum demand (mostly incremental repairs and maintenance)

- Need to balance cost of developing LRMC estimates with the benefits from signalling future network costs

Average Incremental Cost Methodology



Perturbation Methodology



Step 3: Estimate Customer LRMC

Aim: To determine how future customer service costs are influenced by growth in customers

- A number of network costs are unrelated to use of the network infrastructure, including:
  - new meter installation and replacement
  - meter reading
  - customer billing
  - call centre costs
- Important to only consider incremental future costs caused by growth in customer numbers

Step 4: Develop Tariffs

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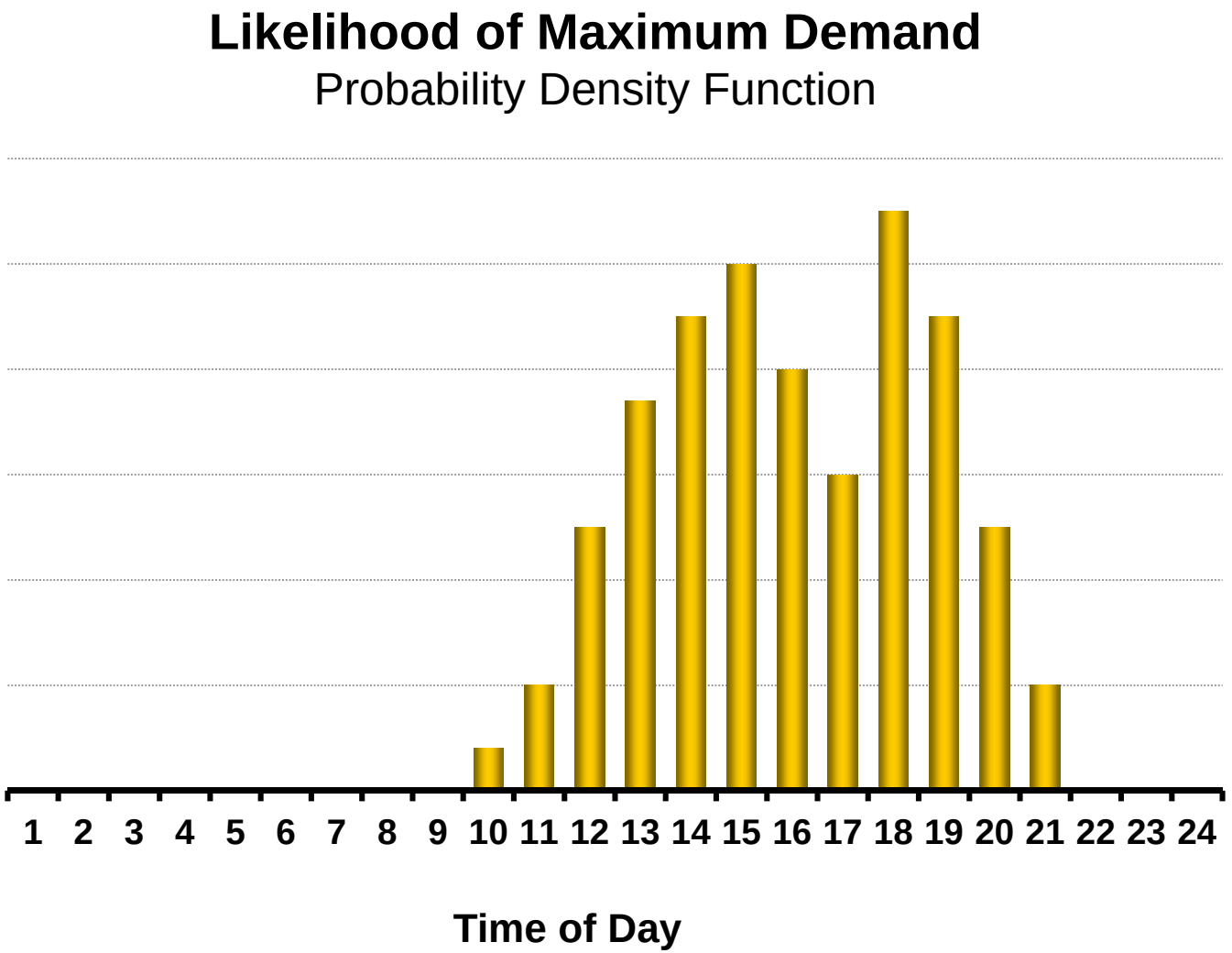
Aim: To use estimates of LRMC to inform the design of network tariffs

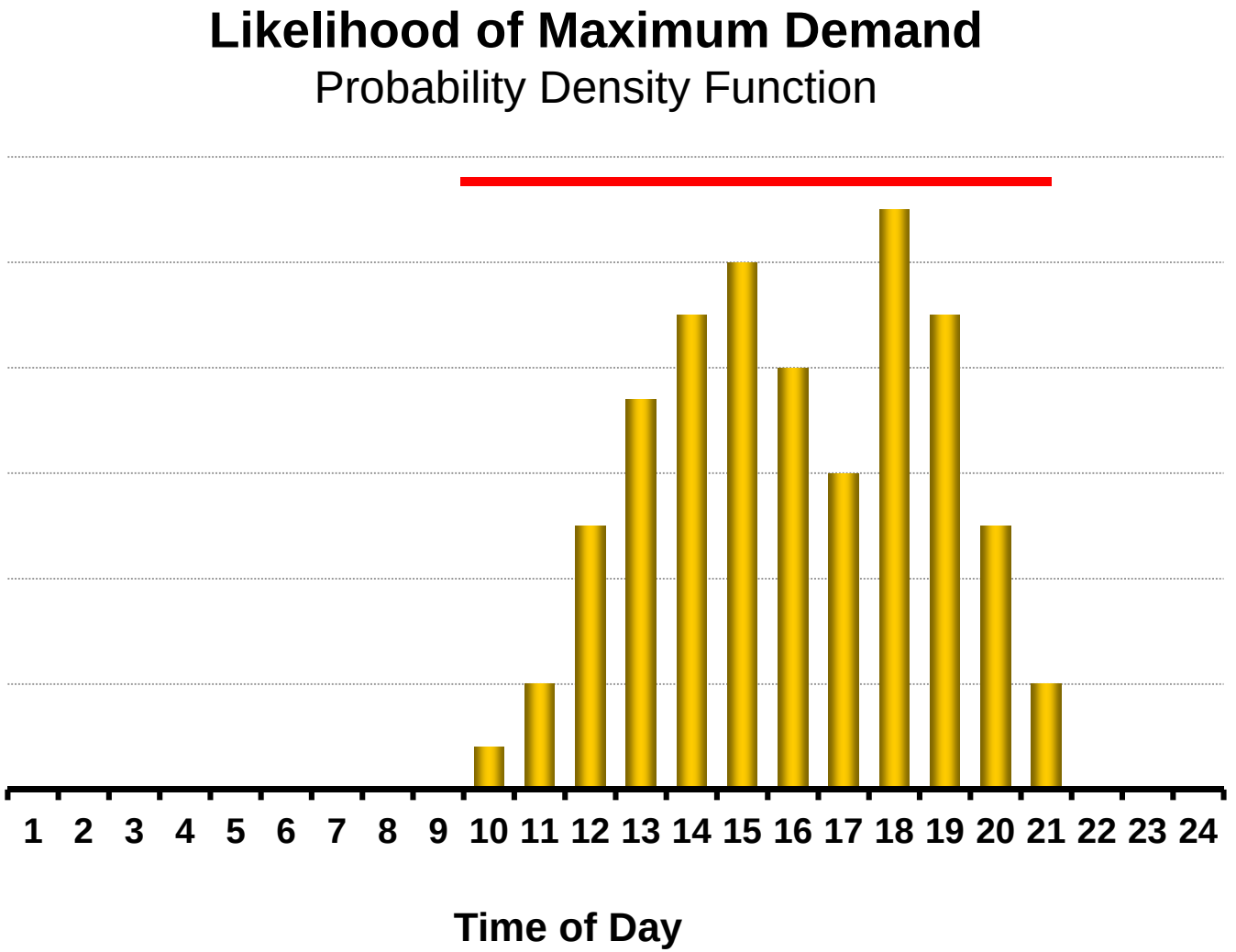
- Estimates of LRMC are inherently imperfect, so there is always a tradeoff between the desirability of sending price signals and practicalities

- Identify charging parameter available due to metering technology
  - kWh, kVa, daily per customer, peak/off-peak, seasonal, critical peak

Challenge of Signaling Future Network Costs



Charging LRMC in all periods that could be maximum demand will lead to inefficiencies



Matters to consider when designing tariffs

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- Apply power factor adjustment to convert kVa to kWh
- If demand charge applied, need to adjust for difference between customer peak demand and network peak
- Demand or consumption charging parameter should be **at least** the estimate of LRMC, divided by hours that charge applied
  - Eg, Peak charge = LRMC ($/kW)xProp(Max D) / Peak Hours
- Leads to even recovery of LRMC across those hours where Maximum Peak is possible
- Charge per customer should be at least the customer LRMC

Need to Align Peak/Off-Peak Periods with Likelihood that Maximum Demand will occur in the Period

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Figure 1: Probability of Ausgrid peak winter demand by time period (%)

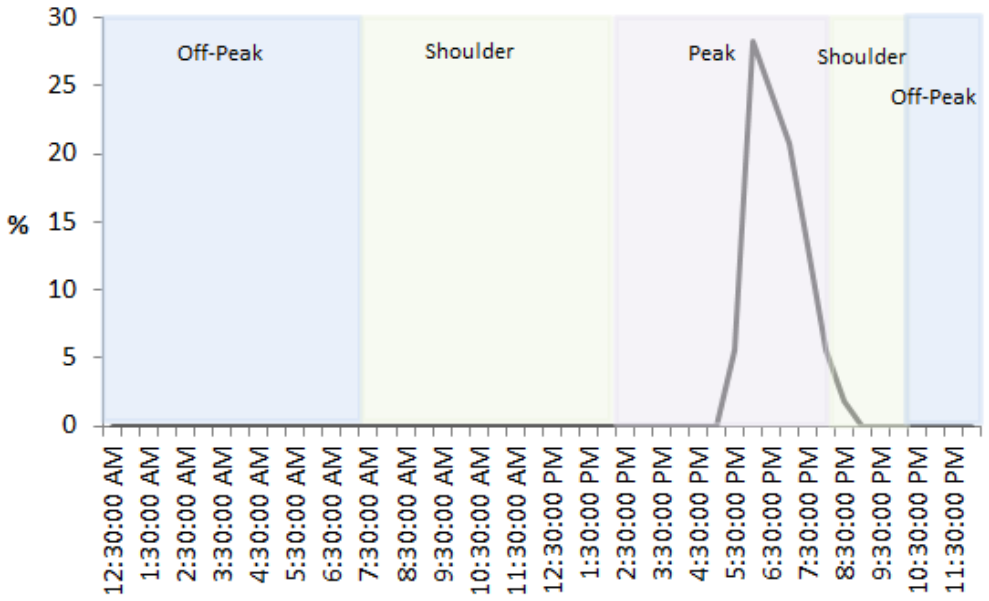
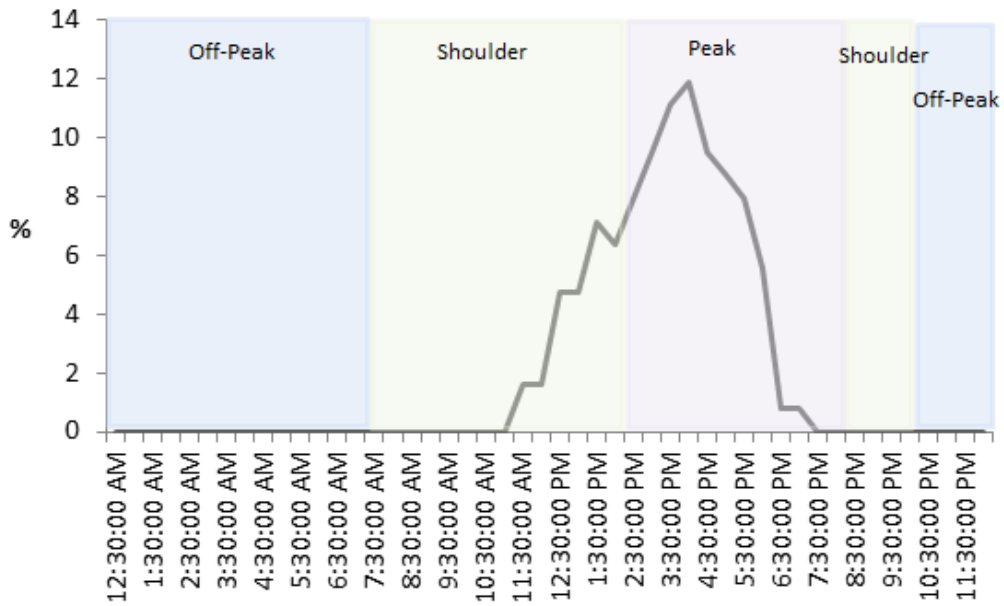


Figure 2: Probability of Ausgrid peak summer demand by time period (%)



Source: Ausgrid.

Note: Data for FY2006 to FY2009.

Example of Translating LRMC to Tariff Surcharge

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LRMC = $160/kVa/annum = $188/kW/annum

(power factor 0.85)

Tariff	c/kWh
Critical Peak Surcharge (4 hours)	4,705
Seasonal Peak Surcharge	25
Peak Surcharge	12.5
Flat Surcharge	2.2

Current LRMC Methodologies applied by Distributors in Australia

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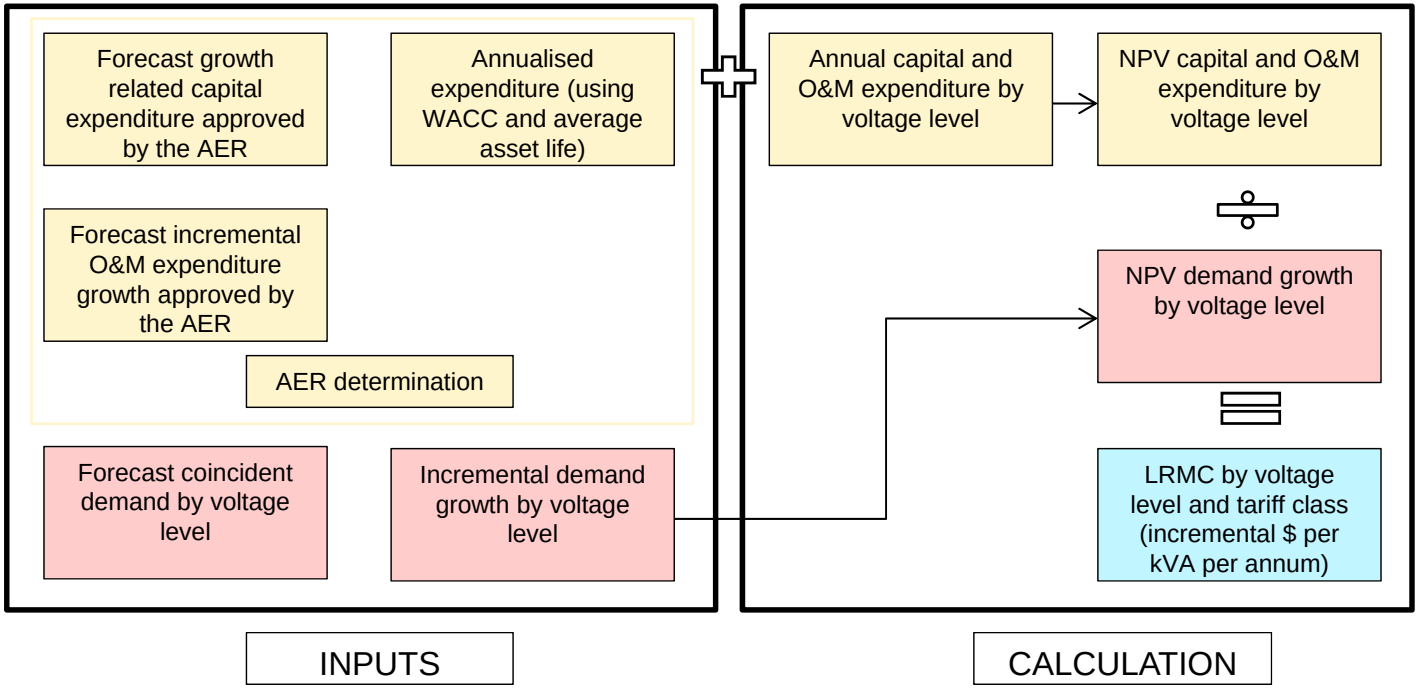
All DNSP's apply a similar approach to estimating LRMC

LRMC calculation approach for each tariff class



Source: ETSA Utilities, Pricing proposal 2010-11, June 2010, p 63.

Long Run Marginal Cost
Recent estimates

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Recent LRMC estimates

DNSP	LRMC estimate	Customer class
AusGrid	$152.30/kVA p.a.	Low voltage
Integral Energy	$348.39/kVA p.a.	Low voltage
ETSA Utilities	$156/kVA p.a.	Residential
JEN	6.95c/kWh	Residential
United Energy	5.38c/kWh	Small low voltage
ActewAGL	$239.57/kVA p.a. ($2010)	Low voltage residential

Aproaches adopted Overseas to Estimate LRMC

- Ofgem, Great Britain
  - **LRMC for low voltage customers**
    - **incremental costs involved in meeting a 500MW capacity increment**
    - **Allocation is based on contribution to simultaneous maximum load and agreed capacity and fixed charge factors**
    - **Charges scaled up or down to meet required revenue**
  - **LRMC for high voltage customers**
    - **Based on the incremental cost of reinforcement**
- Electricity Authority, New Zealand
  - **Prices should be 'equal to or greater than incremental costs, and less than or equal to standalone costs'**

Methodology Adopted by Distributors to Estimate Avoidable Costs

- Identified as categories of costs that would be avoided if a tariff class was no longer served
- Allocated to each avoidable cost category based on volume or customer numbers, depending on cost category.
- Categories vary between DNSP's but typically include:
  - **Repairs and maintenance**
  - **Customer service**
  - **Metering costs**
  - **Corporate and divisional support costs**
  - **Customer connections and installation inspections**
  - **Capital expenditure**

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Illustrative Case Studies

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Approach to Illustrative Case Studies

Aim: To illustrate the implications for consumers of improving the cost reflectivity of network tariffs

1. Capacity-based charging
2. Improved targeting of time-of-use tariffs
3. Seasonal network tariffs
4. Ramsey pricing tariffs

Matters to consider

- On average, consumers will be no better or worse off in the short term with cost reflective tariffs
- With demand response, cost reflective tariffs should lead to reduced network costs and so lower tariffs in the future
- Case studies will assume same level of total revenue recovery

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