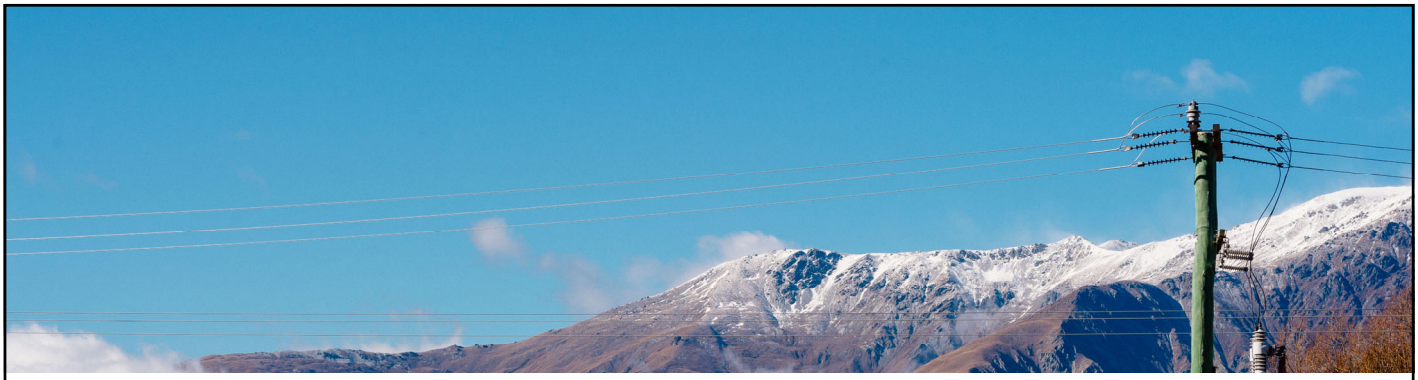


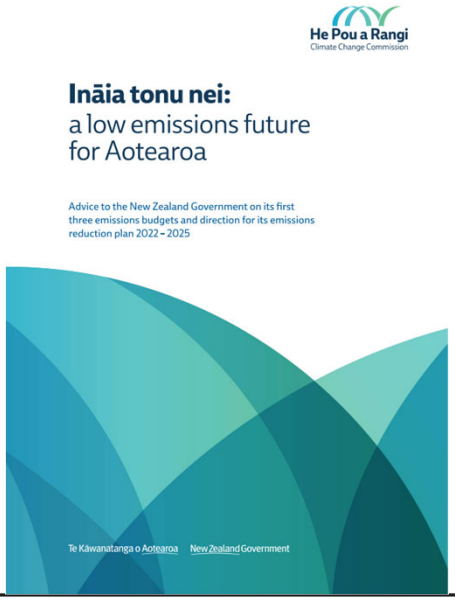
Aurora Energy
Decarbonisation Scenarios

Aurora ENERGY

Anthony Mirfin

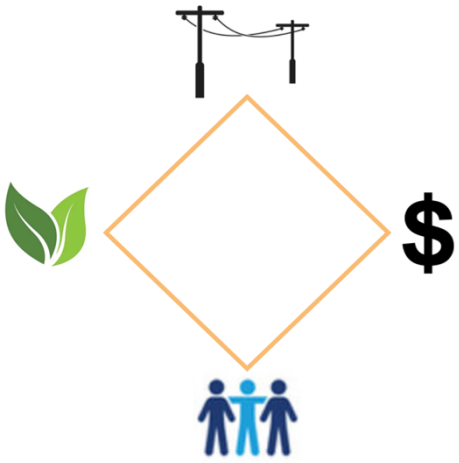
Decarbonisation by electrification

- Climate Change Commission outlines paths for NZ to reach climate targets
- Large scale electrification required
- Major focus on transport and industrial heat
- Huge increase in electricity demand
  - Significant implications for electricity networks



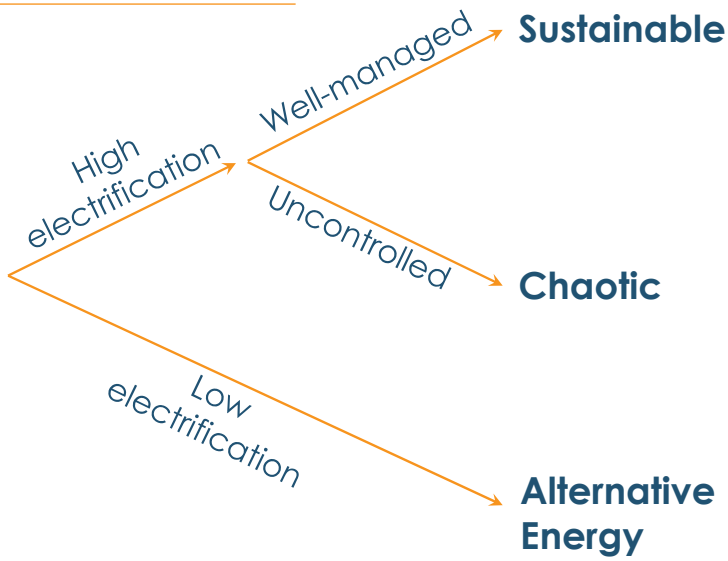
Decarbonisation impact on network

- Want to understand the impact on Aurora's network
- Qualitatively and quantitatively
- Aim to facilitate decarbonisation, ensuring affordable and equitable
- Develop a strategy
  - Steps we should take
- Depends on an unknown future…



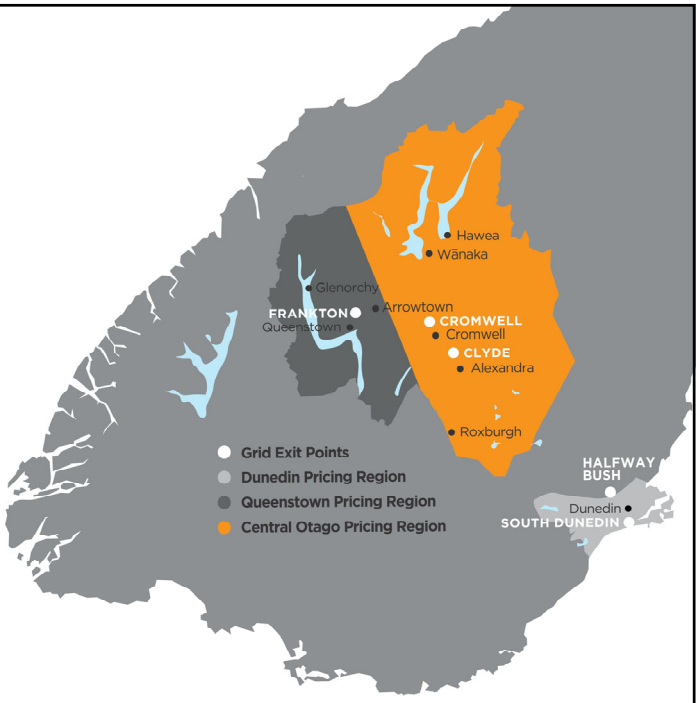
Scenarios

- Aim to cover a range of possible futures
- We define three scenarios:
  - Sustainable
  - Chaotic
  - Alternative Energy



Scenario modelling

- Forecast out to 2050
  - Peak power
  - Annual energy
- Model at regional level
  - Dunedin
  - Central Otago

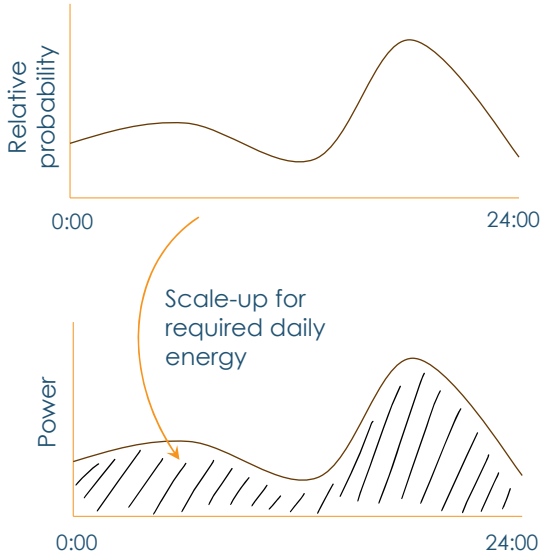


Methodology

- Forecast = existing demand + growth due to each submodel
  - Flexible, transparent, interpretable
- Submodels
  - Residential EV charging
  - Light EV highway charging
  - Heavy EV highway charging
  - E-Busses
  - Residential space heating
  - Residential water heating
  - Residential lighting
  - Residential cooking
  - Commercial heat
  - Commercial lighting
  - Industrial heat
  - Residential solar
  - Commercial solar
  - Batteries
  - Underlying load growth

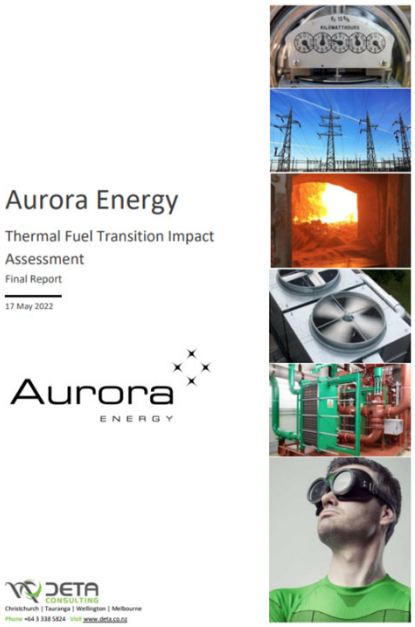
Example: residential EV charging

- Climate Change Commission forecasts of EV travel
- Estimate the distance travelled by EVs for Dunedin and Central Otago
- Applied an EV efficiency (km/kWh) to get annual energy demand
- Apportion to daily energy demand
- For each scenario, assume a charging probability curve
- Combine to give the load curve

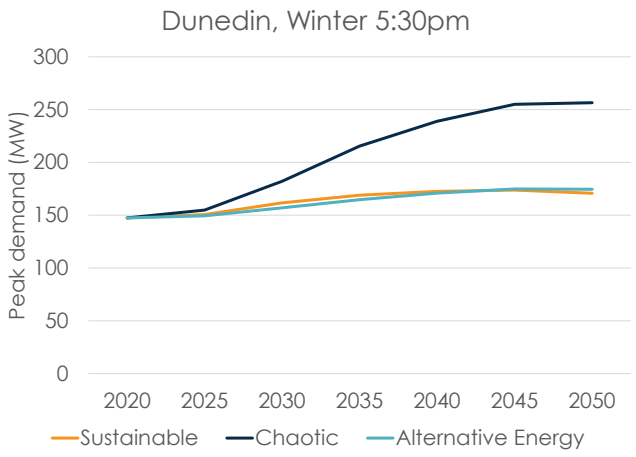


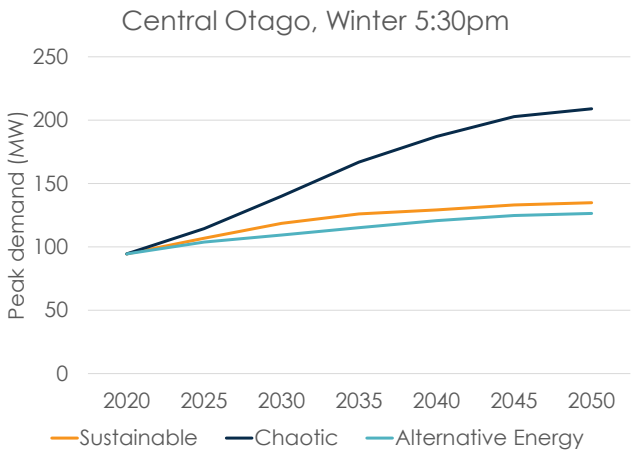
Example: industrial heat

- Communicated with large industrial customers
- Surveys conducted by DETA
  - Size of load
  - When & what they might transition
- Sustainable Scenario:
  - Electric, with demand response
- Chaotic Scenario:
  - Electric, no demand response
- Alternative Energy Scenario:
  - Biomass option

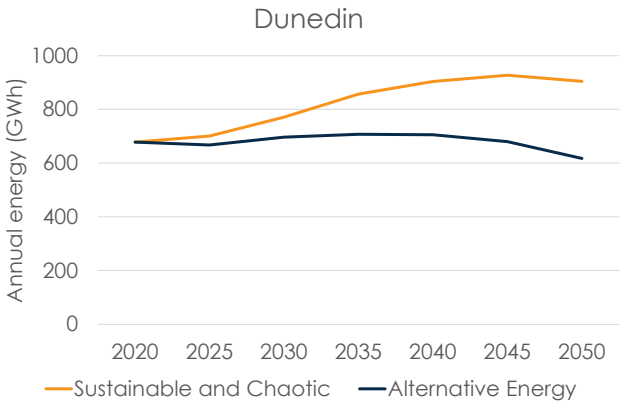


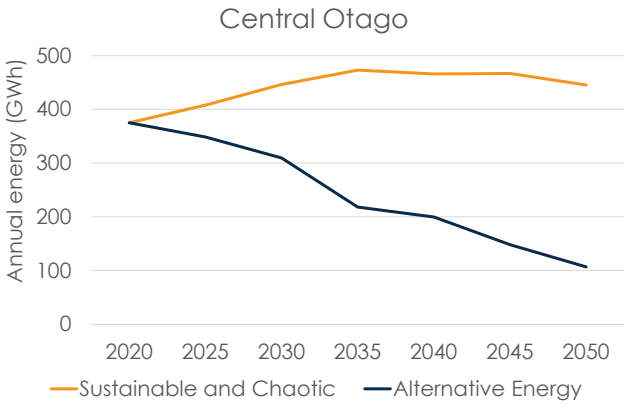
Results: peak demand



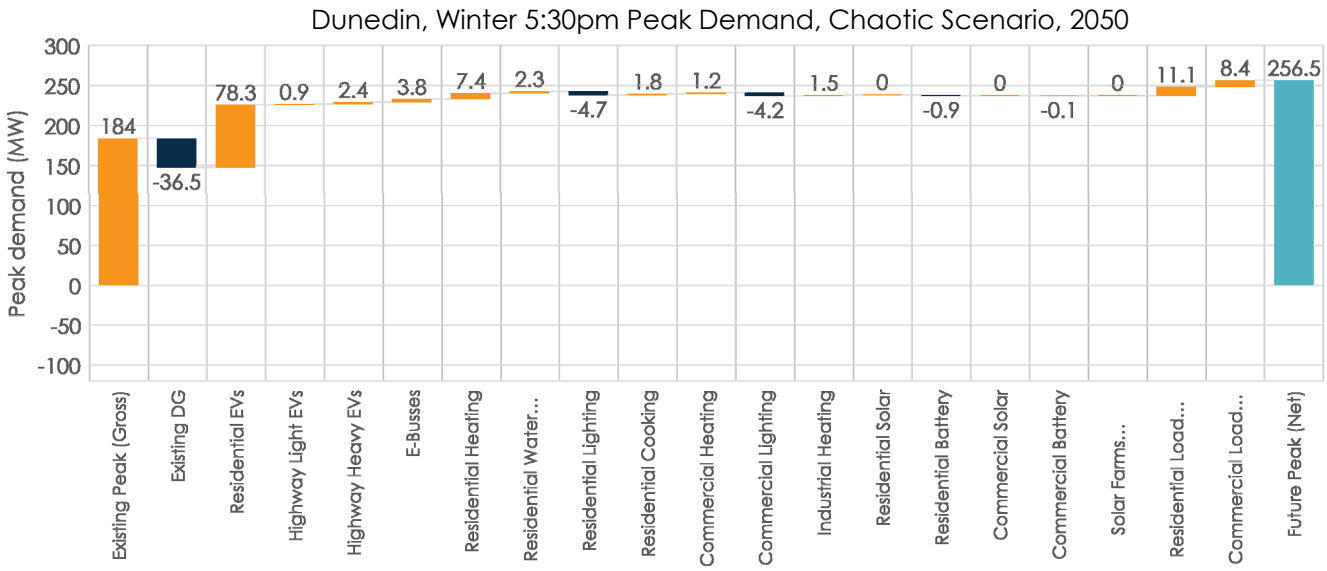


Results: annual energy demand



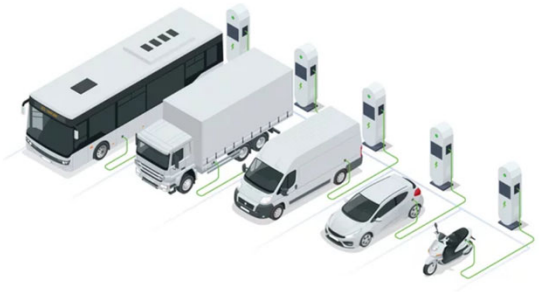


Results: example breakdown



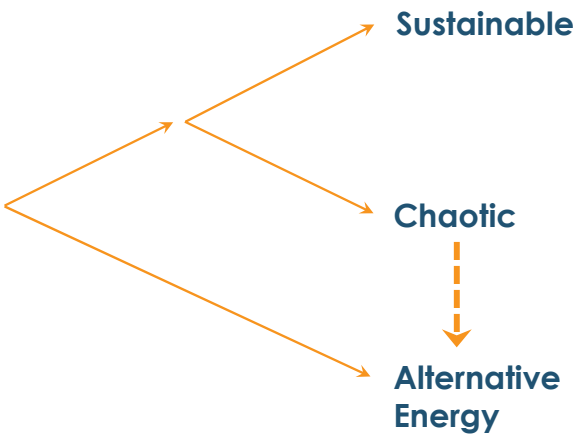
Insights

- Transition coming soon
- Flexible EV charging extremely important
- Batteries can significantly reduce peak demand
  - On a short timescale
- Solar without batteries unlikely to impact peak
- Efficiency improvements important
- Peak demand may grow faster than energy demand



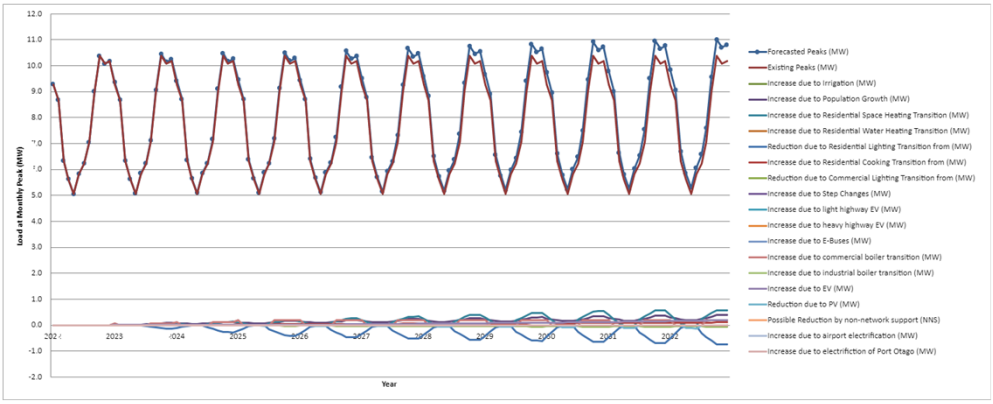
Implications

- Need to be prepared
  - Flexibility trials
  - Asset planning
- Sustainable Scenario:
  - Reduced network upgrades
  - Minimal cost increases
- Chaotic Scenario:
  - Significant network upgrades
  - Large cost increases
- Alternative Energy Scenario:
  - Costs borne by remaining grid customers



Bonus: demand forecasting

- Incorporated scenario model into demand forecasting
- 10-year, monthly peak forecast
- Use 'expected' inputs
- Regional scale -> zone substation
- Asset planning

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ANSA