

4/9/26

TIMES-NZ 3.0

How we built it and what it's telling us

Presentation to EPOC Winter Workshop 2026

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EECA ENERGY EFFICIENCY &
CONSERVATION AUTHORITY
TE TARI TIAKI PŪNGAO



Overview

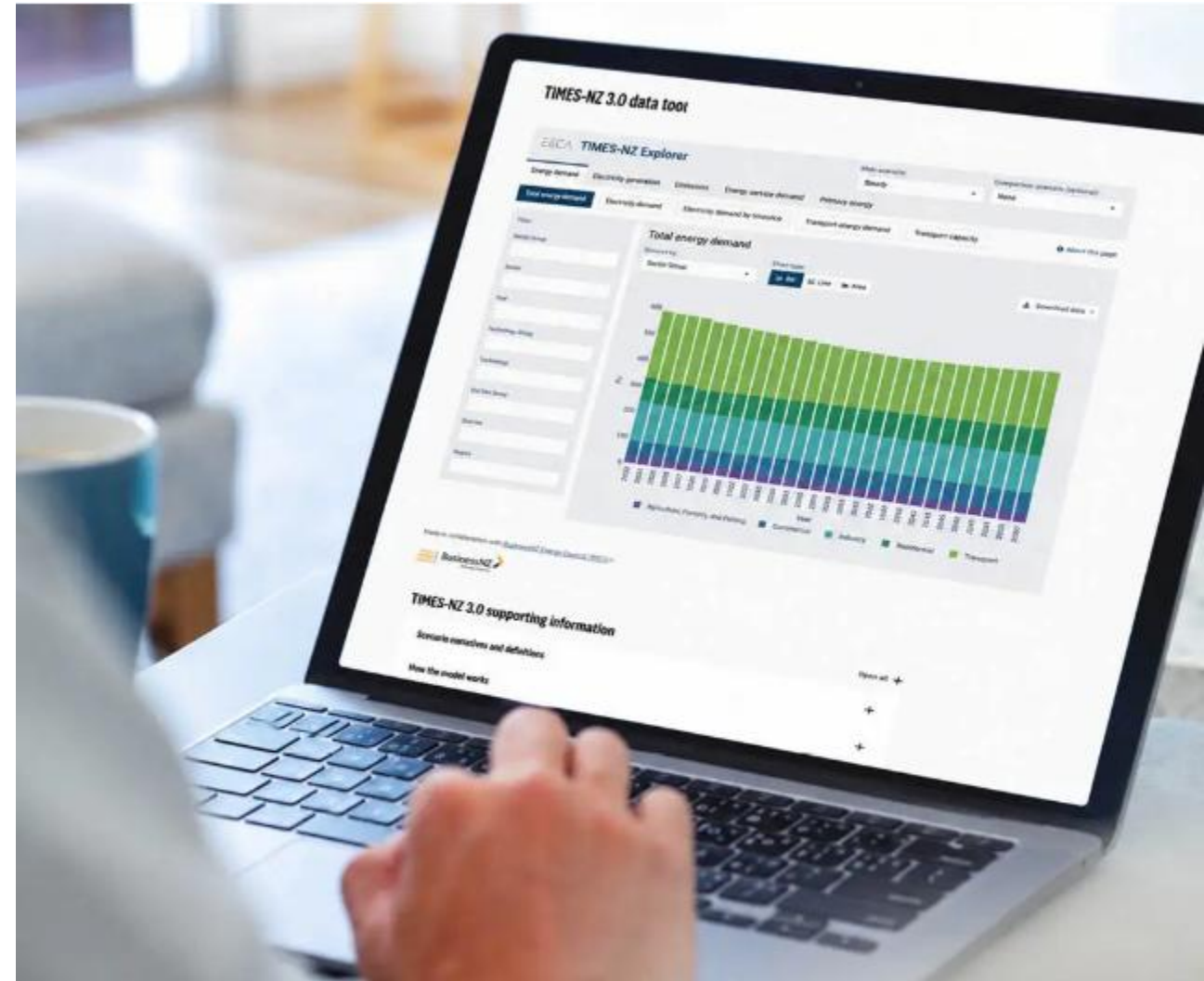
The TIMES-NZ project

The TIMES framework

Building TIMES-NZ:

- Managing complexity
- Scenario design

What the model is telling us



The TIMES-NZ project

A partnership of EECA and BusinessNZ Energy Council

Project history

- 2015: v0 aka BEC2050 | ‘Kayak’ and ‘Waka’
- 2019: v1 aka BEC2060 | ‘Kea’ and ‘Tui’
- 2021: v2 | Refresh of ‘Kea’ and ‘Tui’
- 2026: v3 | ‘Steady’ and ‘Shift’

The TIMES framework

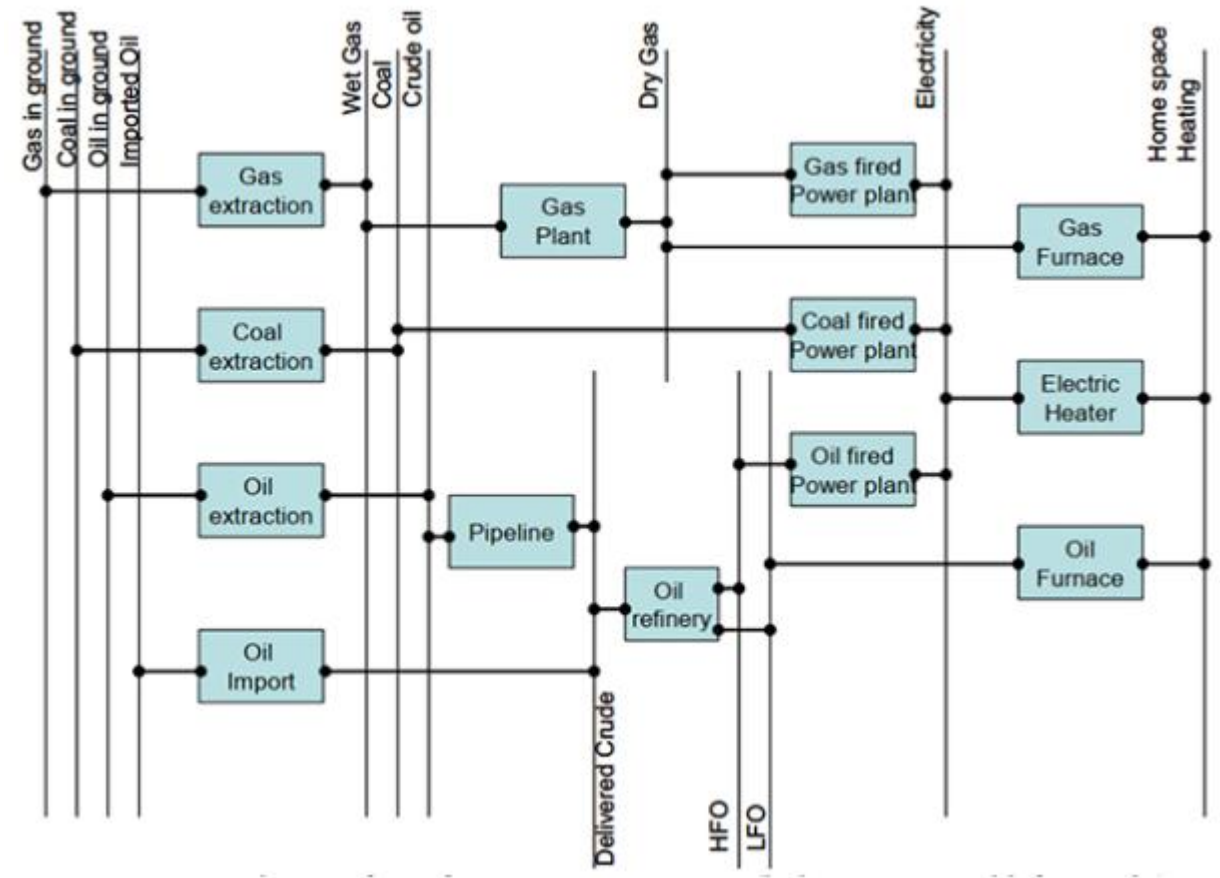
Energy system modelling

The TIMES framework

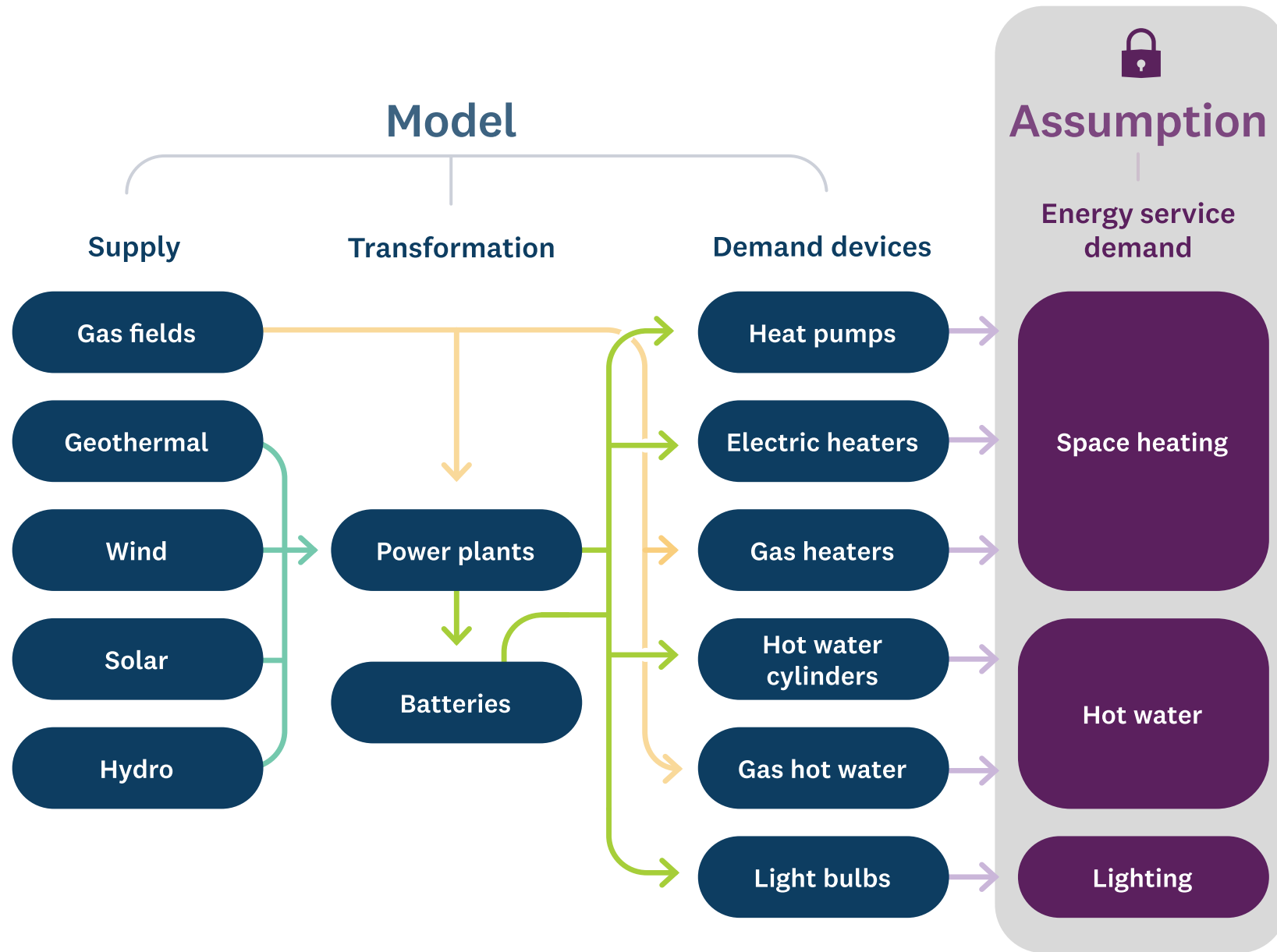
Covers the entire energy system – primary energy, transformation, transportation, distribution, end use, service demand

Key concepts:

- *Energy Service Demand*: focused on meeting demand of useful energy
- *Reference Energy System*: tracks commodity flows through thousands of distinct processes



How it works



Framework pros and cons

Strengths

Comprehensive and flexible: can reflect many complex interactions

Fuel switching results are model outputs, not input assumptions – genuine insights possible

Feature set built over decades: performant and comprehensive

Weaknesses

Deterministic scenarios: not full coverage of uncertainty

System cost approach does not always reflect real-world capital constraints: tweaking and tuning required

Complexity of interactions: challenging to troubleshoot

Building TIMES-NZ

Managing complexity

Building TIMES-NZ: the databases

The boring stuff is the real work

Underlying database of:

- Demand devices, efficiencies, costs
- Powerplants (present and future)
- End use demand profiles and related technologies
- Demand regionalisation
- Transmission, distribution, HVDC parameters
- Cost curve scenarios
- Security margins
- More...

Building TIMES-NZ: the old pipeline

The boring stuff is the real work

	Comm-IN	Comm-OUT	EFF	AFA	AFA*LO	NCAP_LI	CAP2AC	NCAP_P	NCAP_PAS	ACT_ON	INVCOST	FXDOM	NCAP_B	NCAP_B	FLO_MA	FLO_MA	FLO_MA	FLO_MA
						FE	T	ASTI	TI	D			ND	ND*0	FK	FK*2030	FK*2050	FK*0
Energy balance.xlsx								Capacity to Activity Factor	Existing Installed Capacity in P/s	Bound on activity of a process	Investment cost	O&M costs	Limit on new capacity	Limit on new capacity interpolation				
old_VT_NI_IND_V1.xlsx								31.536	1.03	2.662	373				0.15			5
old_VT_SI_IND_V1.xlsx								31.536	0.54	1.393	1260	150						
TIMES-NZ_exportedCases.csv								31.536	0.21	0.540	1260	150						
BY_Trans.xlsx								31.536	0.35	0.050			0	5				
SysSettings.xlsx								31.536	0.23	0.032			0	5				
VT_NI_ELC_V4.xlsx								31.536	0.00	0.008			0	5				
VT_NI_IND_V2.xlsx								31.536	0.00	0.006			0	5				
VT_NI_OTH_V4.xlsx								31.536	0.00	0.001			0	5				
VT_NI_PRI_V4.xlsx								31.536	4.14	10.719	558							
VT_NI_TRA_V4.xlsx								31.536	0.92	2.377	24							
VT_SI_ELC_V4.xlsx								31.536	0.00	0.002			0	5				
VT_SI_IND_V2.xlsx								31.536	0.03	0.137	2121		0	5				
VT_SI_OTH_V4.xlsx								31.536	2.40	9.447	758							
VT_SI_PRI_V4.xlsx								31.536	2.33	1.002	150							
VT_SI_TRA_V4.xlsx								31.536	0.87									
Before_SubRES_NewTechs_Industry.xlsx								31.536	0.00									
old_SubRES_NewTech_RCA1.xlsx								31.536	0.00									
SubRES_NewTech_AGR_KEA.xlsx								31.536	1.32									
SubRES_NewTech_AGR_KEA_Trans.xlsx								31.536	0.02									
SubRES_NewTech_AGR_TUI.xlsx								31.536	0.01									
SubRES_NewTech_AGR_TUI_Trans.xlsx								31.536	0.14									
SubRES_NewTech_ELC_KEA.xlsx								31.536	0.00									
SubRES_NewTech_ELC_TUI.xlsx								31.536	0.00									
SubRES_NewTech_RC.xlsx								31.536	0.00									
SubRES_NewTechs_Industry.xlsx								31.536	0.00									
SubRES_NewTechs_Industry_Trans.xlsx								31.536	0.00									
SubRES_NewTransport-KEA.xlsx								31.536	0.00									
SubRES_NewTransport-TUI.xlsx								31.536	0.00									
Trades								31.536	0.00									
Scen_AF_Renewable.xlsx								31.536	0.00									
Scen_Base_constraints.xlsx								31.536	0.00									
Scen_Carbon_Budgets.xlsx								31.536	0.00									
Scen_Cohesive.xlsx								31.536	0.00									
Scen_Individualistic.xlsx								31.536	0.00									
Scen_LoadCurve_COM-FR.xlsx								31.536	0.00									
Scen_RE_Potentials.xlsx								31.536	0.00									
Scen_WEM_WCM.xlsx								31.536	0.00									

Hundreds of GAMS-tagged tables across dozens of spreadsheets

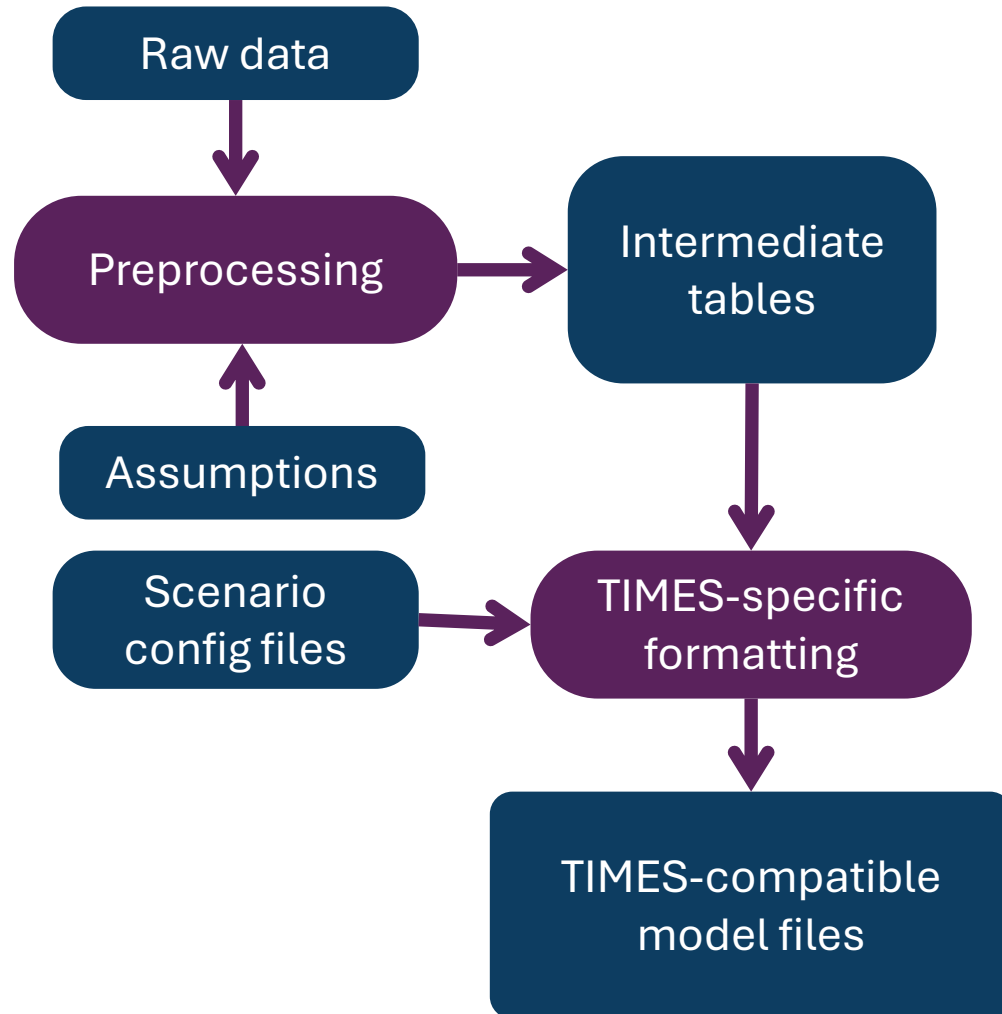
Derivation/source data often not included

Labour-intensive, vulnerable to turnover

Changes not trackable, methods not transparent, models not replicable

Change tracking done by diffing binary files

Building TIMES-NZ: the new pipeline



- Transparent, replicable
- Maintainable
- Open-source



EECA TIMES-NZ docs

[Assumptions](#) [Scenarios](#) [Developer guide](#) [Changelog](#)

Demand assumptions

Agriculture, forestry and fishing
Commercial
Industry

Residential

1. Scenario adjustments
2. Base year demand
3. Demand projections
4. Technology parameters
5. Future available technologies
6. Demand curves
7. Service demand flexibility
8. Model structure
9. Appendix

Transport

Supply & transformation assumptions

Electricity generation
Oil and gas supply

Biofuel supply

Hydrogen

Other assumptions

Model-wide constraints

Wood burner

65%

2.1.4. Step 4: Apply modelled fuel demand shares to known residential fuel demand

We map the census technologies to known EEUD technologies and fuels. We then apply the modelled fuel demand shares to the EEUD results to estimate heat demand by technology, fuel, region, and dwelling type. Results of this exercise are displayed in [Fig. 2](#)

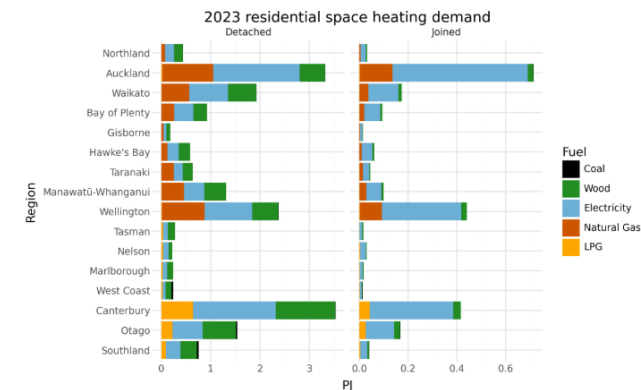


Fig. 2 Estimated regional shares of space heating demand

Note that total demand for joined dwellings is much lower than for detached dwellings, because standalone houses are much more common than apartments or joined townhouses in all areas of the country.

Possible structural improvements

List not exhaustive

Unit dispatch features (warmup times, minimum load levels, ramping constraints)

Natural gas seasonality (sectoral demand curves, supply inflexibility, storage)

Retrofitting methods (boiler conversions)

Increased temporal detail (hourly, half-hourly electricity demand/dispatch)

Increased spatial detail (RC-level demand, interregional trade)

Elasticity of demand (eg via CGE linkage)

Building TIMES-NZ

Scenario design

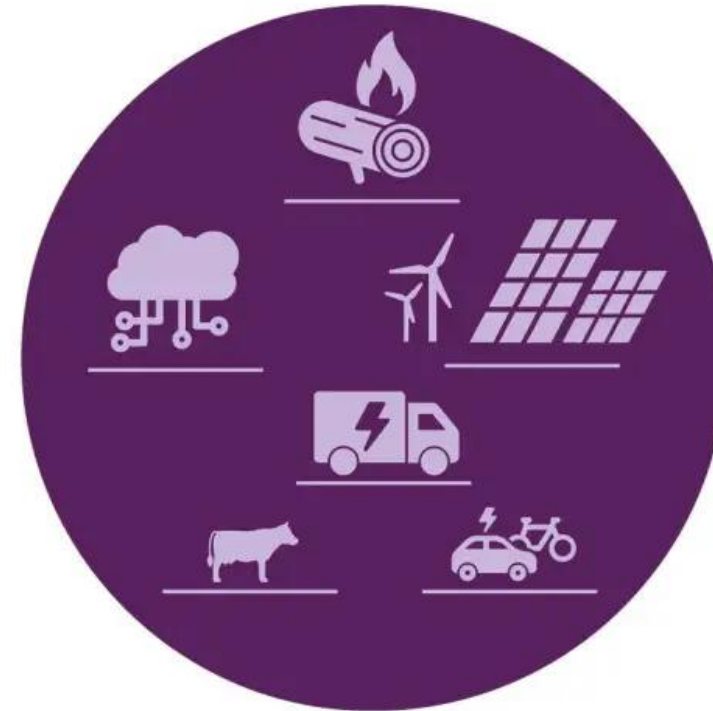
Scenario Design

Two scenarios capture dichotomies across *key uncertainties* identified by stakeholders

Steady



Shift

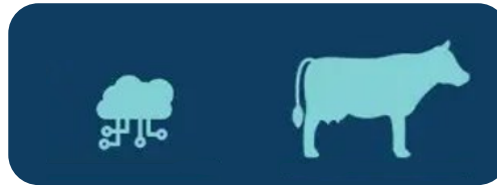


Key uncertainties

Steady

Shift

Economic structure



Technology costs



Climate policy, societal trends



The role of natural gas

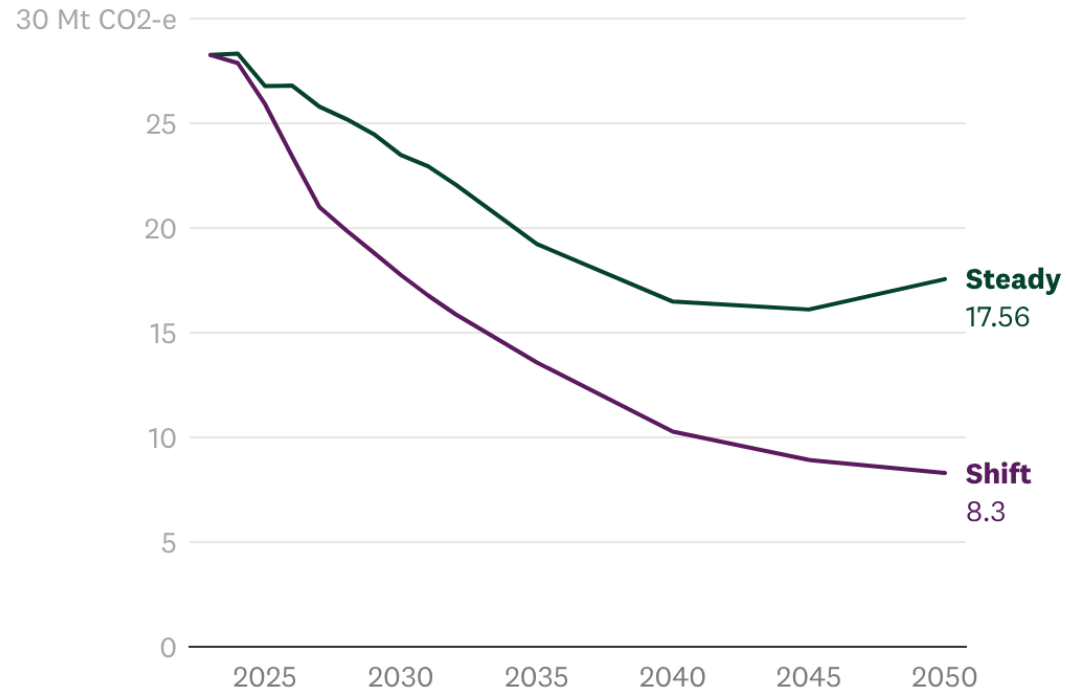


What it's telling us

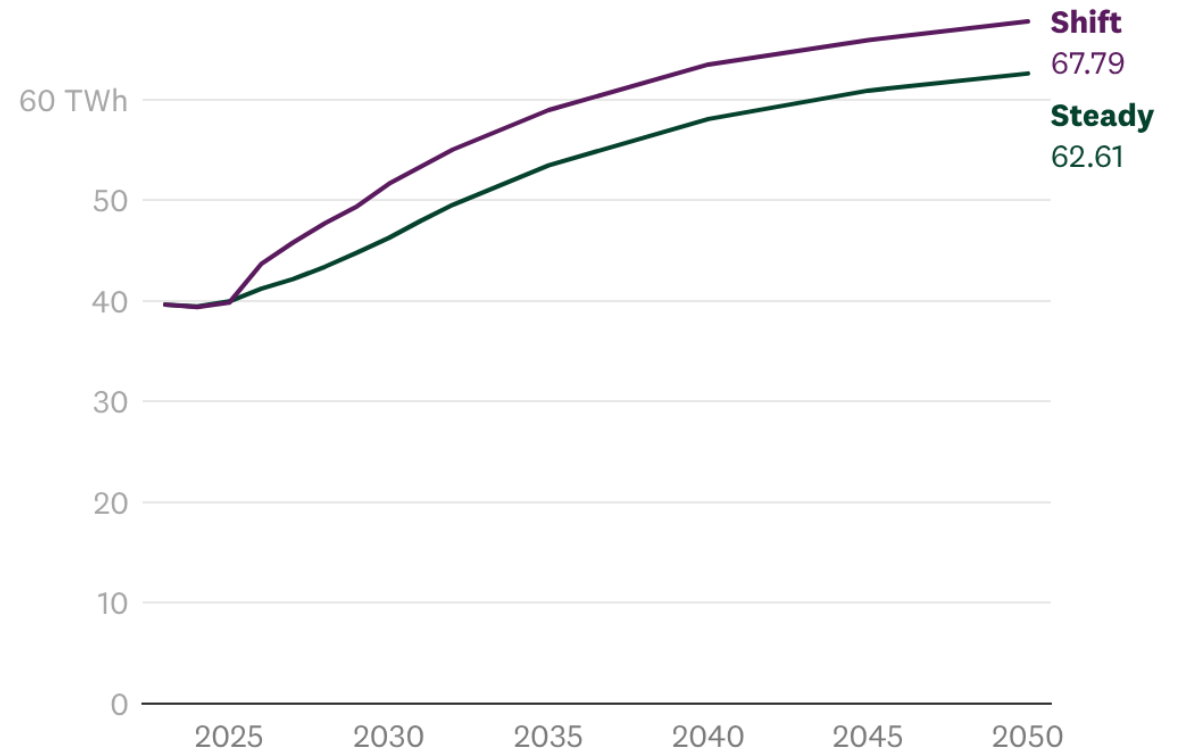
Efficient pathways

Scenarios drive different outcomes

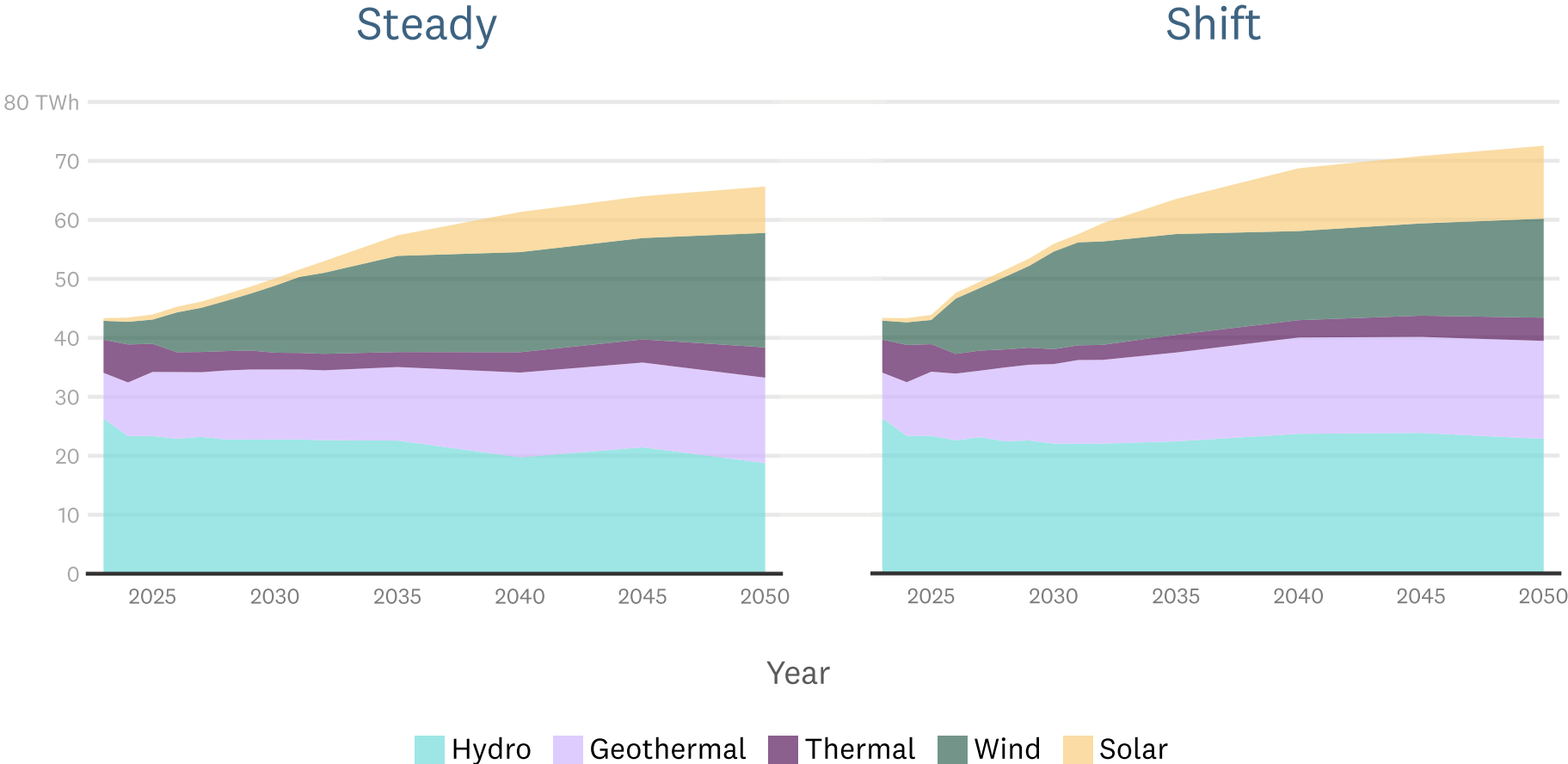
Energy emissions



Electricity demand



Thermal support still needed

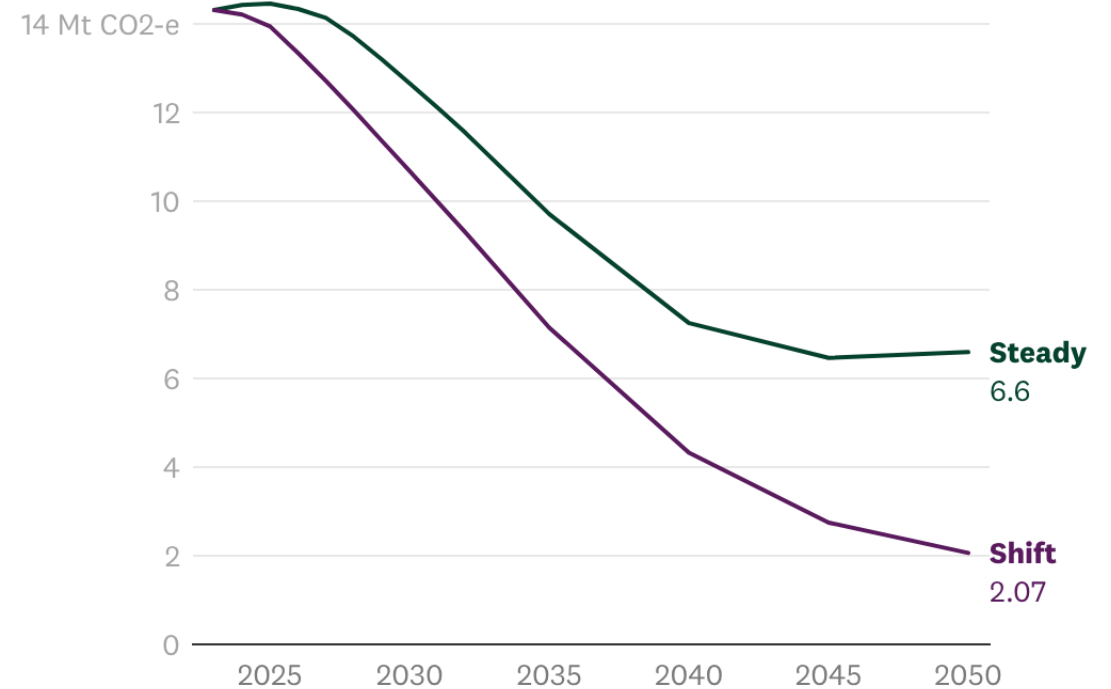


Heavy transport: a key marginal area

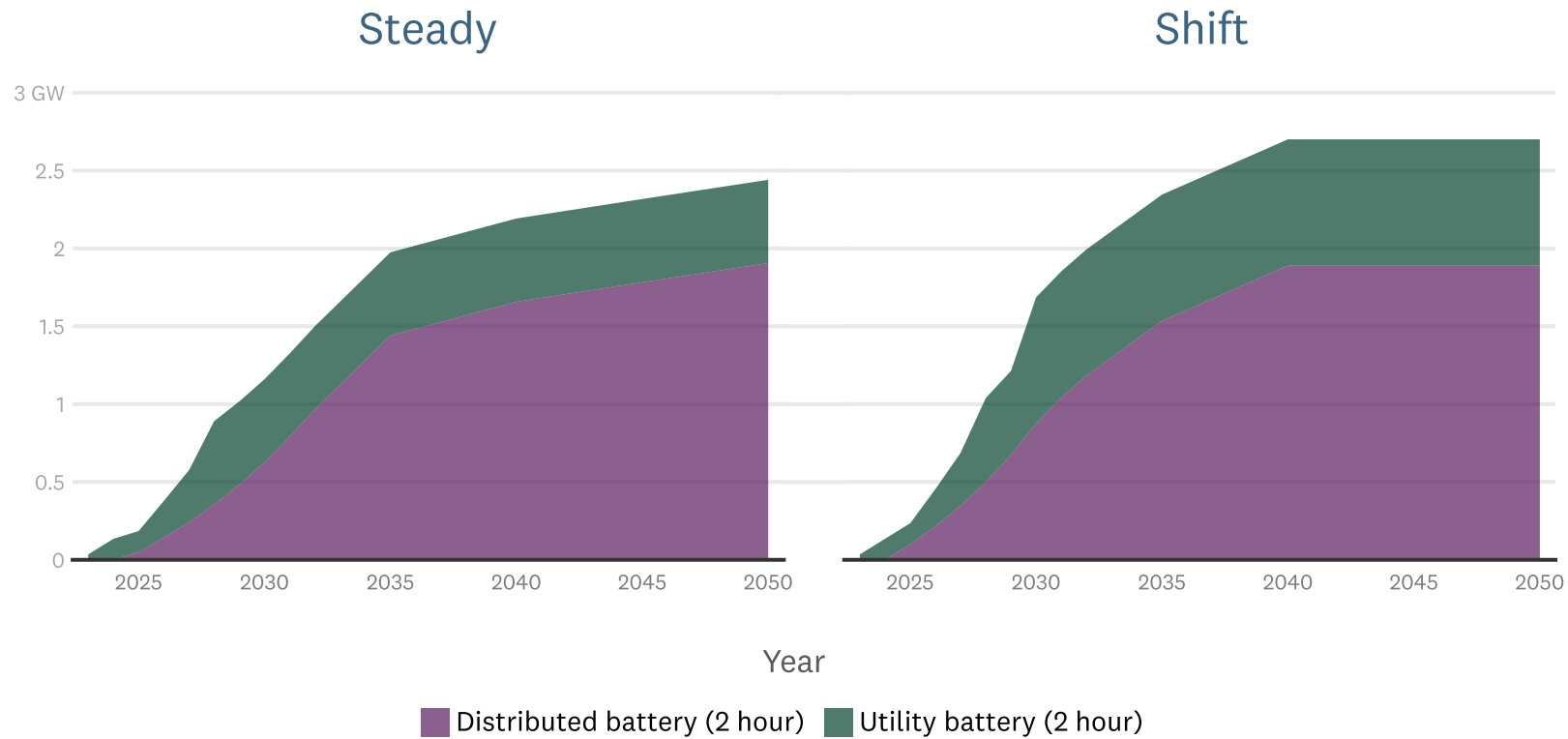
Truck electrification



Transport emissions

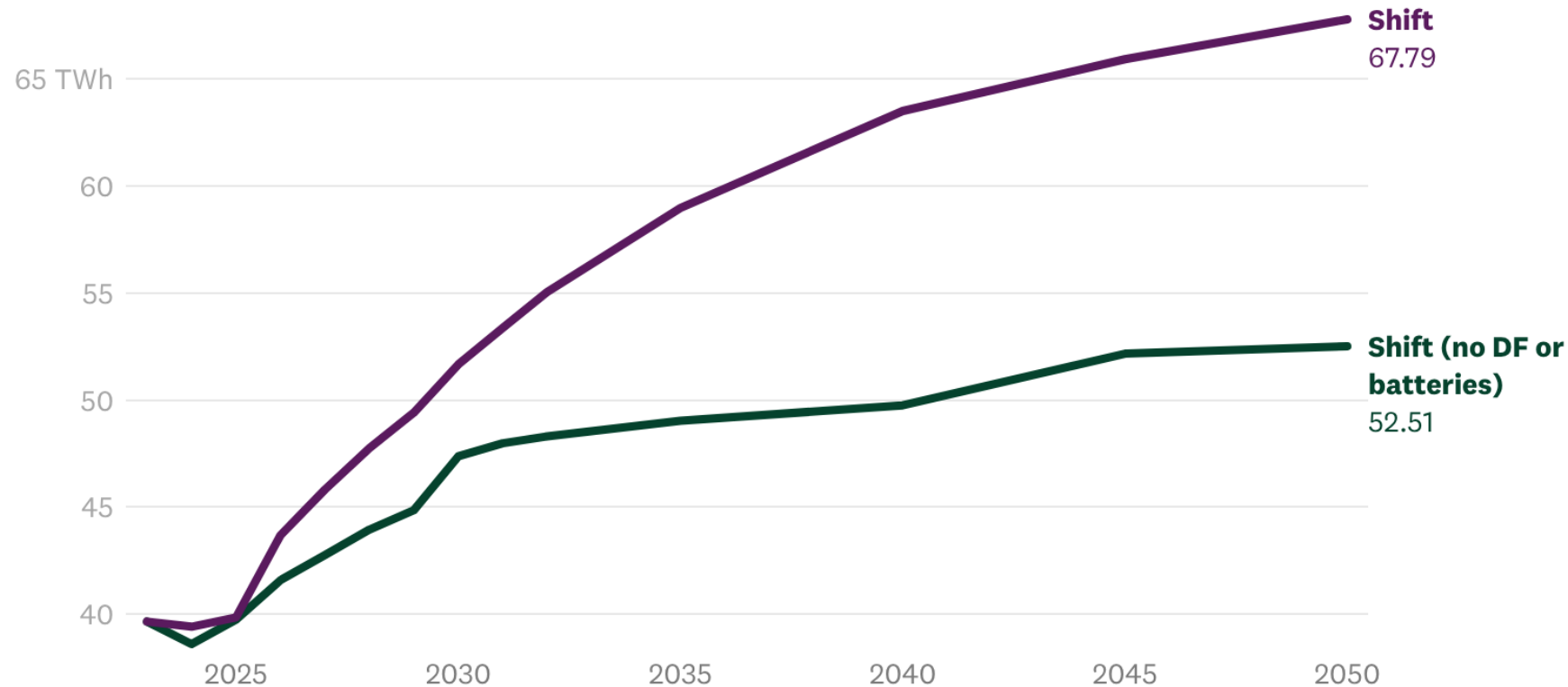


DER: reducing transmission load



Demand flex: impacts on electrification

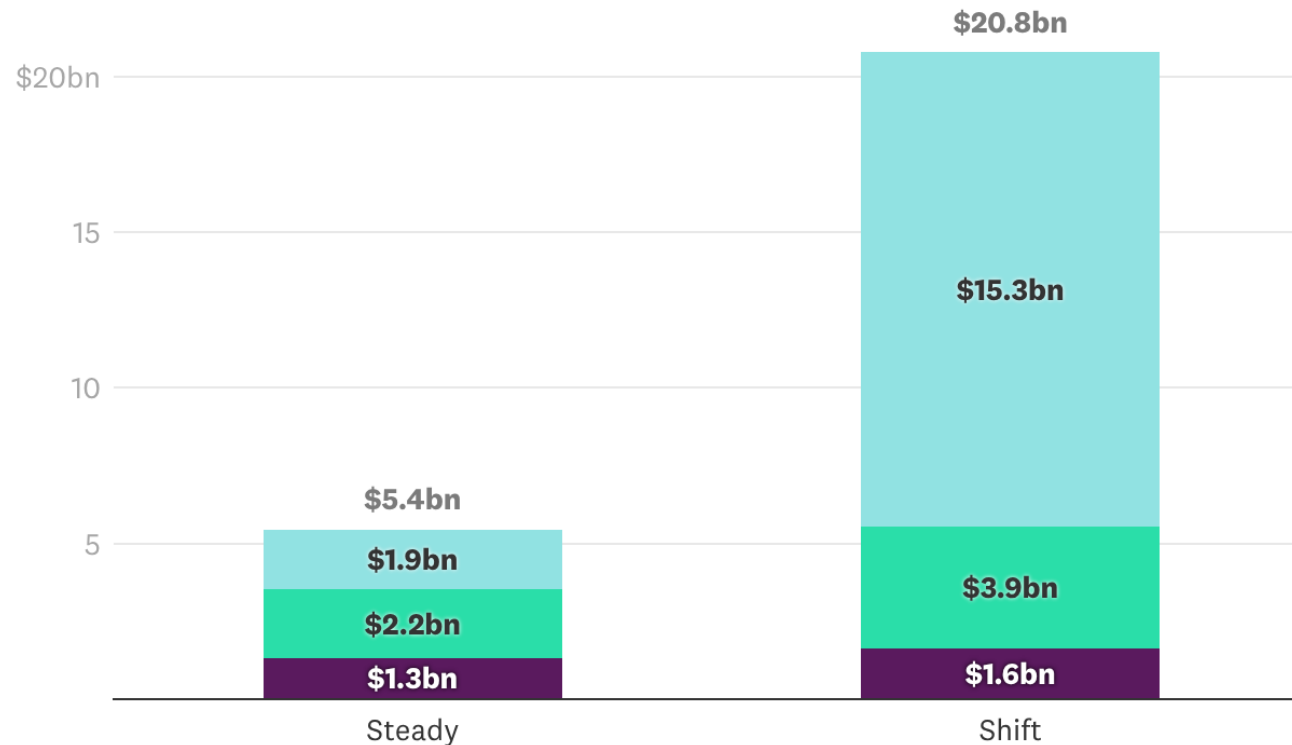
Electricity demand tests



Value of demand flexibility

Demand flex system value components

■ Demand Flex ■ Batteries ■ Additional system value



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