SAVE Close Down Event

Network Investment Tool

June 2019

Scottish & Southern Electricity Networks

Network Investment Tool

Introduction

- Requirement for LV networks management
- LCT uptake
  - EV, HP, PV
- Clustering effects
- Higher demand
- Customer behaviour
- SAVE interventions
  - LED, Customer engagement, Pricing signals, Community coaching

Network Investment Tool

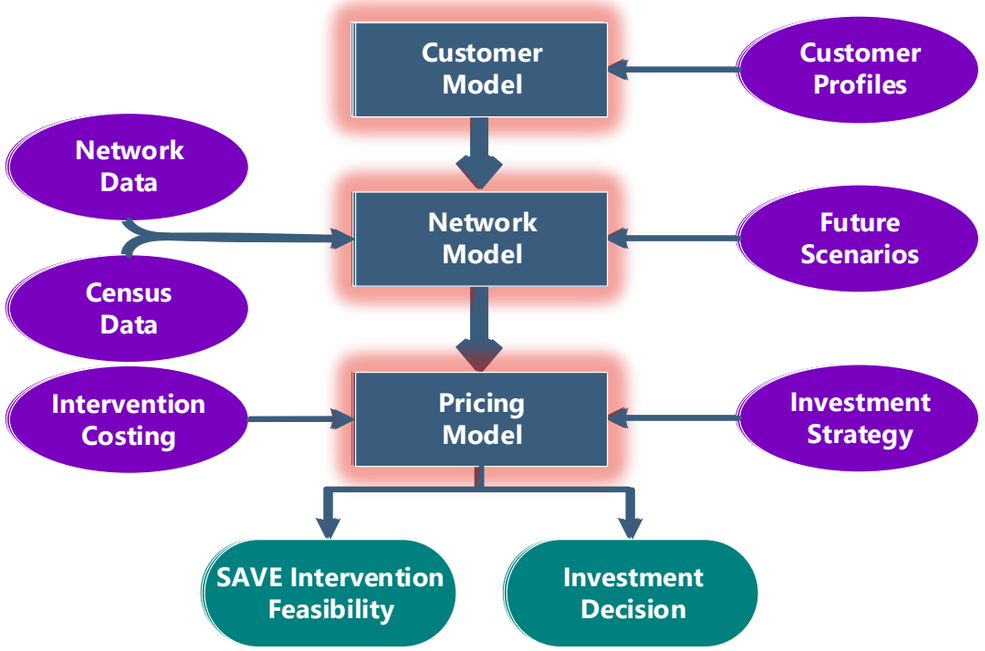
Why do we need it?

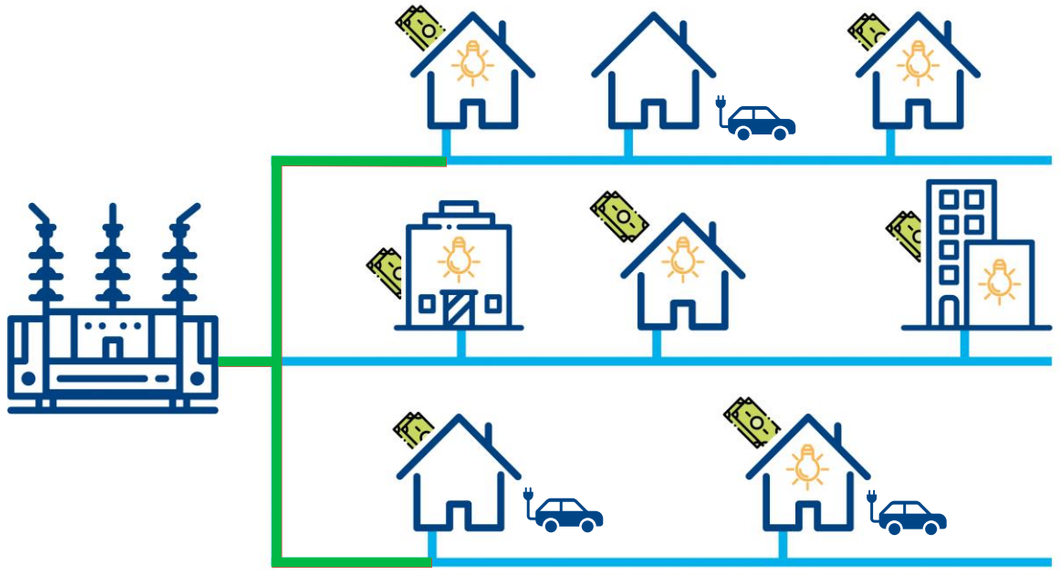
Better informed and more effective investment decisions

- Feasibility of Smart Intervention (thermal and financial)
- Cost of each intervention
- Flexibility analysis – Traditional reinforcement versus SAVE (smart) Intervention
- Investment decision
  - Strategy selection
  - Time scale (price control review, network planning, load growth certainty)

Network Investment Tool

Model/Structure





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Pricing Model

Assessment setup

Financial settings

- Intervention costs
- Interest rate

Scenario Selection

- LCTs uptake
- Load growth

Analysis timescale

- Start Year
- End Year
- Design Year

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Pricing Model Output

Intervention feasibility and costing output

- 3 strategy versus 4 scenarios

Scenario	Strategy		
	All Knowing	Flexibility Minimum	Flexibility Maximum
Low Growth			
Mid Growth			
High Growth			
Very High Growth			

- Intervention and year required
- Intervention cost and NPV

Scenario 1 Low Growth

	Year	Intervention	Action	Actual Cost	NPV to Evaluation Year
All Knowing Strategy	2030	SAVE Intervention	1) Low Energy Lightbulbs	24.65	29260.41
	2031	Split Feeder 2	1) Substation to node 23 distance 84m with WAVE 300	30720.00	
	2035	Transformer	1) Upgrade capacity to 750KVA	26500.00	
Flexibility Minimum	2030	Split Feeder 2	1) Substation to node 23 distance 84m with WAVE 185	29880.00	29610.17
	2035	Transformer	1) Upgrade capacity to 750KVA	26500.00	
Flexibility Maximum	2030	SAVE Intervention	1) Low Energy Lightbulbs	24.65	28792.67
	2031	Split Feeder 2	1) Substation to node 23 distance 84m with WAVE 185	29880.00	
	2035	Transformer	1) Upgrade capacity to 750KVA	26500.00	

Scenario 2 Mid Growth

	Year	Intervention	Action	Actual Cost	NPV to Evaluation Year
All Knowing Strategy	2027	SAVE Intervention	1) Low Energy Lightbulbs	24.65	79204.38
	2028	Split Feeder 2	1) Substation to node 23 distance 84m with WAVE 600	54240.00	
	2028	Overlay Feeder 2	1) Node 12 to node 13 distance 38m with WAVE 185 2) Node 13 to node 14 distance 36m with WAVE 185	34380.00	
	2032	Transformer	1) Upgrade capacity to 750KVA	26500.00	
	2034	Overlay Feeder 5	1) Node 36 to node 37 distance 35m with WAVE 185	16650.00	
Flexibility Minimum	2027	Split Feeder 2	1) Substation to node 23 distance 84m with WAVE 185	29880.00	51104.90
	2032	Transformer	1) Upgrade capacity to 750KVA	26500.00	
	2033	Overlay Feeder 2	1) Node 12 to node 13 distance 38m with WAVE 185	17460.00	
	2034	Overlay Feeder 5	1) Node 36 to node 37 distance 35m with WAVE 185	16650.00	
Flexibility Maximum	2027	SAVE Intervention	1) Low Energy Lightbulbs	24.65	50158.54
	2028	Split Feeder 2	1) Substation to node 23 distance 84m with WAVE 185	29880.00	
	2032	Transformer	1) Upgrade capacity to 750KVA	26500.00	
	2033	Overlay Feeder 2	1) Node 12 to node 13 distance 38m with WAVE 185	17460.00	
	2034	Overlay Feeder 5	1) Node 36 to node 37 distance 35m with WAVE 185	16650.00	

Scenario 3 High Growth

	Year	Intervention	Action	Actual Cost	NPV to Evaluation Year
All Knowing Strategy	2026	SAVE Intervention	1) Low Energy Lightbulbs	24.65	157197.96
	2027	Split Feeder 2	1) Substation to node 23 distance 84m with WAVE 600	54240.00	
	2027	Overlay Feeder 2	1) Node 100 to node 2 distance 3m with WAVE 300 2) Node 2 to node 12 distance 3m with WAVE 300 3) Node 12 to node 13 distance 38m with WAVE 300 4) Node 13 to node 14 distance 36m with WAVE 300 5) Node 14 to node 15 distance 136m with WAVE 185	95120.00	
	2030	Transformer	1) Upgrade capacity to 1000KVA	28700.00	
	2032	Split Feeder 5	1) Substation to node 129 distance 239m with WAVE 300	74120.00	
Flexibility Minimum	2026	Split Feeder 2	1) Substation to node 23 distance 84m with WAVE 185	29880.00	115953.34
	2030	Transformer	1) Upgrade capacity to 750KVA	26500.00	
	2032	Split Feeder 5	1) Substation to node 129 distance 239m with WAVE 185	71730.00	
	2035	Overlay Feeder 2	1) Node 13 to node 14 distance 36m with WAVE 300 2) Node 14 to node 15 distance 136m with WAVE 185	61200.00	
	2035	Transformer	1) Upgrade capacity to 1000KVA	28700.00	
Flexibility Maximum	2026	SAVE Intervention	1) Low Energy Lightbulbs	24.65	96645.61
	2027	Split Feeder 2	1) Substation to node 23 distance 84m with WAVE 185	29880.00	
	2030	Transformer	1) Upgrade capacity to 750KVA	26500.00	
	2031	Overlay Feeder 2	1) Node 12 to node 13 distance 38m with WAVE 185	17460.00	
	2032	Split Feeder 5	1) Substation to node 129 distance 239m with WAVE 185	71730.00	
	2035	Transformer	1) Upgrade capacity to 1000KVA	28700.00	

Scenario 4 Very High Growth

	Year	Intervention	Action	Actual Cost	NPV to Evaluation Year
All Knowing Strategy	2024	SAVE Intervention	1) Low Energy Lightbulbs	24.65	304857.15
	2025	Split Feeder 2	1) Substation to node 23 distance 84m with WAVE 185	29880.00	
	2025	Overlay Feeder 2	1) Node 100 to node 2 distance 3m with WAVE 600 2) Node 2 to node 12 distance 3m with WAVE 600 3) Node 12 to node 13 distance 38m with WAVE 600 4) Node 13 to node 14 distance 36m with WAVE 600 5) Node 14 to node 15 distance 136m with WAVE 300	118880.00	
	2029	Split Feeder 5	1) Substation to node 129 distance 239m with WAVE 600	141040.00	
	2029	Overlay Feeder 5	1) Node 100 to node 5 distance 3m with WAVE 300 2) Node 36 to node 37 distance 35m with WAVE 185	24690.00	
	2029	Transformer	1) Upgrade capacity to 2000KVA	150000.00	
Flexibility Minimum	2024	Split Feeder 2	1) Substation to node 23 distance 84m with WAVE 300	30720.00	176366.39
	2024	Overlay Feeder 2	1) Node 12 to node 13 distance 38m with WAVE 185	17460.00	
	2029	Overlay Feeder 5	1) Node 36 to node 37 distance 35m with WAVE 185	16650.00	
	2029	Transformer	1) Upgrade capacity to 750KVA	26500.00	
	2030	Overlay Feeder 2	1) Node 13 to node 14 distance 36m with WAVE 185	16920.00	
	2032	Transformer	1) Upgrade capacity to 2000KVA	150000.00	
	2034	Overlay Feeder 2	1) Node 13 to node 14 distance 36m with WAVE 300	17280.00	
	2034	Overlay Feeder 7	1) Node 231 to node 24 distance 84m with WAVE 185	29880.00	
Flexibility Maximum	2024	SAVE Intervention	1) Low Energy Lightbulbs	24.65	178271.29
	2025	Split Feeder 2	1) Substation to node 23 distance 84m with WAVE 300	30720.00	
	2025	Overlay Feeder 2	1) Node 12 to node 13 distance 38m with WAVE 185	17460.00	
	2029	Overlay Feeder 5	1) Node 36 to node 37 distance 35m with WAVE 185	16650.00	
	2029	Transformer	1) Upgrade capacity to 750KVA	26500.00	
	2030	Overlay Feeder 2	1) Node 13 to node 14 distance 36m with WAVE 185	16920.00	
	2032	Transformer	1) Upgrade capacity to 2000KVA	150000.00	
	2034	Overlay Feeder 2	1) Node 13 to node 14 distance 36m with WAVE 300	17280.00	
	2034	Overlay Feeder 7	1) Node 231 to node 24 distance 84m with WAVE 185	29880.00	
	2035	Overlay Feeder 5	1) Node 100 to node 5 distance 3m with WAVE 300	8040.00	

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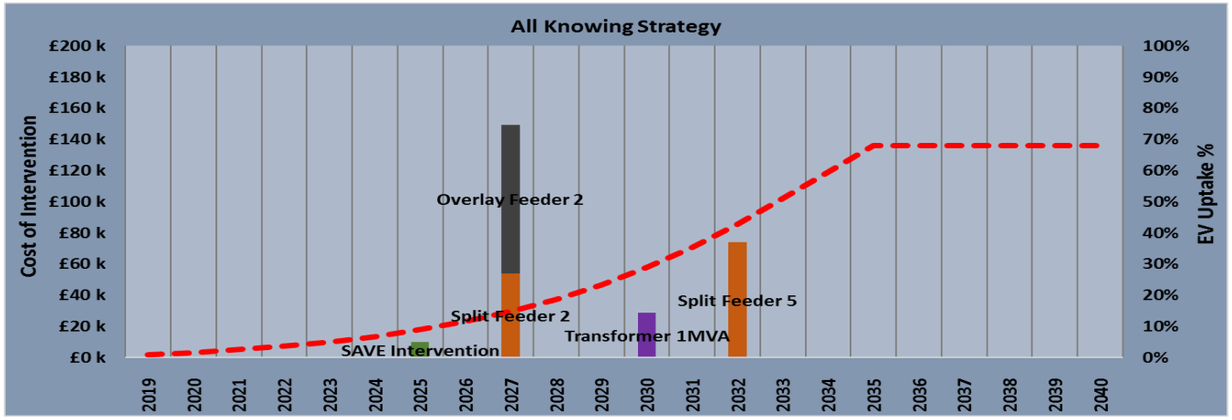
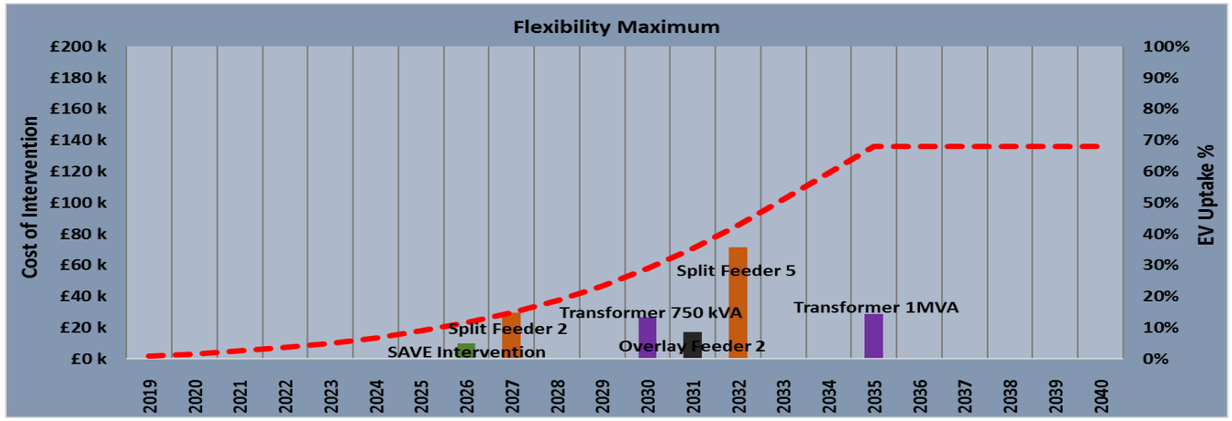
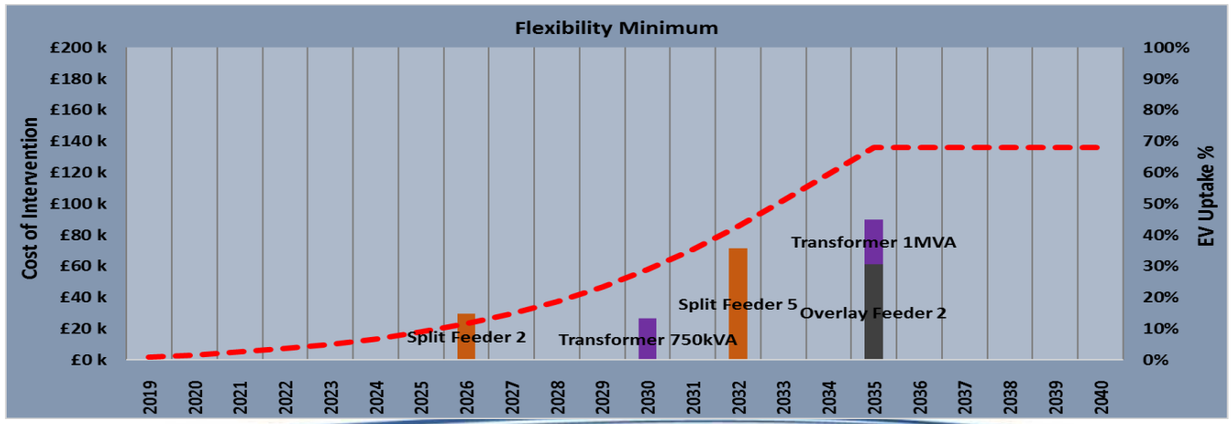
Pricing Model Output

Visualisation







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Pricing Model

Regret Table

- 3 strategy versus 4 scenarios
- Assessment Year
- NPV for each Strategy
- Worst Least Regret
- Investment decision

		Low Growth	Mid Growth	High Growth	Very High Growth
Assessment Year	Strategy	Outcome	Outcome	Outcome	Outcome
2040		Scenario1	Scenario2	Scenario3	Scenario4
	All Knowing	£ 29,260	£ 79,204	£ 157,198	£ 304,857
	Flexibility Max	£ 29,610	£ 51,105	£ 115,953	£ 176,366
	Flexibility Min	£ 28,793	£ 50,159	£ 96,646	£ 178,271
	Minimum	£ 28,793	£ 50,159	£ 96,646	£ 176,366

	Least Regret				Worst Least Regret
All Knowing	£ 468	£ 29,046	£ 60,552	£ 128,491	£ 128,491
Flexibility Max	£ 818	£ 946	£ 19,308	£ -	£ 19,308
Flexibility Min	£ -	£ -	£ -	£ 1,905	£ 1,905

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Network Investment Tool

Summary

NIT allows DNOs to :

- Investigate feasibility and financial viability of LV and HV network interventions (both traditional and smart)
- Compare impact and cost of traditional reinforcement versus SAVE (smart) interventions
- Help network planner to make investment decision based on
  - WLR
  - Optionality value
- Demonstrate that alternative network interventions CAN/CANNOT be used to manage network constraints