



Load Research Roadmap

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Structure

- What does users of LR roadmap want?
- Drivers for LR roadmap?
- LR roadmap
 - Domestic
 - LPU
 - SPU
 - LR hub
- What's next?

What does users of LR roadmap want?

Stakeholder	Strategic interests
Utilities	Cost of Supply management, adherence to regulatory standards.
Universities	Data, problems, mentoring, papers.
Research organisations	High quality ref data/models/information for energy/resources planning for decision-support.
Consultants	Industry standard references/methods.
Standards Authorities	Standards enabling lower ESI costs and regulation.

What does users of LR roadmap want?

- We surveyed new members of SAIEE LR Chapter (Apr 2019)
- What members want (Descending order):
 - Members want engineering applications & tools
 - Members want to know more about load research
 - Members want to know about distribution channels
 - (Distribution is approx 60:30:10)
- Applications without traceable references / models / assumptions is unwise, so

Drivers for LR roadmap?

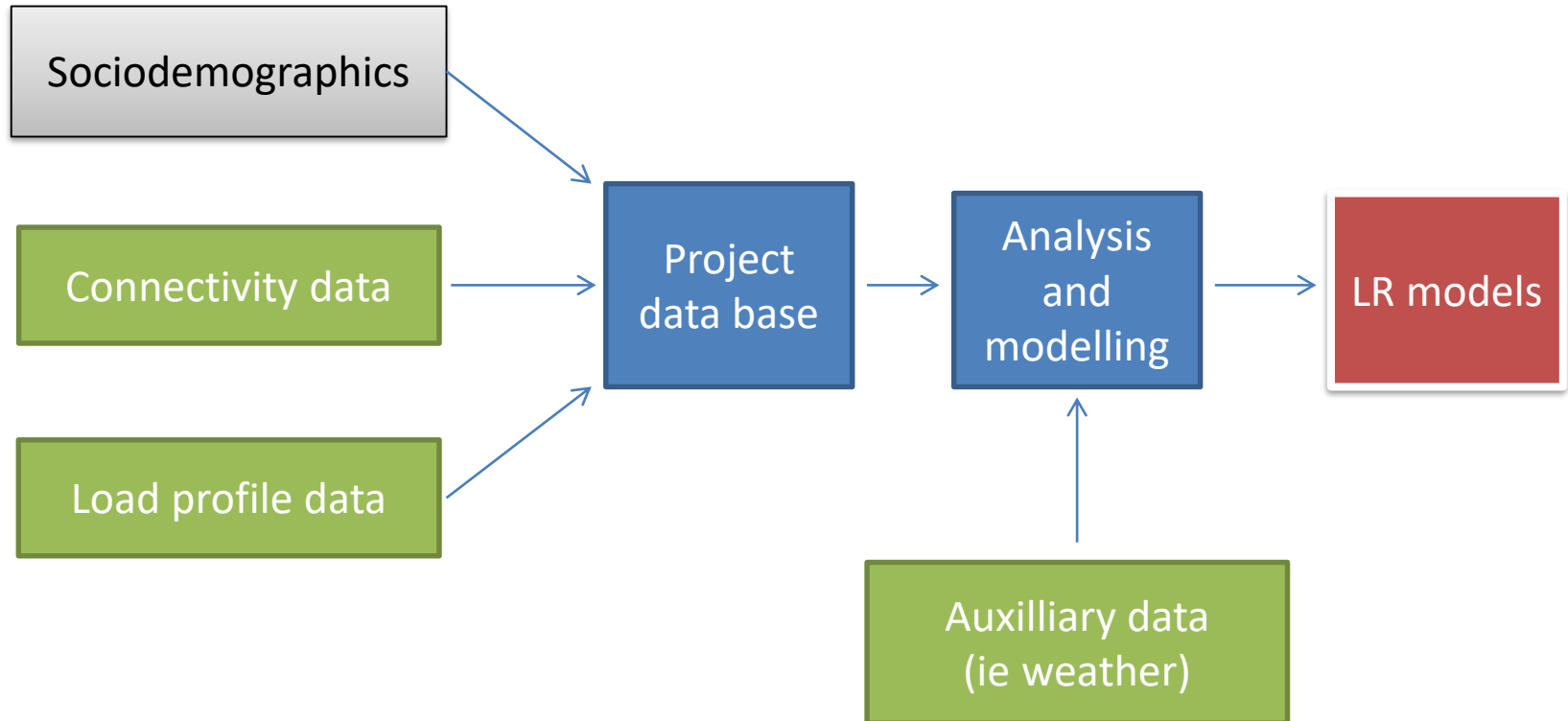
- Future networks won't be ready for future loads (ie Renewables and tech).
- Supplementary energy and storage sources are arriving (renewables, gas, battery).
- Must understand and broadcast changing customer behaviours.
- Need to collaborate and coordinate under common standards.
- Obtain funding with business case/s.
- Without “the right stuff”, engineering tools/applications are GIGO.

Load Research roadmap

- What do we want to achieve and what resources are required?
 - Current state
 - Desired state
 - Estimated resources required**

**Resources estimate is completed down to Role, Skill, task, man-hours, expenses and CAPEX.

Domestic load research (current state)



All 16 “live” sites is currently Eskom customers.

Stats for SA (2014)
15m “households”.
9m dwellings.

Domestic load research (what's required)

- Representative live sample for SA.
- 26 or more live sites, with remaining 10-12 from Municipal customers.
- 360 additional loggers.
- Collect socio-demographics each year (>1620 interviews).
- Increase scope to track renewables & storage.

Summary resource estimates (DLR)

Phase 1 – 16 sites (current)

Manhours (Tech)	Manhours (Eng)	OPEX	CAPEX
(Hr)	(Hr)	(R)	(R)
5 880	3 062	3 465 177	-

Phase 2 – 26 sites (includes phase 1)

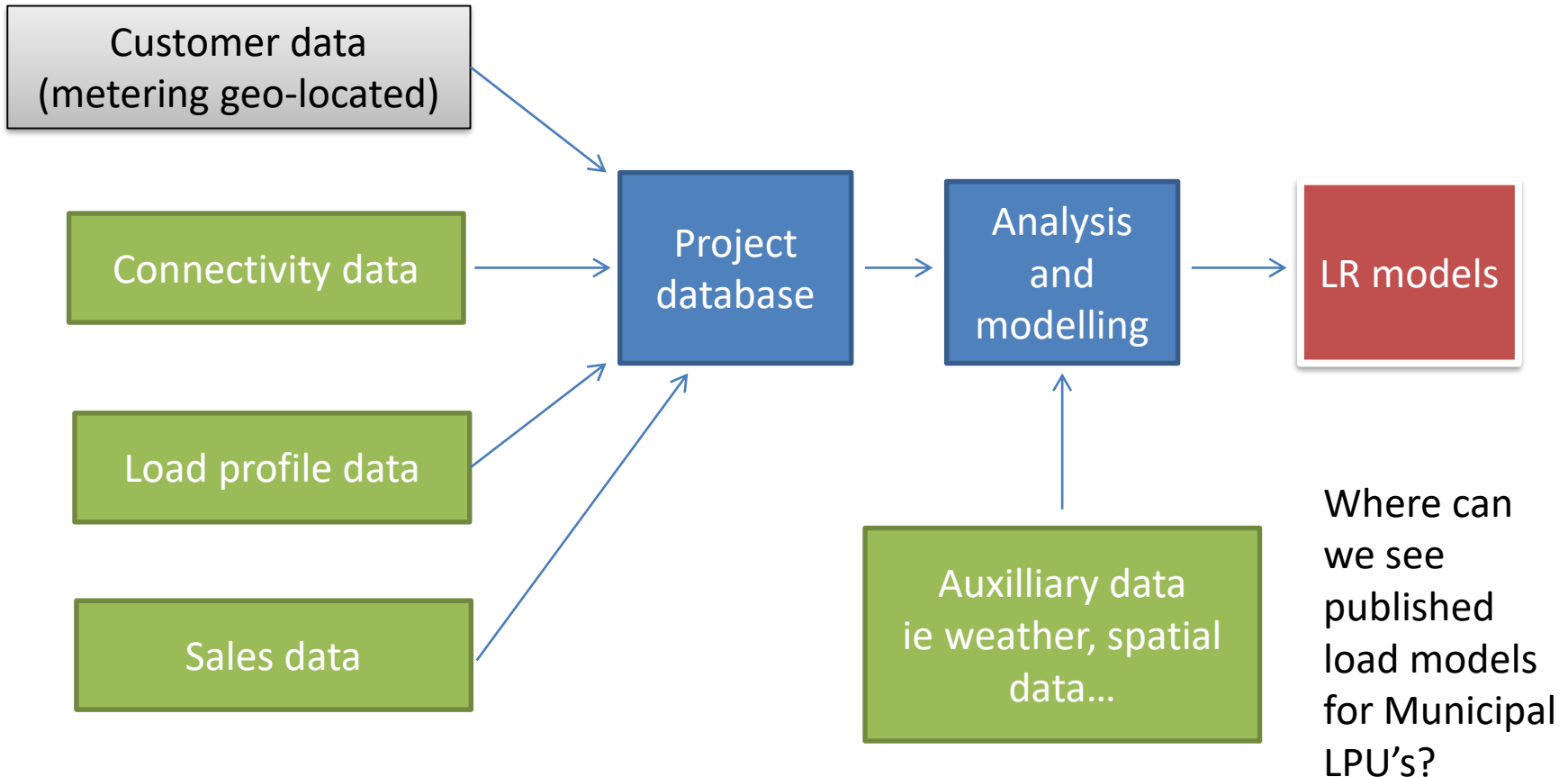
Manhours (Tech)	Manhours (Eng)	OPEX	CAPEX
(Hr)	(Hr)	(R)	(R)
5 880	4 126	5 161 169	7 201 680

Phase 2
Includes
phase 1

Capex =360 meters@20k/unit

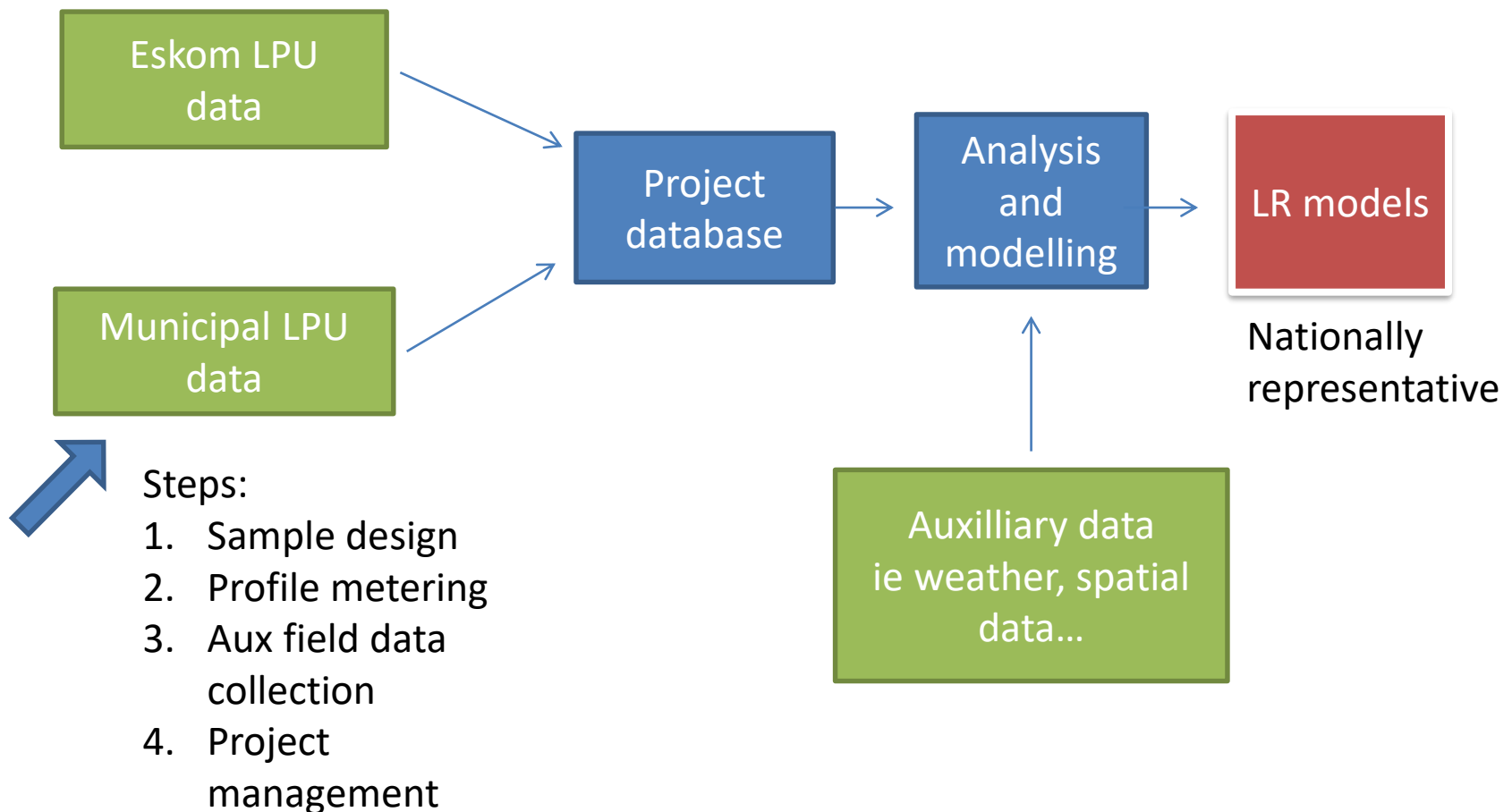
Manhour and OPEX budgets is annual

Large Power User load research (current state)



15,000-20,000 Eskom customers analysed.
Load subclass models published into GLF standard

Large Power User load research (what's required)



Summary resource estimates (LPU)

Phase 1 – Eskom data-pipes, Sample, Local survey 500

Manhours (Tech) (Hr)	Manhours (Eng) (Hr)	OPEX (R)	CAPEX (R)
1564	2188	960 000	440 000

Phase 2 – Municipal data, Sample, Local survey 500

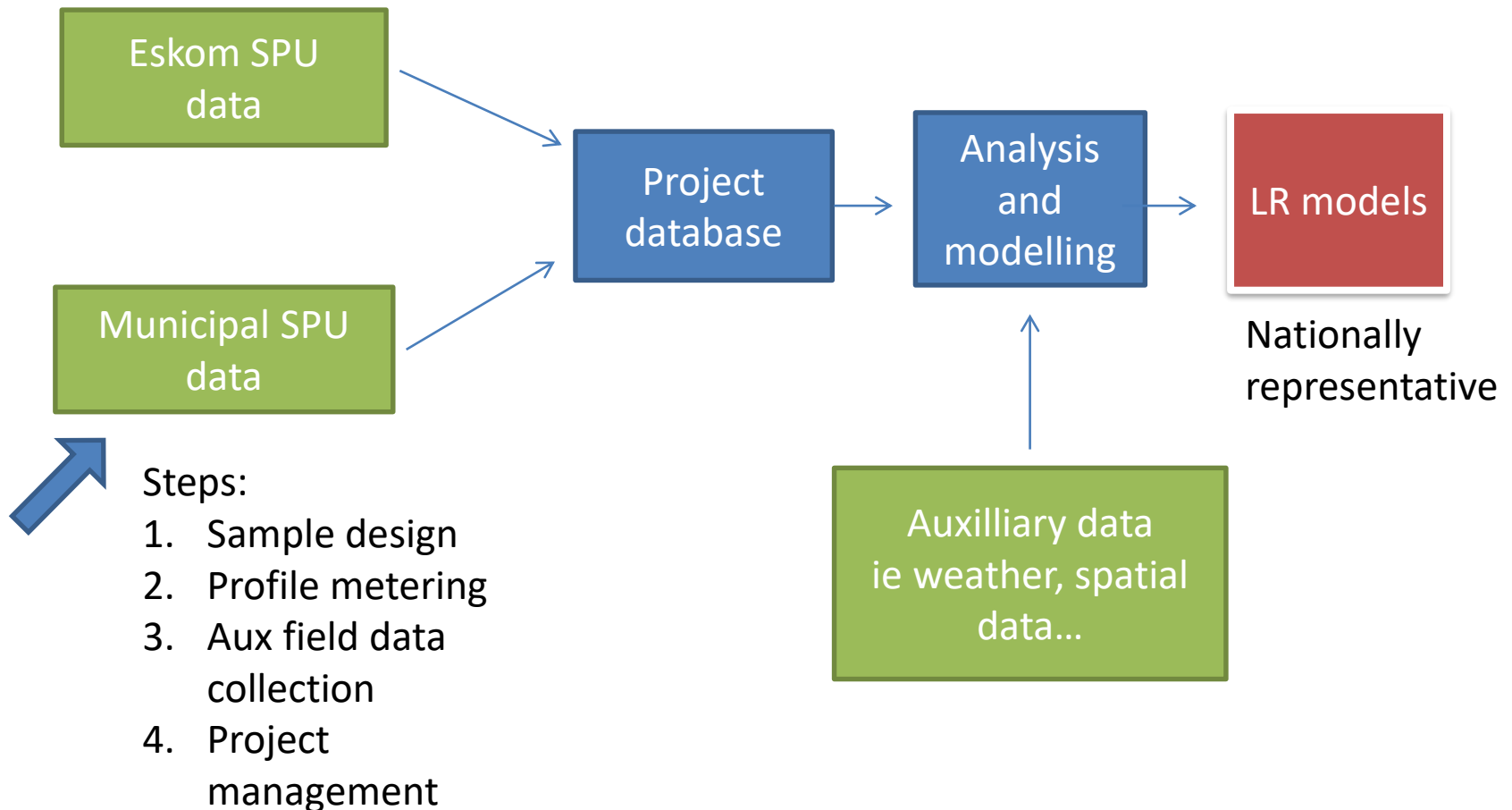
Manhours (Tech) (Hr)	Manhours (Eng) (Hr)	OPEX (R)	CAPEX (R)
2 304	952	665 032	40 000

Note:
Phase 2
exclude
Phase1

Small Power Users load research (current state)

- Estimate there is 10 times more SPU 's than LPU's in SA.
- No published load models for SPU's.
- Most rural distribution lines carry these customers.

Small power user Load research (what's required)



Summary resource estimates (SPU)

Phase 1 – Eskom data-pipes, Sample, metering, Local survey 500

Manhours (Tech)	Manhours (Eng)	OPEX	CAPEX
(Hr)	(Hr)	(R)	(R)
6240	2160	2 160 000	10 440 000

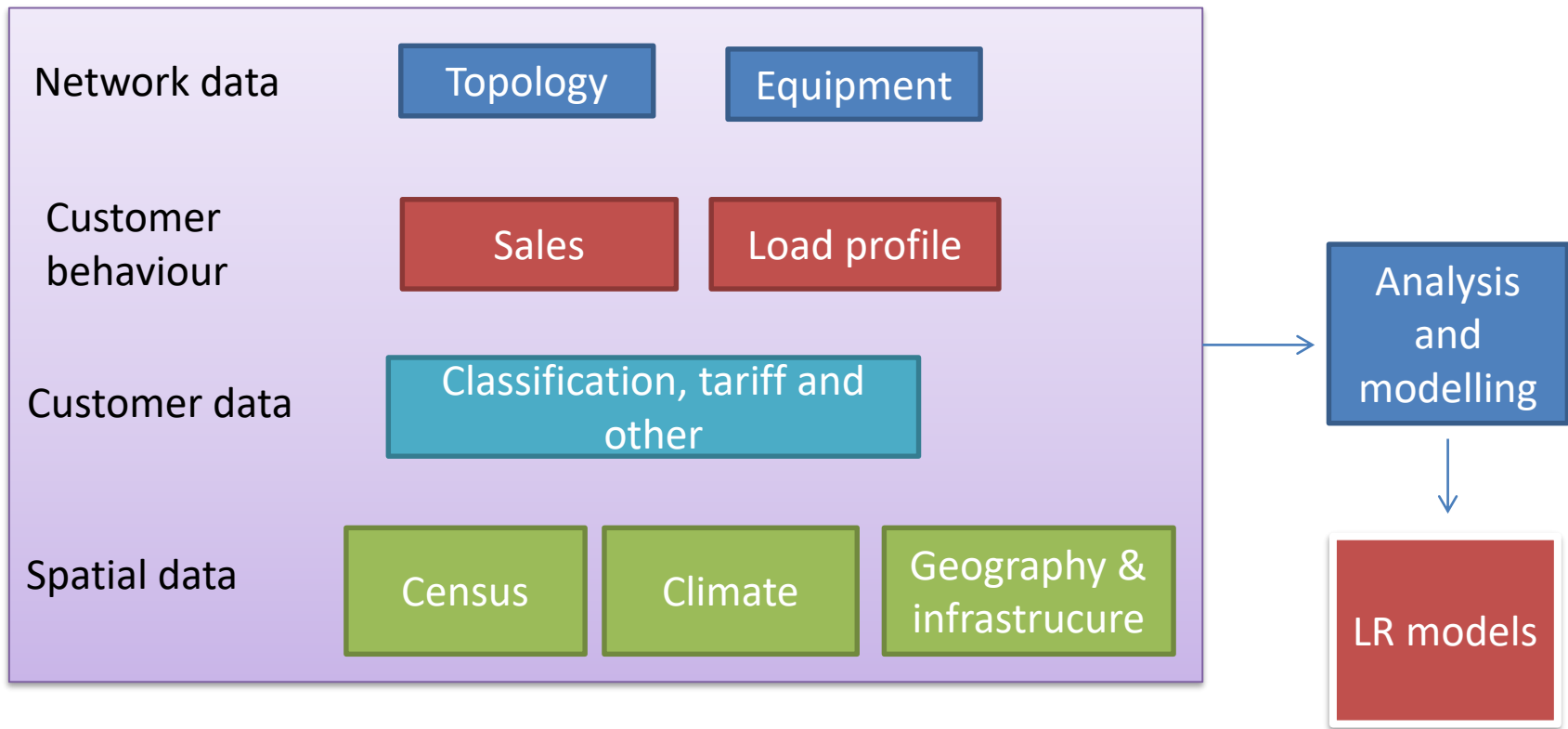
Phase 2 – Municipal data, Sample, Local survey 500

Manhours (Tech)	Manhours (Eng)	OPEX	CAPEX
(Hr)	(Hr)	(R)	(R)
2304	952	665 032	40 000

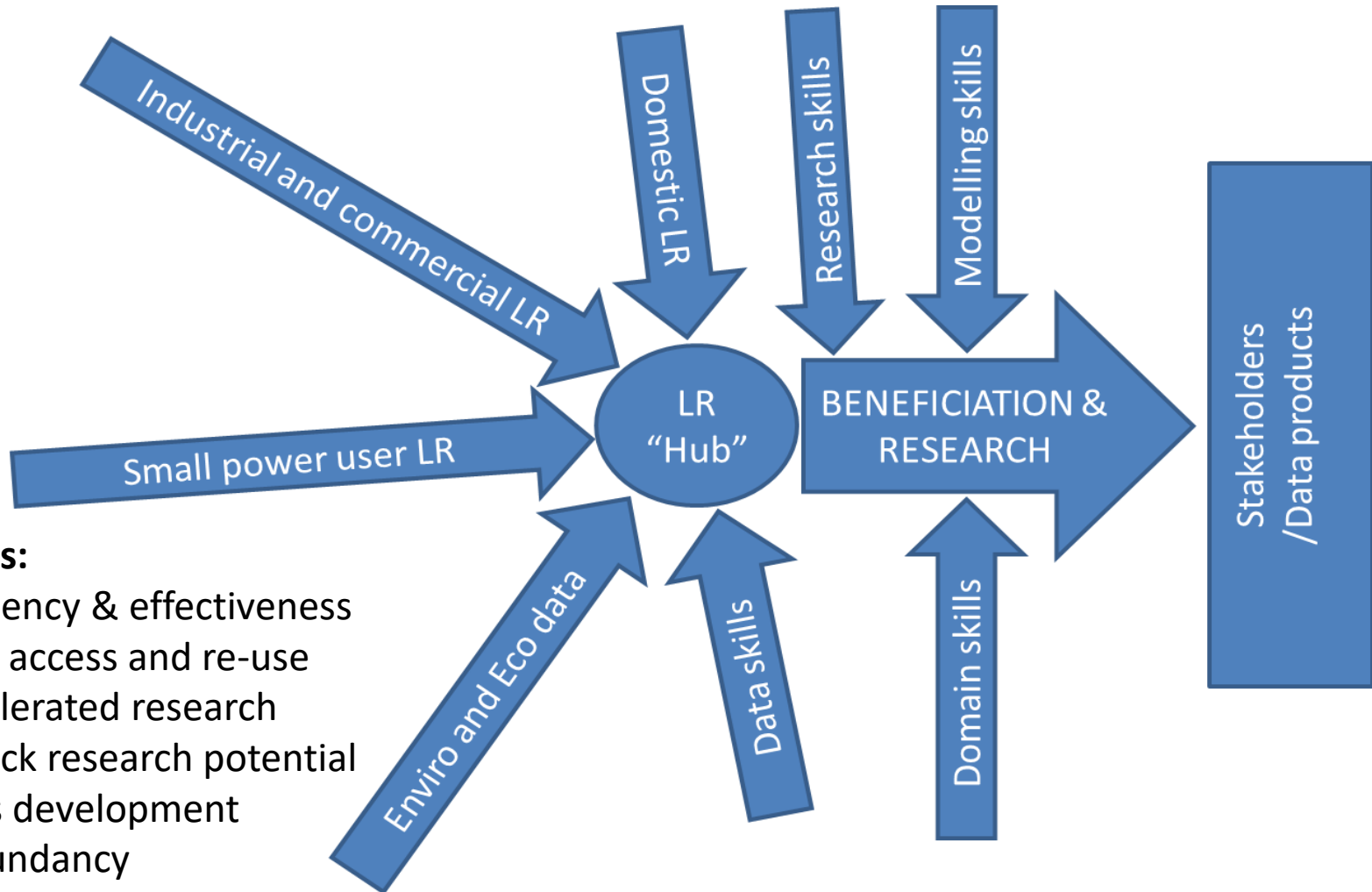
Note:
Phase 2
exclude
Phase1

Load research Hub (sample of current state)

Project database



Load research Hub (future state)



Features:

- Efficiency & effectiveness
- Data access and re-use
- Accelerated research
- Unlock research potential
- Skills development
- Redundancy

Summary resource estimates (SPU)

Data-pipes to validated research data sets (DLR, LPU, SPU collection projects and Auxiliary data sets)

Manhours (Tech) (Hr)	Manhours (Eng) (Hr)	OPEX (R)	CAPEX (R)
0	5432	1 920 000	1 000 000

Staffing:

- Steering committee
- Hub manager
- Domain advisers
- Application experts
- Data scientists

OPEX includes project support:

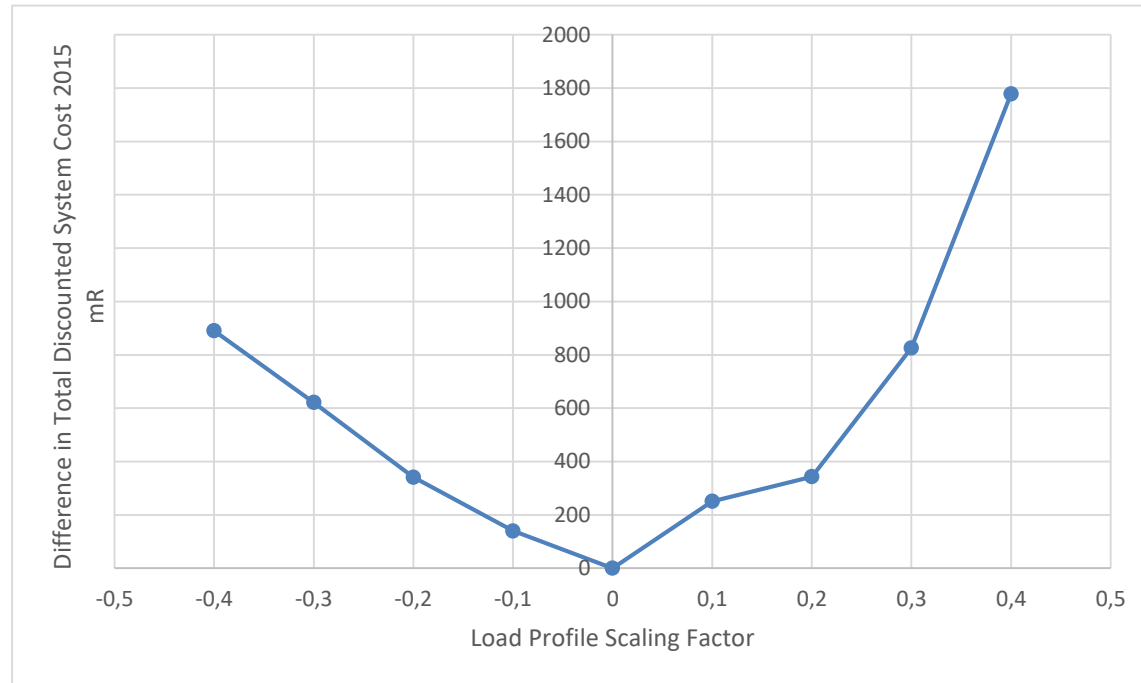
- Service window requests
- Academic support
- Projects (DLR/LPU/SPU results)

Summary

- Have illustrated where we are, how we need to meet the future.
- Have estimated resources by Scope, Skills, Manhours, Opex & Capex.
- Have defined a way (LR Hub) to concentrate data and get economies of scale.
- This has already been demonstrated on DLR and GLF projects.
- Wide collaborations will be required to achieve this.

What's next? Business cases required

Example: Sensitivity of IRP to load



**10% error in “peakiness” of loadshape = R200m total discounted system cost (at generation).
Excludes energy error.**

What's next? Business-cases required

- IRP level
 - Transmission level
 - DX Masterplanning
 - Renewables
 - Electrification
 - Optimisation
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- Once we have business cases, future funding becomes easier.