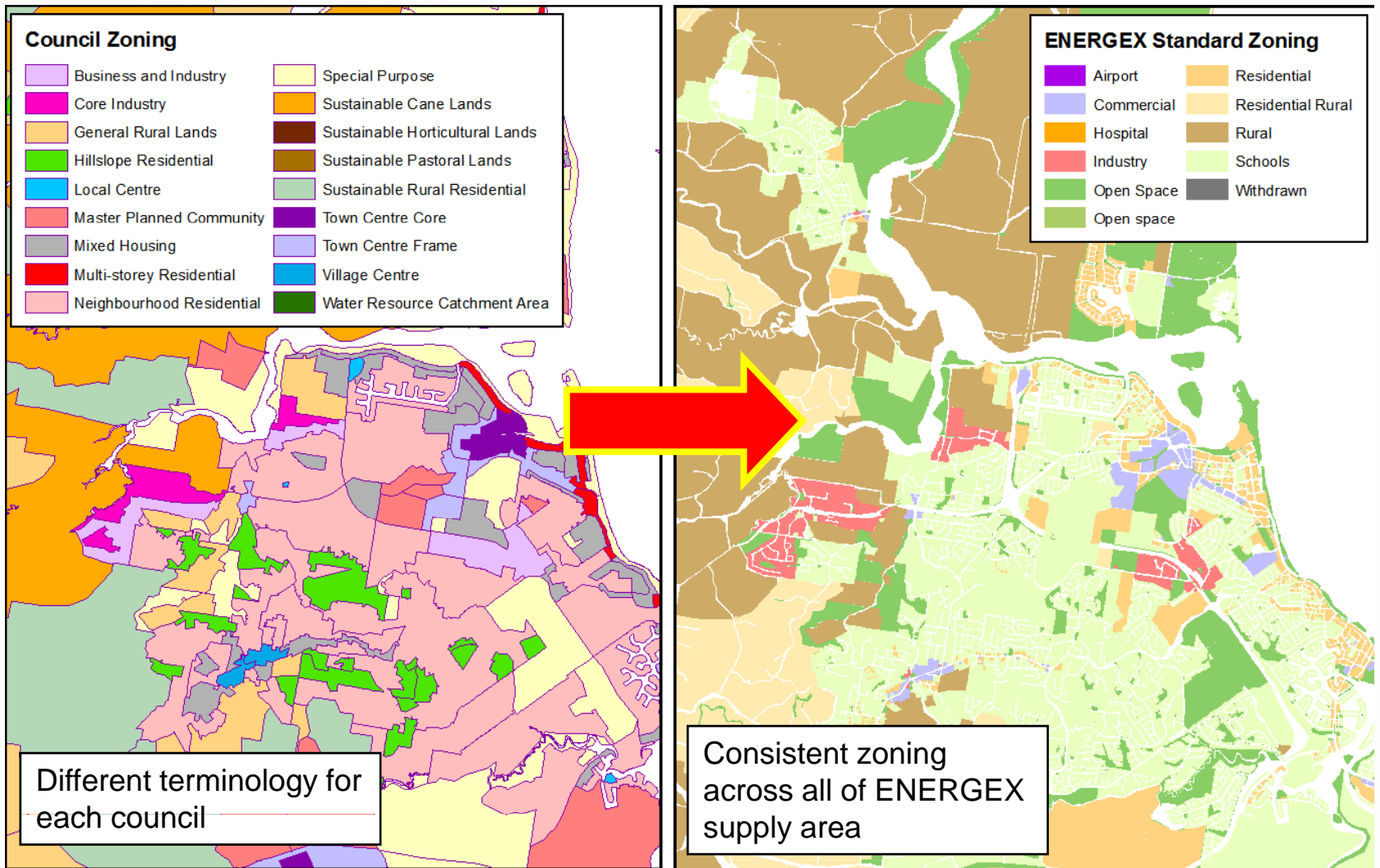


Spatial Load Forecasting & Substation Location Optimisation

David Ingram (Network Development Planning Dept.)

Conversion of planning schemes

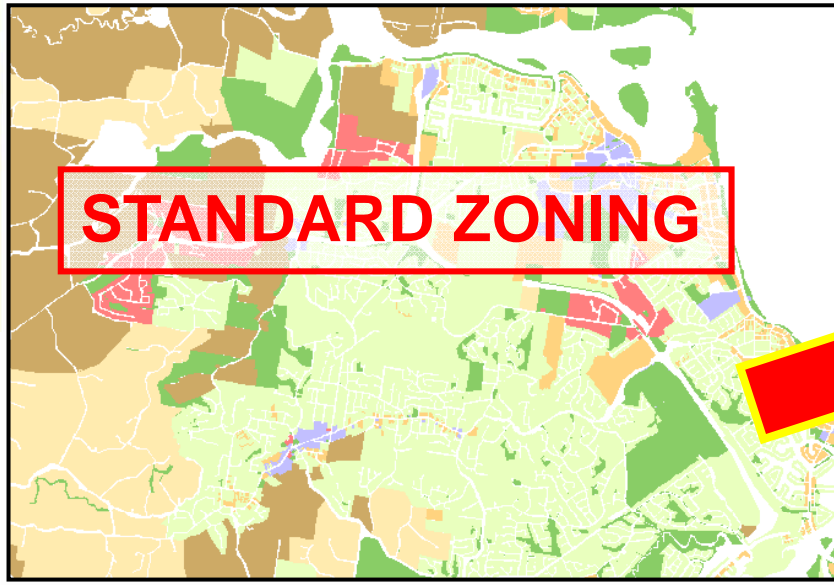
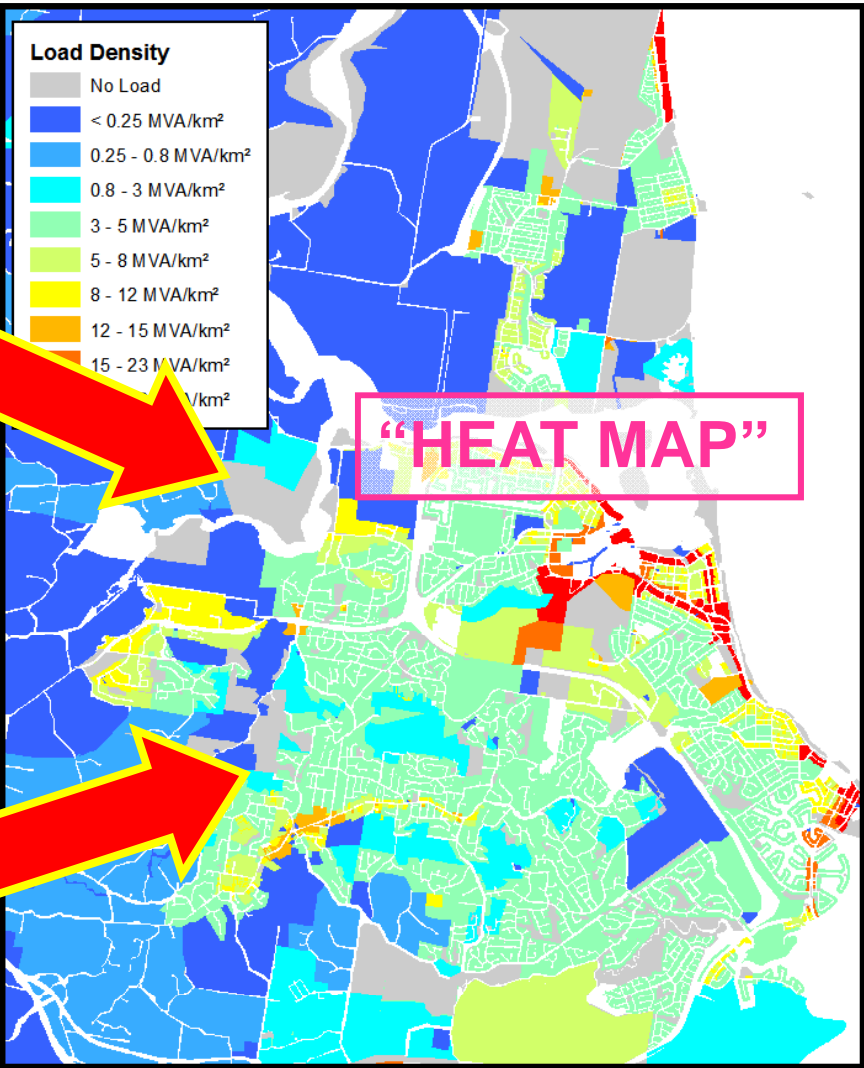
positive energy



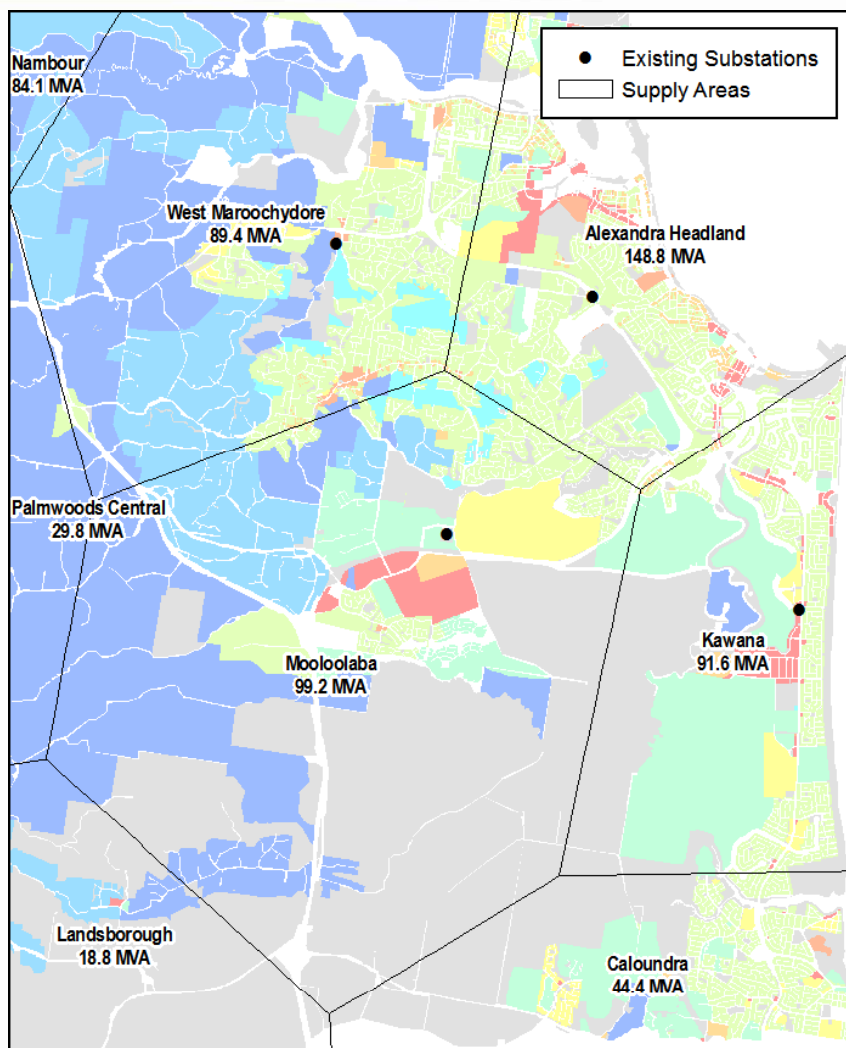
Load density map

A	E	F
1	Standard Zoning	New Description
20	Commercial 9	Major shopping centre, such as Capalaba Park.
21	Commercial 10	Major shopping complex.
22	Commercial 11	Major shopping complex.
	Commercial 12	Principal activity centre shopping complexes, such as Carindale, Chermside and Indooroopilly.
23		
24	Residential A 1	Detached residential with 4000m ² blocks
25	Residential A 2	Detached residential with 3000m ² blocks
26	Residential A 3	Detached residential with 2000m ² blocks
27	Residential A 4	Detached residential with 1500m ² blocks
28	Residential A 5	Detached residential with 1000m ² blocks
29	Residential A 6	Low density detached residential with 600m ² blocks (eg. BCC LR)
30	Residential A 7	Low/medium density detached residential with 600m ² blocks (eg. BCC LMR)
31	Residential A 8	Medium density detached residential with 400m ² blocks (eg. BCC MR)
32	Residential A 9	Undeveloped future detached residential with 600m ² blocks, with roads and parks yet to be formed.
33	Residential B 1	Medium density unit residential with 330m ² units (75 people per hectare)

LOAD DENSITY TABLE

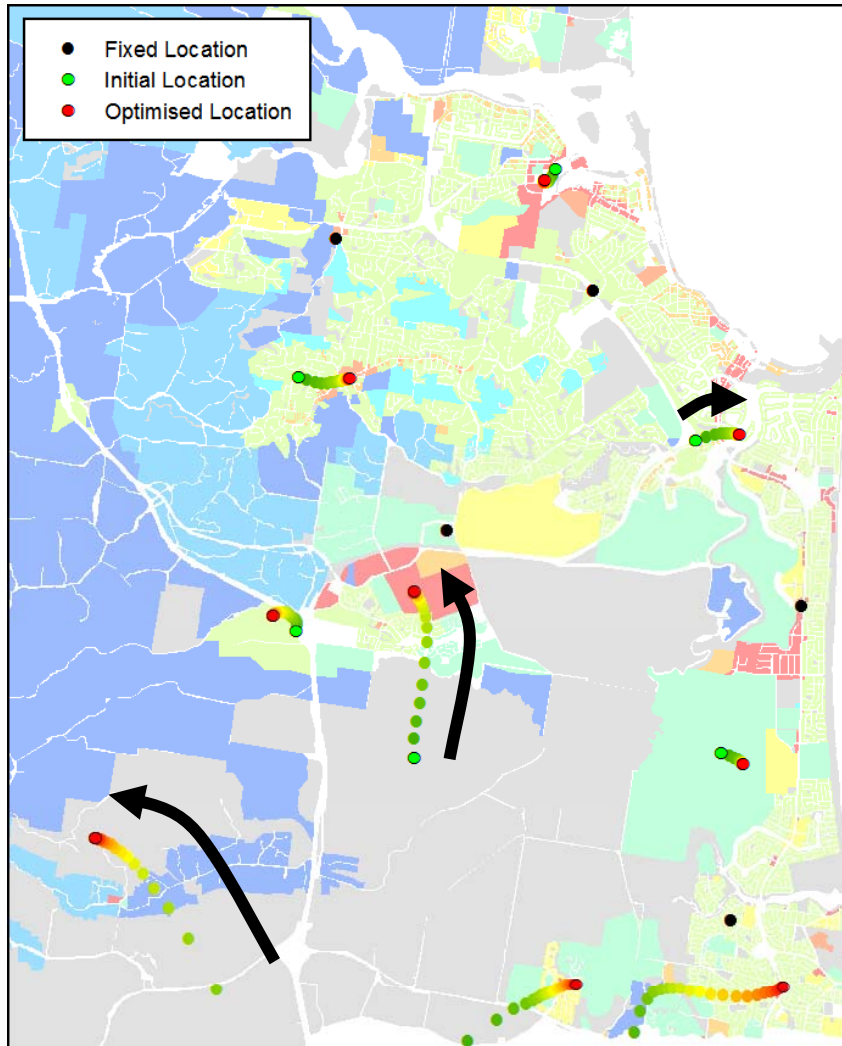


“Fully Developed” load *existing substations*



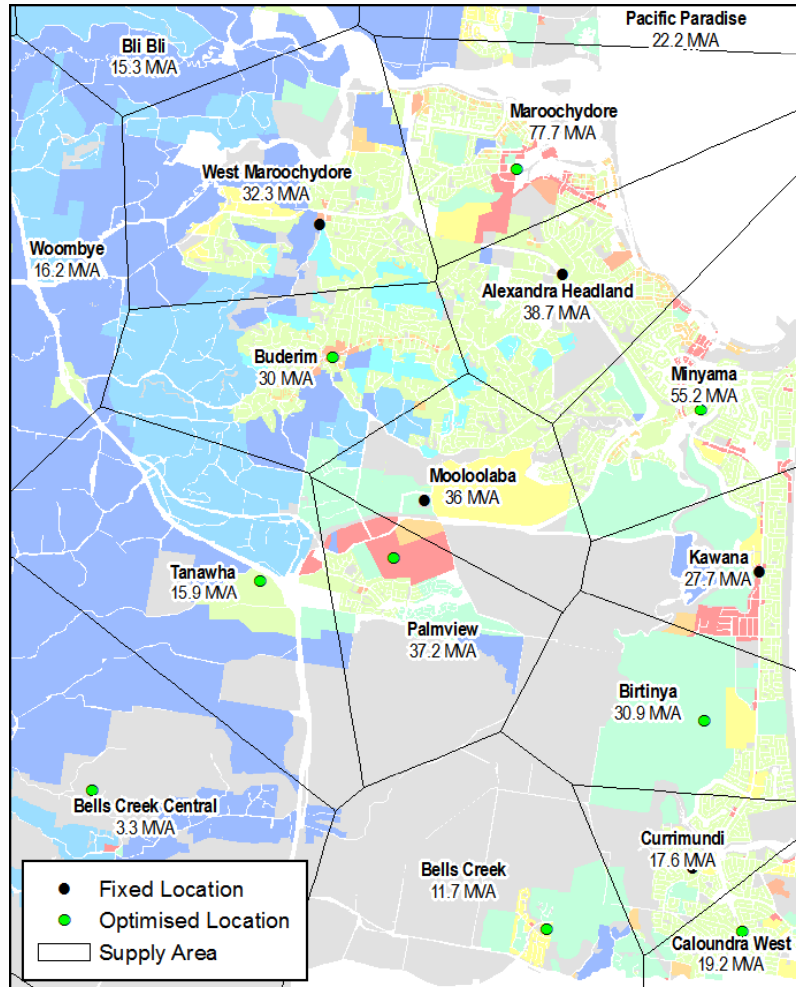
- “Fully developed” load is determined for existing substations.
 - Assumption is that no new substations are built.
 - Loads will be too high for existing substations, but gives an indication of number of future substations that will be required.
- ‘Supply area’ is the boundary of land that is closest to any given substation.

Substation location optimisation



- Additional substations are added.
 - Some will be fixed in known locations if a site has been purchased.
- “Variable” substations have their location optimised to minimise the load-substation distance.
 - Minimises voltage drop.
- Each iteration moves the substation a small amount.
- Stop when the maximum shift is within a given tolerance.

“Fully developed” load with additional substations



- Check loads again after optimisation.
- Loads on each substation have reduced.
- Some substations are lightly loaded.
 - May not be required.
- Loads on some may still be too high.
 - Add additional sites.
 - Run optimisation again.

- Contact me:

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- Two papers (oldies but goodies):
 - K.O. Mitchell, “Use of Load Density Techniques in Power System Load Forecasting and Zone Substation Site Selection”, *Electrical Engineering Transactions (IEAust)*, Vol. EE9, Nos. 1&2, pp 6-12, 1973.
 - H.L. Willis and J.E.D. Northcote-Green, “Spatial Electric Load Forecasting: A Tutorial Review”, *Proc. IEEE*, Vol. 71, No. 2, pp 232-253, 1983.