

Wind Farm Investment in New Zealand



Energy Spotlight 29 Nov 2018
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THE UNIVERSITY OF
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Te Whare Wānanga o Tamaki Makaurau
NEW ZEALAND

BUSINESS SCHOOL
ENERGY CENTRE

Low-emissions transition

- Government's target of net-zero carbon by 2050
- Energy sector accounts for 40% of the total GHG emissions
- Government's goal: 90% of electricity generated from renewables by 2025
- Currently wind generation contributes 6%
- NZWEA target's of 20% wind energy by 2030



Wind energy expansion

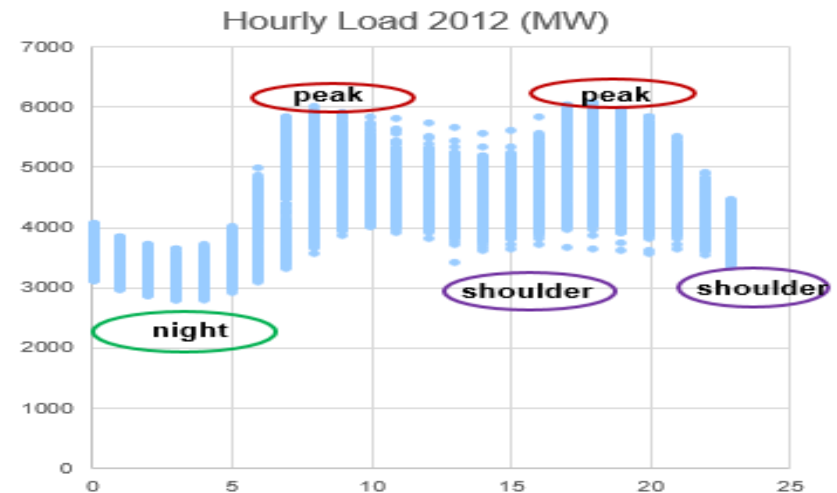
Research questions

Q1: How does an increase of wind penetration influence the nodal price?

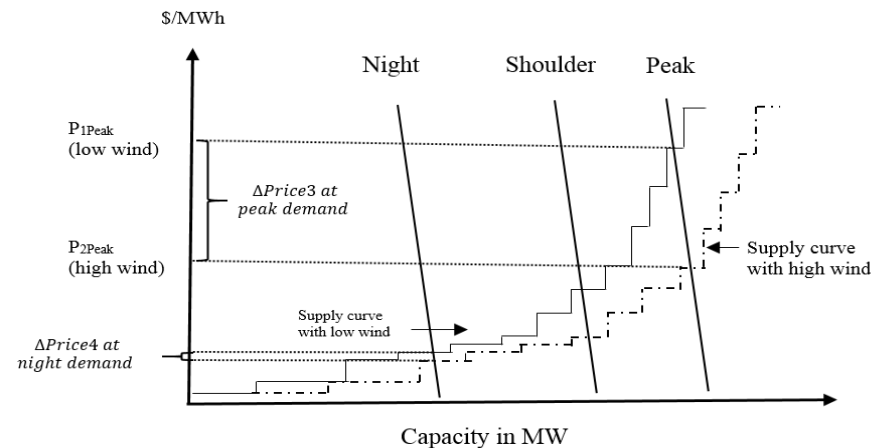
Q2: Is the MOE larger during the peak demand, and smaller during the off-peak demand?

Q3: Can we use answers to question (1) to predict the regional price reduction for each node and to further explore where to build wind sites?

Hourly Electricity Demand

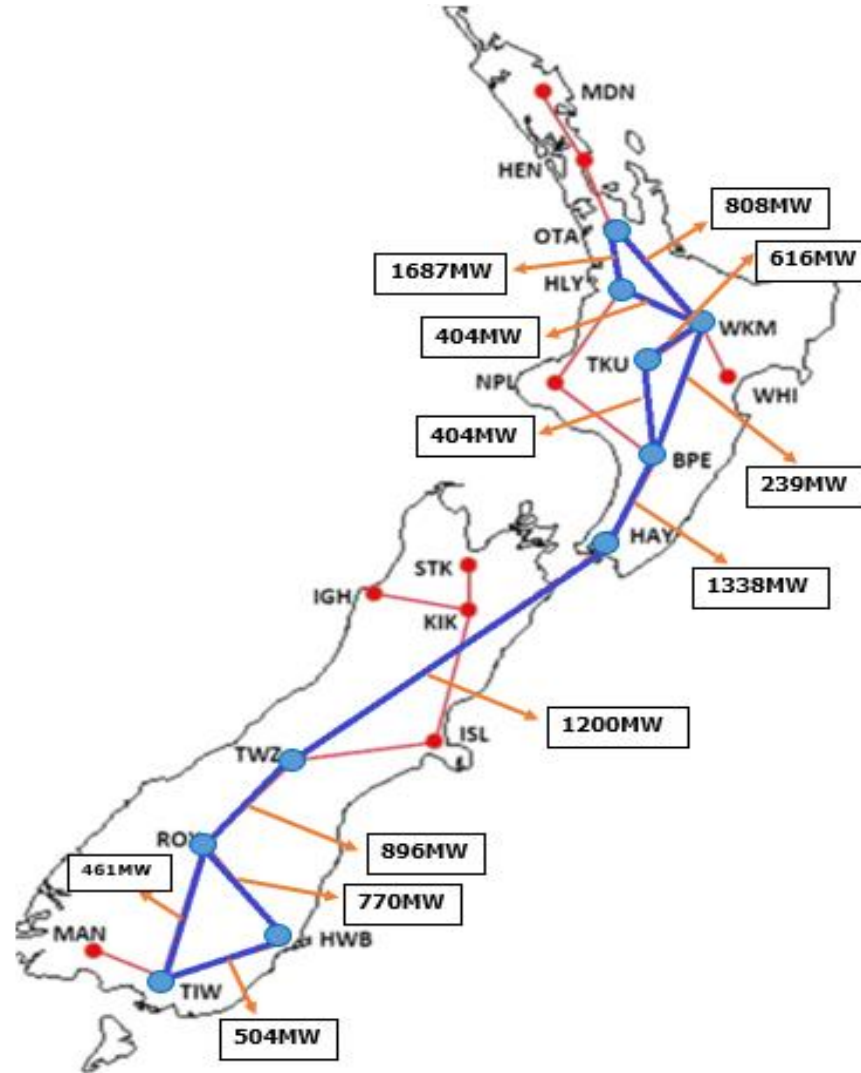


Merit-order effect of wind power in different demand



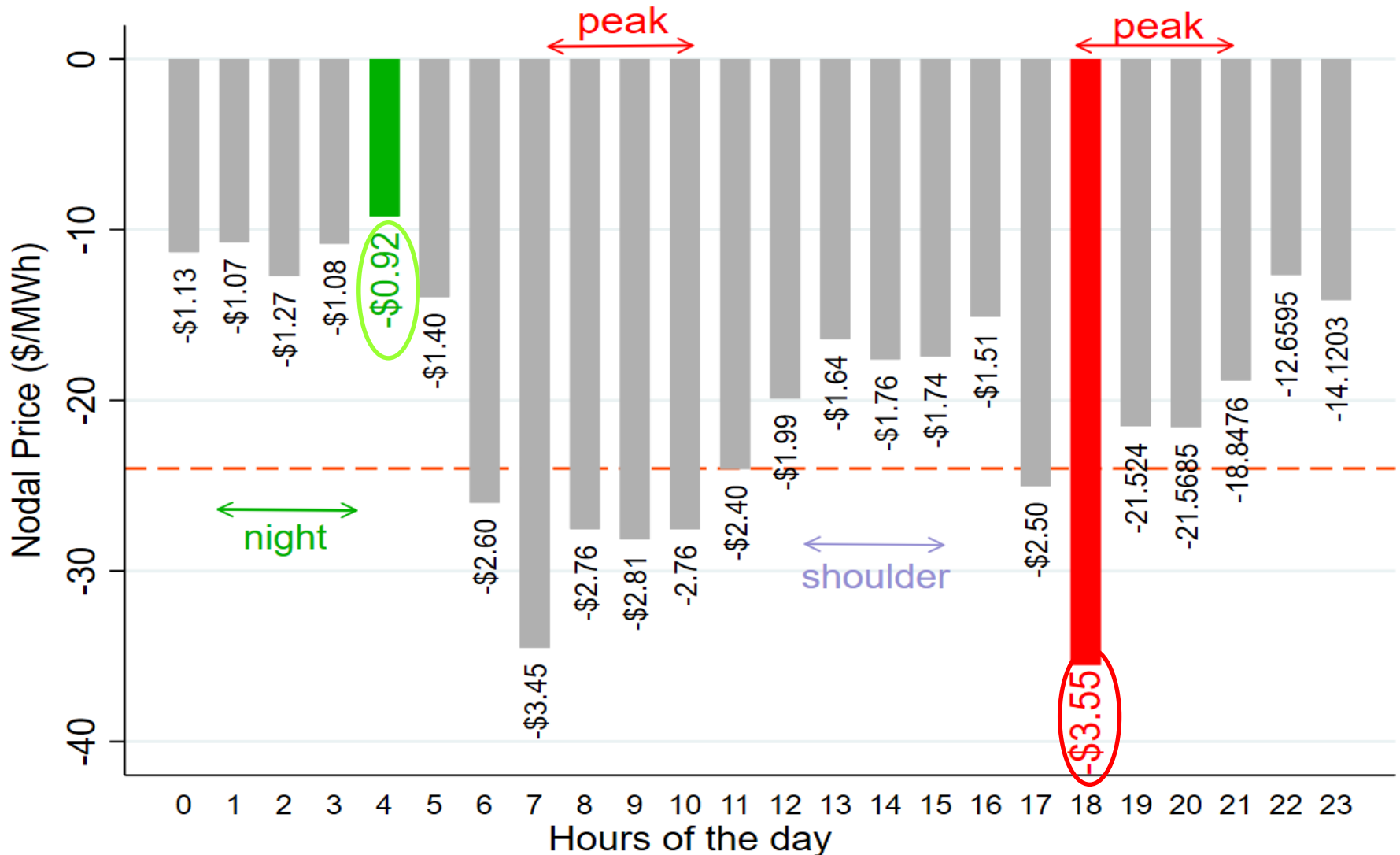
Econometric Models

Spatial Models – The Transmission Line Capacity in MW

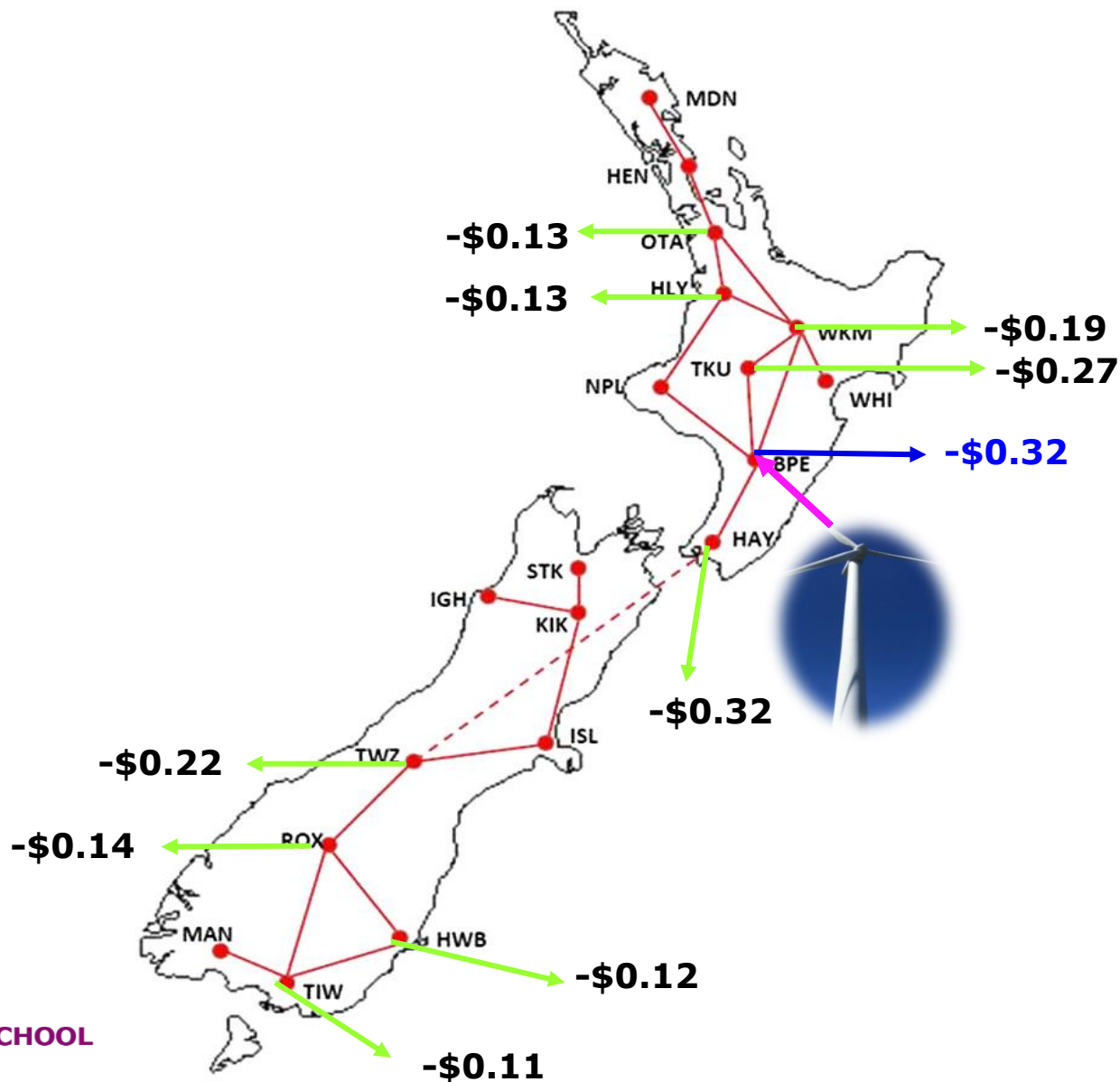


Average network hourly price effects of an increase of 10% in wind

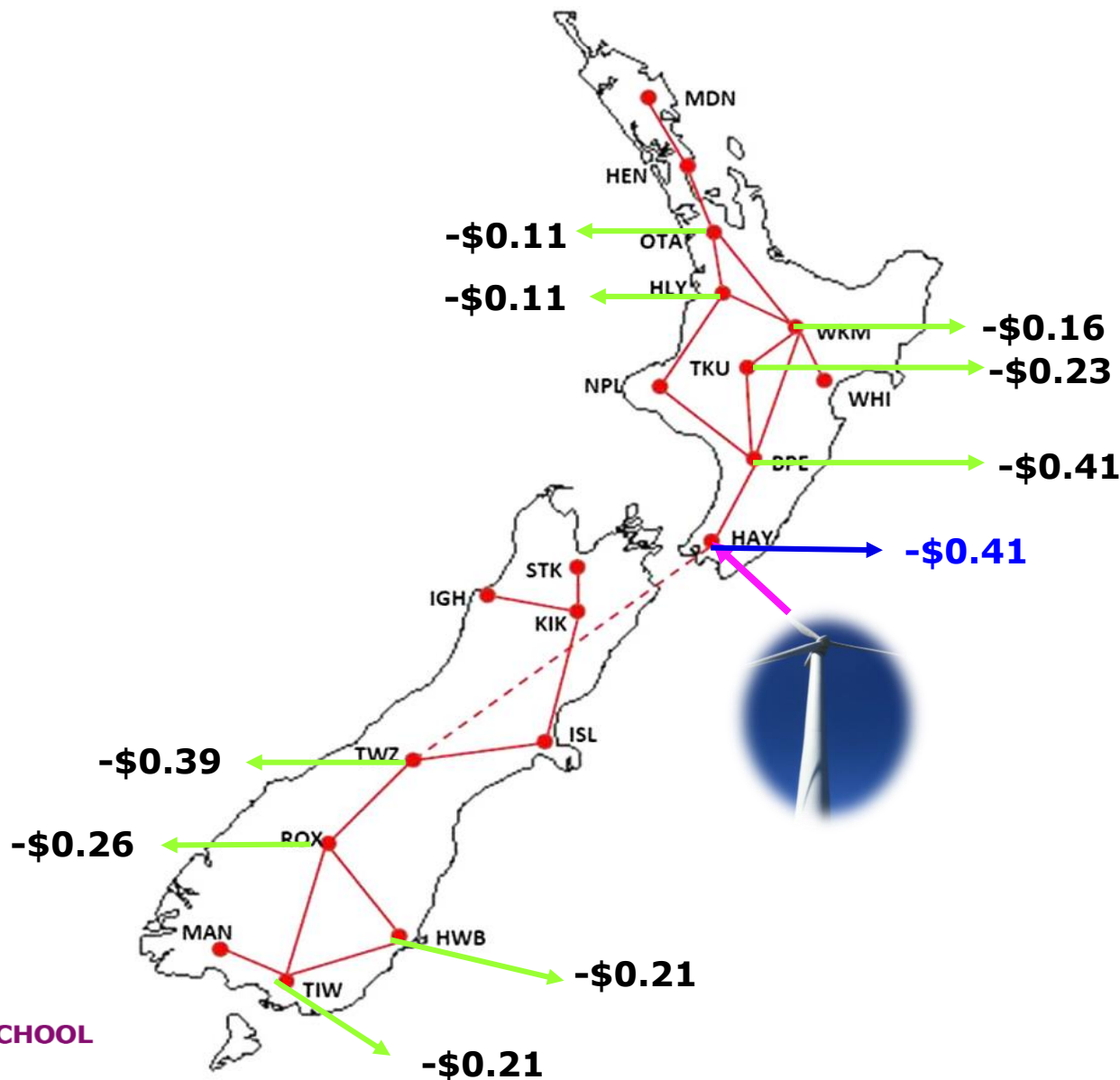
Average hourly effects of an increase of 10% in wind penetration on nodal price



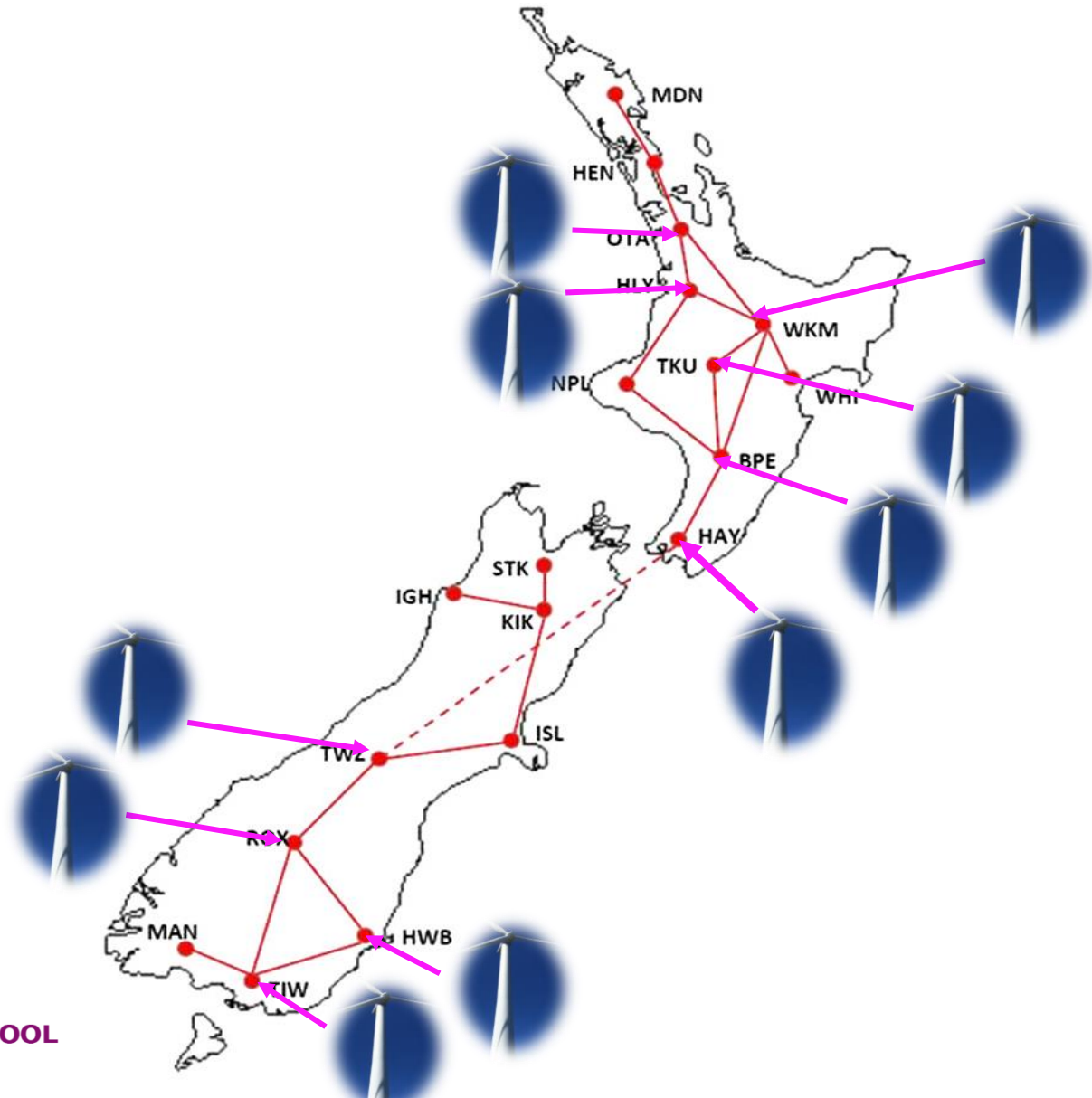
The regional price effect \$/MWh of a 10% point increase in wind penetration at BPE



The regional price effect \$/MWh of a 10% point increase in wind penetration at HAY

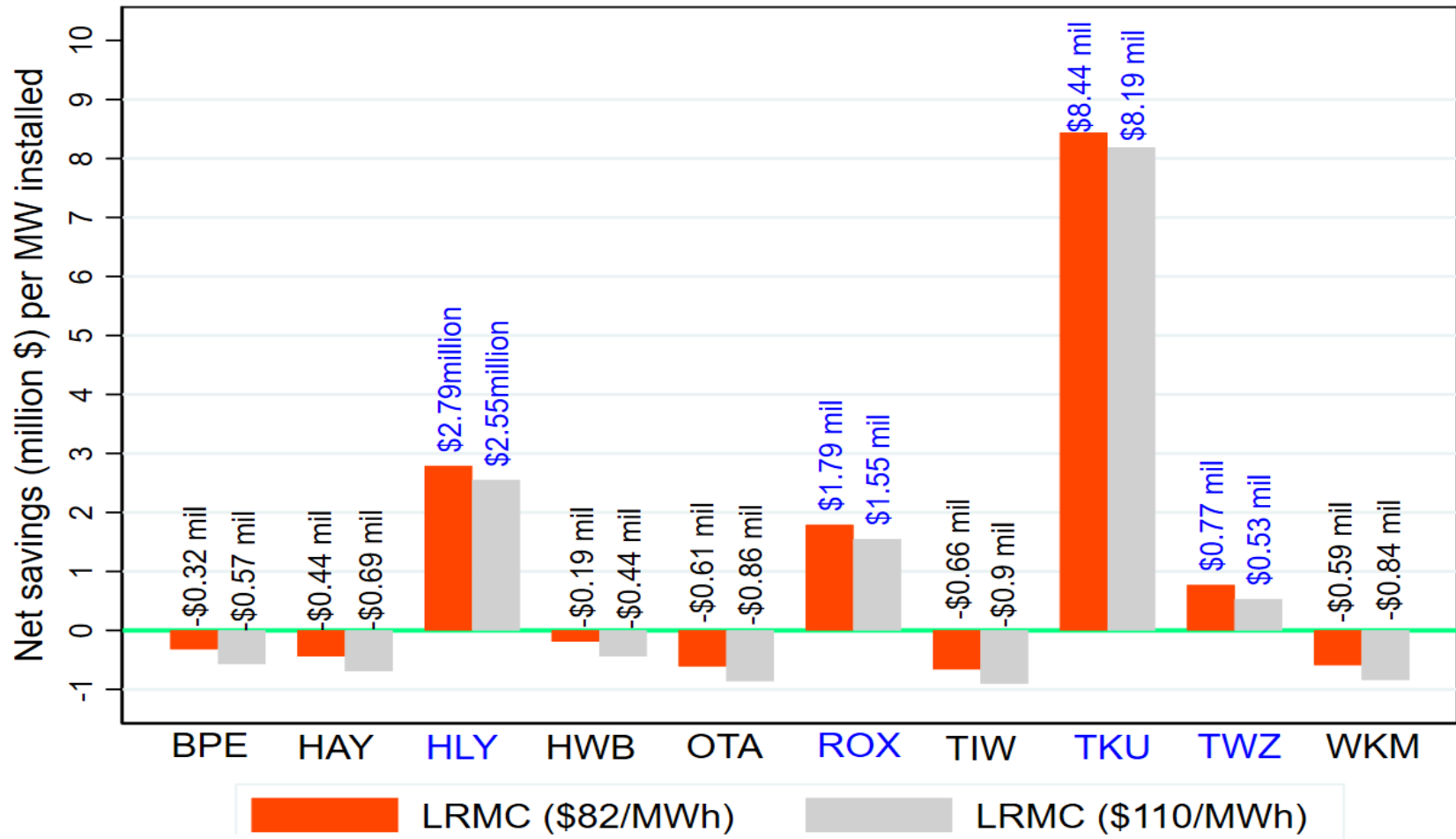


Price prediction and simulation



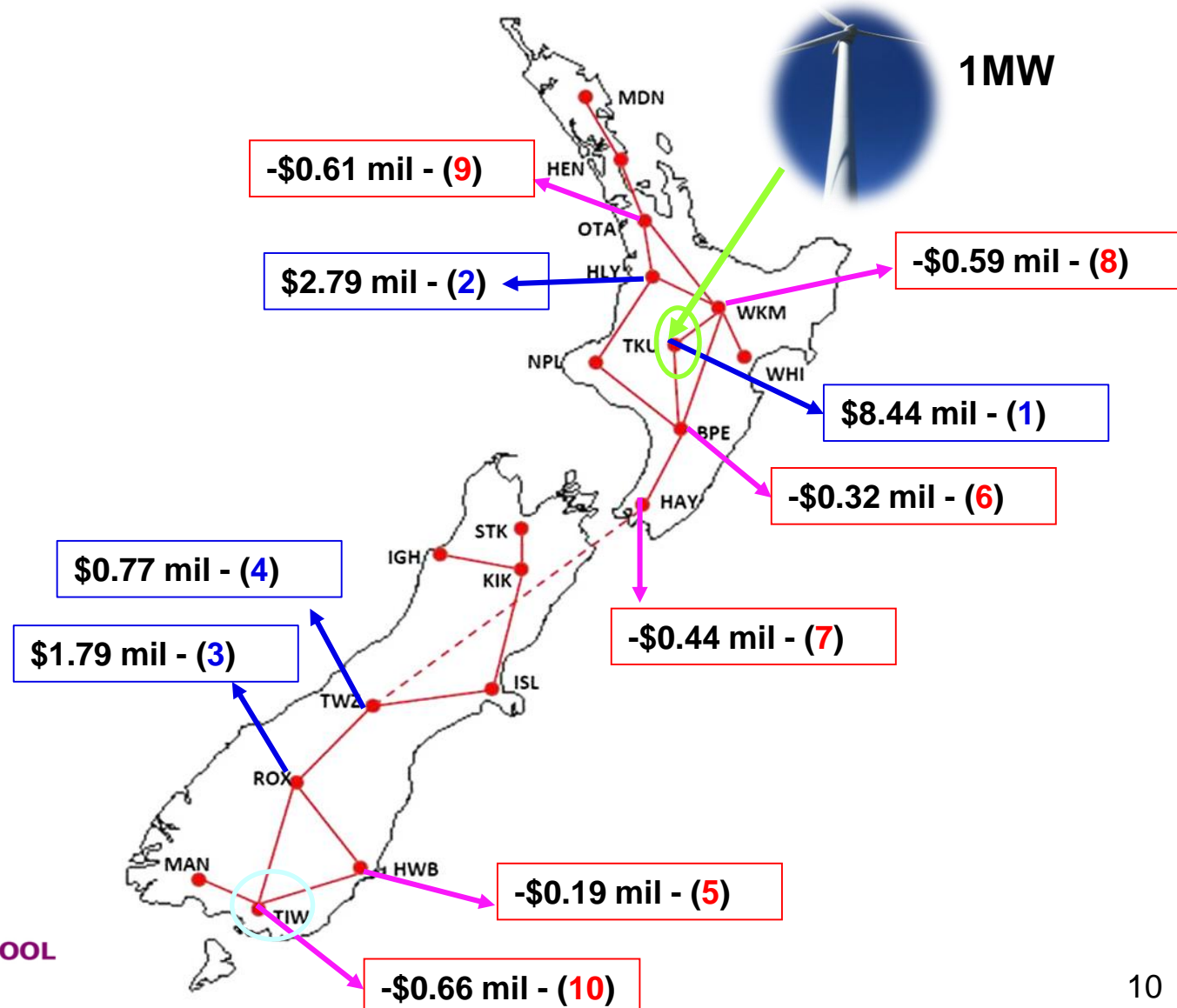
Price prediction and simulation

Estimated net annual savings (million \$) per MW installed



From national point of view: where to build?

Estimated net annual savings (million \$) per MW installed – (Rank#)
LRMC (\$82/MWh)



Take away

- Results show that private investment in additional wind capacity leads to positive gains in economic value.
- However, it's not clear if private investment is financially profitable. Investing in capacity at a given node can reduce the return to a generator's assets in the network.
- Reaching the goal of 20% electricity from wind generation depends on growth in demand. Maybe, this can come about from growth in electrification of transport.



Thank you for your attention!

“We cannot direct the wind, but we can adjust the sails.” –Dolly Parton

