



Meridian.

# Lake Pūkaki Contingent Storage Operation

Modelling, framing analysis,  
and telling the story

# Lake Pūkaki : Then < 1973



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# Lake Pūkaki : During 1972-79



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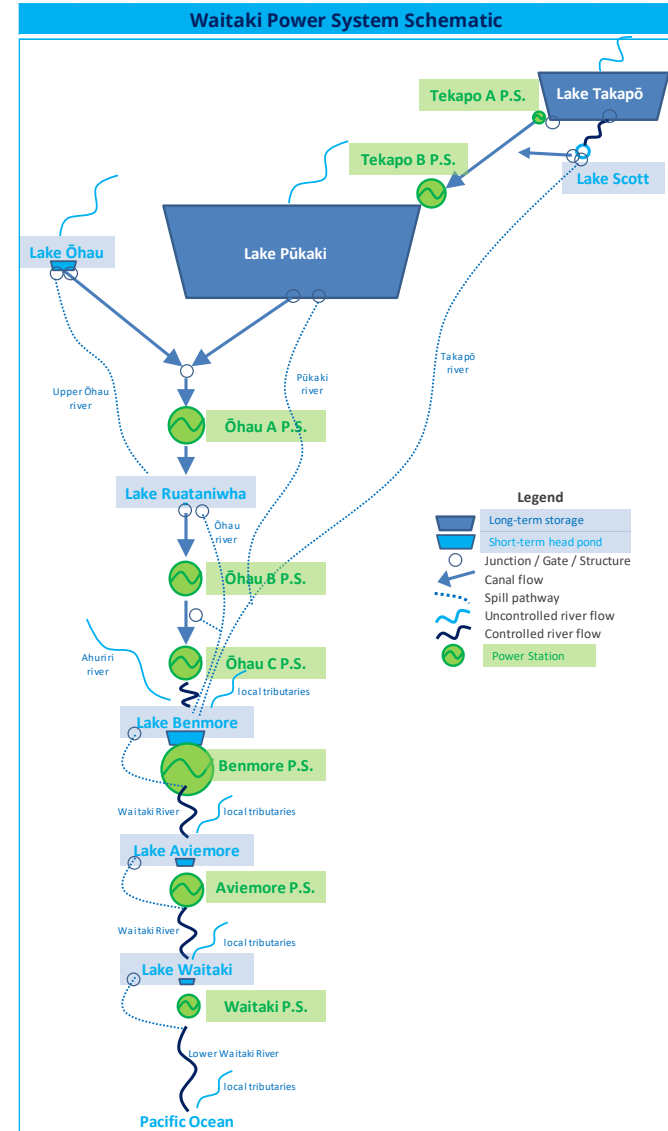
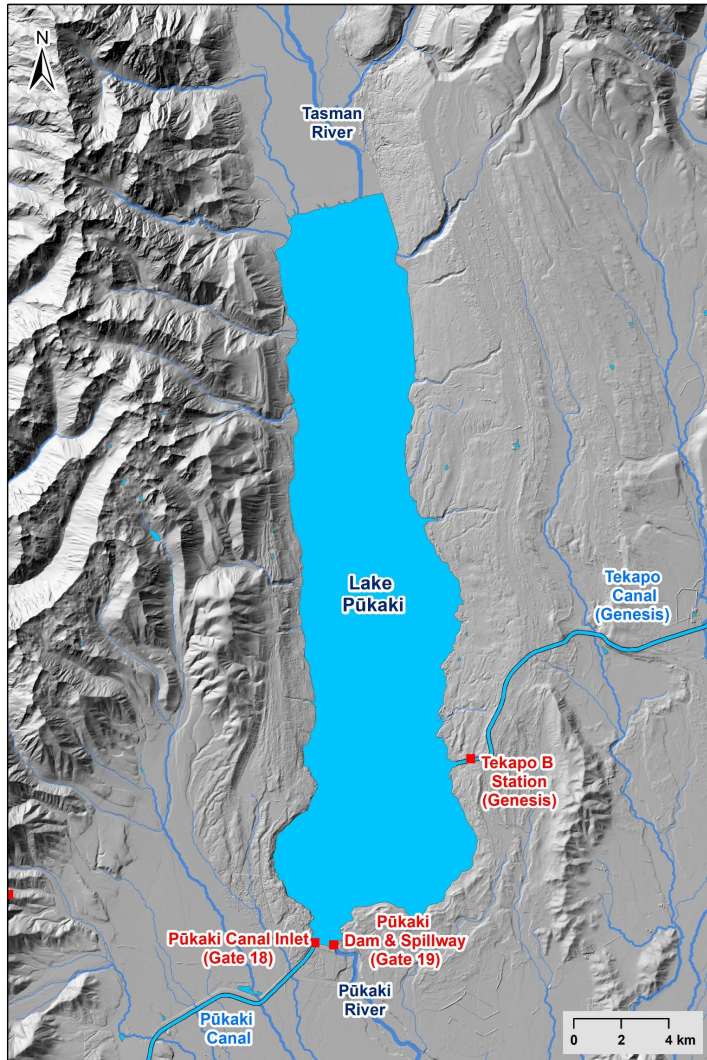
# Lake Pūkaki : During 1972-79



# Lake Pūkaki : After > 1980

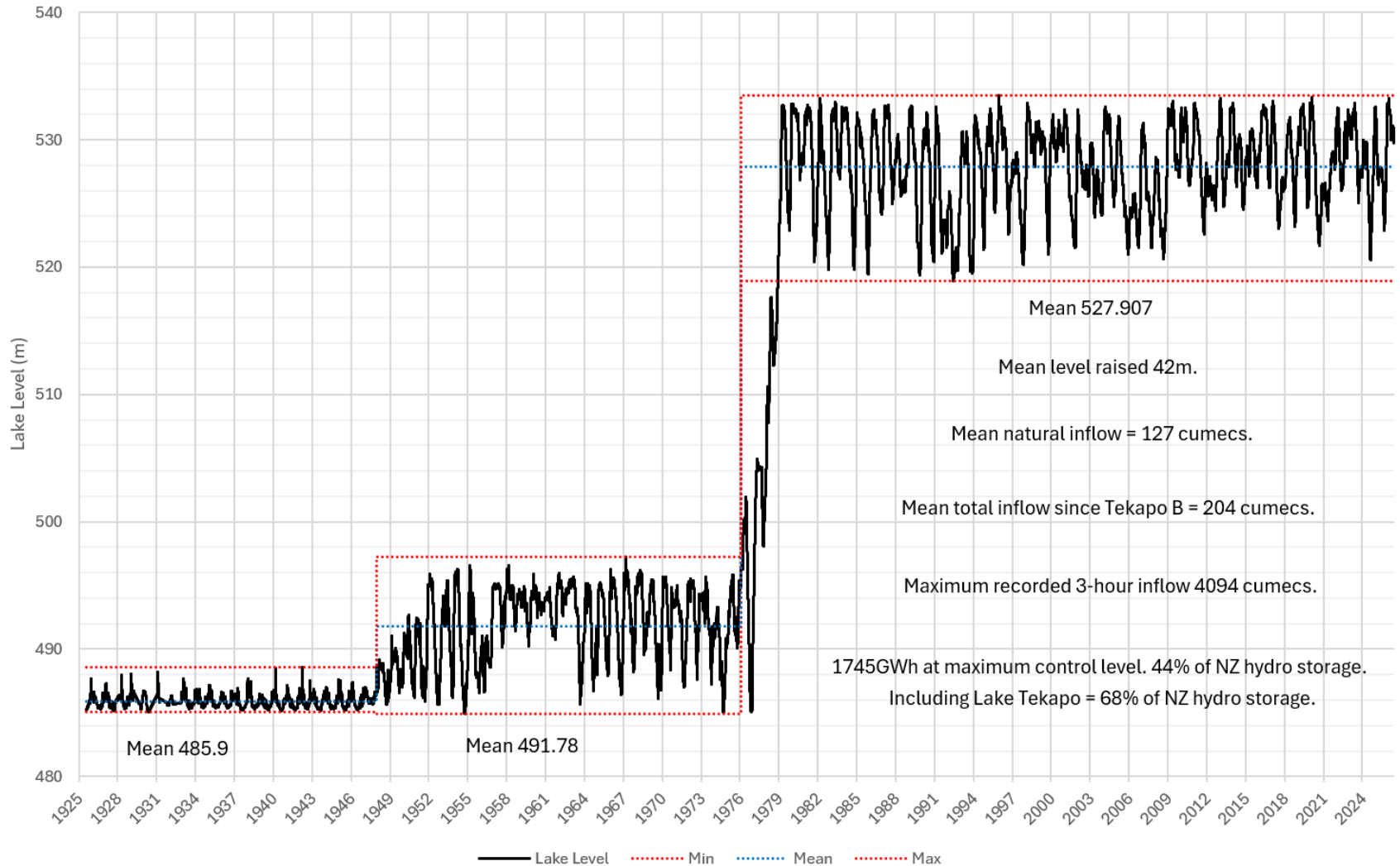


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Lake Pukaki



# Pūkaki timeline

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2008 dry-year, 520.7m

- (Tekapo, 703.9m)

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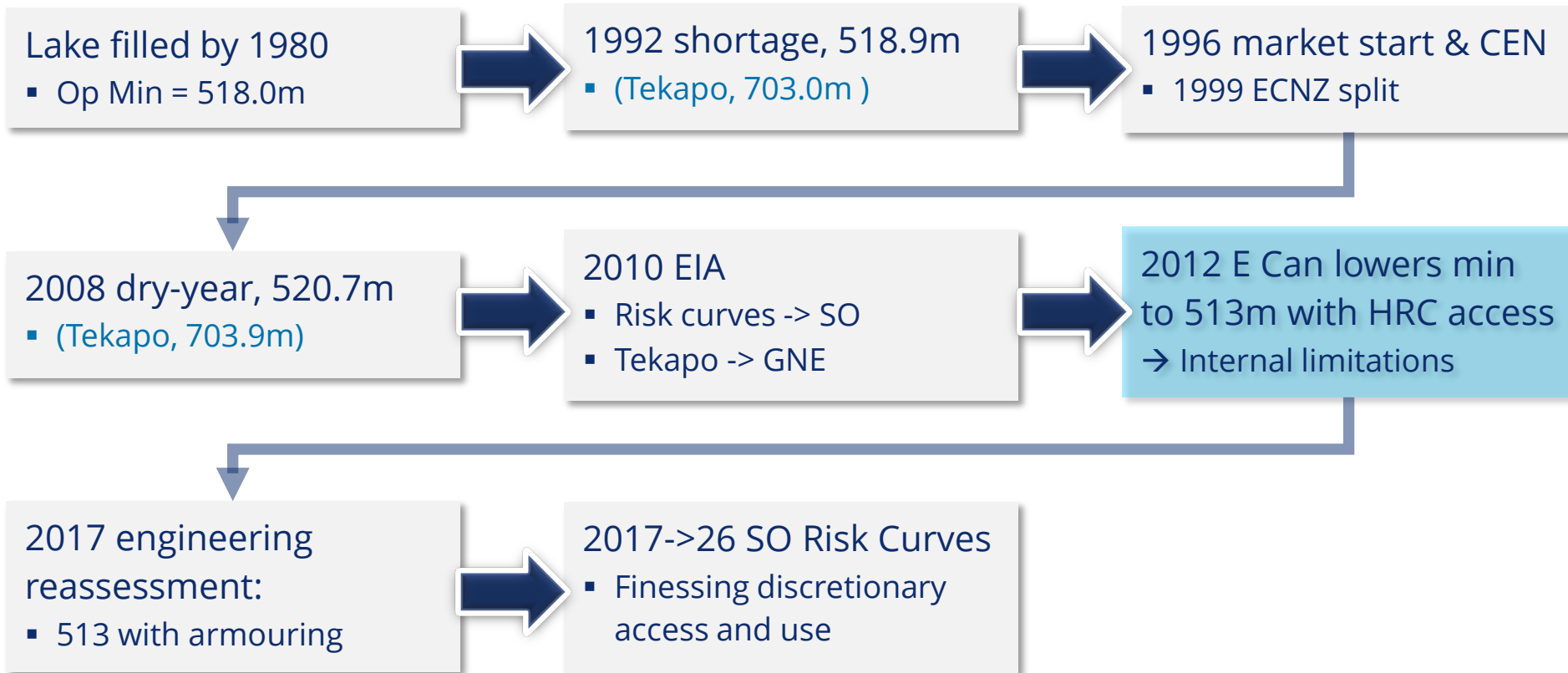
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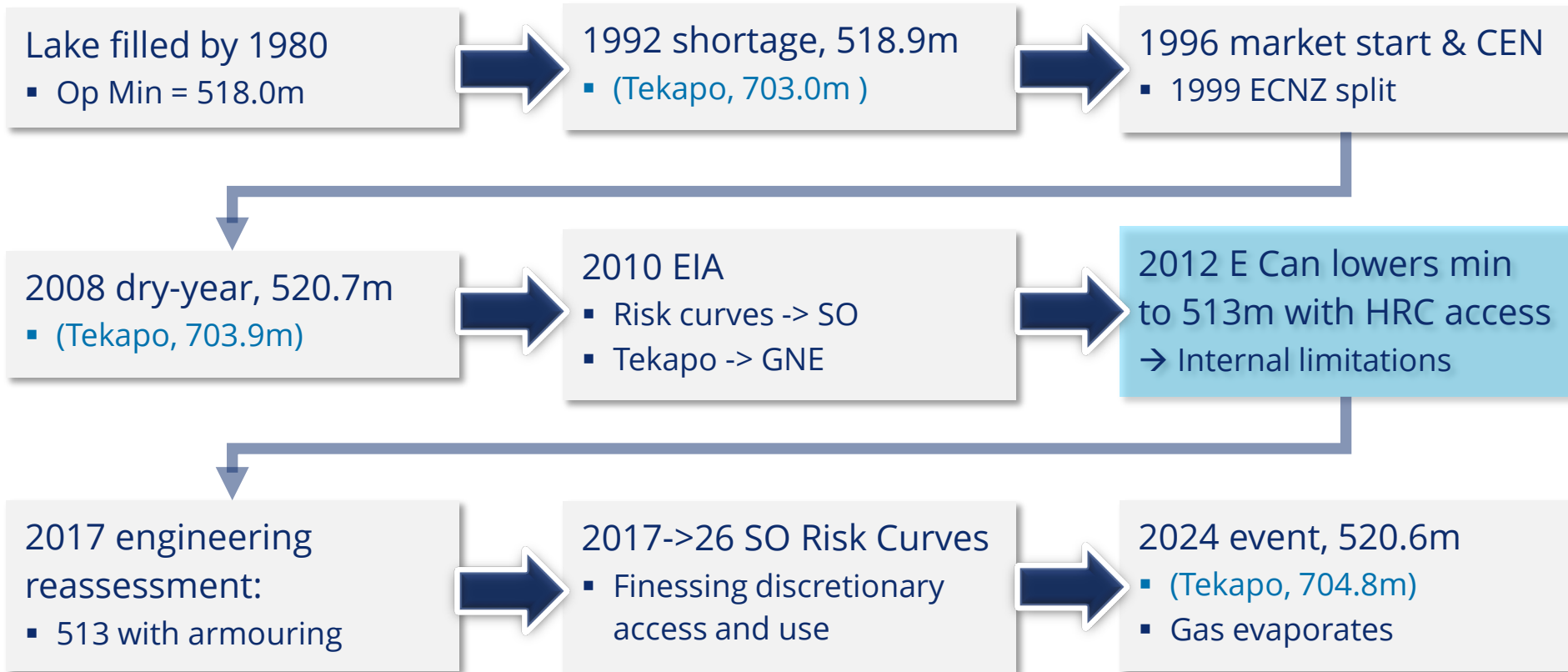
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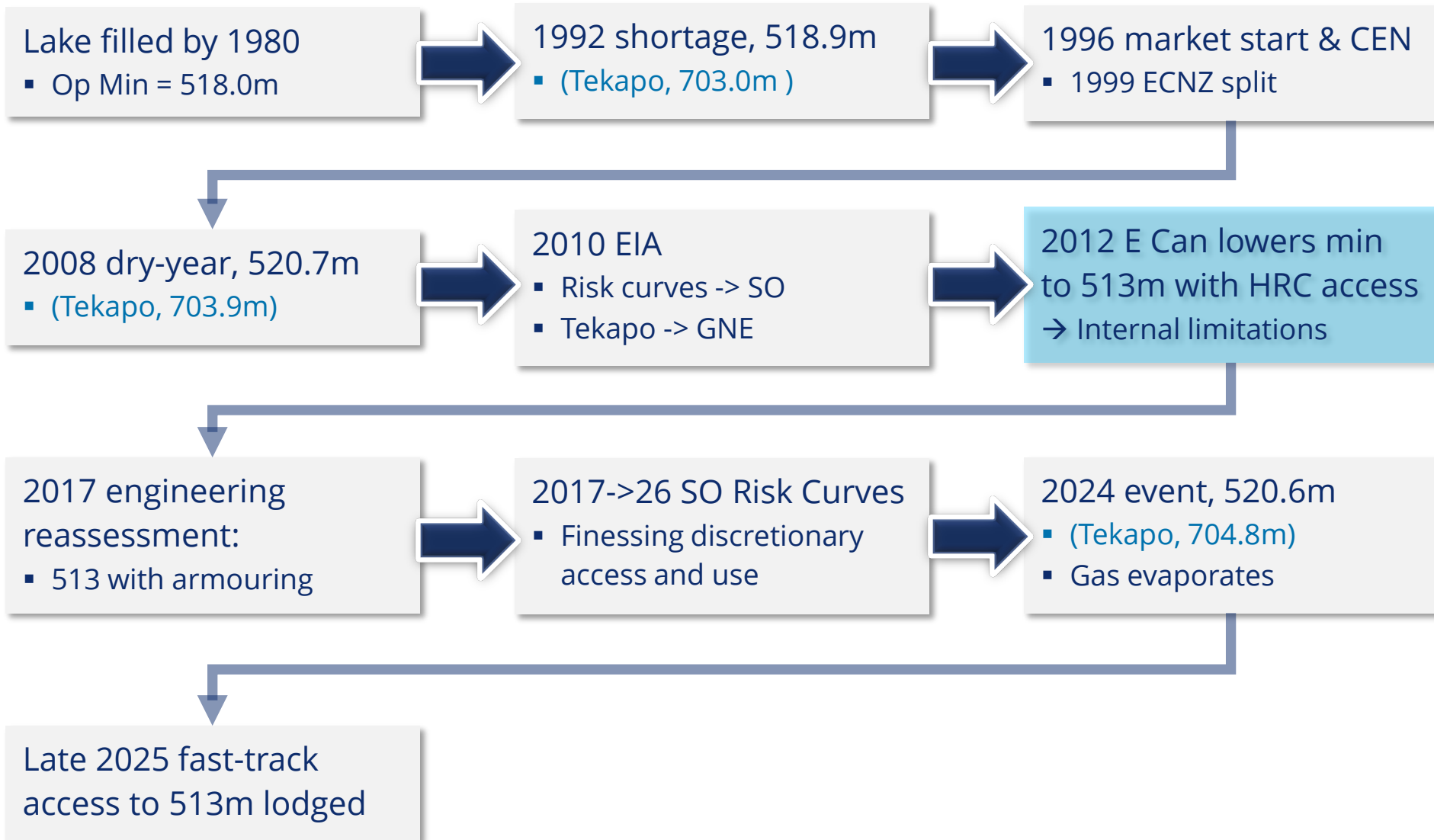
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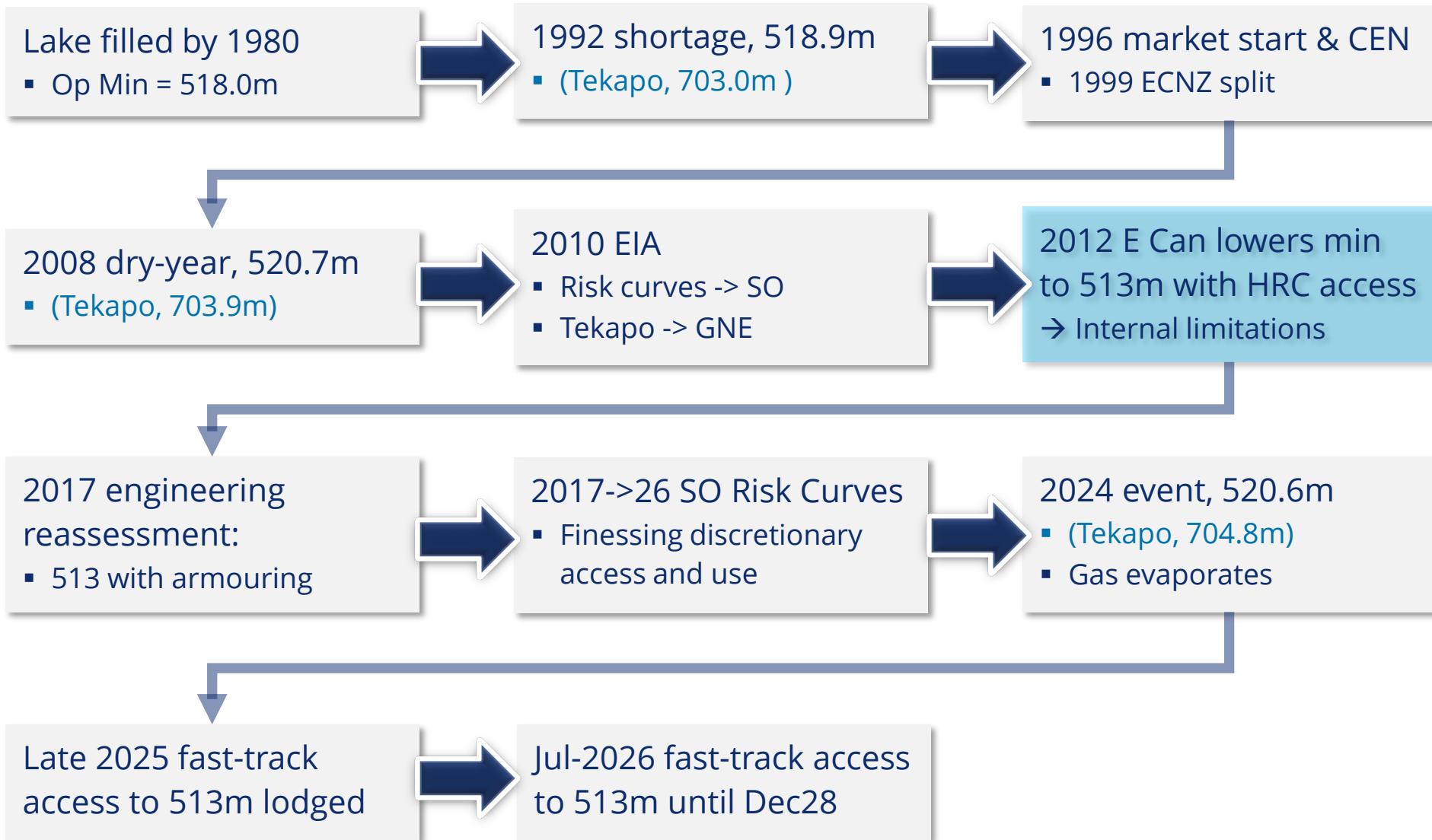
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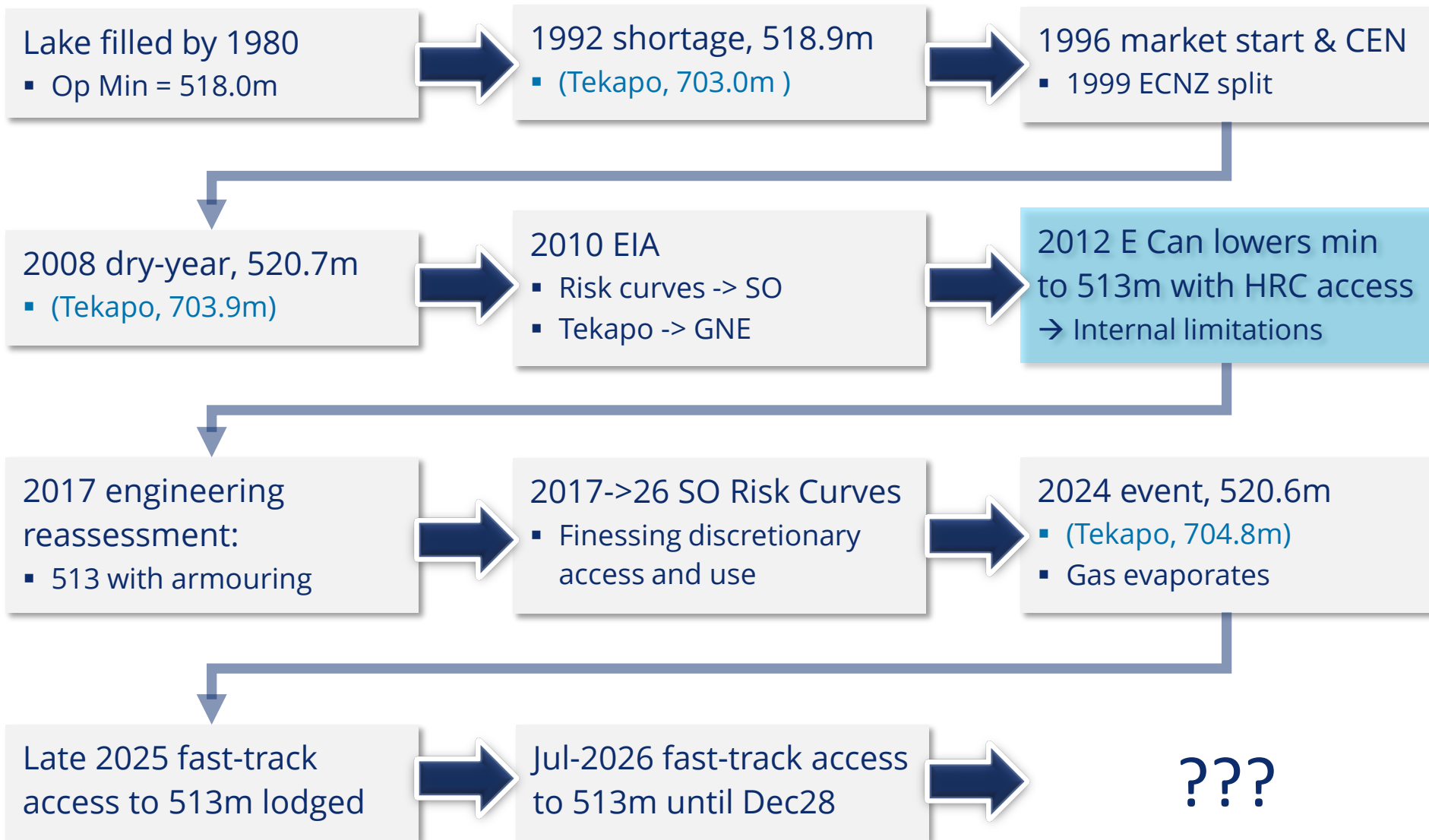
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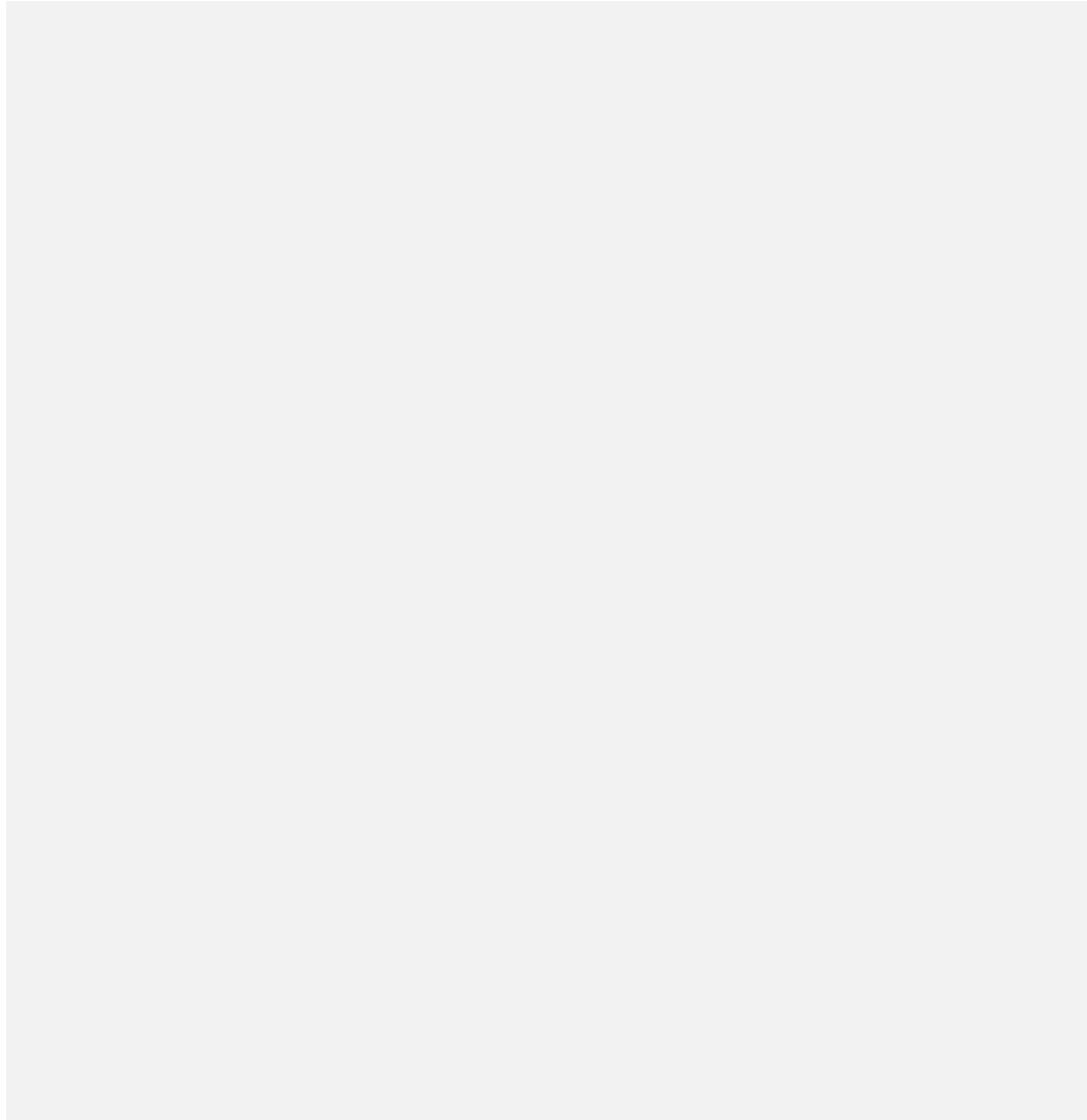
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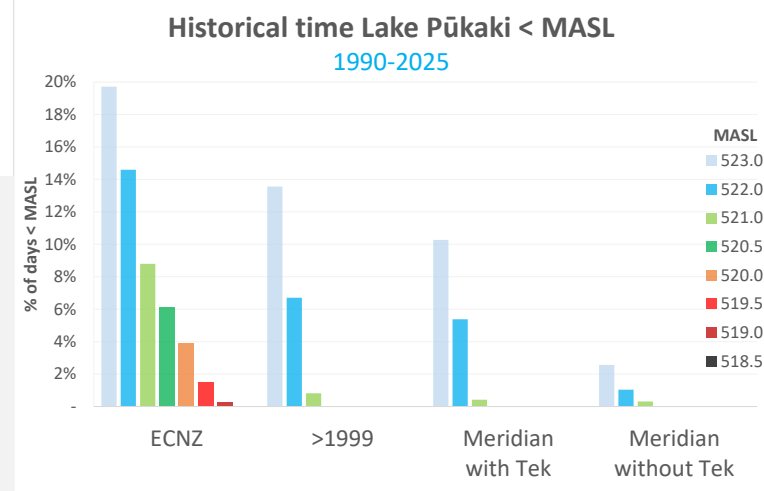


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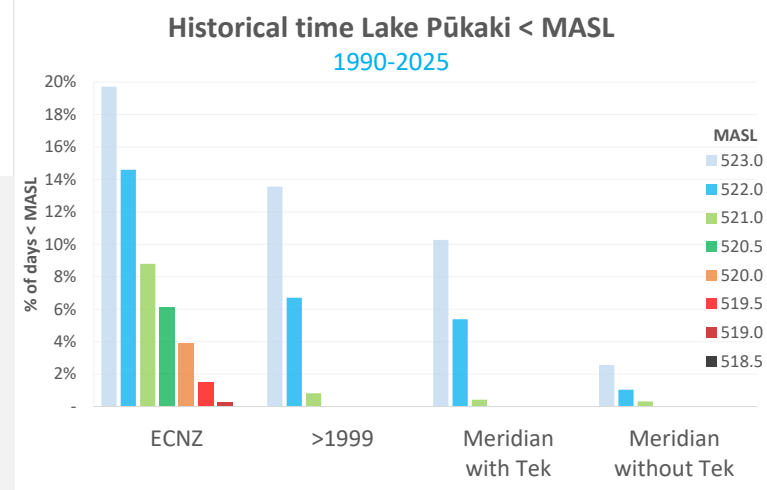


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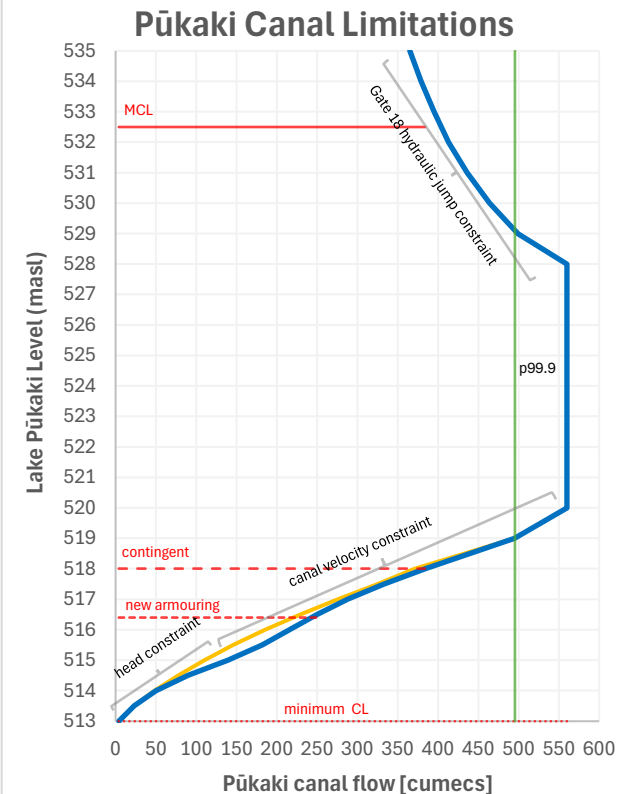
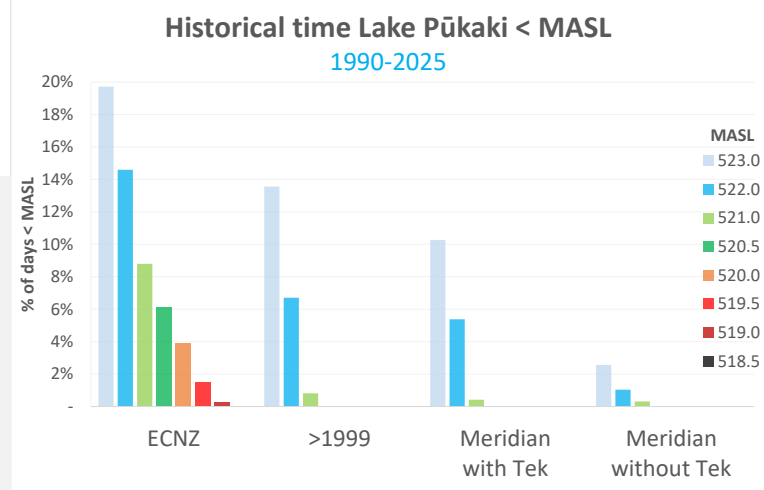
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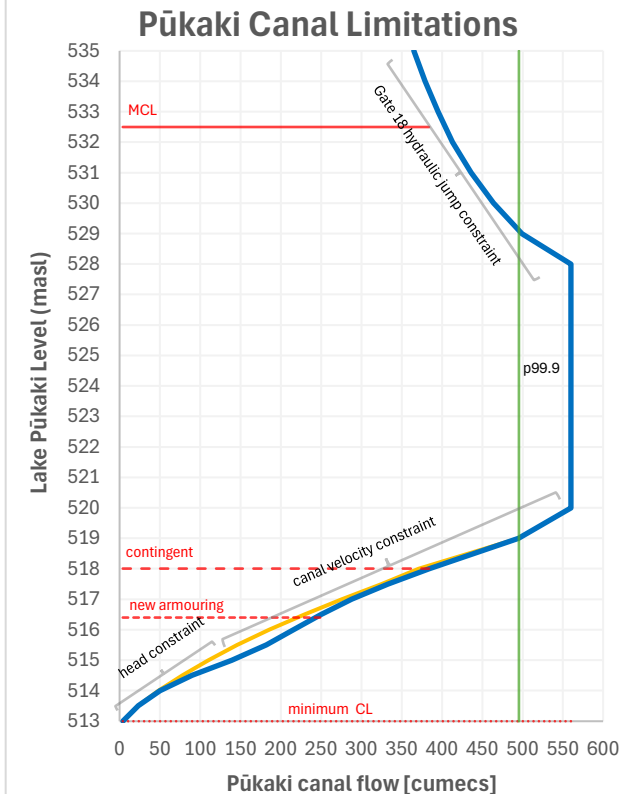
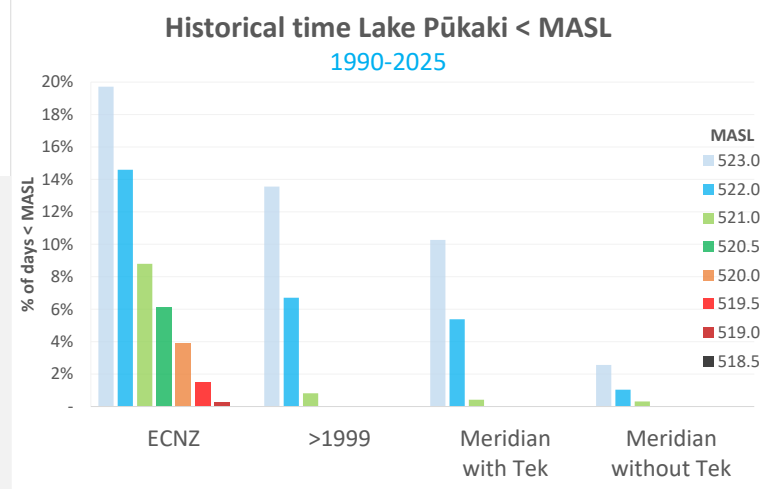
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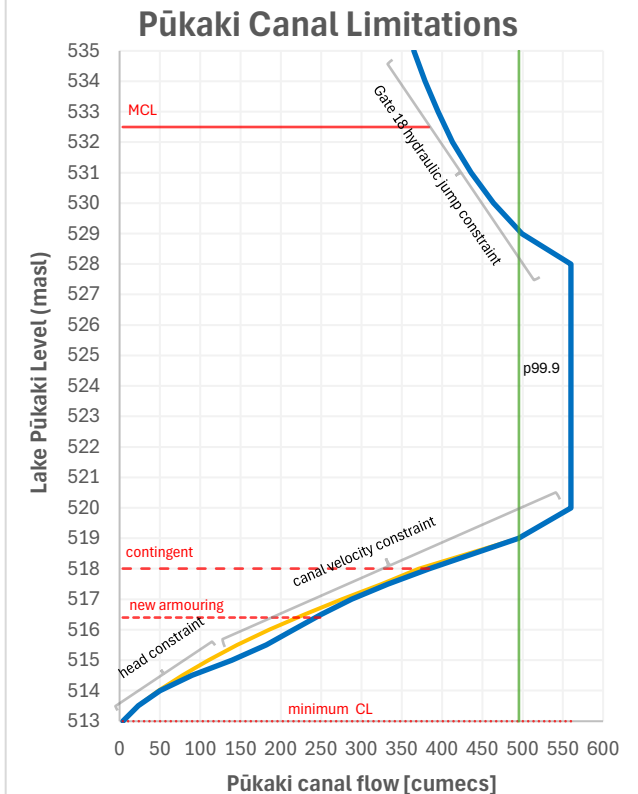
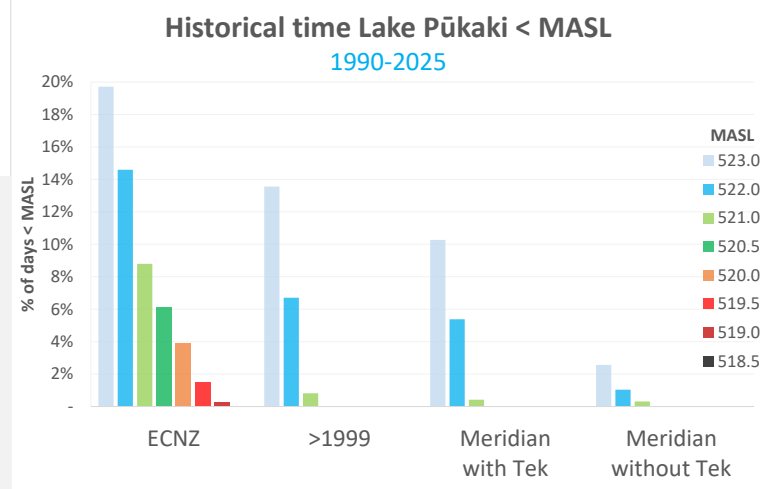
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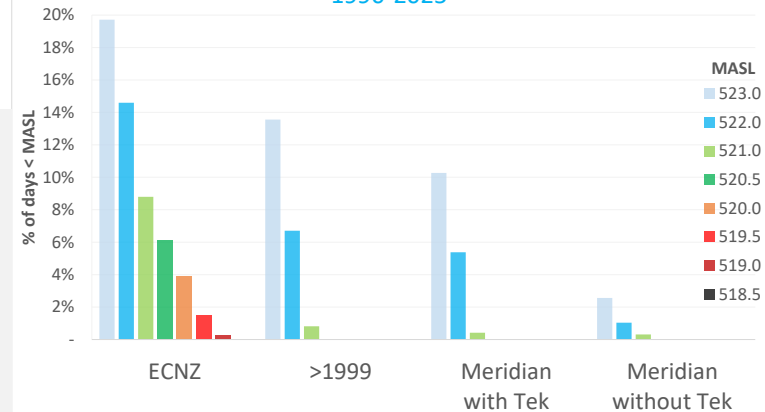
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Eased access to discretionary storage should resolve:

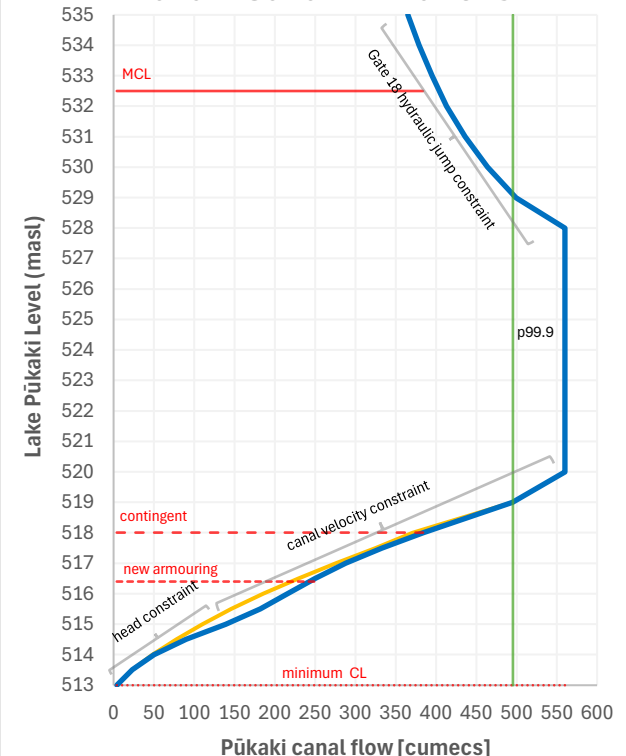
- Physical constraints on system operation: risk curve trigger needs to be in place before Pūkaki < 518 allowed
- Proxy constraint on reservoir operation: a priori assumptions earlier in the year may not line up with reality later in winter.

Historical time Lake Pūkaki < MASL

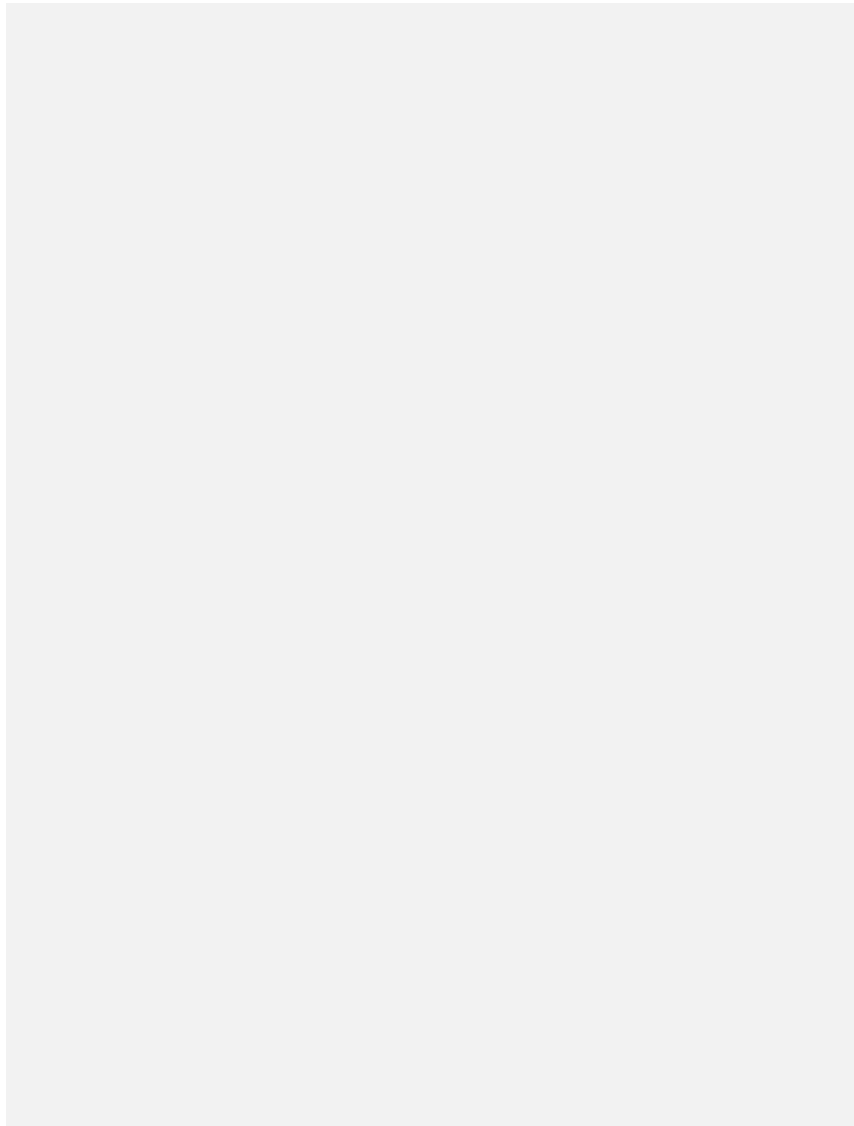
1990-2025



Pūkaki Canal Limitations



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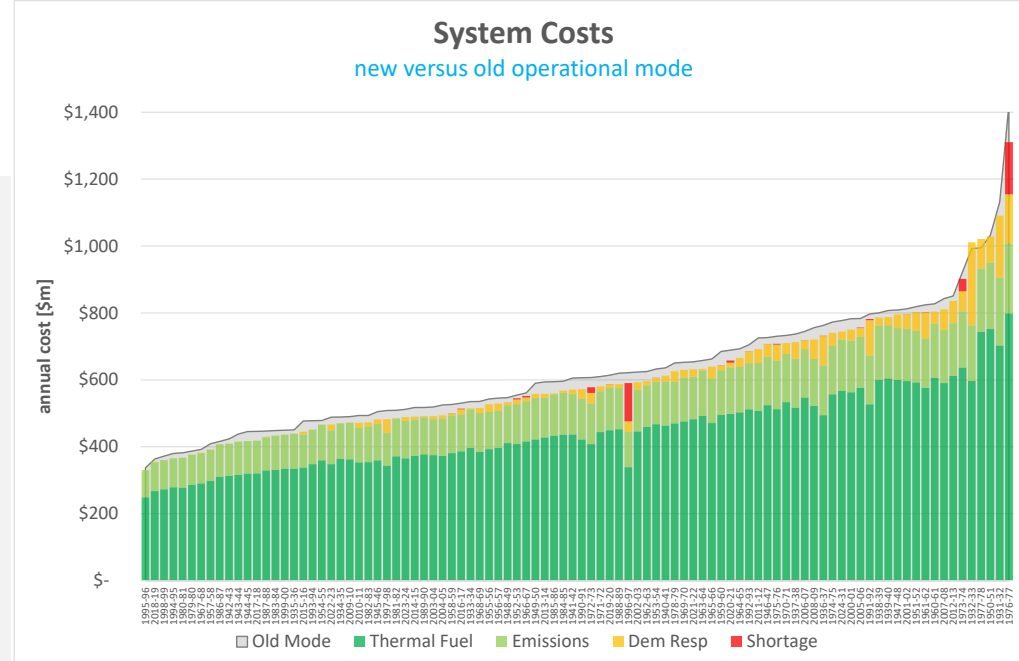
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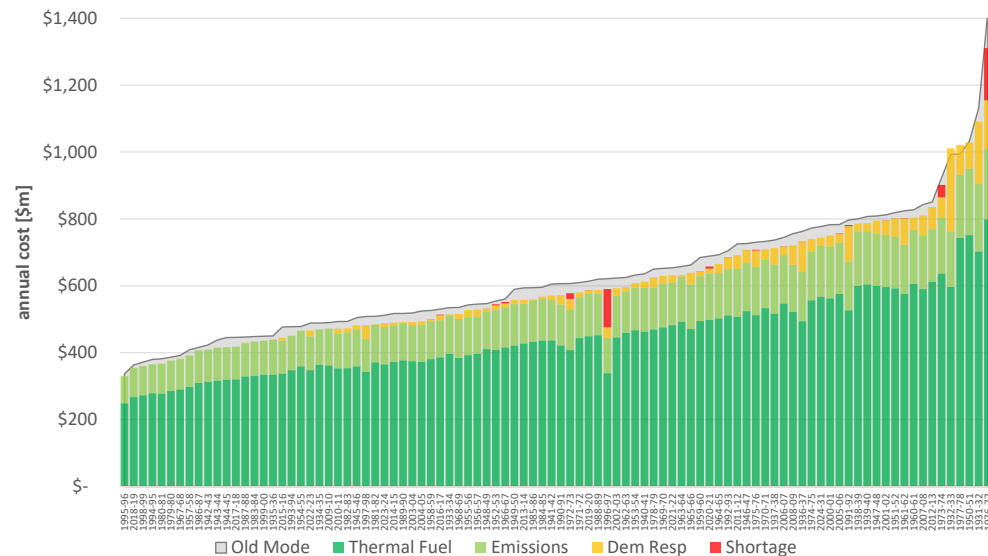
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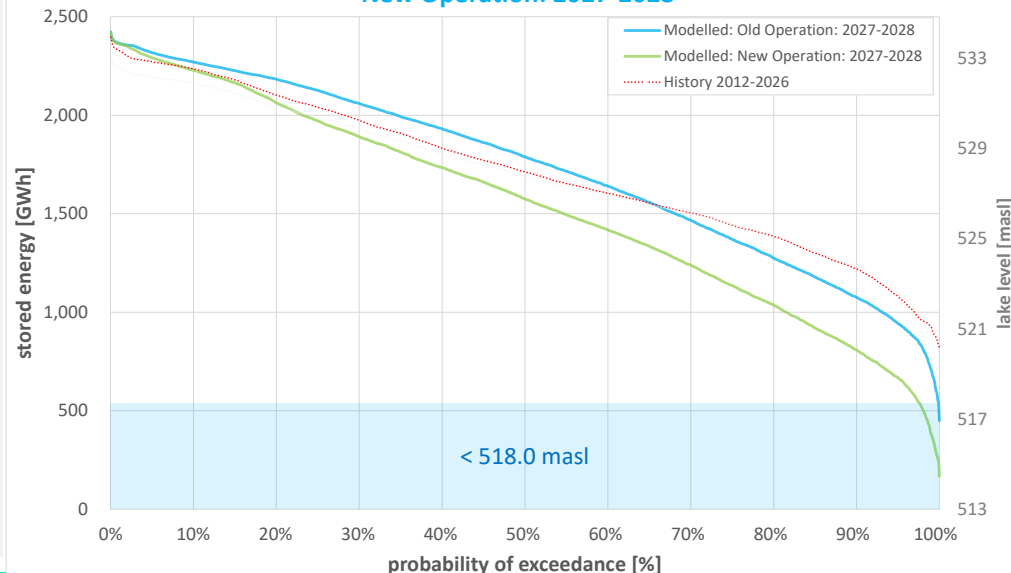
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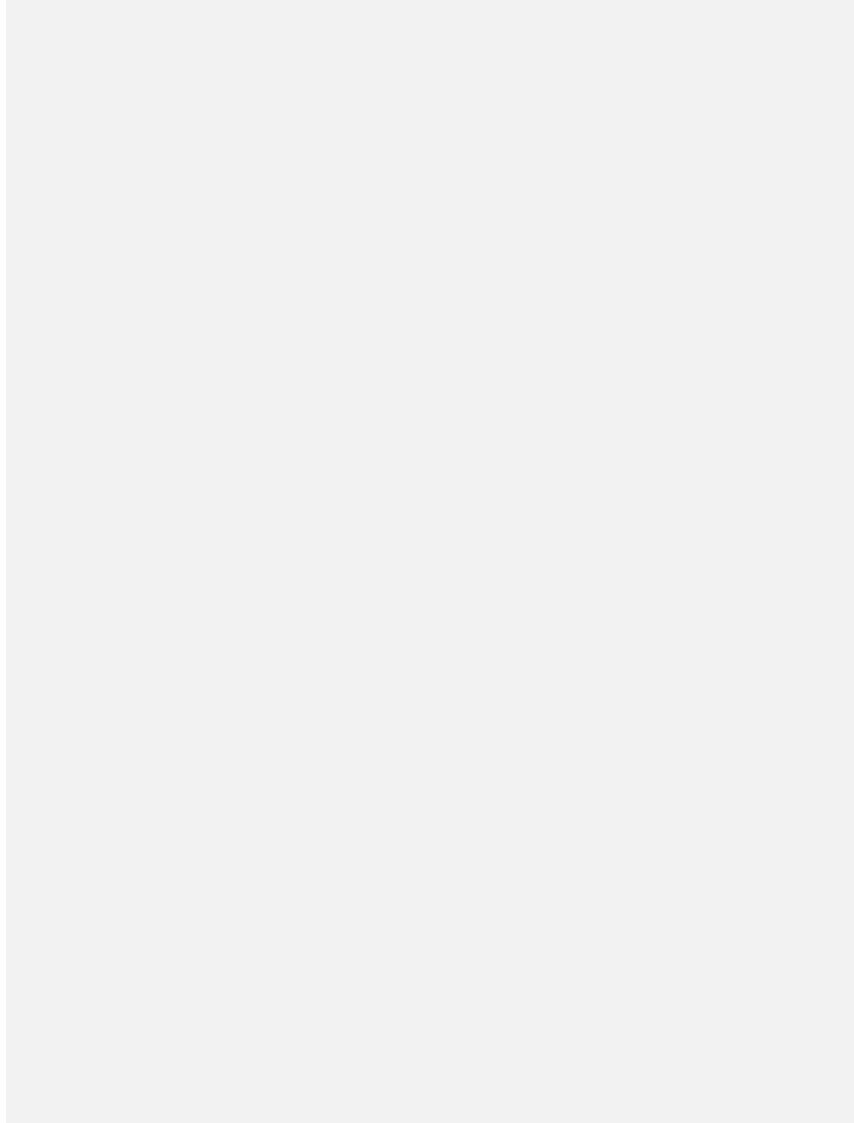
**System Costs**  
new versus old operational mode



**Pūkaki Weekly Storage**  
New Operation: 2027-2028



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Comparing typical results:

- Hydro spill, renewable spill, thermal generation, CO<sub>2</sub>, LWAP, price volatility, demand response, & load costs are modestly but consistently lower.
- Sustained prices are 3% (\$4/MWh) lower.
- Sustained load costs are \$180m pa lower.

|               |        | Annualised | New vs Old Pūkaki : Market Operation  |          |               |          |         |         |          |         |
|---------------|--------|------------|---------------------------------------|----------|---------------|----------|---------|---------|----------|---------|
|               |        | History    | Sustained results 2027-28; annualised |          |               |          |         |         |          |         |
|               |        | 2012-26    | New Operation                         |          | Old Operation |          | delta   |         |          |         |
|               |        | mean       | mean                                  | p50      | mean          | p50      | mean    | p50     | % (mean) | % (p50) |
| LWAP          | \$/MWh | \$ 134     | \$ 130                                | \$ 122   | \$ 133        | \$ 125   | -\$ 4   | -\$ 3   | -3%      | -2%     |
| Hydro         | GWh    | 24,550     | 24,521                                | 24,688   | 24,471        | 24,639   | 50      | 49      | 0%       | 0%      |
| Thermal       | GWh    | 4,250      | 1,403                                 | 1,329    | 1,466         | 1,413    | -62     | -83     | -4%      | -6%     |
| Non-Hydro RE  | GWh    |            | 17,159                                | 17,174   | 17,115        | 17,109   | 44      | 65      | 0%       | 0%      |
| Hydro spill   | GWh    |            | 1,827                                 | 1,494    | 1,939         | 1,574    | -112    | -80     | -6%      | -5%     |
| Dem Resp      | GWh    |            | 99                                    | 60       | 117           | 85       | -18     | -25     | -15%     | -30%    |
| VoLL          | GWh    |            | 0.2                                   | -        | 0.2           | -        | -0      | 0       | -25%     |         |
| CO2 Emissions | kT     | 3,250      | 1,855                                 | 1,805    | 1,895         | 1,868    | -40     | -62     | -2%      | -3%     |
| Load Cost     | \$M    | \$ 6,523   | \$ 5,966                              | \$ 5,609 | \$ 6,146      | \$ 5,742 | -\$ 180 | -\$ 133 | -3%      | -2%     |

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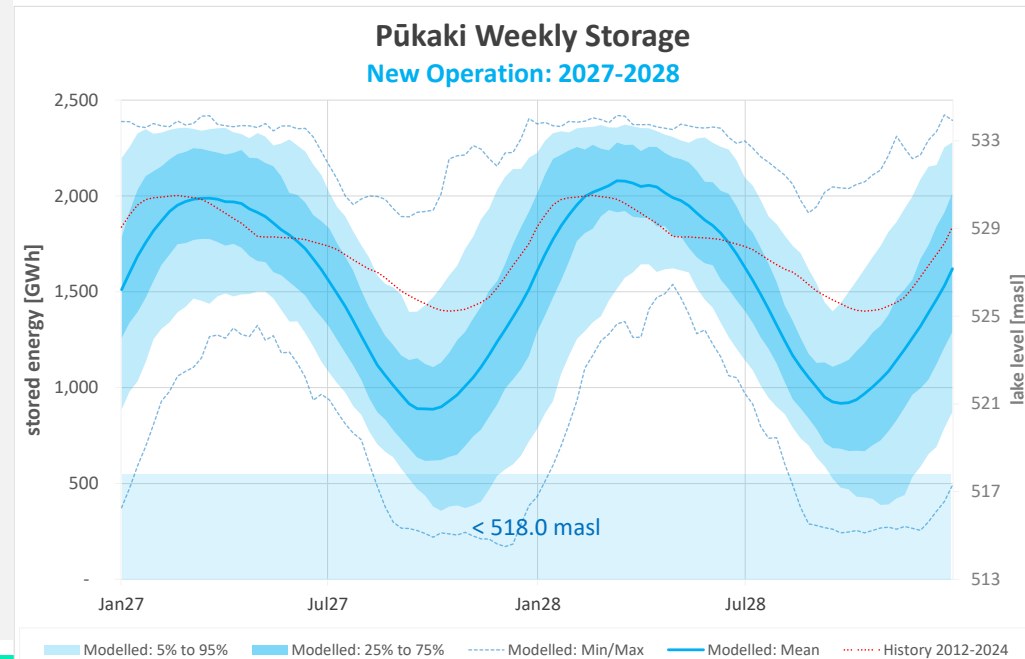
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Storage relaxes seasonally and in extremes:

- Old view: higher than history over summer/autumn, lower over winter/spring
- New view: close to history over summer and significantly lower over winter
- Below 518.0m ~3% of the time

|                           |        | Annualised<br>History<br>2012-26<br>mean | New vs Old Pūkaki : Market Operation  |          |               |          |         |         |          |         |
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From the perspective of what Meridian thought was under discussion where did this come from?

- Miscommunication?
- Misunderstanding?
- Different perspectives on what matters?
- Different perspectives on decision rights?

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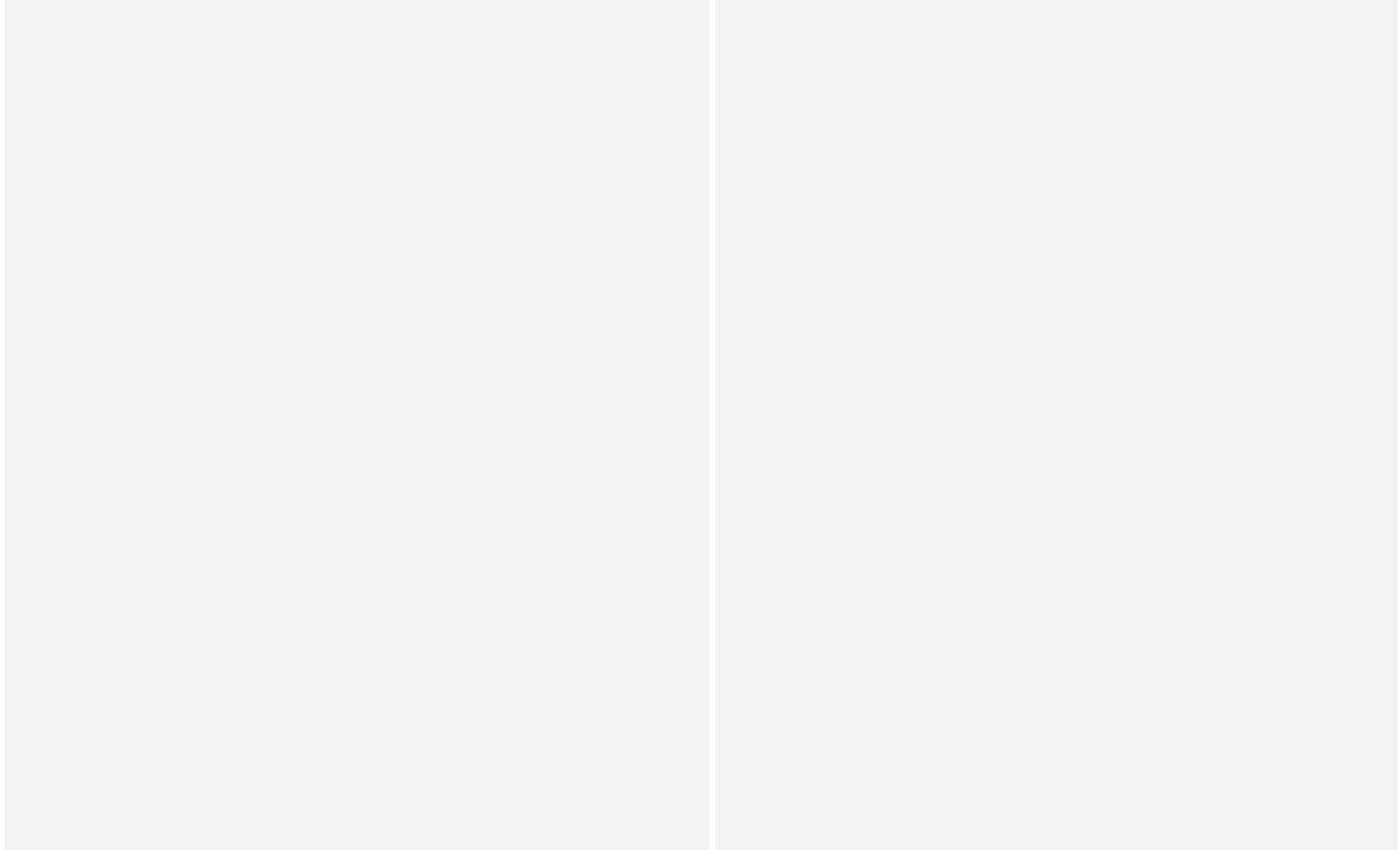
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As with price discovery, we are exploring evolving relative perspectives

- What might seem like a great idea today may look terrible in a few years time
- Doesn't mean its wrong, but things change
- Best case we estimate a scale of impact

# Didactic segue #1

You are the expert. There is no omniscient referee who knows better.

- Analysts know more about the details of the issue at hand than the decision maker
- But analysts often miss importance of context, framing, multiplicity of views, & story-telling.

Perspective matters:

- Analytical bias is a risk: data and context
- Sometimes other peoples' views matter:
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  - engineers sometimes know things
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Most people have good intentions:

- Cost, security, and sustainability remain the prevailing focus
- Trilemma balance is often forgotten
- Frequent (lazy) accusations of profiteering
- BUT ... wealth transfers remain an elephant in the industry room

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Consensus is nice, but not always possible

- Public good vs private benefits and who holds the decision rights

# Risk aversion and security standards?

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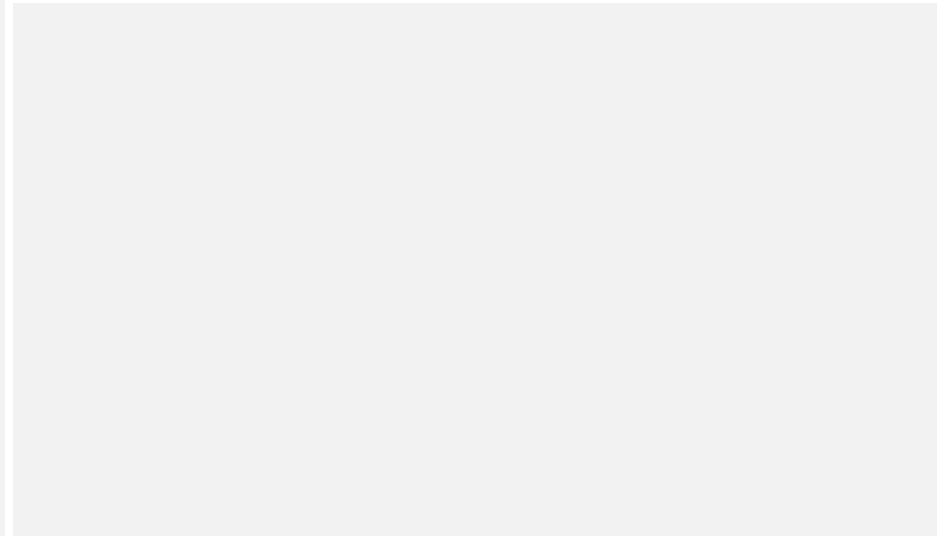
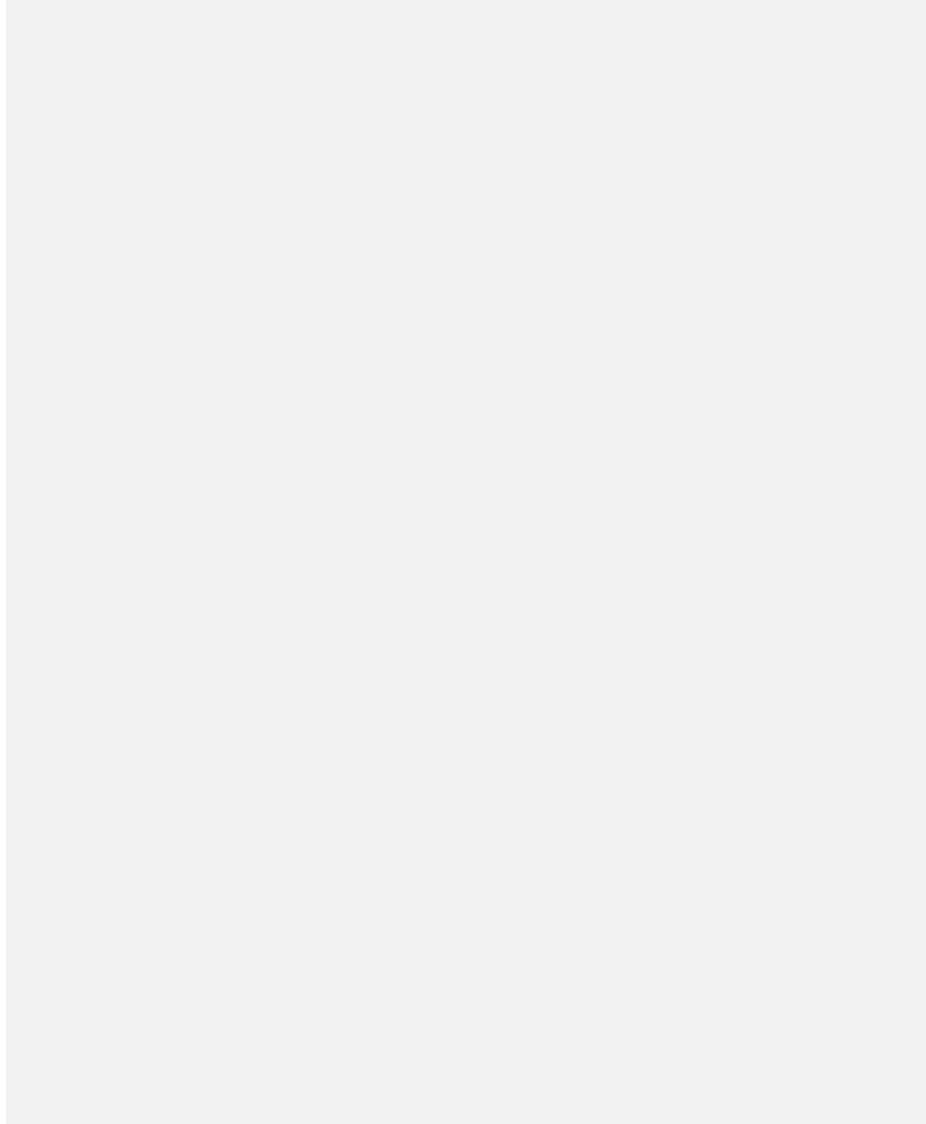
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Regardless, this perspective may have been superseded by MBIE's WERO concept

# An example: when details matter



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WERO will create an obligation to secure sufficient complying supply to ensure that (one of) the SOSA scenarios is above the Winter Energy Margin (WEM):

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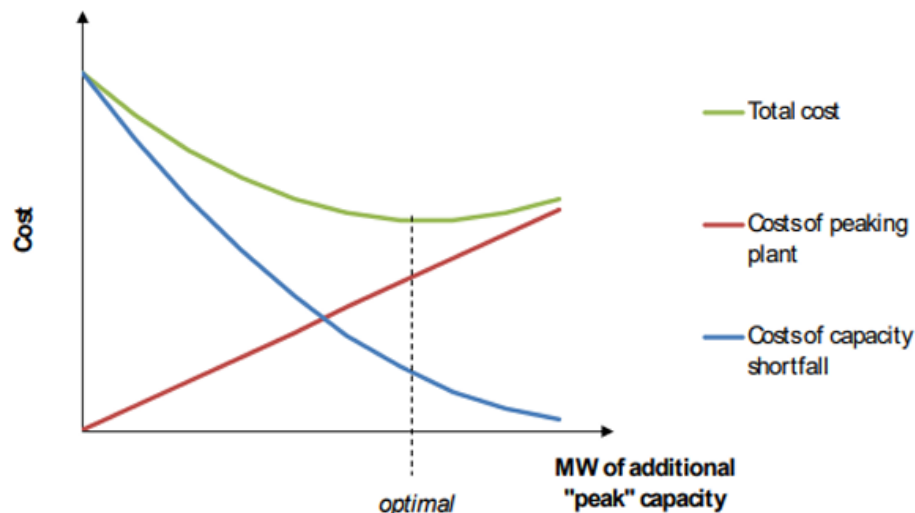
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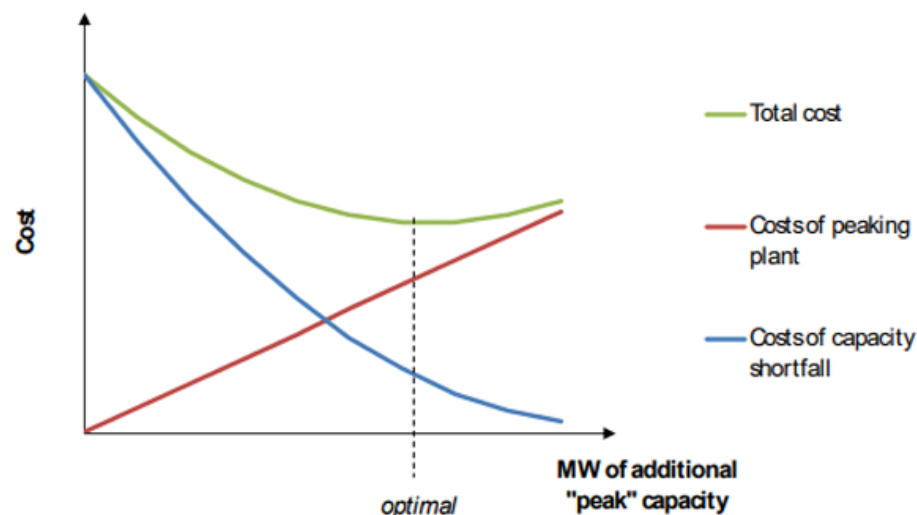
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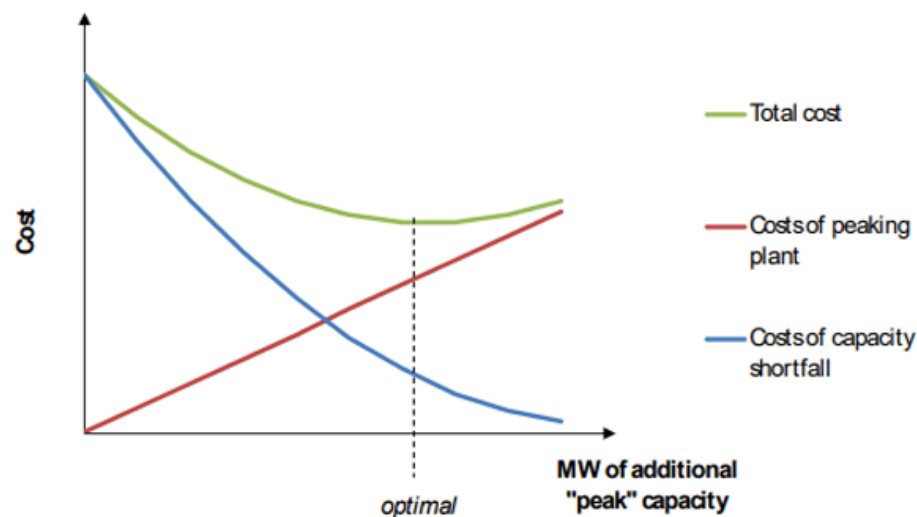
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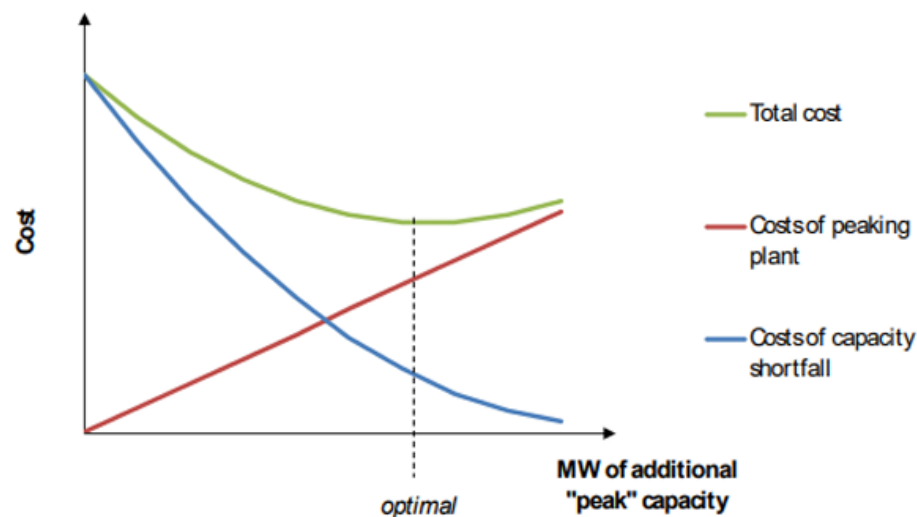
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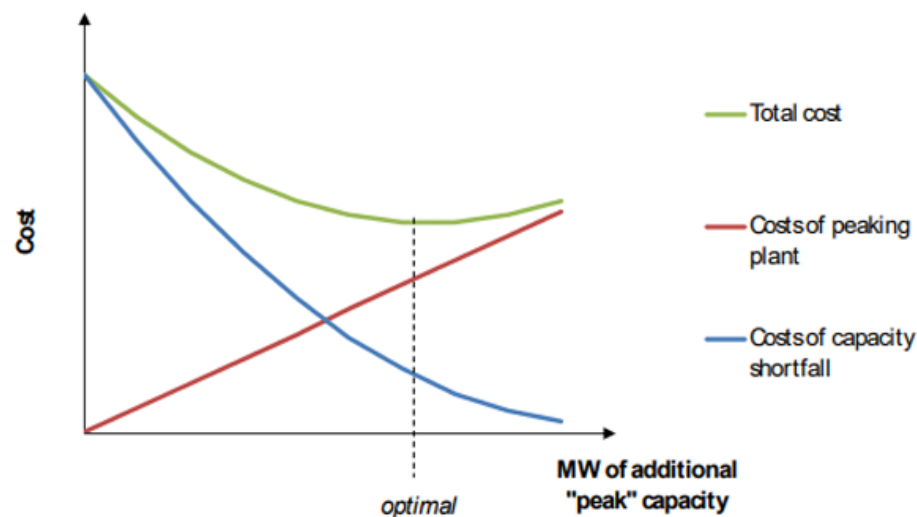
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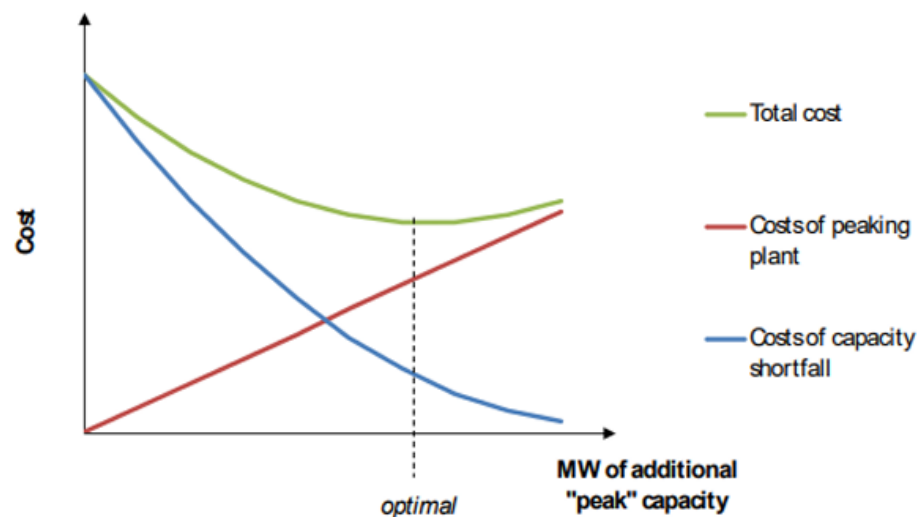
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- A multiplicity of views and opinions are needed

# Fin

