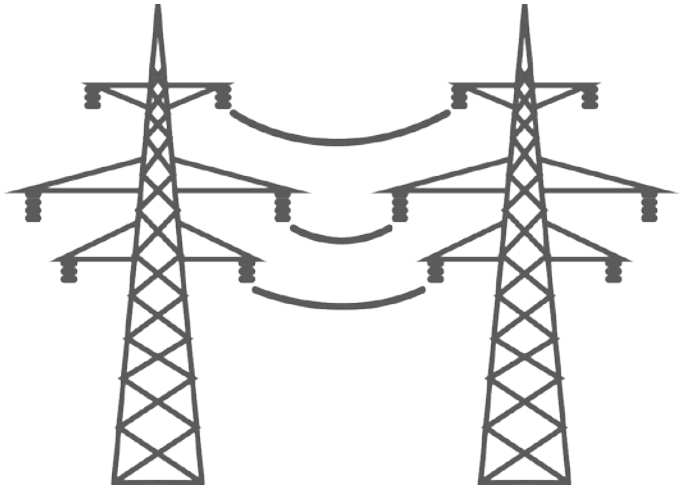

Valuing Deferred Transmission & Distribution for EE

Presented at the 2019 ACEEE National Conference on Energy Efficiency as a Resource

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Northwest Power and Conservation Council

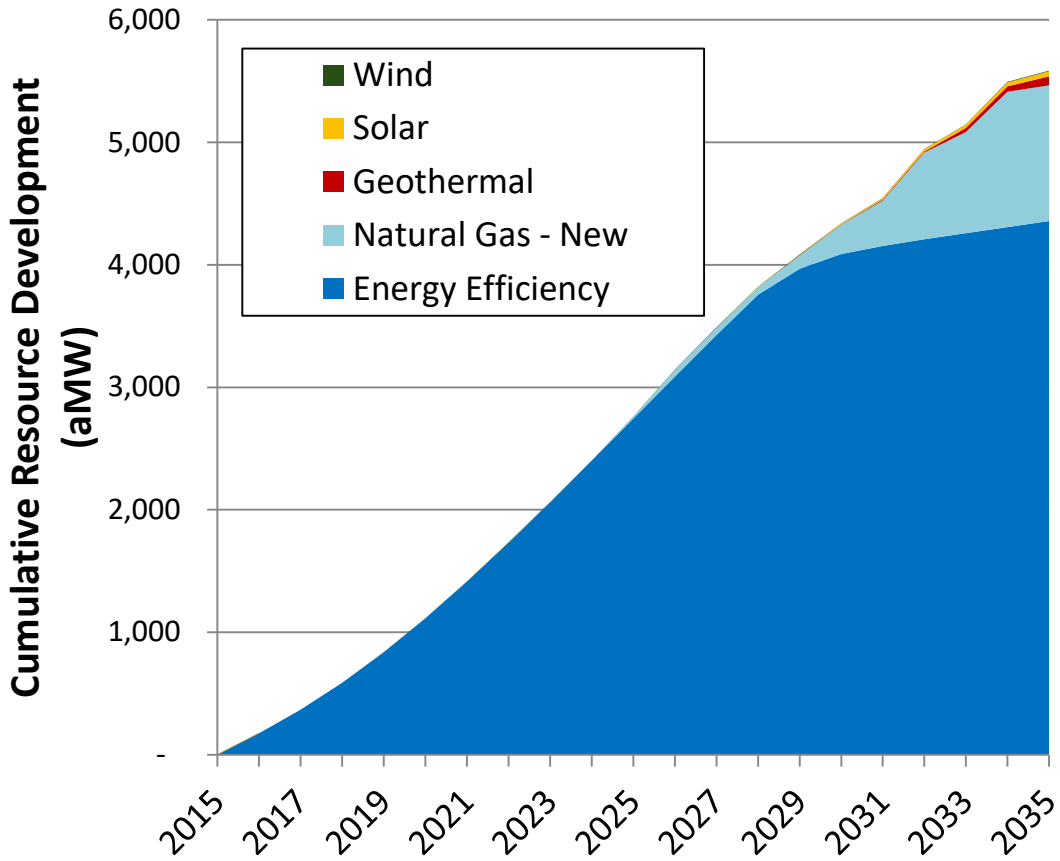
Interstate compact agency formed in 1980 by the Northwest Power Act

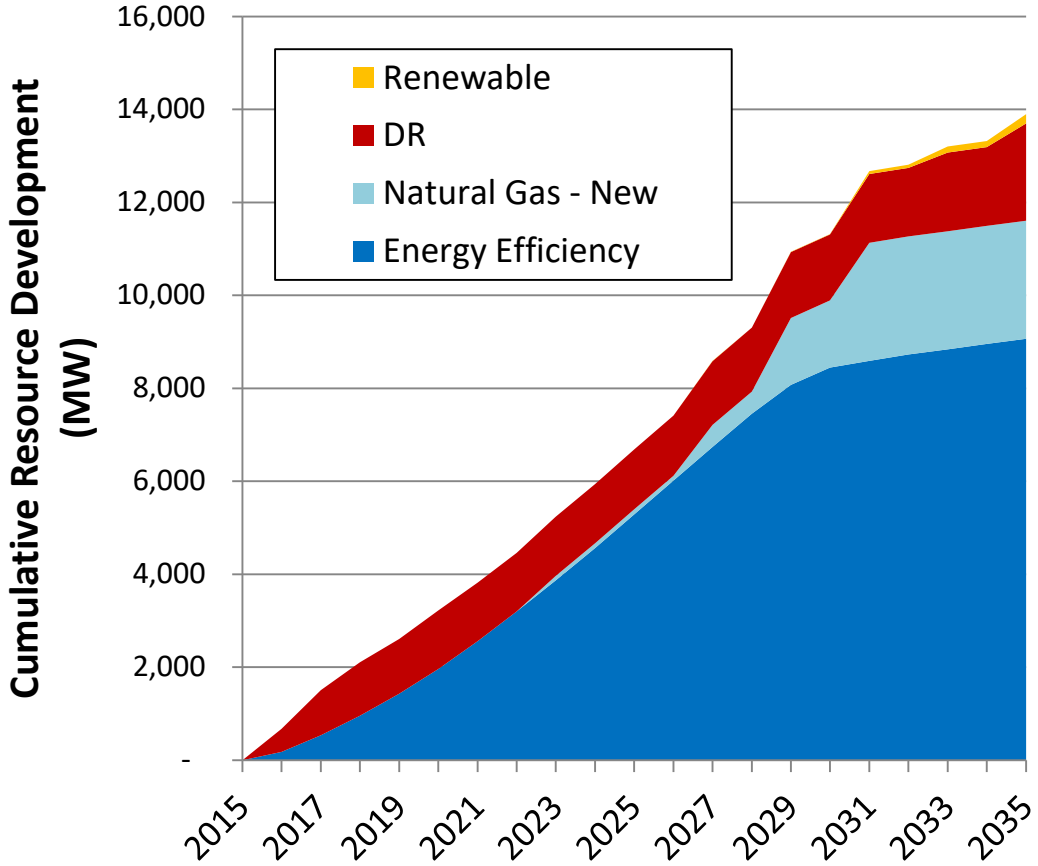
Three main tenets:

- Conduct regional power plan to ensure "an adequate, efficient, economical, and reliable **power** supply"
- Work to protect, mitigate, and enhance **fish and wildlife** resources associated with the BPA system
- Work through a **public** stakeholder process

Funded by the Bonneville Power Administration

Seventh Plan (Feb 2016) Preferred Resource Strategy





Mean resource build for least-cost resource portfolio

EE Benefit – to – Cost Calc

$$\frac{Benefit}{Cost} = \frac{NPV(energy + capacity + other\ fuel + NEI + avoided\ periodic\ replacement)}{NPV(capital\ cost * (1 + admin) + annual\ O\&M + other\ fuel + NEI + periodic\ replacement)}$$

Where NPV is the net present value and:

$$energy = kWh_{i,bb} * \left((MP + C)_i + RMC\right) * (1 + 10\%)$$

and

$$capacity = kW_{peak,bb} * (T_{avoid} + D_{avoid} + Gen_{avoid}) * (1 + 10\%)$$

The terms are defined as:

NEI = non-energy impacts

admin = administration cost adder (assumed 20%)

kWh = energy saved by time segment *i* (e.g. heavy/light load hours, monthly)

kW_{peak} = winter peak power saved

bb = busbar

MP = market price forecast ($/kWh) by time segment *i*

C = carbon cost forecast ($/kWh) by time segment *i*

RMC = risk mitigation credit for stochastic variation in inputs ($/kWh)

T_{avoid} = deferred transmission capacity credit ($/kW-yr)

D_{avoid} = deferred distribution capacity credit ($/kW-yr)

Gen_{avoid} = deferred generation capacity credit ($/kW-yr)

10% = Regional Act conservation credit

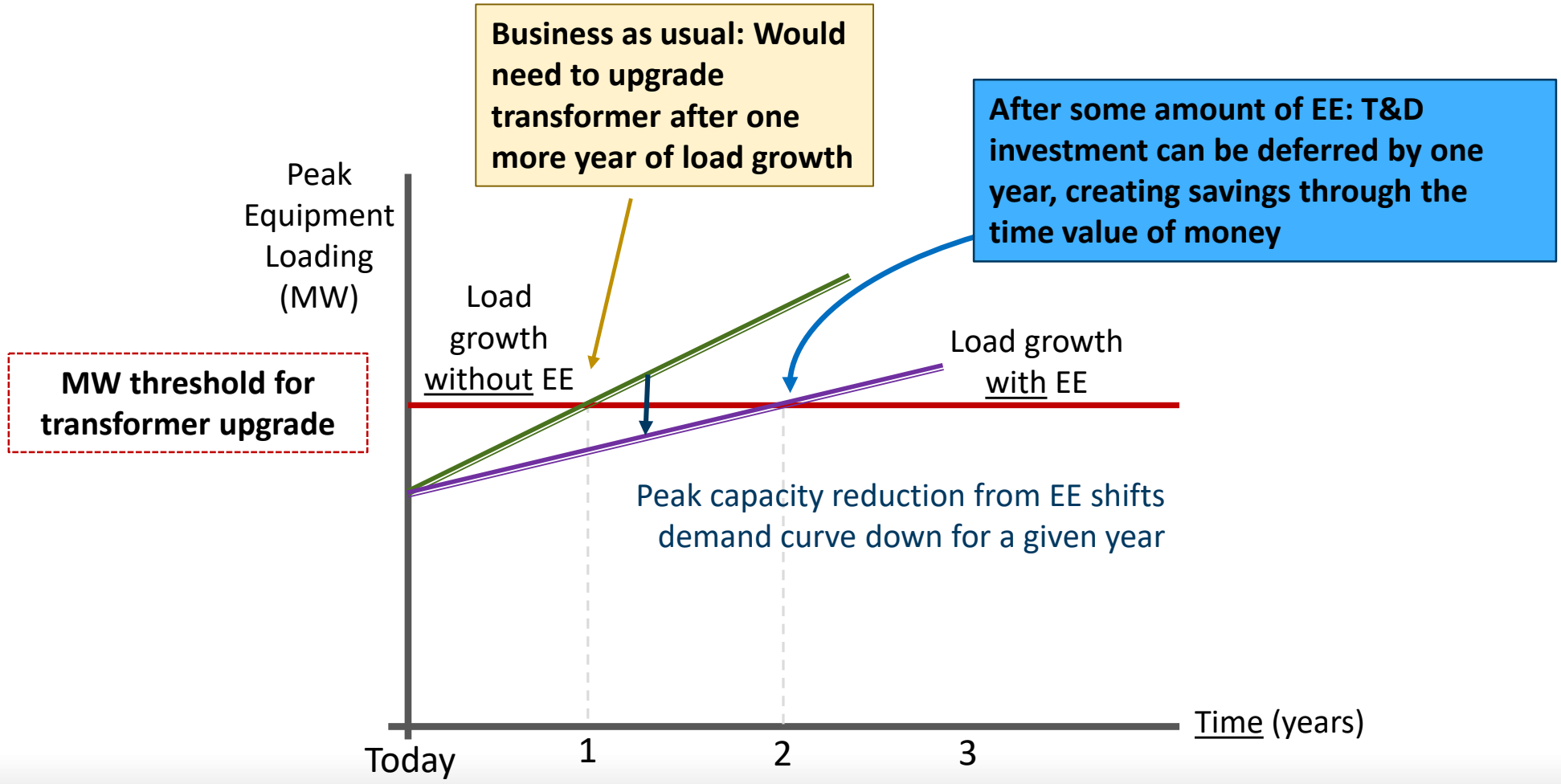
Benefit-to-Cost Calc, simplified

- EE benefits include energy & capacity savings
- Capacity savings include deferred transmission and distribution investment

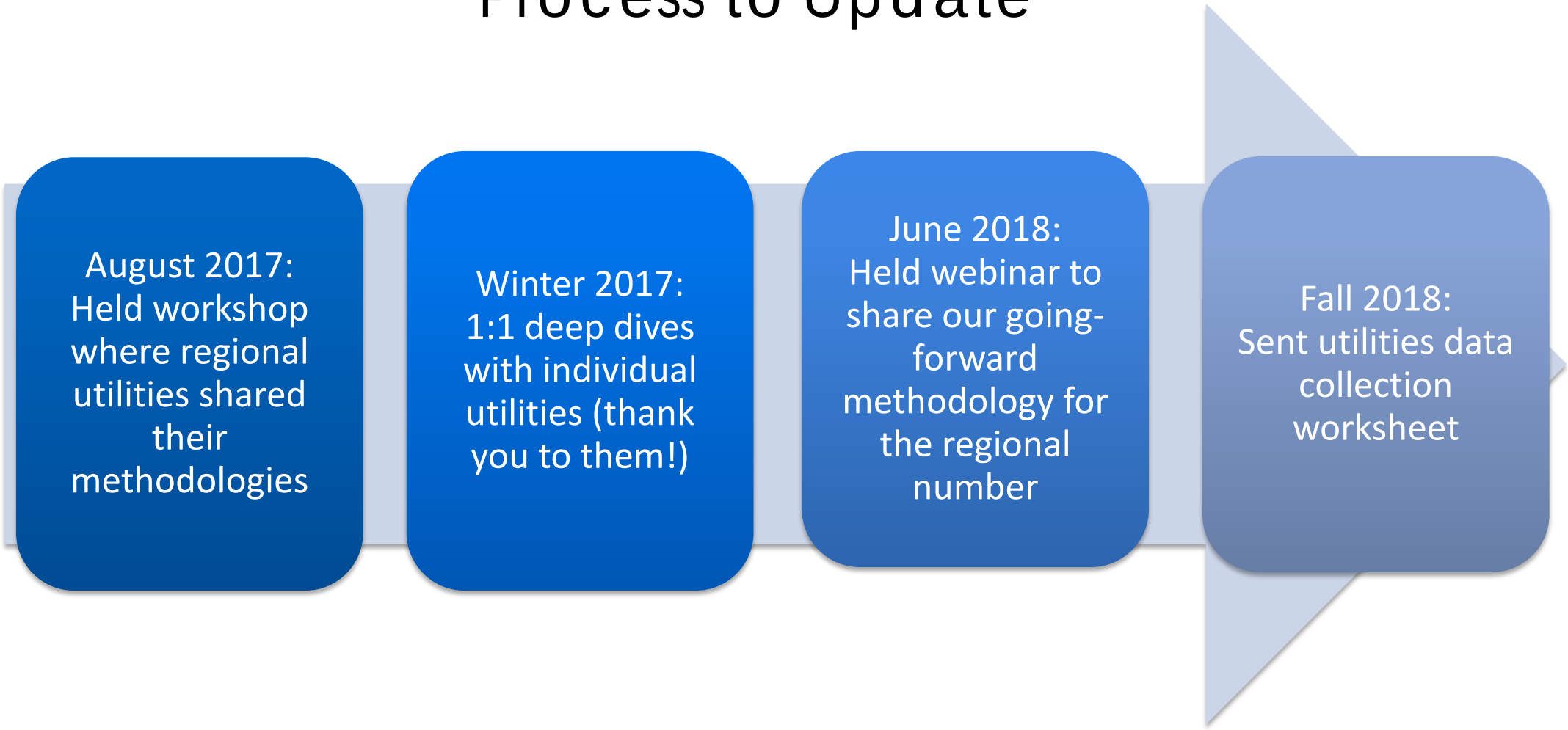
Purpose of T&D Deferral Values

- Resources which reduce T&D load coincident with asset, branch, or system peak can help defer growth-related upgrades
- In addition to EE, Council's 7th Plan used deferred T for demand response and west-side gas generation valuation
  - T: $31/kW-yr, D: $26/kW-yr
  - Data used were incomplete

Example of T&D Deferral with EE



Process to Update

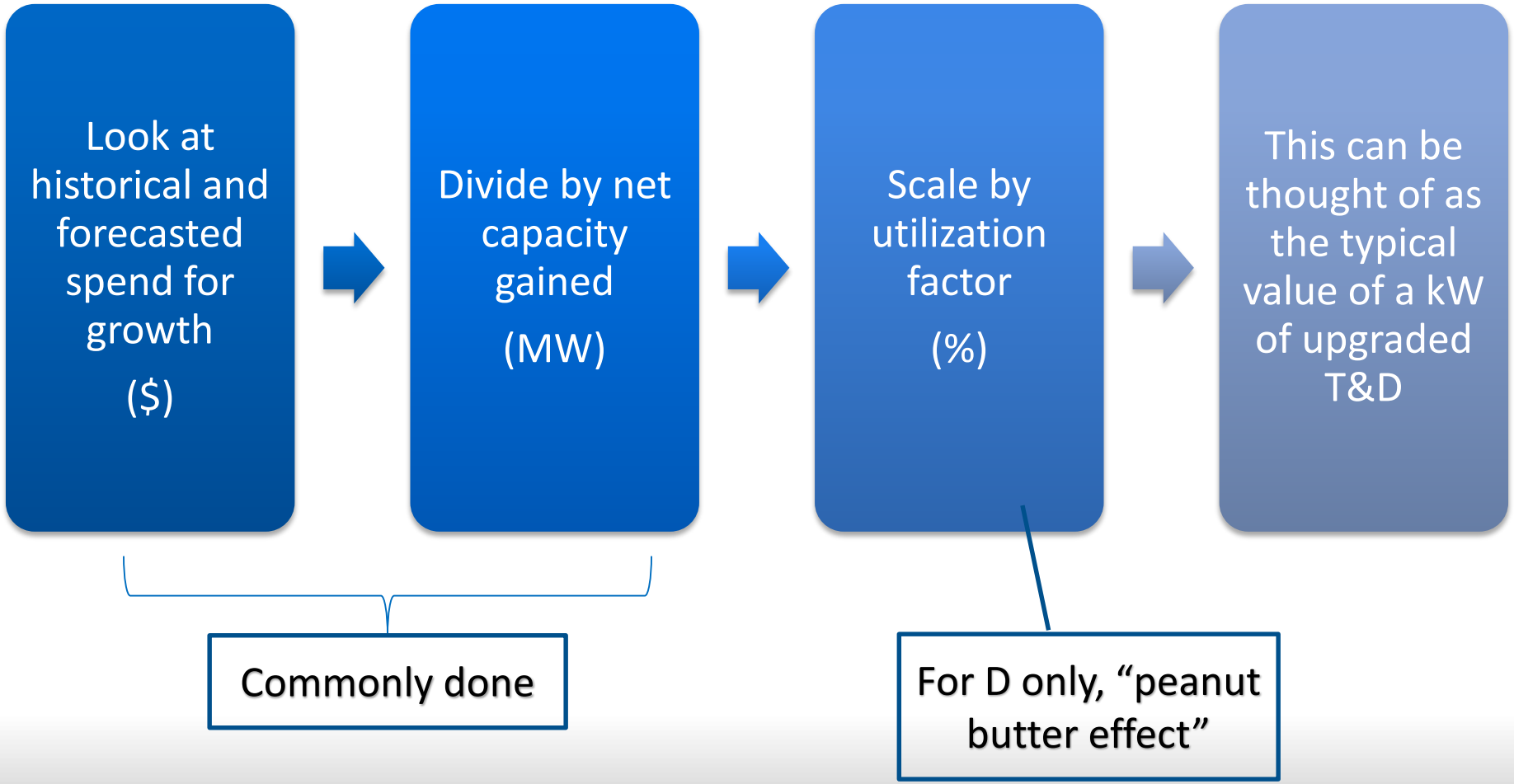


Thanks to PNUCC for help throughout this process!

Methodology

- Goal is to represent a *planning* estimate, not necessarily an *implementation* value
  - Planning covers large geographic territory
  - Location-focused EE can have different valuation
- Needed approach for which utilities could provide data
- Council staff reviewed many methodologies, none were perfect, all have pros and cons

Methodology for 2021 Plan



Example Calculation

- Invested $5M to gain 15 MW of capacity (10 MW -> 25 MW transformer upgrade)
  - $5M/15MW = $330/kW for new incremental T&D capacity
- T&D utilization factor of 60%
  - $330/kW * 60% = $200/kW
- Annualize based on discount rate and average asset life, or 6% per year
  - $200/kW * 6%/yr = $12/kW-yr

Challenges (1)

- Only including expenditures deferrable by EE:
  - Growth (yes) *vs.* O&M (no)
  - "Brownfield" (yes) *vs.* "greenfield" (no) growth
- Transformers are often purposefully oversized due to low incremental cost
  - Limits need for deferral

Challenges (2)

- In regions with long history of EE, historical T&D spend has likely already included deferral value
- Quantifying “utilization factor”
  - Proxy is System Peak / System Carrying Capability
  - Should T have comparable utilization factor?
- Timing of peak distribution varies widely

Data Received

- Received data from 5 regional utilities (*thanks!*)
- Weighted average values are (2016$ levelized)
  - Transmission: $3.10/kW-yr
  - Distribution: $6.90/kW-yr
- If more utilities provide data, we will add them in

THANK YOU!

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