

**Exh. JL-5C
Docket UE-200115
Witness: Jing Liu
REDACTED VERSION**

**BEFORE THE WASHINGTON
UTILITIES AND TRANSPORTATION COMMISSION**

In the Matter of the Application of

DOCKET UE-200115

PUGET SOUND ENERGY

**For an Order Authorizing the Sale of All
of Puget Sound Energy's Interests in
Colstrip Unit 4 and Certain of Puget
Sound Energy's Interests in the Colstrip
Transmission System**

**EXHIBIT TO
TESTIMONY OF**

Jing Liu

**STAFF OF
WASHINGTON UTILITIES AND
TRANSPORTATION COMMISSION**

*Cost-Benefit Analysis with Staff's Alternative Cost Assumptions
and the Assumption of High Market Prices*

October 2, 2020

CONFIDENTIAL PER PROTECTIVE ORDER – REDACTED VERSION

Shaded information is designated as CONFIDENTIAL per Protective Order in Docket UE-200115



**Quantitative Analysis Comparing "Business
as Usual" Scenario and the "Proposed Sale" Scenario
with UTC Staff Alternative Cost Assumptions and High Market Price**

SHADED INFORMATION IS DESIGNATED AS CONFIDENTIAL PER
PROTECTIVE ORDER IN WUTC DOCKET UE-200115

| <u>Line</u> | (A) | (B) Scenario 1 No hedging | (C) Scenario 2 Hedge 95MW |
|--|-----|---------------------------------|---------------------------------|
| 1 Operational cost (\$ in millions) | | | |
| 2 Colstrip unit 4 continuing operations | | | |
| 3 90MW 5-year PPA + 95MW replacement | | | |
| 4 PPA Savings NPV | | | |
| 5 Average Annual Savings | | | |
| 6 Operational cost (\$/MWh) | | | |
| 7 Colstrip unit 4 continuing operations | | | |
| 8 90MW 5-year PPA + 95MW replacement | | | |
| 9 Savings \$/MWh | | | |

**Quantitative Analysis Comparing "Business
as Usual" Scenario and the "Proposed Sale" Scenario
Five-Year Comparison
with UTC Staff Alternative Cost Assumptions and High Market Price**

SHADED INFORMATION IS DESIGNATED AS CONFIDENTIAL PER
PROTECTIVE ORDER IN WUTC DOCKET UE-200115

| | (A) | (B) | (C) | (D) | (E) | (F) | (G) | |
|------|--|----------------------|--------------|------------|------------|------------|------------|------------|
| | Scenario 1 - No hedging | | | | | | | |
| | | | 12/17/2020 - | | | | | |
| Line | | | 12/31/2020 | 12/31/2021 | 12/31/2022 | 12/31/2023 | 12/31/2024 | 12/31/2025 |
| 1 | Operational cost (\$ in millions) | Present Value | | | | | | |
| 2 | Colstrip unit 4 continuing operations | | | | | | | |
| 3 | 90MW 5-year PPA + 95MW replacement | | | | | | | |
| 4 | PPA savings | | | | | | | |
| 5 | | | | | | | | |
| 6 | Operational cost (\$/MWh) | Average | | | | | | |
| 7 | Colstrip unit 4 continuing operations | | | | | | | |
| 8 | 90MW 5-year PPA + 95MW replacement | | | | | | | |
| 9 | Savings \$/MWh | | | | | | | |

**Quantitative Analysis Comparing "Business
as Usual" Scenario and the "Proposed Sale" Scenario
Five-Year Comparison
with UTC Staff Alternative Cost Assumptions and High Market Price**

SHADED INFORMATION IS DESIGNATED AS CONFIDENTIAL PER
PROTECTIVE ORDER IN WUTC DOCKET UE-200115

| | (A) | (B) | (C) | (D) | (E) | (F) | (G) | |
|--------------------------------|---------------------------------------|----------------------|--------------|------------|------------|------------|------------|------------|
| Scenario 2 - Hedge 95MW | | | | | | | | |
| | | | 12/17/2020 - | | | | | |
| 1 | <i>\$ in millions</i> | | 12/31/2020 | 12/31/2021 | 12/31/2022 | 12/31/2023 | 12/31/2024 | 12/31/2025 |
| 2 | Operational cost | Present Value | | | | | | |
| 3 | Colstrip unit 4 continuing operations | | | | | | | |
| 4 | 90MW 5-year PPA + 95MW replacement | | | | | | | |
| 5 | PPA savings | | | | | | | |
| 6 | | | | | | | | |
| 7 | Operational cost (\$/MWh) | Average | | | | | | |
| 8 | Colstrip unit 4 continuing operations | | | | | | | |
| 9 | 90MW 5-year PPA + 95MW replacement | | | | | | | |
| 10 | Savings \$/MWh | | | | | | | |

Colstrip Unit 4 - Continuing Operations
with UTC Staff Alternative Cost Assumptions and High Market Price

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PROTECTIVE ORDER IN WUTC DOCKET UE-200115

| Line | \$ in millions | 12/17/2020- 12/31/2020 | 12/31/2021 | 12/31/2022 | 12/31/2023 | 12/31/2024 | 12/31/2025 | Average |
|------|---------------------------------------|---------------------------|------------|------------|------------|------------|------------|---------|
| 1 | PSE's share of unit 4 capacity | 185 MW | 185 MW | 185 MW | 185 MW | 185 MW | 185 MW | 185 MW |
| 2 | PSE's take (MWh) | | | | | | | |
| 3 | | | | | | | | |
| 4 | Net capacity factor | | | | | | | |
| 5 | | | | | | | | |
| 6 | Colstrip unit 4 operating cost | | | | | | | |
| 7 | Fixed operating expenses | | | | | | | |
| 8 | Overhaul | | | | | | | |
| 9 | Capital | | | | | | | |
| 10 | Dispatch cost | | | | | | | |
| 11 | Colstrip unit 4 operating cost | | | | | | | |
| 12 | | | | | | | | |
| 13 | Property Tax | | | | | | | |
| 14 | | | | | | | | |
| 15 | Total cost (line 11 +13) | | | | | | | |
| 16 | | | | | | | | |
| 17 | Dispatch cost (line 10 / 2) | | | | | | | |
| 18 | Cost \$/MWh (line 15 / 2) | | | | | | | |
| 19 | | | | | | | | |
| 20 | Total cost NPV (line 15) | | | | | | | |
| 21 | Cost \$/MWh (5-year average) | | | | | | | |

Scenario 1 - No Hedging
with UTC Staff Alternative Cost Assumptions and High Market Price

SHADED INFORMATION IS DESIGNATED AS CONFIDENTIAL PER
PROTECTIVE ORDER IN WUTC DOCKET UE-200115

| Line | \$ in millions | 12/17/2020- 12/31/2020 | 12/31/2021 | 12/31/2022 | 12/31/2023 | 12/31/2024 | 1/1/2025- 12/2/2025 |
|------|----------------------------------|---------------------------|------------|------------|------------|------------|------------------------|
| 1 | 90 MW NEW PPA | | | | | | |
| 2 | NW + Talen PPA capacity | 90 MW | 90 MW | 90 MW | 90 MW | 90 MW | 90 MW |
| 3 | | | | | | | |
| 4 | Energy (MWh) | | | | | | |
| 5 | PPA price (\$/MWh) | | | | | | |
| 6 | PPA cost | | | | | | |
| 7 | Base O&M | | | | | | |
| 8 | Total PPA (line 6+7) | | | | | | |
| 9 | | | | | | | |
| 10 | 95 MW Replacement | | | | | | |
| 11 | Replacement energy post PPA | | | | | | |
| 12 | Replacement energy (MWh) | | | | | | |
| 13 | Mid-C price (\$/MWh) | | | | | | |
| 14 | Energy replacement | | | | | | |
| 15 | | | | | | | |
| 16 | Replacement capacity winter only | | | | | | |
| 17 | Capacity (MW) | 95 MW | 95 MW | 95 MW | 95 MW | 95 MW | 95 MW |
| 18 | Capacity charge \$/KW-yr | | | | | | |
| 19 | Capacity replacement cost | | | | | | |
| 20 | | | | | | | |

Scenario 1 - No Hedging
with UTC Staff Alternative Cost Assumptions and High Market Price

SHADED INFORMATION IS DESIGNATED AS CONFIDENTIAL PER
PROTECTIVE ORDER IN WUTC DOCKET UE-200115

| | 12/3/2020- | | | | | | 12/31/2020 | |
|----|---|--------|--------|--------|--------|--------|------------|--|
| 21 | 90 MW Replacement after PPA Ends | | | | | | | |
| 22 | Replacement energy post PPA | | | | | | | |
| 23 | Replacement energy (MWh) | | | | | | | |
| 24 | Mid-C price (\$/MWh) | | | | | | | |
| 25 | Energy replacement | | | | | | | |
| 26 | | | | | | | | |
| 27 | Replacement capacity winter only | | | | | | | |
| 28 | Capacity (MW) | | | | | | 90 MW | |
| 29 | Capacity charge \$/KW-yr | | | | | | | |
| 30 | Capacity replacement cost | | | | | | | |
| 31 | | | | | | | | |
| 32 | Total cost (line 8+14+19+25+30) | | | | | | | |
| 33 | | | | | | | | |
| 34 | Total capacity | 185 MW | 185 MW | 185 MW | 185 MW | 185 MW | 185 MW | |
| 35 | Total energy MWh | | | | | | | |
| 36 | Cost \$/MWh (line 32 / 35) | | | | | | | |
| 37 | | | | | | | | |
| 38 | Total cost NPV (line 32) | | | | | | | |
| 39 | Cost \$/MWh (5-year average) | | | | | | | |

Scenario 2 - Hedging
with UTC Staff Alternative Cost Assumptions and High Market Price

SHADED INFORMATION IS DESIGNATED AS CONFIDENTIAL PER PROTECTIVE ORDER IN WUTC DOCKET UE-200115

| Line | \$ in millions | 12/17/2020- 12/31/2020 | 12/31/2021 | 12/31/2022 | 12/31/2023 | 12/31/2024 | 1/1/2025- 12/2/2025 |
|------|----------------------------------|---------------------------|------------|------------|------------|------------|------------------------|
| 1 | 90 MW NEW PPA | | | | | | |
| 2 | NW + Talen PPA capacity | 90 MW | 90 MW | 90 MW | 90 MW | 90 MW | 90 MW |
| 3 | | | | | | | |
| 4 | Energy (MWh) | | | | | | |
| 5 | PPA price (\$/MWh) | | | | | | |
| 6 | PPA cost | | | | | | |
| 7 | Base O&M | | | | | | |
| 8 | Total PPA (line 6+7) | | | | | | |
| 9 | | | | | | | |
| | | 12/17/2020- 12/31/2020 | 12/31/2021 | 12/31/2022 | 12/31/2023 | 12/31/2024 | 12/31/2025 |
| 10 | 95 MW Replacement | | | | | | |
| 11 | Replacement energy post PPA | | | | | | |
| 12 | Replacement energy (MWh) | | | | | | |
| 13 | Mid-C price (\$/MWh) | | | | | | |
| 14 | Energy replacement | | | | | | |
| 15 | | | | | | | |
| 16 | Replacement capacity winter only | | | | | | |
| 17 | Capacity (MW) | 95 MW | 95 MW | 95 MW | 95 MW | 95 MW | 95 MW |
| 18 | Capacity charge \$/KW-yr | | | | | | |
| 19 | Capacity replacement cost | | | | | | |
| 20 | | | | | | | |

Scenario 2 - Hedging
with UTC Staff Alternative Cost Assumptions and High Market Price

SHADED INFORMATION IS DESIGNATED AS CONFIDENTIAL PER
PROTECTIVE ORDER IN WUTC DOCKET UE-200115

| | | 12/3/2020- |
|----|---|---|
| | | 12/31/2020 |
| 21 | 90 MW Replacement after PPA Ends | |
| 22 | Replacement energy post PPA | |
| 23 | Replacement energy (MWh) | |
| 24 | Mid-C price (\$/MWh) | |
| 25 | Energy replacement | |
| 26 | | |
| 27 | Replacement capacity winter only | |
| 28 | Capacity (MW) | 90 MW |
| 29 | Capacity charge \$/KW-yr | |
| 30 | Capacity replacement cost | |
| 31 | | |
| 32 | Total cost (line 8+14+19+25+30) | |
| 33 | | |
| 34 | Total capacity | 185 MW 185 MW 185 MW 185 MW 185 MW 185 MW |
| 35 | Total energy MWh | |
| 36 | Cost \$/MWh (line 32 / 35) | |
| 37 | | |
| 38 | Total cost NPV (line 32) | |
| 39 | Cost \$/MWh (5-year average) | |

Proposed 2020 Budget

SHADED INFORMATION IS DESIGNATED AS CONFIDENTIAL PER PROTECTIVE ORDER IN WUTC DOCKET UE-200115

| Line Total | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 |
|-----------------------------|------|------|------|------|------|------|
| 1 Output | | | | | | |
| 2 | | | | | | |
| 3 O&M Costs | | | | | | |
| 4 High Calcuim | | | | | | |
| 5 Startup Fuel | | | | | | |
| 6 Pollution Control Fees | | | | | | |
| 7 Mercury Control Fees | | | | | | |
| 8 Water Treatment Chemicals | | | | | | |
| 9 O&M Maintenance | | | | | | |
| 10 Overhaul | | | | | | |
| 11 Reserves | | | | | | |
| 12 Total | | | | | | |
| 13 | | | | | | |
| 14 Capital | | | | | | |
| 15 | | | | | | |
| 16 Total | | | | | | |
| 17 PSE Unit 4 Share | | | | | | |

Proposed 2020 Budget

SHADED INFORMATION IS DESIGNATED AS CONFIDENTIAL PER
PROTECTIVE ORDER IN WUTC DOCKET UE-200115

| | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 |
|-------------------------------------|------|------|------|------|------|------|
| 18 | | | | | | |
| 19 Output | | | | | | |
| 20 | | | | | | |
| 21 O&M Costs | | | | | | |
| 22 High Calcuim | | | | | | |
| 23 Startup Fuel | | | | | | |
| 24 Pollution Control Fees | | | | | | |
| 25 Mercury Control Fees | | | | | | |
| 26 Water Treatment Chemicals | | | | | | |
| 27 O&M Maintenance | | | | | | |
| 28 Overhaul | | | | | | |
| 29 Reserves | | | | | | |
| 30 Total | | | | | | |
| 31 | | | | | | |
| 32 Capital | | | | | | |

No Hedging

SHADED INFORMATION IS DESIGNATED AS CONFIDENTIAL PER PROTECTIVE ORDER IN WUTC DOCKET UE-200115

| | Present Value | 12/17/2020- 12/31/2020 | 12/31/2021 | 12/31/2022 | 12/31/2023 | 12/31/2024 | 1/1/2025- 12/2/2025 |
|-----------------------------------|---------------|---------------------------|------------|------------|------------|------------|------------------------|
| 1 Cost | | | | | | | |
| 2 90 MW PPA | | | | | | | |
| 3 Market Replacement | | | | | | | |
| 4 Total | | | | | | | |
| 5 | | | | | | | |
| 6 S/MWh | | | | | | | |
| 7 Average | | | | | | | |
| 8 90 MW PPA | | | | | | | |
| 9 Market Replacement | | | | | | | |
| 9 Total | | | | | | | |
| 10 | | | | | | | |
| 11 100% Market Replacement | | | | | | | |
| 12 Present Value | | | | | | | |
| 12 Energy MWh | | | | | | | |
| 13 Rate | | | | | | | |
| 14 Market Value | | | | | | | |
| 15 | | | | | | | |
| 16 Capacity MW | | 95 | 185 | 185 | 185 | 185 | 185 |
| 17 Capacity charge \$/KW-yr | | | | | | | |
| 18 Capacity Cost | | | | | | | |
| 19 | | | | | | | |
| 20 Total | | | | | | | |
| 21 | | | | | | | |
| 22 Average | | | | | | | |
| 23 \$/MWh | | | | | | | |
| 24 | | | | | | | |

Hedging

SHADED INFORMATION IS DESIGNATED AS CONFIDENTIAL PER PROTECTIVE ORDER IN WUTC DOCKET UE-200115

| | Present Value | 12/17/2020- 12/31/2020 | 12/31/2021 | 12/31/2022 | 12/31/2023 | 12/31/2024 | 1/1/2025- 12/2/2025 |
|-----------------------------------|----------------------|---------------------------|------------|------------|------------|------------|------------------------|
| 26 | | | | | | | |
| 27 Cost | | | | | | | |
| 28 90 MW PPA | | | | | | | |
| 29 Market Replacement | | | | | | | |
| 30 Total | | | | | | | |
| 31 | | | | | | | |
| 32 \$/MWh | | | | | | | |
| | Average | | | | | | |
| 33 90 MW PPA | | | | | | | |
| 34 Market Replacement | | | | | | | |
| 35 Total | | | | | | | |
| 36 | | | | | | | |
| 37 100% Market Replacement | Present Value | | | | | | |
| 38 Energy MWh | | | | | | | |
| 39 Rate | | | | | | | |
| 40 Market Value | | | | | | | |
| 41 | | | | | | | |
| 42 Capacity MW | | | 185 | 185 | 185 | 185 | 185 |
| 43 Capacity charge \$/KW-yr | | | | | | | |
| 44 Capacity Cost | | | | | | | |
| 45 | | | | | | | |
| 46 Total | | | | | | | |
| 47 | | | | | | | |
| 48 | Average | | | | | | |
| 49 \$/MWh | | | | | | | |

Colstrip Unit 4 Dispatch Assumptions
with UTC Staff Alternative Cost Assumptions and High Market Price

Assumption Coal Contract

SHADED INFORMATION IS DESIGNATED AS CONFIDENTIAL PER
PROTECTIVE ORDER IN WUTC DOCKET UE-200115

| Line | Assumption Coal Contract | | | | | | | | PPA | | Replacment Power |
|------|--------------------------|------|------|------|------|------|------|--------------------|--------------------|------|------------------|
| | 12/17/2020-12/31/2020 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 1/1/2025-12/2/2025 | 1/1/2025-12/2/2025 | 2025 | |
| 1 | Energy (MWh) | | | | | | | | | | |
| 2 | Revenue (\$'000) | | | | | | | | | | |
| 3 | Cost (\$'000) | | | | | | | | | | |
| 4 | | | | | | | | | | | |
| 5 | Market Rate (\$/MWh) | | | | | | | | | | |
| 6 | Dispatch costs (\$/MWh) | | | | | | | | | | |

| O&M Adder | O&M Base Equivalent | | | Time Frame | MWH | PPA MWH | PPA Costs |
|-----------|---------------------|----------|-----|-----------------------|-----|---------|-----------|
| | Rate | O&M Base | MWH | | | | |
| 2020 | | | | 12/15/2020-12/31/2020 | | | |
| 2021 | | | | 2021 | | | |
| 2022 | | | | 2022 | | | |
| 2023 | | | | 2023 | | | |
| 2024 | | | | 2024 | | | |
| 2025 | | | | 1/1/2025-12/2/2025 | | | |

PSE's Weighted Average Cost of Capital

Line

1

| 2 | Capital Structure | Ratio | Cost | Weighted Cost | Tax Rate | After-tax Weighted Cost |
|---|--------------------------|---------------|-------------|----------------------|-----------------|--------------------------------|
| 3 | Debt | 51.5% | 5.50% | 2.83% | 21.00% | 2.24% |
| 4 | Equity | 48.5% | 9.40% | 4.56% | | 4.56% |
| 5 | Total | 100.0% | | 7.39% | | 6.80% |