WASHINGTON STATE
UNIVERSITY

Scalable Multi-Period Optimal Power Flow
for Active Power Distribution Systems

or simply, Scalable MP-OPF in ADS

Aryan Ritwajeet Jha

Graduate Research Assistant

Washington State University

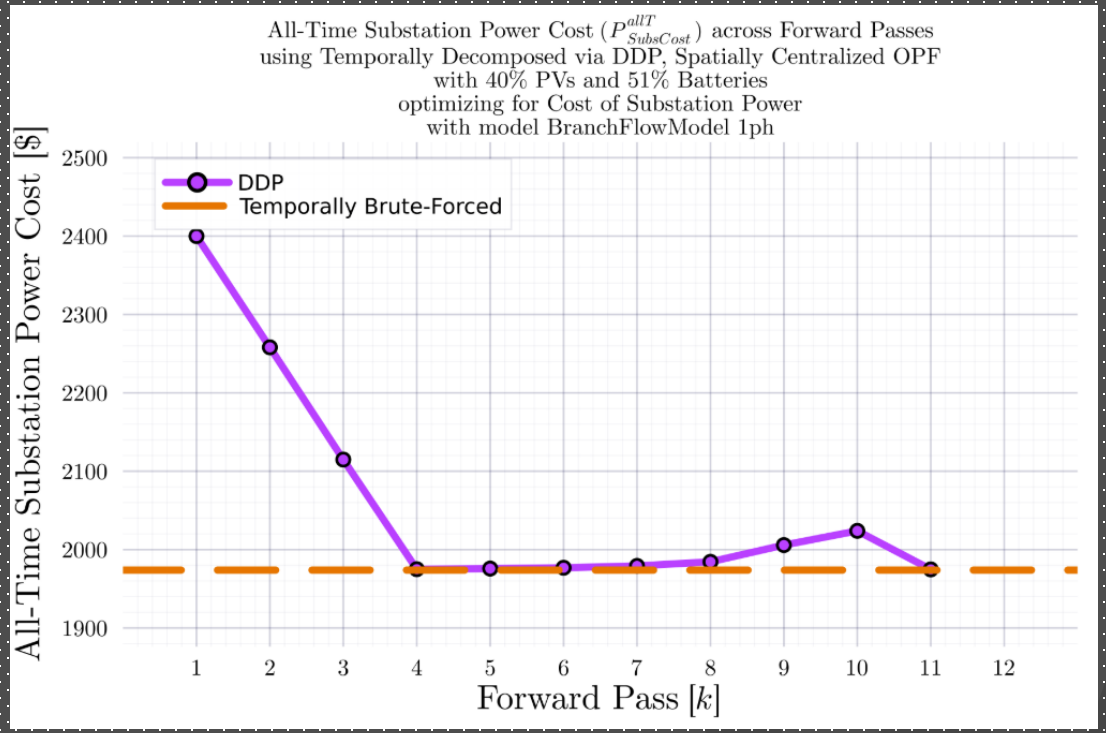
$IEEE123B_{\{1ph\}}$, $T = 24$

DDP Trajectory vs #Forward Passes $[k]$

Terminal SOC Constraint Relaxed

DDP

```
**************
∇L_{B_j^t} for [61, 1]: 0_0649
∇L_{B_j^t} for [61, 2]: 0_0695
∇L_{B_j^t} for [61, 3]: 0_0257
∇L_{B_j^t} for [61, 4]: -0_01
∇L_{B_j^t} for [61, 5]: -258_3461
∇L_{B_j^t} for [61, 6]: 255_2
∇L_{B_j^t} for [61, 7]: 0_7125
∇L_{B_j^t} for [61, 8]: 0_3203
∇L_{B_j^t} for [61, 9]: -0_6333
∇L_{B_j^t} for [61, 10]: 0_003
∇L_{B_j^t} for [61, 11]: -0_1014
∇L_{B_j^t} for [61, 12]: 1_774
∇L_{B_j^t} for [61, 13]: 0_3056
∇L_{B_j^t} for [61, 14]: -2_1936
∇L_{B_j^t} for [61, 15]: -0_1915
∇L_{B_j^t} for [61, 16]: 1_479
∇L_{B_j^t} for [61, 17]: 1_605
∇L_{B_j^t} for [61, 18]: 1_241
∇L_{B_j^t} for [61, 19]: 1_549
∇L_{B_j^t} for [61, 20]: 0_2987
∇L_{B_j^t} for [61, 21]: -1_1867
∇L_{B_j^t} for [61, 22]: -0_2987
∇L_{B_j^t} for [61, 23]: 2_219
∇L_{B_j^t} for [61, 24]: 0_0
**************
Total KKT balance for B_61: 22_08
**************
```



$k_{Max} = 11$

BruteForced (BF)

```
**************
∇L_{B_j^t} for [61, 1]: 0_0
∇L_{B_j^t} for [61, 2]: 0_0
∇L_{B_j^t} for [61, 3]: 0_0
∇L_{B_j^t} for [61, 4]: -0_0
∇L_{B_j^t} for [61, 5]: 0_0
∇L_{B_j^t} for [61, 6]: 0_0
∇L_{B_j^t} for [61, 7]: 0_0
∇L_{B_j^t} for [61, 8]: 0_0
∇L_{B_j^t} for [61, 9]: 0_0
∇L_{B_j^t} for [61, 10]: 0_0
∇L_{B_j^t} for [61, 11]: -0_0
∇L_{B_j^t} for [61, 12]: 0_0
∇L_{B_j^t} for [61, 13]: 0_0
∇L_{B_j^t} for [61, 14]: 0_0
∇L_{B_j^t} for [61, 15]: -0_0
∇L_{B_j^t} for [61, 16]: 0_0
∇L_{B_j^t} for [61, 17]: 0_0
∇L_{B_j^t} for [61, 18]: 0_0
∇L_{B_j^t} for [61, 19]: 0_0
∇L_{B_j^t} for [61, 20]: 0_0
∇L_{B_j^t} for [61, 21]: -0_0
∇L_{B_j^t} for [61, 22]: 0_0
∇L_{B_j^t} for [61, 23]: 0_0
∇L_{B_j^t} for [61, 24]: -0_0
**************
Total KKT balance for B_61: 0_0
**************
```

$IEEE123B_{\{1ph\}}$, $T = 24$

DDP Trajectory vs #Forward Passes $[k]$

Terminal SOC Constraint Relaxed

DDP

```
**************
∇L_{B_j^t} for [61, 1]: 0_0649
∇L_{B_j^t} for [61, 2]: 0_0695
∇L_{B_j^t} for [61, 3]: 0_0257
∇L_{B_j^t} for [61, 4]: -0_01
∇L_{B_j^t} for [61, 5]: -258_3461
∇L_{B_j^t} for [61, 6]: 255_2
∇L_{B_j^t} for [61, 7]: 0_7125
∇L_{B_j^t} for [61, 8]: 0_3203
∇L_{B_j^t} for [61, 9]: -0_6333
∇L_{B_j^t} for [61, 10]: 0_003
∇L_{B_j^t} for [61, 11]: -0_1014
∇L_{B_j^t} for [61, 12]: 1_774
∇L_{B_j^t} for [61, 13]: 0_3056
∇L_{B_j^t} for [61, 14]: -2_1936
∇L_{B_j^t} for [61, 15]: -0_1915
∇L_{B_j^t} for [61, 16]: 1_479
∇L_{B_j^t} for [61, 17]: 1_605
∇L_{B_j^t} for [61, 18]: 1_241
∇L_{B_j^t} for [61, 19]: 1_549
∇L_{B_j^t} for [61, 20]: 0_2987
∇L_{B_j^t} for [61, 21]: -1_1867
∇L_{B_j^t} for [61, 22]: -0_2987
∇L_{B_j^t} for [61, 23]: 2_219
∇L_{B_j^t} for [61, 24]: 0_0
**************
Total KKT balance for B_61: 22_08
**************
```

```
λ_lb[61, 1] = 0_0 | λ_ub[61, 1] = 0_0
λ_lb[61, 2] = 0_0 | λ_ub[61, 2] = 0_0
λ_lb[61, 3] = 0_0 | λ_ub[61, 3] = 0_0
λ_lb[61, 4] = 0_0 | λ_ub[61, 4] = 0_0
λ_lb[61, 5] = 0_0 | λ_ub[61, 5] = 0_0
λ_lb[61, 6] = 0_0 | λ_ub[61, 6] = 0_0001
λ_lb[61, 7] = 0_0 | λ_ub[61, 7] = 0_0
λ_lb[61, 8] = 0_0 | λ_ub[61, 8] = 0_0
λ_lb[61, 9] = 0_0 | λ_ub[61, 9] = 0_0
λ_lb[61, 10] = 0_0 | λ_ub[61, 10] = 0_0
λ_lb[61, 11] = 0_0 | λ_ub[61, 11] = 0_0
λ_lb[61, 12] = 0_0 | λ_ub[61, 12] = 0_0
λ_lb[61, 13] = 0_0 | λ_ub[61, 13] = 0_0
λ_lb[61, 14] = 0_0 | λ_ub[61, 14] = 0_0001
λ_lb[61, 15] = 0_0 | λ_ub[61, 15] = 242_6
λ_lb[61, 16] = 0_0 | λ_ub[61, 16] = 3_98
λ_lb[61, 17] = 0_0 | λ_ub[61, 17] = 0_9011
λ_lb[61, 18] = 0_0 | λ_ub[61, 18] = 0_5681
λ_lb[61, 19] = 0_0 | λ_ub[61, 19] = 0_0649
λ_lb[61, 20] = 0_0 | λ_ub[61, 20] = 0_0
λ_lb[61, 21] = 0_0 | λ_ub[61, 21] = 0_0
λ_lb[61, 22] = 244_1 | λ_ub[61, 22] = 0_0
λ_lb[61, 23] = 1_809 | λ_ub[61, 23] = 0_0
λ_lb[61, 24] = 47_34 | λ_ub[61, 24] = 0_0
```

```
μ[61, 1, 11] = 49_05
μ[61, 2, 11] = 48_99
μ[61, 3, 11] = 48_92
μ[61, 4, 11] = 48_89
μ[61, 5, 11] = 48_9
μ[61, 6, 11] = 307_2
μ[61, 7, 11] = 52_03
μ[61, 8, 11] = 51_32
μ[61, 9, 11] = 51_0
μ[61, 10, 11] = 51_63
μ[61, 11, 11] = 51_63
μ[61, 12, 11] = 51_73
μ[61, 13, 11] = 49_95
μ[61, 14, 11] = 49_65
μ[61, 15, 11] = 51_84
μ[61, 16, 11] = 294_6
μ[61, 17, 11] = 297_1
μ[61, 18, 11] = 296_4
μ[61, 19, 11] = 295_7
μ[61, 20, 11] = 294_2
μ[61, 21, 11] = 294_0
μ[61, 22, 11] = 295_1
μ[61, 23, 11] = 51_37
μ[61, 24, 11] = 47_34
```

$k_{Max} = 11$

$IEEE123B_{\{1ph\}}$, $T = 24$

DDP Trajectory vs #Forward Passes $[k]$

Terminal SOC Constraint Relaxed

BruteForced (BF)

```
***************
∇L_{B_j^t} for [61, 1]: 0_0
∇L_{B_j^t} for [61, 2]: 0_0
∇L_{B_j^t} for [61, 3]: 0_0
∇L_{B_j^t} for [61, 4]: -0_0
∇L_{B_j^t} for [61, 5]: 0_0
∇L_{B_j^t} for [61, 6]: 0_0
∇L_{B_j^t} for [61, 7]: 0_0
∇L_{B_j^t} for [61, 8]: 0_0
∇L_{B_j^t} for [61, 9]: 0_0
∇L_{B_j^t} for [61, 10]: 0_0
∇L_{B_j^t} for [61, 11]: -0_0
∇L_{B_j^t} for [61, 12]: 0_0
∇L_{B_j^t} for [61, 13]: 0_0
∇L_{B_j^t} for [61, 14]: 0_0
∇L_{B_j^t} for [61, 15]: -0_0
∇L_{B_j^t} for [61, 16]: 0_0
∇L_{B_j^t} for [61, 17]: 0_0
∇L_{B_j^t} for [61, 18]: 0_0
∇L_{B_j^t} for [61, 19]: 0_0
∇L_{B_j^t} for [61, 20]: 0_0
∇L_{B_j^t} for [61, 21]: -0_0
∇L_{B_j^t} for [61, 22]: 0_0
∇L_{B_j^t} for [61, 23]: 0_0
∇L_{B_j^t} for [61, 24]: -0_0
***************
Total KKT balance for B_61: 0_0
***************
```

```
λ_lb[61, 1] = 0_0 | λ_ub[61, 1] = 0_0
λ_lb[61, 2] = 0_0 | λ_ub[61, 2] = 0_0
λ_lb[61, 3] = 0_0 | λ_ub[61, 3] = 0_0
λ_lb[61, 4] = 0_0 | λ_ub[61, 4] = 0_0
λ_lb[61, 5] = 0_0 | λ_ub[61, 5] = 0_0
λ_lb[61, 6] = 0_0 | λ_ub[61, 6] = 0_0
λ_lb[61, 7] = 0_0 | λ_ub[61, 7] = 0_0
λ_lb[61, 8] = 0_0 | λ_ub[61, 8] = 0_0
λ_lb[61, 9] = 0_0 | λ_ub[61, 9] = 0_0
λ_lb[61, 10] = 0_0 | λ_ub[61, 10] = 0_0
λ_lb[61, 11] = 0_0 | λ_ub[61, 11] = 0_0
λ_lb[61, 12] = 0_0 | λ_ub[61, 12] = 0_0
λ_lb[61, 13] = 0_0 | λ_ub[61, 13] = 0_0
λ_lb[61, 14] = 0_0 | λ_ub[61, 14] = 0_0001
λ_lb[61, 15] = 0_0 | λ_ub[61, 15] = 240_6
λ_lb[61, 16] = 0_0 | λ_ub[61, 16] = 1_425
λ_lb[61, 17] = 0_0 | λ_ub[61, 17] = 0_7012
λ_lb[61, 18] = 0_0 | λ_ub[61, 18] = 0_3623
λ_lb[61, 19] = 0_0 | λ_ub[61, 19] = 0_0001
λ_lb[61, 20] = 0_0 | λ_ub[61, 20] = 0_0
λ_lb[61, 21] = 0_0001 | λ_ub[61, 21] = 0_0
λ_lb[61, 22] = 243_9 | λ_ub[61, 22] = 0_0
λ_lb[61, 23] = 2_515 | λ_ub[61, 23] = 0_0
λ_lb[61, 24] = 48_58 | λ_ub[61, 24] = 0_0
```

```
μ[61, 1] = 51_84
μ[61, 2] = 51_84
μ[61, 3] = 51_84
μ[61, 4] = 51_84
μ[61, 5] = 51_84
μ[61, 6] = 51_84
μ[61, 7] = 51_84
μ[61, 8] = 51_84
μ[61, 9] = 51_84
μ[61, 10] = 51_84
μ[61, 11] = 51_84
μ[61, 12] = 51_84
μ[61, 13] = 51_84
μ[61, 14] = 51_84
μ[61, 15] = 51_84
μ[61, 16] = 292_5
μ[61, 17] = 293_9
μ[61, 18] = 294_6
μ[61, 19] = 295_0
μ[61, 20] = 295_0
μ[61, 21] = 295_0
μ[61, 22] = 295_0
μ[61, 23] = 51_09
μ[61, 24] = 48_58
```

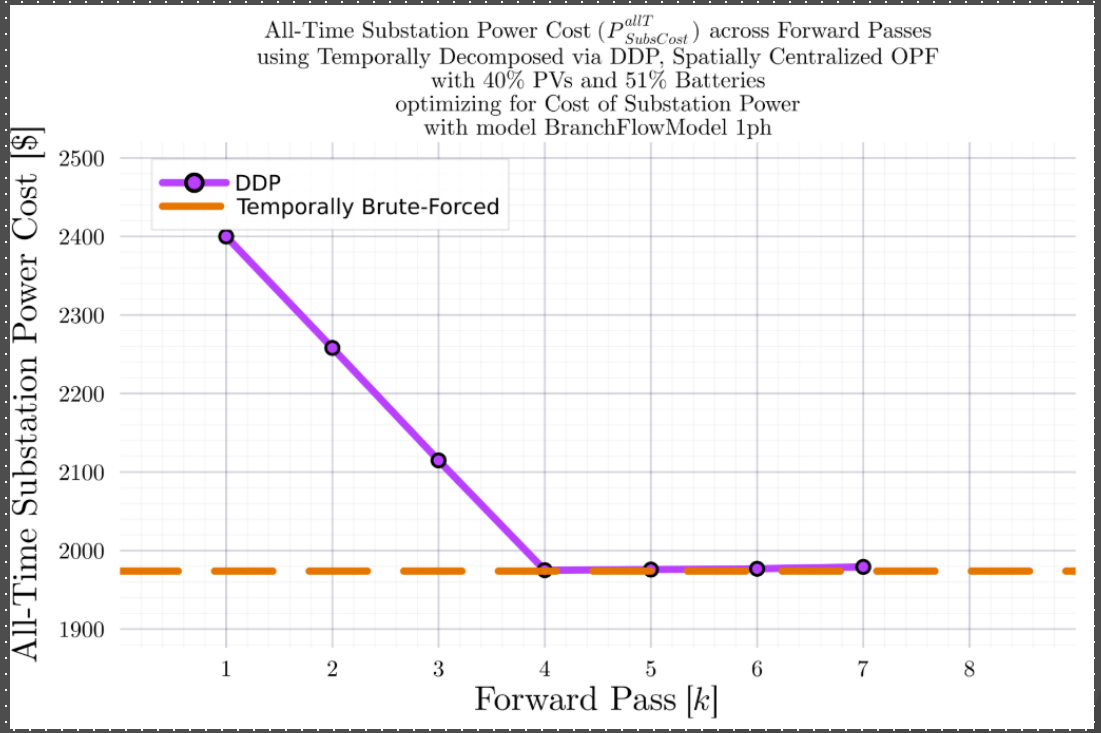
$IEEE123B_{\{1ph\}}$, $T = 24$

DDP Trajectory vs #Forward Passes $[k]$

Terminal SOC Constraint Relaxed

DDP

```
**************
∇L_{B_j^t} for [61, 1]: -0_058
∇L_{B_j^t} for [61, 2]: 0_2752
∇L_{B_j^t} for [61, 3]: -0_0761
∇L_{B_j^t} for [61, 4]: 0_2075
∇L_{B_j^t} for [61, 5]: 0_0649
∇L_{B_j^t} for [61, 6]: 0_0695
∇L_{B_j^t} for [61, 7]: 0_0257
∇L_{B_j^t} for [61, 8]: -0_01
∇L_{B_j^t} for [61, 9]: -258_3464
∇L_{B_j^t} for [61, 10]: 255_2
∇L_{B_j^t} for [61, 11]: 0_7125
∇L_{B_j^t} for [61, 12]: 0_3203
∇L_{B_j^t} for [61, 13]: -0_6333
∇L_{B_j^t} for [61, 14]: 0_0029
∇L_{B_j^t} for [61, 15]: 0_1537
∇L_{B_j^t} for [61, 16]: 250_4
∇L_{B_j^t} for [61, 17]: 0_3057
∇L_{B_j^t} for [61, 18]: -244_7698
∇L_{B_j^t} for [61, 19]: -4_1714
∇L_{B_j^t} for [61, 20]: 0_5775
∇L_{B_j^t} for [61, 21]: 1_291
∇L_{B_j^t} for [61, 22]: -0_0283
∇L_{B_j^t} for [61, 23]: 0_0327
∇L_{B_j^t} for [61, 24]: -0_0
**************
Total KKT balance for B_61: 42_41
**************
```



$k_{Max} = 7$

BruteForced (BF)

```
**************
∇L_{B_j^t} for [61, 1]: 0_0
∇L_{B_j^t} for [61, 2]: 0_0
∇L_{B_j^t} for [61, 3]: 0_0
∇L_{B_j^t} for [61, 4]: -0_0
∇L_{B_j^t} for [61, 5]: 0_0
∇L_{B_j^t} for [61, 6]: 0_0
∇L_{B_j^t} for [61, 7]: 0_0
∇L_{B_j^t} for [61, 8]: 0_0
∇L_{B_j^t} for [61, 9]: 0_0
∇L_{B_j^t} for [61, 10]: 0_0
∇L_{B_j^t} for [61, 11]: -0_0
∇L_{B_j^t} for [61, 12]: 0_0
∇L_{B_j^t} for [61, 13]: 0_0
∇L_{B_j^t} for [61, 14]: 0_0
∇L_{B_j^t} for [61, 15]: -0_0
∇L_{B_j^t} for [61, 16]: 0_0
∇L_{B_j^t} for [61, 17]: 0_0
∇L_{B_j^t} for [61, 18]: 0_0
∇L_{B_j^t} for [61, 19]: 0_0
∇L_{B_j^t} for [61, 20]: 0_0
∇L_{B_j^t} for [61, 21]: -0_0
∇L_{B_j^t} for [61, 22]: 0_0
∇L_{B_j^t} for [61, 23]: 0_0
∇L_{B_j^t} for [61, 24]: -0_0
**************
Total KKT balance for B_61: 0_0
**************
```

$IEEE123B_{\{1ph\}}$, $T = 24$

DDP Trajectory vs #Forward Passes $[k]$

Terminal SOC Constraint Relaxed

DDP

```
**************
∇L_{B_j^t} for [61, 1]: -0_058
∇L_{B_j^t} for [61, 2]: 0_2752
∇L_{B_j^t} for [61, 3]: -0_0761
∇L_{B_j^t} for [61, 4]: 0_2075
∇L_{B_j^t} for [61, 5]: 0_0649
∇L_{B_j^t} for [61, 6]: 0_0695
∇L_{B_j^t} for [61, 7]: 0_0257
∇L_{B_j^t} for [61, 8]: -0_01
∇L_{B_j^t} for [61, 9]: -258_3464
∇L_{B_j^t} for [61, 10]: 255_2
∇L_{B_j^t} for [61, 11]: 0_7125
∇L_{B_j^t} for [61, 12]: 0_3203
∇L_{B_j^t} for [61, 13]: -0_6333
∇L_{B_j^t} for [61, 14]: 0_0029
∇L_{B_j^t} for [61, 15]: 0_1537
∇L_{B_j^t} for [61, 16]: 250_4
∇L_{B_j^t} for [61, 17]: 0_3057
∇L_{B_j^t} for [61, 18]: -244_7698
∇L_{B_j^t} for [61, 19]: -4_1714
∇L_{B_j^t} for [61, 20]: 0_5775
∇L_{B_j^t} for [61, 21]: 1_291
∇L_{B_j^t} for [61, 22]: -0_0283
∇L_{B_j^t} for [61, 23]: 0_0327
∇L_{B_j^t} for [61, 24]: -0_0
**************
Total KKT balance for B_61: 42_41
**************
```

```
λ_lb[61, 1] = 0_0 | λ_ub[61, 1] = 0_0
λ_lb[61, 2] = 0_0 | λ_ub[61, 2] = 0_0
λ_lb[61, 3] = 0_0 | λ_ub[61, 3] = 0_0
λ_lb[61, 4] = 0_0 | λ_ub[61, 4] = 0_0
λ_lb[61, 5] = 0_0 | λ_ub[61, 5] = 0_0
λ_lb[61, 6] = 0_0 | λ_ub[61, 6] = 0_0
λ_lb[61, 7] = 0_0 | λ_ub[61, 7] = 0_0
λ_lb[61, 8] = 0_0 | λ_ub[61, 8] = 0_0
λ_lb[61, 9] = 0_0 | λ_ub[61, 9] = 0_0
λ_lb[61, 10] = 0_0 | λ_ub[61, 10] = 0_0001
λ_lb[61, 11] = 0_0 | λ_ub[61, 11] = 0_0
λ_lb[61, 12] = 0_0 | λ_ub[61, 12] = 0_0
λ_lb[61, 13] = 0_0 | λ_ub[61, 13] = 0_0
λ_lb[61, 14] = 0_0 | λ_ub[61, 14] = 0_0
λ_lb[61, 15] = 0_0 | λ_ub[61, 15] = 243_9
λ_lb[61, 16] = 0_0 | λ_ub[61, 16] = 4_984
λ_lb[61, 17] = 0_0 | λ_ub[61, 17] = 0_0
λ_lb[61, 18] = 0_0 | λ_ub[61, 18] = 0_0
λ_lb[61, 19] = 0_0 | λ_ub[61, 19] = 0_0
λ_lb[61, 20] = 0_0 | λ_ub[61, 20] = 0_0
λ_lb[61, 21] = 0_0001 | λ_ub[61, 21] = 0_0
λ_lb[61, 22] = 245_7 | λ_ub[61, 22] = 0_0
λ_lb[61, 23] = 2_532 | λ_ub[61, 23] = 0_0
λ_lb[61, 24] = 48_49 | λ_ub[61, 24] = 0_0
```

```
μ[61, 1, 7] = 49_4
μ[61, 2, 7] = 49_46
μ[61, 3, 7] = 49_18
μ[61, 4, 7] = 49_26
μ[61, 5, 7] = 49_05
μ[61, 6, 7] = 48_99
μ[61, 7, 7] = 48_92
μ[61, 8, 7] = 48_89
μ[61, 9, 7] = 48_9
μ[61, 10, 7] = 307_2
μ[61, 11, 7] = 52_03
μ[61, 12, 7] = 51_32
μ[61, 13, 7] = 51_0
μ[61, 14, 7] = 51_63
μ[61, 15, 7] = 51_63
μ[61, 16, 7] = 295_3
μ[61, 17, 7] = 49_95
μ[61, 18, 7] = 49_65
μ[61, 19, 7] = 294_4
μ[61, 20, 7] = 298_6
μ[61, 21, 7] = 298_0
μ[61, 22, 7] = 296_7
μ[61, 23, 7] = 51_05
μ[61, 24, 7] = 48_49
```

$k_{Max} = 11$

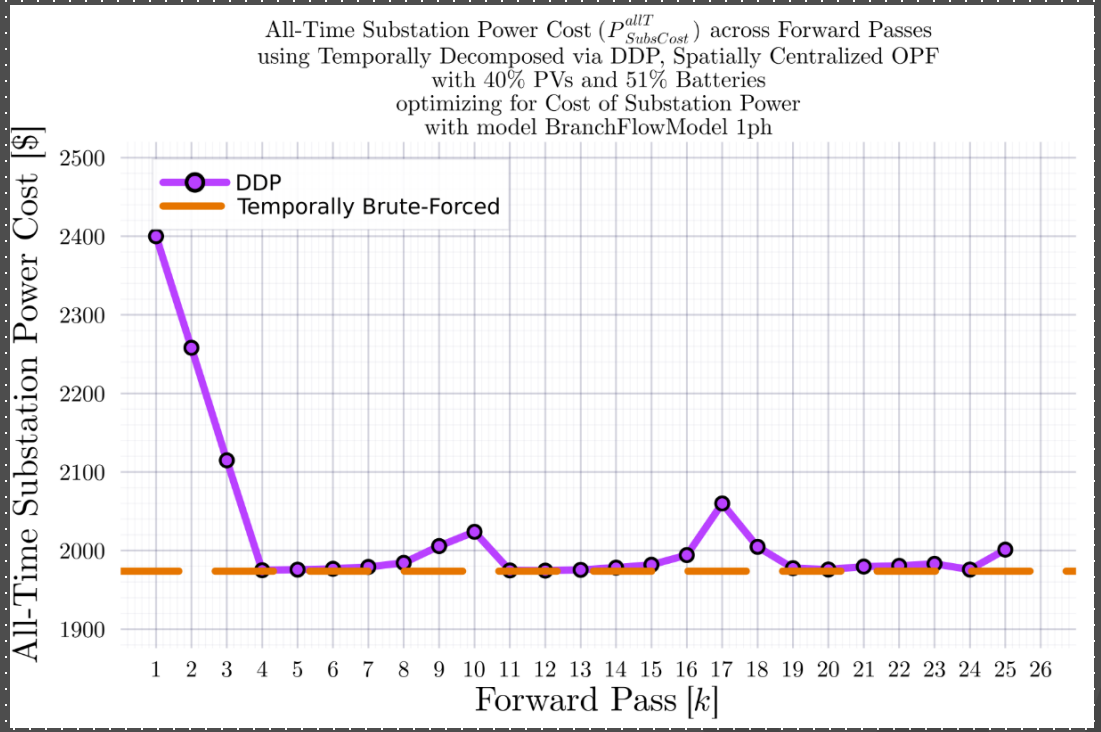
$IEEE123B_{\{1ph\}}$, $T = 24$

DDP Trajectory vs #Forward Passes $[k]$

Terminal SOC Constraint Relaxed

DDP

```
**************
∇L_{B_j^t} for [61, 1]: 0_2341
∇L_{B_j^t} for [61, 2]: 0_0087
∇L_{B_j^t} for [61, 3]: 0_0049
∇L_{B_j^t} for [61, 4]: -0_1182
∇L_{B_j^t} for [61, 5]: 0_0026
∇L_{B_j^t} for [61, 6]: -239_3876
∇L_{B_j^t} for [61, 7]: 239_1
∇L_{B_j^t} for [61, 8]: 0_2523
∇L_{B_j^t} for [61, 9]: 0_1387
∇L_{B_j^t} for [61, 10]: -0_0274
∇L_{B_j^t} for [61, 11]: -0_0082
∇L_{B_j^t} for [61, 12]: -0_0664
∇L_{B_j^t} for [61, 13]: -0_0043
∇L_{B_j^t} for [61, 14]: 0_1052
∇L_{B_j^t} for [61, 15]: -0_7692
∇L_{B_j^t} for [61, 16]: 0_103
∇L_{B_j^t} for [61, 17]: -0_3328
∇L_{B_j^t} for [61, 18]: -0_0635
∇L_{B_j^t} for [61, 19]: 0_4364
∇L_{B_j^t} for [61, 20]: 0_01
∇L_{B_j^t} for [61, 21]: 0_0276
∇L_{B_j^t} for [61, 22]: 0_0446
∇L_{B_j^t} for [61, 23]: 0_0227
∇L_{B_j^t} for [61, 24]: 0_0
**************
Total KKT balance for B_61: 20_05
**************
```



$k_{Max} = 25$

BruteForced (BF)

```
**************
∇L_{B_j^t} for [61, 1]: 0_0
∇L_{B_j^t} for [61, 2]: 0_0
∇L_{B_j^t} for [61, 3]: 0_0
∇L_{B_j^t} for [61, 4]: -0_0
∇L_{B_j^t} for [61, 5]: 0_0
∇L_{B_j^t} for [61, 6]: 0_0
∇L_{B_j^t} for [61, 7]: 0_0
∇L_{B_j^t} for [61, 8]: 0_0
∇L_{B_j^t} for [61, 9]: 0_0
∇L_{B_j^t} for [61, 10]: 0_0
∇L_{B_j^t} for [61, 11]: -0_0
∇L_{B_j^t} for [61, 12]: 0_0
∇L_{B_j^t} for [61, 13]: 0_0
∇L_{B_j^t} for [61, 14]: 0_0
∇L_{B_j^t} for [61, 15]: -0_0
∇L_{B_j^t} for [61, 16]: 0_0
∇L_{B_j^t} for [61, 17]: 0_0
∇L_{B_j^t} for [61, 18]: 0_0
∇L_{B_j^t} for [61, 19]: 0_0
∇L_{B_j^t} for [61, 20]: 0_0
∇L_{B_j^t} for [61, 21]: -0_0
∇L_{B_j^t} for [61, 22]: 0_0
∇L_{B_j^t} for [61, 23]: 0_0
∇L_{B_j^t} for [61, 24]: -0_0
**************
Total KKT balance for B_61: 0_0
**************
```

$IEEE123B_{\{1ph\}}$, $T = 24$

DDP Trajectory vs #Forward Passes $[k]$

Terminal SOC Constraint Relaxed

DDP

```
**************
∇L_{B_j^t} for [61, 1]: 0_2341
∇L_{B_j^t} for [61, 2]: 0_0087
∇L_{B_j^t} for [61, 3]: 0_0049
∇L_{B_j^t} for [61, 4]: -0_1182
∇L_{B_j^t} for [61, 5]: 0_0026
∇L_{B_j^t} for [61, 6]: -239_3876
∇L_{B_j^t} for [61, 7]: 239_1
∇L_{B_j^t} for [61, 8]: 0_2523
∇L_{B_j^t} for [61, 9]: 0_1387
∇L_{B_j^t} for [61, 10]: -0_0274
∇L_{B_j^t} for [61, 11]: -0_0082
∇L_{B_j^t} for [61, 12]: -0_0664
∇L_{B_j^t} for [61, 13]: -0_0043
∇L_{B_j^t} for [61, 14]: 0_1052
∇L_{B_j^t} for [61, 15]: -0_7692
∇L_{B_j^t} for [61, 16]: 0_103
∇L_{B_j^t} for [61, 17]: -0_3328
∇L_{B_j^t} for [61, 18]: -0_0635
∇L_{B_j^t} for [61, 19]: 0_4364
∇L_{B_j^t} for [61, 20]: 0_01
∇L_{B_j^t} for [61, 21]: 0_0276
∇L_{B_j^t} for [61, 22]: 0_0446
∇L_{B_j^t} for [61, 23]: 0_0227
∇L_{B_j^t} for [61, 24]: 0_0
**************
Total KKT balance for B_61: 20_05
**************
```

```
λ_lb[61, 1] = 0_0 | λ_ub[61, 1] = 0_0
λ_lb[61, 2] = 0_0 | λ_ub[61, 2] = 0_0
λ_lb[61, 3] = 0_0 | λ_ub[61, 3] = 0_0
λ_lb[61, 4] = 0_0 | λ_ub[61, 4] = 0_0
λ_lb[61, 5] = 0_0 | λ_ub[61, 5] = 0_0
λ_lb[61, 6] = 0_0 | λ_ub[61, 6] = 0_0
λ_lb[61, 7] = 0_0 | λ_ub[61, 7] = 0_0001
λ_lb[61, 8] = 0_0 | λ_ub[61, 8] = 0_0001
λ_lb[61, 9] = 0_0 | λ_ub[61, 9] = 0_0
λ_lb[61, 10] = 0_0 | λ_ub[61, 10] = 0_0
λ_lb[61, 11] = 0_0 | λ_ub[61, 11] = 0_0
λ_lb[61, 12] = 0_0 | λ_ub[61, 12] = 0_0
λ_lb[61, 13] = 0_0 | λ_ub[61, 13] = 0_0
λ_lb[61, 14] = 0_0 | λ_ub[61, 14] = 0_0
λ_lb[61, 15] = 0_0 | λ_ub[61, 15] = 239_9
λ_lb[61, 16] = 0_0 | λ_ub[61, 16] = 1_511
λ_lb[61, 17] = 0_0 | λ_ub[61, 17] = 1_149
λ_lb[61, 18] = 0_0 | λ_ub[61, 18] = 0_2085
λ_lb[61, 19] = 0_0 | λ_ub[61, 19] = 0_0001
λ_lb[61, 20] = 0_0 | λ_ub[61, 20] = 0_0
λ_lb[61, 21] = 0_0001 | λ_ub[61, 21] = 0_0
λ_lb[61, 22] = 244_0 | λ_ub[61, 22] = 0_0
λ_lb[61, 23] = 2_555 | λ_ub[61, 23] = 0_0
λ_lb[61, 24] = 48_45 | λ_ub[61, 24] = 0_0
```

```
μ[61, 1, 25] = 51_84
μ[61, 2, 25] = 51_6
μ[61, 3, 25] = 51_6
μ[61, 4, 25] = 51_59
μ[61, 5, 25] = 51_71
μ[61, 6, 25] = 51_71
μ[61, 7, 25] = 291_1
μ[61, 8, 25] = 52_02
μ[61, 9, 25] = 51_76
μ[61, 10, 25] = 51_62
μ[61, 11, 25] = 51_65
μ[61, 12, 25] = 51_66
μ[61, 13, 25] = 51_73
μ[61, 14, 25] = 51_73
μ[61, 15, 25] = 51_63
μ[61, 16, 25] = 292_3
μ[61, 17, 25] = 293_7
μ[61, 18, 25] = 295_2
μ[61, 19, 25] = 295_5
μ[61, 20, 25] = 295_1
μ[61, 21, 25] = 295_1
μ[61, 22, 25] = 295_0
μ[61, 23, 25] = 51_03
μ[61, 24, 25] = 48_45
```

$k_{Max} = 25$

Latest Slides End Here.
Previous Slides Follow.