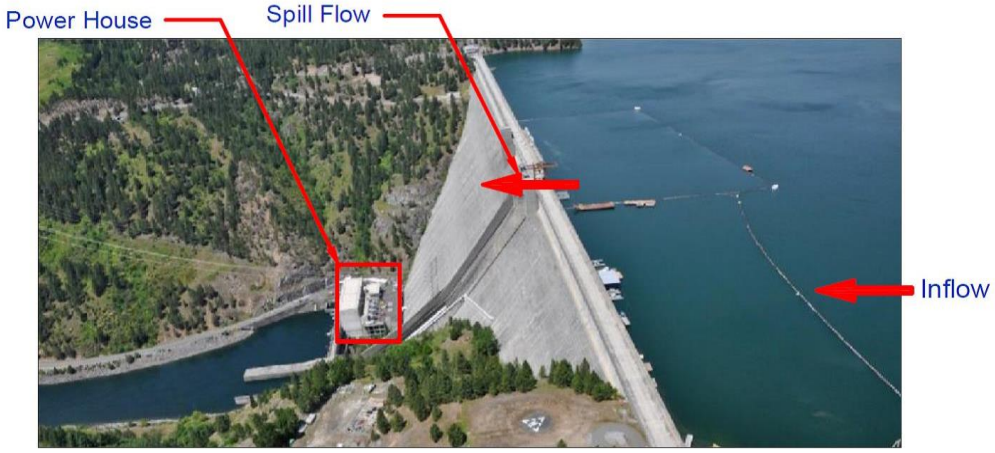
An approach to Robust Optimization of Large Scale Complex River System

Arpan Biswas

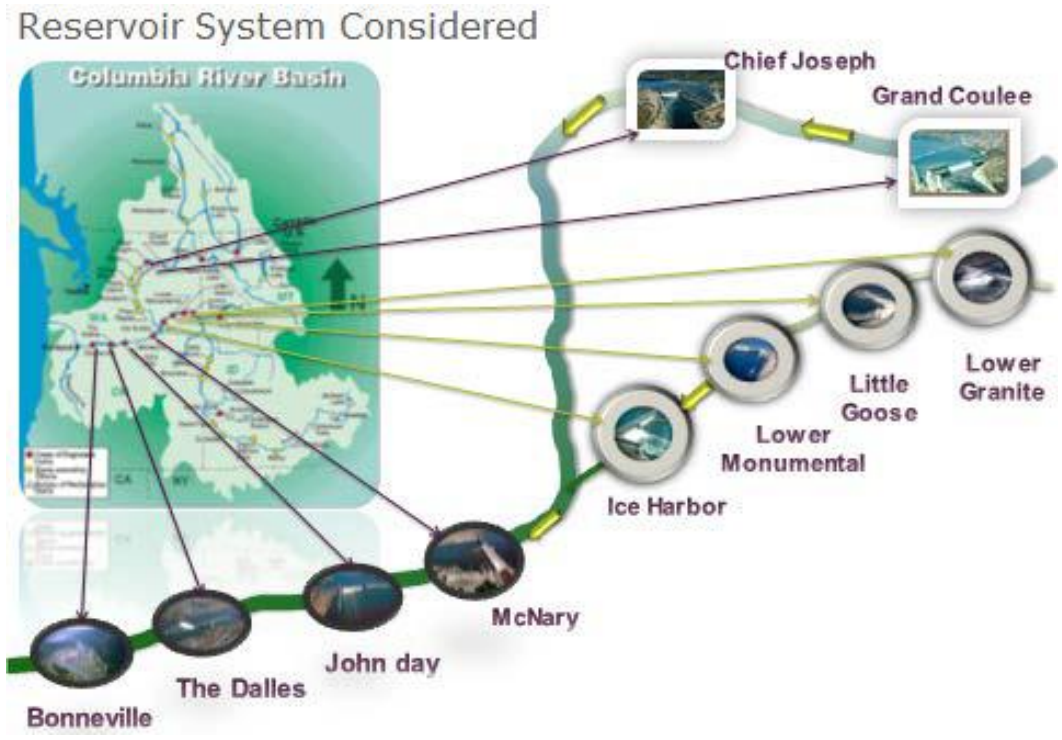
ST 541 Project

28th Nov, 2018

GitHub Link: https://github.com/ST541-Fall2018/arpanbiswas52-project-ComplexRiverSystem



Hydro energy generation problem



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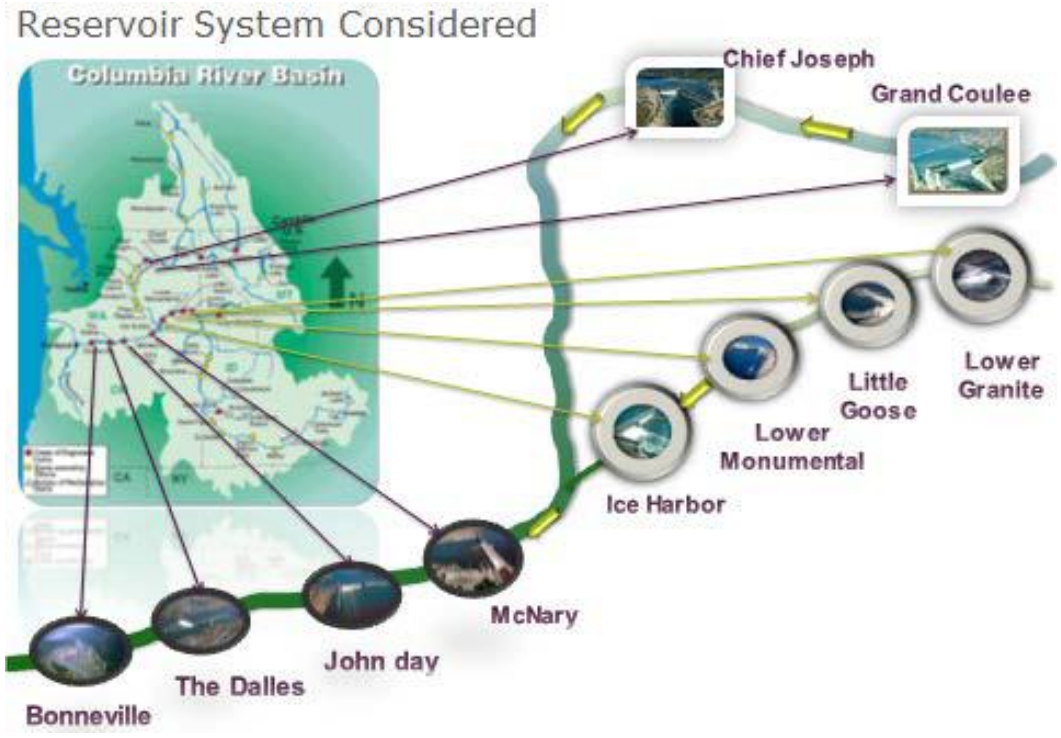
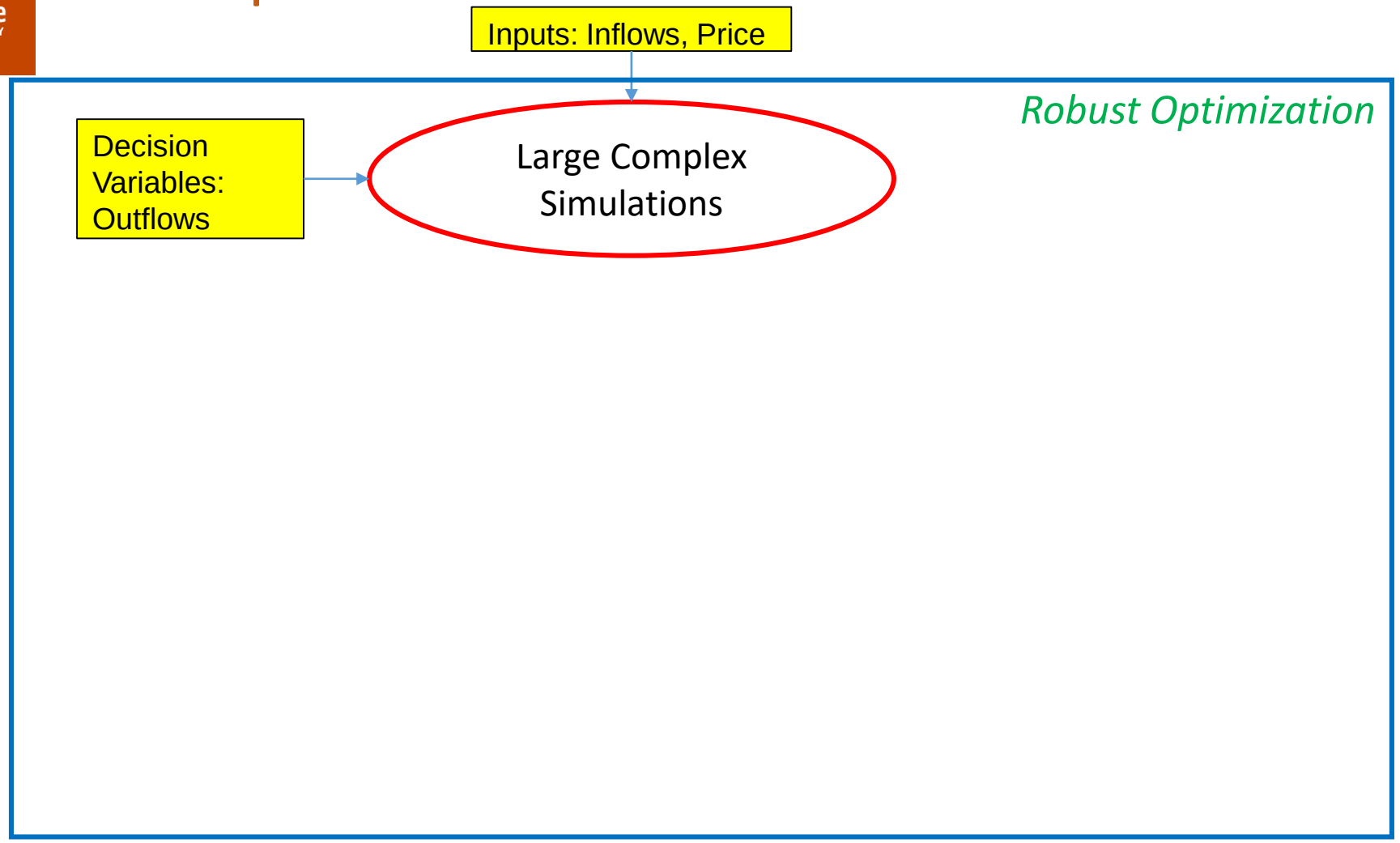


Goal:

- **Uncertainty Quantification** of Inflows, Prices etc.
- **Robust Decision** of Optimal Energy Allocation.

Optimization Model Framework



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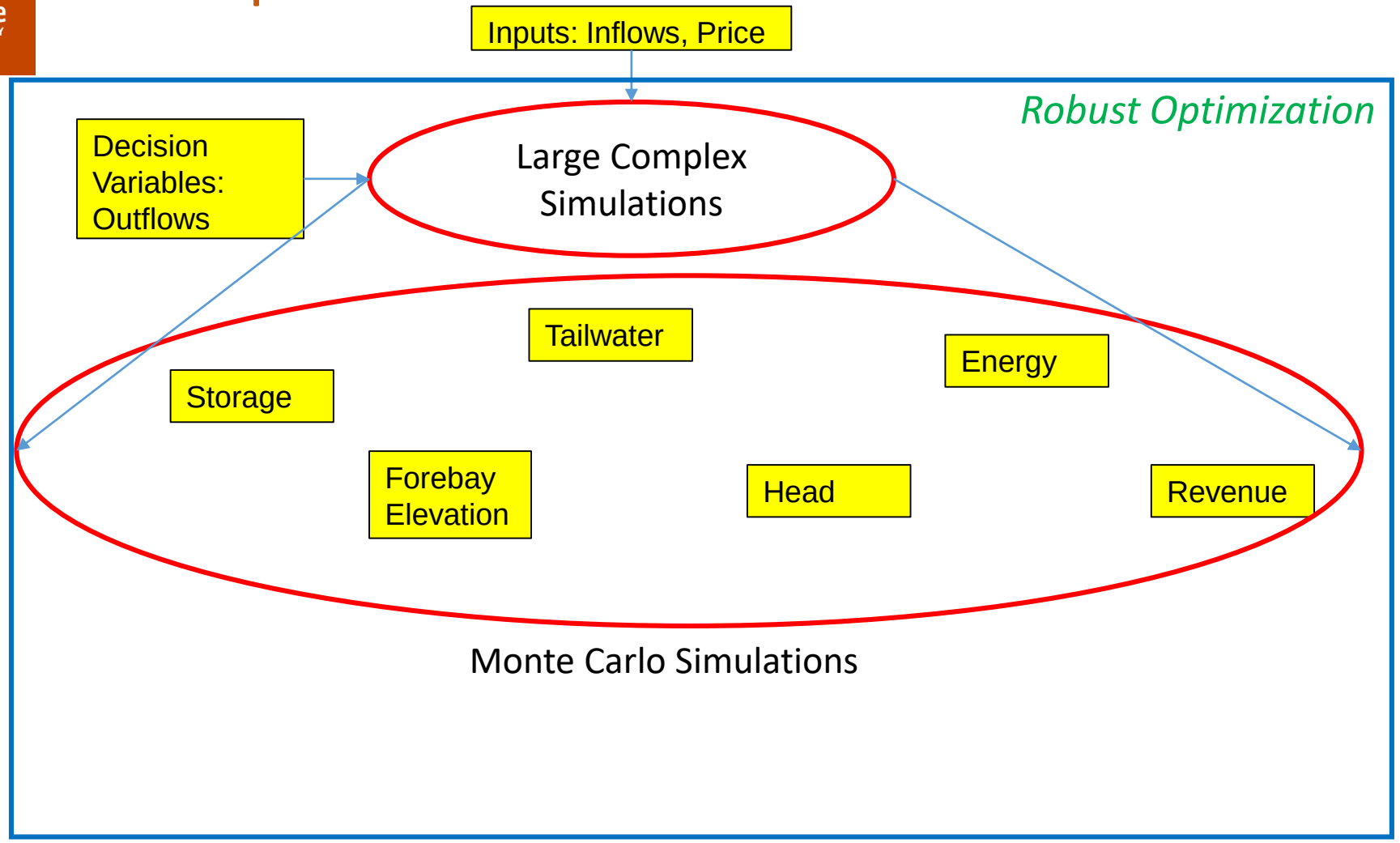

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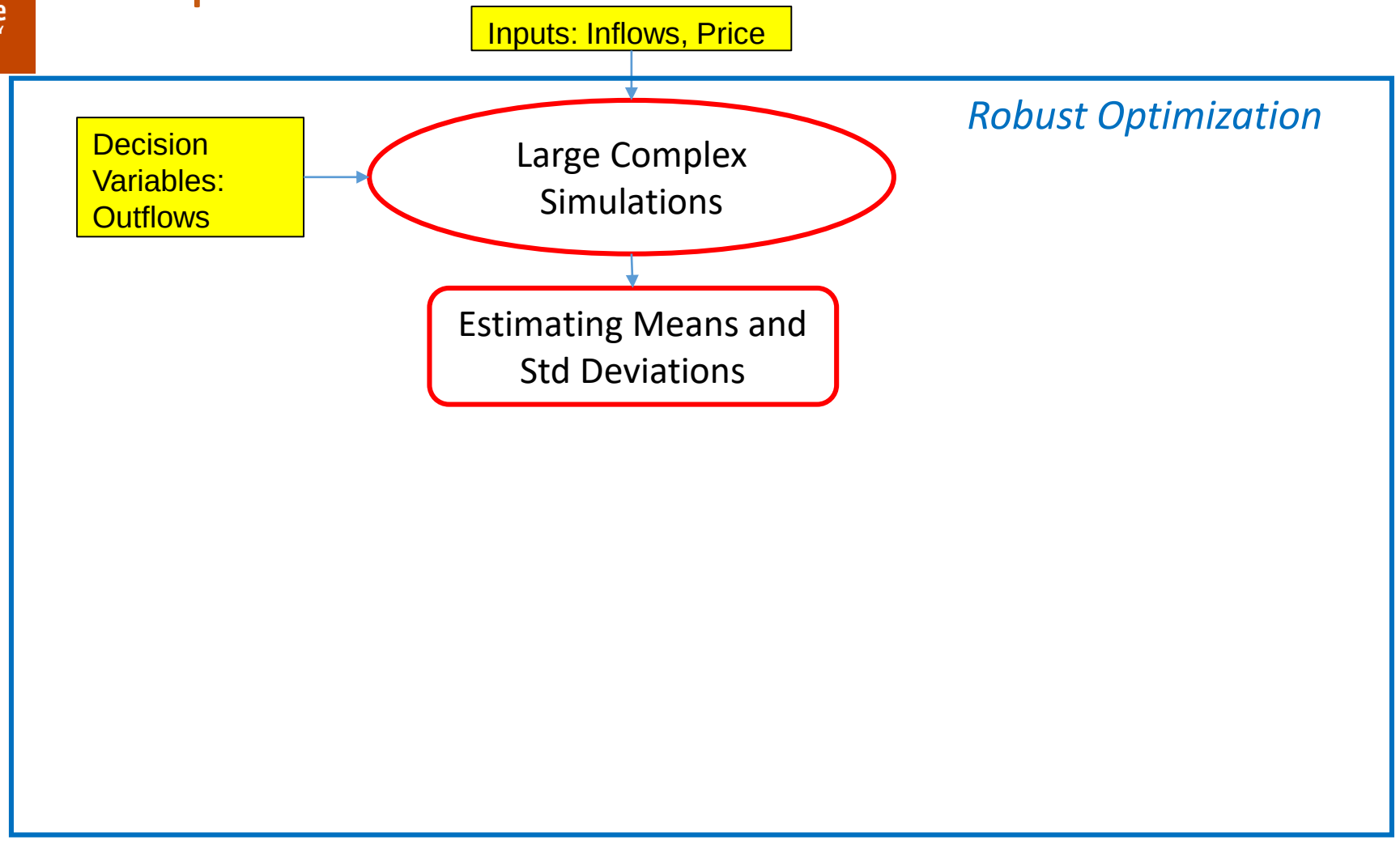

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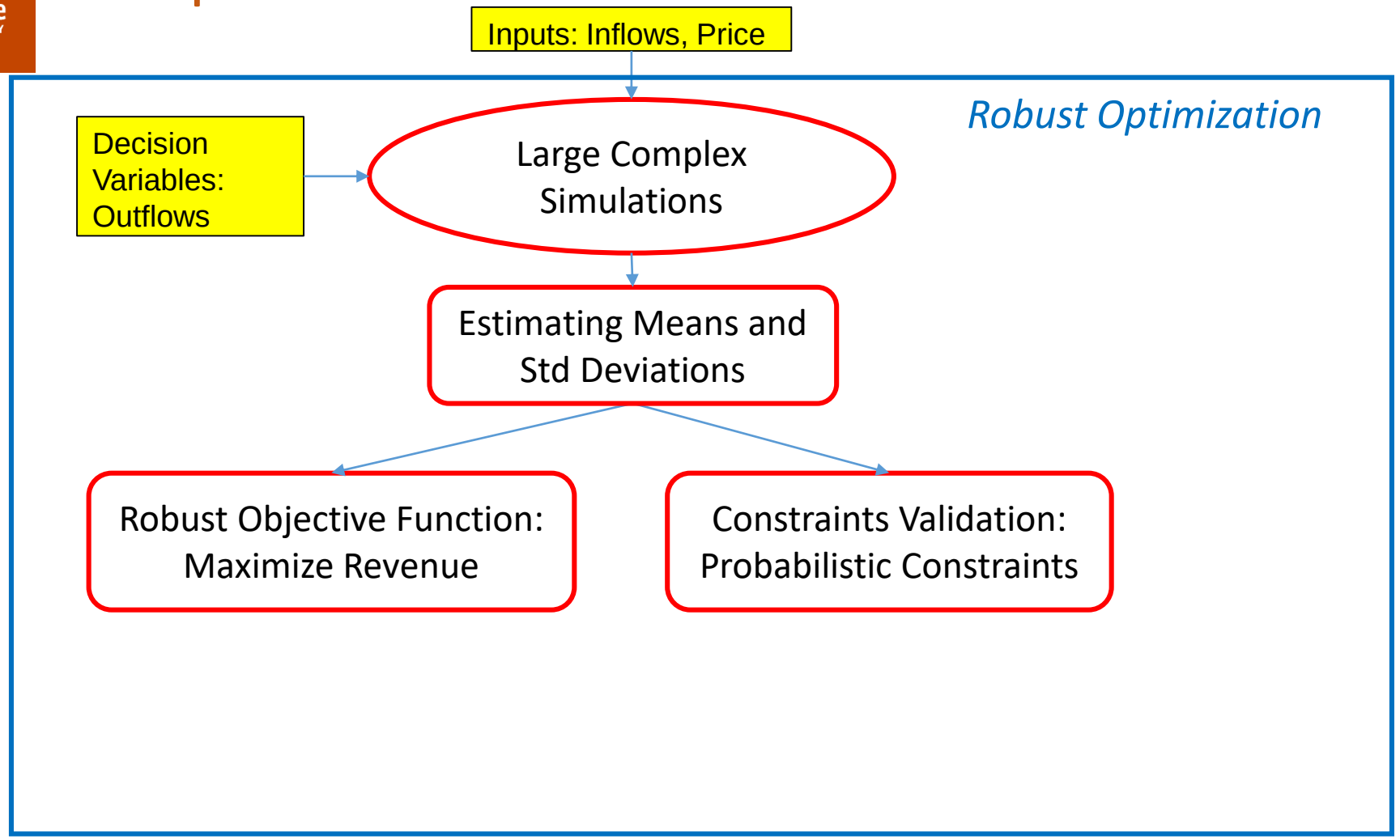

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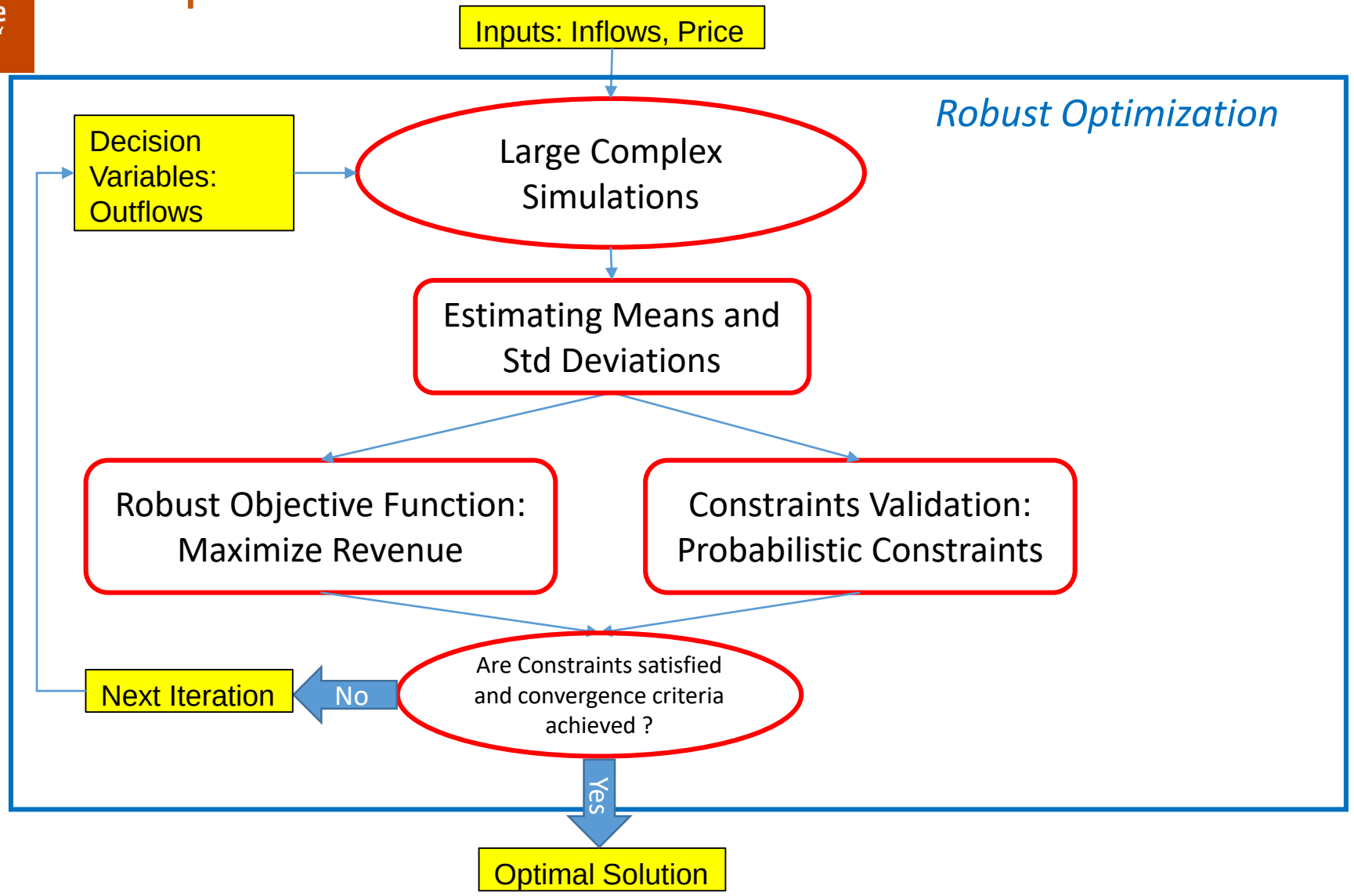

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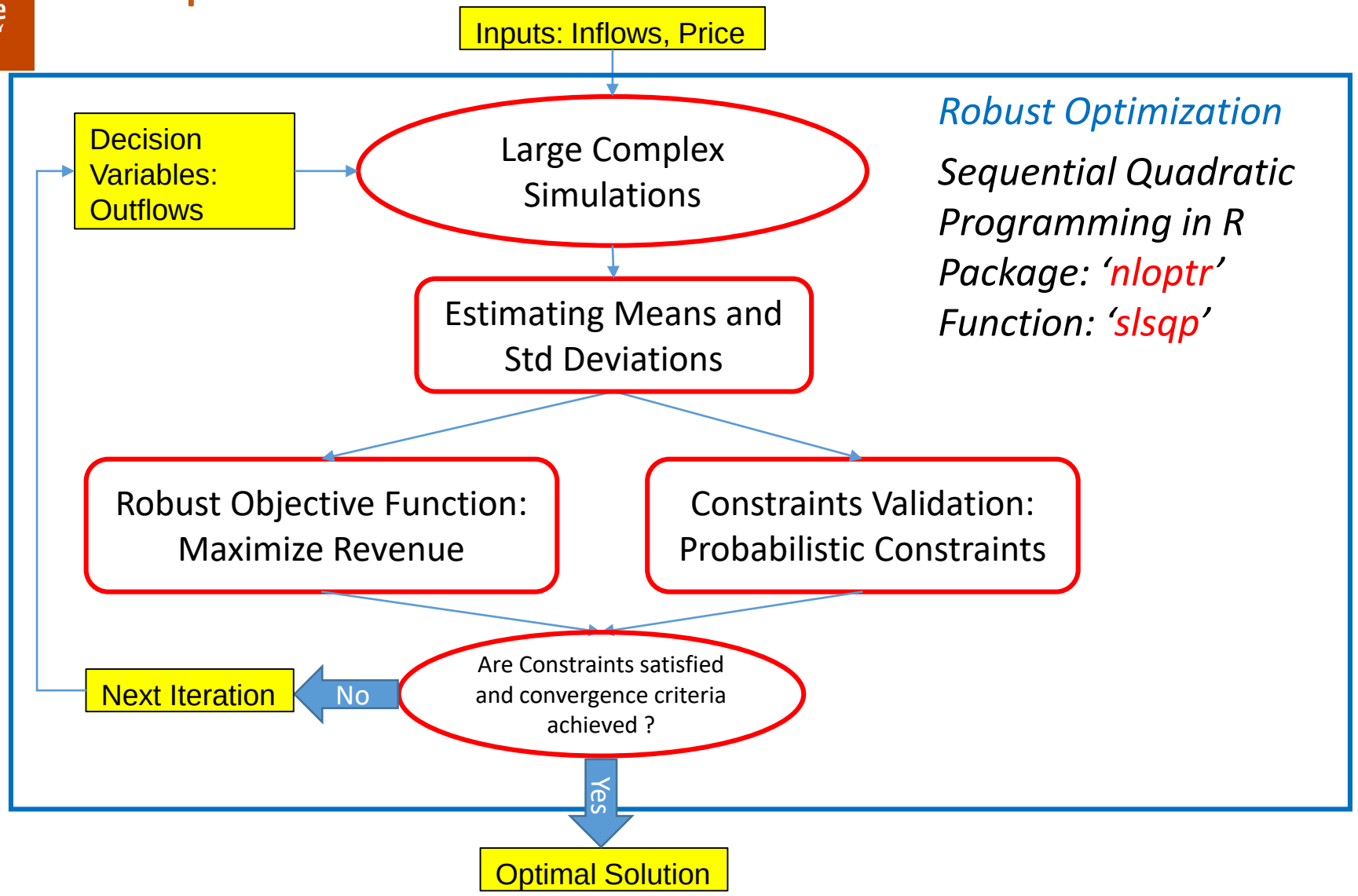
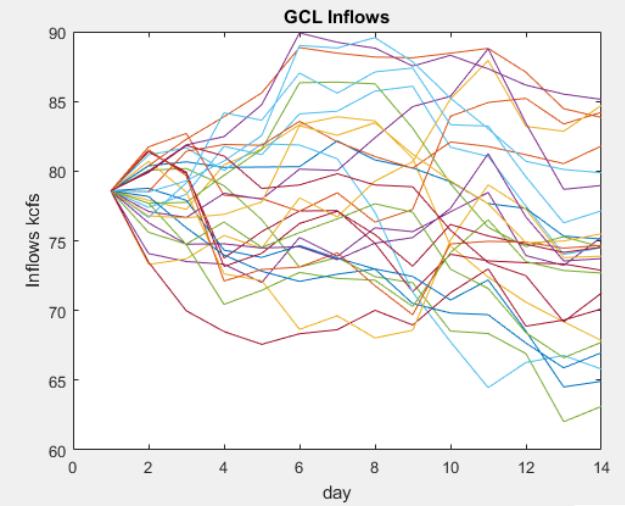
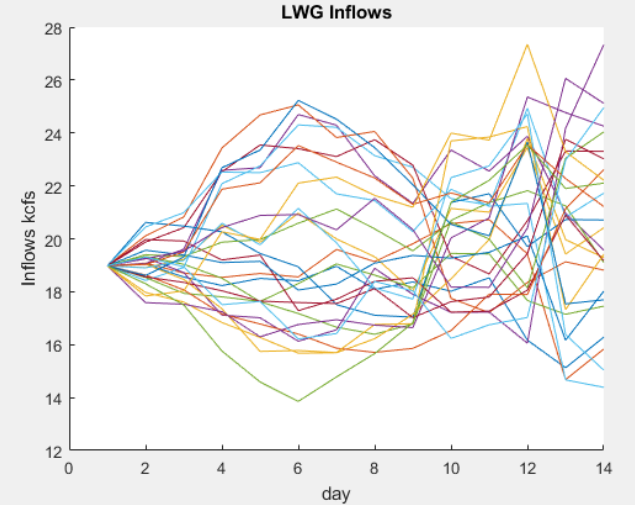
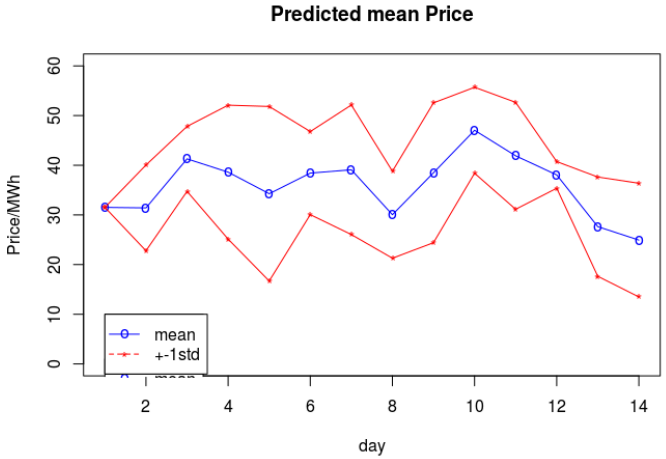


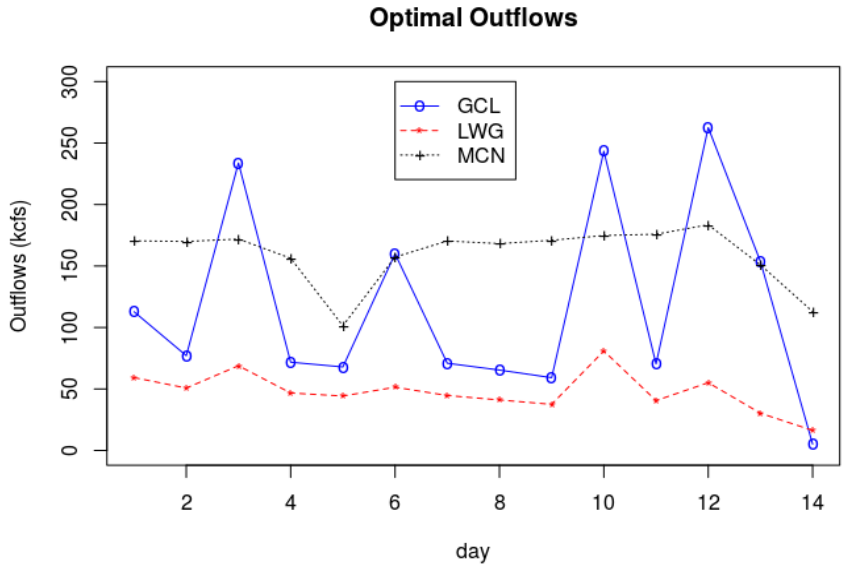
RESULTS

Reservoirs: Grand Coulee, Lower Granite and McNaire







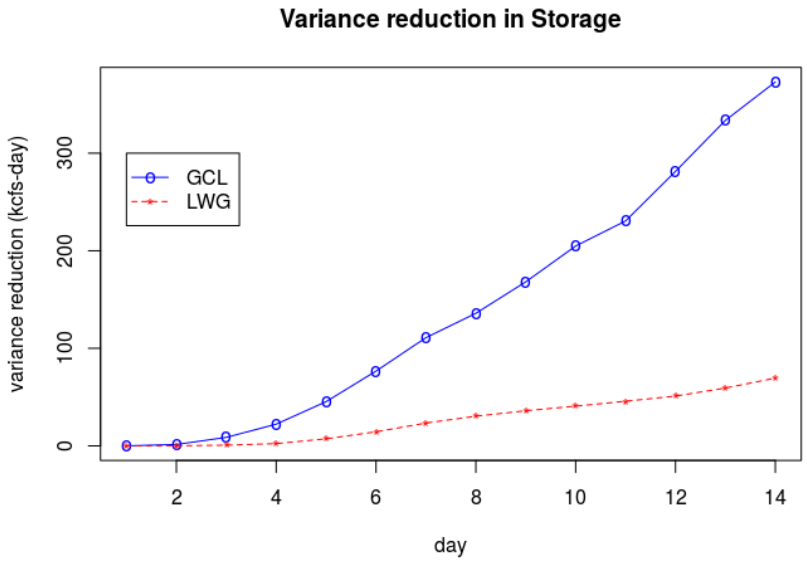


Challenges

Challenges

- **Antithetic Variable Approach** for efficient UQ and better decision

COMPARISON



	MC approach	Antithetic variables approach
No. of simulations	500	100
Run-time per iterations (approx.)	128 s (Total time = 19 min approx.)	4.64 s (Total time = 8 min approx.)
Revenue (at optimal sol.)	$88 M	$88.9 M
Improvement in Revenue		$0.9 M (1%)

Thank You!!!

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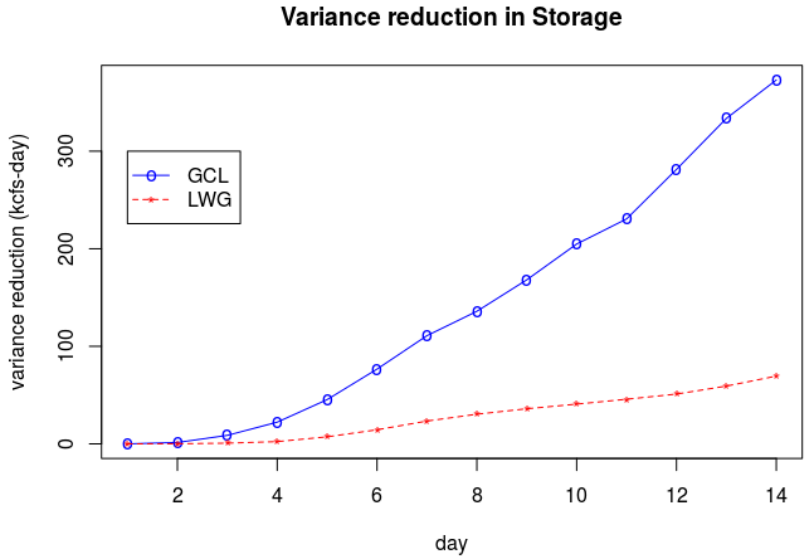
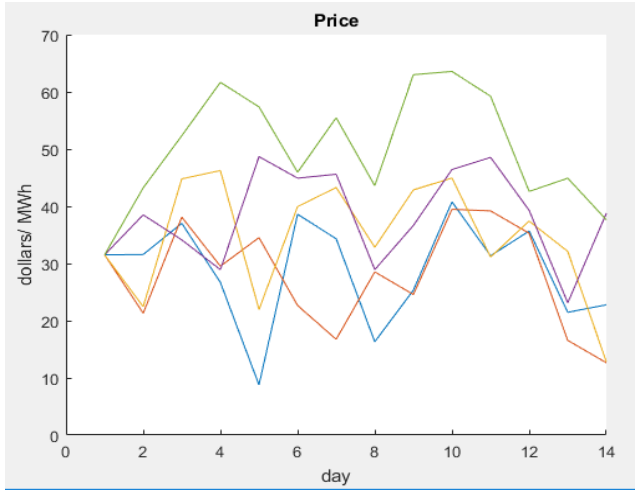
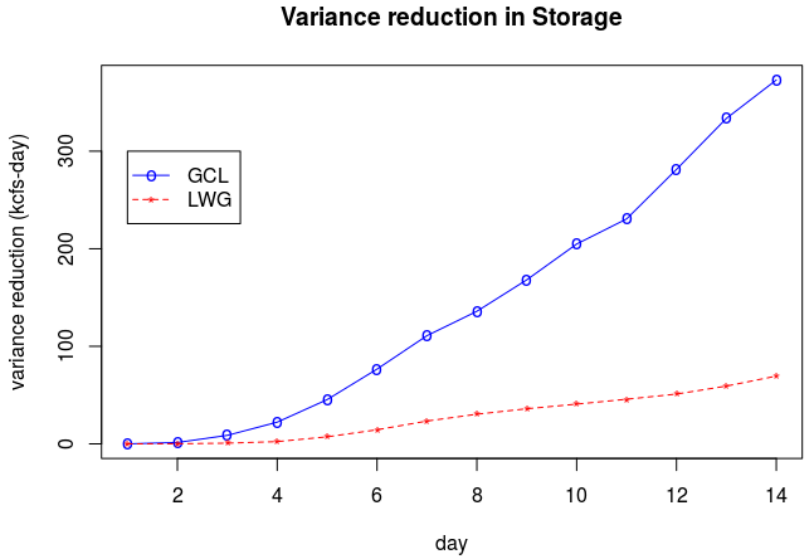
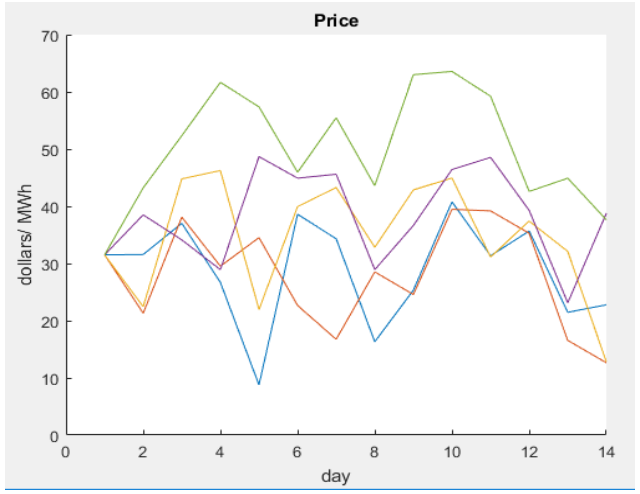
COMPARISON


Variance reduction in Storage
variance reduction (kcfs-day)
0
100
200
300
GCL
LWG
2
4
6
8
10
12
14
day

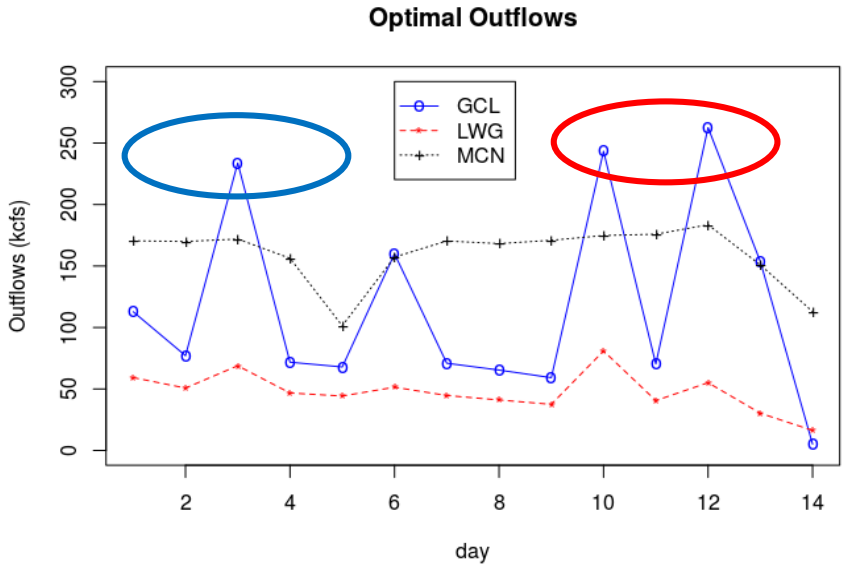

Price
dollars/ MWh
0
10
20
30
40
50
60
70
0
2
4
6
8
10
12
14
day

COMPARISON

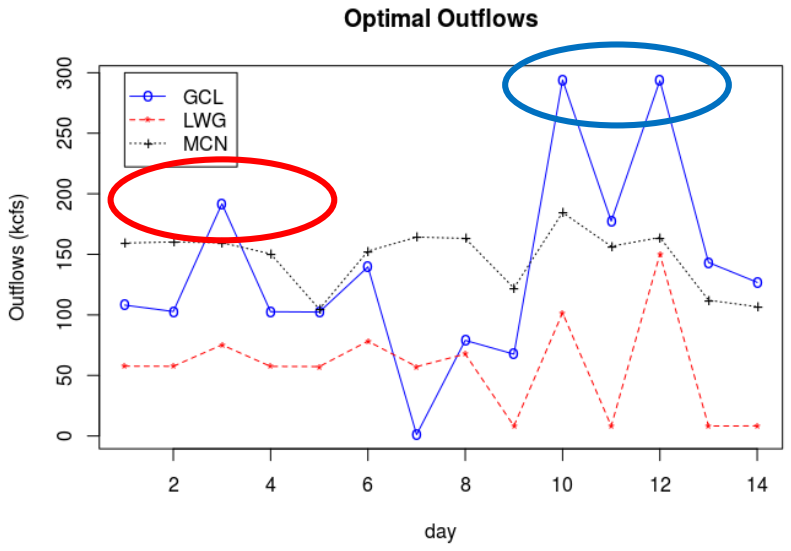




MC approach



Antithetic variables approach



lower

higher