Significant Scenarios Benchmark: Gurobi vs QPU Comprehensive Analysis
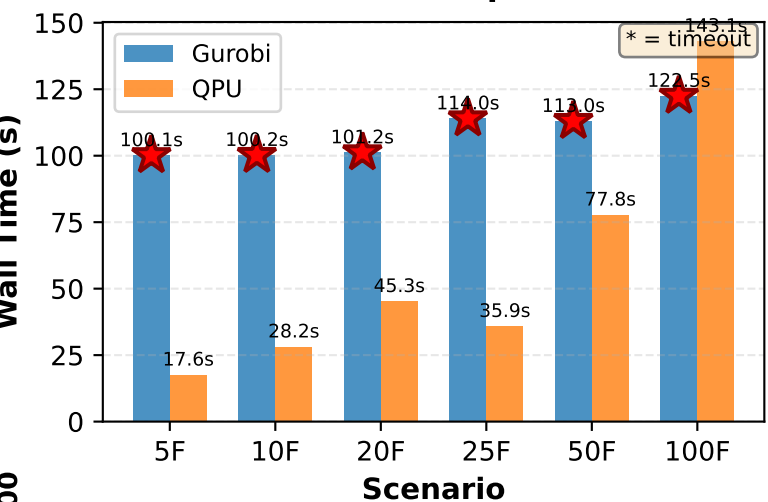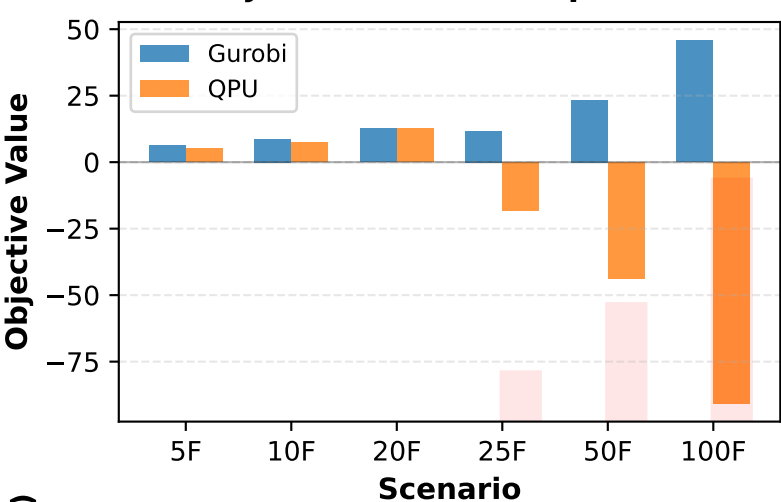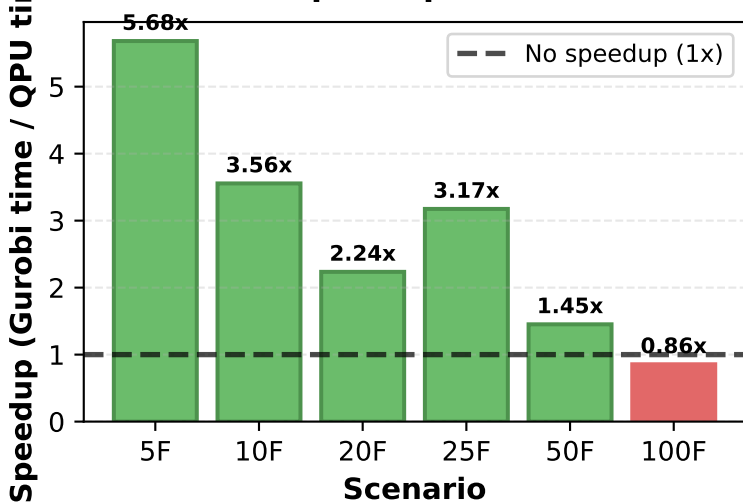

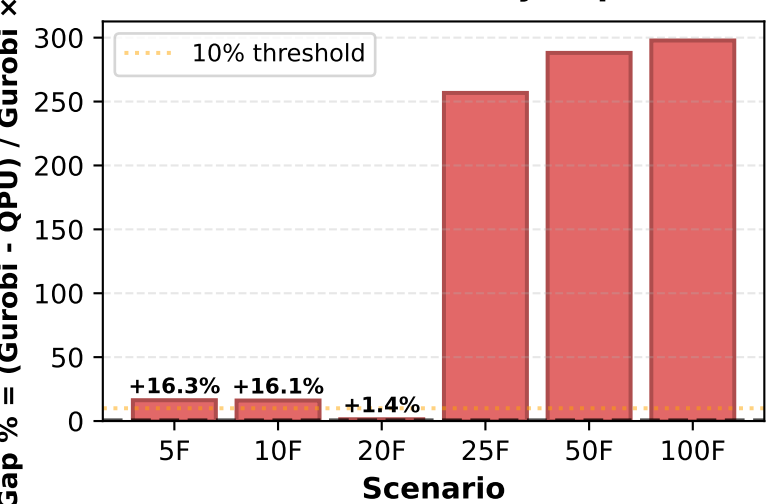**Runtime Comparison** — Wall Time (s) vs Scenario (5F, 10F, 20F, 25F, 50F, 100F). Gurobi times: 100.1s, 100.2s, 101.2s, 114.0s, 113.0s, 122.5s (marked with * = timeout). QPU times: 17.6s, 28.2s, 45.3s, 35.9s, 77.8s, 143.1s.

Objective Value Comparison — Gurobi vs QPU objective values by scenario.

QPU Speedup vs Gurobi — Speedup (Gurobi time / QPU time): 5.68x, 3.56x, 2.24x, 3.17x, 1.45x, 0.86x. Dashed line = No speedup (1x).

Solution Quality Gap — Gap % = (Gurobi − QPU) / Gurobi × 100: +16.3%, +16.1%, +1.4%, ~257%, ~288%, ~298%. Dotted line = 10% threshold.

QPU Constraint Violations (QPU only) — Rotation, Diversity, Area. 5F: 30, 10F: 60, 20F: 120.
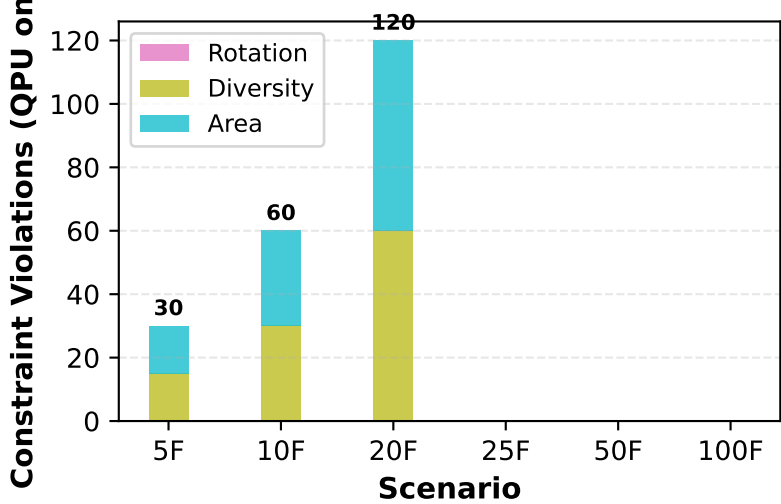
Scaling with Problem Size — Runtime (s) vs Problem Size (number of variables) for Gurobi and QPU; Crossover marked.
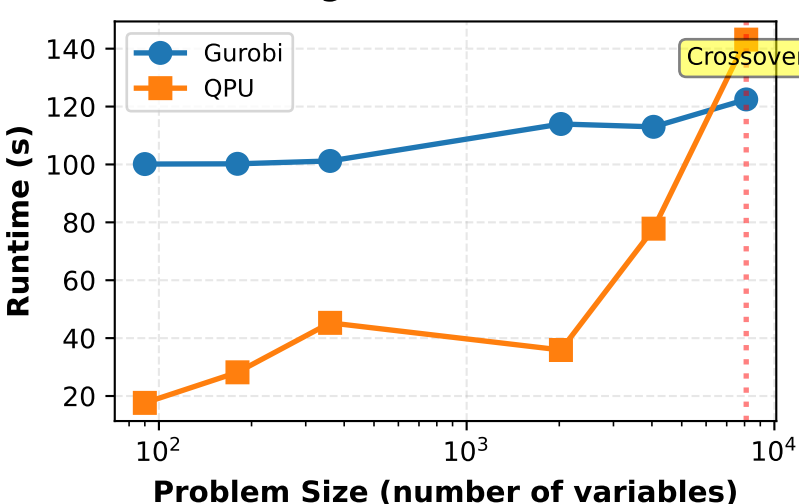
Summary: Gurobi vs QPU Performance

Scenario	Size	Gurobi Obj	QPU Obj	Gap%	Gurobi Time(s)	QPU Time(s)	Speedup	QPU Violations	Status
5F-6C	90	6.17	5.16	+16.3%	100.1	17.6	5.68x	30	✓
10F-6C	180	8.69	7.29	+16.1%	100.2	28.2	3.56x	60	✓
20F-6C	360	12.78	12.61	+1.4%	101.2	45.3	2.24x	120	✓
25F-27C	2025	11.68	-18.30	+256.7%	114.0	35.9	3.17x	INFEAS	⚠
50F-27C	4050	23.35	-43.92	+288.1%	113.0	77.8	1.45x	INFEAS	⚠
100F-27C	8100	45.87	-90.72	+297.8%	122.5	143.1	0.86x	INFEAS	⚠

Summary: 6 scenarios tested | Gurobi timeouts: 6/6 | Avg speedup: 2.83x | Avg gap (clique only): +11.2%