Performance Monitoring Results for the DoD Fuel Cell Fleet

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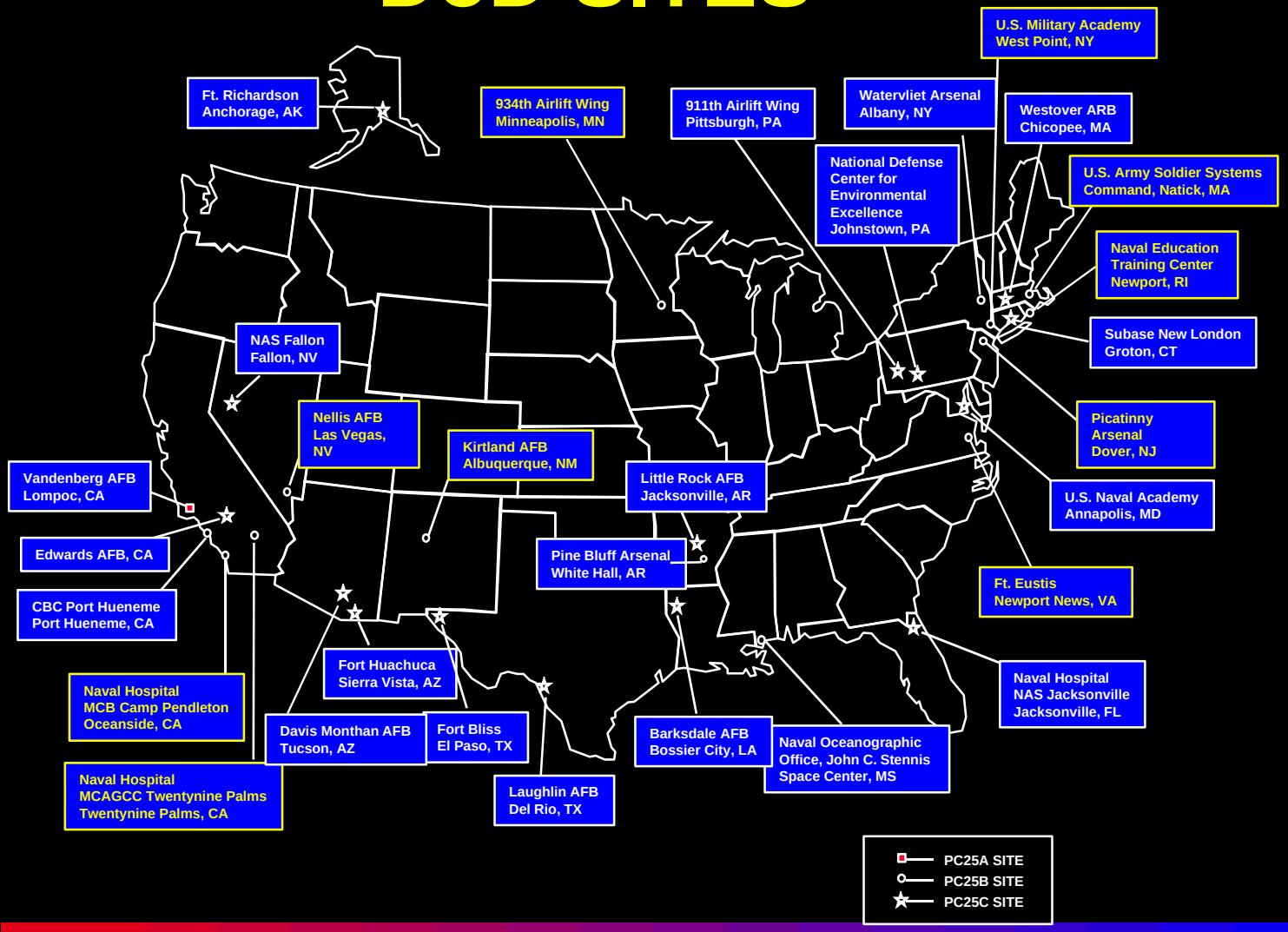
DoD PC25 Fleet

- Installed 1995
  - 10 PC25 Model B Units
- Installed 1997
  - 4 PC25 Model B Units
  - 15 PC25 Model C Units

PC25 POWER PLANT
DoD SITES



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11/11/98

Facility Applications

- Central Heat Plants

  11 Sites

- Hospital Utility Plants

  7 Sites

- Pool / Gymnasiums

  3 Sites

- Others

  Barracks, Dining Facility, Laundry, NG Armory, Launch Control Bldg, Office, Evaporator process

Model B Fleet Performance

- Availability
- Outages
- Stack Voltage
- Efficiency
- Issues / Experiences
- Emissions Field Tests

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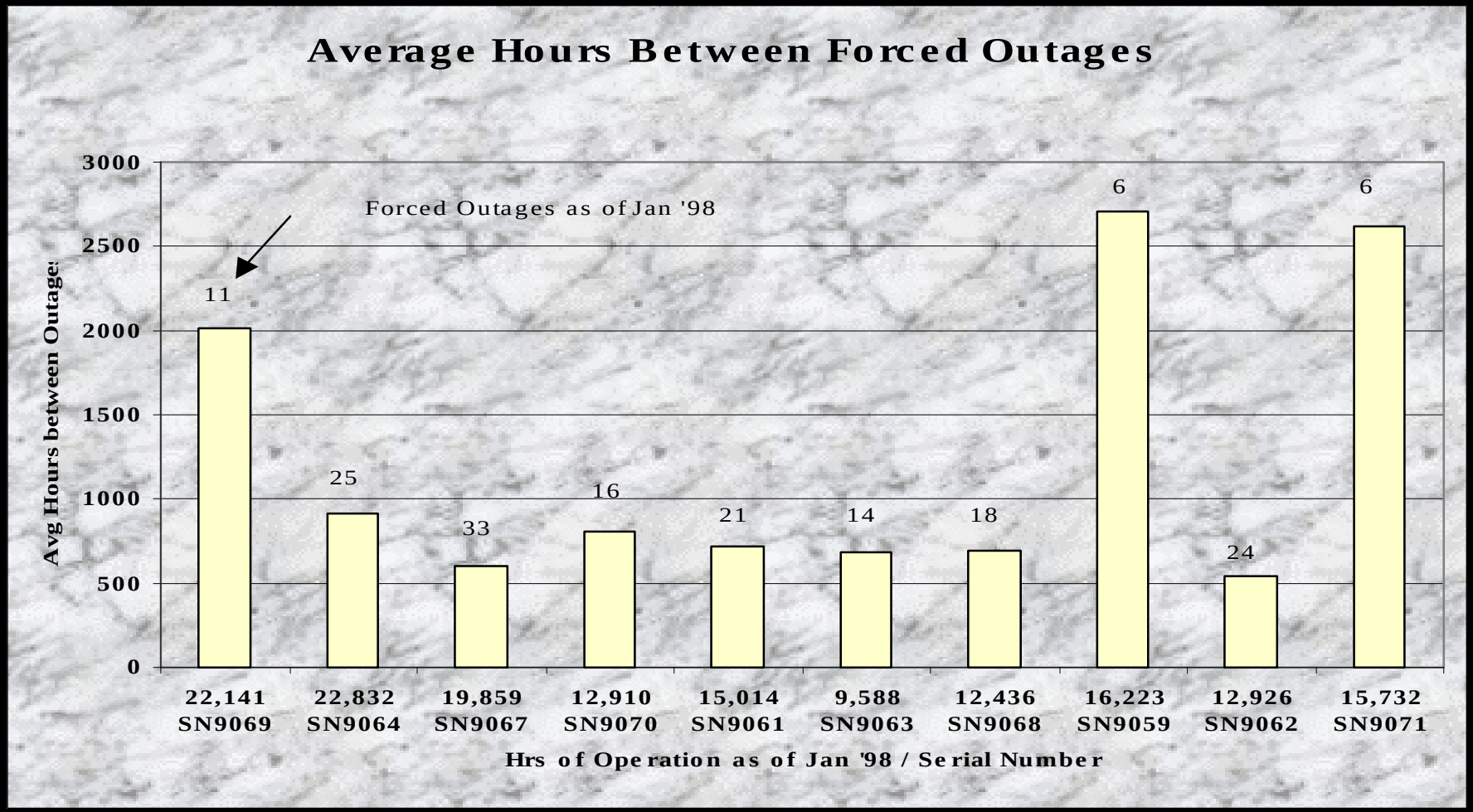
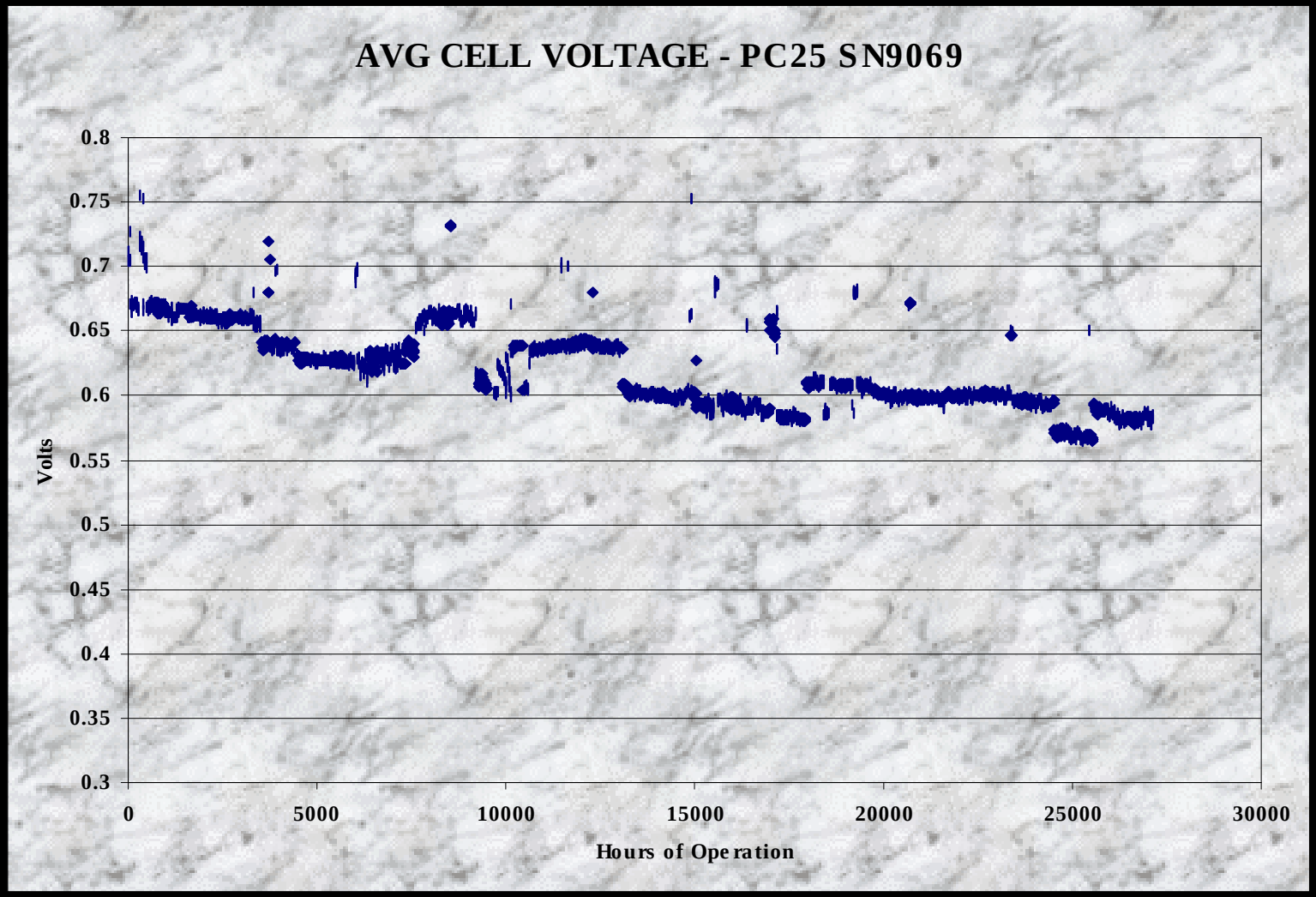
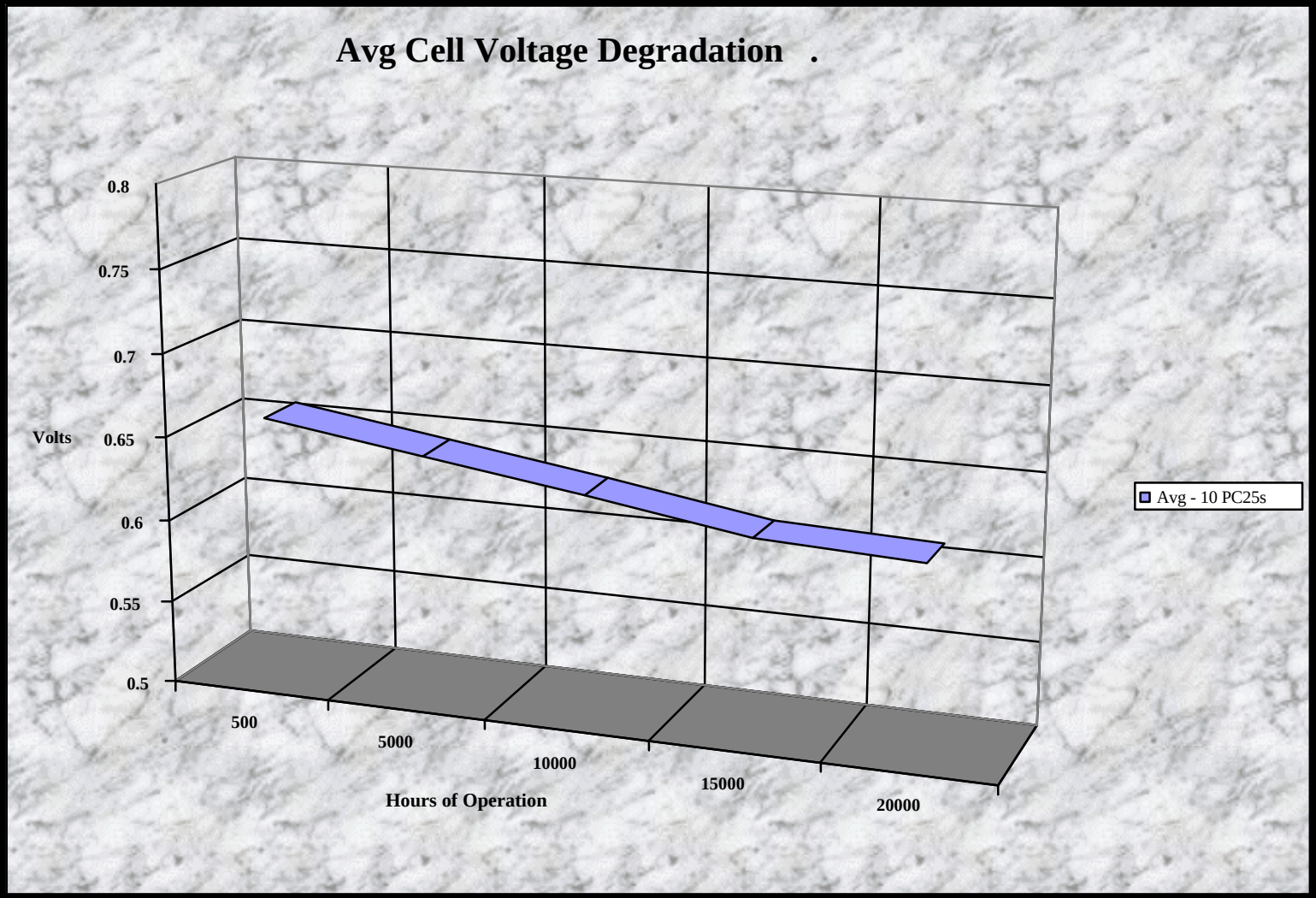
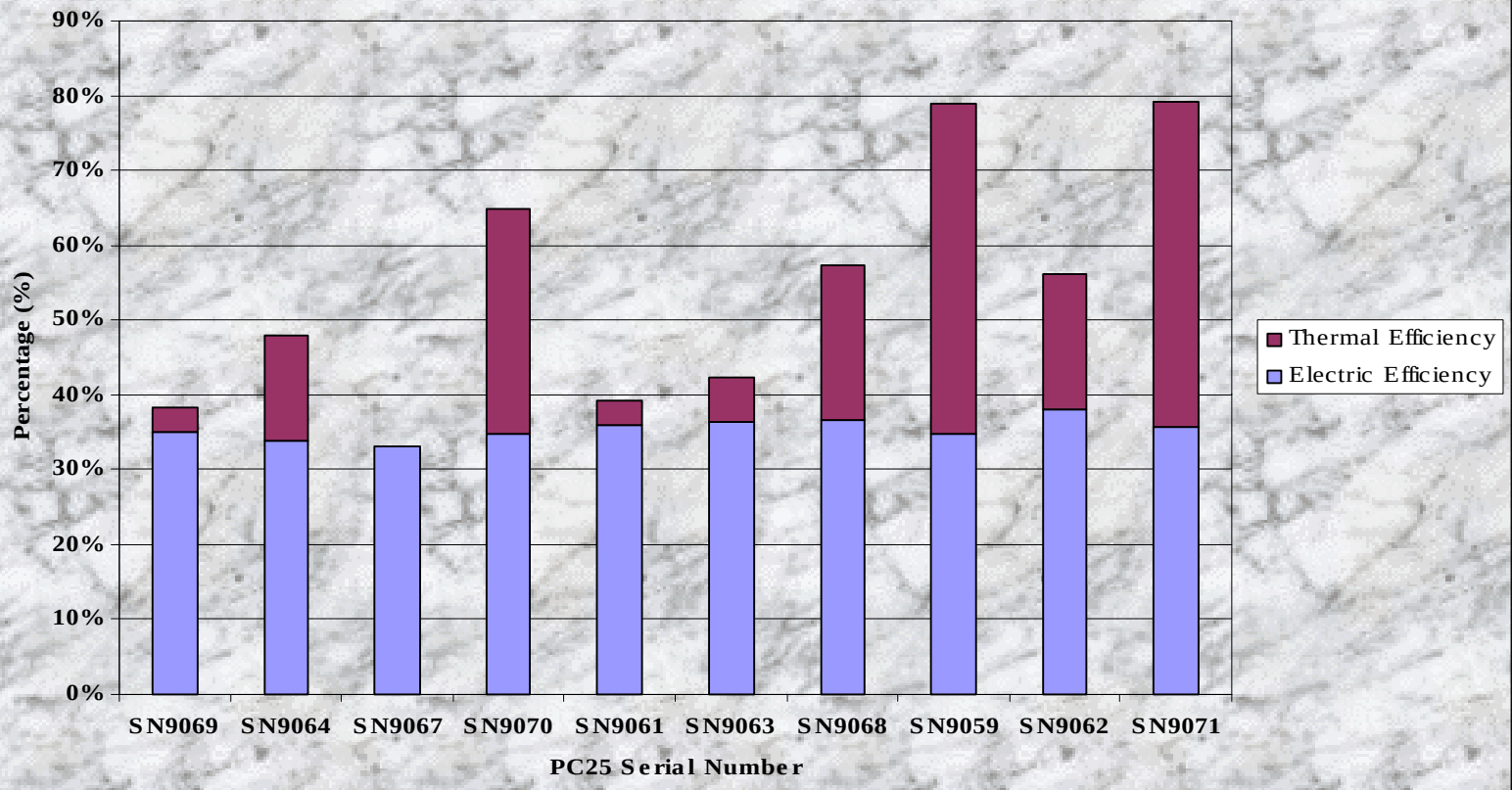

Average Hours Between Forced Outages
Forced Outages as of Jan '98
Avg Hours between Outages
3000
2500
2000
1500
1000
500
0
11
25
33
16
21
14
18
6
24
6
22,141 SN9069
22,832 SN9064
19,859 SN9067
12,910 SN9070
15,014 SN9061
9,588 SN9063
12,436 SN9068
16,223 SN9059
12,926 SN9062
15,732 SN9071
Hrs of Operation as of Jan '98 / Serial Number


AVG CELL VOLTAGE - PC25 SN9069
Volts
0.8
0.75
0.7
0.65
0.6
0.55
0.5
0.45
0.4
0.35
0.3
0
5000
10000
15000
20000
25000
30000
Hours of Operation


Avg Cell Voltage Degradation .
Volts
0.8
0.75
0.7
0.65
0.6
0.55
0.5
500
5000
10000
15000
20000
Hours of Operation
Avg - 10 PC25s

EFFICIENCY - LHV

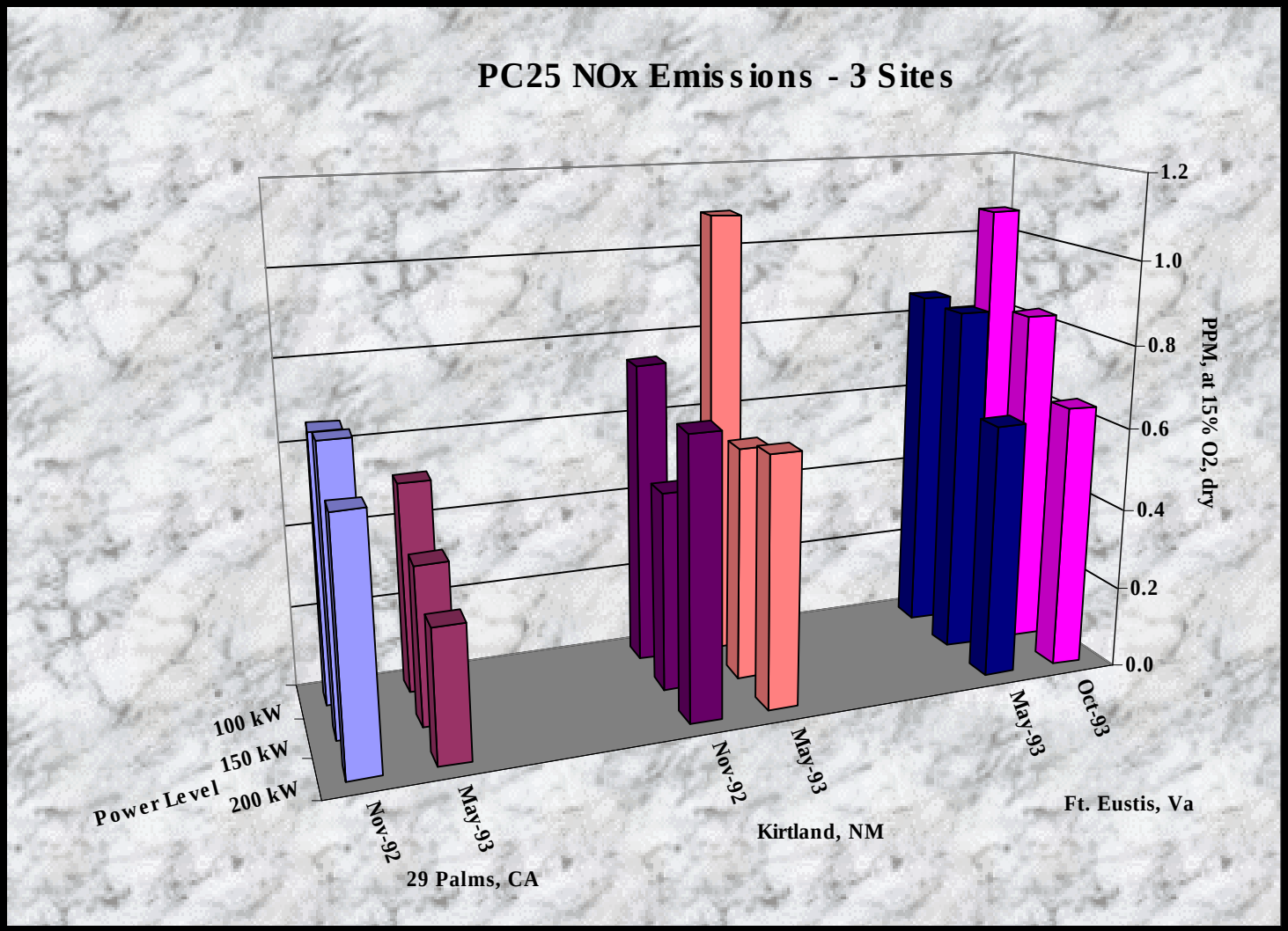


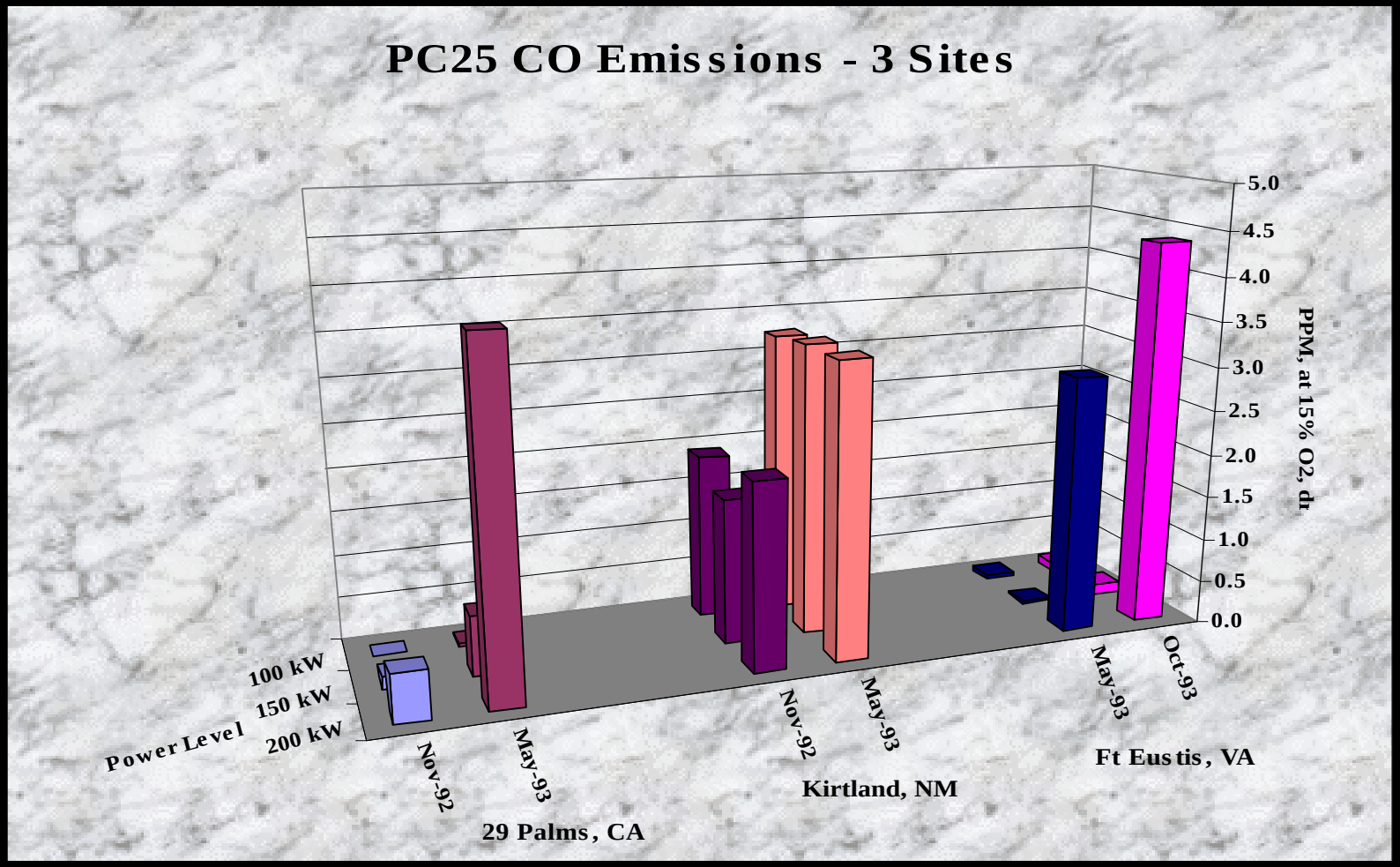
Operational Experiences

- Water Chemistry Issue
  - 3 Stack Replacements
- Reduced Output Operation
  - Inverter Input Voltage
  - Max. Temperature / Flow

Emissions Field Test

- 3 PC25B Sites
- 2 Readings - 6 months apart at each site
- Emissions sampled at 100kW, 150kW, 200kW


PC25 NOx Emissions - 3 Sites
PPM, at 15% O2, dry
1.2
1.0
0.8
0.6
0.4
0.2
0.0
Power Level
100 kW
150 kW
200 kW
Nov-92
May-93
29 Palms, CA
Nov-92
May-93
Kirtland, NM
May-93
Oct-93
Ft. Eustis, Va



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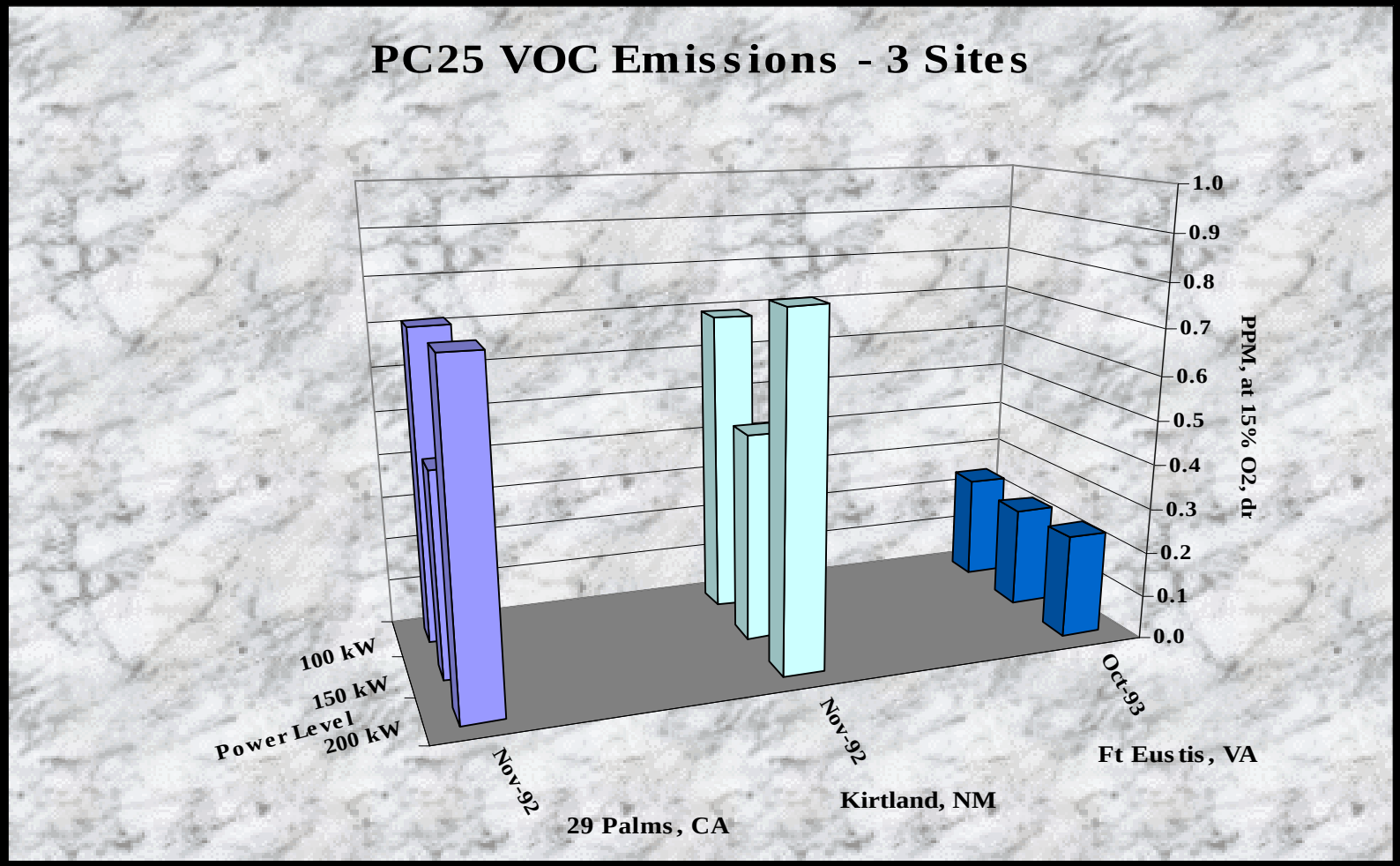

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DoD Fleet Performance
(29 power plants)
As of 1 Oct 98

Total Run Time	328,725 hrs
Unadjusted Availability	71%
Energy $ Saved (est)	$2,331,958
NOx Abated	113 tons
SOx Abated	249 tons
CO Abated	9 tons
CO_2 Abated	13,924 tons

Comments / Conclusions

- Availability - Mixed Results
- Outages - Continue Plant Improvements
- Stack Life - To Be Determined
- Efficiency - Greatly Affected by Thermal Appl.
- Emissions - Clean
- Monitoring Will Be Continued
- Check www.dodfuelcell.com