

Comparative Testing of Different Ohmic Measurement Meters and their Relation to Battery Capacity INFOBATT 2007

by

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Many meters many results?

- Alber – Resistance (pulls a DC load)
Low good, high bad
- Biddle – Impedance (injects an AC current)
Low good, high bad
- Midtronics – Conductance
High numbers good, low numbers bad
- World Energy LABS
Injects AC current of multiple frequencies. Low good, high bad

So that we might be better able to visualize the ohmic readings between Resistance (Alber, Biddle, and World energy Labs), and Midtronics with its Conductance values, we inverted the Conductance values to arrive at an “impedance” value.

We realize that this is not the best, but we decide that it will work for these visualizations.

Purpose of testing

1. To determine if any relationship between the individual readings and capacity.
2. To determine if any correlation could be found between the different meters.
3. To determine if any meter has a superior correlation between its readings and capacity or capability.

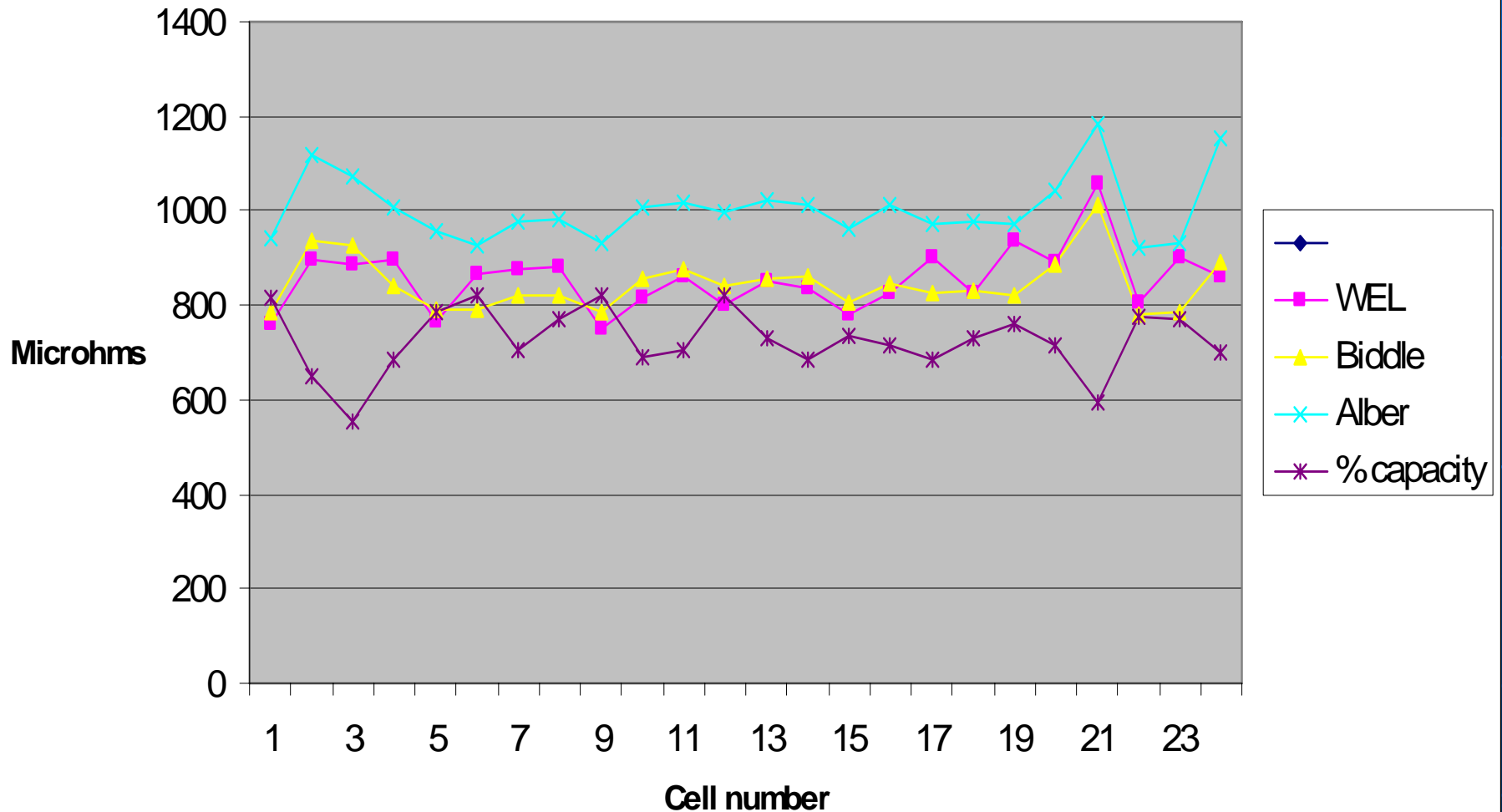
Battery Specification

- Five strings of 24 cells each of GNB 90A07's.
- Cells all came from the same original 120 cell battery system.
- Battery age 86 months.
- Application – Substation - climate controlled
- Battery capacity at 1 hour rate as found at substation 55 – 62%

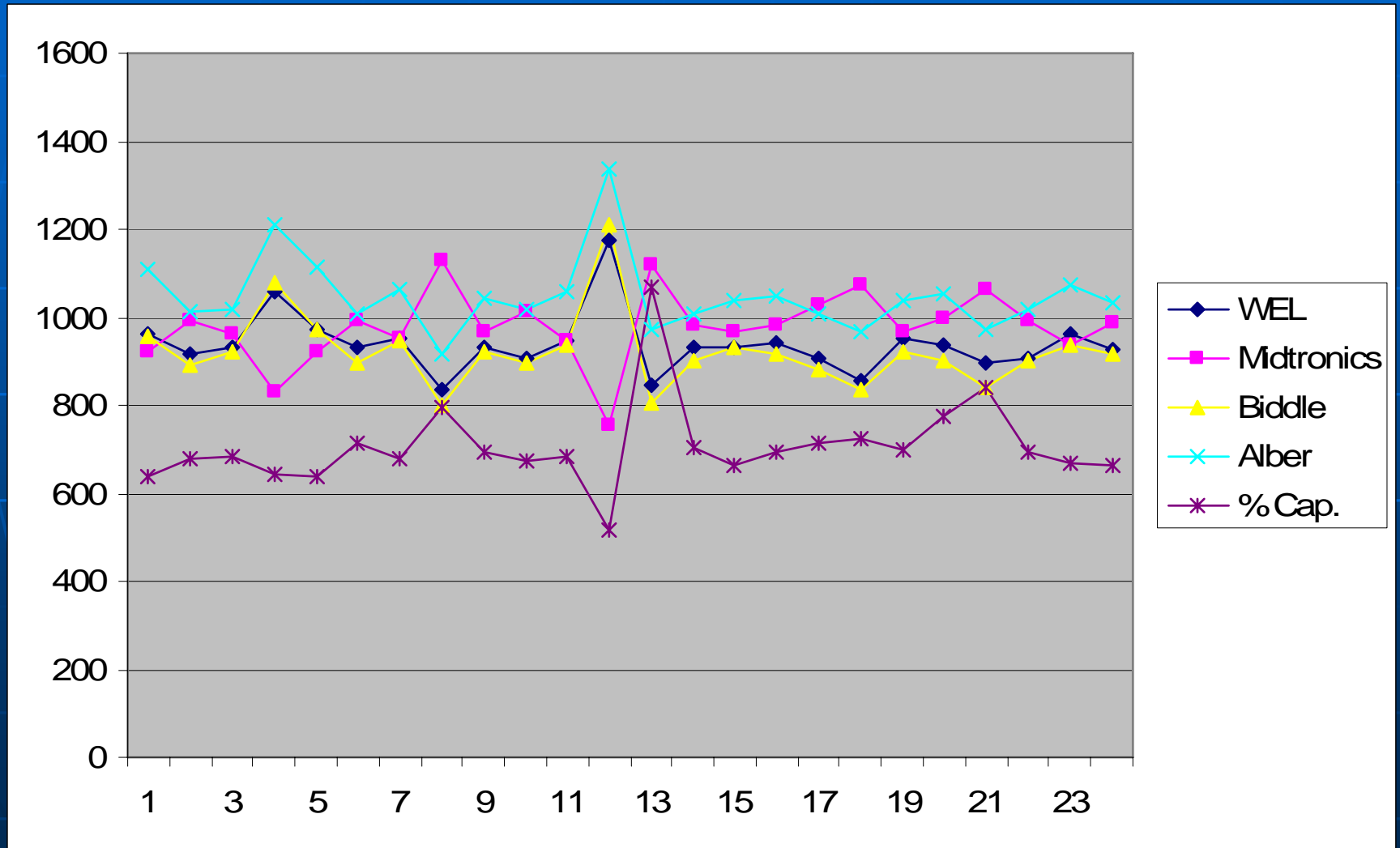
Testing Regime

- All strings on float on same system
- All inspected with all meters prior to each load test
- Initial 3 hour load test on each string
- Recharging at float voltage, 2 week time frame between load tests
- 1 hour load tests
- IOVR process in various stages to effect readings and capacity results
- Follow up one hour load tests

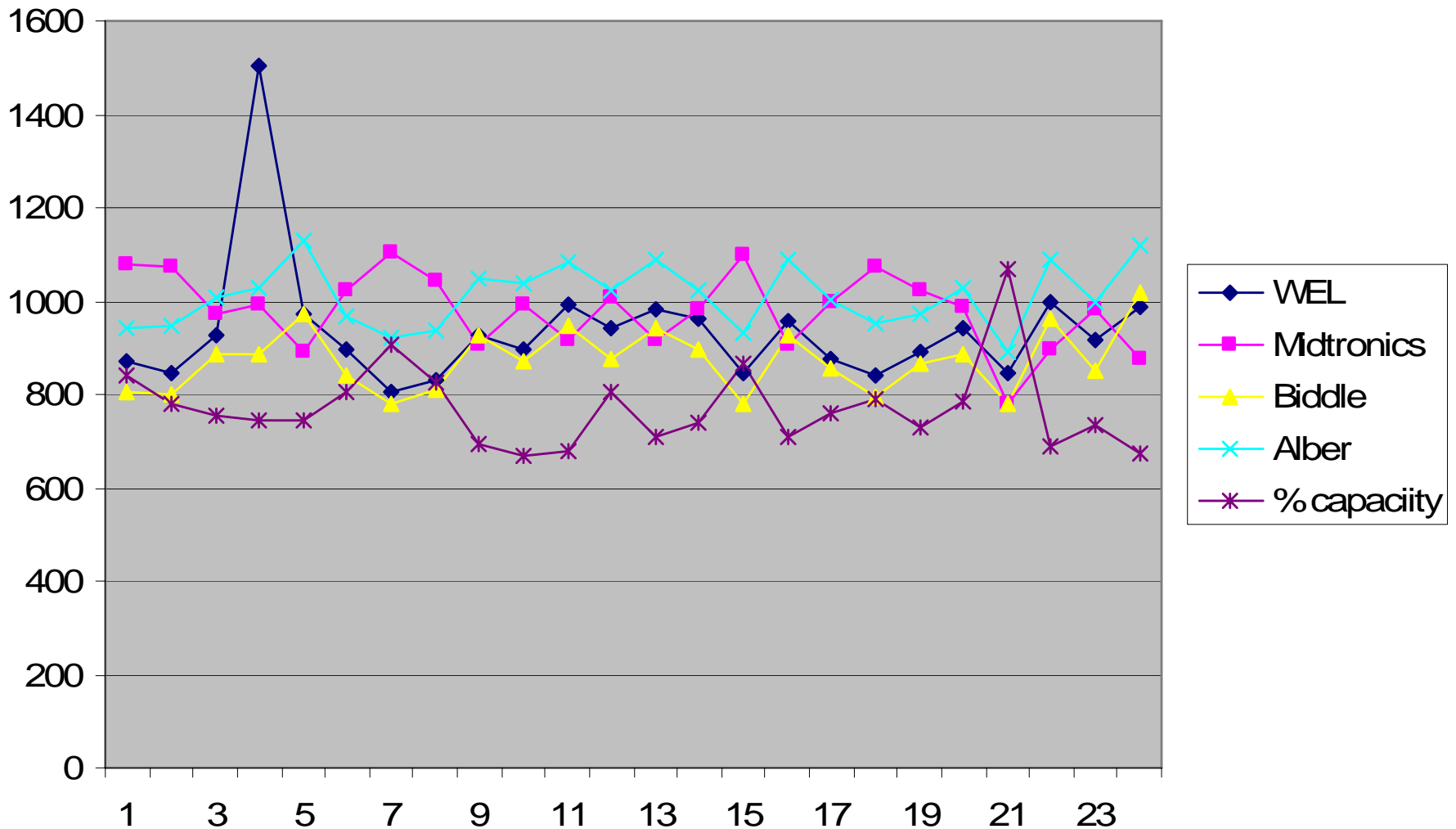
String 1 with as found 3 hour LT



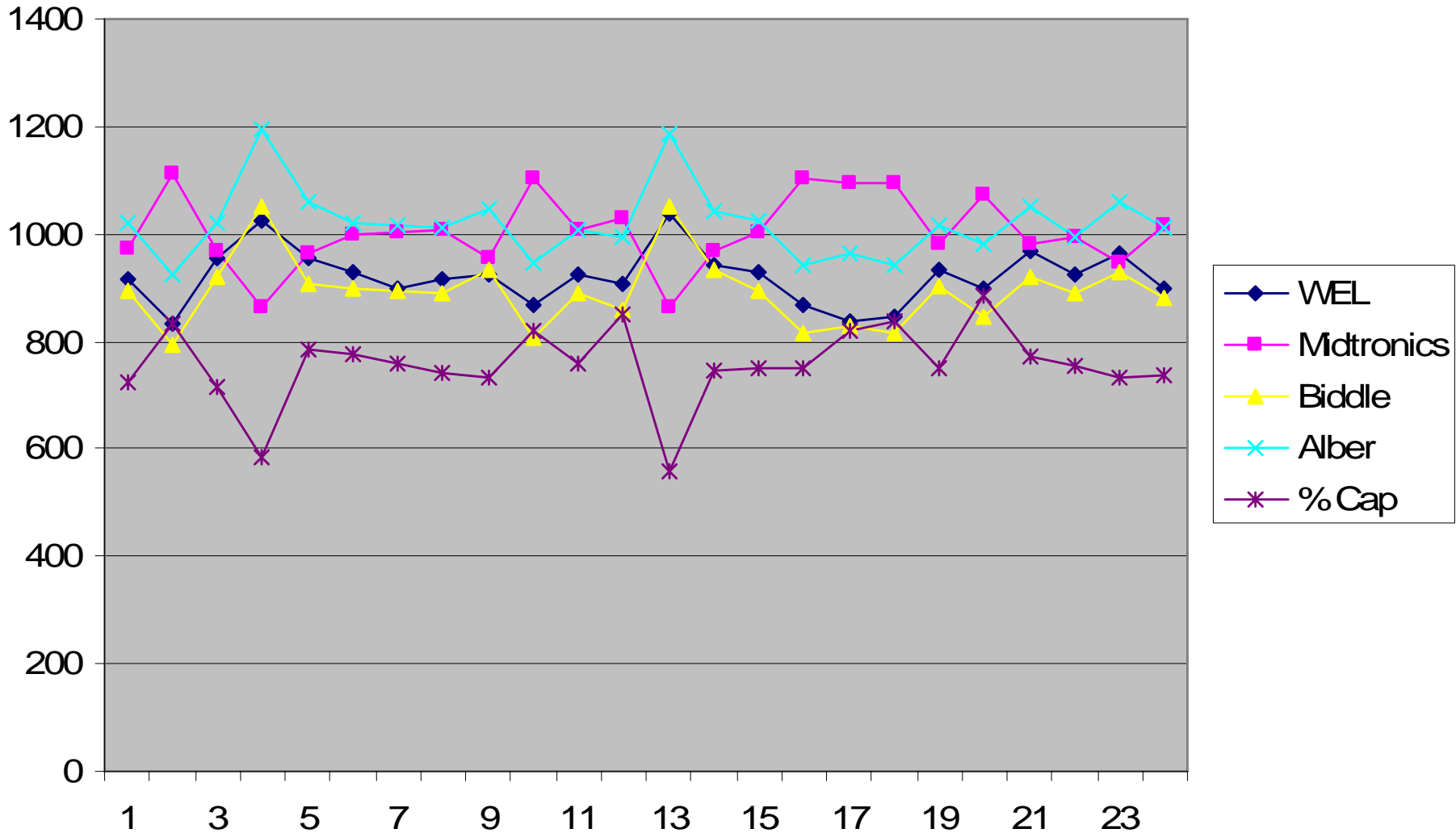
String 2 with as found 3 hour LT



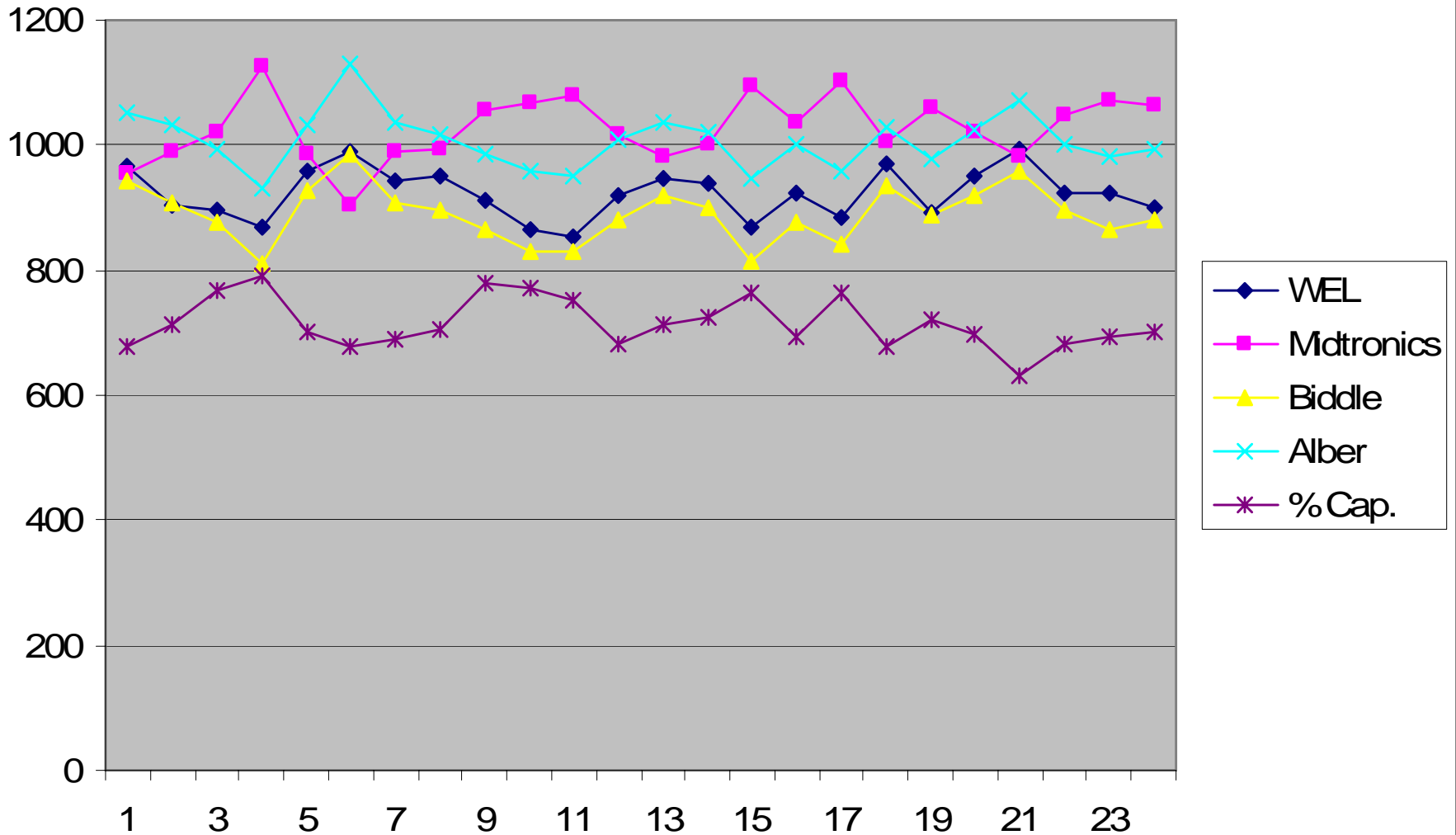
String 3 with as found 3 hour LT



String 4 with as found 3 hour LT



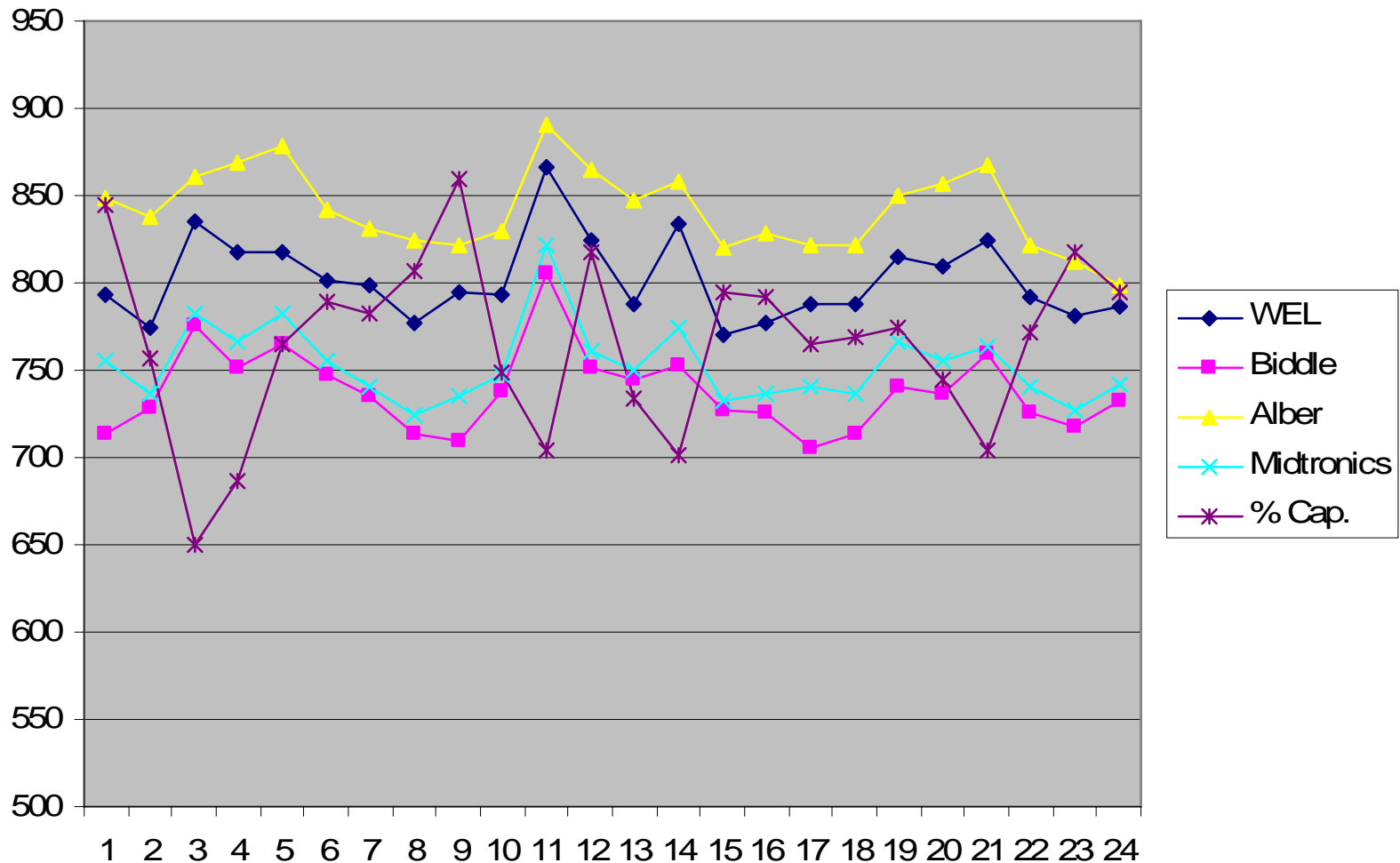
String 5 with 3 hour as found LT



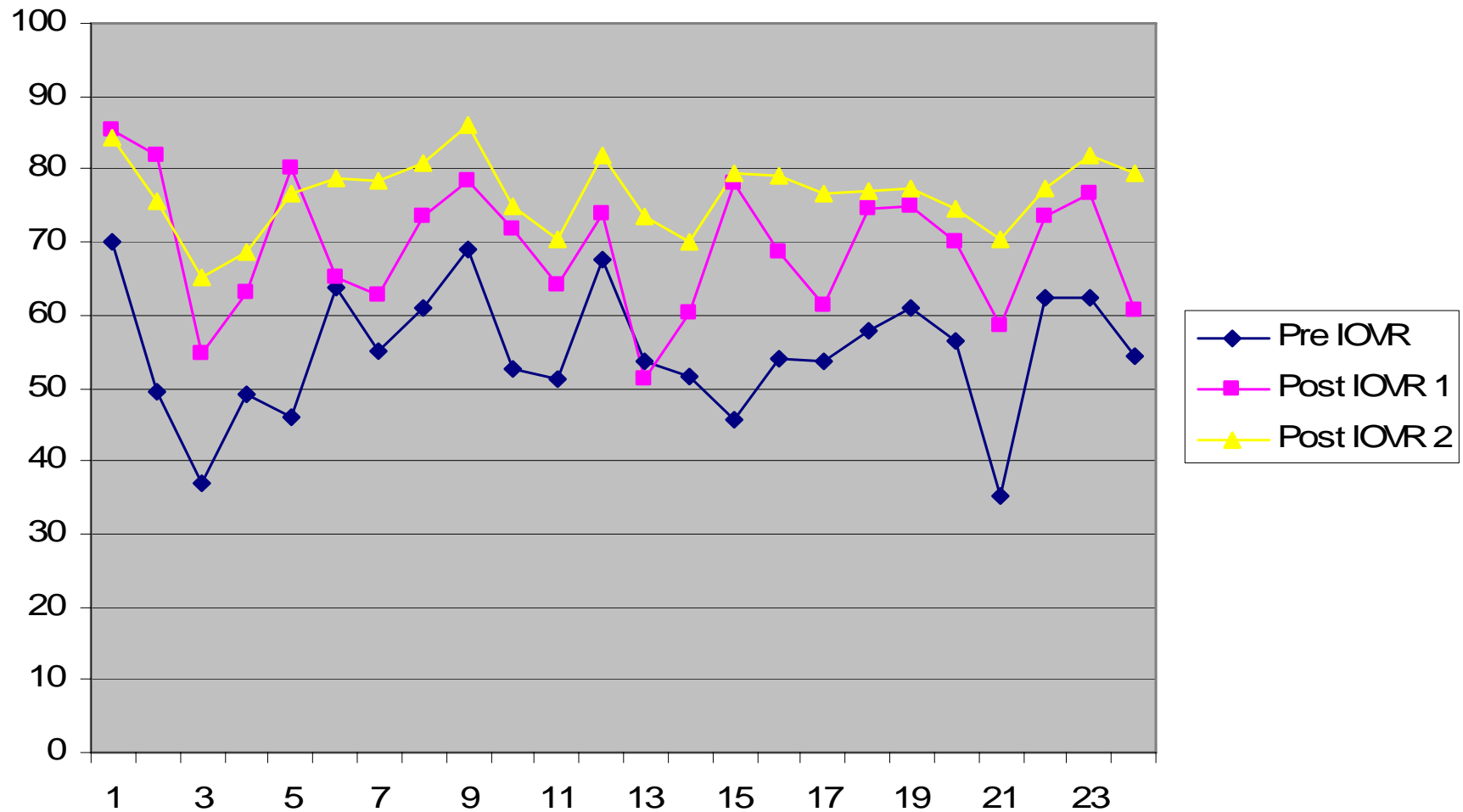
Following initial load testing

- The following slides show the comparison of the Ohmic values between the individual batteries and the capacity at the one hour rate.
- Strings 1 thru 4 underwent various parts of the IOVR process prior to these load tests.

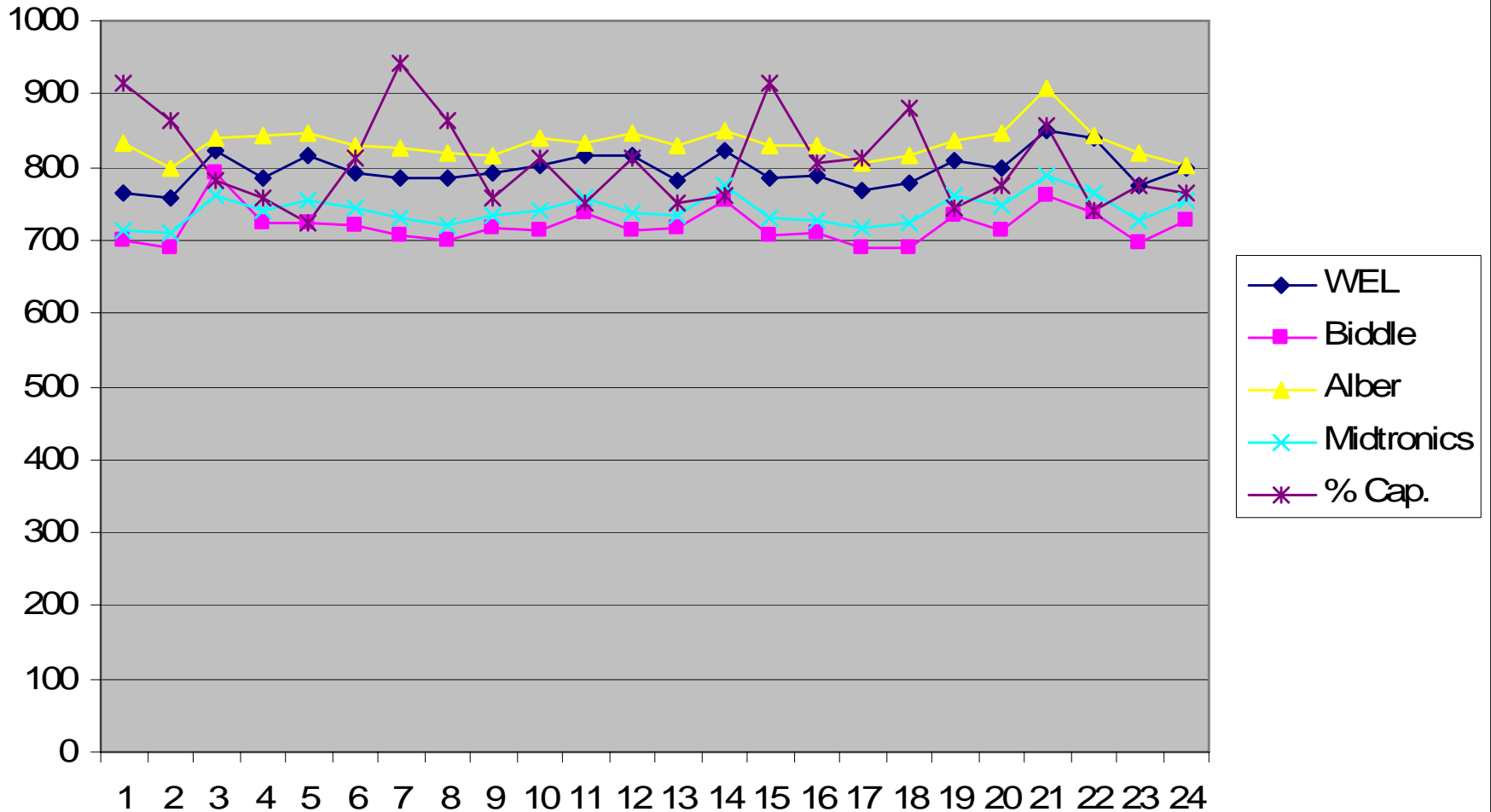
String 1 Post IOVR Ohmic values and Capacity at 1 hour rate



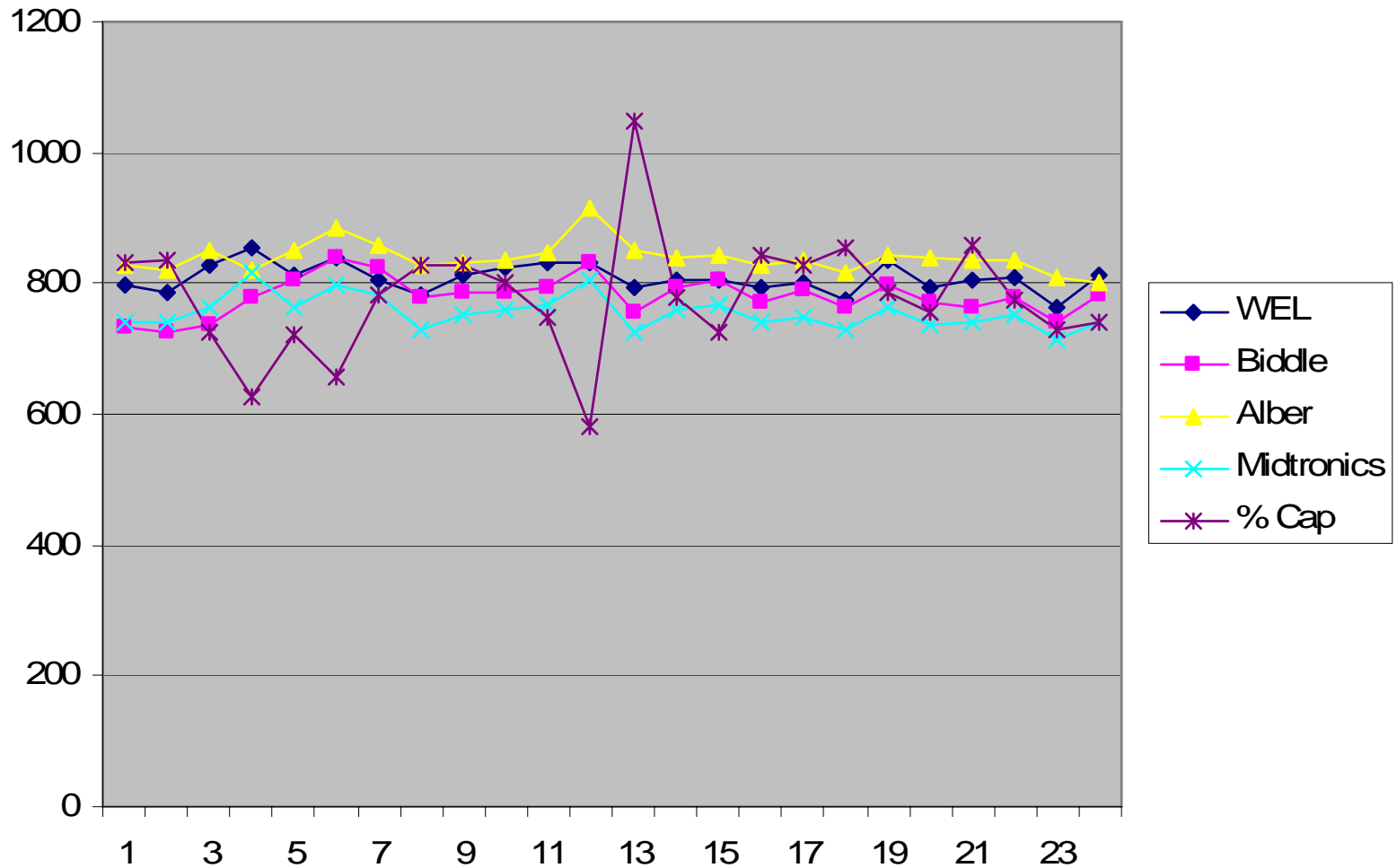
1 hour load test results pre IOVR, and 2 Post IOVR tests, String 1



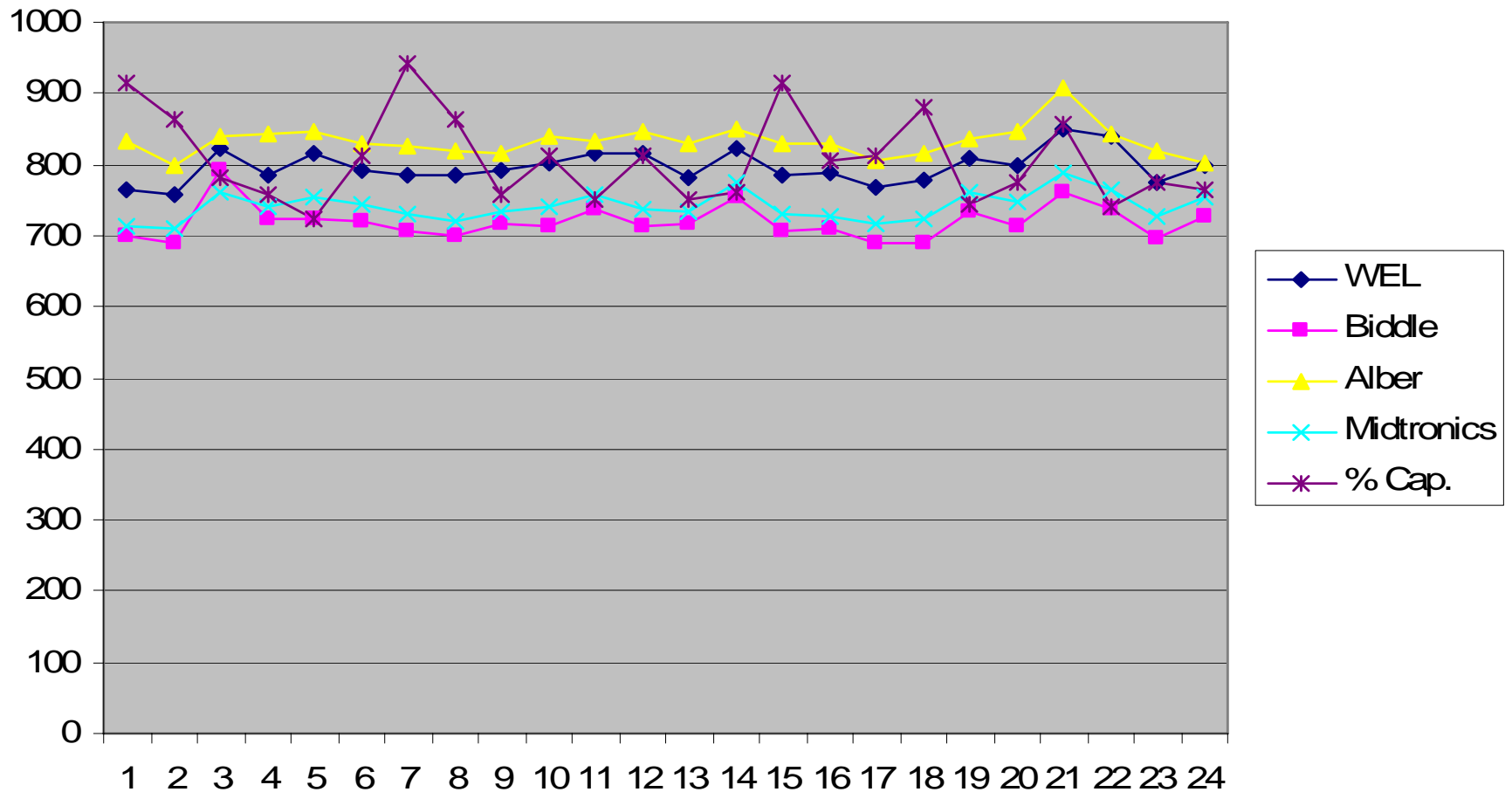
String 2 Post IOVR Ohmic values and Capacity at 1 hour rate



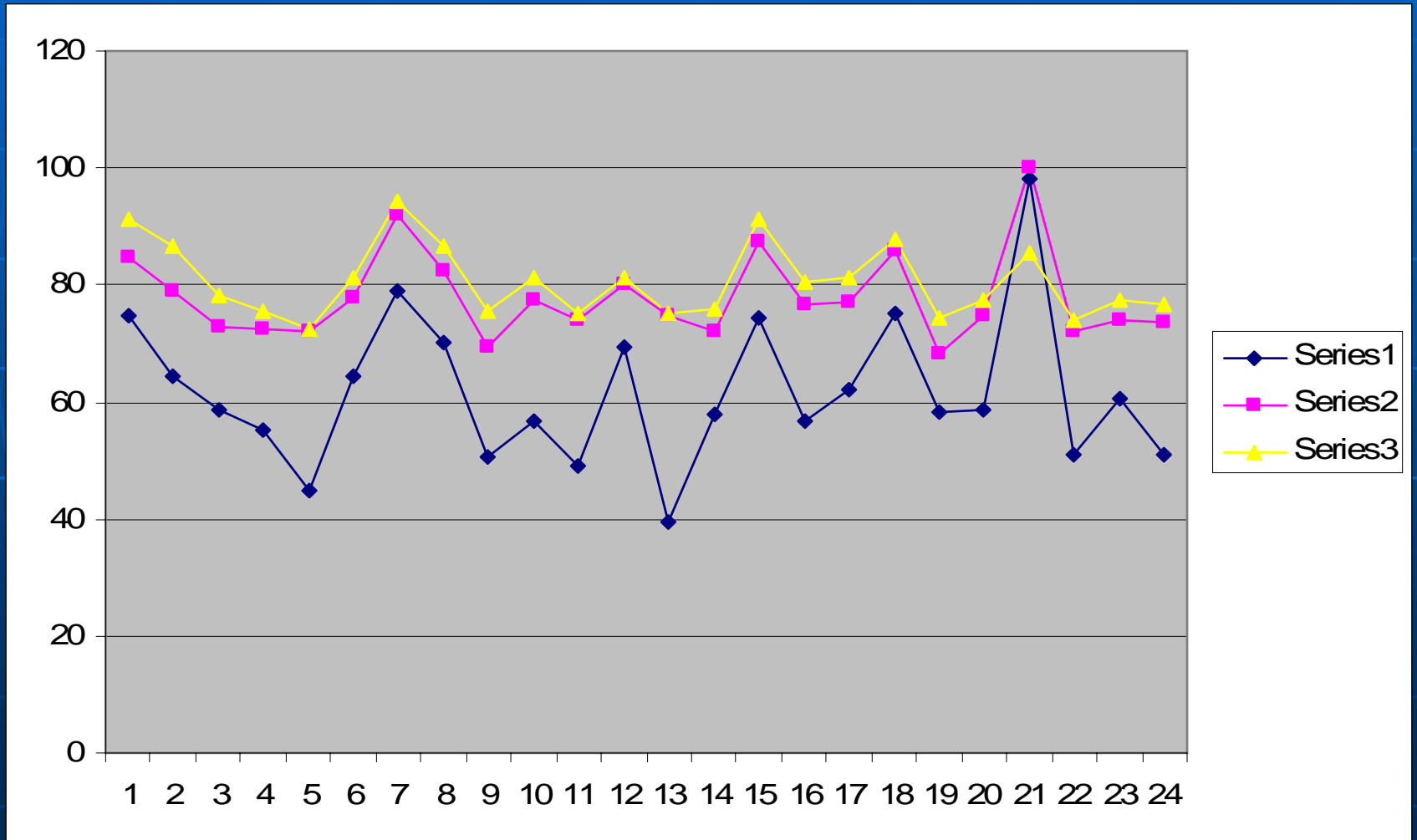
String 2 Post IOVR Ohmic values and Capacity at 1 hour rate



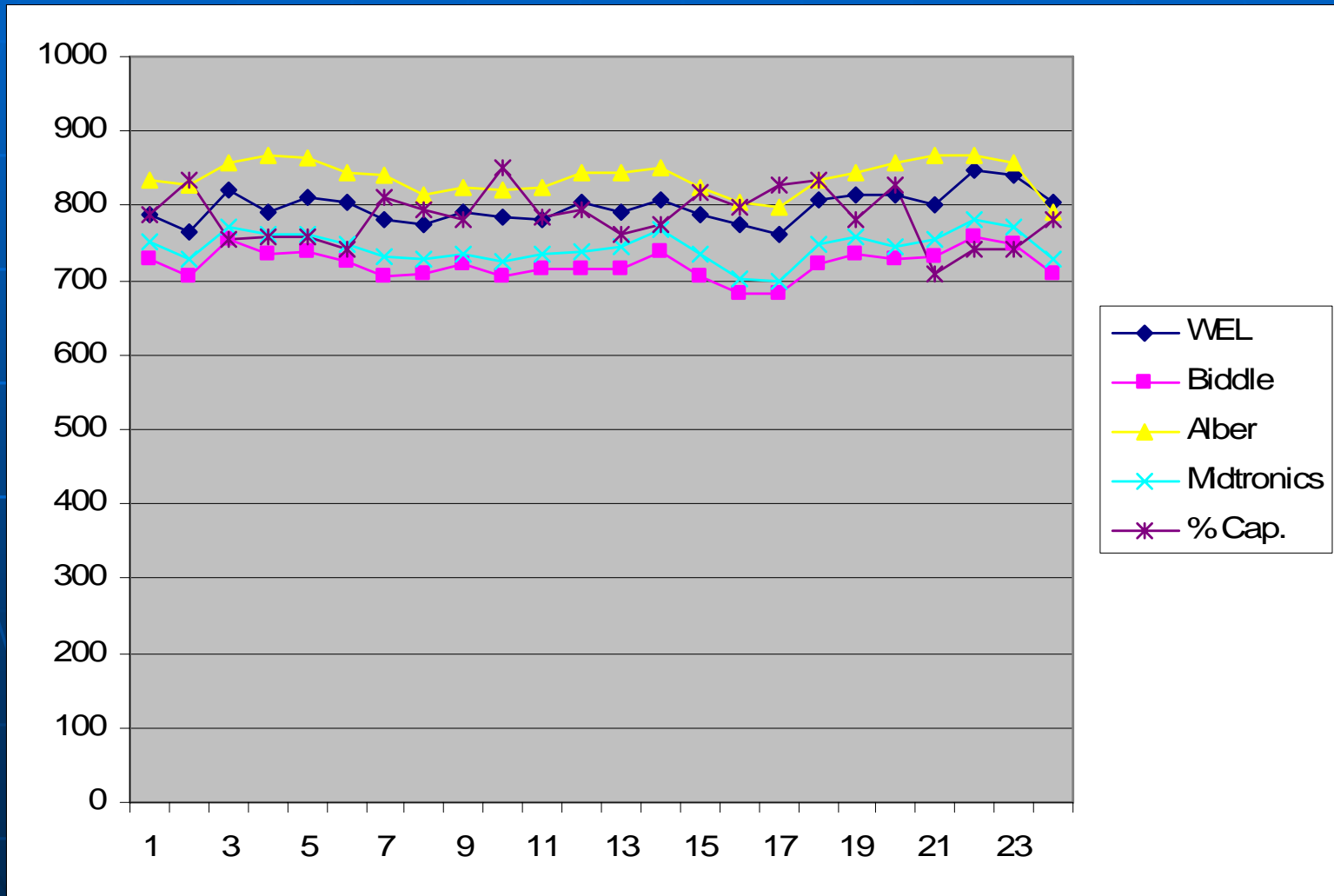
String 3 Post IOVR Ohmic values and Capacity at 1 hour rate



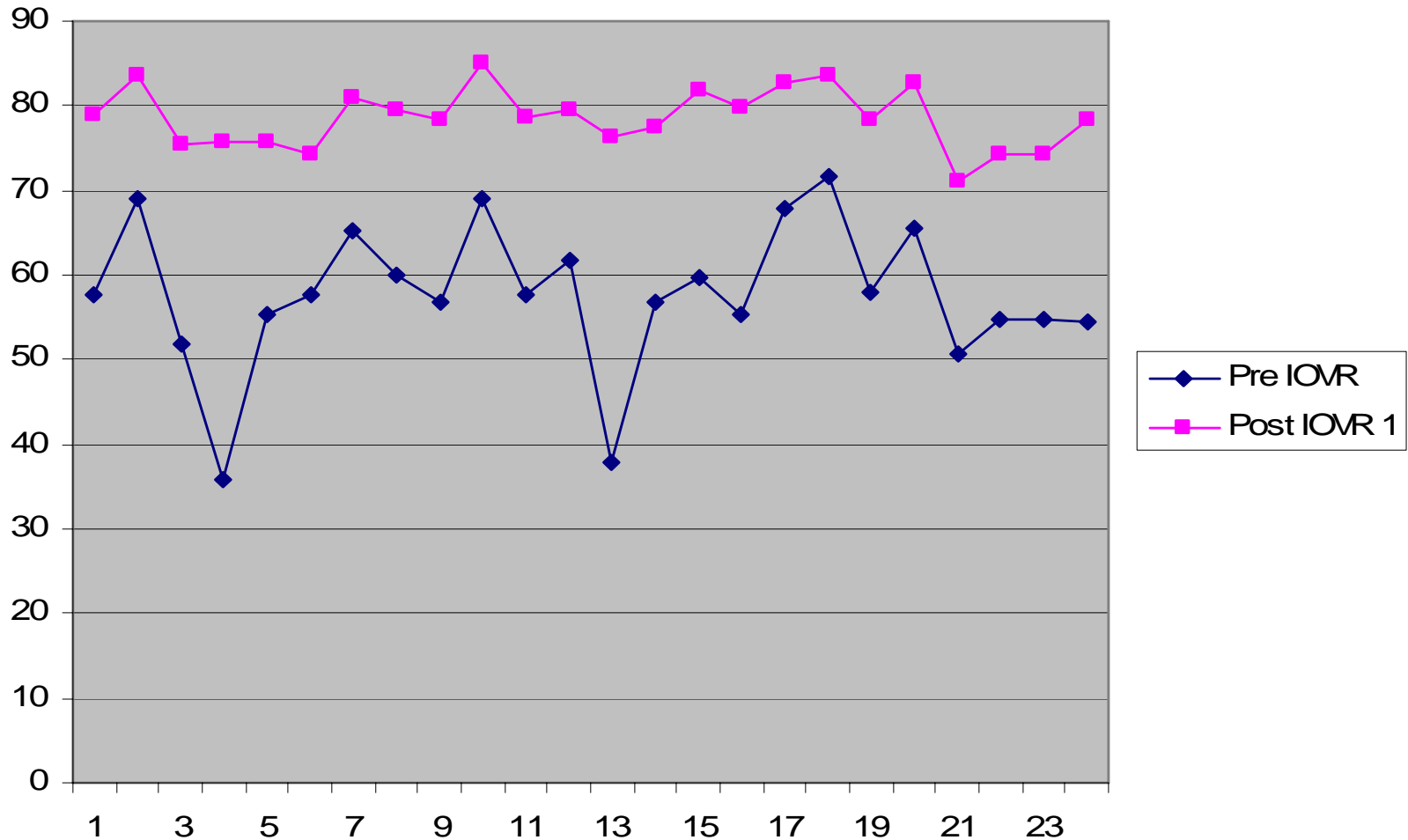
1 hour load test results pre IOVR, and 2 Post IOVR tests, String 3



String 4 Post IOVR Ohmic values and Capacity at 1 hour rate



String 4 Post IOVR Ohmic values and Capacity at 1 hour rate



Conclusions

- All of the meters appear to track fairly well on this 270 AH battery. Time will tell if this continues with larger cells.
- Visually they track the capacity tests, with some anomalies.
- They all will show variations inside the cells.
- They all will detect a very bad cell.
- None should be used as a replacement for load testing.
- Repeat testing on these battery strings will be ongoing over the next few years.
- In addition, we are in the process of using these same meters on much larger cells.