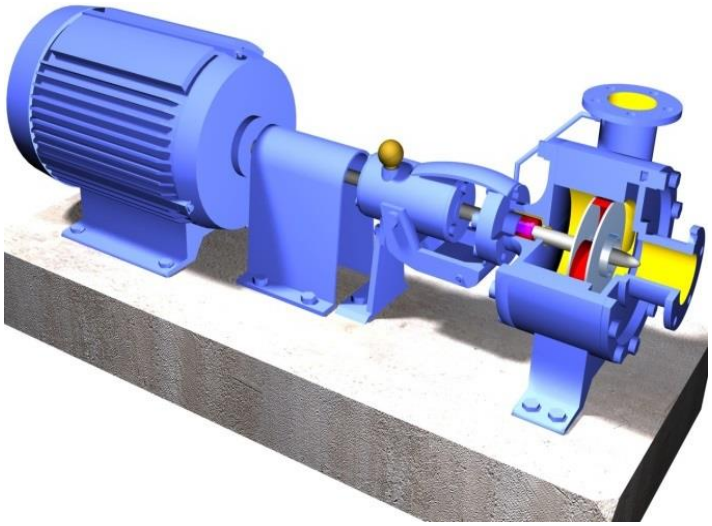
# ASRAC Pumps Working Group

# PER C-Value Update - Comparison of DOE and HI data



U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

**BUILDING TECHNOLOGIES PROGRAM**

**May 27, 2014**

# Introduction

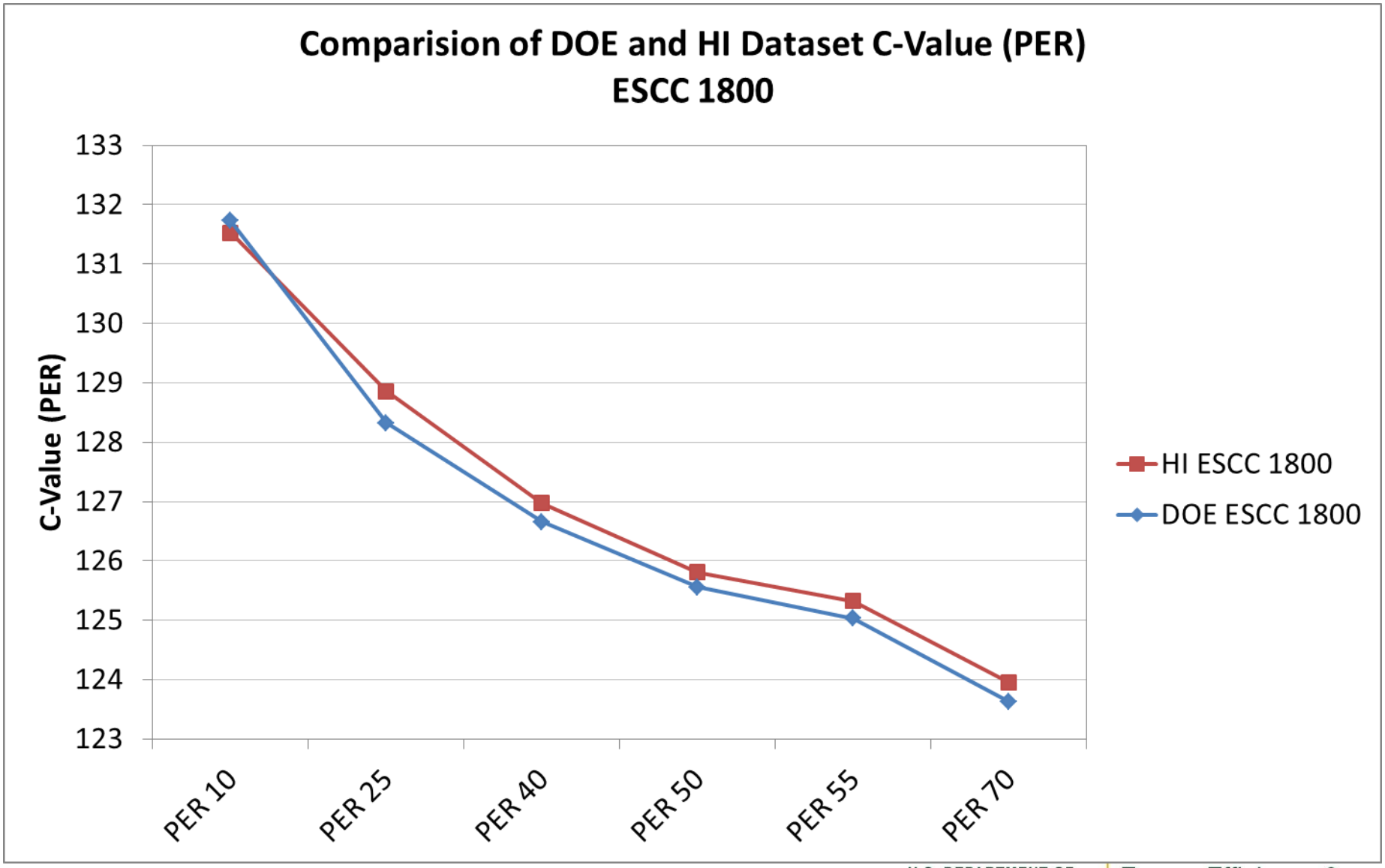
- Using the PER Metric, C-Values are used to define each Efficiency Level for each Equipment Class
- At this time, we have developed PER C-Values at each Efficiency Level from both the HI and DOE data sets
  - When the data sets are merged, we will have one set of proposed C-Values
- The following slides will present and compare the current DOE and HI PER C-Values
- Please note the following:
  - End Suction and Inline DOE C-Values have not change since the April 29-30 meetings
  - Based on preliminary feedback, we are not presenting C-Values for the 4-Pole VT-S equipment class
  - PER C-Values for RS-V have been established by shifting the EU Lot 11 MEI C-Values by -0.524 points.

# Summary of C-Values

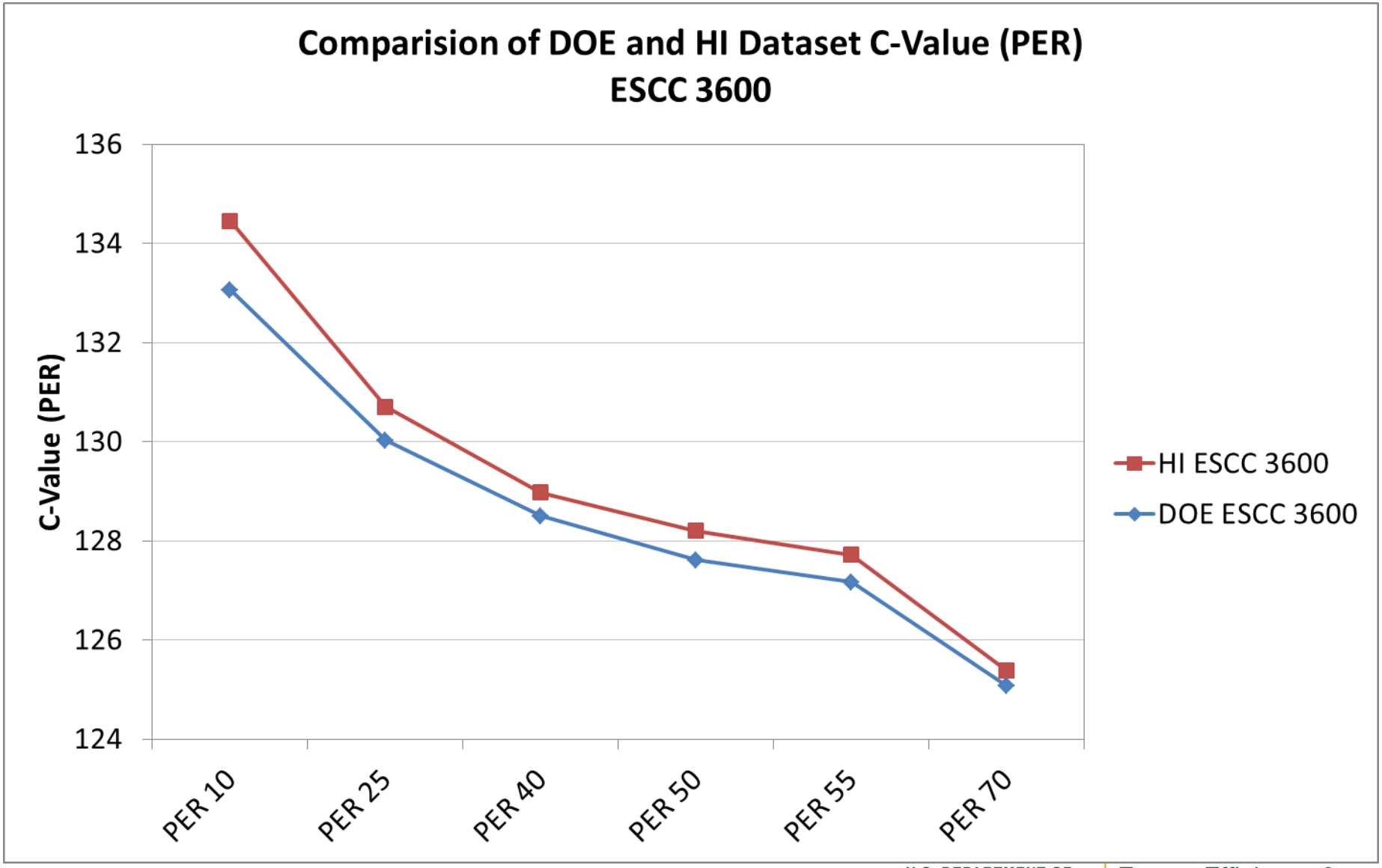
| | | Proposed DOE PER C-Values | | | | | |
|---|---|---|---|---|---|---|---|
| Equipment Class | | PER 10 | PER 25 | PER 40 | PER 50 | PER 55 | PER 70 |
| ESCC | 1800 | 131.73 | 128.32 | 126.66 | 125.56 | 125.03 | 123.63 |
| ESCC | 3600 | 133.06 | 130.03 | 128.50 | 127.61 | 127.17 | 125.08 |
| ESFM | 1800 | 130.92 | 127.98 | 126.36 | 125.33 | 124.86 | 123.33 |
| ESFM | 3600 | 132.71 | 130.40 | 128.60 | 127.78 | 127.50 | 125.29 |
| IL | 1800 | 133.91 | 129.05 | 127.20 | 126.43 | 125.76 | 124.19 |
| IL | 3600 | 138.89 | 133.17 | 130.52 | 129.68 | 129.26 | 127.17 |
| RSV | 1800 | 133.93 | 132.16 | 129.86 | 129.52 | 128.11 | 124.96 |
| RSV | 3600 | 137.67 | 134.63 | 133.43 | 132.91 | 132.13 | 129.85 |
| VTS | 1800 | | | | | | |
| VTS | 3600 | 135.78 | 133.90 | 130.91 | 129.49 | 128.62 | 127.21 |

| | | Proposed HI PER C-Values | | | | | |
|---|---|---|---|---|---|---|---|
| | | PER 10 | PER 25 | PER 40 | PER 50 | PER 55 | PER 70 |
| ESCC | 1800 | 131.53 | 128.86 | 126.97 | 125.81 | 125.32 | 123.95 |
| ESCC | 3600 | 134.45 | 130.70 | 128.97 | 128.20 | 127.72 | 125.39 |
| ESFM | 1800 | 133.22 | 129.33 | 127.52 | 126.29 | 125.74 | 124.04 |
| ESFM | 3600 | 134.90 | 131.19 | 129.34 | 128.26 | 127.96 | 126.12 |
| IL | 1800 | 134.78 | 129.63 | 127.09 | 126.21 | 125.49 | 124.14 |
| IL | 3600 | 138.90 | 134.06 | 131.40 | 130.00 | 129.45 | 127.10 |
| RSV | 1800 | 133.93 | 132.16 | 129.86 | 129.52 | 128.11 | 124.96 |
| RSV | 3600 | 137.67 | 134.63 | 133.43 | 132.91 | 132.13 | 129.85 |
| VTS | 1800 | | | | | | |
| VTS | 3600 | 134.78 | 131.88 | 129.93 | 128.88 | 128.03 | 126.84 |

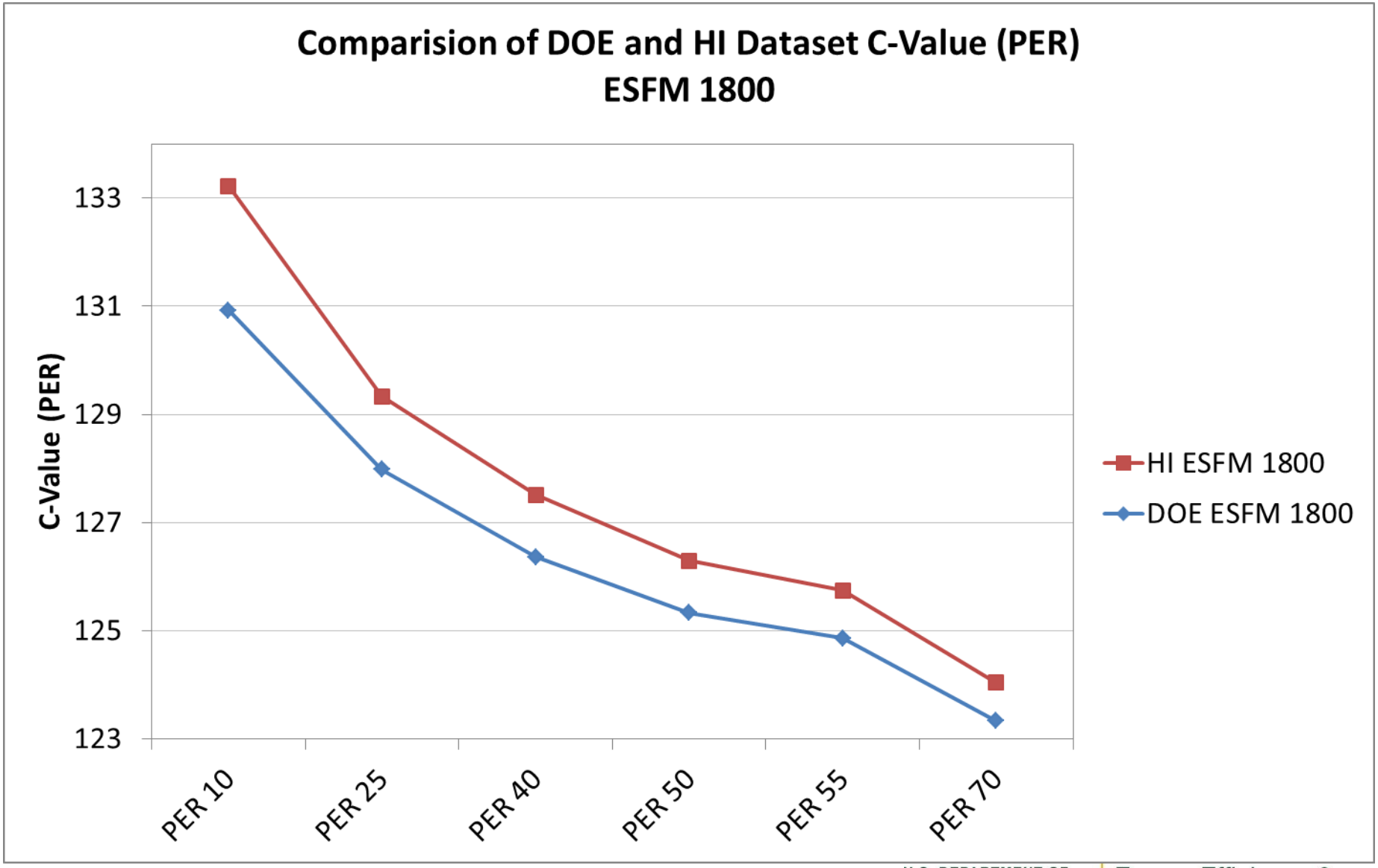
# Results: ESCC 1800



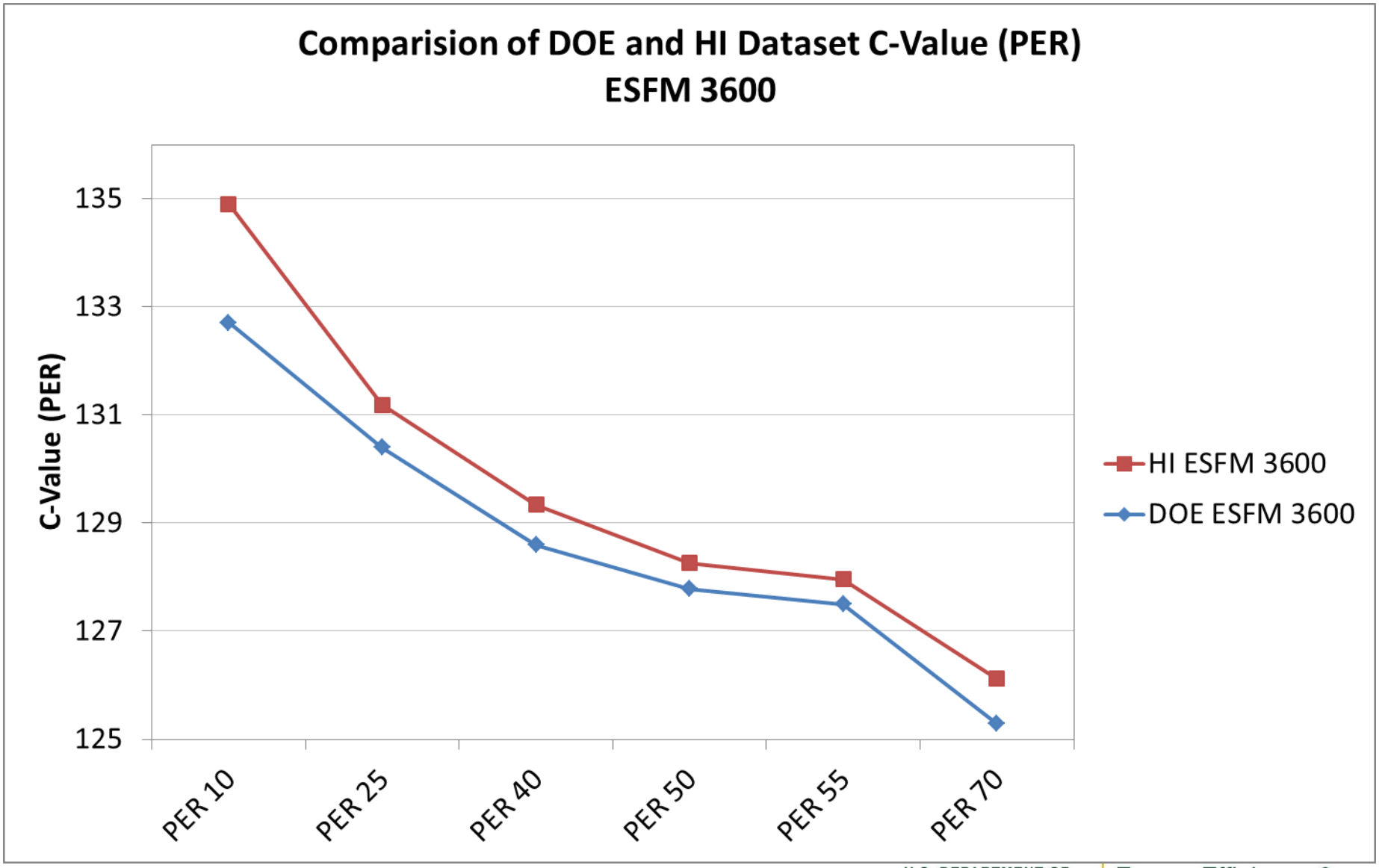
# Results: ESCC 3600



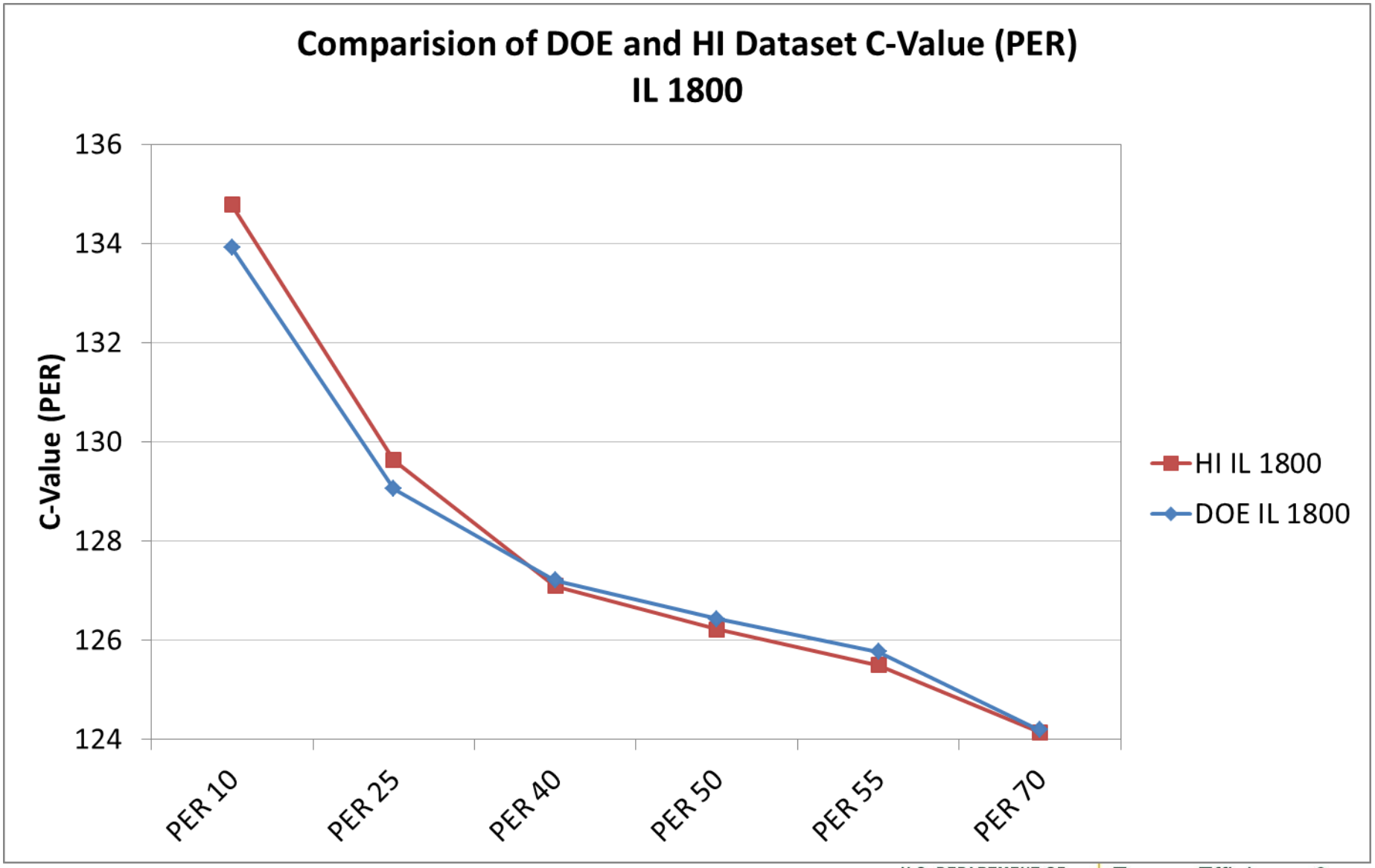
# Results: ESFM 1800



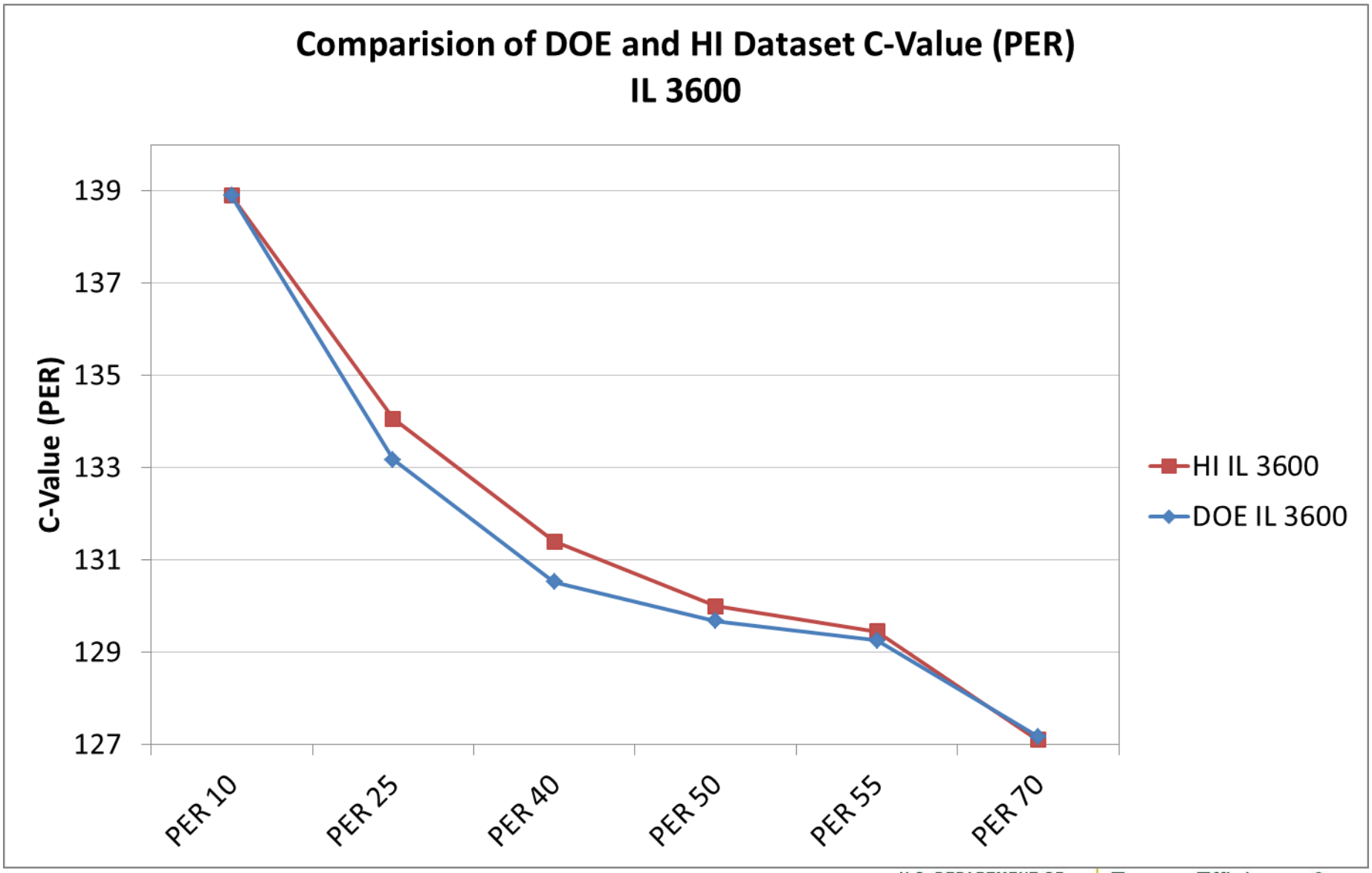
# Results: ESFM 3600



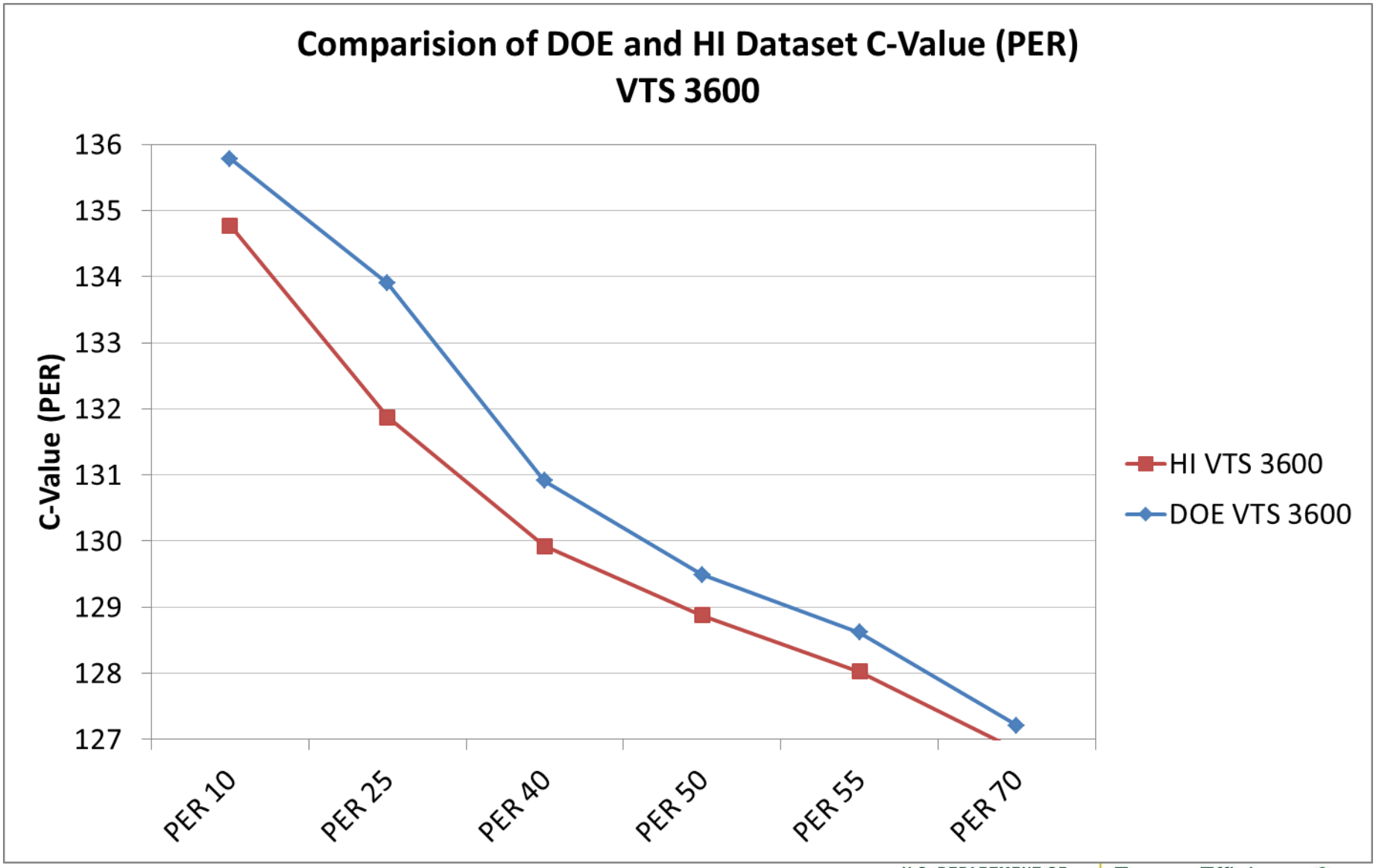
# Results: IL 1800



# Results: IL 3600



# Results: VT-S 3600



# Summary: HI (Navigant Calc) vs. DOE C-Values

- ESCC
  - DOE C-Values are consistently more efficient, by an average of 0.5 efficiency points at each cut-off level
    - MEI C-Values varied by the same delta.
- ESFM
  - DOE C-Values are consistently more efficient, by an average of 1.1 efficiency points at each cut-off level
    - MEI C-Values varied by the same delta
- IL
  - DOE C-Values are consistently more efficient, by an average of 0.25 efficiency points at each cut-off level
    - MEI C-Values varied by 0.5 efficiency points
- VT-S
  - DOE C-Values are consistently less efficient, by an average of 0.7 efficiency points at each cut-off level
    - MEI C-Values varied by 0.7 efficiency points

# Conclusions

## Comments on variation among US C-Value data sets

- Variation between the HI and DOE C-Values was expected, as DOE and HI data sets contain a number of non-overlapping models.
  - The presented PER variation was found be consistent with the MEI variation presented previously
  - Calculation of PER C-Values from the merged data set should settle the issue