Isoenergy Maps

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RA-17/2011

12.12.2011

Partially supported by a grant of Polish National Science Center.

Contents

1 Introduction

In this paper we present a large set of isoenergy maps we obtained during research on isoenergy.

The idea of isolines is widely used in science and engineering to visualize complex phenomena in a communicative way as, e.g., cartography contour lines, isotherms, isobars, isogones, etc. For presented isomaps lines of equal energy consumption (the isolines) are used. The isoenergy maps presented in this paper are in their concept similar to isoefficiency presented in [6, 7, 5]. The relationships determining energy consumption can be perceived as a set of points of equal energy consumption in the multidimensional space of the system and application parameters. The proposed visualization method is a projection of such multidimensional body onto a two-dimensional plane of just two parameters. For conciseness of presentation we will be calling the lines of equal energy *isoenergy* lines, and their two-dimensional representation *isoenergy maps*.

All the presented isoenergy maps are built on energy consumption model emerging from the divisible load theory (DLT). In DLT large amounts of data that are arbitrarily divisible and have no precedence constraints are computed on remote computers. For more information on DLT please refer to [1, 2, 10, 9]. Energy can be considered a form of the computation cost. Scheduling divisible computations for minimum cost has been analyzed in [4, 3, 8, 11]. This paper builds on energy use model presented in [3]. We assume that performance is the primary criterion, and the shortest schedules are always used. This, in turn, determines energy consumption.

Considered energy consumption model uses 8 parameters originating from DLT. Let us summarize the parameters shortly as well as present their reference values used for drawing maps unless stated else:
processor number $m = 1000$,
computation rate $A =$1E-3,
communication rate $C =$1E-8,
startup time $S = 100$,
load size $V =$1E11,
idle power reduction $k = 3$,
processor power $P_C = 200$,
network power $P_N = 50$.

In the following sections isoenergy maps are shown for various values of system-application parameters.

2 Isoenergy maps for processor number m, and startup time S.

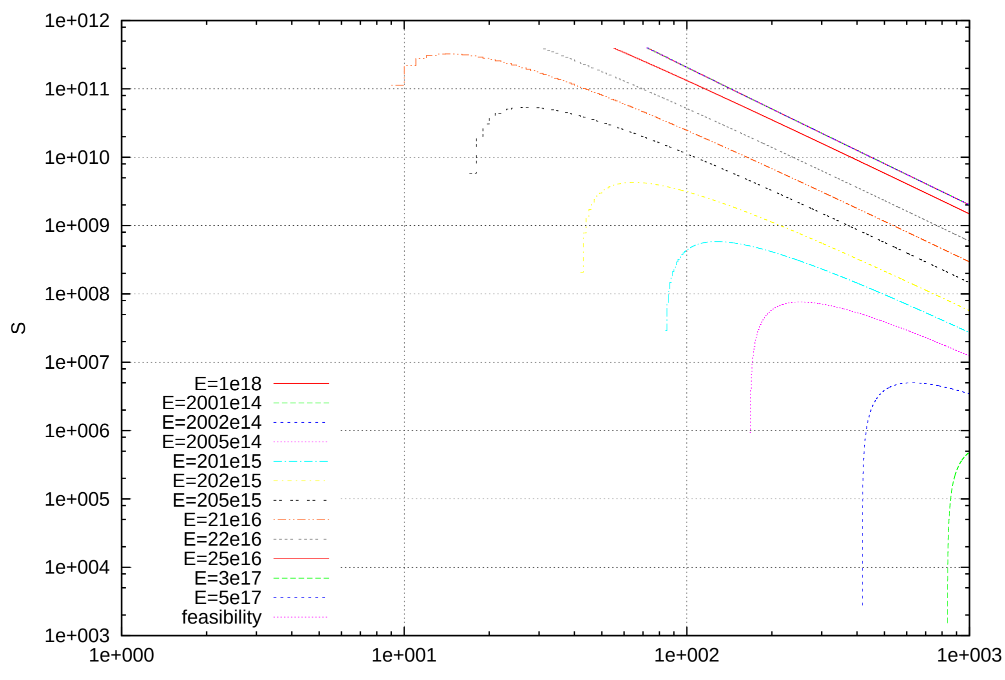

Fig. 1: Isoenergy map for processor number m, and startup time S. Value of $A = 1E2$ used.

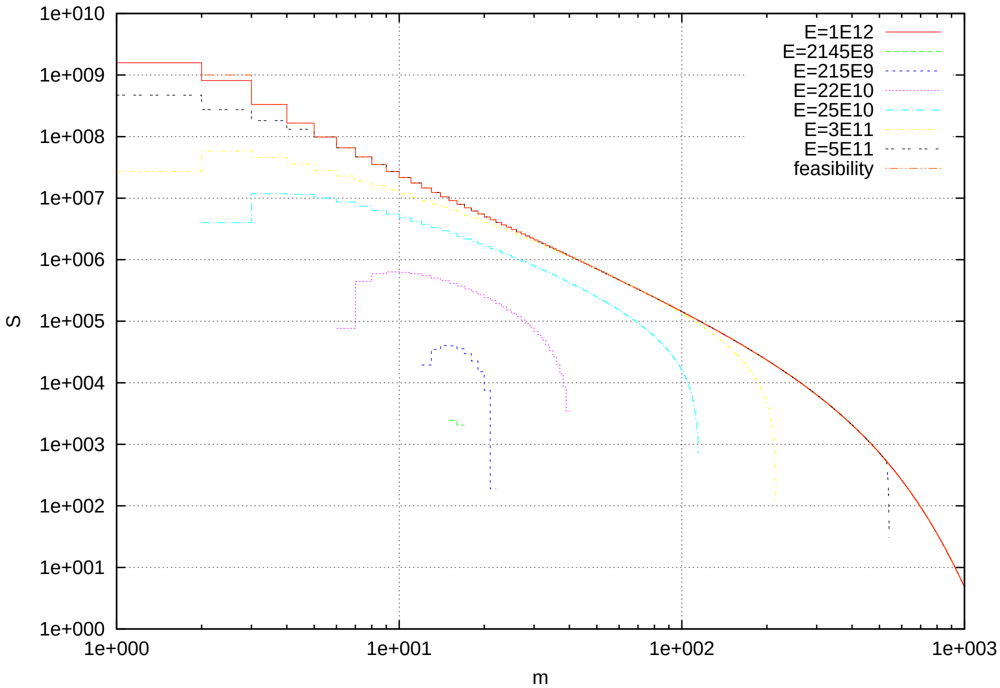

Fig. 2: Isoenergy map for processor number m, and startup time S. Value of $A = 1E-4$ used.

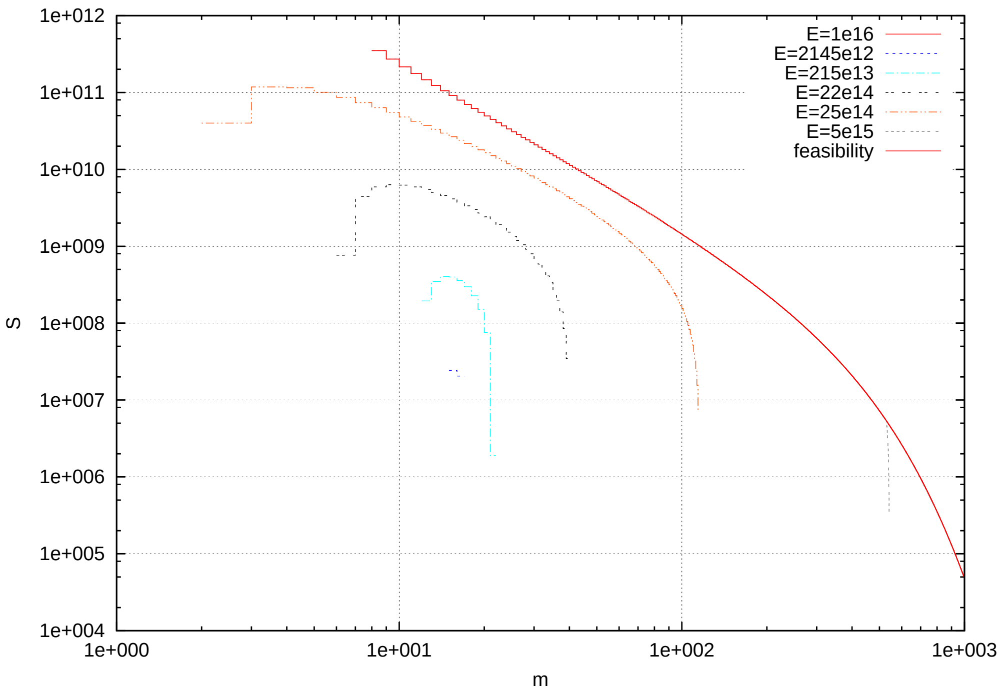

Fig. 3: Isoenergy map for processor number m, and startup time S. Value of $C = 1E-2$ used.

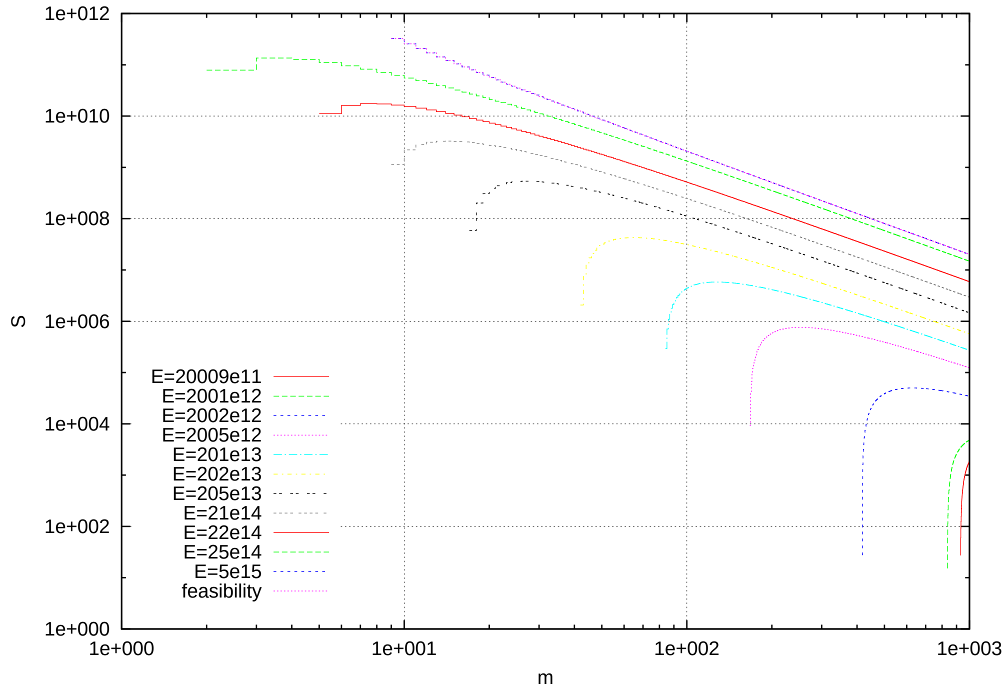

Fig. 4: Isoenergy map for processor number m, and startup time S. Value of $C = 1E - 8$ used.

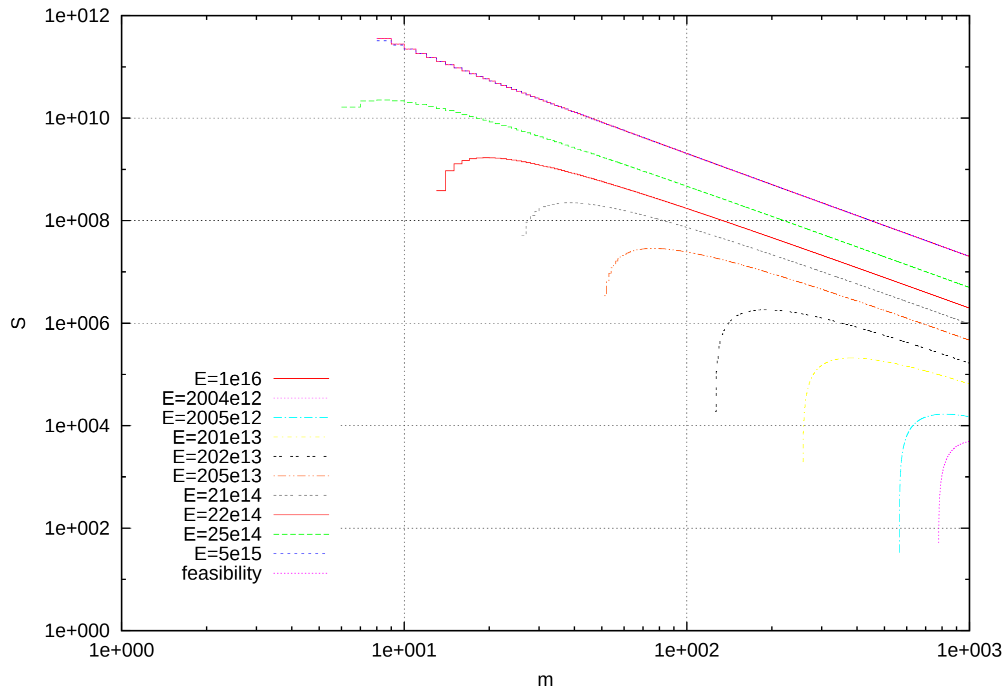

Fig. 5: Isoenergy map for processor number m, and startup time S. Value of $k = 1$ used.

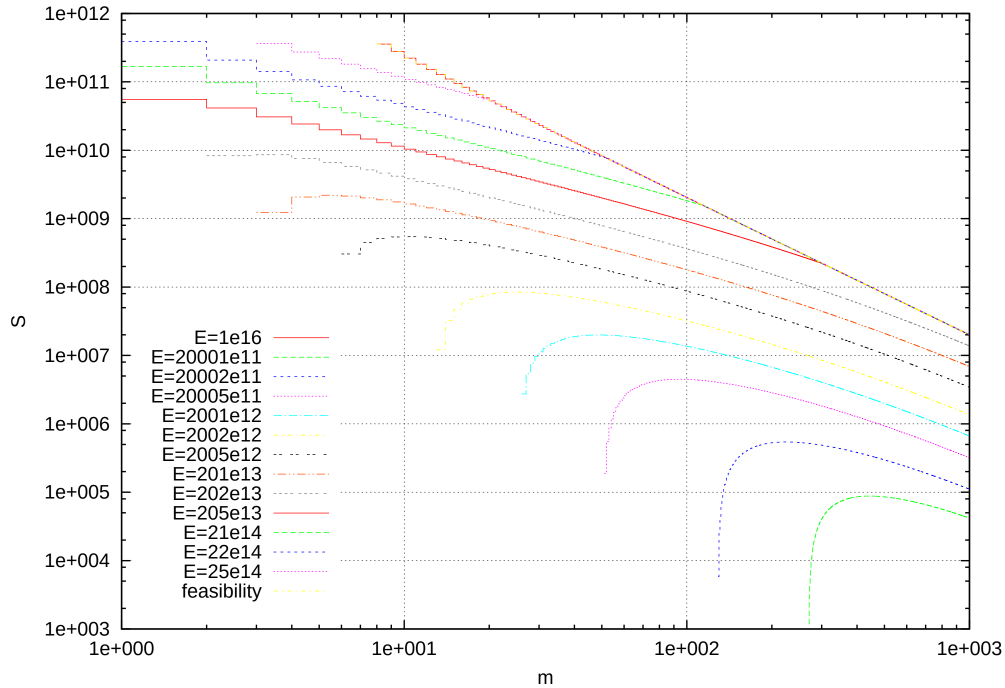

Fig. 6: Isoenergy map for processor number m, and startup time S. Value of $k = 100$ used.

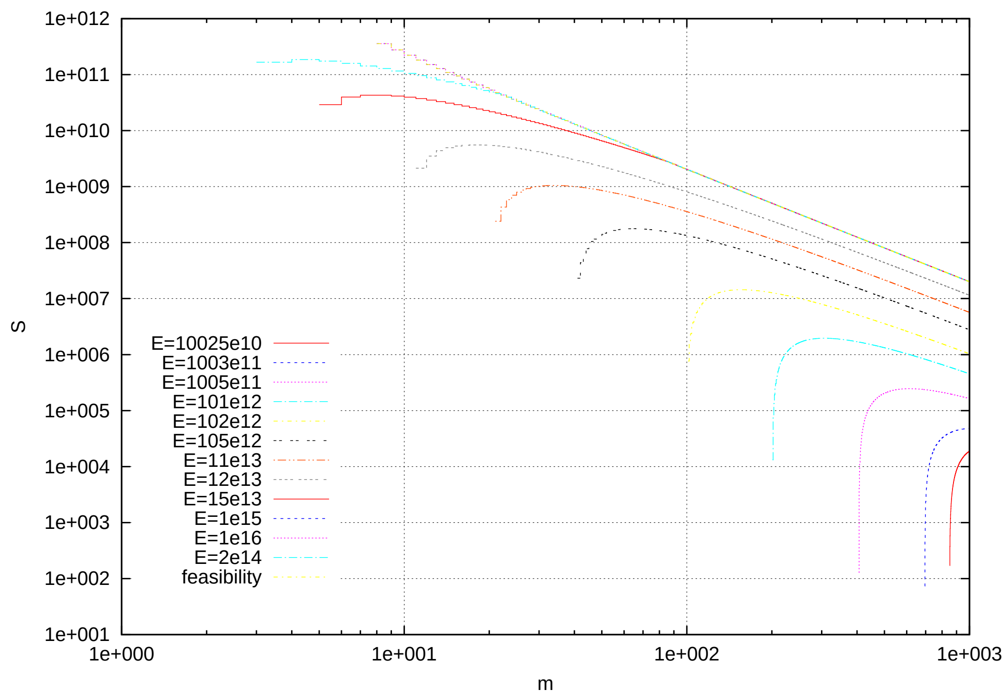

Fig. 7: Isoenergy map for processor number m, and startup time S. Value of $Pc = 10$ used.

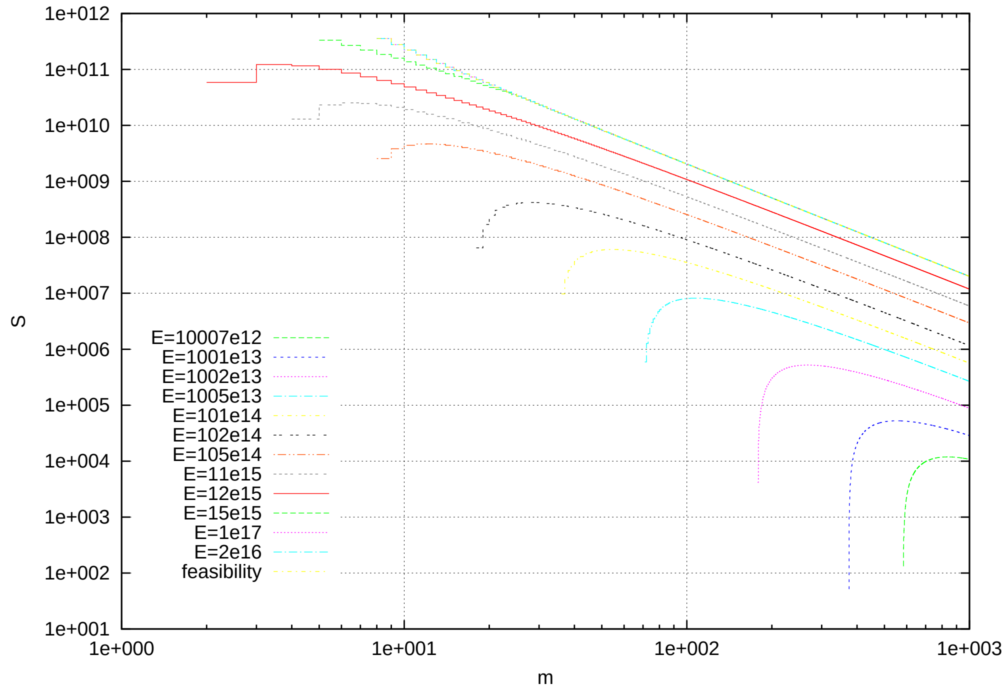

Fig. 8: Isoenergy map for processor number m, and startup time S. Value of $Pc = 1E3$ used.

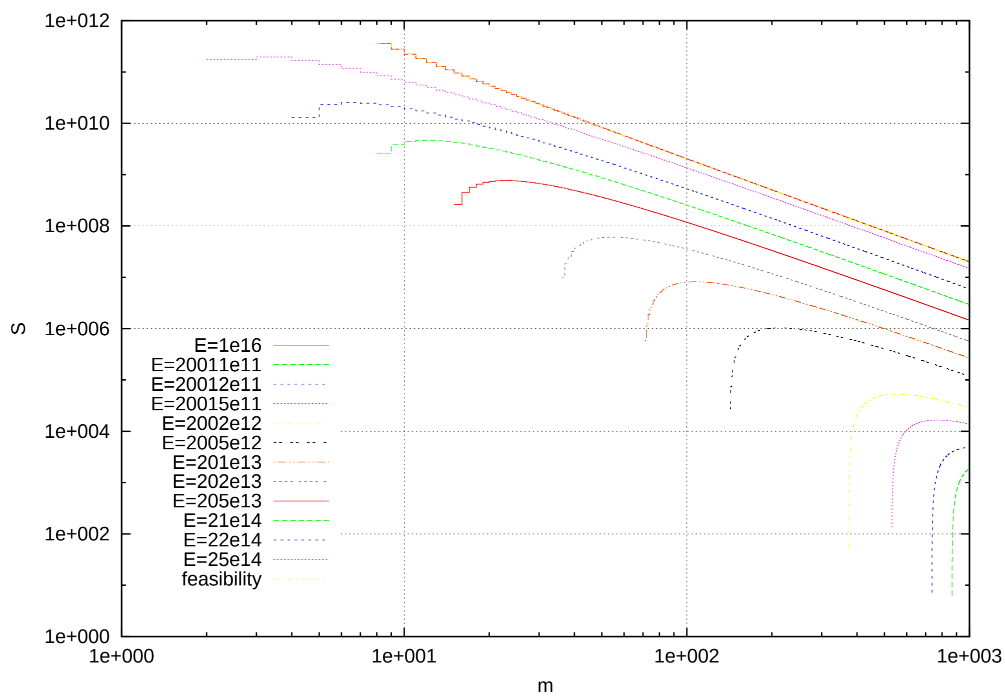

Fig. 9: Isoenergy map for processor number m, and startup time S. Value of $Pn = 1E1$ used.

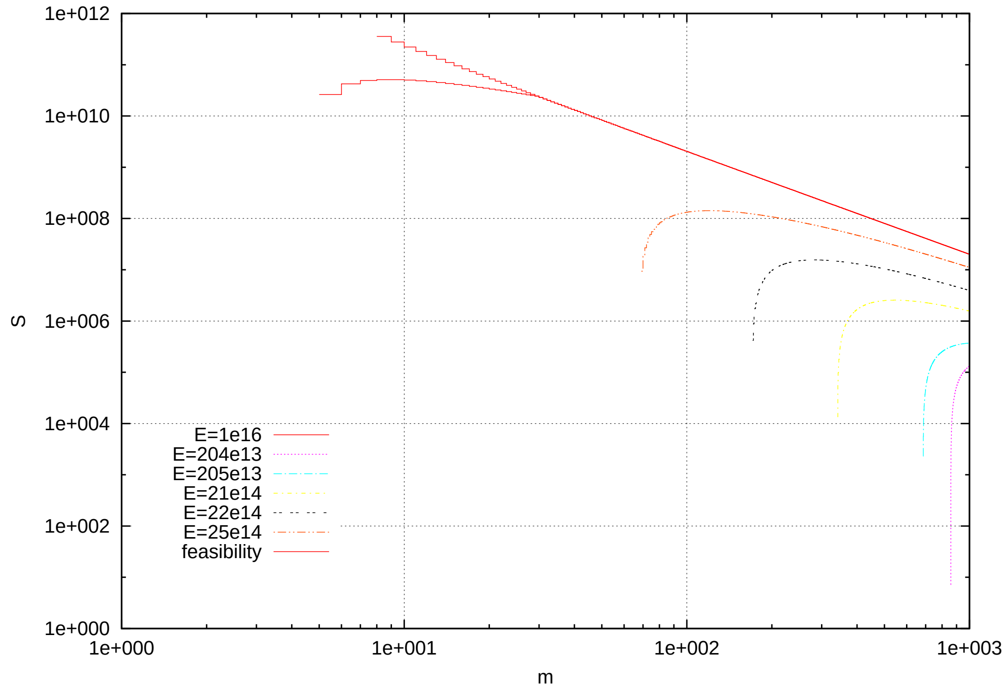

Fig. 10: Isoenergy map for processor number m, and startup time S. Value of $Pn = 1E4$ used.

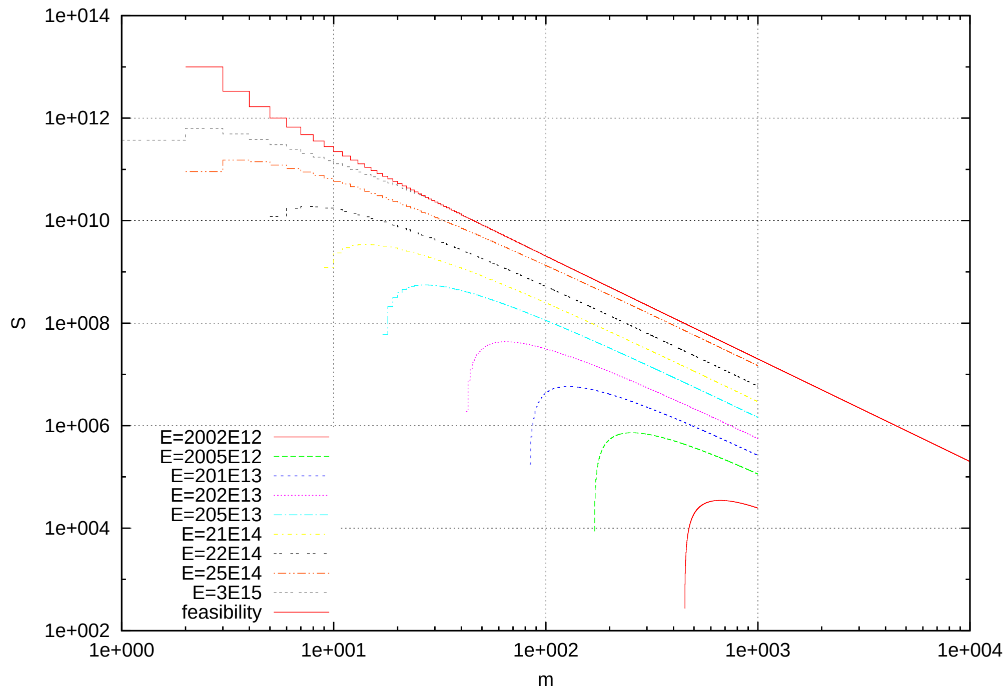

Fig. 11: Isoenergy map for processor number m, and startup time S. Value of $V = 1E13$ used.

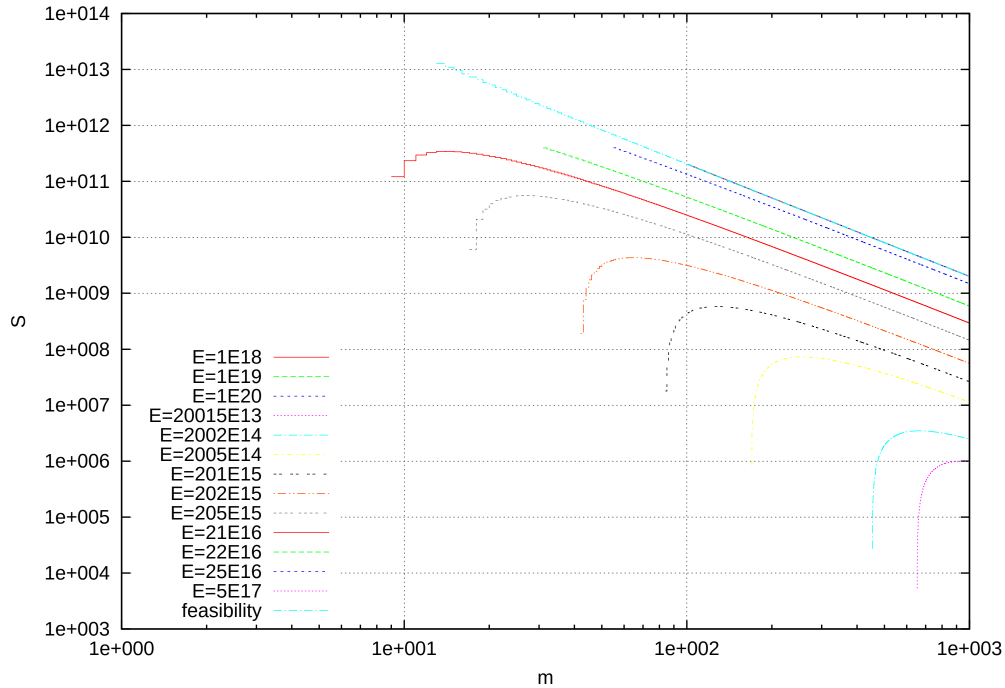

Fig. 12: Isoenergy map for processor number m, and startup time S. Value of $V = 1E15$ used.

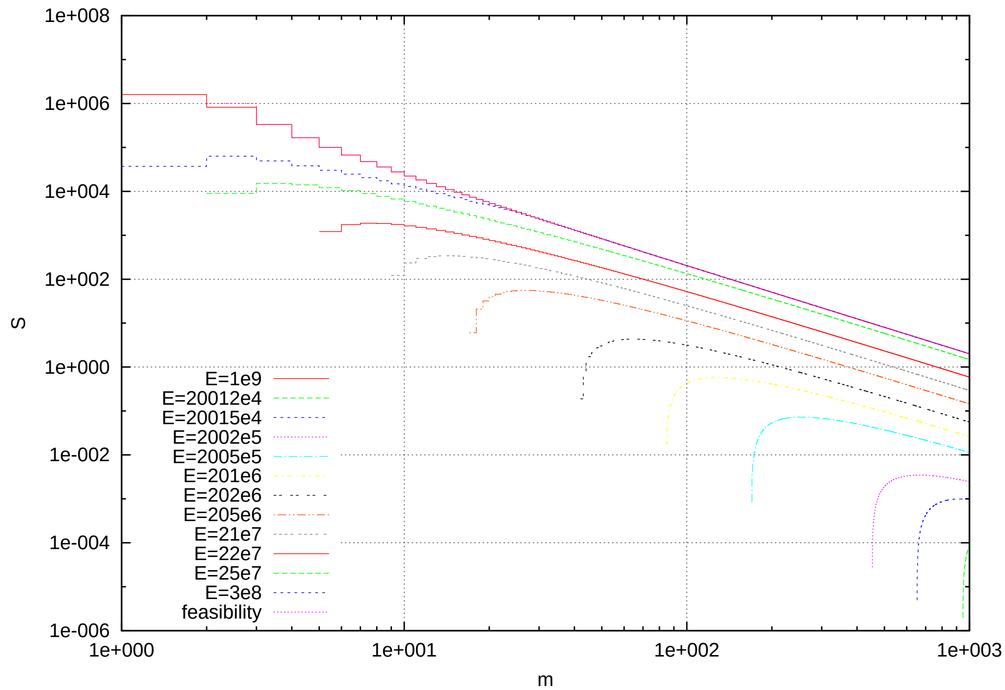

Fig. 13: Isoenergy map for processor number m, and startup time S. Value of $V = 1E6$ used.

3 Isoenergy maps for processor number m, and communication rate C.

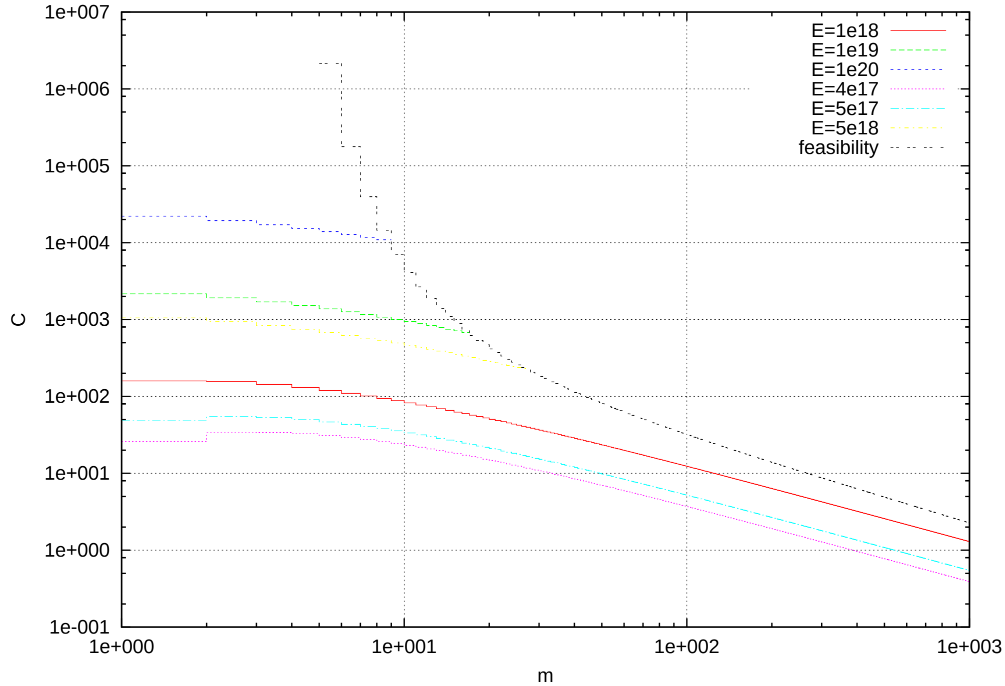

Fig. 14: Isoenergy map for processor number m, and communication rate C. Value of $A = 1E2$ used.

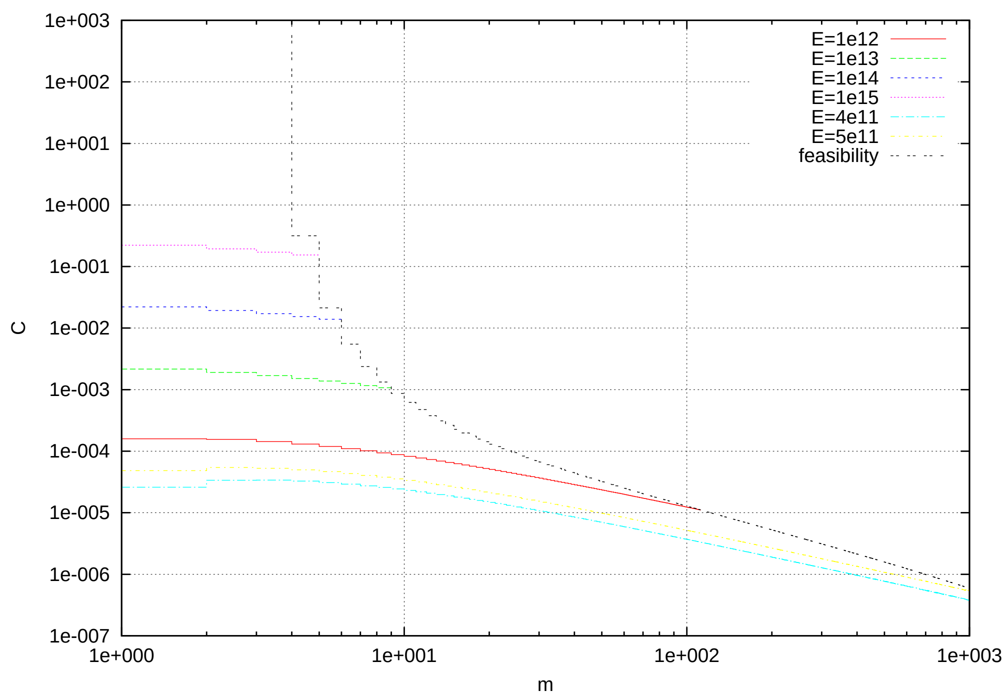

Fig. 15: Isoenergy map for processor number m, and communication rate C. Value of $A = 1E - 4$ used.

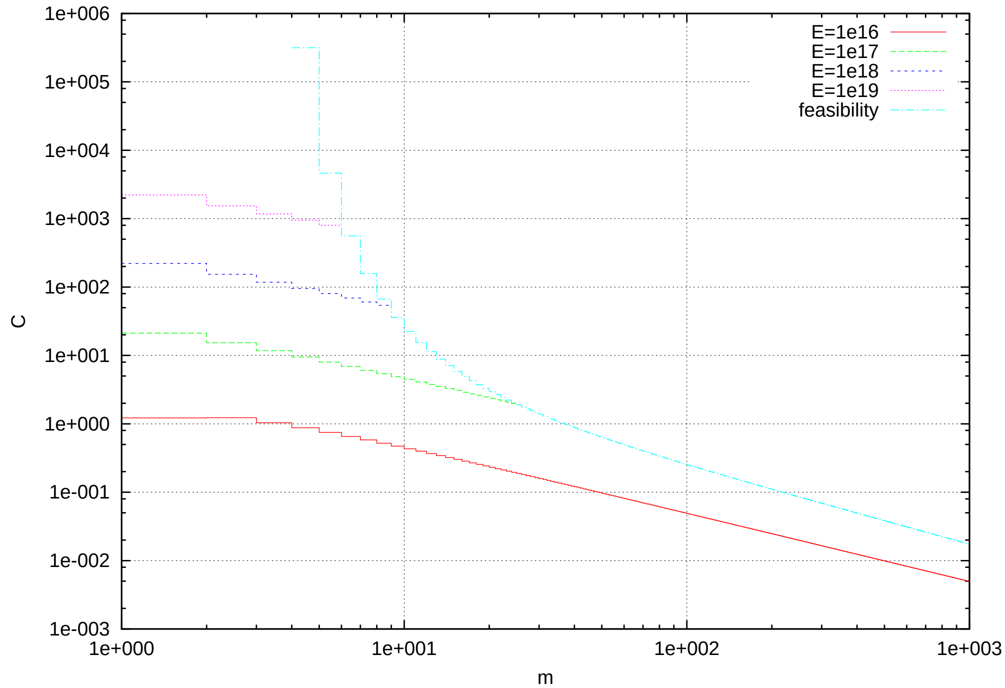

Fig. 16: Isoenergy map for processor number m, and communication rate C. Value of $k = 1$ used.

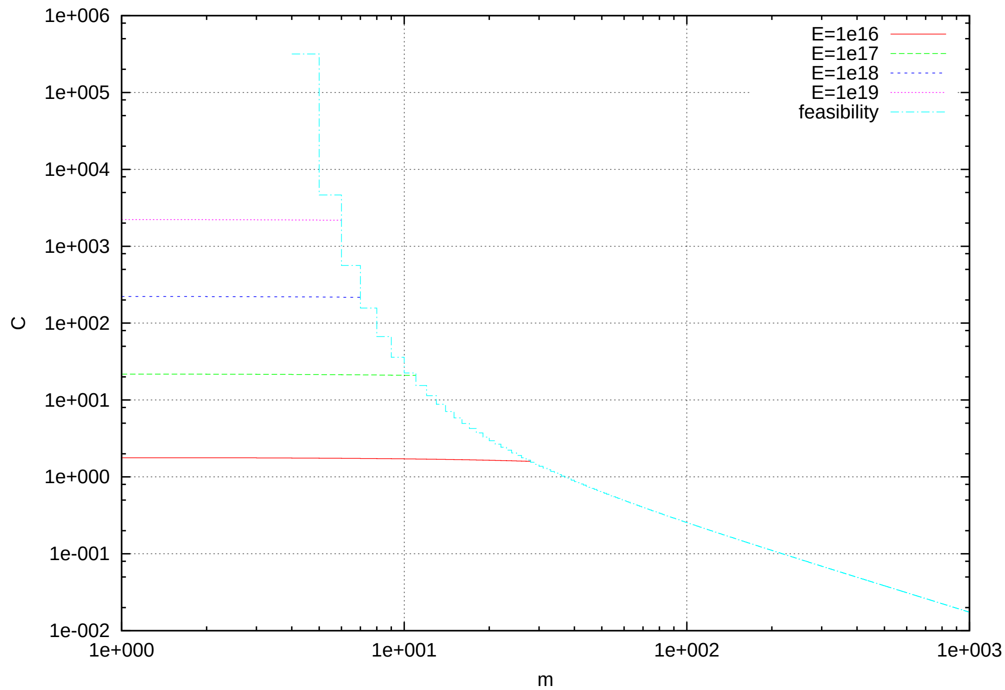

Fig. 17: Isoenergy map for processor number m, and communication rate C. Value of $k = 100$ used.

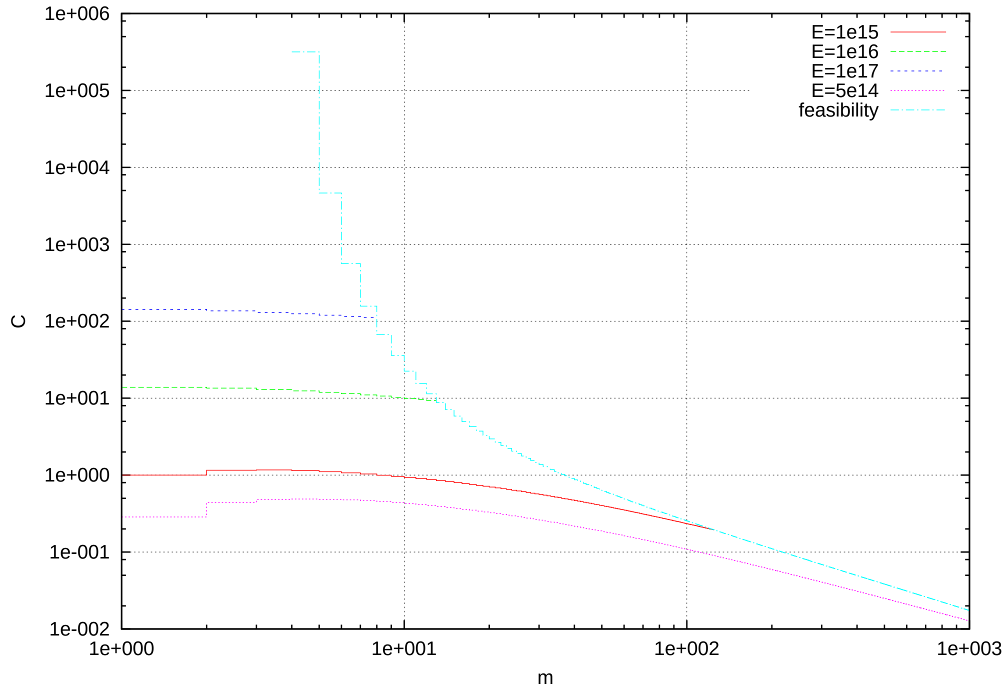

Fig. 18: Isoenergy map for processor number m, and communication rate C. Value of $Pc = 10$ used.

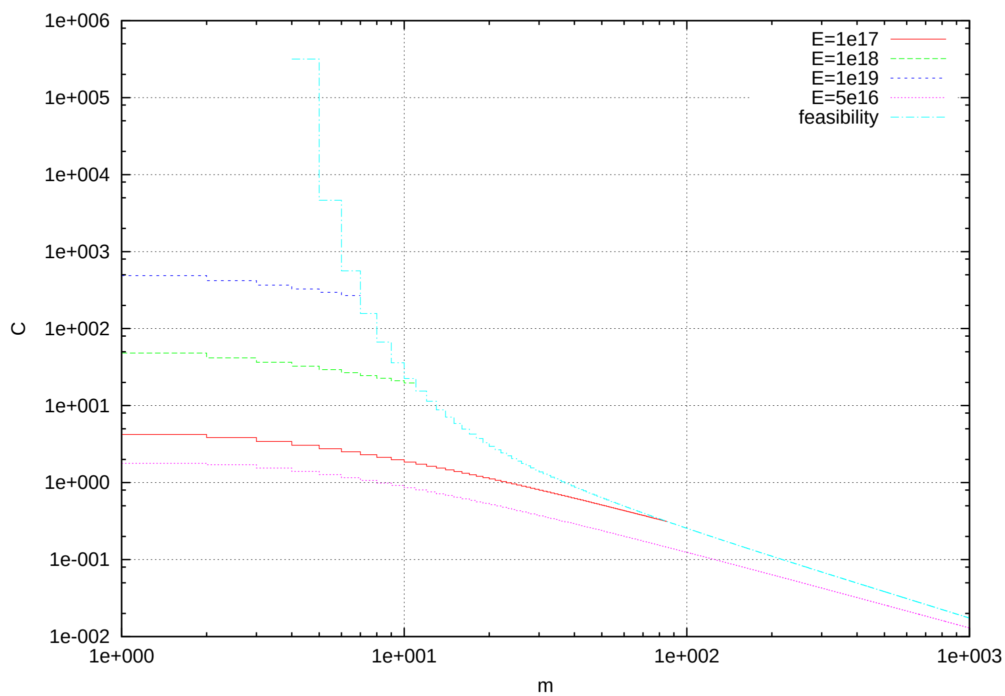

Fig. 19: Isoenergy map for processor number m, and communication rate C. Value of $Pc = 1E3$ used.

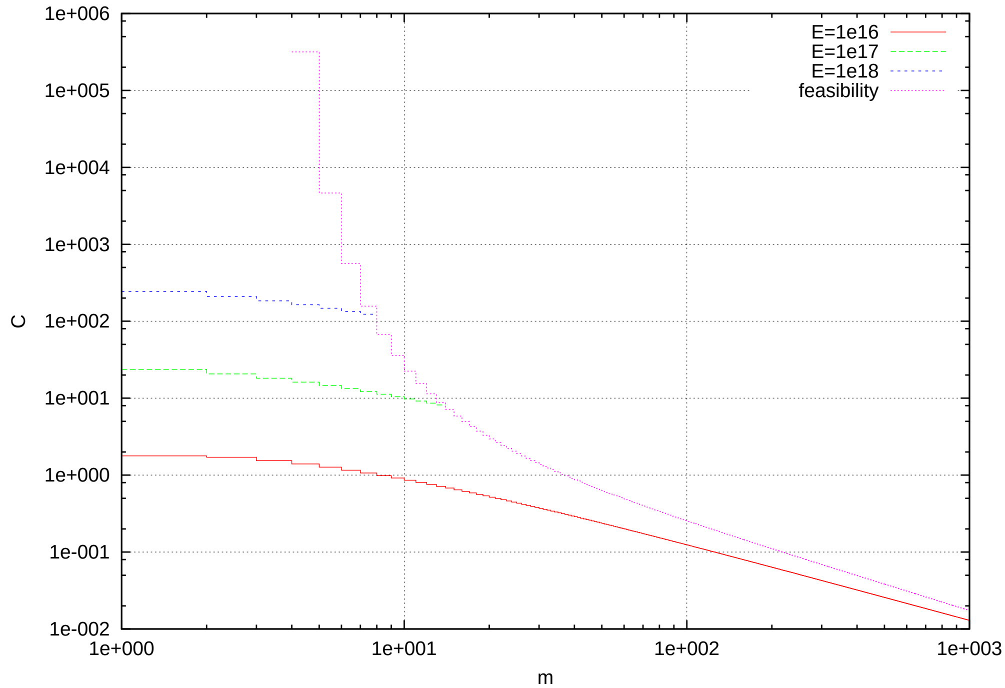

Fig. 20: Isoenergy map for processor number m, and communication rate C. Value of $Pn = 1E1$ used.

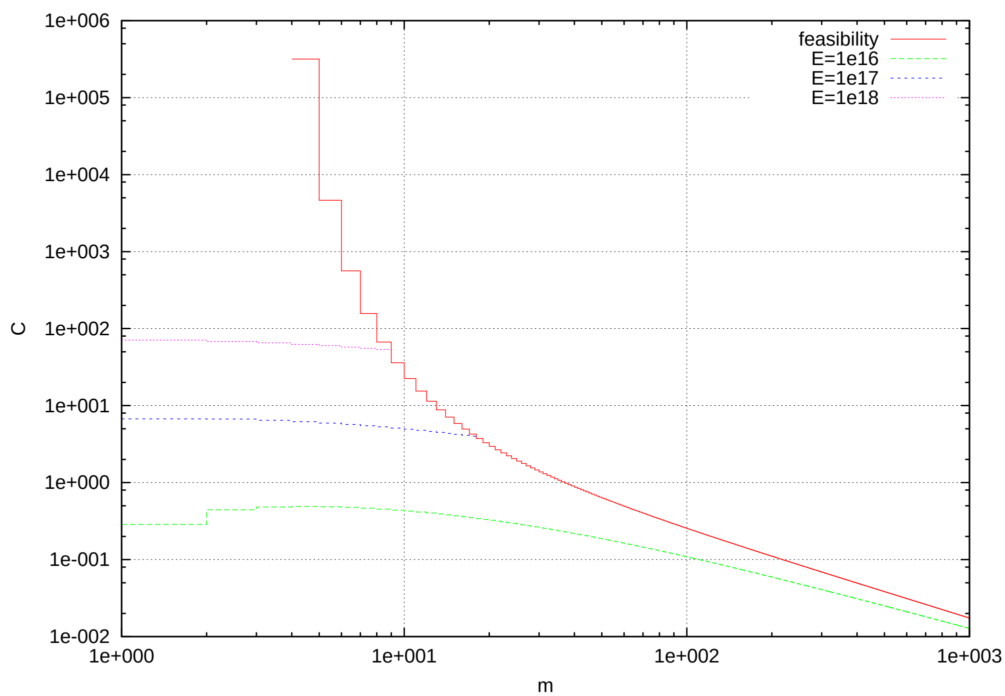

Fig. 21: Isoenergy map for processor number m, and communication rate C. Value of $Pn = 1E3$ used.

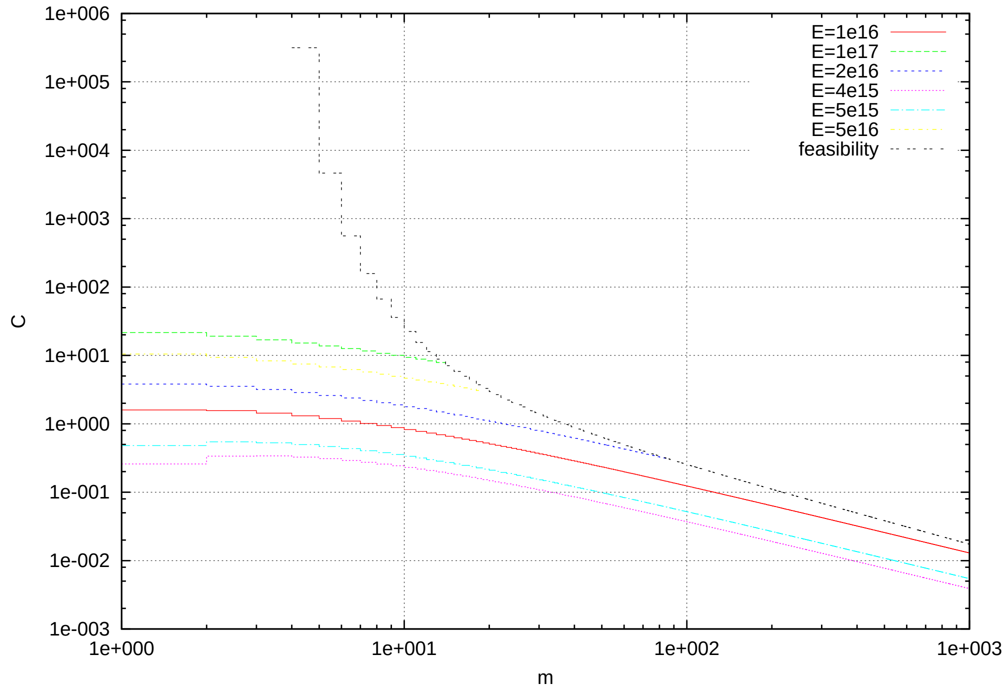

Fig. 22: Isoenergy map for processor number m, and communication rate C. Value of $A = 1$ used.

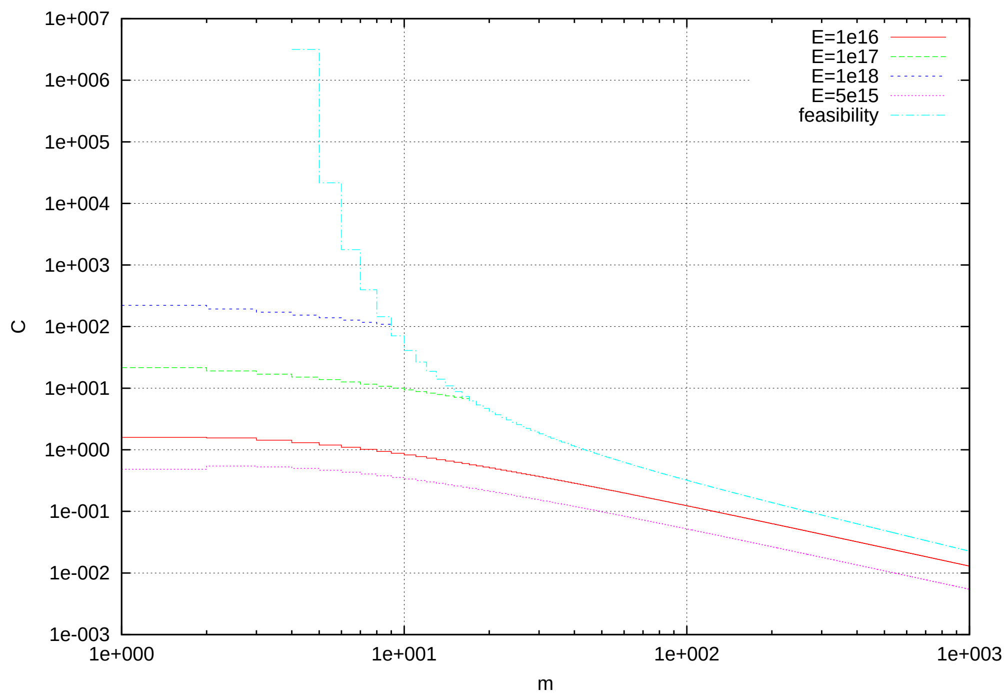

Fig. 23: Isoenergy map for processor number m, and communication rate C. Value of $S = 1E0$ used.

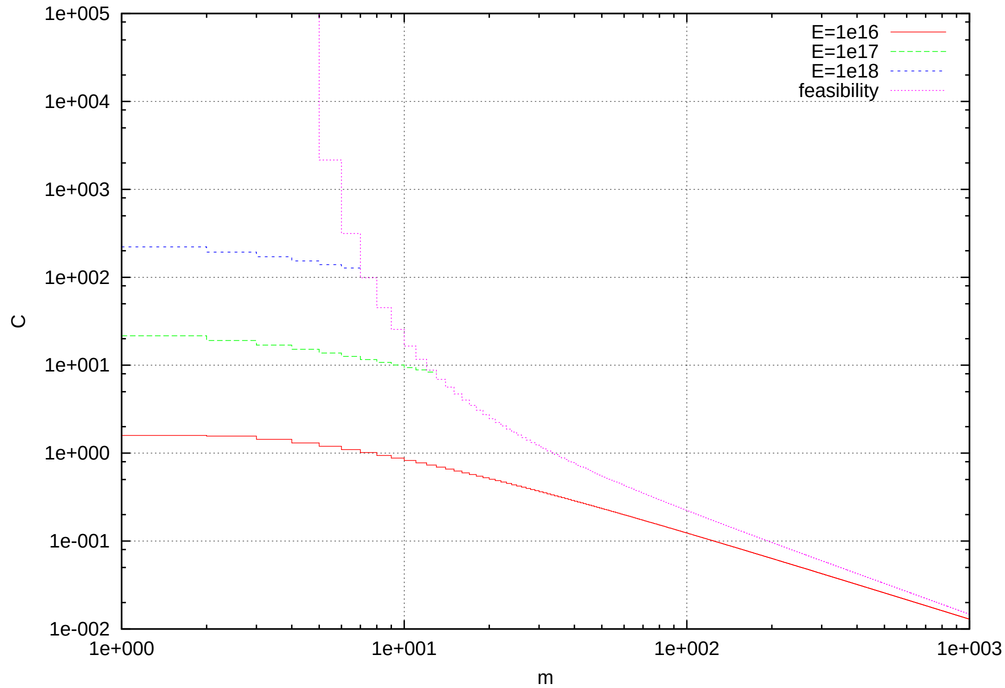

Fig. 24: Isoenergy map for processor number m, and communication rate C. Value of $S = 1E3$ used.

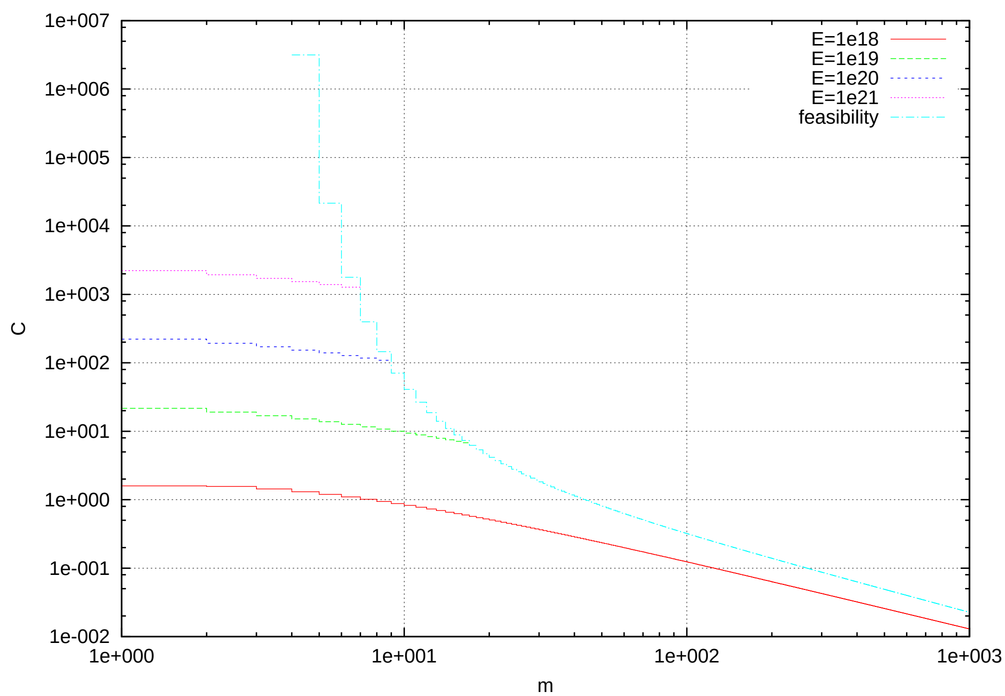

Fig. 25: Isoenergy map for processor number m, and communication rate C. Value of $V = 1E15$ used.

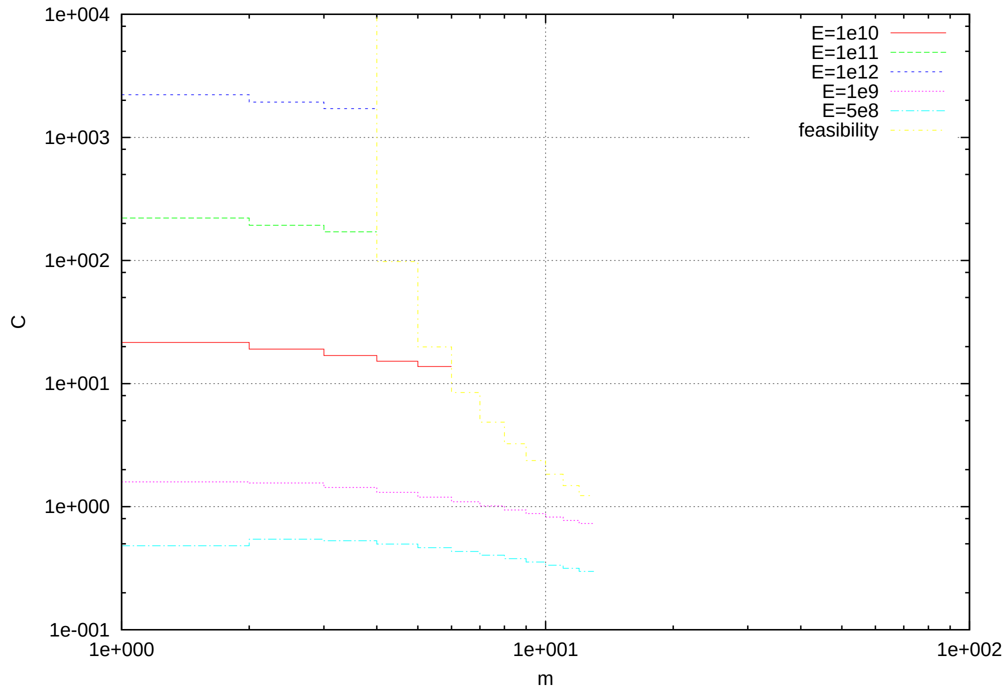

Fig. 26: Isoenergy map for processor number m, and communication rate C. Value of $V = 1E6$ used.

4 Isoenergy maps for processor number m, and computation rate A.

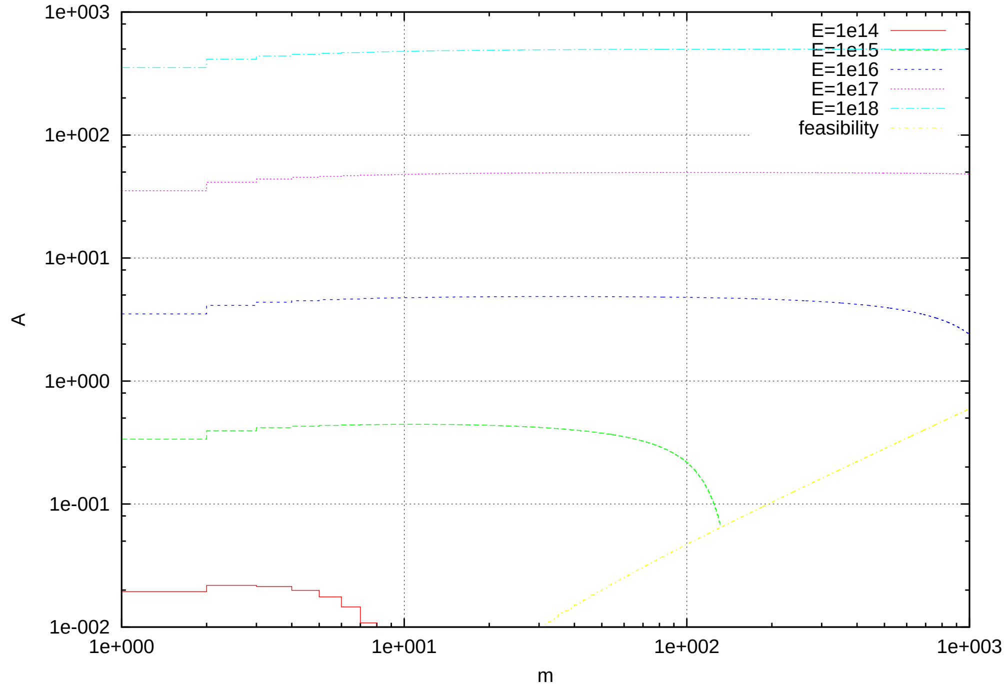

Fig. 27: Isoenergy map for processor number m, and computation rate A. Value of $C = 1E-2$ used.

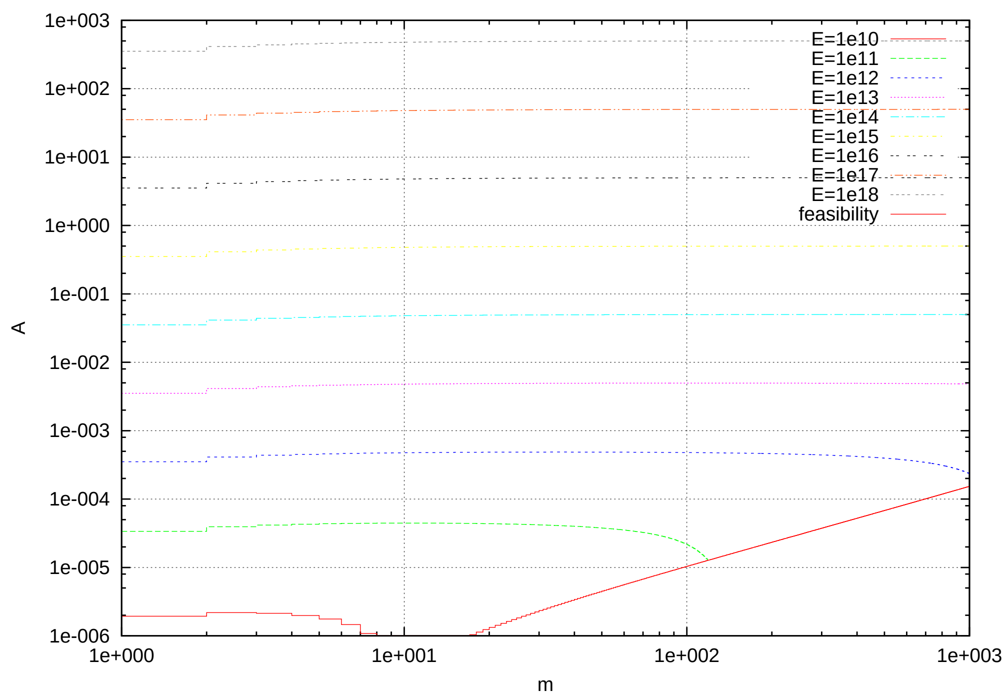

Fig. 28: Isoenergy map for processor number m, and computation rate A. Value of $C = 1E-6$ used.

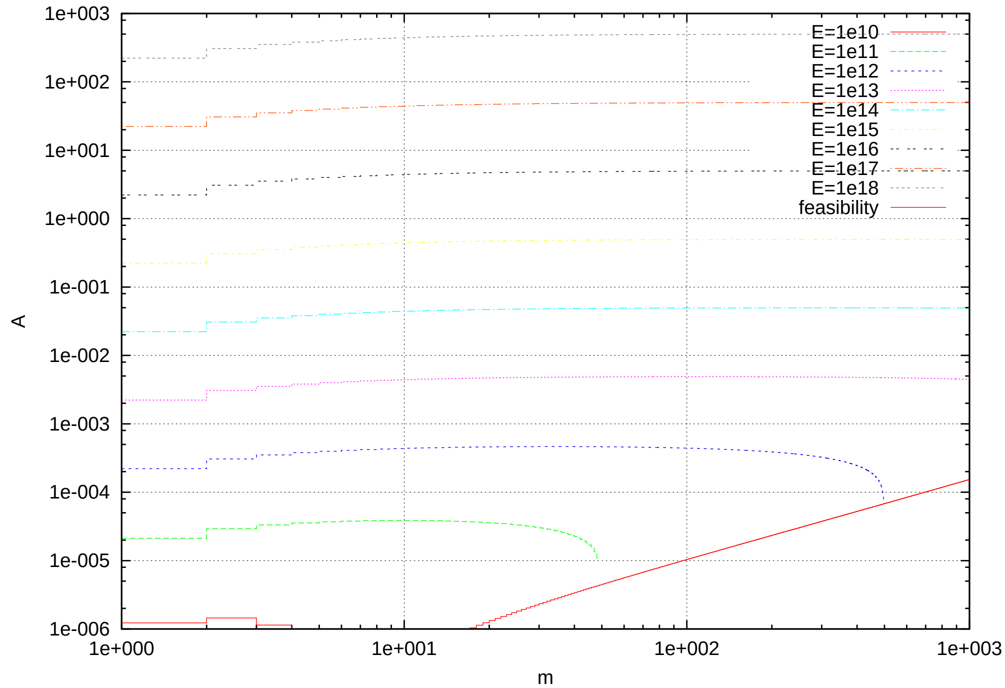

Fig. 29: Isoenergy map for processor number m, and computation rate A. Value of $k = 1$ used.

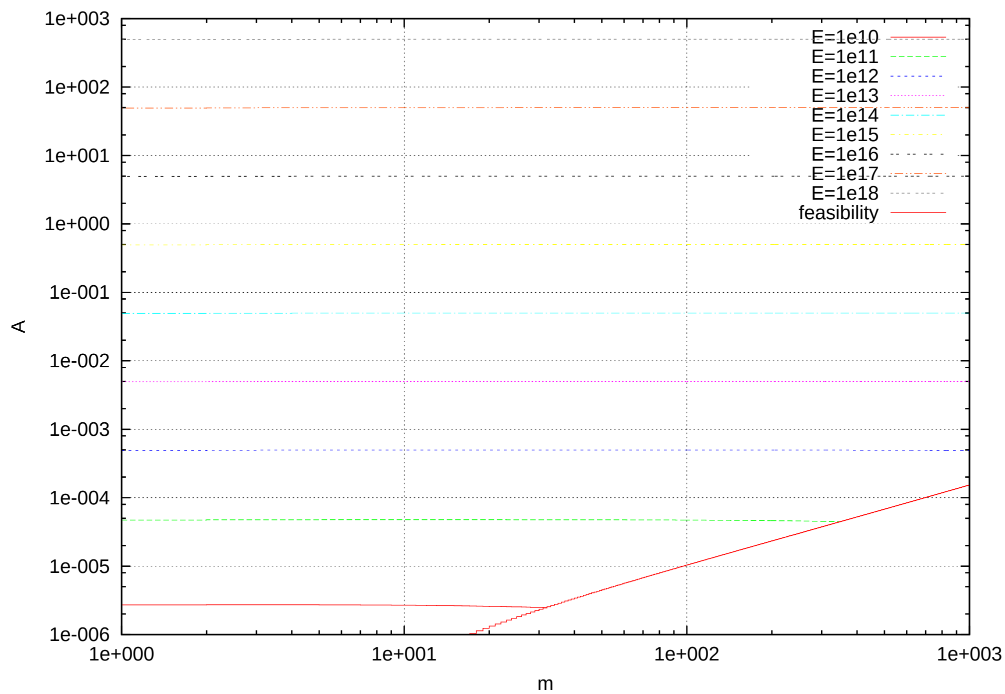

Fig. 30: Isoenergy map for processor number m, and computation rate A. Value of $k = 100$ used.

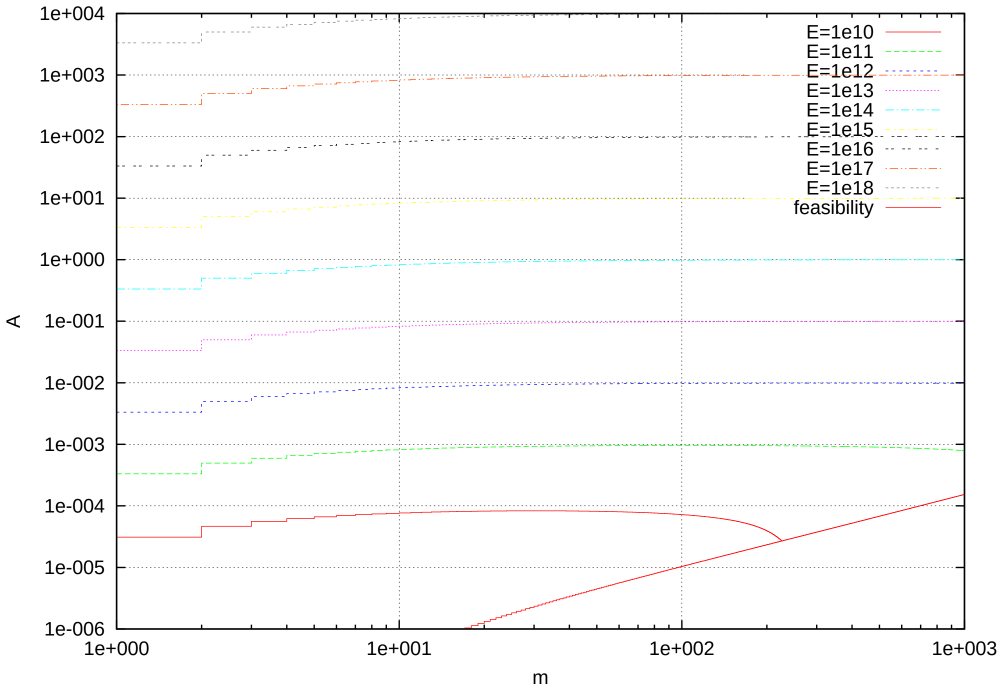

Fig. 31: Isoenergy map for processor number m, and computation rate A. Value of $Pc = 10$ used.

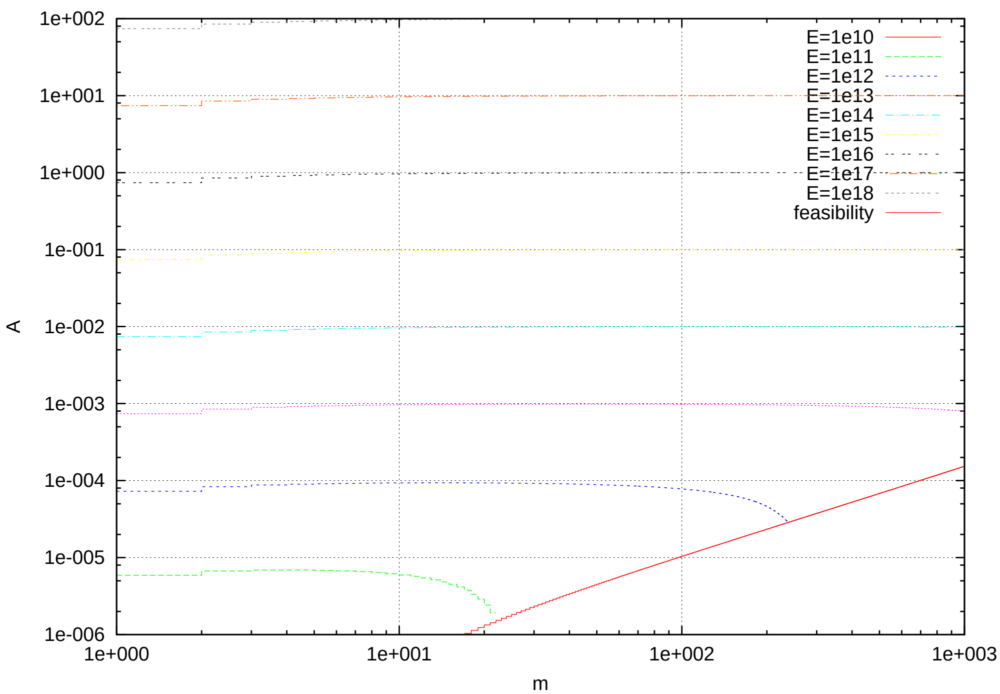

Fig. 32: Isoenergy map for processor number m, and computation rate A. Value of $Pc = 1E3$ used.

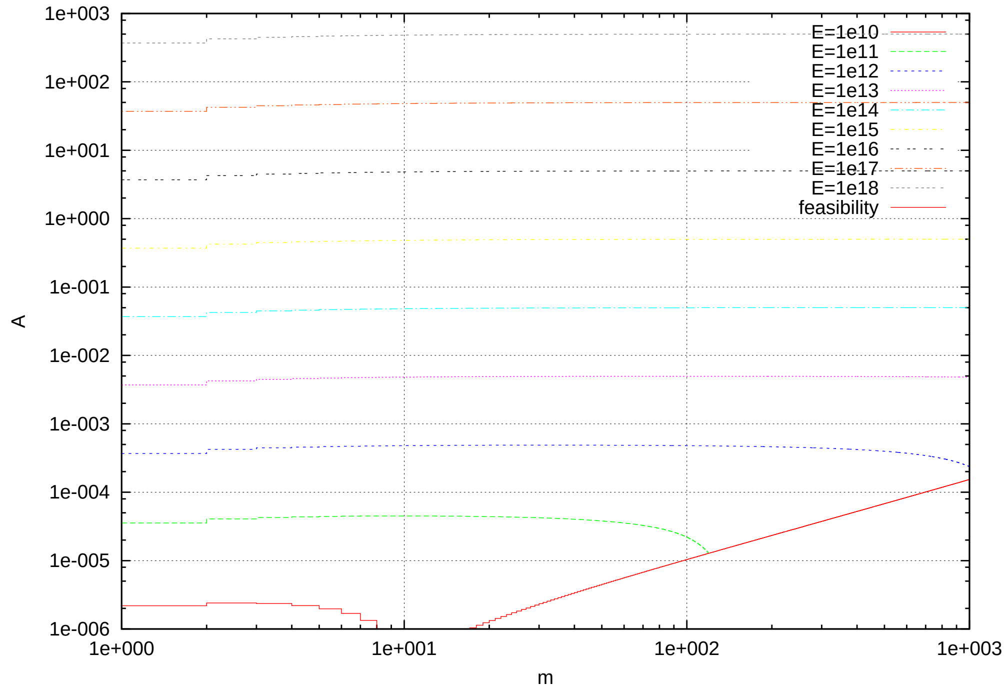

Fig. 33: Isoenergy map for processor number m, and computation rate A. Value of $Pn = 1E1$ used.

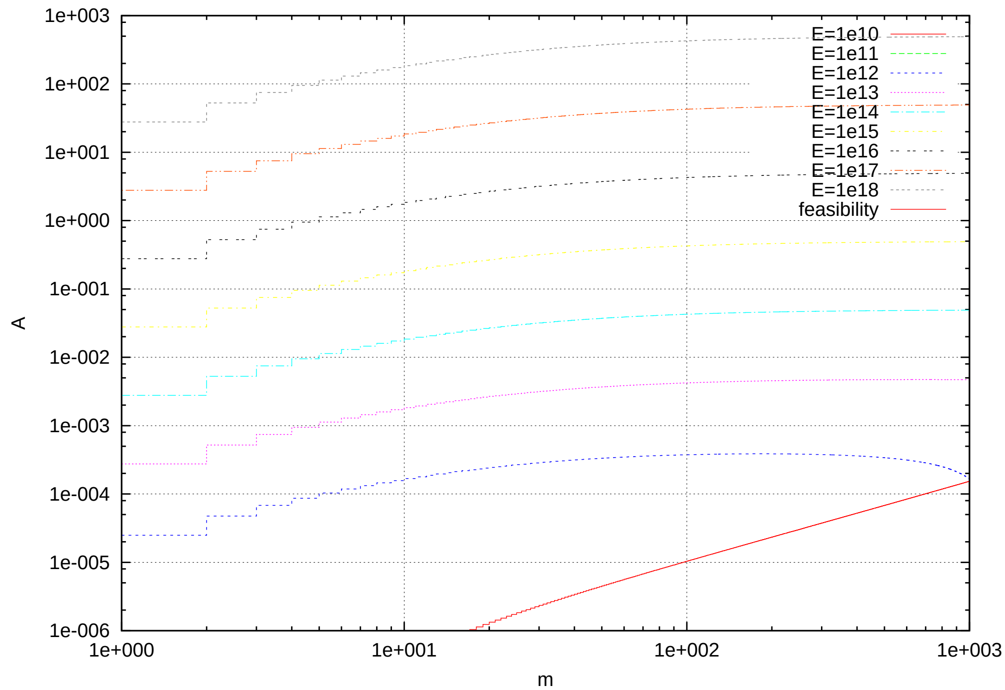

Fig. 34: Isoenergy map for processor number m, and computation rate A. Value of $Pn = 1E4$ used.

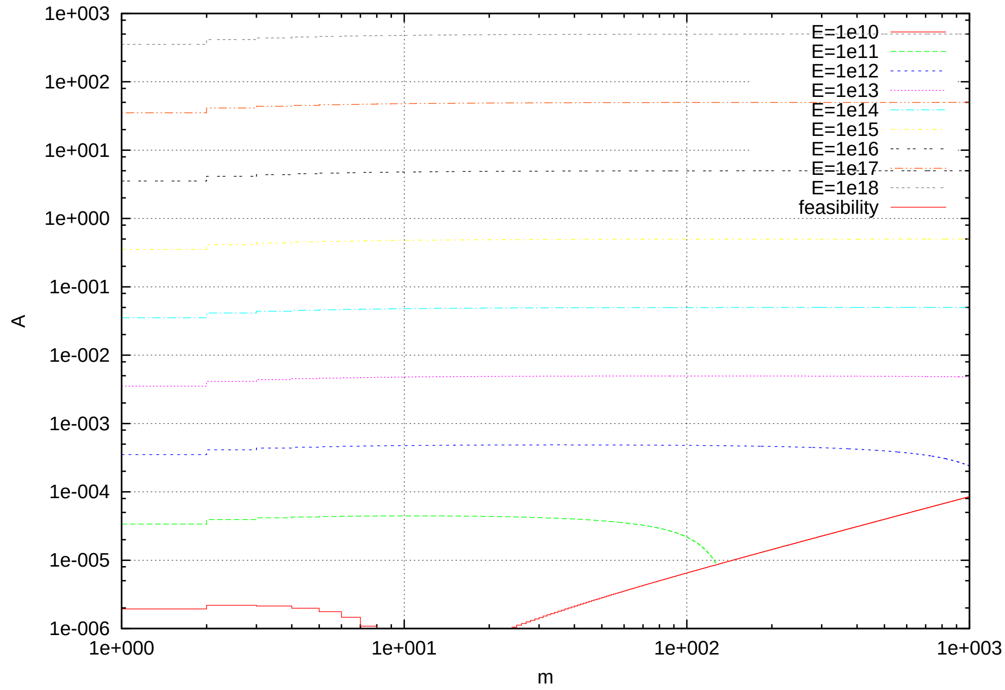

Fig. 35: Isoenergy map for processor number m, and computation rate A. Value of $S = 1$ used.

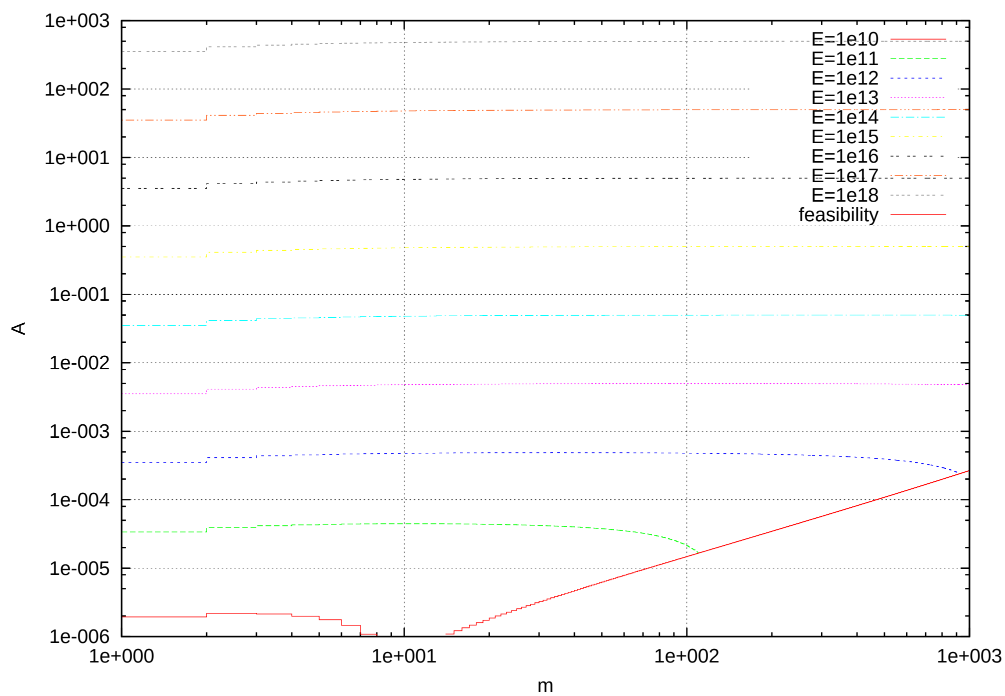

Fig. 36: Isoenergy map for processor number m, and computation rate A. Value of $S = 1E3$ used.

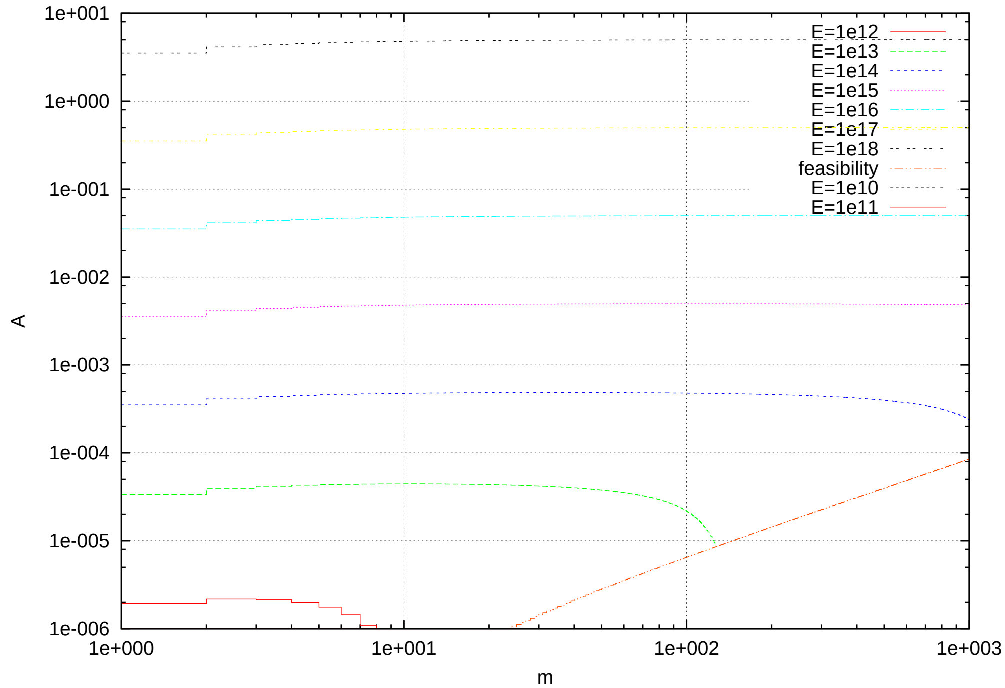

Fig. 37: Isoenergy map for processor number m, and computation rate A. Value of $V = 1E15$ used.

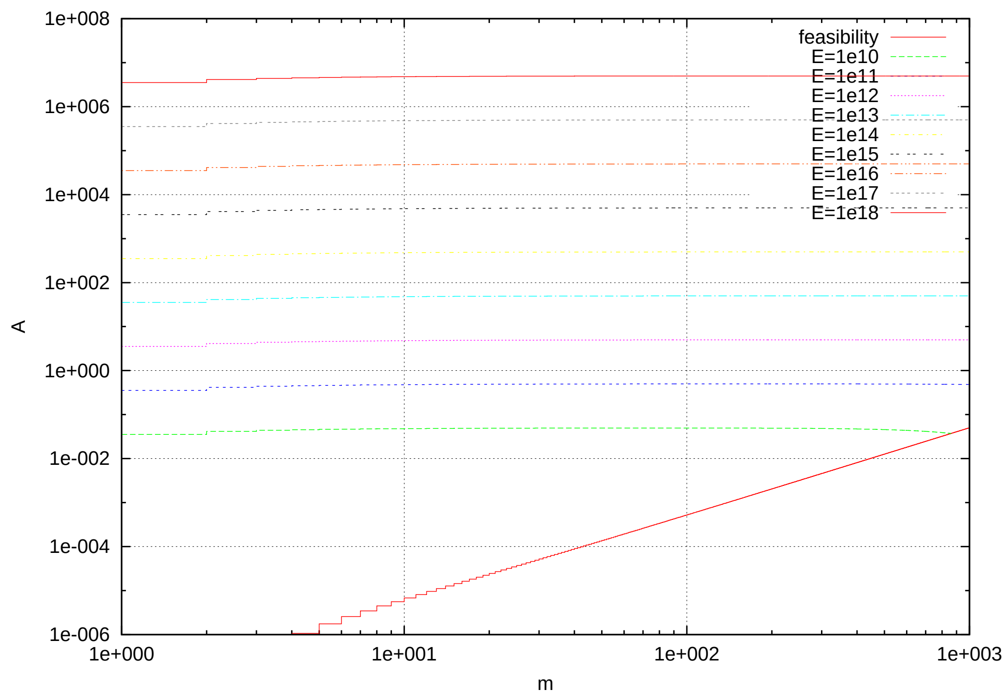

Fig. 38: Isoenergy map for processor number m, and computation rate A. Value of $V = 1E9$ used.

5 Isoenergy maps for processor number m, and load size V.

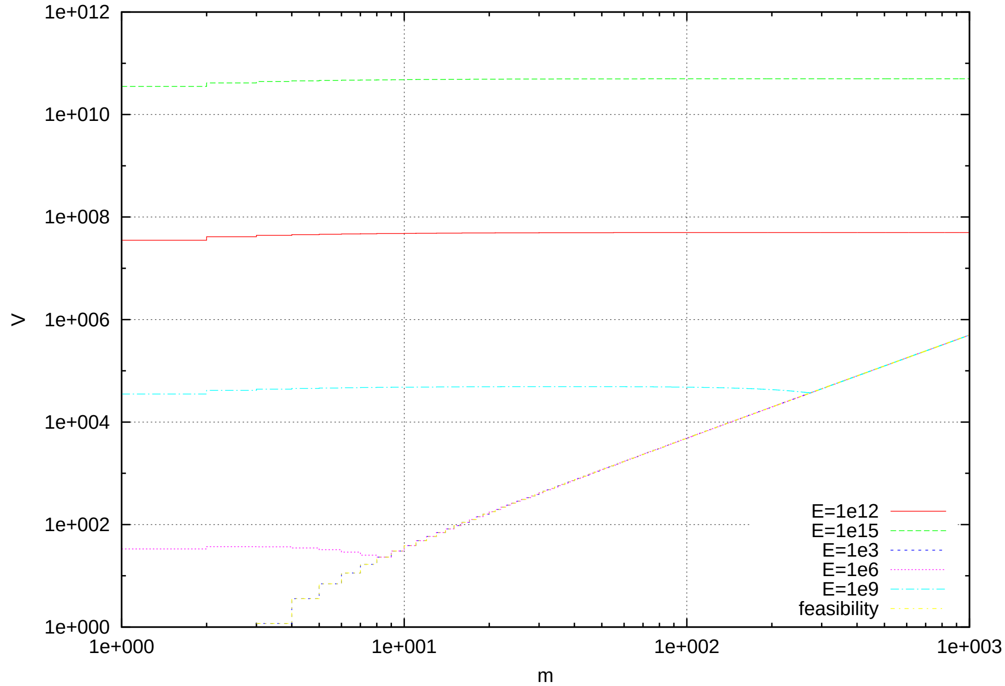

Fig. 39: Isoenergy map for processor number m, and load size V. Value of $A = 1E2$ used.

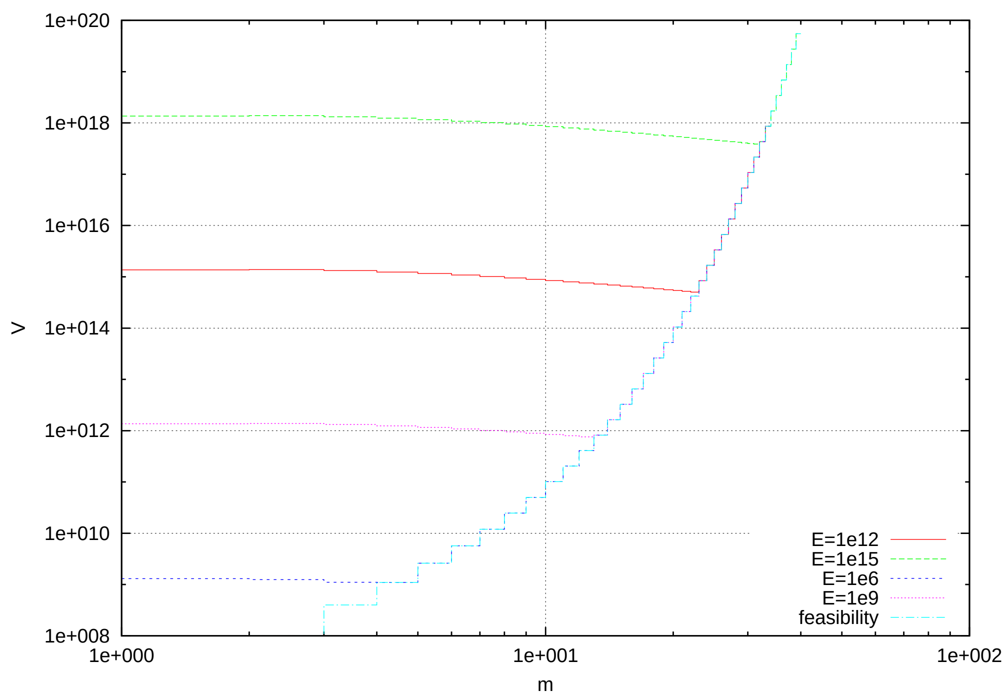

Fig. 40: Isoenergy map for processor number m, and load size V. Value of $A = 1E - 6$ used.

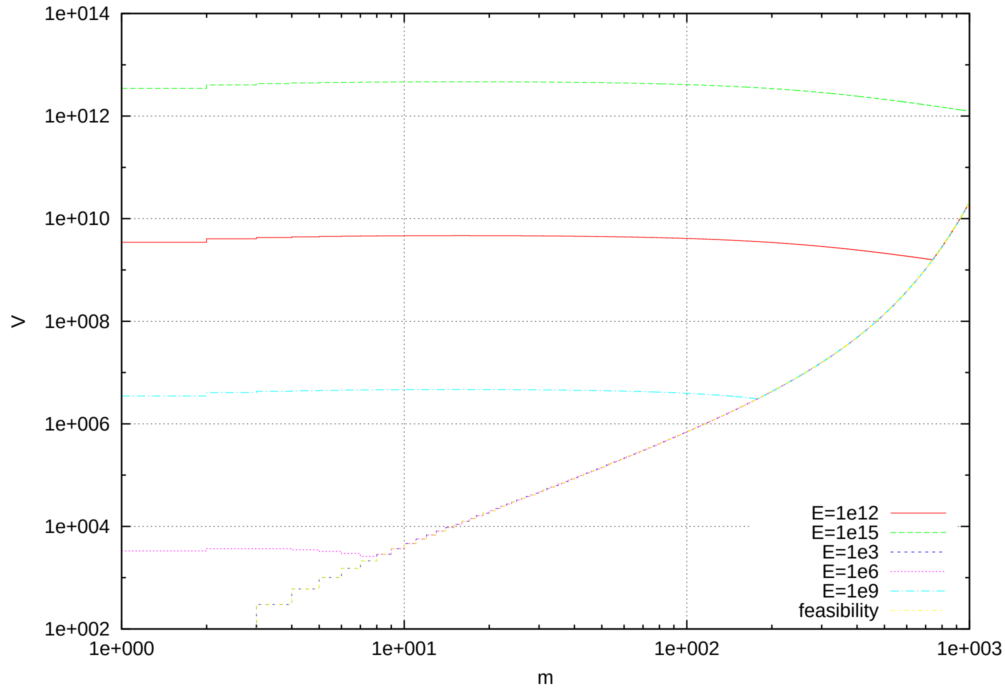

Fig. 41: Isoenergy map for processor number m, and load size V. Value of $C = 1E - 2$ used.

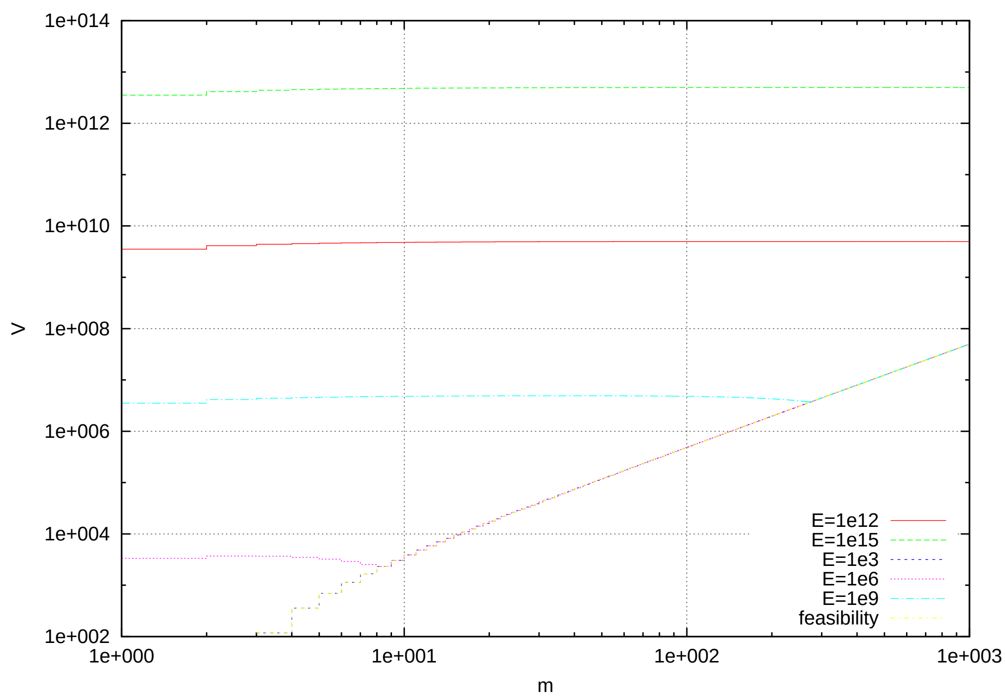

Fig. 42: Isoenergy map for processor number m, and load size V. Value of $C = 1E - 8$ used.

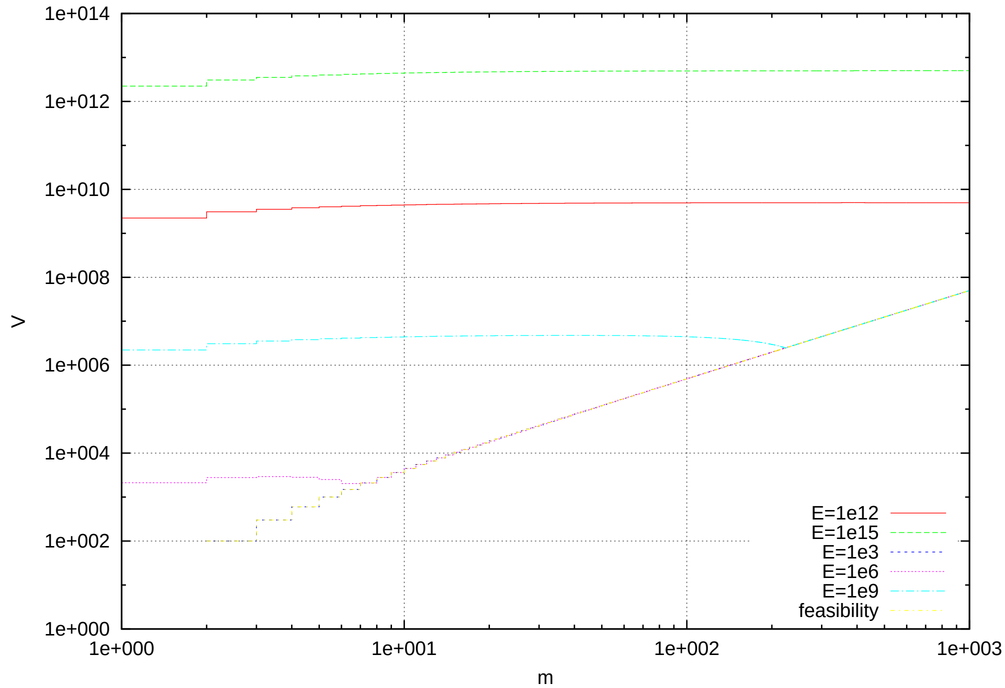

Fig. 43: Isoenergy map for processor number m, and load size V. Value of $k = 1$ used.

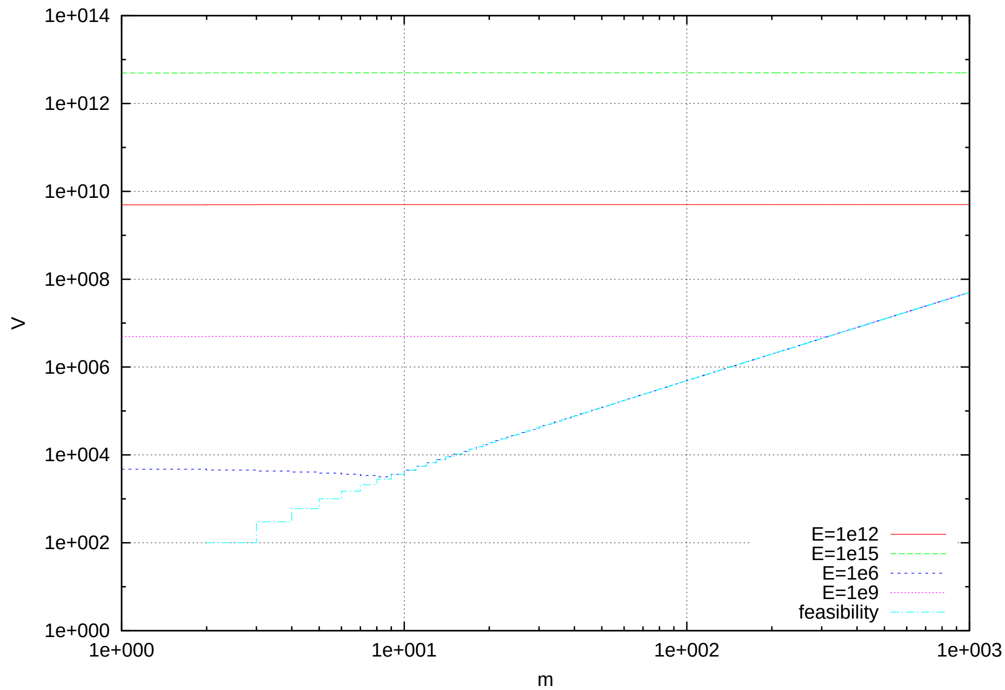

Fig. 44: Isoenergy map for processor number m, and load size V. Value of $k = 100$ used.

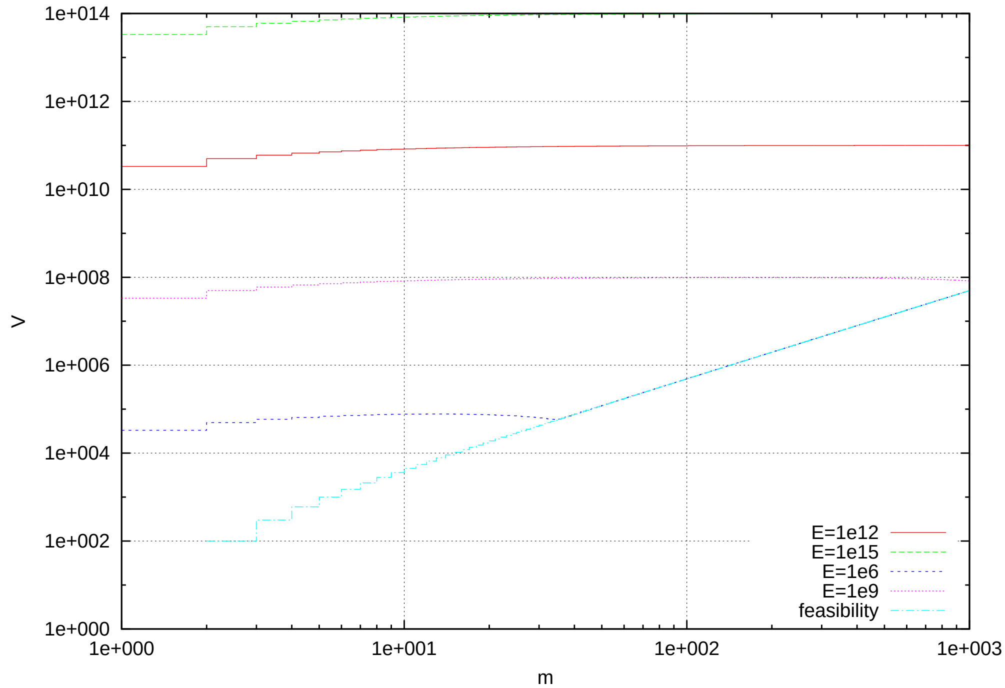

Fig. 45: Isoenergy map for processor number m, and load size V. Value of $Pc- = 10$ used.

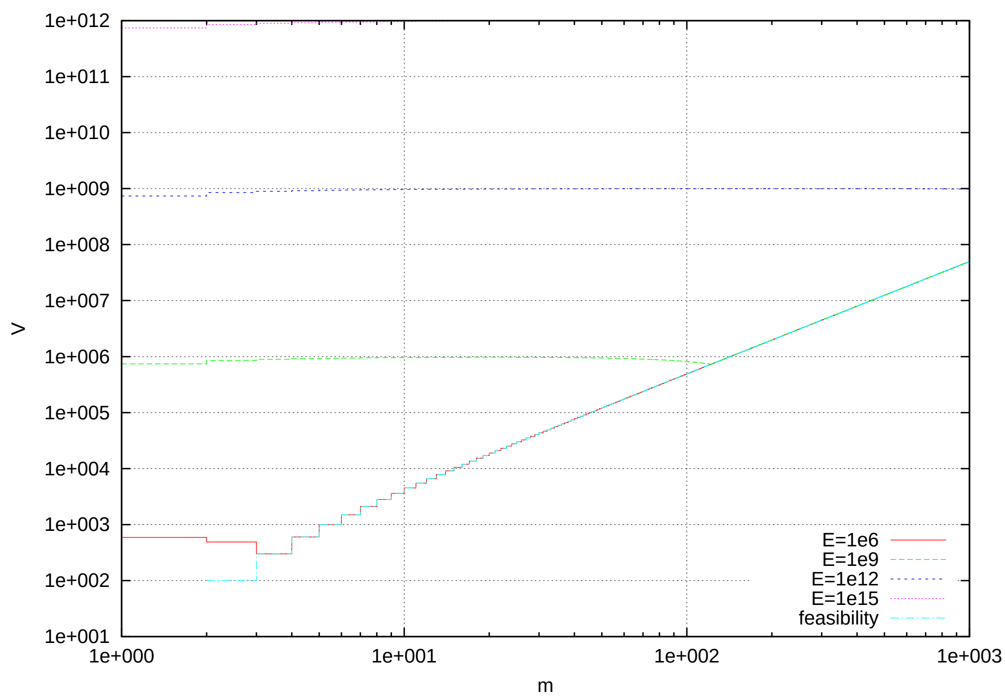

Fig. 46: Isoenergy map for processor number m, and load size V. Value of $Pc- = 1E3$ used.

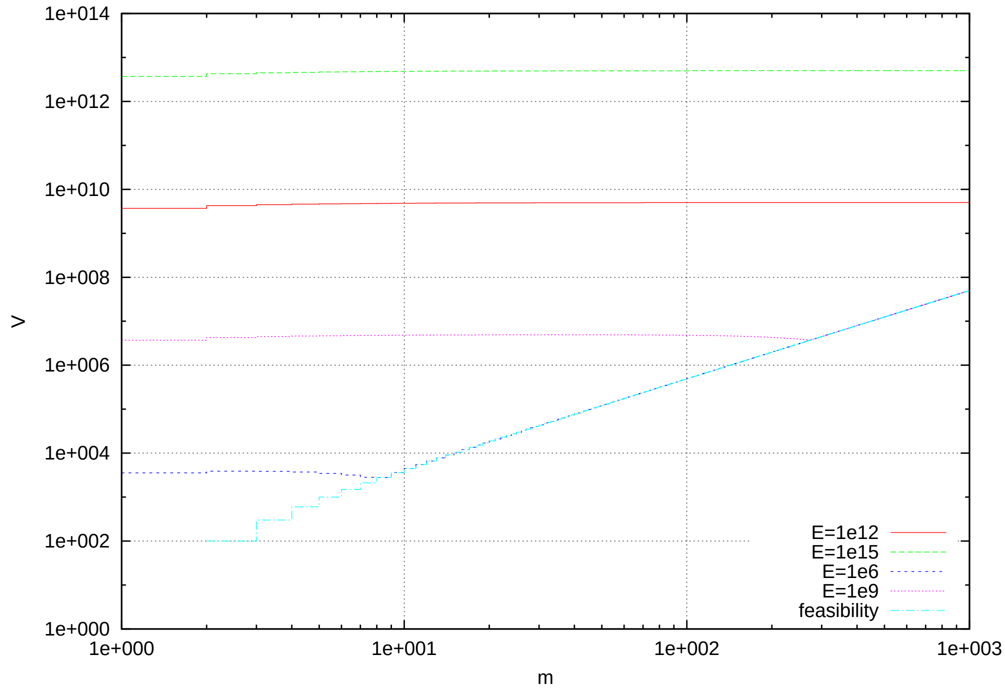

Fig. 47: Isoenergy map for processor number m, and load size V. Value of $Pn = 10$ used.

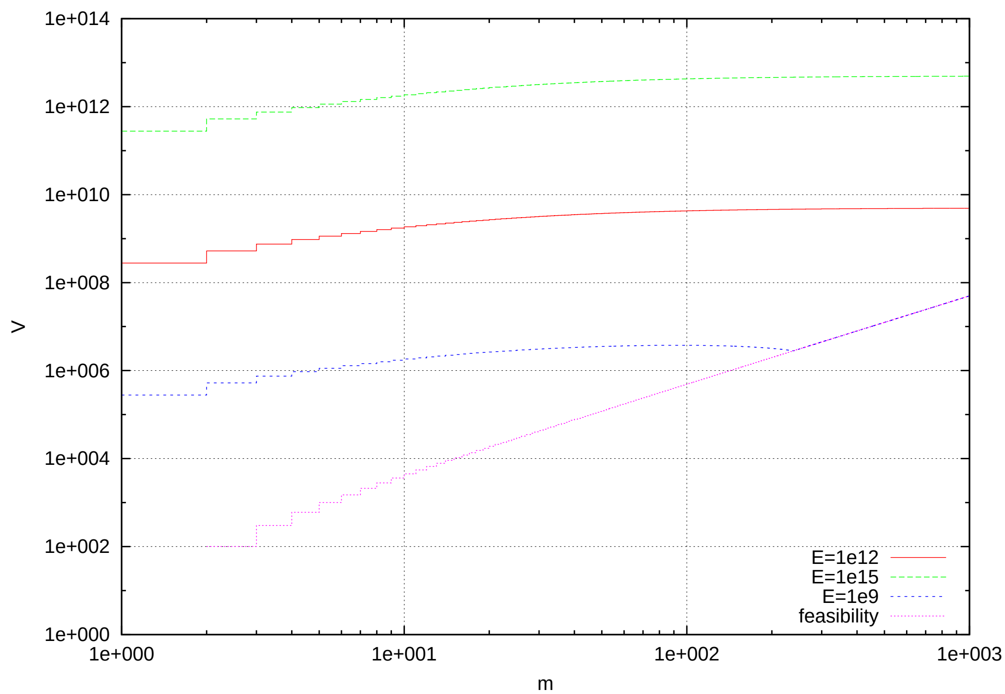

Fig. 48: Isoenergy map for processor number m, and load size V. Value of $Pn = 1E4$ used.

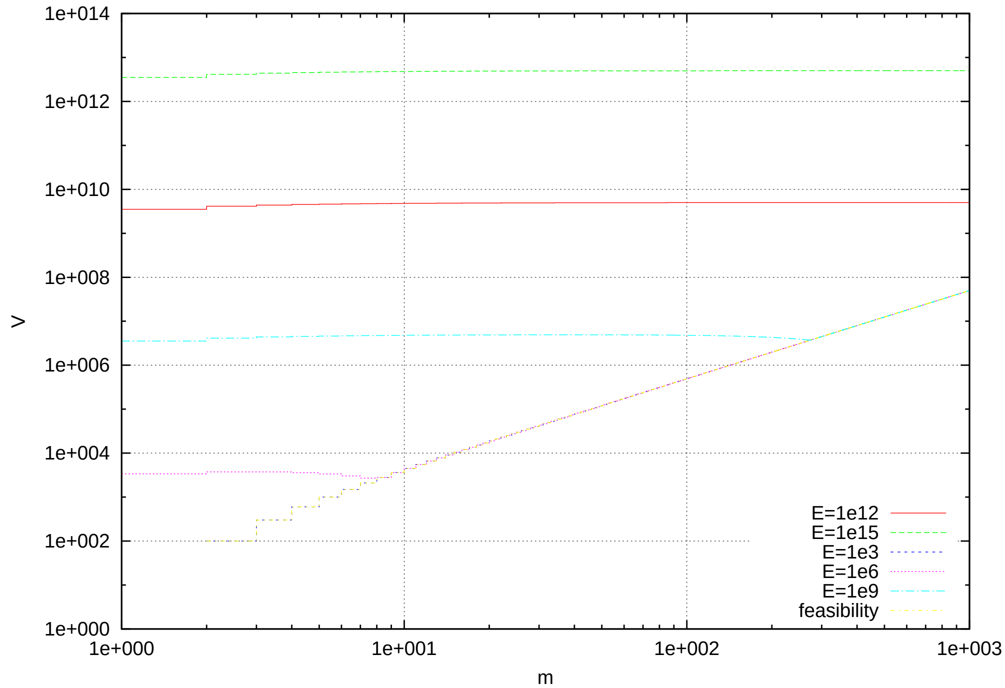

Fig. 49: Isoenergy map for processor number m, and load size V. Value of $A = 1$ used.

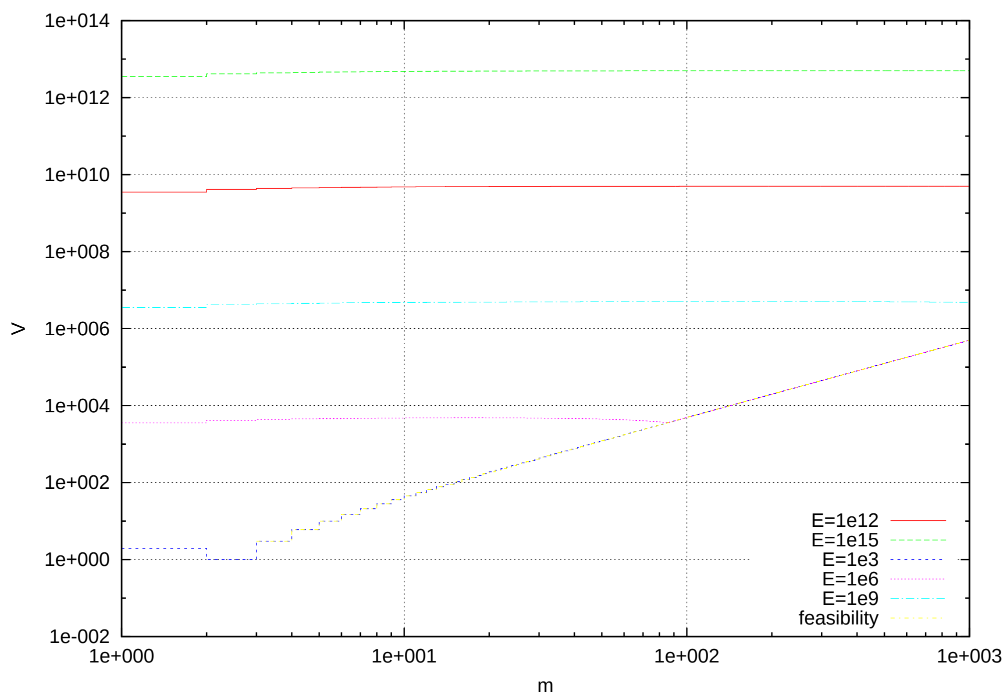

Fig. 50: Isoenergy map for processor number m, and load size V. Value of $S = 1$ used.

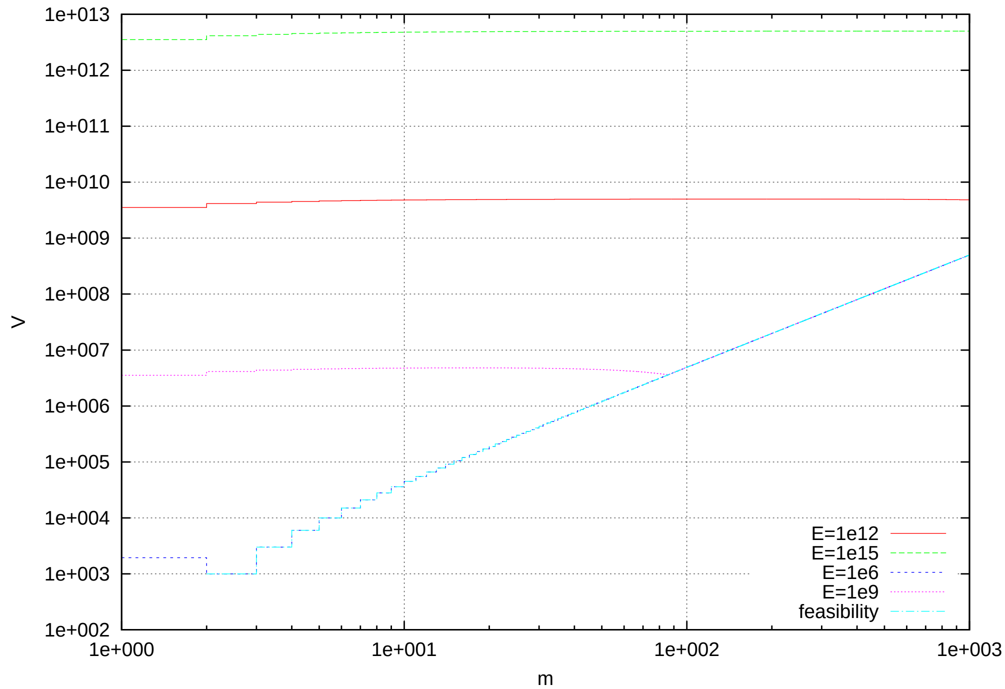

Fig. 51: Isoenergy map for processor number m, and load size V. Value of $S = 1E3$ used.

6 Isoenergy maps for processor number m, and idle power reduction k.

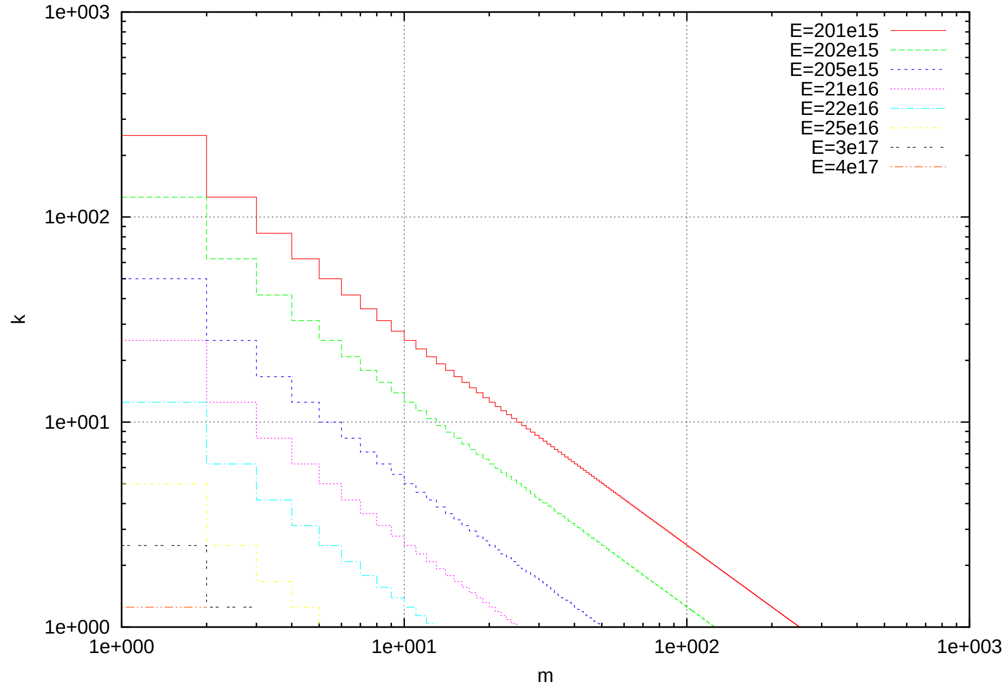

Fig. 52: Isoenergy map for processor number m, and idle power reduction k. Value of $A = 1E2$ used.

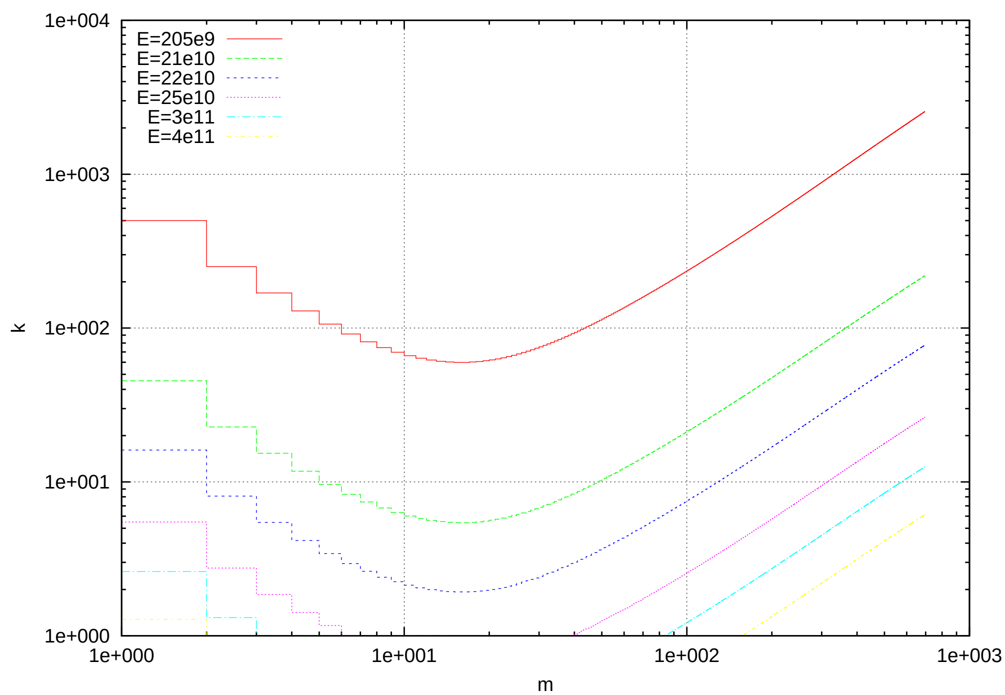

Fig. 53: Isoenergy map for processor number m, and idle power reduction k. Value of $A = 1E-4$ used.

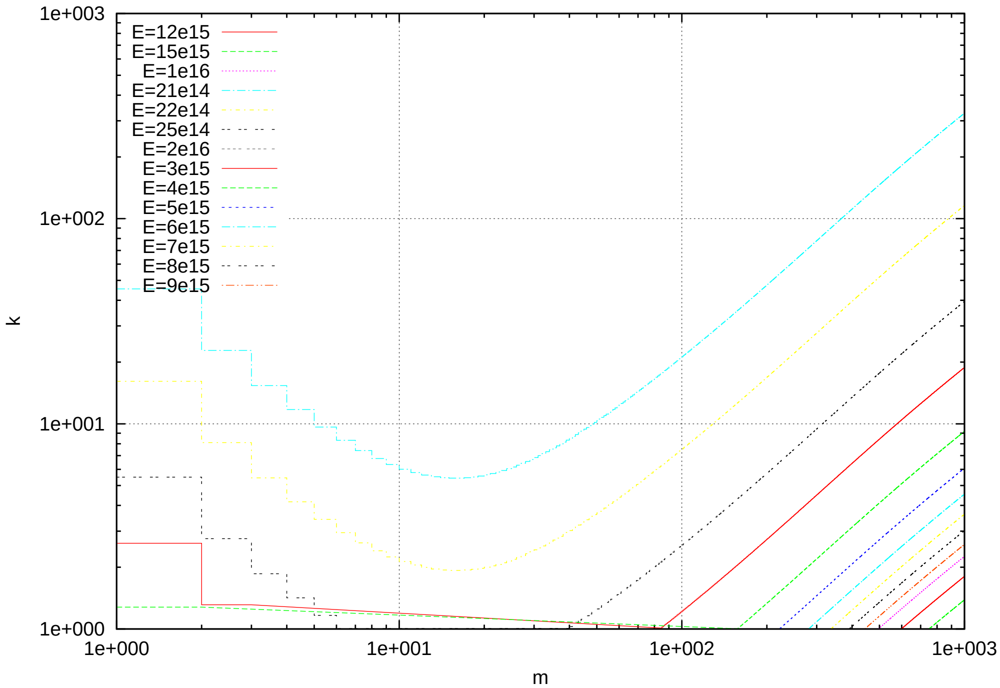

Fig. 54: Isoenergy map for processor number m, and idle power reduction k. Value of $C = 1E-2$ used.

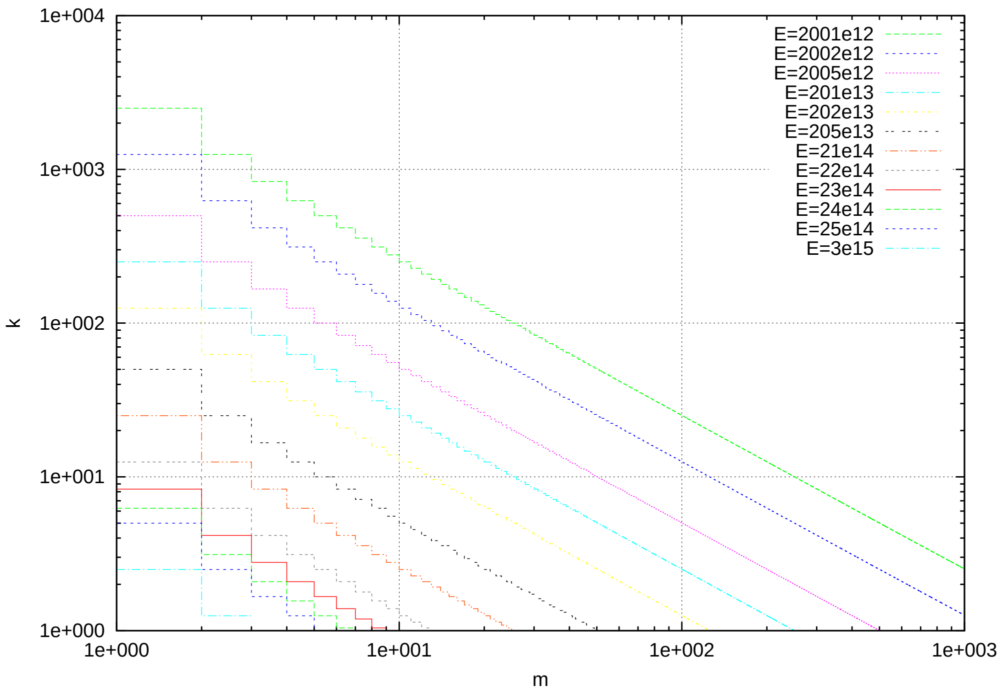

Fig. 55: Isoenergy map for processor number m, and idle power reduction k. Value of $C = 1E-8$ used.

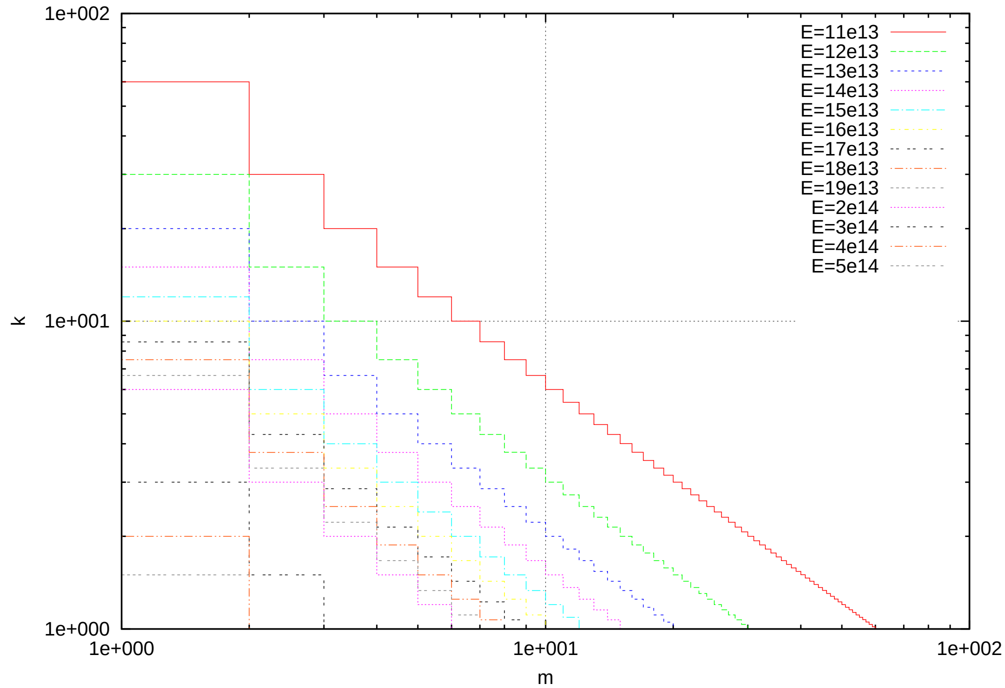

Fig. 56: Isoenergy map for processor number m, and idle power reduction k. Value of $Pc = 10$ used.

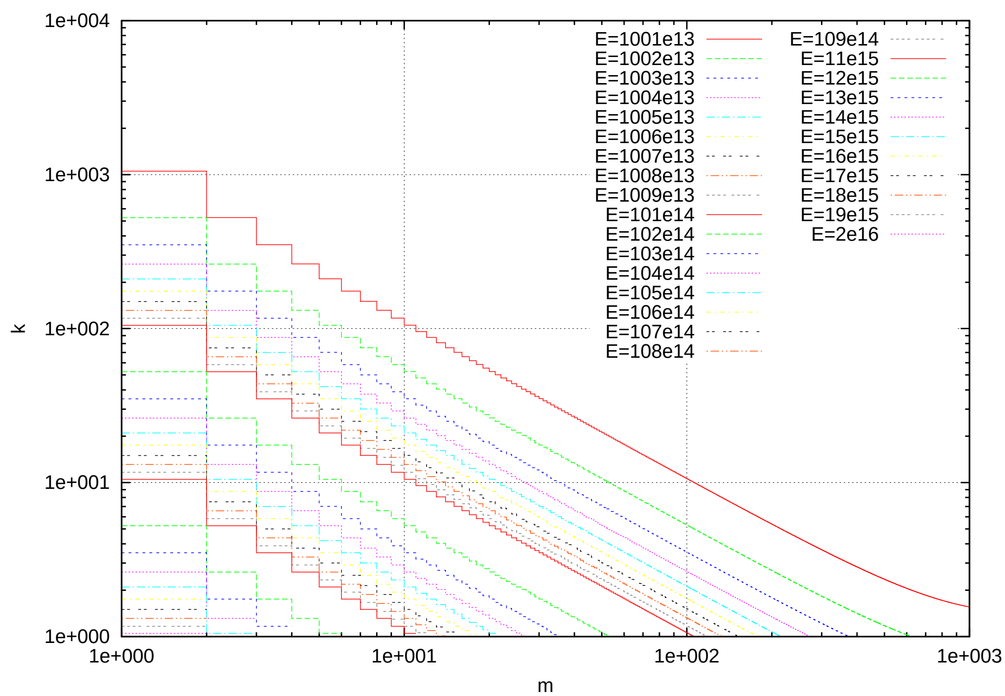

Fig. 57: Isoenergy map for processor number m, and idle power reduction k. Value of $Pc = 1E3$ used.

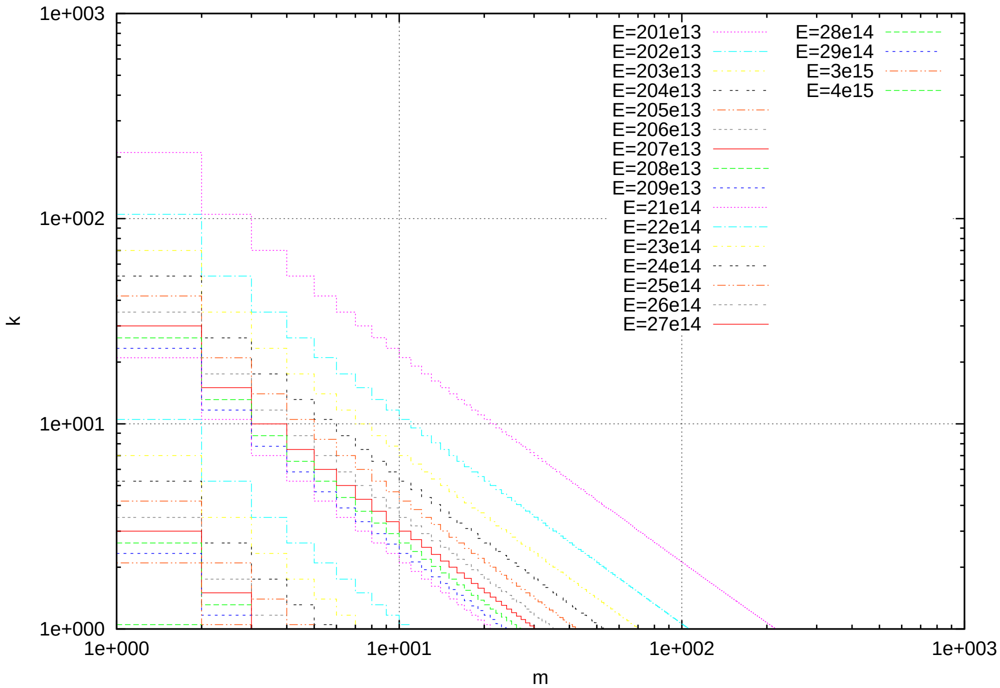

Fig. 58: Isoenergy map for processor number m, and idle power reduction k. Value of $Pn = 1$ used.

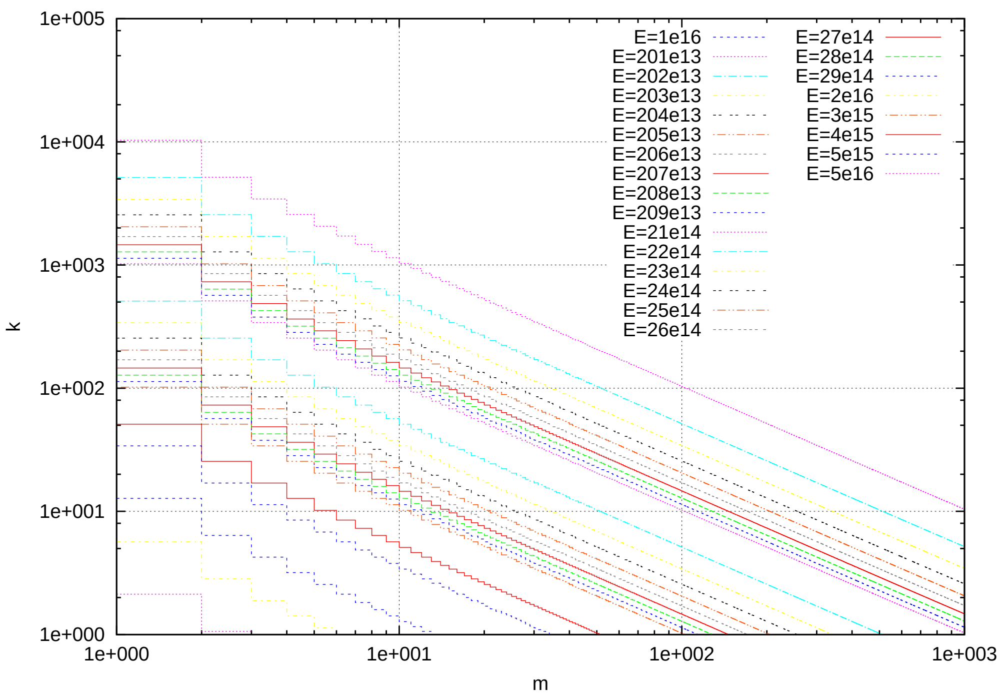

Fig. 59: Isoenergy map for processor number m, and idle power reduction k. Value of $Pn = 1E4$ used.

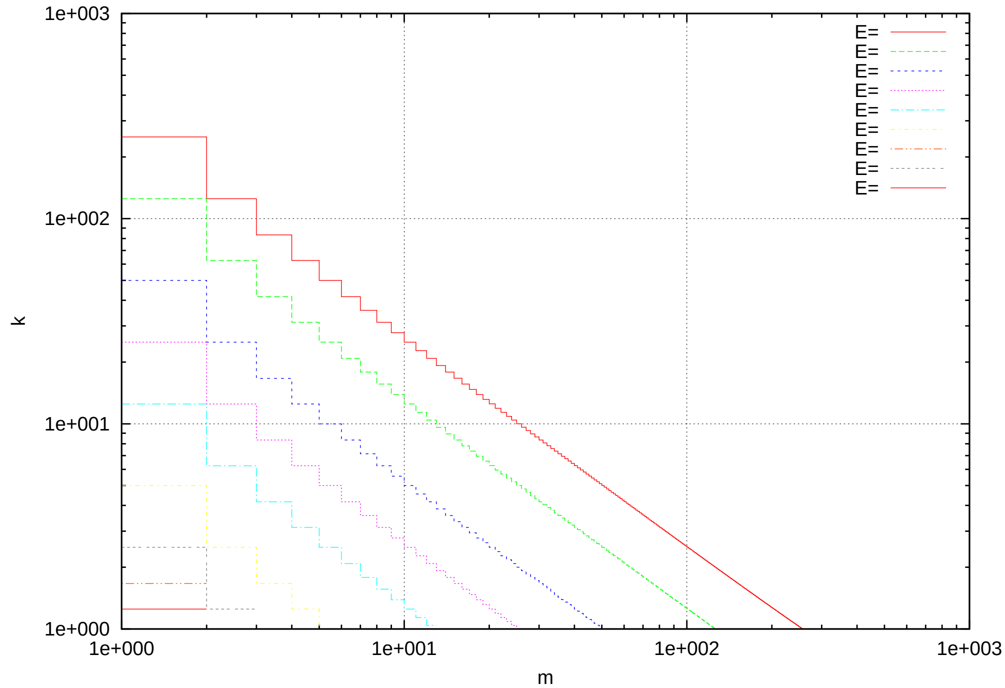

Fig. 60: Isoenergy map for processor number m, and idle power reduction k. Value of $V = 1E13$ used.

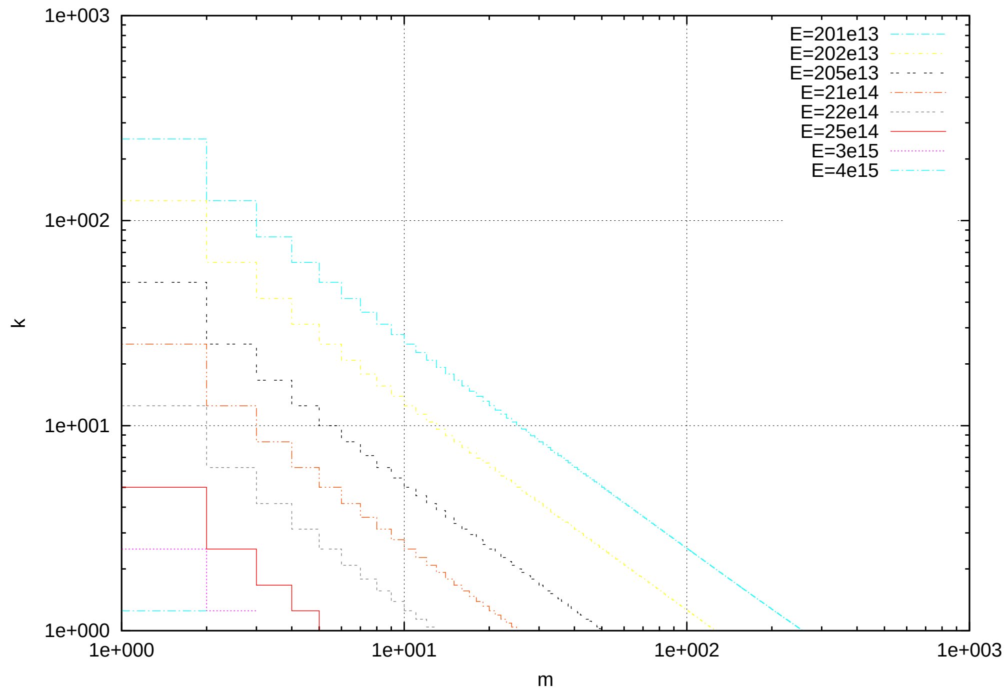

Fig. 61: Isoenergy map for processor number m, and idle power reduction k. Value of $S = 1$ used.

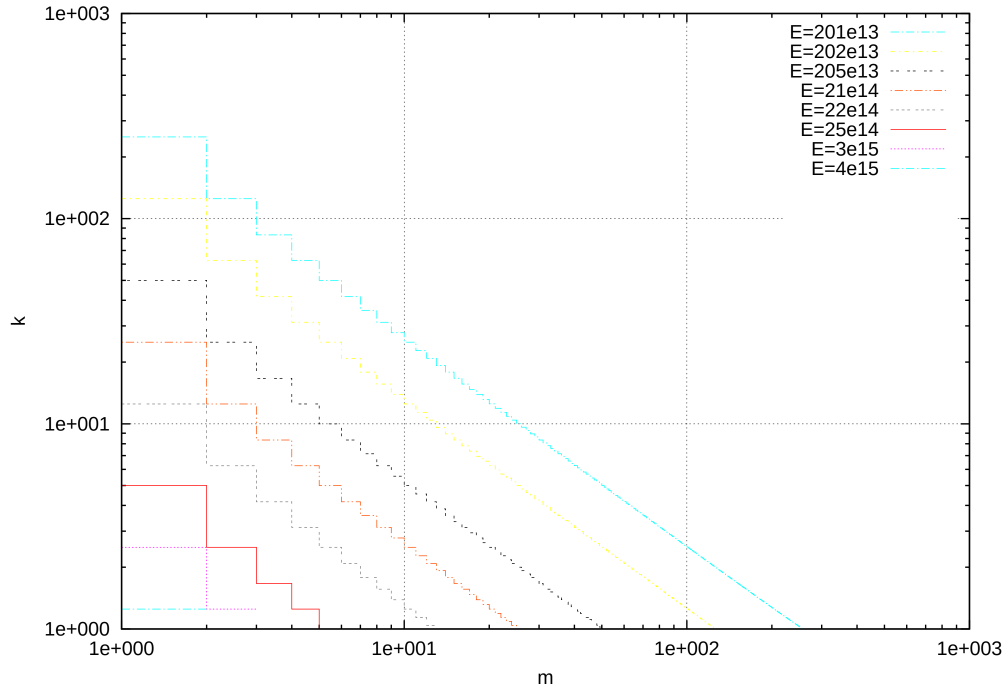

Fig. 62: Isoenergy map for processor number m, and idle power reduction k. Value of $S = 1E3$ used.

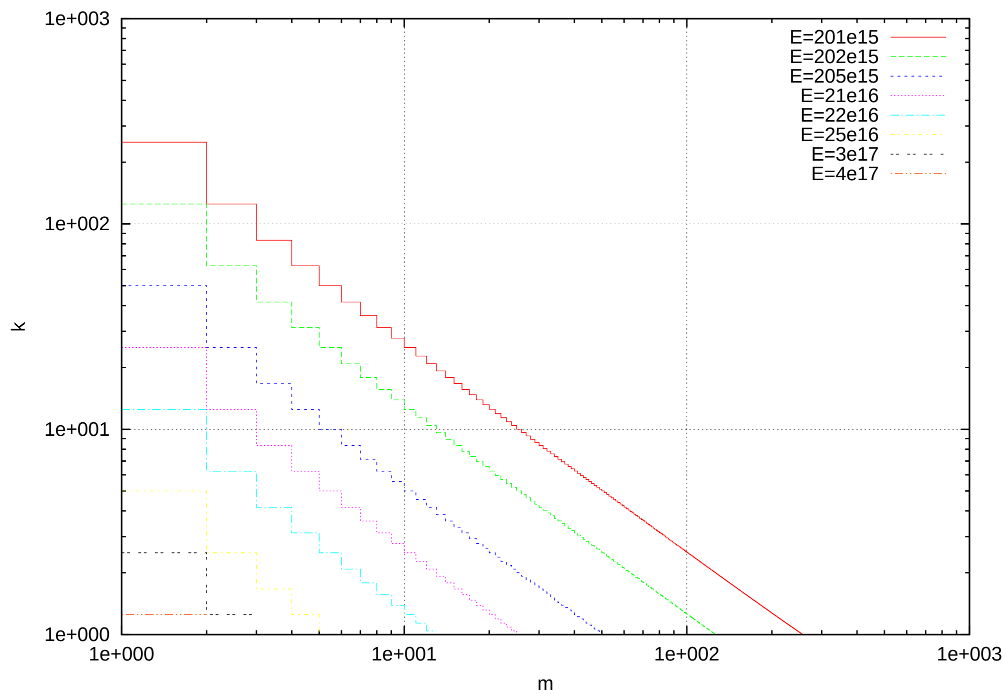

Fig. 63: Isoenergy map for processor number m, and idle power reduction k. Value of $V = 1E15$ used.

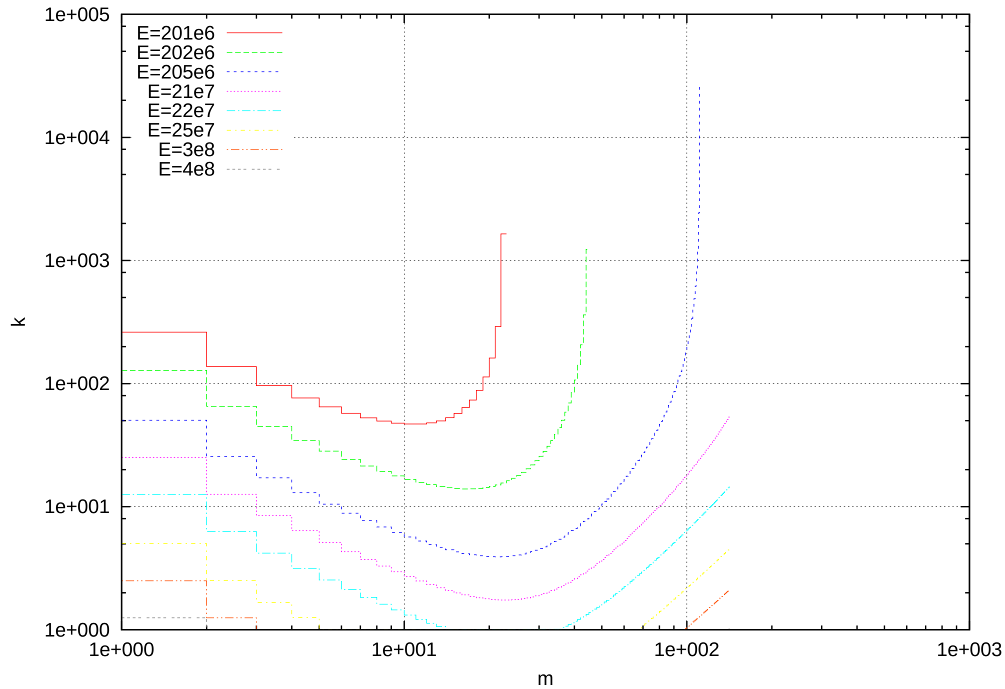

Fig. 64: Isoenergy map for processor number m, and idle power reduction k. Value of $V = 1E6$ used.

7 Isoenergy maps for processor number m, and network power Pn.

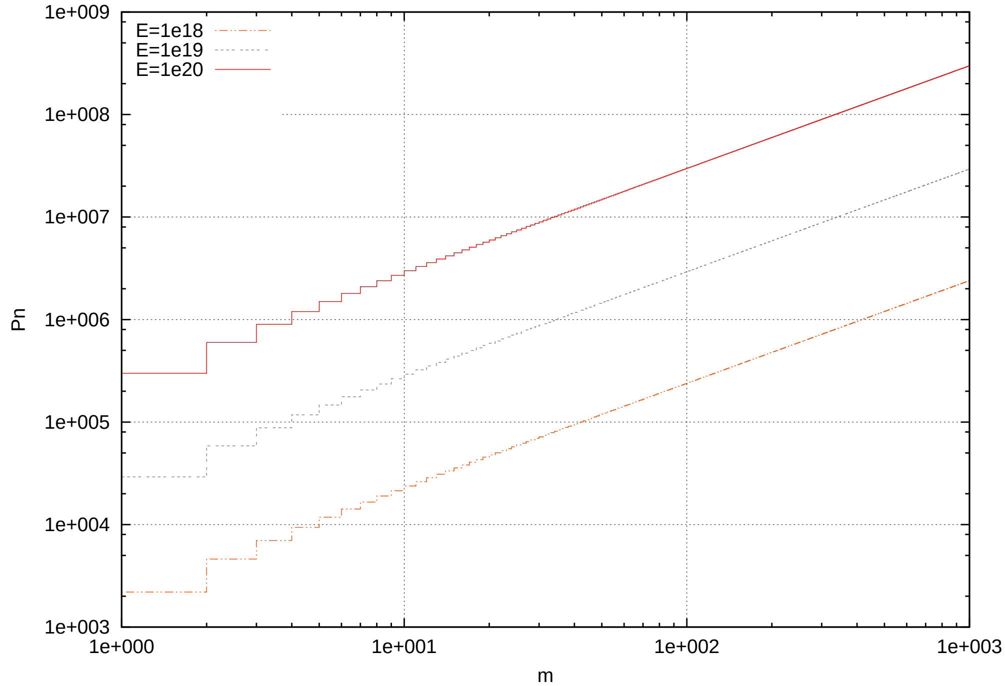

Fig. 65: Isoenergy map for processor number m, and network power Pn. Value of $A = 1E2$ used.

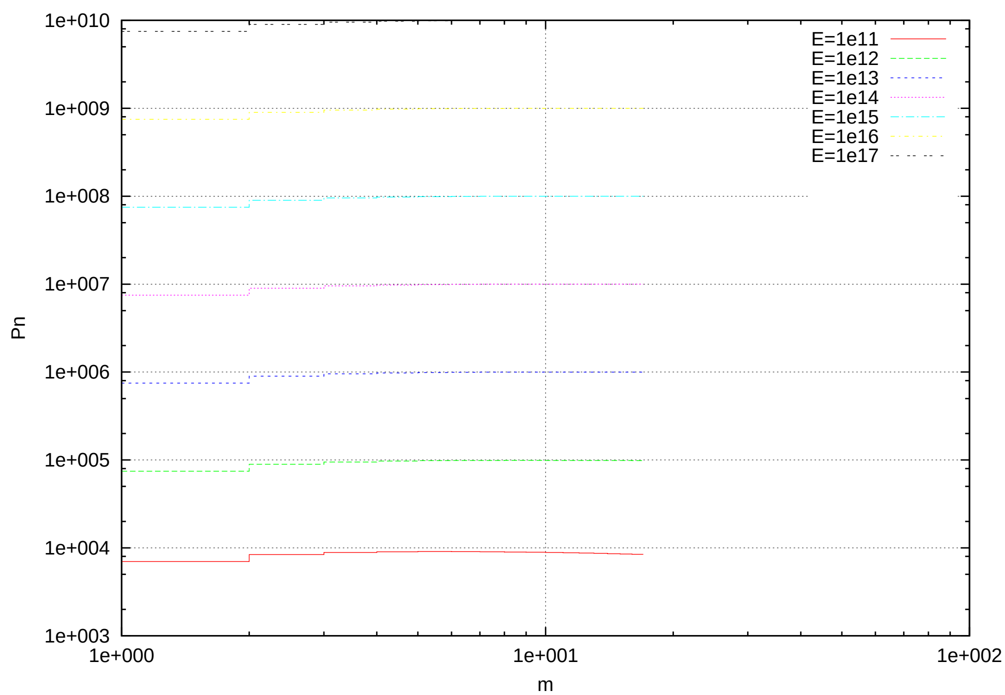

Fig. 66: Isoenergy map for processor number m, and network power Pn. Value of $A = 1E-6$ used.

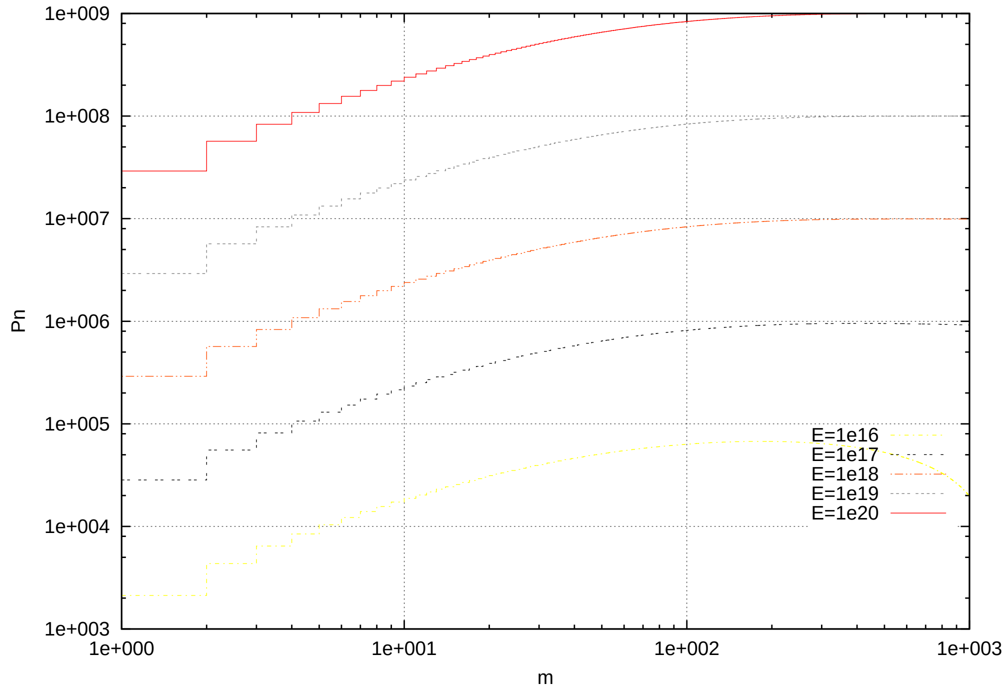

Fig. 67: Isoenergy map for processor number m, and network power Pn. Value of $C = 1E-2$ used.

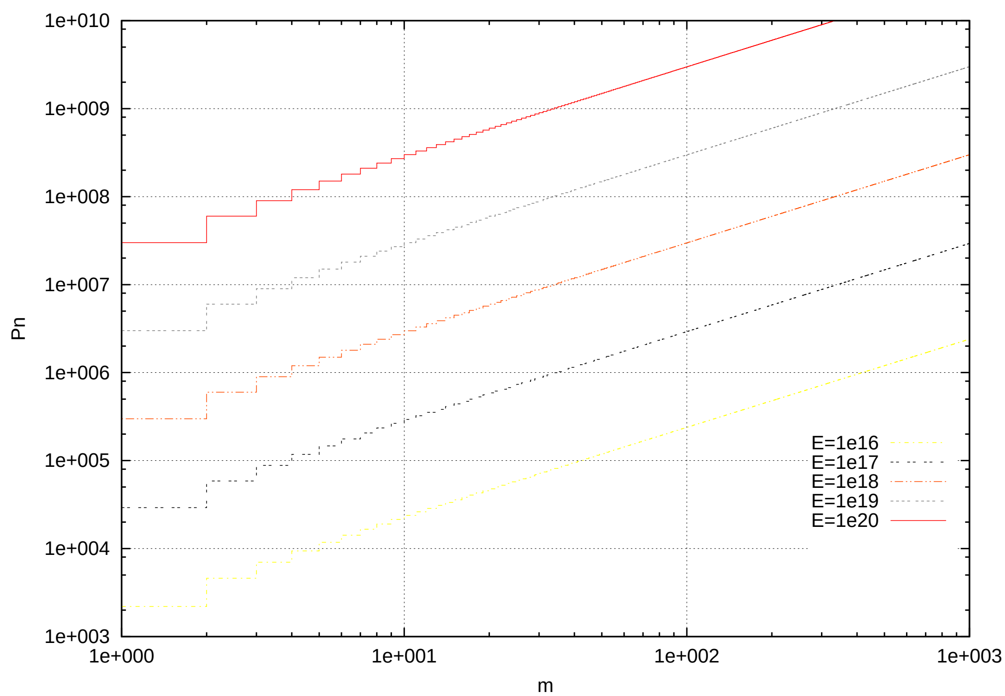

Fig. 68: Isoenergy map for processor number m, and network power Pn. Value of $C = 1E-8$ used.

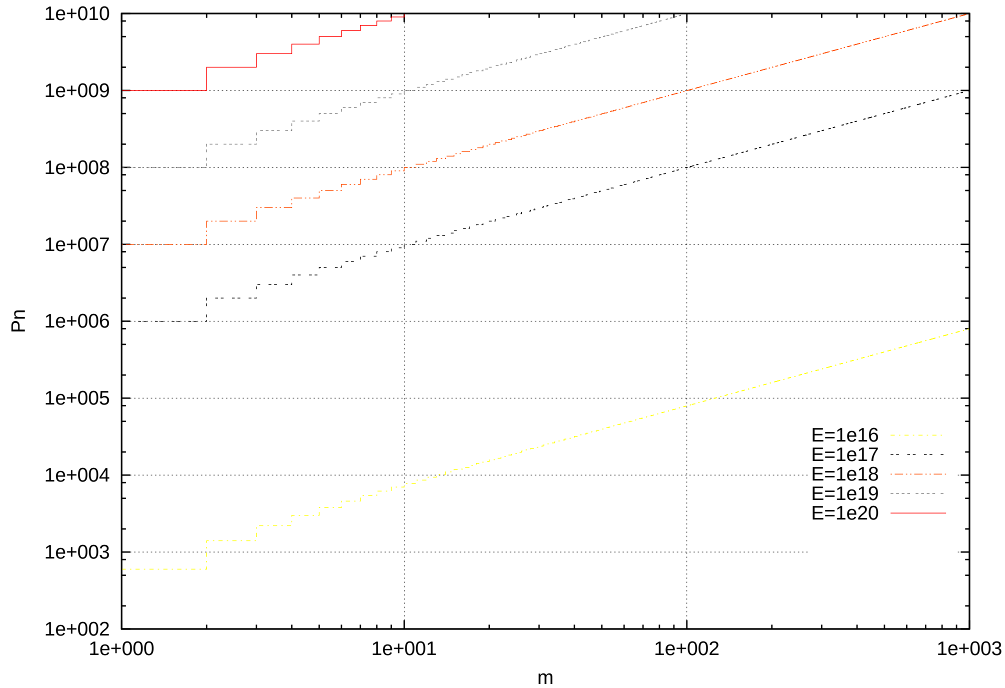

Fig. 69: Isoenergy map for processor number m, and network power Pn. Value of $k = 1$ used.

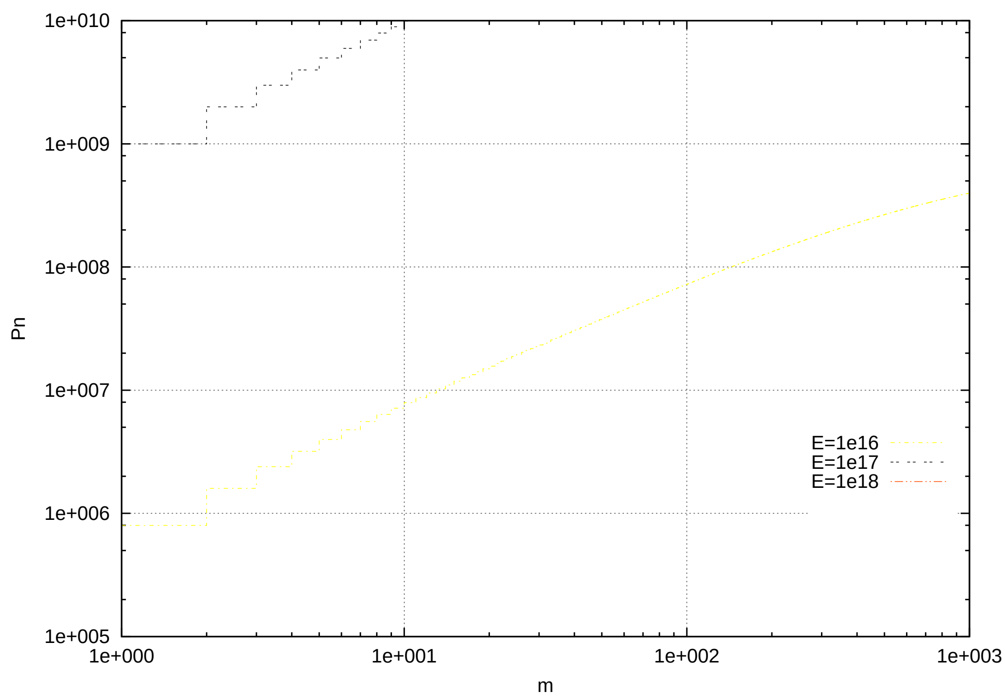

Fig. 70: Isoenergy map for processor number m, and network power Pn. Value of $k = 100$ used.

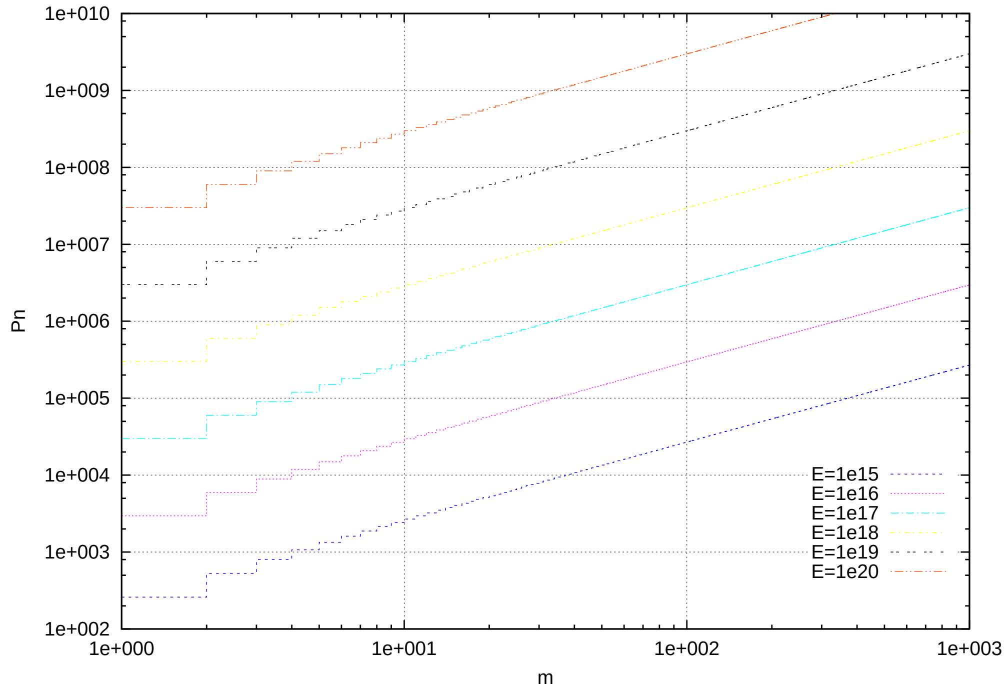

Fig. 71: Isoenergy map for processor number m, and network power Pn. Value of $Pc = 10$ used.

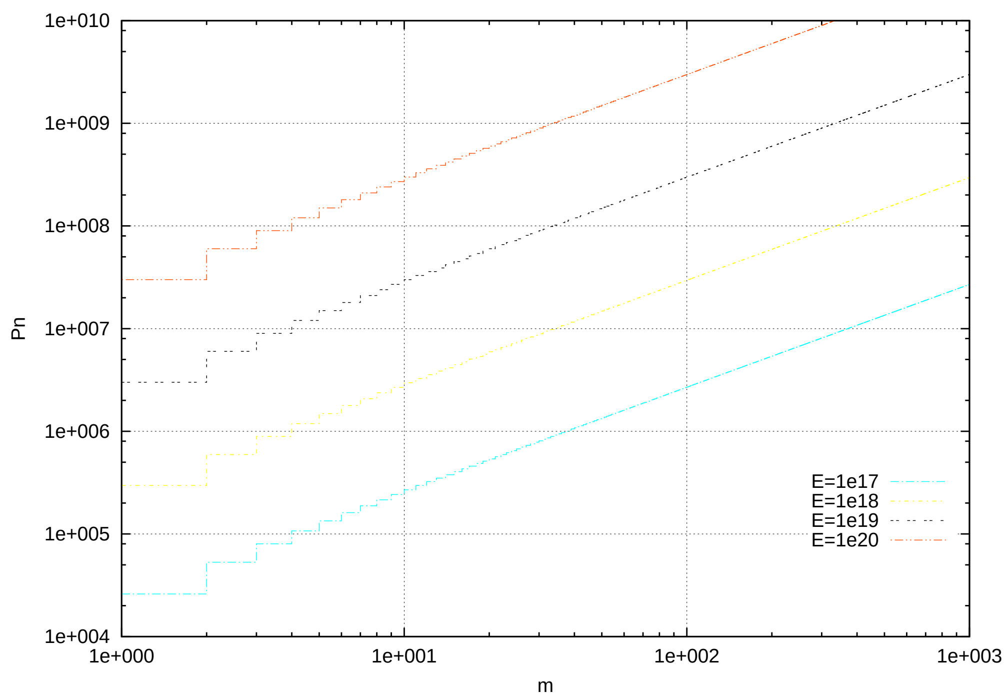

Fig. 72: Isoenergy map for processor number m, and network power Pn. Value of $Pc = 1E3$ used.

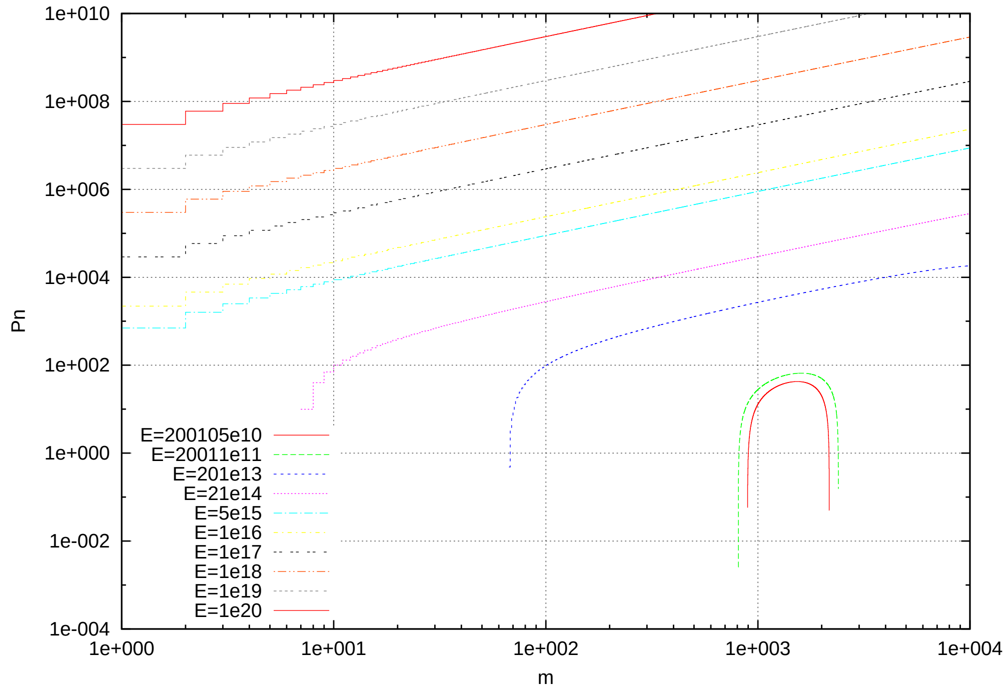

Fig. 73: Isoenergy map for processor number m, and network power Pn. Value of $V = 1E13$ used.

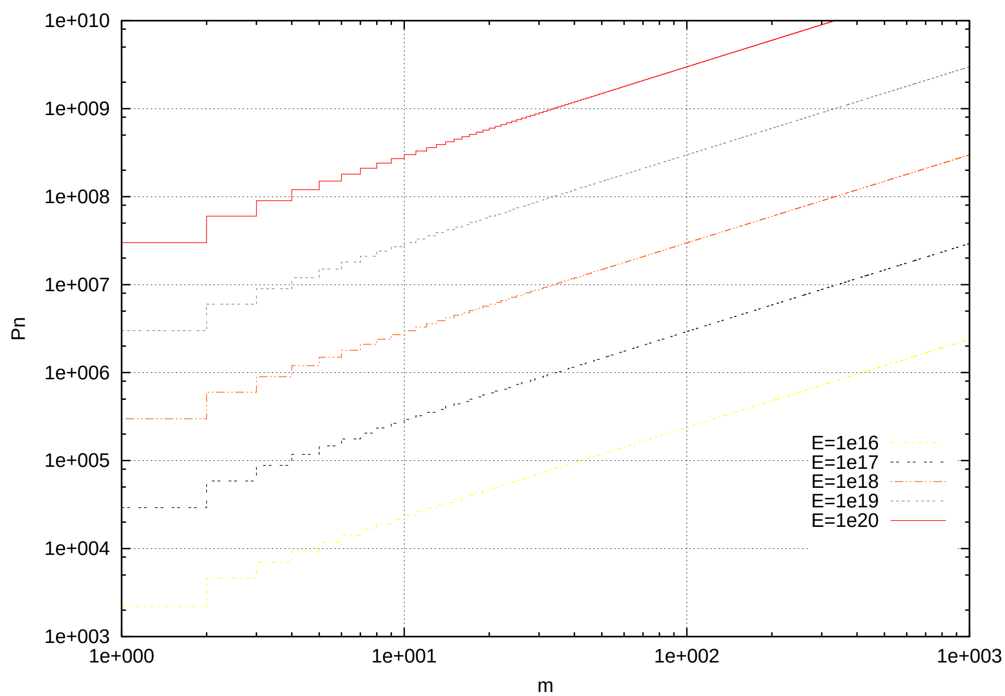

Fig. 74: Isoenergy map for processor number m, and network power Pn. Value of $S = 1$ used.

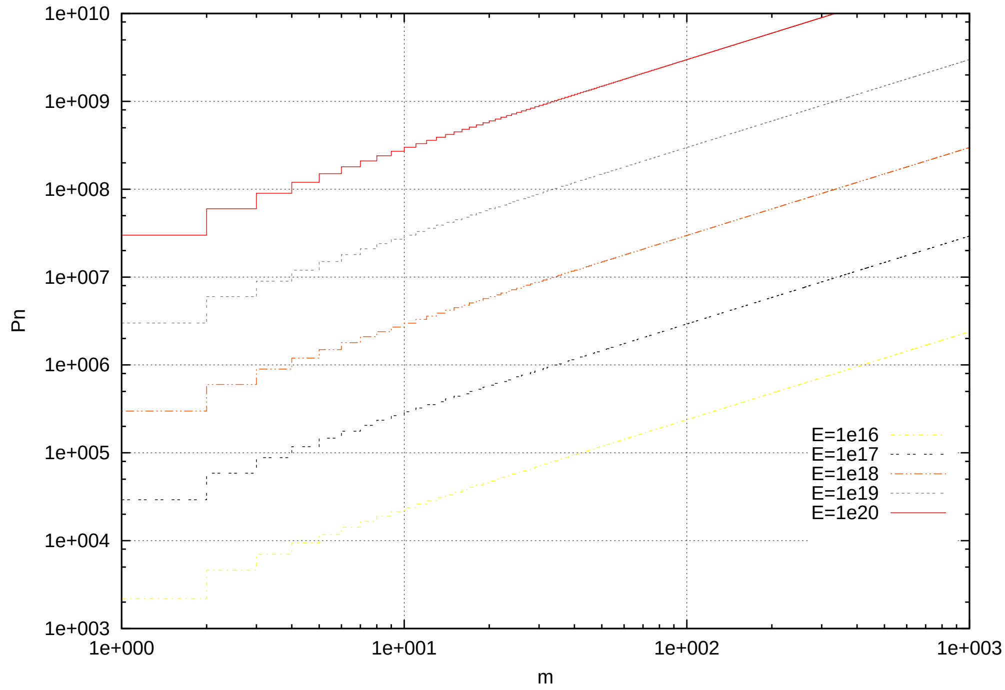

Fig. 75: Isoenergy map for processor number m, and network power Pn. Value of $S = 1E3$ used.

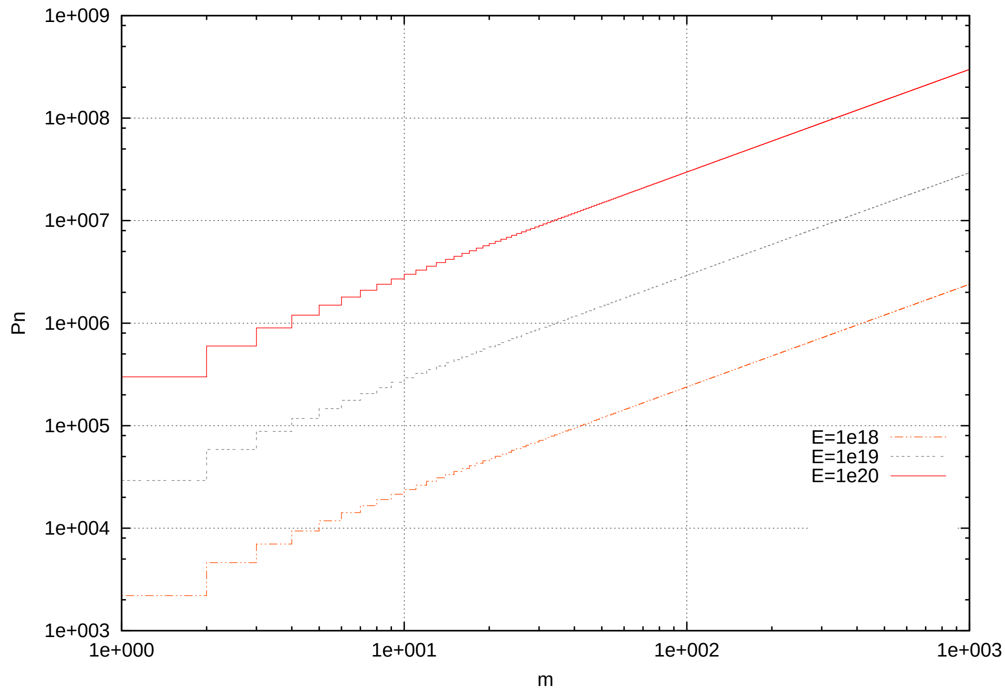

Fig. 76: Isoenergy map for processor number m, and network power Pn. Value of $V = 1E15$ used.

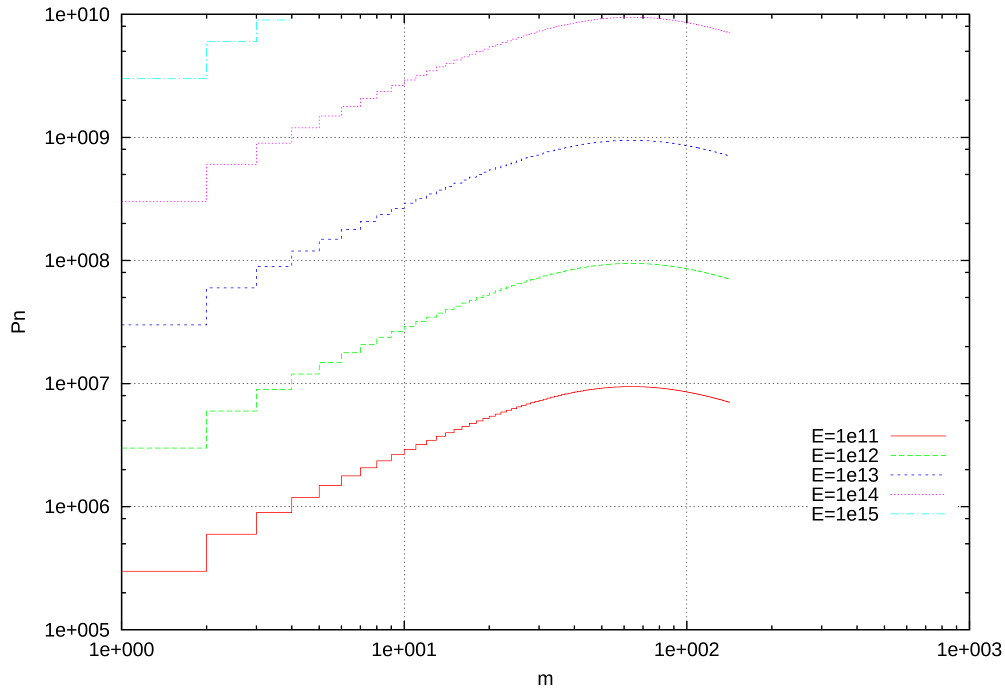

Fig. 77: Isoenergy map for processor number m, and network power Pn. Value of $V = 1E6$ used.

8 Isoenergy maps for processor number m, and processor power Pc.

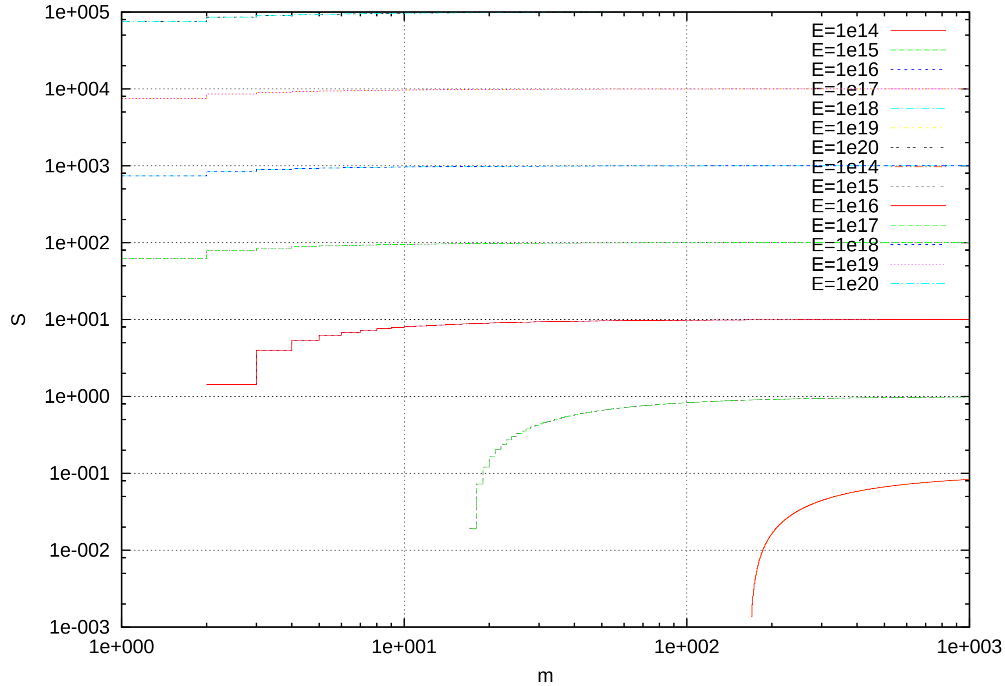

Fig. 78: Isoenergy map for processor number m, and processor power Pc. Value of $A = 1E2$ used.

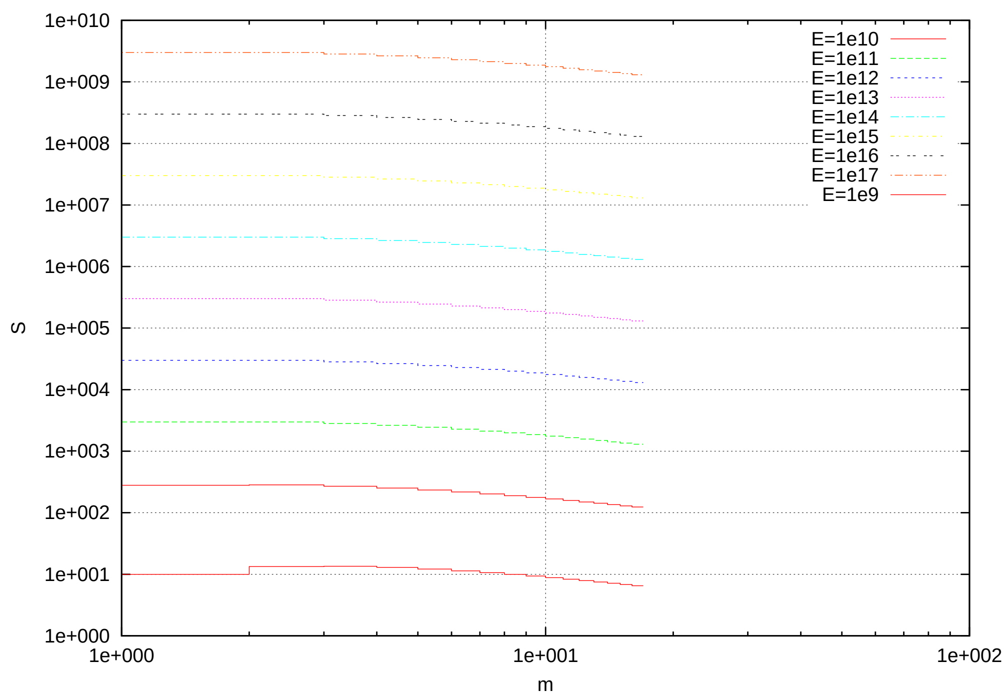

Fig. 79: Isoenergy map for processor number m, and processor power Pc. Value of $A = 1E-6$ used.

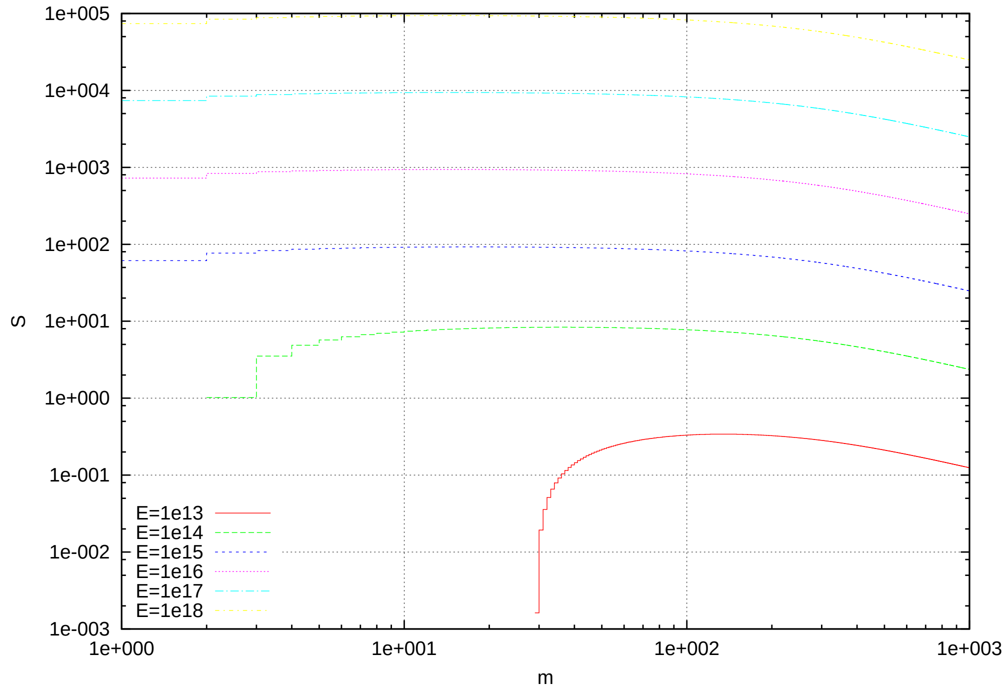

Fig. 80: Isoenergy map for processor number m, and processor power Pc. Value of $C = 1E-2$ used.

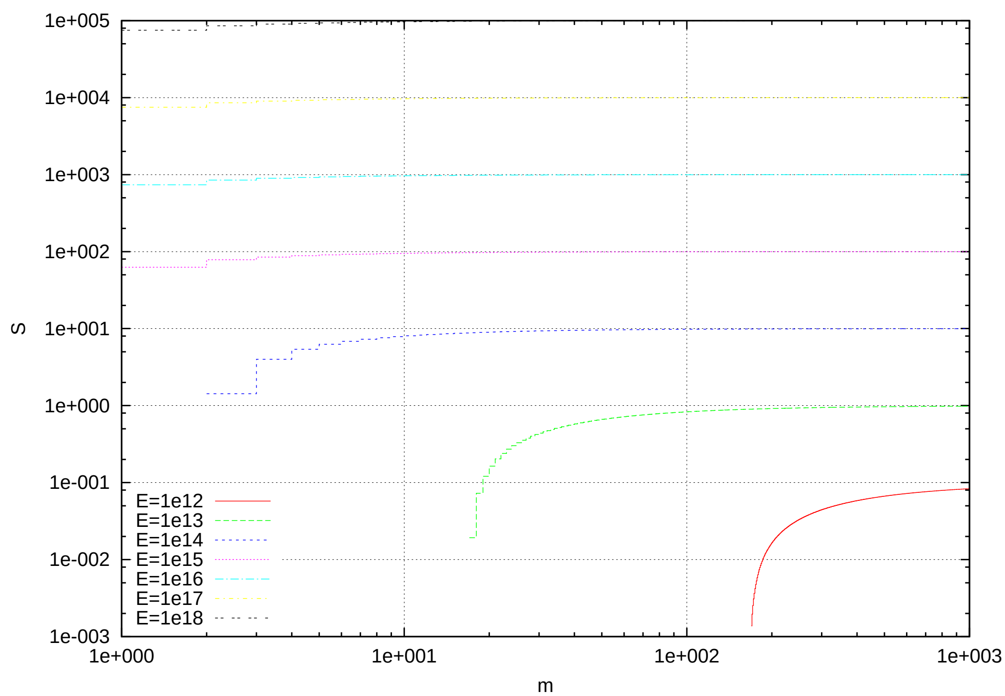

Fig. 81: Isoenergy map for processor number m, and processor power Pc. Value of $C = 1E-8$ used.

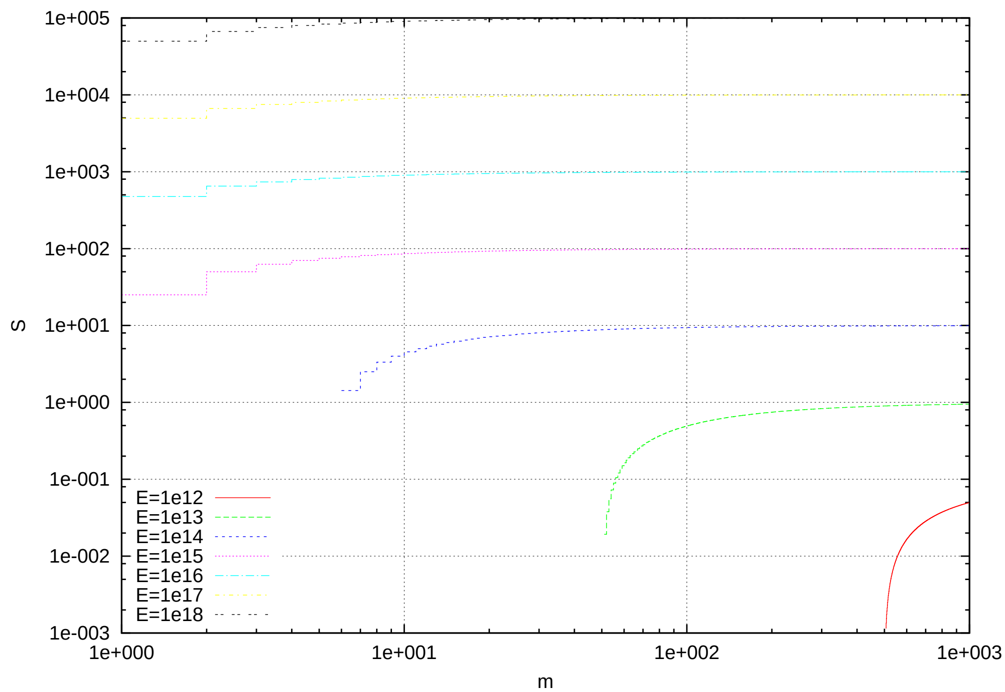

Fig. 82: Isoenergy map for processor number m, and processor power Pc. Value of $k = 1$ used.

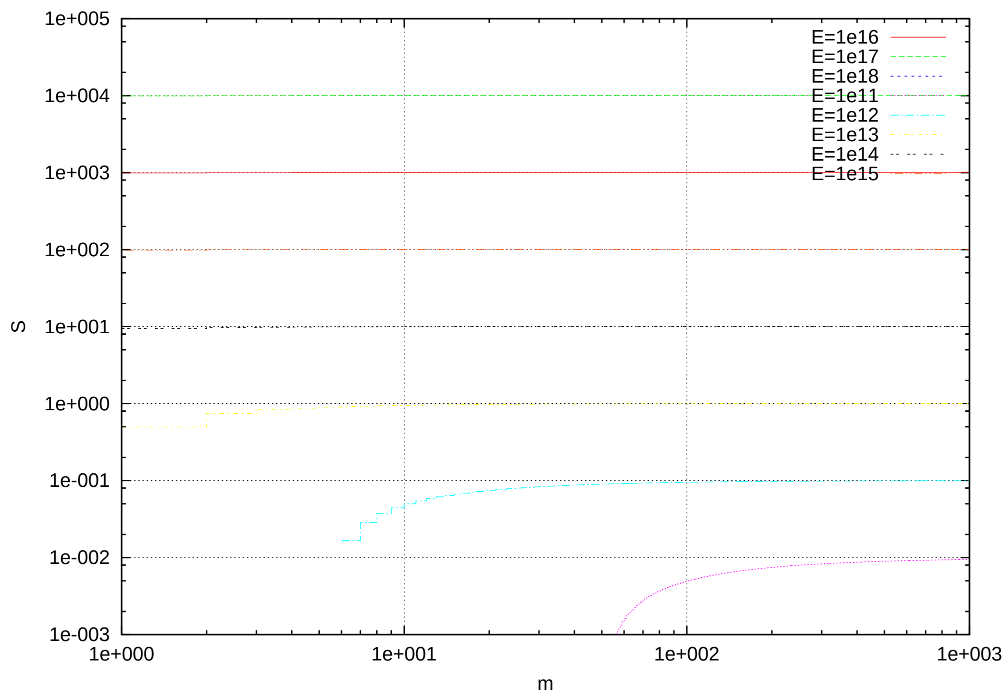

Fig. 83: Isoenergy map for processor number m, and processor power Pc. Value of $k = 100$ used.

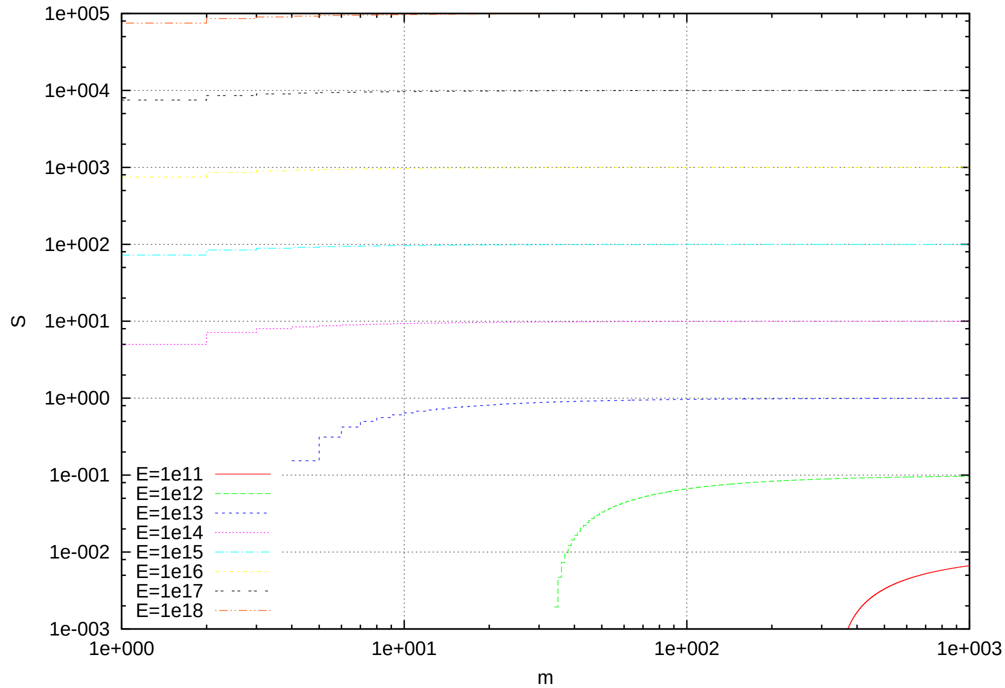

Fig. 84: Isoenergy map for processor number m, and processor power Pc. Value of $Pn = 10$ used.

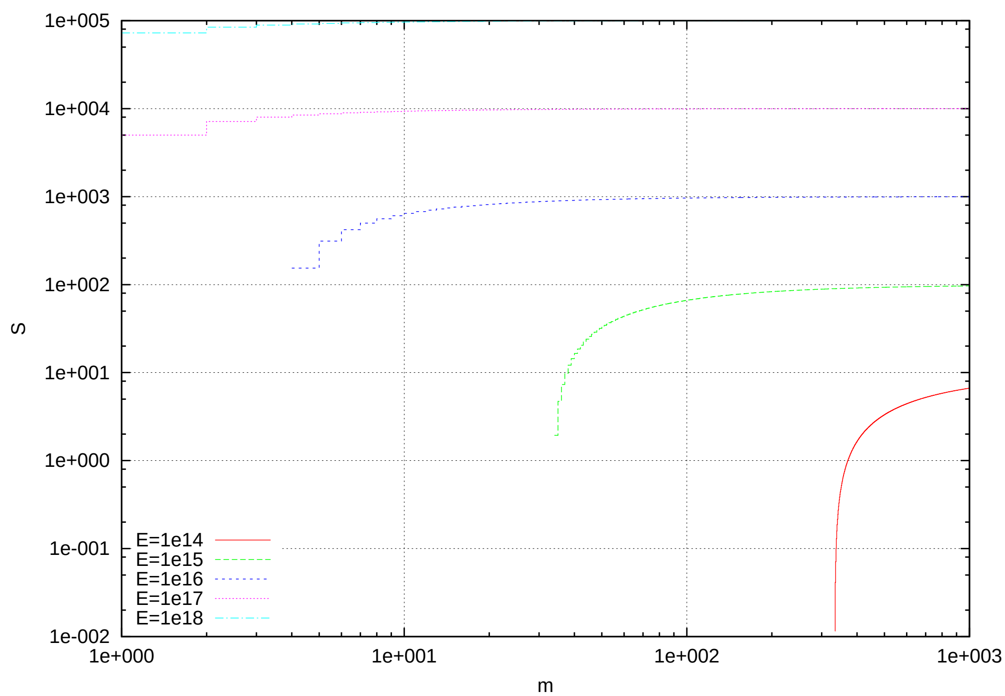

Fig. 85: Isoenergy map for processor number m, and processor power Pc. Value of $Pn = 1E4$ used.

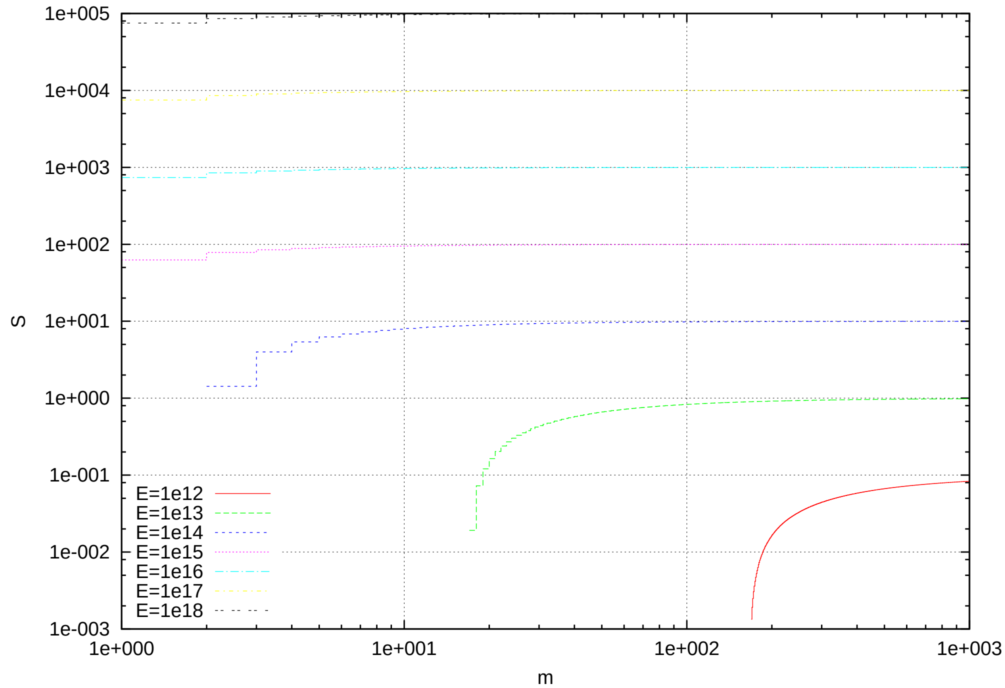

Fig. 86: Isoenergy map for processor number m, and processor power Pc. Value of $V = 1E13$ used.

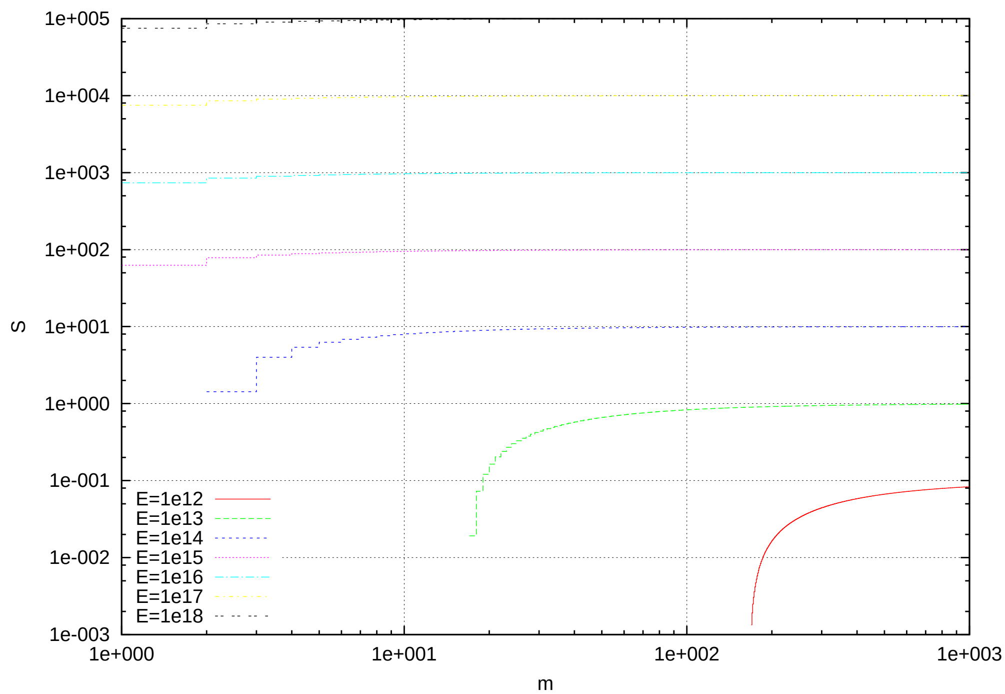

Fig. 87: Isoenergy map for processor number m, and processor power Pc. Value of $S = 1$ used.

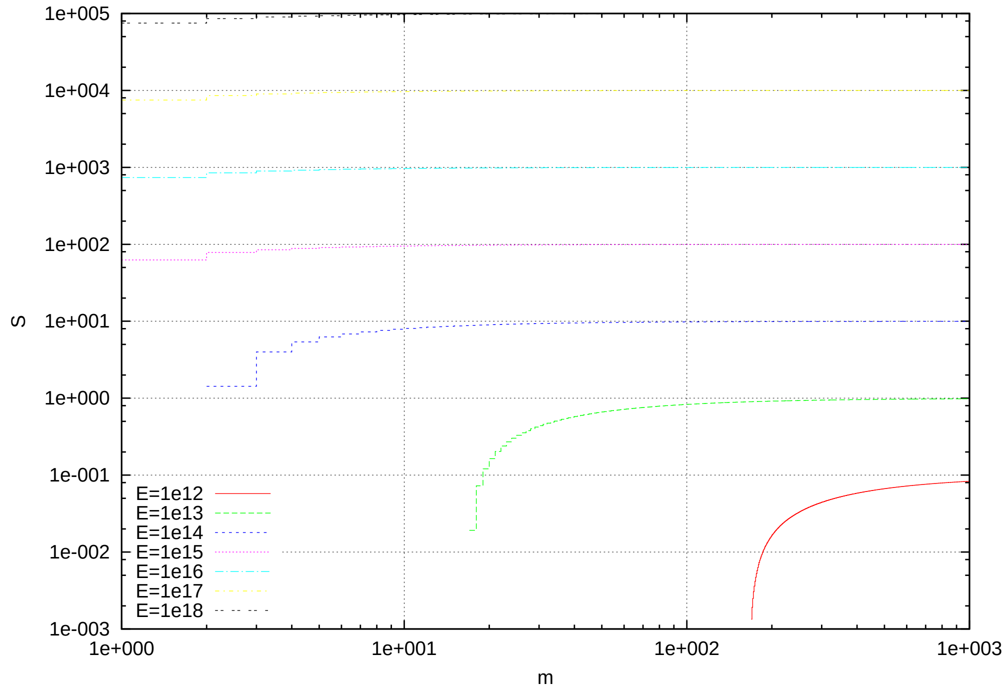

Fig. 88: Isoenergy map for processor number m, and processor power Pc. Value of $S = 1E3$ used.

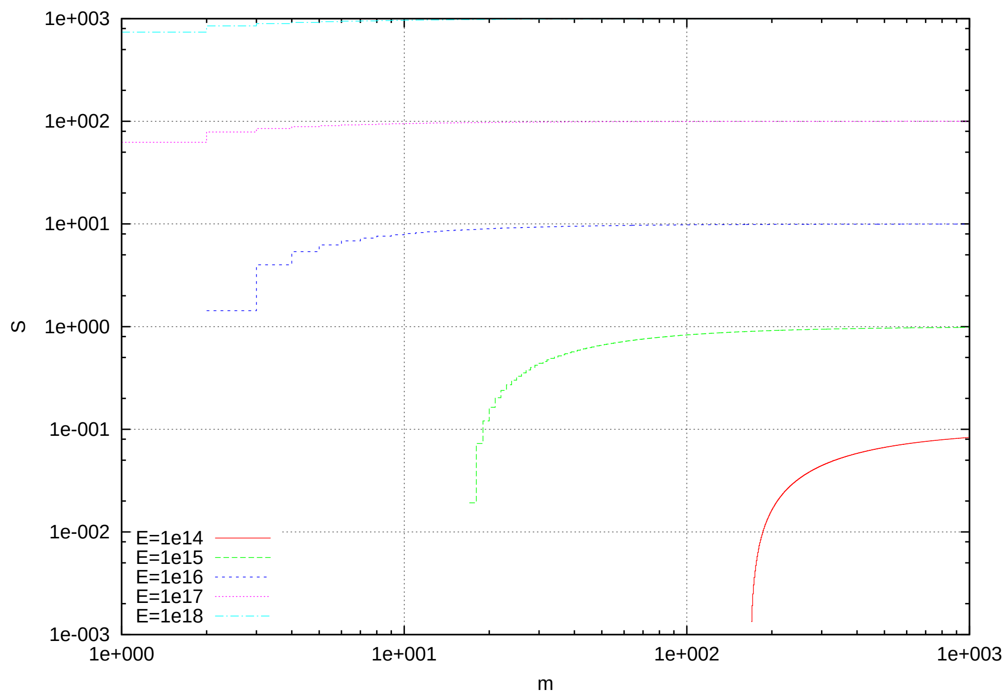

Fig. 89: Isoenergy map for processor number m, and processor power Pc. Value of $V = 1E15$ used.

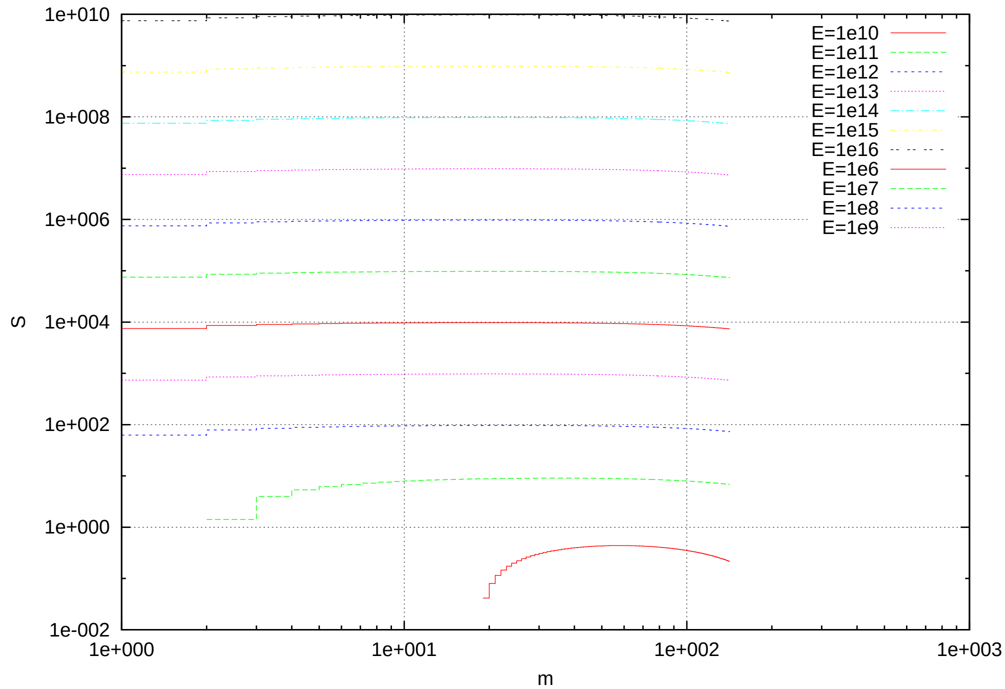

Fig. 90: Isoenergy map for processor number m, and processor power Pc. Value of $V = 1E6$ used.

9 Isoenergy maps for processor power Pc, and startup time S.

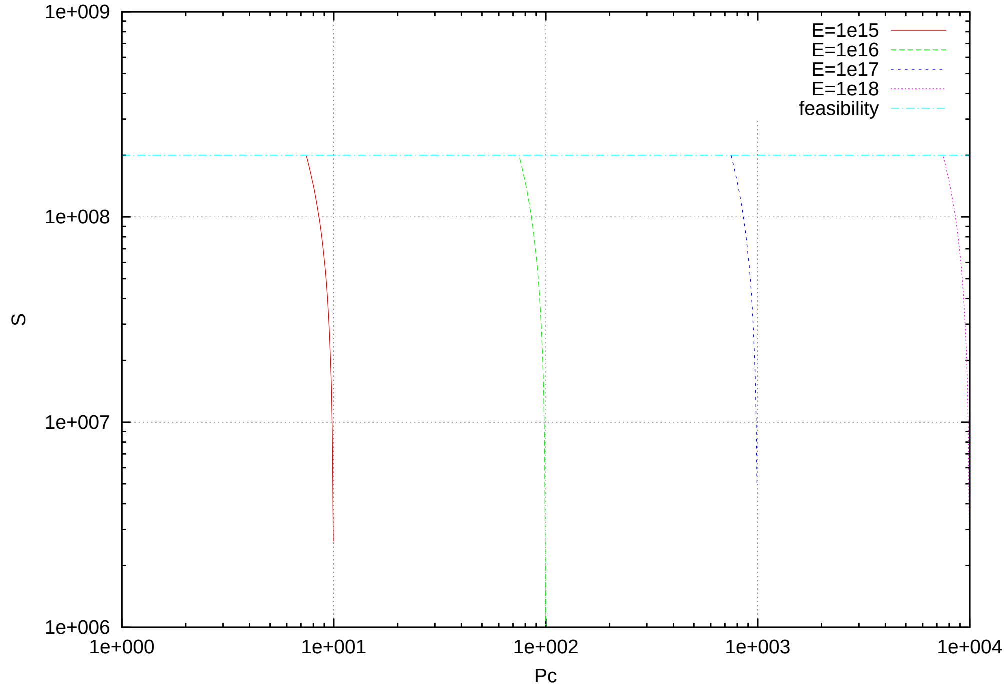

Fig. 91: Isoenergy map for processor power Pc, and startup time S. Value of $A = 10$ used.

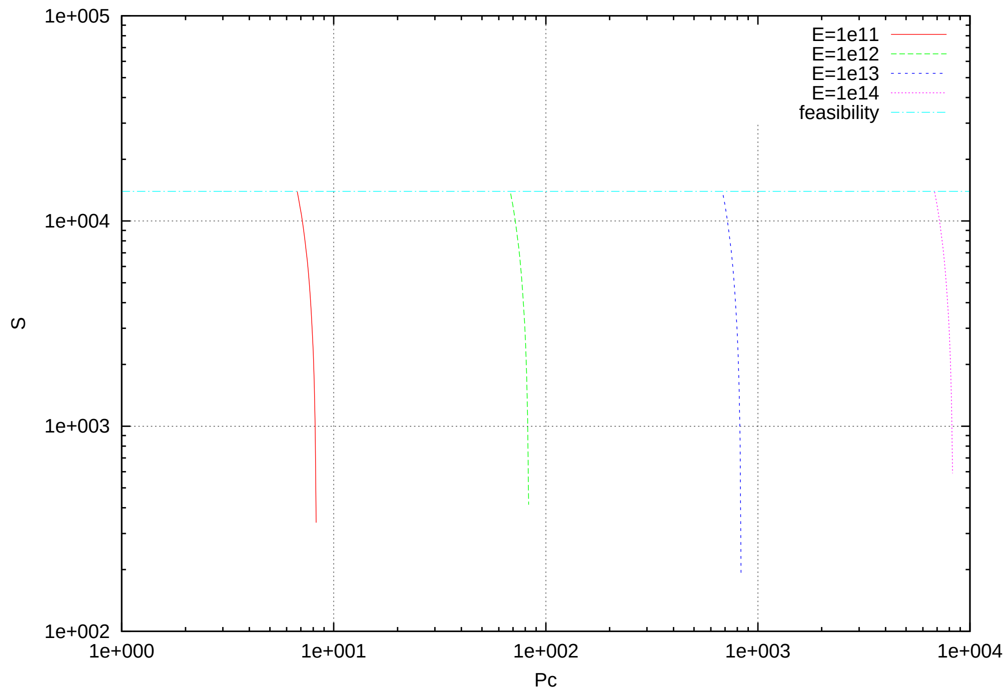

Fig. 92: Isoenergy map for processor power Pc, and startup time S. Value of $A = 1E - 3$ used.

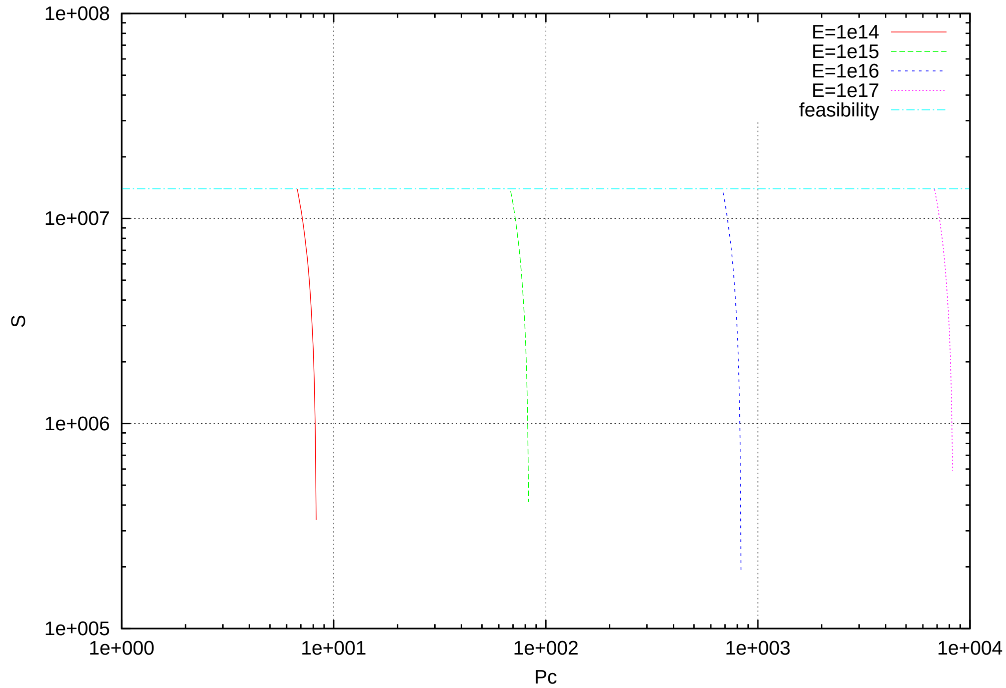

Fig. 93: Isoenergy map for processor power Pc, and startup time S. Value of $C = 1E - 3$ used.

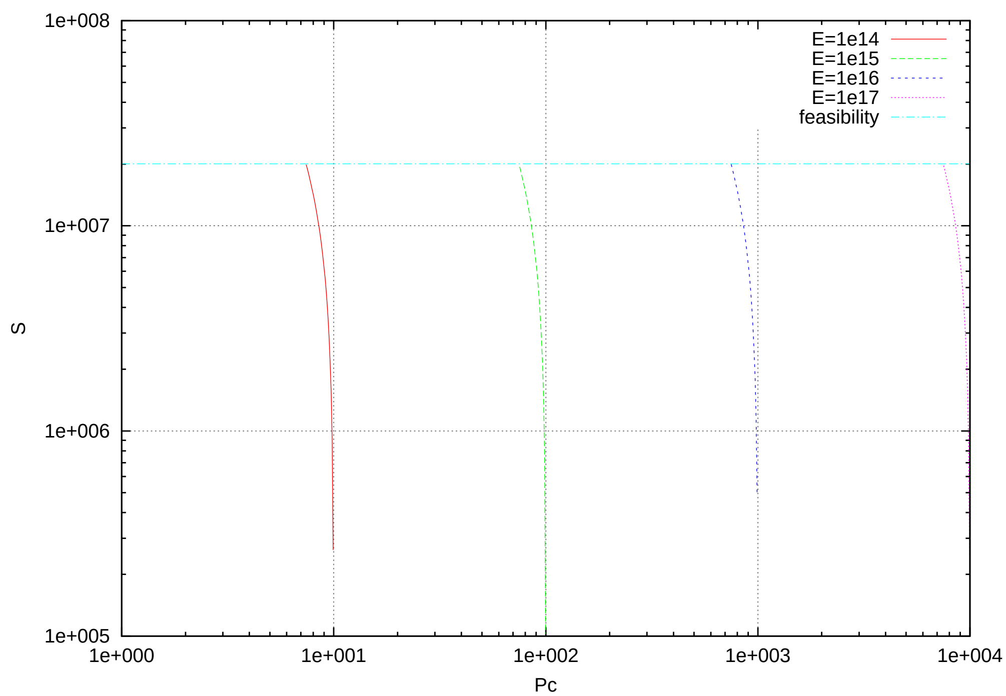

Fig. 94: Isoenergy map for processor power Pc, and startup time S. Value of $C = 1E - 8$ used.

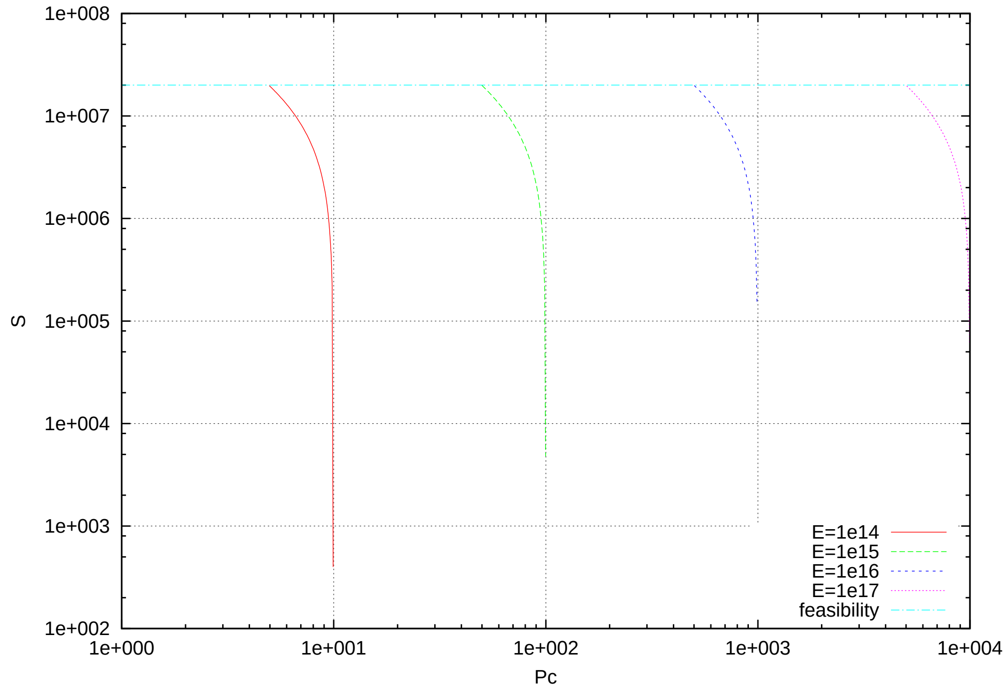

Fig. 95: Isoenergy map for processor power Pc, and startup time S. Value of $k = 1$ used.

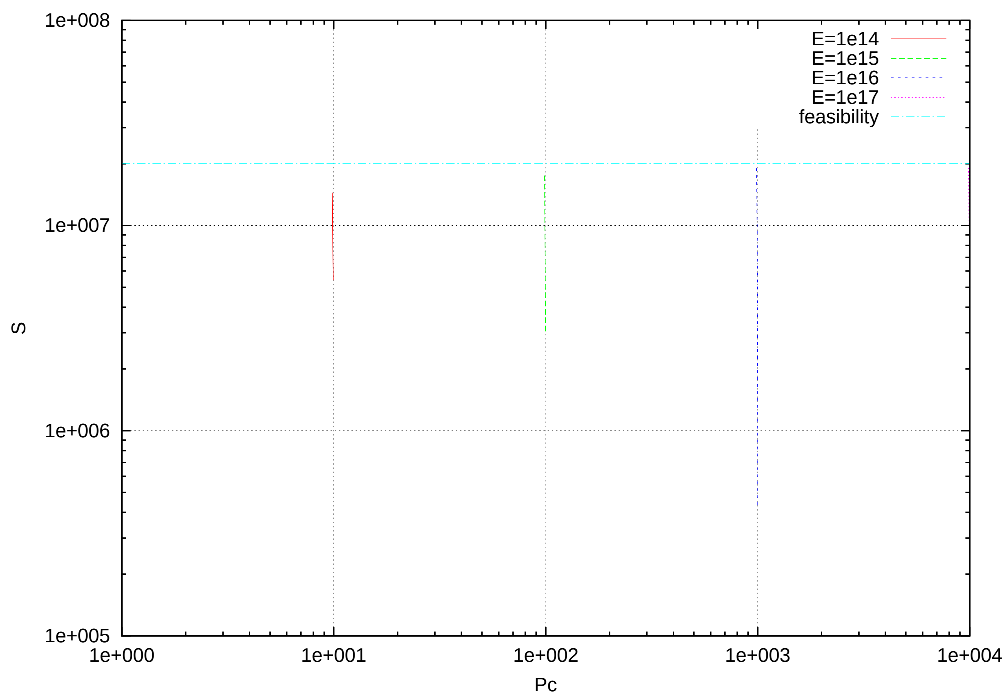

Fig. 96: Isoenergy map for processor power Pc, and startup time S. Value of $k = 100$ used.

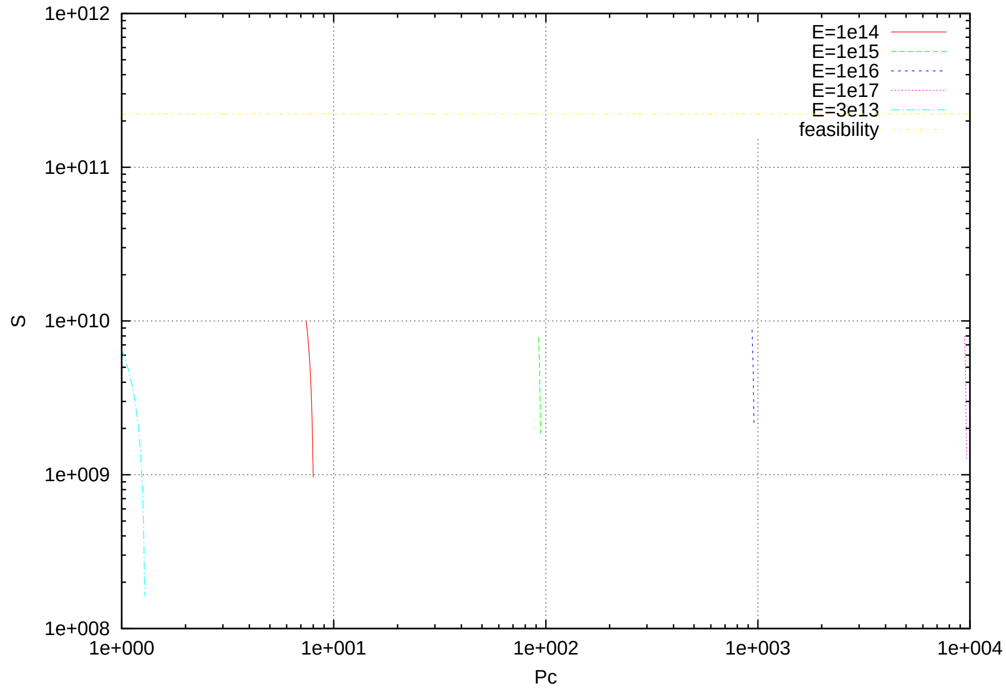

Fig. 97: Isoenergy map for processor power Pc, and startup time S. Value of $m = 10$ used.

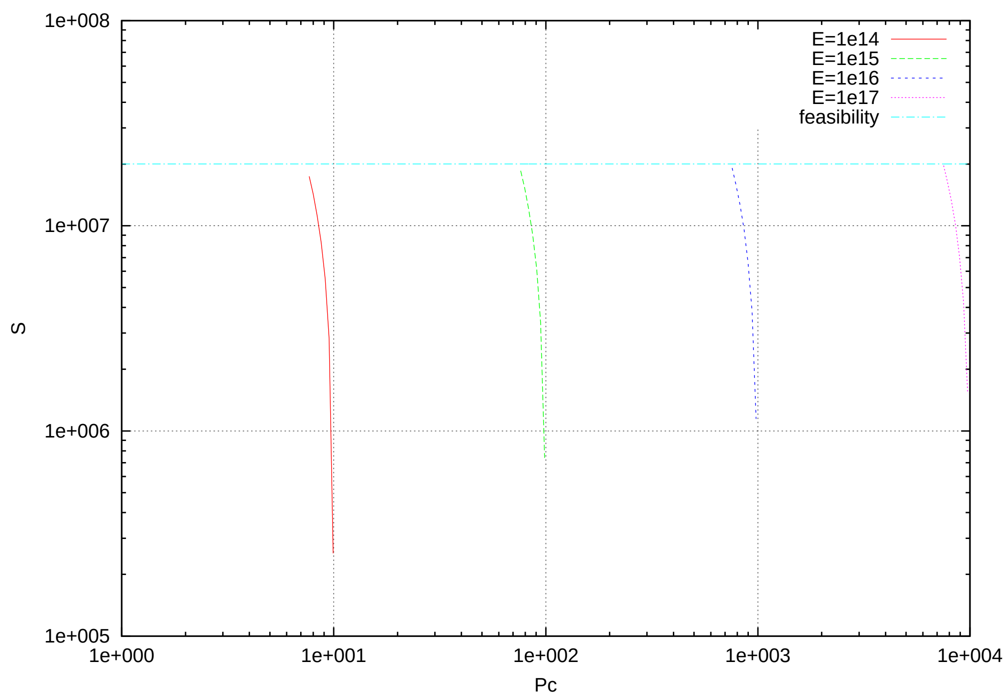

Fig. 98: Isoenergy map for processor power Pc, and startup time S. Value of $m = 1E3$ used.

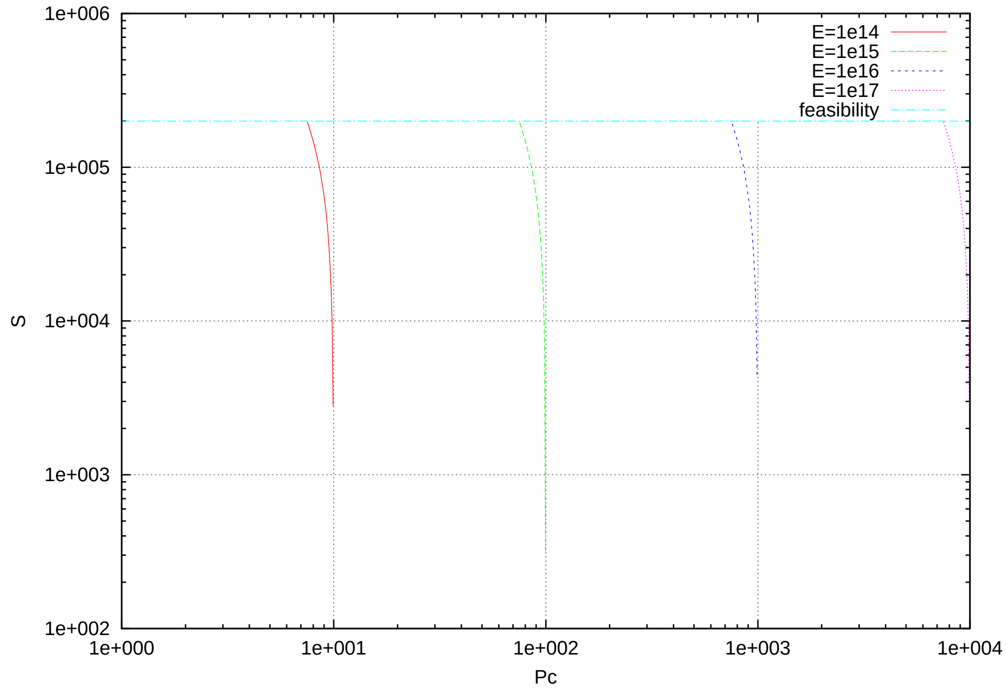

Fig. 99: Isoenergy map for processor power Pc, and startup time S. Value of $m = 1E4$ used.

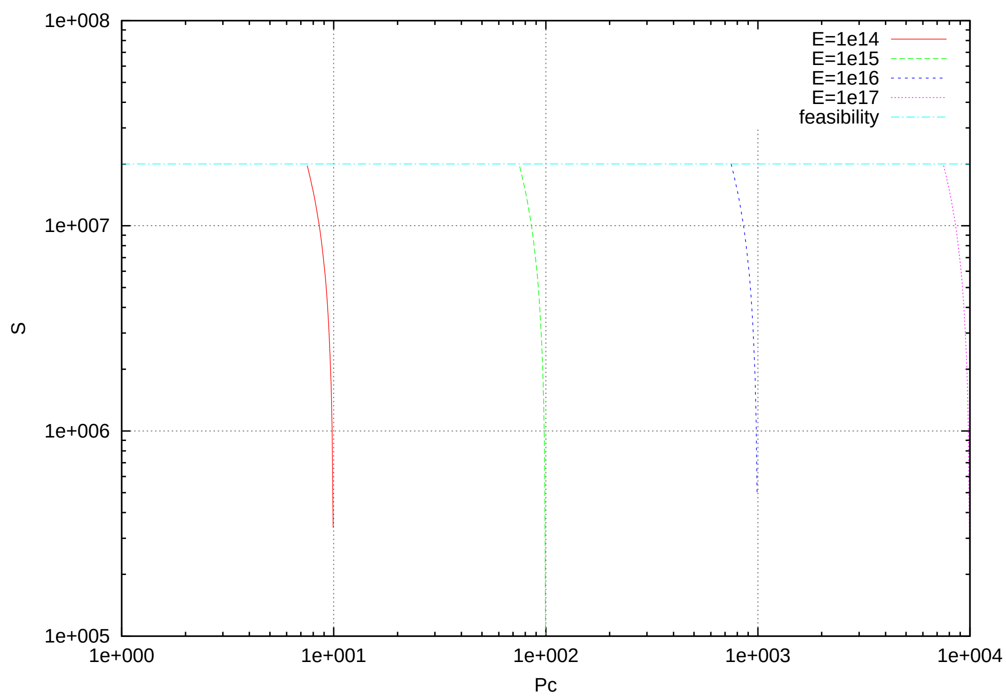

Fig. 100: Isoenergy map for processor power Pc, and startup time S. Value of $Pn = 10$ used.

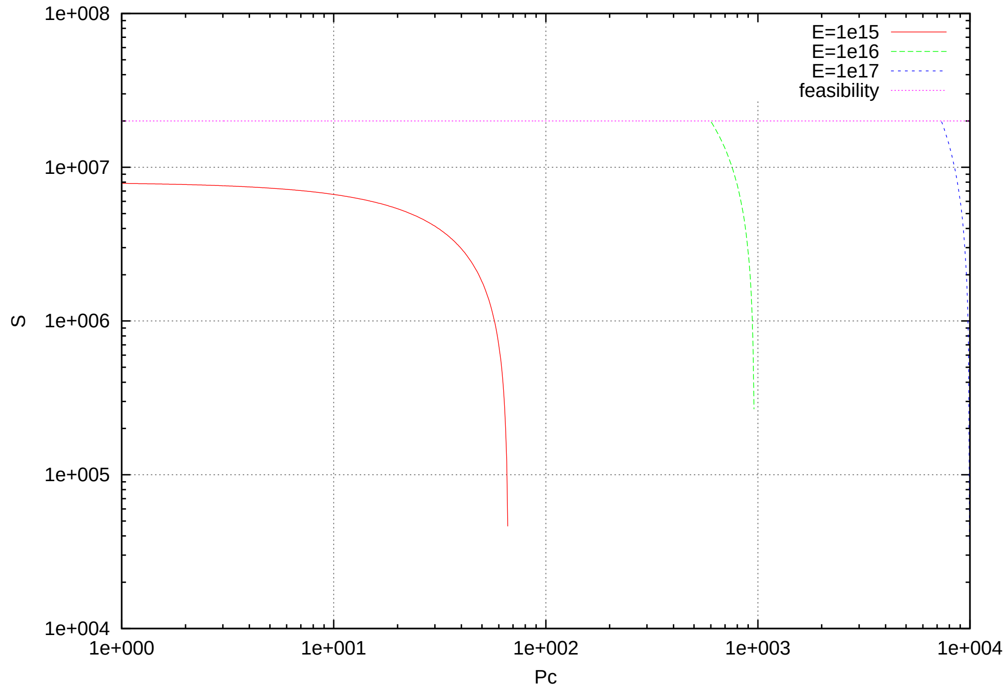

Fig. 101: Isoenergy map for processor power Pc, and startup time S. Value of $Pn = 1E5$ used.

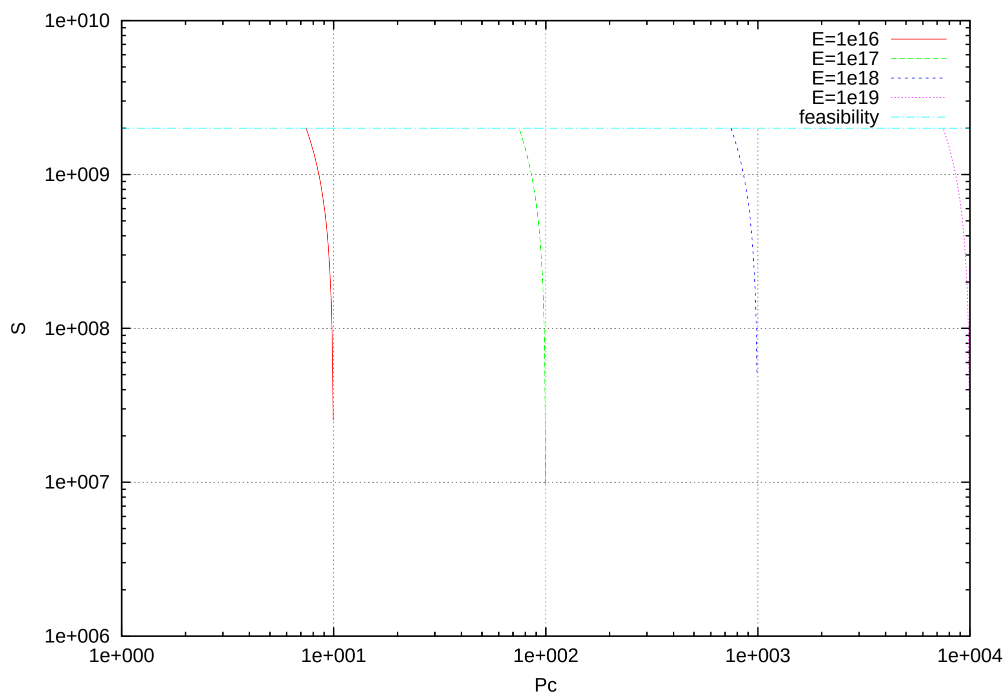

Fig. 102: Isoenergy map for processor power Pc, and startup time S. Value of $V = 1E15$ used.

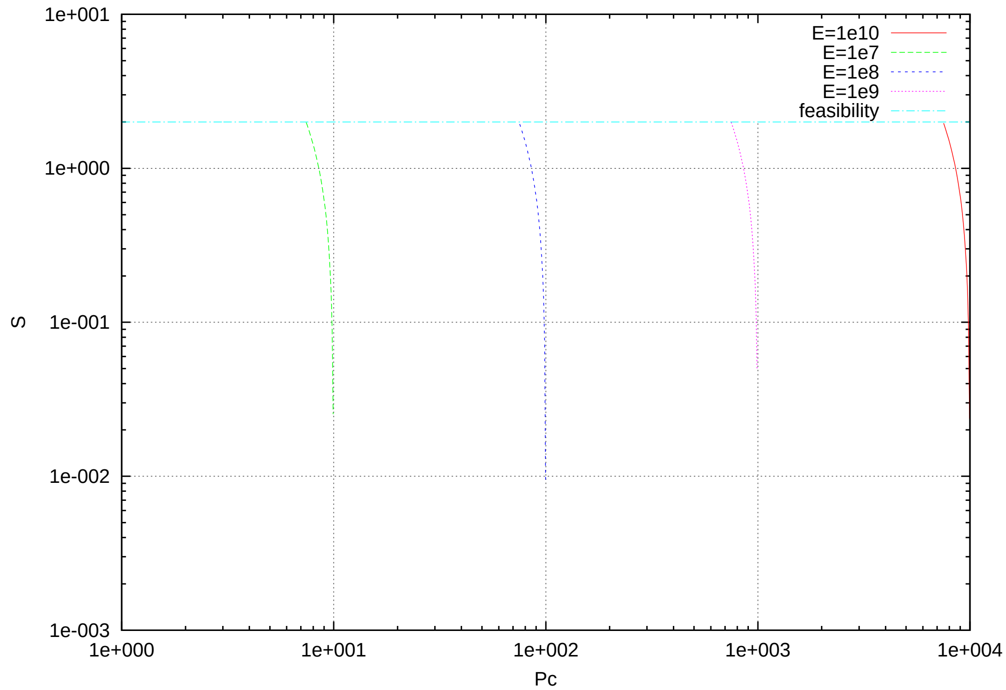

Fig. 103: Isoenergy map for processor power Pc, and startup time S. Value of $V = 1E6$ used.

10 Isoenergy maps for processor power Pc, and communication rate C.

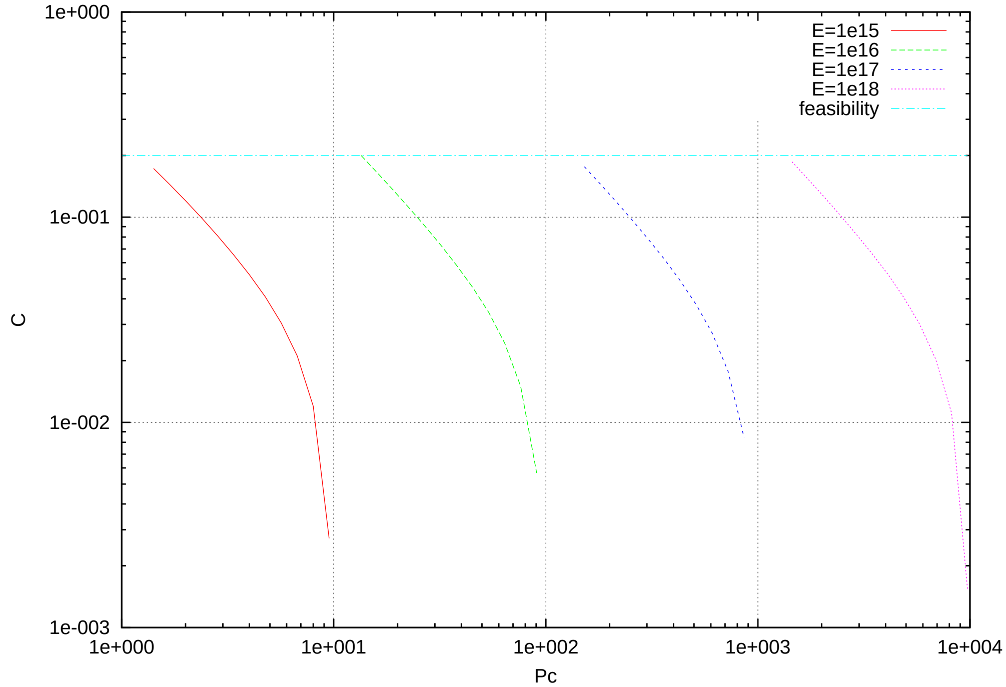

Fig. 104: Isoenergy map for processor power Pc, and communication rate C. Value of $A = 10$ used.

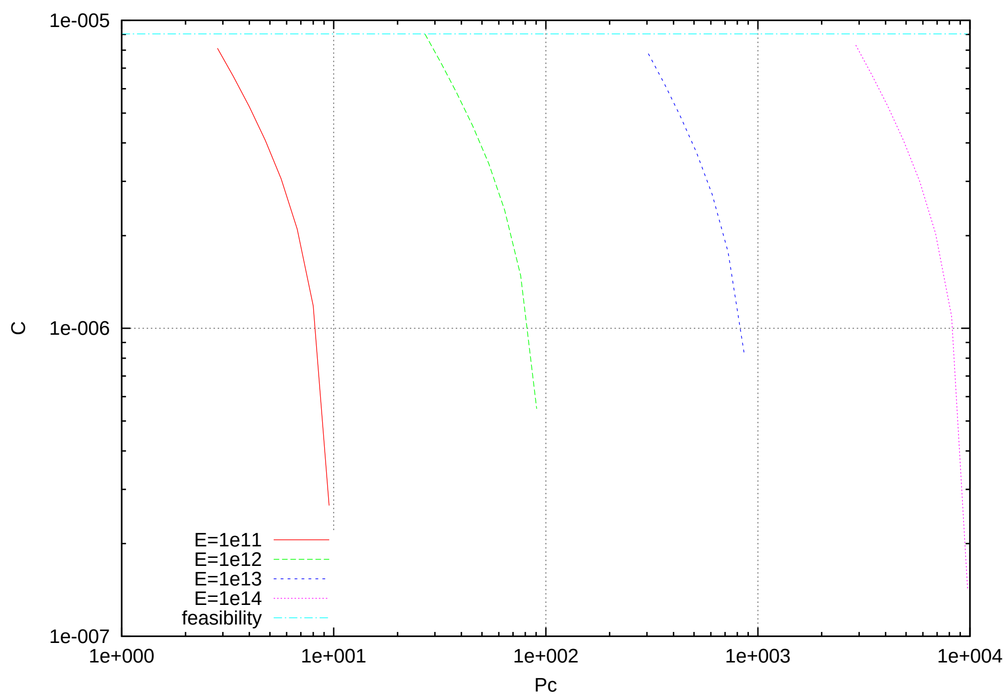

Fig. 105: Isoenergy map for processor power Pc, and communication rate C. Value of $A = 1E - 3$ used.

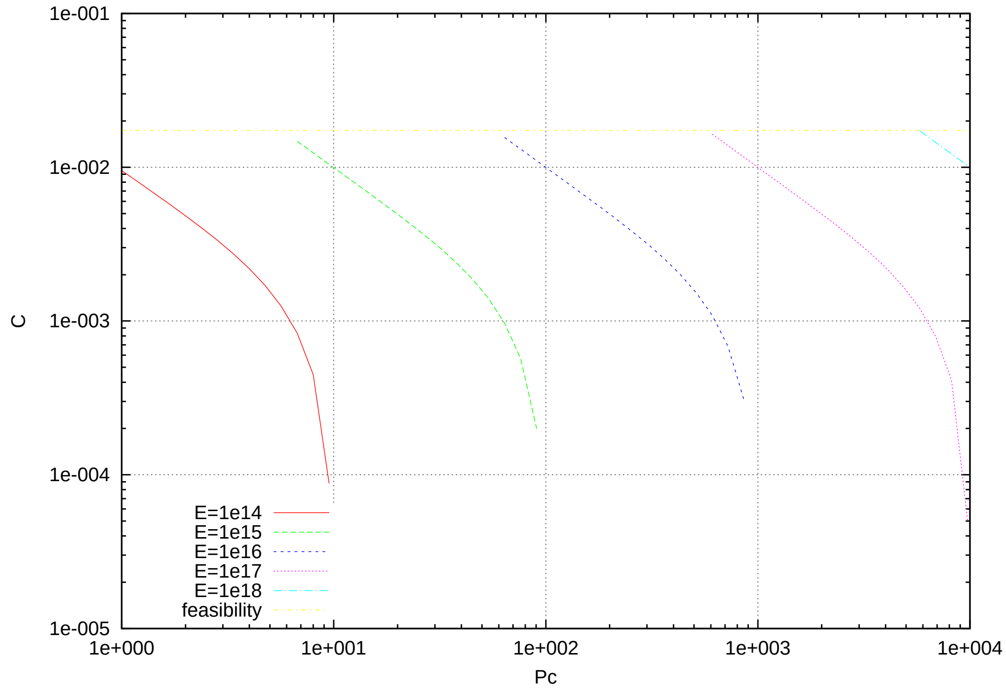

Fig. 106: Isoenergy map for processor power Pc, and communication rate C. Value of $k = 1$ used.

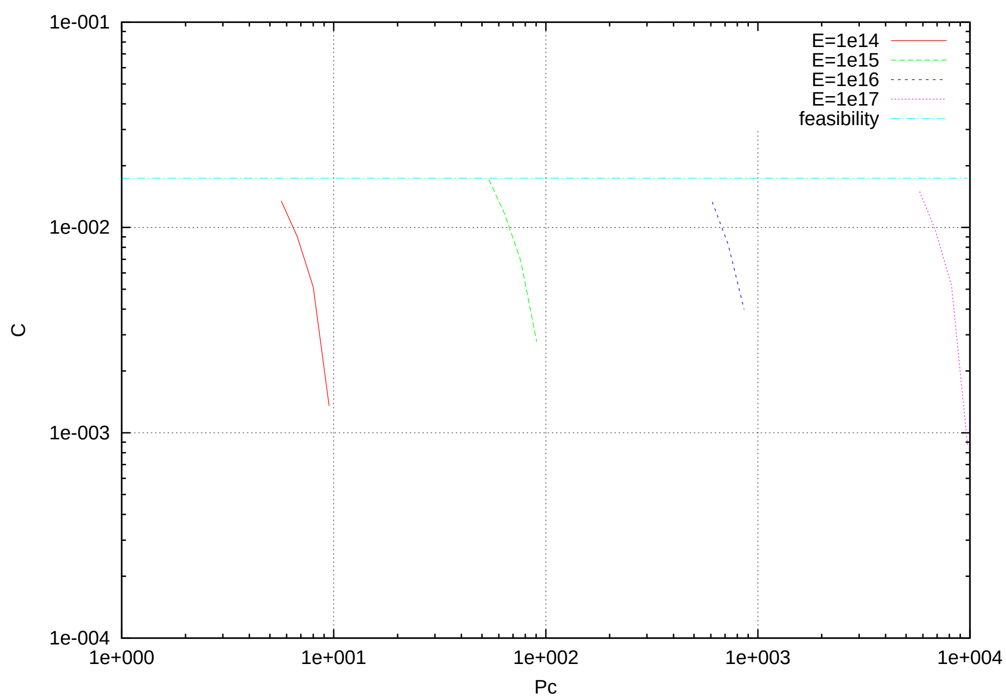

Fig. 107: Isoenergy map for processor power Pc, and communication rate C. Value of $k = 20$ used.

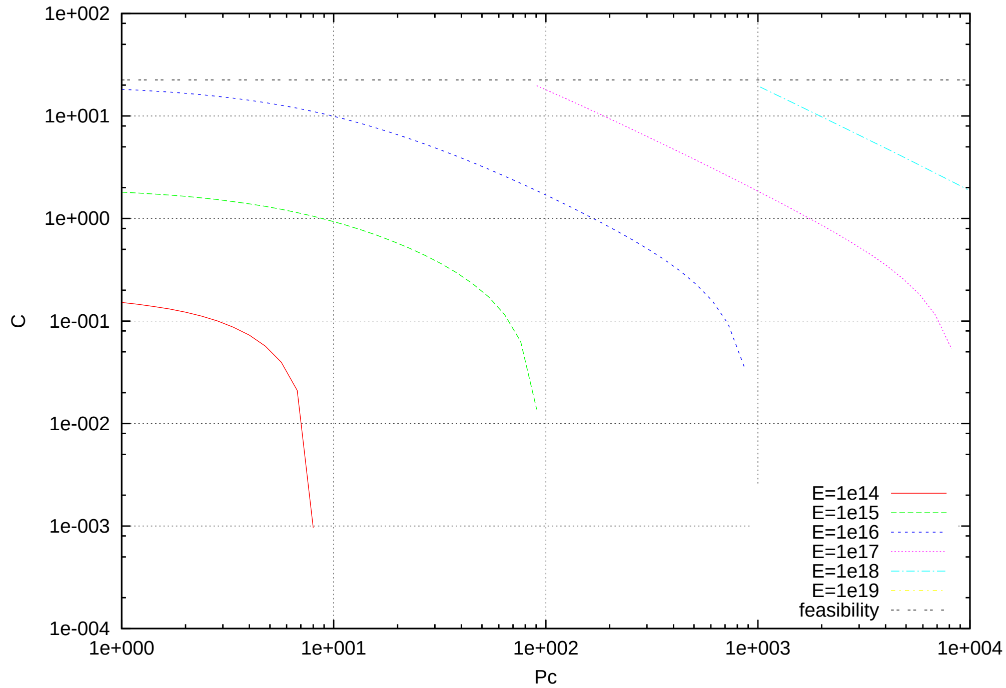

Fig. 108: Isoenergy map for processor power Pc, and communication rate C. Value of $m = 10$ used.

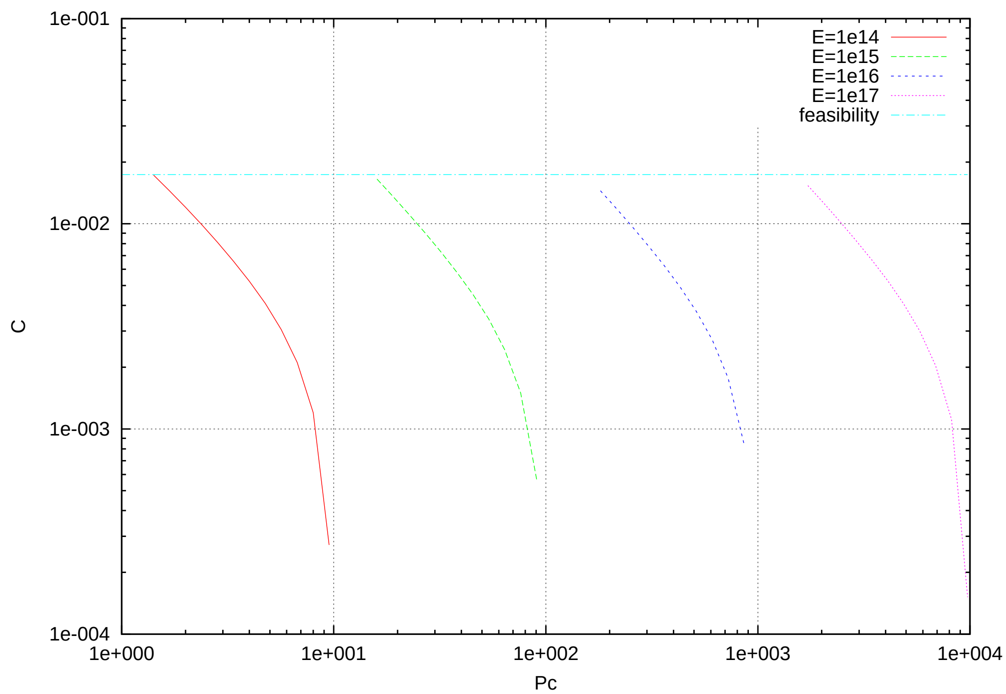

Fig. 109: Isoenergy map for processor power Pc, and communication rate C. Value of $m = 1E3$ used.

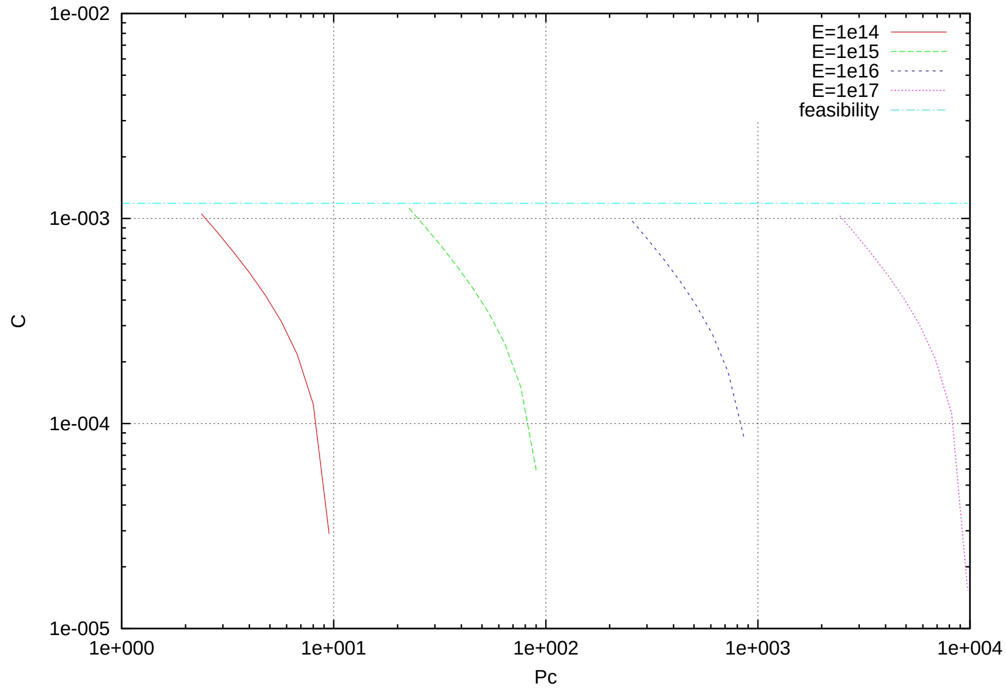

Fig. 110: Isoenergy map for processor power Pc, and communication rate C. Value of $m = 1E4$ used.

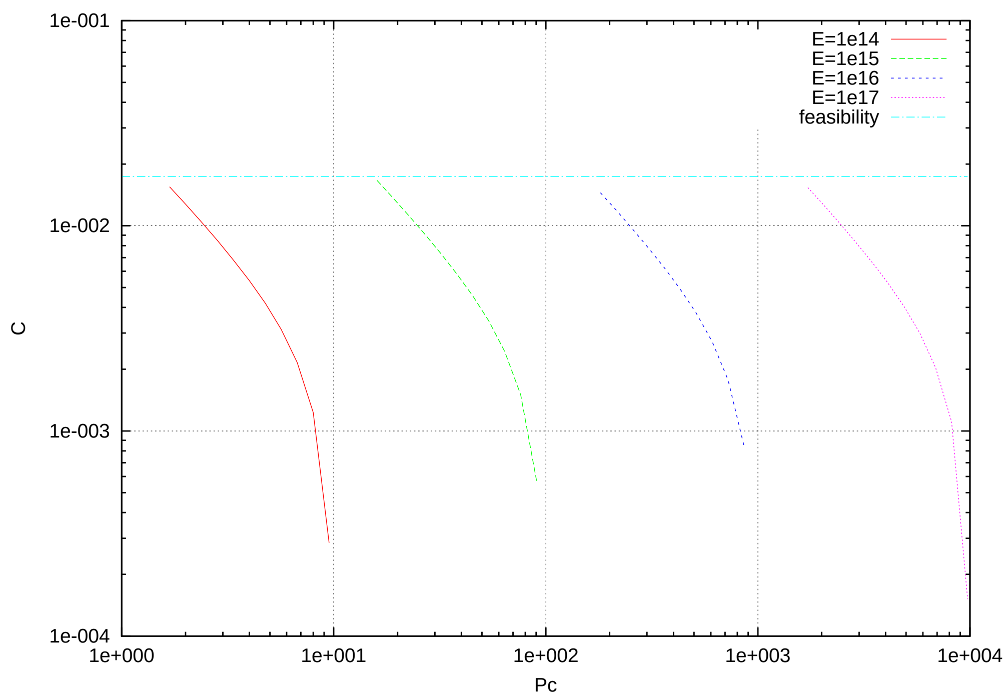

Fig. 111: Isoenergy map for processor power Pc, and communication rate C. Value of $Pn = 10$ used.

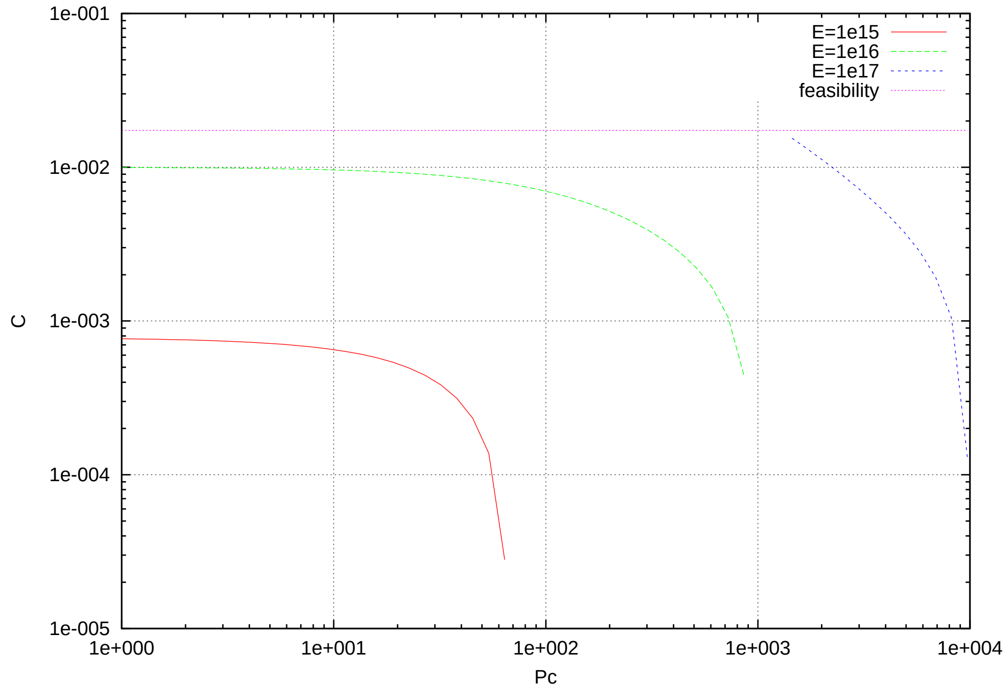

Fig. 112: Isoenergy map for processor power Pc, and communication rate C. Value of $Pn = 1E5$ used.

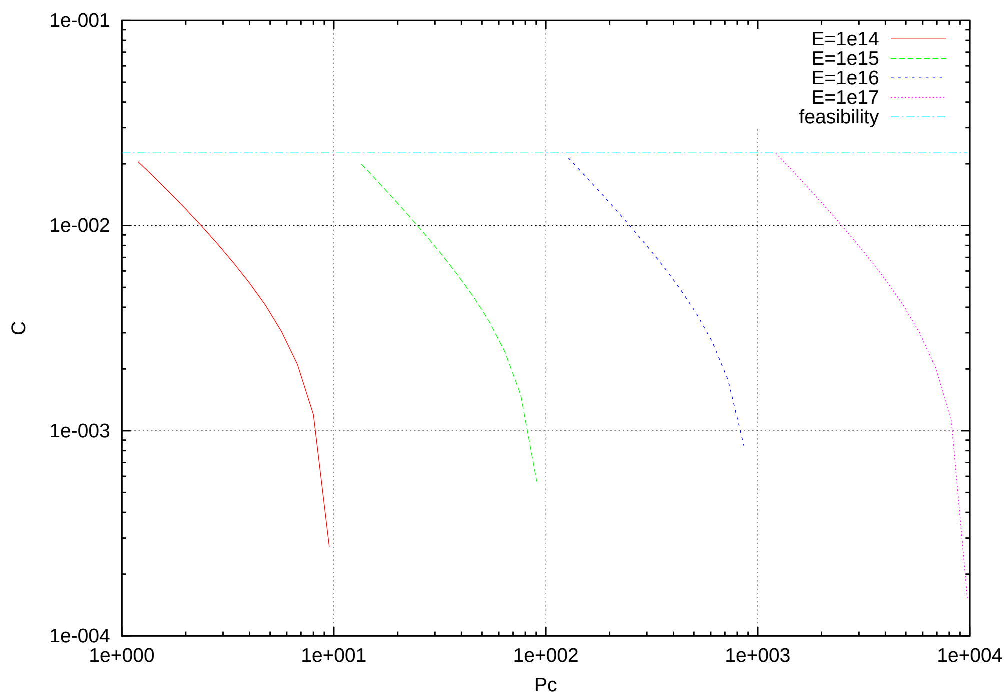

Fig. 113: Isoenergy map for processor power Pc, and communication rate C. Value of $S = 1$ used.

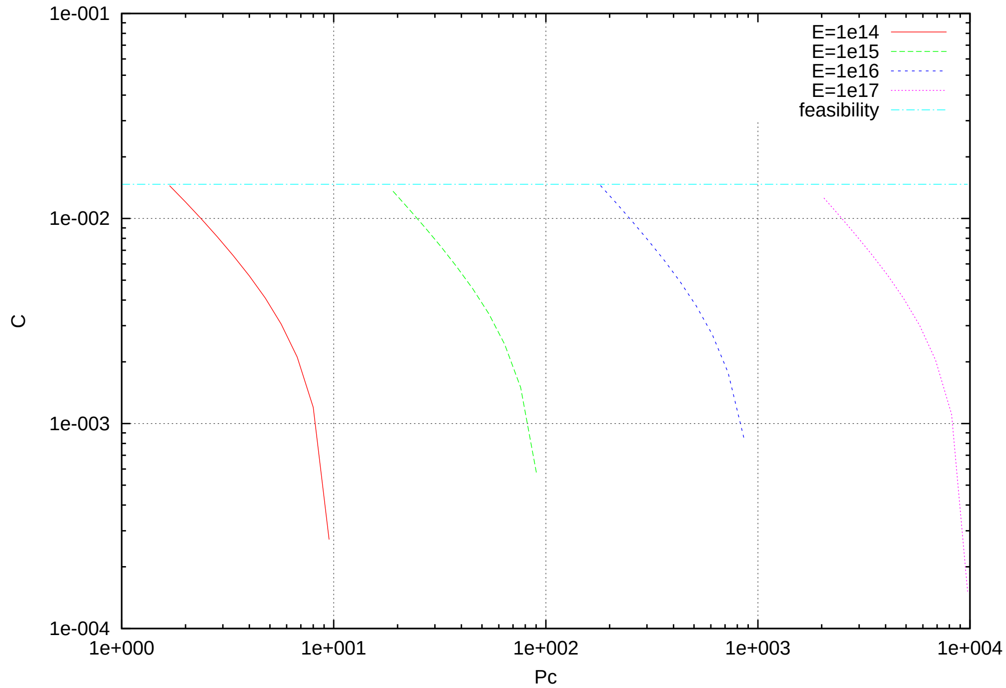

Fig. 114: Isoenergy map for processor power Pc, and communication rate C. Value of $S = 1E3$ used.

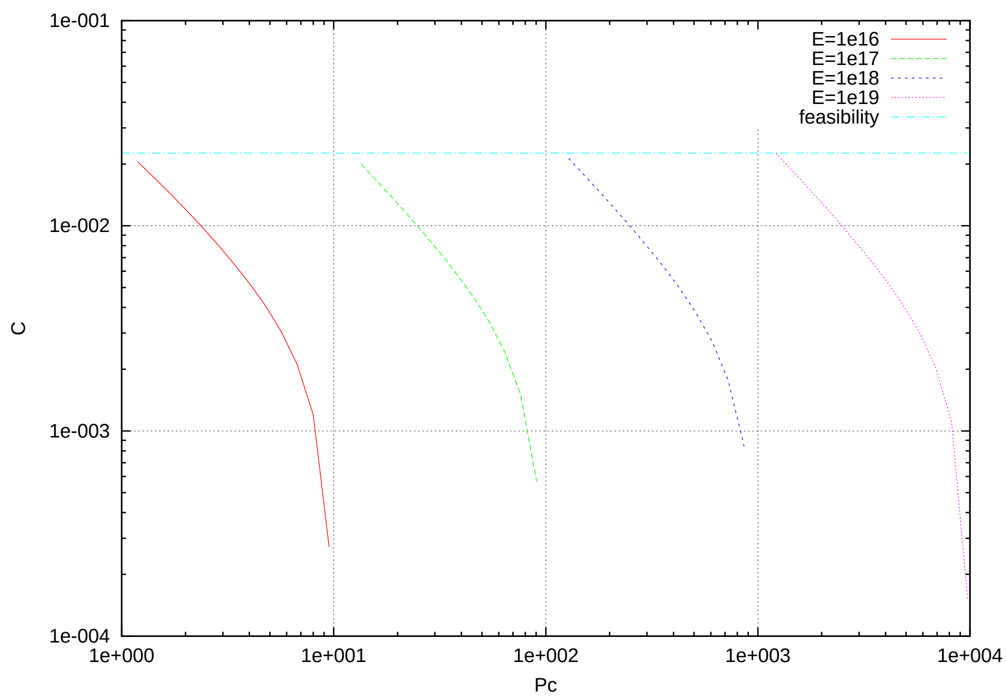

Fig. 115: Isoenergy map for processor power Pc, and communication rate C. Value of $V = 1E15$ used.

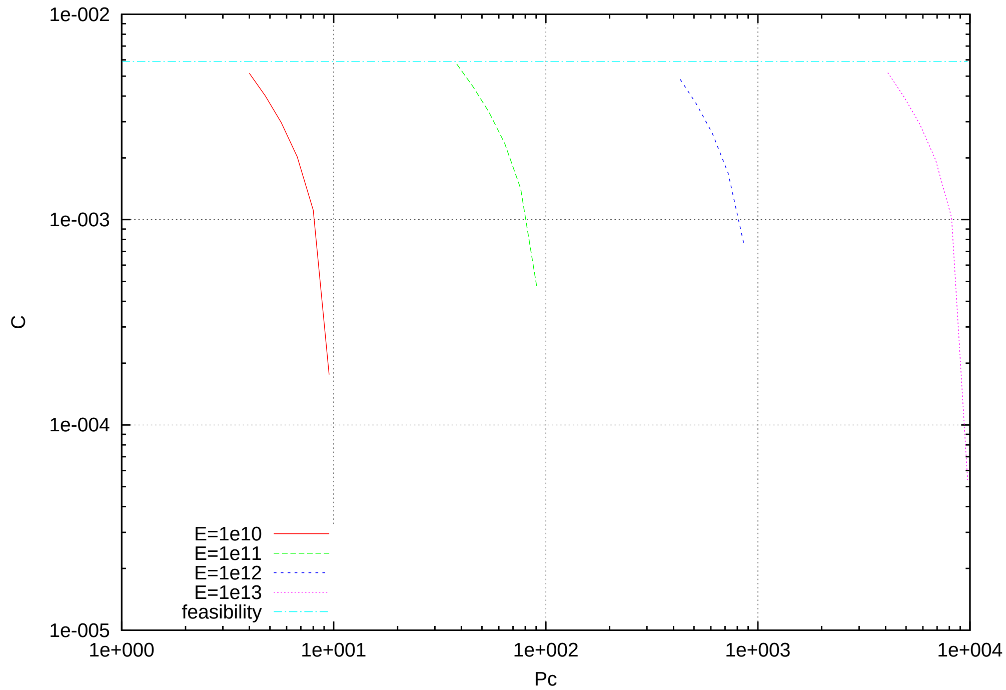

Fig. 116: Isoenergy map for processor power Pc, and communication rate C. Value of $V = 1E9$ used.

11 Isoenergy maps for processor power Pc, and computation rate A.

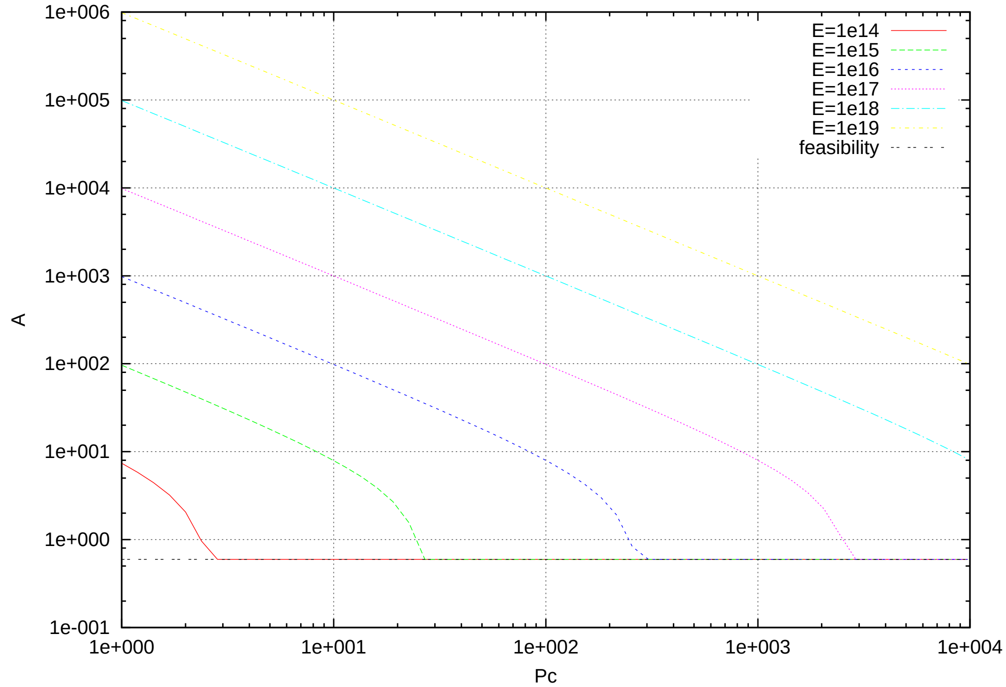

Fig. 117: Isoenergy map for processor power Pc, and computation rate A. Value of $C = 1E - 2$ used.

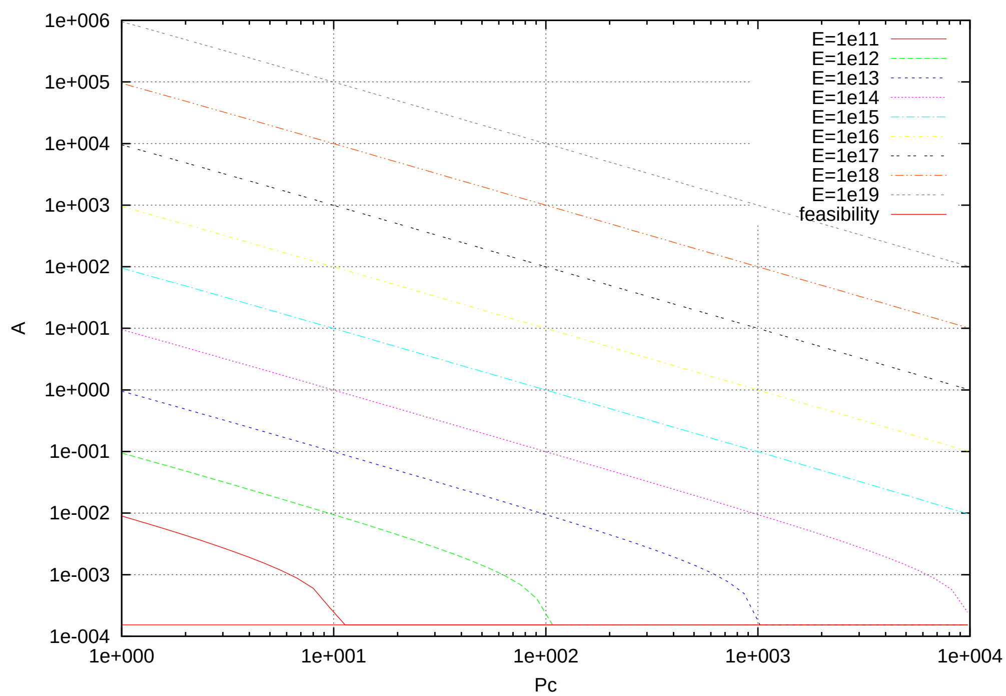

Fig. 118: Isoenergy map for processor power Pc, and computation rate A. Value of $k = 1$ used.

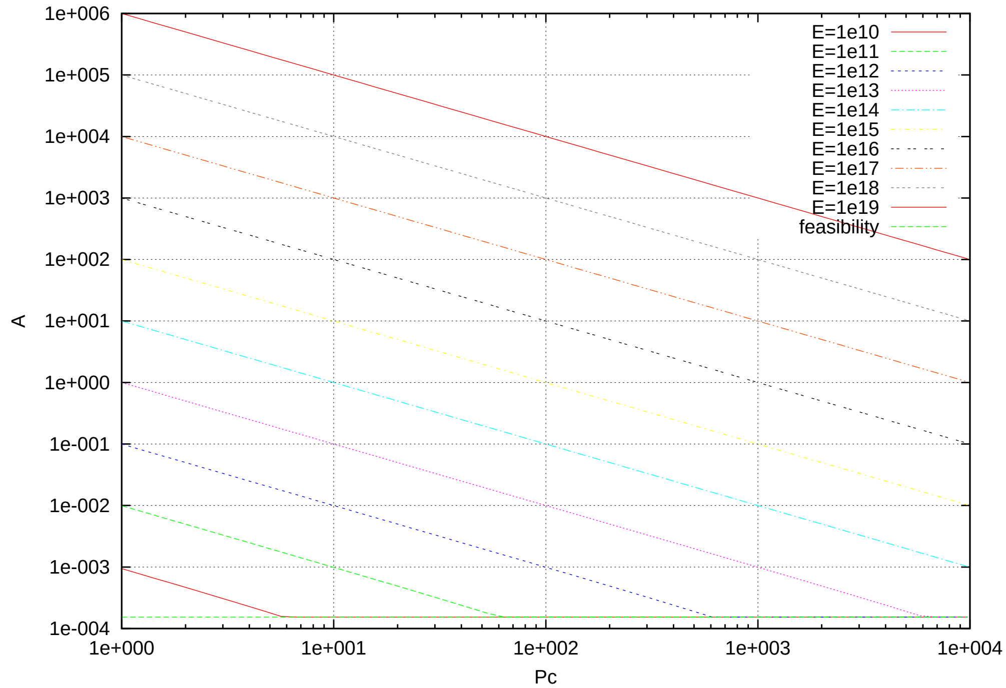

Fig. 119: Isoenergy map for processor power Pc, and computation rate A. Value of $k = 100$ used.

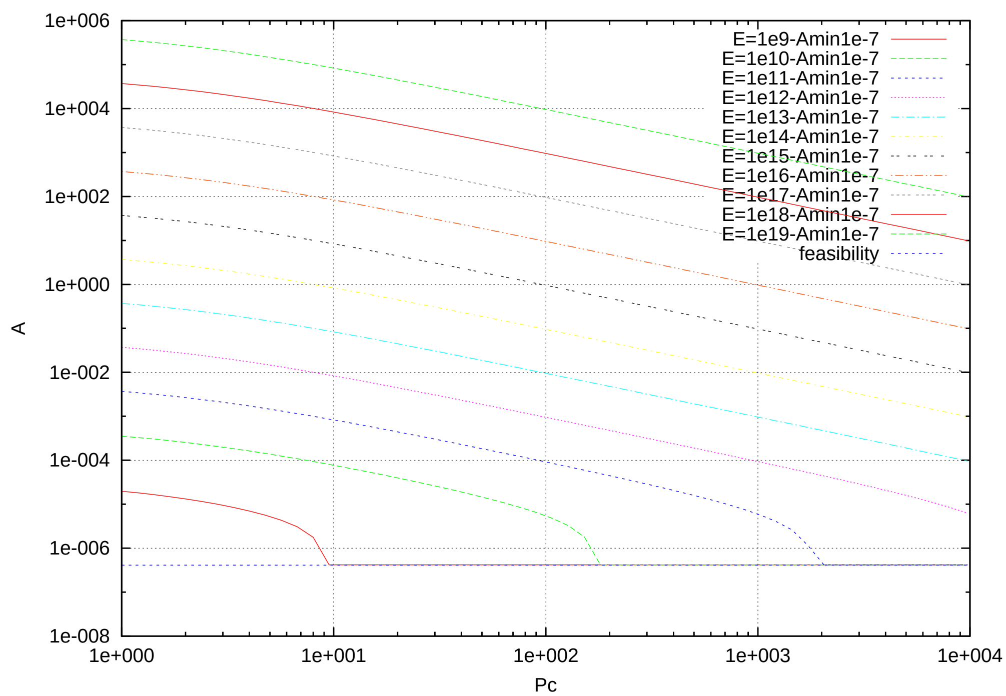

Fig. 120: Isoenergy map for processor power Pc, and computation rate A. Value of $m = 10$ used.

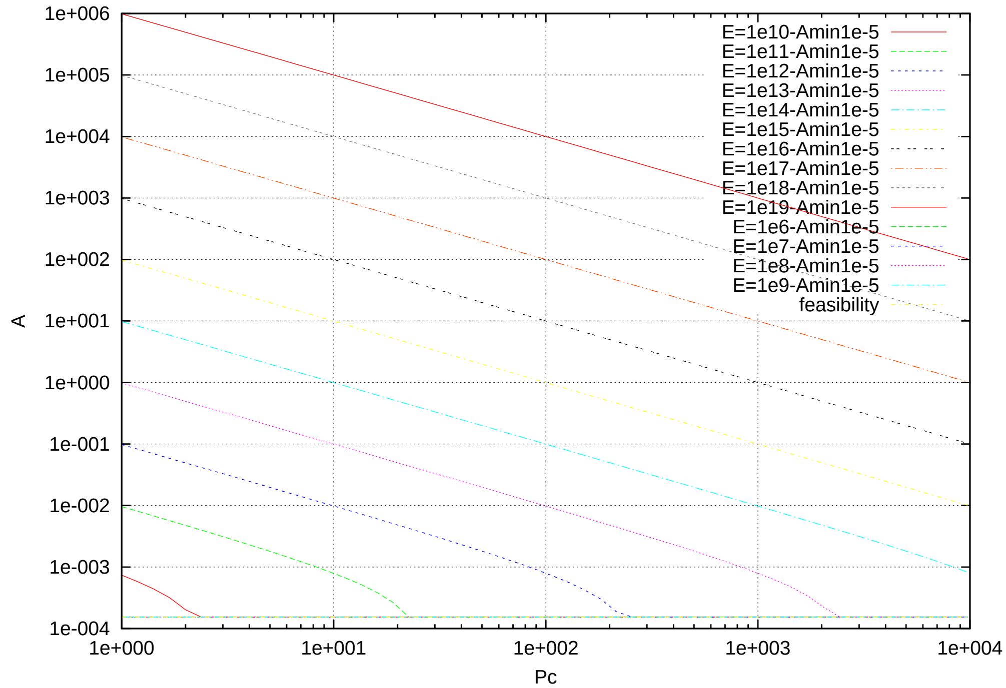

Fig. 121: Isoenergy map for processor power Pc, and computation rate A. Value of $m = 1E3$ used.

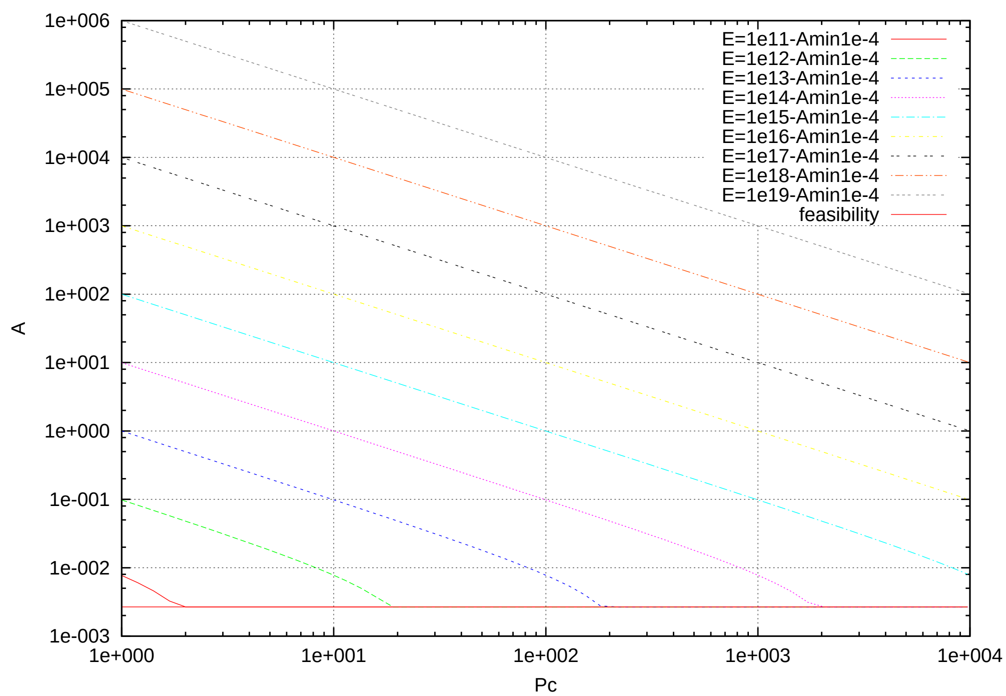

Fig. 122: Isoenergy map for processor power Pc, and computation rate A. Value of $m = 1E4$ used.

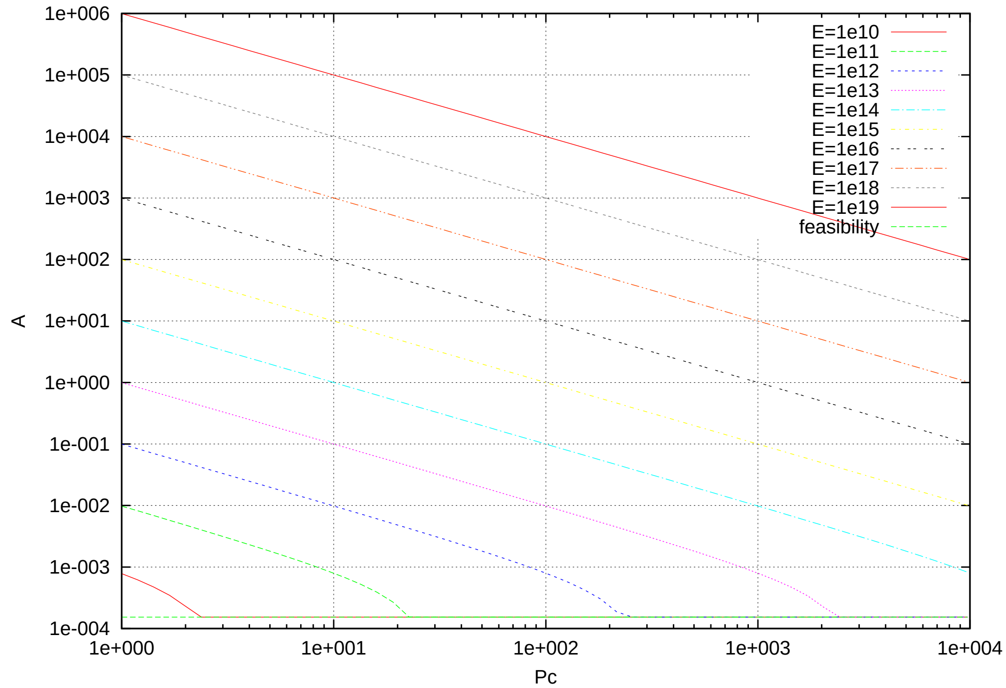

Fig. 123: Isoenergy map for processor power Pc, and computation rate A. Value of $Pn = 10$ used.

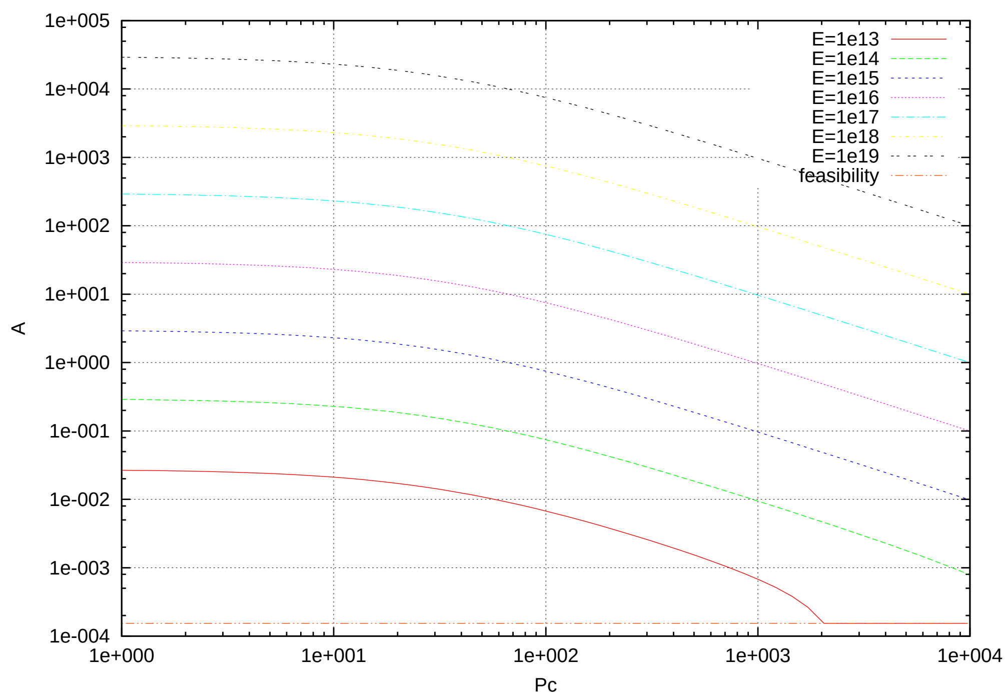

Fig. 124: Isoenergy map for processor power Pc, and computation rate A. Value of $Pn = 1E5$ used.

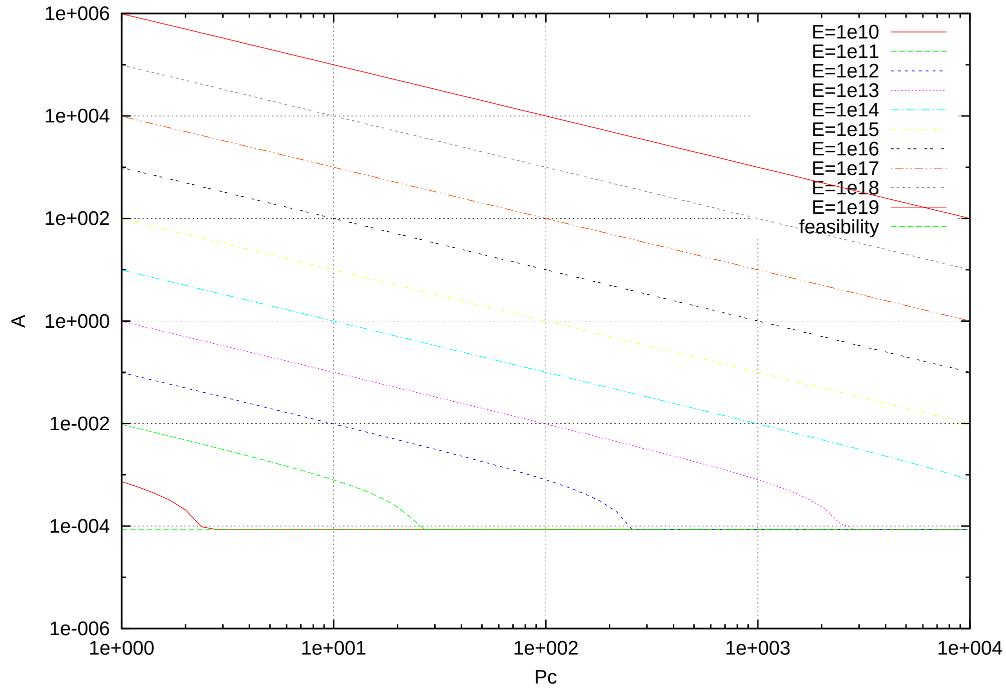

Fig. 125: Isoenergy map for processor power Pc, and computation rate A. Value of $S = 1$ used.

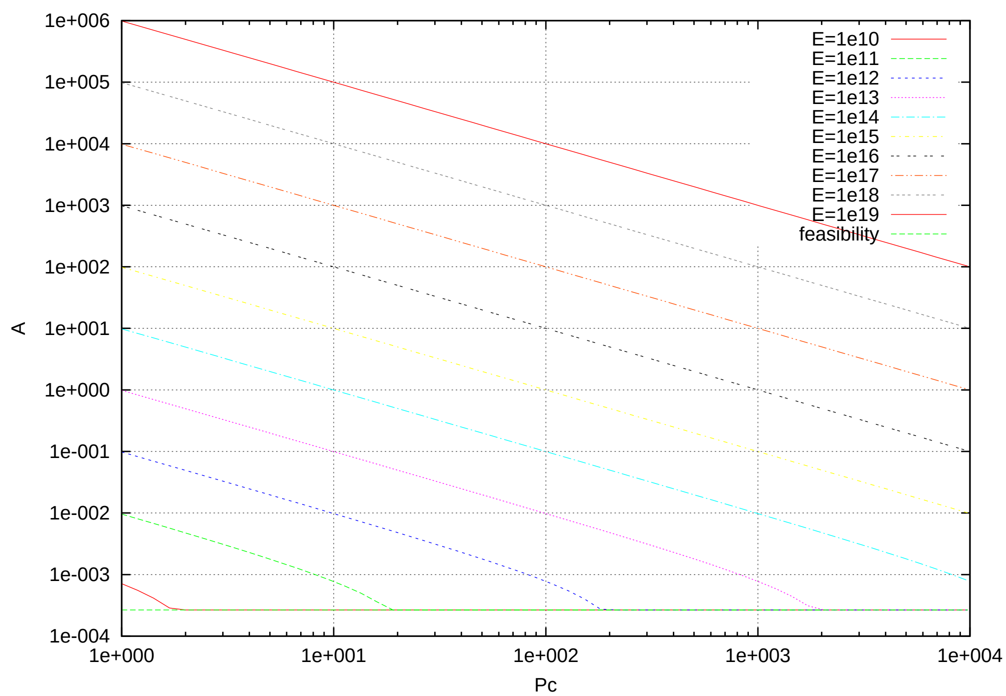

Fig. 126: Isoenergy map for processor power Pc, and computation rate A. Value of $S = 1E3$ used.

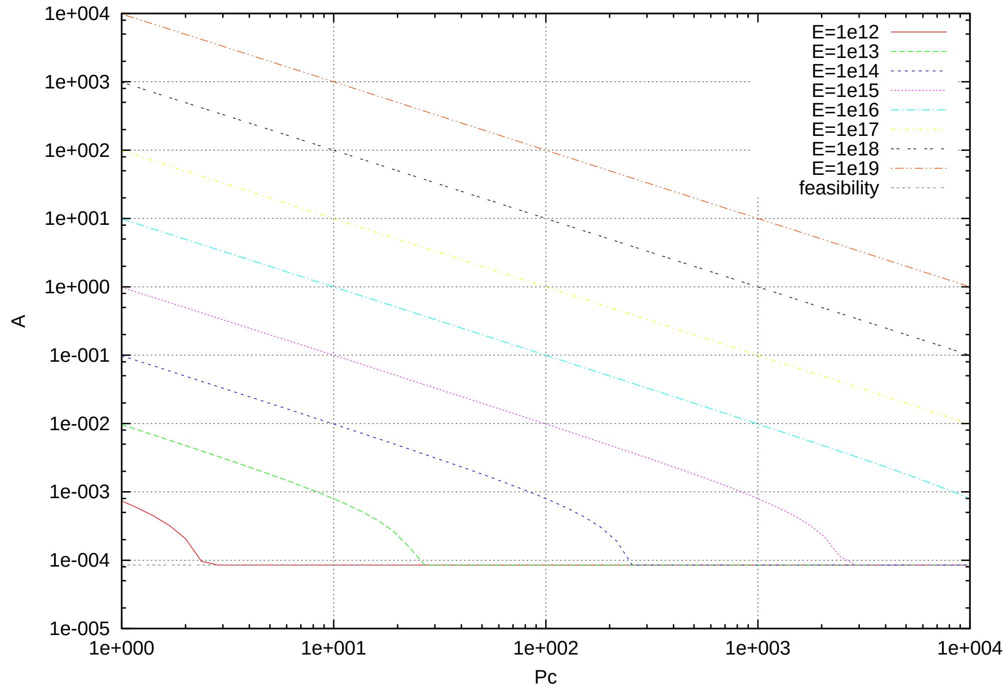

Fig. 127: Isoenergy map for processor power Pc, and computation rate A. Value of $V = 1E15$ used.

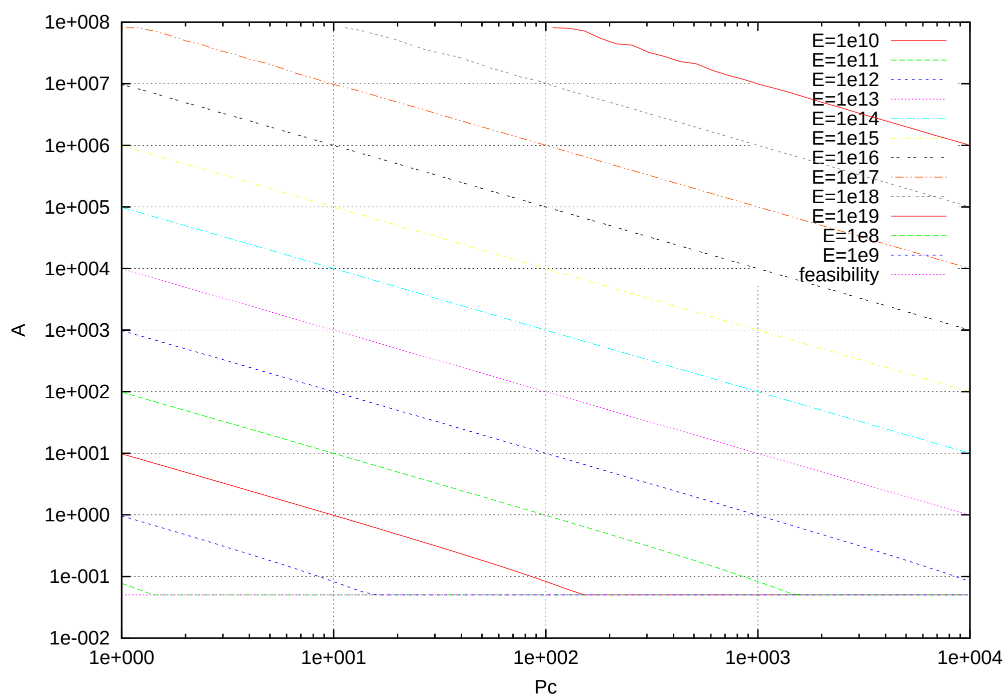

Fig. 128: Isoenergy map for processor power Pc, and computation rate A. Value of $V = 1E9$ used.

12 Isoenergy maps for processor power Pc, and load size V.

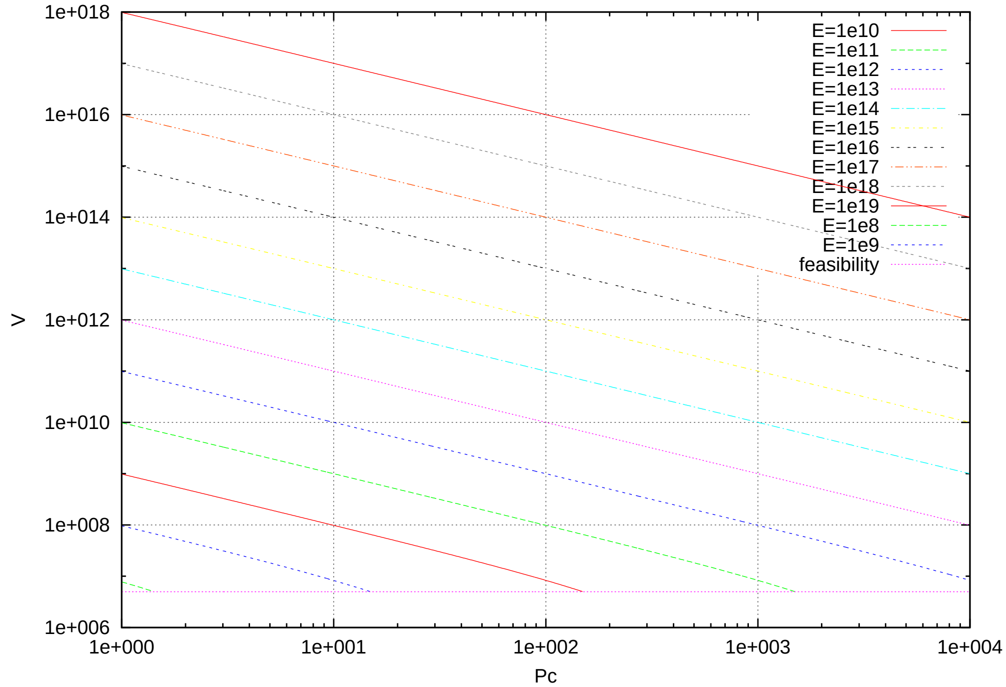

Fig. 129: Isoenergy map for processor power Pc, and load size V. Value of $A = 10$ used.

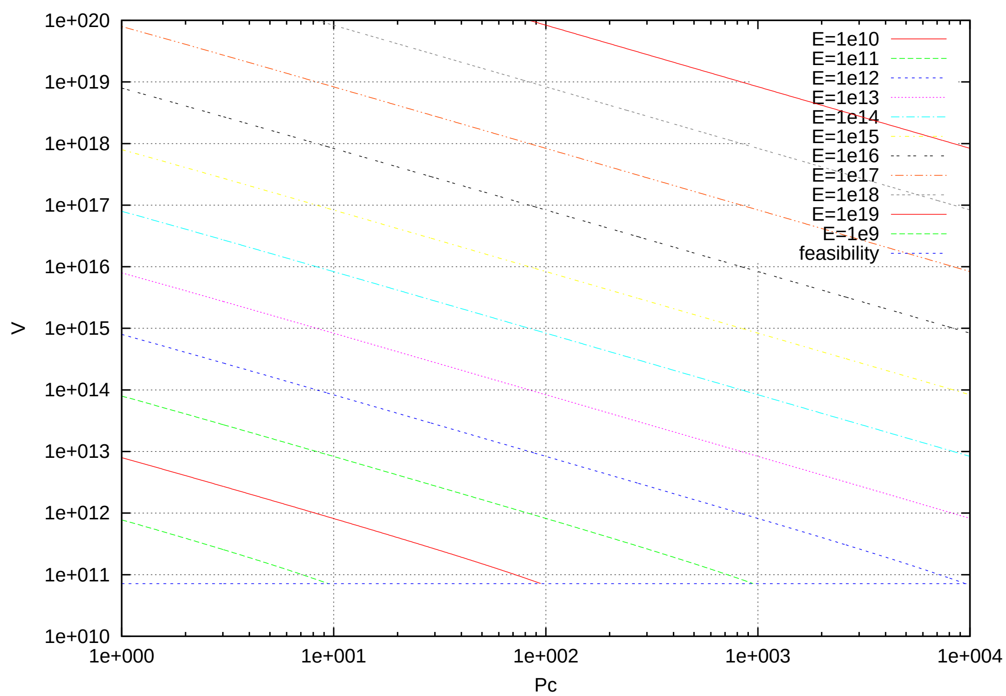

Fig. 130: Isoenergy map for processor power Pc, and load size V. Value of $A = 1E-3$ used.

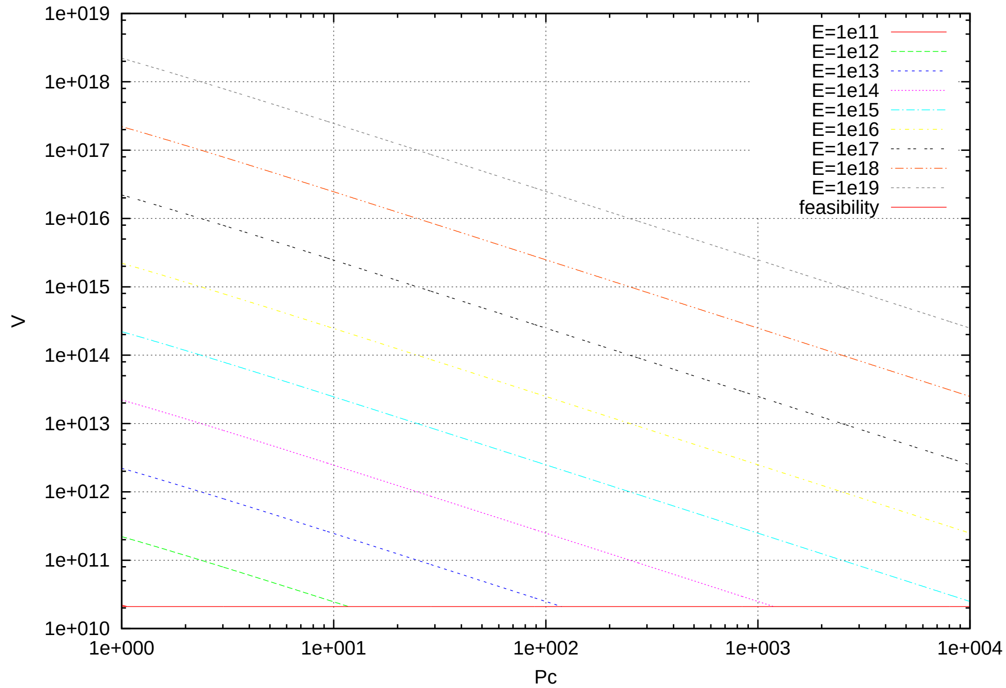

Fig. 131: Isoenergy map for processor power Pc, and load size V. Value of $C = 1E - 2$ used.

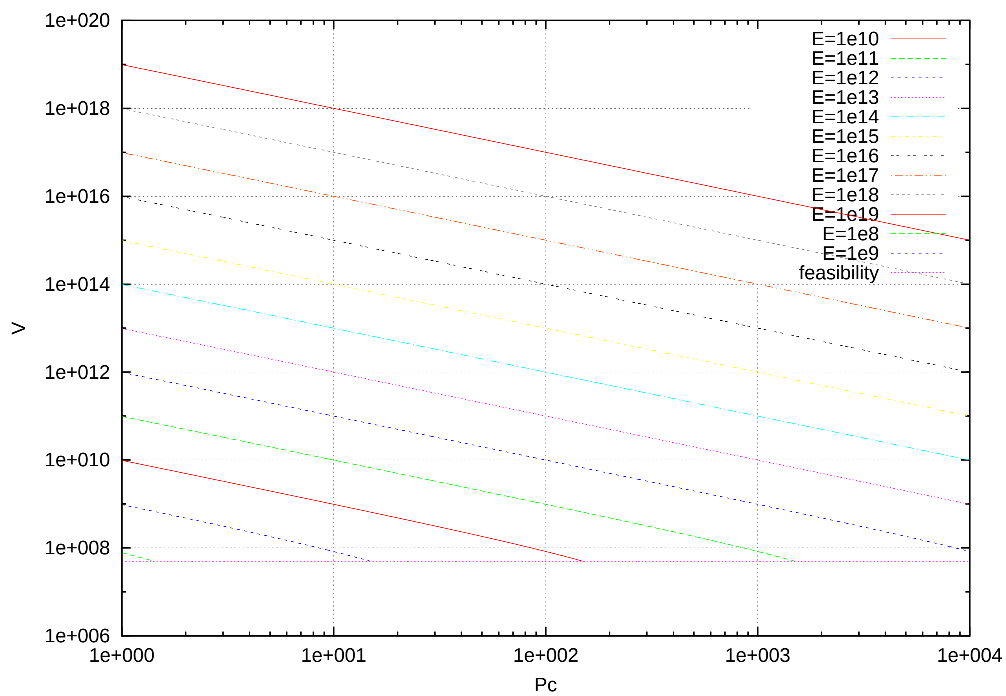

Fig. 132: Isoenergy map for processor power Pc, and load size V. Value of $C = 1E - 8$ used.

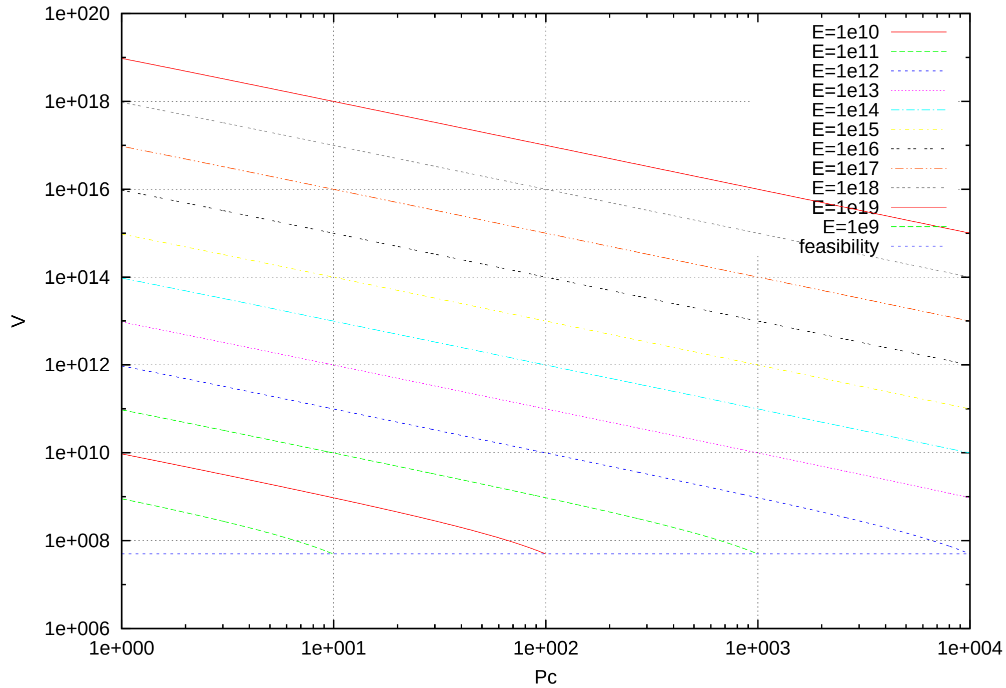

Fig. 133: Isoenergy map for processor power Pc, and load size V. Value of $k = 1$ used.

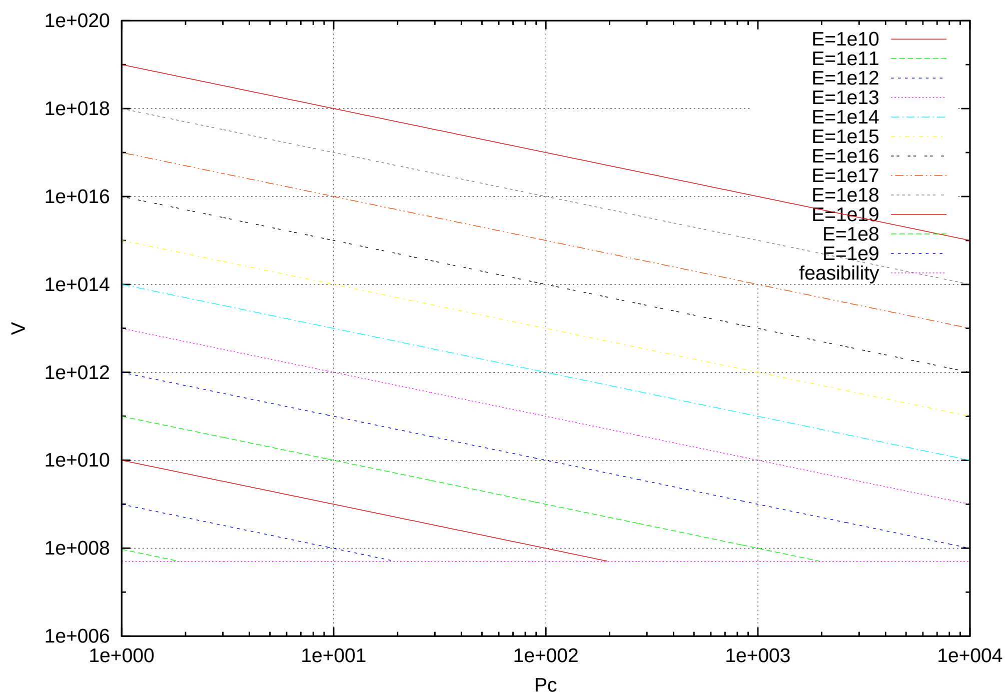

Fig. 134: Isoenergy map for processor power Pc, and load size V. Value of $k = 100$ used.

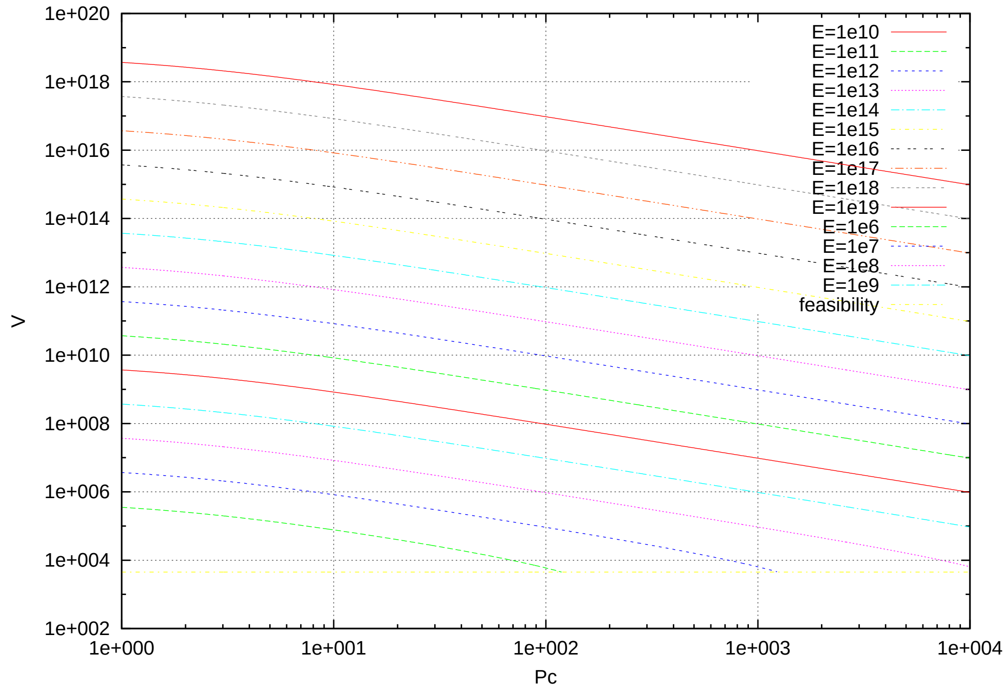

Fig. 135: Isoenergy map for processor power Pc, and load size V. Value of $m = 10$ used.

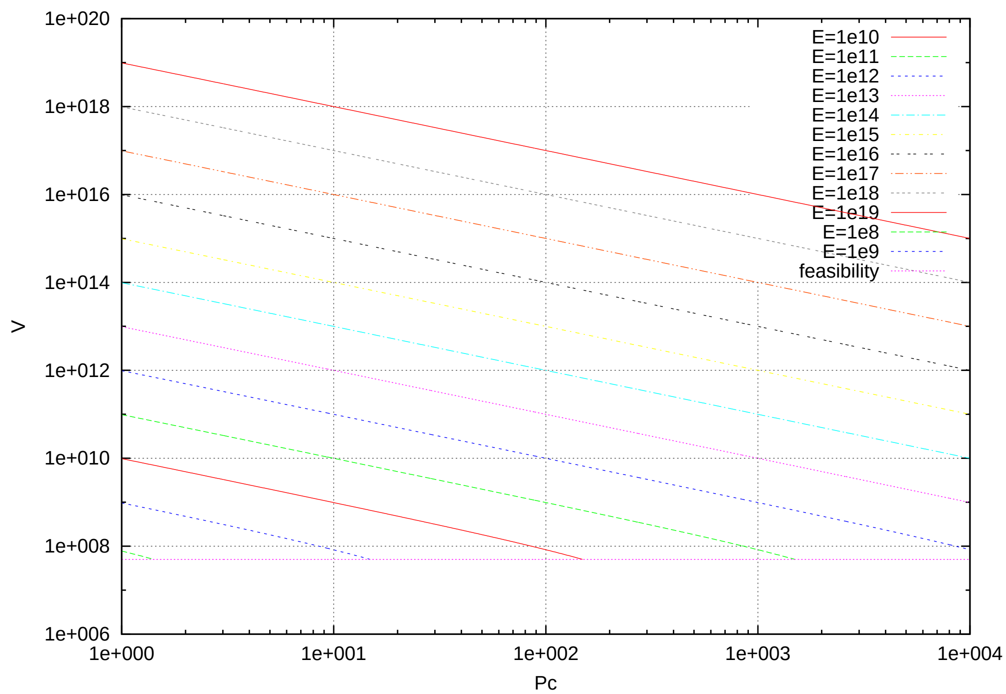

Fig. 136: Isoenergy map for processor power Pc, and load size V. Value of $m = 1E3$ used.

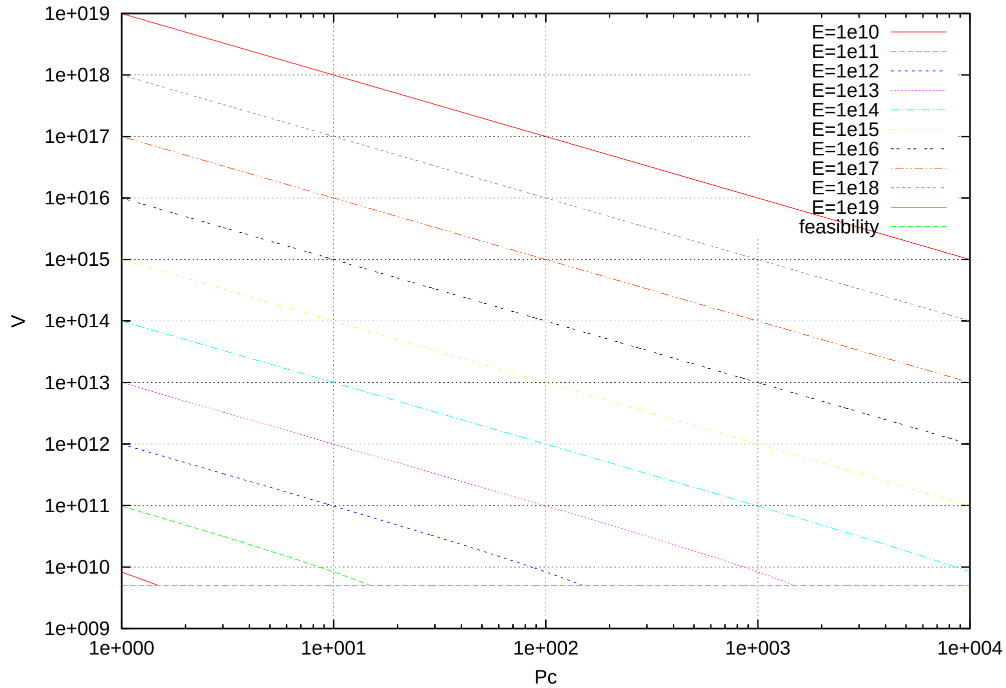

Fig. 137: Isoenergy map for processor power Pc, and load size V. Value of $m = 1E4$ used.

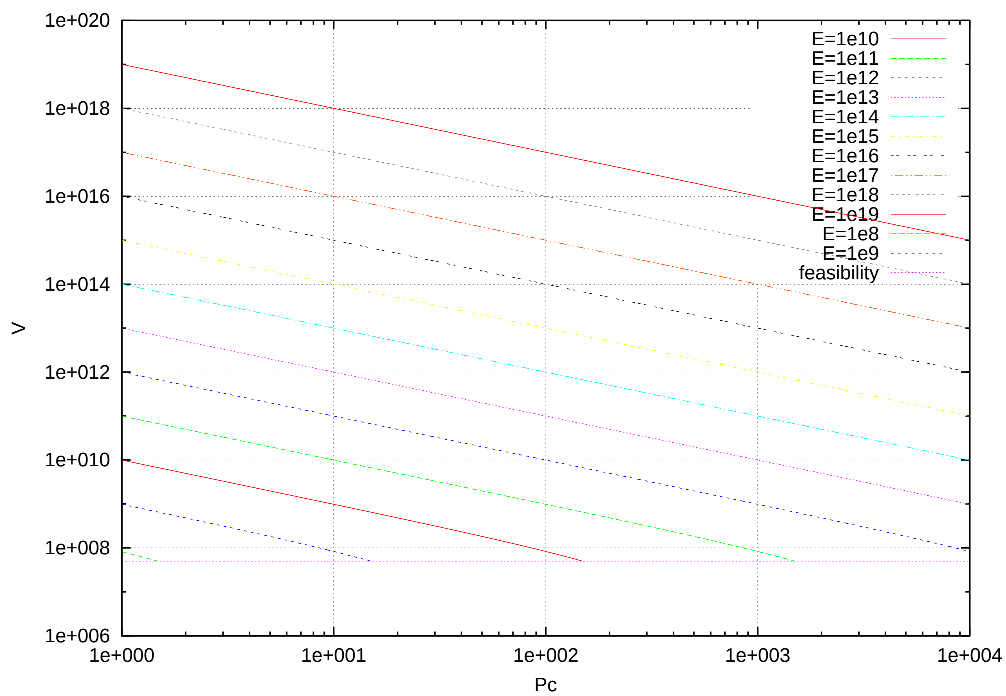

Fig. 138: Isoenergy map for processor power Pc, and load size V. Value of $Pn = 10$ used.

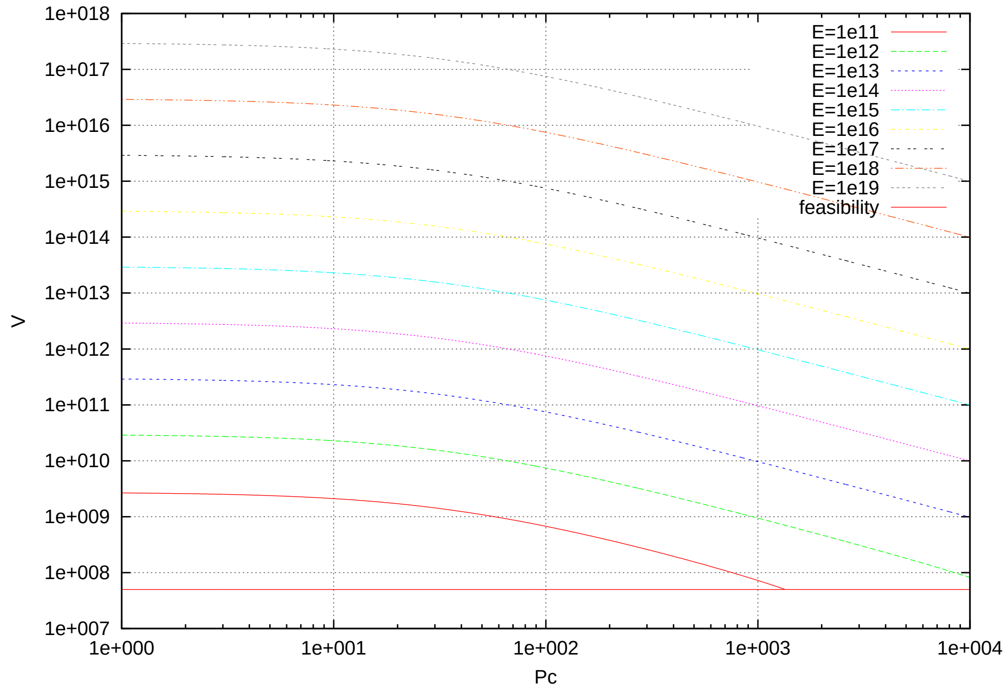

Fig. 139: Isoenergy map for processor power Pc, and load size V. Value of $Pn = 1E5$ used.

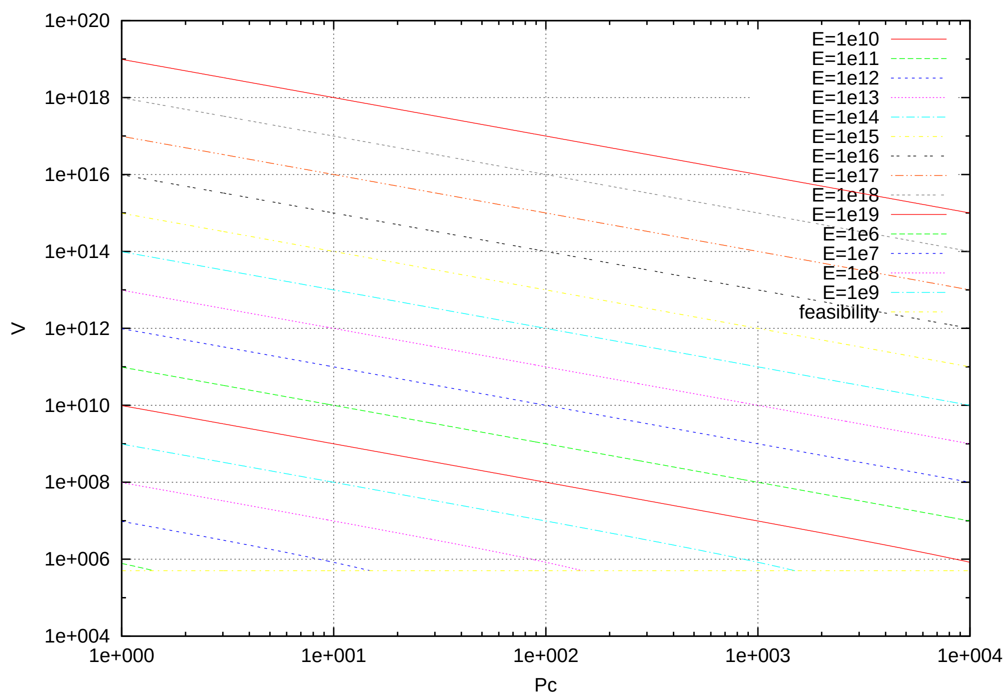

Fig. 140: Isoenergy map for processor power Pc, and load size V. Value of $S = 1$ used.

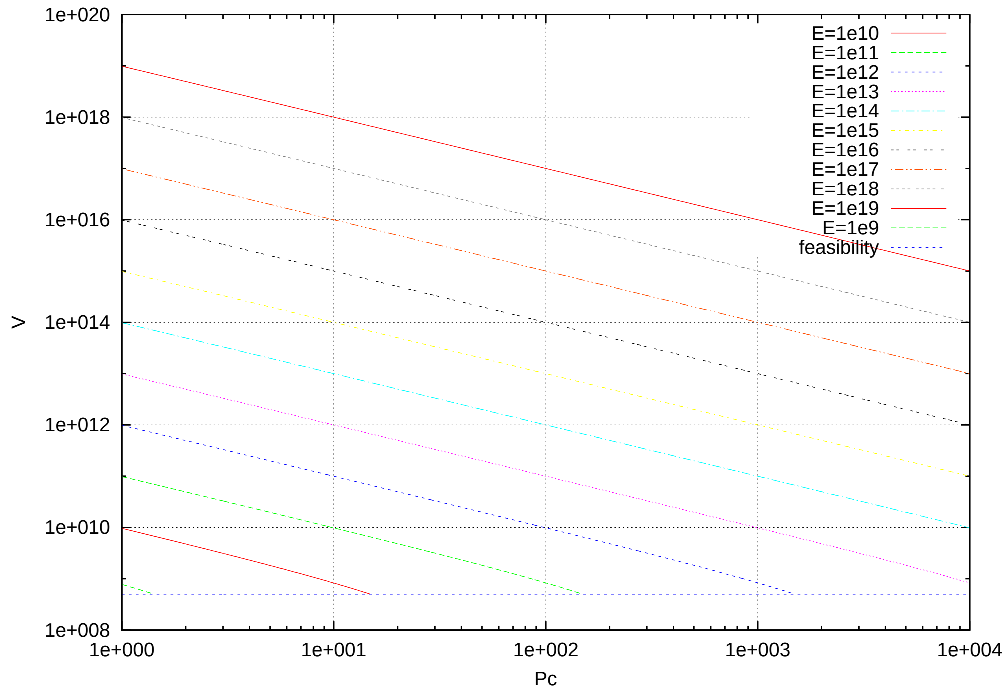

Fig. 141: Isoenergy map for processor power Pc, and load size V. Value of $S = 1E3$ used.

13 Isoenergy maps for processor power Pc, and idle power reduction k.

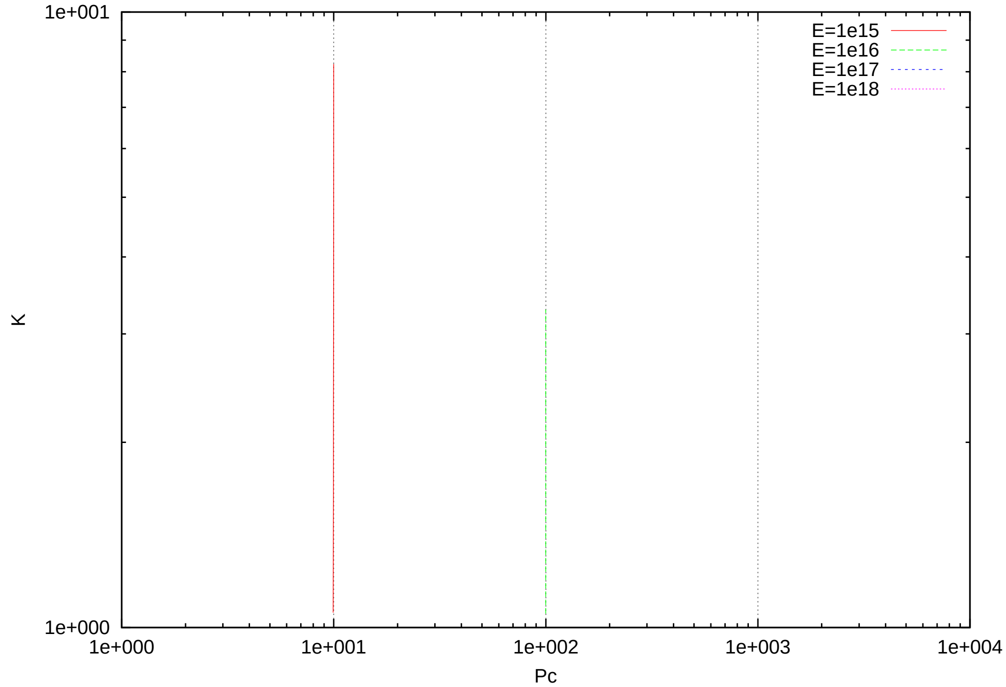

Fig. 142: Isoenergy map for processor power Pc, and idle power reduction k. Value of $A = 10$ used.

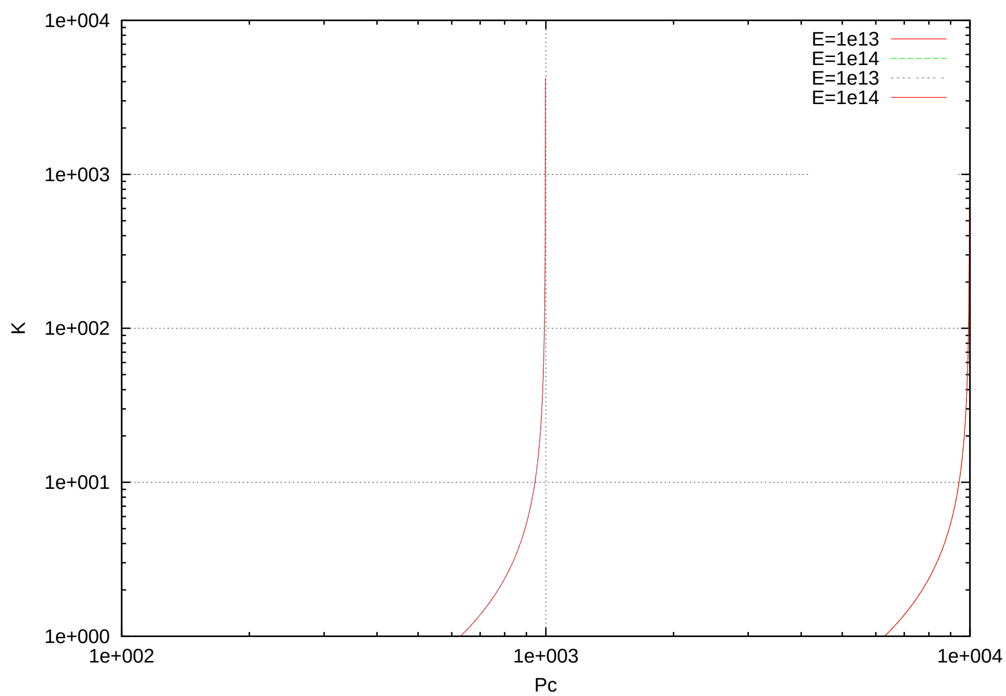

Fig. 143: Isoenergy map for processor power Pc, and idle power reduction k. Value of $A = 1E-3$ used.

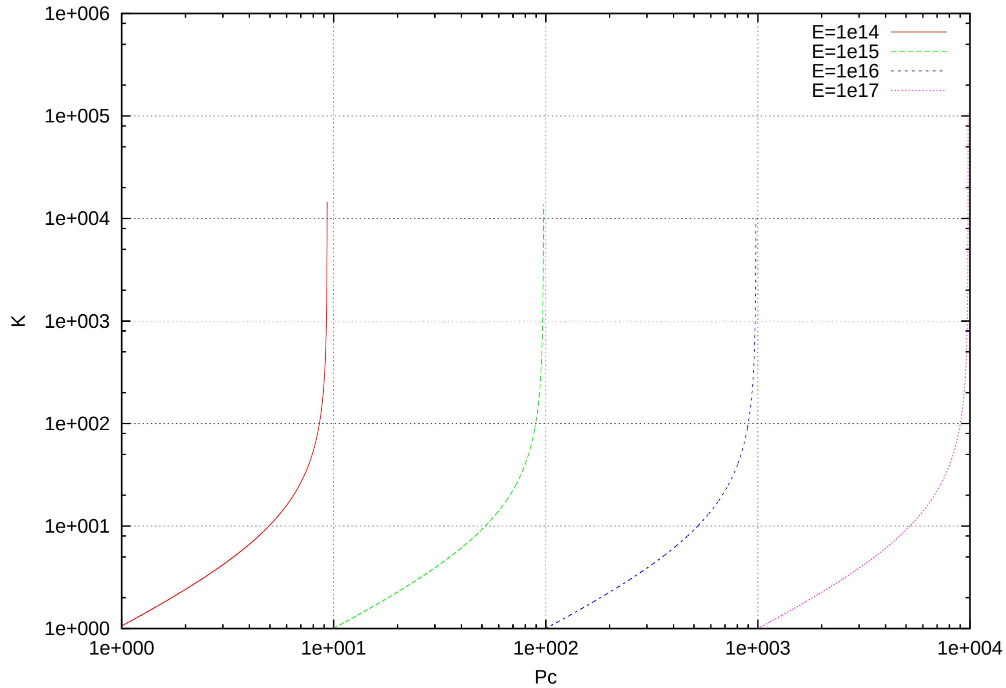

Fig. 144: Isoenergy map for processor power Pc, and idle power reduction k. Value of $C = 1E-2$ used.

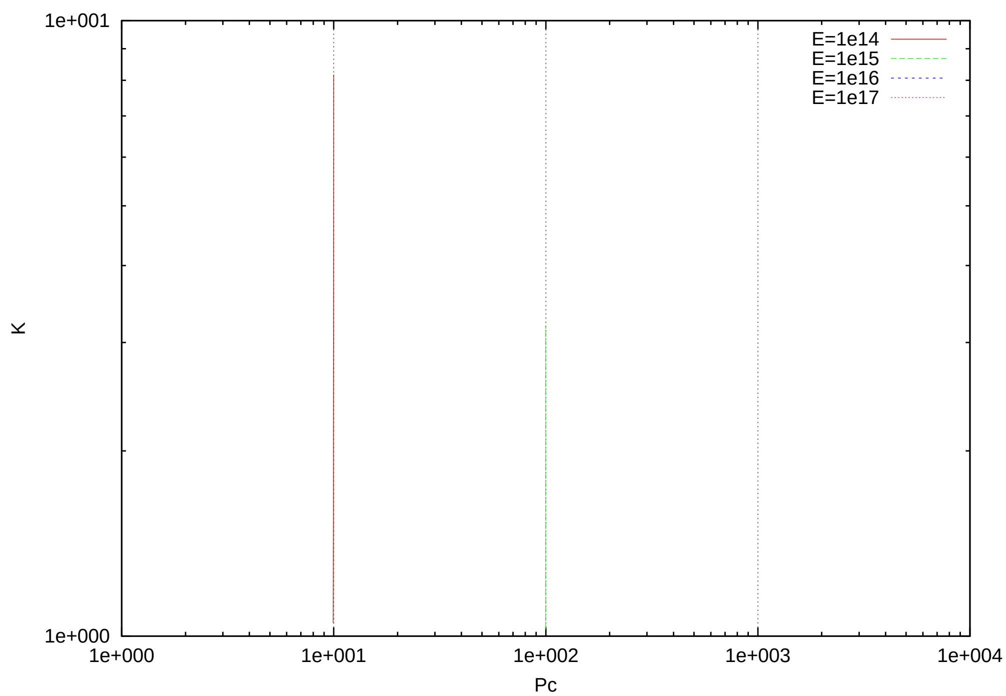

Fig. 145: Isoenergy map for processor power Pc, and idle power reduction k. Value of $C = 1E-8$ used.

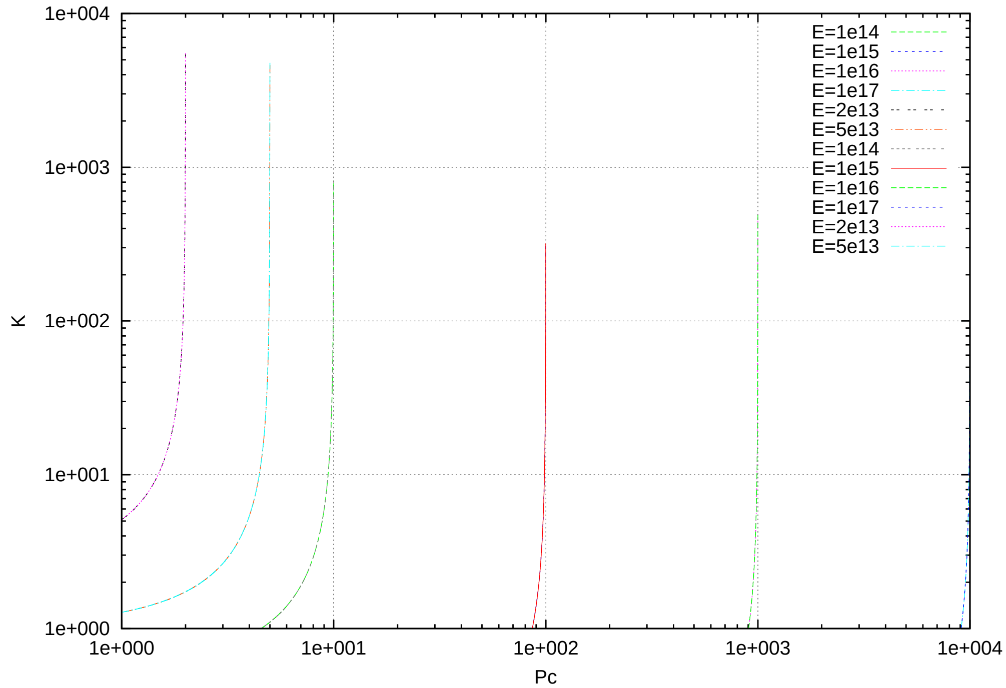

Fig. 146: Isoenergy map for processor power Pc, and idle power reduction k. Value of $m = 10$ used.

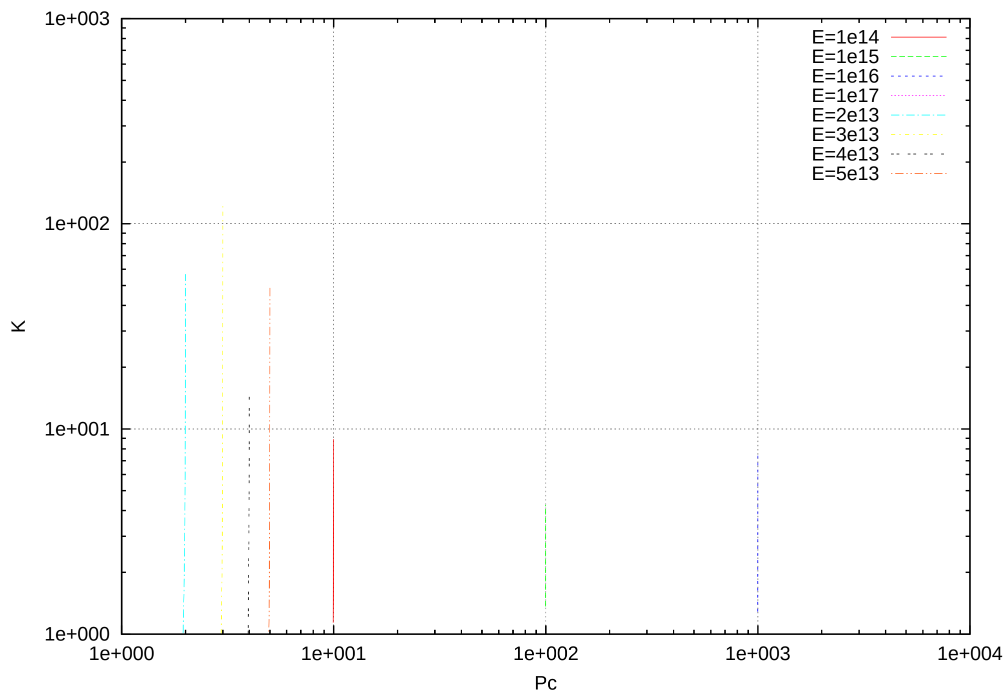

Fig. 147: Isoenergy map for processor power Pc, and idle power reduction k. Value of $m = 1E3$ used.

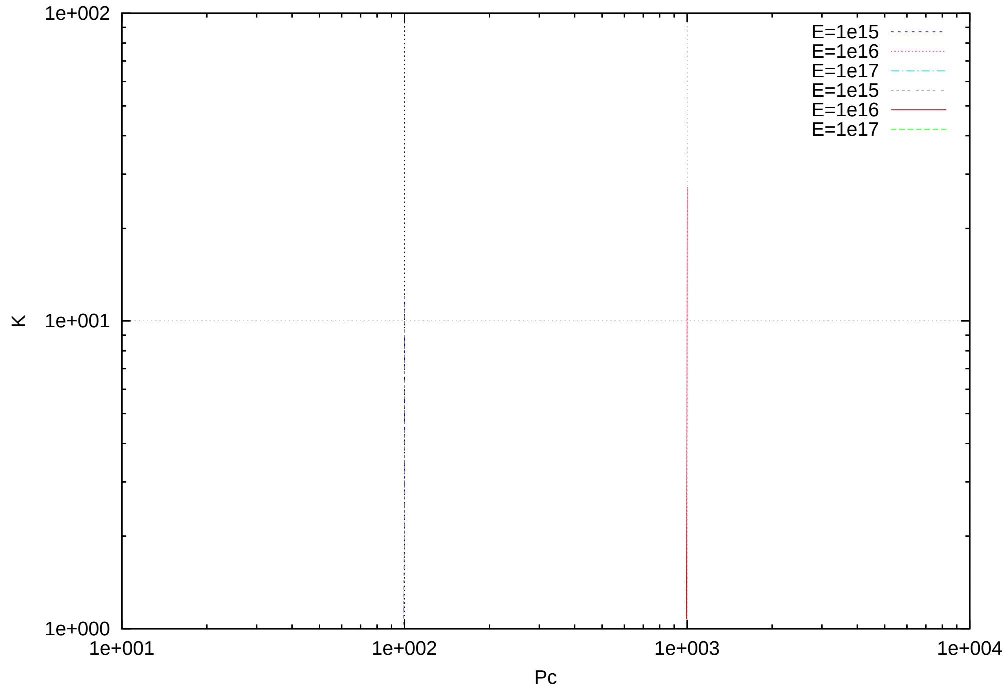

Fig. 148: Isoenergy map for processor power Pc, and idle power reduction k. Value of $m = 1E4$ used.

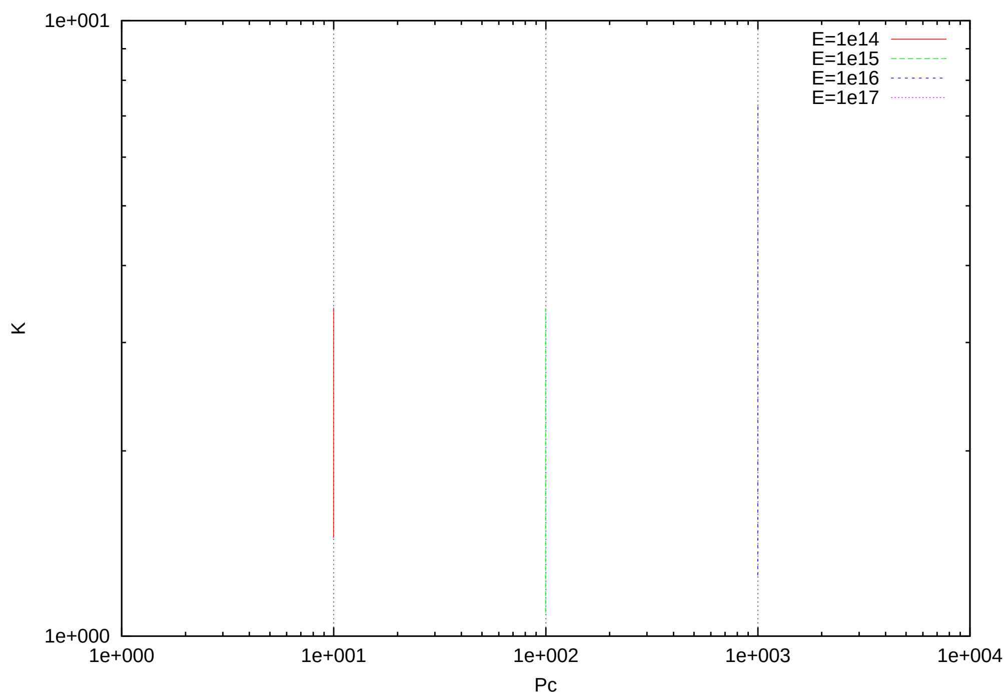

Fig. 149: Isoenergy map for processor power Pc, and idle power reduction k. Value of $Pn = 10$ used.

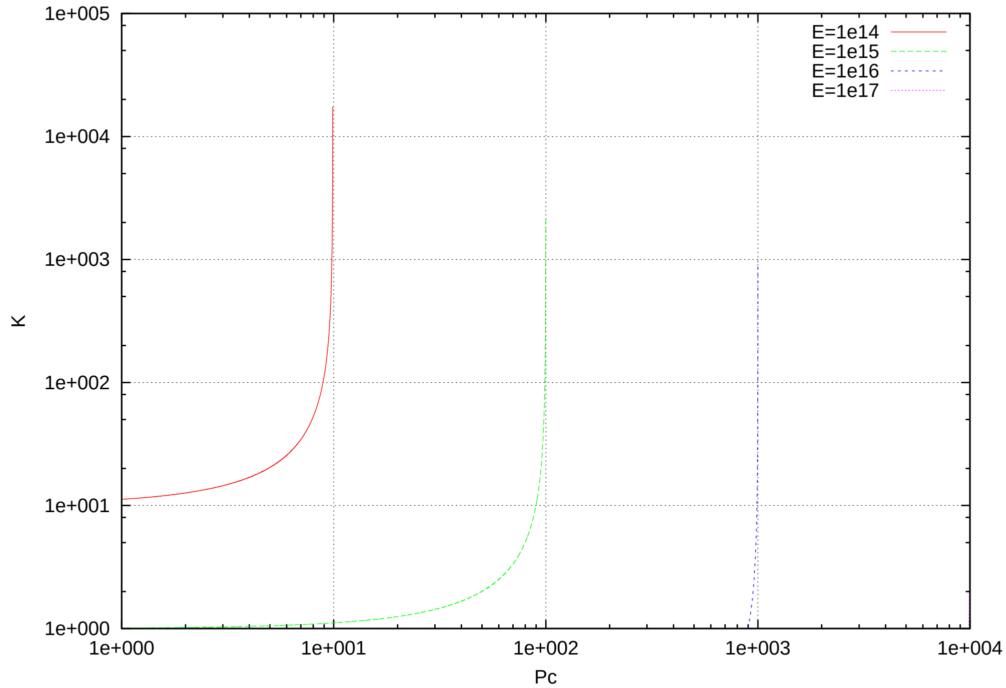

Fig. 150: Isoenergy map for processor power Pc, and idle power reduction k. Value of $Pn = 1E5$ used.

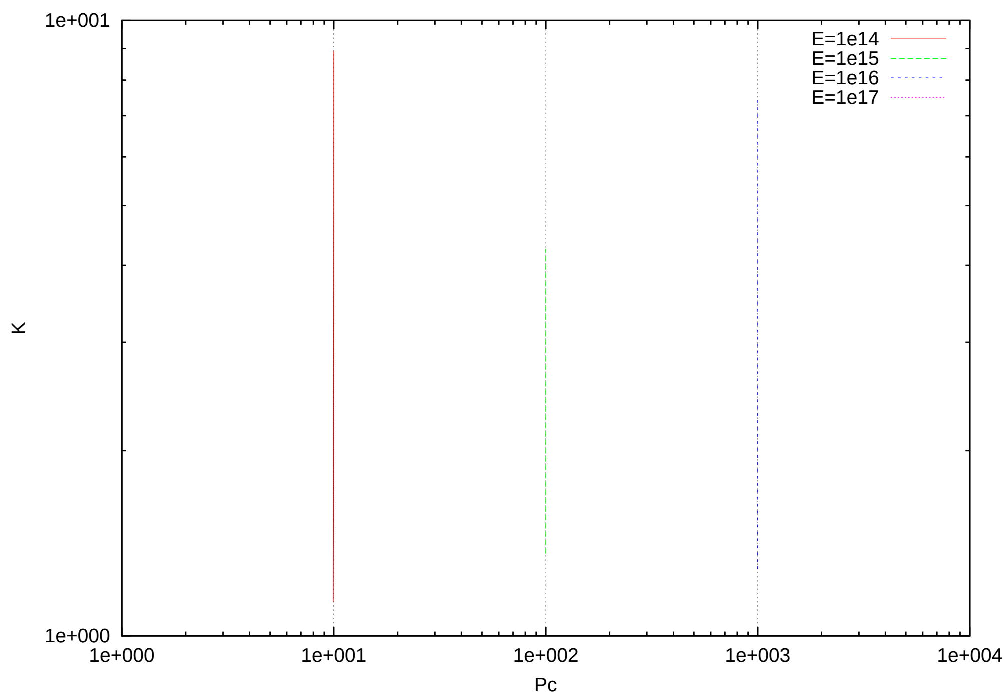

Fig. 151: Isoenergy map for processor power Pc, and idle power reduction k. Value of $S = 1$ used.

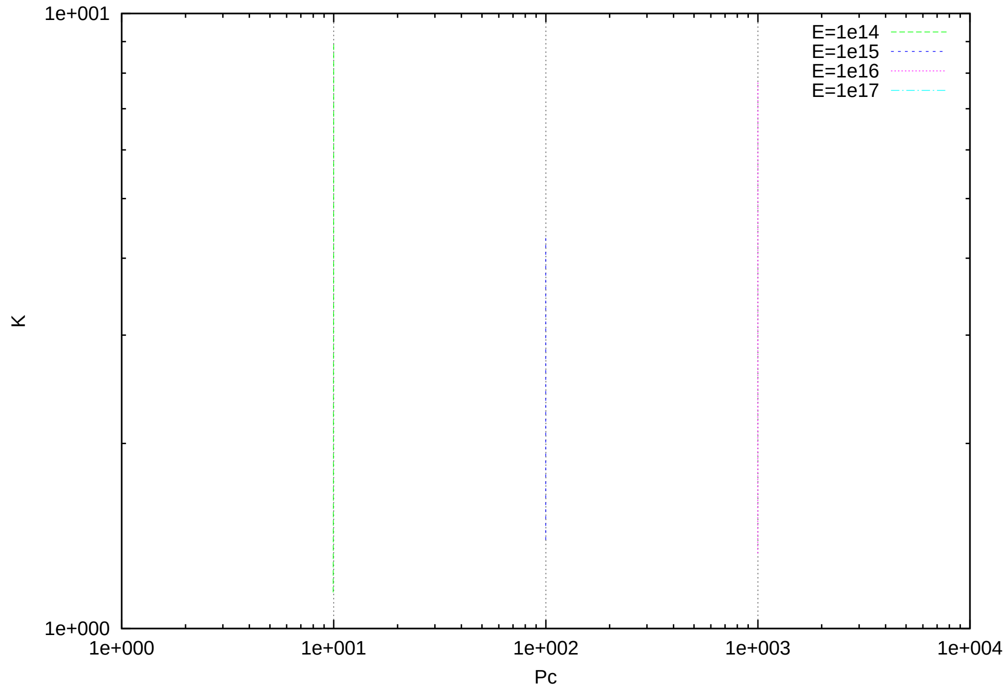

Fig. 152: Isoenergy map for processor power Pc, and idle power reduction k. Value of $S = 1E3$ used.

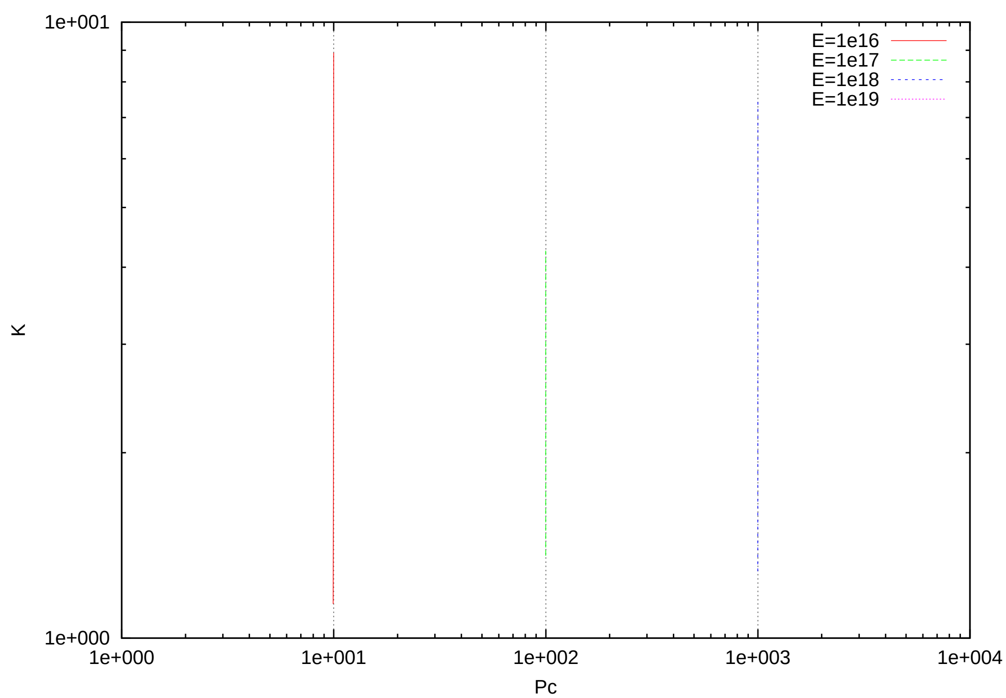

Fig. 153: Isoenergy map for processor power Pc, and idle power reduction k. Value of $V = 1E15$ used.

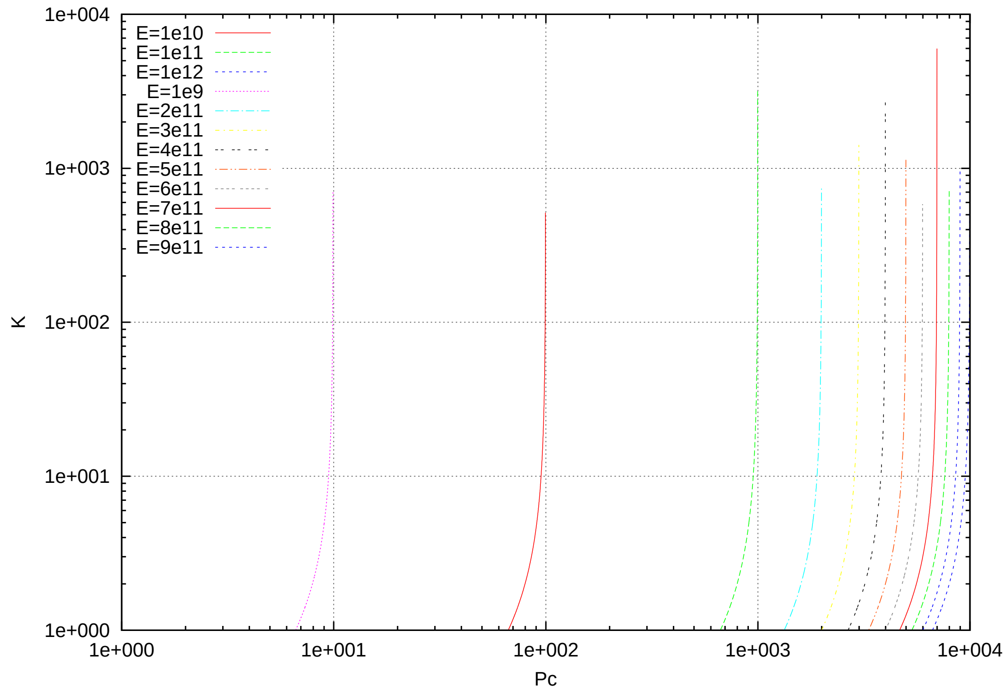

Fig. 154: Isoenergy map for processor power Pc, and idle power reduction k. Value of $V = 1E8$ used.

14 Isoenergy maps for processor power Pc, and network power Pn.

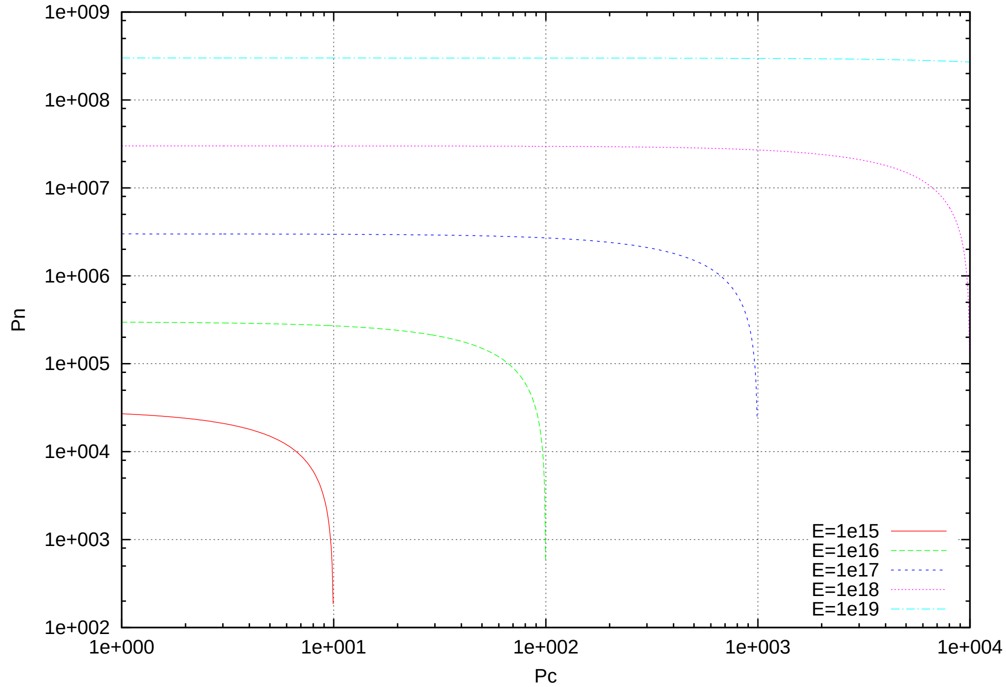

Fig. 155: Isoenergy map for processor power Pc, and network power Pn. Value of $A = 10$ used.

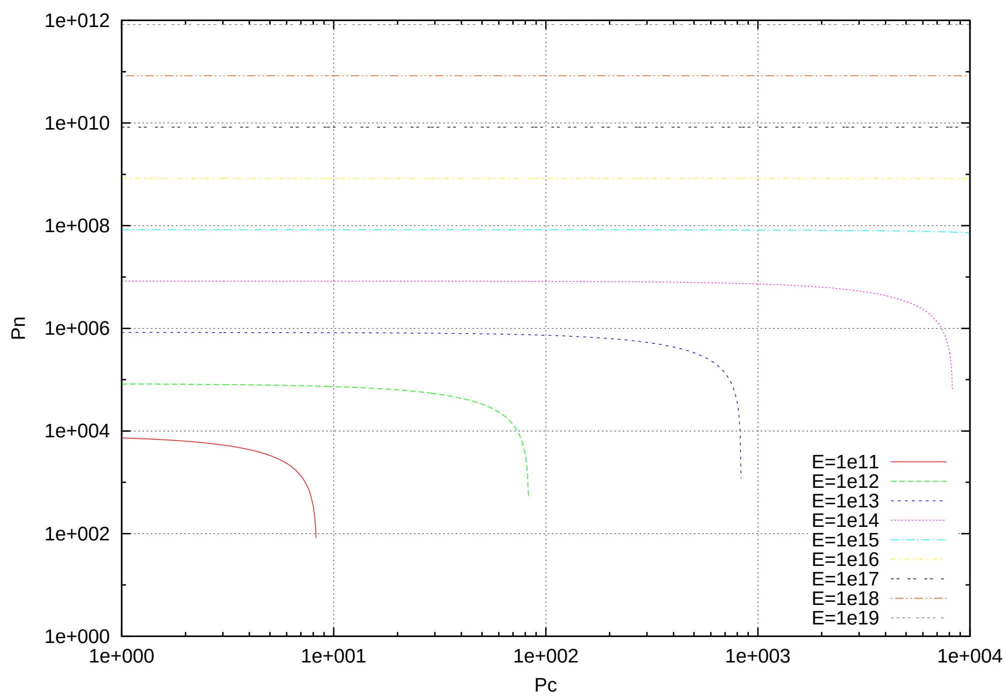

Fig. 156: Isoenergy map for processor power Pc, and network power Pn. Value of $A = 1E - 3$ used.

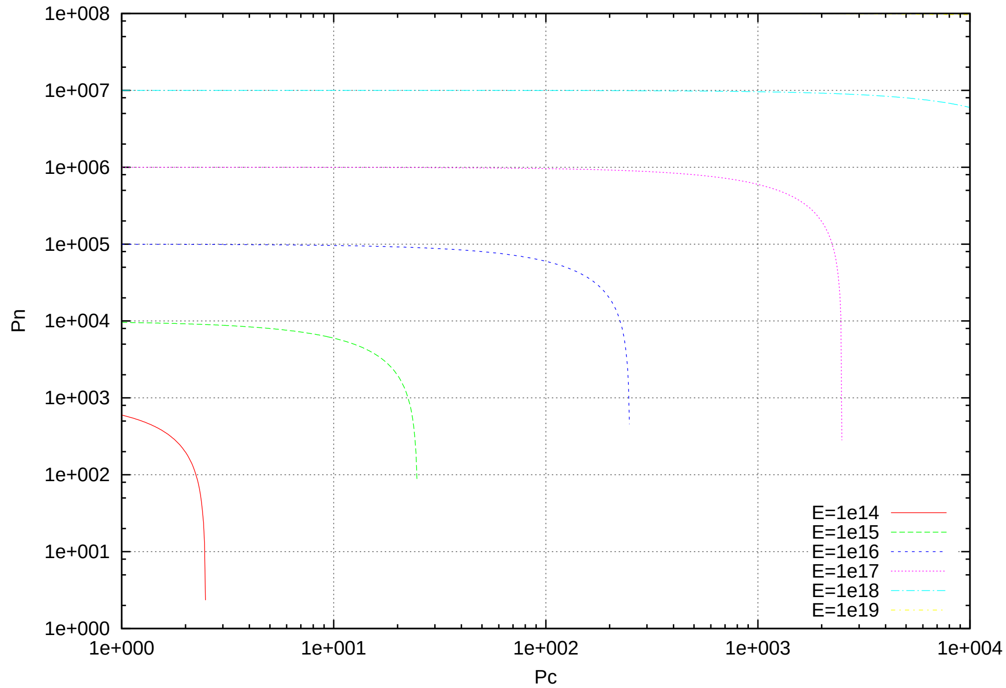

Fig. 157: Isoenergy map for processor power Pc, and network power Pn. Value of $C = 1E-2$ used.

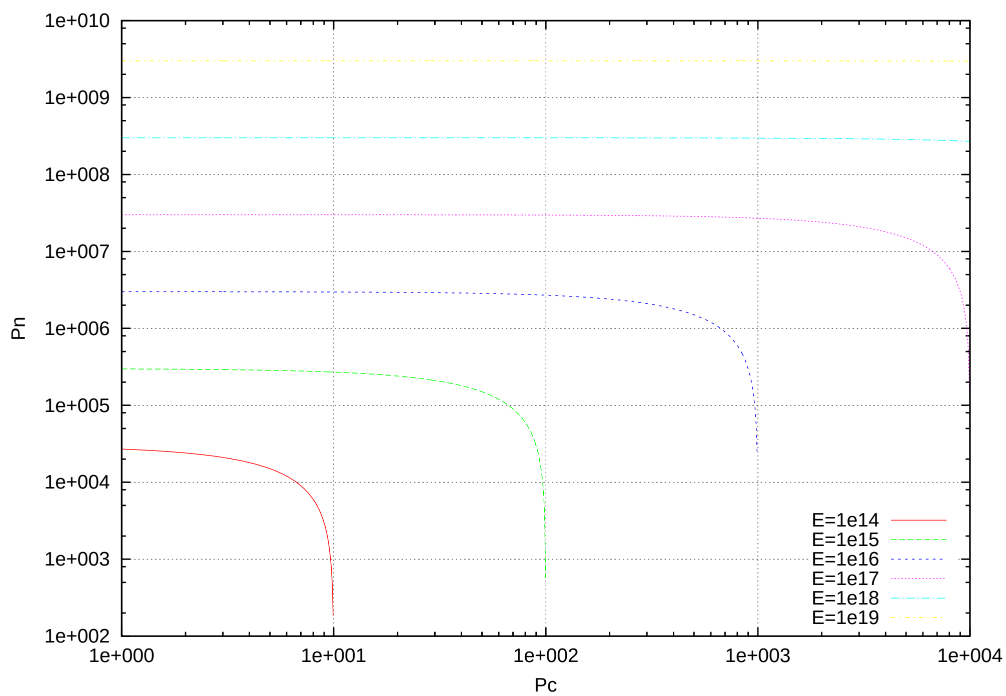

Fig. 158: Isoenergy map for processor power Pc, and network power Pn. Value of $C = 1E-8$ used.

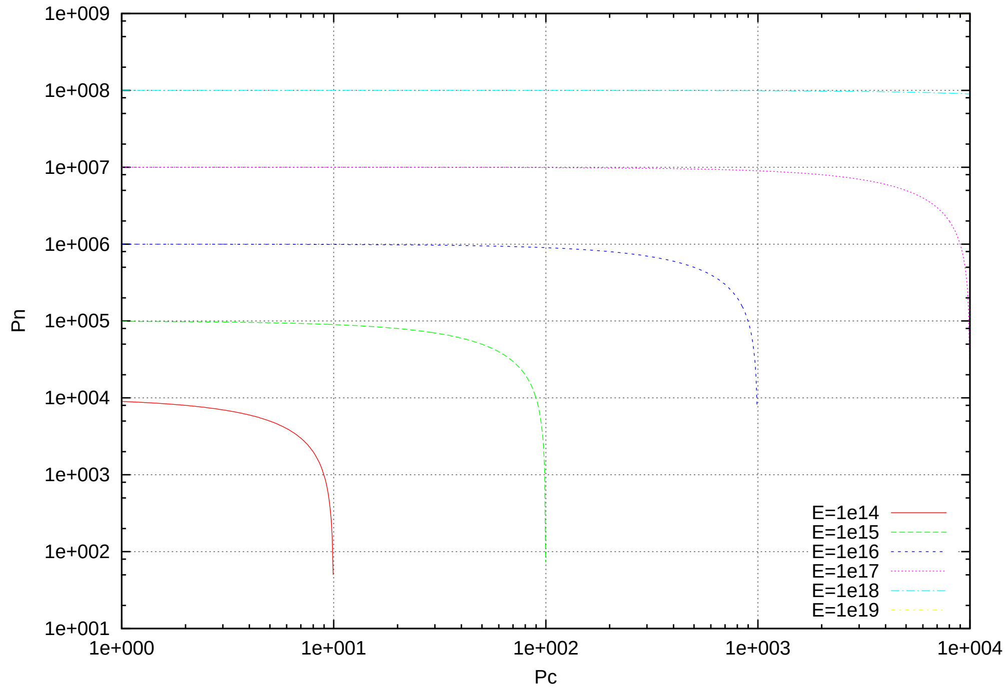

Fig. 159: Isoenergy map for processor power Pc, and network power Pn. Value of $k = 1$ used.

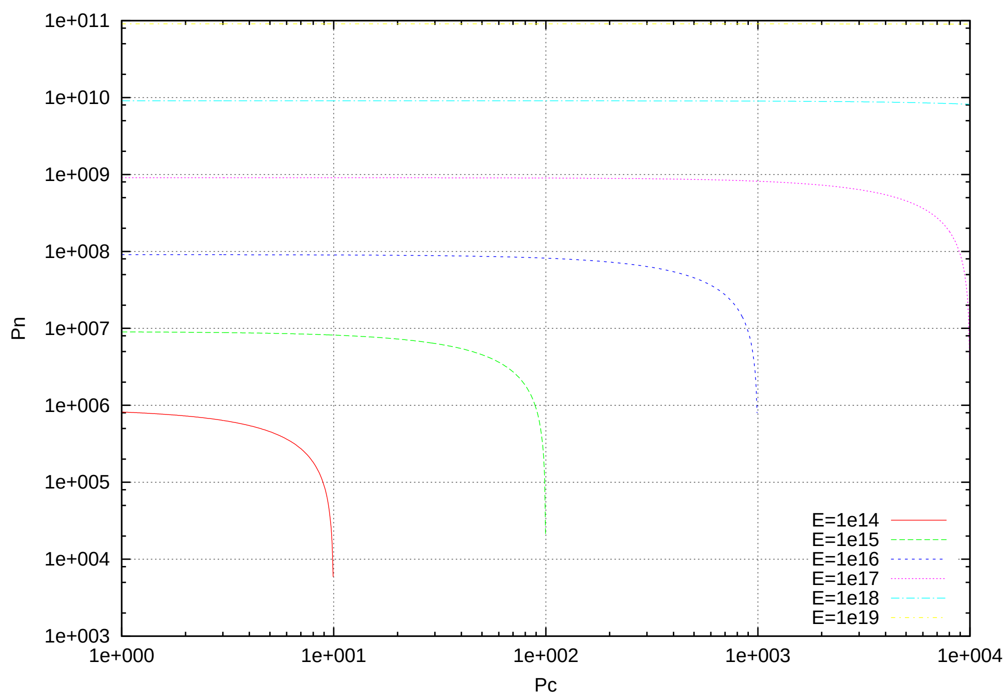

Fig. 160: Isoenergy map for processor power Pc, and network power Pn. Value of $k = 100$ used.

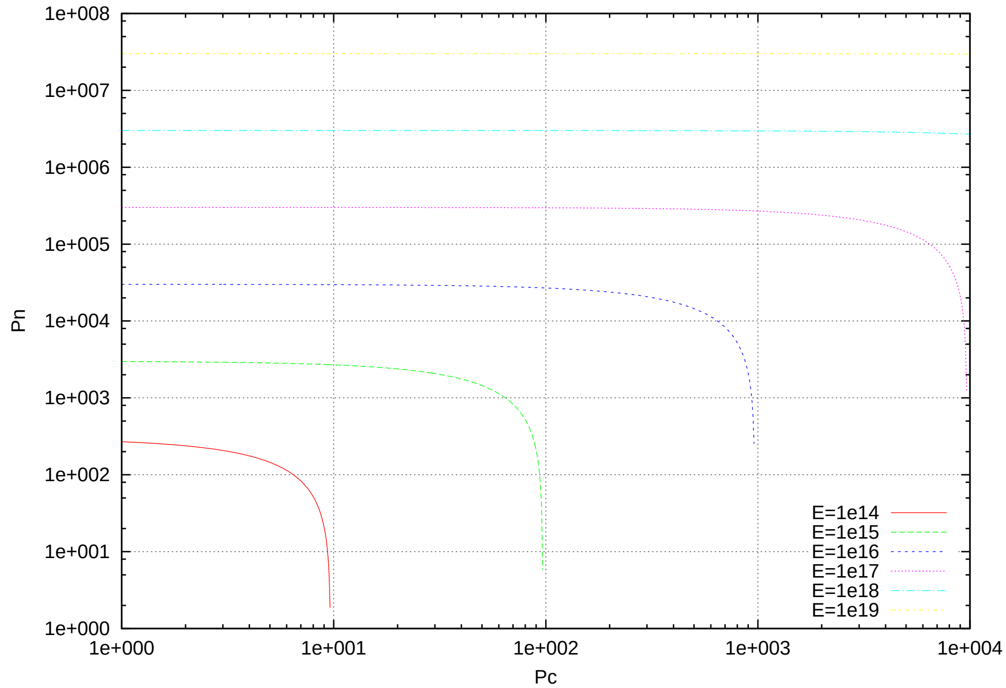

Fig. 161: Isoenergy map for processor power Pc, and network power Pn. Value of $m = 10$ used.

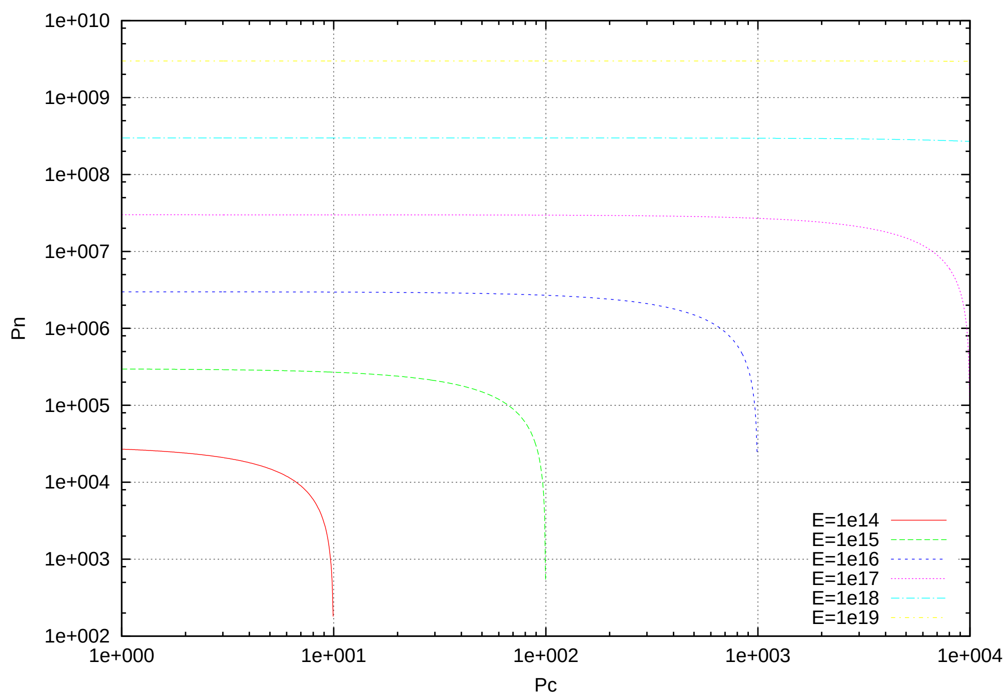

Fig. 162: Isoenergy map for processor power Pc, and network power Pn. Value of $m = 1E3$ used.

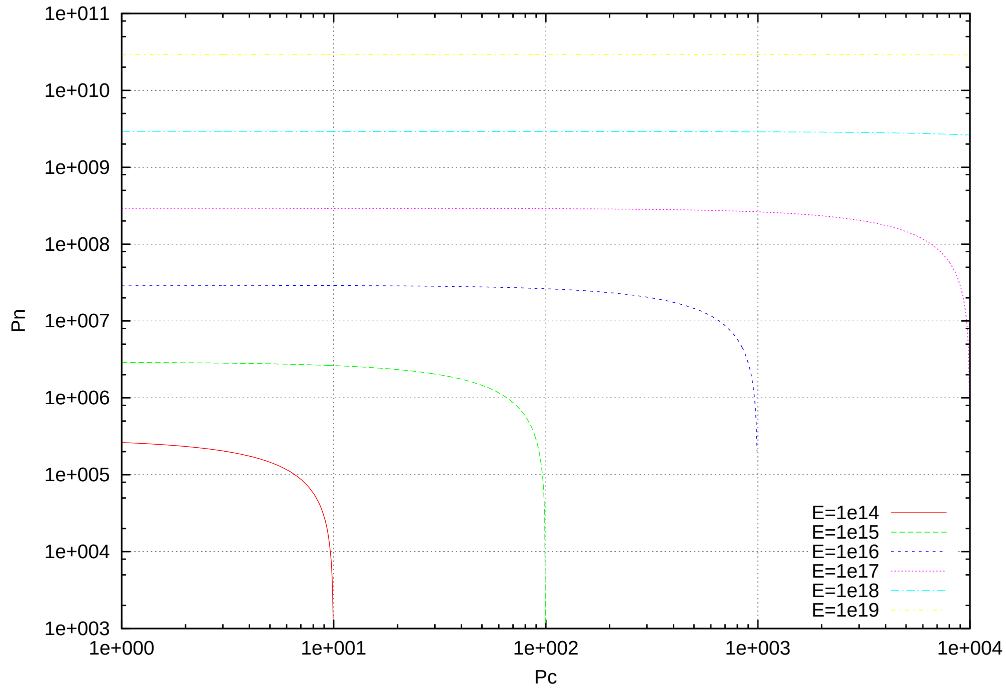

Fig. 163: Isoenergy map for processor power Pc, and network power Pn. Value of $m = 1E4$ used.

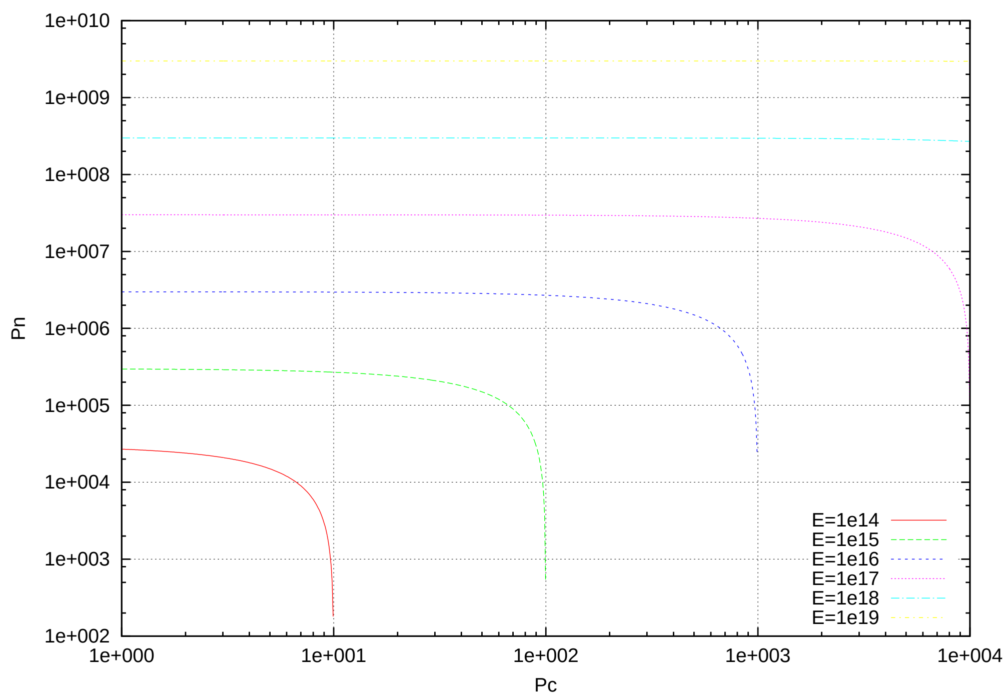

Fig. 164: Isoenergy map for processor power Pc, and network power Pn. Value of $S = 1$ used.

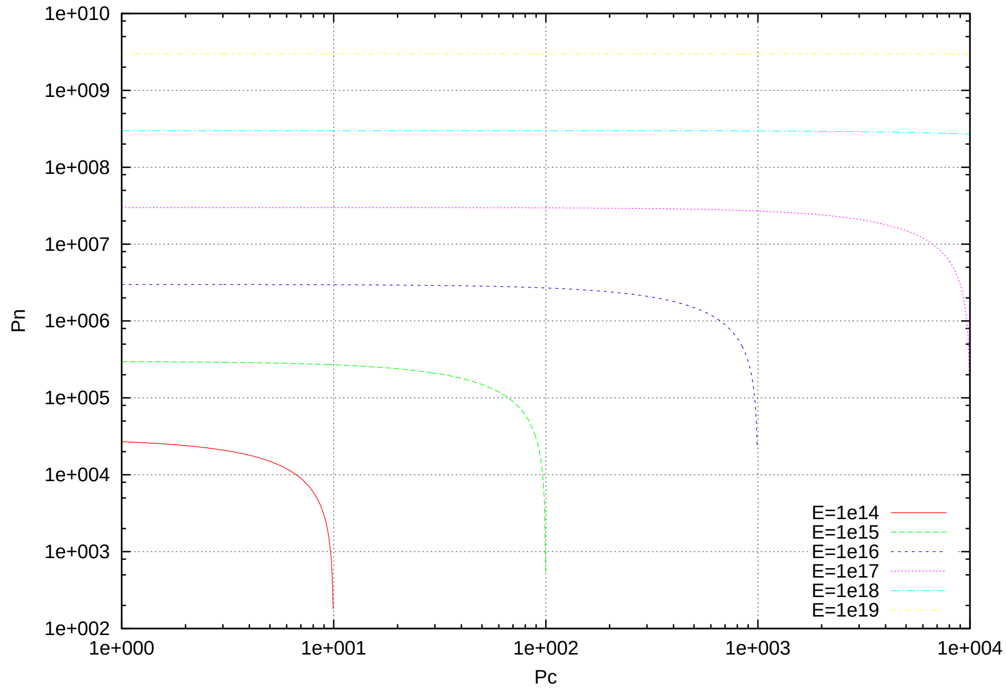

Fig. 165: Isoenergy map for processor power Pc, and network power Pn. Value of $S = 1E3$ used.

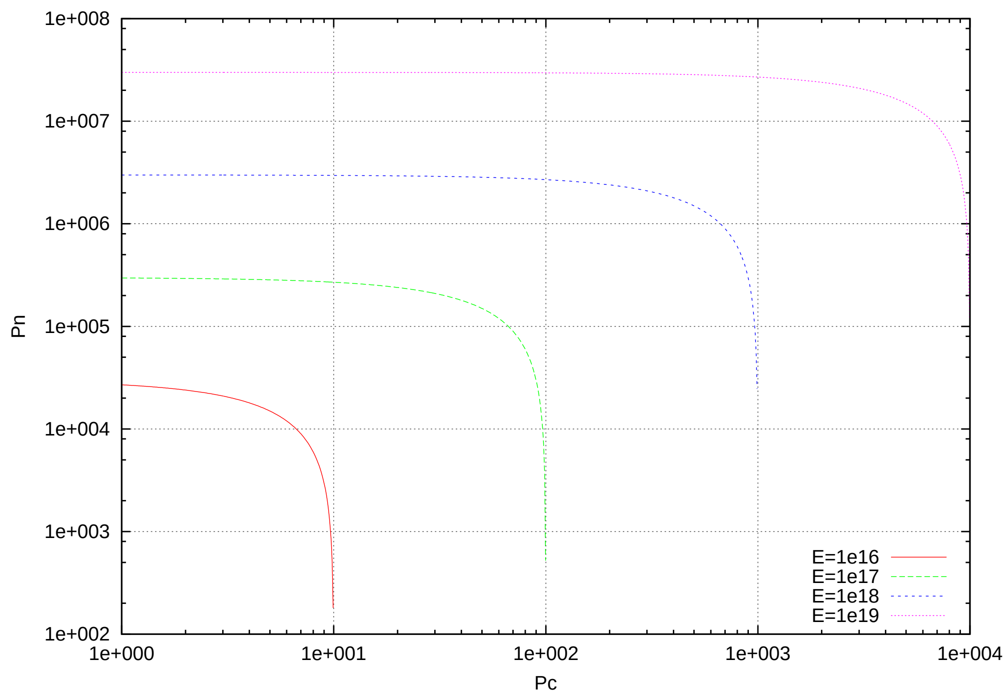

Fig. 166: Isoenergy map for processor power Pc, and network power Pn. Value of $V = 1E15$ used.

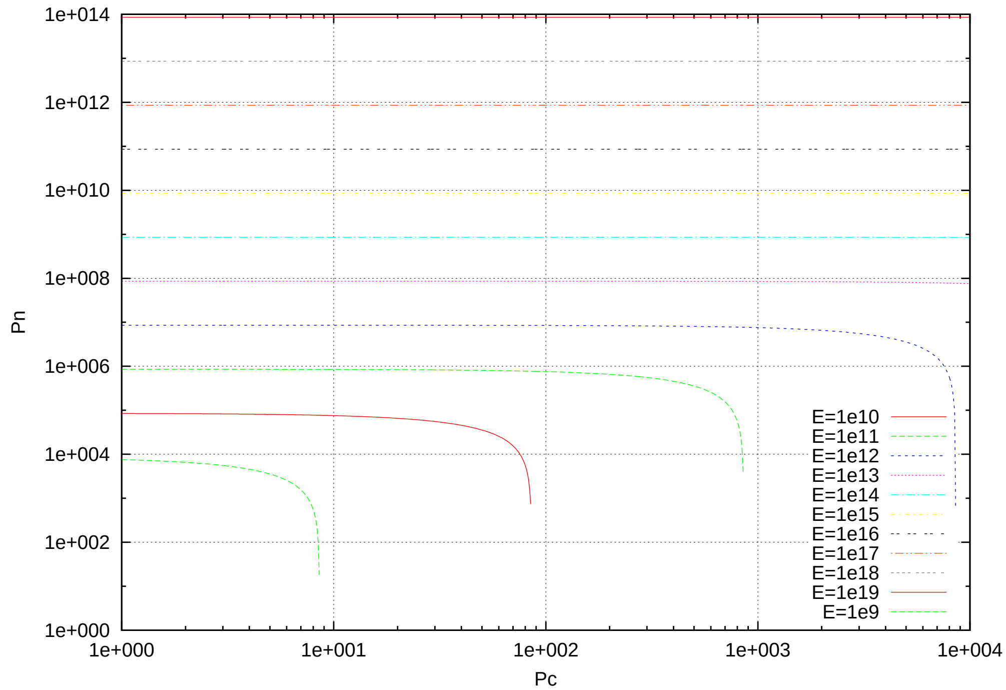

Fig. 167: Isoenergy map for processor power Pc, and network power Pn. Value of $V = 1E8$ used.

15 Isoenergy maps for network power Pn, and startup time S.

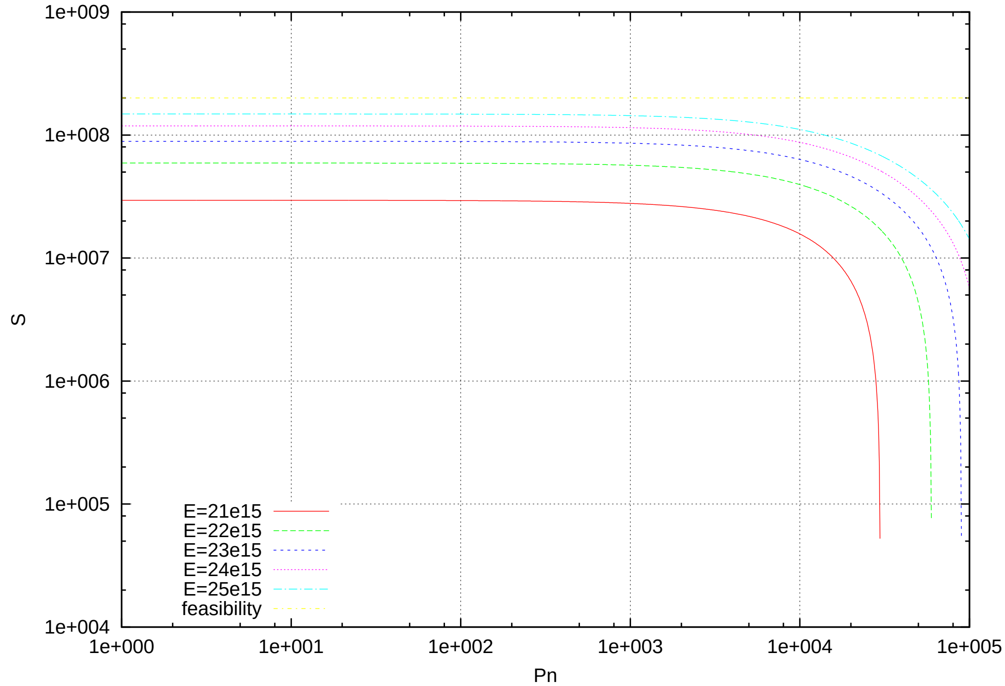

Fig. 168: Isoenergy map for network power Pn, and startup time S. Value of $A = 10$ used.

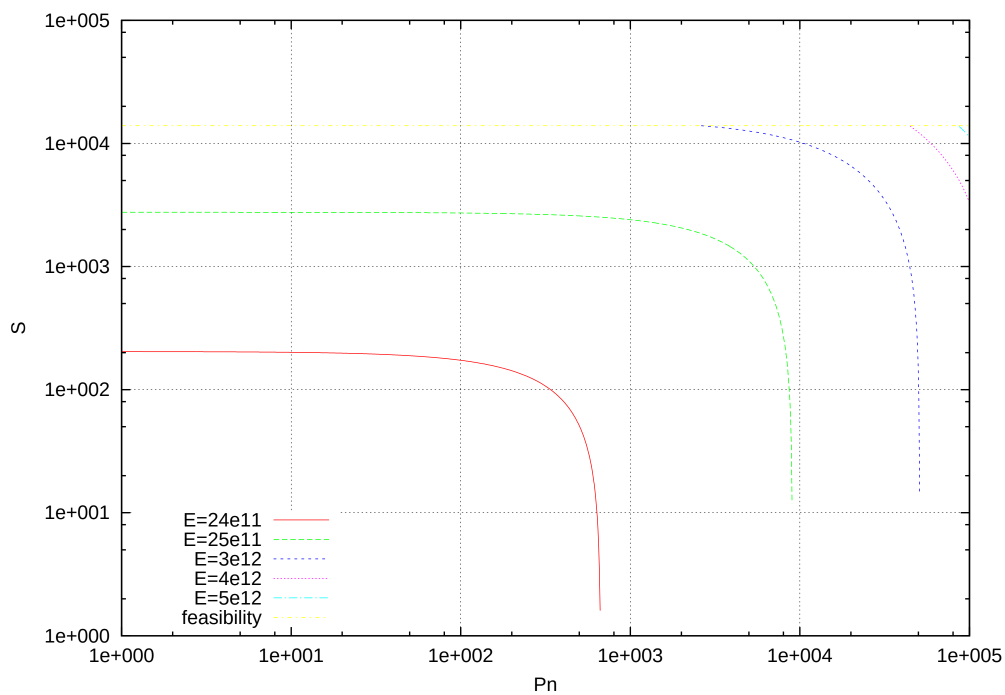

Fig. 169: Isoenergy map for network power Pn, and startup time S. Value of $A = 1E-3$ used.

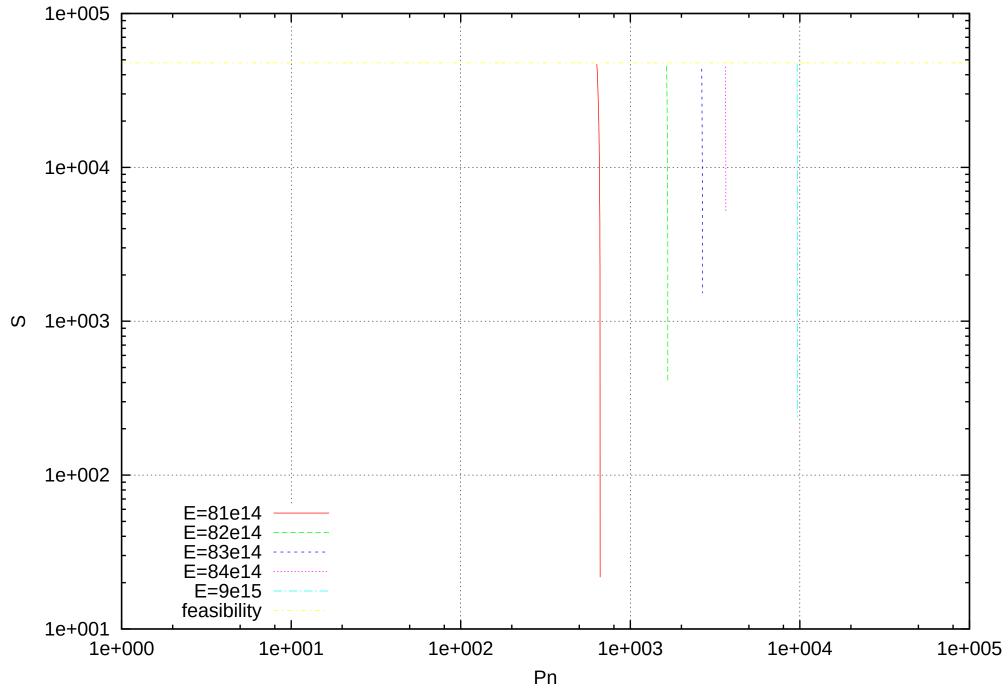

Fig. 170: Isoenergy map for network power Pn, and startup time S. Value of $C = 1E-2$ used.

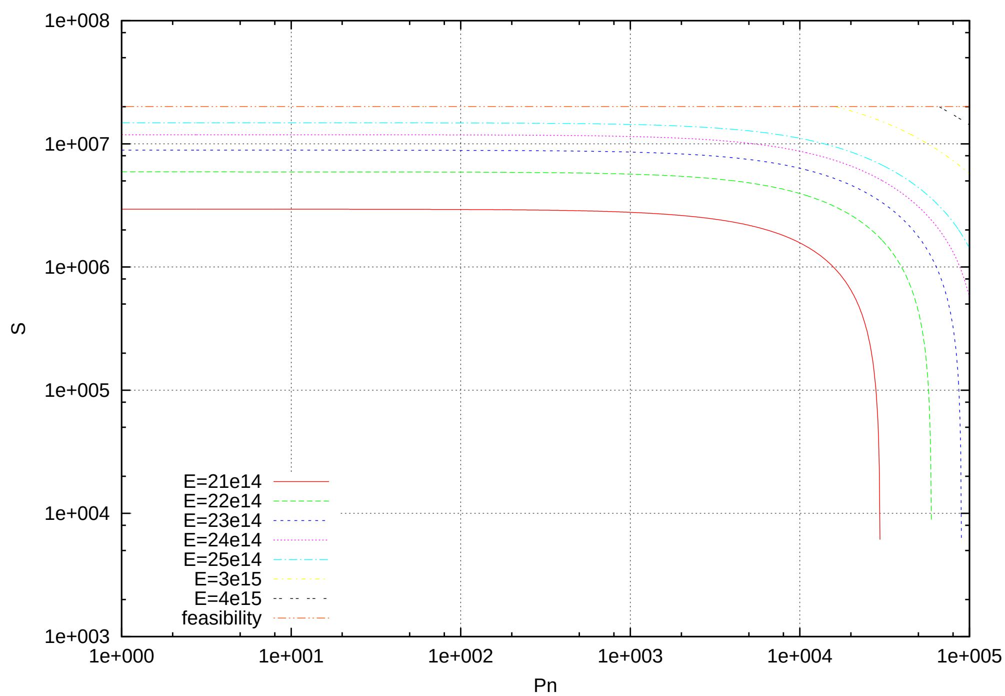

Fig. 171: Isoenergy map for network power Pn, and startup time S. Value of $C = 1E-8$ used.

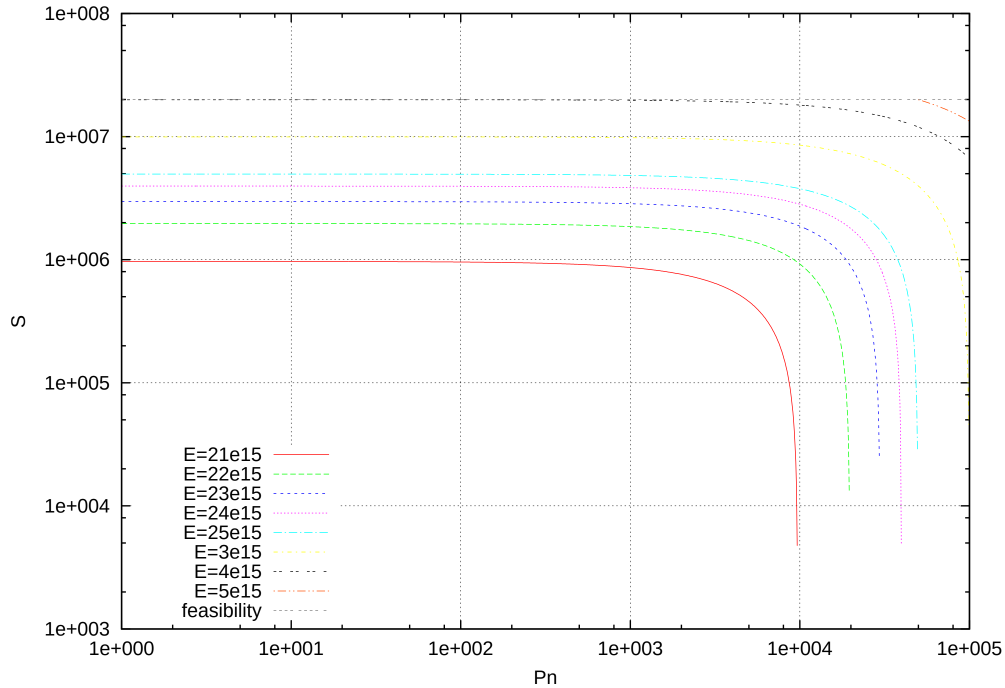

Fig. 172: Isoenergy map for network power Pn, and startup time S. Value of $k = 1$ used.

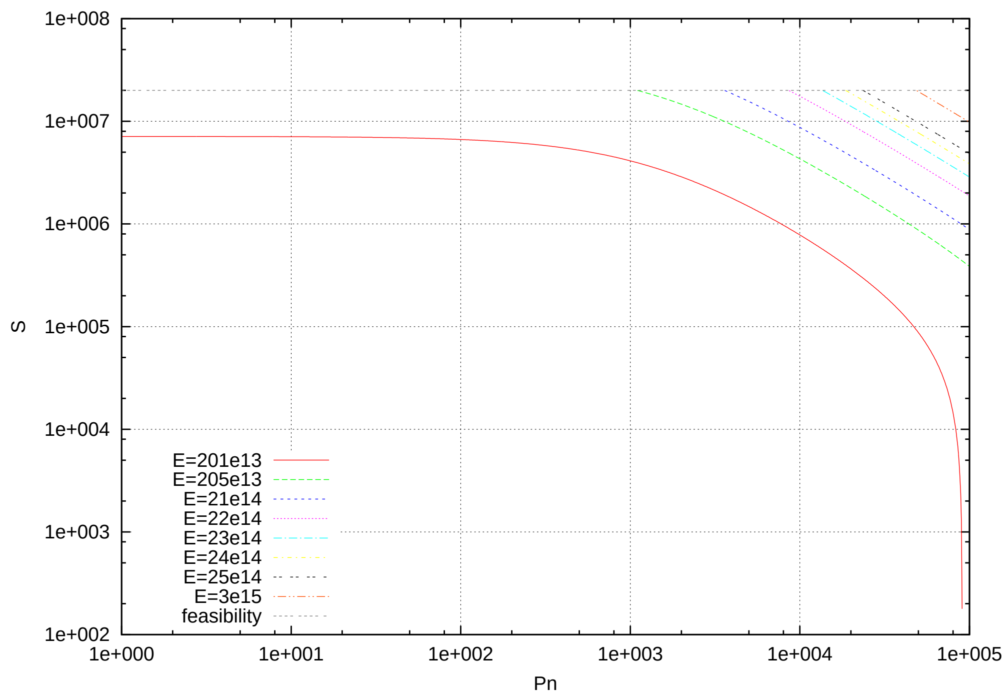

Fig. 173: Isoenergy map for network power Pn, and startup time S. Value of $k = 100$ used.

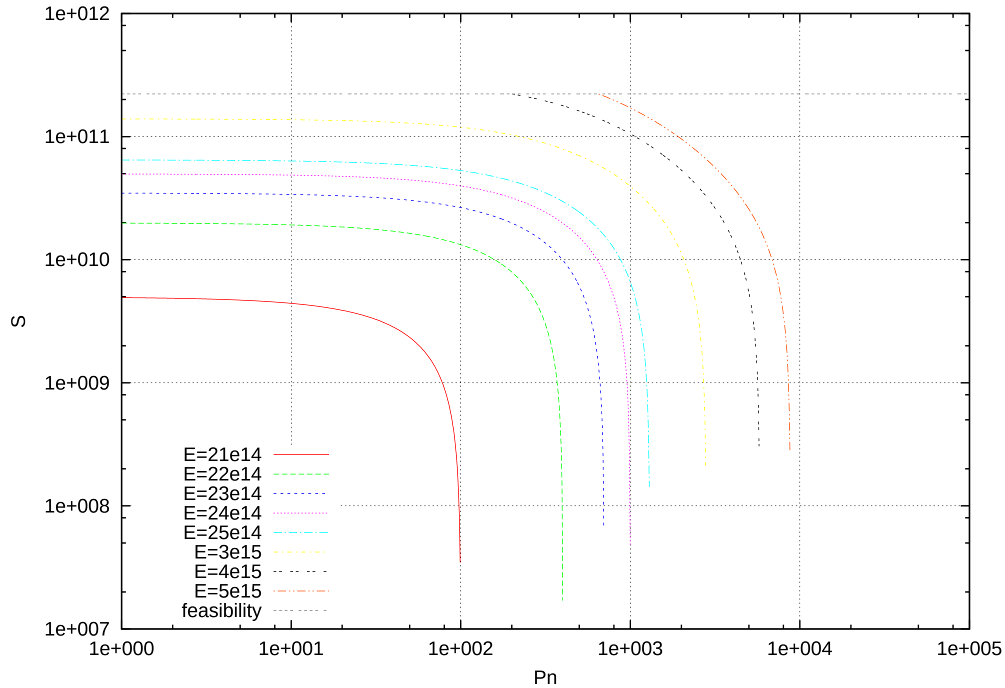

Fig. 174: Isoenergy map for network power Pn, and startup time S. Value of $m = 10$ used.

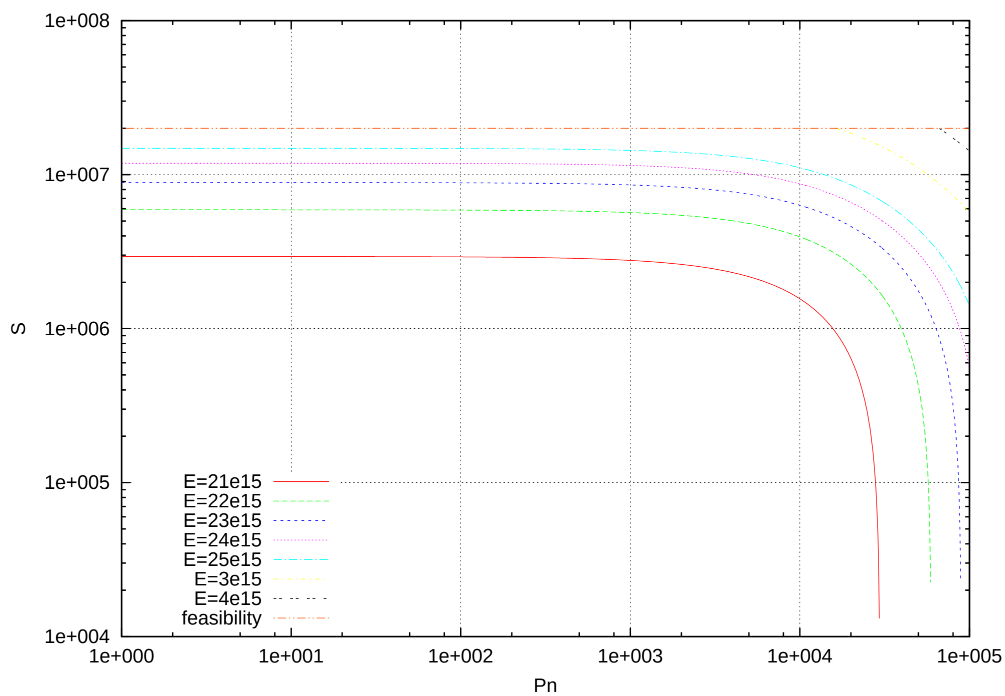

Fig. 175: Isoenergy map for network power Pn, and startup time S. Value of $m = 1E3$ used.

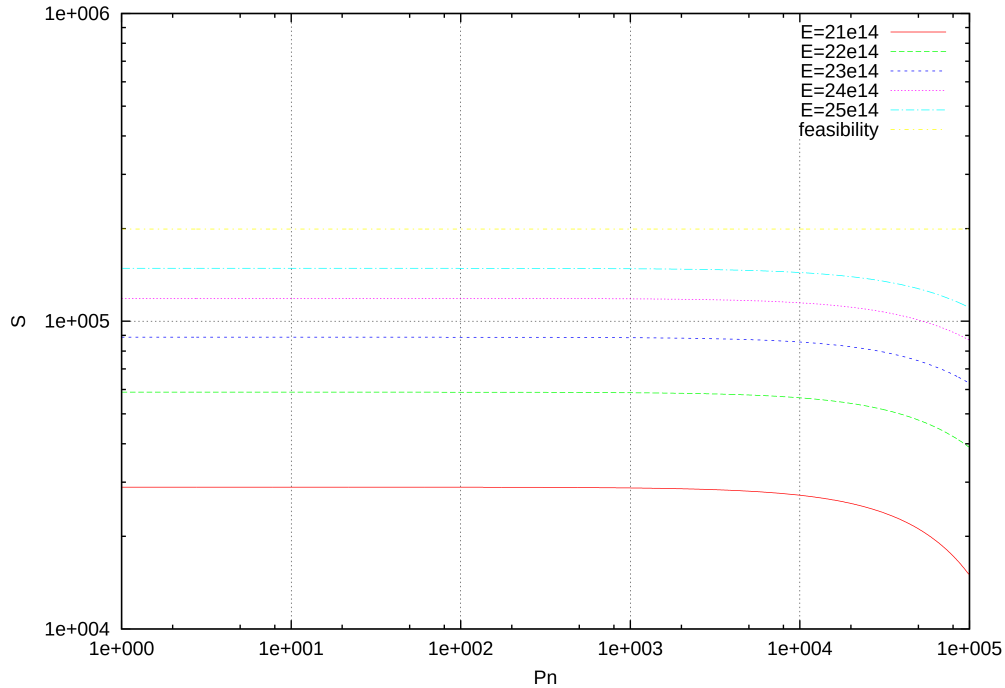

Fig. 176: Isoenergy map for network power Pn, and startup time S. Value of $m = 1E4$ used.

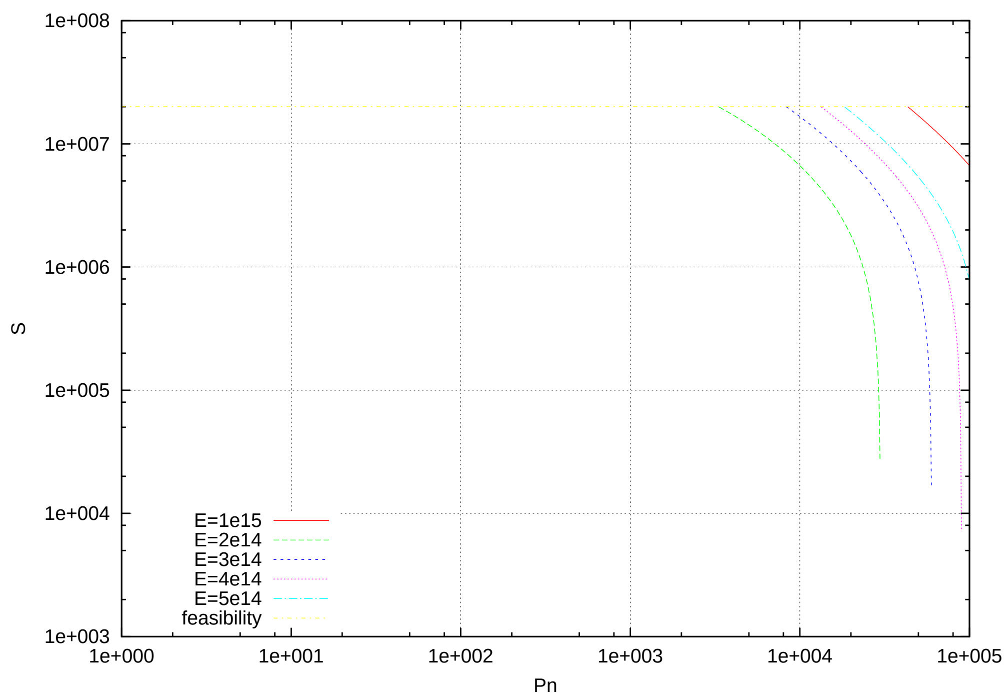

Fig. 177: Isoenergy map for network power Pn, and startup time S. Value of $Pc = 10$ used.

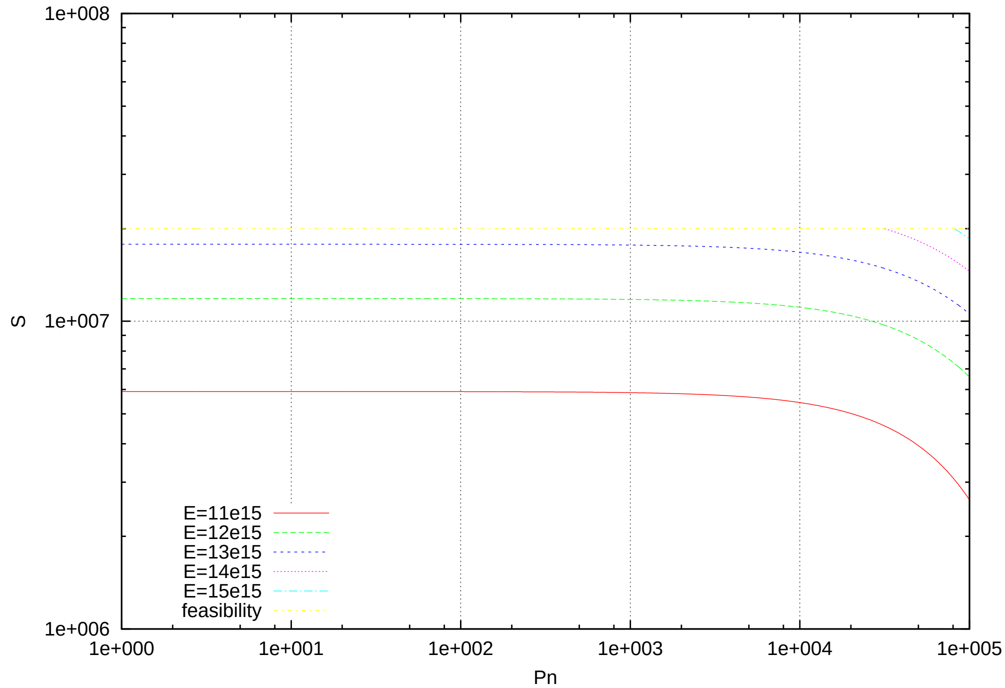

Fig. 178: Isoenergy map for network power Pn, and startup time S. Value of $Pc = 1E3$ used.

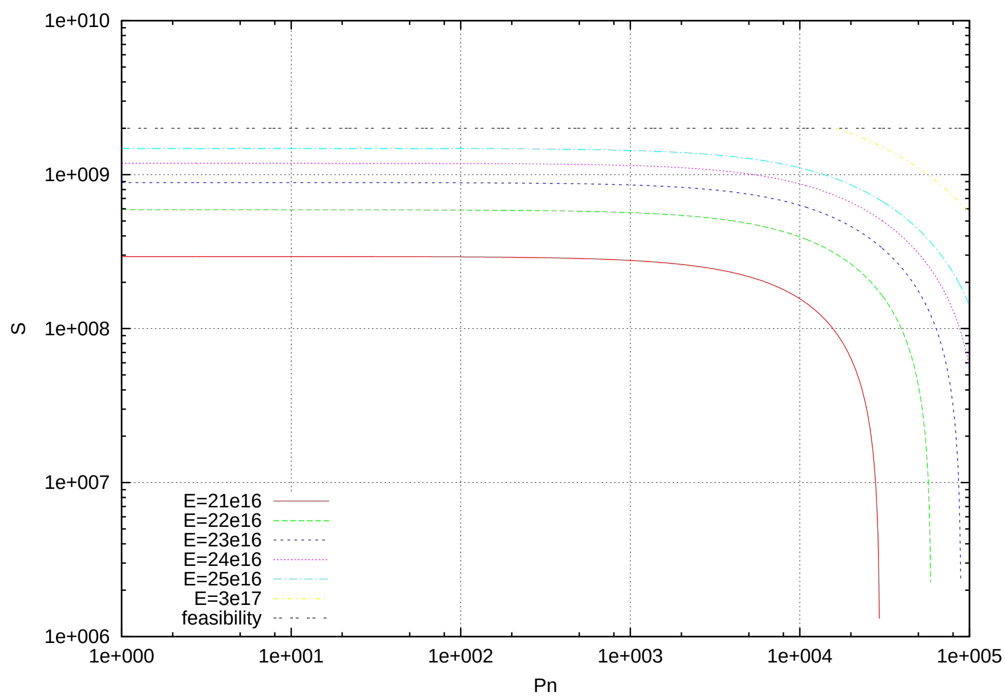

Fig. 179: Isoenergy map for network power Pn, and startup time S. Value of $V = 1E15$ used.

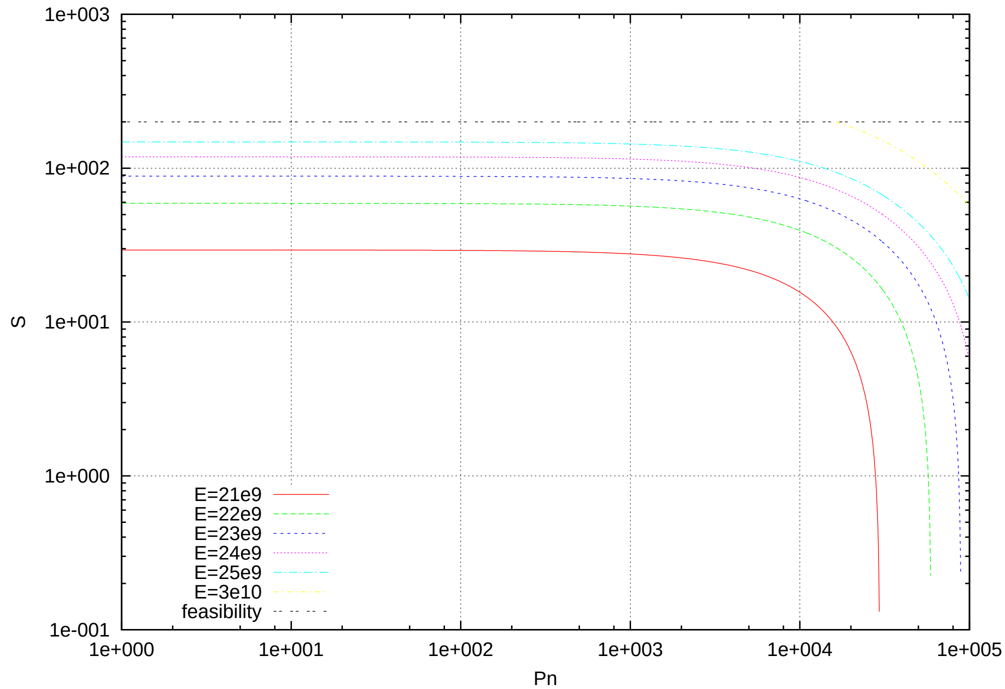

Fig. 180: Isoenergy map for network power Pn, and startup time S. Value of $V = 1E8$ used.

16 Isoenergy maps for network power Pn, and communication rate C.

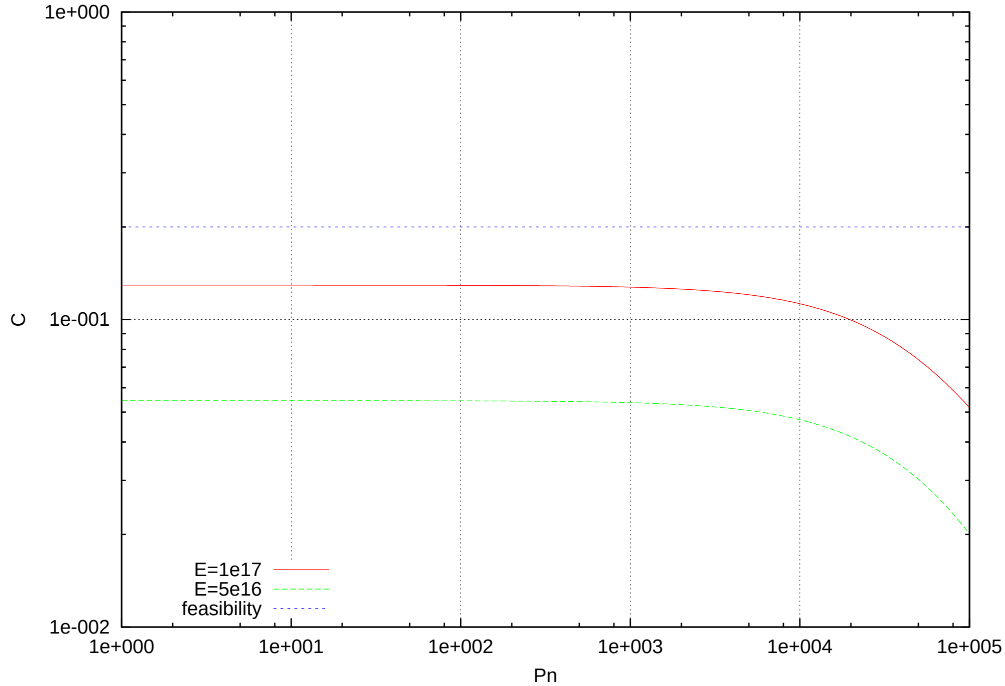

Fig. 181: Isoenergy map for network power Pn, and communication rate C. Value of $A = 10$ used.

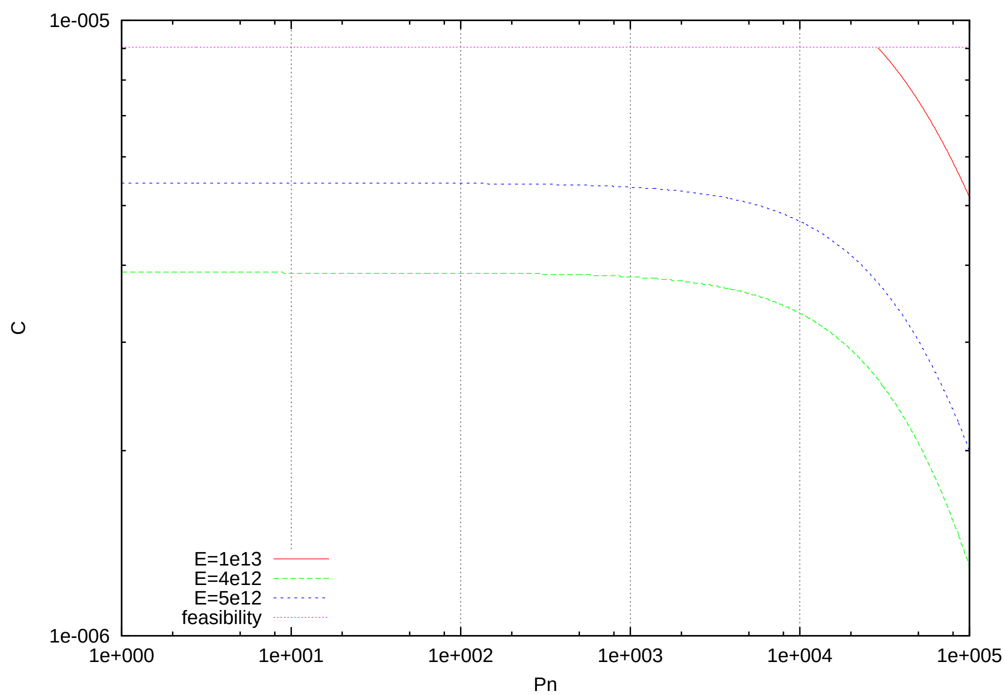

Fig. 182: Isoenergy map for network power Pn, and communication rate C. Value of $A = 1E-3$ used.

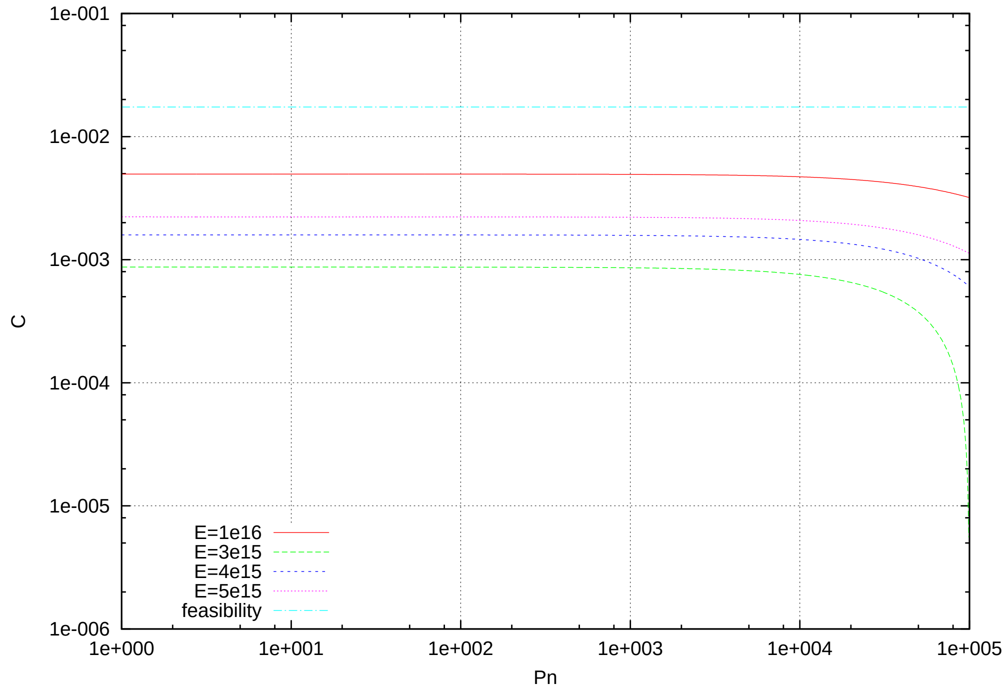

Fig. 183: Isoenergy map for network power Pn, and communication rate C. Value of $k = 1$ used.

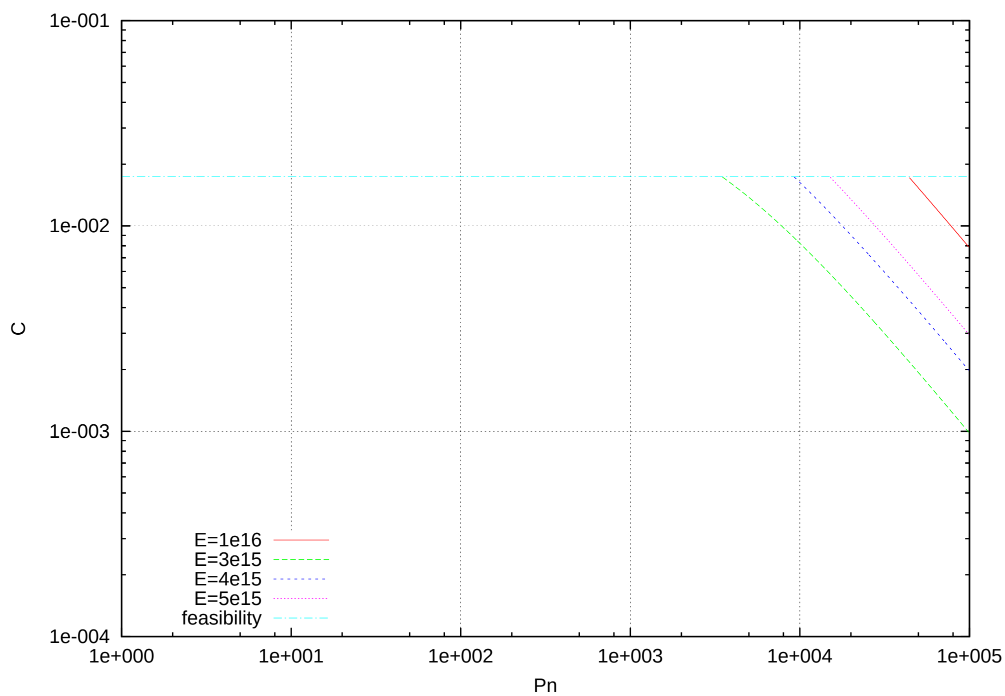

Fig. 184: Isoenergy map for network power Pn, and communication rate C. Value of $k = 100$ used.

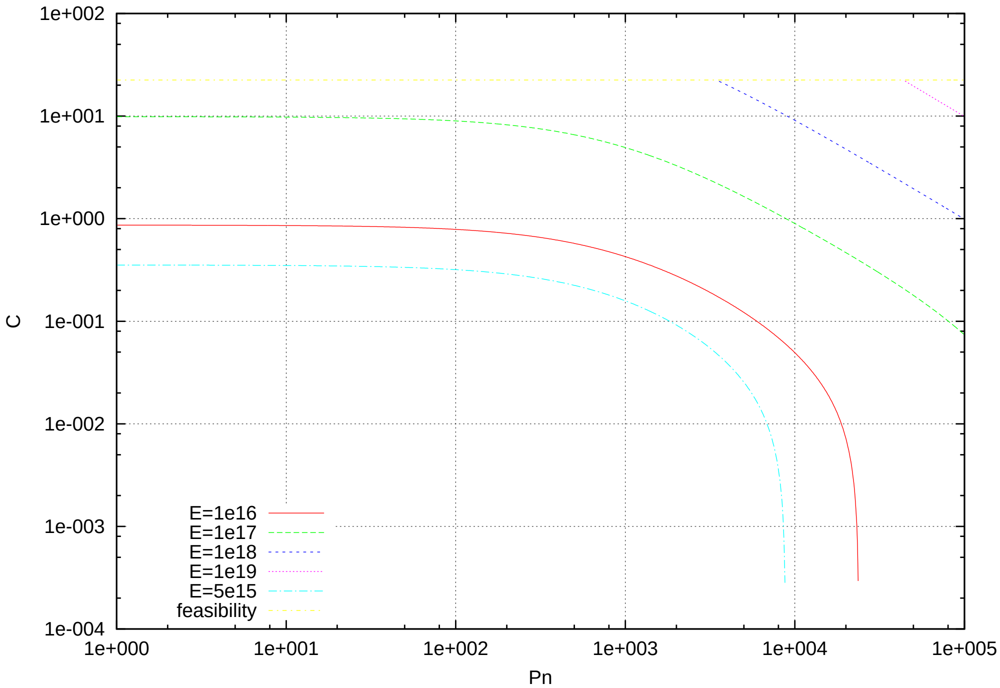

Fig. 185: Isoenergy map for network power Pn, and communication rate C. Value of $m = 10$ used.

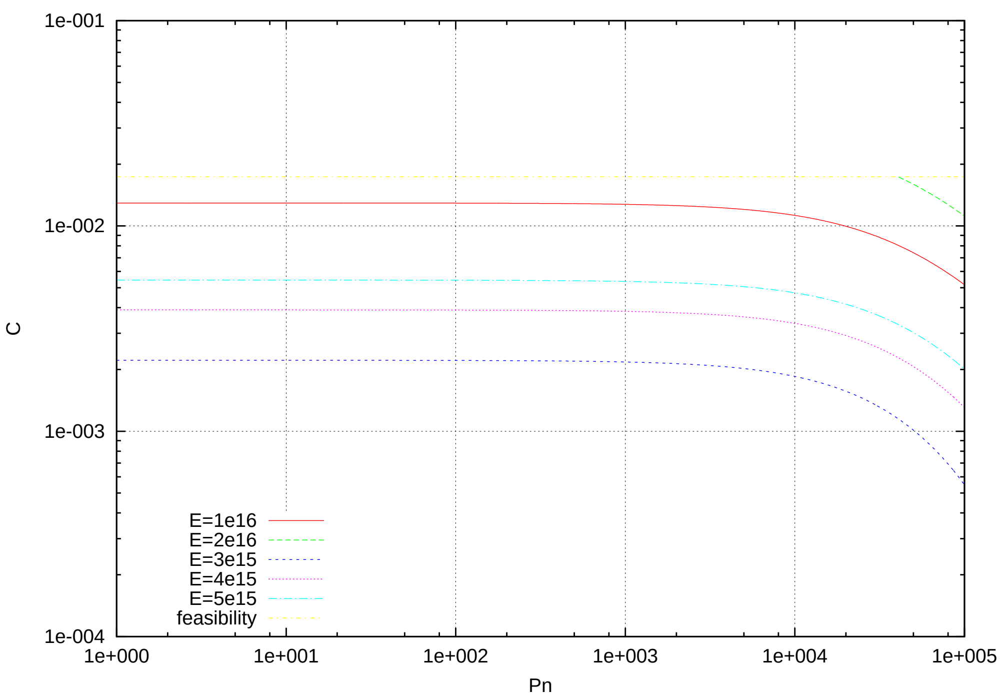

Fig. 186: Isoenergy map for network power Pn, and communication rate C. Value of $m = 1E3$ used.

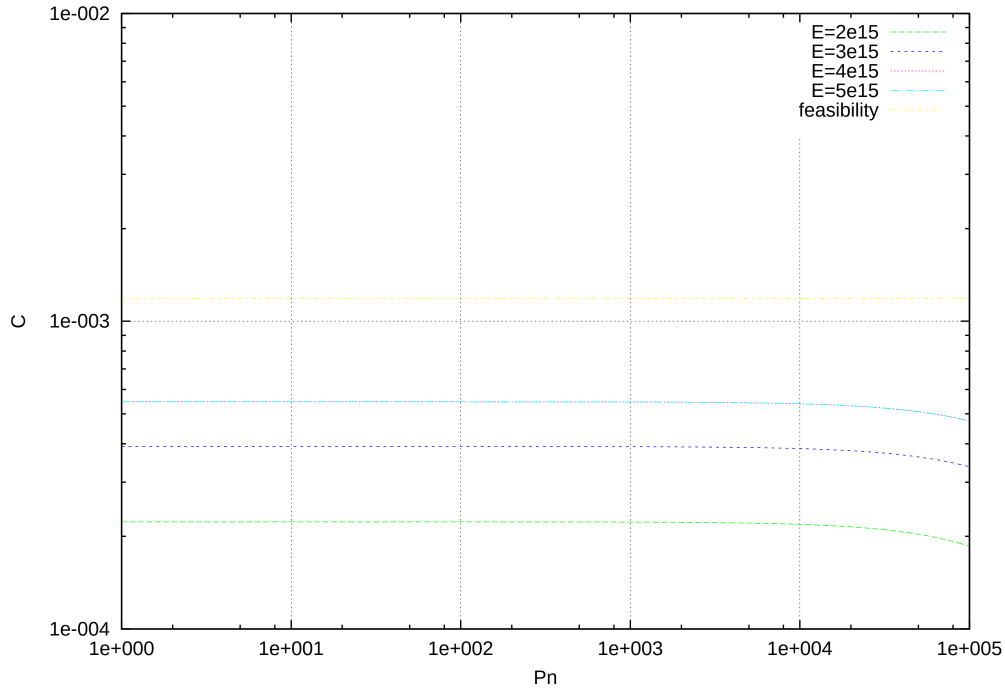

Fig. 187: Isoenergy map for network power Pn, and communication rate C. Value of $m = 1E4$ used.

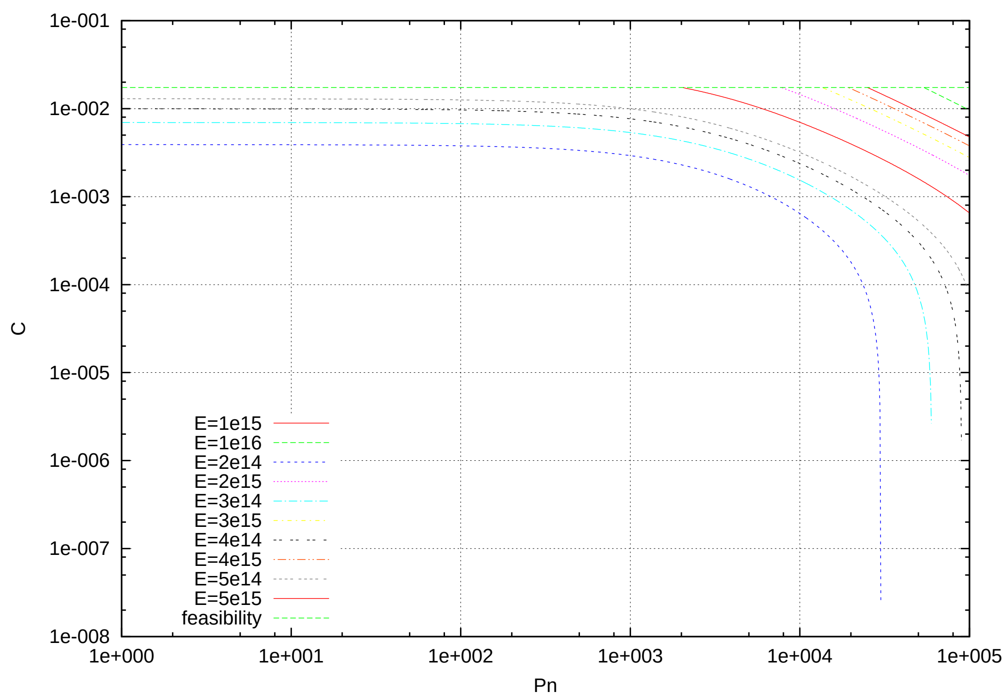

Fig. 188: Isoenergy map for network power Pn, and communication rate C. Value of $Pc = 10$ used.

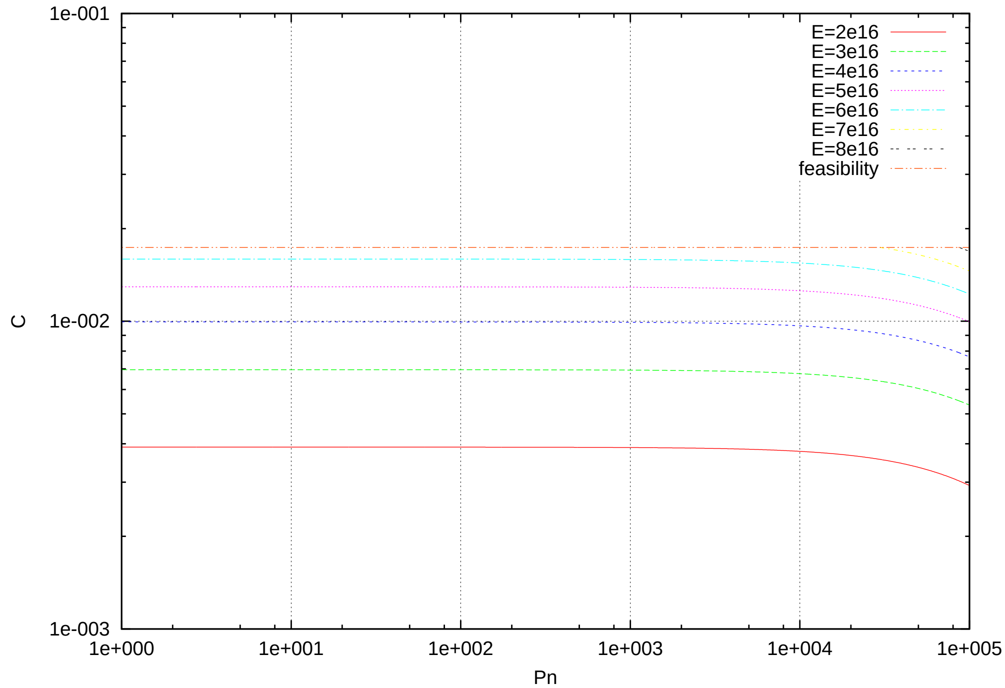

Fig. 189: Isoenergy map for network power Pn, and communication rate C. Value of $Pc = 1E3$ used.

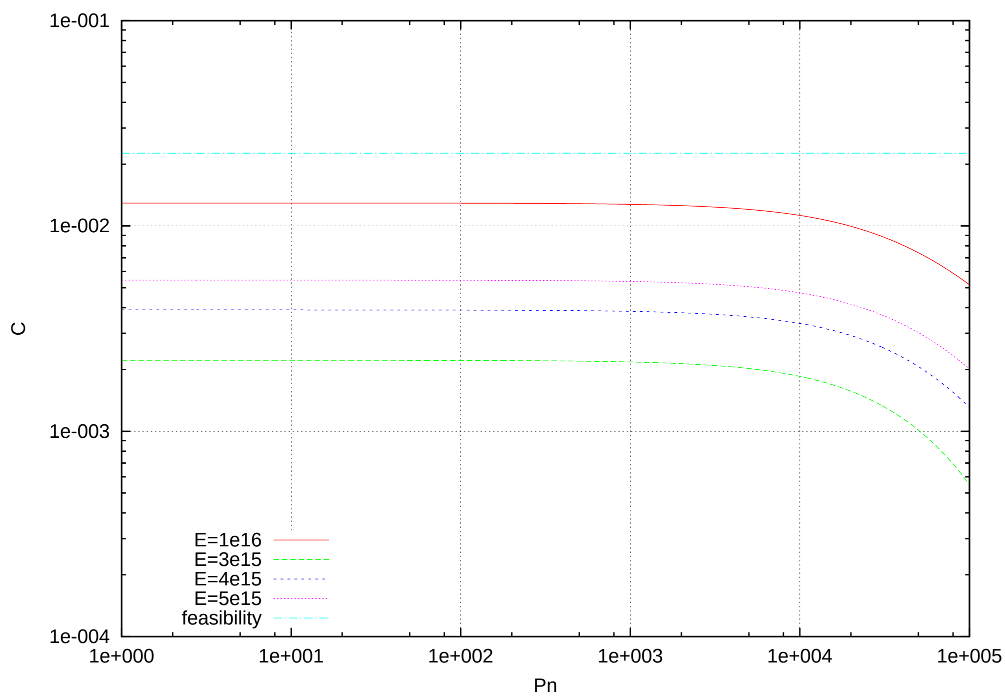

Fig. 190: Isoenergy map for network power Pn, and communication rate C. Value of $S = 1$ used.

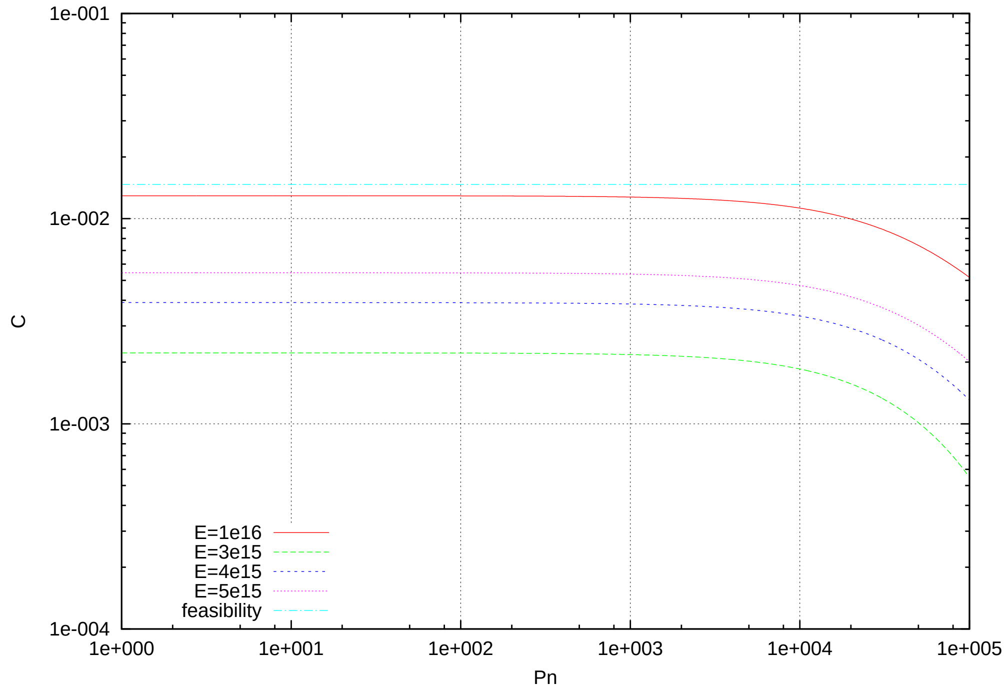

Fig. 191: Isoenergy map for network power Pn, and communication rate C. Value of $S = 1E3$ used.

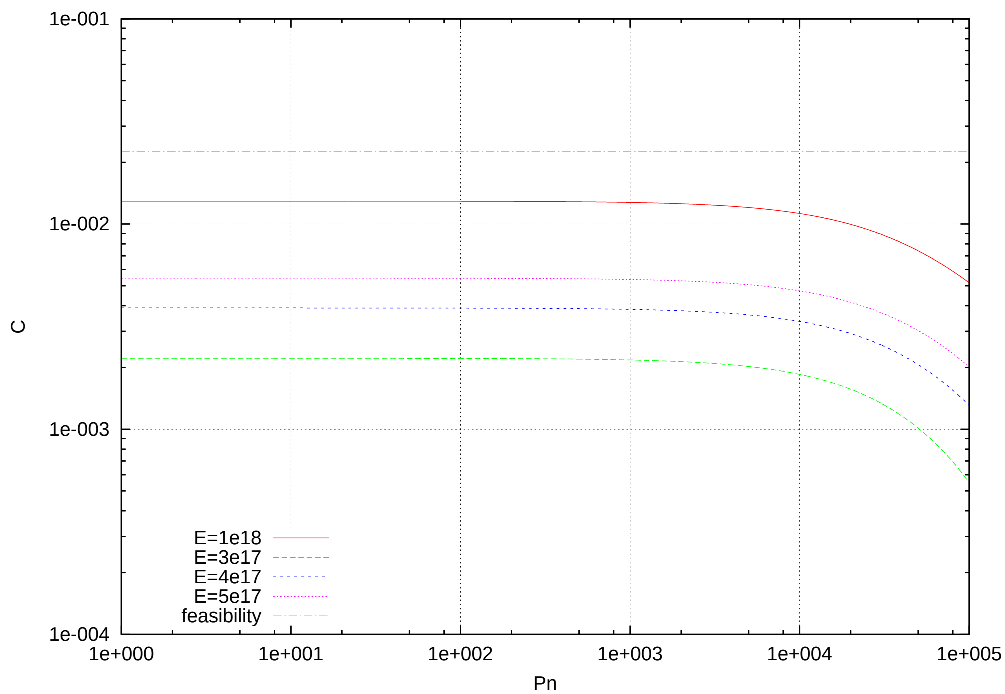

Fig. 192: Isoenergy map for network power Pn, and communication rate C. Value of $V = 1E15$ used.

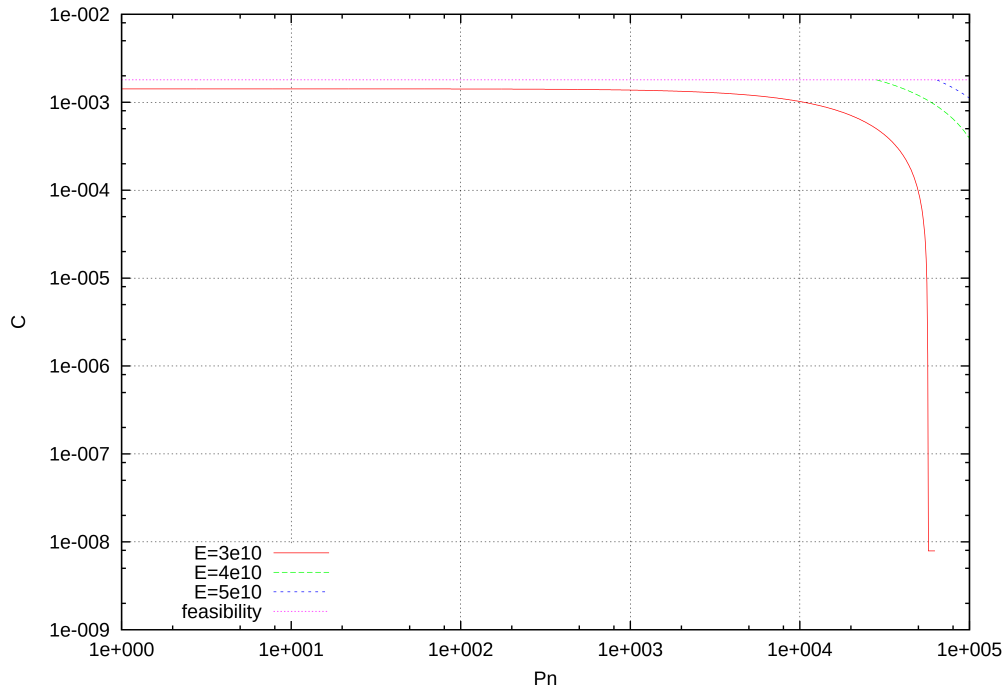

Fig. 193: Isoenergy map for network power Pn, and communication rate C. Value of $V = 1E8$ used.

17 Isoenergy maps for network power Pn, and computation rate A.

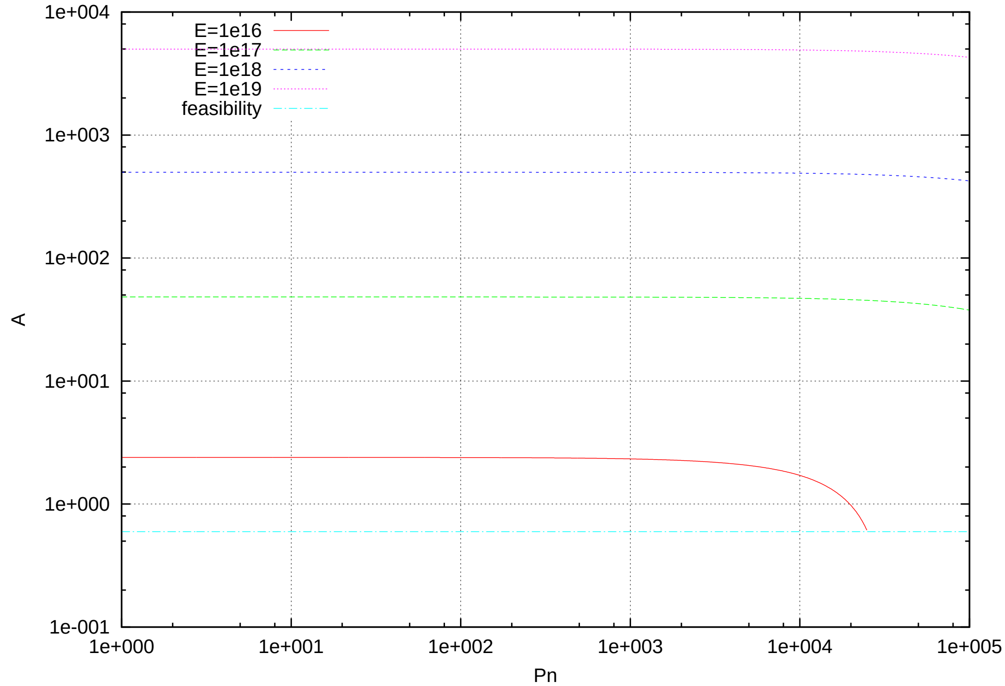

Fig. 194: Isoenergy map for network power Pn, and computation rate A. Value of $C = 1E-2$ used.

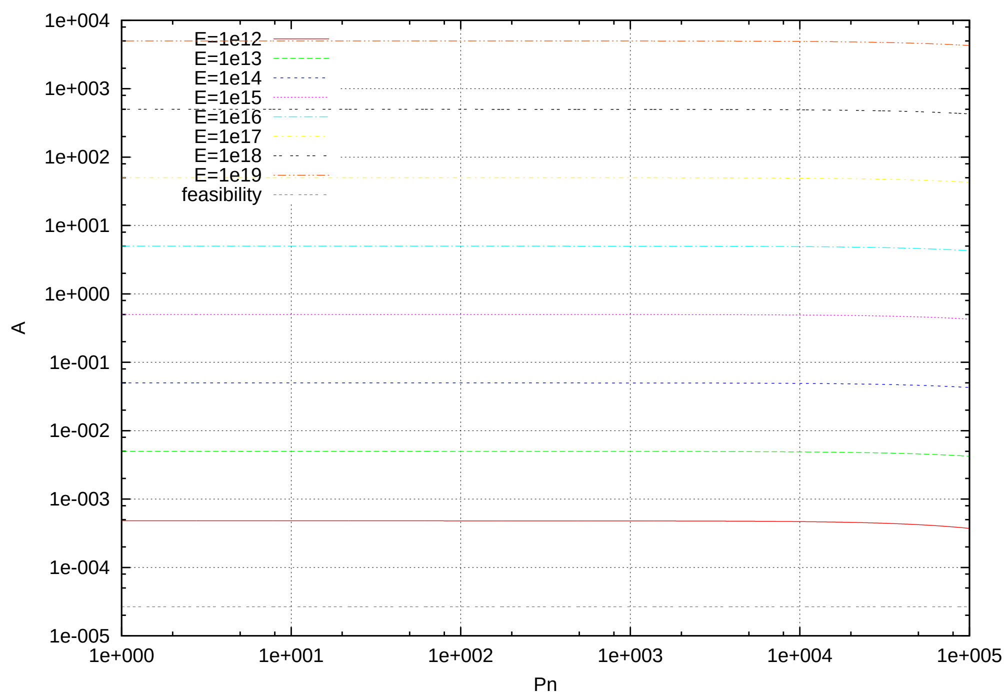

Fig. 195: Isoenergy map for network power Pn, and computation rate A. Value of $C = 1E-7$ used.

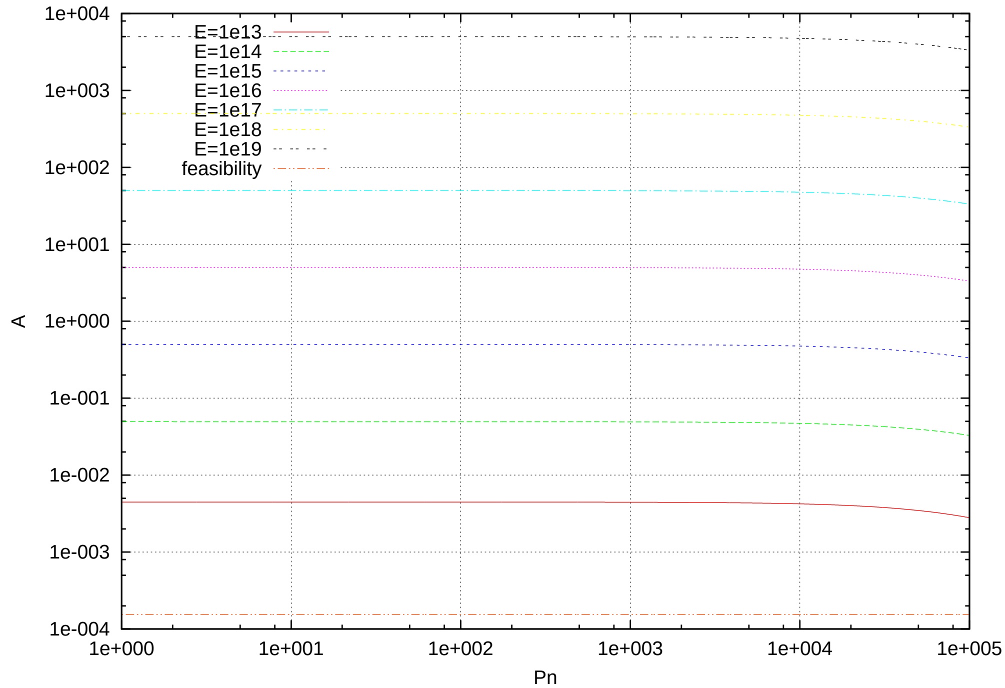

Fig. 196: Isoenergy map for network power Pn, and computation rate A. Value of $k = 1$ used.

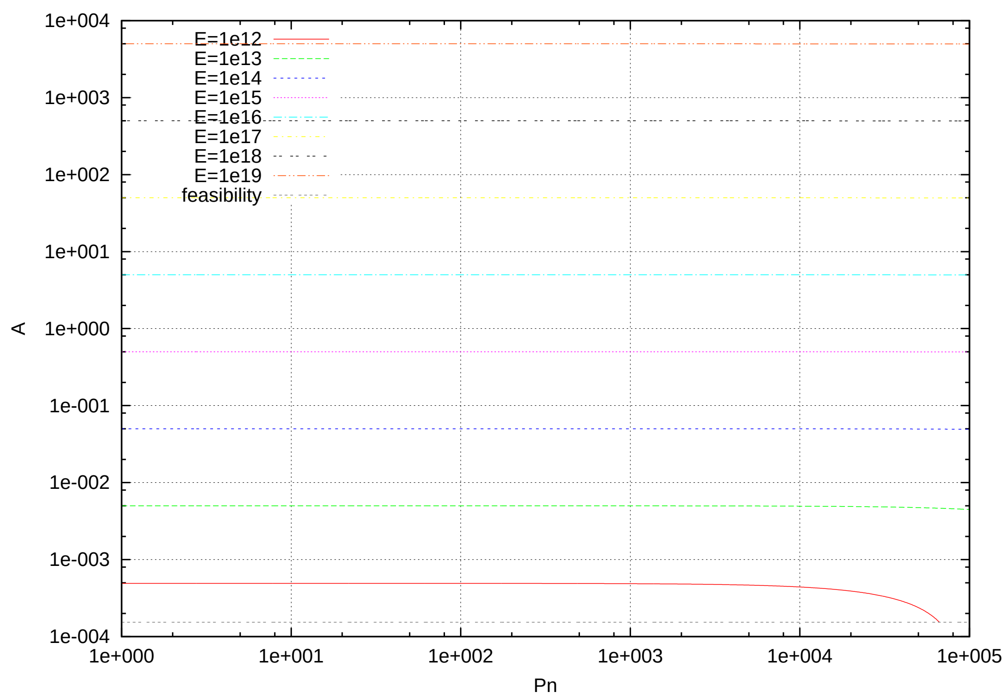

Fig. 197: Isoenergy map for network power Pn, and computation rate A. Value of $k = 100$ used.

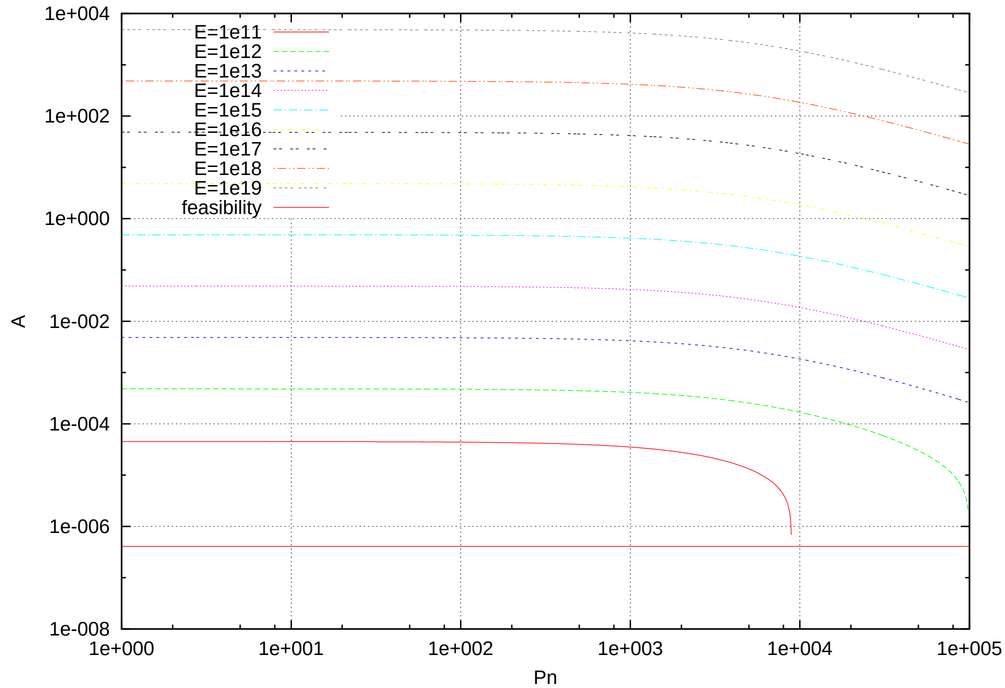

Fig. 198: Isoenergy map for network power Pn, and computation rate A. Value of $m = 10$ used.

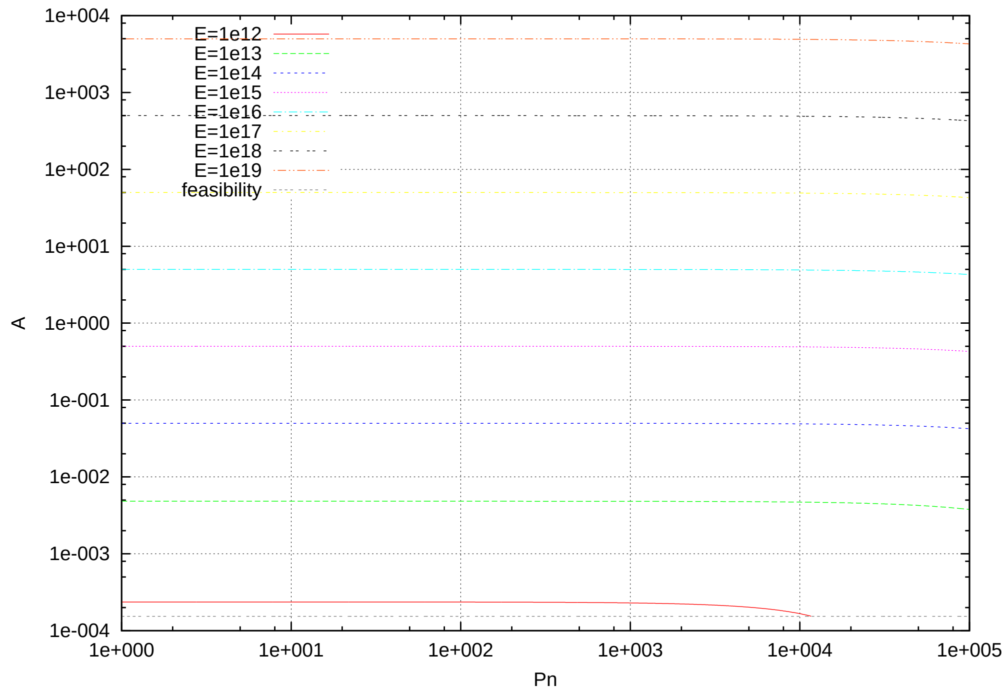

Fig. 199: Isoenergy map for network power Pn, and computation rate A. Value of $m = 1E3$ used.

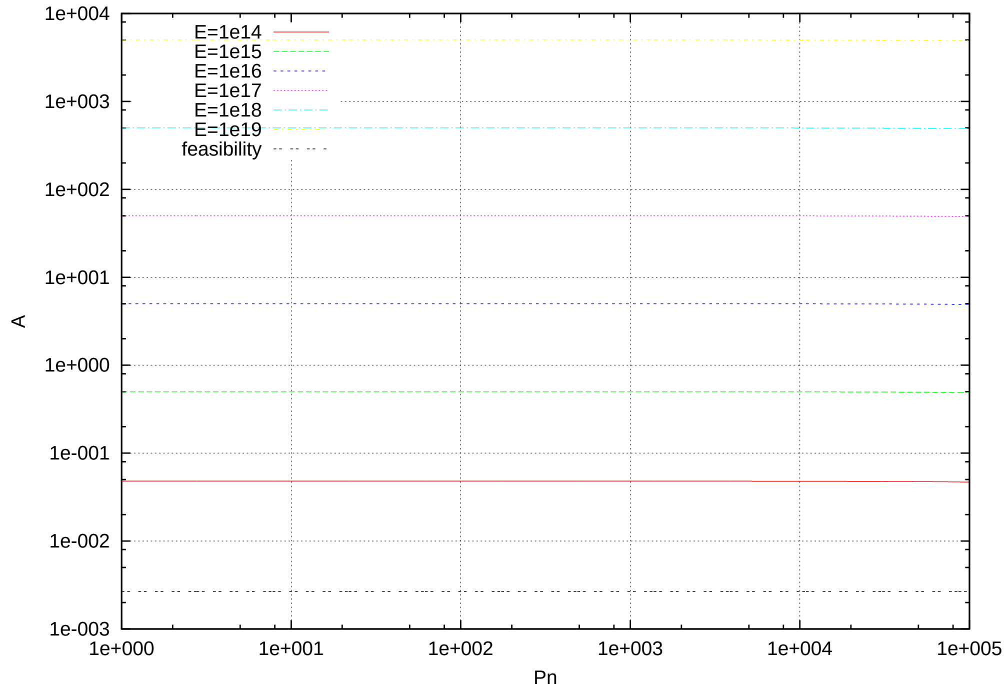

Fig. 200: Isoenergy map for network power Pn, and computation rate A. Value of $m = 1E4$ used.

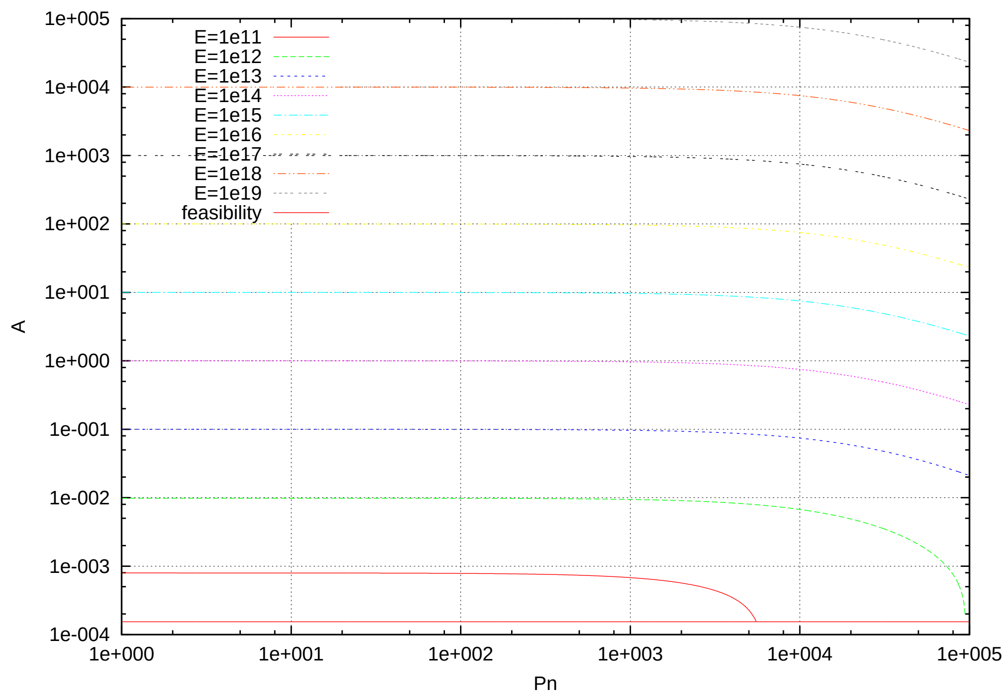

Fig. 201: Isoenergy map for network power Pn, and computation rate A. Value of $Pc = 10$ used.

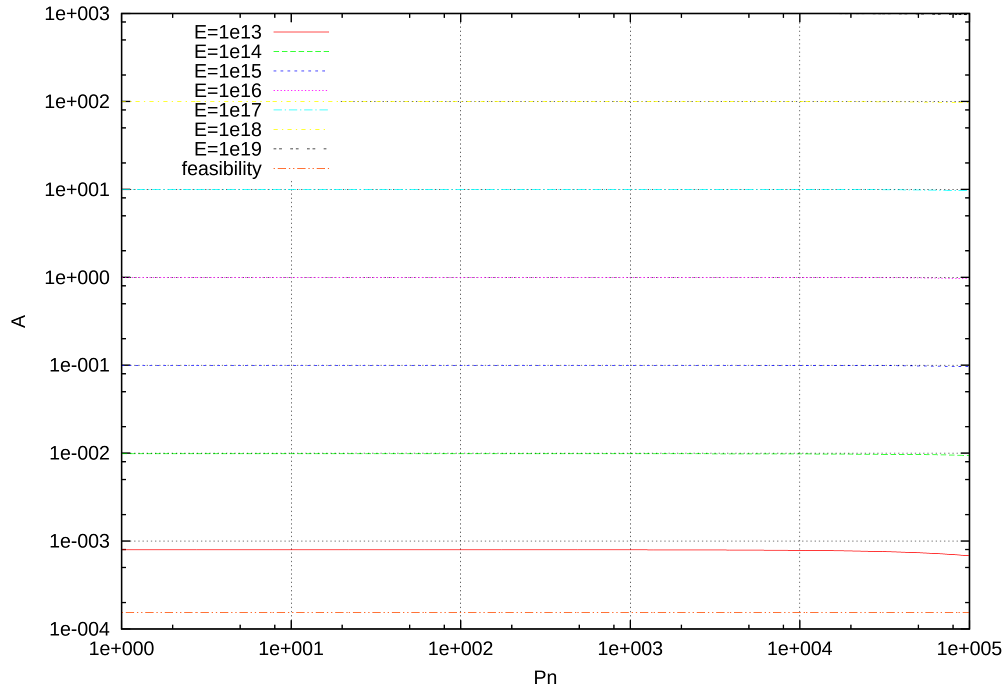

Fig. 202: Isoenergy map for network power Pn, and computation rate A. Value of $Pc = 1E3$ used.

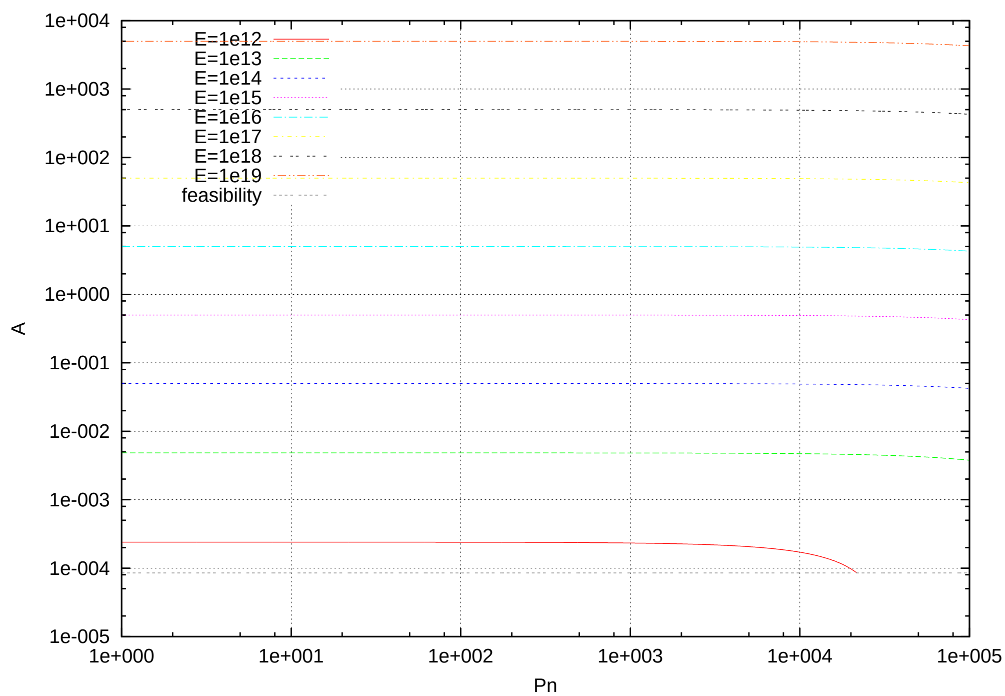

Fig. 203: Isoenergy map for network power Pn, and computation rate A. Value of $S = 1$ used.

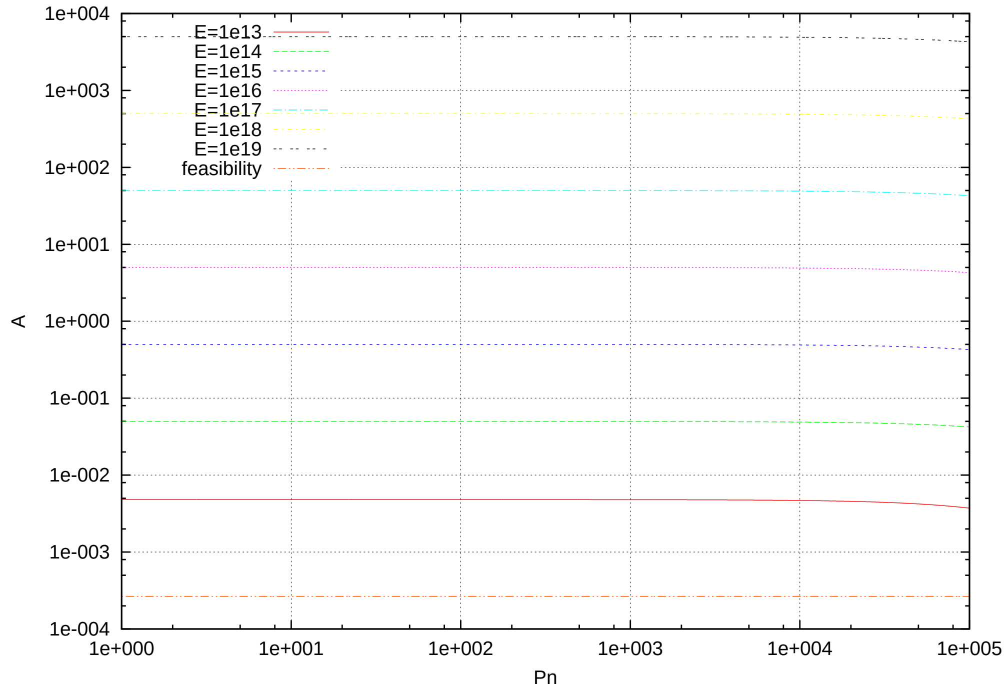

Fig. 204: Isoenergy map for network power Pn, and computation rate A. Value of $S = 1E3$ used.

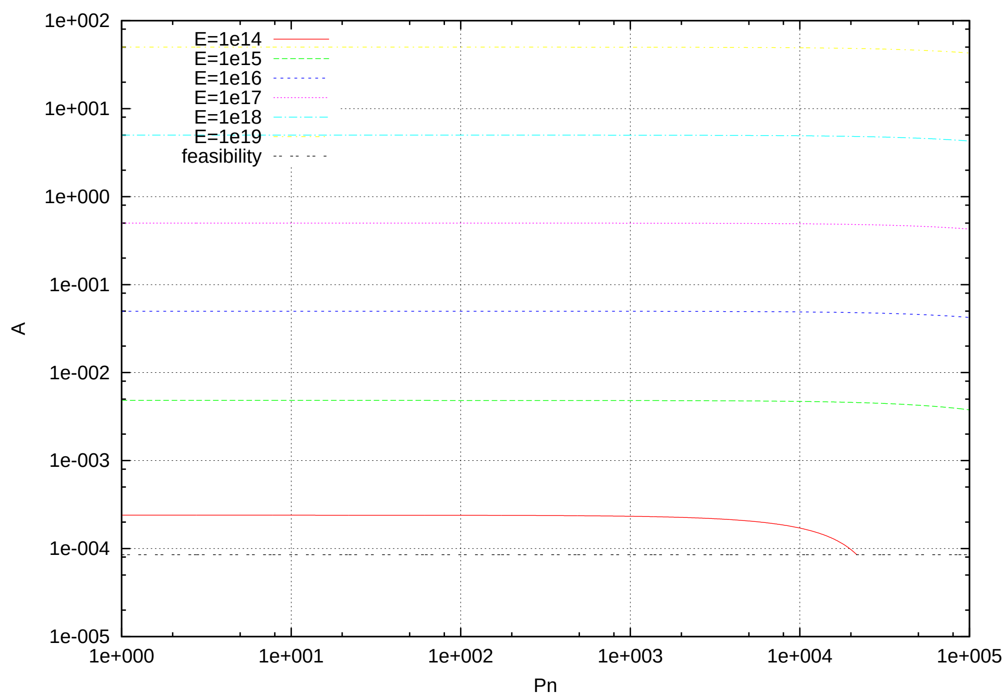

Fig. 205: Isoenergy map for network power Pn, and computation rate A. Value of $V = 1E15$ used.

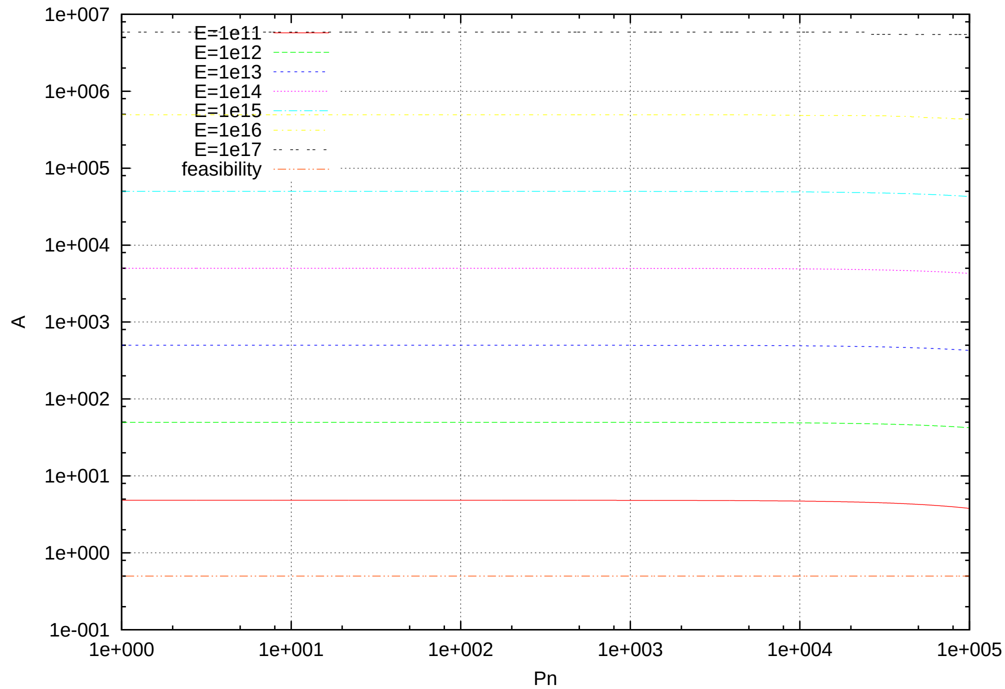

Fig. 206: Isoenergy map for network power Pn, and computation rate A. Value of $V = 1E8$ used.

18 Isoenergy maps for network power Pn, and load size V.

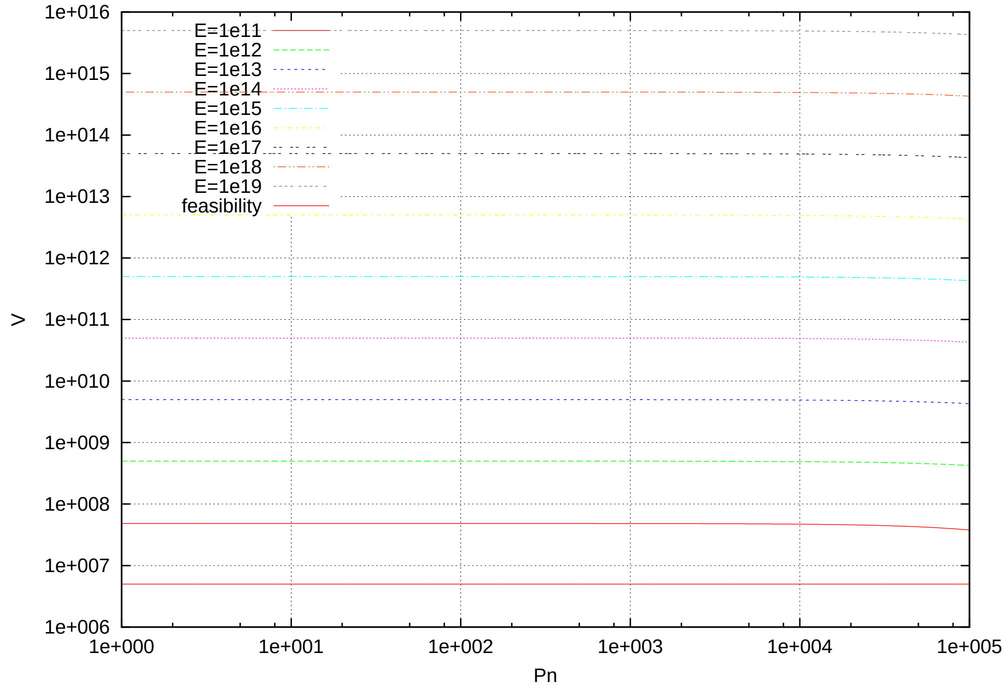

Fig. 207: Isoenergy map for network power Pn, and load size V. Value of $A = 10$ used.

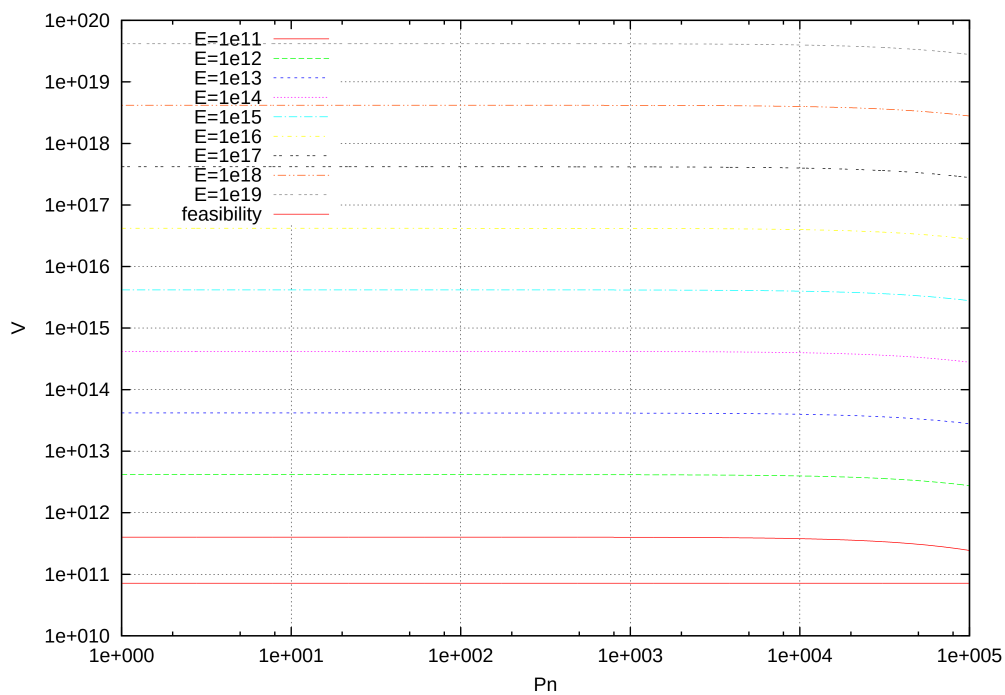

Fig. 208: Isoenergy map for network power Pn, and load size V. Value of $A = 1E-3$ used.

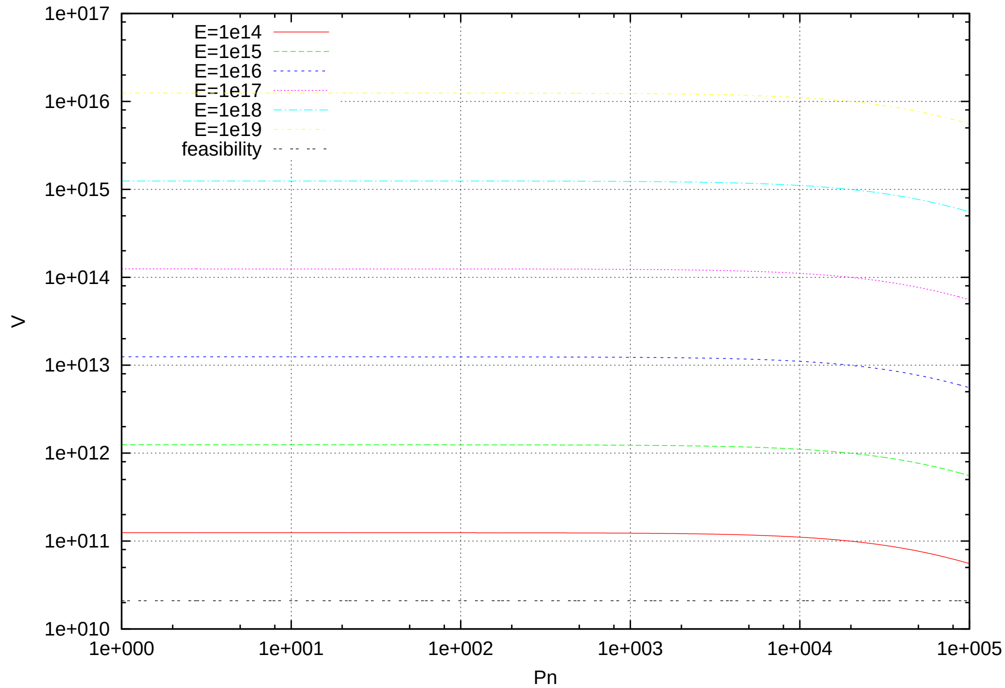

Fig. 209: Isoenergy map for network power Pn, and load size V. Value of $C = 1E-2$ used.

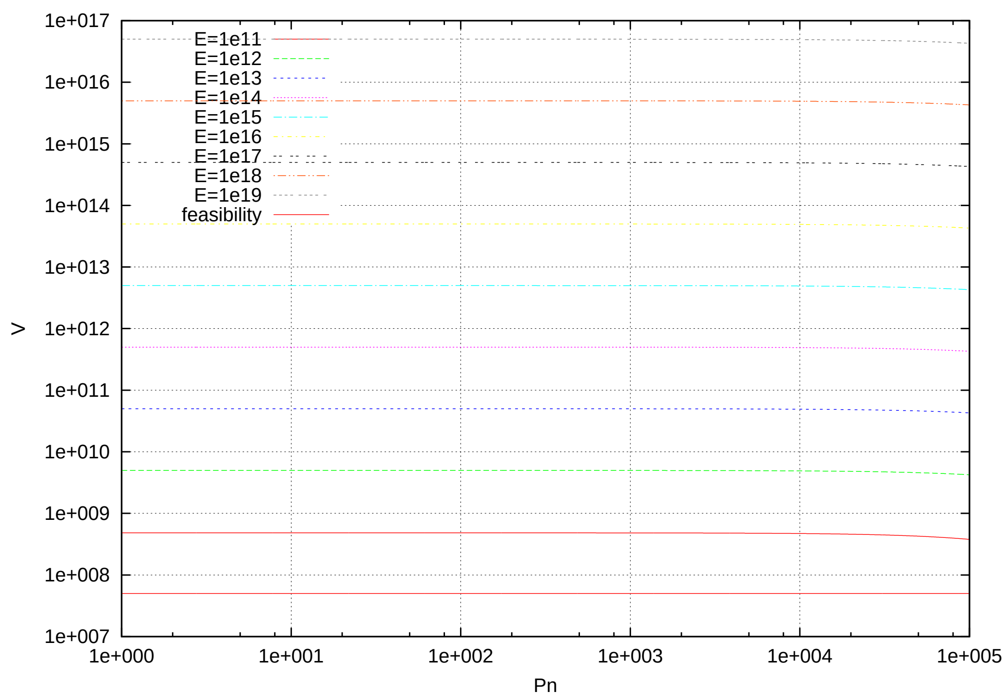

Fig. 210: Isoenergy map for network power Pn, and load size V. Value of $C = 1E-8$ used.

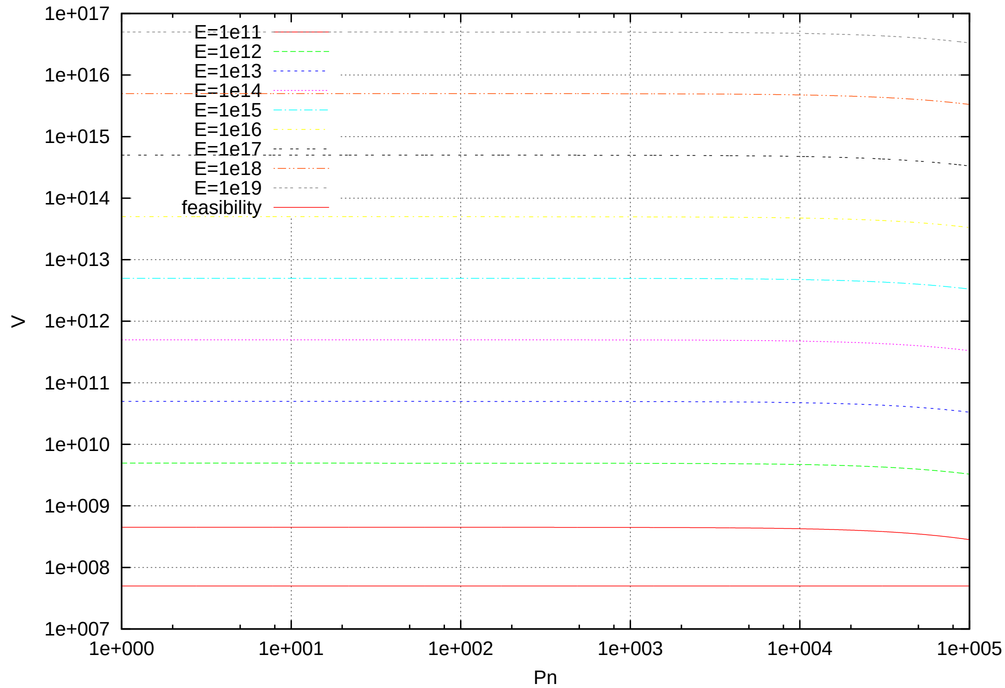

Fig. 211: Isoenergy map for network power Pn, and load size V. Value of $k = 1$ used.

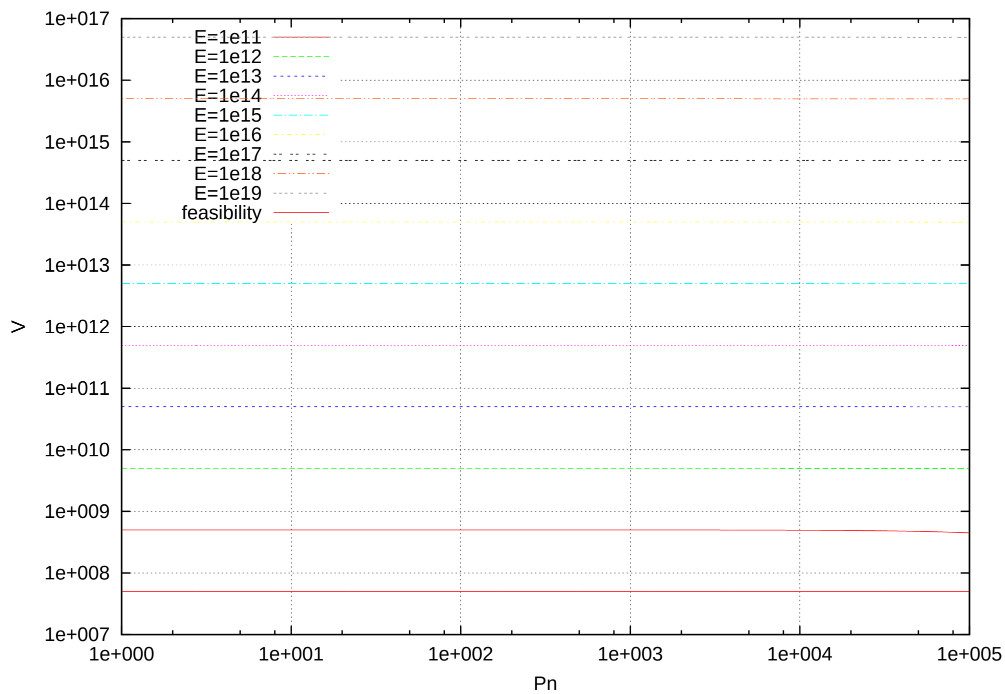

Fig. 212: Isoenergy map for network power Pn, and load size V. Value of $k = 100$ used.

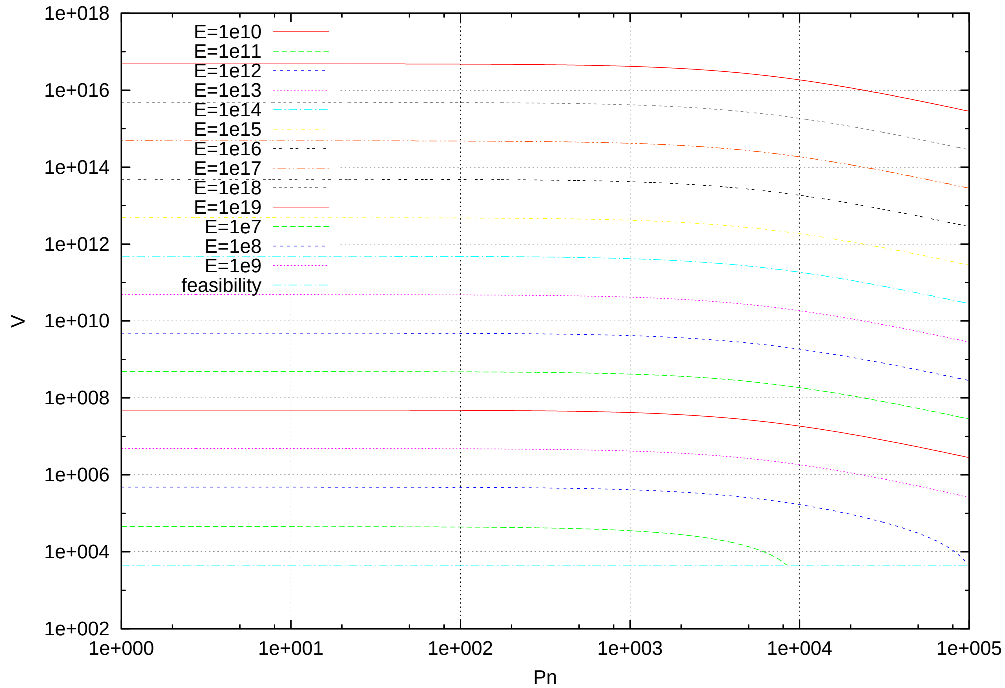

Fig. 213: Isoenergy map for network power Pn, and load size V. Value of $m = 10$ used.

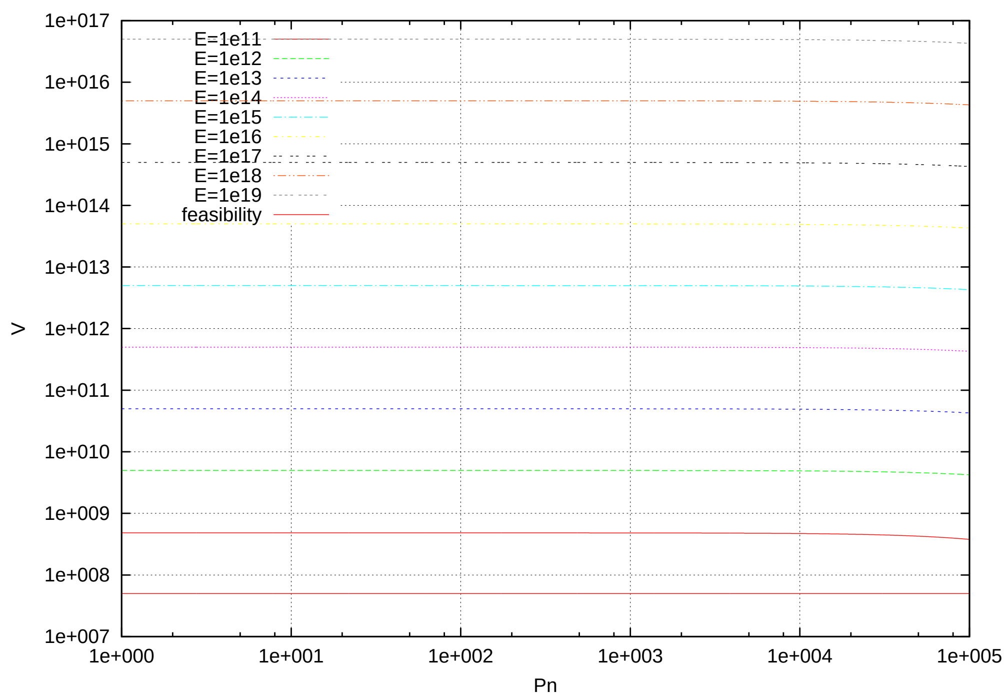

Fig. 214: Isoenergy map for network power Pn, and load size V. Value of $m = 1E3$ used.

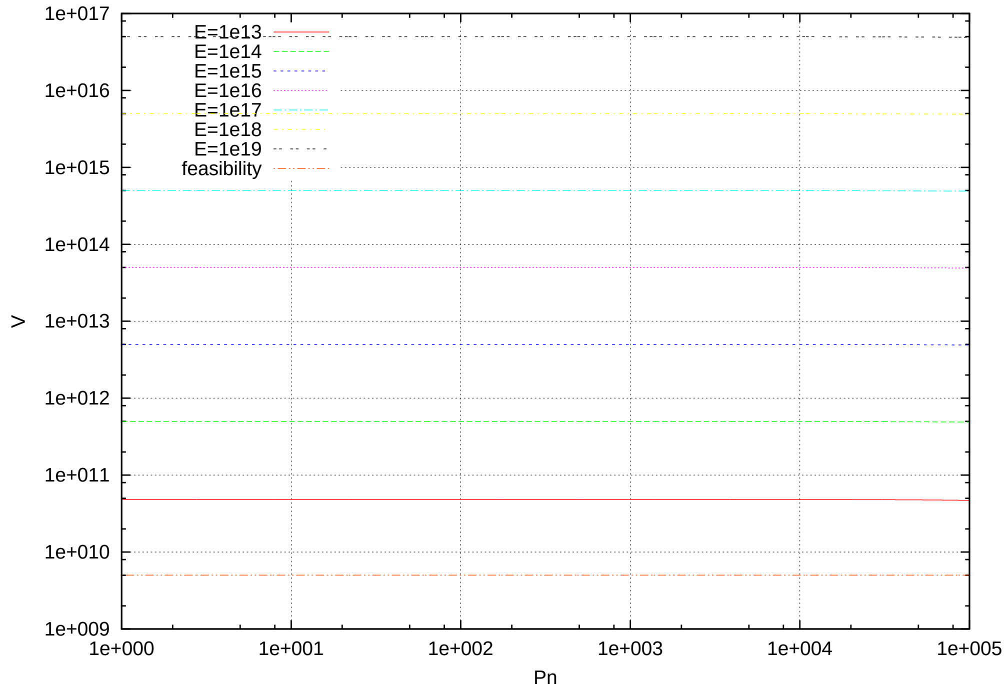

Fig. 215: Isoenergy map for network power Pn, and load size V. Value of $m = 1E4$ used.

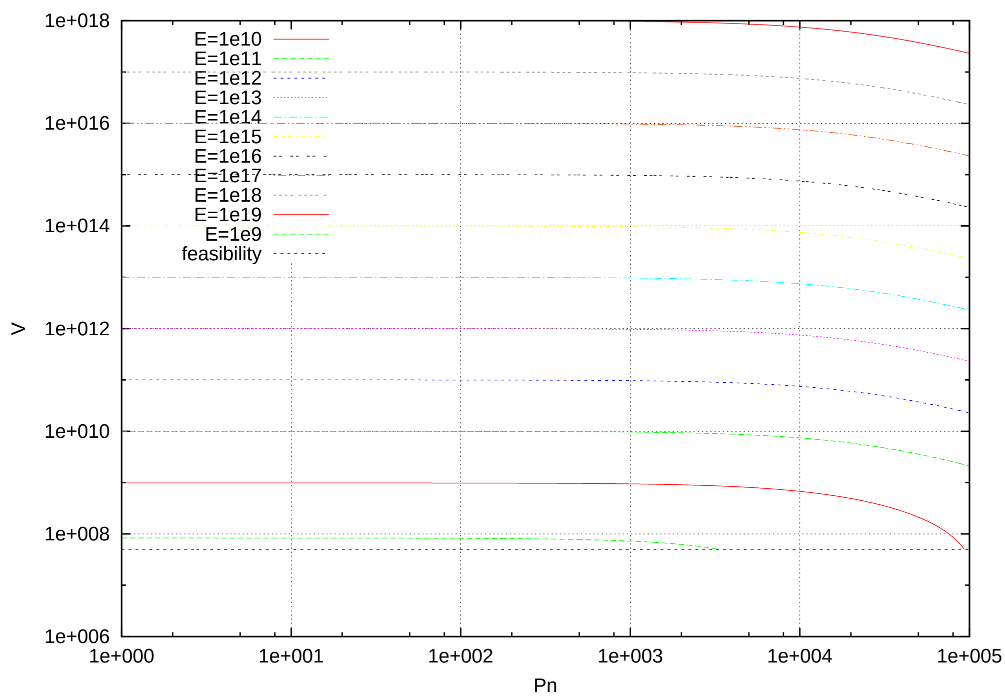

Fig. 216: Isoenergy map for network power Pn, and load size V. Value of $Pc = 10$ used.

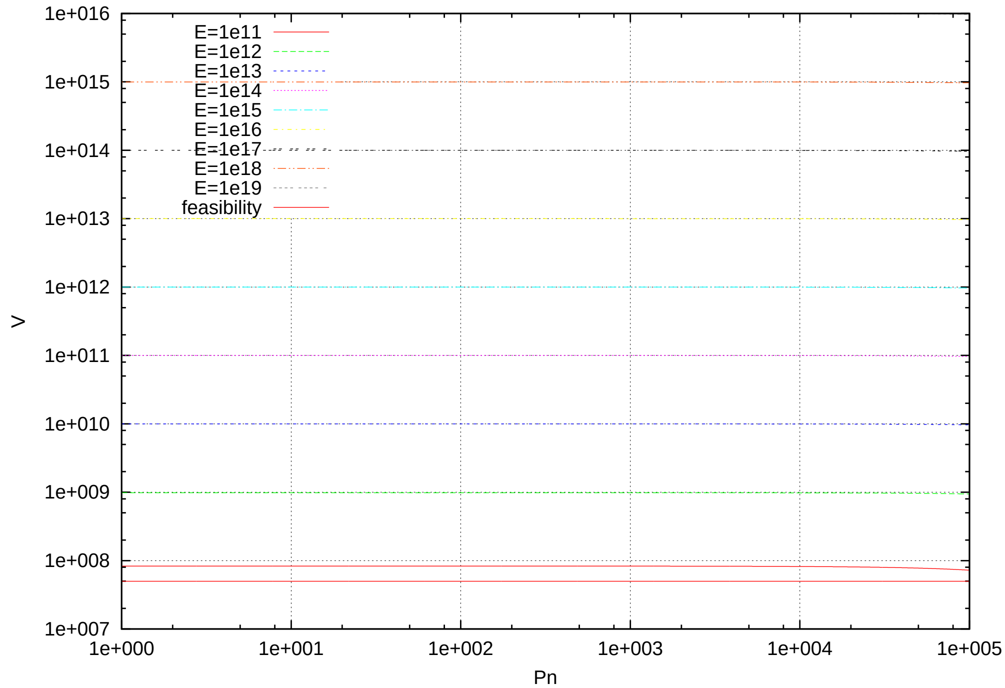

Fig. 217: Isoenergy map for network power Pn, and load size V. Value of $Pc = 1E3$ used.

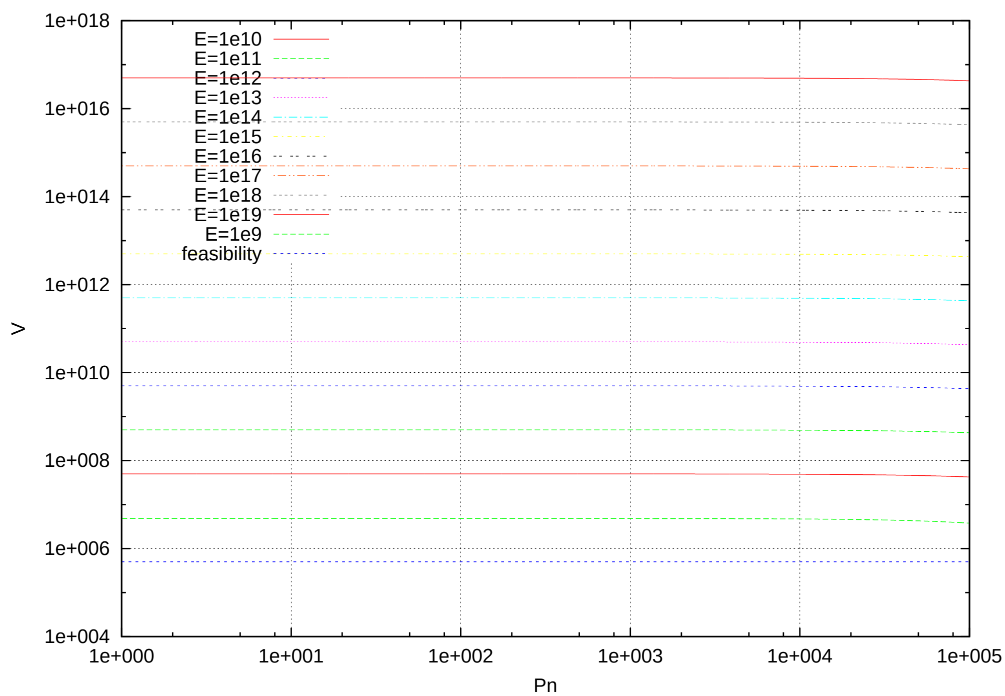

Fig. 218: Isoenergy map for network power Pn, and load size V. Value of $S = 1$ used.

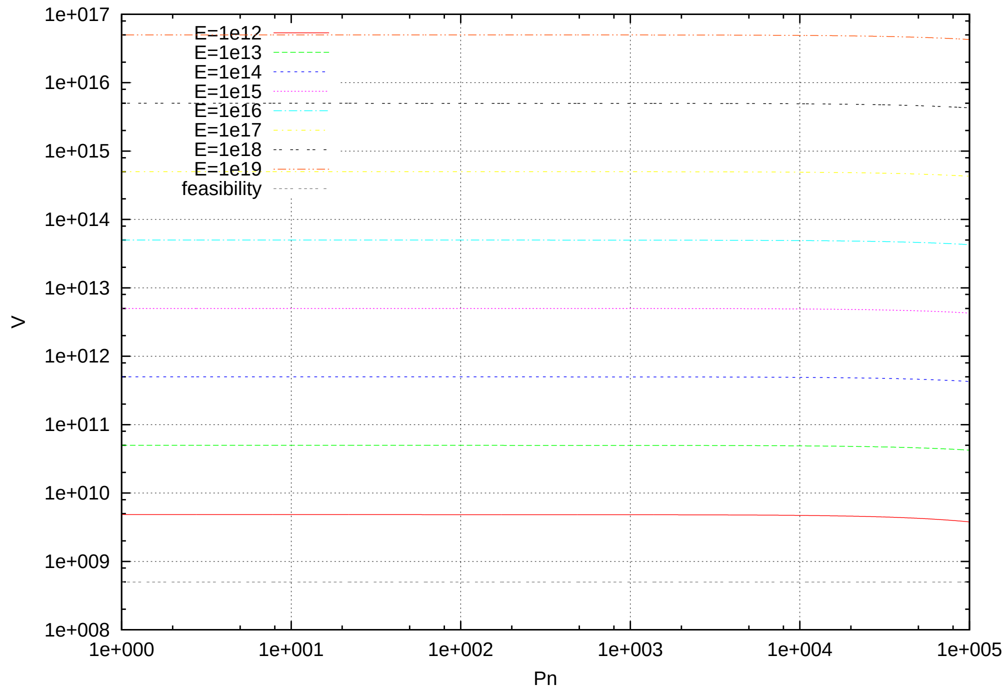

Fig. 219: Isoenergy map for network power Pn, and load size V. Value of $S = 1E3$ used.

19 Isoenergy maps for network power Pn, and idle power reduction k.

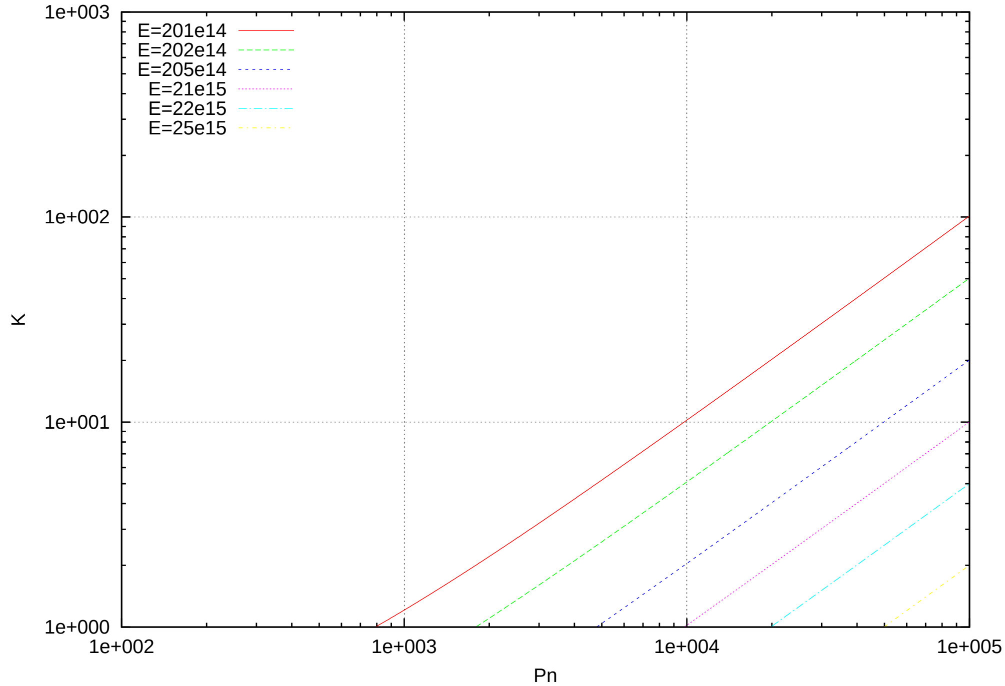

Fig. 220: Isoenergy map for network power Pn, and idle power reduction k. Value of $A = 10$ used.

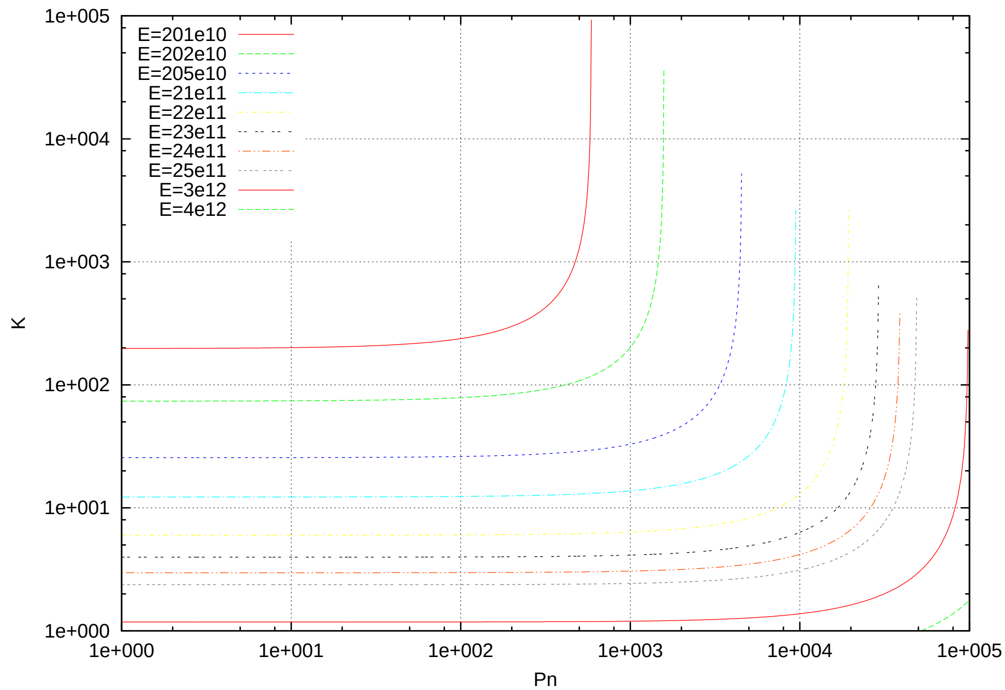

Fig. 221: Isoenergy map for network power Pn, and idle power reduction k. Value of $A = 1E-3$ used.

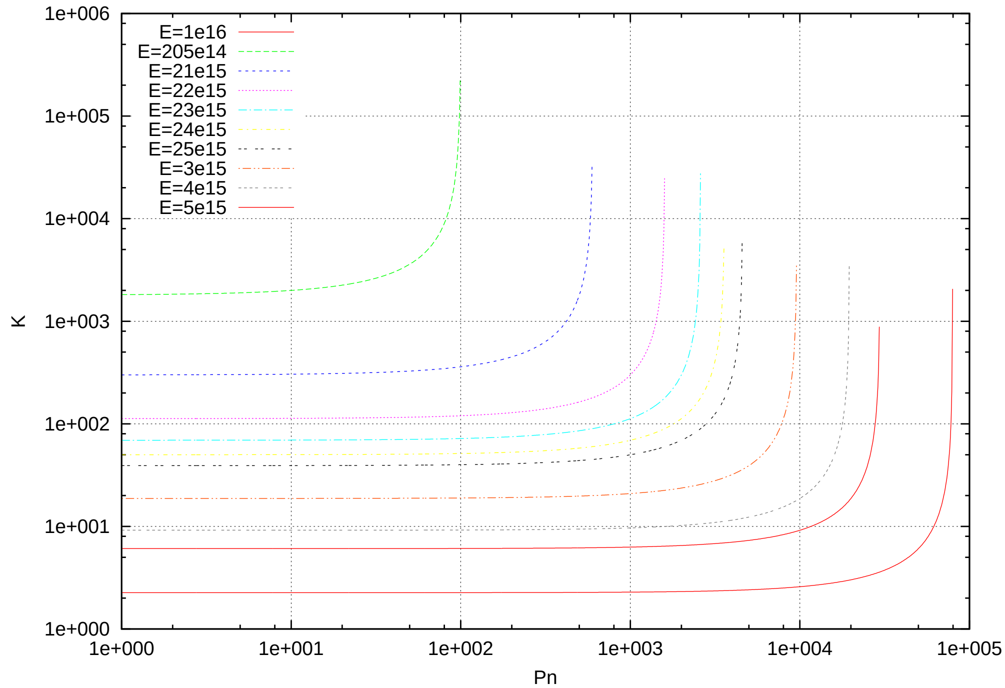

Fig. 222: Isoenergy map for network power Pn, and idle power reduction k. Value of $C = 1E - 2$ used.

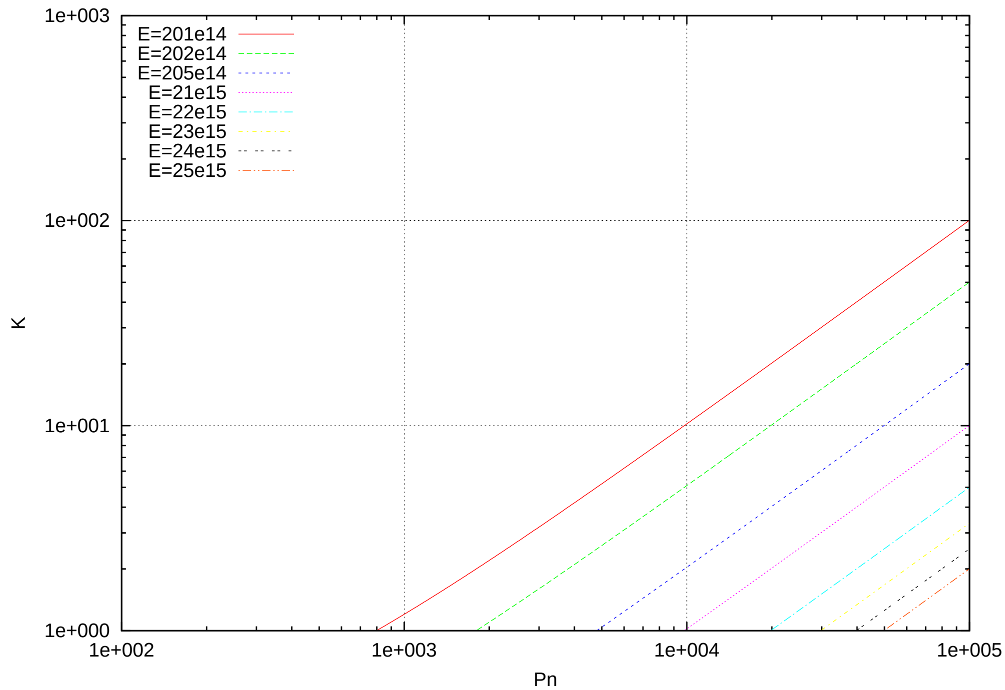

Fig. 223: Isoenergy map for network power Pn, and idle power reduction k. Value of $C = 1E - 8$ used.

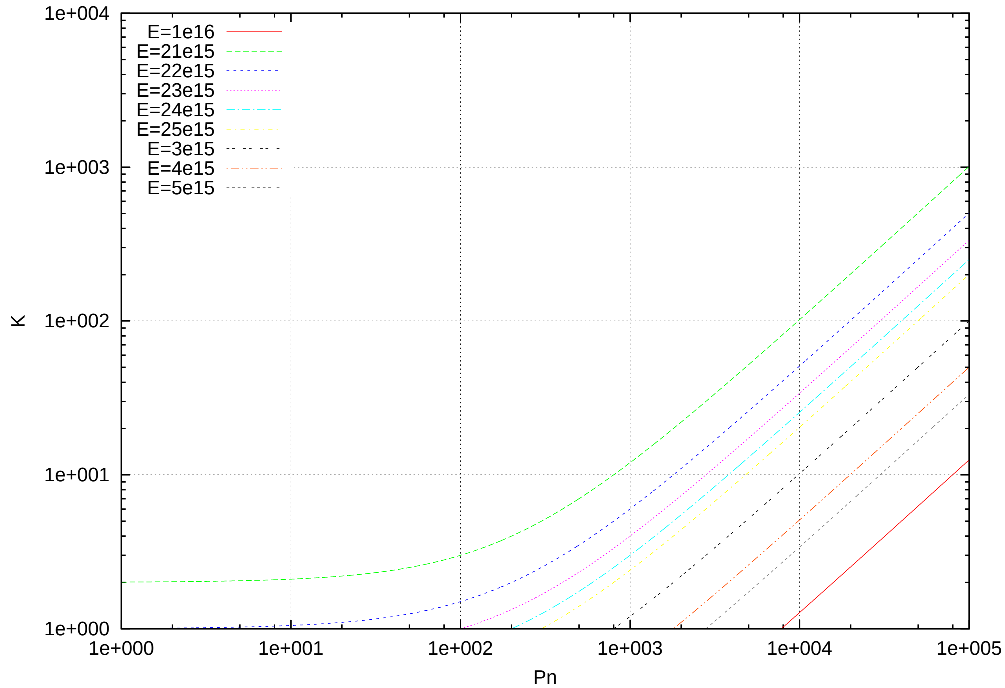

Fig. 224: Isoenergy map for network power Pn, and idle power reduction k. Value of $m = 10$ used.

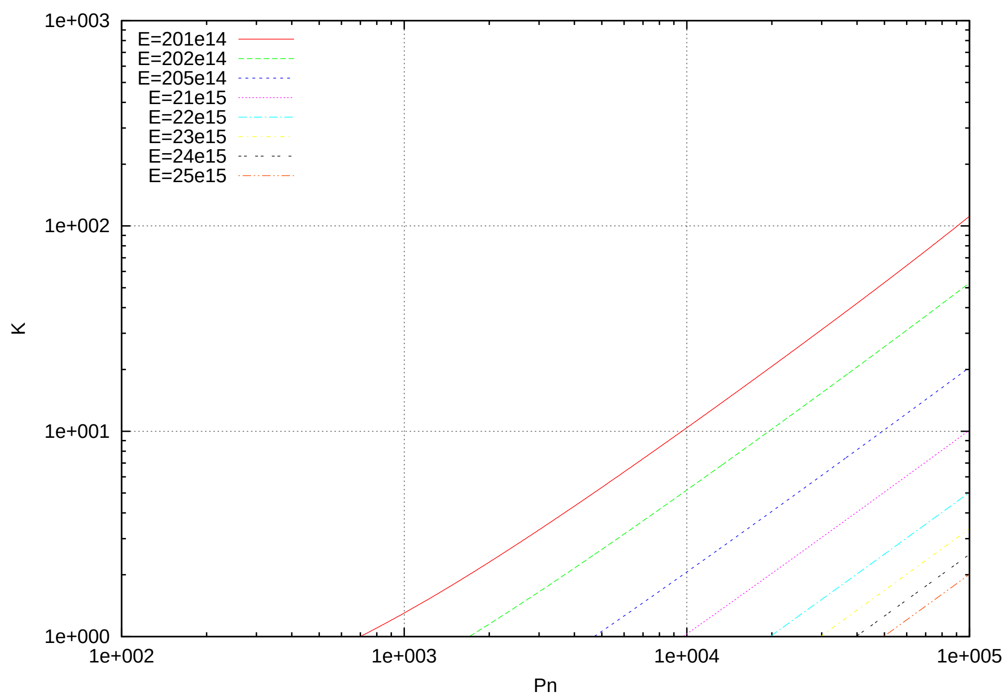

Fig. 225: Isoenergy map for network power Pn, and idle power reduction k. Value of $m = 1E3$ used.

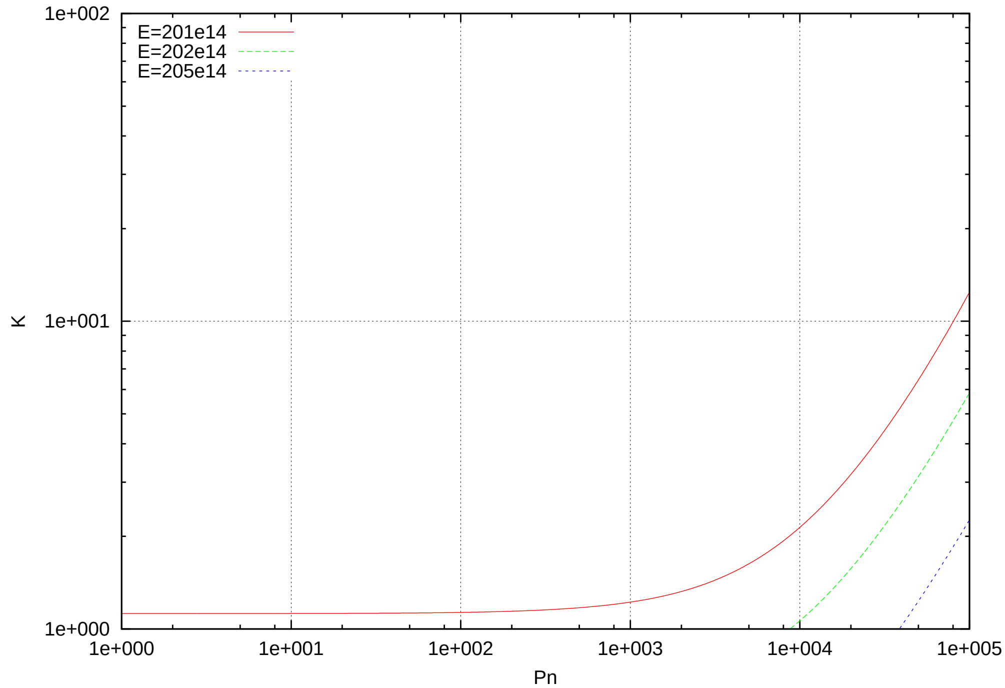

Fig. 226: Isoenergy map for network power Pn, and idle power reduction k. Value of $m = 1E4$ used.

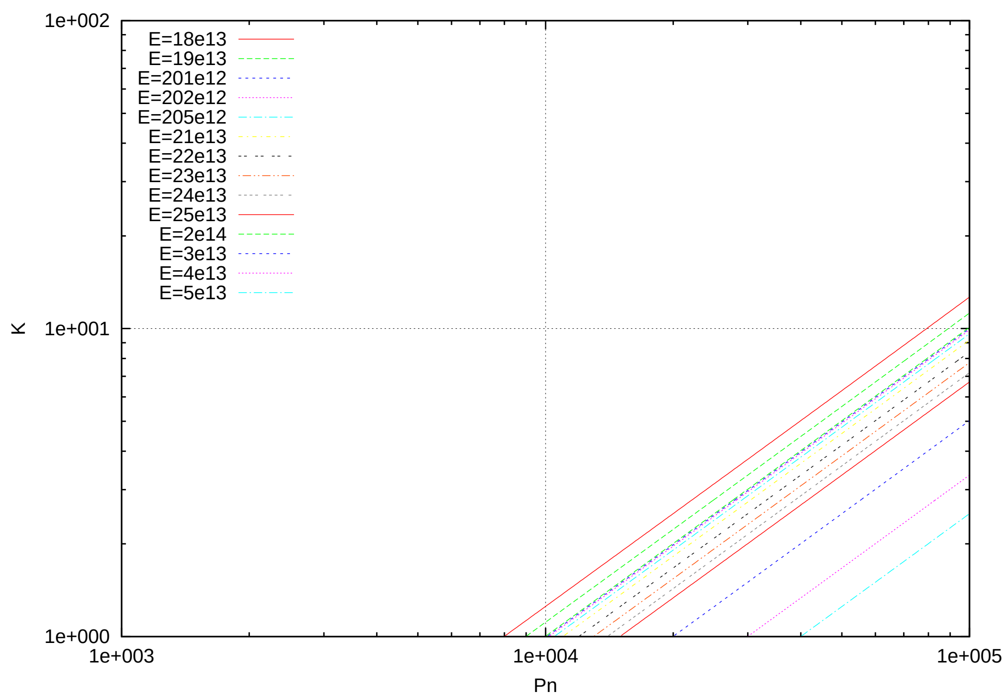

Fig. 227: Isoenergy map for network power Pn, and idle power reduction k. Value of $Pc = 10$ used.

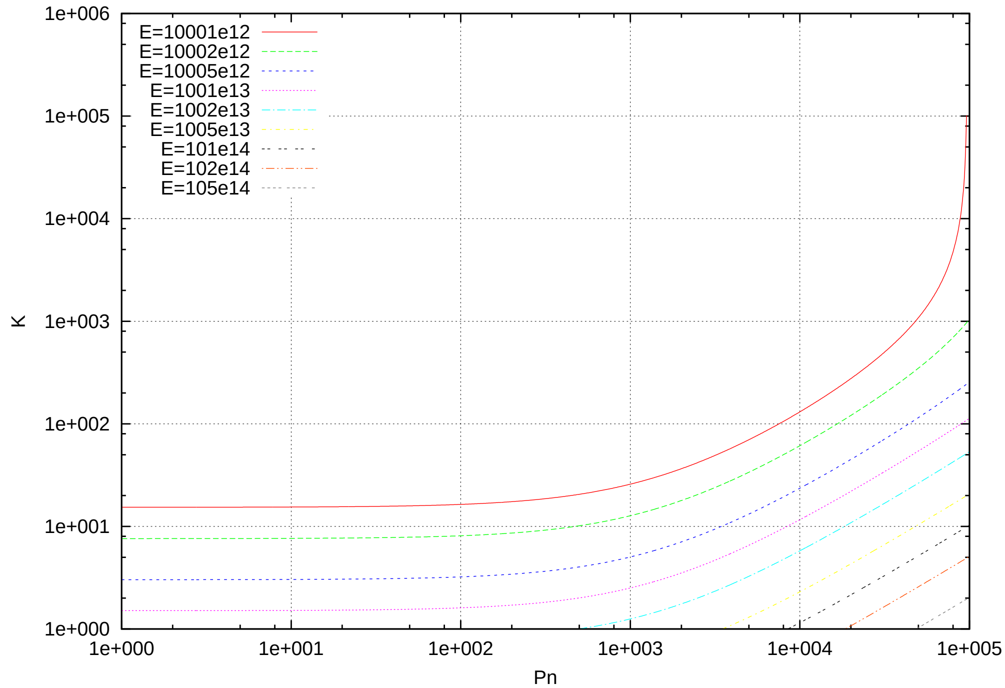

Fig. 228: Isoenergy map for network power Pn, and idle power reduction k. Value of $Pc = 1E3$ used.

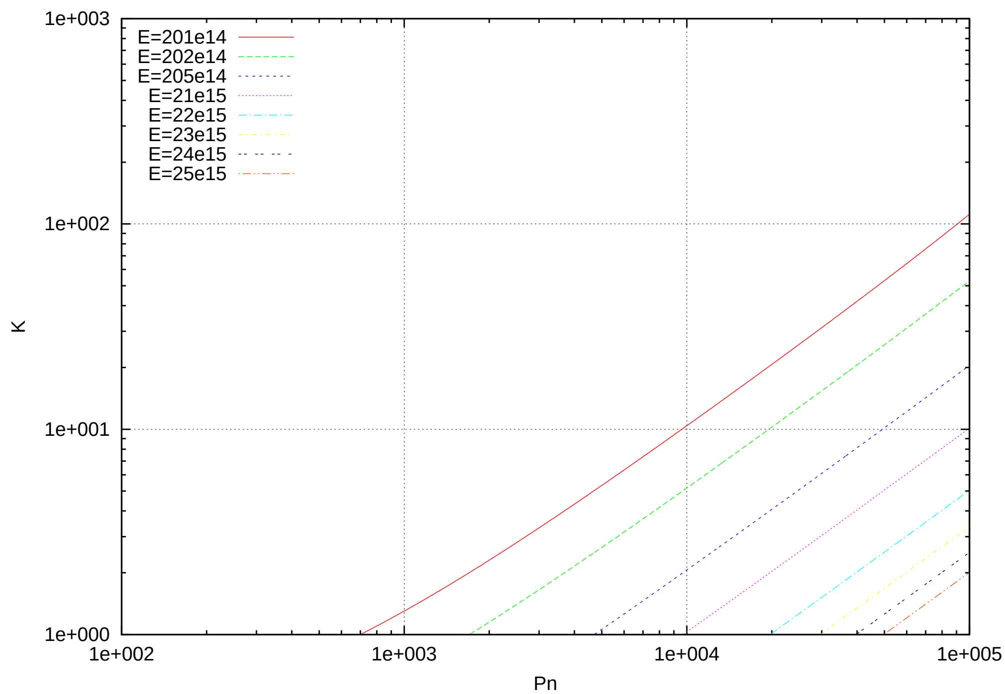

Fig. 229: Isoenergy map for network power Pn, and idle power reduction k. Value of $S = 1$ used.

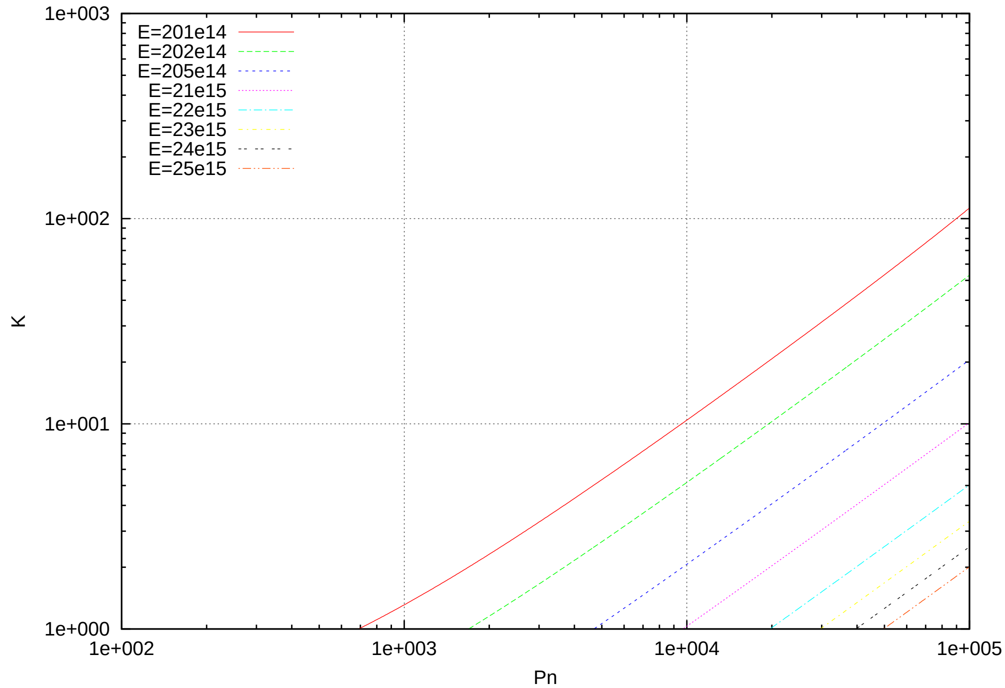

Fig. 230: Isoenergy map for network power Pn, and idle power reduction k. Value of $S = 1E3$ used.

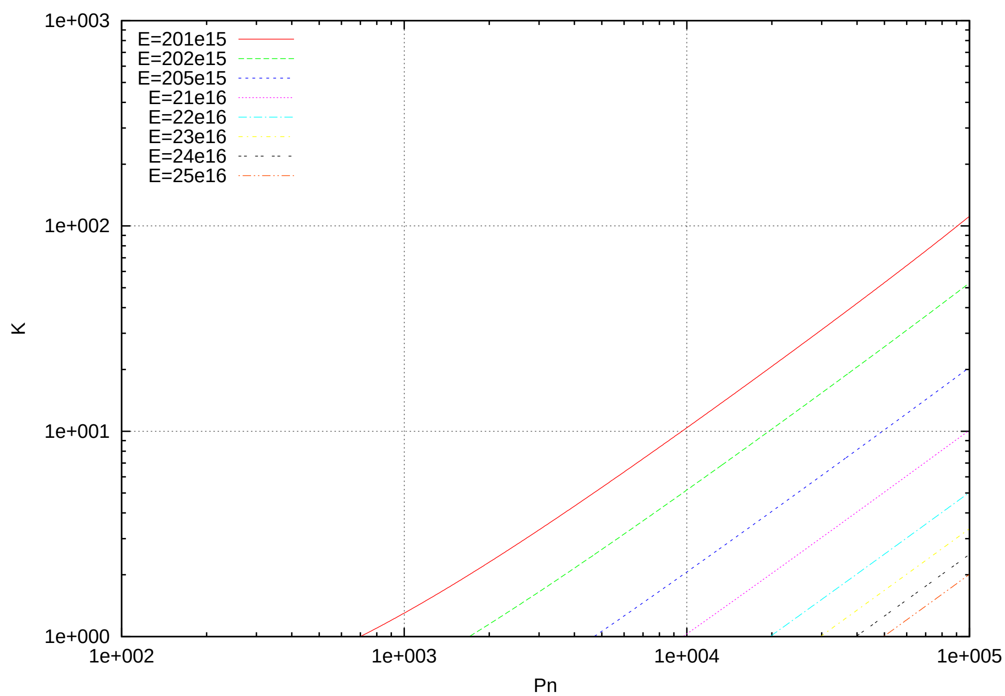

Fig. 231: Isoenergy map for network power Pn, and idle power reduction k. Value of $V = 1E15$ used.

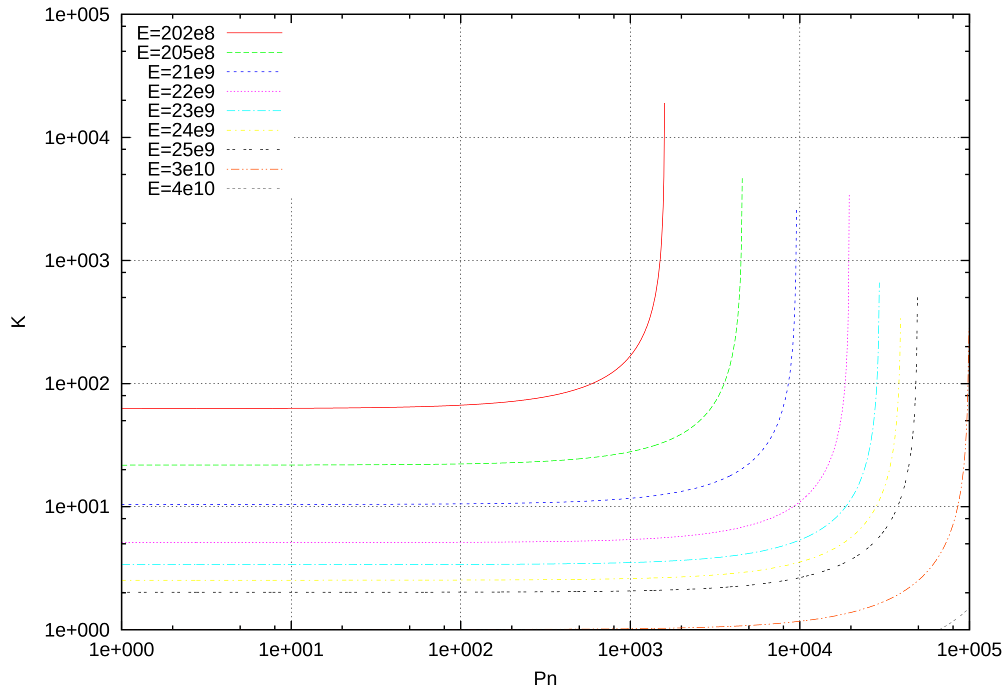

Fig. 232: Isoenergy map for network power Pn, and idle power reduction k. Value of $V = 1E8$ used.

20 Isoenergy maps for idle power reduction k, and startup time S.

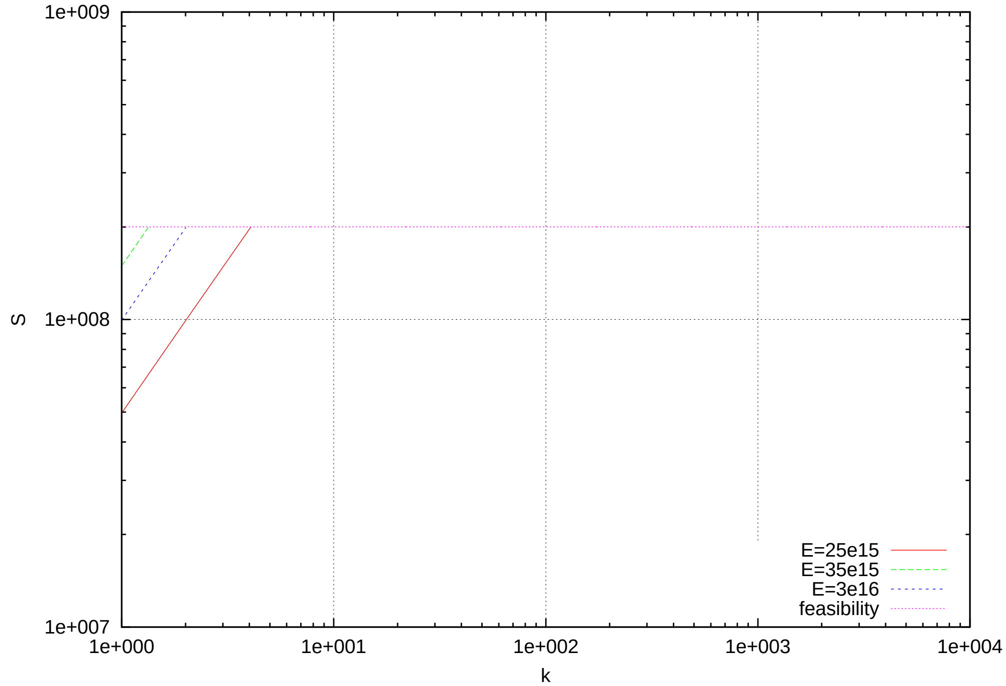

Fig. 233: Isoenergy map for idle power reduction k, and startup time S. Value of $A = 10$ used.

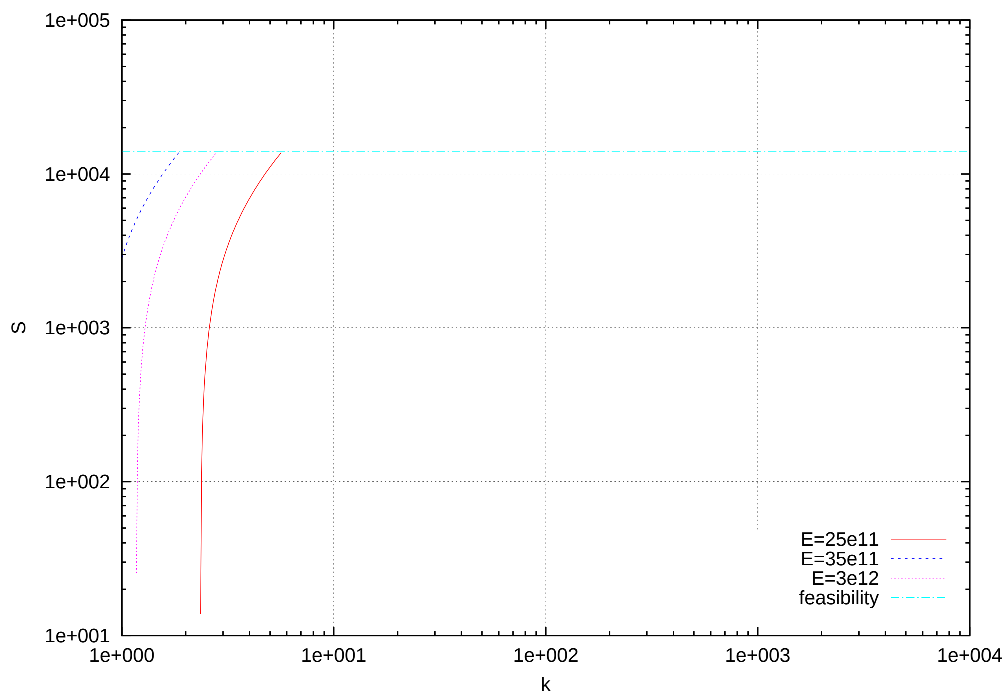

Fig. 234: Isoenergy map for idle power reduction k, and startup time S. Value of $A = 1E-3$ used.

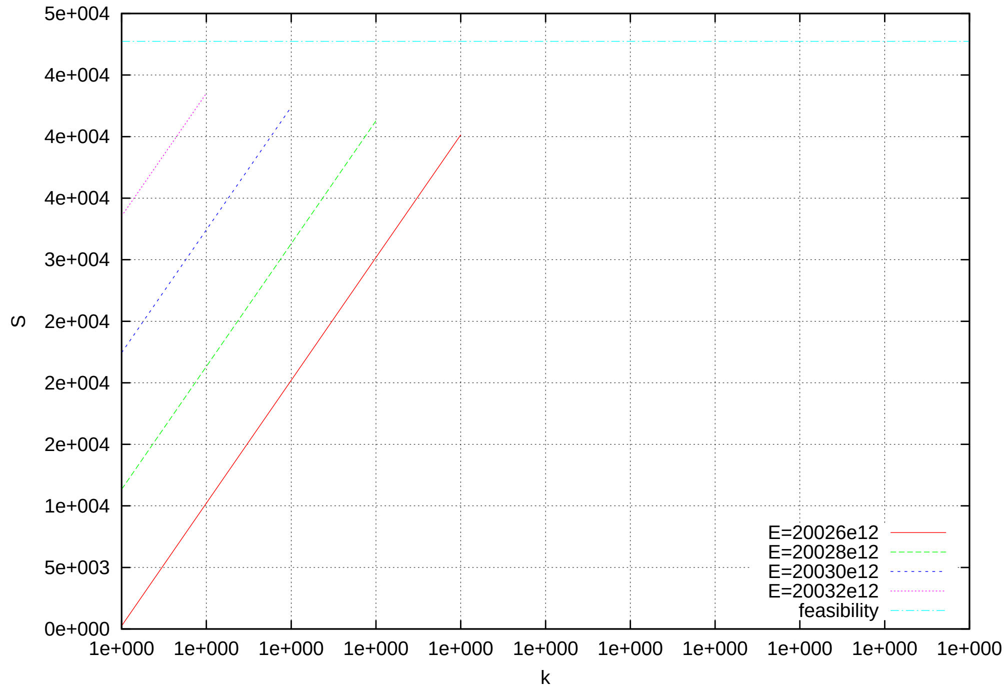

Fig. 235: Isoenergy map for idle power reduction k, and startup time S. Value of $C = 1E-2$ used.

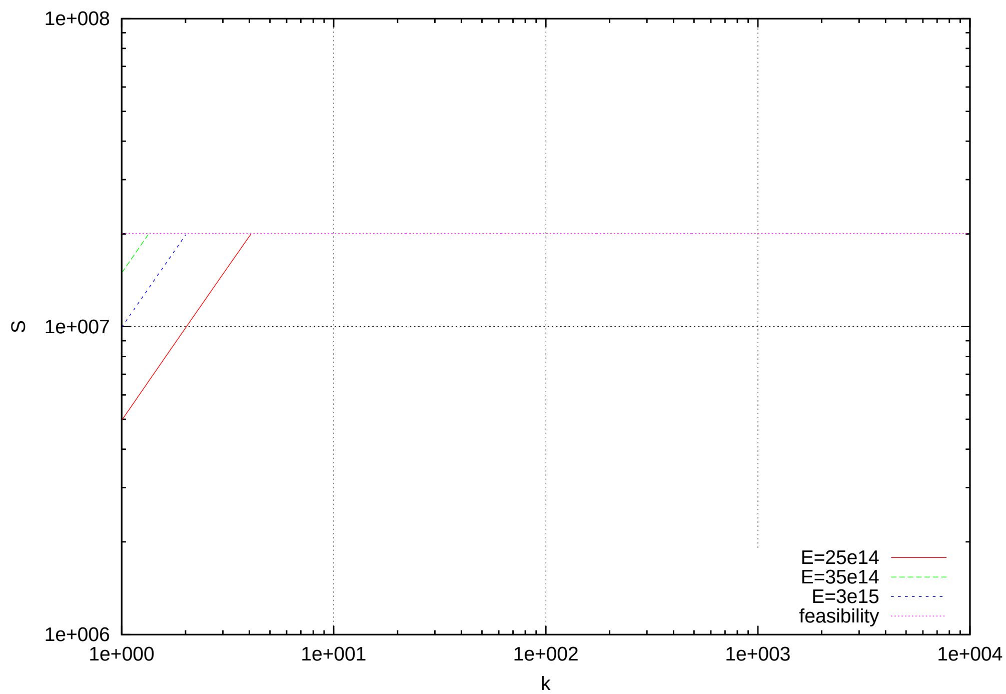

Fig. 236: Isoenergy map for idle power reduction k, and startup time S. Value of $C = 1E-8$ used.

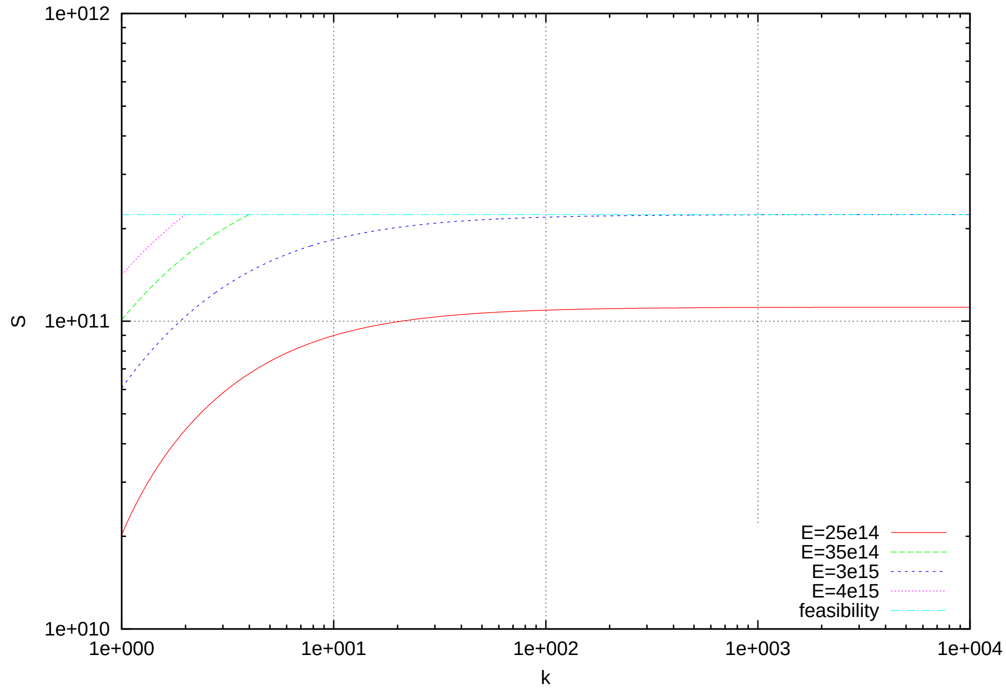

Fig. 237: Isoenergy map for idle power reduction k, and startup time S. Value of $m = 10$ used.

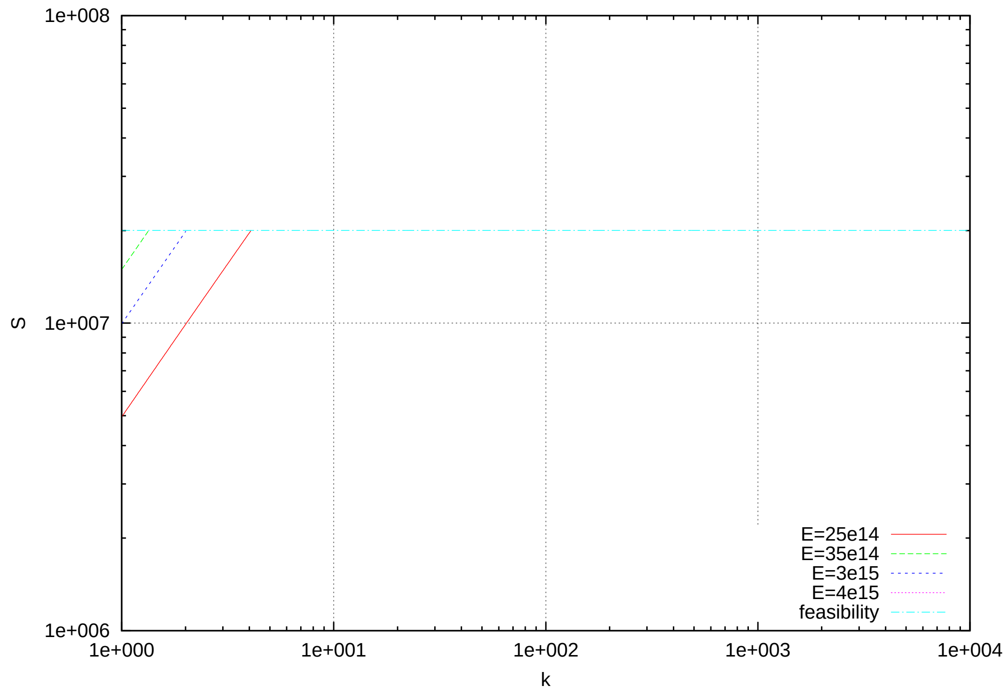

Fig. 238: Isoenergy map for idle power reduction k, and startup time S. Value of $m = 1E3$ used.

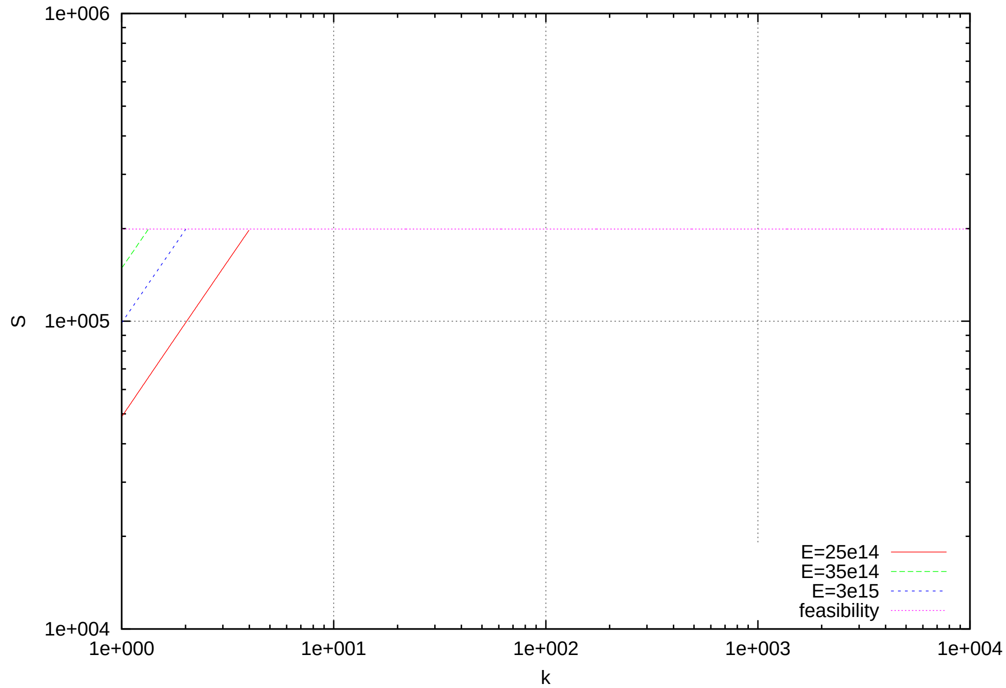

Fig. 239: Isoenergy map for idle power reduction k, and startup time S. Value of $m = 1E4$ used.

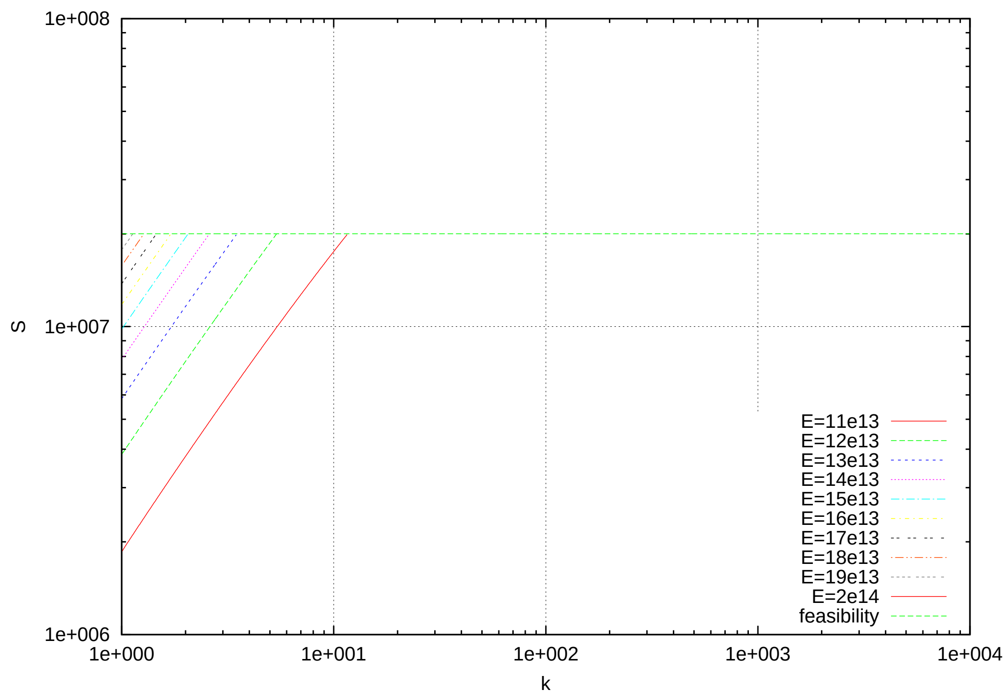

Fig. 240: Isoenergy map for idle power reduction k, and startup time S. Value of $Pc = 10$ used.

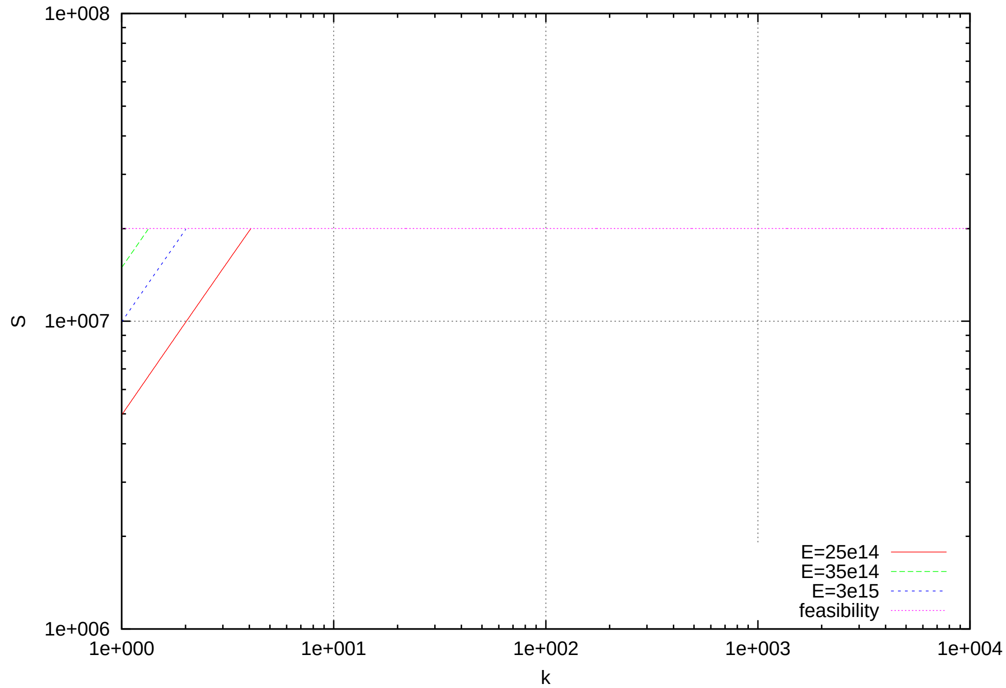

Fig. 241: Isoenergy map for idle power reduction k, and startup time S. Value of $Pn = 10$ used.

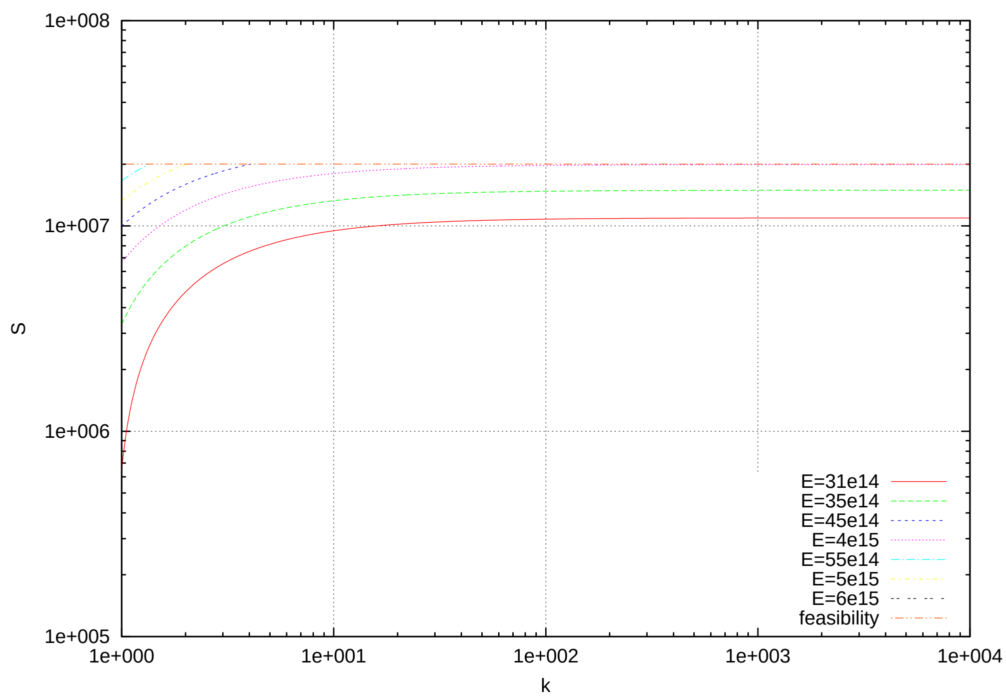

Fig. 242: Isoenergy map for idle power reduction k, and startup time S. Value of $Pn = 1E5$ used.

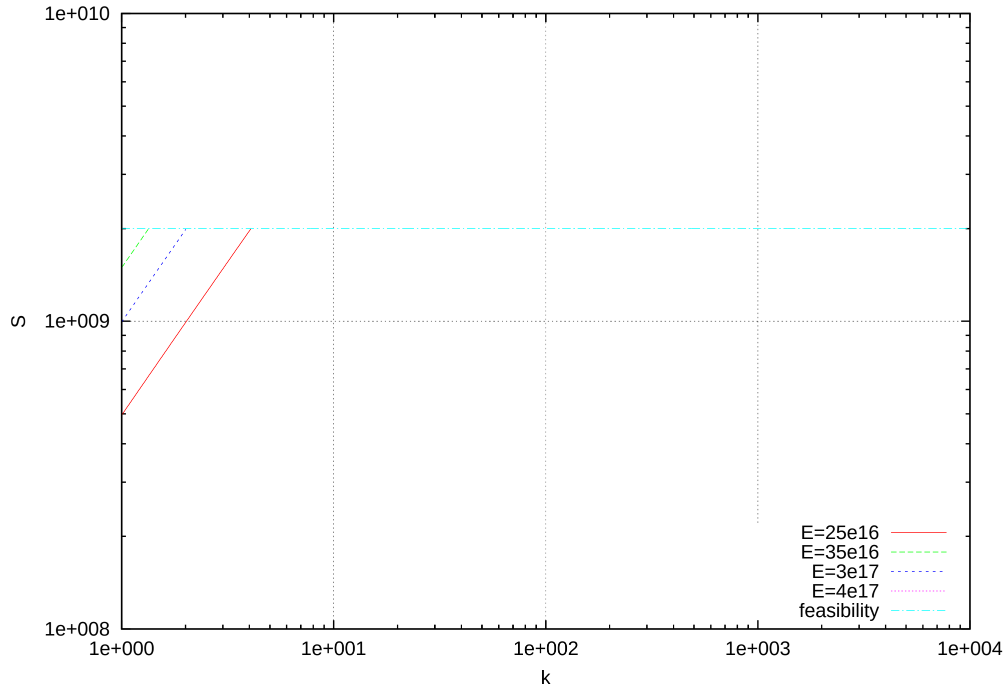

Fig. 243: Isoenergy map for idle power reduction k, and startup time S. Value of $V = 1E15$ used.

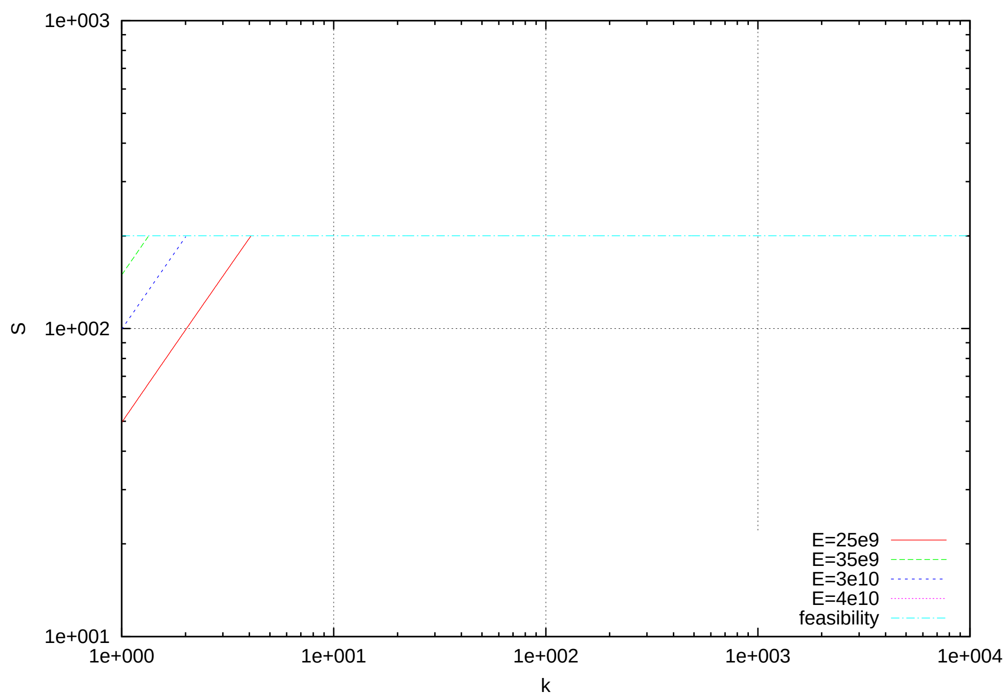

Fig. 244: Isoenergy map for idle power reduction k, and startup time S. Value of $V = 1E8$ used.

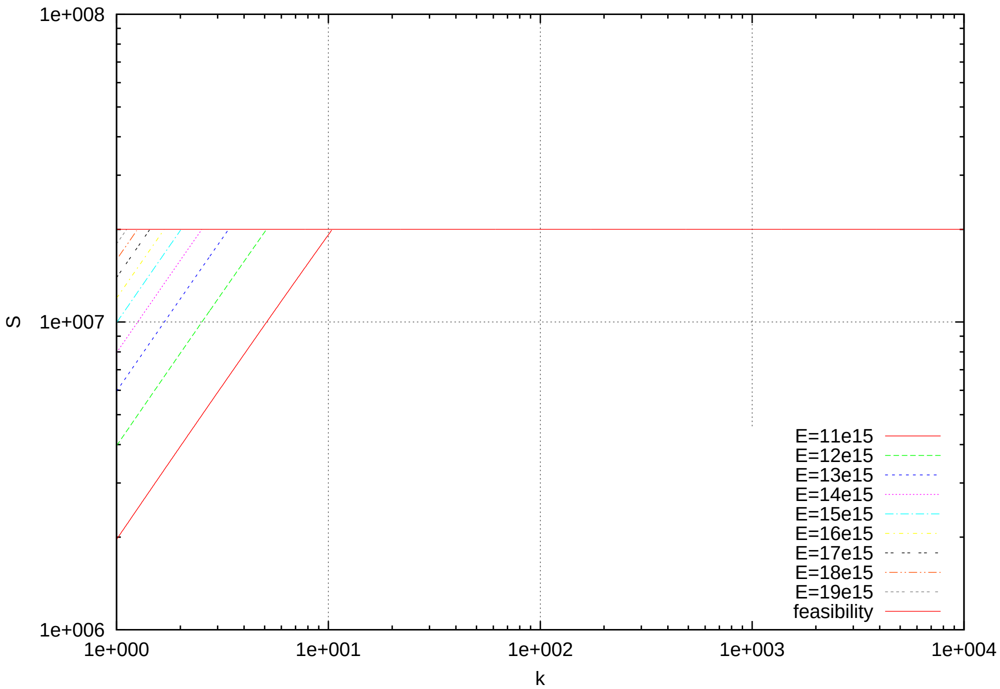

Fig. 245: Isoenergy map for idle power reduction k, and startup time S. Value of $Pc = 1E3$ used.

21 Isoenergy maps for idle power reduction k, and communication rate C.

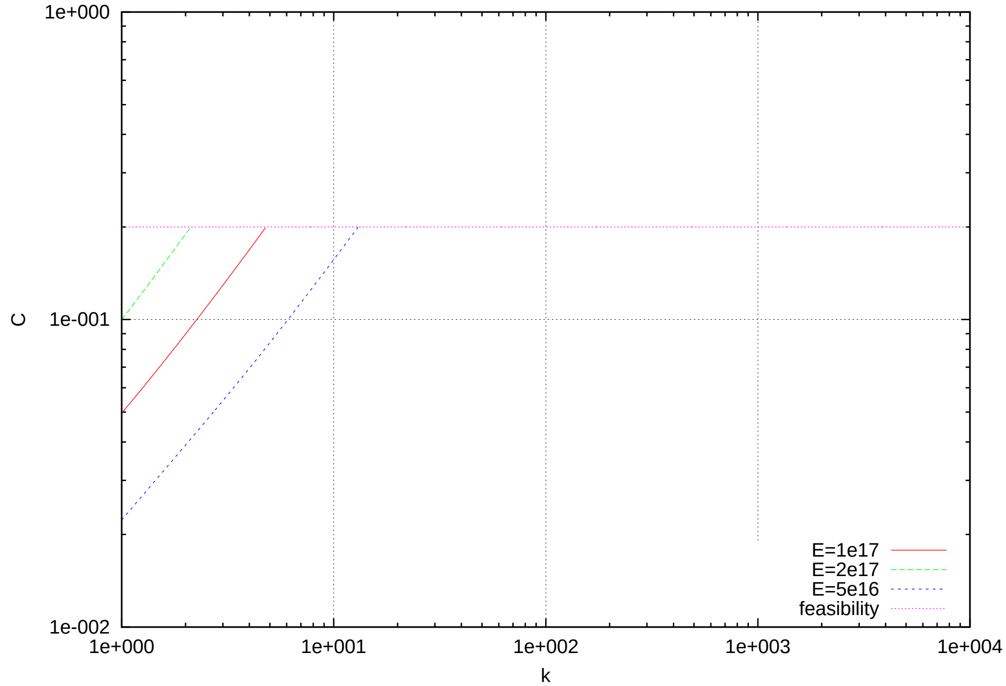

Fig. 246: Isoenergy map for idle power reduction k, and communication rate C. Value of $A = 10$ used.

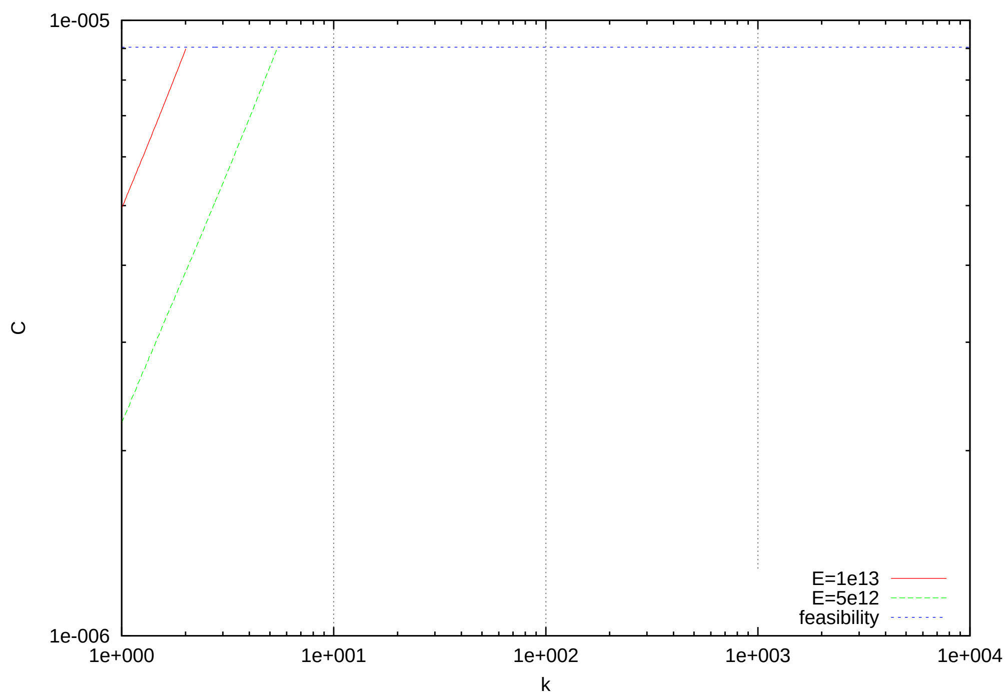

Fig. 247: Isoenergy map for idle power reduction k, and communication rate C. Value of $A = 1E-3$ used.

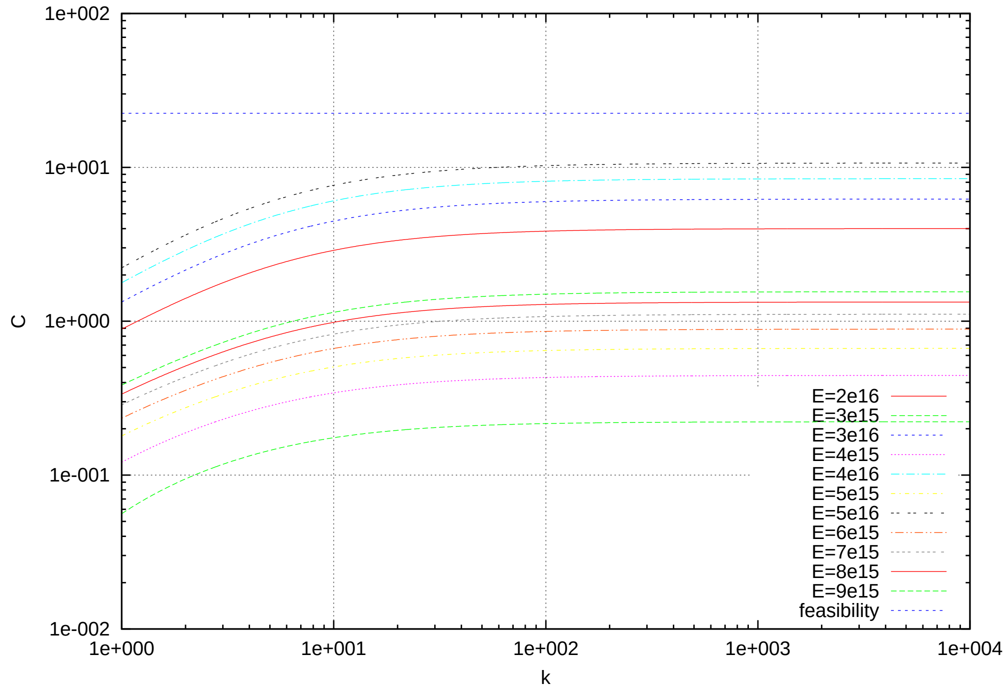

Fig. 248: Isoenergy map for idle power reduction k, and communication rate C. Value of $m = 10$ used.

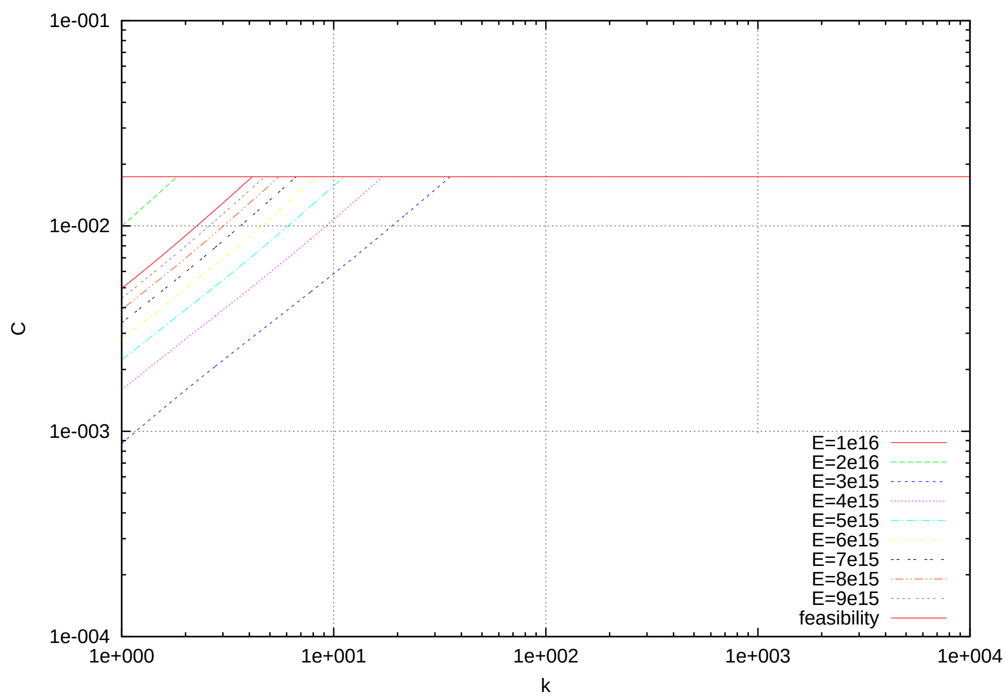

Fig. 249: Isoenergy map for idle power reduction k, and communication rate C. Value of $m = 1E3$ used.

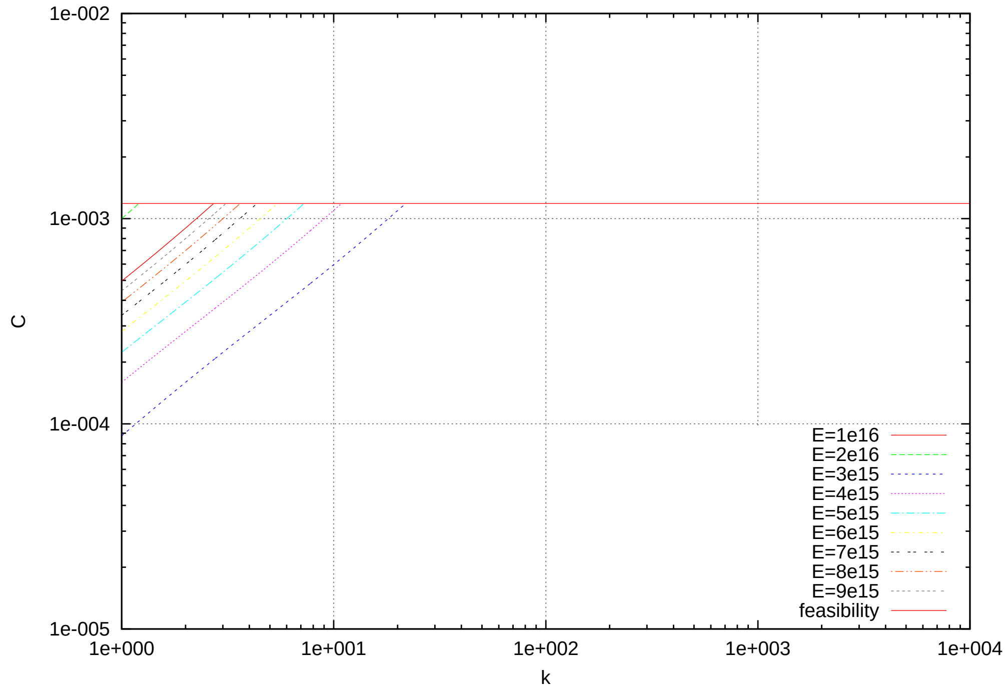

Fig. 250: Isoenergy map for idle power reduction k, and communication rate C. Value of $m = 1E4$ used.

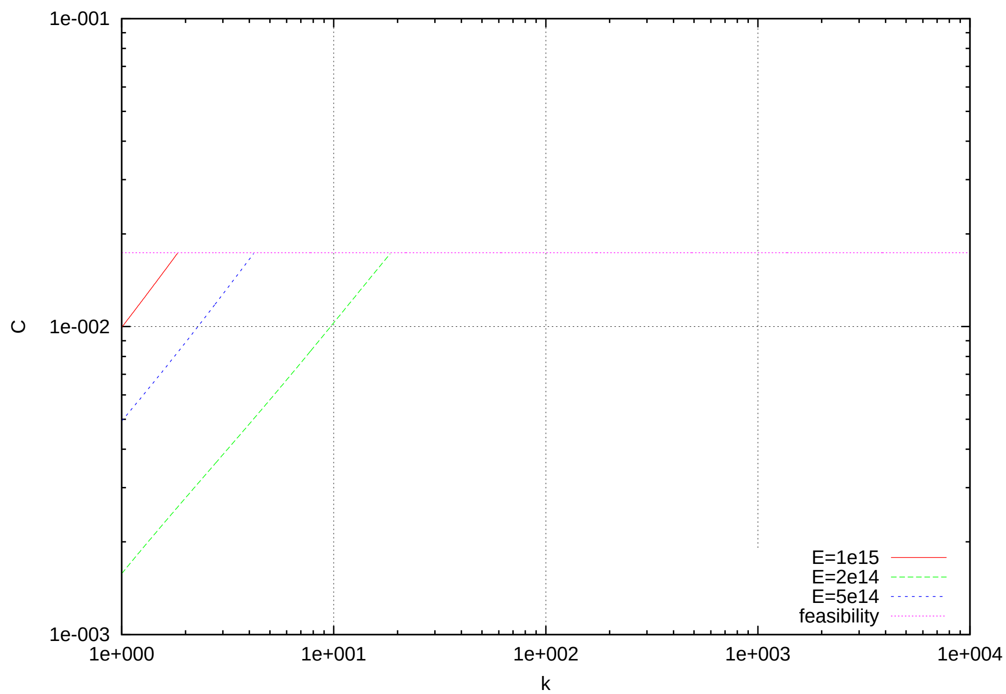

Fig. 251: Isoenergy map for idle power reduction k, and communication rate C. Value of $Pc = 10$ used.

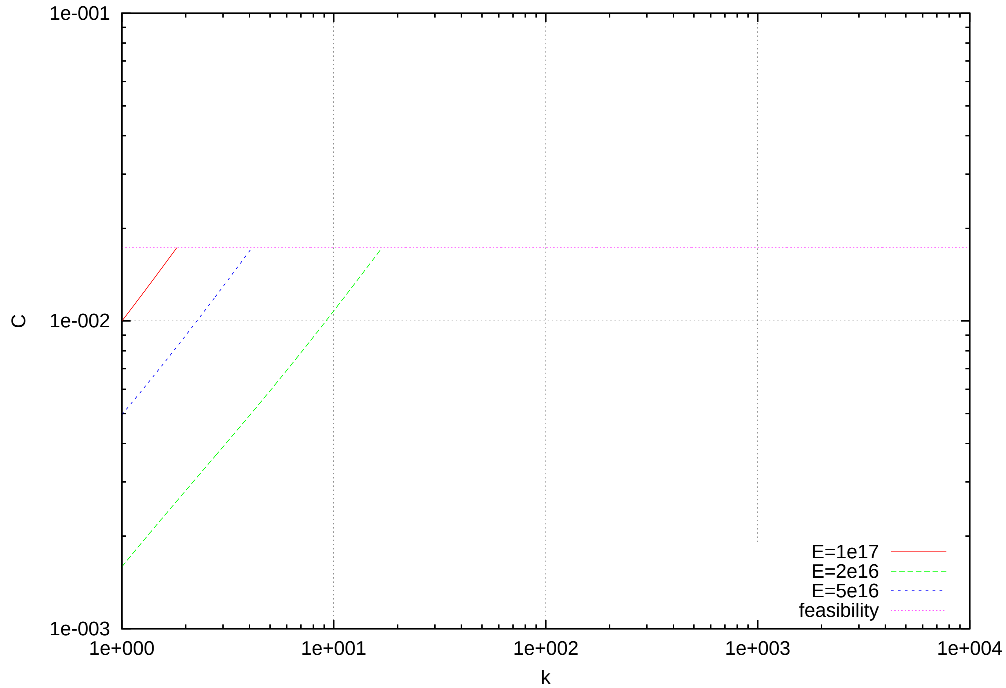

Fig. 252: Isoenergy map for idle power reduction k, and communication rate C. Value of $Pc = 1E3$ used.

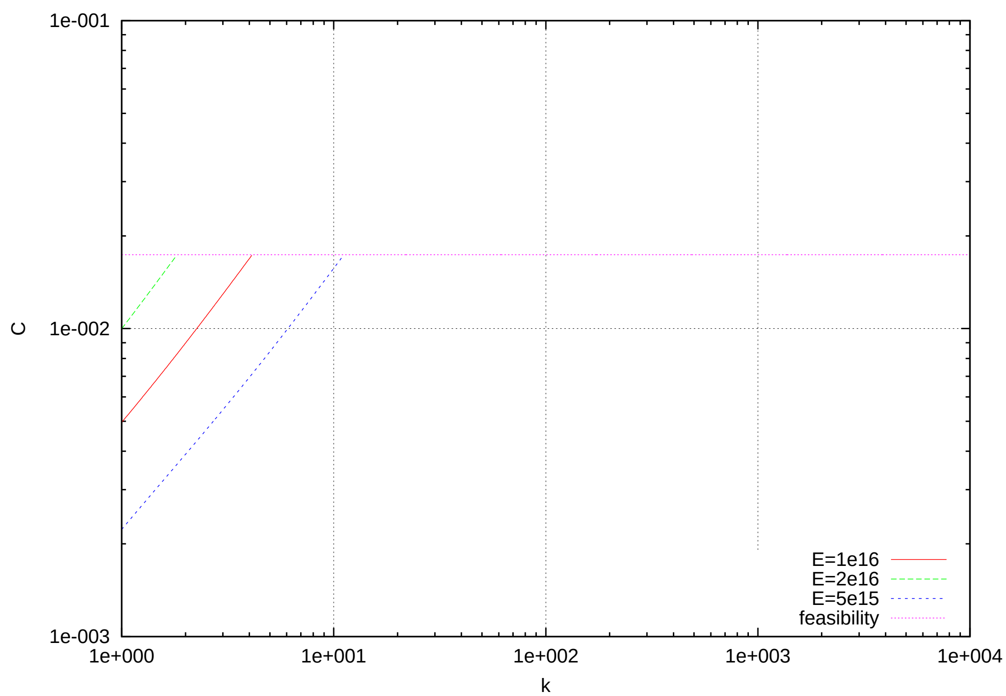

Fig. 253: Isoenergy map for idle power reduction k, and communication rate C. Value of $Pn = 10$ used.

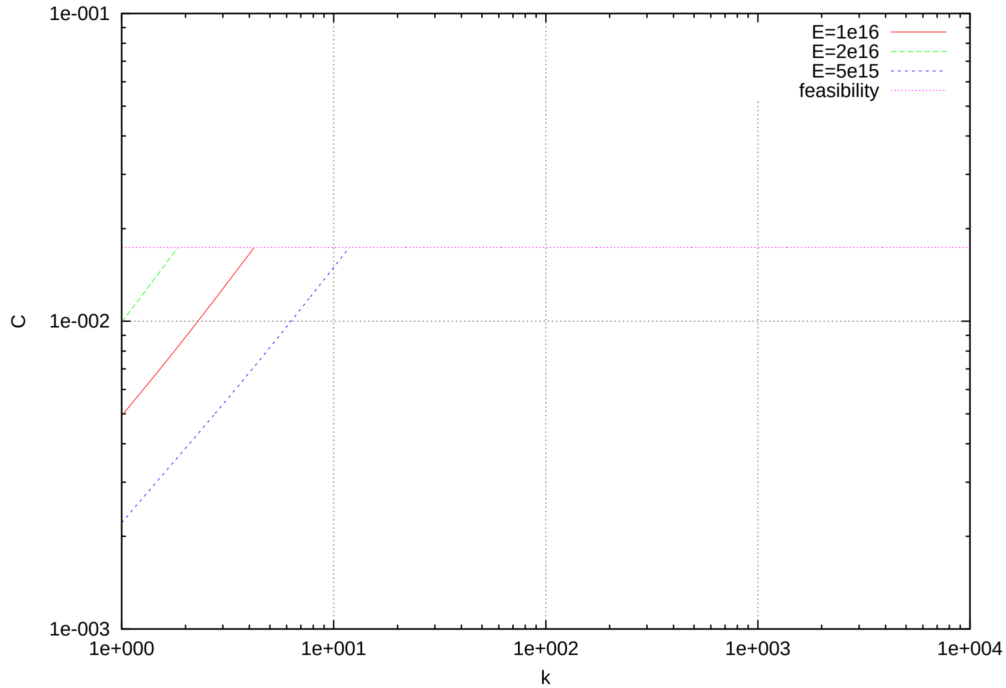

Fig. 254: Isoenergy map for idle power reduction k, and communication rate C. Value of $Pn = 1E5$ used.

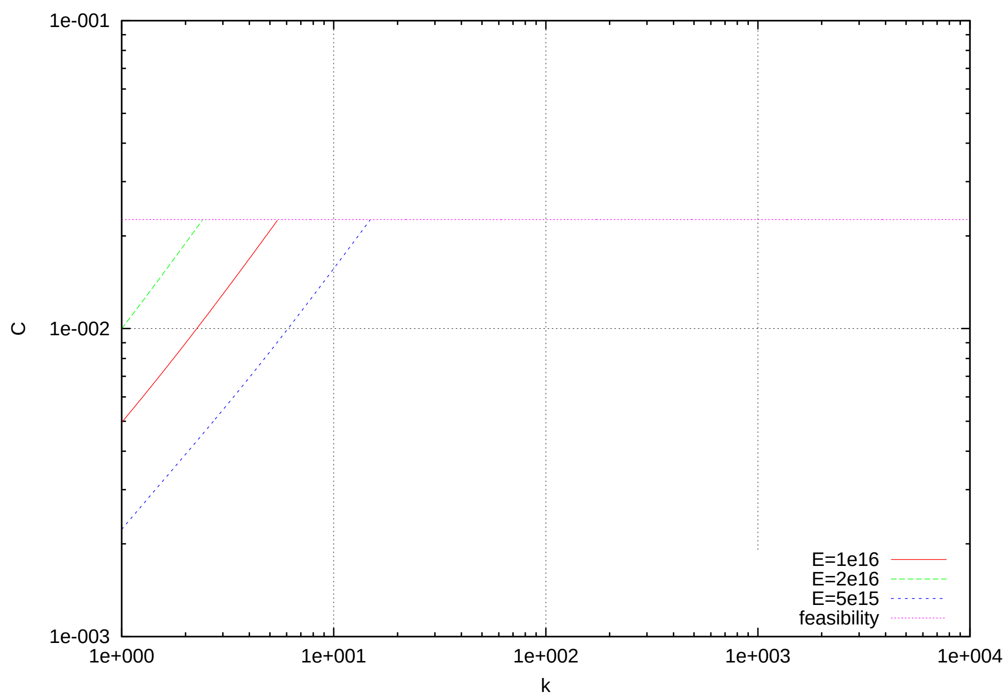

Fig. 255: Isoenergy map for idle power reduction k, and communication rate C. Value of $S = 1$ used.

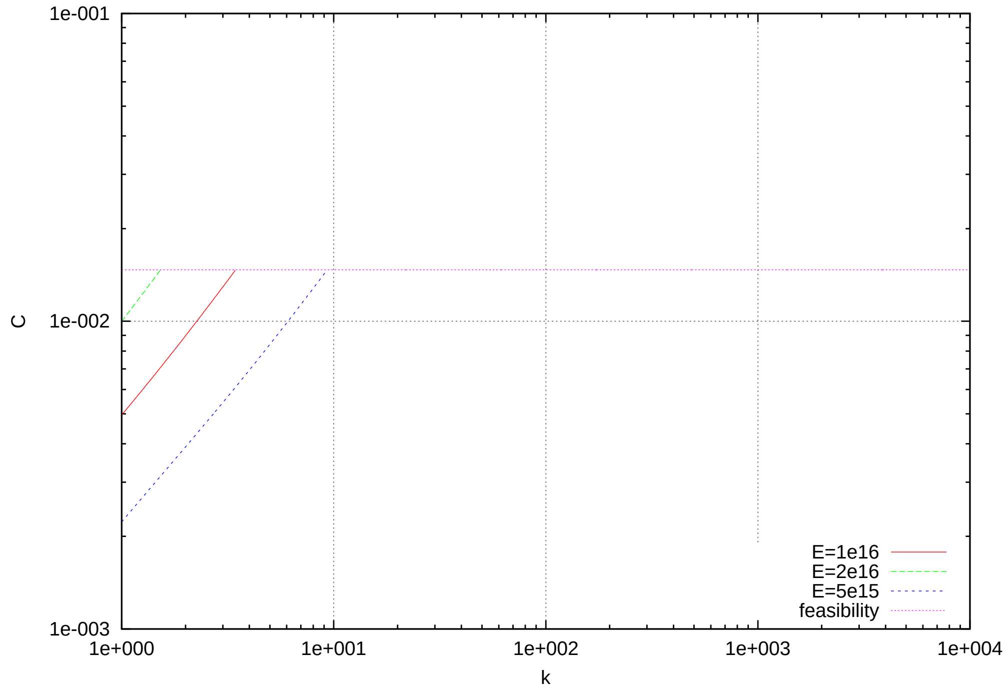

Fig. 256: Isoenergy map for idle power reduction k, and communication rate C. Value of $S = 1E3$ used.

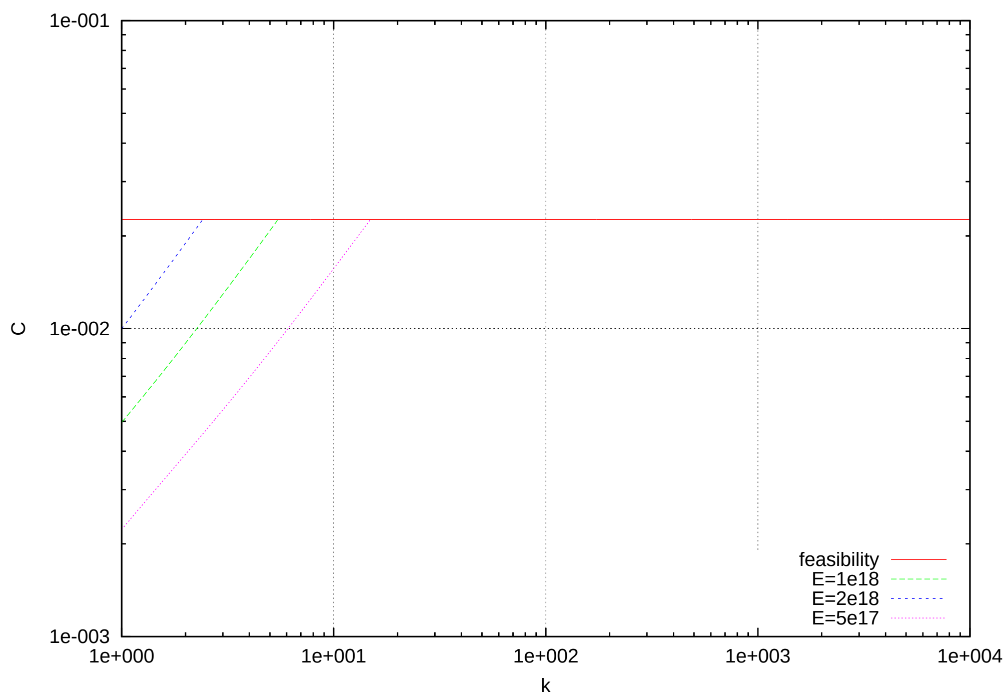

Fig. 257: Isoenergy map for idle power reduction k, and communication rate C. Value of $V = 15$ used.

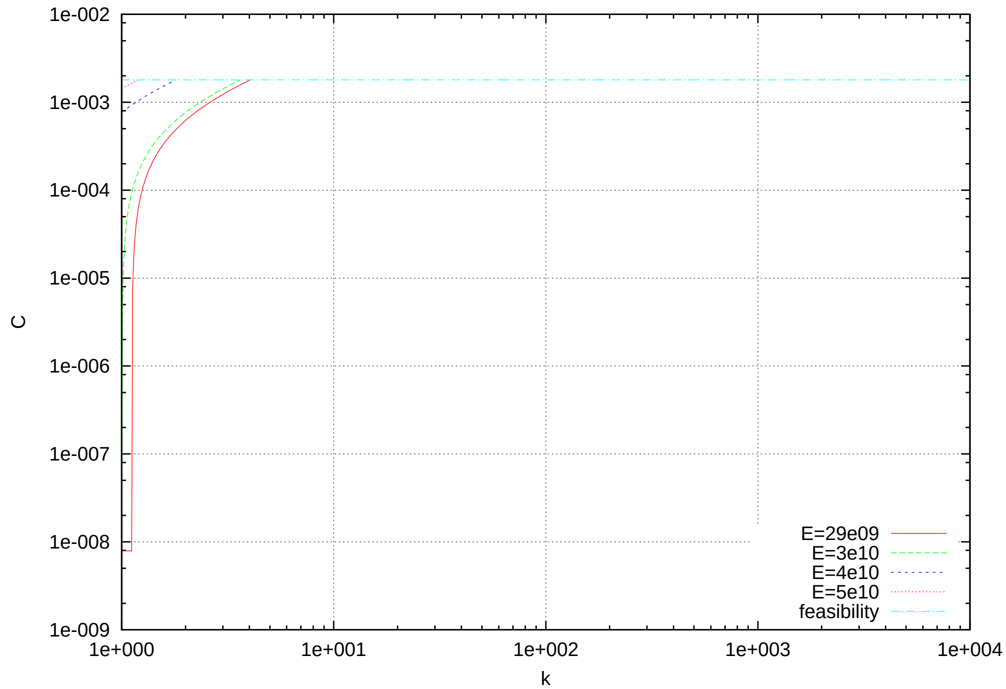

Fig. 258: Isoenergy map for idle power reduction k, and communication rate C. Value of $V = 8$ used.

22 Isoenergy maps for idle power reduction k, and computation rate A.

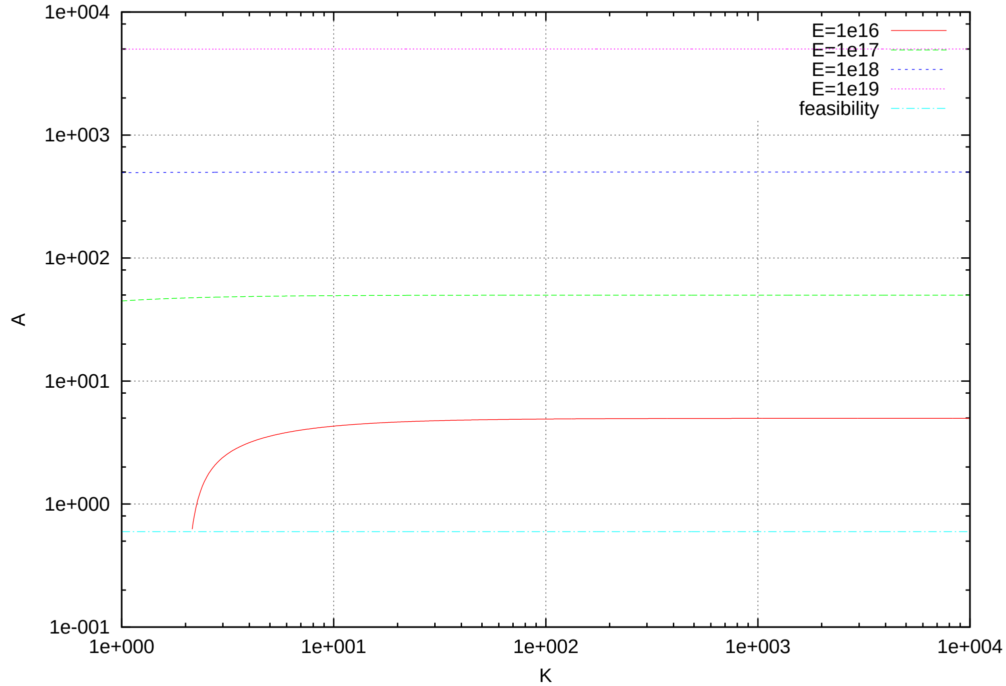

Fig. 259: Isoenergy map for idle power reduction k, and computation rate A. Value of $C = 1E-2$ used.

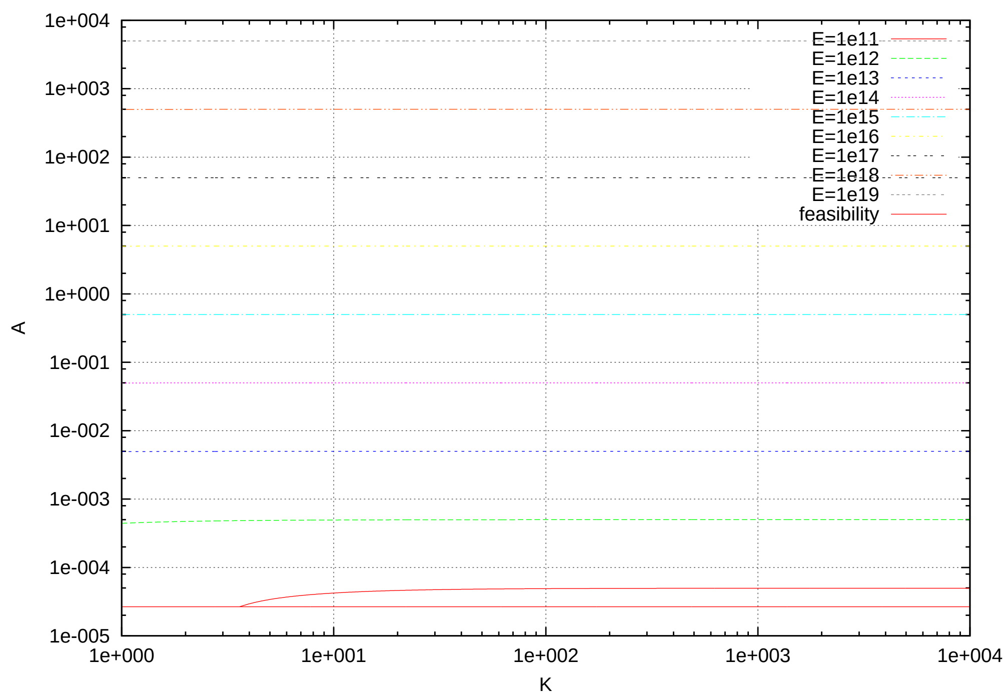

Fig. 260: Isoenergy map for idle power reduction k, and computation rate A. Value of $C = 1E-7$ used.

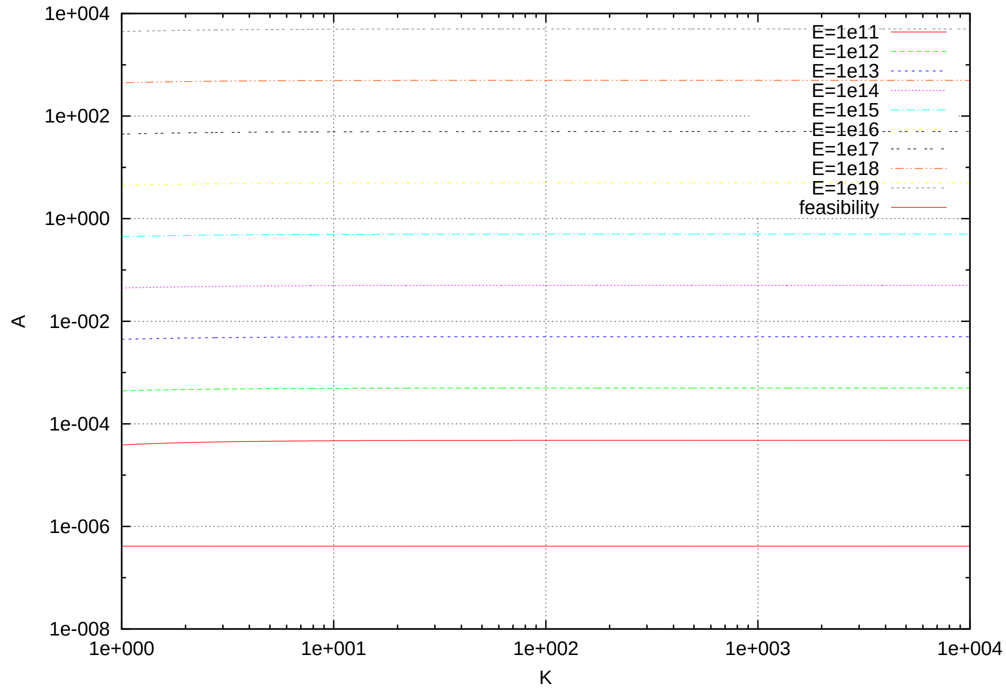

Fig. 261: Isoenergy map for idle power reduction k, and computation rate A. Value of $m = 10$ used.

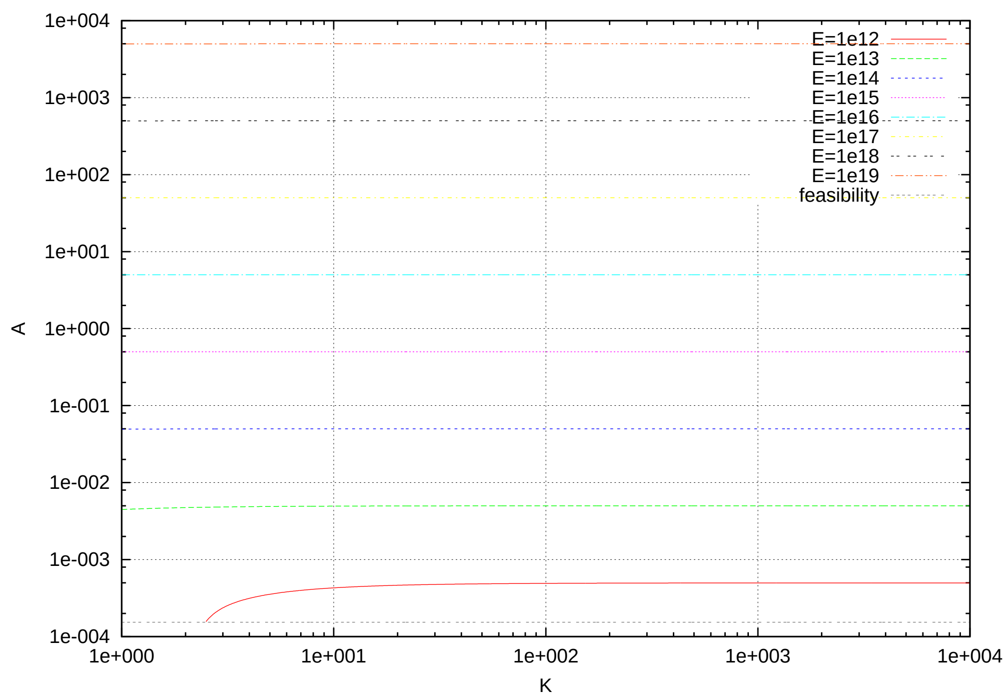

Fig. 262: Isoenergy map for idle power reduction k, and computation rate A. Value of $m = 1E3$ used.

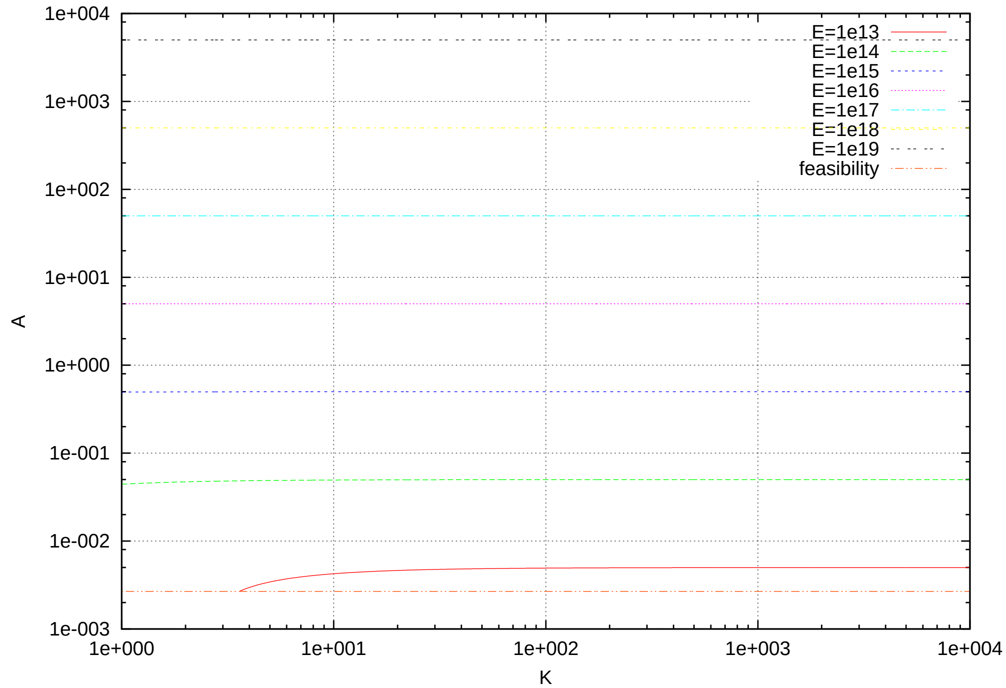

Fig. 263: Isoenergy map for idle power reduction k, and computation rate A. Value of $m = 1E4$ used.

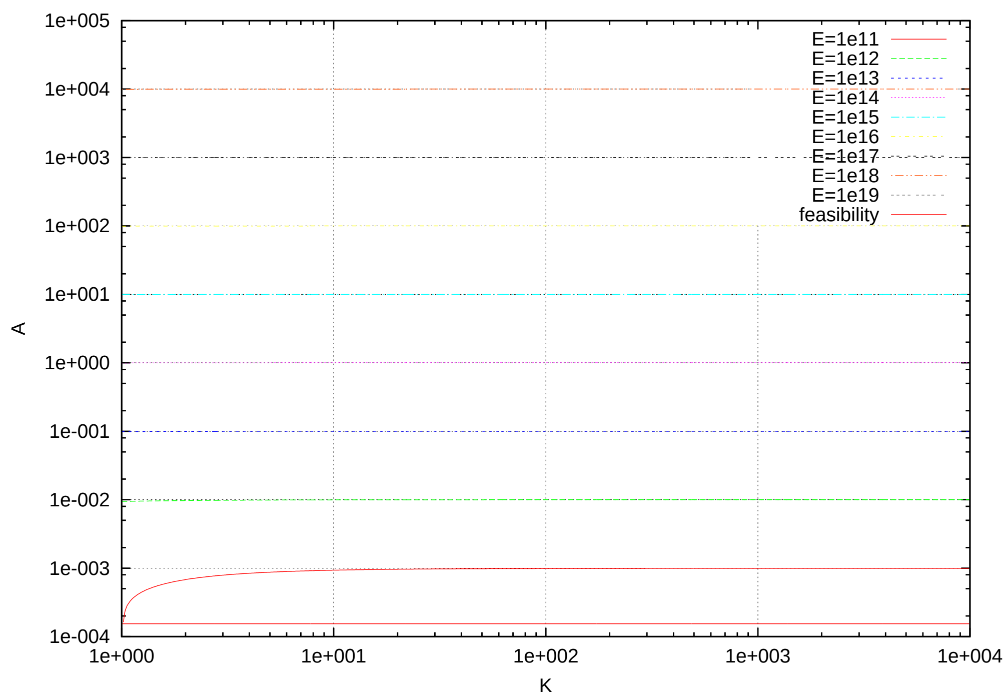

Fig. 264: Isoenergy map for idle power reduction k, and computation rate A. Value of $Pc = 10$ used.

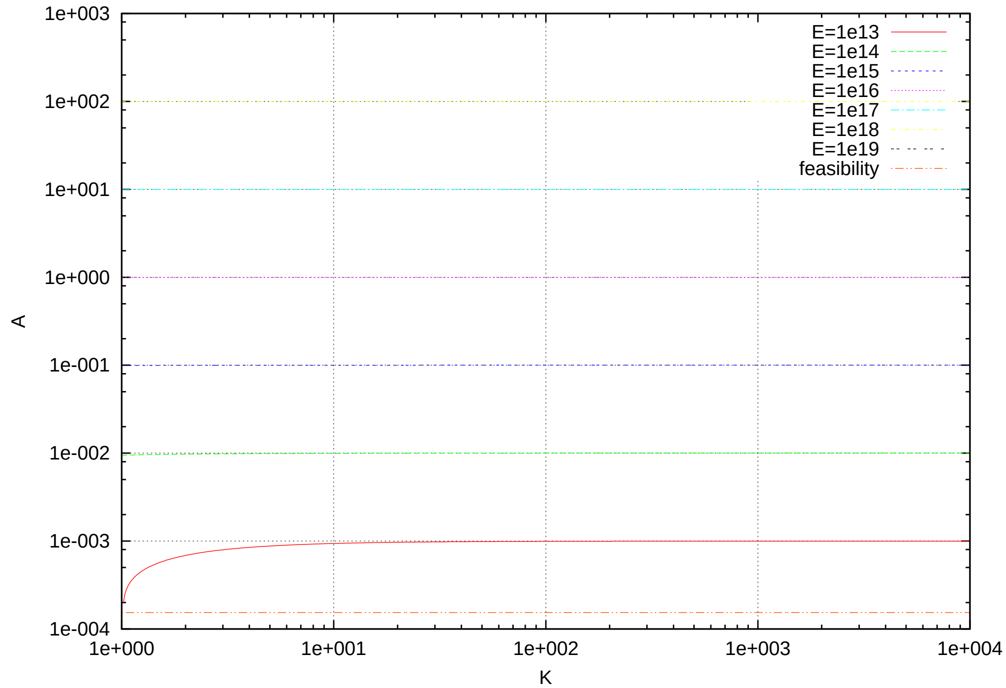

Fig. 265: Isoenergy map for idle power reduction k, and computation rate A. Value of $Pc = 1E3$ used.

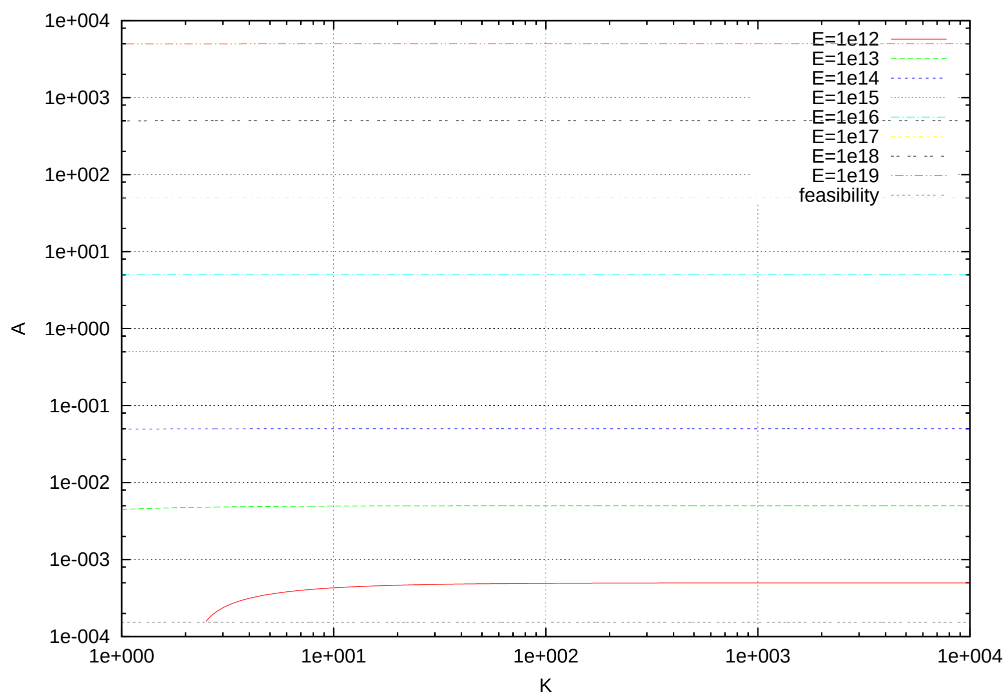

Fig. 266: Isoenergy map for idle power reduction k, and computation rate A. Value of $Pn = 10$ used.

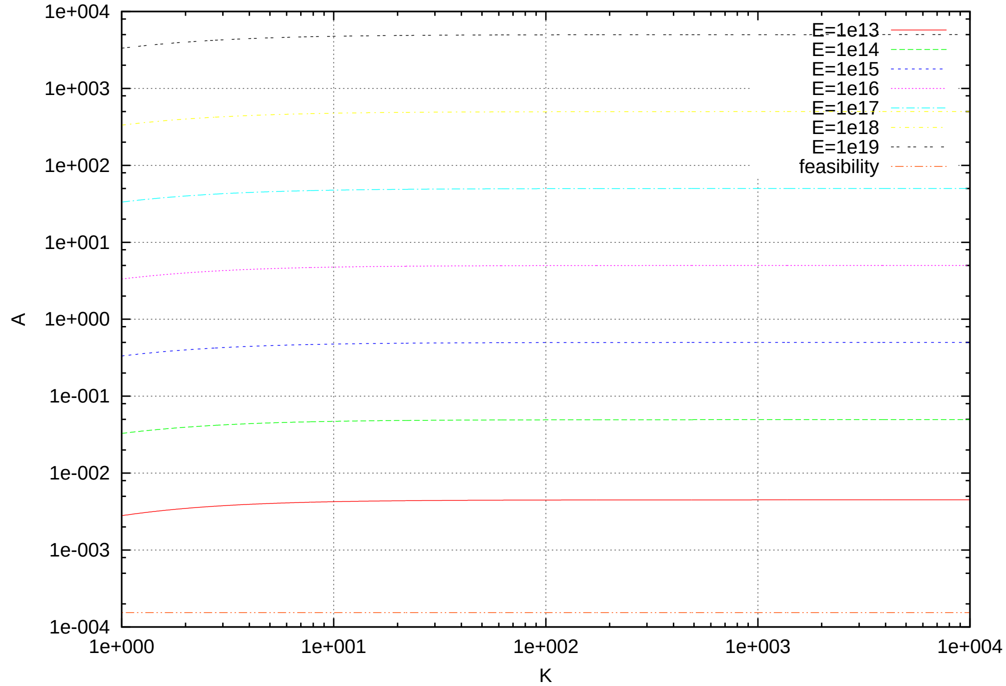

Fig. 267: Isoenergy map for idle power reduction k, and computation rate A. Value of $Pn = 1E5$ used.

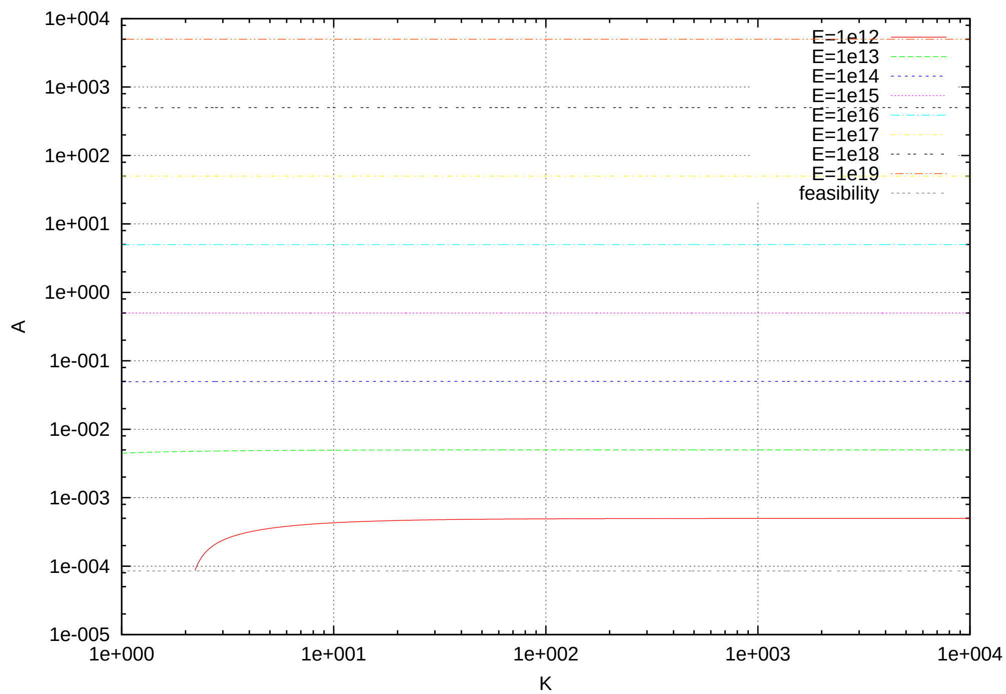

Fig. 268: Isoenergy map for idle power reduction k, and computation rate A. Value of $S = 1$ used.

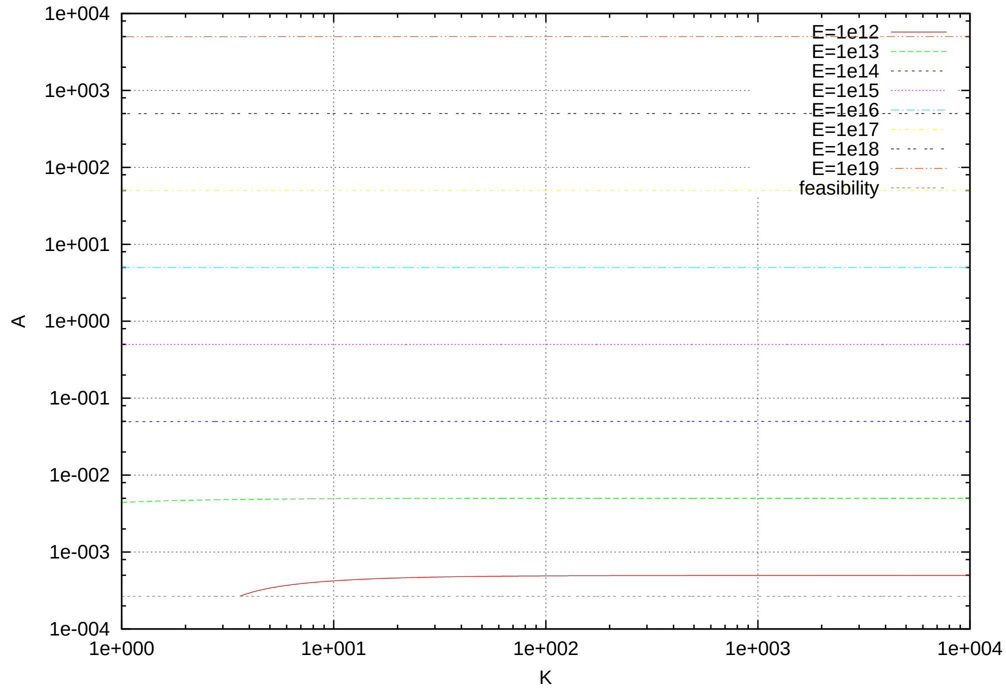

Fig. 269: Isoenergy map for idle power reduction k, and computation rate A. Value of $S = 1E3$ used.

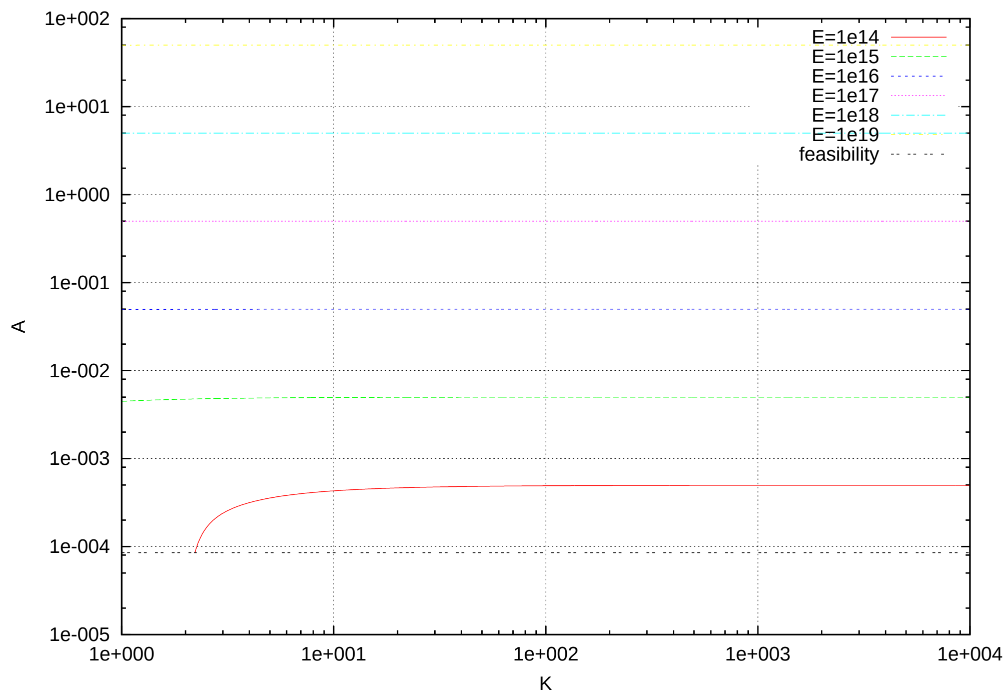

Fig. 270: Isoenergy map for idle power reduction k, and computation rate A. Value of $V = 1E15$ used.

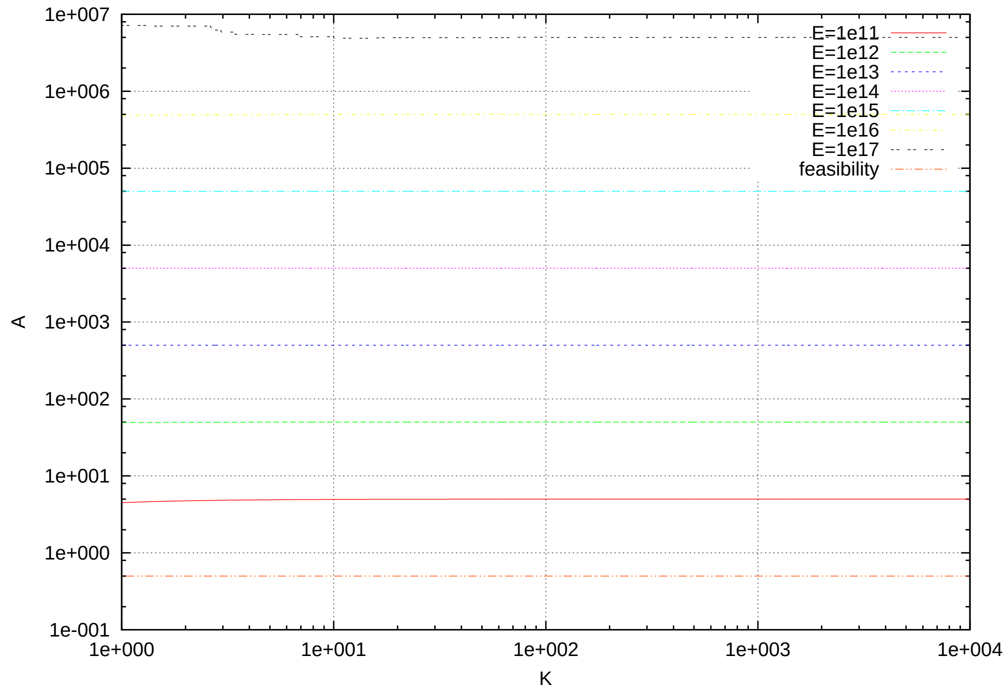

Fig. 271: Isoenergy map for idle power reduction k, and computation rate A. Value of $V = 1E8$ used.

23 Isoenergy maps for idle power reduction k, and load size V.

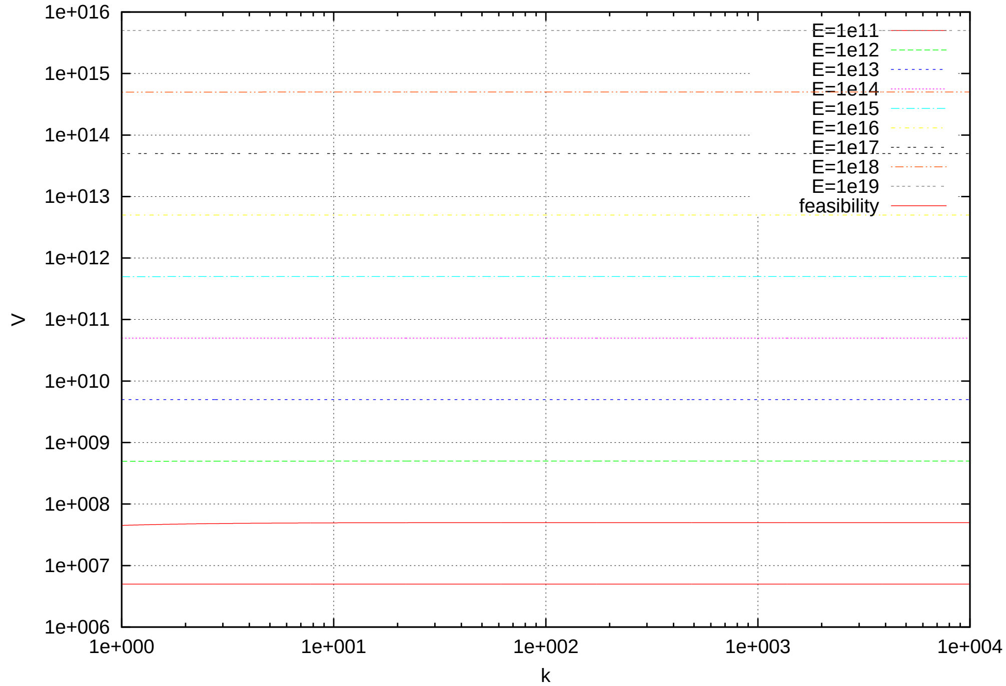

Fig. 272: Isoenergy map for idle power reduction k, and load size V. Value of $A = 10$ used.

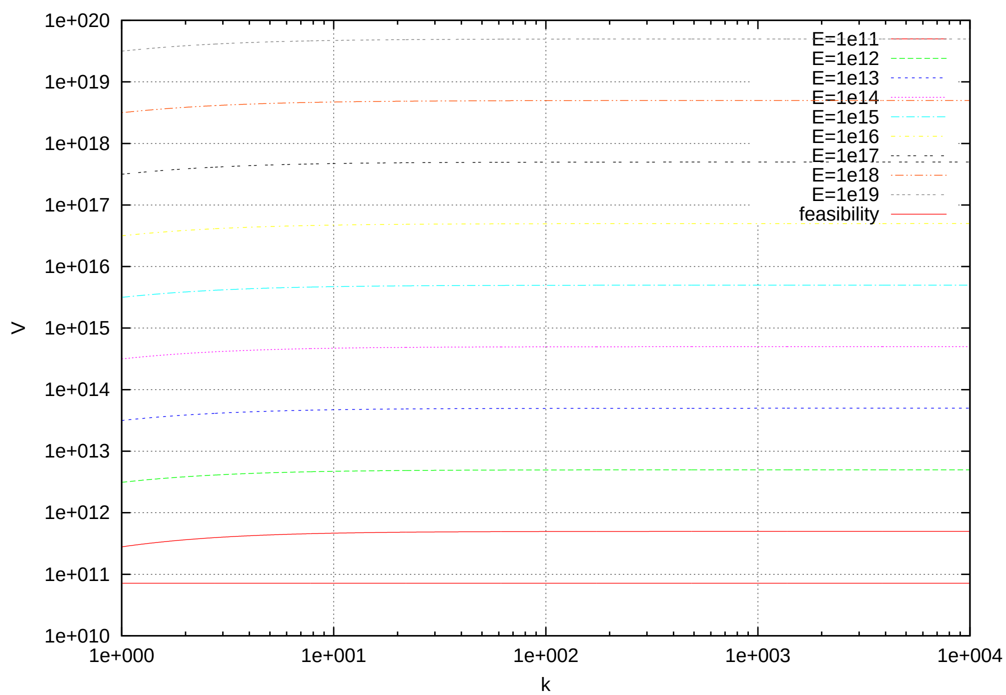

Fig. 273: Isoenergy map for idle power reduction k, and load size V. Value of $A = 1E-3$ used.

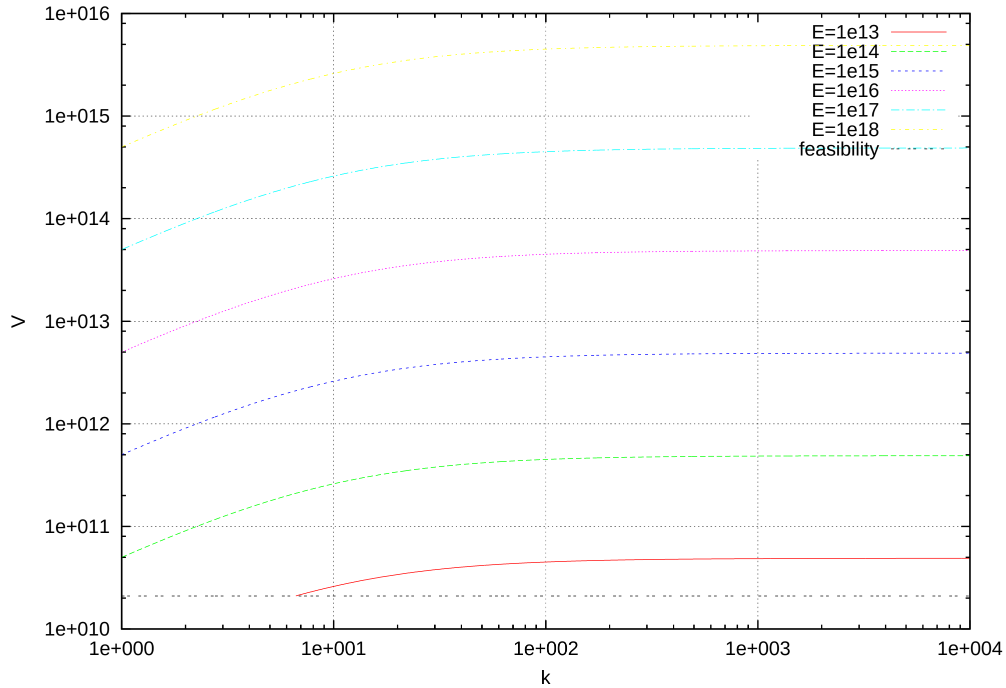

Fig. 274: Isoenergy map for idle power reduction k, and load size V. Value of $C = 1E - 2$ used.

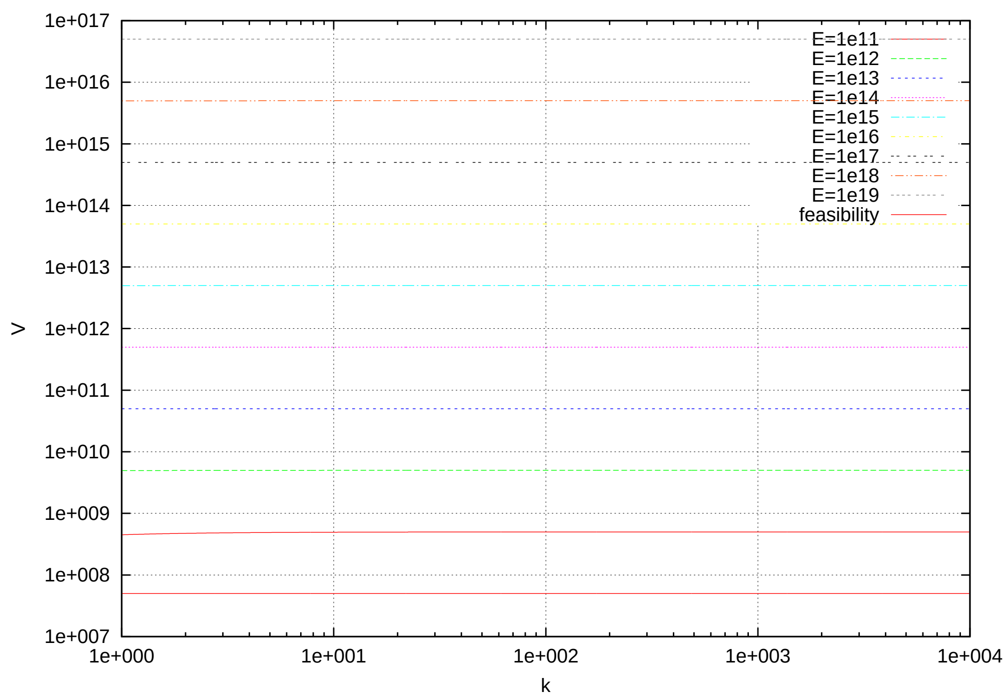

Fig. 275: Isoenergy map for idle power reduction k, and load size V. Value of $C = 1E - 8$ used.

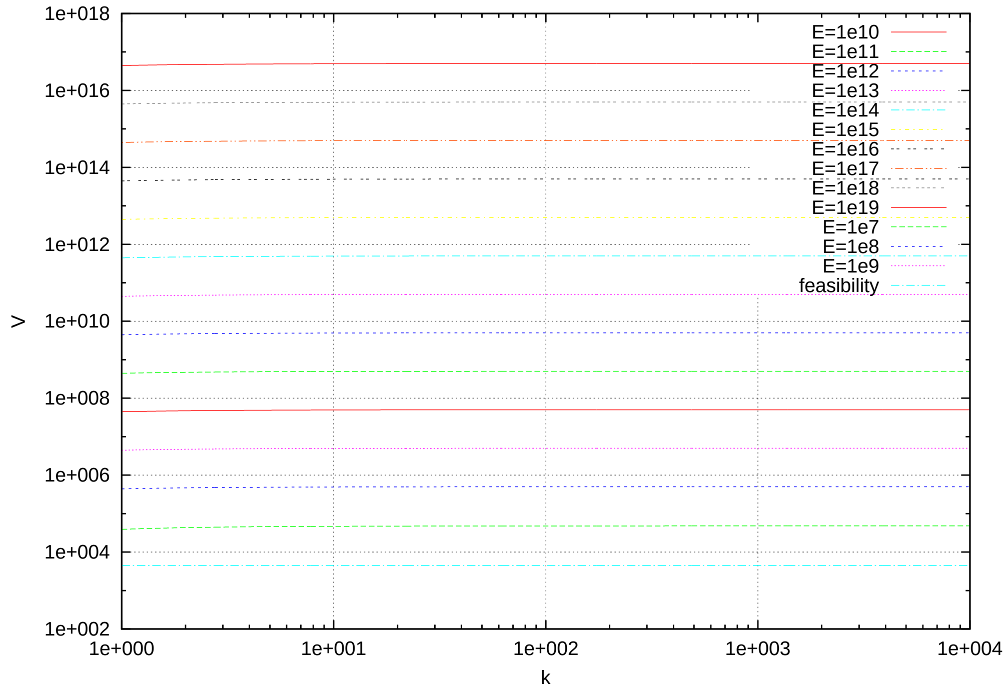

Fig. 276: Isoenergy map for idle power reduction k, and load size V. Value of $m = 10$ used.

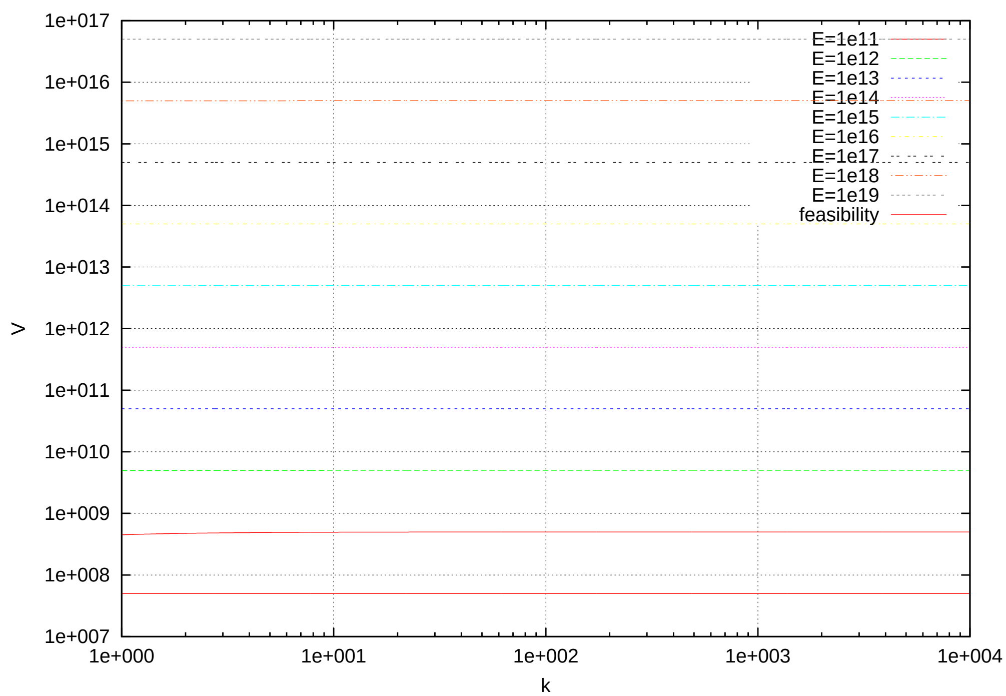

Fig. 277: Isoenergy map for idle power reduction k, and load size V. Value of $m = 1E3$ used.

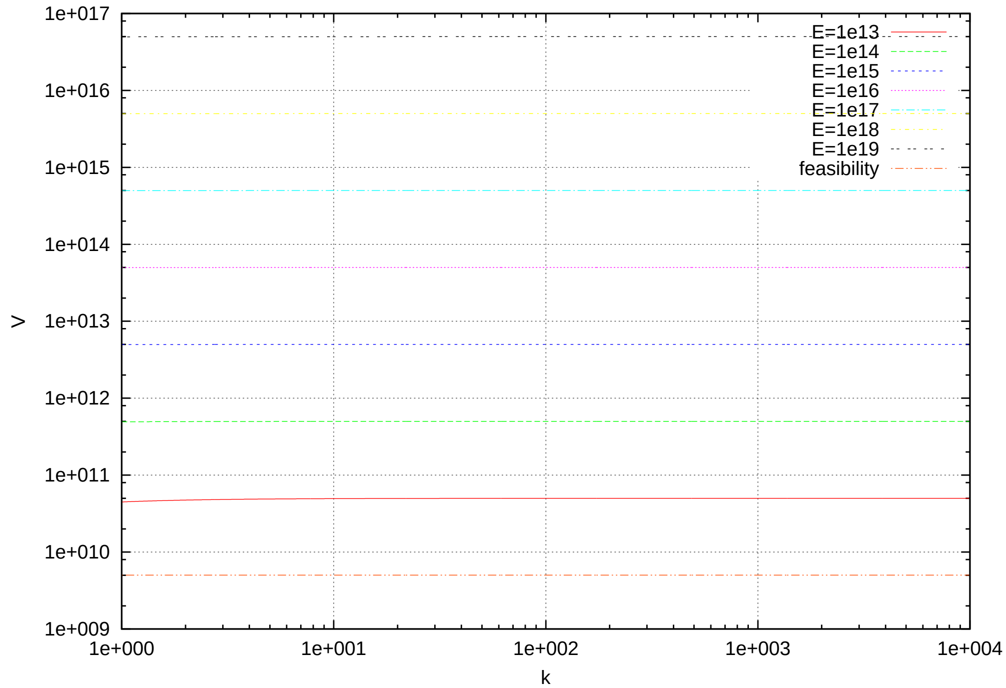

Fig. 278: Isoenergy map for idle power reduction k, and load size V. Value of $m = 1E4$ used.

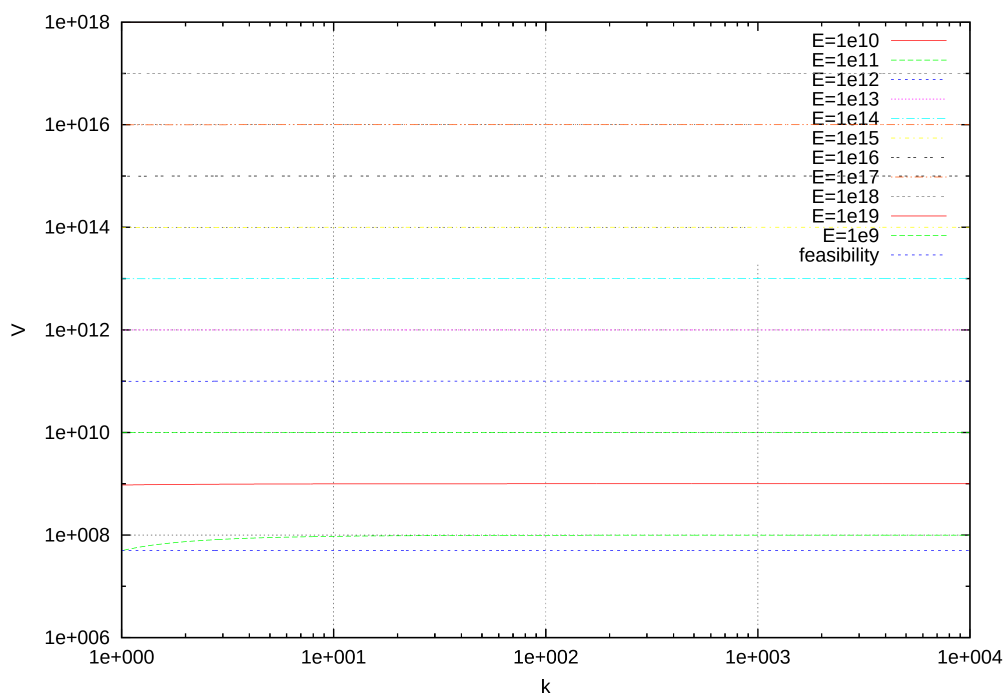

Fig. 279: Isoenergy map for idle power reduction k, and load size V. Value of $Pc = 10$ used.

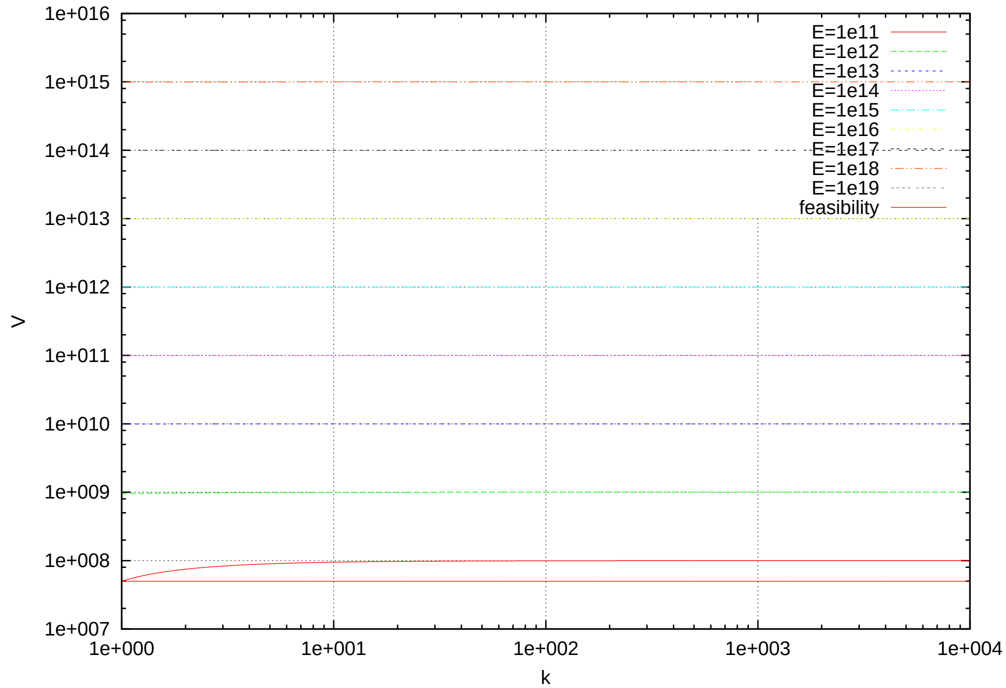

Fig. 280: Isoenergy map for idle power reduction k, and load size V. Value of $Pc = 1E3$ used.

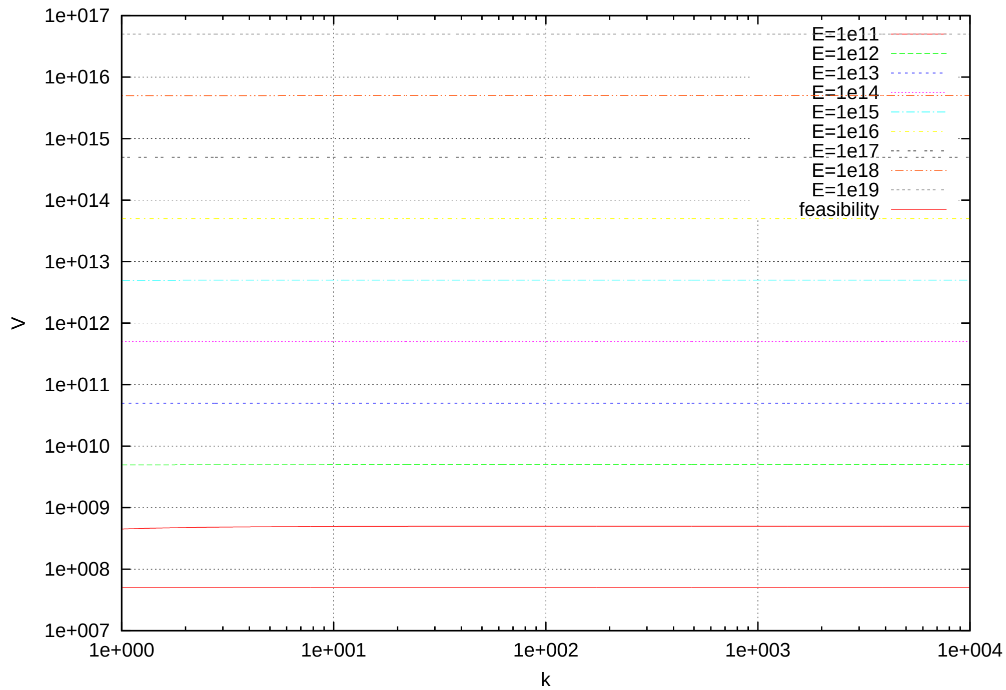

Fig. 281: Isoenergy map for idle power reduction k, and load size V. Value of $Pn = 10$ used.

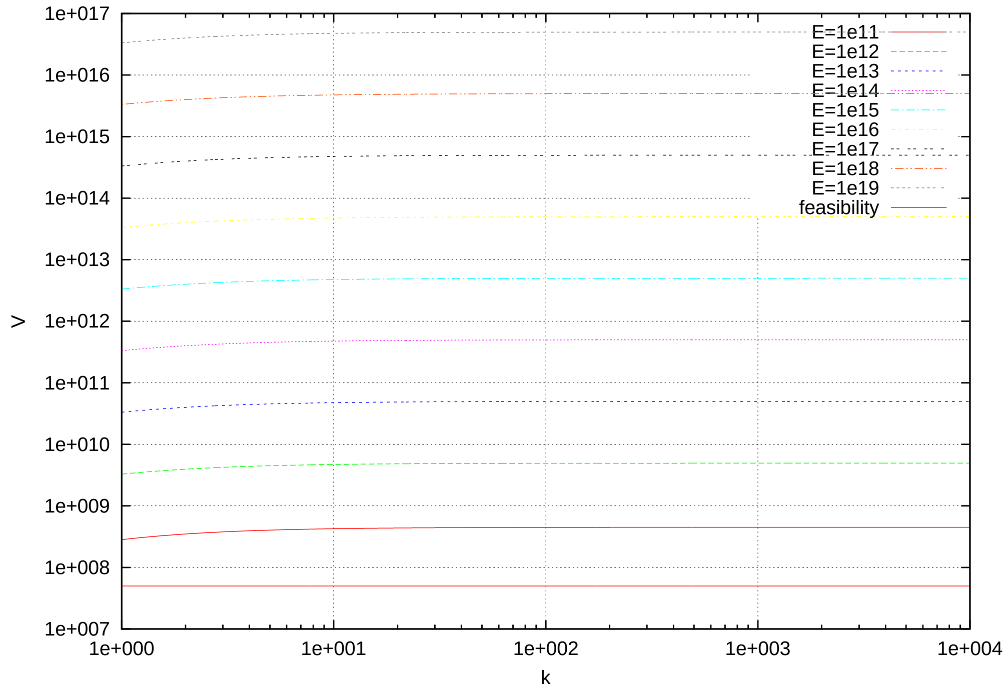

Fig. 282: Isoenergy map for idle power reduction k, and load size V. Value of $Pn = 1E5$ used.

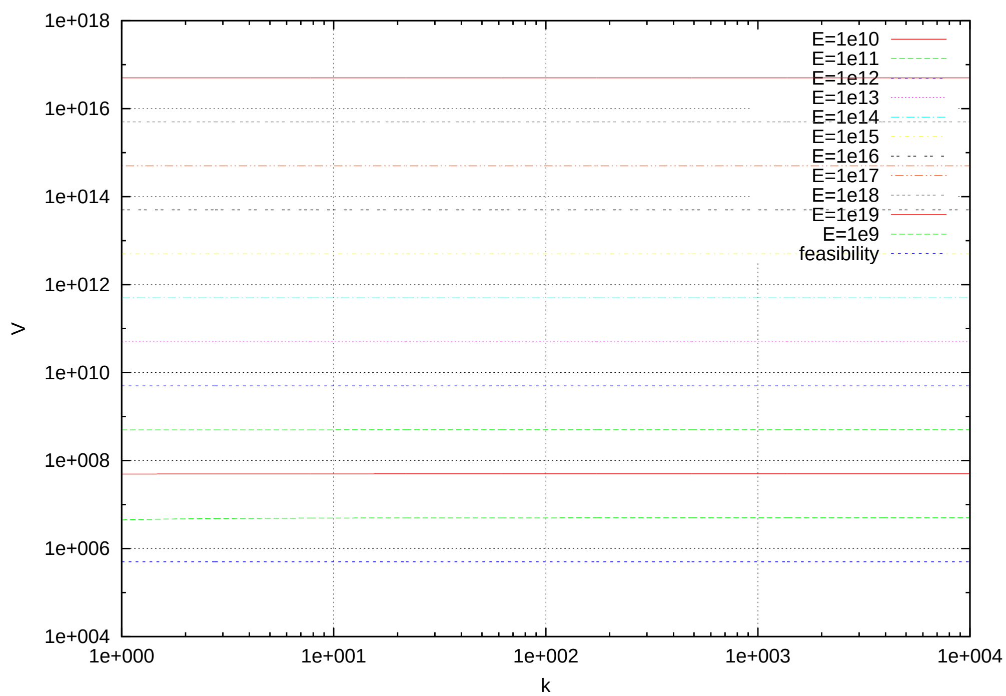

Fig. 283: Isoenergy map for idle power reduction k, and load size V. Value of $S = 1$ used.

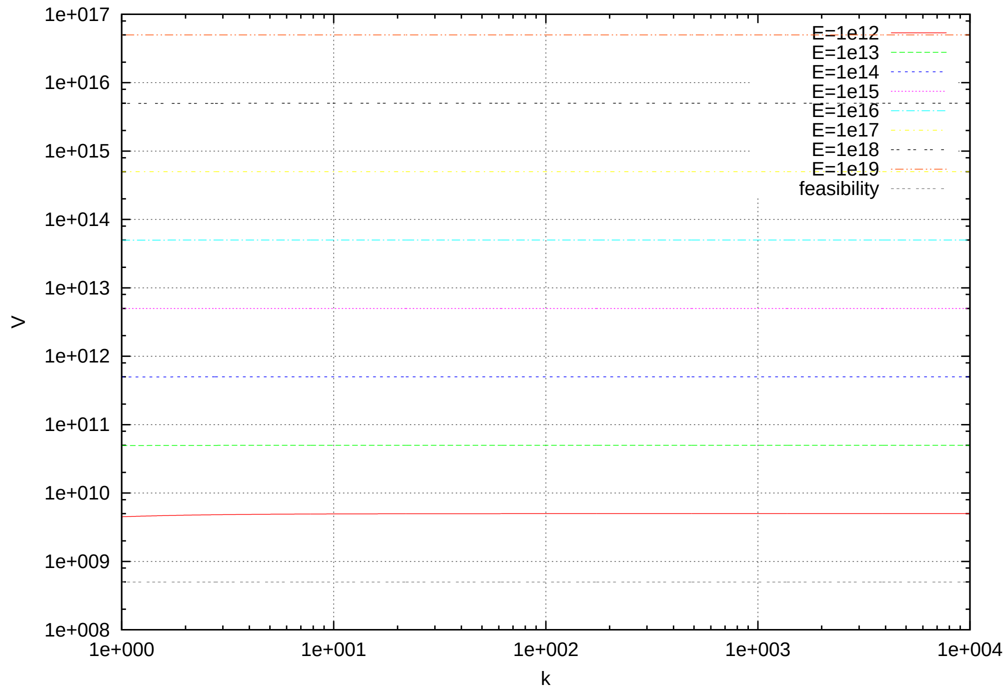

Fig. 284: Isoenergy map for idle power reduction k, and load size V. Value of $S = 1E3$ used.

24 Isoenergy maps for computation rate A, and startup time S.

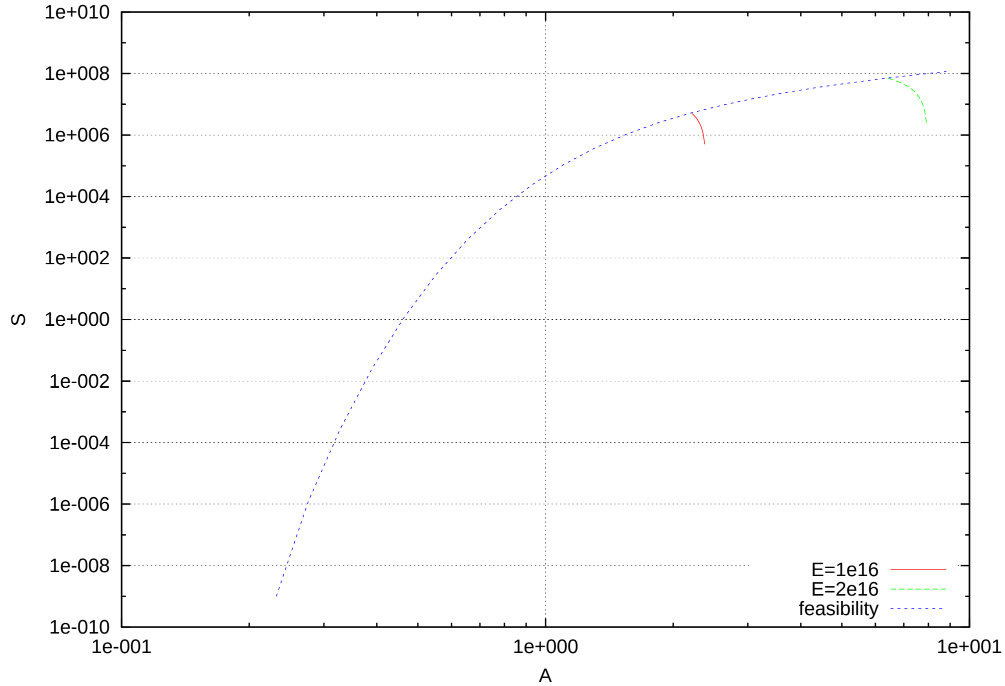

Fig. 285: Isoenergy map for computation rate A, and startup time S. Value of $C = 1E-2$ used.

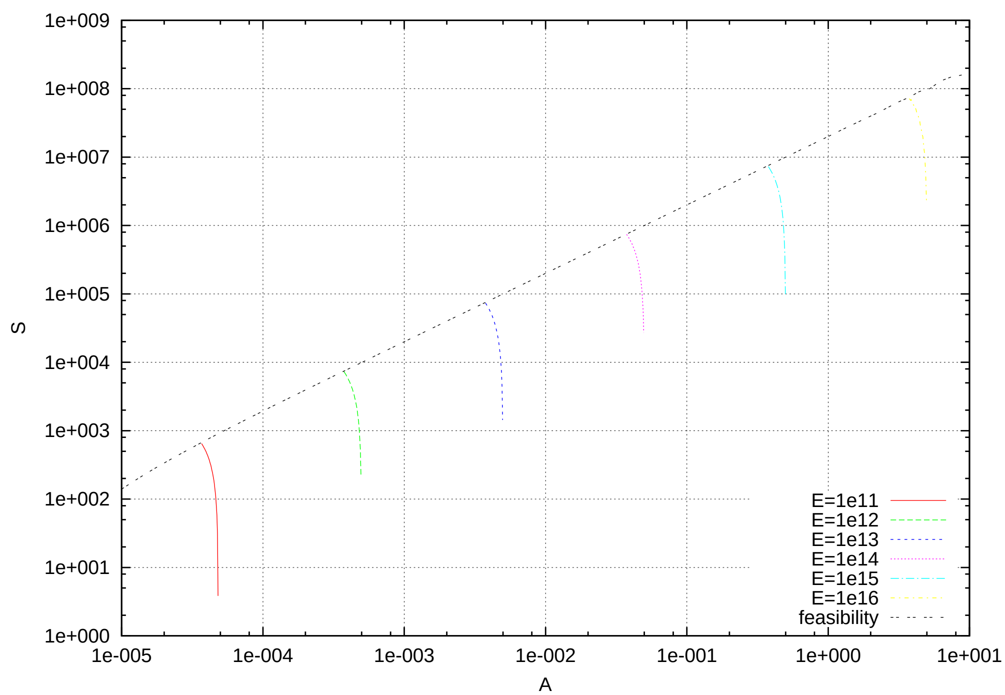

Fig. 286: Isoenergy map for computation rate A, and startup time S. Value of $C = 1E-8$ used.

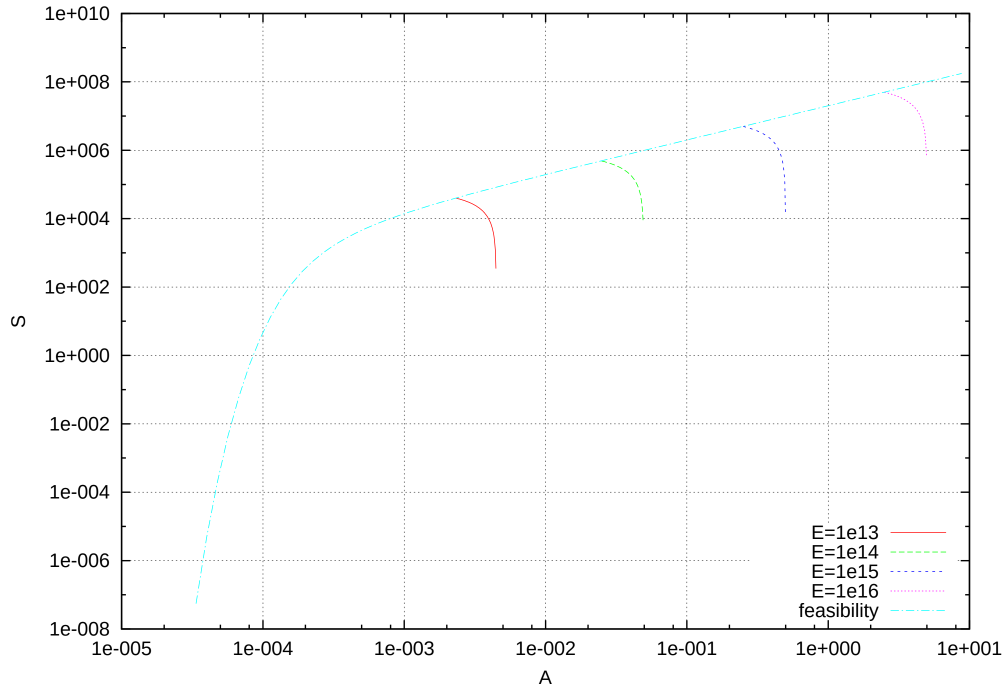

Fig. 287: Isoenergy map for computation rate A, and startup time S. Value of $k = 1$ used.

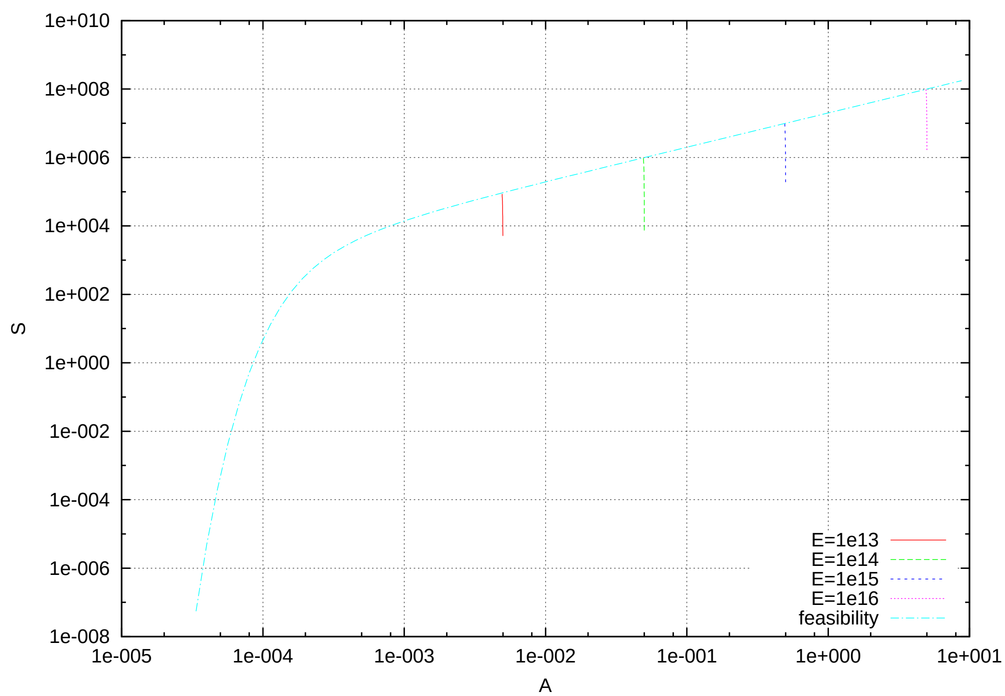

Fig. 288: Isoenergy map for computation rate A, and startup time S. Value of $k = 100$ used.

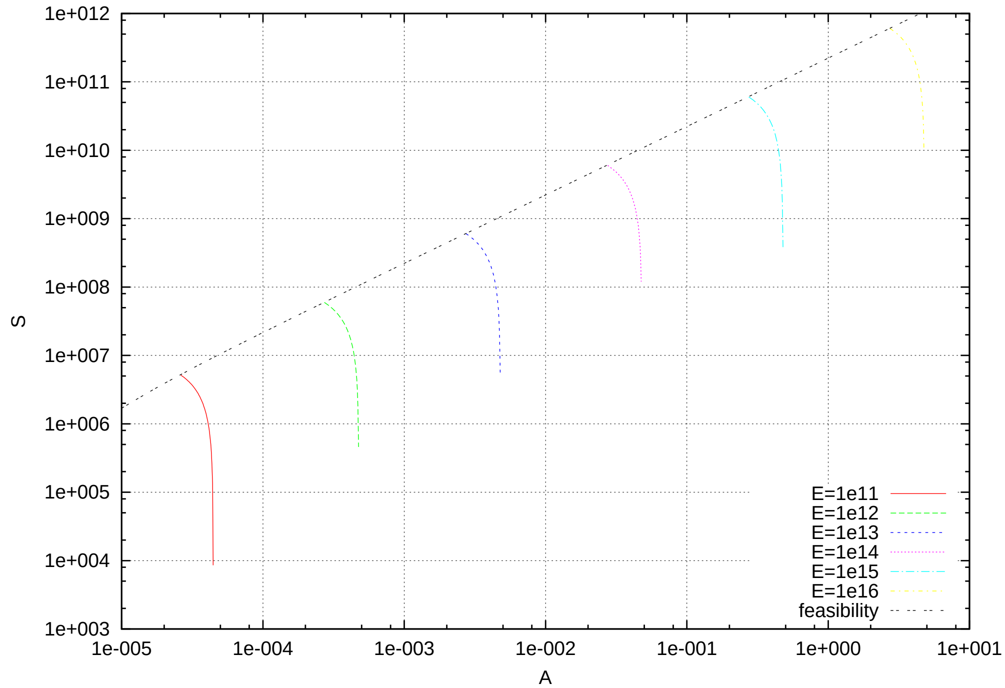

Fig. 289: Isoenergy map for computation rate A, and startup time S. Value of $m = 10$ used.

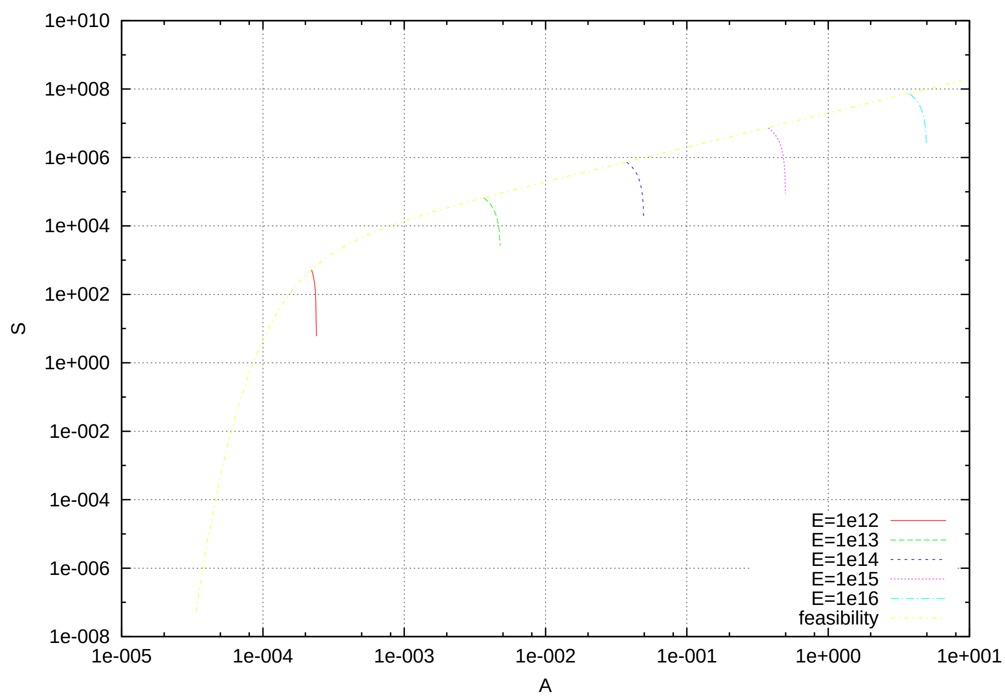

Fig. 290: Isoenergy map for computation rate A, and startup time S. Value of $m = 1E3$ used.

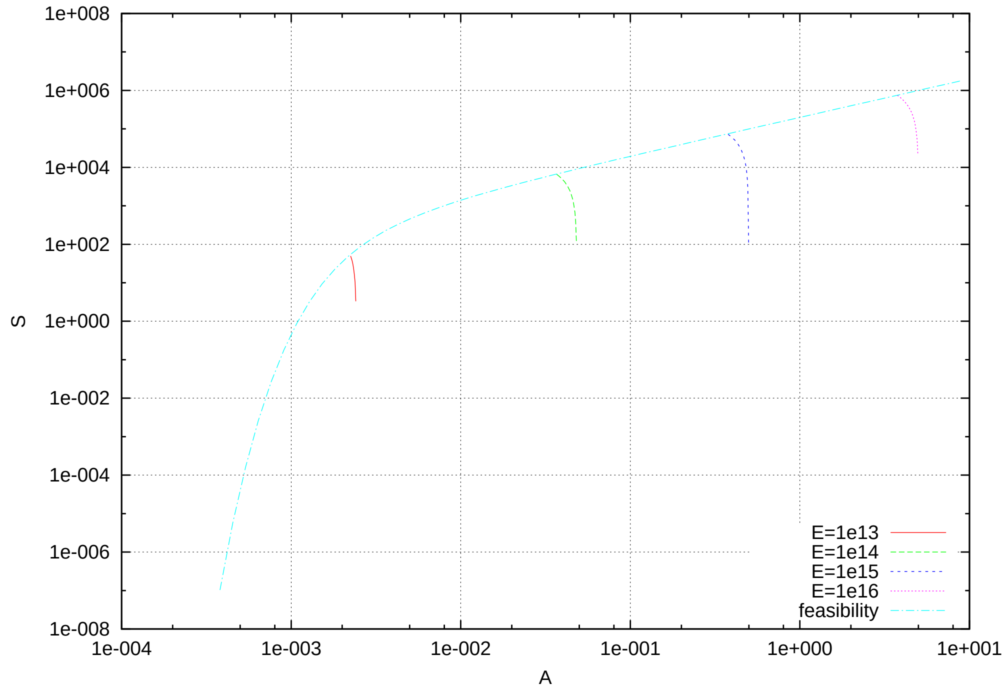

Fig. 291: Isoenergy map for computation rate A, and startup time S. Value of $m = 1E4$ used.

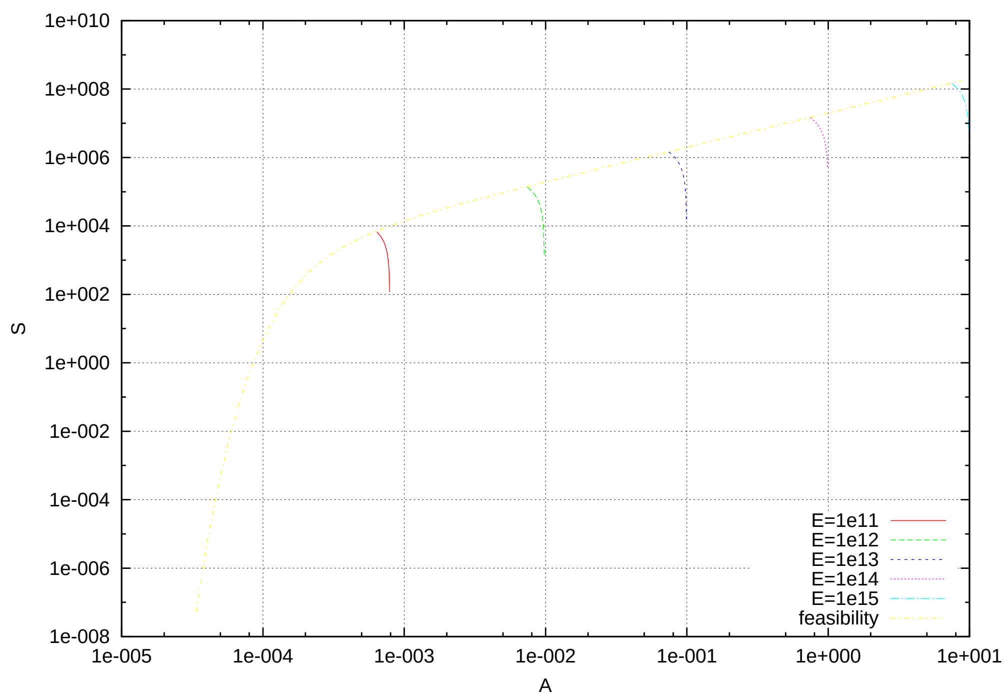

Fig. 292: Isoenergy map for computation rate A, and startup time S. Value of $Pc = 10$ used.

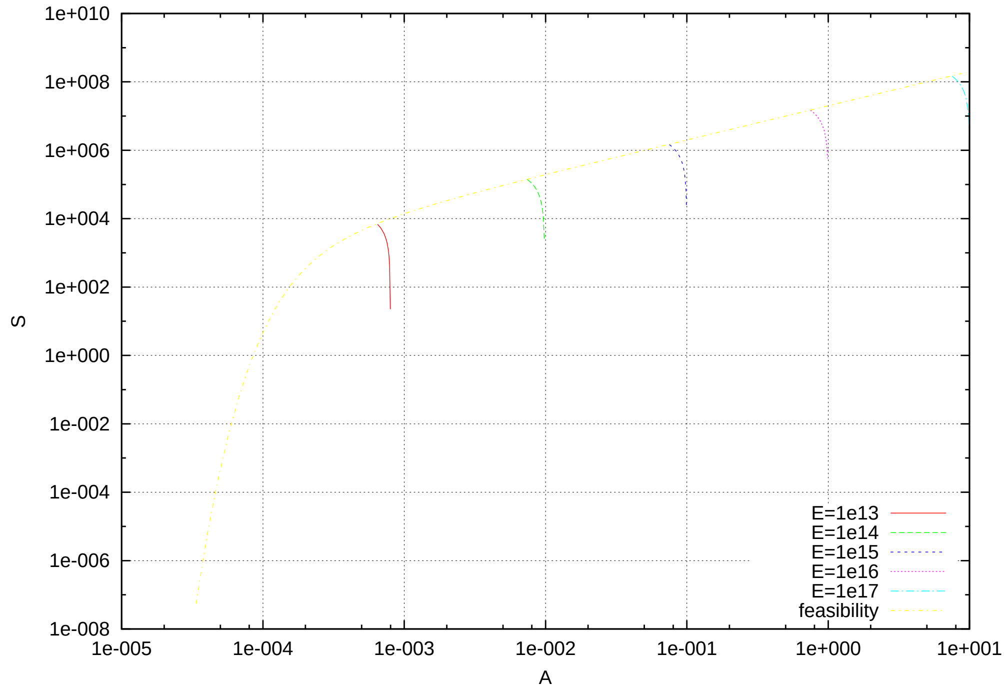

Fig. 293: Isoenergy map for computation rate A, and startup time S. Value of $Pc = 1E3$ used.

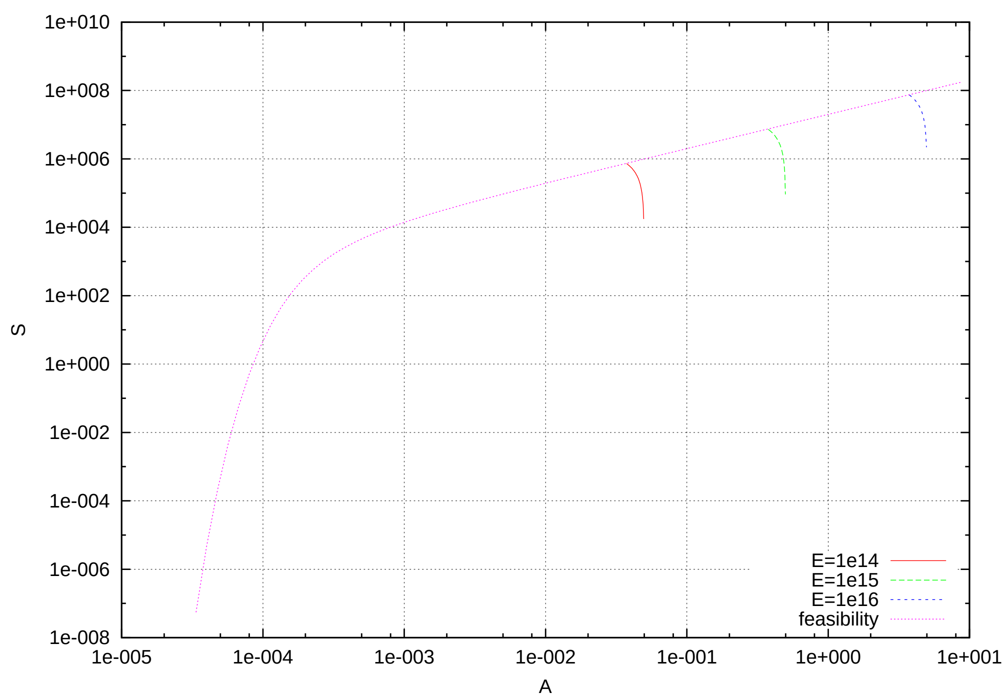

Fig. 294: Isoenergy map for computation rate A, and startup time S. Value of $Pn = 10$ used.

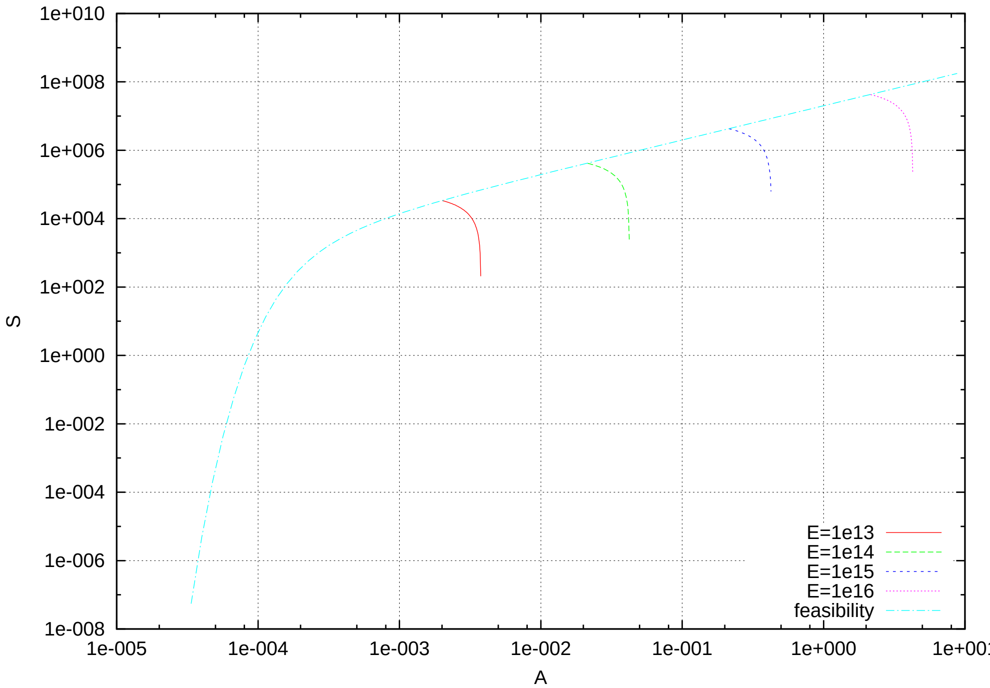

Fig. 295: Isoenergy map for computation rate A, and startup time S. Value of $Pn = 1E5$ used.

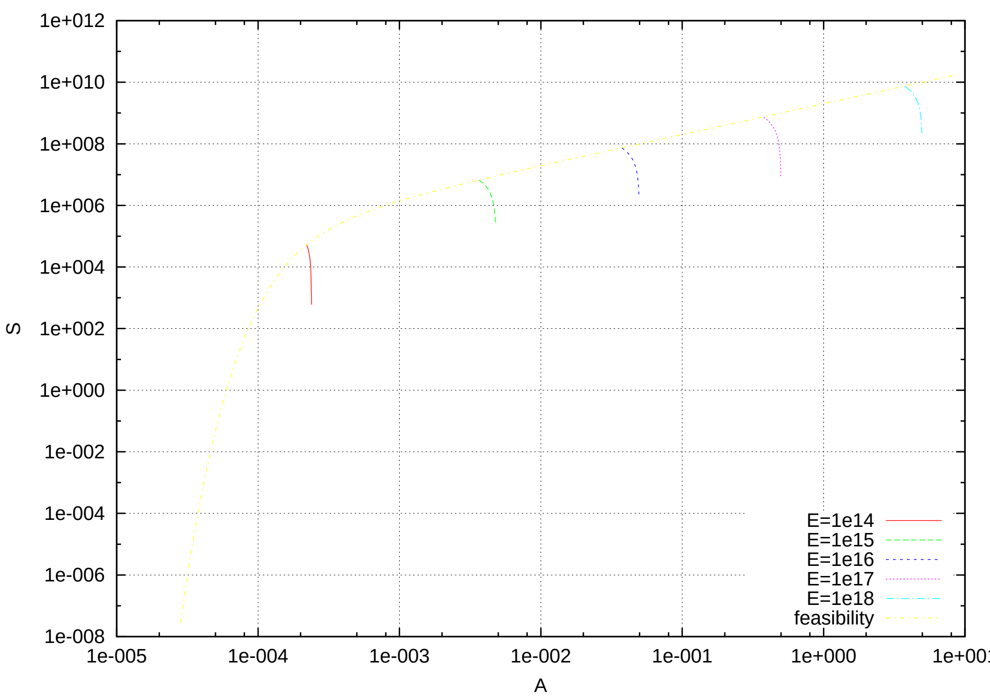

Fig. 296: Isoenergy map for computation rate A, and startup time S. Value of $V = 1E15$ used.

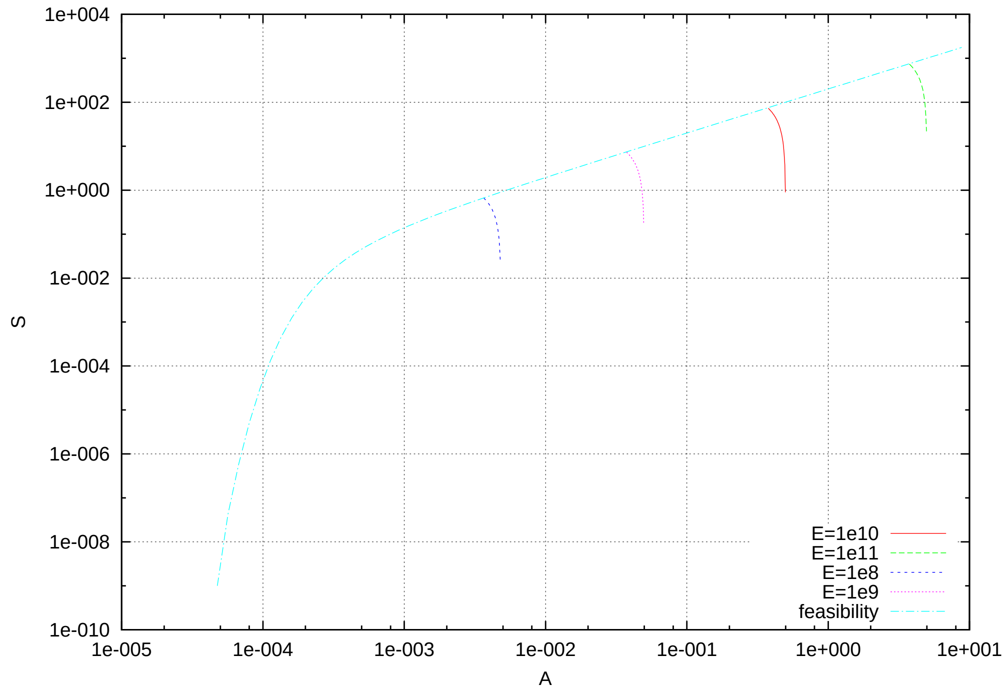

Fig. 297: Isoenergy map for computation rate A, and startup time S. Value of $V = 1E8$ used.

25 Isoenergy maps for computation rate A, and communication rate C.

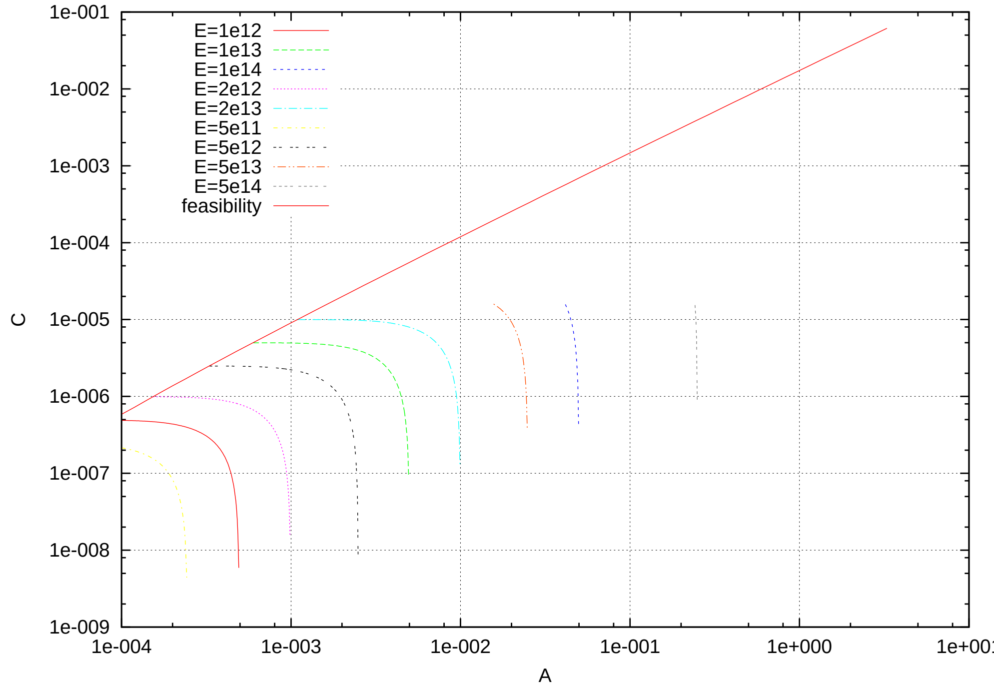

Fig. 298: Isoenergy map for computation rate A, and communication rate C. Value of $k = 1$ used.

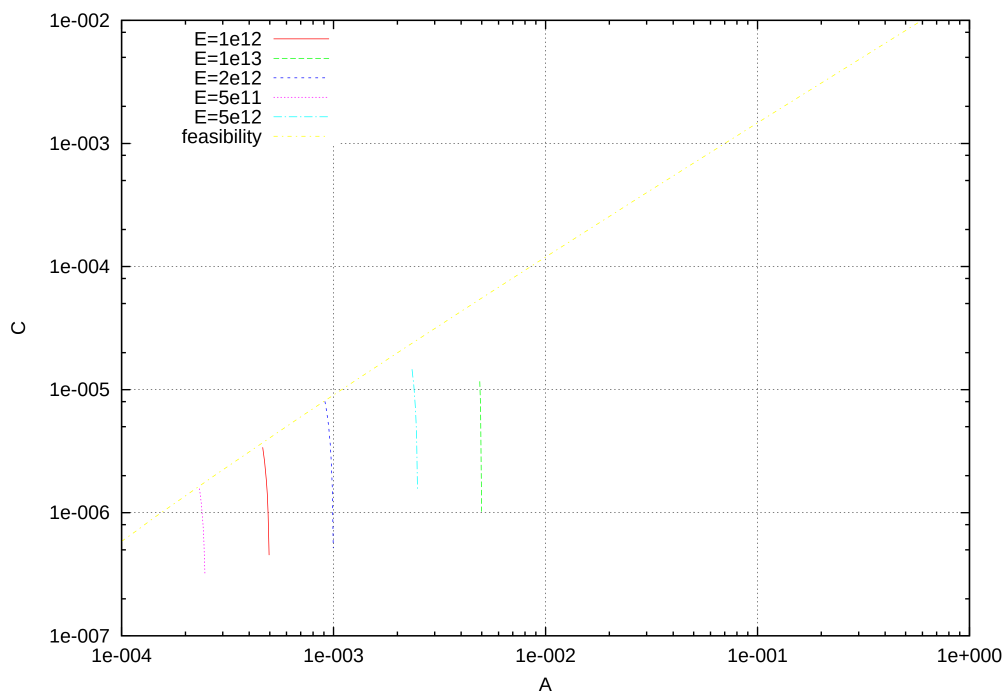

Fig. 299: Isoenergy map for computation rate A, and communication rate C. Value of $k = 100$ used.

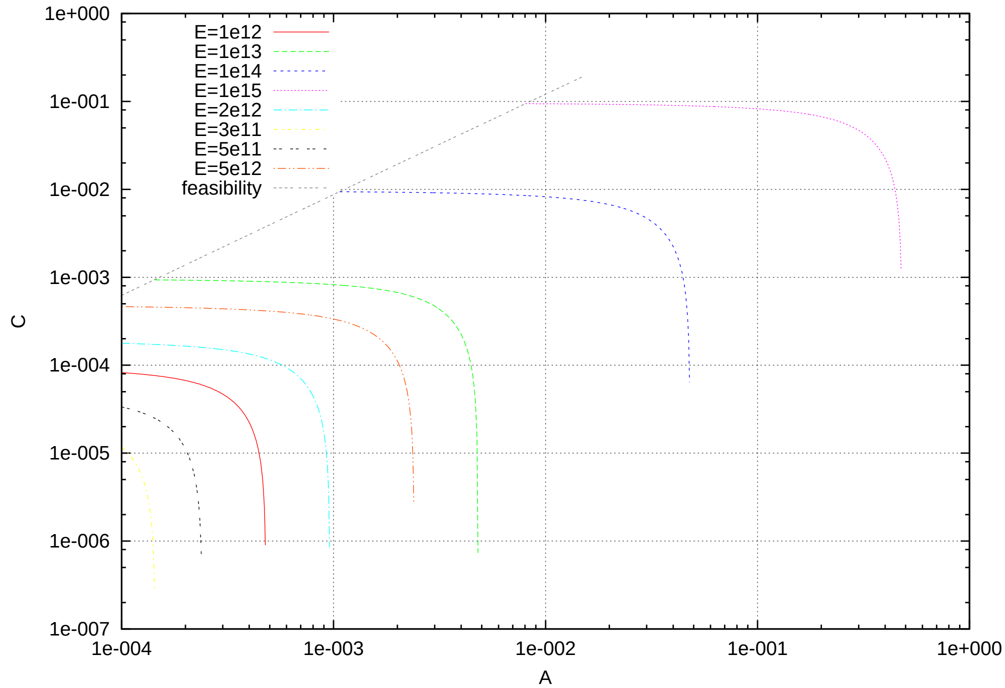

Fig. 300: Isoenergy map for computation rate A, and communication rate C. Value of $m = 10$ used.

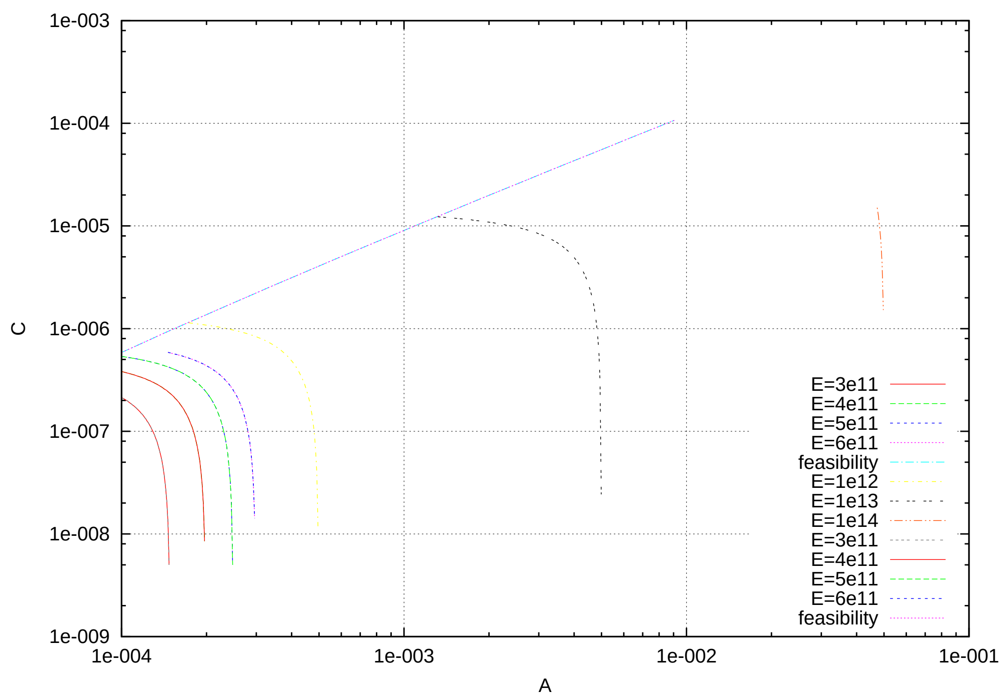

Fig. 301: Isoenergy map for computation rate A, and communication rate C. Value of $m = 1E3$ used.

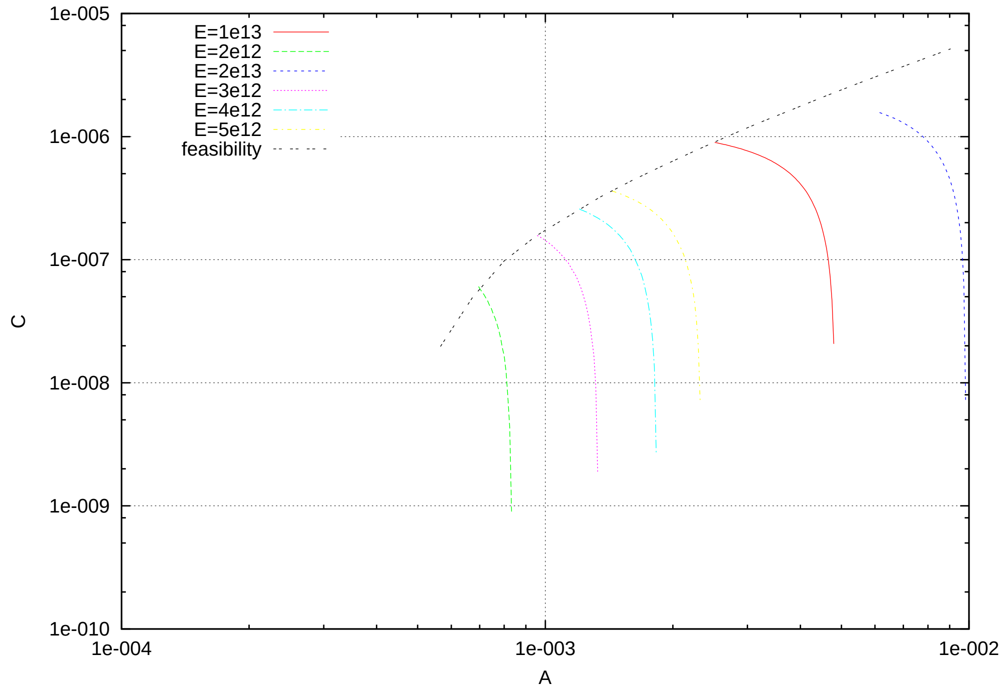

Fig. 302: Isoenergy map for computation rate A, and communication rate C. Value of $m = 1E4$ used.

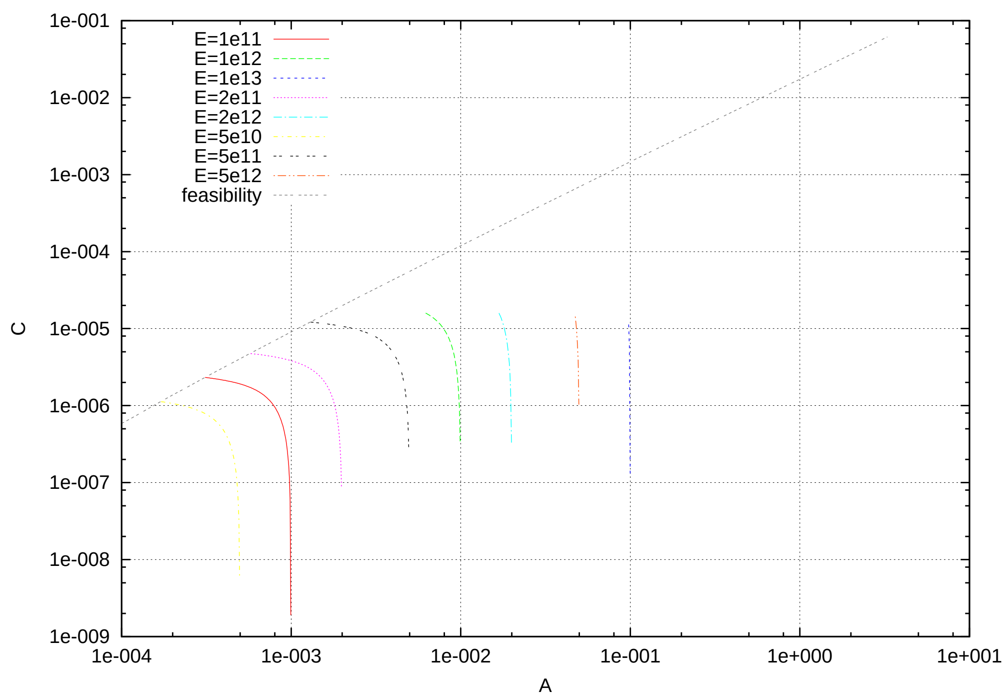

Fig. 303: Isoenergy map for computation rate A, and communication rate C. Value of $Pc = 10$ used.

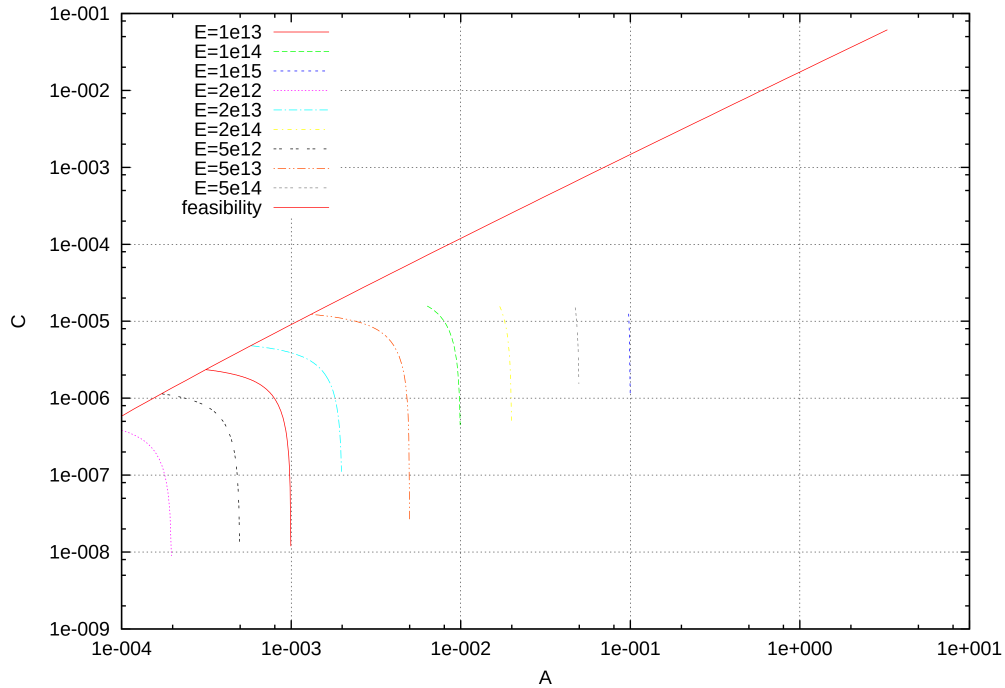

Fig. 304: Isoenergy map for computation rate A, and communication rate C. Value of $Pc = 1E3$ used.

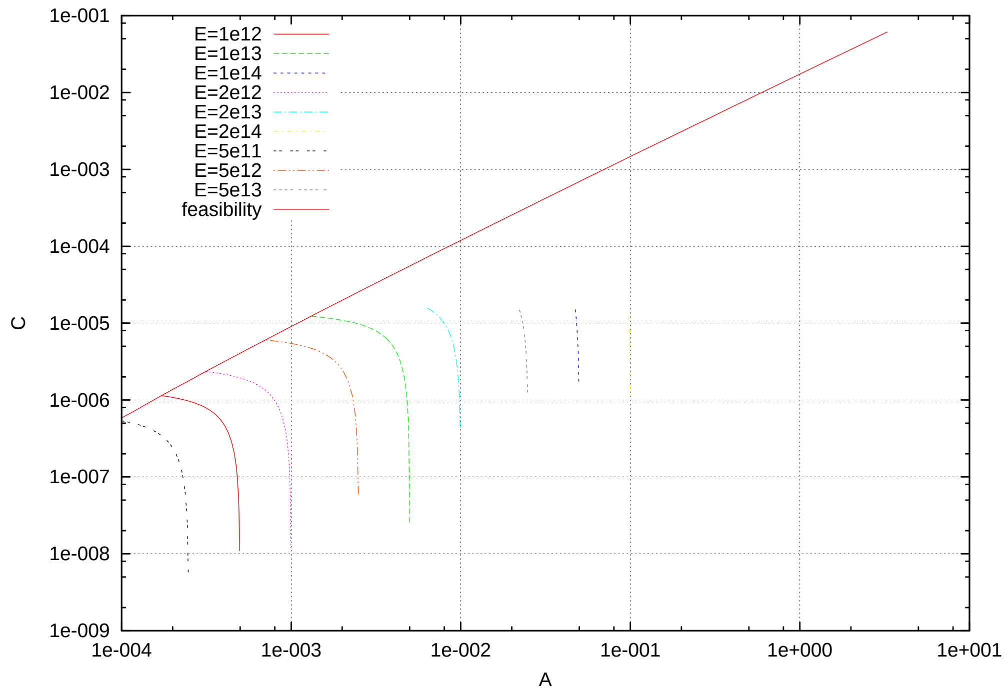

Fig. 305: Isoenergy map for computation rate A, and communication rate C. Value of $Pn = 10$ used.

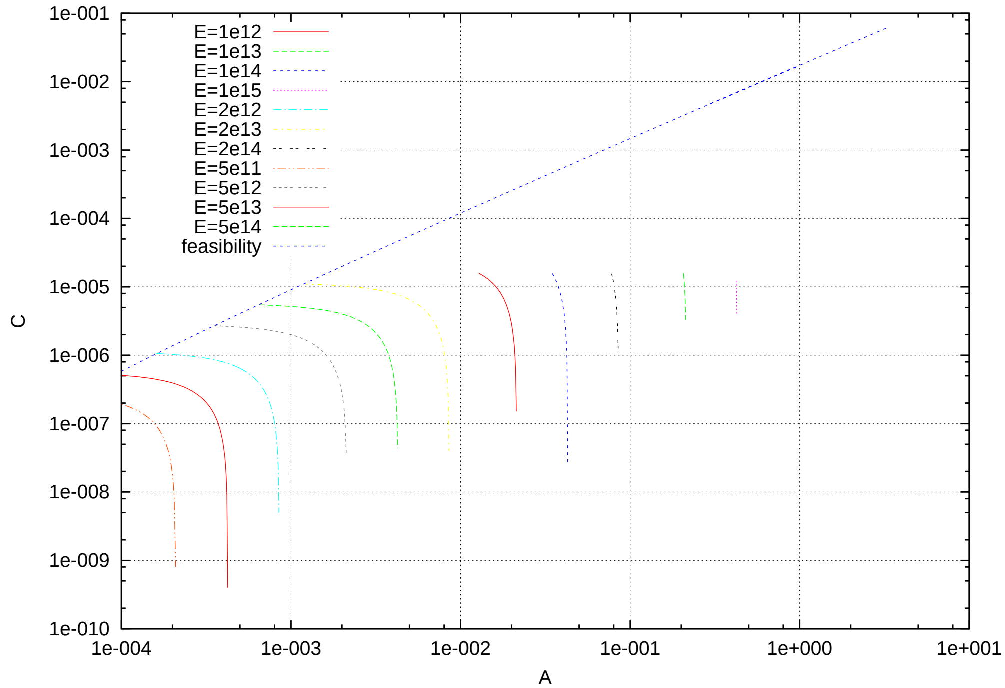

Fig. 306: Isoenergy map for computation rate A, and communication rate C. Value of $Pn = 1E5$ used.

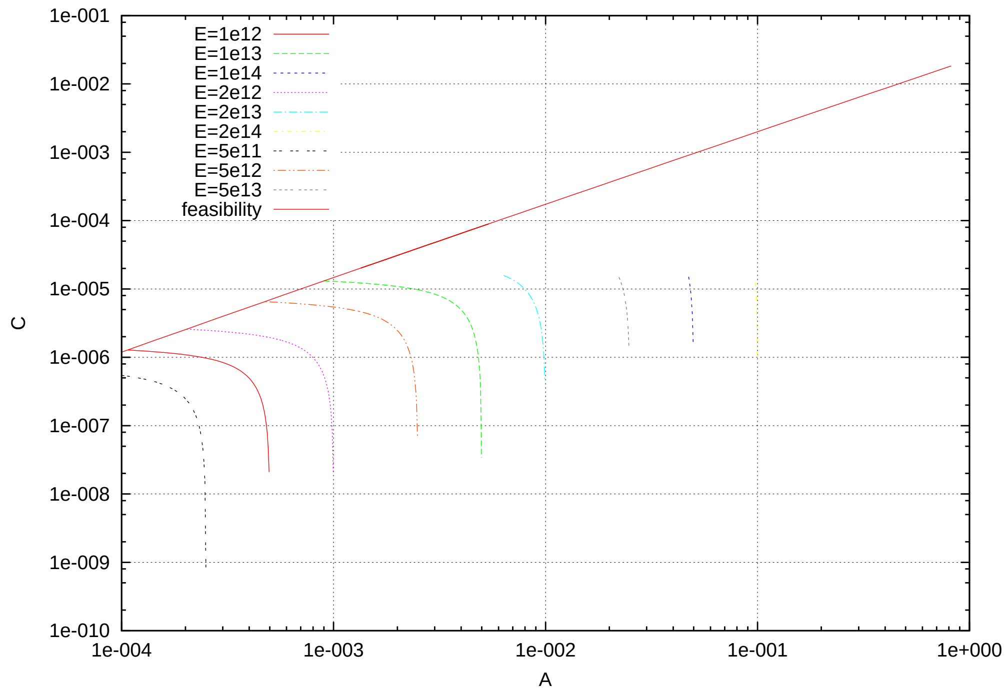

Fig. 307: Isoenergy map for computation rate A, and communication rate C. Value of $S = 1$ used.

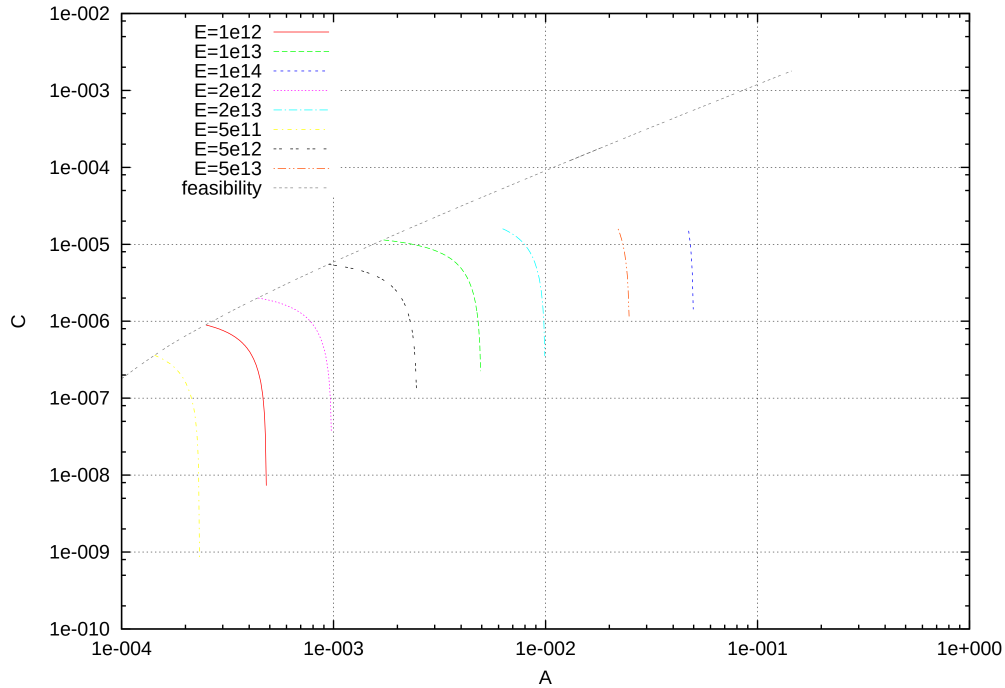

Fig. 308: Isoenergy map for computation rate A, and communication rate C. Value of $S = 1E3$ used.

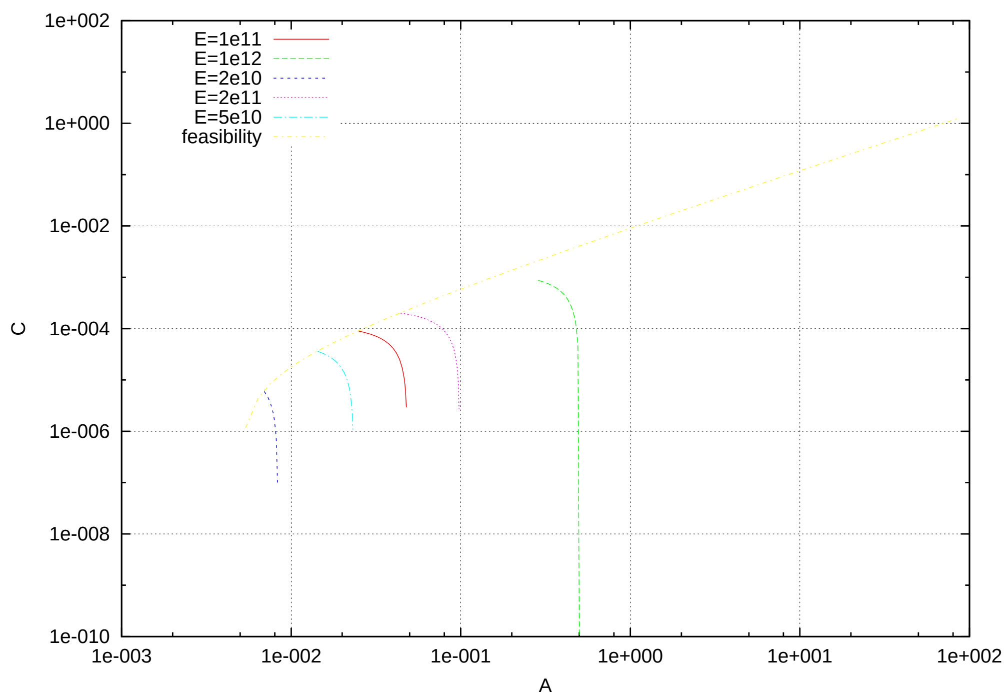

Fig. 309: Isoenergy map for computation rate A, and communication rate C. Value of $V = 1E10$ used.

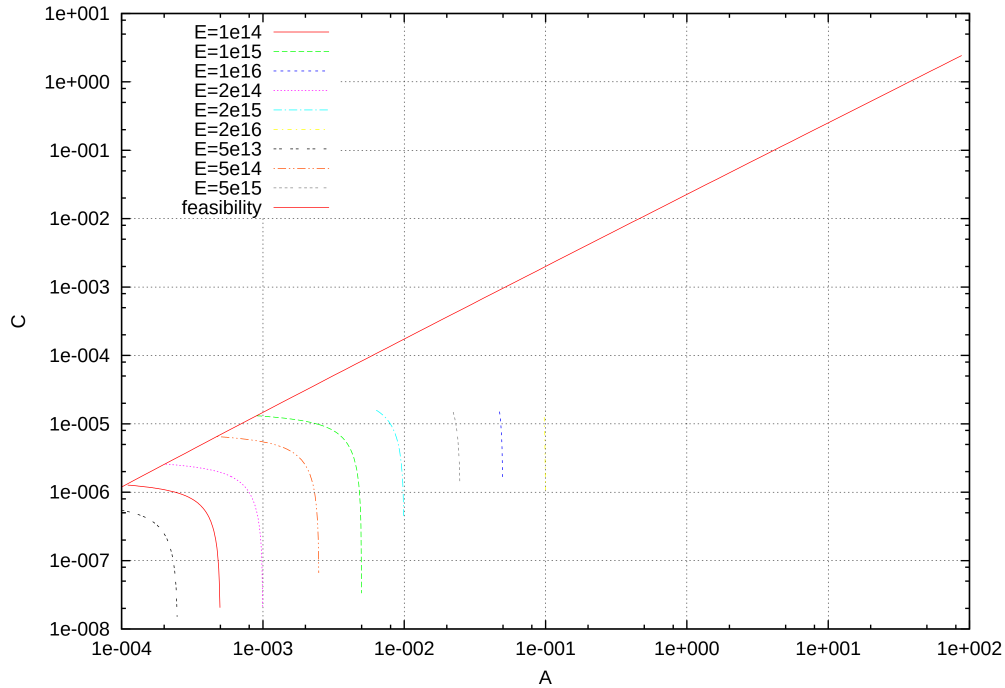

Fig. 310: Isoenergy map for computation rate A, and communication rate C. Value of $V = 1E15$ used.

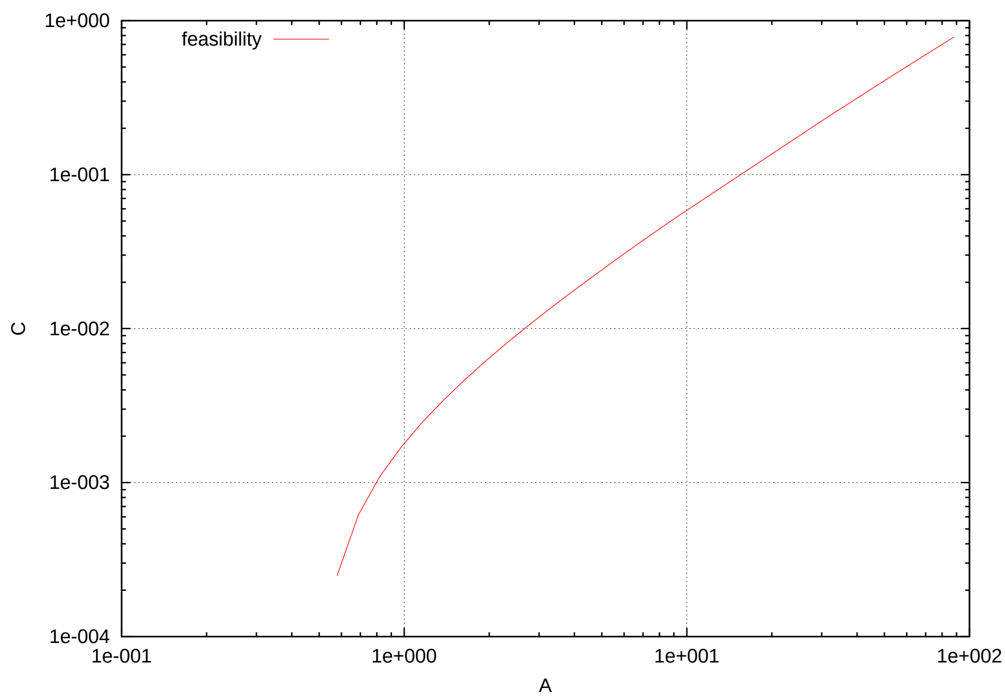

Fig. 311: Isoenergy map for computation rate A, and communication rate C. Value of $V = 1E8$ used.

26 Isoenergy maps for communication rate C, and startup time S.

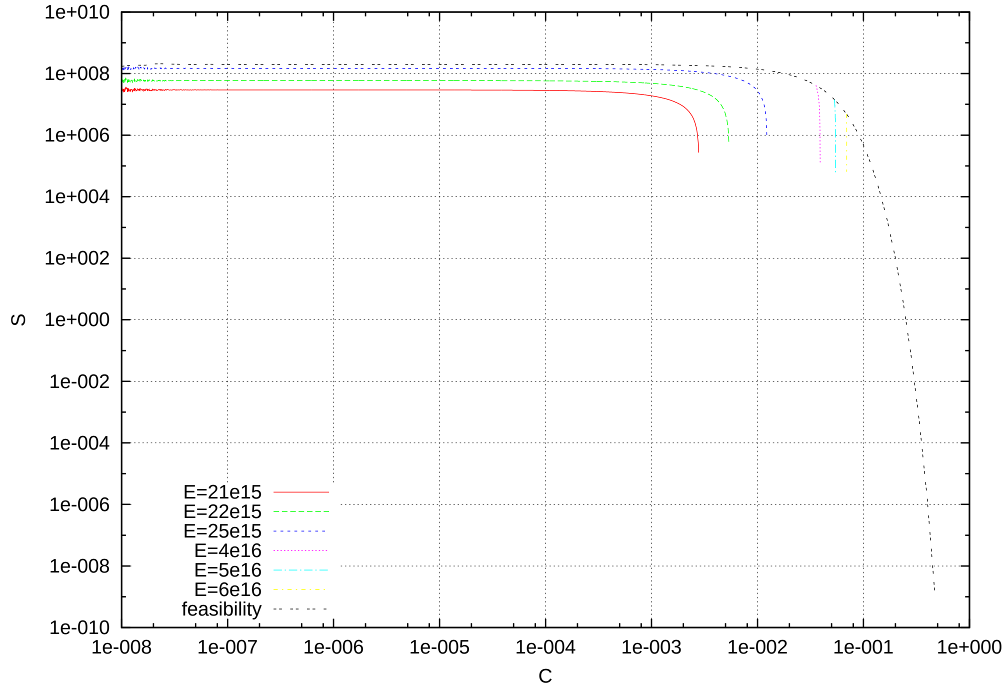

Fig. 312: Isoenergy map for communication rate C, and startup time S. Value of $A = 10$ used.

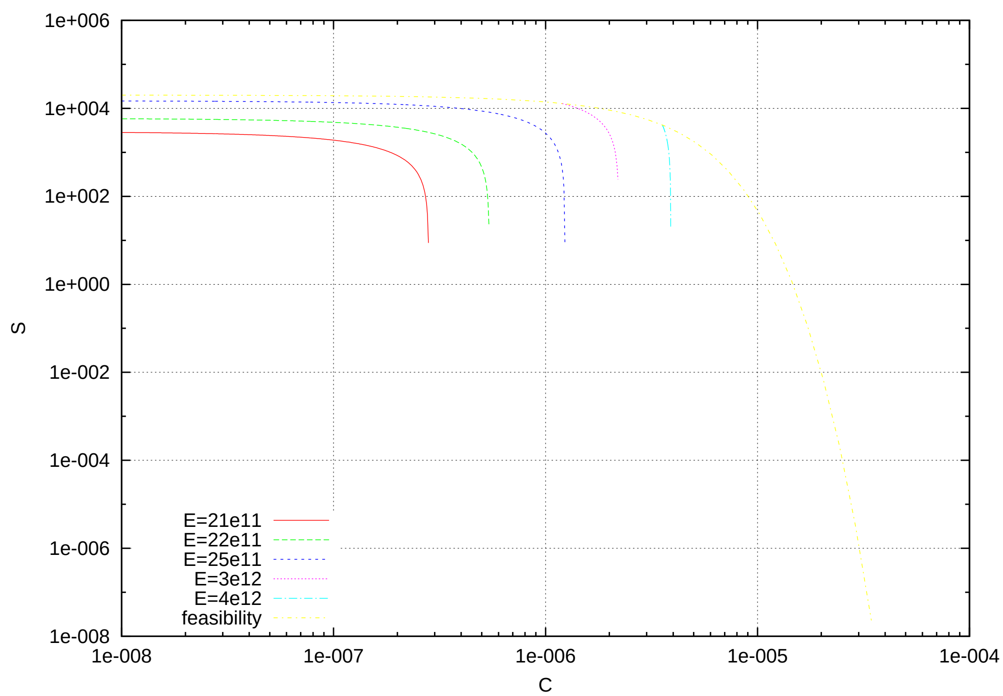

Fig. 313: Isoenergy map for communication rate C, and startup time S. Value of $A = 1E-3$ used.

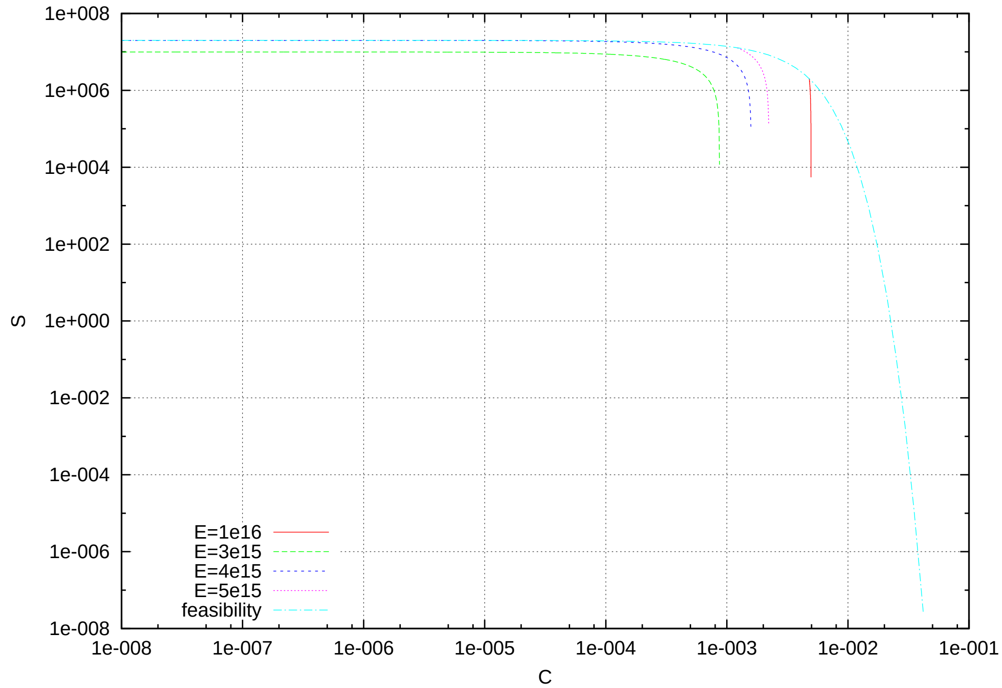

Fig. 314: Isoenergy map for communication rate C, and startup time S. Value of $k = 1$ used.

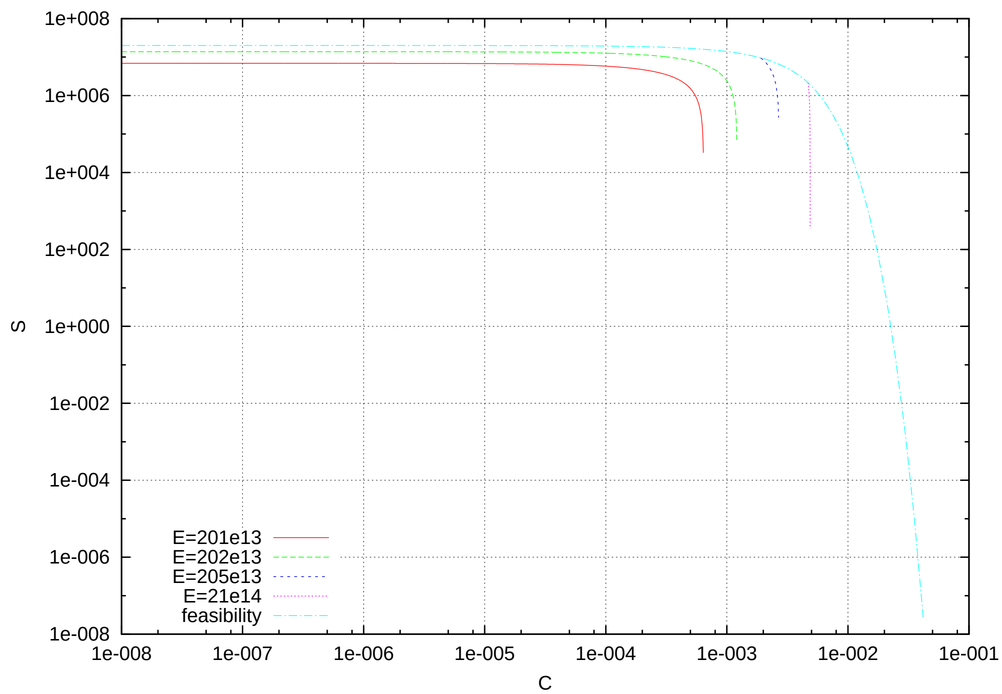

Fig. 315: Isoenergy map for communication rate C, and startup time S. Value of $k = 100$ used.

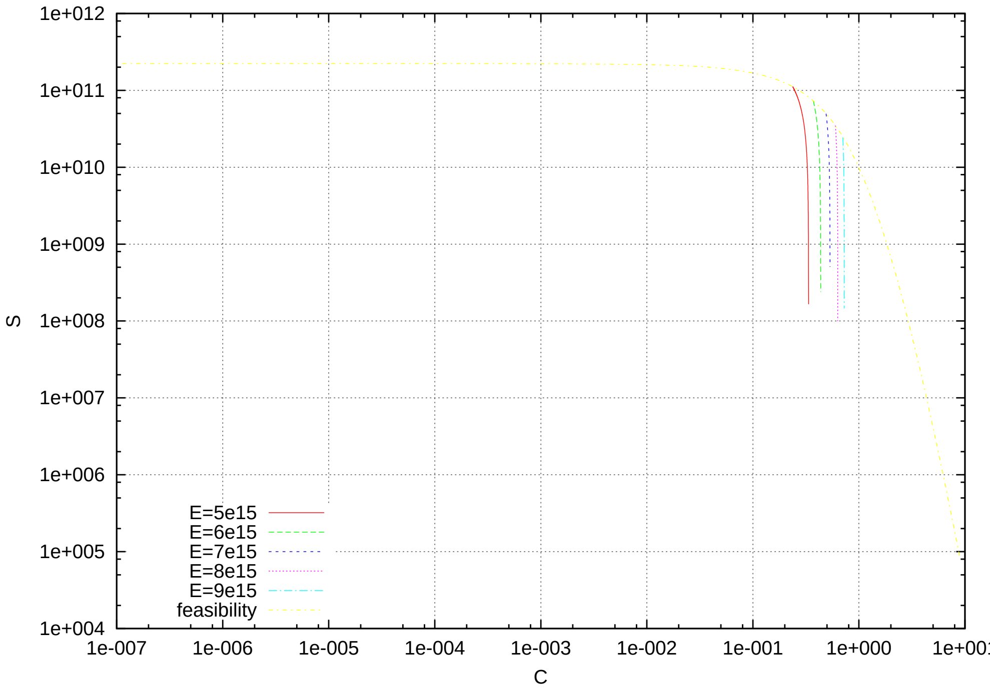

Fig. 316: Isoenergy map for communication rate C, and startup time S. Value of $m = 10$ used.

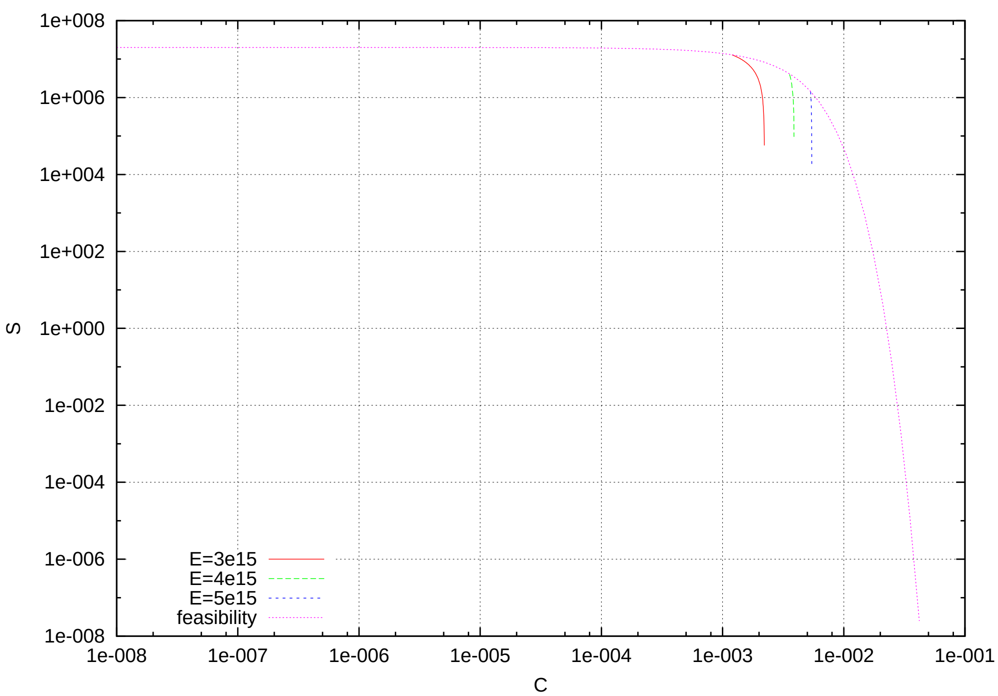

Fig. 317: Isoenergy map for communication rate C, and startup time S. Value of $m = 1E3$ used.

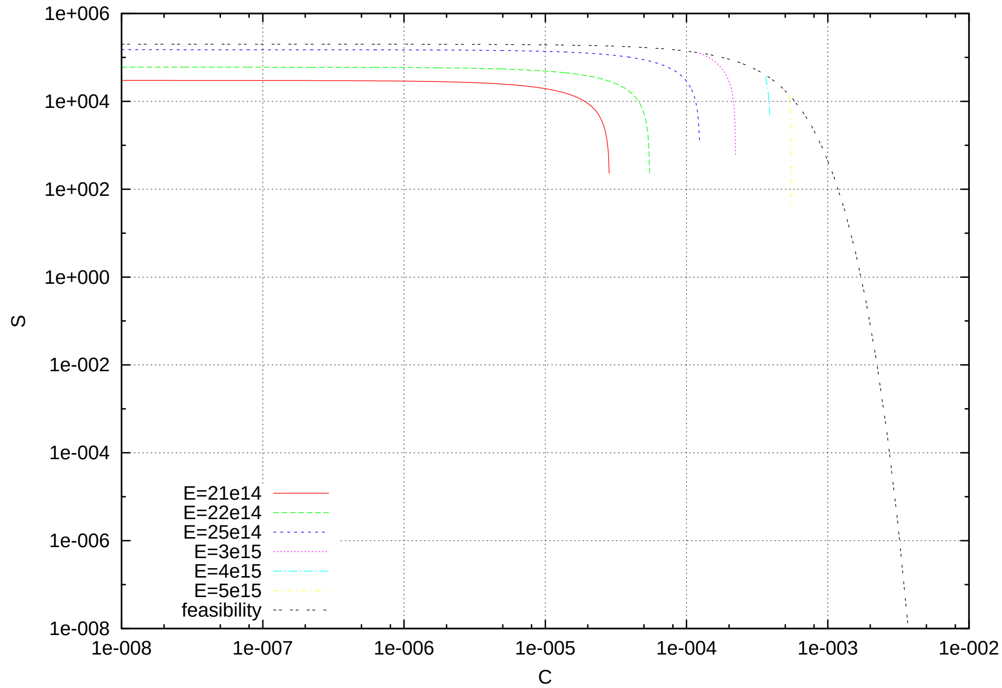

Fig. 318: Isoenergy map for communication rate C, and startup time S. Value of $m = 1E4$ used.

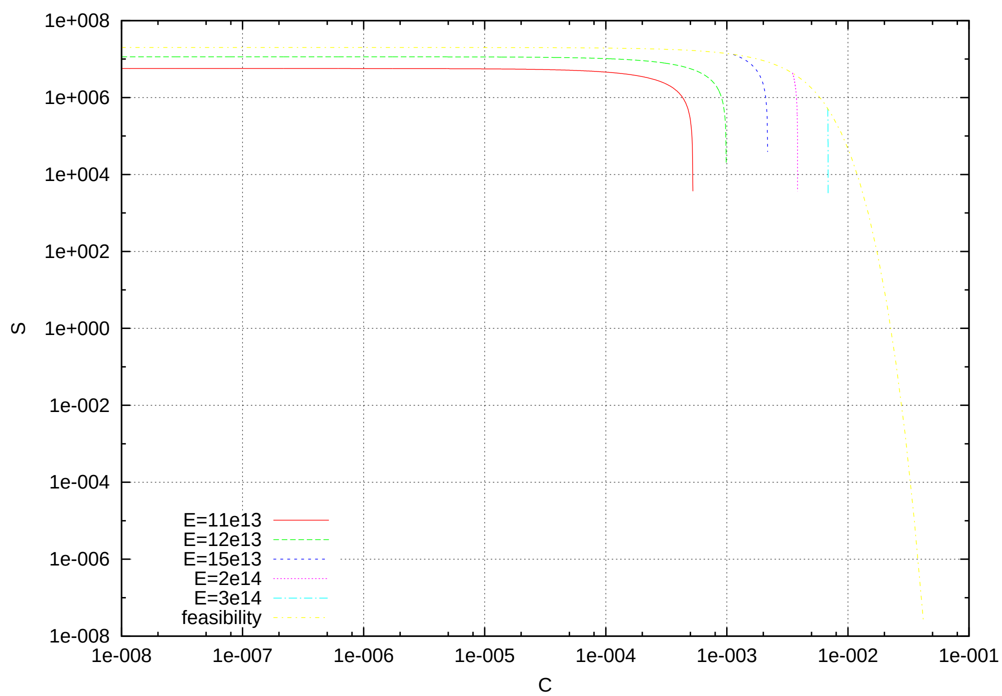

Fig. 319: Isoenergy map for communication rate C, and startup time S. Value of $Pc = 10$ used.

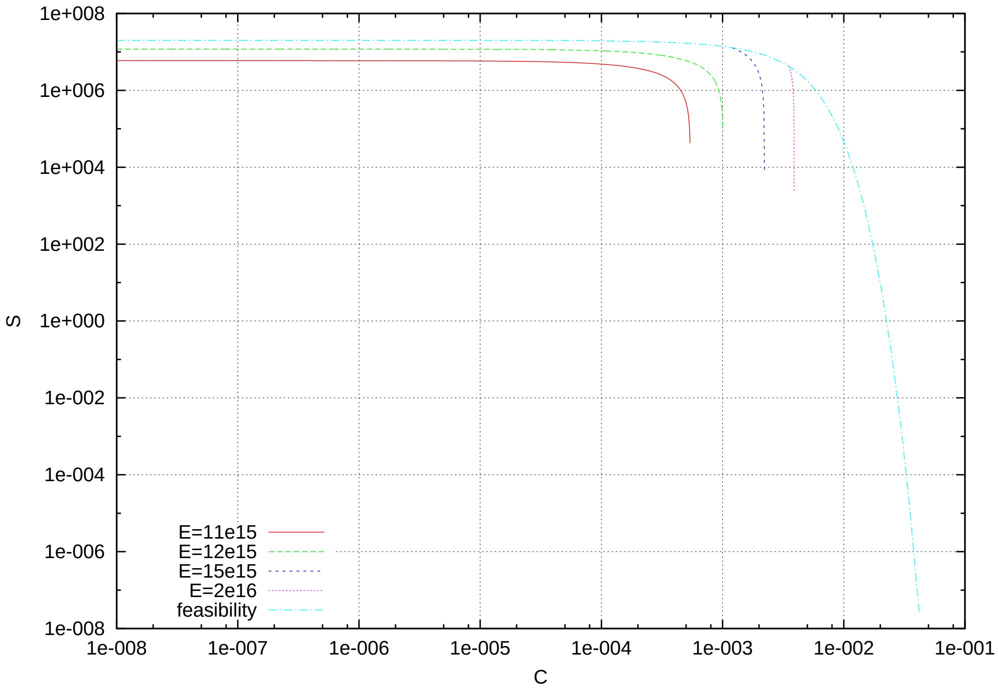

Fig. 320: Isoenergy map for communication rate C, and startup time S. Value of $Pc = 1E3$ used.

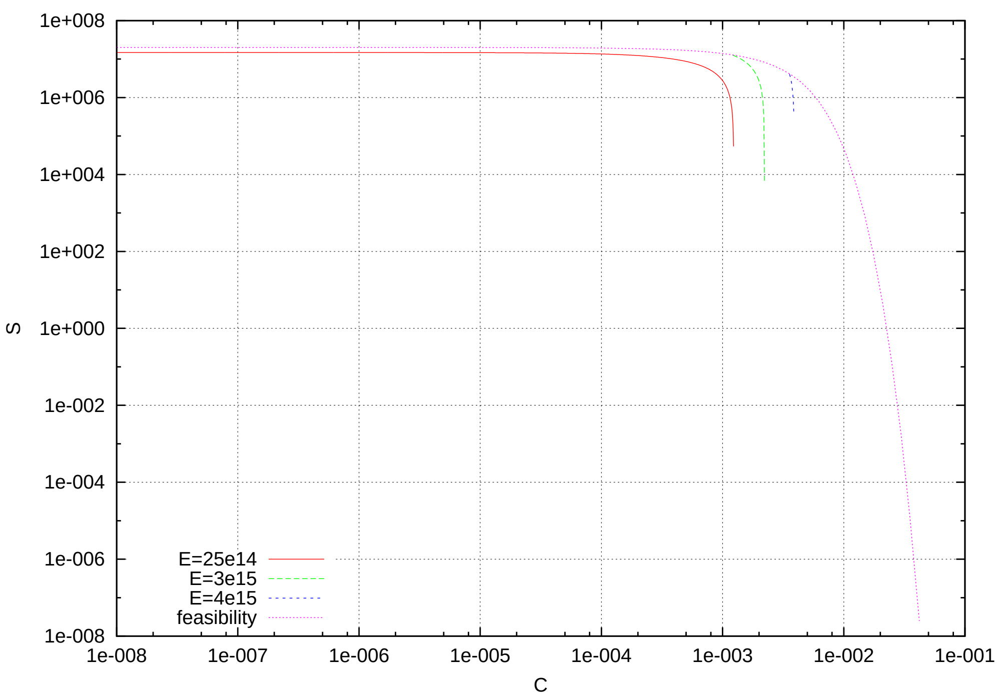

Fig. 321: Isoenergy map for communication rate C, and startup time S. Value of $Pn = 10$ used.

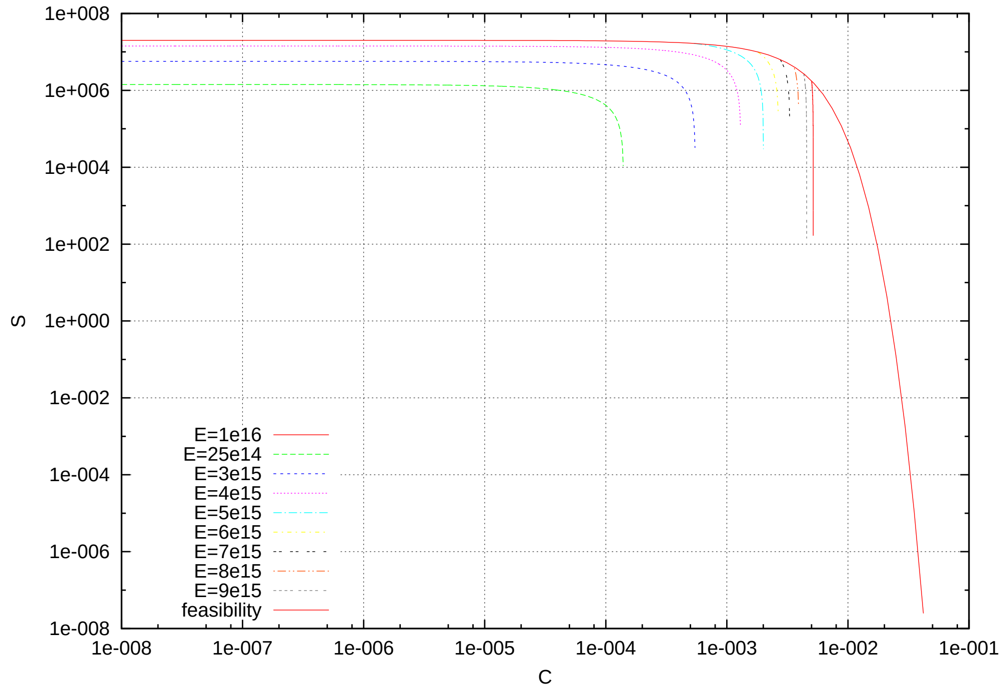

Fig. 322: Isoenergy map for communication rate C, and startup time S. Value of $Pn = 1E5$ used.

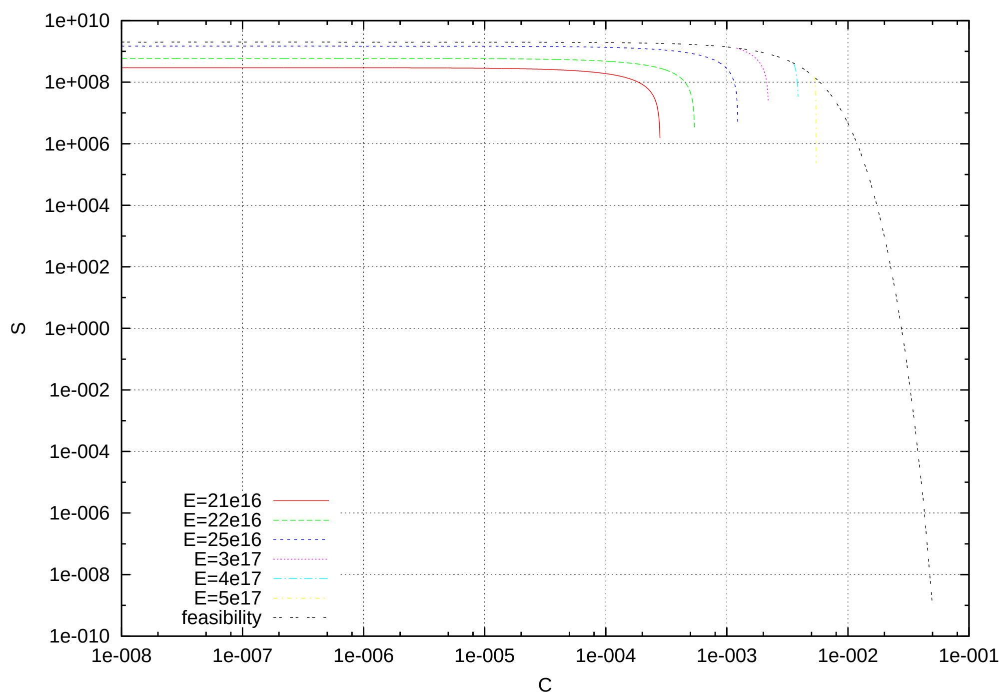

Fig. 323: Isoenergy map for communication rate C, and startup time S. Value of $V = 1E15$ used.

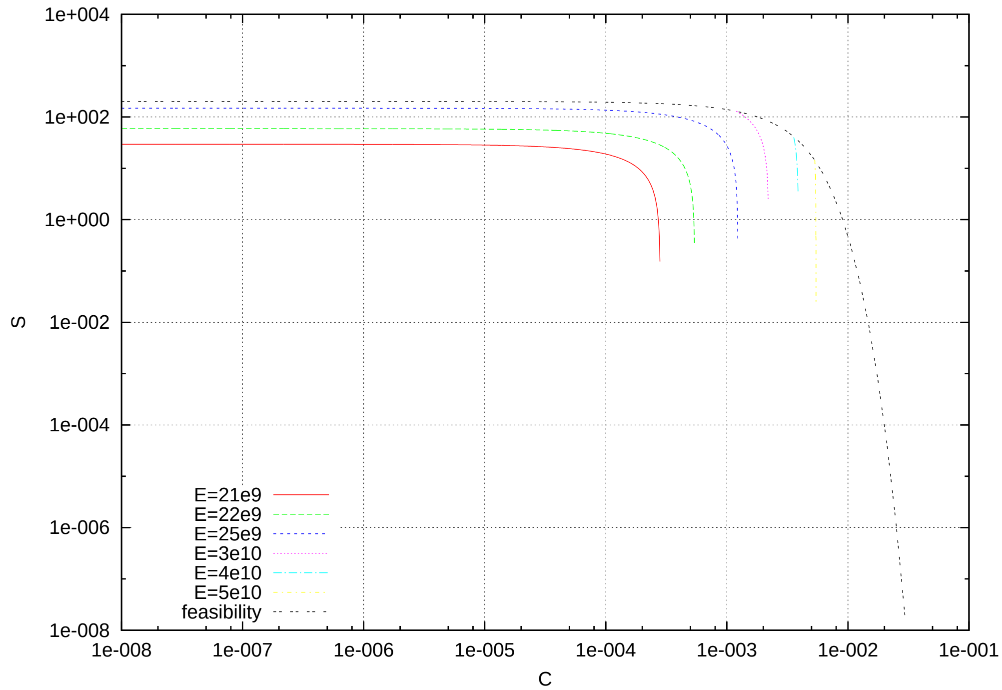

Fig. 324: Isoenergy map for communication rate C, and startup time S. Value of $V = 1E8$ used.

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