7187

Docket EFSC 90-12/90-12A Exhibit CLF-PLC-1

COMMONWEALTH OF MASSACHUSETTS ENERGY FACILITIES SITING COUNCIL

. .

DIRECT TESTIMONY OF

PAUL CHERNICK

ON BEHALF OF THE

CONSERVATION LAW FOUNDATION OF NEW ENGLAND, INC.

December 14, 1990

RESOURCE INSIGHT, Inc. 18 Tremont Street Boston MA 02108 (617)-723-1774

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APPENDICES

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B Documents Received from BECo in Response to IR CLF 1-29

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1 1. INTRODUCTION AND QUALIFICATIONS

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2 - Q: State your name, occupation, and business address.

A: I am Paul L. Chernick. I am President of Resource Insight,
Inc., 18 Tremont Street, Suite 1000, Boston, Massachusetts.
Resource Insight, Inc. was formed in August 1990 as the
combination of my previous firm, PLC, Inc., with Komanoff
Energy Associates.

8 Q: Summarize your professional education and experience.

9 A: I received a S.B. degree from the Massachusetts Institute of Technology in June, 1974 from the Civil Engineering 10 Department, and a S.M. degree from the Massachusetts 11 Institute of Technology in February, 1978 in Technology and 12 13 Policy. I have been elected to membership in the civil 14 engineering honorary society Chi Epsilon, and the engineering honor society Tau Beta Pi, and to associate 15 16 membership in the research honorary society Sigma Xi.

17 I was a Utility Analyst for the Massachusetts Attorney 18 General for over three years, and was involved in numerous aspects of utility rate design, costing, load forecasting, 19 20 and the evaluation of power supply options. Since 1981, I 21 have been a consultant in utility regulation and planning, 22 first as a Research Associate at Analysis and Inference, 23 after 1986 as President of PLC, Inc., and in my current 24 position at Resource Insight. My work has considered, among 25 other things, the need for, cost of, and cost-effectiveness 26 of prospective new generation plants and transmission lines; 27 retrospective review of generation planning decisions;

ratemaking for plant under construction; ratemaking for 1 excess and/or uneconomical plant entering service; 2 conservation program design; cost recovery for utility 3 efficiency programs; and the valuation of environmental 4 externalities from energy production and use. My resume is 5 attached to this testimony as Appendix A to this testimony. 6 Have you testified previously in utility proceedings? 0: 7 I have testified approximately seventy times on 8 A: Yes. utility issues before various regulatory, legislative, and 9 judicial bodies, including the Massachusetts Department of 10 Public Utilities, the Vermont Public Service Board, the 11 Texas Public Utilities Commission, the New Mexico Public 12 Service Commission, the District of Columbia Public Service 13 14 Commission, the New Hampshire Public Utilities Commission, 15 the Connecticut Department of Public Utility Control, the Michigan Public Service Commission, the Maine Public 16 17 Utilities Commission, the Minnesota Public Utilities Commission, the Maryland Public Service Commission, the 18 19 Federal Energy Regulatory Commission, and the Atomic Safety 20 and Licensing Board of the U.S. Nuclear Regulatory 21 Commission. A detailed list of my previous testimony is 22 contained in my resume.

Q: Have you testified previously before the Council?
A: Yes. I have testified before the Council in 7 cases.
Q: Have you been involved in least-cost utility resource planning?

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I have been involved in utility planning issues since A: Yes. 1 1978, including load forecasting, the economic evaluation of 2 proposed and existing power plants, and the establishment of 3 rate for qualifying facilities. Most recently, I have been 4 a consultant to various energy conservation design 5 collaboratives in New England, New York, and Maryland; to 6 the Conservation Law Foundation's (CLF's) conservation 7 design project in Jamaica; to CLF interventions in a number 8 of New England rulemaking and adjudicatory proceedings; to 9 the Boston Gas Company on avoided costs and conservation 10 program design; to the City of Chicago in reviewing the 11 least-cost plan of Commonwealth Edison; and to several 12 parties on incorporating externalities in utility planning 13 and resource acquisition. I also assisted the DC PSC in 14 drafting order 8974 in Formal Case 834 Phase II, which 15 established least-cost planning requirements for the 16 electric and gas utilities serving the District. 17

18 Q: Have you authored any publications on utility planning and19 ratemaking issues?

A: Yes. I have authored a number of publications on rate
design, cost allocations, power plant cost recovery,
conservation program design and cost-benefit analysis, and
other ratemaking issues. These publications are listed in
my resume.

25 Q: On whose behalf are you testifying?

- 3 -

A: My testimony is being sponsored by the Conservation Law.
 Foundation (CLF).

3 Q: What is the purpose of this testimony?

A: This testimony reviews the adequacy of the filing of Boston
Edison (BECo) in this proceeding, as it supports the
proposal to build the Edgar combined-cycle power plant.
Except as otherwise noted, references are to the Resource
Plan.

9 Responses to discovery are still not complete, and I 10 have not had an opportunity to review the large number of 11 responses provided over the last week. Hence, I may need to 12 supplement this testimony.

13 Q: How have you organized your testimony?

I present the remainder of my testimony in six more 14 A: Section 2 discusses the general problems in 15 sections. BECo's presentation and participation in this proceeding. 16 17 Section 3 discusses the shortcomings in BECo's treatment of DSM in this Resource Plan. That section demonstrates that 18 the Company is neglecting savings that may be less expensive 19 20 (in terms of expected costs, risks, and environmental 21 effects) than Edgar.

Section 4 discusses errors and biases in BECo's
analysis of supply options, in the Resource Plan. Section 5
discusses more general problems in BECo's planning process
and perspectives.

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Section 6 discusses mitigation measures which may be appropriate if and when BECo is allowed to proceed with construction of Edgar.

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Finally, Section 7 summarizes my conclusions and recommendations.

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1 2. GENERAL PROBLEMS

Q: What general problems have you identified in BECo's presentation in this proceeding?

There are two categories of such problems. First, BECo's 4 A: responses to discovery have often been uncooperative and 5 For example, for many questions that requested evasive. 6 explanations of estimates, BECo described the process 7 without supplying any support for the estimates. Questions 8 that requested derivations of non-price factors, weights, 9 scoring rules or rankings were answered with a restatement 10 of BECo's position, or a statement that BECo derived the 11 result. BECo has refused to provide avoided costs, 12 emissions factors, and other information it used in its 13 14 analyses.

15 Q: What was the other category of problems?

Where BECo has responded to discovery, its responses are 16 A: 17 frequently inconsistent. An example of this problem concerns DRI's estimates of the probability of each of its 18 19 three fuel price forecasts. In IR CLF 1-28, BECo denied it 20 had any DRI document that laid out these probabilities. 21 Nonetheless, in response to IR CLF 2-41, BECo provided several such documents. In IR AG 1-8, BECo provides a table 22 23 indicating that it used DRI probabilities in estimating the 24 probabilities of the three fuel-price scenarios. Thus, 25 depending on which response one believes, BECo did not know 26 that DRI had estimated the probability of its various fuel

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price forecasts, or BECo knew but ignored that information, or BECo used the DRI estimates.

Another example of the same problem concerns the share of Edgar generation assumed to be from oil, rather than gas. The oil/gas split is given as:

- one month on oil (Exhibit I-D-3, p. 2, IR 5-13),
 - 45-60 days on oil, at the option of Boston Gas (Edgar filing, p. 6-2),
- five months on oil (Exhibit I-D-3, p. 1), and
- all gas generation (Exhibit I-C-14).

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It is not clear what mix of oil and gas BECo actually assumed for each of its calculations (e.g., the levelized cost of Edgar, the selection of Edgar in the decision analysis, and the rating of Edgar for externality and nonprice factors), and the various calculations appear mutually inconsistent.

17 Combining inconsistent assumptions regarding capital 18 costs (which are lower with interruptible gas and 5 months 19 of oil), fuel costs (which are lower with 100% gas, 20 especially if demand charges are not included), gas demand 21 charges (which are zero for interruptible gas, high with 1-22 2 months of gas, and highest for 100% gas), and externalities (which rise linearly with oil use) can produce 23 24 nonsensical results. Depending on how BECo used the Edgar options in its analysis, it may have significantly 25 26 understated the total cost of the project.

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A third example of inconsistencies occurs in the price 1 - differentials BECo estimates for #2 oil with sulfur levels 2 below the 0.3% currently required. In the DEIR, BECo 3 4 estimates a price differential of 3.4% between 0.3% and 0.2% distillate, for a levelized price of \$9,640/ton or \$4.82/1b 5 of SO_2 avoided. In IR CLF 2-18, BECo estimates that cost 6 7 differential at only 0.58%. In 1990, this differential would be equivalent to \$0.331/1b SO,, even at oil prices 8 9 BECo had not anticipated occurring until 1999. While some of the difference in \$/ton SO, is due to BECo's use of 10 11 nominally-levelized costs in the BACT analysis (which 12 inflates the apparent cost), the fact remains that BECo has 13 assumed a differential six times as large in one response as 14 in another.

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- 3. BECO'S TREATMENT OF DSM

2 Q: What problems have you identified in BECo's treatment of DSM 3 in its Resource Plan?

- A: BECo has treated DSM as an exogenous variable, like fuel
 prices, rather than a resource option. In addition, BECo
 has ignored fuel-switching from electricity to other fuels,
 has understated the effects of existing programs, has
 excluded all future programs, and appears to have used
 avoided costs for DSM that are much lower than those implied
 by the Resource Plan.
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- 12 3.1 DSM as a Resource Option

13 Q: Is DSM treated equivalently to supply in the Resource Plan? 14 BECo establishes a "base" DSM program, which appears to A: No. be the result of extending existing residential 15 16 collaborative programs to 1994 and then terminating them. 17 Commercial programs are allowed to run through various 18 years, including 1994, 1998, 1999, 2004, 2005, and 2006. 19 BECo then assumes that this is essentially the maximum achievable DSM program, 1 and that a "low" case about 30% 20 below this level is not unlikely, with a probability of 21 22 about 28%. BECo identifies a large number of supply-side 23 options that can be deployed in various sizes and time-24 frames, and selects a least-cost supply plan, given input

25 ¹The "high" case BECo develops is essentially the same as 26 the base case, and is not used in the Decision Analysis. assumptions for load growth, DSM, fuel prices, and existing
 resources.² DSM is treated as a random variable rather
 than a decision variable. That is, DSM happens to BECo,
 like fuel prices and purchased resource failures, rather
 than being optimized by BECO, as is supply.

6 Q: What is the result of this asymmetry?

A: At best, BECo's Resource Plan might be a least-cost <u>supply</u>
plan.³ It cannot be a least-cost resource plan, since no
attempt is made to include all DSM measures that are less
expensive than the supply options. It certainly is not an
integrated plan, since BECo does not allow additional DSM
measures, programs, or enhancements to compete with the
supply options.

14 Q: Has BECo provided the derivation of its low DSM case, or of 15 the probability of this case?

16 A: No. Both the amount of DSM and the probability of the low
17 case appear to be the result of simple speculation on the
18 part of BECo employees.

19

20 3.2 Treatment of Existing Programs

21 Q: What is wrong with BECo's treatment of existing programs?

22 ²The supply plan appears to be least-cost, given BECo's 23 artificial constraints, as discussed below.

As noted below, the errors in the supply plan make it unlikely that the supply choices are least-cost, even compared to one another.

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A: First, BECo has not explained how it determined the effect

of these programs. CLF requested in IR 1-53:

Q: Please explain how BECo determined the amount of DSM it would include in the Resource Plan, and why additional DSM was excluded.

The amount of DSM included in the A: Resource Plan is the result of the Collaborative design and evaluation of DSM measures and strategies by the Conservation Law Foundation, Massachusetts Public Interest Research Group, the Division of Energy Resource (sic) the Massachusetts Office of the Attorney General and the Company. It was the expert judgement of consultants to these parties and Company staff that the participation rates and savings were achievable. The programs were designed to facilitate the addition of or elimination of measures based on their cost-effectiveness. The design and implementation of DSM programs is an evolving process which is flexible enough to change as technology improves.

BECo's response cited the collaborative without producing
any information on the derivation of long-term
effectiveness, participation rates, penetration rates, or
other inputs determining the magnitude of the programs.

33 Second, BECo assumes that the current programs can
 34 continue only as currently designed (in the base case), or
 35 contract (in the low case). No significant expansion of the

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programs is even considered.⁴ Certainly, BECo does not consider expansion or acceleration of existing programs as a resource comparable to the construction of power plants.

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Third, the residential existing programs are assumed to 4 5 stop in 1994, which is too soon. For the retrofit programs, IR MP 1-43 indicates that BECo expects to reach only 4% to 6 34% of eligible load by this time. Appliance labelling is 7 terminated in 1992, never reaching even 10% of eligible 8 9 customers; new construction is terminated in 1994 and never 10 reaches more than 5% of new construction. Both of these 11 transitory-opportunity programs have new eligible customers 12 in every year. BECo offers no justification for assuming 13 the termination of the retrofit programs before they are 14 complete, or for assuming the termination of cost-effective programs for transitory opportunities.⁵ 15

⁵It may be appropriate to change the programs BECo has in place, or even to terminate some of them and replace them with more effective approaches. However, terminating the programs without replacement does not appear to be justified. Nor does BECo appear to have assumed in its load forecasts the high levels of increased natural efficiency that might make these programs superfluous.

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¹⁶ 4 On page A-7 of the Resource Plan, BECo suggests that 17 increased penetration of existing programs may occur, providing 18 an "opportunity to defer or avoid the need for additional supply 19 resources during the 1995-2014 period." BECo does not consider 20 the possibility of deciding to increase penetration or broaden 21 programs to affect the addition of Edgar in 1994. Increased DSM 22 savings either before or after 1994 will reduce the benefits of 23 Edgar.

Fourth, most of the commercial programs are assumed to 1 end rather early as well.⁶ The CCS lighting program ends in 2 1994; CCS cooling and "other" in 1999; Calculated Rebate in 3 2000; CCS water and space heating in 2004; Design Build in 4 2005; and Efficient Motors in 2006.7 BECo assumes that the 5 equipment replacement program reaches only 46% of eligible -6 customers, and that large C/I retrofit reaches only 60%; 7 8 BECo does not appear to have specified what percentage of the participants' equipment and floor space would be covered 9 by the programs.⁸ Again, BECo has not justified the early 10 termination of the programs, and has not explained why any 11 transitory-opportunity program should ever be terminated. 12

Fifth, BECo does not account for conservative
assumptions in program design that may have been made in its
projection of program effects. Instead, the company uses
the savings assumed in cost-effectiveness analysis of

17 ⁶It is difficult to determine what BECo assumed in some 18 cases, due to inconsistencies in its reporting formats.

⁷See Exhibit I-B-43 for projected energy savings by program. Since BECo assumes all measures are replaced in kind by the participant (IR CLF 1-55), the program must end in the year in which savings stop growing (this raises some questions about the programs whose savings <u>decrease</u> over time in Exh. I-B-43). IR MP 1-43 provides inconsistent responses in terms of participation rates.

26 ⁸A customer may participate in the equipment replacement 27 program by buying one efficient motor. Similarly, a customer 28 may participate in the retrofit program by adding an economizer, without replacing the chiller, or lighting, or elevator motors, 29 30 or adding lighting controls or an EMS. Thus, the participation 31 rates BECo provided in MP-1-43 (which requested penetration 32 rates) are not useful descriptors of commercial/industrial 33 programs.

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program design as if those were unbiased estimates of 1 program effects. My experience, in fact, has been the 2 opposite: collaborative program cost-effectiveness is 3 generally based on very conservative savings estimates. 4 Program designers are not usually interested in estimating 5 the long-run effects of the program, but only in determining 6 whether the proposed program is cost-effective. If the 7 parties disagree over the effectiveness of a program or 8 measure, the analysis is likely to use the low end of the 9 range of estimated effectiveness.⁹ 10

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> For example, if the design team estimates of the number 11 12 of compact fluorescent bulbs to be installed per participating household range from 2 to 6, but the proposed 13 14 program is cost-effective with an assumed value of 2 bulbs/household, there is no reason for the design team to 15 spend the time and effort necessary to reach consensus on 16 17 any higher number. Similarly, if the proposed industrial 18 retrofit program is cost-effective for 15% average savings, 19 the use of a higher value (even if supported by the 20 available data) will have no effect on the screening. 21 Thus, so long as the overall program is selected for 22 implementation, and the detailed assumptions to be used in

⁹My understanding of this point is based on my general knowledge of collaborative DSM design processes, since I am not directly involved in the BECo collaborative. Susan Coakley will provide testimony on behalf of CLF in this docket regarding the specifics of the BECo collaborative.

implementing the program are reasonable,¹⁰ the forecasting
of program results is not important to the design teams.
Based on my experience with other collaboratives, and on the
testimony of Ms. Coakley, I would expect the savings
estimates prepared for program screening to be understated.
BECo has offered no evidence to the contrary.

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3.3 Limitation of Future Programs

9 Q: How has BECo limited future DSM programs in its Resource 10 Plan analysis?

A: BECo assumes no new programs will be implemented, even though the residential DSM efforts are projected to end in 13 1994, and most of the major commercial programs are terminated between 1997 and 2005. Thus, either as part of the existing programs or as potential new programs, BECO has neglected

any new technologies, such as aerogel insulation;
additional end-uses, such as incentives for selecting
efficient water heaters, ranges, clothes washers,
dryers, dishwashers, copiers, and computers;
additional measures, such as heat-pump water heaters;
and

¹⁰This is important primarily for programs using sitespecific measure design, or measure-specific rebates based on
savings estimates. Specifying the proper number of kWh saved per
0.1 point improvement in SEER, or the number of hours use assumed
for commercial lighting, is vital to this type of program design,
but does not produce estimates of the average percentage by which
cooling or lighting load will be reduced.

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| 1 | | improved program design. |
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| 3 | | 3.4 Fuel-Switching |
| 4 | Q: | Did BECo include any fuel-switching from electricity to |
| 5 | | other fuels in its DSM options? |
| 6 | A: | No. ¹¹ |
| 7 | Q: | Should BECo include fuel switching in its DSM program |
| 8 | | analysis? |
| 9 | A: | Yes. Fuel switching can produce large reductions in |
| 10 | | electric usage. Alternative fuels are often less expensive |
| 11 | | than electricity. Depending on the costs of selecting or |
| 12 | | converting to the alternative fuel, and the relative end- |
| 13 | | use efficiencies, fuel-switching can be quite cost- |
| 14 | | effective. ¹² |
| 15 | Q: | Has fuel-switching been found to be cost-effective in other |
| 16 | · | studies, or adopted by utilities as part of their DSM |
| 17 | | programs? |
| | | |

¹¹BECo does have a heat-pump program, not described in any 18 19 of the documentation, that may promote fuel-switching to 20 electricity. I also understand BECo offers incentives to 21 commercial customers to select electric chilling over gas or If this is the case, BECo should be able to demonstrate 22 steam. 23 the social cost-effectiveness of its promotional practices. As 24 used below, "fuel switching" will refer to reduction of electric load by the substitution of other fuels at the end use. 25 26

^{27 &}lt;sup>12</sup>The costs of fuel-switching vary with the application 28 (e.g., scale, building layout), with the building's status (e.g., 29 new construction, retrofit, major renovation), and with the 30 length of gas service required, if any.

The cost-effectiveness of fuel-switching has been 1 A: Yes. addressed for various applications and various fuels, in the 2 study I performed for Boston Gas in DPU 89-239,13 in the 3 work of non-utility parties to the Central Vermont Public 4 Service DSM collaborative, in the Bonneville Power 5 Administration Resource Plan,¹⁴ and in a Lawrence Berkeley 6 Lab study for Michigan,¹⁵ among others. All of these 7 studies indicated that alternative fuels can be less 8 expensive than electricity for at least some applications of 9 each end-use considered. Fuel switching for at least some 10 end uses have been incorporated in the DSM programs of Green 11 Mountain Power, Burlington (VT) Electric Department, New 12 、 York State Electric and Gas, Long Island Lighting, Consumers 13 Power, Madison Gas and Electric, and Consolidated Edison, to 14 name a few. Most of these studies and programs involve 15 fuel-switching to gas, but Con Ed is switching electric 16 chilling to steam, and the CVPS collaborative also 17 determined that conversion of residential space and water 18

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- ¹³Chernick, Paul, et al., <u>Analysis of Fuel Substitution as</u>
 an Electric Conservation Option. December 1989.
- ¹⁴Bonneville Power Administration, <u>1990 Resource Program</u>
 <u>Technical Report</u>. July 1990.
- ¹⁵Krause, Florentin, et al., <u>Analysis of Michigan's Demand-</u>
 <u>Side Electricity Resources in the Residential Sector</u>. MERRA
 Research Corporation, April 1988.

- 17 -

heating to oil and propane will often be cost-effective.¹⁶ 1 Thus, fuel-switching is not a particularly exotic or obscure 2 The technology is also well-developed. 3 DSM option. 4 0: Does BECo have any responsibility to include fuel-switching in its analysis of DSM program potential? 5 6 A: Yes. While the proper mechanism for analyzing, promoting, 7 and financing fuel-switching are currently under consideration by the DPU in Docket DPU 90-261-A, recent DPU 8 and EFSC rulemakings on IRM leave no doubt that fuel-9 switching must be considered as an option in an electric 10 11 utility's long-run analysis of resource availability, and in the bidding process. 12 Has BECo studied its options for cost-effective fuel 13 Q: switching? 14 15 A: In response to IR CLF 1-49, No. 16 17 Q: Please provide any and all documents 18 discussing the Company's consideration of 19 whether to include fuel-switching as a DSM 20 option. Please describe any studies or 21 analyses that BECo plans to undertake to 22 assess fuel-switching as a DSM option. 23 24 25 BECo replied 26 27 A: To our knowledge the Company has no 28 documents discussing fuel switching as a 29 DSM option and is not currently planning 30 to use fuel switching. 31 ¹⁶Solar might also be included in this list, especially for 32 33 water heating. I would generally treat solar as a conservation 34 option, rather than fuel-switching, since it does not require any

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continuing energy input.

1 BECo admits to knowing nothing about this potentially significant DSM resource, and has no plans to do anything to 2 3 achieve the potential of the fuel-switching resource. This admission, in itself, is sufficient to demonstrate that BECO 4 has not prepared a least-cost resource plan.¹⁷ 5 Does fuel-switching have the potential to provide a 6 Q: 7 significant DSM resource for BECo? BECo has significant amounts of space-heating and 8 A: Yes. 9 water-heating load in the residential sector, and a very 10 large chilling load in the commercial sector. Fuel-11 switching large parts of each of these loads could have a 12 substantial effect on BECo's resource needs. 13 14 3.5 Avoided Costs for DSM 15 Inadequate documentation 3.5.1 16 Has BECo provided an adequate explanation of the avoided Q: 17 costs it used in evaluating DSM?

¹⁷BECo should determine the amount of such actions that 18 19 would be cost-effective. There is an additional policy reason 20 for BECo to develop an analysis of cost-effective fuel-switching 21 prior to constructing Edgar. Edgar would be a primarily gasfired facility. As such, it would tie up pipeline capacity that 22 23 could otherwise carry gas to serve energy needs directly at the 24 end use. For most end uses, less gas will be required to serve 25 loads directly than to serve loads through electric generation. 26 In addition, major investments in electric generation, 27 transmission, and distribution capacity can be avoided by using 28 the gas directly. Hence, before devoting so much gas to an 29 electric generation facility, the EFSC should know whether its 30 customers have any better use for the gas, such as fuel 31 switching.

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A: No. BECo clearly has a specific set of avoided costs,
 against which it screened the proposed DSM programs. BECo
 says as much on page B-19:

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[DSM p]rogram benefits are calculated by applying avoided energy costs to kilowatthour savings and the economic carrying charge of marginal generation, transmission, and distribution to peak kilowatt savings.

9 Without a specific set of avoided costs, BECo could not have 10 produced the benefit/cost ratios shown in Exhibit I-B-11. 11 However, in response to CLF IR 1-11, which requested the 12 avoided costs actually used in the analysis, BECo refused to 13 provide the avoided costs. BECo has not responded to our 14 follow-up requests.

Where BECo has provided some documentation, as in IR
MP-1-53, that documentation is vague. For example, IR MP17 1-53

lists avoided energy costs for 21 cases, without
explaining whether the DSM programs (and component
measures, and decisions to expand or enhance measures)
were screened on the "base" avoided costs, some
weighted average of the 21 cases, or something else;¹⁸
lists a single avoided generation cost (\$/kW), without
specifying whether that cost includes a reserve

25 ¹⁸This seems inconsistent with the one run reported in 26 Exhibit I-B-11.

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1 margin,¹⁹ or the year it becomes effective, or how it 2 varies over time; 3 lists a distribution cost (\$/kW), without specifying 4 whether that cost is intended to include secondary 5 transmission, whether the kW denominator is customer

fails to state the year's dollars in which the capacity
costs are stated;

peak, class peak, or system peak;

- 9 fails to describe how the capacity costs are assigned
 10 to seasons; and
- states a carrying charge for each type of capacity
 (generation, transmission, and distribution), without
 stating whether that carrying charge is nominal or
 real.

In addition to its refusal to evaluate fuel switching and its failure to evaluate other DSM alternatives properly, BECo has failed to demonstrate that it is even prepared to compare DSM alternatives to supply options, or to determine the measures and enhancements that should be included in its DSM programs.

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3.5.2 Omissions and understatements

Q: What factors has BECo omitted or understated in determining
the avoided-cost value of DSM?

¹⁹The avoided costs are represented as being used both for supply, which should not include a reserve credit, and for demand, which should include reserves.

- 21 -

| 1 | A: | The omissions and understatements appear to include: |
|----|----|--|
| 2 | | the externalities monetized by the DPU in DPU 89-239; |
| 3 | | the other externalities BECo identifies and values in |
| 4 | | its Resource Plan; |
| 5 | | the non-price factors BECo values for supply in the |
| 6 | | Resource Plan; |
| 7 | | ullet the high reserve margins BECo finds justified in the |
| 8 | | Resource Plan; |
| 9 | | the high value of unserved energy (51 vs 7.5 \$/MWH) |
| 10 | | BECo finds justified in the Resource Plan; and |
| 11 | | • the reduction in risk due to DSM. |
| 12 | Q: | How does BECo understate the externalities monetized by the |
| 13 | | DPU in DPU 89-239? |
| 14 | A: | In three ways. First, of the DPU externalities, BECo |
| 15 | | includes only SO_2 , NO_x , and particulates. ²⁰ Carbon dioxide |
| 16 | | is omitted entirely, as are all of the more minor emissions |
| 17 | | Second, the three air emissions are under-valued. For |
| 18 | | the generic combustion turbine, the value given the air |
| 19 | | emissions is less than 4 points, or about \$2/MWH. ²¹ The DPU |
| 20 | | would value these emissions at \$9.5/MWH. ²² |
| | | |

....

24 ²¹The value of 0.05 cents/kWh per point is derived below.

25 ²²This value is derived below. I believe that the DPU 26 values are understated, especially for NO_x.

^{21 &}lt;sup>20</sup>For some reason, BECo scores particulates on a non-linear 22 scale. This was apparently intentional, but BECo cannot explain 23 its decision (IR CLF 3-10).

Third, BECo does not appear to have added even these 1 small values to the avoided costs used in screening DSM. 2 What is the effect of understating the externalities 3 Q: monetized by the DPU in DPU 89-239? 4 As shown in Table 3.1, these externalities are worth roughly A: 5 5 cents/kWh in 1990\$, so long as most of the avoided energy 6 is from existing plants. The avoided costs developed for 7 DSM appear to assume that only combustion turbines are 8 avoidable, so most of the avoided energy would be from the 9 NEPOOL margin.²³ Table 3.1 also provides DPU externality 10 11 values for a combustion turbine and a combined-cycle plant. Table 3.2 converts these real values to current dollars for 12 1990-2014, given BECo inflation assumptions. 13 What is the effect of understating the other externalities 14 Q: BECo identifies and values in its Resource Plan? 15 BECo has asserted that it can meaningfully compare the A: 16 values of other externalities to air emissions, and that its 17 valuations should be included in ranking alternatives.²⁴ 18 BECo was asked the following question as Request CLF-1-47: 19

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^{20 &}lt;sup>23</sup>These estimates of the NEPOOL marginal externalities are 21 from Tellus's work for the Vermont Department of Public Service. 22 WMECo's estimate of the emission factors is somewhat lower, and 23 MECo's estimate is somewhat higher. BECo claims to have no 24 information about emissions from the NEPOOL margin. (IR CLF 1-25 43, 1-44)

²⁴See Exhibit I-D-3 of BECo's 5/1/90 Resource Plan for
externality evaluations for a wide range of technologies,
including three air emissions (SO2, NOx, and particulates) and 13
other factors.

| 1 2 3 4 5 6 7 8 9 10 | Q. Please explain whether BECo believes that the relative weight it gave to the three air emissions (SO ₂ , NO _x , and particulates), compared to the other externalities included in the externalities ranking, is correct and should be reflected in the new combined price/externality component to be included in BECo's IRM analysis under DPU 89-239. | | | | | | | | | | |
|--|---|--|--|--|--|--|--|--|--|--|--|
| 12 | BECo responded: | | | | | | | | | | |
| 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 | A. Yes we do. In D.P.U. 89-239 the Department agreed with project evaluations that distinguished energy project evaluations by their expected emissions levels as we have done. Our new methodology, we believe, remains consistent with the Department's further finding that electric companies should implement an environmental evaluation methodology which recognizes, to the greatest extent possible, the expected level of environmental impacts of proposed projects as we have done in our May 1, 1990 filing effort. | | | | | | | | | | |
| 29 | While it is not clear what methodology BECo believes the DPU | | | | | | | | | | |
| 30 | accepted in DPU 89-239, it is clear that BECo's official | | | | | | | | | | |
| 31 | position is that the 13 other externalities should be | | | | | | | | | | |
| 32 | included in project valuation, and that the relative weights | | | | | | | | | | |
| 33 [·] | of the three air emissions to the other externalities is | | | | | | | | | | |
| 34 | appropriate. | | | | | | | | | | |
| 35 | In BECo's valuation of the externalities of the generic | | | | | | | | | | |
| 36 | oil-fired combustion turbine (Resource Plan, Ex. I-D-3, p. | | | | | | | | | | |
| 37 · | 4), the total externality penalties reduce the externality | | | | | | | | | | |
| 38 | score by 63.5 points from the perfect score of 265. Of | | | | | | | | | | |

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those 63.5 points, 20.5 points are due to the three air

emissions. As demonstrated in Table 3.3, BECo's reported

emissions of these three pollutants is worth \$0.789 per 1 MMBtu. BECo does not provide the average heat rate for this 2 plant in either the Resource Plan or the RFP, but Exhibit I-3 C-14 of the Resource Plan provides a full-load heat rate of 4 11,146 BTU/kWh. The average heat rate is likely to be 5 considerably higher, especially for a peaking plant; I will 6 optimistically assume an average heat rate of 12,000 BTU/kWh 7 for this unit. This brings the externality value of the 8 three air emissions to \$9.468/MWH.²⁵ Hence, each air 9 emission point is worth \$9.468/20.5 = \$0.4619/MWH. The 43 10 points BECo assigns to the other environmental externalities 11 of the combustion turbine are thus worth 43*\$0.4619 = 12 This value in 1989 dollars should be added to \$19.86/MWH. 13 BECo's avoided costs, if the peaker is to be used as the 14 avoided supply capacity.²⁶ 15

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16 Q: How does BECo omit the non-price benefits of DSM, as 17 suggested by its non-price factor evaluation in the Resource 18 Plan?

¹⁹ ²⁵BECo reports a total value of these three pollutants of \$3.81 on RFP 3 Evaluation Sheet 5, page 4. This is for a largely 20 gas-fired turbine, presumably with much lower sulfur and 21 particulate emissions, and somewhat lower NO, emissions than the 22 oil-fired generic peaking unit evaluated in the Resource Plan. 23 BECo's unjustified change in avoidable unit, its failure to 24 describe the RFP avoidable unit fuel type pollution controls, and 25 its failure to document the emissions in the RFP, make 26 27 reconciliation of these values impossible.

^{28 &}lt;sup>26</sup>BECo assigns 60 points to the non-air externalities of 29 Edgar (Resource Plan, Ex. I-D-3, page 1), which would be worth 30 60*\$0.4619 = \$27.71/MWH.

A: First, BECo does not allow DSM to benefit from its superior
 performance in most of the non-price factors BECo uses to
 rank supply sources. Instead, DSM programs are rated on a
 separate non-price scale.

5 Second, BECo does not appear to have included any non6 price factors in the avoided costs with which it screened
7 DSM programs.

8 Q: Is BECo's non-price rating procedure for DSM useful in 9 determining the value of DSM programs relative to one 10 another and to supply?

11 A: No. BECo's DSM non-price rating procedure is a mixed bag of irrelevant and misapplied considerations. First, some 12 13 factors on this DSM non-price scale appear more suitable for 14 program design than for program screening. For example, 15 programs that produce cream skimming should be corrected, 16 not dropped. Second, some of the DSM non-price factors 17 (such as targeting vulnerable classes) could be used to give 18 additional points to the best DSM programs; few if any of 19 the factors reflect fundamental disadvantages of DSM compared to supply. Third, many of BECo's DSM non-price 20 21 factors appear to discriminate against the most important 22 DSM programs: for example, the "breakeven" factor would downgrade the measures least likely to be accepted without 23 24 utility intervention, "product availability" and "delivery 25 infrastructure" would downgrade programs that would develop

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new market infrastructure, 27 and "market potential" 1 downgrades programs (such as new construction) applicable to 2 3 only a few customers. Similar problems arise in the "identify target market," "product awareness" and "team 4 experience" categories. For no apparent reason, BECo gives 5 a perfect 20-point score for Front-load Security to all 6 7 utility-owned supply resources and to some load management, 8 but arbitrarily gives utility conservation programs only a 10-point score on the same scale. With all of these errors, 9 biases, and inconsistencies, BECo's current form of DSM non-10 price factor scoring provides little useful information. 11

12 Since BECo has refused to document the procedure it 13 used in screening measures, measure enhancements, and 14 programs, it is not clear whether the DSM non-price factors 15 have ever been used for any practical purpose. If BECo has 16 screened out measures, enhancements, or programs based on misapplication of the non-price factors, BECo's DSM 17 projections are further understated, and BECo's resource 18 19 plan is further from least-cost.

Q: How can the non-price factors BECo values for supply in the
Resource Plan be reflected in the avoided cost used for DSM?
A: BECo provides a long list of non-price factors that apply to
supply-side resources. The points assigned to these factors

24 ²⁷These factors may be useful in identifying programs that 25 will ramp up slowly. This may be important information for 26 resource planning, but it does not imply the program is bad. 27 Rather, it implies the program should be started as soon as 28 possible, to allow for the ramp-up period. are equivalent to dollar values, since a resource with a higher non-price score can charge a higher price and still be preferred to a resource with a lower price and a lower non-price score.

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To make explicit BECo's implicit monetization, I 5 converted price points to equivalent real-levelized avoided 6 costs. From BECo's point formula, each additional levelized 7 price point requires that the levelized price be reduced by 8 1/125 of avoided cost, or 0.8%. From Table 3.4, the RFP 2 9 real-levelized avoided cost for 1994-2011 was 7.5 cents/kWh 10 in 1994\$. Thus, each price point (and hence each non-price 11 12 point) is worth 0.06 cents/kWh, or 0.05 cents/kWh in 1990\$.

Table 3.5 evaluates the "avoidable" CT and a generic 13 marginally cost-effective DSM program under the supply-side 14 non-price factors. The CT ratings are generally the same as 15 BECo's, except for the breakeven date. As shown in the QF 16 17 RFPs, the CT does not break even (against the real-levelized 18 capacity cost) until the last year of its life. BECo has treated the CT as breaking even in the first year of its 19 20 In Table 3.5, I have accepted BECo's optimistic life. treatment of utility-owned plants (which receive perfect 21 22 scores in several areas), and assumed the same scores apply 23 to utility-financed DSM. The 44 additional points are worth 24 about 2.64 cents/kWH in 1994\$, or about 2.2 cents/kWh in 25 1990\$.

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Q: What reserve margins does BECo find justified in the Resource Plan?

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A: BECo's decision to plan for the 80% confidence level clearly
implies greater resource additions than those required for
"best estimate" conditions. However, BECo has refused to
provide the reserve margins that would be produced by its
plan under base load growth (IR CLF 1-31). I have thus
performed my own computation of the reserve margins implied
by BECo.

Table 3.6 computes the reserve margins implied by the 10 Resource Plan, under two interpretations. The "target" 11 reserve margins are those produced at BECo's base-case 12 13 availability (57%) of planned resources, and with the additions specified in BECo's Optimal Plan (pp. E-21 and E-14 26 of the Resource Plan). The "planning" reserve margins 15 16 are those that would be produced if all the planned resources are completed, and if BECo continues to assume 17 that only 57% of planned resources will be completed. 18 How would use of these higher reserve margins affect the 19 Q: 20 cost-effectiveness of DSM? Any reduction in annual or monthly peak demand achieved by 21 A: 22 the DSM program should be credited with avoiding at least

40% reserves, rather than the roughly 27% BECo apparently
applied.²⁸

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^{25 &}lt;sup>28</sup>See Exhibit I-C-2; BECo does not specify the reserve 26 margin requirements used in developing avoided costs for DSM 27 analysis.

Q: What value of unserved energy does BECo find justified in
 the Resource Plan?

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A: BECo concludes that unserved energy is worth about 51
cents/kWh (p. I-E-18).²⁹ This value is apparently in 1990\$,
although BECo does not specify how this value is expressed,
and has refused to provide documentation of the derivation
of the value.

What value of unserved energy did BECo use in screening DSM? Q: 8 We do not know, since BECo has refused to provide its DSM 9 A: avoided costs, let alone a breakdown or derivation of those 10 However, the scant documentation we have received 11 costs. from BECo appears to use 7.5 cents/kWh as the default value 12 of unserved energy. That documentation is provided as 13 Appendix B. 14

15 Q: How much does this difference in unserved energy affect the avoided cost used for DSM?

Table 3.7 shows the change in unserved energy between the 17 A: 18 base and low load growth case, with all other inputs at the 19 base level. It also shows the amount of DSM necessary to 20 reduce load from the base to the low growth level. From 21 these two values, Table 3.7 computes the fraction of that 22 additional DSM energy that would represent a reduction in 23 unserved energy. The last column of Table 3.7 multiplies

²⁹"Unserved" energy is not served by BECo plants under own load dispatch. It is likely to be served by purchased power or
 NEPOOL interchange. Thus, the value of unserved energy is a
 proxy for a mix of purchased power costs, voltage reductions, and
 service interruptions.

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the fraction of avoided energy "unserved" by the 51 cent/kWh
 value BECo assigns to unserved energy to estimate the
 contribution of unserved energy to the value of additional
 DSM.³⁰

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- 5 Q: Has BECo reflected in the valuation of DSM any reduction in
 6 risk compared to supply sources?
- 7 A: Not so far as I have seen. BECo does not discuss any credit
 8 for risk reduction in the scanty avoided-cost data it has
 9 provided.
- 10 Q: What would be the effect of reflecting supply-side risks in11 the valuation of DSM?
- Considering only the risks inherent in building for 12 A: uncertain load forecasts, the Northwest Power Planning 13 14 Council (NPPC) found a 10% advantage for conservation over 15 power-plant construction. This benefit resulted from shorter lead times, and the tendency of DSM program 16 17 effectiveness to follow loads. DSM is less likely to result 18 in expensive over-capacity or under-capacity situations than 19 are conventional supply options. The advantage of DSM over 20 supply would be even larger, if the analysis included 21 uncertainty and risks in fuel prices, construction 22 schedules, operating costs, capacity factors, and completion 23 probabilities. Each of these factors contribute to
- 24 ³⁰Assuming that 7.5 cents/kWh is already reflected in the 25 analysis, the avoided cost would be increased by about 85% of the 26 value in column 8.

- 31 -

| 1 | | over/under-capacity, and/or to selection of sub-optimal |
|----|----|---|
| 2 | | generation choices. |
| 3 | Q: | Please summarize your recommended changes in BECo's avoided |
| 4 | | costs for DSM. |
| 5 | A: | BECo should: |
| 6 | | ullet include the DPU-monetized externalities (roughly 5 |
| 7 | | cents/kWh, 1990\$), |
| 8 | | include the other externalities BECo has valued |
| 9 | | relative to the DPU externalities (about 2 cents/kWh, |
| 10 | | 1989\$), |
| 11 | | include DSM advantages over supply in non-price |
| 12 | | factors, as BECo implicitly monetized those factors in |
| 13 | | its scoring system (about 2.2 cents/kWh, 1990\$), |
| 14 | | ullet eliminate any use of the DSM non-price factors in |
| 15 | | screening, |
| 16 | | include in the generation capacity value the 40% |
| 17 | | reserve margin for which BECo intends to plan, |
| 18 | | include in the value of saved energy the value of |
| 19 | | unserved energy BECo determines (51 cents/kWh to 2000, |
| 20 | | 15.6 cents/kWh thereafter, 1990\$), and |
| 21 | | include a credit for reduced planning risk, using the |
| 22 | | NPPC's 10% adder until BECo-specific values become |
| 23 | | available. |
| 24 | | |
| 25 | | |

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1 3.5.3 Importance of proper avoided costs 2 Q: Given the low costs and high benefit/cost ratios generally 3 determined for most electric utility DSM programs, what would be the effect of using understated avoided costs? 4 5 A: For most of the common program concepts, the DSM program as a whole will likely be cost-effective even with understated 6 avoided costs. However, properly computed avoided costs are 7 vital for DSM program design and implementation for several 8 First, some cost-effective programs will not be 9 reasons. 10 found to be cost-effective if avoided costs are understated. Second, higher avoided costs will result in more measures 11 12 screening into programs. For example, a commercial lighting program may be cost-effective at only half of true avoided 13 14 cost, but the daylighting component may not be costeffective. 15

Third, for each measure included in a program, higher 16 17 avoided costs allow it to be applied to smaller applications. Refrigeration audits can be offered to 18 19 smaller food stores, and incandescents may be cost-20 effectively replaced with compact fluorescents in fixtures 21 which are used for fewer hours. Fourth, higher-efficiency 22 technologies become cost-effective at higher avoided costs. 23 Heat-pump water heaters may be cost-effective at higher 24 avoided costs than those needed to justify water-heater 25 wraps.

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Fifth, where a single technology can be applied at 1 2 different levels (such as varying thicknesses of insulation), higher avoided costs result in higher cost-3 effective efficiency levels. Sixth, for programs consisting 4 of custom rebates, site-specific audits, or other incentives 5 tailored to the particular building, higher avoided costs 6 7 will result in more DSM being cost-effective in each installation. The program as a whole may be cost-effective 8 over a wide range of avoided costs. Seventh, higher avoided 9 costs may justify changing program design, to allow for more 10 intensive site-specific DSM investment. For example, a 11 menu-driven rebate program can be replaced by an audit-12 driven direct installation program, which will produce 13 14 greater savings (at a higher cost) by eliminating creamskimming. Finally, misallocation of capacity costs to 15 seasons, time periods, and types of demand (e.g., system 16 . 17 peak versus customer peak) may result in the selection of 18 uneconomic DSM and the rejection of economic DSM.

19 The determination of avoided costs for DSM is not an 20 idle or peripheral exercise. Until BECo produces a 21 reasonable and reviewable set of avoided costs, reflecting 22 the assumptions and conclusions of the Resource Plan, and 23 fairly reflecting the externality, non-price, and risk 24 benefits of DSM over supply, BECo cannot produce a maximum 25 cost-effective DSM program. Without that DSM program, BECo 26 cannot develop a least-cost Resource Plan, or demonstrate

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1 4. ERRORS IN SUPPLY OPTION ANALYSIS 2 What problems have you identified in BECo's analysis of Q: 3 supply options? 4 BECo has arbitrarily excluded apparently viable supply A: 5 options from the analysis, has not properly included 6 externalities in the analysis, and has arbitrarily treated 7 non-price factors. 8 9 4.1 Arbitrary Exclusion of Options How has BECo arbitrarily excluded supply options? 10 Q: 11 A: BECo has made a series of assumptions which appear to be 12 biased in favor of building Edgar. Most of these 13 assumptions are documented in Exhibit I-C-14. These 14 include: 15 No other combined cycle (CC) plants can be built 16 burning interruptible gas and oil, which is the lowestcost fuel supply for Edgar.³¹ 17 18 Only one other gas-fired combined-cycle plant can be built, and that must be 400 MW.³² This plant cannot be 19 20 built until 1996.

' e :

28 ³²BECo allows any number of 100, 200, 300, or 400 MW oil-29 fired CC to be built. However, the high cost of #2 oil results 30 in none of these plants being selected in any of the cases.

³¹BECo's recent projections of gas availability for new generation have been unreliable and subject to rapid changes. In evaluating the cost-effectiveness of Pilgrim in DPU 89-100 (in testimony filed June 1989), BECo assumed that Edgar would burn 100% #2 oil for its entire life, and that gas would not be available for either Edgar or any other CC, either firm or interruptible.

- No combustion-turbines (CTs) can burn gas, even though
 RFP 3 assumes that all new CTs will burn gas, at no
 additional capital cost.
- Edgar cannot be delayed; it must be built in 1994, or
 not at all.
- If Edgar is not built, no alternative use is allowed
 for the gas Edgar would have burned. With Edgar, 706
 MW of gas combined-cycle plants can be built. Without
 Edgar, gas supply is assumed to support only 400 MW of
 CC.
- Despite the assumed tight market for gas supplies,
 burning gas at Edgar does not affect the amount of gas available for existing plants.
- No provision is made for any CCs to be retrofit for
 coal gasification.
- The capital cost of the MWRA plant includes the present value of the demand charges for pipeline gas supply (IR S-30). BECo does not appear to have added a comparable charge to the capital cost of Edgar. Since a taxable equity return and property taxes are charged on capital costs, BECo appears to have overstated the cost of the MWRA plant.

Q: How are these exclusions and overstatements of cost likely
to have affected the role of Edgar in the Resource Plan?
A: Given the large number of cases, it is difficult to
generalize. BECo's assumptions have caused Edgar to be

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inappropriately accepted in 1994. Without those
 constraints, it is likely that some slippage, or the
 replacement of Edgar with a smaller and/or later CC, would
 be desirable in the low-growth cases.

The only way to determine these effects is to rerun the analyses without the artificial constraints.

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Failure to Consider Externalities Properly 8 4.2 How did BECo err in its treatment of externalities? 9 Q: As discussed above, BECo has failed to use monetized 10 A: 11 externalities, as required by the DPU. In fact, BECo has refused to provide information on emissions factors for its 12 13 supply options (IR CLF 1-45), or to re-rank alternatives 14 using the DPU methodology. In short, BECo has failed to comply with its responsibilities under DPU 89-239.³³ This 15 failure is sufficient justification for denying BECo 16 approval of its preferred supply source. Massachusetts 17 18 electric utilities should have strong incentives to comply 19 with DPU and EFSC orders and directives, particularly in the 20 context of the IRM process.

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³³The requirement of quantification was established in DPU 86-36G, dated December 6, 1989; the debate over monetization was started by Boston Gas's filings in its rate case (DPU 88-67) and DPU 89-239 (December 1989); and the requirement to use the DPU's monetized values was established in DPU 89-239, dated August 31, 1990.

- Q: Do you have any other comments on BECo's treatment of the
 externalities, other than its refusal to comply with DPU 89 239?
- 4 A: Yes. BECo's treatment of externalities is undocumented and
 5 subjective. For example,
- BECo cannot defend any of its externality rating
 procedure, including the weights given various factors,
 or the scores given to particular characteristics or
 projects.
- BECo measures air emissions in lb/MMBtu, and adds the
 resulting scores to total project scores for other
 factors without accounting for heat rate or capacity
 factors. BECo continues to insist that non-linear
 scales are appropriate for air emissions (i.e.,
 particulates).³⁴ This position highlights the
 arbitrary nature of BECo's externality ranking.
- BECO rounds externality scores to 0.5, which further
 obscures its assumptions regarding emission factors
 (which BECO claims not to have in any case), and makes
 small changes in assumptions more important.
- BECo applies very peculiar rules in ranking Edgar's
 externalities. Despite the requirement for a lengthy
 pipeline through a heavily populated area, BECo gives
 itself a score of 3.5 (out of 5) for fuel transport.

³⁴BECo's justification for this practice (IR CLF 3-10,
 follow-up to a non-response in CLF 1-38) is unintelligible.

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Even though BECo's Environmental Externality Form gives 1 once-through cooling systems 0 points (the worst 2 3 possible), BECo gives Edgar's once-through system 2 4 points on "cooling water availability" and 3 points (better than average) for "aquatic impacts".³⁵ 5 Until BECo can demonstrate that Edgar is competitive 6 with other options, including additional DSM, using a 7 reasonable, reproducible, documentable methodology, the 8 EFSC should not approve Edgar. 9

10 11

4.3 Arbitrary Treatment of Non-price Factors

12 Q: What problems have you identified in BECo's treatment of 13 non-price factors?

A: There are several problems. BECo cannot justify any of the
 weights given to the non-price factors nor explain how it
 rated projects for each factor. BECo's ratings of its own
 Edgar project are particularly suspect.³⁶

18

194.3.1Weights are not supported

Q: Should BECO be able to justify the weights it assigns to
various non-price factors?

A: Yes. All other things equal, BECo asserts that its
 ratepayers should be willing to pay more for a project with

24 ³⁵See IR CLF 1-41. Once again, BECo's explanations of its 25 rating system are undocumented and unclear.

26 ³⁶I have already discussed the problem of not using the same 27 set of non-price factors for DSM and supply-side options. higher non-price scores. Specifically, each point on the non-price scores equals about 0.05 cents/kWh real-levelized over 1994-2011. BECo should be able to explain why each of the non-price factors it has identified, and each of the rating levels for each of those factors, is worth the price it suggests its customers pay.

BECo argues that it may use judgment in setting non-price 7 Q: 8 Is the use of judgment consistent with the factors. 9 justification of factor weights and rating criteria? 10 Yes. For example, BECo might set the factor weight for a A: particular permit by estimating that (a) 10% of projects 11 will fail to get this permit, (b) denial of the permit and 12 failure of the project will not become obvious for two 13 years, and (c) the two-year delay would require two years of 14 replacement power, at an average of 2 cents/kWh more than 15 16 the cost of long-term power contracts. The absence of the permit would thus be worth about .04 cents/kWh over a 20-17 year contract life,³⁷ or 0.8 points on BECo's non-price 18 19 scale.

Data may be available to support each of the components described above, but considerable judgment will also be required. For the probability of obtaining the permit, BECo might start with the applications that actually have been filed for power generation projects, and the number that

^{25 &}lt;sup>37</sup>This is 10% * 2 cents * (1.7/8.5), where 1.7 is the 26 present value of \$1/year over 2 years, and 8.5 is the present 27 value of \$1/year over 20 years, all at a 10% discount rate.

1 In addition, projects which have withdrawn have succeeded. 2 their applications might be reviewed to determine whether some of them were withdrawn because they could not be 3 Trends in the data might be examined to 4 permitted. determine if developers have become more sophisticated in 5 formulating applications. Utility-sponsored and non-6 utility projects might be disaggregated. Changes in the 7 agency's regulations, standards, or governing statute might 8 9 also indicate that future results would be different than 10 the historical data. Especially if the database is small, 11 judgment will be important in selecting the probability of 12 failure. The same is true for each of the other factors.

Thus, the reasonable application of judgment is very
different from undocumented assertions.

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4.3.2 Ratings are not supported

17 Q: What problems have you identified with BECo's ratings of18 non-price factors?

A: In most cases, the ratings are not even well-defined. For
example, the location factor allows 2 points for projects in
Area 3, defined as "Southeastern Massachusetts," without
defining that region, and without specifying whether the

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portion of BECo's service territory not in Areas 1 and 2 is part of Area 3.³⁸

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3 BECo also cannot explain how the scoring within each factor was determined. See IR CLF 1-1. For example, the 4 request for the basis of the location factor in CLF 1-8 5 elicited only a description of the score. It is highly 6 7 counter-intuitive that resources outside BECo's service 8 territory, such as Edgar, would receive a better score than 9 resources in much of the service territory. BECo could not provide a single word of explanation of this anomaly. 10

11 A top score in the Technical and Environmental 12 Feasibility factor requires that a similar facility have 13 achieved an 85% EAF for 5 consecutive years. The rating 14 itself is inappropriate since the time period is not 15 specified; an unscrubbed high-sulfur coal plant would 16 probably qualify, even though it would now be 17 environmentally infeasible.

18 One particularly odd aspect of BECo's scoring is the
19 breakeven period score. Even though this is a simple
20 mathematical formula, BECo's results are not reproducible.³⁹

26 ³⁹The formula is 27 (1 + last contract year - breakeven year)*1.2. 28 Breakeven year is the year after the last year in which the 29 cumulative present value (CPV) of expected avoided costs is less 30 than the CPV of expected purchase prices.

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^{21 &}lt;sup>38</sup>BECo's location rating appears to have changed dramatically 22 between RFP #2 and RFP #3. The non-BECo portion of Southeastern 23 Massachusetts (including the Edgar site) was preferred to the core 24 of BECo's territory (including most of the region inside Route 128) 25 in RFP #2, while in RFP #3, the preference is reversed.

1 For example, Exhibit I-D-7 lists the generic combustion 2 turbine as having a breakeven score of 24, implying that it breaks even in the first year of a 20-year contract.⁴⁰ The 3 derivation of the avoided real-levelized capacity costs in 4 the RFPs demonstrates that the CT would not break even until 5 after the end of the 20-year contract. The CT should get a 6 7 score of 0, not 24. Similarly, IR S-81 reports that Edgar would break even in 2003. Since the contract runs to 2013, 8 the breakeven score should be 13.2; for some reason, BECo 9 10 reports a breakeven score of 17.

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4.3.3 Edgar is overrated

13 Q: What special concerns do you have about the non-price14 ratings BECo gives to Edgar?

A: BECo appears to have given its favored project over-stated
or highly suspect ratings in a number of areas, including
sponsor experience, financing, permits, and fuel contracts.

BECo gives Edgar a perfect score for "sponsor
 experience," which requires that the sponsor have built a
 similar plant which operated at an EAF of 70% or more.⁴¹
 BECo defines the "sponsor" as "the party submitting the

^{22 &}lt;sup>40</sup>The DPU has not allowed QF evaluation to be based on periods 23 of more than 20 years. BECo does not provide avoided costs for 24 much more than 20-year contracts.

⁴¹If BECo used the same 85% standard as in Technical Feasibility, it probably would not get the highest rating as a developer of any type of plant. See page I-E-8 for BECo plant historical EAFs.

Project Proposal, including all partners, joint venturers,
 subsidiaries, affiliates and individual investors" (IR CLF
 1-2). Thus, BECo (with Edgar Energy and other affiliates)
 is the sponsor of Edgar. BECo has never built a combined cycle plant, and thus should get 1 point on experience, not
 the 4 points it awards itself.

BECo gives Edgar a perfect score for "financing," which 7 requires that 100% of the required funds be "paid or 8 quaranteed." BECo may consider its 30% equity share of the 9 project to be "guaranteed," but it still requires DPU 10 approval. The debt has not been issued, nor does there seem 11 to be any formal guarantee of its availability.⁴² This 12 would appear to entitle Edgar to 0 points, not the 6 BECo 13 gives itself. 14

BECO gives Edgar a score of 4 for permits, out of a total of 6 points. BECO appears to have filed for all of its permits, and received one from the FAA. Thus, BECO should give Edgar only 1.5 points, rather than 4 points.

BECO gives Edgar a perfect score for "fuel supply," which requires that the sponsor have fuel supply contracts for the life of the power sales contract. BECO does not appear to possess any gas supply contracts for Edgar, and has only precedent agreements for transportation. The

⁴²It appears that BECo has rejected UE&C's offer of
 construction financing. It is not clear that UE&C could guarantee
 funding on this scale without other parties. UE&C financing would
 also raise BECo's bid price (IR S-84).

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company should score Edgar at 0 points, rather than the 6
 points it claims for Edgar.

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- 3 Q: Do you have any other concerns about BECo's applications of 4 non-price factors?
- BECo has allowed Edgar to use a price formula with an 5 A: Yes. actual fuel-cost flow through, while other projects are 6 required to use a national gas-price inflator.43 This 7 transfers some of the price risk associated with specific 8 contracts, and all of the heat-rate risk, from the project 9 sponsor (BECo, in this case) to the ratepayers.⁴⁴ Either 10 similar flow-through provisions should be offered to all 11 projects (which would reduce their required price bids), or 12 those assuming the most risk should receive some recognition 13 Since BECo's non-formula in their non-price scores. 14 variable rate for Edgar would not be allowed for any other 15 bidder, and since it creates adverse incentives for BECo's 16 maintenance of Edgar, it is probably worse than many 17

18 ⁴³Ocean States Power was also allowed to use an actual fuel-19 price flow-through.

⁴⁴For example, Exhibit BE-RSH-8 assumes that Edgar operates 20 at an average heat rate of 8236 BTU/kWh, which is the full load 21 heat rate specified in Exhibit I-C-14. Average heat rates are 22 usually higher than full-load heat rates, especially for units that 23 are frequently cycled or operated at part load, as would be the 24 case for Edgar on oil (and perhaps on gas in some high-fuel-price 25 scenarios). Hence, BECo's projected cost of Edgar energy is 26 probably understated, even in the best of cases. Edgar's heat rate 27 may be even worse, since BECo will have no incentive to maintain 28 a good heat rate, but it will have an incentive to maintain high 29 availability and low maintenance costs (and hence limit heat-rate-30 31 related maintenance).

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variable rates with floor prices, and should thus receive 1 zero or negative points on the "price formula risk" factor. 2 These corrections are summarized in Table 4.1. I have 3 included Edgar's price formula risk at one point. 4 Q: Has BECo explained any of its scores for Edgar? 5 In IR S-84(a), BECo evades the question the Council 6 A: Yes. asked, regarding differences in non-price scoring for Edgar 7 and RFP #2. BECo argues that different rules should apply 8 to it, because it is a utility, and the RFP#2 bidders were 9 10 not. Given the prevalence of utilities in the QF business, this is a specious argument; BECo did not know when it 11 designed RFP#2 that PG&E/Bechtel and Mission Energy would 12 not bid.⁴⁵ NEES was a participant in RFP#1, and an Iowa 13 Electric affiliate, with which BECo has recently refused to

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sign a contract on the basis of rating on the RFP#2 scale, 15 is part of the Everett Energy project.46 16

In IR S-84(b), BECo elaborates on the special rules it 17 applies to itself and hence to Edgar. For licensing, 18 financing, sponsor experience (which BECo now calls "project 19 team experience," but with the same definition), and fuel 20 ,--supply, BECo takes the position that its projects will 21 22 succeed because it is BECo. Nonetheless, Pilgrim 2 never

23 ⁴⁵Pacific Gas and Electric and Southern California Edison (a Mission affiliate) are two of the country's largest utilities. 24

25 ⁴⁶NEES is a larger utility than BECo, with a better reputation 26 for plant operation. IE is about half the size of BECo, and is 27 thus a major utility. Other projects may have utility affiliates.

was licensed, the DPU found BECo's attempt to finance it was imprudent, the second Edgar plant did not survive for its planned lifetime, BECo has never built a combined-cycle plant (and in fact hasn't built any plant since Mystic 7 in 1976), and it has not been able to operate its existing plants at NEPOOL standards. BECo participation in project development is hardly an assurance of success.

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5. RESOURCE PLANNING PROBLEMS

Q: What problems did you identify in BECo's resource planning
process, other than the specific demand-side and supplyside problems discussed above?

5 A: I have identified three such issues: BECo's use of
6 unrealistic scenarios, the "Delphi" technique, and the abuse
7 of the RFP process.

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5.1 Unrealistic Scenarios

How are BECo's demand and supply scenarios unrealistic? 10 Q: 11 A: BECo uses two types of planning scenarios. In Subsection III of Section I-E, BECo assumes perfect knowledge of the 12 future, and assumes that the supply system can be optimized 13 14 for future conditions, including load, existing resources, and fuel prices.⁴⁷ Since forecasts are almost always wrong, 15 this is obviously unrealistic. 16

In Subsection IV of Section I-E, BECo recognizes that the future will be different from the one for which it plans its system. BECo examines the performance of each of 7 supply plans under each of 30 futures (where each future is an exogenous combination of demand growth, DSM effectiveness, fuel prices, and existing resource

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 ⁴⁷This optimization applies only to the supply side, since DSM
 is assumed fixed through 1994, and essentially non-existent
 thereafter. The supply-side optimization is further constrained
 by a number of unrealistic limits BECo imposes, as discussed in
 Section 4 above.

availability).⁴⁸ However, BECo unrealistically assumes that
 the supply plan for the next 25 years will be established in
 1990, and that no adaptation will occur, regardless of the
 information that becomes available in the meantime. Hence,
 BECo produces nonsensical results, such as deficiencies in
 2014 of over 2600 MW.⁴⁹

7 Q: Why is the lack of realism in BECo's resource modelling
8 process a problem?

9 A: Neither of BECo's approaches will teach BECo anything about
10 the relative flexibility and risk-mitigating value of
11 various resource plans and capability building. As a
12 result, BECo cannot reflect the major advantages of DSM over
13 supply: small increments, short lead time, security of
14 continued supply, and load following in installation and
15 operation.⁵⁰ BECo also cannot reflect the advantages of 100

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⁴⁸DSM is not compared to supply in either analysis.

⁴⁹BECo describes this section of the Resource Plan as a 17 "Decision Analysis." However, decision analysis requires the 18 computation of a tree of events and decisions, where future 19 20 decisions can be determined by preceding events, to determine the 21 best initial decision. BECo includes only a tree of events (very 22 clearly displayed in Exhibit I-E-9), without any intervening In the Subsection III analysis, BECo assumes the 23 decisions. outcome of the tree is known in year 0, before any decisions are 24 made; and in Subsection IV BECo assumes that all decisions must be 25 made in year 0, before the outcomes of any events are known. 26 27 Neither analysis is a decision analysis, in the normal sense of 28 that term.

⁵⁰DSM follows load in operation, in that increased usage of efficient equipment (in extreme weather conditions, or vigorous economic conditions) results in increased savings. Similarly, new construction, purchase of new equipment, and upgrades and replacement of equipment will tend to occur at a higher rate in periods of high load growth. MW additions over 300 MW additions, determine the cost effectiveness of building Edgar with provisions for
 conversion to coal gasification, determine the cost effectiveness of pre-licensing potential additions to reduce
 lead time, or otherwise compare the costs and benefits of
 alternatives under uncertainty.

7 If BECo developed a more realistic modelling tool, it 8 could study the effects of both external uncertainties and its potential resource plans on expected costs and the 9 variability in costs. For each given future pattern of 10 future events, including future forecasts, BECo could run a 11 series of strategies, such as "high DSM," "small additions," 12 13 and "over-build." For each strategy, the specific resource 14 plans would have to be varied over time, in accordance with 15 the strategy, as "actual" and forecast values for load, 16 supply, and prices change. As noted above, the NPPC has 17 used a Monte Carlo simulation of load growth to study the effects of unit size, lead time, and DSM load-following on 18 19 expected resource costs.

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21 5.2 Use of "Delphi" Technique

Q: How has BECO used the technique it describes as "Delphi?"
A: BECo used surveys to determine the probability distributions
it would use for fuel prices, EAF's for existing units,
committed capacity completions, load forecasts, and DSM

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effectiveness. BECo also used a survey to determine the
 base-case EAFs.

3 Q: What is the problem with this approach?

There are a couple of problems. First, the method produces 4 A: no meaningful documentation. There is no argument, no 5 analysis of fundamentals, no explanation of the final 6 result.⁵¹ BECo simply presents results in the Resource 7 Its only documentation is a list of respondents, the Plan. 8 weight given each respondent, each respondent's opinions, 9 and the weighted average (IR AG 1-8, 3-1, 3-3; CLF-27; S-10 110). No reasons are given for any opinions. 11

Second, the expertise of many of the respondents is
subject to some question.⁵²

14Third, BECo has almost total control over the results,15without ever having to explain them. For two of the five16forecasts, only BECo employees were polled. For the

⁵¹This is partially a result of BECo's application of the 17 The classic "Delphi" technique combines initial polling 18 technique. with circulation of poll results and of participant comments to 19 (with luck) produce consensus. The comments of the participants 20 whose position is eventually accepted as the consensus (if any) 21 22 would provide some justification of final result. Even a fully 23 documented Delphi technique is of limited usefulness, especially in regulatory proceedings, unless the participants are really 24 25 convinced by the dialogue and are prepared to defend the results. As the name implies, the standard Delphi technique is itself far 26 27 from a scientific forecasting method.

BECo does not appear to have allowed for feedback and consensus. Instead it simply weighted the opinions of various respondents. Hence, no individual is responsible for any of the opinions, and BECo can offer no analytical basis for them. Thus, BECo's probability estimation process is even less rigorous than a true Delphi process.

⁵²See IR S-100.

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remainder, BECo could select the number of its employees polled, and the weights given to each BECo respondent. Hence, BECo could produce any desired probability distribution.

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Fourth, BECo largely ignores DRI's position on its own 5 fuel price forecasts. DRI states in the documentation of 6 the 2/89 fuel price forecast that the high case has a 20% 7 chance of being exceeded, the base case is the median 8 forecast, and the low case has a 20% chance of being too 9 high.⁵³ Thus, DRI was forecasting fuel prices so that there 10 was a 30% probability of being between base and high, and a 11 30% probability of being between base and low. Splitting 12 these 30% increments between the two adjacent forecasts 13 would give a total probability of 35% high, 30% base, and 14 35% low.⁵⁴ BECo assigns fuel price probabilities of 19% 15 high, 47% base, and 34% low, shifting the weighting away 16 from the high-fuel-price cases in which Edgar is least 17 advantageous. In determining this weighting, BECo 18 misinterprets the DRI confidence intervals,⁵⁵ and gives 19 DRI's opinion only equal weight with the other respondents. 20 This is tantamount to saying that DRI's fuel price forecasts 21

⁵³A typo in the text was corrected in the cover letter.
 Similar distributions appear in later DRI forecasts.

24 ⁵⁴The intervals might be split in other ways, but they should 25 yield similar results.

26 ⁵⁵This may be related to BECo's failure to understand that it 27 had written probability distributions from DRI. See IR CLF 1-xx. are not reliable, since the forecasts are obviously meaningful only with their associated probabilities.

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5.3 Abuse of RFP Process

5 Q: How has BECo abused the RFP process?

BECo has set up the process so that Edgar is not avoidable 6 A: 7 in any RFP. In RFP #2, issued 4/14/89, no combined-cycle plants were scheduled in BECo's expansion plan. 8 In draft 9 RFP #3, issued 10/15/90, Edgar is treated as a committed 10 unit (even though it is not approved and hence not committed 11 by DPU rules), and the only avoidable units are a pair of CTs in 1997 and 1999. Hence, Edgar was never avoidable; 12 13 alternatives first were too early, then they were too late.

Bids for the Edgar project were solicited on 3/23/88,
and received on 7/25/88. Hence, the Edgar project was in
development throughout this period.

17 In addition, as BECo admits in IR 2-44, and as shown in Table 5.1, Edgar flunks RFP #3. The Edgar contract is more 18 expensive than the ceiling price for RFP #3, so Edgar would 19 not even be eligible as a bidder in that RFP. BECo's 20 21 current plans would have BECo building Edgar and then 22 refusing to even consider less expensive supply options. 23 Assuming that the same approach is taken with respect to DSM, BECo would similarly refuse to undertake DSM programs 24 25 with costs below Edgar. This outcome constitutes a form of 26 cream-skimming, in which the most expensive avoided energy

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and demand costs are "skimmed" off by Edgar, leaving the dregs of avoidable supply for other (potentially less expensive) sources to compete against. This approach virtually guarantees an inefficient planning outcome.

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- 1 6. MITIGATION OPTIONS
- 2 Q: Has BECo investigated a wide range of options for mitigating
 `3 the environmental effects of Edgar?
- A: No. In IR CLF 2-30 through 2-36, BECo indicates it has no
 information on any of the following options at existing
 plants:
- the cost and effectiveness of fuel desulfurization
 equipment,
- 9 the cost and effectiveness of enhanced particulate
 10 control, or even the efficiency of particulate control
 11 at those plants,
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 low-NO burners, or
- any other NO_x, SO₂, or particulate control technology
 applicable at Mystic or New Boston.
- 15 Q: If the EFSC were to approve the Edgar project, what 16 mitigation options should be required in conjunction with 17 that approval?

18 A: The EFSC should require that Edgar reduce and offset its 19 emissions to the extent possible under the DPU's valuation 20 of externalities. In addition to control equipment on 21 Edgar, I can identify three mitigation options that appear 22 to be cost-effective, and four others BECo should consider 23 and analyze.

First, it appears from IR CLF 2-18 that the sulfur content of oil at all of BECo's plants could be reduced to

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0.05% for 0.331/1b SO₂, which is less than half the 0.75/1b SO₂ selected by the DPU.

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Second, conversion of Mystic 4, 5, and 6 to burn gas 3 also appears to be cost-effective. BECo estimates average 4 annual sulfur emissions of 10,115 T SO₂ (IR CLF 2-22), which 5 are worth about \$15 million annually. BECo also estimates 6 that the plant, if converted to qas, would use gas 7 months 7 of the year (IR CLF 2-26). Assuming that 7/12 of the sulfur 8 emissions are avoided, this is worth about \$9 million 9 annually in 1989\$.⁵⁶ Conversion would cost about \$12 10 million in 1985\$, or perhaps \$15 million in 1989\$. Thus, 11 conversion appears to be highly cost-effective based only on 12 sulfur emissions and equal monthly dispatch. Since gas is 13 cheaper than oil in the seven-month summer period, Mystic 14 would tend to be used more when gas-fired, backing out other 15 oil units and increasing the emission reductions. 16 In addition, the fuel cost differential would produce direct 17 cost savings, gas firing eliminates virtually all 18 particulates and air toxics,⁵⁷ and gas firing of utility 19 boilers usually reduces NO, emissions. 20

Third, low-NOx burners are generally very inexpensive.
The DEP estimated that installing these burners on the six
Mystic and New Boston steam-electric units would cost \$175-

24 ⁵⁶This is the assumption stated in IR 2-28, which parallels 25 my analysis.

⁵⁷IR CLF 2-28 estimates the particulate reduction at about
 500 T/yr, worth \$2 million at the DPU's \$2/lb valuation.

\$641/ton (roughly 1986\$), for 1982 emission levels.⁵⁸ 1 Emissions are probably higher today, due to increased loads, 2 which would make the costs per ton even lower. Since the 3 DPU valued NO at \$6500/ton, the low-NO burners are clearly 4 cost-effective. The 1990 Clean Air Act Amendments will 5 require low-NO, burners on oil-fired plants by the year 6 2000, implying that the low-NOx burners can be considered to 7 offset Edgar emissions only until 1999 (when they would have 8 been required anyway), but also implying that the 9 incremental cost of installing the burners early will be 10 even lower than the DEP estimates. 11

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In addition, I would recommend that BECo examine other 12 mitigation options. One such option would be oil 13 desulfurization at Mystic and New Boston, essentially 14 capitalizing much of the cost differential of low- and high-15 sulfur fuel. The advantage of this approach over simply 16 buying lower-sulfur fuel is that the variable fuel cost of 17 the plants will stay low and they will be heavily 18 dispatched. Using low-sulfur oil would tend to shift 19 generation to other units in the region which use higher-20 21 sulfur oil.

Another option worth investigation would be thepromotion of conservation and burner tune-ups in oil-heated

⁵⁸Massachusetts State Acid Rain Program, <u>Development and</u>
 <u>Testing of a Planning Approach to Acid Deposition Control</u>.
 Massachusetts Department of Environmental Quality Engineering,
 February 1987.

1 buildings, particularly in the areas most affected by 2 Edgar's local environmental effects, such as Weymouth. This 3 would achieve reductions in SO2, NO2, VOC, and CO2 emissions 4 from a source for which no comprehensive controls appear 5 likely in the short term. A third mitigation option would 6 involve the use of Edgar to cogenerate steam or hot water 7 for Procter & Gamble (to which Edgar previously provided 8 steam), other discrete facilities, and/or a district heating 9 system.

Finally, BECo should examine the cost and effectiveness
 of ammonia and urea injection to control NO_x emissions from
 its existing boilers.

13 Q: Why is this mitigation appropriate?

14 A: First, mitigation is appropriate as part of a socially
15 least-cost resource plan, since it decreases the total cost
16 of BECo's system. Second, mitigation is particularly
17 appropriate for Edgar, which has not been subjected to
18 meaningful competition from other resources, including DSM,
19 with lower social costs.

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CONCLUSIONS AND RECOMMENDATIONS

7.1 Conclusions

3 Q: Please summarize your conclusions.

BECo appears to have understated the potential for cost-4 A: effective DSM, in several ways. It has understated the 5 likely effects of existing programs, ignored the potential 6 for future programs, and ignored the potential for fuel 7 8 switching from electricity to other fuels. BECo has also understated avoided costs by understating or ignoring the 9 environmental, non-price, risk, and other benefits of DSM. 10 BECo has not produced an integrated supply plan, since DSM 11 12 is not allowed to compete with supply. BECo has failed to 13 document its avoided costs, their derivation, and the 14 screening of DSM programs.

The company has also artificially constrained its 15 analysis of utility-owned supply alternatives, including the 16 17 potential for gas-fired combined-cycle plants other than 18 Edgar in 1994. BECo has overstated the non-price benefits of Edgar, compared to non-utility generation, by applying 19 20 unique rating rules to BECo-owned plants. By assuming a 21 best-case heat rate rather than an expected or guaranteed 22 heat rate, BECo has understated the cost of Edgar power to 23 ratepayers.

In evaluating supply alternatives, BECo has used
 modelling techniques not structured to reflect uncertainty
 and adaptation to future events. The probability

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distributions used in those analyses are not based upon any
 documented analysis, nor do they rely on clearly expert
 judgments. BECo has not evaluated DSM as an alternative to
 Edgar, nor allowed QFs to compete with Edgar. BECo's
 "decision analysis" is not a decision analysis.

6 As a result of all of these problems, it appears that 7 BECO's case for Edgar's benefits is seriously inflated. 8 Given documentation problems and fundamental deficiencies in 9 BECO's methodologies, it is not possible to estimate the 10 magnitude of the overstatement.

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7.2 Recommendations

13 Q: What actions do you recommend the EFSC take in this 14 proceeding?

A: I recommend that the EFSC not approve Edgar's construction,
or the rest of the Resource Plan, on the basis of the case
BECO has put before it. Instead, I urge the Council to
instruct BECO to:

e correct its projections of DSM potential, by:

21 - assuming continuation of programs until they have
22 achieved all cost-effective savings,

treating DSM as a resource comparable to supply,

23 - projecting program savings based on achievable but
 24 aggressive acquisition of cost-effective DSM
 25 resources,

26 - correcting the avoided cost estimates,

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1 explaining and justifying any efforts BECo has 2 made to promote electric chilling, and 3 including fuel-switching in the analysis, and 4 including it in DSM projections wherever it is the 5 option with the greatest net social benefits; correct the errors in the supply analysis, by: 6 7 removing the constraints imposed on Edgar timing, ---removing the inappropriate constraints imposed on 8 9 alternatives, 10 including monetized externalities, and 11 correcting the errors I identified in the 12 treatment of non-price factors, including the 13 absence of any justification and the unequal 14 treatment of QF and BECo options; 15 adopt a realistic planning approach, which incorporates 16 both uncertainty and future options for responding to 17 uncertainty; 18. allow QFs, IPPs, and DSM to compete against Edgar 19 before committing to construction of Edgar; and 20 fully investigate the options for mitigating Edgar's 21 environmental effects. 22 If the corrected analysis indicates Edgar is likely to be 23 part of BECo's least-cost Resource Plan, BECo should refile 24 a new application for approval of Edgar (for whatever in-25 service date the analysis supports) at that time. 26 Q: Have you concluded that Edgar is not a least-cost option?

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- A: I cannot reach a conclusion one way or the other, given the
 deficiencies in BECo's analysis.
- 3 Q: Do you see any problems with EFSC approval of Edgar on the 4 basis of this record, other than the possibility that Edgar 5 is not a least-cost option?
- If the uncertainty regarding Edgar's desirability were Yes. 6 A: due solely to external factors, such as fuel-price and load-7 growth uncertainties, the EFSC might reasonably allow BECo 8 to proceed.⁵⁹ In this case, however, the critical 9 uncertainties are due to BECo's own actions, including its 10 failure to pursue least-cost alternatives and its 11 unwillingness to document its planning process. Allowing 12 uncertainties BECo has created to force the EFSC into 13 approving Edgar would simply encourage other utilities to 14 fail to pursue least-cost planning, including the pending 15 16 IRM process.

Q: How has BECo created the uncertainties to which you refer?
A: Much of this testimony has dealt with just this issue. I
will summarize a few of the ways in which BECo has created
uncertainties.

The Resource Plan's approach to DSM analysis has been half-hearted, and it has totally failed to consider fuelswitching. BECo has imposed a number of artificial constraints on its non-Edgar supply options. BECo has skewed its fuel forecast and even its modest DSM projection

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⁵⁹It might also reasonably not allow construction.

1 in ways which favor Edgar. BECo has refused to comply with 2 the externalities-monetization requirements of DPU 89-239. 3 BECo has arbitrarily assigned its own proposed plants higher non-price scores than its would have assigned to otherwise 4 identical proposals from other parties. BECo has selected 5 6 planning techniques which do not realistically reflect 7 uncertainty and adaptation. It also has chosen to propose 8 construction of a plant that would not satisfy the threshold requirements for its pending RFP. Cutting across most of 9 10 these issues, BECo has been unable or unwilling to document 11 many of its assumptions, decisions, and conclusions.

12 Q: Does this conclude your testimony?

A: Yes.

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| | NEPOOL Margin | | <u>All G</u> | <u>as CC</u> | <u>All O</u> | il CC | <u>All G</u> | as CT | <u>#2 Oil CT</u> | | |
|--------|-----------------------------|-----------|--------------|--------------|---------------|-----------|--------------|-----------|------------------|-----------|-------------|
| Emissi | on Value | Emissions | Externality | Emissions | Externality . | Emissions | Externality | Emissions | Externality | Emissions | Externality |
| | \$/lb | lbs/MMBtu | \$/MMBtu | lbs/MMBtu | \$/MMBtu | lbs/MMBtu | \$/MMBtu | lbs/MMBtu | \$/MMBtu | lbs/MMBtu | \$/MMBtu |
| | [1] | [2] | [3] | [4] | [5] | . [6] | [7] | [8] | [9] | [10] | [11] |
| NOx | \$3.25 | 0.479 | \$1.56 | 0.039 | \$0.13 | 0.048 | \$0.16 | 0.393 | \$1.28 | 0,483 | \$1.57 |
| SOx | \$0.75 | 1.14 | \$0.86 | 0 | \$0.00 | 0.3 | \$0.23 | 0 | \$0.00 | 0.3 | \$0.23 |
| VOCs | \$2.65 | | \$0.00 | 0.012 | \$0.03 | 0.0341 | \$0.09 | 0.012 | \$0.03 | 0.0341 | \$0.09 |
| TSP | \$2.00 | 0.0784 | \$0.16 | 0.013 | \$0.03 | 0.0357 | \$0.07 | 0.013 | \$0.03 | 0.0357 | \$0.07 |
| CO | \$0.43 | 0.0507 | \$0.02 | 0.11 | \$0.05 | 0.11 | \$0.05 | 0.11 | \$0.05 | 0.11 | \$0.05 |
| CO2 | \$0.011 | 170 | \$1.87 | 119 | \$1.31 | 162 | \$1.78 | 119 | \$1.31 | 162 | \$1.78 |
| CH4 | \$0.11 | 0.00175 | \$0.00 | 0 | \$0.00 | 0.29 | \$0.03 | 0 | \$0.00 | 0.29 | \$0.03 |
| N2O | \$1.98 | 0.0321 | \$0.06 | | \$0.00 | | \$0.00 | | \$0.00 | | \$0.00 |
| | Sum [12] \$4.52 | | • | \$1.54 | | \$2.41 | | \$2.69 | | \$3.82 | |
| | Heat rate (Btu/kWh) [13] 10 | | 10,677 | 8,500 | | 9,000 | | | 8,500 | | 12,000 |
| | ¢/kwh [14] | | 4.83 | | 1.31 | | 2.16 | | 2.29 | | 4.58 |

Table 3.1: Value of Externalities of Selected Plant Types, Based on DPU 89–239.

NOTES:

[1]: Values are from Massachusetts DPU Order 89-239, 8/31/90.

[2]: Emissions are from Vermont PSB Docket 5330, Exh. RAR-2, "The Role of Hydro-Quebec Power in a Least-Cost Energy Resource Plan for Vermont," 12/29/89.

[3]: [1] * [2].

[4]: From California Energy Commission "Generic Emmission Factors," 8/89, SCR assumed.

[5]: [1] * [4].

[6]: From CEC 8/89, except for SOx figure, which is derived from AP-42; SCR and 0.3% sulfur assumed.

[7]: [1] * [6].

[8]: From California Energy Commission "Generic Emmission Factors," 8/89.

[9]: [1] * [8].

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[10]: From California Energy Commission "Generic Emmission Factors," 8/89, except for SOx figure, which is from AP-42.

[11]: [1] * [10].

[12]: Sum of column for each plant type.
[13]: Heat rates from Resource Plan Exh I-C-14, rounded for cycling, except for heat rate [3], which is from same source as [2].
[14]: [12] * [13] / 10,000.

12/13/90 sab

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Table 3.2: Externality Values for Selected Plant Types, Inflated Through 2014.

| | | NEPOOL | All gas | All oil | All gas | All oil |
|--------|----------|---------|---------|---------|------------------|---------|
| | GNP | margin | CC | CC | СТ | СТ |
| Year | deflator | (¢/kWh) | (¢/kWh) | (¢/kWh) | (¢/kWh) | (¢/kWh) |
| · | [1] | [2] | [3] | [4] | [5] | [6] |
| | | | | | | |
| 1989 | 125.5 | 4.83 | 1.31 | 2.16 | 2.29 | 4.58 |
| 1990 | 131.6 | 5.07 | 1.37 | 2.27 | 2.40 | 4.80 |
| 1991 | 137.4 | 5.29 | 1.43 | 2.37 | 2.51 | 5.02 |
| 1992 | 144.4 | 5.56 | 1.51 | 2.49 | 2.64 | 5.27 |
| 1993 | 151.7 | ~ 5.84 | 1.58 | 2.61 | 2.77 | 5.54 |
| 1994 | 159.2 | 6.13 | 1.66 | 2.74 | 2.91 | 5.81 |
| 1995 | 167.3 | 6.44 | 1.75 | 2.88 | 3.05 | 6.11 |
| 1996 | 176.1 | 6.78 | 1.84 | 3.03 | 3.21 | 6.43 |
| 1997 | 185.6 | 7.15 | 1.94 | 3.20 | 3.3 9 | 6.78 |
| 1998 | 195.8 | 7.54 | 2.04 | 3.37 | 3.57 | 7.15 |
| 1999 | 206.8 | 7.96 | 2.16 | 3.56 | 3.77 | 7.55 |
| 2000 | 218.5 | 8.41 | 2.28 | 3.76 | 3.99 | 7.98 |
| 2001 | 230.5 | 8.87 | 2.41 | 3.97 | 4.21 | 8.42 |
| 2002 | 243.1 | 9.36 | 2.54 | 4.19 | 4.44 | 8.88 |
| 2003 | 256.1 | 9.86 | 2.67 | 4.41 | 4.67 | 9.35 |
| 2004 | 269.7 | 10.38 | 2.82 | 4.64 | 4.92 | 9.85 |
| 2005 👘 | 283.9 | 10.93 | . 2.96 | 4.89 | 5.18 | 10.36 |
| 2006 | 298.8 | 11.50 | 3.12 | 5.14 | 5.45 | 10.91 |
| 2007 | 314.4 | 12.10 | 3.28 | 5.41 | 5.74 | 11.48 |
| 2008 | 330.8 | 12.74 | 3.45 | 5.70 | 6.04 | 12.08 |
| 2009 | 347.8 | 13.39 | 3.63 | 5.99 | 6.35 | 12.70 |
| 2010 | 365.9 | 14.09 | 3.82 | 6.30 | 6.68 | 13.36 |
| 2011 | 385.0 | 14.82 | 4.02 | 6.63 | 7.03 | 14.06 |
| 2012 | 405.2 | 15.60 | 4.23 | 6.98 | 7.40 | 14.79 |
| 2013 | 426.5 | 16.42 | 4.45 | 7.34 | 7.79 | 15.57 |
| 2014 | 448.7 | 17.28 | 4.69 | 7.73 | 8.19 | 16.38 |

Notes:

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[1]: GNP implicit price deflator from BECo RFP #3, Table 4, index J (1989 value extrapolated from following values).

[2] - [6]: Source for externality values: see table 3.1.

Table 3.3: BECo Avoided Emissions

| | BECo scores | Emissions for | Implied CT | | |
|-------|-------------|---------------|------------|-----------|------------|
| | for CT | 0 points | Emissions | DPU value | Value |
| | (lb/MMBtu) | (lb/MMBtu) | (lb/MMBtu) | (\$/lb) | (\$/MMBtu) |
| | [1] | [2] | [3] | [4] | [5] |
| SOx | 4 | 1.2 | 0.24 | 0.75 | 0.180 |
| NOx | 3.5 | 0.6 | 0.18 | 3.25 | 0.585 |
| TSP | 3 | 0.03 | 0.01 | 2 | 0.024 |
| Total | | | | | 0.789 |

Notes:

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[1], [2]: Resource Plan, Ex. 1-D-#, p.4.
[3]: [2] * [1-[1]/5]
[5]: [3] * [4]

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Table 3.4: Comparison of BECo Avoided Costs and Edgar Costs, Using 10.88% Discount Rate from RFP #2.

| | | | | | Cumulative PV @ 10.88% | | | | | |
|------|--------|---------|-----------------|----------------|------------------------|-------------|------------|--------------------|--|--|
| | Avoide | d Costs | Edg | ar Cost | Avoid | ed Costs | Edgar Cost | | | |
| Year | RFP2 | RFP3 | <u>Planning</u> | Current | <u>RFP2</u> | <u>RFP3</u> | Planning | Current | | |
| | [1] | [2] | [3] | [4] | [5] | [6] | [7] | [8] | | |
| | | | | | | | | | | |
| 1994 | 5.71 | 3.91 | 7.46 | 6.93 | | | | | | |
| 1995 | 6.71 | 4.26 | 7.60 | 7.13 | 10.61 | 6.99 | 12.91 | 12.05 | | |
| 1996 | 7.21 | 4.33 | 7.77 | . 7.37 | 15.90 | 10.17 | 18.61 | 17.46 | | |
| 1997 | 8.15 | 5.22 | 8.03 | 7.73 | 21.29 | 13.62 | 23.92 | 22.57 | | |
| 1998 | 9.32 | 5.73 | 8.36 | 8.13 | 26.85 | 17.04 | 28.91 | 27.42 | | |
| 1999 | 10.56 | 6.82 | 8.82 | 8.62 | 32.53 | 20.71 | 33.66 | 32.06 | | |
| 2000 | 10.13 | 7.53 | 9.34 | 9.19 | 37.45 | 24.36 | 38.19 | 36.52 | | |
| 2001 | 11.16 | 7.84 | 9.96 | 9.86 | 42.33 | 27.80 | 42.55 | 40.84 | | |
| 2002 | 12.14 | 8.73 | 10.64 | 10.58 | 47.13 | 31.24 | 46.75 | 45.01 | | |
| 2003 | 13.48 | 9.67 | 11.34 | 11.33 | 51.92 | 34.68 | 50.79 | 49.05 | | |
| 2004 | 14.91 | 10.62 | 11.97 | 12.02 | 56.71 | 38.09 | 54.63 | 52.90 | | |
| 2005 | 16.26 | 11.74 | 12.62 | 12.72 | 61.42 | 41.49 | 58.28 | 56.59 | | |
| 2006 | 15.17 | 12.88 | 13.30 | 13.45 | 65.38 | 44.86 | 61.76 | 60.10 | | |
| 2007 | 15.07 | 14.11 | 14.03 | 14.25 | 68.93 | 48.18 | 65.06 | 63.46 | | |
| 2008 | 17.27 | 15.48 | 14.73 | 15.00 | 72.60 | 51.47 | 68.19 | 66.64 | | |
| 2009 | 19.67 | 16.81 | 15.44 | 15.77 | 76.37 | 54.69 | 71.15 | 69.66 | | |
| 2010 | 15.54 | 18.00 | 16.17 | 16.50 | 79.05 | 57.80 | 73.94 | 72.52 | | |
| 2011 | 19.47 | 18.39 | 16.99 | 17.26 | 82.09 | 60.67 | 76.59 | 75.21 | | |
| 2012 | | 20.13 | 17.87 | 18.07 | | 63.50 | 79.10 | 77.74 [·] | | |
| 2013 | | 19.54 | 18.84 | 18.98 | | 65.97 | 81.49 | 80.15 | | |
| | | | | | | | | | | |
| | | | <u>Le</u> | evelized cost: | , | | | | | |
| | | | nominal | 1994 - 2011: | 10.6 | 7.6 | 9.5 | 9.4 | | |
| | | | | 1994 - 2013: | | 8.2 | 10.2 | 10.0 | | |
| | • | | | | | | | | | |
| | | | real | 1994 - 2011: | 7.5 | 5.5 | 7.0 | 6.8 | | |
| | | | | 1994 - 2013: | | 5.6 | 6.9 | 6.8 | | |

Notes:

All costs are in ¢/kWh.

[1]: BECo RFP#2, Table 3 [2]: BECo RFP#3, Table 6

[3]: DPU 90-117, 90-118, Exh. BE-RSH-7.

[4]: DPU 90-117. 90-118, Exh. BE-RSH-8.

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Table 3.5: DSM Non-Price Points on Supply Options Scale

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| | Max | Combustion | Generic | Comments |
|---|-------|------------|---------|--------------------------------------|
| | Score | Turbine | DSM | |
| Breakeven | 24 | 0 | 0 | corrected, see text |
| Front load security | 20 | 20 | 20 | used CT values |
| Price formula risk | 6 | 4 | 6 | |
| Technical and environmental feasibility | 6 | 6 | 6 | |
| Project team experience | 4 | 4 | . 4 | |
| Siting | 10 | 0 | 10 | no siting required |
| Design and engineering | 4 | 0 | 4 | program designed |
| Permitting and licensing | 6 | 0 | 6 | no licensing required |
| Financing | 6 | 0 | 6 | used CT value |
| Thermal energy | 2 | 2 | 2 | no thermal load needed |
| Construction/operation | 2 | 0 | 1 | DSM programs are in operation |
| Additional contract deposit | 4 | 4 | 4 | used CT value |
| Milestone schedule | 6 | 6 | 6 | used CT value |
| Fuel supply | 6 | 6 | 6 | no fuel |
| Debt and operating coverages | 6 | 6 | 6 | used CT value |
| Maintenace escrow | 2 | 2 | . 2 | no maintenance, or BECo escrow as CT |
| Optional operating security | 6 | 6 | 6 | used CT value |
| Dispatchability/interruptibility | 10 | 10 | 10 | used CT value |
| Fuel type | 10 | 0 | 10 | no fuel |
| Size | 2 | · 0 | 2 | size per installation |
| Location | 4 | 0 | 3 | part territory-wide, part targeted. |
| Maintenance schedule subject to BECo | 4 | 4 | 4 | no maintenance |
| Total points: | 150 | 80 | 124 | |

Table 3.6: Load and Capacity Comparisons (Summer Ratings)

| | | | | | | BECo Targets | | Required Commitments | | | | | | |
|------|----------------------|---------------|----------|-----|-------|--------------------------|---------|---------------------------|----------|------|-------|--------------|-------|---------|
| | Peak Load w/ C&LM | BECo Baseline | | ne | | Cumulative Additional | | Fully Committed Resources | | | | Cumulative | | |
| Year | | Existing | Purchase | SPP | Total | Requirements | Total | % Reserve | Purchase | SPP | Total | Requirements | Total | Margin |
| | [1] | [2] | [3] | [4] | [5] | [6] | [7] | [8] | [9] | [10] | [11] | [12] | [13] | [14] |
| 1990 | 2613 | 2744 | 758 | 23 | 3525 | | 3525 | 34.9% | 758 | 23 | 3526 | 0 | 3525 | 34 906 |
| 1991 | 2638 | 2744 | 812 | 23 | 3579 | | 3579 | 35.7% | 936 | 23 | 3703 | 0 | 3579 | 35 706 |
| 1992 | 2651 | 2744 | 563 | 182 | 3489 | 100 | 3589 | 35.4% | 687 | 302 | 3733 | 175 | 3664 | 38 2% |
| 1993 | 2674 | 2744 | 464 | 210 | 3418 | 175 | 3593 | 34.4% | 588 | 351 | 3682 | 307 | 3725 | 39.3% |
| 1994 | 2681 | 2744 | 164 | 387 | 3295 | 400 | 3695 | 37.8% | 288 | 661 | 3692 | 702 | 3997 | 49 1% |
| 1995 | 2705 | 2744 | 164 | 387 | 3295 | 500 | 3795 | 40.3% | 288 | 661 | 3692 | 877 | 4172 | 54 2% |
| 1996 | 2741 | 2744 | 164 | 501 | 3409 | 400 | 3809 | 39.0% | 288 | 861 | 3892 | 702 | 4111 | 50.0% |
| 1997 | 2776 | 2744 | 164 | 501 | 3409 | 500 | 3909 | 40.8% | 288 | 861 | 3892 | 877 | 4286 | 54.4% |
| 1998 | 2810 | 2744 | 164 | 501 | 3409 | 600 | 4009 | 42.7% | 288 | 861 | 3892 | 1053 | 4462 | 58.8% |
| 1999 | 2849 | 2744 | 164 | 501 | 3409 | 700 | 4109 | . 44.2% | 288 | 861 | 3892 | 1228 | 4637 | 62.8% |
| 2000 | 2892 | 2744 | 164 | 501 | 3409 | 700 | 4109 | 42.1% | 288 | 861 | 3892 | 1228 | 4637 | 60.3% |
| 2001 | 2942 | 2728 | 66 | 501 | 3295 | 800 | 4095 | 39.2% | 117 | 861 | 3705 | 1404 | 4699 | 59.7% |
| 2002 | 2998 | 2728 | 66 | 501 | 3295 | 800 | 4095 | 36.6% | 117 | 861 | 3705 | 1404 | 4699 | 56.7% |
| 2003 | 3043 | 2728 | 66 | 501 | 3295 | 800 | 4095 | 34.6% | 117 | 861 | 3705 | 1404 | 4699 | 54.4% : |
| 2004 | 3108 | 2728 | 66 | 501 | 3295 | 900 | 4195 | 35.0% | 117 | 861 | 3705 | 1579 | 4874 | 56.8% |
| 2005 | 3182 | 2728 | 66 | 501 | 3295 | 1000 | 4295 | 35.0% | 117 | 861 | 3705 | 1754 | 5049 | 58.7% |
| 2006 | 3263 | 2701 | 66 | 501 | 3268 | 1200 | 4468 | 36.9% | 117 | 861 | 3678 | 2105 | 5373 | 64.7% |
| 2007 | 3353 | 2701 | 66 | 501 | 3268 | 1300 | 4568 | 36.2% | 117 | 861 | 3678 | 2281 | 5549 | 65.5% |
| 2008 | 3444 | 2648 | 66 | 501 | 3215 | 1400 | 4615 | 34.0% | 117 | 861 | 3625 | 2456 | 5671 | 64.7% |
| 2009 | 3542 | 2648 | 66 | 477 | 3191 | 1600 | 4791 | 35.3% | 117 | 837 | 3602 | 2807 | 5998 | 69.3% |
| 2010 | 3665 | 2648 | 66 | 477 | 3191 | 1700 | 4891 | 33.5% | 117 | 837 | 3602 | 2982 | 6173 | 68.4% |
| 2011 | 3765 | 2648 | | 477 | 3125 | 1900 | 5025 | 33.5% | 0 | 837 | 3485 | 3333 | 6458 | 71.5% |
| 2012 | 3860 | 2648 | | 438 | 3086 | 2100 | 5186 | 34.4% | 0 | 769 | 3417 | 3684 | 6770 | 75.4% |
| | | | | | | A | verage | 37.0% | | | | | | 56.7% |
| | | | | | | Lev | velized | 37.7% | | | | , | | 49.7% |

Notes: [1], [2], [3], [4], [9], [10]: Boston Edison Long-Range

Integrated Resource Plan, May 1, 1990, Exhibit IC-2, page C-13.

[5]: [2] + [3] + [4].

[6]: Boston Edison, Long-Range IRP, 5/1/90, page E-21 for 1992-2000, page E-25 for 2001-2012.

[7]: [5] + [6].

[8]: [7] / [1] - 1. [12]: [6] / 0.57.

[9], [10]: Assumes 100% HQ, OSP, and RFP #2. [13]: [5] + [12]. [11]: [2] + [9] + [10]. [14]: [13] / [1] -1
Table 3.7: Value of Unserved Energy for DSM Avoided Cost.

| | | | | | | | Ratio of | Value |
|------|---------------|--------------|----------|----------|----------|-------------|---------------|---------|
| | Net territory | <u>sales</u> | | Unserved | energy | | ▲ in sales to | per kWh |
| | Base case | Low case | Change | scenario | scenario | Diff. betw. | ▲ in unserved | saved |
| Year | (scen. 41) | (scen. 50) | in sales | 41 | 50 | scenarios | energy | (¢/kWh) |
| | [1] | [2] | [3] | [4] | [5] | [6] | [7] | [8] |
| | | | | | | | | |
| 1990 | 13,176 | 12,958 | 218 | 21 | 17 | 4 | 1.8% | 0.94 |
| 1991 | 13,532 | 13,141 | 391 | 33 | 23 | 10 | 2.6% | 1.30 |
| 1992 | 13,752 | 13;284 | 468 | 44 | 49 | (5) | -1.1% | -0.54 |
| 1993 | 13,948 | 13,455 | 493 | 64 | 41 | 23 | 4.7% | 2.38 |
| 1994 | 16,038 | 13,485 | 2,553 | 36 | 21 | 15 | 0.6% | 0.30 |
| 1995 | 14,162 | 13,448 | 714 | 39 | 20 | 19 | 2.7% | 1.36 |
| 1996 | 14,352 | 13,408 | 944 | 28 | 12 | 16 | 1.7% | 0.86 |
| 1997 | 14,514 | 13,511 | 1,003 | 32 | 13 | 19 | 1.9% | 0.97 |
| 1998 | 14,678 | 13,539 | 1,139 | 37 | 13 | 24 | 2.1% | 1.07 |
| 1999 | 14,880 | 13,698 | 1,182 | 43 | 15 | 28 | 2.4% | 1.21 |
| 2000 | 15,070 | 13,810 | 1,260 | 33 | 10 | 23 | 1.8% | 0.93 |
| 2001 | 15,317 | 13,967 | 1,350 | 28 | 7 | 21 | 1.6% | 0.24 |
| 2002 | 15,594 | 14,178 | 1,416 | 23 | 5 | 18 | 1.3% | 0.20 |
| 2003 | 15,816 | 14,411 | 1,405 | 27 | 7 | 20 | 1.4% | 0.22 |
| 2004 | 16,141 | 14,650 | 1,491 | 23 | 5 | 18 | 1.2% | 0.19 |
| 2005 | 16,514 | 14,901 | 1,613 | 20 | · 4 | 16 | 1.0% | 0.15 |
| 2006 | 16,919 | 15,167 | 1,752 | 21 | 3 | 18 | 1.0% | 0.16 |
| 2007 | 17,351 | 15,430 | 1,921 | 19 | 2 | 17 | 0.9% | 0.14 |
| 2008 | 17,784 | 15,647 | 2,137 | 8 | 1 | 7 | 0.3% | 0.05 |
| 2009 | 18,240 | 15,940 | 2,300 | 13 | 1 | 12 | 0.5% | 0.08 |
| 2010 | 18,804 | 16,265 | 2,539 | 13 | 1 | 12 | 0.5% | 0.07 |
| 2011 | 19,307 | 16,584 | 2,723 | 11 | 0 | 11 | 0.4% | 0.06 |
| 2012 | 19,799 | 16,900 | 2,899 | . 4 | 0 | 4 | 0.1% | 0.02 |
| 2013 | 20,335 | 17,236 | 3,099 | 5 | 0 | 5 | 0.2% | 0.03 |
| 2014 | 20,818 | 17,510 | 3,308 | 6 | 0 | 6 | 0.2% | 0.03 |

Notes:

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[1]: from BECo's Long Range Integrated Resource Plan, 1990-2014, Vol. II, Exh. II-K-14, base case.

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[2]: from Ibid., low case.

[3]: [1] - [2].

[4]: from Appendix B, unmet gigawatt hours, 40% level, scenario 41.

[5]: from Ibid., scenario 50.

[6]: [4] - [5].

[7]: [6]/[3].

[8]: [7] x 51¢/kWh, to 2000; [7] x 15.6¢/kWh in 2001–2014.

Table 4.1: Edgar Non-Price Score

| | Max | Per | | | |
|---|-------|--------|---------------|--------------|--|
| · · · | Score | BECo | Corrected | Difference | Comments |
| Breakeven | 24 | 17 | 13.2 to 14.4 | 26+0.28 | 10.0 / |
| Front load security | 20 | 20 | 10.210 14.4 | 2.0103.8 | 13.2 from breakeven year 2003, IR S-81; 14.4 from |
| Price formula risk | 6 | 20 | 20 | | breakeven year 2002, Table 3.4, contract ends 2013 |
| Technical and environmental feasibility | 6 | | 3 | 1 | Adjusted for non-formula risk and heat rate risk. |
| Project team experience | 0 | 4 | 4 | | |
| Siting | 4 | 4 | 1 | . 3 | BECo has never developed a CC. |
| Design and engineering | 10 | 10 | 10 | | |
| Permitting and licensis | 4 | 4 | 0 to 4 | 0 to 4 | Data not available. |
| Financing | 6 | 4 | 1.5 | 2.5 | Applications pending for all but EAA |
| | 6 | 6 | 0 | 6 | Approval for 30% equity commitment by BECer |
| Chernal energy | 2 | 2 | 2 | - | Dending in DPI 190-117; dobt upper where |
| Construction/operation | 2 | 0 | 0 | | pending in bill 30-117, debt uncommitted. |
| Additional contract deposit | 4 | 4 | 4 | | · |
| Milestone schedule | • 6 | 6 | 6 | | |
| Fuel supply | 6 | 6 | 0, | • | WE all a state of the second |
| Debt and operating coverages | 6 | e e | 4 to 6 | 6 | "Letters of interest" for transport, not supply. |
| Maintenance escrow | 2 | 2 | 4106 | 0 to 2 | Data not available. |
| Optional operating security | 6 | 2 | 2 | | • |
| Dispatchability/interruptability | 10 | 10 | 6 | | |
| Fuel type | 10 | 10 | 10 | | |
| Size | 10 | U | 0 | | |
| Location | 2 | 0 | 0 | | |
| Maintenance schedule subject to PEOs | 4 | 2 | 2 | | |
| = | 4 | 4 | 4 | | |
| Total points: | 150 | 121 | 93.7 to 100.9 | 20.1 to 27.3 | |

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Table 5.1: Comparison of BECo Avoided Costs and Edgar Costs, Using 12.155% Discount Rate from RFP #3 and Resource Plan.

| | | | | | Cumulati | ve PV @ 1 | 12.155% | |
|------|--------|---------|-----------------|----------------|----------|-----------|-------------------|-------------------|
| | Avoide | d Costs | Edg | ar Cost | Avoide | ed Costs | Edga | r Cost |
| Year | RFP2 | RFP3 | <u>Planning</u> | <u>Current</u> | RFP2 | RFP3 | Planning | Current |
| | [1] | [2] | [3] | [4] | [5] | [6] | [7] | [8] |
| | | | | | | | | |
| 1994 | 5.71 | 3.91 | 7.46 | 6.93 | | | | |
| 1995 | 6.71 | 4.26 | 7.60 | 7.13 | 10.43 | 6.87 | 12.69 | 11.85 |
| 1996 | 7.21 | 4.33 | 7.77 | 7.37 | 15.54 | 9.94 | 18.20 | 17.07 |
| 1997 | 8.15 | 5.22 | 8.03 | 7.73 | 20.69 | 13.24 | 23.28 | 21.96 |
| 1998 | 9.32 | 5.73 | 8.36 | 8.13 | 25.94 | 16.47 | 27.9 9 | 26.54 |
| 1999 | 10.56 | 6.82 | 8.82 | 8.62 | 31.24 | 19.90 | 32.42 | 30.87 |
| 2000 | 10.13 | 7.53 | 9.34 | 9.19 | 35.78 | 23.27 | 36.60 | 34.99 |
| 2001 | 11.16 | 7.84 | 9.96 | 9.86 | 40.24 | 26.40 | 40.58 | 38.92 |
| 2002 | 12.14 | 8.73 | 10.64 | 10.58 | 44.56 | 29.51 | 44.37 | 42.6 9 |
| 2003 | 13.48 | 9.67 | 11.34 | 11.33 | 48.85 | 32.58 | 47.97 | 46.29 |
| 2004 | 14.91 | 10.62 | 11.97 | 12.02 | 53.07 | 35.59 | 51.36 | 49.69 |
| 2005 | 16.26 | 11.74 | 12.62 | 12.72 | 57.17 | 38.55 | 54.55 | 52.91 |
| 2006 | 15.17 | 12.88 | 13.30 | 13.45 | 60.59 | 41.45 | 57.54 | 55.93 |
| 2007 | 15.07 | 14.11 | 14.03 | 14.25 | 63.61 | 44.28 | 60.36 | 58.79 |
| 2008 | 17.27 | 15.48 | 14.73 | 15.00 | 66.70 | 47.05 | 62.99 | 61.48 |
| 2009 | 19.67 | 16.81 | 15.44 | 15.77 | 69.84 | 49.74 | 65.46 | 63.99 |
| 2010 | 15.54 | 18.00 | 16.17 | 16.50 | 72.05 | 52.30 | 67.76 | 66.34 |
| 2011 | 19.47 | 18.39 | 16.99 | 17.26 | 74.52 | 54.63 | 69.91 | 68.53 |
| 2012 | | 20.13 | 17.87 | 18.07 | | 56.91 | 71.93 | 70.57 |
| 2013 | | 19.54 | 18.84 | 18.98 | | 58.88 | 73.83 | 72.49 |
| | | | | | | | • | |
| | | | Le | evelized cost: | | | | |
| | | | nominal | 1994 - 2011: | 10.4 | 7.4 | 9.5 | 9.3 |
| | | | | 1994 - 2013: | | 8.0 | 10.0 | 9.8 |
| | | | | | | | | |
| • | | | real | 1994 - 2011: | 7.4 | 5.4 | 6.9 | 6.8 |
| | | | | 1994 - 2013: | | 5.5 | 6.9 | 6.8 |

Notes: All costs are in ¢/kWh. [1]: BECo RFP#2, Table 3 [2]: BECo RFP#3, Table 6 [3]: DPU 90-117, 90-118, Exh. BE-RSH-7. [4]: DPU 90-117. 90-118, Exh. BE-RSH-8.

| | 1 | | | | | | | | | | | | | | | | | ~- | | | ~ | | | | . | | | - 11 |
|---------|---------------|-------|-------|---------|------------|----------|-------------|---------|------|-----|------|-------|-------|-----------|-------------------|-----------|--------|-------------|--------------|-------------|---------------|----------------|---------------|--------|--------------|--------|------|------|
| | | 80 | -148 | 162 | 1 | 5 | 390 | 504 | 619 | 890 | 682 | 1050 | 1016 | 887 | 1013 | 1170 | 1208 | 1540 | 1543 | 1689 | 1961 | 1911 | 0017 | 2441 | 2638 | 2718 | | |
| | 5 | 2 | -118 | 185 | 3 | 35 | 191 | 450 | 556 | 63 | 630 | 995 | 385 | 835 | 991 | 1152 | 1203 | 1543 | 1559 | 1694 | 1990 | 9051 | 01816 | 2485 | 2685 | 2118 | | |
| 7 | ; | 2 | -115 | 226 | 190 | Ē | 524 | 644 | 766 | 842 | 842 | 1209 | 1181 | 1035 | 1192 | 1353 | 1403 | 1744 | 1759 | 1894 | 2190 | 2012 | 2687 | 2876 | 2873 | 2952 | | |
| | | 21 | -213 | ; ? | 671- | -238 | 21 | 5 | 130 | 181 | 128 | 480 | 419 | 260 | 360 | 540 | 546 | 845 | 805 | 883 | 1112 | +05 | 1571 | 1398 | 1546 | 1588 | | |
| de G | ; | = | -213 | 38 | - | -102 | 220 | 285 | 340 | 392 | 341 | 694 | 635 | 460 | 580 | 740 | 746 | 1045 | 1005 | 1084 | 1313 | C011 | 5791 | 1588 | 1735 | 1762 | | |
| D. | - | 7 O 7 | -180 | 3 | -53 | -118 | 191 | 231 | 112 | 333 | 289 | 639 | 584 | 428 | 558 | 722 | 141 | 1048 | 1021 | 1109 | 1761 | 0171 | 1583 | 1633 | 1781 | 1822 | | |
| | | 00 | -180 | 103 | 12 | 8 | 354 | 424 | 487 | 544 | 502 | 853 | 800 | 628 | 758 | 922 | 341 | 1249 | 1221 | 1309 | 1542 | 1410 | 1877 | 1823 | 1969 | 1395 | | |
| plus | 5 | | -269 | -56 | -201 | -302 | -85 | -33 | 7 | = | -56 | 224 | Ħ | 68- | Ŧ | 8 | -12 | 95 | 18- | 19- | 106 | 5 | 22 | -28 | 2 | -67 | | |
| Sun | 9 | 2 | -231 | 5 | -105 | -183 | 50 | 901 | 143 | 163 | 105 | 383 | 279 | 86 | 135 | 130 | 122 | 562 | 180 | 161 | 335 | 201 | 364 | 201 | 245 | 166 | | |
| Ð, | 3 | | -231 | (iq | <u>:</u> | Ŧ | 242 | 300 | 353 | 374 | 319 | 597 | 495 | 286 | 335 | 390 | 322 | 66+ | 380 | 362 | 535 | 200 | 559 | 398 | £ 133 | 340 | | |
| | 5 | 3 | 871- | 162 | 6 | 52 | 390 | 504 | 619 | 690 | 583 | 1050 | 015 | 867 | 1013 | 0711 | 1208 | 1540 | 1543 | 1669 | 1961 | 1101 | 2 1 50 | 2441 | 2638 | 8118 | | |
| | 51 | 5 | -116 | 185 | †6 | ŝ | 331 | 450 | 556 | 631 | 630 | 395 | 365 | 835 | 166 | 1152 | 1203 | 1543 | 1559 | 163 | 930 | 0000 | 683 | 2485 | 2685 | 8113 | | |
| | LEVEL 50 | , | 115 | 226 | 190 | Ш | 524 | 110 | 766 | 342 | 842 | 1209 | 181 | 035 | 192 | 353 | 103 | ŧ | 759 | 168 | 0.51 | 0670 | 683 | 516 | 1873 | 1952 | | |
| | - 95% | | 213 | ċ | 641. | -238 | 21 | 91 | 130 | 181 | 128 | 180 | 614 | 260 | 360 | 540 | 546 | 845 | 805 | 883 | 211 | 500 | 151 | 398 | 546 | 588 2 | | |
| | 1ENCY | ţ | 513 | 38 | • | 102 - | 220 | 285 | 340 | 392 | (11) | 0'j4 | 635 | 460 | 5:0 | 140 | 146 | 045 | 005 | 08 1 | | 130 | 645 | 588 | 135 1 | 152 1 | | |
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| | 1 | | 231 - | 6 | - 501 | 183 - | 50 | 106 | 143 | 163 | 105 | 38.1 | 219 | 86 | 135 | 130 | 122 | 299 | 180 | 101 | - 601 | 24.3 | 364 | 201 | 245 | 166 | | |
| | 32 | | - 162 | 50 | - 9 | - + | 242 | 300 | 353 | 374 | 318 | 597 | 135 | 286 | 335 | 330 | 322 | 6 33 | 380 | 202 | 505 | [H] | 559 | 398 | 433 | 340 | | |
| | 26 | | - 140 | 162 | 94 | 52 | 390 | 204 | 619 | 630 | 682 | 050 | 016 | 867 | 013 | 21 | 204 | 240 | | 500 | 105 | 188 | 450 | -11 | 638 | 811 | | |
| | 54 | | - 911 | 185 | 7 5 | 35 | 331 | 450 | 556 | 631 | 630 | 995 1 | 385 1 | 835 | 991 | 152 | 507 I | | 225 | 1 1000 | | 220 2 | 489 2 | 485 2 | 685 2 | 118 2 | | |
| | 23 | | 116 | 226 | 190 | . 111 | 524 | 644 | 766 | 842 | 842 | 209 | 181 | 035 | 132 | | 102 | ŧ | | 1 460 | 108 1 | 420 2 | 683 2 | 676 2 | 813 2 | 952 2 | | ** |
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| YLAR | 5 | 6 | 9 | 14 | 15 | 17 | 18 | 23 | 24 | 26 | 32 | 33 | 35 | 41 | 42 | 44 | 45 | 100RS 50 | ี 95 มีเ 51 | .LVEL 53 | 53 | 60 | 63 | 68 | 69 | 71 | 72 | 11 | 78 | 80 |
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| 1991 | 14 38 | 55 | 51 | 21 | 30 81 | 13 | 52 | 21 | 42 | 18 | 14 | 13 59 | 51 | 21 | 50 | 13 | J2 66 | 17 | 42 5 a | 18 | 14 | 35 | 31 | 21 | 50 | 13 | 32 | 17 | 42 | 18 |
| 1992 | 31 | 59 | 12 | 11 | 81 | 12 | 60 | . 23 | 41 | 14 | 30 | 50 | 42 | 33 | 01 141 | 31 | 30 | 23 | 0 Y | 20 | 30 | 20 | 04 | 33 | 81 01 | 31 | 50 | 23 | 59 | 26 |
| 1993 : | 41 | 91 | 69 | 64 | 123 | 24 | 59 | 41 | 130 | 51 | 17 | 91 | 46 64 | 64 | 127 | 20 | 50 | 23 11 | 110 | 51 | 47 | 33 01 | 42 20 | 44 | 03 | 32 | 0U 50 | 23 | 120 | 54 j |
| 1994 | 24 | 94 | 114 | 18 | 12 | 23 | 88 | 10 | 45 | 13 | 24 | 94 | 114 | 18 | 12 | 23 | 88 | 10 | 45 | 13 | 21 | 10 | 114 | 19 | 123 | 23 27 | 23 | 4 I 10 | 130 | - J |
| 1995 | 18 | 12 | 89 | 12 | 52 | 14 | 66 | 6 | 28 | 8 | 18 | 12 | 89 | 12 | 52 | 14 | 68 | | 28 | 8 | 18 | 12 | 89 | 12 | 52 | 14 | 66 | 6 | 4J 28 | 1.0 1 |
| 1995 | 13 | 52 | 18 | 9 | 44 | 12 | . 56 | J | 19 | 4 | 13 | 62 | 78 | 9 | 44 | 12 | 58 | 3 | 19 | 4 | 13 | 62 | 78 | 9 | ü | 12 | 56 | 3 | 19 | 1 |
| 1997 ; | 11 | 52 | 66 | 6 | 33 | 9 | 43 | 2 | 13 | 3 | 11 | 52 | 66 | 6 | 33 | 9 | 43 | 2 | 13 | 3 | 11 | 52 | 66 | 5 | 33 | 9 | 43 | 2 | 13 | 3 |
| 1998 ¦ | 13 | 60 | 78 | 1 | 31 | - 11 | 49 | 2 | 13 | 3 | 13 | 60 | 18 | 1 | 31 | 41 | 49 | 2 | 13 | 3 | 13 | 60 | 78 | i | 31 | 11 | 49 | 2 | 13 | 3 |
| 1999 ¦ | 4 | 22 | 29 | 2 | 10 | 3 | 15 | 0 | 3 | 1 | 4 | 22 | 29 | 2 | 10 | 3 | 15 | 0 | 3 | 1 | 4 | 22 | 29 | 2 | 10 | 3 | 15 | Ō | 3 | . 1 |
| 2000 | 6 | 29 | 39 | 2 | 12 | 3 | 17 | 0 | 3 | 1 | 6 | 29 | 39 | 2 | 12 | 3 | 17 | 0 | 3 | 1 | 6 | 29 | 39 | 2 | 12 | 3 | 17 | Ó | 3 | 1 |
| 2001 | 9 | 40 | 54 | 3 | 16 | 5 | 22 | 0 | 4 | 1 | 9 | 40 | 54 | 3 | 16 | 5 | 22 | 0 | 4 | 1 | 9 | 40 | 54 | 3 | 16 | 5 | 22 | 0 | 4 | 1 |
| 2002 | 6 | 28 | 39 | 1 | 8 | 2 | 12 | 0 | 2 | Q | 6 | 28 | 39 | 1 | 8 | 2 | 12 | 0 | 2 | 0 | 6 | 28 | 39 | 1 | 8 | 2 | 12 | 0 | 2 | 0 |
| 2003 | 4 | 19 | 27 | 0 | 4 | 1 | δ | 0 | 1 | Q | 4 | 19 | 21 | 0 | 4 | 1 | 6 | 0 | 1 | 0 | 4 | 19 | 21 | 0 | 4 | 1 | 8 | 0 | 1 | 0 |
| 2004 | 5 | 21 | 30 | 0 | 3 | 1 | 5 | 0 | 0 | Q | 5 | 21 | 30 | Û | 3 | 1 | 5 | 0 | 0 | Û | 5 | 21 | 30 | 0 | 3 | 1 | 5 | 0 | 0 | 0 |
| 2005 | 2 | 8 | 13 | 0 | Û | Û | 1 | 0 | 0 | 0 | 2 | 8 | 13 | 0 | Ú | 0 | 1 | Q | Û | 0 | 2 | 8 | 13 | 0 | 0 | 0 | 1 | Q | 0 | 0 |
| 2006 | 2 | 11 | 11 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 2 | 11 | 11 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 2 | - 11 | 17 | 0 | 1 | 0 | 1 | 0 | Q | 0 |
| 2007 ; | 2 | 10 | 16 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 2 | 10 | 16 | 0 | 0 | Û | 1 | Ú | Û | U | 2 | 10 | 16 | 0 | Q | 0 | 1 | 0 | 0 | 0 |
| 2008 ; | 1 | 4 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 4 | 1 | 0 | 0 | 0 | Ű | 0 | 0 | 0 | 1 | 4 | 1 | 0 | Q | 0 | Q | 0 | 0 | 0 |
| 2010 | 2 | 3 | 14 | U | 0 | V | 0 | U | 0 | 0 | 2 | 9 | 14 | 0 | Q | 0 | 0 | Û | 0 | 0 | 2 | 3 | 14 | 0 | 0 | 0 | 0 | 0 | 0 | 0. |
| 2010 | 1 | 4 | | 0 | 0 | U | U | 0 | 0. | 0 | Ì | 4 | 1 | 0 | 0 | 0 | Ũ | 0 | 0 | 0 | 1 | 4 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
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| 5 : | 6 | ¥ | | 15 | | 18 | 23 | 24 | 26 | 32 | 33 | 38 | 41 | 42 | 44 | 45 | 50 | 51 | 53 | 59 | 60 | 63 | 68 | 69 | 71 | 12 | 11 | 78 | 80 |
| -251 | 231 | -263 | -180 | - 180 | -213 | -213 | -115 | -116 | - 148 | -237 | · 231 | -269 | -180 | -180 | -213 | -213 | -116 | -116 | -148 | -231 | -237 | -269 | -180 | -180 | -213 | | | | -149 |
| 50 | 9 | -50 | 103 | 61 | 38 | -3 | 226 | 185 | 162 | 50 | 9 | -58 | 103 | 61 | 38 | -3 | 226 | 185 | 162 | 50 | 9 | -58 | 103 | 61 | 38 | -1 | 226 | 185 | 162 |
| ; 10 | 105 | -201 | 42 | - 53 | - 54 | -149 | 190 | 94 | 94 | -10 | · 105 | -201 | 42 | -53 | -54 | - 149 | 190 | 94 | 94 | 10 | -105 | -201 | 42 | -53 | -54 | -149 | 190 | 91 | 40 |
| : • 47 | -183 | -302 | 18 | -118 | -102 | -238 | 171 | 35 | 52 | -47 | -183 | -302 | 18 | -118 | -102 | -238 | 171 | 35 | 52 | -41 | -183 | -302 | 18 | -118 | -102 | -238 | 171 | 35 | 52 |
| 142 | 50 | -185 | 254 | 61 | 120 | -13 | 424 | 231 | 290 | 142 | 50 | -185 | 254 | 61 | 120 | -13 | 424 | 231 | 290 | 142 | -50 | -185 | 254 | 61 | 120 | -13 | 424 | 231 | 290 |
| ; 200 (| 6 | -133 | 324 | 131 | 185 | -9 | 544 | 350 | 404 | 200 | 6 | -133 | 324 | 131 | 185 | - 4 | 544 | 350 | 404 | 200 | 6 | -133 | 324 | 131 | 185 | -9 | 544 | 350 | 104 |
| : 253 | 43 | -104 | 381 | 111 | 240 | 30 | 666 | 455 | 519 | 253 | 43 | ~104 | 387 | 111 | 240 | 30 | 668 | 456 | 519 | 253 | 43 | · 104 | 387 | 117 | 240 | 30 | 655 | 458 | 519 |
| 2/4 | 63 | -81 | 444 | 233 | 292 | 81 | 142 | 531 | 590 | 214 | 63 | -89 | 444 | 233 | 292 | ងរ | 142 | 531 | 590 | 214 | 63 | -89 | 444 | 233 | 292 | 81 | 142 | 531 | 590 |
| ; 318 | 105 | -50 | 502 | 289 | 341 | 128 | 842 | 630 | 682 | 318 | 105 | -56 | 50Ż | 289 | 341 | 128 | 842 | 630 | 682 | 318 | 105 | -58 | 502 | 289 | 341 | 128 | 842 | 630 | 682 |
| 297 | 83 | -16 | 553 | 324 | 394 | 180 | 90 Y | 695 | 150 | 291 | 83 | -76 | 553 | 338 | 394 | 1:10 | 909 | 695 | 750 | 297 | 83 | -16 | 553 | 339 | 394 | 180 | 909 | 695 | 750 |
| 195 | · 21 | -108 | 500 | 284 | 335 | 119 | 881 | 665 | 716 | 195 | -21 | -186 | 500 | 284 | 335 | 119 | 881 | 665 | 116 | 195 | -21 | -186 | 500 | 284 | 335 | 119 | 881 | 665 | 716 |
| ; 386 | 186 | H | 728 | 520 | 560 | 360 | 1135 | 935 | 961 | 386 | 186 | 11 | 128 | 528 | 560 | 360 | 1135 | 935 | 967 | 386 | 185 | 17 | 128 | 528 | 560 | 360 | 1135 | 935 | 967 |
| 235 | 35 | - 144 | 658 | 458 | 1 00 | 280 | 1092 | 891 | 913 | 235 | 35 | -144 | 658 | 458 | 480 | 230 | 1092 | 891 | 913 | 235 | 35 | - 144 | 658 | 458 | 480 | 280 | 1092 | 891 | 913 |
| 170 | 30 | -212 | 102 | 502 | 520 | 320 | 1133 | 932 | 450 | 170 | -30 | -212 | 102 | 502 | 520 | 320 | 1133 | 932 | 950 | 110 | -30 | -212 | 102 | 502 | 520 | 320 | 1133 | 932 | 950 |
| ; 102 | - 98 | -295 | 121 | 521 | 528 | 326 | 1183 | 983 | 988 | 102 | · 98 | 293 | 121 | 521 | 526 | J26 | 1183 | 983 | 988 | 102 | -98 | -293 | 721 | 521 | 526 | 325 | 1183 | 983 | 988 |
| ; 179 | -21 | -225 | 929 | 728 | 125 | 5 25 | 1424 | 1223 | 1220 | 179 | -21 | -225 | 923 | 728 | 725 | 525 | 1424 | 1223 | 1220 | 179 | -21 | -225 | 929 | 728 | 725 | 525 | 1424 | 1223 | 1220 |
| 180 | -20 | -231 | 1021 | 821 | 805 | 605 | 1559 | 1359 | 1343 | 180 | - 20 | -231 | 1021 | 821 | 805 | 665 | 1559 | 1359 | 1343 | 180 | -20 | -231 | 1021 | 821 | 805 | 605 | 1559 | 1359 | 1343 |
| 162 | - 39 | -264 | 1109 | 909 | 884 | 683 | 1694 | 1494 | 1469 | 162 | -39 | -284 | 1109 | 909 | 884 | 683 | 1694 | 1494 | 1469 | 162 | -39 | -264 | 1109 | 909 | 884 | 683 | 1694 | 1494 | 1469 |
| 135 | 135 | - 94 | 1342 | 1141 | 1113 | 912 | 1990 | 1790 | 1761 | 335 | 135 | - 94 | 1342 | 1141 | 1113 | 912 | 1990 | 1790 | 1761 | 335 | 135 | - 94 | 1342 | 1141 | 1113 | 912 | 1990 | 1790 | 1761 |
| 182 | -18 | -249 | 1298 | 1096 | 1065 | 864 | 1988 | 1788 | 1151 | 182 | -18 | -249 | 1296 | 1096 | 1065 | 864 | 1988 | 1788 | 1757 | 182 | -18 | -249 | 1296 | 1096 | 1085 | 864 | 1988 | 1788 | 1757 |
| ; 323 | 123 | -110 | 1542 | 1342 | 1310 | 1109 | 2300 | 2100 | 2068 | 323 | 123 | -110 | 1542 | 1342 | 1310 | 1109 | 2300 | 2100 | 2068 | 323 | 123 | -110 | 1542 | 1342 | 1310 | 1109 | 2300 | 2100 | 2058 |
| i 59 | ~130 | -308 | 1311 | 1183 | 1145 | 951 | 2183 | 1989 | 1950 | 59 | -136 | -368 | 1311 | 1183 | 1145 | 951 | 2183 | 1989 | 1950 | 59 | -136 | -368 | 1377 | 1183 | 1145 | 951 | 2183 | 1989 | 1950 |
| ; 198 I 000 | 1 | -228 | 1623 | 1433 | 1388 | 1198 | 2476 | 2285 | 2241 | 198 | 1 | -228 | 1623 | 1433 | 1388 | 1198 | 2416 | 2285 | 2241 | 198 | 1 | -228 | 1623 | 1433 | 1388 | 1198 | 2476 | 2285 | 2241 |
| ; 233 | 45 | -190 | 1/69 | 1581 | 1535 | 1346 | 2673 | 2485 | 2438 | 233 | 45 | -190 | 1769 | 1581 | 1535 | 1345 | 2673 | 2485 | 2438 | 233 | 45 | -190 | 1769 | 1581 | 1535 | 1348 | 2673 | 2485 | 2438 |
| ; 140 / | -14 | -207 | 1/95 | 1622 | 1562 | 1388 | 2752 | 2578 | 2518 | 140 | - 34 | -267 | 1795 | 1622 | 1562 | 1388 | 2752 | 257.8 | 2518 | 140 | -34 | -287 | 1795 | 1622 | 1562 | 1388 | 2752 | 2578 | 2518 |
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| 195 28 105 128 19 78 25 296 9 43 11 20 105 128 19 70 25 98 9 41 13 10 105 127 10 53 127 | 10 6/ 21 |
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| TEAR | 5 | 6 | 9 | 14 | 15 | 17 | 10 | 23 | 24 | 26 | 32 | 33 | 36 | 41 | 42 | 44 | 45 | 50 | 51 | 53 | 59 | 60 | 63 | 68 | 69 | 71 | 72 | 11 | 78 | 80 |
| 1990 ; | -231 | 237 | -269 | -180 | ·180 | -213 | -213 | ·116 | -116 | - 148 | -237 | -231 | -269 | -180 | - 180 | -213 | -213 | -116 | -116 | · 148 | -237 | 237 | -269 | -180 | -180 | -213 | -213 | -115 | -118 | -148 |
| 1991 ; | 50 | 9 | -56 | 103 | 61 | 38 | -3 | 226 | 185 | 162 | 50 | 9 | -56 | 103 | 61 | 38 | -3 | 228 | 185 | 162 | 50 | 9 | -58 | 103 | 61 | 38 | -3 | 226 | 185 | 162 |
| 1992 ; | -10 | -105 | -201 | 42 | -53 | -54 | 149 | 190 | 94 | 94 | - 10 | -105 | 201 | 42 | -53 | -54 | -149 | 190 | 94 | 94 | -10 | -105 | -201 | 42 | - 53 | -54 | -149 | 190 | 94 | 94 |
| 1993 ; | -41 | -183 | -302 | 18 | -118 | -102 | -238 | 171 | 35 | 52 | -47 | -183 | -302 | 18 | -118 | -102 | -238 | 171 | 35 | 52 | -47 | -183 | -302 | 18 | -118 | -102 | -238 | 171 | 35 | 52 |
| 1994 : | 142 | · 50 | -185 | 254 | 61 | 120 | -13 | 424 | 231 | 290 | 142 | -50 | -185 | 254 | 61 | 120 | -73 | 424 | 231 | 290 | 142 | -50 | - 185 | 254 | 61 | 120 | -73 | 424 | 231 | 290 |
| 1995 ; | 200 | 6 | -133 | 324 | 131 | 185 | -9 | 544 | 350 | 404 | 200 | 6 | -133 | 324 | 151 | 185 | -9 | 544 | 350 | 404 | 200 | 6 | -133 | 324 | 131 | 185 | -9 | 544 | 350 | 404 |
| 1996 | 253 | 43 | -104 | 387 | W1 | 240 | 30 | 660 | 456 | 519 | 253 | 43 | -104 | 381 | m | 240 | 30 | 665 | 456 | 519 | 253 | 43 | -104 | 387 | 177 | 240 - | 30 | 666 | 458 | 519 |
| 1997 : | (14 | -31 | -189 | 344 | 133 | 192 | -19 | 642 | 431 | 490 | 174 | -31 | -189 | 344 | 133 | 192 | -19 | 642 | 431 | 490 | 174 | -31 | -189 | 344 | 133 | 192 | -19 | 642 | 431 | 490 |
| 1936 | 218 | 5 | - 156 | 402 | 189 | 241 | 28 | 142 | 530 | 582 | 218 | 5 | 156 | 402 | 189 | 241 | 28 | 142 | 530 | 582 | 218 | 5 | -156 | 402 | 189 | 241 | 28 | 142 | 530 | 582 |
| 1999 ! | 91 | -117 | -215 | 353 | 139 | 194 | -20 | 109 | 495 | 550 | 97 | -117 | -276 | 353 | 139 | 194 | -20 | 703 | 495 | 550 | 91 | -117 | -276 | 353 | 139 | 194 | -20 | 709 | 495 | 550 |
| 2000 : | 32 | · 121 | 286 | 400 | 184 | 235 | 13 | 181 | 565 | 616 | 95 | - 121 | ·286 | 400 | 184 | 235 | 19 | 781 | 565 | 616 | 35 | 121 | 286 | 400 | 184 | 235 | 19 | 781 | 565 | 616 |
| 2001 : | 286 | 85 | -83 | 628 | 428 | 460 | 260 | 1035 | 835 | 86 <i>i</i> | 286 | üÖ | ·83 | 628 | 428 | 460 | 260 | 1035 | 835 | 867 | 286 | 88 | -83 | 628 | 428 | 460 | 260 | 1035 | 835 | 867 |
| 2002 : | 135 | ~65 | -244 | 558 | 358 | 300 | 180 | 992 | 791 | 813 | 135 | · 85 | -244 | 558 | 358 | 380 | 180 | 992 | 791 | 813 | 135 | -65 | -244 | 558 | 358 | 380 | 180 | 992 | 791 | 813 |
| 2003 ; | -30 | -230 | -412 | 502 | 302 | 320 | 120 | 933 | 132 | 750 | -30 | -230 | -412 | 502 | 302 | 320 | 120 | 833 | 132 | 750 | -30 | -230 | -412 | 502 | 302 | 320 | 120 | 933 | 732 | 750 |
| 2004 : | -98 | -298 | -493 | 521 | 321 | 326 | 126 | 983 | 783 | 188 | -98 | -298 | -493 | 521 | 321 | 325 | 126 | 983 | 783 | 788 | -98 | 298 | -493 | 521 | 321 | 326 | 125 | 983 | 783 | 788 |
| 2005 : | -221 | -421 | -625 | 529 | 328 | 325 | 125 | 1024 | 823 | 820 | -221 | 421 | -625 | 529 | 359 | 325 | 125 | 1024 | 823 | 820 | -221 | -421 | -625 | 529 | 328 | 325 | 125 | 1024 | 823 | 820 ; |
| 2006 | 140 | - 340 | -557 | 701 | 501 | 485 | 285 | 1233 | 1039 | 1023 | 140 | -340 | -\$57 | 701 | 501 | 485 | 285 | 1239 | 1039 | 1023 | -140 | · 340 | -557 | 701 | 501 | 485 | 285 | 1239 | 1039 | 1023 |
| 2007 ; | -138 | -339 | -564 | 808 | 609 | 584 | 383 | 1394 | 1194 | 1169 | -138 | -339 | -564 | 809 | 609 | 584 | 383 | 1394 | 1194 | 1189 | -138 | -339 | -564 | 809 | 609 | 584 | 383 | 1394 | 1194 | 1169 |
| 2008 ; | 165 | - 365 | -594 | 842 | 641 | 613 | 412 | 1490 | 1290 | 1261 | -165 | -365 | -594 | 842 | 641 | 613 | 412 | 1490 | 1290 | 1261 | -165 | · 365 | - 594 | 842 | 641 | 613 | 412 | 1490 | 1290 | 1281 |
| 2003 : | -18 | -218 | -449 | 1096 | 896 | 865 | 664 | 1788 | 1588 | 1557 | - 18 | -218 | -449 | 1096 | 896 | 865 | 664 | 1788 | 1588 | 1557 | -18 | -218 | -449 | 1098 | 895 | 865 | 664 | 1788 | 1588 | 1557 |
| 2010 | -111 | 311 | -610 | 1042 | 842 | 0,10 | 609 | 1800 | 1600 | 1568 | -177 | -311 | ·610 | 1042 | 842 | 810 | 609 | 1800 | 1600 | 1568 | -111 | -311 | -610 | 1042 | 842 | 810 | 609 | 1800 | 1500 | 1568 ; |
| 2011 ; | -61 | -256 | -488 | 1257 | 1053 | 1025 | 831 | 2063 | 1869 | 1830 | -61 | -256 | -488 | 1257 | 1063 | 1025 | 831 | ·2063 | 1869 | 1830 | -61 | -258 | -488 | 1257 | 1063 | 1025 | 631 | 2083 | 1869 | 1830 |
| 2012 | 98 | - 93 | -328 | 1523 | 1333 | 1288 | 1098 | 2376 | 2185 | 2141 | 98 | -93 | - 328 | 1523 | 1333 | 1288 | 1098 | 2376 | 2185 | 2141 | 98 | -93 | -328 | 1523 | 1333 | 1288 | 1098 | 2376 | 2185 | 2141 |
| 2013 | -147 | -335 | -510 | 1389 | 1201 | 1155 | 900 | 2293 | 2105 | 2058 | -147 | · 335 | -570 | 1389 | 1201 | 1155. | 968 | 2293 | 2105 | 2058 | -147 | -335 | -570 | 1389 | 1201 | 1155 | 966 | 2293 | 2105 | 2058 |
| 2014 | - 60 | 234 | -487 | 1595 | 1422 | 1362 | 1188 | 2552 | 2378 | 2318 | -60 | -234 | -467 | 1595 | 1422 | 1362 | 1188 | 2552 | 2378 | 2318 | -60 | -234 | -461 | 1595 | 1422 | 1362 | 1188 | 25 52 | 2378 | 2318 |

| | | | | | | | | | | ····· | | | | UN | MLI GIO | GAWATTI | IOUIIS | 70% 1 | LLVEL | •••••• | | | | | | | | | | ******* |
|--------------|-------|-----|-----|-----|------|----|-------------|----|-----|-------|----|-----|-----|---------|---------|---------|--------|--------|-------|--------|----|-------|-----|------|--------|--------|--------|--------|-----|---------|
| .AR • • • | 5 | 5 | ł | 14 | 15 | 17 | IJ | 23 | 24 | 26 | 32 | 33 | 36 | 41 | 42 | 44 | 45 | 50 | 51 | 53 | 59 | 60 | 63 | 68 | 69 | 71 | 12 | 11 | 78 | 80 |
| 190 : | 14 | 35 | 31 | 21 | 50 | 13 | 32 | И. | 42 | 18 | 14 | 35 | 31 | 21 | 50 | 13 | 32 | 11 | 42 | 18 | 14 | 35 | 31 | 21 | 50 | 13 | 32 | 17 | | 18 |
| 91 1 | 30 | 58 | 64 | 33_ | 81 | 37 | 56 | 23 | 59 | 26 | 38 | 58 | 54 | 33 | 81 | 31 | 56 | 23 | 59 | 26 | 38 | 58 | 64 | 33 | 81 | 37 | 56 | 23 | 59 | 26 |
| 192 ; | 31 | 59 | 42 | 44 | 83 | 32 | 6 0. | 29 | 91 | 34 | 31 | 59 | 42 | 44 | 83 | 32 | 60 | 29 | 91 | 34 | 31 | 59 | 42 | - 44 | 83 | 32 | 60 | 29 | 91 | 34 |
| 193 | 41 | 91 | 69 | 64 | 123 | 29 | 59 | 41 | 130 | 51 | 41 | 91 | 69 | 64 | 123 | 29 | 59 | 41 | 130 | 51 | 47 | 91 | 69 | 64 | 123 | 29. | 59 | 41 | 130 | 51 |
| .94 | 31 | 136 | 163 | 21 | 105 | 35 | 127 | 16 | 67 | 21 | 31 | 136 | 163 | 21 | 105 | 35 | 127 | 16 | 67 | 21 | 37 | 138 | 163 | 21 | 105 | 35 | 127 | 18 | 67 | 21 |
| 95 | 28 | 105 | 120 | 19 | 18 | 25 | УĈ | 9 | 43 | 13 | 28 | 105 | 128 | 19 | 18 | 25 | 96 | 9 | 43 | 13 | 28 | 105 | 128 | 19 | 18 | 25 | 98 | 9 | 43 | 13 |
| 96 | 21 | 91 | 112 | 14 | 66 | 19 | 82 | 5 | 30 | 1 | 21 | 91 | 112 | 14 | 66 | 19 | 82 | 5 | 30 | 1 | 21 | 91 | 112 | 14 | 66 | 19 | 82 | 5 | 30 | ï |
| 81 | 26 | 111 | 137 | 16 | - 14 | 22 | 93 | 6 | 32 | 8 | 20 | 111 | 137 | 15 | - 14 | 22 | 93 | 5 | 32 | 8 | 25 | 111 | 137 | 15 | 14 | 22 | 93 | 6 | 32 | Å |
| 98 ¦ | 20 | 88 | 112 | 12 | 56 | 16 | 12 | 3 | 21 | 5 | 20 | 88 | 112 | 12 | 56 | 16 | 12 | 3 | 21 | 5 | 20 | 88 | 112 | 12 | 56 | 16 | 12 | 3 | 21 | 5 |
| 39 ; | 29 | 119 | 150 | 14 | 64 | 19 | 83 | 4 | 23 | 6 | 29 | 119 | 150 | 14 | 64 | 19 | 83 | 4 | 23 | 6 | 29 | 119 | 150 | 14 | 64 | 19 | 83 | i | 23 | Ň |
| 00 ; | 26 | 105 | 135 | 10 | 50 | 15 | 66 | 2 | 16 | 4 | 26 | 106 | 135 | 10 | 50 | 15 | 66 | 2 | 16 | 4 | 26 | 106 | 135 | 10 | 50 | 15 | 66 | , | 16 | Ĭ |
| 01 | 9 | 40 | 54 | 3 | 16 | 5 | 22 | 0 | 4 | 1 | 9 | 40 | 54 | 3 | 16 | 5 | 22 | Û | 4 | 1 | 9 | 40 | 54 | 3 | 16 | 5 | 22 | ñ | 1 | - |
| 02 | 15 | 60 | 80 | 4 | 20 | 6 | 28 | 1 | 5 | 1 | 15 | 60 | 80 | 4 | 20 | 6 | 28 | 1 | 5 | 1 | 15 | 60 | 80 | i | 20 | Ň | 28 | 1 | 5 | ÷ |
| ·03 ¦ | 24 | 90 | 120 | 5 | 24 | 1 | 33 | 1 | 6 | 1 | 24 | 90 | 120 | 5 | 24 | 1 | 33 | 1 | 6 | i | 24 | 90 | 120 | 5 | 24 | ĩ | 21 | - i | Å | 1 |
| 04 | 26 | 96 | 129 | 4 | 20 | 1 | 29 | 1 | 4 | 1 | 26 | 96 | 129 | 4 | 20 | 1 | 29 | 1 | 4 | i | 28 | 96 | 129 | Ĭ | 20 | i | 20 | | ž | 1 |
| 05 | 32 | 115 | 157 | 3 | 18 | 6 | 25 | 0 | 3 | 1 | 32 | 116 | 157 | 3 | 18 | 6 | 25 | 0 | 3 | 1 | 32 | 118 | 157 | 3 | 18 | | 26 | , , | 1 | |
| 06 | 20 | 75 | 105 | 1 | 8 | 2 | 13 | 0 | 1 | 0 | 20 | 75 | 105 | 1 | 8 | ż | 13 | 0 | i | Ô | 20 | 15 | 105 | 1 | A | ŷ | 17 | Ň | 1 | |
| 01 | 18 | 60 | 86 | 1 | 4 | 1 | 1 | 0 | 0 | 0 | 16 | 60 | 60 | 1 | 4 | 1 | 1 | 0 | ò | Ô | 16 | 60 | 86 | 1 | Å | 1 | 7 | ň | 0 | Ň |
| 08 ¦ | 15 | 54 | 79 | 0 | 3 | 1 | 5 | 0 | 0 | 0 | 15 | 54 | 79 | 0 | 3 | 1 | 5 | ů. | 0 | ñ | 15 | 54 | 79 | | 7 | 1 | ŝ | v n | ~ | Ň |
| 03 (| 1 | 26 | 40 | 0 | 1 | 0 | 2 | 0 | 0 | 0 | 1 | 26 | 40 | Ō | 1 | 0 | 2 | 0. | ů | ñ | 1 | 26 | 40 | ň | 1 | 0 | 3 | ų A | 0 | U A |
| 10 | 10 | 36 | 53 | 0 | ł | 0 | 2 | 0 | 0 | 0 | 10 | 36 | 53 | Ó | 1 | Ō | 2 | 0 | ň | Ô | 10 | 16 | 53 | 0 | 1 | ň | 2 | v A | Ň | v o |
| H [| б | 19 | 29 | 0 | ί | 0 | 0 | 0 | 0 | Ũ | 6 | 19 | 29 | Ú | Ó | Ŭ | 0 | ί Ú | 6 | ñ | 6 | 19 | 24 | 0 | י ה | 0 | ۲ ۵ | v A | 0 | 0 |
| 12 | 3 | 10 | 15 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 10 | 15 | 0 | 0 | 0 | 0 | Ň | Ô | ñ | ĩ | 10 | 15 | ň | Ň | Ň | 0 | 0 | 0 | U A |
| 13 ; | 4 | 8 | 12 | U | 0 | 0 | 0 | U | 0 | Û | 4 | 8 | 12 | - () | Ű | ۱ | ů. | ů | 0 | ĥ | 4 | 8 | 12 | 0 | ů n | v n | 0 | U N | 0 | V A |
| 14 🗄 | 2 | 5 | 1 | 0 | 0 | 0 | Ũ | Ó | 0 | 0 | 2 | 5 | 1 | ò | Ň | ñ | n n | 0 | ñ | ñ | 2 | 5 | 12 | 0 | U A | v n | V A | U | U | U |
| 1 | | | | | | | | - | - | • | • | • | | v | v | v | v | U | v | v | ٤ | J | I. | v | V | U | V | V | Ų | U |
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(F) SURPLUS/ ODEFICIENCY)

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|--------|-----------|-------|-------|-------|-------|------|------|------|------|-------|-------|--------|-------|--------|--------|--------|--------|--------|------|-------|-------|-------|--------|------|------|------|------|------|------|-------|
| LAH | 5 | Ô | 9 | 14 | 15 | 17 | 18 | 23 | 24 | 25 | 32 | 33 | 36 | 41 | 42 | 44 | 45 | 50 | 51 | 53 | 59 | 60 | 63 | 68 | 69 | 71 | 72 | 11 | 78 | 80 |
| 1990. | -237 | -231 | · 259 | 180 | - 180 | 213 | -213 | -118 | 116 | · 148 | -237 | ·237 | -269 | · 180 | - 180 | · 213 | -213 | - 116 | -116 | - 148 | -237 | -237 | -269 | -180 | | | | | -118 | -1/8 |
| 1991 | 50 | 9 | -56 | 103 | 61 | 38 | -3 | 226 | 185 | 182 | 50 | 9 | -56 | 103 | 61 | 38 | -3 | 226 | 185 | 162 | 50 | 9 | -58 | 103 | 81 | 38 | -3 | 228 | 185 | 162 1 |
| 1992 | -10 | 160 | -201 | 42 | - 53 | -54 | -149 | 190 | 94 | 94 | -10 | - 105 | -201 | 42 | -53 | -54 | -149 | 190 | 94 | 94 | -10 | -105 | -201 | 42 | -53 | -54 | -149 | 190 | 94 | 94 |
| 1993 | -41 | -183 | -302 | 18 | -118 | -102 | -238 | 171 | 35 | 52 | -41 | -183 | -302 | 18 | -118 | 102 | -238 | 171 | 35 | 52 | -47 | -183 | -302 | 18 | -118 | -102 | -238 | 171 | 35 | 52 |
| 1994 | 142 | · 5u | -185 | 254 | 61 | 120 | -13 | 424 | 231 | 290 | 142 | -50 | -185 | 254 | 61 | 120 | -73 | 424 | 231 | 290 | 142 | -50 | -185 | 254 | 61 | 120 | -73 | 424 | 231 | 290 1 |
| 1995 | 100 | -94 | -233 | 224 | 31 | 85 | -109 | 444 | 250 | 304 | 100 | -94 | -233 | 224 | 31 | 85 | -109 | 444 | 250 | 304 | 100 | -94 | -233 | 224 | 31 | 85 | -109 | 444 | 250 | 304 1 |
| 1936 | 151 | -51 | -204 | 287 | 11 | 140 | -70 | 566 | 356 | 419 | 153 | · 51 | -204 | 287 | 11 | 140 | -70 | 566 | 356 | 419 | 153 | -57 | -204 | 287 | 11 | 140 | -70 | 566 | 356 | 419 |
| 1997 | 174 | -31 | -189 | 344 | 133 | 192 | -19 | 642 | 431 | 490 | 174 | -31 | -189 | 344 | 133 | 192 | -19 | 642 | 431 | 490 | 174 | -37 | -189 | 344 | 133 | 192 | -19 | 642 | 431 | 490 |
| 1998 | 118 | 32 | 256 | 302 | 89 | 141 | -12 | 842 | 430 | 432 | 118 | 95 | -258 | 302 | 89 | 141 | -12 | 642 | 430 | 482 | 118 | -95 | -256 | 302 | 89 | 141 | -12 | 642 | 430 | 482 |
| 1333 | 91 | -111 | -278 | 353 | 139 | 194 | -20 | 709 | 495 | 550 | 97 | -117 | -276 | 353 | 139 | 194 | -20 | 109 | 495 | 550 | 97 | -117 | -218 | 353 | 139 | 194 | -20 | 709 | 495 | 550 ; |
| 2000 | •5 | 224 | -386 | 300 | 84 | 135 | -81 | 681 | 465 | 516 | ~5 | -221 | -385 | 300 | 84 | 135 | -81 | 681 | 465 | 515 | -5 | -221 | - 386 | 300 | 84 | 135 | -81 | 681 | 465 | 516 |
| 2001 | 188 | - 14 | -183 | 528 | 328 | 360 | 150 | 932 | 135 | 767 | 186 | -14 | -183 | 528 | 328 | 360 | 160 | 935 | 135 | 161 | 186 | -14 | -183 | 528 | 328 | 360 | 160 | 935 | 135 | 767 |
| 2002 | 35 | -105 | -344 | 458 | 258 | 280 | 80 | 892 | 691 | 113 | 35 | 165 | -344 | 458 | 258 | 280 | 80 | 892 | 691 | 113 | 35 | -165 | 344 | 458 | 258 | 280 | 80 | 892 | 691 | 713 |
| 2003 | -130 | -310 | -512 | 402 | 202 | 220 | 20 | 833 | 632 | 650 | -130 | -330 | -512 | 402 | 202 | 220 | 20 | 833 | 632 | 650 | -130 | -330 | - 512 | 402 | 202 | 220 | 20 | 833 | 632 | 650 |
| 2004 | 298 | - 495 | -693 | 321 | 121 | 125 | -14 | 183 | 583 | 298 | -298 | 498 | -693 | 321 | 124 | 126 | -14 | 783 | 583 | 588 | -298 | -498 | - 693 | 321 | 121 | 126 | -74 | 783 | 583 | 588 |
| 2005 | -421 | -621 | -825 | 329 | 128 | 125 | -15 | 824 | 623 | 620 | -421 | -621 | -825 | 329 | 128 | 125 | ·15 | 824 | 623 | ti 20 | -421 | -621 | -825 | 329 | 128 | 125 | -15 | 824 | 623 | 620 |
| 2005 | -440 | 040 | -851 | 401 | 201 | 185 | -15 | 939 | 739 | 723 | · 440 | 640 | -851 | 401 | 201 | 185 | -15 | 838 | 139 | 123 | -440 | -640 | - 851 | 401 | 201 | 185 | -15 | 939 | 139 | 123 ; |
| 2007 | -538 | -133 | -984 | 409 | 209 | 184 | -11 | 994 | 794 | /69 | -538 | -739 | -964 | 409 | 209 | 184 | -17 | 994 | 194 | 169 | -538 | -739 | -364 | 409 | 209 | 184 | -17 | 994 | 794 | 769 ; |
| 2008 | -005 | -805 | -1094 | 342 | 141 | 113 | -88 | 990 | 190 | /61 | -665 | 165 | -1094 | 342 | 141 | 113 | -88 | 990 | 190 | 761 | -665 | -865 | -1094 | 342 | 141 | 113 | ~88 | 930 | 790 | 761 |
| 2009 | -115 | -918 | -1149 | 330 | 198 | 165 | -38 | 1088 | 888 | 851 | -118 | -918 | -1149 | 398 | 196 | 165 | -36 | 1088 | 888 | 857 | -718 | -918 | -1149 | 396 | 196 | 165 | -36 | 1088 | 888 | 857 |
| 2010 | 1 - 161 | -1011 | -1310 | 542 | 142 | 110 | -91 | 1100 | 900 | 868 | -811 | 1077 | -1310 | 342 | 142 | 110 | -91 | 1100 | 900 | 868 | -877 | -1077 | -1310 | 342 | 142 | 110 | -91 | 1100 | 900 | 858 |
| 2011 | 101 - 101 | -330 | -1100 | 221 | 303 | 323 | 131 | 1303 | 1109 | 1130 | -/61 | -958 | -1188 | 551 | 363 | 325 | 131 | 1363 | 1169 | 1130 | -761 | ~956 | ~1188 | 557 | 363 | 325 | 131 | 1363 | 1169 | 1130 |
| 2012 | 047 | -1122 | -1420 | 425 | 233 | 188 | -2 | 1276 | 1085 | 1041 | 1002 | - 1193 | -1428 | 423 | 233 | 188 | -2 | 1276 | 1085 | 1041 | -1002 | -1193 | - 1428 | 423 | 233 | 188 | -2 | 1276 | 1085 | 1041 |
| 2013 | 1 301 | -1125 | -1230 | 505 | 301 | 333 | 140 | 14/5 | 1285 | 1238 | -30/ | -1155 | -1390 | 569 | 381 | 335 | 148 | 1473 | 1285 | 1238 | -967 | -1155 | -1390 | 569 | 381 | 335 | 148 | 1473 | 1285 | 1238 |
| LV 4 | 1 1200 | 1494 | 1007 | J / J | 202 | 142 | -75 | 1222 | 1120 | 1038 | -1280 | . 1424 | -108/ | 315 | 202 | 142 | -32 | 1332 | 1158 | 1098 | -1280 | -1454 | -1687 | 375 | 202 | 142 | -32 | 1332 | 1158 | 1098 |

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| (AR *- | 5 | 6 | ų | 14 | 15 | 17 | 13 | 23 | 24 | 20 | 32 | .1 | 36 | 41 | 42 | 44 | 45 | 50 | 51 | 53 | 59 | ΰĴ | 63 | 68 | 69 | 71 | 12 | 11 | 78 | 80 ; |
| 390 : | 14 | 35 | 1/ | 21 | 50 | 13 | 22 | 17 | | J <i>u</i> | | | 12 | | · · · · | •••••• | • • • • | | • | | ••• | | | • • • • • • | | · • • · • • | | | | |
| 331 : | :1 | 58 | 51 | 30 | AI | · · · | 56 | 25 | 44 | 10 26 | 14 | 10 10 | 31 | 21 | 30 | 15 | 52 | 17 | 42 | 18 | 14 | 35 | 37 | 21 | 50 | 13 | 32 | 17 | 42 | 18 ; |
| 342 | .1 | 59 | 42 | 41 | 87 | 1. | 60 | 20 | 0 J J | 20 | J0 71 | 20 | 42 | 33 | 01 | 31 | 20 | 23 | 23 | 26 | 38 | 58 | 64 | 33 | 81 | 37 | 56 | 23 | 59 | 26 |
| 143 ! | 11 | 91 | 69 | 1- 11 | 121 | 94 94 | 60 60 | 2 J 4 J | 31 170 | | 41 | | 42 | 44 | 83 | 32 40 | 00 | 23 | 31 | 34 | 31 | 29 | 42 | - 44 | 83 | 32 | 60 | 29 | 91 | 34 |
| 194 1 | 31 | 135 | 163 | 21 | 105 | 35 | 121 | 16 | 67 | 21 | 11 | 11 | 163 | 04 | 123 | 29 | 33 | 41 | 130 | 51 | 41 | 91 | 63 | 64 | 123 | 29. | 59 | 41 | 130 | 51 |
| 195 | 42 | 152 | 182 | <u>.</u> | 114 | .01 | 178 | 15 | 65 | د ۱ 26 | 10 | 150 | 103 | 21 | 105 | 20 | 127 | 10 | 01 | 21 | 31 | 136 | 163 | 21 | 105 | 35 | 127 | 16 | 67 | 21 |
| 996 | j1 | 131 | 160 | 22 | 95 | 29 | 114 | Q | 16 | 12 | 71 | 1.12 | 160 | 30 | 114 | 38 20 | 130 | 13 | 00 | 20 | 42 | 152 | 182 | 30 | 114 | 38 | 138 | 15 | 65 | 20 |
| 191 | Zb | 111 | 137 | 15 | 14 | 22 | 93 | د ۲ | 12 | 14 | 26 | 111 | 100 | 16 | 30 | 23 | 113 | y r | . 40 | 12 | 11 | 131 | 160 | 22 | 96 | 29 | 119 | 9 | 46 | 12 ¦ |
| 338 | 31 | 127 | 159 | 18 | 83 | 25 | 105 | 6 | 32 | Â | 31 | 197 | 150 | 10 | /4 87 | 22 | 32 | 0 | 52 | 8 | 20 | 111 | 137 | 16 | 14 | 22 | 93 | 6 | 32 | 8 |
| 999 | 29 | 119 | 150 | 14 | 64 | 19 | 83 | Å | 23 | 6 | 24 | 114 | 158 | 10 | 0.J 6.1 | 23 | 100 | 0 | 32 | 8 | 31 | 127 | 159 | 18 | 83 | 25 | 105 | 6 | 32 | 8 |
| :00 | 39 | 151 | 189 | 16 | 14 | 23 | 96 | 1 | 25 | ĩ | 10 | 151 | 190 | 14 | 04 14 | 17 97 | 00 | + | 23 | , | 23 | 119 | 150 | 14 | 64 | 19 | 83 | 4 | 23 | 8 |
| 501 - | 14 | 59 | 11 | 5 | 24 | 1 | 33 | i | 1 | 2 | 14 | 101 | 103 | 10 | 21 | 23 | 30 | * | 23 | 1 | 73 | 101 | 189 | 10 | 14 | 23 | 96 | 4 | 25 | 11 |
| nu2 ; | 22 | 86 | 113 | 6 | 30 | 9 | 41 | i | , 8 | 2 | 22 | 36 | 113 | 5 6 | 20 | a | 41 | 1 | 1 | () | 14 | 23 | 11 | 2 | 24 | | 33 | 1 | 1 | 2 |
| :03 | 35 | 127 | 155 | 8 | 35 | 12 | 49 | 1 | 10 | 2 | 35 | 121 | 166 | Å | 35 | 12 | 10 | 1 | 10 | 2 | 22 | 00 | 110 | р 0 | 30 | 3 | 41 | 1 | 8 | 2 |
| 004 | 54 | 186 | 242 | 10 | 45 | 15 | 62 | 2 | 12 | 3 | 54 | 186 | 242 | 10 | 45 | 15 | 62 | 2 | 10 | 1 | 22 | 121 | 243 | 8 10 | 12 | 12 | 49 | 1 | 10 | 2 |
| 005 } | ÖÖ | 220 | 287 | 9 | 39 | 14 | 56 | 1 | 9 | 2 | 66 | 270 | 287 | ÿ | 39 | 14 | 56 | 1 | 12 | 2 | 56 | 220 | 242 | 10 | 43 | 10 | 50 | 2 | 12 | 3 ; |
| 006 | 60 | 198 | 264 | 6 | 21 | 10 | 40 | 1 | 5 | ī | 60 | 198 | 264 | 6 | 21 | 10 | 10 | , | 5 | 1 | 09 60 | 109 | 201 | 3 | 33 | 19 | 30 | | 3 | 2 |
| 007 ; | 60 | 218 | 292 | 5 | 23 | 9 | 35 | Û | 3 | 1 | 68 | 218 | 292 | 5 | 23 | q | 15 | ň | 1 | 1 | 69 | 218 | 204 | . E | 21 | 10 | 40 25 | 1 | 3 | |
| 600 ; | 81 | 267 | 354 | 6 | 26 | 10 | 40 | 0 | 3 | 1 | 87 | 261 | 354 | 5 | 26 | 10 | 40 | ă | 1 | 1 | R7 | 267 | 151 | J K | 25 | 3 10 | 70 | v A | 3 | 11 |
| 609 ; | :13 | 254 | 339 | 4 | 19 | 1 | 29 | 0 | 2 | 0 | 83 | 254 | 339 | i | 19 | 1 | 29 | Ő | ŷ | 0 | 81 | 251 | 120 | 4 | 10 | 10 | 4U 20 | v A | , | |
| 610 ¦ | 110 | 318 | 418 | 4 | 20 | ł | 30 | 0 | 1 | 0 | (10 | 318 | 418 | i | 20 | 8 | 30 | ů | 1 | Û. | 110 | 718 | 418 | | 20 | , | 20 | v n | 4 | |
| 011 | ٥3 | 182 | 248 | 1 | 1 | 3 | 12 | 0 | 0 | Û | 63 | 182 | 248 | i | 1 | 3 | 12 | 0 | 0 | 6 | 63 | 182 | 248 | 1 | 7 | 0 2 | 10 | v ۸ | - 1 | 0 1 |
| U12 ¦ | 121 | 302 | 396 | 3 | 11 | 5 | 18 | 0 | 0 | 0 | 121 | 302 | 395 | 3 | u. | . 5 | 18 | ů. | ů. | ů. | 121 | 302 | 206 | | 11 | 5 | 16 | 0 | U A | V ; |
| 913 | 44 | 112 | 160 | Ú | 2 | F | 3 | Ú | 0 | Ű | 49 | 112 | 160 | Ű | 2 | 1 | 1 | ú | ñ | ñ | 19 | 112 | 160 | ŝ | 2 | | 10 | 0 | 0 | |
| 014 ¦ | 111 | 218 | 297 | 1 | 3 | 2 | 6 | Ú | 0 | 0 | 117 | 218 | 297 | 1 | 3 | 2 | 6 | u | ñ | ũ | 117 | 218 | 297 | 1 | 1 | 2 | J A | v ۵ | 0 | |
| 1 | | | | | | | | | | | | - | | • | - | - | - | - | v | v | | | 2.91 | | J | 4 | v | v | v | V 1 |
| ł | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 |
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(SURPLUS / DEFICIENCY)

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|--------|-------|--------|-------|--------|-------|-------|--------|------|-------------|-----|--------|--------|-----------|------|-------|------|--------|--------|--------|--------|--------|--------|--------|-----|-------|-------|--------|------|--------------|--------------|
| LAH | 5 | tt | |)4 | 15 |) | 18 | 23 | 24 | 28 | J2 | 3j | 35 | 41 | 42 | 44 | 45 | 50 | 51 | 53 | 59 | 50 | 5 J | 68 | 89 | 71 | 72 | 11 | 78 | 80 |
| 1990 | 237 | -231 | -269 | 180 | ·180 | 213 | 213 | 118 | 110 | 148 | 231 | ·231 | -209 | -180 | 180 | 213 | 213 | -116 | -116 | - 148 | 231 | | - 289 | | | | | | | |
| 1991 ; | 50 | 9 | -56 | 103 | 61 | 38 | -3 | 225 | 185 | 162 | 50 | 9 | -55 | 103 | 61 | 38 | -3 | 226 | 185 | 162 | 50 | 4 | -55 | 100 | 61 | -213 | -213 | -110 | 105 | -148 |
| 1995 ; | 10 | - 105 | -201 | 42 | - 53 | 54 | -149 | 190 | 94 | 94 | ·10 | 105 | · 201 | 42 | -53 | -54 | -149 | 190 | 94 | 94 | - 10 | -105 | -201 | 42 | -53 | - 54 | -149 | 100 | 102 | 102 ; |
| 1993 ; | -47 | -183 | -302 | 18 | -118 | 102 | -238 | 171 | ĴŚ | 52 | -41 | 183 | -302 | វែង | -118 | -102 | -238 | 171 | 35 | 52 | -41 | -183 | -302 | 18 | -118 | -102 | -219 | 171 | - 2 34 16 | 34 j 50 j |
| 1994 | 15 | -117 | -252 | 187 | 6 | 53 | -140 | 351 | 104 | 223 | 75 | ·117 | · 252 | 18/ | -6 | 53 | 140 | 357 | 164 | 223 | 75 | -117 | - 252 | 187 | -8 | 53 | -140 | 257 | 184 | 202 1 |
| 1995 ; | 33 | -161 | -300 | 157 | -36 | 18 | -176 | 311 | 183 | 237 | 33 | -161 | -300 | 157 | -36 | 18 | -176 | 377 | 183 | 231 | 33 | -161 | -300 | 157 | -36 | 19 | -176 | 177 | 194 | 123 1 |
| 1996 ; | 86 | -124 | ·271 | 220 | 10 | 13 | -131 | 499 | 289 | 352 | 86 | -124 | -271 | 220 | 10 | 13 | -137 | 493 | 289 | 352 | 86 | -124 | -271 | 220 | 10 | 11 | -127 | 100 | 290 | 201 1 |
| 1997 ; | · 1 | -204 | -356 | 177 | -34 | 25 | -186 | 475 | 264 | 323 | 1 | -204 | -356 | 177 | -34 | 25 | -186 | 475 | 264 | 323 | 1 | -204 | -356 | 177 | -34 | 25 | -186 | 475 | 264 | 122 1 |
| 1998 ; | -49 | -262 | -423 | 135 | -18 | · 26 | -239 | 415 | 26J | 315 | 49 | -262 | -423 | 135 | -78 | 26 | · 239 | 475 | 263 | 315 | -49 | -262 | - 423 | 135 | -78 | -26 | -219 | 475 | 287 | 215 |
| 1999 ! | -170 | -384 | -543 | 86 | -128 | -13 | -287 | 442 | 228 | 283 | -170 | -384 | -543 | 86 | -128 | -73 | -281 | 442 | 228 | 283 | -170 | -384 | -543 | 86 | ~128 | -11 | -287 | 442 | 200 | 293 1 |
| 2000 ; | -1/2 | - 388 | 553 | 133 | -83 | 32 | -248 | 514 | 238 | 349 | · 172 | ·388 | -553 | 133 | -03 | - 32 | -240 | 514 | 298 | 349 | -112 | -388 | 553 | 133 | -83 | -32 | -248 | 511 | 200 | 240 1 |
| 2001 | -281 | - 48 1 | -650 | 81 | -139 | ·107 | -307 | 468 | 268 | 300 | 281 | -481 | ·65U | 61 | -139 | -107 | -301 | 468 | 268 | 300 | -281 | -481 | -650 | 81 | -139 | -107 | - 301 | 469 | 250 | 200 1 |
| 2002 | - 332 | -532 | 711 | 91 | · 109 | -81 | -287 | 525 | 324 | 34ō | - 332 | -532 | -711 | 11 | ·109 | · 87 | -281 | 525 | 324 | 346 | -332 | -532 | .711 | 91 | ~ 109 | - 87 | -281 | 525 | 104 | 246 |
| 2003 | -491 | -697 | -819 | 35 | -165 | -147 | -347 | 465 | 265 | 283 | -497 | -697 | -879 | 35 | -165 | -147 | -347 | 466 | 265 | 283 | -491 | -697 | -819 | 35 | -165 | -147 | -347 | 468 | 285 | 240 1 |
| 2004 ; | - 565 | -155 | 980 | 54 | ·148 | 141 | -341 | 516 | 516 | 321 | 565 | -165 | 960 | 54 | · 146 | -141 | -341 | 516 | 316 | 321 | 565 | -765 | 960 | 54 | -146 | -141 | -341 | 518 | 216 | 205 1 |
| 2005 ; | -888 | -889 | -1032 | 62 | - 133 | · 142 | - 342 | 551 | 356 | 353 | -088 | ~888 | 1092 | 62 | -139 | -142 | -342 | 557 | 356 | 353 | -088 | -888 | -1092 | 62 | -134 | ~112 | -112 | 557 | 256 | 767 1 |
| 2006 | .901 | -1007 | ·1224 | 34 | 105 | 182 | - 382 | 572 | 312 | 356 | 001 | - 1007 | - 1224 | 34 | 168 | -102 | - 382 | 512 | 3/2 | 356 | -807 | - 1007 | - 1224 | 34 | -166 | -182 | - 182 | 572 | 272 | 555 558 |
| 2007 | -925 | -1125 | -1351 | 22 | -178 | -203 | -404 | 601 | 407 | 382 | 925 | -1126 | ·1351 | 22 | -1/8 | -203 | -404 | 607 | 407 | 382 | -925 | -1126 | 1351 | 22 | -178 | -203 | -404 | 807 | 407 | , 10 1 |
| 2008 | · 152 | -952 | 1181 | 255 | 54 | 25 | -175 - | 403 | 703 | 6/4 | 152 | 352 | 1811- | 255 | 54 | 26 | -175 | 903 | 703 | 6/4 | -752 | -952 | 181 | 255 | 54 | 26 | -175 | 901 | 707 | 674 1 |
| 2009 | -985 | -1185 | -1416 | 129 | -11 | ·102 | -303 | 821 | 621 | 590 | - 985 | -1185 | -1416 | 129 | -11 | ~102 | -303 | 821 | 621 | 590 | -985 | -1185 | 1416 | 129 | -11 | -102 | - 20.2 | 821 | 891 | 500 1 |
| 2010 | 1144 | ·1344 | -1511 | 15 | -125 | - 157 | -358 | 833 | 6]ĵ | 601 | 1144 | - 1344 | 1577 | 15. | - 125 | -157 | -358 | 833 | 633 | 601 | -1144 | -1344 | - 1577 | 15 | -125 | -157 | -158 | 833 | 877 | 1 100 |
| 2011 ; | -1228 | -1423 | -1655 | 30 | -104 | - 142 | -338 | 896 | 702 | 663 | · 1228 | -1423 | -1655 | 90 | -104 | -142 | -338 | 896 | 102 | 663 | -1228 | -1423 | -1655 | 90 | -104 | -147 | -336 | AUA | 702 | 662/1 |
| 2012 ; | 1(របង | -1280 | 1515 | 336 | 145 | 101 | 89 | 1189 | 998 | 954 | 1089 | - 1280 | - 1515 | 336 | 146 | 101 | 89 | 1189 | 998 | 954 | -1089 | -1280 | - 1515 | 336 | 148 | 101 | -80 | 1180 | 908 | 054 1 |
| 2013 ; | -1454 | ~1642 | -1811 | 82 | -105 | ~152 | -341 | 986 | 198 | 151 | 1454 | -1642 | -1877 | 82 | -106 | -152 | -341 | 986 | 798 | 751 | -1454 | -1642 | -1877 | 82 | -106 | -152 | -141 | 1103 | J 30 70A | 751 |
| 2014 | 1647 | - 1821 | -2054 | 8 | -165 | 225 | -349 | 965 | 791 | 131 | -1647 | -1821 | 2054 | 8 | - 165 | -225 | · 399 | 365 | 791 | 731 | -1647 | -1821 | - 2054 | 8 | -165 | - 225 | -399 | 965 | 701 | 731 1 |
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| 114 | 169 | 488 | 181 | 784 | 661 | ÷ | 601 | 626 | 829 | 455 | 431 | 303 | 302 | 318 | 350 | 212 | 238 | 966 | 225 | 203 | 63 | 42 | 6.4 | 37 | | م | |
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| TLAR ! | • • • • | D | y | - 14 | 15 | 1/ - 41- | 18 | 23 | 24 | 20 | 32 | 35 | 30 | 41 | 42 | 44 | 45 | 50 | 51 | 53 | 59 | 60 | 63 | 68 | 69 | 71 | 72 | 11 | 78 | 80 |
| 1930 | 231 | - 23 / | 269 | 180 | 180 | 213 | 213 | 110 | 116 | 148 | -231 | -231 | -269 | - 180 | - 180 | -213 | -213 | | | 13.0 | | | -260 | | | | | •••• | | |
| 1991 ; | 50 | j | -56 | 103 | 61 | 38 | -3 | 226 | 185 | 162 | 50 | 9 | -56 | 103 | 61 | 38 | -3 | 226 | 105 | 162 | 50 | -231 | -209 | 102 | -180 | -213 | -213 | -116 | -116 | -148 |
| 1895 | 10 | -105 | 201 | 42 | 53 | 54 | - 149 | 190 | 94 | 34 | 10 | 105 | -201 | 42 | - 53 | 54 | -149 | 190 | 94 | 43 | - 10 | - 105 | -201 | 103 | 01 | 30 | -3 | 220 | 185 | 102 |
| 1993 ; | -41 | -183 | -302 | 18 | -118 | -102 | -238 | 171 | 35 | 52 | -41 | -183 | 302 | 18 | -118 | -102 | -238 | 171 | 35 | 52 | - 17 | -187 | -201 | 46 | - 110 | -100 | -143 | 190 | 94 | 94 ; |
| 1994 ; | 15 | -117 | 252 | 151 | ·6 | 53 | 140 | 351 | 164 | 223 | 15 | -117 | 252 | 187 | -6 | 53 | 140 | 357 | 164 | 223 | 75 | -117 | -252 | 10 | -110 | -102 | -140 | 967 | 33 | 52 ; |
| 1995 ; | 33 | -151 | -300 | 151 | -36 | 18 | -176 | 377 | 183 | 237 | 33 | -161 | -300 | 157 | -36 | 18 | -178 | 311 | 183 | 231 | 22 | -161 | - 300 | 167 | - 25 | 10 | -140 | 301 | 104 | 223 |
| 1996 ; | ដថ | ·124 | 271 | 220 | 10 | 13 | 137 | 499 | 289 | 352 | 85 | 124 | 271 | 220 | 10 | . 13 | · 137 | 499 | 289 | 352 | 86 | -124 | - 271 | 220 | 10 | 10 | -127 | 311 | 183 | 231 |
| 1931 ; | 1 | -204 | -356 | 1/1 | -34 | 25 | -185 | 475 | 264 | 323 | 1 | -204 | -356 | 177 | -34 | 25 | -186 | 475 | 264 | 323 | 1 | -201 | -158 | 177 | -14 | 13 | -108 | 433 | 289 | 352 ; |
| 1998 ; | - 23 | -242 | 403 | 155 | - 58 | -6 | -219 | 495 | 283 | 335 | -29 | -242 | -403 | 155 | -58 | - 5 | -219 | 495 | 283 | 335 | .29 | -212 | -103 | 155 | -5H | - 6 | -100 | 413 | 204 | 323 |
| 1999 | -150 | -364 | 523 | 106 | -108 | -53 | -267 | 402 | 248 | 303 | 150 | -364 | -523 | 106 | -108 | - 53 | -261 | 462 | 248 | 303 | -150 | -364 | ~522 | 105 | -109 | -0 | -213 | 433 | 203 | 333 (|
| 2000 | -252 | -468 | 633 | 53 | - 163 | -112 | - 328 | 434 | 218 | 269 | 252 | 468 | - 633 | 53 | -160 | -112 | -328 | 434 | 218 | 269 | -252 | -468 | -677 | 63 | - 167 | -110 | -201 | 402 | 240 | 303 ; |
| 2001 ; | -361 | -561 | 130 | - 19 | -219 | -191 | - 387 | 388 | 188 | 220 | -381 | -581 | -730 | -19 | -219 | -187 | -307 | 388 | 188 | 220 | -361 | -551 | -730 | -10 | - 310 | -107 | -320 | 434 | 210 | 203 ; |
| 2002 | - 512 | -115 | 891 | · 8 A | -289 | -261 | -467 | 345 | 144 | 166 | · 512 | -712 | -891 | - 89 | -289 | -267 | -467 | 345 | 144 | 166 | -512 | -712 | -891 | - 89 | -290 | - 107 | - 167 | 300 | 100 | 220 ; |
| 2003 (| 511 | -111 | 328 | - 45 | -245 | -221 | -427 | 386 | 185 | 203 | - 577 | -111 | -959 | -45 | -245 | -221 | -427 | 386 | 185 | 203 | -577 | -111 | -950 | -15 | -245 | -227 | -401 | 343 | 144 | 100 |
| 2004 | 545 | ·145 | э40 | 14 | 126 | ~121 | -321 | 538 | 335 | 341 | 545 | -145 | -940 | 74 | -125 | -121 | - 321 | 535 | 335 | 341 | - 545 | -745 | -940 | 74 | - 126 | -121 | -221 | 200 526 | 103 | 203 |
| 2005 | -168 | 988 | 1172 | - 18 | -219 | -222 | -422 | 411 | 276 | 213 | -768 | -968 | -1172 | ~18 | -219 | -222 | -422 | 411 | 276 | 213 | - 168 | -968 | - 1172 | -18 | -210 | -222 | -121 | 330 177 | JJ0 178 | 341 1 |
| 2006 | ·81/ | -1007 | 1304 | 40 | -246 | -202 | - 462 | 492 | 292 | 216 | ·087 | -1087 | -1304 | -40 | -246 | -262 | -462 | 492 | 292 | 216 | -aal | -1087 | -1304 | -46 | -246 | -282 | -187 | 411 | 210 | 213 1 |
| 2007 1 | -1005 | -120d | 1431 | 58 | -258 | -283 | -484 | 521 | 321 | 302 | -1005 | -1206 | 1431 | -58 | -258 | -283 | -484 | 527 | 321 | 302 | 1005 | -1206 | -1471 | -53 | -258 | -202 | -101 | 432 597 | 232 | 210 1 |
| 2008 | -1132 | - 1342 | 1561 | -125 | -326 | -354 | -555 | 523 | 323 | 294 | -1132 | - 1332 | 1561 | ~125 | 326 | -354 | 555 | 523 | 323 | 291 | ~1132 | -1332 | -1581 | - 125 | - 12R | -351 | -404 | 361 | 321 | JUZ (|
| 2009 ; | 1285 | -1485 | 1716 | -171 | -371 | -402 | -603 | 521 | 321 | 230 | -1285 | -1485 | -1/15 | -171 | .371 | -402 | -603 | 521 | 321 | 290 | -1285 | -1485 | -1718 | -171 | -771 | -102 | -603 | 525 | 323 | 294 |
| 2010 | 1444 | -1644 | 1877 | -225 | -425 | -457 | -658 | 533 | 333 | 301 | -1444 | -1644 | 1877 | -225 | -425 | -451 | -658 | 533 | 333 | 301 | -1444 | ~1614 . | -1877 | - 925 | | 402 | -620 | J2] 500 | 321 | 290 |
| 2011 | -1328 | -1523 | 1755 | -10 | -204 | -242 | -438 | 190 | 602 | 563 | -1328 | -1523 | 1155 | -10 | -204 | -242 | -438 | 196 | ñ02 | 563 | -1328 | -1521 - | -1755 | -10 | -964 -984 | -431 | -030 | 333 704 | JJJ #00 | JUI |
| 2012 : | 1569 | -1/60 | 1995 | - 144 | 334 | -319 | -589 | 109 | 518 | 414 | -1569 | -1760 | 1995 | -144 | -334 | -314 | -569 | 109 | 518 | 474 | - 1560 | -1780 | -1004 | -14 | -171 | -242 | -430 | 130 | 002 | 203 |
| 2013 | - 1934 | -2122 | 2351 | - 374 | - 586 | ~632 | -821 | 506 | 318 | 2/1 | 1934 | -2122 | 2357 | -398 | -586 | -632 | -821 | 506 | 118 | 271 | 1993 | -2122 | . 976J | - 144 | -334 | -830 | -209 | 108 | 518 | 4/4 |
| 2014 | ·2147 | - 2321 | 2554 | - 492 | 665 | -125 | -899 | 465 | 291 | 231 | -2141 | -2321 | 2554 | - 492 | -665 | -125 | - 899 | 465 | 241 | 231 | -2141 | 6122 -9991 - | -2561 | -103 | "JOQ . 665 | -032 | -021 | 300 | 318 | 2/1 |
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| EAR | 5 | 6 | 9 | 14 | 15 | 17 | 18 | 23 | 24 | 26 ' | 32 | 33 | 36 | 41 | 42 | 44 | 45 | .50 | 51 | 53 | 59 | 60 | 63 | 68 | 69 | 11 | 72 | η | 78 | 80 |
| 1990 | 14 | | . 31 | 21 | 50 | 13 | 32 | 1/ | 42 | 18 | | 35 | 31 | 21 | 50 | 13 | 32 | 17 | 17 | 18 | 11 | | 17 | | 50 | 11 | 99 | | | ·¦ |
| 1991 | 38 | 58 | 64 | 33 | 81 | 31 | 58 | 23 | 59 | 26 | 38 | 58 | 64 | 33 | 81 | 31 | 56 | 23 | 59 | 28 | 38 | 58 | 64 | 33 | 81 | 13 | 58 | 27 | 42 60 | 26 1 |
| 1992 | 31 | 59 | 42 | 44 | 83 | 32 | 60 | 29 | 91 | 34 | 31 | 59 | 42 | 44 | 83 | 32 | 60 | 29 | 91 | 34 | 31 | 59 | 42 | 11 | 83 | 32 | 60 | 29 | Q 1 | 20 1 |
| 1333 | 41 | 91 | 69 | 64 | 123 | 29 | 59 | -41 | 130 | 51 | 47 | 41 | 69 | 64 | 123 | 29 | 59 | 41 | 130 | 51 | - 41 | 91 | 69 | RA . | 123 | 29 | 59 | 41 | 130 | 51 - |
| 1334 | 48 | 1/1 | 203 | 30 | 133 | 45 | 159 | 21 | 85 | 21 | 48 | 171 | 203 | 36 | 133 | 45 | 159 | 21 | 86 | 27 | 48 | 1/1 | 203 | 36 | 133 | 45 | 159 | 21 | 86 | 27 1 |
| 1995 | 54 | 183 | 225 | 33 | 144 | 50 | 173 | 20 | 83 | 26 | 54 | 184 | 225 | 39 | 144 | 50 | 1/3 | 20 | 83 | 26 | 54 | 189 | 225 | 39 | 111 | 50 | 173 | 20 | 83 | 28 |
| 1339 | 41 | 164 | 193 | 23 | 122 | 31 | 149 | 12 | 59 | 18 | 41 | 184 | 199 | 28 | 122 | 31 | 149 | 12 | 59 | 16 | 41 | 164 | 199 | 28 | 122 | 37 | 149 | 12 | 59 | 15 |
| 1981 | 51 | 197 | 238 | 37 | 136 | 42 | 167 | 13 | 64 | 18 | 51 | 197 | 238 | 32 | 136 | 42 | 167 | 13 | 64 | 18 | 51 | 197 | 238 | 32 | 138 | 42 | 167 | 13 | 81 | 18 1 |
| :338 | 55 | 209 | 254 | 34 | 140 | 45 | 174 | 12 | 59 | 16 | 55 | 209 | 254 | 34 | 140 | 45 | 174 | 12 | 59 | 16 | 55 | 209 | 254 | 34 | 140 | 45 | 174 | 12 | 59 | 16 1 |
| 333 : | 15 | 212 | j28 | 39 | 128 | 51 | 198 | 13 | 65 | 18 | 75 | 272 | 328 | 39 | 158 | 51 | 196 | 13 | 55 | 18 | 15 | 272 | 328 | 39 | 158 | 51 | 198 | 13 | 85 | 18 |
| :000 ; | 91 | 334 | 405 | 45 | 179 | 60 | 222 | 14 | 70 | 20 | 97 | 334 | 405 | 45 | 179 | 60 | 222 | 14 | 70 | 20 | 97 | 334 | 405 - | 45 | 179 | 60 | 222 | 14 | 70 | 20 1 |
| 1001 | 91 | 314 | 385 | 35 | 154 | 52 | 195 | 11 | 55 | 16 | 91 | 314 | 385 | 38 | 154 | 52 | 135 | 11 | 55 | 16 | 91 | 314 | 385 | 38 | 154 | 52 | 195 | 11 | 55 | 16 1 |
| .005 | 134 | 430 | 525 | 47 | 183 | 64 | 233 | 13 | 52 | 19 | 134 | 430 | 525 | 47 | 183 | 84 | 233 | 13 | 62 | 19 | 134 | 430 | 525 | 47 | 183 | 64 | 233 | 13 | 82 | 19 |
| ü63 ¦ | 140 | 442 | 543 | 31 | 149 | 52 | 193 | 10 | 49 | 15 | 140 | 442 | 543 | 31 | 149 | 52 | 193 | 10 | 49 | 15 | 140 | 442 | 543 | 31 | 149 | 52 | 193 | 10 | 49 | 15 1 |
| .004 | 105 | 340 | 433 | 21 | 89 | 31 | 121 | 4 | 25 | 1 | 105 | 340 | 433 | 21 | 89 | 31 | 121 | 4 | 25 | 1 | 105 | 340 | 433 | 21 | 89 | 31 | 121 | 4 | 25 | 1 |
| .002 | 190 | 528 | 651 | 28 | 114 | 41 | 155 | 5 | 31 | 9 | 180 | 528 | 857 | 28 | 114 | 41 | 155 | 5 | 31 | 9 | 180 | 528 | 857 | 28 | 114 | 41 | 155 | 5 | 31 | 9 |
| 006 | 225 | 624 | 113 | 29 | 115 | 43 | 159 | 5 | 21 | 9 | 225 | 624 | 113 | 29 | 115 | 43 | 159 | 5 | 21 | y | 225 | 624 | 173 | 29 | 115 | 43 | 159 | 5 | 21 | 9 |
| 1007 | 265 | 102 | 867 | 21 | 107 | 41 | 150 | 4 | 22 | 1 | 285 | 702 | 867 | 21 | 107 | 41 | 150 | 4 | 22 | 1 | 265 | 102 | 867 | 27 | 107 | 41 | 150 | ī | 22 | 1 |
| 1008 | 321 | 819 | 1001 | 36 | 117 | 45 | 185 | 3 | 20 | 1 | 327 | 819 | 1001 | 30 | 117 | 46 | 165 | 3 | 20 | 1 | 327 | 819 | 1001 | 30 | 117 | 45 | 165 | 3 | 20 | 1 |
| :009 | 411 | 911 | 1171 | 32 | 122 | 48 | 172 | 3 | 19 | 6 | 417 | 971 | 1171 | 32 | 122 | 48 | 172 | 3 | 19 | 6 | 417 | 971 | 1171 | 32 | 122 | 48 | 172 | 3 | 19 | 6 |
| :010 | 518 | 1129 | 1341 | 33 | 125 | 50 | 176 | 3 | 16 | 5 | 518 | 1129 | 1341 | 33 | 125 | 50 | 178 | 3 | 15 | 5 | 518 | 1129 | 1341 | 33 | 125 | 50 | 176 | 3 | 16 | 5 |
| :011 | 358 | 195 | 970 | 17 | 61 | 25 | 88 | 1 | 8 | 2 | 358 | 795 | 970 | 17 | 61 | 26 | 88 | i | 6 | 2 | 358 | 795 | 970 | 17 | 61 | 26 | 88 | 1 | R | , ! |
| 1012 | 605 | 1163 | 1373 | 21 | 81 | 41 | 124 | 2 | 8 | 3 | 605 | 1163 | 1373 | 21 | 87 | 41 | 124 | 2 | 8 | 3 | 605 | 1163 | 1373 | 27 | A7 | 11 | 124 | 5 | Å | 21 |
| 1013 | 880 | 1387 | 1619 | 36 | 76 | 46 | 113 | 1 | 5 | 3 | 880 | 1387 | 1619 | 30 | 16 | 46 | 113 | 1 | 5 | 3 | 880 | 1387 | 1619 | 30 | 76 | 48 | 113 | 1 | r r | 31 |
| 1014 | 1255 | 1752 | 2000 | 39 | 86 | 59 | 126 | 2 | 5 | 3 | 1255 | 1752 | 2000 | 39 | 85 | 59 | 128 | , | 5 | 3 | 1255 | 1752 | 2000 | 20 | 86 | 4V 50 | 128 | ו ס | J E | 3 I 3 I |
| 1 | | | | | | | | | | | | | | | •• | | | • | v | v | 1200 | 1102 | 2000 | 44 | 44 | 43 | 129 | 2 | Ş | 3 j |
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| YEAR | 5 | Ŭ | 9 | 14 | 15 | 11 | 18 | 23 | 24 | 26 | 32 | 33 | 36 | 41 | 42 | 44 | 45 | 50 | 51 | 53 | 59 | 60 | 63 | 68 | 69 | 71 | 72 | 11 | 78 | 80 | l |
| 1990. | -237 | 231 | 269 | - IJŪ | - 180 | 213 | - 213 | 115 | -116 | 148 | 231 | 231 | - 269 | 180 | 1:0 | -213 | 213 | 116 | -116 | • 148 | -231 | · 237 | -269 | | - 180 | -213 | -213 | -116 | -116 | -148 | ; |
| 1991 | 50 | 9 | - 56 | 103 | t i | 38 | · 3 | 226 | 185 | 162 | 50 | y | - 58 | 103 | 61 | 38 | •3 | 226 | 185 | 102 | 50 | 9 | -56 | 103 | 81 | 38 | -3 | 226 | 185 | 162 | |
| 1995 | 10 | 105 | 201 | 42 | 53 | -54 | 149 | 190 | 94 | 94 | · 10 | 105 | -201 | 42 | 53 | - 54 | 149 | 190 | 94 | 94 | -10 | + 105 | ·201 | 42 | -53 | -54 | -149 | 190 | 94 | 94 | i ' |
| 1333 | -41 | - 183 | -302 | 19 | -118 | -102 | -238 | ុហ | 35 | 52 | -47 | -183 | - 302 | 18 | -118 | -102 | 238 | 171 | 35 | 52 | -47 | · 183 | -302 | 18 | -118 | -102 | -230 | 171 | 35 | 52 | |
| 1334 | 15 | 117 | -252 | 141 | 6 | 53 | 140 | 357 | 164 | 223 | 15 | -117 | -252 | 181 | 6 | 53 | 140 | 357 | 164 | 223 | 15 | - 117 | ·252 | 187 | -6 | 53 | ~140 | 357 | 164 | 223 | İ |
| 1935 | 33 | 161 | - 300 | 157 | - 38 | 18 | -176 | 377 | 183 | 231 | 33 | -161 | -300 | 157 | - 30 | 18 | -1/6 | 371 | 183 | 231 | 33 | -151 | -300 | 157 | -36 | 18 | -176 | 377 | 183 | 237 | i |
| 1336 | ង 🕈 | 124 | -271 | 220 | 10 | 73 | ·137 | 499 | 289 | 352 | 86 | ·124 | -2/1 | 220 | 10 | 73 | - 137 | 499 | 289 | 352 | 86 | - 124 | -271 | 220 | 10 | 73 | -137 | 499 | 289 | 352 | İ |
| 1997 | 1 | -204 | -356 | 111 | -34 | 25 | -186 | 475 | 254 | 323 | 1 | -204 | -356 | 111 | ·34 | 25 | 185 | 475 | 264 | 323 | 1 | -204 | -356 | 177 | -34 | 25 | -186 | 475 | 284 | 323 | 1 |
| 1338 | -29 | -242 | -403 | 155 | ~ 58 | -6 | -219 | 495 | 283 | 335 | -29 | -242 | -403 | 155 | 58 | -6 | 219 | 495 | 283 | 335 | -29 | -242 | -403 | 155 | -58 | -6 | -219 | 495 | 283 | 335 | 1 |
| 1999 | -150 | -364 | -523 | 106 | -108 | -53 | -267 | 462 | 248 | 303 | · 150 | -364 | -523 | 106 | -108 | -53 | · 267 | 462 | 248 | 303 | - 150 | -364 | -523 | 106 | -108 | -53 | -267 | 462 | 248 | 303 | 1 |
| 2000 | -232 | 448 | 613 | 13 | -143 | -92 | -308 | 454 | 238 | 289 | · 232 | -448 | - 613 | 13 | -143 | - 92 | 308 | 454 | 238 | 289 | -232 | - 448 | -613 | 73 | -143 | -92 | -308 | 454 | 238 | 289 | 1 |
| 2001 | -441 | -641 | -810 | - 44 | -299 | -267 | -461 | 308 | 108 | 140 | -441 | -641 | -810 | - 99 | · 299 | -261 | -467 | 308 | 108 | 140 | -441 | 641 | -810 | -99 | -293 | -267 | -467 | 308 | 108 | 140 | ł |
| 2002 | - 592 | -192 | -9/1 | -169 | -369 | -341 | - 547 | 265 | 54 | 85 | -592 | -792 | -971 | -169 | -369 | -347 | - 541 | 265 | 64 | 85 | -592 | 192 | -971 | -169 | -369 | -347 | -547 | 265 | 64 | 86 | 1 |
| 2003 | -151 | 951 | -1139 | -225 | -425 | -401 | -607 | 206 | 5 | 23 | -151 | -951 | -1139 | -225 | -425 | -407 | -607 | 206 | 5 | 23 | -151 | 1-957 | -1139 | -225 | -425 | -407 | -607 | 206 | 5 | 23 | 1 |
| 2004 | - 925 | 1125 | -1320 | -306 | -506 | - 501 | -701 | 156 | - 44 | - 39 | · 925 | -1125 | 1320 | - 306 | -506 | -501 | -701 | 155 | -44 | -39 | -925 | -1125 | -1320 | -305 | -506 | -501 | -701 | 156 | -44 | -39 | 1 |
| 2005 | -1148 | -1348 | -1552 | -398 | -599 | -602 | -905 | 97 | -104 | -107 | -1148 | -1348 | 1552 | -398 | -213 | -602 | 902 | 97 | -104 | -107 | -1148 | -1348 | -1552 | -398 | -599 | -602 | -802 | 97 | -104 | -107 | 1 |
| 2005 | -1207 | ·140/ | -1684 | 425 | -625 | -642 | -842 | 112 | - 88 | -104 | -1267 | · 1487 | ·1684 | -426 | -626 | -642 | 842 | 112 | -88 | 104 | -1267 | -1467 | -1584 | -428 | -828 | -642 | -842 | 112 | -88 | -104 | 1 |
| 2007 | -1385 | - 1586 | -1811 | -4.78 | -638 | -653 | -864 | 147 | -53 | -78 | -1385 | -1585 | - 1811 | -438 | -618 | -663 | 864 | 147 | -53 | -18 | -1385 | -1586 | -1811 | -438 | -638 | -663 | -864 | 147 | -53 | -78 | 1 |
| 2008 | 1012 | 1/12 | 1941 | 505 | -105 | -134 | 335 | 143 | - 57 | -86 | -1512 | -1712 | - 1941 | -505 | -100 | -734 | 935 | 143 | -57 | ·86 | -1512 | -1712 | -1941 | -505 | -708 | -734 | -935 | 143 | -57 | -85 | 1 |
| 20113 | -1000 | 1803 | -2090 | -551 | -151 | -782 | - 393 | 141 | -51 | - 90 | -1665 | -1865 | 2096 | -551 | -751 | -782 | 983 | 141 | -59 | - 40 | -1665 | -1865 | -2096 | -551 | -751 | -782 | -983 | 141 | -59 | -90 | 1 |
| 2010 | 1824 | 2024 | -2257 | -605 | -805 | -831 | 1038 | 153 | -47 | -19 | - 1824 | -2024 | ·2257 | -605 | -805 | -837 | · 1038 | 153 | -41 | -19 | -1824 | -2024 | -2251 | -805 | -805 | -837 | -1038 | 153 | -47 | -79 | 1 |
| 2011 | -2008 | -2203 | -2435 | -6.10 | -884 | -922 | -1118 | 116 | -18 | -117 | -2008 | -2203 | -2435 | -690 | -8:14 | -922 | -1116 | 116 | -78 | -111 | -2008 | -2203 | -2435 | -690 | -884 | -922 | -1115 | 115 | -18 | -117 | 1 |
| 2012 | 1-2169 | -2360 | -2595 | - 144 | - 934 | -979 | -1169 | 109 | · 82 | -126 | -2169 | -2360 | -2595 | +144 | -954 | -979 | - 1169 | 109 | -82 | 126 | -2169 | -2360 | -2595 | -744 | -934 | -979 | -1169 | 109 | -82 | -126 | 1 |
| 2013 | -2134 | -2322 | -2551 | -299 | -786 | -832 | -1021 | 306 | 118 | 11 | -2134 | -2322 | -2551 | -598 | -736 | -832 | 1021 | 306 | 118 | 11 | -2134 | -2322 | -2557 | -598 | -786 | -832 | -1021 | 306 | 118 | 11 | 1 |
| 2414 | 1•2441 | -2621 | - 2854 | - 192 | -965 | -1025 | -1199 | 185 | 9 | - 69 | ·2441 | -2621 | - 2854 | -792 | -365 | -1025 | - 1 1 9 9 | 165 | - 9 | 69 | -2447 | -2621 | -2854 | -792 | -985 | -1025 | -1199 | 185 | -9 | -69 | 1 |
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| 1 | YEAR | 5 | 8 | ¥ | 14 | 15 | | 18 | 23 | 24 | 20 | 32 | 33 | ĴŐ | 41 | 42 | 44 | 45 | 50 | 51 | 53 | 59 | 60 | 63 | 68 | 69 | 11 | 12 | 11 | 78 | 80 |
| ł | 1990 ; | 14 | 35 | 37 | 21 | 50 | IJ | 32 | 17 | 42 | 10 | 14 | 35 | 31 | 21 | · 50 | 13 | 32 | 17 | 42 | 13 | 14 | 35 | 37 | 21 | | 13 | | | | { 18 |
| i | 1991 | 39 | 58 | 64 | 33 | 81 | 3! | 56 | 23 | 59 | 26 | 38 | 58 | 64 | 33 | 81 | 31 | 50 | 23 | 59 | 26 | 30 | 58 | 64 | 33 | 81 | 37 | 56 | 23 | 59 | 28 |
| i | 1995 ; | J1 | 59 | 42 | 44 | 83 | 32 | 60 | 29 | 91 | 34 | 31 | 59 | 42 | 44 | :13 | 32 | ΰŰ | 29 | 91 | 34 | 31 | 59 | 42 | 44 | 83 | 32 | δÚ | 29 | 91 | 34 |
| 1 | 1493 | 41 | 91 | 69 | 64 | 123 | 29 | 59 | - 41 | 130 | 51 | 47 | 91 | 69 | 64 | 123 | 29 | 59 | 41 | 130 | 51 | 41 | 91 | 69 | 64 | 123 | 29 | 59 | 41 | 130 | 51 |
| 1 | 1994 | 48 | 171 | 203 | 36 | 133 | 45 | 159 | 21 | 80 | 21 | 48 | 171 | 203 | 36 | 133 | 45 | 159 | 21 | 86 | 27 | 48 | 171 | 203 | 35 | 133 | 45 | 159 | 21 | 86 | 21 |
| í | 1332 : | 54 | 189 | 225 | 38 | 144 | 50 | 173 | 20 | 83 | 26 | 54 | 189 | 225 | 39 | 144 | 50 | 1/3 | 20 | 83 | 26 | 54 | 189 | 225 | 39 | 144 | 50 | 173 | 20 | 83 | 26 |
| i | 1330 | 41 | 154 | 199 | 28 | 122 | 31 | 149 | 12 | 23 | 10 | 41 | 154 | 199 | 28 | 172 | 31 | (4) | 12 | 59 | 16 | 41 | 164 | 199 | 28 | 122 | 37 | 149 | 12 | 59 | 16 |
| i , | 1997 ; | 21 | 19/ | 238 | 32 | 136 | 42 | 167 | 13 | 64 | 18 | 51 | 197 | 238 | 32 | 136 | 42 | 161 | 13 | δ4 | 18 | 51 | 197 | 238 | 32 | 135 | 42 | 167 | 13 | 64 | 18 |
| 1 | 10-20 | 33 | 203 | 234 | 34 | 140 | 45 | 1/4 | 12 | 59 | 16 | 55 | 209 | 254 | 34 | 140 | 45 | 1/4 | 12 | 59 | 16 | 55 | 209 | 254 | 34 | 140 | 45 | 174 | 12 | 59 | 16 |
| • | 1533 <u>1</u> 2008 - | 10 | 212 | 328 | 23 | 158 | 51 | 190 | 13 | 65 | 18 | 15 | 212 | 328 | 39 | 158 | 51 | 1.)0 | 13 | 65 | 18 | 15 | 212 | 328 | 39 | 158 | 51 | 196 | 13 | 85 | 18 |
| • | 2000 1 | 199 | 461 | 192 | 42 | 100 | 33 | 201 | 13 | 04 | 10 | 90 | 312 | រូវរូ | 42 | 100 | 55 | 291 | 13 | 64 | 18 | 90 | Ĵ12 | 383 | 42 | 166 | 55 | 207 | 13 | 64 | 18 |
| + | 260 2 - | 175 | 407 | 433 885 | 33 64 | 200 | 2 10 | 232 | 10 | 15 | 22 | 122 | 407 | 495 | 53 | 203 | 10 | 252 | lô | 75 | 22 | 122 | 407 | 495 | 53 | 203 | 70 | 252 | 18 | 75 | 22 |
| 1 | 2603 1 | 251 | 144 | 883 | 36 | 233 | 60 101 | 233 | 10 | 83 | 20 | 1/0 | 227 | 055 | 04 | 239 | 36 | 223 | 18 | 85 | 26 | 1/6 | 553 | 665 | 54 | 239 | 86 | 299 | 18 | 85 | 26 |
| ÷ | 2004 1 | 378 | 980 | 1152 | 43 | 126 | 12.5 | 119 | 22 98 | 33 | 24 | 201 | 144 | 003 | 10 | 211 | 101 | 343 | 22 | 99 | 32 | 251 | 144 | 883 | 75 | 271 | 101 | 343 | 22 | 99 | 32 |
| | 2005 1 | 5:16 | 1354 | 1580 | 120 | 165 | 164 | 515 | 12 | 177 | - J.G - 1.6 | 510 | 1264 | 1132 | 33 | 120 101 | 120 | 419 | 20 | 114 | 18 | 376 | 930 | 1152 | 93 | 326 | 128 | 419 | 28 | 114 | 38 |
| ; | 2006 | 107 | 1518 | 1745 | 121 | 405 | 164 | 523 | 74 | 100 | 40 | 701 | 1610 | 1746 | 120 | 403 | 104 | 515 | 32 | 133 | 40 | 290 | 1354 | 1560 | 120 | 405 | 164 | 515 | 32 | 133 | 46 |
| ÷ | 2007 | 798 | 1841 | 1883 | 113 | 376 | 160 | 191 | 33 27 | 121 | 15 | 749 | 1310 | 1/4-3 | 121 | 403 | 103 | 323 | 33 | 121 | 43 | 101 | 1518 | 1/45 | 121 | 405 | 169 | 523 | 39 | 121 | 43 |
| 1 | 2008 : | 932 | 1829 | 2084 | 124 | 405 | 1/6 | 531 | 21 | 55 | 11 | 022 | 1930 | 100J 2003 | 113 | 104 | 100 | 434 | 23 | 33 | 15 | 198 | 1041 | 1997 | 113 | 3/6 | 160 | 494 | 23 | 99 | 35 |
| i | 2009 | 1105 | 2058 | 2325 | 128 | 414 | 183 | 543 | 20 | 86 | 11 | 1105 | 2058 | 2004 | 129 | 400 | 110 | 531 | 20 | 31 | 33 | 932 | 1029 | 2004 | 124 | 405 | 1/0 | 531 | 21 | 93 | 33 |
| ; | 2010 | 1282 | 2280 | 2552 | 132 | 418 | 108 | 548 | 17 | 15 | 27 | 1282 | 2280 | 2552 | 132 | 418 | 144 | 548 | 17 | 00 75 | 3 I 2 T | 1703 | 2030 | 2323 | 120 | 414 | 183 | 34J | 20 | 80 | 31 |
| ł | 2011 | 1605 | 2520 | 2896 | 161 | 455 | 221 | 603 | 19 | 16 | 30 | 1605 | 2620 | 2896 | 161 | 110 | 227 | 603 | 14 | 76 | 27 | 1605 | 2620 | 2332 980e | 132 | 410 | 100 | 348 802 | 1/ | 13 | 27 |
| ł | 2012 | 1925 | 2949 | 3229 | 188 | 498 | 259 | 640 | 20 | 14 | 31 | 1925 | 2419 | 3224 | 185 | 143 | 259 | 630 | 20 | 74 | 21 | 1000 | 2020 | 2030 | 100 | 400 | 221 | 003 | 13 | 10 | 30 ; |
| ł | 2013 | 1333 | 1952 | 2221 | 63 | 154 | 95 | 218 | 4 | 13 | 8 | 1333 | 1962 | 2221 | 63 | 154 | 45 | 218 | 1 | 17 | 31 | 1323 | 1067 | 3223 | 100 | 430 | 233 | 040 | 20 | 14 | 31 |
| 1 | 2014 ; | 1227 | 2769 | 3045 | 117 | 238 | 171 | 327 | 8 | 20 | 13 | 1221 | 2169 | 3045 | 117 | 238 | 171 | 321 | 8 | 20 | 13 | 1227 | 2769 | 3045 | 117 | 134 | 33 | 210 | 4 | 13 | 10 |
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