Reasonable Concession Period for Build Operate Transfer Contract Projects: A Case Study of Theun-Hiboun Hydropower Dam Project and National Road No. 14 A Project

Panyasith Vorasing* and Dr.Sounthone Phommasone**

Abstract

The Public-Private-Partnerships is generally absent to provide policy-makers with pros and cons about PPP and a suitable form and approach to be applied in Lao PDR. A majority of infrastructure development projects approved so far were in accordance with individual negotiation between the public and private sectors with a case-by-case agreement. And the concession period is one of the most important decisions to be made for PPP project contract is applied to infrastructure projects as implemented under the build-operate-transfer contract. This is the measure for making decision on the timing of ownership and for delineating benefits, authorities, and responsibilities between the government and private investor. The duration of the concession period directly affects both the investor's level of return on investment and the government's interests. In currently Lao very lack of research on this issue. Therefore this paper determined the suitable concession period for Theun-Hiboun Hydropower Dam Project and National Road No. 14A Project .The cash flow of the project was applied analysis method and also analytical as regression analysis and Shen's model the for concession period.

Keyword: Concession Period, Hydropower Project, Public-Private Partnerships, Road No. 14A, Theun-Hiboun,

Introduction

Normally major PPP infrastructure projects in Laos were implemented under the form of the build-operate-transfer (BOT) procurement system, a private investor, or a group of investors forming a consortium, which is sometimes called a project promoter, provides funds for the construction of an infrastructure and operates the built infrastructure for a given period of time on behalf of The Government. This arrangement is often referred to as the franchise of the investor, by which the investor is to Build and then operate the project within a predetermined concession period and then Transfer the project free of charge to the host government at the end of the concession period. This type of contract arrangement Has been widely applied to infrastructure projects throughout the world since the middle of the 1980s. The benefit of this contractual arrangement is commonly considered to be the use of private money for developing public infrastructure facilities such as highways, railways, ports, tunnels, airports, power plants, hydraulic structures and water conservation facilities (Shen et al., 1996). Infrastructure projects normally require a large amount of initial investment and span a long period of construction time, and they normally have a slow payback rate, low profit ratio, and high level of risk. Thus in the application of a BOT contract the Investor is given the privilege of franchise, which grants, to some extent, monopoly power during the

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concession period. As the BOT approach provides the mechanism for using private financing, it also allows the government to be able to build more infrastructure facilities without using additional public funds. The BOT procurement system has been developed with several similar approaches in a ‘‘family,’’ including ‘‘private finance initiative,’’ ‘‘build-own-operate and transfer,’’ ‘‘build-own and operate’’ and ‘‘design-build-finance and operate’’ (Franks, 1998). Over the last 20 years, the BOT contract has proven to be an effective method in financing public infrastructure projects in both developing and developed countries. In the early 1990s, when the British government sought to privatize more public projects, the BOT approach gained popularity (Franks, 1998).

In practice, the government relies on the Pay Back Period (PBP) under the minimal Internal Rate of Return (IRR) as expected by the concessionaire to determine the concession period (Shen and Li, 2000). This enables the PBP to be easily computed by the conventional Net Present Value (NPV) method. As an alternative, Ngee et al (1997) have developed a multiple linear regression model which enables the value of any concession item to be calculated when the other two items are known. Both these approaches, however, are dominated by high levels of risk and uncertainty (fluctuations in interest rate, inflation, cost, revenue, etc.). An overly optimistic estimate based on the cash flow evaluation, for instance, could mean that the return rate expected by the concessionaire may never be realized during the agreed concession period. Therefore, when establishing the concession items, due consideration of the effects of the risks and uncertainties involved is needed. A further salient issue is the need to embrace the views of various stakeholders-the public partner, the investor and the end-users-when the concession items are determined.

Most of the major public infrastructure projects in Hong Kong were built using the BOT system, which also has proven effective in attracting overseas investments in developing countries such as China. For example, Lee and Shen (1998) show the successful application for underground rail and highway works in China and suggest the future potential of adopting the system in China. A quantitative measure for determining a concession period that can protect the interest of both the government concerned and the private investor is an important aspect for win-win decision making. There are speculations that in a BOT contract the government benefits too little or the private entity benefits too much. Generally, a longer concession period is more beneficial to the private investor, but a prolonged concession period may result in loss to the government. On the other hand, if the concession period is too short, the investor will either reject the contract offer or be forced to increase the service fees in the operation of the project in order to recover the investment costs and to make a certain level of profit. Consequently, the risk burden due to the short concession period will be shifted to the public who use the facilities.

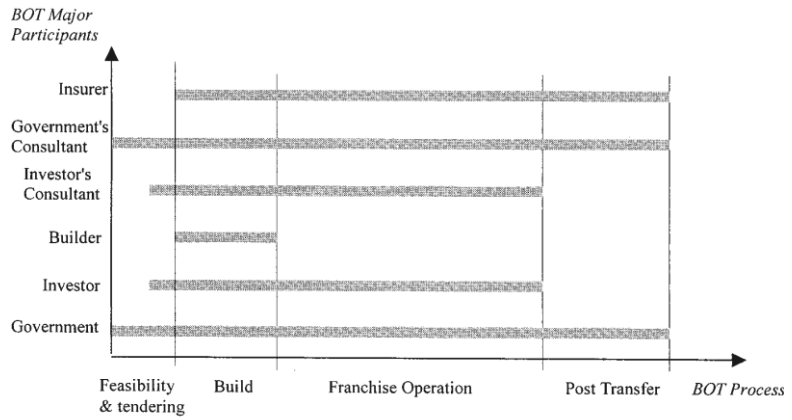

Fig. 1 Involvement of major participants in build operate transfer contract process

In traditional practice, the concession period is determined by a cash flow analysis normally conducted by the investor, and the government's interests are not necessarily incorporated in the analysis. Based on the analysis, a period such as 10, 20, or 30 years or even longer will be adopted. For example, building the English-French Channel tunnel gives a 55-year concession period to the investor that involves the investment cost of $10.3 billion (Jun, 1998). It is noticeable that, aside from the financial compensations to the investor, the interests of the government were not seriously considered in the analysis. The range of alternative concession period t_c that can protect the interests of both the government concerned and the private investor defined in following model (Shen et al., 2002)

$$I_c R \le NPV^a(t_c) \le NPV^a(F), \quad (1)$$

Where I_c = investor's capital,

R = investor's expectation return rate from capital investment,

NPV^a denotes the accumulated NPV, and

F is the economic life of the project.

In this paper, we aim to establish the concession period in a BOT of hydropower dams project.

Implementation Process of Build Operate Transfer Contract

The implementation process of a BOT contract involves many parties, including the government, investor, financing institutions, construction contractor, and operating firms. The involvement of the project participants in a typical BOT-contract process is highlighted in Fig. 1. The process of implementing a BOT-contract project can be divided into four major stages: project feasibility study and tendering, construction, operation, and post transfer. The concerned government and its consultants will be engaged in the project feasibility study and tendering stage. The major activities involved in this stage are to; (1) Initiate a project that is often an infrastructure project requiring private investment; (2) Examine the project environment and conduct a feasibility study; (3) invite tenders private investors to bid; and (4) offer the franchise contract. The duration of this stage is affected by the availability of project information, project complexity, negotiations between Tenderers and the government concerned, and the public response to the project. Investors' participation in this stage is to gain more understanding of the project in order to submit competitive tenders.

The construction stage covers a much wider range of activities such as project financing, land acquisition, design, procurement of building materials and plant, construction work, equipment installation, operation test, and training for operating staff. The timing for this stage is mainly affected by the procurement process of building materials and plant, size and complexity of the project, and construction methods selected. The project operation stage assumes the major part of the BOT-contract time and concerns the daily operation and maintenance of the project. During the operation stage, the project investor is able to make income from providing services such as provision of bridges and highways. The investor also starts to pay capital gains taxes and repayments to financing institutions. The construction period and operation period form the concession period in a BOT contract. Upon the expiration of the concession period, the ownership of the project will be transferred to the government concerned. Transfer and post transfer involve the inspection of the project and arrangement of transfer, operation by government, and finally dismantling of the project. The

Duration of the post transfer operation period depends on the project's type and nature, its natural and economic life, maintenance and management costs, and so on.

Case Study

Two BOT projects in Lao PDR were used to test the effectiveness of the proposed methodology for detraining the reasonable concession period as describe the project detail as followings:

Theun-Hinboun Hydropower Project

In 1991, the Government of Laos started studies to identify a suitable project in central Laos to export power to Thailand and provide a local supply. The project, initially, was conceived as a public sector project. A full feasibility study started in 1992 and foreign investors joined in 1993. Project implementation started in November 1994, and the Project was completed well by the total project cost 240.2 million USD. Commercial operation commenced on 31 March 1998. The project considered an implementation period of five years and project life of 25 years, as stipulated during project appraisal. All benefits and cost are expressed in constant terms. A standard conversion factor of 0.90 was used to convert financial cost of non-tradable items into economic terms. The project incurred maintenance cost of about $3.7 million in 1998, which corresponded to about 1.5 percent of the $240.2 million capital cost of the project. During appraisal, the maintenance cost was assumed to be about 2 percent of the appraised capital cost of $270.0 million.

According to the Economic Internal Rate of Return of (Appendix A), the average growth rate of the total cost in operation period of Theun-Hiboun Hydropower Project decrease $0.07 million per year, and by the regression analysis the total revenue satisfy the following formula

Total Revenue	=	2245.285 (sig=0.000)	-	1.093 t, (sig=0.000)
Where t	=	1998, 1999, 2000, …		

The graph of the total cost, the total revenue and the net cash flow are follows:

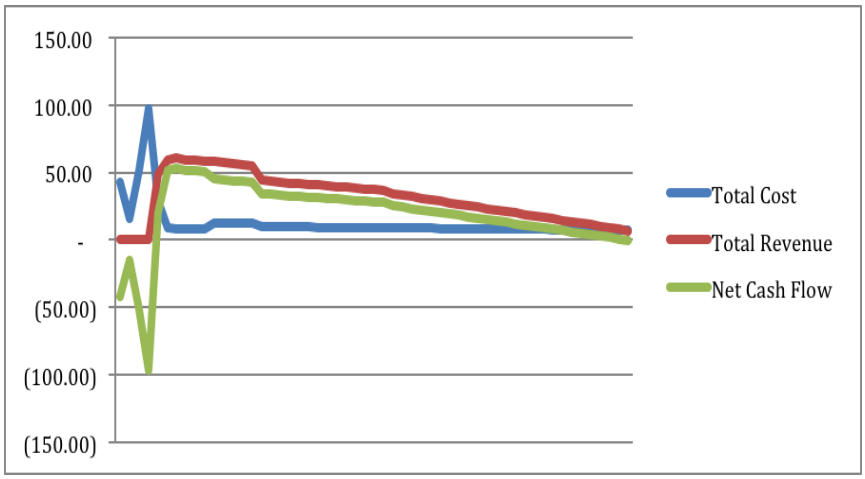

Fig. 2 Total Cost, the Total Revenue and the Net Cash Flow

The negative Net Cash Flow will occur in year 2048. The accumulated NPV, NPV^a of investor on the last year of concession (year 2022) is \$733.45 million. Due to I_c = \$240.2 million, suppose R = 15%, we found $I_c R = 36.03$, and according to inequality (1), we also found that

$$I_c R \pounds NPV^a(year\,2003) = 73.84 \quad (2)$$

This means the investor of the Theun-Hiboun Hydropower Project gains 18 years with \$697.42 million. On the other hand, in the concession period, Lao government receives from the Theun-Hiboun Hydropower Project as Tax and 5% Royalty, amount \$127.5 million. Suppose the life time of the Theun-Hiboun Hydropower Project is year 2048, after concession period the accumulated NPV of Lao government, NPV^a of gov, will \$454.77 million, and found that (see appendix B)

$$I_c R = 36.03 \pounds NPV^a(year\,2022) = 733.45 \pounds 454.77 \quad (3)$$

Contradiction or false inequality. The inequality (1), see appendix C, satisfy

$$I_c R = 36.03 \pounds NPV^a(year\,2016) = 557.24 \pounds NPNa \text{ of gov} = 605.99$$

This means, the suitable concession period for the Theun-Hiboun Hydropower Project is 23 years or year 2017 should transfer to Lao government.

The Road 14 A Project

The construction Road No. 14A is one of a project with in Phonthong District's development plan which was connected to Champak District, the project started point is Ban Huayphak, phonthong District and finished point is Ban Phaphin, Champasak District, Champasak Province. The total distance from start to the end of project is 25 Kilometers, 9 meters wide and the project passed 12 villages which were 750 households.

The feasibility study started in 2007 by the private local company namely "Duangdy Construction Sole Company". Project implementation started in 2008, and the Project was completed well by the total project cost 22,605,086.00 million USD. Operation commenced on 2011. The project considered an implementation period of five years and project life of 45 years, as stipulated during project appraisal. All benefits and cost are expressed in constant terms.

The Economic Internal Rate of Return of the Road No.14A Project is:

Table 1 The Economic Internal Rate of Return of the Road No.14A Project

No.	Year	Income	Cost	Net Value
1	2008		12,897,073.00	(12,897,073.00)
2	2009		5,784,252.00	(5,784,252.00)
3	2010		3,923,761.00	(3,923,761.00)
4	2011	3,812,119.00	3,950,479.00	(138,360.00)
5	2012	4,130,385.00	3,819,130.00	311,255.00
6	2013	4,696,423.00	3,687,780.00	1,008,643.00

Table 1 (Con.)

No.	Year	Income	Cost	Net Value
7	2014	5,282,138.00	3,760,752.00	1,521,386.00
8	2015	4,735,083.00	3,425,082.00	1,310,001.00
9	2016	3,984,656.00	3,293,732.00	690,924.00
10	2017	3,936,150.00	3,050,226.00	885,924.00
11	2018	1,547,875.00	112,157.00	1,435,718.00
12	2019	1,841,972.00	316,478.00	1,525,494.00
13	2020	2,191,946.00	112,157.00	2,079,789.00
14	2021	2,608,416.00	112,157.00	2,496,259.00
15	2022	3,104,015.00	112,157.00	2,991,858.00
16	2023	4,513,502.00	316,478.00	4,197,024.00
17	2024	5,371,067.00	112,157.00	5,258,910.00
18	2025	6,391,570.00	112,157.00	6,279,413.00
19	2026	7,605,968.00	112,157.00	7,493,811.00
20	2027	9,051,102.00	316,478.00	8,734,624.00
21	2028	10,770,812.00	112,157.00	10,658,655.00
22	2029	12,817,266.00	112,157.00	12,705,109.00
23	2030	15,252,547.00	112,157.00	15,140,390.00
24	2031	18,150,530.00	316,478.00	17,834,052.00
25	2032	21,599,131.00	112,157.00	21,486,974.00

By the regression analysis the income of the Road 14A Project satisfy the following formula

income = -1252000000 + 622619.39 t,
(sig=0.000) (sig=0.000)

where t = 2011, 2012, 2013, …

But the cost will periodic since year 2018.

The graph of income, cost and the net cash flow are follows:

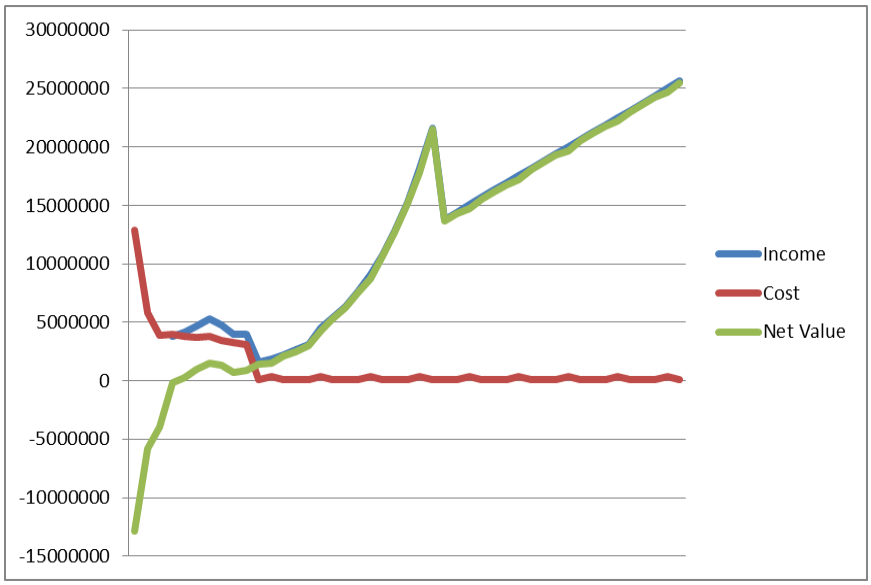

Fig. 3 Income, Cost and the Net Cash Flow are Follows

The negative Net Cash Flow will not occur. The accumulated NPV, NPV^a (see appendix), of investor on the last year of concession (year 2052) is \$494,040,103.50. Due to I_c = \$22,605,086, suppose R = 15%, we found $I_c R = \$3,842,864.62$, and according to inequality (1), we also found that

$$I_c R \pounds NPV^a(year\,2025) = 9,249,152.00 \quad (4)$$

This means the investor of the Road 14A Project gains 27 years with \$484,790,951.50.

Conclusions

The concession period is one of the most important decisions to be made when the build operate transfer (BOT) contract is applied to infrastructure projects. This is the measure for deciding the timing of ownership and for delineating benefits, authorities, and responsibilities between the government and private investor. The duration of the concession period directly affects both the investor's level of return on the investment and the government's interests. The case Theun-Hiboun Hydropower Project, suppose that R = 15%, we found that the investor can transfer to Lao government on 6 years after commercial operation or in year 2003. For fairly interest of both sides, investor should transfer to Lao government on 18 years after commercial operation or in year 2017.

The case Road No. 14A Project, suppose that R = 15%, we found that the investor can transfer to Lao government on 18 years after operation or in year 2025. Otherwise Lao government loss interest for 27 years with \$484,790,951.

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Appendix A

Year	Total Cost	Total Revenue	Net Cash Flow	Year	Total Cost	Total Revenue	Net Cash Flow
1994	42.05	0	(42.05)	2028	8.23	28.681	20.45
1995	15.31	0	(15.31)	2029	8.16	27.588	19.43
1996	51.40	0	(51.40)	2030	8.09	26.495	18.40

Year	Total Cost	Total Revenue	Net Cash Flow	Year	Total Cost	Total Revenue	Net Cash Flow
1997	96.97	0	(96.97)	2031	8.02	25.402	17.38
1998	28.22	48.63	20.41	2032	7.95	24.309	16.36
1999	8.29	59.59	51.30	2033	7.88	23.216	15.34
2000	7.50	60.94	53.44	2034	7.81	22.123	14.31
2001	7.83	59.32	51.49	2035	7.74	21.03	13.29
2002	7.71	59.56	51.85	2036	7.67	19.937	12.27
2003	7.67	58.75	51.08	2037	7.60	18.844	11.24
2004	12.26	57.94	45.68	2038	7.53	17.751	10.22
2005	12.16	57.15	44.99	2039	7.46	16.658	9.20
2006	12.06	56.37	44.31	2040	7.39	15.565	8.18
2007	11.96	55.6	43.64	2041	7.32	14.472	7.15
2008	11.86	54.85	42.99	2042	7.25	13.379	6.13
2009	9.59	44.09	34.50	2043	7.18	12.286	5.11
2010	9.51	43.49	33.98	2044	7.11	11.193	4.08
2011	9.43	42.9	33.47	2045	7.04	10.1	3.06
2012	9.36	42.31	32.95	2046	6.97	9.007	2.04
2013	9.28	41.74	32.46	2047	6.90	7.914	1.01
2014	9.21	41.17	31.96	2048	6.83	6.821	(0.01)
2015	9.13	40.61	31.48				
2016	9.06	40.05	30.99				
2017	8.99	39.51	30.52				
2018	8.92	38.97	30.05				
2019	8.85	38.44	29.59				
2020	8.78	37.91	29.13				
2021	8.72	37.4	28.68				
2022	8.65	36.89	28.24				
2023	8.58	34.146	25.57				
2024	8.51	33.053	24.54				
2025	8.44	31.96	23.52				
2026	8.37	30.867	22.50				
2027	8.30	29.774	21.47				

Appendix B

Year	Total Cost	Total Revenue	Net Cash Flow	NPVa	Royalty	Tax	NPVa of gov
1994	42.05	0	(42.05)	(42.05)			
1995	15.31	0	(15.31)	(57.36)			
1996	51.40	0	(51.40)	(108.76)			
1997	96.97	0	(96.97)	(205.73)			
1998	28.22	48.63	20.41	(185.32)	2.43		2.43
1999	8.29	59.59	51.30	(134.02)	2.98		5.41
2000	7.50	60.94	53.44	(80.58)	3.05		8.46
2001	7.83	59.32	51.49	(29.09)	2.97		11.43
2002	7.71	59.56	51.85	22.76	2.98		14.41
2003	7.67	58.75	51.08	73.84	2.94		17.35

Year	Total Cost	Total Revenue	Net Cash Flow	NPVa	Royalty	Tax	NPVa of gov
004	12.26	57.94	45.68	119.52	2.90	4.46	24.71
2005	12.16	57.15	44.99	164.51	2.86	4.57	32.14
2006	12.06	56.37	44.31	208.82	2.82	4.51	39.47
2007	11.96	55.6	43.64	252.46	2.78	4.45	46.70
2008	11.86	54.85	42.99	295.45	2.74	4.39	53.83
2009	9.59	44.09	34.50	329.95	2.20	3.53	59.56
2010	9.51	43.49	33.98	363.93	2.17	3.48	65.21
2011	9.43	42.9	33.47	397.40	2.14	3.43	70.78
2012	9.36	42.31	32.95	430.35	2.12	3.38	76.28
2013	9.28	41.74	32.46	462.81	2.09	3.34	81.71
2014	9.21	41.17	31.96	494.77	2.06	3.29	87.06
2015	9.13	40.61	31.48	526.25	2.03	3.25	92.34
2016	9.06	40.05	30.99	557.24	2.00	3.20	97.54
2017	8.99	39.51	30.52	587.76	1.98	3.16	102.68
2018	8.92	38.97	30.05	617.81	1.95	3.12	107.75
2019	8.85	38.44	29.59	647.40	1.92	3.07	112.74
2020	8.78	37.91	29.13	676.53	1.90	3.03	117.67
2021	8.72	37.4	28.68	705.21	1.87	2.99	122.53
2022	8.65	36.89	28.24	733.45	1.84	2.95	148.10
2023	8.58	34.146	25.57				172.64
2024	8.51	33.053	24.54				196.16
2025	8.44	31.96	23.52				218.66
2026	8.37	30.867	22.50				240.13
2027	8.30	29.774	21.47				260.58
2028	8.23	28.681	20.45				280.01
2029	8.16	27.588	19.43				298.41
2030	8.09	26.495	18.40				315.80
2031	8.02	25.402	17.38				332.15
2032	7.95	24.309	16.36				347.49
2033	7.88	23.216	15.34				361.80
2034	7.81	22.123	14.31				375.09
2035	7.74	21.03	13.29				387.36
2036	7.67	19.937	12.27				398.60
2037	7.60	18.844	11.24				408.83
2038	7.53	17.751	10.22				418.02
2039	7.46	16.658	9.20				426.20
2040	7.39	15.565	8.18				433.35
2041	7.32	14.472	7.15				439.48
2042	7.25	13.379	6.13				444.59
2043	7.18	12.286	5.11				448.67
2044	7.11	11.193	4.08				451.73
2045	7.04	10.1	3.06				453.77
2046	6.97	9.007	2.04				454.78
2047	6.90	7.914	1.01				454.77
2048	6.83	6.821	(0.01)				454.77

Appendix C

Year	Total Cost	Total Revenue	Net Cash Flow	NPVa	Royalty	Tax	NPVa of gov
1994	42.05	0	(42.05)	(42.05)			
1995	15.31	0	(15.31)	(57.36)			
1996	51.40	0	(51.40)	(108.76)			
1997	96.97	0	(96.97)	(205.73)			
1998	28.22	48.63	20.41	(185.32)	2.43		2.43
1999	8.29	59.59	51.30	(134.02)	2.98		5.41
2000	7.50	60.94	53.44	(80.58)	3.05		8.46
2001	7.83	59.32	51.49	(29.09)	2.97		11.43
2002	7.71	59.56	51.85	22.76	2.98		14.41
2003	7.67	58.75	51.08	73.84	2.94		17.35
2004	12.26	57.94	45.68	119.52	2.90	4.46	24.71
2005	12.16	57.15	44.99	164.51	2.86	4.57	32.14
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2008	11.86	54.85	42.99	295.45	2.74	4.39	53.83
2009	9.59	44.09	34.50	329.95	2.20	3.53	59.56
2010	9.51	43.49	33.98	363.93	2.17	3.48	65.21
2011	9.43	42.9	33.47	397.40	2.14	3.43	70.78
2012	9.36	42.31	32.95	430.35	2.12	3.38	76.28
2013	9.28	41.74	32.46	462.81	2.09	3.34	81.71
2014	9.21	41.17	31.96	494.77	2.06	3.29	87.06
2015	9.13	40.61	31.48	526.25	2.03	3.25	92.34
2016	9.06	40.05	30.99	557.24	2.00	3.20	97.54
2017	8.99	39.51	30.52				128.06
2018	8.92	38.97	30.05				158.11
2019	8.85	38.44	29.59				187.70
2020	8.78	37.91	29.13				216.83
2021	8.72	37.4	28.68				245.51
2022	8.65	36.89	28.24				273.75
2023	8.58	34.146	25.57				299.32
2024	8.51	33.053	24.54				323.86
2025	8.44	31.96	23.52				347.38
2026	8.37	30.867	22.50				369.88
2027	8.30	29.774	21.47				391.35
2028	8.23	28.681	20.45				411.80
2029	8.16	27.588	19.43				431.23
2030	8.09	26.495	18.40				449.63
2031	8.02	25.402	17.38				467.02
2032	7.95	24.309	16.36				483.37
2033	7.88	23.216	15.34				498.71
2034	7.81	22.123	14.31				513.02
2035	7.74	21.03	13.29				526.31
2036	7.67	19.937	12.27				538.58
2037	7.60	18.844	11.24				549.82

2038	7.53	17.751	10.22	560.05
2039	7.46	16.658	9.20	569.24
2040	7.39	15.565	8.18	577.42
2041	7.32	14.472	7.15	584.57
2042	7.25	13.379	6.13	590.70
2043	7.18	12.286	5.11	595.81
2044	7.11	11.193	4.08	599.89
2045	7.04	10.1	3.06	602.95
2046	6.97	9.007	2.04	604.99
2047	6.90	7.914	1.01	606.00
2048	6.83	6.821	(0.01)	605.99