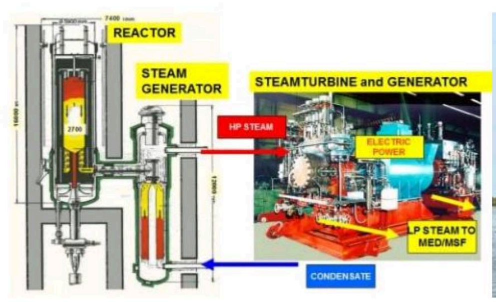
# COMMERCIAL ONFORMATION ON THE 5STGR POWER STATIONS.





**"On-Land Powerstation"**  **"Barge-Mounted Powerstation"**

**1: Project-cost**
The 5STGR can be ordered as "On-Land" 20 MWe Modular Power Station or as "Barge-Mounted" 100 MWe Power Station.
In the Financial-analysis (page 9) the 1st powerplant will cost:
**"On Land"** = 120 million $ for Electricity and 10 million $ for Drinking-water plant.
Power output 20 MW (20.000 kW) and 5 million liters quality water per day.
**"On Barge"** = 600 million $ for Electricity and 50 million $ for Drinking-water plant.
Power output 100 MW (100.000 kW) and 25 million liters quality water per day.
In "Production in series" the price will go down to 75-80 % of initial cost.

**2: Cost of per unit electricity :** In the Financial-analysis (page 9):
At 0.8 cent profit per liter high quality water, the Generation Cost for the electricity will be about 0.2 cent per kWh (**this is almost FREE**. Power Generation people do not want to believe this. They must use their brains!).
I have a good friend in New Delhi – Dr. Keshavendra Govil. He believes the 5STGR and will be very happy to help you.

**3: Cost of drinking water per liter:** In the Financial-analysis (page 9):
In the Netherlands on each trainstation bottled drinking water cost 1.8 Euro per half liter. Let us assume 3.0 Euro per liter.

If we can make a profit of 3 cent per liter of high quality water, in the model, the price for the electricity becomes negative (FREE Electricity).

**4: Total production per day:** In the Financial-analysis (page 9):
"On Land" 20 MW 5STGR Plant:

| | |
|---|---|
| Power 20 MW output = 20.000 (kW) x 24 (hours) x 0,2 cent/kWh = | 960 $/day. |
| At 3 cent per kWh selling price the cashflow is: | 14,400 $/day. |
| Water:5.000.000 x 0,03 $/liter= | 150,000 $/day. |

On the Power Barge 100 MW (5STGR) and 25.000.000 liter water per day:

| | |
|---|---|
| Power 20 MW output = 20.000 (kW) x 24 (hours) x 0,2 cent/kWh = | 4,800 $/day. |
| At 3 cent per kWh selling price the cashflow is: | 72,000 $/day. |
| Water: 25.000.000 x 0,03 $/liter= | 750,000 $/day. |

**5: Cost of maintenance per month/year:** In the Financial-analysis (page 9):
The 5STGR is a very simple power station that requires minimal maintenance.

In the German Financial Analysis, as Siemens experience, 1.2 % of the capital cost is used as annual maintenance cost. Plant Life 40 years. That mean that the anuual maintenance cost for the 5STGR will be 1.440.000 million dollar per year.

**6: Land requirement for this project**
On Land it is advised to use 100x100 meter of land for the 5 STGR plant.
Because the plants are modular we advise to use 200x100 meter of land for 5 modular units adjacent to each other.

**7: Water requirement per day**
The 5STGR “On-Land” will require a little more than 5.000.000 liter of water per day, from a river, lake or sea, to make 5.000.000 liter of pure water.

The Power Barge is assumed to be on water so it will have sufficient water available to make 25.000.000 liters of high quality water per day.

**8: Total staff** In the Financial-analysis (page 5):
In the Financial analysis 16 men (4 shifts of 4 men) are included at 40.000 $/year.

On the Power Barge we assume that 32 men (4 shifts of 8 men) will be sufficient.

Total Staff: 16 men in 4 shifts of 4 men. Picture below is the control-room in Beijing-China for the HTR-10 reactor that is the Chinese version of the 5 STGR. The 5STGR is sofar following the German technology. Very soon the Chinese will be leading. When will India follow? The 5STGR – Made in India – that is our dream.

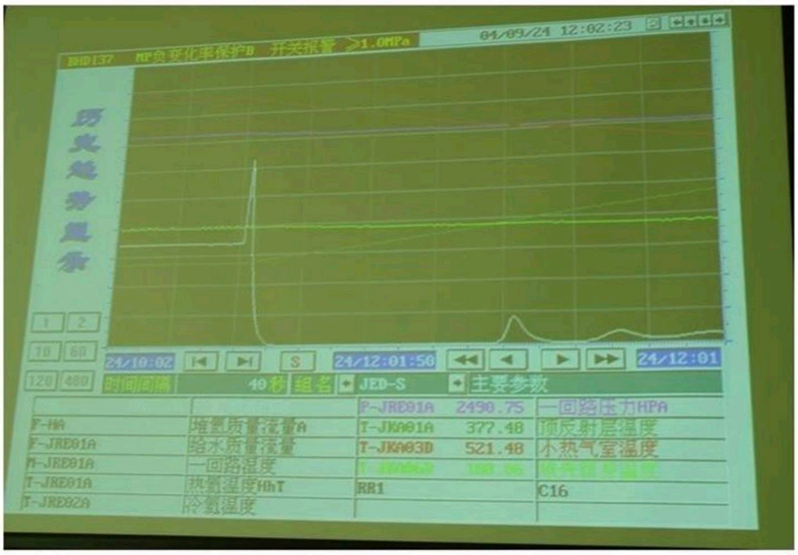
**9: Any special skilled person specific for this project .**
Power plant operators for conventional steam-plants will be qualified to operate such plants. However, there must be (will be) scientists and experts in the nuclear society and research centers that will support the 5 STGR in India.
Dr. Keshavendra Govil is a retired authority in the power-generation world in India. He lives in New Delhi and can be of great help to introduce the 5STGR.

**10: What are the unseen threats**
10.1 : **The first threat** is that most of the time the regulatory commissions on nuclear energy are specialized in current nuclear technology that is based on the Defence in Depth approach. This means, place about 10 safety systems one after the other to mitigate an Core Accident in a nuclear reactor; in still happened in Harrisburg TMI-Island, Chernobyl, Fukushima. This means safety systems can also fail!!
Better is: Make a reactor where you can not have a Core Accident (CDF=0); **that is the 5STGR.**

10.2 : **The second threat** is misinformation by the Environmental Organizations. Being an **expert in the field of Safety of Nuclear Reactors**, I think that the Germans did a great job to give the World the best nuclear technology for power generation that was ever developed. They spent up to 6 billion Deutsche Mark (DM) up to 1988 in this technology. After the Chernobyl accident the environmental organizations like Greenpeace took control over politics in Europe, USA and Asia. They will never discuss this absolute safe nuclear technology in public. The technology was transferred to South Africa – the PBMR 200 Reactor – that failed and to China to build the HTR-10 reactor that was/is a success. The HTR-PM200 is the successor of the HTR-10.

The environmental groups are the main threat for safe nuclear energy; but also for the climate in the world. They do not have the real knowledge of nuclear energy. By denial of absolute safe nuclear energy (CDF=0) they have create a world that is at great risk.

10.3 : **The third threat is the unknown.** People have seen the nuclear accidents that happened in Harrisburg (TMI), Chernobyl and Fukushima. The **Media and Press** magnify the fear for nuclear energy. They must convince the public that: “**There is also Safe Nuclear Energy**”. That is shown below on 24 September 2004.




In this graph the serious accident in Chernobyl and Harrisburg were simulated on 24 September 2004 on the HTR-10 (5STGR) in Beijing, China. An after that it was demonstrated many times over again. As one can see, the reactor stops when the operator wants to create the Chernobyl and Harrisburg accident with the reactor.

10.4 : **The forth threat** is the establishment that does not want to change for innovation. They will let the society die, but will not allow innovation, here cheap electricity, drinking-water and safe food are obstructed for a better and healthy nation.

The environmental groups, often controlled by multinationals, are the greatest risk and threat to the world today.

10.5 : **The most dangerous threat is the Indian Thorium Mafia**, wherby Indians are helping, rich countries, to steal the huge deposits of India its Thorium, and smuggle it out of the country.

**In this way they help to keep India in Poverty.**

India has the largest deposits of Thorium in the World. On Thorium, India could provide all its electricity very cheap and drinking-water very cheap for thousands of years.

The total known world reserves of thorium in the Reasonably Assured Reserves (RAR) and Estimated Additional Reserves (EAR) categories are in the range of 2.23 million tonnes and 2.13 million tonnes respectively as shown in Table 8.

Table 8. Estimated thorium reserves (tonnes of Th metal) [78]

| Country | RAR | EAR |
|---|---|---|
| Australia | 19 000 | - |
| Brazil | 606 000 | 700 000 |
| Canada | 45 000 | 128 000 |
| Greenland | 54 000 | 32 000 |
| Egypt | 15 000 | 309 000 |
| India | 319 000 | - |
| Norway | 132 000 | 132 000 |
| South Africa | 18 000 | - |
| Turkey | 380 000 | 500 000 |
| United States | 137 000 | 295 000 |

In the RAR category, the deposits in Brazil, Turkey and India are in the range of 0.60, 0.38 and 0.32 million tonnes respectively. The thorium deposits in India has recently been reported to be in the range 0.65 million tonnes.

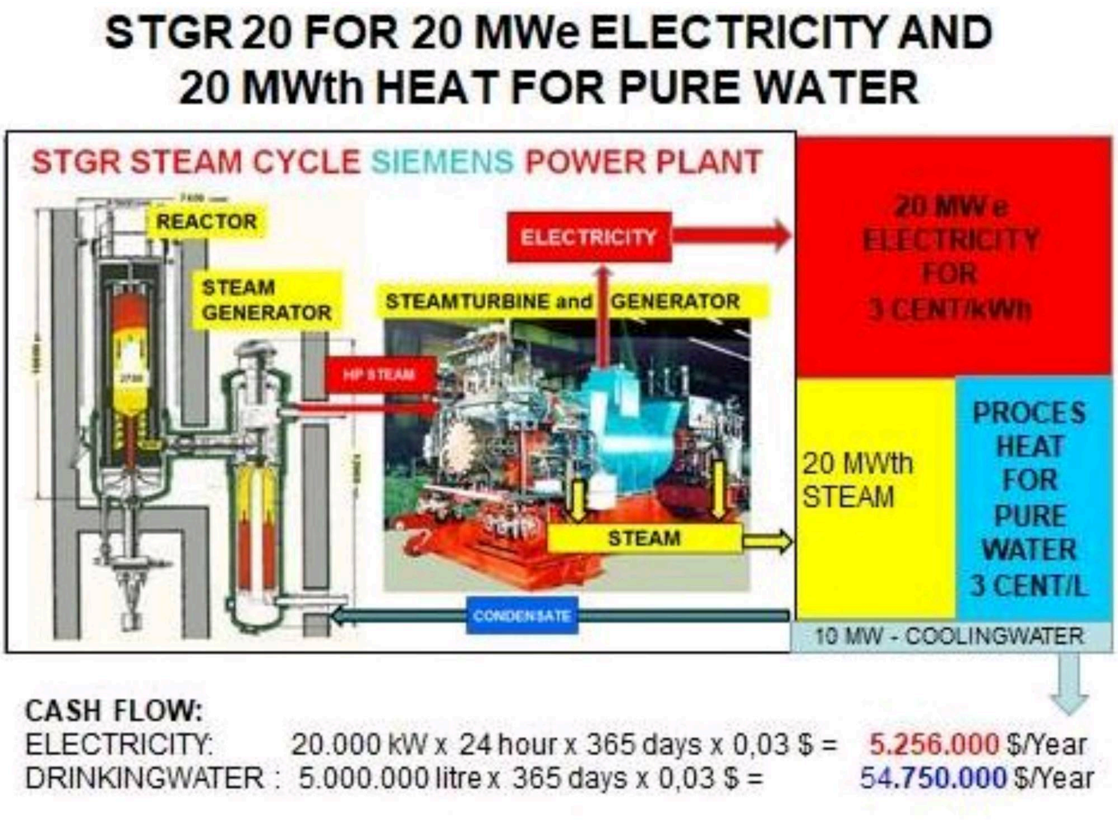
# APPENDIX 1 – 5STGR POWERPLANT INFORMATION

## MOST ECONOMIC ELECTRIC POWERPLANT PRODUCES WATER .

By: R.R. Pahladsingh - TEN|Energy – The Netherlands June 17, 2019

**Introduction:** The Most Economic electric power plant operates as CHP- Combined Heat and Power - in co-generation. The calculation below shows that the bestelectric power plant generates **10 times higher cash-flow** with drinking water than with electricity; this at a price of 3 cent per kWh and a profit of 3 cent per liter of high quality drinking-water. At this water-profit the “payback period” for the plant is 3 years. On page 3 in the financial analysis a water-profit of 0.8 cent per liter is used; and the “pay-back period” is 10 years. When high quality water is used for beverages and beer, one can imagine what happens with the cash-flow for pure water.

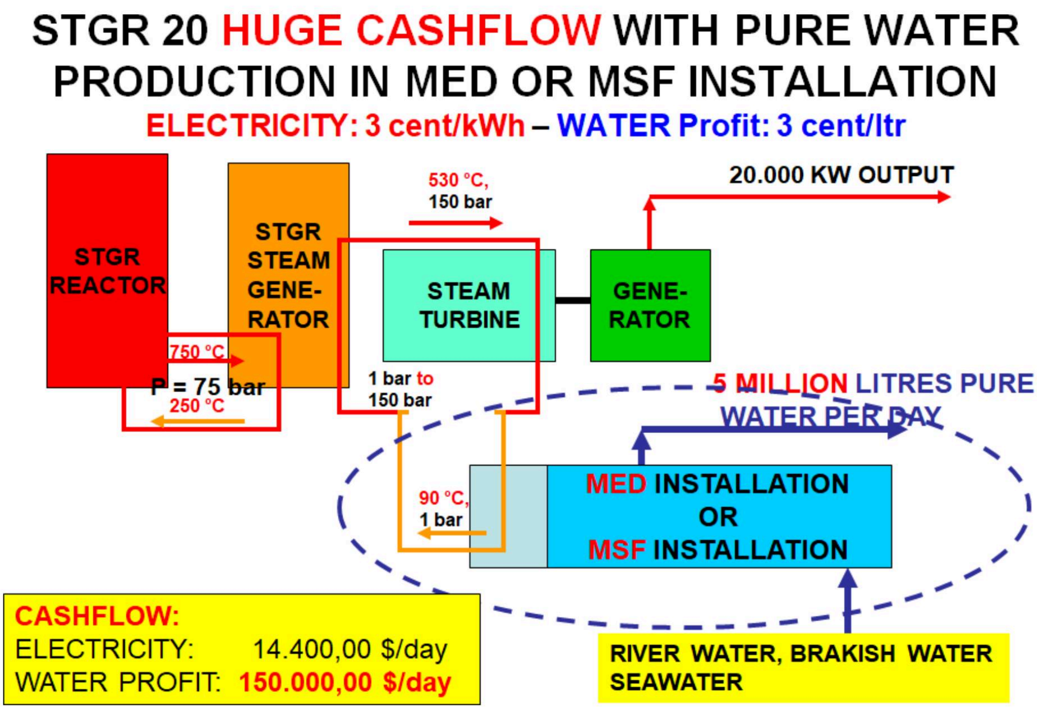
A 20 MW STGR power station will show a cash-flow of **5.256.000 $/year** for electricity and **54.750.000 $/year** for drinking-water. That is why we have to go back to small size power stations in co-generation. Water-scarcity will make the STGR the super solution when compare with the Large Scale power-plants.



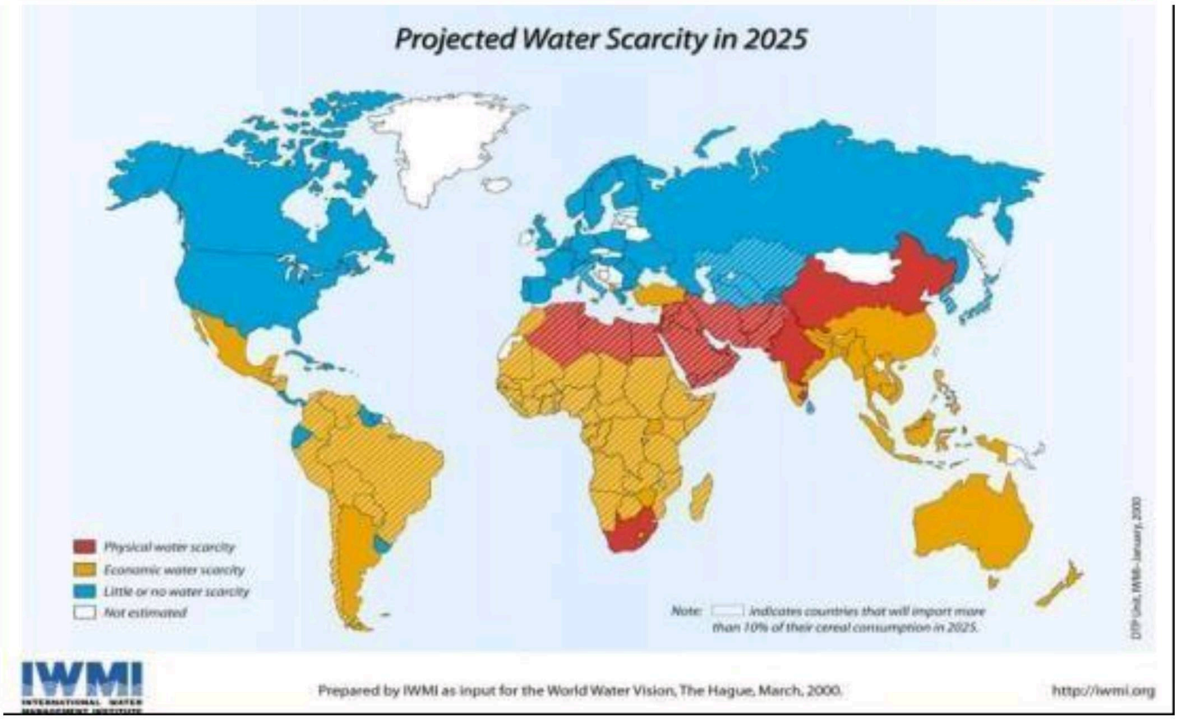

A conventional large scale power plant has an electric efficiency of about 40-50 percent. That means that 50 to 60 of the heat produced with the fuel is wasted in cooling-water that goes to the river. With the STGR we minimizes heat loss to the river and try to use as much as possible low pressure steam to produce drinking-water. When investors see these cash-flows, they will select the STGR instead of the large scale power plants.

In the schematic below, one can see the STGR CHP – Combined Heat and Power - plant process. Almost any type of water can be used to make drinking-water.

Soon environmental regulations will forbid water wells, which are a danger for agriculture, because they lower the groundwater level of the land. That means we will have to produce drinking-water by using “Brackish - ” or “Sea-water” to produce drinking-water.



**The STGR is urgently needed to save India from a disaster: Water Scarcity.**



# FINANCIAL ANALYSIS STGR WITH WATERPLANT

In the input data the power selling price of 5 cent per kWh (50 $MWh) is used. This is only to make the calculation model run. **Generation cost for the Electricty is: 0,2 cent per kWh (Unit) (almost free) at 0,8 cent profit per liter water**.

**Investment Cost** — **STGR 20 MWe plant**

| | | |
|---|---|---|
| STGR PLANT | 120 million USD | |
| Water plant | 10 million USD | |
| Power Generation cost | 0,2 cent/kWh | with water at 0,8 cent profit per liter |

**INPUT DATA:**

| | | STGR 20 Unit | Water | Barge | Total | Increase |
|---|---|---|---|---|---|---|
| | | | | | | %/yr |
| Equipment Cost | m$ | 120 | 10 | 0 | 130 | 3 |
| Owners Cost at site | m$ | 0 | 0 | 0 | 0 | 3 |
| Maintenance 1) | %/yr | 1,2 | | | 1,1 | 3 |
| Insurance 1) | %/yr | 0,2 | | | 0,2 | 3 |
| Personnel | men | 16 | | | | 3 |
| Wages | 1000$/men/yr | 40 | | | | 3 |
| Fixed Overhead costs | m$/yr | 2,80 | | | | 3 |
| Taxes 2) | %/yr | 0 | | | | 0 |
| Decomissioning Cost | m$ | 10 | | | | 3 |
| Decomm. Period | yr | 3 | | | | |

| Consumptions | Unit | Quantity | Price | Increase |
|---|---|---|---|---|
| | | units / hour | $ / unit | %/yr |
| Nuclear fuel | MW th | 50 | 5,01 | 3 |
| Helium | kg | 1 | 20 | 3 |
| c | | | | |
| d | | | | |
| e | | | | |

| Products | Unit | Quantity | Price | | Increase |
|---|---|---|---|---|---|
| | | units / hour | | | %/yr |
| Electricity | MW e | 20 | 50 | $/MWhe | 3 |
| Water | m^3 | 200 | 8 | $/m^3 | 3 |
| | | | 0,8 | cent/liter | |

| | | |
|---|---|---|
| Cost Base Year | | 2019 |
| Year of Commissioning | | 2022 |
| Depreciation Period | yr | 10 |
| Operation Time | yr | 40 |
| Rated load hours | h/yr | 8320 |
| Cost Levelization Period | yr | 25 |
| Procurement & errection time | yr | 4 |
| Investment Schedule: | | |
| 1st year | | 0,1 |
| 2nd year | | 0,3 |
| 3rd year | | 0,3 |
| 4th year | | 0,3 |
| 5th year | | |
| 6th year | | |
| 7th year | | |
| 8th year | | |
| 9th year | | |
| 10th year | | |
| Inflation rate | %/yr | 9 |
| Interest rate equity | %/yr | 3 |
| Interest rate dept | %/yr | 3 |
| Discount rate | %/yr | 6 |
| Equity share | | 1 |
| annuity (m or v) | | m |
| 0,00 | | |

1) applied to plant equipment cost

2) applied to total investment cost

**Investment Cost** — **STGR 20 MWe plant**

**RESULTS:**

## Present net value calculation of power generation

| Electricity generating cost | | | | |
|---|---|---|---|---|
| Cost base 2019 | - 1st year of operation | | - levelized over 25 years | |
| | | | | $/MWhe |
| Investment Cost | 76 | | 16 | |
| Taxes | 0 | | 0 | |
| Decomisioning Cost | 6 | | 1 | |
| CAPITAL COST | 82 | | 17 | |
| Nuclear fuel | 11 | | | |
| Helium | 1 | | | |
| c | 0 | | | |
| d | 0 | | | |
| e | 0 | | | |
| FUEL COST | 11 | | 6 | |
| Maintenance | 7 | | | |
| Insurance | 1 | | | |
| Wages | 3 | | | |
| Fixed Overhead costs | 14 | | | |
| OPERATING COST | 26 | | 13 | |
| Water | 68 | | | |
| 0 | 0 | | | |
| 0 | 0 | | | |
| 0 | 0 | | | |
| REVENUES | -68 | | -33 | |
| GENERATION COST | 52 | $/MWhe | 2 | $/MWhe |
| | | | 0,2 | Cent/kWh |

## Economy of the plant

| Opera year | Internal Interest1) % | Surplus per year m$ | Cash Flow accumulated m$ (Con.) | Cash Flow accumulated m$ (Oper.) |
|---|---|---|---|---|
| 1 | -77,1 | -1,612 | -11,0 | -98,6 |
| 2 | -49,6 | -1,251 | -43,9 | -87,2 |
| 3 | -33,2 | -0,879 | -76,8 | -75,4 |
| 4 | -22,7 | -0,496 | -109,7 | -63,2 |
| 5 | -15,4 | -0,101 | | -50,7 |
| 6 | -10,2 | 0,305 | | -37,7 |
| 7 | -6,4 | 0,723 | | -24,3 |
| 8 | -3,4 | 1,155 | | -10,5 |
| 9 | -1,1 | 1,599 | | 3,8 |
| 10 | 0,7 | 2,056 | | 18,5 |
| 11 | 2,3 | 16,172 | | 34,7 |
| 12 | 3,6 | 16,657 | | 51,3 |
| 13 | 4,6 | 17,157 | | 68,5 |
| 14 | 5,5 | 17,672 | | 86,2 |
| 15 | 6,2 | 18,202 | | 104,4 |
| 16 | 6,8 | 18,748 | | 123,1 |
| 17 | 7,4 | 19,310 | | 142,4 |
| 18 | 7,8 | 19,890 | | 162,3 |
| 19 | 8,2 | 20,486 | | 182,8 |
| 20 | 8,5 | 21,101 | | 203,9 |
| 21 | 8,8 | 21,734 | | 225,6 |
| 22 | 9,1 | 22,386 | | 248,0 |
| 23 | 9,3 | 23,058 | | 271,1 |
| 24 | 9,5 | 23,749 | | 294,8 |
| 25 | 9,7 | 24,462 | | 319,3 |
| 26 | 9,9 | 25,196 | | 344,5 |
| 27 | 10,0 | 25,952 | | 370,4 |
| 28 | 10,1 | 26,730 | | 397,2 |
| 29 | 10,2 | 27,532 | | 424,7 |
| 30 | 10,3 | 28,358 | | 453,1 |

1) Internal capital return without reinvested earnings