25 April 2008

Actuarial Guidance for a Modified Defined Benefit Pension Scheme with a Supplementary Salary Savings Plan

European Patent Office

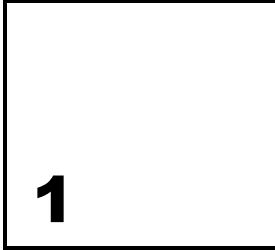# MERCER

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Content

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Introduction

The European Patent Office (EPO) pension scheme is at present a full DB system, pensions being paid from the budget and supported by a Reserve Fund for Pensions and Social Security (RFPSS). It offers pensions for its employees when they retire and to their dependants in case of death. The pension scheme covers both the first and second pillar, such as social security and occupational pension provision. After 35 years of reckonable service employees are entitled to the maximum amount of the retirement pension worth 70% of final base salary. Minimum benefits are additionally granted. Benefits paid under this pension scheme are supported by the Reserve Fund for Pensions and Social Security (RFPSS). The overall contribution rate currently amounts to 27.3% of salaries, of which 9.1% (one third) have to be paid by the eligible employees.

The EPO decided to develop a strategy to reduce the overall long-term DB liabilities. In the end, the extent of the reduction has to result from the final choices made for the new scheme after examination of a range of DB/DC schemes. A reduction of approx. 50% is the starting point of the analysis.. In order to achieve this goal, a **new pension scheme (NPS)** with mixed DB/SSP elements will be applicable for future hires joining the EPO after the end of 2008. The new part of the scheme will be designed as a **salary savings plan (SSP).** Current employees shall also be encouraged to opt for the new mixed DB/SSP pension scheme to enhance the reduction of DB liabilities.

The EPO has appointed Mercer to carry out a study on the design of a mixed DB/SSP pension scheme and Mercer already provided a report as of 22 February 2008 "Concept for the Reorganization of the Pension Plan". The present report builds on the results and considerations of that report and on the following discussion within the EPO.


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Objectives

The key objectives at this stage of the consulting services are:

(1) The benefit level for the new hires should ultimately be more or less the same as under the "old" DB plan. The risk benefits and minimum retirement benefits should also be safeguarded. This notion also implies that the long-term cost for the EPO stays basically on an estimated basis, ceteris paribus unchanged.

(2) The overall employee contributions should stay at a third of the total cost of the benefit provision (currently 9.1% of base salary).

(3) The new retirement system should achieve acceptance of all stakeholders (Member States, Administration, Staff) by attaining a balanced plan combining excellent benefits with affordability (i.e. attractiveness for the new staff and reduction of EPO liabilities).

(4) The SSP should be qualified as a DC plan under IAS19.

(5) The SSP should provide favourable tax conditions to compensate the new hires for the abolition of the tax-adjustment.

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Challenges

The key obstacles at this stage of the project are:

(1) The benefit level for the new hires can be calibrated to be the same as under the "old" DB plan, but the individual allocation of benefits will change especially with regard to career development and retirement age. Despite the long-term cost for the EPO stays basically unchanged, changes in the short-term cash-flow and expense pattern may occur (see chapter 6).

(2) The retaining of employee contributions of a third of total benefit costs is difficult because contributions also have a benefit impact in a DC plan resp. the new SSP, what makes a key difference from the current system, where the employee contributions do not have a direct impact on the benefits.

(3) The economic attractiveness of the new mixed DB/SSP system can be demonstrated; however the abovementioned two objectives induce rather complex regulations in detail. It requires an appropriate information management.

(4) The qualification of the SSP as a DC plan under IAS19 without a third party to provide benefits is challenging, but the tax treatment requires the omission of such a third party pension fund. The issue is covered in annex 4 of the previous report.

(5) The tax treatment of the SSP is not a subject of this report and will only be covered as a restraint to the plan design. The EPO legal department is in charge of this issue.

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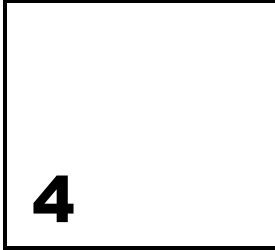
The Basic Mechanism of the New System

(1) Modification of the Present Plan Design

The current benefit formula provides a pension on retirement calculated as 2% of salary paid in respect of the last step which the employee had reached in the last grade held for not less than one year before retirement for each year of reckonable service, subject to a maximum of 70% of his salary. The amount of the retirement pension shall not be less than 4% of the salary for grade C1, step 3, for each year of reckonable service.

In case of death in service, the spouse will receive a survivor's pension of 60% of the retirement pension to which the employee was entitled at the time of death, but not less than 35% of his/her last salary and not less than 100% of C1/3. The invalidity risk has already been removed from the pension plan. Instead, an invalidity allowance of 70% of salary is paid to the disabled employee who is regarded as a permanent employee in non-active status and hence continues to accrue retirement pension entitlements.

Pensions in the course of payment and deferred pensions are annually increased in line with the general salary scales (the "specific indicator" defined in the Implementing Rule for Article 64 of the Service Regulations).

The current contributions to the Reserve Fund for Pensions and Social Security (RFPSS) are made by the EPO and by active or invalid (non-active) staff. The contribution rate at its current level amounts to 27.3 % of salary (respectively of the invalidity allowance), which is borne by one third from the employees and by two thirds from the EPO.

The DB element of the NPS (as discussed in the previous report) will no longer depend on final (full) salary, but instead on a certain final pensionable salary PS of the form:

PS = factor x minimum (final salary, salary ceiling).

The factor is 1 in the Half Average Approach and 2/3 in the Two Thirds Approach.
The salary ceiling is € 52,000 in the Half Average Approach and € 84,000 in the Two Thirds Approach.

The terms "Half Average Approach" and "Two Thirds Approach" do not rely on the current salaries (which are on average € 80,000 p.a.) but on salaries including career trend, because the present pension plan is a final salary plan. Average salary including career trend, but based on present salary scale, is around € 105,000. The average taken only over all A grade employees would be € 120,000.

In those models the employee also earns a benefit of 2%, but of a pensionable salary PS for each year of reckonable service. The salary ceiling is calibrated so that DB pension liabilities will tend to 50% compared to current DB plan. This calibration is done by using the current staff structure as a model population. If only A grade employees are taken as a model population, the salary ceiling must be increased (up to nearly € 60,000 in the Half Average Approach).

Alternative target benefit levels with regard to the DB/SSP allocation have different consequences:

- The salary ceiling can also be calibrated so that DB pension liabilities will only tend to 80% compared to current DB plan (**80%-Approach**). This would result in a salary ceiling of. € 84,000 resp. € 96,000 when only A-grades are considered for new hires. The results are similar to those covered in the following chapters on the basis of the Two Thirds and Half Average Approach. The de-mixing effect would be nearly neglectable. However, the tax relief aspect of the SSP would be weaker and the abolition of the tax adjustment for new hires would result in higher reductions in net retirement income. Finally, less then half of the original goal "50% DB reduction" would be achieved.

- A total shift to DC would very much reduce the technical complexity of the reorganization. The de-mixing-effect could be anticipated by a little bit lower contribution rates to the SSP. Minimum retirement benefits could only be maintained by additional minimum EPO contributions on an estimated basis (additional employer contributions up to a minimum contributory salary, e.g. twice the salary of C1/3). The qualification of the SSP as a tax-free non-retirement component with a lump-sum benefit makes such a total shift difficult. A total abolition of all formal retirement benefits seems hardly explainable and also troublesome (or even impossible) regarding transfers from and to other retirement systems. On the one hand, no guarantees at all would be highly unusual for a system replacing social security. On the other hand, guarantees would menace the IFRS qualification as DC plan and leave the EPO with the full DB liability volume and volatility. A mere lump-sum payment would also not meet the needs of retirees.

Some flexibility might be added by gradual changes of the target DB/DC allocation over time. However, gradual changes would imply huge additional challenges for the administration and communication (One Plan Concept). A gradual change already occurs via the step-by-step nature of future service accruals and the option for current staff (see chapter 6).

Concepts and consequences for alternative target benefit levels are not the focus of this report and will be covered later as required by the EPO.

(2) Modified One Plan Concept

As already mentioned in the previous report, it is advantageous to make the old DB plan and the DB element for the new entrants as similar as possible in order to keep the administration simple and to dampen the de-mixing effect for smoothening the accounting and funding effects.

Closer actuarial calculations showed a significant effect stemming from the omission of the individual career trend on the new DB plan due to the ceiling, which is only increased in line with general salary increases. This makes it appear inappropriate to combine both groups to one plan. However, the lower sector of the old plan (quadrant I in the picture below) can fictionally be split off and be combined with the new DB plan (quadrant II in the picture below):
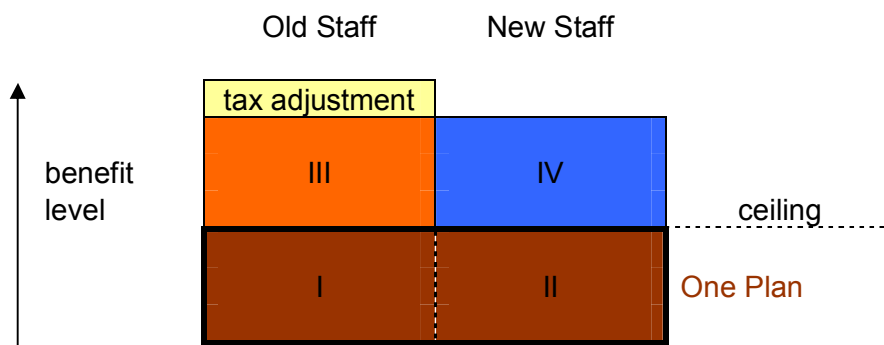
Quadrant II is the new DB element (e.g. Half Average Approach)
Quadrant IV is the new DC element, the SSP
Quadrants I plus III is the current old DB plan, which can be divided (fictitiously) into:
    Quadrant I equivalent to "new" DB element as if that also applied to old staff
    Quadrant III the excess of old DB plan over fictitious new DB element.

The Base model does not rely on a ceiling. However, the 50%-equality of such a new DB element also represents a subset of the old DB plan and the equal parts can be seen as one plan.

The size of the quadrants only demonstrates the individual benefit level and not the size of the DB obligation. The quadrant I and III will remain dominant in their volume for a long time.

(3) Model Employee

The recruiting policy of the EPO can be summarized to a typical plan participant joining the new retirement system. This model employee is male and starts at the age of 30 with a base salary of € 60,000 per year and retires at the age of 63. The age of 63 seems quite high from a historic perspective outside the EPO, however with the European workforce subject to a significant aging process it seems a rather realistic age for such new entrants and corresponds in any case to the EPO historic average.

Over 80% of new hires in 2007 belong to grade A. This percentage may even increase in future.

The numbers in this report have mainly been based on such model employees for individual calculations of benefit levels, costs and contributions, whereas the numbers provided for the entire population are estimates not finally adjusted on the calculation techniques of the EPO actuaries.

(4) Minimum Benefits Approach

The Half Average Approach and the Two Thirds Approach would not **automatically** safeguard the minimum retirement benefits (of 4% of C1/3 per reckonable year of service); because in the Half Average Approach salaries are capped below the double of C1/3 (€ 58,448.40) or salaries count only two thirds as in the Two Thirds Approach. This problem would be smaller in the 80%-Approach.

Safeguarding the minimum retirement benefits will produce one of the two problems:

1. Either the sum of the DB and the SSP benefits is (eventually) increased such that the minimum benefits are provided; then the DC character under IAS 19 of the SSP is jeopardized.

2. Or the minimum retirement benefits are already included in the DB element; and SSP benefits are granted on top even for such employees, which would increase cost and would neither be justified.

The consequence could be not to guarantee minimum retirement benefits in the strict sense, but to pay minimum SSP contributions (on the basis of an "enhanced salary") such that the minimum level is reached with a "high probability". This would not endanger the DC character of the SSP under IAS 19 and would not increase costs dramatically, but minimum benefits are not guaranteed by 100%.

A further solution could be to increase the salary ceiling in the Half Average Approach to the double of C1/3 (€ 58,448.40) in order to safeguard **automatically** the minimum retirement benefits. We call this approach "**Minimum Benefits Approach**". This ceiling would be easy to understand and to communicate to employees.

If the starting point (50%) calibration is done by using the current staff structure as a model population, then increasing the salary ceiling from € 52,000 in the Half Average Approach to € 58,448.40 in the Minimum Benefits Approach would lead to a DB level of around 59% instead of 50%. But if this calibration is done by using the current A grade staff as a model population (which would be more realistic under future hiring policy), then the salary ceiling of € 58,448.40 in the Minimum Benefits Approach would lead to a DB level of around 51%.

The Minimum Benefits Approach would also have the advantage (like the Half Average Approach, but unlike to the Two Thirds Approach) that the salary ceiling is still so low that nearly all new hires earn more than this salary ceiling. That means that the career trend would not have any significant effect on that DB element. Actuarial present value factors would no longer depend on the career trend:

Under the unit credit method (no longer: projected), the actuarial present value of a benefit of 2% of PS for an employee with current age xc is valued by a premium (service cost), which is a percentage pci_{xc} of PS, where the actuarial percentage factors pci_{xc} depend on current age xc, but do not depend on career trend.[1] Such premiums (service costs) do generally **increase** by age, which shall be indicated by the letter i in pci_{xc}. The second letter c shall indicate that **current** salary (**no** projection with career trend) is used.

pci_{xc} = **p**ercentage, **c**onstant salary (no career trend), **i**ncreasing premium, current age xc.

Under the Modified One Plan Concept, the new DB element for new staff should be put together with the capped part (capped at the salary ceiling, no career trend) of the DB plan for current staff, but not kept together with the whole DB plan for current staff (which depends on career trend). One should not mix DB plans depending on career trend with DB plans not depending on career trend!

If the assumptions prove correct, all benefits earned to date will be funded as the unit credit method was used to calculate the contributions. .

(5) Calculation of Contribution Rates

The effective contribution rate in the Modified One Plan Concept should be chosen as an average rate to have a better understandable, uniform rate for employee communications.

In principle, the EPO does not want to cut neither costs nor benefits. This can be translated into a system of equations, where the desired cost-neutral contribution rates can be determined by the following steps:

1. Calculate overall contribution with PUC method as if old plan remained in force (presently overall service cost equal to 27.3% of salaries, employees contribute 9.1%). Calculations do include salary trend etc.

2. Consider Quadrants I and II as one plan (modified one plan concept): Calculate service cost with PUC method as percentage of pensionable salary PS under new DB plan regulations. If salary ceiling is low enough, then those calculations must be done without career trend. In Half Average Approach and in Minimum Benefits Approach such contribution may be around 23% of PS for the current population.

3. Consequently: The cost for Quadrants III and IV must be – as a sum – equal to the difference between the calculations in number 1 and number 2, i.e.:
   "27.3% of salaries minus 23% of PS".
   The second percentage would be much closer to the 27.3% in the 80%-Approach.

4. How can costs and benefits to Quadrants III and IV allocated in a "justifiable" way? That is a problem, because Quadrant III consists of old staff and Quadrant IV consists of new staff and the PUC method is traditionally used.

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[1] The career trend used in the actuarial valuations differs from year to year with generally higher percentages in earlier years. The average career trend on a 35 year career (age 30 to 65) is 1.9%. This trend is on top of the general salary scale trend of 2.5% = 2% Inflation + 0.5% additional salary scale inflation.

5. An identical contribution rate formula for Quadrant III and Quadrant IV (independent of age of employees, which is normal for DC plans) would eventually give too much SSP benefits to Quadrant IV (because of lower age) and would hence not suffice to pay the benefits for Quadrant III. But exactly the amount given too much to Quadrant IV is equal to the amount missing for Quadrant III.

6. Therefore the "correct" SSP contributions for Quadrant IV necessary to provide the **same estimated** benefits in sum for Quadrants II and Quadrant IV have to be calculated as if the old plan remained in force. Such contribution should be a constant one over time (as normal for DC plans). If age 30 is the average entry age for new staff, then this contribution must be:

   $SSPpremium = ppc_{30} \bullet salary - pcc_{30} \bullet PS$, where

   ppc is the contribution percentage with career trend, constant from 30 to 65 and pcc is the contribution percentage without carer trend, constant from 30 to 65.

7. Things would be easier, if that SSP premium would be equal to "27.3% of salaries minus 23% of PS" (like in the current plan). Then there would be no excess benefits in Quadrant IV and no extra cost in Quadrant III, which is not "compensated".

8. Normally that correct SSP premium is lower than "27.3% of salaries minus 23% of PS". If nevertheless higher SSP contributions are paid, then new staff would receive too high expected SSP benefits and the extra cost for Quadrant III would not be compensated.

9. If that correct SSP premium is **only a very bit** lower than "27.3% of salaries minus 23% of PS", then paying nevertheless the higher SSP contributions (and accepting the higher cost in Quadrant III without compensating) could be justified, because the investment and longevity risk is transferred from the EPO to the new employees. **The extra cost is exactly the difference between "correct" SSP premiums and actually paid SSP premiums.**

10. It seems to be that 7 is nearly correct, indeed, according to our calculations for the model employee in the Half Average and Minimum Benefit Approach:

    $SSPpremium = 27,7\% \bullet salary - 21,4\% \bullet PS$ is greater than

    "27.3% of salaries minus 23% of PS".[2]

    Apparently, the active staff population is not yet in a "steady state", so that the 27.3% are not yet at the "final end" (under current assumptions and old pension plan formula). With this result it is even easier and better to communicate that an overall approach "27.3% of salaries minus 23% of PS" can be chosen for all.

Annex 1 provides deeper insights within the actuarial considerations given above. Annex 2 shows the calculations for the sample employee quoted in number 10.

Transforming these calculation steps into legal plan documents seems not easy, however doable. The financial stability of the system requires annual or maybe at least triennial recalculations. The fixation of contribution rates in 2008 appears risky.

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[2] Similarly to 10 we have (if we use a deferred disability pension instead a life time disability pension) a collective SSP rate of "24.5% of salaries minus 20% of PS" and an individual rate of SSPpremium = 26% of salary – 20% of pensionable salary.

(6) Simplified Reasoning

The EPO does not want to cut neither costs nor benefits. This means the old calculation pattern has to be preserved by "as-if" calculations. The technical (computational) side of this is sophisticated, but no real challenge with basically the same calculations already performed for IFRS and funding purposes. The communication side of this is the lack of constant contribution percentages over time.

Current employees and new hires will continue to pay 1/3 of the overall costs. There is no change regarding the old plan participants (quadrants I and III).

The new hires only get a DB plan – like in the Half Average or Minimum Benefits Approach – basically without career trend (quadrant II), what means that this can be financed by approx. 23% contribution instead of 27.3% (see chapter 5.3). The "missing 4%" have to be compensated within the SSP (quadrant IV) to keep the goal of the old benefit level. The de-mixing effect in quadrant III is partly neutralized by the salary trend and not as strong as formerly expected.

The 27.3% contribution for the model employees are too high for the value of the capped DB plan (quadrant II), but at the same time, the 27.3% are too high for the value of the SSP part. To keep the system flexible for changes, it is necessary to keep the definition of the 27.3% as the resulting contribution rate for the cost of the overall benefits.

This table summarizes the contribution structure (rough numbers):
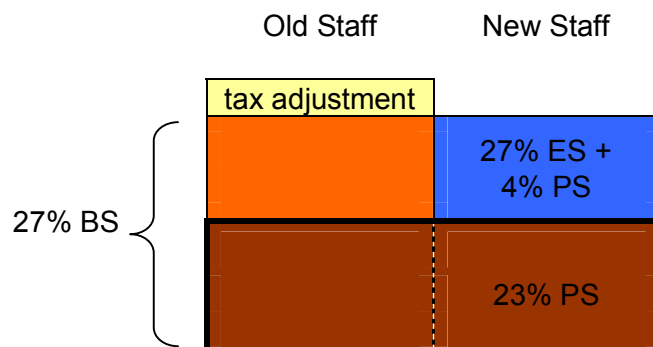
BS = basic salary = ES + PS
ES = excess salary (above the ceiling)
PS = pensionable salary (below the ceiling)

The division between the quadrants I and III is merely fictional for old staff. The division between the quadrants II and IV is real for new staff. Both groups require overall contributions of 27.3% of basic salary.

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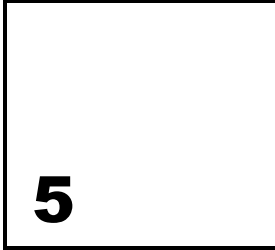
Design of the Salary Savings Plan in Detail

(1) Funding Vehicle

There is no independent plan provider or insurance company, which can operate as tax-efficient as the EPO and the RFPSS, because the taxation is only tax privileged as long as the assets are basically assets of the EPO. This issue has already been largely discussed in the previous Mercer report.

The qualification of the new plan as a SSP however, is a reason to rethink the idea of combining the administration and investments of all plans within the RFPSS. The separation of the SSP from the other pension schemes to achieve a more favourable tax treatment might be better organized by a vehicle separate from the RFPSS[3].

(2) Risk Benefits (Death-in-service Benefits)

The goal to make the SSP a DC plan under IAS19 makes it necessary to use a third party – an insurance company – to provide risk benefits if not all risk benefits are covered by the DB plan for new hires. Such insurance coverage is usually rather expensive and needs a lot of administration.

An easier way to solve the problem would be to omit real risk benefits in the SSP and only to pay the accrued account balance in case of death before retirement and to compensate the beneficiaries by higher retirement benefits. This technique was used to calculate the contribution rates for the model employee.

The risk benefits within the new DB component have to be defined separately, because the ceiling has considerable effects on the minimum benefit provision:

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[3] Plan assets of a DB plan comprise assets held by a long-term employee benefit fund (IAS19.7). The RFPSS may be qualified as long-term employee benefit fund apart from the lack of legal separation. IAS19 however, does not use the term long-term employee benefit fund for DC plans. Using the same funding vehicle for DC and DB plans might weaken the DC argument for the SSP (see annex 4 of the previous report) despite it is very well possible to have DC plans and DB plan assets with the same insurance company for example.

- A spouse pension worth 60% of the accrued retirement pension is in line with the new financing system. Also the minimum of C1/3 can be fully financed within the Minimum Benefits Approach.

- A spouse pension worth 35% of the deceased's full salary is especially for the widow/ widower of well-earning employees with salaries exceeding the ceiling. The financing of the new DB plan (quadrant II) however, is focused on the income parts below the ceiling. This might be considered as inappropriate, however, the economic volume is really small and may not justify the administrative increase in complexity by different spouse benefits within the One-Plan-Concept.

Higher overall survivor benefits occur in cases, where the DB minimum benefits already cover the full benefit due to the current plan. The survivors get the SSP lump-sum on top in these cases. This could be corrected by decreasing the 35% guarantee for high salaries over years of service. The economic volume however, seems small.

The orphan benefits shall be treated likewise.

(3) Plan Design and Gender Differentiation

The current DB plan collects contributions and provides benefits without any gender differentiation. Gender-related differences in the pension expense are born by the EPO (2/3) resp. distributed over all the employees (1/3). Contributions will also be unisex for the SSP and the lump-sum payment derived from that contributions will also not depend on gender. However, when it comes to buy an annuity contract at retirement, insurance companies always differentiate their tariffs due to genders, because of the longer life-expectation of females. The amount of a "male" annuity is close to the amount of a "female" annuity, when spouse coverage is included and when the age difference is typical. Typical age difference means that woman are approx. three years younger than men. Mere retirement annuities without dependant's pensions do have much larger differences for males and females.

While the decision to use a male as model employee incurs little doubt with approx. 70% male employees in the current EPO population, it may be discussed on which ratio of genders the calculation of the contribution rates may be based.

These differences are related to the basic mechanism of DB and DC plans. Paying higher contributions for female employees would be logic to avoid this effect, but this would be highly uncommon and also raise discrimination issues. With the purchase of annuities outside the SSP as a form of private investment, no direct discrimination issues seem to be touched because the employment anti-discrimination legislation is not applicable on private purchases. However the EPO should be aware of that effect.


(4) Contribution Rates

The overall SSP contributions should be "complementary" to the DB contributions as explained in chapter 4 to safeguard the current benefit and contribution level. An

independent contribution rate would underline the clear separation of the new SSP from the old DB plan, but the qualification as a DC plan under IAS19 is also possible when contributions are derived from an overall contribution rate.

DC plans usually have uniform contribution rates regarding age. This is much better understandable for the employees and for the accounting. Consequently, the SSP contribution rate will be "basically" constant and not depend on age, although this might appear logic if a DB plan with age-related costs is partly replaced.

The first idea is to define the SSP contributions as a percentage of the excess salary above the ceiling; however, this makes the SSP contributions and the related benefits very sensitive to salary increases. It seems sensible to avoid such extreme effects and define the basis for the contributions in a broader way, such as total base salary. This means also that low-earners do also have a decent SSP in their overall retirement package. This picture shows the individual contributions for new hires with salaries below and above the salary ceiling (rough numbers, the colour shows the sponsored plan):

23% PS + 4% PS + 27% ES
ceiling
23% PS + 4% PS
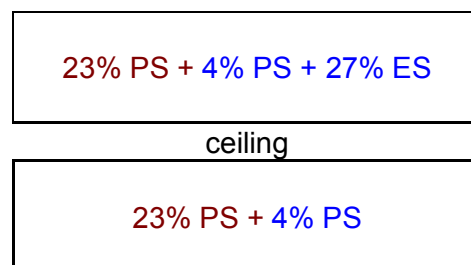
This structure implies the notion that – in the absence of a career development – the SSP benefit may be "on top" for low-earners because their benefits are already covered by the minimum benefits in the new DB plan (Minimum Benefits Approach). This "divergence loss" will result in some cost increases for those "career-less" low-earners, but the increase will not be large considering the small number of hires in Grades B and C and the even smaller number without career development.

(5) Early and late Careers

The contribution rate for the SSP is based on a model career to obtain the same benefit level as before under the current DB plan. The mechanics of a defined contribution plan however, make deviations from that model career more relevant for the benefit level, because the current DB plan only changes the years of service but does not consider the time and the amount of prior contributions. A DC plan also considers time and amount of prior contributions. This means that late careers will get lower benefits than under the current DB plan and that early careers will get higher benefits than under the current DB plan.

If an employee starts with a salary below the ceiling and exceeds the ceiling in later years, then additional SSP contributions are justified even before the time point when his salary exceeds the ceiling, because the SSP contribution rate is designed to be "basically" constant and not depending on age. So, this is adequate to reach the benefit goal from an

actuarial point of view. It would only be "actuarially correct" to start SSP contributions at the time when the employee's salary exceeds the salary ceiling, if the SSP contribution rates were depending on age (i.e. increasing with age).

(6) Early and late Retirement

The basic mechanics of a defined contribution plan like the SSP is to follow economic principles for each individual without the consideration of other aspects. It is not possible to change these economic mechanisms while maintaining the DC qualification of the plan.

Early retirement means an increase in the value of the pension cash-flow. The consequence is a reduction in the resulting pension amount to maintain the equilibrium of the plan. However, the current DB plan design only omits further pension increases in the case of early retirement prior to the achievement of 35 years of service and does not apply reductions for the premature payment. The extra cost for this is distributed on the EPO (2/3) and the employees (1/3).

Late retirement means a decrease in the value of the pension cash-flow. The consequence is an increase in the resulting pension amount to maintain the equilibrium of the plan. However, the current DB plan design grants further pension increases in the case of late retirement prior to the achievement of 35 years of service and does not apply enhancements for the later payment. The cost reduction for this is distributed on the EPO (2/3) and the employees (1/3). It is also unusual for DC plans to stop benefit-enhancing contributions after a certain number of years of service, but the contributions are usually paid as long as a salary is paid. It is even not recommendable from a legal point of view to limit the payments of contributions to a certain age or a certain number of years of service because such restrictions are more and more seen as a form of age discrimination and it is difficult to find convincing reasons to justify such discriminations – especially with DC plans.

(7) Expected Returns

The reorganisation will also affect the investment framework:

- The DB plan will receive lower contributions than currently. With expected benefit payments of € 81 million (2008), expected contributions of € 150 million (2008) and assets of € 3,329 million (31 December 2007), halving the approx. € 6 million contributions for new hires will only have a very small influence on investments in the next years. The use of the transfer option by the old staff would have more influence (see chapter 8). A reduction of the duration of the current pension obligations – currently 21 years – will only occur as far as the population gets more mature.

- The SSP will start with relatively low contributions and duration of approx. 30 years. However, this investment horizon is shorter than for the DB part because the benefit is a lump sum payment instead of pensions. The long-term reduction of the duration will reduce the long-term investment horizon and possibly lead to a

slight reduction in investment returns. The individual investment approach is more subject to lower returns incurred by shorter investment periods than a collective approach. Individual investment accounts for each plan member have the advantage of investment choice for the individuals, which are not possible under a collective approach.

The reason for the reduction in duration is the lump-sum benefit of the SSP. The tax treatment and IFRS treatment require a lump sum payment.

(8) Severance Grants

The severance grant is paid to employees leaving the EPO before acquiring an entitlement to a pension (usually before serving 10 years). It is not subject to national income tax. It is calculated as the sum of employee contributions plus 4% interest rate plus 1.5 basic salaries per year of service.

This benefit formula could principally be continued with the new retirement system. Only the internal clearing of the overall payment between the new DB plan/ RFPSS and the SSP has to be defined. A simple way to integrate the severance grants into the new system would be to use primarily the SSP account balance to make these payments. The only modification of the benefit formula may occur, when the SSP would be larger than the sum of employee contributions plus 4% interest rate plus 1.5 basic salaries per year of service – this is unlikely. It is sensible then to always grant the full SSP account balance to the leaving employee.

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Optional Application for Current Staff

Granting an option to the current beneficiaries to join the SSP is a means to significantly enhance the reduction of the DB obligations.

(1) Past Service

However, with the SSP designed as a tax-free non-pension plan, it is not recommendable to undermine this character by the unlimited possibility to transfer past service accruals from an existing DB pension plan:

- Current Staff
  Past service "transfers" will have to be limited to the time of retirement, where a lump-sum option will be established. This is no real transfer, however, it is an employee-friendly way to reduce DB liabilities without undermining the SSP character. The relative size of that lump sum option may be half (SSP target level), a third (United Nations) or a quarter (NATO) of the total worth of the pension. It is recommendable to ask for a decision at least a year before retirement to avoid negative selection. The use of the IFRS discount rate for these lump sum calculations would lead to P&L neutrality (apart from amortization amounts), however, substantial differences in benefit amounts would occur when the discount rate is adjusted.

- Pensioners
  Granting a lump-sum option to pensioners is a reliable way for a fast reduction of DB liabilities. However, the collateral damage of such offers is the negative selection effect with higher long term cost by the longevity of the remaining pensioners and, in many countries, a higher tax burden on lump sum payments. This seems not recommendable, especially if the EPO had to bear a higher tax adjustment.

(2) Future Service

Offering the current staff to opt into the SSP for future service only requires some modifications of the conditions for new hires. The SSP is generally more attractive to young employees and less attractive to older employees. Older plan participants have higher benefit accruals and higher service cost in the current DB plan, without gaining a higher contribution in the SSP in the case of a change. This is the economic problem behind a change. A solution to enhance changes to the SSP is to grant age-related (and maybe even career-related) extra contributions, compensating the lost higher benefit accruals resp. higher service costs.

What premiums should be paid to old staff opting in full for the SSP ("opters") then? In order to keep costs unchanged (on an estimated basis), the SSP contributions should be based on individual age (service cost). The sum of SSP contribution and individual DB contribution should equal the age dependent service cost for the old DB plan; i.e. the SSP contribution should be:

$$SSPpremium_{xc} = ppi_{xc} \bullet salary - pci_{xc} \bullet PS \text{ , where}$$

ppi is the contribution percentage with career trend, increasing with current age and

pci is the contribution percentage without carer trend, increasing with current age xc.

Using that formula would not change cost and benefit on an estimated basis. The EPO would gain the advantage that DB risk is transferred to the employee. Therefore the EPO could grant an extra premium, maybe done by a "flat increase" or by calculating the actuarial factors ppi_{xc} and pci_{xc} with a lower discount rate.

The possibility of a partial transfer to the SSP will enhance the willingness of current staff to use the SSP option. In the Minimum Benefits Approach, a partial option may be granted for salary parts above the ceiling, because the ceiling has a side-effect on such a decision and the probability would be high that the overall cost for the EPO would increase due to selection processes. The calculation is similar to part time work. The premium to the SSP is calculated like this:

$$SSPpremium_{xc} = ppi_{xc} \bullet salary \bullet OP$$

OP is the relevant percentage of option use. For example, if OP is 15%, 85% of the employee's future service will continue within the DB plan. The percentage indicates that the career remains proportionally covered by the DB plan – this would be different for salary parts below the ceiling, but these salary parts may not be used to opt. If the sample option of 15% SSP was used after 20 years of service, the DB benefit would be calculated as 20 years with 2% per year and maximal 15 years with 1.7% per year (85%). The resulting benefits would be a pension worth 65.5% of final full salary plus a lump sum out of the SSP.

The maximum option percentage is defined by the relation to the ceiling. If an employee had a salary of six times C1/3, than he could use up to four times C1/3 (or two thirds of his salary) for the option, because two times C1/3 is needed to cover the ceiling.

For simplicity reasons, only the second formula (partial transfer for salaries exceeding the ceiling) should be offered.

(3) Incentive for Opters

An incentive to motivate current staff to opt for the SSP would be to enhance their SSP contributions with parts of the value of the "risk-savings" of the EPO created by their choice for the SSP.

The reduced DB risk available as an incentive for the opters can be seen in two different ways:

- Economic risk

  The economic risk of the existing DB plan can be measured by the difference to market prices for disposing the DB obligations. The comparable market price is the premium offered by an insurance company. This premium would be far higher than the DBO. The key drivers for this difference apart from administration cost would be the lower interest rate and the more prudent mortality tables.

- Accounting risk

  The pension mapping of IFRS does not follow that economic risk concept. IAS 19 just relies on the market value of plan assets and on a discount rate based on AA-rated bonds. The risk just becomes relevant, when losses actually occur, not in advance.

The EPO was basically satisfied with the old DB plan and the financing mechanism with its risk and chance features (based on 5.75% p.a. expected long term return). The introduction of IFRS accounting changed that confidence. The accounting risk could be diminished by cash-flow hedging, that means investing in AA-rated bonds with the duration of the pension obligations.

This leads to the idea, that the difference between the formerly expected rate of return (5.75%) and the discount rate under IAS 19 (5.53% as of 31 December 2007 and 4.92% as of 31 December 2006) may be an appropriate measurement of the avoided accounting risk. A possibility to motivate current staff to opt for the SSP would be to calculate their contributions with such a lowered discount rate. The lower discount rate would be justified by the gain in security by less DB pension risk for the EPO. This process may be described as going down on the efficient frontier.

Stepping totally down to a zero risk portfolio would mean to reduce the expected return from today's 5.75% to approx. 4.0%. (net of expected salary scale increases only 1.5%). The extra 1.75% of discount rate would mean a huge increase in expected benefits under the current investment policy as well as a huge cost increase for the EPO.

Based on the fact that the EPO chose the current upper position on the efficient frontier, it seems sensible to judge the gain in security smaller than that maximum amount, e.g. with the above-mentioned difference of 5.75% - 5.53% = 0.22% (31.12.2007) resp. 5.75% - 4.92% = 0.83% (31.12.2006). The rate to calculate the opter´s contributions would be in the range of 2.42% (= 4.92% - 2.5%) up to 3.03% (= 5.53% - 2.5%). A rate of 2.75% seems to be a sensible average here.

The following graph shows the dimensions of additional contributions as a contribution percentage of total salary:
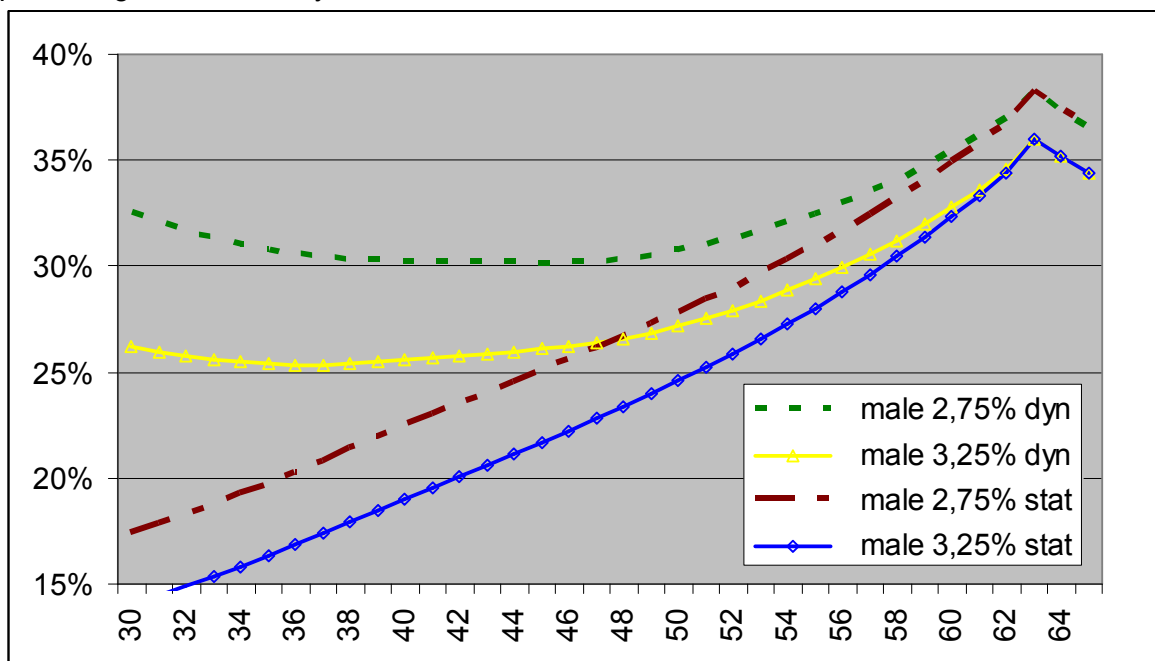
IAS19 however, does not directly honour such economic risk considerations. Additional contributions would in the first instance imply higher costs. Gains would gradually occur in later years in the form of avoided losses.

> The pension obligations have an average duration of 31 years. This means a DBO reduction of 16% by a discount rate reduction of 0.5% (= 3.25% - 2.75%). The respective service cost increase would only be for half of the total obligation. This means the overall service cost and contribution rate would be affected by approx. 2.2% of base salary or € 12 million (2007). And this means a total contribution rate of approx. 29.5% instead of 27.3% of total base salary; the increase just defined on excess salary would be higher.

> These average contribution figures should not be confused with the age-dependant contribution rates for the individuals. The differentiation by age is necessary to avoid negative selection and the associated cost increase.

Annex 3 shows model calculations for the Minimum Benefits Approach for two individuals with different salaries. These examples are different from the examples in the Annex 2, because the contribution amounts for each year are not dependant on the entry age or "option" age; the numbers are also relevant e.g. for a fifty-year-old opter. The relative height of the incentive is determined by the influence of the interest rate; this means the incentive is bigger for contributions in younger years (24% at age of 30) than for later contributions (8% at age of 60). This is justified, because higher salary scales increases have to be compensated by higher SSP contributions in earlier years.

(4) Limitations

Another issue is the limitation to 70% of final salary (or 35 years of service) applicable to the old DB scheme, but hardly justified for the new SSP. The option would certainly be used by employees, who already accomplished 35 years of service and would not have further increases within their old scheme. It might be appropriate to introduce such a 35-years-cap (rather than a 70% cap) also for the opters to avoid such additional cost.

The minimum benefits would also be a wrong incentive to switch to the SSP, because additional costs would emerge, when e.g. employees in the grade C just gained additional SSP contributions and preserved all DB benefits by the help of the minimum benefit regulations. It may be appropriate to limit the option to employees not affected by the minimum retirement benefits – so only employees with salaries above twice C1/3 would receive the option to switch to the SSP, resp. starting from the time point when the employee's salary exceeds the salary ceiling, which is also "actuarially correct", because the opter´s SSP premiums depend on each year's current age.

Each current employee will have to make an individual decision to opt into the new plan or not: There are various possibilities for the time-window for such an option. Limiting the option time is generally difficult if consulting capacities are small.

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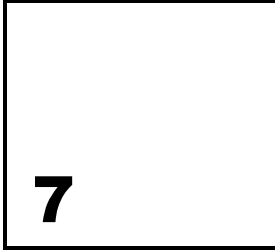
Transfers from Other Institutions

Employees joining the EPO from other national or multi-national institutions often want to transfer existing benefit accruals to the EPO pension plan (inward transfers).

With usually cash transferred, it appears suitable to bring this cash into the SSP. This however, would not be a good idea with regard to the transfer agreements, because only a transfer into a pension plan is mentioned and allowed.

The present procedure can be maintained for transfers into the DB plan, that means the number of reckonable years of service to be taken into account shall be calculated by applying the employee's monthly "pensionable salary" on the transfer date instead of his/her "basic salary". The ceiling in the new DB component may be an obstacle to bigger transfers, so that

> a) either more years of service may be used to compensate this within the new DB component
> b) or that the old DB plan is used for such high transfers.

Solution a) is recommended, because this will be in line with the overall system from 2009 on and incurs the least problems of unequal treatment between outside hires and long-term EPO employees.

Future service accruals can be carried out via the SSP and the new DB component – like for all other new hires. The limitation to 70% of pensionable salary resp. 35 years of service should also be applicable with regard to the "transferred years of service" in the new DB component, despite this increases the probability to reach the 70%-limitation. New hires may rather be inclined to keep their pension entitlement with their previous employer then, what will also help to reduce the DB liabilities of the EPO.

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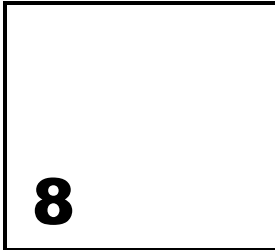
Velocity of the DB Liability Reduction

The transformation incurred by the SSP will take a very long time, because new hires are only a small group in the beginning with relatively small impact (service cost) on the overall schemes. A steady state will be reached when all current employees (and potential widows) will be deceased in approx. 80 years. On an estimated basis, the DB liability will then have reduced to 51% of the current relative level[4] if the Minimum benefits Approach was chosen. This is only a relative reduction, because its overall volume of the DB plan will also increase because the plan is not yet in a steady state, so it may be helpful to note this is partially only a slowdown of the increase and not a reduction. This is especially relevant in the first years, when the new hires only have a very small share in the overall obligation:

		New Staff
Old Staff		
tax adjustment		
III		IV
I		II
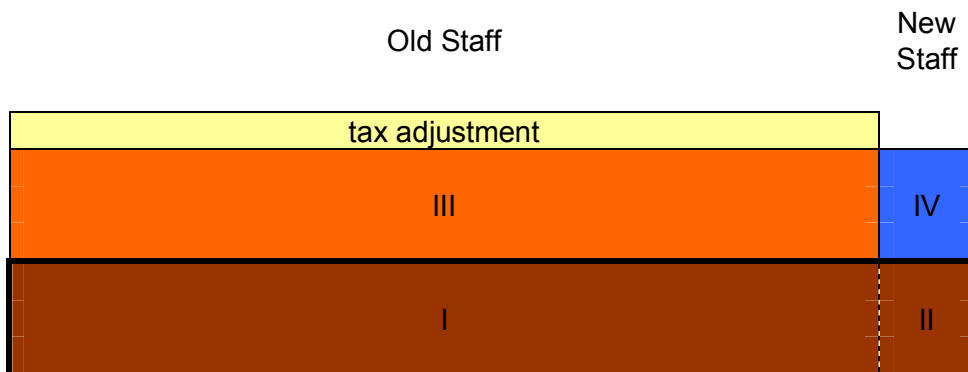
The conclusion of non double taxation agreements also incurs some long-term reduction of the DB liability corresponding to the tax adjustment. This issue will be covered later as required by the EPO.

The transformation will be faster resp. bigger in earlier years when the current staff opts for the SSP. This graph shows the proportions:

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[4] This number relies on the current and future recruitment policy, which is very much concentrated on Grade A, with 80% A-hires in 2007. The reduction is much smaller for B- and C-Grades.

DBO New Plan versus DBO Old Plan (pensions only)
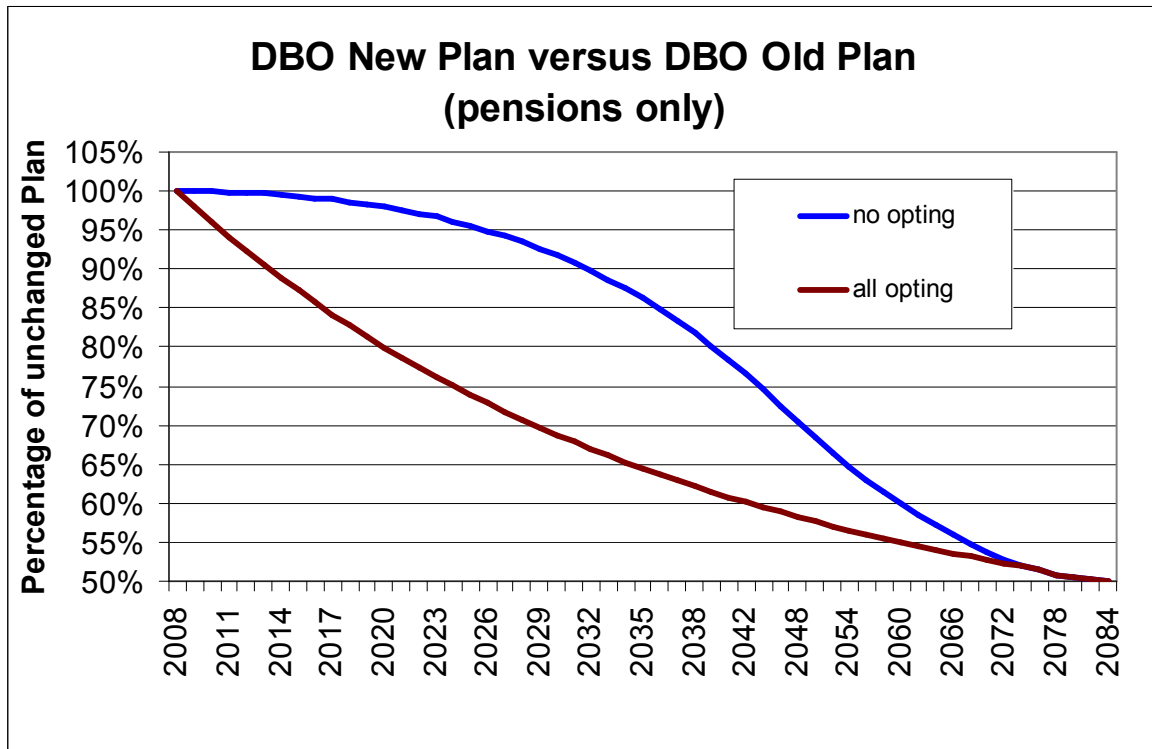
The blue line indicates the relative reduction with new hires only, the red line shows the reduction when all the current staff would opt to serve future service under the SSP. The largest difference between the opters would be in the very first year because this is the year when the old staff has the largest share in the overall population. However, it is always only the future service (=service cost) that is concerned by a change and not the overwhelmingly important past service accrual.

Important is, that it takes very long time until the 50% level of DB liabilities is reached. If current staff does not elect for the new plan, it will take until **all** present employees (and their dependents) died; i.e. 80 years. Even to reach a 75% level will take 35 years: Then all active employees are replaced by new staff, but the pensioners are still the "old" plan participants. Observe that in a steady state over 50% of the DB liabilities will be with pensioners.

This effect can be measured by the following reasoning:

The DB liabilities will only "decrease" by half of the service cost for new staff, because the NPS provides 50% of the overall benefits in the DB plan and in the SSP: If in the first year around 300 employees are hired, then their half service cost may be only around € 3 million. In the second year 6 million (plus some returns), then 12 million (plus some returns). That shows that this is a "very gradual effect" compared to the overall present DB liabilities of around EUR 3.5 billion.

On the other hand (in an unrealistically optimistic scenario), if **all** current employees elected for the NPS with respect to future service, then the annual service cost of around € 150 million would be half; so that each year around € 75 million would go to the SSP. This would decrease DB liabilities annual by around € 75 million each year, what is a big

amount, but still only 2% of the present obligations. Also in this scenario it takes a long time to go to the 50% level.

All abovementioned numbers did not include the lump sum option at retirement granted to new pensioners. With a DBO of approx. € 150 million of new annual retirements in 2008, the lump sum option may provide a substantial contribution to the DB liability reduction. If a 50% lump sum option is offered and half of the new pensioners accept this offer, then the DB liabilities would decrease by approx. € 40 million.

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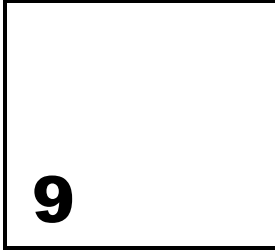
Conclusion

The adoption of the Minimum Benefits Approach needs careful explanation, but it is most suitable to fulfil most of EPO's goals for the reorganization of the existing pension plan. A total shift to the SSP would be helpful to meet the goal of DB liability reduction; however, the side-effects seem not acceptable. The 80%-Approach would only be a small step towards a DB liability reduction.

A disadvantage of the solidarity financing features is the necessity to constantly perform "as-if" calculations to determine the actual contribution rates, also for the SSP. Other disadvantages are the dependence from the current recruitment policy with the concentration on grade A and the individual deviations in benefit levels. The advantages of the Minimum Benefits Approach are the remaining financial solidarity within the One Plan Concept, the uniform SSP contribution percentage, the coverage of all minimum benefits and – most important – the conservation of the cost and benefit allocation of the old DB plan. The initial contributions will be

- for the DB plan approx. 23% of salary parts up to the ceiling and

- for the SSP approx. 27% of total salary less the DB contributions.

The velocity of DB liability reduction depends very much on the use of the transfer and lump sum option by the current staff. Granting incentives for the use of the option would speed up the process; however the associated costs will only be compensated by risk reductions.

Munich, 25 April 2008

Prof. Dr. Raimund Rhiel   Dr. Wolfgang Beck

Annex 1

Profound Actuarial Reasoning

In the current ("old") DB plan of the EPO an employee earns (besides risk and minimum retirement benefits) a benefit of 2% of final salary for each year of reckonable service (up to a number of 35 years).

Minimum retirement benefits are 4% of the salary C1/3, for each year of reckonable service. They are automatically safeguarded, if the employee's salary exceeds the double of C1/3, i.e. if it exceeds EUR 58448.40 (= 2435.35 x 12 x 2). This is the case for the vast majority of employees.

Because pensions and deferred pensions are raised annually in line with general salary increases, actuarial present value calculations can be performed "net of general salary increases", i.e. by using a net discount factor. In the last "Joint Report of the Independent Actuarial Advisory Group" such net discount factor was 3.25%. This would correspond to a nominal discount rate of 5.75%, if general salary increases are assumed to be 2.5% p.a. (i.e. exceeding assumed long-term inflation rate of 2% p.a. by 0.5% p.a.). In this report we will apply this net discount factor of 3.25%, because we suppose that such net discount rate is both realistic and fairly prudent to value future service benefits.

Furthermore, actuarial calculations depend on demographic assumptions, such as invalidity and mortality probabilities (describing longevity), career trends, employee turnover rates and assumed retirement age.

Of special importance is the assumed career trend for an employee's salary: e.g. the average annualized career trend for a 30 year old employee over the next 35 years up to age 65 is 1.9% p.a.

For the purpose of funding the RFPSS the EPO decided to use the so-called projected unit credit method (PUC method).

Under the PUC method, the actuarial present value of a benefit of 2% of final salary for an employee with current age xc is valued by a premium (service cost), which is a percentage ppi_{xc} of current salary, where the actuarial percentage factors ppi_{xc} depend on current age xc and depend (especially) on the assumed projected career trend (see Annex 2). Such premiums (service costs) do generally **increase** by age, which shall be indicated by the letter i in ppi_{xc}. The second letter p shall indicate that **projected** salary (projection with career trend) is used.

ppi_{xc} = **p**ercentage, **p**rojected salary, **i**ncreasing premium, current age xc.

The effective contribution rate under the chosen funding method is an average rate (of currently 27.3% calculated in 2006). Employees contribute one third, i.e. 9.1%.

Some employers do use alternative methods for funding purposes, e.g. the projected entry age normal method (PEAN method). Under the PEAN method the premium

calculated as a percentage ppc_{xe} of current salary shall not increase with age, but shall remain **constant** from entry age xe to retirement age, which shall be demonstrated by the letter c in ppc_{xe}. The second letter p shall indicate that **projected** salary (projection with career trend) is used.

ppc_{xe} = **p**ercentage, **p**rojected salary, **c**onstant premium, entry age xe.

It is also possible to use the <u>current</u> salary (<u>no</u> projection with career trend):

pcc_{xe} = **p**ercentage, **c**onstant salary (no career trend), **c**onstant premium, entry age xe.

If there is a representative (average) entry age xe (e.g. xe = 30), then some employers use such a single age for calculating contribution rates. In a DB plan nevertheless all employees would earn the same benefits, although their entry ages may be different actually. In a DC plan benefits to be earned will depend on entry age.

The following graph demonstrates the service cost allocation over time of the current DB plan without the career trend (still including invalidity benefits). The x-axis shows the age of the employee. The y-axis shows percentages of base salary necessary as contribution to fund the service cost of the respective year.
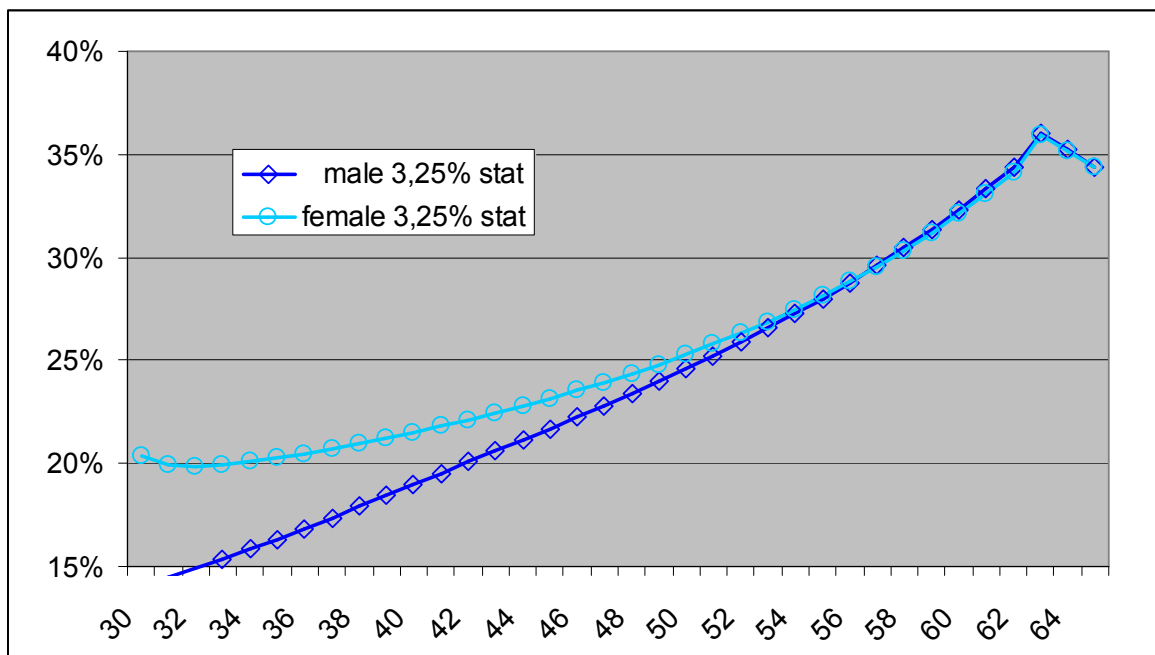
The increase over time is caused by the PUC. Women require higher service cost in the beginning, because women require higher risk benefits – the difference will nearly disappear when the invalidity benefits will be removed from the pension plan, only a small difference will remain primarily because woman often have lower salaries and do rather receive minimum benefits.

The current contribution percentage represents an average service cost percentage over the total EPO population. In contrast to this, a contribution calculated by PEAN does not increase with age (as long as the assumptions prove true).

New hires with salaries above the ceiling do de facto have a partly static DB plan, because the ceiling will only increase in line with the general salary scales (the "specific indicator" defined in the Implementing Rule for Article 64 of the Service Regulations). This can be translated into a discount rate of 3.25% (expected return on assets of 5.75% less 2.5% for expected general salary scale increases).

The picture looks different, when the career trend is considered:
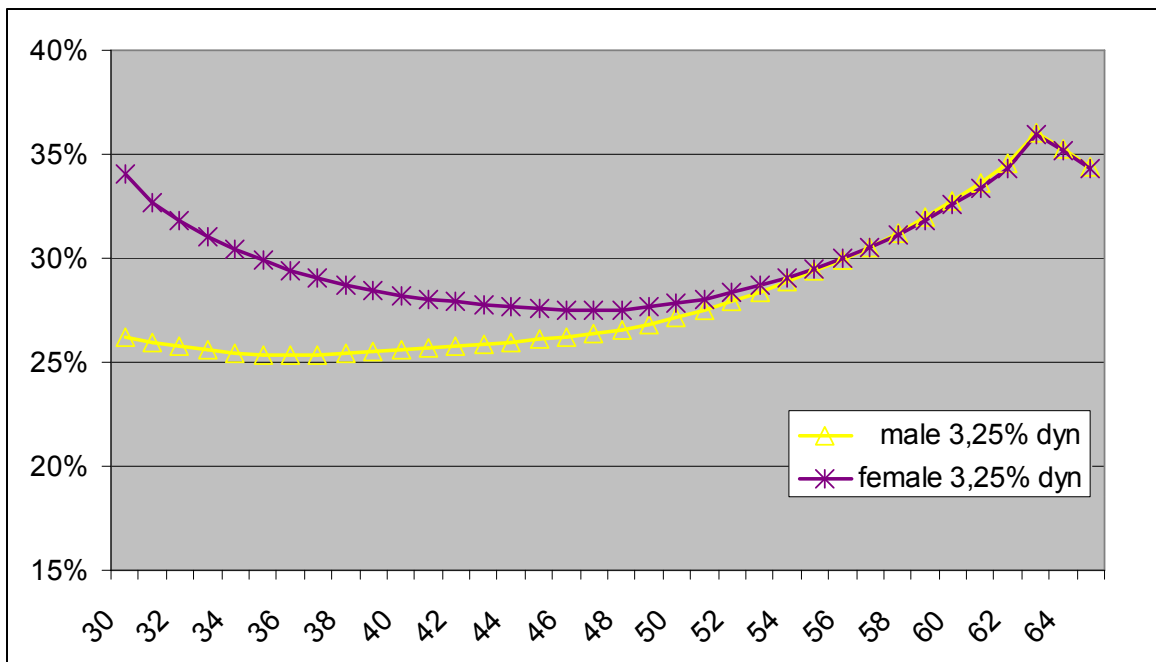
For women, the high career trend in early years nearly equals the age-induced increase in later years. A positive aspect of the career trend is the weakened impact of the de-mixing effect.

Annex 2

Model Calculations

The following three examples show calculations for a model employee with a salary of € 60,000 under the Minimum Benefits Approach. The target in example 1 was to find a constant contribution rate sufficient to produce a similar overall benefit as in the old plan (21.36%). This was done by the transformation with the help of a net present value factor of 18 at the age of 63.

The box on the left hand side simulates the current plan, which results in a pension worth € 1.365 million. This box is the same in all 3 examples. The percentage of 2.76% p.a. represents a net asset return rate after inflation, salary scale increase and compensated risk benefits. The cost for the risk coverage provision is 0.49% p.a. in this example. A higher actual return rate means a higher SSP lump sum payment at retirement and this means the compensation for the reduced risk coverage compared to the old DB plan.

The box on the right hand side simulates the SSP, which results in a lump-sum worth € 0.670 million (example 1) resp. € 0.727 million (example 2) resp. € 0.926 million (example 3). This is more than necessary to compensate for the expected loss in DB benefits in the examples 2 and 3. The percentage of 3.25% p.a. represents the net asset return rate after inflation and salary scale increase. The saved cost for the risk coverage provision results in a compensation of € 0.056 million in lump-sum payment at retirement.

Example 3 applies the historic returns of the RFPSS instead of the uniform rate of 3.25%. The yellow column shows the asset returns after deduction of 2.5% for salary scale increase. The percentages for the first 23 years are the returns of the years 1985-2007 and the percentages for the last 10 years are the returns of the years 1998-2007. This was done because the RFPSS returns only exist since 1985. The surplus over the comparable DB benefit of € 1.580 million is even € 0.255 million in lump-sum payment at retirement in this case.

Asset returns of the past are of course no guarantee for future returns, however example 3 demonstrates a realistic chance for the employees to get a higher overall benefit in exchange for the risk savings of the EPO. Such high asset returns would also result in advantages for the employees in the current DB plan, however they would only take advantage from reduced employee contributions representing a third of the extra returns. An objection may be that the high returns of the RFPSS become less likely with a reduced investment horizon; however, the duration is still long enough for good returns high enough to leave something of this € 0.255 million advantage in the example.

Minimum Benefits Approach - Example 1

Example for male employee, grade A, hired with age **30**, to retire at age **63**:

Salary today at age 30:	**€ 60.000**
salary with career trend at age 63:	€ 114.880
retirement pension at age 63 in old model (**66%**):	€ 75.821
capital value of retirement pension at 63 (**18,0**):	€ 1.364.778
constant contribution rate from 30 to 63:	**27,67%**

New DB element:

pensionable salary today:	**€ 58.448**
pensionable salary at age 63:	€ 58.448
excess salary today:	€ 1.552
excess salary at age 63:	€ 56.432
retirement pension at age 63 in new model (**66%**):	€ 38.576
constant contribution rate on pensionable salary:	**21,36%**
capital value of retirement pension at 63 (**18,0**):	€ 694.362
necessary capital at age 63 from SSP:	**€ 670.416**

Age	Grade A career trend	salary	27,67% contribution	2,76% SSP capital	salary	€ 58.448 pensionable salary	contribution	2,76% SSP capital
20	5,13%							
21	5,23%							
22	5,36%							
23	5,44%							
24	5,47%							
25	5,41%							
26	5,31%							
27	5,09%							
28	4,73%							
29	4,31%							
30	4,03%	€ 60.000	€ 16.602	€ 17.060	€ 60.000	€ 58.448	€ 4.118	€ 4.231
31	3,92%	€ 62.420	€ 17.272	€ 35.278	€ 62.420	€ 58.448	€ 4.787	€ 9.267
32	3,81%	€ 64.864	€ 17.948	€ 54.693	€ 64.864	€ 58.448	€ 5.463	€ 15.137
33	3,69%	€ 67.336	€ 18.632	€ 75.345	€ 67.336	€ 58.448	€ 6.147	€ 21.872
34	3,55%	€ 69.823	€ 19.320	€ 97.275	€ 69.823	€ 58.448	€ 6.835	€ 29.500
35	3,36%	€ 72.298	€ 20.005	€ 120.512	€ 72.298	€ 58.448	€ 7.520	€ 38.042
36	3,15%	€ 74.724	€ 20.676	€ 145.080	€ 74.724	€ 58.448	€ 8.192	€ 47.510
37	2,99%	€ 77.076	€ 21.327	€ 170.993	€ 77.076	€ 58.448	€ 8.842	€ 57.907
38	2,81%	€ 79.382	€ 21.965	€ 198.277	€ 79.382	€ 58.448	€ 9.481	€ 69.248
39	2,64%	€ 81.613	€ 22.582	€ 226.947	€ 81.613	€ 58.448	€ 10.098	€ 81.536
40	2,53%	€ 83.771	€ 23.179	€ 257.021	€ 83.771	€ 58.448	€ 10.695	€ 94.776
41	2,49%	€ 85.889	€ 23.765	€ 288.525	€ 85.889	€ 58.448	€ 11.281	€ 108.985
42	2,40%	€ 88.027	€ 24.357	€ 321.506	€ 88.027	€ 58.448	€ 11.873	€ 124.193
43	2,37%	€ 90.144	€ 24.943	€ 355.998	€ 90.144	€ 58.448	€ 12.458	€ 140.423
44	2,30%	€ 92.277	€ 25.533	€ 392.048	€ 92.277	€ 58.448	€ 13.048	€ 157.707
45	2,18%	€ 94.396	€ 26.119	€ 429.693	€ 94.396	€ 58.448	€ 13.635	€ 176.071
46	2,06%	€ 96.449	€ 26.687	€ 468.959	€ 96.449	€ 58.448	€ 14.203	€ 195.525
47	1,90%	€ 98.438	€ 27.238	€ 509.874	€ 98.438	€ 58.448	€ 14.753	€ 216.082
48	1,66%	€ 100.304	€ 27.754	€ 552.447	€ 100.304	€ 58.448	€ 15.270	€ 237.737
49	1,47%	€ 101.965	€ 28.214	€ 596.665	€ 101.965	€ 58.448	€ 15.729	€ 260.462
50	1,29%	€ 103.463	€ 28.628	€ 642.528	€ 103.463	€ 58.448	€ 16.144	€ 284.240
51	1,23%	€ 104.797	€ 28.997	€ 690.035	€ 104.797	€ 58.448	€ 16.513	€ 309.054
52	1,07%	€ 106.091	€ 29.355	€ 739.219	€ 106.091	€ 58.448	€ 16.871	€ 334.920
53	1,02%	€ 107.222	€ 29.668	€ 790.080	€ 107.222	€ 58.448	€ 17.184	€ 361.822
54	0,97%	€ 108.312	€ 29.970	€ 842.653	€ 108.312	€ 58.448	€ 17.485	€ 389.776
55	0,85%	€ 109.361	€ 30.260	€ 896.973	€ 109.361	€ 58.448	€ 17.776	€ 418.800
56	0,80%	€ 110.289	€ 30.517	€ 953.055	€ 110.289	€ 58.448	€ 18.032	€ 448.889
57	0,72%	€ 111.176	€ 30.762	€ 1.010.934	€ 111.176	€ 58.448	€ 18.278	€ 480.061
58	0,61%	€ 111.982	€ 30.985	€ 1.070.638	€ 111.982	€ 58.448	€ 18.501	€ 512.322
59	0,50%	€ 112.666	€ 31.175	€ 1.132.182	€ 112.666	€ 58.448	€ 18.690	€ 545.668
60	0,50%	€ 113.230	€ 31.331	€ 1.195.582	€ 113.230	€ 58.448	€ 18.846	€ 580.095
61	0,46%	€ 113.794	€ 31.487	€ 1.260.891	€ 113.794	€ 58.448	€ 19.002	€ 615.633
62	0,49%	€ 114.317	€ 31.632	€ 1.328.148	€ 114.317	€ 58.448	€ 19.147	€ 652.300
63	0,00%	€ 114.880	€ 0	**€ 1.364.756**	€ 114.880	€ 58.448	€ 0	**€ 670.303**
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Minimum Benefits Approach - Example 2

Example for male employee, grade A, hired with age **30**, to retire at age **63**:

Salary today at age 30:	**€ 60.000**
salary with career trend at age 63:	€ 114.880
retirement pension at age 63 in old model (**66%**):	€ 75.821
capital value of retirement pension at 63 (**18,0**):	€ 1.364.778
constant contribution rate from 30 to 63:	**27,67%**

New DB element:

pensionable salary today:	**€ 58.448**
pensionable salary at age 63:	€ 58.448
excess salary today:	€ 1.552
excess salary at age 63:	€ 56.432
retirement pension at age 63 in new model (**66%**):	€ 38.576
constant contribution rate on pensionable salary:	**21,36%**
capital value of retirement pension at 63 (**18,0**):	€ 694.362
necessary capital at age 63 from SSP:	**€ 670.416**

Age	Grade A career trend	salary	27,67% contribution	2,76% SSP capital	salary	€ 58.448 pensionable salary	contribution	3,25% SSP capital
20	5,13%							
21	5,23%							
22	5,36%							
23	5,44%							
24	5,47%							
25	5,41%							
26	5,31%							
27	5,09%							
28	4,73%							
29	4,31%							
30	4,03%	€ 60.000	€ 16.602	€ 17.060	€ 60.000	€ 58.448	€ 4.118	€ 4.251
31	3,92%	€ 62.420	€ 17.272	€ 35.278	€ 62.420	€ 58.448	€ 4.787	€ 9.332
32	3,81%	€ 64.864	€ 17.948	€ 54.693	€ 64.864	€ 58.448	€ 5.463	€ 15.277
33	3,69%	€ 67.336	€ 18.632	€ 75.345	€ 67.336	€ 58.448	€ 6.147	€ 22.120
34	3,55%	€ 69.823	€ 19.320	€ 97.275	€ 69.823	€ 58.448	€ 6.835	€ 29.897
35	3,36%	€ 72.298	€ 20.005	€ 120.512	€ 72.298	€ 58.448	€ 7.520	€ 38.633
36	3,15%	€ 74.724	€ 20.676	€ 145.080	€ 74.724	€ 58.448	€ 8.192	€ 48.347
37	2,99%	€ 77.076	€ 21.327	€ 170.993	€ 77.076	€ 58.448	€ 8.842	€ 59.048
38	2,81%	€ 79.382	€ 21.965	€ 198.277	€ 79.382	€ 58.448	€ 9.481	€ 70.755
39	2,64%	€ 81.613	€ 22.582	€ 226.947	€ 81.613	€ 58.448	€ 10.098	€ 83.481
40	2,53%	€ 83.771	€ 23.179	€ 257.021	€ 83.771	€ 58.448	€ 10.695	€ 97.237
41	2,49%	€ 85.889	€ 23.765	€ 288.525	€ 85.889	€ 58.448	€ 11.281	€ 112.045
42	2,40%	€ 88.027	€ 24.357	€ 321.506	€ 88.027	€ 58.448	€ 11.873	€ 127.944
43	2,37%	€ 90.144	€ 24.943	€ 355.998	€ 90.144	€ 58.448	€ 12.458	€ 144.966
44	2,30%	€ 92.277	€ 25.533	€ 392.048	€ 92.277	€ 58.448	€ 13.048	€ 163.150
45	2,18%	€ 94.396	€ 26.119	€ 429.693	€ 94.396	€ 58.448	€ 13.635	€ 182.530
46	2,06%	€ 96.449	€ 26.687	€ 468.959	€ 96.449	€ 58.448	€ 14.203	€ 203.127
47	1,90%	€ 98.438	€ 27.238	€ 509.874	€ 98.438	€ 58.448	€ 14.753	€ 224.961
48	1,66%	€ 100.304	€ 27.754	€ 552.447	€ 100.304	€ 58.448	€ 15.270	€ 248.038
49	1,47%	€ 101.965	€ 28.214	€ 596.665	€ 101.965	€ 58.448	€ 15.729	€ 272.340
50	1,29%	€ 103.463	€ 28.628	€ 642.528	€ 103.463	€ 58.448	€ 16.144	€ 297.859
51	1,23%	€ 104.797	€ 28.997	€ 690.035	€ 104.797	€ 58.448	€ 16.513	€ 324.589
52	1,07%	€ 106.091	€ 29.355	€ 739.219	€ 106.091	€ 58.448	€ 16.871	€ 352.558
53	1,02%	€ 107.222	€ 29.668	€ 790.080	€ 107.222	€ 58.448	€ 17.184	€ 381.758
54	0,97%	€ 108.312	€ 29.970	€ 842.653	€ 108.312	€ 58.448	€ 17.485	€ 412.219
55	0,85%	€ 109.361	€ 30.260	€ 896.973	€ 109.361	€ 58.448	€ 17.776	€ 443.970
56	0,80%	€ 110.289	€ 30.517	€ 953.055	€ 110.289	€ 58.448	€ 18.032	€ 477.017
57	0,72%	€ 111.176	€ 30.762	€ 1.010.934	€ 111.176	€ 58.448	€ 18.278	€ 511.392
58	0,61%	€ 111.982	€ 30.985	€ 1.070.638	€ 111.982	€ 58.448	€ 18.501	€ 547.114
59	0,50%	€ 112.666	€ 31.175	€ 1.132.182	€ 112.666	€ 58.448	€ 18.690	€ 584.193
60	0,50%	€ 113.230	€ 31.331	€ 1.195.582	€ 113.230	€ 58.448	€ 18.846	€ 622.638
61	0,46%	€ 113.794	€ 31.487	€ 1.260.891	€ 113.794	€ 58.448	€ 19.002	€ 662.494
62	0,49%	€ 114.317	€ 31.632	€ 1.328.148	€ 114.317	€ 58.448	€ 19.147	€ 703.794
63	0,00%	€ 114.880	€ 0	**€ 1.364.756**	€ 114.880	€ 58.448	€ 0	**€ 726.668**
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Minimum Benefits Approach - Example 3

Example for male employee, grade A, hired with age **30**, to retire at age **63**:

|	
Salary today at age 30:	**€ 60.000**
salary with career trend at age 63:	€ 114.880
retirement pension at age 63 in old model (**66%**):	€ 75.821
capital value of retirement pension at 63 (**18,0**):	€ 1.364.778
constant contribution rate from 30 to 63:	**27,67%**

New DB element:

pensionable salary today:	€ 58.448
pensionable salary at age 63:	€ 58.448
excess salary today:	€ 1.552
excess salary at age 63:	€ 56.432
retirement pension at age 63 in new model (**66%**):	€ 38.576
constant contribution rate on pensionable salary:	**21,36%**
capital value of retirement pension at 63 (**18,0**):	€ 694.362
necessary capital at age 63 from SSP:	**€ 670.416**

Age	Grade A career trend	salary	27,67% contribution	2,76% SSP capital	salary	€ 58.448 pensionable salary	contribution	SSP capital	historic returns after 2,5% salary scale increase
20	5,13%								
21	5,23%								
22	5,36%								
23	5,44%								
24	5,47%								
25	5,41%								
26	5,31%								
27	5,09%								
28	4,73%								
29	4,31%								
30	4,03%	€ 60.000	€ 16.602	€ 17.060	€ 60.000	€ 58.448	€ 4.118	€ 4.411	7,14%
31	3,92%	€ 62.420	€ 17.272	€ 35.278	€ 62.420	€ 58.448	€ 4.787	€ 9.570	4,04%
32	3,81%	€ 64.864	€ 17.948	€ 54.693	€ 64.864	€ 58.448	€ 5.463	€ 14.001	-6,87%
33	3,69%	€ 67.336	€ 18.632	€ 75.345	€ 67.336	€ 58.448	€ 6.147	€ 21.587	7,14%
34	3,55%	€ 69.823	€ 19.320	€ 97.275	€ 69.823	€ 58.448	€ 6.835	€ 29.468	3,68%
35	3,36%	€ 72.298	€ 20.005	€ 120.512	€ 72.298	€ 58.448	€ 7.520	€ 36.911	-0,21%
36	3,15%	€ 74.724	€ 20.676	€ 145.080	€ 74.724	€ 58.448	€ 8.192	€ 48.481	7,49%
37	2,99%	€ 77.076	€ 21.327	€ 170.993	€ 77.076	€ 58.448	€ 8.842	€ 60.866	6,18%
38	2,81%	€ 79.382	€ 21.965	€ 198.277	€ 79.382	€ 58.448	€ 9.481	€ 79.773	13,40%
39	2,64%	€ 81.613	€ 22.582	€ 226.947	€ 81.613	€ 58.448	€ 10.098	€ 86.438	-3,82%
40	2,53%	€ 83.771	€ 23.179	€ 257.021	€ 83.771	€ 58.448	€ 10.695	€ 105.972	9,10%
41	2,49%	€ 85.889	€ 23.765	€ 288.525	€ 85.889	€ 58.448	€ 11.281	€ 134.723	14,90%
42	2,40%	€ 88.027	€ 24.357	€ 321.506	€ 88.027	€ 58.448	€ 11.873	€ 170.638	16,40%
43	2,37%	€ 90.144	€ 24.943	€ 355.998	€ 90.144	€ 58.448	€ 12.458	€ 202.321	10,50%
44	2,30%	€ 92.277	€ 25.533	€ 392.048	€ 92.277	€ 58.448	€ 13.048	€ 263.182	22,20%
45	2,18%	€ 94.396	€ 26.119	€ 429.693	€ 94.396	€ 58.448	€ 13.635	€ 272.387	-1,60%
46	2,06%	€ 96.449	€ 26.687	€ 468.959	€ 96.449	€ 58.448	€ 14.203	€ 262.803	-8,30%
47	1,90%	€ 98.438	€ 27.238	€ 509.874	€ 98.438	€ 58.448	€ 14.753	€ 219.547	-20,90%
48	1,66%	€ 100.304	€ 27.754	€ 552.447	€ 100.304	€ 58.448	€ 15.270	€ 261.116	11,20%
49	1,47%	€ 101.965	€ 28.214	€ 596.665	€ 101.965	€ 58.448	€ 15.729	€ 300.931	8,70%
50	1,29%	€ 103.463	€ 28.628	€ 642.528	€ 103.463	€ 58.448	€ 16.144	€ 371.612	17,20%
51	1,23%	€ 104.797	€ 28.997	€ 690.035	€ 104.797	€ 58.448	€ 16.513	€ 426.704	9,94%
52	1,07%	€ 106.091	€ 29.355	€ 739.219	€ 106.091	€ 58.448	€ 16.871	€ 451.515	1,79%
53	1,02%	€ 107.222	€ 29.668	€ 790.080	€ 107.222	€ 58.448	€ 17.184	€ 517.912	10,50%
54	0,97%	€ 108.312	€ 29.970	€ 842.653	€ 108.312	€ 58.448	€ 17.485	€ 654.256	22,20%
55	0,85%	€ 109.361	€ 30.260	€ 896.973	€ 109.361	€ 58.448	€ 17.776	€ 661.279	-1,60%
56	0,80%	€ 110.289	€ 30.517	€ 953.055	€ 110.289	€ 58.448	€ 18.032	€ 622.929	-8,30%
57	0,72%	€ 111.176	€ 30.762	€ 1.010.934	€ 111.176	€ 58.448	€ 18.278	€ 507.194	-20,90%
58	0,61%	€ 111.982	€ 30.985	€ 1.070.638	€ 111.982	€ 58.448	€ 18.501	€ 584.573	11,20%
59	0,50%	€ 112.666	€ 31.175	€ 1.132.182	€ 112.666	€ 58.448	€ 18.690	€ 655.747	8,70%
60	0,50%	€ 113.230	€ 31.331	€ 1.195.582	€ 113.230	€ 58.448	€ 18.846	€ 790.624	17,20%
61	0,46%	€ 113.794	€ 31.487	€ 1.260.891	€ 113.794	€ 58.448	€ 19.002	€ 890.103	9,94%
62	0,49%	€ 114.317	€ 31.632	€ 1.328.148	€ 114.317	€ 58.448	€ 19.147	€ 925.525	1,79%
63	0,00%	€ 114.880	€ 0	**€ 1.364.756**	€ 114.880	€ 58.448	€ 0	**€ 925.525**	
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Relative Allocation DB/SSP

The SSP share of the total benefit is higher for employees with salaries far above the ceiling. The following graph also demonstrates the uniform height of the DB pension value. This is because all final salaries are above the ceiling in the Minimum Benefits Approach.
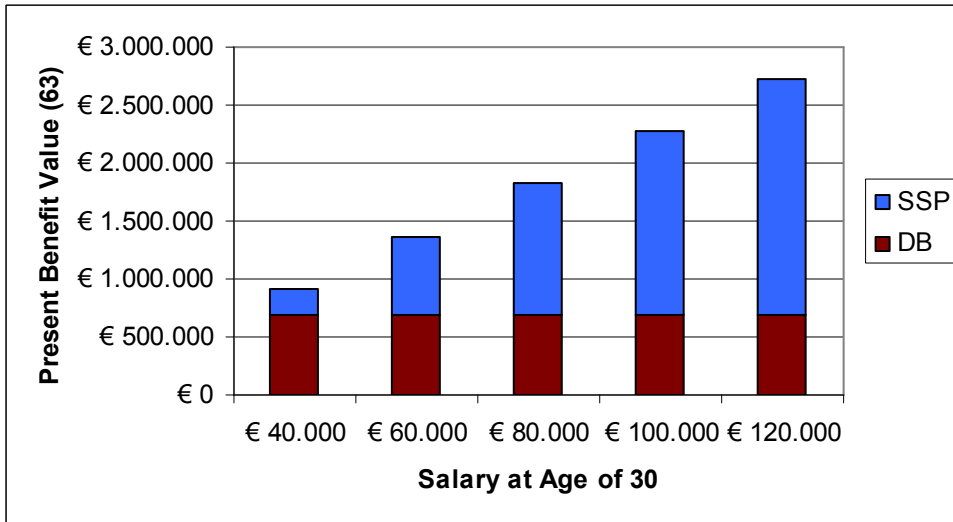
This result is similar in all ceiling approaches. Only the Base Model would not change the relative individual allocation of DB and SSP benefits – the DB share would always be 50% just as the SSP share would also be 50% for new entrants.

Annex 3

Model Calculations

Incentive for Opters - Example 1

Example for male employee
salary today: **€ 60.000**
ceiling for Pensionable Salary (PS)   **€ 58.448**
contribution to SSP = service cost (1) x salary - service cost (2) x PS

Age	service cost (1) without ceil. 2,75%	3,25%	service cost (2) with ceiling 2,75%	3,25%	contribution to SSP 3,25%	2,75%	incentive
65	37%	34%	37%	34%	€ 534	€ 567	6%
64	37%	35%	37%	35%	€ 547	€ 581	6%
63	38%	36%	38%	36%	€ 559	€ 595	6%
62	37%	35%	37%	34%	€ 635	€ 679	7%
61	36%	34%	36%	33%	€ 705	€ 759	8%
60	35%	33%	35%	32%	€ 781	€ 843	8%
59	35%	32%	34%	31%	€ 851	€ 923	8%
58	34%	31%	33%	30%	€ 935	€ 1.019	9%
57	33%	31%	32%	30%	€ 1.034	€ 1.132	10%
56	33%	30%	32%	29%	€ 1.142	€ 1.257	10%
55	32%	29%	31%	28%	€ 1.252	€ 1.385	11%
54	32%	29%	30%	27%	€ 1.374	€ 1.527	11%
53	32%	28%	30%	27%	€ 1.499	€ 1.674	12%
52	31%	28%	29%	26%	€ 1.624	€ 1.821	12%
51	31%	28%	28%	25%	€ 1.771	€ 1.996	13%
50	31%	27%	28%	25%	€ 1.919	€ 2.173	13%
49	30%	27%	27%	24%	€ 2.088	€ 2.374	14%
48	30%	27%	27%	23%	€ 2.277	€ 2.602	14%
47	30%	26%	26%	23%	€ 2.495	€ 2.864	15%
46	30%	26%	26%	22%	€ 2.731	€ 3.150	15%
45	30%	26%	25%	22%	€ 2.974	€ 3.445	16%
44	30%	26%	25%	21%	€ 3.227	€ 3.756	16%
43	30%	26%	24%	21%	€ 3.481	€ 4.069	17%
42	30%	26%	24%	20%	€ 3.732	€ 4.383	17%
41	30%	26%	23%	20%	€ 3.986	€ 4.702	18%
40	30%	26%	22%	19%	€ 4.238	€ 5.023	19%
39	30%	25%	22%	18%	€ 4.496	€ 5.354	19%
38	30%	25%	21%	18%	€ 4.771	€ 5.708	20%
37	30%	25%	21%	17%	€ 5.061	€ 6.084	20%
36	31%	25%	20%	17%	€ 5.365	€ 6.478	21%
35	31%	25%	20%	16%	€ 5.689	€ 6.903	21%
34	31%	25%	19%	16%	€ 6.032	€ 7.353	22%
33	31%	26%	19%	15%	€ 6.388	€ 7.824	22%
32	32%	26%	18%	15%	€ 6.753	€ 8.310	23%
31	32%	26%	18%	14%	€ 7.126	€ 8.810	24%
30	33%	26%	17%	14%	€ 7.512	€ 9.331	24%

Incentive for Opters - Example 2

Example for male employee
salary today: € 100.000
ceiling for Pensionable Salary (PS)   € 58.448
contribution to SSP = service cost (1) x salary - service cost (2) x PS

Age	service cost (1) without ceil.		service cost (2) with ceiling		contribution to SSP		
	2,75%	**3,25%**	**2,75%**	**3,25%**	**3,25%**	**2,75%**	**incentive**
65	37%	34%	37%	34%	€ 14.298	€ 15.179	6%
64	37%	35%	37%	35%	€ 14.634	€ 15.556	6%
63	38%	36%	38%	36%	€ 14.964	€ 15.930	6%
62	37%	35%	37%	34%	€ 14.460	€ 15.468	7%
61	36%	34%	36%	33%	€ 14.158	€ 15.220	8%
60	35%	33%	35%	32%	€ 13.889	€ 15.002	8%
59	35%	32%	34%	31%	€ 13.637	€ 14.799	9%
58	34%	31%	33%	30%	€ 13.425	€ 14.638	9%
57	33%	31%	32%	30%	€ 13.257	€ 14.523	10%
56	33%	30%	32%	29%	€ 13.120	€ 14.440	10%
55	32%	29%	31%	28%	€ 13.002	€ 14.376	11%
54	32%	29%	30%	27%	€ 12.916	€ 14.348	11%
53	32%	28%	30%	27%	€ 12.849	€ 14.338	12%
52	31%	28%	29%	26%	€ 12.792	€ 14.338	12%
51	31%	28%	28%	25%	€ 12.781	€ 14.392	13%
50	31%	27%	28%	25%	€ 12.782	€ 14.458	13%
49	30%	27%	27%	24%	€ 12.824	€ 14.571	14%
48	30%	27%	27%	23%	€ 12.908	€ 14.732	14%
47	30%	26%	26%	23%	€ 13.046	€ 14.957	15%
46	30%	26%	26%	22%	€ 13.219	€ 15.224	15%
45	30%	26%	25%	22%	€ 13.408	€ 15.510	16%
44	30%	26%	25%	21%	€ 13.616	€ 15.824	16%
43	30%	26%	24%	21%	€ 13.829	€ 16.143	17%
42	30%	26%	24%	20%	€ 14.040	€ 16.464	17%
41	30%	26%	23%	20%	€ 14.254	€ 16.792	18%
40	30%	26%	22%	19%	€ 14.466	€ 17.121	18%
39	30%	25%	22%	18%	€ 14.688	€ 17.465	19%
38	30%	25%	21%	18%	€ 14.933	€ 17.841	19%
37	30%	25%	21%	17%	€ 15.202	€ 18.251	20%
36	31%	25%	20%	17%	€ 15.501	€ 18.697	21%
35	31%	25%	20%	16%	€ 15.841	€ 19.199	21%
34	31%	25%	19%	16%	€ 16.219	€ 19.751	22%
33	31%	26%	19%	15%	€ 16.626	€ 20.344	22%
32	32%	26%	18%	15%	€ 17.056	€ 20.970	23%
31	32%	26%	18%	14%	€ 17.508	€ 21.627	24%
30	33%	26%	17%	14%	€ 17.998	€ 22.337	24%

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