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Terje Dammen
Safetec Nordic AS
terje.dammen@safetec.no

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- Endringer i hovedstruktur og vedlegg
- Nye definisjoner
- Annex C – Assessment of loss of main safety functions
- Annec G - Procedure for probabilistic explosion simulation
- Annex H - Environmental risk and environmental preparedness and response analysis

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Hva er nytt?

Endret fokus gir endret struktur inkl. nye vedlegg

Økt detaljgrad i krav-formulering også i normativ del

Flere definisjoner

Fra 119 skal-krav i forrige versjon (normativ del) til over 400 skal-krav

Ulike formål og krav i ulike livsløpsfaser

Retningslinjer (normative og informative) knyttet til beregninger av risiko

- spesielt beregning av tap av hovedsikkerhetsfunksjoner

Noe av det informative i forrige versjon har blitt flyttet til normativ del

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Vedlegg – informativ del i rev 02

Annex A - Risk acceptance criteria
- Noe forkortet i nye Annex B

Annex B - Analysis of causes and consequences of various accidents
- Noe flyttet til nye normativ del

Annex C - Analyses in development and operations
- Mer utfyllende i nye normativ del

Annex D - Recognised data bases and computer software
- Mer utfyllende i nye Annex E
- Ingen dataprogram inkludert

Annex E -Guidelines for cost benefit analysis
- Tatt ut

Annex F - Scenario based system design (SBSD)
- Tatt ut

Annex G - Procedure for probabilistic explosion simulation
- Oppdatert

Annex H Informative references
- Oppdatert i nye Annex A

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Informative vedlegg - 1

- **Annex A** - Informative references
  - lite endringer
- **Annex B** - Risk metrics, criteria and ALARP evaluations
  - Noe mindre om hvert risikomål
  - Inkludert akseptkriterier for miljørisiko
  - Mer om ALARP:
    - Objectives of risk reduction/ALARP process
    - ALARP demonstration process
    - ALARP evaluation principles
    - Scope of ALARP evaluation in different project phases

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Informative vedlegg - 2

Annex C - Assessment of Loss of Main Safety Functions (offshore only)
- nytt detaljert vedlegg
- regelverkstolkning og anvendelse

Annex D - HAZID check list
- nytt vedlegg
- sjekkliste basert på bla ISO 17776 Annex C

Annex E - Recognised data sources
- Mye mer utfyllende
- Ingen programvare

Annex F - Probabilistic Fire Analysis (HOLD)
- skal lages senere

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Informative vedlegg - 3

Annex G - Procedure for probabilistic explosion simulation

- Er oppdatert av egen undergruppe med eksperter fra oljeselskap og konsulenter

Annex H - Environmental risk and environmental preparedness and response analysis

- Nytt vedlegg

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Nye definisjoner

- **area exposed by the accidental event (AEAE), main area, fire area**
- area risk
- average individual risk (AIR)
- barrier element, barrier function, barrier system
- design accidental load
- emergency preparedness assessment
- emergency preparedness philosophy
- emergency response
- emergency response strategy
- environment, environmental impact, recovery time
- **escalation, internal and external escalation**
- **escape route**
- evacuation
- explosion load
- facility
- group individual risk (GIR)
- individual risk (IR)
- hazard
- hazardous event
- immediate vicinity of the scene of accident
- inherently safer design
- intermittently manned, normally unmanned, permanently manned
- **main load bearing structures**
- major accident
- normalisation
- risk assessment , evaluation, picture
- **rooms of significance to combating accidental events**
- **safe area**
- safety barrier
- safety function
- safety objective
- system
- system basis
- system boundaries

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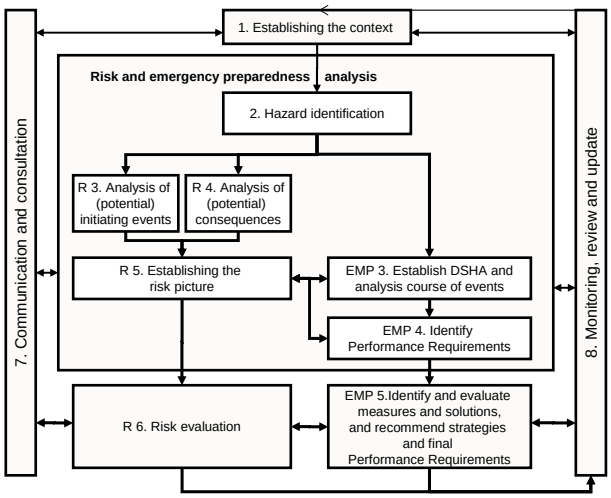
Risk and emergency preparedness assessment process



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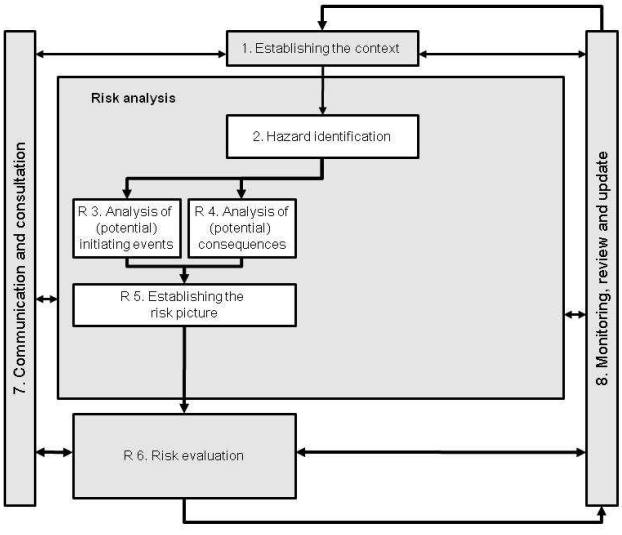
Risk assessment process



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QRA i ulike faser

Detaljerte krav til hver ulykkestype

- initierende hendelse
- konsekvens

Krav i ulike faser:

- Gjentagende krav fra generell del (referanse)
- Økende detaljgrad og flere krav, med økende grad av informasjon tilgjengelig

Operasjonsfasen

- Oppdatering
- Sensitivitetsanalyser - effekt av avvik fra forutsetninger

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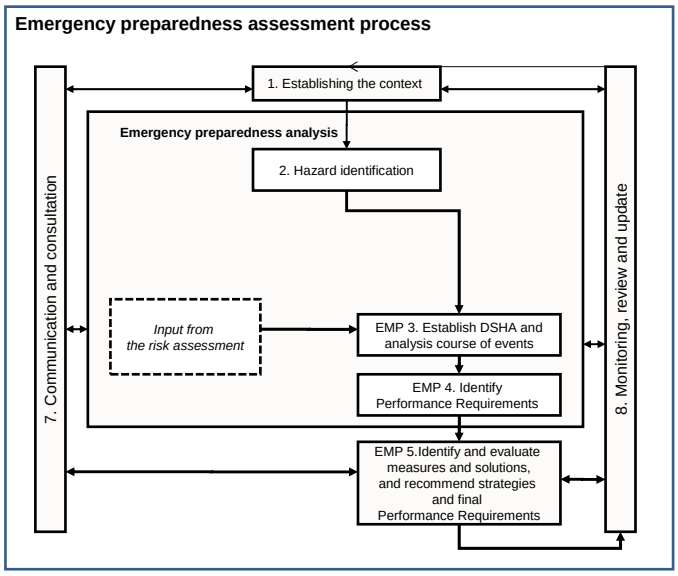

Formål med EPA i ulike faser

Konseptvalgsfase:

- Innspill til sammenligning og rangering av konsept
- Identifisere mulige konsept stoppere

Konsept definisjon, optimalisering og detailed engineering faser:

I tidlige faser, basis for

- Optimalisering av valgt konsept
- EER løsninger

I sene engineeringsfaser og **operasjons**fasen:

- Etablering og strukturering av responsstrategier, ytelseskrav for beredskap, beredskapsorganisasjonen og tiltak
- Minimumskrav til organisatorisk respons
- Basis for beredskapsplan
- Innretningsspesifikk trenings- og øvelsesplaner

Annex C – Assessment of Loss of Main Safety Functions

- Definisjoner
- Regelverkskrav og tolkninger
- Fremgangsmåte

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Viktige definisjoner - 1

fire area

an area separated from other areas on the facility, either by physical barriers (fire/blast partition) or distance, which will prevent a dimensioning fire to spread.

main area

a defined part of the facility with a specific functionality and/or level of risk.

Note 1: A main area may consist of one or several fire areas.

Note 2: The defined main areas shall be separated by distance, by use of physical barriers as fire and blast divisions or by a combination of these to prevent external escalation.

Note 3: For an offshore installation the following main areas shall as a minimum be defined when relevant: a) Accommodation (living quarter), b) Utility, c) Drilling and wellhead, d) Process and e) Hydrocarbon storage.

Note 4: For a land-based facility the following main areas shall as a minimum be defined when relevant: a) Administration building, b) Central control room, c) Process area, d) Utility area, e) Storage area, f) Loading/unloading area and g) Landfall.

Note 5: Some of the above listed main areas in Note 3 and 4 may for some facilities be divided into two or several main areas due to other requirements (e.g. requirements related to fire water coverage and/or capacity or the level of risk on the facility). This may typically be relevant for large process areas.

area exposed by the accidental event (AEAE)

the area(s) on the facility (or its surroundings) exposed by the accidental event.

NOTE 1 - An area (fire area or main area) shall be considered included as a part of the AEAE if the AE may cause loss of life or damage to health and/or assets in the area. The AEAE may be limited to a single fire area, or it may include several fire areas or several main areas.

NOTE 2 - For some AE the AEAE may expand after a period of time due to the evolvement of the accidental event (e.g. due to impairment of a fire wall after a period of time).

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Viktige definisjoner - 2

escalation

when the area exposed by the accidental event (AEAE) covers more than one fire area or more than one main area escalation has occurred.

Note 1: The definition of escalation covers both a) immediate escalation: escalation due to the initial accidental event (e.g. an initial explosion causing impairment of a fire and/or explosion wall separation two neighbouring areas) and b) Delayed escalation: escalation occurring at any time after the initial accidental event has occurred (e.g. a fire causing the impairment of a fire wall separation two neighbouring areas after a period of time).

Note 2: An escalation is either internal or external

internal escalation

when the area exposed by the accidental event (AEAE) covers more than one fire area within the same main area internal escalation has occurred

external escalation

when area exposed by the accidental event (AEAE) covers more than one main area, external escalation has occurred.

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Regelverk – hovedsikkerhetsfunksjoner - 1

Facility Regulations (3rd September 2001), Section 6: Main safety functions, paragraph 1: *The main safety functions shall be defined unambiguously in respect of each individual facility in order to ensure the safety for personnel and to limit pollution.*

Area of application/interpretation:

This requirement applies to all phases of the offshore petroleum activities and to all offshore facilities regardless of when the facility was build/used the first time, and regardless of whether they are permanently manned or not.

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Regelverk – hovedsikkerhetsfunksjoner - 2

Facility Regulations (3rd September 2001), Section 6: Main safety functions, paragraph 2: *With regard to permanently manned facilities the following main safety functions shall be maintained in the event of an accident situation:*
a)preventing escalation *of accident situations so that personnel outside the immediate vicinity of the scene of accident, are not injured,*
b)maintaining the ***main load carrying capacity*** *in load bearing structures until the facility has been evacuated,*
c)protecting ***rooms of significance*** *to combating accidental events, so that they are operative until the facility has been evacuated,*
d)protecting the facility's ***safe areas*** *so that they remain intact until the facility has been evacuated,*
e)maintaining at least one ***escape route*** *from every area where personnel may be staying until evacuation to the facility's safe areas and rescue of personnel has been completed.*

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Anvendelses/tolkning - 1

applies to all phases of the offshore petroleum activities and to all offshore facilities regardless of when a facility was build/used the first time

only to permanently manned

'preventing escalation'

- external escalation between the defined main areas.
- applies to each division established between each main area.

'main load carrying capacity'

- cause significant deformation or collapse of the entire or any major part of the facility.
- assessed globally for the entire facility.

'rooms of significance'

- applies to each such room.

'safe areas'

- applies to each defined safe area.

'escape route'

- applies to the escape possibilities from manned parts of each main area to the defined safe are(s)
- at least one escape route from central positions in the main area to the defined safe area(s) shall be available
- except form the main area where the accident was initiated

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Anvendelses/tolkning - 2

The time period for which each of the five defined main safety functions (as a minimum) shall be intact/maintained are:

- For main safety function a) '**preventing escalation'** and e) '**escape routes'**: The time required to escape to the defined safe area(s) and the time required to perform search and rescue of personnel. This applies to personnel located in other areas than the main area where the accident was initiated.
- Main safety function b) '**main load carrying capacity'**, c) **'rooms of significance'** and d) **'safe areas'**: The time required includes the time to escape and evacuate the whole facility in a safe manner, including the time required to perform search and rescue of personnel.

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Ulykkes- og miljølaster

The following accidental and environmental load categories **shall** be used when distinguishing between different types of hazards and loads that **shall** be assessed and compared separately against the defined risk acceptance criteria for loss of main safety functions:

- Heat loads (e.g. due to HC processing leaks, riser/pipeline leaks, blowouts or fires in combustible materials).
- Smoke and toxic loads (e.g. due to HC processing leaks, riser/pipeline leaks, blowouts or fires in combustible materials).
- Explosion loads (any kind of explosion). This includes static pressure loads, dynamic pressure loads etc.
- Impact loads (e.g. collision loads from vessels, helicopters drifting icebergs etc, dropped object loads from lifting operations, falling ice etc.)
- Extreme environmental loads (design load principles according to N-001) such as:
  - from wind, wave, current
  - earthquake

Other accidental and environmental load categories (e.g. to cover loads from nuclear accidents, gross error, ballasting failure etc) **shall** be considered when relevant.

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Regelverk – Akseptkriterier - 1

Management Regulations (3rd September 2001), Section 6: Acceptance criteria for major accident risk and environmental risk: *The operator shall set acceptance criteria for major accident risk and environmental risk. Acceptance criteria shall be set for:*

.....

b) the loss of main safety functions as mentioned in the Facility Regulation Section 6 on Main safety functions

Area of application/interpretation:

This requirement applies to all phases of the offshore petroleum activities and to all facilities regardless of when a facility was build/used the first time, and regardless of whether a facility is permanently manned or not.

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Regelverk – Akseptkriterier 2

Facility Regulations (3rd September 2001), Section 10: Loads, load effects and resistance: *... Accidental loads and environmental loads with an annual probability greater than or equal to 1x10^{-4} shall not cause the loss of a main safety function cf. Facility Regulation Section 6 on main safety functions….*

Area of application/interpretation:

The '1x10^{-4} criterion' applies to offshore petroleum facilities build in accordance with the 2001 regulations regardless of whether a facility is permanently manned or not. Offshore petroleum facilities build in accordance with regulations issued prior to the 2001 regulations may use another annual probability than 1x10^{-4} as their risk acceptance criteria related to loss of main safety functions.

The risk acceptance criterion related to loss of main safety functions (regardless of whether the criterion is 1x10^{-4} or another annual probability) applies to the loss of <u>each</u> main safety function, due to <u>each</u> accidental or environmental load category.

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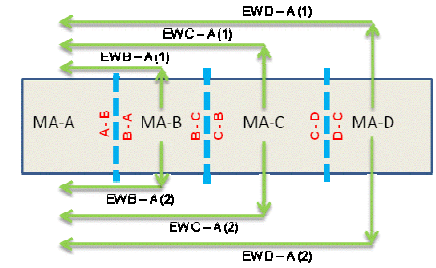
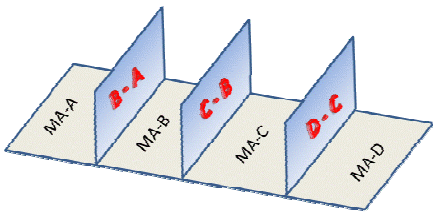
Hvordan utføre beregningene





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Fremgangsmåte

1. Identify all accidental events which may expose/threaten the main safety function of interest, including their potential evolvement during the period of time for which the main safety function (as a minimum) shall be intact or maintained.
2. Identify the appurtenant environmental and accidental loads.
3. Compare the environmental and accidental loads with the design specifications (or current design).
4. Identify which scenarios/accidental events that may cause the impairment of the main safety function.
5. Based on the above, identify the probability for impairing the main safety function for each of the defined accidental and environmental load categories.
6. Compare the results from point 5 for each defined accidental and environmental load categories with the established risk acceptance criteria ($1x10^{-4}$ per year).
7. For safety function a), c), and e) repeat point 1. to 6. for each subset of the main safety function (e.g. each side of each fire and/or explosion wall separating main areas on the facility).

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Summere flere ganger?

The contributions due to loss of another main safety function shall not be included when assessing the loss of each specific main safety function.

This does not mean that accidents causing loss of several main safety functions shall only be ‘counted’ once.

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Eskalering

An accident or environmental load category which origin in one main area on the facility shall not cause external escalation (escalate into another main area on the facility) before escape and rescue in/from the other main area has been completed. **External escalation in this respect means that the area exposed by the accidental event (AEAE) covers more than one main area.**

Failure of this main safety function shall include the probability of external escalation due to failure of a physical barrier between the main areas, and external escalation into a neighbouring main area due to insufficient extent of barriers between the areas. All requirements related to the fulfilment of the **safety function** (integrity, functionality, capacity, etc) should be considered. An assessment of e.g. the radiation from a fire compared to the applied passive fire protection on a wall alone is therefore not necessarily sufficient.

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Hovedbæreevne

A defined accidental and environmental load category shall not cause impairment of the installations main load bearing structure or stability (relevant for floaters) before the facility has been evacuated, including the time required to perform search and rescue of personnel. The criterion is valid for the whole facility. All structure which when impaired may cause box girder or chassis to collapse shall be accounted for. Hence, loss of support structure for equipment etc. shall not normally be accounted for.

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Rom som er av betydning for bekjempelse av ulykkehendelser

An accident load category shall not cause impairment of a room which is of significance for the ability to combat the accident before the facility has been evacuated, including the time required to perform search and rescue of personnel.

The Central Control Room (CCR) is an example of a room that typically will be defined as significance for the ability to combat the accident. But other rooms such as fire pump rooms, electrical rooms, emergency generator rooms, etc. could also be of importance to combat an accident as such rooms could have functions that are more or less critical to maintain in order to combat the accident.

When assessing the loss of this main safety function consideration should be made with respect to the function and role each room have in maintaining one or several functions. If it is identified that the loss of one particular room (in the event of an accidental event) may reduce or remove the facilities ability to maintain safety critical functions, measures shall be implemented in order to reduce or eliminate such situations from occurring.

However, considerations related to the design of each room (that may have an effect on the facilities ability to maintain safety critical functions) is not to be considered as a part of the assessment of this main safety function, as it is assumed that normal design in accordance with the regulations will provide the appropriate level of protection of such rooms.

The assessment of loss of this main safety functions shall therefore only include the assessment of loss of CCR and other rooms manned during the combating of the accident. Rooms where the BOP operation panel is located may be one such room (given that the panel is to be operated during the combating of the accident). Although it is expected that rooms not manned during the combating of an accident are assessed and designed in an suitable manner, such rooms (not manned during the combating of an accident) shall, as stated above, not be accounted for when assessing the loss of this main safety function.

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Sikre områder

An accident load category shall not cause impairment of the defined safe area(s) before the facility has been evacuated, including the time required to perform search and rescue of personnel. The criterion is valid for each safe area defined, given the set of situations/accidental events that each area is defined to be used.

Some facilities, typically minor stand-alone offshore facilities, may only have one defined safe area to be used for all possible accidental events that may occur. Other facilities, typically large onshore plants or bridge connected installations, may define and use different safe areas depending on the situations. A typical approach is to use a bridge to a neighbouring installation(s) for all situations (requiring mustering of personnel) that do not impair of threaten the bridge, and to define a safe area on the neighbouring installation(s) for those situations. For events which impair or could impair the bridge, other safe areas on the facility may be defined.

Rømningsveier

The availability of at least one escape routes from central positions in all main areas, except the main area where the accident was initiated, shall not be impaired due to any accident or environmental load category which origin in another main area before the main area (not initially exposed by the accidental event) has been evacuated and rescue of personnel in the area has been completed. This requirement applies to all main areas permanently or intermittently manned.

Loss of escape possibilities from the main area that is initially exposed by the accidental event (i.e. in the period before the event escalates) shall not be included in the assessment of loss of this main safety function. Nor shall the assessment include loss of escape possibilities from areas not permanently or intermittently manned.

The requirement applies to the entire escape route, from the central position in the main area to the safe area.

Annex G - Endringer

Egen presentasjon

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Annex H - Environmental risk and environmental preparedness and response analysis - Informative

- Hovedprinsippene for miljørisiko-, beredskaps- og responsanalyse
  - Skiller mellom offshore og onshore anlegg
- Krav til inputdata for miljørisikoanalyse
- Metodebekrivelse for miljørisikoanalyse
- Metodebeskrivelse for beredskaps- og responsanalyse – bør integreres med miljørisikoanalysen
  - Dimensjonerende tiltak
  - Abefalte tiltak

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Vi kom i mål til slutt!

standard norge

ESRA

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Hva tok vi med oss fra sist vi var her? …… og ikke minst, hva har vi gjort noe med?

Risiko:

- Få konkrete krav
- Mye lærebokstoff
- Bør bli konsistent… uavh. av den som gjennomfører
- Økt fokus på å synliggjøre hvordan analysene blir/er brukt i beslutnings- prosesser
- Formålstjenlig
- Vurdere og synliggjøre usikkerhet
- Krav til ALARP-vurderinger (prosess og dokumentasjon)
- Ulike utfordringer i ulike faser

Beredskap

- Analysen påvirker lite beredskapsløsninger i driftsfasen
- Analyse tilpasset fase
- Selskapsspesifikke metoder og tilleggskrav
- Valg av tiltak uavh. av analyse
- Personell med for mange beredskapsoppgaver
- Beredskap og ALARP