

CLAIMS

1. A shallow water desalination system comprising:
a subsea desalination template (20) adapted to be located on a seabed, including
5 at least one Reverse Osmosis (RO)-module zone (23), at least one RO-module
connection (24) and desalination template piping (27) in fluid connection with the
at least one RO-module connection (24);
at least one retrievable subsea RO-module (4) adapted to be placed in the at least
one RO-module zone (23) of the subsea desalination template (20), the at least
10 one retrievable subsea RO-module (4) including a RO- template connection (36)
adapted to be connected to the at least one RO-module connection (24), and at
least one RO-cartridge assembly (3) in fluid connection with the RO-template
connection (36);
at least one seawater booster pump assembly (1) with an inlet and an outlet
15 adapted to be in fluid connection with a seawater inlet side of the at least one RO-
cartridge assembly (3);
at least one retrievable subsea booster module (2) including at the at least one
seawater booster pump assembly (1);
at least one booster module template connection (34) on the at least one
20 retrievable subsea booster module (2), adapted to be connected to a booster
module connection (22) on a template with a booster module zone (21);
at least one desalinated water line (43) adapted to convey desalinated water from
the at least one retrievable subsea RO-module (4) to a location above a sea level;
and
25 a pressure regulator (11) in fluid connection with a retentate side of the least one
retrievable subsea RO-module (4).
2. The shallow water desalination system of claims 1, wherein the template with a
booster module zone (21) is the desalination template (20).
- 30 3. The shallow water subsea desalination system of claim 1, further including:

at least one desalinated water transport pump assembly (5) in fluid connection with a desalinated water side of the at least one RO-cartridge assembly (3) in the retrievable subsea RO-module (4).

5 4. The shallow water desalination system of claim 3, wherein the at least one seawater booster pump assembly (1) and the at least one desalinated water transport pump assembly (5) are located in the booster module (2).

10 5. The shallow water desalination system of any of the claims 3, wherein the at least one desalinated water transport pump assembly (5) is located in a retrievable subsea desalinated water transport module (6); and wherein the retrievable transport module (6) is adapted to be located in a desalinated water transport module zone (25).

15 6. The shallow water desalination system of any of the preceding claims wherein the pressure regulator (11) includes an energy recovery assembly (9).

20 7. The shallow water desalination system of claim 6, wherein the energy recovery assembly (9) is located in a separate retrievable energy recovery module (10).

25 8. The shallow water desalination system of claim 6 or 7 wherein the energy recovery assembly (9) includes a turbine aggregate with a turbine and one of an electric generator and a mechanical connection through a transmission to the booster pump or the transport pump.

30 9. The shallow water desalination system of any of the preceding claims, further including at least one retrievable control module (86) located in at least one control module zone (39) on the desalination template (20).

35 10. The shallow water desalination system of any of the preceding claims, further including a prefilter assembly (7) in a retrievable prefilter module (8) upstream of the booster pump assembly (1).

11. The shallow water desalination system of claim 10, wherein the retrievable prefilter module (8) includes a filter (17) and is located on a separate filtering and pumping station (46), and wherein the booster module (2) is located on the filtering and pumping station (46) upstream and in fluid connection with the desalination template (20).

12. The shallow water desalination system of claim 5, wherein at least one separate pump template (46) with the at least one transport module (6) is located on a downstream side of the at least one subsea desalination template (20) and includes a desalinated water inlet and a desalinated water outlet, whereby the separate pump template (46) with the at least one transport module (6) is adapted to convey the desalinated water from the desalination template (20).

13. The shallow water desalination system of claim 5, wherein at least one separate pump template (64) with the at least one transport module (6) is located on a downstream side of the at least one subsea desalination template (20) and includes a desalinated water inlet and a desalinated water outlet, whereby the separate pump template (64) with the at least one transport module (6) is adapted to convey the desalinated water from the desalination template (20).

14. The shallow water desalination system of any of the preceding claims, further including a permanent seabed foundation (85) secured to seabed anchoring elements (30), and wherein any of the subsea templates are adapted to be located on top of the permanent seabed foundation (85).

15. The shallow water desalination system of claim 1, wherein any of the subsea templates are adapted to be located on a further base template (80) in fluid connection with the desalinated water pipeline (43) and a concentrated seawater outlet (44).

16. The shallow water desalination system of claim 15, wherein the further subsea base template (80) is adapted to be located on top of a permanent seabed foundation (85).

17. A subsea desalination booster module (4) for a desalination system of claim 1, comprising at least one seawater booster pump assembly (1) with an inlet and an outlet adapted to be in fluid connection with a seawater inlet side of at least one RO-cartridge assembly (3); and
- 5 at least one booster module template connection (34) on the at least one retrievable subsea booster module (2), adapted to be connected to a booster module connection (22) on a template with a booster module zone (21).