Q&A Osmotic power – updated 5 November 2009

How does osmotic power work?	When freshwater and seawater meet on either side of a membrane, the natural phenomenon of osmosis will cause the freshwater to be drawn towards the seawater side. The membrane only allows freshwater to flow trough and stop the saltwater. Thus creating a pressure on the seawater side that can be used to drive a turbine. The pressure is 12 BAR, equivalent to a 120-metre waterfall.
What are the advantages of osmotic power, compared to other energy sources?	Osmotic power is a renewable, environment-friendly energy source. Power plants can in principle be built anywhere freshwater meets seawater. They can generate power 24/7, regardless weather conditions.
What are the most important parts of an osmotic power plant?	The membrane is the heart of the technology, while a turbine is needed to generate electricity, as well as pumps and pipes to transport water throughout the plant. The plant also comprises a water cleaning unit (to prevent clogged/damaged membranes) and a cleaning unit for the membranes (which must be washed regularly).
What is the production potential?	According to our calculations, osmotic power has a global potential of 1600-1700 TWh annually, or equivalent to 50 per cent of current power production in the EU. The potential is approx. 180 TWh in Europe and 12 TWh in Norway.
Why has Statkraft decided to invest in osmotic power?	This is in line with our vision of meeting the world's need for cleaner energy. At the same time, we can exploit our hundred years of experience in using river water and turbines to generate power.
Is your facility at Tofte the world's first osmotic power prototype?	This is the first time anyone has generated electricity by mixing freshwater and seawater.
How is the prototype constructed?	The prototype consists of membranes, pipes, a cleaning unit, pressure exchangers and a turbine. The plant is modular and consists of 66 pressure pipes with rolled-up membranes on the inside. The advantage of a module-based plant is that parts of the facility can be taken out of operation for cleaning and maintenance while the rest of the facility remains in operation. The Tofte prototype holds a total of 2000 m2 of membranes.
What is the membrane's efficiency?	The one we are going to test now has a efficiency of less than 1 watt per square metre, but we plan to install membranes that can deliver 2-3 watts after we have run the plant for awhile. The objective is to reach 5 watts.
How much electricity will the prototype generate?	It's designed for 10 kW, but will initially be around 2-4 kW, enough to operate a coffee-maker.

Will the plant be connected to the grid?	Whatever we generate will be supplied to the Hurum Energiverk power grid.
When will Statkraft build a full-scale osmotic power plant?	The prototype will be in operation for 2-3 years, the next phase is a 1-2 MW pilot facility, before we build a full-scale facility, if viable. The ambition is to build a full-scale osmotic power plant in 2015.
What do you need to build a full-scale power plant?	First and foremost, the membrane must be better. We must also be able to transfer the pressure to the turbine without using too much of the energy in the system. Membrane performance must be increased up towards 5 watts per square metre.
What will a full-scale power plant look like?	A power plant the size of a football stadium could have a capacity of 25 MW, which would require five million square metres of membrane. The plant could produce 166 GWh of electricity per year – enough to supply 30 000 European households.
How much water is needed for a full-scale plant?	To achieve an output of 1 MW, one cubic meter of freshwater (per second) must be mixed with two cubic meters of seawater at 12 bar. This means that a typical 25 MW plant will need 25 m3 of freshwater and 50 m3 of seawater per second. As the technology is based on modules, the power plant can be scaled up or down according to the available resources.
Where are possible building sites in Norway?	Anywhere where clean freshwater runs into the sea. Preferably close to consumers/the grid. Most relevant in Western Norway and northwards along the coast, where the water in the rivers is often very clean.
Which parts of the world have the best conditions for production of osmotic power?	All areas of the world that have ample access to both freshwater and saltwater. In the northern hemisphere, this is particularly interesting for Scandinavia, Russia and Canada because of the water resources. Comparable resources also exist in South America and Africa.
Who came up with the idea of developing osmotic power?	The late US professor Sidney Loeb had the idea to use membranes for desalination in the early 1970s when he discovered that a similar process could be used to generate power, that is, osmotic power. Back then, power prices were so low that no one was interested in investing to develop the technology. Later on, the researchers Dr. Thor Thorsen and Dr. Torleif Holt at SINTEF began to research osmotic power. These men contacted Statkraft in 1996, which led to the beginning of the development up to the present day.