Which solar water heating system is best for New Zealand conditions?

"Although the value of COP (Co-efficient of Performance). effectively determines the overall performance of the tested systems and allows comparisons to be made, it is of more use to potential buyers of solar and heat pump systems to compare financial figures which incorporate both performance and the costs of the systems. For Dunedin the evacuated tube system gives an attractive Internal Rate of Return (IRR) of 9.0% and a positive Net Present Value (NPV) of $936 using a discount rate of 5% (after tax). The heat pump system in Dunedin also gives a positive NPV of $263, while both flat-plate models give negative NPV's. For the Auckland estimation the evacuated tube system still yields the most favourable economic result with an IRR of 10.3% due to its low capital cost, despite having a slightly lower COP than both the heat pump or flat-plate thermosyphon systems. In the Auckland location all systems except the flat-plate pumped circulation system give attractive economic results. "

"The main conclusion from this study is that it is important to test actual systems before making any assumptions about energy savings and or economic performance. In particular it can be seen that the high cost of installed systems in NZ makes it difficult for them to achieve good economic return on capital. It is also clear that evacuated tube systems need to be taken into serious consideration as a preferred system type, especially for the cooler parts of the country. The performance of the flat-plate pumped circulation system has proved to be highly suspect and possibly dependant on the fact that it was a 'retrofit' installation to an existing domestic hot water cylinder.

This is an important finding, as there are no on site performance tests for solar hot water systems undertaken and many New Zealand systems may be seriously underperforming, perhaps unbeknown to the house owner."

Source:

Experimental and Simulated Performance of Commercially available Solar and Heat-pump Water Heaters in New Zealand - *S.E. Thomas and C.R. (Bob) Lloyd, Energy Management Department, University of Otago*

Commentary:

This report indicates that there may be serious performance issues with flat plate panels; especially with those that are retrofitted to existing hot water cylinders. This report does not take account the almost universal and progressive corrosion of flat panel surfaces that begins to become visible and within months of installation in some cases.

There is also a further progressive loss of performance over the years on non-heat exchange flat panel systems caused by internal corrosion and build-up of deposits on the internals of the system. Heat exchange systems that use liquids like glycol in them are more expensive and this

must be taken account when comparing performance to initial cost and return on investment over the years.

From a straight dollar return on investment, it is difficult to recommend any kind of flat panel system at this stage. As the report indicates, more research is required because "many New Zealand systems may be seriously underperforming".

Evacuated Solar Tubes

The evacuated solar tube systems look very promising and I met a number of very satisfied owners. While their durability in the NZ setting still needs to be confirmed, inspection of existing setups in the Wellington Region show that they are promising. As the study referred to above indicates, these systems crank out the heat and do so in poor light conditions.

In their favour is their relative low initial cost and ease of installation. However; I am very cautious to make a recommendation as to which brand to go with and caution that cheaper is not necessarily best - And not all evacuated tube systems have the same performance as the best of them. So I have been advised by industry experts.

Not all evacuated tubes are the same, as is the case with flat panel systems. You get very much get what you pay for and that there are any number of cheap Chinese made systems available that should be treated with caution, although not discounted outright. Similarly, you should be wary that there may be brands passing themselves off as European when in fact they are Chinese made components and may not be of the same quality as those European made systems. You are seeking a system that will last as long as two decades, so take care.

Ensure that the tubes meet the NZ and Australian standards for roof mounted structures with regards to resistance to hail damage.

Because each tube is independent of the other, the owner can easily remove and replace a damaged tube. These tubes are delicate but light weight. This amounts to being able to provide ongoing onsite maintenance; whereas replacement of a heavy flat panel that is faulty is quite an exercise and each unit is costly. This ease of servicing makes sense for a roof mounted system that has to last for decades.

Damaged tubes are recyclable which is a huge plus for the green household.

My recommendation is to look closely and carefully at the emerging evacuated tube technology when shopping around for a solar water heating system.
Here is an interesting TV3 video item worth looking at. Of course, what it is telling you, the viewer, is based on the assumption that all panels will still be working efficiently 5 years later! Take care when selecting what is best for you.