

**APPLICATION FORM**  
**Mistra Innovation 2013**

(Submit electronically by 10 April 2013)

***Project title:***

***Main applicant (to whom all correspondence will be addressed)***

Family name:

Other names:

Date of birth:

Full work address:

Phone:

Mobile:

Email:

***Primary researcher (at hosting academic institution)***

Family name:

Other names:

Date of birth:

Full work address:

Phone:

Mobile:

Email:

***Total grant applied for (SEK):***

***Appendices*** (Tick boxes where included)

1. Summary (1 page, English)
2. Summary (1 page, Swedish)
3. Project description (Max 8 pages, English)
4. Project budget (Download table format Mistra Innovation homepage)
5. Project time plan
6. List of collaborating partners
7. CV of project leader and key investigators (1 page per person)
8. Publication list (Last 5 years)
9. Commitment to cooperate
10. Letters of Intent – LOI

Please note that this document is an example.

The project described is fictitious as are all of the names and organisations.

# **Heat Recycling from Household Waste Water**

**Research Proposal**

# 1. English summary (1 page)

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## Heat Recycling from Household Waste Water (HeRe HoWW)

### Summary

Swedish households consume in the region of 10 000 kwh (kilo watt hours) energy annually for heating water for laundry, dishwashing, washing and showering. The energy content in the water leaving the house is wasted along with the valuable investment it represents.

This project presents a method to recover energy content from waste water using a simple heat exchanger with limited moving parts, providing a ready source of heated water which is returned to the household. Furthermore the system is coupled to a thermoelectric generator which provides the power to drive the system.

Do not exceed 1 page for this summary.

## 2. Svensk sammanfattning (1 page)

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### Värmeåtervinning från hushållsavloppsvatten

#### Sammanfattning

Svenska hushåll förbrukar ca. 10 000 kwh (kilowatt-timmar) årligen uppvärmning av vatten till olika ändamål. Energiinnehållet i vattnet går förlorat när vattnet spolats bort till avloppsnätet.

Projektet presenterar en metod för återvinningen av energiinnehållet från vattnet med hjälp av värmeväxlare och en termoelektrisk generator.

Överskrid inte en sida för sammanfattning

## 3. Project description (8 pages)

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### Background

Waste water from Swedish households contains energy worth in the region of 5000 SEK per household. The total value for the loss of this energy resource is at least 2 billion SEK. Recovery of even a fraction of this value would have a significant effect on Swedish household economy. The vision encompassed in this project is to achieve a high level of energy recovery through the use of simple technology in an innovative manner. The system proposed is simple, robust and should have a payback time for consumers of three years or less. Implementation should be simple and therefore market penetration rapid.

### Objectives of the project

This project will produce a prototype system to demonstrate the feasibility of using simple separation and recombination methods together with heat exchangers and pumps to recover low grade energy from effluent waters and to convert it into high grade (high temperature) energy for reuse in households. The project will produce models for calculation of heat loss and recovery and also economic models for demonstration of the efficiency of the system.

### The project

The energy recovery system to be developed requires concentration and separation of solid waste from liquid waste followed by heat recovery using a static heat exchanger. A heat pump coupled to the system further refines the energy recovered for return to the household.

Expand the description of the project and provide an account of how researchers at the academic institution will contribute to the project. Provide a list of tasks or work packages to be included in the project for the commercial and academic partners. The scientific and commercial values should be estimated.

## **Environmental problems addressed**

Successful commercialisation will lead to a reduction in energy consumption which in turn will reduce emission of greenhouse gasses.

Expand this section for a complete review of environmental problems addressed and how the project can help in their solution.

## 4. Budget

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A template document (Word) is available from Mistra.

### Budget

Cost (kSEK)	2013	2014	2015	Total
<b>Cost at KTH</b>				
Salary, researchers	450	450	150	1 050
Salary, other personnel	130	130	0	260
Equipment	50	50	0	100
Materials and consumables	80	80	20	180
Travel	50	50	30	130
Other costs	100	100	50	250
Overhead (max 140 kkr/employee)	140	140	40	320
<b>Total at research institute</b>	<b>1000</b>	<b>1000</b>	<b>290</b>	<b>2 290</b>
<b>Cost at CTH</b>				
Salary, researchers	450	450	0	900
Salary, other personnel	130	130	0	260
Equipment	50	50	0	100
Materials and consumables	30	30	0	60
Travel	50	50	0	100
Other costs	50	50	0	100
Overhead (max 140 kkr/employee)	140	140	0	280
<b>Total at research institute</b>	<b>900</b>	<b>900</b>	<b>0</b>	<b>1 800</b>
<b>Costs at Avloppsvatten AB</b>				
Salary, Project leader	200	200	120	520
Salary, other personnel	250	250	0	500
Materials and consumables	200	200	10	410
Other costs	100	100	20	220
<b>Total at company</b>	<b>750</b>	<b>750</b>	<b>150</b>	<b>1 650</b>
<b>Costs at Pump AB</b>				
Salary, Project leader	200	200	100	500
Salary, other personnel	250	250	0	500
Materials and consumables	200	200	0	400
Other costs	100	100	0	200
<b>Total at company</b>	<b>750</b>	<b>750</b>	<b>100</b>	<b>1 600</b>
<b>Total for project</b>	<b>3 400</b>	<b>3 400</b>	<b>540</b>	<b>7 340</b>

## Funding

Mistras investment in the project must be matched by contributions from commercial partners in the project.

<b>Funding (kSEK)</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>	<b>Total</b>
<b>Cash</b>				
Mistra	1 600	1 600	0	3 200
Avloppsvatten AB	130	130	130	390
Pump AB	170	170	160	500
<b>Total cash</b>	<b>1900</b>	<b>1900</b>	<b>290</b>	<b>4 090</b>
<b>In kind</b>				
Avloppsvatten AB	750	750	150	1 650
Pump AB	750	750	100	1 600
<b>Total in Kind</b>	<b>1500</b>	<b>1500</b>	<b>250</b>	<b>3250</b>
<b>Total for project</b>	<b>3400</b>	<b>3400</b>	<b>540</b>	<b>7 340</b>



# 5. Time plan

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Other formats for presentation of the time plan may be more suitable for different applications

## Deliverables

The project will deliver a number of separate units which will be combined to form a final product prototype.

The Separation unit is crucial to the project, failure for this unit will result in termination of the project.

Deliverable	Date	Consequence
Separation unit	June 2014	Stop/Go
Heat pump	December 2014	Redesign
TEG	September 2015	Alternative power source
1 <sup>st</sup> prototype	February 2015	Stop/Go
Demonstrator	December 2015	Market development
Energy calculation (feasibility)	September 2014	Market value
LCA	September 2014	Market value
Energy calculation (Experimental)	December 2015	Market value

## Activity schedule

	2013		2014			2015		
Development of separation unit	█	█	█	█				
Adaptation of Heat pump			█	█	█			
Design and construction of heat exchanger		█	█	█	█			
Design of TEG						█	█	█
Construction of 1 <sup>st</sup> prototype				█	█	█		
Construction of demonstrator							█	█
Energy calculation	█	█	█				█	█
LCA			█	█	█		█	█

## 6. Collaborating Partners

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### **KTH**

Department

Address

Contact details of primary researcher

### **CTH**

Department

Address

Contact details of primary researcher

### **Avloppsvatten AB**

Department

Address

Contact details

### **Pump AB**

Department

Address

Contact details

# 7. CV for key personnel (1 page each)

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Submit for project leader (SME) and lead investigators at the academic institution(s).

Name: Kalle Kran  
Date of Birth: 1 January 1970  
Place of Birth: New York, USA  
Current Address: 1 Storgatan  
111 00 Storstaden  
Contact: 00-123-456-78  
[Kalle.kran@avloppsvatten.se](mailto:Kalle.kran@avloppsvatten.se)

## Education

2007 PhD Microbiology, University of Hawaii, USA.  
2001 MSc Pharmaceutical Sciences, Linné University, Kalmar.  
1996 High school diploma, Borås.

## Appointments

2009 – present Development director, Avloppsvatten AB  
2007 – 2009 Site manager, Vattenverket, Kranfors.

## 8. Publications

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Provide a listing of 10 relevant publications from the research group.

# 9. Commitment to cooperate

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Signed by all researchers expected to participate in the project

## Avsiktssförklaring (Commitment to cooperate)

Undertecknade forskare bekräftar härmed vår intention att delta i projektet ”Heat recycling from household waste water” inom ramen för forskningsprogrammet Mistra Innovation. Projektet kommer huvudsakligen att bedrivas vid KTH och CTH.

Ägandet av immateriella rättigheter hanteras i ett avtal som upprättas efter beslut om medel från Mistra Innovation. Undertecknandet av avtalet blir en förutsättning för deltagandet i projektet.

Stockholm den 7 december 2012

R E Searcher

KTH

U P Finnare

CTH

# 10. Letters of intent

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Signed by companies intending to participate in the project. Companies can alternatively submit separate letters of intent.

## Avsiktssförklaring (Memorandum of Understanding)

Undertecknad som behörig representant för respektive företag bekräftar härmed vår intention att delta i projektet "Heat recycling from household waste water" inom ramen för forskningsprogrammet Mistra Innovation. Projektet kommer huvudsakligen att bedrivas vid KTH och CTH.

Inom projektet kommer företagen att samarbeta genom delning av information och resultat.

Fördelning av resultat samt tillgång till respektive företags know-how och rättigheter till immateriella rättigheter hanteras i ett avtal som upprättas efter beslut om medel från Mistra Innovation.

Stockholm den 7 december 2012

N Person

N Person-Till

Avloppsvatten AB

Pump AB

D Ekan

S Rektor

KTH

CTH