

### Small Scale Hydro Calculator

Name/Location of Watercourse:

|                       |                                     |                     |                                       |
|-----------------------|-------------------------------------|---------------------|---------------------------------------|
| Intake Elevation (m)  | <input type="text" value="400"/>    | Kinematic Viscosity | <input type="text" value="1.31E-06"/> |
| Turbine Elevation (m) | <input type="text" value="250"/>    | Roughness Coef (mm) | <input type="text" value="0.003"/>    |
| Head (m)              | <input type="text" value="150"/>    |                     |                                       |
| Pipe Length (m)       | <input type="text" value="600"/>    |                     |                                       |
| Hydraulic Gradient    | <input type="text" value="0.2502"/> |                     |                                       |
| Turbine Eff. (%)      | <input type="text" value="80"/>     |                     |                                       |

### Low Flows Summary

| Annual            | Monthly    |       |     |       |       |       |       |       |       |       |       |       |       |       |       |
|-------------------|------------|-------|-----|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
|                   | Jan        | Feb   | Mar | Apr   | May   | June  | July  | Aug   | Sep   | Oct   | Nov   | Dec   |       |       |       |
| Annual mean flow  | 0.055 m³/s |       |     |       |       |       |       |       |       |       |       |       |       |       |       |
| Annual Q95 (m³/s) | 0.032 m³/s |       |     |       |       |       |       |       |       |       |       |       |       |       |       |
| P (%)             | Q (m³/s)   |       |     |       |       |       |       |       |       |       |       |       |       |       |       |
| 1                 | 5          | 0.201 | 5   | 0.296 | 0.299 | 0.228 | 0.144 | 0.099 | 0.078 | 0.089 | 0.133 | 0.19  | 0.241 | 0.253 | 0.293 |
| 2                 | 10         | 0.136 | 20  | 0.208 | 0.179 | 0.159 | 0.1   | 0.066 | 0.048 | 0.06  | 0.089 | 0.126 | 0.186 | 0.187 | 0.217 |
| 3                 | 20         | 0.082 | 40  | 0.136 | 0.108 | 0.101 | 0.061 | 0.036 | 0.028 | 0.034 | 0.05  | 0.075 | 0.115 | 0.117 | 0.139 |
| 4                 | 30         | 0.055 | 50  | 0.086 | 0.077 | 0.073 | 0.041 | 0.022 | 0.019 | 0.022 | 0.031 | 0.048 | 0.08  | 0.083 | 0.097 |
| 5                 | 40         | 0.039 | 60  | 0.071 | 0.057 | 0.055 | 0.031 | 0.016 | 0.014 | 0.015 | 0.021 | 0.033 | 0.057 | 0.065 | 0.072 |
| 6                 | 50         | 0.028 | 70  | 0.053 | 0.043 | 0.044 | 0.025 | 0.012 | 0.01  | 0.01  | 0.014 | 0.023 | 0.043 | 0.049 | 0.052 |
| 7                 | 60         | 0.02  | 80  | 0.04  | 0.032 | 0.034 | 0.02  | 0.009 | 0.008 | 0.007 | 0.01  | 0.015 | 0.032 | 0.036 | 0.038 |
| 8                 | 70         | 0.014 | 90  | 0.03  | 0.024 | 0.025 | 0.016 | 0.007 | 0.006 | 0.005 | 0.007 | 0.011 | 0.023 | 0.027 | 0.028 |
| 9                 | 80         | 0.009 | 95  | 0.021 | 0.017 | 0.018 | 0.012 | 0.006 | 0.004 | 0.004 | 0.005 | 0.006 | 0.015 | 0.02  | 0.02  |
| 10                | 90         | 0.005 | 99  | 0.014 | 0.011 | 0.013 | 0.008 | 0.004 | 0.003 | 0.003 | 0.003 | 0.004 | 0.009 | 0.014 | 0.014 |
| 11                | 95         | 0.003 |     | 0.01  | 0.008 | 0.01  | 0.007 | 0.003 | 0.002 | 0.002 | 0.002 | 0.003 | 0.007 | 0.01  | 0.01  |
| 12                | 99         | 0.002 |     | 0.007 | 0.006 | 0.007 | 0.005 | 0.002 | 0.001 | 0.001 | 0.001 | 0.002 | 0.004 | 0.006 | 0.005 |

### Cost of System

**Sizing Turbine**

Turbine Rating (kW)

Chosen Pipe Diameter (m)

**Operational Range**

Rated Flowrate (m³/s)

Cut in flow

Cut out flow

**Cost Breakdown**

Est. Pipe Cost (per m)

Est. Cost of Pipe

Est. Cost of Turbine

Groundwork/Power House  include the costs for powerhouse

Transmission Distance (km)

Overhead

Underground

Est. Transmission Cost

Est. CapEx

Est. OpEx

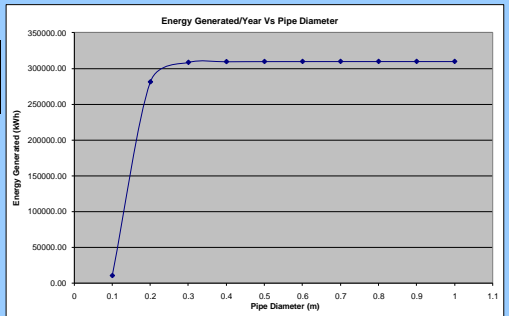
**Feed-in Tariff**

| FTS Range    | Generation Price (£) | Export | Total |
|--------------|----------------------|--------|-------|
| < 15kW       | 0.199                | 0.03   | 0.229 |
| >15 - 100 kW | 0.178                | 0.03   | 0.208 |
| >100kW - 5MW | 0.11                 | 0.03   | 0.14  |
| >5MW - 5MW   | 0.045                | 0.03   | 0.075 |

Tariff Price

**Revenue Forecast**

| Pipe Diameter (m) | Energy Generated per year (kWh) | Revenue per year (£) |
|-------------------|---------------------------------|----------------------|
| 0.1               | 10354.29                        | £1480.60             |
| 0.2               | 281246.34                       | £39374.49            |
| 0.3               | 308549.37                       | £43196.91            |
| 0.4               | 309534.19                       | £43334.79            |
| 0.5               | 309739.03                       | £43363.46            |
| 0.6               | 309801.21                       | £43372.17            |
| 0.7               | 309824.44                       | £43375.42            |
| 0.8               | 309834.47                       | £43376.83            |
| 0.9               | 309839.30                       | £43377.50            |
| 1                 | 309841.83                       | £43377.86            |



### Payback Period

|                                |                                 |   |               |                                     |
|--------------------------------|---------------------------------|---|---------------|-------------------------------------|
| Tax rate                       | <input type="text" value="35"/> | % | Turbine (kW)  | <input type="text" value="110.00"/> |
| Long term interest rate        | <input type="text" value="7"/>  | % | Pipe Dia. (m) | <input type="text" value="0.30"/>   |
| Long term inflation rate       | <input type="text" value="2"/>  | % |               |                                     |
| % of profits to debt repayment | <input type="text" value="80"/> | % |               |                                     |

| Year | Investment Balance | Generation Income | Debt Interest Repayment | Annual OpEx | Total Outgoings | Pre-Tax Profit/Loss | Tax Profit/Loss | Net Profit/Loss | Cumulative Profit/Loss | Debt Capital Repayment |
|------|--------------------|-------------------|-------------------------|-------------|-----------------|---------------------|-----------------|-----------------|------------------------|------------------------|
| 1    | £244,867           | £43,197           | £17,141                 | £12,550     | £29,691         | £13,506             | £8,779          | £22,285         | £22,285                | £7,023                 |
| 2    | £237,844           | £44,061           | £16,649                 | £12,801     | £29,450         | £14,611             | £9,497          | £22,591         | £44,876                | £7,598                 |
| 3    | £230,246           | £44,949           | £16,117                 | £13,067     | £29,173         | £15,768             | £10,249         | £22,942         | £67,818                | £8,199                 |
| 4    | £222,037           | £45,841           | £15,543                 | £13,339     | £28,861         | £16,973             | £11,071         | £23,336         | £91,154                | £8,823                 |
| 5    | £213,218           | £46,758           | £14,925                 | £13,585     | £28,510         | £18,248             | £11,861         | £23,769         | £114,923               | £9,485                 |
| 6    | £203,729           | £47,693           | £14,261                 | £13,856     | £28,117         | £19,576             | £12,724         | £24,243         | £139,166               | £10,179                |
| 7    | £193,599           | £48,647           | £13,548                 | £14,143     | £27,682         | £20,968             | £13,647         | £24,750         | £163,916               | £10,904                |
| 8    | £182,848           | £49,620           | £12,785                 | £14,446     | £27,201         | £22,418             | £14,572         | £25,289         | £189,205               | £11,658                |
| 9    | £171,500           | £50,612           | £11,969                 | £14,764     | £26,724         | £23,938             | £15,560         | £25,859         | £215,064               | £12,444                |
| 10   | £158,542           | £51,621           | £11,098                 | £14,998     | £26,096         | £25,528             | £16,593         | £26,452         | £241,516               | £13,275                |
| 11   | £145,067           | £52,651           | £10,169                 | £15,258     | £25,407         | £27,191             | £17,674         | £27,099         | £268,615               | £14,158                |
| 12   | £131,129           | £53,710           | £9,179                  | £15,504     | £24,753         | £28,927             | £18,800         | £27,827         | £296,442               | £15,092                |
| 13   | £116,687           | £54,794           | £8,126                  | £15,916     | £24,043         | £30,742             | £19,982         | £28,604         | £325,046               | £15,866                |
| 14   | £100,101           | £55,880           | £7,007                  | £16,235     | £23,242         | £32,638             | £21,215         | £29,433         | £354,479               | £16,672                |
| 15   | £81,430            | £56,977           | £5,818                  | £16,580     | £22,379         | £34,610             | £22,500         | £30,310         | £384,789               | £17,500                |
| 16   | £60,728            | £58,137           | £4,565                  | £16,891     | £21,459         | £36,668             | £23,847         | £31,235         | £415,024               | £18,350                |
| 17   | £46,050            | £59,300           | £3,224                  | £17,228     | £20,452         | £38,848             | £25,251         | £32,216         | £446,240               | £19,201                |
| 18   | £25,849            | £60,486           | £1,809                  | £17,573     | £19,362         | £41,104             | £26,717         | £33,253         | £478,493               | £20,074                |
| 19   | £4,075             | £61,696           | £313                    | £17,924     | £18,238         | £43,458             | £28,241         | £34,359         | £511,852               | £20,968                |
| 20   | £0                 | £62,930           | £0                      | £18,283     | £18,283         | £44,647             | £29,020         | £35,537         | £547,389               | £0                     |